WAR DEPARTMENT TECHNICAL MANUAL **TM 5-3014**

TRACTOR, WHEELED, RUBBER TIRED, GASOLINE, 23 D. B. H. P., STANDARD. CASE "SI" (AIRBORNE), WITH HOUGH "SI" LOADER BUCKET.

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MAINTENANCE INSTRUCTIONS AND PARTS CATALOG

WAR DEPARTMENT • JANUARY 1944

TM5-3014

WAR DEPARTMENT

TM5 - 3014, Maintenance Manual and Parts Catalog. Air Borne, Model "SI", published by the J. I. Case Company, is furnished for the information and guidance of all concerned.

(AG 300.7 (18 June 1943)

G. C. MARSHALL,
CHIEF OF STAFF.

Official:

J. A. ULIO,
Major General,
The Adjutant General.

TM5-3014

Combined

OPERATOR'S MANUAL
MAINTENANCE MANUAL
and
SPARE PARTS LIST
for
AIR BORNE TRACTOR
Model "SI"

Manufactured For

CORPS OF ENGINEERS

by

J. I. CASE COMPANY
RACINE - - WISCONSIN

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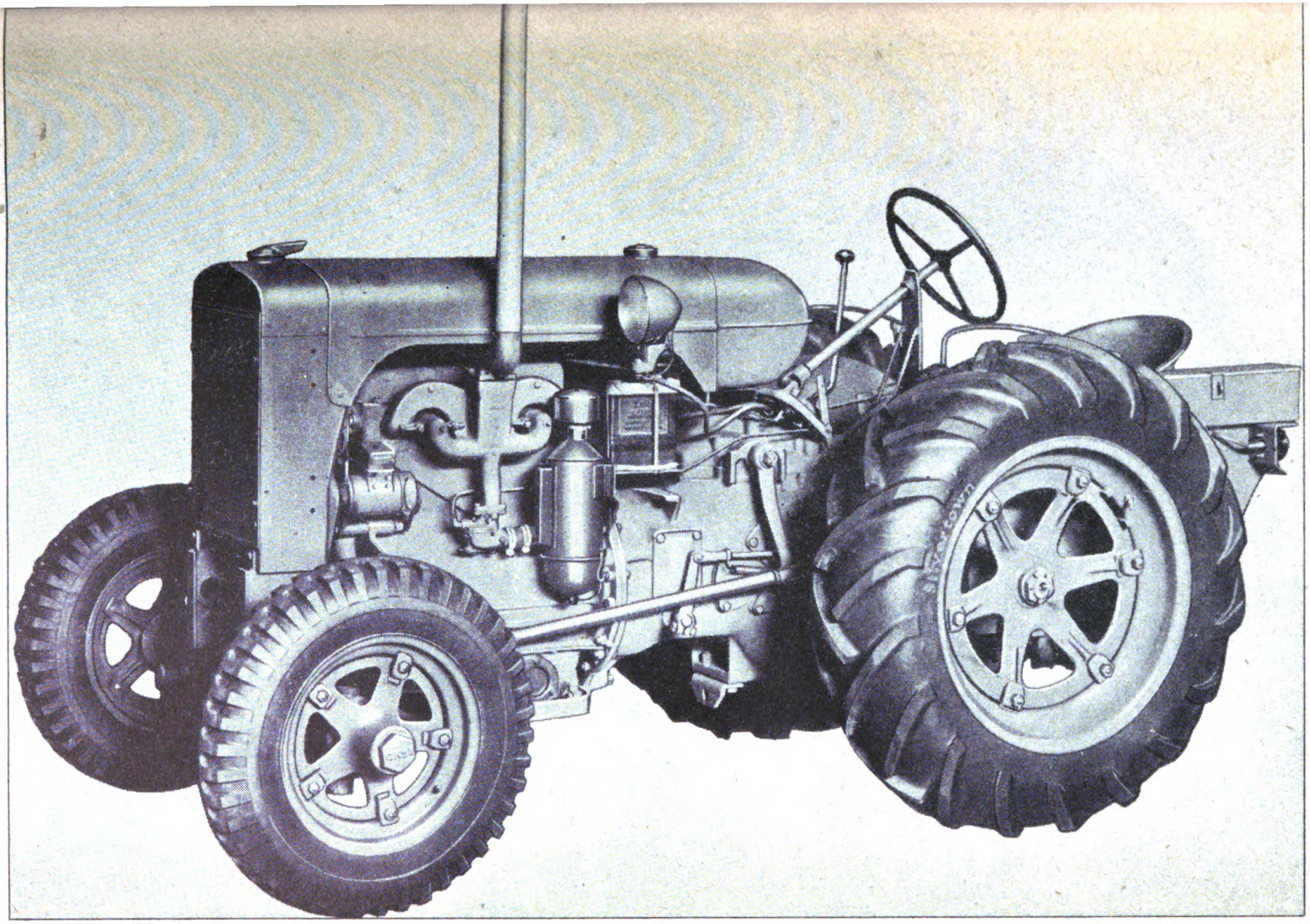


Fig. 1. Case Model 'SI' Air Borne Tractor Ready for Operation (with one piece rear wheel)

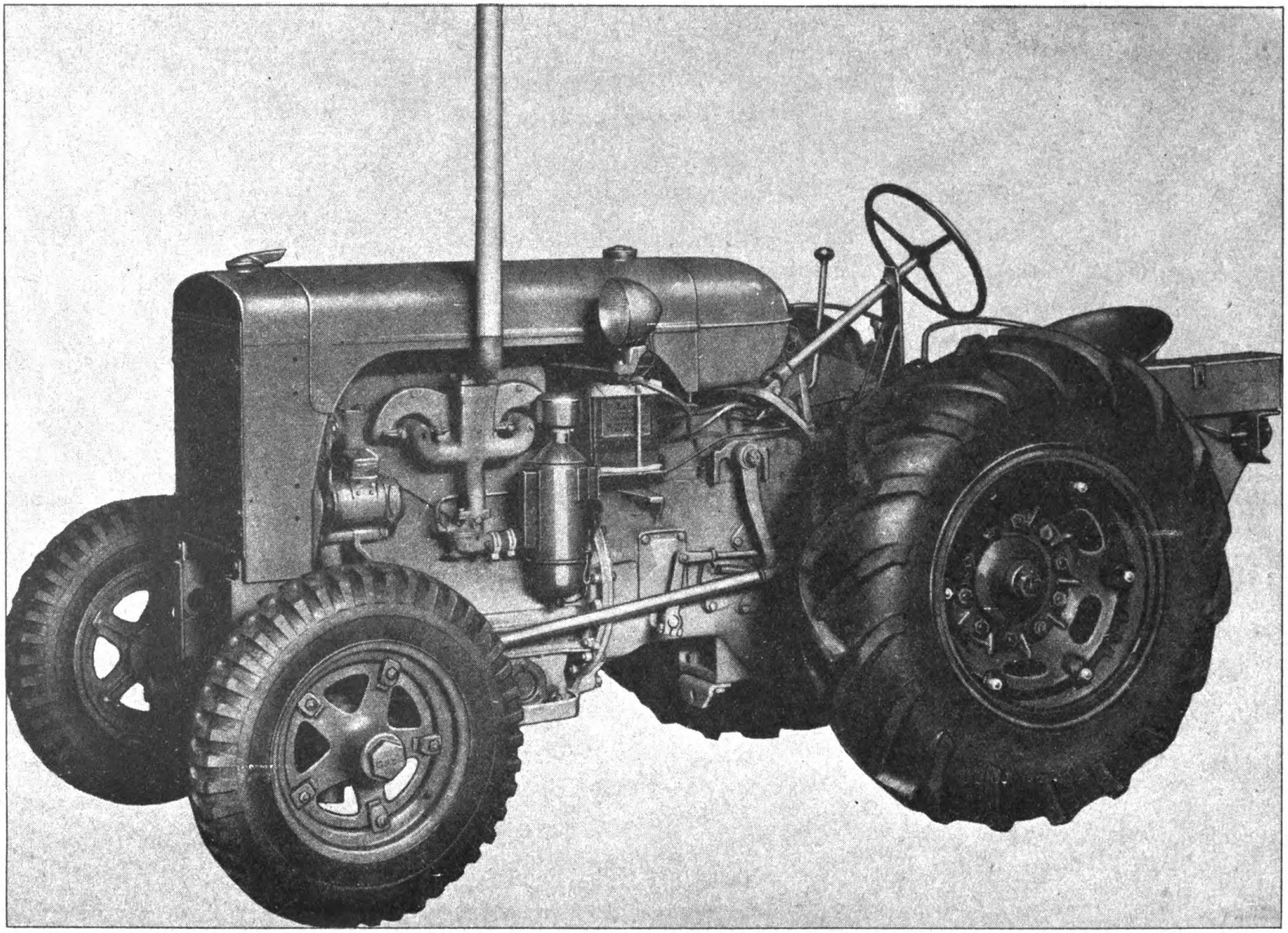


Fig. 1A.—Case Model "SI" Air Borne Tractor Ready for Operation (with two piece rear wheel).

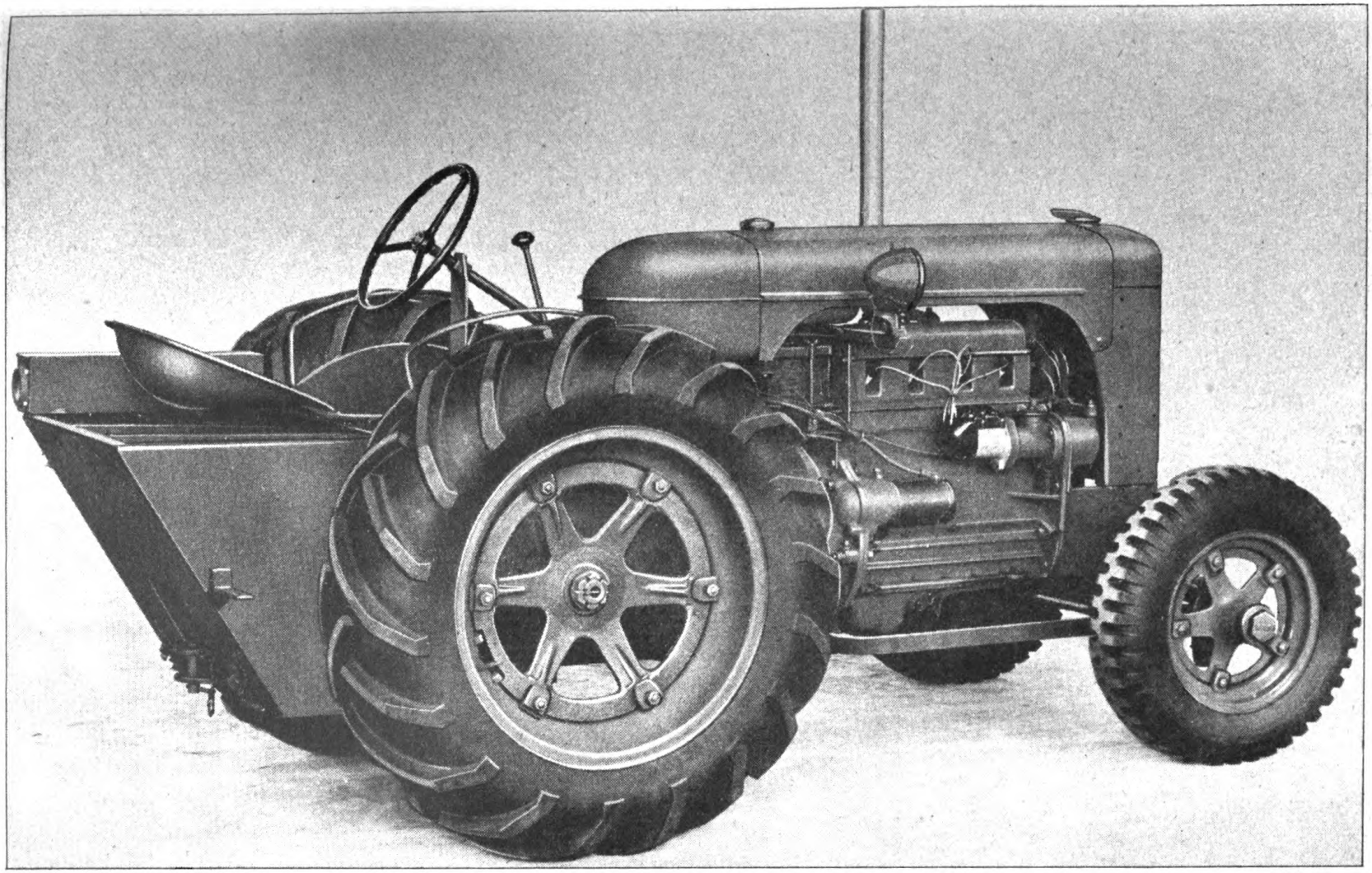


Fig. 2. Case Model 'SI' Air Borne Tractor as Furnished the U. S. Army (with one piece rear wheel)

6A

The Case Model 'SI' Air Borne Tractor which you are operating was designed and built to do a specific job for your Army. The primary consideration is a maximum of power and dependability with a minimum of weight.

Case tractors have, for many years, built a reputation for dependable and economical service both in the Agricultural field and for Highway and Industry as well. This tractor includes all these features which have made possible long, dependable service, together with latest engineering knowledge and design.

This tractor is first of all light enough in weight to be handled easily by plane. The simple, dependable, valve-in-head Case built engine assures a power plant that will see the job through. The transmission is the same time-proven construction with chain final drive for best performance.

More work can be done each day of operation because the Model 'SI' is easier to get ready for the job and easier to operate once it is in use. Routine attention such as lubrication has been simplified. There are only a few points to lubricate with a pressure gun. The packless water pump with sealed ball bearing requires no special care. Battery is mounted over the clutch housing—protected yet easily accessible.

Operator convenience also means more work done. Gauges and controls are grouped for convenient observation and operation. Clutch and brake pedals are convenient. Brakes are of the latest type, operating individually or locked together.

SAFETY RULES

For your safety and to prevent damage to the tractor, the following safety rules should be observed at all times:

1. Never make a short turn at high speed. Use brakes for turning only at slow speeds.
2. Exercise extreme caution when traveling on hill sides or over rough ground.
3. Never get on or off a tractor while it is in motion.
4. Engage the clutch gradually when starting the tractor so that the load will be picked up slowly. This is particularly true when the tractor is going up a steep hill, climbing out of a bog or ditch or hitched to a heavy load. When working under these conditions, the operator must be prepared to disengage the clutch quickly if the front wheels raise off the ground.
5. **The power take-off should never be operated without proper guards.** A guard on the tractor and telescoping shields to cover the revolving shaft from the tractor to the driven machine must be securely mounted in place.
6. Because special equipment is mounted on the front of the tractor, when it is necessary to hand crank the engine, this must be done through the first reduction shaft on the right side of the tractor.
7. **Read this Instruction Manual carefully.**

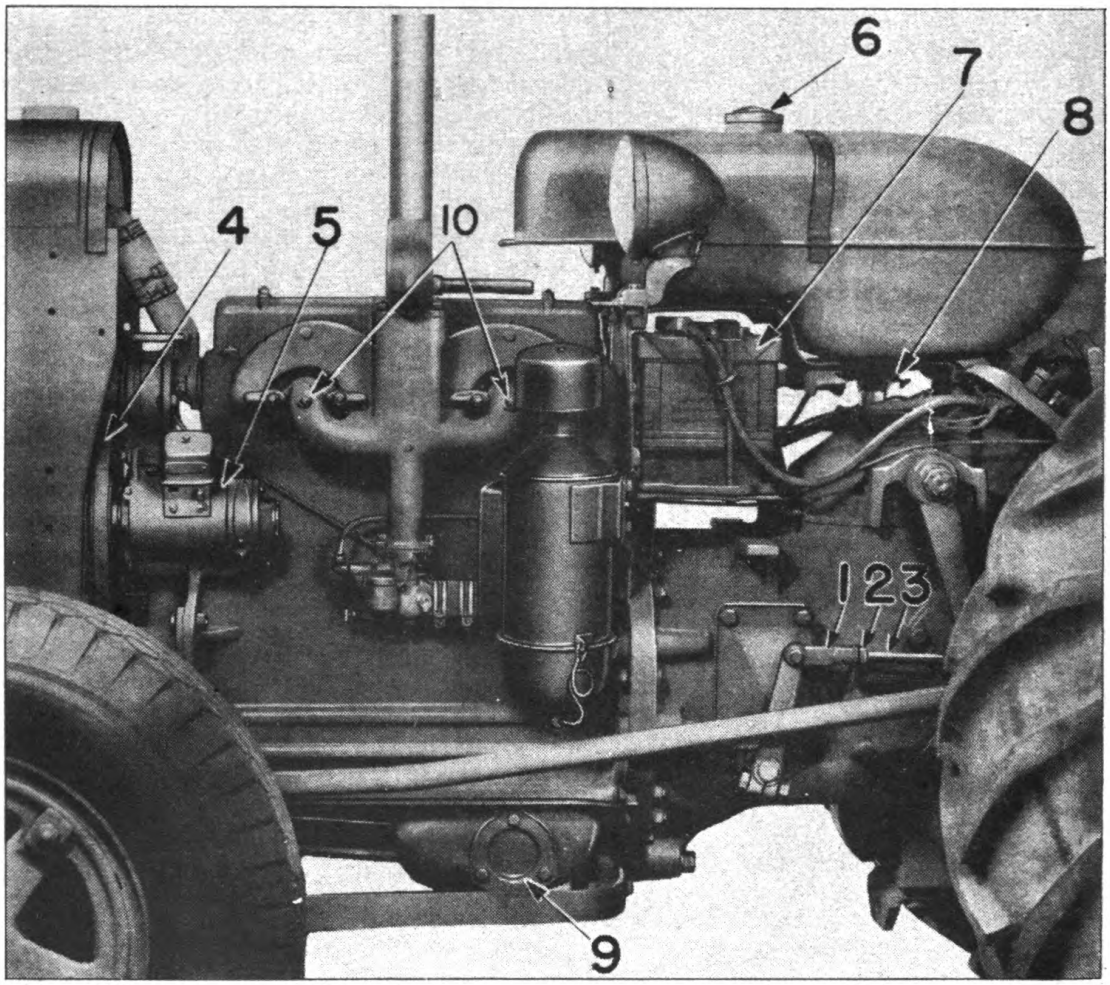


Fig. 3. Left Side of Tractor with Hood Removed

1. Adjustable Clutch Rod Yoke End
2. Locking Nut
3. Clutch Rod
4. Fan Belt
5. Electric Generator
6. Fuel Tank Cap
7. Electric Storage Battery
8. Fuel Strainer Valve
9. Oil Pump Screen
10. Pipe Plugs in Intake Manifold

CONDENSED SPECIFICATIONS AND SERVICE DATA FOR "SI" AIR BORNE TRACTORS

Approximate Capacities

Fuel tank	—14 U. S. gal.,	11.7 Imp. gal.,	53 liters
Cooling system	— 4 U. S. gal.,	3.5 Imp. gal.,	15.2 liters
Engine Crankcase	—5 qts.,	1.12 Imp. gal.,	4.64 liters

Transmission & Differential—9 gal., 7.5 Imp. gal., 34.1 liters.

Engine

Cylinders—4
Bore—3½ inch
Stroke—4 inch
Displacement—153.9 cu. inch
Compression ratio—5.66-1
Compression pressure—126 lbs. (1550 R. P. M.)
Full load speed—1550 R. P. M.
No load speed—1680 R. P. M.
Spark plugs (A. C. No. 45)
Spark plug gap—.025 inch
Valve adjustment—.010 inch when warm
Carburetor (Zenith 161 AXJ 7) No. 18 Venturi.

Clutch

Single plate, spring loaded—11 inch diameter.

Brakes

Disk type, self-energizing in forward and reverse. Mounted on differential side gears—6 inch diameter.

Transmission Speeds (with 12.00-24 tires)

1st—2.1 M. P. H.
2nd—2.86 M. P. H.
3rd—3.94 M. P. H.
4th—8.00 M. P. H.
} at 1550 R. P. M.

4th—10.4 M. P. H. at 2000 R. P. M.

Power Take-Off

Speed (at loaded engine speed)—541 R. P. M.
Size (A. S. A. E. Standard Spline)—1⅜ inch
Height above ground—27¼ inch
Located on center line of tractor.

General Dimensions (tractor only without adapting equipment)

Overall length—9 feet 11 inch
Overall width—59 inch
Height to top of hood—50 7/16 inch
Height to top of steering wheel—56 11/16 inch
Height to top of exhaust—74 inch
Wheelbase—66 inch
Turning radius—11 feet 7½ inch
Drawbar height—13¾ inch

Operating Weight—3188 lbs. (tractor only) (Complete with water, oil and gasoline)

Dry or shipping weight—3062 lbs. (Tractor less water, oil and gasoline).

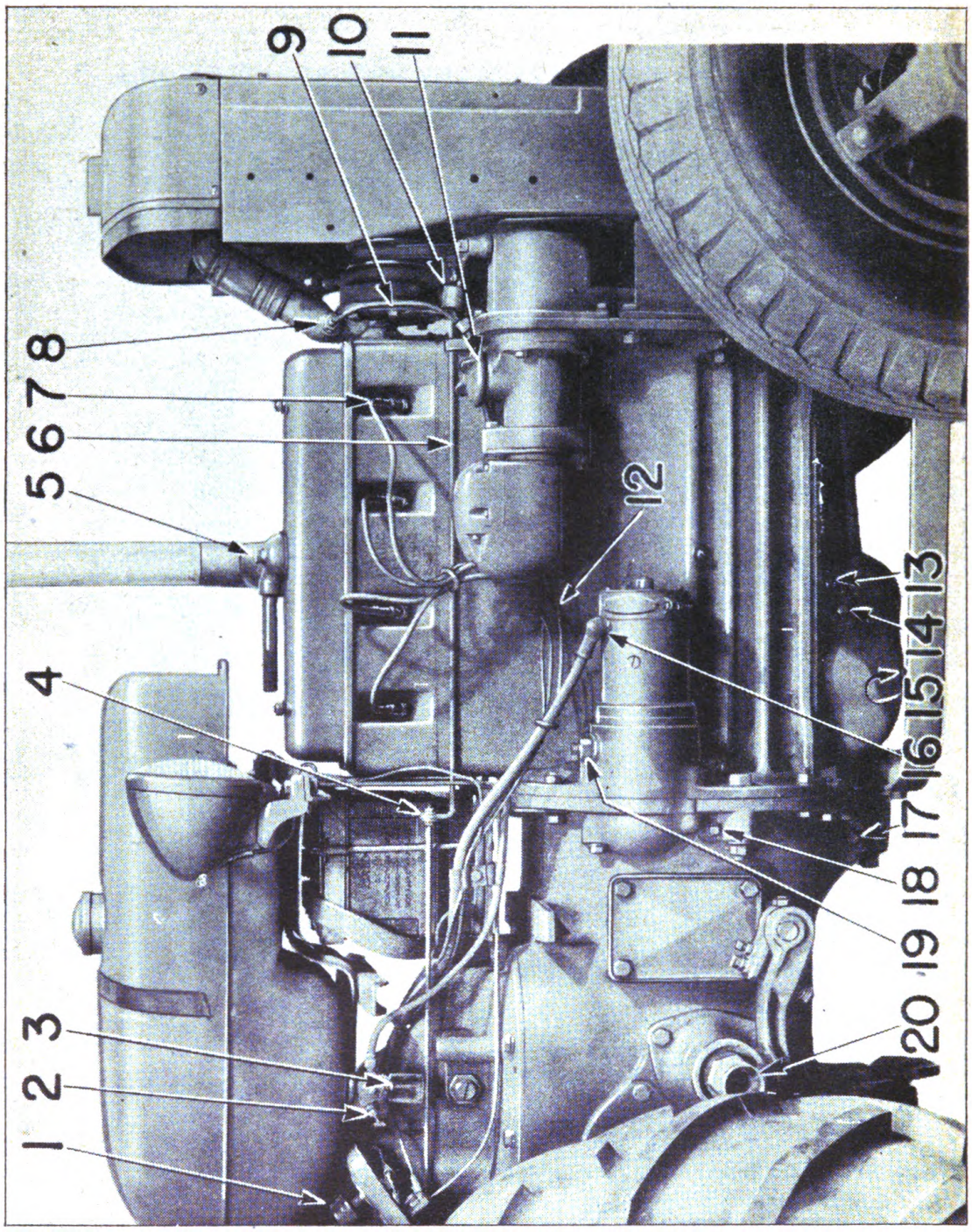


Fig. 4. Right Side of Tractor with Hood Removed

1. Transmission Breather Cap
2. Fuel Strainer Valve
3. Fuel Strainer Bowl
4. Adjusting Point in Throttle Control Rod
5. Engine Breather
6. Throttle Control Rod
7. No. 1 Spark Plug
8. Heat Indicator Bulb
9. Clip Holding Generator Wire
10. Governor Spring
11. Cap for Oil Filler Opening
12. Magneto Ground Wire
13. Upper Engine Oil Level Plug
14. Lower Engine Oil Level Plug
15. Crankcase Drain Plug
16. Starting Motor Attaching Cable
17. Clutch Housing Drain Plug
18. Timing Hole Plug
19. Starting Motor Lock Screw
20. Cranking Jaw and Sleeve

PREPARING A NEW TRACTOR FOR USE

This tractor has been tested and thoroughly inspected before being shipped from the factory. It is strongly recommended that the operator make a careful inspection as outlined herein before putting the tractor in service.

LUBRICATION

Lubricate the entire tractor using the Lubrication Chart Fig. 8 as a guide.

Check the oil level in the engine crankcase by removing the oil plugs No. 13 and 14 Fig. 4 on the right side of engine. The oil level should be between the two plugs when the engine is not running.

Check the oil level in the air cleaner cup to see that it is filled to the level indicated on the inside of the baffle. Fig. 9.

Check the oil level in the transmission and differential case and be sure it is filled to the height of the level plug on the rear transmission cover.

Before starting a new engine, remove the spark plugs and pour a small quantity of light oil into each cylinder. Replace the spark plugs and crank the engine several revolutions to distribute oil over the cylinder walls. This assures ample lubrication for the pistons and cylinders immediately after the engine starts. This procedure is necessary only for a new engine, or an engine that has been idle for some time (a month or more).

CAUTION: Never test oil levels with the engine running.

NOTE: Tractors are shipped from the factory without oil in the crankcase. Before a new engine is started, five quarts of a good grade of oil having a viscosity of O.E. SAE. No. 10 should be put in the crankcase. In addition to this, for the first fifty hours, add one pint of light oil to each five gallons of fuel. After the engine has been properly run in, discontinue the use of light oil in the fuel, but continue its use in the crankcase in cold weather.

CAUTION: A tractor engine should never be started to facilitate unloading or run even a short distance before the crankcase is filled to the proper level with a good grade of engine oil and the cooling system is filled to capacity. This practice will result in damage to the engine and must be prohibited.

If any new engine is allowed to stand for a considerable length of time, oil drains from the interior parts, causing them to sweat and rust. They may seize when the tractor is started before the engine obtains sufficient lubrication. This is particularly true in cold weather.

COOLING SYSTEM

The capacity of the cooling system is 4 gallons.

See that the drain cap on the lower radiator pipe located on the left side of the radiator is closed tight.

Fill the radiator with clean, soft water. When the tractor is operated in freezing temperatures (32°F. or 0° Cent. or lower), anti-freeze solutions must be used.

FUEL SYSTEM

The fuel system of this tractor is gravity flow.

Capacity of the fuel tank is 14 U. S. gallons.

Shut off valve No. 8 Fig. 3 under the fuel tank and fill tank with gasoline. When the tractor is new, add a pint of light oil to each five gallons of fuel. The engine is designed to operate on gasoline having a minimum rating of 65 octane. To obtain maximum performance, a high grade of fuel should be used.

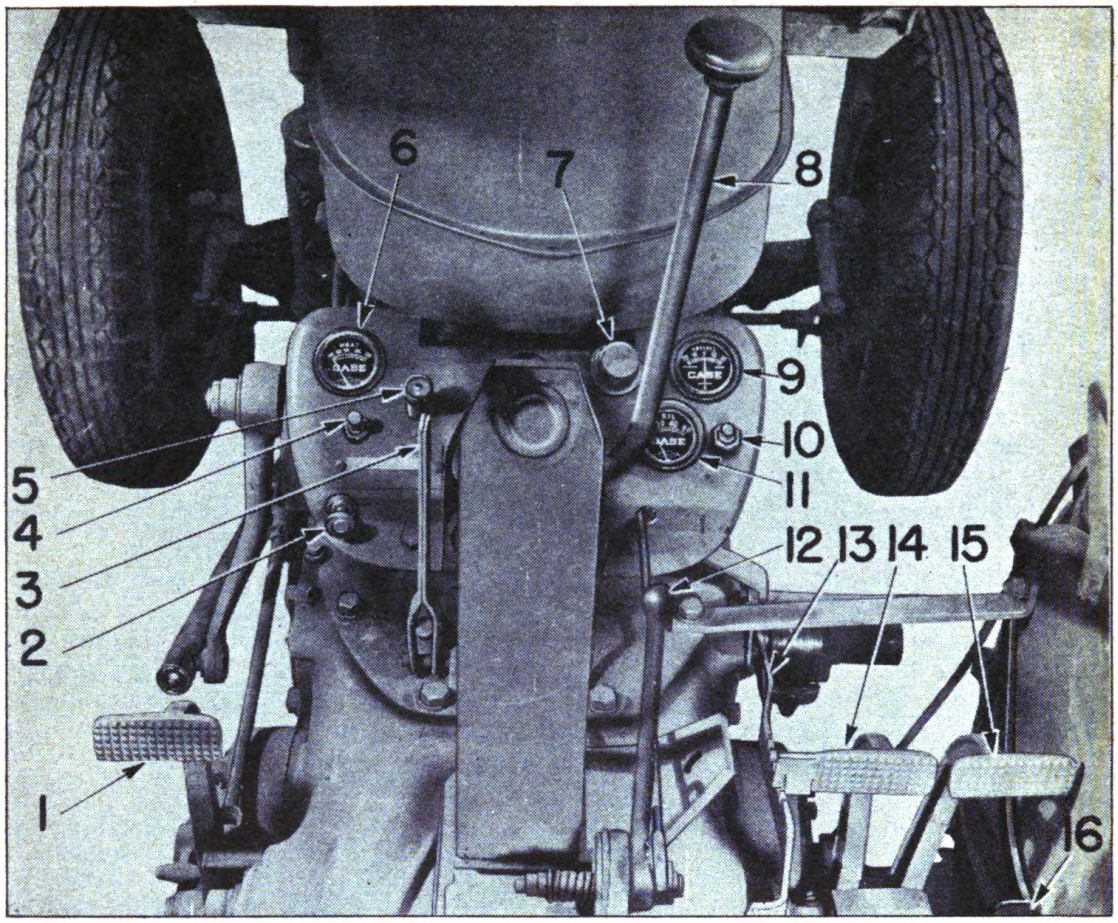


Fig. 5. Operating Controls

1. Clutch Pedal
2. Choke Button
3. Power Take-Off Shifter
4. Ignition Switch
5. Starter Switch
6. Heat Indicator Gauge
7. Transmission Case Breather Cap
8. Gear Shift Lever
9. Ammeter
10. Light Switch
11. Oil Pressure Gauge
12. Throttle Lever
13. Brake Pedal Parking Lock
14. Pedal for Left Brake
15. Pedal for Right Brake
16. Foot Accelerator

Make certain that the air vent in the fuel tank cap is kept open at all times to assure the proper flow of fuel.

CAUTION: Never fill the fuel tank when near an open flame or when the tractor engine is running.

Open drain cock No. 3 Fig. 9 at bottom of the carburetor and turn on the gasoline. Allow enough gasoline to run through to clean out the fuel line and carburetor bowl, then close the drain cock.

SPARK PLUGS AND IGNITION CABLES

Spark plugs are packed in the tool box. Check spark plug gaps. They should be .025 inch. If necessary, adjust the spark plug points by bending the outer electrode; never attempt to bend the center electrode. Always use the socket wrench provided when installing or removing spark plugs. Make certain that the spark plug gaskets are in place to form a gas-tight seal.

The firing order of the engine is 1-3-4-2. No. 1 spark plug is near the front end of the engine—connect the cable from the No. 1 outlet of the magneto distributor to it. No. 2 cable should be attached to No. 2 cylinder, etc.

PNEUMATIC TIRES

Tractor tires are overinflated to assure rigid blocking in shipment.

Before operating the tractor, even to unload, deflate tires—

Front tires	28 lbs. pressure
Rear tires	12 lbs. pressure

Air pressure should not be allowed to drop below these recommendations. Tires should be checked regularly once a week with an accurate low pressure gauge.

Keep tire valve caps in place and screwed tight to prevent mud, gravel and water from entering and damaging the valve core, also to prevent the loss of air.

ELECTRICAL EQUIPMENT

Make sure that all electrical connections are properly made.

Check to see that plates in battery are properly covered with liquid. If not, add distilled water or clean rain water. Fig. 6.

Make a hydrometer test of each cell in the battery. The full charge gravity is between 1.270 and 1.285 at 80 degrees F. In service, the gravity should be between 1.240 and the full charge gravity. With normal use, the generator should maintain the gravity above 1.250.

STARTING THE ENGINE

Before starting, place the gear shift lever in the neutral position. Fig. 5.

Turn carburetor main jet needle valve No. 2 Fig. 9 2 turns counter-clockwise from the closed position.

Set the throttle lever Fig. 5 at about mid-position. Pulling back opens the throttle and causes the engine to operate at higher speed.

Before switching on the ignition, by pulling out switch handle, crank the engine a few revolutions and make sure that the impulse is working freely.

Pull the choke Fig. 5 out ½ to ¾ of its full travel, when starting a cold engine. As the engine warms up, push the choke in gradually. No specific point can be recommended, as this will vary slightly. Do not choke the engine too much or the carburetor will "flood". If the engine is warm, it is best to try starting without using the choke at all. Flooding is usually due to excessive choking or stopping the engine by turning off ignition switch with the throttle fully open.

Use care in hand cranking the tractor Fig. 73 to protect the operator.

Immediately after engine starts, check oil pressure gauge No. 11 Fig. 5 to see that it is registering pressure. If it is not, stop the engine and inspect the oil system to learn the cause of this failure.

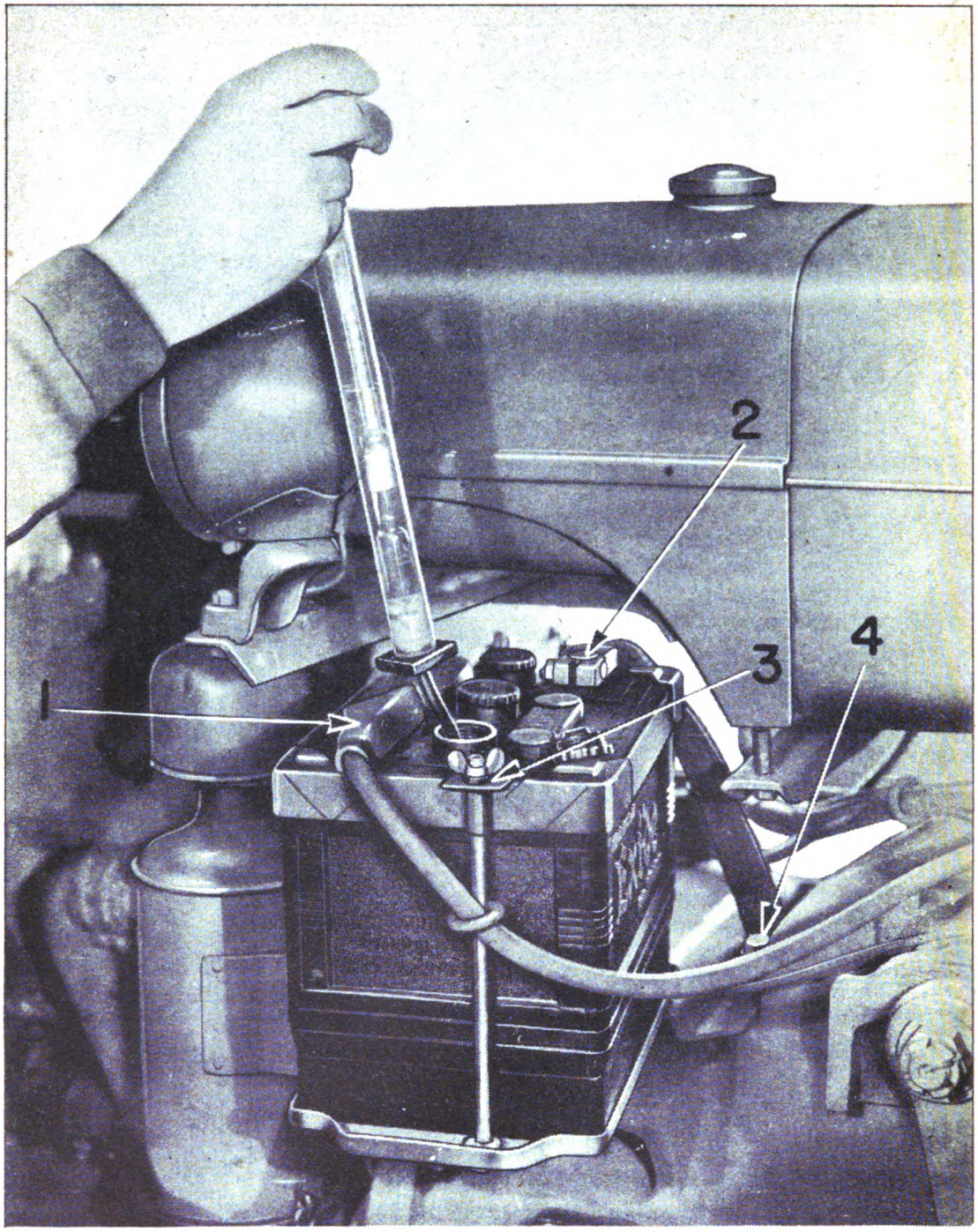


Fig. 6. Servicing Storage Battery

1. **Positive (+) Pole of Battery to Starting Motor**
2. **Negative (−) Pole of Battery to Ground**
3. **Rubber Washer Absorbing Vibration**
4. **Cap Screw Grounding Battery to Transmission Case**

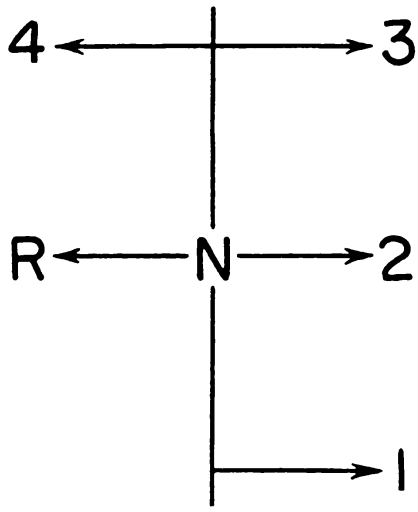


Fig. 7. Gear Shift Diagram

DRIVING THE TRACTOR

With the engine running, depress the clutch pedal and shift into the road speed desired. The positions for the different speeds are shown in Fig. 7. When starting the tractor, speed up the engine with the foot accelerator and engage the clutch gradually by slowly releasing the pressure on the clutch pedal. Do not engage the clutch suddenly thus allowing the tractor to jerk into the load.

The gear speed selected depends entirely on the load and ground conditions. Occasionally the gears will stop with the teeth opposite each other and thereby prevent easy meshing. Should this occur, partly engage the clutch and allow the gears to rotate slowly. The teeth will then mesh readily. This condition occurs most frequently when the tractor is new.

The road speeds in miles per hour for this tractor equipped with 12.00-24 rear tires and the engine operating at 1550 R. P. M. is as follows:

1st Gear 2.1 M. P. H.
2nd Gear 2.86 M. P. H.
3rd Gear 3.94 M. P. H.
4th Gear 8.00 M. P. H.
Reverse Gear 2.26 M. P. H.

CAUTION: Do not drive the tractor with your foot resting on the clutch pedal. This will cause undue wear on the clutch facings and throwout bearings.

STOPPING TRACTOR

Disengage the clutch by pressing down firmly on the clutch pedal and move the gear shift lever to neutral position. It is recommended that the engine be throttled down before disengaging the clutch and then applying the brakes to stop forward motion of the tractor. If the tractor is to remain standing for a length of time, it is advisable to lock the foot brake.

STOPPING ENGINE

Retard the throttle completely by pushing the throttle lever forward, thus reducing the engine speed, then turn off ignition switch.

It is advisable to close the fuel tank shut-off valve if the tractor is to remain idle for any length of time.

TRACTOR BRAKES

This tractor is equipped with differential or turning brakes No. 14 and 15, Fig. 5. They can be used independently to assist in turning, locked together as regular driving brakes or locked as a parking brake.

When used independently, operator should not attempt to steer the tractor with the brakes alone. They are to only assist in turning. It is therefore, necessary, in making short turns, to turn the steering wheel in the desired direction of travel before the brake is applied.

When traveling at high speeds or with loads on highways, the brake pedals should be locked together. This is done by engaging the Brake Pedal Lock Pin mounted in the right-hand brake pedal No. 15 Fig. 5 in the hole in the left-hand brake pedal No. 14 Fig. 5 and locking. When stopping a heavy rolling load such as a loaded trailer, throttle the engine down before applying the brakes. In this way the compression of the engine will slow down the load and reduce the strain and wear on brakes and brake linings.

By using brake pedal parking lock No. 13 Fig. 5, the brakes can be locked and used as a parking brake.

POWER TAKE-OFF

The power take-off is put into operation by pushing the power take-off shifter Fig. 5 toward the instrument panel with the clutch disengaged. The power take-off is stopped and started by means of the main tractor clutch.

This power take-off has an A. S. A. E. standard 1 3/8 inch spline and operates at 541 R. P. M. at a normal engine speed of 1550 R. P. M. The speed of the power take-off shaft is in direct proportion to the speed of the engine, regardless of the gear in which the tractor is operated.

A Careful Operator

IS THE BEST INSURANCE

AGAINST AN ACCIDENT

—National Safety Council.

LUBRICATION

Engine Lubricating and Oiling System

A pressure feed lubricating system built into this engine assures positive lubrication to all working parts. A gear type oil pump circulates oil through "Tunnel-Type" passages in the engine block to all main, connecting rod and camshaft bearings, valve rocker arms and governor. All other parts operate in an oil spray from connecting rod bearings. Valve lifters are flood lubricated. Clutch shaft pilot bearing and throw out collar are also pressure lubricated from the engine.

Oil Pump and Screen

Every 256 hours of operation the oil pump screen should be removed and cleaned thoroughly. This will make certain that the oil delivered to the bearings is not restricted in its flow through the screen. Finely finished bearing surfaces will thus be protected.

To take out the screen, drain the oil and remove the three cap screws Fig. 3. The screen and cap can then be withdrawn as a unit. Use care to protect the gasket from damage.

Rinse the screen in a pail of gasoline to remove all dirt, water and other matter. Clean the screen thoroughly.

While the screen is out of the engine, inspect the interior of the crankcase and clean out any sludge or dirt that may have collected.

Replace the screen and tighten cap screws securely. Fill the crankcase Fig. 4 with 5 quarts of oil. During the first hour or so of operation observe carefully to make sure no oil leaks are present.

Oil Pressure

The oil pump is equipped with a non-adjustable relief valve. This valve is set to show 25 to 30 pounds pressure on the oil gauge when the oil and the bearings are in good condition.

With continued use of the engine, the pressure may gradually decrease due to the increased clearance in the bearings. The pressure should never be allowed to go below 15 pounds at normal engine speed without investigating cause and correcting it.

The oil pressure necessary to properly supply the engine may fail because of—

1. Dirty oil pump screen.
2. Condensation of water in crankcase and freezing around the screen when operating in cold weather.
3. Lack of oil in crankcase.
4. Oil too heavy to flow.
5. Loose bearings.
6. Broken oil pump parts.

Crankcase Breather

The breather on the valve cover Fig. 4 should be removed and inspected every 256 hours. Clean out any dirt that may have accumulated in the pipe. A clean, unobstructed pipe is necessary to obtain the proper breathing action.

Crankcase Capacity

The oil capacity of the crankcase is 5 quarts (U. S. Measure). After 128 hours of operation, remove the crankcase drain plug and clutch housing drain plug, No. 15 and 17 Fig. 4 when the engine is hot and drain out all oil. Fill with 5 quarts of new oil, No. 11 Fig. 4.

Lubrication Guide for Case Model "SI" Air Borne Tractor

Manufacturer's Serial No. Located on Plate on Instrument Panel

Key Lubricants

OE - OIL, Engine Crankcase Grade
GO - LUBRICANT, Gear Universal
CG - GREASE, General Purpose
No. 1 (Above + 32° F.)
No. 0 (+ 32° F. to 0° F.)
WB - GREASE, General Purpose No. 2

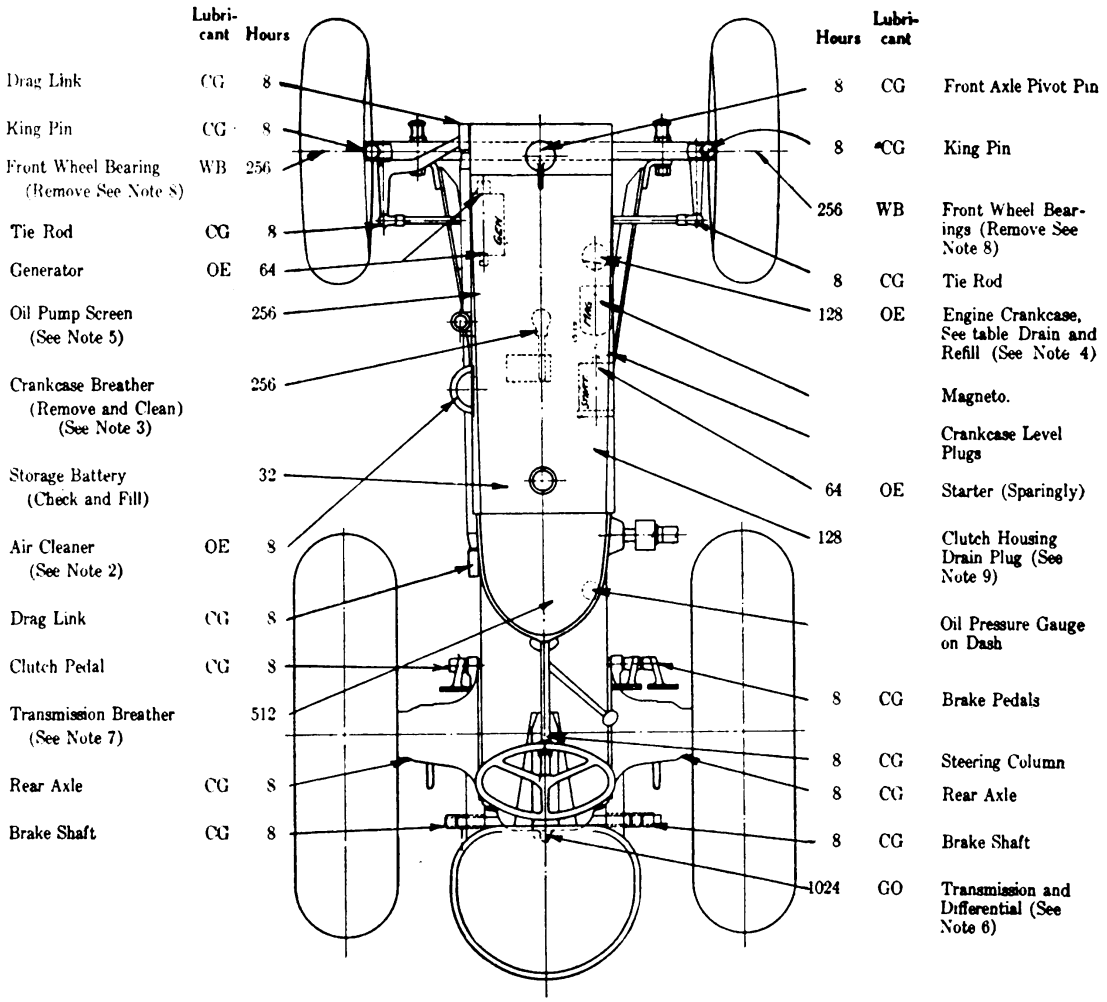


Fig. 8. Lubrication Chart for Case Model 'SI' Air Borne Tractor

Table of Capacities and Lubricants to be Used

UNIT	Capacity (Approx.)	Lowest Expected Air Temperature		
		Above + 32° F.	+ 32° F. to 0° F.	Below 0° F.
Crankcase	5 Qts.	OE SAE 30	OE SAE 10	
Transmission and Differential	9 Gals.	GO SAE 90	GO SAE 80	

Tire Pressures Front 28 lbs. Rear 12 lbs.

NOTES—Additional Lubrication and Service Instructions on Individual Units and Parts

Fittings

1. Clean before applying the lubricant gun.

Air Cleaner

2. Every 8 hours take off oil cup and remove baffle. Clean thoroughly and refill to indicated level with OE. Under dusty conditions, clean and refill more often. Keep all connections tight. See pages 23 and 47 for further information.

Crankcase Breather

3. Every 256 hours remove and clean thoroughly.

Crankcase

4. Every 8 hours check and fill to level of upper level plug. Every 128 hours completely drain crankcase and clutch housing, when engine is hot, then refill to upper level plug. See table. **Caution:** When running engine, be sure pressure gauge indicates oil is circulating.

Oil Pump Screen

5. Every 256 hours remove, clean and replace. See page 17 for full instructions.

Transmission and Differential

6. Every 128 hours check level with tractor on level ground and add lubricant if necessary. When draining, drain immediately after operation.

Transmission Breather

7. Every 512 hours, remove, wash in gasoline and add OE.

Front Wheel Bearings

8. Remove wheel, clean and repack bearings.

Clutch Housing

9. Drain oil from clutch housing when completely draining crankcase.

Oil Can Points

10. Every 64 hours lubricate clutch and brake linkage, throttle and governor connections with OE.

Points Requiring No Lubrication

11. Clutch pilot bearing, clutch release bearing, steering gear, governor, power take-off, magneto, radius rod ball and socket, engine valve rocker arms.

Although the oil level should be maintained to the level of the top plug, no difficulty will be experienced if the engine is operated with the level slightly below this top plug. Under no circumstances should it be operated if the oil level is below the lower plug.

ENGINE OIL RECOMMENDATIONS

Air Temperatures	Viscosity of Oil
*Above +32°F.	SAE 30
*+32°F. to 0°F.	SAE 10

*Lowest expected air temperature.

TRANSMISSION AND DIFFERENTIAL

The shafts, gears, chains and bearings in the transmission and differential case are continually bathed in oil. The case is completely sealed, and the only way dirt can enter the lubricant is through careless filling. The oil used is of such heavy body that any dirt in it may remain suspended due to the continuous surging action caused by the gears and chains. This gritty oil will cause rapid wear and early replacement of parts.

TRANSMISSION OIL RECOMMENDATIONS

Capacity—Approximately 9 gallons U. S. Measure

Air Temperature	Viscosity
32°F. and above	SAE 90
Below 32°F.	SAE 80

Every 1024 hours the transmission case should be drained, flushed and refilled.

Transmission Case Breather

The breather on the transmission case top cover should be removed and inspected every 512 hours. Rinse it out in gasoline, then dip in engine oil.

GREASE GUN LUBRICATION

The front wheel bearings are packed with grease at the factory and, under normal conditions, will require no attention for the first 256 hours of operation. The wheel bearings should be removed, cleaned thoroughly and repacked with a good grade of fiber grease. This should be repeated every 256 hours thereafter.

Pressure lubrication fittings are provided wherever automatic lubrication cannot be provided. A good grade of semi-fluid pressure gun lubricant should be used in the grease gun in warm weather. In cold weather a lighter grade of lubricant is desirable, to insure proper lubrication of the bearing surfaces. Wipe the pressure fittings clean before using the grease gun.

OPERATOR'S MAINTENANCE

In addition to operating and lubricating the tractor as previously indicated, under many circumstances it will be necessary for the operator to make minor field adjustments and repairs. All the adjustments discussed in the remainder of the **Operator's Instruction** section can be made by the operator with the tools carried on the tractor. It is suggested that other servicing be left to field maintenance sections or the tractor returned to a base for complete overhaul.

Carburetor Adjustments

The carburetor used on this tractor is easily adjusted and once properly set, requires little attention. Only three adjustments are provided—Idling Speed Screw, Idling Jet and the Main Jet. All carburetors are sensitive, so use care in making adjustments.

Idling Adjustment

Adjustment for idle speed and idle mixture can best be made together and should be made with the engine warm. The throttle lever on the seat mounting bracket should be all the way forward before making the adjustment. The idling speed screw No. 4 Fig. 9 should be adjusted so that the engine will idle fast enough to prevent stalling. Then turn the idling jet adjusting screw No. 1 Fig. 9 in or out until the engine runs smoothly.

A good starting point for this adjustment is one full turn from the idling needle valve seat because the correct setting is usually between ¾ and 1¼ turns open.

Main Jet Adjustment

This adjustment should be made when the engine is warm and working under load because it exerts the greatest influence under those conditions. Turning the valve No. 2 Fig. 9 inward provides a leaner mixture, while turning outward produces a richer mixture.

Turn the valve inward until the engine starts to miss or power falls off. Then turn outward until proper operation is secured—about ⅛ of a turn is usually sufficient. This setting will assure maximum fuel economy with very nearly maximum power.

If the engine will not run with the original setting, make an approximate setting as follows: Turn the main jet valve inward until the needle just seats. Use great care not to force the point against the seat as this may ruin the seat. Next turn the valve outward two full turns. This setting is sufficiently close so that the engine can be operated until final adjustment is made.

Loss of power and spitting through the carburetor indicates the mixture is too lean. This is especially evident when the engine is accelerated by pulling lightly on the throttle rod. An overly rich mixture is indicated by sluggish action of the engine and by the appearance of black smoke at the exhaust. The final setting should be as lean as possible and still have satisfactory engine operation and power.

Further information on Disassembly and Repair of Carburetor is discussed under Maintenance Instructions on page 39.

FUEL FILTER

Another thing that can disturb the functioning of the carburetor on this tractor is dirt and water in the fuel.

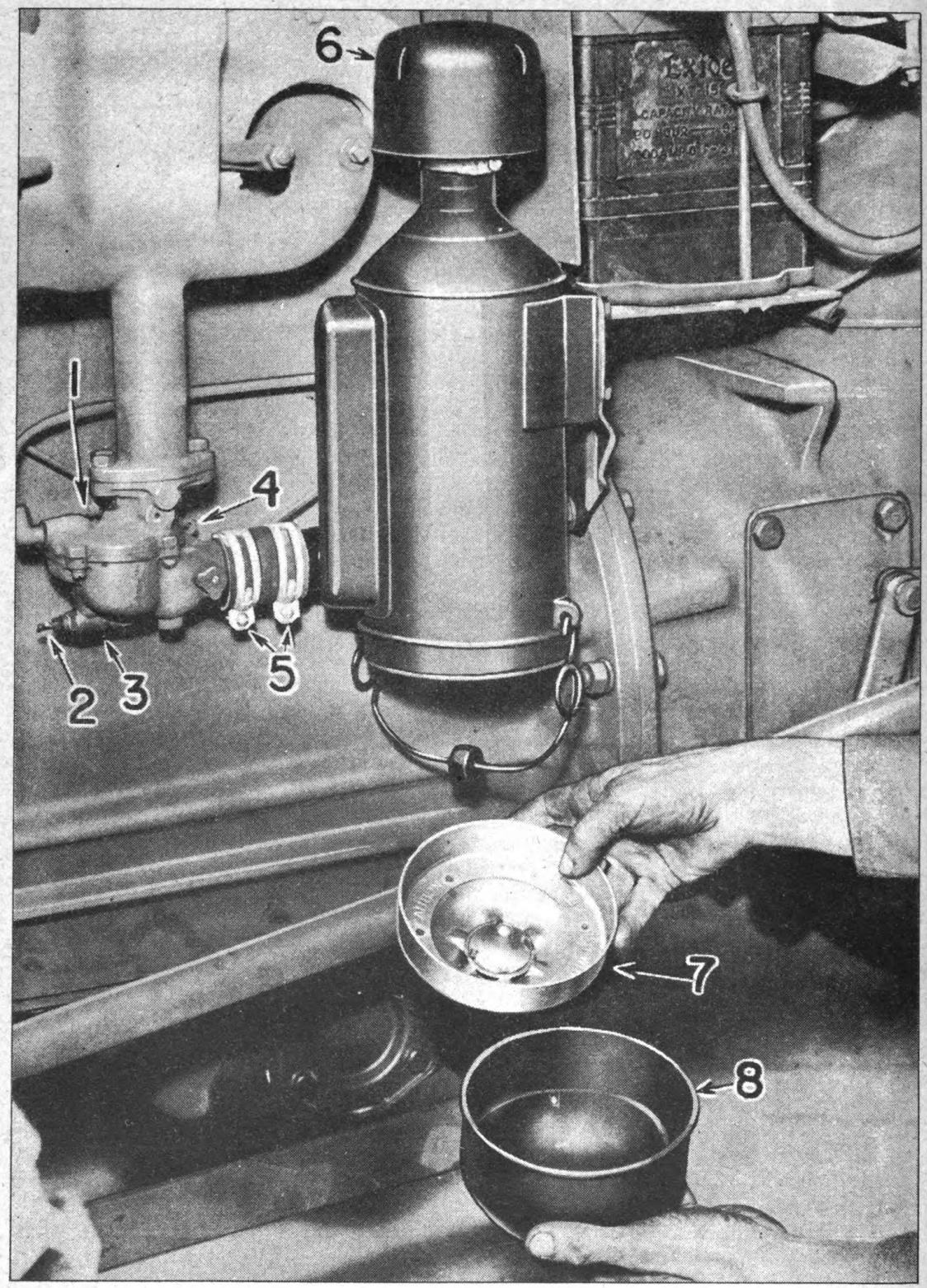


Fig. 9. Left Side of Engine Showing Details of Air Cleaner and Carburetor

1. Idling Jet Adjusting Screw
2. Main Jet Adjusting Screw
3. Carburetor Drain Valve
4. Idling Speed Adjustment
5. Air Cleaner Hose Clamps
6. Air Cleaner Cap
7. Air Cleaner Baffle
8. Air Cleaner Oil Cup

The filter under the fuel tank should be inspected and cleaned at least once every 64 hours (once a week) under ordinary conditions. Shut off the fuel supply valve Fig. 4, remove the spring clip and unscrew the glass sediment bowl. Clean out any foreign matter adhering to the filter disks by unscrewing the filter element and shaking it in clean gasoline. Clean the bowl and reassemble. In cold weather, watch for water or ice that may collect in the bowl.

Keeping the fuel clean will prevent trouble due to clogging of the filter. Water in the fuel is especially troublesome because it may not be completely removed by the filter. Occasionally open the drain valve No. 3 Fig. 9 in the bottom of the carburetor bowl so that any water and foreign material will drain out.

AIR CLEANER

Daily inspection and cleaning of the oil-bath air cleaner is imperative when operating under ordinary conditions. In extremely dusty conditions, more frequent servicing is necessary.

In order to service the air cleaner Fig. 9, it is necessary to loosen the bail which holds the oil cup (8) to the air cleaner body and remove the cup, including the baffle (7). The baffle (7) must be removed from the cup in order to clean the cup. Never let dirt accumulate in the cup. Clean all foreign matter out of the cup and wipe the baffle clean. Replace the baffle and fill the cup with fresh, free-flowing, clean engine oil to the level indicated on the inside of the baffle (7) Fig. 9. Make certain that the gasket is smooth within the lower flange of the body. Then replace cup and baffle as a unit. Lock them into place by swinging bail downward and inward until it snaps into place. See page 47.

CARE OF AIR INLET CONNECTIONS

The clean air connection Fig. 9, should be kept air-tight. Otherwise, the purpose of the air cleaner will be defeated. Be sure hose between the air cleaner and carburetor is properly installed and hose clamps (5) Fig. 9 kept tight. Excessive engine wear will result if there are leaks between the air cleaner and the carburetor or in the manifold.

SPARK PLUGS

The spark plugs used in this tractor are of the 14 m. m. thread size, AC Spark Plug Co. No. 45 or equivalent. Shank length should be 3/8 inch. A gap of .025 inch should be maintained between the electrodes. If the gap between the electrodes is too great due to inproper setting or burning, the spark may jump elsewhere in the circuit, resulting in misfiring. Therefore, it is very important that the gap be maintained properly.

In case one cylinder is missing the probable cause is failure of the ignition or low compression. First, as you crank the engine slowly, notice the compression on the cylinder at fault. Sometimes a valve sticks open, which always causes the cylinder to miss. If the compression is satisfactory, replace the spark plug with a new one, or one from a live cylinder. If the cylinder then fires, the trouble was due to a defective spark plug.

If further difficulty is experienced, examine all wires leading to the plugs and see that they are in good condition. When removing or installing spark plugs, use the special socket wrench furnished with the tools, rather than pliers, open end wrench, or an adjustable wrench, to prevent damage to the porcelain. A cracked porcelain will necessitate replacement of the plug.

Information concerning care of magneto, starter, generator, battery and lights is contained in Maintenance Instructions page 65.

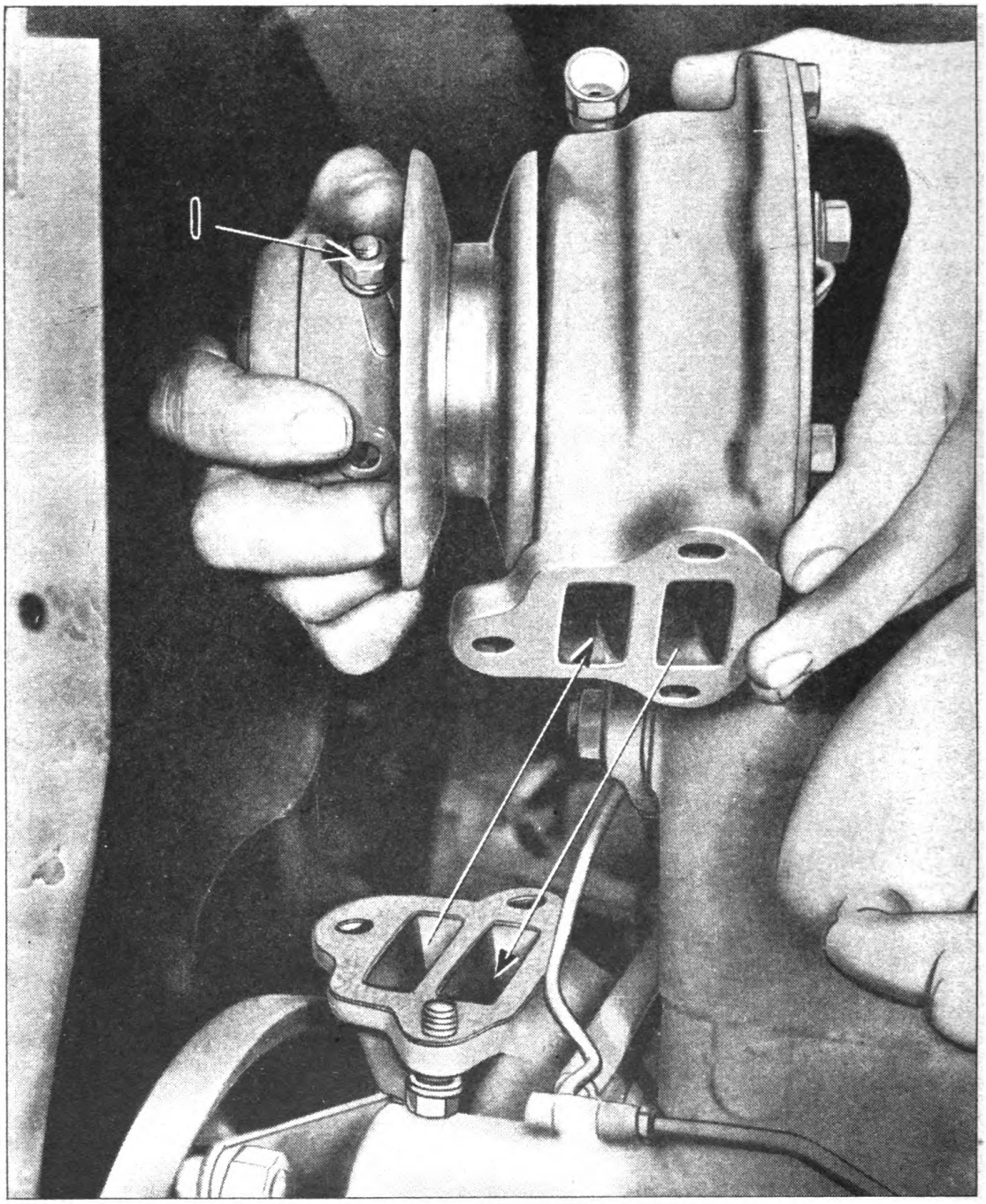


Fig. 10. Removing Water Pump. Arrows Indicate Direction of Flow of Water

1. Adjusting Bolt on Fan Pulley

COOLING SYSTEM

The capacity of the cooling system is 4 U. S. gallons. An impeller type pump driven by a 'V' belt from the crankshaft forces the cooling solution through the radiator, engine block and engine head. A thermostat, opening at 160°F. automatically controls the flow.

Fan Belt Adjustment

Loosen two hexagon nuts on the fan hub. Fig. 10. To tighten, turn the front half of the pulley in the direction in which the blades turn. The tension should be just enough to take up any looseness or slack in the belt. Having the fan belt too tight causes rapid belt wear, excessive load on the bearings and does not aid cooling. A properly adjusted belt can easily be depressed an inch without effort. After adjusting the belt, tighten hexagon nuts.

This adjustment can also be made by loosening the generator and swinging it outward until the desired tension is obtained.

Installing New Fan Belt

A new fan belt can easily be installed by loosening the adjustable pulley flange on the water pump and slipping on the new belt. It is necessary to remove the generator in order to provide clearance between the generator pulley and the radiator shroud.

The proper method of **Cleaning the Cooling System** is given in the section Maintenance Instructions on page 58.

Proper winter care is discussed in the **Operator's Instructions** under **Cold Weather Operation** on page 32.

CAUTION: Never pour cold water into a hot engine in which the water has been allowed to become very low. To do so may result in cracking the cylinder block or cylinder head. If it is necessary to pour warm water into a cold engine that has been drained, add the water slowly. Too rapid pouring may result in breakage.

CLUTCH

The clutch used in this tractor is a spring loaded, dry disk, single plate, foot operated unit. It will require very little attention except for occasional adjustment to compensate for normal wear of the facings. When slippage is noted, as when the engine speeds up without picking up the load, immediate adjustment should be made to prevent damage to clutch facings.

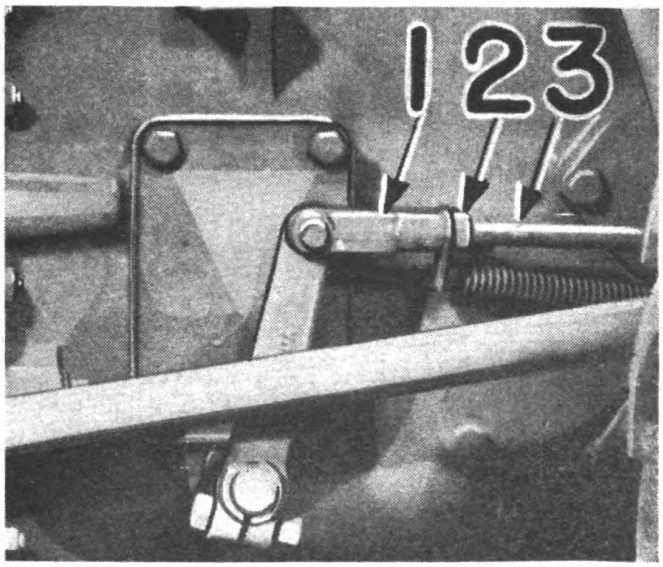


Fig. 11. Adjustment for "Free Movement" of Clutch Pedal

1. **Adjustable Yoke End**
2. **Jam Nut**
3. **Clutch Rod**

Free Movement of Pedal

Free movement of the clutch pedal must be maintained and can be adjusted as follows:

Caution: Remove all spark plug wires to avoid any possibility of the engine starting while working on the clutch.

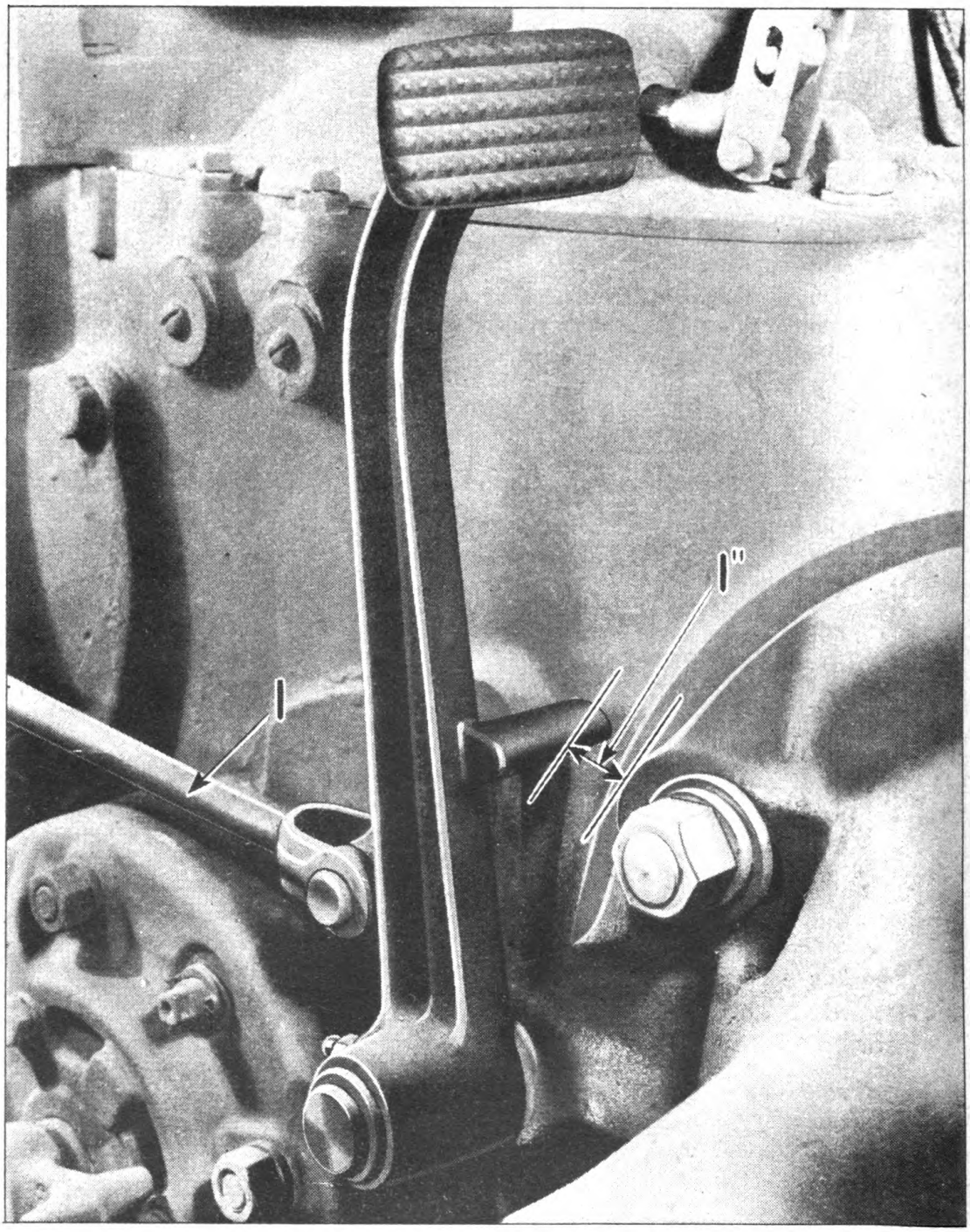


Fig. 12. Free Movement of Clutch Pedal shown as 1"

1. Clutch Rod to Clutch Arm

1. When clutch is engaged, the foot pedal should have one inch free movement from the clutch pedal to the rear axle housing. Fig. 12.
2. Throwout bearing Fig. 69 must not be in contact with clutch finger. This can be observed by removing the left-hand clutch hand hole plate.
3. Adjust length of pedal connection so as to provide 1/8 inch clearance between fingers and throwout bearing shown as 1/8" in Fig. 69. This is accomplished by disconnecting the clevis at the clutch lever and unscrewing it to give the desired length Fig. 11. Be sure lock nut behind clevis is turned down securely. When length is correct, the foot pedal can be depressed about an inch before throwout bearing contacts the fingers. By depressing pedal the point of contact can readily be felt.
4. As clutch facings wear, the fingers get closer to throwout bearing and clearance will eventually be used up. The length of the foot pedal connection should be re-adjusted before clearance is entirely used up.
5. This clutch was properly assembled before it was put into the tractor. It is self-compensating for wear to the extent of 1/8 inch wear allowance on the friction material of the clutch plate. After the clutch plate has worn 1/8 of an inch, it should be replaced. When this amount of wear has taken place, the rivets used for holding facings to clutch plate have come in contact with the flywheel on one side and the pressure plate on the other.

The proper method of **Removing Clutch Assembly** and **Installing Clutch and Reassembling Tractor** is included in **Maintenance Instructions** on page 87.

CLUTCH BRAKE

The object of the clutch brake is to stop the first reduction shaft from revolving when the clutch is disengaged for shifting gears. Correct adjustment makes gear shifting easier.

After the clutch has been adjusted, inspect the clutch brake shoe Fig. 73 to make sure that it contacts the clutch brake sleeve when the clutch is disengaged.

Adjustment

When the clutch is engaged make sure that the brake shoe does not contact the clutch brake sleeve. The proper clearance when the clutch is engaged is 1/8 inch. This can be changed by means of the adjusting screw Fig. 73. Turning the screw to the right increases the clearance. After the proper adjustment is secured, lock the adjusting screw by tightening the lock nut.

FOOT BRAKES

This tractor is equipped with disk type brakes mounted on the side gears of the differential shaft. With proper care and reasonable usage, they will give very satisfactory service.

Adjusting Brakes

After considerable service, foot brakes will require adjustment to compensate for lining wear. When the arm on the brake actuating lever strikes stop 3 Fig. 13, it is necessary to adjust the brakes. This adjustment may be easily made, without disassembling the brake, by following these steps:

1. Jack up the rear wheels.
2. On the outside of the brake housing are three cap screws (1), Fig. 13. Loosen each of these screws several turns.

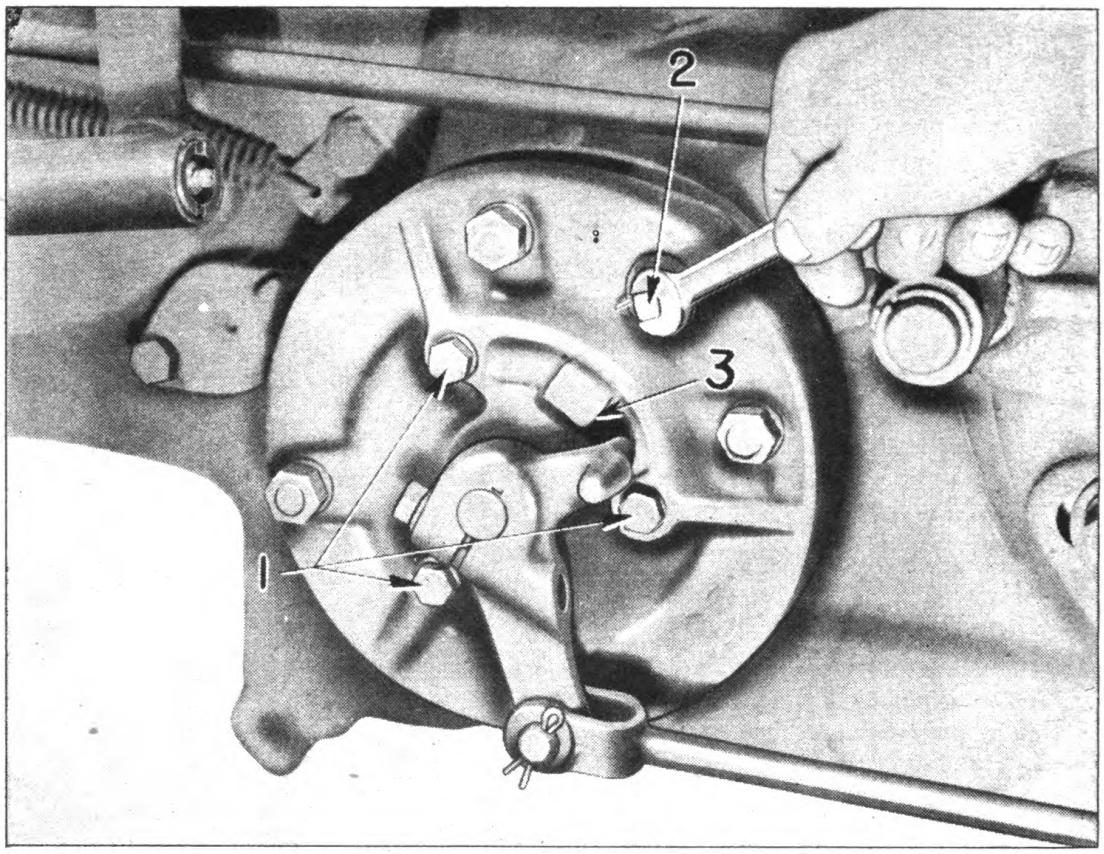


Fig. 13. Adjusting Brake

1. Cap Screws
2. Adjusting Pinion
3. Actuating Lever Stop

3. Turn the adjusting pinion (2) clockwise, thereby screwing adjusting ring outward on its threads, and forcing the power plate inward. This action forces the primary disc inward, and decreases clearance at the brake lining. Continue to rotate the adjusting pinion (2) until the brake pedal can be depressed by hand about 1½" to 2". This should leave adequate clearance to assure that the brake will not drag when released.
4. When proper adjustment is secured, depress brake pedal and lock it. Then tighten the three cap screws (1) to lock the internal brake parts in place. It is not necessary to lock adjusting pinion (2) as the adjusting ring with which the pinion meshes is prevented from turning when the cap screws are pulled up tight.

Repeat these steps for the brake on the opposite side of the tractor. The adjustment should be equalized on both sides, so that each pedal will be depressed an equal amount during brake application.

After several adjustments have been made, it may become necessary to replace the facings. In this case, replace entire middle brake ring complete with facings. Relining in the field is not advisable. See page 105.

RUBBER TIRES

When rubber tire equipped tractors leave the factory, all tires are inflated to a pressure of from 25 to 30 pounds. This is done to prevent bouncing of the tractor in shipment.

Before using tractor, check all tire inflations and see that the front wheels have 28 pounds of pressure and the rear wheels 12 pounds. If heavy equipment is carried on the front end of the tractor, the air pressure must also be increased accordingly.

TIRE INFLATION PRESSURES FOR CASE 'SI' AIR BORNE TRACTOR

7.50x16 6-ply front tires

Maximum pressure	36 pounds
Mininum pressure	20 pounds
Recommended Pressure	28 pounds

12.00-24 6-ply rear tires

Maximum pressure	14 pounds
Minimum pressure	12 pounds
Recommended pressure	12 pounds

This applies to tractors as they will be used for drawbar work, such as pulling dig and carry scrapers, etc. If equipment such as loaders or diggers are mounted on the tractor, these will not apply.

Tire care has only a few rules:

1. Maintain the inflation pressures specified in the preceding table.
2. Keep valve caps on all valve stems.
3. Repair any cuts or breaks in the casing promptly to prevent damage from water, dirt, or weakened fabric.

Normal air pressure in the rear tires is 12 lbs., except when weight is added. If the tire is operated at 10 lbs. pressure (only 2 lbs. under normal, but actually 17% under inflated) the tire may buckle when subjected to heavy drawbar loads. Buckling will quickly ruin the casing, requiring an excessive replacement expense. In addition lower inflation pressures will not materially increase traction, and may permit slippage between casing and rim on heavy drawbar loads, resulting in damage to the valve stem.

Therefore, maintain your inflation pressures specified in the preceding table. Check the pressures with an accurate gauge every other week unless you find that under your own individual operating conditions the pressure will be maintained for longer periods. Inflation pressures decrease when the tractor is idle as well as when it is operating, so be sure to recheck the pressures after the tractor has been inactive for some time.

It is far more expensive to operate tractors with underinflated tires than it is to operate the average motor vehicle with tire pressures too low.

The valve caps perform an important function in maintaining proper inflation pressures. They serve two main purposes:

1. Sealing the valve stem against entrance of dirt, which will be forced into the valve mechanism and inner tube when the tire is inflated the next time.
2. Preventing leakage of air past the valve. This leakage is accentuated by dirt or other foreign matter which may accumulate on the valve seat because of the absence of the valve cap.

Protect your tires by keeping the valve caps on all valve stems at all times (except when checking pressures or inflating). These caps seal the dirt out and the air in.

Injuries to the casing such as cuts and breaks should be repaired promptly to prevent excessive deterioration of the cord structure, which may result in complete failure or expensive repairs. Small cuts in the sidewall or tread rubber, exposing the fabric, should be washed out with gasoline and filled with tread cut repair gum. This will prevent moisture and dirt working into the fabric. If the tire is punctured by a large nail or similar object, a regular rubber plug may be inserted from the inside, at the time the tube is repaired.

After mounting rear casings on the rim, the tires should be inflated to about 30 lbs., to insure positive seating of the tire bead. Then the pressure should be decreased to the specified value for normal operation.

WEIGHT BOX AND TRACTION

Under many conditions slippage will be experienced when using rubber-tired tractors to pull heavy loads. When there is evidence of slippage by the rear tires, the weight box on the rear of the tractor should be filled or partly filled with dirt, gravel or some other loose material to get the necessary traction.

The weight box, when level full, holds approximately 6 cubic feet. Filled with gravel, the added weight will vary from 540 to 810 pounds, with earth 450 to 690 pounds or with sand 450 to 720 pounds. The added weight will vary with the material used to fill the box, and this should be kept in mind in loading the box.

Emptying the Weight Box

When the tractor is to be transported, the door on the bottom of the weight box can be opened easily and the loose material dumped. Be sure that the bottom door is properly secured before the box is again filled.

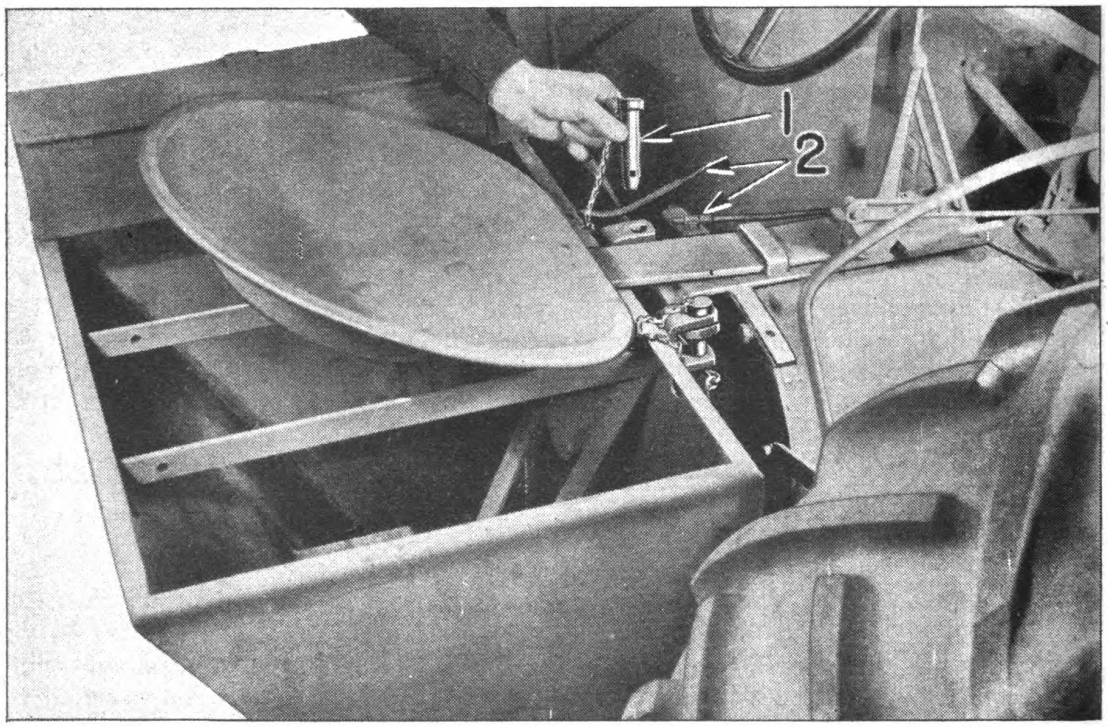


Fig. 14. Removing Pin Holding Weight Box

1. Weight Box Pin **2. Electrical Connection to Tail Light**

Detaching the Weight Box

The weight box is attached to the tractor by means of four pins Figs. 14 and 15. These are secured with cotter keys. Before removing the weight box, make sure that the tail light wire Fig. 14 is disconnected at the bracket on the seat. This is done by pulling out of sleeve on the bracket.

It can be attached by reversing the procedure.

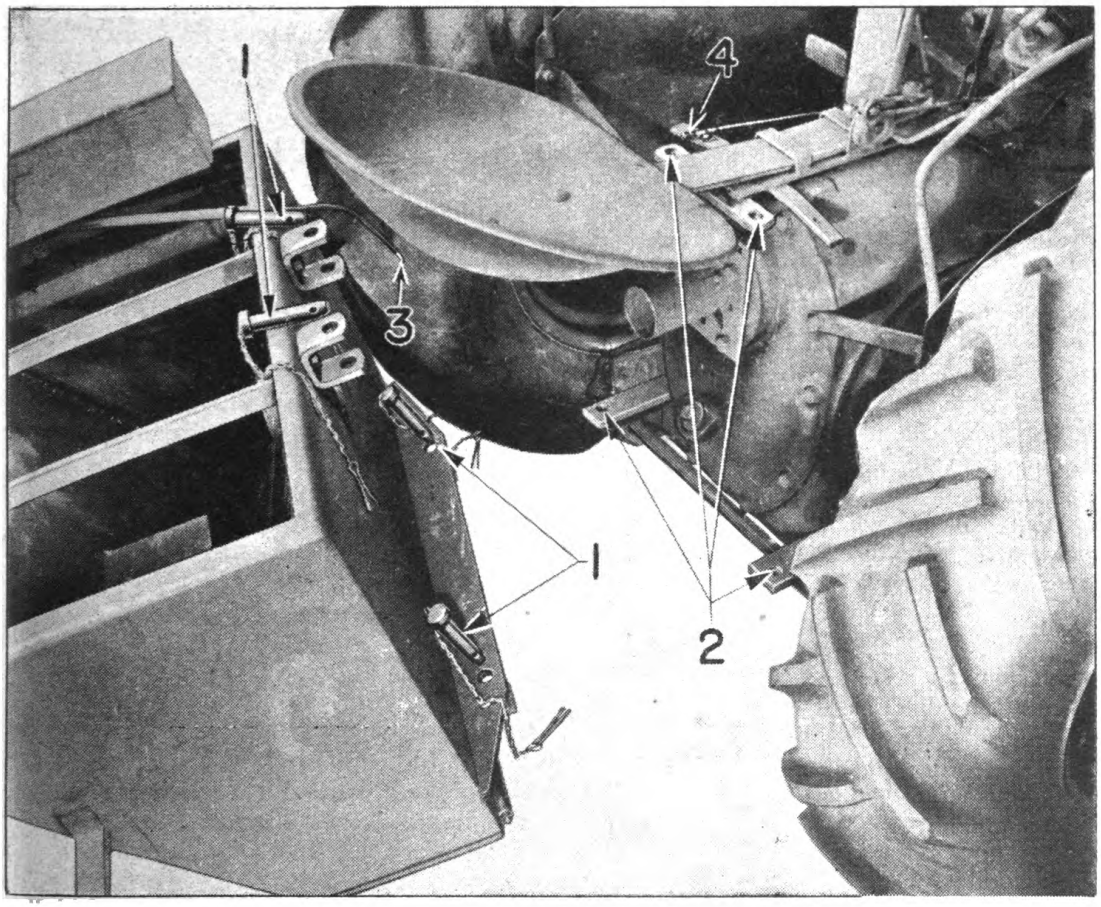


Fig. 15. Detail of Weight Box Attachment

1. Weight Box Pins
2. Attaching Holes for Weight Box
3. Tail Light Wire
4. Attaching Point for Tail Light Wire

OPERATION UNDER ABNORMAL CONDITIONS

The instructions for operation of the Case Model 'SI' Air Borne Tractor given so far are for reasonably normal operation in the temperate zone. Operation under abnormal conditions, such as extreme cold (below freezing), in dust or in mud requires that certain precautions be taken.

COLD WEATHER OPERATION

When the tractor is operated in cold weather (air temperatures below freezing), the cooling system must receive special care, and the tractor must be carefully lubricated with lighter oils and greases.

Cooling System

In cold weather, use a good grade of anti-freeze in the radiator. While Prestone or similar anti-freeze are to be preferred, alcohol or alcohol-base solutions will be satisfactory. However, to prevent loss of alcohol by evaporation, the water temperature must not be allowed to rise above 160°F.

It is well to flush the cooling system and inspect radiator hoses and connections before putting anti-freeze in the radiator in order to prevent loss of solution.

Under no circumstances should a compound of unknown composition be used, as it may prove harmful to the cooling system. No solutions of calcium chloride, sodium chloride or magnesium chloride should be used. The electrolytic and corrosive action is very damaging to metal parts. Likewise, no substances such as lubricating oil, kerosene, honey or sugar solutions, sodium silicate or glucose should be used. Extra fire hazard, destruction of the radiator hoses and gumming action on the interior surfaces of the cooling system may result from the use of such solutions.

Lubrication

In cold weather, use light oils as recommended in lubrication chart Fig. 8. In exceedingly cold weather it is very important to change oil more often than in warm weather. Condensation of water in the engine crankcase is much greater during cold weather. If a quantity of water is allowed to collect, it may freeze and cause breakage of parts or burned out bearings. To avoid this danger, loosen the oil pan drain plug daily, after the tractor has stood for a couple of hours. If there is water in the crankcase it will drain out when the drain plug is backed out until only one or two threads are holding. It is not necessary to completely remove the drain plug.

Air Cleaner

In cold weather see that the oil in the air cleaner remains fluid so that it can be carried by the air stream to the filter screens. If the oil congeals, it can be thinned down with kerosene.

OPERATION IN EXTREMELY DUSTY CONDITIONS

Under extremely dusty conditions care should be used to make sure that dust and grit do not enter the fuel tank in filling or bearings while lubricating. The air cleaner must be serviced regularly.

Air Cleaner

All air passing to the carburetor passes through an oil-bath air cleaner which removes dust and abrasive material and keeps it from entering the engine. In order to accomplish this, the air cleaner must be serviced regularly. This must

always be done at 8 hour intervals, under bad dust conditions **4 hour intervals.** Instructions for servicing are contained on page 23. In addition, the hose connection from the air cleaner to the carburetor must be kept tight at all times so the clean air will not be contaminated in passing to the carburetor.

The motor is completely dust sealed at all other points by means of gaskets and machined surfaces. The crankshaft has a leather oil seal at the timing gear cover.

Transmission

All shafts and bearing carriers in the transmission are sealed to prevent loss of oil or entrance of dust. Rear axles are likewise carefully sealed.

OPERATION UNDER MUDDY CONDITIONS

Front Wheels

Front wheels have oil seals which fit into a retainer. The retainer is held to the front wheel with 5 machine screws and should be kept tight at all times. The oil seal keeps grease from leaking out of the bearings or water from entering. The hub cap is used for greasing the bearings and also keeps out dust and mud.

Seals on engine and transmission retain lubricant and prevent entrance of mud or water.

PROCEDURE FOR STORAGE OR SHIPMENT

Overnight Storage

When tractors are to be left from one shift to another, overnight or periods up to a week:

1. Shut off ignition—No. 4 Fig. 5.
2. Shut off lights—No. 10 Fig. 5.
3. Shut off valve under fuel tank—No. 2 Fig. 4.

Storage for Periods from a Week up to a Month—Under these conditions:

1. Shut off ignition—No. 4 Fig. 5.
2. Shut off lights—No. 10 Fig. 5.
3. Drain all fuel from the fuel tank, fuel lines and carburetor by opening drain valve No. 3 Fig. 9 in the carburetor. Remove fuel strainer bowl No. 3 Fig. 4.
4. Drain cooling system if operation is done in freezing weather unless the cooling system is protected with anti-freeze.
5. Tag tractor indicating care given tractor and date prepared for storage.

Storage for Periods over a Month

As the storage period grows longer, the tractor must receive additional care as follows:

1. **Shoot with No-OX-Id.** To do this, stop the engine and remove the two ⅛ inch pipe plugs No. 10 Fig. 3 in the intake manifold. Attach cups or containers to them. These can be made with a ⅛ inch elbow and a short piece of ⅛ inch pipe. Then start the engine, set the throttle at half speed; then pour into each container or pipe approximately ½ cupful or ¼ pint of oil and shut off the engine when excessive blue smoke appears at the exhaust. (An oil widely used for this purpose is commercially known as No-Ox-Id. However, SAE No. 10 engine oil will be satisfactory). This operation of drawing oil into the engine puts a protective oil film on pistons, rings, cylinder barrels, pins and other engine parts, protecting them from

the elements which cause rust. After the operation is completed, the pipe and elbow should be removed and the pipe plugs put back into the intake manifold using care to tighten securely.

2. Drain fuel tank, fuel lines, and carburetor by opening drain valve No. 3 Fig. 9 in the carburetor. Remove fuel strainer bowl No. 3 Fig. 4.
3. Remove the storage battery and make provision to charge every month or at frequent enough intervals to keep the gravity above 1.240.
4. Drain the cooling system if operation is done in freezing weather, unless the cooling system is protected with anti-freeze solution.
5. Lubricate the tractor completely following lubrication chart page 18.
6. Protect tires by storing tractor in dry place and placing blocks under axles to take weight off the tires and prevent their touching the ground. Protect from light and heat. Before putting back into service, be sure air pressure is brought up to 28 pounds for front tires and 12 pounds for rear tires.
7. Tag tractor indicating care given tractor and date prepared for storage.

Shipment by Rail

For rail shipment in box cars or on flat cars:

1. Shoot with No-Ox-Id as outlined on page 33.
2. Drain fuel tank, fuel line and carburetor by opening drain valve No. 3 Fig. 9 in carburetor. Remove fuel strainer bowl No. 3 Fig. 4.
3. Drain cooling system if shipment is made in freezing weather, unless the cooling system is protected with anti-freeze solution.
4. Protect battery either by removing from tractor or covering securely.
5. Inflate tires to 28 to 30 pounds pressure to prevent bouncing and chafing in shipment. Before putting into service, reduce pressures to 28 pounds for front tires and 12 pounds for rear tires.
6. Securely block and strap tractor to car floor to prevent shifting and damage in transit.

Shipment by Boat

Model "SI" Air Borne Tractor equipped with **Hough Loader** when packed for Export Shipment is securely packed in a crate of the following dimensions:

Length 9′ 3″
Width 5′ 2″ } Cu. ft. 254-10
Height 5′ 4″

Gross Weight 5182 Lbs.
Net Weight 4082 Lbs.

The complete weight of gas, oil and water used in this tractor is 126 pounds making a total net weight of 4208 pounds.

Before tractor can be put into operation the following parts, which are also in crate, must be installed:

Tires and Rims
Shovel Bucket and Control Rods
Weight Box
Steering Wheel
Rear Support for Steering Shaft
Exhaust Pipe
Seat and Seat Spring
Throttle Lever Assembly
Starting Crank

Before starting out tractor be sure that front tire has 28 pounds of air pressure and rear tire has 12 pounds of air pressure.

Model "SI" Air Borne Tractor equipped with **LaPlant Choate Hydraulic Controls** when packed for Export Shipment is securely packed in a crate of the following dimensions:

Length	8′ 9″	Cu. ft. 222-4
Width	5′ 2″	
Height	4′ 11″	

Gross Weight 4302 Lbs.
Net Weight 3282 Lbs.

The complete weight of gas, oil and water used in this tractor is 126 pounds making a total net weight of 3408 pounds.

Before tractor can be put into operation the following parts, which are also packed in crate, must be installed:

Tires and Rims
Weight Box
Steering Wheel
Rear Support for Steering Shaft
Exhaust Pipe
Seat and Seat Spring
Throttle Lever Assembly
Bumper Plate
Starting Crank

Before starting out tractor be sure that front tire has 28 pounds of air pressure and rear tire has 12 pounds of air pressure.

Shipment by Plane

Methods will vary, depending on the destination. If going into combat, tractors must be lubricated and filled with oil, fuel and cooling solution. If moving to a depot, tractor may be drained as desired.

The tractor alone equipped with a Hough Loader weighs approximately 4208 pounds when filled with gas, oil and water ready for operation. With gas, oil and water removed, it weighs approximately 4082 pounds.

The tractor equipped with LaPlant Choate Hydraulic controls weighs 3408 pounds when filled with gas, oil and water, ready for operation; with gas, oil and water removed, it weighs approximately 3282 pounds.

In any case the cooling system must be prepared for the minimum air temperature likely to be encountered either in flight or on the ground. Anti-freeze solutions must be added if freezing temperatures might be encountered. Complete information is found on page 32 under **Cold Weather Operation.**

The tractor must be securely lashed in the plane to prevent shifting in flight.

SUGGESTIONS TO THE OPERATOR

The operator's responsibilities do not terminate with merely driving the tractor and keeping the fuel tank filled. It is his responsibility to see that the tractor is kept in first-class mechanical and operating condition as well as to maintain its general appearance. Service and maintenance sections must depend on the operator to report on the general performance of the tractor. It is, therefore, to each operator's advantage to become thoroughly familiar with the functions of every working part of the tractor. We urge the study of the information and recommendations contained in this book.

TABLE OF TOLERANCES AND CLEARANCES

Location	Measurements	Refer to Page for Complete Instructions
Carburetor float level	$1\frac{5}{32}$ in. + or − $\frac{2}{64}$ in.	45
Chain, final drive tension	Raise or lower 1 in.	100
Clutch brake clearance when engaged	$\frac{1}{8}$ in.	92
Clutch, clearance between fingers and throwout bearing	$\frac{1}{8}$ in.	87
Compression ring, clearance of first ring in groove	.003-.0045 in.	61
Compression rings, clearance second and third rings in groove	.002-.0035 in.	61
Compression ring gap when compressed to 3.5 in.	.010-.020 in.	61
Compression ring, tension required to close joint	11 to 14 lbs.	61
Connecting rod bearing end play	.005-.011 in.	60
Connecting rod bearing running clearance	.0015 to .0035	60
Connecting rod bearing total length	1.500 in. minus .003 in.	60
Connecting rod cap screws, torque to tighten	65 ft. lbs.	61
Crank pin diameter	2.374-2.375 in.	60
Cylinder barrel, clearance above block	.001 to .003 in.	63
Cylinder head bolts, torque to tighten	60 ft. lbs.	57
Intake and exhaust valve seats	45 degrees	57
Magneto breaker points, opening	.015 to .020 in.	73
Center Main bearing, end clearance	.004 to .008 in.	64
Main bearings, oil clearance	.0015 to .0035 in.	64
Main bearings, torque to tighten	100 ft. lbs.	64
Oil ring, clearance in groove	.0015-.003 in.	61
Oil ring, tension required to close joint	8 to 11 lbs.	61
Oil ring gap when compressed to 3.5 in.	.007-.017 in.	61
Piston, clearance at skirt	.004 to .005 in.	61
Piston, clearance in barrels, check with feeler stock $\frac{1}{2}$ inch wide	Select piston .004 to .005 in.	61
Piston pin, clearance in bushing in rod	Select .0003 to .0006 in. smaller	62
Piston pin, clearance in piston	Select .0001 to .0003 in. smaller	62
Piston pin, diameter	.9992 minus .0003 in.	62
Piston pin length	3 in.	62
Shaft, first reduction allowable runout	.002 in.	94
Spark plug gap	.025 in.	23
Valve clearance	.010 in.	55
Valve inserts in exhaust valve	Concentric with guide within .002 in. indicator reading	
Valve stem clearance in guide	.0025 to .0045 in.	
Valve springs, free length	$2\frac{1}{32}$ in.	57
Valve spring, pressure at a compressed height of $1\frac{3}{4}$ in. (Valve closed)	25 to 28 lbs.	57
Valve spring, pressure at a compressed height of $1\frac{13}{32}$ in. (Valve open)	61 to 69 lbs.	57

SERVICE SUGGESTIONS

Listed herewith under their respective headings are some of the possible causes of engine difficulty. If you are having any difficulty with your engine, it may be well to check your engine with this list.

ENGINE HARD TO START

ENGINE MISSING

ENGINE OVERHEATING

LACK OF POWER

	For information see page
Valve seat worn	56
Valves sluggish or sticking	56
Piston rings weak	61
Piston ring stuck	61
Improper gas mixture	46
Improper timing	65
Exhaust stopped up	
Oil diluted	11, 18
Air cleaner choked with dust	23, 47

ENGINE KNOCKS

Carbon in cylinders		56
Loose connecting rod bearings		60
Loose main bearings		64
Loose piston pins		62
Worn piston and cylinders		61, 62
Magneto timed too early		65
Loose cam follower		56
Overheated engine		11, 18
Tight Pistons		61
Loose flywheel		64
Lack of oil or water		11, 18, 24

EXCESSIVE SMOKE FROM EXHAUST

Carburetor needle valve open too far	Black	21
Carburetor float sticking	Smoke	21
Poor piston rings	Blue	61
Lubricating oil too thin	Smoke	18
Too much oil in crankcase		18

EXPLOSION IN EXHAUST PIPE

Ignition too late	65
Weak spark	65
Exhaust valve holding open	57
Exhaust valve warped	56

MAINTENANCE INSTRUCTIONS FOR THE CASE MODEL 'SI' AIR BORNE TRACTOR

ENGINE

Under most circumstances much of the service required on the engine in this tractor can be done without removing the engine from the tractor. Many assemblies can easily be removed, serviced quickly, put back in place and the tractor put into service with a minimum of delay.

CARBURETOR

The Zenith carburetor used on the Case Model 'SI' Tractor is extremely simple to adjust and once properly adjusted, it will require attention very rarely. Only three adjustments are provided. Fig. 9.

1. The **Idling Speed Screw** determines the minimum speed of the engine when throttled down and under no load.
2. The **Idling Jet** controls the mixture supplied when idling.
3. The **Main Jet** controls primarily the mixture supplied at the higher speeds and on heavier loads.

For best results, including power, fuel economy and smoothness of operation, carburetor adjustments should be made carefully. Once settings are made, they should not be changed except under new temperature conditions or when different fuel is used. For this reason, the grade of fuel should be maintained as long as possible.

Disassembly of Carburetor

The carburetor should be disassembled only at main bases. While it is a simple unit, nevertheless it is a precision mechanism. Disassembly should never be attempted in the field. If the carburetor must be taken apart, replace it with a new unit in the field, and send the carburetor taken off the tractor to a main base for overhauling.

To properly repair the Zenith 161 series carburetors we suggest the following routine:

1. Remove idling adjusting screw (6 Figure 19) and spring.
2. Remove throttle body to bowl assembly screws with a screw driver. (There are four assembly screws and lock washers.)
3. Raise the throttle body slightly and loosen the gasket from the bowl assembly so you may
4. Lift the throttle body and gasket clear of the bowl assembly, being careful to avoid damaging the float.
5. Remove the venturi (1 Figure 19).
6. Remove the float axle using a screw driver to push the axle from the slotted end of the bracket, and the fingers to remove it the rest of the way.
7. Remove the float assembly and the fuel valve needle.
8. Remove the throttle body to bowl gasket.
9. Remove the fuel valve seat and gasket using Zenith C161-85 Service Tool.
10. Remove idling jet (5) using a small screw driver ($\frac{3}{16}$" blade).
11. BEFORE removing the throttle plate READ NOTE A following section "Parts to be Replaced", then proceed to remove the throttle plate screws, plate and shaft assembly.

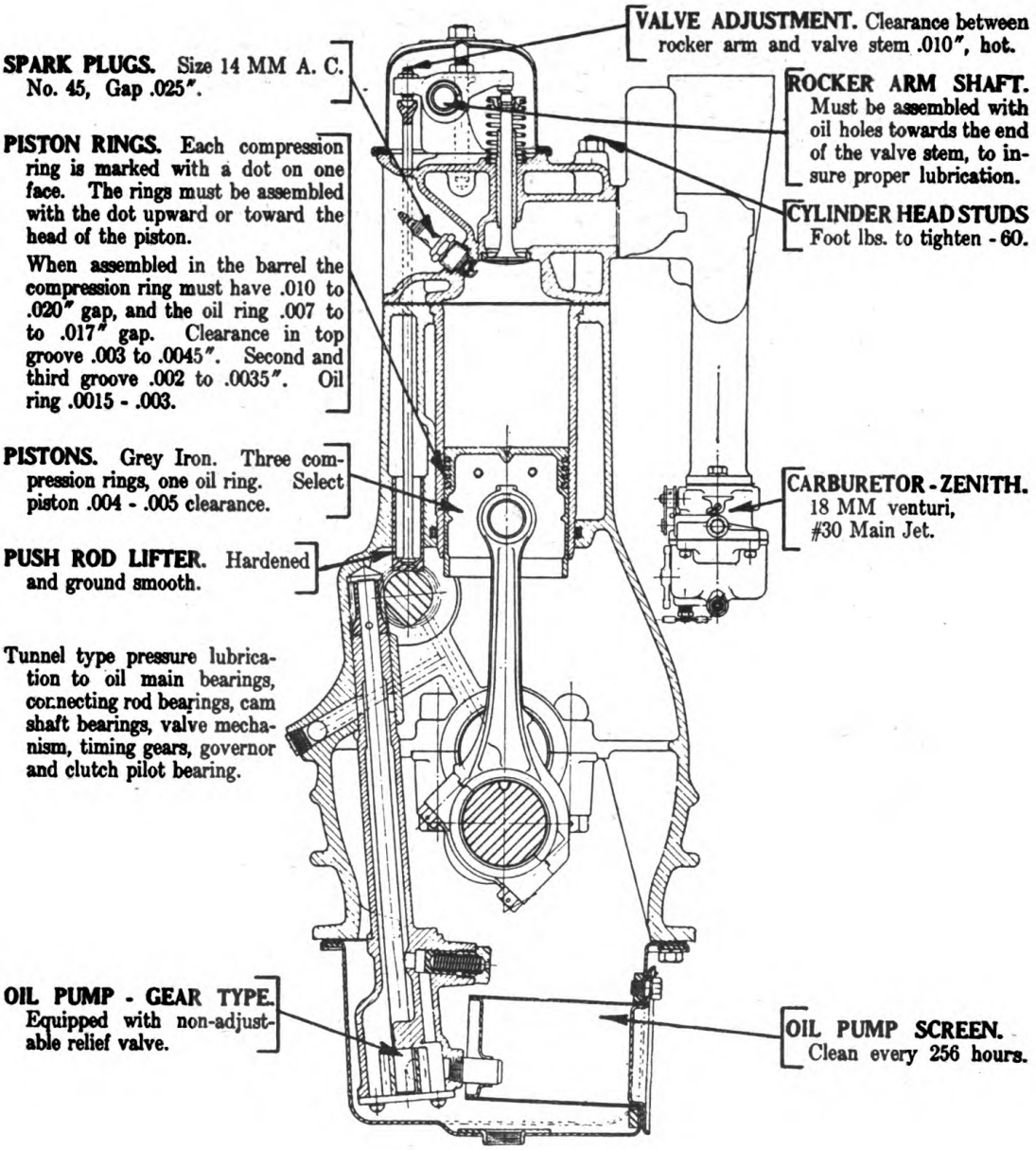


Fig. 16. End View of Engine

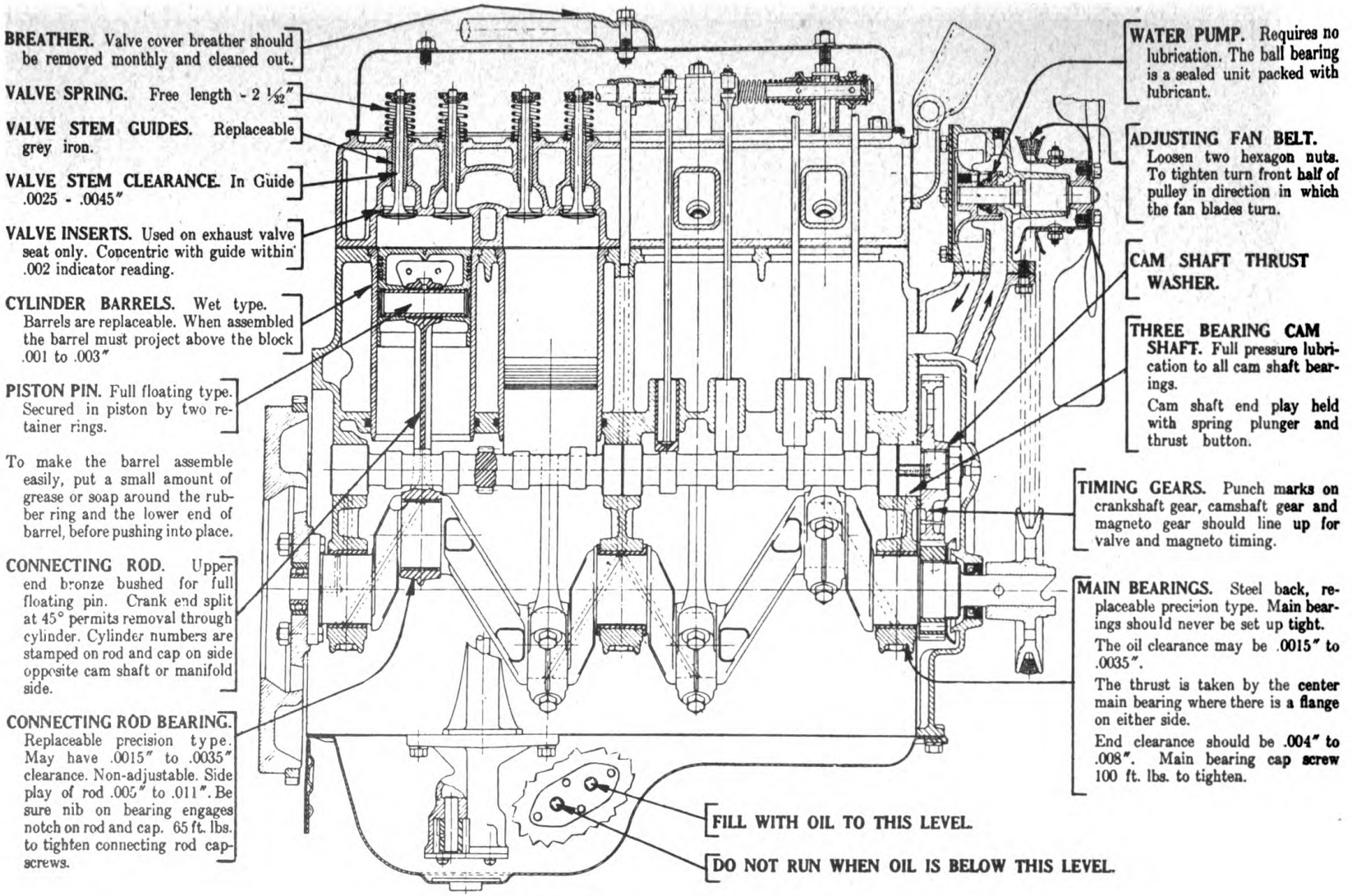


Fig. 17. Side View of Engine

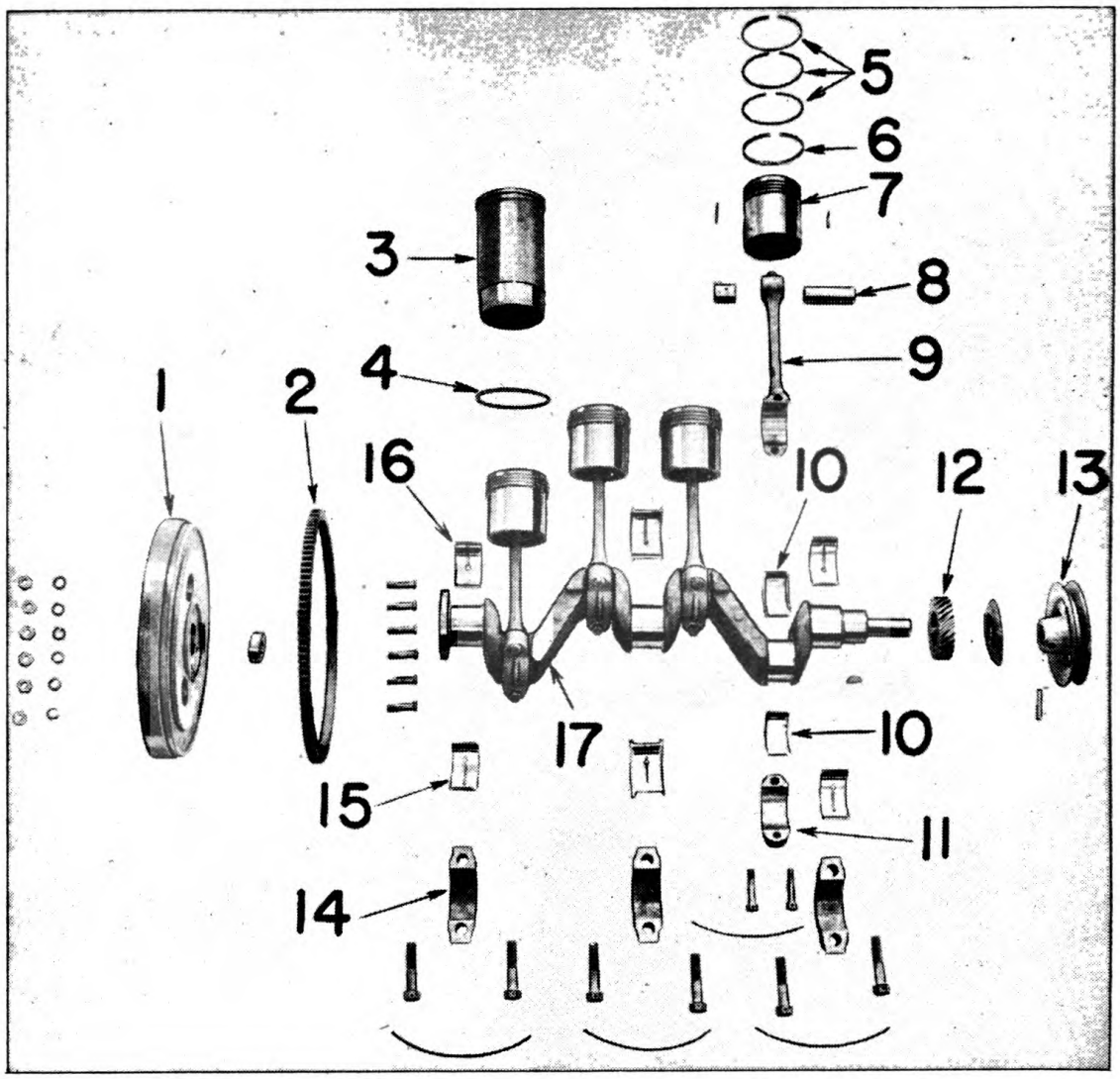


Fig. 18. Detail of Engine Crankshaft, Connecting Rods and Pistons

1. Flywheel
2. Ring Gear
3. Cylinder Barrel
4. Packing Ring for Cylinder Barrel
5. Piston Rings, Compression
6. Piston Ring, Oil
7. Piston
8. Piston Pin
9. Connecting Rod
10. Connecting Rod Bearing
11. Connecting Rod Bearing Cap
12. Gear
13. Fan Drive Pulley
14. Cap for Crankshaft Bearing
15. Main Bearing, Lower
16. Main Bearing, Upper
17. Crankshaft

Note: Refer to Parts when Ordering Replacement Parts.

12. Remove stop lever taper pin using a small punch and a hammer.
13. Remove the throttle shaft packing retainers and packings using a screw driver or a small pair of pliers to lift out the retainers.

NOTE: Do not remove the identification disc which is riveted to the bowl cover (see note B) the priming plug (8), the throttle stop pin, the float hinge bracket, or the brass channel plugs.

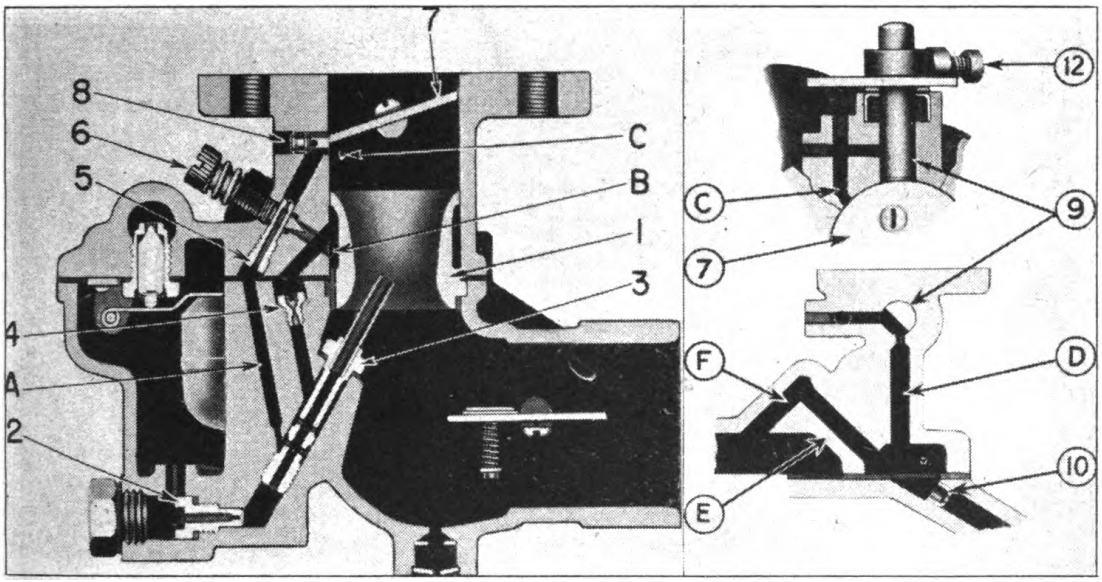


Fig. 19. Sectional View of Zenith Carburetor Used on "SI" Tractor

Fig. 20. Details of Zenith Carburetor

14. Remove the well vent (4 Figure 19) using a small screw driver ($\frac{3}{16}$" blade).
15. Remove main discharge jet (3) and gasket using Zenith C161-25 Service Tool.
16. Remove main jet adjustment assembly and gasket using a $\frac{1}{2}$" open-end wrench.
17. Remove main jet (2) and gasket using C161-1 Service Tool (or a suitable screw driver).
18. Remove air shutter lever taper pin using suitable punch and light hammer.
19. Remove air shutter lever.
20. Remove air shutter screws and lockwashers to
21. Remove air shutter plate and shaft.
22. Remove air shutter shaft pole plug (CR137-19) using a suitable punch and hammer.

NOTE: Do not remove air vent channel bushing (10, Fig. 20), air shutter stop pin, air shutter bracket locating pin, or drip plug.

23. Clean the bowl and throttle body casting in gasoline or other solvent and blow through each channel with compressed air to make sure that all channels are clean.
24. Refer to section titled "Parts to be Replaced" for list of parts which we recommend replacing when overhauling this type of carburetor. (See note C.)

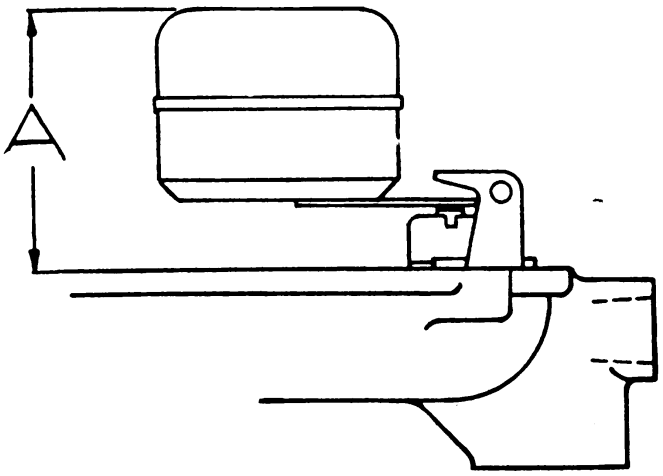


Fig. 21. Diagram Showing Measurement of Carburetor Float Level. Measurement A Should be 1 5/32 Inch Plus or Minus 3/64 Inch

Re-Assemble Carburetor as Follows

1. Place air shutter shaft in position and
2. Install air shutter plate screws and lockwashers. Be sure air shutter valve is in correct position as shown in Figure 19 and that the air shutter plate is properly centered before tightening the screws securely.
3. Install air shutter lever assembly as follows:
   (a) Hold the air shutter in wide-open position.
   (b) Place the lever on the shaft and against the stop pin in the direction to open.
   (c) Pin lever in position (CT63-2 taper pin.)
   (d) Check operation to make sure the air shutter opens and closes fully.
4. Install air shutter shaft hole plug (CR137-19) using a light hammer.
5. Replace main jet (2) and new gasket using Zenith Service Tool C161-1.
6. Install main jet adjustment and new gasket using a 1/2" open-end wrench.
7. Replace main discharge jet (3) and new gasket using Zenith Service Tool C161-25.
8. Replace well vent (4) using a small screw driver (no gasket required).
9. Place new throttle shaft packing in new packing retainer ring and
10. Install packing retainer ring (with packing in) in right hand shaft boss using a light hammer.
11. Place new throttle shaft in position and
12. Install throttle plate (see note A). The throttle plate should be properly centered before tightening the screws and lockwashers securely.
13. Install stop lever assembly on the throttle shaft.

NOTE: When the throttle plate is straight up and down in the barrel (wide open) the stop lever should be against the stop pin, then

14. Drill and pin the stop lever assembly and shaft using a No. 45 drill and Zenith CT63-2 taper pin.
15. Replace idling jet (5) using a small screw driver (no gasket required).
16. Replace fuel valve seat and new gasket using Zenith Service Tool C161-85.
17. Place new throttle body to bowl gasket in position.
18. Place fuel valve needle in position followed by the float assembly and
19. Install float axle using the handle end of a screw driver to strike the end of the axle to force it into the slotted end of the bracket. The float should move freely on the axle.

20. Check position of float to obtain correct fuel level, as shown in Figure 21. The A dimension should be $1\frac{5}{32}$" plus or minus $\frac{3}{64}$". (Move the gasket to one side while making the measurement.)
21. Place the venturi (1) in position in the throttle body.

NOTE: 161 Series venturi has a locating boss that fits into a groove in the throttle body.

22. Place the bowl assembly in position on the throttle body being careful to avoid damaging the float.
23. Install assembly screws and lockwashers. Be sure to tighten the screws evenly and securely.
24. Install idling adjusting screw (6) and spring.

NOTE: As a preliminary adjustment, set the idling adjustment (6) and the main jet adjustment at one full turn open and adjust the throttle stop screw to hold the throttle just slightly open.

TOOL LIST

To properly service the 161 series carburetor we recommend the following Service Tools: all available from Zenith Carburetor Division, 696 Hart Ave., Detroit, Mich.

C161- 1 Main Jet Wrench.

C161-25 Main Discharge Jet Wrench.

C161-85 Fuel Valve Seat Wrench.

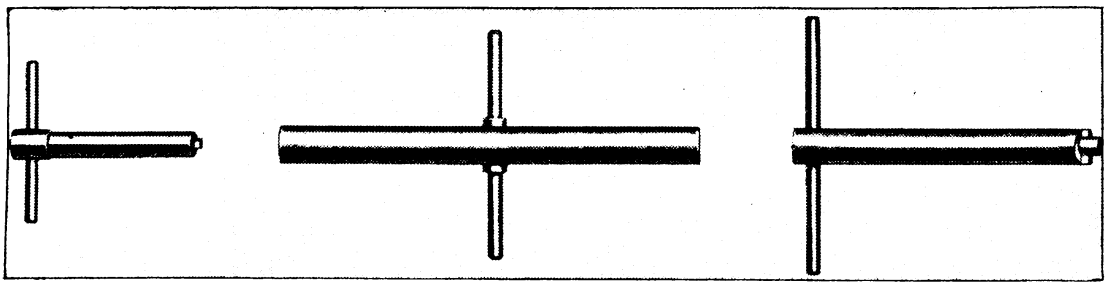


Fig. 22. Zenith Carburetor Service Tools

C161-1 C161-25 C161-85

PARTS TO BE REPLACED

In some cases the following parts should be replaced when overhauling this type of carburetor. All Gaskets, C181-66 gasket kit contains them; C81-17 Fuel Valve and Seat Assembly, (size No. 35); Main Jet C52-6 No. 30; C55-6 No. 16 Idling Jet; Main Discharge Jet C66-46 No. 50; C52-2 No. 28 Well Vent; C85-28 Float Assembly; C120-4 Float Axle; C23-258 Throttle Shaft; Air Shutter Shaft C105-88; CR37-1x1 Throttle Shaft Hole Plug; C131-4-2 Packing Cap (2 required); CT57-4 Packing Washer (2 required); CT62-1 Cotter; CT63-2 Taper Pin; T15B5-3 Plate Screw (4 required); T41-5 Plate Screw Lockwasher (4 required).

The THROTTLE PLATE is C21-88.

The VENTURI C38-50A.

NOTE A: The location of the priming hole plug in relation to the throttle plate is extremely important for uniform idling and part throttle operation. To maintain a uniform relation between the priming hole plug and the throttle plate, our factory assemblies the throttle shaft and plate in the throttle body before drilling the body for the priming hole plug, locating the hole in a definite relation to the throttle plate in each case. It is readily apparent from the above that throttle plates and throttle bodies cannot be interchanged indiscriminately. When it becomes necessary to replace the throttle shaft or throttle plate, we suggest the following routine:

1. Unscrew the throttle stop screw to permit complete closing of the throttle plate.
2. Hold throttle in tightly closed position and mark the inside of the throttle body close to the throttle plate with a steel scriber.
3. Using this scribed line as a guide, replace the throttle shaft or plate. If new plate used shows a noticeable variation from old one, select another new plate to get one that fits very close to the scribed line when installed.
4. If throttle body has to be replaced, we recommend obtaining a complete throttle body assembly including shaft, plate, priming hole plug, etc., built to the outline number which appears on the identification disc on the bowl cover.

NOTE B: A round aluminum identification disc riveted to the carburetor bowl cover specifies the assembly outline number to which the carburetor was originally built. When ordering special parts such as throttle bodies, throttle lever and stop lever assemblies, etc., be sure to specify outline number of the carburetor to prevent errors in selecting parts required.

NOTE C: REBUSHING THE THROTTLE SHAFT BEARINGS is an operation that should not be attempted unless the shop is properly equipped for such work.

We suggest replacing the throttle body assembly with a new one built to the outline number shown on the identification disc.

Idling Adjustment

Adjustment for idle speed and idle mixture can best be made together and should be made with the engine warm. The throttle lever on the seat mounting bracket should be all the way forward before making the adjustment. The idling speed screw Fig. 9 should be adjusted so that the engine will idle fast enough to prevent stalling. Then turn the idling jet adjusting screw Fig. 9 in or out until the engine runs smoothly.

A good starting point for this adjustment is one full turn from the idling needle valve seat because the correct setting is usually between ¾ and 1¼ turns open.

Main Jet Adjustment

This adjustment should be made when the engine is warm and working under load because it exerts the greatest influence under those conditions. Turning the valve Fig. 9 inward provides a leaner mixture, while turning outward produces a richer mixture.

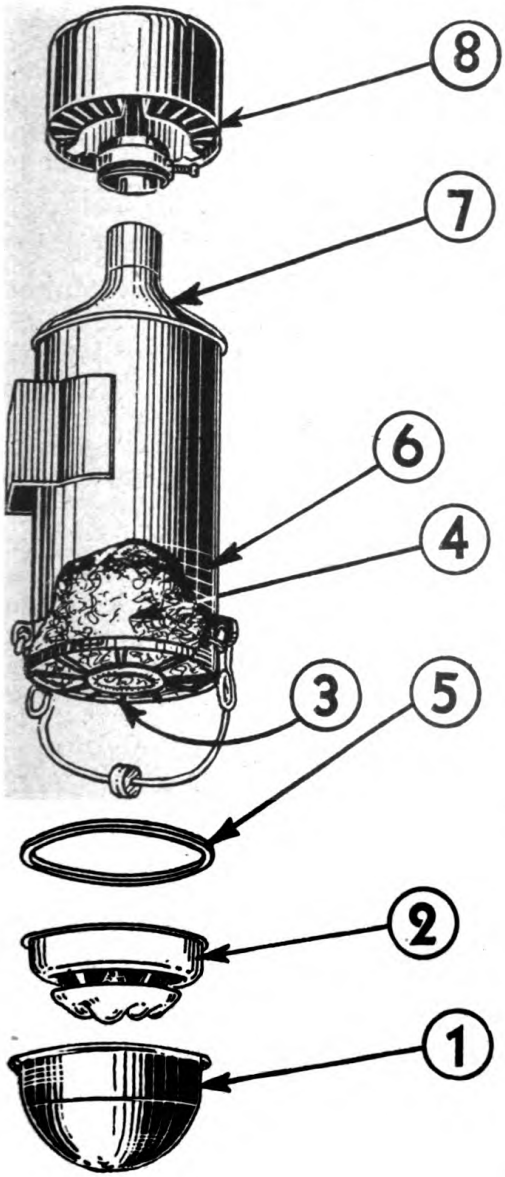
Turn the valve inward until the engine starts to miss or power falls off. Then turn outward until proper operation is secured—about ⅛ of a turn is usually sufficient. This setting will assure maximum fuel economy with very nearly maximum power.

If the engine will not run with the original setting, make an approximate setting as follows: Turn the main jet valve inward until the needle just seats. Use great care not to force the point against the seat as this may ruin the seat. Next turn the valve outward two full turns. This setting is sufficiently close so that the engine can be operated until final adjustment is made.

Loss of power and spitting through the carburetor indicates the mixture is too lean. This is especially evident when the engine is accelerated by pulling lightly on the throttle rod. An overly rich mixture is indicated by sluggish action of the engine and by the appearance of black smoke at the exhaust. The final setting should be as lean as possible and still have satisfactory engine operation and power.

OIL BATH AIR CLEANER

The function of the air cleaner is to prevent dirt and abrasive material from entering the engine. Proper servicing cannot be too strongly urged because dirt or dust taken into the engine with the intake air are extremely harmful. They will cause excessive wear on pistons and cylinders, sticking of valves, wear on valve stem guides and may cause the valves to become sluggish or hold open so that they will leak or burn.



Daily inspection and cleaning of the oil-bath air cleaner is imperative when operating under ordinary conditions. In extremely dusty conditions, more frequent servicing is necessary.

In order to service the air cleaner Fig. 23, it is necessary to loosen the bail which holds the oil cup to the air cleaner body and remove the cup, including the baffle. The baffle must be removed from the cup in order to clean the cup. Never let dirt accumulate in the cup. Clean all foreign matter out of the cup and wipe the baffle clean. Replace the baffle and fill the cup with fresh, free-flowing, clean engine oil to the level indicated on the inside of the baffle. Make certain that the gasket is smooth within the lower flange of the body. Then replace cup and baffle as a unit. Lock them into place by swinging bail downward and inward until it snaps into place.

Fig. 23. Details of Oil Bath Air Cleaner

1. Oil Cup
2. Baffle
3. Retainer
4. Metallic Wool
5. Gasket
6. Air Cleaner Body
7. Chamber at Top of Air Cleaner
8. Air Cleaner Cap

Once or twice a year, possibly more often, depending entirely on dust conditions, the entire cleaner should be removed from the engine and cleaned. Under no circumstance should the metallic wool and retainer be removed from the cleaner body. Pick all foreign particles off the lower side of metallic wool. Then rinse the entire cleaner in a pail of clean kerosene.

At the same time, remove the air cleaner cap and clean the inside of the chamber in the top of the air cleaner. A swab, made of piece of flexible wire with a rag wound around the end, is an effective tool for this purpose. The air intake passage must be kept free of excessive dirt, as a blocked intake will reduce the amount of air reaching the carburetor. Too rich a mixture will result, in turn, causing loss of engine power.

If it becomes necessary to replace the metallic wool in the body of the cleaner, the entire unit should be replaced. If the wool is not properly installed and sealed in the body, the unit will not operate properly.

CARE OF AIR INLET CONNECTIONS

The clean air connection, should be kept air-tight. Otherwise, the purpose of the air cleaner will be defeated. Be sure hose between the air cleaner and carburetor are properly installed and hose clamps kept tight. Excessive engine wear will result if there are leaks between the air cleaner and the carburetor or in the manifold.

GOVERNOR

This engine is equipped with an efficient flyball type governor driven directly from the camshaft.

The governor is set at the factory to give a no-load engine speed of 1680 R. P. M. and a full-load engine speed of 1550 R. P. M. To determine the engine speed use a reliable tachometer (speed indicator) and take the speeds from the first reduction shaft used for cranking. No. 20 Fig. 4. The no-load speed of shaft should be 1170 to 1175 R. P. M. Engine R. P. M. can be calculated by multiplying first reduction shaft R. P. M. by 1.44.

If inspection discloses that the engine speed must be changed to bring it to the recommended speed, adjustment can be made by lengthening or shortening the rod connecting the throttle lever on the seat mounting bracket with the governor spring on the right hand side of the engine. No. 4 Fig. 4. Shortening the control rod increases the engine speed, while lengthening decreases the speed. After the proper adjustment has been made, be sure that the lock nuts are fastened securely.

Caution: Do not attempt to adjust length of throttle rod at the end nearest the radiator. **Always** do it at the point near the battery box No. 4 Fig. 4.

SERVICING GOVERNOR

Removing Governor

1. Remove spark plug wires and disconnect grounding wire No. 12 Fig. 4 at magneto.
2. Hold No. 1 spark plug wire about 1/8 inch from engine block. Turn motor over until magneto fires on No. 1 cylinder
3. Remove magneto No. 11 Fig. 24 from magneto bracket No. 1 Fig. 24.
4. Take out three 3/8 x 1 1/4 inch cap screws holding magneto bracket to cylinder block. Pull complete assembly out.

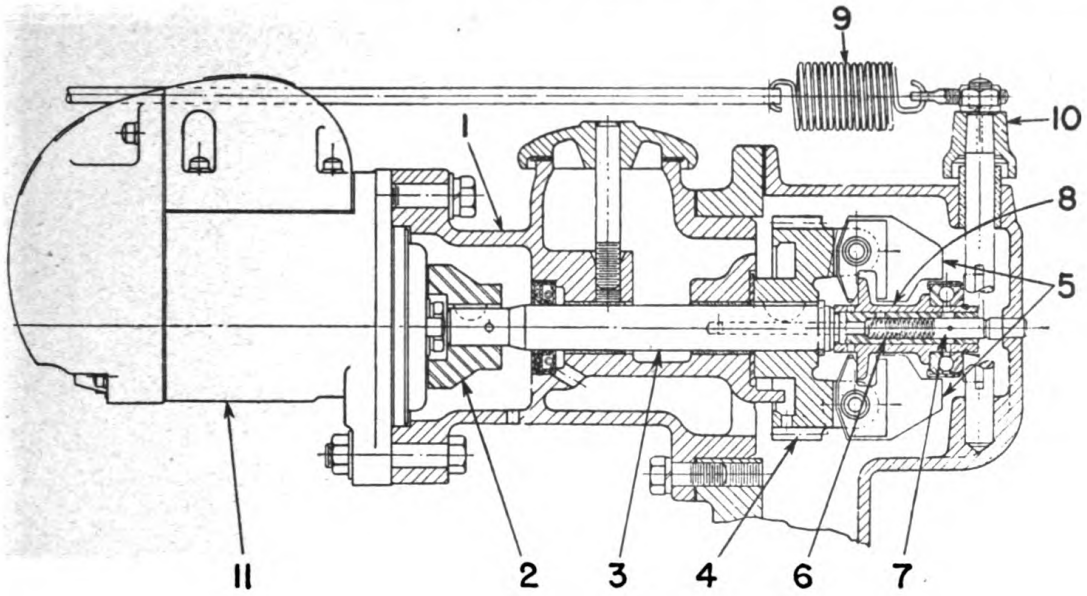


Fig. 24. Governor and Magneto Assembly

1. Magneto Bracket
2. Magneto Coupling
3. Governor Shaft
4. Governor Gear
5. Governor Weights
6. Spring
7. Plunger
8. Sleeve for Governor
9. Governor Spring
10. Governor Arm
11. Magneto

Disassembly of Governor

1. Remove snap rings from either end of pins for governor weights, which are a tight fit in weights. Drive out. **Care** should be taken not to damage governor gear.
2. Governor sleeve No. 8 Fig. 25 can now be removed from the end of shaft No. 3 Fig. 25, which is a loose fit and should slide freely. Remove snap ring on governor sleeve and pull off bearing, which is not a tight fit.
3. To remove governor gear No. 4 Fig. 25 from shaft, take off snap ring that holds gear in place. Gear can be pulled with any suitable puller available.
4. Remove Woodruff key from gear end of shaft No. 3 Fig. 25, and pull shaft out through end of magneto bracket No. 1 Fig. 25.

Inspection

1. If the governor shaft No. 3 Fig. 25 has excessive play in the magneto bracket No. 1 Fig. 25, the bushings should be replaced. Drive bushings out and press new ones into place. Shaft should turn freely when replaced.
2. The thrust bearing on the governor sleeve should be replaced if it shows signs of wear. This is a very light press fit.
3. Examine governor parts, paying particular attention to governor weights. If they are worn, replace, using care in forcing governor pins in place and making sure that snap rings are properly secured.

Caution: Crankshaft gear, camshaft gear and governor gear are marked for proper timing Fig. 26, but cannot be seen unless radiator and timing gear cover are removed, so **Special Care** should be taken when governor assembly is installed.

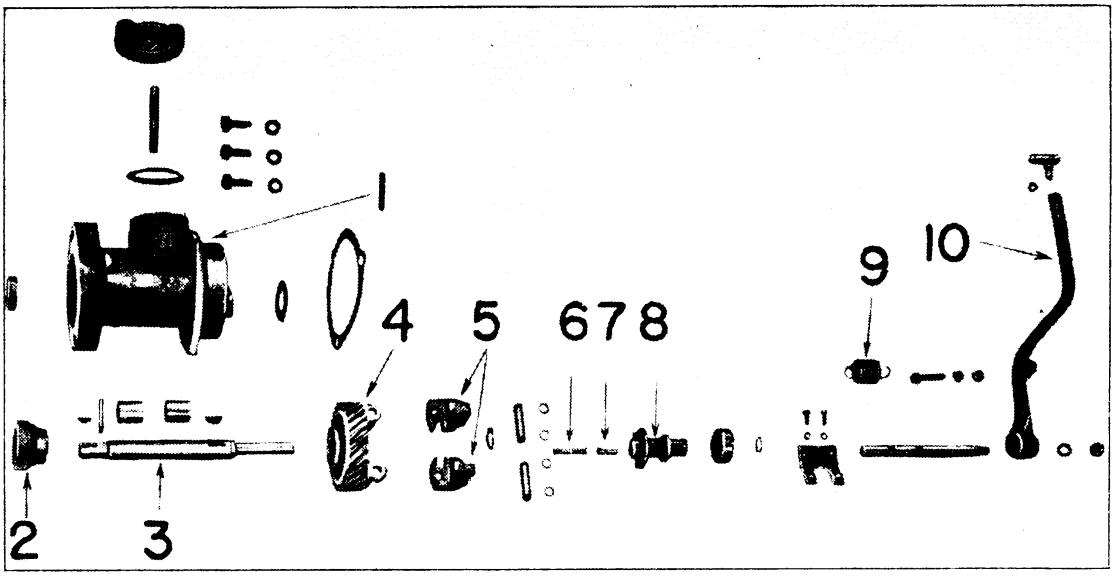


Fig. 25. Details of Governor and Magneto Drive

1. Magneto Bracket
2. Magneto Coupling
3. Governor Shaft
4. Governor Gear
5. Governor Weights
6. Spring
7. Plunger
8. Sleeve for Governor
9. Governor Spring
10. Governor Arm

Note: Refer to Parts List when Ordering Replacement Parts.

Reassembly

1. As the worn parts are replaced the complete assembly is again built up. Turn the governor shaft until the driving slot in the magneto coupling No. 2 Fig. 25 is 25 degrees beyond the horizontal position of governor housing.
2. Install entire assembly in place and put in the three $\frac{3}{8}$ cap screws and tighten.
3. Hold magneto in upright position and hold spark plug wire leading from hole marked No. 1 on distributor about $\frac{1}{8}$ inch from aluminum frame of magneto. Fig. 36. Turn the impulse coupling in a clockwise direction with a wrench one click at a time until a spark jumps between the cable and the frame. Use care to hold the wrench firmly so the impulse will not move beyond the point where it trips and the spark occurs.
4. The driving lugs on impulse of magneto will be 25 degrees beyond the horizontal center line of magneto Fig. 35, and should match the magneto driving slot in governor housing. Attach the magneto to the magneto bracket with bolt and cap screw and tighten securely.
5. Turn motor over and check to see that impulse trips freely, so magneto will give a good starting spark.
6. Turn the engine over slowly with the hand crank until the impulse coupling releases at this point. The $\frac{3}{16}$ inch hole No. 1 Fig. 34 in the flywheel rim should be immediately under the inspection hole in the right-hand side of clutch housing. If the impulse coupling releases at some other point, it will be necessary to loosen the two screws holding the magneto to the governor housing, and rotate the magneto slightly until the impulse releases at the proper point. Moving the top of the magneto toward the engine retards the spark; moving it away from the engine advances the spark. When timed by this method, the running spark is automatically set at the correct advance for most fuels to give the best power over the whole range of engine speeds.

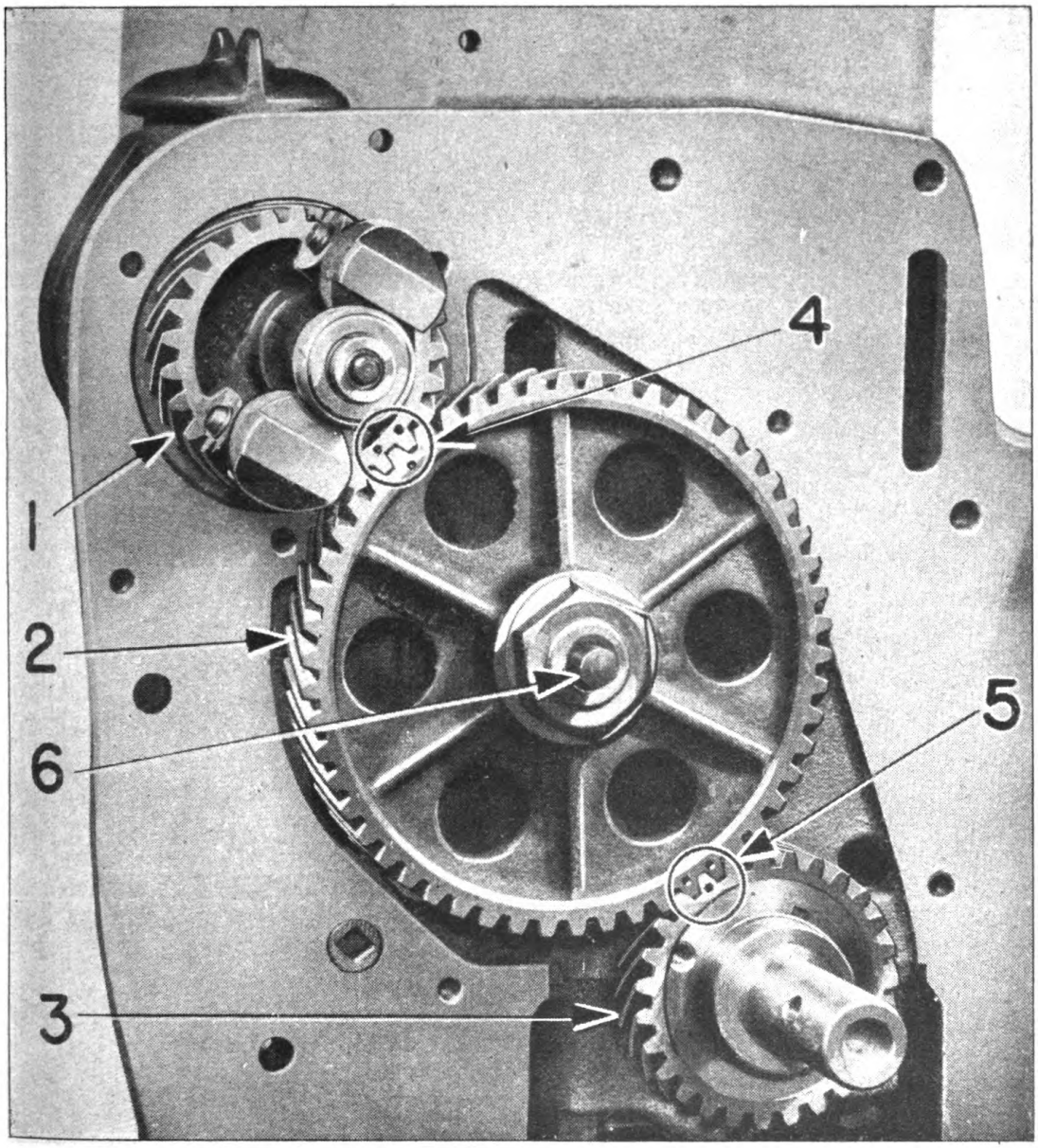


Fig. 26. Timing Marks on Gears at Front of Engine

1. Governor Gear
2. Camshaft Gear
3. Crankshaft Gear
4. Governor and Camshaft Gears Correctly Meshed
5. Camshaft and Crankshaft Gears Correctly Meshed
6. Camshaft Thrust Plunger has Coiled Spring Behind it

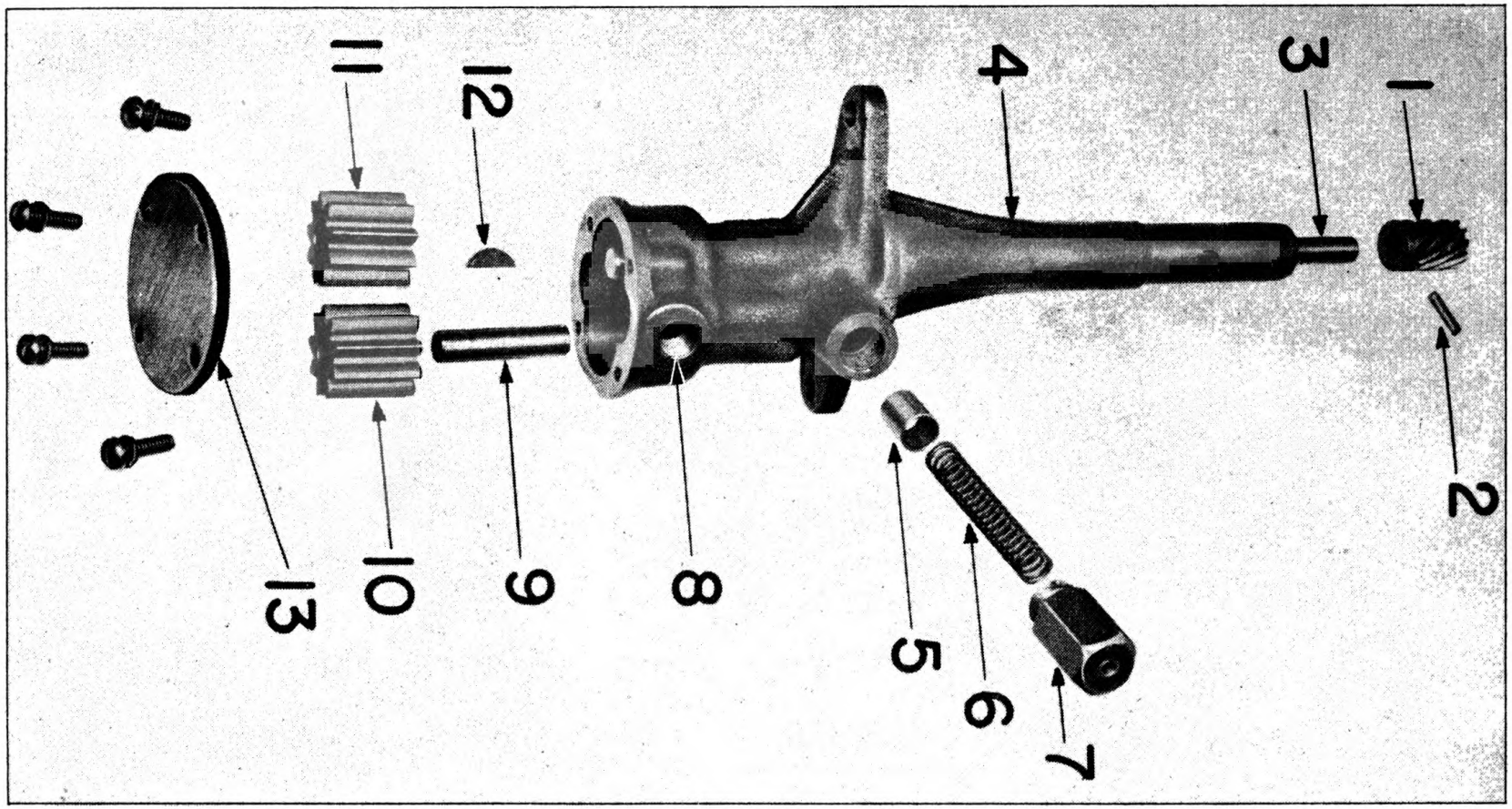


Fig. 27. Disassembled View of the Oil Pump

1. Gear for Oil Pump Shaft
2. Pin for Oil Pump Shaft Gear
3. Drive Shaft
4. Oil Pump Body
5. Relief Plunger
6. Spring for Oil Pump Relief Plunger
7. Relief Nut
8. Opening for Inlet Tube
9. Stub Shaft
10. Driven Gear
11. Drive Gear
12. Woodruff Key
13. Oil Pump Cover

Note: Refer to Parts List when Ordering Replacement Parts.

OIL PUMP

The oil pump is a gear-driven type operating through spiral bevel gears from the camshaft. It circulates oil through passages in the engine block to all main, connecting rod and camshaft bearings as well as valve rocker arms and governor. Valve lifters are flood lubricated. All other engine parts operate in an oil spray from the connecting rod bearings. The same pump provides pressure lubrication to the clutch shaft pilot bearing and the clutch throw-out collar.

The only regular servicing required is to remove and clean thoroughly the oil pump screen every 256 hours of operation. This procedure is described on page 17.

A non-adjustable pressure relief valve is located in the side of the pump body. Fig. 27. The valve by-passes the oil in cases where oil passages are plugged or the oil too heavy or too thin. These conditions will be indicated on the oil pressure gauge. This valve is set to register 25 to 30 pounds on the oil pressure gauge Fig. 5 when the oil and bearings are in good condition. The pressure will gradually become less as the engine is used, but it should never be allowed to drop below 15 pounds at normal engine speed without investigating the cause and correcting it.

The oil pressure necessary to properly lubricate the engine will fail if these conditions exist:

1. Dirty oil pump screen—correct as outlined on page 17.
2. Condensation of water in crankcase and freezing around the screen when operating in cold weather—correct as outlined on page 32.
3. Lack of oil—check oil level page 11.
4. Oil too thin or too heavy—check lubrication chart for recommended grade of oil page 18.
5. Loose engine bearings—usually occurring after long service. Correction indicated on page 64.
6. Broken oil pump parts.

Removing and Disassembling the Oil Pump

By examining Fig. 17 it will be noted that the oil pump is mounted on the lower side of the engine block. To remove oil pump, the oil pump screen must first be taken out as outlined on page 17. The oil pan must be taken off the engine as indicated on page 61. The oil pump can then be removed as a unit by taking out two cap screws.

To disassemble the oil pump, refer to Fig. 27 and drive out pin (2) from oil pump shaft and pull off gear (1).

Remove oil pump cover (13) and slide out drive gear (11) together with shaft (3) and key (12). Remove driven gear (10).

Remove relief nut (7) and slide out spring (6) and relief plunger (5).

Inspection

If there are broken or badly worn parts in the oil pump, they should be replaced.

Reassembly

The oil pump can be reassembled by reversing the procedure indicated under disassembly. Use care to see that the relief nut (7) is securely tightened. No gasket is required between the oil pump cover (13) and the body of (4) so the cover should be carefully mounted and the machine screw securely tightened.

The pin (2) should also be carefully installed to protect drive gear and cam shaft gear.

After the oil pump is assembled and before it is installed in the engine, the drive shaft should revolve freely. If pressure does not show on the oil pressure gauge, when the engine is started, stop the engine at once and check to make sure oil of the proper grade is in the crankcase and the oil pump properly assembled.

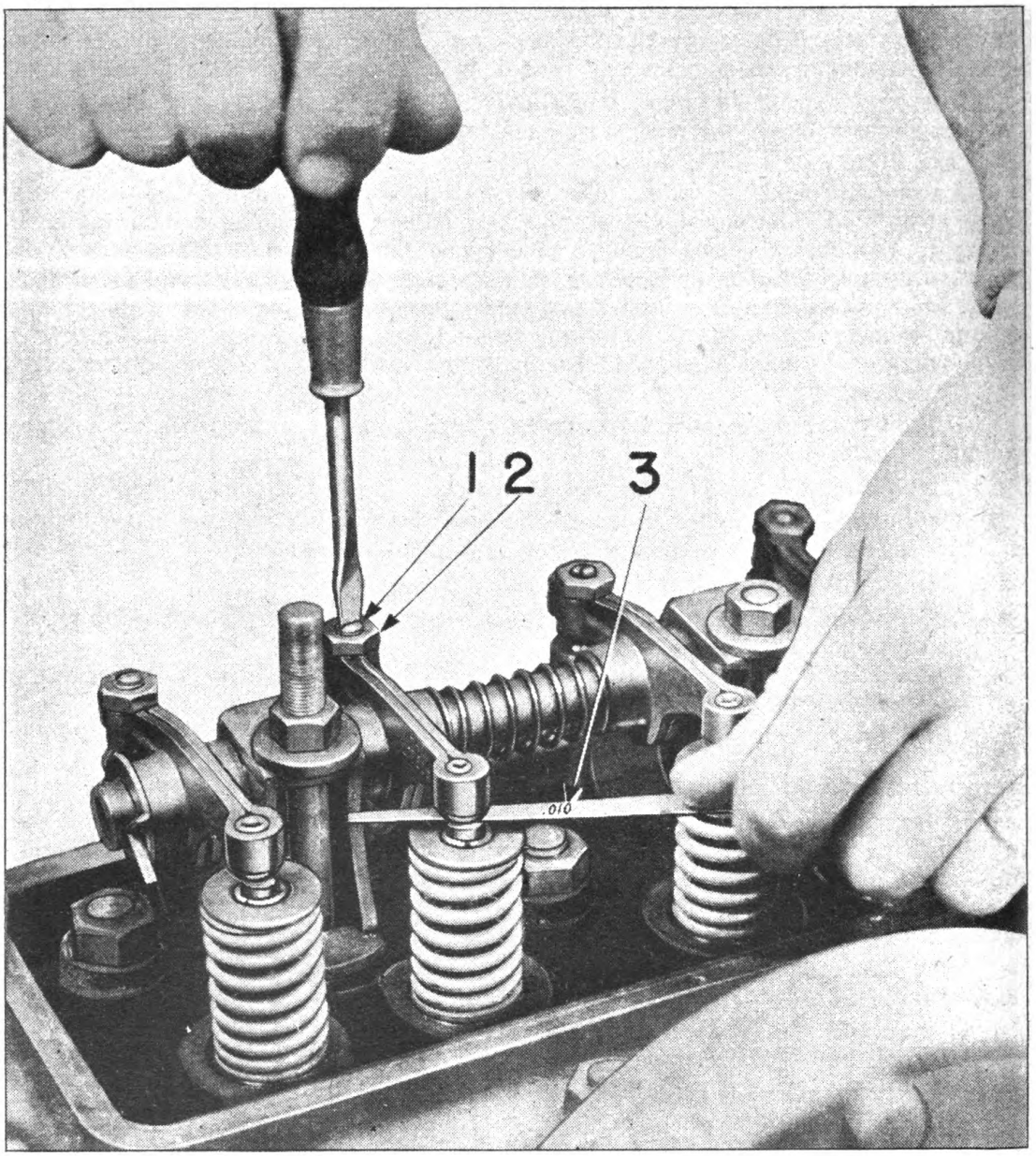


Fig. 28. Adjusting Valve Clearance

1. Adjusting Button for Push Rod 2. Jam Nut 3. .010 Inch Feeler Gauge

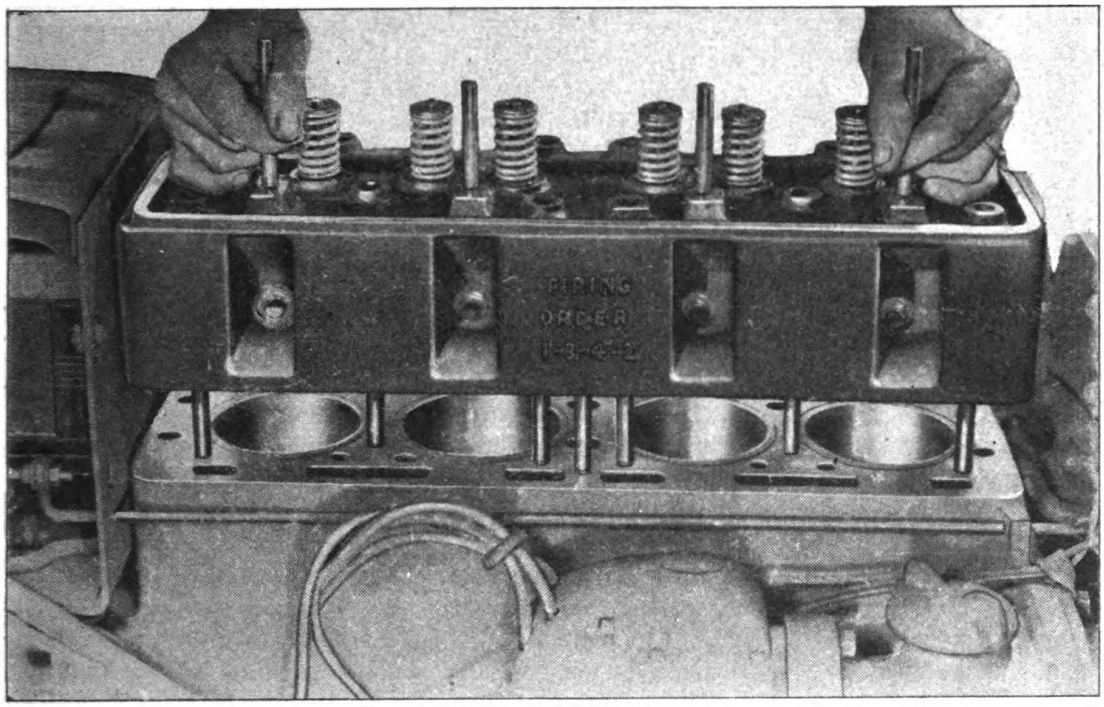


Fig. 29. Removing Cylinder Head by Lifting Straight Up

VALVES AND ROCKER ARMS

A number of engine troubles can be traced to the operation and adjustment of the valves. Hard starting, engine missing, engine overheating, lack of power and explosions in the exhaust pipe are a few of these difficulties.

ADJUSTING VALVE CLEARANCE

The engine hood and the valve cover must be removed and all spark plugs taken out in order to adjust valve clearance.

Clearance between rocker arms and ends of valve stems should be kept properly adjusted. The clearance should be .010 inch when the valve is fully closed and the engine warm.

For convenience in setting valve clearance, the rim of the flywheel is marked for dead center for No. 1 cylinder. Remove the plug from inspection hole on right side of clutch housing Fig. 34 and crank the engine until mark "D" on flywheel is directly in line with the hole. This is top dead center of No. 1 and No. 4 cylinders.

The end of the compression stroke can be detected by noting the action of the valve mechanism; on compression both valves and push rods are stationary.

In this position the adjustment of both valves for this cylinder can be made. Fig. 28. Loosen lock nut and turn adjusting screws until .010 inch clearance is obtained. Tighten lock nuts securely after adjustment is made. Recheck after tightening locknut.

The firing order of the engine is 1-3-4-2.

Turn the starting crank slowly until a distinct "click" is heard from the magneto impulse coupling. When the click sounds, stop the crank immediately

and adjust the tappets on No. 3 cylinder. Proceed in the same manner for No. 4 and No. 2 cylinders.

VALVES AND VALVE SEATS

One of the chief sources of lack of power is lack of compression in one or more cylinders. An engine with poor compression is inefficient and should not be kept in service.

The engine can easily be tested for compression leaks. Before making the test, the engine should be run until it is warmed up to working temperature and the valves and other parts properly oiled. Do not try to test compression on a cold engine, as this is misleading. When a warm engine is hand cranked, there should be marked resistance as each piston is on compression stroke. If compression is poor, it is probably because of compression leaks past the valves, or if the engine has been operated for several months, there may be compression leaks past the piston rings which will require replacement of rings or pistons.

If the compression is poor, remove the valve cover and squirt kerosene on the valve stems and rocker arms to remove any gummy oil accumulation; then oil with light oil. Many times this care will cause valves to seat tight.

Operators should not be alarmed if they hear a slight amount of compression escaping past the valve seats. Valves seldom remain absolutely tight in service and slight leaks are very noticeable because the exhaust pipe is close to the man cranking the engine.

Generally speaking, if the engine has good power, it is best to leave the valves alone. It is time enough to recondition valve seats when they are known to be the cause of lack of power.

RECONDITIONING VALVE SEATS

If it is indicated the engine lacks power due to leaking past the valves, valve seats may be distorted or pitted, and when this occurs, mere grinding will not tune up the seat and restore the conditions that are necessary for satisfactory operation. They should be reconditioned as follows:

Remove Cylinder Head.

1. Drain all water from cooling system and remove spark plugs.
2. Remove the engine hood.
3. Remove the valve cover.
4. Remove manifold and carburetor as a unit by loosening air cleaner hose and removing nuts and clamps attaching manifold to cylinder head.
5. Remove the four nuts holding bearing brackets that hold rocker arm assembly, and the rocker arm shaft and assembly can be removed.

NOTE: Before removing the above 4 mentioned nuts, a wire should be placed lengthwise of this assembly to hold same together. This will facilitate reassembly of this unit.

6. Remove the push rods.
7. Remove the nuts from the cylinder head studs. Disconnect the cap screws in front of cylinder head that hold water flange.
8. The cylinder head can be lifted off. Fig. 29.
9. Compressor tool available from Owatonna Tool Co., Owatonna, Minn., shown in Fig. No. 30 simplifies the removal of valves.

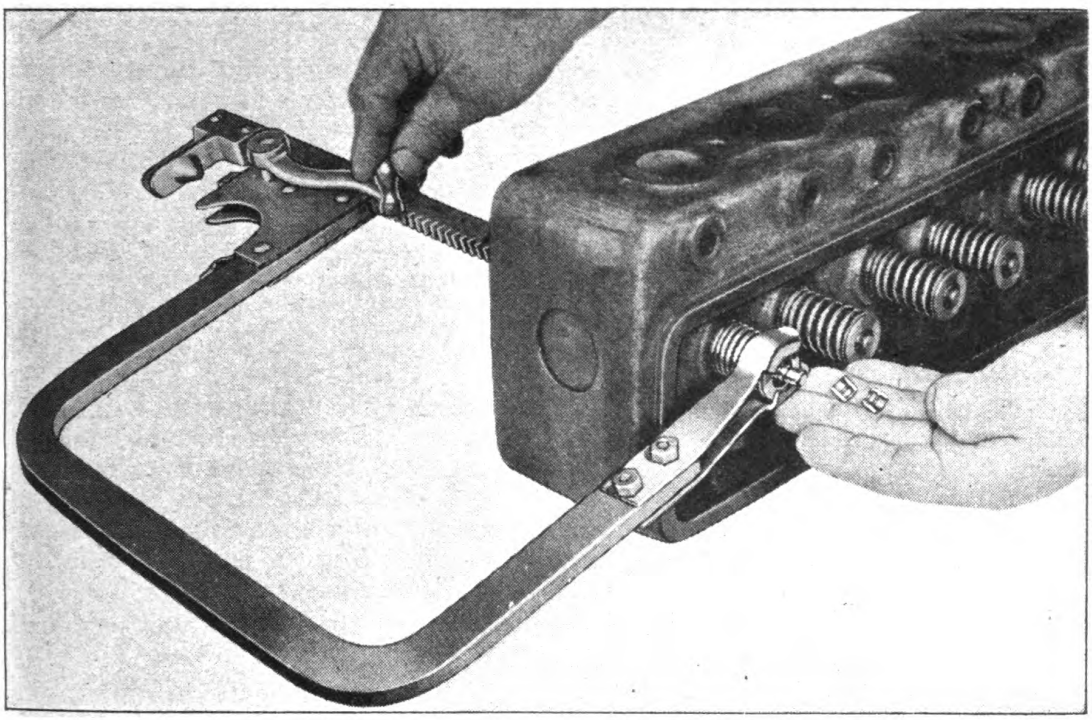


Fig. 30. Removing Valve Retainers Using Owatonna Tool Company's Valve Lifter No. A200. Other Standard Tools will do as well.

10. The exhaust valve seats are hard alloy steel inserts and cannot be reconditioned with hand tools. Use modern valve insert grinding equipment for reconditioning the seats. The intake seats may be refaced with hand tools. All seats have a 45° angle.
11. When replacing the cylinder head on engine see that the gasket is not damaged or turned up at the edge and that the water passages in the gasket line up correctly with the passages in the cylinder block. At time of major overhaul or after long service, it is desirable to install a new cylinder head gasket. Tighten all cylinder head stud nuts evenly. Begin at center studs and tighten from the center outwards. Tighten to 60 ft.-lb. After engine has run for about an hour and is warmed up, retighten studs and reset valve clearance to .010" as discussed in **Adjusting Valve Clearance** page 55.

VALVE SPRINGS

Valve springs should be checked while head is removed and should meet these specifications:

Free length	2 1/32 inch approx.
Pressure at a compressed height of 1 13/32 inches (valve open)	61 to 69 lbs.
Pressure at a compressed height of 1 3/4 inches (valve closed)	25 to 28 lbs.

COOLING SYSTEM

Cooling solution is circulated by means of an impeller type pump through the radiator, engine block and engine head. The pump is driven by a 'V' belt from the crankshaft. Circulation is automatically controlled by a thermostat which opens at a temperature of 160° F.

The capacity of the cooling system is 4 U. S. gallons.

CAUTION: Never pour cold water into a hot engine in which the water has been allowed to become very low. To do so may result in cracking the cylinder block or cylinder head. If it is necessary to pour warm water into a cold engine that has been drained, add the water slowly. Too rapid pouring may result in breakage.

Cleaning the Cooling System

At least once a year, particularly in the spring after draining the anti-freeze, the cooling system should be given a treatment with washing soda solution to remove any sludge and sediment that is accumulated. The easiest way is to drain the system and put back in 2 gallons of fresh water. Then bring to a boil an equal amount of water and add all the common washing soda that will dissolve. While this is still hot, add it to the cooling system. Run the engine as usual for 24 hours, then drain, flush thoroughly, and refill with clean water.

Use of an anti-rust oil is recommended to preserve the interior surface of the cooling system.

Keep radiator hose clamps tight. Remove any weeds or dirt from the core of the radiator to prevent overheating.

Fan Belt Adjustment

Loosen two hexagon nuts on the fan hub. Fig. 10. To tighten, turn the front half of the pulley in the direction in which the blades turn. The tension should be just enough to take up any looseness or slack in the belt. Having the fan belt too tight causes rapid belt wear, excessive load on the bearings and does not aid cooling. A properly adjusted belt can easily be depressed an inch without effort. After adjusting the belt, tighten hexagon nuts.

Further adjustment can be made by loosening the generator and swinging it outward using care to see that V-belt does not pull down to the bottom of the fan hub pulley.

Installing New Fan Belt

A new fan belt can easily be installed by loosening the adjustable pulley flange on the water pump and slipping on the new belt. It may be necessary to remove the generator in order to provide clearance between the generator pulley and the radiator shroud.

Care of Radiator for Winter Operation

In operating an engine in cold weather, use a good grade of anti-freeze in the radiator. While Prestone or similar anti-freeze are to be preferred, alcohol or alcohol-base solutions will be satisfactory. However, to prevent loss of alcohol by evaporation, the water temperature must not be allowed to rise above 160° F.

It is well to inspect radiator hoses and connections before putting anti-freeze in the radiator in order to prevent loss of solution.

Under no circumstances should a compound of unknown composition be used, as it may prove harmful to the cooling system. No solutions of calcium chloride, sodium chloride or magnesium chloride should be used. The electrolytic and corrosive action is very damaging to metal parts. Likewise, no substances such as lubricating oil, kerosene, honey or sugar solutions, sodium silicate or

glucose should be used. Extra fire hazard, destruction of the radiator hoses and gumming action on the interior surfaces of the cooling system may result from the use of such solutions.

SERVICING WATER PUMP

Removing the Water Pump

1. Remove the fan blades No. 10 Fig. 31 by taking out four cap screws that hold fan pulley hub No. 7 Fig. 31 to hub No. 9 Fig. 31 on water pump shaft.
2. Remove the fan belt by loosening the generator and swinging it toward the engine. Remove vent pipe and 2 wire clips.
3. Loosen the three cap screws which attach the water pump to the water connection No. 12 Fig. 31 on the front of the engine. Remove the water pump complete as shown in Fig. 10.

Disassembling the Water Pump

1. Remove back plate No. 1 Fig. 31 on water pump housing by taking out six $\frac{5}{16}$ x $\frac{5}{8}$ inch cap screws. Use care so that gasket No. 2 Fig. 31 is not damaged.

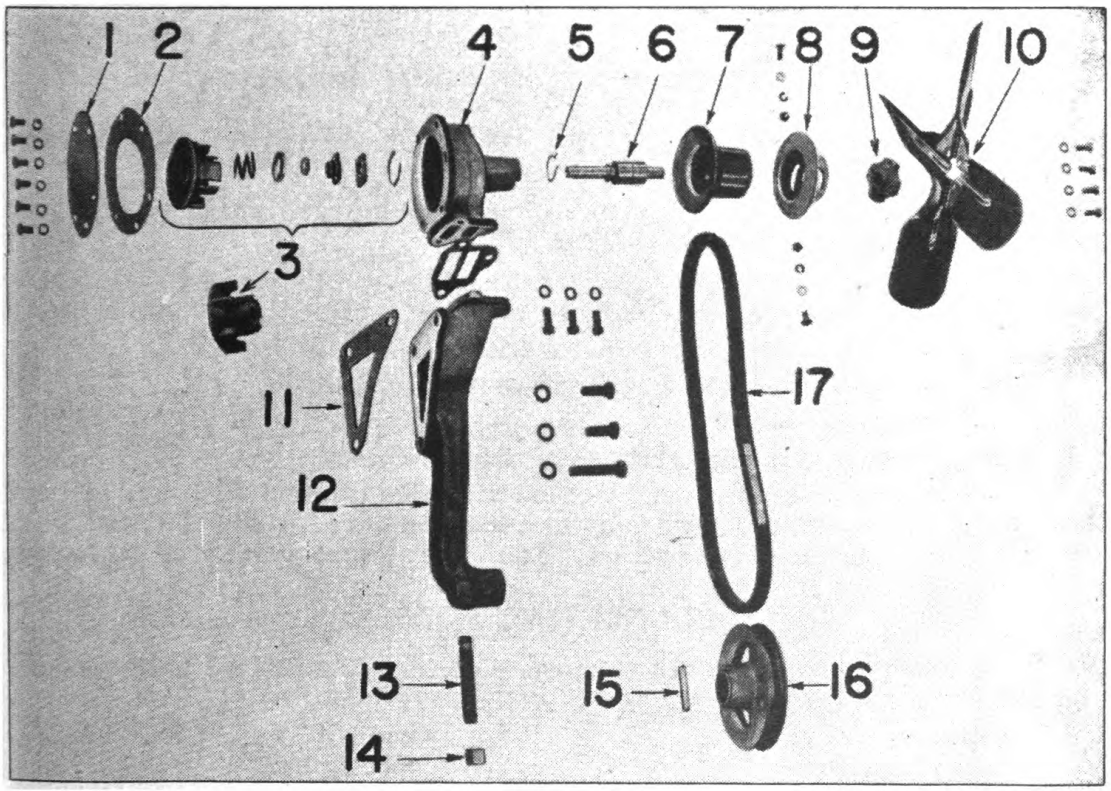


Fig. 31. Details of Water Pump

1. Back Plate
2. Gasket
3. Impeller
4. Water Pump Body
5. Snap Ring
6. Shaft for Water Pump and Fan
7. Fan Pulley, Drive Hub Half
8. Fan Pulley, Adjustable Half
9. Fan Hub Flange
10. Fan Blade Assembly
11. Gasket
12. Body
13. Drain Nipple
14. Pipe Cap
15. Taper Groove Pin
16. Fan Drive Pulley
17. Fan Drive Belt

Note: Refer to Parts List when Ordering Replacement Parts.

2. Remove impeller No. 3 Fig. 31 by using suitable puller. **Do not drive off** as this will damage end of impeller.
3. Remove snap ring No. 5 Fig. 31 on the fan blade end of bearing and drive out water pump bearing assembly. This should be driven away from the the impeller or toward the fan end of pump.

Inspection

1. If the water pump has been leaking, indicated by water dripping from the water pump housing, it may be that the water pump seal is worn. In that case, the entire impeller should be replaced.
2. If the water pump bearings No. 6 Fig. 31 are worn, a complete new water pump bearing assembly should be installed by pressing into place and reinstalling the snap ring No. 5 Fig. 31.

Reassembly and Adjustment

When the worn parts indicated by **Inspection** are replaced, the water pump can be reassembled and reinstalled on the engine. The fan belt should be adjusted as indicated on page. 25.

REMOVING RADIATOR

If the radiator is damaged or develops serious leaks, it must be removed following this procedure:

1. Disconnect all spark plug wires to avoid any possibility of the engine starting.
2. Drain water from cooling system by removing hexagon cap at bottom pipe on the left-hand side of the radiator.
3. Remove the engine hood.
4. Loosen top clamp on upper radiator hose.
5. Loosen top clamp on lower radiator hose.
6. Remove 4 bolts which hold radiator on radiator bracket.
7. Lift radiator off bracket.
8. Remove upper and lower sections of radiator shroud.

When reassembling radiator, place lower section of radiator shroud in position on the radiator bracket, put radiator into shroud and install bolts mentioned in 6 above through shroud and bracket. From this point reverse above procedure.

CONNECTING RODS

Connecting rods used in this tractor are accurately machined to the following specifications:

Length—center to center	8½ inches
Crank pin diameter	2.374-2.375 inches
Precision type bearings	
Bearing total length	1.500 inches minus .003 inches
Bearing running clearance	.0015 to .0035 inches
Bearing end play	.005-.011 inches

Connecting rods are removable from top of block

A marked decrease in oil pressure indicates that bearings are loose.

When removing bearing caps, note their positions and keep them separated so there will be no error in reassembling. Numbered side of caps and rods are away from the camshaft.

The connecting rod bearings on the crank end are precision type, heavy steel-backed babbitt. Bearing shells are interchangeable and quickly replaced. They are locked in place to prevent their rotating on the crankshaft.

The connecting rod should be straight, free of twist and parallel to the piston. The connecting rod is assembled with two heat-treated cap screws which are tightened to 65 ft. lbs.

PISTONS AND RINGS

The pistons are cast iron with 4 rings, all above the piston pin, including 3 plain compression and one ventilated oil ring.

SPECIFICATIONS

Piston material	Special Grey Iron
Clearance at skirt	.004 to .005 inch

RINGS

Total number required per piston	4
Number compression rings required per piston	3
Number oil rings required per piston	1
Width compression ring	.1240-.1235 inch
Width of oil ring	.1865-.1860 inch
Gap of compression ring when compressed to 3.5 inches	.010-.020 inch
Gap of oil ring when compressed to 3.5 inches	.007-.017 inch
Clearance in groove first compression ring	.003-.0045 inch
Clearance in groove second and third compression rings	.002-.0035 inch
Clearance in groove oil ring	.0015-.003 inch
Tension required to close joint on compression rings	11 to 14 lbs.
Tension required to close joint on oil ring	8 to 11 lbs.

REMOVING ENGINE OIL PAN

When it is necessary to service connecting rod or main bearings or remove connecting rods and pistons, it is necessary to remove the engine oil pan. The procedure is as follows:

1. Remove the radius rod complete.
2. Drain engine lubricating oil by removing oil drain plug No. 15 Fig. 4.
3. Take out oil pump screen No. 9 Fig. 3 by removing three cap screws. Use care in removing to protect gasket.
4. Remove four ½ inch S. A. E. bolts with lock washers and nuts that attach oil pan to transmission flange front end. The gasket is one piece—use care in removing.
5. Remove sixteen cap screws from bottom of oil pan.
6. Oil pan can now be removed.

To reinstall, reverse the procedure outlined.

Removing Pistons and Connecting Rods

After the engine oil pan is removed the connecting rod bearing caps can be removed, the cylinder head removed Fig. 29, the piston and connecting rod can be taken out upward through the cylinder barrel.

In replacing piston rings use care in fitting new ones to grooves. Compression rings should be installed with dot upward or toward the top of the piston.

Follow closely specifications listed above. When installing rings on pistons, be sure that rings are free in the ring groove on piston. Dip the piston in oil before assembling and stagger the ring gaps around the piston.

Piston Pins

Pins are of the full floating type retained in the pistons on each end by snap rings which engage grooves in the piston.

Specifications

Length of piston pin	3 inches
Diameter of piston pin	.9992 minus .0003 inch

Select pin .0001 to .0003 inch smaller than piston hole.
Select pin .0003 to .0006 inch smaller than bushing in rod.
Pins are removed by taking out the snap rings and pushing out pin.

CYLINDER BARRELS

The engine block is equipped with replaceable wet-type cylinder barrels.

The cylinder head must be removed Fig. 29 and the connecting rods and pistons removed before pulling the sleeve.

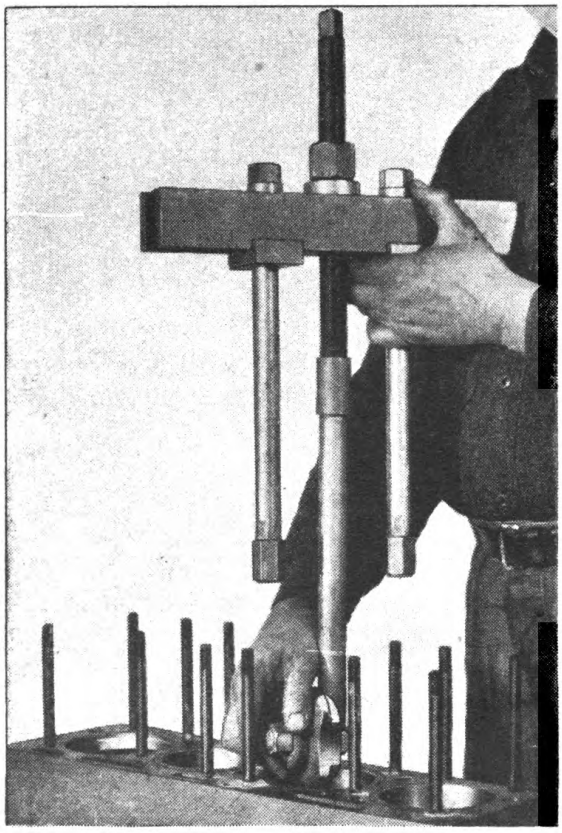


Fig. 32. Inserting Puller into Cylinder Barrel Preparatory to Pulling. This is a Combination of Owatonna Tool Co. Tools—other Standard Tools will do as well.

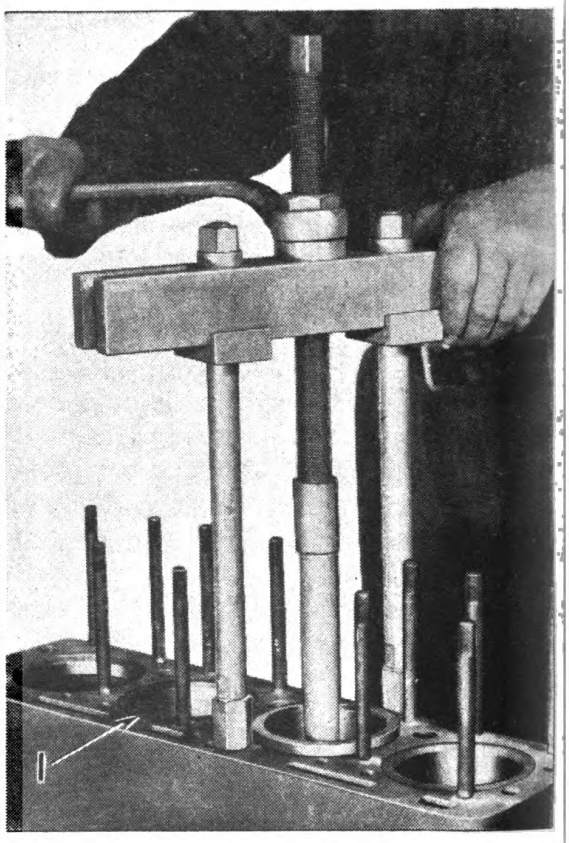


Fig. 33. Cylinder Barrel Partially Pulled From Block

1. Barrels Should be .001 to .003 InchHigher Than Top Surface of Block When Cylinder Head is Tightened in Place

The pulling of the cylinder barrel is illustrated in Fig. 32 and 33. In this case, tools available through the Owatonna Tool Company, Owatonna, Minn. are used. Other standard tool sets will do as well.

After the sleeve is pulled and the rubber ring removed, the lower groove in the cylinder block should be cleaned. The shoulders on the new barrel and in the cylinder block should be cleaned.

Replace the rubber ring with a new one and fit it into the lower groove of the cylinder block. Put grease around the rubber ring before it is put in place around lower edge and outside the lower end of barrel, before putting it in place.

When sinking the barrel, note when the end enters the rubber gasket. Push the barrel down in place so that the top shoulder seats in the corresponding shoulder in block. If resistance is encountered in replacing the barrel, a block of hard wood over the top of the barrel and a hammer will serve. The final position of the barrel is .001 to .003 inch higher than the top surfaces of the block, when the cylinder head is put on and tightened.

Cylinder barrels and pistons are select fits in manufacture. Therefore, both must be installed new at the same time.

Pistons should be assembled and installed as indicated before.

Replace the cylinder head gasket with a new one. Replace the cylinder head and tighten cylinder head nuts. These should be tightened evenly and firmly. Center nuts should be drawn up first, working from the center outward. Tighten nuts to 60 ft.-lbs.

Connect up the cooling system.

Replace the push rod and rocker arm assembly and set the clearance to .010 inch. After the engine has warmed up, the head stud nuts should be tightened and the push rod clearance again adjusted.

Replace the manifold and carburetor and connect up the air cleaner.

Make all electrical connections, install gasoline lines, controls, etc., and check carefully before attempting to start engine.

CAUTION: Engines that have had new cylinder barrels and piston assemblies installed should be given the same consideration that is given a new tractor. Pistons and cylinder barrels are machined and honed to a very fine finish and should be handled carefully. For the first fifty hours, run at half load or less before going to full load.

REMOVING THE ENGINE

If the entire engine, cylinder block or crankshaft is to be replaced in the tractor, the engine must be removed according to the instructions outlined here.

Remove radiator as described on page 60. Then proceed as follows:

1. Remove generator to prevent damaging.
2. Remove fan belt from crankshaft pulley.
3. Drive out grooved pin and pull fan drive pulley off the crankshaft. Do not damage oil seal back of pulley.
4. Remove water pump and fan assembly as a unit by taking out three 3/8" x 1" N. C. cap screws, which secure the lower water pump body to the cylinder block.
5. Remove radius rod from under the tractor.
6. Drain oil from the engine crankcase and from the clutch housing at the front end of the transmission case.

7. Remove oil screen on the left-hand side of the oil pan by taking out 3 cap screws.
8. Remove oil pan and oil pump. Pages 53 and 61.
9. Complete the operations for splitting the tractor, as shown on page 87. Then continue:
10. Disconnect rod from carburetor at governor lever.
11. Remove manifold and carburetor assembly as a unit, by removing nuts and clamps from four—⅜" studs in the cylinder head.
12. Block up under front and rear ends of crankcase. (Use tackle and chain if available.)
13. Remove all bolts holding the radiator bracket to the cylinder block and move forward with front axle assembly.
14. Place planks on blocks along the left side of the tractor. **Caution:** These planks must be rigid enough to support the engine.
15. Remove the two—¾" x 13 13/16" splitting pins mentioned on page 89.
16. Carefully set the engine on its left side.

REMOVING CRANKSHAFT

After the engine has been removed as recommended on page 63, and it becomes necessary to remove the crankshaft, proceed as follows:

1. Remove the flywheel from the crankshaft by taking off the jam nuts and lockwashers from the flywheel bolts.
2. Remove the timing gear cover from the cylinder block. Be careful not to damage the enclosed oil seal in the cover. (Set small camshaft thrust plunger and spring aside to avoid misplacement.) No. 6 Fig. 26.
3. Remove the oil thrower from the crankshaft.
4. Remove the connecting rod and piston assemblies through the bottom of the engine.
5. Remove the three main bearing caps.
6. Remove the crankshaft.
7. Before installing the crankshaft, clean all parts thoroughly.
8. Piston pins must turn freely when inserted in place.
9. Piston rings must move smoothly in their grooves. The ring gaps should not be in line when assembled.
10. The numbers on the connecting rods and caps should face away from the the camshaft side of engine.
11. In installing crankshaft make certain that the three gears at the front of the engine are assembled as shown in Fig. 26. The tooth on the crankshaft gear bearing a punch mark must be between the two teeth having punch marks on the camshaft gear, when the tooth on the camshaft gear having a single punch mark is between the two teeth bearing punch marks on the governor gear. If they are matched this way valve and magneto drive timing will be correct.
12. When attaching the timing gear cover, be careful not to damage the oil seal.
13. Reverse the above operations when installing the crankshaft.

ELECTRICAL SYSTEM

The electrical system on this tractor consists of a high-tension magneto for ignition, an electric starter, electric generator, battery and electric head and tail lights.

IGNITION

The Case 4JMA Magneto—located on the right side of the engine—is a very precisely built, self-contained unit which should not be taken apart in the field except as discussed in the paragraphs under **Field Servicing.** Many magnetos are ruined because they are tampered with by inexperienced operators, under dirty, dusty conditions or at places where proper service tools are not available.

FIELD SERVICING MAGNETO

This should include only service operations involving the timing of the engine or replacement of the entire magneto unit.

In normal use, the magneto will seldom require timing unless it has been removed from the engine for servicing. The magneto has been properly timed and adjusted at the factory and the position of the crankshaft in relation to the occurrence of the spark does not change appreciably in use.

Checking Timing of Magneto

In checking the timing, turn the engine over slowly with the hand crank until the impulse coupling releases. At this point the 3/16 inch hole in the flywheel rim Fig. 34 should be visible in the center of the inspection hole in the right hand

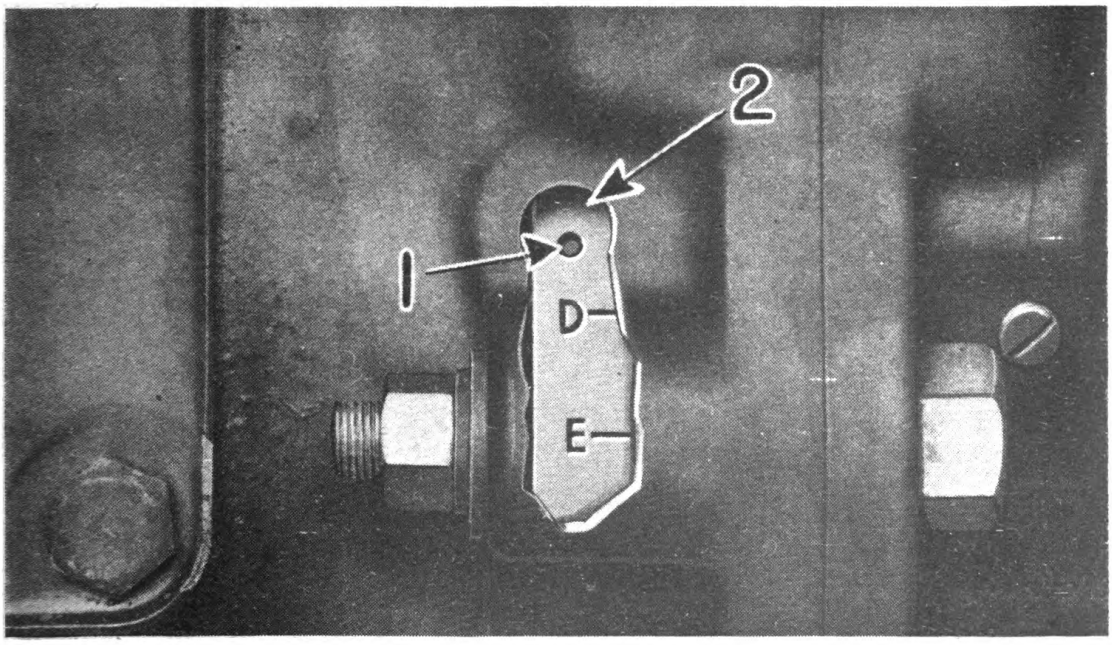


Fig. 34. Inspection Hole and Timing Marks on Flywheel

1. 3/16 inch hole in flywheel for ignition timing
2. Inspection Hole Broken out to show Flywheel
D. When in Front of Inspection Hole, Indicates Top Dead Center on No. 1 or 4 Piston
E. When in Front of Inspection Hole, Indicates Point of Exhaust Valve Closing

side of the clutch housing. This hole is located a fraction of an inch from the "D" mark on the flywheel rim and can readily be seen, or, if preferred, felt with a rod.

If the impulse coupling releases at some other point, it will be necessary to loosen the two cap screws in the mounting flange of the magneto and rotate the magneto slightly until the impulse releases at the desired point. Moving the top of the magneto toward the engine retards the spark; moving it away from the engine advances the spark.

CAUTION: Never advance the spark from that established above, especially if the tractor is to be hand cranked. There is danger of kick back due to the spark occuring ahead of the top dead center position of the crankshaft.

Removing the Magneto from the Engine

Fig. 35—Disconnect all wires from the magneto to spark plugs. Disconnect the grounding wire. Take out the two cap screws attaching the flange of the magneto to the magneto drive. The magneto can then be lifted off.

Installing the Magneto

When the magneto is installed on the tractor, it must be retimed. Follow this procedure:

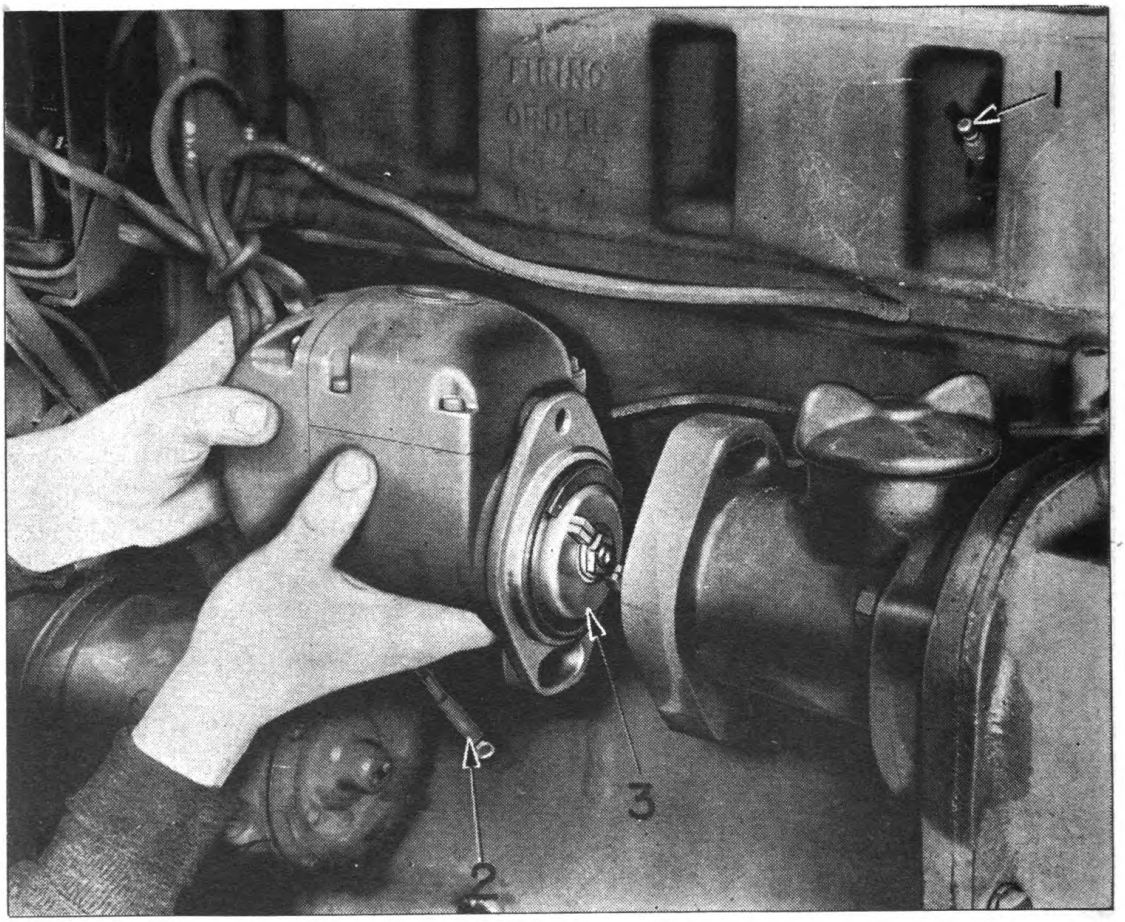


Fig. 35. Magneto in Proper Position for Installing on Engine

1. No. 1 Spark Plug 2. Magneto Ground Wire 3. Magneto Impulse

1. Remove all spark plug wires and Nos. 2, 3 and 4 spark plugs from head. The spark plug in No. 1 cylinder remains in place Fig. 35.
2. Make sure the gear shift is in a neutral position.
3. Remove the plug from the timing inspection hole on the right side of the clutch housing. Fig. 34.
4. Crank the engine until piston comes up strongly against compression.
5. Remove No. 1 spark plug.
6. Crank the engine very slowly. Watch through the timing inspection hole Fig. 34 and stop turning immediately when a 3/16 inch hole in the flywheel becomes visible and is seen in the center of the inspection hole. This is the proper position for timing the magneto.
7. Support the magneto in an upright position, as shown in Fig. 36. Connect one of the spark plug wires to the Number 1 terminal of the magneto cap. The terminal is marked 1 and is the upper-right hand terminal. Hold the free end of the spark plug wire about 1/8 inch from the frame of the magneto Fig. 36. Turn the impulse with the wrench one click at a time, Fig. 36, until a spark jumps between the wire and the frame. Use care to hold the wrench and magneto firmly so impulse will not move beyond the point where it trips and the spark occurs. The position at which the spark occurs indicates the approximate setting of the magneto for firing position of No. 1 cylinder.
8. Without disturbing the settings of the engine or magneto as established above, install the magneto on the engine. Install the cap screws holding the magneto to the housing in this position.

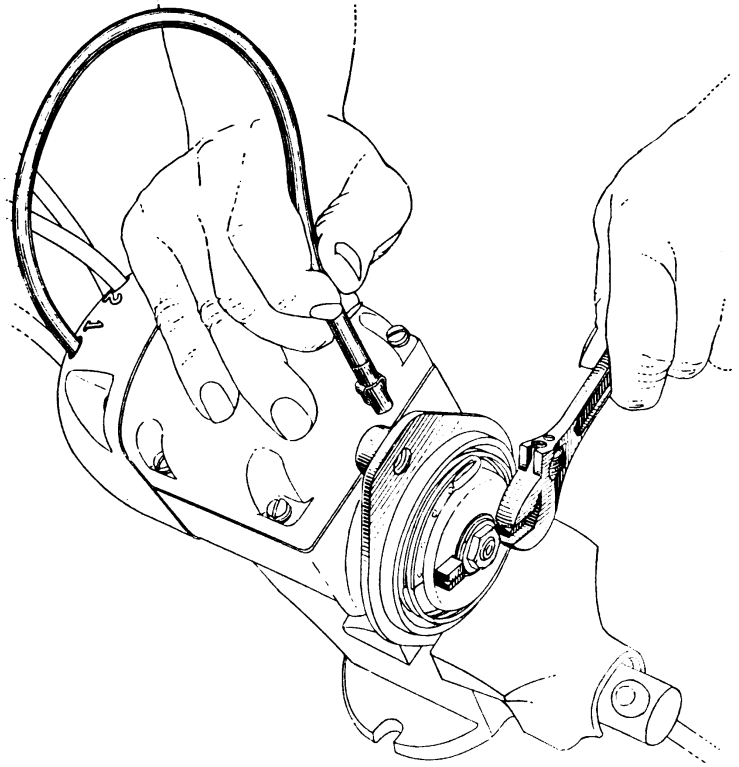


Fig. 36. Locating No. 1 Firing Position of Magneto

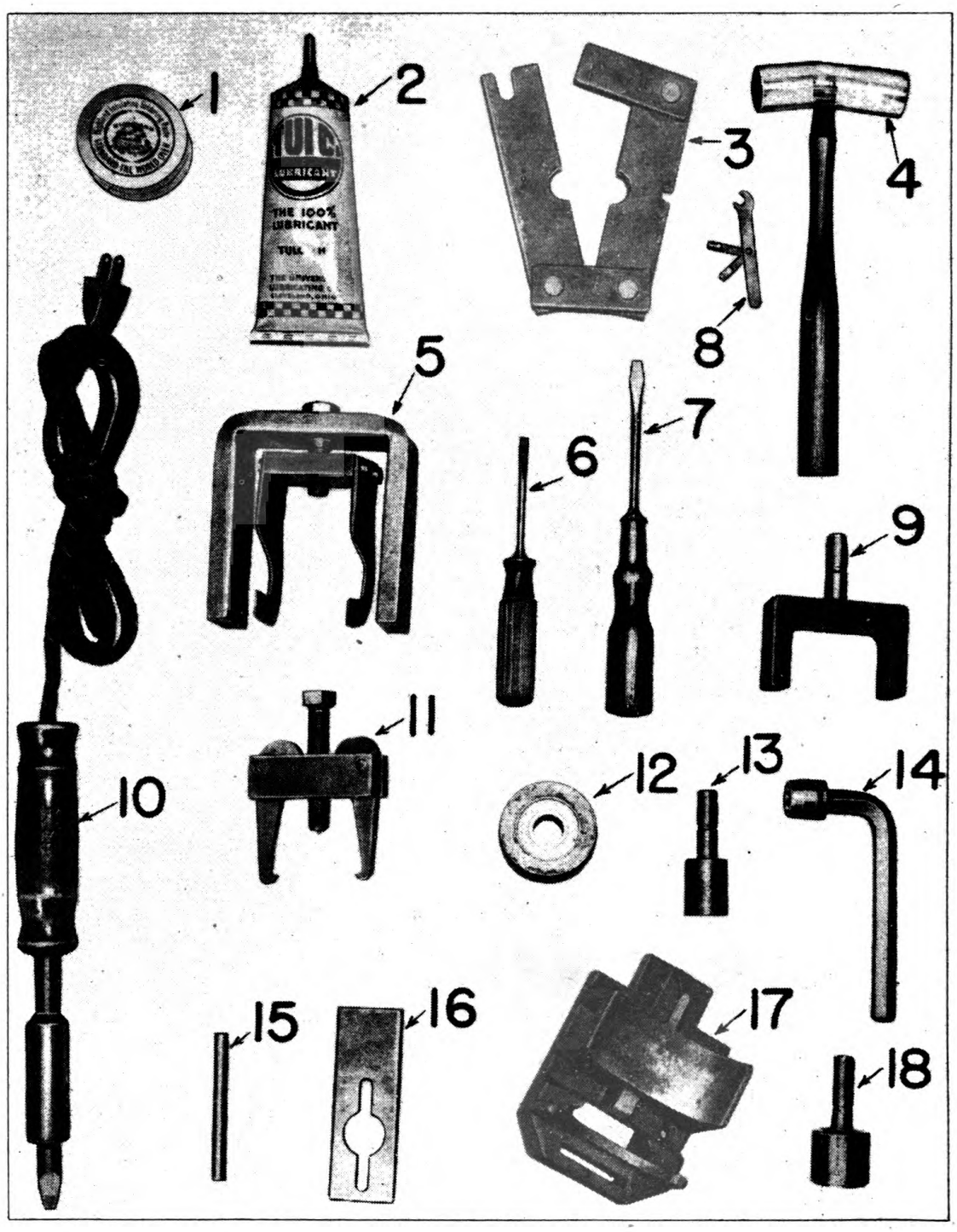


Fig. 37. Small Tools Required to Service Case 4JMA Magneto Listed on Page 69

9. Connect the grounding wire and install the spark plug wires. Connect the No. 1 terminal as marked on the distributor cap with the No. 1 spark plug, the No. 2 terminal with No. 2 spark plug, etc.
10. Final setting for maximum economy is made by rotating the magneto to obtain the best setting of the spark as described under "Checking Timing of Magneto". Page 65.

LUBRICATING THE MAGNETO

The Case Type JMA Magneto used on this tractor is equipped with sealed ball bearings and oil impregnated bushings which reqı ire no lubrication except at time of general overhaul.

ADJUSTING BREAKER POINTS

After long service, breaker points sometimes require adjusting Fig. 47. This operation is fully described on page 73 under Servicing at Base.

SERVICING MAGNETO AT BASE

Equipment Required

1. Charging coil as built by H. G. Makelim, 1583 Howard St., San Francisco, Cal. or similar unit.
2. Synchroscope as built by H. G. Makelim, 1583 Howard St., San Francisco, Cal. or similar unit.
3. Coil tester as built by the Eisemann Magneto Co., Brooklyn, N. Y. or similar unit.
4. No. 3 Famco Arbor Press as built by the C. W. Leinen Mfg. Co., Racine, Wis. or similar unit having a capacity over the table of 11 inches.

Some of the tool parts are held in the ram of the arbor press by the pressure of the ball into a groove cut in the shanks of the tools. The installation of this ball should be made according to the sketch Fig. 38.

Use caution in drilling the $^{17}/_{64}$ inch hole in the ram for this ball. The hole must not be drilled through but must have a flange to keep the ball from being pushed into the $^{1}/_{2}$ inch hole by the spring.

The following small tools are necessary to properly service the Case JMA Magneto shown in Fig. 37.

1. Can of insulating soldering paste.
2. Can of VH Tulc as manufactured by the Universal Lubricating Co., Cleveland, Ohio or its equivalent.
3. Gear and ball bearing puller.
4. Composition mallet.
5. Coil pulling tool.
6-7 Large and small screw drivers.
8. Contact point and spark plug gap gauges.
9. Yoke for driving coil on pole pieces.
10. Electric soldering iron or equivalent.
11. Impulse coupling puller.
12. Tool for assembling ball bearings on shaft.
13. Tool for use in ram to press bearing on to shaft.
14. Socket wrench for impulse coupling unit.

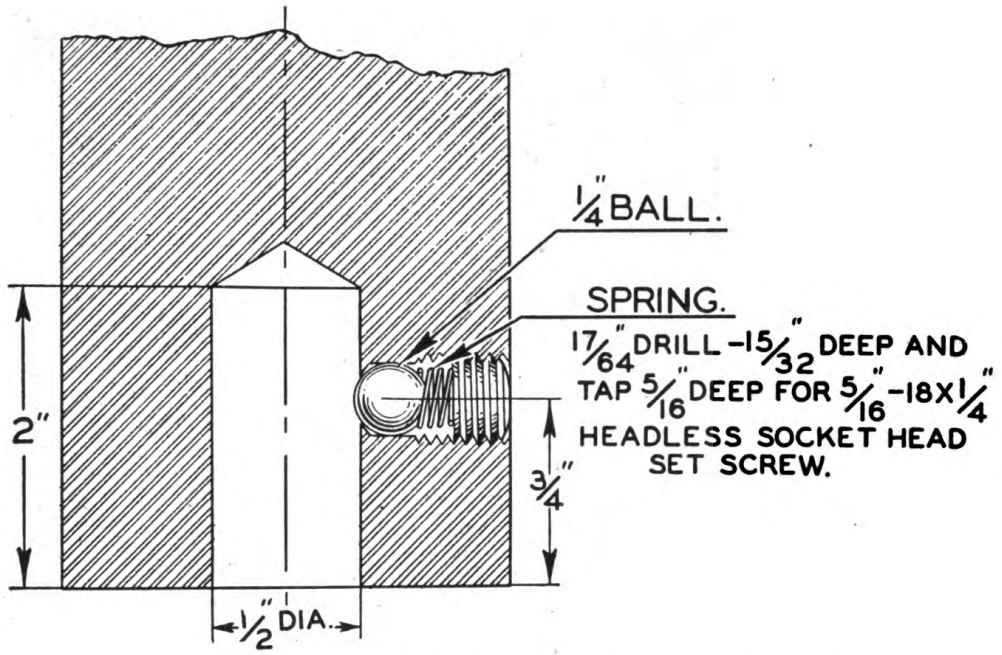


Fig. 38. Drawing Showing Method of Adapting Ram of Arbor Press to Retain Case Magneto Tools

15. Driving tool for center brush.
16. Impulse lug wrench.
17. Magneto frame supporting stand.
18. Tool for use in ram to press shaft out of bearing.

TESTS TO MAKE BEFORE DISASSEMBLING MAGNETO

Test with 3-point spark gaps.

1. Place the magneto on a bracket or in a bench vise where it can be turned by hand. Fig. 39.
2. The 4 spark plug wires from the distributor cap terminals should be attached to the four 3-point spark gaps which are set at 3/8 inch spark jump gaps. Fig. 40.

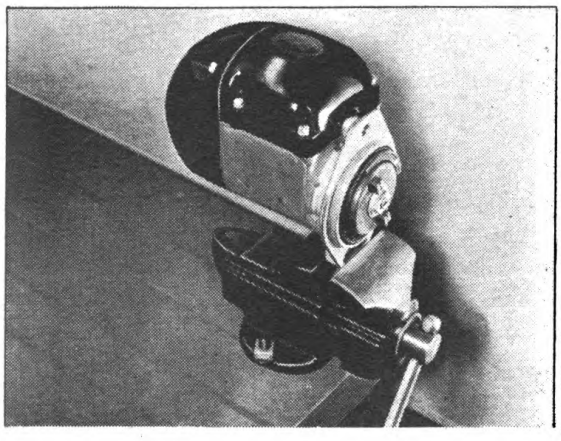


Fig. 39. Magneto Properly Set in Vise

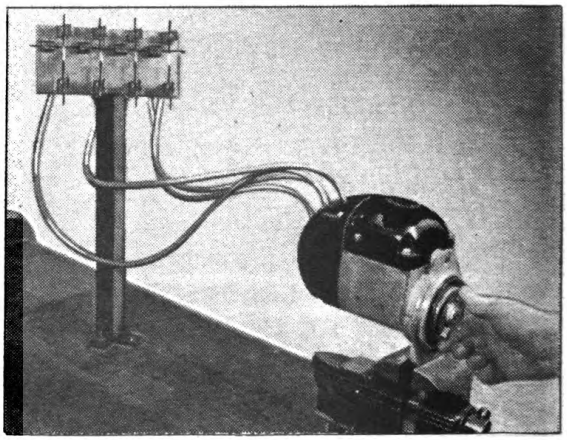


Fig. 40. Testing Magneto with Three-Point Spark Gaps Set at 3/8 Inch Jumps

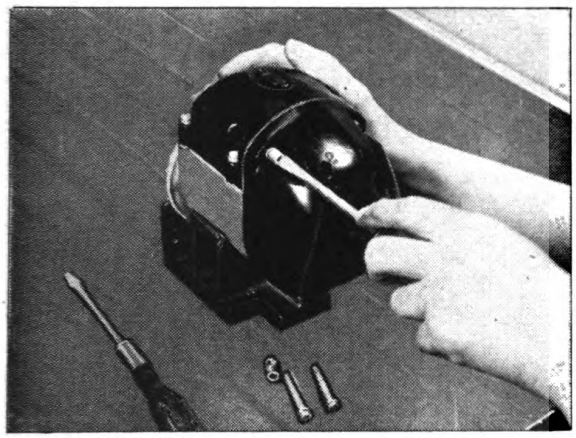


Fig. 41. Removing Slotted Nuts Preparatory to Taking Off Cap

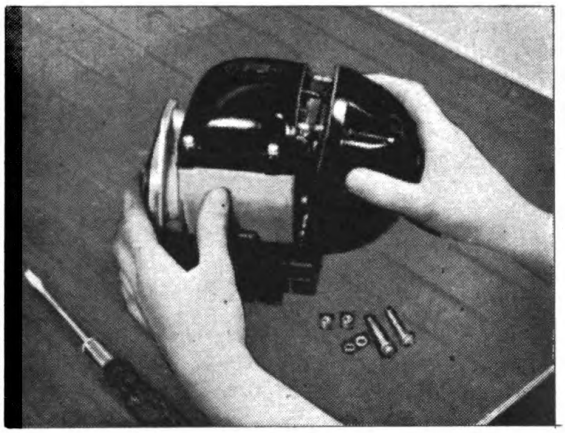


Fig. 42. Method of Removing or Installing Distributor Cap

3. Turn the magneto by hand in the same direction as it revolves on the engine to see if there is sufficient spark to jump the 3/8 inch gap at all 4 terminals. Fig. 40. Also determine whether or not the impulse latches and trips freely like a new magneto. The latter is checked by feeling only, and the operator must accustom himself to know how a correctly operating impulse feels.
4. If the magneto is dead when tripped by hand, continue with tests headed "Remove the Distributor Cap". If it sparks O. K., refer to "Spark Cutting Out at High Speed", page 76.

Remove the Distributor Cap

1. Remove the two screws and the two special nuts holding the distributor cap. Fig. 41.
2. Remove the distributor cap from magneto. Be careful not to pull distributor disk out of bearing thus pulling gears out of mesh at the same time. The grounding spring fastened in the distributor cap is assembled slightly back of the distributor disk so when the distributor cap is removed, it is necessary to turn the distributor cap slightly clockwise to move grounding spring from in back of the distributor disk.

Checking Gear Drive

1. It is essential that the steel gear on the rotor shaft be properly meshed with the gear on the distributor shaft. When the gears are in any way incorrectly meshed, the T-sector on the distributor disk is away from the brushes in the distributor cap when spark occurs. This would cause the magneto to become corroded and badly burn the distributor disk face
2. The red dot on the steel gear directly under one tooth must mesh between two beveled teeth on the distributor gear. Fig. 43. The bevel on the two teeth on the (canvas base bakelite) distributor gear must be on the side of the gear next to the red distributor disk. If the bevel on the teeth is on the side away from the distributor disk, the gear is on the shaft wrong and should be turned over.
3. If the gears are correctly meshed, remove the distributor disk for further tests.

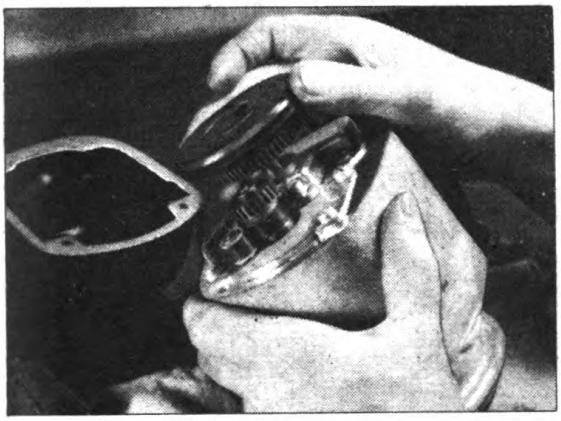


Fig. 43. Method of Removing or Properly Meshing Distributor Gear with Steel Gear

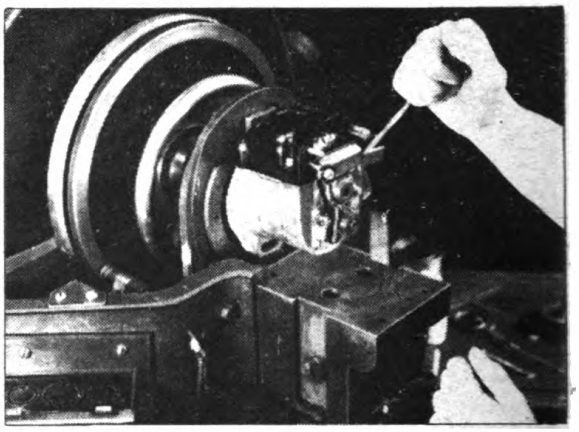


Fig. 44. Running Magneto on Synchroscope to Test Spark

Corroded or Rusty Magneto

This condition results because the spark is incorrectly jumping a gap in the magneto. This may be caused by—

1. Spring on coil secondary lead too short or burned off and not making contact with the brass insert in the distributor cap. The distance from the edge of the top cover to the end of the spring should be $1\frac{3}{16}$ inches.
2. Broken or stuck brushes in distributor cap.
3. Worn or broken spring on distributor disk.
4. Incorrectly meshed gears. See paragraph "Checking Gear Drive" page 71.
5. Distributor gear on the distributor shaft backwards. See paragraph "Checking Gear Drive" page 71.

Running Test on Synchroscope

1. Remove the distributor disk. Fig. 43.
2. Mount the magneto in the synchroscope. Fig. 44.
3. Hold a screw driver tight on the frame or bearing plate of the magneto so that it passes $\frac{1}{8}$ inch from the spring on the secondary lead wire from the coil. Fig. 44.
4. Run the magneto at full speed and spark should jump from spring to grounded screw driver. Fig. 44.
5. If test shows the magneto is dead, refer to "Breaker Arm and Contact Point" page 73.
6. If tests show the spark is weak (only jumping from $\frac{1}{16}$ inch to $\frac{1}{8}$ inch.)
   (a) Place the magneto in the field of the charging coil. Fig. 45.
   (b) Recharge the magnet in the frame. Fig. 45.
   (c) Repeat the running test on the synchroscope as indicated in "Running Test on Synchroscope" above.
7. If the test shows the magneto spark is O. K.
   (a) Replace the distributor disk with a new one. Fig. 43.
   (b) Put the distributor cap back into place. Fig. 42.
   (c) Repeat the tests outlined in "Test with 3-Point Spark Gaps" page 70.

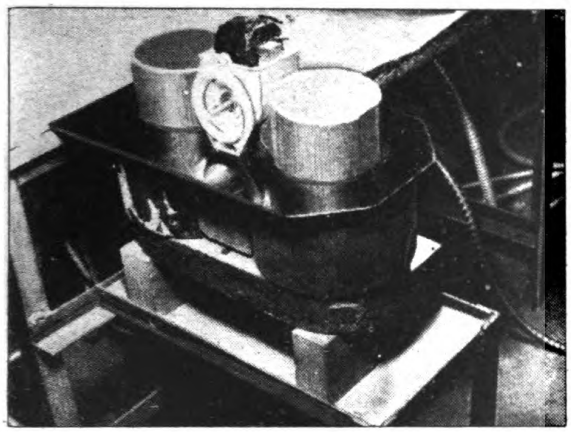


Fig. 45. Recharging Magnet in Magneto Frame

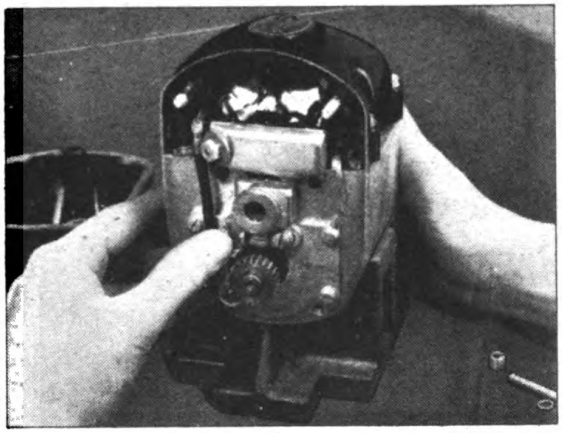


Fig. 46. Checking Breaker Arm for Free and Easy Operation

8. If test made in previous paragraphs shows the magneto to be dead,
   (a) Replace the distributor cap with a new one. Fig. 42.
   (b) Repeat the tests outlined in paragraph "Test with 3-Point Spark Gaps" page 70.

Breaker Arm and Contact Points

1. Test action of the breaker arm to be sure that it is free and operates easily. Fig. 46.
2. Examine contact points and make certain they are clean. Fig. 46.
3. Make certain that the cam opens the breaker arm between .015 inch and .020 inch using the contact point opening gauge. Fig. 47.
4. If the breaker arm is not free,
   (a) Remove the breaker arm. Fig. 48.
   (b) Clean fulcrum pin thoroughly.
   (c) Clean the bushing in the breaker arm.

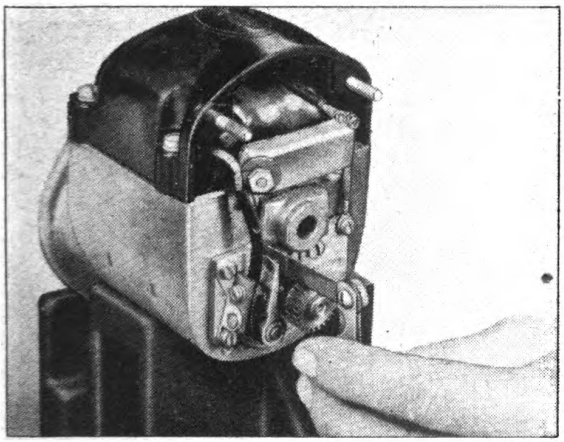


Fig. 47. Testing Opening of Contact Points

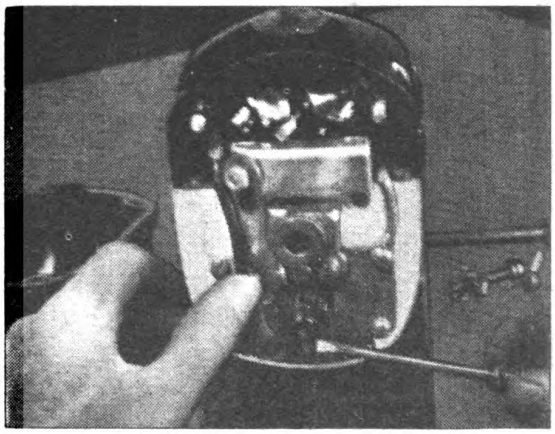


Fig. 48. Removing Breaker Arm

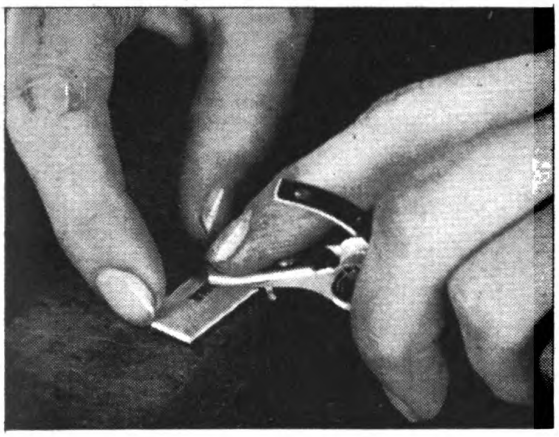


Fig. 49. Stoning off Contact Points

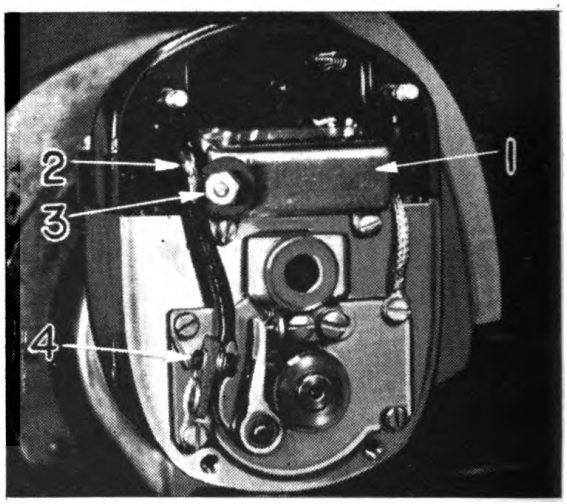


Fig. 50. Running Test of Magneto on Synchroscope

1. Condenser
2. Lead Wire to Coil
3. Nut Attaching Lead Wire to Condenser
4. Breaker Spring Screw

(d) Clean the contact points.

1. If contact points have blue or black surface, it must be removed. This should be done on a whetstone and NOT A FILE. Use a very fine stone, setting the point as nearly square on the stone as possible. Rub so that the point is made flat. It is essential to leave a very smooth surface on the point. Fig. 49.
2. After stoning the points, be sure they are clean and free of oil. Wash with alcohol or some degreasing fluid.

The Condenser

1. If the magneto is still dead, run it at the same speed as it runs on the tractor and observe the contact points. In normal running there should be some tiny arcing between the contact points. Fig. 50.
2. If there is no arcing at the contact points, there is a ground in the primary circuit or the condenser is shorted, thus grounding it.
3. Remove the primary lead wire from the condenser leaving it connected to the coil and the breaker spring screw. Fig. 50. If excessive arcing at the contact point results, this indicates that the condenser was at fault. This would also be indicated by excessive missing at the spark gaps or perhaps the inability of the magneto to jump 3/8 inch gap.
4. Replace condenser with new one.
5. Retest as outlined above.

The Primary Circuit

The primary circuit follows the wire leading from the coil to the breaker arm and from the breaker arm through the contact points back to the bearing plate and through the grounding wire to the coil. If it is grounded or short circuited before it gets to contact points, it will be necessary to check to see if the insulation is broken on the lead wire or the wire is touching the bearing plate or condenser box.

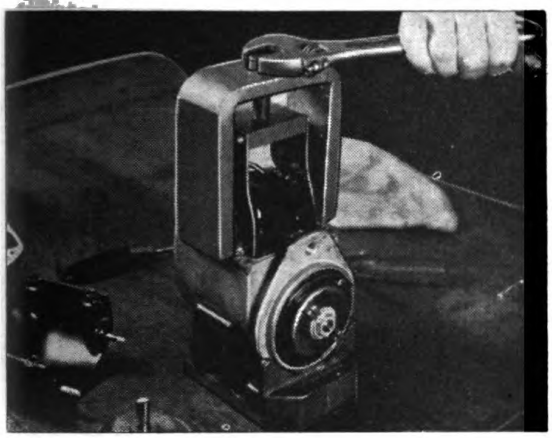


Fig. 51. Pulling Coil From Magneto Frame

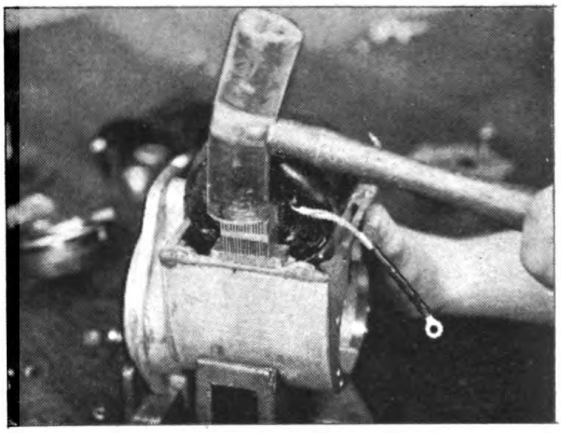


Fig. 52. Interlocking and Starting Coil Bar

The Coil

1. If the magneto is still dead, remove the coil.
   (a) Using the coil puller, No. 5 Fig. 37, slip the hooks on the puller jaws under the bars through the coil. Fig. 51.
   (b) Place the outer jaws over the puller jaws against the magneto frame. Fig. 51.
   (c) Put the puller bolt in place and by turning with a wrench pull the coil from the frame. Fig. 51.
2. Replace with new coil.
   (a) Hold new coil in same position as the one removed with connecting wires toward the bearing plate.
   (b) Interlock the bars in the coil with those in the frame and drive down gently a short distance with Composition Mallet No. 4 Fig. 37.

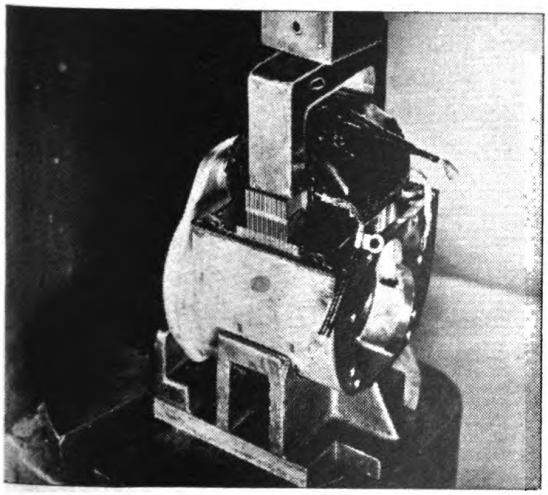


Fig. 53. Pressing Coil Into Place Using Yoke in Ram of Arbor Press

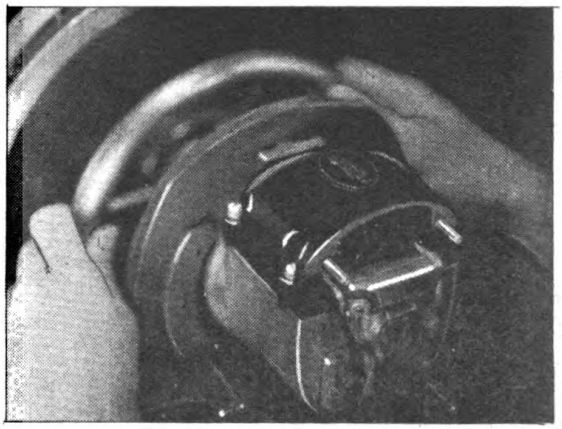


Fig. 54. Checking Impulse on Synchroscope

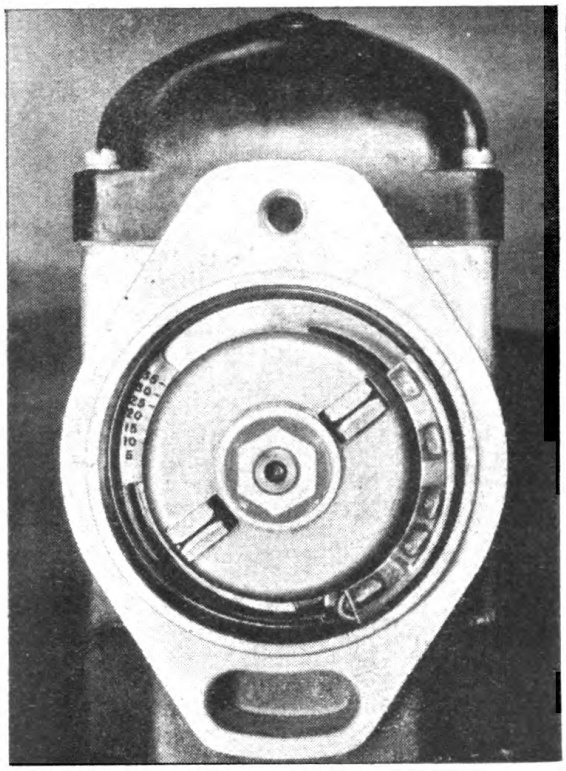


Fig. 55. Arrow on Stop Pin Plate Points to Impulse Timing

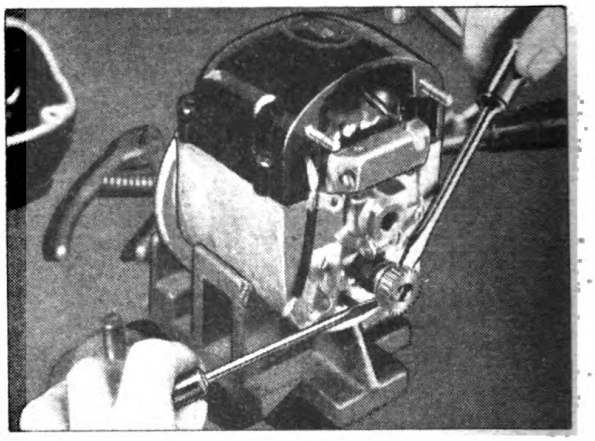


Fig. 56. Removing Steel Gear from Rotor Shaft

(c) Place the magneto in magneto frame supporting stand on the table of the arbor press. Put the yoke for driving coil on pole pieces No. 9 Fig. 37 in the ram of the arbor press. Press the coil firmly back into place. Fig. 53.

3. Test with new coil: Retest as outlined in "The Condenser" page 74.

Spark Cutting Out at High Speed

If a magneto sparks O. K. when turned by hand, "Test with 3-Point Spark Gaps" page 70. Then run it at full speed on the synchroscope. If the spark cuts out at full speed, it indicates that the breaker arm is sluggish on the fulcrum pin. This must run freely and can be remedied by cleaning as in "Breaker Arm and Contact Points" page 73.

Timing of the Impulse

1. If the magneto sparks O. K. when turned by hand, "Test with 3-Point Spark Gaps" page 70, and still sparks O. K. when run at full speed, "Spark Cutting Out at High Speed".
2. The timing of the magneto must then be checked on the synchroscope. Fig. 54. The impulse should trip the number of degrees at which the arrow on stop pin plate indicates. This is located back of the impulse. Fig. 55.
3. The impulse coupling timing should only be tested while the magneto is being turned by hand very, very slowly on the synchroscope.
4. If, in timing the magneto, it is found that the cam is worn so that in order to properly time the magneto the contact points would open too far, it is possible to reverse (turn over) the cam, thus creating the same condition as a new cam. Pry off the steel gear on the rotor shaft. Fig. 56. Pry off the cam. Fig. 57. Reverse the cam and reinstall the steel gear. At this point the opening should be the right amount when the spark occurs at the right time. The timing of the spark may be changed by adjusting the contact

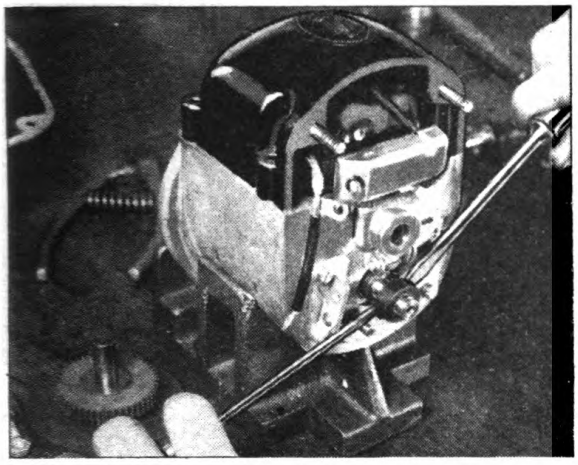


Fig. 57. Removing Cam From Rotor Shaft

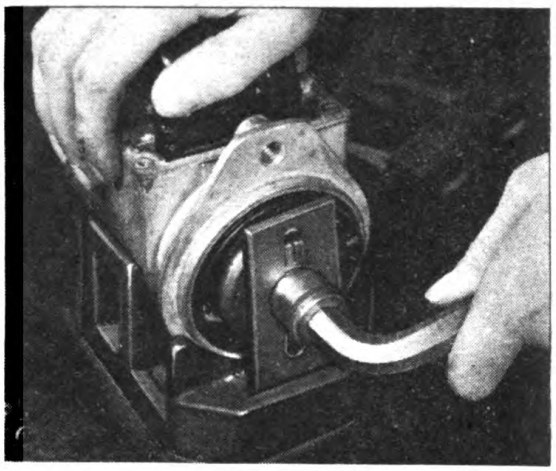


Fig. 58. Removing Impulse Coupling Nut

points. Closing the gap tends to retard the spark, while opening it tends to advance the spark. This should take care of the necessary adjustment and still remain within the tolerance of our opening. If not, a new cam should be installed and the magneto timed again.

Final Check Distributor Cap and Points

1. If the magneto sparks O. K. in test outlined in "Timing of the Impulse" page 76,
   (a) Remove the distributor cap and see if there is any dirt or grease left between contact points which could have caused the magneto to fail.
   (b) If points are dirty or discolored, clean as in "Breaker Arm and Contact Points" page 74. The contact points should have a frosted silver appearance on contact surface.
2. Retest as in "Timing of the Impulse" page 76.

Impulse Coupling

1. If when checking as outlined in "Test with 3-Point Spark Plugs" page 70 the impulse coupling does not work according to instructions, remove from the magneto.
   (a) Set the magneto in the magneto frame supporting stand No. 17 Fig. 37.
   (b) Place wrench No. 16 Fig. 37 on the impulse coupling lugs and lock in the supporting stand. Fig. 58.
   (c) Using the socket wrench No. 14 Fig. 37, unscrew the nut holding the impulse coupling. Fig. 58.
   (d) Apply the impulse coupling puller No. 11 Fig. 37 to the coupling and the end of the shaft. Fig. 59. Turn the long cap screw to pull the impulse coupling.
2. With the impulse coupling off, check for mechanical defects. The impulse coupling hub should be free in the impulse shell, the spring holding it against the stop in the shell. The impulse pawls should be very free on the bosses on the impulse coupling hub. The end of the pawls which strike the stop pin should not be worn or broken off at the corner which drags over the stop pin. Do not use any grease and only rarely a very light oil on the bosses of the impulse where the pawls fulcrum. Fig. 60.

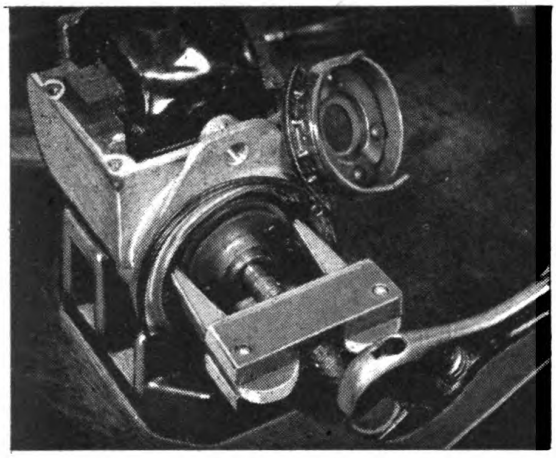


Fig. 59. Pulling Impulse Coupling

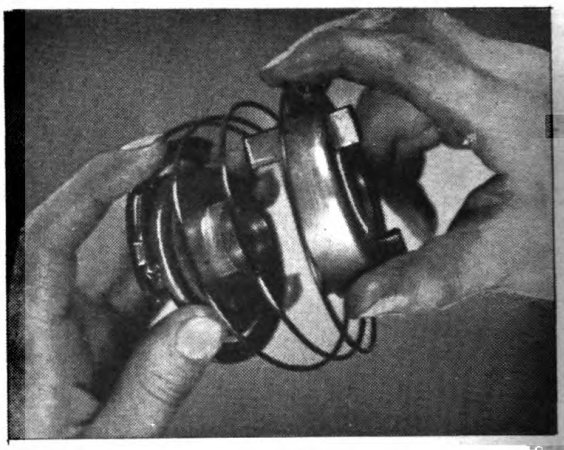


Fig. 60. Checking Impulse Coupling

Dismantling Case 4JMA Magneto

Impulse Coupling

Use magneto frame supporting stand No. 17, impulse lug wrench No. 16, and socket wrench No. 14 all in Fig. 37 as outlined in "Impulse Coupling" page 77.

Distributor Cap

Using screw driver, take out two screws and two nuts and remove distributor cap as indicated in "Remove the Distributor Cap" page 71. Fig. 42.

Top Cover

Remove 4 screws and lift cover up.

Distributor Disk and Gear

Draw the distributor disk assembly forward out of the bearing. Fig. 43.

Rotor Drive Gear

Remove snap ring and pry off steel gear with two screw drivers. Fig. 56.

Breaker Bar

Remove breaker spring screw and pull off breaker bar. Fig. 48.

Bearing Plate

Remove four screws and take off bearing plate. Fig. 61.

Rotor

Draw rotor out of frame. Remember that the moment this is done, the magnet is weakened, and it must be charged up again after inserting rotor in the frame. Fig. 62.

Bearings

If sluggish should be removed and replaced.

1. Removing bearings: Use the gear and ball bearing puller No. 3 Fig. 37 as shown in Fig. 63. Place the bearing driver No. 18 Fig. 37 in the ram of the arbor press as in Fig. 63 and press the shaft out of the bearing.
2. Replacing bearings: Place the tool for assembling bearings on the shaft on the table of the arbor press. Place the socket for assembling ball bearings on shaft in ram of arbor press. Place the ball bearings on the shaft and press into place. Fig. 64.

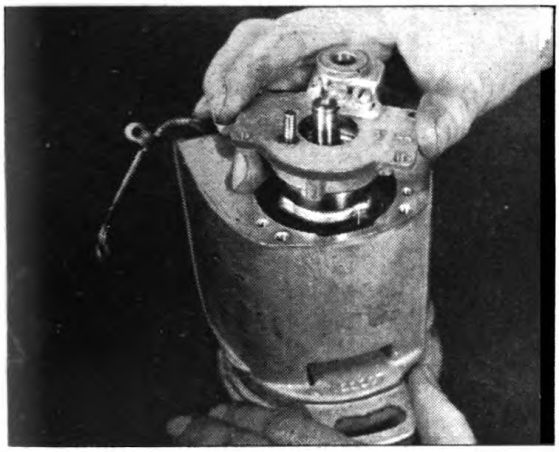


Fig. 61. Removing Magneto Bearing Plate

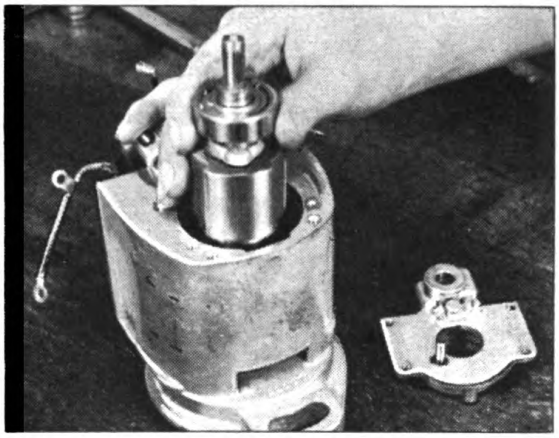


Fig. 62. Drawing Magnet out of Magneto Frame

Condenser

Remove nut and primary lead terminal and take out two screws. Fig. 65.

Coil

Using the coil puller No. 5 Fig. 37 as shown in Fig. 51 and described in "The Coil" page 75.

Stationary Contact Point and Support

Remove two screws and clamp plate. Fig. 66.

Reassembling Case 4JMA Magnetos

CAUTION: Be sure all parts are clean before assembly. Do not try to clean one part then assemble it, as there will be too much dirt getting into the magneto. Support the magneto frame in the magneto frame supporting stand. This will hold the magneto in position for most operations.

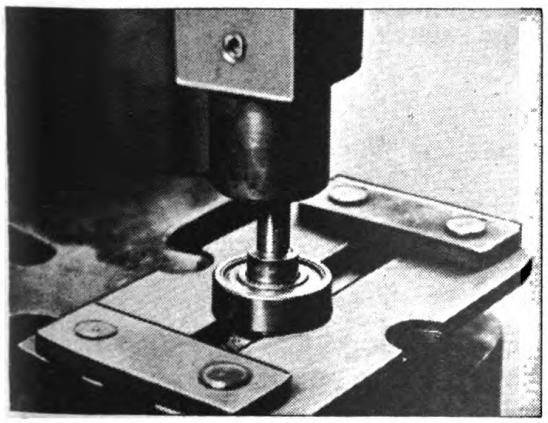


Fig. 63. Removing Rotor Shaft Bearing

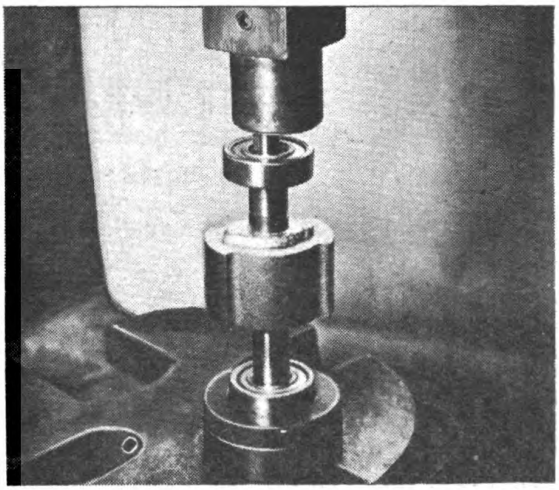


Fig. 64. Replacing Bearing on Rotor Shaft

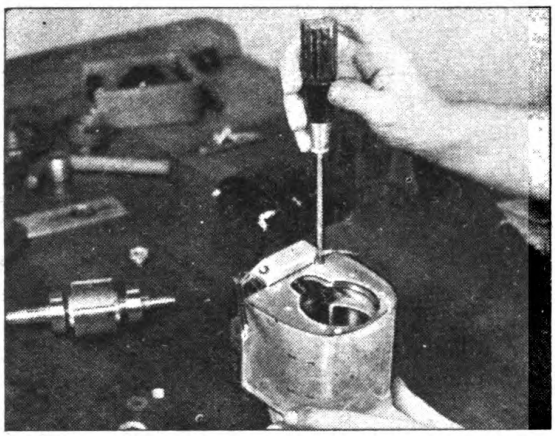


Fig. 65. Removing Condenser

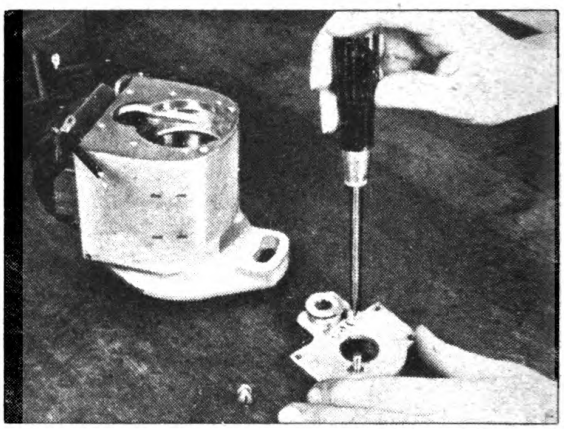


Fig. 66. Stationary Contact Point and Support

1. **Coil**
   If necessary to replace, place it in frame as in Fig. 52 starting interlacing bridge with the pole pieces. Press to place as shown in Fig. 53. For complete explanation see "The Coil" page 75.

2. **Condenser**
   Install it on the frame. Make certain both screws are tight on lock washers. Fig. 65.

3. **Rotor**
   With bearings mounted on rotor shaft as outlined in "Replacing Bearings" page 78, insert rotor in frame. Be sure both rotor and frame are clean. Fig. 62. Press rotor in with hand; bearings should not be tight.

4. **Bearing Plate**
   Should be assembled in place. Make sure grounding wire is fastened under upper right hand screw and the breaker bar spring support is assembled on on the bearing plate. Fig. 61.

5. **Stationary Contact Point**
   Should be assembled with locking plate held by two screws. Fig. 66.

6. **Breaker Bar**
   Should be assembled in place. It should require 11 to 15 ounces on rubbing block to open contact points.

7. **Cam**
   Is assembled on rotor shaft making sure the Woodruff key which holds it is in place.

8. **Two Spacing Washers**
   Should be placed on the shaft following the cam.

9. **Steel Gear**
   Should be assembled on the shaft making sure the Woodruff key which holds it is in place and the face with the red dot is away from the magnet.

10. **Top Cover**
    Examine top cover gasket to be sure it is not broken. Be sure primary wire

lock nut and lock washer are tight on the condenser terminal; then put top cover in place.

11. **Charging Magnet**

In charging the magnet through the frame, place the frame between the blocks on the ends of the charging coil poles with the keyway on the driving shaft horizontal. Keep in mind that the keyway is on the North Pole side of the magnet. Fig. 45.

12. **Impulse Stop Pin Plate**

Should be placed in the frame. Place arrow to number which will give the desired lag angle in the SI tractor 25. Then screw down tight. Fig. 55.

13. **Impulse Coupling**

Make sure hub is free in the shell. Make sure that the spring is securely attached to the hub and shell of the impulse. Fig. 60.

Assembling

Place woodruff key in keyway on rotor shaft and assemble on the rotor shaft. Be very careful not to push key out of keyway in shaft. This can be seen in the keyway after impulse coupling is in place.

Locking on Shaft

Assemble spacer, lockwasher and nut on shaft. Be sure to get key on spacer in keyway in impulse hub. Tighten nut securely.

14. **Test Timing on Synchroscope**

Place magneto on synchroscope and test as outlined in "Timing of Impulse" page 76 Fig. 54. Check position where impulse trips by turning magneto very slowly by hand. There is always a lag in the time between where the impulse trips and the time when the spark occurs when the magneto is in motion.

15. **Opening of Contact Points**

When the magneto is timed correctly there should be .015 inch to .020 inch between contact points when the rubbing block is on high point of cam. Test as in "Timing of Impulse" page 76 Fig. 47.

16. **Distributor Disk**

Should be clean and smooth where it rubs the brushes in the distributor cap.

17. **Distributor Gear Assembly**

Can be placed in frame using care to match marked gear teeth. Tooth over red dot on steel gear should be placed between the two beveled teeth on the bakelite gear. Bevels should be on side of gear next to distributor disk. See "Checking Gear Drive" page 71 Fig. 43.

18. **Distributor Cap**

(a) Make sure distributor cap gasket is not broken.

(b) Be sure all brushes are free.

(c) Be sure center brush is not worn down below brass retainer. If it is to be replaced, remove the old brush. Assemble new one in place and drive into position with driving tool for center brush No. 15 Fig. 37 and composition mallet No. 4 Fig. 37 as used in Fig. 67.

19. After assembling distributor disk Fig. 43 and distributor cap Fig. 42, check

as in "Test with 3-Point Spark Gaps" page 70 to see if magneto is O. K. and grounding terminal grounds magneto.

20. If magneto does not ground out when you press the outside grounding spring to the screw, remove the distributor cap. Bend inside grounding spring Fig. 67 so it will touch breaker spring screw when cap is replaced.

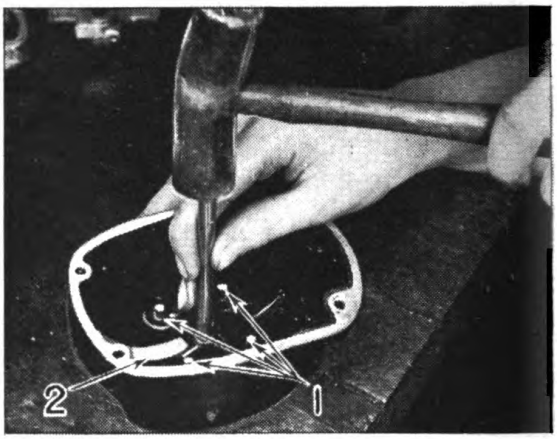


Fig. 67. Driving Center Brush Into Place
1. Carbon Brushes
2. Grounding Spring

STARTING AND LIGHTING

Lubrication

The only parts of the lighting and starting system that need lubrication are the generator and starting motor. A few drops of oil should be put in the oilers weekly, or every 64 hours of operation. The oiler openings in the ends of both starter and generator are closed with small sheet metal covers, which should be swung to one side (after cleaning the surrounding surfaces to prevent dirt getting in the lubricant reservoirs.) Two lubrication fittings are provided on the generator, one at each end, and one on the starter. Do not over-oil the starter. Three to five drops of oil are sufficient.

Starting Motor

The starting motor is held in position by means of a heavy set screw and lock nut No. 19 Fig. 4. This screw must be tight to prevent rocking of the starter motor in the housing. It should be checked at intervals of 128 hours.

The terminal post on the starter to which the cable from the starter switch is attached is copper. Care must be exercised in tightening the nut because the post can easily be broken off if too much pressure is applied to the wrench.

Generator

The generator used on this tractor is of the belt driven, adjustable third brush type, with charging rate controlled by a "two-rate" regulator. As adjusted at the factory, the generator charges approximately 11-14 amperes when the battery is only partly charged, but when the battery approaches full charge the two-rate regulator automatically reduces the charging rate of approximately 3 amperes, which is sufficiently low to prevent over-charging.

Charging rate is adjusted by shifting the position of the "third" brush, which is reached by removing the cover band on the rear end of the generator; the movable third brush is on top, somewhat toward the engine. Moving the third brush in the same direction as the rotation of the generator armature increases the charging rate, and movement opposite to armature rotation reduces the rate. However, there should normally be no reason for shifting the position of the third brush; a charge rate of more than 15 amperes will tend to overheat the generator, and in many cases a rate of less than 12 amperes will not allow the two-charge regulator to operate, as the voltages developed in the electrical system may not be sufficient to actuate the voltage relay in the regulator.

Two-Charge Regulator

The factory adjustment of the regulator is such that the rate of charge is cut down when the battery is between three-quarters charged and fully charged. The exact state of charge is affected by many factors, such as age and condition

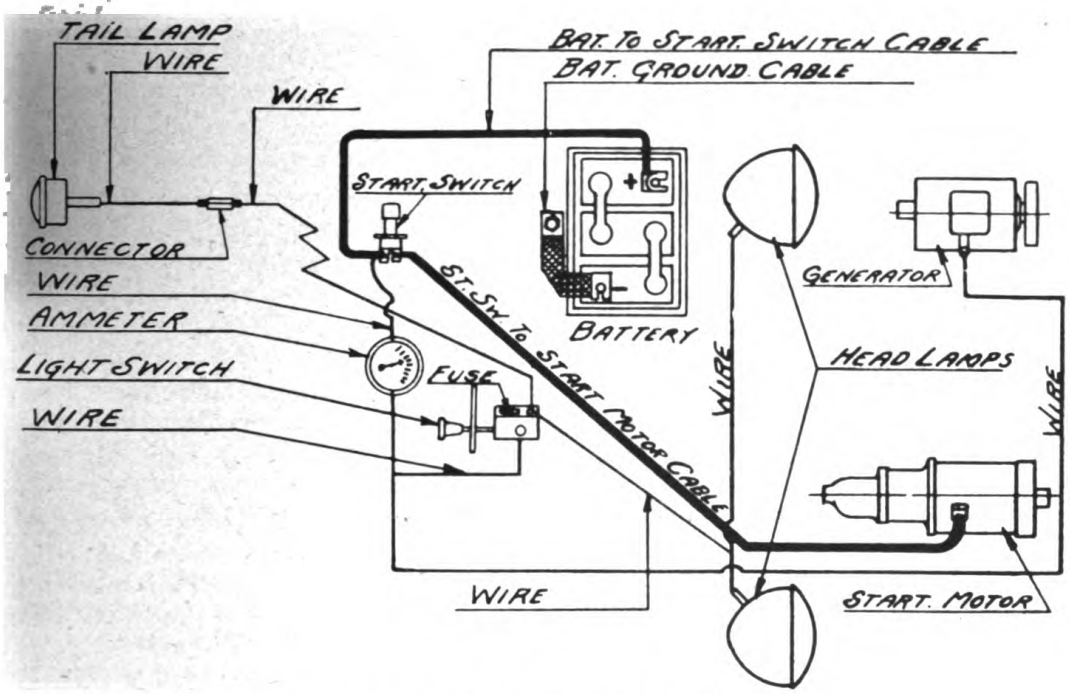


Fig. 68. Wiring Diagram of Electrical System

of battery, temperature, rate of charge, type of service, etc., so that no definite figures can be given as to specific gravity reading of the battery electrolyte when the charge rate is reduced. In addition, on charging the battery the electrolyte specific gravity lags behind the state of charge, due to the heavy electrolyte settling to the bottom of the battery cells. By automatically controlling the charge rate in accordance with battery requirements, gassing of the cells is markedly reduced, the battery should give longer service, run down batteries prevented, and less water is required to maintain the proper electrolyte level.

The field fuse is located in the base of the regulator. The fuse can be removed by taking off the screw cap which is to be found on the front side of the regulator. Lack of movement of the ammeter needle under all running conditions, particularly immediately after starting the engine, indicates that the fuse has been burned out and needs replacing. In normal service this seldom occurs, but if the engine is operated without a battery and without the generator being grounded, or the fuse removed, the voltage may increase to an excessive value and burn out the fuse.

CAUTION: If the engine is ever operated with the battery removed, always protect the generator by removal of the field fuse.

In case the generator continues to charge on high rate with the battery gravity 1.280 to 1.300, and particularly if the battery is gassing, the regulator setting probably is defective. Calibrations of the circuit breaker and regulator are necessarily within close limits and no attempt at adjustment should be made without accurate meters. If this unit is not functioning correctly, it should be replaced with a new regulator.

THE STORAGE BATTERY

Low electrolyte temperature reduces the battery capacity as though numbed by cold. In cold weather if the battery is kept warm its capacity will be greatly increased (do not allow temperature to exceed 110° F.) Regular maintenance is essential.

CAUTION: Before working around the battery, observe these precautions.

The battery is in a hard rubber container. When working around the battery remember that all its exposed metal parts are "Alive" and that no metal tool or wire should be laid across the terminals as a spark or short-circuit will result.

Sparks and lighted matches or exposed flames should be avoided near the battery due to the danger of exploding the gas in the battery.

When necessary to tighten or loosen the clamped connections at the battery terminals, use a wrench of the proper size. Care must be taken that the wrench does not come in contact with any of the other metal parts of the battery or metal parts of the tractor, or holddown. When removing terminals, remove grounded or (negative) terminal first and when replacing terminals, replace grounded terminal last.

Care should be exercised in tightening the holddown to guard against too much pressure being applied. In replacing holddown, check to see that cable connectors to battery are tight, that the ungrounded terminals are clear of any metal part of the holddown and the cables are not subject to rubbing to wear off insulation. Be sure cables and ground strap do not touch battery.

Take and record Hydrometer Readings of each cell.

If readings are below 1.240 the battery is not receiving sufficient charge. The electrical system should be adjusted to increase the charge rate. (In zero weather there is danger of freezing if readings are below 1.175; at −35° F. if below 1.225). If water must be added oftener than every two weeks the electrical system should be adjusted to decrease the charge rate, and electrolyte is not being lost by leakage otherwise the battery life will be shortened by overcharge.

The electrolyte temperature affects the hydrometer reading. For each 30° F. that the electrolyte is above 77° F. add 10 points to hydrometer reading; for each 30° F. that the electrolyte is below 77° subtract 10 points from hydrometer reading for true reading.

Where temperature of electrolyte is 30° or more from standard of 77° F. corrections are necessary to obtain true readings. The following table shows these corrections.

Electrolyte	Temperature Correction
+122° F.	Add 15 points
107° F.	Add 10 points
92° F.	Add 5 points
77° F.	No correction
62° F.	Subtract 5 points
47° F.	Subtract 10 points
17° F.	Subtract 20 points
− 13° F.	Subtract 30 points
− 43° F.	Subtract 40 points

Example, hydrometer reads 1.250, battery temperature is plus 17° F. True or corrected reading is 1.250 minus 20 points, or 1.230.

When taking hydrometer readings on batteries equipped with No-Over-Flo it will be necessary to return all electrolyte, withdrawn from battery for purpose of reading, by depressing lead washer. A shoulder on stem of Exide S-1-B hydrometer is provided for this purpose. If other type hydrometer is used depress washer with end of hydrometer tube. **Caution:** This washer should be depressed only when returning electrolyte to cell; not when filling with water. See "Caution" under "Adding Water".

ADDING WATER

(a) If water is added in freezing temperature and battery is not charged to mix water and electrolyte, water will remain on top and freeze. In freezing weather water should be added to the battery just before using. Sufficiently charge battery to thoroughly mix water with electrolyte by gassing of battery on charge before the water can freeze. If this is not done the ice may break the rubber container.

(b) Distilled water, rain water or drinking water may be used.

(c) Do not overfill as subsequent electrolyte expansion may cause flooding and damage. The proper filling height is approximately $\frac{3}{8}$" above top of separators.

(d) Since your Exide battery is equipped with Exide No-Over-Flo, water should be added until it begins to rise into the vent plug well. Draw off any excess to obtain proper level when vent caps are replaced.

CAUTION: When filling do not touch lead washer in filling tube as this may break air lock and cause over-filling.

Replace Vent Plugs

Always keep vent plugs in place and tight except when filling and taking gravity readings. Be certain that hole in vent plugs is clean and free of dirt to prevent gas pressure in cells breaking sealing or container.

Keep Battery Clean and Dry

If wet or dirty wash with baking soda solution or ammonia, then with clear water. Be sure vent plugs are tight before washing.

Keep Cable Terminals Tight and Clean

If terminals are corroded, disconnect and clean, wash as in above. Apply a thin coat of vaseline (or light cup grease) to terminal and battery posts before re-applying terminal.

Idle Batteries

An idle battery requires a charge every month or two, or at sufficient intervals to keep the gravity above 1.240.

Resealing

If sealing becomes loose batteries should be resealed. Before resealing, first remove vent plugs and blow out any gas trapped as this will be exploded by flames which may result in injury. Then test for gas by cautiously bringing flame to cell opening with plugs removed. Old compound must be thoroughly cleaned out and both jar and cover scraped thoroughly to remove all traces of old compound. Sealing surfaces should be neutralized by cloth soaked in soda or ammonia, taking care to keep from getting into cells. Then wipe with damp cloth, dry and reseal. If new compound is not available old may be used bv heating in a container and pouring while liquid.

Reseal in two applications, flaming compound and rubber parts to get penetration of compound into rubber.

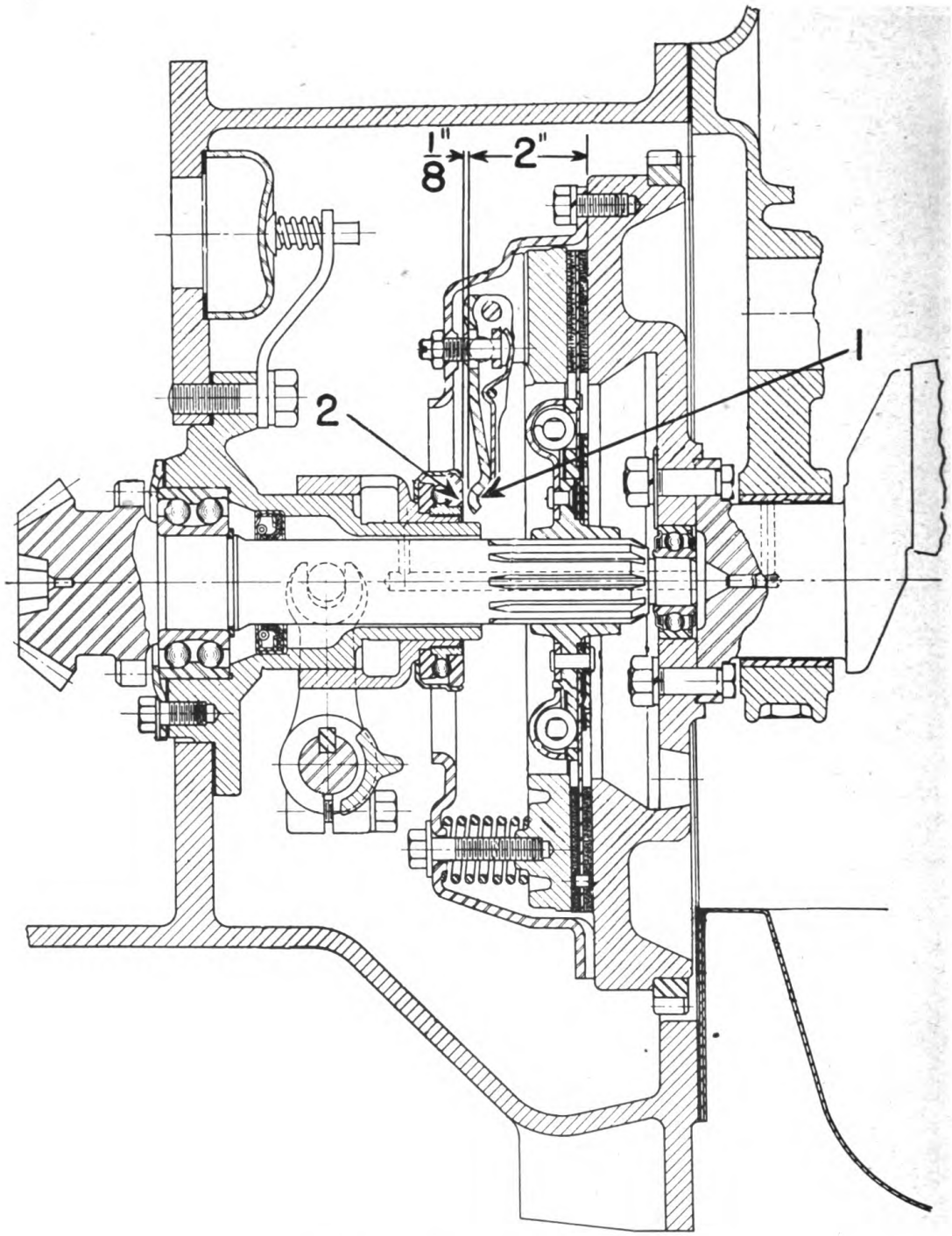


Fig. 69. Details of Clutch

1. Clutch Finger **2. Clutch Throw-Out Bearings**
Distance shown as ⅛ inch indicates proper clearance between fingers and throw-out bearing. Measurement 2 inch indicates correct distance from face of flywheel to clutch fingers.

CLUTCH

The clutch used in this tractor is a spring loaded, dry disk, single plate, foot operated unit. It will require very little attention except for occasional adjustment to compensate for normal wear of the facings. When slippage is noted, as when the engine speeds up without picking up the load, immediate adjustment should be made to prevent damage to clutch facings.

"Free Movement" of Clutch Pedal

Free movement of the clutch pedal must be maintained and can be adjusted as follows:

CAUTION: Remove all spark plug wires to avoid any possibility of the engine starting while working on the clutch.

1. When clutch is engaged, the foot pedal should have one inch free movement from the clutch pedal to the rear axle housing. Fig. 12 Page 26..
2. Throwout bearing Fig. 69 must not be in contact with clutch finger. This can be observed by removing the left hand clutch hand hole plate.
3. Adjust length of pedal connection so as to provide 1/8 inch clearance between fingers and throwout bearing shown as 1/8" in Fig. 69. This is accomplished by disconnecting the clevis at the clutch lever and unscrewing it enough to give the desired length Fig. 11. Be sure lock nut behind clevis is turned down securely. When length is correct, the foot pedal can be depressed about an inch before throwout bearing contacts the fingers. By depressing pedal the point of contact can readily be felt.
4. As clutch facings wear, the fingers get closer to throwout bearing and clearance will eventually be used up. The length of the foot pedal connection should be re-adjusted before clearance is entirely used up.
5. This clutch was properly assembled before it was put into the tractor. It is self-compensating for wear to the extent of 1/8 inch wear allowance on the friction material of the clutch plate. After the clutch plate has worn 1/8 of an inch it should be replaced. When this amount of wear has taken place, the rivets used for holding facings to clutch plate have come in contact with the flywheel on one side and the pressure plate on the other.

8

REMOVING CLUTCH ASSEMBLY

In order to remove the clutch assembly, it is necessary to split the tractor as outlined below and illustrated in Figs. 70 and 71.

1. Block drive wheels as shown in Figs. 70 and 71 and lock foot brake Fig. 5.
2. Remove all spark plug wires to avoid any possibility of engine starting.
3. Make certain that gear shift lever is in neutral position.
4. Remove engine hood.
5. Loosen thumb nuts on top of battery bracket, slide out battery box and remove the cable to the starter switch. No. 10 Fig. 71.
6. Remove pressure fitting and lock from drag link. Remove threaded plug and floating bearing. No. 7 Fig. 71.
7. Remove nuts from bolts on radius rod ball socket and loosen bolts from radius ball socket. No. 4 Fig. 71.
8. Shut off gas line at fuel tank and disconnect gas line at carburetor. No. 1 Fig. 70.
9. Remove air cleaner hose to carburetor. Remove two bolts from transmission case and remove air cleaner complete. No. 3 Fig. 71.
10. Disconnect two jam nuts from flexible choke rod.

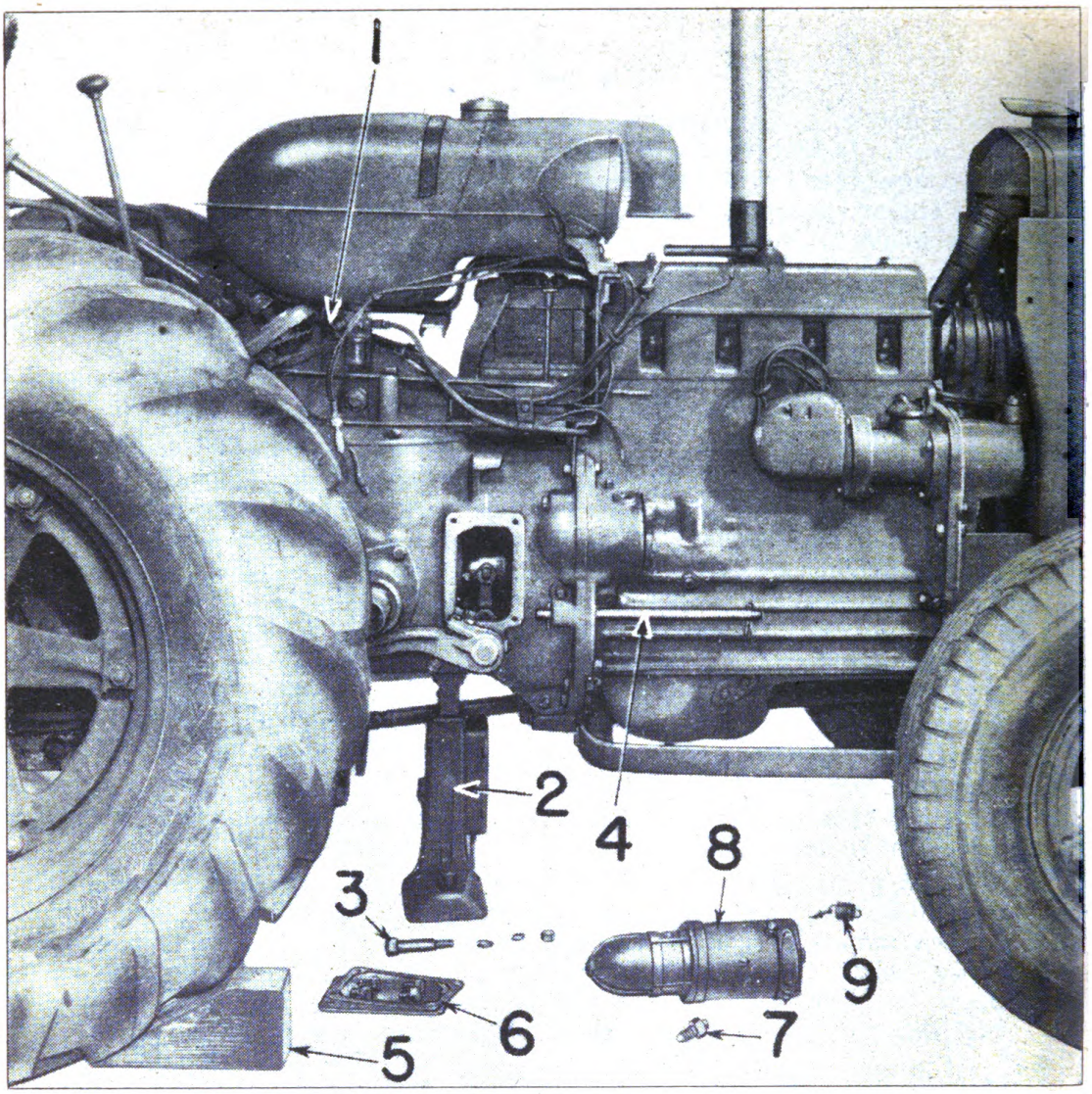


Fig. 70. Right Side of Tractor Prepared for Splitting

1. Fuel Strainer Valve
2. Jack
3. ¾ Inch Shoulder Bolt
4. Special Splitting Pin
5. Wheel Block
6. Hand Hole Cover and Gasket
7. Starting Motor Lock Screw
8. Starting Motor
9. Governor Spring

11. Drain water from radiator.
12. Disconnect various cables—Remove wire from regulator on generator and loosen two clips from water pump. Remove heat indicator bulb from radiator elbow and remove clip from governor housing. Disconnect ground wire to magneto. Disconnect starter cable from starter. All wires can then be laid back.
13. Remove starting motor No. 8 Fig. 70 by taking out starting motor lock screw No. 7 Fig. 70 to prevent damage when splitting.
14. Disconnect throttle rod front and remove governor lever adjusting screw from arm. Unhook governor spring No. 9 Fig. 70 from rod and push back as far as possible.

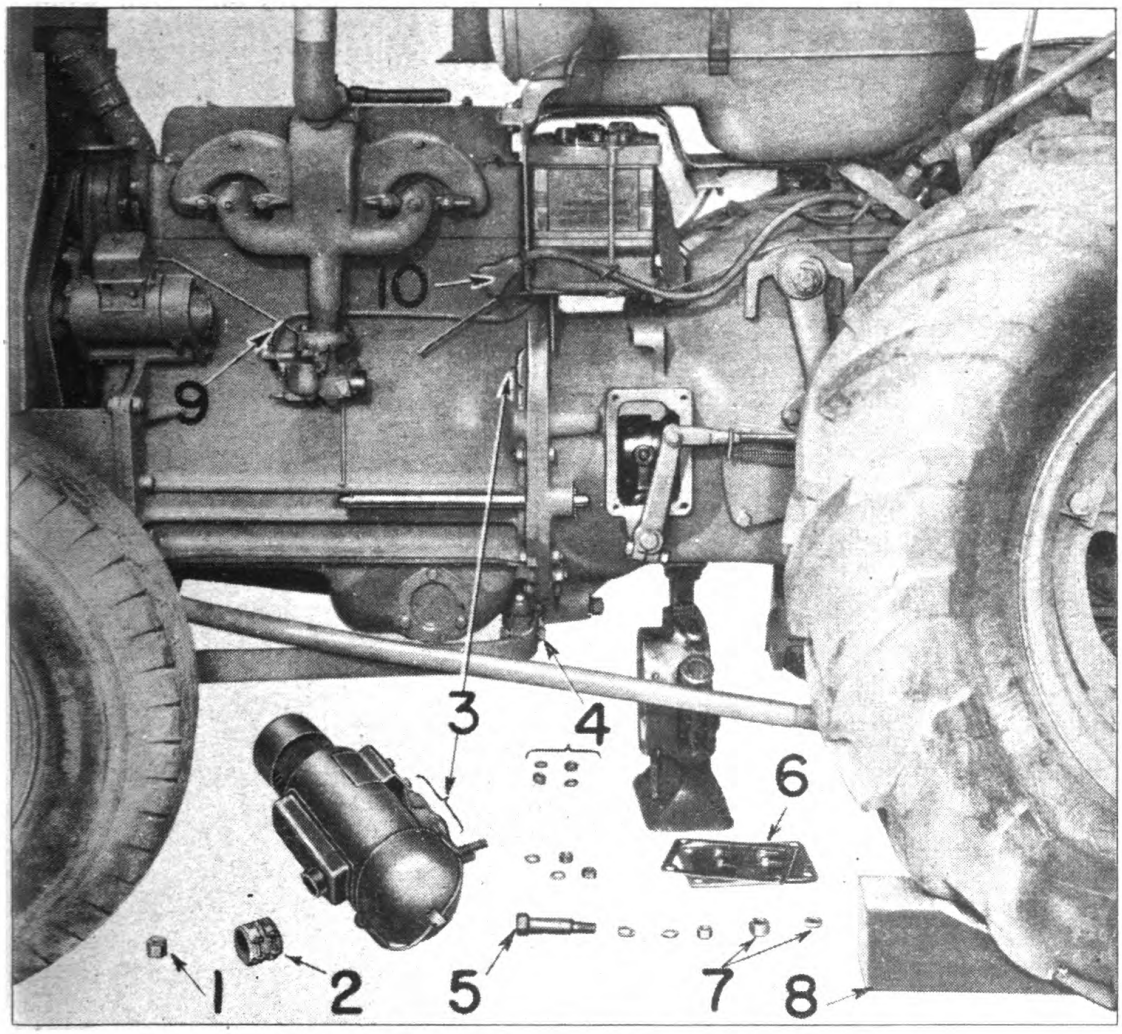


Fig. 71. Left Side of Tractor Prepared for Splitting

1. Radiator Drain Plug
2. Air Cleaner Hose and Clamps
3. Air Cleaner Mounting Bracket
4. Nuts from Radius Rod Ball Socket
5. ¾ inch Shoulder Bolt
6. Hand Hole Cover and Gasket
7. Drag Link Adjusting Screw and Bearing.
8. Wheel Block
9. Fuel Line to Carburetor
10. Cable, Starter Switch to Battery

15. Disconnect oil pressure line on rear cylinder block.
16. Remove hand hole covers from both sides of clutch housing. No. 6 Fig. 70 and 71.
17. Remove the ¾ inch shoulder bolts on each side of the engine—transmission flange and replace with splitting pins ¾ by $13\frac{13}{16}$ inches. Oil these pins and use cotter keys in each end to prevent the pins from coming out. The pins act as dowels and guides to hold the engine and transmission case in line when split.
18. Put jack under transmission case. Fig. 70
19. Drain oil from clutch housing.
20. Remove remaining bolts from transmission case flange.
21. Using bar press down on radius rod and push motor forward approximately 9½ inches. Fig. 72

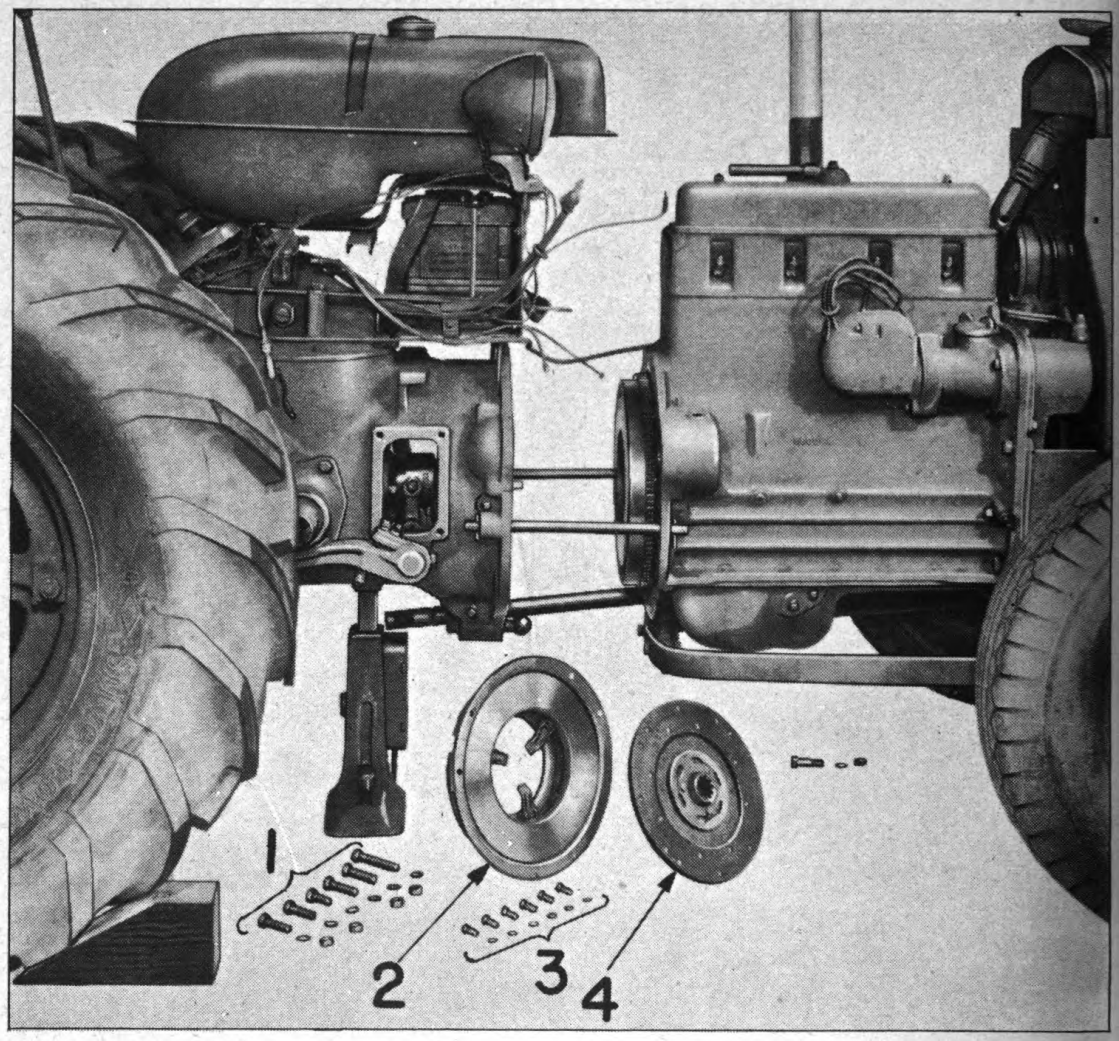


Fig. 72. Tractor Split and Clutch Removed

1. **Bolts and Cap Screws from Engine-Transmission Flange**
2. **Clutch Back Plate and Pressure Plate**
3. **Cap Screws to Hold Clutch to Flywheel**
4. **Drive Plate Assembly with Facings**

CAUTION: Put three 3/8x1¾" cap screws through holes in clutch back plate into pressure plate and tighten to keep clutch from expanding.

22. Remove the six 3/8 inch cap screws that hold the clutch to the flywheel.
23. The clutch complete together with the drive plate can now be removed as a unit from the right side or bottom. When the clutch is out of the tractor any repairs and adjustments such as replacing clutch facings, fingers, springs, throwout collar, etc., can be made.

INSTALLING CLUTCH AND REASSEMBLING TRACTOR

The clutch and clutch drive plate should be installed as follows:

1. Replace the clutch and clutch plate on clutch shaft.
2. Screw two 3/8 x 2 inch studs into the top of the rim of the flywheel.
3. Push the motor back **until** the clutch shaft pilot enters the pilot bearing in flywheel.

4. Push the clutch over the studs mentioned in Step No. 2 to hold clutch in position.
5. Push the motor together and insert and tighten the dowel bolt on the left side No. 5 Fig. 71.
6. Screw cap screws attaching clutch to flywheel into place with fingers. Put at least four cap screws in place before removing studs.
With the studs out, the two remaining cap screws can be put in place and all tightened securely.

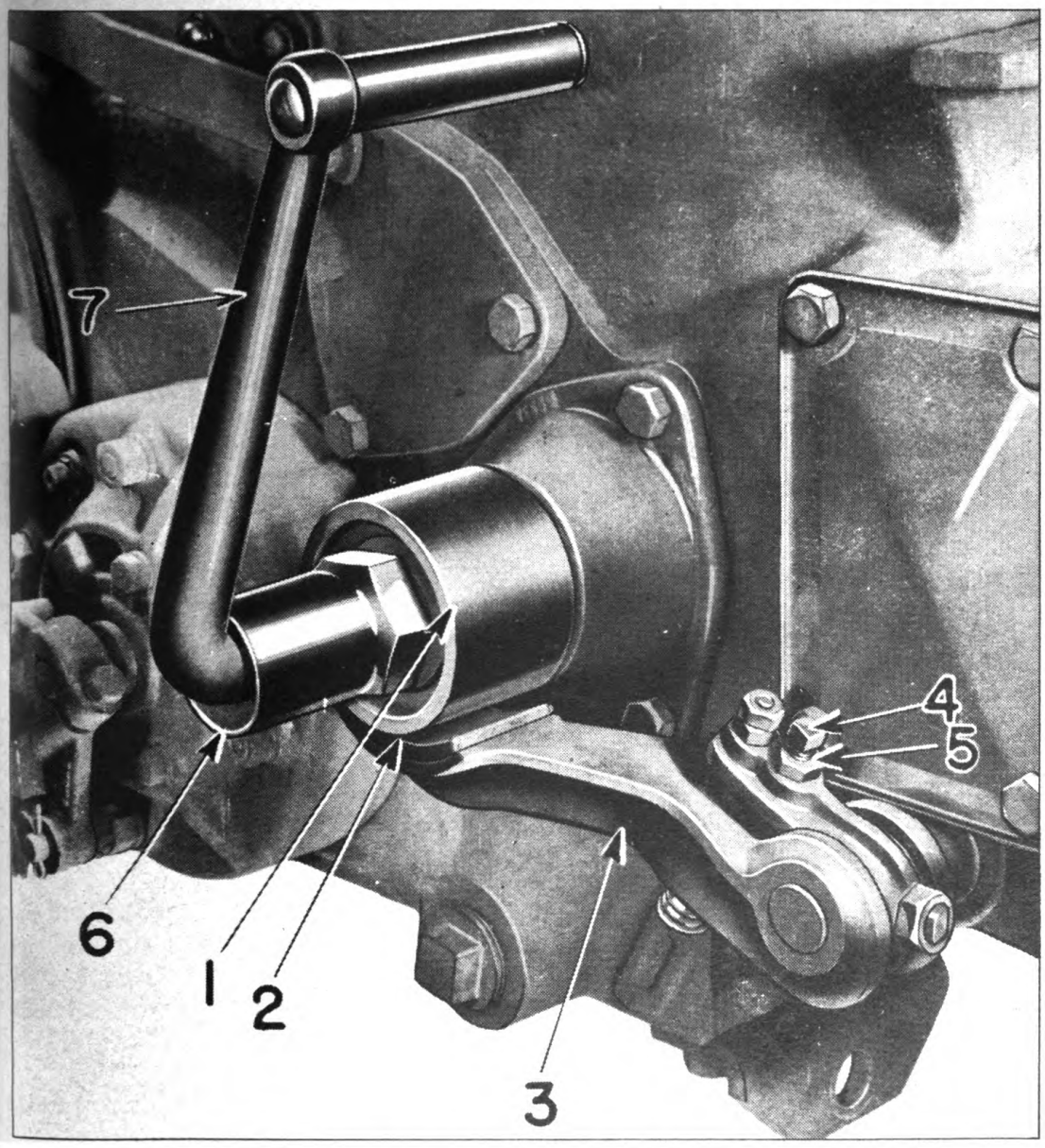


Fig. 73. Clutch Brake and Crank

1. Clutch Brake Drum
2. Correct Clearance Between Drum and Shoe is ⅛ Inch
3. Brake Shoe and Lining
4. Adjusting Screw
5. Lock Nut
6. Starting Jaw
7. Hand Crank

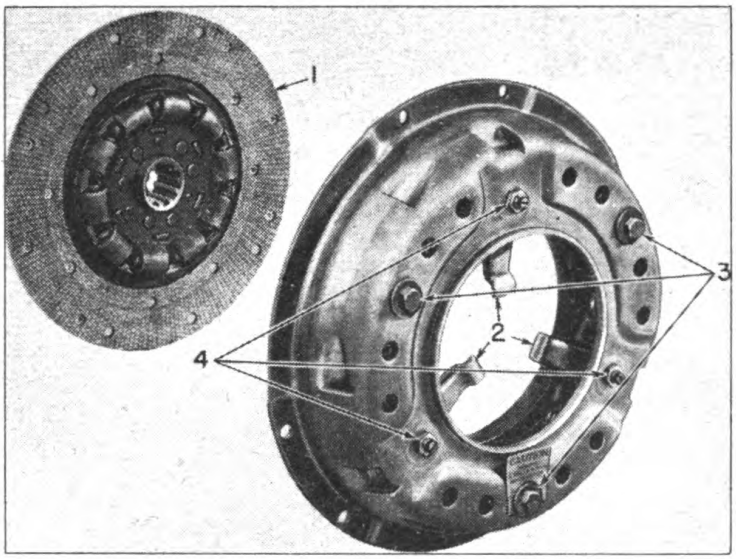


Fig. 74. Clutch and Clutch Driving Plate

1. **Drive Plate Assembly with Facings**
2. **Clutch Fingers**
3. **⅜ x 1¾ Inch Cap Screws Installed to Hold Clutch Pressure**
4. **Screws for Adjusting Clearance of Fingers**

7. Remove the cap screws holding tension on the clutch.

Install the remaining parts in their correct places by reversing the instructions discussed in **Removing Clutch Assembly.**

CLUTCH BRAKE

The object of the clutch brake is to stop the first reduction shaft from revolving when the clutch is disengaged for shifting gears. Correct adjustment makes gear shifting easier.

After the clutch has been adjusted, inspect the clutch brake shoe **Fig. 73** to make sure that it contacts the clutch brake sleeve when the clutch is disengaged.

Adjustment—When the clutch is engaged make sure that the brake shoe does not contact the clutch brake sleeve. The proper clearance when the clutch is engaged is ⅛ inch. This can be changed by means of the adjusting screw **Fig. 73.** Turning the screw to the right increases the clearance. After the proper adjustment is secured, lock the adjusting screw by tightening the lock nut.

TRANSMISSION

Most adjustments and inspections of gears, bearings and chains in the transmission require that the transmission case top cover be removed.

Removing Transmission Case Top Cover

1. Remove hood from over engine.
2. Disconnect fuel line at strainer and remove fuel tank.
3. Disconnect battery ground cable by removing cap screw on transmission case top cover.
4. Disconnect rear end of drag link on left side of tractor.
5. Disconnect choke rod near carburetor and pull out through the instrument panel.

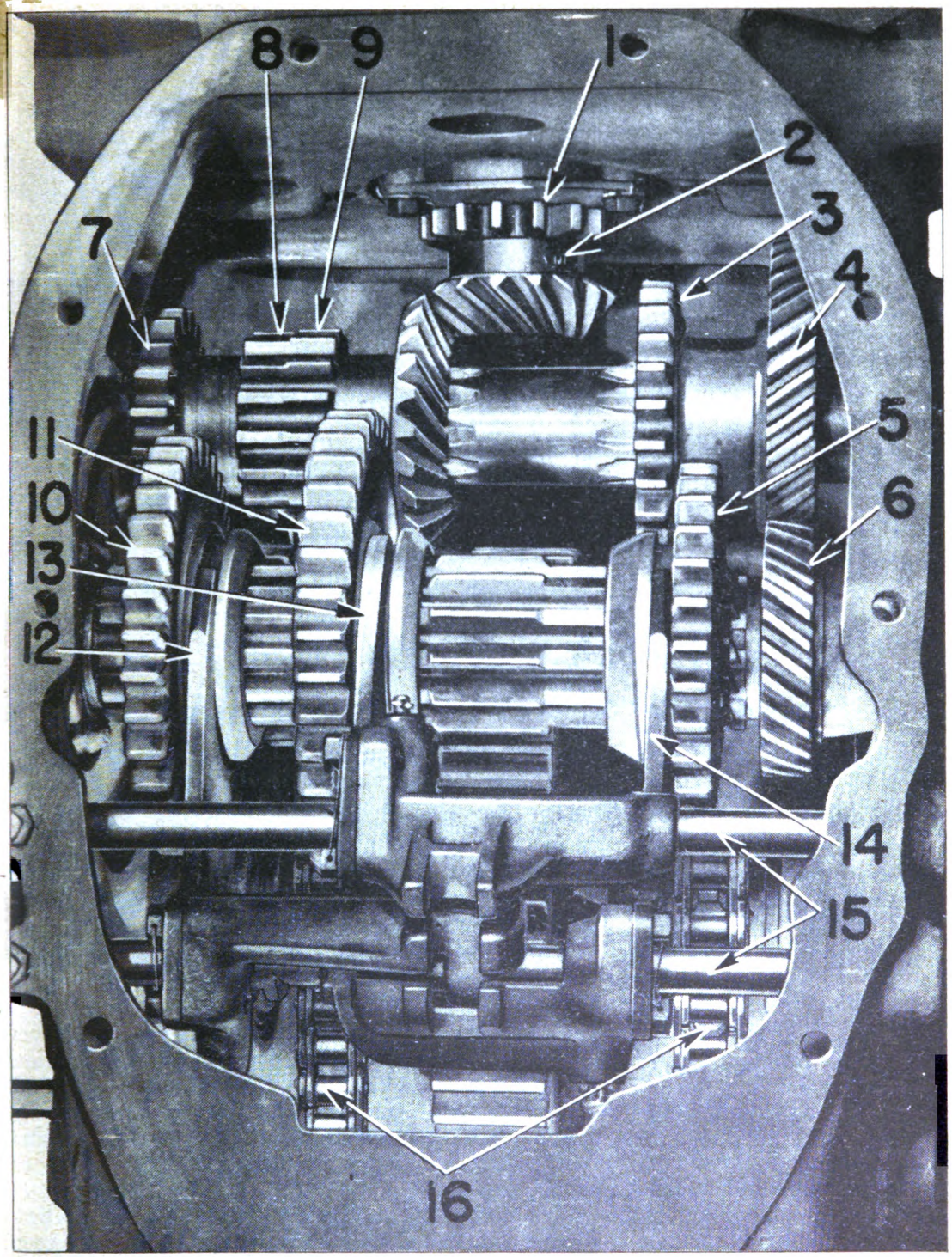


Fig. 75. Details of Transmission and Differential

1. Power Take-Off Drive Gear
2. Clutch Shaft and Pinion
3. 3rd Speed Gear on First Reduction Shaft
4. 4th Speed Gear on First Reduction Shaft
5. 3rd Speed Gear on Second Reduction Shaft
6. 4th Speed Gear on Second Reduction Shaft
7. 2nd Speed Gear on First Reduction Shaft
8. Reverse Gear on First Reduction Shaft
9. Low Gear on First Reduction Shaft
10. 2nd and Reverse Gear on Second Reduction Shaft
11. Low Speed Gear on Second Reduction Shaft
12. 2nd and Reverse Shifter Fork
13. Low Gear Shifter Fork
14. 3rd and 4th Speed Shifter Fork
15. Shifter Shafts
16. Drive Chains

6. Disconnect oil line at oil gauge on right side of instrument panel.
7. Remove middle and rear portions of hand throttle control rod on right side of engine.
8. Remove foot throttle control by taking out two screws on right rear side of transmission case.
9. Disconnect tail light wire at light switch on the instrument panel.
10. Remove four cap screws securing instrument panel to the transmission case top cover. Lift the panel, with its attached wires, and place on top of the battery shield.
11. Remove all cap screws holding the top cover to the transmission case.
12. Remove two nuts holding the steering shaft bearing support to the transmission case.
13. Remove transmission case top cover.

To reassemble reverse the procedure outlined.

ADJUSTMENT OF SPIRAL BEVEL GEARS

The spiral bevel pinion on the clutch shaft is marked on the end for correct gauge and back lash setting.

NOTE: As an example Fig. 76 shows a pinion marked + 14 as well as .004 Back Lash. Do not assume that the pinion you are installing or adjusting in your tractor will be marked exactly as shown in this illustration. The + amount may be more or less for spacing of the pinion,and the back lash may also be more or less; on the other hand, it may be exactly as illustrated.

The end of the clutch shaft is ground flat and square with the center line and is used to gauge the correct setting of the spiral bevel pinion.

Fig. 76. Spiral Bevel Gear and Clutch Shaft Showing Gauge and Back Lash Markings

Set the spiral bevel pinion using gauge No. 05694-AB as illustrated in Fig. 77, being sure that the first reduction shaft is mounted in place and adjusted so there is no end play. With gauge No. 05694-AB, use a thickness gauge or a piece of feeler stock the same thickness as the + mark on the end of the pinion you are adjusting.

If for any reason a new set of spiral bevel gears are to be installed, check the first reduction shaft for runout prior to installing a new spiral bevel gear on the first reduction shaft. It should not have a runout of more than .002 inch when checking at the ground portion at the center of the shaft.

Recheck this runout after the first reduction shaft has been installed in the transmission case and adjusted to the correct clearance.

With the pinion properly spaced the correct distance from the first reduction shaft, adjust the first reduction shaft to the right or left by changing shims from one side to the other until you arrive at a back lash between the teeth of the spiral pinion and spiral gear equal to the amount shown as B. L. (Back Lash on the end of the pinion.)

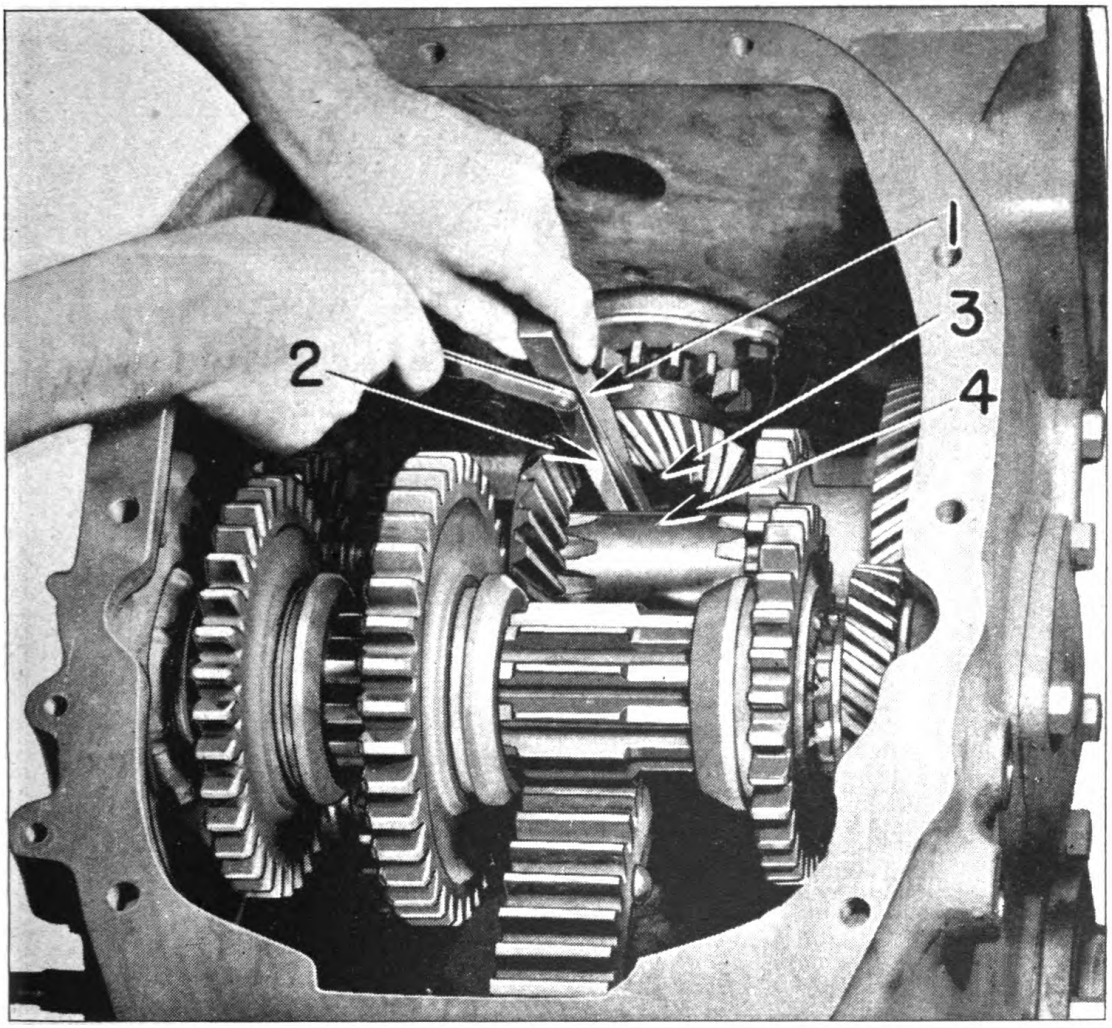


Fig. 77. Adjusting Spiral Bevel Gears

1. Gauge No. 05694-AB
2. Feeler Gauge
3. Bevel Pinion
4. First Reduction Shaft

Three thicknesses of shims, .003, .005 and .012 are used back of the bearing carriers. The shims back of the clutch shaft bearing carriers are for adjusting to the gauge setting. The shims back of the first reduction shaft bearing carriers are used for adjusting the back lash and removing end play in the first reduction shaft.

SLIDING GEAR OR SECOND REDUCTION SHAFT

If the sliding gear or second reduction shaft is to be removed, the procedure to remove the top transmission cover discussed on page 92 must be followed.

The shifter shafts and shifter forks must be removed.

Take off both bearing carriers, keeping the shims as removed with each carrier.

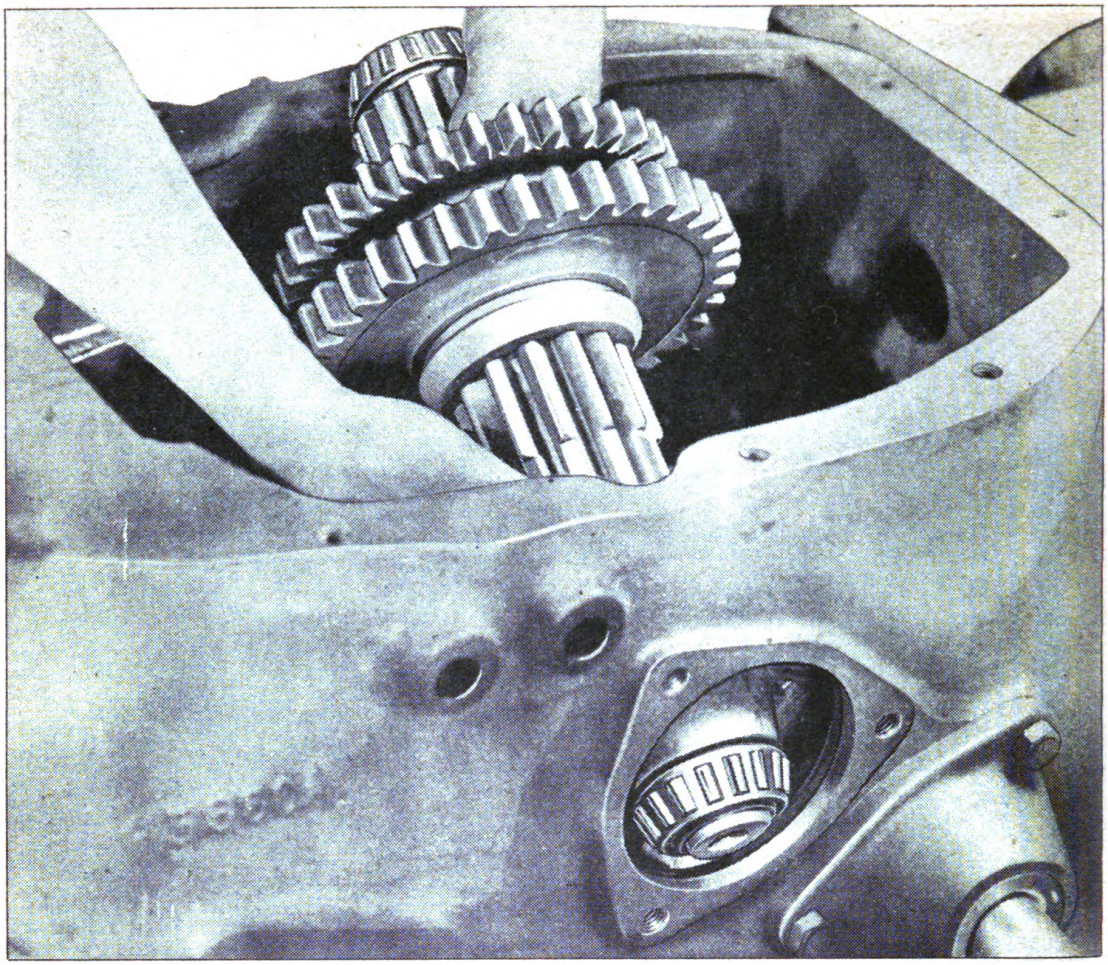


Fig. 78. Removing Sliding Gear or Second Reduction Shaft

Raise the left-hand end of the sliding gear shaft and lift it out through the top of the transmission case. Fig. 78.

FIRST REDUCTION SHAFT

In order to remove the first reduction shaft, it is necessary that sliding gear shaft be removed as outlined in "Sliding Gear or Second Reduction Shaft". In addition, the tractor must be split exactly as if removing the clutch, page 87 and the clutch shaft and pinion removed.

Remove the brake sleeve and cranking jaw from the first reduction shaft. Be sure to clean the outer shaft carefully before removing the right-hand bearing carrier. This will prevent the possibility of dirt or grit damaging the retainer.

Take off both bearing carriers keeping the shims as removed with each carrier. Remove the reverse idler gear No. 2 Fig. 79 by taking out the cotter pin (4) and hexagon nut (5). Next take out the two cap screws on the left-hand side of the transmission case below the shaft bearing and remove reverse gear stud. Push the first reduction shaft to the right as far as it will go; take hold of the left-hand end of the shaft and withdraw it up through the top of the transmission case Fig. 80.

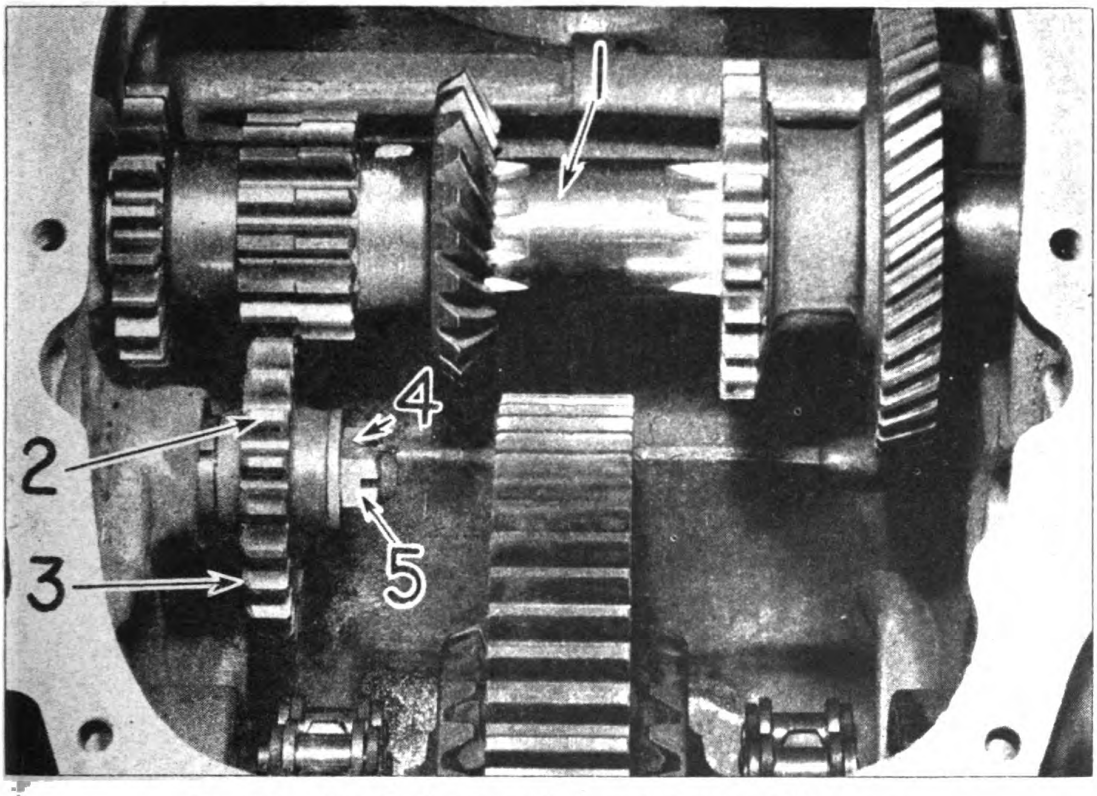


Fig. 79. First Reduction Shaft and Reverse Idler Gear

1. First Reduction Shaft
2. Reverse Idler Gear
3. Bevel Side of Teeth on Reverse Idler Gear
4. Reverse Idler Cotter Pin
5. Reverse Idler Nut

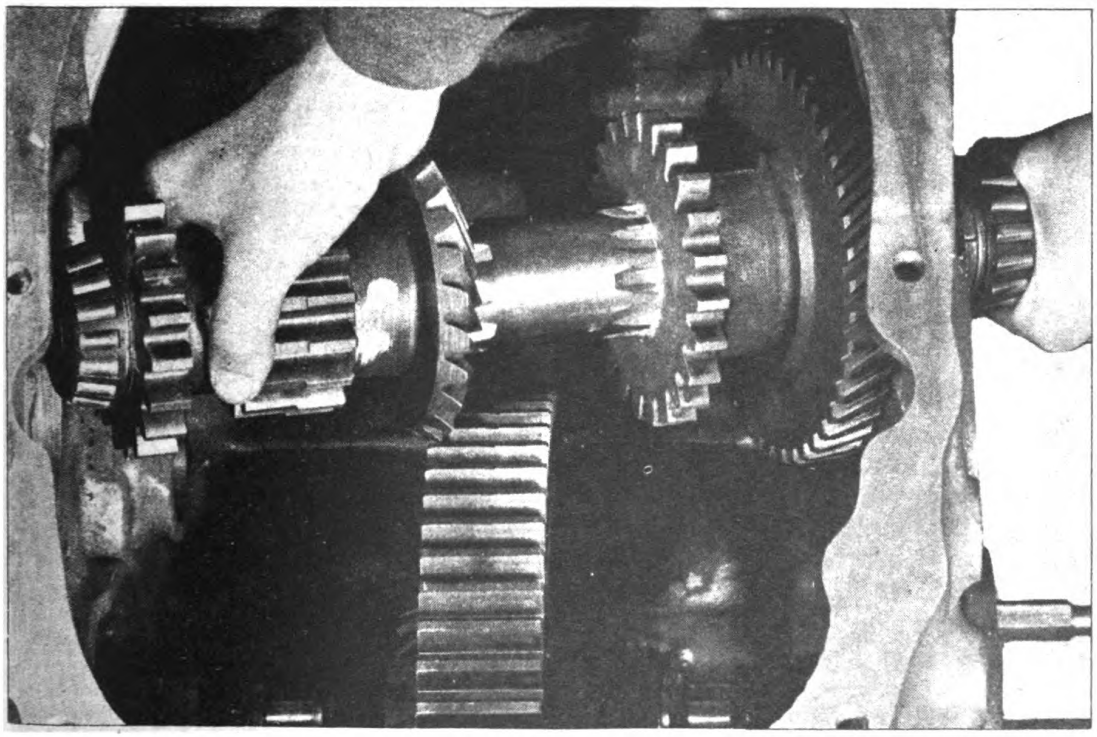


Fig. 80. Removing First Reduction Shaft Complete with Gears and Bearings

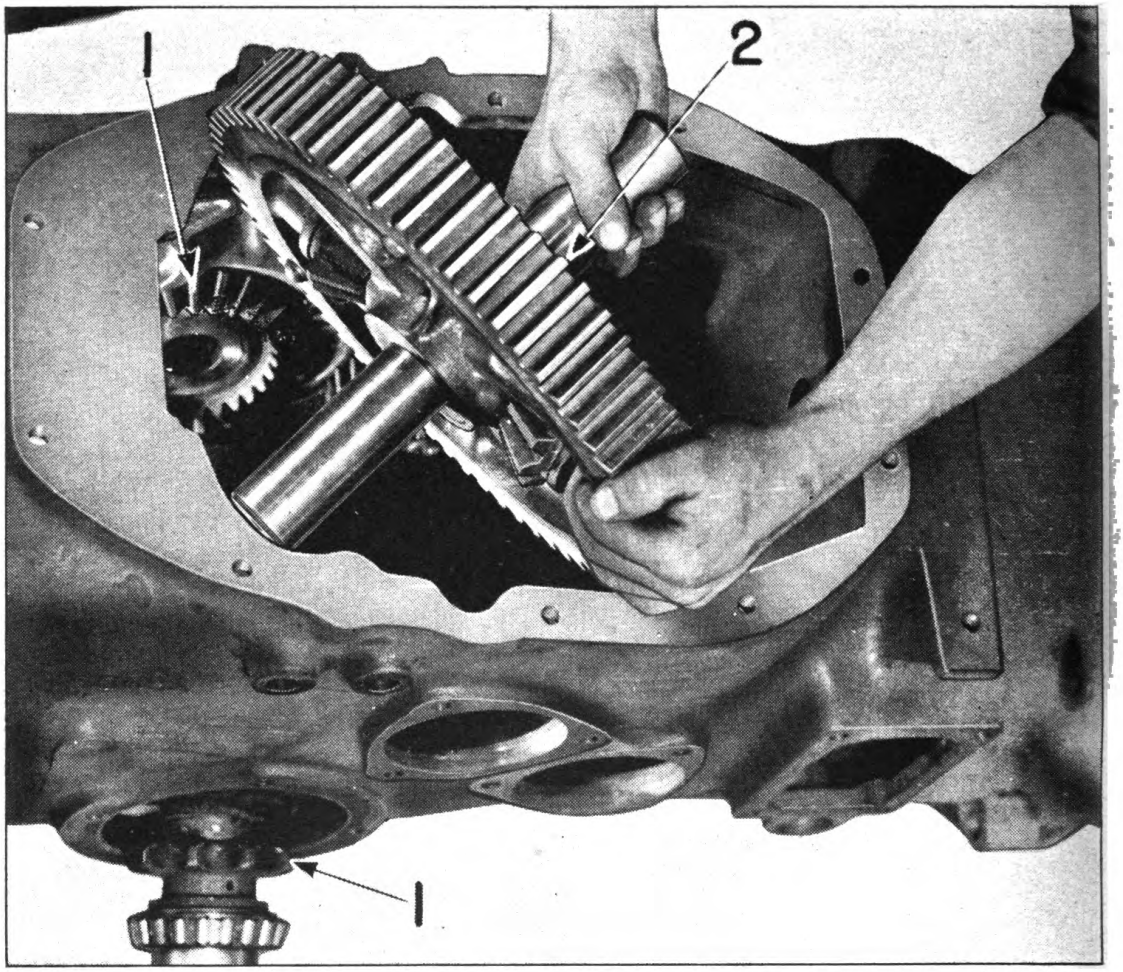


Fig. 81. Removing Differential

1. **Differential Bevel Gear and Sprocket**
2. **Differential Complete with Ring Gear, Pinion and Shaft**

DIFFERENTIAL ASSEMBLY

In order to remove the differential assembly, it is necessary that the sliding gear shaft and first reduction shaft be removed as outlined on pages 95 and 96.

Drain all the oil from the transmission and take off the rear transmission cover. Remove the drive chains by taking out the master link in each one. Remove differential bearing carriers from each side by removing four cap screws using care to keep shims with the proper carrier. Tip the differential slightly and remove the bevel gear and sprocket No. 1 Fig. 79. Remove the assembly through the top of the case.

If wear on the gear or sprockets is noticeable, the entire assembly can be reversed end for end without changing bearings.

Be sure to use the correct amount of shims so that the assembly turns freely but without end play.

When replacing differential, put the bevel gear and sprocket in place in the transmission case before putting differential in place. See Fig. 79.

CAUTION: Extreme care should be exercised in putting on the clutch shaft bearing carrier and the right-hand sliding gear shaft bearing carrier. If seals are damaged, oil leaks will develop because these shafts have machined shoulders over which the oil seals must pass. It is recommended that a thimble be used at these locations.

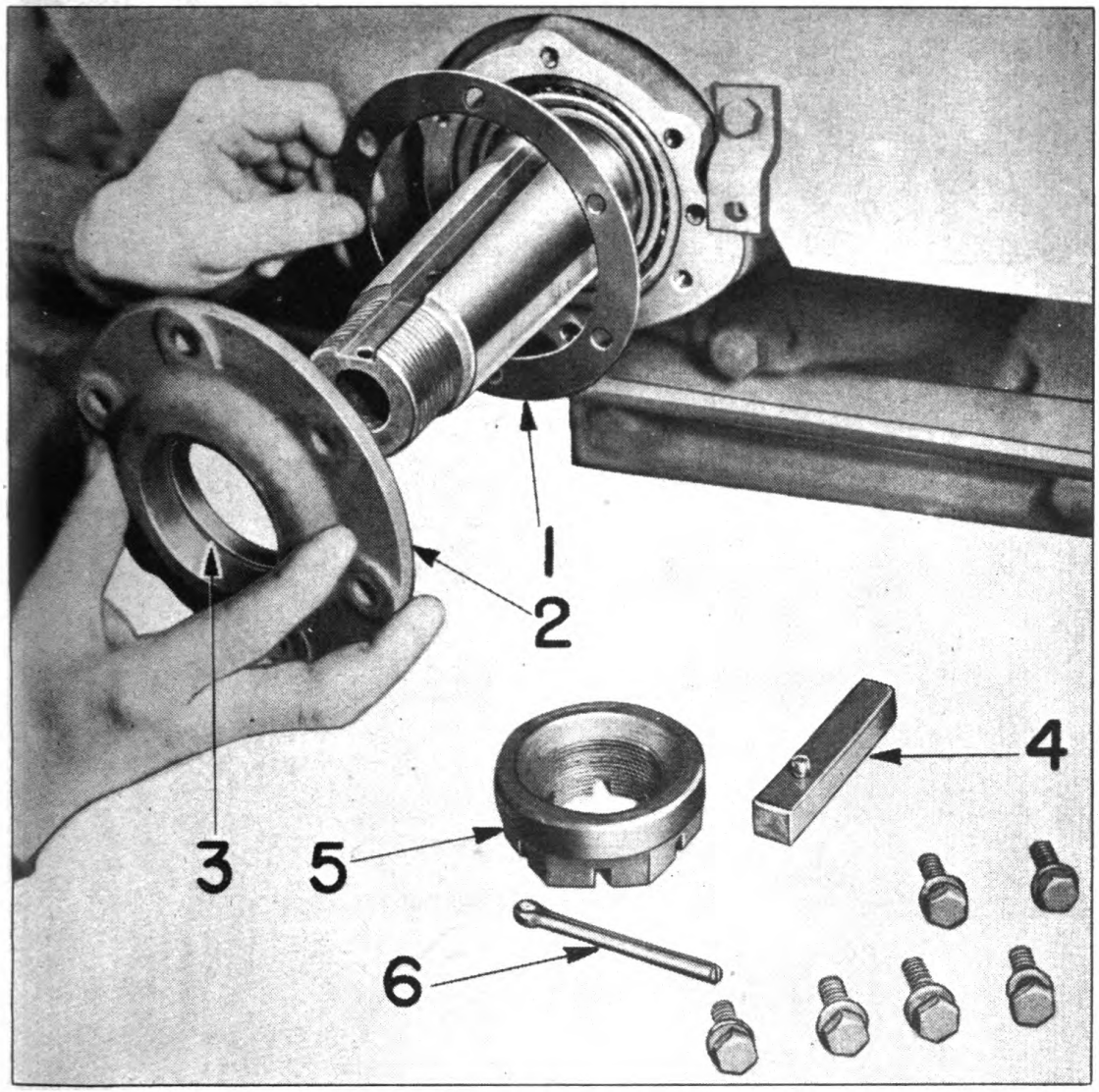


Fig. 82. Adjusting Rear Axle Bearings

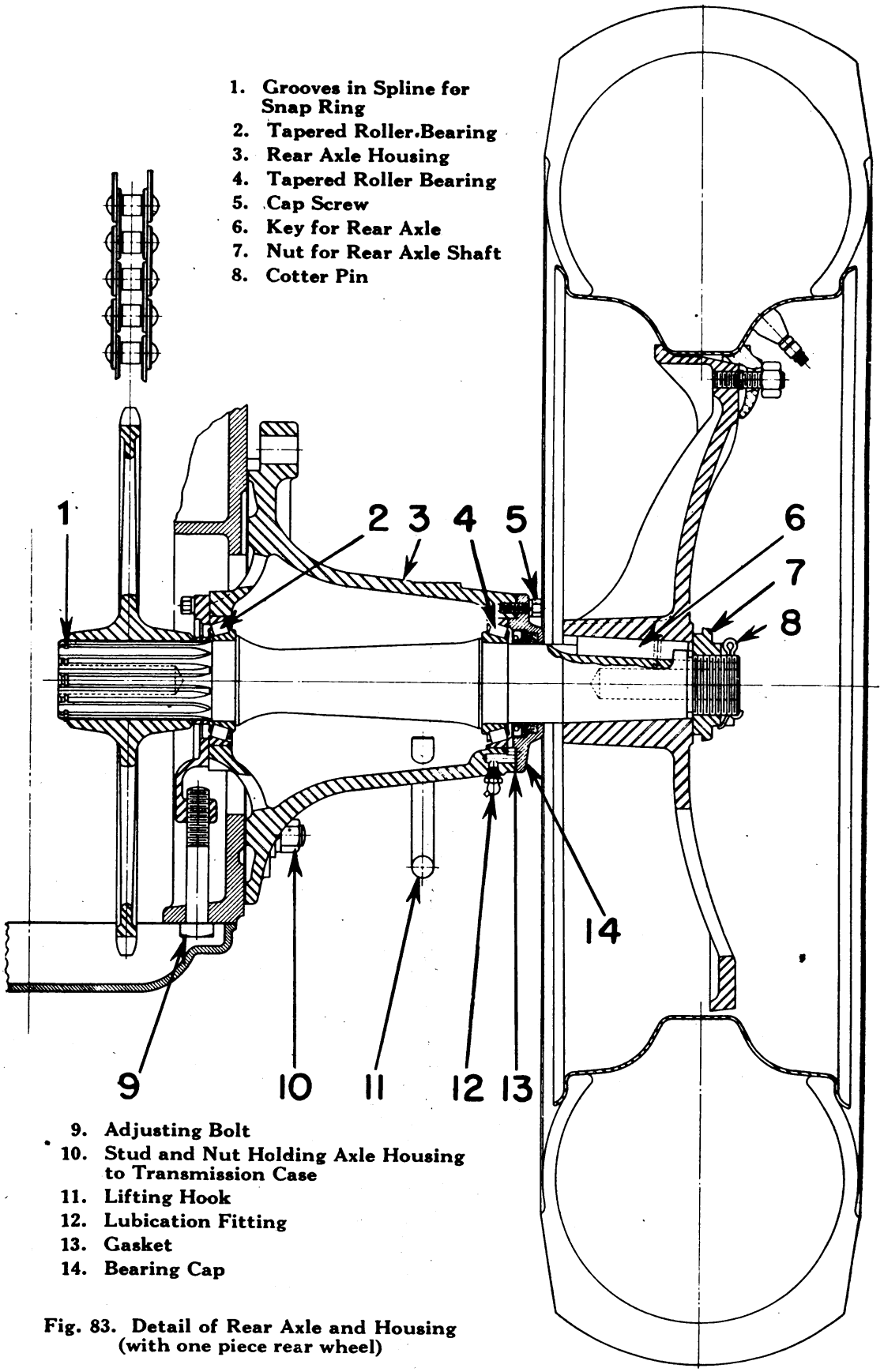
1. Shims
2. Bearing Cap
3. Oil Seal
4. Key for Rear Axle
5. Nut for Rear Axle Shaft
6. Cotter Pin

REAR AXLE BEARING ADJUSTMENT

These large, tapered roller, anti-friction bearings seldom require adjustment. However, they should be inspected periodically, and if any looseness or end play is found, adjustment should be made immediately.

By studying Fig. 80 you will see that rear axle bearings must be adjusted at the outer end.

End play in the rear axle bearings is detected by blocking up the rear end of the tractor so that the drive wheels are free of the ground. Pry in and out on the wheel, watching for end motion, and, if it is noticeable, adjust the bearings as follows:



1. Grooves in Spline for Snap Ring
2. Tapered Roller Bearing
3. Rear Axle Housing
4. Tapered Roller Bearing
5. Cap Screw
6. Key for Rear Axle
7. Nut for Rear Axle Shaft
8. Cotter Pin
9. Adjusting Bolt
10. Stud and Nut Holding Axle Housing to Transmission Case
11. Lifting Hook
12. Lubication Fitting
13. Gasket
14. Bearing Cap

Fig. 83. Detail of Rear Axle and Housing (with one piece rear wheel)

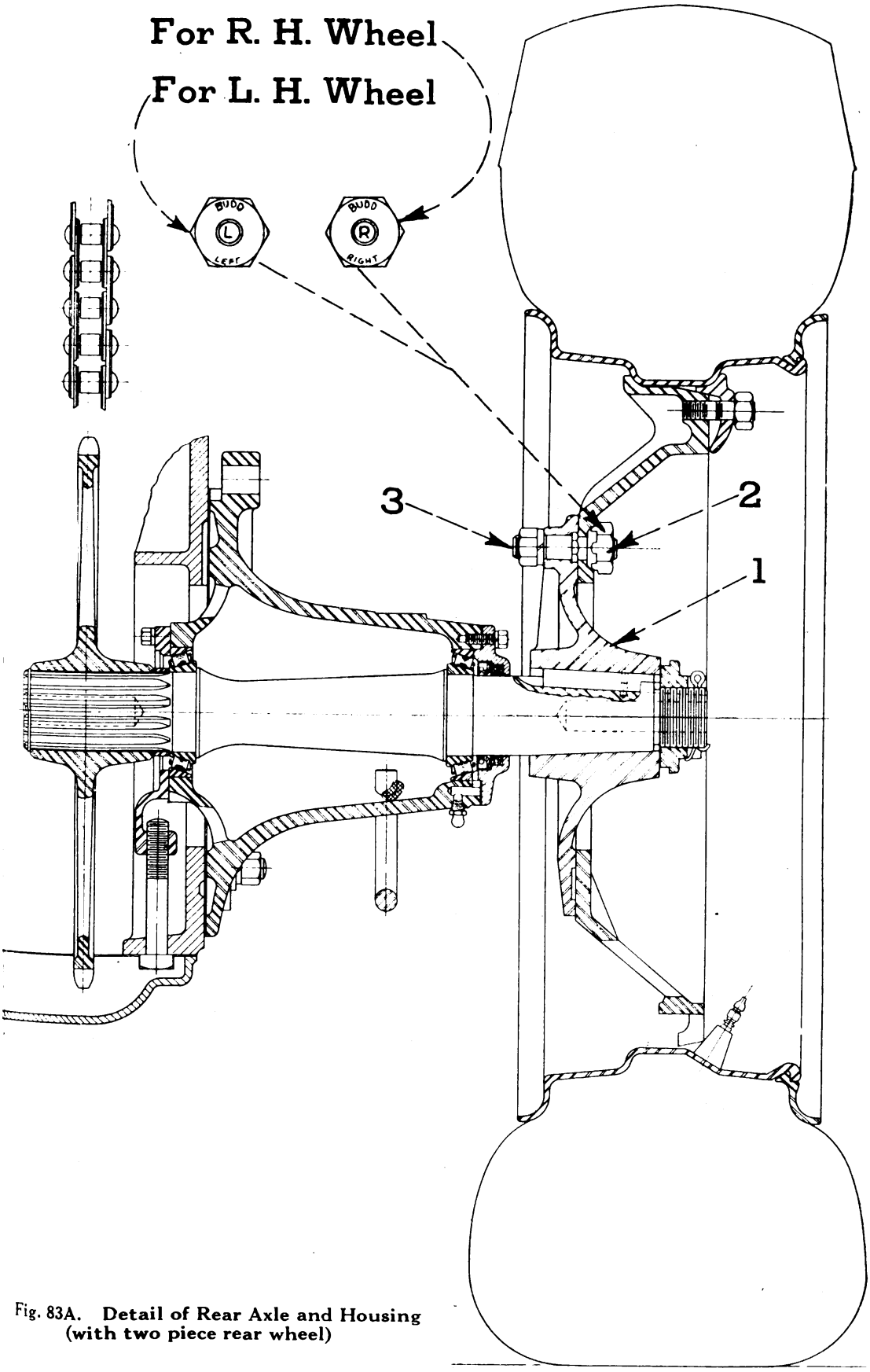


Fig. 83A. **Detail of Rear Axle and Housing (with two piece rear wheel)**

Fig. 83A shows the high speed two piece rear wheel which will be used on some Air Borne Tractors. The hub of this wheel is held in place on the axle in the same manner as the hub for wheel shown in Fig. 83.

In the event it is necessary, at any time, to change the rear wheel on hub 1, Fig. 83A, to another one of our wheels or the high speed Budd wheel No. E 46140 used with 20 x 10.00 C.W.rim as is now being used on Army Units, this change-over can easily be accomplished by simply jacking up the tractor and removing nuts from studs holding wheel to hub (one of which is shown at 2, Fig. 83A).

If at any time it becomes necessary to remove studs from wheel, one of which is shown as 3, Fig. 83A, care must be exercised to see that all studs marked R, which are threaded with right hand threads at the end that carries nut are again put in right hand wheel, and studs marked L, which are threaded with left hand threads at the end that carries nut are again put in left hand wheel. The studs are threaded in this manner so that they will not work loose when wheels turn.

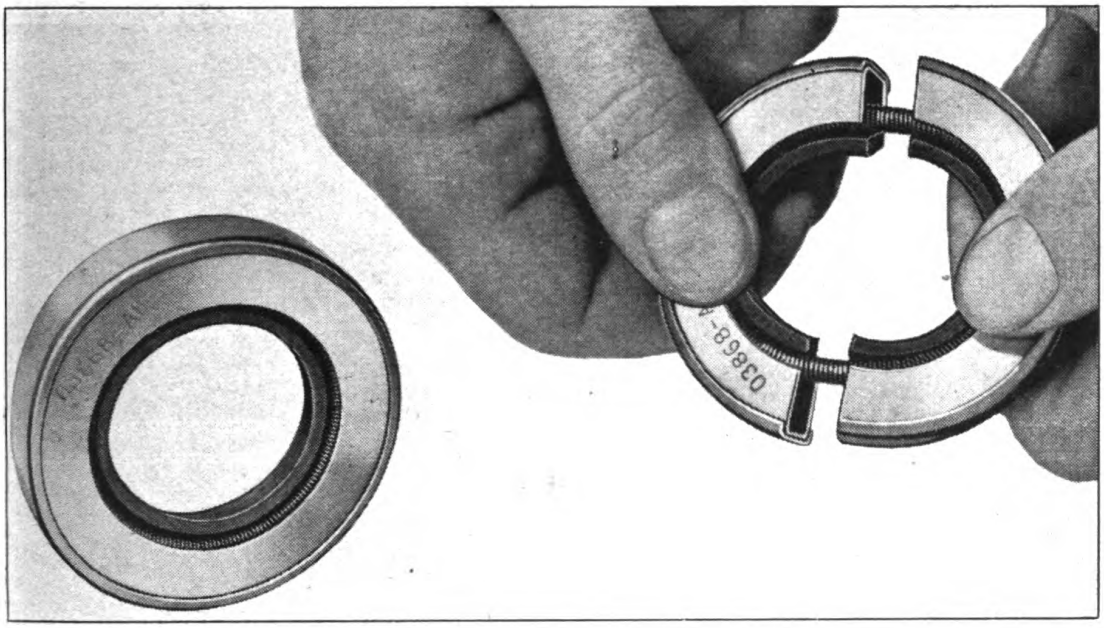


Fig. 84. Detail of Oil Seal. At Left Complete Seal Ready for Installation with face Toward the Oil Pressure. Seal at Right Cut Open to Show Arrangement of Leather and Coiled Spring in Seal

CAUTION: If oil seal is damaged in installation oil leaks will develop. The use of thimbles or placing of shim stock over key ways is strongly recommended.

1. Block the rear end of the tractor securely with the rear wheels clear of the ground.
2. After taking out the large cotter key and hub nut remove the rear wheel.
3. Take off the outer bearing cap by removing the six cap screws. Use care so that neither the shims between the cap and housing nor the oil seal in the cap are damaged.
4. Shims used here are of two thicknesses, .005 and .012 inches. Taking out shims takes up looseness and end play.
5. Replace bearing cap and tighten cap screws, then replace rear wheel. Use care in replacing bearing cap so that the oil seal is not damaged in sliding it over the keyway of the shaft. Laying shim stock over the keyway and sliding the oil seal over it will guard against injury.

When the proper adjustment is made, the axle should turn freely in its bearings, but there should be no end play.

DRIVE CHAINS

The tension of the drive chains should be inspected once a year and adjusted if necessary. This inspection is made by removing the top transmission cover. The chains should be tight enough so that they may be raised or lowered one inch midway between the sprockets.

To Tighten Drive Chains

Place a jack under the transmission case so that the drive wheels are clear of the ground. Drain transmission oil. Take off the rear transmission cover. Loosen the six nuts which hold the rear axle housings to the transmission case so that the axle housing can be shifted Fig. 83. Turn the adjusting bolt to the right

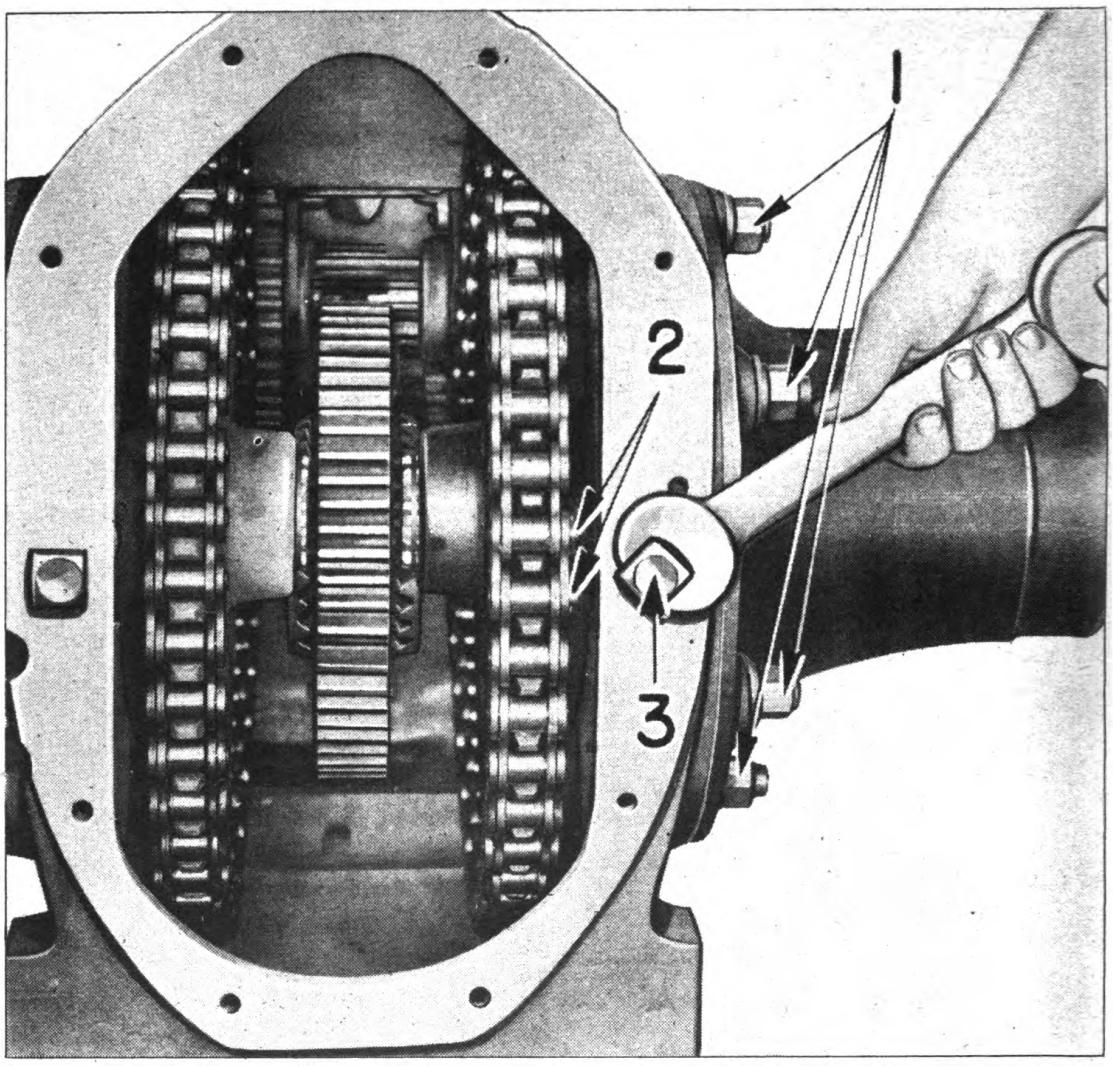


Fig. 85. Adjusting Drive Chains

1. **Nuts Holding Axle Housing to Transmission Case**
2. **Hardened Steel Cotter Pins in Master Links of Chain**
3. **Adjusting Bolt**

to shift the position of the axle housing thus tightening the chain. After making this adjustment, rotate the rear wheel to make sure that the chain is not set so tight that it will cause excessive wear on chain or bearings.

The head of the adjusting bolt must be set square Fig. 83 so that the recesses in the transmission cover will fit over it locking the bolt from turning.

If it is necessary to remove either chain, or both, take out the cotter pins Fig. 83 and remove the master link. Chain may then be removed easily. After chains have been adjusted, be sure to check brake and clutch adjustment.

CAUTION: When servicing tractor chains, or any other part requiring cotter pins, never use old cotter pins the second time. In all cases use new cotter pins of the "Heat-Treated Special Type". If the old worn cotter pins or a new common type pin is used, it would wear out in a short time. If the cotter pin fails, the chain may become disconnected which in turn may cause considerable damage.

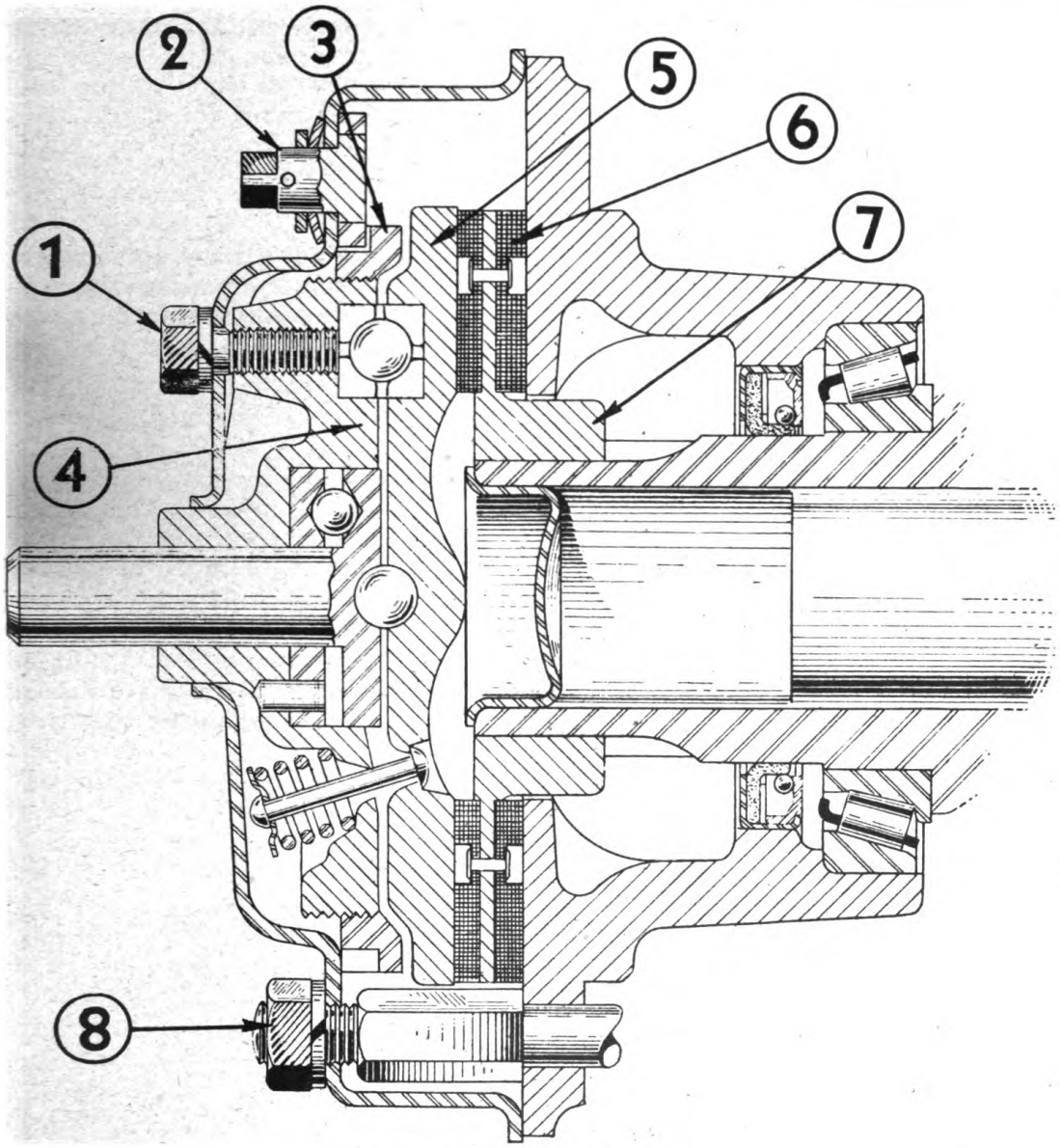


Fig. 86. Details of Brakes

1. Cap Screws
2. Adjusting Pinion
3. Adjusting Ring
4. Power Plate
5. Primary Disc
6. Middle Ring Facings
7. Middle Ring
8. Nuts Holding Housing

10

BRAKES

This tractor is equipped with disk type brakes which are mounted on the side gears of the differential shaft. When the tractor leaves the factory, brakes are adjusted to work smoothly and effectively. When the tractor is new or after installing new middle ring complete with facings, apply the brakes lightly for the first 50 hours of operation. This will permit the braking surfaces to acquire a good friction face and reduce the necessity for frequent adjustment. These brakes can be used to assist turning; therefore, turn the steering wheel in the direction

you desire to travel before applying brakes. Do not force the brakes to swing the tractor around. When stopping the tractor, disengage the clutch before applying the brakes. Do not stall the engine with the brakes. A heavy rolling load can be slowed down by throttling the engine before disengaging the clutch, thus using the engine as a brake. Turning sharply or sudden application of one brake at high speed should be avoided to prevent tipping the tractor over.

Adjusting Brakes

After considerable service, foot brakes will require adjustment to compensate for lining wear. When the arm on the brake actuating lever strikes the stop Fig. 13, it is necessary to adjust the brakes. This adjustment may be easily made, without disassembling the brake, by following these steps:

1. Jack up the rear wheels.
2. On the outside of the brake housing are three cap screws (1), Fig. 87. Loosen each of these screws several turns.
3. Turn the adjusting pinion (2) clockwise, thereby screwing adjusting ring (3) outward on its threads, and forcing the power plate (4) inward. This action forces the primary disc (5) inward, and decreases clearance at the brake lining (6). Continue to rotate the adjusting pinion (2) until the brake pedal can be depressed by hand about 1½" to 2". This should leave adequate clearance to assure that the brake will not drag when released.
4. When proper adjustment is secured, depress brake pedal and lock it. Then tighten the three cap screws (1) to lock the internal brake parts in place. It is not necessary to lock adjusting pinion (2) as the adjusting ring with

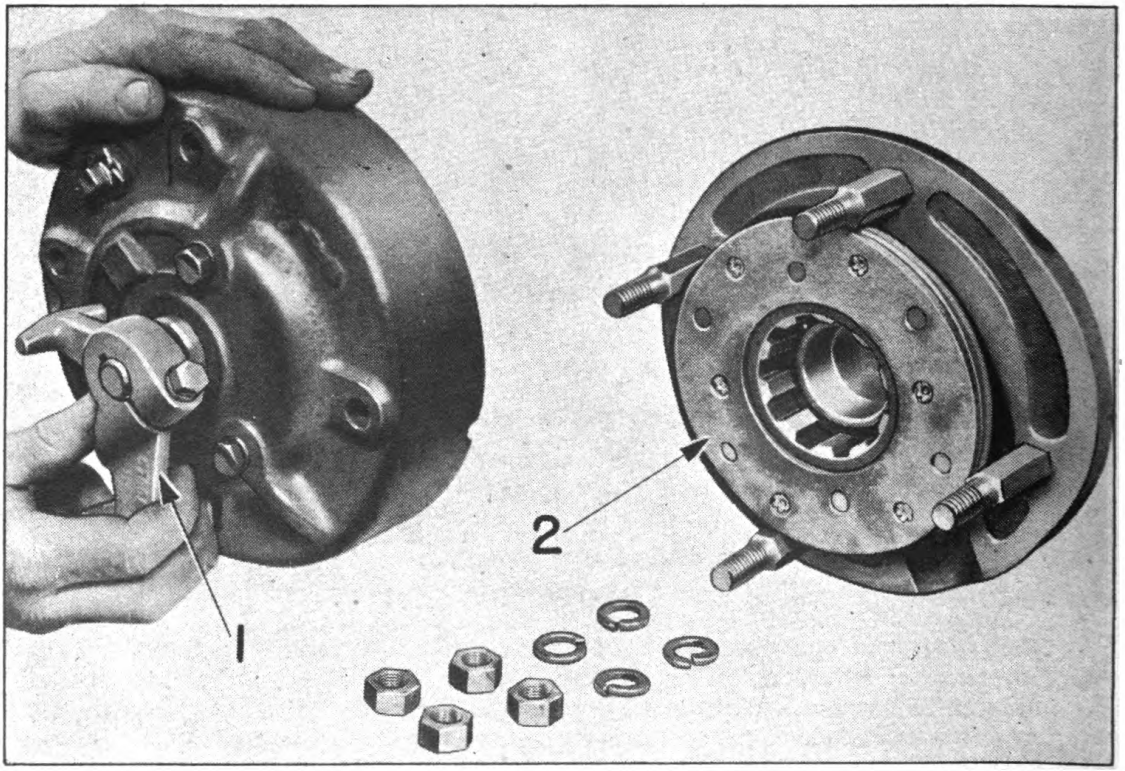


Fig. 87. Removing Brake to Replace Middle Ring

1. Actuating Lever **2. Middle Ring Complete with Facings**

which the pinion meshes is prevented from turning when the cap screws are pulled up tight.

Repeat these steps for the brake on the opposite side of the tractor. The adjustment should be equalized on both sides, so that each pedal will be depressed an equal amount during brake application.

After several adjustments have been made, it may become necessary to replace the facings (6). In this case, replace entire middle brake ring (7) complete with facings. Relining in the field is not advisable.

If a middle ring complete with facings is not available, facings can be installed on the original middle ring if the mechanic has proper facilities to do the job of riveting.

Replacing Middle Brake Ring

To renew the facings, the brake must be partly disassembled. Disconnect the brake actuating lever, take off the four nuts (8) and lift off the entire brake assembly, exposing the facings. The middle brake ring (7) then can be pulled off the splined outer end of the differential shaft. After installing the new brake ring, it will be necessary to readjust the brake.

Brakes can be locked with a ratchet Fig. 5 to act as a parking brake. They should be locked whenever the tractor is to stand for some time.

STEERING

It is recommended that the steering equipment be checked regularly (every

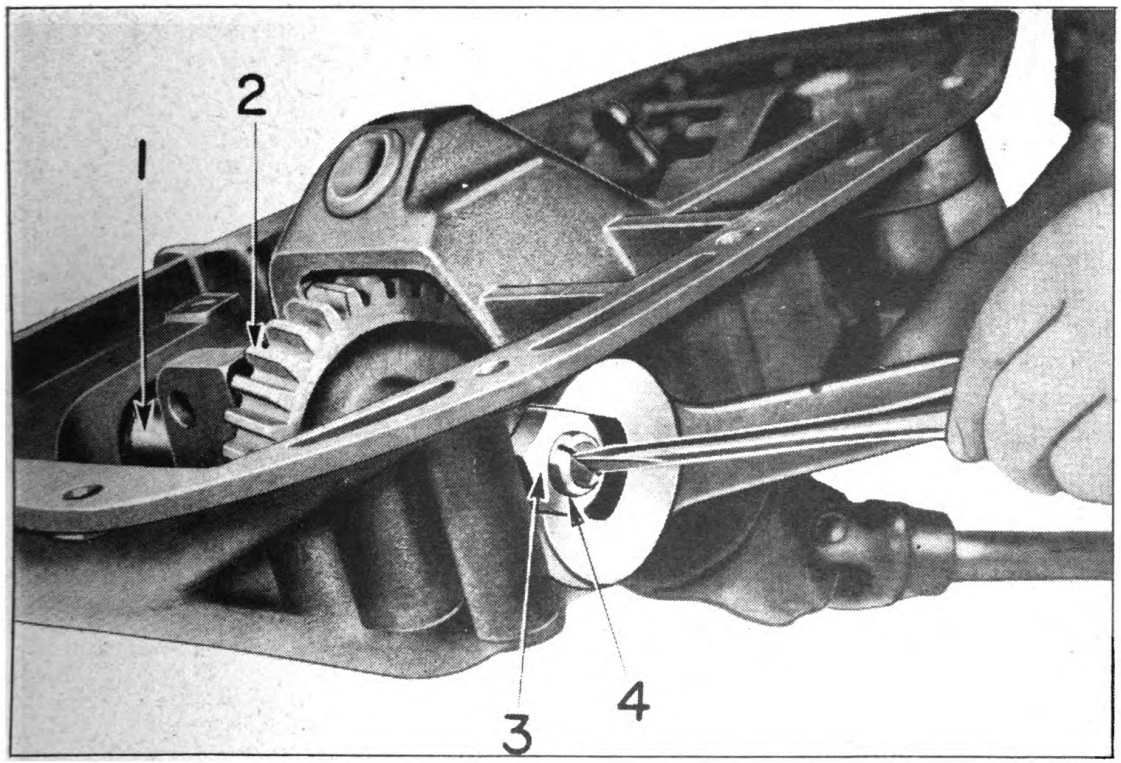


Fig. 88. Adjusting Steering Arm Shaft

1. Steering Arm Shaft
2. Steering Worm Wheel
3. Lock Nut
4. Adjusting Screw

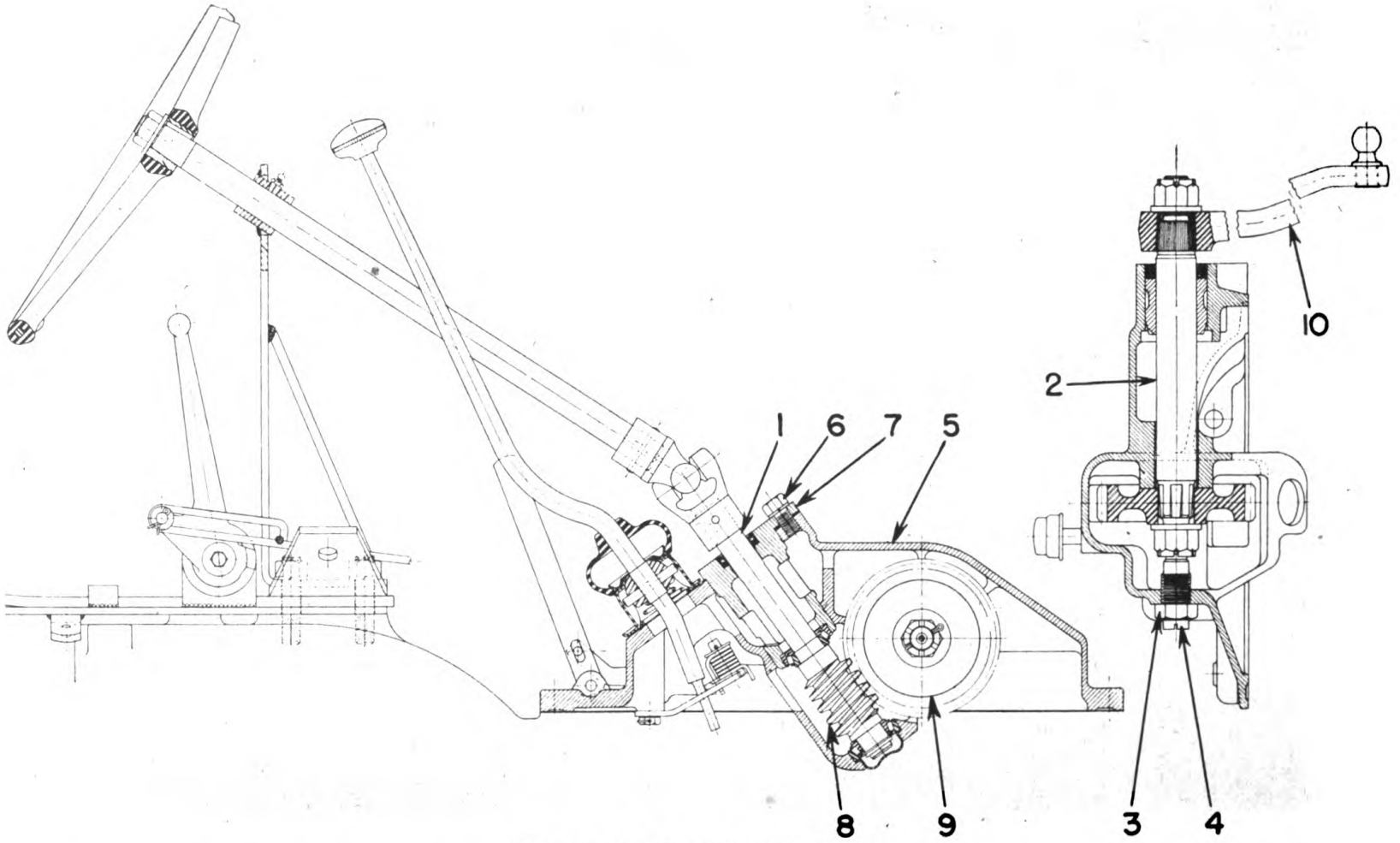


Fig. 89. Details of Steering Device

1. Steering Column Shaft
2. Steering Arm Shaft
3. Lock Nut
4. Adjusting Screw
5. Steering Gear Housing
6. Cap Screws
7. Steering Column
8. Steering Worm
9. Steering Worm Wheel
10. Steering Arm

6 months) and adjustments made if necessary. If the steering wheel can be turned appreciably without a corresponding movement of the wheels the steering equipment may need adjusting.

Drag Link Adjustment

The joints are a spring cushion type so as to maintain positive contact with the ball joints of the steering arms and take up any slight wear that may occur. Adjustment is made by unlocking the threaded plugs at each end of the link and turning the plug inward until it bottoms; then back it off a half turn to allow proper spring action and to prevent binding. Relock the plugs after adjusting. After every 1024 hours of operation, disassemble the link completely, clean out thoroughly, reassemble and lubricate.

Steering Gear Adjustment

End play in the steering arm shaft is taken up by loosening the lock nut Fig. 88 and making the proper setting of adjusting screw. Relock the set screw with the lock nut after making the adjustment.

This adjustment can be made either on the tractor or with the transmission cover off.

REMOVING THE STEERING COLUMN

Any excessive end play in the steering column can be taken up by removing one or more shims between the steering shaft column and the transmission case

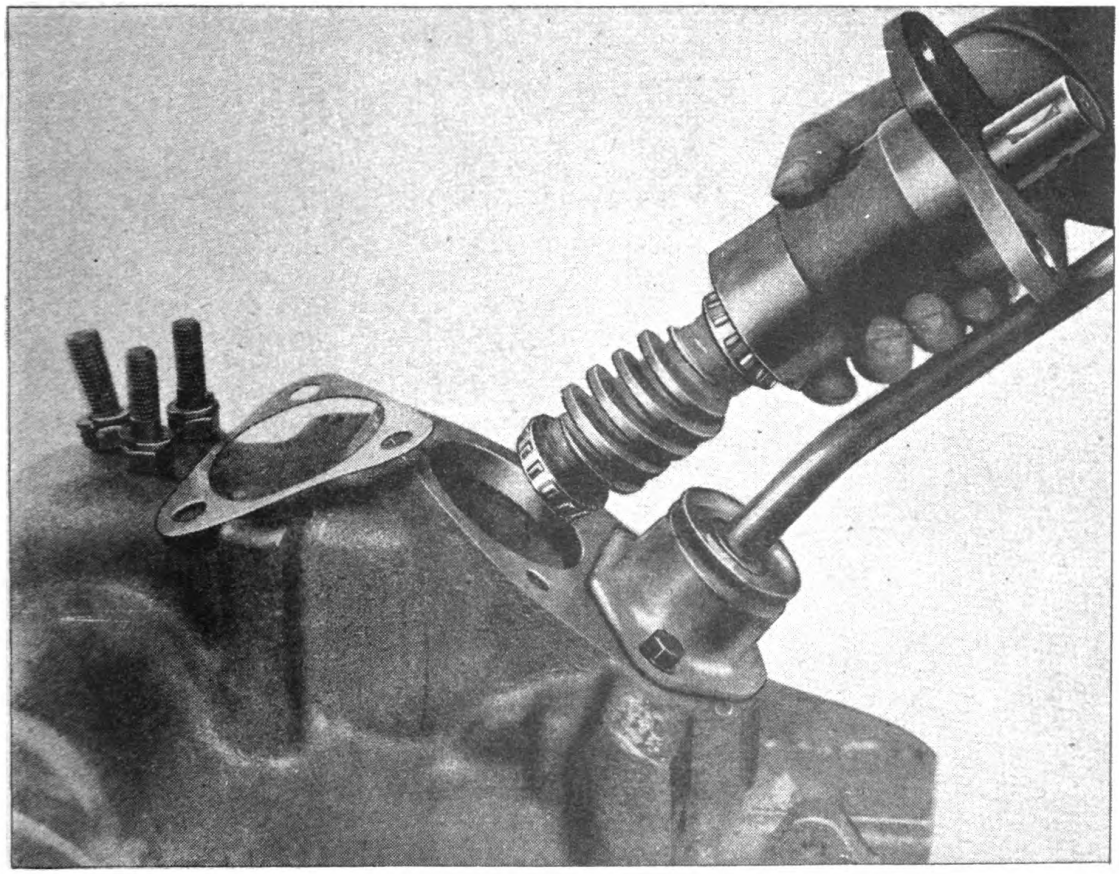


Fig. 90. Removing steering column from top transmission cover.

top cover. Extreme care must be taken in doing this. Otherwise the tapered roller bearing on the lower end of the shaft may be damaged.

Remove the transmission case top cover as outlined on page 92. Disconnect the lower yoke of the universal joint and remove the steering wheel, upper steering column and universal. It is then possible to make any adjustments or replacements required. Before replacing the steering column, remove the bearing cage and its roller from its place in the transmission case top cover. With the transmission case top cover and steering column upside down, put rollers

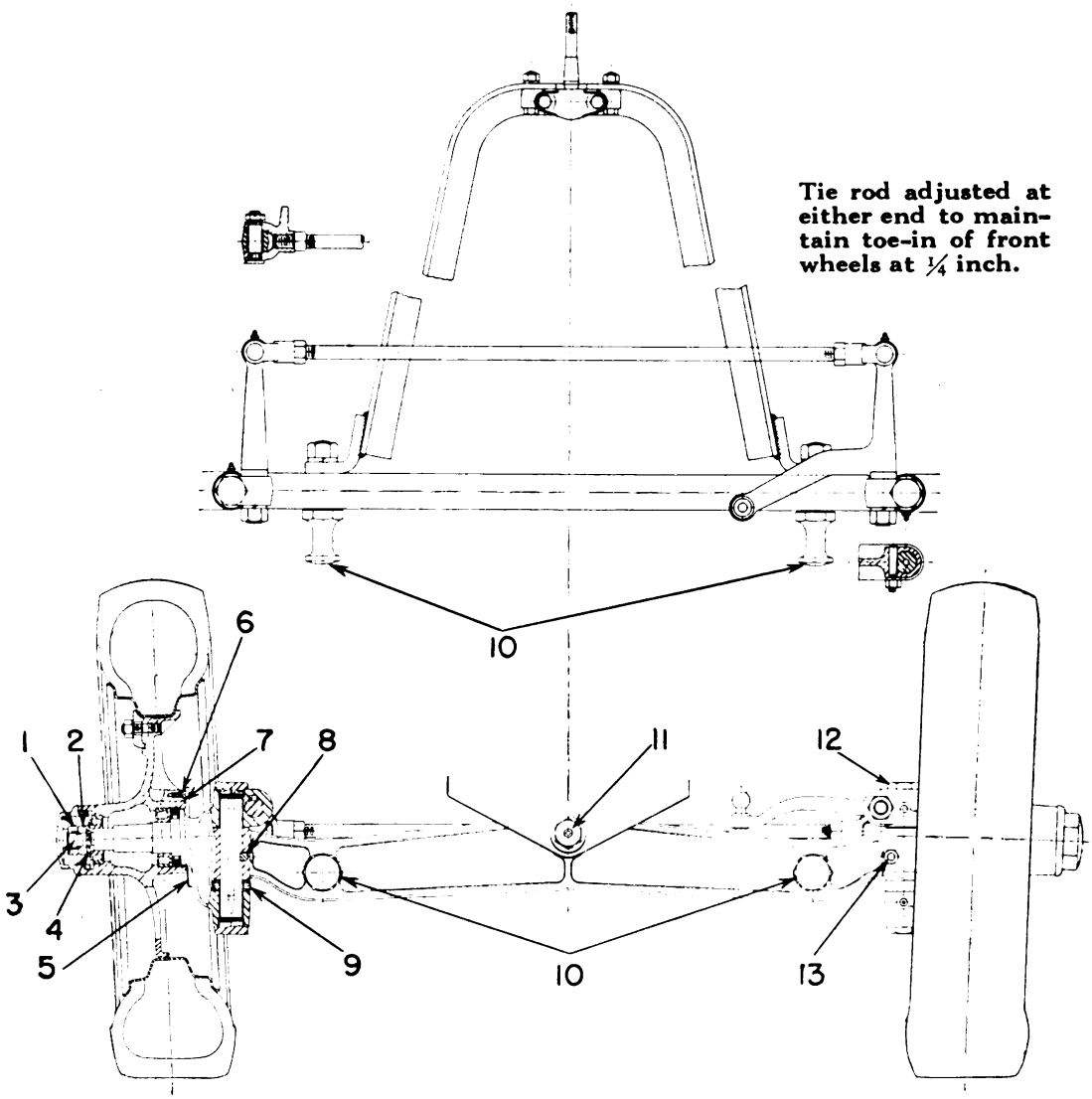


Fig. 91. Detail of Front Axle and Spindle

1. Lock Washer
2. Hexagon Jam Nut
3. Jam Nut
4. Washer
5. Dust Shield
6. Machine Screw
7. Gasket
8. Tapered Pin
9. Thrust Bearing
10. Lifting Points
11. Front Axle Pivot Pin
12. Cap for Steering Spindle
13. Tapered Pin

and cage in place on the cone which remains on the column. Hold the parts in place with heavy grease and reassemble into the transmission case top cover. Make certain the bearing is properly installed before putting transmission case top cover in place. Fig. 88.

If, after long service, excessive back lash is found between steering worm (8) and steering worm wheel (9), take up back lash by removing steering arm (10) and rotating steering shaft (2) one-third revolution. This operation presents new working surfaces between steering worm (8) and steering worm wheel (9). Fig. 86.

King Pins

The king pin is clamped from turning with a threaded, tapered pin. Fig. 89. It must be taken out to remove the king pin. The caps on the top and bot-

Fig. 92. Adjusting Front Wheel Bearing

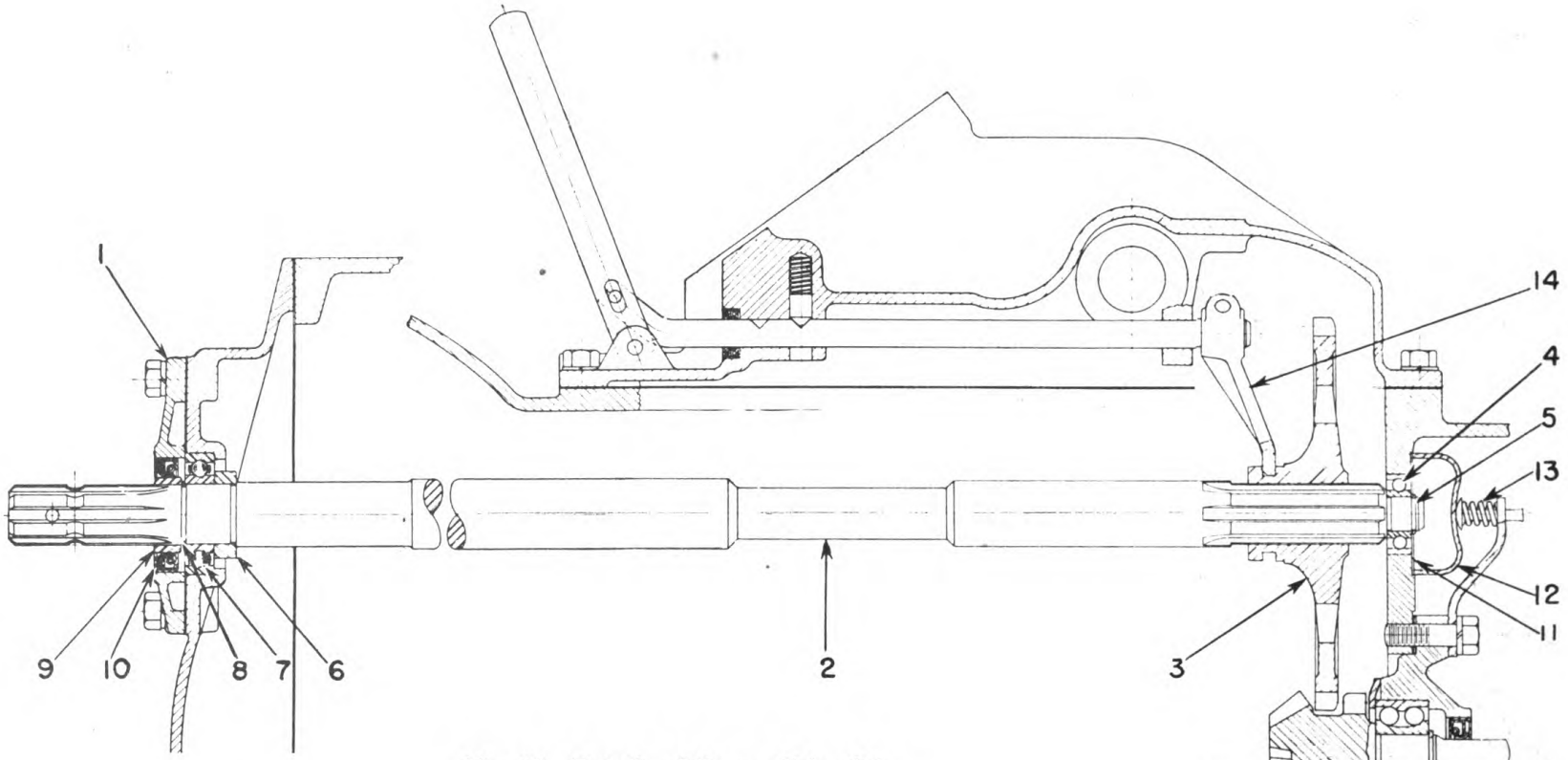


Fig. 93. Details of Power Take-Off

1. Cap for Transmission End Cover
2. Power Take-Off Shaft
3. Power Take-Off Gear
4. Pilot Bearing
5. Snap Ring
6. Spacer
7. Ball Bearing
8. Snap Ring
9. Collar
10. Oil Seal
11. Front Cover Gasket
12. Front Power Take-Off Cover
13. Spring
14. Power Take-Off Shifter Fork

tom of the knuckle should be taken out to allow driving out the king pin.

With the king pin out the spindle and thrust bearing can be removed.

If the bushings are badly worn, drive them out and replace with new bushings.

Front Wheel Bearings

The front wheels operate on tapered roller bearings. They are sealed against dirt and grit with a dust seal and shield behind the wheel and a sturdy screw cap on the outer end. The hub and bearings are packed with wheel grease and require no further attention except to remove bearings, clean and repack with WB grease every 256 hours.

Use a block or jack under the front end of the tractor so that all weight is off the wheels when inspecting and adjusting the bearings.

The adjusting nut Fig. 90 should be drawn up against the flat washer forcing the outer bearing cone inward until the pressure of the nut produces a noticeable bind in the bearings. The nut should then be backed off one-sixth of a turn, or until the bearings run freely with .002 to .006 inch end play.

After the correct adjustment is secured the lock washer should be put on and clamped with a lock nut. Recheck adjustment after lock nut is tightened.

Gasket should always be in place between hub and dust shields. Fasten the shields securely in place when assembling and keep them tight with machine screws.

POWER TAKE-OFF

Installing Power Take-Off

When it becomes necessary to install a new power take-off or replace one already in service, it should be done according to the following procedure. Careful study of Fig. 91 will be helpful in making the installation.

With the transmission case top cover removed (see page 92) and the cap for transmission end cover off, (1) Fig. 91 insert the power take-off shaft (2) through the rear cover.

Assemble the power take-off gear (3) on the front end of the shaft—free on the spline with the shift collar groove toward the back of the tractor.

Drive the pilot bearing (4) on the end of the shaft and secure with snap ring (5). Then insert the pilot bearing and shaft in the hole in the front end of the transmission case.

Drive the spacer (6) on the rear end of the shaft up to the shoulder. Assemble ball bearing (7) and secure with snap ring (8).

Mount transmission end cover cap with gasket and secure with four cap screws. Install collar (9) and oil seal (10) on shaft. Oil seal should be installed carefully with the sharp edge toward the oil. Be sure that the sharp leather edge is not broken down in installing. See Fig. 82. Drive the oil seal into the end, cover cap flush with the outer surface.

With the shaft assembly in place carefully install the front cover gasket (11) in the recessed face in the clutch housing. This gasket is held in place with the front power take-off cover (12) which in turn is secured by the spring. It is extremely important that this gasket and cover be properly assembled to prevent transmission oil entering the clutch housing.

After the power take-off assembly is installed, the transmission case top cover can be put into place making sure that the power take-off shifter fork (14) is properly engaged.

Specifications

Drive—spur gears from clutch shaft.

Spline—1⅜ inch A. S. A. E. standard.

Location of spline—on center line of tractor and 26 11/16 inches above the ground.

Direction of rotation—Clockwise, viewed from behind tractor.

Speed—541 R. P. M. at loaded engine speed of 1550 R. P. M.

Ratio of P. T. O. speed to engine speed—35:100.

Operation

The power take-off shaft is put into operation by meshing the power take-off gear with the pinion on the clutch shaft. This is accomplished by pushing the power take-off shifter lever toward the instrument panel while the clutch is disengaged. The rotation of the power take-off is controlled by means of the main tractor clutch. The power take-off is disengaged by pulling the power take-off shifter lever toward the rear. Whenever it is not being used, the power take-off should be disengaged.

Before tractor is used to pull and operate any power driven machine, make a careful study of the power take-off drive and be sure it is properly connected.

Shields

Air borne tractors are equipped with a standard power take-off mounting plate which provides a standardized attaching point for the shields furnished with each driven machine. Whenever a power take-off driven machine is in operation, these shields must be in place to prevent injury to the operator. The mounting plate on the rear of transmission cover should never be removed at any time.

SAFETY FIRST

The power take off should never be operated without proper guards. A guard on the tractor and telescoping shields to cover the revolving shaft from the tractor to the driven machine must be securely mounted in place.

ALPHABETICAL INDEX TO PARTS LIST

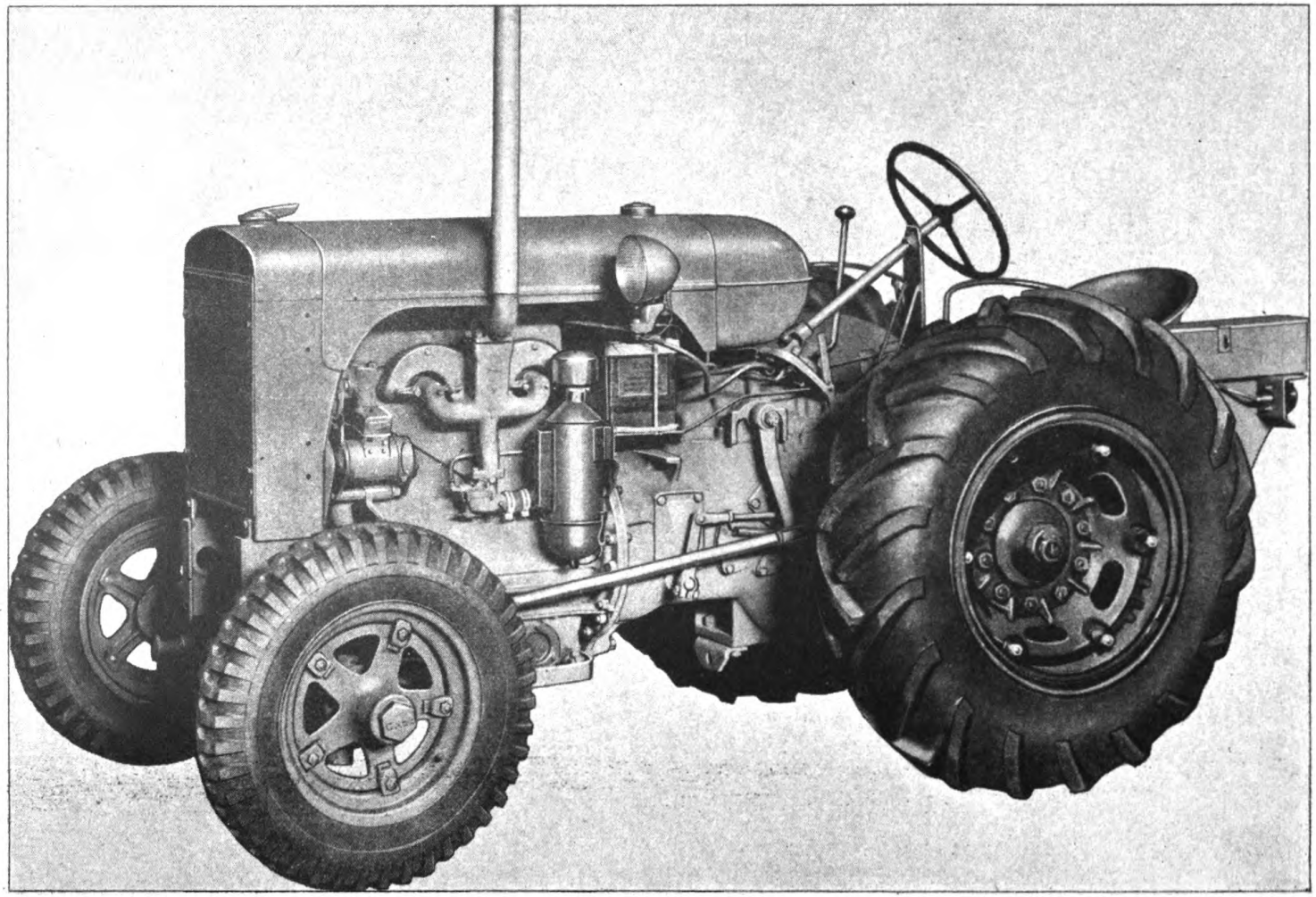
WARNING

SPARE PARTS can be supplied promptly and accurately only if positively identified by correct part number and correct part name.

FURNISH THIS INFORMATION ON ALL REQUISITIONS. WITHOUT FAIL, on all requisitions, give name of machine, name of manufacturer, model or size, manufacturer's serial number of each machine and subassemblies attached to machine, and components and accessories for which spare parts are required. List spare parts for only one make or kind of machine on each requisition.

Requisitions must be double spaced to provide room for office notations when necessary.

ALPHABETICAL INDEX



CASE MODEL "SI" AIRBORNE TRACTOR

ALPHABETICAL INDEX
(Continued)

PREPARATION OF REQUISITIONS

A sample requisition in the correct form for submission by the Engineer Property Officer is shown on the opposite page.

THIS SHALL BE FOLLOWED IN MAKING OUT REQUISITIONS

In order to eliminate duplication of work, Property Officers may authorize organizations to prepare requisitions in final form, leaving requisition number space blank for completion by Property Officer.

THE FOLLOWING RULES WILL BE OBSERVED CAREFULLY IN PREPARING REQUISITIONS FOR SPARE PARTS:

a. Prepare a separate requisition for each different machine.

b. Type "SPARE PARTS" in upper right hand corner of requisition form.

c. State PERIOD designation by use of one of the following terms:

(1) "INITIAL"—first requisition of authorized allowances.

(2) "REPLENISHMENT"—subsequent requisitions to maintain authorized allowances.

(3) "SPECIAL"—requisitions for necessary repairs not covered by allowances.

d. Give complete shipping instructions.

e. State proper nomenclature of machine, and make, model, serial number and registration number.

f. State basis of authority, and date delivery is required, immediately below description of machine.

g. Group parts required under group headings as shown in manufacturer's parts catalogs.

h. State manufacturers' parts numbers and nomenclature descriptions accurately and completely. Do not use abbreviations.

i. Double space between items.

j. Emergency requisitions sent by telephone, telegraph, or radio must always be confirmed immediately with requisition marked: "*Confirming* (state identifying data)."

k. Nonexpendable items must be accounted for.

PREPARATION OF REQUISITIONS

Sample Copy for Use in the Preparation of Requisitions

Revisions in QMC Form 400 for requisitioning spare parts are confined to new column headings. Until new forms are available all organizations will use the present form and type or write in corrections indicated.

Under revised heading "Nomenclature and Unit" list the article and the unit (ea for each; lb for pound; etc.). Under heading "Maximum or Authorized Level" list the authorized organizational allowances or depot stock levels given in ENG 7 and ENG 8 of the ASF Engineer Supply Catalog (superseding Part III, Corps of Engineers Supply Catalog). The total number on hand for each item is listed under "On Hand". In column headed "Due In" enter the total quantity previously requisitioned but not delivered. Column headed "Required" is to be changed to read "Quantity Desired." In "Remarks" column enter additional information. For "Initial" and "Replenishment" requisitions, the sum of "Quantity Desired", "Due In", and "On Hand" should equal "Maximum or Authorized Level".

On this page is shown a sample requisition on QMC Form No. 400 which conforms to the latest revisions. The marginal notes give instructions for preparing a requisition for spare parts for Engineer equipment. Additional information on this subject is contained in Section ENG 1-2 of the ASF Engineer Supply Catalog (superseding Section AA-1 of Part III Engineer Supply Catalog), available on requisition from Engineer Field Maintenance Office, P. O. Box 1679, Columbus, Ohio.

State PERIOD designation by use of one of the following terms:
(1) "INITIAL"—first requisition of authorized allowances.
(2) "REPLENISHMENT"—subsequent requisitions to maintain authorized allowances.
(3) "SPECIAL"—requisitions for necessary repairs not covered by allowances.

Type "SPARE PARTS" in upper right hand corner of requisition.

WAR DEPARTMENT
Q. M. C. Form No. 400
(Revised 10 Aug. 1943)

SPARE PARTS

REQUISITION

To: Engineer Field Maintenance Office — No. of Sheets 1 — Sheet No. 1
P.O.Box 1679, Columbus, Ohio.
Requisition No. E-531-3-44 — Date 6 October 1943 — Period Special

SHIP TO Engineer Property Officer, Pine Camp, New York.
MARKED FOR: Supply Officer, 147th Engineer Regiment, Pine Camp, New York.

Requisitioned By (show Signature, Rank, Organization, Destination. If different from "ship to" include address):
Robt. E. Roe
Robert E. Roe.
Major C. E.
Engineer Property Officer

Approved By For The Commanding Officer:
John D. Doe
John D. Doe.
Colonel. C. E.
Executive Officer

MFG. NO.	NOMENCLATURE AND UNIT	AUTH. or MAX. LEVEL	ON HAND	DUE IN	REQUIRED	APPROVED
	PARTS FOR TRACTOR, GASOLINE, CASE MODEL "SI" AIRBORNE SERIAL No. 4705690 U S A, REG No. 810577					
	Basis: Repair of Disabled Equipment.					
	Delivery is requested by 20 October 1943					
	CASE ENGINE GROUP					
	CYLINDER HEAD, CYLINDER BLOCK AND OIL PAN PARTS.					
2584AA	CYLINDER HEAD WITH VALVE GUIDES, ea	--	0	0	1	
05762AB2	Gasket for Cylinder Head, ea	--	0	0	1	
05764AB	Gasket for Cylinder Head Cover, ea	--	0	0	1	
	VALVES, PUSH ROD AND CAMSHAFT PARTS					
05746AB	Exhaust Valves, ea	--	0		4	
05747AB	Inlet Valves ea	--			4	
	TRANSMISSION GROUP					
01405AB	Gasket for Trans. Hand-hole Cover ea	--	0	0	2	
	REAR AXLE GROUP					
06670AB	Rear Axle Shaft ea	--	0	0	1	
	*					

Give complete shipping instructions. Special instructions for packing, marking, routing, etc., should be given at the end of requisition.

State proper nomenclature of machine, also make, model, machine serial number and U. S. A. registration number.

Prepare a separate requisition for each different machine.

State basis or authority and date delivery is required, immediately below description of machine.

Double space between items.

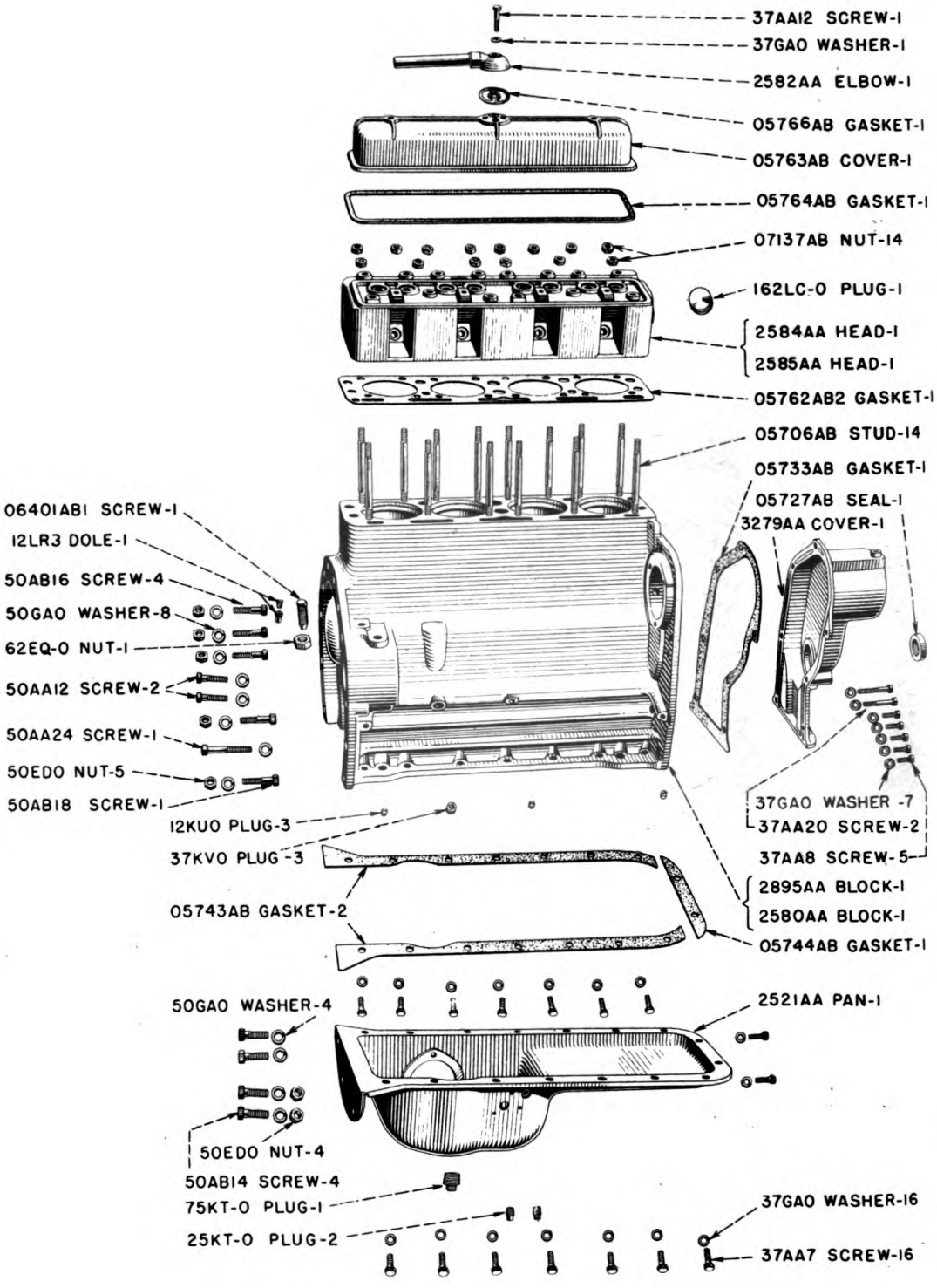
Group parts required under group headings as shown in manufacturers' parts catalogs (Technical Manuals).

State stock numbers, manufacturers' parts numbers and nomenclature accurately and completely. Do not use abbreviations.

*Nonexpendable items such as tools must be accounted for, when requisitioned, by a statement that they have been placed on REPORT OF SURVEY or STATEMENT OF CHARGES.

Emergency requisitions sent by telephone, telegraph or radio must always be confirmed immediately with requisition marked: "Confirming (state identifying data)."

CYLINDER HEAD, CYLINDER BLOCK AND OIL PAN PARTS



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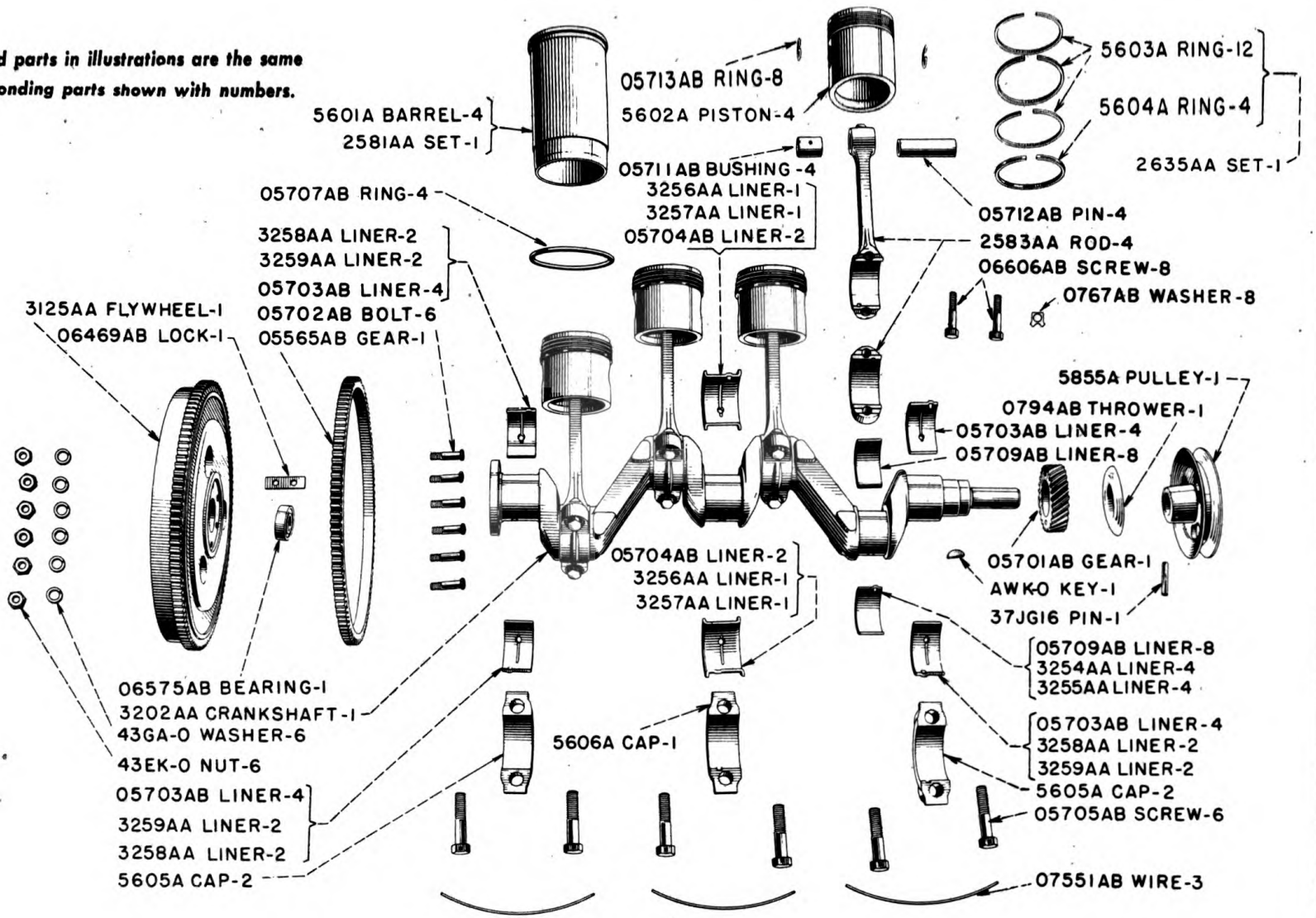
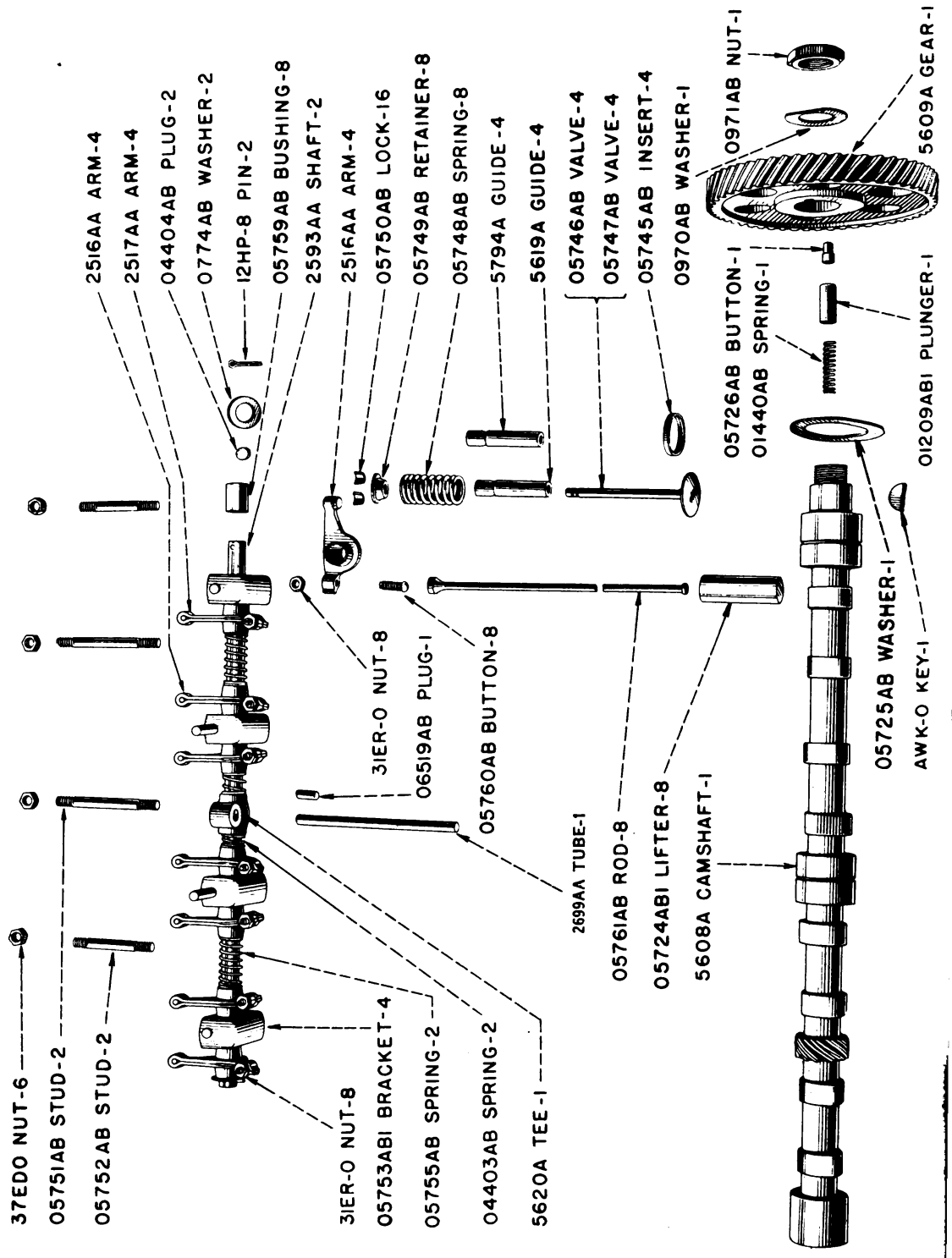


VALVES, PUSH RODS AND CAM SHAFT PARTS



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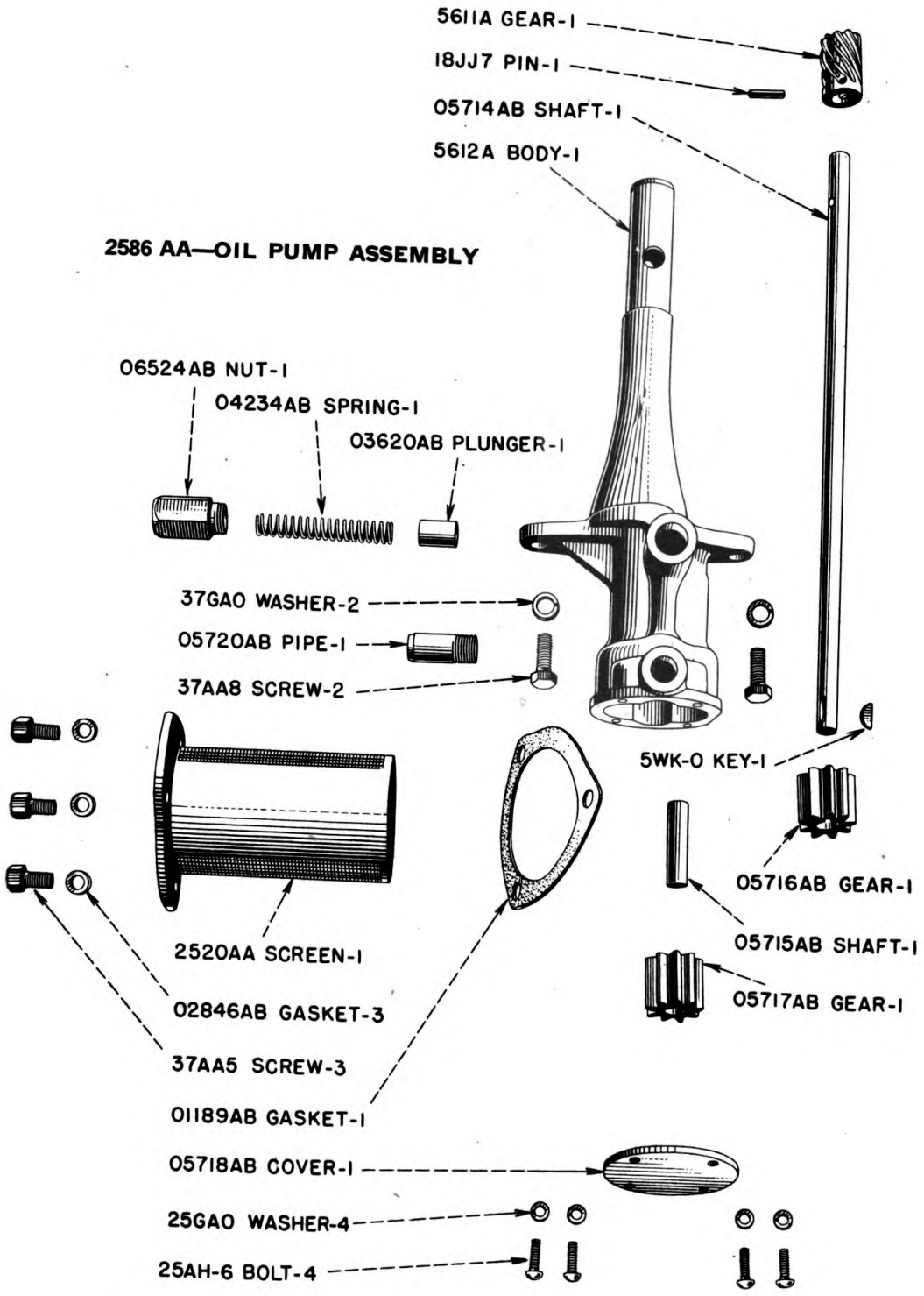
OIL PUMP



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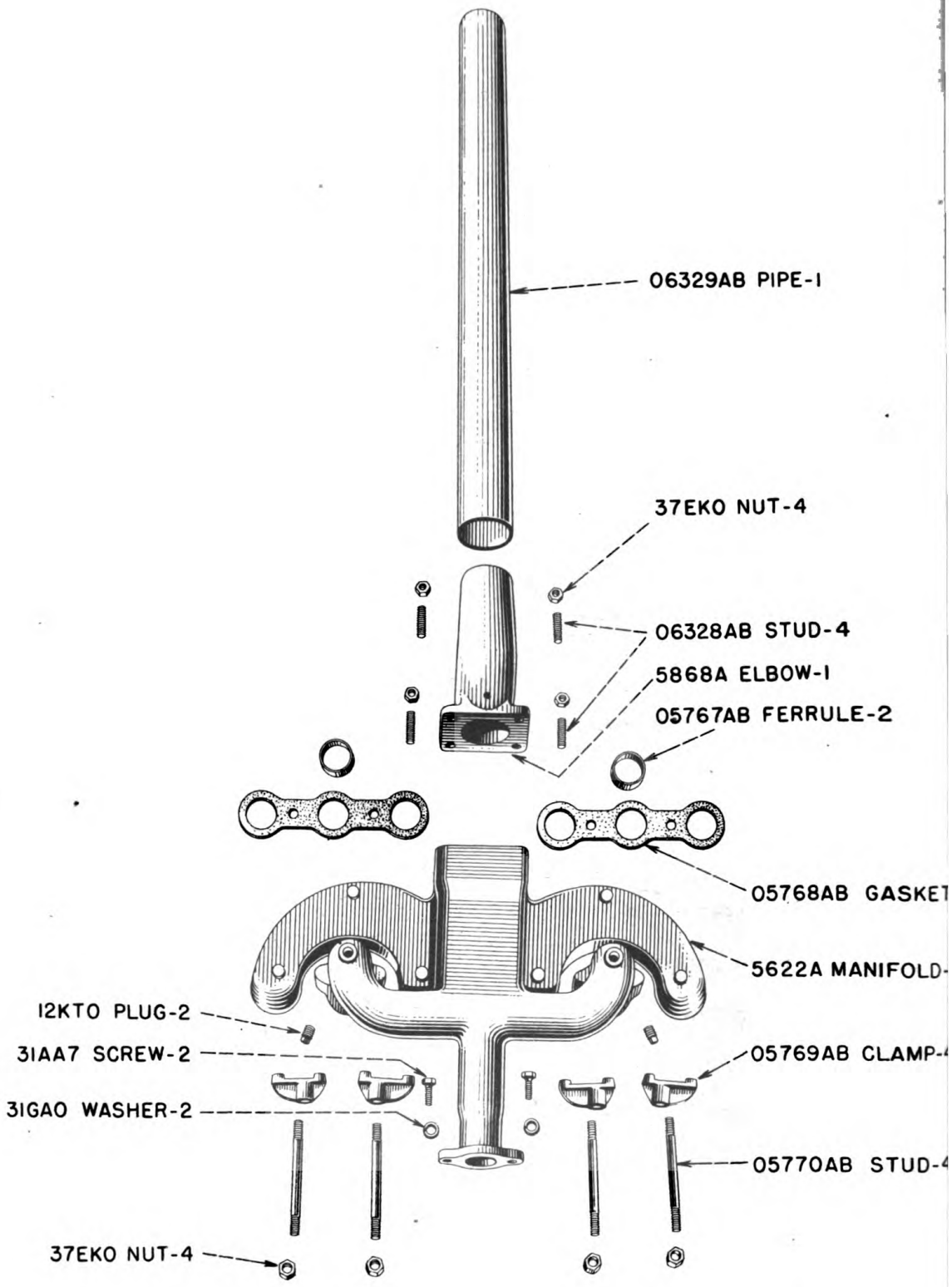
MANIFOLD AND EXHAUST PIPE



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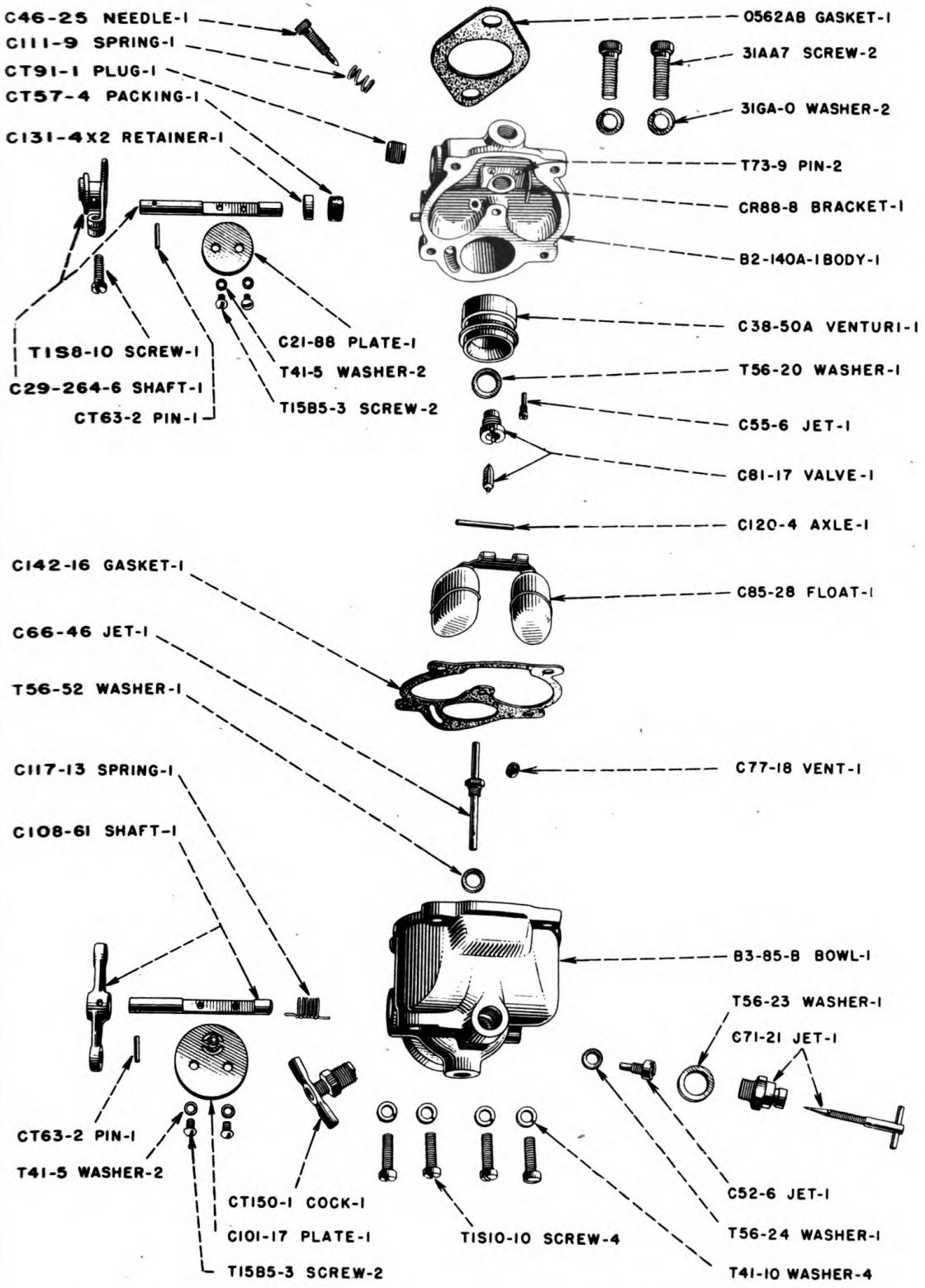
05771 AB—CARBURETOR ASSEMBLY



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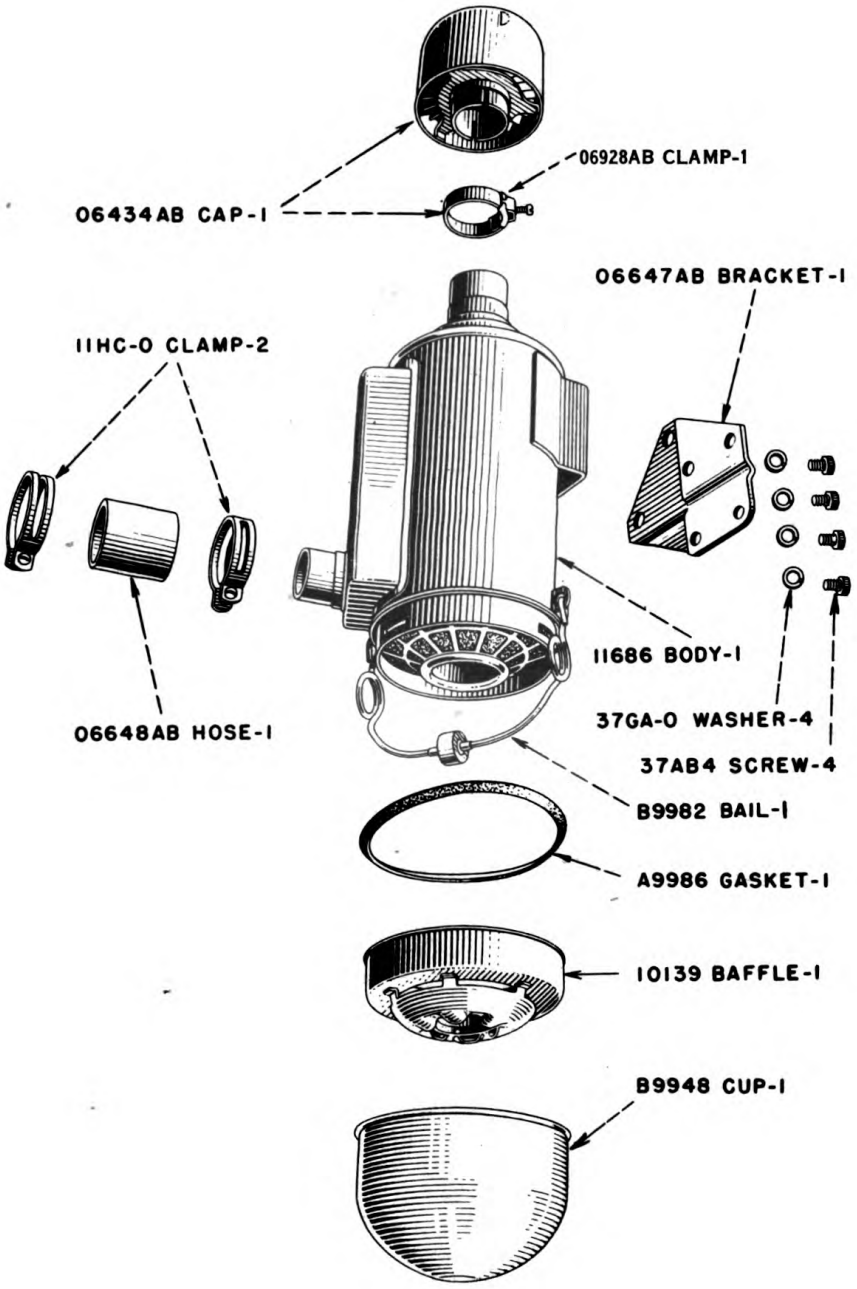
06646 AB—AIR CLEANER ASSEMBLY



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A Careful Operator

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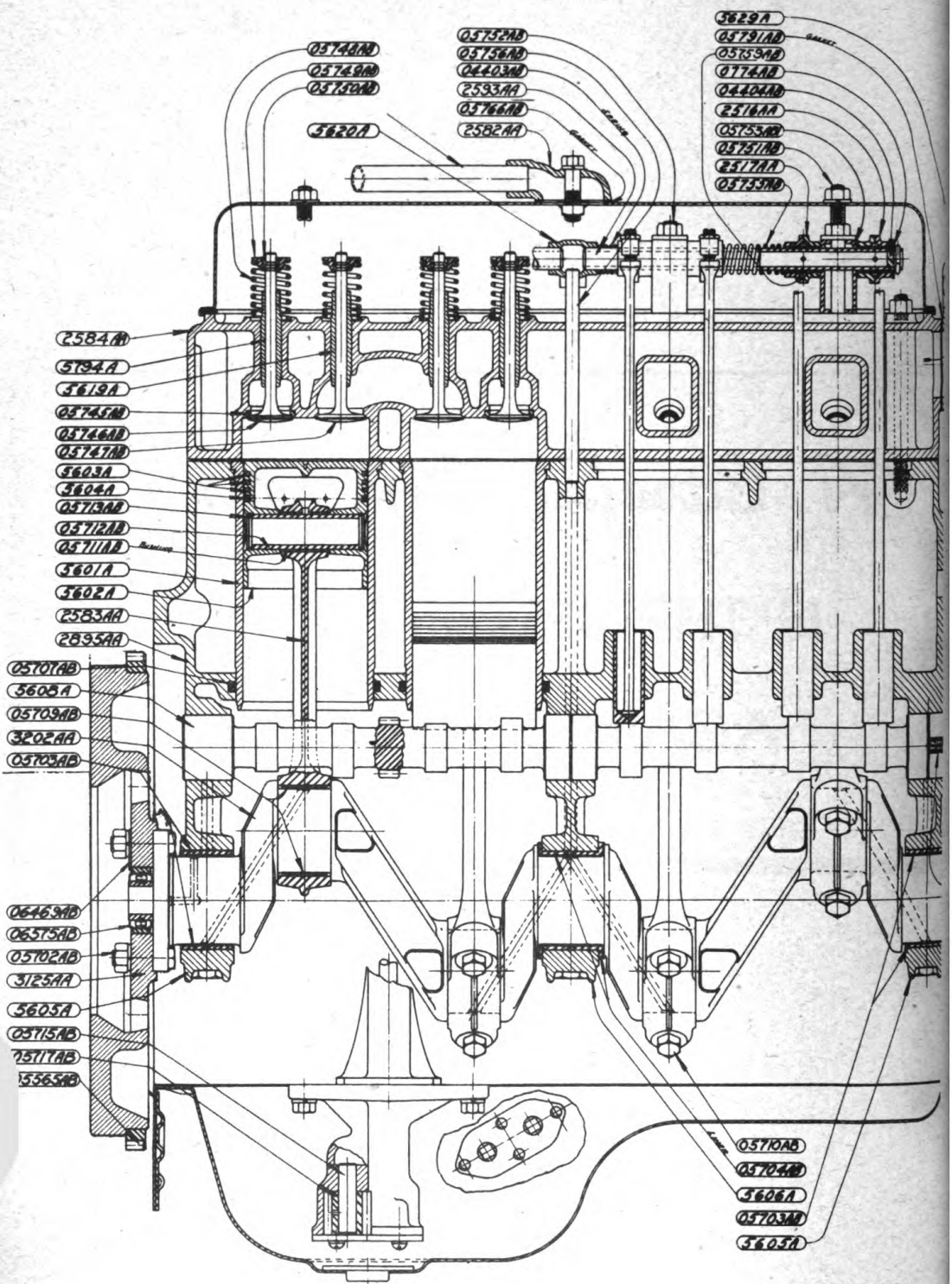
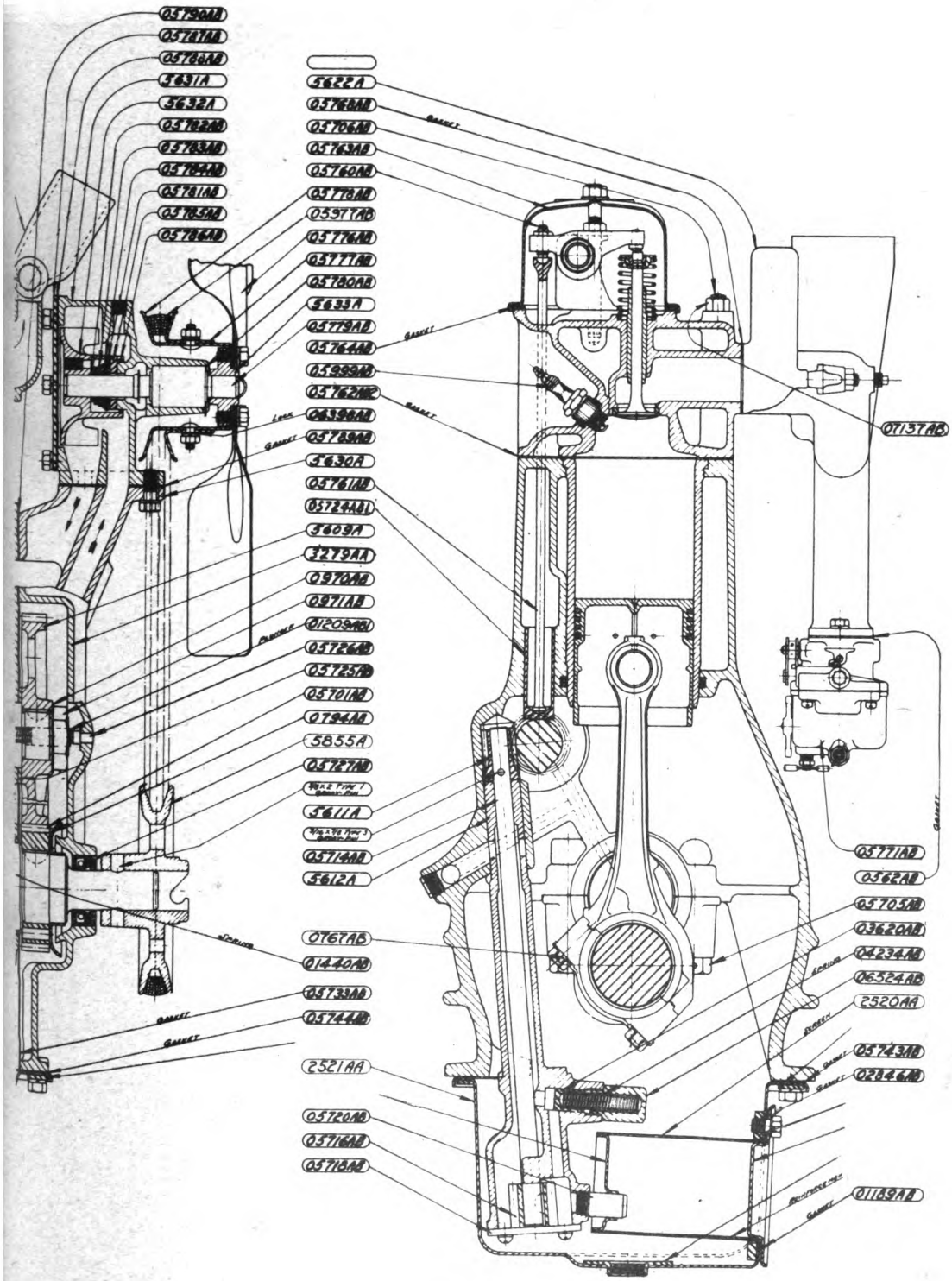
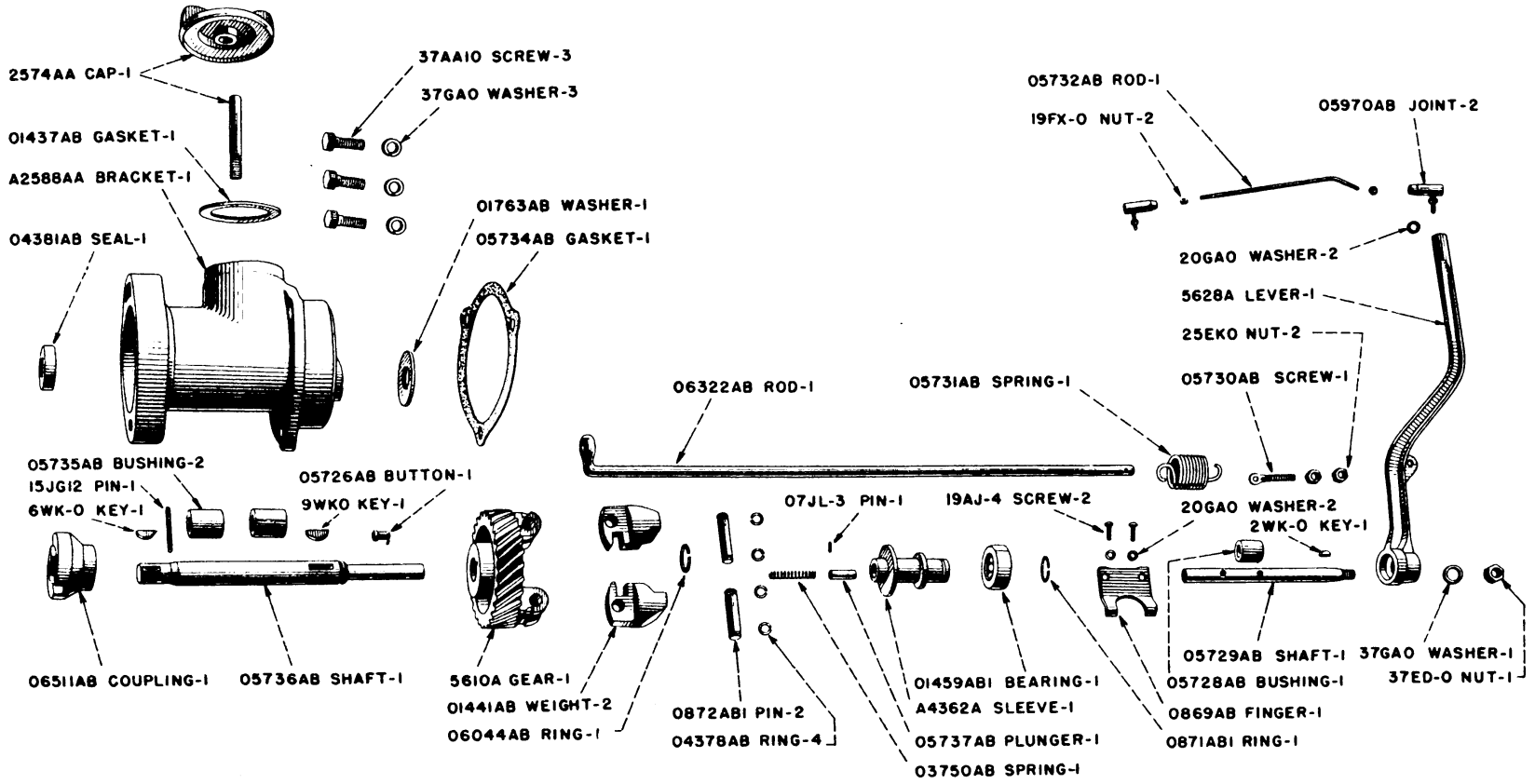
—National Safety Council.





A2587 AA—GOVERNOR ASSEMBLY



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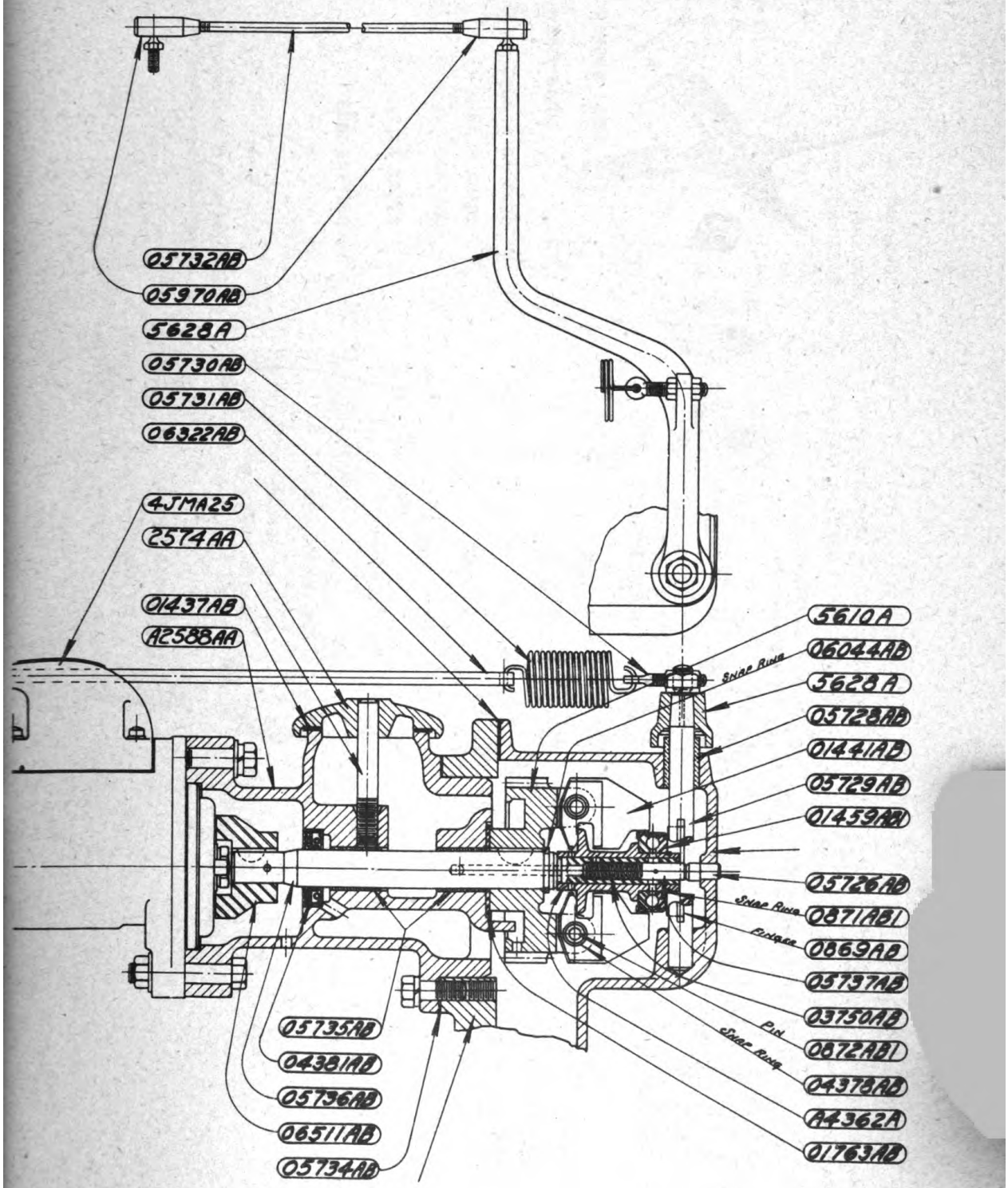
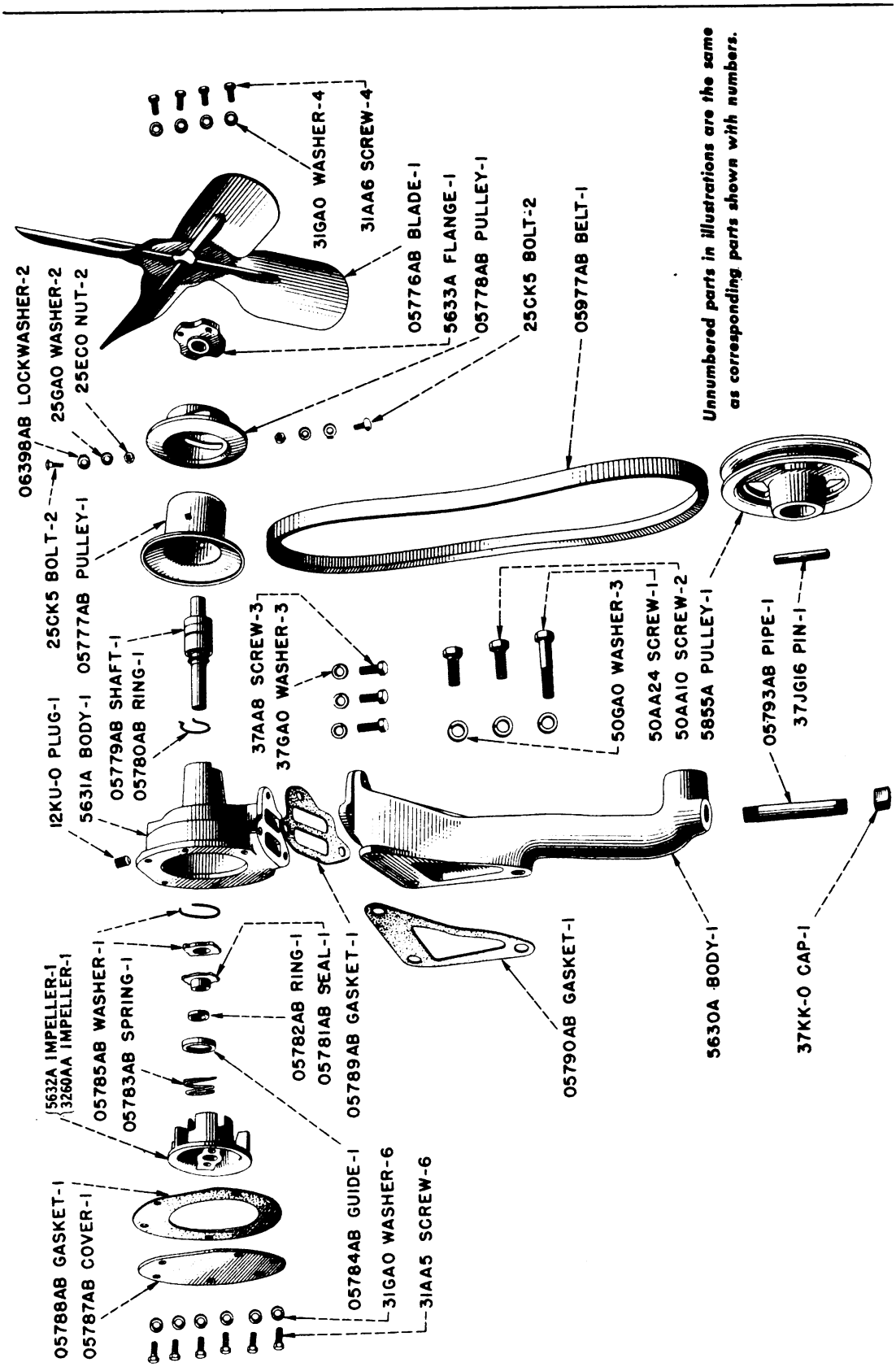
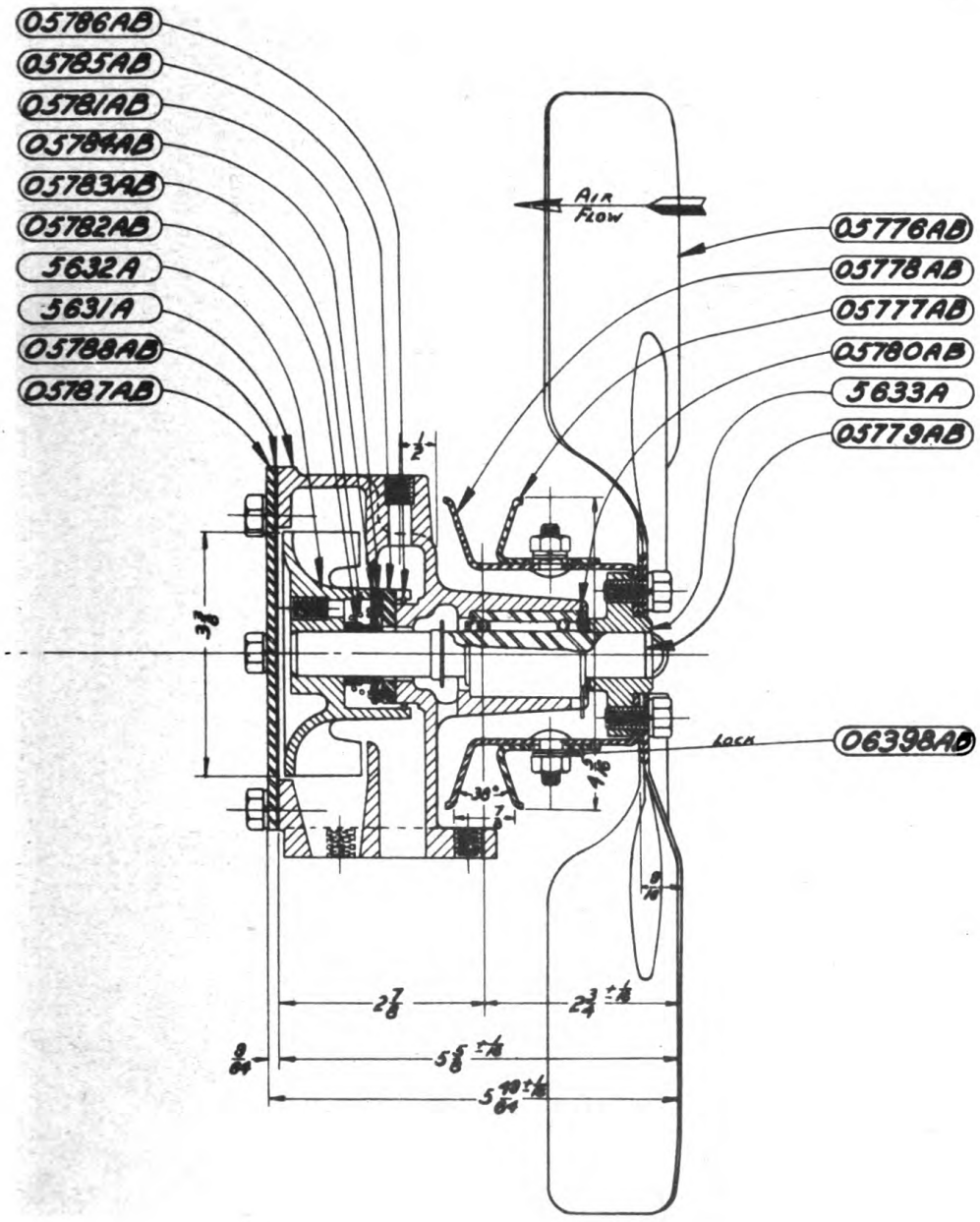
GOVERNOR ASSEMBLY

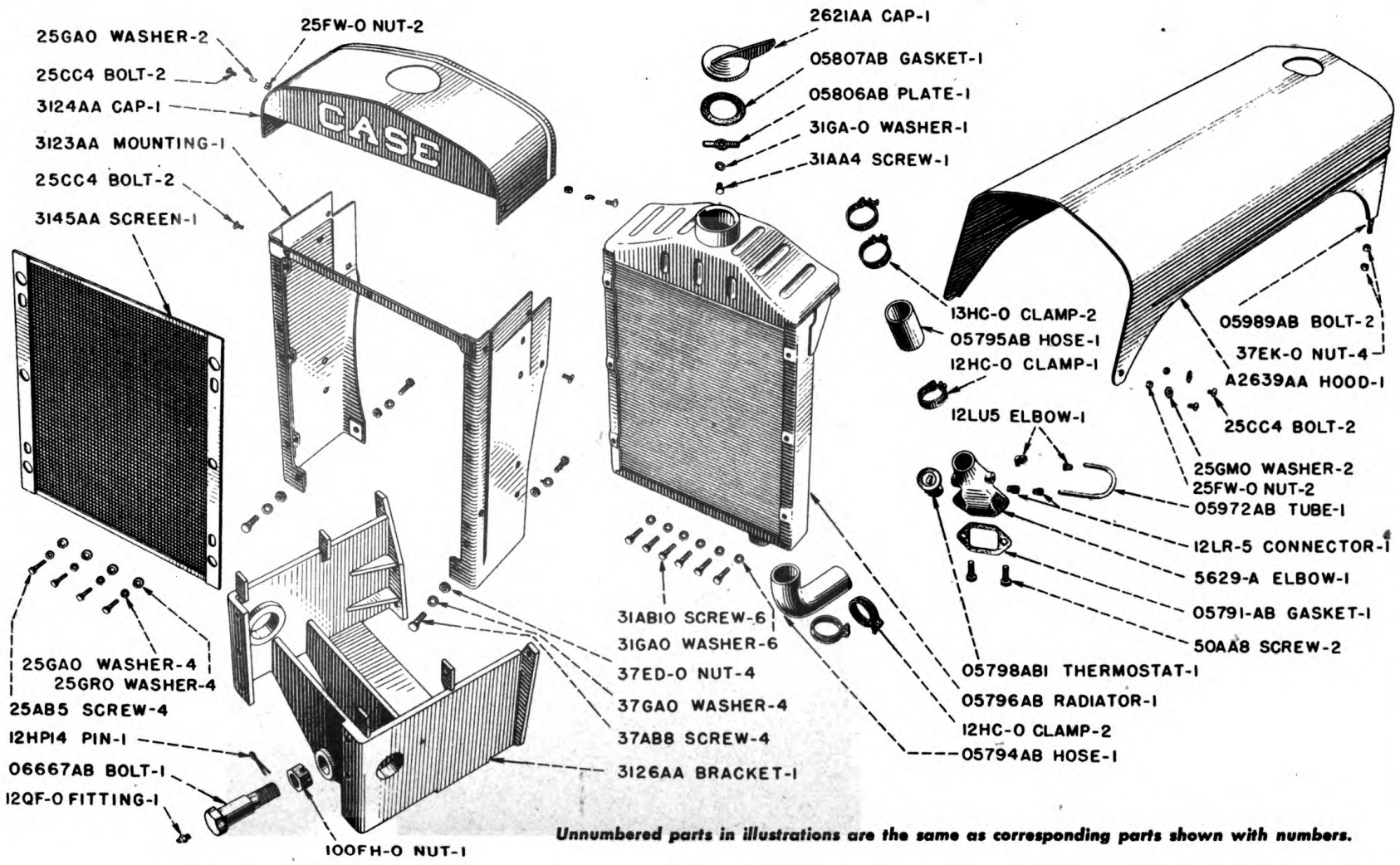


FAN AND WATER PUMP



2540AA—FAN AND WATER PUMP ASSEMBLY COMPLETE





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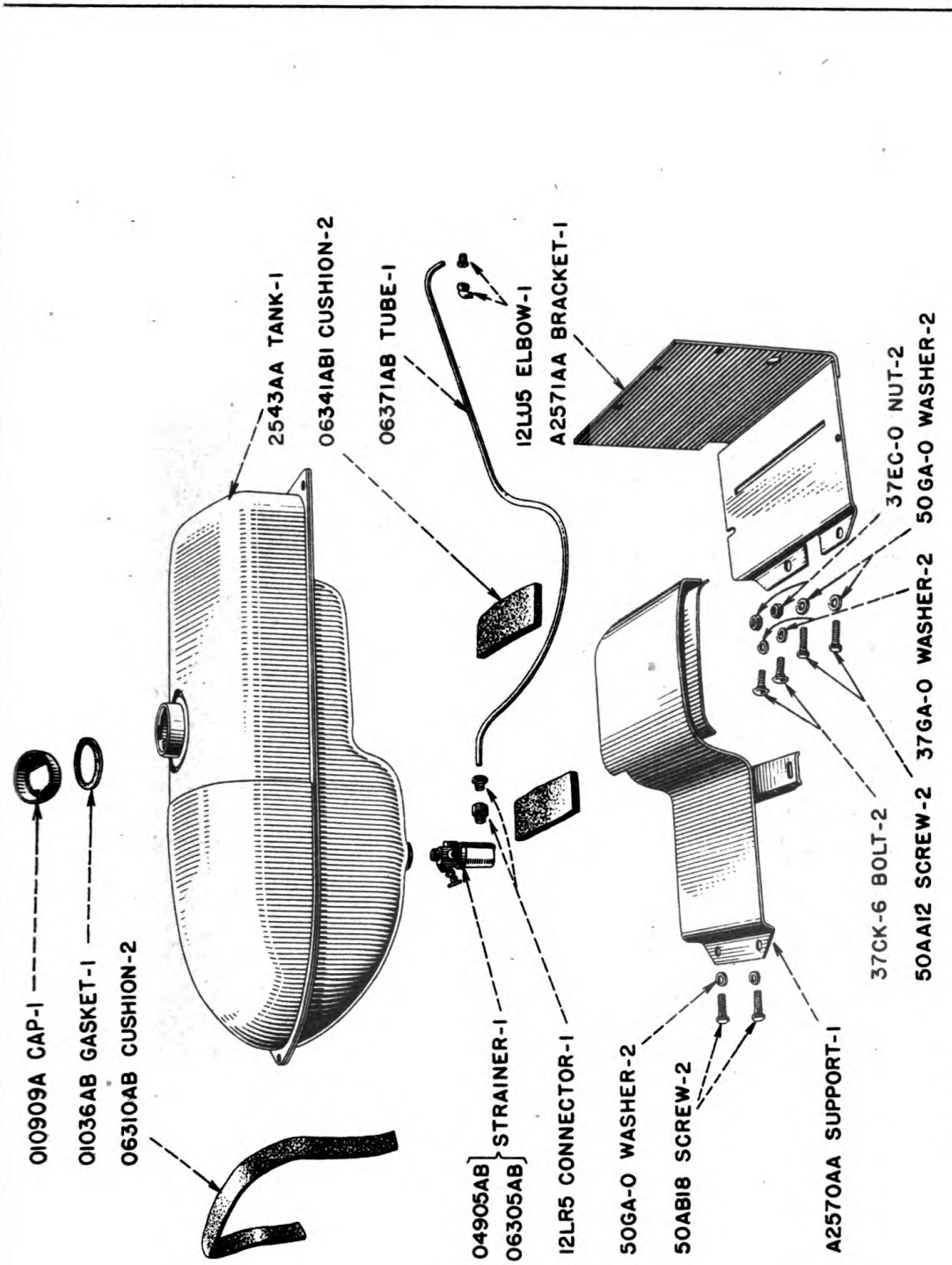
FUEL TANK



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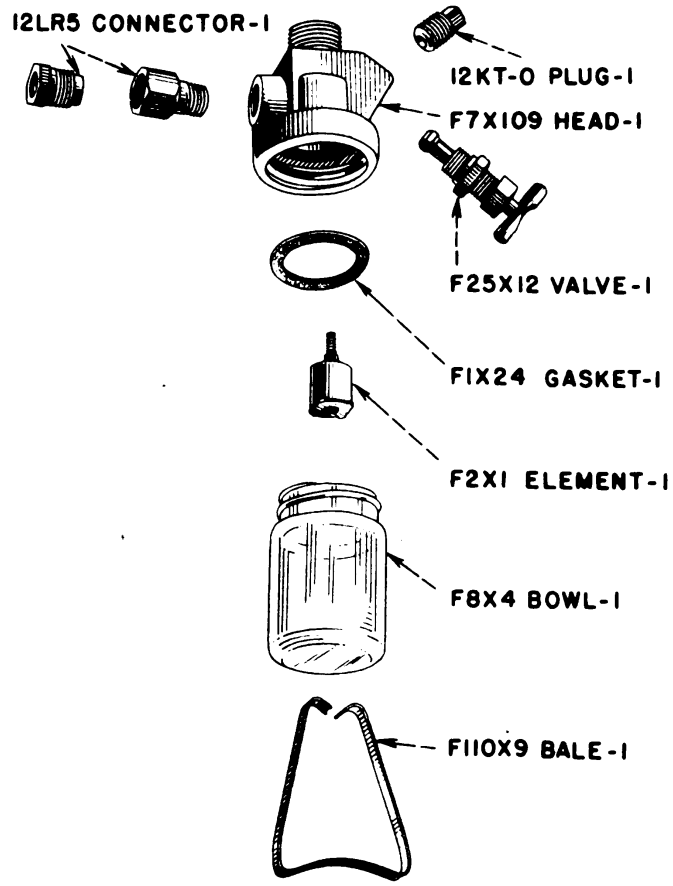
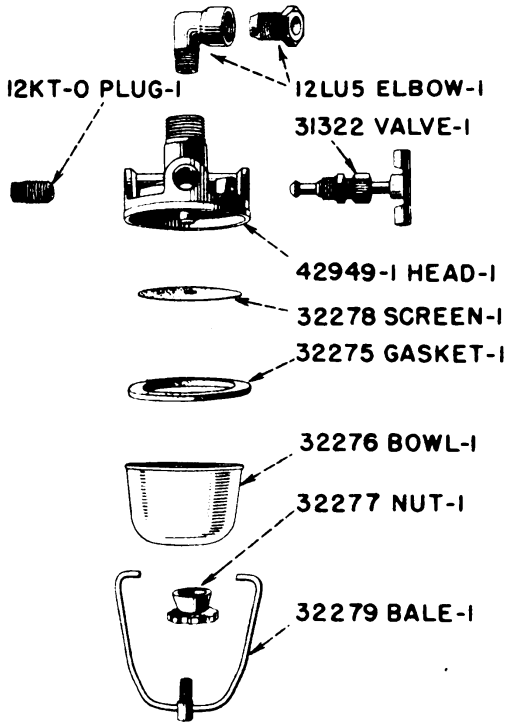
FUEL STRAINER

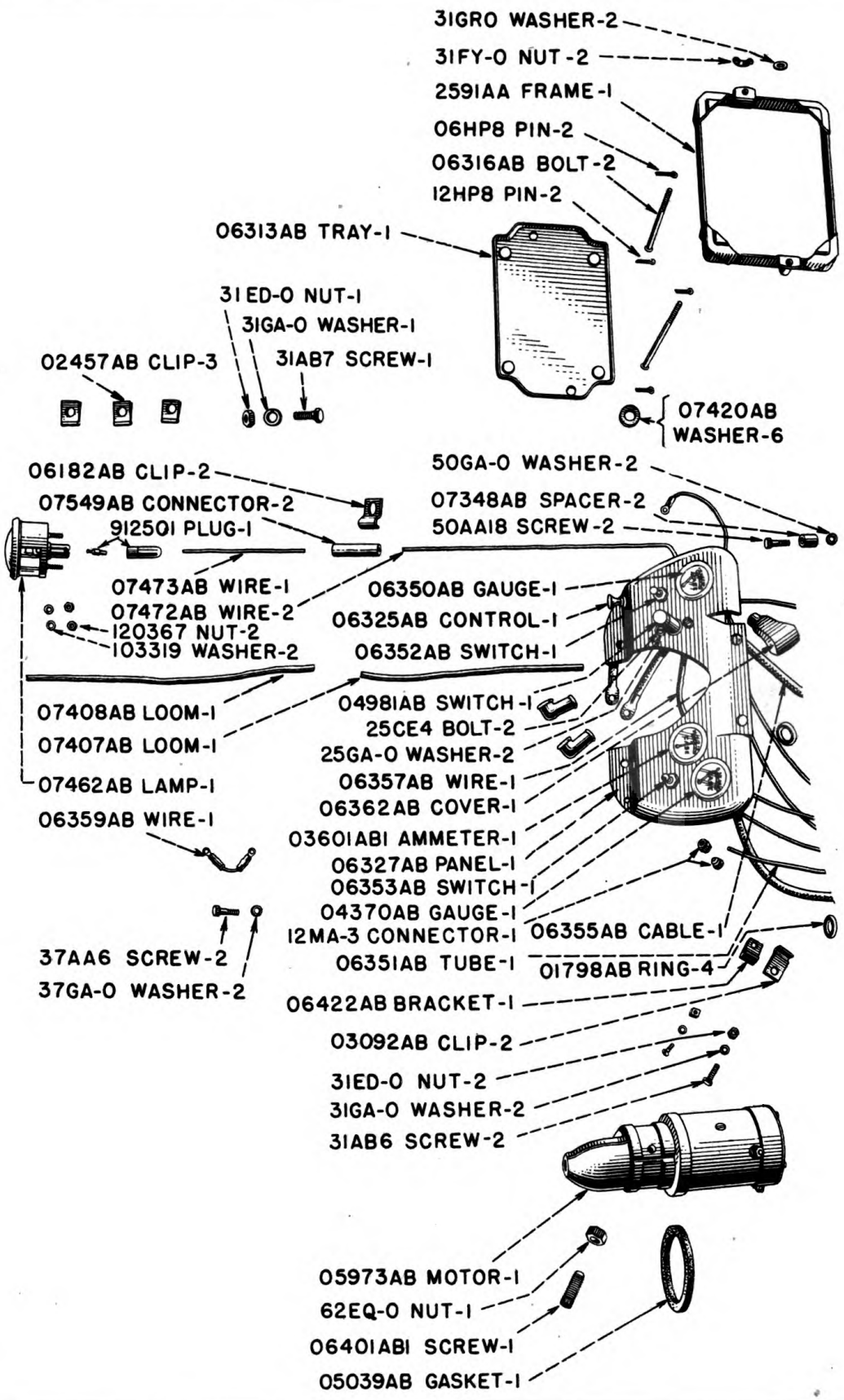
06305 AB FUEL STRAINER ASSEMBLY—PRIOR TO TRACTOR SERIAL NO. 4705661.
NOTE: WHEN FUEL STRAINER IS WANTED FOR REPLACEMENT AS A UNIT, USE 04905 AB.

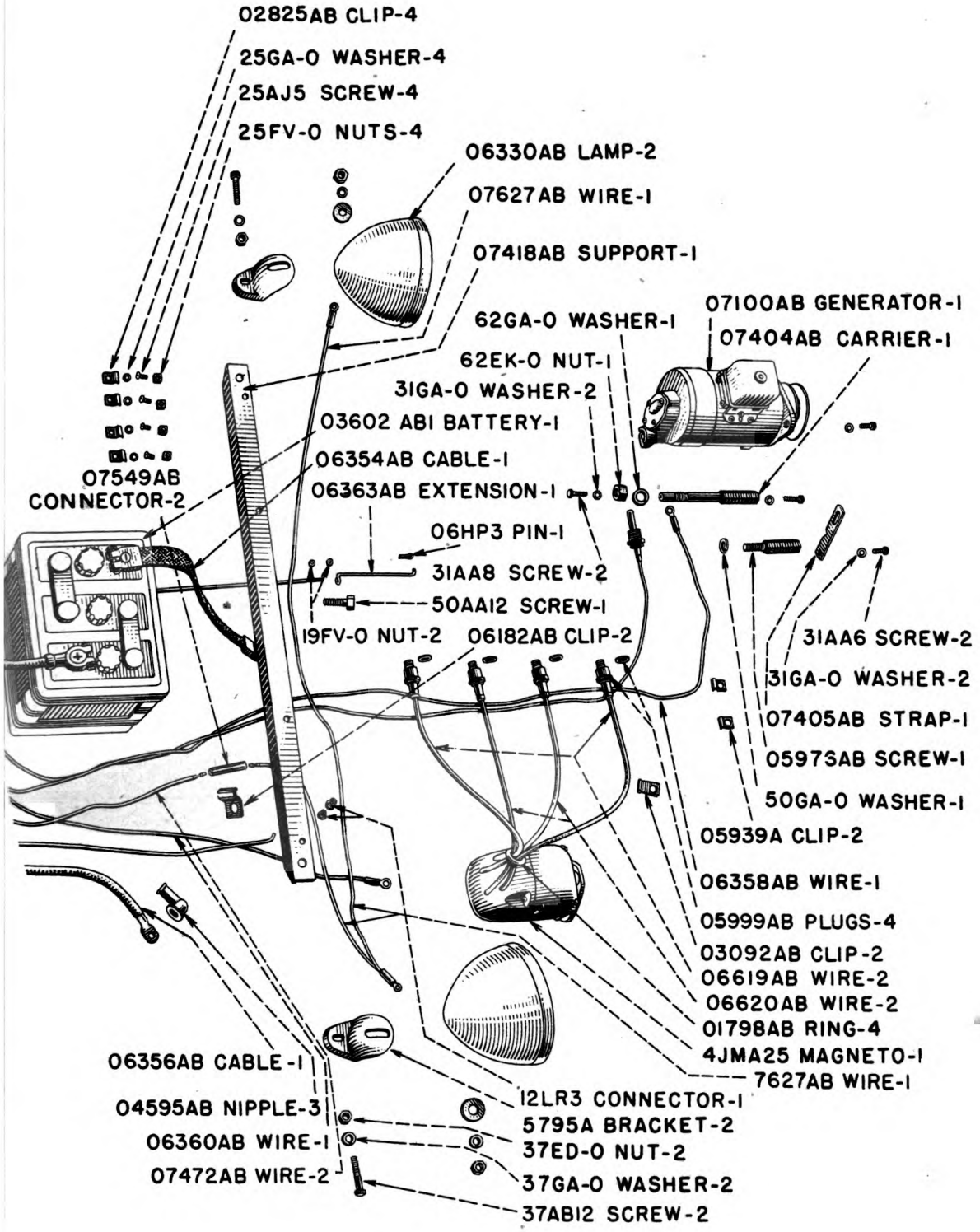


FUEL STRAINER

04905 AB—FUEL STRAINER ASSEMBLY—AFTER TRACTOR SERIAL NO. 4705660.







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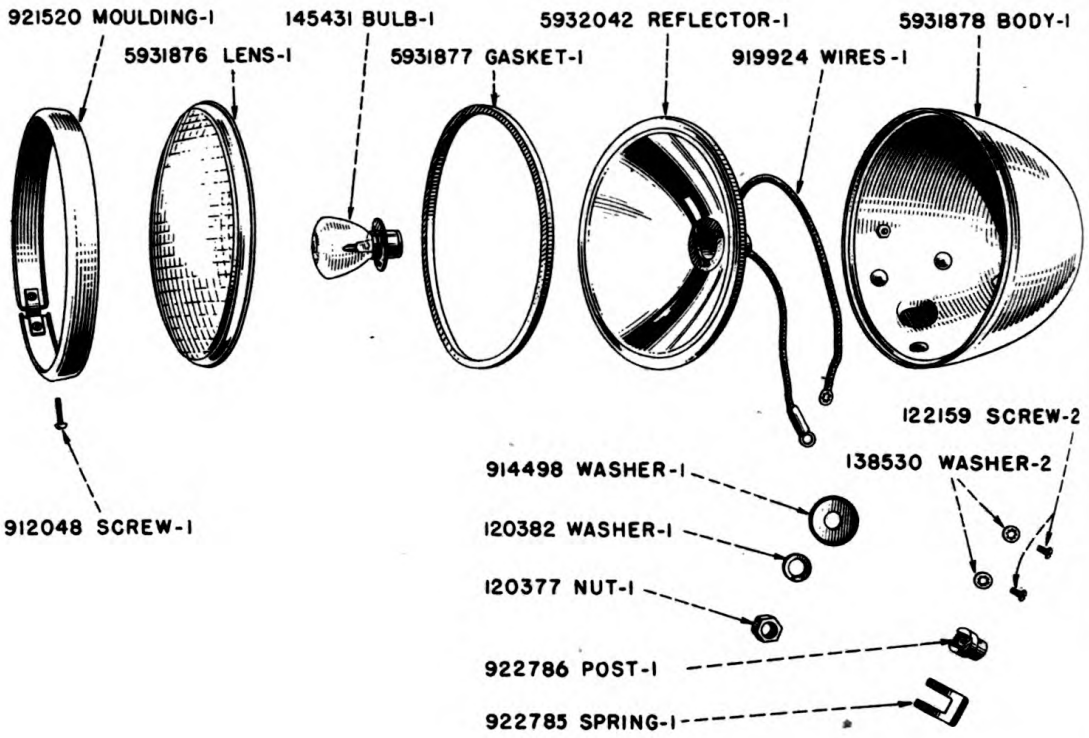
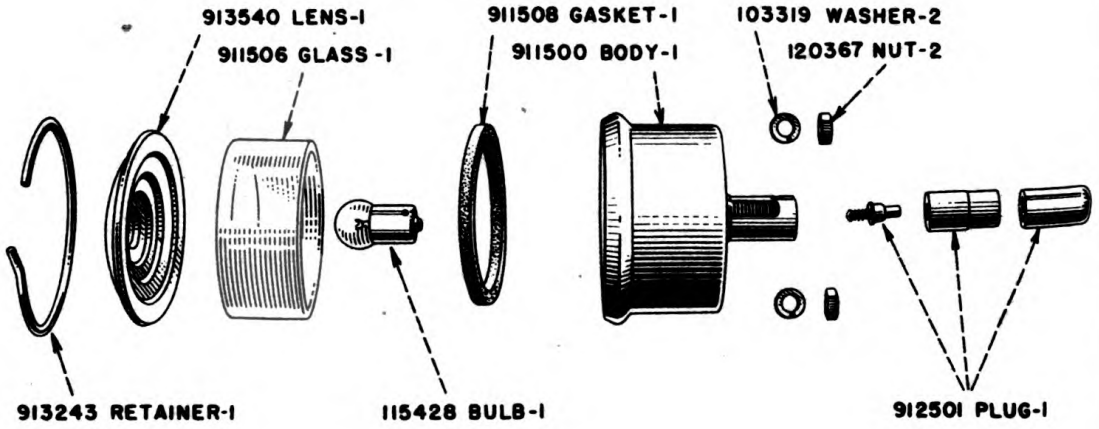
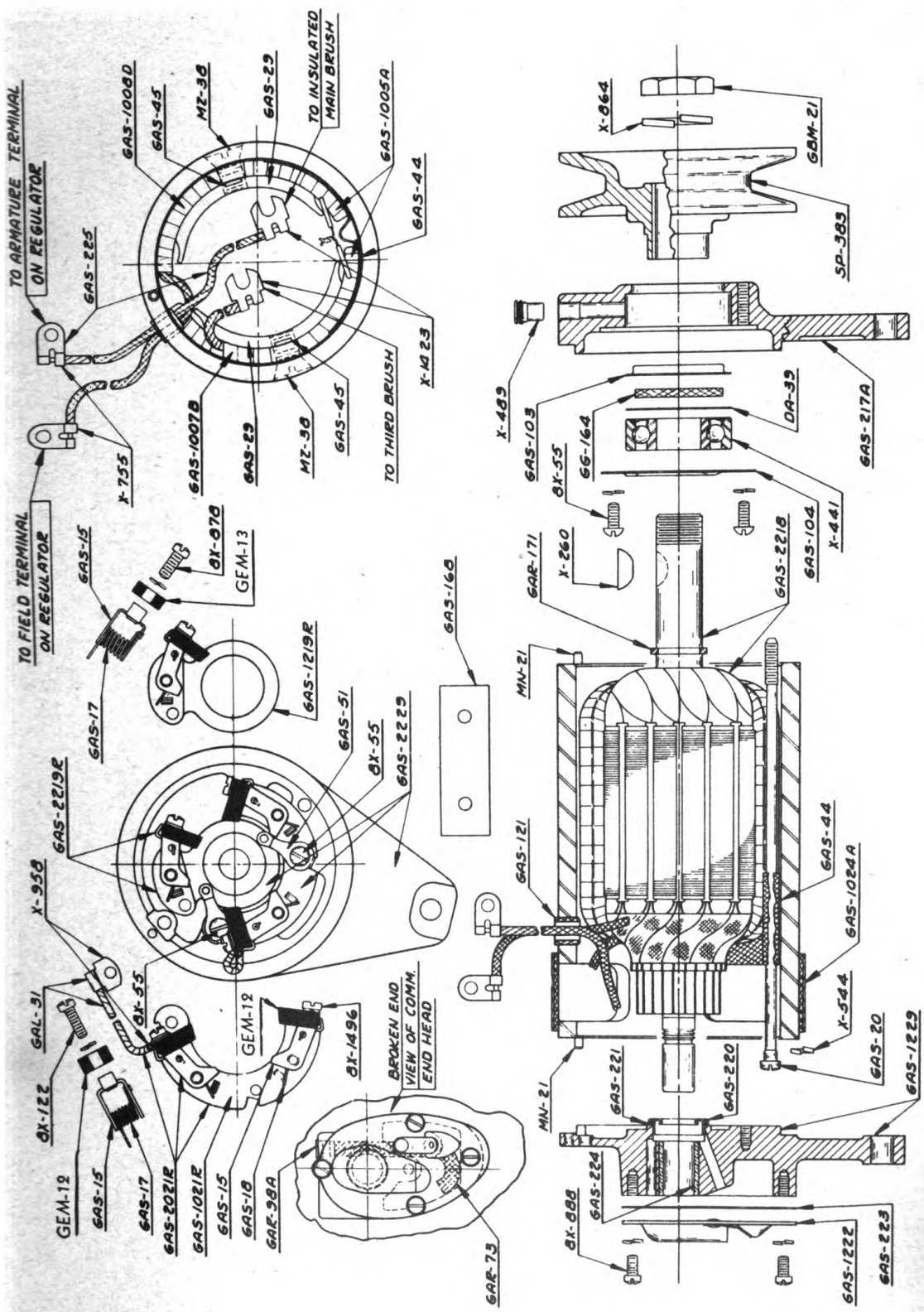
HEAD LAMP PARTS



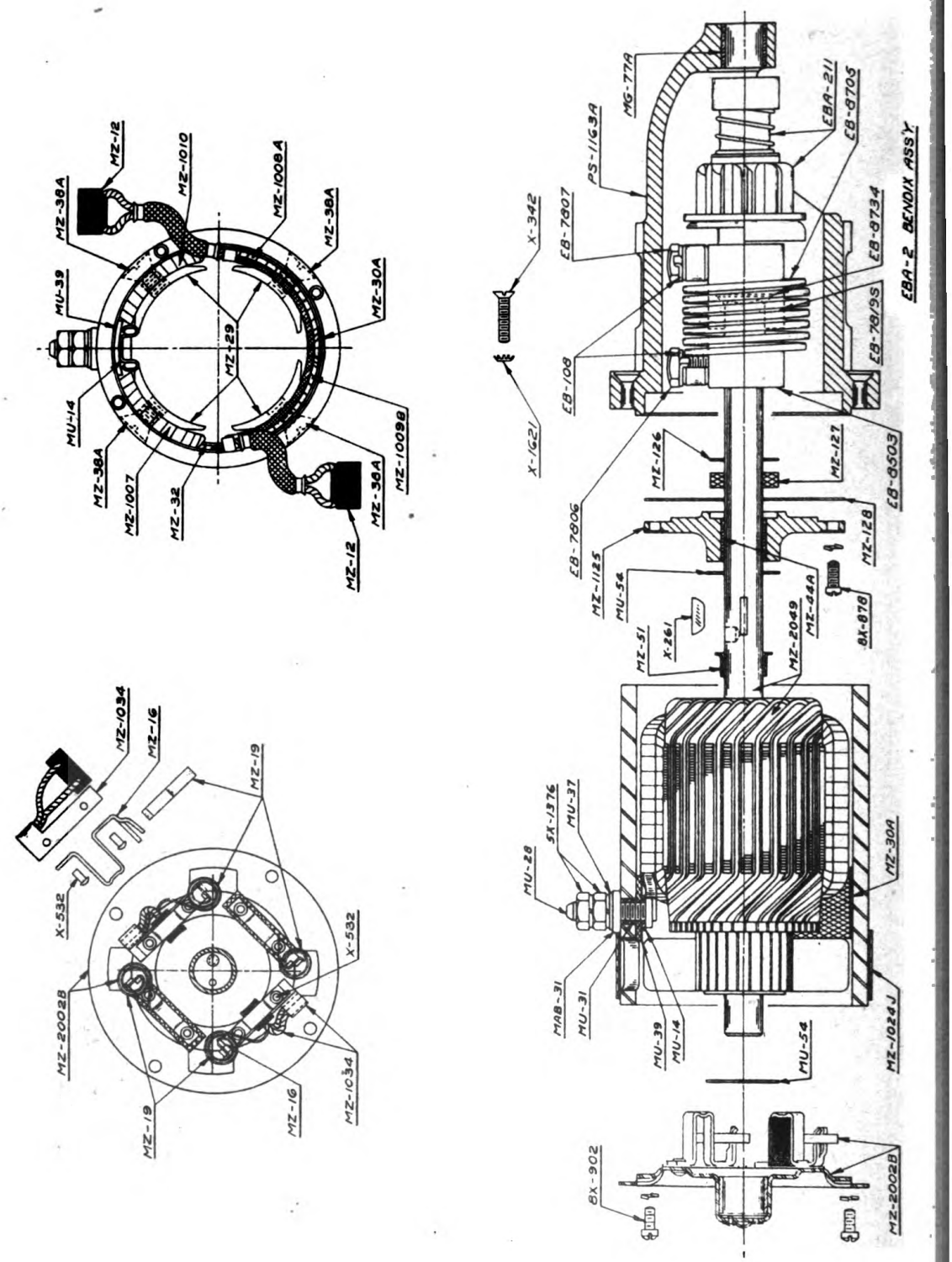
TAIL LAMP PARTS

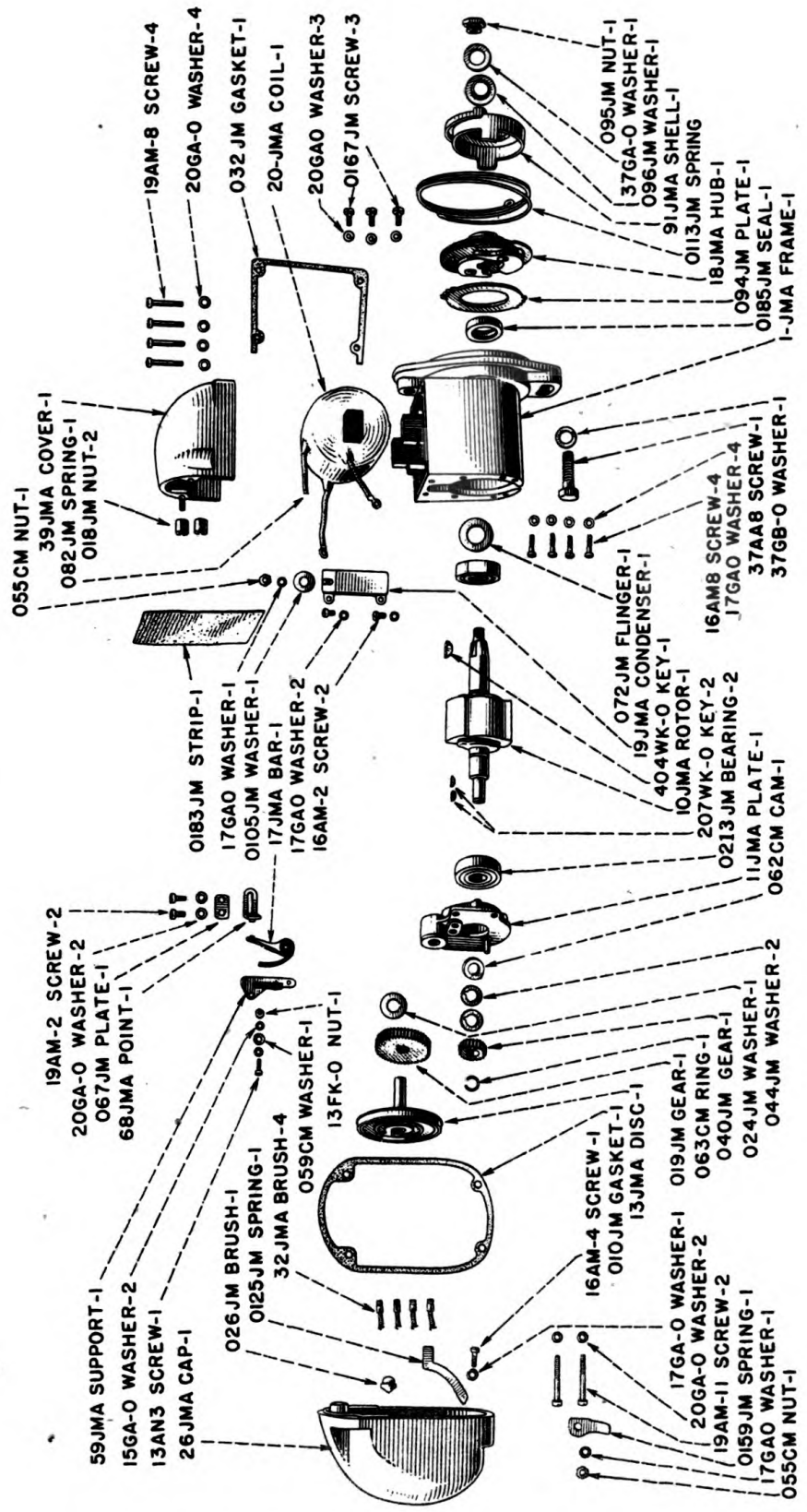


PARTS FOR GENERATOR (GAS-4167)



PARTS FOR STARTING MOTOR (MZ-4095)





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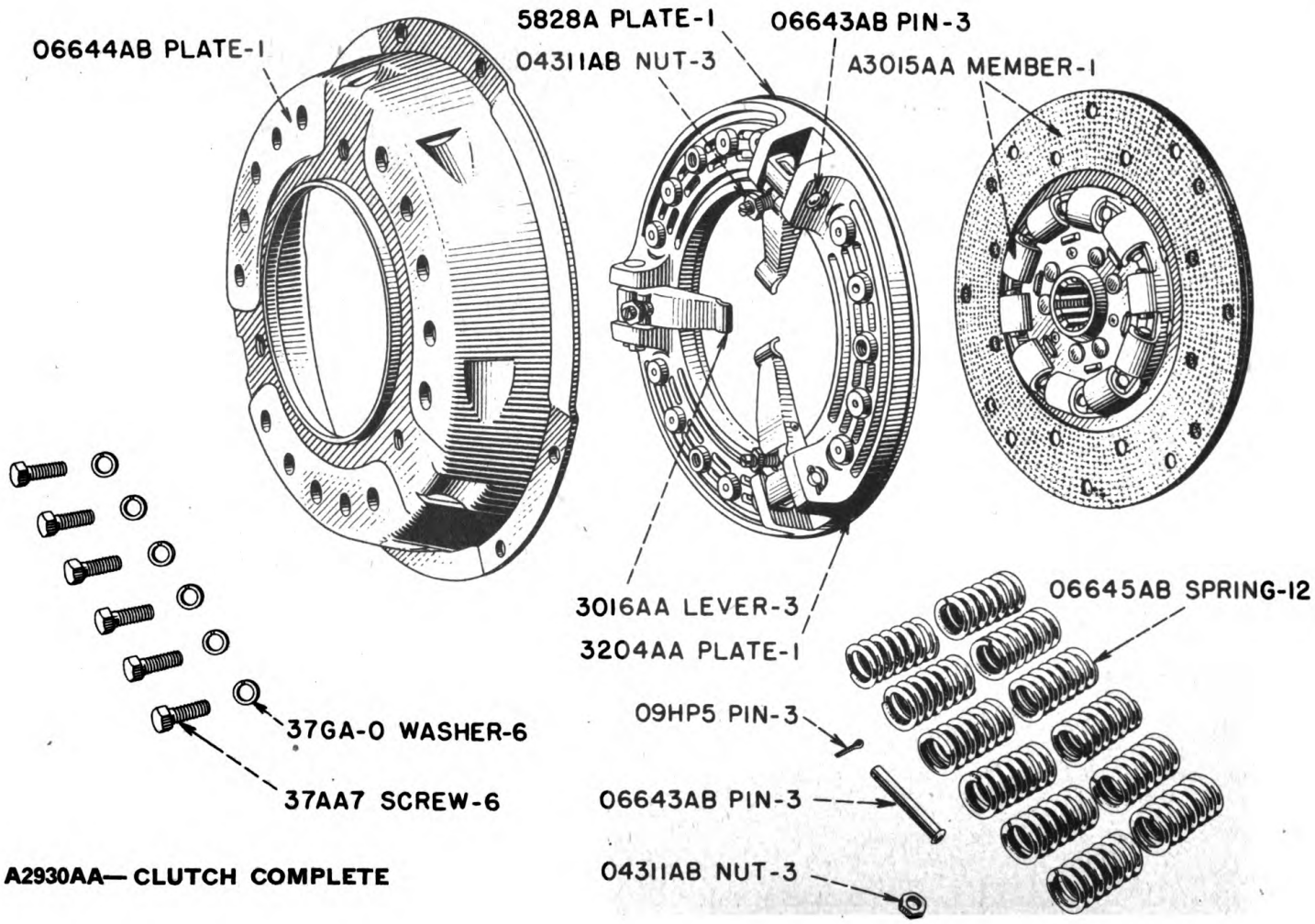

A2930AA— CLUTCH COMPLETE

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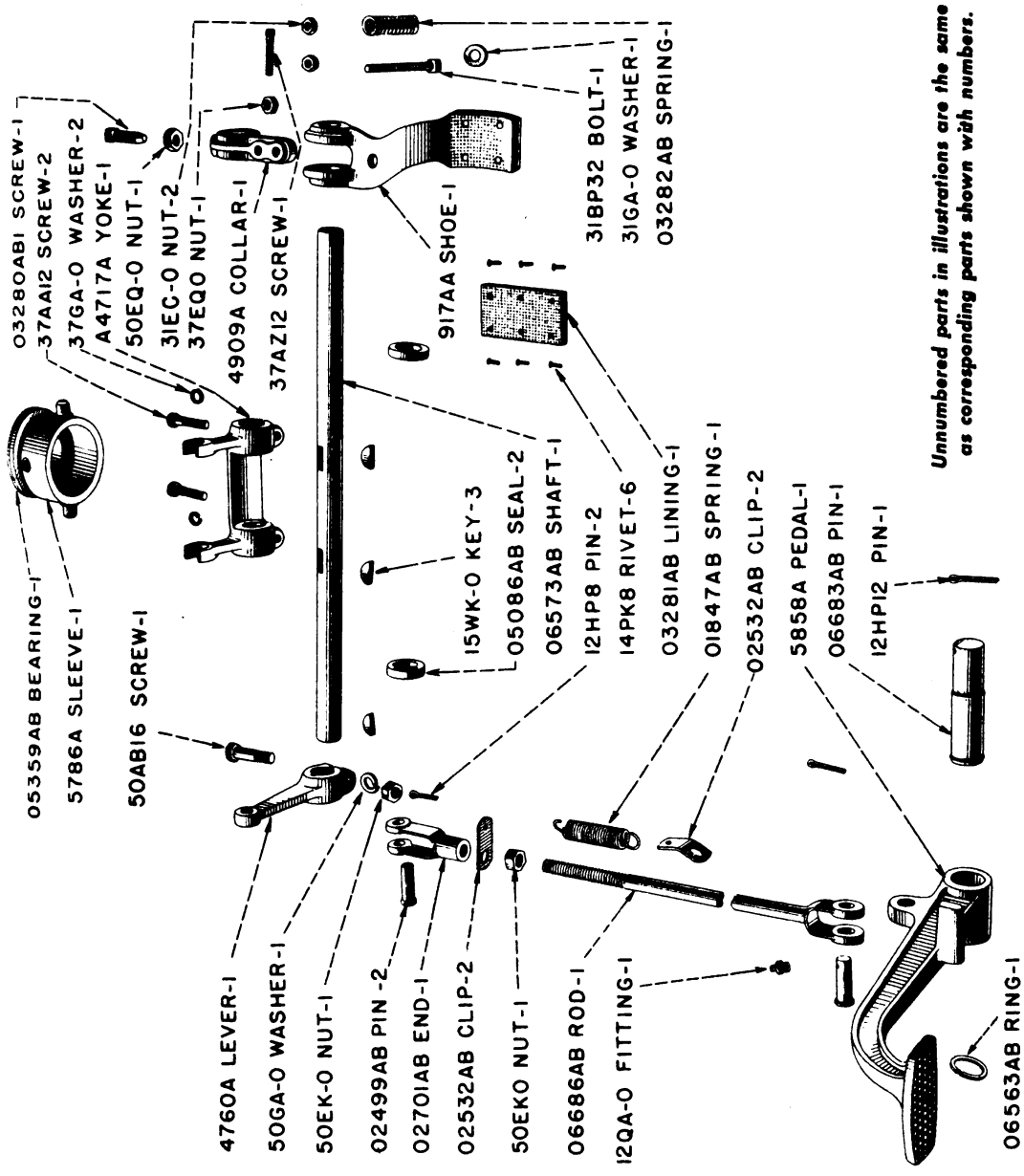
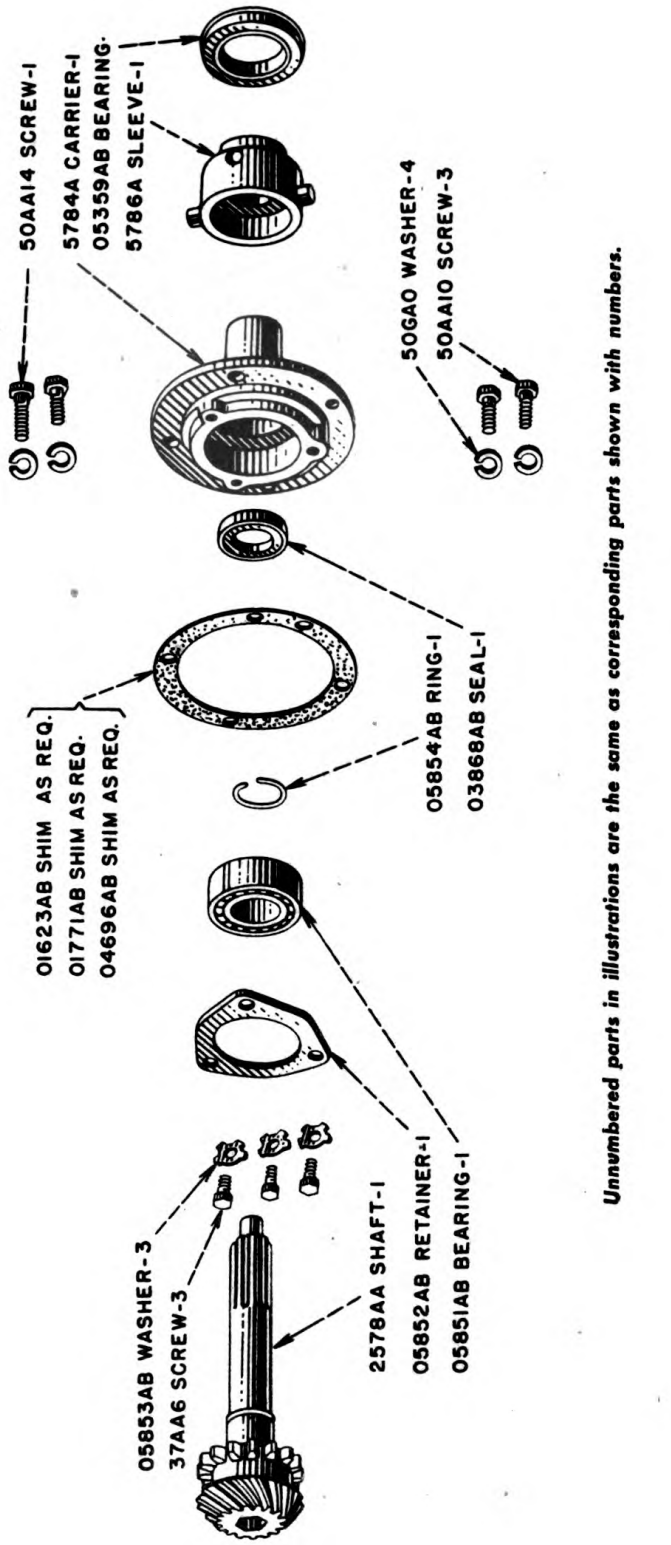
CLUTCH THROWOUT PARTS





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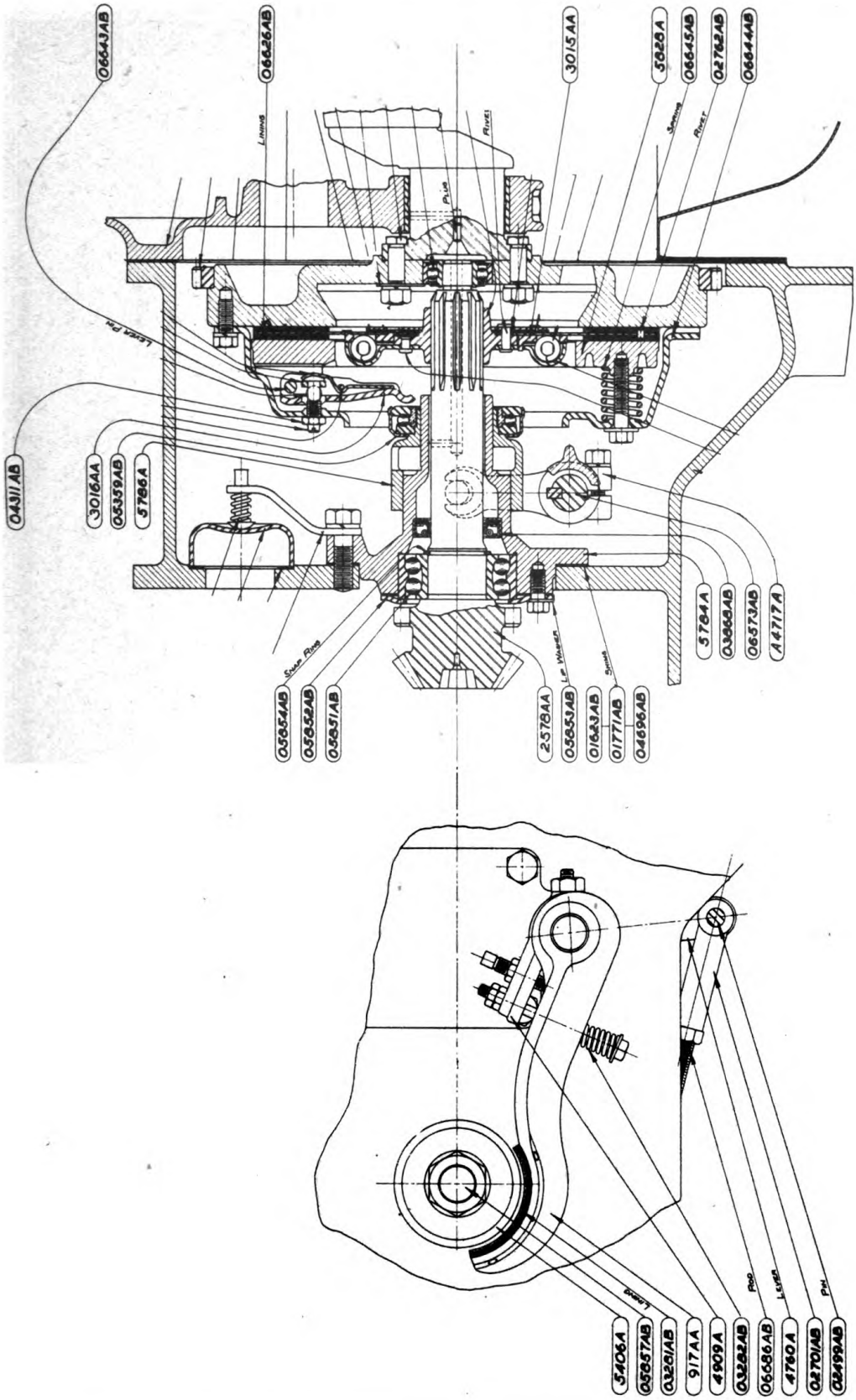
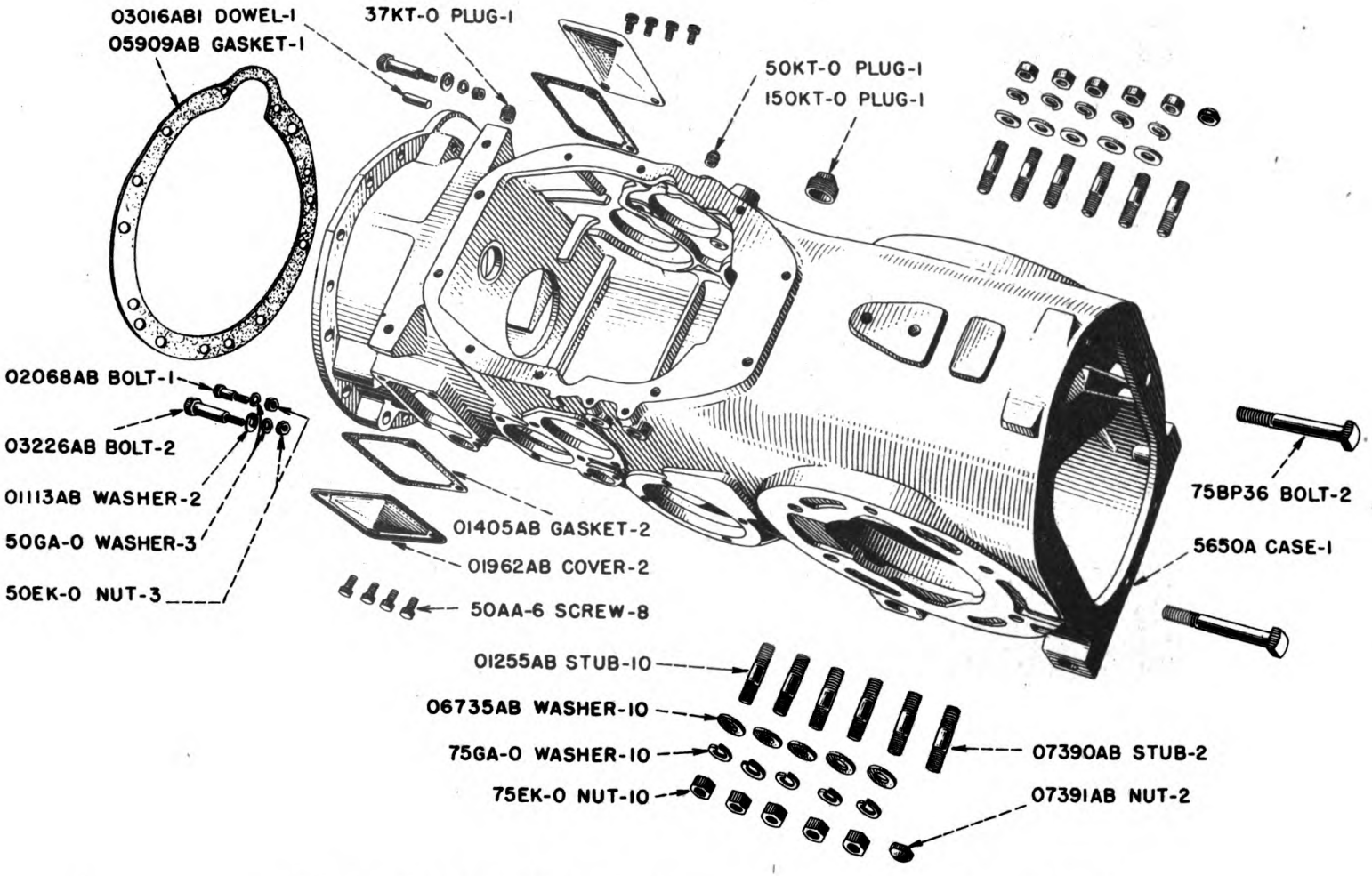
CLUTCH ASSEMBLY





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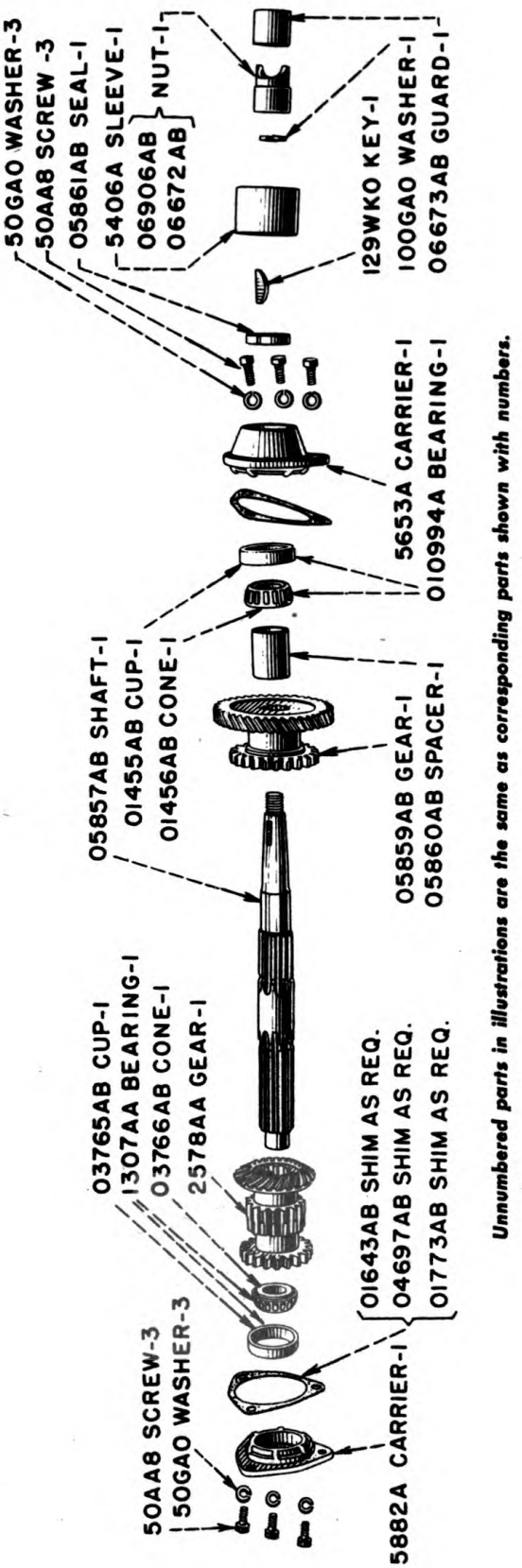
TRANSMISSION
FIRST REDUCTION SHAFT



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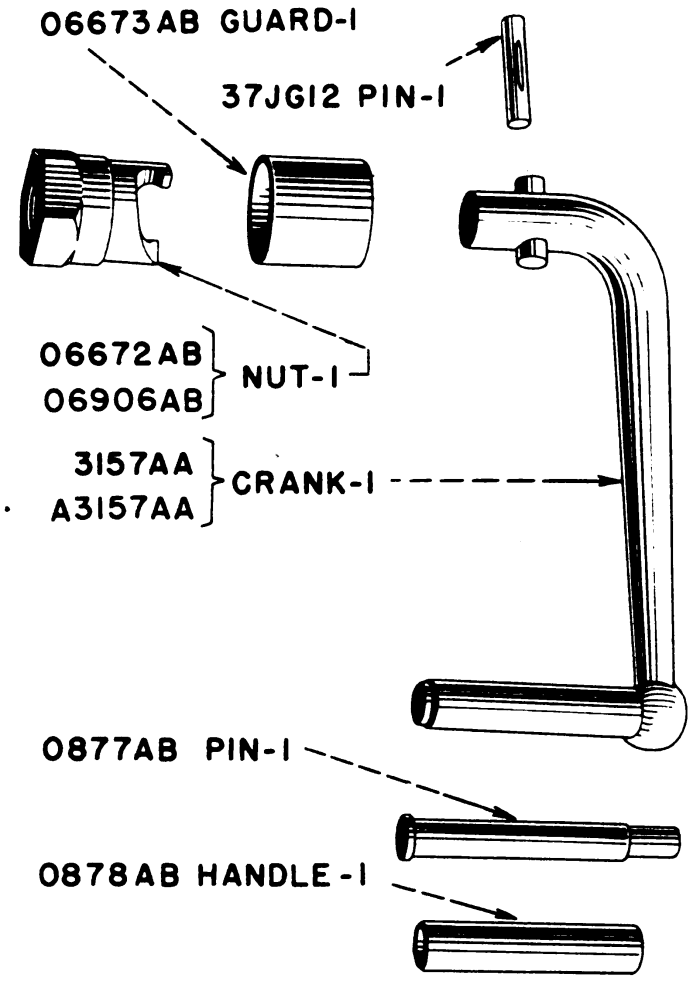
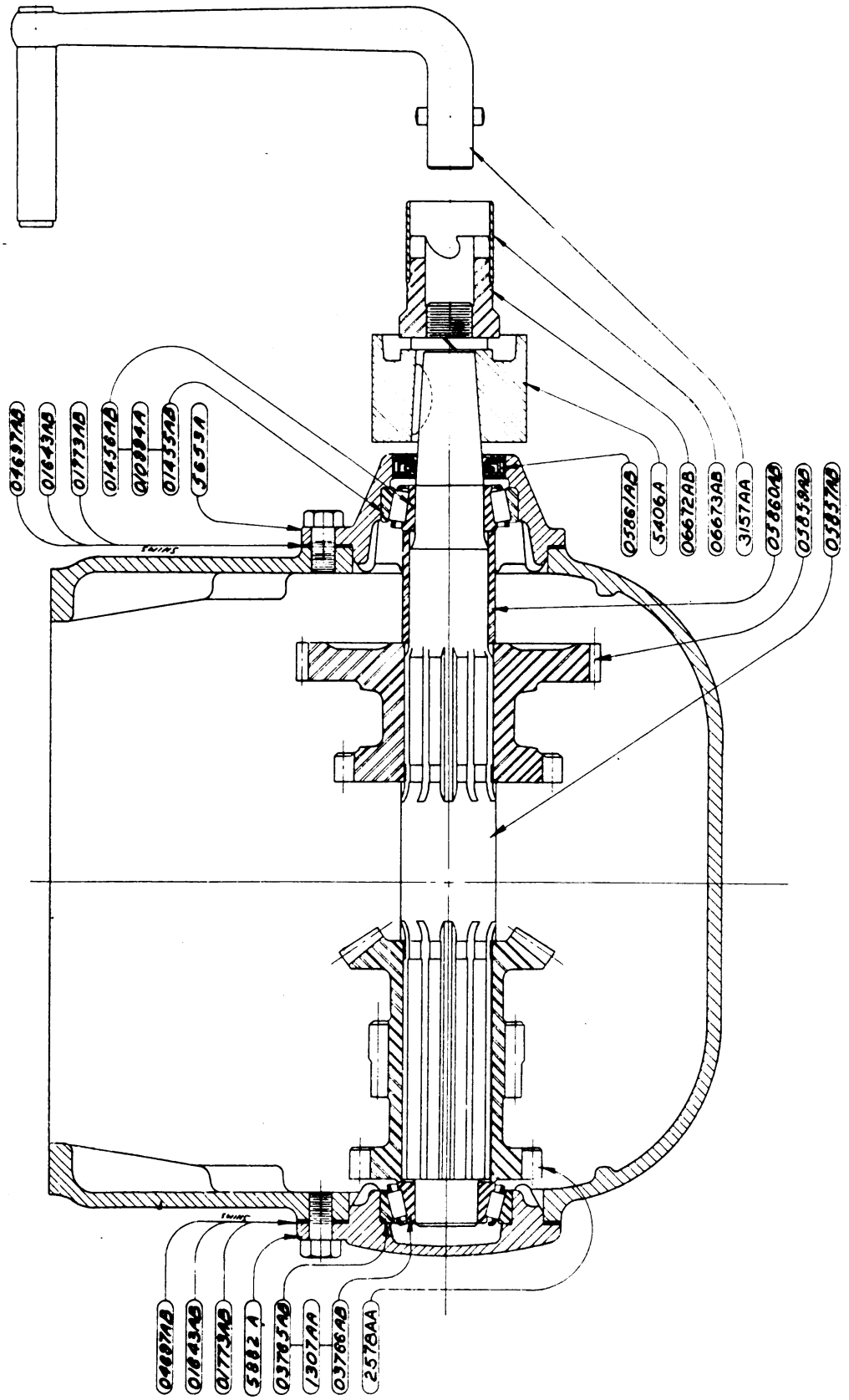
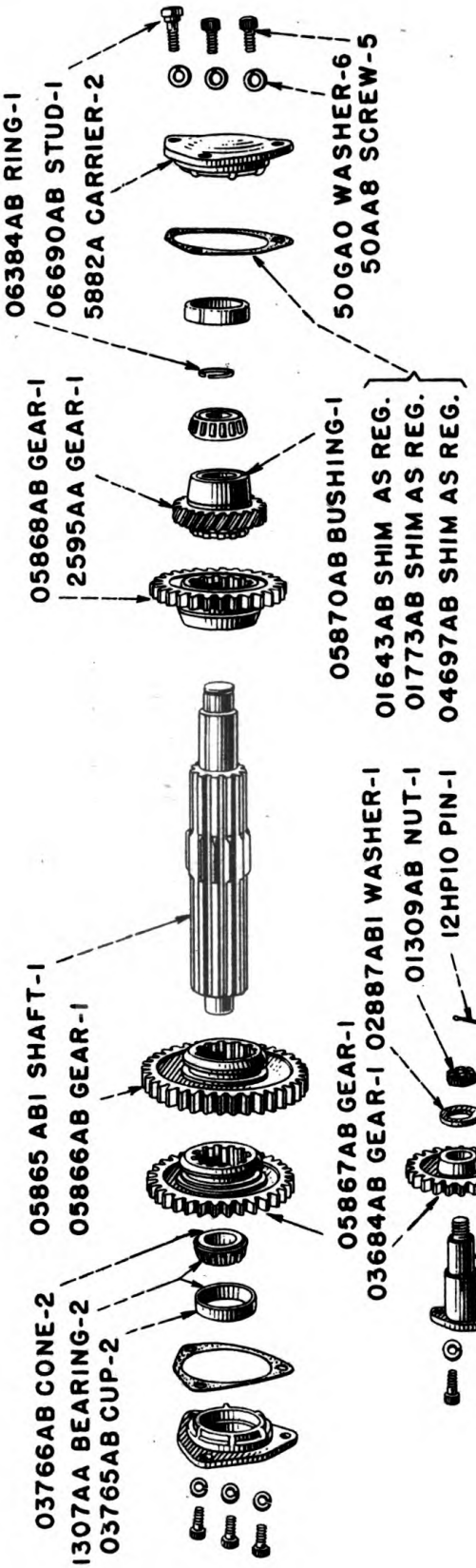
STARTING CRANK



FIRST REDUCTION SHAFT ASSEMBLY



TRANSMISSION
SLIDING GEAR SHAFT



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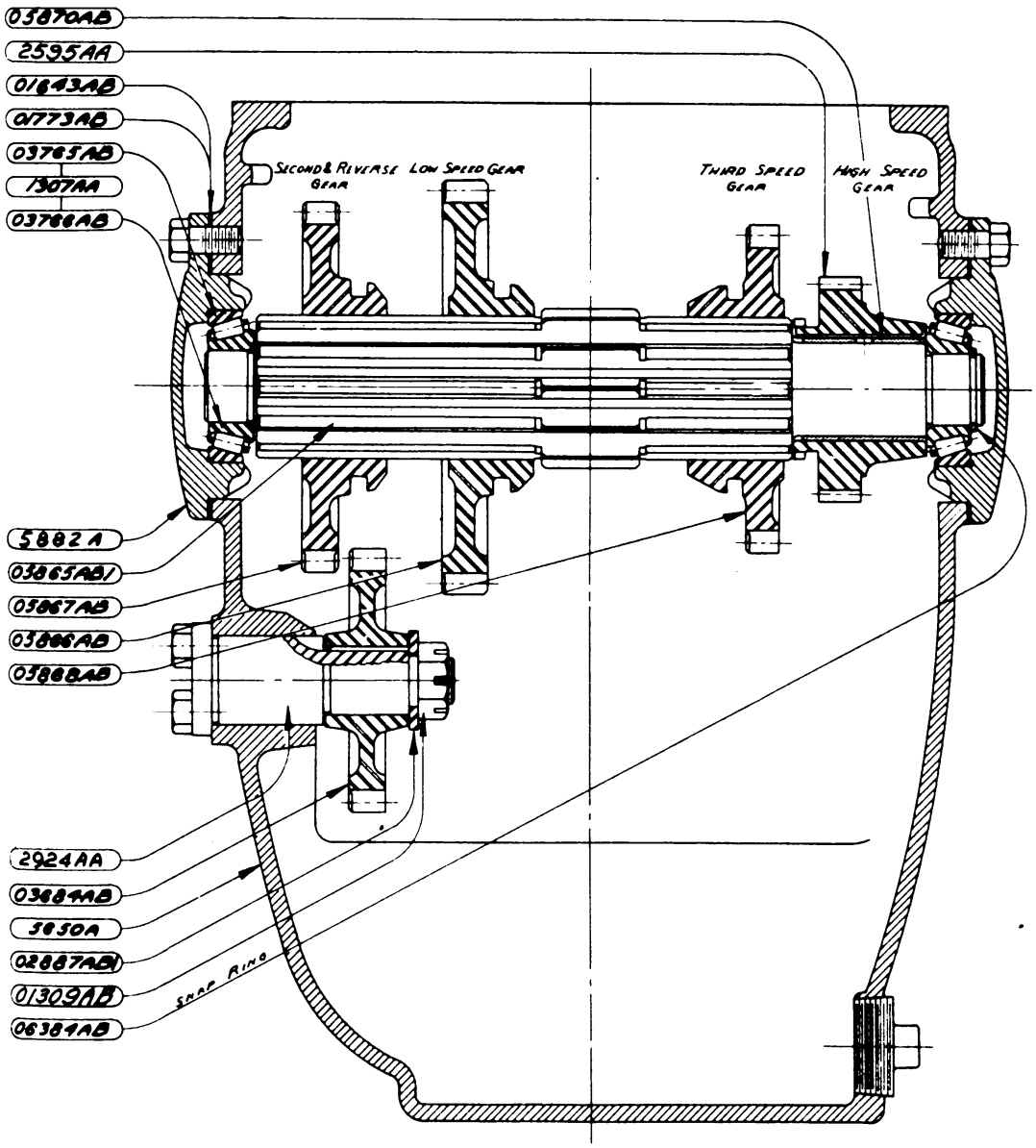
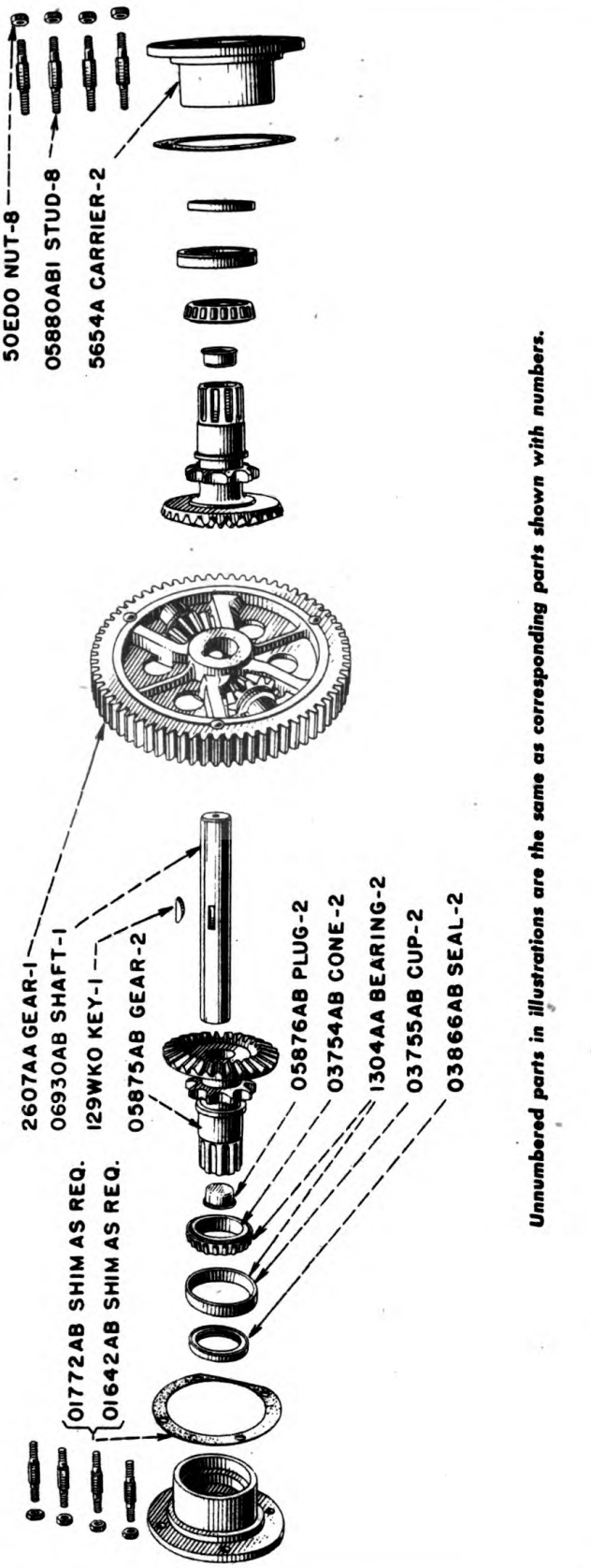
SLIDING GEAR SHAFT ASSEMBLY



TRANSMISSION
DIFFERENTIAL SHAFT



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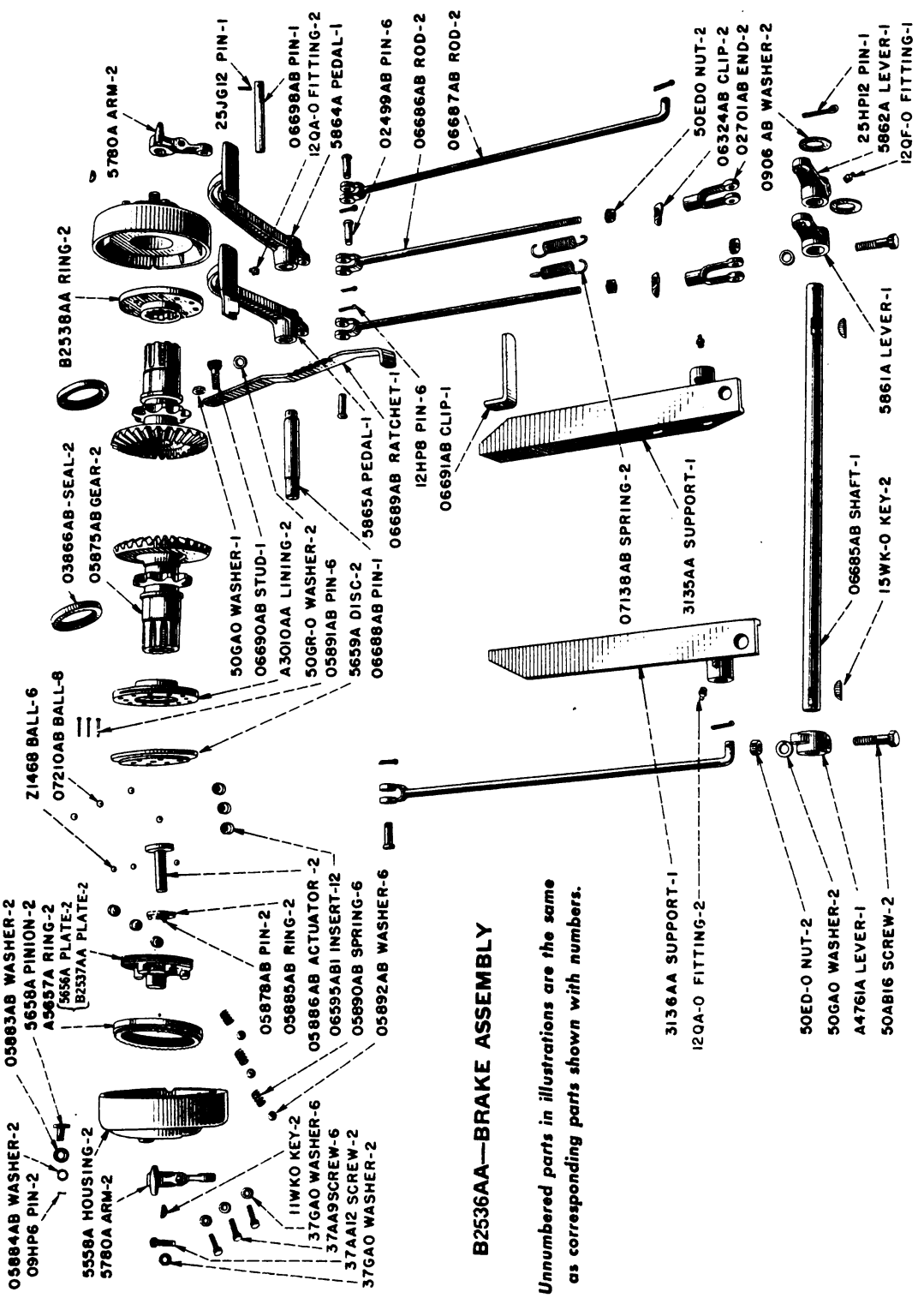

B2536AA—BRAKE ASSEMBLY

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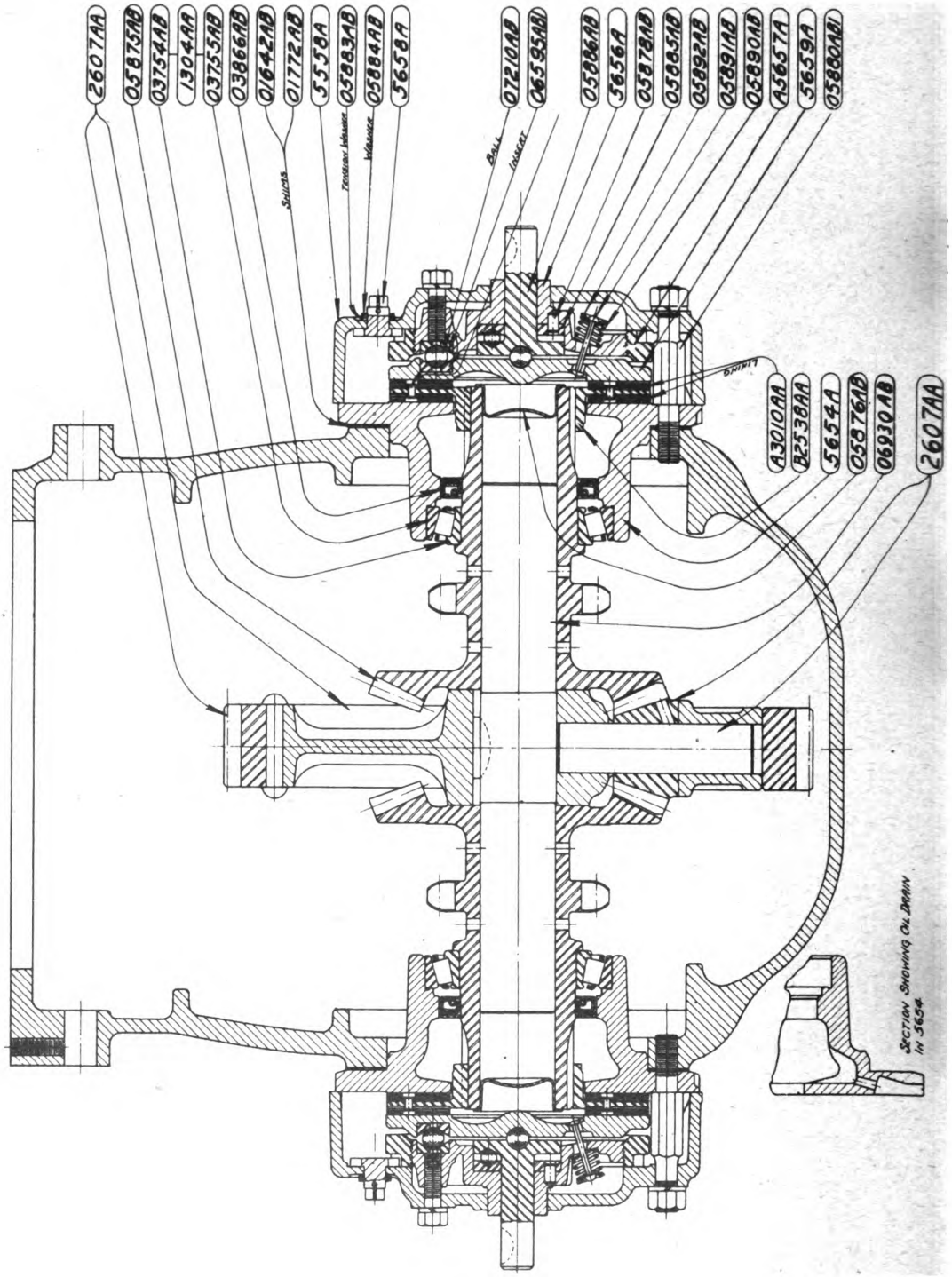
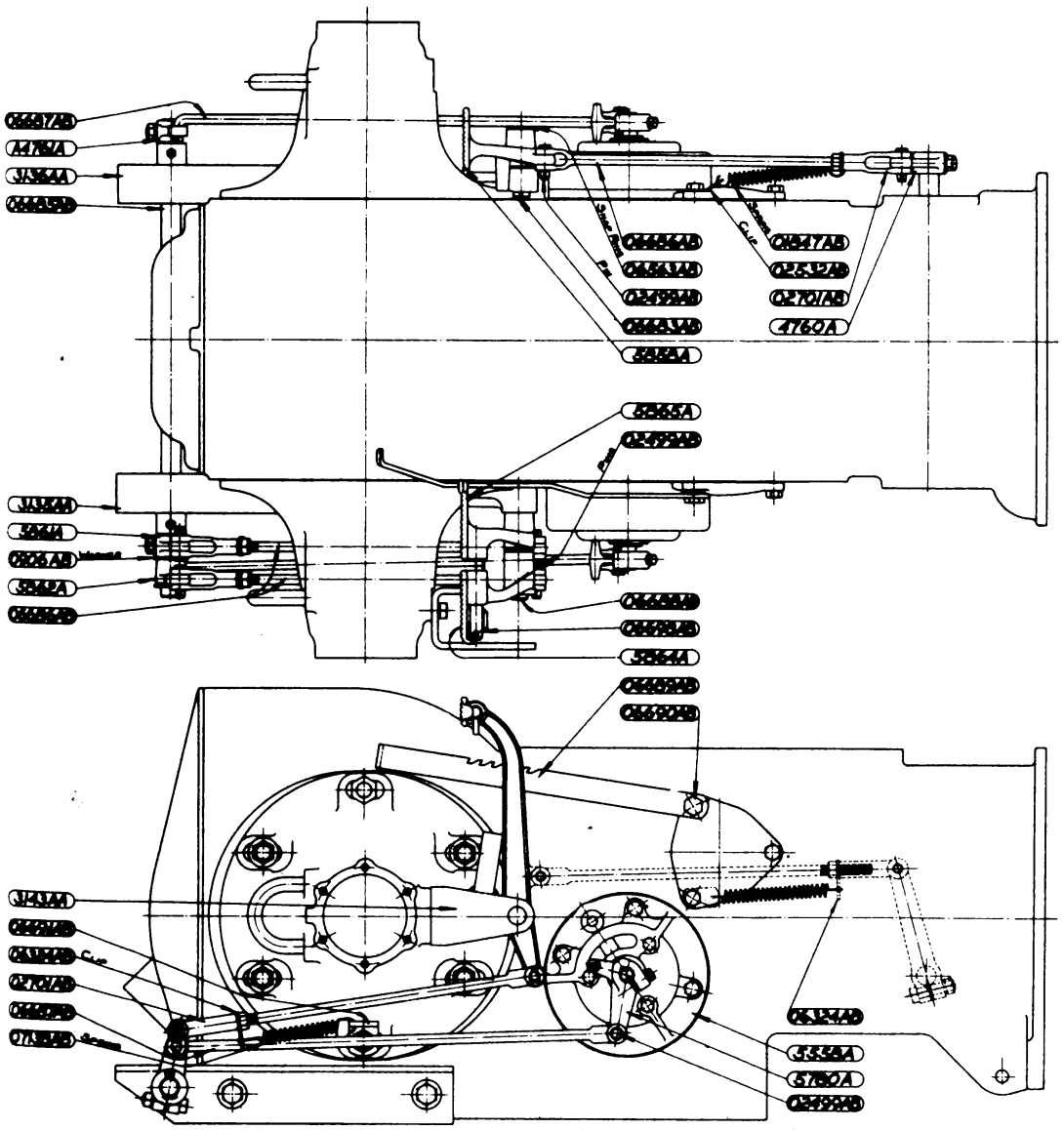
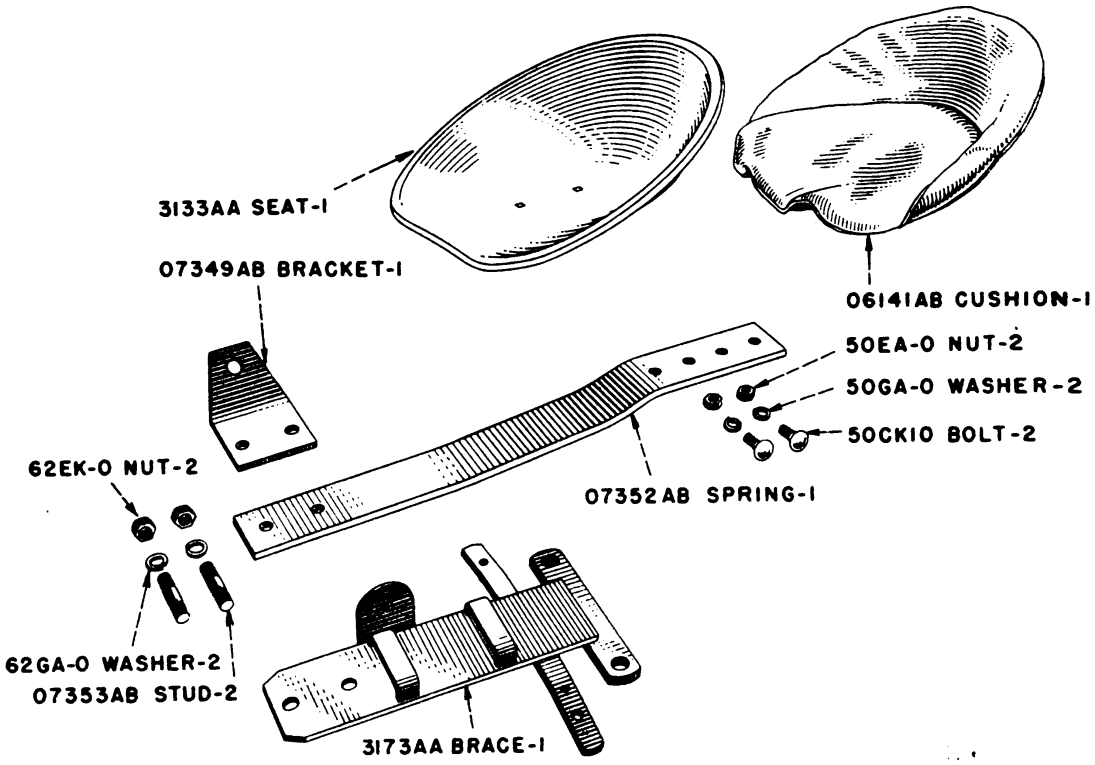
DIFFERENTIAL SHAFT AND BRAKE ASSEMBLY



CONTROL MECHANISM FOR CLUTCH AND BRAKE





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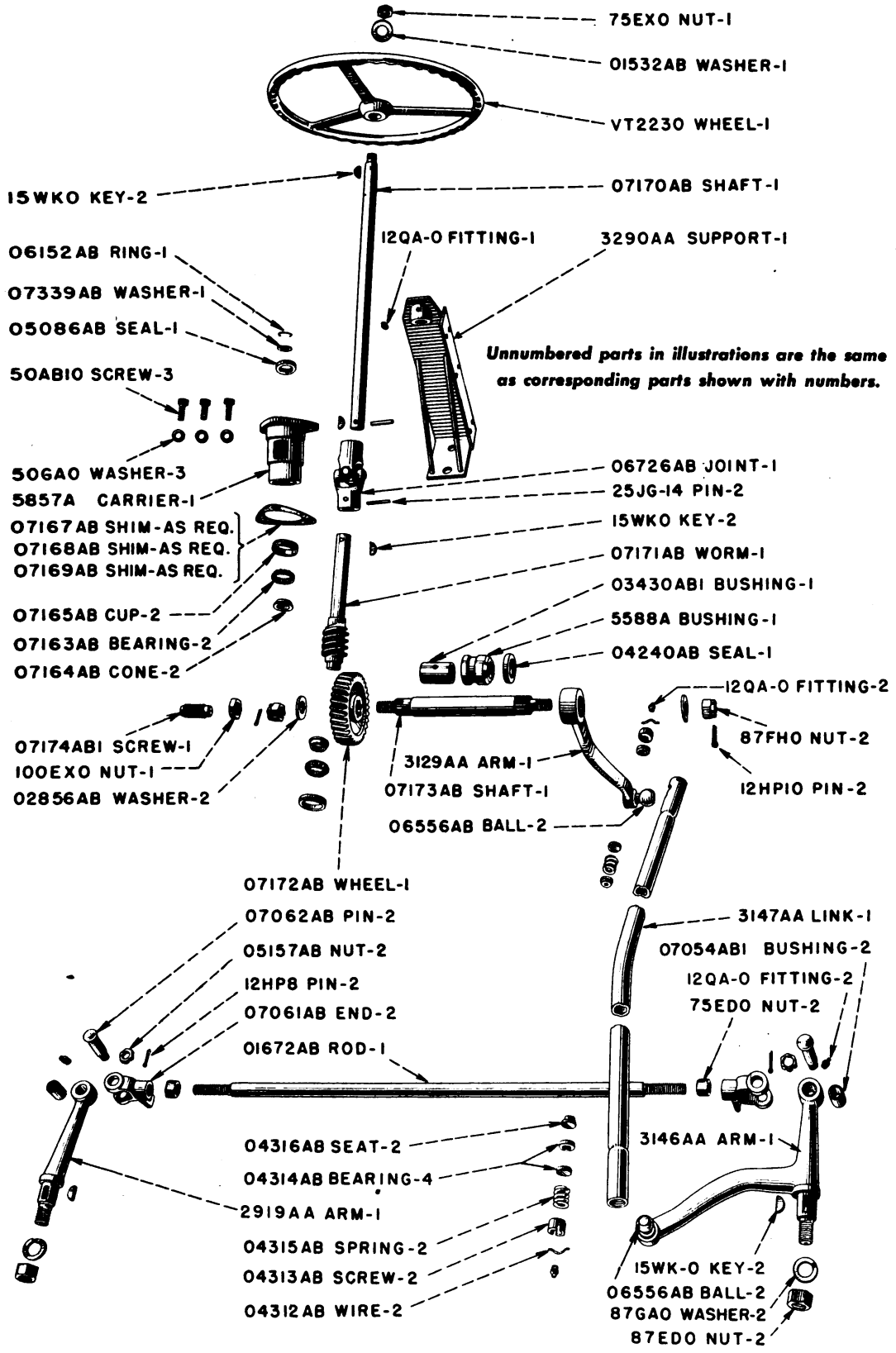
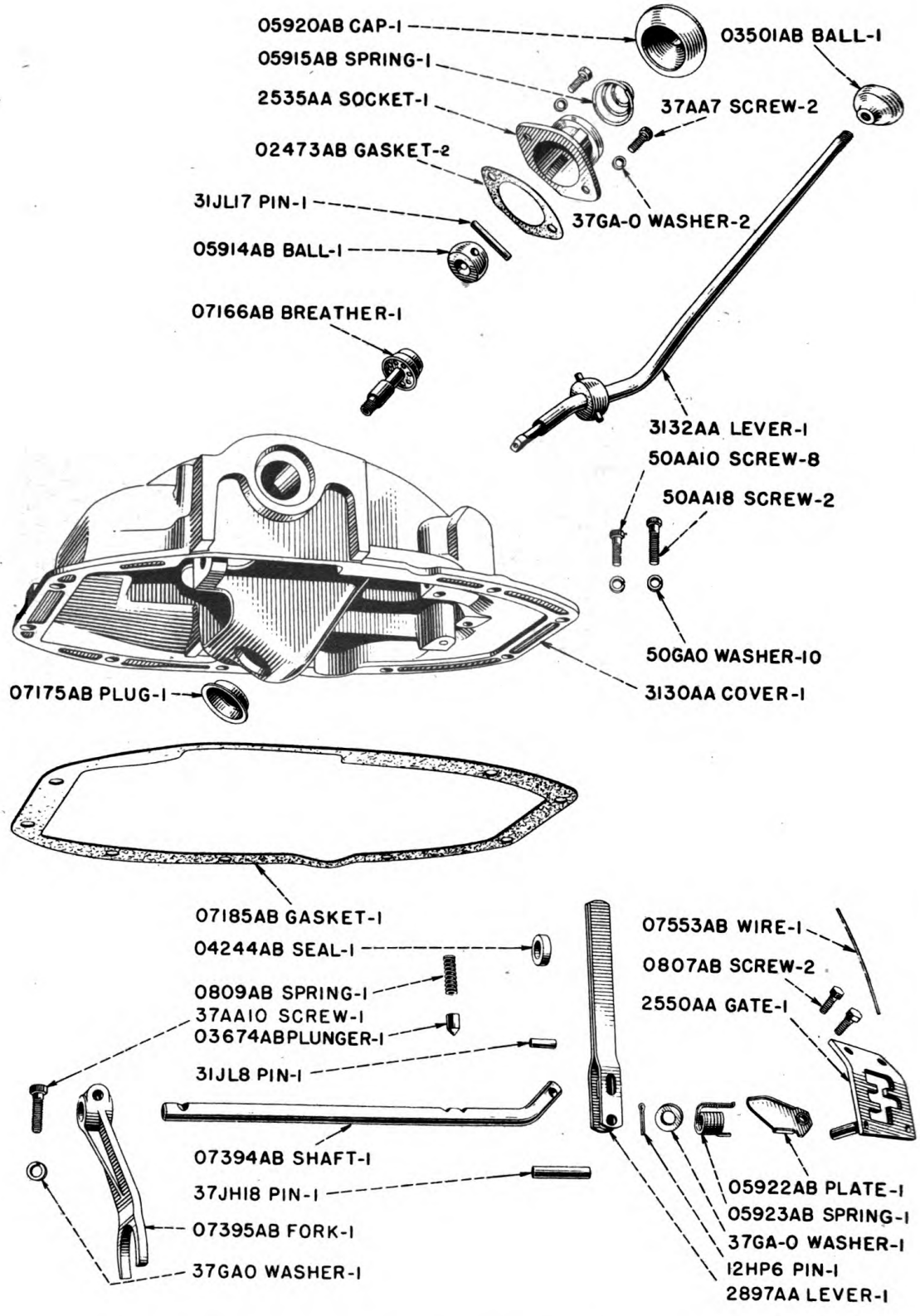
STEERING GEAR



GEAR SHIFT PARTS



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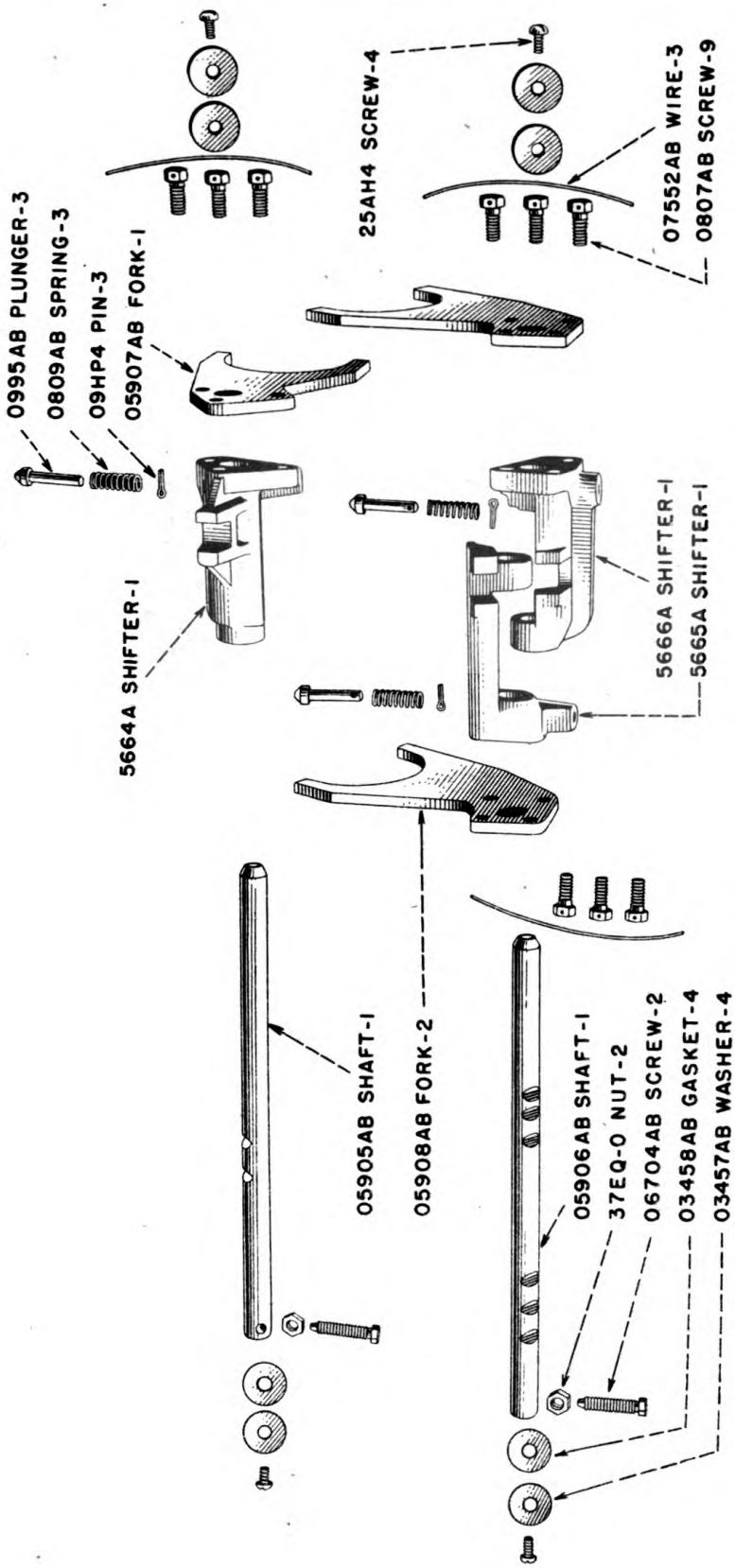
GEAR SHIFT PARTS



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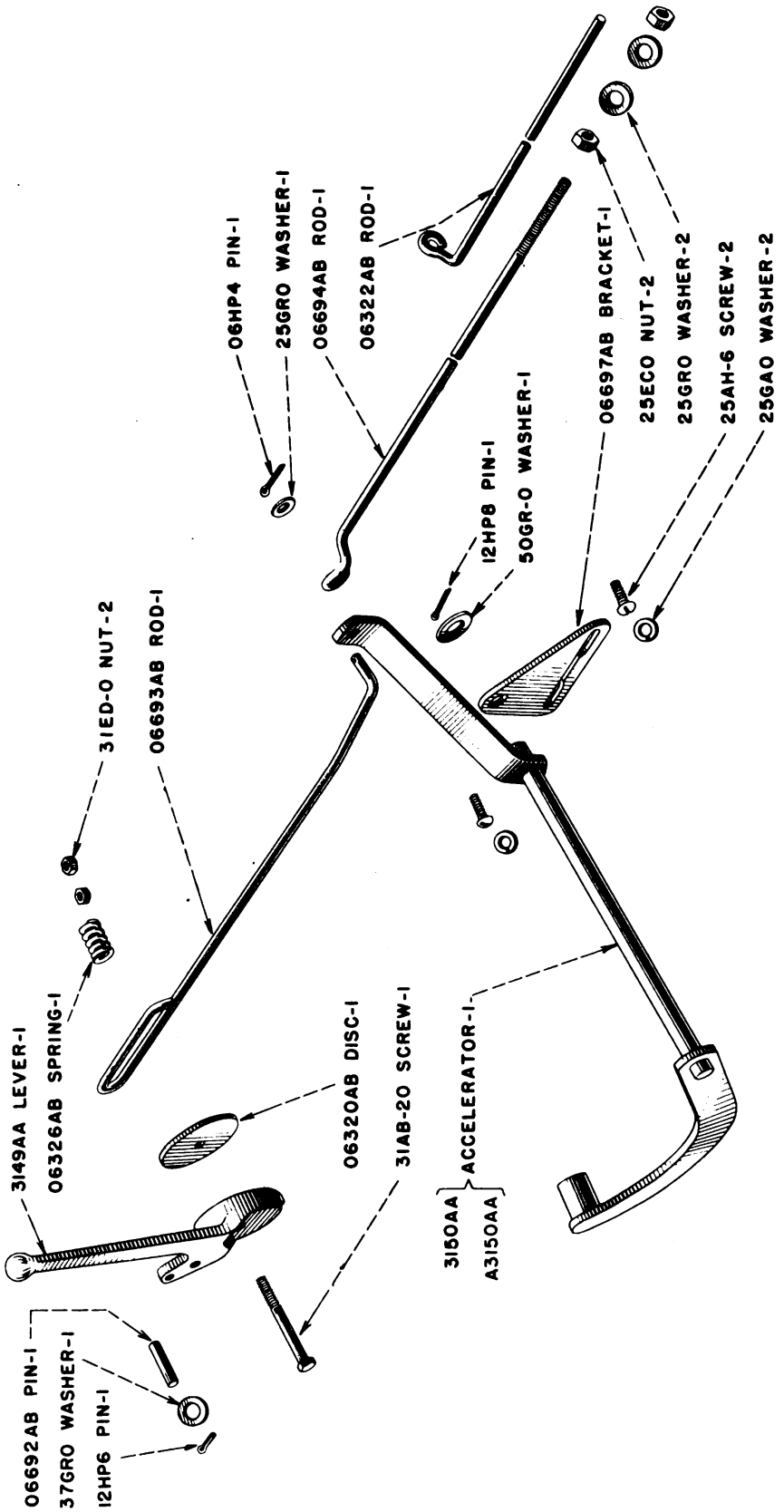
THROTTLE AND ACCELERATOR



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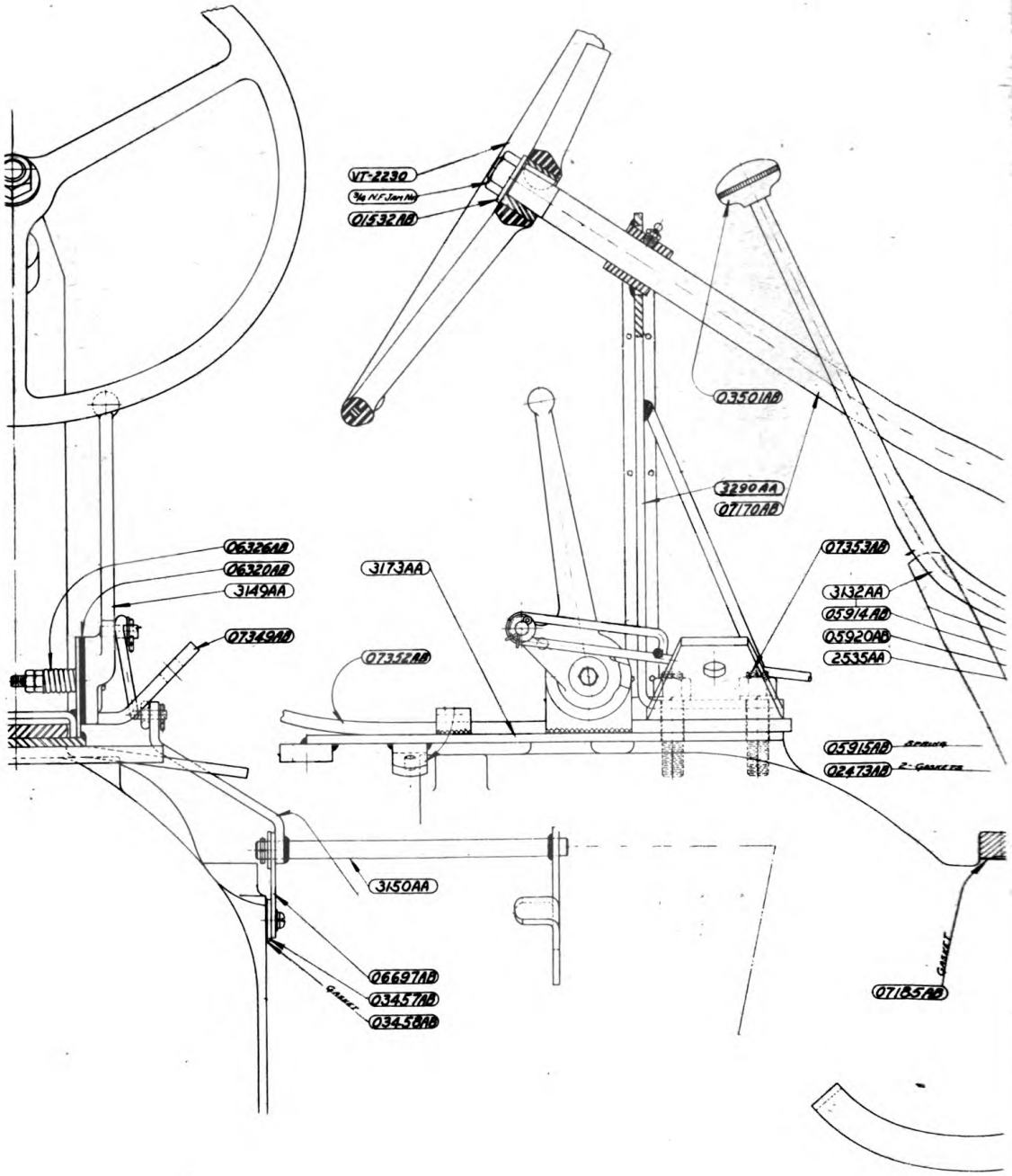
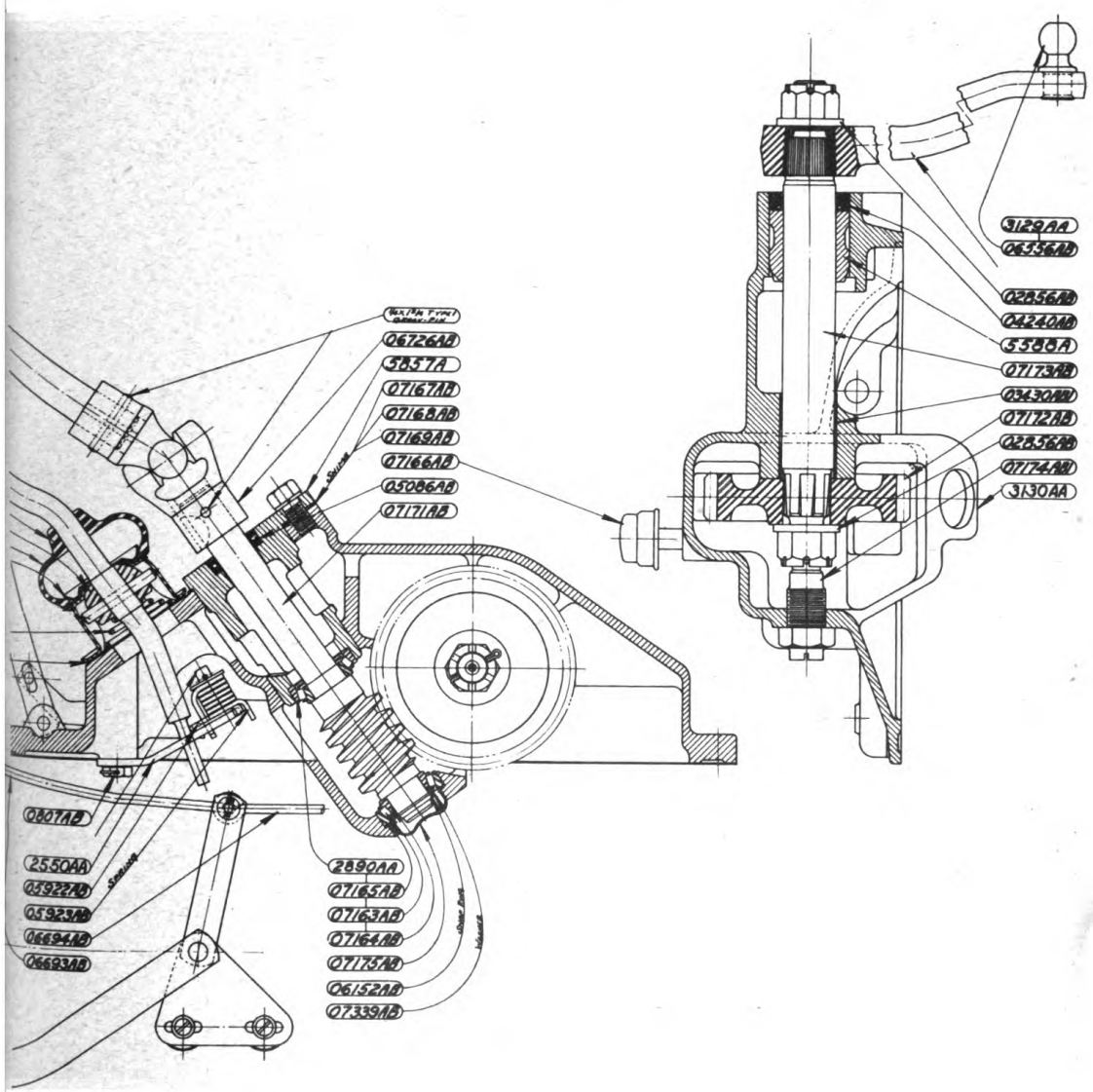
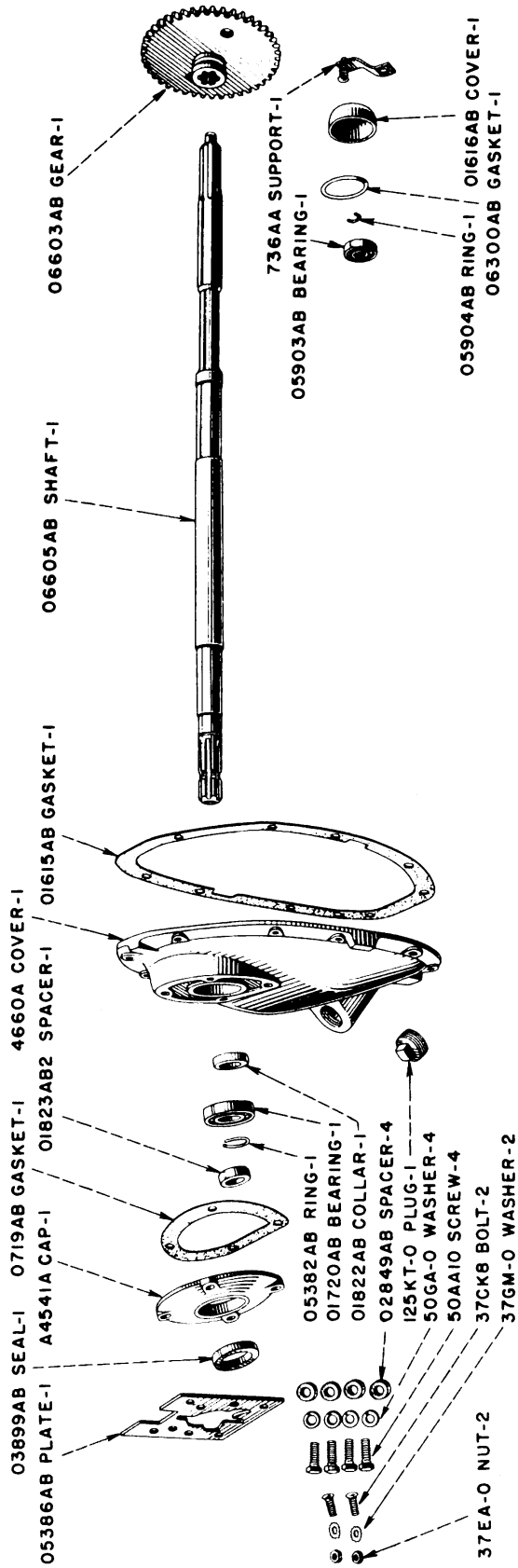


SHIFT LEVER, THROTTLE AND ATOR ASSEMBLY





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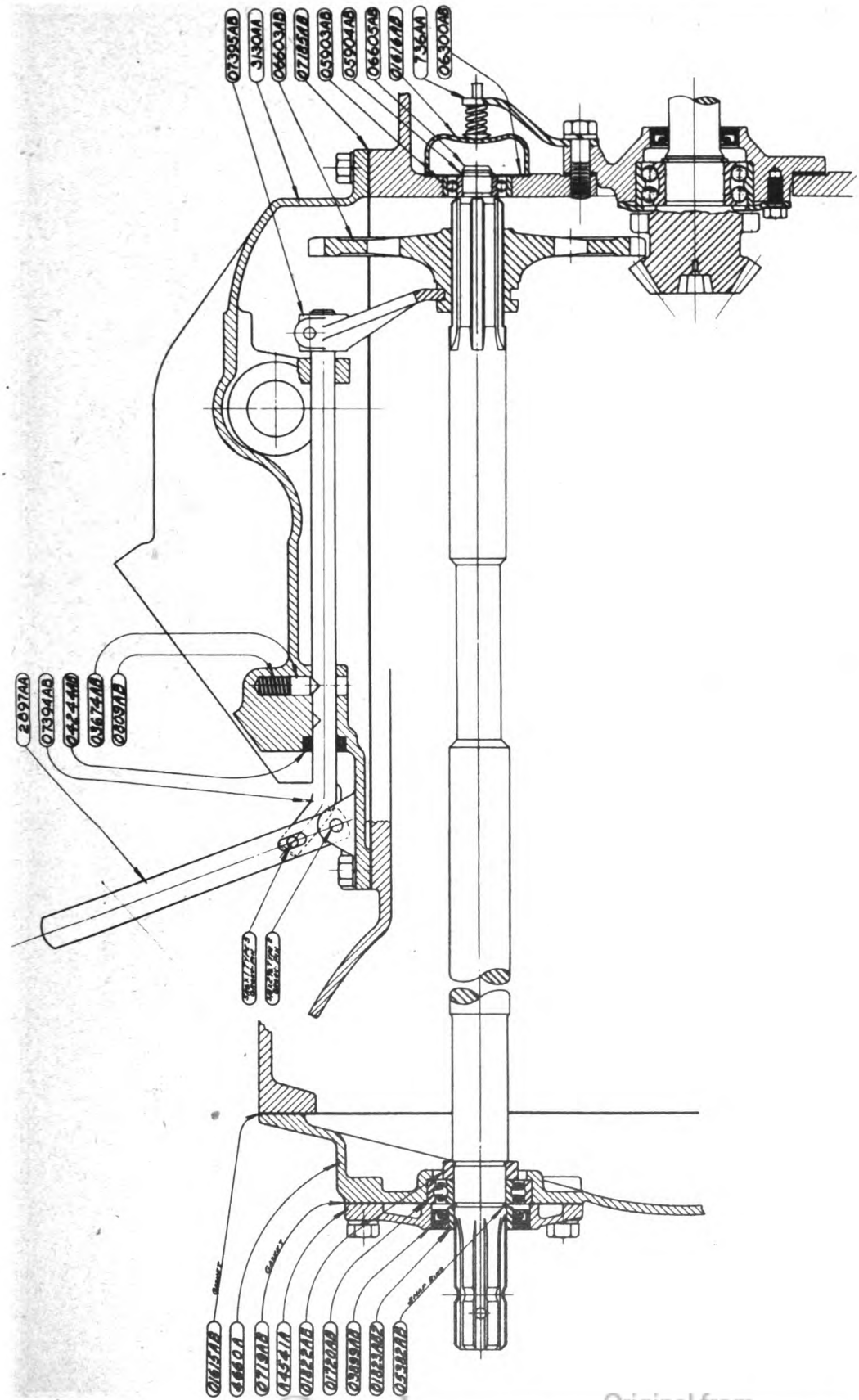
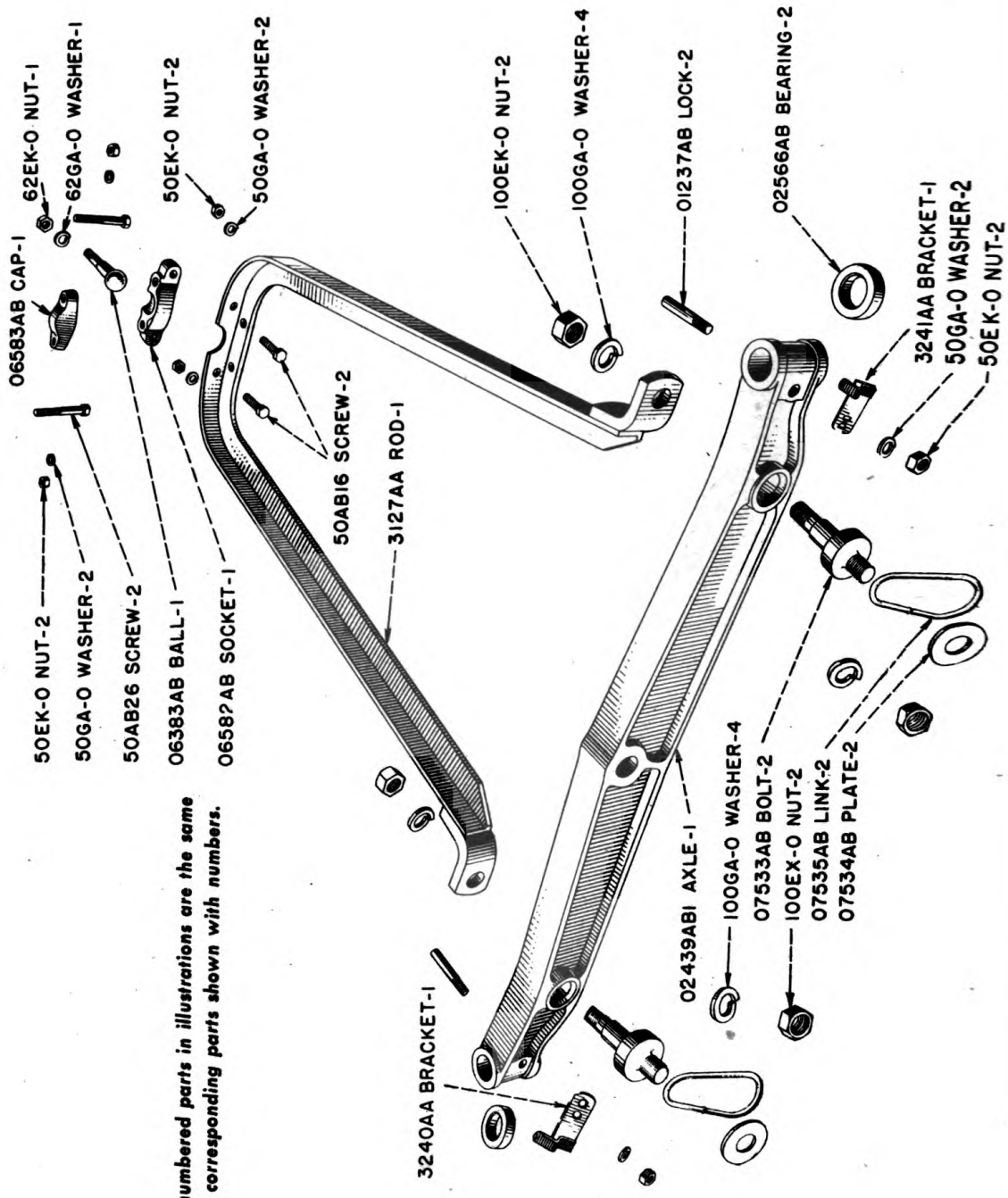


FRONT AXLE



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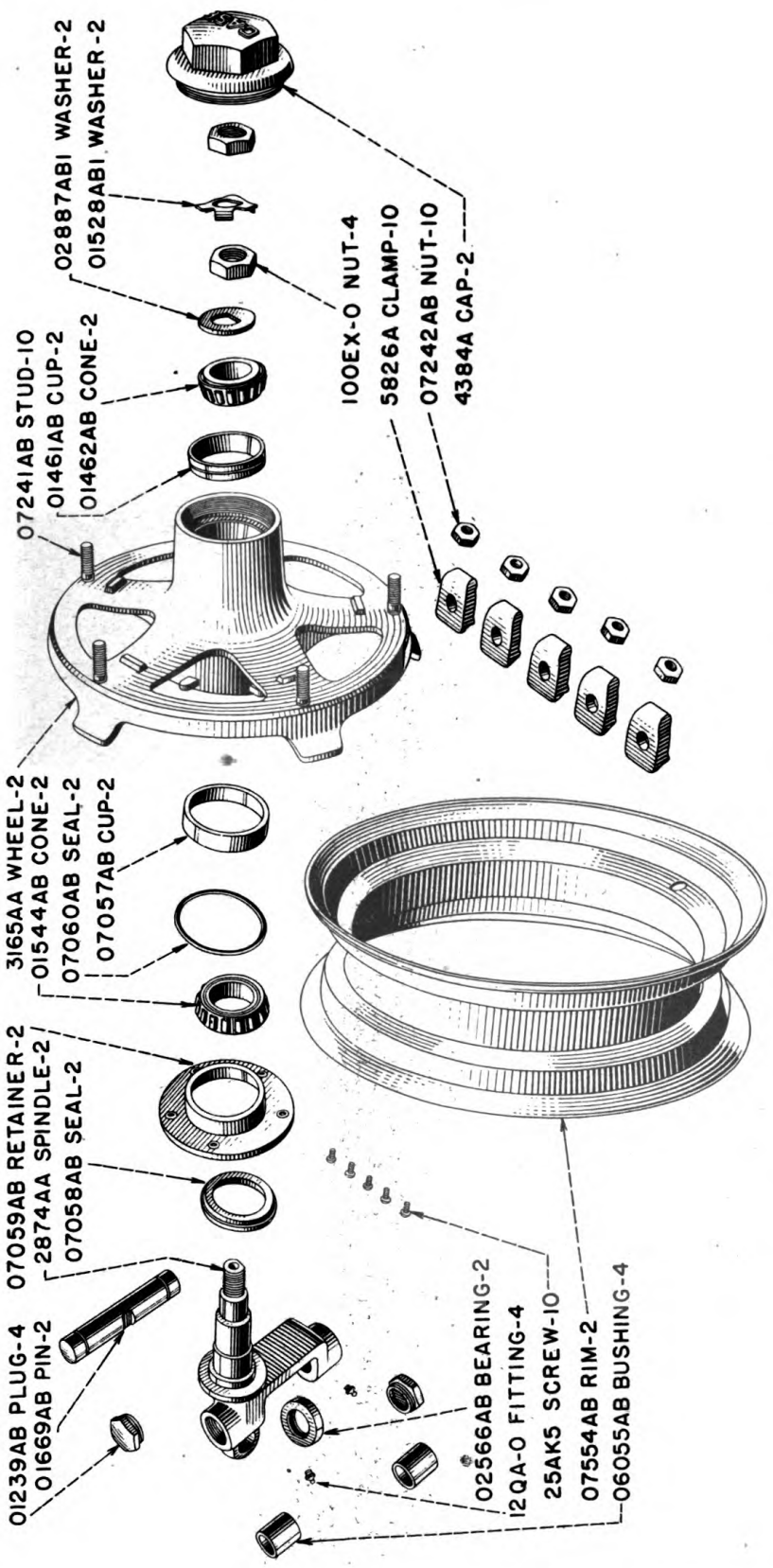
FRONT WHEEL AND SPINDLE



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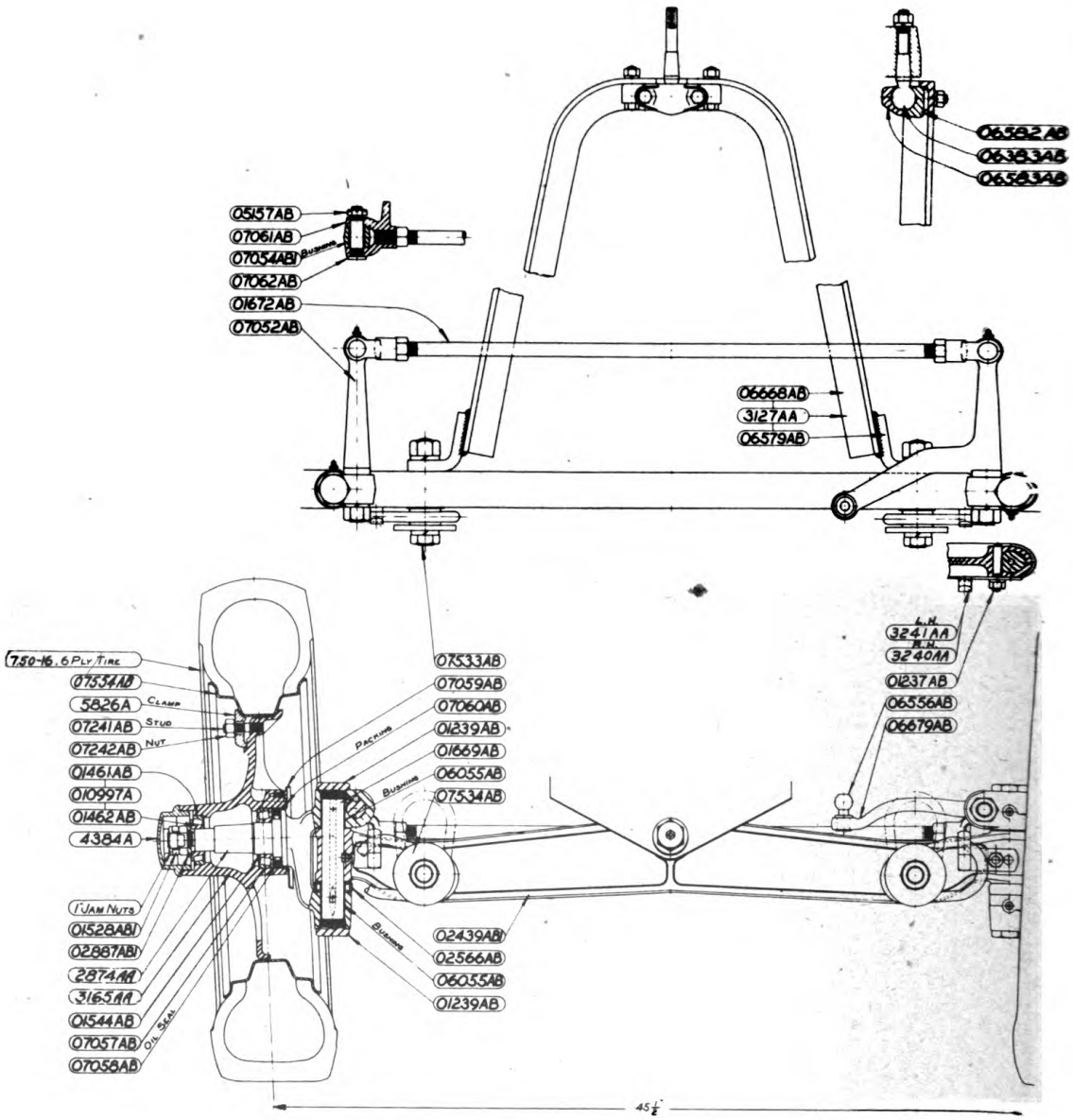
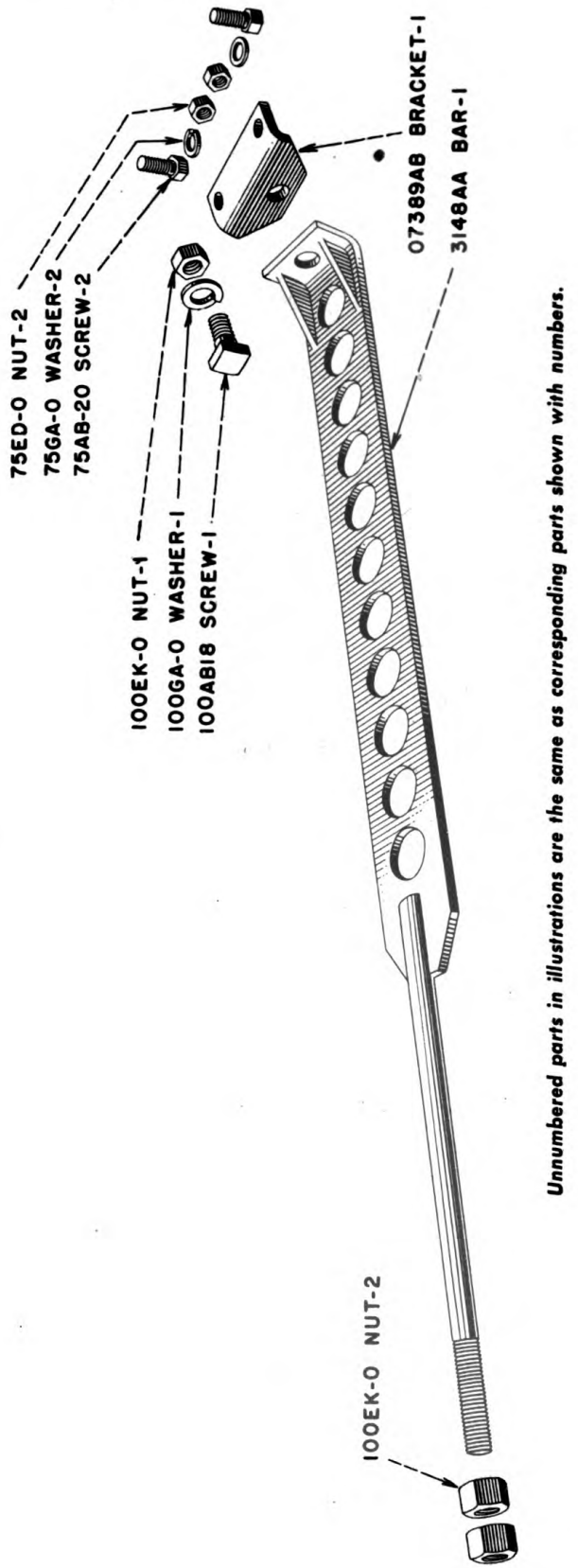
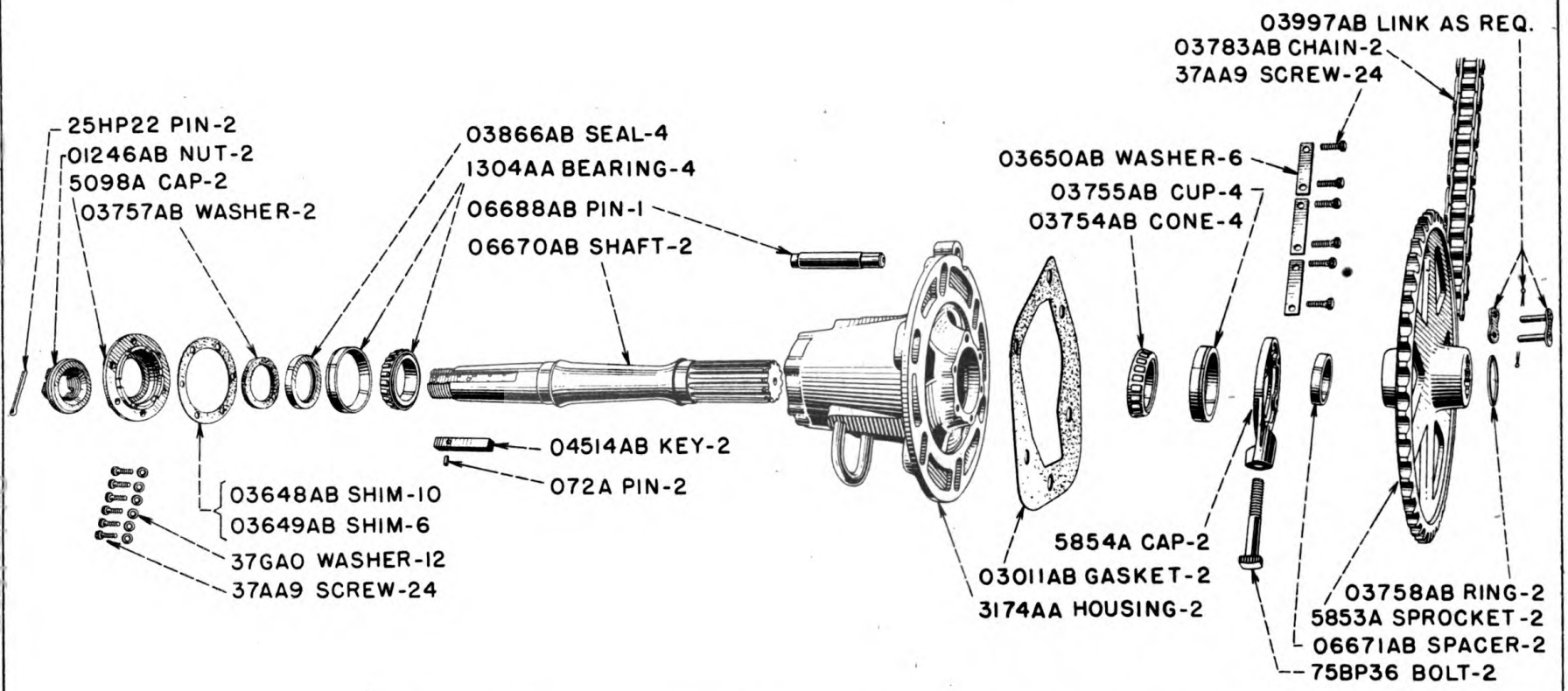
FRONT WHEEL AND AXLE ASSEMBLY



FRONT TIE BAR



Unnumbered parts in illustrations are the same as corresponding parts shown with numbers.



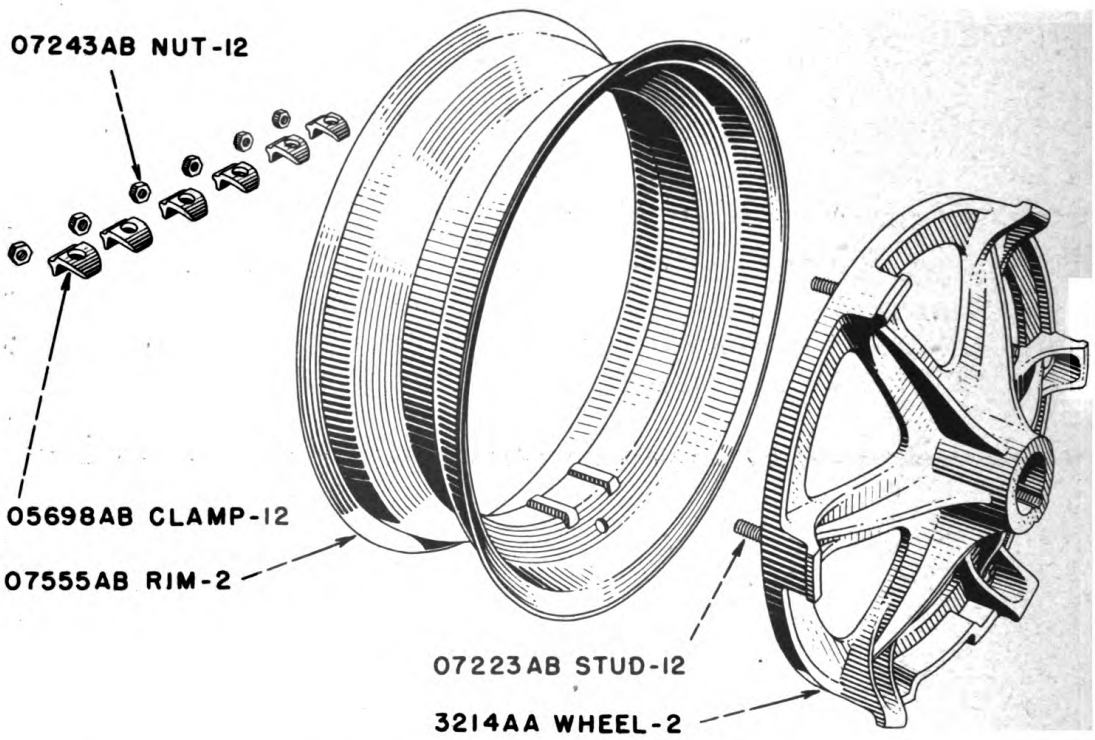
Unnumbered parts in illustrations are the same as corresponding parts shown with numbers.

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 IN MOTION.

—National Safety Council.

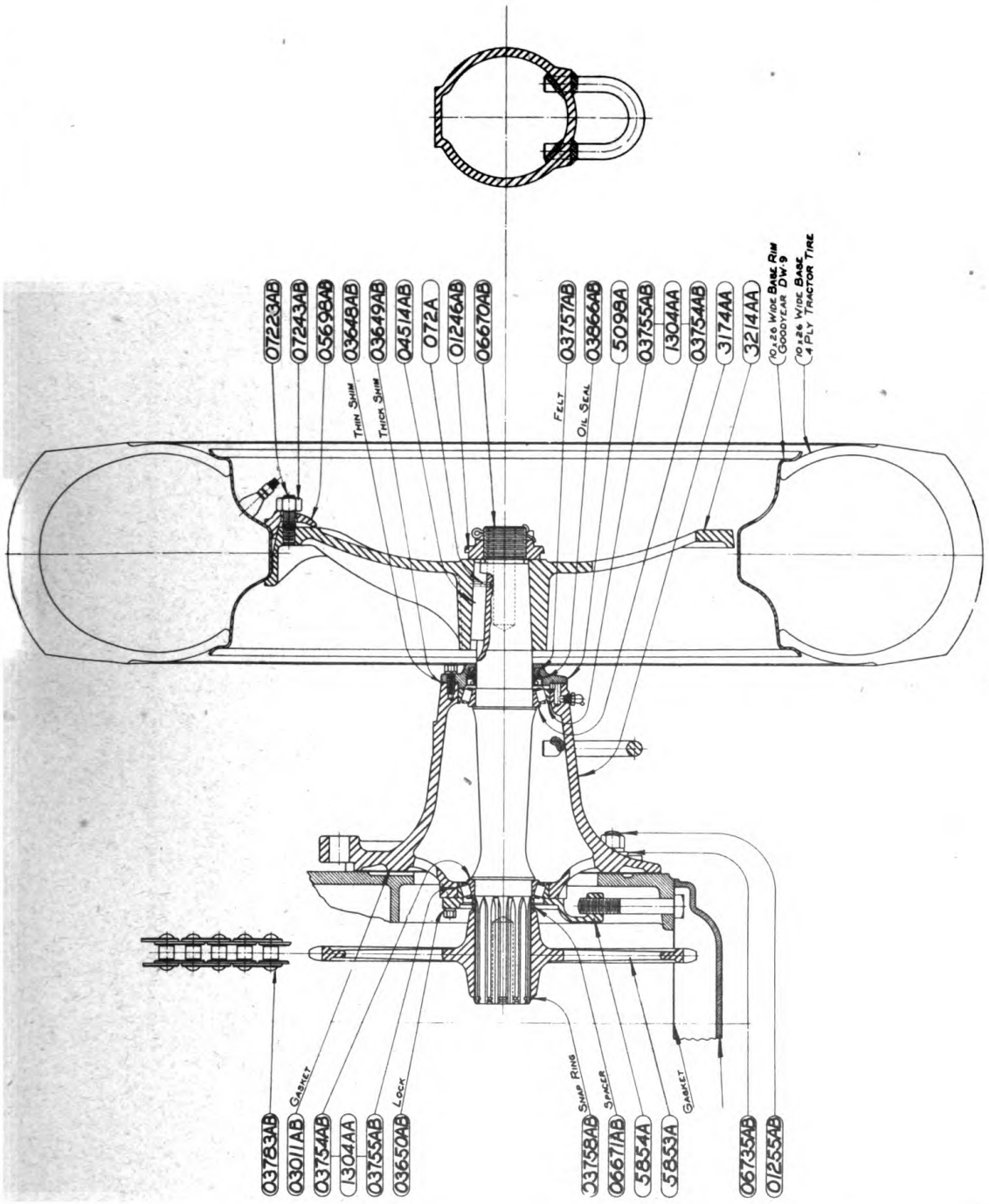
REAR WHEEL USED ON FOLLOWING CONTRACTS

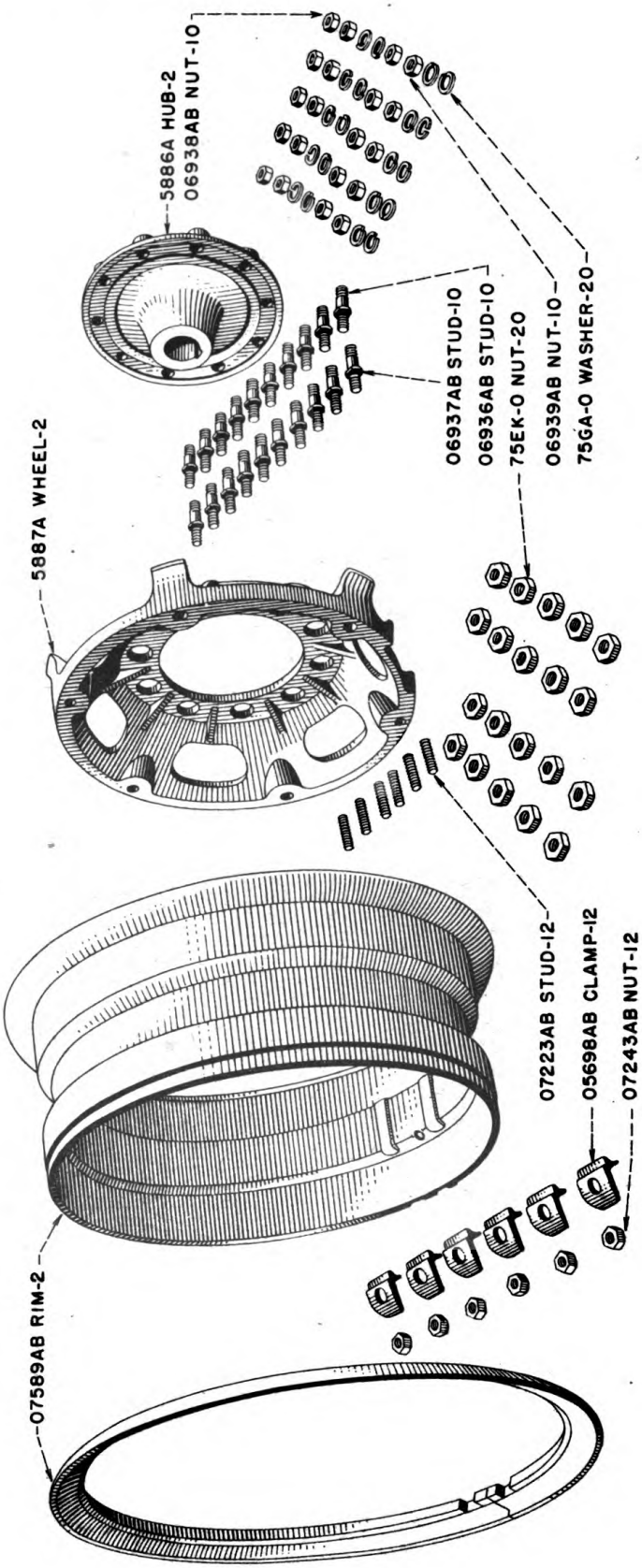
NO. W145 ENG. 514
NO. W1088 ENG. 2163
NO. W1088 ENG. 2159
NO. W1088 ENG. 2461



Unnumbered parts in illustrations are the same as corresponding parts shown with numbers.

REAR WHEEL AND AXLE ASSEMBLY

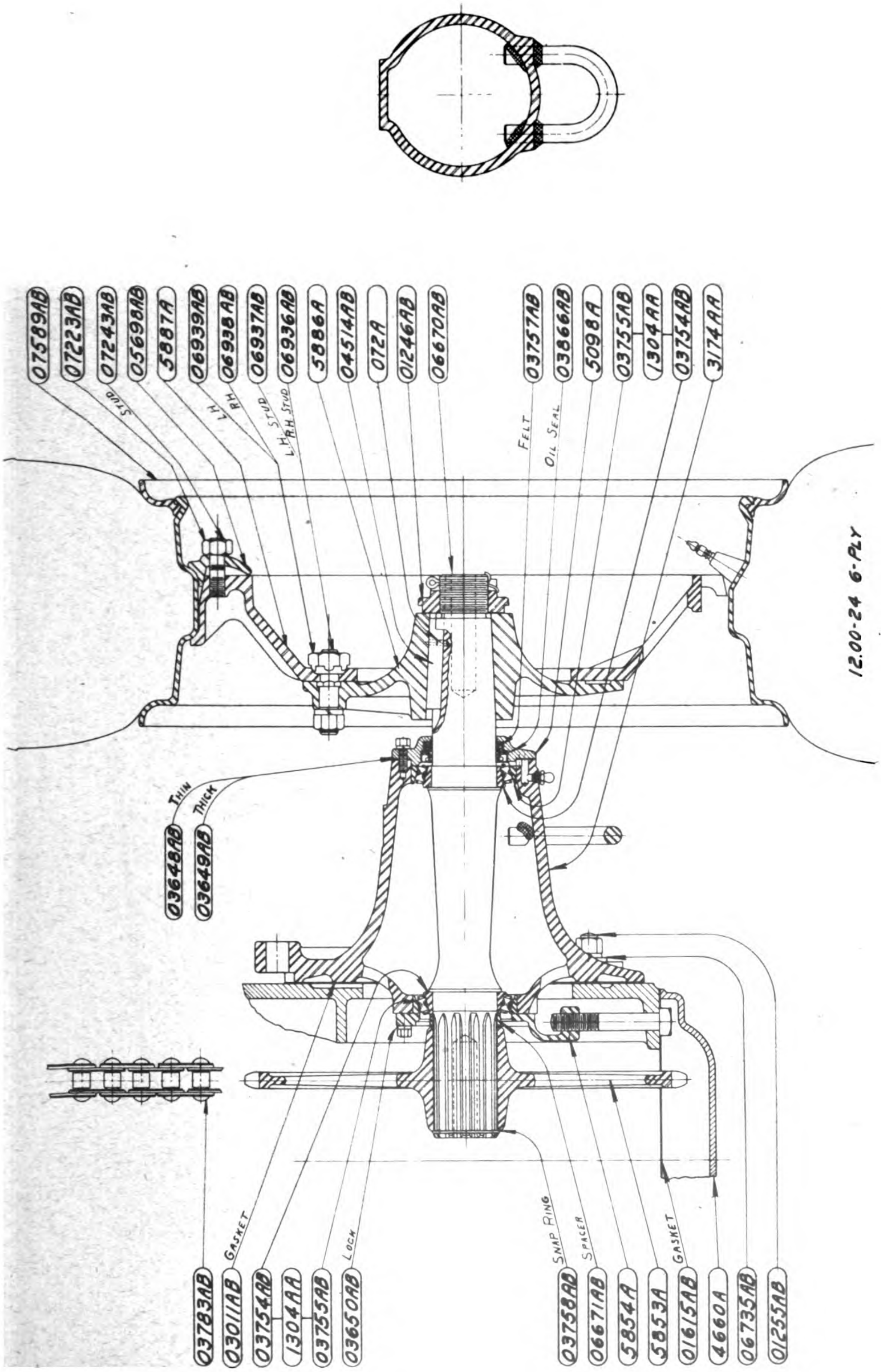


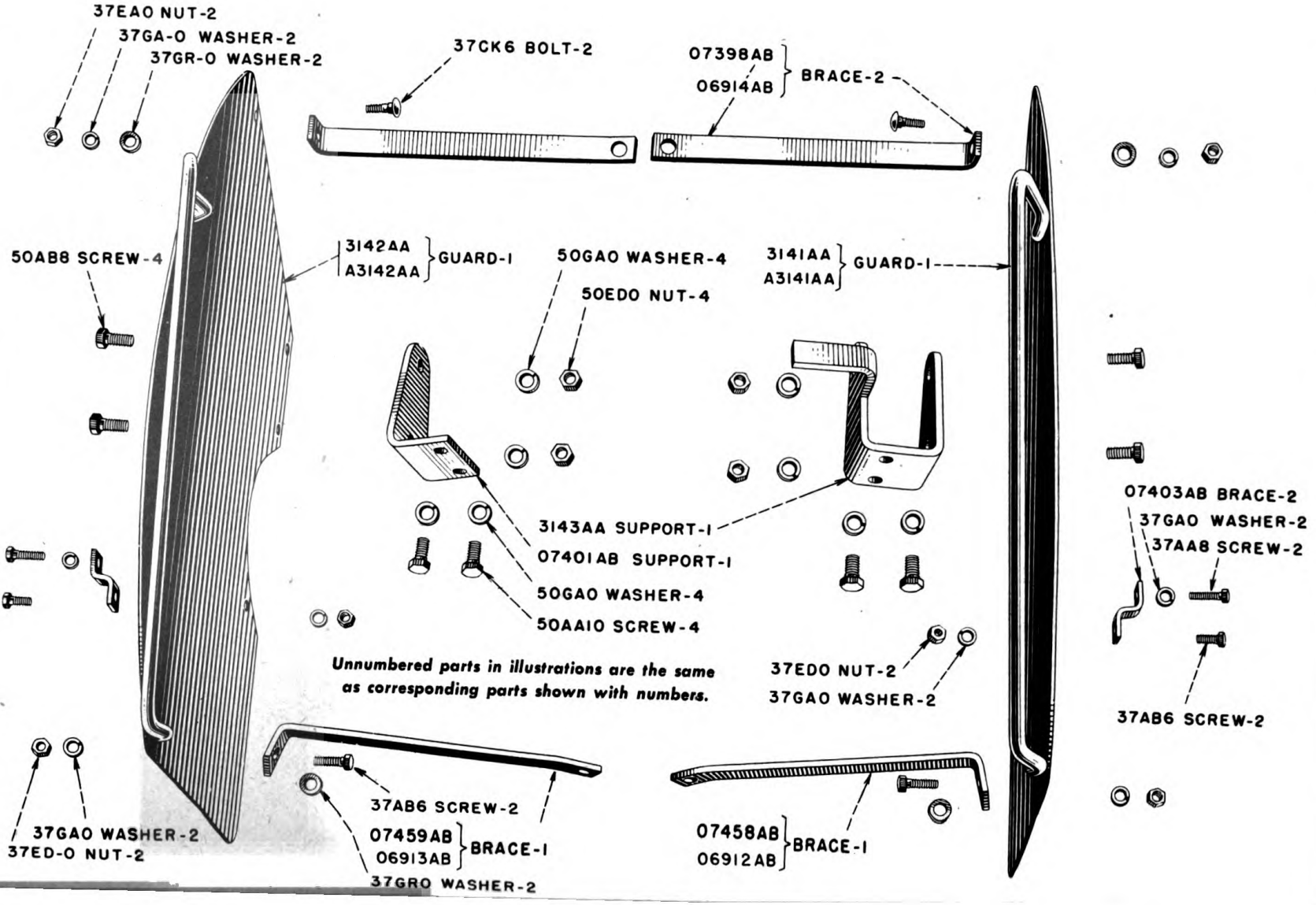


REAR WHEEL USED ON CONTRACT NO. W 1088 ENG. 2632 AND AFTER.

Unnumbered parts in illustrations are the same as corresponding parts shown with numbers.

REAR WHEEL AND AXLE ASSEMBLY





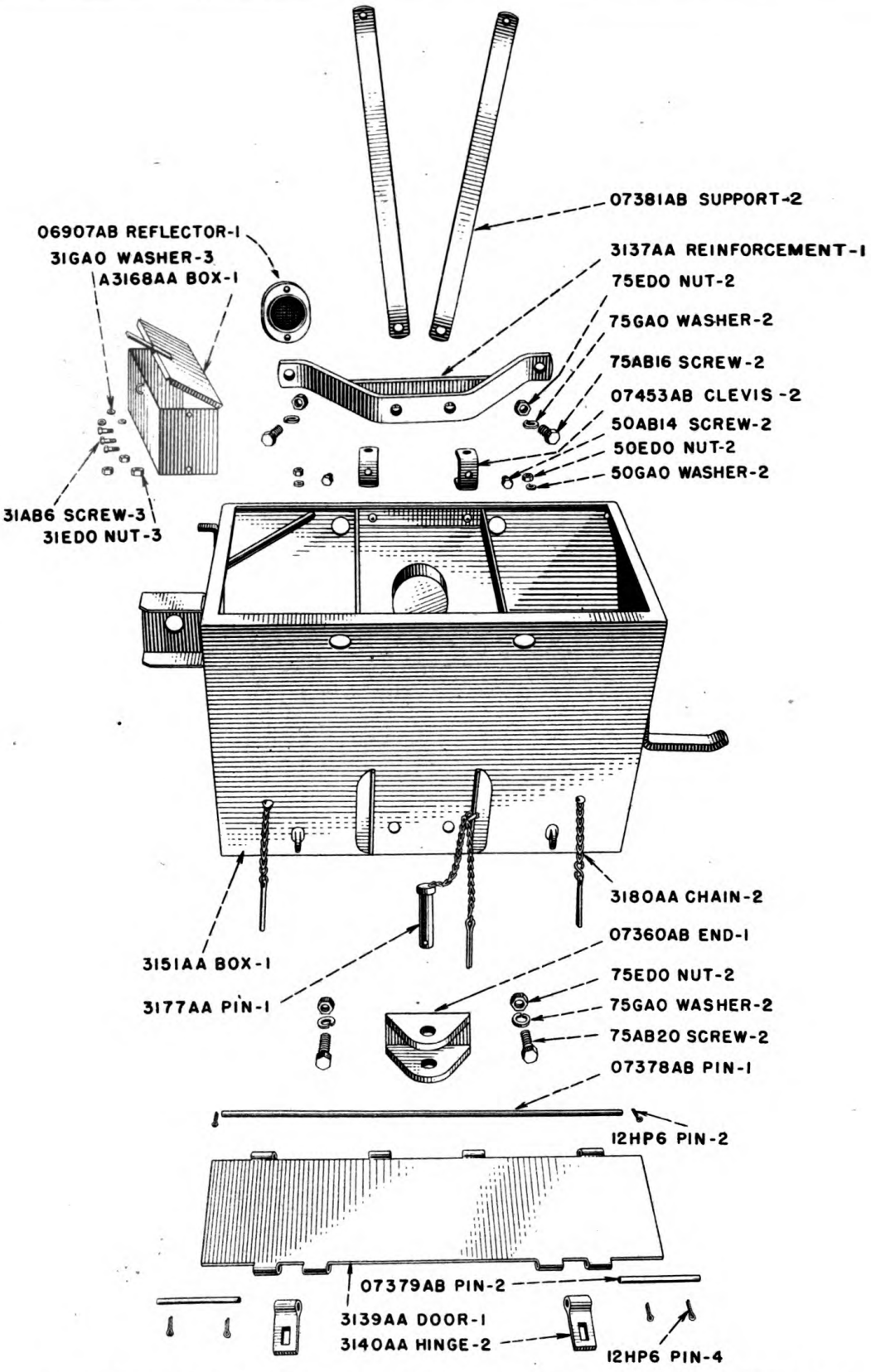
A Careful Operator

IS THE BEST INSURANCE

AGAINST AN ACCIDENT

—National Safety Council.

DIRT BOX



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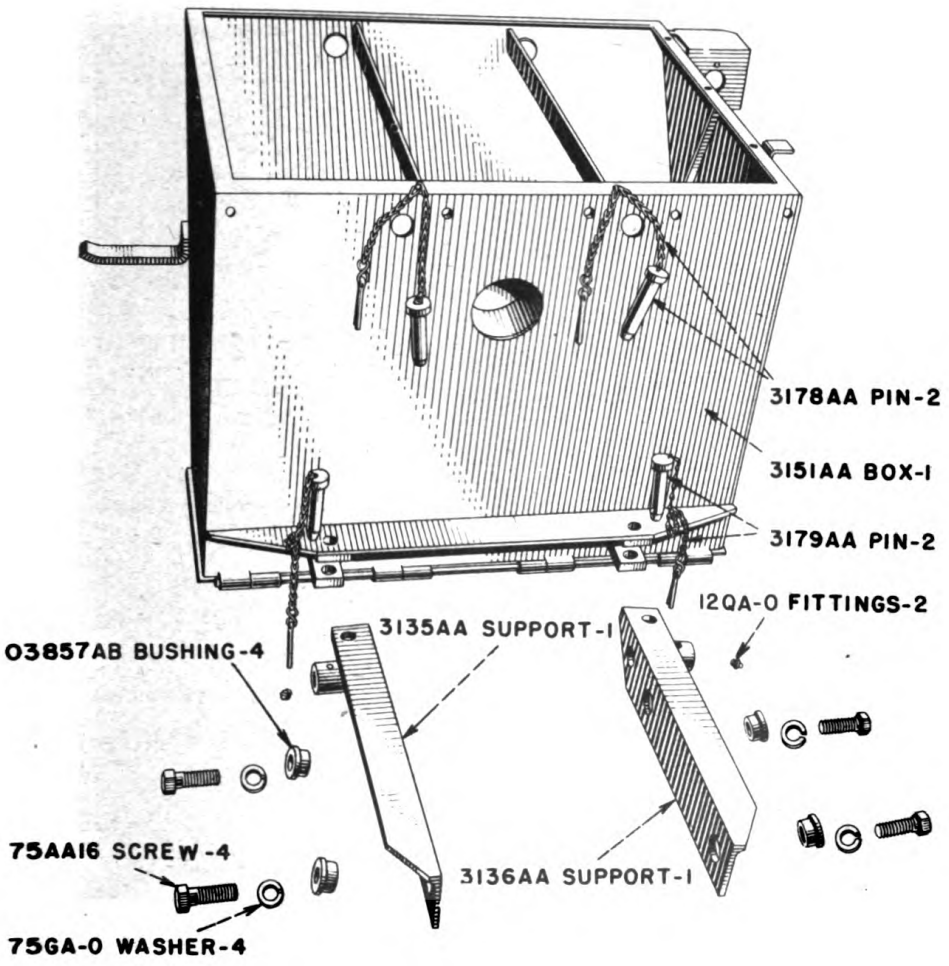
DIRT BOX



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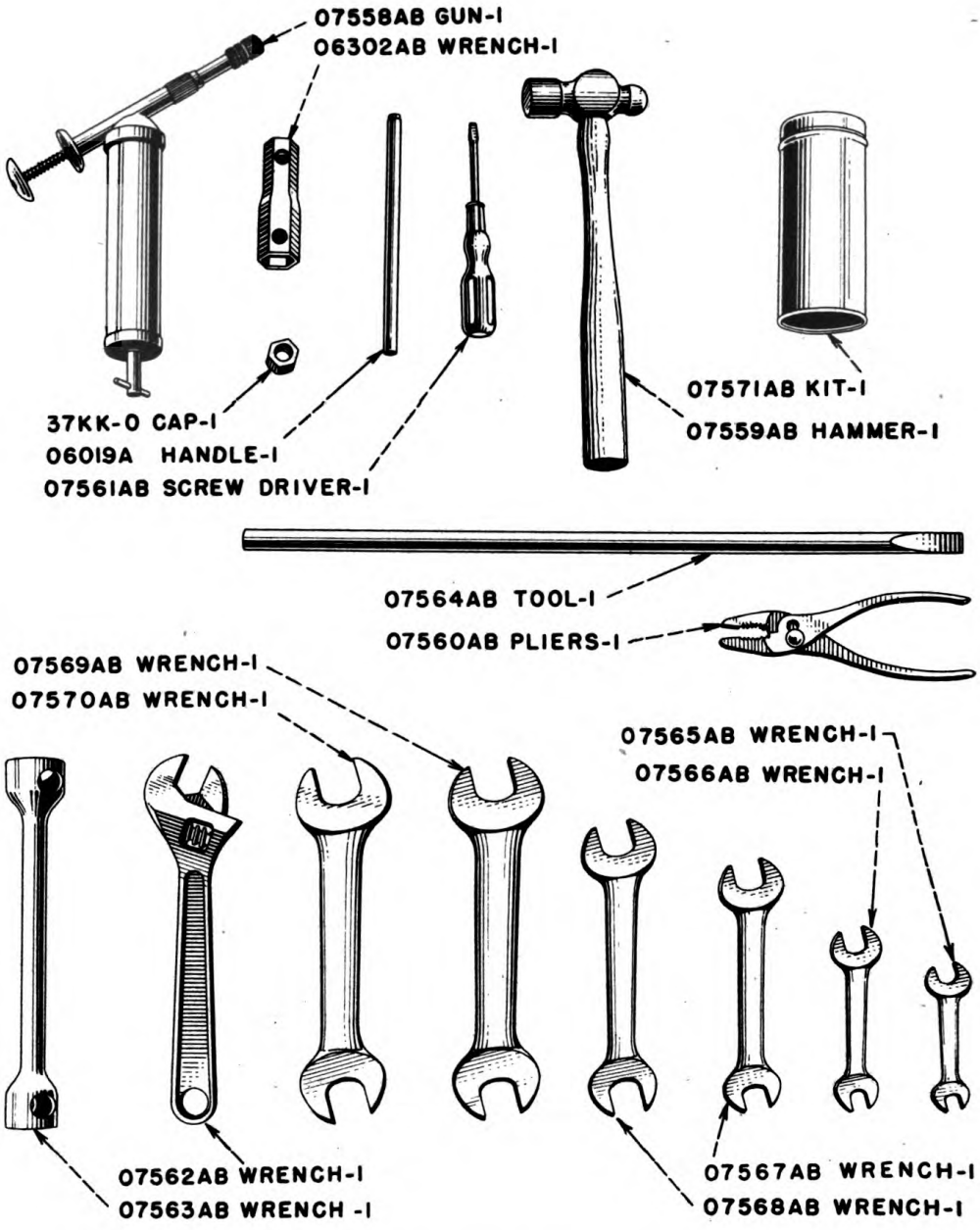

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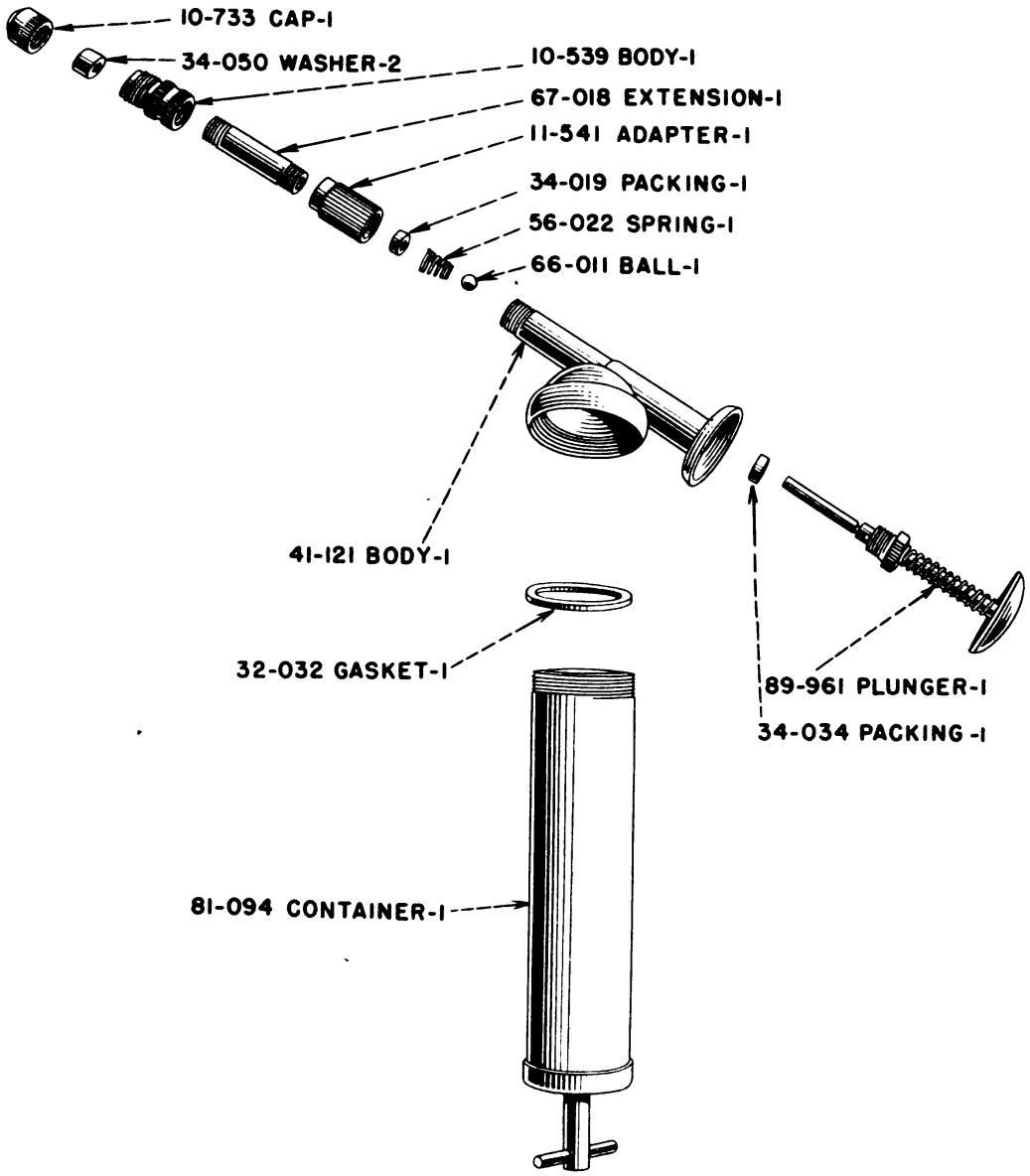
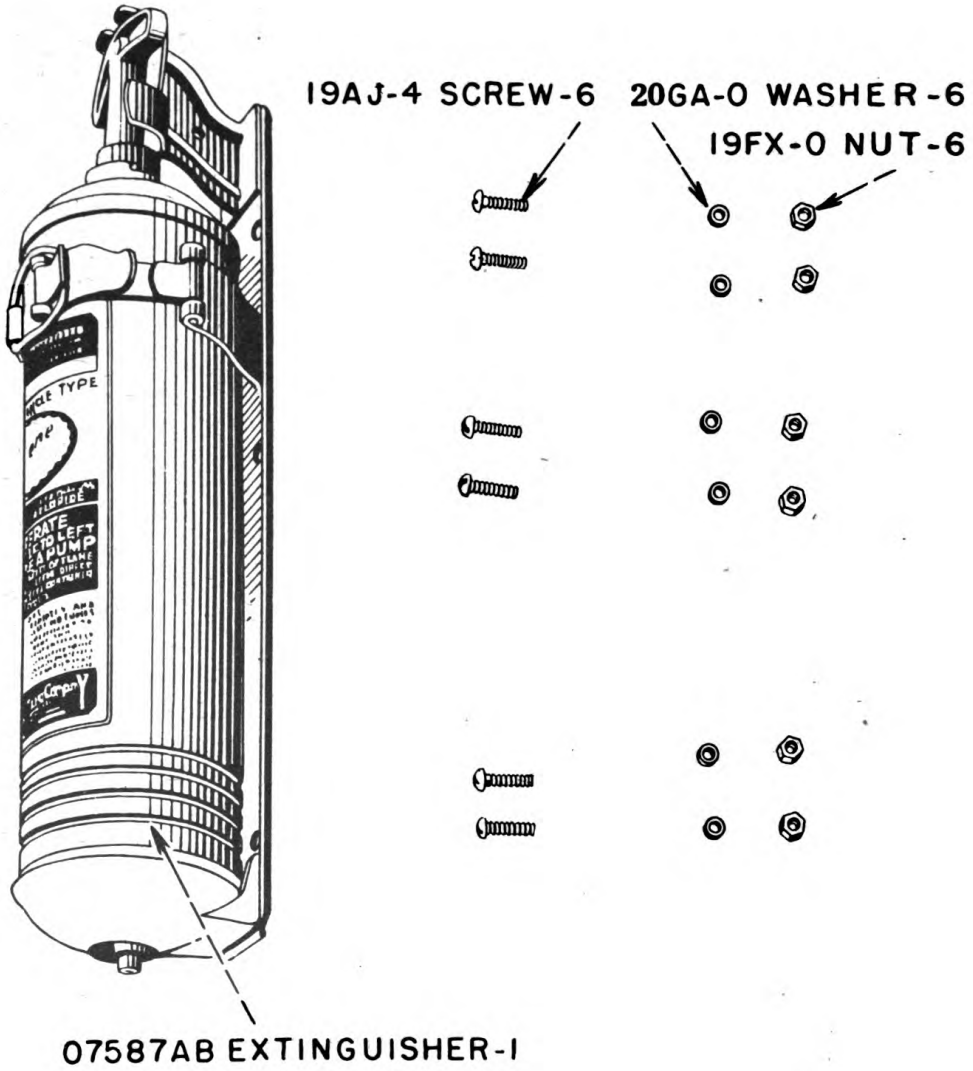
GREASE GUN



FIRE EXTINGUISHER



PARTS AND PRICE LIST "SI" AIRBORNE TRACTORS

Part No.	Description	Page No.	Qty. Used	Weight Each		Price Each
				Lbs.	Oz.	
A4362 A	Sleeve, Governor	16	1	..	4	$0.85
4384 A	Cap, Hub, front	55	2	1	10	.70
A4541 A	Cap, power take off shaft rear cover . . .	52	1	2	3	1.95
4660 A	Cover, transmission case, rear	52	1	25	12	7.70
A4717 A	Yoke, clutch throwout. .	31	1	1	14	2.00
4760 A	Lever, foot clutch throw-out shaft	31	1	1	2	1.10
A4761 A	Lever, foot brake cross shaft, short	41	1	..	12	1.10
4909 A	Collar, adjustable brake	31	1	..	12	1.65
5098 A	Cap, rear axle outer bearing	58	2	2	4	1.10
5406 A	Sleeve clutch brake . .	35	1	4	..	2.20
5558 A	Housing, independent brake	41	2	8	7	2.75
5588 A	Bushing, transmission case top cover, outer.	45	1	..	14	1.10
5601 A	Barrel, cylinders. . . .	7	4	4	11	3.20
5602 A	Piston	7	4	2	4	2.85
5603 A	Ring, piston, com-pression	7	12	..	1	.30
5604 A	Ring, piston, oil. . . .	7	4	..	1	.40
5605 A	Cap, crankshaft bearing, front and rear	7	2	1	14	.95
5606 A	Cap, crankshaft bearing, center	7	1	1	12	.95
5608 A	Camshaft	8	1	9	7	12.65
5609 A	Gear, camshaft	8	1	3	14	3.30
5610 A	Gear, governor	16	1	1	10	2.50
5611 A	Gear, oil pump drive . .	9	1	..	2	1.65
5612 A	Body, oil pump	9	1	4	13	8.25
5619 A	Guide, inlet valve stem.	8	4	..	2	.30
5620 A	Tee, valve rocker arm, oil supply	8	1	..	4	.30
5622 A	Manifold, inlet and exhaust.	10	1	20	10	8.00
5628 A	Lever, Governor.	16	1	..	12	1.10
5629 A	Elbow, water outlet. . .	20	1	2	4	.95
5630 A	Body, lower, water pump.	18	1	7	3	3.00
5631 A	Body, upper, water pump; purchased from Schwitzer-Cummins Co. Indianapolis, Ind. Their No. 110166 . . .	18	1	4	8	6.35
5632 A	Impeller, water pump; purchased from Schwitzer-Cummins Co. Indianapolis, Ind. Their No. C110169. . .	18	1	..	13	1.40
5633 A	Hub, fan; purchased from Schwitzer-Cummins Co. Indianapolis, Ind. Their No. C105185. . .	18	1	..	5	.95
5650 A	Case, transmission . . .	34	1	373	..	75.90
5653 A	Carrier, first reduction shaft bearing, R. H. .	35	1	3	4	1.40
5654 A	Carrier, differential bearing and brake. . .	40	2	10	14	3.85

PARTS AND PRICE LIST "SI" AIRBORNE TRACTORS
(Continued)

Part No.	Description	Page No.	Qty. Used	Weight Each		Price Each
				Lbs.	Oz.	
5656 A	Plate, power, independent brake; purchased from Auto Specialties Mfg. Co., St. Joseph, Mich. Their No. BP-205	41	2	2	4	2.75
A5657 A	Ring, adjusting, independent brake; purchased from Auto Specialties Mfg. Co., St. Joseph, Mich. Their No. BP-266 . . .	41	2	1	6	1.10
5658 A	Pinion, adjusting, independent brake; purchased from Auto Specialties Mfg. Co., St. Joseph, Mich. Their No. BP-295 . . .	41	2	..	1	.55
5659 A	Disc, primary, independent brake; purchased from Auto Specialties Mfg. Co., St. Joseph, Mich. Their No. BP-210 . . .	41	2	2	12	1.95
5664 A	Shifter, low gear. . . .	47	1	1	11	1.50
5665 A	Shifter, second and reverse gear	47	1	1	9	1.50
5666 A	Shifter, third and fourth gear.	47	1	1	8	1.50
5780 A	Arm, foot brake.	41	2	1		1.00
5784 A	Carrier, clutch shaft bearing.	32	1	7	8	2.50
5786 A	Sleeve, clutch release .	31, 32	1	1	14	3.30
5794 A	Guide, exhaust valve stem	8	4	..	2	.30
5795 A	Bracket, lamp.	25	2	..	9	.40
5826 A	Clamp, front wheel rim .	55	10	..	5	.15
5828 A	Plate, clutch pressure; purchased from Rockford Drilling Machine Co., Rockford, Ill. Their No. CL5242-1 . .	30	1	11	2	5.50
5853 A	Sprocket, rear axle. . .	58	2	26	..	30.00
5854 A	Cap, rear axle inner bearing.	58	2	8	4	3.25
5855 A	Pulley, fan drive and power take-off	7, 18	1	3	13	5.00
5857 A	Carrier, steering shaft bearing.	45	1	3	12	3.00
5858 A	Pedal, foot clutch . . .	31	1	2	10	1.50
5861 A	Lever, brake cross shaft, inner	41	1	..	14	.85
5862 A	Lever, brake cross shaft, outer	41	1	..	12	1.25
5864 A	Pedal, brake, right. . .	41	1	3	2	2.00
5865 A	Pedal, brake, left . . .	41	1	3	..	2.00
5868 A	Elbow, exhaust	10	1	3	4	1.25
5882 A	Carrier, first reduction shaft bearing, and sliding gear shaft bearing.	35, 38	3	3	4	2.00
5886 A	Hub, rear wheel. (Used on Contract No. W1088 Eng. 2632 and after.).	62	2	31	8	50.00
5887 A	Wheel, rear. (Used on Contract No. W1088 Eng. 2632 and after.).	62	2	56	8	60.00

PARTS AND PRICE LIST "SI" AIRBORNE TRACTORS
(Continued)

Part No.	Description	Page No.	Qty. Used	Weight Each Lbs.	Weight Each Oz.	Price Each
072 A	Pin, dowel, rear axle shaft.	58	2	..	1/10	.03
05939 A	Clip, generator wire, fastens to water pump body. . . .	25	2	..	1/12	.06
06019 A	Handle, spark plug wrench	68	1	1	4	.11
010909 A	Cap, fuel tank	21	1	..	3	.30
010994 A	Bearing, first reduction shaft, Timken. No. 2720-2788.	35	1	1	2	3.90
736 AA	Support with spring for P.T.O. front cover . .	52	1	..	4	.22
917 AA	Shoe with lining, clutch brake.	31	1	3	8	2.50
1304 AA	Bearing, rear axle. Timken No. 399A-394A .	40, 58	4	1	11	6.50
1307 AA	Bearing, first reduction and sliding gear shaft. Timken No. 02820-02877.	35, 38	3	1	1	3.50
2516 AA	Arm, valve rocker, R. H. with bushing and adjusting button . . .	8	4	..	4	1.10
2517 AA	Arm, valve, rocker, L.H. with bushing and adjusting button . . .	8	4	..	4	1.10
2520 AA	Screen, oil pump	9	1	..	15	2.20
2521 AA	Pan, oil	6	1	9	5	8.00
2535 AA	Socket, gear shift lever	46	1	..	7	.40
B2536 AA	Brake, independent, assembly; purchased from Auto Specialties Mfg. Co., St. Joseph, Mich.	41	2	9	10	15.00
B2537 AA	Plate, power, assembly, independent brake; purchased from Auto Specialties Mfg. Co., St. Joseph, Mich. Their No. BP201-B. . .	41	2	7	10	8.25
B2538 AA	Ring, middle, with linings, independent brake; purchased from Auto Specialties Mfg. Co., St. Joseph, Mich. Their No. BP275-B. . .	41	2	2	..	6.05
2540 AA	Pump, water and fan assembly; purchased from Schwitzer-Cummins Co., Indianapolis, Ind. Their No. A110165	18	1	10	6	10.20
2543 AA	Tank, fuel	21	1	19	..	12.65

PARTS AND PRICE LIST "SI" AIRBORNE TRACTORS
(Continued)

Part No.	Description	Page No.	Qty. Used	Weight Each Lbs.	Weight Each Oz.	Price Each
2550 AA	Gate, gear shaft lever	46	1	..	10	.30
A2570 AA	Support, fuel tank and battery cover	21	1	10	3	4.15
A2571 AA	Bracket, fuel tank front support	21	1	10	..	3.30
2574 AA	Cap, oil filler	16	1	..	9	.65
2578 AA	Shaft and pinion with bevel gear	32, 35	1	13	11	28.60
	NOTE*-When clutch shaft and bevel pinion or transmission bevel gear are ordered, we furnish clutch shaft and bevel pinion with matched bevel gear which is included in 2578 AA*.					
2580 AA	Block, cylinder, with barrels, packing and bearing caps	6	1	202	..	74.80
2581 AA	Barrels, pistons, rings, piston pins and packing for cylinder (set of 4)	7	1	30	..	26.40
2582 AA	Elbow, breather	6	1	..	8	.55
2583 AA	Rod, connecting, with liners, bushing and cap screws	7	4	3	6	11.00
2584 AA	Head, cylinder, with guides and valve inserts	6	1	54	3	30.25
2585 AA	Head, cylinder, with guides, valves and valve springs	6	1	56	..	40.00
2586 AA	Pump, oil, assembly	9	1	7	..	14.85
A2587 AA	Governor, assembly	16	1	12	10	18.15
A2588 AA	Bracket, magneto with bushings	16	1	7	8	4.70
2591 AA	Frame, battery	24	1	1	1	.70
2593 AA	Shaft, valve rocker arm, with plug	8	2	..	7	1.10
2595 AA	Gear, fourth speed, with bushing	38	1	3	12	6.60
2607 AA	Gear, differential ring, assembly	40	1	46	..	31.30
2621 AA	Cap, radiator, with lock plate and gasket	20	1	..	13	.65
2635 AA	Rings, piston, set of 16	7	1	..	13	5.20
A2639 AA	Hood, engine	20	1	12	6	6.60
2699 AA	Tube, valve rocker arm oil supply	8	1	..	1	.40
2874 AA	Spindle, steering with bushings	55	2	11	..	9.90
2895 AA	Block, cylinder; with studs, bearing caps, and bearing screws	6	1	180	..	60.50
2897 AA	Lever, power take-off shifter	46	1	..	8	.50
2919 AA	Arm, steering spindle with bushing, R.H.	45	1	2	8	3.30

PARTS AND PRICE LIST "SI" AIRBORNE TRACTORS
(Continued)

Part No.	Description	Page No.	Qty. Used	Weight Each Lbs.	Weight Each Oz.	Price Each
2924 AA	Stud, reverse idler gear, with nut	38	1	2	9	3.00
A2930 AA	Clutch, Rockford, Model 11" TT; purchased from Rockford Drilling Machine Co., Rockford, Ill. Their No. CLA-1554 . .	30	1	28	..	24.00
A3010 AA	Linings and rivets, independent brake. (2 linings and 12 rivets)	41	2	..	8	3.00
A3015 AA	Member, clutch driving, assembly from Rockford Drilling Machine Co., Rockford, Ill. Their No. UCL-1-3832-4 . . .	30	1	6	..	14.00
3016 AA	Lever, clutch release, assembly; purchased from Rockford Drilling Machine Co., Rockford, Ill. Their No. UCL-1-4620 .	30	3	..	8	2.00
3123 AA	Mounting, radiator, assembly	20	1	10	..	4.00
3124 AA	Cap, grille, complete. .	20	1	2	2	3.50
3125 AA	Flywheel and ring gear .	7	1	33	8	18.00
3126 AA	Bracket, front axle and radiator	20	1	49	..	60.00
3127 AA	Rod, radius.	54	1	24	..	7.00
3129 AA	Arm, steering drop, with ball	45	1	4	2	2.50
3130 AA	Cover, transmission case, top, with bushing and oil seal . . .	46	1	55	..	17.00
3132 AA	Lever and ball, gear shifter.	46	1	2	1	3.00
3133 AA	Seat, operator	44	1	9	9	2.00
3135 AA	Support, drabar, R.H. .	41, 67	1	7	..	7.50
3136 AA	Support, drawbar, L.H. .	41, 67	1	7	..	7.50
3137 AA	Drawbar.	66	1	11	8	2.50
3139 AA	Door, dirt box, bottom .	66	1	22	6	6.00
3140 AA	Hasp and Hinge, dirt box	66	2	..	8	1.50
3141 AA	Guard and rail, wheel, R.H. (Used on Contract No. W145 Eng. 514 and Contract No. W1088 Eng. 2163.). . .	64	1	13	..	4.00
A3141 AA	Guard and rail, wheel, R. H. (Used on Contract No. W1088 Eng. 2159 and after.) . . .	64	1	13	..	4.00
3142 AA	Guard and rail, wheel, L. H. (Used on Contract No. W145 Eng. 514 and Contract No. W1088 Eng. 2163.). . .	64	1	13	..	4.00
A3142 AA	Guard and rail, wheel, L. H. (Used on Contract No. W1088 Eng. 2159 and after.) . . .	64	1	13	..	4.00

Part No.	Description	Page No.	Qty. Used	Weight Each Lbs.	Weight Each Oz.	Price Each
3143 AA	Support and stop, wheel guard and brake pedal pin.	64	1	3	2	2.75
3145 AA	Screen, radiator	20	1	1	8	2.50
3146 AA	Arm, steering spindle, with ball and bushing, L.H.	45	1	4	8	5.25
3147 AA	Link, steering drag. . .	45	1	2	7	4.00
3148 AA	Bar, front tie	57	1	16	..	8.50
3149 AA	Lever and pin assembly, throttle	48	1	1	6	1.00
3150 AA	Shaft and lever, foot accelerator. (Used on Contract No. W145 Eng. 514 and Contract No. W1088 Eng. 2163.). . .	48	1	1	8	3.25
A3150 AA	Shaft and lever, foot accelerator. (Used on Contract No. W1088 Eng. 2159 and after.)	48	1	1	6	1.50
3151 AA	Box. dirt, complete.	66–67	1	125	..	30.00
3157 AA	Crank, starting. (Used on Contract No. W145 Eng. 514 and Contract No. W1088 Eng. 2163.).	36	1	3	..	1.50
A3157 AA	Crank, starting. (Used on Contract No. W1088 Eng. 2159 and after.)	36	1	3	..	2.50
3165 AA	Wheel, front, with bearing cups and studs . .	55	2	25	..	35.00
A3168 AA	Box, tool.	66	1	9	8	7.50
3173 AA	Brace, dirt box, upper .	44	1	7	6	3.50
3174 AA	Housing, rear axle . . .	58	2	53	..	50.00
3177 AA	Pin and chain, drawbar .	66	1	1	4	1.25
3178 AA	Pin and chain, dirt box, upper.	67	2	..	10	.75
3179 AA	Pin and chain, dirt box, lower.	67	2	..	10	.75
3180 AA	Chain, dirt box door . .	66	2	..	4	.35
3202 AA	Shaft, crank	7	1	46	..	38.50
3204 AA	Plate, clutch pressure, with release levers assembled.	30	1	12	10	15.00
3214 AA	Wheel, rear, with studs. (Used on following Contracts, W145 Eng. 514; W1088 Eng. 2163; W1088 Eng. 2159; and W1088 Eng. (MSP) 2461.)	60	2	74	..	50.00
3224 AA	Gaskets, complete set of engine	6	1	1	5	3.50
3240 AA	Bracket for tractor lifting link, R. H. .	54	1	..	2	.40
3241 AA	Bracket for tractor lifting link, L. H. .	54	1	..	2	.40
3254 AA	Liners, connecting rod bearing, upper and lower half. .010" undersize.	7	4	..	4	1.50
3255 AA	Liners, connecting rod bearing, upper and lower half. .020" undersize.	7	4	..	4	1.50

Part No.	Description	Page No.	Qty. Used	Weight Each Lbs.	Weight Each Oz.	Price Each
3256 AA	Liners, crankshaft bearing, center, upper and lower. .010" undersize	7	1	1	2	7.00
3257 AA	Liners, crankshaft bearing, center, upper and lower. .020" undersize	7	1	1	2	7.00
3258 AA	Liners, crankshaft bearing, upper and lower, front or rear. .010" undersize	7	2	..	8	3.00
3259 AA	Liners, crankshaft bearing, upper and lower, front or rear. .020" undersize	7	2	..	8	3.00
3260 AA	Impeller assembly, water pump; purchased from Schwitzer-Cummins Co., Indianapolis, Ind. Their No. C114537	18	1	..	14	3.00
3279 AA	Cover, timing gear	6	1	14	..	5.75
3290 AA	Support, steering shaft, with fire extinguisher bracket	45	1	5	8	3.25
0562 AB	Gasket, carburetor	11	1	..	1/6	.11
0719 AB	Gasket, transmission case and power take-off rear cover caps	52	1	..	1/4	.20
0767 AB	Washer, lip, for connecting rod bolt	7	8	..	1/14	.03
0774 AB	Washer, valve rocker arm shaft	8	2	..	1/2	.06
0794 AB	Thrower, oil, crankshaft	7	1	..	3	.17
0807 AB	Screw, cap, gear shifter fork	46, 47	11	..	1	.11
0809 AB	Spring, plunger, power take-off and gear shifter	46, 47	4	..	1/2	.11
0869 AB	Finger, governor	16	1	..	1	.30
0871 AB1	Ring, snap, governor thrust bearing	16	1	..	1/12	.06
0872 AB1	Pin, governor weight	16	2	..	1	.17
0877 AB	Pin, starting, crank handle	36	1	..	1	.22
0878 AB	Handle, starting crank	36	1	..	4	.17
0906 AB	Washer, foot brake cross shaft	41	1	..	1	.11
0970 AB	Washer, lock, camshaft nut	8	1	..	1/4	.07
0971 AB	Nut, camshaft (1-1/8"-12 thrd. hexagon)	8	1	..	4	.30
0995 AB	Plunger, gear shift	47	3	..	1/2	.22
01036 AB	Gasket, fuel tank cap	21	1	..	1/30	.11
01113 AB	Washer, transmission flange bolt and cylinder block flange	34	2	..	1/4	.06

Part No.	Description	Page No.	Qty. Used	Weight Each Lbs.	Weight Each Oz.	Price Each
01189 AB	Gasket, oil pump screen flange	9	1	..	1/12	.11
01209 AB1	Plunger, thrust, camshaft	8	1	..	1	.35
01237 AB	Lock, front axle king pin	54	2	..	3	.22
01239 AB	Plug, steering spindle	55	4	..	6	.30
01246 AB	Nut, rear axle shaft	58	2	2	4	1.95
01255 AB	Stud, rear axle housing	34	10	..	7	.17
01309 AB	Nut, reverse idler gear stud	38	2	..	1	.22
01405 AB	Gasket, clutch hand hole cover	34	2	..	1/4	.11
01437 AB	Gasket, oil filler cap	16	1	..	1/3	.12
01440 AB	Spring, camshaft thrust plunger	8	1	..	1/6	.11
01441 AB	Weight, governor	16	2	..	6	1.40
01455 AB	Cup, first reduction shaft. Timken No. 2720	35	1	..	8	1.45
01456 AB	Cone, first reduction shaft. Timken No. 2788	35	1	..	10	2.45
01459 AB1	Bearing, thrust, governor shaft; purchased from Aetna Ball Bearing Mfg. Co., Chicago, Ill. Their No. A1506.	16	1	..	2	.90
01461 AB	Cup, front wheel. Timken No. 14274	55	2	..	5	.65
01462 AB	Cone, front wheel. Timken No. 14125	55	2	..	7	1.85
01528 AB1	Washer, lock, steering spindle	55	2	..	1	.11
01532 AB	Washer, steering shaft	45	2	..	2	.11
01544 AB	Cone, front hub. Timken No. 358	55	2	..	13	2.95
01615 AB	Gasket, transmission case rear cover	52	1	..	1/2	.30
01616 AB	Cover, front, power takeoff	52	1	..	5	.40
01623 AB	Shim, clutch shaft bearcarrier No. 30 gauge	32	As required	..	1	.11
01642 AB	Shim, differential bearing and brake carrier.	40	As required	..	1	.11
01643 AB	Shim, transmission bearing carrier	35, 38	As required	..	1/3	.11
01669 AB	Pin, king, front axle	55	2	1	15	1.65
01672 AB	Rod, tie, front axle	45	1	4	..	.85
01720 AB	Bearing, power take off shaft. New departure No. 1207	52	1	..	12	3.50
01763 AB	Washer, thrust, governor gear	16	1	..	1	.11
01771 AB	Shim, clutch shaft bearing carrier .005" thick	32	As required	..	1/5	.11
01772 AB	Shim, differential and brake carrier, .005" thick	40	As required	..	1/4	.11

PARTS AND PRICE LIST "SI" AIRBORNE TRACTORS
(Continued)

Part No.	Description	Page No.	Qty. Used	Weight Each Lbs.	Weight Each Oz.	Price Each
01773 AB	Shim, transmission bearing carrier, .005" thick.	35, 38	As required	..	1/10	.11
01798 AB	Ring, spark plug wire.	24, 25	1	..	1/6	.11
01822 AB	Collar, power take off	52	1	..	4	.40
01823 AB2	Spacer, power take off shaft.	52	1	..	5	.45
01847 AB	Spring, return, clutch throwout lever	31	1	..	2	.17
01962 AB	Cover, clutch hand hole.	34	2	1	..	.30
02068 AB	Dowel bolt, transmission	34	1	..	1	.22
02439 AB1	Axle, front.	54	1	42	..	16.50
02457 AB	Clip, tail lamp wire	24	1	..	1/6	.11
02473 AB	Gasket, gear shift lever ball socket.	46	2	..	1/18	.11
02499 AB	Pin, yoke end.	31, 41	8	..	2	.17
02532 AB	Clip, clutch foot pedal return spring.	31	2	..	1/2	.11
02566 AB	Bearing, thrust, front axle. Timken T-126.	54, 55	2	..	5	.60
02701 AB	End, yoke, brake rod and clutch throwout rod.	31, 41	2	..	5	.45
02825 AB	Clip, front and rear lamp wire.	25	4	..	1/4	.06
02846 AB	Gasket, oil pump screen flange cap screw	9	3	..	1/50	.06
02849 AB	Spacer, power take off mounting plate	52	4	..	1	.11
02856 AB	Washer, steering drop arm shaft.	45	2	..	1	.11
02887 AB1	Washer, reverse idler gear stud.	38, 55	3	..	1	.11
03011 AB	Gasket, rear axle housing.	58	2	..	2	.25
03016 AB1	Dowel, transmission and cylinder block	34	1	..	2	.22
03092 AB	Clip, fuel tube, oil gauge tube, temperature gauge tube.	24, 25	2	..	1	.06
03226 AB	Bolt, transmission flange	34	2	..	7	.30
03280 AB1	Screw, clutch brake adjustable collar.	31	1	..	1	.17
03281 AB	Lining, clutch brake shoe	31	1	..	2	.40
03282 AB	Spring, clutch brake shoe	31	1	..	1	.17
03430 AB1	Bushing, steering drop arm shaft.	45	1	..	4	.25
03457 AB	Washer, end, shifter shaft	47	4	..	1/2	.06
03458 AB	Gasket, shifter shaft end washer	47	4	..	1/50	.06
03501 AB	Ball, gear shift lever handle	46	1	..	4	.55
03601 AB1	Ammeter; purchased from Rochester Mfg. Co. Inc., Rochester, N. Y. Their No. 4000	24	1	..	6	.85

PARTS AND PRICE LIST "SI" AIRBORNE TRACTORS
(Continued)

Part No.	Description	Page No.	Qty. Used	Weight Each Lbs.	Weight Each Oz.	Price Each
03602 AB1	Battery, storage - 15 plate - 6 volt. Exide No. XT-151A with no overflo vents; purchased from Electric Storage Battery Co., Philadelphia, Pa. . .	25	1	41	10	13.20
03620 AB	Plunger, oil pump relief	9	1	..	1	.11
03648 AB	Shim, rear, axle outer bearing, .005" thick .	58	As required	..	1/4	.11
03649 AB	Shim, rear axle, outer bearing, .0125" thick	58	As required	..	1/2	.11
03650 AB	Washer, lock, rear axle inner bearing plate. .	58	6	..	1/3	.11
03674 AB	Plunger, power take off and gear shifter . . .	46	1	..	1	.17
03684 AB	Gear, reverse idler. . .	38	1	2	8	3.60
03750 AB	Spring, thrust, governor shaft.	16	1	..	1/2	.11
03754 AB	Cone, differential gear and sprocket. Timken No. 399A	40, 58	6	1	1	3.65
03755 AB	Cup, differential gear and sprocket. Timken No. 394A	40, 58	6	..	10	2.85
03757 AB	Washer, felt, rear axle.	58	2	..	1/2	.22
03758 AB	Ring, snap, rear axle shaft.	58	2	..	1	.11
03765 AB	Cup, first reduction shaft, L.H. Timken No. 02820.	35, 38	3	..	7	1.30
03766 AB	Cone, first reduction shaft, L.H. Timken No. 02877.	35, 38	3	..	10	2.20
03783 AB	Chain, roller; purchased from Whitney Mfg. Co., Hartford, Conn. Their No. 212HS.	58	2	16	..	12.65
03857 AB	Bushing, draw bar support.	67	4	..	4	.30
03866 AB	Seal, oil, rear axle shaft	40,41, 58	4	..	5	.80
03868 AB	Seal, oil, clutch shaft.	32	1	..	4	.60
03899 AB	Seal, oil, power take off shaft.	52	1	..	4	.65
03997 AB	Link, pin, with plate and cotter pins for 03783AB drive chain. .	58	As required	..	5	.35
04234 AB	Spring, oil pump relief valve.	9	1	..	1/2	.11
04240 AB	Seal, oil, steering drop arm shaft.	45	1	..	3	.55
04244 AB	Seal, oil, power take off shifter shaft.	46	1	..	1/2	.40
04311 AB	Nut, clutch release lever adjusting screw; purchased from Rockford Drilling Machine Co., Rockford, Ill. Their No. CL-1608. . .	30	3	..	1/5	.11

PARTS AND PRICE LIST "SI" AIRBORNE TRACTORS
(Continued)

Part No.	Description	Page No.	Qty. Used	Weight Each Lbs.	Weight Each Oz.	Price Each
04312 AB	Wire, lock, steering drag link.	45	2	..	1/25	.11
04313 AB	Screw, adjusting, steering drag link.	45	2	..	2	.35
04314 AB	Bearing, steering drag link	45	4	..	1	.17
04315 AB	Spring, steering drag link	45	2	..	1/4	.17
04316 AB	Seat, steering drag link	45	2	..	1	.17
04370 AB	Gauge, oil pressure. - Rochester Mfg. Co., Inc, Rochester, N. Y.	24	1	..	6	1.25
04378 AB	Ring, snap, govenor weight pin.....	16	4	..	1/24	.06
04381 AB	Seal, oil, governor shaft.	16	1	..	1	.40
04403 AB	Spring, valve rocker arm shaft, short	8	2	..	1/4	.11
04404 AB	Plug, valve rocker arm shaft.	8	2	..	1/3	.06
04514 AB	Key, rear axle	58	2	..	6	.35
04595 AB	Nipple starting terminal	24	3	..	1/3	.40
04696 AB	Shim, clutch shaft bearing carrier .003" thick.	32	As required	..	1/7	.11
04697 AB	Shim, first reduction shaft bearing carrier .003" thick.	35, 38	As required	..	1/7	.11
04905 AB	Strainer, fuel. Purchased from Imperial Brass Mfg. Co., Chicago, Ill. Their No. 42949.	23	1	..	7	1.40
04981 AB	Switch, starting. - Purchased from Electric Autolite Co., Toledo, O. Their No. SW-01. .	24	1	..	5	.55
05039 AB	Gasket, starting motor .	24	1	..	1/4	.17
05086 AB	Seal, oil, clutch throwout shaft and steering worm bearing	31, 45	3	..	1	.45
05157 AB	Nut, front axle tie rod yoke end pin	45	2	..	1/2	.17
05359 AB	Bearing, clutch release; purchased from Aetna Ball Bearing Mfg. Co., Chicago, Ill. Their No. A959-1 Type T. . .	31, 32	1	1	..	2.50
05382 AB	Ring, snap, power take off shaft.	52	1	..	1/12	.11
05386 AB	Plate, mounting, power take off guard	52	1	1	9	.55
05565 AB	Gear, flywheel ring. . .	7	1	3	2	3.30
05698 AB	Clamp, rear wheel rim. .	60-62	12	..	10	.30
05701 AB	Gear, crankshaft	7	1	1	6	3.30
05702 AB	Bolt, flywheel	7	6	..	1	.11
05703 AB	Liner, crankshaft bearing, front and rear. .	7	4	..	4	1.15
05704 AB	Liner, crankshaft, bearing, center.	7	2	..	9	2.85
05705 AB	Screw, cap, crank shaft bearing.	7	6	..	5	.17

PARTS AND PRICE LIST "SI" AIRBORNE TRACTORS
(Continued)

Part No.	Description	Page No.	Qty. Used	Weight Each		Price Each
				Lbs.	Oz.	
05706 AB	Stud, cylinder head. . .	6	14	..	3	.11
05707 AB	Ring, cylinder barrel packing.	7	4	..	1/3	.17
05709 AB	Liner, connecting rod bearing.	7	8	..	2	.60
05711 AB	Bushing, connecting rod.	7	4	..	2	.30
05712 AB	Pin, piston.	7	4	..	4	.65
05713 AB	Ring, piston pin retainer	7	8	..	1/5	.06
05714 AB	Shaft, oil pump drive. .	9	1	..	12	.65
05715 AB	Shaft, stub, oil pump. .	9	1	..	1-1/2	.22
05716 AB	Gear, with keyway, oil pump	9	1	..	4	1.10
05717 AB	Gear, without keyway, oil pump	9	1	..	4	1.10
05718 AB	Cover, oil pump.	9	1	..	5	.30
05720 AB	Pipe, inlet, oil pump. .	9	1	..	1	.11
05724 AB1	Lifter, push rod	8	8	..	3	.55
05725 AB	Washer, thrust, camshaft	8	1	..	1/4	.11
05726 AB	Button, thrust, cam shaft and governor shaft.	8, 16	2	..	1/3	.11
05727 AB	Seal, oil, crankshaft. .	6	1	..	2	.95
05728 AB	Bushing, governor lever shaft.	16	1	..	1	.17
05729 AB	Shaft, governor lever. .	16	1	..	4	.85
05730 AB	Screw, adjusting, governor lever.	16	1	..	1/4	.11
05731 AB	Spring, governor	16	1	..	2	.17
05732 AB	Rod, governor lever to carburetor	16	1	..	1	.22
05733 AB	Gasket, timing gear cover.	6	1	..	1/2	.17
05734 AB	Gasket, magneto bracket.	16	1	..	1/14	.06
05735 AB	Bushing, magneto bracket	16	2	..	1	.17
05736 AB	Shaft, governor.	16	1	..	12	2.20
05737 AB	Plunger, thrust, governor shaft.	16	1	..	1/2	.11
05743 AB	Gasket, oil pan sides. .	6	2	..	1	.11
05744 AB	Gasket, oil pan front. .	6	1	..	1/3	.06
05745 AB	Insert, exhaust valve seat	8	4	..	1/2	.55
05746 AB	Valve, exhaust	8	4	..	4	.90
05747 AB	Valve, inlet	8	4	..	4	.80
05748 AB	Spring, inlet and exhaust valve.	8	8	..	2	.23
05749 AB	Retainer, valve spring .	8	8	..	1/4	.11
05750 AB	Lockwasher, valve spring retainer	8	16	..	1/12	.06
05751 AB	Stud, valve rocker arm bracket, long.	8	2	..	2	.11
05752 AB	Stud, valve rocker arm bracket, short	8	2	..	2	.11
05753 AB1	Bracket, valve rocker arm shaft.	8	4	..	5	1.25
05755 AB	Spring, valve rocker arm shaft, long. . . .	8	2	..	1/5	.11
05759 AB	Bushing, valve rocker arm.	8	8	..	1/2	.17

PARTS AND PRICE LIST "SI" AIRBORNE TRACTORS
(Continued)

Part No.	Description	Page No.	Qty. Used	Weight Each Lbs.	Weight Each Oz.	Price Each
05760 AB	Button, push rod adjusting.	8	8	..	1/3	.11
05761 AB	Rod, push.	8	8	..	3	.40
05762 AB2	Gasket, cylinder head. .	6	1	..	10	1.00
05763 AB	Cover, cylinder head . .	6	1	3	15	1.65
05764 AB	Gasket, cylinder head cover.	6	1	..	1	.55
05766 AB	Gasket, breather tube elbow.	6	1	..	1/50	.06
05767 AB	Ferrule, inlet post. . .	10	2	..	1/5	.11
05768 AB	Gasket, inlet and exhaust manifold . . .	10	2	..	1/3	.12
05769 AB	Clamp, manifold.	10	4	..	3	.30
05770 AB	Stud, manifold clamp . .	10	4	..	2	.11
05771 AB	Carburetor; purchased from Zenith Carburetor Co., Detroit, Mich. Their No. 61AXJ-7. . .	11	1	2	13	12.00
05776 AB	Blade, fan, assembly . .	18	1	1	11	1.65
05777 AB	Flange, adjustable, fan pulley hub; purchased from Schwitzer-Cummins Co., Indianapolis, Ind. Their No. C-105187	18	1	..	5	.85
05778 AB	Hub, fan pulley; purchased from Schwitzer-Cummins Co., Indianapolis, Ind. Their No. C-105186	18	1	..	11	1.40
05779 AB	Bearing, assembly, water pump; purchased from Schwitzer-Cumming Co., Indianapolis, Ind. Their No. C-110147 . .	18	1	..	10	3.00
05780 AB	Ring, snap, water pump bearing; purchased from Schwitzer-Cummins Co., Indianapolis, Ind. Their No. C102178.	18	1	..	1/34	.11
05781 AB	Seal, flexible, water pump; purchased from Schwitzer-Cummins Co., Indianapolis, Ind. Their No. C105-710 . .	18	1	..	1/10	.40
05782 AB	Ring, water pump seal clamp; purchased from Schwitzer-Cummins Co., Indianapolis, Ind. Their No. C-19895. . .	18	1	..	1/50	.11
05783 AB	Spring, water pump seal; purchased from Schwitzer-Cummins Co., Indianapolis, Ind. Their No. C-106658 . .	18	1	..	1/6	.30

Part No.	Description	Page No.	Qty. Used	Weight Each Lbs.	Weight Each Oz.	Price Each
05784 AB	Guide, water pump flexible seal spring; purchased from Schwitzer-Cummins Co., Indianapolis, Ind. Their No. C-105762	18	1	..	1/14	.17
05785 AB	Washer, water pump carbon seal; purchased from Schwitzer-Cummins Co., Indianapolis, Ind. Their No. C-105704	18	1	..	1/6	.45
05786 AB	Ring, snap, water pump impeller; purchased from Schwitzer-Cummins Co., Indianapolis, Ind. Their No. C-19395.	18	1	..	1/36	.06
05787 AB	Cover, water pump; purchased from Schwitzer-Cummins Co., Indianapolis, Ind. Their No. C-110167	18	1	..	13	1.10
05788 AB	Gasket, water pump, cover; purchased from Schwitzer-Cummins Co., Indianapolis, Ind. Their No. C-110168 . .	18	1	..	1/8	.17
05789 AB	Gasket, upper, water pump body.	18	1	..	1/3	.11
05790 AB	Gasket, lower, water pump body.	18	1	..	1/2	.17
05791 AB	Gasket, water outlet elbow.	20	1	..	1/4	.11
05793 AB	Pipe, radiator drain. (3/8x4-1/2 black steel pipe).	18	1	..	3	.30
05794 AB	Hose, water inlet. . . .	20	1	..	8	.55
05795 AB	Hose, water outlet - 1-3/4" I.D. x 4" long.	20	1	..	4	.30
05796 AB	Radiator; purchased from Modine Mfg. Co., Racine, Wis.	20	1	19	..	25.30
05798 AB1	Thermostat; purchased from The Dole Mfg. Co. Chicago, Ill. Their Dwg. No. EX-1402 . . .	20	1	..	3	1.10
05806 AB	Plate, lock, radiator cap.	20	1	..	1/6	.11
05807 AB	Gasket, radiator cap . .	20	1	..	1/2	.11
05851 AB	Bearing, clutch shaft; purchased from New Departure, Bristol, Conn., special for "Case". Their No. 5208	32	1	1	7	7.70
05852 AB	Retainer, clutch shaft bearing.	32	1	..	5	.17
05853 AB	Washer, lip, clutch shaft bearing retainer	32	3	..	1/16	.06

PARTS AND PRICE LIST "SI" AIRBORNE TRACTORS
(Continued)

Part No.	Description	Page No.	Qty. Used	Weight Each Lbs.	Weight Each Oz.	Price Each
05854 AB	Ring, snap, clutch shaft	32	1	..	1/6	.11
05857 AB	Shaft, first reduction .	35	1	12	13	8.25
05859 AB	Pinion, third and fourth speed.	35	1	10	13	9.90
05860 AB	Spacer, first reduction shaft.	35	1	..	10	.45
05861 AB	Seal, oil, first reduction shaft	35	1	..	2	.65
05865 AB1	Shaft, sliding gear. . .	38	1	16	8	10.75
05866 AB	Gear, low speed sliding.	38	1	7	12	6.05
05867 AB	Gear, second and reverse sliding.	38	1	6	1	5.80
05868 AB	Gear, third speed sliding.	38	1	4	15	6.90
05870 AB	Bushing, fourth speed gear (2595AA).	38	1	..	6	.55
05875 AB	Gear and sprocket, differential	40, 41	2	10	7	15.95
05876 AB	Plug, differential gear and sprocket	40	2	..	1	.11
05878 AB	Pin, lock, actuator ring; purchased from Auto Specialties Mfg. Co., St. Joseph, Mich. Their No. BP-270 . . .	41	6	..	1/16	.06
05880 AB1	Stud, brake housing. . .	40	8	..	4	.22
05883 AB	Washer, tension, independent brake adjusting pinion; purchased from Auto Specialties Mfg. Co., St. Joseph, Mich. Their No. BP-296	41	2	..	1/8	.06
05884 AB	Washer, left, independent brake adjusting pinion; purchased from Auto Specialties Mfg. Co., St. Joseph, Mich. Their No. BP-297 . . .	41	2	..	1/25	.06
05885 AB	Ring, actuator; purchased from Auto Specialties Mfg. Co., St. Joseph, Mich. Their No. BP-260 . . .	41	2	..	2	.85
05886 AB	Actuator; purchased from Auto Specialties Mfg. Co., St. Joseph, Mich. Their No. BP-215 . . .	41	2	..	8	1.95
05890 AB	Spring, disc separating; purchased from Auto Specialties Mfg. Co., St. Joseph, Mich. Their No. BP-245 . . .	41	6	..	1/7	.06
05891 AB	Pins, spring lock; purchased from Auto Specialties Mfg. Co., St. Joseph, Mich. Their No. BP-250 . . .	41	6	..	1/16	.06

PARTS AND PRICE LIST "SI" AIRBORNE TRACTORS
(Continued)

Part No.	Description	Page No.	Qty. Used	Weight Each Lbs.	Weight Each Oz.	Price Each
05892 AB	Washer, spring retainer; purchased from Auto Specialties Mfg. Co., St. Joseph, Mich. Their No. BP-255 . . .	41	6	..	1/29	.06
05903 AB	Bearing, pilot, power take-off shaft; purchased from New Departure, Bristol, Conn. Their No. 3204.	52	1	..	3	2.00
05904 AB	Ring, snap, power take-off shaft.	52	1	..	1/14	.11
05905 AB	Shaft, shifter, low gear	47	1	1	11	1.65
05906 AB	Shaft, shifter, second, reverse, third and fourth	47	1	1	11	1.65
05907 AB	Fork, low gear	47	1	1	..	.70
05908 AB	Fork, second and reverse, third and fourth gear.	47	2	1	8	1.10
05909 AB	Gasket, transmission case, front end. . . .	34	1	..	1	.30
05914 AB	Ball, gear shift, lever.	46	1	..	6	.30
05915 AB	Spring, gear shift lever ball	46	1	..	1	.06
05920 AB	Cap, gear shift dust . .	46	1	..	2	.30
05922 AB	Plate, gear shifter gate lockout.	46	1	..	1	.30
05923 AB	Spring, gear shifter gate lockout	46	1	..	1	.17
05970 AB	Ball joint, governor lever, to carburetor .	16	2	..	1	.30
05972 AB	Tube, water by pass. . .	20	1	..	1	.30
05973 AB	Motor, starting; purchased from Electric Autolite Co., Toledo, Ohio. Their No. MZ-4095. . .	24	1	19	5	15.95
05976 AB	Screw, water pump body .	25	1	..	6	.30
05977 AB	Belt, fan and generator.	18	1	..	9	1.20
05989 AB	Bolt, hood hold down . .	20	2	..	1	.11
05999 AB	Spark plug; purchased from A. C. Spark Plug Co., Flint, Michigan. Their No. 45AC 14M/M .	25	4	1	3/4	.65
06044 AB	Ring, snap, governor shaft and brake pedal stud	16	1	..	1/12	.06
06055 AB	Bushing, steering spindle.	55	4	..	3	.35
06141 AB	Cushion, seat.	44	1	1	11	2.75
06152 AB	Ring, snap, steering worm bearing retainer washer	45	1	..	1/4	.06
06182 AB	Clip for head lamp and tail lamp wire connectors.	24, 25	2	..	1/3	.06
06300 AB	Gasket, power take-off cover.	52	1	..	1/6	.06
06302 AB	Wrench, spark plug . . .	68	1	..	4	.30
06305 AB	Strainer, fuel . . . . . NOTE—When fuel strainer is wanted for replacement as a unit, use 04905 AB.	22	1	..	7	1.40

PARTS AND PRICE LIST "SI" AIRBORNE TRACTORS
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Part No.	Description	Page No.	Qty. Used	Weight Each Lbs.	Weight Each Oz.	Price Each
06310 AB	Anti-squeak, hood, front and rear	21	2	..	4	.11
06313 AB	Tray, battery	24	1	1	10	1.10
06316 AB	Bolt, battery clamping frame	24	2	..	4	.30
06320 AB	Disc, friction, throttle lever	48	1	..	1	.17
06322 AB	Rod, front, throttle control	16, 48	1	..	6	.30
06324 AB	Clip, choke rod and clutch throwout lever return spring	41	1	..	1/2	.06
06325 AB	Control, flexible choke	24	1	..	4	.55
06326 AB	Spring, throttle lever	48	1	..	1	.11
06327 AB	Panel, instrument	24	1	1	12	1.10
06328 AB	Stud, exhaust elbow	10	4	..	1	.11
06329 AB	Pipe, exhaust	10	1	2	11	1.65
06330 AB	Headlamp; purchased from Guide Lamp Co., Anderson, Ind. Their No. 524M	25	2	2	..	4.95
06341 AB1	Cushion, fuel tank	21	2	..	1/2	.11
06350 AB	Gauge, temperature; purchased from Rochester Mfg. Co., Inc., Rochester, N. Y.	24	1	..	10	2.50
06351 AB	Tube, oil gauge	24	1	..	2	.40
06352 AB	Switch, magneto; purchased from H. A. Douglas Mfg. Co., Bronson, Mich.	24	1	..	1	.45
06353 AB	Switch, light; purchased from H. A. Douglas Mfg. Co., Bronson, Mich.	24	1	..	3	.55
06354 AB	Cable, battery ground	25	1	..	11	.55
06355 AB	Cable, battery to starting switch	24	1	1	..	.85
06356 AB	Cable, starting switch to starting motor	24	1	..	14	1.10
06357 AB	Wire, starting switch to ammeter	24	1	..	1/2	.17
06358 AB	Wire, generator to ammeter	25	1	..	2	.40
06359 AB	Wire, ammeter to light switch and cut out wire	24	1	..	1/6	.11
06360 AB	Wire, magneto to magneto switch	24	1	..	1-1/4	.17
06362 AB	Cover, battery positive terminal	24	1	..	1	.17
06363 AB	Extension, choke control	25	1	..	1/4	.11
06371 AB	Tube, fuel tank to carburetor	21	1	..	5	.85
06383 AB	Ball, radius rod pivot	54	1	..	13	.95
06384 AB	Ring, snap, sliding gear shaft	38	1	..	1/3	.11

PARTS AND PRICE LIST "SI" AIRBORNE TRACTORS
(Continued)

Part No.	Description	Page No.	Qty. Used	Weight Each Lbs.	Weight Each Oz.	Price Each
06398 AB	Washer, fan hub lock screw; Purchased from Schwitzer-Cummins Co., Indianapolis, Ind. Their No. C-105189 . .	18	2	..	1/50	.03
06401 AB1	Screw, lock, starting motor.	6, 24	1	..	3	.30
06422 AB	Bracket, wire and cable clip	24	1	..	1	.06
06434 AB	Cap, air cleaner; purchased from United Specialties Co., Chicago, Ill. Their No. B-8118	12	1	..	12	1.10
06469 AB	Lock, clutch pilot bearing.	7	1	..	2	.06
06511 AB	Coupling, magneto. . . .	16	1	..	9	1.40
06519 AB	Plug, valve rocker arm oil tube	8	1	..	1/2	.11
06524 AB	Nut, oil pump relief . .	9	1	..	2	.17
06556 AB	Ball, steering, arm. . .	45	1	..	4	.45
06563 AB	Ring, snap, foot pedal anchor pin	31	4	..	1/2	.05
06573 AB	Shaft, clutch throwout .	31	1	4	8	1.10
06575 AB	Bearing, pilot, clutch shaft; purchased from New Departure Bristol, Conn. Their No. 88504.	7	1	..	4	2.40
06582 AB	Socket, radius rod ball.	54	1	2	..	.75
06583 AB	Cap, radius rod ball socket	54	1	1	1	.75
06595 AB1	Inserts, independent brake, 40 degree; purchased from Auto Specialties Mfg. Co., St. Joseph, Mich. Their No. BP-232	41	12	..	1/3	.30
06603 AB	Gear, power take off . .	52	1	9	..	7.50
06605 AB	Shaft, power take off. .	52	1	20	..	12.50
06606 AB	Screw, connecting rod. . NOTE-When 06606 AB screw is furnished for repairs include two 0767 AB Lip Washers	7	8		2	.15
06619 AB	Wire, spark plug, No. 1 and No. 4 cylinder . .	25	2	..	1	.40
06620 AB	Wire, spark plug, No. 2 and No. 3 cylinder . .	25	2	..	2	.40
06643 AB	Pin, clutch release lever; purchased from Rockford Drilling Machine Co., Rockford, Ill. Their No. CL-4520	30	3	..	1	.35
06644 AB	Plate, back, clutch; purchased from Rockford Drilling Machine Co., Rockford, Ill. Their No. CL-3688-2.	30	1	5	2	6.00

PARTS AND PRICE LIST "SI" AIRBORNE TRACTORS
(Continued)

Part No.	Description	Page No.	Qty. Used	Weight Each Lbs.	Weight Each Oz.	Price Each
06645 AB	Spring, clutch pressure; purchased from Rockford Drilling Machine Co., Rockford, Ill. Their No. CL-2317-4. .	30	12	..	1	.22
06646 AB	Cleaner, air; purchased from United Specialties Co., Chicago, Ill. Their Model No. CT50-11420	12	1	5	8	7.50
06647 AB	Bracket, air cleaner . .	12	1	1	2	.25
06648 AB	Hose, air cleaner. 1-1/2 I. dia. x 2" long. . .	12	1	..	2	.10
06667 AB	Bolt, front axle pivot .	20	1	1	8	2.00
06670 AB	Shaft, rear axle	58	2	27	4	25.00
06671 AB	Spacer, rear axle shaft.	58	2	..	4	.25
06672 AB	Nut, first reduction shaft. (Used on Contract No. W145 Eng. 514 and Contract No. W1088 Eng. 2163.). . .	36	1	..	4	2.50
06673 AB	Guard, side crank. . . .	35, 36	1	..	2	.75
06683 AB	Pin, anchor, foot pedal.	31	1	..	14	.75
06685 AB	Shaft, brake cross . . .	41	1	5	8	1.50
06686 AB	Rod, brake, pedal to cross shaft.	31, 41	3	1	..	1.75
06687 AB	Rod, brake, cross shaft to brake	41	2	1	6	1.50
06688 AB	Pin, anchor, brake pedal	41, 58	1	1	4	1.25
06689 AB	Ratchet, foot brake pedal	41	1	1	2	.75
06690 AB	Stud, foot brake ratchet	38, 41	1	..	2	.50
06691 AB	Clip, foot brake spring.	41	1	..	10	.40
06692 AB	Pin, throttle lever control rod	48	1	..	1	.20
06693 AB	Rod, throttle, hand lever to accelerator lever.	48	1	..	6	.50
06694 AB	Rod, throttle control, rear	48	1	..	4	.40
06697 AB	Bracket, foot accelerator pedal shaft.	48	1	..	4	.25
06698 AB	Pin, lock, brake pedal .	41	1	..	6	.35
06704 AB	Screw, set, shifter shaft.	47	2	..	1	.11
06726 AB	Joint, universal, steering shaft; Blood Bros. Allegan, Mich. Their No. K1C, Drawing No. 9197	45	1	2	..	2.75
06735 AB	Washer, rear axle housing stud	34	10	..	3/4	.11
06906 AB	Nut, first reduction shaft. (Used on Contract No. W1088 Eng. 2159 and after.) . . .	36	1	..	14	2.25
06907 AB	Reflector, rear.	66	1	..	6	.60
06912 AB	Brace, rear, wheel guard R. H. (Used on Contract No. W1088 Eng. 2159 and after.) . . .	64	1	..	12	.30

PARTS AND PRICE LIST "SI" AIRBORNE TRACTORS
(Continued)

Part No.	Description	Page No.	Qty. Used	Weight Each Lbs.	Weight Each Oz.	Price Each
06913 AB	Brace, rear, wheel guard L. H. (Used on Contract No. W1088 Eng. 2159 and after.) . . .	64	1	..	12	.30
06914 AB	Brace, wheel guard front. (Used on Contract No. W1088 Eng. 2159 and after.) . . .	64	2	..	12	.30
06928 AB	Clamp, air cleaner cap; purchased from United Specialties Co. Chicago, Ill. Their No. 8136	12	1	..	2	.15
06930 AB	Shaft, differential. . .	40	1	9	6	4.50
06936 AB	Stud, R. H., rear wheel. (Used on Contract No. W1088 Eng. (MSP) 2632 and after.).	62	10	..	6	.50
06937 AB	Stud, L. H., rear wheel. (Used on Contract No. W1088 Eng. 2632 and after.).	62	10	..	6	.50
06938 AB	Nut, rear wheel stud, R. H. (Used on Contract No. W1088 Eng. 2632 and after.) . . .	62	10	..	4	.25
06939 AB	Nut, rear wheel stud, L. H. (Used on Contract No. W1088 Eng. 2632 and after.) . . .	62	10	..	4	.25
07054 AB1	Bushing, steering spindle arm.	45	2	..	1/2	.15
07057 AB	Cup, front wheel. Timken No. 354 A.	55	2	..	6	1.75
07058 AB	Seal, front wheel. . . .	55	2	..	1	1.10
07059 AB	Retainer, front wheel seal	55	2	..	7	.22
07060 AB	Seal, front wheel retainer	55	2	..	1/6	.30
07061 AB	Yoke, end, front axle tie rod.	45	2	..	12	1.10
07062 AB	Pin, front axle tie rod yoke end	45	2	..	5	.45
07100 AB	Generator;purchased from Electric Auto Lite Co., Toledo, Ohio. Their No. GAS-4167	25	1	15	..	26.05
07137 AB	Nut, cylinder head stud.	6	14	..	1/2	.03
07138 AB	Spring, independent brake pedal.	41	2	..	1	.11
07163 AB	Bearing, steering gear, assembly. Timken No. 11 BC.	45	2	..	1	.70
07164 AB	Cone, bearing, steering gear. Timken No. 12 CB	45	2	..	2	.90
07165 AB	Cup, bearing, steering gear. Timken No. 13 C.	45	2	..	1	.65

PARTS AND PRICE LIST "SI" AIRBORNE TRACTORS
(Continued)

Part No.	Description	Page No.	Qty. Used	Weight Each Lbs.	Weight Each Oz.	Price Each
07166 AB	Breather, assembly, transmission; purchased from Industrial Wire Cloth Products Corp., Wayne, Mich. Their No. A-1854	46	1	..	2	.40
07167 AB	Shim, steering column, .003" thick.	45	3	..	1/8	.06
07168 AB	Shim, steering column, .005" thick.	45	3	..	1/4	.06
07169 AB	Shim, steering column, No. 30 gauge	45	4	..	1/5	.06
07170 AB	Shaft, steering wheel.	45	1	4	8	2.20
07171 AB	Worm, steering	45	1	3	4	2.50
07172 AB	Wheel, steering worm	45	1	5	..	3.30
07173 AB	Shaft, steering drop arm	45	1	4	8	3.85
07174 AB1	Screw, adjusting, steering drop arm shaft	45	1	..	8	.40
07175 AB	Plug,steering column end	46	1	..	2	.06
07185 AB	Gasket, transmission case top cover	46	1	..	1	.35
07210 AB	Ball, 1/2" steel, foot brake.	41	8	..	1/4	.06
07223 AB	Stud, rear wheel rim clamp.	60-62	12	..	2	.22
07241 AB	Stud, front wheel.	55	10	..	1	.22
07242 AB	Nut, front wheel	55	10	..	1	.11
07243 AB	Nut, rear wheel rim clamp stud	60-62	12	..	3	.11
07339 AB	Washer, steering worm bearing retainer	45	1	..	2	.05
07348 AB	Spacer, instrument panel and fuel tank support.	24	2	..	2	.15
07349 AB	Bracket, control lever	44	1	2	4	.35
07352 AB	Spring, seat	44	1	8	8	2.50
07353 AB	Stud, seat mounting.	44	2	..	5	.30
07360 AB	End, drawbar	66	1	6	6	2.50
07378 AB	Pin, dirt box door front hinge.	66	1	..	14	.50
07379 AB	Pin, dirt box door rear hinge.	66	2	..	4	.25
07381 AB	Support, dirt box.	66	2	2	8	.50
07389 AB	Bracket, tie bar	57	1	2	14	.85
07390 AB	Stud, rear axle housing, upper.	34	2	..	6	.35
07391 AB	Nut, rear axle housing, upper stud	34	2	..	2	.25
07394 AB	Shaft, power take off shifter.	46	1	1	4	1.00
07395 AB	Fork, power take off shifter.	46	1	..	14	2.50
07398 AB	Brace, wheel guard front. (Used on Contract No. W145 Eng. 514 and Contract No. W1088 Eng. 2163.).	64	2	..	14	.30
07401 AB	Support, wheel guard, left	64	1	1	14	.50
07403 AB	Brace,wheel guard bottom	64	2	..	2	.10

PARTS AND PRICE LIST "SI" AIRBORNE TRACTORS
(Continued)

Part No.	Description	Page No.	Qty. Used	Weight Each		Price Each
				Lbs.	Oz.	
07404 AB	Carrier, generator . . .	25	1	..	10	.50
07405 AB	Strap, adjusting, generator.	25	1	..	4	.30
07407 AB	Loom, tail lamp wire, front.	24	1	..	2	.15
07408 AB	Loom, tail lamp wire, rear	24	1	..	2	.15
07418 AB	Support, head lamp bracket.	25	1	3	6	1.00
07420 AB	Washer, rubber, for battery.	24	6	..	1	.10
07453 AB	Clevis, dirt box attaching.	66	2	..	14	.50
07458 AB	Brace, rear, wheel guard R. H. (Used on Contract No. W145 Eng. 514 and Contract No. W1088 Eng. 2163.). . .	64	1	..	14	.25
07459 AB	Brace, rear, wheel guard L. H. (Used on Contract No. W145 Eng. 514 and Contract No. W1088 Eng. 2163.). . .	64	1	..	14	.25
07462 AB	Lamp, tail, with frosted lens; purchased from Guide Lamp Co., Anderson, Ind. Their No. 225-J.	24	1	..	12	1.50
07472 AB	Wire, head lamp and tail lamp extension	24, 25	2	..	2	.35
07473 AB	Wire, tail lamp. rear. .	24	1	..	2	.35
07533 AB	Bolt, front, radius rod.	54	2	1	14	3.00
07534 AB	Plate, radius rod front bolt	54	2	..	8	.30
07535 AB	Link, front lifting. . .	54	2	..	14	.75
07549 AB	Connector, two wire line connector for head lamp wire and tail lamp wire; purchased from H. A. Douglas Mfg. Co., Bronson, Mich. Their No. 2321.	24	2	..	1/12	.05
07551 AB	Wire to lock 05705 AB crank shaft bearing cap screw (No.16 gauge x 12" long soft annealed iron wire). . .	7	3	..	1/6	.01
07552 AB	Wire to lock 0807 AB gear shifter fork cap screw (No. 18 gauge x 7" long, soft annealed iron wire)	47	3	..	1/50	.01
07553 AB	Wire to lock 0807 AB gear shifter gate cap screw (No. 18 gauge x 15" long, soft annealed iron wire)	46	1	..	1/8	.01

PARTS AND PRICE LIST "SI" AIRBORNE TRACTORS
(Continued)

Part No.	Description	Page No.	Qty. Used	Weight Each		Price Each
				Lbs.	Oz.	
O7554 AB	Rim for front wheel (4.50 E-16 full drop center rim, without drive lugs, galvanized finish).	55	2	11	..	1.55
O7555 AB	Rim for rear wheel (DW9-26 deep well wide base rim, with drivers Type DW-DC, galvanized finish. Goodyear No. 1058). For 10-26, 4 ply wide base tractor tire. Used on following contracts, W145 Eng. 514; W1088 Eng. 2163.	60	2	42	..	8.10
O7558 AB	Grease gun, 5 oz. capacity;purchased from the Lincoln Engineering Co., St. Louis, Mo. Their Model No. 5950 .	68	1	1	6	2.60
O7559 AB	Hammer, ball peen,12 oz.	68	1	1	..	1.60
O7560 AB	Pliers, combination 6" .	68	1	..	8	.75
O7561 AB	Screw driver, 6"	68	1	..	6	.70
O7562 AB	Wrench, crescent 10" . .	68	1	..	8	1.60
O7563 AB	Wrench, tire clamp. Goodyear No. 211, Goodyear Tire & Rubber Co., Akron, Ohio . . .	68	1	1	8	.75
O7564 AB	Tire tool. Goodyear No. 210, Goodyear Tire & Rubber Co., Akron, O.	68	1	1	6	.70
O7565 AB	Wrench, double end 3/8x1/2. Vlchek No. 723A; purchased from Vlchek Tool Co., Cleveland, Ohio. . . .	68	1	..	1-1/2	.15
O7566 AB	Wrench, double end 7/16x9/16. Vlchek No. 725A, Vlchek Tool Co., Cleveland, Ohio. . . .	68	1	..	3	.20
O7567 AB	Wrench, double end 5/8x3/4. Vlchek No. 729A, Vlchek Tool Co., Cleveland, Ohio. . . .	68	1	..	7	.30
O7568 AB	Wrench, double end 13/16x7/8. Vlchek No. 731B, Vlchek Tool Co., Cleveland, Ohio. . . .	68	1	..	11	.35
O7569 AB	Wrench, double end, 15/16x1-1/16. Vlchek No. 34A, Vlchek Tool Co., Cleveland, Ohio .	68	1	1	5	.65
O7570 AB	Wrench, double end, 1x1-1/8. Vlchek No. 735, Vlchek Tool Co., Cleveland, Ohio. . . .	68	1	1	12	.65

Part No.	Description	Page No.	Qty. Used	Weight Each Lbs.	Weight Each Oz.	Price Each
07571 AB	Kit, tube repair. Firestone No. 2219-1. Firestone Tire & Rubber Co., Akron, Ohio . . .	68	1	..	10	.35
07587 AB	Fire extinguisher; purchased from Pyrene Mfg. Co., Newark, N.J. Their No. C-21-T, their drawing No. B-9307	70	1	7	6	14.00
07589 AB	Rim for rear wheel. (8.00T-24 Goodyear semi drop center rim. type L.T. with drive lugs.) For 12.00x24, 6 ply chevron tread tractor tire. Used on following contracts, W1088 Eng. 2159; W1088 Eng. 2461; W1088 Eng. 2632 and after. . . .	62	2	60	..	9.50
07627 AB	Wire, head lamp.	25	1	..	4	.35
VT-2230	Wheel, steering 16"; purchased from American Hard Rubber Co., Akron, Ohio.	45	1	3	10	3.00
Z1468	Ball, 3/8" steel, foot brake.	41	1	..	1/14	.06

4JMA-25 "CASE" MAGNETO

Part No.	Description	Page No.	Qty. Used	Weight Each Lbs.	Weight Each Oz.	Price Each
055 CM	Nut, primary	29	2	..	3/125	.03
059 CM	Washer,breaker bar screw	29	1	..	1/125	.06
062 CM	Cam	29	1	..	7/125	.40
063 CM	Ring, snap	29	1	..	1/125	.04
010 JM	Gasket, cork, distributor cap	29	1	..	1/25	.10
018 JM	Nut, top cover stud	29	2	..	7/125	.05
019 JM	Gear, fibre, distributor	29	1	..	3/8	1.00
024 JM	Washer, thrust, distributor shaft	29	1	..	7/125	.05
026 JM	Brush, center	29	1	..	1/125	.05
032 JM	Gasket, top cover	29	1	..	3/125	.10
040 JM	Gear, driving, on rotor shaft	29	1	..	2/5	.50
044 JM	Washer, spacer	29	2	..	7/125	.05
067 JM	Plate, locking, for stationary breaker point	29	1	..	3/125	.05
072 JM	Flinger, oil	29	1	..	4/125	.05
082 JM	Spring, secondary	29	1	..	1/125	.03
094 JM	Plate, stop pin	29	1	..	1-1/5	.25
095 JM	Nut for impulse	29	1	..	1/5	.10
096 JM	Washer, tailed, impulse coupling	29	1	..	4/125	.05
0105 JM	Washer, fibre, on condenser	29	1	..	3/125	.10
0113 JM	Spring, impulse coupling	29	1	..	2/3	.40
0125 JM	Spring, inside grounding	29	1	..	1/10	.05
0159 JM	Spring,outside grounding	29	1	..	3/125	.05
0167 JM	Screw, stop pin plate	29	3	..	6/125	.05
0183 JM	Strip, dielectric acetate insulation	29	1	..	.....	.10
0185 JM	Seal, oil	29	1	..	7/125	.25
0213 JM	Ball bearing. New Departure No. 77502	29	2	..	1-1/2	1.35
1 JMA	Frame	29	1	4	1-1/2	10.00
4 JMA-25	"Case" magneto assembly	25	1	7	2	39.50
10 JMA	Rotor	29	1	1	1-1/2	15.00
11 JMA	Plate, bearing	29	1	..	5	2.00
13 JMA	Disc, distributor, assembly	29	1	..	2	2.00
17 JMA	Bar, breaker, assembly	29	1	..	1/4	1.10
18 JMA	Hub, impulse coupling, assembly	29	1	..	7	1.50
19 JMA	Condenser, assembly	29	1	..	1-1/2	.75
20 JMA	Coil assembly	29	1	1	3	8.00
26 JMA	Cap, distributor	29	1	..	10	3.50
32 JMA	Brush with spring, distributor cap	29	4	..	1/65	.15
39 JMA	Cover, top	29	1	..	3	1.50
59 JMA	Support, breaker spring	29	1	..	1/5	.25
68 JMA	Point, stationary breaker, assembly	29	1	..	1/10	.50
91 JMA	Shell, outer, impulse coupling	29	1	..	4-1/2	1.00

CARBURETOR

05771 AB Zenith Carburetor - Model 161JX7 - Outline No. 9667

Purchased from Zenith Carburetor Division
Detroit, Michigan

Part No.	Description	Page No.	Qty. Used	Weight Each Lbs.	Weight Each Oz.	Price Each
B2-140A-1	Body, throttle, assembly	11	1	..	4	4.00
B3-85B	Bowl, fuel, assembly . .	11	1	..	8	5.00
C21-88	Plate, throttle.	11	1	..	1	.70
C29-264-6	Shaft and lever assembly, throttle.	11	1	..	2	1.20
C38-50A	Venturi, main, No. 16. .	11	1	..	1/2	1.10
C46-25	Screw, adjusting, idling	11	1	..	1/8	.30
C52-6	Jet, main, No. 24. . . .	11	1	..	1/10	.75
C55-6	Jet, idling, No. 16. . .	11	1	..	1/12	.50
C66-46	Jet, main discharge, No. 50	11	1	..	1/6	.60
C71-21	Jet, main, adjusting assembly	11	1	..	1/2	.90
C77-18	Vent, well, No. 28 . . .	11	1	..	1/24	.25
C81-17	Valve, fuel, No. 35. . .	11	1	..	1/3	.75
C85-28	Float, assembly.	11	1	..	1/2	1.00
C101-17	Plate, air shutter . . .	11	1	..	1/2	.50
C108-61	Shaft and lever assembly, air shutter . . .	11	1	..	1	.85
C111-9	Spring, adjusting screw.	11	1	..	1/50	.10
C117-13	Spring,air shutter lever	11	1	..	1/25	.10
C120-4	Axle, float.	11	1	..	1/10	.10
C131-4X2	Retainer, packing. . . .	11	1	..	1/8	.05
C142-16	Gasket, bowl to body . .	11	1	..	1/20	.10
CR88-8	Bracket, float	11	1	..	1/4	.10
CT57-4	Packing, throttle shaft.	11	1	..	1/15	.05
CT63-2	Pins, taper, throttle and air shutter valve.	11	2	..	1/15	.05
CT91-1	Plug, gas inlet.	11	1	..	1/2	.10
CT150-1	Cock, drain.	11	1	..	1/4	.25
T1S8-10	Screw, throttle stop . .	11	1	..	1/13	.05
T1S10-10	Screw, bowl to body assembly	11	4	..	1/9	.05
T15B5-3	Screw, throttle plate and air shutter plate.	11	4	..	1/12	.05
T41-5	Lockwasher, throttle plate screw and air shutter plate srew . .	11	4	..	1/40	.05
T41-10	Lockwasher, bowl to body screw.	11	4	..	1/48	.05
T56-20	Washer,fibre, fuel valve	11	1	..	1/50	.05
T56-23	Washer, fibre, main jet adj.	11	1	..	1/48	.05
T56-24	Washer, fibre, main jet.	11	1	..	1/96	.05
T56-52	Washer, fibre, main discharge jet	11	1	..	1/80	.05
T73-9	Pins, float bracket. . .	11	2	..	1/25	.05

FUEL STRAINER

Prior to Serial No. 4705661
06305 AB Fuel Strainer - MFG. No. F299
Purchased from Zenith Carburetor Division
Detroit, Michigan

Part No.	Description	Page No.	Qty. Used	Weight Each Lbs.	Weight Each Oz.	Price Each
F1X24	Gasket, bowl	22	1	..	1/40	.05
F2X1	Element, filter	22	1	..	1/5	.45
F7X109	Head, filter bowl	22	1	..	4	.65
F8X4	Bowl, filter	22	1	..	3	.15
F25X12	Valve, shutoff	22	1	..	1	.45
F110X9	Bale, glass bowl	22	1	..	1/10	.10

FUEL STRAINER

After Serial No. 4705660
04905 AB Fuel Strainer - MFG. No. 42949
Purchased from Imperial Brass Mfg. Co.,
Chicago, Illinois

31322	Valve, needle, assembly	23	1	..	1	.30
32275	Gasket, cork	23	1	..	1/35	.06
32276	Bowl, glass	23	1	..	3	.17
32277	Cap and nut, assembly	23	1	..	2	.17
32278	Screen	23	1	..	1/30	.17
32279	Bale assembly	23	1	..	3	.30
42949-1	Head, strainer	23	1	..	6	.55

AIR CLEANER

06646 AB Air Cleaner - MFG. No. CT50-11420
Purchased from United Air Cleaner Division of
United Specialities Co., Chicago, Illinois.

B9948	Cup, oil	12	1	..	4	.50
B9982	Bail assembly	12	1	..	4	.75
A9986	Gasket	12	1	..	1/2	.05
10139	Baffle, assembly	12	1	..	3	.50
11686	Body, filter, assembly	12	1	1	..	6.00

GENERATOR

07100 AB Generator - Their No. GAS 4167
Purchased from the Electric Auto Lite Company,
Toledo, Ohio

Note:-For service parts on Electric Auto Lite Generator, order from their nearest service station or direct from them at Toledo, O.

Part No.	Description	Page No.	Qty. Used	Weight Each Lbs.	Weight Each Oz.	Price Each
DA-39	Guard, oil, flat	27	1	..	1/10	.01
GAL-31	Connector, ground, assembly	27	1	..	1/10	.04
GAR-73	Wick, oil	27	1	..	1/50	.03
GAR-98A	Cover, wick	27	1	..	1/75	.01
GAR-171	Ring, snap	27	1	..	1/10	.02
GAS-15	Holder, brush	27	1	..	1/10	.05
GAS-17	Spring, brush	27	1	..	1/30	.05
GAS-18	Spring, brush	27	1	..	1/30	.05
GAS-20	Screw, frame	27	2	..	7/100	.06
GAS-29	Pole piece	27	2	..	10-1/2	.50
GAS-44	Connections, field, insulating	27	1	..	1/20	.03
GAS-45	Holder, field coil	27	4	..	1/20	.01
GAS-51	Spring, 3rd brush plate retaining	27	2	..	1/30	.04
GAS-103	Guard, cupped felt	27	1	..	1/8	.08
GAS-104	Retainer, bearing	27	1	..	1/2	.10
GAS-121	Bushing, insulating	27	1	..	1/60	.08
GAS-168	Spacer, T. C. regulator	27	2	..	9/10	.15
GAS-217A	Head, drive end	27	1	1	5	1.50
GAS-220	Guard, oil	27	1	..	1/8	.08
GAS-221	Gasket, oil retaining	27	1	..	1/300	.03
GAS-223	Gasket	27	1	..	1/50	.02
GAS-224	Bearing,absorbent bronze	27	1	..	1/3	.20
GAS-225	Lead assembly	27	1	..	1/5	.11
GAS-1005A	Coil, field, assembly complete	27	1	..	11	2.20
GAS-1007B	Coil, field, assembly, left	27	1	..	5	1.10
GAS-1008D	Coil, field, right	27	1	..	5	1.10
GAS-1021R	Plate, brush holder, part assembly	27	1	..	7/16	.40
GAS-1024A	Band, head, assembly	27	1	..	2-3/8	.20
GAS-1217A	Head, drive end,assembly	27	1	1	8	4.00
GAS-1219R	Plate, 3rd brush holder, part assembly	27	1	..	1/2	.25
GAS-1222	Cover,commutator end cap	27	1	..	1-1/8	.15
GAS-1229	Plate, commutator end, part assembly	27	1	1	5	2.65
GAS-2021R	Plate, brush holder, assembly	27	1	..	1	1.00
GAS-2218	Armature, assembly	27	1	3	3	10.00
GAS-2219R	Plate, 3rd brush holder,	27	1	..	3/4	.45
GAS-2229	Commutator end plate assembly	27	1	1	9	4.75
GAS-2240	Assembly,frame and field	27	1	6	3	5.35
GBM-21	Nut, armature shaft	27	1	..	7/16	.05
GEM-12	Brush, main - See GEM-2012S	27	2	..	3/50	.20
GEM-13	Brush, third - See GEM-2012S	27	1	..	1/20	.20
GEM-2012S	Brushes, Set of	27	1	..	1/5	.60
MN-21	Pin, dowel	27	2	..	1/40	.01
MZ-38	Screw, pole piece	27	2	..	1/4	.02
SP-383	Pulley, drive	27	1	1	..	3.20
TC-4324A	Regulator, two charge	27	1	1	3	5.50
X-195	Washer, lock, #8	27	3	..	1/10	.05
X-196	Washer, lock, #10	27	4	..	1/50	.05
X-260	Key, woodruff, #5	27	1	..	1/16	.05
X-441	Bearing, ball	27	1	..	2-1/4	2.15
X-489	Oiler 1/4",press in type	27	1	..	1/20	.05
X-544	Washer, lock, #10	27	2	..	1/60	.05

GENERATOR (Continued)

Part No.	Description	Page No.	Qty. Used	Weight Each Lbs.	Weight Each Oz.	Price Each
X-714	Screw, #10-32X1-1/2" round head	27	1	..	1/5	.05
X-755	Terminal	27	2	..	1/30	.05
X-864	Washer, lock, .669 . . .	27	1	..	7/16	.05
X-958	Terminal	27	2	..	1/20	.05
X-1423	Terminal	27	1	..	1/5	.05
8X-55	Screw, round head, #8-32x3/8"	27	3	..	1/20	.05
8X-122	Screw, fillister head, #8-32x1/2"	27	2	..	1/20	.05
8X-311	Screw, round head, #10-32x3/8".	27	4	..	1/16	.05
8X-794	Nut, square, #10-32. . .	27	1	..	1/20	.05
8X-878	Screw, fillister head, #8-32x7/16".	27	1	..	1/20	.05
8X-888	Screw, fillister head, #8-32x5/16".	27	4	..	1/20	.05
8X-1496	Screw, #8-32x7/16" . . .	27	2	..	1/20	.05

STARTING MOTOR

05973 AB Starting Motor - Their No. MZ-4095
Purchased from the Electric Auto Lite Co., Toledo, Ohio

Note: For service parts on Electric Auto Lite Starting Motor, order from their nearest service station or direct from them at Toledo, Ohio.

Part No.	Description	Page No.	Qty. Used	Weight Each		Price Each
				Lbs.	Oz.	
EB-108	Lock washer.	28	2	..	1/16	.01
EB-7806	Hd. spring bolt or screw	28	1	..	1/2	.08
EB-7807	Shaft spring screw . . .	28	1	..	1/2	.07
EB-7819 S	Compression sleeve . . .	28	1	..	4	.30
EB-8503	Driving head	28	1	..	3	.45
EB-8705	Drive spring	28	1	..	2	.55
EB-8734	Take-up spring	28	1	..	1	.01
EBA-2	BENDIX DRIVE ASSEMBLY. .	28	1	1	6	5.50
EBA-211	S - A assembly	28	1	1	2	3.90
MAB-31	Washer, insulating . . .	28	1	..	1/40	.01
MG-77-A	Bearing,absorbent bronze	28	1	..	5/16	.20
MU-14	Terminal	28	1	..	1/10	.05
MU-28	Terminal post.	28	1	..	1/2	.10
MU-31	Bushing, terminal post .	28	1	..	1/125	.02
MU-37	Washer, 5/16" plain. . .	28	1	..	1/30	.01
MU-39	Washer, inner.	28	1	..	1/20	.01
MU-54	Washer, thrust	28	2	..	1/50	.01
MZ-12	Brush.	28	2	..	3/4	.25
MZ-16	Holder, brush.	28	2	..	3/16	.01
MZ-19	Spring, brush.	28	4	..	1/10	.05
MZ-30A	Connection, field, insulation	28	1	..	1/20	.01
MZ-32	Connector, field coil. .	28	1	..	1/4	.03
MZ-38A	Screw, pole piece. . . .	28	4	..	7/25	.02
MZ-44A	Bearing,absorbent bronze	28	1	..	3/8	.15
MZ-51	Spacer, thrust bearing .	28	1	..	3/16	.07
MZ-126	Washer, thrust	28	1	..	1/20	.02
MZ-127	Felt, washer	28	1	..	1/40	.03
MZ-128	Gasket	28	1	..	1/40	.09
MZ-1007	Coil, field.	28	1	..	3-11/16	.80
MZ-1008A	Coil, field, assembly L. R.	28	1	..	4-3/8	105
MZ-1009B	Coil, field, assembly L. L.	28	1	..	4-3/8	1.05
MZ-1024J	Band, head, assembly . .	28	1	..	2-5/8	.20
MZ-1034	Brush assembly	28	2	..	3/4	.25
MZ-1125	Bearing assembly, intermediate.	28	1	..	9-1/4	2.75
MZ-2002-B	Commutator end plate assembly	28	1	..	12-5/8	1.30
MZ-2049	Armature assembly. . . .	28	1	5	..	6.35
PS-1163A	Pinion housing assembly.	28	1	5	10	5.50
X-261	Key, woodruff, No. 6 . .	28	1	..	1/16	.05
X-342	Screw, pinion housing. .	28	4	..	1/9	.05
X-532	Rivet, brush holder. . .	28	4	..	1/50	.05
8X-878	Screw, intermediate bearing plate.	28	4	..	7/125	.05
8X-902	Screw, commutator end plate.	28	4	..	5/16	.05
5X-1376	Nut, terminal post . . .	28	2	..	1/5	.05
X-1621	Washer, lock, pinion housing.	28	4	..	1/200	.05

HEAD LAMP AND TAIL LAMP PARTS

06330 AB Head Lamp – MFG. Model No. 524M
07462 AB Tail Lamp – MFG. Model No. 225J
Purchased from Guide Lamp Company, Anderson, Ind.

Part No.	Description	Page No.	Qty. Used Per Lamp	Weight Each Lbs.	Weight Each Oz.	Price Each
103319	Lockwasher for mounting plate	26	2	..	4/125	.05
115428	Bulb, 3 C.P. single contact, 6–8 Volt	26	1	..	8/25	.35
120367	Nut, mounting bolt	26	2	..	4/25	.05
120377	Nut, mounting bolt	26	1	..	6/25	.05
120382	Washer, mounting bolt	26	1	..	2/25	.05
122159	Screw, terminal	26	2	..	6/125	.05
138530	Washer, shakeproof, for terminal screw	26	2	..	6/125	.05
145431	Bulb, 32 C.P.. single contact, 6–8 volt	26	1	..	17/25	.35
911500	Body, assembly	26	1	..	8–4/5	.75
911506	Glass, outlook	26	1	..	4	.20
911508	Gasket, outlook glass	26	1	..	11/125	.05
912048	Screw, moulding	26	1	..	1/10	.05
912501	Plug assembly	26	1	..	2/5	.15
913243	Ring, lens retaining spring	26	1	..	1/2	.10
913540	Lens, frosted	26	1	..	2–4/25	.30
914498	Washer, bearing, mounting plate	26	1	..	17/25	.05
919924	Wiring assembly	26	1	..	5/8	.20
921520	Moulding assembly	26	1	..	2–2/5	.50
922785	Spring, terminal post	26	1	..	1/20	.05
922786	Post, terminal	26	1	..	1/8	.20
5931876	Lens	26	1	..	11	.60
5931877	Gasket	26	1	..	2/3	.10
5931878	Body assembly	26	1	..	13–3/5	1.50
5932042	Reflector with gasket	26	1	..	3–7/25	.75

GREASE GUN

07558 AB Grease Gun – MFG. Model No. 5950
Purchased from Lincoln Engineering Company, St. Louis, Mo.

Part No.	Description	Page No.	Qty. Used	Weight Each Lbs.	Weight Each Oz.	Price Each
10539	Body, nozzle	69	1	..	1/4	.20
10-733	Cap, linpak	69	1	..	1/12	.25
11-541	Adapter	69	1	..	1/10	.15
32-032	Gasket, container	69	1	..	1/50	.05
34-019	Packing, adapter	69	1	..	1/15	.10
34-034	Packing, plunger	69	1	..	1/15	.08
34-050	Washer, linpak	69	2	..	1/35	.10
41-121	Body, pump	69	1	..	9	.65
56-022	Spring, ball check	69	1	..	1/25	.05
66-011	Ball, pump check	69	1	..	1/30	.02
67-018	Extension, nozzle	69	1	..	6	.15
81-094	Container assembly	69	1	1	..	1.10
89-961	Plunger assembly	69	1	..	3	.30

AMERICAN STANDARD HEXAGON HEAD CAP SCREWS

Part No.	Description	Qty. Used	Weight Per 100 Pieces		Price Per 100 Pieces
			Lbs.	Oz.	
31AA–4	Screw, 5/16x1/2 hexagon head cap screw N. C. thread	1	2	3	1.00
31AA–5	Screw, 5/16x9/16 hexagon head cap screw N. C. thread	6	2	5	1.15
31AA–6	Screw, 5/16x11/16 hexagon head cap screw N. C. thread	6	2	9	1.15
31AA–7	Screw, 5/16x7/8 hexagon head cap screw N. C. thread	4	2	14	1.30
31AA–8	Screw, 5/16x1 hexagon head cap screw N. C. thread	2	3	2	1.30
37AA–5	Screw, 3/8x5/8 hexagon head cap screw N. C. thread	3	3	6	1.45
37AA–6	Screw, 3/8x3/4 hexagon head cap screw N. C. thread	5	3	14	1.45
37AA–7	Screw, 3/8x7/8 hexagon head cap screw N. C. thread	24	4	3	1.60
37AA–8	Screw, 3/8x1 hexagon head cap screw N. C. thread	13	4	10	1.60
37AA–9	Screw, 3/8x1–1/8 hexagon head cap screw N. C. thread	30	5	..	1.75
37AA–10	Screw, 3/8x1–1/4 hexagon head cap screw N. C. thread	4	5	5	1.75
37AA–12	Screw, 3/8x1–1/2 hexagon head cap screw N. C. thread	5	6	2	1.85
37AA–20	Screw, 3/8x2–1/2 hexagon head cap screw N. C. thread	2	9	3	2.65
50AA–6	Screw, 1/2x3/4 hexagon head cap screw N. C. thread	8	8	2	3.20
50AA–8	Screw, 1/2x1 hexagon head cap screw N. C. thread	15	9	7	3.50
50AA–10	Screw, 1/2x1–1/4 hexagon head cap screw N. C. thread	21	10	2	3.75
50AA–12	Screw, 1/2x1–1/2 hexagon head cap screw N. C. thread	4	11	14	4.00
50AA–14	Screw, 1/2x1–3/4 hexagon head cap screw N. C. thread	1	13	5	4.25
50AA–18	Screw, 1/2x2–1/4 hexagon head cap screw N. C. thread	4	16	..	4.85
50AA–24	Screw, 1/2x3 hexagon head cap screw N. C. thread	2	20	5	5.85
75AA–16	Screw, 3/4x2 hexagon head cap screw N. C. thread	4	34	11	10.50
25AB–5	Screw, 1/4x5/8 hexagon head cap screw N. F. thread	4	1	8	1.00
31AB–6	Screw, 5/16x3/4 hexagon head cap screw N. F. thread	5	2	11	1.15
31AB–7	Screw, 5/16x7/8 hexagon head cap screw N. F. thread	2	3	..	1.30
31AB–10	Screw, 5/16x1–1/4 hexagon head cap screw N. F. thread	6	3	13	1.45
31AB–20	Screw, 5/16x2–1/2 hexagon head cap screw N. F. thread	1	6	6	2.15
37AB–4	Screw, 3/8x1/2 hexagon head cap screw N. F. head	4	3	5	1.30
37AB–6	Screw, 3/8x3/4 hexagon head cap screw N. F. thread	4	4	5	1.45
37AB–8	Screw, 3/8x1 hexagon head cap screw N. F. thread	4	4	13	1.60
37AB–12	Screw, 3/8x1–1/2 hexagon head cap screw N. F. thread	2	6	6	1.85
50AB–8	Screw, 1/2x1 hexagon head cap screw N. F. thread	4	9	13	3.50
50AB–10	Screw, 1/2x1–1/4 hexagon head cap screw N. F. thread	3	11	3	3.75
50AB–14	Screw, 1/2x1–3/4 Hexagon head cap screw N. F. thread	6	14	..	4.25

AMERICAN STANDARD HEXAGON HEAD CAP SCREWS (Continued)

Part No.	Description	Qty. Used	Weight Per 100 Pieces		Price Per 100 Pieces
			Lbs.	Oz.	
50AB–16	Screw, 1/2x2 hexagon head cap screw N. F. thread	9	15	5	4.50
50AB–18	Screw, 1/2x2–1/4 hexagon head cap screw N. F. thread	3	16	11	4.85
50AB–26	Screw, 1/2x3–1/4 hexagon head cap screw N. F. thread	2	22	..	6.20
75AB–16	Screw, 3/4x2 hexagon head cap screw N. F. thread	2	35	8	10.50
75AB–20	Screw, 3/4x2–1/2 hexagon head cap screw N. F. thread	4	42	14	11.65
100AB–18	Screw, 1x2–1/4 hexagon head cap screw N. F. thread	1	72	13	26.00
AMERICAN STANDARD ROUND HEAD MACHINE SCREW					
19AH–4	Screw, No. 10x1/2" round head machine screw, N. C. thread . .	6	..	8	.36
25AH–4	Screw, 1/4x1/2 round head machine screw, N. C. thread. .	4	1	..	.60
25AH–6	Screw, 1/4x3/4 round head machine screw N. C. thread . .	6	1	4	.68
19AJ–4	Screw, No. 10x1/2 round head machine screw N. F. thread . .	2	..	8	.36
25AJ–5	Screw, 1/4x5/8 round head machine screw N. F. thread . .	4	1	2	.65
AMERICAN STANDARD FLAT HEAD MACHINE SCREW					
25AK–5	Screw, 1/4x5/8 flat head machine screw N. C. thread	10	1	2	.65
AMERICAN STANDARD FILLISTER HEAD MACHINE SCREW					
16AM–2	Screw, No. 8–32x1/4 fillister head machine screw N. C. . . .	2	..	4	.25
16AM–4	Screw, No. 8–32x7/16 fillister head machine screw N. C. . . .	1	..	5	.29
16AM–8	Screw, No. 8–32x1 fillister head machine screw N. C.	4	..	9	.38
19AM–2	Screw, No. 10–24x5/16 fillister head machine screw N. C. . . .	2	..	6	.33
19AM–8	Screw, No. 10–24x1 fillister head machine screw N. C. . . .	4	..	12	.46
19AM–11	Screw, No. 10–24x1–3/8 fillister head machine screw N. C. . . .	2	1	..	.62
13AN–3	Screw, No. 6–40x3/8" fillister head machine screw N. F. . . .	1	..	3	.21
AMERICAN STANDARD CUP POINT SET SCREW					
37AZ–12	Screw, 3/8x1–1/2 cup point set N. C. thread	1	3	8	2.60
AMERICAN STANDARD SQUARE HEAD MACHINE BOLT					
31BP–32	Bolt, 5/16"x4 square head machine bolt N. C. thread. . .	1	11	2	2.15
75BP–36	Bolt, 3/4"x4–1/2 square head machine bolt N. C. thread. . .	4	85	10	10.45
AMERICAN STANDARD STOVE BOLT					
25CC–4	Bolt, 1/4x1/2 oven head stove. .	6	1	14	.55
25CE–4	Bolt, 1/4x1/2 round head stove .	2	1	14	.55

AMERICAN STANDARD ROUND HEAD CARRIAGE BOLT

Part No.	Description	Qty. Used	Weight Per 100 Pieces		Price Per 100 Pieces
			Lbs.	Oz.	
25CK-5	Bolt, 1/4x5/8 round head carriage N. C. thread	2	2	5	.75
37CK-6	Bolt, 3/8x3/4 round head carriage N. C. thread	6	6	5	1.40
37CK-8	Bolt, 3/8x1 round head carriage N. C. thread	2	7	6	1.40
50CK-10	Bolt, 1/2x1-1/4 round head carriage N. C. thread	2	16	5	3.00

AMERICAN STANDARD HEX NUT

37EA-0	Nut 3/8 hexagon, regular, unfinished N. C. thread	4	2	3	1.05
50EA-0	Nut 1/2 hexagon, regular, unfinished N. C. thread	2	4	14	2.00
25EC-0	Nut 1/4 hexagon, regular, semi finish N. C. thread	6	1	3	.60
31EC-0	Nut 5/16 hexagon, regular, semi finish N. C. thread	2	2	..	.85
62EC-0	Nut 5/8 hexagon, regular, semi finish N. C. thread	1	8	14	3.30
31ED-0	Nut 5/16 hexagon, regular, semi finish N. F. thread	7	1	7	.85
37ED-0	Nut 3/8 hexagon, regular, semi finish N. F. thread	26	2	3	1.10
50ED-0	Nut 1/2 hexagon, regular, semi finish N. F. thread	27	4	4	2.10
75ED-0	Nut 3/4 hexagon, regular, semi finish N. F. thread	8	11	6	4.70
87ED-0	Nut 7/8 hexagon, regular, semi finish N. F. thread	2	17	2	7.70
25EK-0	Nut 1/4 hexagon, light, semi finish N. F. thread	2	..	11	.60
37EK-0	Nut 3/8 hexagon, light, semi finish N. F. thread	4	1	8	1.10
43EK-0	Nut 7/16 hexagon, light, semi finish N. F. thread	6	2	2	1.50
50EK-0	Nut 1/2 hexagon, light, semi finish N. F. thread	13	3	10	2.10
62EK-0	Nut 5/8 hexagon, light, semi finish N. F. thread	5	6	15	3.30
75EK-0	Nut 3/4 hexagon, light, semi finish N. F. thread	10	9	14	4.70
100EK-0	Nut 1 hexagon, light, semi finish N. F. thread	3	24	8	10.45
37EQ-0	Nut 3/8 hexagon jam, regular semi finish N. C. thread	3	2	3	1.10
50EQ-0	Nut 1/2 hexagon jam, regular semi finish N. C. thread	1	4	13	2.10
62EQ-0	Nut 5/8 hexagon jam, regular semi finish N. C. thread	1	7	8	3.30
31ER-0	Nut 5/16 hexagon jam, regular semi finish N. F. thread	8	1	6	.85
75EX-0	Nut 3/4 hexagon jam, regular semi finish N. F. thread	1	8	9	4.70
100EX-0	Nut 1 hexagon jam, regular semi finish N. F. thread	7	19	5	10.45
87FH-0	Nut 7/8 hexagon castle, light semi finish N. F. thread	2	17	2	10.75
100FH-0	Nut 1 hexagon castle, light semi finish N. F. thread	1	25	5	16.00
13FK-0	Nut No. 6 hexagon machine screw semi finish N. F. thread	1	..	3	.60

AMERICAN STANDARD HEX NUTS (Continued)

Part No.	Description	Qty. Used	Weight Per 100 Pieces Lbs.	Weight Per 100 Pieces Oz.	Price Per 100 Pieces
19FW-O	Nut No. 10 hexagon standard bolt and machine screw, N. C. thread	6	..	8	.55
25FW-O	Nut 1/4 hexagon oven head stove bolt N. C. thread.	2	..	12	.55
19FX-O	Nut No. 10 hexagon standard bolt and machine screw N. F. thread	2	..	8	.55

WING NUTS

31FY-O	Nut 5/16 wing.	2	2	3	3.05

AMERICAN STANDARD SQUARE NUT FOR STOVE BOLT AND MACHINE SCREW

19FV-O	Nut No. 10 square stove bolt and machine screw.	2	..	8	.50
25FV-O	Nut 1/4 square stove bolt and machine screw.	4	1	..	.50

SAE STANDARD LOCK WASHERS

15GA-O	Washer No. 6 standard lock . . .	2	..	2/5	.11
17GA-O	Washer No. 8 standard lock . . .	9	..	7/10	.11
20GA-O	Washer No. 10 standard lock. . .	8	..	1	.11
25GA-O	Washer 1/4 standard lock	20	..	3	.14
31GA-O	Washer 5/16 standard lock. . . .	32	..	5	.22
37GA-O	Washer 3/8 standard lock	89	..	8	.30
43GA-O	Washer 7/16 standard lock. . . .	6	1	1	.50
50GA-O	Washer 1/2 standard lock	78	1	5	.70
62GA-O	Washer 5/8 standard lock	5	2	6	1.20
75GA-O	Washer 3/4 standard lock	20	4	5	2.20
87GA-O	Washer 7/8 standard lock	2	5	2	2.55
100GA-O	Washer 1 standard lock	6	9	1	4.95
37GB-O	Washer 3/8 standard lock light .	1	..	6	.30

STANDARD SHAKEPROOF LOCK WASHERS

			Weight Per 100 Pieces		Price Each
25GM-O	Washer, 1/4 standard shakeproof lock	2	..	3	.02
37GM-O	Washer, 3/8 standard shakeproof lock	3	..	4	.02

U. S.. STANDARD PLAIN WASHER

			Pieces Per Lb.	Price Per Lb.
25GR-O	Washer, 1/4" standard plain. . .	7	362	.20
31GR-O	Washer, 5/16" standard plain . .	3	149	.18
37GR-O	Washer, 3/8" standard plain. . .	5	111	.14
50GR-O	Washer, 1/2" standard plain. . .	2	41	.12

HOSE CLAMPS

			Weight Each		Price Each
11HC-O	Clamp, No. 11 for 1-7/8" O. Dia. hose	2	..	1/2	.11
12HC-O	Clamp, No. 12 for 2-1/8" O. Dia. hose	3	..	3/4	.17
13HC-O	Clamp, No. 13 for 2-3/16" O.Dia. hose	2	..	1	.17

COTTER PIN

Part No.	Description	Qty. Used	Weight Per 100 Pieces Lbs.	Weight Per 100 Pieces Oz.	Price Per 100 Pieces
06HP-3	Pin, 1/16x3/8 cotter	1	..	3/4	.05
06HP-4	Pin, 1/16x1/2 cotter	1	..	1	.05
06HP-8	Pin, 1/16x1 cotter	2	..	1-5/8	.07
09HP-4	Pin, 3/32x1/2 cotter	3	..	2-1/3	.05
09HP-5	Pin, 3/32x5/8 cotter	3	..	2-5/8	.06
09HP-6	Pin, 3/32x3/4 cotter	2	..	3	.06
12HP-6	Pin, 1/8x3/4 cotter	9	..	5-1/2	.08
12HP-8	Pin, 1/8x1 cotter.	15	..	7	.09
12HP-10	Pin, 1/8x1-1/4 cotter.	3	..	8	.11
12HP-12	Pin, 1/8x1-1/2 cotter.	1	..	9-1/2	.13
12HP-14	Pin, 1/8x1-3/4 cotter.	1	..	11	.14
25HP-12	Pin, 1/4x1-1/2 cotter.	1	2	8	.46
25HP-22	Pin, 1/4x2-3/4 cotter.	2	4	..	.77

GROOVE PIN

			Weight Lbs.	Each Ozs.	Price Each
15JG-12	Pin, 5/32x1-1/2, full length taper groove, Type 1	1	..	1/7	.04
25JG-12	Pin, 1/4x1-1/2, full length taper groove, Type 1	1	..	1/2	.06
25JG-14	Pin, 1/4x1-3/4, full length taper groove, Type 1	2	..	5/8	.09
37JG-12	Pin, 3/8x1-1/2, full length taper groove, Type 1	1	..	3/4	.10
37JG-16	Pin, 3/8x2, full length taper groove, Type 1	2	..	1	.10
37JH-18	Pin, 3/8x2-1/4, half length taper groove, Type 2	1	..	1	.10
18JJ-7	Pin, 3/16x7/8, full length parallel groove, Type 3	1	..	1/4	.04
07JL-3	Pin, 5/64x3/8, center groove, Type 5	1	..	1/16	.02
31JL-8	Pin, 5/16x1, center groove, Type 5	1	..	1/3	.05
31JL-17	Pin, 5/16x2-1/8, center groove, Type 5	1	..	5/16	.09

PIPE CAP

37KK-0	Cap, 3/8" pipe, hexagon head	2	..	3/4	.06

PIPE PLUG

12KT-0	Plug, 1/8" pipe, square head	3	..	1/4	.04
25KT-0	Plug, 1/4", pipe, square head	2	..	1/2	.04
37KT-0	Plug, 3/8" pipe, square head	1	..	3/4	.05
50KT-0	Plug 1/2" pipe, square head.	1	..	1	.04
75KT-0	Plug, 3/4" pipe, square head	1	..	1-3/4	.05
125KT-0	Plug, 1-1/4" pipe, square head	1	..	5	.08
150KT-0	Plug, 1-1/2" pipe, square head	1	..	7	.11
12KU-0	Plug, 1/8 pipe, slotted head	4	..	3/16	.04
37KV-0	Plug, 3/8" pipe, countersunk head	3	..	1/2	.04

WELCH PLUG

162LC-0	Plug, 1-5/8" Welch	1	..	3/4	.11

LUBRICATING FITTING

Part No.	Description	Qty. Used	Weight Each Lbs.	Weight Each Oz.	Price Each
12 QA-0	Fitting, 1/8" straight Lincoln; purchased from Lincoln Engineering Co., St. Louis, Mo. Their No. 5000	16	..	1/4	.06
12 QF-0	Fitting, 1/8"-90° Lincoln; purchased from Lincoln Engineering Co., St. Louis, Mo. Their No. 5400	2	..	1/4	.12

DOLE COMPRESSION COUPLINGS

12LR-3	Connector, 1/8x3/16 Dole compression couplings A3 male . .	1	..	1/3	.06
12LR-5	Connector, 1/8x5/16 Dole compression couplings A3 male . .	3	..	3/4	.06
12LU-5	Elbow, 1/8x5/16 Dole Compression couplings A7 male.	2	..	1	.17
12MA-3	Connector, 1/8x3/16 Dole compression couplings A13 female.	1	..	1	.17

RIVETS

			Weight Per 100 Pieces		Price Each
14PK-16	Rivet, 9/64x1 brass tubular, countersunk.	6	..	9	.01

WOODRUFF KEY

			Weight Each		Price Each
AWK-0	Key, No. A - Woodruff.	2	..	1/6	.02
2WK-0	Key, No. 2 - Woodruff.	1	..	1/25	.01
5WK-0	Key, No. 5 - Woodruff.	1	..	1/16	.01
6WK-0	Key, No. 6 - Woodruff.	1	..	1/14	.01
9WK-0	Key, No. 9 - Woodruff.	1	..	1/8	.01
11WK-0	Key, No. 11 - Woodruff	2	..	1/4	.02
15WK-0	Key, No. 15 - Woodruff	11	..	1/3	.03
129WK-0	Key, No. 129 - Woodruff.	2	..	1	.05
207WK-0	Key, No. 207 - Woodruff.	2	..	1/16	.01
404WK-0	Key, No. 404 - Woodruff.	1	..	1/14	.01

WAR DEPARTMENT
MAINTENANCE MANUAL AND PARTS CATALOG

SHOVEL-LOADER WITH BUCKET AND CRANE HOOK FOR CASE MODEL SI AIRBORNE TRACTOR

SERIAL NO. 8501 AND UP.

THE FRANK G. HOUGH CO.
LIBERTYVILLE, ILL.

OPERATING AND MAINTENANCE INSTRUCTIONS
AND
SPARE PARTS CATALOG

HOUGH MODEL "SI" AIRBORNE SHOVEL-LOADER
WITH BUCKET AND CRANE HOOK

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TABLE OF CONTENTS (CON'T.)

Fig. 1
Loader With Bucket

LIST OF ILLUSTRATIONS

HOUGH MODEL "SI" AIRBORNE SHOVEL-LOADER

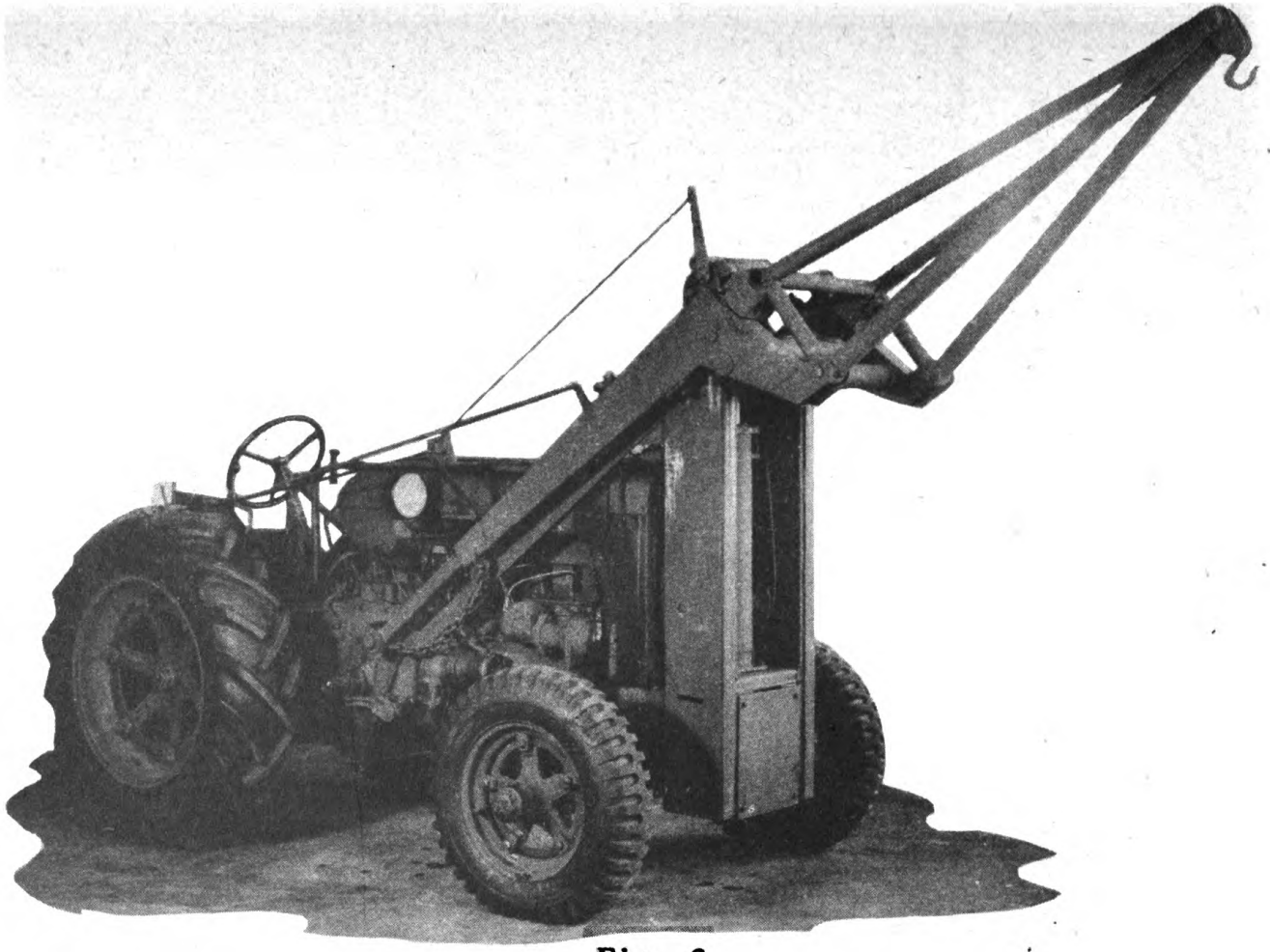


Fig. 2
Loader With Crane Hook

FOREWORD

The main factor in the performance of any machine of this type lies with the operator.

Familiarity with the tractor is the first requirement, and is acquired much the same as with an automobile.

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

This Hough Model "SI" Airborne Shovel-Loader was designed and built for the maximum of durability and dependability with a minimum of weight. A straight line power take-off drives a hydraulic gear-type pump which furnishes pressure for the hydraulic system of the loader.

This loader can be mounted or dismounted efficiently and with a minimum of time.

SAFETY RULES

For your safety and to prevent damage to the tractor or loader, the following safety rules should be observed at all times.

1. Never transport loads with bucket raised to its full height.
2. Exercise extreme caution when travelling on hillsides or over rough ground.
3. Never stand or work under raised bucket unless it is properly blocked.
4. Never get on or off the tractor while it is in motion.
5. Never start tractor engine without oil in the loader hydraulic system.
6. The loader should never be loaded beyond its capacities.
7. READ THIS INSTRUCTION MANUAL CAREFULLY.

SHOVEL-LOADER MODEL—"SI"

●

OPERATOR'S INSTRUCTION

SECTION I

●

CONTENTS

CONDENSED SPECIFICATIONS & SERVICE DATA

WORKING CAPACITIES

Bucket - 1/3 cu. yd. - 9 cu. ft. - 1000 lbs.
Crane Hook - 1300 lbs.

CYLINDER

Bore - 4-1/2"
Stroke - 17-1/2"
Displacement - 278.4 cu. in.

HYDRAULIC SYSTEM

Capacity - 5 U.S. Gal. - 4.3 Imp. Gal. - 19 Liters

PUMP & P. T. O.

Pump - gear type - 18 Gal. per Min. at 1550 R. P. M.
P. T. O. Shaft - 3/4" x 6 spline. } Serial Nos. 8501 to
P. T. O. Coupling - 3/4" x 6 spline. } 8532.

P. T. O. Shaft and P. T. O. Coupling fitted with chain couplings, Serial Nos. 8533 and up.

DUMPING CLEARANCE - 45"

TIME OF BOOM TRAVEL

Raising - 7 sec.
Lowering - 4 sec.

WEIGHTS

Tractor - 3108 lbs. (Operating weight)
Loader - 1100 lbs. (Operating weight complete with oil)

Total - 4208 lbs.

DIMENSIONS

Overall height - 60-1/2" (Mounted)
Overall length - 153-1/4" (Mounted)

PREPARING A NEW LOADER FOR USE

This loader has been thoroughly tested and inspected before it left the factory. Nevertheless, a careful inspection should be made before the loader is put into service.

MOUNTING LOADER TO TRACTOR

If the tractor and loader have been received unassembled, refer to page 39 of the Maintenance Manual for instructions on assembly.

LUBRICATION

For lubrication of the tractor see "Case Operator's Instruction Book".

Lubricate all points of the loader, referring to Fig. 8 pages 16a and 16b for lubrication chart.

CHECK OIL LEVEL

Remove gauge rod from left top of guide frame, and check oil mark on rod. The correct oil level is about one inch up from the bottom of the gauge rod.

After tractor has been run a few minutes, recheck level, adding oil if necessary.

To add oil, remove the breather plug from right top of guide frame and pour oil in the hole with a funnel.

CAUTION: NEVER CHECK OIL LEVEL WITH ENGINE RUNNING, AND NEVER RUN MACHINE WITHOUT OIL IN THE LOADER RESERVOIR.

Fig. 3
Checking Oil Level

THREE-WAY COCK

The three-way cock (Fig. 4 page 9) has been set for loader operation at the factory.

To set this cock for scraper operation, turn it one quarter turn counterclockwise as viewed from top. To prevent damage, this cock must be fully turned either way, and the engine must be shut off before it is turned.

To reset the cock for loader operation, turn it one quarter turn clockwise, as viewed from on top.

PIPING AND HOSE

Oil under pressure is circulated through the piping and hose, therefore, all fittings and hose clamps must be tight to prevent loss of oil and leakage of air.

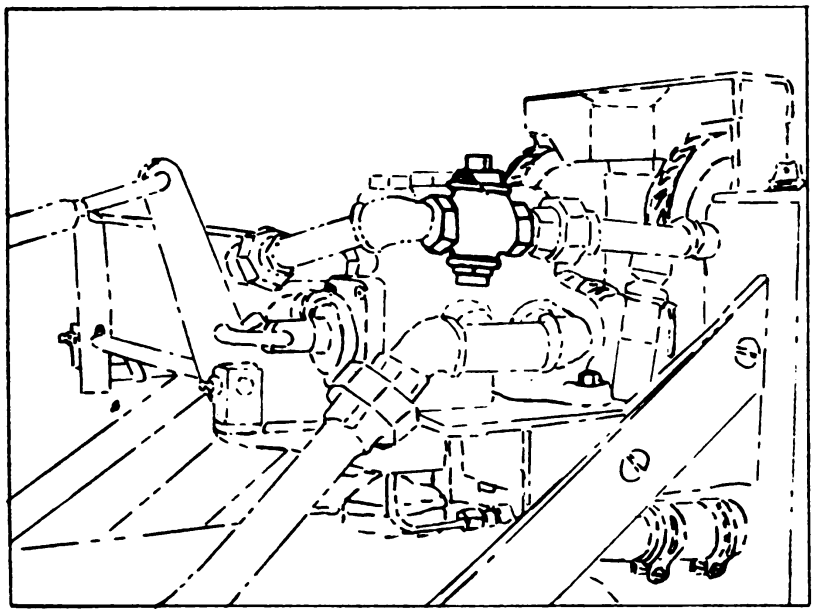


Fig. 4
Three-Way Cock

Check the hoses to see they are free, and are not in contact with metal parts which will cause wear.

CAUTION: WHEN PUTTING LOADER INTO INITIAL OPERATION, RUN MACHINE A FEW MINUTES, THEN INSPECT ENTIRE HYDRAULIC SYSTEM FOR LEAKS.

CABLES AND SHEAVES

Check to see sheaves are lubricated.

Inspect all cable clips to be sure they are tight.

If crosshead pulls unevenly or tends to turn, stop operation immediately and adjust the looser cable. (See Cable Adjustment page 18.)

Whenever cable shows cracks or strands become frayed, replace immediately with new cable. Refer to Fig. 10 page 19 for reeving of cable.

CAUTION: DO NOT SHORTEN BOTH CABLES, OTHERWISE THE BOOM MAY LIFT CLEAR OF THE GUIDE FRAME.

BOOMS AND BUCKET

The booms and bucket support the material handled by the loader. Check the following items before operating the machine:

1. The chains from the slide guides to the booms must be securely fastened to the booms.
2. The bucket snap chain must be secure to the booms and to the bucket.
3. The trip rods must be fastened together.

4. The camshaft and latch hooks must work freely. The latch hooks must seat fully into the bucket latch pockets. For this adjustment see page 18.

VALVE CONTROL LEVER ASSEMBLY

The valve control linkage is so constructed that no adjustments are necessary. Before putting the loader into operation check the following:

1. All rods, links and shafts must be securely connected.
2. Cross shaft must turn freely in bearing blocks.
3. Bearing blocks must be thoroughly lubricated.
4. Left hand bearing block must be securely fastened.

PNEUMATIC TIRES

Tractor tires are overinflated to insure rigid blocking in shipment.

Air pressure should not be allowed to drop below these recommendations. Tires should be checked regularly once a week with an accurate low pressure gauge.

Keep tire valve caps in place and screwed tight to prevent mud, gravel, and water from entering and damaging valve core, also to prevent loss of air.

RUNNING IN

The loader, like the tractor engine, should not be loaded to full capacity until it has had reasonable running in period. For the first 16 hours the bucket (or crane hook) should be loaded lightly to allow all moving parts to wear in. The sides of the guide frame and the slide tubes should be greased heavily during this time to facilitate the wearing in process.

This loader has been designed to do a wide variety of work within the tractor's range of speed and power. If the loader is subjected to loads beyond its capacity all working parts will be unnecessarily strained. If continued over long periods of time, unnecessary expense and loader failure will be experienced.

OPERATORS INSTRUCTIONS

OPERATION

With the tractor and loader properly serviced and checked as explained in the preceding pages, the tractor may be started. Since power to revolve the hydraulic pump on the loader is taken from the front end of the engine crankshaft (See Fig. 29 Page 59) there is oil pressure for operating the loader as soon as the engine is started.

Proper and efficient loader operation will be experienced by carefully following the instructions as outlined.

CAUTION: NEVER START TRACTOR ENGINE WITHOUT OIL IN HYDRAULIC SYSTEM.

CONTROLS

The hand control lever is located at the right and forward from the operator's seat. (See Fig. 5 Page 12). There are three positions encountered by the operator, "RAISE", "HOLD", "LOWER".

"RAISE" POSITION

The bucket is raised by pulling the hand control lever toward the operator's seat. The booms and bucket will raise at a speed in proportion to the engine speed.

The booms will automatically stop when the lever is held in the "raise" position, if the cables are properly adjusted. This is due to the by-pass in the cylinder wall that directs the oil from beneath the piston back into the reservoir, as soon as the piston has reached maximum height. (See Fig. 15 Page 28).

"HOLD" POSITION

"Hold" position is the neutral or centralized position of the hand control lever. The booms and bucket may be stopped and held at any point between the top and bottom of the guide frame by placing the lever in the hold position. This position is used in transporting loads. (See TRANSPORTING LOADS Page 14).

"LOWER" POSITION

The booms and bucket are lowered by pushing the hand control lever forward or away from the operator's seat.

USE OF WEIGHT BOX

SEE CASE OPERATOR'S INSTRUCTION BOOK FOR WEIGHT BOX SPECIFICATIONS AND OPERATION.

In loader operation the weight box is used not only for traction, but as a counter-balance weight to balance the weight of material being handled by the bucket.

Whenever the weight box is removed to accommodate equipment on the rear of the tractor, plug the unions immediately ahead of the weight box with the half unions provided for that purpose. (See Fig. 6 Page 13).

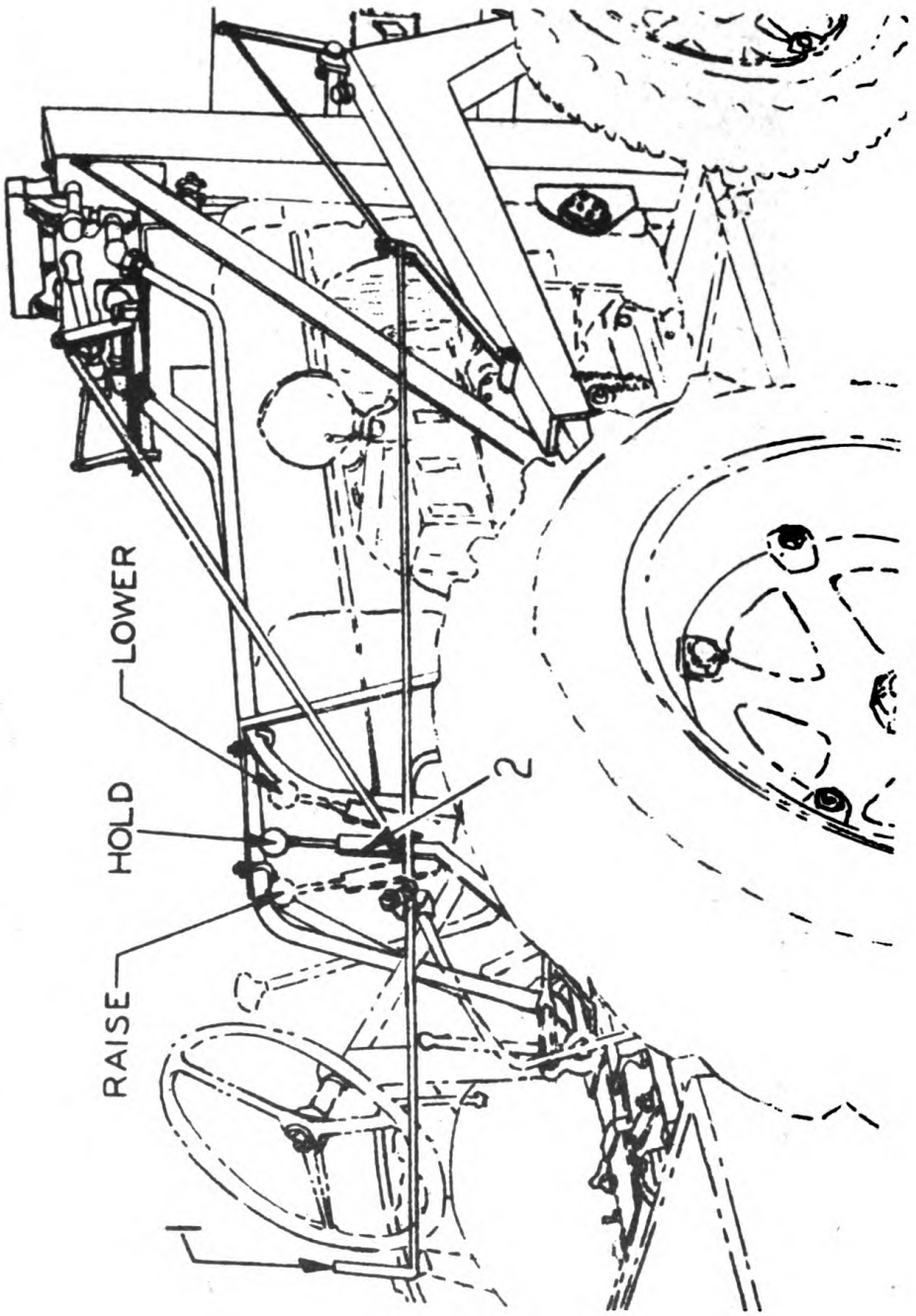


Fig. 5
Valve Controls and Trip Rod
1. Trip Rod, 2. Valve Control Lever.

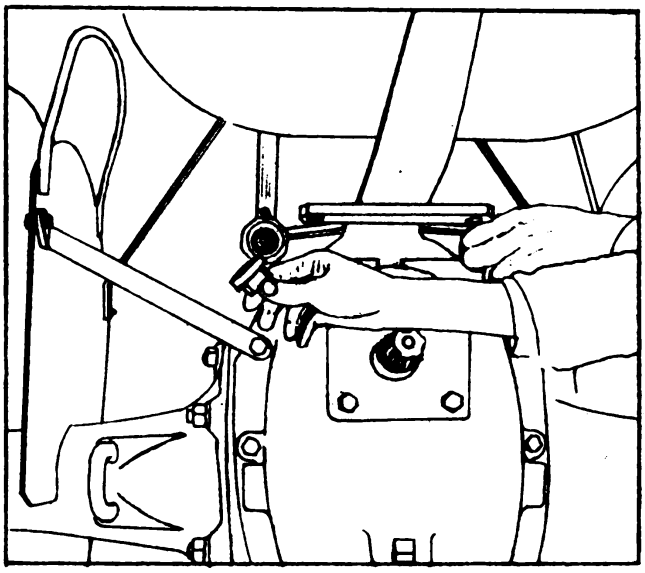


Fig. 6
Plugging Scraper Pipes

LOADING THE BUCKET

Normal operation in loading the bucket is to drive the tractor forward with bucket in the "DOWN" position. Second gear is the best average loading speed. The bucket should be held as nearly as possible at the same height during the loading for best results. The bucket cutting edge and teeth are set at a steep pitch to get good penetration in hard soil. There is, therefore, a tendency for the bucket to dig in, which has to be offset by the valve control in order to keep a smooth grade. (See Fig. 7 page 15.)

NOTE: THE BEST RESULTS ARE OBTAINED BY TAKING A THIN CUT OVER A LONGER STRETCH RATHER THAN GOUGING OUT A BUCKET LOAD IN ONLY A FEW FEET.

DUMPING THE BUCKET

The bucket is dumped by pulling the trip rod (See Fig. 5 page 12) toward the operator. This trips or unlatches the bucket hooks and allows the bucket to pivot on the hinge pins, and to dump the load.

To latch the bucket, lower the bucket while backing the tractor. As the bucket teeth touch the ground they cause the bucket to pivot on the hinge pins and automatically relatch as the boom lowers.

LOADING FROM STOCK PILE

Loading aggregate or from a stock pile the bucket should be raised as the tractor is driven forward, similar to the action of a dipper-stick shovel.

If possible, approach pile on a level surface or slightly uphill. It will be easier and safer to back away from the pile with a load.

Loading trailers from stock pile, it is advisable to load from the rear. Less tractor movement is encountered in this operation.

USING LOADER AS BACKFILLER

The unit may be used for backfilling, or for pushing loose material into a fill by driving forward with the bucket in tripped position and allowing material to accumulate in front of the bucket as the machine is driven forward toward the fill.

Caution must be used in this operation. Keep the tractor moving slowly and avoid catching the bucket cutting edge and teeth on buried obstructions such as boulders, etc.

A smooth finish operation is best accomplished by backing the machine with the bucket dragging on the ground.

TRANSPORTING LOADS

The bucket is one-third cubic yard capacity (line of plate measure) or approximately 1000 pounds of dirt. This is equal to approximately 25% of the weight of the tractor and shovel, so the center of gravity of the unit may vary considerably depending upon the height to which the load is raised.

For transporting the load under average conditions, it is recommended that the bucket be held at a point about midway from the top to the bottom of the guide frame.

CAUTION: DO NOT TRANSPORT WITH THE BUCKET RAISED TO THE FULL HEIGHT.

When transporting on a side slope it is advisable to keep the bucket as close to the ground as possible. This practice will insure better stability.

SPREADING OPERATION

On some short hauls, it may be advisable to have the loader transport material rather than dump the load into a trailer, in which case the bucket can be tripped when driving in third or fourth speed to spread the load to three or four inch depth. Practice will soon show the best height to dump the bucket to obtain the depth of the spread desired.

COLD WEATHER OPERATION

TRACTOR: Consult your tractor operating manual for complete instructions for cold weather protection of the tractor.

HYDRAULIC SYSTEM: Cold weather operation of the loader differs from operation in moderate temperatures only in connection with the weight of oil used in the hydraulic system.

Below 32° Fahrenheit - SAE 10 OE
Above 32° Fahrenheit - SAE 30 OE

CAUTION: WHEN CHANGING OIL NEVER ALLOW WATER TO ENTER HYDRAULIC SYSTEM AS IT CAUSES CORROSION AND EROSION AT HIGH VELOCITIES.

OPERATIONS IN EXTREMELY DUSTY CONDITIONS

Tractor: Consult your tractor operating manual for complete instructions for the protection of the tractor under extremely dusty conditions.

Hydraulic System: Under extremely dusty conditions make sure that dust and grit do not enter the system while changing oil. Be sure that all connections are tight at all times.

Oil in hydraulic system should not be used after it becomes dirty and contaminated. Under very severe conditions it may be necessary to change oil frequently.

OPERATIONS UNDER MUDDY CONDITIONS

Operating under muddy conditions be sure bumper plate is secure. This will prevent a great deal of mud from collecting around the pump ahd piping.

At intervals remove all mud and dirt that has collected around pump and piping. This mud will add weight and possibly strain the connections at this point.

CAUTION: BE SURE ALL CONNECTIONS ARE TIGHT - WATER ENTERING HYDRAULIC SYSTEM WILL CAUSE EROSION AND CORROSION AT HIGH VELOCITIES.

When operating in mud which will freeze during the night, it is recommended that the machine be cleaned at the end of each operating period; time will be lost if material is allowed to freeze.

Fig. 7
Loading Bucket

LUBRICATING CHART

UNIT	CAPACITY (APPROX.)	LOWEST EXPECTED AIR TEMPERATURES		
		ABOVE 32°F	32 F to 0°F	BELOW 0°F
Hydraulic System	5 gal.	OE SAE 30	OE SAE 10	OE SAE 10 PLUS 20 PERCENT DILUENT

KEY TO LUBRICANTS

OE - Oil, Engine, Crankcase Grade
CG - Grease, General Purpose

No. 1 (above 32°F)
No. 0 (32°F to 0°F)

NOTE: CLEAN ALL FITTINGS THOROUGHLY BEFORE APPLYING THE LUBRICANT GUN.

GUIDE FRAME

1. During the first sixteen hours of operation heavily grease the outside of the guide frame and the front of the wear strips to facilitate the wearing-in process.

SLIDE TUBES

2. Like the guide frame, heavily grease the slide tubes and slide guides to facilitate their wearing-in.

HYDRAULIC SYSTEM

3. Every eight hours check oil level and add lubricant if necessary. When draining, drain immediately after operation.

NOTE: SEE CARE OF HYDRAULIC SYSTEM PAGE 17.

OPERATOR MAINTENANCE

In addition to operating and lubricating the loader, it may be necessary to make minor field adjustments and repairs. All the adjustments discussed in the remainder of the OPERATOR'S INSTRUCTION section can be made by the operator in the field. It is suggested that other servicing be left to field maintenance sections or the loader returned to a base for complete overhaul.

CARE OF HYDRAULIC SYSTEM

The Hydraulic System is so constructed that very few adjustments will be necessary in the field. The pump and valves have no adjustments. If they should not operate it is advisable to replace them and send the old ones to a base to be reconditioned.

CYLINDER ASSEMBLY

In order to keep the hydraulic system in good operating condition check the following:

1. Check piston rod packing every 256 hours.
2. Check oil level every eight hours.
3. Change oil every 256 hours.

NOTE: TO DRAIN OIL, RAISE BUCKET TO FULL HEIGHT AND BLOCK BOOMS. MANUALLY PUSH THE PISTON ROD TO A LOWER POSITION TO DRIVE OIL OUT OF CYLINDER. REMOVE THE BUMPER BY TAKING OUT THE FOUR CAP SCREWS WHICH HOLD BUMPER TO GUIDE FRAME. REMOVE THE DRAIN PLUG WHICH IS DIRECTLY TO THE FRONT OF THE MANIFOLD AND THE RIGHT OF THE SUCTION LINE.

4. Flush the System every 512 hours.

NOTE: TO FLUSH SYSTEM, DRAIN AND REFILL WITH A MIXTURE OF FOUR GALLONS OF KEROSENE AND ONE GALLON OF LUBRICATING OIL. RUN THE PUMP FOR FIVE MINUTES THEN DRAIN FLUSHING OIL.

PIPING AND HOSE

The piping and hose should be checked every eight hours for any leaks or wear. All hose clamps should be tightened when necessary. If the high pressure hoses show signs of wear, replace them before actual break occurs.

THREE-WAY COCK

If the three-way cock shows signs of leakage around the stem, tighten nut on bottom of cock.

CYLINDER

A regular inspection of packing gland and packing cap is imperative. Be sure packing gland and cover are tight. If it is necessary to replace packing the following is correct procedure: (Fig. 9 page 18).

1. Lower bucket to the ground.
2. Turn off tractor engine.
3. Remove wire lacing and 4 cap screws from packing cap.
4. Remove worn packing from packing gland.
5. Clean out packing recess in packing gland thoroughly.
6. Place in new packing and work it into the recess. Do not use a sharp tool.
7. Replace packing cap and tighten down securely.
8. Be sure to replace wire lacing through the 4 cap screws.

Fig. 9
Checking the Packing

CARE OF BREATHER PLUGS

The holes in the breather plugs should be kept clean at all times to permit expansion and contraction of air within the reservoir. Under normal conditions they should be checked every thirty-two hours. In extremely dusty or muddy conditions servicing is necessary every eight hours. To clean the breather plugs, take a piece of small wire and run it through the openings in the plug, cleaning the hole. Always remove plugs from machine when cleaning.

NOTE: THE GAUGE ROD SERVES AS A BREATHER PLUG ON THE LEFT HAND GUIDE FRAME UPRIGHT.

CAM AND EYEBOLT ADJUSTMENT

Turning of the camshaft rotates the cam and raises the eyebolt. This pulls the latch hook away from the latch pocket, and "trips" the bucket. Through usage an eyebolt may become bent, thus preventing proper action of the latch hook.

Replace the bent eyebolt and readjust. (Fig. 11 page 19.) In case no new eyebolts are available, adjust the two nuts on the upper part of the eyebolt until the latch hook clears by 1/8" the bucket latch pocket when the trip rod is pulled all the way towards the operator's seat. It is imperative that both latch hooks operate together.

When installing the crane hook (see page 20) on the booms, the latch hooks must fully engage the latch pockets on the crane hook. If the latch hooks do not fully engage, lengthen the eyebolts enough to permit the safety key to be inserted thru the latch pockets and over top of the latch hooks. These safety keys must be inserted before the crane hook is used.

CABLE ADJUSTMENT

If the crosshead tends to rotate or to pull down on one side the cables must be adjusted. Loosen the cable clips of the loose cable at boom connection end and shorten slightly. Test the machine to determine if the adjustment is correct.

CAUTION: NEVER SHORTEN BOTH CABLES. THIS WILL CAUSE THE BOOMS TO BE PULLED TOO HIGH ON THE GUIDE FRAME.

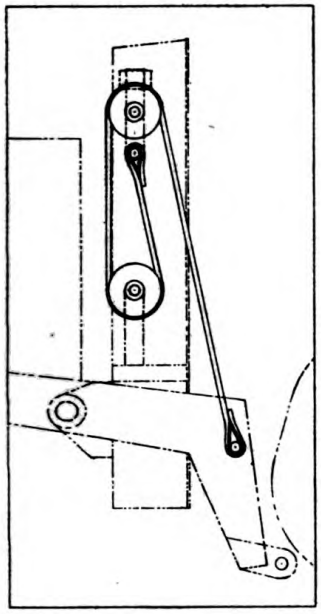


Fig. 10
Reeving the Cable

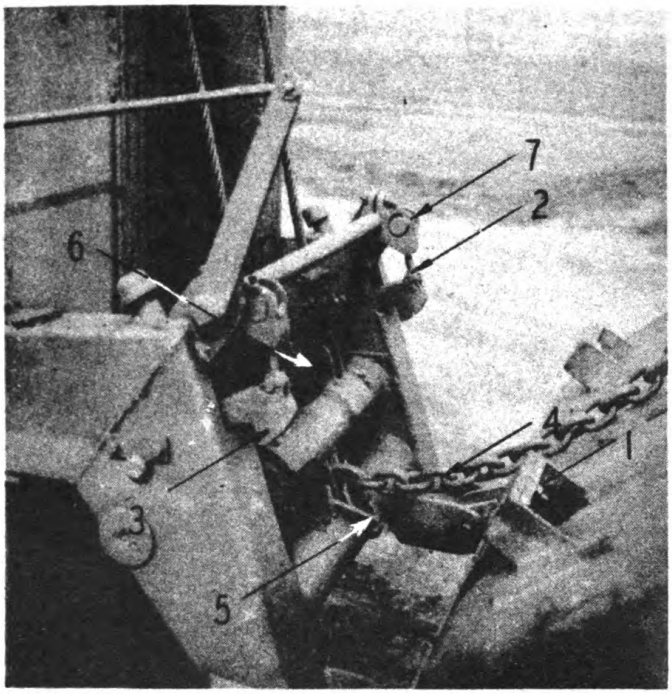


Fig. 11
Adjustments for Bucket
1. Latch Pocket Shim, 2. Eye Bolt, 3. Latch Hook, 4. Snap Chain, 5. Quick Release Pin, 6. Quick Release Pin, 7. Cam.

LATCH POCKET SHIMS

The latch pocket shims should be inspected for wear. Whenever excessive wear is apparent, turn the shims end for end. When the second side becomes worn, replace with a new set of shims. (Fig. 11 page 19).

ADJUSTING DUMPING CLEARANCE

As shipped, the distance between bucket teeth and ground when bucket is raised to full height, is 45 inches.

When material being handled is sticking and will not dump from bucket easily, the angle of the bucket may be steepened and the dumping clearance lowered. This is done by the following procedure. (Fig. 11 page 19).

1. Trip bucket and raise booms about one foot off ground.
2. Place control lever in "HOLD" position.
3. Remove quick release pin from boom end of snap chain.
4. Insert quick release pin through last link in bucket snap chain.

THRUST SHOES.

The thrust shoes should be inspected for wear. Whenever

excessive wear is apparent, replace immediately with a new set of shoes.

NOTE: ALWAYS REPLACE THRUST SHOES IN SETS.

VALVE CONTROLS

No adjustment is necessary on the valve control. All rods, links and shafts should be inspected every 64 hours to see that they are securely connected.

TRIP ROD ASSEMBLY

The trip rod assembly needs no adjustment other than a daily check to see that all connections are secure.

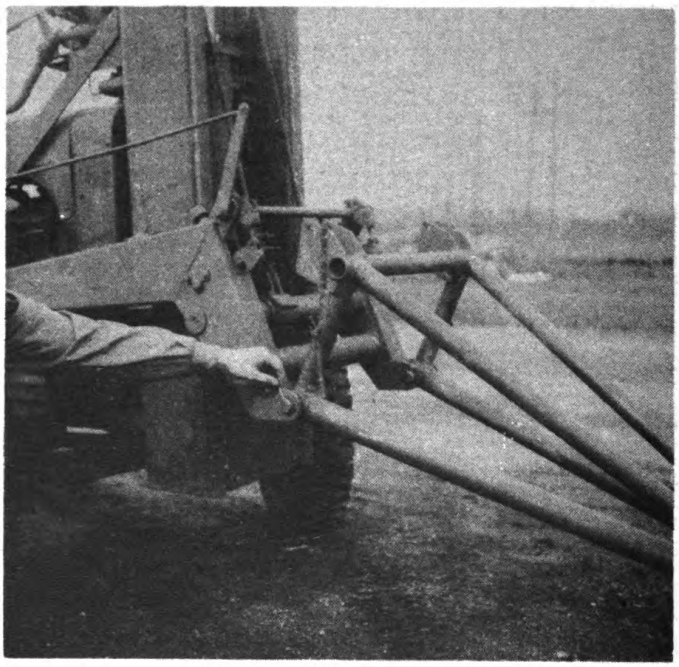


Fig. 12
Crane Hook Installation

CRANE HOOK INSTALLATION

The crane hook may be installed in place of the bucket in only a few minutes.

NOTE: THE LIFTING CAPACITY OF THE CRANE HOOK IS APPROXIMATELY 1300 LBS.

REMOVAL OF BUCKET

1. Raise booms to a height so bucket can be tripped without hitting the ground.
2. Trip bucket.
3. Lower bucket until teeth hit the ground.
4. Remove quick release pin at booms to disconnect bucket

snap chain from booms.

5. Remove cotter keys from hinge pins, and push out hinge pins.

6. Pull bucket away from booms.

INSTALLING CRANE HOOK (See Fig. 12 page 20.)

1. Leave booms at same height after removing bucket.

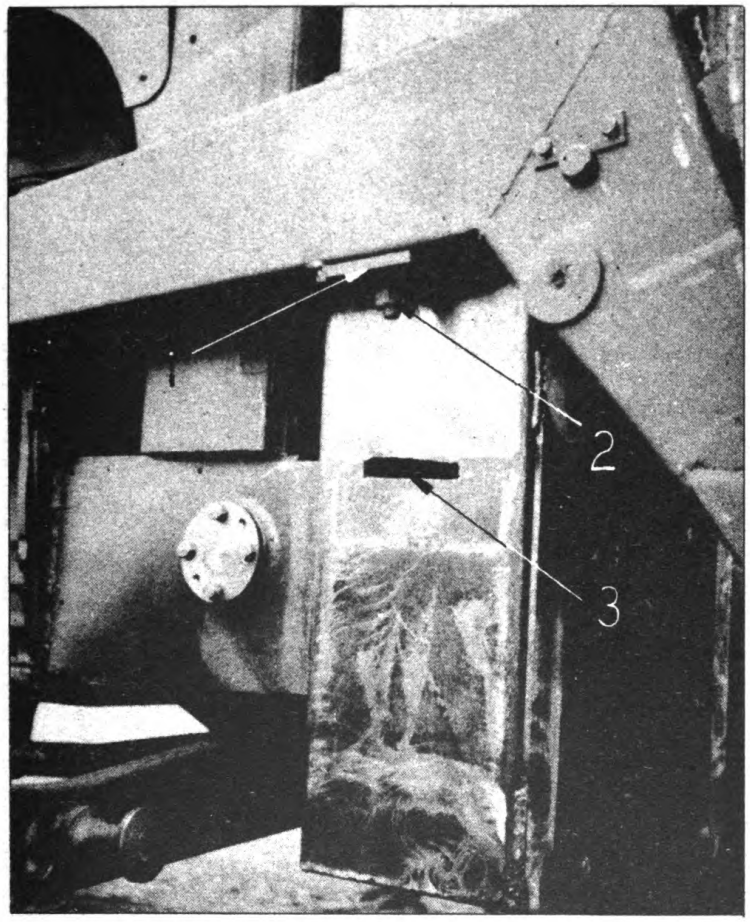


Fig. 13
Travel Lock Position
1. Travel Lock, 2. Nut,
3. Travel Lock Slot

2. With hook end of crane hook resting on ground, lift crane hook into position so hinge pins can be inserted through booms and crane hook hinges.

3. Insert hinge pins, and replace cotters.

4. Lift hook end of crane hook and latch crane hook to booms.

5. Insert safety keys in holes provided in crane hook latch pockets.

CAUTION: THE SAFETY KEYS PROVIDED MUST ALWAYS BE INSTALLED TO PREVENT THE HOOKS FROM UNLATCHING WHILE HANDLING A LOAD.

CONVERSION OF LOADER TO SCRAPER OPERATION

The unit may be easily converted from loader operation to scraper operation. However, the operator must make a careful inspection before making the conversion.

1. Raise the loader booms to the height of the slots in the guide frame.
2. Loosen the nuts on the bottom of the boom arms and slide the travel locks into the slots. (See Fig. 13 page 21.)
3. Tighten nuts securely.
4. Turn off Tractor engine.
5. Turn three-way cock so oil will be directed into the scraper valve. (See Fig. 14 page 26.)
6. Turn shut off cocks, located just ahead of the weight box, to the "OPEN" position. (See Fig. 14 page 26.)
7. Hook up scraper drawbar and hose.

NOTE: CONSULT LAPLANT-CHAOTE OPERATING MANUAL FOR THIS OPERATION AND SCRAPER OPERATION.

STORAGE FOR PERIODS OF A WEEK OR LONGER

1. Consult Tractor Operators Manual for Tractor storage.
2. Remove gauge rod and breather cap and plug holes.
3. Grease all pins and moving parts for protection against rust.
4. Tag loader indicating care given loader and date service was rendered.

CAUTION: ALWAYS HAVE BOOMS AND BUCKET RESTING ON GROUND OR FLOOR.

SUGGESTIONS TO OPERATOR

The operators responsibilities do not terminate with merely driving the tractor and operating the loader. It is his responsibility to see that the tractor and loader are kept in first class mechanical and operating condition as well as to maintain its general appearance, service and maintenance of the tractor and loader. It is, therefore, to each operators advantage to become thoroughly familiar with the functions of each working part of the loader. We urge the complete study of the information and recommendations set forth in this book.

INSPECTION TABLE

Cylinder Assembly	Every	512	hours
Cylinder Packing	"	256	"
Loader Operating Valve	"	256	"
Poppets and Seats	"	256	"
Scraper Operating Valve	"	256	"
PTO Shaft and Coupling	"	256	"
Breather Plugs	"	8	"
Pump	"	256	"
Controls	"	64	"
Piping and Hose, Oil Level	"	8	"
Cables	"	32	"

TABLE OF TOLERANCES

Piston Ring Clearance in Groove	.003 to .006 in.
Piston Ring Gap	.012 in.

SERVICE SUGGESTIONS

Listed herewith under their respective headings are some of the possible causes of loader difficulty.

BUCKET WILL NOT "RAISE"

Not enough oil.
Pump intake line defective.
PTO Shaft or coupling-splines stripped.
Operating valve defective, low pressure poppet not seating.
Controls loose.
Dirt in operating valve.

BUCKET WILL NOT "HOLD"

Leaks in hydraulic system.
Operating valve defective, high pressure poppet not seating.
Oil seeping past piston rings.

OIL OVERHEATS

Oil diluted.
Defective operating valve.
Defective pump.
Defective cylinder assembly.
Using too heavy an oil.

NOISY SYSTEM

Not enough oil.
Defective pump.
Defective valve.
Leak in system.

OIL LEAKAGE AROUND CYLINDER PACKING

Packing cover loose.
Packing worn or loose.
Piston rod scored or grooved.
Piston worn or grooves plugged.
Piston rings defective.

SHOVEL-LOADER MODEL—"SI"

●

MAINTENANCE INSTRUCTION

SECTION II

●

CONTENTS

MAINTENANCE INSTRUCTIONS FOR THE HOUGH MODEL SI AIRBORNE SHOVEL-LOADER

HYDRAULIC SYSTEM OIL FLOW

(See Fig. 14 page 26.)

The oil is circulated through the hydraulic system by means of a gear type pump operated by a power take off shaft from the engine crankshaft. The oil circulates whenever the tractor engine runs.

The guide frame serves a two fold purpose on this loader. It serves as a guide for the boom travel and also as the oil reservoir. The two uprights are connected by a manifold which keeps the oil at a common level in them.

The oil is drawn from the manifold into the pump. The pump discharges this oil, under pressure, through the high pressure line up to a three-way cock. This cock directs the flow of the oil either into the scraper operating valve, or into the loader operating valve.

During loader operation, and with the valve control lever in "RAISE" position, the oil is directed through the loader operating valve into the high pressure line to the cylinder. This oil raises the piston as long as the control lever remains in the "RAISE" position or until the piston reaches the by pass. If the piston reaches the by pass, the oil passes from beneath the piston through the by pass line into the manifold.

Whenever the valve control lever is placed in "HOLD" position, the oil coming from the pump is directed from the loader operating valve into the return line to the reservoir. The oil in the cylinder and in the high pressure line remains static.

With the valve control lever placed in "LOWER" position, the weight of the booms pushes the piston down forcing the oil back through the high pressure line into the loader operating valve, thence into the return line to the reservoir. Meanwhile, the oil coming from the pump passes through the loader operating valve to the reservoir along with the oil expelled from the cylinder.

During scraper operation, the three-way cock directs the flow of oil into the scraper operating valve. This valve directs the flow of oil to the scraper. When oil is directed to the scraper through either line, oil is being returned to the reservoir in the other line.

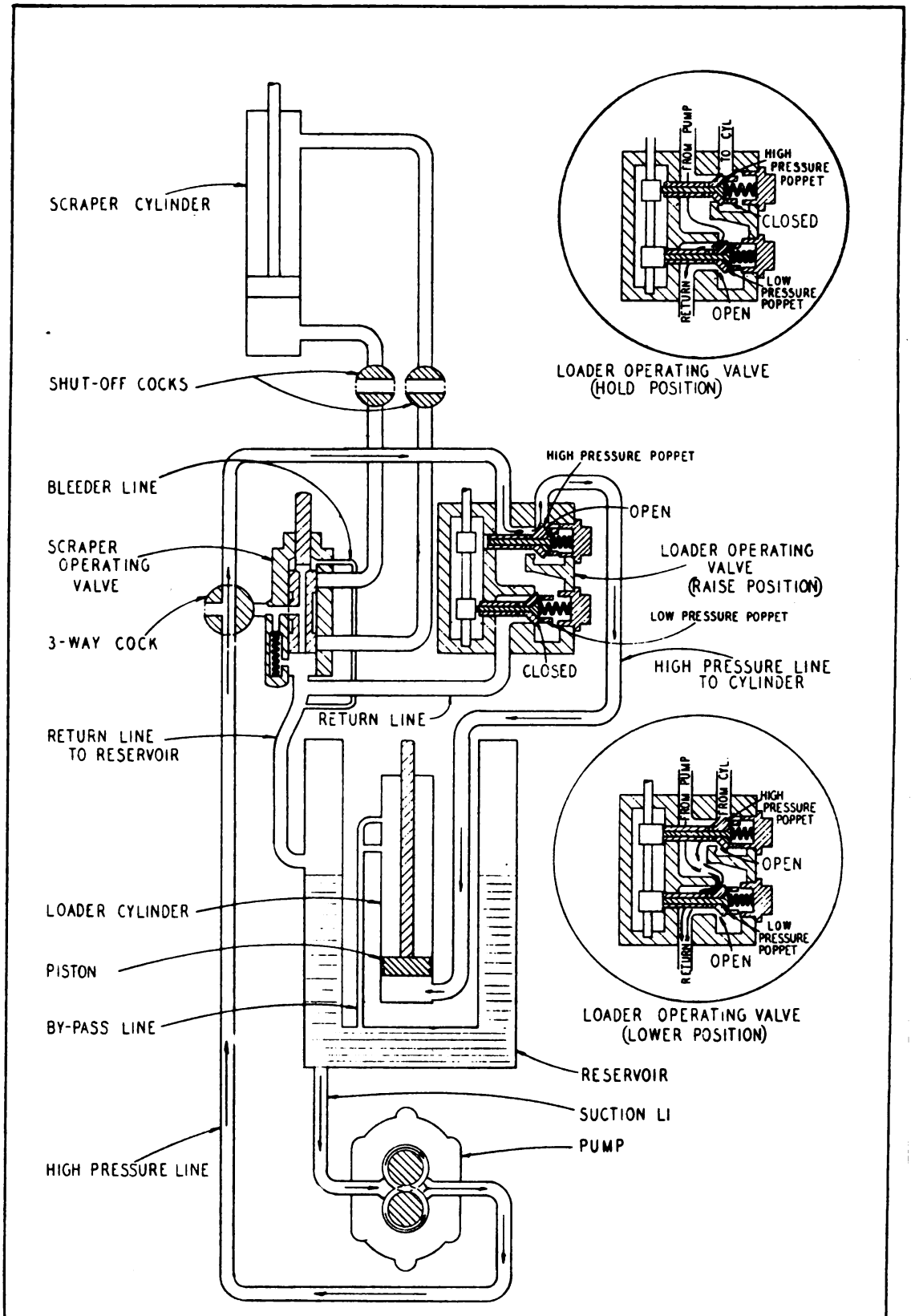


Fig. 14
Hydraulic System

CYLINDER ASSEMBLY

Under most circumstances much of the servicing required on the cylinder assembly can be done without removing the cylinder from the loader.

DISASSEMBLY OF CYLINDER

To properly repair the cylinder follow this outline:

1. DRAIN SYSTEM. (NOTE: NEVER REFILL WITH OLD OIL - ALWAYS FLUSH AND REFILL WITH NEW OIL.)
2. Release cables at boom end.
3. Remove crosshead assembly.
4. Remove wire lacing from four bolts holding cylinder cap to cylinder and remove the cap screws.
5. Insert 1/2" - 13 NC x 3" cap screw in hole on top of piston rod and pull out rod and cap together.

CAUTION: DO NOT DAMAGE PACKING LOCATED BETWEEN CYLINDER CAP AND CYLINDER.

6. Remove rings and inner rings.
7. Drive out piston pin to remove piston.

REMOVING CYLINDER FROM LOADER

If it is necessary to remove cylinder from loader follow this procedure:

1. See steps 1, 2, and 3 in DISASSEMBLY OF CYLINDER.
2. Disconnect both high pressure hoses.
3. Remove the three cap screws holding cylinder to guide frame.
4. Remove two cap screws from the base of the cylinder.
5. Lift cylinder straight up and away from guide frame.

INSPECTION

Check the following parts of the cylinder assembly thoroughly.

1. Packing is not worn or loose.
2. Piston rod is not scratched or gouged from dirt or grit.
3. Piston rings are not excessively worn or broken.
4. Inner rings are not broken.
5. Piston is not worn excessively, grooves are not pitted or chipped.

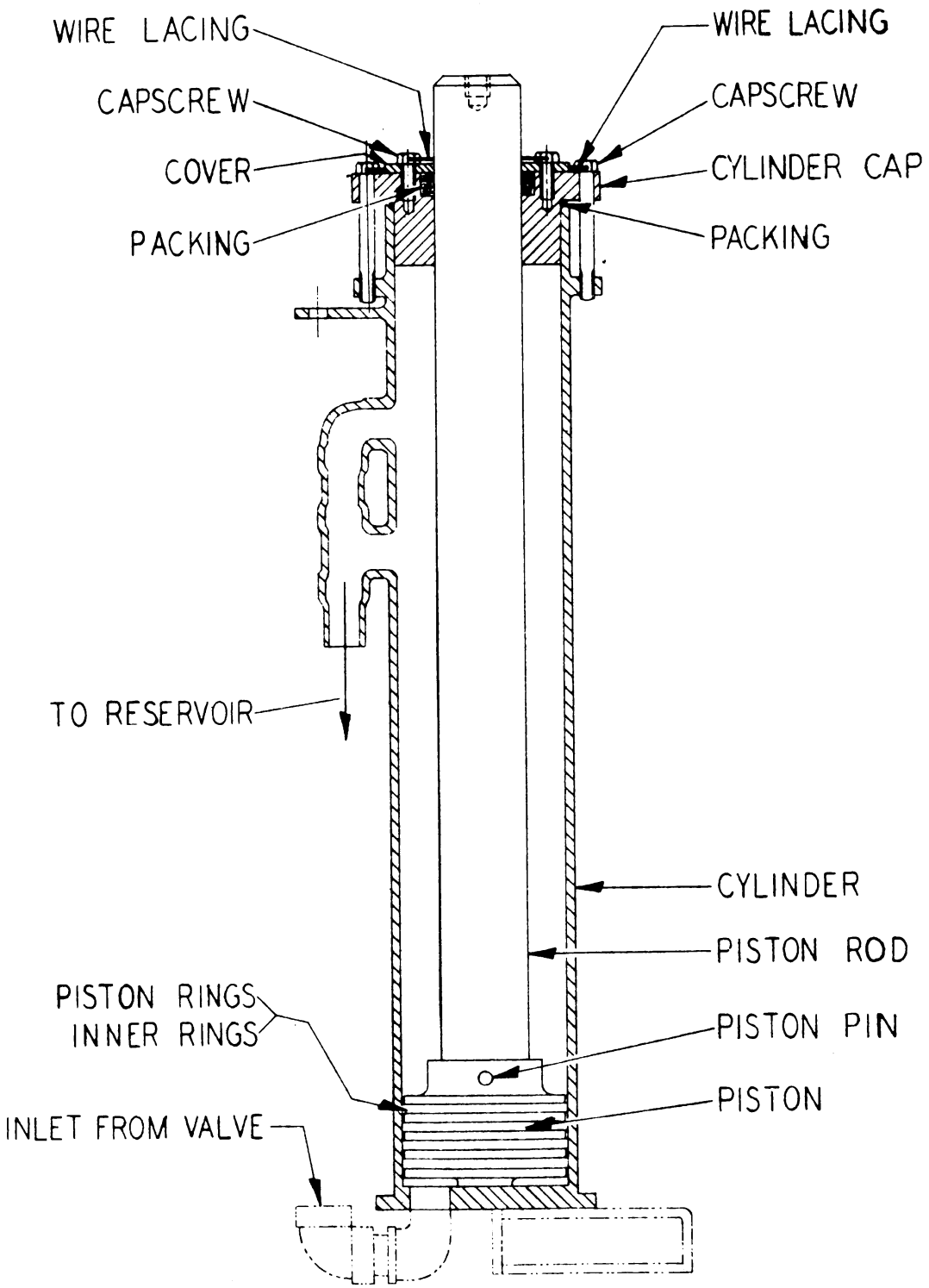


Fig. 15
Cylinder Section

REASSEMBLY

The cylinder is assembled by reversing the procedure of disassembly.

During the procedure of reassembly check the following:

1. Broken and badly worn parts are replaced.
2. All parts are thoroughly clean.
3. Inner rings are installed.
4. Piston rings have correct clearances and openings are staggered around the piston. (See table of Tolerances Page 23).
5. Packing is replaced evenly and has not been damaged during disassembly.
6. Packing cap and cylinder cap are drawn down evenly and securely and wire lacings are replaced.

CAUTION: NEVER ALLOW WATER TO ENTER HYDRAULIC SYSTEM AS IT CAUSES CORROSION AND EROSION AT HIGH VELOCITIES.

LOADER OPERATING VALVE

The "Operating Valve" is made up of a cast body, camshaft, two sets of steel poppets and two steel springs.

The function of the valve is to control the direction of the flow of oil to bring about the "RAISE", "HOLD" and "LOWER" positions of the booms and bucket.

INSPECTION OF VALVE

To inspect the valve in the field follow this procedure:

1. Stop the tractor engine.
2. Lower the bucket to the ground.
3. Remove the two valve caps on the top side of the valve.
4. Check the position of the poppets in "RAISE", "HOLD" and "LOWER" positions. (See Fig. 14 Page 26 for valve poppet positions.)
5. Any dirt or foreign matter found in valve should be removed before checking poppets.

"RAISE" POSITION

With the valve control lever in the "RAISE" position the poppets in both valve chambers should seat solidly. (See Fig. 14 Page 26).

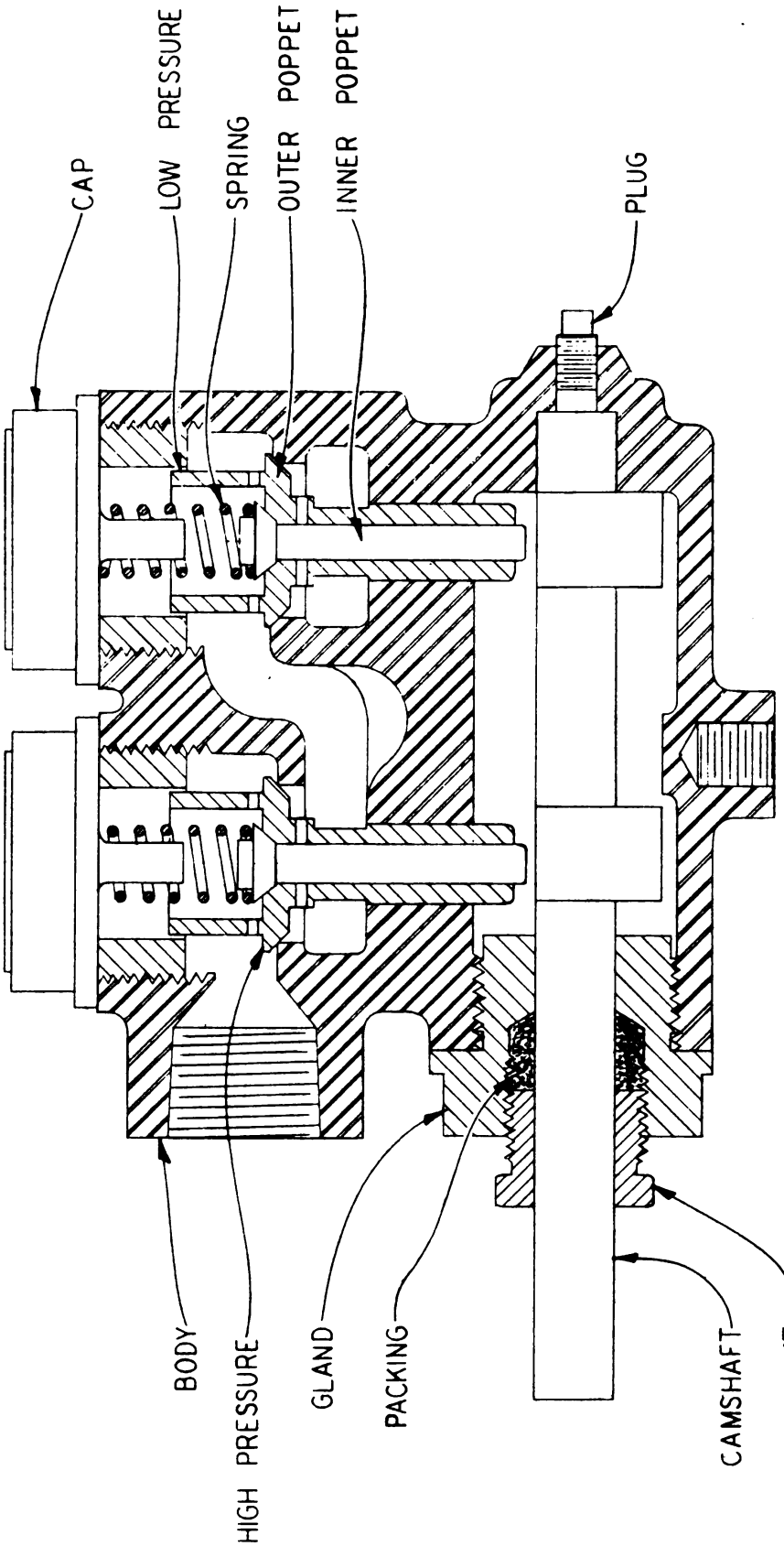


Fig. 16
Loader Operating Valve Section

NOTE: IN OBSERVING FIG. 14 PAGE 26 NOTE THAT THE HIGH PRESSURE POPPET IS OPEN DUE TO PRESSURE FROM THE PUMP, AND IS FREE OF THE CAMSHAFT.

If the poppets do not seat solidly remove them and grind just enough stock from the lower ends so they will not rest on the camshaft with the valve in "RAISE" position. The poppets, both inner and outer, should be lapped in with regular automotive valve grinding compound, in order to provide a good seat.

If necessary to grind poppets remove valve and wash thoroughly before assembling to tractor.

"HOLD" POSITION

With the operating control lever in "HOLD" position the high pressure poppet should be closed and the low pressure poppet should be open. (See Fig. 14 page 26).

"LOWER" POSITION

With the valve control lever in "LOWER" position both high and low pressure poppets should be open. (See Fig. 14 page 26).

NOTE: CHECKING THE ABOVE POPPET POSITIONS CAN BE DONE WITH VALVE MOUNTED ON LOADER.

DISASSEMBLY OF VALVE

1. Remove valve from loader by breaking the union on high pressure line between 3-way cock and valve, loosen hose clamps on hose between valves, remove 1/2"-13 NC capscrew.
2. Remove valve caps.
3. Turn valve upside down and poppets will fall out.
4. Remove valve control lever.
5. Screw out packing nut.
6. Remove packing gland.
7. Pull out camshaft.
8. Remove packing from packing gland.

INSPECTION OF DISASSEMBLED VALVE

1. Inspect seats and poppets to be sure poppets are seating properly.
2. Inspect springs to see if they are broken or cracked.
3. Check condition of packing.
4. Replace all broken and badly worn parts.

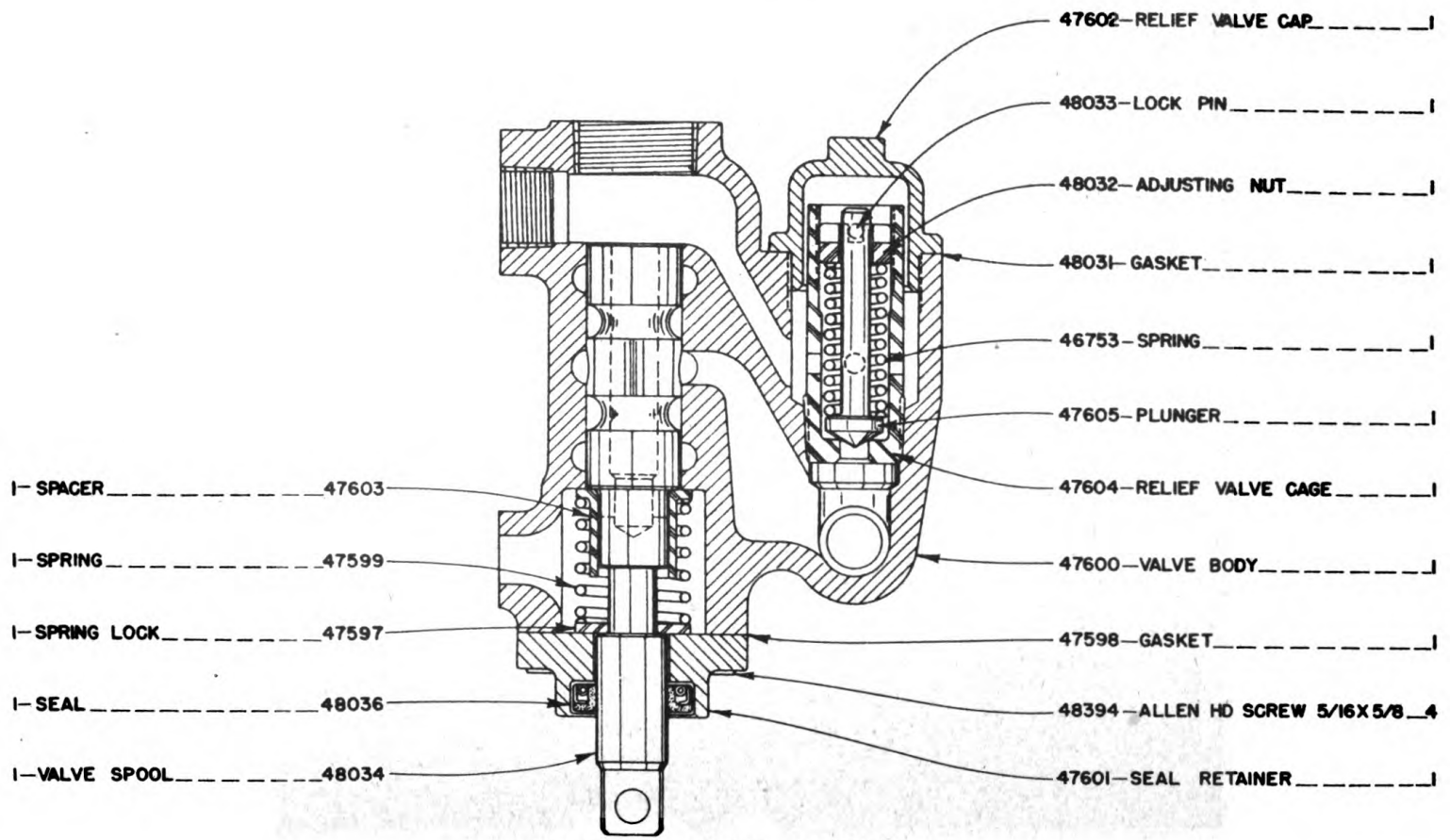


Fig. 17
Scraper Operating Valve Section

REASSEMBLY OF VALVE

The valve can be reassembled by reversing the procedure outlined under "DISASSEMBLY OF VALVE"

During reassembly of the valve take the following precautions:

1. Broken and badly worn parts are replaced.
2. All parts are thoroughly clean.
3. Packing has not been damaged during the disassembly.
4. Poppets seat properly.

NOTE: TAKE CARE THAT POPPETS ARE PUT BACK INTO SAME SIDE OF VALVE FROM WHICH THEY WERE TAKEN.

5. Poppets attain their proper position in all three positions of the operating lever.
6. Springs are replaced.
7. Valve caps are drawn on tightly.

SCRAPER OPERATING VALVE

The scraper operating valve is used to control the direction of the flow of oil to the LaPlant Choate scraper attachment.

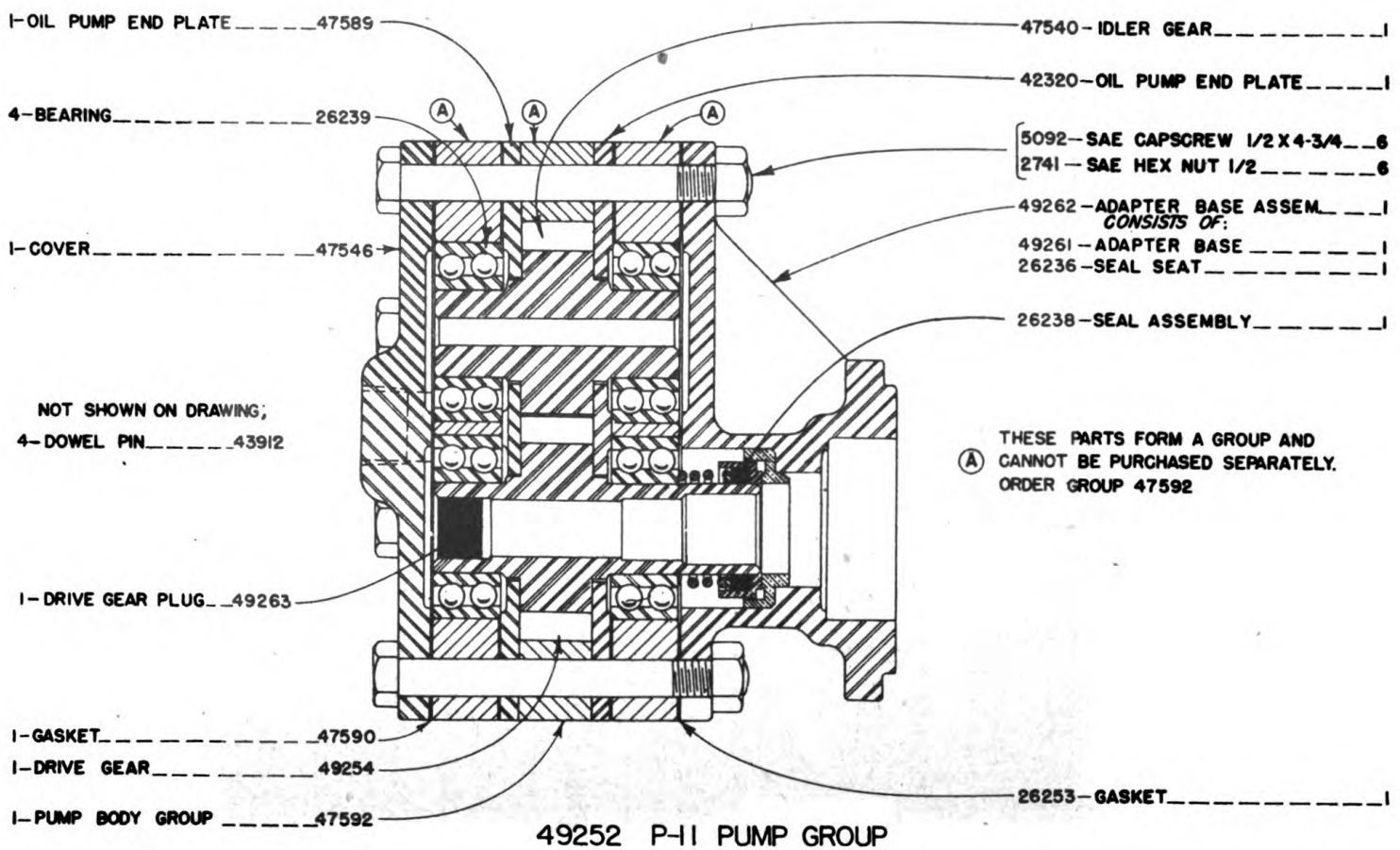
During loader operation the return oil from the loader operating valve passes through the scraper operating valve to the reservoir.

DISASSEMBLY OF SCRAPER OPERATING VALVE

1. Remove four Allen head screws from seal retainer.
2. Pull off seal retainer being careful not to damage gasket between retainer and valve body.
3. Pull out operating spool withdrawing with it the spring, lock and spacer.
4. Remove cap, being careful not to damage gasket.
5. Turn valve on end and complete relief assembly will fall out.
6. Drive pin from nut to release spring from plunger.

INSPECTION

1. Spool has not been corroded or eroded.
2. Gaskets have not been broken.
3. Springs are not broken or cracked.



49252 P-11 PUMP GROUP

Fig. 18
Pump Section

SERIAL No. 8501 THRU 8532

1362

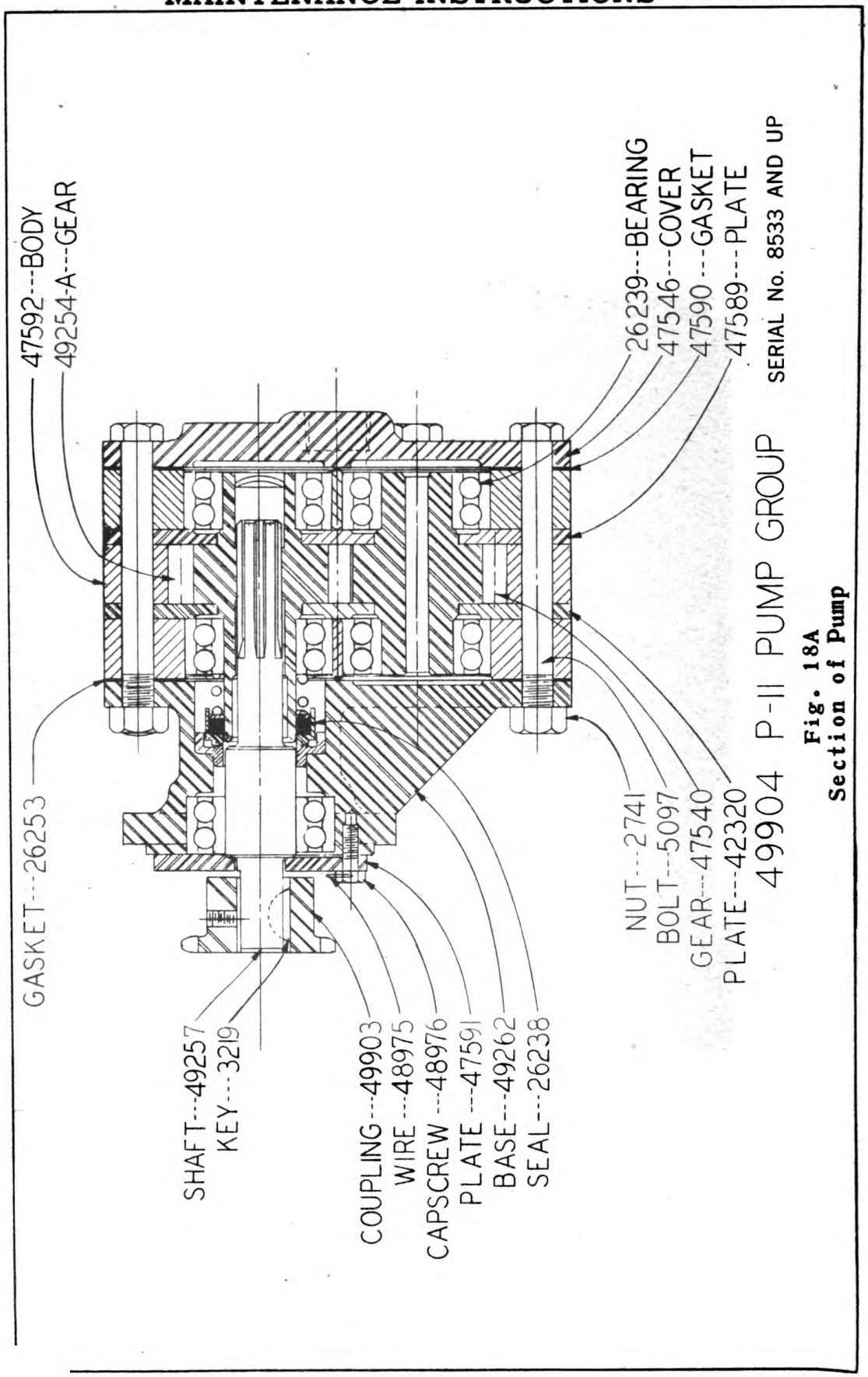


Fig. 18A
Section of Pump

4. All fittings on the ports are drawn up tight.

PUMP

The pump is a gear pump powered by the tractor engine. It drives the oil through the hydraulic system at a speed in proportion to the speed of the engine.

DISASSEMBLY OF PUMP

1. Remove six capscrews bolting cover.
2. Tap cover and pull it away from pump body group being careful not to damage gasket.
3. Tap adapter base and pull it away from pump body group being careful not to damage gasket. Seal assembly will come out when adapter base is removed.
4. Drive out four dowel pins and pull pump body group apart.
5. Press out bearings and gears from pump body group.

INSPECTION

1. Inspect gears for wear, tolerances and back lash.
2. Inspect bearings for dirt and grit.
3. Check gaskets to be sure they have not been broken during assembly.
4. Inspect seal assembly for wear and breakage.

REASSEMBLY OF PUMP

The reassembly of the pump is the reverse procedure of disassembly. Care of the following must be taken:

1. All broken and badly worn parts are replaced.
2. All parts are thoroughly clean.
3. The six cover capscrews are drawn up tight and evenly.

POWER TAKEOFF SHAFT AND COUPLING

Both the power take off shaft and power take off coupling require no servicing or adjustments. In case of damage, they must be replaced.

To remove the power take off shaft or power take off coupling the following procedure must be followed:

1. Remove bumper plate.
2. Disconnect high pressure hose connections.
3. Disconnect chain coupling nearest pump (only on machines with Serial Nos. 8533 and up).

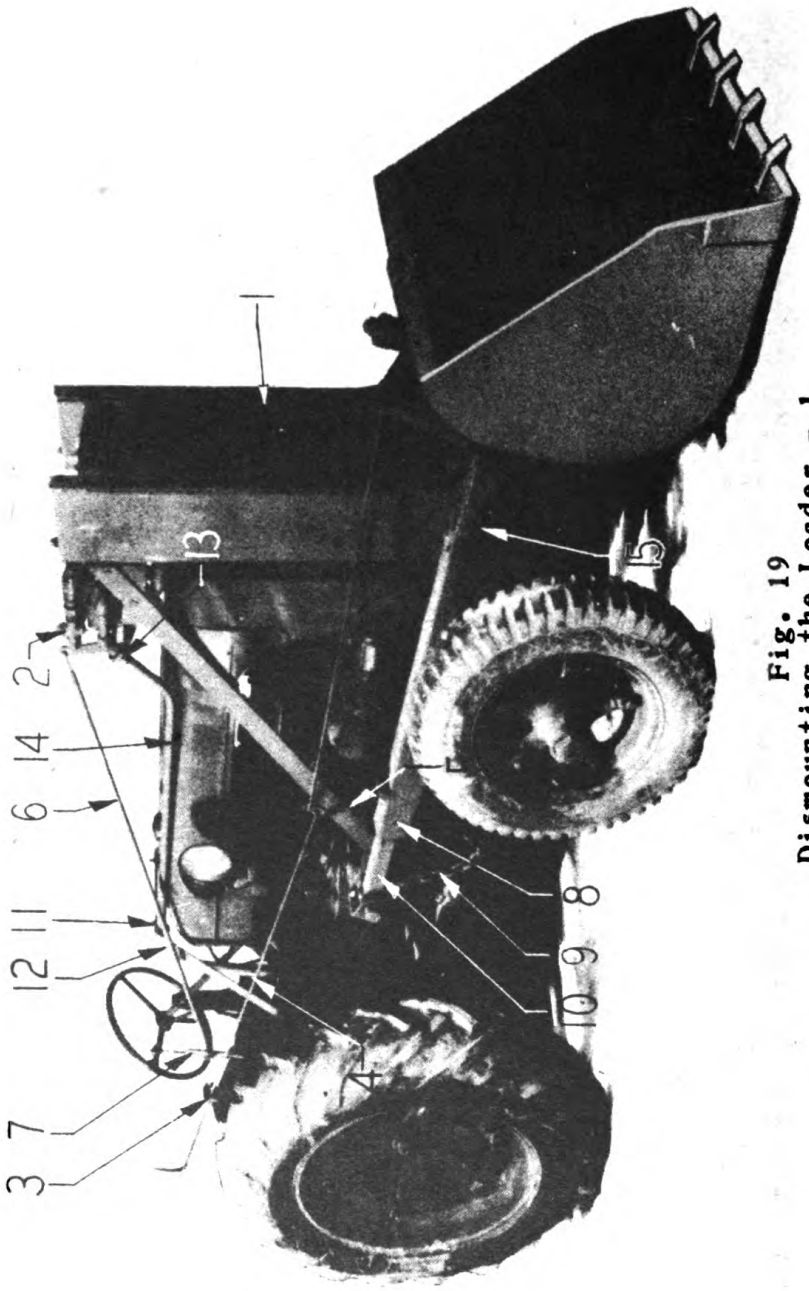


Fig. 19
Dismounting the Loader - 1

1. Cable, 2. Shut Off Cock, 3. Trip Rod Guide, 4. Trip Rod-Rear, 5. Pivot Arm, 6. Valve Control Rod, 7. Valve Control Lever, 8. Special Cotter, 9. Boom Chains, 10. Slide Guides, 11. Hook Bolt, 12. Tie Brace, 13. Union, 14. Scraper Line, 15. Booms.

4. Remove four cap screws which hold pump to support plate and pull pump straight away from plate.

5. Remove three cap screws from power take off coupling which hold coupling to fan pulley.

NOTE: IF SPLINES ARE BADLY WORN OR SHAFT IS BENT, REPLACE IMMEDIATELY TO FORESTALL FAILURE.

REMOVING LOADER FROM TRACTOR

To dismount the loader from the tractor follow the procedure outlined. (See Fig. 19 page 36.)

1. Lower booms to the ground so cables (1) are slack, then shut off tractor engine.

2. Check 3-Way cock (2) to be sure it is set for loader operation.

3. Remove trip rod guide (3); take out cotter and remove rear trip rod (4) from pivot arm. (5)

4. Take out cotters from control rod (6) and remove.

5. Take out cotter, unscrew nut holding control lever (7) to tractor and remove control lever.

6. Take out special cotters (8) which hold boom chains (9) to booms.

7. Pull out quick release pins which hold cables (1) to booms.

8. Pull booms (15) and bucket away from slide guides (10) and away from the tractor.

9. Loosen hook bolts (11) on tiebrace (12) and remove tiebrace from tractor.

10. Break union (13) on scraper line (14) at guide frame and weight box, and take off scraper lines.

(SEE FIG. 20 PAGE 38 FOR FOLLOWING):

11. If chain hoist is available, secure to top of guide frame (5).

12. Disconnect chain coupling nearest pump (only on machine with Serial Nos. 8533 and up).

13. Take out four flat head cap screws which hold side braces (1) to guide frame.

14. Remove eight cap screws that secure anchor pin (2) to guide frame, and pull out anchor pins.

NOTE: IF ANCHOR PINS ARE TIGHT, USE PULLOUT HOLES PROVIDED IN ANCHOR PINS.

15. Pull guide frame straight away from tractor.

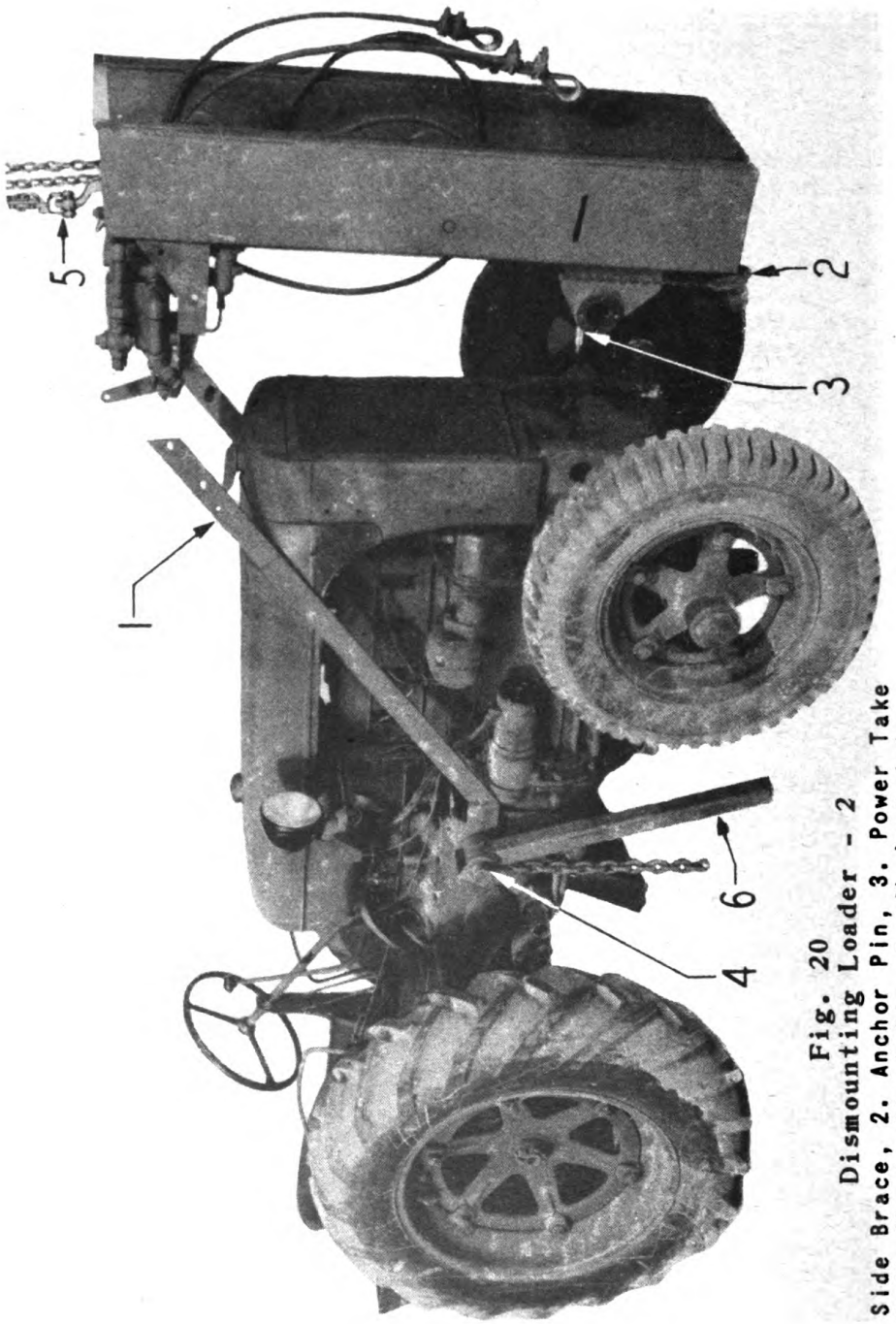


Fig. 20
Dismounting Loader - 2
1. Side Brace, 2. Anchor Pin, 3. Power Take Off Shaft, 4. Pivot Pin, 5. Chain Hoist, 6. Slide Guide

CAUTION: NEVER ALLOW THE WEIGHT OF THE GUIDE FRAME TO BEAR ON THE PTO SHAFT.

16. Remove cotters from inside end of rear pivot pins. (4) Hold castellated nut and screw out pin by a rod or drift pin in the hole provided in the pin for this purpose.

NOTE: REMOVING THE REAR PIVOT PINS RELEASES THE SIDE BRACES (1) AND SLIDE GUIDES (6).

(SEE FIG. 23 PAGE 47 FOR FOLLOWING):

17. Remove eight cap screws which hold sides SI-1225 and SI-1228 to cross bars SI-1229 and SI-1230.

NOTE: LEFT HAND SIDE SI-1228 IS LIFTED OUT FROM BETWEEN TRANSMISSION CASE AND CLUTCH ROD.

18. Remove two bolts holding upper cross bar SI-1229 to tractor.

19. Take out two bolts securing lower cross bar SI-1230 to tractor.

MOUNTING THE LOADER

To mount the loader to the tractor, reverse the above procedure for dismounting. The following precautions must be taken during mounting the loader.

1. Insert the PTO Shaft into the pump, being careful to hold the shaft in line with the opening in the pump, rotating the shaft very slowly to prevent the collar on the shaft from damaging the oil seal in the pump. This applies only to machines with Serial Nos. 8501 to 8532.

CAUTION: NEVER USE FORCE TO INSERT THE PTO SHAFT.

2. Be sure the guide frame assembly is lifted to correct height so that the PTO Shaft and coupling are in line.

3. Move the guide frame assembly towards the tractor until the splines on the shaft engage properly in the coupling. If necessary, revolve the shaft in the pump to line the splines. Push the guide frame easily but firmly into place and secure to tractor.

   For machines with serial Nos. 8533 and up, secure the guide frame to the tractor, then rotate the pump shaft enough to install the chain coupling.

CAUTION: NEVER ALLOW THE WEIGHT OF THE GUIDE FRAME TO BEAR ON THE PTO SHAFT.

REBUSHING THE SHEAVES

To rebush a sheave, drive or press out old bushing. Be sure hole is clean, press in new bushing, and ream to 1".

Using grease fitting hole in the sheave as a guide, drill 1/4" hole through bushing. Then put grease fitting back into sheave hub.

SHOVEL-LOADER MODEL—"SI"

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SPARE PARTS CATALOG

SECTION III

●

CONTENTS

WARNING

SPARE PARTS can be supplied promptly and accurately only if positively identified by correct part number and correct part name.

FURNISH THIS INFORMATION ON ALL REQUISITIONS. WITHOUT FAIL, on all requisitions, give name of machine, name of manufacturer, model or size, manufacturer's serial number of each machine and subassemblies attached to machine, and components and accessories for which spare parts are required. List spare parts for only one make or kind of machine on each requisition.

Requisitions must be double spaced to provide room for office notations when necessary.

PREPARATION OF REQUISITIONS

Sample Copy for Use in the Preparation of Requisitions

Revisions in QMC Form 400 for requisitioning spare parts are confined to new column headings. Until new forms are available all organizations will use the present form and type or write in corrections indicated.

Under revised heading "Nomenclature and Unit" list the article and the unit (ea for each; lb for pound; etc.). Under heading "Maximum or Authorized Level" list the authorized organizational allowances or depot stock levels given in ENG 7 and ENG 8 of the ASF Engineer Supply Catalog (superseding Part III, Corps of Engineers Supply Catalog). The total number on hand for each item is listed under "On Hand". In column headed "Due In" enter the total quantity previously requisitioned but not delivered. Column headed "Required" is to be changed to read "Quantity Desired." In "Remarks" column enter additional information. For "Initial" and "Replenishment" requisitions, the sum of "Quantity Desired", "Due In", and "On Hand" should equal "Maximum or Authorized Level".

On this page is shown a sample requisition on QMC Form No. 400 which conforms to the latest revisions. The marginal notes give instructions for preparing a requisition for spare parts for Engineer equipment. Additional information on this subject is contained in Section ENG 1-2 of the ASF Engineer Supply Catalog (superseding Section AA-1 of Part III Engineer Supply Catalog), available on requisition from Engineer Field Maintenance Office, P. O. Box 1679, Columbus, Ohio.

State PERIOD designation by use of one of the following terms:
(1) "INITIAL"—first requisition of authorized allowances.
(2) "REPLENISHMENT"—subsequent requisitions to maintain authorized allowances.
(3) "SPECIAL"—requisitions for necessary repairs not covered by allowances.

Type "SPARE PARTS" in upper right hand corner of requisition.

Give complete shipping instructions. Special instructions for packing, marking, routing, etc., should be given at the end of requisition.

State proper nomenclature of machine, also make, model, machine serial number and U. S. A. registration number.

Prepare a separate requisition for each different machine.

State basis or authority and date delivery is required, immediately below description of machine.

Double space between items.

Group parts required under group headings as shown in manufacturers' parts catalogs (Technical Manuals).

State stock numbers, manufacturers' parts numbers and nomenclature accurately and completely. Do not use abbreviations.

WAR DEPARTMENT
Q. M. C. Form No. 400
(Revised 19 Aug. 1943)

SPARE PARTS

REQUISITION

To: Engineer Field Maintenance Office — No. of Sheets 1 — Sheet No. 1
P.O.Box 1679, Columbus, Ohio.
Requisition No. E-531-3-44 — Date 6 October 1943 — Period Special

SHIP TO Engineer Property Officer, Pine Camp, New York.
MARKED FOR: Supply Officer, 147th Engineer Regiment, Pine Camp, New York.

Requisitioned By (show Signature, Rank, Organization, Destination. If different from "ship to" include address):
Robt. E. Roe
Robert E. Roe.
Major C. E.
Engineer Property Officer

Approved ~~by~~ For The Commanding Officer:
John D. Doe
John D. Doe.
Colonel. C. E.
Executive Officer

MFG. NO.	NOMENCLATURE AND UNIT		AUTH. or MAX. LEVEL	ON HAND	DUE IN	REQUIRED	APPROVED
PARTS FOR AIRBORNE SHOVEL - LOADER, HOUGH MODEL SI - TRACTOR MOUNTED - SERIAL NO 3505							
	Basis : Repair of disabled equipment						
	Delivery is requested by 20 October 1943						
	GUIDE FRAME GROUP						
SI-1279	SHEAVE - Lower	ea	--	0	2	2	
SI-1283	SHEAVE SHAFT - Lower	ea	--	0	2	2	
	BOOM GROUP						
SI-1165	LATCH HOOK	ea	--	00	2	2	
SI-1168	SPRING, Latch	ea	--	0	2	2	
	LOADER OPERATING VALVE GROUP						
GH-9020A1	CAM SHAFT	ea	--	0	1	1	
GH-9010B1	SPRING - Valve	ea	--	0	2	2	
	*						

U. S. GOVERNMENT PRINTING OFFICE

*Nonexpendable items such as tools must be accounted for, when requisitioned, by a statement that they have been placed on REPORT OF SURVEY or STATEMENT OF CHARGES.

Emergency requisitions sent by telephone, telegraph or radio must always be confirmed immediately with requisition marked: "Confirming (state identifying data)."

PREPARATION OF REQUISITIONS

A sample requisition in the correct form for submission by the Engineer Property Officer is shown on the opposite page.

THIS SHALL BE FOLLOWED IN MAKING OUT REQUISITIONS

In order to eliminate duplication of work, Property Officers may authorize organizations to prepare requisitions in final form, leaving requisition number space blank for completion by Property Officer.

THE FOLLOWING RULES WILL BE OBSERVED CAREFULLY IN PREPARING REQUISITIONS FOR SPARE PARTS:

a. Prepare a separate requisition for each different machine.

b. Type "SPARE PARTS" in upper right hand corner of requisition form.

c. State PERIOD designation by use of one of the following terms:
   (1) "INITIAL"—first requisition of authorized allowances.
   (2) "REPLENISHMENT"—subsequent requisitions to maintain authorized allowances.
   (3) "SPECIAL"—requisitions for necessary repairs not covered by allowances.

d. Give complete shipping instructions.

e. State proper nomenclature of machine, and make, model, serial number and registration number.

f. State basis of authority, and date delivery is required, immediately below description of machine.

g. Group parts required under group headings as shown in manufacturer's parts catalogs.

h. State manufacturers' parts numbers and nomenclature descriptions accurately and completely. Do not use abbreviations.

i. Double space between items.

j. Emergency requisitions sent by telephone, telegraph, or radio must always be confirmed immediately with requisition marked: "*Confirming* (state identifying data)."

k. Nonexpendable items must be accounted for.

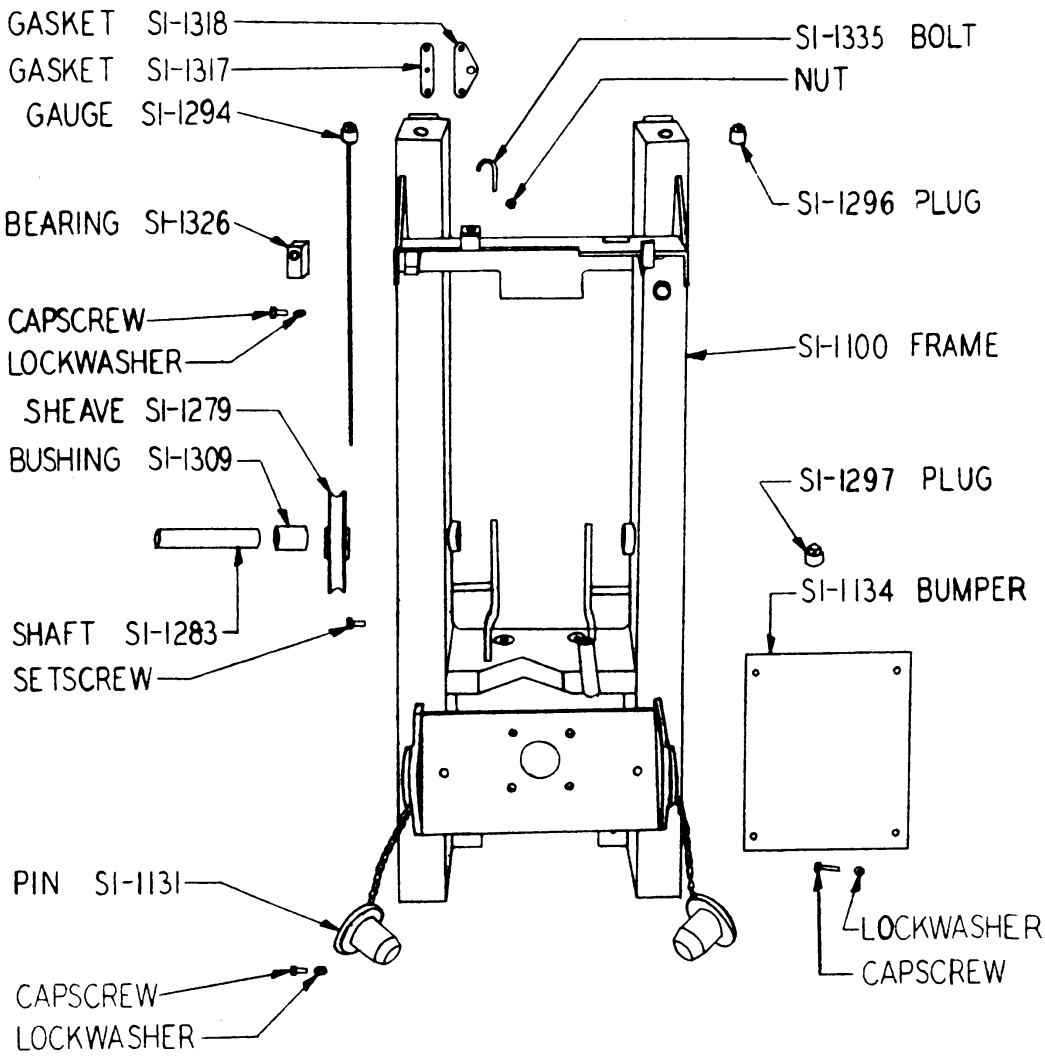


Fig. 21
Guide Frame Group

GUIDE FRAME GROUP
(See Fig. 21)

PART NO.	QTY.	PART NAME	WEIGHT EACH	
			LBS.	OZ.
SI-1100	1	Guide Frame (Include SI-1131)	225	...
SI-1131	2	Anchor Pin with chain.	3	8
	2	Cap screw - Anchor Pin - 3/8" - 24 N.F. x 7/8" Hex. Hd.		
	8	Lock washer - 3/8" Std. S.A.E.		
SI-1296	1	Filler Plug.	...	4
SI-1294	1	Oil Gauge.	...	8
SI-1134	1	Bumper Plate	5	8
	4	Cap screw - Bumper - 3/8" - 24 N.F. x 1-1/4" Hex. Hd.		
	4	Lock washer - 3/8" Std. S.A.E.		
SI-1326	1	Bearing.	...	6
	1	Cap screw - Bearing - 5/16" - 18 N.C. x 3/4" Hex. Hd.		
	1	Lock washer - 5/16" Std. S.A.E.		
	2	Grease fitting - 1/8" I.P.T. Lincoln straight.		
SI-1335	1	Hook Bolt.	...	4
	1	Nut - Hook Bolt - 3/8" - 24 N.F. Hex.		
SI-1279	2	Sheave with bushing.	6	...
SI-1309	2	Bushing.	...	4
SI-1283	2	Sheave Shaft - Lower	1	8
	2	Set Screw - Sheave Shaft 3/8" - 16 N.C. x 3/4" Sq. Hd.		
	2	Grease Fitting - 1/8" I.P.T. Lincoln straight.		
SI-1317	1	Gasket - Rear.	...	.5
SI-1318	1	Gasket - Front	...	.5
SI-1297	1	Drain Plug - Magnetic - Lisle.	...	.4

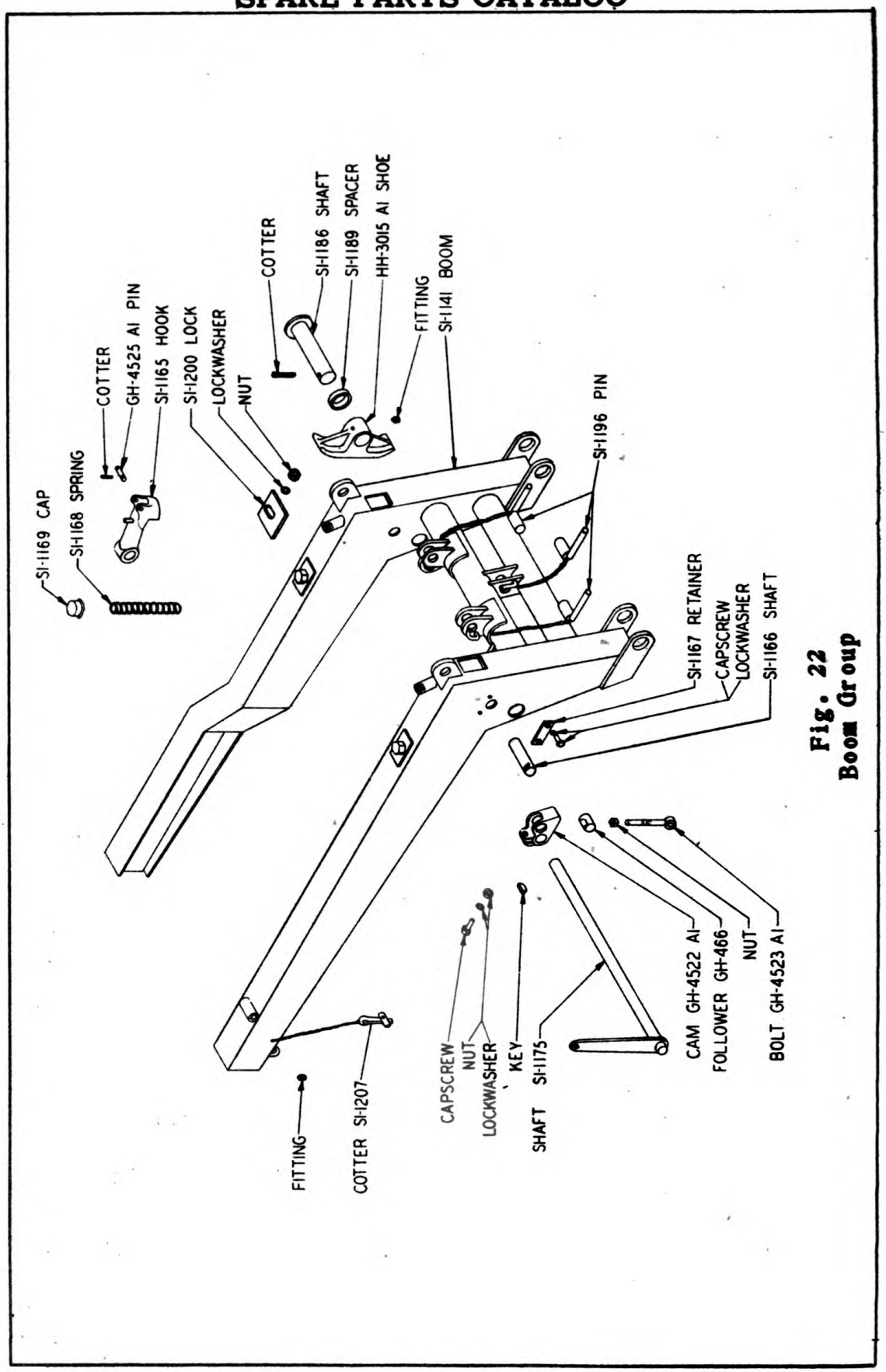


Fig. 22
Boom Group

BOOM GROUP

(See Fig. 22)

PART NO.	QTY.	PART NAME	WEIGHT EACH LBS.	WEIGHT EACH OZ.
SI-1141	1	Boom (complete fabricated)	162	...
	2	Grease Fitting - 1/8" Lincoln straight.		
SI-1165	2	Latch Hook	3	...
SI-1166	2	Latch Shaft.	1	...
SI-1167	2	Retainer - Latch Shaft	...	1
	4	Cap screw-Retainer - 1/4" - 28 N.F. x 1/2" Hex. Hd.		
	4	Lock washer - 1/4" Std. S.A.E.		
SI-1168	2	Latch Spring	...	4
SI-1169	2	Cap-Latch Spring - 3/4" Std. Pipe Cap.	...	4
GH-4523A1	2	Eye Bolt - Latch Hook.	1	8
	4	Nut-Eye Bolt - 3/8" - 24 N.F. Hex.		
GH-4525A1	2	Pin-Eye Bolt	...	1
	4	Cotter Key - Pin - 3/32"x 3/4" Cotter.		
GH-466	2	Cam Follower	...	4
GH-4522A1	2	Cam.	1	8
	2	Cap screw - Cam - 5/16" 24 N.F. x 1-1/2" Hex. Hd.		
	2	Nut - 5/16" - 24 N.F. Hex.		
	2	Lock washer - 5/16" Std. S.A.E.		
SI-1175	1	Cam Shaft.	5	4
	2	Woodruff Key #18.		
HH-3015A1	2	Thrust Shoe.	5	...
	2	Grease Fitting - 1/8" Lincoln straight.		
SI-1186	2	Thrust Shoe Shaft.	3	5
	2	Cotter Key - 1/4" x 2".		
SI-1189	2	Spacer	...	4
SI-1207	2	Cotter - Special with chain.	...	4
SI-1200	2	Boom Lock.	1	...
	2	Nut - 5/8" - 18 N.F. Hex.		
	2	Lock washer - 5/8" Std. S.A.E.		
SI-1196	3	Pin - Quick Release.	...	8

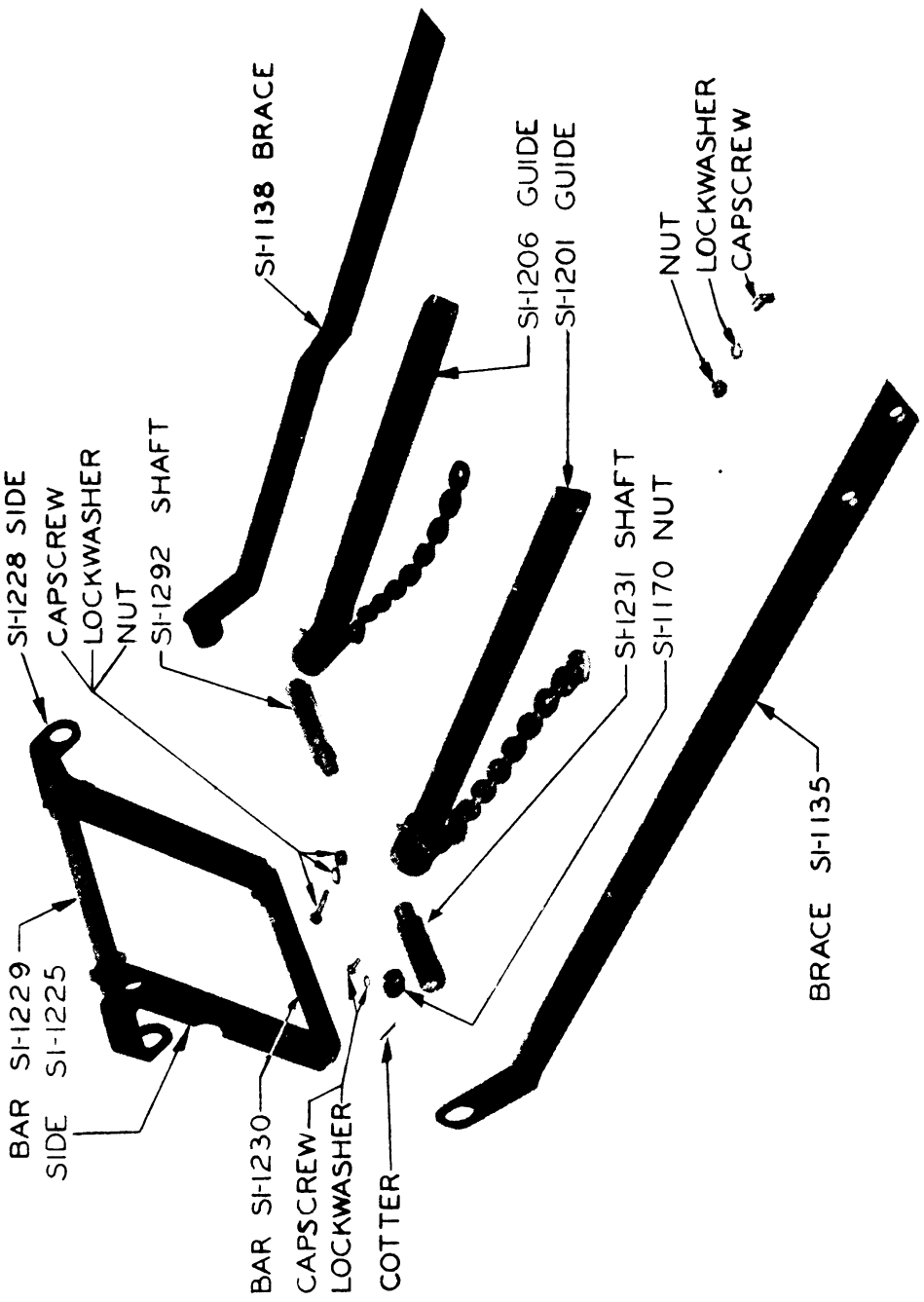


Fig. 23
Rear Pivot Group

REAR PIVOT GROUP

(See Fig. 23)

PART NO.	QTY.	PART NAME	WEIGHT EACH LBS.	WEIGHT EACH OZ.
SI-1225	1	Side-Rear Pivot - R.H.	10	...
	3	Cap screw - Side - 1/2" - 20 N.F. x 1-1/2" Hex. Hd.		
	3	Nut - 1/2" - 20 N.F. Hex.		
	1	Cap screw - Side - 1/2" - 13 N.C. x 1" Hex. Hd.		
	4	Lock washer - 1/2" Std. S.A.E.		
SI-1228	1	Side-Rear Pivot - L.H.	11	8
	3	Cap screw - Side - 1/2" - 20 N.F. x 1-1/2" Hex. Hd.		
	3	Nut - 1/2" - 20 N.F. Hex.		
	1	Cap screw - Side - 1/2" - 13 N.C. x 1" Hex. Hd.		
	4	Lock washer - 1/2" Std. S.A.E.		
SI-1229	1	Cross Bar - Upper.	5	...
	2	Cap screw - Cross Bar - 1/2" - 13 N.C. x 1-1/2" Hex. Hd.		
	2	Lock washer - 1/2" Std. S.A.E.		
SI-1230	1	Cross Bar - Lower.	5	...
	2	Cap screw - Cross Bar - 3/4" - 16 N.F. x 2-3/4" Hex. Hd.		
	2	Nut - 3/4" - 16 N.F. Hex.		
	2	Lock Washer - 3/4" Std. S.A.E.		
SI-1231	1	Rear Pivot Shaft - R.H..	3	12
SI-1170	1	Special nut.	...	4
	1	Cotter Key - 5/32" x 2-1/2".		
SI-1292	1	Rear Pivot Shaft - L.H..	4	...
SI-1170	1	Special Nut.	...	4
	1	Cotter Key - 5/32" x 2-1/2".		
SI-1135	1	Side Brace - R.H..	9	...
	2	Cap screw - Side Brace - 1/2" - 20 N.F. x 1-1/4" Flat Hd.		
	2	Nut - 1/2" - 20 N.F. Hex.		
	2	Lock washer - 1/2" Std. S.A.E.		
SI-1138	1	Side Brace - L.H..	11	...
	2	Cap screw - Side Brace - 1/2" - 20 N.F. x 1-1/4" Flat Hd.		
	2	Nut - 1/2" - 20 N.F. Hex.		
	2	Lock washer - 1/2" Std. S.A.E.		
SI-1201	1	Slide Guide, R.H. with chain	13	8
	1	Grease Fitting, 1/8" Lincoln straight.		
SI-1206	1	Slide Guide, L.H. with chain	14	4
	1	Grease Fitting, 1/8" Lincoln straight.		

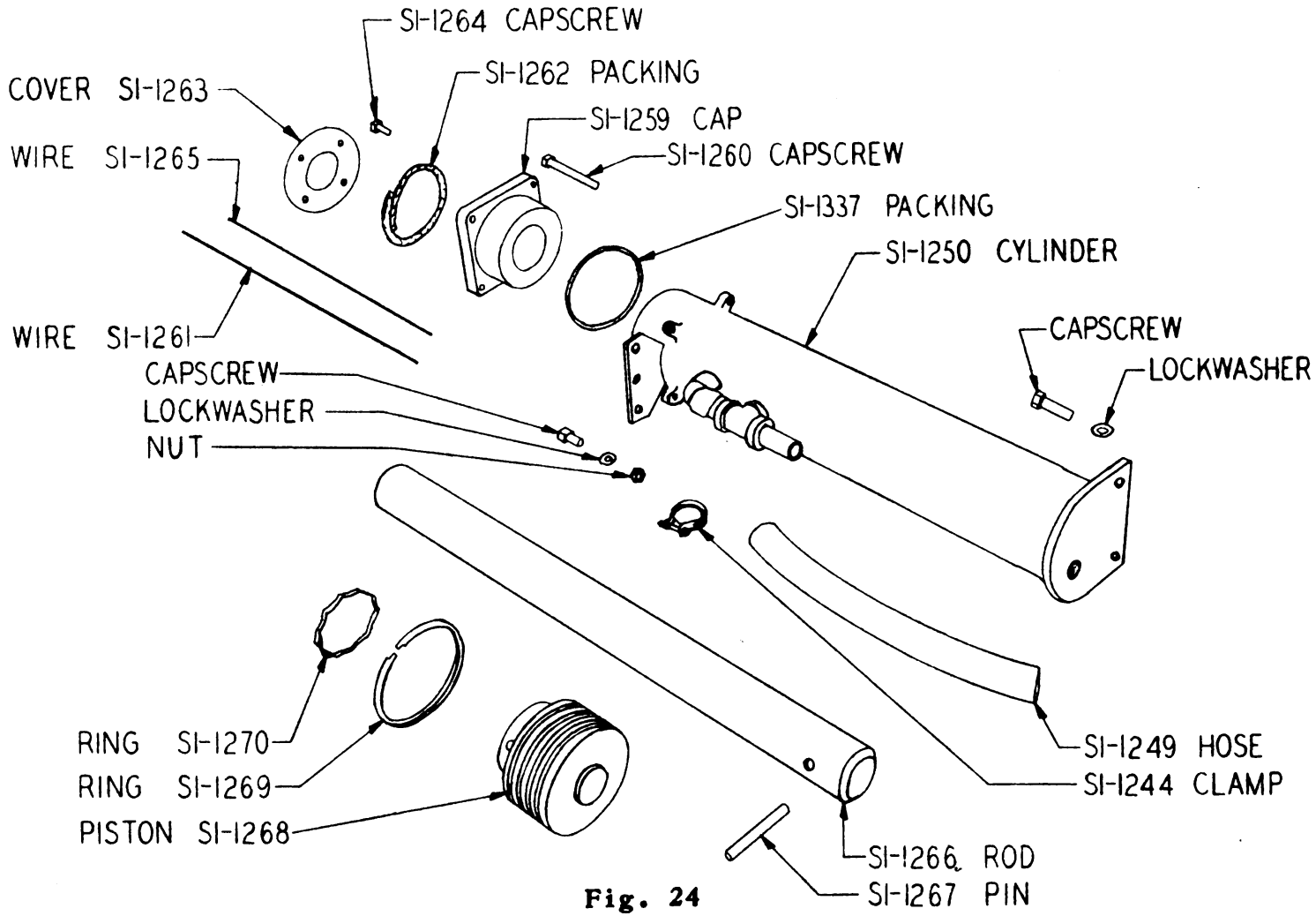


Fig. 24
Cylinder Group

CYLINDER GROUP
(See Fig. 24)

PART NO.	QTY.	PART NAME	WEIGHT EACH	
			LBS.	OZ.
SI-1250	1	Cylinder	40	...
	2	Cap screw - Cyl. to base - 1/2" - 13 N.C. x 1-1/2" Hex. Hd.		
	3	Cap screw - Cyl. to G.F. - 1/2" - 20 N.F. x 1" Hex. Hd.		
	3	Nut - 1/2" - 20 N.F. Hex.		
	5	Lock washer - 1/2" Std. S.A.E.		
SI-1259	1	Cylinder Cap	8	12
SI-1260	4	Cap screw - Drilled - 3/8" - 24 N.F. x 4" Hex. Hd.	...	3
SI-1261	1	Wire Lacing - #19 A.S.W.G. - 21" Lg. .	...	.5
SI-1337	1	Packing - 1/8" Dia. Allen Anti-Friction Metallic	...	2
SI-1262	1	Packing - Set - 3/8" Dia. Rawhide Hydraulic	...	2
SI-1263	1	Cover.	...	15
SI-1264	4	Cap screw - Drilled - 3/8" - 16 N.C. x 1" Hex. Hd.	...	3
SI-1265	1	Wire Lacing - #19 A.S.W.G. - 16" Lg. .	...	.2
SI-1266	1	Piston Rod	36	
SI-1267	1	Piston Pin	...	2
SI-1268	1	Piston	8	4
SI-1269	4	Piston Ring.	...	2
SI-1270	4	Inner Ring	...	.5
SI-1249	1	Hose - Low Pressure.	1	8
SI-1244	2	Hose Clamp	...	2

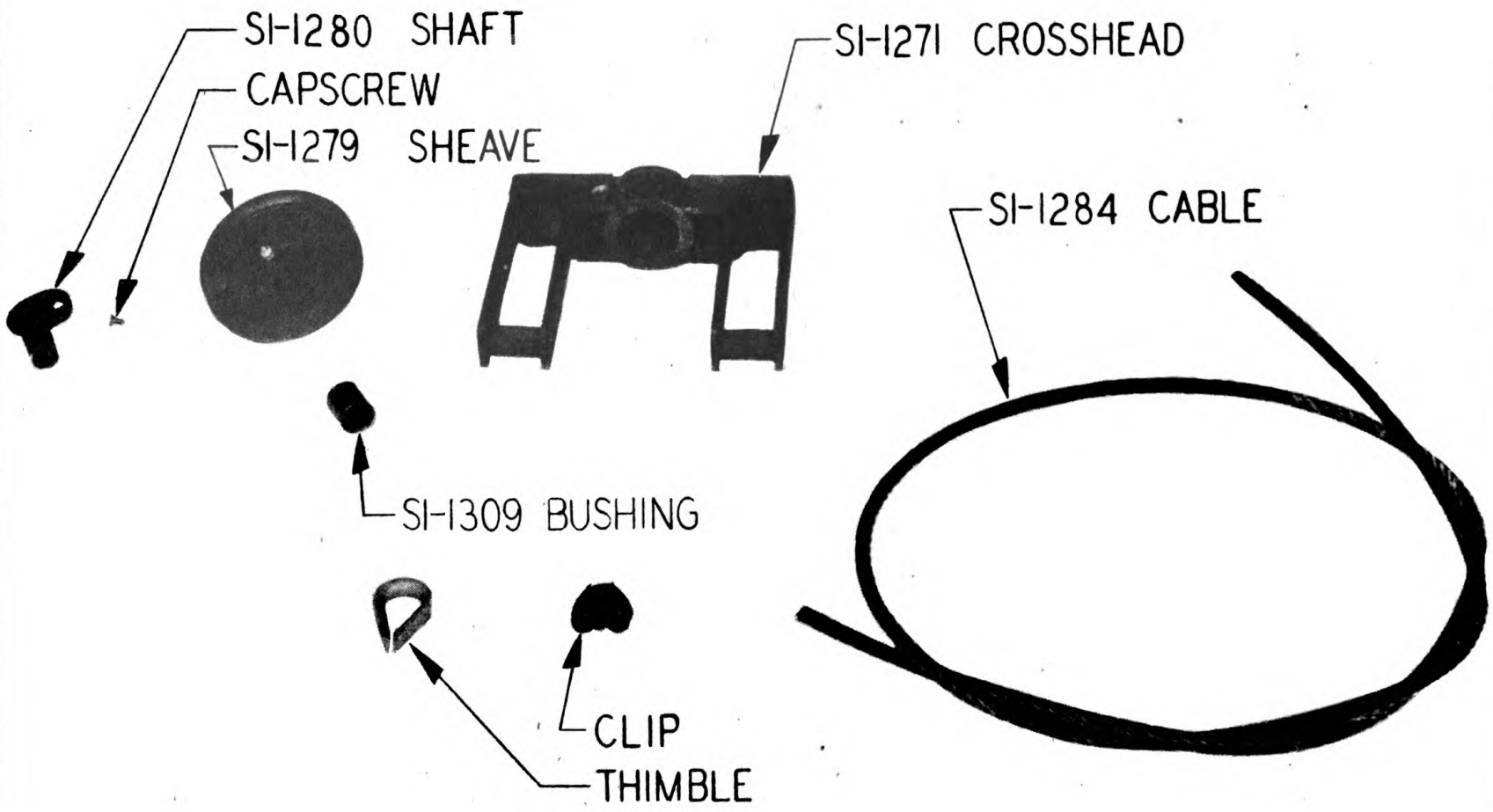


Fig. 25
Crosshead Group

CROSSHEAD GROUP

(See Fig. 25)

PART NO.	QTY.	PART NAME	WEIGHT EACH	
			LBS.	OZ.
SI-1271	1	Crosshead.	13	8
SI-1279	2	Sheave with Bushing.	6	...
	2	Grease Fitting - 1/8" Lincoln straight.		
SI-1309	2	Bushing - Sheave	...	4
SI-1280	2	Shaft - Upper Sheave	...	12
	2	Cap screw - Shaft - 1/4" - 20 N.C. x 1/2" Flat Hd.		
SI-1284	2	Cable - 1/2" x 6 x 19 Preformed x 9 ft.	4	4
	4	Thimble - 1/2" Std.		
	8	Clip - 1/2" Std.		

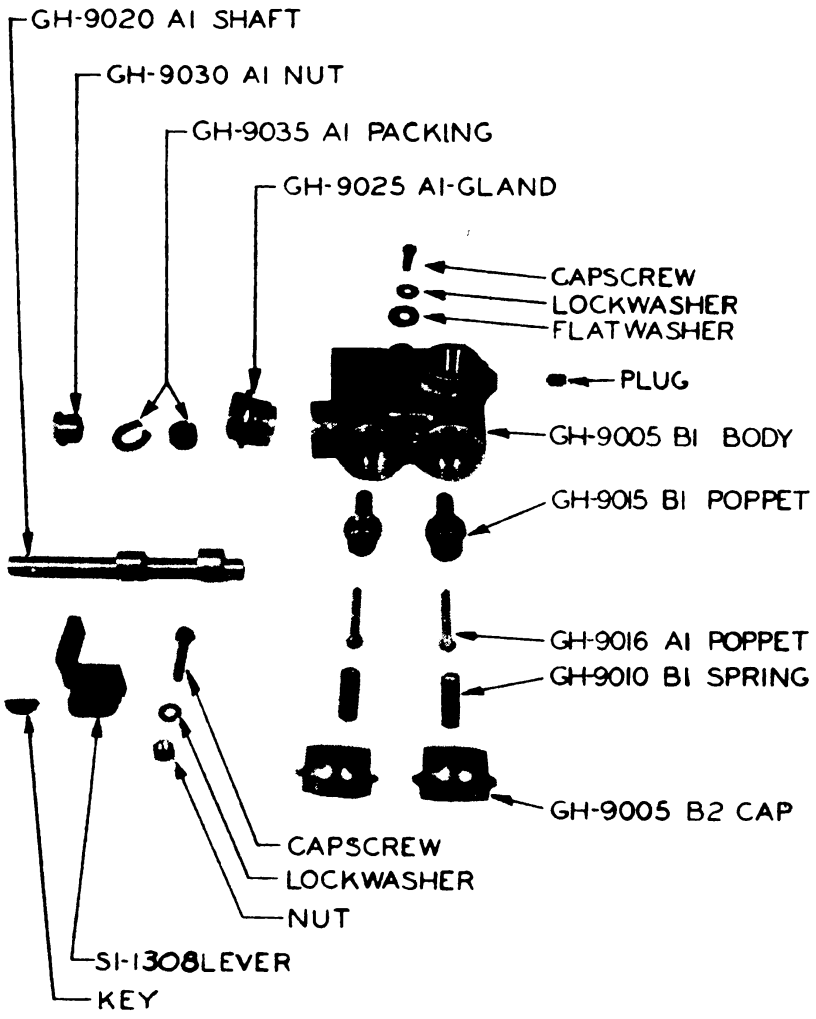
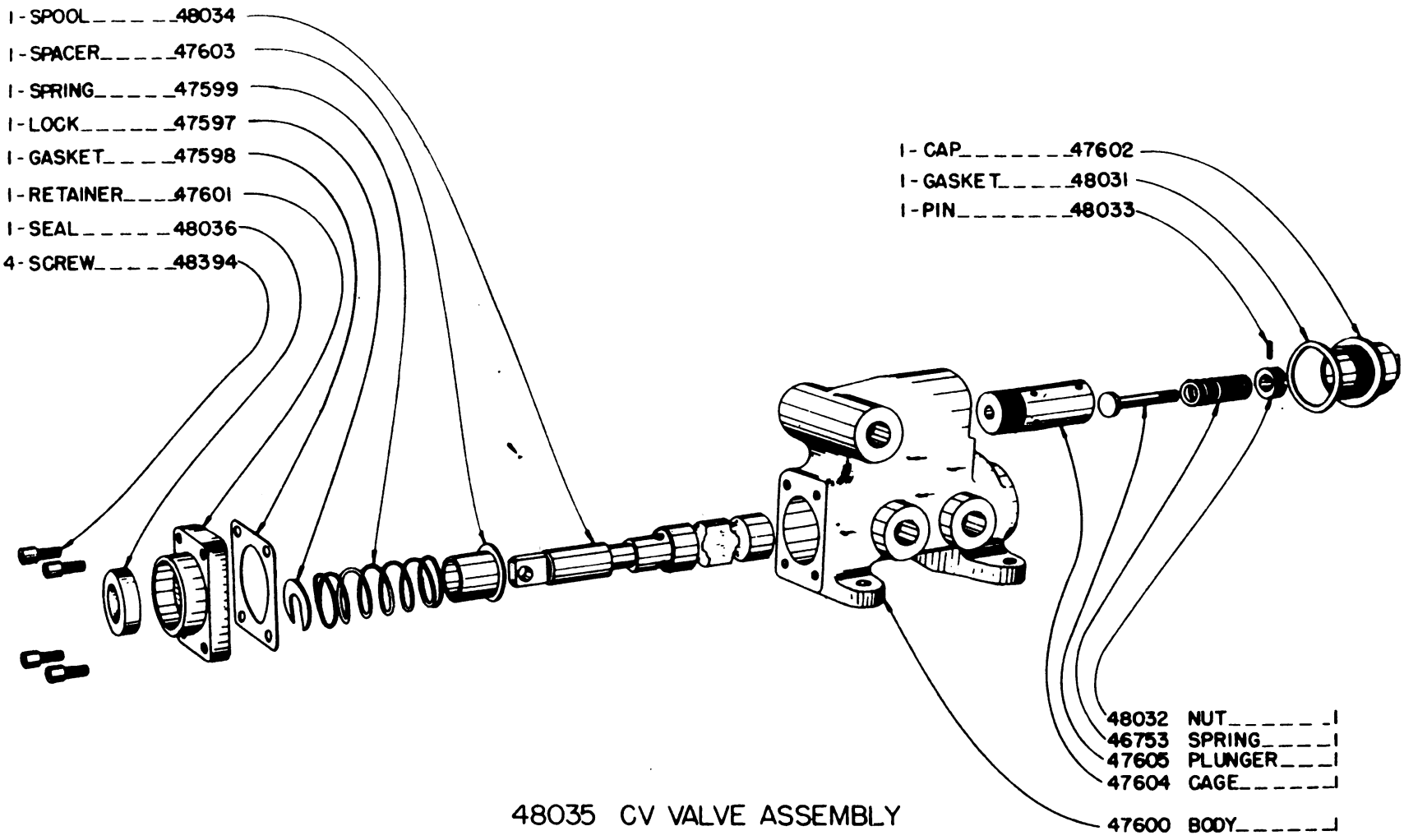


Fig. 26
Loading Operating Valve Group

LOADER OPERATING VALVE GROUP

(See Fig. 26)

PART NO.	QTY.	PART NAME	WEIGHT EACH	
			LBS.	OZ.
GH-565	1	Valve Assembly - complete.	16	12
GH-9005B1	1	Valve Body	11	...
	1	Plug - 1/4" Std. Pipe Plug.		
GH-9005B2	2	Cap - Valve.	...	8
GH-9010B1	2	Spring - Valve	...	1
GH-9015B1	2	Valve - Outer Poppet Type.	...	4
GH-9016A1	2	Valve - Inner Poppet Type.	...	1
GH-9020A1	1	Camshaft - Valve	1	...
GH-9025A1	1	Packing nut.	...	4
GH-9030A1	1	Packing Gland.	...	14
GH-9035A1	1	Packing Set.	...	1
	1	Cap screw - valve to plate - 1/2" - 13 N.C. x 1" Hex. Hd.		
	1	Lock washer - 1/2" S.A.E. Std.		
	1	Flat Washer - 1/2" Std. wrought.		
SI-1308	1	Valve Lever - Poppet	1	12
	1	Woodruff Key #9.		
	1	Cap screw - Lever - 5/16" - 24 N.F. x 1-1/4" Hex. Hd.		
	1	Nut - 5/16" - 24 N.F. Hex.		
	1	Lock washer - 5/16" Std. S.A.E.		



48035 CV VALVE ASSEMBLY

Fig. 27

1353

SCRAPER OPERATING VALVE L.P.C. #48035

(See Fig. 27)

Mfg. By: La Plant-Choate Mfg. Co.
Cedar Rapids, Iowa

PART NO.	QTY.	PART NAME	WEIGHT EACH	
			LBS.	OZ.
SI-1248	1	CV Valve Assembly Complete - L.P.C. #48035	17	6
	1	Body - L.P.C. #47600	13	...
	1	Cage - L.P.C. #47604	...	9
	1	Plunger - L.P.C. #47605.	...	2
	1	Spring - L.P.C. #46753	...	*
	1	Nut - L.P.C. #48032.	...	1
	1	Cap - L.P.C. #47602.	...	10
	1	Gasket - L.P.C. #48031	...	*
	1	Pin - L.P.C. #48033.	...	*
	1	Spool - L.P.C. #48034.	1	4
	1	Spacer - L.P.C. #47603	...	8
	1	Spring - L.P.C. #47599	...	2
	1	Lock - L.P.C. #47597	...	*
	1	Gasket - L.P.C. #47598	...	*
	1	Retainer - L.P.C. #47601	...	14
	1	Seal - L.P.C. #48036	...	2
	4	Screw - L.P.C. #48394.	...	1
	4	Cap screw - Valve to Plate - 3/8" - 24 N.F. x 1-1/4" Hex. Hd.		
	4	Nut - 3/8" - 24 N.F. Hex.		
	4	Lock washer - 3/8" Std. S.A.E.		
SI-1340	2	1/2" Magnetic Plug - Lisle	...	3
	1	1/2" Std. Pipe Plug.	...	2

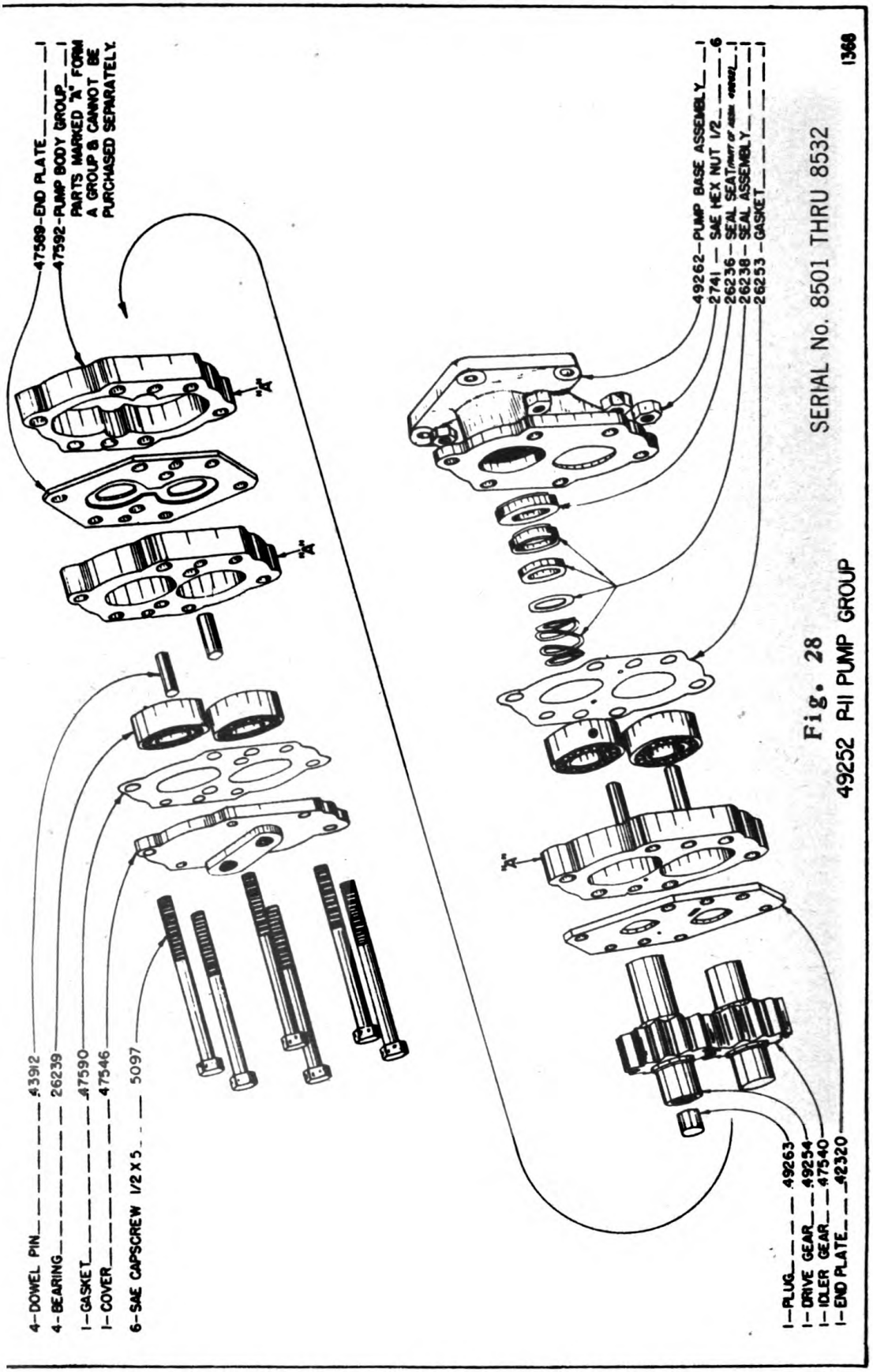


Fig. 28
49252 R11 PUMP GROUP

SERIAL No. 8501 THRU 8532

1368

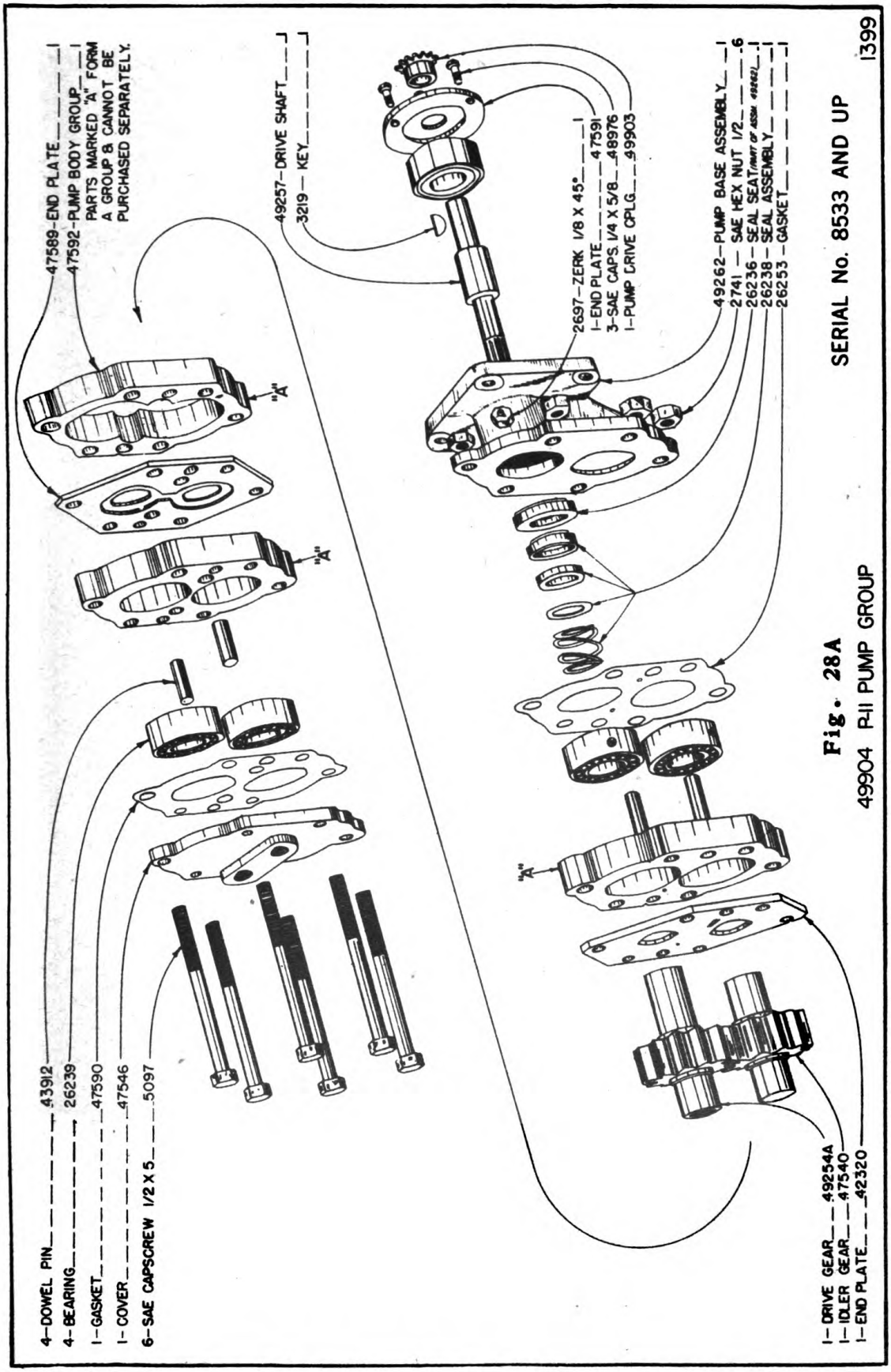


Fig. 28A

49904 R-II PUMP GROUP

SERIAL No. 8533 AND UP

1399

PUMP GROUP - L.P.C. #49904

(See Fig. 28-A)

Mfg. By: LaPlant-Choate Mfg. Co.
Cedar Rapids, Iowa

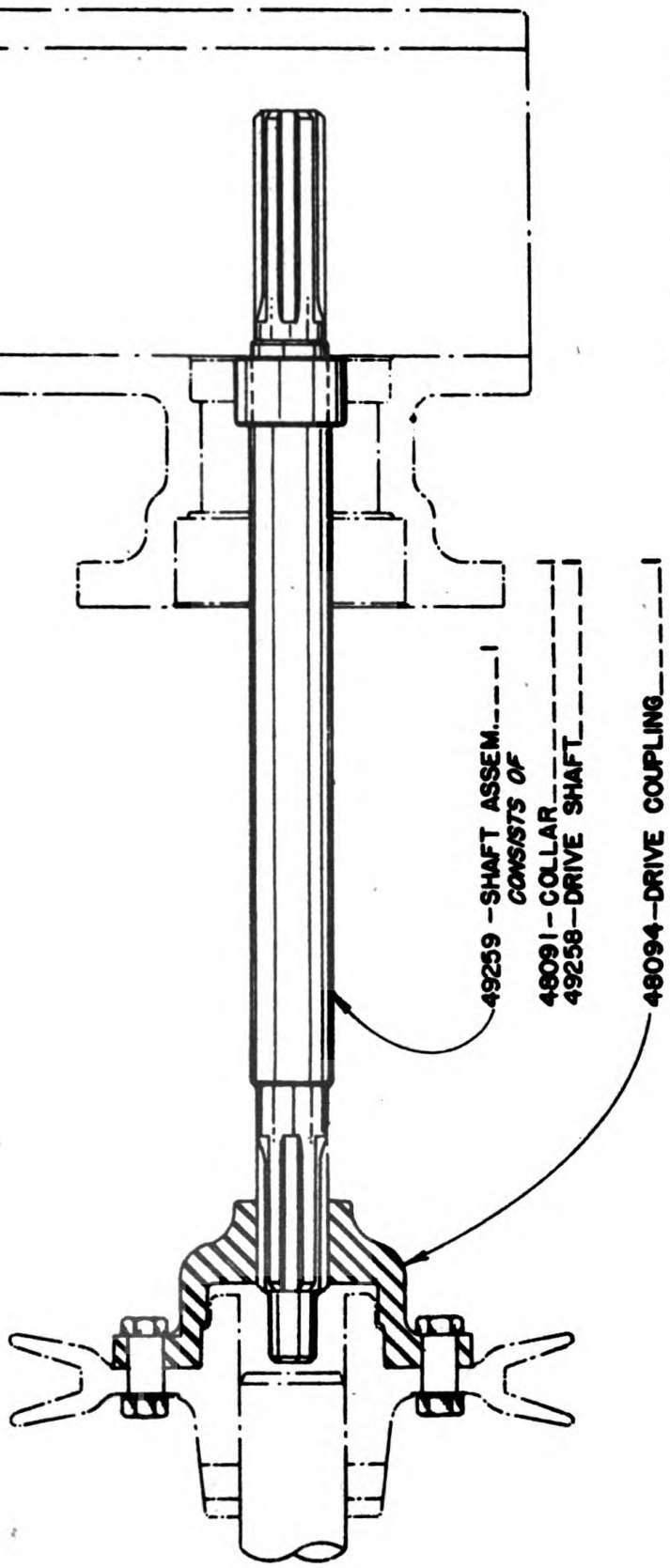
PART NO.	QTY.	PART NAME	WEIGHT EACH	
			LBS.	OZ.
SI-1420	1	P-11 Pump Complete - L.P.C. #49904. . .	38	12
	6	Cap screw 1/2" - 20 N.F. x 5" - L.P.C. #5097	...	6
	1	Gasket - L.P.C. #47590.	...	*
	1	Cover - L.P.C. #47546	2	1
	4	Bearing - L.P.C. #26239	...	11
	4	Dowel Pin - L.P.C. #43912	...	*
	1	End Plate - L.P.C. #47589	1	4
	1	Pump Body Group - L.P.C. #47592 . . .	12	4
	1	Drive Gear - L.P.C. #49254-A.	2	4
	1	Idler Gear - L.P.C. #47540.	1	6
	1	End Plate - L.P.C. #42320	1	9
	1	Gasket - L.P.C. #26253.	...	*
	1	Seal Assembly - L.P.C. #26238	...	4
	1	Pump Base Assembly - L.P.C. #49262. .	7	...
	6	Nut - L.P.C. #2741.	...	*
	1	Zerk 1/8" x 45° - L.P.C. #2697. . . .	...	*
	1	End Plate - L.P.C. #47591	1	4
	3	Cap screw S.A.E. 1/4" x 5/8" - L.P.C. #48976	...	*
	1	Pump Drive Coupling - L.P.C. #49903 .	...	12
	1	Drive Shaft - L.P.C. #49257	1	4
	1	Key - L.P.C. #3219.	...	*

PUMP GROUP L.P.C. #49252

(See Fig. 28)

Mfg. By: LaPlant-Choate Mfg. Co.
Cedar Rapids, Iowa

PART NO.	QTY.	PART NAME	WEIGHT EACH	
			LBS.	OZ.
SI-1234	1	P-11 Pump complete - L.P.C. #49252 . .	38	...
	6	Cap screw - 1/2" - 20 N.F. x 5" Hex. Hd. - L.P.C. #5097	...	6
	1	Cover - L.P.C. #47546.	2	1
	1	Gasket - L.P.C. #47590	...	*
	4	Bearing - L.P.C. #26239.	...	11
	4	Dowel Pin - L.P.C. #43912.	...	*
	1	End Plate - L.P.C. #47589.	1	4
	1	Pump Body Group (Parts not sold separately) - L.P.C. #47592	12	4
	1	Plug - L.P.C. #49263	...	*
	1	Drive Gear - L.P.C. #49254	2	4
	1	Idler Gear - L.P.C. #47540	1	6
	1	End Plate - L.P.C. #42320.	1	9
	1	Gasket - L.P.C. #26253	...	*
	1	Seal Assembly - L.P.C. #26238. . . .	...	4
	1	Pump Base Assembly - L.P.C. #49262 .	7	...
	6	Nut - 1/2" - 20 N.F. Hex. - L.P.C. #2741	...	*
	4	Cap screw - Pump to Guide Frame - 7/16" - 20 N.F. x 1-1/2" Hex. Hd. .		
	4	Nut - 7/16" - 20 N.F. Hex.		
	4	Lock washer - 7/16" Std. S.A.E.		



SERIAL No. 8501 THRU 8532
1361

Fig. 29
Pump Adapter Parts For Case Tractor

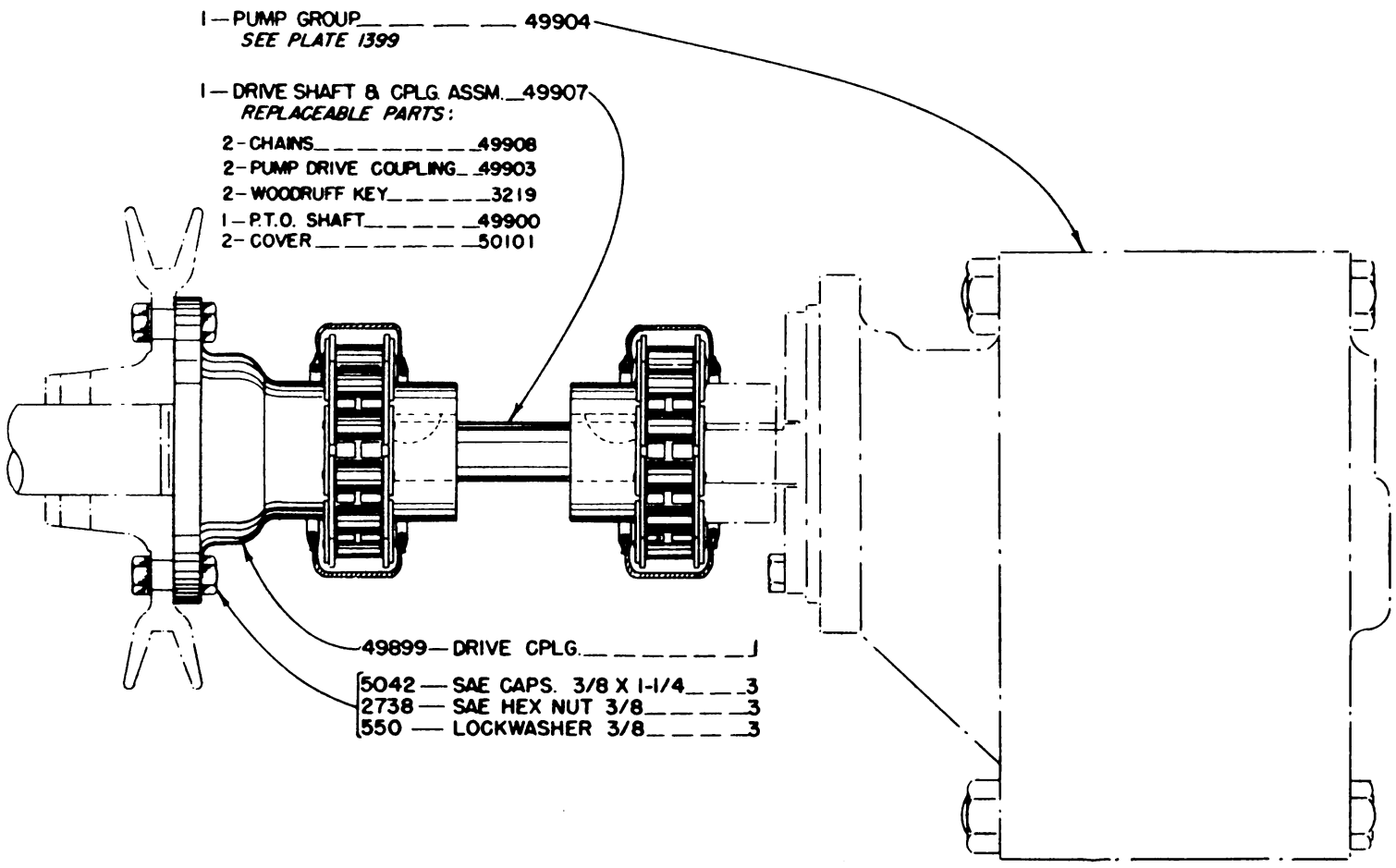


Fig. 29A

PUMP ADAPTER PARTS FOR "CASE" TRACTOR

SERIAL No. 8533 AND UP

PUMP ADAPTER GROUP
(Machines No. 8501 to 8532)

(See Fig. 29)

Mfg. By: LaPlant-Choate Mfg. Co.
Cedar Rapids, Iowa

PART NO.	QTY.	PART NAME	WEIGHT EACH	
			LBS.	OZ.
SI-1232	1	Coupling - Fan Pulley - L.P.C. #48094 .	1	10
	3	Cap screw - Coupling - 3/8" 24 N.F. x 1-1/4" Hex. Hd.		
	3	Nut - 3/8" - 24 N.F. Hex.		
	3	Lock washer - 3/8" Std. S.A.E.		
SI-1233	1	Pump Shaft - L.P.C. #49259.	2	...

PUMP ADAPTER GROUP
(Machines No. 8533 and Up)

(See Fig. 29A)

Mfg. By: LaPlant-Choate Mfg. Co.
Cedar Rapids, Iowa

PART NO.	QTY.	PART NAME	WEIGHT EACH	
			LBS.	OZ.
SI-1421	1	Coupling - Fan Pulley - L.P.C. #49899 .	1	13
SI-1422	1	Drive Shaft and Coupling Ass'y. L.P.C. #49907 comprising:	3	...
	2	Chain - L.P.C. #49908	...	8
	2	Pump Drive Coupling - L.P.C. #49903 .	...	12
	2	Woodruff Key - L.P.C. #3219	...	*
	1	P.T.O. Shaft - L.P.C. #49900.	...	8
	2	Cover - L.P.C. #50101	...	*

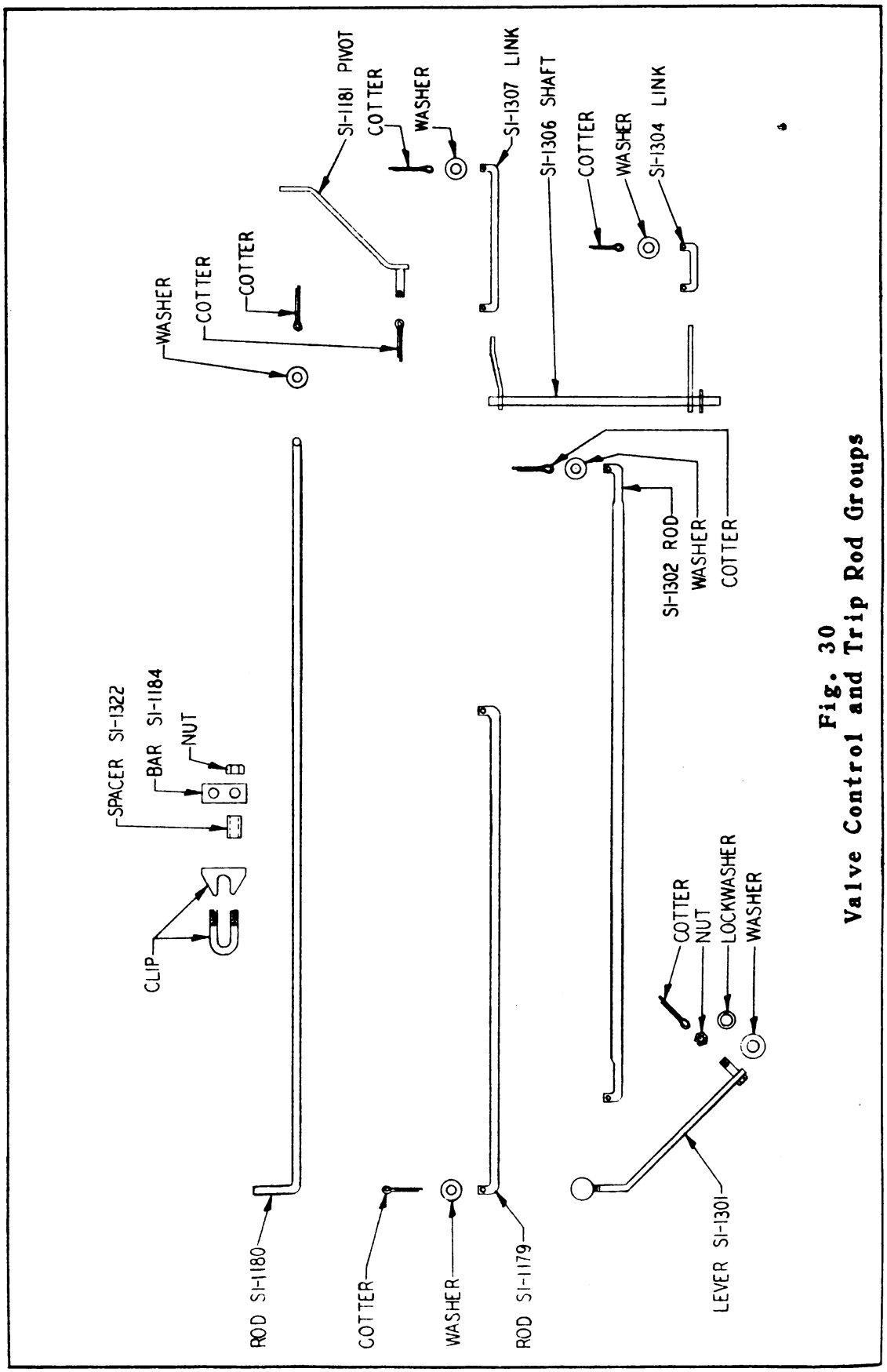


Fig. 30
Valve Control and Trip Rod Groups

VALVE CONTROL GROUP
(See Fig. 30)

PART NO.	QTY.	PART NAME	WEIGHT EACH LBS.	WEIGHT EACH OZ.
SI-1301	1	Control Lever with Ball.	1	12
	1	Washer - 1/2" Std. Cut.		
	1	Lock washer - 1/2" Std. S.A.E.		
	1	Nut - 1/2" - 20 N.F. Castellated Hex.		
	1	Cotter Key - 3/32" x 1".		
SI-1302	1	Rod - Control Lever to Cross Shaft . .	3	...
	2	Washer - 3/8" Std. Cut.		
	2	Cotter Key - 1/8" x 3/4".		
SI-1304	1	Link - Scraper Operating Valve	...	...
	2	Washer - 3/8" Std. Cut.		2
	2	Cotter Key - 1/8" x 3/4".		
SI-1306	1	Cross Shaft.	1	12
SI-1307	1	Link - Loader Operating Valve	1	6
	2	Washer - 3/8" Std. Cut.		
	2	Cotter Key - 1/8" x 3/4".		
		TRIP ROD GROUP		
SI-1321	1	Trip Rod Guide (Includes the following 3 parts.)	...	14
	1	Cable Clip - 1/2" Std.		
SI-1322	2	Spacer.		
SI-1184	1	Bar.		
SI-1180	1	Trip Rod - Rear.	2	...
	2	Washer - 3/8" Std. Cut.		
	1	Cotter Key - 1/8" x 3/4".		
SI-1181	1	Pivot Arm - Trip Rod	2	...
	2	Washer - 3/8" Std. Cut.		
	2	Cotter - 1/8" x 3/4".		
SI-1179	1	Trip Rod - Front	1	8
	2	Washer - 3/8" Std. Cut.		
	2	Cotter - 1/8" x 3/4".		

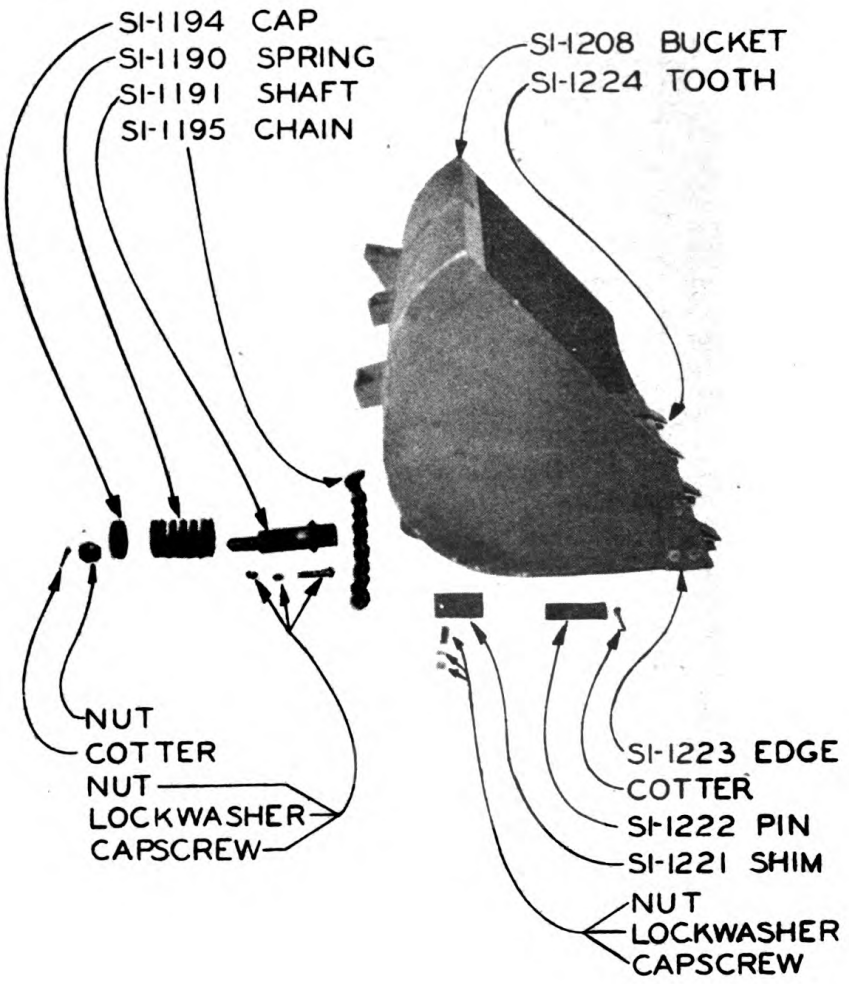


Fig. 31
Bucket Group

BUCKET GROUP
(See Fig. 31)

PART NO.	QTY.	PART NAME	WEIGHT EACH	
			LBS.	OZ.
SI-1208	1	Bucket - (with cutting edge, teeth, latch pocket shims)	185	...
SI-1221	2	Shim - Latch Pocket.	...	12
	4	Cap screw - Shim - 3/8" - 24 N.F. x 1-1/2" Flat Hd.		
	4	Nut - 3/8" - 24 N.F. Hex.		
	4	Lock washer - 3/8" Std. S.A.E.		
SI-1222	2	Hinge Pin.	1	12
	4	Cotter Key - Hinge Pin - 3/16" x 2"		
SI-1223	1	Cutting Edge - 36"	13	8
	11	Rivets - Cutting Edge - 1/2" x 3/4" Flat Hd. Ctsk.		
SI-1224	4	Bucket Tooth	1	8
	8	Rivet - Tooth - 1/2" x 1-1/2" Button Hd.		
SI-1190	1	Snap Spring.	2	...
SI-1194	1	Cap - Snap Spring.	1	...
	1	Nut - 1" - 8 N.C. Hex.		
	1	Cotter Key - Shaft - 1/8" x 2".		
SI-1195	1	Snap Chain	3	...
	1	Cap screw - Snap Chain - 1/2" - 20 N.F. x 2-1/2" Hex. Hd.		
	1	Nut - 1/2" - 20 N.F. Hex.		
SI-1191	1	Shaft - Snap Spring.	5	4

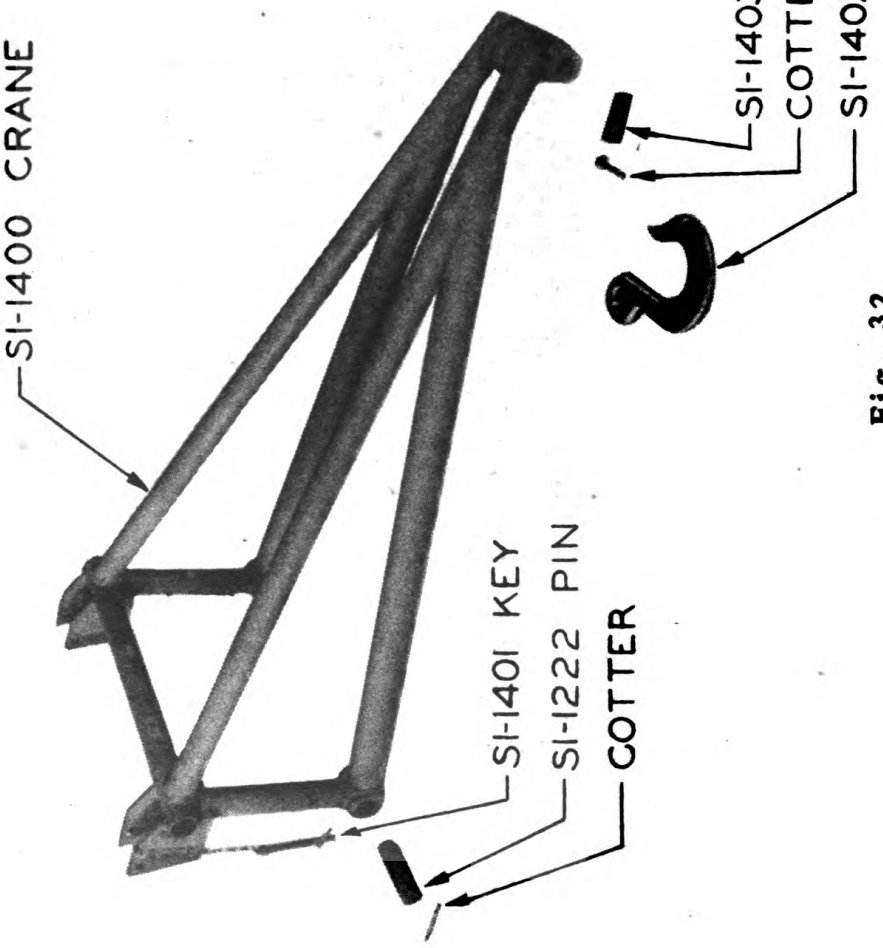


Fig. 32
Crane Hook Group

CRANE HOOK GROUP
(See Fig. 32)

PART NO.	QTY.	PART NAME	WEIGHT EACH	
			LBS.	OZ.
SI-1400	1	Crane Hook	87	...
SI-1222	2	Hinge Pin.	1	12
	4	Cotter Key - 3/16" x 2".		
SI-1402	1	Hook	1	...
SI-1403	1	Pin - Hook	...	2
	2	Cotter Key - 1/8" x 1-1/2".		
SI-1401	2	Safety Key - Special with chain. . . . (Included with SI-1400)	...	8

HIGH PRESSURE LINE - PUMP TO VALVES
(See Fig. 33)

PART NO.	QTY.	PART NAME	WEIGHT EACH	
			LBS.	OZ.
SI-1350	3	Street Ell - 1/2" Std. x 90°	...	8
SI-1351	3	Close Nipple - 1/2" Std.	...	3
SI-1352	3	Union - 1/2" Std..	...	8
SI-1354	4	Elbow - 1/2" Std. x 90°.	...	4
SI-1355	1	Nipple - Special	...	12
SI-1237	1	Swivel Union	...	8
SI-1238	1	Hose - High Pressure - 1/2" x 43" . .	3	...
SI-1357	1	Nipple - Special	...	4
SI-1353	1	Short Nipple - 1/2" Std.	...	2
SI-1241	1	3-Way Valve #268 Crane	1	4
SI-1360	1	Nipple - Special	...	6
SI-1361	1	Nipple - Special	...	3
SI-1356	1	Reducer - 1-1/4" to 1/2" Std..	...	2

HIGH PRESSURE LINE LOADER OPERATING VALVE TO CYLINDER
(See Fig. 33)

SI-1379	1	Street Ell - 1" Std. x 90°	...	5
SI-1363	1	Reducer - 1" to 3/4" Std..	...	4
SI-1377	1	Close Nipple - 3/4" Std.	...	2
SI-1365	1	Union - 3/4" Std..	...	12
SI-1358	1	Short Nipple - 3/4" Std.	...	3
SI-1367	1	Elbow - 3/4" Std. x 45°.	...	4
SI-1359	1	Hose - High Pressure - 3/4" x 23-1/4".	2	4
SI-1236	1	Swivel Union	...	14
SI-1362	2	Street Ell 3/4" Std. x 90°	...	4
SI-1390	1	Pipe Assembly.	1	...

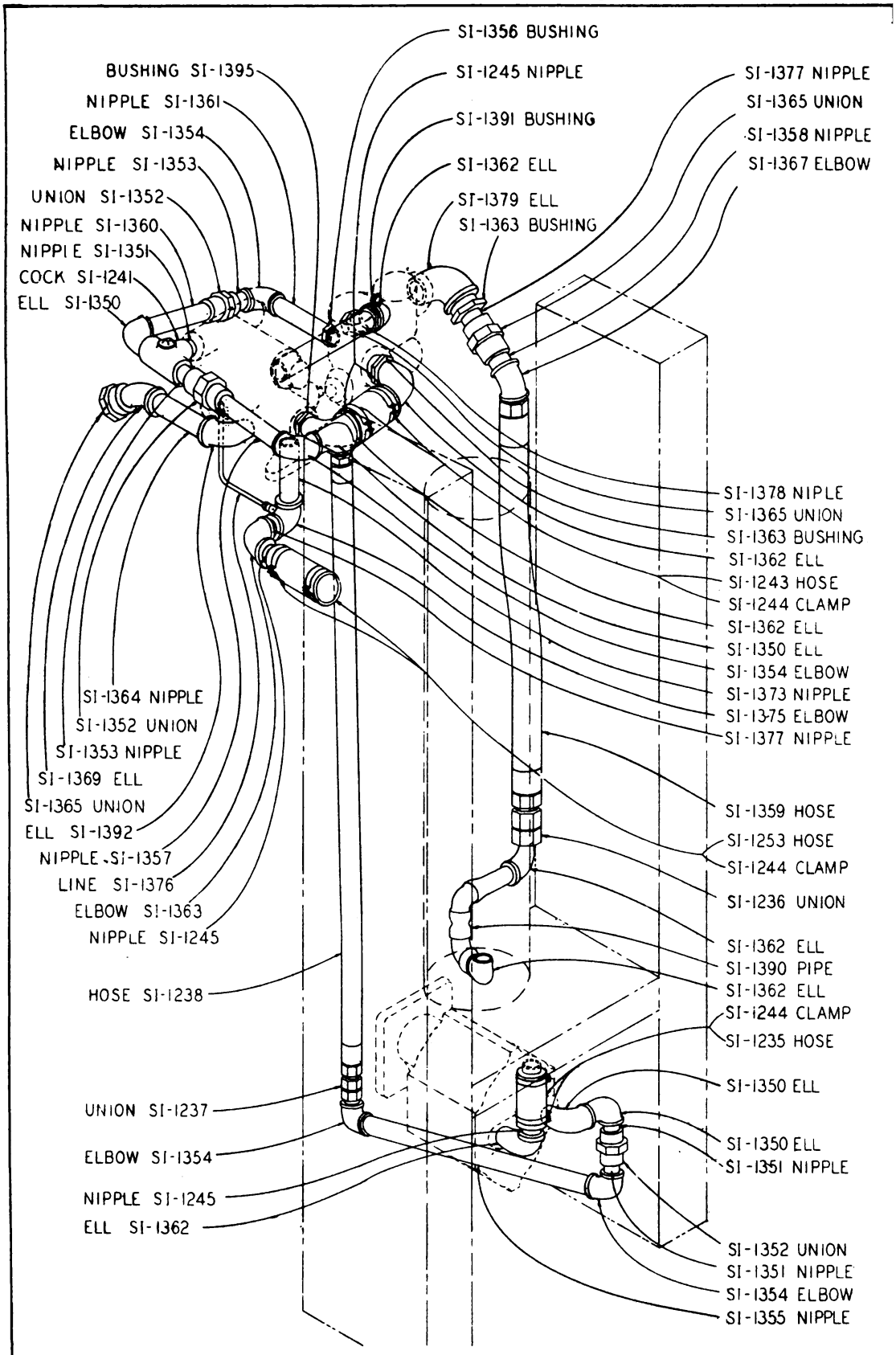


Fig. 33
Loader Piping Group

LOW PRESSURE LINE
LOADER OPERATING VALVE TO SCRAPER OPERATING VALVE
(See Fig. 33)

PART NO.	QTY.	PART NAME	WEIGHT EACH LBS.	WEIGHT EACH OZ.
SI-1363	1	Reducer - 1" to 3/4"	...	3
SI-1362	2	Street Ell - 3/4" Std. x 90°	...	4
SI-1245	2	Nipple - Special	...	1
SI-1243	1	Hose - Low Pressure	...	3
SI-1244	2	Hose Clamp	...	2
SI-1395	1	Reducer - 1-1/4" to 3/4"	...	6
		LOW PRESSURE LINE SCRAPER OPERATING VALVE TO RESERVOIR (See Fig. 33)		
SI-1373	1	Nipple - Special	...	6
SI-1375	1	Elbow - Special	...	6
SI-1377	1	Close Nipple - 3/4" Std.	...	2
SI-1368	1	Elbow - 3/4" Std. x 90°	...	6
SI-1245	1	Nipple - Special	...	1
SI-1253	1	Hose - Low Pressure	...	4
SI-1244	2	Hose Clamp	...	2
SI-1376	1	Bleeder Line with male connectors	...	4
		SUCTION LINE-RESERVOIR TO PUMP (See Fig. 33)		
SI-1235	1	Hose	...	4
SI-1362	1	Street Ell - 3/4" Std.	...	4
SI-1245	2	Nipple - Special	...	1
SI-1244	2	Hose Clamp	...	2
		RIGHT HAND LINE SCRAPER OPERATING VALVE TO SCRAPER (See Fig. 33, 34)		
SI-1392	1	Reducing Street Ell - 3/4" to 1/2"	...	6
SI-1364	1	Nipple - Special	...	5
SI-1369	1	Street Ell - 3/4" Std. x 45°	...	1
SI-1365	2	Union - 3/4" Std.	...	12
SI-1242	1	Pipe	8	...
SI-1240	1	Shut Off Cock #804 - 1/2 Crane	1	...

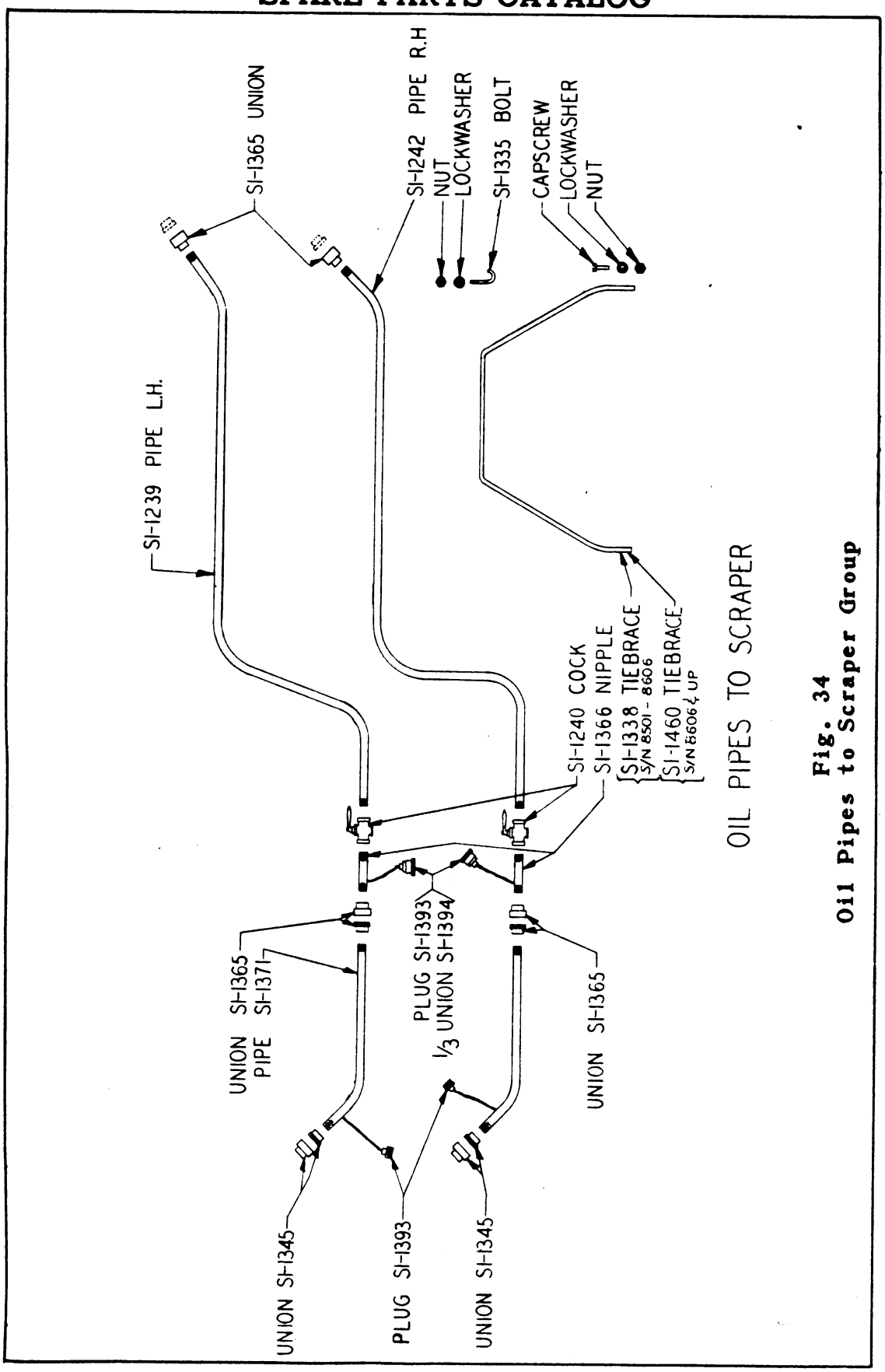


Fig. 34
Oil Pipes to Scraper Group

RIGHT HAND LINE
SCRAPER OPERATING VALVE TO SCRAPER (CONT'D.)
(See Fig. 34)

PART NO.	QTY.	PART NAME	WEIGHT EACH	
			LBS.	OZ.
SI-1366	1	Nipple - Special with chain and plug .	...	8
SI-1371	1	Pipe	2	4
SI-1345	1	Union - 3/4" A.A.R. #819E Crane. . . .	1	...
SI-1393	2	Plug with chain.	...	13
SI-1394	1	Threaded part of 3/4" Union.	...	4
		LEFT HAND LINE **SCRAPER OPERATING VALVE TO SCRAPER** (See Fig. 33, 34)		
SI-1378	1	Nipple - Special	...	7
SI-1391	1	Reducer - 3/4" to 1/2" Std..	...	4
SI-1362	1	Street Ell - 3/4" Std.	...	4
SI-1365	1	Union - 3/4" Std..	...	12
SI-1239	1	Pipe	8	...
SI-1240	1	Shut-Off Cock - #804-1/2 Crane	1	...
SI-1366	1	Nipple - Special	...	8
SI-1365	2	Union - 3/4" Std..	...	12
SI-1371	1	Pipe	2	4
SI-1345	1	Union - 3/4" A.A.R. #819E Crane. . . .	1	...
SI-1393	2	Plug with chain.	...	13
SI-1394	1	Threaded Part of Union	...	4
SI-1338	1	Tiebrace - Oil Pipe S/N 8501 to 8606.	4	4
SI-1460	1	Tiebrace - Oil Pipe S/N 8606 and up. .	4	4
SI-1335	6	Hook Bolt.	...	4
	6	Nut - 3/8" - 24 N.F. Hex.		
	2	Cap screw - 3/8" - 24 N.F. x 1-1/2" Lg. Hex. Hd.		
	2	Nut - 3/8" - 24 N.F. Std. Hex.		
	2	Lock washer - 3/8" Std.		

LIST OF PARTS MANUFACTURERS

COMPONENT	MANUFACTURER
Hoses - Hydraulic Swivel Union	Anchor Coupling Co. Libertyville, Illinois
Hose Clamps Packing	W. D. Allen Mfg. Co. Chicago, Illinois
Piston Rings	Wausau Motor Co. Wausau, Wisconsin
Inner Rings	Burd Piston Ring Co. Rockford, Illinois
Chain Cable	American Chain & Cable Co. Chicago, Illinois
Springs	Advance Spring Co. Chicago, Illinois
Pump Valve - Scraper Operating P.T.O. Shaft P.T.O. Coupling	LaPlant-Choate Mfg. Co. Cedar Rapids, Iowa
Shut-off Cocks #804-1/2 Three-Way Valve #268	Crane Co. Chicago, Illinois
Magnetic Plugs	Lisle Corp. Clarinda, Iowa

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SI-1206	47, 48	7.90	SI-1307	61, 62	1.00
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