

TM 10-1623

R DEPARTMENT TECHNICAL MANUAL

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TRACTOR (WHEELED),
WAREHOUSE, CASE
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WAR DEPARTMENT 15 AUGUST 1945

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WAREHOUSE, CASE
V.A.I.W. (GASOLINE)**



WAR DEPARTMENT (15 AUGUST 1945)

WAR DEPARTMENT
Washington 25, D.C., 15 August 1945

TM 10-1623, TRACTOR (WHEELED), WAREHOUSE, CASE, VIAW (GASOLINE), is published for the information and guidance of all concerned.

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For Explanation of symbols, see FM 21-6

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PART ONE – INTRODUCTION

Section I – General:

NOTE: THE CONTENTS OF THIS MANUAL PERTAIN TO BOTH VAIW-3 AND VAIW-4 MODELS, EXCEPT WHEN OTHERWISE SPECIFIED.

1. SCOPE:

a. These instructions are published for the information and guidance of the personnel to whom this tractor is assigned. They contain information on the operation and maintenance of the tractor as well as descriptions of the major units and their functions in relation to the other components of the tractor. They apply only to the VAIW Tractor and are arranged in four parts: Part One, Introduction; Part Two, Operating Instructions; Part Three, Maintenance Instructions; and Part Five, Repair Instructions.

b. Technical manuals and other publications applicable to the material covered by this manual are listed in the reference section at end of the book.

2. RECORDS:

Using personnel will make use of the following maintenance forms and records in the performance of prescribed operations.

a. W.D., A.G.O. Form No. 6, "Duty Roster." This form provides the basis for a control system whereby preventive maintenance services may be performed at regular intervals without withdraw-

ing too many tractors from use at any given time. It may be adapted to serve as a record of the maintenance and lubrication activities of an organization.

b. W.D. Form No. 48, "Driver's Trip Ticket and P.M. Service Record." This form, properly executed, will be furnished the driver when his tractor is dispatched on non-tactical missions. The driver and the official user of the tractor will complete in detail appropriate parts of this form. The reverse side of the form contains the driver's preventive maintenance service reminder schedule.

c. W.D., A.G.O. Form No. 461, "Preventive Maintenance Service and Technical Inspection Work Sheet for Wheeled and Half-Track Vehicles." This form will be used for all 48-hour and 192-hour maintenance services and all technical inspections.

d. W.D., A.G.O. Form No. 468, "Unsatisfactory Equipment Report." This form will be used to report unsatisfactory conditions found in equipment upon receipt thereof.

e. A.G.O. Form No. 478, "Modification Work Order." This form will be used whenever a modification is made on the equipment.

Section II – Description and Data:

3. DESCRIPTION:

a. General Information:

(1) EQUIPMENT:

4-speed transmission
Operator's platform
Electric starter and lights
Foot operated clutch and brakes

Engine temperature and oil gage
Variable speed governor with hand and foot control
Front bumper
Muffler (spark arresting)
Front and rear fenders with running board
Upholstered seat with backrest
Automatic coupler

Tractor (Wheeled), Warehouse, Case VAIW (Gasoline)

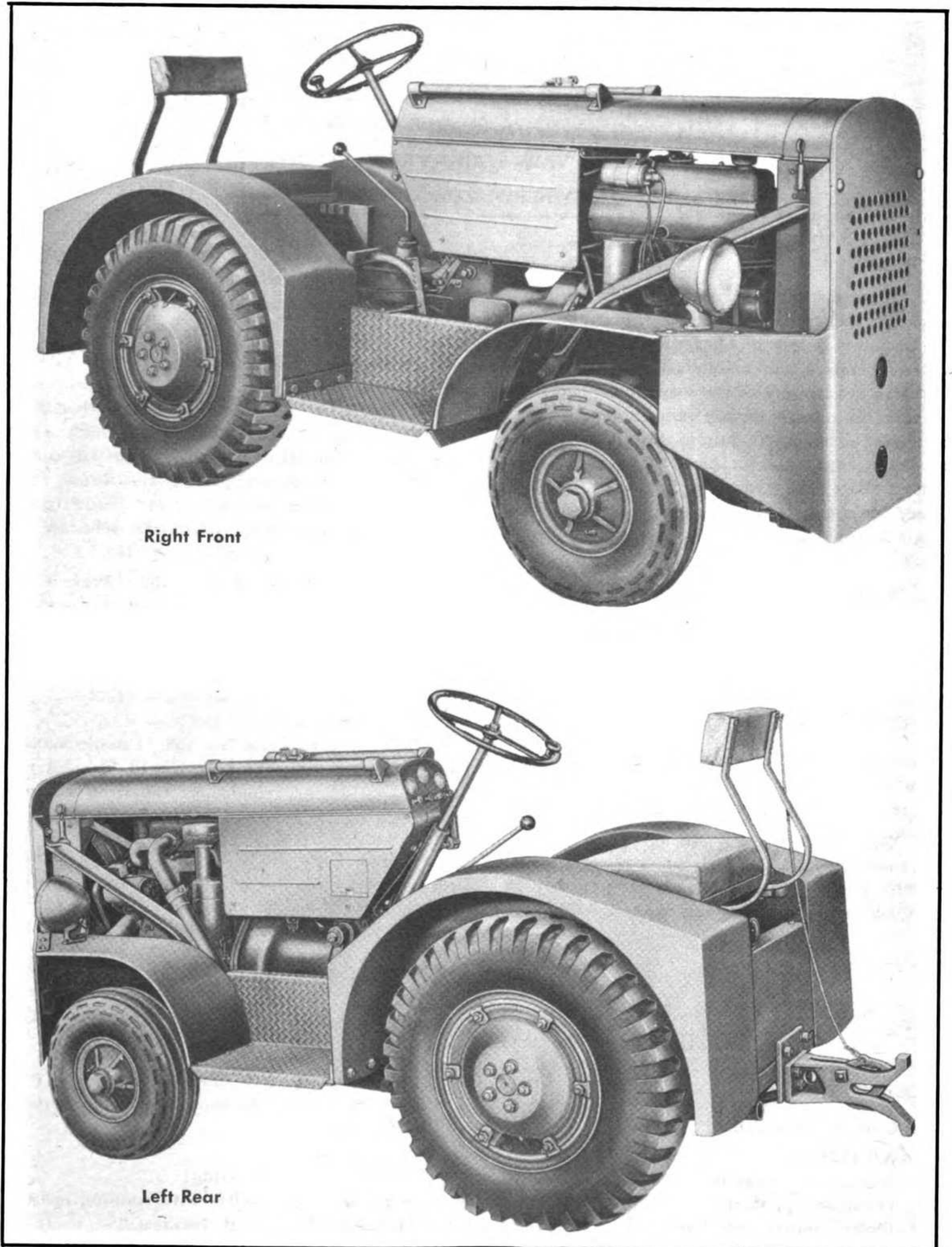
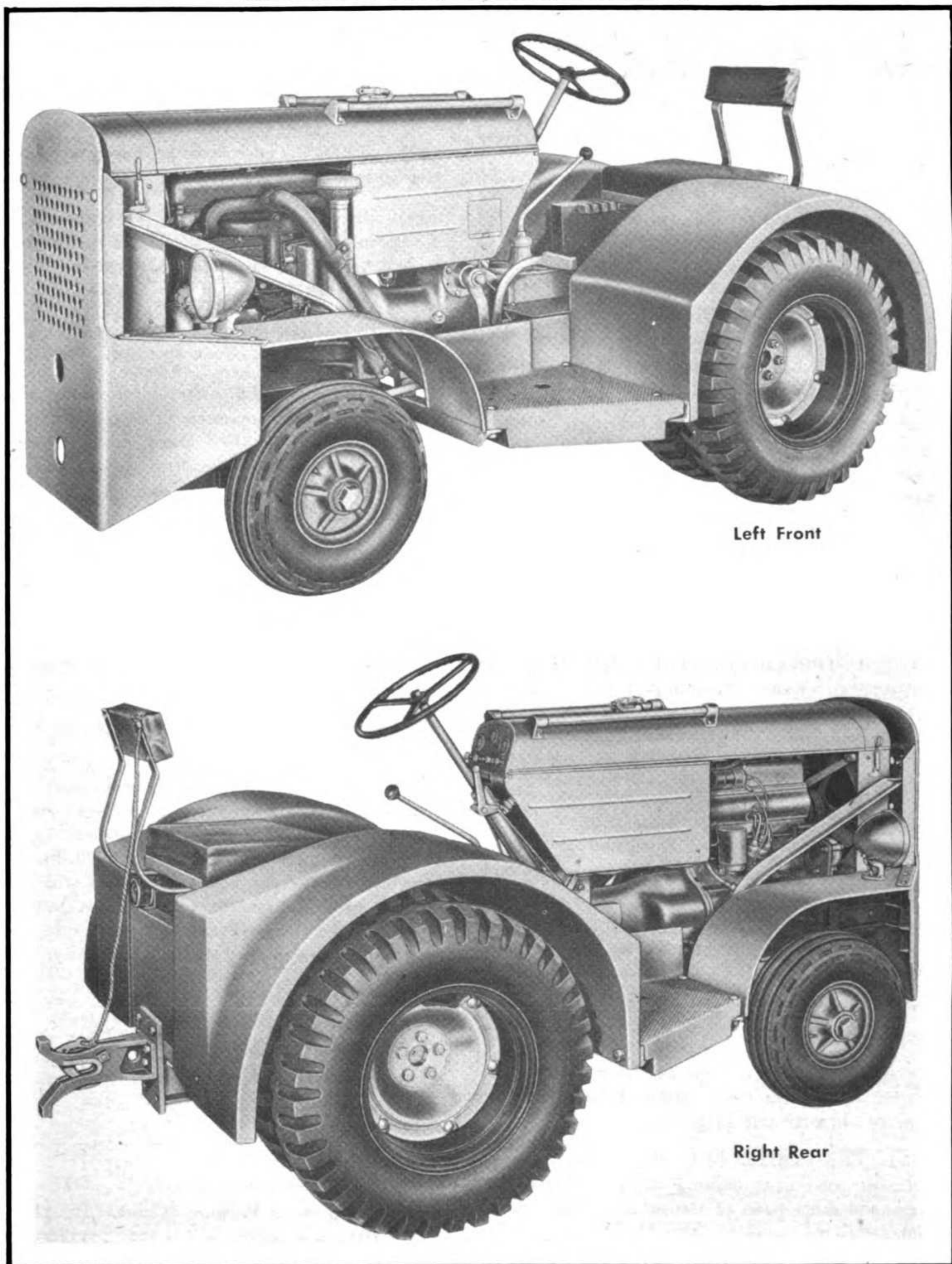


Figure 1 - VAIW-3 Tractor

Tractor (Wheeled), Warehouse, Case VAIW (Gasoline)



Left Front

Right Rear

Digitized by **Google** **Figure 2 — VAIW-4 Tractor** Original from UNIVERSITY OF CALIFORNIA

Tractor (Wheeled), Warehouse, Case VAIW (Gasoline)

- (2) **ENGINE:** Four-cylinder, valve-in-head, 3¼" bore, 3¾" stroke, 124 cu. in. displacement. Full Load R.P.M. 1800. Replaceable wet sleeves. Inserts on exhaust valve seats.
- (3) **PISTONS:** Cast; three compression rings; one oil ring.
- (4) **PISTON PINS:** Hardened steel, full floating type with snap retainer rings.
- (5) **CRANKSHAFT:** Three main bearings, precision and replacement type.
- (6) **CONNECTING RODS:** Drop forged, heat-treated steel; crank end, precision-replacement type bearings; piston end, bronze bushing.
- (7) **LUBRICATION:** Pressure lubrication to main bearings, connecting rod bearings, camshaft bearings, and rocker arm shaft. Other parts of engine lubricated by splash. Bayonet type oil gage. Crank case capacity—4 quarts.
- (8) **COOLING SYSTEM:** High capacity impeller pump. Pump and fan shaft special alloy steel, mounted on ball bearings. 16" four-blade fan, driven by V-belt. Thermostat temperature regulator. Radiator capacity—13 quarts.
- (9) **DUSTPROOF CONSTRUCTION (Engine):** Oil type air cleaner. Double seal at front end of crankshaft. Heavy gasket on valve cover. Felt washer on bayonet oil gage. Oil filler and breather cap located on valve cover. Oil seals on all projecting shafts.
- (10) **IGNITION:** Distributor and coil type. Automatic spark advance. Dustproof and waterproof distributor.
- (11) **GOVERNOR:** Variable speed, flyball type, sensitive and positive in operation. Either hand or foot control permits speed changes throughout entire range.
- (12) **FUEL TANK:** Capacity—9¼ gallons. Protectoseal filler cap.
- (13) **BEARINGS:** Tapered roller bearings installed throughout transmission, differential, front wheels and rear axle shafts.
- (14) **TRANSMISSION CASE:** Heavy one-piece unit construction containing all gears, shafts, bearings, and other parts of transmission and differential.
- (15) **DIFFERENTIAL:** Spiral bevel ring gear

- and driving pinion, and three bevel pinions with heavy duty side gears.
- (16) **GEARS:** Drop forged and hardened; all alloy steel.
- (17) **SPEEDS:** Four forward, one reverse; selective sliding gear type.
- (18) **BRAKES:** Disk type, 6" diameter, self-energizing in forward and reverse motion; operated by foot pedal having a ratchet lock to hold brakes in engagement for parking.
- (19) **CLUTCH:** Single 11" diameter plate; dry type; spring loaded. Foot operated.
- (20) **FRONT AXLE:** Structural steel welded frame, ball pivot mounted in rear, spring pivot mounted in front. 34½" tread, center to center. Spindles and steering arms drop forged, heat treated. Front wheels one piece casting, mounted on tapered roller bearings.
- (21) **REAR AXLE HOUSING:** Rear axle live type final drive, mounted on tapered roller bearings. Wheel tread 33¼", center to center.
- (22) **STEERING GEAR:** Worm and worm wheel type, located in torque tube which provides oil bath.
- (23) **DRAWBAR:** Automatic coupler type.

b. Identification Information:

The VAIW-3 Model is a four-wheel tractor (Figure 1) with maximum drawbar pull of 3000 lbs. The VAIW-4 Model has dual rear wheels (Figure 2) with maximum drawbar pull of 4000 lbs. Identification features of both models are the front bumper grille, automatic coupler, cast iron rear fenders, and cushioned seat with back-rest. Both models are also equipped with electric starter, lights and horn.

4. TABULATED DATA:

α. General:

(1) **ENGINE SPECIFICATIONS:**

Cylinders	4
Bore	3¼"
Stroke	3¾"
Compression Ratio	5:1
Compression Pressure (Crank) .	105 Lbs.
Displacement	124 Cu. In.
Engine Speed (Full Load)	1800 R.P.M.

Tractor (Wheeled), Warehouse, Case VAIW (Gasoline)

Spark Plugs025" Gap
Valve Clearance, Intake and
Exhaust (Engine Cold) .012"
Carburetor (Updraft)7/8" Venturi

b. Performance:

(1) ROAD SPEEDS AT 1800 R.P.M.

	VAIW-3	VAIW-4
1st Gear	2.62 MPH	2.04 MPH
2nd Gear	4.53 MPH	3.52 MPH
3rd Gear	5.81 MPH	4.52 MPH
4th Gear	13.88 MPH	10.80 MPH
Reverse	3.63 MPH	2.81 MPH

(2) WHEELS AND TREADS:

Front Wheels (for pneumatic,
multiple rib tires) Size 6:00-9"
Rear Wheels (for pneumatic,
combat, all service tires) Size 7:50-16"
Tread (front), Center to Center 34 1/2"
Tread, (rear), Center to Center 33 1/4"
Front Wheel Toe-in..... 1/8"

(2) MAXIMUM DRAWBAR PULL (Dead Load)

	VAIW-3	VAIW-4
1st Gear	3000 Lbs.	4000 Lbs.
2nd Gear	1900 Lbs.	2500 Lbs.
3rd Gear	1500 Lbs.	1800 Lbs.
4th Gear	250 Lbs.	400 Lbs.

(3) GENERAL DIMENSIONS:

Wheelbase 54 1/4"
Overall Length 105"
Overall Width 44"
Overall Height 51 1/2"
Ground Clearance 6"
Drawbar Height (Fixed Type) 12"
Turning Radius..... 8 1/2'
Turning Clearance 9'

c. Capacities:

- (1) Fuel Tank 9 1/4 Gals.
- (2) Cooling System 13 Qts.
- (3) Crankcase 4 Qts.
- (4) Transmission Differential
Rear Axle Housing 5 1/2 Gals.
- (5) Torque Tube Housing 7 Pts.

Section III - Tools and Spare Parts:

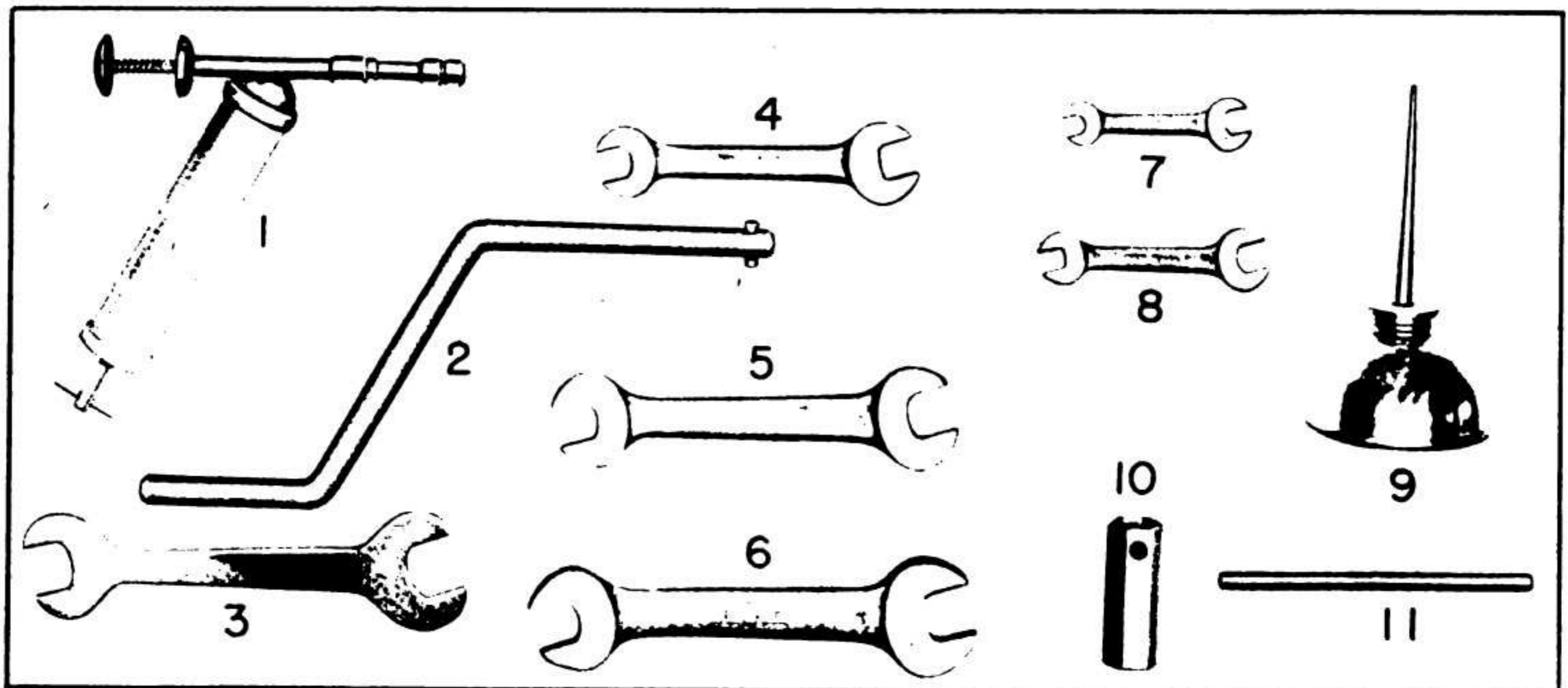


Figure 3 - Tools Furnished with Tractor

- | | | | |
|----------------|-----------------------------------|-----------------|--------------------------------|
| 1. No. 5950 | GREASE GUN | 7. No. 723-A | 3/8 - 1/2" DOUBLE END WRENCH |
| 2. No. VTA-714 | STARTING CRANK | 8. No. 725-A | 7/16 - 9/16" DOUBLE END WRENCH |
| 3. No. VT-2549 | WRENCH | 9. No. 14-AA | OIL CAN |
| 4. No. 729 | 5/8 - 3/4" DOUBLE END WRENCH | 10. No. VT-3538 | SPARK PLUG WRENCH |
| 5. No. 732 | 13/16 - 1" DOUBLE END WRENCH | 11. No. VT-2341 | SPARK PLUG WRENCH HANDLE |
| 6. No. 34-A | 15/16 - 1-1/16" DOUBLE END WRENCH | | |

5. TOOLS:

α. Figure 3 shows the tools supplied with the tractor to be issued to the using organizations. These tools are packed in the tool compartment of the tractor.

6. SPARE PARTS:

α. Figure 4 shows the spare parts supplied for each tractor to be issued to the using organizations. Most of these parts may be stored in the tool compartment of the tractor.

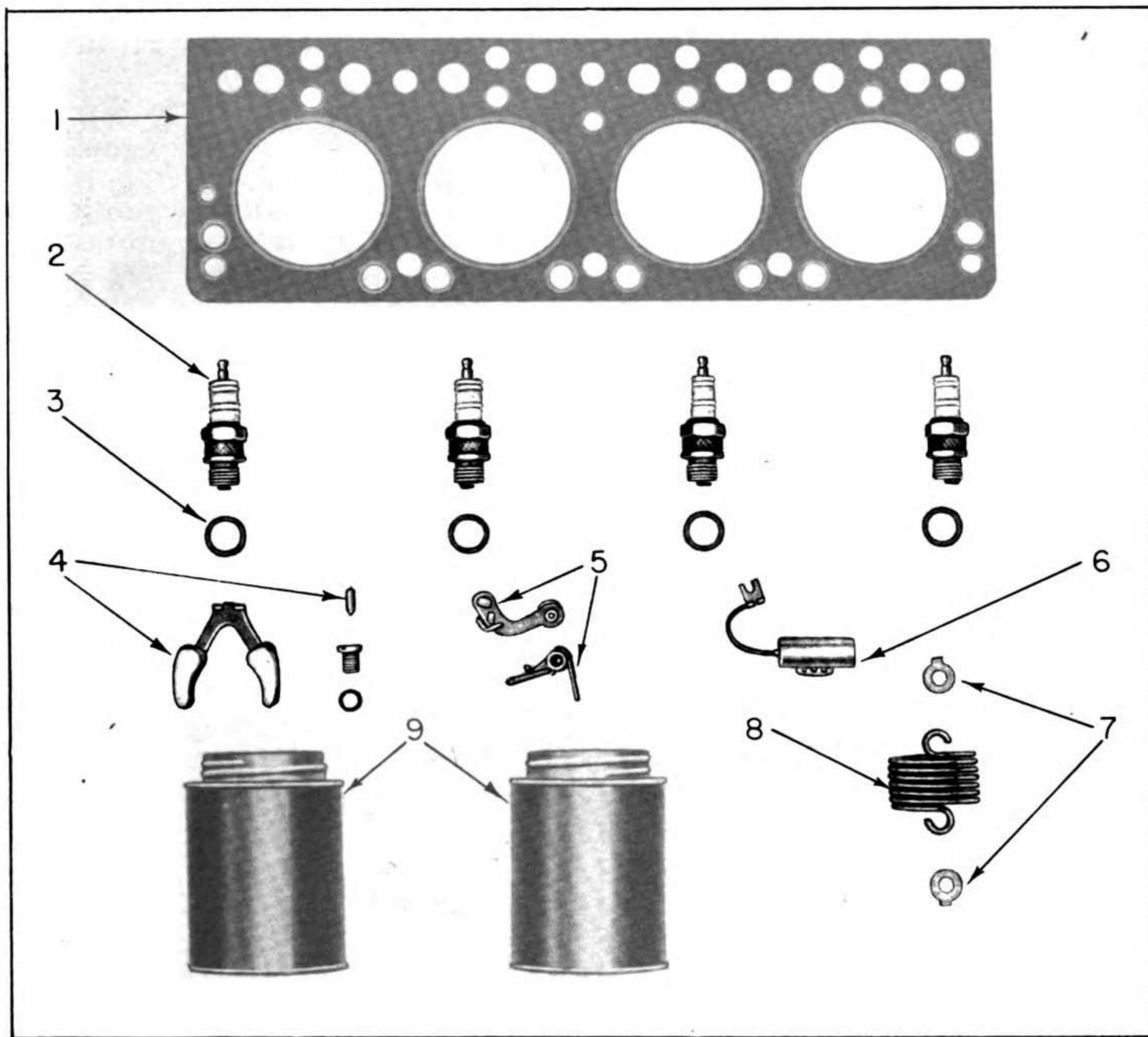


Figure 4 — Spare Parts

- | | | |
|-------------|------------|---------------------------------------|
| 1. | VT-3312 | CYLINDER HEAD GASKET |
| 2. | VT-3618 | SPARK PLUGS |
| 3. | VT-4020 | SPARK PLUG GASKETS |
| 4. | VTA-698 | FLOAT VALVE, SEAT AND GASKET ASSEMBLY |
| 5. | IGP-3028FS | DISTRIBUTOR SERVICE CONTACT SET |
| 6. | IGW-3139 | DISTRIBUTOR CONDENSER ASSEMBLY |
| 7. | EB-108 | STARTING MOTOR LOCK WASHERS |
| 8. | EBA-405 | STARTING MOTOR DRIVE SPRING |
| 9. | VT-3589 | OIL FILTER REPLACEMENT ELEMENT |
| (NOT SHOWN) | | FIRE EXTINGUISHER — EXTRA EQUIPMENT |

PART TWO – OPERATING INSTRUCTIONS

Section IV – General:

7. SCOPE:

α. Part Two contains information for the guidance of the personnel responsible for the operation

of this tractor. It contains information on the operation of the tractor together with the description and location of the controls and instruments.

Section V – Service Upon Receipt Of Equipment:

8. BEFORE STARTING THE NEW ENGINE:

α. Pre-Lubricate Cylinder Walls:

To pre-lubricate the cylinder walls before starting the engine, remove the spark plugs and pour one teaspoonful of crankcase oil into each cylinder; replace the spark plugs and turn the engine several revolutions to distribute the oil over the cylinder walls. This assures sufficient lubrication for the pistons and cylinders immediately after the engine starts. This procedure is necessary only when the engine is new or when it has been idle for a month or more. The following instructions are given to assist in performing this procedure:

(1) **SPARK PLUGS:** Use the socket wrench furnished with the tools for removing and installing the spark plugs, rather than pliers, open end, or adjustable wrenches. (Figure 5)

(2) **IGNITION CABLES:** When attaching the ignition cables, note that the firing order of the

engine is 1-3-4-2. Attach No. 1 cable to No. 1 cylinder, No. 3 cable to No. 3 cylinder, etc.

(3) **IGNITION CABLE HOLDER:** The ignition cable holder (Figure 6), which fits over the spark plug ends, is provided to prevent the cable terminal shells from "shorting out" on the push rod guides of the engine. The holder must be kept in place at all times. Also, see that the metal spark plug cover is in place to aid in preventing dirt and moisture from collecting around the cables and plugs.

9. SERVICE PROCEDURES FOR NEW TRACTOR:

The following procedures, as outlined herein, must be followed before putting the VAIW Tractor in operation.

α. Lubrication:

(1) **SPECIAL LUBRICATION FOR NEW ENGINE:** To protect the new engine parts from any

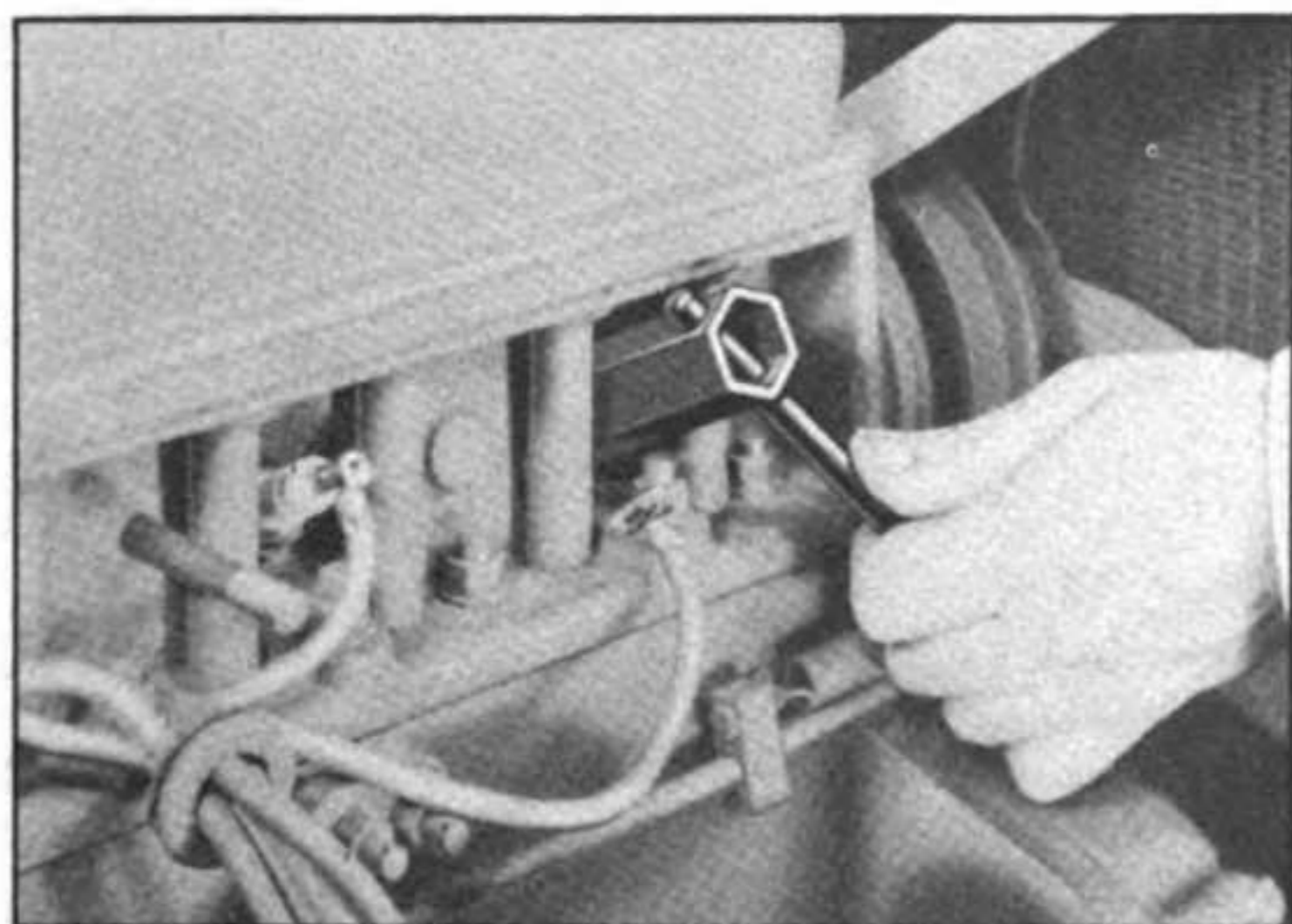


Figure 5 – Installing Spark Plugs with VT-3538 Spark Plug Wrench

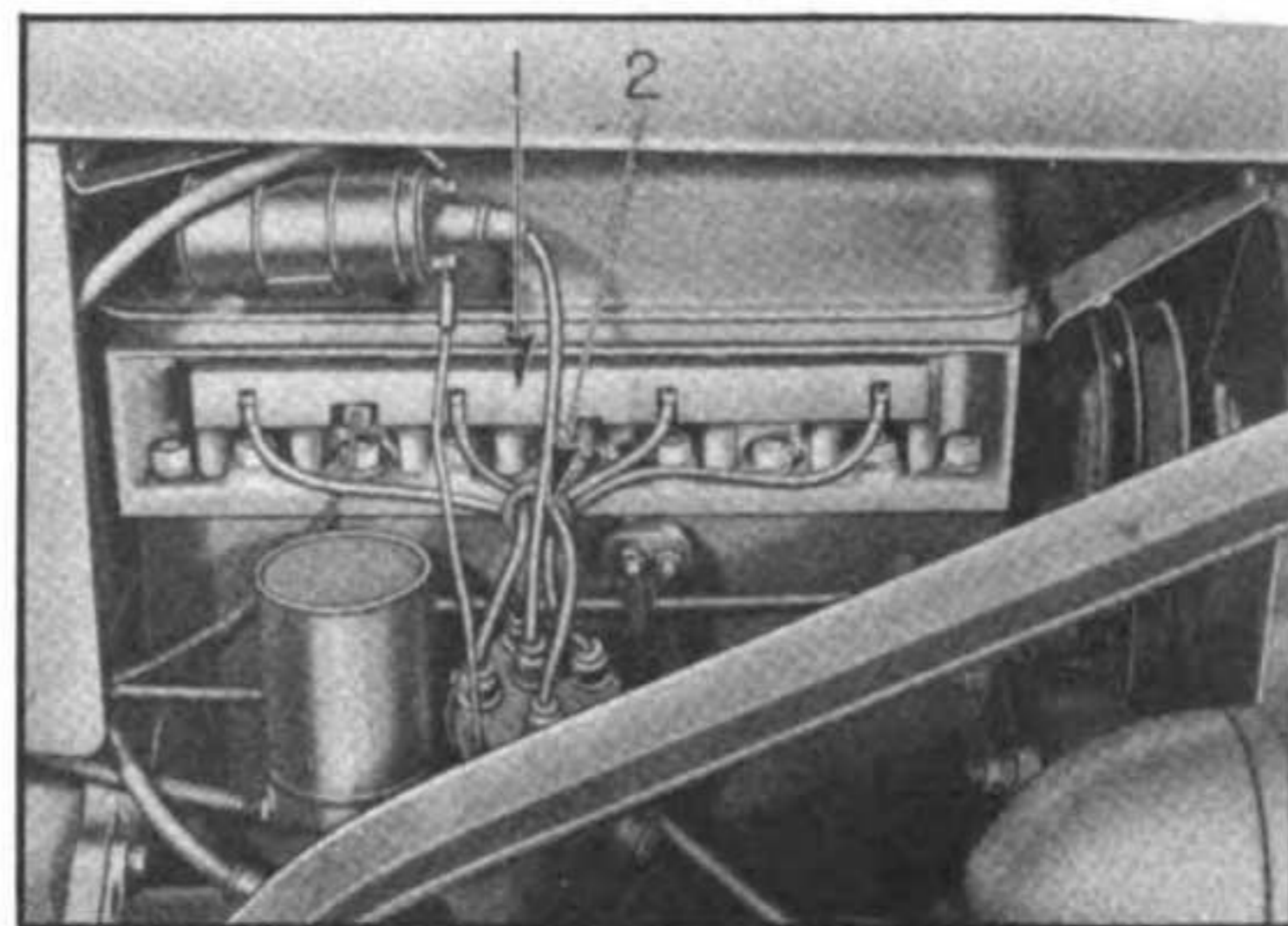


Figure 6 – Right Side of Engine

1. IGNITION CABLE HOLDER
2. IGNITION CABLES

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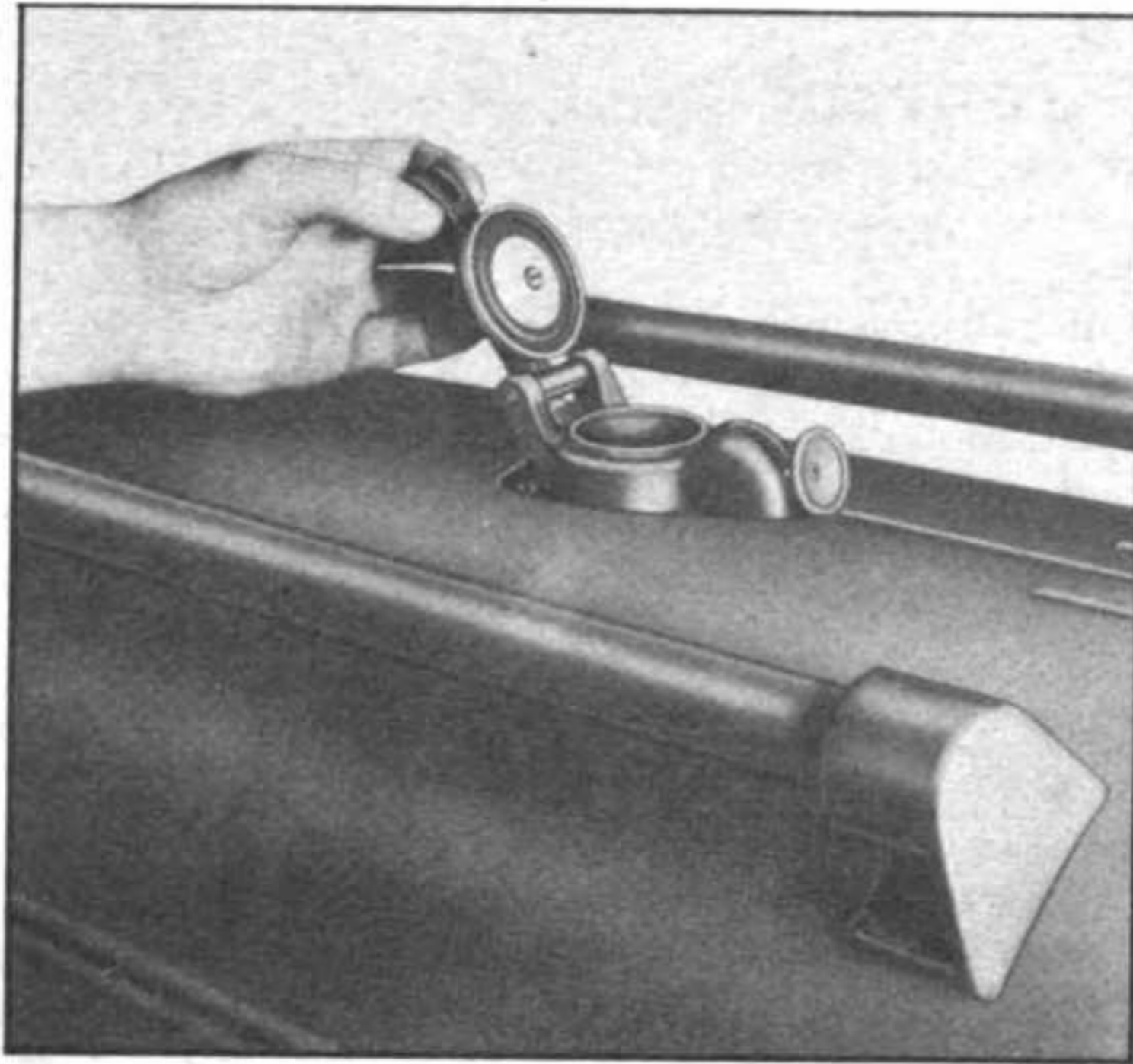


Figure 7 — Protectoseal Filler Cap

possible undo friction, it is necessary to mix one pint of light oil (SAE 10) with each five gallons of gasoline during the first forty-eight hours of operation.

(2) **LUBRICATE ENTIRE TRACTOR:** Lubricate the entire tractor in accordance with the Lubrication Order (Figure 12), Section XI. Complete information on lubricant specifications will also be found in Section XI.

NOTE: Engine may be operated for the first twenty-four hours with original oil as received from factory. When drained, this will act as a flush to the engine, removing all foreign particles.

b. Cooling System:

(1) **CLOSE DRAINS:** See that the drain cap on the lower radiator pipe and the drain on the left hand side of the engine block are closed tightly. (Figure 17)

(2) **FILL RADIATOR:** Fill the radiator with clean, soft water, taking care to leave sufficient space for expansion. When the tractor is to be operated in freezing temperature, 0° Cent. (32°F., or lower), anti-freeze solution must be put in the radiator. See Section VIII for further details pertaining to operating tractor under unusual conditions.

c. Fuel System:

(1) **FILLING FUEL TANK:** Close the fuel line valve under the fuel tank and fill the tank with clean gasoline, observing safety precautions for

grounding static electricity. Use care so as not to allow any dirt or foreign substances to enter the fuel. Now, remove the drain plug from the bowl of the carburetor (Figure 8), open the fuel line valve, and allow a small amount of gasoline to flow through to clean out the line and the carburetor bowl; then replace the drain plug.

d. Pneumatic Tires:

(1) **OVER-INFLATED FOR SHIPMENT:** When the tractor is shipped from the factory, tires are over-inflated to facilitate rigid blocking in the freight cars.

(2) **DEFLATE BEFORE OPERATING:** Before operating the tractor under its own power, the tires must be deflated to the following recommended air pressures:

FRONT TIRES	Lbs. Per Sq. In.
6:00-9, 4-Ply	35
REAR TIRES	
7:50-16, 6-Ply	40

e. Battery:

(1) **BATTERY ELECTROLYTE LEVEL:** Remove battery caps (Figure 9), and inspect electrolyte. If it is low, replenish with distilled water to a level $\frac{3}{8}$ " above the plates.

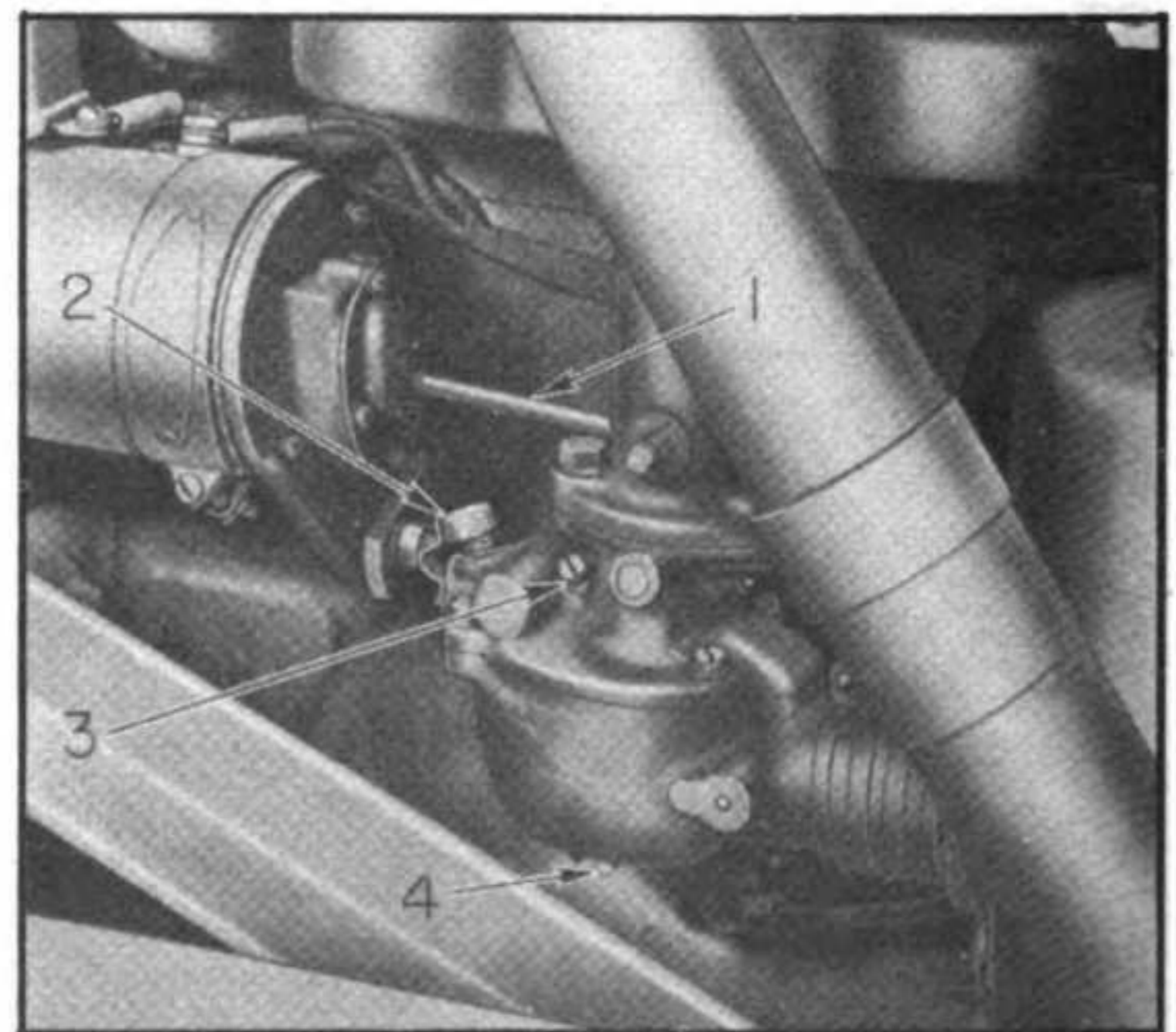


Figure 8 — Carburetor

- 1. THROTTLE LEVER ROD
- 2. POWER JET NEEDLE
- 3. IDLE JET NEEDLE
- 4. DRAIN PLUG

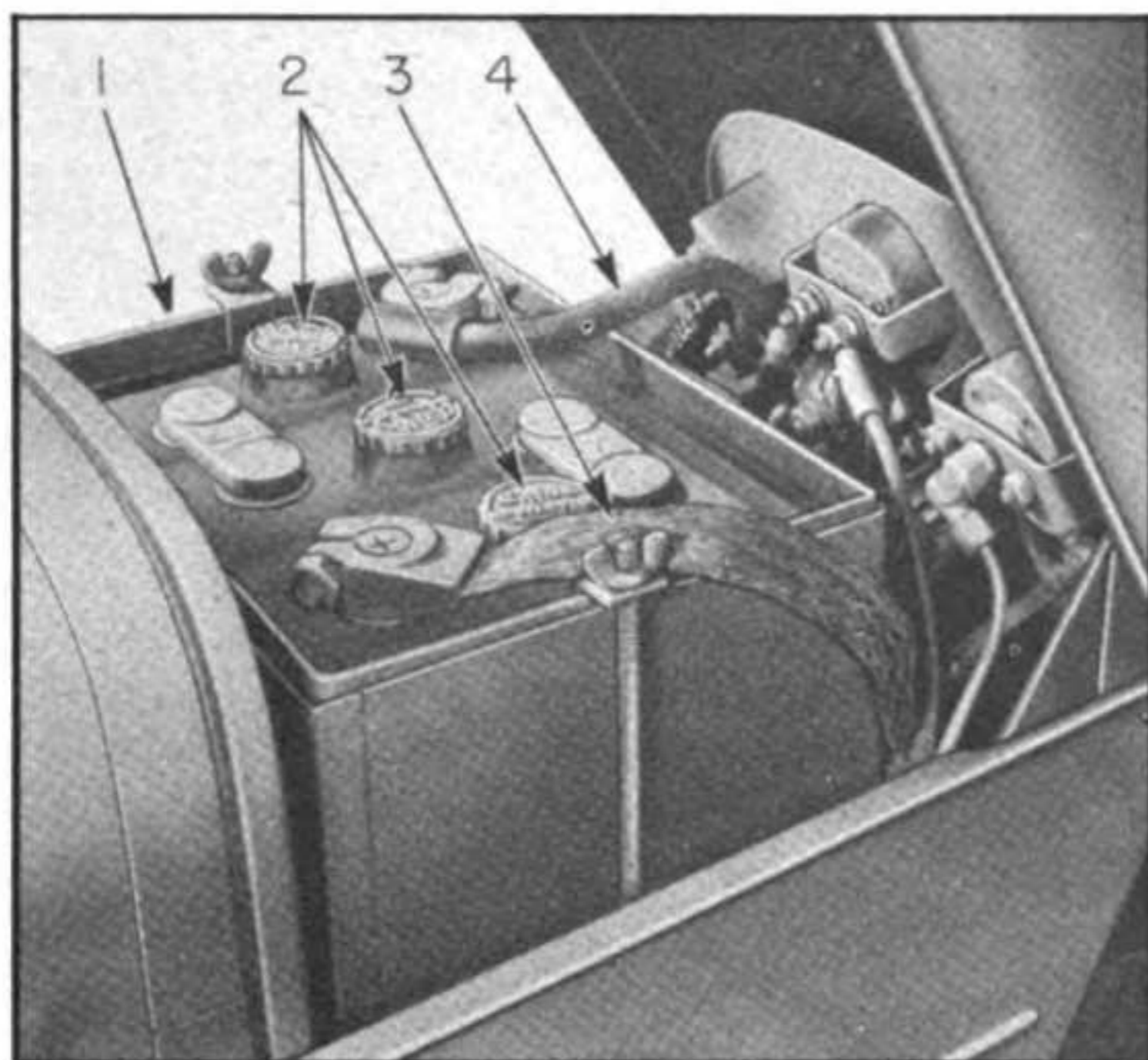


Figure 9 — Battery

1. BATTERY HOLD-DOWN CLAMP RING
2. BATTERY CELL CAPS
3. POSITIVE (+) TO GROUND STRAP
4. NEGATIVE (-) TERMINAL TO STARTER BUTTON CABLE

10. PURPOSE OF RUN-IN TEST:

α. When a new tractor is first received by the using organization, it is necessary for second echelon personnel to determine whether or not the tractor will operate satisfactorily when placed in service. For this purpose, inspect all assemblies, tools, and important parts of the tractor to see if they are in place and correctly adjusted. In addition, they will perform a run-in test of at least two hours, as directed in AR 850-15, paragraph 25, table III, according to procedures in paragraph 12.

11. CORRECTION OF DEFICIENCIES:

α. Deficiencies disclosed during the course of the run-in test will be treated as follows:

- (1) Correct any deficiencies within the scope of the maintenance echelon of the using organization before the tractor is placed in service.
- (2) Refer deficiencies beyond the scope of the maintenance echelon of the using organization to a higher echelon of correction.
- (3) Bring deficiencies of serious nature to the attention of the supply organization.

12. RUN-IN TEST PROCEDURES:

α. Preliminary Service:

(1) **FIRE EXTINGUISHER:** See that the portable extinguisher is present and in good condition. Test it momentarily for proper operation and mount it securely.

(2) **FUEL, OIL, AND WATER:** Fill fuel tank. Inspect crankcase oil and coolant supply; add oil and coolant as necessary to bring to correct levels. Allow room for expansion in fuel tank and radiator. During freezing weather, test value of anti-freeze and add as necessary to protect cooling system against freezing.

CAUTION: If there is a tag attached to filler cap or steering wheel concerning engine oil in crankcase, follow the instructions on tag before driving the tractor.

(3) **FUEL FILTER:** Inspect sediment bowl for leaks, damage, secure mountings, and connections. Drain bowl to see if any appreciable amount of dirt or water is present. If so, remove bowl and element and clean in SOLVENT, dry cleaning. Also, drain accumulated dirt or water from bottom of fuel tank. Drain only until fuel runs clean.

(4) **BATTERY:** Make hydrometer and voltage test of battery and add clean water to bring electrolyte $\frac{3}{8}$ " above the plates.

(5) **AIR CLEANER:** Examine air cleaner to see if it is in good condition and secure. Remove element and wash thoroughly in SOLVENT, dry cleaning. Fill oil cup to proper level with fresh oil and reinstall securely. Be sure cup and gaskets are in good condition and that the air horn connection is tight.

(6) **ACCESSORIES AND BELT:** See that accessories such as carburetor, generator, distributor, fan, and oil filter are securely mounted. Make sure that fan and generator drive belt is in good condition and adjusted to have $\frac{1}{2}$ " finger-pressure deflection.

(7) **ELECTRICAL WIRING:** Examine all accessible wiring and conduits to see if they are in good condition, securely mounted, and properly supported.

(8) **TIRES:** See that the front tires are properly inflated to 35 lbs., and that the rear tires are 40 lbs. See that stems are in correct position and all valve caps are present and finger-tight. Inspect for damage and remove any obstructions lodged in treads and carcasses.

(9) **WHEEL AND FLANGE NUTS:** See that all wheel mounting and axle flange nuts are present and secure.

(10) **FENDERS AND BUMPER-GRILLE:** Examine fenders and front bumper-grille for looseness or damage.

(11) **TOWING CONNECTIONS:** Examine automatic coupler for looseness or damage. See that the latch operates properly and locks securely.

(12) **BODY:** Inspect attachments, hardware, seat, grab rails, and hood to see that they are in good condition, correctly assembled, and securely mounted or fastened. Examine body paint for rust or shiny surfaces that might cause glare. See that the tractor markings are legible.

(13) **LUBRICATION:** Perform a complete lubrication service of the tractor if not already accomplished (Paragraph 9). Inspect all gear case oil levels and add as necessary to bring to proper levels. Change only if condition of oil indicates the necessity or if gear oil is not of proper grade for existing atmospheric temperatures.

(14) **SPRING AND SUSPENSION:** Inspect front spring to see that it is in good condition and correctly assembled, secure, and that bushings and shackle pins are not excessively loose or damaged.

(15) **STEERING LINKAGE:** See that the steering arm rods and connections are in good condition and secure and that the adjusting sleeve is mounted securely and not leaking.

(16) **CHOKER:** Examine choke to be sure it opens and closes fully in response to operation of choke button.

(17) **ENGINE WARM-UP:** Start engine and note if starting motor action is satisfactory and if engine has any tendency toward hard starting. Set governor control lever to run engine at fast idle during warm-up. As warm-up progresses, re-set choke button so that engine will run smoothly, preventing over-choking and oil dilution.

(18) **INSTRUMENTS:**

(a) *Oil Pressure Gage:* Immediately after engine starts, observe if oil pressure is satisfactory, (normal pressure during idle will show a reading of 8 to 10 lbs.). Stop engine if pressure is not indicated within 30 seconds.

(b) *Ammeter:* Ammeter should show positive (+) charge with engine at fast idle, and at slower

speeds, with lights on, it may show discharge (-). Any unusual drop or rise in reading must be investigated.

(c) *Temperature Gage:* Engine temperature should rise gradually during warm-up period to normal operating range (160°F. to 180°F.).

(19) **HORN:** See that the horn is in good condition and secure. If tactical situation permits, test horn for proper operation and tone.

(20) **LAMPS (LIGHTS):** Clean lenses and inspect all units for looseness or damage. If tactical situation permits, open and close light switch to see if lights respond properly.

(21) **LEAKS; GENERAL:** Look under tractor and within engine compartment for indications of fuel, oil, or coolant leaks. Trace to source any leaks found and correct or report them to designated authority.

(22) **TOOLS AND EQUIPMENT:** Inspect tools to be sure all items are present. See that they are serviceable and properly mounted or stored.

b. **"Run-In" Test:**

Perform the following procedures, steps (1) to (10) inclusive, during the run-in test of the tractor.

(1) **DASH INSTRUMENTS AND GAGES.** Do not move tractor until engine temperature reaches 135°F. Also, observe readings of ammeter and oil temperature to be sure they are indicating the proper function of the units to which they apply.

(2) **BRAKES:** Test service brakes to see if they stop tractor effectively without side-pull, chatter, or squealing; and observe if pedal has 1/8" free travel. Parking brake lock should hold tractor on reasonable incline, leaving ample brake pedal travel in reserve.

CAUTION: Avoid long application of brakes until disks become evenly seated to plates.

(3) **CLUTCH:** Observe if clutch operates smoothly without grab, chatter, or squeal on engagement, or slippage (under load) when fully engaged. See that the pedal has 1 1/2" to 2" free travel before meeting resistance.

CAUTION: Do not ride clutch pedal at any time, and do not engage and disengage new clutch severely or unnecessarily.

(4) **TRANSMISSION:** Gear shift mechanism should operate efficiently and smoothly, and gears

Section V—Service Upon Receipt Of Equipment

should operate without excessive noise and not slip out of mesh.

(5) **STEERING:** Observe steering action for binding or looseness, and note any excessive pull to one side, wander, shimmy, or wheel tremble. See that steering column and wheel are secure.

(6) **ENGINE:** Be on the alert for any abnormal engine operating characteristics or unusual noise, such as lack of pulling power or acceleration, back-firing, stalling, overheating, or excessive exhaust. Observe if engine responds properly to all controls.

(7) **UNUSUAL NOISE:** Be on the alert throughout the run-in test for any unusual noise from body and attachments, running gear, suspension, or wheels that might indicate looseness, damage, wear, inadequate lubrication, or under-inflated tires.

(8) **HALT TRACTOR AT THIRTY MINUTE INTERVALS FOR SERVICES:** (Step (9) and (10) below.)

(9) **TEMPERATURES:** Cautiously hand-feel each brake housing and wheel hub for abnormal temperatures. Examine the transmission, torque tube, and differential housings for indications of over-heating and excessive lubricant leaks at connections, seals, or gaskets.

(10) **LEAKS:** With engine running, and fuel, engine oil, and cooling system under pressure, look within engine compartment and under tractor for indications of leaks.

c. Completion of Run-In Test:

Upon completion of run-in test, correct or report any deficiencies noted. Report general condition of tractor to designated individual in authority.

Tractor (Wheeled), Warehouse, Case VAIW (Gasoline)

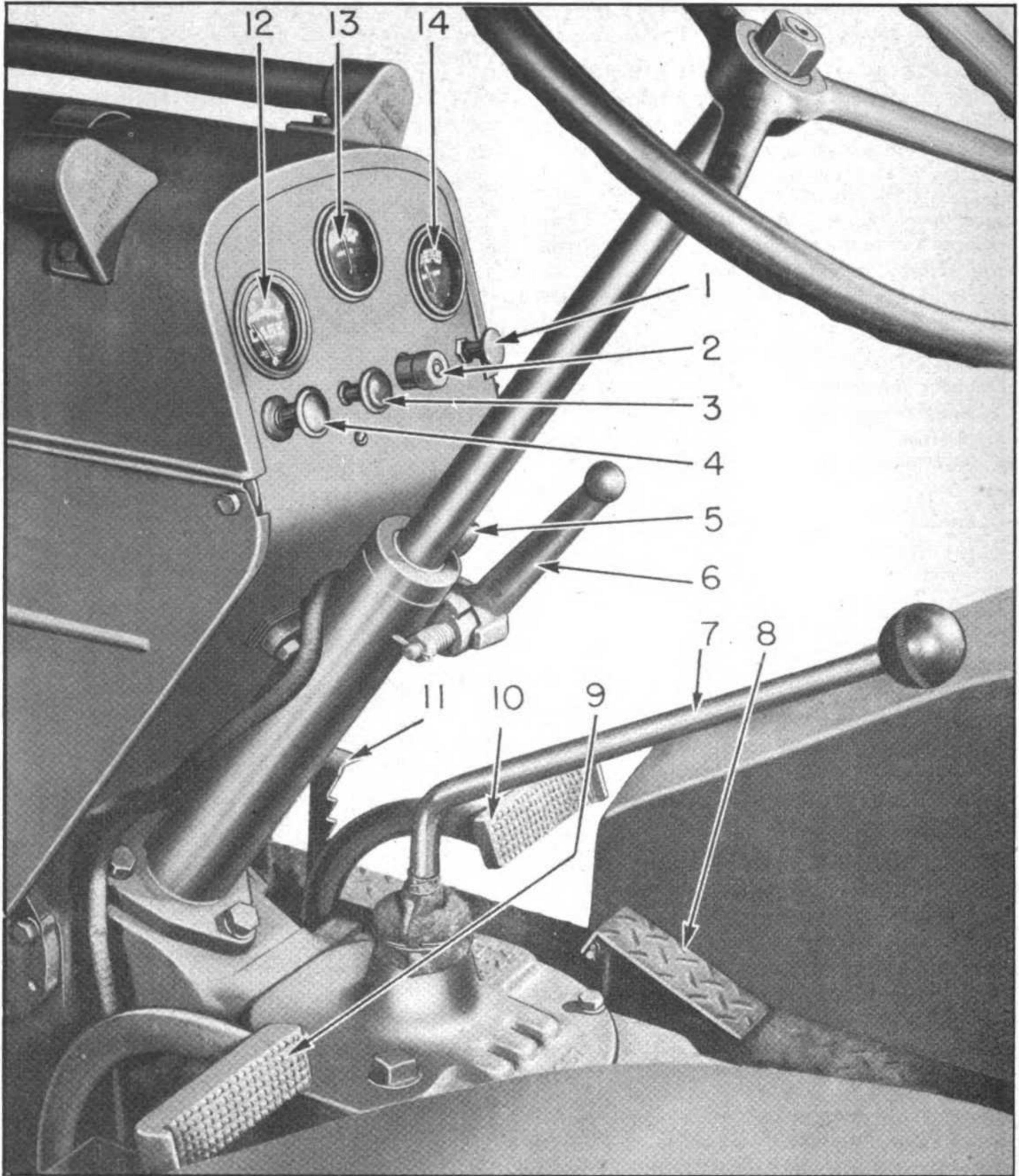


Figure 10 — Controls and Instruments

- | | |
|---------------------------|-----------------------------|
| 1. IGNITION BUTTON | 8. ACCELERATOR |
| 2. STARTER BUTTON | 9. CLUTCH PEDAL |
| 3. LIGHT BUTTON | 10. BRAKE PEDAL |
| 4. CHOKE BUTTON | 11. BRAKE PARKING LOCK |
| 5. HORN BUTTON | 12. OIL PRESSURE GAGE |
| 6. GOVERNOR CONTROL LEVER | 13. AMMETER |
| 7. GEAR SHIFT LEVER | 14. ENGINE TEMPERATURE GAGE |

Section VI - Controls and Instruments:

13. CONTROLS:

a. Ignition Switch Button:

The ignition switch is operated by a button located to the extreme right on the instrument panel (1, Figure 10). To operate, in starting engine pull button outward closing contact circuit from battery to coil.

b. Starter Button:

The starting motor is operated by a button located on the instrument panel (2, Figure 10). When the button is depressed, contact is made with the battery and starter motor.

c. Light Button:

The light switch is controlled by a button on the instrument panel (3, Figure 10). When the button is pulled completely out, contact is made with battery for illumination of lights. In the event the use of the lights has weakened the battery, recharging can be accomplished more readily by pulling button to second position (Figure 47) during daytime driving.

d. Choke Button:

The choke button is located to the extreme left on the instrument panel (4, Figure 10). It regulates the fuel mixture in the carburetor and is used to aid in starting when engine is cold. It is to be pulled out just far enough to allow the engine to run smoothly during the warm-up. It must be pushed in as soon as normal engine operation has been reached.

e. Horn Button:

The horn button is located at the extreme lower right on the instrument panel (5, Figure 10). When button is depressed, contact is made with battery for sounding horn.

f. Governor Control Lever:

The governor control lever is located to the right of the steering column (6, Figure 10). This lever is used when a desired motor revolution is required in starting engine and also as a hand feed in the event of starting a load on an incline when the right foot of the operator is on the brake pedal. To increase the engine revolution, push the lever downward.

g. Gear Shift Lever:

The gear shift lever is located in the center of the transmission case directly below the steering

wheel (7, Figure 10). The gear shift lever permits the selection of transmission speeds (gear ratios). The transmission has four speeds forward, and one reverse. These speeds are indicated by a diagram on the transmission cover to the right of the gear shift.

h. Foot Accelerator:

The accelerator pedal is located on the right hand floor plate (8, Figure 10). The accelerator pedal controls the traction or road speed of the tractor by regulating the governor control rod, thereby regulating the throttlefly, which controls the amount of fuel and air passing through the carburetor.

i. Clutch Pedal:

The clutch pedal is located to the left of the steering column and to the front of the left floor plate (9, Figure 10). Depressing the clutch pedal disengages the engine from the transmission, thereby enabling the operator to make the selection of gear desired.

j. Brake Pedal:

The brake pedal is located to the right of the steering column ahead of the foot accelerator (10, Figure 10). By depressing the brake pedal, the pressure plates are forced against the brake linings, thereby binding the rotation of the differential to the transmission case, halting the movement of the tractor.

k. Parking Brake Lock:

The parking brake lock is located to the front of the brake pedal (11, Figure 10). When use of the parking brakes is required, depress brake pedal and engage notch of the brake lock with the floor plate.

l. Automatic Coupler:

The coupler located at the rear of the tractor (Figure 11) is of cast steel construction so designed that it will work automatically when the tractor is backed against the tongue of the load. The load may be connected at any angle up to sixty degrees from the center line of the tractor. To disconnect coupler, back the tractor enough to take the load off the catch, then pull catch upwards by means of the attached rope. After the tractor moves forward far enough to clear the tongue of the load, the coupler catch may be released.

14 INSTRUMENTS:**a. Oil Pressure Gage:**

The oil pressure gage is located to the upper left of the instrument panel (12, Figure 10). The gage consists of a dial and indicator. When engine is in operation, a low or zero reading is an indication that proper lubrication is not being supplied to all moving parts of the engine.

b. Ammeter:

The ammeter is located in the upper center of the instrument panel (13, Figure 10). It consists of a dial and indicator; reading of charge and discharge. This is an electrical device which indicates the amperage out-put of the generator. When no electrical equipment is in use, the generator should show a reading on the charge side of the dial.

c. Engine Temperature Gage:

The engine temperature gage is located to the upper right of the instrument panel, (14, Figure 10). It consists of a dial and indicator which is connected to the water jacket of the engine. This

instrument is a constant indicator of the water temperature in the engine.

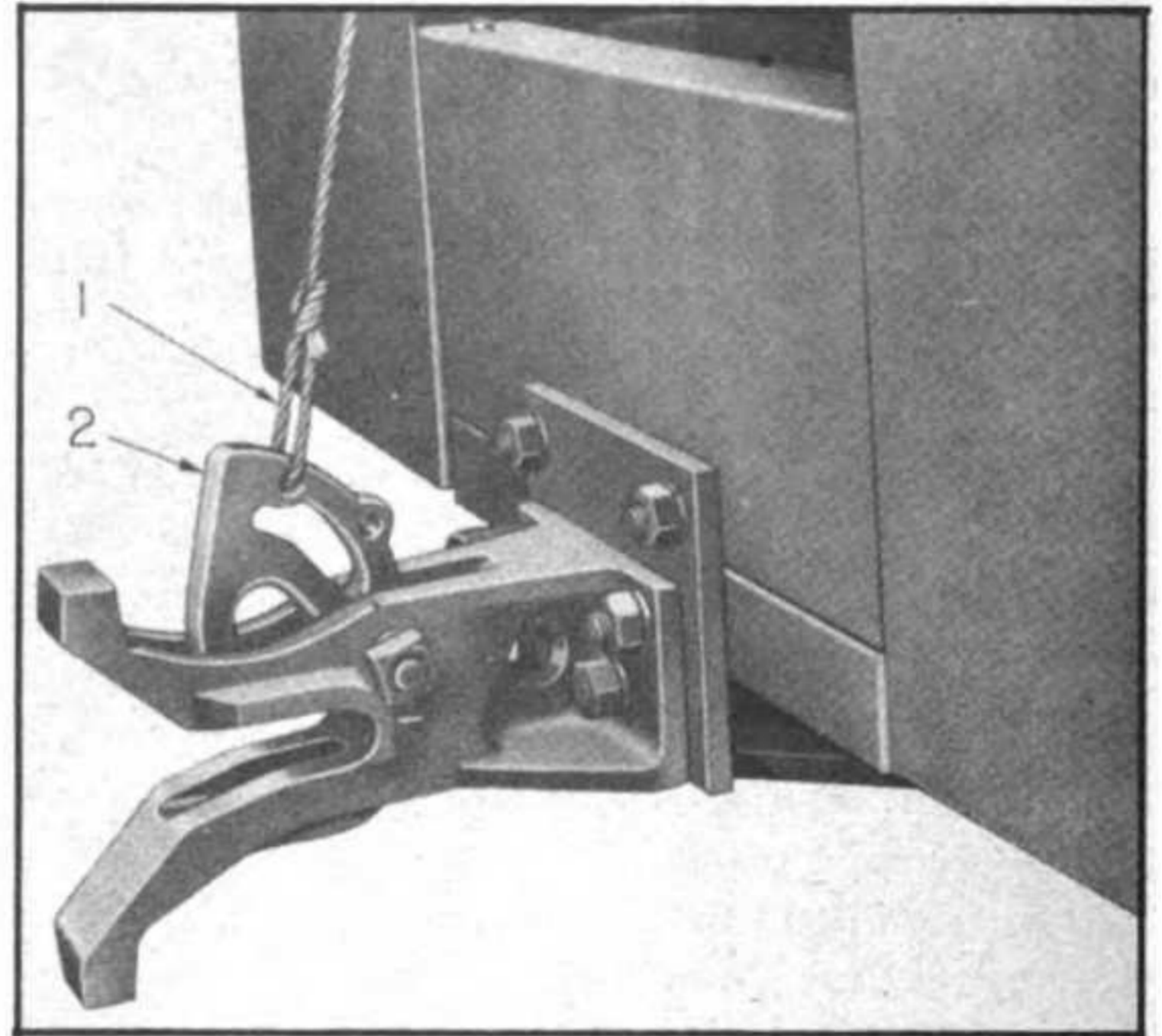


Figure 11 — Automatic Coupler

1. CONTROL ROPE
2. SPRING LOAD CATCH

Section VII – Operation Under Usual Conditions:

15 ENGINE IN OPERATION:

a. Starting the Engine:

Place the gear shift lever in neutral (7, Figure 10), advance the governor control lever (6, Figure 10) one-third of open position (push downward on lever to advance) holding the choke control button all the way out, pull the ignition switch control button out, depress the starting switch button (2, Figure 10) and release it immediately when the engine starts. In cold weather, disengage the clutch by pushing the pedal forward and holding it in this position until the engine is running. Doing this relieves the starter of unnecessary work, for when the clutch is engaged the transmission gears will be turning in the cold lubricant. Following this practice will save the starter and battery from unnecessary loads.

b. Use Choke Sparingly:

After the engine starts, the choke must be adjusted so the engine turns without missing. As the engine warms up, the choke rod must be gradually pushed all the way inward. Do not use the choke to regulate the fuel mixture, except for starting the engine and never operate the engine under load with choke rod partly out.

c. Watch Oil Pressure:

Immediately after the engine starts, observe the oil pressure gage to see if it is registering pressure. If it is not, stop the engine and inspect the oil system to learn the cause of this failure. (Pressure during idle is approximately 8 to 10 lbs.)

d. Carburetor Adjustments:

Although the carburetor has been adjusted at the factory before shipment, varying conditions present such as altitude, temperature, and grade of fuel may necessitate changing the carburetor adjustment. Three adjustments are provided: Power Needle Adjustment, Idle Adjusting Needle, and Idle Stop Screw Adjustment.

(1) **Power Needle Adjustment:** While vehicle is under full load, turn the needle clockwise until engine begins to lope. Then turn needle back approximately one-half turn or until engine operates smoothly. See Figure 28 for location of needle.

(2) **Idle Adjusting Needle:** Adjustment must be made when the engine is warm. Tighten screw and start engine. While engine is operating, turn screw counter-clockwise until engine runs smoothly. See Figure 28 for location of needle.

(3) **Idle Stop Screw Adjustment:** The idle stop screw adjustment is located behind the intake manifold and secured to the throttle shaft on the side of the carburetor nearest the engine. While the engine is warm, turn screw clockwise until the desired engine idling speed is obtained.

16. DRIVING THE TRACTOR:

a. Selecting Gear:

With the engine running, push the clutch pedal forward in disengaged position. Move the gear shifting lever to the position of speed desired. The positions for the different speeds are shown on the gear shift cover. When starting the tractor, speed up the engine with the foot accelerator and engage the clutch gradually by slowly releasing the pressure on the foot pedal. Do not engage the clutch suddenly, allowing the tractor to jerk into the load; it is of no advantage when starting with a heavy load. Any gear may be selected for starting; and with operating familiarity, gears may be shifted while the tractor is in motion.

b. Caution:

Do not drive tractor with foot resting on the clutch pedal, as this will cause undue wear on the clutch facings and throwout bearing.

c. Running-In Period:

This tractor must not be loaded to full capacity until it has had a reasonable running-in period.

17. TO STOP TRACTOR:

The engine must be throttled down before disengaging the clutch and applying the brakes to stop the forward motion of the tractor. Disengage the clutch by pressing down firmly on the clutch pedal, apply brakes, and move the gear shift lever to neutral position. If the tractor is parked on an incline, or if it is necessary to set brakes, the brake lock must be used.

18. TO STOP ENGINE:

Retard the governor control lever by pushing the lever all the way forward and shut off the ignition switch button by pushing it all the way in. If the tractor is to remain idle for any length of time, the fuel tank shut-off valve must be closed.

Section VIII - Operation Under Unusual Conditions:

19. FREEZING TEMPERATURES:

a. Cooling System:

The cooling system must be protected by using an anti-freeze solution in the radiator. Ethylene Glycol, or similar anti-freeze solutions, which do not evaporate at high temperatures, or alcohol base solutions, will be satisfactory. Flush the system thoroughly and inspect the hose connections before putting in these solutions. Solutions containing salts such as sodium chloride, magnesium chloride, or calcium chloride must not be put in radiators because of their corrosive action on metal.

b. Lubrication:

Lubrication oils must be changed to a lighter body as recommended in tables given in Section XI. Chassis grease must be of lighter body, one that will flow readily to insure positive lubrication. The engine oil pan must be inspected daily to be sure that any water due to condensation has not frozen in the bottom of the pan. This can be accomplished by unscrewing the drain plug in the pan; if the oil flows freely, it is very likely there is no condensation. Engine oil must be changed as recommended in tables given in Section XI.

c. Change of Engine Oil:

Engine oil must be changed to a lighter viscosity as recommended in the table given in Section XI.

d. Gasoline Sediment Bowl:

In freezing temperatures, the sediment bowl must be removed, drained, and cleaned at each engine oil change to remove sludge and water caused by condensation of vapor.

20. UNUSUALLY WARM TEMPERATURES:

a. Cooling System:

The winter time anti-freeze solution must be drained from the radiator and cylinder block (see Figure 17). Thoroughly flush out the radiator and cylinder block before adding clear, soft water. When tractor is operated constantly during warm temperature, the water content must be inspected frequently to insure a level well above the core of the radiator.

b. Change of Engine Oil:

Engine oil must be changed to a heavy viscosity, as recommended in Section XI.

21. DRY, DUSTY CONDITIONS:

a. Breather and Oil Filler Cap:

It is absolutely necessary that the oil filler cap be in place at all times to insure that impurities, in no way, enter the engine. When the tractor is used during dry, dusty conditions, the cap must be cleaned daily by dipping it several times in a small amount of SOLVENT, dry cleaning to remove any moisture or oil which may clog the filter.

b. Oil Bath Air Cleaner:

The air cleaner is connected to the air horn of the carburetor; its purpose being to prevent dirt and abrasive material from entering the engine and causing excessive wear to parts. Keep the cup of the cylinder filled to the baffle plate with SAE 10 oil, and change oil at least every eight hours when tractor is being used in extremely dusty conditions. Keep the hose clamps which connect to the carburetor tight at all times to prevent entrance of dirt into the air stream.

Section IX – Demolition to Prevent Enemy Use:

NOTE: Destroy identical parts on each and every tractor to prevent repair and operation through cannibalization.

22. (METHOD 1) TO DESTROY TRACTOR ENGINE THROUGH LACK OF LUBRICANT:

Remove crankcase drain plug to drain lubricant from crankcase. Remove coolant from cooling system by opening drain plugs. Then start engine and accelerate to full speed with governor control lever, and leave in operation. Results of this procedure will be extensive damage to engine, preventing re-use without a complete overhaul.

23. (METHOD 2) TO DESTROY TRACTOR ENGINE AND GEARS THROUGH LACK OF LUBRICANT:

Jack up one rear wheel of tractor. Remove drain plugs from crankcase, torque tube, transmission, and rear axle housing to drain lubricant from these units. Also, remove coolant from cooling system by opening drain plugs. Start engine, set transmission in high gear, and accelerate engine to full speed with governor control lever. Results of this procedure will be extensive damage to engine, transmission, and final drive gears.

24. (METHOD 3) TO DEMOLISH ENGINE PARTS WITH HAMMER:

If large, heavy hammer or weight is available, demolish distributor, starting motor, ignition coil, air cleaner, generator, manifold, carburetor, etc., by striking with forceful blows. Engine block may also be destroyed by this method if hammer is large enough.

25. (METHOD 4) TO DESTROY ENGINE AND GEARS BY USE OF SAND:

If sand is available, start engine and pour a considerable amount of sand into engine lubricant filler hole and leave engine in operation. To make this method more effective by also destroying transmission and final drive gears, jack up one rear wheel of tractor, set transmission in a high gear, and pour sand into torque tube and transmission lubricant filler holes as well as in engine. By leaving engine in operation, this will cause considerable destruction to engine and gears.

26. (METHOD 5) TO DESTROY TRACTOR BY FIRE:

Open fuel tank filler cap. Remove or destroy sediment bowl underneath tank to allow gasoline to flow out of tank onto tractor parts and the ground. Step back at least twenty feet, ignite oil soaked waste, and throw to saturated tractor. Immediately get as far away as possible, as tractor will become inflamed and possible fuel tank explosion will occur within a few seconds. Tractor will either be damaged by explosion or engine and torque units will become warped due to the intense heat from the ignited gasoline. In either event, all wiring, insulation, etc. will be extensively destroyed.

PART III – MAINTENANCE INSTRUCTIONS

Section X – General:

27. SCOPE:

α. Part III contains information for the guidance of the personnel of the using organizations responsible for the maintenance (1st and 2nd echelon) of this tractor. It contains information needed

for the performance of the scheduled lubrication and preventive maintenance service, as well as descriptions of the major systems and units and their functionings in relation to other components of the tractor.

Section XI – Lubrication:

28. LUBRICATION ORDER:

α. War Department Lubrication Order No. 6005 (Figure 12) prescribes lubrication maintenance for the VAIW Tractor.

b. A Lubrication Order is placed on or is issued with each tractor and is to be carried with it at all times. In the event a tractor is received without an Order the using arm shall immediately requisition a replacement from the Warehouse Equipment Parts Division, Columbus ASF Depot, Columbus, Ohio.

c. Lubrication instructions on the Order are binding on all echelons of maintenance and there shall be no deviations, except as indicated in subparagraph d below.

d. Service intervals specified on the Order are for normal operating conditions. Reduce these intervals under extreme conditions such as excessively high or low temperatures, prolonged periods of high speed operation, continued operation in sand or dust, immersion in water or exposure to moisture; any one of which may quickly destroy the protective qualities of the lubricant.

e. Lubricants are prescribed in the "Key" in accordance with three temperature ranges; above +32°F, +32°F to 0°F, and below 0°F. Determine the time to change the grade of lubricants by maintaining a close inspection on the operation of the tractor during the approach to change-over periods. Be particularly observant when starting the engine. Sluggish starting is an indication of thickened lubricants and the signal to change to grades prescribed for the next lower temperature range. Ordinarily, it will be necessary to change grades of lubricants only when air temperatures are consistent-

ly in the next higher or lower range, unless malfunctioning occurs sooner due to lubricants being too thin or too heavy.

f. Figures 13 through 15 are localized views of the lubrication points that apply to the VAIW Tractor. The localized views are keyed to the Lubrication Order to facilitate proper lubrication.

29. DETAILED LUBRICATION INSTRUCTIONS:

α. Lubrication Equipment:

Each tractor is supplied with lubrication equipment for adequate lubrication maintenance. Be sure to clean this equipment both before and after use. Operate the lubricating gun carefully and in such a manner as to insure a proper distribution of the lubricant.

b. Points of Application:

Lubricant fittings, grease cups, and oilers are readily accessible. Such lubricators and the surrounding surfaces must be wiped clean before lubricant is applied.

c. Cleaning Fluid:

Use only SOLVENT, dry cleaning to clean or wash all parts. CAUTION: *Use of gasoline for this purpose is prohibited.* After washing, dry all parts thoroughly before applying lubricant.

d. Lubrication Notes on Individual Units and Parts:

The following instructions supplement those notes on the Lubrication Order which pertain to lubrication and service of individual units and parts of the VAIW Tractor.

(1) AIR CLEANER. At specified interval, inspect level and refill engine air cleaner oil reservoir to top of baffle plate with SAE 30 above +32°F, SAE 10 from +32°F to 0°F. From 0°F to -40°F use a

No. 6005
WAR DEPARTMENT LUBRICATION ORDER
WASHINGTON 25, D.C., 17 JULY 1944

TRACTOR, WAREHOUSE
(J. I. CASE MODEL VAIW)

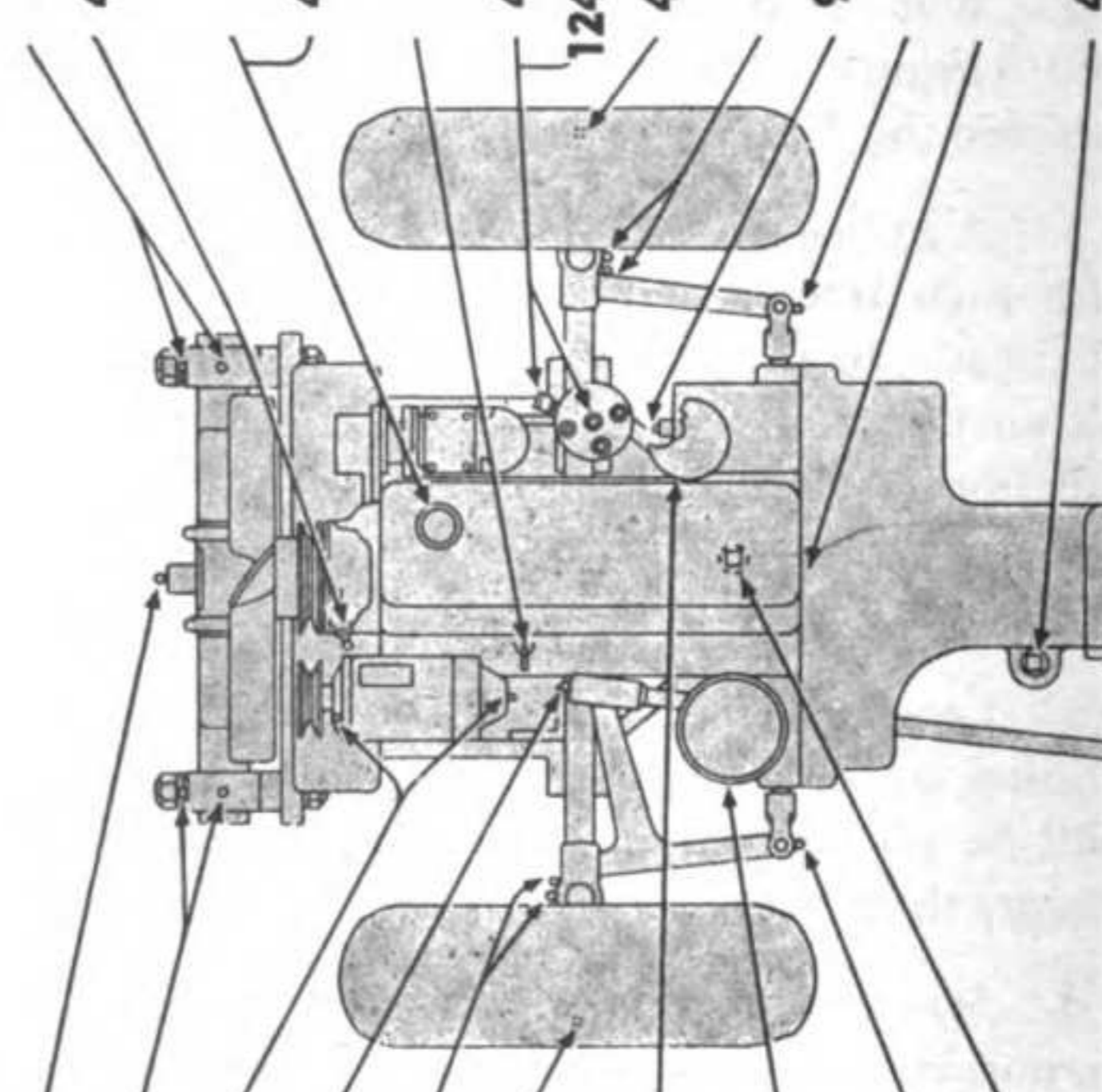
For detailed instructions, refer to TM 10-1623.

Clean fittings before lubricating. Lubricate after washing.
Clean parts with SOLVENT, dry cleaning OIL, fuel, Diesel or Kerosine. Dry before lubricating.

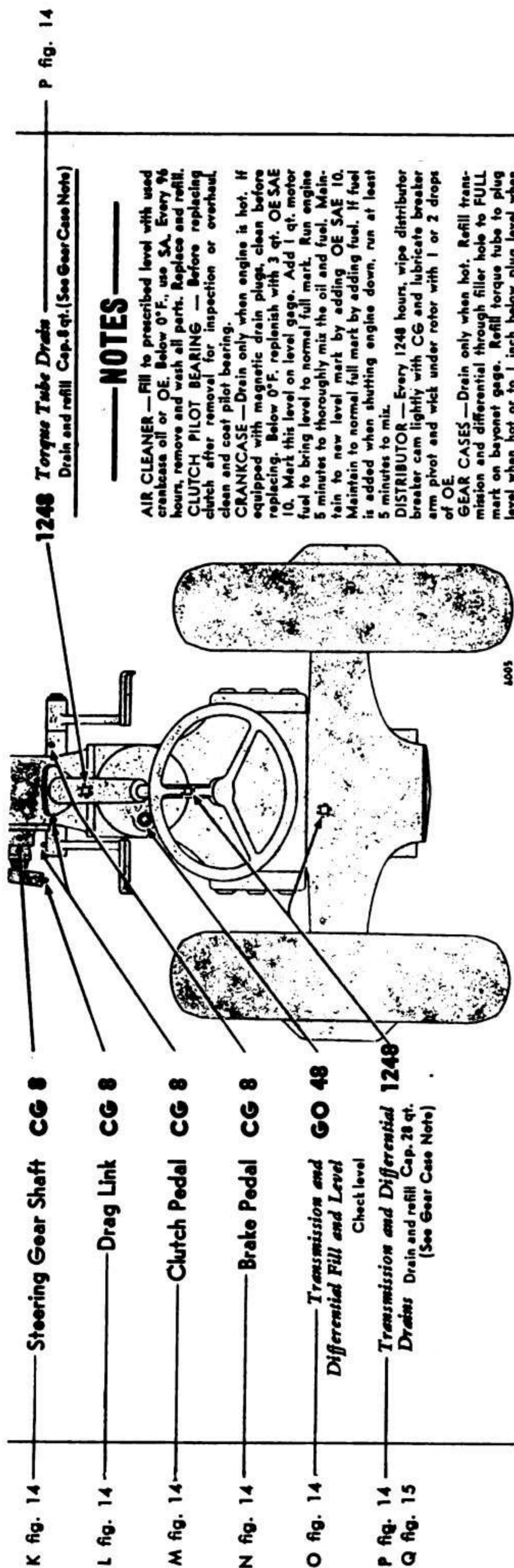
Requisition replacement Lubrication Orders from the Warehouse Equipment Parts Division, Columbus ASF Depot, Columbus, Ohio.

Reduce intervals under severe operating conditions.

Figure	Part	Lubricant	Operating Hours	Notes
A fig. 13	Pivot Pin	CG 8		
B fig. 13	Spring Shackle	CG 8	8	B fig. 13
C fig. 13	Generator	OE 96	48	R fig. 15
D fig. 13	Drag Link	CG 8		S fig. 15
E fig. 13	King Pin	CG 8	8	T fig. 15
F fig. 13	Wheel Bearings	WB 48	48	U fig. 15
G fig. 13	Oil Filter	(See Note)	48	F fig. 13
H fig. 13	Air Cleaner	OE 8	96	V fig. 15
I fig. 14	Tie Rod	CG 8	8	W fig. 15
J fig. 14	Crankcase Drains	48	48	X fig. 15
	Clutch Pilot Bearing	CG		Y fig. 15
	Torque Tube Fill and Level	GO	48	



Section XI—Lubrication



NOTES

AIR CLEANER—Fill to prescribed level with used crankcase oil or OE. Below 0°F., use SA. Every 96 hours, remove and wash all parts. Replace and refill.
CLUTCH PILOT BEARING—Before replacing clutch after removal for inspection or overhaul, clean and coat pilot bearing.
CRANKCASE—Drain only when engine is hot. If equipped with magnetic drain plugs, clean before replacing. Below 0°F., replenish with 3 qt. OE SAE 10. Mark this level on level gage. Add 1 qt. motor fuel to bring level to normal full mark. Run engine 5 minutes to thoroughly mix the oil and fuel. Maintain to normal level mark by adding OE SAE 10. If fuel is added when shutting engine down, run at least 5 minutes to mix.
DISTRIBUTOR—Every 1248 hours, wipe distributor breaker cam lightly with CG and lubricate breaker arm pivot and wick under rotor with 1 or 2 drops of OE.
GEAR CASES—Drain only when hot. Refill transmission and differential through filler hole to FULL mark on bayonet gage. Refill torque tube to plug level when hot or to 1 inch below plug level when cold. If equipped with magnetic drain plugs, clean before replacing.
OIL FILTER—Every 48 hours, while crankcase is being drained, remove element, clean inside of case and install new element.
OIL PUMP SCREEN—Every 1248 hours, remove oil pump screen, wash in SOLVENT, dry cleaning and replace.
STARTING MOTOR—Every 96 hours, lubricate starter bearing with OE. Every 1248 hours, remove starting motor and clean, but do not lubricate Bendix drive.
WHEEL BEARINGS—Every 48 hours, lubricate through fitting. Every 1248 hours, remove, clean and repect.
OIL CAN POINTS—Every 48 hours, lubricate Clutch and Brabe Linkage, Throttle and Governor connections and other rubbing surfaces with OE.
DO NOT LUBRICATE—Clutch Release Bearing

Copy of this Lubrication Order will remain with the equipment at all times; instructions contained therein are mandatory and supersede all conflicting lubrication instructions dated prior to 17 July 1944.

BY ORDER OF THE SECRETARY OF WAR:
 G. C. MARSHALL,
 Chief of Staff.

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

KEY

LUBRICANTS	LOWEST ANTICIPATED AIR TEMPERATURE
OE—OIL, engine	above +32°F. to 0°F. below 0°F.
Crankcase	SAE 30 See Note
Other Points	SAE 30 PS
GO—LUBRICANT, gear, universal	SAE 90 Grade 75
CG—GREASE, general purpose	No. 1 No. 0
WB—GREASE, general purpose, No. 2—All temperatures	
SA—FLUID, shock-absorber, light	
PS—OIL, lubricating, preservative, special	

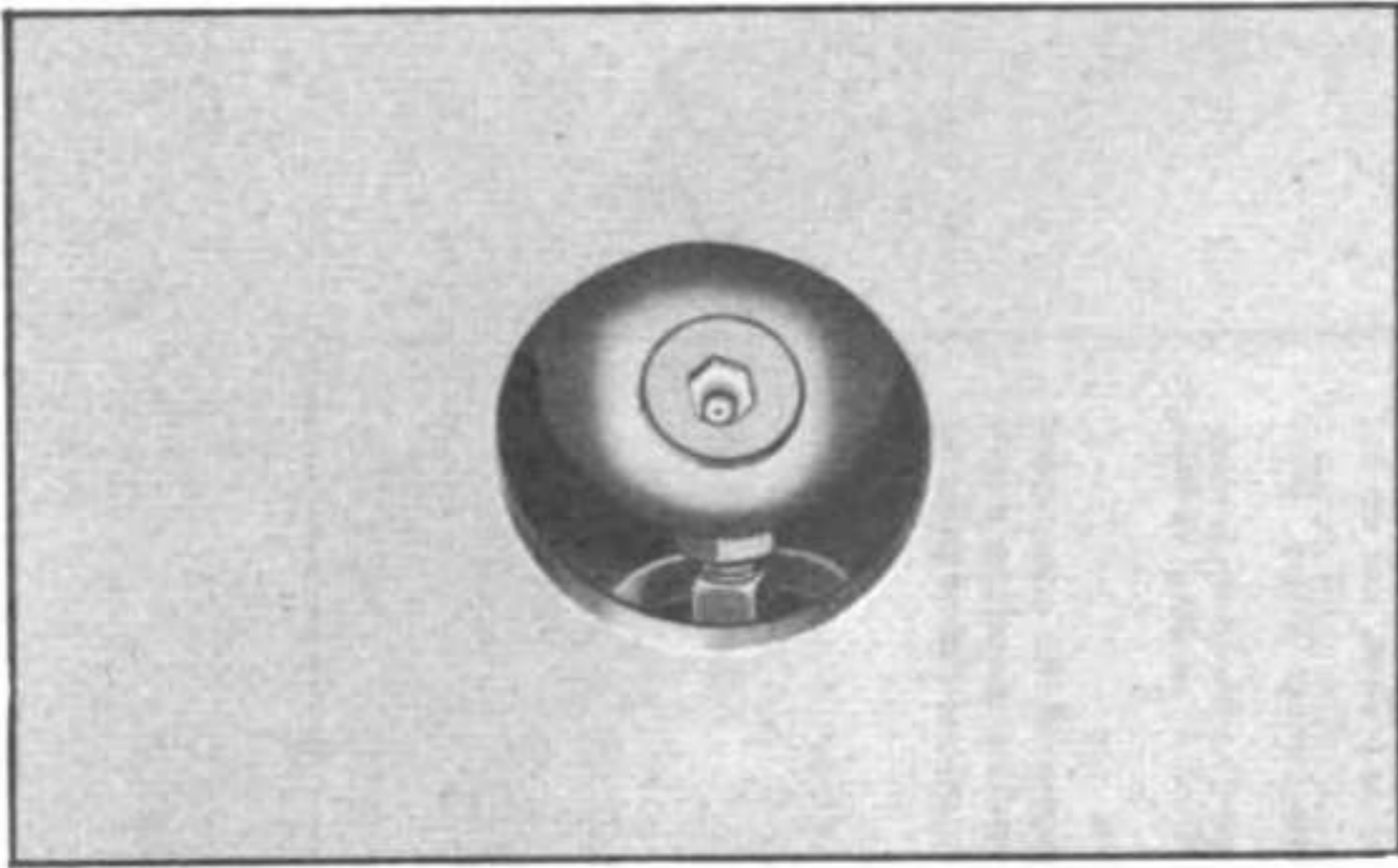
No. 6005 [NOT TO BE REPRODUCED in whole or in part without permission of the Office of The Quartermaster General.]

Data based on inspection of Pilot Model

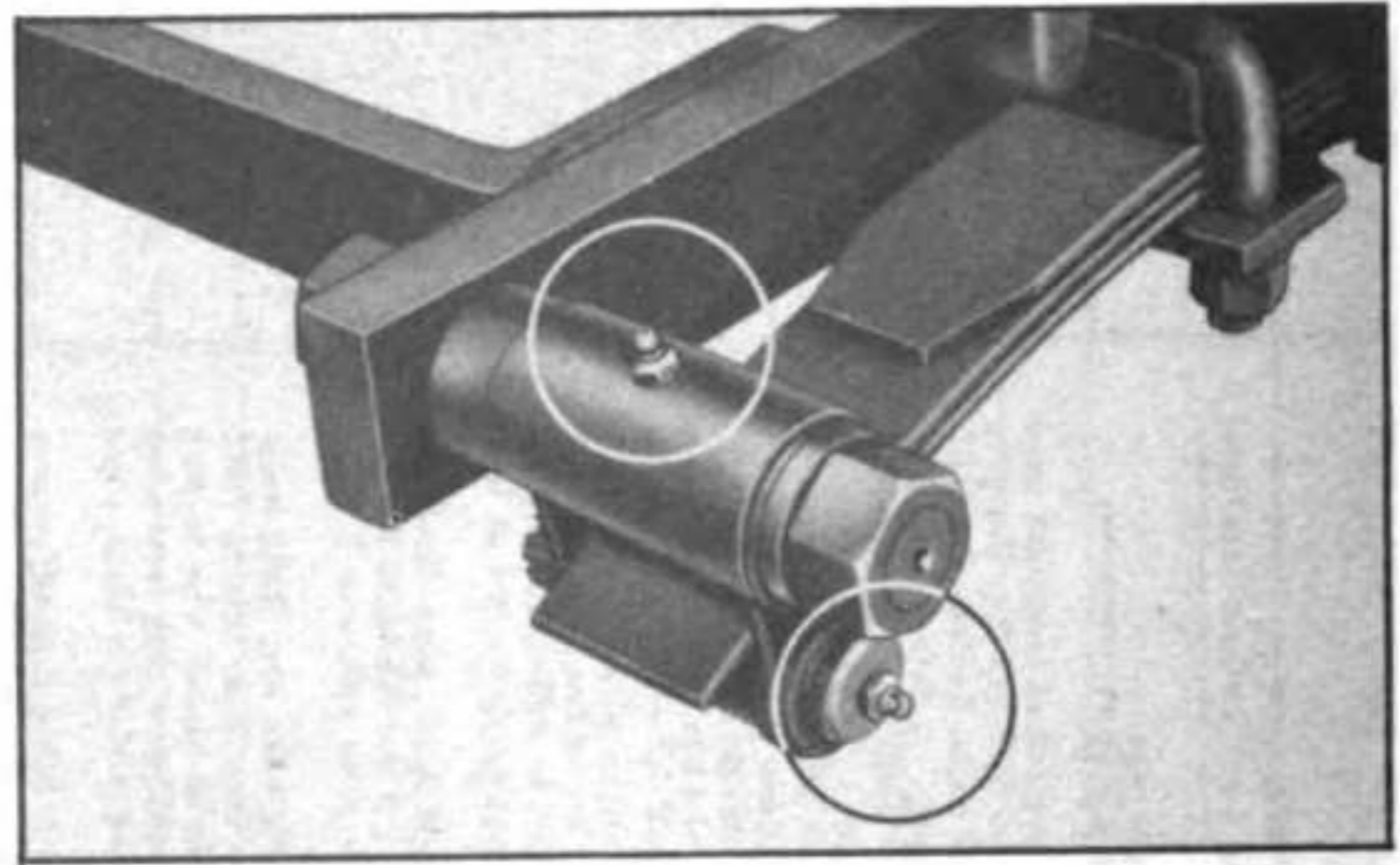
Location—Install Lubrication Order No. 6005 on right side of Hood.
 Mounting Surface Finish—Smooth dull painted metal.

Figure 12 — Lubrication Order

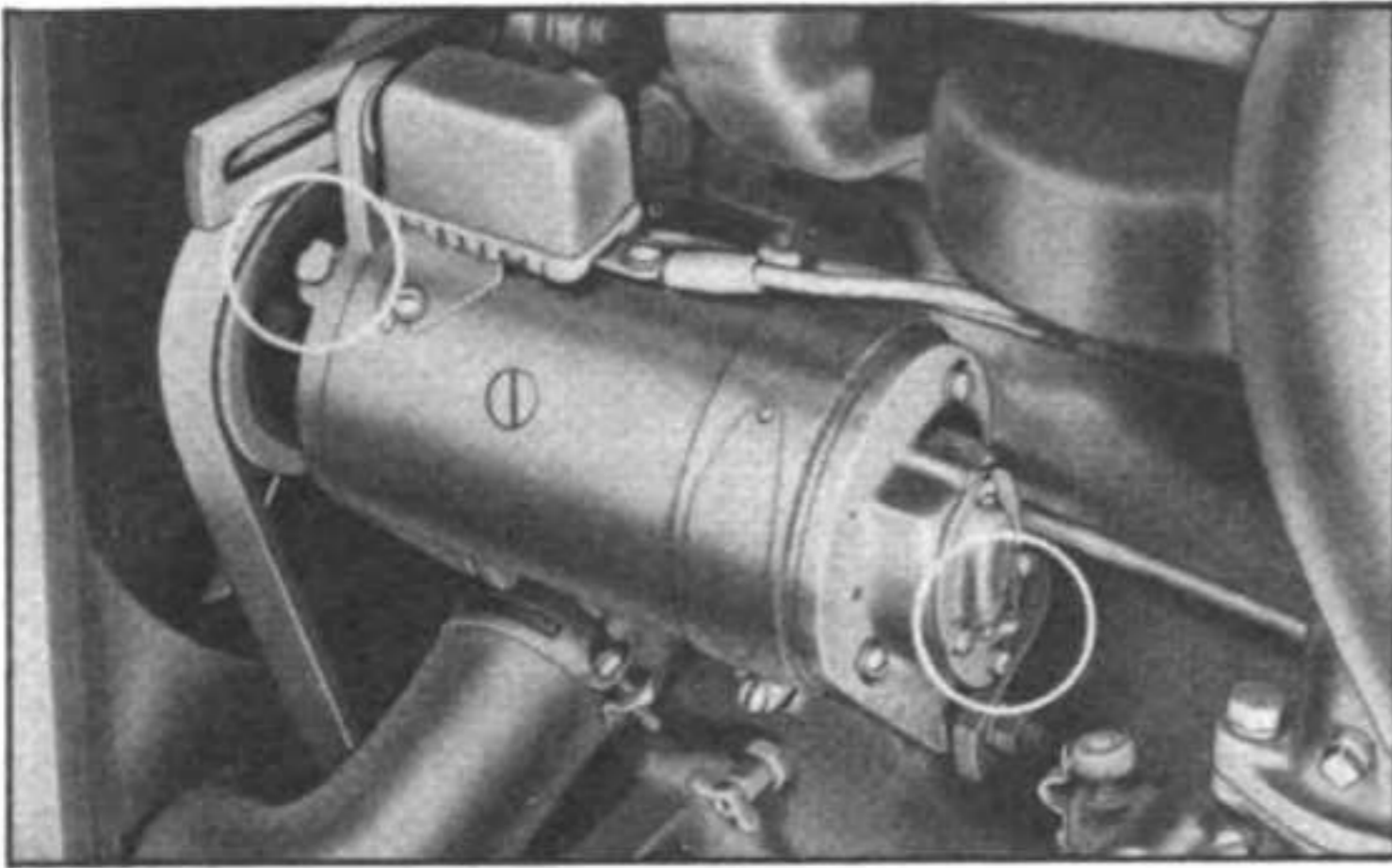
Tractor (Wheeled), Warehouse, Case VAIW (Gasoline)



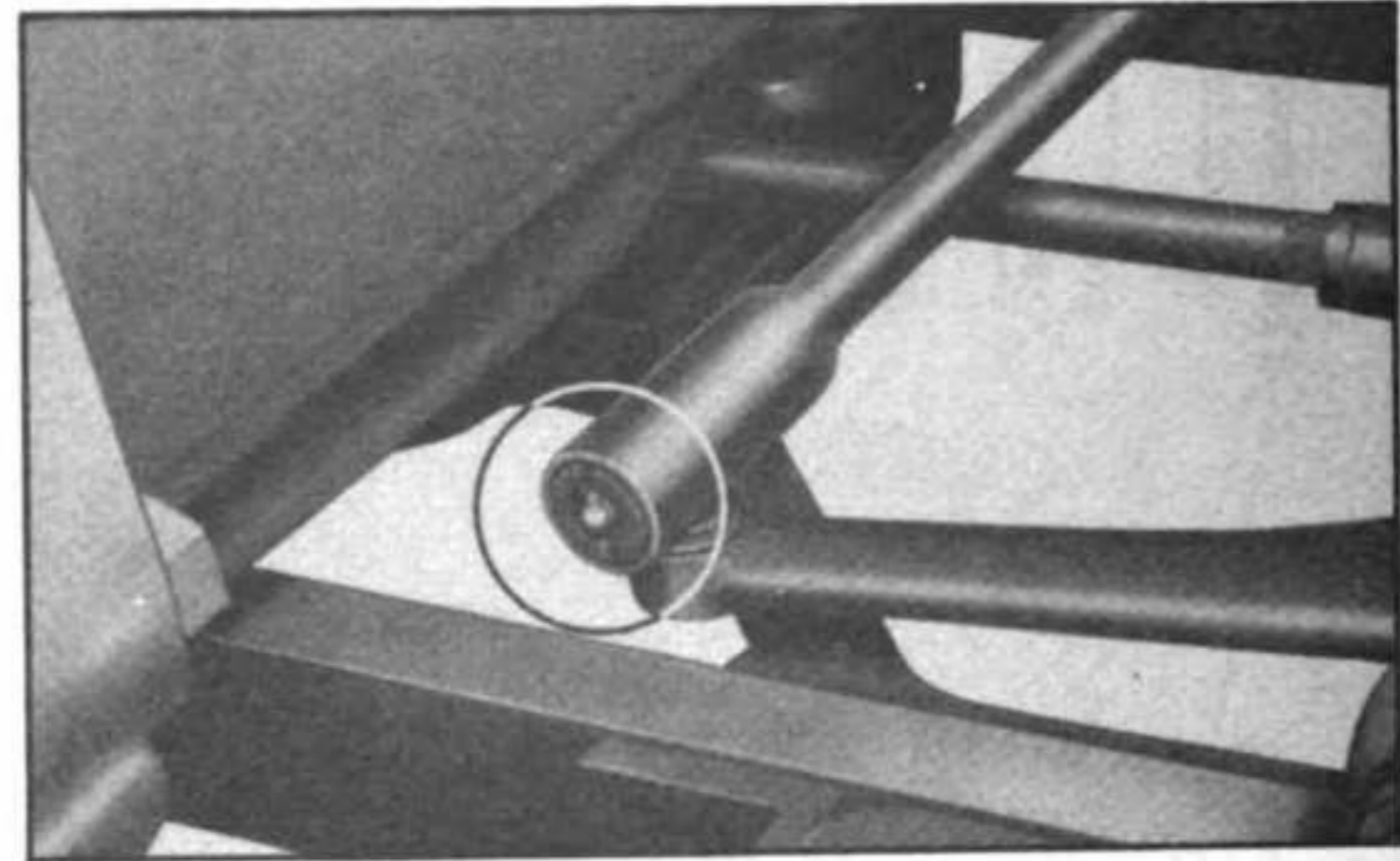
A — PIVOT PIN



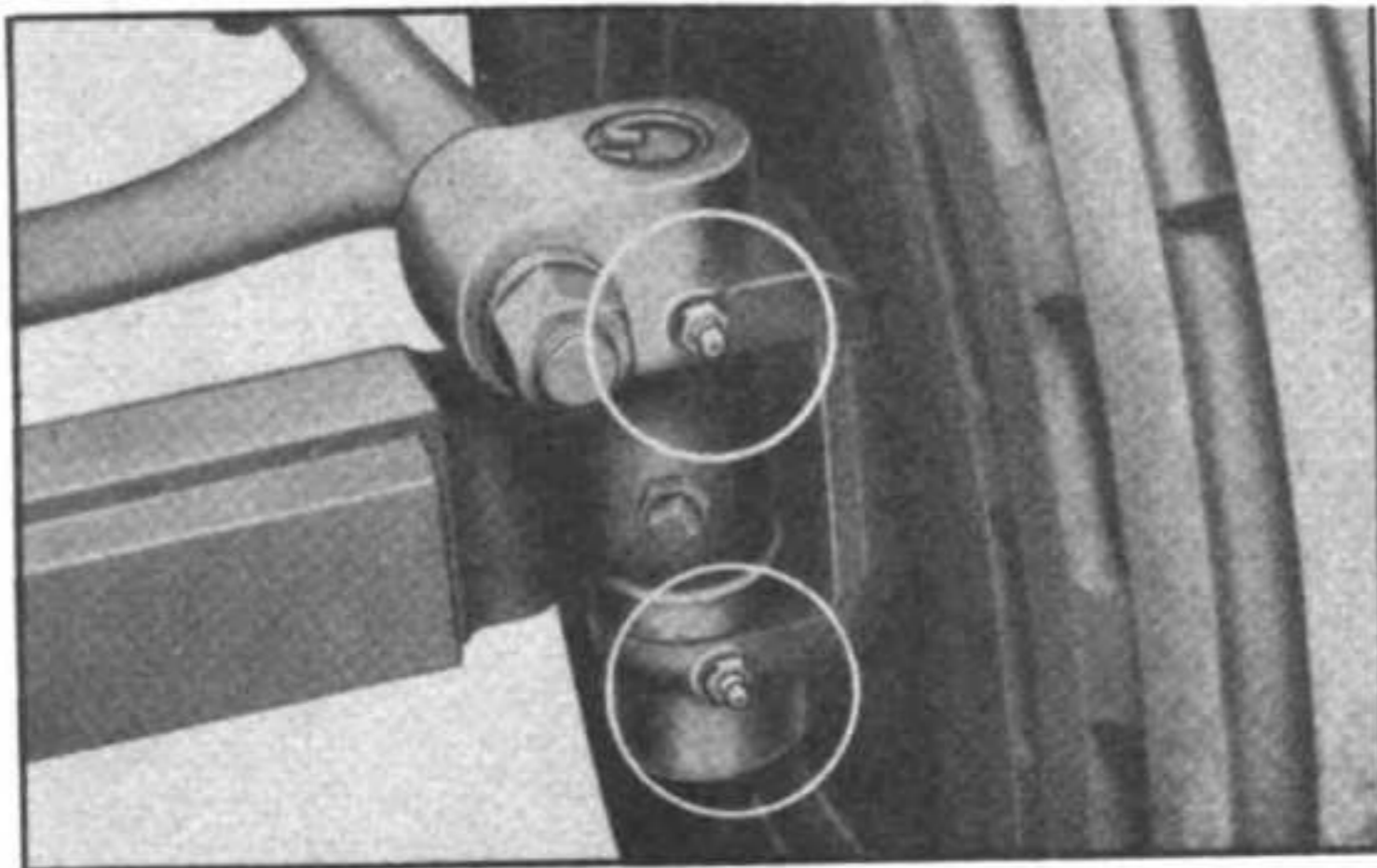
B — SPRING SHACKLE (R.H. Shown)



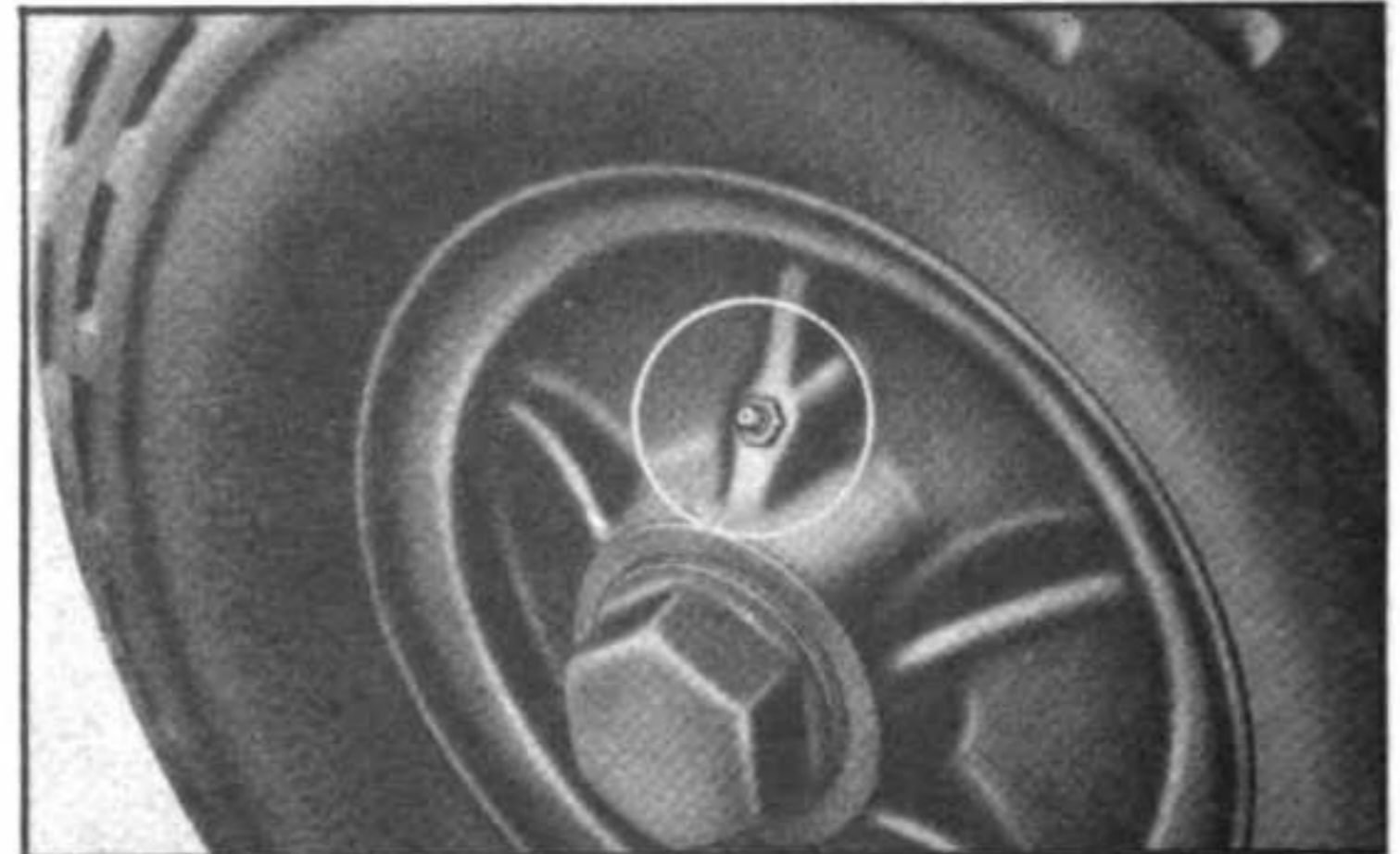
C — GENERATOR



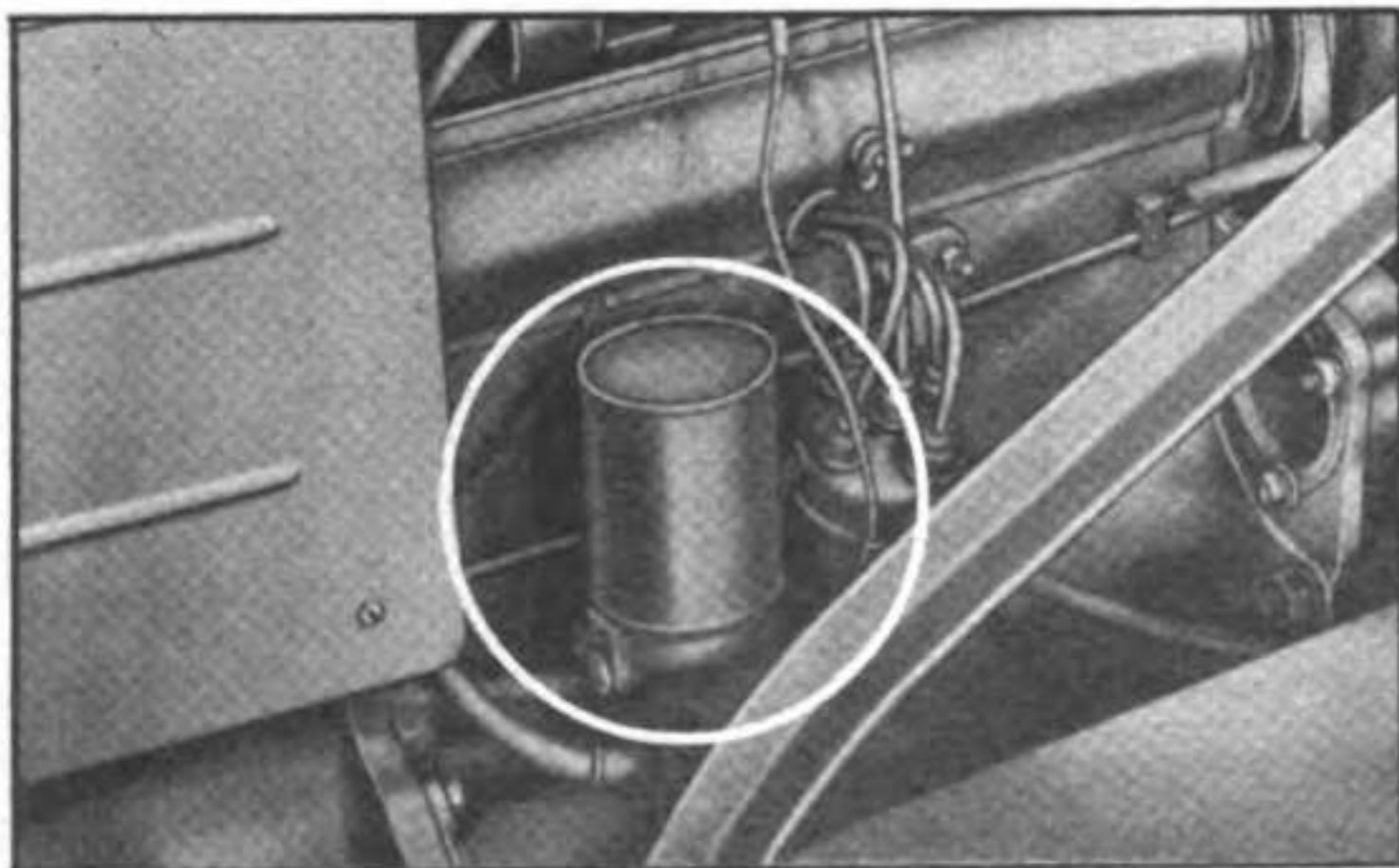
D — DRAG LINK (Front)



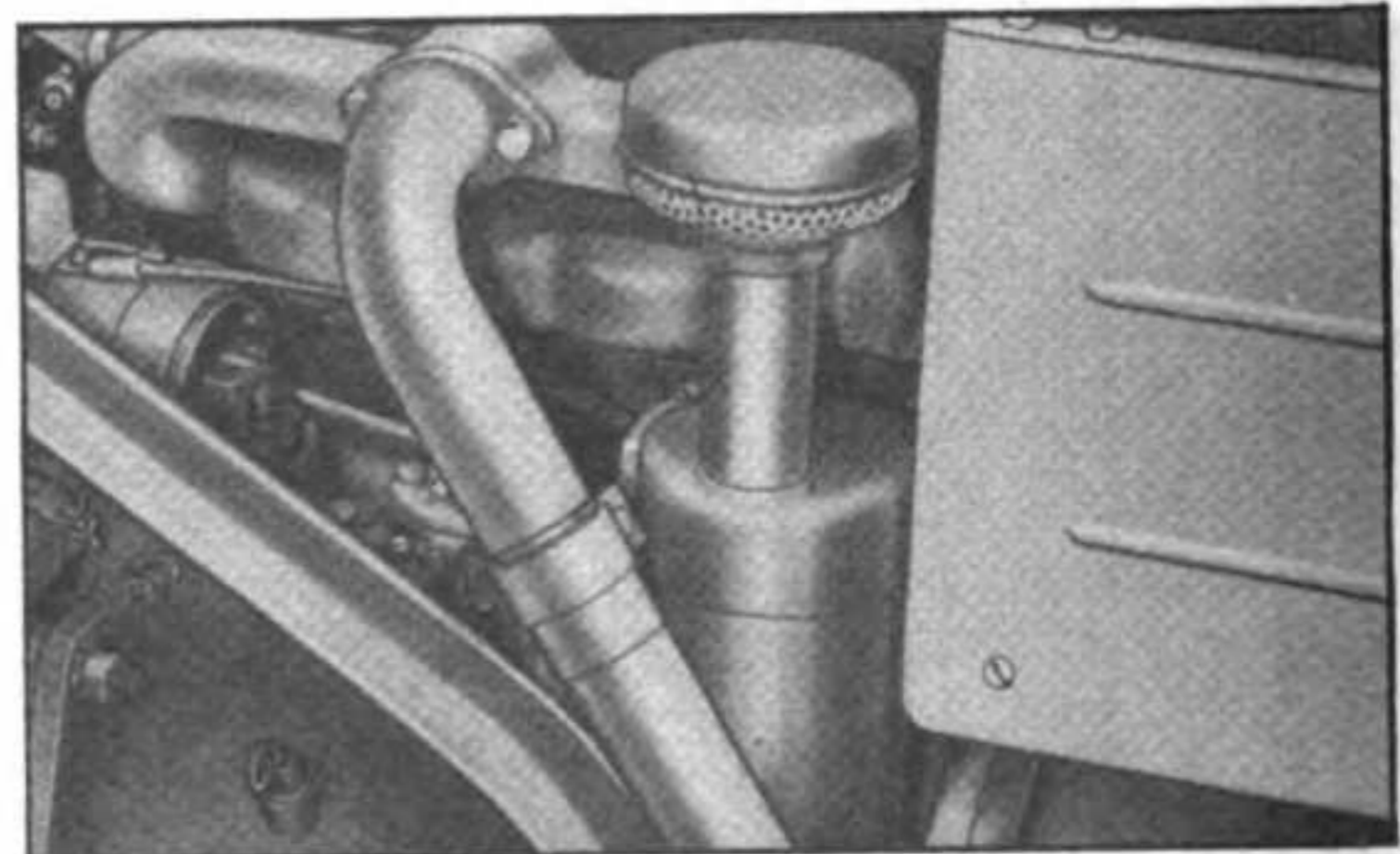
E — KING PIN (L.H.)



F — WHEEL BEARINGS



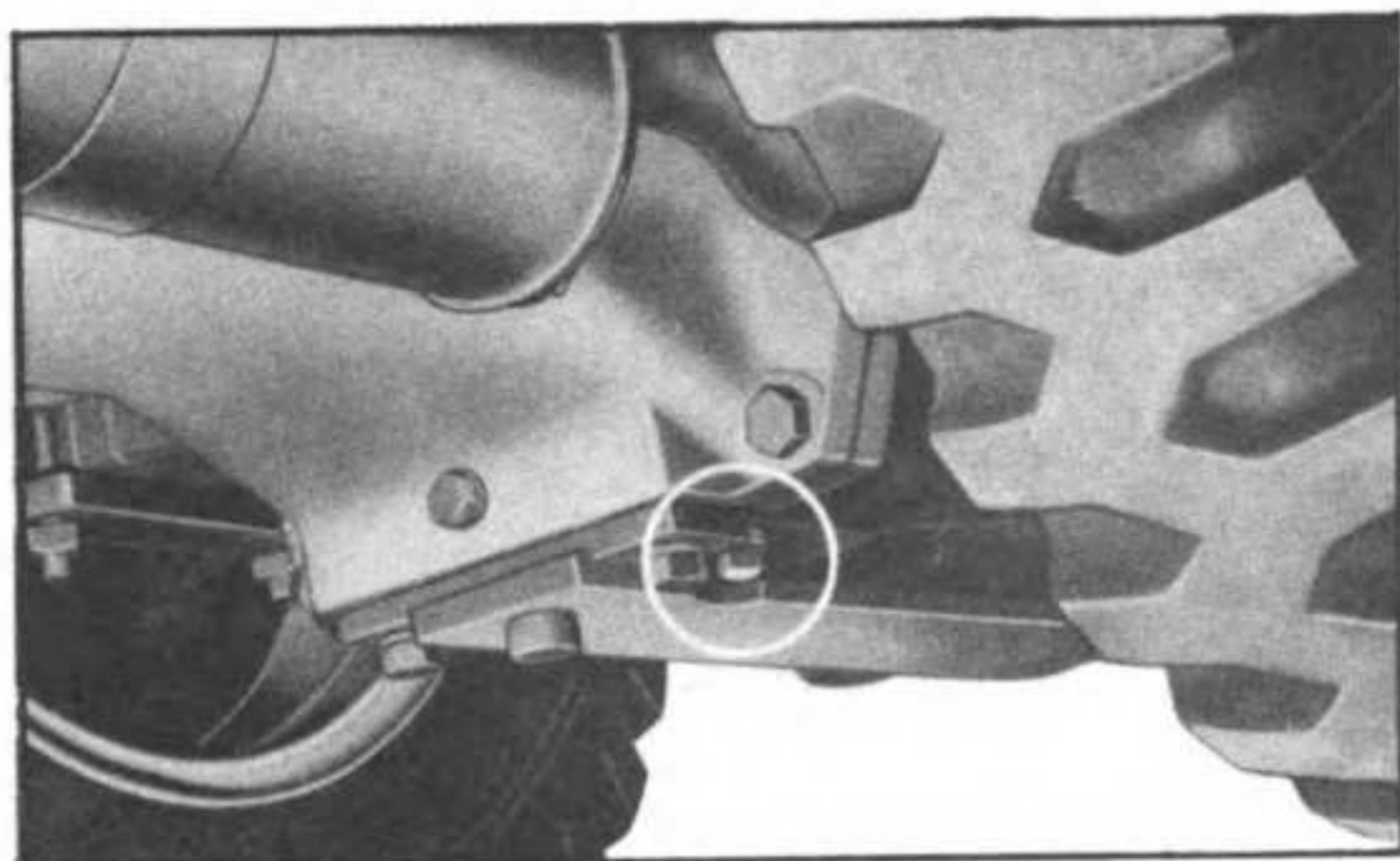
G — OIL FILTER



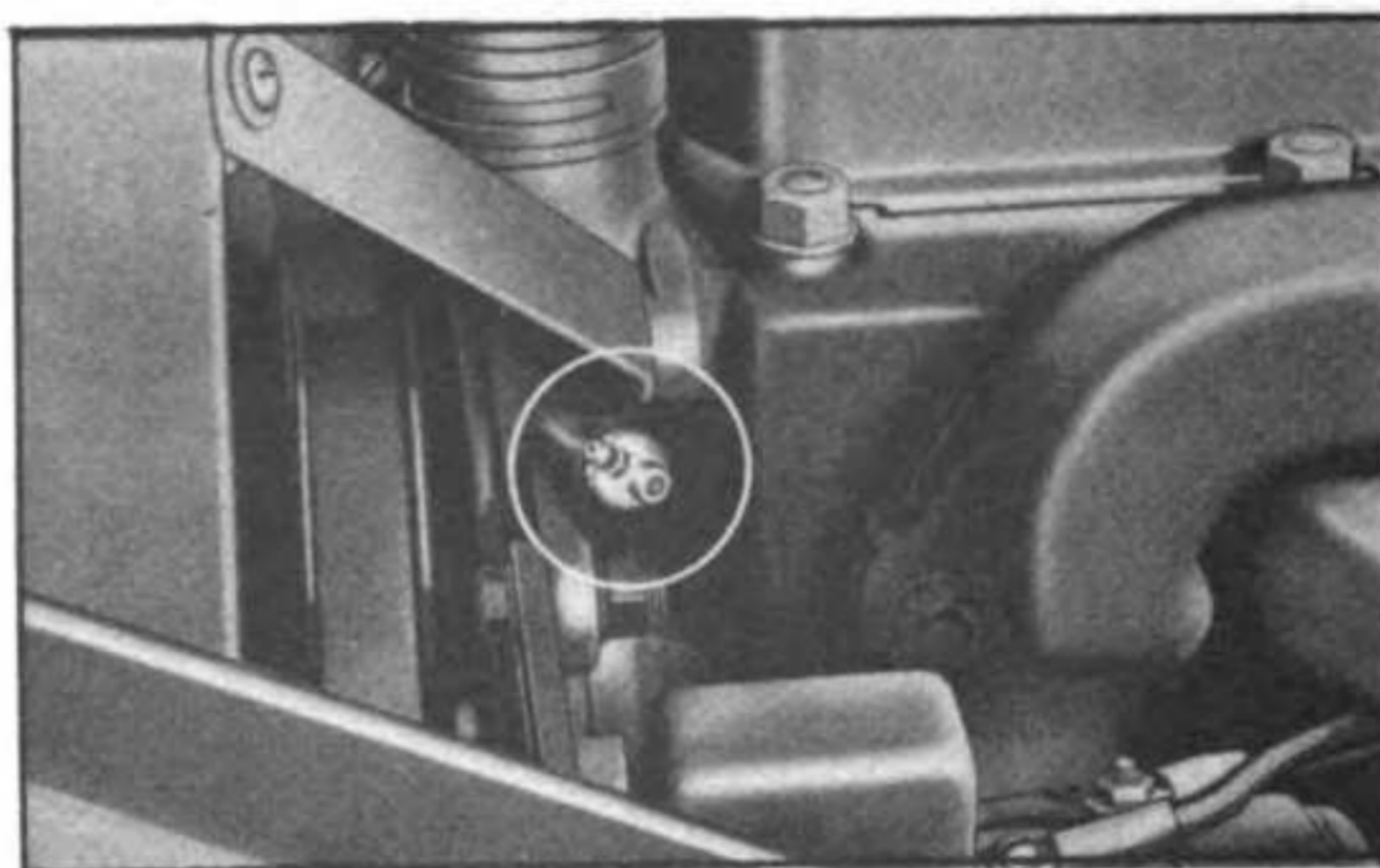
H — AIR CLEANER

Figure 13 — Localized Lubrication Points

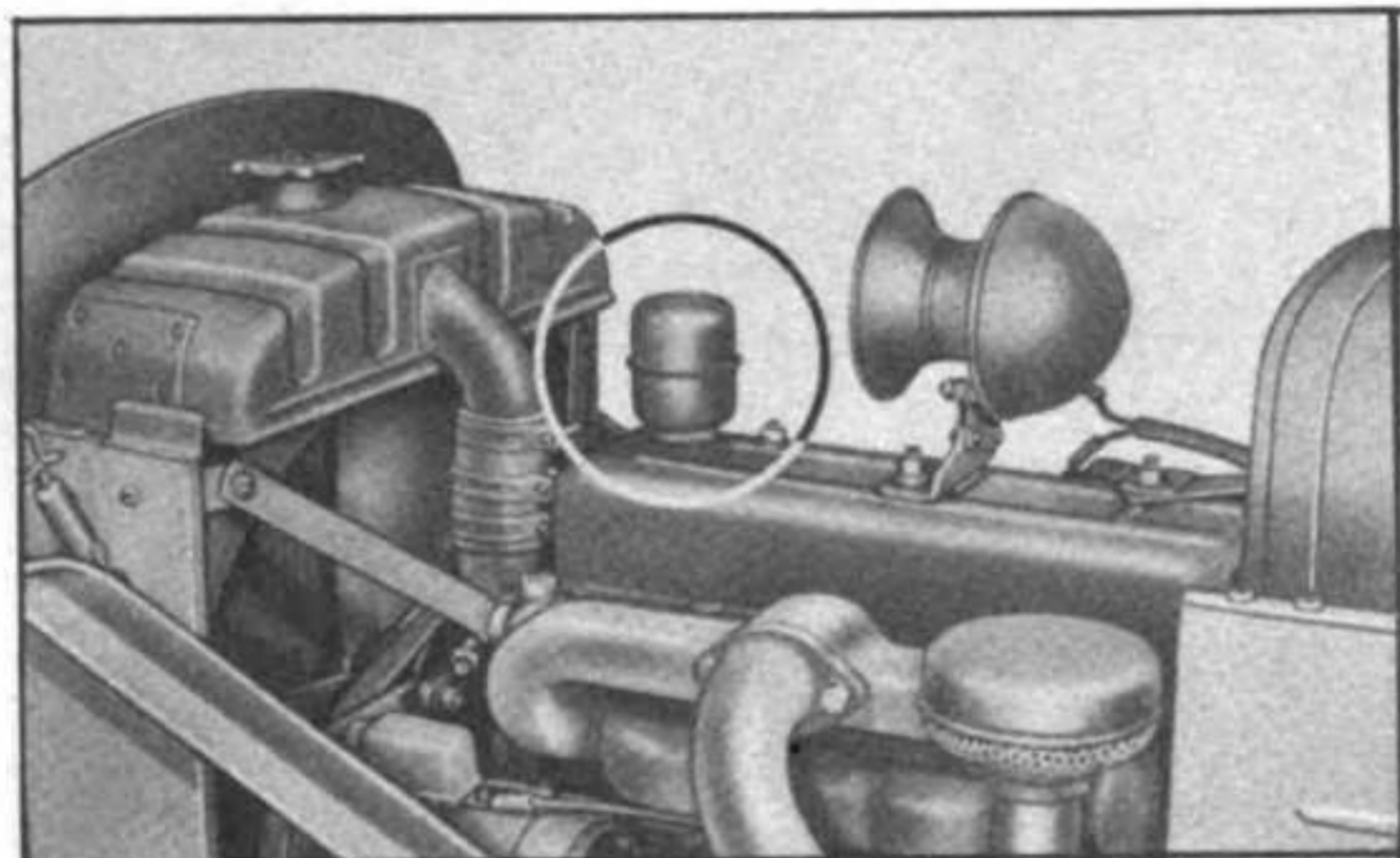
Tractor (Wheeled), Warehouse, Case VAIW (Gasoline)



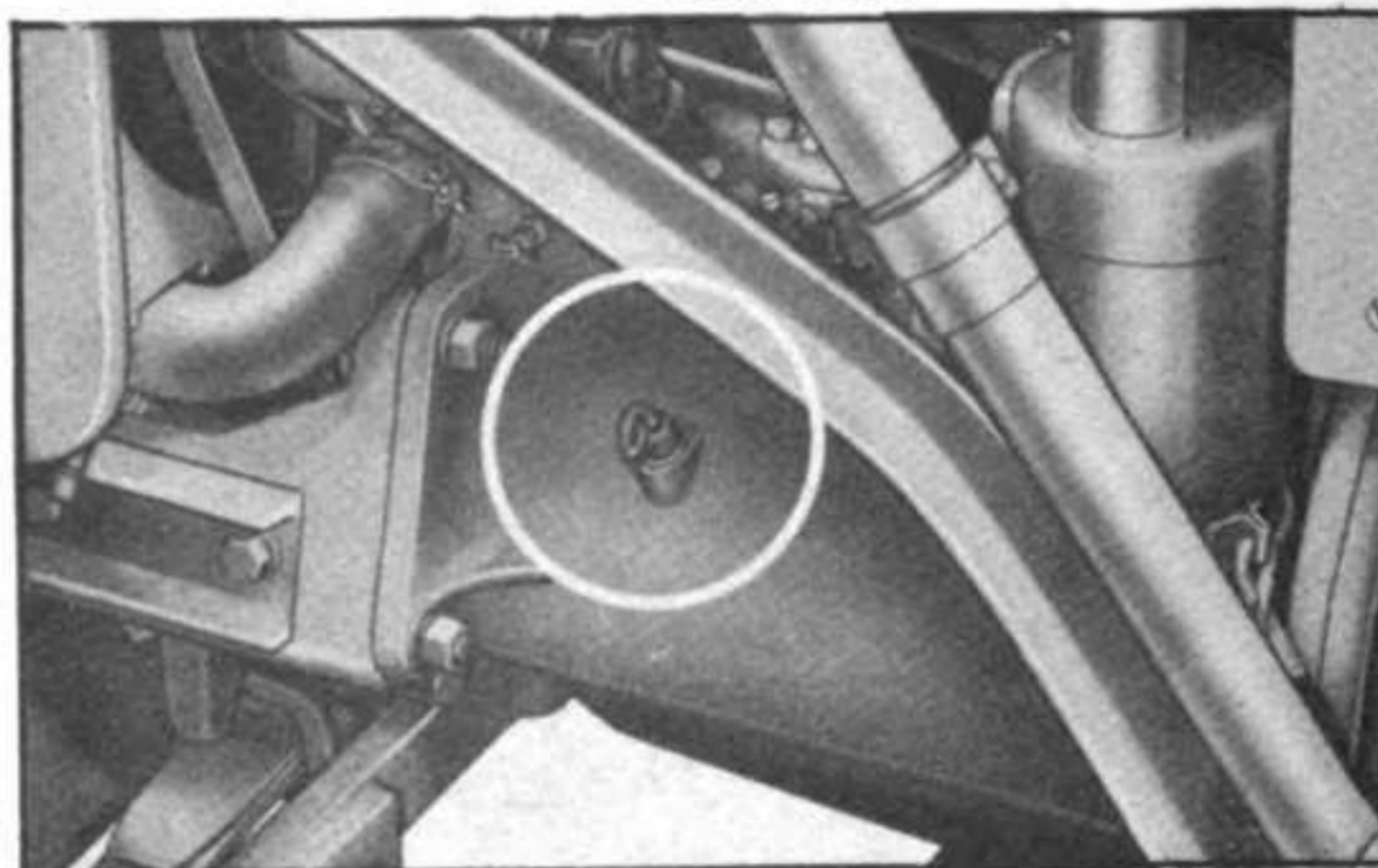
Q — DIFFERENTIAL DRAIN



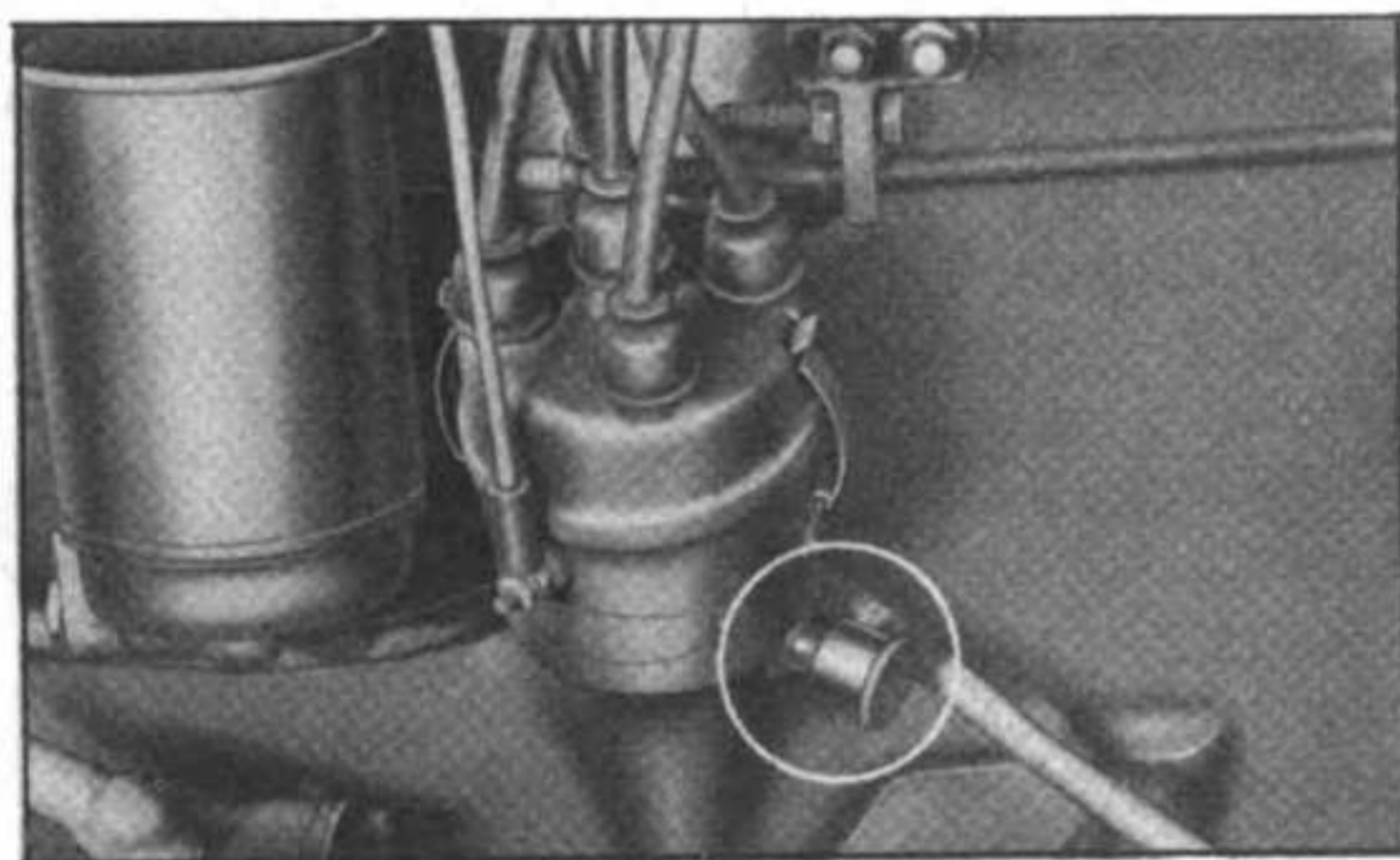
R — WATER PUMP



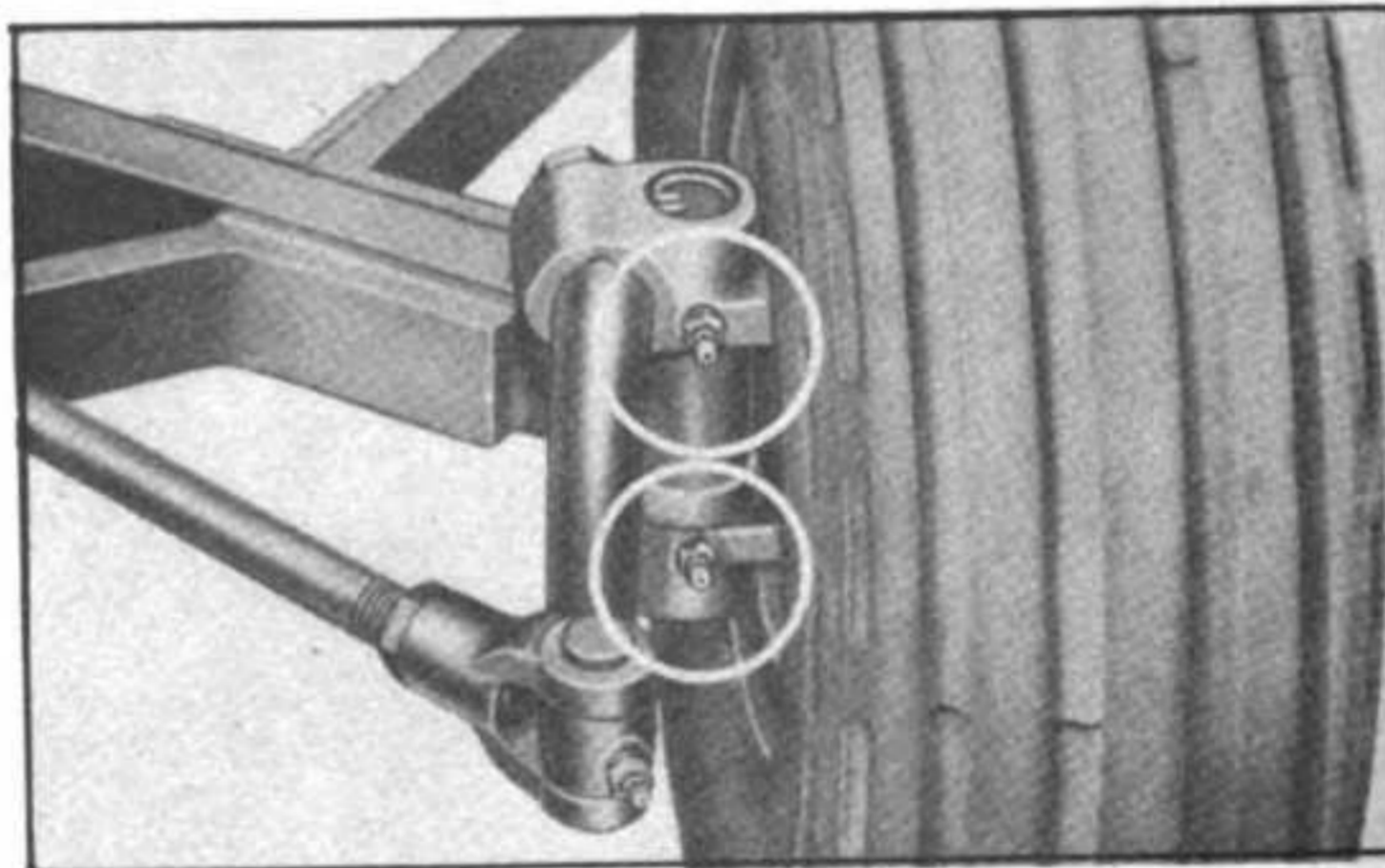
S — CRANKCASE FILL AND BREATHER



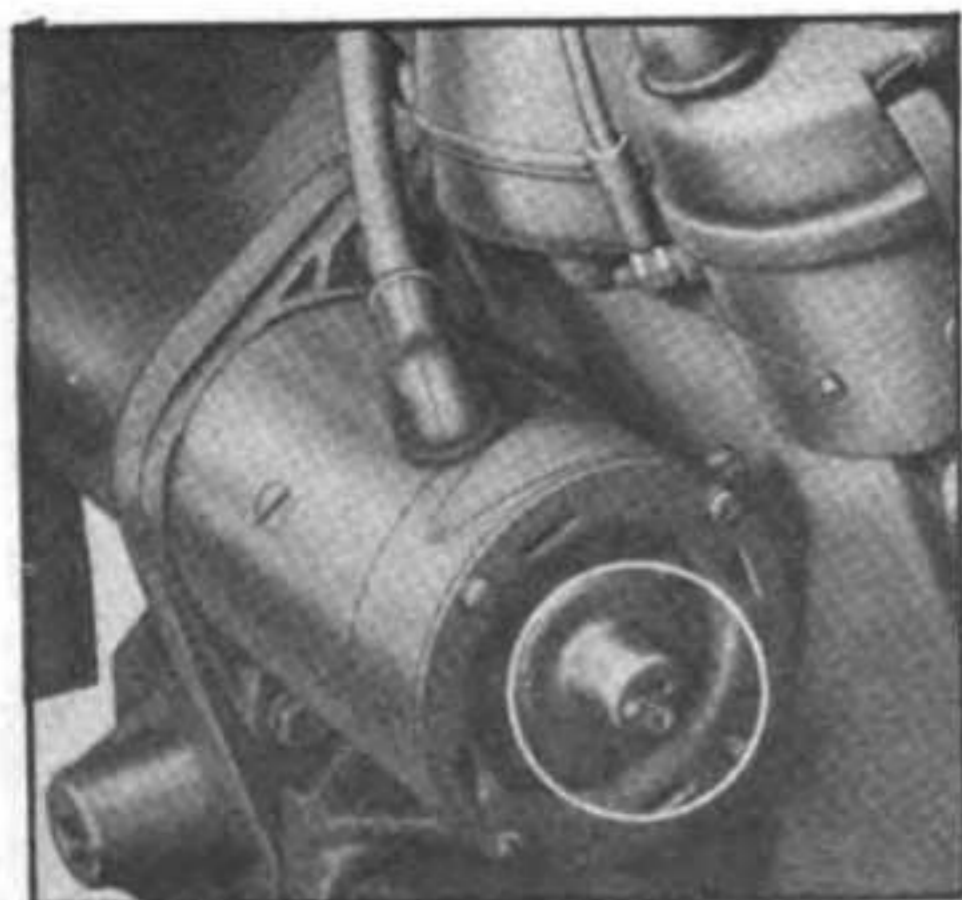
T — CRANKCASE LEVEL



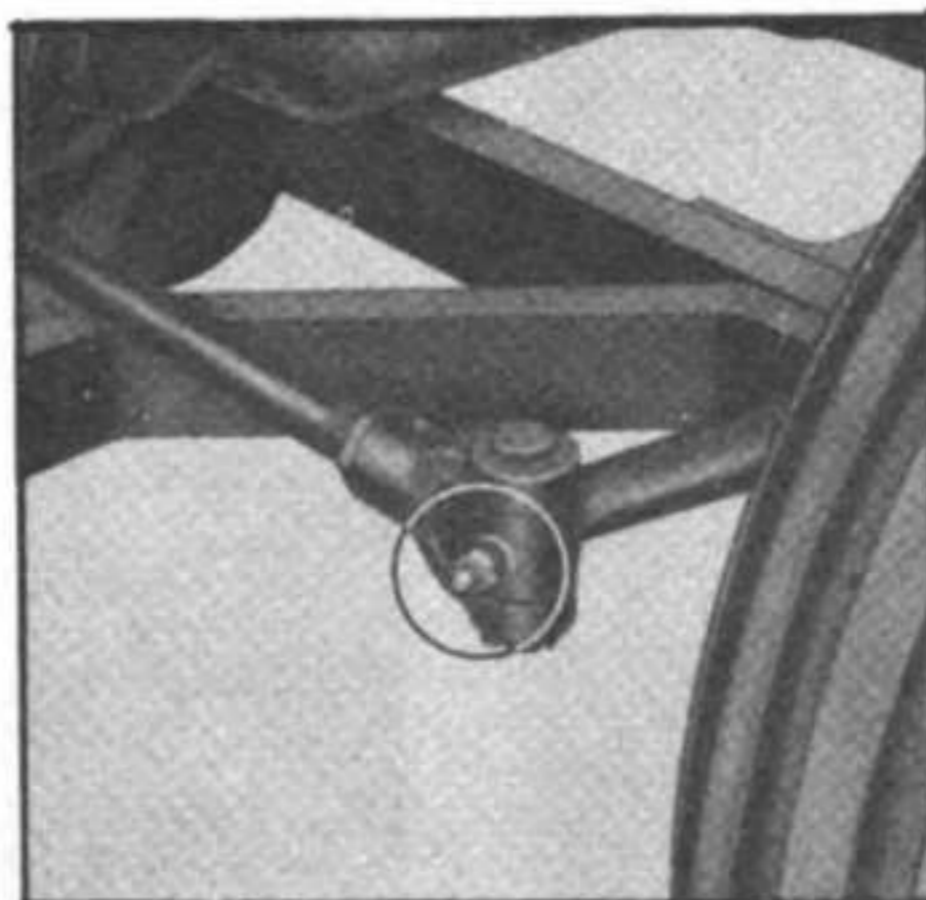
U — DISTRIBUTOR SHAFT



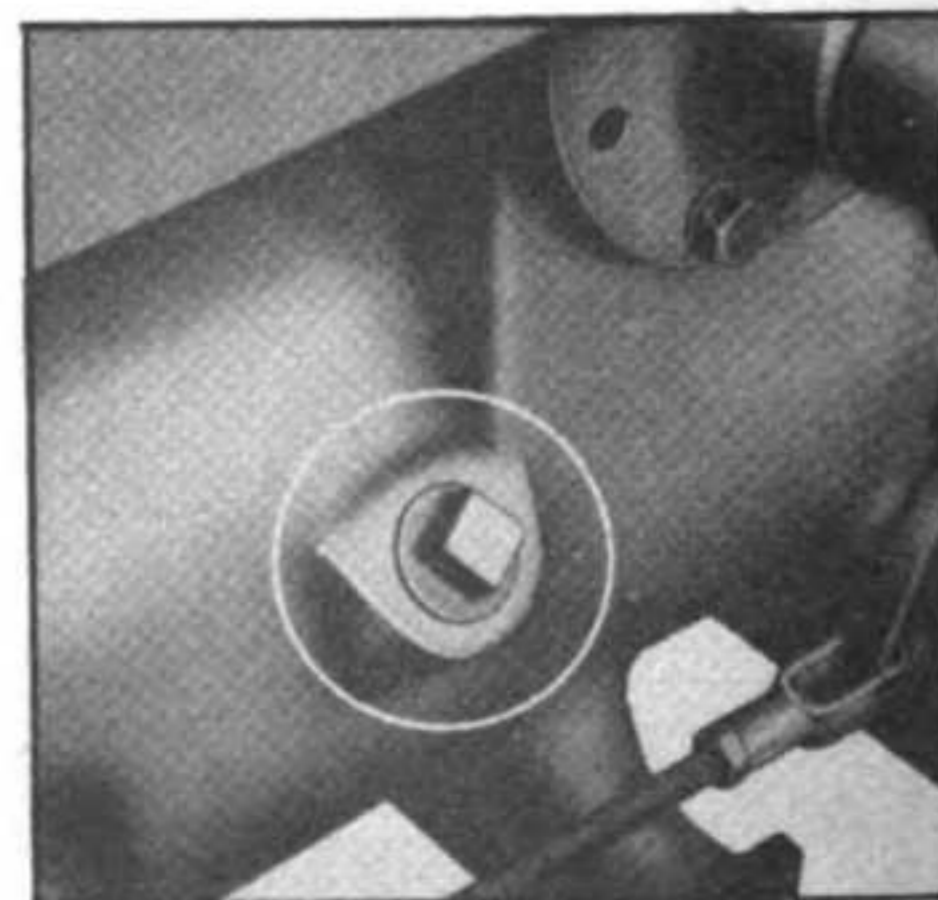
V — KING PIN (R.H.)



W — STARTING MOTOR



X — TIE ROD (R.H.)



Y — TORQUE TUBE FILL

Figure 15 — Localized Lubrication Points

Section XI—Lubrication

hydraulic oil or shock absorber light. Below -40°F remove oil and operate dry. At specified interval remove air cleaner and wash all parts. CAUTION: *Keep all connections clean and tight.*

(2) **BREATHER:** At specified interval, remove crankcase breather cap, wash thoroughly, dry and replace.

(3) **CLUTCH PILOT BEARING:** When clutch is disassembled for any other purpose, clean, remove, and repack.

(4) **CRANKCASE:** At specified interval, inspect level and refill to "FULL" mark with oil, SAE 30 above $+32^{\circ}\text{F}$, or SAE 10 from $+32^{\circ}\text{F}$ to 0°F . Below 0°F , replenish with three quarts SAE 10. Mark this level on level gage. Add one quart of engine fuel to bring level to normal "FULL" mark. Run engine five minutes to thoroughly mix the oil and fuel. Maintain to new level mark by adding SAE 10. Maintain to normal "FULL" mark by adding fuel. If fuel is added when shutting engine down, run at least five minutes to mix. At specified interval remove plug from oil pan and completely drain engine. Drain only when engine is hot. After thoroughly draining, replace drain plug and refill crankcase to "FULL" mark on gage with correct lubricant to meet temperature requirements. Run engine a few minutes and reinspect oil level. Do not inspect oil level while engine is running. CAUTION: *Be sure pressure gage indicates oil is circulating.*

(5) **DISTRIBUTOR:** At specified interval, wipe distributor breaker cam lightly with GREASE, general purpose, No. 1, above $+32^{\circ}\text{F}$. or No. 0, below $+32^{\circ}\text{F}$., and lubricate breaker arm pivot and wick under rotor with 1 to 2 drops of OIL, engine, SAE 30 above $+32^{\circ}\text{F}$.; SAE 10 from $+32^{\circ}\text{F}$. to 0°F .; OIL, lubricating, preservative, special, below 0°F .

(6) **GEAR CASE:**

(a) *At specified interval:* Inspect level with tractor on the ground, and if necessary add lubricant to within $\frac{1}{2}$ " of bayonet gage mark when cold, or to bayonet mark when hot. At specified interval, drain and refill. Drain only after operation when gear lubrication is warm.

(b) *Transmission Case and Torque Tube:* Add approximately one pint of LUBRICANT, gear, universal, through filler plug opening whenever tractor has been immobile for 30 days or longer, or whenever the tractor has been overhauled and re-

assembled. This service should be performed in addition to the periodic inspecting of lubricant levels and drain. Refill with LUBRICANT, gear, universal SAE 90 above $+32^{\circ}\text{F}$., SAE 80 from $+32^{\circ}\text{F}$. to 0°F ., or grade 75 below 0°F .

(7) **OIL FILTERS:** At specified interval, if the filter becomes clogged, remove the filter element, clean the inside of case, and install new element. After renewing element, run engine a few minutes. Reinspect crankcase oil level and fill to "FULL" mark with correct grade of OIL, engine.

(8) **WHEEL BEARINGS:** Remove bearing cone assembly from hub. Wash bearing cones, spindle, and inside of hub, and dry thoroughly. Do not use compressed air. Inspect bearing races and replace if damaged. Wet the spindle and inside of hub and hub cap with GREASE, general purpose, No. 2, to a maximum thickness of $\frac{1}{16}$ " only to retard rust. Lubricate bearings with GREASE, general purpose, No. 2, with a packer or by hand, kneading lubricant into all spaces in the bearing. Use extreme care to protect the bearings from dirt and immediately reassemble and re-install wheel. Do not fill hub or hub cap. The lubricant in the bearings is sufficient to provide lubrication until the next service period. Adjust bearings.

(9) **OIL CAN POINTS:**

(a) At specified interval, lubricate throttle and governor linkage, hood hinges, hood latches, brake rods and clutch rods, pintle hook, and other rubbing surfaces with OIL, engine, SAE 30 above $+32^{\circ}\text{F}$., SAE 10 from $+32^{\circ}\text{F}$. to 0°F ., or OIL, lubricating, preservative, special, below 0°F .

(b) At specified interval, lubricate generator and starter motor with same oil as in (a) above.

(10) **POINTS REQUIRING NO LUBRICATION SERVICE:** Clutch release bearing.

e. Reports and Records:

If lubrication instructions are carefully followed, proper lubricants used, and satisfactory results are not obtained, make a report to the designated individual in authority. Complete record of lubrication servicing in the Duty Roster (W.D. A.G.O. Form No. 6).

Section XII: Preventive Maintenance Services:

30. GENERAL INFORMATION:

a. To insure mechanical efficiency, it is necessary that the tractor be systematically inspected at regular intervals. Certain scheduled maintenance services will be performed at these designated intervals. The services set forth in this section are those performed by the driver before, during, and after operation, and those performed by organizational maintenance personnel at 48-hour and 192-hour intervals.

b. The general inspection of each item applies also to any supporting member or connection, and generally includes a check to see if the item is in "good condition," "correctly assembled," "secure," or "excessively worn."

(1) The inspection for "good condition" is an external visual inspection to determine if the unit is damaged beyond safe or serviceable limits, not bent or twisted, not chafed or burned, not broken or cracked, not bare or frayed, not dented or collapsed, not torn or cut.

(2) The inspection of a unit to see that it is "correctly assembled" is an external visual inspection to see if it is in its normal assembled position in the tractor.

(3) The inspection of a unit to determine if it is "secure" is an external visual examination, a wrench, hand-feel, or a pry-bar check for looseness. Such an inspection includes any brackets, lock washers, lock nuts, cable clips, locking wires, or cotter pins used in assembly.

(4) "Excessively worn" means worn close to, or beyond, serviceable limits, and likely to result in a failure if not replaced before the next scheduled inspection.

31. FIRST ECHELON PREVENTIVE MAINTENANCE SERVICES:

a. Driver's preventive maintenance services are listed on the reverse side of Driver's Trip Ticket and Preventive Maintenance Service Record, W.D. Form No. 48, to cover vehicles of all types and models. The items listed on W.D. Form No. 48 that apply to the VAIW Tractor, are expanded in this manual to provide specific procedures for accomplishment of the inspections and services. Certain items on W.D. Form No. 48 that do not apply to this tractor are omitted. The services are

arranged to facilitate inspection and conserve the time of the driver. The item numbers, however, are identical with those shown on W.D. Form No. 48.

b. Any defects or unsatisfactory operating characteristics beyond the scope of first echelon to correct must be reported at the earliest opportunity to the designated individual in authority.

c. Before-Operation Service:

This inspection schedule is designed primarily as a check to see that the tractor has not been tampered with or damaged since the last After-Operation Service. It is the duty of the driver to determine whether or not the tractor is in condition to carry out any mission to which it is assigned. This service will not be entirely omitted, even in extreme tactical situations.

Before-Operation Service consists of inspecting items listed below according to the procedure described and correcting or reporting any deficiencies. Upon completion of the service, results should be reported promptly to the designated individual in authority.

(1) **ITEM 1, TAMPERING AND DAMAGE:** Inspect for any injury to the tractor and items of equipment. Inspect for any damage that may have occurred from sabotage or presence of booby traps. Raise the hood and look for signs of tampering or sabotage, such as loosened or damaged accessories or drive belts. Dry the spark plugs, distributor, and wiring if they are wet, to facilitate starting.

(2) **ITEM 2, FIRE EXTINGUISHER:** See that it is fully charged, securely mounted and not damaged, and look for evidences of leakage.

(3) **ITEM 3, FUEL OIL AND WATER:** Inspect the amount of fuel in the tank, noting any indication of leaks or tampering. Add fuel if necessary. Inspect level and condition of coolant. During period when anti-freeze is used, have hydrometer test made of coolant. Add anti-freeze with water, if required. *NOTE: Any appreciable change in levels since the last operation service should be investigated, and reported to the designated authority.*

(4) **ITEM 4, ACCESSORIES AND DRIVES:** Inspect accessories, such as carburetor, generator, governor control rod, starting motor, distributor, oil filter, fan, and water pump. Make certain these

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items are in good condition, and that the fan belt adjustment provides ½" finger pressure deflection.

(5) **ITEM 6, LEAKS; GENERAL:** Inspect under the tractor and in the engine compartment for any indication of fuel, oil, water, or transmission oil leaks. Inspect the cooling system for indication of leaks, paying particular attention to radiator core and connecting hose. Inspect the fuel system for indication of leaks. Trace all leaks to the source, and correct or report them to the designated authority.

(6) **ITEM 7, ENGINE WARM-UP:** Start engine and note any tendency toward hard starting. Observe action of starting motor, particularly if it has sufficient cranking speed, and engages and disengages without unusual noise when in operation. Advance the governor control lever one-third of open position, (push down on lever to advance), with the choke control button out. (NOTE: If oil pressure is not evident in 30 seconds, stop engine and investigate.) As engine warm-up progresses, readjust choke button position inward to smooth out engine performance and prevent crankcase dilution.

(7) **ITEM 8, CHOKE:** For description on operation of choke, see Item 7, Engine Warm-up.

(8) **ITEM 9, INSTRUMENTS:**

(a) **Oil Gage:** Inspect the gage to see whether it indicates properly. Normal pressure during idle should show a reading of 8 to 10 lbs.

(b) **Ammeter:** Ammeter indicator should show "Charge" (+) with engine at fast idle, and at slower speeds with lights on, it may show "Discharge" (—). Any unusual drop or rise in readings must be investigated. Any unusual or extreme deviation from the normal readings is an indication that the generator brushes or armature are out of adjustment and require attention.

(c) **Engine Temperature Gage:** Reading should increase gradually during warm-up period to normal operating range. Maximum safe operating temperature is 200°F. Extremely low temperature after a reasonable warm-up period may indicate existing trouble that should be investigated and corrected.

(9) **ITEM 10, HORN:** If tactical situation permits, inspect operation of horn by pressing horn button. If sound is not emitted, inspect horn and wiring for defects.

(10) **ITEM 12, LAMPS (LIGHTS):** Within the limits permitted by the tactical situation, inspect the operation of the light switch to see that the two headlights and tail-light operate properly. Inspect to see that the lamps (lights) are secure, and that the lenses are clean and not broken.

(11) **ITEM 13, WHEEL AND FLANGE NUTS:** Inspect the rear wheel bolting flange nuts, and rim clamp nuts to see that they are secure. Front wheel spindle nuts can be inspected by first removing the hub caps.

(12) **ITEM 14, TIRES:** Normal maximum air pressure for front 6:00x9 tires is 35 lbs. and 7:50 x16 rear tires is 40 lbs. Inspect tires for damage, and remove any imbedded objects from treads and casings.

(13) **ITEM 15, SPRING AND SUSPENSION:** Inspect the front spring to see if it has abnormal sag, broken or shifted leaves, loose U-bolts or shackles. Inspect the shackle mounting pins to see that they are secure.

(14) **ITEM 16, STEERING LINKAGE:** Inspect the steering gear and linkage to see that they are in condition for safe operation. Pay particular attention to the ends of the steering arms to make certain the yoke pins are secure and that ball socket joints are tight. Also, inspect linkage for possible bends causing steering interference.

(15) **ITEM 17, FENDERS AND BUMPER:** See that the fenders and front bumper-grille are secure and not damaged.

(16) **ITEM 18, TOWING CONNECTIONS:** Inspect automatic coupler for looseness or damage. Examine to be sure it operates freely and locks securely. Inspect control rope for weakness which may result in breakage.

(17) **ITEM 19, BODY:** Inspect side sheets and hood for looseness and damage. Make certain latch holds hood in place.

(18) **ITEM 21, TOOLS AND EQUIPMENT:** See that the tools belonging to the tractor are present, serviceable, and properly stowed in the tool box.

(19) **ITEM 22, ENGINE OPERATION:** If the engine has not yet reached the minimum operating temperature of 110°, normal operating temperature may be assumed when the engine will operate under load with the choke fully released, and when

the oil pressure indicates approximate normal operating pressure, during engine acceleration. Gradually accelerate engine several times after it has reached normal operating temperature, and note any unusual noises or unsatisfactory operating characteristics which indicate trouble.

(20) **ITEM 23, DRIVER'S PERMIT:** Operator must make sure that driver's permit is in his possession, and that the Lubrication Order and a copy of this manual are present with the tractor, and that they are legible and safely stored.

(21) **ITEM 25, DURING-OPERATION CHECK:** The during-operation service is to start immediately, as soon as the tractor is put in motion.

d. During-Operation Service:

While the tractor is in motion, the driver (or crew) are to listen for any unusual sounds that may be a sign of trouble, such as rattles, knocks, squeals, or hums. He should look for steam from the radiator, and smoke from any part of the tractor, and should know and be on the alert for the odor of an overheated generator, overheated brakes, overheated clutch, boiling coolant, fuel vapor from a leak in the fuel system, exhaust gas, or other signs of trouble. Every time the brakes are used, gears shifted, or tractor turned, the driver is to consider it a test, and note any unsatisfactory or unusual performance. A good driver will inspect the instruments constantly, and notice promptly if any instrument indicates that some unit may be operating improperly. The procedures of the During-Operation service consist of observing the following items according to preceding description, stopping the tractor if serious trouble develops, and noting minor deficiencies to be corrected or reported at the earliest opportunity.

(1) **ITEM 27, FOOT AND PARKING BRAKES:** The foot brakes must operate smoothly and effectively, without pulling the tractor to one side, leaving ample reserve of pedal travel available. Cause of brake failure to hold tractor may be due to burned-out linings, wet or greasy facings, or ill adjusted brake rods. Make sure the brake lock is fully released when tractor is in motion. When the tractor is parked, and the parking lock brake engaged, it must hold the tractor on a reasonable incline, leaving a reserve pedal travel available.

(2) **ITEM 28, CLUTCH:** See that clutch does not grab or chatter during engagement, or slip when fully engaged. Clutch pedal must have 1½

to 2" free travel before clutch begins to disengage. Excessive gear clashing is an indication that the clutch is not properly disengaging, and this may be due to an improper adjustment of the clutch rod.

(3) **ITEM 29, TRANSMISSION:** Gears must be shifted with reasonable ease, operate quietly, and not creep out of mesh when in operation.

(4) **ITEM 31, ENGINE AND CONTROLS:** The driver must be on the alert for deficiencies in engine performance, such as lack of usual power, misfiring, unusual noise, stalling, indications of engine overheating, or unusual exhaust smoke. Notice if the engine responds to the governor control, and see that the controls are in proper adjustment.

(5) **ITEM 32, INSTRUMENTS:** Observe the readings on all instruments frequently during operation to see that they are indicating properly.

(a) *Temperature Gage:* See that the gage reads in normal range, 160°F to 180°F. Excessive engine heat may indicate trouble, and must be investigated immediately.

(b) *Oil Pressure Gage:* The oil pressure gage must show a normal pressure of 12 to 14 pounds while the tractor is in operation. In case of any unusual drop in oil pressure, stop the tractor immediately. Report trouble to proper authorities for correction. Lack of oil pressure may indicate insufficient oil, leaks, loose bearings, or a defective oil pump, and may result in premature wear, or may damage the engine to the extent of failure.

(c) *Ammeter:* During operation, the ammeter must show a charge reading of approximately two amperes (+) (without electrical devices in use.) A discharge reading may indicate a faulty generator or cut-out.

(6) **ITEM 33, STEERING GEAR:** See if there is an excessive pulling to either side (except that due to crown of road) or excessive wandering or shimmy of the tractor. If these conditions exist, it may be due to low tire pressure, excessive wear, loose parts, maladjustment, loose bearings, or improper wheel alignment.

(7) **ITEM 34, RUNNING GEAR:** Listen for any unusual noise from wheels, axles, or suspension units that might indicate looseness or damage or under-inflated tires.

(8) **ITEM 35, BODY:** Note any noise and abnormal conditions that may indicate loose side sheets or hood.

Section XII—Preventive Maintenance Services**e. After-Operation Service:**

When performing the After-Operation servicing, the driver or crew must remember and consider any irregularities noticed during the day in the Before-Operation service and During-Operation service. Any units that require inspection or service while they are still at operating temperatures should be inspected as soon as possible after parking the tractor and before any interruptions allow the units to cool. The After-Operation service should never entirely be omitted, even in the extreme tactical situations. The procedure of the After-Operation service consists of inspecting the following items according to the procedure described herewith, and correcting any deficiencies.

- (1) **ITEM 54, FUEL, OIL, AND WATER:** Inspect coolant level, and replenish as necessary, taking care to leave sufficient space for expansion. Fill fuel tank, observing safety precautions for grounding static electricity. Bring engine oil to proper level. If an unusual amount of oil or coolant is required by engine, inspect for leaks and report the condition. **NOTE:** During period when anti-freeze is in use, have hydrometer test made of coolant.
- (2) **ITEM 55, ENGINE OPERATION:** Inspect to see that the engine idles satisfactorily. Accelerate and decelerate the engine, and note any tendency to miss or back-fire, or any unusual engine noise or vibration that might indicate defective parts, loose mountings, incorrect fuel mixture, or faulty engine operating characteristics noted during operation.
- (3) **ITEM 56, INSTRUMENTS:** Inspect all instruments to see that they are securely mounted, properly connected, and undamaged.
- (4) **ITEM 57, HORN:** Inspect the horn to see that it is securely mounted, and properly connected. Test for sound.
- (5) **ITEM 59, LAMPS (LIGHTS):** Observe whether the lights are properly illuminated when switch is at the *on* position, and are not illuminated when switch is at the *off* position. Inspect lenses for dirt or damage. Clean or replace if necessary.
- (6) **ITEM 60, FIRE EXTINGUISHER:** Inspect for looseness or damage and full charge. If extinguisher has been in use or valves open, report for refill or exchange.
- (7) **ITEM 62, BATTERY:** Inspect the battery to see that it is clean, secure, and not leaking. Caps and vents must be clean and secure.
- (8) **ITEM 63, ACCESSORIES AND BELTS:** Inspect carburetor, generator, starter, fan, oil filter, and water pump for loose connections or mountings. Inspect adjustment of fan and drive belt. Belt must deflect $\frac{1}{2}$ " finger pressure; loose or un-serviceable belt must be reported to proper authority.
- (9) **ITEM 64, ELECTRIC WIRING:** Inspect all ignition wiring to see that it is securely connected, clean, and not damaged.
- (10) **ITEM 65, AIR CLEANER AND BREATH-ER CAP:** Remove the air cleaner cup from the air cleaner to see that the oil is at the correct level, and not excessively dirty. Excessive dirt in the oil may be felt with the fingers. If the oil is excessively dirty, clean cup and refill with fresh oil. If operating in sandy or dusty territory, remove breather cap and clean in solvent. **NOTE:** *To keep abrasive dirt out of the engine the air cleaner and breather cap must be kept clean and properly serviced at all times. Remove air cleaner cup, wash in SOLVENT, dry cleaning, refill with clean oil, and reinstall securely. Be sure all joints and connections are secure.*
- (11) **ITEM 66, FUEL FILTER:** Inspect sediment bowl for looseness, damage, or fuel leaks.
- (12) **ITEM 67, ENGINE CONTROLS:** Inspect governor control rods and linkage from governor control lever to governor, and from governor to carburetor to be certain that they are free in action and performing properly.
- (13) **ITEM 68, TIRES:** Remove foreign matter, such as nails, glass, or stones, from tires. Inspect tires for signs of low pressure, abnormal tread wear, position of valve stems, and presence of valve caps. Correct deficiencies noted, and replace missing valve caps.
- (14) **ITEM 69, SPRING AND SUSPENSIONS:** Inspect the front spring to see whether it has abnormal sag, broken or shifted leaves, or loose or broken U-bolts or shackles.
- (15) **ITEM 70, STEERING LINKAGE:** Inspect the steering linkage to see whether parts are bent, loose or inadequately lubricated. Also inspect steering gear housing and knuckles for looseness.

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(16) **ITEM 73, LEAKS; GENERAL:** Inspect in the engine compartment and beneath the tractor for indications of fuel, oil, and water leaks. Inspect rear axle flanges and drain plugs in rear axle transmission and torque tube for indications of lubricant leaks. Trace all leaks to their source, and correct or report them.

(17) **ITEM 74, GEAR OIL LEVELS:** Inspect the torque tube and transmission units for lubricant level. See that oil in the torque tube is to the filler plug and the transmission oil to the full mark on the dip stick. This must not be done until these items have cooled at least enough to permit the hand to be placed on them. Hot or foamy lubricant will not give a true lubricant-level indication.

(18) **ITEM 76, FENDERS AND BUMPER-GRILLE:** Inspect these items to see that they are in good condition and secure.

(19) **ITEM 77, TOWING CONNECTIONS:** Inspect automatic coupler for looseness or damage. Examine to be sure it operates freely and locks securely. Examine control rope for possibility of being frayed or broken.

(20) **ITEM 78, BODY, LOAD, AND TARPS:** Carefully inspect side sheets and hood for damage or loose connections.

(21) **ITEM 82, TIGHTEN: WHEEL, RIM, AXLE DRIVE FLANGE, AND SPRING U-BOLT NUTS:** Tighten rear wheel rim clamps if loose. Also, tighten rear wheel mounting nuts, and front spring U-bolt nut if loose. Report any damaged wheels, rims, rings, flanges, or missing nuts and studs.

(22) **ITEM 83, LUBRICATE AS NEEDED:** Lubricate all items such as shackles, hinges, latches, and other points that are lubricated by the driver, if inspection indicates that it is necessary.

(23) **ITEM 84, CLEAN ENGINE AND TRACTOR:** Clean dirt and trash from floor plates in operator's compartment. Also, remove excessive dirt from exterior of the engine.

(24) **ITEM 85, TOOLS:** Inspect tractor tool list to see that all tools are present, in good condition, and properly stored in the tool compartment.

32. ORGANIZATIONAL MAINTENANCE (SECOND ECHELON):

a. Regular scheduled maintenance inspections and services are a preventive maintenance function

of the using arms and services, and are the responsibility of commanders of operating organizations or installations.

b. Frequency:

The frequency of the preventive maintenance services outlined herein is considered a minimum requirement for normal operation of tractors. Under unusual operating conditions such as extreme temperatures and dusty conditions, it may be necessary to perform certain maintenance services more frequently.

c. Instructions:

If instructions other than those contained in the general procedures in step d below, or the specific procedures in step e below are required for the correct performance of a preventive maintenance service, or for correction of a deficiency, other sections of this manual pertaining to the item involved, or a designated individual in authority should be consulted.

d. General Procedure:

General procedures are basic instructions which are to be followed when performing the services on the items on W.D., A.G.O. Form No. 461 listed in the specific procedures. (The second echelon personnel must be thoroughly trained in these procedures so that they will apply them automatically.)

(1) When new or overhauled sub-assemblies are installed to correct deficiencies, care should be taken to see that they are clean, correctly installed, and properly lubricated and adjusted.

(2) When installing new lubricant retainer seals, a coating of the lubricant should be wiped over the sealing surface of the lip of the seal. When the new seal is a leather seal, it should be soaked in SAE 10 engine oil (warm, if practicable) for at least 30 minutes. Then the leather lip should be worked carefully by hand before installing the seal. The lip must not be scratched or marred.

(3) **SPECIAL SERVICES:** These are indicated by repeating the item numbers in the columns which show the interval at which the services are to be performed, and show that the parts or assemblies are to receive certain mandatory services. For example, an item number in one or both columns opposite a "tighten" procedure, means that the actual tightening of the object must be performed. The special services include—

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(a) *Adjust:* Make all necessary adjustment in accordance with the pertinent section of this manual, special bulletins, or other current directives.

(b) *Clean:* Clean units of the tractor with SOLVENT, dry cleaning to remove excess lubricant, dirt, and other foreign material. After cleaning, rinse parts in clean fluid and dry them thoroughly. Keep the parts clean until reassembled, and be certain to keep cleaning fluid away from rubber or other material which it will damage. Clean the protective grease coating from new parts, since this material is usually not a good lubricant.

(c) *Special Lubrication:* This applies both to lubrication operations that do not appear on the tractor Lubrication Order and to items that do appear on such charts, but which should be performed in connection with the maintenance operations if parts have to be disassembled for inspection or service.

(d) *Serve:* This consists of performing operations such as replenishing battery fluid, draining and refilling units with oil, and changing or cleaning the oil filter or cartridge.

(e) *Tighten:* Tightening should be performed with sufficient wrench torque (force on the wrench handle) to tighten the unit according to good mechanical practice. Use torque-indicating wrench where specified. Over-tightening may strip threads or cause distortion. Tightening includes the replacement, correct installation of lock washers, lock nuts, and cotter pins necessary to secure the tightening.

(4) **CONDITIONS:** When conditions make it difficult to perform the complete preventive maintenance procedures at one time, they can sometimes be handled in sections, planning to complete all operations within the 48 hours, if possible.

(5) The numbers of the preventive maintenance procedures that follow are identical to those outlined on W.D., A.G.O., Form No. 461, which is the preventive maintenance service Work Sheet for Wheeled and Half-track Vehicles. Certain items on the work sheet that do not apply to this tractor are not included in the procedures in this bulletin. In general, the numerical sequence of items on the work sheet is followed in the manual procedures, but in some instances there is deviation for conservation of the mechanic's time and effort.

e. Specific Procedures:

The procedures for performing each item in the 48-hour and the 192-hour maintenance procedures

are described in the following chart. Each page of the chart has two columns at the left edge corresponding to the 48-hour and 192-hour maintenance, respectively. Very often it will be found that a particular procedure does not apply to both scheduled maintenances. In order to determine which procedure to follow, look down the column corresponding to the maintenance due, and wherever an item appears, perform the operations indicated opposite the number.

ROAD TEST

192 HRS.	48 HRS.	
		NOTE: Road test will include operation of the tractor, using suitable load weights. Loads carried should be within the limits indicated on the manufacturer's load chart attached to the tractor. The road test should be over a reasonably uneven road and should last not less than 15 minutes nor more than 30 minutes.
1	1	BEFORE OPERATION SERVICE: Perform the "Before Operation Service" as described in paragraph 28c.
3	3	INSTRUMENTS AND GAGES: <i>Oil Pressure Gage:</i> Oil pressure must be between 12 and 14 pounds at normal operating engine speed and 8 to 10 pounds minimum pressure at idle speed. CAUTION: If the gage indicates zero or excessively low oil pressure, stop the engine immediately and investigate the cause. <i>Ammeter:</i> During normal engine operation, the ammeter must show a charge reading of approximately two amperes (+). At low idle, the indicator may point slightly to the discharge side. CAUTION: Should indicator give an abnormal reading to the charge side of the ammeter during normal operation or an abnormal discharge reading upon idling, the condition must be quickly investigated. <i>Engine Temperature Gage:</i> Reading should increase gradually during warm-up to normal operating temperature of 160° to 180°. Should indicator show an abnormally quick rise, or pass beyond the normal reading, it is a direct indica-

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192 HRS.	48 HRS.	
		tion that the radiator core is obstructed, or possibly frozen, if tractor is being operated during low temperatures.
4	4	HORN: If the tactical situation permits, test the horn to see that the signal is normal.
5	5	BRAKES: Apply brakes sufficiently to stop the tractor in minimum distance. Observe effectiveness. Note whether tractor pulls to one side. Observe any unusual noises, pedal travel and feel, or pull-back spring action. <i>Parking Brakes:</i> Stop tractor on reasonable incline; engage parking brake lock ratchet and observe if it holds tractor effectively. Note if brake has ample travel and reserve.
6	6	CLUTCH: The clutch pedal must have a minimum free travel of 1-1/2 to 2" before meeting resistance. Clutch must stop transmission entirely when tractor is stationary so that shift can be made without gear clashing. Any unusual noise, such as chatter or squeal, when clutch is engaged, is an indication that the clutch plate or the release bearing are defective, or the clutch may be out of alignment.
7	7	TRANSMISSION: With the tractor at a stand-still, and the engine operating at fast idle, depress clutch and go through the gears to test free gear movement. Any abnormal resistance to the hand lever is an indication of damaged, excessively worn, or inadequately lubricated parts.
8	8	STEERING: While tractor is in motion, move steering wheel fully in both directions, and observe any indications of looseness or binding. Also, note any tendency of the tractor to wander, shimmy, or to pull to one side. Examine the steering column and steering wheel to see that they are in good condition and secure.
9	9	ENGINE: Observe engine operation characteristics as follows: <i>Unusual Noises:</i> Listen for knocks and rattles as the engine is accelerated and

192 HRS.	48 HRS.	
		decelerated, and while it is under both light and heavy loads. <i>Acceleration and Power:</i> Operate the engine at various speeds in all gears, noting whether the tractor has normal pulling power and acceleration. A slight "ping" may indicate early timing, heavy accumulation of carbon, or low octane fuel. <i>Governor Speed:</i> Accelerate engine to its full governor capacity by depressing the accelerator to the step plate and holding. Observe tachometer reading and note if the engine speed exceeds the specified 2000 RPM.
10	10	UNUSUAL NOISES: Be on the alert continually for unusual noises that would indicate loose wheel mountings, floor plates, hood, or side sheets.
13	13	TEMPERATURES: Place hand cautiously on brake covers and front wheel hubs to see if they are abnormally hot. An overheated brake cover is an indication of a dragging brake or defective, dry, or improperly adjusted bearings. An abnormally cool brake is an indication of an inoperative brake. Cautiously feel the rear axle, transmission, and torque housing for overheating. If gear case is excessively hot, for the distance traveled, it is an indication of an abnormal condition in the unit. This must be corrected or reported to the proper authority.
14	14	LEAKS: Look within the engine compartment and underneath the tractor for engine oil, water, or fuel leaks, and determine their source.
16	16	GEAR OIL LEVEL AND LEAKS: Remove filler plug from torque tube and transmission case to inspect lubricant levels. The proper level for the transmission case is to the full mark on the dip stick; and for the torque tube, the proper level is up to the filler hole. Allow sufficient time for foaming to subside before inspecting levels. Note condition of lubricant. If an oil change is due in these units, or condition of lubricant indicates an oil change is necessary,

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192 HRS.	48 HRS.		192 HRS.	48 HRS.	
		drain and refill units with fresh specified oil. Note any indications of lubricant leaks at oil seals or gaskets.			
		MAINTENANCE OPERATIONS Raise Tractor — Block Safely			
17	17	UNUSUAL NOISES: With engine running, observe as follows: Engine, Water Pump Belt, and Accessories. Accelerate and decelerate the engine momentarily, and listen for any unusual noises in these units which may indicate damaged, loose, or excessively worn parts. <i>Transmission, Drive Shaft, Rear Wheels, and Bearings:</i> With the transmission in an intermediate gear, operate these units at a constant moderate speed by use of the governor control lever and listen for any unusual noise that might indicate loose, damaged, or excessively worn unit parts. Also observe drive shaft and wheels for vibrations and run-out, and for vibrations in the other units which may indicate looseness or unbalance. The rear wheels should rotate at approximately the same speed. Slow turning wheels may indicate tight brakes or wheel bearings. Also, be sure to locate, correct, or report any noises noted during road test to proper authority.	19		<i>Adjust:</i> Adjust valve stem clearance if necessary. The proper clearances are .012 inches for both intake and exhaust valves when the engine is cold.
				20	SPARK PLUGS: Wipe off the installed spark plugs and examine insulation for damage or indications of leakage around insulators or gaskets.
			20		Remove spark plugs and examine to see that they are in good condition. Pay particular attention to broken insulations, excessive carbon deposits, and to electrodes burned thin. Clean deposits from electrodes and insulations, and inspect again for cracks. If a plug cleaner is not available, install new or reconditioned plugs.
			20		<i>Adjust:</i> Adjust plug gaps to .025 inches by bending only grounded electrodes. After completing Item 21, reinstall the plugs, using new gaskets and taking care not to over-tighten them.
18	18	CYLINDER HEAD AND GASKET: Remove engine valve cover and look for cracks or indications of oil, coolant, or compression leaks around studs, cap screws, and gaskets. CAUTION: <i>The cylinder head must not be tightened unless there is a definite indication of looseness or leaks. If tightening is necessary, use torque-indicating wrench, and tighten nuts starting from center, working to outside.</i>	21		COMPRESSION TEST: While spark plugs are removed, test the engine compression. The cylinder pressure should be approximately 90 pounds, with no more than 5 pounds variation between cylinders. Record the reading on the space provided on the back of the form. If pressure in a cylinder is below normal, squirt sufficient engine oil on the piston head to prevent loss of compression temporarily, and reinspect. Low compression brought up to normal by oil seals indicates faulty piston rings, cylinder wear, or damage. Low compression not brought up to normal by this procedure indicates valve or gasket leakage.
19	19	VALVE MECHANISM: Examine tappet clearance while engine is cold. Valve tappets, rocker arms, shafts, and springs should appear in good condition, correctly assembled and secure. Oil should be delivered properly. Also, make sure that the valve cover gasket is in good condition.	22	22	BATTERY: Inspect battery case for cracks and leaks. Clean top of battery. Inspect terminals, cables, bolts, posts, and hold-down clamps for good condition. Test specific gravity and voltage, and record on W.D., A.G.O. Form No. 461. Specific gravity reading below 1.225 at normal temperature indicates battery must be recharged or replaced. Electrolyte level must be 3/8" above top of plates.

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22		Perform high rate discharge test according to instructions for "condition" test, which accompany test instrument, and record voltage on W.D., A.G.O. Form No. 461. Cell variation should not be more than 30 per cent. NOTE: <i>Specific gravity must be above 1.225 to make this test.</i>			enough to see that the solution penetrates all parts of the system thoroughly. Drain and flush thoroughly with water.
22	22	Bring electrolyte to proper level by adding distilled or clean water. Clean entire battery and carrier. Repair carrier if corroded. Clean battery cable terminals, terminal bolts and nuts, and battery posts, and grease them lightly. Inspect bolts for serviceability. Tighten terminals and hold-downs carefully to avoid damage to battery.	25	25	<i>Tighten:</i> Carefully tighten all loose radiator mountings and hose clamps.
23	23	CRANKCASE: With engine idling, examine crankcase, valve covers, and timing gear cover for oil leaks. Stop engine and inspect oil in the crankcase to see that it is at the proper level: NOTE: <i>If an oil change is due, drain the crankcase, and refill to the proper level with specified oil. Do not start the engine again until Item 24 has been completed.</i>	26	26	WATER PUMP, FAN, AND SHROUD: Inspect pump to see that it is in good condition, secure, and not leaking. Loosen drive belt, examine shaft for end-play, and loose bearings. Leave loose until adjustment is made (Item 29). Examine fan blades to see that they are in good condition, properly secured to the hub, and that the radiator shroud is in good condition.
24	24	OIL FILTER: Inspect the oil filter to see that it is in good condition, secure, and does not leak. Inspect oil filter element, and change if necessary.	27	27	GENERATOR, STARTER, AND SWITCH: See that these items are in good condition, securely mounted, and the wiring connections are free of dirt and secure.
24		Remove the filter element, clean the case, and install a new element, and tighten securely.	27		Remove the generator and starter inspection covers to see that the commutators and brushes are in good condition and not excessively worn. Also, make certain the brushes are free in the holders and have sufficient spring tension to hold them in contact with the commutators, and that the brush connecting wires are secure and not grounding.
25	25	RADIATOR: (CORE, SHELL MOUNTINGS, HOSE, CAP, AND OVERFLOW) Inspect these items to see that they are in good condition, correctly assembled, securely mounted, free of obstruction, and connected. Also, see that there are no leaks. Examine the coolant to see whether it is so contaminated with rust, oil, or other foreign matter that the cooling system must be cleaned. If cleaning is necessary, drain the radiator, taking care to save the drainings if ethylene-glycol anti-freeze is used. Take one gallon of water and one pound of washing soda or one-half pound of soda ash mix. Pour this into the radiator and run the engine long	27		Clean the commutator end of the generator and starter by blowing out with compressed air. If the commutator is dirty or corroded, clean with fine sand paper, (00) only, having sand paper backed with a suitable piece of wood. After buffing commutator, blow out the dust with compressed air, and replace inspection cover.
			27		<i>Tighten:</i> Tighten the starter mounting bolts securely.
			29	29	DRIVE BELT: Observe the water pump and generator drive belt for evidence of worn conditions. See that the belt and hubs are in good condition, and securely mounted.
			29	29	<i>Adjust:</i> Adjust to 1/2" finger deflection.
			31	31	DISTRIBUTOR: Observe whether the distributor body and external attachments are in good condition and secure. Examine other parts of the distributor

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		as follows: Cap, Rotor, and Points: Clean the dirt or dust from the distributor cap and see that the small vent holes are open. Remove the cap, and see that the cap, rotor, and the breaker plate assembly parts are in good condition, correctly assembled, secure, and sufficiently cleaned. Pay particular attention to cracks in the cap and rotor, corrosion of terminals, and connections in these parts, and to burning of the outer ends of the conductor strap of the rotor. Also, see that the breaker points are in good condition and well aligned. Also, make certain that the adjustment, when open, is .020, with the breaker arm in contact with the peak of the lobe on the rotating shaft. If contact points are rough or pitted, smooth with a file before adjustment.			tight and are not leaking around the gaskets. Also, inspect the manifolds for leaks resulting from expansion cracks and sand holes usually indicated by carbon streaks.
31			33		<i>Tighten:</i> Tighten the manifold and exhaust pipe mountings and flange nuts for carburetor to intake manifold. AIR CLEANER: Every 96 hours remove the cup from the air cleaner. Clean the element, baffles, and body with SOLVENT, dry cleaning. Refill to its proper level with clean oil, and replace securely. Inspect hose clamps from carburetor horn to air cleaner and make certain that they are tight.
31	31	<i>Shaft:</i> Test shaft by hand-feel for looseness of worn camshaft or bushings.	35	35	BREATHING CAP: See that the breather cap is in good condition, secure, correctly assembled, and that it is not obstructed with dirt or foreign materials.
31	31	<i>Centrifugal Advance:</i> Reinstall the rotor on distributor camshaft and note whether shaft can be rotated by finger force through its normal range of movement, which is permitted by its centrifugal advance mechanism. Note also if it returns to its original position when the fingers are quickly removed from the rotor. Be certain that there is no binding or drag in this mechanism during this check.	35	35	<i>Clean and Service:</i> Remove breather cap, and wash in SOLVENT, dry cleaning until crimp-cut foil has a bright clean appearance. Dry with compressed air and replace securely.
31	31	<i>Special Lubrication:</i> Lubricate the distributor by removing grease cup provided on the side, and fill with grease specified on the Lubrication Order.	36	36	CARBURETOR: (CHOKE, THROTTLE, LINKAGE, AND GOVERNOR) See that these items are in good condition, correctly assembled, and securely installed; that the carburetor is free from leaks; that the linkage, including the choke and governor control rod, are not excessively worn; and free in action. NOTE: <i>Make certain that the choke valve opens fully when choke button is in outward position, that the throttle valve opens fully when governor control is open, and that the governor is securely and properly sealed.</i>
32	32	COIL AND WIRING: Examine the coil to see that it is in good condition, clean and properly mounted. All high voltage ignition wire and looms must be in good condition and securely fastened to all support mountings and terminals. See that all connections are tight and free from corrosion. Also, inspect low voltage wires in like manner. NOTE: <i>Do not tighten wiring connections unless actually loose, as overtightening of terminals will cause damage.</i>	37	37	FUEL FILTER AND LINE: Examine the protectoseal filter attached to the fuel cap, and the sediment bowl under the gasoline tank. See that they are in good condition, secure, and that the bowl and line connections are not leaking. Close the fuel shut-off valve, and remove the filter bowl and gasket. Clean the bowl with SOLVENT, dry cleaning. Dry the bowl thoroughly, and reinstall, using new gasket. Remove the line from
33	33	MANIFOLDS: Inspect the intake and exhaust manifolds to see that they are			

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		the carburetor, and inspect for dirt and sediment. Remove protectoseal filter, clean in solvent, and reinstall. Turn on the fuel shut-off valve after assembling, and re-examine for leaks.
39	39	STARTER: Start the engine, observing whether the general action of the starter is satisfactory, particularly whether it engages and operates properly without excessive noises, and has adequate cranking speed.
40	40	LEAKS: Look in the engine compartment and under the tractor for engine oil, fuel, and water leaks; trace all leaks to the source, and report or correct them.
41	41	IGNITION TIMING: With the engine running, and with timing wire connected to the distributor in position for cylinder 1 or 4, hold the point $\frac{1}{4}$ " from the flywheel by first removing the small inspection cover on the left hand side of the bell-housing of the torque tube. (Figure 17). Be certain that the ignition spark jumps to the mark on the flywheel marked D.C. (Dead Center).
41	41	<i>Adjust:</i> If the spark does not strike upon the line marked D.C. on the flywheel, correct by loosening the clamp of the adjusting plate at the base of the distributor and rotate the distributor in the direction necessary to obtain the proper setting. (Detailed adjusting information can be found in Par. 84.)
42	42	ENGINE IDLE: To make adjustment, connect a vacuum gage to the intake manifold. Adjust the engine to its normal idle speed with the governor control stop screw, and adjust the idle mixture adjusting needle until the vacuum gage indicates a steady maximum reading. If this latter adjustment changes the idle speed appreciably, re-set the idle speed, and with engine at fast idle reset the mixture, until both are satisfactory.
42	42	<i>Vacuum Test:</i> With the engine at normal idle speed, the vacuum gage should read approximately 15 to 18

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		inches, and the pointer should be steady. A badly fluctuating needle between 10 to 15 inches may indicate a defective cylinder head gasket or valve. An extremely low reading may indicate a leak in the intake manifold or gasket. Accelerate and decelerate the engine quickly. If the gage indicator fails to drop to approximately two inches as the throttle is opened, and fails to recoil to at least 24 inches as the throttle is closed, it may be an indication of diluted oil, poor piston ring seals, or abnormal restriction in the carburetor, air cleaner, or exhaust.
43	43	REGULATOR UNIT: (CONNECTIONS AND CUT-OUT) See whether it is in good condition, and whether all connections and mountings are secure.
43		<i>Test:</i> Connect the low voltage circuit tester, and observe whether the cut-out controls the generator out-put properly. Follow the instructions which accompany the test instruments. Inspect, if test shows faulty operation.
		CHASSIS, BODY, and ATTACHMENTS
47	47	TIRES AND RIMS: Inspect as follows: <i>Valve Stems and Caps:</i> Observe whether all valve stems are in good condition and in correct position. See that all valve caps are present and securely installed. Do not tighten with pliers. <i>Condition:</i> Examine all tires for cuts, bruises, breaks, and blisters. Remove embedded glass, nails, and stones. Look for irregular tread wear, watching for any signs of flat spots, cupping, feather edges, and one-sided wear. Remove tires worn thin at center of tread (or other unserviceable tires), and exchange for new or retreaded tires. Any mechanical deficiencies causing such conditions must be determined and corrected, or reported to the proper authority. <i>Direction:</i> When original bar type tires are in use, the direction of the bars will always be correct, regardless as to which side the tires are mounted. If directional tires with a "V" chevron are used, the "V" must point upward when viewed from the rear.

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		<p>Matching: With tires properly inflated, inspect them to see if they are matched according to overall circumference and type of tread.</p> <p>Rims: All rims and their lock rings or flanges must be in good condition and secure.</p>			<p>Adjust: After brake housing has been reassembled, adjust the brakes by loosening the three locking screws several turns, but do not remove them. Turn down the three adjusting screws in a clockwise direction until a noticeable drag is present when the wheel is turned by hand. This action forces the primary disk and pressure plate inward, and decreases the clearance at the brake lining. Next, back off the adjusting screws one-fourth to one-half turn. This must leave adequate clearance to assure that the brake will not drag. The screws must be turned down equally, to assure uniform pressure at all three points. When proper adjustment is obtained, tighten the locking screws to lock the pressure plate in place. To take up the free play in the actuating levers, adjust the length of the brake rod so there is no more than 1/8" of free movement at the end of the lever.</p>
47	47	<p>Tighten: Tighten rear wheel lug nuts securely.</p>	49	49	
47		<p>Serve: With rear tires properly inflated to 40 lbs., and front tires to 35 lbs., measure overall circumference of rear tires and front tires respectively, noting that they will not have differences in overall circumference exceeding the 3/4" limits specified in current directories and bulletins. NOTE: <i>After performing the tire-matching service, do not reinstall the front wheels until the front wheel bearing service is completed.</i></p>			
48		<p>REAR BRAKES: With rear tires and brake cover removed, examine brake plates to see that they are in good condition, securely mounted, and are not excessively worn or scored. Remove brake plates and clean all dirt and grease from these parts thoroughly, keeping SOLVENT, dry cleaning away from brake linings.</p>	52	52	<p>REAR WHEELS: Inspect the wheels to see that they are in good condition and secure. Revolve the wheels and listen for indications of damaged bearings. If this condition exists, report to designated authority for servicing by higher echelon. Note if drive flanges and nuts are in good condition.</p>
49	49	<p>REAR BRAKE DISKS: With rear tires and brake cover removed, examine the linings to see whether they are so worn that the rivet heads may contact the pressure plates within the next 48 hours of operation. To inspect the lining, remove the brake rod and the four nuts holding the brake cover to the transmission housing. The brake cover of the pressure plate assembly can now be pulled out for inspection of the brake lining by the motor officer, to determine whether the linings are so worn that they should be replaced. A similar inspection of the brake linings must be made after the tractor has recently been operated in deep water, mud, loose sand, or dirt which may have entered the brake housing.</p>	55	55	<p>STEERING KNUCKLES: Note if the steering knuckles are in good condition and properly secured by the king pins, and whether the king pins and bushings are excessively worn.</p>
		<p>Clean: Clean any dust or dirt from the disks with a wire brush, clean cloth, or compressed air.</p>	56	56	<p>FRONT SPRING: See that the front spring is in good condition, correctly assembled, and secure. Spring clips and bolts must be in place, and spring leaves must not be shifted out of their correct position. Note whether the deflection of spring bolts is normal. Test the hangers and bolts for excessive wear by means of a pry bar.</p>
49			56	56	<p>Tighten: Tighten all spring U-bolts securely and uniformly.</p>
			57	57	<p>STEERING: (ARMS, TIE RODS, DRAG LINK, SEALS, GEAR, COLUMN, AND WHEEL) See that these items are in good condition and securely</p>

48 HRS. mounted. Pay particular attention to the arms to see that they are securely mounted, and not bent out of their normal shape. Also, observe whether the steering system is in good adjustment. *Tighten:* Tighten the steering arm shaft nut and the right and left spindle shaft nuts securely. Also, tighten the adjusting sleeve attaching screws.

60 **FRONT WHEELS:** To inspect front wheels, bearings, and seals, remove front wheel by first removing hub cap, and then removing castellated nut from end of steering knuckle after which wheel may be removed. *Clean:* When wheel bearings and seals are removed, inspect and clean thoroughly. *Lubrication:* When bearings, seals, and wheels are ready to be reassembled, lubricate the bearings as follows: Be sure to have all parts clean and dry, the hands clean, and use clean lubricant. Wet the inside of spindle or axle with lubricant to a 1/16" minimum thickness, to retard rusting. Bearing shall be machine or hand-packed by kneading lubricant into all spaces in the bearings. Coat the cups or outer races and the lips of the oil seals, with lubricants and install new lubricant retainer seals, if necessary. *CAUTION:* *Do not pack the large cavity in the wheel hubs between the wheel-bearings with lubricant, as this will cause leakage past the seals.* *Adjust:* Adjust wheel-bearings by tightening nut on end of steering knuckle until slight drag is felt from rotating the wheel by hand. Now, back the nut to the first position which will permit installation of the cotter key.

61 **FRONT AXLE:** Note whether the axle is sprung or bent, and whether it appears to be properly aligned and securely mounted. If the axle appears to be out of line, measure the distance from the center of the steering knuckle to the center of the rear axle shaft. This distance should be the same on each side.

63 **ENGINE MOUNTINGS:** Inspect front and rear engine mountings, and be sure that all bolts are secure.

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65	65	CLUTCH PEDAL: See that the pedal free travel is satisfactory, that the pedal is securely mounted on its shaft, and that the clutch operating linkage is in good condition and secure. Observe whether the external operating linkage is worn excessively, and that the pedal return spring brings the pedal back to its correct released position. <i>Adjust:</i> Adjust clutch pedal so that it has 1-1/2" to 2" free travel.
65		
66	66	BRAKE PEDAL: Examine to see that the pedal has 1/8" free travel. See that the pedal is in good condition, that the brake pedal operating linkage is securely connected to pedal, and that its connection is not excessively worn, and that the pedal retracting spring returns the pedal against its stop.
71	71	TRANSMISSION: Note whether the transmission case is in good condition and securely mounted. Inspect to see whether oil is leaking from its seals or gaskets. Examine shift mechanism for damage or excessive wear. <i>Tighten:</i> Tighten all transmission external assembly bolts and cap screws securely.
71		
75	75	REAR AXLE: (SHAFT END PLAY AND SEALS) See that the axle housing is in good condition, securely assembled, mounted properly, and not leaking. Inspect axle end play by pushing in and pulling out on wheels when tractor is blocked up.
79	79	CAB AND BODY MOUNTINGS: (SEAT MOUNTINGS) Note whether seat mountings and tool compartment under seat are in good condition and secure. Also, note whether drawbar braces are secure. Also see that hood and side panels are secure and intact.
80	80	FRAME: Inspect fender brackets, cross tie angles, and bumper side mounting angles to see that they are in good condition and secure, and correctly aligned. If any of these appear to be out of line, correct or report the condition to the proper authority.

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81	81	WIRING, CONDUITS, AND GROMMETS: Observe these items under the hood, in the engine compartment, and underneath the tractor floor plates; and wherever they come in contact with the tractor proper. Make sure that they are in good condition, without broken coverings, properly supported, connected, and secure. Should any of these become disattached, correct or report to the proper authority.			fication ($\frac{1}{8}$ "). See that the wheel-turning stops are present and secure. Turn the wheels fully in both directions, and see that the turn is limited by the stops. In this position, note whether the tires clear all parts of the tractor.
82	82	FUEL TANK, FITTINGS AND LINES: Inspect the fuel tank to see that it is in good condition and securely mounted. See that the protectoseal fuel cap fits securely. Inspect the fuel line and fittings to see that they are in good condition, securely supported, and not leaking. Remove sediment bowl and drain off accumulated water and sediment. Wipe bowl clean, and replace, making certain that the gasket is secure and not leaking.	91	91	LAMPS, (LIGHTS): Operate the light switch, and note whether both head lights and tail light respond. Note whether any lights remain on with the switch "off". <i>Adjust:</i> Adjust lamp-unit beams by loosening screw under lamp.
84	84	EXHAUST PIPE AND MUFFLER: Examine exhaust pipe to see that it is securely attached to the exhaust manifold, and that the other end is clamped securely to the muffler. Inspect the muffler to see that it is in good condition and securely mounted. Inspect the tail pipe to see that it is securely clamped to the muffler, properly supported, and unobstructed at its outer end. See that the drain hole in the muffler is at the lowest point and not clogged. To drain and clean, remove the plug.	93	93	FRONT BUMPER: See that the front bumper-grille is in good condition, secure, and properly mounted. Also see that the grille is not obstructed.
85	85	TRACTOR LUBRICATION: If due, lubricate in accordance with Lubrication Order (Section XI), and current lubrication directives. Use only clean lubricant, and to avoid duplication or over-lubrication, omit items that have special lubrication during service. Replace damaged or missing fittings and plugs. LOWER TRACTOR TO GROUND	94	94	HOOD: Observe whether the hood, hinges, fasteners, and hood support are in good condition and secure.
86	86	TOE-IN AND TURNING STOPS: With the front wheels on the ground, in a straight-ahead position, and using a toe-in gage, determine whether the front wheel toe-in is of the correct speci-	95	95	FRONT FENDERS AND RUNNING BOARDS: See that they are in good condition and securely mounted.
			96	96	CAB: (SEAT, HAND RAILS, AND FLOOR PLATES) Inspect these items to see that they are in good condition and secure. Make certain floor plates are securely bolted and not damaged.
			98	98	FUSE BLOCK: Observe whether the fuse block is clean, dry, in good condition, secure, and whether any electrical connections are loose. See that the fuse is held securely by the clips.
			99	99	REAR FENDERS: Make certain the rear fenders are secure and in good condition.
			101	101	PINTLE HOOK: Inspect automatic coupler to see that it is in good condition and secure. Test the latch to see that it operates properly, is adequately lubricated, and that the spring is not broken. See that the latch rope is not worn or frayed.
			103	103	PAINT AND MARKINGS: Examine the paint of the entire tractor to see that it is in good condition, paying particular attention to any bright spots in

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		the finish that might cause glare or reflection. Inspect tractor markings and identification for legibility.
TOOLS AND EQUIPMENT		
131	131	TOOLS: Inspect tools to see that they are all present, in good condition, and properly stowed in tool box.
132	132	FIRE EXTINGUISHER: See that it is in good condition, securely mounted, and fully charged. The charge may be determined on a gas-type extinguisher by weighing with the scale, and on a liquid type by shaking. Also be sure the nozzle is free from corrosion.

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135	135	PUBLICATIONS: See that a copy of this manual and a Lubrication Order are present, legible, and properly stored.
142	142	FINAL ROAD TEST: Make a final road test reinspecting items 2 to 16, inclusive, and also be sure to reinspect the transmission and torque tube to see that the lubricant is at the correct level and not leaking. Confine this road test to the minimum distance necessary to make satisfactory observations. <i>NOTE: Correct or report all deficiencies found during final road test.</i>

Section XIII – Trouble Shooting

33. GENERAL:

This section contains trouble shooting information and suggested corrections with cross reference to paragraphs of manual which give detailed direc-

tions. Each symptom of trouble given under the individual unit or system involved is followed by a list of possible causes of the trouble. Correction of the trouble is explained after each possible cause.

34. ENGINE:

TROUBLE	POSSIBLE CAUSE	REMEDY
Starting motor will not turn engine.	Battery discharged.	Charge or replace battery. (Par. 77).
	Battery terminals or ground cables loose or corroded.	Remove and clean. (Par. 78).
	Starting motor or drive gear faulty.	Replace or repair starting motor. (Pars. 175 and 95).
	Starting motor drive gear jammed in flywheel teeth.	Rock vehicle backward or loosen starting motor. (Par. 95).
	Piston lock or seizure.	Free-up pistons or remove plugs and let out water. Inspect gasket and head for leaks.
Engine will not start (no spark).	Poor starting switch contact.	Replace switch. (Par. 94).
	Ignition switch partly on.	Turn on fully.
	Ignition switch faulty.	Replace switch. (Par. 94).
	Distributor points burned, pitted, or dirty.	Clean or replace and adjust. (Par. 87).
	Distributor points not closing.	Replace or clean and adjust; put one drop of oil on arm post. (Par. 87).

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TROUBLE	POSSIBLE CAUSE	REMEDY	
	Distributor points not opening.	Replace or clean and adjust; put one drop of oil on arm post. (Par. 87).	
	Loose or corroded ground or battery cable connections.	Clean or replace, and tighten. (Par. 78).	
	Primary wire from coil to distributor broken, grounded, or out of terminals.	Repair or replace (Par. 82).	
	Short-circuit in coil.	Replace coil (Par. 83).	
	Short-circuited condenser or broken condenser lead.	Replace condenser or repair lead (Par. 83).	
	Short-circuited or burned distributor cap or rotor.	Replace part (Pars. 85 and 86).	
	Spark plugs, distributor cap, or wires wet (shorted).	Dry and clean thoroughly.	
	Spark plug gaps incorrect.	Re-set gaps (Par. 89).	
	Ignition timing incorrect.	Set timing (Par. 84).	
	Ignition wires installed wrong in distributor.	Install in proper terminals (Par. 82).	
	Short-circuited wire between ammeter and ignition switch or coil.	Repair or replace wire.	
	Short-circuited primary winding in ignition coil.	Install new coil (Par. 83).	
Engine will not start (weak spark).	Distributor points pitted or burned.	Clean or replace, and adjust (Par. 87).	
	Distributor condensor weak.	Replace (Par. 88).	
	Ignition coil weak.	Replace (Par. 83).	
	Primary wire connections loose.	Tighten.	
	Spark plug wires or distributor cap wet.	Dry thoroughly.	
	Spark plug wires or distributor cap damaged.	Replace (Pars. 82 and 85).	
	Distributor rotor burned or broken.	Replace (Par. 86).	
	Engine will not start (good spark).	Lack of fuel.	Fill fuel tank.
		Dirt or water in carburetor, or float stuck.	Repair or replace carburetor (Pars. 161 and 63).
		Carburetor and engine flooded by excessive use of choke.	Allow engine to set 5 min. Attempt starting with throttle fully open and choke in.

TROUBLE	POSSIBLE CAUSE	REMEDY
Engine will not start (backfires).	Choke control not operating properly.	Remove carburetor, inspect operation of choke fly, repair or replace defective parts (Par. 161).
	Fuel does not reach carburetor.	Inspect for damaged or leaky line. Repair or replace (Par. 66).
	Dirt in fuel line or tank.	Drain tank and clean tank and line (Pars. 66 and 67).
	Fuel line collapsed.	Repair or replace (Par. 66).
	Fuel strainer clogged.	Dismantle and clean (Par. 65).
	Ignition out of time.	Retime (Par. 84).
	Spark plug wires in wrong terminals in distributor cap, or at spark plugs.	Install in proper places (Par. 82).
Engine operates but backfires and spits.	Distributor cap cracked or shorted.	Replace (Par. 85).
	Overheated engine.	Allow engine to cool.
	Faulty cylinder head gasket.	Replace (Par. 57).
	Improper ignition timing.	Retime (Par. 84).
	Spark plug wires in wrong terminals in distributor cap.	Install in proper terminals (Par. 82).
	Dirt or water in carburetor.	Clean and adjust (Par. 63).
	Carburetor improperly adjusted.	Inspect adjustment (Par. 63).
	Carburetor float level low.	Repair or replace (Par. 161).
	Valve sticking or not seated properly, burned, or pitted.	Service valves (Par. 58).
	Excessive carbon in cylinders.	Remove carbon (Par. 57).
Engine stalls on idle.	Valve springs weak.	Replace springs (Par. 58).
	Fuel strainer clogged.	Dismantle and clean (Par. 65).
	Partly clogged or pinched fuel line.	Clean or repair (Par. 66).
	Intake manifold leak.	Replace gaskets. Inspect manifold (Par. 54).
	Distributor cap cracked or shorted.	Replace (Par. 85).
	Carburetor throttle valve closes too far, or idle mixture incorrect.	Adjust (Par. 63).
	Carburetor choke valve sticks closed.	Free-up and lubricate.

Section XIII—Trouble Shooting

TROUBLE	POSSIBLE CAUSE	REMEDY
Engine misfires on one or two cylinders.	Dirt or water in carburetor.	Clean or replace carburetor (Pars. 161 and 63).
	Air leak at intake manifold.	Tighten manifold stud nuts or replace gaskets (Par. 54).
	Spark plugs faulty, gaps incorrect.	Clean or replace, set gaps (Par. 89).
	Ignition timing too early.	Re-set (Par. 84).
	Water leak in cylinder head or gasket.	Replace gasket; repair or replace cylinder head (Par. 57).
	Dirty spark plugs.	Clean and adjust, or replace (Par. 89).
	Wrong type spark plugs.	Replace with correct type (Par. 89).
	Spark plug gap incorrect.	Re-set gap (Par. 89).
	Cracked spark plug porcelain.	Replace spark plug (Par. 89).
	Spark plug wires grounded.	Replace wires (Par. 82).
	Spark plug wires in wrong terminals in cap or at spark plugs.	Install correctly (Par. 82).
	Distributor cap or rotor burned or broken.	Replace (Pars. 85 and 86).
	Valve tappet holding valve open.	Service (Par. 58).
Engine does not idle properly. (Erratic).	Leaky cylinder head gasket.	Replace gasket (Par. 57).
	Cracked cylinder block.	Replace (Pars. 139 to 142).
	Ignition timed too early.	Reset (Par 84).
	Dirty spark plugs or gaps incorrect.	Clean and adjust (Par. 89).
	Ignition coil or condenser weak.	Replace (Pars. 83 and 88).
	Distributor points sticking, dirty, or improperly adjusted.	Adjust or replace (Par. 87).
	Distributor rotor or cap cracked or burned.	Replace (Pars. 85 and 86).
	Weak or broken valve spring.	Replace (Par. 58).
	Leaky cylinder head gasket.	Replace (Par. 57).
	Uneven cylinder compression.	Service valves (Par. 58).
Spark plug wires leaky—cracked insulation.	Replace (Par. 82).	
Dirt or water in carburetor, or float level incorrect.	Service or replace carburetor (Pars. 161 or 63).	

TROUBLE	POSSIBLE CAUSE	REMEDY	
Engine misses on acceleration.	Carburetor adjustment not set right.	Adjust (Par. 63).	
	Leaky intake manifold.	Tighten manifold stud nuts or replace gasket (Par. 54).	
	Dirty spark plugs or gaps too wide.	Clean and adjust (Par. 89).	
	Wrong type spark plug.	Replace (Par. 89).	
	Ignition coil or condenser weak.	Replace (Pars. 83 and 88).	
	Distributor breaker points sticking, dirty or improperly adjusted.	Adjust or replace (Par. 87).	
	Distributor cap or rotor cracked or burned.	Replace (Pars. 85 and 86).	
	Distributor cap, spark plugs, or wires wet or dirty.	Clean and dry thoroughly.	
	Spark plug wires leaky—cracked insulation.	Replace (Par. 82).	
	Carburetor choke not adjusted.	Adjust choke valve to be fully open when choke is in.	
	Air cleaner dirty.	Clean (Par. 64).	
	Valves sticking—weak or broken valve springs.	Service valves (Par. 58).	
	Overheated engine.	(See "Engine Overheats".)	
	Engine misses at high speeds.	Fuel strainer clogged.	Dismantle and clean (Par. 65).
Distributor points sticking, adjusted too wide or burned.		Clean and adjust or replace (Par. 89).	
Weak distributor breaker arm spring.		Replace (Par. 87).	
Incorrect type of spark plugs.		Replace (Par. 89).	
Excessive play in distributor shaft bearing.		Replace distributor (Par. 84).	
Spark plugs faulty, dirty, or incorrect gap.		Clean, adjust or replace (Par. 89).	
Weak ignition coil or condenser.		Replace (Pars. 83 and 88).	
Valves sticking—weak or broken springs.		Service valves (Par. 58).	
Fuel supply lacking at carburetor.		Inspect and service fuel system (Pars. 65 and 66).	
Air cleaner dirty.		Clean (Par. 64).	
Engine pings (spark knock).		Ignition timing early.	Re-set (Par. 84).

Section XIII—Trouble Shooting

TROUBLE	POSSIBLE CAUSE	REMEDY
Engine lacks power.	Distributor automatic spark advance stuck in advance position or spring broken.	Repair or replace distributor (Pars. 174 and 84).
	Overheated engine.	(See "Engine Overheats".)
	Excessive carbon deposit in cylinders.	Remove cylinder head and clean (Par. 57).
	Wrong type spark plug.	Replace (Par. 89).
	Old or incorrect fuel.	Drain and use correct fuel.
	Ignition timing late.	Re-set (Par. 84).
	Ignition system faulty.	(See "Engine will not start — no spark, weak spark, and good spark".)
	Old or incorrect fuel.	Drain and use correct fuel.
	Leaky cylinder head gasket.	Replace (Par. 57).
	Engine overheated.	(See "Engine Overheats".)
	Excessive carbon formation.	Remove cylinder head and clean (Par. 57).
	Engine too cold.	Inspect thermostat (Par. 74); in cold weather, cover radiator.
	Insufficient oil or improper grade.	Use correct grade (Par. 29).
	Oil system failure.	Inspect main bearings, connecting rod bearings, and oil pump. Replace defective parts (Pars. 147, 153, and 154).
Air cleaner dirty.	Clean; change oil in cup (Par. 64).	
Spark plug gaps too wide.	Re-set (Par. 89).	
Choke valve partially closed or throttle does not open fully.	Adjust choke valve to be fully open when choke is in.	
Exhaust pipe, muffler, or tail pipe damaged or clogged.	Service or replace (Pars. 100-102).	
Lack of fuel.	Clean filter (Par. 65); inspect carburetor for water or dirt (Par. 63).	
Engine overheats.	Cooling system deficient.	Water low; air flow through radiator core restricted, clean from engine side; clogged core, clean or replace radiator (Par. 75).
	Radiator or water pump leaky.	Replace (Pars. 71 and 75).
	Leaky cylinder head gasket.	Tighten or replace gasket (Par. 57).

TROUBLE	POSSIBLE CAUSE	REMEDY
Low fuel mileage.	Damaged or deteriorated hose or fan belt.	Replace (Pars. 72 and 74).
	Loose fan belt.	Adjust or tighten (Par. 72).
	Ignition timing incorrect.	Re-set (Par. 84).
	Damaged muffler; bent or clogged exhaust pipe or tail pipe.	Service or replace (Pars. 100-102).
	Excessive carbon in cylinders.	Remove cylinder head and clean (Par. 57).
	Insufficient oil or improper grade.	Use correct grade (Par. 29).
	Air cleaner restricted.	Clean and renew oil (Par. 64).
	Inoperative thermostat or radiator cap.	Replace (Par. 64).
	Ignition system faulty.	(See "Engine will not start — no spark, weak spark, and good spark".)
	Water pump impeller broken.	Repair or replace pump (Pars. 169 or 71).
	Oil system failure (clogged screen).	Clean oil pump screen (Par. 60).
	Air cleaner clogged.	Clean and renew oil (Par. 64).
	Fuel line leaks.	Tighten or replace (Par. 66).
	Overheated engine.	(See "Engine Overheats".)
	Carburetor parts worn or broken.	Repair or replace carburetor (Pars. 161 or 63).
	Engine cold.	Inspect thermostat (Par. 74); cover radiator.
	Damaged or leaky tank.	Repair or replace (Par. 67).
	Low oil mileage.	Choke partially closed.
Ignition timed wrong.		Re-set (Par. 84).
Low compression.		Service engine (Par. 137).
Carburetor controls sticking.		Free-up and lubricate.
Engine idles too fast.		Adjust carburetor idle stop screw (Par. 63).
Spark plugs dirty.		Clean or replace (Par. 89).
Weak coil or condenser.		Replace (Pars. 83 and 88).
Oil leaks.		Replace leaky gaskets.
Improper grade or diluted oil.		Use new oil of proper grade (Par. 29).

Section XIII—Trouble Shooting

TROUBLE	POSSIBLE CAUSE	REMEDY	
Low oil pressure.	Overheating of engine causing excessive temperature and thinning of oil.	(See "Engine Overheats".)	
	Oil filter clogged.	Clean; replace element (Par. 50).	
	Worn main bearings.	Replace (Par. 153).	
	Worn piston rings and sleeves.	Replace (Pars. 147 and 148).	
	Improper grade of oil or diluted oil.	Change oil; (Par. 29); inspect for water in oil by inspecting dip stick.	
	High oil temperature causing oil to be thin.	(See "Engine Overheats".)	
	Oil screen clogged.	Remove oil pan and clean screen (Par. 60).	
	Oil leak causing lack of oil.	Inspect and service.	
	Faulty oil pump.	Repair or replace oil pump (Par. 154).	
	Abnormal engine noises.	Loose fan, fan pulley or belt.	Tighten or service (Pars. 71 and 72).
Leaky intake or exhaust manifold or gaskets, cylinder head gasket or spark plug.		Replace or tighten (Pars. 54, 57, and 89).	
Overheaded engine; clogged exhaust system.		Remove obstruction from muffler tail pipe.	
35. CLUTCH:		Improper pedal adjustment.	Adjust pedal free travel (Par. 61).
	Release linkage binding.	Free-up and lubricate.	
	Clutch facings burned or worn, torn loose from plate, or oil-soaked.	Replace clutch driven plate (Par. 157).	
	Weak pressure spring.	Replace pressure plate (Par 157).	
	Sticking pressure plate.	Replace plate (Par. 157).	
	Clutch grabs or chatters.	Control linkage binding.	Free-up and lubricate.
		Facings burned, worn, or loose on driven plate; driven plate crimped or cushion flattened out, worn, or binding on splined shaft.	Replace clutch driven plate (Par. 157).
		Pressure plate or flywheel face scored or rough; pressure plate broken.	Replace clutch pressure plate (Par. 157).
	Clutch drags.	Too much pedal play.	Adjust pedal free play (Par. 61).

TROUBLE	POSSIBLE CAUSE	REMEDY
Clutch rattles.	<p>Driven plate warped; facings torn or loose.</p> <p>Pressure plate warped or binding.</p> <p>Clutch pedal return spring is broken or disconnected.</p> <p>Release fork loose on ball stud.</p> <p>Driven plate springs broken. Worn release bearing.</p>	<p>Replace clutch driven plate (Par. 157).</p> <p>Replace pressure plate (Par. 157).</p> <p>Replace or connect (Par. 157).</p> <p>Adjust clutch pedal free travel to 1½ inch (Par. 61).</p> <p>Replace defective parts (Par. 157)</p>
36. FUEL SYSTEM:		
Fuel does not reach carburetor.	<p>No fuel in tank.</p> <p>Fuel filter clogged.</p> <p>Fuel line clogged.</p>	<p>Fill tank.</p> <p>Service fuel filter (Par. 65).</p> <p>Disconnect and blow out line (Par. 66).</p>
Fuel reaches carburetor but does not enter cylinders.	<p>Choke does not close.</p> <p>Fuel passages in carburetor clogged.</p> <p>Carburetor float valve stuck closed.</p>	<p>Free-up and lubricate; inspect for proper operation.</p> <p>Repair or replace carburetor (Par. 161 or 63).</p> <p>Repair or replace carburetor (Par. 161 or 63).</p>
Engine idles too fast.	<p>Improper carburetor throttle adjustment.</p> <p>Carburetor controls sticking.</p>	<p>Adjust idle stop screw (Par. 63).</p> <p>Free-up and lubricate.</p>
37. INTAKE AND EXHAUST SYSTEM:		
Intake system not operating properly.	Leaky gaskets, sand hole, or crack in manifold.	Replace gasket or manifold (Par. 54); tighten studs.
Exhaust system not operating properly.	<p>Leaky gaskets, sand hole, or crack in manifold.</p> <p>Exhaust pipe and connections loose or leaking.</p> <p>Muffler leaks or rattles.</p> <p>Exhaust system or muffler restricted; exhaust pipe kinked or tail pipe plugged.</p>	<p>Replace gasket or manifold (Par. 54); tighten studs.</p> <p>Service or replace (Par. 102).</p> <p>Replace or tighten (Par. 101).</p> <p>Service or replace parts (Pars. 100-103).</p>
38. COOLING SYSTEM:		
Overheating.	<p>Abnormal conditions.</p> <p>Loose hose connection.</p> <p>Damaged or deteriorated hose.</p> <p>Leaky radiator.</p> <p>Radiator cap gasket unserviceable.</p>	<p>(See "Engine Overheats".)</p> <p>Tighten.</p> <p>Replace (Par. 74).</p> <p>Repair or replace (Par. 75).</p> <p>Correct or replace.</p>

Section XIII—Trouble Shooting

TROUBLE	POSSIBLE CAUSE	REMEDY
Engine operating too cool.	Thermostat stuck open. Low air temperatures.	Replace (Par. 74). Cover radiator.
Noises.	Frayed or loose fan belt. Water pump faulty. Fan blades striking radiator cover shroud.	Replace or adjust (Par. 72). Repair or replace (Pars. 169 or 71). Aline blades and correct shoud.
39. BATTERY AND LIGHTING SYSTEM:		
Battery low.	Excessive use of electrical equip- ment.	Engage light switch in 2nd posi- tion (Par. 90).
Battery discharged.	Battery solution level low.	Add distilled water to bring level above plates; inspect for cracked case.
	Short in battery cell.	Replace battery (Par. 77).
	Generator not charging.	Inspect generator, circuit breaker, fan belt, and ammeter (Pars. 72, 79, and 80).
	Loose or dirty connections; bro- ken cables.	Clean and tighten connections; re- place cables (Par. 78).
	Excessive use of starting motor.	Tune up engine; charge battery.
	Idle battery, or excessive use of lights.	Replace or charge battery (Par. 77).
Battery faulty.	Overheated battery.	Inspect for short circuit, excessive generator charge, or plugged vents.
	Case bulged or out of shape.	Inspect for overcharging and too tight hold-down frame.
Faulty light switch.	Loose or dirty connections or bro- ken wire.	Clean and tighten; replace broken wire.
	Internal fault.	Replace switch (Par. 90).
Faulty wiring.	Loose or dirty connections, broken wire or terminal.	Clean, tighten, or replace (Par. 91).
Lights do not light.	Switch not fully on.	Pull switch on fully.
	Loose or dirty connection, or bro- ken wire or terminal.	Clean and tighten; repair or re- place wire or terminal (Par. 91).
	Burned fuse.	Replace.
	Wiring circuit shorted or open.	Localize and repair.
	Headlight or tail light burned out.	Replace bulb (Pars. 92 and 93).

TROUBLE	POSSIBLE CAUSE	REMEDY
Lights dim.	Loose or dirty connection or poor ground connection.	Clean and tighten.
	Wire grounding.	Localize and replace.
	Poor switch contact.	Replace switch (Par. 90).
	Headlight aim not right.	Adjust lights (Par. 92).
Horn faulty.	Loose or dirty connections.	Clean and tighten.
	Sounds continuously (short circuit in wiring between horn and horn button).	Replace wire.
	Improper tone.	Adjust points, tighten cover or bracket screws; clean and tighten loose or dirty wiring connections.
	Internal defect.	Replace horn (Par. 97).
	Battery low.	Charge or replace battery (Par. 77).
40. IGNITION SYSTEM:		
Ignition system faulty.	No spark.	(See "Engine will not start — no spark".)
	Weak spark.	(See "Engine will not start—weak spark".)
	Timing incorrect. Moisture on distributor wires, coil, or spark plugs.	Retime ignition (Par. 84). Dry and clean thoroughly with cloth dampened with SOLVENT, dry cleaning.
	Ignition switch "OFF."	Pull "ON" fully.
	Ignition switch does not make contact.	Replace switch (Par. 81).
	Primary or secondary wiring loose, broken, or grounded.	Service (Par. 82).
	Primary or secondary wiring wrong.	Install secondary wires correctly in distributor cap and on spark plugs (Par. 82).
	Ground strap connections loose or dirty.	Clean and tighten.
	Coil faulty.	(See "Ignition Coil Faulty".)
	Distributor faulty.	(See "Distributor Faulty".)
	Spark plug faulty.	Replace (Par. 89).
Ignition coil faulty.	Connections loose; dirty or broken external wire; wet.	Clean and tighten or repair; dry thoroughly.
	Coil internal fault.	Replace coil (Par. 83).

Section XIII—Trouble Shooting

TROUBLE	POSSIBLE CAUSE	REMEDY
Distributor faulty.	Distributor breaker points dirty or pitted; gap incorrect.	Clean or replace and adjust (Par. 87).
	Distributor breaker point arm spring weak.	Replace breaker point arm (Par. 87).
	Distributor breaker points stuck open.	Free-up and lubricate arm on post.
	Distributor automatic advance faulty.	Lubricate and free-up; replace distributor if seized (Par. 84).
	Distributor rotor shorted, cracked, or broken.	Replace (Par. 86).
	Distributor rotor does not turn.	Correct or replace distributor (Pars. 174 and 84).
	Distributor cap cracked or shorted.	Replace cap (Par. 85).
	Condenser or lead wire faulty.	Replace condenser (Par. 88).
	Cracked, broken, or leaky.	Replace spark plug (Par. 89).
	Spark plug wires installed on wrong plugs, or in distributor cap.	Install in correct place (Par. 82).
Spark plugs faulty.	Spark plugs dirty; gaps incorrect.	Clean or replace; set gaps (Par. 89).
	Spark plug porcelain cracked or broken.	Replace plug (Par. 89).
	Spark plugs wrong type.	Replace with correct type (Par. 89).

41. STARTING AND GENERATING SYSTEMS.

Starting motor rotates engine slowly.	Engine oil too heavy.	Change to proper seasonal grade (Par. 29).
	Battery low.	Replace or recharge (Par. 77).
	Battery cell shorted.	Replace battery (Par. 77).
	Battery connections corroded, broken, or loose; or ground strap connections dirty or loose.	Clean and tighten or replace (Par. 78).
	Poor brush contact.	Free-up brush or replace starting motor (Par. 175 or 94).
	Starting motor internal fault.	Repair or replace starting motor (Par. 175 or 94).
	Starting switch faulty.	Replace switch (Par. 94).
Starting motor does not rotate engine.	Engine oil too heavy.	Change to proper seasonal grade (Par. 29).
	Starting motor, starting switch or cables faulty; loose connections.	Replace; tighten loose connections.

TROUBLE	POSSIBLE CAUSE	REMEDY
No generator output.	Generator faulty.	Repair or replace generator (Par. 172 or 80).
	Circuit breaker faulty.	Replace (Par. 80).
Low or fluctuating generator output.	Loose fan belt.	Adjust (Par. 72).
	Poor brush contact, weak brush springs, worn commutator, broken or loose connections.	Repair or replace generator (Par. 172 or 80).
	Dirty commutator.	Clean (Par. 172).
	Loose or dirty connections in charging circuit.	Clean and tighten (Par. 172).
	Ground strap broken.	Replace.
Excessive generator output.	Short circuit between field coil and armature leads.	Repair or replace generator (Pars. 172 or 80).
	Circuit breaker faulty.	Replace (Par. 80).
Noisy generator.	Loose pulley or generator mounting.	Tighten.
	Faulty bearings, improperly seated brushes, or armature rubbing on field poles.	Repair or replace generator (Pars. 172 or 80).
42. TRANSMISSION:		
Excessive noise.	Insufficient lubricant.	Add lubricant (Par. 28).
	Incorrect lubricant.	Use correct lubricant (Par. 29).
	Gears or bearings broken or worn; shift fork bent; gears worn on splines.	Repair or replace transmission (Par. 183).
	Overheated transmission.	Inspect lubricant grade and supply (Par. 29).
Hard shifting.	Clutch fails to release.	Adjust clutch pedal free travel (Par. 61).
	Misaligned forks.	Replace forks (Par. 183).
	Clutch driven plate binds on splines, or pressure plate faulty.	Repair or replace worn parts.
Slips out of gear.	Weak or broken mesh lock spring.	Replace spring (Par. 183).
	Interlocking ball not in place.	Install Ball (Par. 183).
	Transmission gears or bearings worn.	Repair or replace transmission (Par. 183).
	Shift fork bent, causing partial engagement.	Replace shift fork (Par. 183).

Section XIII—Trouble Shooting

TROUBLE	POSSIBLE CAUSE	REMEDY
Loss of lubricant.	Worn or damaged seals or gaskets. Loose bolts and screws.	Replace gaskets. Tighten.
43. FRONT AXLE:		
Front axle faulty.	Steering trouble. Damaged axle. Abnormal tire wear.	(See "Steering System".) Replace axle (Par. 187). Inflate tires (Par. 115); correct toe-in (Par. 107).
44. REAR AXLE:		
Rear axle faulty.	Damaged axle. Lubrication leaks.	Repair or replace axle (Par. 189). Drain excessive lubricant; replace wheel bearing grease seals; tighten or replace housing cover gasket (Par. 110).
45. BRAKE SYSTEM:		
Brakes drag.	Improper pedal adjustment. Brake pedal return spring broken or weak. Brakes improperly adjusted.	Adjust brake pedal free travel (Par. 114). Replace (Par. 191). Adjust (Par. 112).
One brake drags.	Brake adjustment faulty. Brake shoe return spring broken or weak.	Adjust (Par. 112). Replace (Par. 191).
One brake grabs (vehicle pulls to one side).	Improper brake equalization. Tires under-inflated. Tires worn unequally. Grease or oil on linings.	Equalize (Par. 113). Inflate tires (Par. 114). Replace (Pars. 116 and 117). Clean with SOLVENT, dry cleaning. Replace differential oil seal.
Excessive pedal travel.	Normal lining wear. Lining worn out. Brake not properly adjusted. Improper pedal adjustment. Brake rod broken.	Adjust brakes (Par. 112). Replace lining assemblies (Par. 191). Adjust (Par. 112). Adjust (Par. 114). Repair or replace (Par. 191).
No brakes.	Brake lining worn.	Replace (Par. 191).

TROUBLE	POSSIBLE CAUSE	REMEDY
	Grease or oil on linings.	Clean with SOLVENT, dry cleaning. Replace differential oil seal.
46. WHEELS, WHEEL BEARINGS, AND RELATED PARTS:		
Wheel faulty.	Rear wheel wobbles. Front wheel loose on spindle. Front wheel bearings run hot. Front wheels misaligned. Excessive or uneven tire wear.	Inspect mounting on rim; adjust wheel rim bolts evenly. Adjust bearings (Par. 106). Lubricate and adjust (Par. 106). Correct (Par. 107). (See "Steering System".)
47. SPRING:		
Broken spring.	Improper handling of vehicle on rough terrain. Shackles or pivot bolts too tight. Main leaf broken at end.	Use correct practice when possible. Free-up and lubricate. Replace spring (Par. 126).
Noisy spring.	Worn shackles, pivot pins, or bushings.	Replace worn parts (Par. 125).
Stiff spring.	Rusted spring leaves. Shackle or pivot bolts too tight.	Lubricate. Free-up and lubricate.
48. STEERING SYSTEM:		
Steering difficult.	Lack of lubrication. Worn thrust bearings. Tire pressures low. Tight steering system connections. Tight steering gear; misaligned front wheels (caster or camber); or bent drag link.	Lubricate (Par. 29). Replace (Par. 187). Inflate (Par. 115). Lubricate and adjust. Correct or replace defective parts (Pars. 107, 119, 121 and 193).
Wander or weaving.	Improper front wheel toe-in. Bent steering connecting parts. Improper toe-in. Improper camber or caster (axle twisted). Front springs broken. Axle shifted (spring center bolt broken). Loose or worn spring shackles or bolts.	Adjust (Par. 107). Straighten or replace. Adjust (Par. 107). Correct or replace axle (Par. 186). Replace spring (Par. 126). Replace bolt (Par. 186). Replace or tighten.
	Tire pressures uneven.	Inflate (Par. 115).

Section XIII—Trouble Shooting

TROUBLE	POSSIBLE CAUSE	REMEDY
Shimmy or wobble.	Loose wheel bearings.	Adjust (Par. 106).
	Steering drop arm loose.	Tighten.
	Loose steering connections.	Adjust.
	Front axle loose on spring (broken spring center bolt).	Replace bolt (Par. 186).
	Insufficient toe-in.	Adjust (Par. 107).
	Improper caster or twisted axle.	Correct or replace axle (Par. 186)
	Loose wheel or king pin bushings.	Adjust or replace.
Vehicle pulls to one side.	Tire pressures low or uneven.	Inflate (Par. 115).
	Tires not inflated evenly.	Inflate (Par. 115).
	Unequal caster or camber (bent axle).	Correct toe-in (Par. 107); or replace axle.
	Tight wheel bearing.	Adjust (Par. 106).
	Bent steering arm or connection.	Straighten or replace (Par. 192).

Section XIV – Engine

49. DESCRIPTION AND DATA:

a. Description:

The engine is a four cylinder valve-in-head type. The design includes replaceable precision type crankshaft, connecting rod bearings, and cylinder sleeves; variable speed fly-ball type governor, and pressure lubrication. The engine is equipped with air cleaner and fuel and oil filters.

b. Data:

Bore	3-1/4"
Stroke	3-3/4"
Cylinders	4
Cylinder (Type)	Wet Sleeve
Main Bearings	3
Displacement	124 Cu. In.
Full Load Speed	1800 R P.M.
Compression Pressure (Crank)	105 lbs.
Firing Order	1-3-4-2
Compression Ratio	6:1
Fuel	Gasoline

50. OIL FILTER ELEMENT AND ASSEMBLY:

a. Removal:

Remove the element (Figure 18) from the base by turning it counter-clockwise. Remove the valve plug, ring gasket, spring, and ball and clean with SOLVENT, dry cleaning.

b. Installation:

Reinstall ball, spring, and ring gasket, and secure with plug. Replace filter element.

51. OIL PRESSURE GAGE:

a. Removal:

Detach line from the oil gage elbow. Remove elbow from oil gage. Remove two nuts that secure gage to the instrument panel. Remove gage from face side of the instrument panel. Remove compression nut from gage line at engine block. Remove gage line and inspect for sediment.

b. Installation:

Position gage on instrument panel and secure with bolts and nuts. Reinstall elbow to gage. Reinstall line to gage elbow and engine block. Tighten compression nuts (Figure 19).

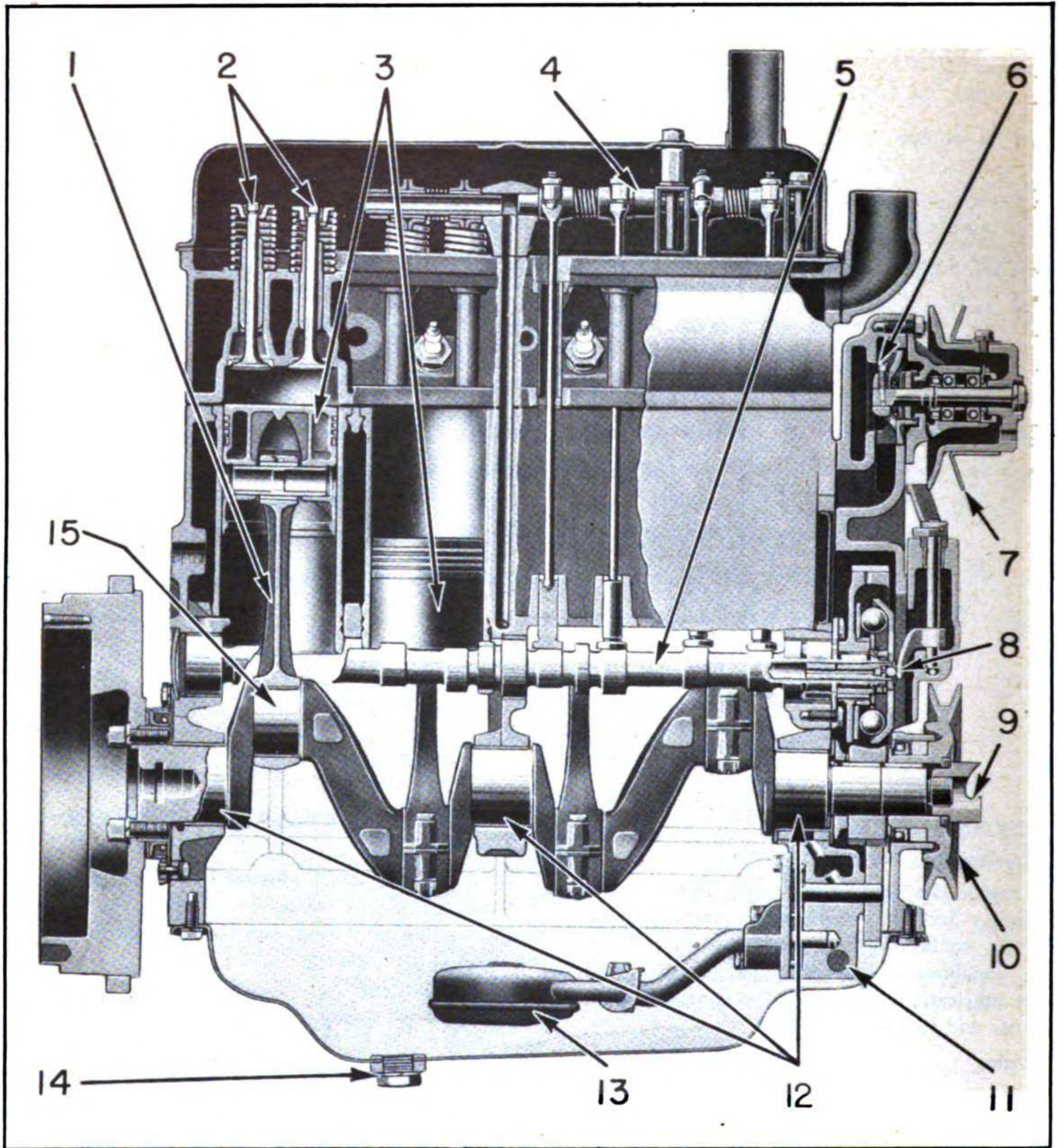


Figure 16 – Engine Cutaway

- | | |
|-------------------------|----------------------------------|
| 1. CONNECTING RODS | 9. CRANKSHAFT STARTING JAW |
| 2. VALVES | 10. CRANKSHAFT PULLEY |
| 3. PISTONS | 11. OIL PUMP |
| 4. ROCKER ARM MECHANISM | 12. CRANKSHAFT AND MAIN BEARINGS |
| 5. CAMSHAFT | 13. OIL PUMP FLOAT ASSEMBLY |
| 6. WATER PUMP | 14. DRAIN PLUG |
| 7. WATER PUMP PULLEY | 15. CONNECTING ROD BEARINGS |
| 8. GOVERNOR | |

Section XIV—Engine (Second Echelon)

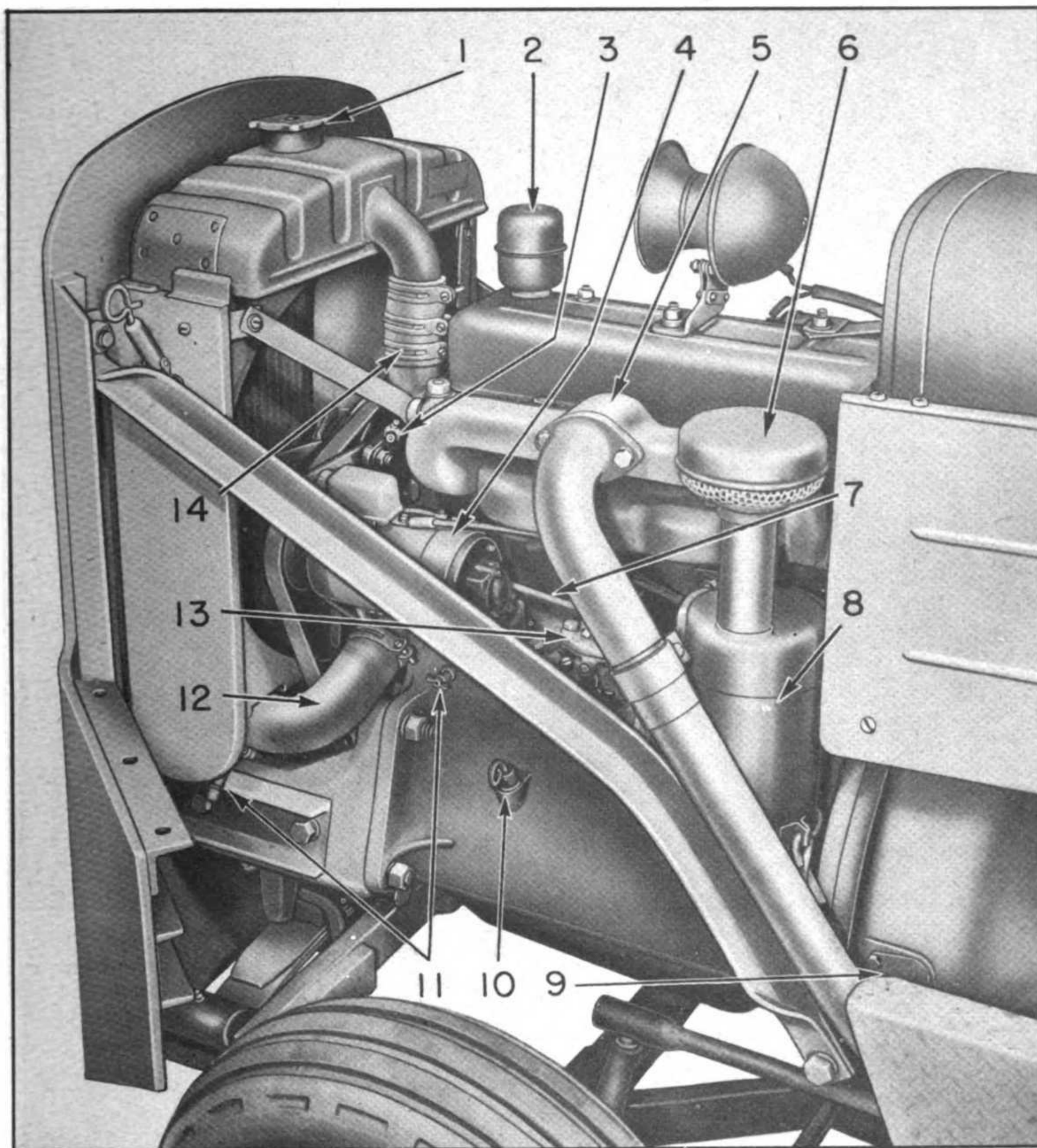


Figure 17 — Left Side of Engine

- | | |
|-----------------------------------|---------------------------|
| 1. RADIATOR CAP | 8. AIR CLEANER |
| 2. OIL FILLER AND BREATHER CAP | 9. TIMING HOLE COVER |
| 3. WATER PUMP LUBRICATION FITTING | 10. BAYONET GAGE |
| 4. GENERATOR | 11. WATER DRAINS |
| 5. MANIFOLD | 12. WATER PUMP INLET HOSE |
| 6. AIR CLEANER INLET CAP | 13. CARBURETOR |
| 7. GOVERNOR CONTROL THROTTLE ROD | 14. UPPER WATER HOSE |

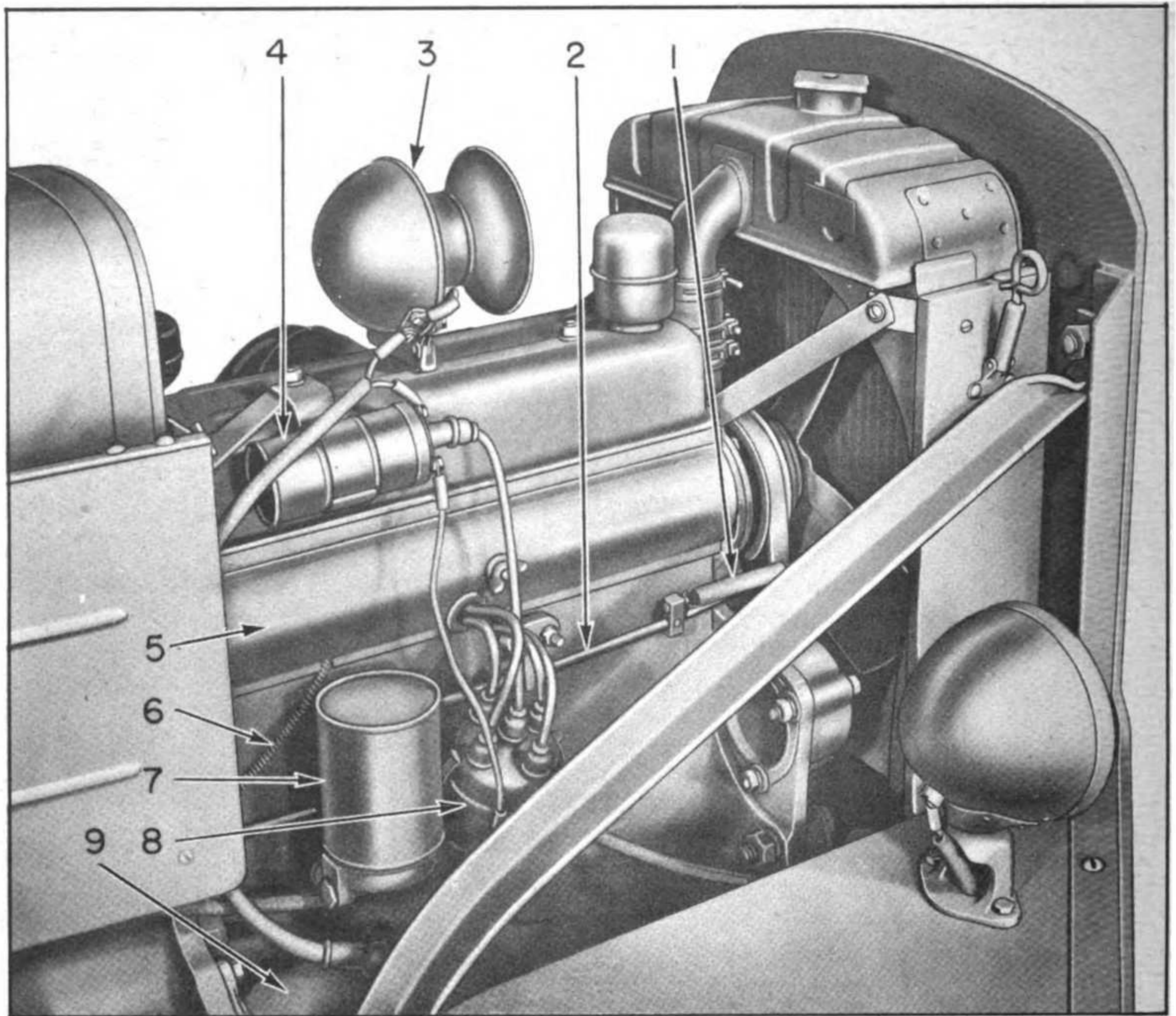


Figure 18 — Right Side of Engine

- | | |
|----------------------------|------------------------------------|
| 1. GOVERNOR CONTROL SPRING | 6. HEAT INDICATOR THERMO CONNECTOR |
| 2. GOVERNOR CONTROL ROD | 7. OIL FILTER |
| 3. HORN | 8. DISTRIBUTOR |
| 4. IGNITION COIL | 9. STARTING MOTOR |
| 5. SPARK PLUG COVER | |

Section XIV—Engine (Second Echelon)

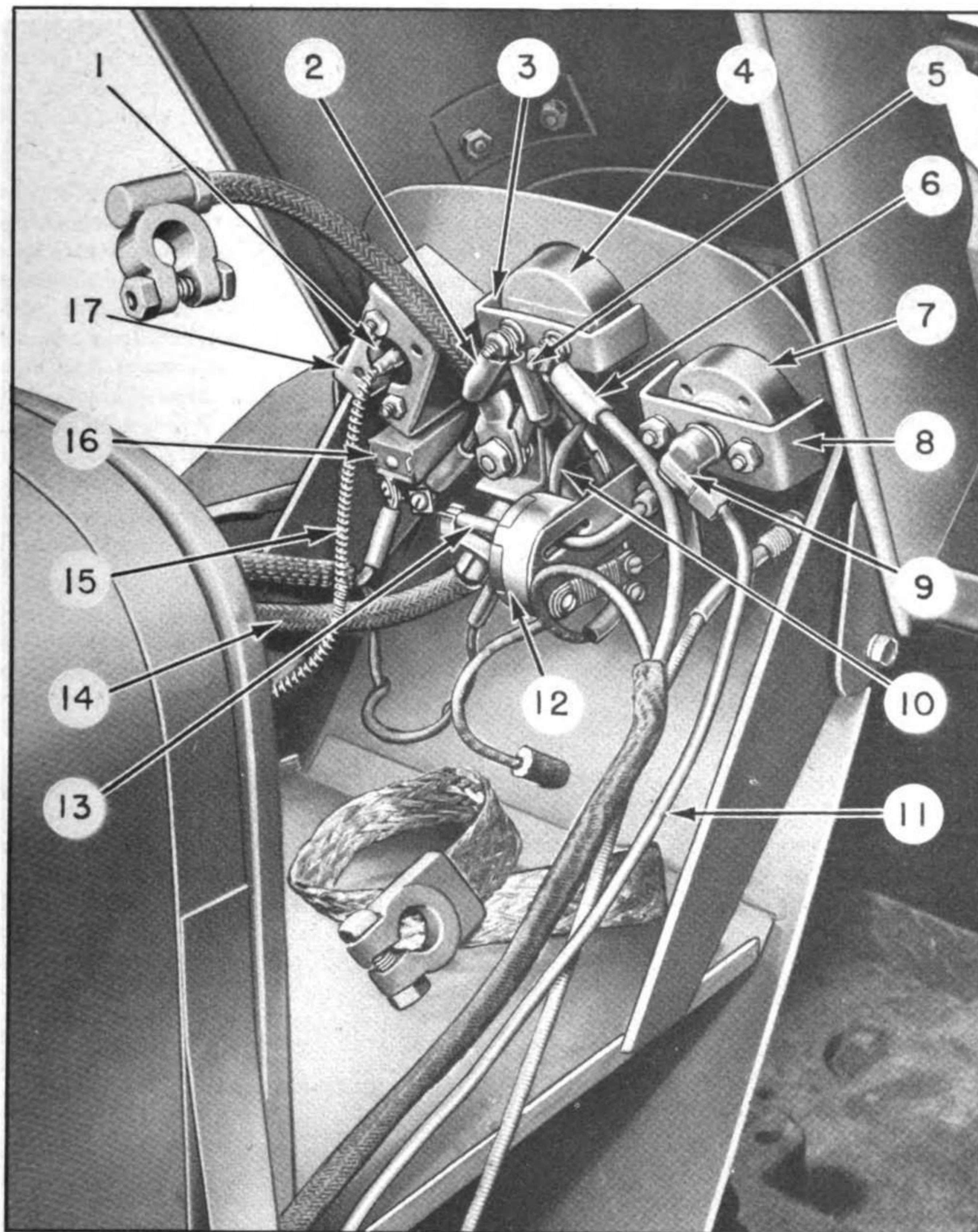


Figure 19 — Instrument Panel

- | | |
|------------------------------------|---|
| 1. TEMPERATURE GAGE | 10. AMMETER TO LIGHT SWITCH LEAD |
| 2. AMMETER TO IGNITION SWITCH LEAD | 11. OIL LINE |
| 3. AMMETER BRACKET | 12. LIGHT SWITCH |
| 4. AMMETER | 13. FUSE |
| 5. AMMETER TO STARTER SWITCH LEAD | 14. STARTER SWITCH TO STARTER MOTOR CABLE |
| 6. AMMETER TO GENERATOR LEAD | 15. THERMO BULB LEAD |
| 7. OIL GAGE | 16. IGNITION SWITCH |
| 8. OIL GAGE BRACKET | 17. TEMPERATURE GAGE BRACKET |
| 9. OIL GAGE ELBOW | |

52. OIL PAN ASSEMBLY:**a. Removal:**

Remove front axle assembly (Paragraph 187). Remove drain plug (Figure 16) and drain. Remove cap screws and lock washers. Remove oil pan and gasket.

b. Installation:

Clean oil pan. Inspect intake screen. Wash in SOLVENT, dry cleaning. Clean oil and dirt from facing surfaces of crankcase and oil pan. Inspect gasket, replace if necessary. Coat gasket and attaching surfaces with shellac; install gasket. Reinstall oil pan by inserting cap screws and lock washers loosely. Tighten screws; start in the center and work toward the ends. Reinstall front axle assembly (Paragraph 187).

53. CRANKCASE BREATHER CAP:**a. Removal and Service:**

The breather cap is located at the front of the valve cover. To remove, pull cap upward. To clean, wash in SOLVENT, dry cleaning.

b. Installation:

Place breather cap on pipe and push into position. *NOTE: Breather cap must be in place at all times when engine is in operation. A wood plug or other substitute is not suitable.*

54. INTAKE AND EXHAUST MANIFOLD AND GASKET:**a. Removal:**

Remove exhaust elbow (Paragraph 103) and air

cleaner inlet cap (Paragraph 64). Loosen clamps from air cleaner to carburetor. Remove two cap screws securing the carburetor to the manifold. Remove the seven nuts from the cylinder head studs and remove manifold from engine. Remove manifold gasket.

b. Installation:

Clean surfaces of cylinder head and manifold. Replace gasket and reinstall manifold with washers and nuts. Inspect carburetor gasket; replace if broken or frayed. Coat gasket with shellac and reinstall with carburetor to manifold. Secure retaining nuts and clamps. Reinstall air cleaner inlet cap (Paragraph 64) and exhaust elbow (Paragraph 103).

55. VALVE COVER AND GASKET:**a. Removal:**

Remove three nuts and washers and remove ignition coil, side panels, and spacers. Remove valve cover and gasket.

b. Installation:

Clean attaching surfaces of cylinder head and coat with shellac. Coat gasket with shellac and reinstall gasket and valve cover. Reinstall ignition coil, horn, side panels, and spacers. Secure nuts.

56. ROCKER ARM ASSEMBLY:**a. Removal:**

Remove valve cover and gasket (Paragraph 55) and rocker arm retaining cap screws from the cylinder head. Remove rocker arm assembly and

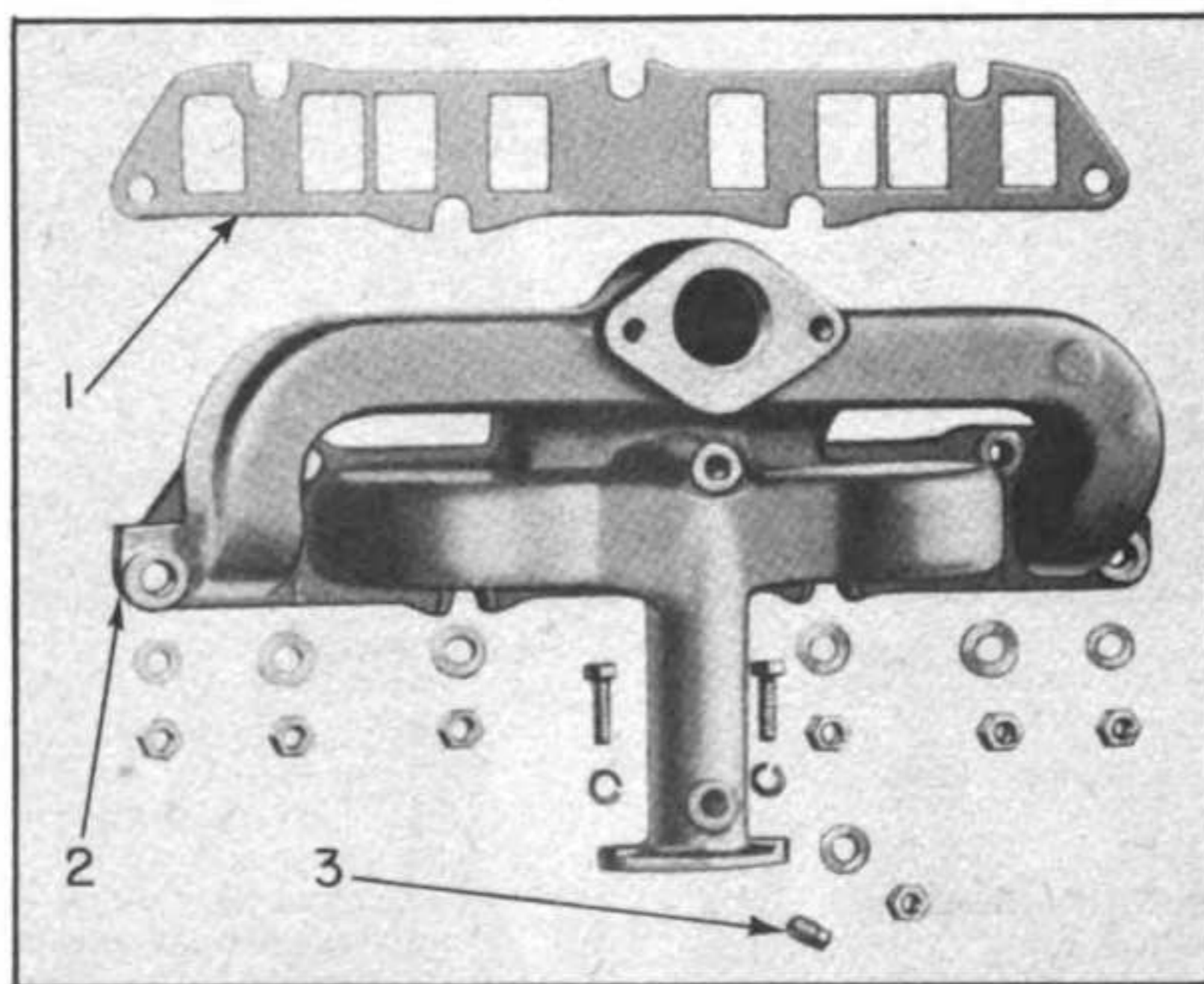


Figure 20 — Manifold and Gasket

1. GASKET
2. INTAKE AND EXHAUST MANIFOLD
3. PLUG

Section XIV—Engine (Second Echelon)

disassemble. Remove each spring, spacer, and rocker arm from the shaft, keeping the parts in proper sequence to facilitate reassembly.

b. Installation:

Wash parts in SOLVENT, dry cleaning. Replace damaged, bent, or misaligned rocker arms. Install each rocker arm, bushing, and spring on the shaft in its proper sequence, and reinstall both ends of rocker arm shafts securely in the valve rocker arm bracket. Oil holes must be clean and alined to face toward the valve springs. Position rocker arm assembly (Figure 23). Aline holes and reinstall cap screws and washers. (Lock washer must be reinstalled on center cap screw.) Tighten securely. Adjust valves (Paragraph 58). Clean surface of cylinder head. Reinstall valve cover and gasket (Paragraph 55).

57. CYLINDER HEAD AND GASKET:

a. Removal:

Remove the drain plugs (Figure 17), and drain the water. Reinstall drain plugs. If anti-freeze is being used, save for re-use. Disconnect the upper water elbow by removing the two attaching cap screws. Disconnect the spark plug wires from the plugs and remove spark plugs (Paragraph 89). Disconnect heat indicator thermo bulb. Remove valve cover and attaching parts (Paragraph 55). Remove rocker arm assembly (Paragraph 56). Disconnect carburetor and exhaust elbow from manifold. Remove stud nuts and washers (fourteen nuts hold head to the block), and remove push rods before removing head. Remove the head assembly. Grasp under the manifold and under the top flange on the spark plug side (Figure 21). If head sticks, tap lightly around the edges with a lead or rawhide mallet. Do not pry with a sharp tool.



Figure 21 — Removing Cylinder Head

b. Installation:

Inspect gaskets and replace as required. Clean facing surfaces of cylinder head and block. Coat cylinder head gasket with shellac and reinstall. Reinstall cylinder head assembly and secure with nuts, using a torque wrench pressure of 45 lbs. Reinstall push rods, rocker arm assembly (Paragraph 56), and valve cover and attaching parts (Paragraph 55). Connect carburetor and exhaust elbow to manifold. Reinstall spark plugs and connect plug wires. Connect heat indicator thermo bulb to engine. Connect upper water elbow and fill cooling system.

58. VALVE SPRINGS AND VALVES:

a. Valve Spring Data:

Free length.....	2 ³ / ₈ "
Compressed length	1-11/32"
Pressure at compressed height of	
1.521 inch (valve open).....	114 lbs.
Pressure at compressed height of	
1 ⁷ / ₈ " (valve closed).....	56 lbs.

b. Removal:

Remove valve cover (Paragraph 55), rocker arm assembly (Paragraph 56), and cylinder head assembly (Paragraph 57). Place cylinder head on its side and, with the use of a valve lifter, depress each spring until the valve stem retainer locks can be removed. Remove valve stem retainers and springs. Remove each valve through the reverse side of the cylinder head (Figure 22).

c. Installation:

Inspect guides to see that they are clean. Coat the stem of the valve with OIL, engine, SAE 10 before reinstalling in valve stem guides. Coat valve head with Prussian Blue and bring valve in contact with seat to ascertain the presence of low spots. Re-seat valve and cylinder head seats by lapping with grinding compound. Repeat this process until all low spots are removed. Clean grinding compound

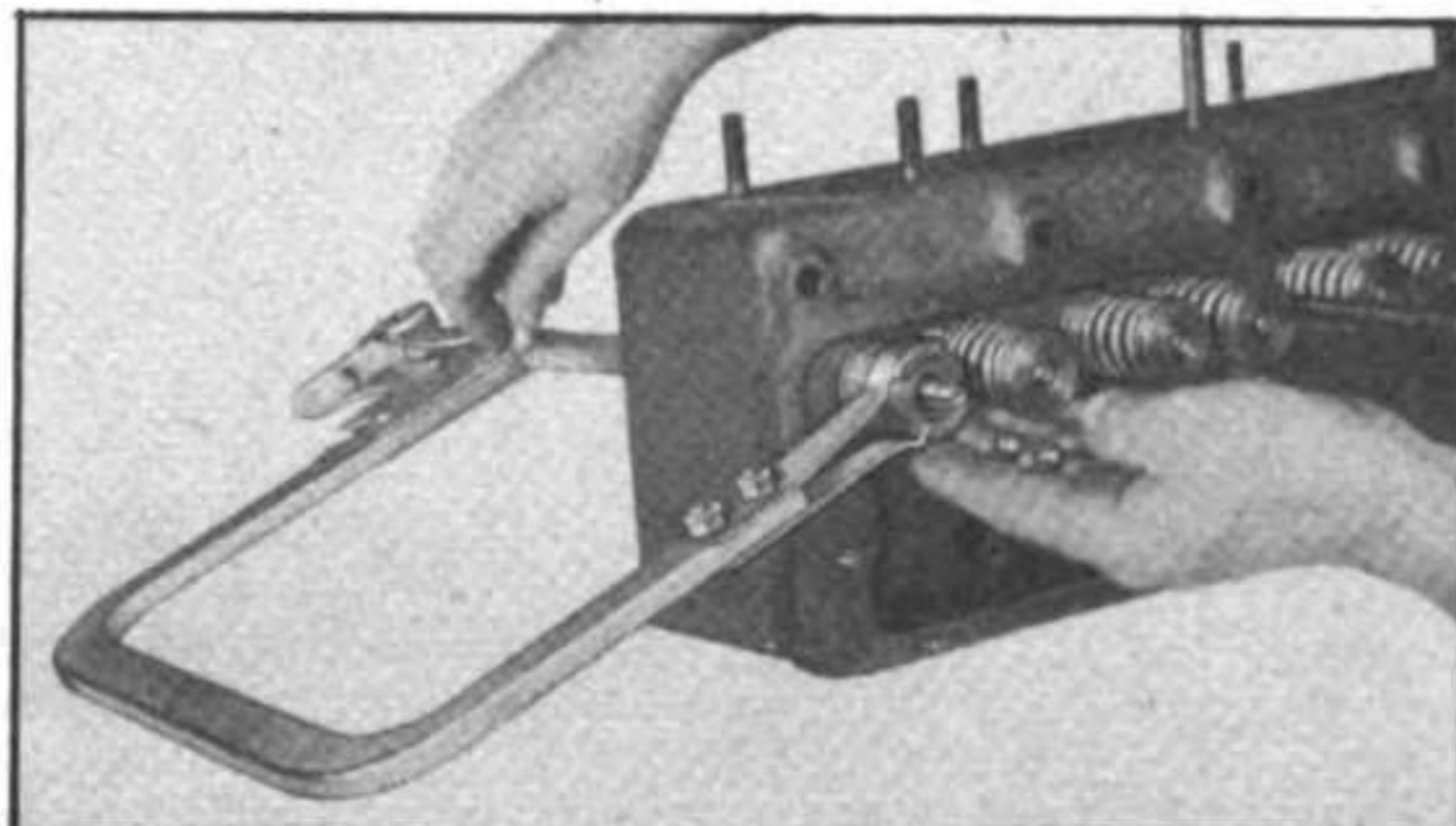


Figure 22 — Removing Valve Spring Retainers

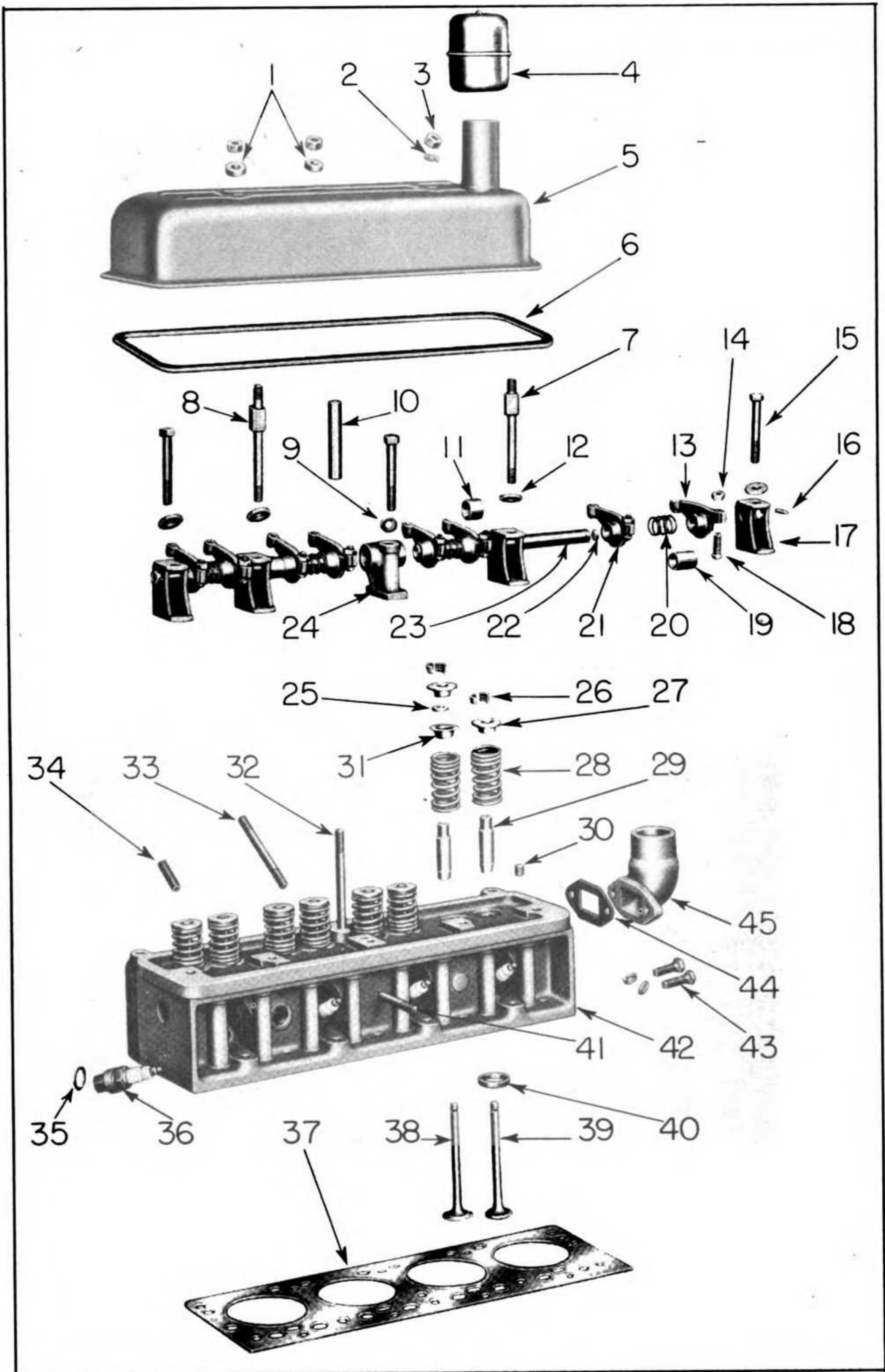


Figure 23 - Cylinder Head and Attaching Parts

Section XIV—Engine (Second Echelon)

from valves and cylinder head. Reinstall springs. Reinstall valve stem retainers. With the use of a valve lifter, depress springs until valve stem is through far enough to insert retainer locks. Reinstall cylinder head assembly (Paragraph 57) and rocker arm assembly (Paragraph 56).

d. Valve Adjustment:

After cylinder head and rocker arm assembly have been reinstalled, inspect clearance between the rocker arm and valve stem. Crank the engine slowly until each rocker arm has cleared the valve stem to the maximum clearance. With each rocker arm in position, insert a feeler gage between the rocker arm and valve stem. Clearance must be .012 inch when engine is cold. Loosen lock nut and turn adjusting screw until proper clearance has been obtained (Figure 24). Tighten lock nut and reinspect for proper clearance. Reinstall valve cover, gasket and attaching parts (Paragraph 55).

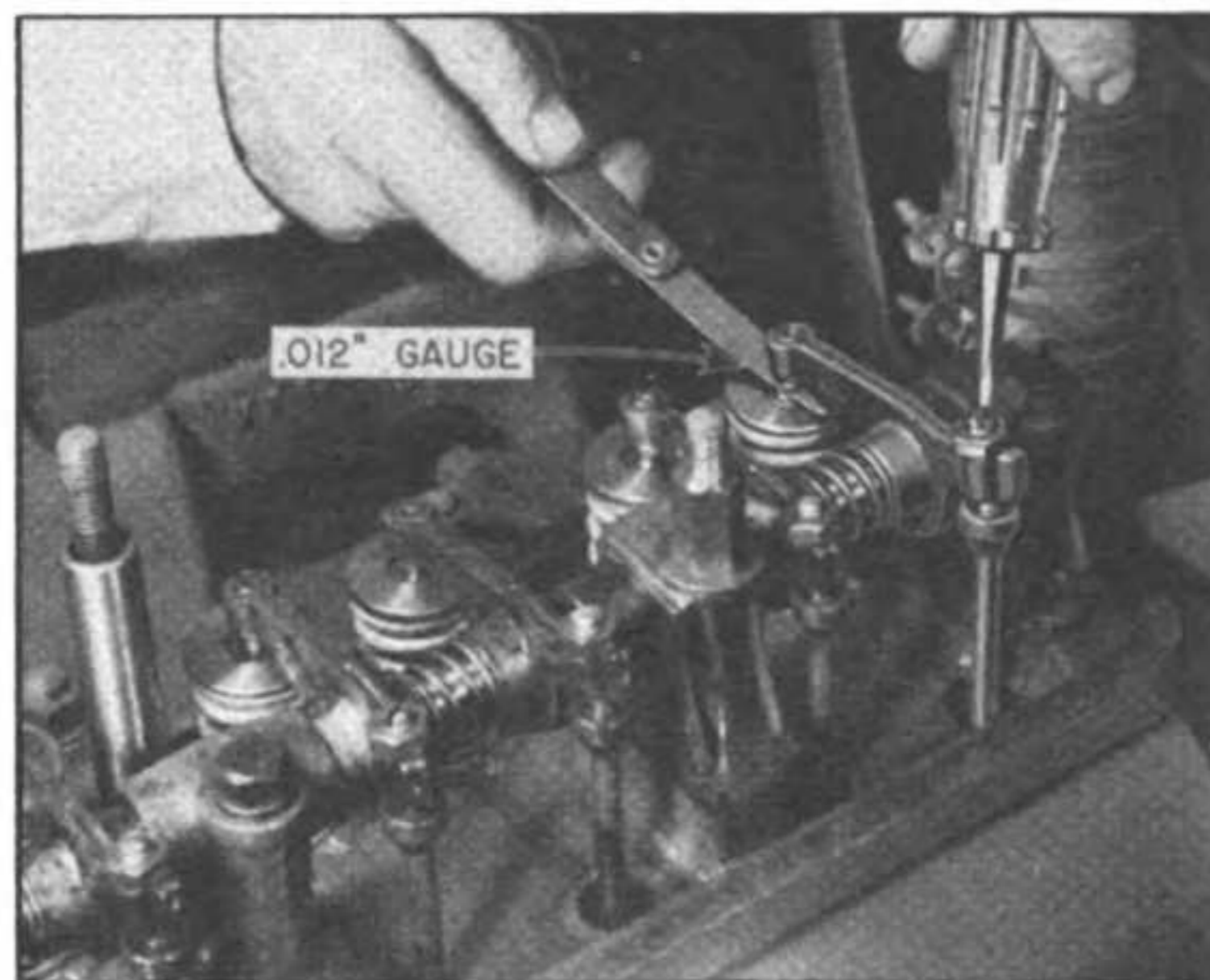


Figure 24 — Setting Valve Clearance with Aid of Feeler Gauge

59. CRANKSHAFT AND GENERATOR PULLEYS:**a. Crankshaft Pulley:**

(1) Removal: Remove bumper-grille (Paragraph 131), radiator (Paragraph 75), and drive belt (Paragraph 72). Place transmission in gear to prevent engine from rotating. Remove crankshaft starting jaw (Figure 16) from the end of the crankshaft and remove crankshaft pulley, using a puller.

(2) Installation: Reinstall pulley, keeping keyway in line with the key on the shaft far enough to permit installation of the starting jaw collar. Secure pulley by tightening starting jaw against it. Reinstall drive belt (Paragraph 72), radiator (Paragraph 75), and bumper-grille (Paragraph 131).

b. Generator Pulley:

(1) Removal: Remove generator (Paragraph 80). Remove retaining nut from shaft and remove pulley from generator.

(2) Installation: Reinstall pulley on generator shaft and secure with nut. Reinstall generator on vehicle (Paragraph 80). Adjust drive belt (Paragraph 72).

60. FLOAT-ASSEMBLY:**a. Removal:**

Drain oil from engine. Remove front axle assembly (Paragraph 187). Remove oil pan and gasket (Paragraph 52). Remove cotter pin attaching float-assembly to oil pump suction pipe. Remove float-assembly.

b. Installation:

Clean float-assembly in SOLVENT, dry cleaning, and inspect. If damaged, replace. Position assembly on suction pipe and secure with new cotter pin. Reinstall front axle assembly (Paragraph 187). Reinstall oil pan and gasket (Paragraph 52).

Figure 23 — Cylinder Head and Attaching Parts

- | | | |
|--------------------------------|---|-------------------------------|
| 1. SPACER | 16. TAPER PIN | 31. VALVE STEM GASKET |
| 2. PLAIN WASHER 3/8" | 17. VALVE ROCKER ARM SHAFT BRACKET | 32. STUD 3/8 x 5" |
| 3. HEX. NUT 3/8" | 18. ROCKER ARM ADJUSTING SCREW | 33. STUD 3/8 x 4-5/8" |
| 4. OIL FILLER CAP | 19. ROCKER ARM BUSHING | 34. STUD 3/8 x 1-3/4" |
| 5. CYLINDER HEAD COVER | 20. VALVE ROCKER ARM SHAFT SPRING | 35. SPARK PLUG GASKET |
| 6. VALVE COVER GASKET | 21. L.H. ROCKER ARM ASSEMBLY | 36. SPARK PLUG |
| 7. STUD | 22. ROCKER ARM PLUG | 37. CYLINDER HEAD GASKET |
| 8. STUD 3/8 x 4-3/4" | 23. ROCKER ARM SHAFT | 38. INTAKE VALVE |
| 9. LOCK WASHER 3/8" | 24. VALVE ROCKER ARM SHAFT CENTER BRACKET | 39. EXHAUST VALVE |
| 10. CYLINDER HEAD COVER SPACER | 25. INTAKE VALVE STEM GASKET | 40. VALVE SEAT INSERT |
| 11. VALVE ROCKER ARM SPACER | 26. VALVE SPRING RETAINER LOCK | 41. SPARK PLUG COVER STUD |
| 12. WASHER | 27. VALVE SPRING RETAINER | 42. CYLINDER HEAD |
| 13. R.H. ROCKER ARM ASSEMBLY | 28. VALVE SPRING | 43. BOLT 3/8 x 1-1/4" |
| 14. HEX. JAM NUT 5/16" | 29. VALVE STEM GUIDE | 44. WATER OUTLET ELBOW GASKET |
| 15. HEX. HD. BOLT 3/8 x 2-3/4" | 30. SLOTTED PIPE PLUG 1/8" | 45. WATER OUTLET ELBOW |

Section XV - Clutch

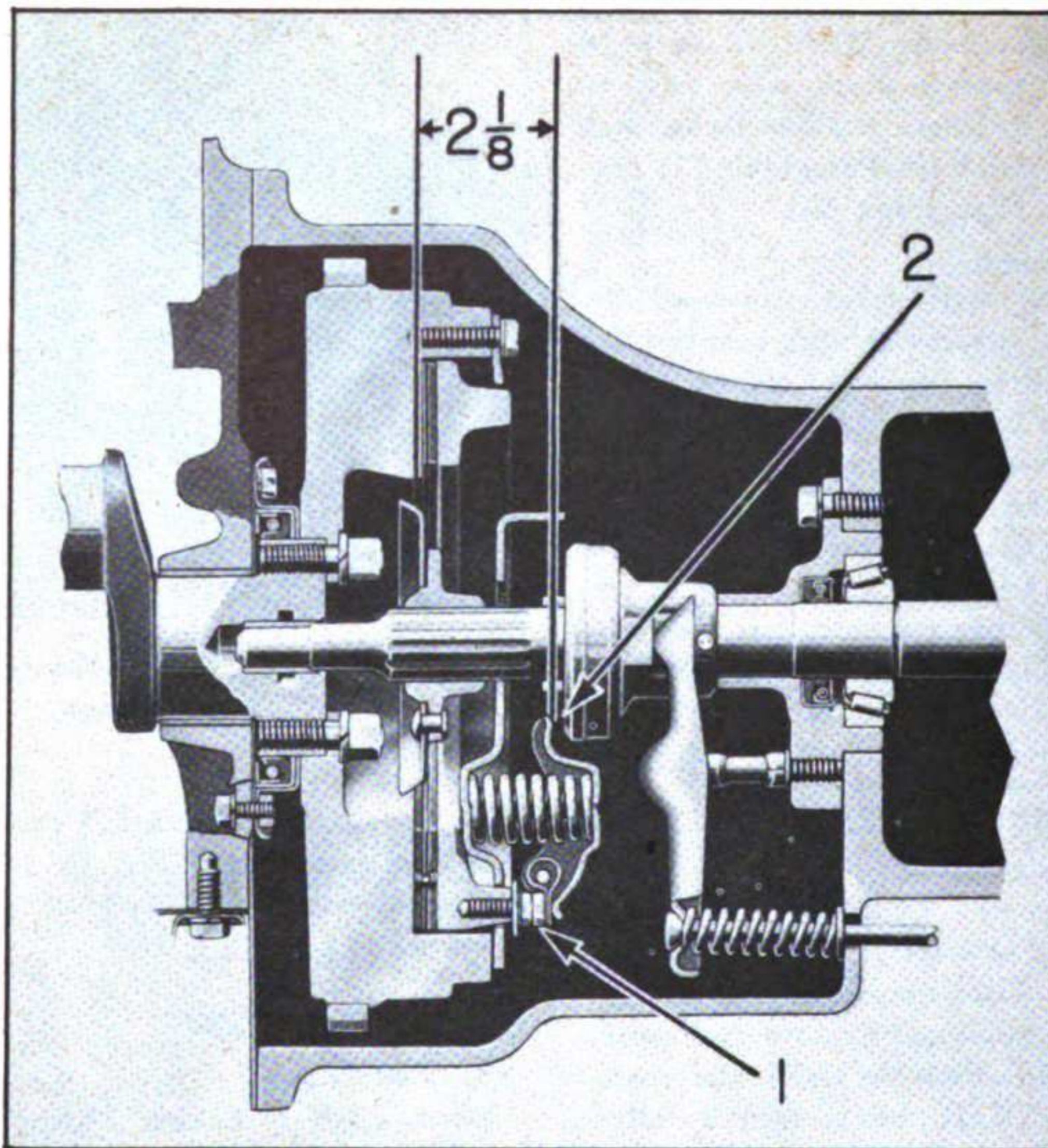


Figure 25 - Clutch Cutaway

1. THROW-OUT LEVER ADJUSTING SCREW
2. CLEARANCE (1/8 to 3/16")

61. DESCRIPTION AND DATA:

a. Description:

The clutch is the spring loaded, dry disk, single plate type. It is foot operated. The throw-out bearing is the ball thrust type. The pilot bearing is the oil impregnated bronze type.

b. Data:

Size 9" Dia.
Pressure at Disk 1110 lbs.

c. Service:

Clearance between clutch release bearing and clutch release lever must be 1/8 to 3/16". To maintain this clearance, the clutch foot pedal free travel must be approximately 1-1/2" before clutch begins to disengage. Adjust length of the clutch rod between the foot pedal and throw-out bearing lever by loosening the lock nut, and adjusting yoke (Figure 26).

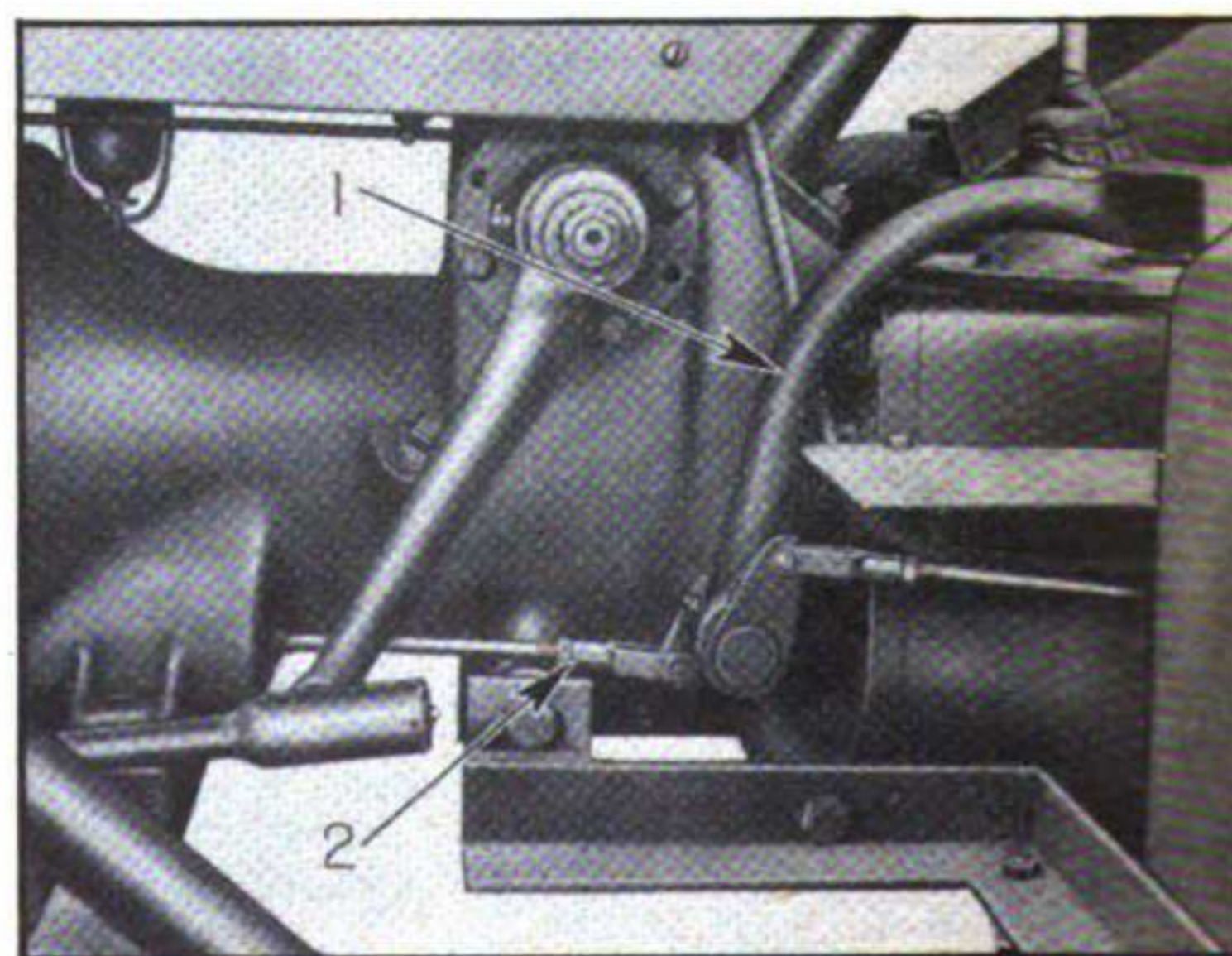


Figure 26 - Clutch Rod Adjustment

1. CLUTCH PEDAL
2. CLUTCH ROD ADJUSTING YOKE

Section XVI - Fuel System

62. DESCRIPTION AND DATA:

a. Description:

The fuel system is gravity flow. It consists of a fuel tank, safety type filler cap unit, fuel line, sediment bowl, carburetor, and air cleaner.

b. Data:

CarburetorSingle 7/8" Venturi Updraft
Air CleanerSingle Baffle Oil Bath
Fuel Tank Capacity . 9-1/4 Gallons
Fuel Line5/16" Dead Soft Copper
Connections (Couplings, Unions) ...Brass, Compression Type

63. CARBURETOR:

a. Description:

The carburetor is the venturi updraft type, with a throttle operated butterfly valve.

b. Adjustment:

- (1) Power Needle Adjustment: While vehicle is under full load, turn the needle clockwise until engine begins to lope. Then turn needle back approximately one-half turn or until engine operates smoothly. See Figure 28 for location of needle.
- (2) Idle Adjusting Needle: Adjustment must be made when the engine is warm. Tighten screw and start engine. While engine is operating, turn screw counter-clockwise until engine runs smoothly. See Figure 28 for location of needle.
- (3) Idle Stop Screw Adjustment: The idle stop screw adjustment is located behind the intake manifold and secured to the throttle shaft on the side of the carburetor nearest the engine. While the engine is warm, turn screw clockwise until the desired engine idling speed is obtained.

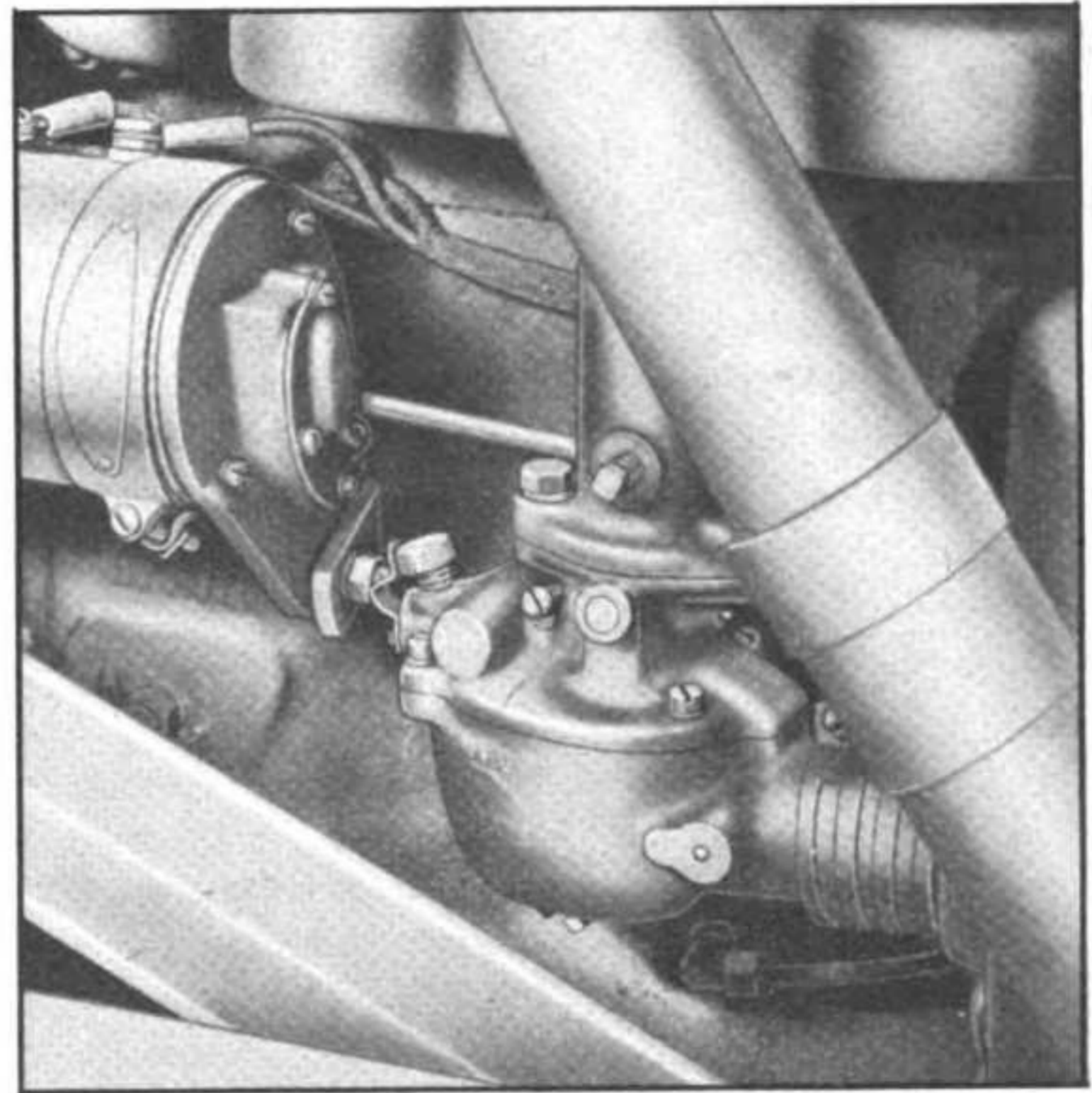


Figure 27 - Carburetor

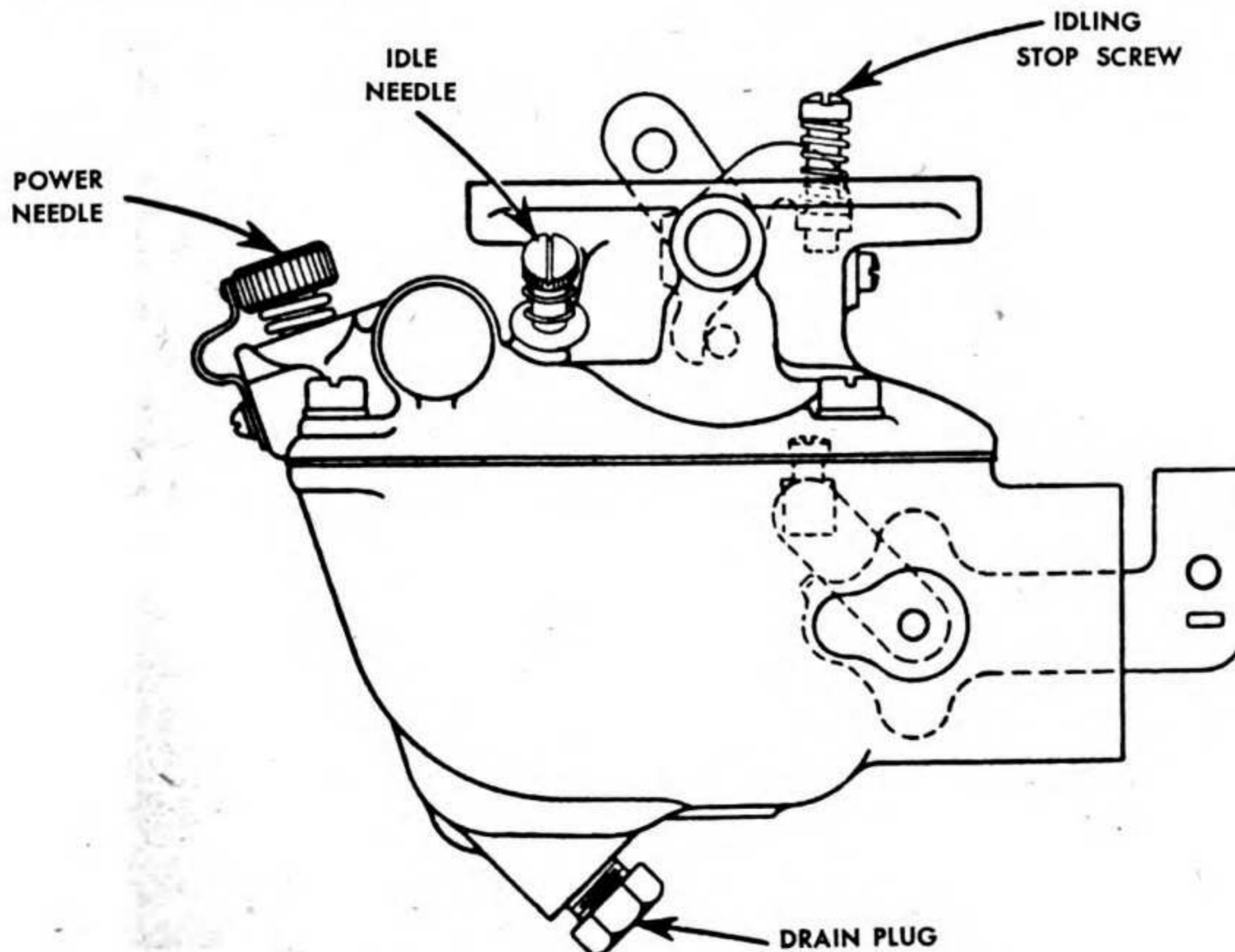


Figure 28 - Carburetor Adjustments

c. Removal:

Shut off fuel by closing the fuel strainer valve. Loosen the hose clamp leading to the air cleaner, disconnect fuel line, and remove the two bolts on the intake manifold. Remove cotter pin from the throttle rod. Detach carburetor and remove the screws securing the choke wire. Remove carburetor.

d. Installation:

Inspect gasket between carburetor and manifold and replace as required. Connect choke wire to carburetor. Install carburetor on manifold. Connect throttle rod to throttle shaft. Tighten hose clamps and connect fuel line. Adjust carburetor (Sub-Paragraph "b" above).

64. AIR CLEANER:**a. Description:**

The oil bath type air cleaner is mounted on the left side of the engine and is connected to the air horn of the carburetor (Figure 17).

b. Removal of Oil Cup:

Hold one hand under cup and loosen the two retaining clamps. Remove cup and chamber (Figure 29). Wash with SOLVENT, dry cleaning, and fill as directed in LUBRICATION ORDER (Figure 12).



Figure 29 — Removing Air Cleaner Oil Cup

1. AIR CLEANER CHAMBER
2. AIR CLEANER CUP

c. Installation of Oil Cup:

Position cup and chamber on bottom of cleaner; push into place, and lock with retaining clamps.

d. Removal and Service of Inlet Cap:

Loosen nut and bolt and remove cap. Wash with SOLVENT, dry cleaning.

e. Installation of Inlet Cap:

Position cap on air cleaner and secure with nut and bolt.

f. Removal of Air Cleaner:

Remove left hand bumper side brace from vehicle. Remove exhaust elbow (Paragraph 103) and exhaust pipe (Paragraph 102). Loosen hose clamps connecting air cleaner to inlet horn of carburetor. Remove nuts from studs securing air cleaner to engine block and remove air cleaner.

g. Installation of Air Cleaner:

Position air cleaner and secure to engine block with nuts and studs. Connect to inlet horn of carburetor and tighten hose clamps. Reinstall exhaust pipe (Paragraph 102) and exhaust elbow (Paragraph 103). Reinstall left bumper side brace.

65. SEDIMENT BOWL AND STRAINER:**a. Removal and Service:**

Close fuel strainer valve, loosen fuel strainer cup and nut, and pull fuel strainer bail assembly to one side. Remove fuel strainer bowl and gasket. Remove strainer screen from fuel strainer head and wash in SOLVENT, dry cleaning. Dry with clean, dry compressed air. Clean bowl with SOLVENT, dry cleaning.

b. Installation:

Reinstall screen in fuel strainer head. Replace fuel strainer gasket in the head channel. Place the bowl face against the gasket and pull bail directly to the center. Tighten the fuel strainer cup and nut. Be sure the gasket is firmly in place and the bowl is flush with the gasket. Open the fuel strainer valve and inspect assembly for leaks.

66. FUEL LINE:**a. Removal and Service:**

Close the fuel strainer valve. Loosen hex nuts from ends of fuel line and remove fuel line from fuel strainer head and carburetor. Wash in SOLVENT, dry cleaning, and blow out with clean, dry compressed air.

b. Installation:

Connect fuel line to carburetor and fuel strainer head. Tighten nuts and open fuel strainer valve.

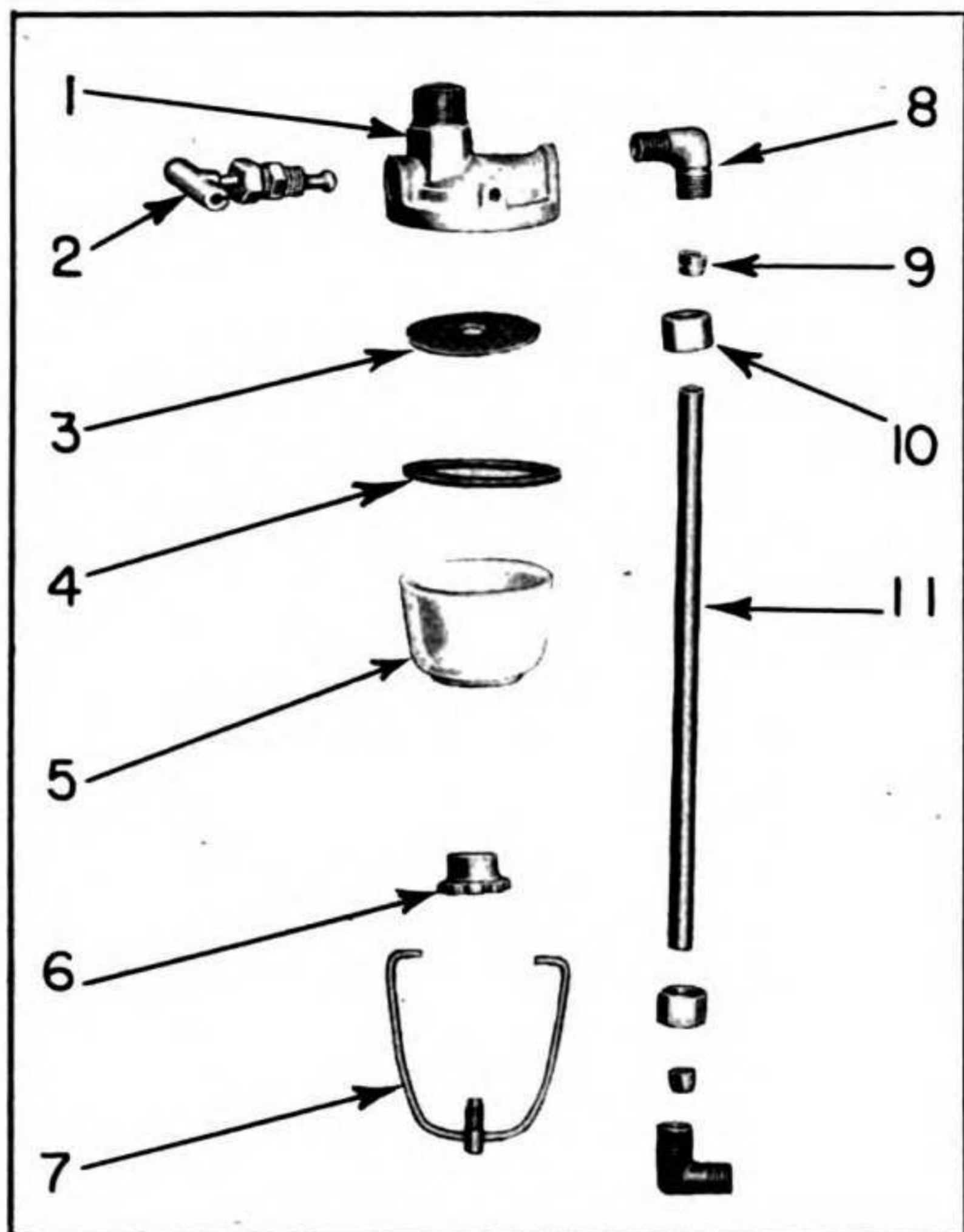


Figure 30 — Fuel Strainer Bowl and Attaching Parts

1. FUEL STRAINER HEAD
2. FUEL STRAINER VALVE
3. FUEL STRAINER SCREEN
4. FUEL STRAINER GASKET
5. FUEL STRAINER BOWL
6. FUEL STRAINER CUP AND NUT
7. FUEL STRAINER BAIL
8. COMPRESSION COUPLING ELBOW
9. COMPRESSION COUPLING SLEEVE
10. COMPRESSION COUPLING NUT
11. FUEL LINE

67. FUEL TANK AND FILLER CAP:

a. Description:

The fuel tank is located under the hood at the rear of the engine. Attached to the tank cap is a strainer unit extending into the tank (Figure 31).

b. Removal of Strainer Unit:

Raise hood. Turn cap unit counter-clockwise until loosened. Remove complete unit from tank.

c. Installation of Strainer Unit:

Before reinstalling, blow out sediment with clean, dry compressed air and inspect leather seal, washer, and cap. If frayed or damaged, replace. Position unit in tank and turn clockwise until secure.

d. Removal of Fuel Tank:

Close the fuel strainer valve. Remove the hood side panels (Paragraph 128). Remove the fuel line from the fuel strainer head. Remove nuts and lock washers from front and rear fuel tank straps. Remove tank. Remove fuel strainer head assembly from tank and drain. Clean tank.

e. Installation of Fuel Tank:

Reinstall the fuel strainer head assembly. Position tank and secure with front and rear straps. Connect

fuel line to fuel strainer head and open fuel strainer valve. Reinstall hood side panels (Paragraph 128). Fill tank.

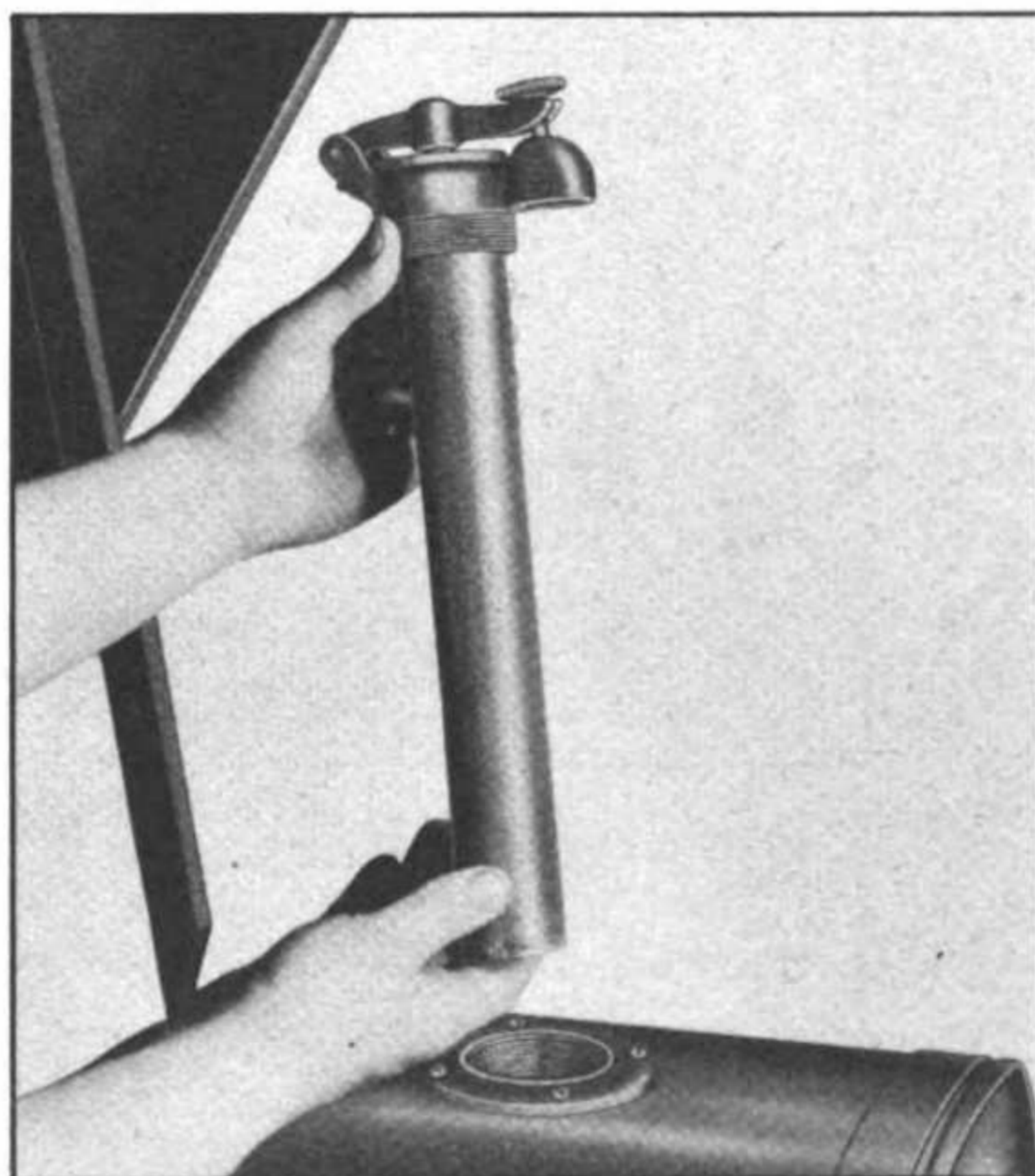


Figure 31 — Fuel Strainer Unit

68. GOVERNOR:

a. Description:

The centrifugal, self-energized, flyball type governor is located in the engine housing front cover. It rotates with the camshaft. It rotates with the camshaft.

b. Removal:

Remove bumper-grille (Paragraph 131), radiator (Paragraph 75), drive belt (Paragraph 72), and crankshaft pulley (Paragraph 59). Disconnect the governor control rod and spring from the right side and disconnect the throttle rod from the left side of the governor control lever assembly. Remove the nuts (seven) and lock washers securing the governor inspection cover; remove the cover. Remove the upper race shaft assembly and balls. Re-

move the nut, washer and governor ball driver from the shaft, and remove the lower race assembly.

c. Installation:

Inspect the oil hole in the camshaft to see that it is clean. Inspect the governor rocker arm and replace if the throw-seat is pitted or worn. Reinstall the lower race assembly, governor ball driver, plain washer, and nut. The balls can be retained in the driver assembly for reinstallation by packing them with grease. Reinstall the upper race over the balls and hold in place until the governor inspection cover is positioned. Secure cover with lock washers and nuts. Reinstall the crankshaft pulley (Paragraph 59), drive belt (Paragraph 72), and governor control linkage. Reinstall the radiator (Paragraph 75) and bumper-grille (Paragraph 131).

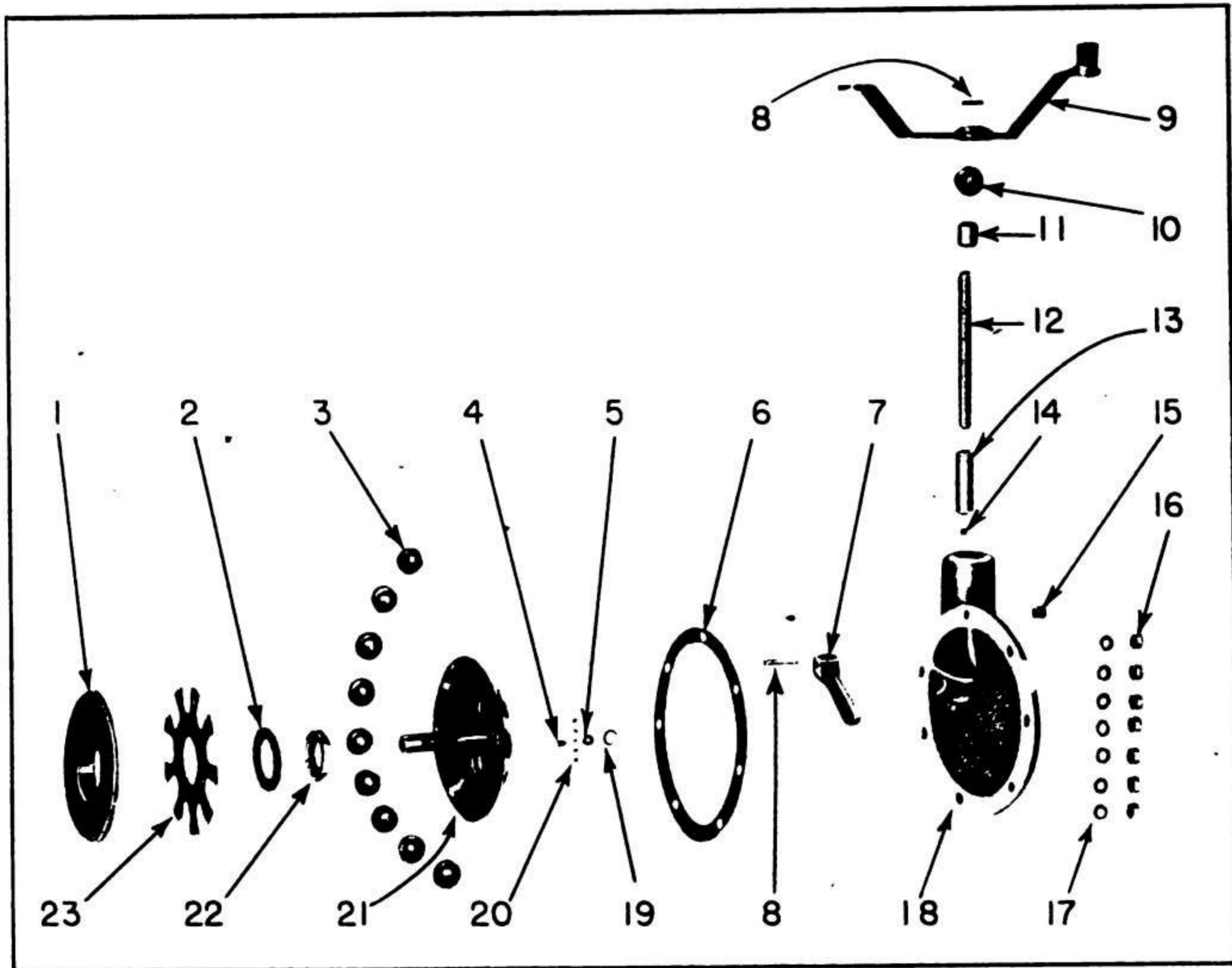


Figure 32 – Governor

- | | |
|-----------------------------------|---------------------------------------|
| 1. LOWER RACE ASSEMBLY | 13. GOVERNOR ROCKER ARM THRUST SPACER |
| 2. PLAIN WASHER | 14. BALL |
| 3. BALL | 15. SLOTTED PIPE PLUG |
| 4. PIN | 16. 1/4" HEX. NUT |
| 5. BALL | 17. 1/4" LOCK WASHER |
| 6. GASKET | 18. GOVERNOR INSPECTION COVER |
| 7. GOVERNOR ROCKER ARM | 19. RETAINER RING |
| 8. TAPER PIN | 20. BALL |
| 9. GOVERNOR CONTROL LEVER | 21. UPPER RACE AND SHAFT ASSEMBLY |
| 10. GOVERNOR SHAFT FELT DUST SEAL | 22. NUT |
| 11. GOVERNOR ROCKER SHAFT BEARING | 23. GOVERNOR BALL DRIVER |
| 12. GOVERNOR ROCKER SHAFT | |

Section XVII - Cooling System

69. DESCRIPTION AND DATA:

a. Description:

The cooling system is thermostatically controlled. The two-bearing impeller type water pump insures proper circulation of the coolant. The system consists of the radiator, filler pipe and cap, hoses, fan, drive belt, water pump, thermostat, and temperature gage. The filler pipe is located at the top of the radiator (Figure 17). There are two water drains; one in the radiator inlet at the lower left

of the radiator, and one at the left side of the cylinder block (Figure 17).

b. Data:

Cooling System Capacity 13 Quarts
 Radiator Fin and Tube Type
 Water Pump Centrifugal Type
 Drive Belt
 Bearings Ball Type
 Drive Belt "V" Type
 Blades 4
 Diameter of Blades 16"

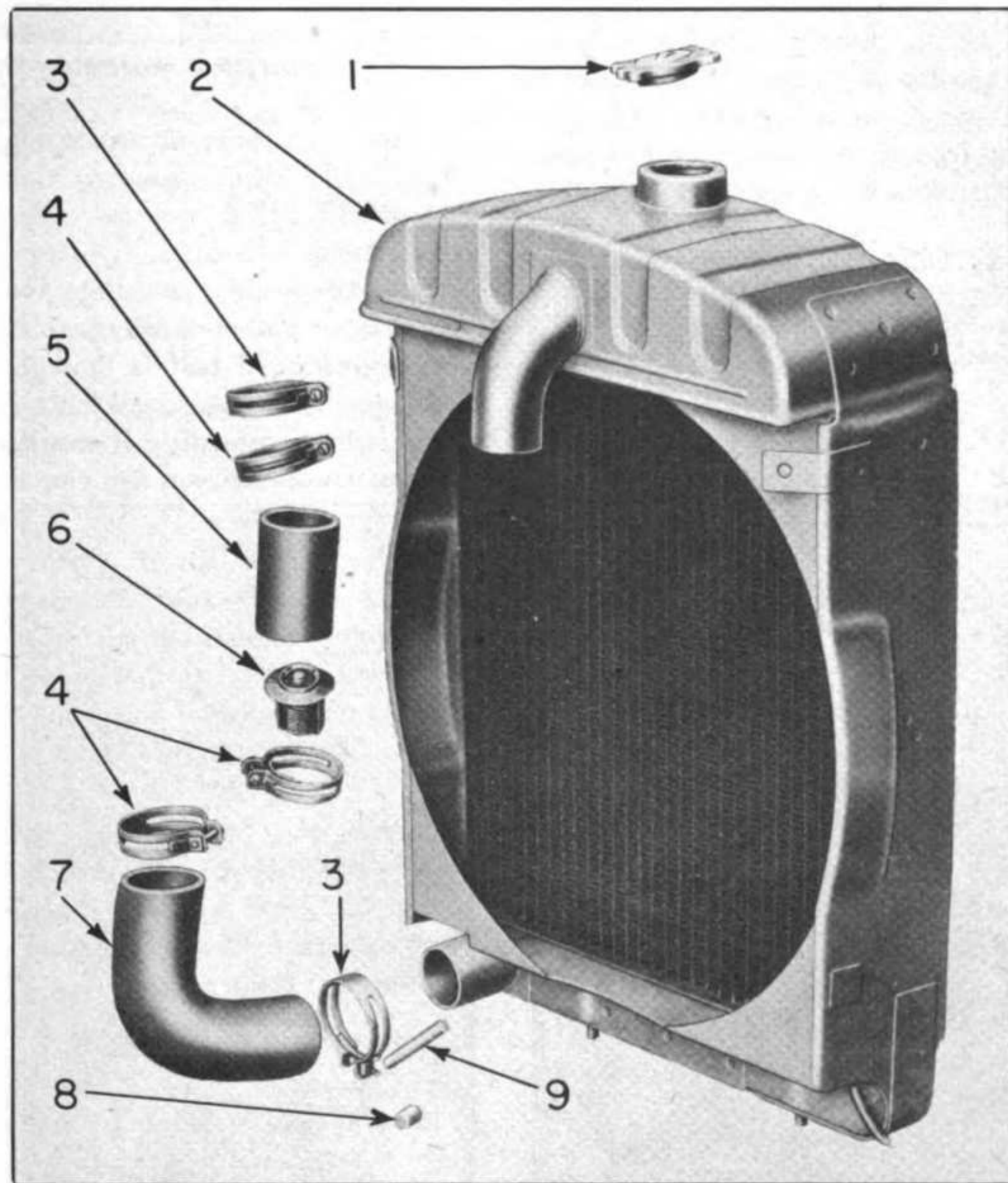


Figure 33 - Radiator and Connections

- | | |
|------------------------|--------------------------|
| 1. RADIATOR CAP | 6. THERMOSTAT |
| 2. RADIATOR | 7. WATER PUMP INLET HOSE |
| 3. #13 HOSE CLAMP | 8. PIPE CAP |
| 4. #12 HOSE CLAMP | 9. PIPE |
| 5. UPPER RADIATOR HOSE | |

70. WATER PUMP:

a. Removal:

Remove bumper-grille (Paragraph 131), radiator (Paragraph 75); and drive belt (Paragraph 72). Remove bolt and nuts from studs attaching flange of water pump housing to engine and remove water pump (Figure 34). Remove pulley and fan from water pump.

b. Installation:

Reinstall pulley and fan to water pump. Reinstall water pump and secure with bolt, nuts, and studs. Reinstall drive belt (Paragraph 72), radiator (Paragraph 75), and bumper-grille (Paragraph 131).

71. WATER PUMP AND FAN PULLEY:

a. Removal:

Remove bumper-grille (Paragraph 131), radiator (Paragraph 75), and drive belt (Paragraph 72). Remove four bolts from fan and remove fan from pulley. Remove nut from shaft and remove pulley using a puller.

b. Installation:

Reinstall pulley, keeping keyway aligned with the key on the shaft; secure with nut. Reinstall fan and secure with four bolts. Reinstall drive belt (Paragraph 72), radiator (Paragraph 75), and bumper-grille (Paragraph 131).

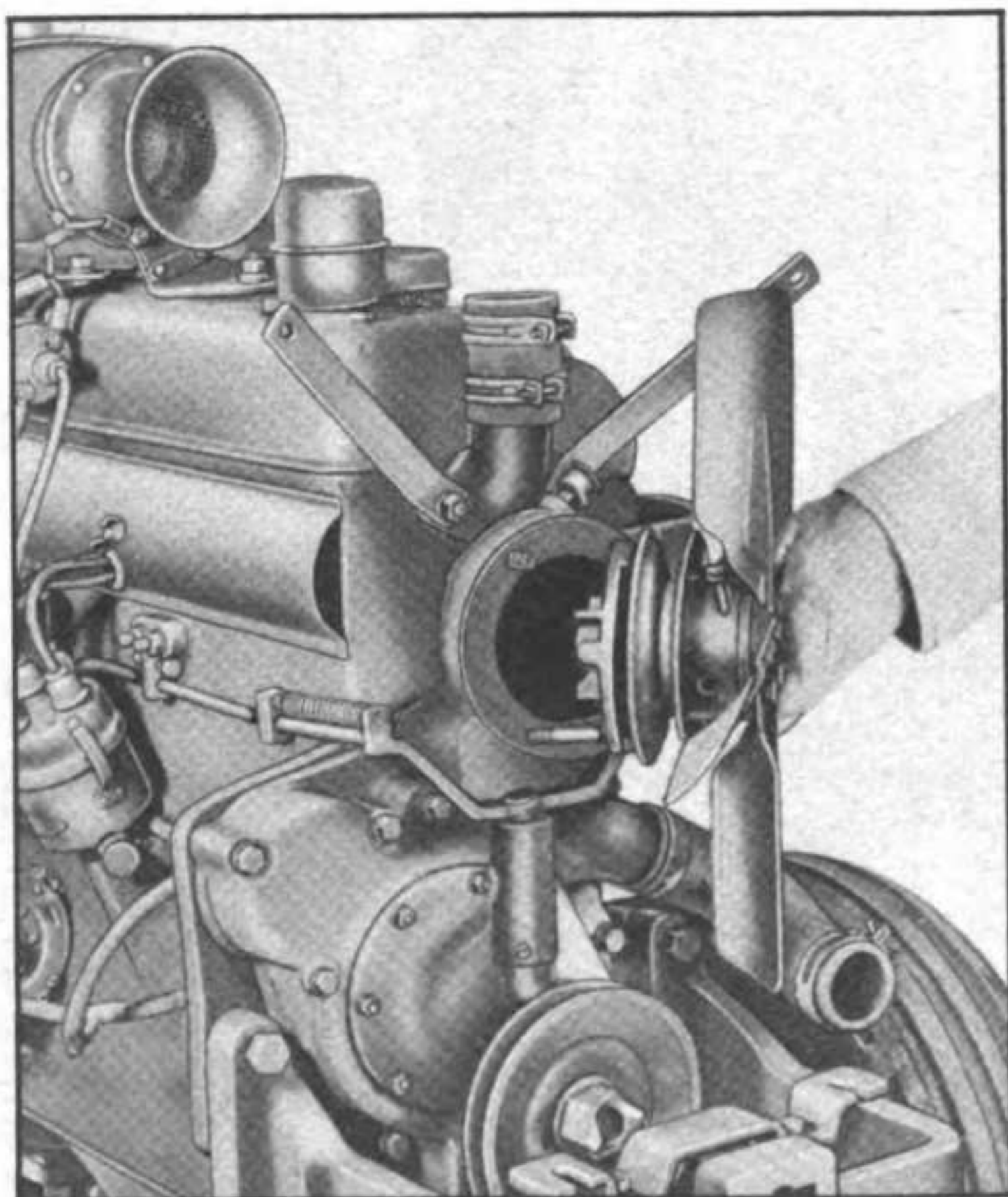


Figure 34 — Water Pump Removal
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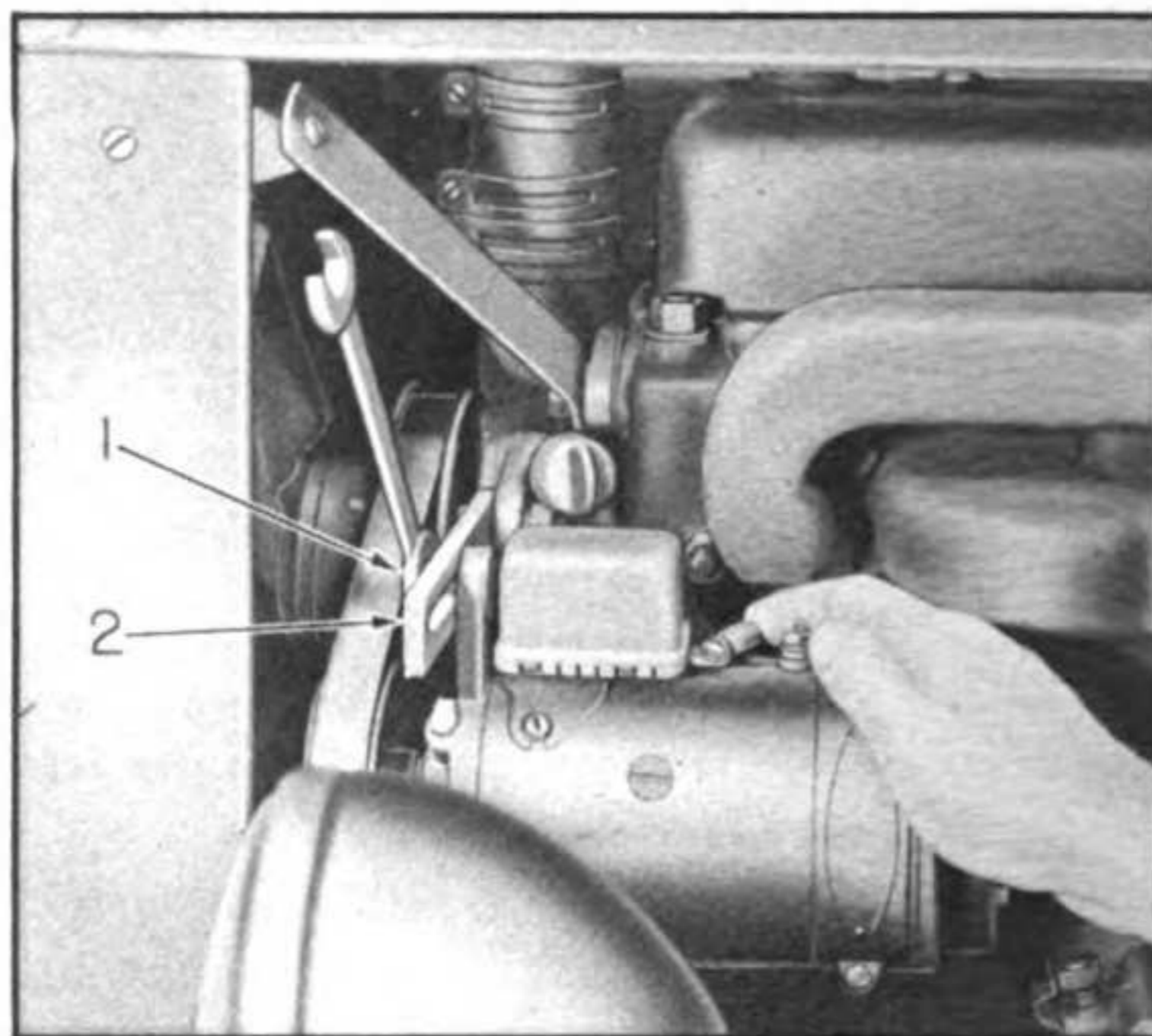


Figure 35 — Adjusting Fan Belt

- 1. CAP SCREW
- 2. ADJUSTING BRACKET

72. DRIVE BELT:

a. Removal:

Loosen cap screw securing generator to its adjusting bracket and slide the generator inward toward the engine until belt is loosened. Disconnect belt from generator and crankshaft drive pulleys. Remove belt by spreading it around the fan and pulling out from between fan and radiator.

b. Installation:

Replace drive belt if worn. Pass belt between fan and radiator and place in pulley grooves of water pump and crankshaft drive pulleys. Start belt over edge of generator drive pulley and rotate engine slowly until belt slips into the pulley channel. Adjust (Paragraph "c").

c. Adjustment:

Correct fan belt tension should permit 1/2" finger deflection at pulley centers. To adjust tension, loosen cap screw securing generator to bracket and re-set generator to desired position on bracket. Tighten cap screw.

73. TEMPERATURE GAGE:

a. Removal:

Remove spark plug cover and wire holder from right side of engine (Figure 18). Loosen lock nut securing thermo bulb to adapter and remove thermo bulb (do not remove bulb from lead). Remove nuts from instrument panel securing temperature gage to its mounting bracket (Figure 19). Remove gage, lead, and thermo bulb from face of instrument panel.

b. Installation:

Position gage, lead, and bulb through face side of instrument panel. Secure gage to its mounting bracket with nut. Reinstall thermo bulb in adapter in engine. Reinstall wire holder and spark plug cover.

74. HOSES AND THERMOSTAT:

a. Removal of Upper Hose and Thermostat:

Drain cooling system. Remove cap screws from elbow flange. Detach radiator braces and remove water outlet elbow and gasket from cylinder head. Loosen hose clamps and remove water outlet elbow from hose. Remove hose from radiator and remove thermostat from hose.

b. Installation of Upper Hose and Thermostat:

Inspect the thermostat and replace if necessary. Replace deteriorated hose. Replace water outlet elbow gasket. Position thermostat in hose with coil end toward the water outlet elbow. Position hose on water outlet elbow. Install clamps on hose and tighten lower clamp. Coat water outlet elbow gasket and connections with shellac and attach gasket, water outlet elbow, and radiator braces to engine. Secure with cap screws. Attach upper end of hose to the radiator inlet pipe and tighten clamp. Fill cooling system.

c. Removal of Lower Hose:

Loosen hose clamp bolts and remove the hose from the vehicle.

d. Installation of Lower Hose:

Replace deteriorated hose. Coat surface of radiator and engine connections with shellac. Position clamps on hose. Reinstall hose and secure with clamps. Fill cooling system.

75. RADIATOR AND CONNECTIONS:

a. Removal:

Remove bumper-grille (Paragraph 131). Drain cooling system, and remove two nuts securing radiator to the radiator support bracket (Figure 36). Remove bolts and nuts from upper radiator support braces, loosen clamps on upper and lower hoses, and remove radiator by grasping the top and bottom and pulling outward and upward (Figure 37).

b. Service:

Inspect radiator for scale, damaged tubes, dirt, or bent fins. Remove dirt. Straighten bent or misaligned fins. Replace damaged radiator.

c. Installation:

Position radiator elbow in upper hose and mount radiator on radiator support bracket. Reinstall nuts loosely. Connect lower hose to radiator and secure support bracket nuts. Tighten upper hose clamps. Reinstall upper radiator bracket and bumper-grille (Paragraph 131).



Figure 36 — Loosening Radiator from Support Bracket

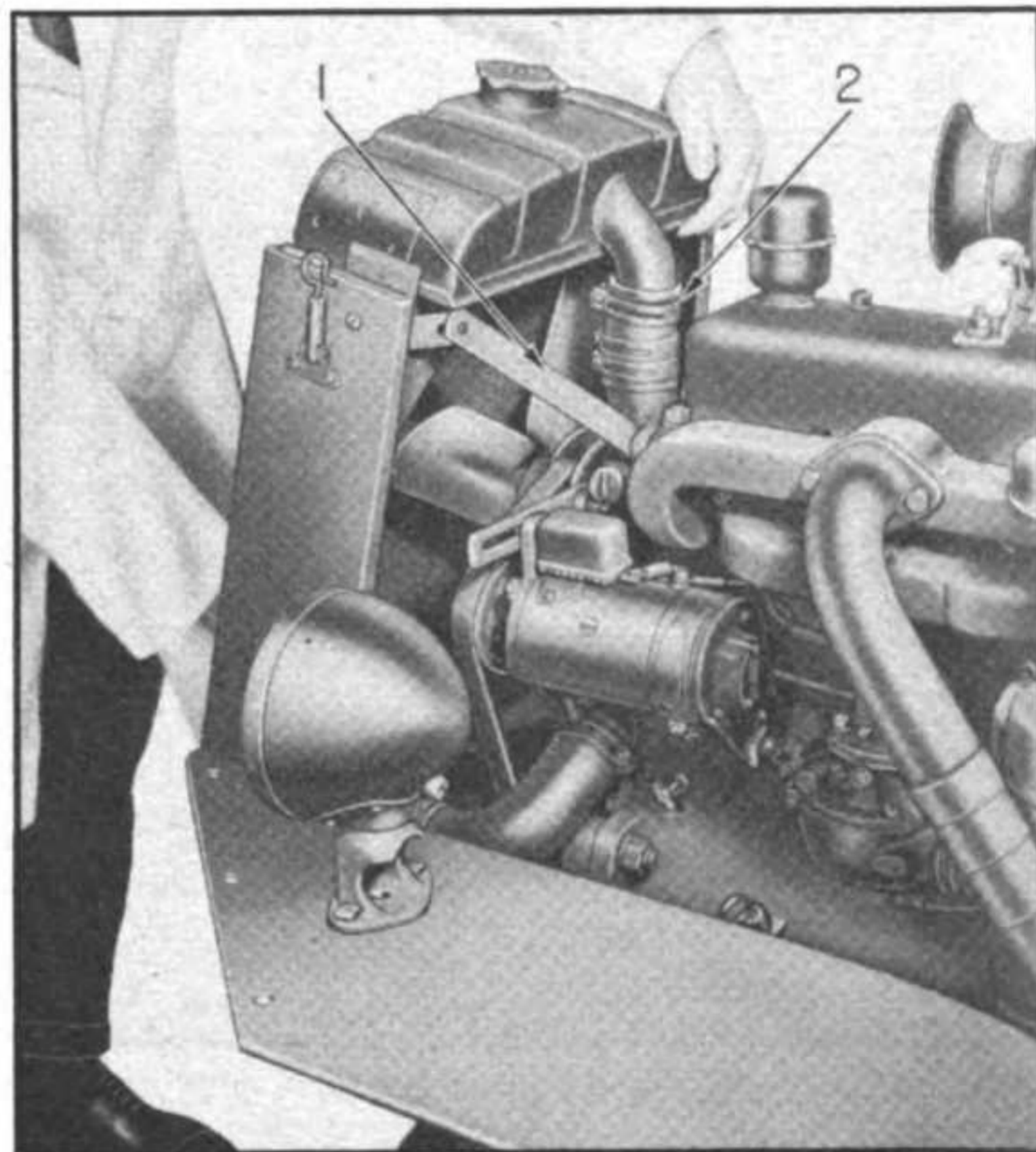


Figure 37 — Removing Radiator

1. UPPER RADIATOR SUPPORT BRACE
2. HOSE CLAMPS

Section XVIII - Electrical System

76. DESCRIPTION AND DATA:

a. Description:

The electrical system consists of a battery, battery cables, ammeter, generator, ignition switch, ignition wiring, ignition coil, distributor, spark plugs, starter switch, starter cable, starting motor, light switch, light wires, head light, tail light, and horn.

b. Data:

Battery 6 Volts, 120 Amps.
Generator (Make and Model) Auto-Lite #GAS-4169-A
Distributor (Make and Model) Auto-Lite #IAD-4101A
Coil Auto-Lite #IG-4803
Starting Motor Auto-Lite #MZ-4114
Spark Plugs (4)025 Inch Gap

77. BATTERY:

a. Description and Data:

The 6-volt, 120 ampere-hour storage battery, consisting of three side-by-side cells of fifteen plates each, is located under the hood between the fuel tank and instrument panel. In normal temperatures, the battery should be recharged when the specific gravity reads 1.240 or lower; it is fully charged when the specific gravity reads 1.270 to 1.285.

b. Removal:

Detach ground strap from positive (+) terminal post and starter button cable from negative (-) post (Figure 39). Remove two wing nuts from battery box and remove battery box. Lift out battery, using a lifting strap (Figure 39).

c. Installation and Service:

Position battery with negative (-) post to rear. Position battery box and secure with wing nuts. Clean cable terminals as required, and apply a thin film of grease. Reinstall starter cable to negative (-) post and ground strap to positive (+) post. Inspect level and specific gravity of electrolyte in battery. Electrolyte level must be up to filler neck (special construction provides for expansion when cell cap is in place), and specific gravity must be 1.270 to 1.285 at 80° F.

78. BATTERY CABLES:

a. Description:

The ground strap is connected to the positive (+) terminal post and ground (steering column bolt). The battery to starter switch cable is connected to the negative (-) terminal post and the starter switch.

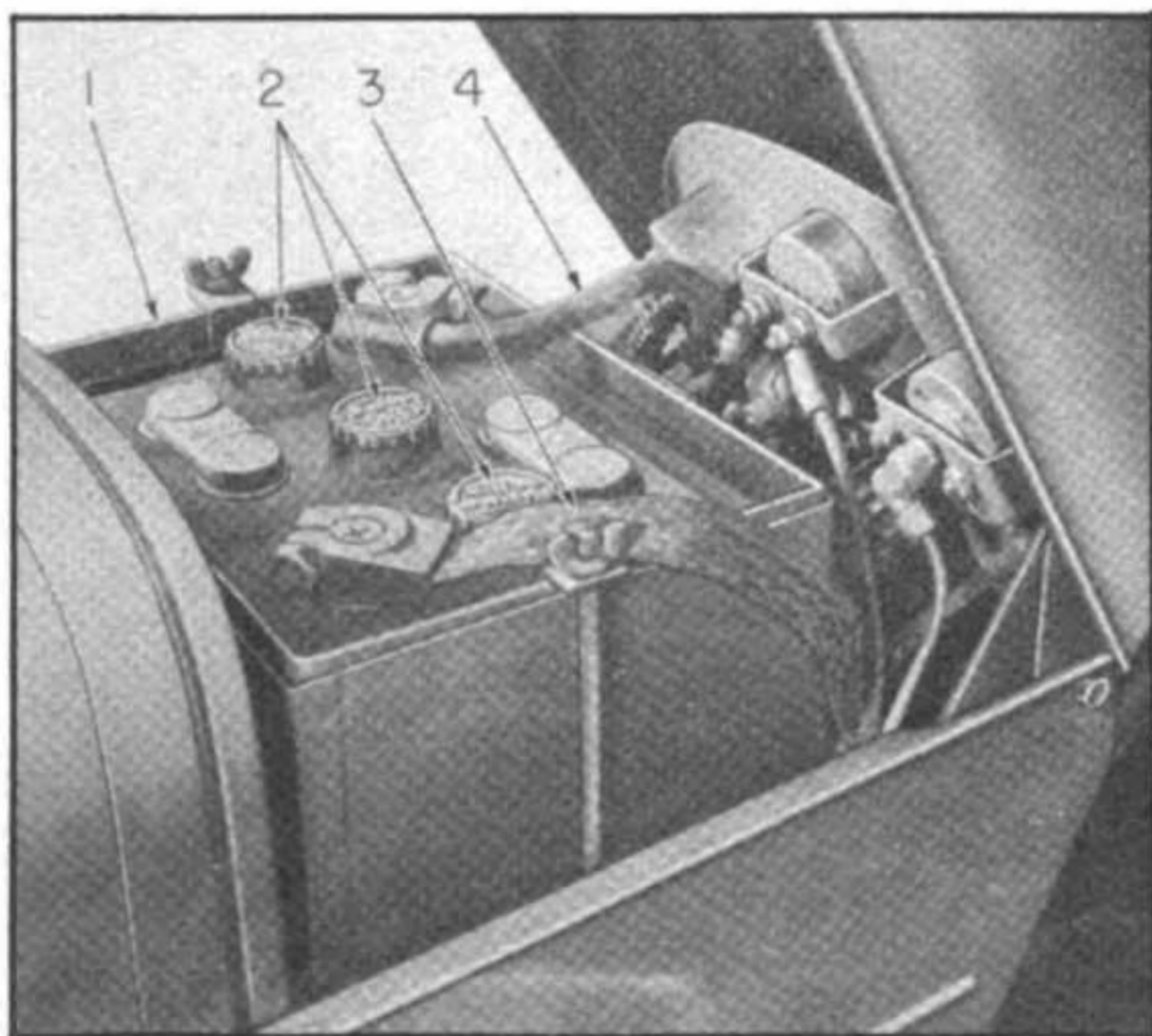


Figure 38 - Battery

1. BATTERY HOLD-DOWN CLAMP RING
2. BATTERY CELL CAPS
3. POSITIVE (+) TO GROUND STRAP
4. NEGATIVE (-) TERMINAL TO STARTER BUTTON CABLE



Fig. 39 - Battery Removal

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Section XVIII—Electrical System (Second Echelon)

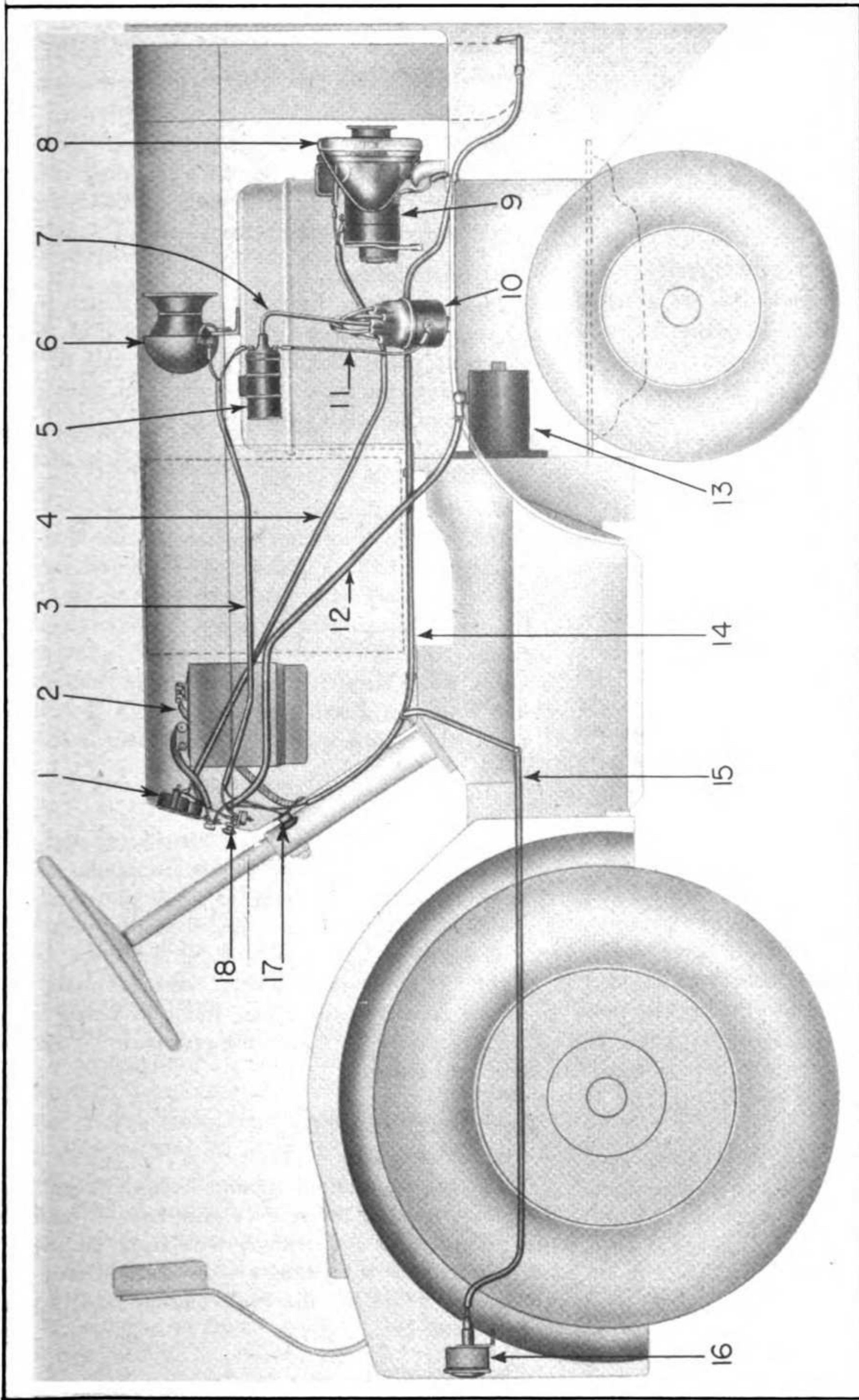


Figure 40 — Electrical Equipment

- | | |
|---|--|
| <ul style="list-style-type: none"> 1. INSTRUMENT PANEL GAGES 2. BATTERY 3. IGNITION COIL AND HORN CABLES 4. GENERATOR CABLE 5. IGNITION COIL 6. HORN 7. HIGH TENSION WIRE 8. HEAD LIGHT 9. GENERATOR | <ul style="list-style-type: none"> 10. DISTRIBUTOR 11. COIL TO DISTRIBUTOR WIRE 12. STARTING MOTOR CABLE 13. STARTING MOTOR 14. HEAD LIGHT WIRES 15. TAIL LIGHT WIRE 16. TAIL LIGHT 17. HORN BUTTON 18. INSTRUMENT PANEL CONTROLS |
|---|--|

b. Removal:

To detach cables from terminal posts, loosen bolts and remove from battery. To detach ground strap from steering column, loosen bolt and remove strap. To detach starter switch cable from starter switch, remove nut (Figure 19).

c. Installation:

Scrape and wash terminal ends of cable with a solution containing soda. Rinse, dry, and apply a thin film of grease. Reinstall starter switch cable to negative (—) post and starter switch, and reinstall ground strap to positive (+) terminal and steering column bolt.

79. AMMETER:**a. Removal:**

Remove two nuts and lock washers from ammeter posts (Figure 19). Detach wire terminals and two retaining nuts so that bracket may be removed. Remove ammeter through face side of instrument panel.

b. Installation:

Position ammeter through face side of instrument panel and position bracket on ammeter posts. Reinstall lock washers and nuts on bracket and secure. Attach lead from starter switch to right terminal post and remaining wire leads to left terminal post.

80. GENERATOR:**a. Description:**

The generator, located on the left side of the engine at the forward end (Figure 17), is a 6-8 volt, adjustable third brush type, having a maximum volt output of approximately 15 amperes, and a maximum hot output of approximately 12 amperes. The charging rate is adjusted by shifting the position of the "third" brush, which can be reached by removing the cover band on the rear of the generator.

b. Removal:

Disconnect wires at generator; remove cap screw from adjusting bracket, and remove two lower generator support bolts. Remove generator. Remove circuit breaker from generator.

c. Installation:

Reinstall circuit breaker. Position generator and reinstall two lower bolts and lock washers loosely. Position drive belt in pulley groove and attach generator to bracket with cap screw. Adjust generator so that drive belt has approximately 1/2" finger deflection midway between the pulley centers. Tighten cap screw and bolts, and connect wires.

81. IGNITION SWITCH:**a. Description:**

The ignition switch, located on the instrument panel, is the single contact push-pull type.

b. Removal:

Remove screws from terminals and disconnect wires. Remove switch button by turning counterclockwise. Remove nut from face side of instrument panel and remove switch from back of panel.

c. Installation:

Position switch. Reinstall nut and switch button by turning clockwise from the face side of the instrument panel. Connect wire from coil to right side of ignition switch and wire from ammeter to left side of ignition switch (Figure 19).

82. IGNITION WIRING:**a. Removal:**

Before removing the ignition switch wire, disconnect the battery positive (+) ground strap. It is not necessary to disconnect the strap to replace the coil-to-distributor primary wire or secondary cables. Disconnect wires at terminals and remove wires. When removing secondary cables, mark terminal tower in distributor cap for No. 1 cylinder spark plug. Remove cables from distributor cap spark plug terminals.

b. Installation:

Reinstall primary wire to distributor and coil, and from coil to switch. Attach terminals securely. Reinstall secondary cables for spark plugs through grommet into the proper distributor towers (No. 1 terminal into No. 1 tower, etc.). Press rubber nipples fully onto the towers. Press terminals fully on the correct spark plugs. Refer to firing order (Paragraph 84). Connect the positive (+) ground strap to battery.

83. IGNITION COIL:**a. Description:**

The ignition coil is mounted on the right side of the engine at the rear (Figure 18). A terminal is provided for the primary wire from the switch, a terminal for the primary wire to the distributor, and a terminal for the high tension cable to the distributor cap.

b. Removal:

Remove nuts from outer wire terminals of coil and disconnect wires. Disconnect center wire by pulling out of position. Remove nuts from coil mounting bracket and remove coil and bracket.

c. Installation:

Position coil and bracket and tighten nut. Attach high tension wire leading from distributor to center position of coil by pressing in place. Attach primary wire leading from outer position of distributor to lower position of coil and secure with nut. Attach primary wire leading from ignition switch to upper position on coil and secure with nut.

84. DISTRIBUTOR:

a. Description:

The distributor is mounted on the right side of the engine (Figure 18). A full automatic spark advance is mechanically governed by two counterweights which advance the spark as the engine speed increases. The distributor is driven by a shaft extending to a gear on the camshaft.

b. Data:

Make and Model	Auto-Lite #IAD-4101A
Type of Advance	Centrifugal
Rotation	Clockwise
Firing Order	1-3-4-2
Point Gap	.020 Inch
Condenser Capacity	.18 to .26 Mfd.

c. Removal.

Disconnect coil wire from side of distributor. Pull outward on spring clips and remove distributor cap and cables. It is not necessary to remove cables from distributor cap. Loosen bolt under distributor and remove distributor from bracket on engine.

d. Installation and Timing:

Upon installation of the distributor, the engine and distributor must be properly timed. Use the following procedure:

(1) Remove No. 1 spark plug. Place the thumb over the plug opening and crank engine until an outward pressure can be felt at the plug opening. This is an indication that the No. 1 piston is nearing top dead center of its compression stroke.

(2) Loosen cap screw and open timing hole cover on left side of engine. Continue cranking engine slowly, while watching flywheel, until marking "DC 1 & 4" over EX-CL appears. The No. 1 piston is then on top dead center of its compression stroke.

(3) Position distributor so that rotor will be in contact with No. 1 spark plug cable (rotor contact must be in correct alignment with distributor body). With dust shield removed, turn body of distributor until the points begin to open. Secure distributor in this position by tightening the cap screw under the distributor. Reinstall dust shield,

rotor, and distributor cap and cable. Connect cable from coil to side terminal of distributor.

(4) Rotating the distributor in a clockwise direction retards the ignition; rotating it in a counterclockwise direction advances the ignition. Make slight readjustment of timing with the engine operating. Loosen cap screw and rotate distributor in proper direction to obtain improved engine performance.

85. DISTRIBUTOR CAP ASSEMBLY:

a. Removal:

Mark terminal tower in distributor cap for No. 1 cylinder spark plug and remove secondary cables from distributor cap by lifting each cable out of its terminal position. Press outward on spring clips (Figure 41) and remove distributor cap.

b. Installation:

Position distributor cap on distributor and secure with spring clips. NOTE: *Be sure cap is in correct alignment with distributor body.* Reinstall secondary cables from spark plugs through grommet to correct towers, making certain No. 1 plug is in No. 1 tower, etc. Reinstall secondary coil cable to center tower of distributor. Press rubber nipples fully into place over distributor towers.

86. DISTRIBUTOR ROTOR:

a. Description:

The rotor, located in the distributor, passes the high tension current from the coil to the spark plug wires.

b. Removal:

Remove distributor cap and cables, and remove rotor by lifting out of distributor (Figure 42).

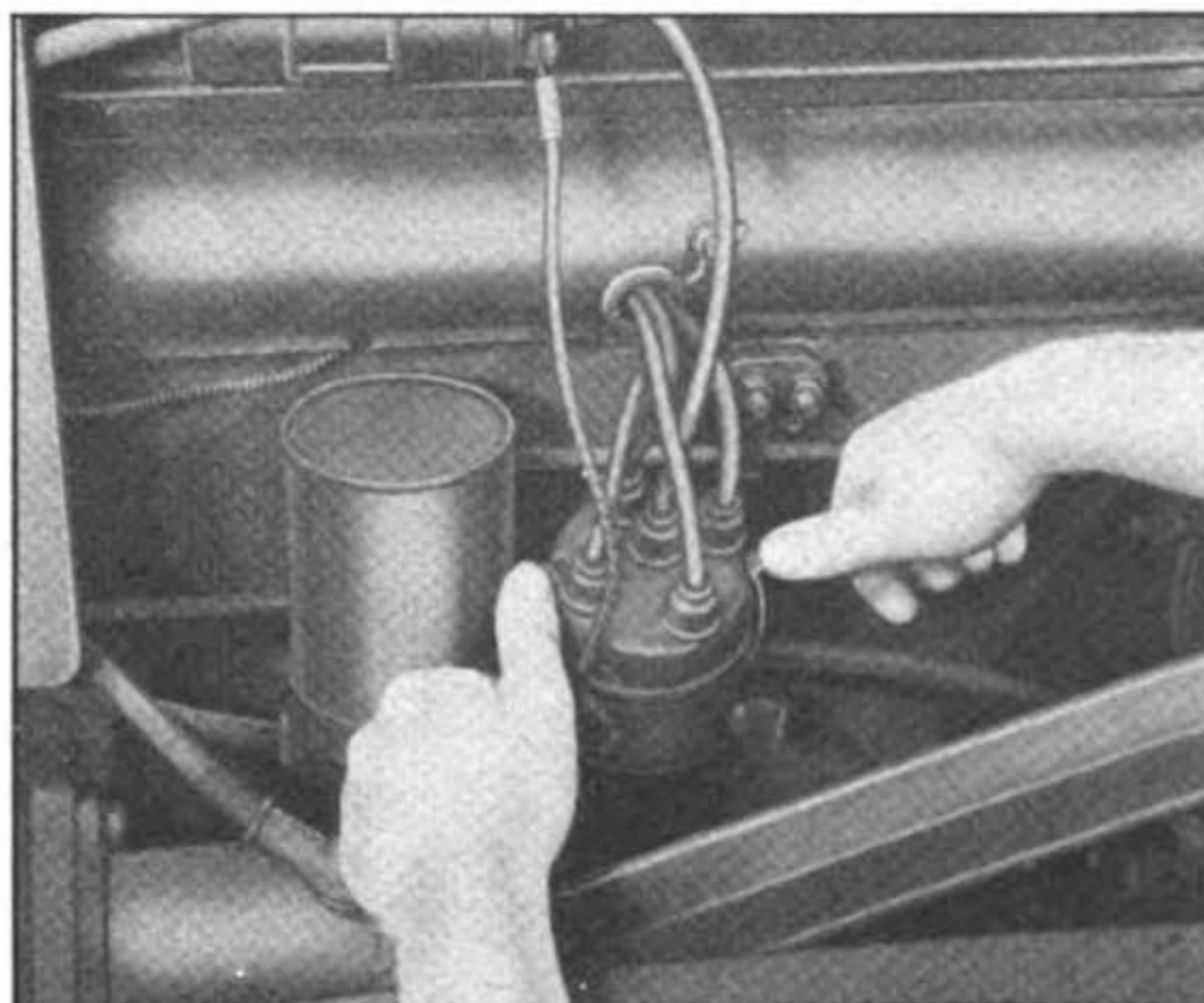


Figure 41 — Removing Distributor Cap

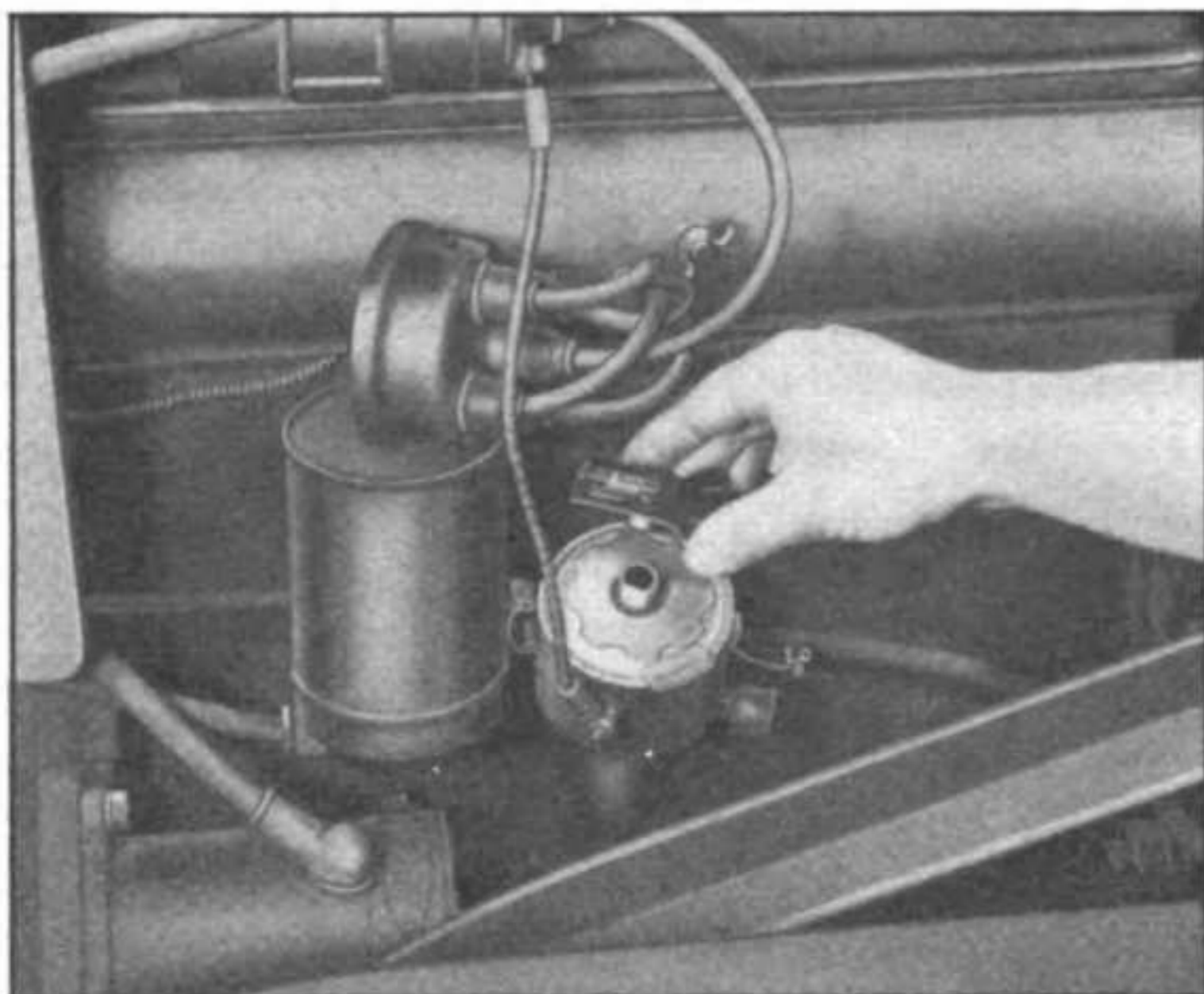


Figure 42 — Removing Rotor from Distributor Shaft

c. Installation:

Position rotor on distributor shaft, making certain that flange of rotor is correctly aligned with flat side of distributor shaft. Reinstall distributor cap and cables.

87. DISTRIBUTOR BREAKER POINTS:

a. Removal:

Remove distributor cap and cables, rotor, and dust shield. Using a small screw driver, unscrew condenser lead, and release breaker arm spring. Remove screw from stationary breaker point and lift out point assembly.

b. Installation:

Position stationary breaker point in distributor and reinstall locking screw loosely. Lightly lubricate breaker arm pivot pin and reinstall breaker

arm. Position spring with condenser lead, insert screw, and secure. Adjust points as required (Paragraph "c").

c. Adjustment:

Remove distributor cap and cables. Lift off rotor and dust shield (Figure 43). Crank engine until point arm rubbing block is on top of cam. Loosen lock screw (Figure 44) and turn eccentric screw until point gap clearance is .020 inch, measured with a thickness gage. Tighten lock screw and re-measure gap.

88. DISTRIBUTOR CONDENSER:

a. Description:

The condenser is attached by one screw to the supporting plate in the distributor, and connected by a short flexible cable to the distributor points. The condenser must be firmly attached to the support plate and the cable must be in good condition. Test the condenser, using a condenser tester.

b. Removal:

Remove distributor cap, cables, rotor, and dust shield. Remove screw securing condenser to support plate. Remove screw in lead and remove condenser.

c. Installation:

Position condenser on the plate and attach with screw. Attach lead. *NOTE: Inspect distributor points for proper adjustment. Adjust as required.* (Paragraph 87.) Reinstall dust shield, rotor, cap, and cables.

89. SPARK PLUGS:

a. Description:

Spark plugs are located on the right side of the cylinder head; an alloy gasket is used on each plug

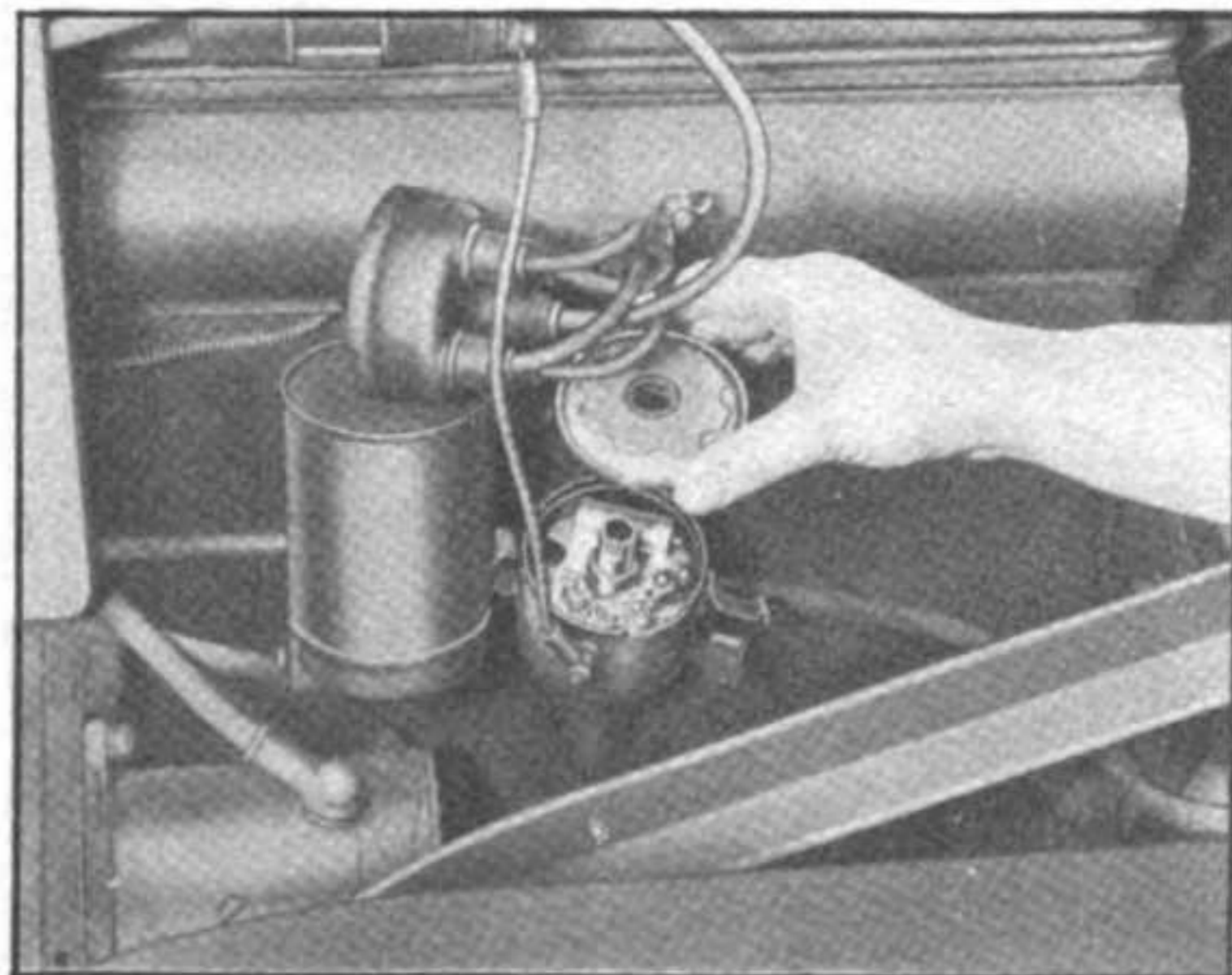


Figure 43 — Removing Distributor Dust Plate

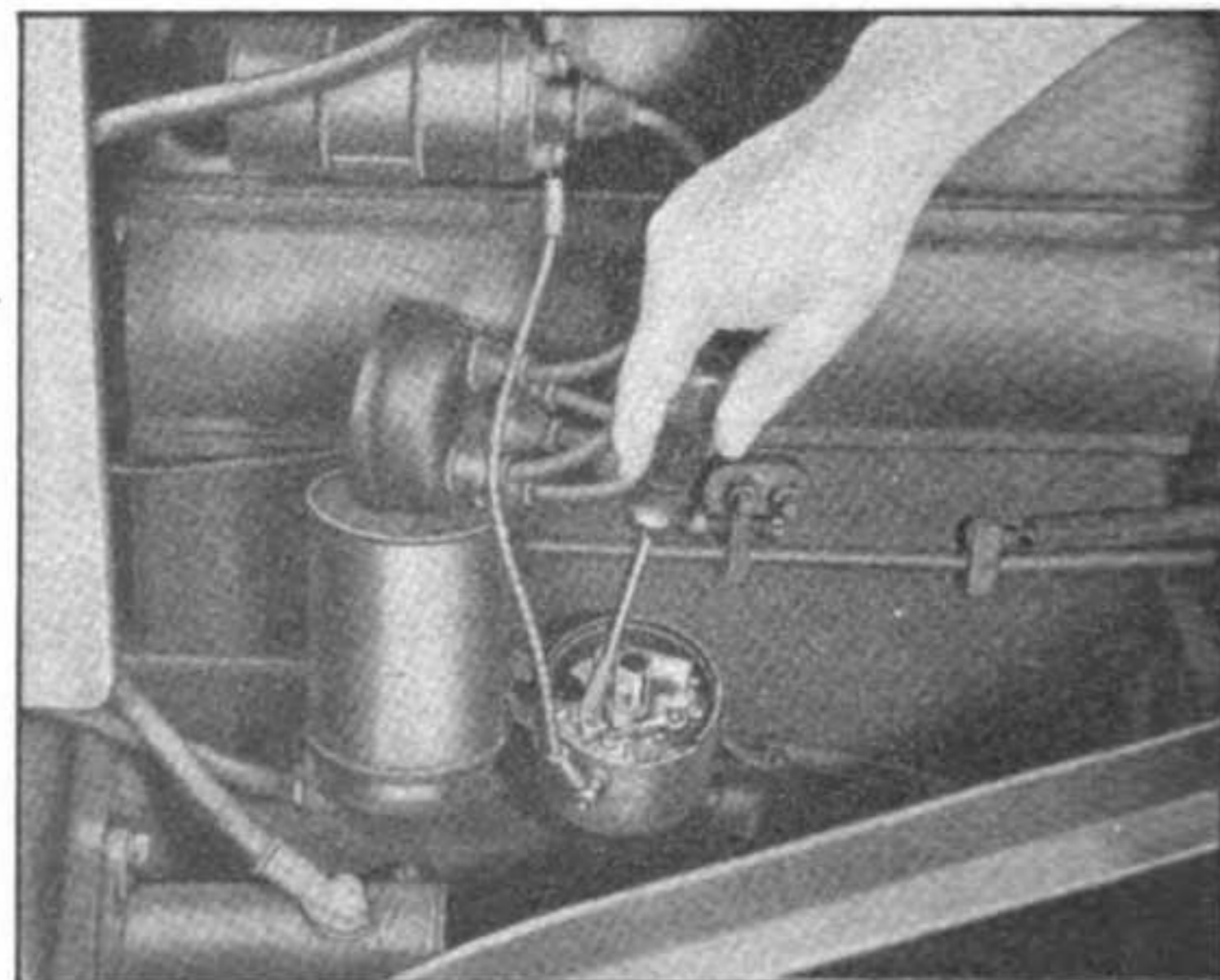


Figure 44 — Adjusting Distributor Points

to prevent leakage of compression. Push-on type cable terminals are used at each plug. An ignition cable holder fits over the spark plug ends to prevent the cable terminal shells from "shorting out" on the push rod guides of the engine. A metal spark plug cover fits over the plugs and holder to prevent dirt and moisture from collecting around the cables and plugs.

b. Removal:

To avoid breakage of the porcelain, remove the plugs with the socket wrench (Figure 5). Turn counterclockwise.

c. Adjustment:

To adjust the gap clearance, bend the outer electrode only, and gage the plug with a feeler gage to a gap of .025 inch.

d. Installation:

Replace plug gaskets. Install plugs using a spark plug wrench and tighten until gaskets are compressed.

90. LIGHT SWITCH:

a. Description:

The light switch, located on the instrument panel, serves as a control for the amperage output of the generator as well as a switch for the light system. It has three regulating positions (Figure 45).

(1) The first position, with switch button in as far as possible, connects a resistance in the field current in the generator, which reduces the generator output to three amperes, but does not turn on the lights.

(2) The second position shorts out the resistance of the generator, but does not turn on the lights.

(3) The third position turns on the lights and also shorts out the resistance, giving full output to the generator.

Do not use the high rate, (2nd), short position unless the battery is low and must be charged quickly.

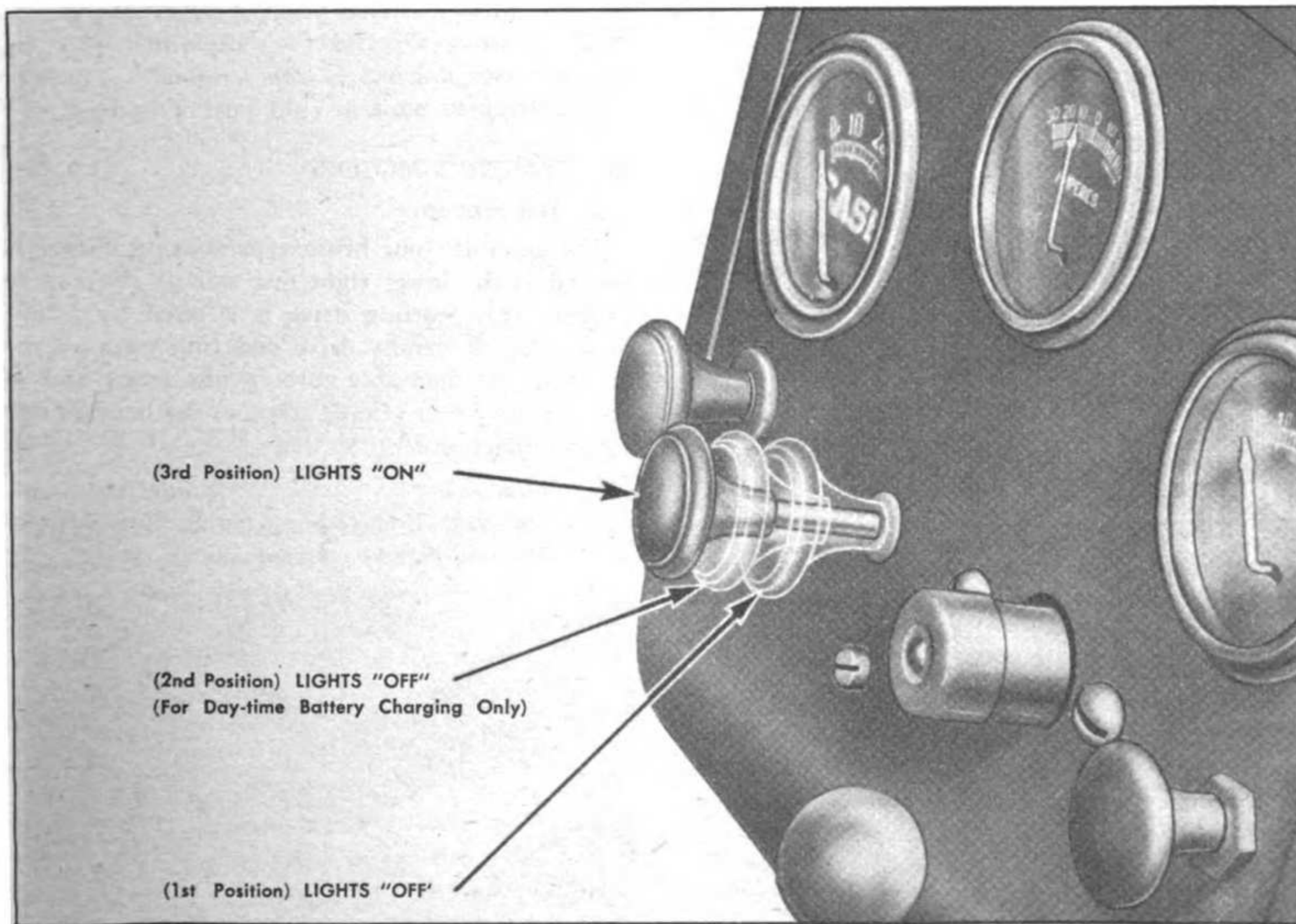


Figure 45 — Light Switch

b. Removal:

Disconnect ground cable from positive (+) terminal of battery. Remove wires from terminals on switch. Remove switch button retaining nut from back of instrument panel and remove switch button through face side of instrument panel. Remove fillister head bolt securing switch to instrument panel and remove switch.

c. Installation:

Attach wire from generator to terminal at lower rear left position on switch. Attach wire from ammeter to terminal on fuse block (terminal B). Connect wire from horn to terminal marked "horn." Connect light wires to terminal marked "H". Position switch on instrument panel and reinstall fillister head nut and bolt loosely. Position switch button through face side of instrument panel, and secure with nut. Tighten fillister head bolt and nut. Attach ground cable to positive (+) post on battery.

91. LIGHT WIRES:**a. Removal:**

Remove ground strap from positive (+) post of battery. Note location of wires; disconnect wires at terminals; loosen clips and remove wires.

b. Installation:

Reinstall wires in harness, making certain that all connections are correctly located and secure. Reinspect location, and tightness of connections; tighten retaining clips. Attach ground strap to positive (+) post on battery.

92. HEAD LIGHTS:**a. Removal:**

Disconnect head light wire and remove nut securing head light to bracket. Remove head light.

b. Service:

Replace defective bulb, and clean reflector and inside of the lens. Inspect terminal connections for secure mountings.

c. Installation:

Position head light on bracket. Position bevel washer and secure head light with lock washer and nut. Connect light wire to light. Head light may be adjusted by loosening retaining nut and tilting to desired position (Figure 46).

93. TAIL LIGHT:**a. Removal:**

Loosen light wire by pressing in at terminal and turning counterclockwise. Remove plug from light. Remove two nuts and washers from retaining bolts. Remove tail light from bracket.

b. Service:

Replace bulb if defective. Clean lens and inspect terminals for secure mounting.

c. Installation:

Position tail light on bracket and tighten two lock washers and nuts. Place plug in terminal and fasten by turning clockwise.

94. STARTER SWITCH AND CABLE:**a. Description:**

The button-type starter switch is located on the instrument panel (Figure 10).

b. Removal:

Remove ground strap at positive (+) post of battery. Remove primary cable terminal nuts on switch and remove cables and wires. Remove two screws securing switch to instrument panel and remove switch through back of instrument panel.

c. Installation:

Position switch on instrument panel and secure with two screws. Attach primary cables and wires. **NOTE:** *Battery negative (-) cable and wire to ammeter are attached to top terminal.* Connect ground strap to positive (+) post of battery.

95. STARTING MOTOR:**a. Description:**

The six volt, four brush type starting motor is located at the lower right rear side of the engine (Figure 18). Starting drive is effected by a left-hand inboard Bendix drive and ring gear on the flywheel. A removable cover at the front end of the starting motor affords access to the brushes and the commutator.

b. Removal:

Remove cable from starting motor. Remove two cap screws and remove starting motor.

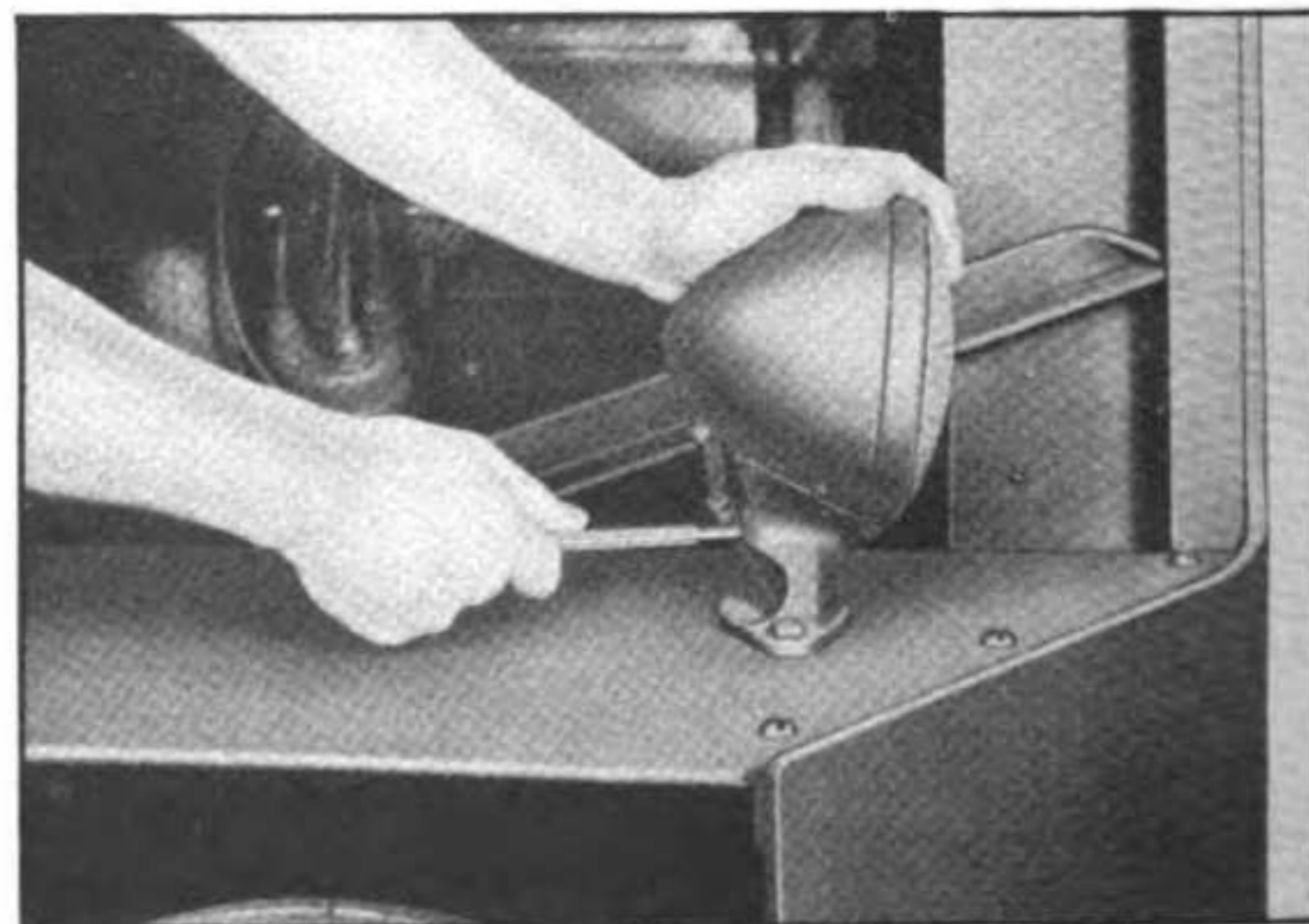


Figure 46 — Adjusting Headlight

Section XVIII—Electrical System (Second Echelon)

c. Installation:

Clean, but do not lubricate Bendix drive. Position starting motor on engine. Insert attaching screws and secure. Attach cable.

96. STARTING MOTOR SPRING:

a. Removal:

Remove starter motor (Paragraph 95). Straighten lock washer flanges. Remove head spring screws and washer from driving head. Remove shaft spring screw and washer and remove driving spring.

b. Installation:

Position spring on Bendix drive. Replace lock washer and reinstall shaft spring screw. Replace

lock washer and reinstall head spring screw. Be sure the point of the screw is properly seated so that the drive head rotates with the driving shaft. Secure lock washers by bending one flange up and the other down on each washer.

97. HORN:

a. Removal:

Detach horn button wire from terminal at horn. Remove nut securing horn to cylinder head cover. Remove horn and bracket.

b. Installation:

Position horn on stud and secure with nut and lock washer. Connect wire to terminal.

Section XIX—Transmission

98. DESCRIPTION AND DATA:

a. Description:

The transmission is the selective spur gear type with four speeds forward and one reverse. The forward gears are mounted on two shafts located on the center line of the vehicle. The upper shaft (main drive) is splined and carries the main shaft driving gears. It is mounted on tapered roller anti-friction bearings at both ends. The shaft operates at engine crankshaft speed, regardless of the gear speed used, being connected directly to the clutch shaft in the torque housing. The lower shaft (countershaft) is also splined and carries the driven gears. On the rear of the shaft is the pinion gear, which drives the differential ring gear. This shaft is mounted on tapered roller anti-friction bearings. The reverse idler gear shaft is fixed to the housing; the gear operates on a bronze bushing.

b. Data:

Type Selective Spur Gear Type
Speeds 4 Forward and 1 Reverse
Road Speeds at 1800 R.P.M.:

	VAIW 3	VAIW 4
First Gear	2.62 M.P.H.	2.04 M.P.H.
Second Gear	4.53 M.P.H.	3.52 M.P.H.
Third Gear	5.81 M.P.H.	4.52 M.P.H.
Fourth Gear	13.88 M.P.H.	10.80 M.P.H.
Reverse	3.63 M.P.H.	2.81 M.P.H.
Lubricant Capacity	5-1/2 Gallons	
Lubricant Grade Reference	Paragraph 29	

c. Service:

Inspect the lubricant level periodically (Paragraph 29). Mounting screws must be tight and dust shield protecting the air vent in transmission must be kept in place at gear shift lever at all times. Report unusual transmission gear noise to designated individual in authority.

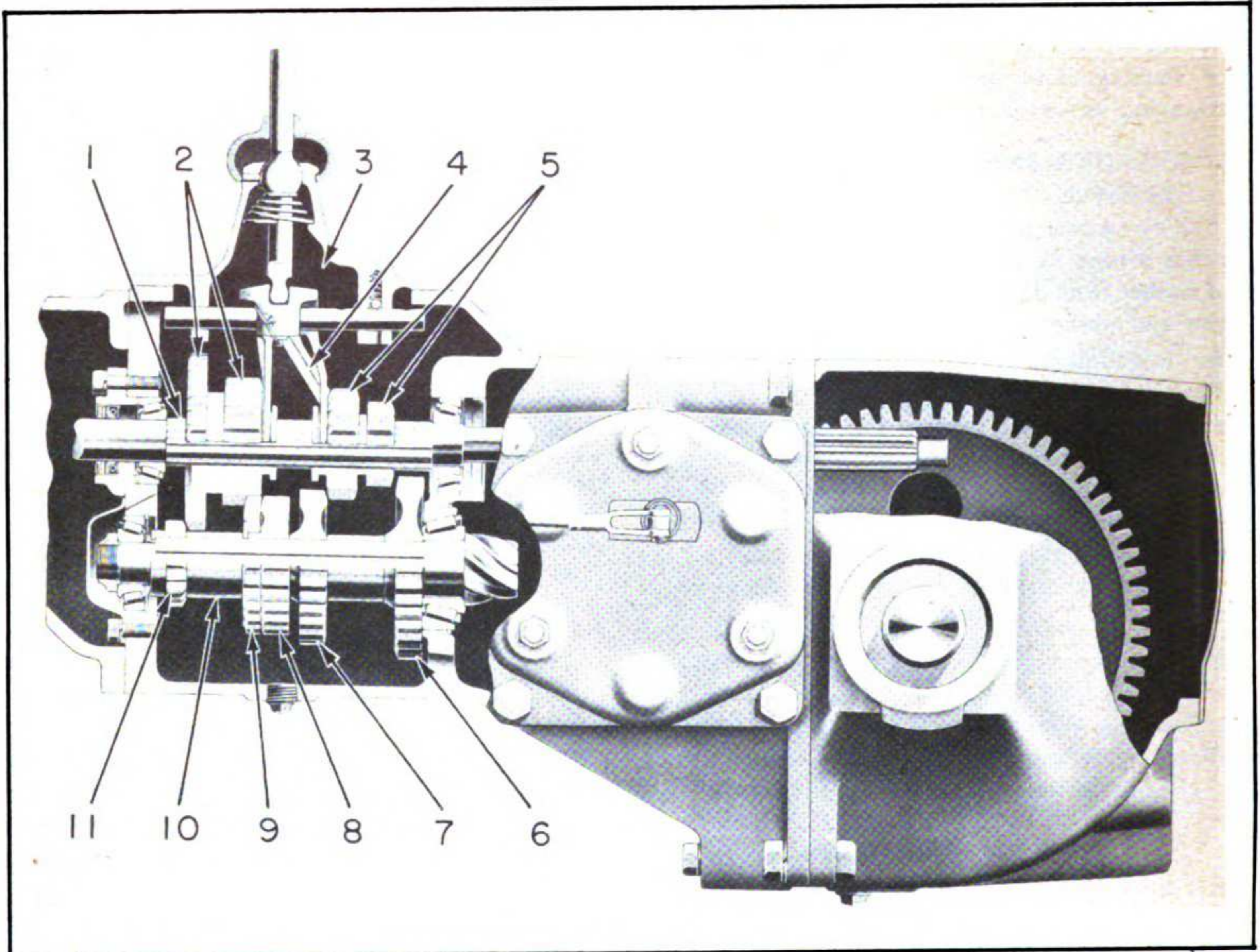


Figure 47 — Transmission Cutaway

- 1. MAIN DRIVE SHAFT
- 2. 3rd AND 4th MAINSHAFT GEARS
- 3. CONTROL COVER
- 4. SHIFTING FORKS
- 5. 1st AND 2nd MAINSHAFT GEARS
- 6. LOW COUNTERSHAFT GEAR
- 7. 2nd COUNTERSHAFT GEAR
- 8. 3rd COUNTERSHAFT GEAR
- 9. OIL SLINGER GEAR
- 10. PINION SHAFT
- 11. HIGH COUNTERSHAFT GEAR

Section XX – Exhaust System

99. DESCRIPTION:

The exhaust system consists of an exhaust elbow, exhaust pipe, muffler, and tail pipe.

100. TAIL PIPE:

a. Removal:

Remove tail pipe clamp, disconnect tail pipe from muffler, and remove tail pipe.

b. Installation:

Position tail pipe to the muffler. Reinstall tail pipe clamp and secure with nut and bolt.

101. MUFFLER ASSEMBLY:

a. Removal:

Remove tail pipe (Paragraph 100). Loosen clamp from exhaust pipe and muffler. Remove muffler clamp and remove muffler.

b. Service:

Inspect muffler and connections for wear or damage. Inspect muffler to see if it is leaking. Remove drain plug from lower rear of muffler and remove accumulated carbon. Replace defective parts.

c. Installation:

Position muffler so that drain plug is located at the lower rear of vehicle. Install muffler clamp to

muffler loosely. Secure clamp to muffler and exhaust pipe and reinstall tail pipe (Paragraph 100).

102. EXHAUST PIPE:

a. Removal:

Loosen exhaust elbow from manifold. Loosen clamp from muffler and exhaust pipe. Remove the exhaust pipe and exhaust elbow. Loosen clamp and remove exhaust pipe from exhaust elbow.

b. Installation:

Position exhaust pipe and exhaust elbow with nut and bolt loose in the clamp. Position exhaust pipe and clamp to the muffler; and exhaust elbow with manifold. Secure exhaust elbow to manifold with two cap screws. Tighten the two clamps.

103. EXHAUST ELBOW:

a. Removal:

Remove two cap screws securing exhaust elbow to manifold. Loosen clamp securing exhaust elbow to exhaust pipe. Remove exhaust elbow.

b. Installation:

Position exhaust elbow with exhaust pipe and manifold. Insert two cap screws in elbow flange and secure elbow to manifold. Tighten clamp securing exhaust elbow to exhaust pipe.

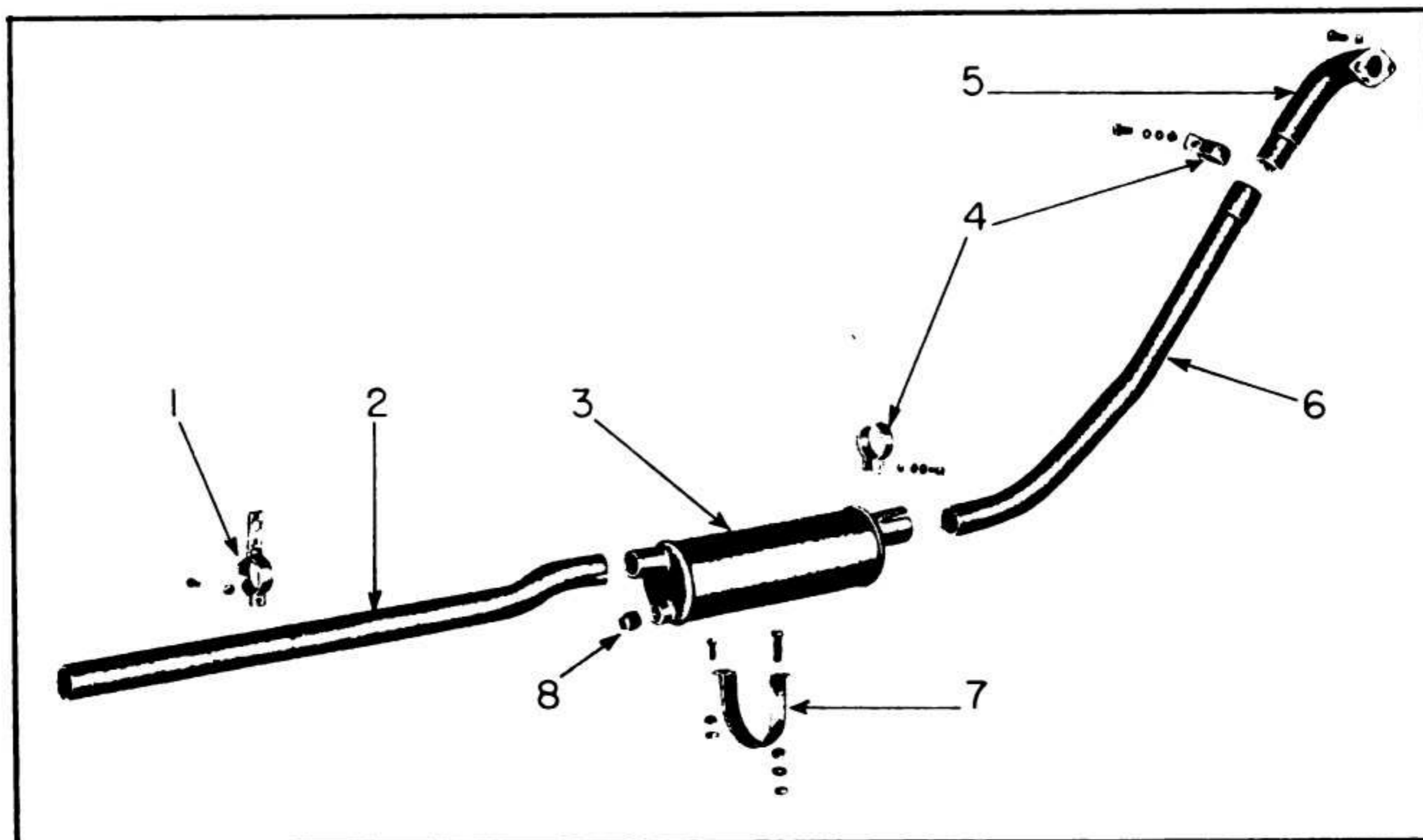


Figure 48 – Exhaust System

1. TAIL PIPE CLAMP
2. TAIL PIPE
3. MUFFLER
4. CLAMPS

5. EXHAUST ELBOW
6. EXHAUST PIPE
7. MUFFLER CLAMP
8. DRAIN PLUG

Section XXI - Front Axle (Steering)

104. DESCRIPTION:

The front axle is a fabricated welded assembly, having a straight beam through the center, spring mounting in the front, and pivot ball mounting in the rear. The front pivot block is attached to the spring and the front pivot bracket is attached to the front end casting of the vehicle.

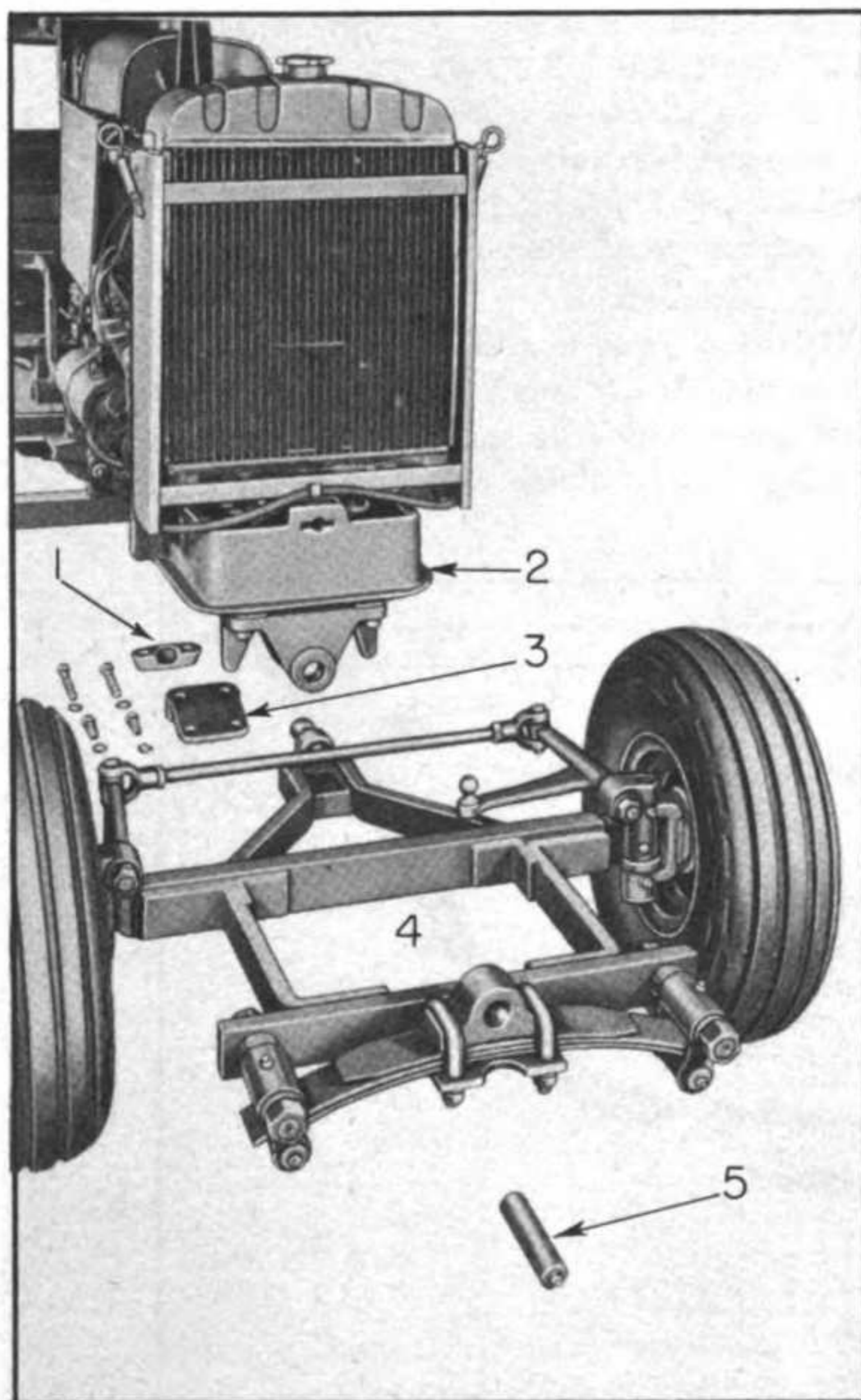


Figure 49 - Front Axle Assembly Removed from Tractor

1. BALL SOCKET CAP
2. FRONT MOUNTING ASSEMBLY
3. PIVOT BALL SOCKET
4. FRONT AXLE ASSEMBLY
5. AXLE PIVOT PIN

105. AXLE ASSEMBLY:

a. Service:

Inspect axle to see if it is properly aligned, securely mounted, and not sprung or bent. If the axle appears to be out of line, measure the distance from the center of the steering knuckle to the center of the rear axle shaft. This distance should be the same on each side.

106. WHEEL BEARINGS, GREASE RETAINERS, AND OIL SEALS:

a. Removal:

Remove hub cap, cotter pin, castellated nut, and washer from spindle. Remove outer cone from wheel and remove wheel. Bearing cups will remain in wheel. Remove felt oil seal. Tap lightly with a lead or rawhide mallet on back of grease retainer and remove inner bearing and grease retainer from spindle. Remove retainer seal.

b. Installation and Adjustment:

Position retainer seal, grease retainer, and felt oil seal on spindle. Place inner cone in inner bearings of wheel and reinstall wheel on spindle. Place outer cone in outer bearing cup and reinstall washer and nut on spindle. While rotating wheel, tighten nut until it binds; back off nut until binding is relieved without end play. Secure with cotter pin and reinstall hub cap.

107. WHEEL ALINEMENT:

a. Toe-In Adjustment:

Correct front wheel toe-in is 1/8". Remove cotter pin from tie rod yoke end pin and remove end pin. Loosen jam nut on tie rod. Adjust yoke on tie rod and secure with jam nut (toe-in will increase as yoke is backed off tie rod). Reinstall yoke end pin and cotter pin. Tighten jam nut.

108. TIE ROD:

a. Removal:

Remove cotter pins from tie rod yoke end pins and remove end pins. Remove tie rod and yokes from steering spindle arms.

b. Installation:

Adjust yoke (Paragraph 107), and position yokes and tie rod on the steering spindle arms. Secure with yoke end pins and secure end pins with cotter pins.

Section XXI—Front Axle (Steering) (Second Echelon)

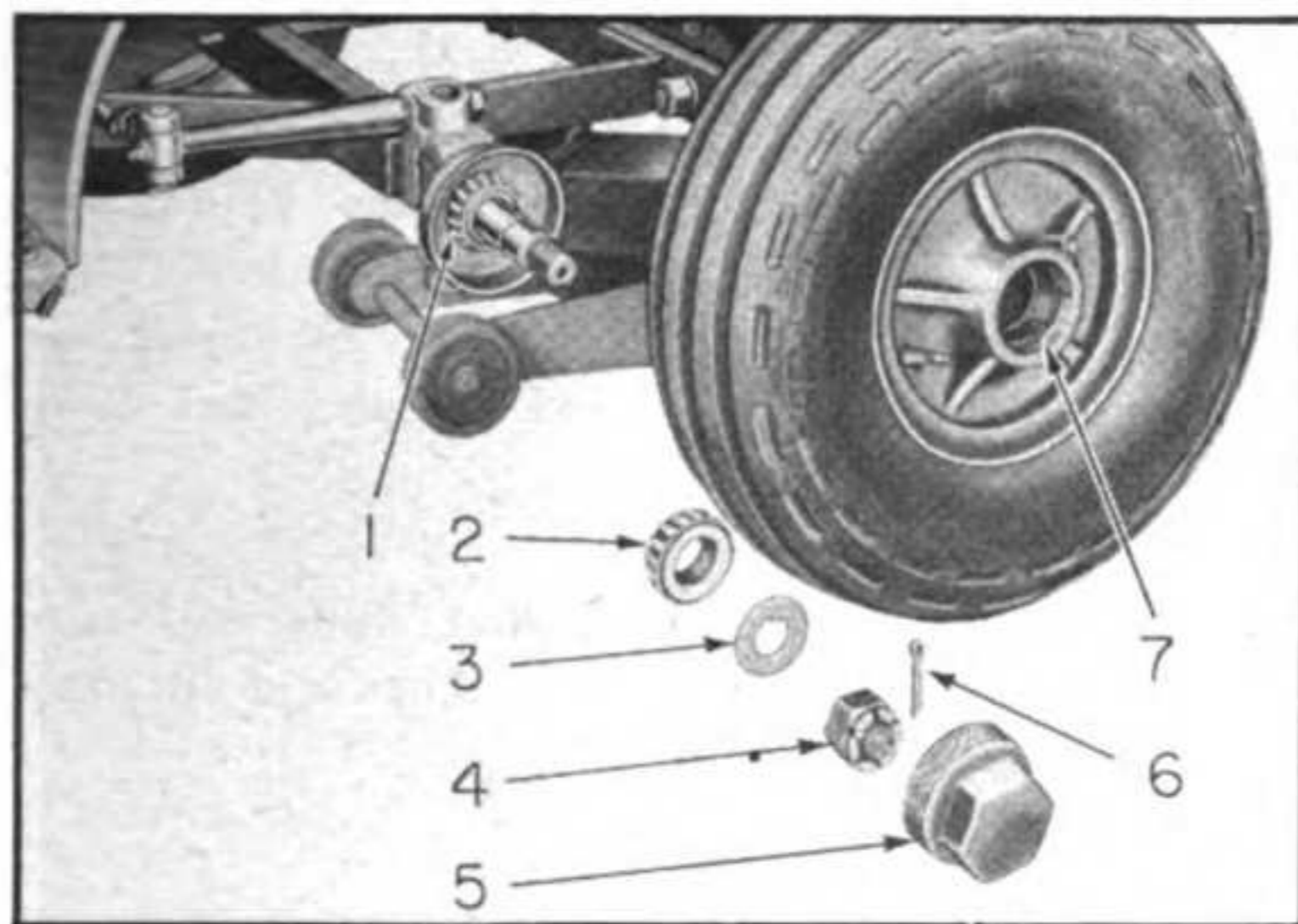


Figure 50 — Front Wheel Bearing Assembly

1. INNER BEARING CUP AND CONE
2. OUTER BEARING CONE
3. PLAIN WASHER
4. ADJUSTING NUT
5. HUB CAP
6. COTTER PIN
7. OUTER BEARING CUP

Section XXII — Rear Axle (Driving)

109. DESCRIPTION:

Rear axle shafts are mounted on tapered roller anti-friction bearings. Bearings are lubricated by the lubricant in the rear axle housing. The final drive gears are mounted on the inner end of the splined shafts. The gears are secured by a castellated nut and cotter pin.

110. WHEEL BEARINGS AND RETAINERS:

α. Removal:

Remove seat and frame (Paragraph 134), rear fenders (Paragraph 130), and coupler and bracket (Paragraph 123). Disconnect tail light (Paragraph 93). Remove rear tool box shield and step plates (Paragraph 133). Remove cap screws and nuts from the rear axle housing flange. NOTE: *The upper right and lower left bolts are precision ground to aid as pilots when reassembling the housing.* Block vehicle at the transmission with a jack or hoist and roll axle and housing straight from vehicle (Figure 51). Remove rear wheels (Paragraph 117) and rear axle housing cover. Place a flat steel bar approximately 1/2" thick between the inside ends of the axle shaft and back off the nuts, forcing the inner bearing cones from the shaft and oil seal from the housing ends. The inner and outer bearing cups in the housing are retained by snap rings; to remove, use a puller tool (Figure 54).

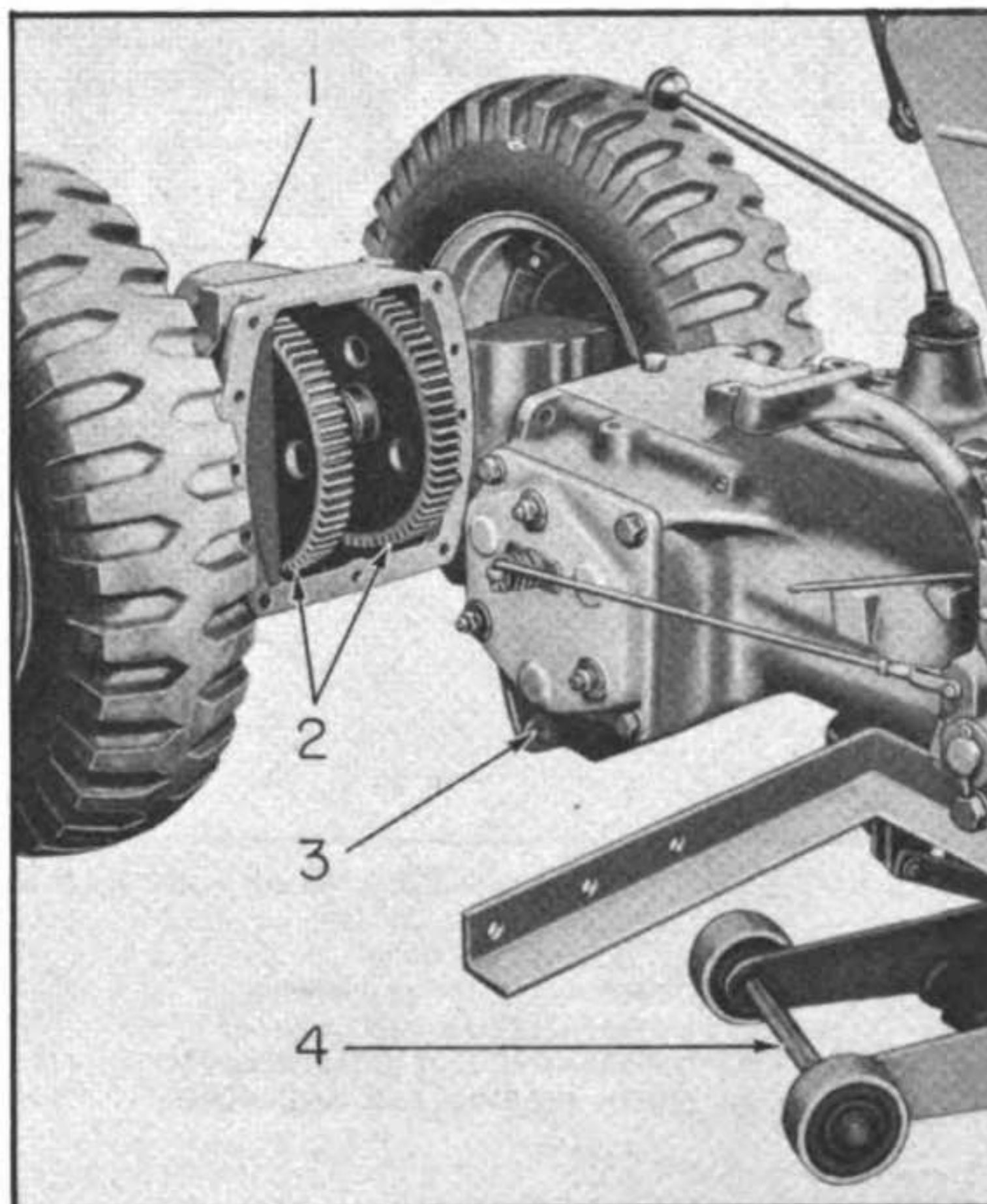


Figure 51 — Removing Rear Axle Housing from Transmission Case

1. REAR AXLE HOUSING
2. FINAL DRIVE GEARS
3. TRANSMISSION HOUSING
4. JACK

b. Installation:

Install snap rings and inner and outer bearing cups in housing using a driving tool. Place outer oil seal and tension washer on axle shaft. Press-fit outer cone on shaft and reinstall shaft in housing. Follow instructions in LUBRICATION ORDER. Reinstall inner bearing cone, final drive gear, and take-up washer on shaft, and secure with nut. Adjust bearings (Paragraph "c"). Reinstall rear axle housing cover and wheels and position unit to the

transmission. Secure with cap screws, making certain pilot bolts are located in upper right and lower left positions. Reinstall step plates (Paragraph 133), tool box shield, coupler and bracket (Paragraph 123), rear fenders (Paragraph 130), seat and frame (Paragraph 134), and connect tail light (Paragraph 93).

c. Adjustment:

Tighten adjusting nut so that shaft will turn without end play (Figure 53). Lock nut in place with new cotter pin.

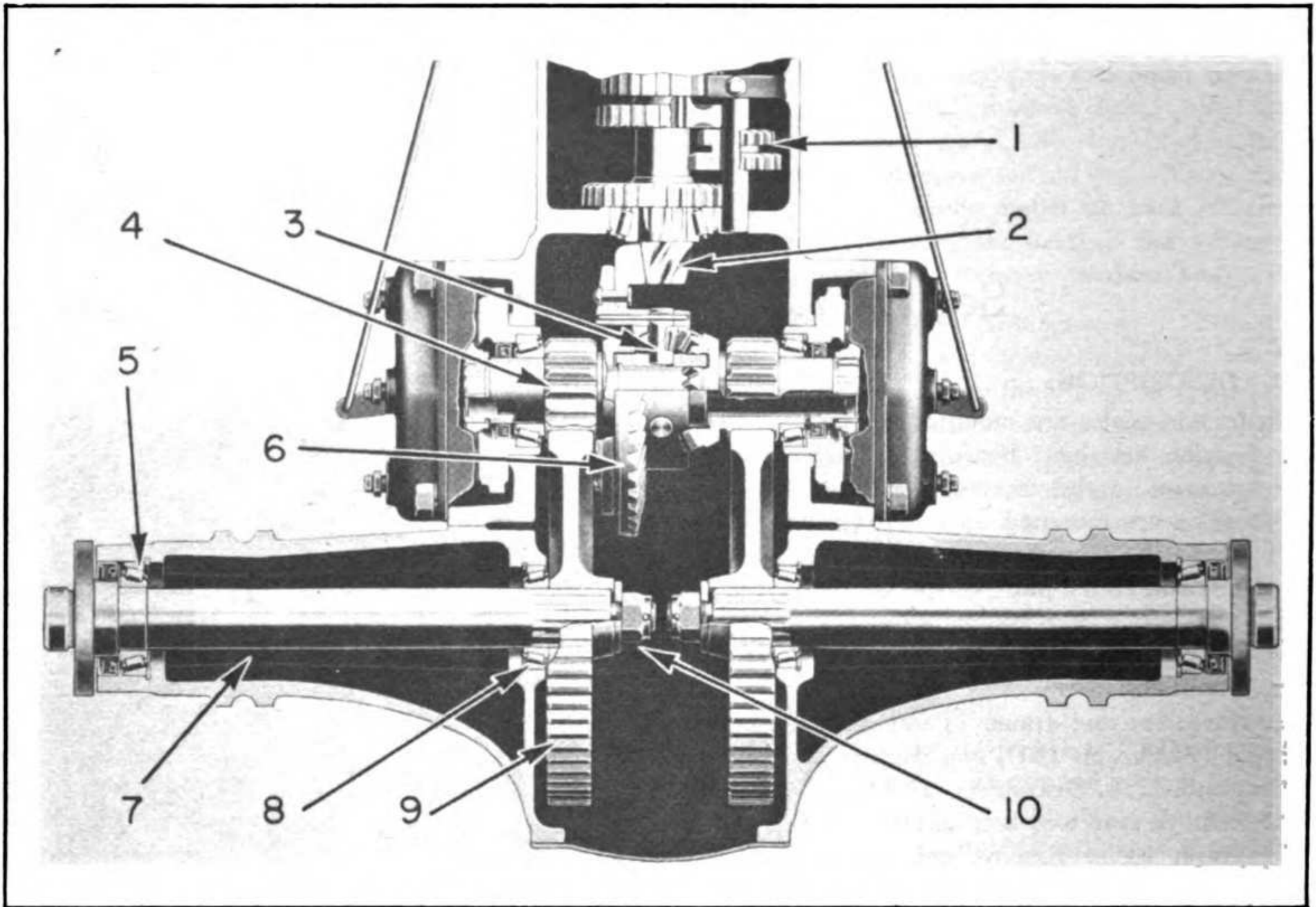


Figure 52 — Rear Axle and Differential Housing Cutaway

- | | |
|------------------------------------|-------------------------------|
| 1. REVERSE IDLER GEAR | 6. DIFFERENTIAL RING GEAR |
| 2. DIFFERENTIAL DRIVE PINION | 7. REAR AXLE SHAFT |
| 3. DIFFERENTIAL PINION ASSEMBLY | 8. INNER BEARING CUP AND CONE |
| 4. DIFFERENTIAL SIDE GEAR ASSEMBLY | 9. FINAL DRIVE GEARS |
| 5. OUTER BEARING CUP AND CONE | 10. ADJUSTING NUT |

Section XXII—Rear Axle (Driving) (Second Echelon)

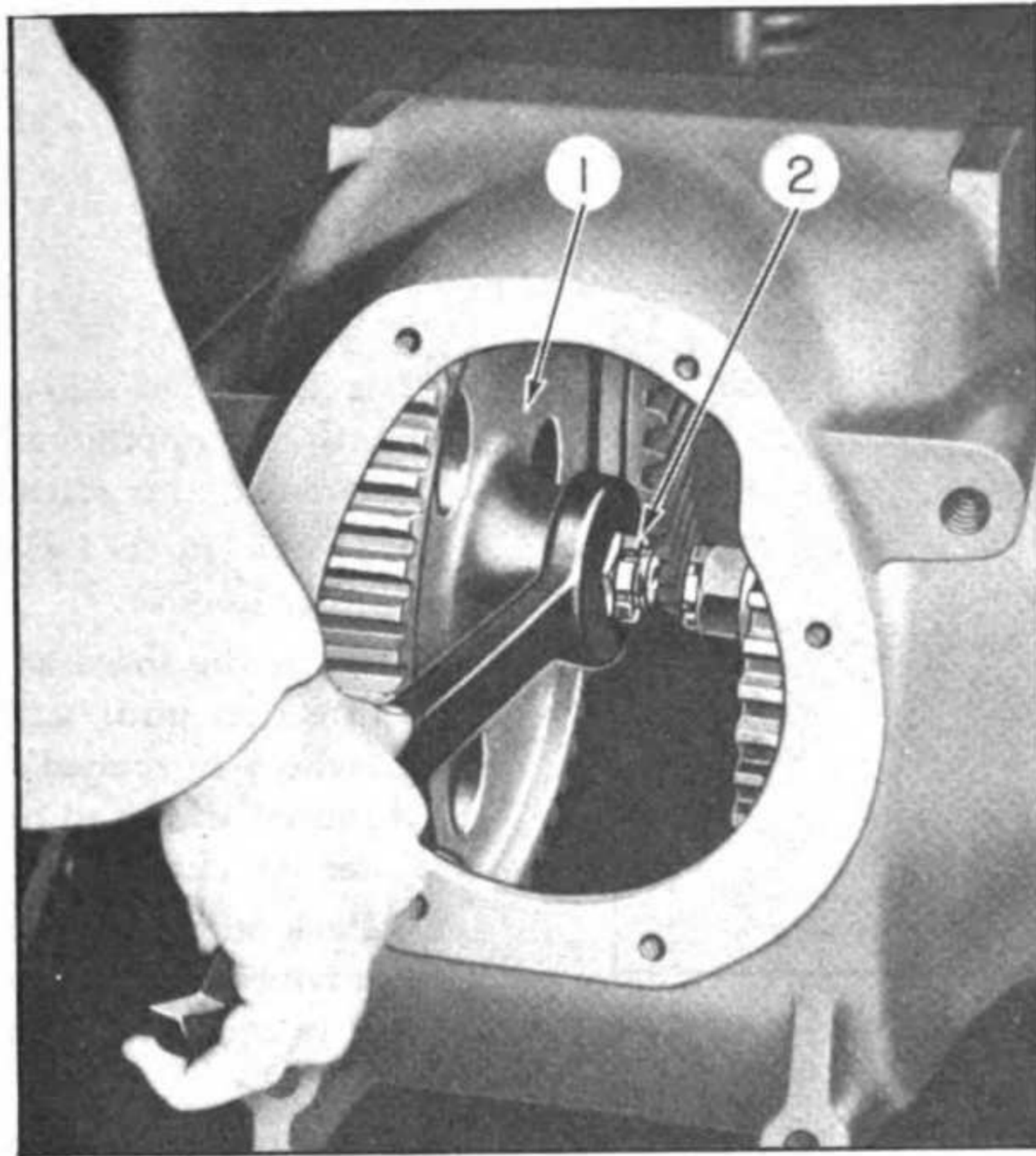


Figure 53 — Adjusting Rear Axle Bearings by Tightening Nut on Inner End of Axle Shaft

1. FINAL DRIVE GEAR
2. ADJUSTING NUT

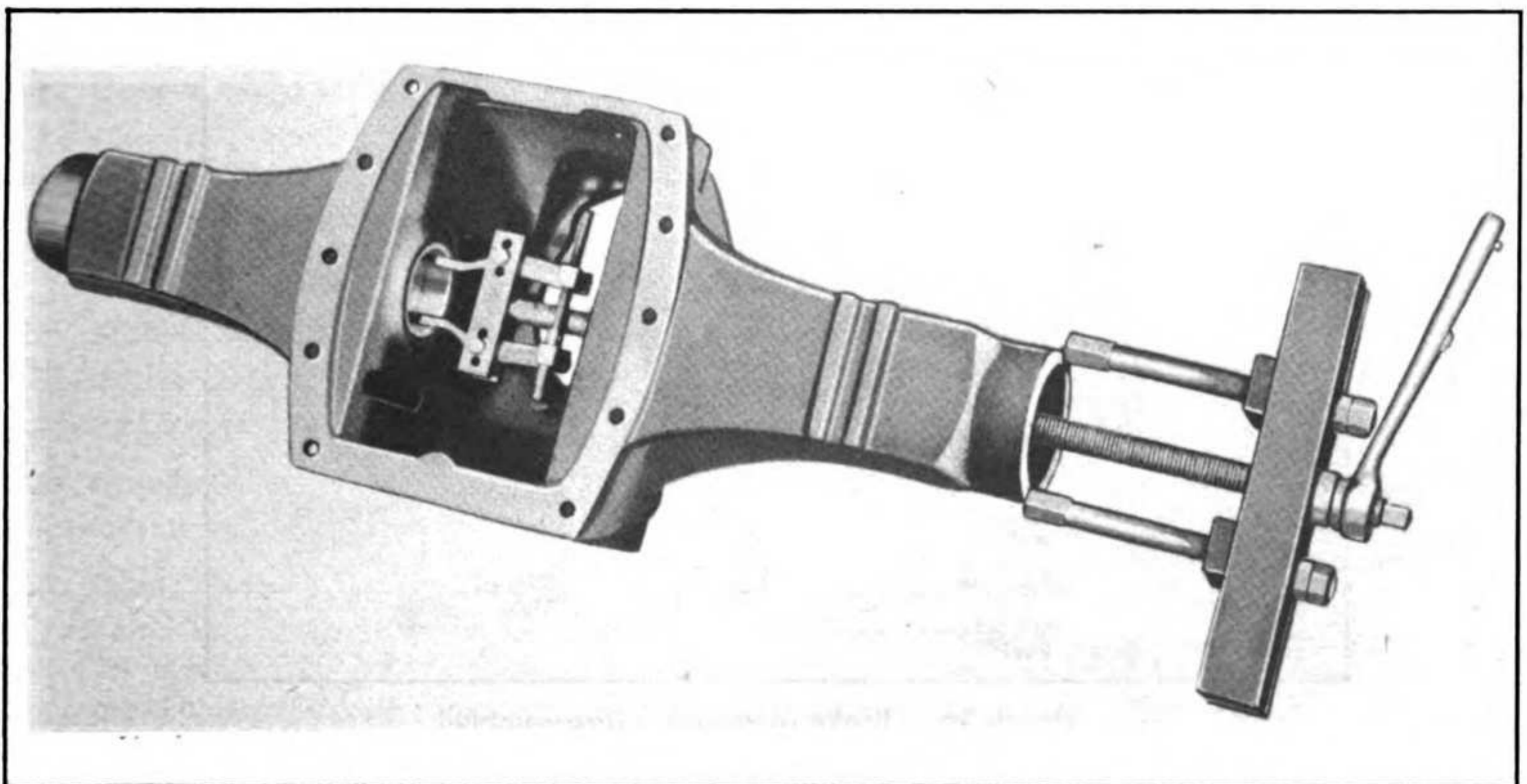


Figure 54 — Removing Inner Bearing Races from Rear Axle Housing

Section XXIII - Brakes

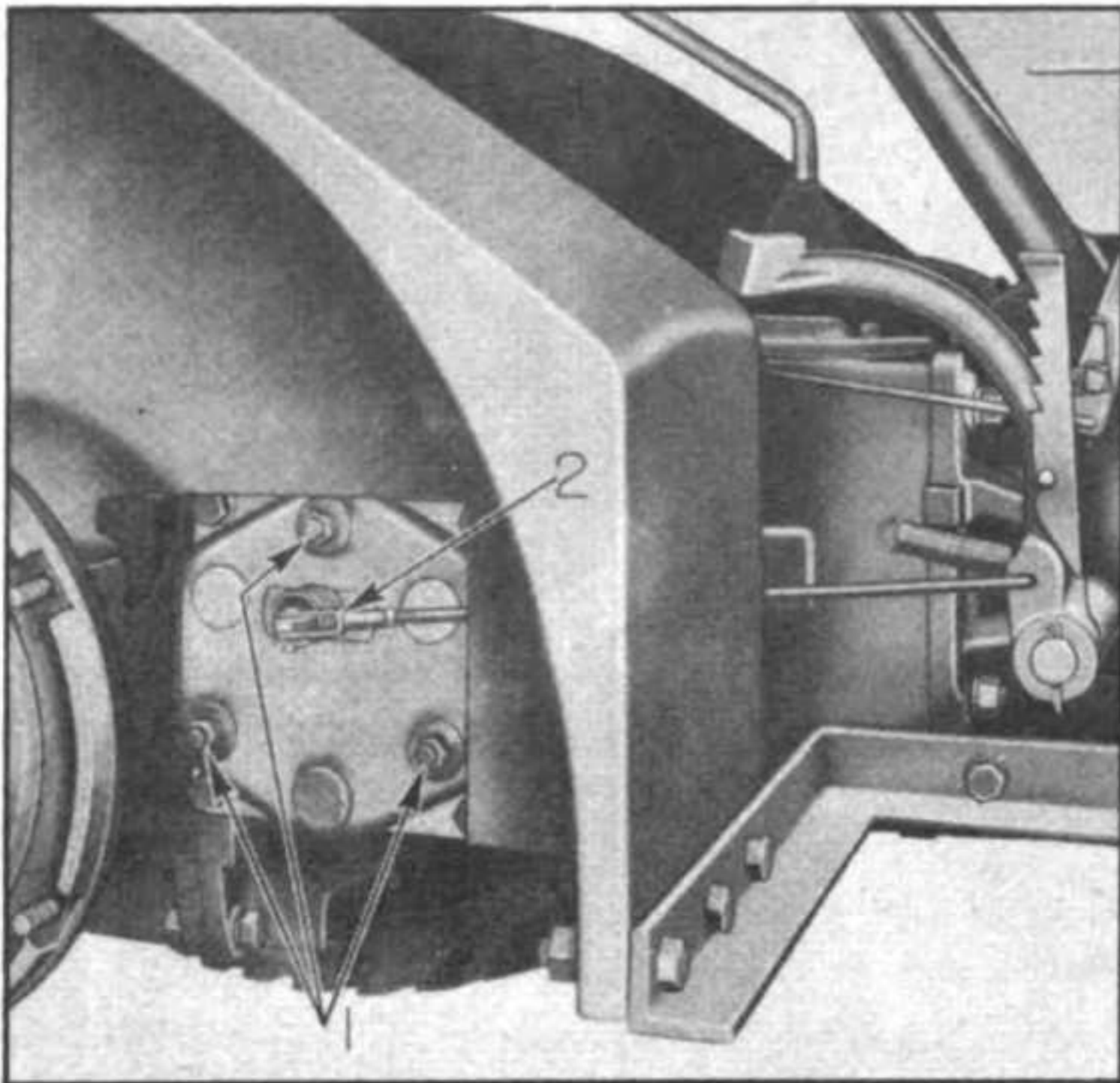


Figure 55 - Brake Housing and Controls

- 1. BRAKE ADJUSTING SCREWS
- 2. ACTUATING LEVER ADJUSTMENT

111. DESCRIPTION:

The brakes are 6" diameter, disk type, mounted on the side gears of the differential shaft. They are self-energizing.

112. BRAKE ADJUSTMENT:

Place jack to one side under rear of vehicle. Raise vehicle so that opposite side will rest on wheel. Remove tire and rim and proceed as follows:

- a. Loosen three locking screws several turns, but do not remove.
- b. Turn the three adjusting screws in a clockwise direction until a noticeable drag is present when wheel is rotated (Figure 57). This forces the primary disk and pressure plate inward and decreases the clearance at the brake lining.
- c. Back off the adjusting screws 1/4 to 1/2 turn. This provides adequate clearance against drag. Turn the screws equally to assure uniform pressure at all points.
- d. When proper adjustment is obtained, tighten locking screws to lock pressure plate in place.
- e. Adjust opposite side in like manner.

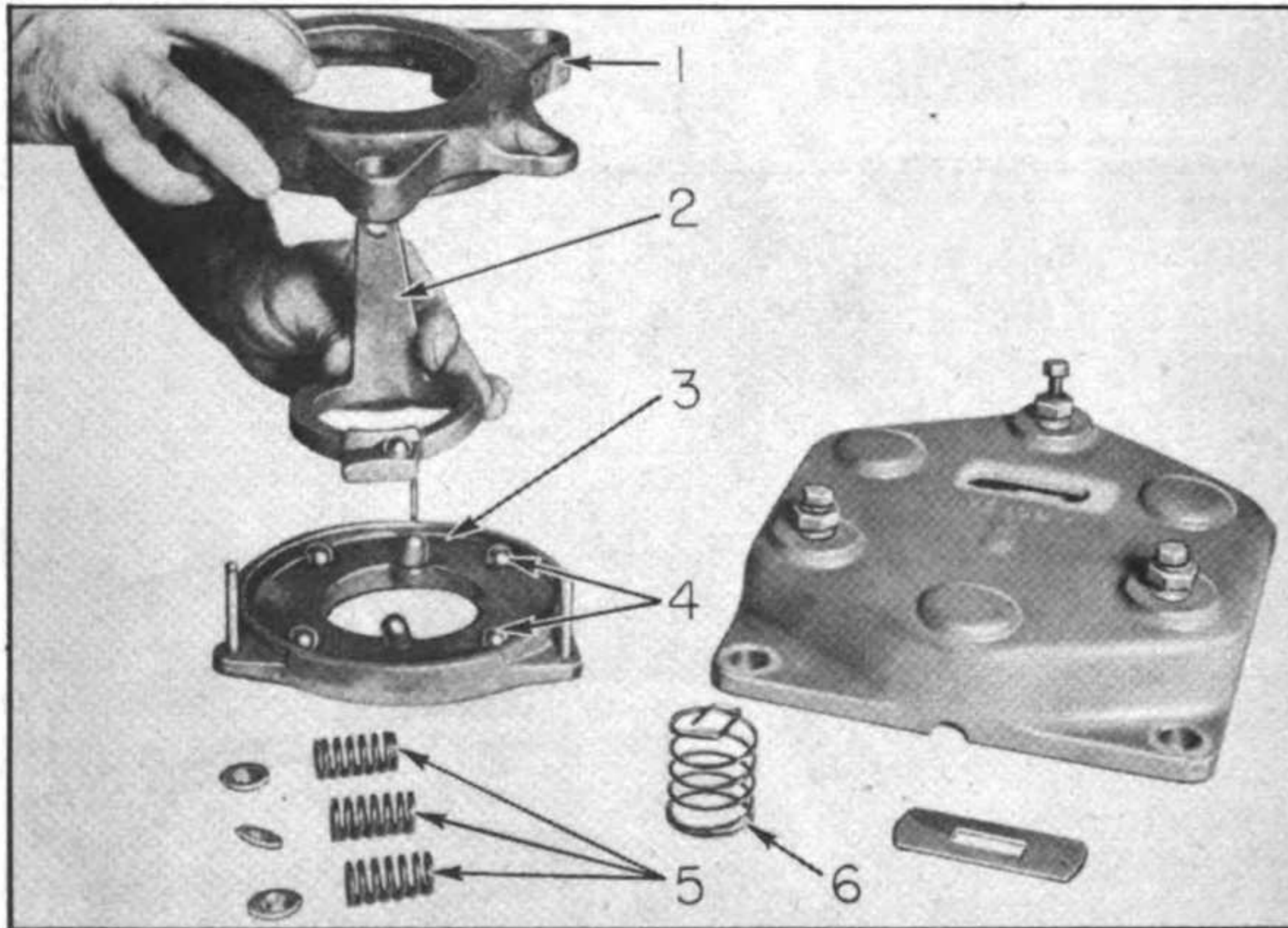


Figure 56 - Brake Mechanism Disassembled

- 1. POWER PLATE
- 2. ACTUATING LEVER
- 3. PRIMARY DISK

- 4. STEEL BALLS AND INSERTS
- 5. SEPARATING SPRINGS
- 6. BRAKE COVER SPRINGS

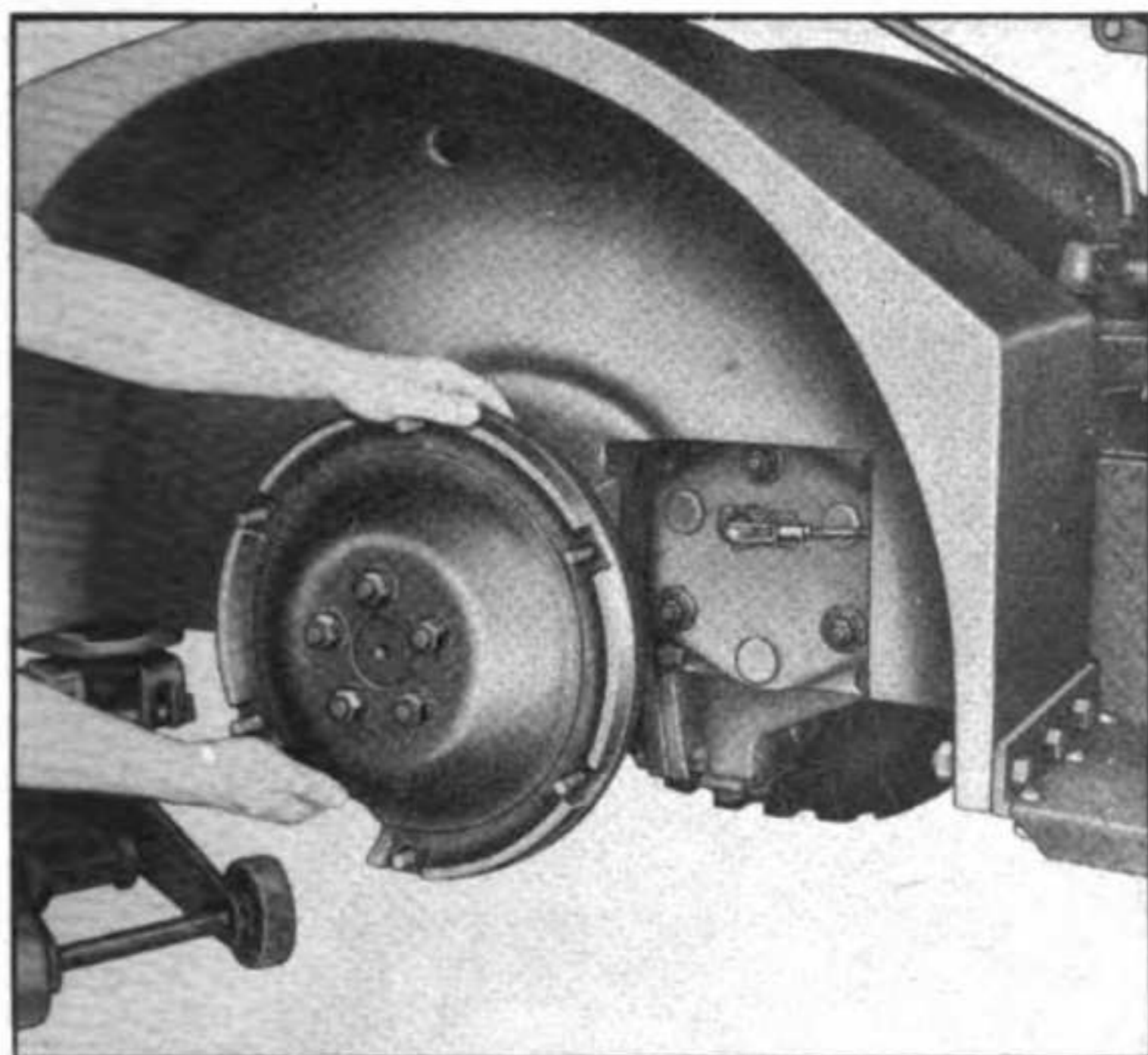


Figure 57 — Inspecting Wheel Drag During Brake Adjustment

113. BRAKE EQUALIZATION:

To make certain each brake lining has the same amount of clearance, position jack under rear of vehicle, block vehicle securely, and raise rear wheels. Start engine and operate vehicle in third or fourth gear. Apply brakes slowly and observe for braking action; wheels should slow down evenly and simultaneously. If one wheel stops turning and the other rotates, adjust brakes (Paragraph 112) until both brakes are equally effective.

114. ACTUATING ROD ADJUSTMENT:

Adjust the brake rod to effect a 1/8" free movement in the brake pedal travel. Remove cotter pin and pin, loosen nut, and adjust yoke end of rod to obtain the correct setting (Figure 55).

Section XXIV — Wheels and Tires

115. DESCRIPTION:

a. Front Wheels:

Cast iron front wheels are the drop center type. Tire size is 6:00 - 9"; correct air pressure is 35 lbs.

b. Rear Wheels:

Cast iron rear wheels are designed for 16" rims. They are secured to the axle flange by means of five 5/8" diameter studs. Tire size is 7:50 - 16"; correct air pressure is 40 lbs.

116. FRONT WHEELS:

a. Removal:

(See Paragraph 106).

b. Installation:

(See Paragraph 106).

c. Front Tires:

(1) Removal: Deflate tire. Loosen tire beads from rim of wheel. Drop tire into center of wheel and remove opposite sides of tire from wheel using a tire iron. Remove tire from wheel and inner tube from tire casing.

(2) Installation: Repair tube as required. Position tube in tire casing and reinstall tire on wheel using a tire iron. Inflate slowly, making certain tire fits properly on rim and does not pinch the tube.

117. REAR WHEELS:

a. Removal:

Place jack under rear of vehicle and raise vehicle. Remove nuts and lock washers from five studs and remove wheel, tire, and rim as a single unit.

b. Installation:

Position wheel on axle shaft and studs. Secure with nuts and lock washers.

c. Rear Tires:

(1) Removal: Deflate tire. Remove six nuts and rim clamps from wheels and remove rim, ring, and tire. Pry ring loose from rim and remove tire from rim. Note: For VAIW-4 models, remove wheels from vehicle (Sub-Paragraph "a").

(2) Installation: Repair tube as required. Position tube in tire casing and reinstall tire on rim. Place ring on rim and reinstall on wheel. Secure with clamps and nuts and inflate tire.

Section XXV - Steering Gear

118. DESCRIPTION:

The steering gear is the worm-wheel type, mounted in the center of the torque tube housing. It has a steering arm connected to the front spindle assembly with a drag link. The hand steering wheel is 16" diameter, three spoke type. Steering drag link rod is adjustable.

119. STEERING GEAR ARM:

a. Removal:

Remove left running board (Paragraph 132). Remove pressure fitting, lock wire, adjusting screw, spring, and bearing from rear of drag link. Remove drag link from steering arm. Remove nut and washers from steering shaft. Remove steering arm assembly from steering shaft, using a puller tool (Figure 58).

b. Installation:

Reinstall steering arm and washers on steering shaft and secure with nut. Reinstall drag link on steering arm with ball and socket arm between bearings. Reinstall spring, adjusting screw, lock wire, and pressure fitting. Reinstall left running board (Paragraph 132).

120. STEERING GEAR:

a. Service:

Lubricate steering gear as directed in LUBRICATION ORDER (Paragraph 29).

121. DRAG LINK:

a. Removal:

Remove pressure fitting, lock wire, adjusting screw, spring, and bearing from rear of drag link. Remove drag link from steering arm and bearing from drag link. Remove pressure fitting, lock wire, adjusting screw, and bearing from front end of drag link. Remove drag link from steering spindle and bearing and spring from drag link.

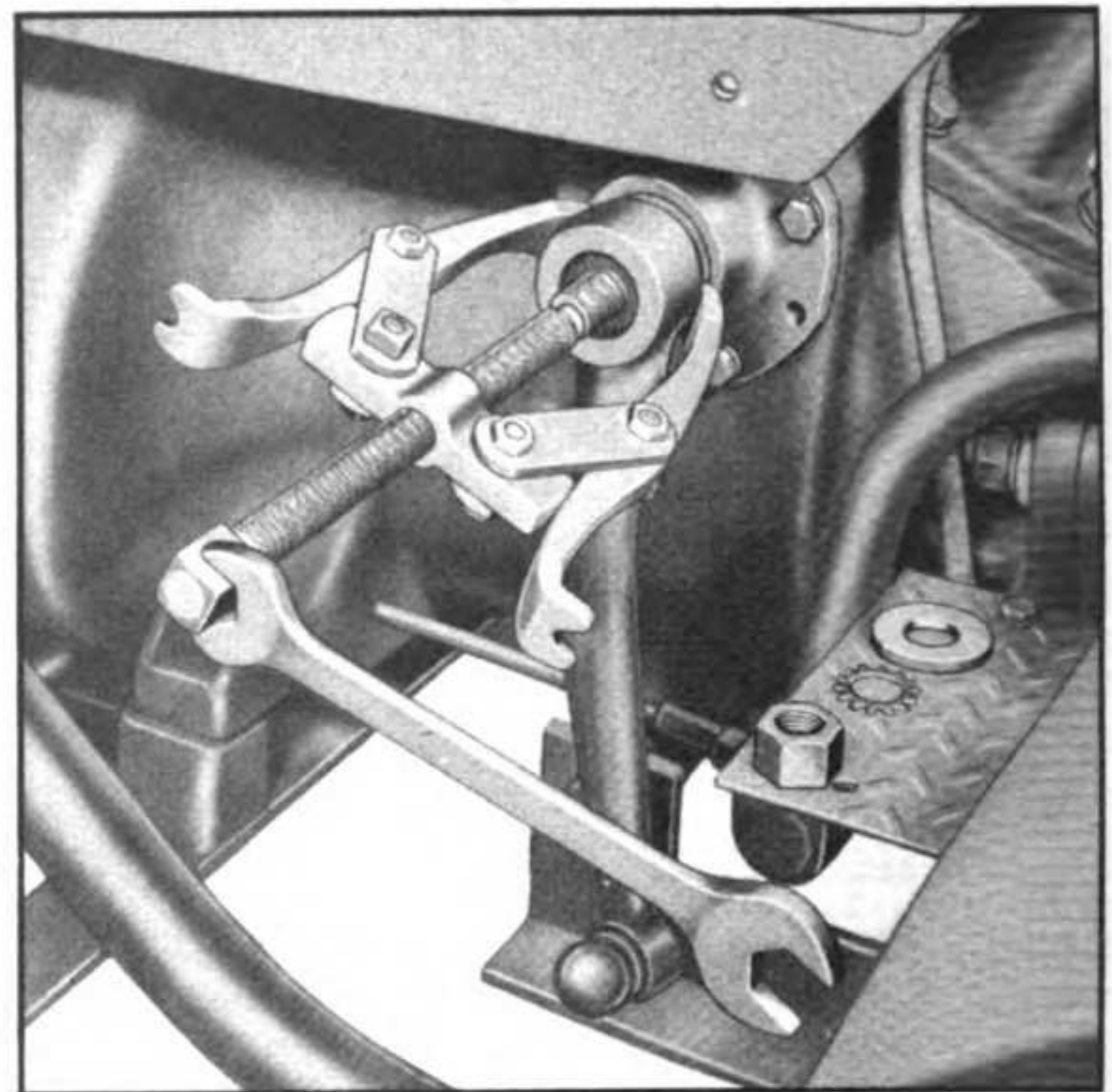


Figure 58 - Steering Arm Removal

b. Installation:

Reinstall spring and bearing in front end of drag link. Position drag link on steering knuckle arm. Reinstall bearing, adjusting screw, lock wire, and pressure fitting. Reinstall bearing in rear of drag link and position on ball end of steering arm. Reinstall bearing, spring, adjusting screw, lock wire, and pressure fitting.

122. STEERING WHEEL:

a. Removal:

Remove nut from steering shaft. Remove hand steering wheel from shaft using a puller tool.

b. Installation:

Reinstall hand steering wheel on shaft in correct alignment with key. Secure with nut.

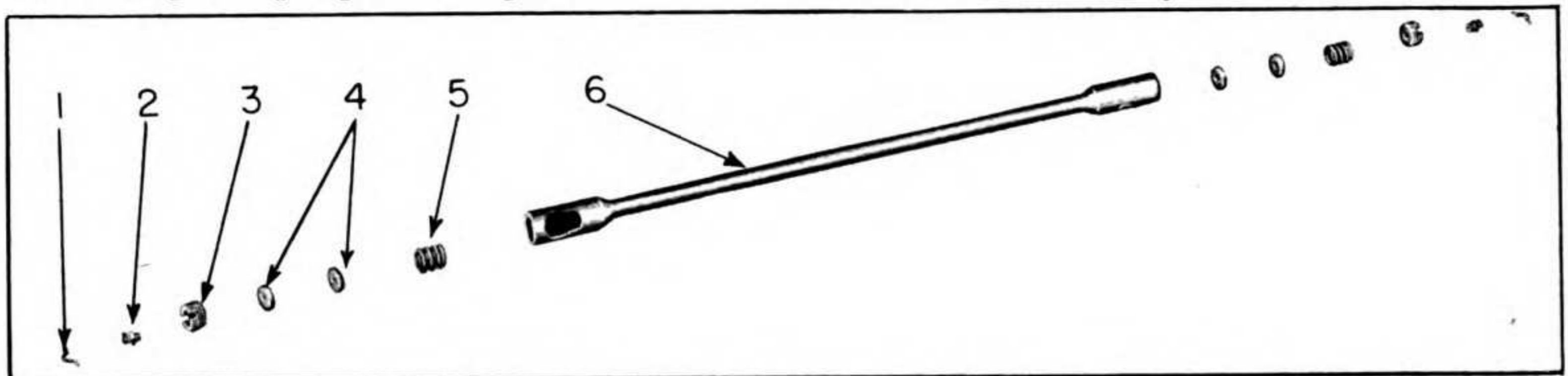


Figure 59 - Drag Link

1. LOCK WIRE
2. PRESSURE FITTING
3. ADJUSTING SCREW

4. BEARINGS
5. SPRING
6. DRAG LINK

Section XXVI – Frame

123. TOWING CONNECTION (COUPLER):

a. Description:

The automatic coupler is constructed of cast steel. For instructions on operation, see Paragraph 13.

b. Removal:

Disconnect latch rope; remove four bolts from coupler bracket. Remove coupler. Remove two lower cap screws securing bracket to rear axle hous-

ing. Remove two cap screws securing bracket under transmission housing. Remove bolts from upper braces and remove bracket.

c. Installation:

Position bracket and reinstall with cap screws under transmission housing and to the rear axle housing. Reinstall braces to rear axle housing and bracket. Reinstall coupler to bracket, and connect latch rope. Tighten cap screws and bolts.

Section XXVII – Spring

124. DESCRIPTION:

The transverse semi-elliptical type front spring is attached to the front axle frame by shackle hanger pins and to the front end casting of the vehicle by a pivot pin.

125. SHACKLE AND BOLT:

a. Removal:

Raise front of vehicle to release weight from spring. Remove locking bolt. Remove pressure fitting from pivot pin. Remove pivot pin and lower spring sufficiently for shackles to be accessible. Remove shackle hanger bolts from shackle. Remove front nut and lock washer from shackle hanger pin and remove shackle.

b. Installation:

Position shackle on hanger pin. Assemble spring and shackle and reinstall shackle bolts. Reinstall lock washer and nut on front of shackle hanger pins. Position spring and reinstall pivot pin. Secure with locking bolt and reinstall pressure fitting.

126. SPRING:

a. Removal:

Raise and block vehicle. Remove lower shackle bolts (Paragraph 125). Remove nut from U-bolts and remove spring plate. Remove spring.

b. Installation:

Position spring and spring plate and secure by reinstalling nuts to U-bolts. Position spring in shackle, reinstall shackle bolts, and secure.

Section XXVIII – Hood

127. HOOD:

a. Removal:

Unhook hood latches. Remove self-threading screws from pivot on each side at rear of hood. Remove hood.

b. Installation:

Position hood and secure by reinstalling self-threading screws and lock washers at two rear pivot points on hood. Secure front end of hood with latches.

128. HOOD SIDE PANELS:

a. Removal:

Remove hood (Paragraph 127). Detach tie straps and remove nuts and bolts from side panels. Remove side panels.

b. Installation:

Position side panels and secure with nuts and bolts. Attach tie straps and reinstall hood (Paragraph 127).

Section XXIX—Fenders

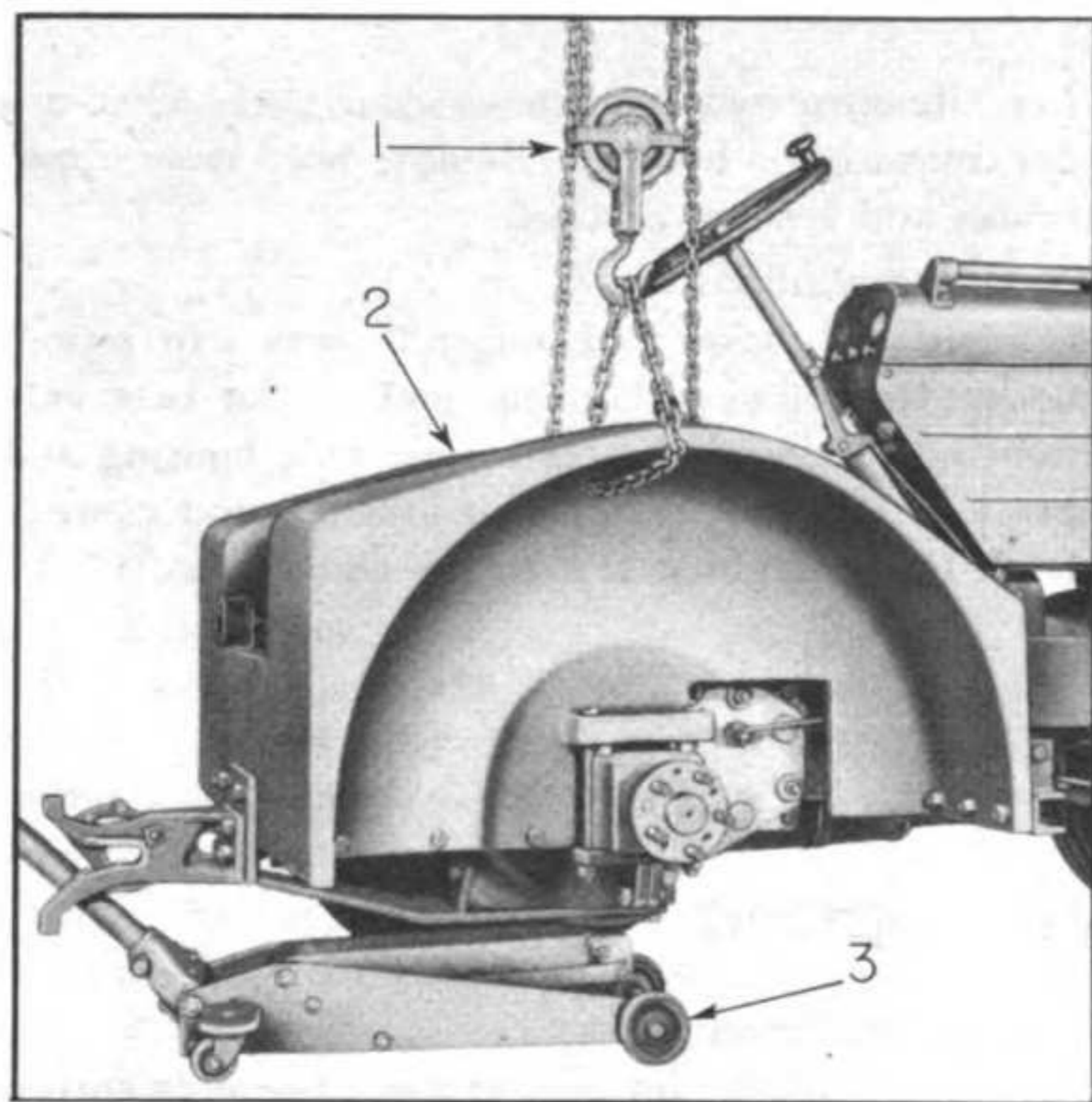


Figure 60 — Preparation for Removing Rear Fender

1. CHAIN HOIST
2. REAR FENDER
3. JACK

129. FRONT FENDERS:

a. Removal:

Disconnect head light wire from light. Remove three nuts and bolts securing front of fender to bumper-grille. Remove three nuts and bolts securing rear of fender to running board angle support. Remove fender.

b. Installation:

Position fender and insert bolts and nuts loosely. Tighten bolts and nuts securing front of fender to bumper-grille and rear of fender to running board angle support. Connect head light wire to head light.

130. REAR FENDERS:

a. Description:

Rear fenders are solid cast iron, weighing approximately 850 lbs. for the VAIW-3 and 1225 lbs. for the VAIW-4. They are designed to balance vehicle weight.

b. Removal:

Position rear of vehicle under a hoist (minimum capacity—VAIW-3 1000 lbs.; VAIW-4 1500 lbs.). Remove seat cushion and frame (Paragraph 134). Remove nuts and bolts securing step plates and

rear tool box shield to rear fenders. Raise rear of vehicle with jack. Remove rear wheel and tire (Paragraph 117). Attach chain hoist to fender (Figure 60). Remove the three nuts and bolts securing the fender to the front fender support angle. Remove the three nuts and bolts securing the fender to the rear drawbar support angle. Remove carriage bolts, spacer, and strap securing the fender to the rear axle housing. Remove fender by raising it vertically with the chain hoist (Figure 61).

c. Installation:

Position fender using the hoist. Reinstall carriage bolts, spacer, and strap loosely. Install attaching bolts and nuts loosely. Tighten bolts and nuts. Reinstall rear wheel and tire (Paragraph 117). Reinstall bolts and nuts securing step plates and tool box shield to rear fender. Reinstall seat frame and cushion (Paragraph 134).

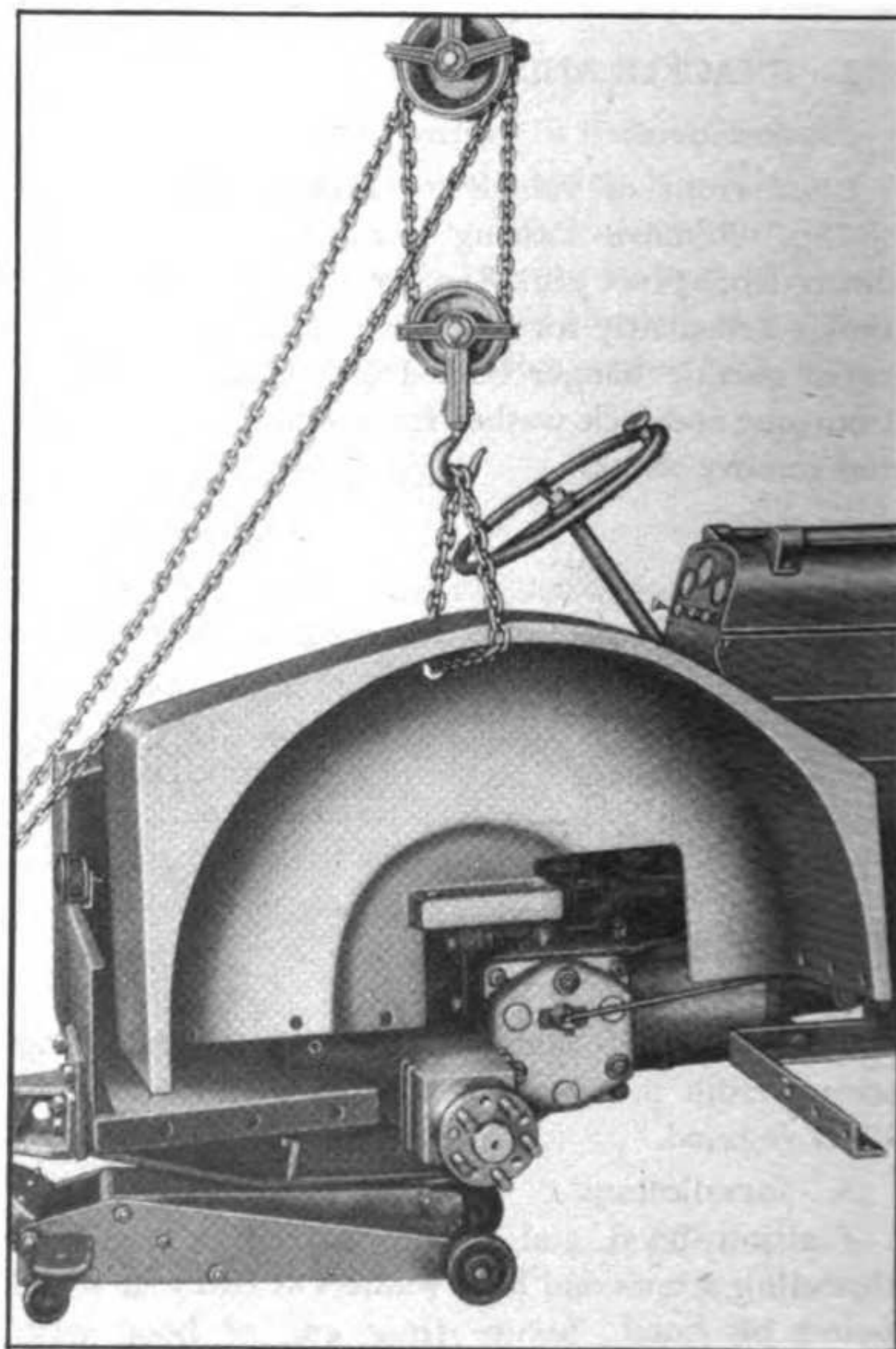


Figure 61 — Removing Rear Fender

Section XXX—Bumper-Grille and Miscellaneous Sheet Metal

131. BUMPER-GRILLE:

a. Removal:

Remove three bolts and nuts from each side securing front fender to bumper angle. Do not remove fenders. Remove cap screws securing bumper side braces to the torque tube. Remove cap screws securing bumper channel to front end casting. Remove bumper-grille by lifting out straight forward from vehicle (Figure 64).

b. Installation:

Position bumper-grille and secure channel to front end casting with cap screws. Secure side braces to torque tube with cap screws and attach front fenders to bumper angle.

132. RUNNING BOARD:

a. Removal:

Remove nuts and bolts securing running board to braces. Remove bolt securing step plate to run-

ning board. Do not remove step plate. Remove running board.

b. Installation:

Position running board and reinstall attaching nuts and bolts loosely. Tighten nuts and bolts.

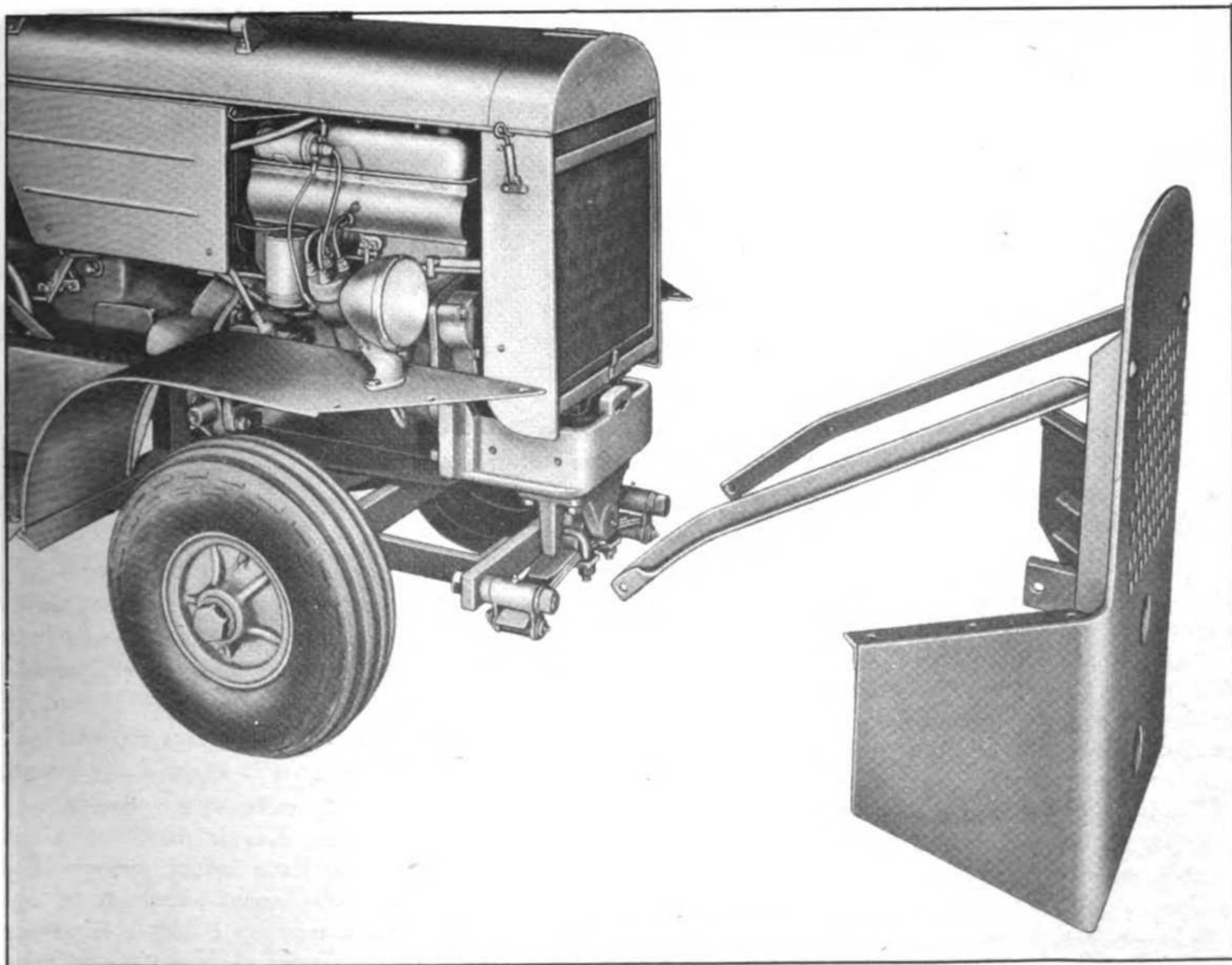
133. STEP PLATES:

a. Removal:

Remove cotter pin and disconnect foot feed link from foot feed on right step plate. Remove brake spring from under right step plate. Remove attaching nuts and bolts from step plates and remove step plates from vehicle.

b. Installation:

Position step plates and reinstall bolts and nuts loosely. Tighten bolts and nuts and attaching brake spring under right step plate; attach foot feed rod to foot feed on right step plate.



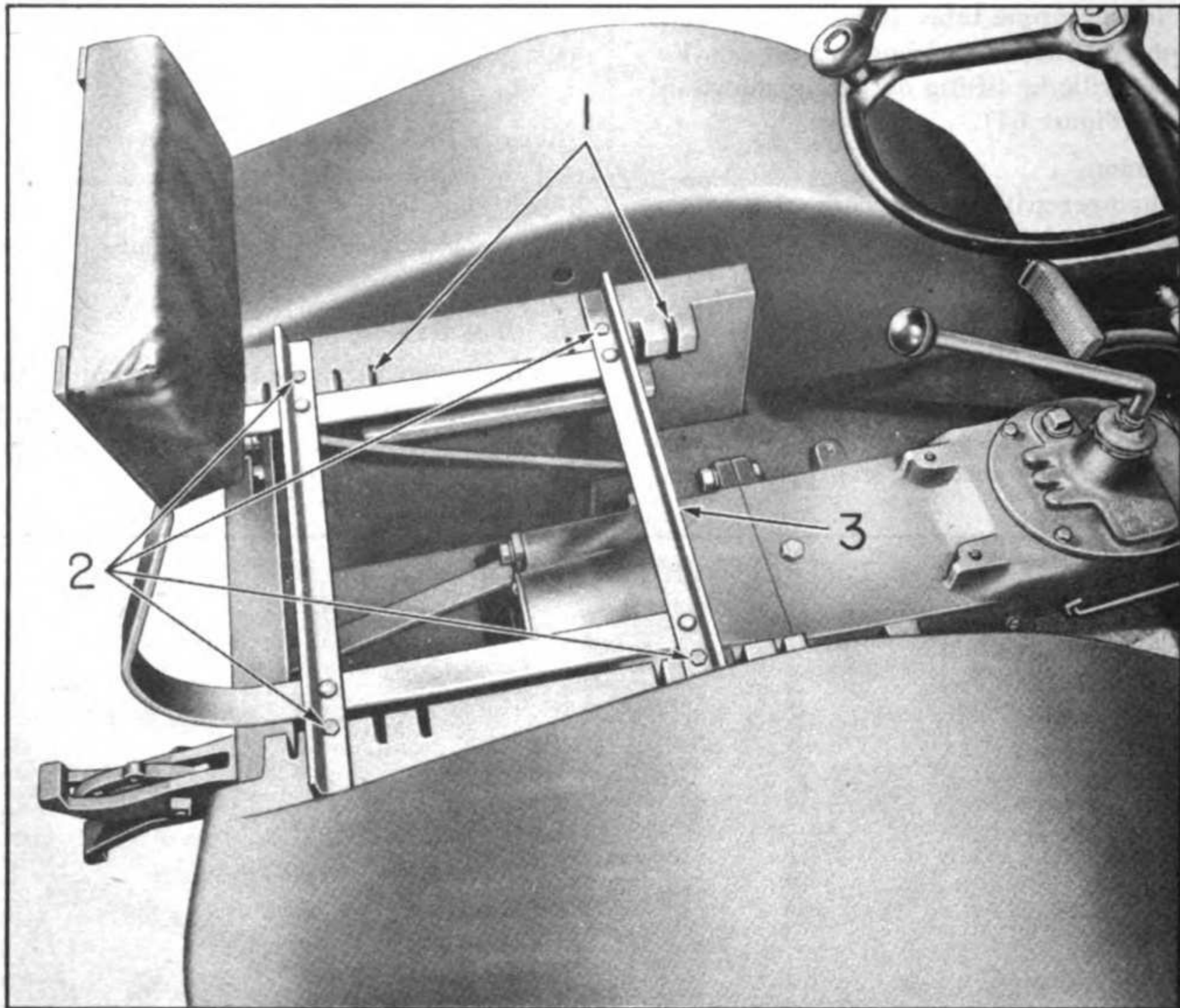
Digitized by Google **Figure 62 — Removal of Bumper Grille** Original from UNIVERSITY OF CALIFORNIA

134. SEAT AND SEAT FRAME:**α. Removal:**

Remove seat cushion from seat frame. Remove bolts securing seat frame to rear fenders. Remove seat frame.

b. Installation:

Position frame on rear fender flanges. Adjust to desired position. Secure with nuts and bolts. Reinstall seat cushion on frame.

**Figure 63 — Seat Frame Adjustment**

1. FENDER FLANGE ADJUSTMENT NOTCHES
2. SEAT SUPPORT BOLTS
3. SEAT FRAME

PART FOUR – AUXILIARY EQUIPMENT

Section XXXI – General

135. AUXILIARY EQUIPMENT:

(Not Used)

PART FIVE – REPAIR INSTRUCTIONS

Section XXXII – General

136. SCOPE:

These instructions are for the information and guidance of the maintenance personnel responsible for the third and higher echelons of maintenance

of this equipment. They contain information on the maintenance of the equipment which is beyond the scope of the tools, equipment, or supplies normally available to using organizations.

Section XXXIII – Engine

137. DESCRIPTION AND TESTS:

a. Description:

Refer to Paragraph 49.

b. Compression Test:

(1) Start engine and operate long enough to establish normal operating temperature.

(2) Test battery for full charge (Paragraph 77). If battery is not fully charged, replace with a battery that is fully charged.

(3) Remove spark plug cables from spark plugs. Remove spark plugs (Paragraph 89).

(4) Attach compression gage into front spark plug port. With throttle and choke valve fully open, operate starter until maximum reading on gage is reached. Record the gage reading and identify it as No. 1 cylinder reading. Repeat this operation on the three remaining cylinders.

(5) Compression pressure depends on starting speed, engine temperature, and compression ratio. If reading indicated by compression gage is 105 lbs., not varying more than 10 lbs. between cylinders, compression pressure can be considered normal.

(6) If pressure in any cylinder is weak, inject oil into spark plug hole while piston is down. Wait a few minutes for oil to run down over the piston rings to prevent oil from getting on valve and repeat test (Paragraph (4) above). The oil seals the rings so a low reading on first test, which remains low on second test, indicates leaky valves. A low reading on first test, which becomes a high reading on second test, indicates leaky rings. An extremely low compression reading on two adjacent cylinders indicates a leaking or blown cylinder head gasket. A gasket which has blown out between cylinders will cause erratic explosions. Replace gasket (Paragraph 57).

c. Vacuum Test:

- (1) Remove pipe plug in base of intake manifold just above carburetor.
- (2) Attach vacuum gage to intake manifold, using fitting necessary and make a tight connection.
- (3) Start engine and operate at low idle speed. If idling adjustment of carburetor is correct, spark plugs are all firing, valve action is normal, intake manifold has no air leak, engine timing is correct, and engine operates normally at idling speed, the vacuum gage indicating hand should read 21 inches and hold steady or have a slight flutter.

(4) If indicating hand does not hold steady, the fuel mixture may be too lean or too rich. Adjust idle needle and power needle (Figure 28) on carburetor until gage indicating hand reads its highest steady point for correct idle adjustment. See "Carburetor Adjustment" (Paragraph 63).

(5) If gage indicating hand cannot be held steady by turning idling adjusting screw, a detailed inspection must be made of the air and fuel intake systems for leaks. The ignition system, including spark plugs and timing, must be inspected (Paragraphs 82, 84, and 89). The valve clearance must be inspected for correct adjustment (Paragraph 58).



Figure 64 — Splitting Tractor Preparatory to Removing Engine

138. ENGINE REMOVAL:**a. Preliminary:**

Shut off fuel valve and disconnect fuel line under fuel tank. Drain coolant from engine and radiator (Figure 17). Detach battery ground strap from battery (Paragraph 78). Remove drain plug from oil pan and drain oil from engine.

b. Remove in Sequence:

Remove generator lead wires from generator. Remove oil gage line from engine (below carburetor). Remove choke wire from carburetor. Remove spark plug cover (Figure 18) and cable holder and remove heat indicator thermo bulb from engine. Remove starting motor (Paragraph 95). Remove horn and ignition coil lead wires. Detach lighting harness from front of vehicle. Remove exhaust elbow and pipe (Paragraphs 102 and 103). Remove flywheel cover at lower rear of engine. Detach governor control rod. Remove side sheet brace from valve cover.

c. Position jack under torque tube. Remove drag link from steering arm. Remove cap screws retaining ball socket cap to torque tube and remove ball socket cap. Remove front axle pivot ball. Remove bumper-grille braces from torque tube and remove flywheel cover at lower rear of engine. Attach chain hoist to engine and remove nuts from studs and cap screws retaining engine to torque tube. Split vehicle between engine and torque tube (Figure 64).

d. Removal of Engine from Front End:

Detach upper radiator braces and water outlet elbow with upper hose from engine. Remove lower water hose (Paragraph 74). Remove nuts from studs retaining engine to front mounting assembly. Block front axle assembly and remove engine from front end of vehicle.

139. ENGINE DISASSEMBLY:**a. Remove External Attachments in Sequence:**

Remove horn and ignition coil (Paragraphs 97 and 83). Remove air cleaner (Paragraph 64), manifold (Paragraph 54), carburetor (Paragraph 63), and fuel line (Paragraph 66). Remove generator (Paragraph 80), distributor (Paragraph 84), ignition wiring (Paragraph 82), spark plugs (Paragraph 89), and oil filter (Paragraph 50). Remove fan belt (Paragraph 72), water pump and fan pulley (Paragraph 71), and water pump (Paragraph 70).

b. Remove Clutch and Flywheel:
(Paragraphs 156 and 152).**c. Remove Valve Cover and Gasket:**
(Paragraph 55).**d. Remove Rocker Arms and Push Rods:**
(Paragraph 56).**e. Remove Cylinder Head and Gasket:**
(Paragraph 57).**f. Remove Oil Pan Assembly:**
(Paragraph 52).**g. Remove Float Assembly:**
(Paragraph 60).**h. Remove Timing Gear Cover:**
(Paragraph 144).**i. Remove Governor and Camshaft:**
(Paragraphs 68 and 151).**j. Remove Pistons, Connecting Rods, and Cylinder Sleeves:**
(Paragraphs 147 and 148).**k. Remove Oil Pump:**
(Paragraph 154).**l. Remove Crankshaft and Main Bearings:**
(Paragraph 153).**140. ENGINE INSPECTION AND REPAIR:****a. General:**

For information covering the disassembly, inspection, and repair, and assembly of any one of the sub-assemblies or assemblies removed in the previous paragraph (Paragraph 139), refer to the individual paragraph in the Repair Section which covers the subject in detail. For example, detailed information concerning the crankshaft can be found in Paragraph 153.

b. Engine Crankcase:

(1) Inspect camshaft expansion plug at rear of crankcase. If plug shows indications of oil leakage or looseness, replace.

(2) Inspect the five long studs and the twelve short studs on top of the crankcase for secure mounting and for any indication of thread damage. Replace studs where necessary.

(3) Inspect two studs at rear of crankcase and replace if damaged or worn.

(4) Inspect crankcase oil passage. Blow clean with compressed air.

(5) Inspect entire crankcase for signs of damage or cracks; clean inside and out with a high pressure hose.

141. ENGINE ASSEMBLY:**a. Reinstall Cylinder Sleeves:**
(Paragraph 148).

- b. **Reinstall Crankshaft and Main Bearings:**
(Paragraph 153).
- c. **Reinstall Oil Pump:**
(Paragraph 154).
- d. **Reinstall Flywheel:**
(Paragraph 152).
- e. **Reinstall Pistons and Connecting Rods:**
(Paragraph 147).
- f. **Reinstall Valve Tappets, Camshaft, Timing Gear, and Governor:**
(Paragraph 68).
- g. **Reinstall Timing Gear Cover:**
(Paragraph 149).
- h. **Reinstall Float Assembly:**
(Paragraph 60).
- i. **Reinstall Oil Pan Assembly:**
(Paragraph 52).
- j. **Reinstall Cylinder Head and Gasket:**
(Paragraph 57).
- k. **Reinstall Push Rods and Rocker Arm Assembly:**
(Paragraph 56).
- l. **Reinstall Valve Cover and Gasket:**
(Paragraph 55).
- m. **Reinstall Engine Clutch:**
(Paragraph 159).
- n. **Reinstall External Attachments in Sequence:**
Reinstall fan, pulley, water pump, and belt (Paragraphs 70-72). Reinstall oil filter (Paragraph 50), spark plugs (Paragraph 89), distributor (Paragraph 84), ignition wiring (Paragraph 82), and generator (Paragraph 80). Reinstall manifold (Paragraph 54), carburetor (Paragraph 63), fuel line (Paragraph 66), and air cleaner (Paragraph 64). Reinstall horn and ignition coil (Paragraphs 97 and 83).

142. ENGINE INSTALLATION:

- a. **Installation of Engine onto Front End:**
Position engine onto front mounting assembly studs and secure with nuts. Reinstall lower radiator hose (Paragraph 74). Attach water outlet elbow and upper radiator braces to engine.
- b. **Installation of Engine to Torque Tube:**
Position engine and clutch into torque tube. Rotate crankshaft slightly to facilitate aid in meshing splines of clutch shaft and clutch plate. Attach engine to torque tube with studs and cap screws and secure with nuts. Reinstall flywheel cover at lower rear of engine. Position front axle pivot ball into the pivot ball socket and secure in place with ball socket cap. Secure ball socket cap to torque tube

with cap screws. Reinstall drag link to pitman.

c. **Reinstall in Sequence:**

Reinstall side sheet brace, governor control rod, and exhaust elbow and pipe (Paragraphs 102 and 103). Reinstall lighting harness, horn and ignition coil wires, starting motor (Paragraph 95), heat indicator thermo bulb, cable holder, and spark plug cover. Reinstall choke wire to carburetor, oil gage line to engine (below carburetor), and generator lead wires to generator. Reinstall drain plug and restore lubricant to engine (Paragraph 29). Attach battery ground strap. Close water drains, restore coolant to engine, and connect fuel line and turn on fuel valve.

143. VALVES:

a. **General:**

The angle of the intake valve seat is 30°; the exhaust, 44°. The width of the seat of both valves is 3/32". The diameter of the seat of the intake valve is 1.177 to 1.167 inches, the exhaust valve is 1.067 to 1.057 inches. Stem diameter of intake valve is .3414 to .3406 inch, the exhaust valve is .3390 to .3382 inch. The diameter of the intake port is 5/16". The exhaust port is 1.09 inches.

b. **Valve Repair:**

Remove valves (Paragraph 58). Valves showing normal burning or pitting can be refaced in a valve refacing machine. The machine must be set to operate with a 30° face angle grinding stone for the intake valve, and 44° for the exhaust valve. No more material must be removed from the valve face than is necessary to true it up and to remove the burned or pitted portion. After refacing the valves, inspect for identical angles between valve seat and valve face, using a very light tint of Prussian Blue. If a full, even seat width contact around entire circle of seated valve is not shown, the angles do not match. The correction then must be made on the valve seat *and not on the valve*. Install valves and adjust (Paragraph 58).

144. VALVE SEAT INSERTS (EXHAUST):

a. **Replace:**

Remove valves (Paragraph 58). Inspect exhaust valve seat inserts. Inserts showing normal burning or pitting must be removed with the aid of an insert removing tool. Pack inserts in dry ice and replace with the aid of a driving tool.

b. **Reseat:**

Reseat intake valve inserts 30° by means of a grinding tool. Refer to Sub-Paragraph "b" above for procedure to match valves and seats.

Section XXXIII—Engine (Repair)

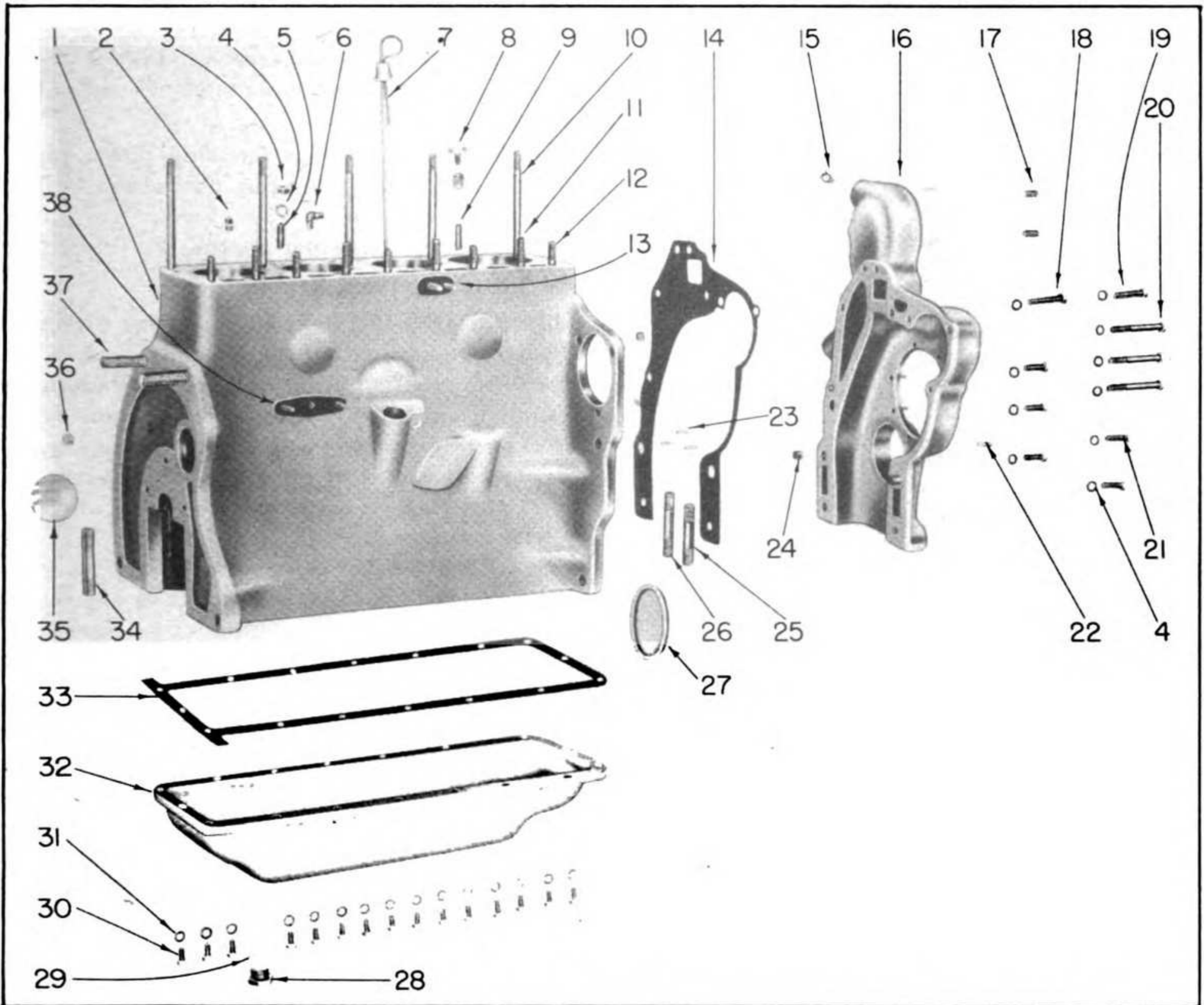


Figure 65 — Crankcase and Related Parts

- | | |
|-----------------------|-----------------------|
| 1. CRANKCASE | 20. HEX. HEAD BOLT |
| 2. PIPE PLUG | 21. HEX. HEAD BOLT |
| 3. HEX. NUT | 22. STUD |
| 4. LOCK WASHER | 23. PIN |
| 5. STUD | 24. RING DOWEL |
| 6. ELBOW FITTING | 25. STUD |
| 7. OIL GAGE ROD | 26. STUD |
| 8. DRAIN COCK | 27. COVER |
| 9. STUD | 28. DRAIN PLUG |
| 10. STUD | 29. DRAIN PLUG GASKET |
| 11. STUD | 30. HEX. HEAD BOLT |
| 12. STUD | 31. LOCK WASHER |
| 13. STUD | 32. OIL PAN |
| 14. GASKET | 33. OIL PAN GASKET |
| 15. GREASE FITTING | 34. STUD |
| 16. TIMING GEAR COVER | 35. HUBBARD PLUG |
| 17. STUD | 36. PIPE PLUG |
| 18. HEX. HEAD BOLT | 37. STUD |
| 19. HEX. HEAD BOLT | 38. OIL FILTER STUD |

145. VALVE GUIDES:

Remove valves (Paragraph 58). Press valve stem guides into place with small end of guide up, and 31/32" above the counterboard surface of the head. Replace valves and adjust (Paragraph 58).

146. ROCKER ARMS:

a. General:

Rocker arms have replaceable steel backed, tin base, babbitt lined, split type bushings, which are pressed in place and reamed to obtain .002 to .003 inch running clearance. Size of rocker arm shaft is .623 to .622 inch.

b. Rebush:

Remove valve cover and gasket (Paragraph 55). Remove rocker arm assembly (Paragraph 56). Disassemble rocker arm and replace bushings with the aid of a bushing driver. Ream new bushings to dimensions in sub-paragraph "a" above. Make certain oil hole in bushing aligns with the oil hole in the rocker arm. Reassemble rocker arm and re-install in engine (Paragraph 56). Adjust rocker arms and valves (Paragraph 58). Reinstall valve cover and gasket (Paragraph 55).

147. PISTONS, PISTON RINGS, PISTON PINS, CONNECTING RODS, AND CONNECTING ROD BEARINGS:

a. General:

Pistons are cylindrical rib type, having four rings; three 1/8" taper face compression rings and one 1/4" oil control ring. Piston fit is set with a .003 inch feeler gage having five to ten pounds pull. Piston pins are the full floating type, being retained in place by snap rings. They have a press fit of .0002 inch tight in the piston bosses and .0003 inch running clearance in connecting rod bushings. Connecting rod bearings are precision type steel backed, tin base, babbitt lined, and should be serviced in the same manner as the main bearings, which consists of replacing the shells.

b. Removal:

(1) Drain the coolant and lubricating oil from the engine. Remove front axle assembly (Paragraph 187). Remove oil pan and float assembly (Paragraphs 52 and 60).

(2) Remove valve cover and gasket (Paragraph 55), rocker arm assembly (Paragraph 56), and cylinder head and gasket (Paragraph 57).

(3) Remove the two cotter pins and two nuts securing each connecting rod to its connecting rod bearing cap. Remove bearing caps and bearings.

Remove each piston and connecting rod upward through bore of engine. If difficulty should be encountered in removing pistons, inspect top of cylinder sleeve for ridge, and remove ridge with reamer or equivalent.

(4) Remove snap rings retaining piston pin in piston and remove piston pin, piston, and bushing from connecting rod.

(5) Remove rings from pistons.

c. Inspection and Repair:

(1) PISTONS AND RINGS: Inspect piston for conditions of being out of round, cracked, or for worn ring grooves. Clean ring grooves thoroughly. Clean (if necessary, with a drill) the oil return holes in the oil control ring groove (lower groove) to insure free flow of oil. Before replacing rings, new rings must be inspected for proper ring gap and clearance in groove.

(a) Ring gap can be determined by fitting the new rings into the cylinder sleeve into which they are to be used before assembling on pistons. Insert piston ring in cylinder sleeve, using a piston to force ring down into the lower portion of the sleeve. Remove piston and determine ring gap with a feeler gage. Correct ring gap is .009 to .014 inch. If this reading is not shown, remove ring and file gap to obtain correct dimension.

(b) Ring clearance in each piston ring groove can be determined by rolling the ring around the piston while in the groove and inspecting the vertical clearance with a feeler gage. Clearance must be within .0015 to .002 inch for each of the four rings. Should the rings be too thick, they can be reduced in thickness to fit by lapping on a sheet of #000 emery cloth placed on a surface plate or other perfectly flat surface and applying equal pressure at all points of the ring.

Install rings after piston has been attached to connecting rod. Refer to following Sub-Paragraph "d" (2) for correct procedure.

(2) CONNECTING RODS, BUSHINGS, PINS, AND BEARINGS:

(a) The bushing at the piston pin end of the connecting rod is phosphor bronze material. It is 1-3/32" long and is press fit of .003 to .004 inch into the bore of the connecting rod. If the clearance between the pin and bushing is excessive, these parts must be replaced. Upon replacement of the bushing, it must be reamed to a bore of .8597 to .8595 inch, or bore to permit .0003 inch clearance over piston pin diameter and not to exceed .001 inch out of round or taper, by indicator reading.

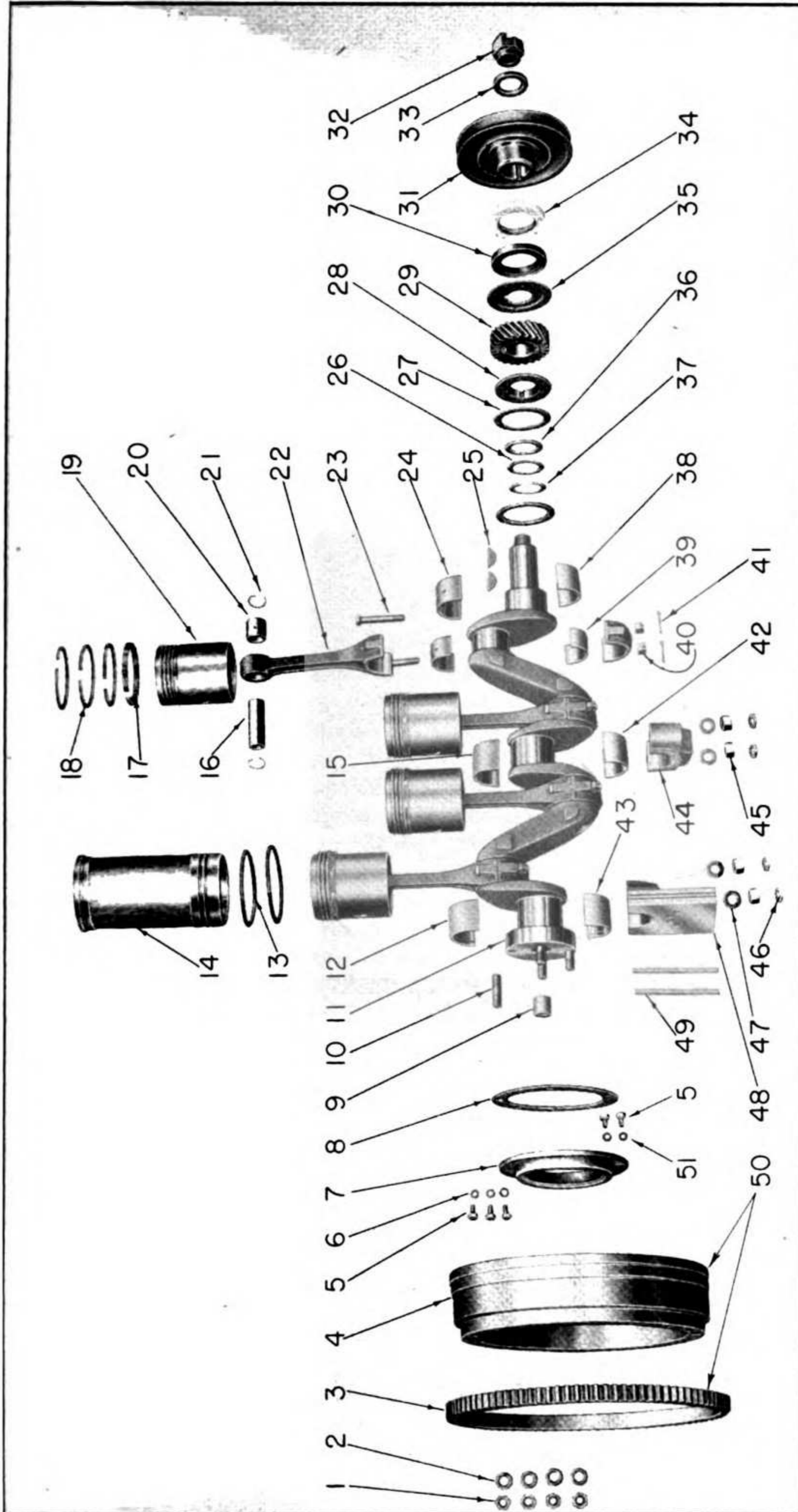


Figure 66 — Crankshaft, Pistons, and Related Parts

- | | | |
|---|--------------------------------------|---------------------------------------|
| 1. HEX. NUT | 18. PISTON RING (OIL RING) | 35. OIL THROWER |
| 2. LOCK WASHER | 19. PISTON | 36. THRUST SPACER |
| 3. RING GEAR — 96 TEETH | 20. PISTON PIN BUSHING | 37. THRUST SHIM |
| 4. FLYWHEEL | 21. RETAINING RING | 38. CRANKSHAFT BEARING — FRONT LOWER |
| 5. FILLISTER HEAD SCREW | 22. CONNECTING ROD | 39. CONNECTION ROD BEARING |
| 6. SHAKEPROOF WASHER, INTERNAL TEETH | 23. CONNECTING ROD BOLT | 40. NUT |
| 7. OIL SEAL RETAINER AND SEAL | 24. CRANKSHAFT BEARING — FRONT UPPER | 41. COTTER PIN |
| 8. OIL SEAL RETAINER GASKET | 25. MORTON KEY | 42. CRANKSHAFT BEARING — CENTER LOWER |
| 9. PILOT BUSHING | 26. THRUST SHIM | 43. CRANKSHAFT BEARING — REAR LOWER |
| 10. STUD | 27. THRUST WASHER | 44. CRANKSHAFT BEARING CAP — CENTER |
| 11. CRANKSHAFT | 28. THRUST PLATE | 45. BEARING CAP NUT |
| 12. CRANKSHAFT BEARING — REAR UPPER | 29. GEAR — 24 TEETH | 46. PAL-NUT |
| 13. CYLINDER LINER PACKING (RUBBER RINGS) | 30. OIL SEAL — FRONT | 47. PLAIN WASHER |
| 14. SLEEVES | 31. FAN DRIVE PULLEY | 48. REAR BEARING CAP AND FILLER BLOCK |
| 15. CRANKSHAFT BEARING — CENTER UPPER | 32. STARTING JAW | 49. FILLER BLOCK PACKING |
| 16. PISTON PIN | 33. STARTING JAW COLLAR | 50. FLYWHEEL ASSEMBLY |
| 17. PISTON RING | 34. FAN DRIVE PULLEY DUST SEAL | 51. COPPER ASBESTOS GASKET |

Bore must be parallel and square with crank end bore of rod within .001 inch total indicator reading for every inch of bearing length. Oil groove in bushing must align with hole in top of connecting rod. Bushing oil holes must be positioned to connecting rod sides.

(b) The connecting rod bearings at the crank end must be inspected for evidences of normal or unusual wear or damage. If any wear or damage is noted, bearings must be replaced, but at the same time a detailed inspection must be made of related engine parts; namely, the crankshaft, connecting rod, and cap to make certain the replacement bearings will be used with serviceable parts. Parts must be cleaned thoroughly in SOLVENT, dry cleaning. Bearing journal diameter is 1.9375 to 1.9365 inches. Bearing shells are 1-1/8" long. They are locked in place by the groove and ear arrangement in the same manner as the main bearings to prevent their rotating on the crankshaft. The running clearance between the bearing and crankshaft journal must be .0015 to .002 inch. When removing bearing caps, note their positions and keep them separated so there will be no error when reassembling. Numbered side of the caps and rods are toward the camshaft. Bolts used in bearing caps are special size and type. Sixty pound pull with a torque wrench is required for proper tightening.

d. Assembly:

(1) **PISTON AND CONNECTING RODS:** With piston pin at room temperature (approximately 70° F.) and coated with lubricant, heat piston in boiling hot water to approximately 200° F. Place connecting rod in position inside of piston with bushing in alignment with piston pin holes and piston. Enter piston pin into piston by pushing with palm of hand through connecting rod bushing until it is completely in place with piston and connecting rod. Dry thoroughly with compressed air. Squeeze pronged end of snap ring and install one ring in groove in piston in each end of piston pin to hold pin in place.

(2) **PISTON AND RINGS:** After preliminary inspection has been made to insure correct dimensions of ring gap and ring groove, install four rings to each piston, using a piston ring expander. The oil control ring must be installed first into the lower ring groove. Install three compression rings into the three remaining ring grooves. The ring surface having the word "top" stamped on it must be up when assembled. Be sure to stagger the ring gaps around the piston.

e. Installation:

(1) **PISTONS AND CONNECTING RODS:** Immerse each piston assembly in OE 10. Using a ring compressor tool, install each connecting rod and piston assembly into its correct cylinder sleeve. *NOTE: The cylinder numbers are stamped on each connecting rod and cap; No. 1 starts at the front of the engine. The No. 1 connecting rod and cap must be installed in the No. 1 cylinder with the numbered side of the connecting rod cap assembled toward the camshaft side of the engine.*

(2) **CONNECTING ROD BEARINGS AND CAPS:** Make certain that the bearing and connecting rod surfaces are absolutely clean and free of dirt. Assemble both halves of bearing to the connecting rod and cap. Each bearing shell has a notch arrangement which will engage into the groove of each rod and cap. Coat surface of bearing with engine oil and assemble each rod and cap with bearings to the cleaned crankshaft. Tighten nuts to connecting rod bolts to a sixty pound pull with a torque wrench. Lock in place with new cotter pins. Hand-crank engine to test for smooth and free rotation of crankshaft and pistons.

(3) Reinstall oil float assembly and oil pan (Paragraphs 60 and 52). Reinstall front axle assembly (Paragraph 187).

(4) Reinstall cylinder head and gasket and rocker arm assembly (Paragraphs 56 and 57). Adjust valves (Paragraph 58).

(5) Reinstall valve cover and gasket (Paragraph 55). Restore coolant and lubricant supply to engine.

148. CYLINDER SLEEVES (LINERS):

a. General:

The engine is equipped with replaceable wet type cylinder sleeves. For best results, it is advisable to replace pistons when replacing sleeves; especially when a complete set of four are to be installed. Sleeves and pistons are available in matched sets.

b. Removal:

(1) Drain the coolant and lubricating oil from the engine. Remove front axle assembly (Paragraph 187). Remove oil pan and float assembly (Paragraphs 52 and 60).

(2) Remove valve cover and gasket (Paragraph 55), rocker arm assembly (Paragraph 56), and cylinder head and gasket (Paragraph 57).

(3) Remove pistons, connecting rods, and related parts (Paragraph 147).

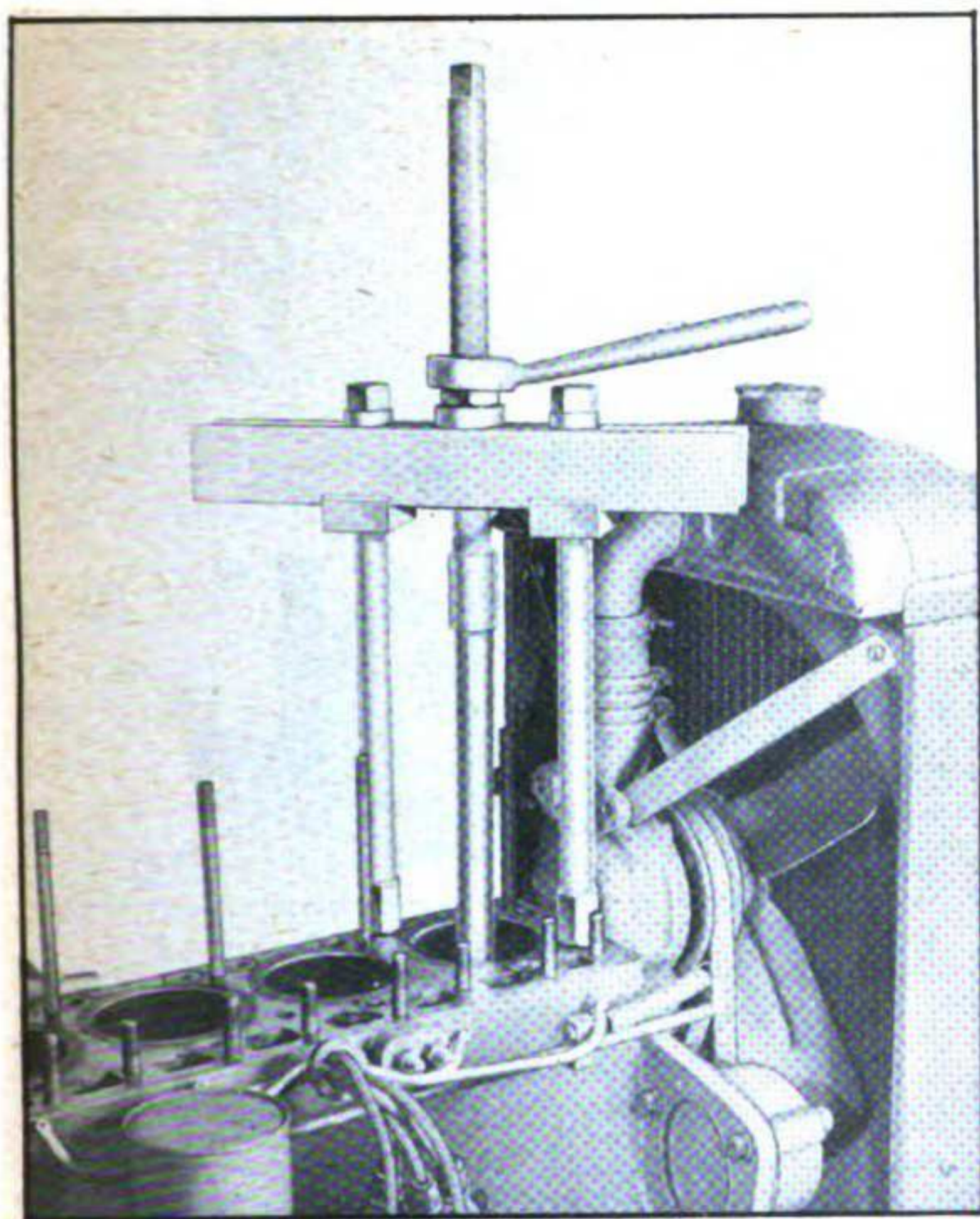


Figure 67 — Removing Sleeve from Engine

(4) Remove sleeves with the aid of a sleeve puller (Figure 67). Make certain sleeve puller adapter is of correct size to fit sleeves. Remove the two rubber rings from the lower bore of each cylinder.

c. Installation:

(1) Before installation, scrape and clean the upper and lower crankcase bores thoroughly. Coat the walls of the lower bores, the lower end of the sleeves, and the new rubber rings with grease. Do not grease sleeve grooves. Install new rubber rings in sleeve grooves. Position sleeve with rings through top bore into lower bore. Press firmly on sleeve and give it a quick twist to start the rings into the bore. When the sleeve is installed fully into place, the top shoulder will be .001 to .004 inch above the surface of the crankcase. Measure this condition with an indicator from a sine bar placed on the crankcase. A sleeve below the crankcase surface is likely to leak water. After installing all sleeves, pour a small amount of water into the crankcase and inspect around the lower bore for leaks.

(2) Reinstall pistons, connecting rods, and related parts (Paragraph 147). Reinstall oil float assembly and oil pan (Paragraph 60 and 52). Reinstall front axle assembly (Paragraph 186).

(3) Reinstall cylinder head and gasket, and rocker arm assembly (Paragraphs 56 and 57). Adjust valves (Paragraph 58).

(4) Reinstall valve cover and gasket (Paragraph 55). Restore coolant and lubricant to engine.

149. TIMING GEAR COVER:

α. Removal:

Drain coolant (Figure 17). Remove bumper-grille (Paragraph 131). Remove radiator and hoses (Paragraphs 74 and 75). Remove fan, fan belt, and water pump (Paragraphs 70-72). Remove generator (Paragraph 80). Remove crankshaft pulley (Paragraph 59). Detach governor control throttle (Figure 17) and governor control rod and spring (Figure 18) from governor inspection cover lever. Remove governor inspection cover. Remaining governor parts may be retained in engine. Remove three cap screws and washers from front end of oil pan. Remove attaching bolts from timing gear cover and remove cover. Clean unit thoroughly of sludge, dirt, or grit.

b. Installation:

Inspect oil seal for damage or wear. Inspect felt dust seal for looseness. If replacement of seals is necessary, coat surfaces with shellac before installation. Inspect dowel pins to see if they are firmly in place in gear cover. Shellac entire attaching surface of gear cover and place gasket in position, aligning with dowel pins. Coat attaching surface of crankcase with shellac and install gear cover with gasket onto crankcase. Secure bolts firmly. Reinstall oil pan front cap screws and lock washers. Reinstall governor inspection cover and attach governor throttle rod and control rod. Reinstall crankshaft pulley (Paragraph 59). Install water pump, water pump and fan pulley, fan, and fan belt (Paragraphs 70-72). Reinstall generator (Paragraph 80). Reinstall radiator and hoses (Paragraphs 74 and 75) and bumper-grille (Paragraph 131).

150. TIMING GEAR:

α. Removal:

Drain coolant from radiator and engine (Figure 17). Remove bumper-grille (Paragraph 131) and radiator and hoses (Paragraphs 74 and 75). Remove fan, fan belt, and water pump (Paragraphs 70-72). Remove generator (Paragraph 80). Remove crankshaft pulley (Paragraph 59), governor (Paragraph 68), and timing gear cover (Paragraph 149). Remove timing gear with the aid of a puller tool.

b. Inspection and Repair:

Inspect gear and Woodruff key. If key causes gear to fit loosely or key is worn, replace. Replace gear if worn or damaged. Inspect oil hole in gear. Make certain it is clean and not plugged. Inspect governor ball driver pin to see that it is firmly in place in gear.

c. Installation and Timing:

Place key on camshaft and position timing gear with key. While timing gear is partially in place, rotate gear and camshaft so that punch point markings on the two teeth of the timing gear mesh with the punch point marking on the tooth of the crankshaft gear (Figure 68). Press timing gear fully into place. Install governor (Paragraph 68), timing gear cover (Paragraph 149), crankshaft pulley (Paragraph 59), and generator (Paragraph 80). Install water pump fan belt, and fan (Paragraphs 70-72). Reinstall radiator and hoses (Paragraphs 74 and 75). Install bumper-grille (Paragraph 131) and restore coolant to radiator.

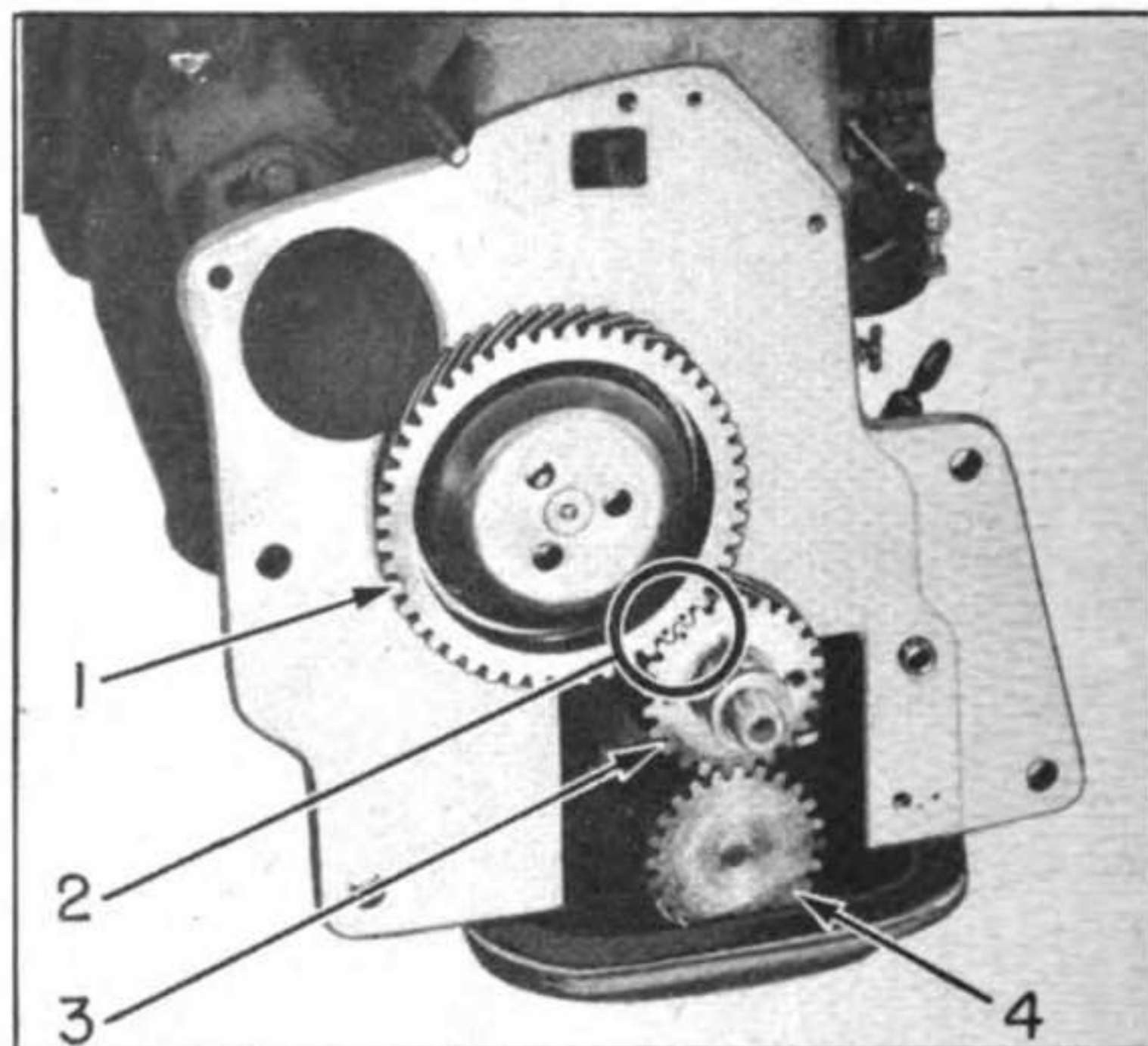


Figure 68 — Front Engine Cover Removed

- 1. CAMSHAFT GEAR
- 2. PUNCH POINT MARKINGS
- 3. CRANKSHAFT GEAR
- 4. OIL PUMP DRIVE GEAR

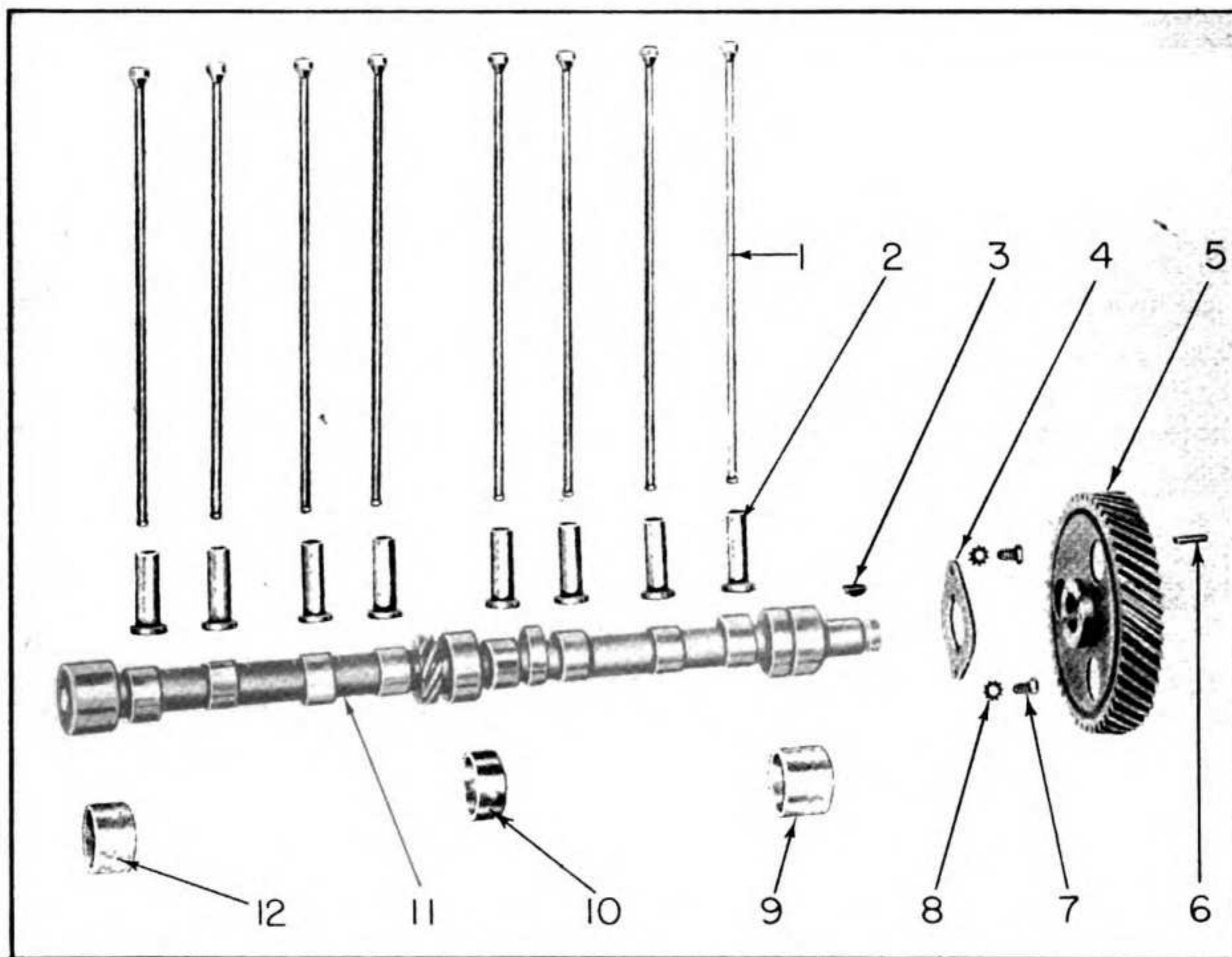


Figure 69 — Camshaft

- | | |
|-----------------------------|-----------------------------|
| 1. PUSH ROD | 7. SCREW |
| 2. VALVE LIFTER | 8. WASHER (SHAKEPROOF) |
| 3. WOODRUFF KEY | 9. CAMSHAFT BUSHING—FRONT |
| 4. CAMSHAFT THRUST PLATE | 10. CAMSHAFT BUSHING—CENTER |
| 5. CAMSHAFT GEAR — 48 TEETH | 11. CAMSHAFT |
| 6. STRAIGHT PIN | 12. CAMSHAFT BUSHING—REAR |

151. CAMSHAFT AND BUSHINGS:**a. General:**

The camshaft is made of special alloy cast iron. It operates in steel backed, tin base, babbitt lined bushings. Running clearance is .0015 to .002 inch. The length of the front bushing is 5/16"; center bushing, 23/32"; and rear bushing, 1-3/16". The camshaft hub end, camshaft thrust plate, and timing gear are precision machined to obtain an end clearance of .003 to .007 inch.

b. Camshaft Removal:

(1) Drain the coolant and lubricating oil from the engine.

(2) Remove bumper-grille (Paragraph 131), radiator (Paragraph 75), and hoses (Paragraph 74). Remove fan, fan belt, and water pump (Paragraphs 70-72). Remove generator (Paragraph 80), crankshaft pulley (Paragraph 59), governor (Paragraph 68), timing gear cover (Paragraph 149), and timing gear (Paragraph 150). Remove two cap screws retaining thrust plate to crankcase and remove thrust plate.

(3) Remove front axle assembly (Paragraph 186), oil pan (Paragraph 52), and float assembly (Paragraph 60).

(4) Remove valve cover and gasket (Paragraph 55) and rocker arm assembly (Paragraph 56). Remove push rods by lifting out through top of crankcase.

(5) To facilitate removal of camshaft, coat flange of each valve lifter and push lifter up into crankcase to allow clearance between lifters and camshaft bearing journals. Remove camshaft through front of engine. Remove valve lifters from bottom of crankcase. Camshaft may also be removed by pushing valve lifters up into crankcase and holding in place manually to allow journal clearance.

c. Inspection and Repair:

Before removal of camshaft from engine, inspect camshaft for signs of looseness. Insert a feeler gage between bushing and shaft journal to determine clearance (refer to Sub-Paragraph "a" for proper clearance allowances). If camshaft is worn or damaged, replace. If bushings are worn, replace.

d. Camshaft Bushings:

(1) **REMOVAL:** Complete procedures as outlined in Sub-Paragraph "b", and remove engine (Paragraph 138). Remove Welch plug from rear of engine. Remove bushings with a bushing remover tool.

(2) **INSTALLATION:** Press bushings into place into crankcase bores. Make certain oil holes are alined. Replacement bushings are sized to afford

a .001 to .003 inch press fit. Bushing must then be line reamed to afford a clearance not greater than .002 inch over the size of the shaft journal diameter. Replace Welch plug. Reinstall engine (Paragraph 142).

e. Camshaft Installation:

(1) Make certain all parts are thoroughly clean. Coat valve lifters lightly with grease and place into position through bottom of engine to enable clearance of camshaft bearing journals. Place camshaft into position through front of engine. Secure in place with thrust plate. Secure thrust plate to crankcase with two shakeproof washers and cap screws. Reinstall timing gear (Paragraph 150), timing gear cover (Paragraph 149), and governor (Paragraph 68).

(2) Reinstall float assembly (Paragraph 60), oil pan (Paragraph 52), and front axle assembly (Paragraph 187).

(3) Reinstall push rods, rocker arm assembly (Paragraph 56), and valve cover and gasket (Paragraph 55).

(4) Reinstall crankshaft pulley (Paragraph 59); generator (Paragraph 80); water pump, fan belt, and fan (Paragraphs 70-72); hoses (Paragraph 74); radiator (Paragraph 75); and bumper-grille (Paragraph 131).

152. FLYWHEEL:**a. General:**

The flywheel is attached to the flange of the crankshaft with four studs, lock washers, and nuts. One of the studs is off-set 1/8" from the center line. This is so arranged that the flywheel can be assembled in one position only with regard to numbers 1 and 4 crankshaft journals.

b. Removal:

(1) **PRELIMINARY:** Shut off fuel valve, drain coolant, detach battery ground strap from battery (Paragraph 78), detach head light wires at head lights, and remove head lights and front fenders as a single unit (Paragraph 129). Remove cap screws and nuts securing bumper side braces to the torque tube and bumper-grille; remove side braces.

(2) **REMOVE AND DETACH FROM LEFT SIDE OF ENGINE:** Remove exhaust pipe and elbow (Paragraph 102). Detach generator lead wires from generator, oil gage line from engine (below carburetor), choke wire from carburetor, and fuel line from carburetor.

(3) **REMOVE AND DETACH FROM RIGHT SIDE OF ENGINE:** Remove spark plug cover and

cable holder and detach heat indicator thermo bulb from engine. Remove starting motor (Paragraph 91). Detach horn and ignition coil lead wires and remove horn and ignition coil (Paragraphs 83 and 97). Detach governor control rod from speed control lever.

(4) Position jack under torque tube or transmission. Attach chain hoist to engine cylinder head studs. Detach front of drag link from left steering arm. Detach front axle assembly at rear pivot ball only; remove two cap screws and ball socket cap. Remove flywheel cover from torque tube. Remove nuts and studs attaching engine to torque tube. Split vehicle as shown in Figure 64.

(5) Remove six cap screws attaching clutch bracket unit to flywheel and remove clutch bracket unit and lined clutch plate. Remove four nuts from cap screws and studs attaching flywheel to crankshaft and remove flywheel assembly.

(6) Inspect flywheel and ring gear for signs of wear. Replace if necessary. Remove ring gear with the aid of a chisel driving tool.

c. Installation:

(1) Heat ring gear and press into position on flywheel. Position flywheel and ring gear with crankshaft and secure with four nuts. Attach clutch bracket unit and lined clutch plate to flywheel with six cap screws and lock washers.

(2) Position engine and clutch into torque tube. Rotate the crankshaft slightly to facilitate meshing the splines of the clutch shaft and clutch lined plate. Attach engine to torque tube at lower position with two bolts. Install nuts finger-tight. Attach front fuel tank bracket support to upper studs and secure nuts. Secure nuts on two lower bolts. Reinstall flywheel cover plate. Attach front axle assembly to the vehicle at the pivot ball by reinstalling the ball socket cap with two cap screws. Attach front of drag link to left steering arm. Remove chain hoist and jack.

(3) **REINSTALL TO RIGHT SIDE OF ENGINE:** Attach governor control rod to speed control lever. Reinstall horn and ignition coil and attach lead wires (Paragraphs 83 and 97). Reinstall starting motor (Paragraph 95). Attach heat indicator thermo bulb to engine and reinstall cable holder and spark plug cover.

(4) **REINSTALL TO LEFT SIDE OF ENGINE:** Attach fuel line to carburetor, choke wire to carburetor, oil gage line to engine (below carburetor), and generator lead wires to generator.

(5) Reinstall bumper side braces to torque tube

and bumper-grille. Reinstall front fenders and head lights (Paragraph 129). Attach battery ground strap to battery (Paragraph 78). Turn on fuel valve.

153. CRANKSHAFT AND MAIN BEARINGS:

a. General:

The crankshaft has three precision steel backed, tin base, babbitt lined main bearings which are drilled for pressure lubrication. Front bearing length is 1-17/32"; center bearing, 1-3/4"; and rear bearing, 1-25/32". Grooves are machined in the crankcase and cap to act as a retainer for matching ears stamped into the steel back of the inserts. This arrangement locks the inserts and prevents their rotating in the crankcase. The crankshaft and bearing running clearance is .0015 to .002 inch. The crankshaft journal diameter is 2.2500 to 2.2490 inches. End thrust of the crankshaft is taken by the front bearing. The crankshaft end play is .003 to .005 inch and is regulated by a removable thrust collar to the rear of the crank gear together with a shim pack to the rear of the collar. It is not necessary to remove the crankshaft when replacing bearing inserts. However, if correct bearing fit is not obtained upon replacement of the bearings, crankshaft must be removed (Sub-Paragraph "c"), inspected for damage or wear, and replaced if necessary. Main bearings are removed and installed individually in accordance with the following procedures. *NOTE: Do not attempt fitting bearing by scraping or filing the bearing cap or crankcase bosses, as in either instance such practice may permanently ruin the crankcase or cap.*

b. Main Bearings, Removal and Installation:

(1) **PRELIMINARY:** Disconnect battery ground cable (Paragraph 78), and drain oil and coolant (Figure 17). Remove spark plugs (Paragraph 89) to eliminate compression drag. Position a jack under the torque tube and raise the front of the vehicle. Remove the front axle assembly (Paragraph 187), oil pan (Paragraph 52), and float assembly (Paragraph 60).

(2) **FRONT BEARING REMOVAL AND INSTALLATION:**

(a) *Removal:* Remove oil pump (Paragraph 154) and remove bearing cap and lower bearing insert. Loosen pal-nuts and nuts on center and rear bearing caps sufficiently to permit clearance for rotating the upper front insert out of position. Rotate crankshaft and remove front upper bearing insert. Inspect bearings and replace if worn.

Section XXXIII—Engine (Repair)

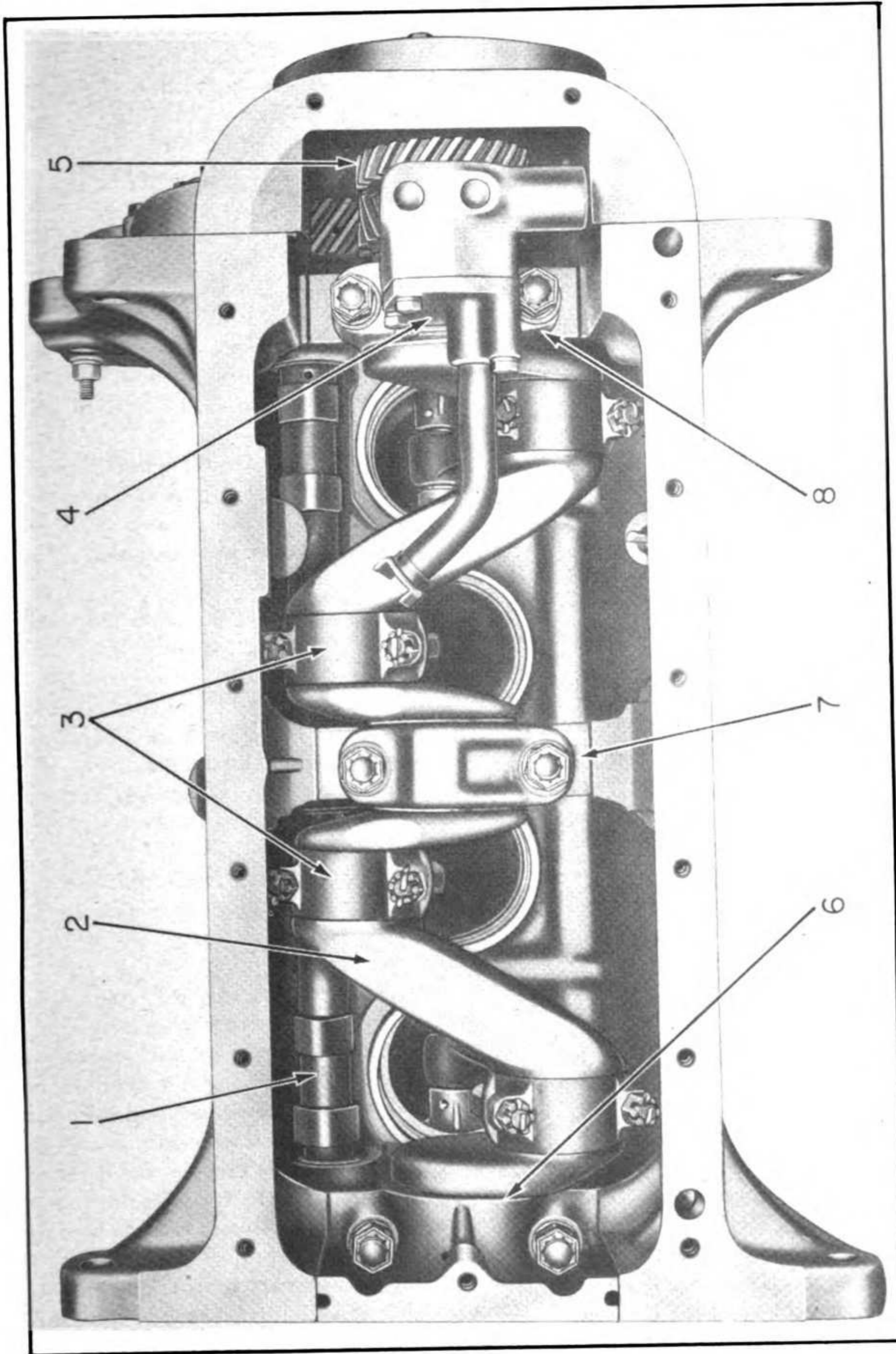


Figure 70 — Engine — Bottom View

- 1. CAMSHAFT
- 2. CRANKSHAFT
- 3. CONNECTING ROD BEARINGS
- 4. WATER PUMP
- 5. WATER PUMP DRIVE GEAR
- 6. REAR CRANKSHAFT BEARING
- 7. CENTER CRANKSHAFT BEARING
- 8. FRONT CRANKSHAFT BEARING

(b) *Installation:* Place upper front bearing insert on crankshaft and rotate crankshaft until bearing is in position. Place lower front bearing insert in position and place a .002 inch brass shim (1/4 x 1-1/2") lengthwise between the bearing insert and the shaft journal. Reinstall bearing cap and oil pump (Paragraph 154). Tighten nuts to a ninety pound torque wrench pull. Rotate shaft and inspect bearing and journal clearance. If clearance is not excessive, there should be a slight drag when rotating the shaft. Remove oil pump and bearing cap and remove brass shim. Reinstall cap and oil pump (Paragraph 154). Reinstall nuts loosely; do not tighten until center and rear bearings have been serviced.

(3) CENTER BEARING REMOVAL AND INSTALLATION:

(a) *Removal:* NOTE: *Mark right and left sides of bearing cap for identification in reinstallation.* Bearing cap must be installed in same position as removed. Remove two pal-nuts and nuts on center bearing cap and remove cap. Remove lower bearing insert and rotate crankshaft and remove upper bearing insert. Inspect bearing inserts and replace if worn.

(b) *Installation:* Place upper center bearing insert on crankshaft and rotate crankshaft until bearing is in position. Place lower center bearing insert in position and place a .002 inch brass shim (1/4 x 1-1/2") lengthwise between the bearing insert and the shaft journal. Reinstall bearing cap and tighten nuts to a ninety-pound torque wrench pull. Rotate shaft and inspect bearing and journal clearance. If clearance is not excessive, there should be a slight drag when rotating the shaft. Remove bearing cap and remove brass shim. Reinstall cap, washers, and nuts. Do not tighten until rear bearings have been serviced.

(4) REAR BEARING REMOVAL AND INSTALLATION:

(a) *Removal:* Remove pal-nuts, nuts, and washers from rear bearing filler block cap and remove cap screws retaining crankshaft oil seal retainer to the bearing cap. Remove cap and rear bearing insert. Rotate crankshaft and remove upper bearing insert. Inspect bearing inserts and replace if worn.

(b) *Installation:* Place upper rear bearing insert on crankshaft and rotate crankshaft until bearing is in position. Place lower rear bearing in position and place a .002 inch brass shim (1/4 x 1-1/2") lengthwise between the bearing insert and the shaft journal. Reinstall bearing cap. Tighten nuts to a

ninety-pound torque wrench pull. Rotate shaft and inspect bearing and journal clearance. If clearance is not excessive, there should be a slight drag when rotating the shaft. Remove bearing cap and remove brass shim. Reinstall cap, washers, and nuts. Reinstall cap screws attaching crankshaft oil seal retainer to the bearing cap. Replace rear bearing filler block packing. Tighten all bearing cap nuts. Start with the center bearing and proceed to tighten alternately from side to side working from the center to both end bearings. Tighten nuts with a torque wrench to a ninety-pound pull. Again inspect crankshaft by rotating. It must be free enough to rotate easily by hand. Lock nuts in place with pal-nuts.

(5) Reinstall float assembly (Paragraph 60), oil pan (Paragraph 52), and front axle assembly (Paragraph 187). Remove jack, replenish oil and coolant, and connect battery ground cable.

c. Crankshaft:

(1) Remove engine (Paragraph 138) and disassemble in the following sequence.

(2) Remove distributor (Paragraph 84) and spark plugs (Paragraph 89). Remove timing gear cover (Paragraph 149), governor (Paragraph 68), and timing gear (Paragraph 150).

(3) Remove flywheel (Paragraph 152), oil pan (Paragraph 52), and float assembly (Paragraph 60).

(4) Remove oil thrower from front of crankshaft and remove crankshaft drive gear with the aid of a puller tool. Remove thrust plate and thrust washer, Morton keys, and shim pack.

(5) To remove connecting rod bearing caps and bearings, it is not necessary to remove connecting rods and pistons. Rotate crankshaft and remove each cap from the connecting rod when the individual piston is at top, dead center, position. Each piston and connecting rod is to remain in this position until reassembled to the crankshaft. Remove main bearings (Sub-Paragraph "b"). Remove remaining cap screws retaining oil seal retainer and remove retainer.

(6) Remove crankshaft from crankcase. Remove pilot bushing and studs from rear of crankshaft and remove inner crankshaft thrust shim from front of crankshaft. Inspect crankshaft and related parts. Replace if worn, damaged, or out of round.

d. Crankshaft Installation:

(1) Reinstall studs and pilot bushing to rear of crankshaft. Reinstall inner crankshaft thrust shim to front end of crankshaft; make certain chamfer

Section XXXIII—Engine (Repair)

side of shim is positioned toward rear of crankshaft. Position crankshaft in crankcase. Reinstall main bearings (Sub-Paragraph "b") and connecting rods (Paragraph 147). Reinstall outer crankshaft thrust washer. Position in place with dowel pins in crankcase. Reinstall shim pack and two keys. Reinstall thrust plate and crankshaft gear in line with keys. Reinstall fan drive pulley, starting jaw collar, and starting jaw temporarily. Tighten starting jaw and determine end play of crankshaft gear. End play must be .003 to .005 inch between outer thrust shim and thrust plate. If this measurement is not obtained, remove or add shims until correct. Remove starting jaw, starting jaw collar, and drive pulley. Reinstall timing gear (Paragraph 150). Reinstall oil thrower to crankshaft and reinstall timing gear cover to front of crankcase (Paragraph 149). Reinstall crankshaft drive pulley, starting jaw, and starting jaw collar (Paragraph 59). Reinstall governor (Paragraph 68).

(2) Reinstall crankshaft oil seal retainer to rear of crankcase. Reinstall flywheel and clutch (Paragraph 152). Reinstall float assembly and oil pan (Paragraphs 60 and 52). Reinstall engine (Paragraph 142).

154. OIL PUMP:

a. General:

The oil pump is a single stage gear driven type operating off the crankshaft gear. The oil pump gasket is sheet lead .007 inch thick. The small drive gear is a line press fit .0015 to .002 inch on the shaft and is locked by means of a small pin. The large driven gear is also a press fit .0015 to .002 inch on the shaft. The end clearance is .002 to .004 inch. The shaft revolves in two steel backed, copper lead lined bushings which are pressed in the housing and alined reamed to .503 to .501 inch. This affords a running clearance of .002 to .0045 inch. The driven gear shaft is a press fit into the housing .002 inch tight. The running clearance for

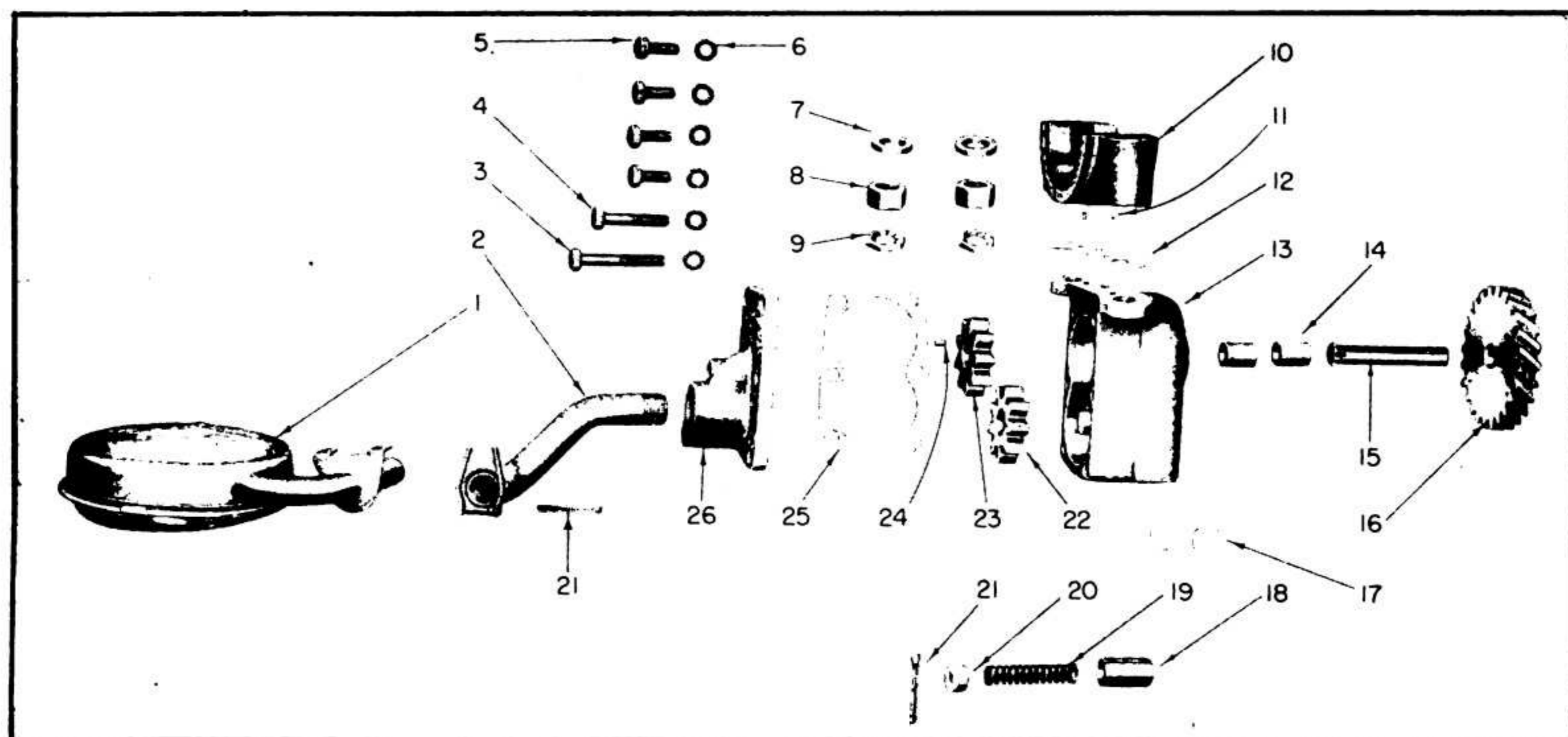


Figure 71 -- Oil Pump

- | | |
|-----------------------------------|--------------------------------|
| 1. FLOAT-ASSEMBLY | 14. BODY BUSHING |
| 2. OIL PUMP SUCTION PIPE ASSEMBLY | 15. DRIVE SHAFT |
| 3. HEX. HEAD CAP SCREW | 16. DRIVE GEAR—DRIVEN—24 TEETH |
| 4. HEX. HEAD CAP SCREW | 17. HUBBARD PLUG |
| 5. HEX. HEAD CAP SCREW | 18. OIL PRESSURE RELIEF VALVE |
| 6. LOCK WASHER | 19. OIL PRESSURE RELIEF SPRING |
| 7. WASHER | 20. OIL RELIEF SPRING RETAINER |
| 8. BEARING CAP NUT | 21. COTTER PIN |
| 9. PAL-NUT | 22. GEAR—DRIVEN—9 TEETH |
| 10. FRONT BEARING CAP | 23. GEAR—DRIVER—9 TEETH |
| 11. STRAIGHT PIN | 24. STRAIGHT PIN |
| 12. SHIM | 25. BODY COVER GASKET |
| 13. OIL PUMP BODY | 26. OIL PUMP COVER |

the gear is .001 to .0035 inch on the shaft. The gear provides a backlash between the teeth of .001 to .002 inch. Drive shaft and gears must turn freely when assembled.

b. Removal:

Remove front axle assembly (Paragraph 187). Drain oil and remove oil pan (Paragraph 52). Remove float assembly (Paragraph 60). Remove pal-nuts and nuts from studs and remove oil pump and gasket. Front crankshaft bearing cap may be retained on studs.

c. Disassembly:

Remove cap screws and remove oil pump cover. Remove large oil pump driven gear with a puller tool. Remove oil pump drive shaft and drive gear. Remove pin retaining gear to shaft and remove gear from shaft. Remove oil pump driven gear. Inspect bushings and remove if worn or damaged. Remove with bushing driver tool. Remove cotter pin

and remove oil relief valve spring retainer, spring, and valve. Inspect all parts and oil pump body for signs of wear or damage. Replace defective parts.

d. Reassembly:

Reinstall oil pressure relief valve, spring, and spring retainer. Secure in place with cotter pin. Reinstall driven gear. Reinstall drive gear to drive shaft and secure with a new pin. Position drive shaft and gear in oil pump body and reinstall large driven gear. Reinstall gasket and cover.

e. Installation:

Position shim on top of oil pump body. Aline with dowel pins. Position pump in place with front bearing cap. Aline with dowel pins and secure with nuts. Tighten nuts to a ninety-pound torque wrench pull. Install new pal-nuts. Reinstall float assembly (Paragraph 60), oil pan (Paragraph 52), and front axle assembly (Paragraph 187). Replenish lubricant supply to engine.

Section XXXIV – Clutch

155. GENERAL:

Refer to Paragraph 61.

156. CLUTCH REMOVAL:

a. Removal of Lined Clutch Plate and Clutch Pressure Plate:

(1) **PRELIMINARY:** Shut off fuel valve, drain coolant, detach battery ground strap from battery (Paragraph 78), detach head lamp wires at head lamp, and remove head lamps and front fenders as a single unit (Paragraph 129). Remove cap screws and nuts securing bumper side braces to the torque tube and bumper-grille; and remove side braces.

(2) **REMOVE AND DETACH FROM LEFT SIDE OF ENGINE:** Remove exhaust pipe and elbow (Paragraphs 102 and 103). Detach generator lead wires from generator, oil gage line from engine (below carburetor), choke wire from carburetor, and fuel line from carburetor.

(3) **REMOVE AND DETACH FROM RIGHT SIDE OF ENGINE:** Remove spark plug cover

and cable holder and detach heat indicator thermo bulb from engine. Remove starting motor (Paragraph 91). Detach horn and ignition coil lead wires and remove horn and ignition coil (Paragraphs 83 and 97). Detach governor control rod from speed control lever.

(4) Position jack under torque tube or transmission. Attach chain hoist to engine cylinder head studs. Detach front of drag link from left side of steering arm. Detach front axle assembly at rear pivot ball only; remove two cap screws and ball socket cap. Remove flywheel cover from torque tube. Remove nuts and studs attaching engine to torque tube. Split vehicle as shown in Figure 64.

(5) Remove six cap screws attaching clutch pressure plate to flywheel and remove clutch pressure plate and clutch plate.

b. Removal of Clutch Bearing Carrier Quill and Related Parts:

(1) Complete procedures (1) through (4), Sub-Paragraph "a" above.

Section XXXIV—Clutch (Repair)

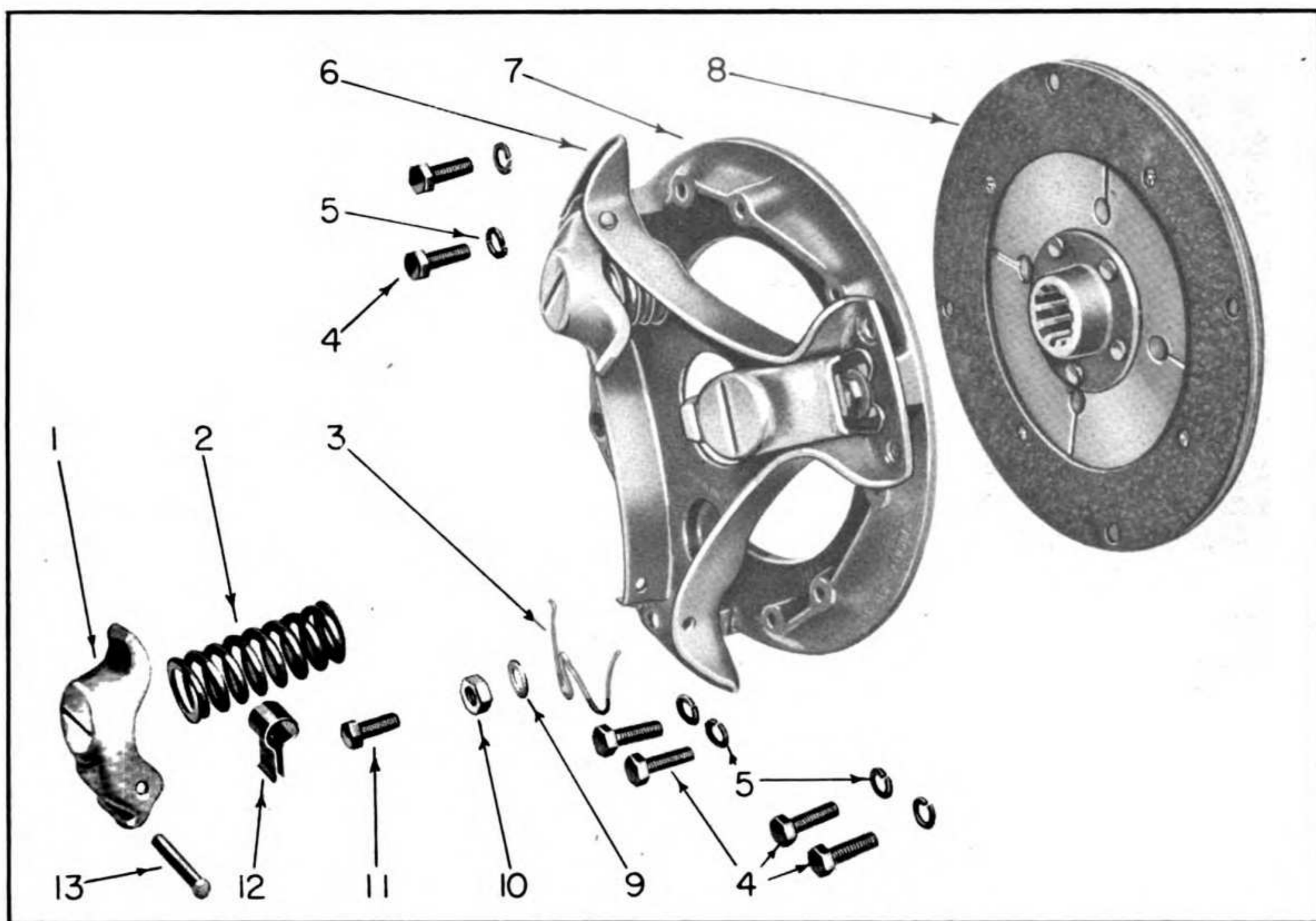


Figure 72 — Clutch Pressure Plate and Lining

- | | |
|-----------------------------------|---------------------------|
| 1. CLUTCH LEVER | 8. LINED PLATE ASSEMBLY |
| 2. CLUTCH SPRING | 9. ADJUSTING SCREW WASHER |
| 3. RETURN SPRING AND STOP | 10. HEX. NUT |
| 4. CLUTCH TO FLYWHEEL CAP SCREW | 11. ADJUSTING SCREW |
| 5. LOCK WASHER | 12. CUSHION SPRING |
| 6. CLUTCH BRACKET UNIT | 13. LEVER PIVOT PIN |
| 7. CLUTCH PRESSURE PLATE ASSEMBLY | |

(2) Detach clutch pedal rod from clutch pedal. Remove clevis and nut from clutch pedal rod. Remove three cap screws retaining clutch quill to the torque tube. Remove clutch quill and related parts as a single unit.

157. CLUTCH DISASSEMBLY AND REPAIR:

a. Clutch Pressure Plate Assembly:

(1) Each spring and its related parts must be removed separately.

(2) Remove adjusting screw, nut, and washer. Remove return spring stop. Press on clutch lever to relieve clutch spring pressure and remove lever pivot pin. Remove clutch lever, clutch spring, and cushion spring. Remove clutch bracket unit from pressure plate.

(3) Inspect clutch lever for signs of wear. Inspect pressure plate for cracks, scoring, burns, or other signs of wear. Inspect springs and test tension. Correct tension is 185 lbs. at a compressed height of 1-13/16". Replace any other worn or faulty parts.

b. Clutch Bearing Carrier Quill and Related Parts:

(1) Remove clutch pedal rod spring and washers from clutch pedal rod. Remove clutch rod from throw-out yoke. Remove throw-out yoke assembly from quill by loosening yoke stud from quill. Do not remove stud from yoke. Remove release bearing and carrier. Remove oil seal and cup with the aid of a puller tool. Remove shims.

(2) Inspect all parts for conditions of cracks or wear; replace as required.

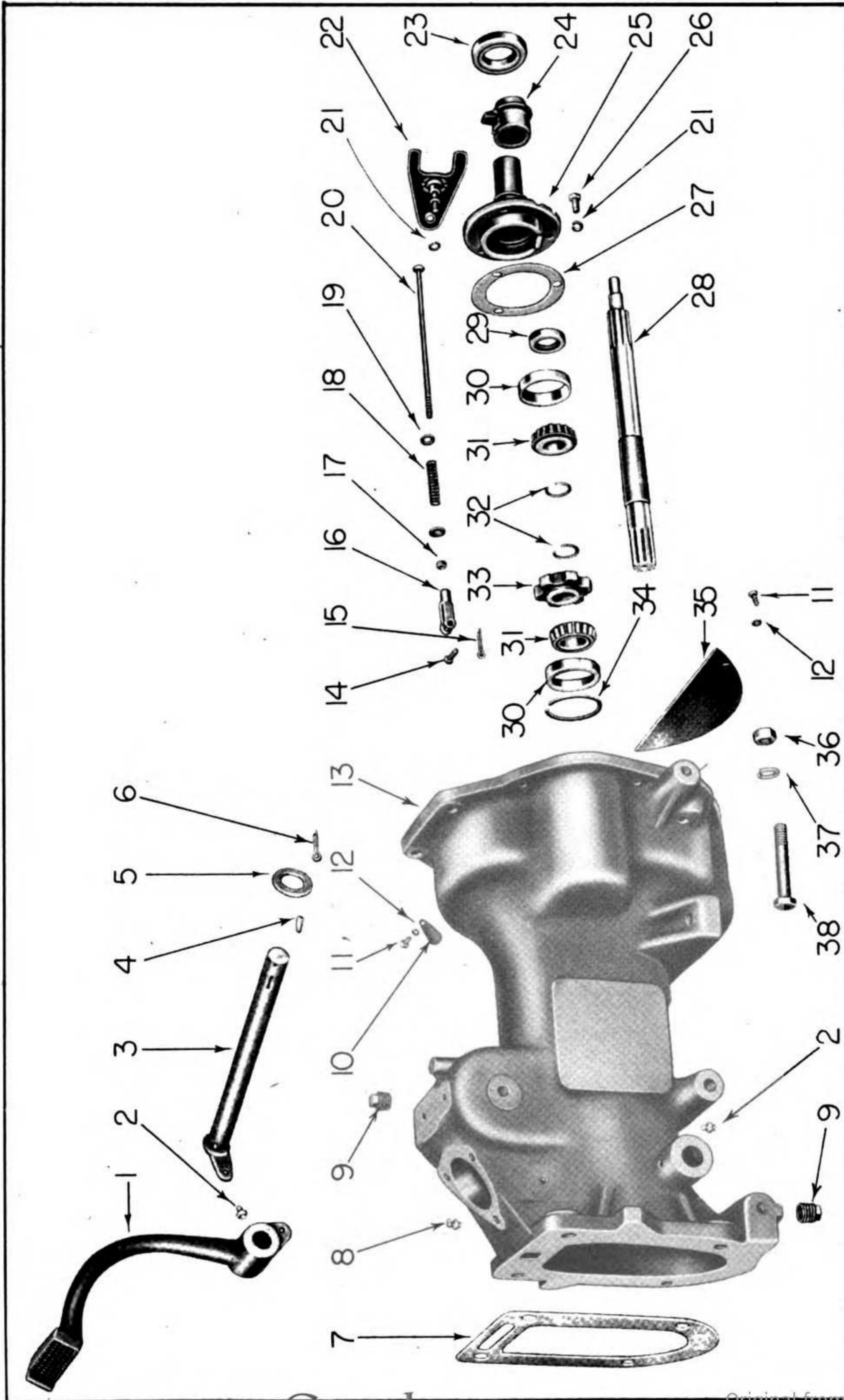


Figure 73 - Torque Tube and Clutch Actuating Parts

- | | | | |
|-----------------------|-----------------------------|----------------------------------|--------------------------|
| 1. CLUTCH PEDAL | 11. CAP SCREW | 21. LOCK WASHER | 31. BEARING CONE |
| 2. GREASE FITTING | 12. LOCK WASHER | 22. CLUTCH THROW-OUT YOKE | 32. SNAP RING |
| 3. BRAKE SHAFT | 13. TORQUE TUBE | 23. RELEASE BEARING | 33. OIL SLINGER GEAR |
| 4. WOODRUFF KEY | 14. CLEVIS PIN | 24. BEARING CARRIER | 34. SNAP RING |
| 5. PLAIN WASHER | 15. COTTER PIN | 25. CLUTCH BEARING CARRIER QUILL | 35. FLYWHEEL COVER PLATE |
| 6. COTTER PIN | 16. ADJUSTING YOKE | 26. CAP SCREW | 36. HEX. NUT |
| 7. GASKET | 17. HEX. NUT | 27. CLUTCH QUILL SHIM | 37. LOCK WASHER |
| 8. GREASE FITTING | 18. CLUTCH PEDAL ROD SPRING | 28. CLUTCH MAIN DRIVE | 38. GROUND BODY BOLT |
| 9. PLUG | 19. WASHER | 29. OIL SEAL | |
| 10. TIMING HOLE COVER | 20. CLUTCH PEDAL ROD | 30. BEARING CUP | |

Section XXXIV—Clutch (Repair)**158. CLUTCH ASSEMBLY:****a. Assembly and Adjustment of Clutch Pressure Plate:**

(1) **ASSEMBLY:** Position clutch bracket unit on to pressure plate. Reinstall return spring stop, adjusting screw, nut, and washer. Reinstall cushion spring, clutch spring and clutch lever; secure in place with lever pivot pin. Reinstall each spring and its related parts in like procedure.

(2) **ADJUSTMENT:** Attach the clutch pressure plate and lined plate to a fixture representing a flywheel. Exercise the levers twenty to thirty times, the exercising being equivalent to the action of the release bearing. Adjust the adjusting screws so that the distance between each lever and the back side of the lined plate is 2-1/8" (+ or— 1/64"), (see Figure 25). Exercise levers again and inspect for proper adjustment. The exercising breaks the hysteresis friction, enabling the setting to be held to a close tolerance. It also aids in adjusting the loaded pressure plate more uniformly. The stroke in exercising should be approximately 3/4 of the maximum lever travel for release.

b. Assembly of Clutch Bearing Carrier Quill and Related Parts:

(1) Reinstall oil seal and clutch shaft bearing cup in bearing quill. Press bearing into position on bearing carrier. Position clutch throw-out yoke assembly in place with bearing carrier. Position carrier on quill shaft and secure with yoke assembly, stud, and lock washer. Position rod through yoke and place washers and spring on the rod.

159. CLUTCH INSTALLATION:**a. Installation of Clutch Bearing Quill and Related Parts:**

Coat shims with shellac or other suitable sealer. Position shims on quill and position quill and re-

lated parts on shaft. Secure quill to torque tube with three bolts and washers. Rotate shaft to inspect bearing tightness. If rotation is too tight or end play exists, correct by adding or removing shims.

b. Installation of Clutch Pressure Plate Assembly:

(1) Attach clutch pressure plate assembly and lined clutch plate to flywheel with six cap screws and lock washers.

(2) Position engine and clutch into torque tube. Rotate crankshaft slightly to facilitate aid in meshing the splines of the clutch shaft and lined clutch plate. Attach engine to torque tube at lower position with two bolts. Install nuts finger-tight. Attach front fuel tank bracket support to upper studs and secure nuts. Secure nuts on two lower bolts. Reinstall flywheel cover plate. Attach front axle assembly to the vehicle at the pivot ball by reinstalling the ball socket cap with two cap screws. Attach front of drag link to left steering arm. Remove chain hoist and jack.

(3) **REINSTALL TO RIGHT SIDE OF ENGINE:** Attach governor control rod to speed control lever. Reinstall horn and ignition coil and attach lead wires (Paragraphs 83 and 97). Reinstall starting motor (Paragraph 95). Attach heat indicator thermo bulb to engine and reinstall cable holder and spark plug cover.

(4) **REINSTALL TO LEFT SIDE OF ENGINE:** Attach fuel line to carburetor, choke wire to carburetor, oil gage line to engine (below carburetor), and generator lead wires to generator.

(5) Reinstall bumper side braces to torque tube and bumper-grille. Reinstall front fenders and head lamps (Paragraph 129). Attach battery ground strap to battery (Paragraph 78). Turn on fuel valve.

Section XXXV - Fuel System

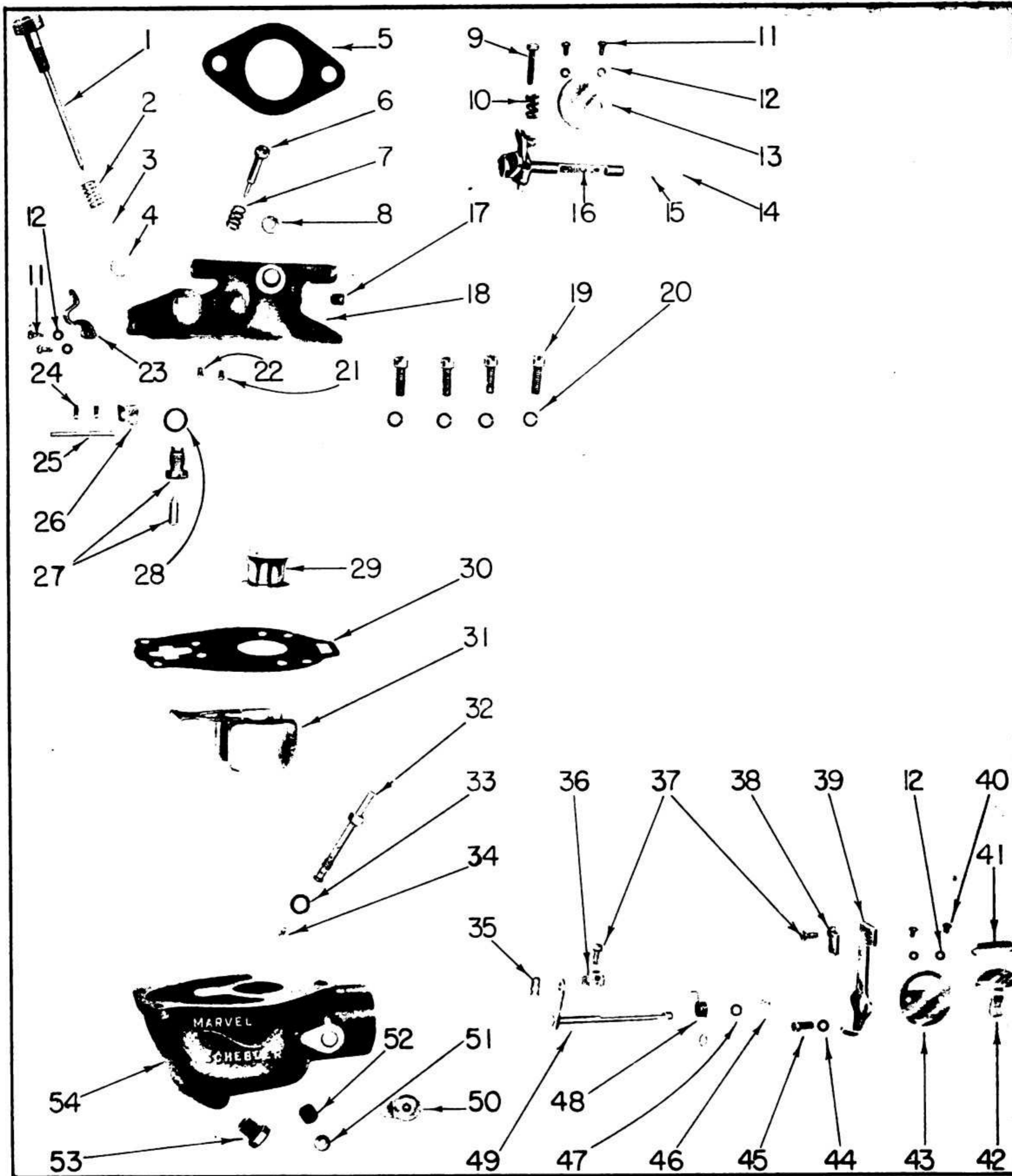


Figure 74 - Carburetor

160. GENERAL:

Refer to Paragraph 62.

161. CARBURETOR DISASSEMBLY AND REPAIR:

a. Carburetor Removal:

Refer to Paragraph 63.

b. Separating the Throttle and Carburetor Body Assemblies:

Remove the power adjusting needle, spring, washer, and gasket. Remove the four body screws and lock washers and separate the throttle and carburetor body assemblies (Figure 75).

c. Removal of Throttle Valve and Related Parts:

Remove the float pin from the bracket in the throttle body and remove the float assembly. Remove the gasket and venturi. Remove the two screws retaining the throttle valve to the throttle shaft and remove the throttle valve. Remove the throttle shaft and related parts from the throttle

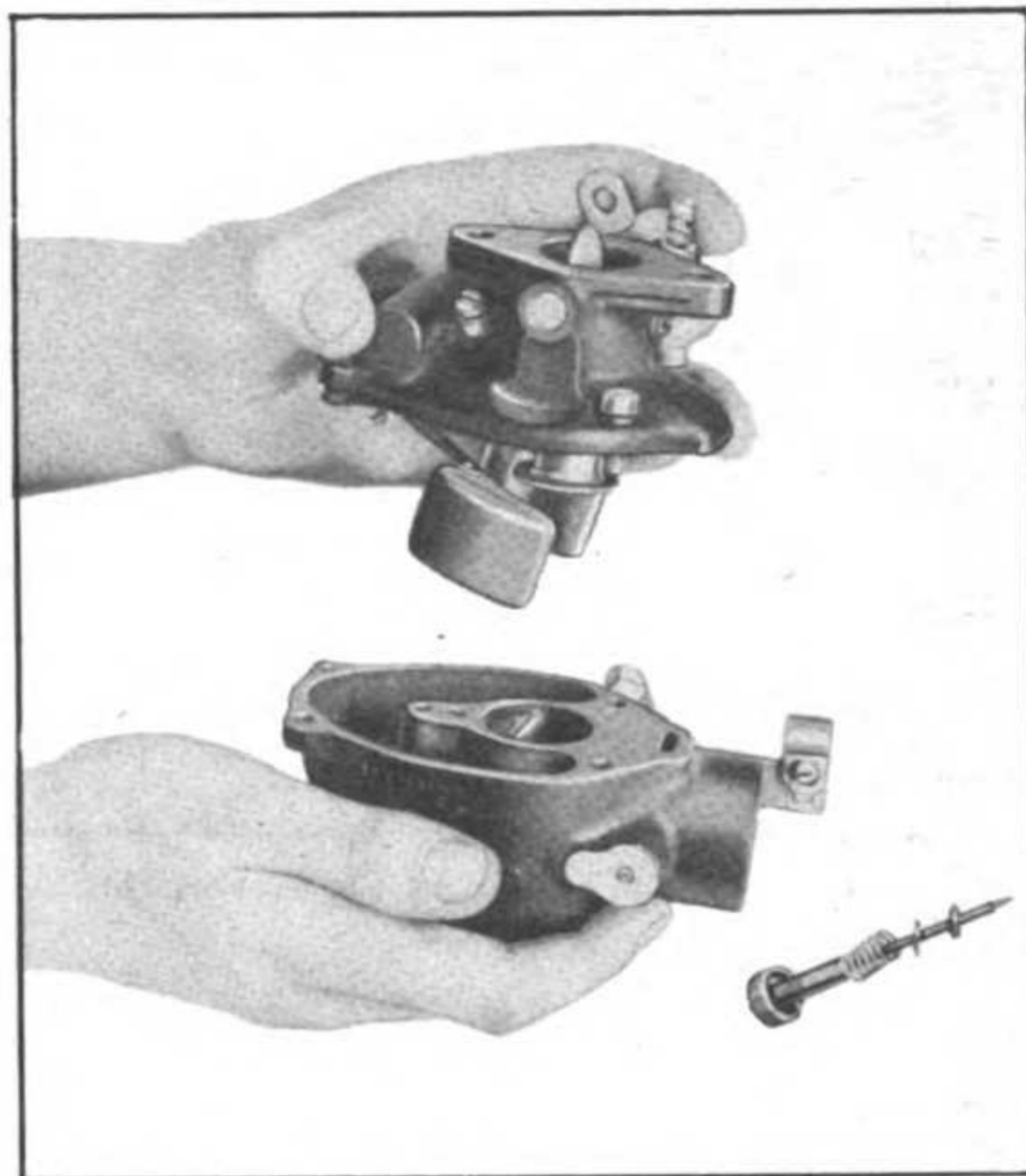


Figure 75 — Separating Carburetor

Figure 74 — Carburetor

- | | |
|--|--|
| <ol style="list-style-type: none"> 1. NEEDLE 2. SPRING 3. PLAIN WASHER 4. GASKET 5. CARBURETOR GASKET 6. IDLER ADJUSTING NEEDLE 7. SPRING 8. CAP 9. SCREW 10. SPRING 11. SCREW 12. LOCK WASHER 13. THROTTLE FLY 14. RETAINER 15. PACKING 16. THROTTLE SHAFT, THROTTLE STOP, AND LEVER ASSEMBLY 17. SCREW 18. THROTTLE BODY ASSEMBLY 19. SCREW 20. LOCK WASHER 21. JET (ECONOMIZER) 22. JET (IDLE) 23. POWER ADJUSTING RACHET SPRING ASSEMBLY 24. SCREW 25. FLOAT LEVER PIN 26. FLOAT BRACKET 27. FLOAT VALVE SEAT AND GASKET ASSEMBLY | <ol style="list-style-type: none"> 28. GASKET 29. VENTURI 30. GASKET 31. FLOAT AND LEVER ASSEMBLY 32. NOZZLE 33. GASKET 34. JET (POWER) 35. COTTER PIN 36. CHOKER SWIVEL 37. SCREW 38. CHOKER BRACKET CLIP 39. CHOKER BRACKET 40. SCREW 41. SPRING 42. CHOKER FLY FLAPPER 43. CHOKER FLY 44. LOCK WASHER 45. SCREW 46. PACKING RETAINER 47. PACKING 48. SPRING 49. CHOKER SHAFT AND LEVER ASSEMBLY 50. NAME PLATE 51. PLUG 52. STRAINER 53. PLUG 54. CARBURETOR BODY ASSEMBLY |
|--|--|



Figure 76 — Removing Carburetor Float

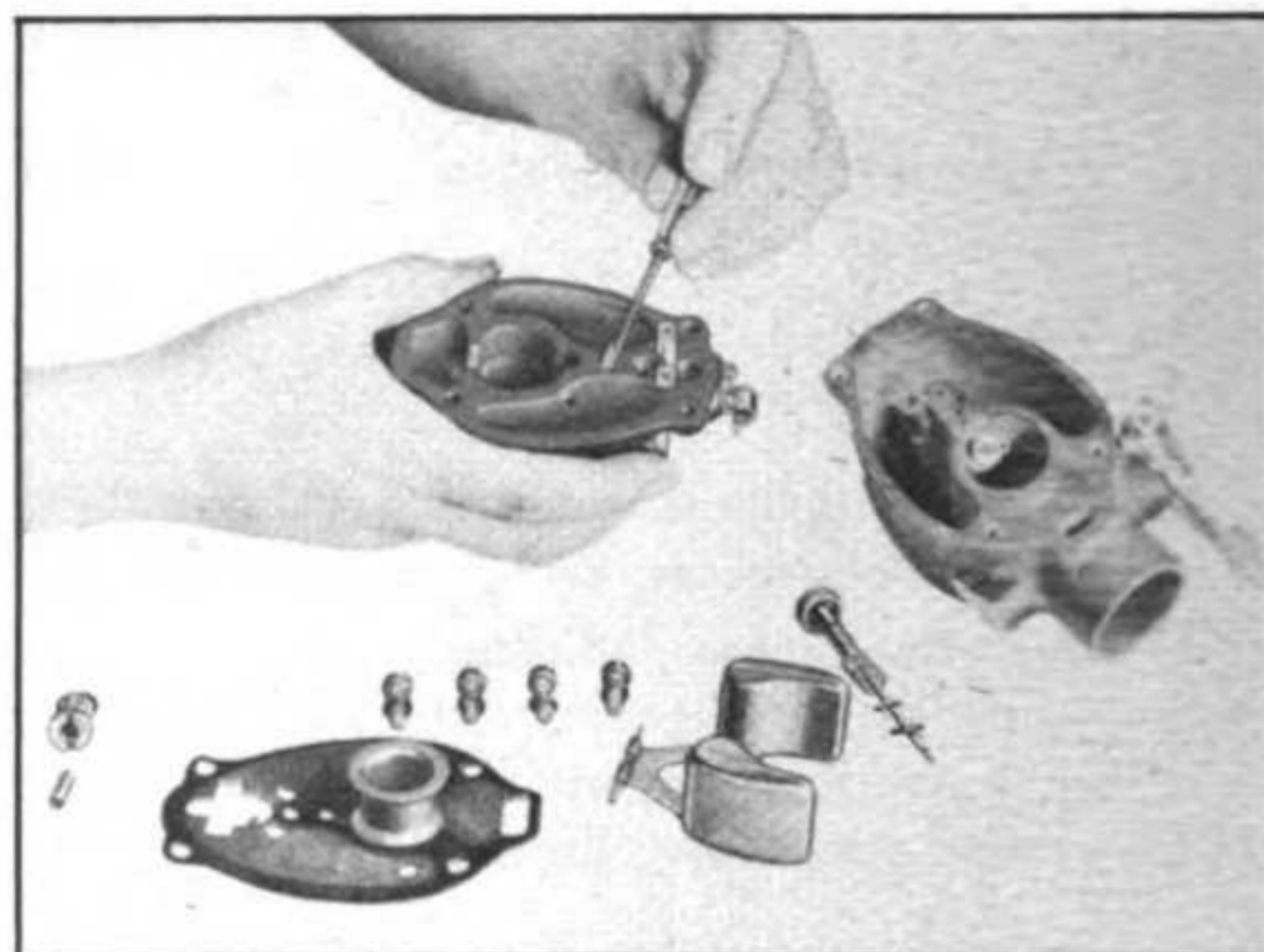


Figure 77 — Removing Fuel Jets

body. Remove adjusting screw and spring from the shaft arm. Remove idler adjusting needle and spring, and float valve and seat from throttle body. Remove the jets with a slender screw driver having a thick edge so as not to damage the slots. Clean and wash all parts thoroughly in SOLVENT, dry cleaning, and dry with compressed air.. Inspect all parts for signs of wear or damage and replace as required. Float valve and seat must be replaced in a matched set.

d. Removal of Choke Valve and Related Parts:

Remove the two screws retaining the choke valve to the choke shaft and remove the choke valve. Remove the shaft and related parts from the carburetor body. Remove drain plugs and strainer from carburetor body. Wash parts thoroughly in SOLVENT, dry cleaning, and dry with compressed air. Inspect parts for wear or damage and replace as required.

e. Power Needle Seat:

(1) **INSPECTION AND REMOVAL:** The power needle seat at the base of the carburetor body need not be removed unless it is damaged or inoperative. Remove discharge nozzle with a small wrench. Clean power needle seat with compressed air and inspect. If replacement is required, remove seat with a hook-end tool.

(2) **INSTALLATION:** Press new seat in place and line ream the calibrated orifice to the specified size of .073 inch plus .003 inch minus .001 inch. Reinstall the discharge nozzle.

162. ASSEMBLY OF CARBURETOR:

a. Installation of Choke Valve and Related Parts:

Reinstall strainer and drain plugs. Reinstall choke swivel, bracket, spring, and valve to the choke shaft and reinstall shaft and related parts in the carburetor body. Secure choke valve to shaft with two screws and lock washers. *NOTE: The side stamped "10°" must be facing out toward air horn.*

b. Installation of Throttle Valve and Related Parts:

Reinstall jets in throttle body. Reinstall float valve in seat. Reinstall idler adjusting needle and spring. Reinstall adjusting screw and spring to the throttle shaft and reinstall shaft and related parts in throttle body. Secure throttle valve to shaft with two screws and lock washers. *NOTE: The side stamped "20°" must face upward.* Reinstall the gasket and venturi. Reinstall the float assembly to float bracket with the float pin.

c. Reassembly of Throttle and Carburetor Bodies:

Position throttle and carburetor bodies together and reinstall the four body screws loosely. Reinstall the power adjusting needle, spring, screw, washer, and gasket. Tighten four body screws.

163. REINSTALL CARBURETOR AND ADJUST:

Refer to Paragraph 63.

Section XXXV—Fuel System (Repair)**164. AIR CLEANER:**

Remove air cleaner and disassemble (Paragraph 64.) Inspect parts for wear or damage and replace as required. Reassemble air cleaner and reinstall (Paragraph 64).

165. SEDIMENT BOWL AND STRAINER (FUEL FILTER):

Remove sediment bowl and related parts (Para-

graph 65). Inspect parts for wear or damage and replace as required. Reinstall sediment bowl and related parts (Paragraph 65).

166. GOVERNOR:

Remove and disassemble governor (Paragraph 68). Inspect parts for wear or damage and replace as required. Reinstall governor (Paragraph 68).

Section XXXVI – Cooling System

167. GENERAL:

Refer to Paragraph 69.

168. RADIATOR:

For removal, service, and installation, refer to Paragraph 75.

169. WATER PUMP:**a. Removal:**

Refer to Paragraph 70.

b. Disassembly:

(1) Loosen set screw from impeller at rear of water pump shaft. Remove impeller and attaching parts from shaft. *NOTE: Care must be exercised in removing and disassembling the impeller so as not to damage the fragile carbon seal.* Remove snap ring from impeller and remove carbon seal, bellows seal, large seal reinforcement ring, small seal reinforcement ring, and the seal spring.

(2) Remove the water pump bearing retainer screw and remove shaft, key, and related parts. Remove bearings, bearing spacer, snap ring retainer, and snap ring from the shaft. Remove the thrust

bushing from the water pump drive support assembly by pressing out of position.

c. Repair:

Inspect parts for wear or damage. Note if seals are cracked or worn. Replace parts as required.

d. Assembly:

(1) Press thrust bushing into place in drive support assembly. Position snap ring, snap ring retainer, bearings, and bearing spacer in place on drive shaft. Position drive shaft and related parts in place in drive support assembly and secure in position with retainer screw.

(2) Position seal spring, small seal reinforcement ring, large seal reinforcement ring, bellows seal, and carbon seal in place in impeller. *NOTE: Make certain seals are aligned in slots in the impeller.* Secure in place with snap ring. Position impeller and related parts in place on shaft. Secure with set screw. *NOTE: Make certain screw is aligned with hole in drive shaft.*

e. Installation:

Refer to Paragraph 70.

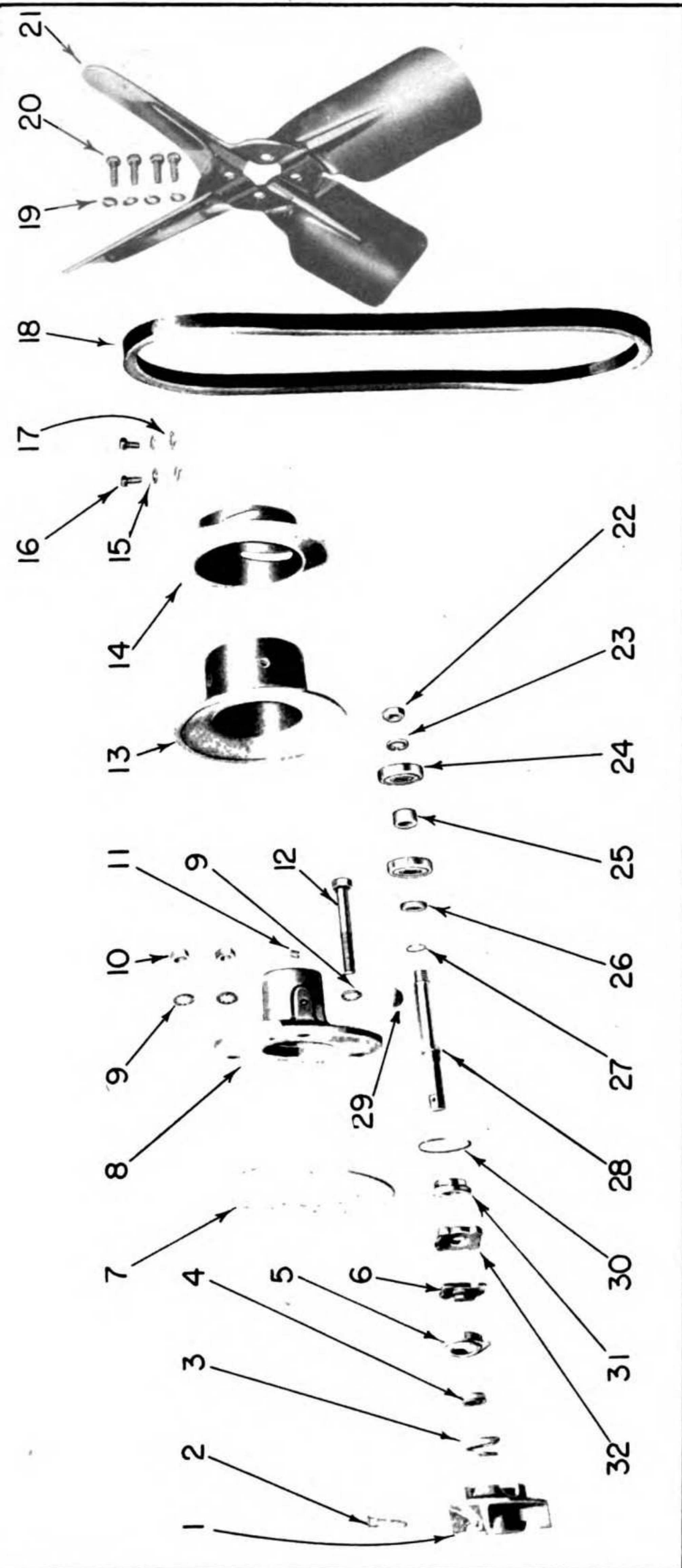


Figure 78 — Water Pump and Fan

- | | |
|---------------------------------------|------------------------------------|
| 1. WATER PUMP IMPELLER | 17. LOCK NUT |
| 2. SET SCREW | 18. FAN BELT |
| 3. SEAL SPRING | 19. LOCK WASHER |
| 4. SEAL REINFORCEMENT RING—SMALL | 20. BOLT |
| 5. SEAL REINFORCEMENT RING—LARGE | 21. FAN |
| 6. SEAL BELLOWS | 22. NUT |
| 7. WATER PUMP DRIVE SUPPORT GASKET | 23. LOCK WASHER |
| 8. WATER PUMP DRIVE SUPPORT ASSEMBLY | 24. BALL BEARING |
| 9. WASHER (INTERNAL SHAKEPROOF) | 25. WATER PUMP BALL BEARING SPACER |
| 10. NUT | 26. WATER PUMP SNAP RING RETAINER |
| 11. WATER PUMP BEARING RETAINER SCREW | 27. WATER PUMP BEARING SNAP RING |
| 12. BOLT | 28. WATER PUMP DRIVE SHAFT |
| 13. FAN HUB | 29. WOODRUFF KEY |
| 14. ADJUSTMENT FLANGE | 30. SEAL SNAP RING |
| 15. LOCK WASHER | 31. WATER PUMP THRUST BUSHING |
| 16. BOLT | 32. SEAL CARBON |

Section XXXVII - Electrical System

170. GENERAL:

Refer to Paragraph 76.

171. BATTERY:

For instructions on removal, service, and installation, refer to Paragraph 77.

172. GENERATOR:

a. General:

Volts.....	6
Rotation	Clockwise at the drive end
Control	Third Brush
Poles.....	2
Brushes	3
Ground Pularity	Positive

b. Inspection and Service:

(1) **COMMUTATOR:** Remove bolt and nut and remove head band. Inspect the commutator; if dirty or discolored, clean by holding a piece of #00 sand paper against it while turning the armature slowly. *Do not use emery cloth.* Clean sand from generator with clean dry compressed air. If commutator is rough or worn, remove generator from vehicle and repair generator as outlined in Sub-Paragraph "c".

(2) **BRUSHES:** Inspect the brushes and brush holders. The brush holders must swing freely on their pivots. If the brushes are oil-soaked or worn to less than one-half their original length, 5/8", they must be replaced (Paragraph "b" (2) below).

(3) **LUBRICATION:** Lubricate the absorbent bronze bushing in the commutator end and the bearing in the drive end as prescribed in the LUBRICATION ORDER, Figure 12.

(4) **WIRING:** Inspect all wiring from generator to circuit breaker, from circuit breaker to battery, and from battery to ground for worn or frayed insulation, broken wires, and for loose or corroded connections. Repair or replace any defective wiring.

(5) **VOLTAGE DROP TEST:** Run the generator approximately to 50% of its maximum output and measure the voltage drop from the circuit breaker terminal to the battery terminal. This drop

must not be more than .1 volt at a 10 ampere charging rate or .05 volt at a 5 ampere charging rate. There must be no volt-meter reading when the drop is measured from the generator frame to the battery ground posts. If larger readings are obtained, the high resistance must be eliminated.

(6) **OPERATION INSPECTION:** Run the generator at near maximum output and note the commutator action. If there is excessive arcing between the brushes and commutator, the generator must be removed for a "tune-up" inspection (Sub-Paragraph "b").

(7) Reinstall generator head band.

c. Tune-Up Inspection:

(1) **Remove generator (Paragraph 80).** Remove head band from generator. Inspect the commutator as in Sub-Paragraph "a" (1) above.

(2) **BRUSHES:** Inspect brushes as in Sub-Paragraph "a" (2) above. If replacement is required, remove the brush screws and remove brushes. Replace brushes so that the long side of the beveled face of the brush is in direction of rotation of the commutator. Inspect the alinement to make sure the brush edge is parallel with the commutator segments. If the alinement is incorrect or the brush holders do not swing freely, the commutator end plate must be inspected as in Sub-Paragraph "c" (5). Sand new brushes with a strip of #00 or #000 sand paper the exact width of the commutator. Slip the sand paper strip under a brush and pull so that the brush is forced toward the brush arm. Caution must be observed so as not to break the edge of the brush. Service all new brushes using this procedure.

Inspect brush spring tension. Proper tension is 15 to 20 ozs. Measure with a spring scale hooked under the brush screw tight against the brush and pull on a line parallel with the face of the brush. Take the reading just as the brush leaves the commutator. If the tension is too great, the brushes and commutator will wear excessively. If the tension is too little, there will be a tendency to arc at the commutator. Correct as necessary.

New brushes must be run in to afford a perfect brush fit before generator output tests are made. To run in new brushes, operate generator under a load long enough to secure a perfect brush fit.

Tractor (Wheeled), Warehouse, Case VAIW (Gasoline)

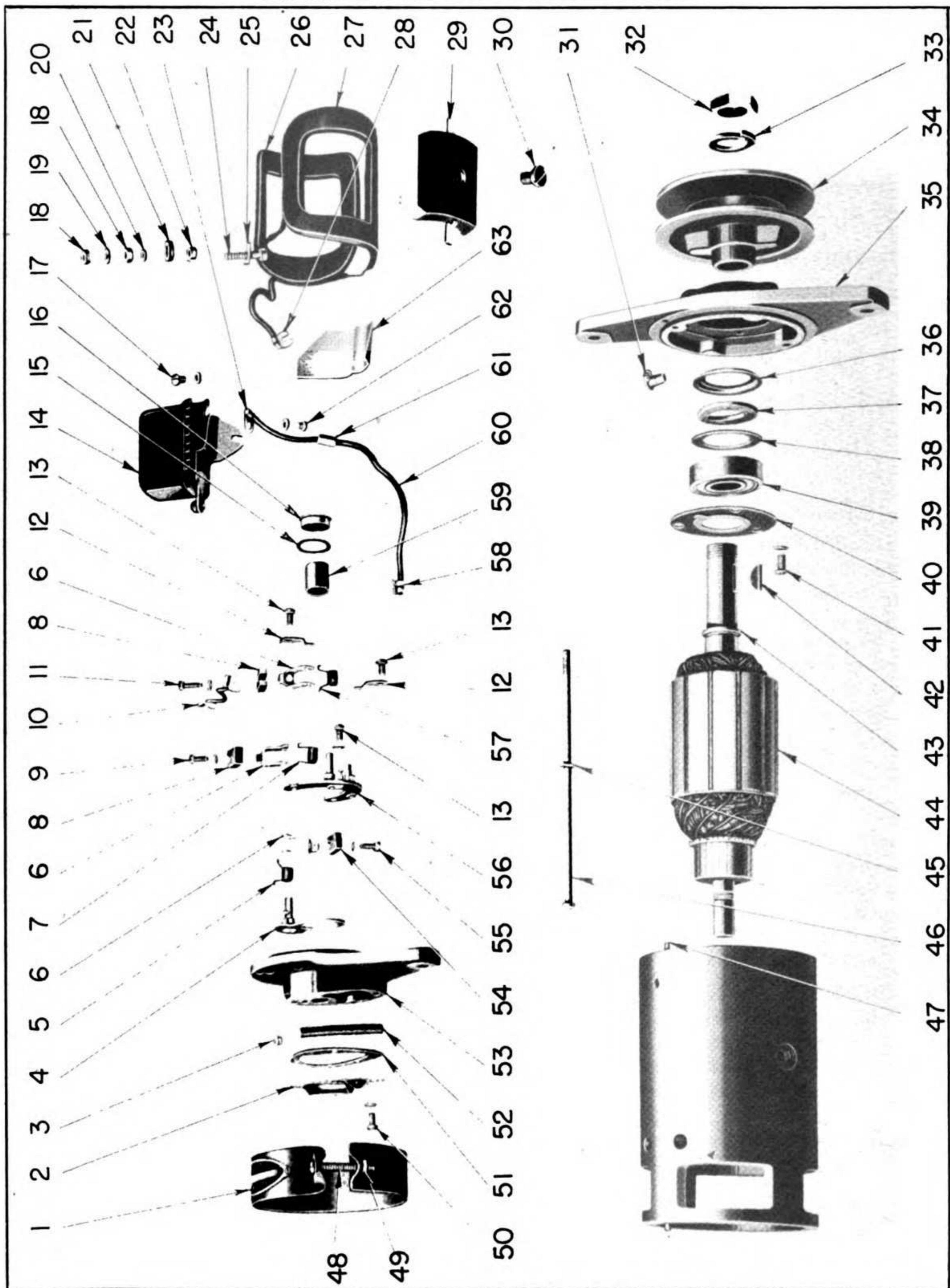


Figure 79 — Generator

- | | |
|--|---------------------------------|
| 1. BAND COVER | 33. ARMATURE SHAFT LOCK WASHER |
| 2. COMMUTATOR END COVER | 34. DRIVE PULLEY |
| 3. FELT WICK COVER | 35. DRIVE END HEAD |
| 4. THIRD BRUSH PLATE | 36. CUPPED FELT WASHER RETAINER |
| 5. THIRD BRUSH SPRING | 37. FELT WASHER |
| 6. BRUSH HOLDER | 38. FLAT FELT WASHER RETAINER |
| 7. INSULATED BRUSH SPRING | 39. BALL BEARING |
| 8. MAIN BRUSH | 40. BEARING RETAINER |
| 9. BRUSH SCREW | 41. RETAINER SCREW |
| 10. GROUND LEAD | 42. WOODRUFF KEY |
| 11. BRUSH SCREW | 43. SNAP RING |
| 12. THIRD BRUSH PLATE RETAINING SPRING | 44. ARMATURE ASSEMBLY |
| 13. BRUSH PLATE SCREW | 45. THRU BOLT LOCK WASHER |
| 14. CUTOUT RELAY ASSEMBLY | 46. THRU BOLT |
| 15. OIL GUARD GASKET | 47. DOWEL PIN |
| 16. OIL GUARD | 48. COVER BAND SCREW |
| 17. MTG. RELAY SCREW | 49. COVER BAND NUT |
| 18. NUT | 50. COVER SCREW |
| 19. TERM. STUD LOCK WASHER | 51. C.E. COVER GASKET |
| 20. TERM. STUD WASHER (SHAKEPROOF) | 52. FELT WICK |
| 21. INS. TERM. STUD WASHER—INNER | 53. C.E. PARTIAL HEAD ASSEMBLY |
| 22. INS. TERM. STUD BUSHING | 54. THIRD BRUSH |
| 23. TERMINAL | 55. BRUSH SCREW |
| 24. TERMINAL STUD | 56. MAIN BRUSH PLATE |
| 25. INS. TERM. STUD WASHER—OUTER | 57. GROUNDED BRUSH SPRING |
| 26. LEFT FIELD COIL ASSEMBLY | 58. TERMINAL |
| 27. RIGHT FIELD COIL ASSEMBLY | 59. BEARING |
| 28. TERMINAL | 60. LEAD ASSEMBLY |
| 29. FIELD COIL HOLDER | 61. INSULATING BUSHING |
| 30. POLE SHOE SCREW | 62. ARM. TERM. SCREW |
| 31. OILER | 63. FIELD CONNECTION INSULATION |

(3) **ARMATURE END PLAY:** Armature end play must be held between .003 and .010 inch. If end play is too great, reduce by installing thrust washers on the armature shaft just inside of either end head. Make certain when installing thrust washers that brushes are correctly centered on the commutator.

(4) **BENCH TEST:** With the proper testing equipment, test the generator for the following readings:

(a) *Field Coil Draw:* 4.09 to 4.52 amperes at 6.0 volts.

(b) *Motorizing Draw:* 5.32 to 5.88 amperes at 6.0 volts.

(c) *Output Test:* 4.0 amperes, 7.2 volts, at 1060 maximum R.P.M. 7.6 volts, 10.8 to 12.8 amperes maximum output. 8.0 volts, 11.5 to 13.5 amperes maximum output.

(5) **ADJUSTMENT:** To adjust the maximum output, advance or retard the third brush by applying pressure to the base of the brush mounting stud.

(6) Reinstall the circuit breaker on the generator and reinstall the generator (Paragraph 80). Follow procedures of Sub-Paragraph "a" (3) to end.

d. Disassembly, Repair, and Assembly:

(1) Remove generator (Paragraph 80).

(2) **DISASSEMBLY:** Remove head band. Remove the drive pulley. Remove the two frame screws at the commutator end and slide the plate off the armature shaft. Disconnect the leads at the brush. Lift the drive end and armature out of the frame and field. Press the armature shaft out of the drive end head.

(3) **ARMATURE:** Inspect the armature, and the commutator for evidences of wear. Inspect the insulation and soldering to make certain all coils are in proper working condition. Inspect the wirings for ground, shorts, and open circuits. If the commutator is rough or worn, it must be turned down in a lathe. For turning, mount shaft on the bearing seats and not on the shaft centers. After turning, undercut the mica clean and squarely to a depth of 1/32". If the solder has been thrown, resolder. Correct any other visible fault. Rewind armatures if necessary. If armatures cannot be repaired by rewinding, replace.

(4) **FRAME AND FIELD:** Inspect the insulation on the field coils and leads and replace any

faulty part. Inspect the field coils for grounds and open circuits. Inspect the leads for broken wires and frayed insulation. If the field coils require replacement, remove the pole piece screws and remove the field coils. Assemble the new coils on the pole piece and tighten securely with pole piece screws that have been dipped in boiled linseed oil. As the screws are tightened, the frame must be tapped lightly with a lead or rawhide hammer to properly settle the pole pieces.

(5) **COMMUTATOR END PLATE:** Remove the third brush plate and clean both plates thoroughly. Inspect the brush arms and pivots to see that they are not bent or corroded. Inspect the insulated brush holders for grounds. Clean the bushing thoroughly and inspect it for wear. Soak the bushing in oil before reassembling. If bushing need be replaced, install new bushing in the bore with the use of the proper arbor which is designed to give the correct bearing fit.

(6) **DRIVE END HEAD:** Disassemble and clean the bearing and retainers. Inspect parts for wear or failures. Lubricate the ball bearing in accordance with LUBRICATION ORDER (Figure 12).

(7) **ASSEMBLY:** Assemble the drive end head on the armature shaft. Assemble the drive end head and armature to the frame and field. Make certain the dowel pin is in place. Secure the end heads with the through bolts. Assemble the commutator end cap cover and gasket. Connect the brush leads to the brush screws. Add a few drops of OE to the commutator end oiler. Follow the tune-up inspection procedures (Sub-Paragraph "b" (3) to end).

e. Reinstall Generator:
Refer to Paragraph 80.

173. CIRCUIT BREAKER:

Inspect circuit breaker. If inoperative, replace (Paragraph 80).

174. DISTRIBUTOR:

a. General:

Rotation.....Right Hand (Viewed from top)
Cylinders 4
Control Full Automatic
Timing.....Adjustable through range of 360°
by loosening advance control arm clamp screw.

Point Gap020 inch
Condenser Capacity..... .18 to .26 M.F.D.
Bearings Two Absorbent Bronze
Breaker Arm Tension 17 to 20 Ounces

b. General Inspection and Service:

(1) **CAP:** Remove the high tension leads, noting the correct order to be used for reassembling. Remove the cap, rotor, and seal plate. Inspect cap for cracks, runners, evidence of arcing, and corroded high tension terminals. If any of these conditions exist the cap must be replaced. Inspect cap for incorrect burning. Through normal usage the inside of the cap inserts will become slightly burned on the inside tip. If these inserts are badly burned or if they are burned at any other point the cap must be replaced. If cap does not require replacement, clean thoroughly.

(2) **ROTOR:** Inspect rotor. If cracked, replace. Through normal usage the end of the rotor contact will become burned. If this burning is not excessive and is found only on the end of the metal strip the rotor need not be replaced. If burning is found on the top of the strip it indicates the rotor is too short and must be replaced. Usually when this condition is found the distributor cap inserts will be burned on their horizontal face and the cap will also need replacing. If none of these conditions are found, thoroughly clean the rotor before reassembling.

(3) **CONDENSER:** Inspect condenser. Test capacity on an approved tester. If found defective, replace. Inspect the condenser lead for broken wire or frayed insulation, and clean and tighten the connections to the terminal. Make certain the condenser is firmly mounted to the base plate.

(4) **BREAKER CONTACTS:** Inspect contacts. If they are a grayish color and are not burned or pitted replacement will not be necessary. Inspect breaker contact gap with a wire feeler gage and readjust if necessary. After adjusting, retighten the lock nut and reinspect the gap. Inspect contact point. Aline contacts so as not to make contact near the center of the contact surfaces. Bend the stationary contact breaker to secure proper alinement and then reinspect the maximum gap.

(5) CIRCUIT INSPECTION:

(a) Inspect the primary circuit to make certain no wires are broken and that the terminals are clean and tight. Turn on the ignition with the engine stopped. If the contacts are closed the ammeter should show a discharge of approximately 5 amperes. Any other reading indicates a grounded, shorted, or open primary circuit.

(b) Inspect the high tension leads and make certain the wires are clean and that the insulation is not worn or frayed. Inspect the terminals of the coil, distributor, and spark plugs, to make certain they are clean and tight.

(6) **LUBRICATION:** Lubricate as prescribed on LUBRICATION ORDER (Figure 12).

(7) Reinstall the cap, rotor, and seal plate and connect the high tension leads.

c. Tune-Up Inspection:

(1) **REMOVAL:** Remove the high tension wires from the cap towers, noting the proper order to be used for reassembling. Remove the primary lead from the terminal at the side of the distributor. Release the two distributor cap springs and lift the cap off of the distributor body. Note the position of the rotor in relationship to the base. This position must be remembered to facilitate reinstalling and retiming. Loosen the screw in the advance arm and lift the distributor from the engine.

(2) **INSPECTION:** Inspect the cap, rotor, condenser, and contacts as outlined in preceding Sub-Paragraph "B".

(3) **CONTACT POINTS:** Contact point pressure should be 17 to 20 ounces. Inspect with a spring scale hooked on the breaker arm at the contact and pull on a line perpendicular to the contact face. Take the reading just as the points separate. This pressure must be within the limits as too low a pressure will cause missing at high speeds and too high a pressure will cause excessive cam wear. Adjust the point pressure by loosening the screw holding the end of the contact arm spring and slide the end of the spring in or out as necessary. Retighten screw and reinspect the pressure.

(4) **GOVERNOR MECHANISM:** Inspect governor mechanisms for free operation. Hold the distributor shaft and turn the cam to the right as far as it will go and release. The cam should immediately return to original position with no drag or restriction. If the governor action is sluggish the distributor must be disassembled and repaired (Sub-Paragraph "D").

(5) **INSTALLATION:** Reinstall and retime distributor, refer to Paragraph 84.

d. Disassembly, Repair, and Assembly:

(1) **REMOVAL:** Refer to Sub-Paragraph "C" (1) preceding.

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(2) **DISASSEMBLY:** Remove rotor and seal plate. Remove the two screws retaining the breaker plate to the base and lift off the plate. Drive out the pin and slide the gear off of the shaft and pull the cam and drive shaft out of the base. Remove the felt wick and cam retaining ring and lift the cam off of the governor.

(3) **INSPECTION:**

(a) Inspect cap, rotor, condenser, and contacts as outlined in Sub-Paragraph "B".

(b) *Driveshaft and governor:* Disassemble and clean the governor and inspect each part for wear. If the weight springs are distorted, replace. Reassemble the governor and apply one drop of light O.E. to each of the weight pivots.

(c) *Base:* Clean the base thoroughly and inspect for cracks and wear, replace if necessary. Replace bearings if they are worn. To replace bearings drive out old bearings with a driving tool and install new ones with the correct arbor as it is designed to give the correct fit and position to the bearings. Soak bearings in medium O.E. and drain off excess.

(d) *Breaker Plate:* Clean the plate thoroughly and inspect the plate, pivot, and terminal for corrosion. Reassemble the contacts and condenser on the plate.

(e) *Cam:* Clean the cam and inspect for wear. Replace, if cam or slots are worn excessively.

(4) **DRIVESHAFT:** Reinstall the drive shaft and governor in the base with the thrust washers at each end of the bearing bore. Reinstall the gear on the shaft and rivet in place.

(5) **END PLAY:**

(a) To inspect end play with a dial indicator, clamp the indicator to the base with a plunger against the end of the shaft, move the shaft to its extreme positions and read the indicator. If the end play is not between .003 and .010 inch, remove the gear, collar, or coupling and install thrust washers between the base and the gear, collar, or coupling.

(b) To measure end play with a feeler gage, insert the gage between the base and lower thrust washer with the shaft pressed to its extreme lower position.

(6) **BREAKER PLATE:** Reinstall the spacing thrust washer on the shaft. Reinstall the cam on the shaft so that the weight pins fit into the slot on the stop plate. Add one drop of light O.E. to the governor slots. Apply a light wipe of grease to the breaker cam. Reinstall the breaker cam in the base and secure with two screws.

Figure 80 — Distributor

- | | |
|------------------------------------|-------------------------------------|
| 1. CAM RETAINING SNAP RING | 22. INNER POST INSULATED BUSHING |
| 2. LOCK SCREW | 23. GEAR RIVET |
| 3. PLAIN WASHER | 24. DISTRIBUTOR DRIVE GEAR |
| 4. BREAKER CONTACT | 25. LOWER DRIVE SHAFT THRUST WASHER |
| 5. ATTACHING SCREW | 26. ADVANCE ARM |
| 6. ARM ASSEMBLY | 27. ADVANCE ARM THRUST WASHER |
| 7. CONTACT ARM SPRING CLIP | 28. ABSORBENT BRONZE BEARING |
| 8. PLAIN WASHER | 29. GREASE CUP |
| 9. LOCK WASHER | 30. DISTRIBUTOR BASE ASSEMBLY |
| 10. SCREW | 31. UPPER DRIVE SHAFT THRUST WASHER |
| 11. CAM SPACER | 32. DRIVE SHAFT |
| 12. GOVERNOR WEIGHT SPRING SET | 33. GOVERNOR WEIGHT |
| 13. ATTACHING SCREW | 34. R.H. 4 CYL. CAM AND STOP PLATE |
| 14. TERMINAL POST | 35. BREAKER PLATE |
| 15. LOCK WASHER | 36. CONDENSER |
| 16. TERMINAL POST CONNECTOR | 37. SCREW |
| 17. INNER TERMINAL POST INSULATION | 38. SEAL PLATE ASSEMBLY |
| 18. TERMINAL POST NUT | 39. CAM SLEEVE FELT WICK |
| 19. TERMINAL POST LOCK WASHER | 40. ROTOR |
| 20. TERMINAL POST PLAIN WASHER | 41. CAP ASSEMBLY |
| 21. TERMINAL POST INSULATED WASHER | |

(7) **CONTACT GAP:** Turn the cam so that the rubbing block is on the high point. Adjust the stationary contact so that the gap is approximately .020 inch. Turn the cam and inspect the alinement of the contacts, bend the stationary contact bracket to secure perfect alinement. Turn the cam to the maximum point opening and adjust the stationary contact so that the gap is .020 inch. Tighten the lock nut and reinspect the gap.

(8) **CONTACT POINT PRESSURE:** Hook a spring scale on the breaker arm at the contact and pull on a line perpendicular to the face of the contact. Take the reading just as the contacts separate. Adjust the reading to 17 to 20 ounces by loosening the screw holding the end of the spring and slide the spring in or out as necessary.

(9) **GOVERNOR ADVANCE:** To determine the governor advance mount the distributor on a test fixture that will show distributor R.P.M. and degrees of governor advance. Inspect the advance bore up and down the speed range so that any indication of sluggishness can be observed. Adjust the advance by bending the outer lugs on which the governor weights are mounted. The governor advance must be adjusted to the curve tabulated.

Start Advance.....	0° at 300 R.P.M.
Intermediate Advance.....	1° at 325 R.P.M.
Intermediate Advance.....	8° at 500 R.P.M.
Intermediate Advance.....	12° at 825 R.P.M.
Full Advance.....	13° at 900 R.P.M.

(10) Add one drop only of light O.E. to the breaker arm hinge pin and saturate the felt in the top of the cam with light O.E. Lubricate distributor as prescribed on the Lubrication Order (Figure 12).

e. Reinstall and Retime Distributor:

Refer to Paragraph 84.

175. STARTING MOTOR:

a. General:

Rotation	Clockwise at the drive end
Volts	6
Drive	Left-hand inboard Bendix
Poles	4
Brushes	4

b. Inspection and Service:

(1) **COMMUTATOR:** Remove bolt and nuts and remove head band. Inspect commutator; if dirty or discolored, clean by holding a piece of #00 sand paper against it while turning the armature slowly. *Do not use emery cloth.* Clean sand from generator with clean, dry compressed air. If commutator is rough or worn, remove starting motor from vehicle and repair generator as outlined in Sub-Paragraph "d".

(2) **BRUSHES:** Inspect the brushes to see that they slide freely in their holders. If brushes are oil-soaked or worn to less than one-half of their original length, 7/16", they must be replaced (Sub-Paragraph "c" (5) below).

(3) **LUBRICATION:** Lubricate the generator as prescribed in LUBRICATION ORDER (Figure 12).

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(4) **WIRING:** Inspect wiring for broken wires, frayed insulation, or corroded connections. Note if ground connections are operative.

(5) **STARTING SWITCH:** Inspect the starting switch to see that the voltage drop across the switch does not exceed .05 volts per 100 amperes. Replace if faulty (Paragraph 94).

(6) Reinstall starting motor head band.

c. Tune-Up Inspection:

(1) Remove starting motor (Paragraph 95). As a bench job, perform procedures for inspection and service as in Sub-Paragraph "a" above. Remove starting motor Bendix drive assembly (Paragraph 96). Inspect for worn or damaged parts. Replace as required. Wipe armature shaft lightly with oil and reinstall Bendix drive assembly (Paragraph 96). Do not lubricate Bendix drive.

(2) Test motor for no-load current draw and for lock torque. The no-load specifications are:

- 70 maximum amperes
- 5.5 volts
- 4300 minimum r.p.m.

The lock torque specifications are:

- 560 amperes
- 4.0 volts
- 11.8 ft. lbs.

(3) Reinstall head band and reinstall starting motor (Paragraph 95).

d. Disassembly, Repair, and Assembly:

(1) Remove starting motor (Paragraph 95).

(2) **DISASSEMBLY:** Remove head band. Remove spring (Paragraph 96) and Bendix drive as-

Section XXXVII—Electrical System (Repair)

sembly. Remove the screws holding the commutator end plate. Lift the brushes out of the holders and slide the commutator end plate off the motor. Remove the screws holding the drive end head and slide off the armature shaft. Lift out the armature.

(3) **ARMATURE:** Inspect the windings to see that they are firmly in place and are properly soldered to the commutator. Inspect the insulation to see that it is not frayed or worn. Inspect for opens, shorts, and grounds. Inspect the bearing seats for wear. Repair or replace parts as necessary.

(4) **COMMUTATOR END PLATE:** Inspect the grounded brushes to see that they are not oil-soaked and are not worn to less than one-half of their original length. If brushes need be replaced, remove the rivets holding the brush holders and brush terminals. Inspect the brush holders and replace if distorted or out of alignment. Replace brush holders and brushes. Make certain rivets fit holes snugly in brush holder so that brush holder will be firm, making a good ground contact. Inspect the bushings for wear. If necessary, replace the end plate.

(5) **FRAME AND FIELD:** Inspect the field coils and terminal posts for grounds and inspect the field coils for open circuits. If it is necessary to replace the field coils, remove the pole piece screw and replace new coils on the pole piece. Dip the pole piece screw in boiled linseed oil before assembling and tighten securely. Tap the frame lightly with a lead or rawhide hammer as the screws are tightened to properly align the pole pieces.

Inspect the insulated brushes for conditions of being oil-soaked or worn. Replace as necessary. To replace brushes, unsolder the brush pigtail from the loop in the field coil and open the loop slightly. Insert the new brush lead and clench the loop lightly. Solder to make a good connection.

(6) **DRIVE END HEAD:** Inspect the bushings for wear and replace if necessary. Use only the proper arbor to replace new bushings to assure a correct bearing fit.

(7) **BENDIX DRIVE ASSEMBLY:** Remove spring (Paragraph 96). Disassemble and inspect parts for wear or damage. Replace as required. Reassemble Bendix drive assembly (Paragraph 96).

(8) **ASSEMBLY:** Place armature in the frame and field and assemble the thrust washer on the drive end of the shaft. Position the drive end head

on the shaft and attach to the frame with the four cap screws and lock washers. Assemble the thrust washer on the commutator end of the shaft and attach commutator end plate on the frame. Make certain the bushings are oiled before assembling. Reinstall the brushes in their holders and attach the head band in place. Reinstall Bendix drive assembly (Paragraph 96).

e. Armature End Play:

The armature end play must be 1/16" maximum. Adjust by removing the commutator end plate and adding or removing thrust washers.

f. Brush Spring Tension:

Inspect the brush spring tension. Tension must be between 42 and 53 ozs. Measure the tension with a spring scale hook under the brush spring at the bend and take the reading just as the spring leaves the brush. Pull the scale on a line parallel to the face of the brush. Adjust the brush spring tension by bending the brush spring at the spring post.

g. Bench-test the Motor:

Refer to Sub-Paragraph "b", Tune-Up Inspection.

h. Reinstall Starting Motor:

(Paragraph 95.)

176. IGNITION SWITCH:

If ignition switch is defective, replace complete switch unit. Refer to Paragraph 81 for instructions on removal and installation.

177. LIGHT SWITCH:

If light switch is defective, replace complete switch unit. Refer to Paragraph 90 for instructions on removal and installation.

178. STARTER SWITCH:

If starter switch is defective, replace complete unit. Refer to Paragraph 94 for instructions on removal and installation.

179. HEAD LAMPS:

a. Removal and Service:

Refer to Paragraph 92.

b. Disassembly:

Remove screw from molding. Spread molding and remove. Remove lens, gasket, and bulb. Remove screws and washers from reflector wires and remove reflector and wires. Remove wires and socket from reflector. Inspect and replace parts as required.

Tractor (Wheeled), Warehouse, Case VAIW (Gasoline)

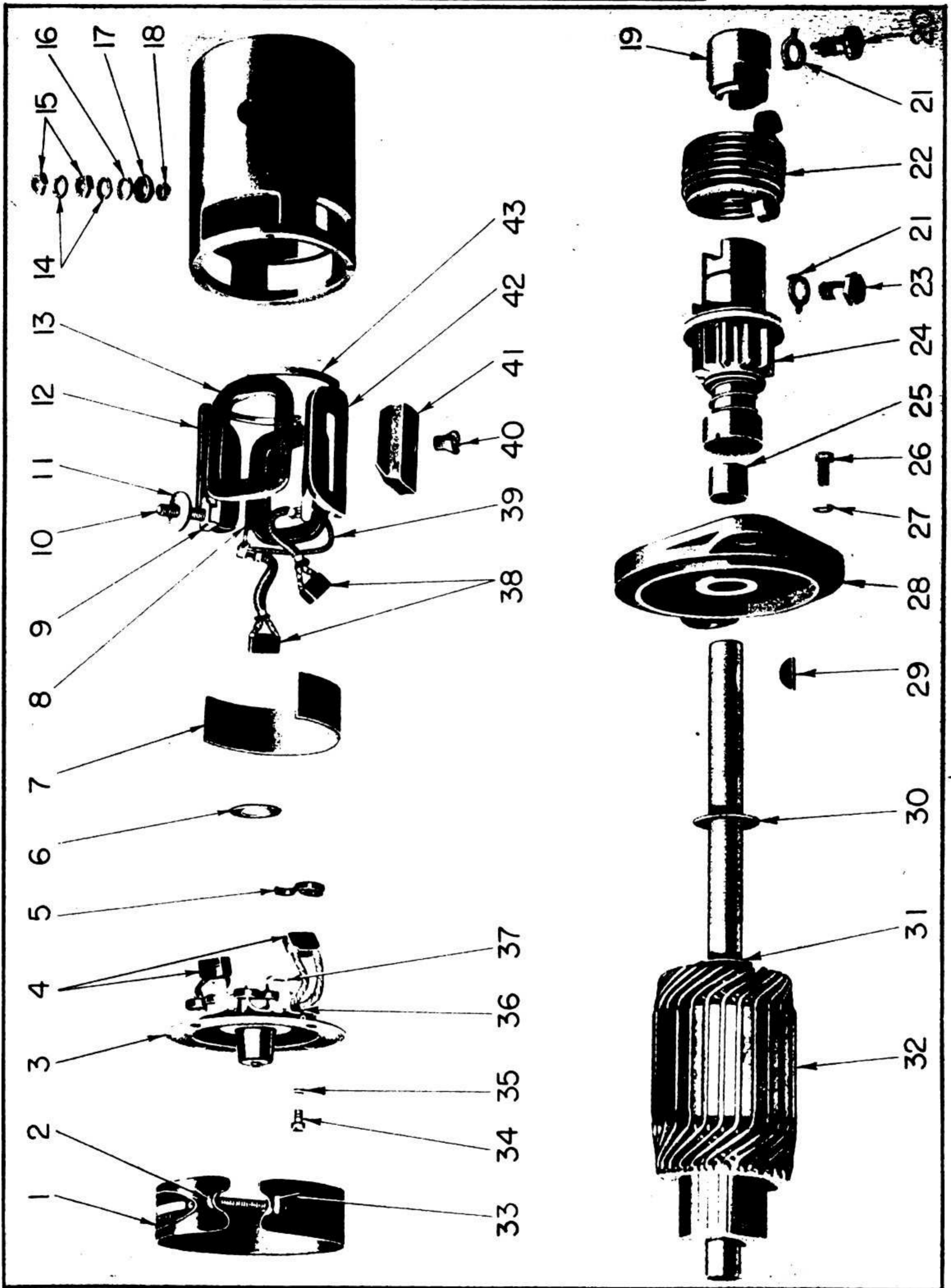


Figure 81 — Starting Motor

- | | |
|---------------------------------------|---------------------------------|
| 1. BAND COVER | 23. SHAFT SPRING SCREW |
| 2. COVER BAND SCREW | 24. SHAFT AND PINION |
| 3. COMMUTATOR END HEAD ASSEMBLY | 25. BUSHING |
| 4. GROUNDED BRUSH | 26. ATTACHING SCREW |
| 5. BRUSH SPRING | 27. LOCK WASHER |
| 6. C.E. ARMATURE THRUST WASHER | 28. DRIVE END HEAD ASSEMBLY |
| 7. FIELD CONNECTION INSULATION | 29. WOODRUFF KEY |
| 8. LOWER LEFT FIELD COIL | 30. D.E. ARMATURE THRUST WASHER |
| 9. TERMINAL | 31. BEARING THRUST SPACER |
| 10. TERMINAL STUD | 32. ARMATURE ASSEMBLY |
| 11. INNER TERM. STUD INS. WASHER | 33. COVER BAND NUT |
| 12. UPPER LEFT FIELD COIL | 34. ATTACHING SCREW |
| 13. UPPER RIGHT FIELD COIL | 35. LOCK WASHER |
| 14. TERMINAL STUD LOCK WASHER | 36. BRUSH HOLDER RIVET |
| 15. TERMINAL STUD NUT | 37. BRUSH HOLDER |
| 16. TERMINAL STUD PLAIN WASHER | 38. INSULATED BRUSH |
| 17. OUTER TERM. STUD INSULATED WASHER | 39. EQUALIZER |
| 18. TERM. STUD INSULATED BUSHING | 40. POLE SHOE SCREW |
| 19. DRIVE HEAD | 41. POLE SHOE |
| 20. HEAD SPRING SCREW | 42. LOWER RIGHT FIELD COIL |
| 21. LOCK WASHER | 43. FIELD COIL CONNECTOR |
| 22. DRIVE SPRING | |

c. Assembly:

Attach wires and socket to reflector. Attach wires to head lamp body. Position reflector in head lamp body and reinstall bulb, gasket, and lens. Reinstall molding and secure with screw.

d. Installation:

Refer to Paragraph 92.

180. TAIL LAMP:

a. Removal and Service:

Refer to Paragraph 93.

b. Disassembly:

Remove retaining spring ring. Remove ruby

glass, gasket, and outlook glass. Remove bulb. Inspect and replace parts as required.

c. Assembly:

Place bulb in position in tail lamp body assembly. Position outlook glass, gasket, and ruby glass in place and secure with retaining spring ring.

d. Installation:

Refer to Paragraph 93.

181. HORN:

Remove rear horn cover. Adjust points for sound. Inspect for broken or worn parts. Replace horn if necessary. Refer to Paragraph 97.

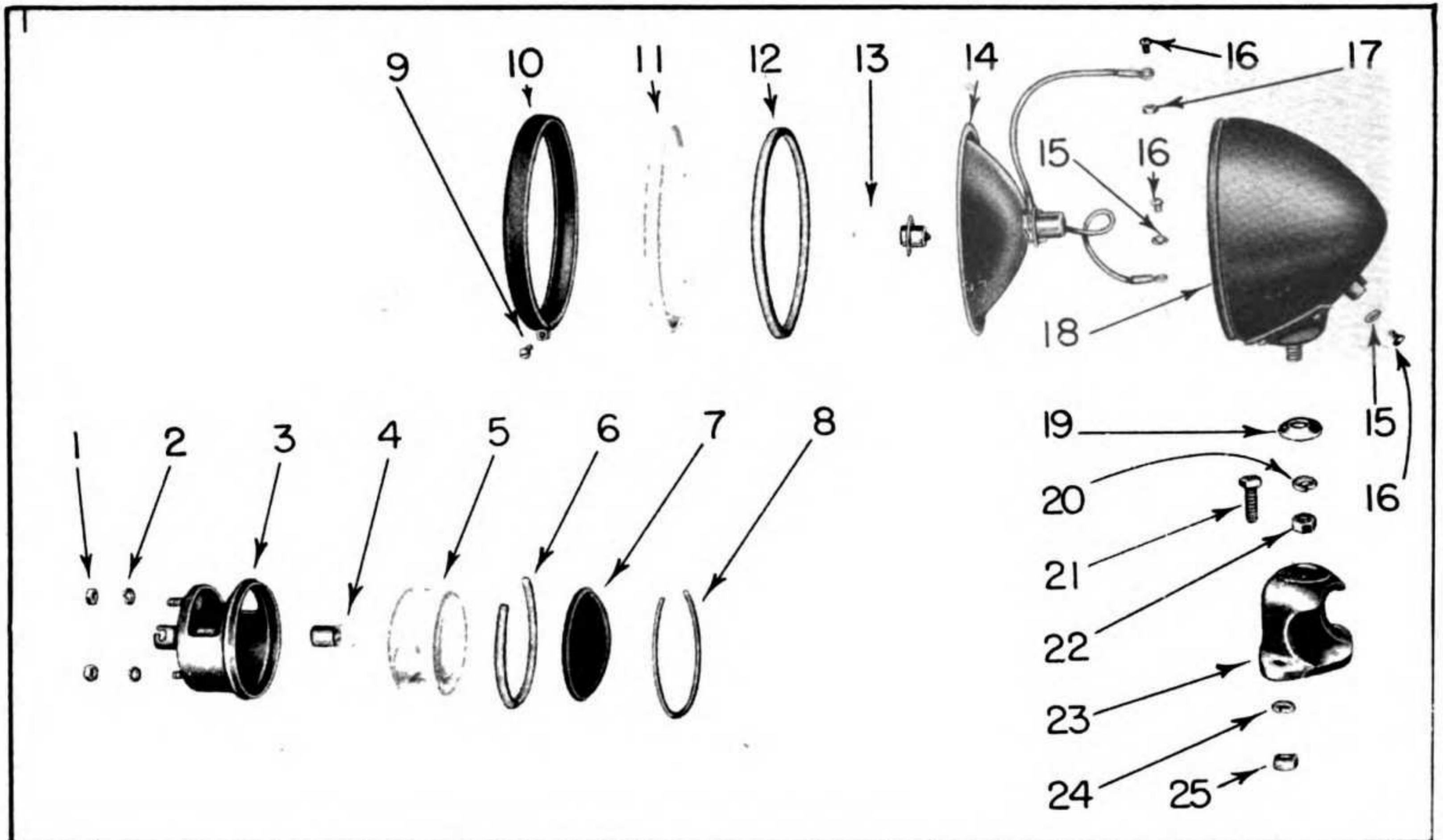


Figure 82 – Head Lamp and Tail Lamp

- 1. NUT
- 2. WASHER
- 3. TAIL LAMP BODY ASSEMBLY
- 4. BULB
- 5. OUTLOOK GLASS
- 6. CORK WASHER
- 7. RUBY SEMAPHOR GLASS
- 8. LENS RETAINING SPRING RING
- 9. SCREW
- 10. MOLDING
- 11. LENS
- 12. GASKET
- 13. BULB

- 14. REFLECTOR
- 15. WASHER
- 16. SCREW
- 17. NUT
- 18. HEAD LAMP BODY ASSEMBLY
- 19. BEVEL WASHER
- 20. LOCK WASHER
- 21. CAP SCREW
- 22. NUT
- 23. HEAD LAMP BRACKET
- 24. LOCK WASHER
- 25. HEX. NUT

Section XXXVIII – Transmission, Differential, and Torque Tube

182. GENERAL:

a. Transmission:

Refer to Paragraph 98.

b. Differential:

The differential is located in the rear housing of the transmission case. It carries the ring gear which is driven by the drive pinion. Two roller bearings and differential shaft carriers support the differential. The side gears and shaft are carried in tapered roller bearings. The bearing cups are pressed fit into the bearing carriers which hold the complete assembly in place. Thrust washers are used to adjust the setting between the side gears and differential pinions. Bearing shims are used to adjust the setting between the ring gear and the drive pinion.

c. Torque Tube:

The torque tube, located between the engine and transmission, houses the drive shaft which is the means of transferring the engine power to the transmission. To service the torque tube and shaft, it is necessary to remove the unit from the tractor. The shaft operates in tapered roller, anti-friction bearings. The bearings are adjusted by removing or inserting shims under the flange of the front bearing carrier.

183. TRANSMISSION:

a. Removal:

(1) **REMOVAL OF REAR AXLE HOUSING:** Remove seat and frame (Paragraph 134), rear fenders (Paragraph 130), running board (Paragraph 132), and coupler and bracket (Paragraph 123). Disconnect tail lamp (Paragraph 93). Remove rear tool box shield and step plates (Paragraph 133). Remove cap screws and nuts from rear axle housing flange. *NOTE: The upper right and lower left bolts are precision ground to aid as pilots in reassembling the housing.* Block vehicle at torque tube with a jack or hoist and roll axle and housing straight back from vehicle (Figure 61).

(2) **REMOVAL OF TRANSMISSION CASE:** Remove steering wheel and attach a chain hoist to the transmission housing. Remove brake control rods. Remove four nuts from studs attaching transmission to torque tube and remove transmission from torque tube. (Figure 83). *NOTE: Caution must be observed when removing transmission so as not to bind and damage the splined ends of the shaft.*

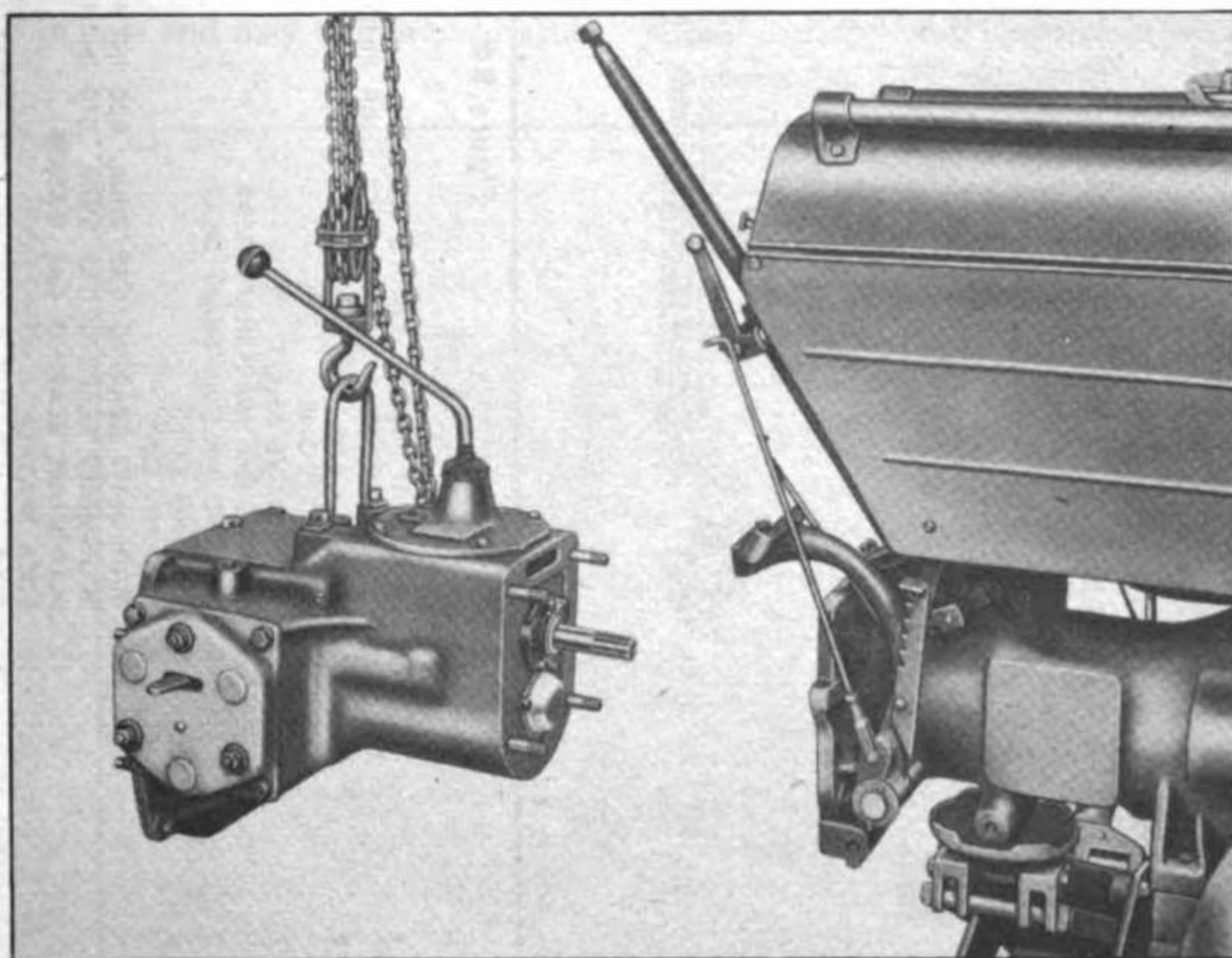


Figure 83 – Removing Transmission Case

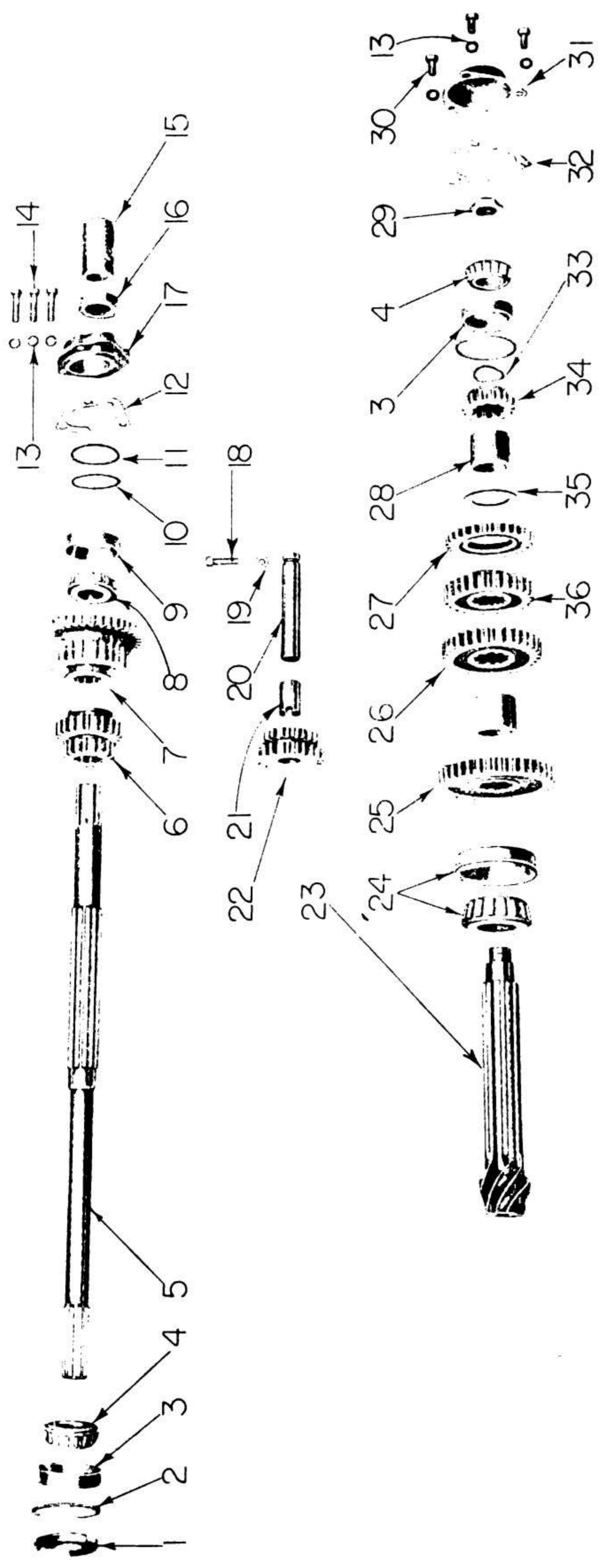


Figure 84 - Transmission Shaft and Gears

- 1. MAINSHAFT FRONT OILING CUP
- 2. C.S. & M.S. BEARING RETAINER SNAP RING
- 3. BEARING CUP
- 4. BEARING CONE
- 5. MAIN DRIVE SHAFT
- 6. 1st AND 2nd MAINSHAFT GEAR
- 7. 3rd AND 4th MAINSHAFT GEAR
- 8. BEARING CONE
- 9. BEARING CUP
- 10. MAINSHAFT BEARING CAP SHIM, .005 INCH
- 11. MAINSHAFT BEARING CAP SHIM, .010 INCH
- 12. MAINSHAFT BEARING CAP GASKET
- 13. LOCK WASHER
- 14. BOLT
- 15. CLUTCH SHAFT SLEEVE
- 16. MAINSHAFT OIL SEAL
- 17. MAINSHAFT BEARING CAP
- 18. SET SCREW

- 19. NUT
- 20. REVERSE IDLER SHAFT
- 21. REVERSE IDLER GEAR BUSHING
- 22. REVERSE IDLER GEAR (WITH BUSHING)
- 23. COUNTERSHAFT AND BEVEL DRIVE PINION
- 24. BEARING CUP AND CONE (WITH SNAP RING)
- 25. LOW COUNTERSHAFT GEAR—35 TEETH
- 26. 2nd COUNTERSHAFT GEAR
- 27. OIL SLINGER GEAR—32 TEETH
- 28. COUNTERSHAFT GEAR SPACER
- 29. COUNTERSHAFT ADJUSTING NUT
- 30. BOLT
- 31. COUNTERSHAFT FRONT BEARING CAP
- 32. COUNTERSHAFT FRONT BEARING GASKET
- 33. SPRING WASHER
- 34. HIGH COUNTERSHAFT GEAR
- 35. OIL SLINGER RETAINING WASHER
- 36. 3rd COUNTERSHAFT GEAR

b. Disassembly:

(1) **MAIN DRIVE SHAFT:** Remove four cap screws from gear shift cover and remove cover, shifting forks, and rail assembly (Sub-Paragraph "d" below). Remove the front bearing carrier assembly from the transmission case. Spread the two sliding gears apart against the walls of the case. Place a short length of block between them and strike the rear of the shaft with a lead or rawhide mallet (Figure 85). This will remove the rear bearing cone from the shaft and the front bearing cup from the case. Slide the gears off the shaft as it is being removed from the case. The rear bearing cup will remain in the case as it is retained by a snap ring and need not be removed unless damaged or transmission case is to be replaced. Note the position of the gears on the shaft and the direction of the chamfered surface of the teeth before disassembling to enable correct reassembly.

(2) **PINION SHAFT:** Remove differential assembly (Paragraph 184). Remove the three cap screws and washers retaining the front bearing cap. Remove the cap and gasket. With the use of a sharp pointed tool, remove staked edge of nut to unlock nut from shaft. Remove nut. Remove shaft through rear of case by striking on front end with a lead or rawhide mallet. *Note position of gears on shaft to aid in reassembly.* The rear bearing will remain on the shaft when it is removed. Gears and related parts will remain in case and may be removed after shaft is removed.

(3) **REVERSE IDLER SHAFT:** Remove set screw from front end of shaft and remove shaft by driving to the rear. Remove bushing and gear from case.

c. Assembly:

(1) **REVERSE IDLER SHAFT:** Position shaft and gear in place in transmission case. Shaft fit is .001 inch tight. Gear operates on a steel backed, tin-copper lined bushing which is pressed in place and reamed to allow .004 to .008 inch running clearance. When in place, the notched end of the bushing projects 1/16" over the outside face of the gear. The bushing has a spiral oil groove and must be positioned so the lead of the spiral is in the same direction as the gear rotates, which is clockwise when viewed from the rear of the case.

(2) **PINION SHAFT:** Position rear bearing on shaft and reassemble the gears and related parts to the shaft from the inside of the case as the shaft is being positioned in the case. Refer to Figure 83 for proper sequence for gears, spacers, and bearings. Secure shaft to front of case with adjusting nut. While tightening nut, adjust shaft and gears so that no noticeable end play exists, but unit turns freely. Stake nut in grooves of shaft when proper adjustment has been obtained. Reinstall gasket and bearing cap and secure in place with three cap screws and lock washers.

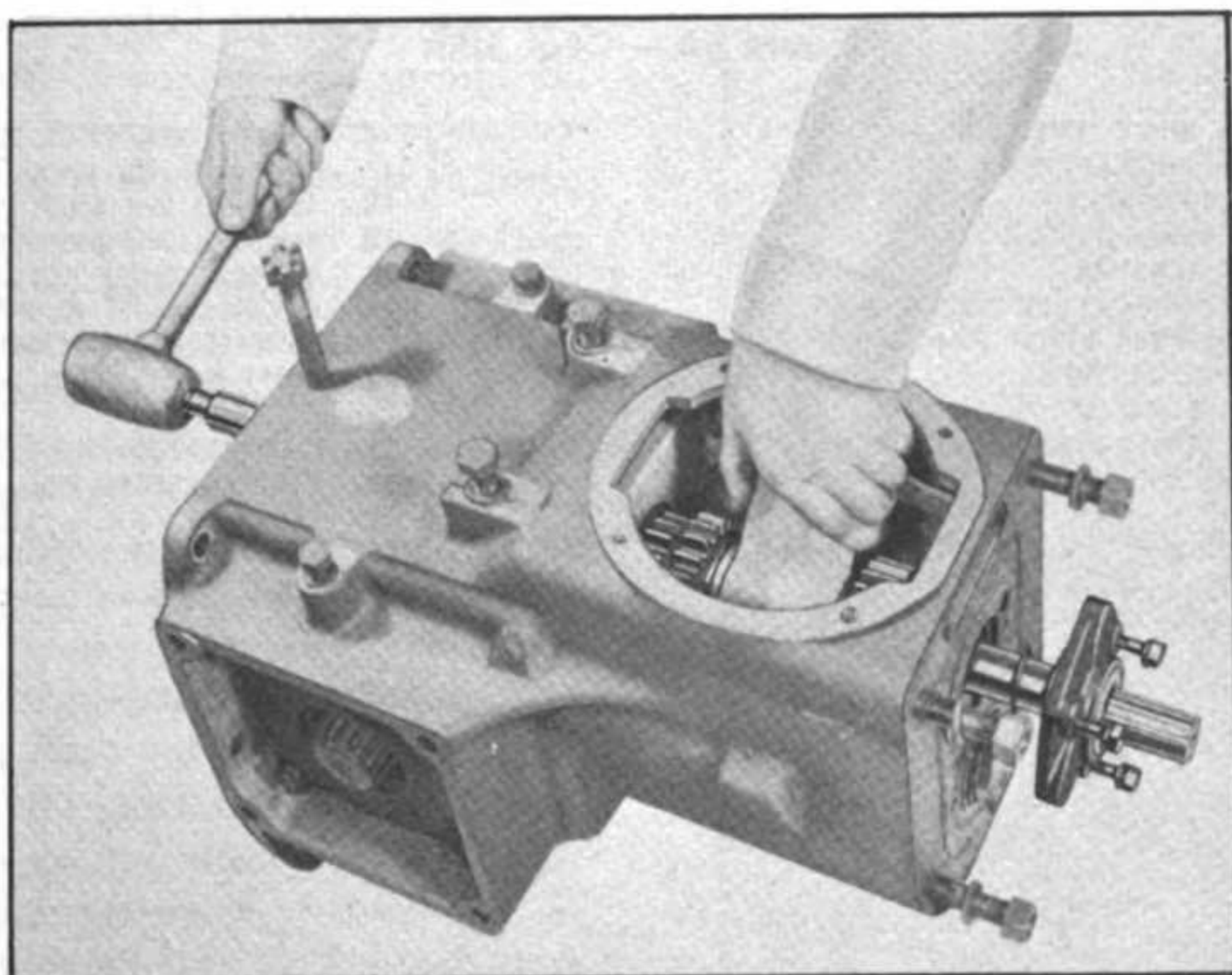


Figure 85 — Remove Drive Shaft from Transmission Case

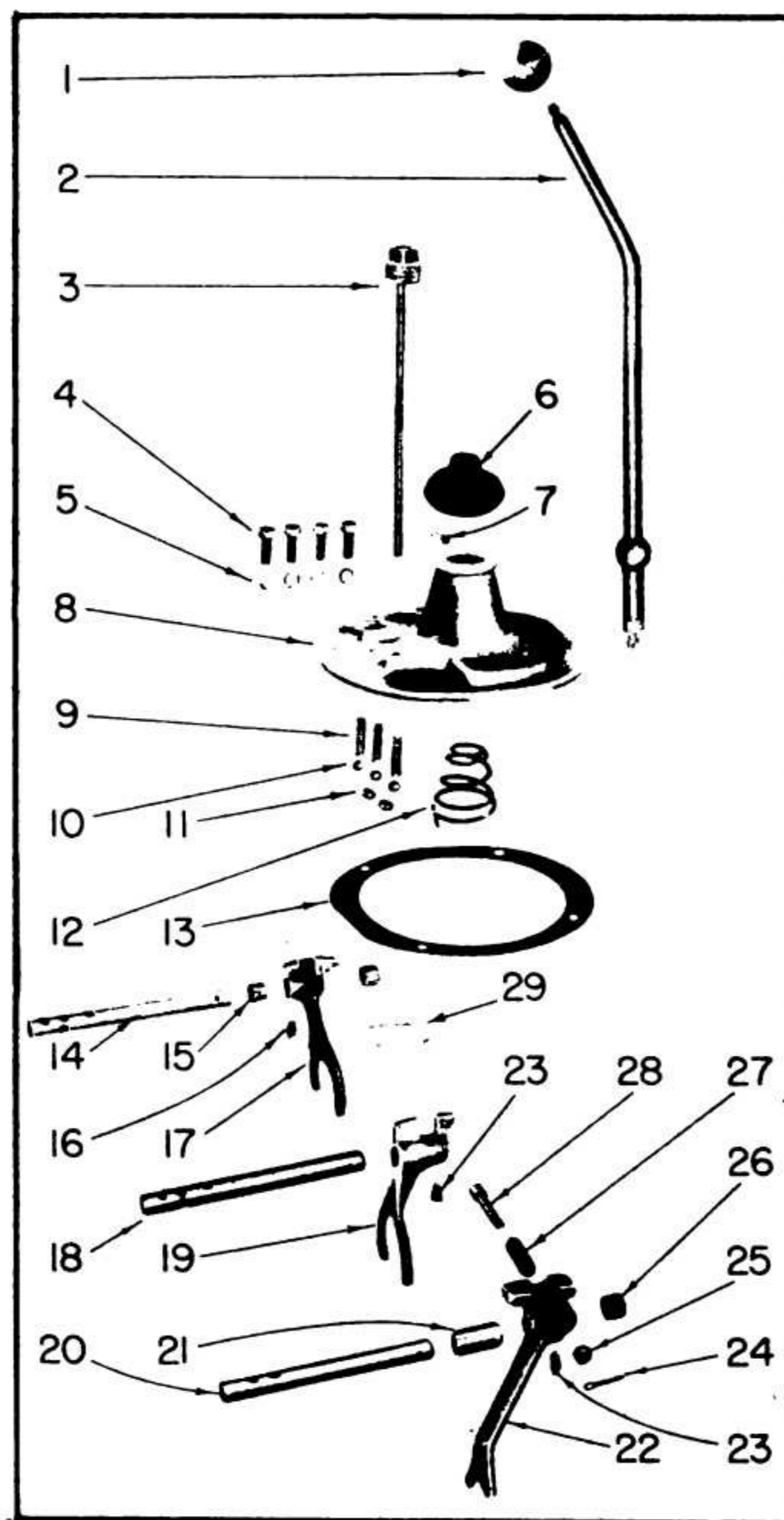


Figure 86 — Gear Shift

- | | |
|----------------------------------|--------------------------------------|
| 1. GEAR SHIFT LEVER BALL | 16. SHIFT FORK LOCK SCREW |
| 2. GEAR SHIFT LEVER | 17. 2nd AND 4th SHIFT FORK |
| 3. DIP STICK ROD | 18. 1st AND 3rd SHIFT ROD |
| 4. HEX. HEAD BOLT | 19. 1st AND 3rd SHIFT FORK |
| 5. LOCK WASHER | 20. REVERSE SHIFT ROD |
| 6. GEAR SHIFT LEVER DUST COVER | 21. REVERSE SHIFT ROD SPACER (LONG) |
| 7. SHIFT LEVER PIVOT PIN | 22. REVERSE SHIFT FORK |
| 8. CONTROL COVER | 23. SHIFT FORK LOCK SCREW |
| 9. MESH LOCK SPRING | 24. COTTER PIN |
| 10. STEEL BALLS—3/8" DIA. | 25. CASTELLATED NUT |
| 11. INTERLOCK PLUG | 26. REVERSE SHIFT ROD SPACER (SHORT) |
| 12. GEAR SHIFT SUPPORT SPRING | 27. REVERSE LATCH PLUNGER SPRING |
| 13. CONTROL COVER GASKET | 28. REVERSE LATCH PLUNGER |
| 14. 2nd AND 4th SHIFT ROD | 29. LOCK WIRE |
| 15. 2nd AND 4th SHIFT ROD SPACER | |

(3) **MAIN DRIVE SHAFT:** Position shaft and bearings through front of transmission case and re-assemble gears and related parts to shaft as it is being pressed into place. Refer to Figure 83 for proper sequence for gears and related parts. Adjust bearings by inserting or removing shims as required ahead of the front bearing carrier. The shaft should have no noticeable end play but should turn freely.

d. Installation:

Reinstall differential (Paragraph 184). Position transmission case into torque tube and secure in place with bolts. Reinstall brake control rods and steering wheel. Position rear axle and housing with transmission case and secure in place with cap screws and nuts. *NOTE: The upper right and lower left bolts are precision ground to aid as pilots in reassembling the housing.* Reinstall rear tool box shield and step plates (Paragraph 133), rear fenders (Paragraph 130), running board (Paragraph 132), coupler and bracket (Paragraph 123), and seat and frame (Paragraph 134). Connect tail lamp (Paragraph 93).

e. Shifting Assembly:

(1) **DESCRIPTION:** The shifter rods are locked in place to the control cover by means of a compression spring and steel ball. The balls ride in the dedents of the rods. Between each rod in the control cover body is an interlocking pin, which also rides in a dedent when one fork is shifted, the purpose being to lock the other rod and to prevent the meshing of more than one gear simultaneously. The reverse shifter fork has a compression spring and plunger arrangement which, when in operation, must be depressed before the fork can be shifted.

(2) **REMOVAL:** Remove four cap screws from control cover and remove cover and attaching parts. Remove dip stick from the cover. Remove the locking wire and set screws from the hub of each of the forks and drive the rods forward with a punch (Figure 87). Remove the rods, pins, steel balls, springs, spacers, and shifting forks. Remove the gear shift support spring and remove the gear shift lever, dust cover, and lever pivot pin. Remove lever ball from shift lever. Inspect all parts for signs of wear or deterioration. Repair or replace as required.

(3) **ASSEMBLY AND INSTALLATION:** Position shift lever pivot pin in control cover and position shift lever through underside of cover and secure in place with support spring. Reinstall dust cover and lever ball onto lever. Reinstall reverse

latch plunger, spring, nut, and cotter pin to reverse shift fork. Position reverse shift rod to right side of control cover and reinstall spacers and reverse shift fork with attaching parts to the rod. Short spacer must be positioned toward the front; long spacer toward the rear. Compress locking spring into position with ball into control cover. Secure in place by inserting reverse shift rod fully into position so that ball rides in rod dedent. Reinstall interlocking plug. Reinstall first and third shift rod into center position of control cover and reinstall shift fork to rod. Compress locking spring into position with ball into control cover. Secure in place by inserting first and third shift rod fully into position so that ball rides in rod dedent. Reinstall interlocking plug. Reinstall second and fourth shift

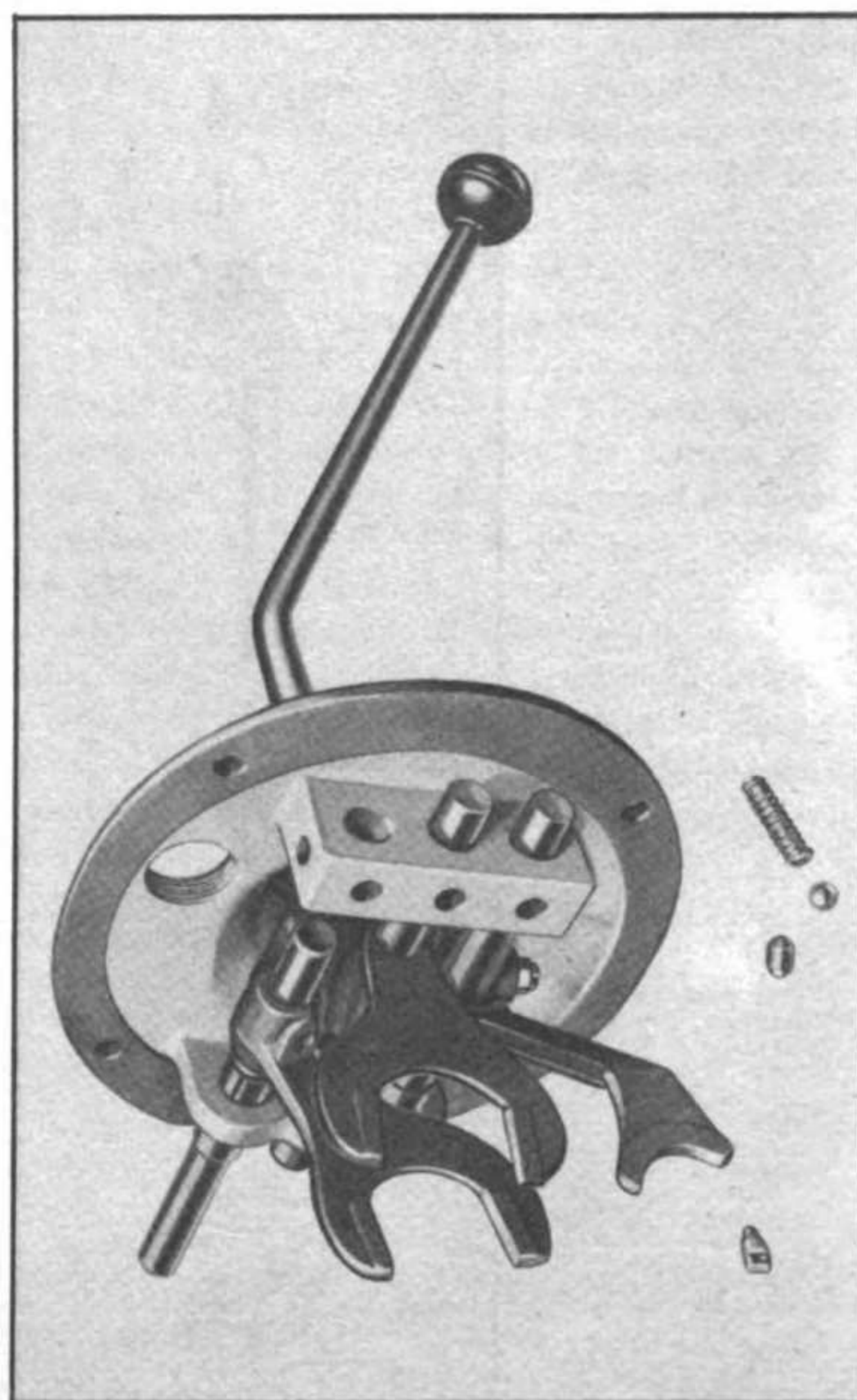
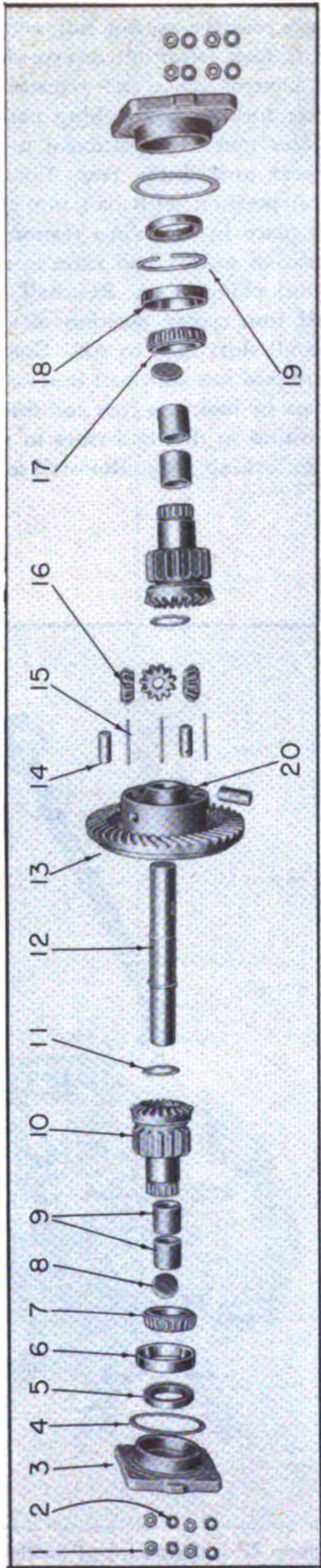


Figure 87 — Removal of Shifter Forks and Rails



1. NUT
2. LOCK WASHER
3. DIFFERENTIAL SHAFT BEARING CARRIER
4. DIFFERENTIAL BEARING SHIM
5. DIFFERENTIAL OIL SEAL
6. BEARING CUP
7. BEARING CONE
8. WELCH PLUG
9. DIFFERENTIAL SIDE GEAR BUSHING
10. DIFFERENTIAL SIDE GEAR (WITH BUSHING)

Figure 88 — Differential

11. DIFFERENTIAL CENTER WHEEL THRUST WASHER
12. DIFFERENTIAL SHAFT
13. DIFFERENTIAL RING GEAR—43 TEETH
14. DIFFERENTIAL PINION PIN
15. DIFFERENTIAL PINION SHAFT PIN
16. DIFFERENTIAL PINION (WITH BUSHING)
17. BEARING CONE
18. BEARING CUP
19. SNAP RING
20. DIFFERENTIAL RING GEAR ASSEMBLY

rod into left side of control cover and reinstall spacers and shift fork onto rod. Spacers must be positioned on each side of fork. Compress locking spring into position with ball into control cover. Secure in place by inserting second and fourth shift rod fully into position so that ball rides in rod dent. Reinstall interlocking plug. Reinstall set screws to each of the shifting forks and secure in place with lock wires. Replace gasket. Reinstall unit to the vehicle. Secure in place with four cap screws and lock washers. Reinstall dip stick into the cover.

184. DIFFERENTIAL:

a. Removal, Disassembly, and Repair:

Remove rear axle housing and related parts (Paragraph 189). Remove the four nuts and lock washers retaining each of the bearing carriers to the transmission case. Remove the bearing carriers. The carriers contain the bearing cups, oil seals, and shims. The shims on the flange of the carriers are for adjusting the bearings and setting the backlash for the pinion and ring gear. Inspect the bearing carrier, oil seal, and shims. Remove and replace if damaged. If bearing cups need be replaced, remove with the aid of a puller tool as shown in Figure 89. Remove the side gears from the differential shaft and case. Side gears have a composition thrust washer .094 inch thick at the bevel gear end; and shims which are used to set the backlash of the bevel gears and differential pinion. The side gears operate on bronze bushings which are pressed in place and reamed to allow a running clearance of .004 to .006 inch. Remove the bearing cones from the side gears with the aid of a puller tool as shown

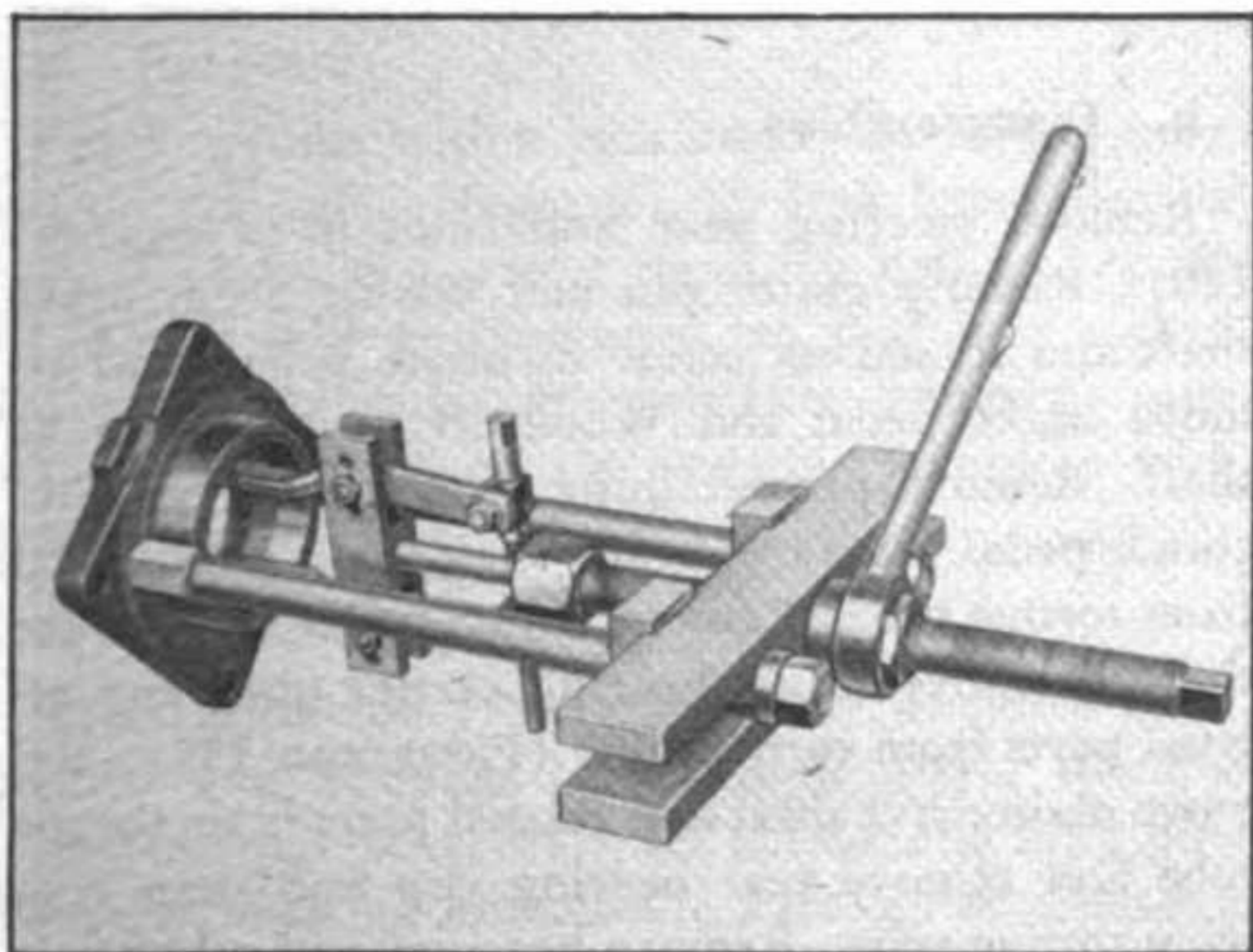


Figure 89 — Removing Bearing Cups

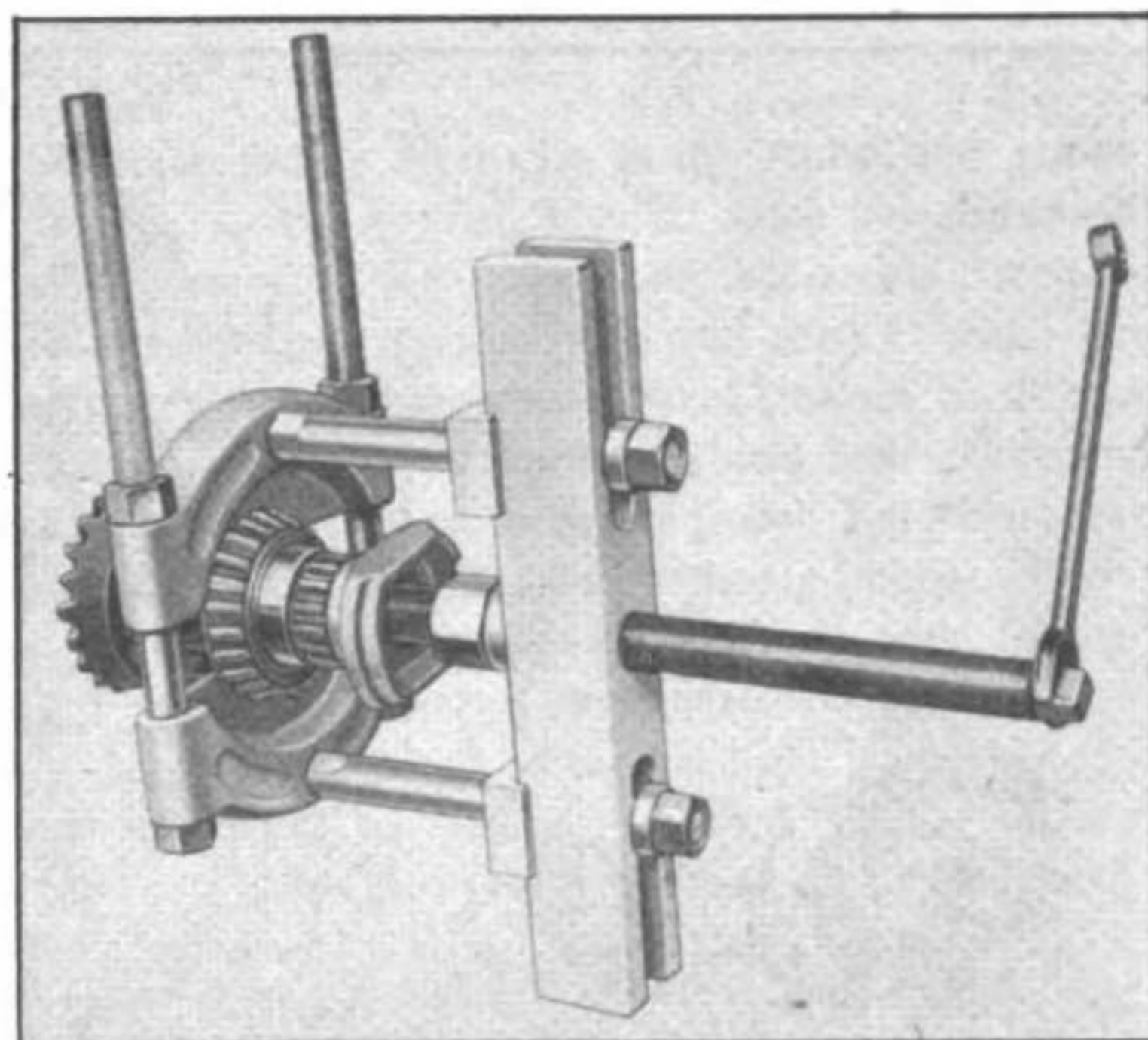


Figure 90 — Removing Bearing Cones

in Figure 90. Remove the differential shaft assembly from the case. The left end of the shaft must be removed first through a groove provided in the wall of the case. Press shaft out of the center wheel (it can be removed in one direction only). The center wheel fit on the shaft is .002 to .0035 inch tight.

Remove the locking pins from the differential center wheel and remove the pinion shafts and pinions. Shafts are .810 to .809 inch diameter and fit .001 to .003 inch loose in the bore. Pinions operate on bronze oil-lite bushings which are pressed into the bore .002 to .004 inch tight and reamed to afford a running clearance of .0027 to .004 inch. Pinions have .040 inch end play when assembled. The ring gear and differential center wheel is a riveted assembly. Ring gear is a press fit on differential center wheel .002 inch tight. Rivets are cold pressed when assembled. If ring gear or drive pinion need be replaced, it is recommended that both these parts be replaced in matched sets.

b. Assembly:

Position ring gear on differential center wheel and secure in place with rivets. Reinstall shaft into differential center wheel and reinstall three bevel gears and pins into center wheel. Secure in place with shaft pins. Reinstall bushings, Welch plugs, and bearings to the differential side gears. (The bearing on the left side gear assembly is larger than that for the right. The right hand bearing must have a snap ring under it to act as a spacer.) Inspect backlash of bevel gear and drive pinion by reinstalling shim and side gear assemblies onto shaft. Re-

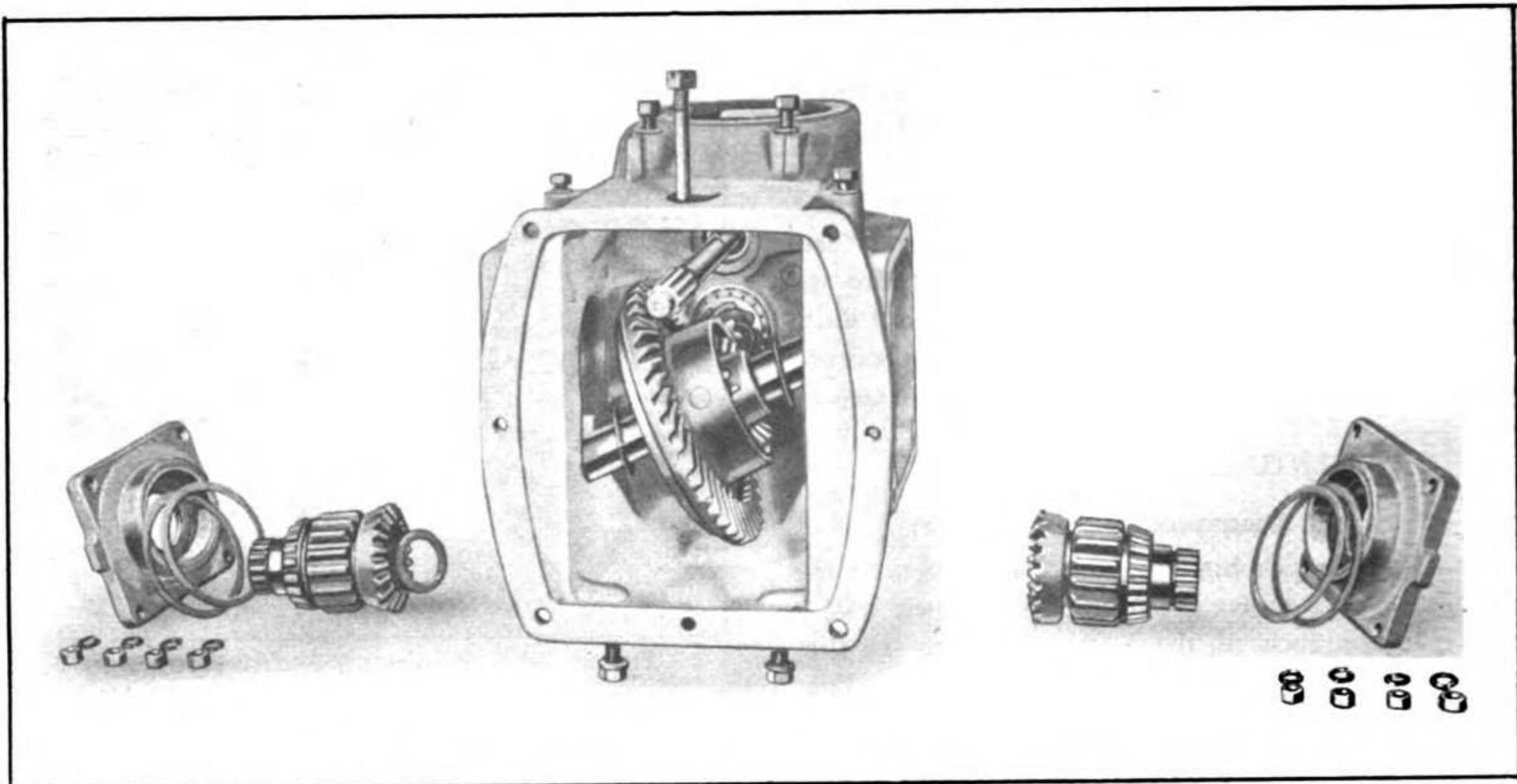


Figure 91 — Removing Differential Shaft Assembly

move or insert shims until correct gear setting has been obtained. Reinstall shaft, ring gear assembly, and side gear assemblies into transmission case. Reinstall the bearing cups, oil seals, and shims to the bearing carriers and reinstall the bearing carriers to the case in position with the differential shaft. Secure in place with nuts and lock washers. Inspect tooth clearance (backlash) of ring gear and pinion. Correct backlash is .006 to .008 inch clearance in the teeth. Adjustment is made by inserting and removing shims from either of the differential shaft bearing carriers, which will move the gear toward or away from the pinion. (Example: Removing the shims from the left hand bearing carrier and inserting them in the right hand carrier will move the ring gear closer to the pinion, thereby reducing the amount of backlash.) Reinstall rear axle housing (Paragraph 189).

185. TORQUE TUBE:

a. Removal:

Remove engine and related parts (Paragraph 138). Remove exhaust pipe and muffler (Paragraphs 102 and 101). Remove hood (Paragraph 127). Remove two cap screws retaining instrument panel to torque tube. Remove two cap screws and nuts retaining the instrument panel to the

steering column. Remove side panels, fuel tank, instrument panel, and related parts as a single unit. Remove running boards (Paragraph 132), step plates (Paragraph 133), and disconnect brake control linkage from brake pedal. Remove cotter pin and bolt retaining governor control linkage to torque tube and remove governor control linkage from torque tube. Block vehicle at transmission case and rear fenders. Remove cap screws retaining running board braces to torque tube. Remove nuts from studs retaining torque tube to transmission case. Remove torque tube from transmission case.

b. Disassembly:

Remove steering gear and column (Paragraph 120). Remove cotter pin and washer from brake shaft and loosen set screw in brake pedal, and remove brake pedal and Woodruff key from brake shaft. Remove pin retaining clutch pedal yoke to clutch pedal. Remove brake shaft and clutch pedal from torque tube. Remove clutch pedal from brake shaft. Remove clutch bearing carrier quill and related parts from torque tube (Paragraph 157). Remove main drive shaft and related parts from torque tube and remove rear bearing cup and snap ring from torque tube. Remove bearings and oil slinger gear from drive shaft with the aid of a puller tool.

Section XXXVIII—Transmission, Differential, and Torque Tube (Repair)

Inspect torque tube for conditions of being cracked, broken, or worn. Remove and inspect drain and filler plugs. Replace parts as required.

c. Assembly:

Reinstall rear bearing, oil slinger gear, snap rings, and front bearing to drive shaft. Reinstall rear bearing cup and snap ring into torque tube. Reinstall drive shaft assembly into torque tube. Reinstall clutch bearing carrier quill and related parts into torque tube (Paragraph 157). Reinstall clutch pedal to brake shaft. Reinstall brake shaft with clutch pedal into torque tube. Reinstall Woodruff key and brake pedal onto brake shaft and secure with set screw. Reinstall washer and cotter pin to brake shaft. Reinstall clutch pedal yoke to clutch pedal and secure with pin. Reinstall steering gear and column into torque tube (Paragraph 120).

d. Installation:

Replace gasket between torque tube and transmission. Position torque tube with transmission and secure with nuts and studs. Reinstall running board braces to torque tube and secure with cap screws. Reinstall governor control linkage to torque tube and secure with cotter pin and bolt. Connect brake control linkage to brake pedal. Reinstall step plates (Paragraph 133), and running boards (Paragraph 132). Position side panels, fuel tank, instrument panel, and related parts with torque tube. Secure instrument panel to torque tube with two cap screws. Secure to steering column with two cap screws and nuts. Reinstall engine and related parts (Paragraph 142). Reinstall hood (Paragraph 127), and exhaust pipe and muffler (Paragraphs 102 and 101).

Section XXXIX – Front Axle

186. GENERAL:

Refer to Paragraphs 104 and 105 for information on description and service of the front axle.

187. FRONT AXLE ASSEMBLY:**a. Removal:**

Block vehicle with a jack under the torque tube, but do not raise. Remove drag link from steering arm. Remove cap screws retaining ball socket cap to torque tube and remove cap and ball socket. Remove nuts from pin shackle hangers, raise vehicle, and remove axle assembly complete with front wheels.

b. Disassembly:

Remove tie rod (Paragraph 108). Remove front wheels and bearings (Paragraph 106). Remove king pin snap rings, disks, set screws, and king pins retaining steering knuckles to axle center. Remove nuts and washers retaining steering arms to knuck-

les and remove steering arms. Remove bushings from knuckles. Inspect all parts for signs of wear or deterioration; replace as required.

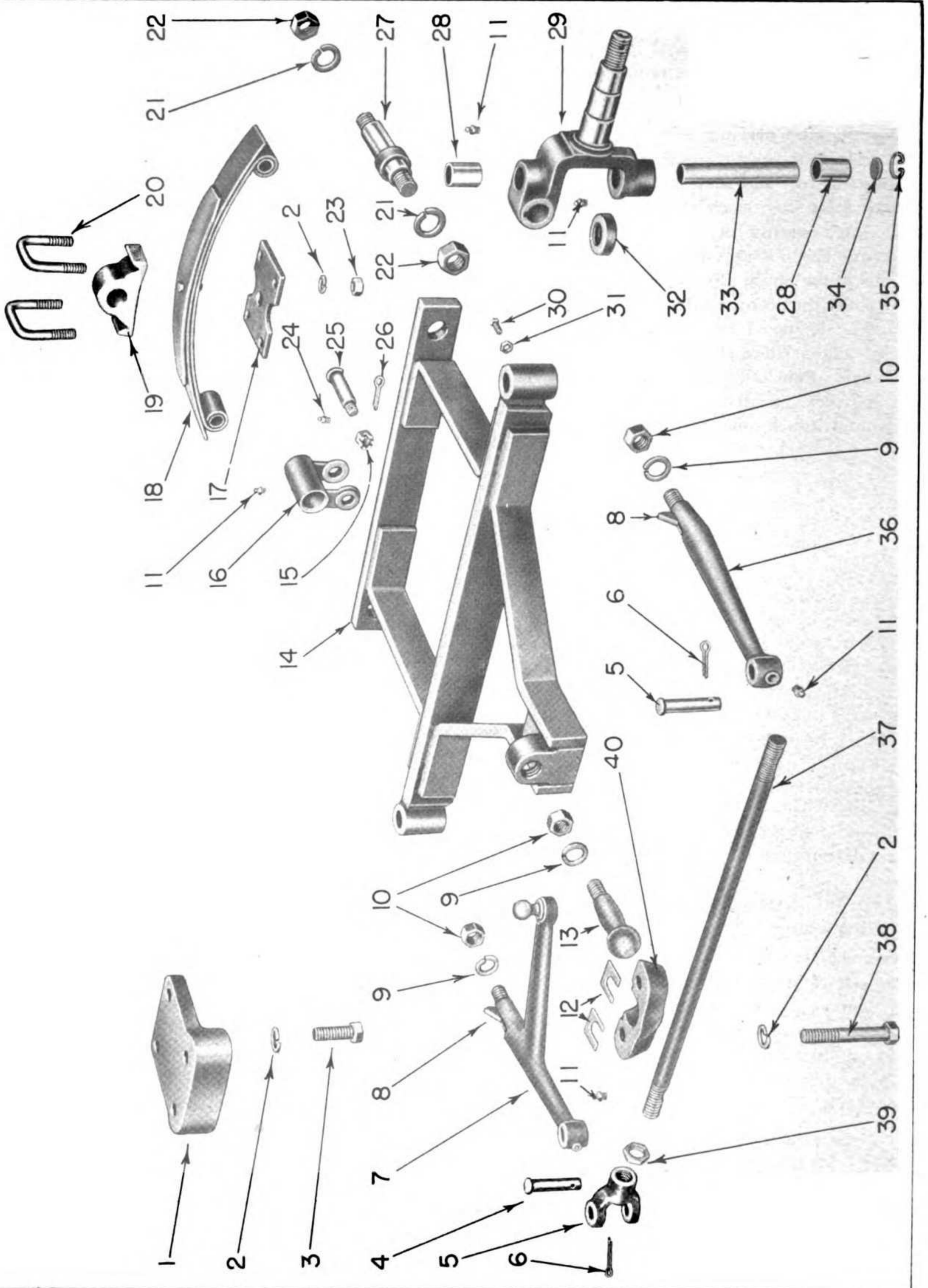
c. Assembly:

Reinstall steering arms with Woodruff keys in knuckles. Secure in place with nuts and washers. Reinstall knuckles to axle center and reinstall king pins. Secure king pins with set screws and reinstall king pin disks and snap rings. Reinstall front wheels and bearings (Paragraph 106). Reinstall tie rod (Paragraph 108).

d. Installation:

Position front axle assembly with vehicle and secure to pin shackle hangers with nuts and lock washers. Reinstall pivot ball socket. Position pivot ball into socket and secure with ball socket cap. Secure cap with cap screws. Reinstall drag link to steering arm. Lower vehicle and remove jack.

Tractor (Wheeled), Warehouse, Case VAIW (Gasoline)



Section XXXIX—Front Axle (Repair)

Figure 92 -- Front Axle

- | | | | |
|-----|------------------------------|-----|---------------------------|
| 1. | RADIUS ROD PIVOT BALL SOCKET | 21. | LOCK WASHER |
| 2. | LOCK WASHER | 22. | NUT |
| 3. | CAP SCREW | 23. | JAM NUT |
| 4. | TIE ROD YOKE END PIN | 24. | ELBOW GREASE FITTING--90° |
| 5. | TIE ROD YOKE END | 25. | SHACKLE HANGER BOLT |
| 6. | COTTER PIN | 26. | COTTER PIN |
| 7. | STEERING ARM, L.H. | 27. | SHACKLE HANGER PIN |
| 8. | WOODRUFF KEY | 28. | BUSHING |
| 9. | LOCK WASHER | 29. | STEERING KNUCKLE |
| 10. | NUT | 30. | SET SCREW |
| 11. | GREASE FITTING | 31. | JAM NUT |
| 12. | SHIM | 32. | THRUST BEARING |
| 13. | RADIUS ROD PIVOT BALL | 33. | KING PIN |
| 14. | FRONT FRAME ASSEMBLY | 34. | KING PIN DISK |
| 15. | CASTELLATED NUT | 35. | KING PIN SNAP RING |
| 16. | SHACKLE | 36. | STEERING ARM, R.H. |
| 17. | SPRING PLATE | 37. | TIE ROD |
| 18. | FRONT SPRING | 38. | CAP SCREW |
| 19. | SPRING PIVOT BLOCK | 39. | JAM NUT |
| 20. | SPRING U-BOLT | 40. | BALL SOCKET CAP |

Section XL - Rear Axle

188. GENERAL:

Refer to Paragraph 109.

189. REAR AXLE AND HOUSING:

α. Removal and Disassembly:

Refer to Paragraph 110.

b. Repair:

Inspect parts for signs of wear or deterioration. Inspect housing for conditions of being broken or cracked. Clean and replace parts as required.

c. Installation and Adjustment:

Refer to Paragraph 110.

Section XLI - Brakes

190. GENERAL:

α. Refer to Paragraph 111.

b. The brake assembly primary disk and power plate bear against four steel balls which fit in replaceable inserts. The actuating lever operates on two steel balls and pins that have spherical shaped ends. Brakes require no lubrication other than packing the ball inserts with grease when reassembling.

191. BRAKES:

α. Removal:

Disconnect brake rods and remove spring and housing cover. Remove four cap screws retaining brake housing to the differential case. Remove brake housing and related parts. Remove middle ring from the differential side gear splines.

b. Disassembly:

Remove bolts from adjusting screws and remove primary disk, actuating lever, power plate, and

related parts from brake cover. Remove adjusting screws from differential brake cover. Compress the separating springs and remove the spring retainer washers. Remove spring pin and disassemble primary disk, actuating lever, power plate, and related parts. Inspect parts for signs of wear or deterioration and replace as required.

c. Assembly:

Position primary disk, actuating lever, power plate, and related parts together. Insert spring pins. Reinstall springs; compress and secure with retainer washers. Position unit into brake cover. Reinstall adjusting screws and secure parts with bolts and washers.

d. Installation:

Reinstall middle ring assembly onto splines of differential side gear. Reinstall brake cover and related parts and secure with four cap screws. Reinstall housing cover, spring, and brake rods. Adjust brakes (Paragraph 112).

Section XLI—Brakes (Repair)

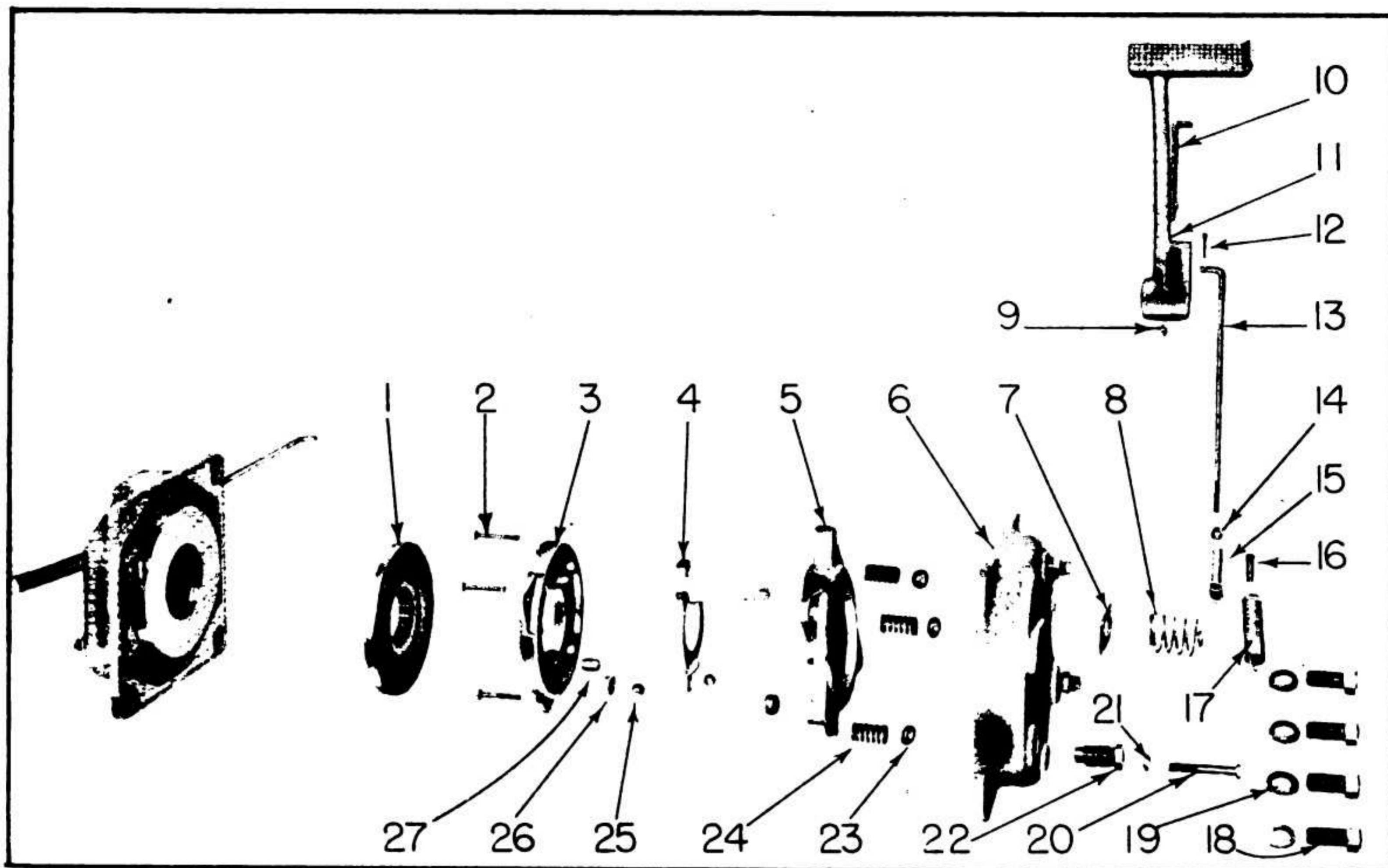


Figure 93 — Brake Assembly

- | | |
|-----------------------------|----------------------------|
| 1. MIDDLE RING ASSEMBLY | 15. ADJUSTING YOKE END |
| 2. SPRING PIN | 16. CLEVIS PIN |
| 3. PRIMARY DISK | 17. BRAKE RETURN SPRING |
| 4. ACTUATING LEVER | 18. BOLT |
| 5. POWER PLATE | 19. LOCK WASHER |
| 6. DIFFERENTIAL BRAKE COVER | 20. BOLT |
| 7. BRAKE HOUSING COVER | 21. LOCK WASHER |
| 8. BRAKE COVER SPRING | 22. ADJUSTING SCREW |
| 9. GREASE FITTING | 23. SPRING RETAINER WASHER |
| 10. BRAKE CATCH | 24. SEPARATING SPRING |
| 11. BRAKE PEDAL AND CATCH | 25. STEEL BALL |
| 12. COTTER PIN | 26. INSERTS |
| 13. BRAKE ROD | 27. PLUNGER |
| 14. NUT | |

Section XLII – Steering Gear and Column

192. GENERAL:

Refer to Paragraph 118.

193. STEERING GEAR:

a. Steering Adjusting Sleeve and Related Parts:

(1) REMOVAL: Remove pitman arm (Paragraph 119). Remove cap screws from adjusting sleeve. Remove adjusting sleeve and related parts. Remove set screw, nut, and lock washer from right side of torque tube. Inspect parts and replace as required.

(2) DISASSEMBLY: Remove cotter pin, nut, washer, and worm gear from pitman arm shaft. Remove shaft and oil seal from adjusting sleeve.

(3) ASSEMBLY, INSTALLATION, AND ADJUSTMENT: Reinstall worm gear onto pitman arm shaft and secure with washer and castellated nut. Secure nut with cotter pin. Reinstall oil seal into adjusting sleeve and reinstall shaft and related parts into sleeve. Inspect gasket; replace if necessary. Position gasket and adjusting sleeve with re-

lated parts into torque tube. Adjust unit with steering worm so that gears have least amount of clearance without binding. Clearance is obtained by rotating adjusting sleeve. When proper setting has been obtained, secure sleeve with cap screws and lock washers. Reinstall set screw, lock nut, and lock washer. Adjust screw to take up excess end play of shaft. Secure screw with lock nut. Reinstall steering gear arm (Paragraph 119). Lubricate steering gear as directed in LUBRICATION ORDER (Figure 12).

b. Steering Column and Related Parts:

(1) REMOVAL: Remove speed control lever from steering column. Remove steering hand wheel (Paragraph 122). Remove two cap screws retaining steering column to instrument panel and remove three cap screws retaining steering column to torque tube. Remove steering column and related parts. Remove bearing cup and cage from torque tube. NOTE: *Caution must be observed so as not to drop bearing cup and cage into torque tube.*

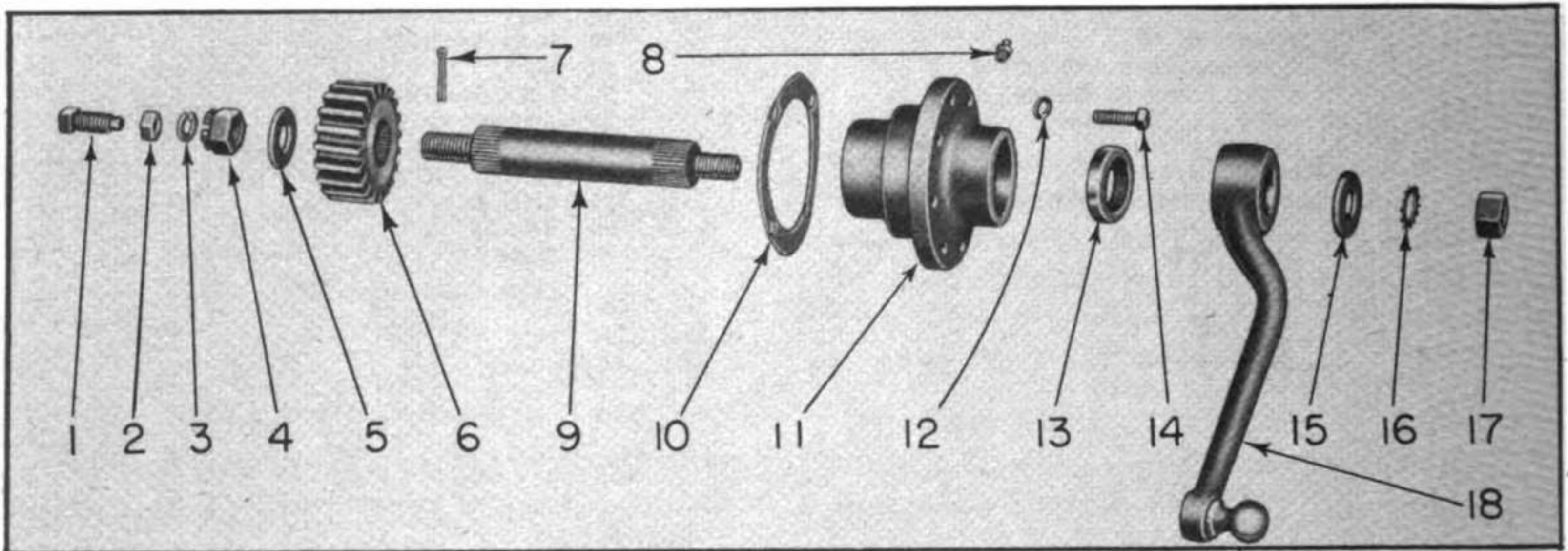


Figure 94 – Steering Adjusting Sleeve and Arm

1. SET SCREW
2. NUT
3. LOCK WASHER
4. NUT
5. STEERING ARM SHAFT WASHER
6. WORM GEAR
7. COTTER PIN
8. GREASE FITTING
9. STEERING ARM SHAFT

10. WORM WHEEL ADJUSTING SLEEVE GASKET
11. WORM WHEEL ADJUSTING SLEEVE
12. LOCK WASHER
13. STEERING GEAR HOUSING OIL SEAL
14. SCREW
15. STEERING ARM SHAFT WASHER
16. WASHER (SHAKEPROOF)
17. NUT
18. PITMAN ARM

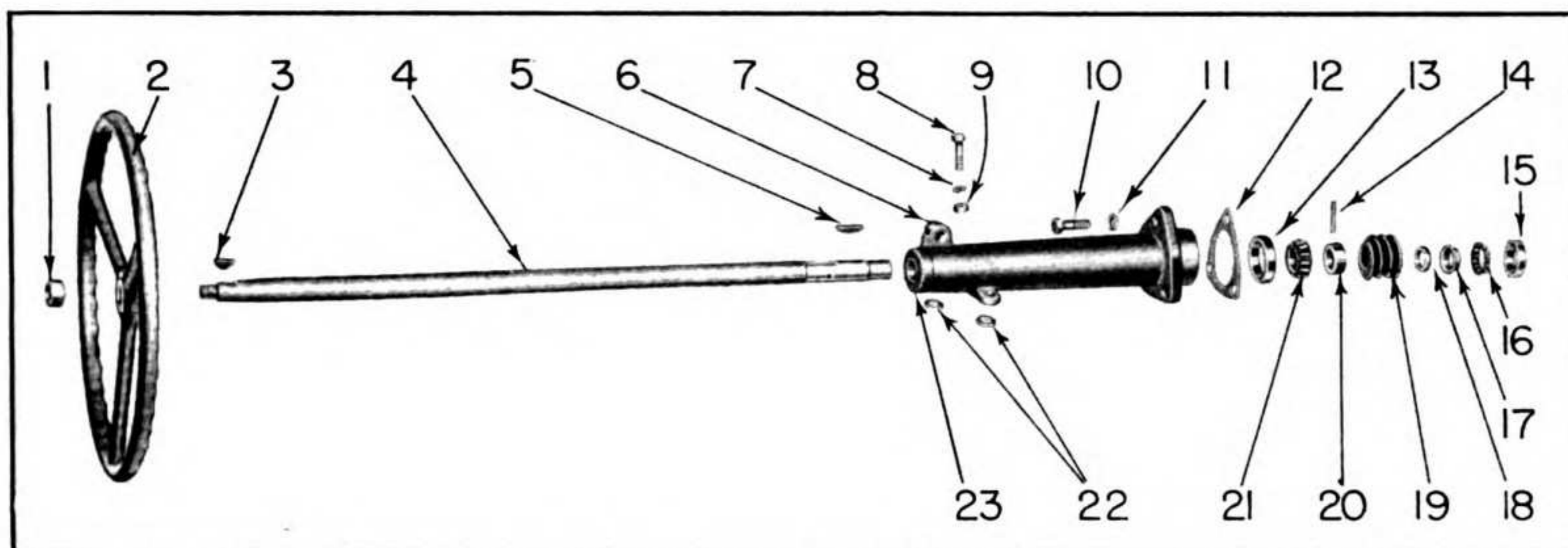


Figure 95 — Steering Column

- | | |
|---------------------------------|--------------------------------|
| 1. NUT | 13. BEARING CUP |
| 2. STEERING WHEEL | 14. GROOVE TYPE PIN #3 |
| 3. WOODRUFF KEY | 15. BEARING CUP |
| 4. STEERING SHAFT | 16. BEARING CAGE |
| 5. WOODRUFF KEY | 17. BEARING CONE |
| 6. STEERING COLUMN WITH BUSHING | 18. STEERING WORM SPACER—LOWER |
| 7. LOCK WASHER | 19. STEERING WORM |
| 8. SCREW | 20. STEERING WORM SPACER—UPPER |
| 9. NUT | 21. BEARING CONE |
| 10. CAP SCREW | 22. WASHER |
| 11. LOCK WASHER | 23. STEERING COLUMN BUSHING |
| 12. STEERING COLUMN SHIM | |

(2) **DISASSEMBLY:** Remove steering worm, lower spacer, and bearing cone from steering shaft with the aid of a puller tool. Remove Woodruff key from shaft. Remove pin and upper spacer from shaft. Remove bearing cone from shaft and remove shaft from steering column. Remove bearing cup from steering column. Inspect parts for signs of wear or deterioration and replace as required.

(3) **ASSEMBLY AND INSTALLATION:** Reinstall bearing cup into steering column. Reinstall shaft into column and reinstall cone, spacer, and pin onto shaft. Reinstall Woodruff key, steering worm, spacer, and lower bearing cone onto shaft. Reinstall bearing cup and cage into torque tube. Replace shims if necessary. Reinstall steering column with related parts and shims into torque tube. Shims are required for adjusting steering shaft bearings. Add or replace as required. Secure steering column to torque tube with three cap screws and lock washers. Adjust steering worm and worm gear (Sub-Paragraph "a" (3) above). Secure steering column to instrument panel with two cap screws, lock washers, and nuts. Reinstall steering hand wheel (Paragraph 122). Reinstall hand speed control lever.



Figure 96 — Removing Steering Column

Section XLIII – Coupler

194. GENERAL:

Refer to Paragraphs 13 and 123.

for signs of wear or deterioration; replace as required. Reinstall coupler (Paragraph 123).

195. COUPLER:

Remove coupler (Paragraph 123). Inspect parts

Section XLIV – Spring

196. GENERAL:

Refer to Paragraph 124.

tion. Remove spring (Paragraph 126) and replace parts as required. Reinstall spring (Paragraph 126).

197. SPRING:

Inspect spring for signs of wear or deteriora-

Section XLV – Hood, Fenders, Bumper-Grille, and Miscellaneous Sheet Metal

198. HOOD:

Inspect hood and attaching parts. Repair or replace as required. Refer to Paragraph 127 for removal and installation instructions.

202. BUMPER-GRILLE:

Inspect bumper-grille and attaching parts. Repair or replace as required. Refer to Paragraph 131 for removal and installation instructions.

199. HOOD SIDE PANELS:

Inspect hood side panels and attaching parts. Repair or replace as required. Refer to Paragraph 128 for removal and installation instructions.

203. RUNNING BOARDS:

Inspect running boards and attaching parts. Repair or replace as required. Refer to Paragraph 132 for removal and installation instructions.

200. FRONT FENDERS:

Inspect front fenders and attaching parts. Repair or replace as required. Refer to Paragraph 129 for removal and installation instructions.

204. STEP PLATES:

Inspect step plates and attaching parts. Repair or replace as required. Refer to Paragraph 133 for removal and installation instructions.

201. REAR FENDERS:

Inspect rear fenders and attaching parts. Repair or replace as required. Refer to Paragraph 130 for removal and installation instructions.

205. SEAT AND SEAT FRAME:

Inspect seat and seat frame and attaching parts. Repair or replace parts as required. Refer to Paragraph 134 for removal and installation instructions.

APPENDIX

Section XLVI - Shipment and Storage

206. PREPARATION FOR SHIPMENT OR STORAGE:

Perform the following operations to prepare the vehicle for shipment or storage:

a. Inspection:

A thorough inspection shall be made of complete vehicle and component parts thereof, including major unit assemblies, sub-assemblies, or parts, to determine correctness of operation and absence of all defects or deficiencies. Make adjustments and repairs, and reinspect as required.

b. Cleaning and Painting:

Thoroughly clean the entire vehicle, including engine compartment, chassis, axles, transmission, gear cases, and etc. Remove rust and spray paint over exposed metal surfaces.

c. Lubrication:

Lubricate the entire vehicle covering all items specified on the LUBRICATION ORDER (Figure 12).

d. Cooling System:

Fill cooling system with a mixture of 50% anti-freeze (4-1116) and 50% water to which has been added 3% compound, inhibitor, corrosion (for water or ethylene glycol) (4-1117). Operate the engine for 10 minutes to mix the fluid. Attach a caution tag to the radiator filler pipe to notify personnel that the cooling system has been protected to minus 40° F. Do not drain.

e. Crankcase and Cylinders:

Place a full charge of OIL, engine, preservative (AXS-934) Grade I (in winter, Grade II when specified). Remove spark plugs, rotate engine slowly, and spray into each cylinder sufficient OIL, engine, preservative, (AXS-934) Grade I to provide adequate protection of cylinder walls, valve heads, stems, and guides. Reinstall spark plugs.

f. Fuel System:

Drain the entire fuel system including tank, carburetor, strainer, and lines, and dry thoroughly. Fog fuel tank with preservative oil (USA 2-122). Remove grease and dirt from exterior of engine.

g. Engine:

Seal all openings in engine and sub-assemblies, including breathers, breather hole in distributor

cap, air intake, exhaust expansion joints, tail pipes, and openings in starter and generator with tape (JAN-P-127). Place a sheet of Grade "A" paper between pulleys and belts. Spray all unprotected surfaces of engine, all taped openings, engine sub-assemblies, and wiring with Compound Insulation and Ignition (USA 3-182). Attach a caution tag giving date on which engine was treated for shipment or storage.

h. Battery:

Wash clean with water and soda solution. Charge to obtain specific gravity reading of not less than 1.275 for each cell. Disconnect leads and tape (JAN-P-127). Coat battery posts with Kendall No. 5 or approved equal. Tighten hold-down clamps.

i. Instruments, Gages, and Switches:

Tape or mask and spray front and rear with compound (USA 3-182). Spray all bare metal surfaces with Kendall No. 5 or approved equal.

j. Horn:

Tape (JAN-P-127) over horn button.

k. Radiator:

Barricade radiator to protect from damage and from entry of liquid water into engine compartment.

l. Engine Compartment:

Use plywood or equal to barricade lower portion of hood to prevent liquid water from entering engine compartment. To secure, use tie rod through both sides or steel straps over top and under engine, or other suitable means. Tape (JAN-P-127) around perimeter.

m. Seat and Back Rest:

Cover with Barrier-Material, Waterproof, Flexible (JAN-P-125) and secure to vehicle.

n. Vehicle Tools:

Clean with petroleum solvent; spray with Kendall No. 5 or approved equal, and wrap to prevent abrasive action. Place tools in box and mark box "Processed for Shipment (Storage)."

o. Pneumatic Tires:

(1) SHIPMENT: When the vehicle is transported on a carrier, such as railroad cars or trailers, the

tire inflation pressure should be increased as follows to make possible proper blocking and to prevent bouncing:

Front Tires: Increase inflation pressure to 37 pounds.

Rear Tires: Increase inflation pressure to 42 pounds.

Caution: Tires should be deflated to correct operating pressures before vehicle is transported under its own power, towed, put into service, or placed in storage; otherwise the rubber will check or crack.

(2) STORAGE:

(a) If tires are left on the vehicle, they should be thoroughly cleaned, then covered and deflated. Block up vehicle just far enough to lift tires off floor. Deflate tires to half of their normal pressure.

(b) Tires removed from the vehicle for a long storage period should be placed in a room or basement that is cool (not cold) and absolutely dry. Room should be naturally dark or either windows or tires should be covered to protect latter from light rays.

(c) Because rubber ages by an oxidation process and continual change of air, tires should be covered if necessary to prevent exposure to air currents or drafts.

(d) Tires removed from the vehicle should be deflated by removing valve cores. After deflating, valve cores should be replaced but not tightly sealed. Valve caps should be attached tightly.

(e) In laying tires and rims flat, one upon another, they should be separated by blocks in such a manner that no weight rests on the tires. Tires should not contact grease or oil saturated floors, walls, or other objects because vulcanized rubber absorbs both grease and oil, with resultant loss of original properties.

(3) **REMOVAL FROM STORAGE:** Reinstall tires if they have been removed. Remove valve caps, tighten valve cores, inflate tires to proper pressures; then install caps securely. Remove covering, if any, from the tires.

p. Loading for Shipment:

Vehicle will be shipped uncrated. When shipping by railroad, block all wheels on the outboard sides with 4 x 4 x 1 blocks. Place chocks in front and rear of tires, and secure to floor to prevent the vehicle from rolling. Fasten tie-down cable or rope to front and rear of vehicle and secure to prevent swaying of vehicle.

q. Storage upon Receipt of Vehicle:

If vehicle is to be placed in storage upon receipt after shipment, follow instructions in AR 850-18, Storage of Motor Vehicle Equipment.

r. Removal from Storage:

Before a vehicle which has been processed for shipment or storage is placed in service, perform operations contained in Section V ;Service Upon Receipt of Equipment.

Section XLVII – Reference

207. PUBLICATIONS INDEXES:

The following publications indexes should be consulted frequently for latest changes to, or revisions of, the publications given in this list of references and for new publications relating to materiel covered in this manual:

FM 21-6. *List and Index of War Department Publications.* (Lists FM's, TM's, and LO's concerning training.)

FM 21-7. *List of War Department Films, Filmstrips, and Recognition Film Slides.* (Lists TF's, FS's, and FB's by serial number and subject.)

FM 21-8. *Military Training Aids.* (Lists graphic training aids, models, devices, and displays.)

208. EXPLANATORY PUBLICATIONS:**a. Fundamental Principles:**

TM 1-455 *Electrical Fundamentals.*

TM 37-2810 *Motor Vehicle Inspections and Preventive Maintenance Service.*

TM 9-2852 *Welding.*

TM 21-305 *Driver's Manual.*

TM 10-580 *Automotive Electricity.*

TM 21-300 *Driver Selection, Training, and Supervision, Wheeled Vehicles.*

TM 21-302 *Operator Selection and Training, Materials Handling Equipment.*

TM 37-250 *Basic Maintenance Manual.*

AR 850-15 *Military Motor Vehicles.*

AR 850-20 *Precautions in Handling Gasoline.*

b. Maintenance and Repair:

TM 9-850 *Cleaning, Preserving, Sealing, Lubricating, and Related Materials. Issued for Ordnance Materiel.*

TM 31-200 *Maintenance and Care of Pneumatic Tires and Rubber Treads.*

c. Storage and Shipment:

JQD 1021. *Preparation of Engines and Unit Spares for Storage or Shipment.*

JQD 1025. *Preparation of Gasoline—Operated Wheeled Vehicles (Unboxed) for Overseas Shipment or Storage.*

JQD 1012A. *Preparation of Spare Parts for Storage or Shipment (Minimum).*

AR 850-18. *Storage of Motor Vehicle Equipment.*

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Tractor (Wheeled), Warehouse, Case VAIW (Gasoline)

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PARTS LIST

FOR

TRACTOR (WHEELED), WAREHOUSE, CASE V.A.I.W. (GASOLINE)

**NOTE: ALL PARTS LISTED ARE COMMON TO
BOTH VAIW-3 AND VAIW-4 VEHICLES, EXCEPT
WHEN OTHERWISE SPECIFIED.**

J. I. CASE CO. _____ RACINE, WISCONSIN

GROUPING

01—Engine Group

- 0101 Crankcase
- 0102 Cylinder Head
- 0103 Crankshaft and Pistons
- 0104 Camshaft
- 0105 Oil Pump
- 0106 Oil Filter
- 0107 Air Cleaner and Bracket
- 0108 Manifold

02—Clutch Group

- 0201 Torque Tube and Clutch Actuating Parts
- 0202 Clutch Pressure Plate and Lining

03—Fuel System Group

- 0301 Carburetor
- 0302 Governor Control Parts
- 0303 Fuel Tank and Line
- 0304 Governor

04—Exhaust Group

- 0401 Muffler and Exhaust Pipe

05—Cooling Group

- 0501 Radiator and Connections
- 0502 Water Pump and Fan

06—Electrical Group

- 0601 Generator
- 0602 Starting Motor
- 0603 Distributor
- 0604 Electrical Equipment
- 0605 Instrument Panel and Attachments
- 0606 Lighting Equipment
- 0607 Head Lamp and Tail Lamp

07—Transmission Group

- 0701 Transmission Case
- 0702 Transmission Shaft and Gears
- 0703 Differential
- 0704 Gear Shift

10—Front Axle Group

- 1001 Front Axle
- 1002 Front End Mounting Assembly

11—Rear Axle Group

- 1101 Rear Axle and Housing

12—Brake Group

- 1201 Brake Assembly

13—Wheel Group

- 1301 Front Wheel Assembly
- 1302 Rear Wheel and Rim

14—Steering Group

- 1401 Drag Link
- 1402 Steering Column
- 1403 Steering Adjusting Sleeve and Arm

15—Frame and Brackets Group

- 1501 Coupler
- 1502 Seat Assembly

17—Hood, Fenders, and Miscellaneous Sheet Metal Group

- 1701 Running Board and Front Fenders
- 1702 Rear Fenders and Step Plates
- 1703 Hood and Panel Assembly
- 1704 Tool Box Assembly

21—Bumper Guard Group

- 2101 Front Bumper Assembly

VENDORS

Code Symbol	Vendor	Vendor's Address
AB	Aetna Ball Bearing Mfg. Co.	4600 Schubert Ave., Chicago 39, Illinois
AC	A. C. Spark Plug Div. (G.M.C.)	1300 N. Dort Highway, Flint 2, Michigan
ADN	Airtress Midland Company	1304 W. 4th St., Davenport, Iowa
AL	Electric Auto-Lite Co.	Main Post Office, Box 931, Toledo 1, Ohio
ASM	Auto Specialties Mfg. Co.	643 Grave St., St. Joseph, Michigan
ASW	American Steel & Wire Co.	614 Superior Ave., Rockefeller Bldg., Cleveland 13, O.
AVM	Atwood Vacuum Machine Co.	2500 N. Main St., Rockford, Ill.
BBC	Bendix Brake Co.	South Bend, Indiana
CC	Chrysler Corporation	Highland Park, 341 Mass. Ave., Detroit 31, Michigan
CCS	Chicago Screw Co.	1026 S. Homan Ave., Chicago 24, Illinois
CEE	Crescent Electric Co.	407 Pershing Ave., Davenport, Iowa
CE	Clark Equipment Co.	Buchanan, Michigan
CG	Cragen and Company	932 First Ave. So., Seattle 4, Washington
CGB	Cleveland Graphite Bronze Co.	17044 St. Clair Ave., Cleveland 10, Ohio
CM	Chicago Rawhide Mfg. Co. (The)	1301 Elston Ave., Chicago 22, Illinois
CON	Continental Rubber Works	1932 Liberty Blvd, Erie, Pennsylvania
CO	Continental Motors Corp.	205 Market Street, Muskegon, Michigan
DGM	Detroit Gasket & Mfg. Co.	12640 Burt Rd., Detroit 32, Michigan
DR	Delco-Remy Div. (G.M.C.)	Anderson, Indiana
EAT	Eaton Mfg. Co. (The)	739 E. 140th St., Cleveland 10, Ohio
ES	Exide Battery	1900 Alligheny Ave., Philadelphia 32, Pa.
FLS	Fulton Sylphon Co.	P. O. Box 400, Knoxville 4, Tennessee
GI	Gibson Co., Wm. D.	1810 Clybourn Ave., Chicago 14, Illinois
GL	Guide Lamp Div. (G.M.C.)	25th St. & Arrow Ave., Anderson, Indiana
GT	Goodyear Tire & Rubber Co.	1144 E. Market St., Akron 16, Ohio
GV	Gates Rubber Co.	999 S. Broadway, Denver 17, Colorado
HC	Cole Hersee Co.	54 Old Colony Ave., S. Boston 27, Mass.
HEE	Henry Engineering Co.	607 3rd Ave., Moline, Illinois
IB	Imperial Brass Mfg. Co. (The)	1200 W. Harrison St., Chicago 7, Illinois
IR	Atlantic Indian Rubber Wks., Inc.	1453 W. Van Buren St., Chicago 7, Illinois
KLE	Killark Electric Mfg. Co.	3940 Easton Ave., St. Louis, Mo.
LEG	Lincoln Engineering Co.	5701 Natural Bridge Ave., St. Louis 20, Missouri
LG	Linograph Co.	107 Scott St., Davenport, Iowa
LMS	Lamson & Sessions Co. (The)	1971 W. 85th St., Cleveland 2, Ohio
MDR	McCord Radiator & Mfg. Co.	2587 E. Grand Blvd., Detroit 11, Michigan
MPC	Michigan Products Corp.	Lock Box 302, Michigan City, Indiana
MSCC	Marvel Schebler Carburetor Corp.	1910 St. John St., Flint 2, Michigan
MW	Motor Wheel Corp.	716 E. Saginaw St., Lansing 3, Michigan
MUM	Mercury Mfg. Co.	4044 S. Halsted St., Chicago 9, Illinois
ND	New Departure Div. (G.M.C.)	Bristol, Connecticut
NFE	National Formetal Co.	6539 Metta Ave., Cleveland, Ohio
NI	Novi Equipment Co.	Novi, Michigan
NLW	National Lock Washer Co.	65 Johnson St., Newark 5, N. J.
NM	Nelson Muffler Corp.	P. O. Box 60, Staughton, Michigan
PTS	Protectoseal Co.	1920 S. Western Ave., Chicago 8, Illinois
RM	Rochester Mfg. Co., Inc.	Rockwood St., Rochester 10, New York
SDF	Spaulding Fibre Co., Inc.	4757 Ravenswood, Chicago, 40, Illinois
SDP	Standard Supply Co.	510 W. Michigan, Milwaukee, Wisconsin
SEP	Service Products Corp.	201 S. Rural St., Indianapolis 1, Indiana
SHA	Shakespeare Products Co.	241 E. Kalamazoo Ave., Kalamazoo ?F, Michigan

VENDORS (continued)

Code Symbol	Vendor	Vendor's Address
SL	Sheller Mfg. Corp.	S. Bridge St., Portland, Indiana
SSP	Stolper Steel Products Corp.	3258 W. Fond du Lac Ave., Milwaukee 10, Wisconsin
TJ	Thermoid Co.	Whitehead Road, Trenton 6, New Jersey
TIM	Timken Roller Bearing Co. (The) ...	1935 Kelley Ave., Canton, Ohio
TO	Toledo Steel Products, Inc.	3300 Summit St., Toledo 11, Ohio
TP	Thompson Products, Inc.	2196 Clarkwood Road, Cleveland 3, Ohio
TR	Torrington Co. (The)	59 Field St., Torrington, Conn.
TRK	Tourek Mfg. Co., J. J.	4701 W. 16th St., Chicago 50, Illinois
TSC	Tuthill Spring Co.	760 Polk St., Chicago 7, Illinois
TSE	Taylor Sales Engr. Co.	117 W. Franklin St., Elkhardt, Indiana
VG	Victor Mfg. & Gasket Co.	P.O. Box 1333, 5750 W. Roosevelt Road, Chicago 9, Ill.
VR	Vortex Mfg. Co.	121 S. Alexander Ave., Claremont, California
WER	Wagner Mfg. Co., E. R.	4611 N. 32 St., Milwaukee 9, Wisconsin
WRC	Western Rubber Co.	E. Douglas St., Goshen 4, Indiana
WWM	Wrought Washer Mfg. Co.	2100 S. Bay St., Milwaukee 7, Wisconsin
WSR	Wisconsin Screw Co.	Racine, Wisconsin
WFW	Western Felt Works	4029-4135 Ogden Ave., Chicago 23, Illinois

LIST OF ABBREVIATIONS

Bdg.	Binding	Mach.	Machine
Cast.	Castellated	M.M.	Millimeter
C.E.	Commutator End	M.S.	Mainshaft
Comm.	Commutator	Mtg.	Mounting
C.P.	Candle Power	N.C.	National Coarse
C.S.	Countershaft	N.F.	National Fine
D.E.	Drive End	P.T.	Pipe Thread
Dia.	Diameter	Rd. Hd.	Round Head
F.	(Rim Type)	R.H.	Right Hand
Fill.	Fillister	S.A.E.	Society of Automotive Engineers
Hd.	Head	S.C.	Single Contact
Hex.	Hexagon	Sq.	Square
H.T.	High Tension	Std.	Standard
Ins.	Insulated	Str.	Straight
Lg.	Long	Term.	Terminal
L.H.	Left Hand	V	Volts
L.T.S.	(Rim Type)	W/	With

GROUP 01 — ENGINE GROUP

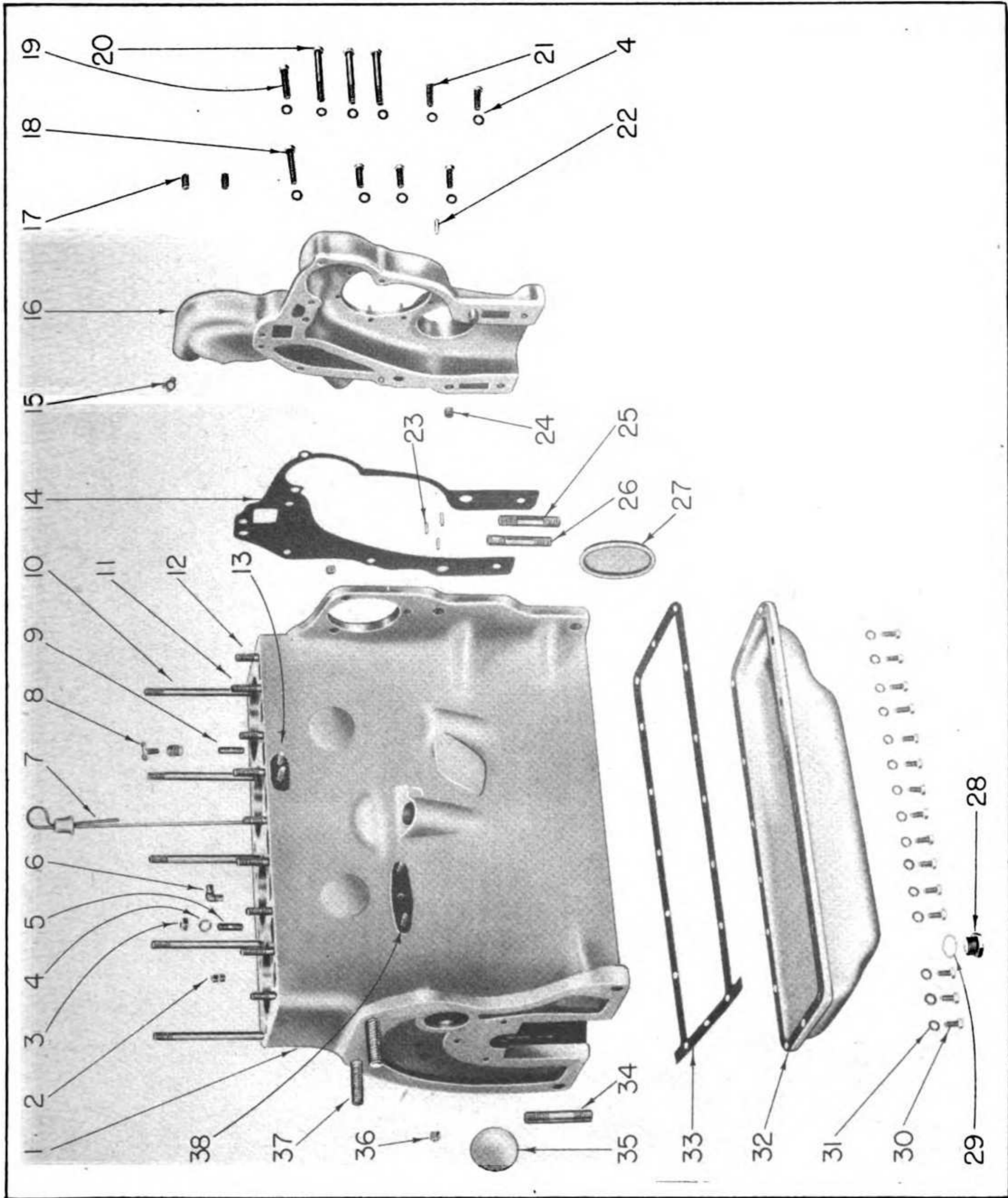


FIG. 01-1 — 0101 CRANK CASE

GROUP 01 — ENGINE GROUP

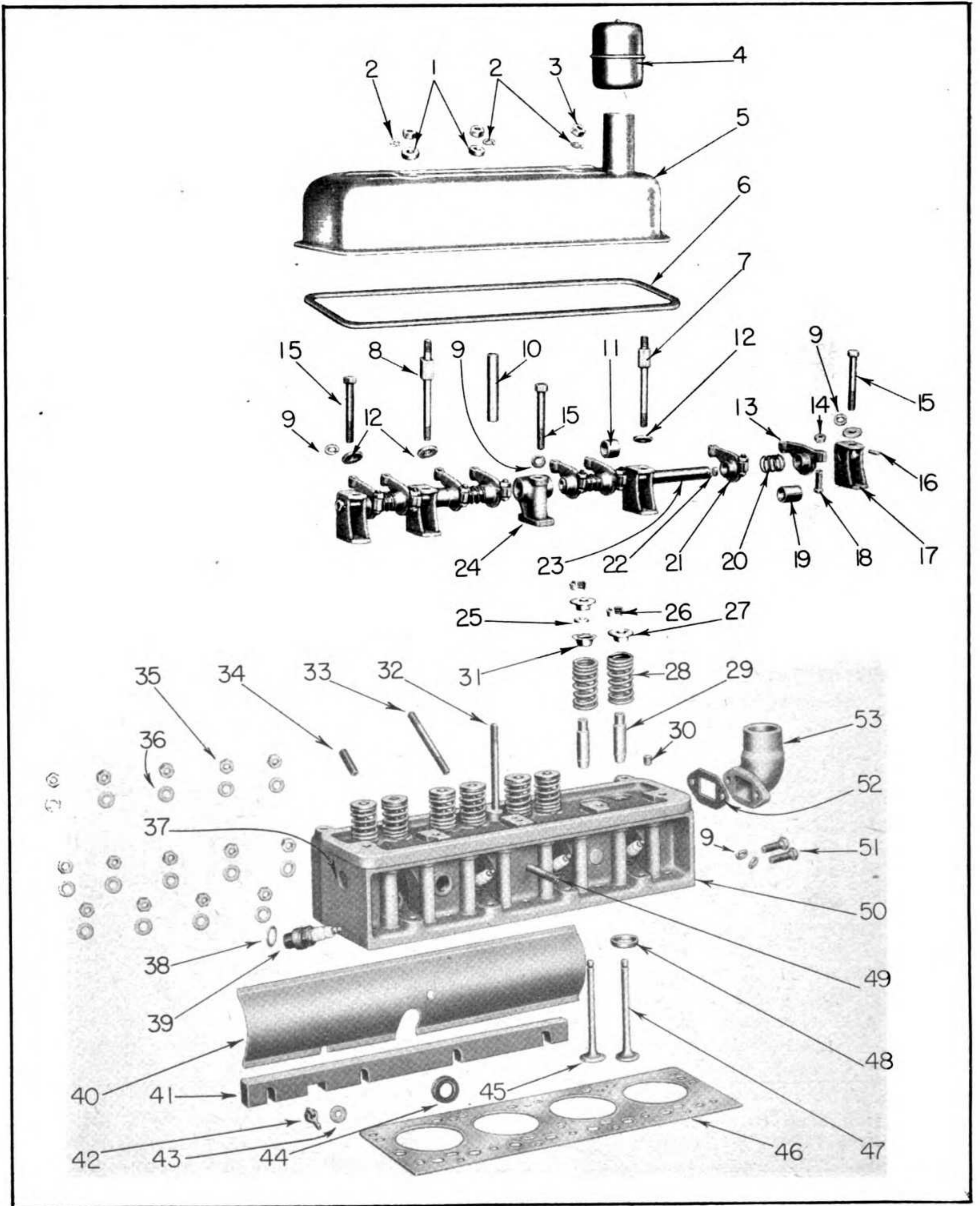


FIG. 01-2 — 0102 CYLINDER HEAD

GROUP 01 — ENGINE GROUP

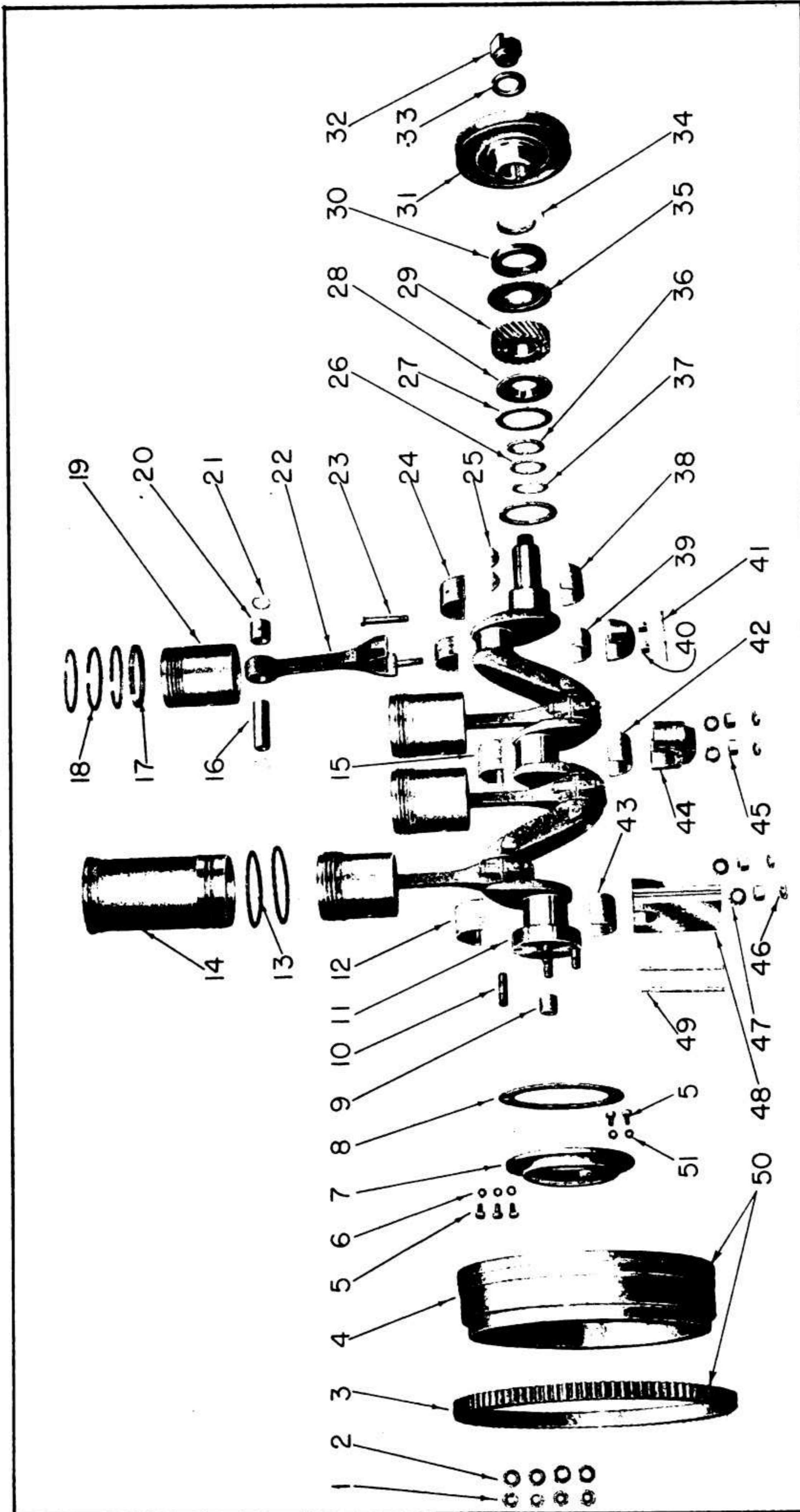


FIG. 01-3 — 0103 CRANK SHAFT AND PISTONS

GROUP 01 — ENGINE GROUP

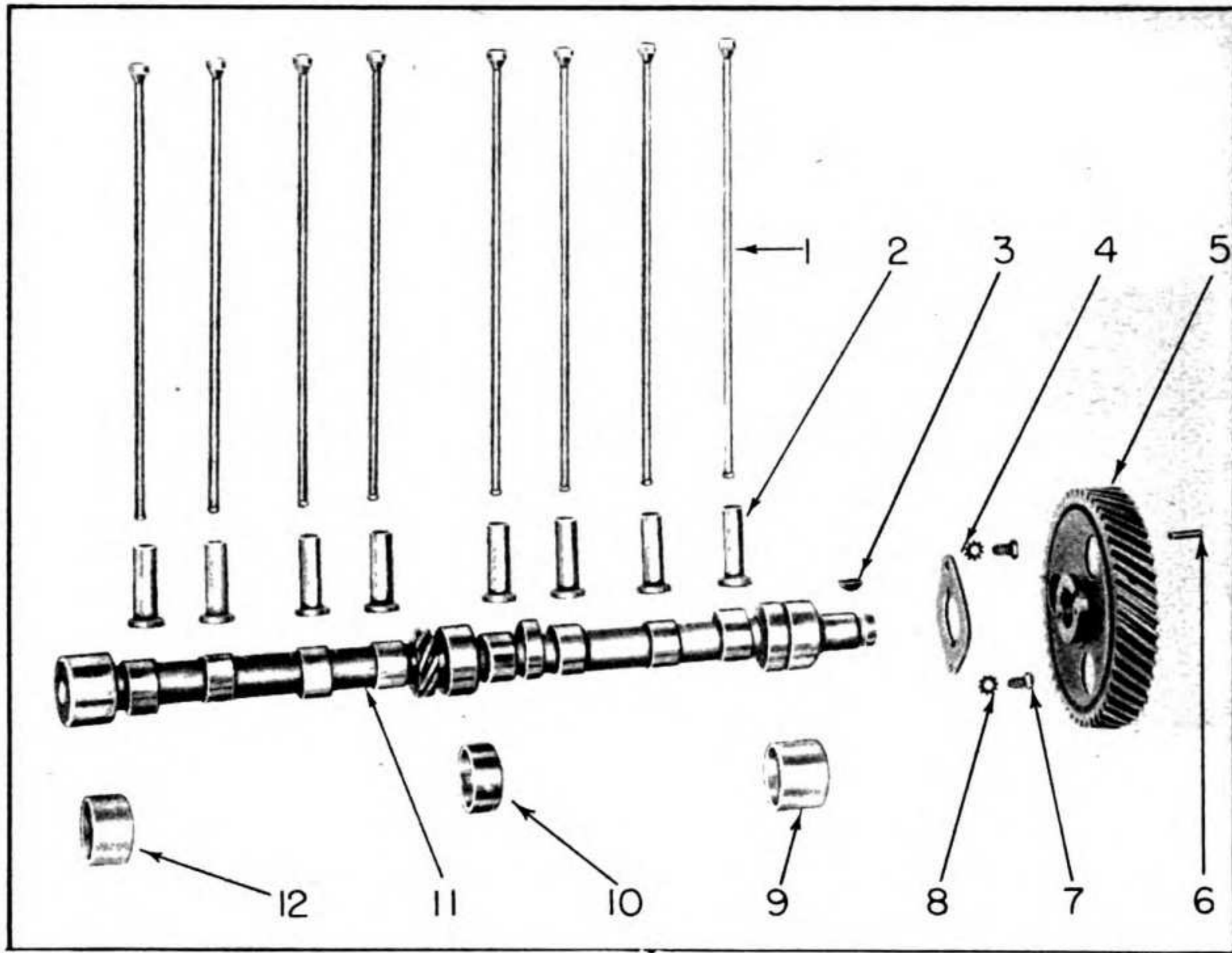


FIG. 01-4 — 0104 CAMSHAFT

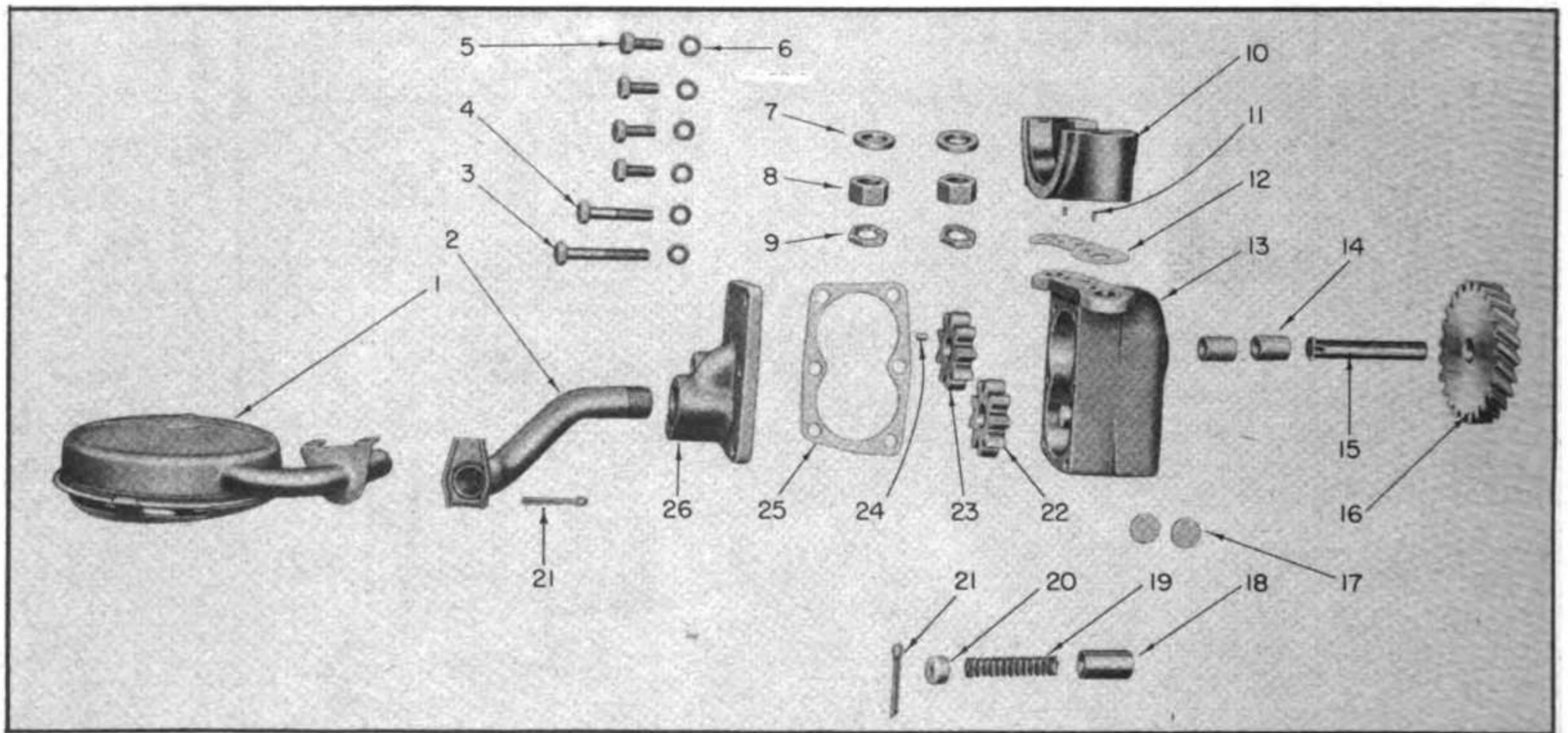


FIG. 01-5 — 0105 OIL PUMP

GROUP 01 — ENGINE GROUP

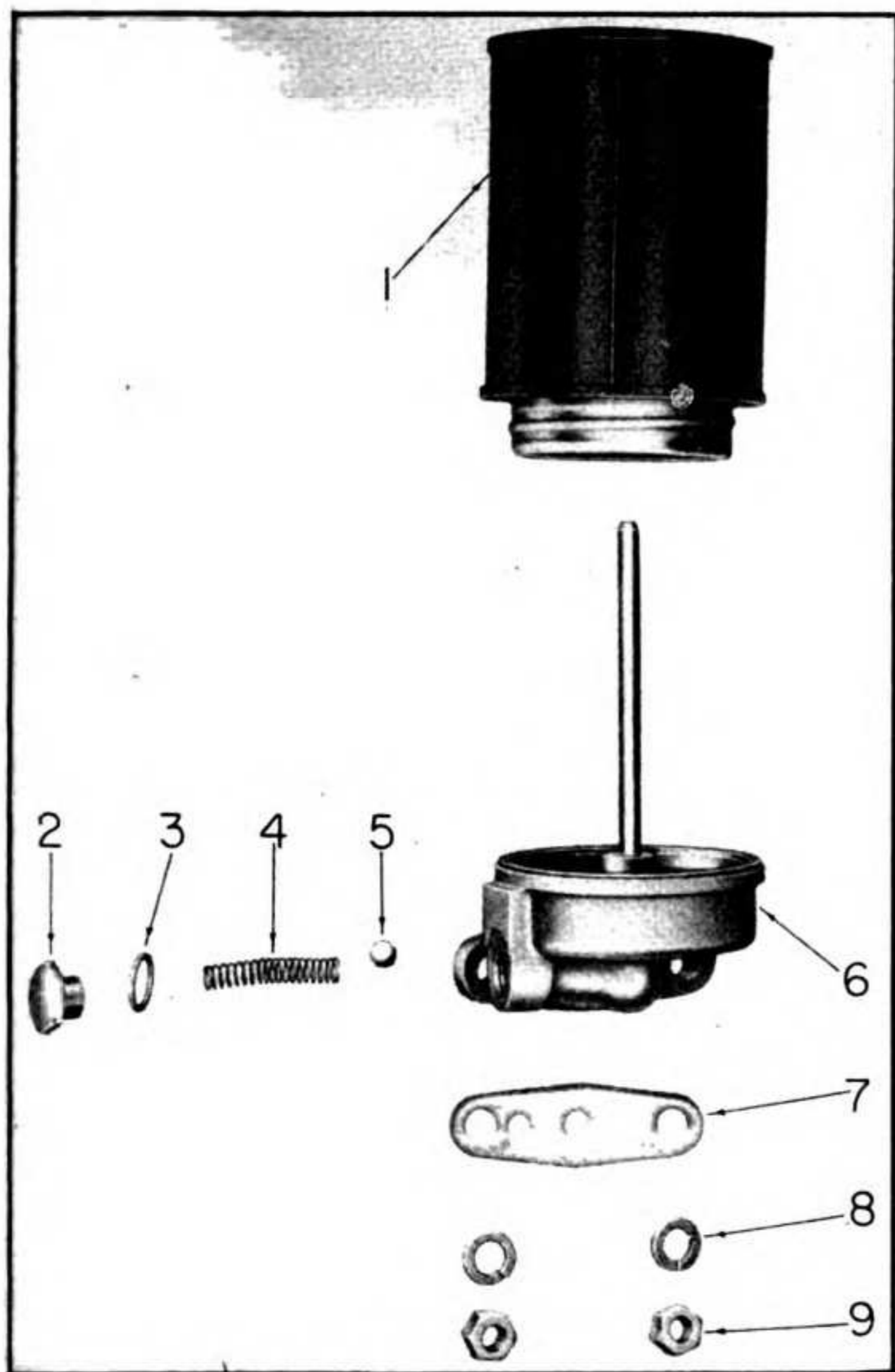


FIG. 01-6 — 0106 OIL FILTER

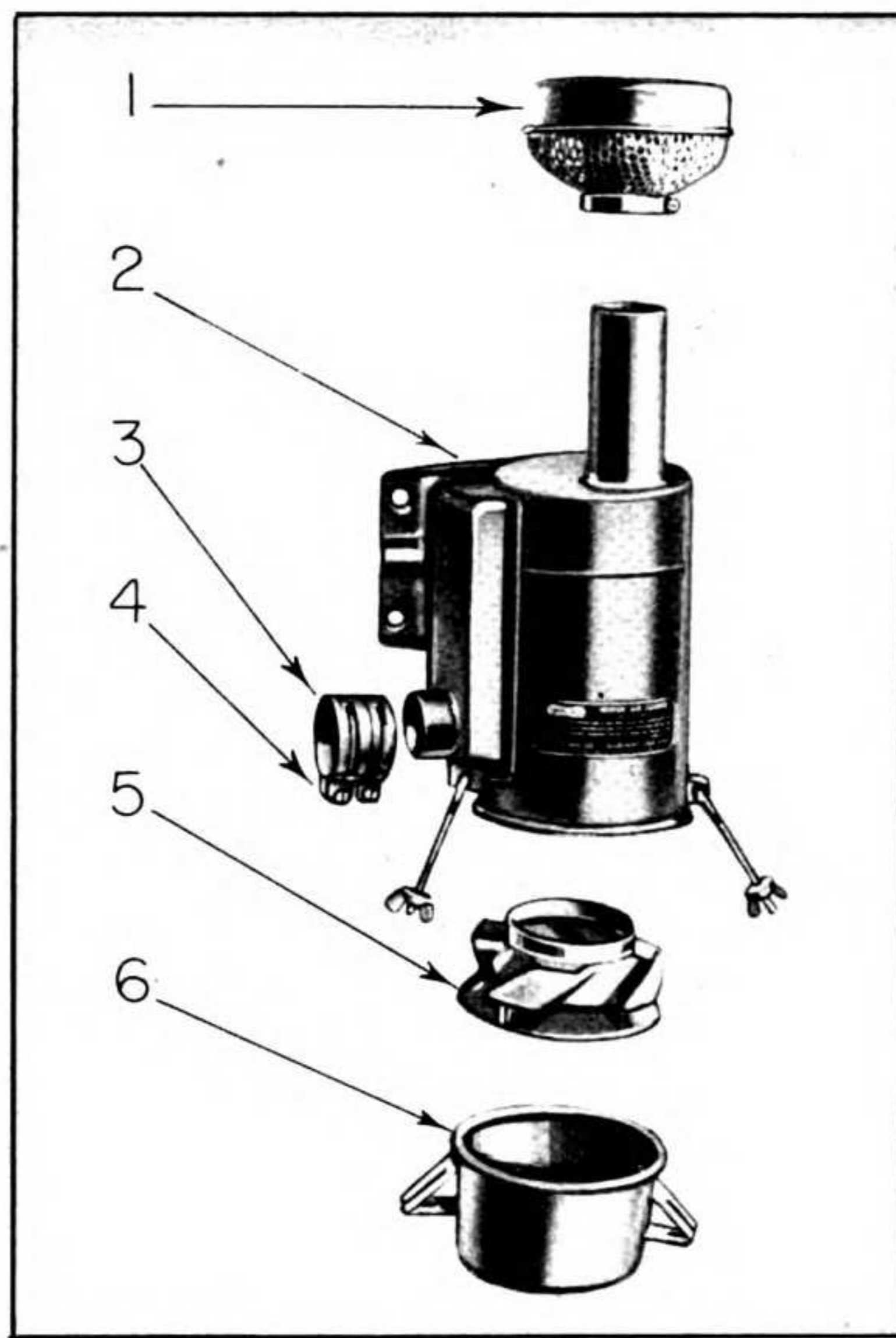


FIG. 01-7 — 0107 AIR CLEANER

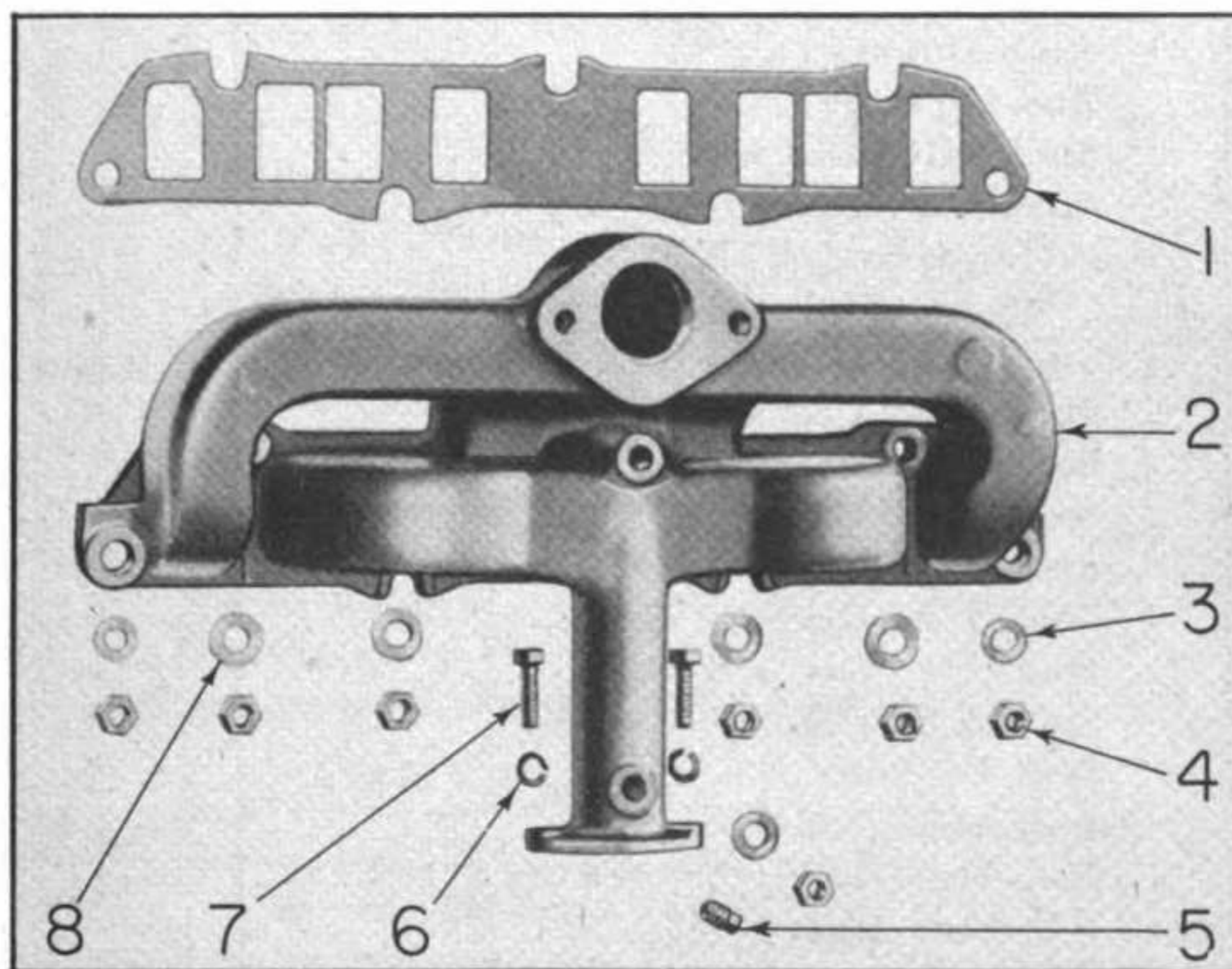


FIG. 01-8 — 0108 MANIFOLD

GROUP 01 — ENGINE GROUP

0101 CRANKCASE

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
01-1		VTA-663	Engine Assembly, Complete (Includes External Attachments)			1
01-1		VTA-632	Engine Assembly, Complete (Less External Attachments)			1
01-1	16	VT-122	Cover, Gear, and Water Pump Body			1
01-1	21	V4B-101	Bolt, Hex. Hd. 3/8 x 1-1/4" N.C.			5
01-1	4		Washer, Lock 3/8"			5
01-1	19	X-3250	Bolt, Hex. Hd. 3/8 x 1-7/8" N.C.			1
01-1	4		Washer, Lock 3/8"			1
01-1	18	X-3259	Bolt, Hex. Hd. 3/8 x 2-3/4" N.C.			1
01-1	4		Washer, Lock 3/8"			1
01-1	20	X-3336	Bolt, Hex. Hd. 3/8 x 3-1/4" N.C.			3
01-1	4		Washer, Lock 3/8"			3
01-1	15	X-940	Fitting, Grease			1
01-1	14	VT-3248	Gasket, Gear Cover and Water Pump Body			1
01-1	22	X-1918	Stud, 1/4" Dia. x 7/8" Lg.			7
01-1	17	X-19098	Stud, 3/8" Dia. x 1" Lg.			2
01-1		VTA-465	Crankcase, (Oil Pump Assembly Included)			1
01-1	1	VT-149-2	Crankcase			1
01-1	27	VT-3243	Cover			1
01-1	6		Fitting, Elbow P.T. 3/16 x 1/8"			1
01-1	23	6TG-101	Pin			3
01-1	8	VT-2784	Plug, Drain Valve			1
01-1	35	X-2208	Plug, Hubbard 2-1/8"			1
01-1	2		Plug, Pipe 1/8"			2
01-1	36	X-137-A	Plug, Pipe, Steel, Hex Socket 1/4"			2
01-1	24	7TC-215	Ring Dowel			2
01-1	7	VTA-333	Rod, Oil Gage			1
01-1	13	VT-3726	Stud, 5/16" Dia. x 1-3/4" Lg.			2
01-1	5	X-4249	Stud, 3/8" Dia. x 1-1/8" Lg.			2
01-1	3		Nut, Hex. 3/8" N.C.			2
01-1	4		Washer, Lock 3/8"			2
01-1	9	X-19002	Stud, 3/8" Dia. x 1-1/4" Lg.			2
01-1	12	X-4405-B	Stud, 1/2" Dia. x 2" Lg.			5
01-1	11	X-19984	Stud, 1/2" Dia. x 2-1/2" Lg.			4
01-1	34	X-19950	Stud, 1/2" Dia. x 3-1/8" Lg.			4
01-1	25	X-19747	Stud, 1/2" Dia. x 3-11/16" Lg.			1
01-1	26	X-19746	Stud, 1/2" Dia. x 4" Lg.			1
01-1	10	X-19983	Stud, 1/2" Dia. x 6" Lg.			5
01-1	37	VT-4138	Stud, 5/8" Dia. x 2-7/8" Lg.			2
01-1	38	VT-3675	Stud, Oil Filter, 3/8" Dia. x 1-1/2" Lg.			2
01-1	32	VTA-326	Pan Assembly, Oil			1
01-1	30	X-3182	Bolt, Hex. Hd. 5/16 x 3/4" N.C.			15
01-1	31	X-202	Washer, Lock 5/16"			15
01-1	33	VT-3245	Gasket, Oil Pan			1
01-1	28	W4B-109	Plug, Drain			1
01-1	29	W4B-108	Gasket, Drain Plug			1

GROUP 01 — ENGINE GROUP**0102 CYLINDER HEAD**

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
01-2	5	VTA-327	Cover, Cylinder Head			1
01-2	4	VT-3545	Cap, Oil Filler			1
01-2	6	VT-3246	Gasket			1
01-2		VT-148-1-C	Cylinder Head Assembly, Complete			1
01-2		VT-148-1	Cylinder Head Assembly, Less Rocker Arm Assembly			1
01-2	50	VT-148-1-A	Cylinder Head Assembly — Stripped			1
01-2	40	VT-3217	Cover, Spark Plug			1
01-2	44	VT-3470	Grommet, Ignition Cable			1
01-2	53	VT-137	Elbow, Water Outlet			1
01-2	51		Bolt, Hex. Hd. 3/8 x 1-1/4" N.C.			2
01-2	9		Washer, Lock 3/8"			2
01-2	52	VT-3228	Gasket, Water Outlet Elbow			1
01-2	46	VT-3312	Gasket, Cylinder Head			1
01-2	29	VT-131	Guide, Valve Stem			8
01-2	25	D6001-251	Gasket, Intake Valve Stem			4
01-2	26	VT-3234	Lock, Valve Spring Retainer			16
01-2	27	VT-3235	Retainer, Valve Spring			8
01-2	31	D6001-236	Retainer, Valve Stem Gasket			4
01-2	28	A6001-338	Spring, Valve			8
01-2	41	VT-3774	Holder, Spark Plug Wire			1
01-2	48	F600A-242	Insert, Valve Seat			4
01-2	35	X-1804-F	Nut, 1/2" - 20 N.F.			14
01-2	37		Plug, Hubbard 1"			1
01-2	30	E600A-215	Plug, Fuse			1
01-2	39		Spark Plug 18MM			4
01-2	38		Gasket, Spark Plug 18MM			4
01-2	34	X-19006	Stud 3/8" Dia. x 1-3/4" Lg.			6
01-2	33	X-4242	Stud 3/8" Dia. x 4-5/8" Lg.			1
01-2	32	X-19087	Stud, 3/8" Dia. x 5" Lg.			1
01-2	3		Nut, Hex. 3/8" N.F.			1
01-2	2		Washer, Plain 3/8"			1
01-2	1	Y69M-218	Spacer			1
01-2	10	VT-3241	Spacer, Cylinder Head Cover			1
01-2	49	VT-3682	Stud, Spark Plug Cover			1
01-2	42		Nut, Wing 3/8"			1
01-2	43		Washer, Plain 3/8"			1
01-2	47	VT-3233	Valve, Exhaust			4
01-2	45	VT-3232	Valve, Intake			4
01-2	36		Washer, Plain 1/2"			14
01-2		VT-3215-1	Shaft Assembly, Rocker Arm, (Complete)			1
01-2	23	VT-3215	Shaft, Rocker Arm			2
01-2	24	VT-138	Bracket, Valve Rocker Arm Shaft Center			1
01-2	15	X-3259	Bolt, Hex. Hd. 3/8 x 2-3/4" N.C.			1
01-2	9		Washer, Lock 3/8"			1
01-2	17	05753-AB1	Bracket, Valve Rocker Arm			4
01-2	15	X-3259	Bolt, Hex. Hd. 3/8 x 2-3/4" N.C.			2
01-2	9		Washer, Lock 3/8"			2

GROUP 01 — ENGINE GROUP

0102 CYLINDER HEAD (continued)

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
01-2	12	VT-3291	Washer			2
01-2	7	VT-3242	Stud, Special			1
01-2	3		Nut, Hex. 3/8" N.F.			1
01-2	12	VT-3291	Washer			1
01-2	2		Washer, Plain 3/8"			1
01-2	8	VT-3287	Stud, 3/8" Dia. x 4-3/4" Lg.			1
01-2	3		Nut, Hex. 3/8" N.F.			1
01-2	2		Washer, Plain 3/8"			1
01-2	1	Y69M-218	Spacer			1
01-2	12	VT-3291	Washer			1
01-2	16		Pin, Taper #00 3/4"			2
01-2	22	04404-AB	Plug, Rocker Arm			2
01-2	21	2517-AA	Rocker Arm Assembly, L.H. (Complete)			4
01-2	13	2516-AA	Rocker Arm Assembly, R.H. (Complete)			4
01-2	19	05759-AB	Bushing, Rocker Arm			8
01-2	18	05760-AB	Screw, Rocker Arm Adjusting			8
01-2	14		Nut, Hex. Jam 5/16" N.F.			8
01-2	11	VT-3238	Spacer, Valve Rocker Arm			2
01-2	20	VT-3237	Spring, Valve Rocker Arm Shaft			4

0103 CRANKSHAFT AND PISTONS

01-3	44	VT-130	Cap, Crankshaft Bearing — Center			1
01-3	45	X-1804-F	Nut, Bearing Cap 1/2" — 20 N.F.			2
01-3	46		Nut, Pal-Nut 1/2" — 20			2
01-3	47	3X-B2B-110	Washer, Plain			2
01-3	48	VT-124	Cap, Rear Bearing and Filler Block			1
01-3	45	X-1804-F	Nut, Bearing Cap 1/2" — 20 N.F.			2
01-3	46		Nut, Pal-Nut 1/2" — 20			2
01-3	49	R-600B-223	Packing, Rear Bearing Filler Block			2
01-3	47	3X-B2B-110	Washer, Plain			2
01-3		VT-3201-1	Crankshaft Assembly (Includes studs, bushing, shims, thrust washers, thrust plate and key.)			1
01-3	11	VT-3201-2	Crankshaft Assembly (Includes studs and bushing)			1
01-3		VTA-721	Bearing, Connecting Rod (Complete set, standard size)			1
01-3		VTA-722	Bearing, Connecting Rod (Complete set, .020 undersize)			1
01-3	39	F600G-312	Bearing, Connecting Rod			8
01-3		VTA-723	Bearing, Main Crankshaft (Complete set, standard size)			1
01-3		VTA-724	Bearing, Main Crankshaft (Complete set, .020 undersize)			1
01-3	42	VT-3204	Bearing, Crankshaft — Center Lower			1
01-3	15	VT-3203	Bearing, Crankshaft — Center Upper			1
01-3	38	VT-3260	Bearing, Crankshaft — Front Lower			1
01-3	24	VT-3261	Bearing, Crankshaft — Front Upper			1
01-3	43	VT-3206	Bearing, Crankshaft — Rear Lower			1
01-3	12	VT-3205	Bearing, Crankshaft — Rear Upper			1

GROUP 01 — ENGINE GROUP
0103 CRANKSHAFT AND PISTONS (continued)

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
01-3	9	15LG-202	Bushing, Crankshaft Pilot			1
01-3	22	VT-3200-1	Connecting Rod Assembly			4
01-3	23	C600D-206	Bolt, Connecting Rod			8
01-3	40	X-18188	Nut			8
01-3	41		Pin, Cotter 3/32 x 3/4"			8
01-3	14	VT-132	Liner, Cylinder — 3-1/4" Bore			4
01-3	13	D600A-201	Packing, Cylinder Liner			8
01-3	16	F600A-214	Pin, Piston			4
01-3	20	R800G-204	Bushing, Piston Pin			4
01-3		F199A-4001E	Piston Assembly (Includes piston, pin, and retaining rings)			4
01-3		F199A-4001A	Piston Assembly with Rings (Includes F-199A-4001-E plus rings)			4
01-3		VTA-561	Piston with Liner — One Matched set (Includes F-199A-4001-A plus liner, packing, and retaining rings)			4
01-3		VTA-557	Piston with Liner — Set of Four (Includes four of VTA-561)			1
01-3	19	F-199A-400	Piston			4
01-3		VTA-319	Ring, Set of 16 (for Complete Engine)			1
01-3	18	F600A-355	Ring, Piston — 1/4" Oil Ring			4
01-3	17	F600A-343	Ring, Piston — 1/8" Taper Face			12
01-3	21	6SA-101	Ring, Retainer, Piston Pin			8
01-3	51	VTA-331	Flywheel Assembly			1
01-3	4	VT-141	Flywheel			1
01-3	3	Y400C-331	Gear, Ring — 96 Teeth			1
01-3	10	X-19949	Stud			4
01-3	1	X-1899	Nut, Hex. 7/16" N.F.			4
01-3	2		Washer, Lock 7/16"			4
01-3	29	VT-3225	Gear, Crankshaft — 24 Teeth			1
01-3	32	D600-0-200	Jaw, Crankshaft Starting			1
01-3	33	8-UO-202	Collar, Crankshaft Starting Jaw			1
01-3	25		Key, Morten Hi-Pro #808			2
01-3	28	VT-3230	Plate, Crankshaft Thrust			1
01-3	31	VT-136	Pulley, Fan Drive			1
01-3	30	A600L-202	Seal, Crankshaft Oil — Front			1
01-3	34	D600K-232	Seal, Fan Drive Pulley Dust			1
01-3	26	10EC-205	Shim, Crankshaft Thrust (.008)			—
01-3	37	10EC-204	Shim, Crankshaft Thrust (.002)			—
01-3	36	D600C-206	Spacer, Crankshaft Thrust			1
01-3	35	VT-3220	Thrower, Crankshaft Oil			1
01-3	27	D600C-204	Washer, Crankshaft Thrust			2
01-3	7	VTA-694	Retainer and Seal, Crankshaft Oil Seal			1
01-3	8	VT-3250	Gasket, Crankshaft Oil Seal Retainer			1
01-3	5		Screw, Flat Fill Hd. 1/4 x 5/8"			2
01-3	50	X-366	Gasket, Copper Asbestos			2
01-3	5		Screw, Flat Fill. Hd. 1/4 x 5/8"			3
01-3	6		Washer, (Shakeproof) Internal Teeth 1/4"			3

GROUP 01 — ENGINE GROUP

0104 CAMSHAFT

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
01-4	11	VT-126	Camshaft			1
01-4	10	VT-3213	Bushing, Camshaft — Center			1
01-4	9	VT-3212	Bushing, Camshaft — Front			1
01-4	12	VT-3214	Bushing, Camshaft — Rear			1
01-4	5	VT-127	Gear, Camshaft — 48 Teeth			1
01-4	6	X-1795	Pin, Str.			1
01-4	3		Key, Woodruff #6			1
01-4	4	Y400I-203	Plate, Camshaft Thrust			1
01-4	7	X-3203	Screw			2
01-4	8		Washer, (Shakeproof) External Teeth 5/16"			2
01-4	1	VT-3239	Rod, Push			8
01-4	2	VT-3236	Tappet, Valve			8

0105 OIL PUMP

01-5		VTA-2506	Body, Oil Pump (Complete Assembly)			1
01-5	13	VT-158	Body, Oil Pump			1
01-5	14	VT-3223	Bushing, Oil Pump Body			2
01-5	10	VT-157	Cap, Front Bearing			1
01-5		VTA-325	Driver Gear and Shaft Assembly, Oil Pump			1
01-5	23	VT-3254	Gear, Driver, Oil Pump — 9 Teeth			1
01-5	24	X-1795	Pin, Str.			1
01-5	15	VT-3252	Shaft, Oil Pump Drive			1
01-5	22	VT-3255	Gear, Driven, Oil Pump — 9 Teeth			1
01-5	16	VT-3226	Gear, Driven, Oil Pump Drive — 24 Teeth			1
01-5	8	X-1804-F	Nut, Bearing Cap 1/2" — 20 N.F.			2
01-5	9		Nut, Pal-Nut 1/2" — 20			2
01-5	11	9NC-101	Pin, Str.			2
01-5	17		Plug, Hubbard 1/2"			2
01-5	12	VT-3328	Shim			—
01-5	18	VT-3298	Valve, Oil Pressure Relief			1
01-5	21		Pin, Cotter 1/8 x 1-1/4"			1
01-5	20	VT-3221	Retainer, Oil Relief Spring			1
01-5	19	F-400L-219	Spring, Oil Pressure Relief			1
01-5	7	3X-B2B-110	Washer			2
01-5	26	VT-142	Cover, Oil Pump			1
01-5	3		Bolt, Hex. Hd. 1/4 x 1-3/4" N.C.			1
01-5	6		Washer, Lock 1/4"			1
01-5	4		Bolt, Hex. Hd. 1/4 x 1-1/4" N.C.			1
01-5	6		Washer, Lock 1/4"			1
01-5	5		Bolt, Hex. Hd. 1/4 x 11/16" N.C.			4
01-5	6		Washer, Lock 1/4"			4
01-5	25	VT-3247	Gasket			1
01-5	2	VTA-332	Pipe, Oil Pump Suction			1
01-5	1	VTA-330	Float-Assembly	TSE	VTA-332	1
01-5	21		Pin, Cotter, 1/8 x 1-1/4"	TSE	VTA-330	1

GROUP 01 — ENGINE GROUP**0106 OIL FILTER**

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
01-6		VT-3590	Filter, Oil (Complete)	MPC	18650	1
01-6	6	VT-4147	Housing with Inlet Tube	MPC	18651	1
01-6	5	VT-4146	Ball, Valve Spring	MPC	523	1
01-6	1	VT-3589	Element, Replacement	MPC	SA-18667	1
01-6	3	VT-4053	Gasket, Valve Plug	MPC	18505	1
01-6	2	VT-4144	Plug, Valve	MPC	18419	1
01-6	4	VT-4145	Spring, Valve	MPC	18418	1
01-6	7	VT-3229	Gasket, Oil Filter	DGM	VT-3229	1
01-6	9		Nut, Hex. 3/8" N.C.			2
01-6	8		Washer, Lock 3/8"			2

0107 AIR CLEANER AND BRACKET

01-7	2	VT-4065	Air Cleaner (Includes VT-3824 and VT-3825)	VR	(EX)R-45-H	1
01-7	1	VT-3812	Cap, Inlet	VR	6426	1
01-7	5	VT-3824	Chamber, Air Cleaner	VR	6908	1
01-7	6	VT-3825	Cup, Air Cleaner	VR	6901	1
01-7	3	VT-3611	Hose, Air Cleaner	TJ	VT-3611	1
01-7	4		Clamp, Hose (#10—1/2) with Bolt and Nut			2

0108 MANIFOLD

01-8	2	VT-128	Manifold, Intake and Exhaust			1
01-8	7		Bolt, Hex. Hd. 5/16 x 3/4" N.C.			2
01-8	6		Washer, Lock 5/16"			2
01-8	1	F400E-303	Gasket, Intake and Exhaust Manifold			1
01-8	4	6EE-100	Nut, Brass			7
01-8	5		Plug, Std., Pipe 1/8"			1
01-8	3	UB-110	Washer			3
01-8	8	X-14141	Washer			4

GROUP 02 — CLUTCH GROUP

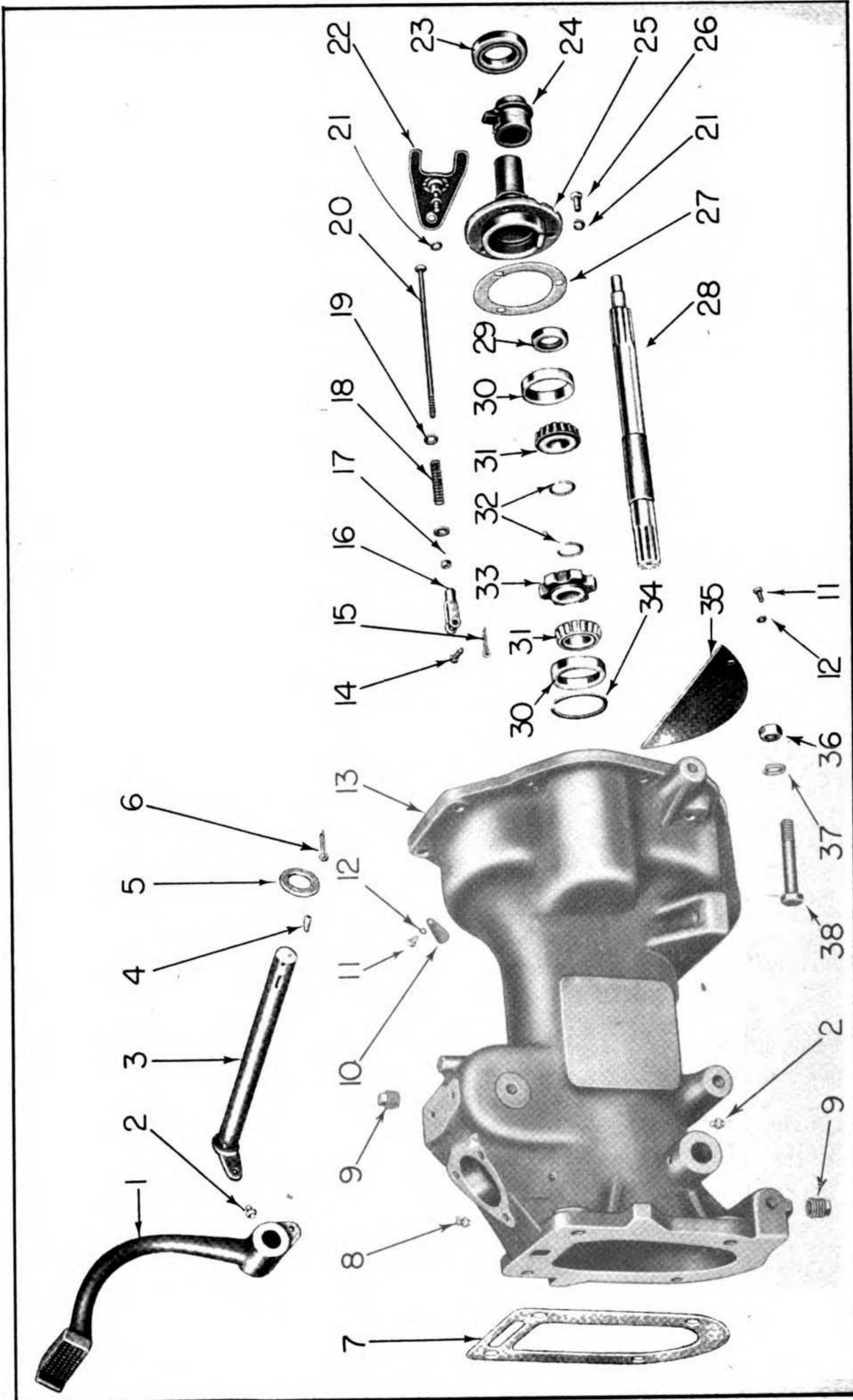


FIG. 02-1 — 0201 TORQUE TUBE AND CLUTCH ACTUATING PARTS

GROUP 02 — CLUTCH GROUP

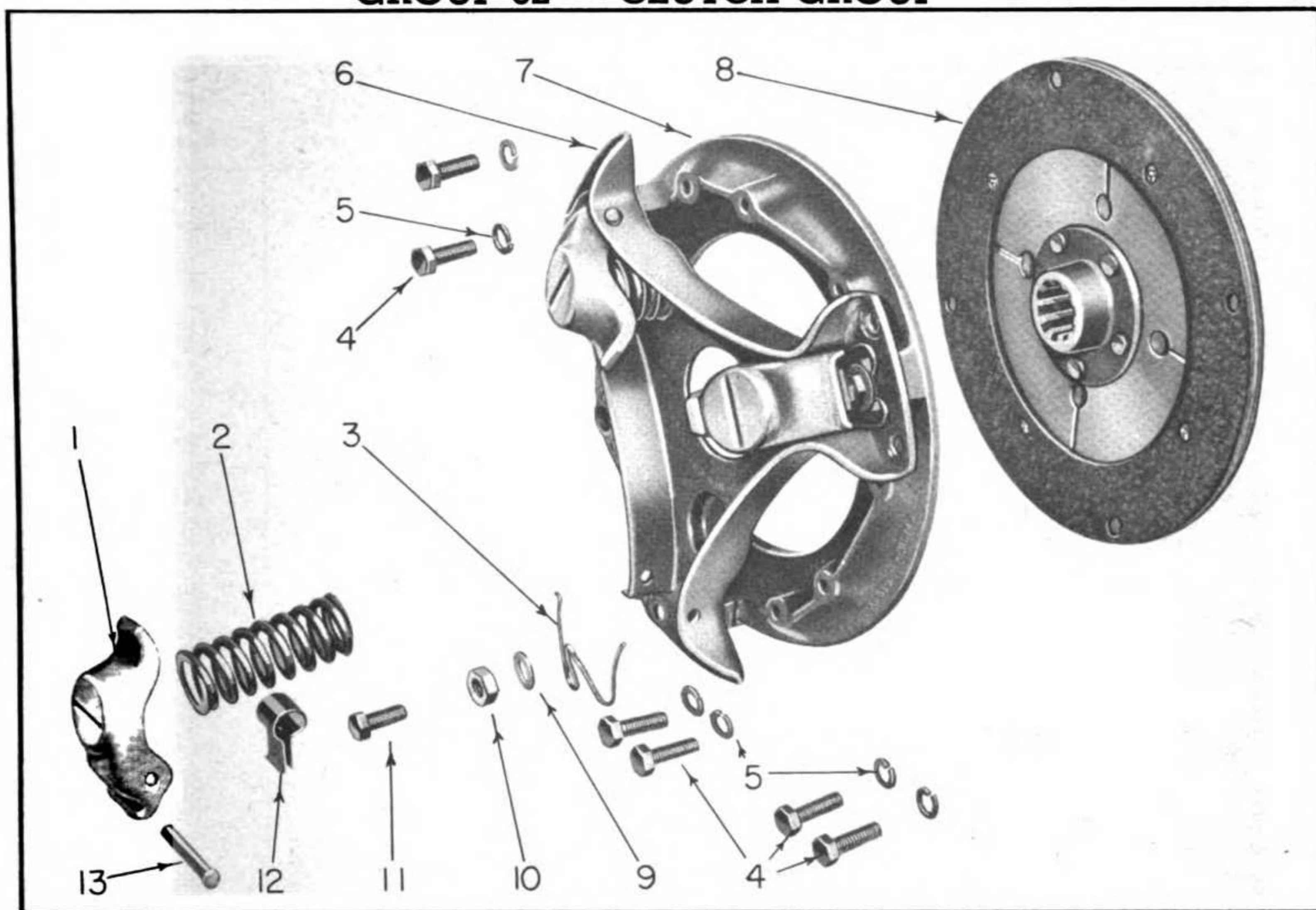


FIG. 02-2 — 0202 CLUTCH PRESSURE PLATE AND LINING

0201 TORQUE TUBE AND CLUTCH ACTUATING PARTS

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
02-1	20	VT-3910	Rod, Clutch Pedal	BUB	VT-3910	1
02-1	17		Nut, Hex. 5/16" N.F.			1
02-1	18	VT-2123	Spring, Clutch Pedal Rod	ASW	134097	1
02-1	19		Washer, Wrought 5/16"			2
02-1	16	VR-2695	Yoke End, Adjusting	NLW	VR-2695	1
02-1	14	V-13836	Pin, Clevis	BBC	75-S-3	1
02-1	15		Pin, Cotter 3/32 x 3/4"			1
02-1	3	VTA-450	Shaft, Brake			1
02-1	2		Fitting, Grease, Str. Drive 1/4"			1
02-1	4		Key, Woodruff #15			1
02-1	1	VT-234	Pedal, Clutch			1
02-1	6		Pin, Cotter 3/16 x 1-1/2"			1
02-1	5		Washer, Plain 1-1/8"			1
02-1	28	VT-3903	Shaft, Clutch Main Drive			1
02-1	30	VT-2097	Cup, Bearing	TIM	14276	2
02-1	31	VT-2112	Cone, Bearing	TIM	14119-A	2
02-1	33	VT-245	Gear, Oil Slinger			1
02-1	25	VT-7	Quill, Clutch Bearing Carrier			1

GROUP 02 — CLUTCH GROUP

0201 TORQUE TUBE AND CLUTCH ACTUATING PARTS (continued)

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
02-1	24	VT-34	Carrier, Bearing			1
02-1	23	VT-2119	Bearing, Release	AB	A-899-2	1
02-1	26		Screw, Cap, Hex. Hd. 3/8 x 1" N.C.			3
02-1	21		Washer, Lock 3/8"			3
02-1	27	VT-2116	Shim, Clutch Quill .003"			—
02-1	27	VT-2117	Shim, Clutch Quill .005"			—
02-1	22	VTA-10	Yoke Assembly, Clutch Throw-Out	AVM	RL9	1
02-1	21		Washer, Lock 3/8"			1
02-1	34	VT-2067	Ring, Snap	CE	4597	1
02-1	32	VT-2111	Ring, Snap	EAT	VT-2111	2
02-1	29	VT--2115	Seal, Oil	CM.	19816	1
02-1	13	VTA-474	Torque Tube w/Bearing Cups			1
02-1	38	VT-4136	Bolt, Ground Body	LMS	VT-4136	2
02-1	36		Nut, Hex. 5/8" N.F.			2
02-1	37		Washer, Lock 5/8"			2
02-1	35	VT-3666	Cover, Flywheel			1
02-1	11		Screw, Cap, Hex. Hd. 1/4" x 1/2" N.C.			2
02-1	12		Washer, Lock 1/4"			2
02-1	10	VT-2176	Cover, Timing Hole			1
02-1	11		Screw, Cap, Hex. Hd. 1/4 x 1/2" N.C.			1
02-1	12		Washer, Lock 1/4"			1
02-1	8		Fitting, Grease, Elbow Drive 1/4 x 67-1/2°			1
02-1	2		Fitting, Grease, Str. Drive 1/4"			1
02-1	9		Fitting, Plug Pipe 3/4"			2
02-1	7	VT-3478	Gasket	DGM	VT-3478	1

0202 CLUTCH PRESSURE PLATE AND LINING

02-2	8	VTA-12	Clutch Plate Assembly (Complete with plate lining and rivets)	AVM	TD-45	1
02-2	8	VT-2173	Lining, Plate	AVM	TD-452	2
02-2	8	VT-2174	Rivets, Facing Plate	AVM	TD-366	8
02-2		VTA-668	Kit, Lining and Rivet (includes two VT-2173 and ten VT-2174)	AVM	VTA-668	1
02-2	7	VTA-11	Plate Assembly, Clutch Pressure (Complete)	AVM	TP-31-7	1
02-2	6	VT-2163	Bracket, Clutch Unit	AVM	TP-315	1
02-2	1	VT-2165	Lever, Clutch	AVM	TP-3117	3
02-2	13	VT-2166	Pin, Lever Pivot	AVM	TP-287	3
02-2	7	VT-2160	Plate, Pressure	AVM	TP-3118	1
02-2	11	VT-2161	Screw, Adjusting	AVM	TP-2829	3
02-2	10		Nut, Hex. Jam 5/16" N.F.			3
02-2	9	VT-2162	Washer, Adjusting Screw	AVM	TP-2338	3
02-2	2	VT-2167	Spring, Clutch	AVM	TP-318	3
02-2	12	VT-2168	Spring, Cushion	AVM	TP-2821	3
02-2	3	VT-2164	Spring and Stop, Return	AVM	TP-2817	3
02-2	4	VT-2485	Screw, Cap, Clutch to Flywheel	LMS	VT-2485	6
02-2	5		Washer, Lock 5/16"			6

GROUP 03 — FUEL SYSTEM GROUP

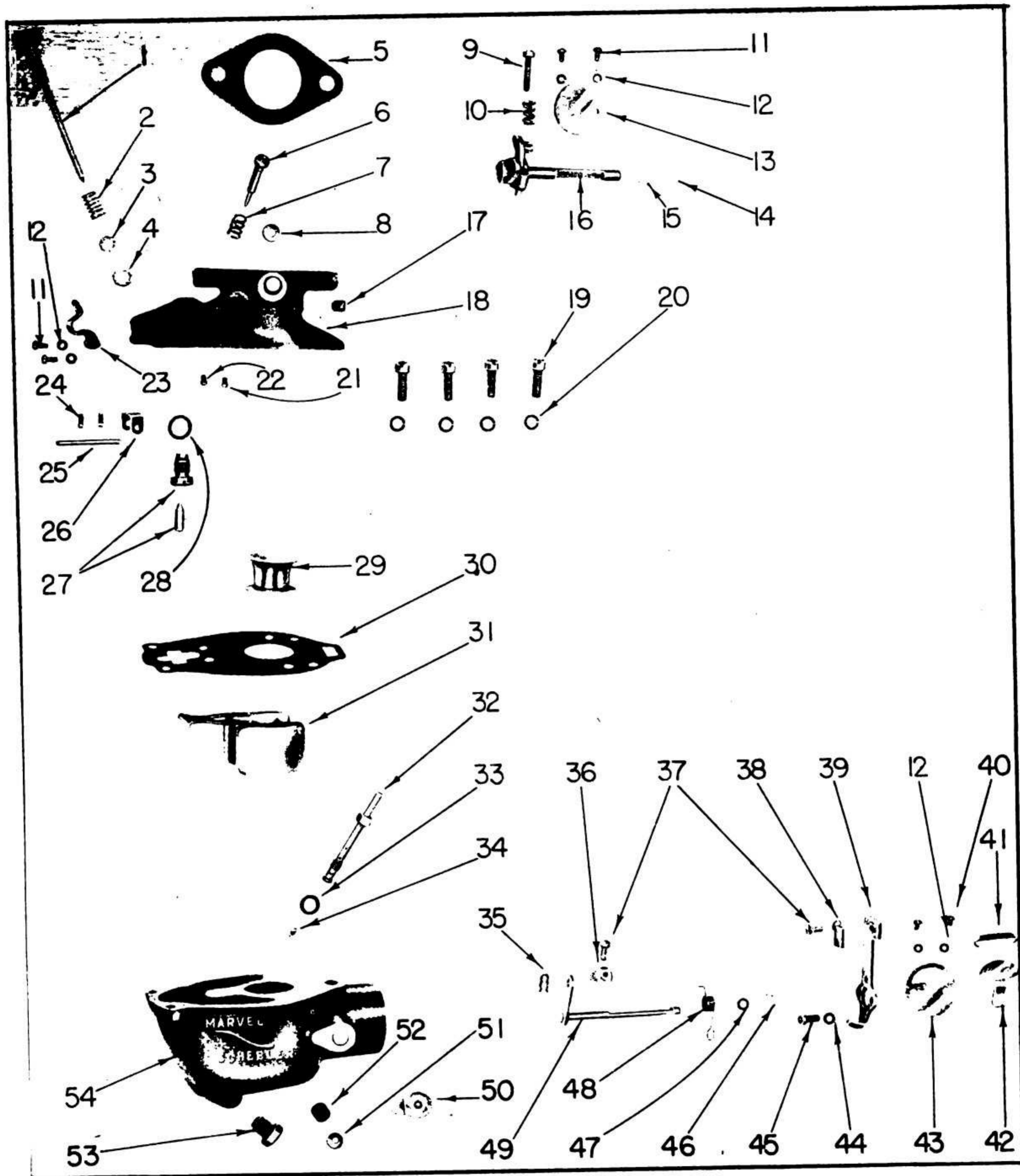


FIG. 03-1 — 0301 CARBURETOR

GROUP 03 — FUEL SYSTEM GROUP

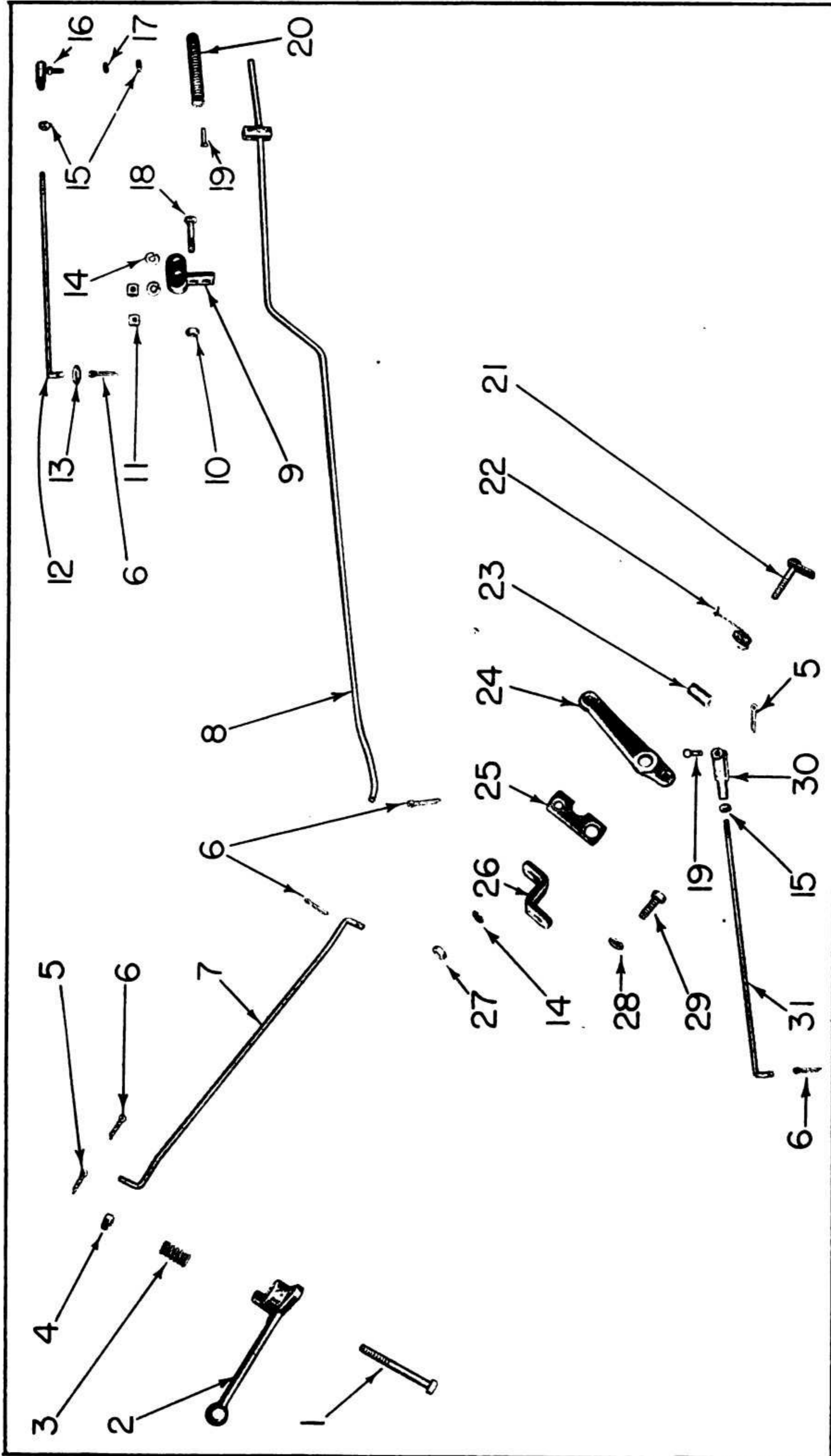


FIG. 03-2 — 0302 GOVERNOR CONTROL PARTS

GROUP 03 — FUEL SYSTEM GROUP

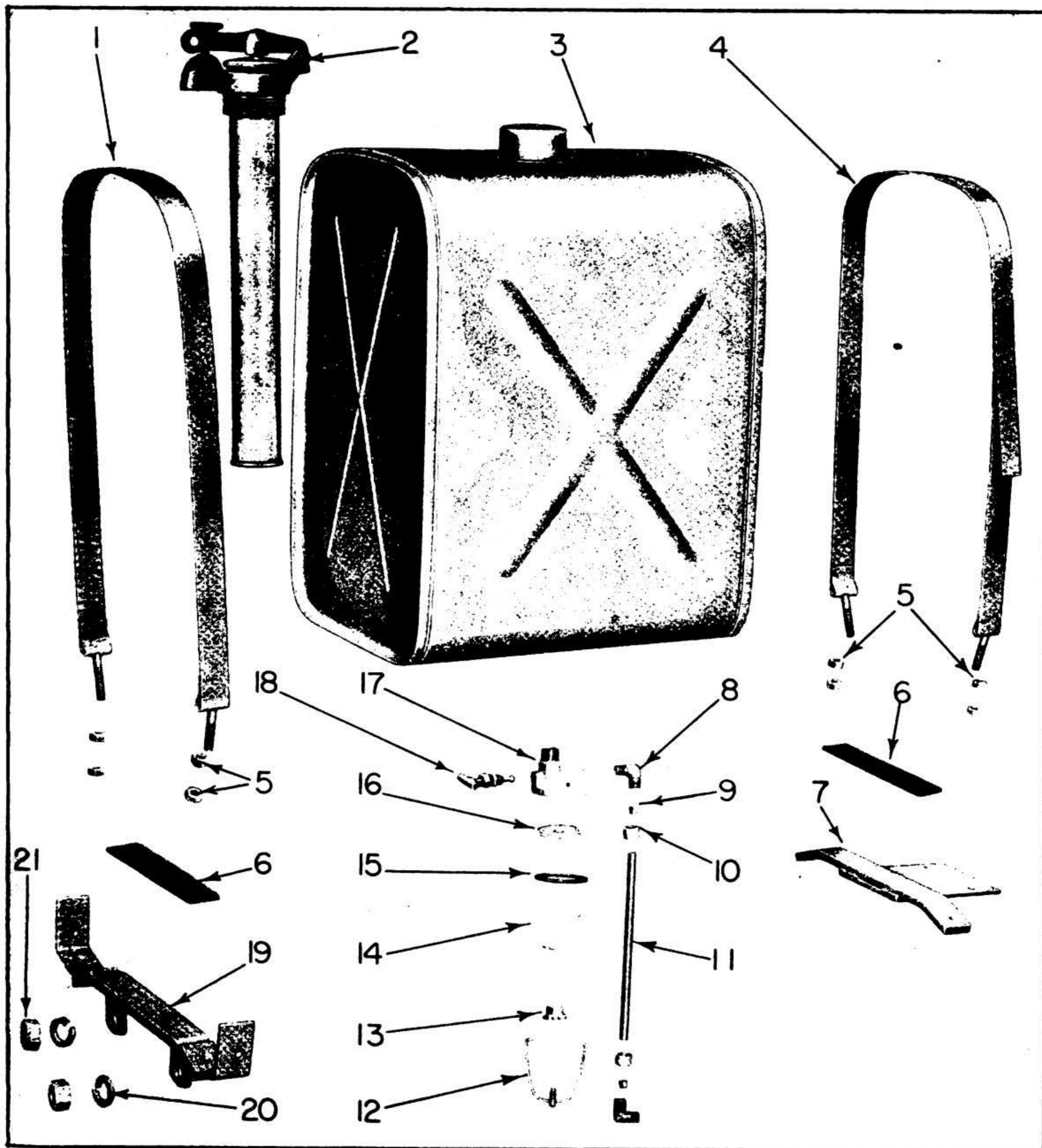


FIG. 03-3 — 0303 FUEL TANK AND LINE

GROUP 03 — FUEL SYSTEM GROUP

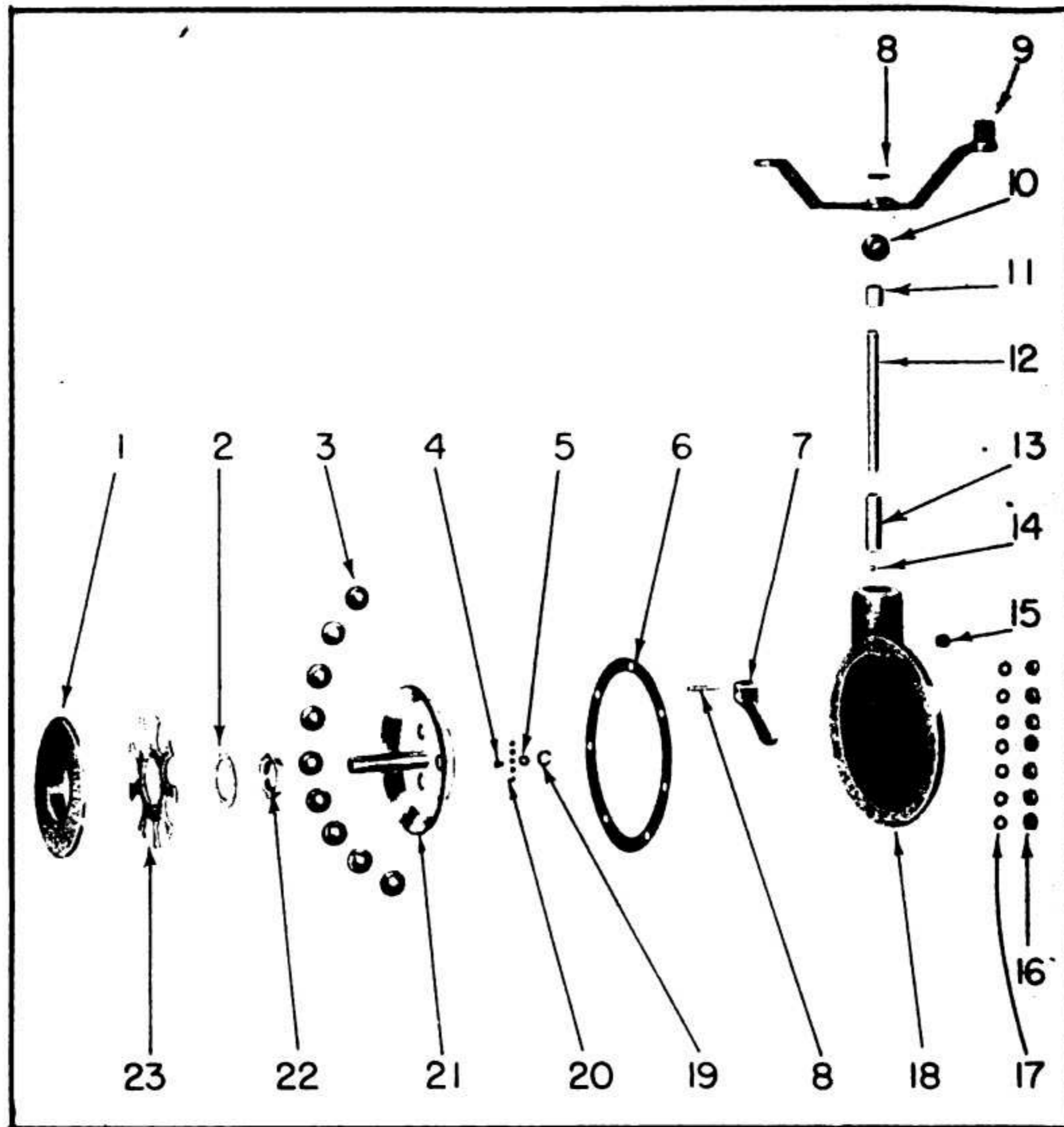


FIG. 03-4 — 0304 GOVERNOR

0301 CARBURETOR

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
03-1		VT-3593	Carburetor	MSCC	TSX-114	1
03-1	54	10-2450	Carburetor Body	MSCC	10-2450	1
03-1	34	49-158	Jet (Power)	MSCC	49-158	1
03-1	32	47-589	Nozzle	MSCC	47-589	1
03-1	33	16-449	Gasket	MSCC	16-449	1
03-1	50	63-125	Plate, Name	MSCC	63-125	1
03-1	51	179-35	Plug	MSCC	179-35	1
03-1	53	99-7	Plug	MSCC	99-7	1
03-1	49	26-637	Shaft and Lever, Choke	MSCC	26-637	1
03-1	39	29-92	Bracket, Choker	MSCC	29-92	1
03-1	37	15-285	Screw	MSCC	15-285	1
03-1	38	29-81	Clip, Choker Bracket	MSCC	29-81	1
03-1	45	15-33	Screw	MSCC	15-33	1
03-1	44		Washer, Lock #8			1
03-1	36	28-49	Choker Swivel	MSCC	28-49	1
03-1	37	15-285	Screw	MSCC	15-285	1
03-1	43	27-154	Fly, Choker	MSCC	27-154	1

GROUP 03 — FUEL SYSTEM GROUP

0301 CARBURETOR (continued)

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
03-1	42	27-144	Fly Flapper, Choker	MSCC	27-144	1
03-1	40	15-7	Screw	MSCC	15-7	2
03-1	12	78-322	Washer, Lock	MSCC	78-322	2
03-1	41	24-A43	Spring	MSCC	24-A43	1
03-1	47	44-39	Packing	MSCC	44-39	1
03-1	46	55-243	Retainer, Packing	MSCC	55-243	1
03-1	35	82-16	Pin, Spring	MSCC	82-16	1
03-1	48	24-247	Spring	MSCC	24-247	1
03-1	52	95-40	Strainer	MSCC	95-40	1
03-1	30	16-80	Gasket	MSCC	16-80	1
03-1	5	VT-2179	Gasket, Carburetor	VG	VT-2179	1
03-1		VTA-690	Kit, Gasket (Includes all carburetor gaskets except VT-2179)	MSCC	16-592	1
03-1		VTA-697	Kit, Carburetor Repair (Includes two each of 15-7 and 15-8, and one each of 13-839, 16-592, 24-247, 32-27, 43-33, 44-38, 44-39, 49-101-L, 49-145, 40-158, 55-230, 55-231, 233-536, and 55-243.)	MSCC	286-622	1
03-1	18	227-831	Throttle Body	MSCC	227-831	1
03-1	26	29-92	Bracket, Choker	MSCC	29-92	1
03-1	24	15-343	Screw	MSCC	15-343	2
03-1	25	32-27	Shaft, Float Lever	MSCC	32-27	1
03-1	31	30-600	Float and Lever	MSCC	30-600	1
03-1	8	55-230	Cap	MSCC	55-230	1
03-1	27	VTA-698	Float Valve, Seat and Gasket Assembly	MSCC	233-536	1
03-1	28	16-4	Gasket	MSCC	16-4	1
03-1	21	49-145	Jet (Economizer)	MSCC	49-145	1
03-1	22	49-101-L	Jet (Idle)	MSCC	49-101-L	1
03-1	6	43-33	Needle, Idler Adjusting	MSCC	43-33	1
03-1	7	24-340	Spring	MSCC	24-340	1
03-1	1	43-554	Needle, Power	MSCC	43-554	1
03-1	4	16-491	Gasket	MSCC	16-491	1
03-1	2	24-489	Spring	MSCC	24-489	1
03-1	3	78-299	Washer, Plain	MSCC	78-299	1
03-1	23	24-501	Ratchet Spring Assembly, High Speed	MSCC	24-501	1
03-1	11	15-8	Screw	MSCC	15-8	2
03-1	12	78-322	Washer, Lock	MSCC	78-322	2
03-1	17	15-233	Screw	MSCC	15-233	1
03-1	19	15-443	Screw	MSCC	15-443	4
03-1	20		Washer, Lock #12			4
03-1	16	13-839	Throttle Shaft and Stop	MSCC	13-839	1
03-1	15	44-38	Packing	MSCC	44-38	1
03-1	14	55-231	Retainer	MSCC	55-231	1
03-1	9	15-42	Screw	MSCC	15-42	1
03-1	10	24-262	Spring	MSCC	24-262	1
03-1	13	14-169	Throttle Fly	MSCC	14-169	1
03-1	11	15-8	Screw	MSCC	15-8	2
03-1	12	78-322	Washer, Lock	MSCC	78-322	2
03-1	29	46-473	Venturi	MSCC	46-473	1

GROUP 03 — FUEL SYSTEM GROUP
0302 GOVERNOR CONTROL PARTS

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
03-2	26	VT-3947	Bracket, Speed Control Lever			1
03-2	25	VT-3711	Lever, Hand Control			1
03-2	24	VT-201	Lever, Speed Control			1
03-2	23	VT-3613	Bushing, Speed Control Lever			1
03-2	21	VTA-382	Bolt and Torsion Spring Assembly			1
03-2	27		Nut, Hex. 5/16" N.C.			1
03-2	22	VT-2435	Spring, Foot Feed	GI	VT-2435	1
03-2	14		Washer, Lock 5/16"			1
03-2	31	VT-3792	Link, Foot Control (Long)			1
03-2	15		Nut, Hex. 1/4" N.F.			1
03-2	6		Pin, Cotter 3/32 x 3/4"			1
03-2	30	VT-2398	Yoke End	NLW	VT-2398	1
03-2	19	VT-2105	Pin, Clevis	NLW	VT-2105	1
03-2	5		Pin, Cotter 1/16 x 3/4"			1
03-2	29		Screw, Cap, Hex. Hd. 3/8 x 1"			1
03-2	28		Washer, Lock 3/8"			1
03-2	2	VT-238	Lever, Hand Speed Control			1
03-2	1	VT-3727	Bolt, Control Handle Tension			1
03-2	4		Nut, Hex. 3/8" N.C.			1
03-2	5		Pin, Cotter 1/16 x 3/4"			1
03-2	3	01554-AB-1	Spring	ASW	108006	1
03-2	7	VT-3709	Rod, Hand Control			1
03-2	6		Pin, Cotter 3/32 x 3/4"			2
03-2	8	VTA-576	Rod, Governor Control			1
03-2	19	VT-2105	Pin, Clevis	NLW	VT-2105	1
03-2	20	VT-3280	Spring, Governor	GI	VT-3280	1
03-2	6		Pin, Cotter 3/32 x 3/4"			1
03-2	9	VT-212	Stop, Governor Control			1
03-2	11		Nut, Hex 5/16" N.F.			2
03-2	18	VT-3672	Screw, Governor Stop Adjusting	LMS	VT-3672	1
03-2	10		Nut, Hex. Jam 5/16" N.F.			1
03-2	14		Washer, Lock 5/16"			2
03-2	12	VT-4100	*Rod, Throttle, for Governor Control			1
03-2	16	VTA-725	*Ball and Socket	TRK	AS-202	1
03-2	15		Nut, Hex. 1/4" N.F.			2
03-2	17		Washer, Lock 1/4"			1
03-2	6		Pin, Cotter 3/32 x 3/4"			1
03-2	13		Washer, Plain 1/4"			1

* On all vehicles before #4929571, replace both VT-4100 and VTA-725 when replacement of either is required.

0303 FUEL TANK AND LINE

03-3	2	VTA-634	Cap, Fuel, Safety Unit	PTS	Type A #311	1
03-3	11	VT-4007	Line, Fuel	SDP	VT-4007	1
03-3	8		Coupling Elbow, Compression, P/T. 5/16 x 1/8"	IB	69-F	2
03-3	10		Nut, Compression Coupling 5/16"	IB	61-F	2
03-3	9		Sleeve, Compression Coupling 5/16"	IB	60-F	2

GROUP 03 — FUEL SYSTEM GROUP

0303 FUEL TANK AND LINE (continued)

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
03-3		03990-AB1	Strainer, Fuel (Complete)	IB	191-J	1
03-3	17	34219	Head, Fuel Strainer	IB	34219	1
03-3	12	32279	Bale Assembly, Fuel Strainer	IB	32279	1
03-3	14	32276	Bowl, Fuel Strainer	IB	32276	1
03-3	13	32277	Cup and Nut, Fuel Strainer	IB	32277	1
03-3	15	32275	Gasket, Fuel Strainer	IB	32275	1
03-3	16	32278	Screen, Fuel Strainer	IB	32278	1
03-3	18	31322	Valve, Fuel Strainer	IB	31322	1
03-3	1	VTA-22	Strap, Fuel Tank (Front)			1
03-3	6	VT-2199	Anti-Squeak, Fuel Tank	WFW	5806	2
03-3	19	VTA-375	Bracket and Support, Fuel Tank (Front)			1
03-3	21		Nut, Hex. 5/8" N.F.			2
03-3	20		Washer, Lock 5/8"			2
03-3	5		Nut, Hex. 5/16" N.C.			4
03-3	4	VTA-185	Strap, Fuel Tank (Rear)			1
03-3	6	VT-2199	Anti-Squeak, Fuel Tank	WFW	5806	2
03-3	7	VTA-20	Bracket and Support, Fuel Tank (Rear)			1
03-3	5		Nut, Hex. 5/16" N.C.			4
03-3	3	VTA-635	Tank, Fuel	SSP	VTA-635	1

0304 GOVERNOR

03-4	18	VT-140	Cover, Governor Inspection			1
03-4	14		Ball, Steel 3/8" Dia.	CO	X-13057	1
03-4	11	F400S-204	Bearing, Governor Rocker Shaft	TR	B-610	1
03-4	6	VT-3284	Gasket, Governor Inspection Cover	CO	VT-3284	1
03-4	16		Nut, Hex. 1/4" N.C.			7
03-4	15	X-103-A	Plug, Pipe Slotted 1/8"	CO	X-103-A	1
03-4	10	VT-3259	Seal, Felt Governor Shaft Dust	CO	VT-3259	1
03-4	12	VT-3240	Shaft, Governor Rocker	CO	VT-3240	1
03-4	9	VTA-345	Lever, Governor Control	CO	VTA-345	1
03-4	8		Pin, Taper #00 3/4" Long			1
03-4	7	VT-3231	Rocker Arm, Governor	CO	VT-3231	1
03-4	8		Pin, Taper #00 3/4" Long			1
03-4	13	VT-3288	Spacer, Governor Rocker Arm Thrust	CO	VT-3288	1
03-4	17		Washer, Lock 1/4"			7
03-4	21	VTA-335	Upper Race and Shaft Assembly (Includes: VT-3272, VT-3273, VT-3274, and VT-3275)	NI	50867-A	1
03-4	5		Ball, Steel 5/16" Dia.			1
03-4	20		Ball, Steel 1/8" Dia.			5
03-4	23	VT-3266	Driver, Governor Ball	NI	50885	1
03-4	3		Ball, 3/4" Dia.			9
03-4	22	X-18255	Nut	CO	X-18255	1
03-4	1	VTA-336	Race, Lower	NI	50861	1
03-4	19	VT-3272	Retainer Ring	NI	50771-A	1
03-4	4	VT-3273	Separator	NI	50865	1
03-4	2	12CH-208	Washer, Plain	CO	12CH-208	1

GROUP 04 — EXHAUST GROUP

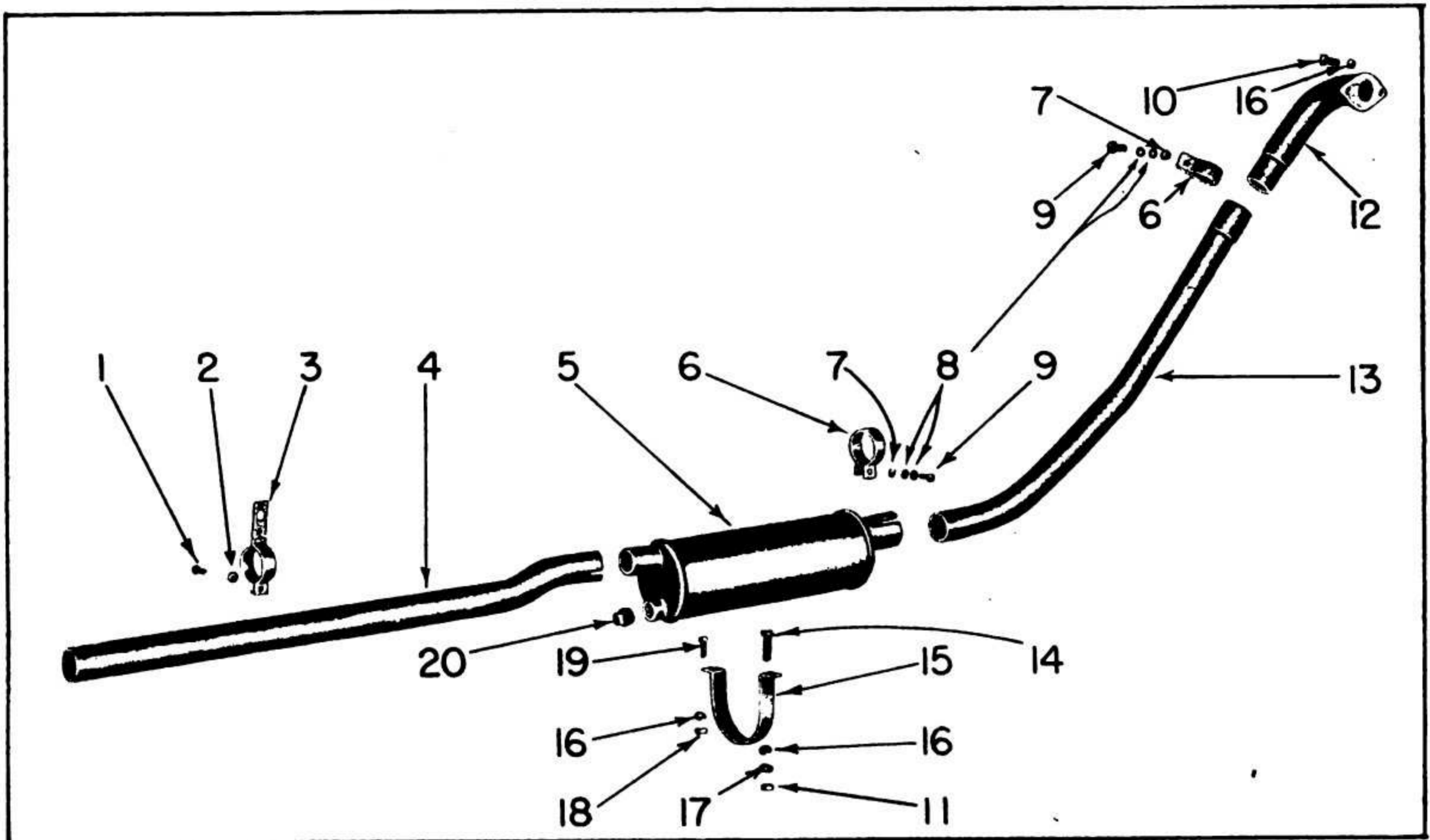


FIG. 04-1 — 0401 MUFFLER AND EXHAUST PIPE

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
04-1	5	VTA-648	Muffler	NM	T-2012-C	1
04-1	15	VT-4092	Clamp, Muffler (VAIW-3 only)			1
04-1	14		Bolt, Machine, Sq. Hd. 3/8 x 1-1/4" N.C. (VAIW-3 only)			1
04-1	11		Nut, Hex. 3/8" N.C. (VAIW-3 only)			1
04-1	16		Washer, Lock 3/8" (VAIW-3 only)			1
04-1	19		Screw, Mach., Rd. Hd. 3/8 x 1-1/4" N.C. (VAIW-3 only)			1
04-1	18		Nut, Sq. 3/8" (VAIW-3 only)			1
04-1	16		Washer, Lock 3/8" (VAIW-3 only)			1
04-1	15	VT-4272	Clamp, Muffler (VAIW-4 only)			1
04-1	14		Screw, Cap, Hex. Hd. 1/2 x 2" N.C. (VAIW-4 only)			1
04-1	11		Nut, Hex. 1/2" N.C. (VAIW-4 only)			1
04-1	16		Washer, Lock 1/2" (VAIW-4 only)			1
04-1	17		Washer, Plain 1/2" (VAIW-4 only)			1
04-1	4	VT-4090	Pipe, Muffler Tail	FTI	VT-4090	1
04-1	3	VTA-710	Clamp Assembly, Tail Pipe			1
04-1	1		Screw, Machine, Rd. Hd. 1/4 x 3/4"			1
04-1	2		Nut, Sq. 1/4"			1
04-1	20		Plug, Pipe, Sq. Hd. 3/4"			1
04-1	13	VT-4087	Pipe, Exhaust	FTI	VT-4087	1
04-1	6	VT-3864	Clamp			2
04-1	9		Screw, Machine, Rd. Hd. 5/16 x 1"			2

GROUP 04 — EXHAUST GROUP

0401 MUFFLER AND EXHAUST PIPE (continued)

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
04-1	7	VT-219	Nut, Sq. 5/16"			2
04-1	8		Washer, Plain, SAE 5/16"			4
04-1	12		Elbow, Exhaust			1
04-1	10		Screw, Cap, Hex. Hd. 3/8 x 1" N.C.			2
04-1	16		Washer, Lock 3/8"			2

GROUP 05 — COOLING GROUP

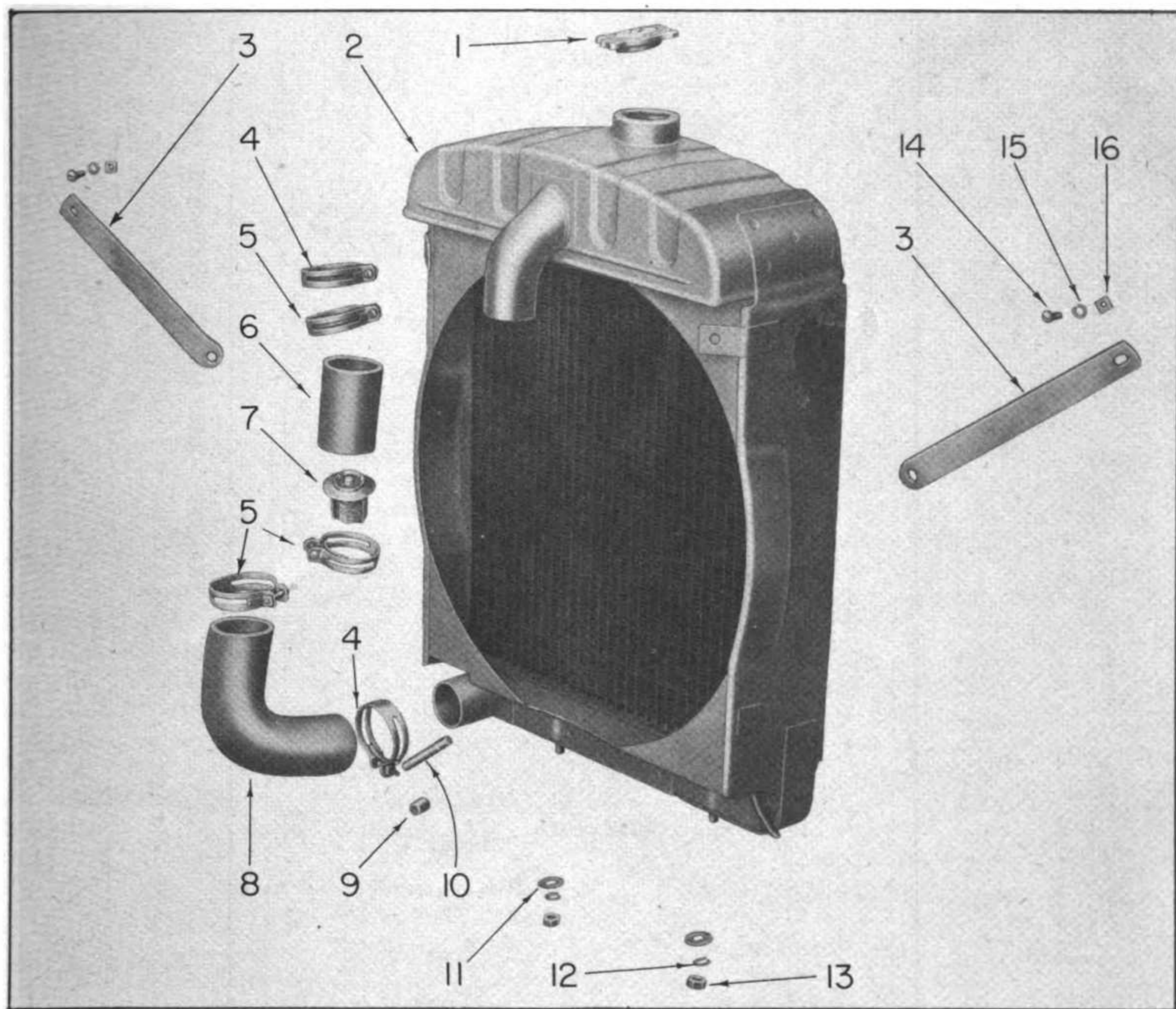


FIG. 05-1 — 0501 RADIATOR AND CONNECTIONS

GROUP 05 — COOLING GROUP

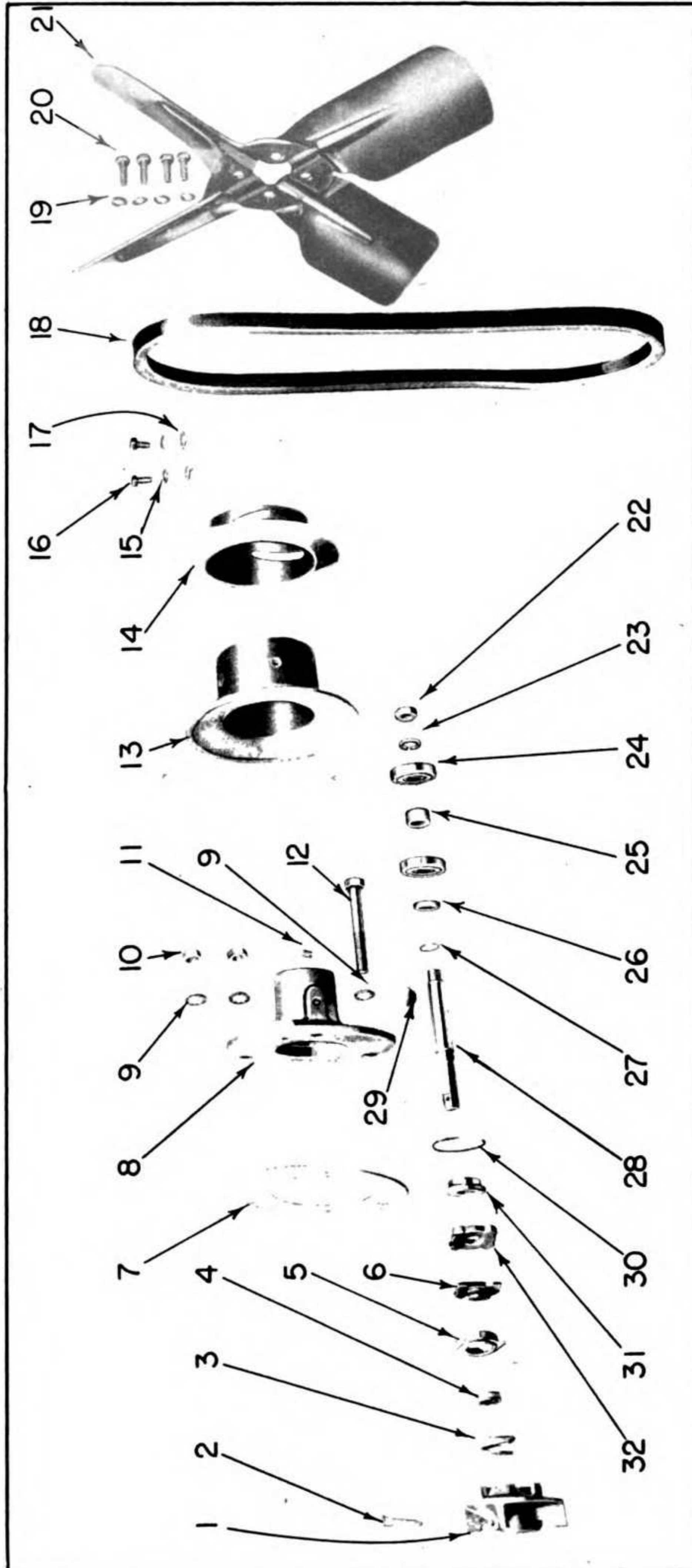


FIG. 05-2 — 0502 WATER PUMP AND FAN

GROUP 05 — COOLING GROUP

0501 RADIATOR AND CONNECTIONS

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
05-1	2	VTA-618	Radiator	MDR	DA134200	1
05-1	3	VT-3581	Brace, Radiator			2
05-1	14		Screw, Rd. Hd. 1/4 x 1/2" N.C.			2
05-1	16		Nut, Sq. 1/4" N.C.			2
05-1	15		Washer, Lock 1/4"			2
05-1	1	VT-3560	Cap, Radiator	MDR	131512	1
05-1	6	VT-3277	Hose, Upper Radiator	TJ	VT-3277	1
05-1	5		Clamp, Hose #12 w/Bolt and Nut			2
05-1	4		Clamp, Hose #13 w/Bolt and Nut			1
05-1	7	VT-3671	Thermostat	FLS	138F	1
05-1	8	VT-3533	Hose, Water Pump Inlet	GV	VT-3533	1
05-1	5		Clamp, Hose #12 w/Bolt and Nut			1
05-1	4		Clamp, Hose #13 w/Bolt and Nut			1
05-1	13		Nut, Hex. 3/8 N.C.			2
05-1	10		Pipe (1/8") x Std. Pipe Nipple (2-1/2")			1
05-1	9	108-B	Cap, Brass Pipe 1/8" P.T.	IB	108-B	1
05-1	12		Washer, Lock 3/8"			2
05-1	11		Washer, Plain 3/8"			2

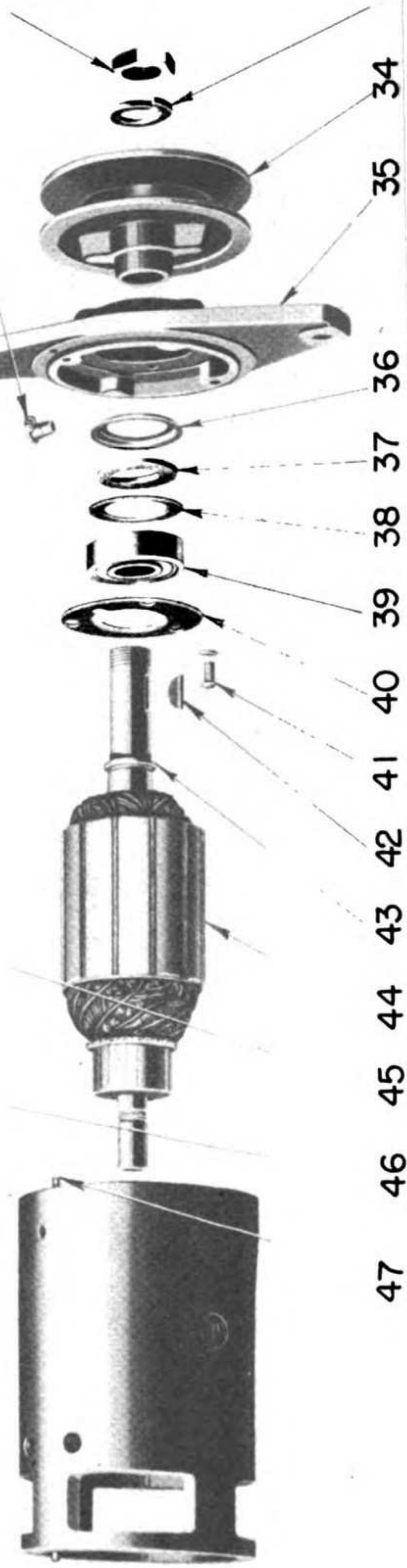
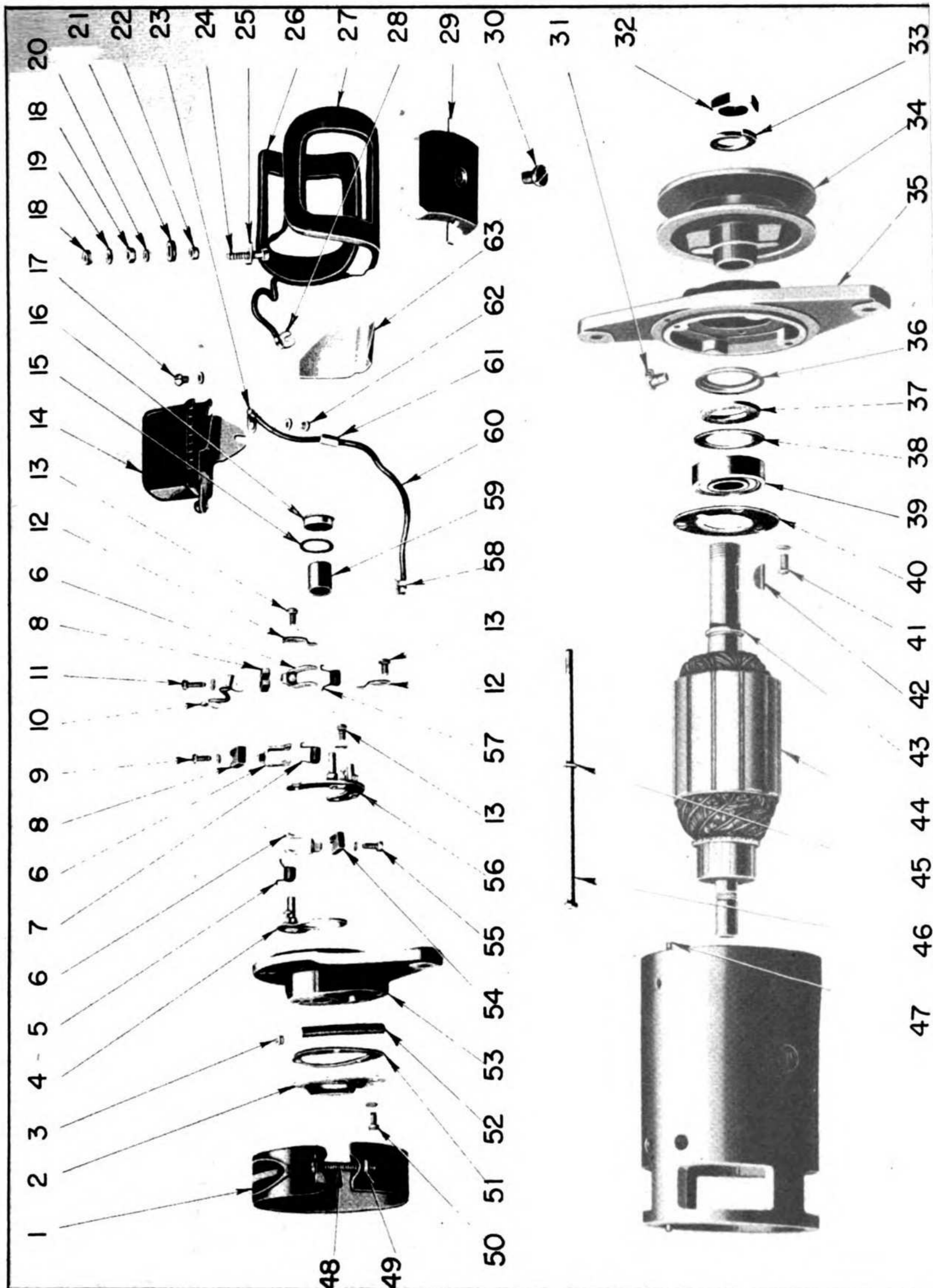
0502 WATER PUMP AND FAN

05-2	8	Y400K-3351	Drive Support Assembly, Water Pump	CO	Y400K-3351	1
05-2	12		Bolt, Hex. Hd. 3/8 x 2-3/4" N.C.			1
05-2	9		Washer, (Internal Shakeproof) 3/8"			1
05-2	7	Y400K-234	Gasket, Water Pump Drive Support	CO	Y400K234	1
05-2	10		Nut 3/8 - 16 x 1/4" High			2
05-2	11	Y400K-235	Screw, Retainer, Water Pump Bearing	CO	Y400K-235	1
05-2	9		Washer, (Internal Shakeproof) 3/8"			2
05-2	13	VT-135	Hub, Fan	CO	VT-135	1
05-2	18	VT-2102	Belt, Fan	GV	25R71	1
05-2	21	VT-2180	Fan	SEP	4012-LD	1
05-2	20		Bolt, Hex. Hd. 5/16 x 3/4" N.C.			4
05-2	19		Washer, Lock 5/16"			4
05-2	14	12AK-203	Flange, Adjustment	CO	12AK-203	1
05-2	16		Bolt, Hex. Hd. 1/4 x 1/2" N.C.			2
05-2	17	8UK-205	Nut, Lock	CO	8UK-205	2
05-2	15		Washer, Lock 1/4"			2
05-2		VTA-773	Kit, Water Pump, (includes — Y400K-332, X-18053-B, X-13073, Y400K-236, F600K-273, F-600K-272, Y-400K-237, D600G-283, and Y400K-3330)			1
05-2	28	Y400K-237	Shaft, Water Pump Drive	CO	Y400K-237	1
05-2	24	X-13073	Ball Bearing, Complete	ND	77502	2
05-2	31	D600G-283	Bushing, Water Pump Thrust	CO	D600G-283	1

GROUP 5 — COOLING GROUP**0502 WATER PUMP AND FAN (continued)**

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
05-2	1	Y400K-332	Impeller, Water Pump	CO	Y400K-332	1
05-2	2	X-3054-C	Screw, Hex. Hd. Dog Point Set	CO	X-3054-C	1
05-2	29		Key, Woodruff #5			1
05-2	22		Nut 7/16-20 x 1/4" High			1
05-2		Y400K-3330	Seal Assembly, Water Pump	CO	Y400K-3330	1
05-2	5	Y400K-239	Ring, Seal Reinforcement — Large	CO	Y400K-239	1
05-2	4	D600K-257	Ring, Seal Reinforcement — Small	CO	D600K-257	1
05-2	30	Y400K-244	Ring, Seal Snap	CO	Y400K-244	1
05-2	6	Y400K-242	Seal, Bellows	CO	Y400K-242	1
05-2	32	Y400K-243	Seal, Carbon	CO	Y400K-243	1
05-2	3	D600K-256	Spring, Seal	CO	D600K-256	1
05-2	26	F600K-273	Retainer, Water Pump Snap Ring	CO	F600K-273	1
05-2	27	F600K-272	Ring, Water Pump Bearing Snap	CO	F600K-272	1
05-2	25	Y400K-236	Spacer, Water Pump Ball Bearing	CO	Y400K-236	1
05-2	23		Washer, Lock 7/16"			1

GROUP 06 — ELECTRICAL GROUP



GROUP 06 — ELECTRICAL GROUP

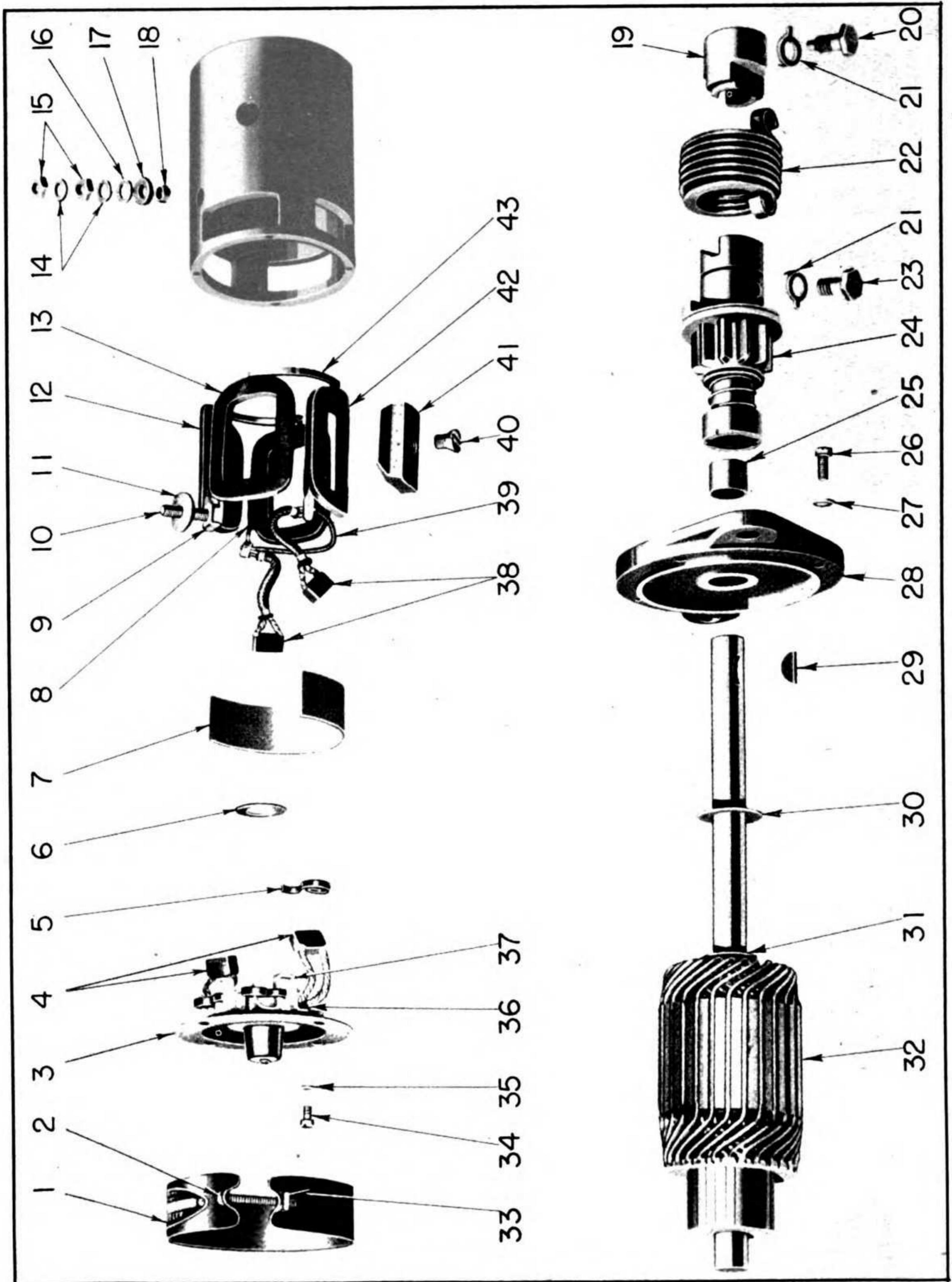


FIG. 06-2 — 0602 STARTING MOTOR

GROUP 06 — ELECTRICAL GROUP

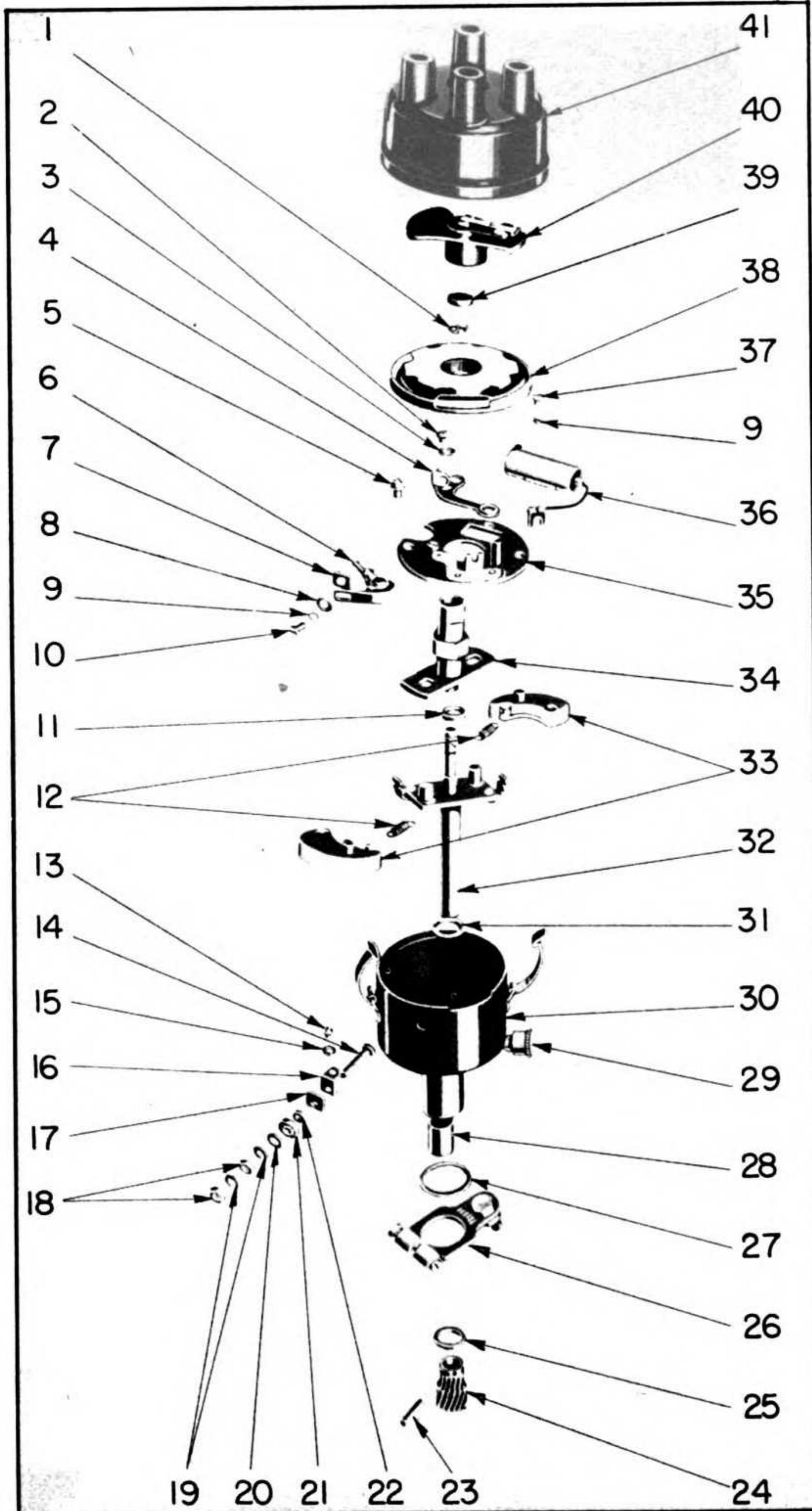


FIG. 06-3 — 0603 DISTRIBUTOR

GROUP 06 — ELECTRICAL GROUP

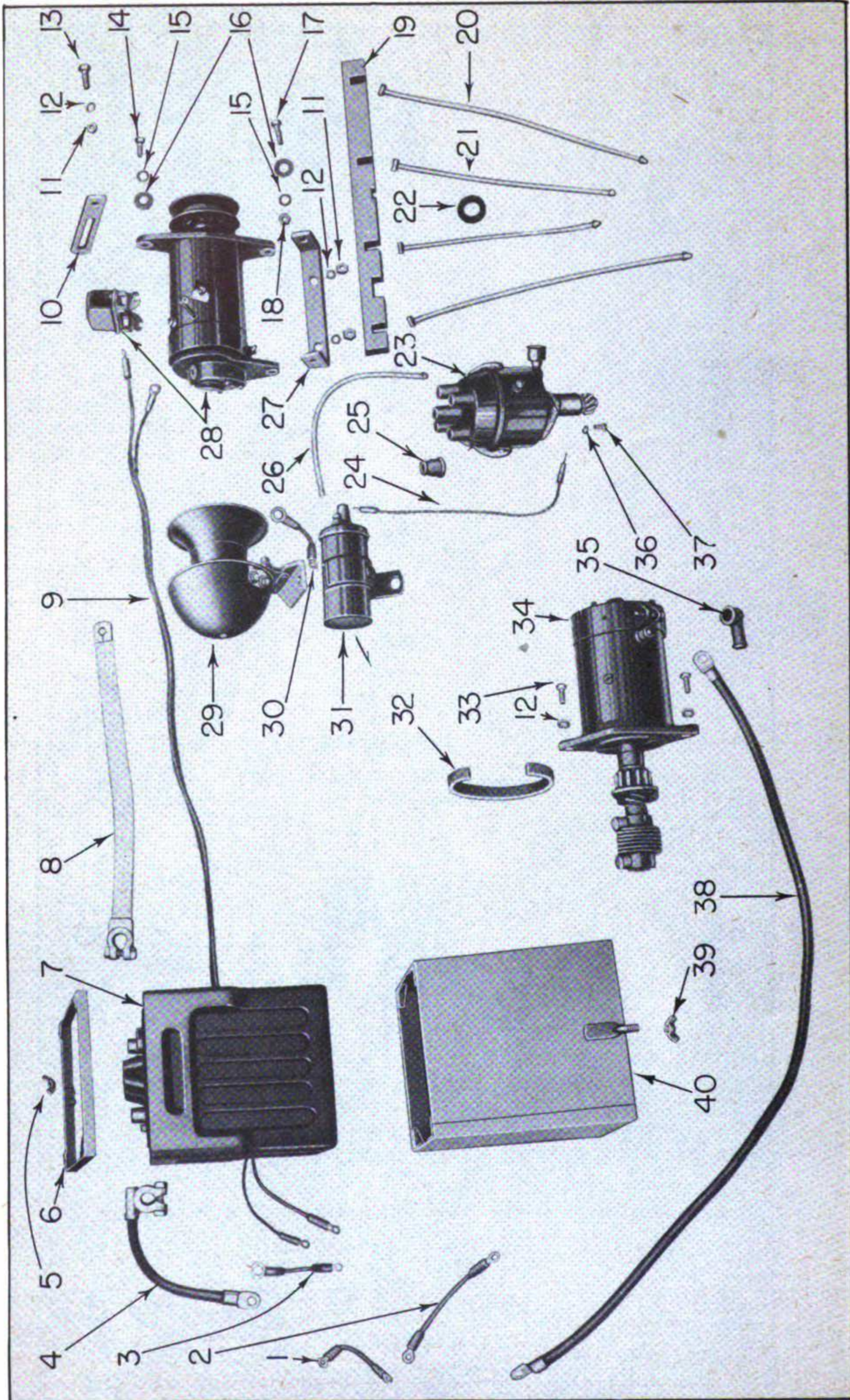


FIG. 06-4 — 0604 ELECTRICAL EQUIPMENT

GROUP 06 — ELECTRICAL GROUP

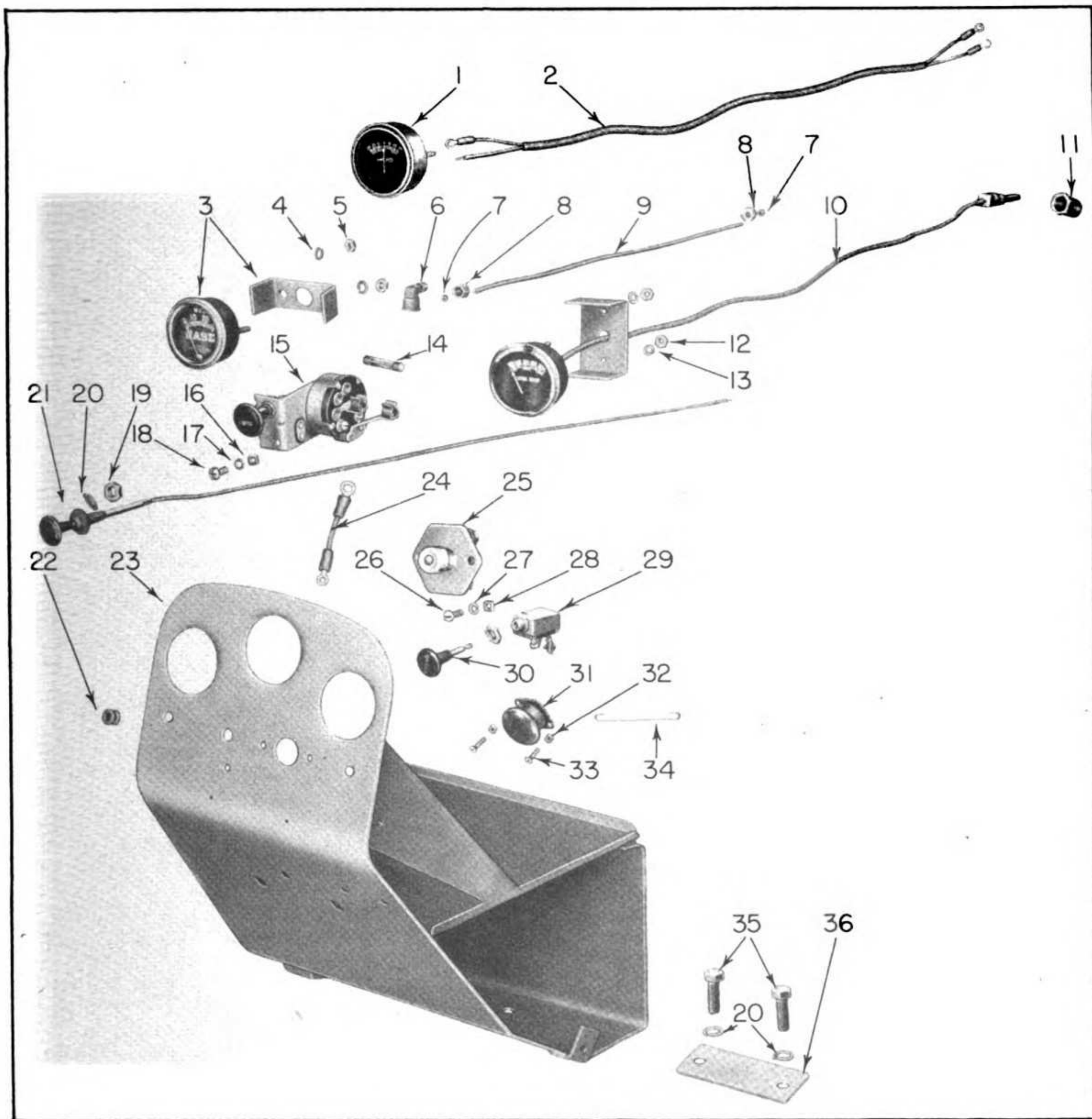


FIG. 06-5 — 0605 INSTRUMENT PANEL AND ATTACHMENTS

GROUP 06 — ELECTRICAL GROUP

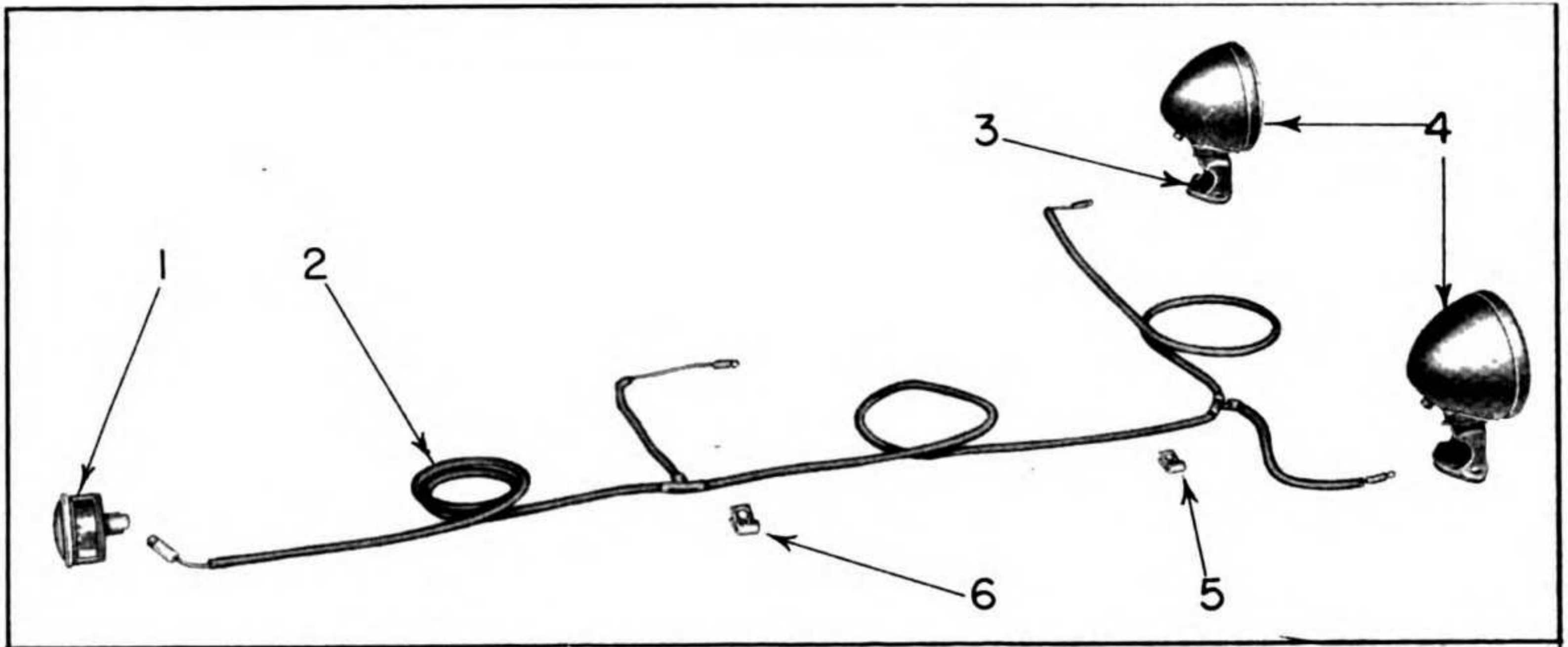


FIG. 06-6 — 0606 LIGHTING EQUIPMENT

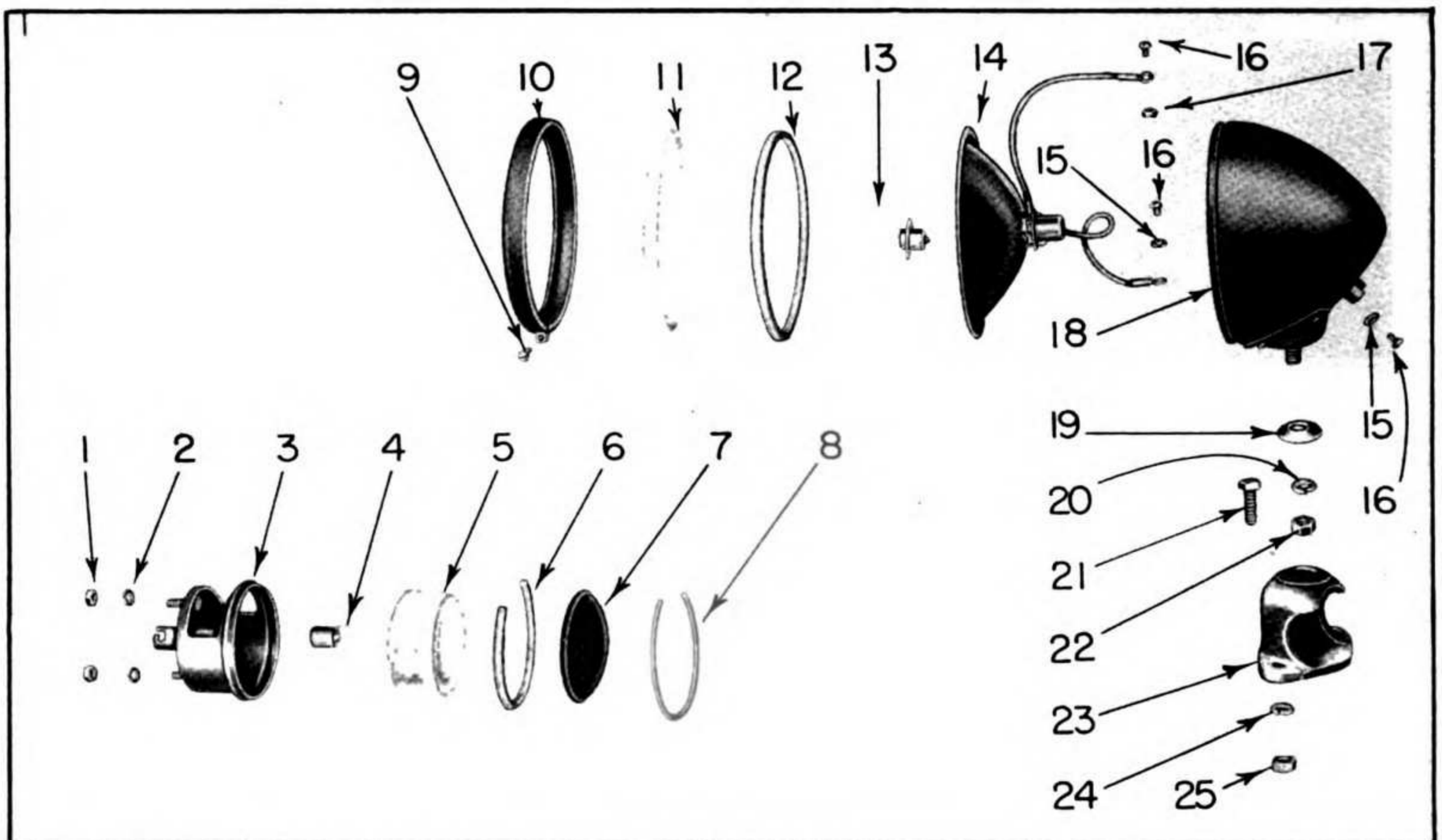


FIG. 06-7 — 0607 HEAD LAMP AND TAIL LAMP

GROUP 06 — ELECTRICAL GROUP

0601 GENERATOR

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
06-1		VT-3467	Generator Assembly	AL	GAS-4169A	1
06-1	44		Armature Assembly	AL	GAS-2218	1
06-1	42		Key, Woodruff #5			1
06-1	32		Nut, Armature Shaft	AL	GBM-21	1
06-1	34		Pulley, Drive	AL	SP-383	1
06-1	43		Ring, Snap	AL	GAR-171	1
06-1	33		Washer, Lock, Armature Shaft	AL	X-864	1
06-1	1		Band Cover	AL	GAS-1024-A	1
06-1	48		Screw, Cover Band, Rd. Hd. #10-32 x 1-1/2"			1
06-1	49		Nut, Cover Band, Sq. #10-32			1
06-1	46		Bolt, Thru	AL	GAS-20A	2
06-1	45		Washer, Lock, Thru Bolt #10	AL	X-544	2
06-1	26		Coil Assembly, Field, Left	AL	GAS-1007B	1
06-1	24		Stud, Terminal	AL	GBF-36	1
06-1	22		Bushing, Ins., Term. Stud	AL	GAS-41	1
06-1	18		Nut, Term. Stud, Hex. #10-32			2
06-1	25		Washer, Ins., Term. Stud, Inner	AL	GAS-40	1
06-1	21		Washer, Ins. Term. Stud, Outer	AL	GBF-55	1
06-1	19		Washer, Lock, Term. Stud, #10			1
06-1	20		Washer, (Shakeproof) Term. Stud, #10			2
06-1	28		Terminal	AL	X-1423	1
06-1	27		Coil Assembly, Field, Right	AL	GAS-1008F	1
06-1	53		Head Assembly, Partial, C.E.	AL	GAS-1229	1
06-1	59		Bearing	AL	GAS-224	1
06-1	2		Cover, Comm. End	AL	GAS-1222	1
06-1	51		Gasket, C.E. Cover	AL	GAS-223	1
06-1	15		Gasket, Oil Guard	AL	GAS-221	1
06-1	16		Guard, Oil	AL	GAS-220	1
06-1	56		Plate, Main Brush	AL	GAS-1021R	1
06-1	8		Brush, Main	AL	GEM-12	2
06-1	6		Holder, Brush	AL	GAS-15	2
06-1	10		Lead, Ground	AL	GAL-31	1
06-1	9		Screw, Brush, Bdg. Hd. #8-32 x 7/16"			1
06-1	11		Screw, Brush, Fil. Hd. #8-32 x 1/2"			1
06-1	7		Spring, Brush, Insulated	AL	GAS-18	1
06-1	57		Spring, Brush, Grounded	AL	GAS-17	1
06-1	4		Plate, Third Brush	AL	GAS-1219R	1
06-1	54		Brush, Third	AL	GEM-13	1
06-1	6		Holder, Brush	AL	GAS-15	1
06-1	55		Screw, Brush, Fil. Hd. #8-32 x 7/16"			1
06-1	5		Spring, Third Brush	AL	GAS-17	1
06-1	13		Screw, Brush Plate, Rd. Hd. #8-32 x 3/8"			3
06-1	12		Spring, Retaining, Third Brush Plate	AL	GAS-51	2
06-1	50		Screw, Cover, Fil. Hd. #8-32 x 5/16"			4
06-1	52		Wick, Felt	AL	GAR-73	1
06-1	3		Cover, Felt Wick	AL	GAR-98A	1
06-1	35		Head, Drive End	AL	GAS-217A	1

GROUP 06 — ELECTRICAL GROUP

0601 GENERATOR (continued)

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
06-1	39		Bearing, Ball, S.A.E. #203	AL	X-441	1
06-1	31		Oiler	AL	X-489	1
06-1	40		Retainer, Bearing	AL	GAS-104	1
06-1	36		Retainer, Felt Washer, Cupped	AL	GAS-103	1
06-1	38		Retainer, Felt Washer, Flat	AL	DA-39	1
06-1	41		Screw, Retainer, Rd. Hd. #8-3/2 x 3/8"			3
06-1	37		Washer, Felt	AL	GG-164	1
06-1	29		Holder, Field Coil	AL	GAS-45	4
06-1	30		Screw, Pole Shoe	AL	MZ-38	4
06-1	63		Insulation, Field Connection	AL	GAS-44	1
06-1	60		Lead Assembly	AL	GAS-260	1
06-1	61		Bushing, Insulating	AL	GT-7	1
06-1	62		Screw, Arm. Term., Relay, Bdg. Hd. #10-32 x 3/16"			1
06-1	23		Terminal	AL	X-755	1
06-1	58		Terminal	AL	X-1423	1
06-1	47		Pin, Dowel	AL	MN-21	2
06-1	14		Relay Assembly, Cutout	AL	CB-4012	1
06-1	17		Screw, Mtg. Relay, Rd. Hd. #10-32 x 5/16"			2

0602 STARTING MOTOR

06-2		VT-3466	Starting Motor	AL	MZ-4114	1
06-2	32		Armature Assembly	AL	MZ-2053	1
06-2	25		Bearing	AL	MZ-44A	1
06-2	19		Head, Drive	AL	EB-8503	1
06-2	20		Screw, Spring, Head	AL	EB-8506	1
06-2	21		Washer, Lock	AL	EB-108	1
06-2	29		Key, Woodruff #6			1
06-2	24		Shaft and Pinion	AL	MB-9911	1
06-2	23		Screw, Spring, Shaft	AL	EB-8507	1
06-2	21		Washer, Lock	AL	EB-108	1
06-2	31		Spacer, Bearing Thrust	AL	MZ-35	1
06-2	22		Spring, Drive	AL	EBA-405	1
06-2	6		Washer, Thrust, Armature, C.E.	AL	MU-54	1
06-2	30		Washer, Thrust, Armature, D.E.	AL	MU-54	1
06-2	1		Band Cover	AL	MZ-1024G	1
06-2	2		Screw, Cover Band, Rd. Hd. #10-32 x 1-3/8"			1
06-2	33		Nut, Cover Band, Sq. #10-32			1
06-2	8		Coil, Field, Lower Left	AL	MZ-1009	1
06-2	42		Coil, Field, Lower Right	AL	MZ-1008	1
06-2	39		Equalizer	AL	MZ-74	1
06-2	38		Brush, Insulated	AL	MZ-12	2

GROUP 06 — ELECTRICAL GROUP

0602 STARTING MOTOR (continued)

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
06-2	12		Coil, Field, Upper Left	AL	MZ-1007	1
06-2	13		Coil, Field, Upper Right	AL	MZ-1010	1
06-2	9		Terminal	AL	MU-14	1
06-2	10		Stud, Terminal 5/16" - 24	AL	MU-28	1
06-2	18		Bushing, Ins., Term. Stud	AL	MU-31	1
06-2	15		Nut, Term. Stud. Hex. 5/16" - 24			2
06-2	11		Washer, Ins., Term. Stud, Inner	AL	MU-39	1
06-2	17		Washer, Ins., Term. Stud, Outer	AL	MAB-31	1
06-2	14		Washer, Lock, Term. Stud 5/16"			2
06-2	16		Washer, Plain, Term. Stud 5/16"			1
06-2	43		Connector, Field Coil	AL	MZ-32	2
06-2	28		Head Assembly, Drive End	AL	MZ-1129	1
06-2	26		Screw, Attaching, Fil. Hd. #10-32 x 1/2"			4
06-2	27		Washer, Lock #10			4
06-2	3		Head Assembly, Comm. End	AL	MZ-2002B	1
06-2	37		Holder, Brush	AL	ME-16	2
06-2	4		Brush, Grounded	AL	MZ-1034	2
06-2	36		Rivet, Brush Holder	AL	8X-532	4
06-2	34		Screw, Attaching, Fil. Hd.: #10-32 x 3/8"			4
06-2	35		Washer, Lock #10			4
06-2	5		Spring, Brush	AL	MZ-19	4
06-2	7		Insulation, Field Connection	AL	MZ-30A	1
06-2	41		Shoe, Pole	AL	MZ-29	4
06-2	40		Screw, Pole Shoe	AL	MZ-38A	4

0603 DISTRIBUTOR

06-3		VT-4001	Distributor	AL	IAD-4101A	1
06-3	26		Arm, Advance	AL	IG-2860A-3	1
06-3	30		Base Assembly, Distributor	AL	IAD-2017	1
06-3	28		Bearing, Absorbent Bronze	AL	IG-579A	2
06-3	29		Grease Cup, 1/8"	AL	X-382	1
06-3	14		Post, Terminal #10-32 x 15/16"	AL	IGL-8	1
06-3	22		Bushing, Ins., Post, Inner	AL	IAD-10	1
06-3	16		Connector, Terminal Post	AL	IAD-7	1
06-3	17		Insulation, Term. Post, Inner	AL	IAD-8	1
06-3	18		Nut, Term. Post, Hex. #10-32			2
06-3	21		Washer, Ins., Term. Post	AL	IGL-9	1
06-3	19		Washer, Lock, Term. Post, #10			2
06-3	20		Washer, Plain, Term. Post, #10			1

GROUP 06 — ELECTRICAL GROUP

0603 DISTRIBUTOR (continued)

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
06-3	34	IG-1324C	Cam and Stop Plate, 4 Cyl., R.H.	AL	IAD-1100R-1	1
06-3	41		Cap Assembly	AL	IG-1324C	1
06-3			Contact, Plunger	AL	IG-514	1
06-3			Spring, Contact	AL	IG-515	1
06-3			Terminal, H. T. Wire	AL	IG-94	5
06-3	24	VT-139	Gear, Distributor Drive	AL	GE-68A	1
06-3	23		Rivet, Gear	AL	GB-31	1
06-3			Plate Assembly, Breaker	AL	IAD-2004	1
06-3	35		Plate, Breaker	AL	IAD-1004	1
06-3	7		Clip, Contact Arm Spring	AL	IG-676	1
06-3	36	IGW-3139 IGP-3028FS	Condenser	AL	IGW-3139	1
06-3			Contact Set, Service	AL	IGP-3028FS	1
06-3	6		Arm Assembly	AL	IGP-3028	1
06-3			Spring	AL	IGP-30	1
06-3	4		Contact, Breaker	AL	IGC-1149	1
06-3	37		Screw, Fil. Hd. #6-32 x 5/32"			1
06-3	9		Washer, Lock #6			1
06-3	2		Screw, Lock, Fil. Hd. #8-32 x 3/16"			1
06-3	3		Washer, Plain #8			1
06-3	10		Screw, Hex. Hd. #6-32 x 5/16"			1
06-3	9	Washer, Lock #6			1	
06-3	8	Washer, Plain #6			1	
06-3	38		Plate Assembly, Seal	AL	IAD-2015	1
06-3			Washer, Felt	AL	IAD-12	1
06-3	40		Rotor	AL	IG-1657R	1
06-3	5		Screw, Attaching, Fil. Hd. #10-32 x 5/16"			1
06-3	13		Screw, Attaching, Rd. Hd. #6-32 x 3/16"			1
06-3	15		Washer, Lock #6			1
06-3			Shaft and Governor Assembly	AL	IGS-2151R	1
06-3	32		Shaft, Drive	AL	IGS-1151R	1
06-3	12		Spring Set, Governor Weight	AL	IGB-328CS	1
06-3	33		Weight, Governor	AL	IGC-2168R	2
06-3	1		Snap Ring, Cam Retaining	AL	IG-680	1
06-3	11		Spacer, Cam	AL	IGS-99	1
06-3	27		Washer, Advance Arm Thrust	AL	IG-816C	1
06-3	25		Washer, Lower Drive Shaft Thrust	AL	IGZ-90	1
06-3	31		Washer, Upper Drive Shaft Thrust	AL	IGS-104	1
06-3	39		Wick, Cam Sleeve Felt	AL	IGH-28	1

GROUP 06 — ELECTRICAL GROUP

0604 ELECTRICAL EQUIPMENT

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
06-4	7	VT-2386	Battery	ES	XT-151	1
06-4	40	VTA-462	Battery Box Assembly			1
06-4	39		Nut, Wing 1/4" N.C.			2
06-4	4	VT-2334	Cable — Battery to Starter Switch	AL	32244	1
06-4	26	VT-3534	Cable — Distributor to Coil	AL	53498	1
06-4	9	VT-2333	Cable — Generator to Ammeter and Light Switch	AL	53448	1
06-4	38	VT-2337	Cable — Starter to Starter Switch	AL	32245	1
06-4	35	04595-AB	Nipple, Starting Terminal			1
06-4	20	VT-3535	Cable — #1 and #4 Spark Plugs	AL	53450	2
06-4	21	VT-3536	Cable — #2 and #3 Spark Plugs	AL	53451	2
06-4	6	VTA-55	Clamp Ring Assembly, Battery (VAIW-3 Before #4929571)			1
06-4	5		Nut, Wing 1/4" N.C. (VAIW-3 Before #4929571)			2
06-4	31	VT-3587	Coil, Ignition	AL	IG-4803	1
06-4	23	VT-4001	Distributor	AL	IAD-4101A	1
06-4	25	VT-3561	Nipple, Spark Plug Cable	CON	VT-3561	6
06-4	37		Screw, Cap, Hex. Hd. 1/4 x 1/2" N.C.			1
06-4	36		Washer, Lock 1/4"			1
06-4	28	VT-3467	Generator	AL	GAS-4169A	1
06-4	27	VT-3548	Bracket, Generator			1
06-4	17		Bolt, Hex. Hd. 5/16 x 1-1/4" N.F.			2
06-4	18		Nut, Hex. 5/16" N.F.			2
06-4	15		Washer, Lock 5/16"			2
06-4	16		Washer, Plain 5/16"			2
06-4	11		Nut, Hex. 3/8" N.C.			2
06-4	12		Washer, Lock 3/8"			2
06-4	10	VT-3547	Strap, Generator Adjusting			1
06-4	13		Bolt, Hex. Hd. 3/8 x 1-1/4" N.C.			1
06-4	11		Nut, Hex. 3/8" N.C.			1
06-4	12		Washer, Lock 3/8"			1
06-4	14		Bolt, Hex. Hd. 5/16 x 3/4"			1
06-4	15		Washer, Lock 5/16"			1
06-4	16		Washer, Plain 5/16"			1
06-4	22	VT-3470	Grommet, Ignition Cable	IR	1626-A	1
06-4	19	VT-3774	Holder, Spark Plug Wire			1
06-4	29	VTA-581	Horn	DR	K261540A	1
06-4	30	VT-2330	Wire, Ground	AL	53564	1
06-4	32	VT-3718	Seal, Felt, Starter and Motor Block	WFW	40	1
06-4	34	VT-3466	Starting Motor	AL	MZ-4114	1
06-4	33		Screw, Cap, Hex. Hd. 3/8 x 1" N.C.			2
06-4	12		Washer, Lock 3/8"			2
06-4	8	VT-2336	Strap, Battery to Ground	AL	53564	1
06-4	2	VT-2335	Wire — Ammeter to Ignition Switch	AL	53449	1
06-4	1	VT-3771	Wire — Ammeter to Light Switch	AL	53454	1
06-4	3	VT-2330	Wire — Ammeter to Starter Switch	AL	53564	1
06-4	24	VT-3544	Wire — Coil to Distributor	AL	53500	1

GROUP 06 — ELECTRICAL GROUP

9605 INSTRUMENT PANEL AND ATTACHMENTS

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
06-5	23	VTA-388	Instrument Panel			1
06-5	1	03601-AB1	Ammeter	AC	03601-AB	1
06-5	31	VT-2493	Button, Horn	CEE	8106B	1
06-5	33		Bolt, Mach., Rd. Hd. 1/8 x 1/2" N.C.			2
06-5	32		Nut, Sq. 1/8" N.C.			2
06-5	24	VT-3838	Cable — Light Switch to Horn Button	AL	53664	1
06-5	21	VT-2340	Choker, Wire Assembly	SHA	VT2340	1
06-5	19		Nut, Hex. Jam 3/8" N.F.			1
06-5	20		Washer, Lock 3/8"			1
06-5	3	VT-2249	Gage, Oil, with Clamp	RM	VT-2249	1
06-5	5		Nut, Hex. Jam, #12-24			2
06-5	4		Washer, Lock #12			2
06-5	10	VT-2265	Gage, Temperature, with Element and Lead	AC	1511022	1
06-5	11	VT-2343	Adapter, Temperature Gage	AC	1510415	1
06-5	12		Nut, Hex. #10-32			2
06-5	13		Washer, Lock #10			2
06-5	22	VT-4079	Grommet, Light Cable	IR	1286	1
06-5		VTA-427	Ignition Switch Assembly	HC	7435	1
06-5	30	VT-3619	Control Rod, Ignition Switch			1
06-5	29	VT-3620	Ignition Switch Box with Nut			1
06-5	9	VT-3596	Line, Oil Gage	SDP	VT-3596	1
06-5	6		Fitting, Elbow P. T. 3/16 x 1/8"	IB	70-F	1
06-5	8		Nut, Compression Coupling 3/16"	IB	61-F	2
06-5	7		Sleeve, Compression Coupling 3/16"	IB	60-F	2
06-5	15	VTA-463	Switch, Light Assembly			1
06-5	15	VT-2108	Switch, Light — less rod	DR	1994008	1
06-5	14	VT-2124	Fuse, Light Switch	KLE	3-20AMP	1
06-5		VT-2109	Rod, Light Switch	DR	1990583	1
06-5	18		Screw, Machine, Fil. Hd. #10-24 x 1/2"			1
06-5	16		Nut, Sq. #10-24			1
06-5	17		Washer, Lock 3/16"			1
06-5	25	VT-3588	Switch, Starting	AL	VT-3588	1
06-5	26		Bolt, Machine, Rd. Hd. 1/4 x 1/2" N.C.			2
06-5	28		Nut, Sq. 1/4" N.C.			2
06-5	27		Washer, Lock 1/4"			2
06-5	2	VTA-706	Wire Assembly — Coil and Horn Cables	AL	VTA-706	1
06-5	34	VT-2268	Wire, Ignition Switch Ground	AL	400180	1
06-5	36	VT-2365	Reinforcement, Instrument Panel			1
06-5	35		Bolt, Hex. Hd. 3/8 x 1" N.C.			2
06-5	20		Washer, Lock 3/8"			2

GROUP 06 — ELECTRICAL GROUP**0606 LIGHTING EQUIPMENT**

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
06-6	4	VT-4054	Head Lamp	GL	862-N	2
06-6	3	VT-57	Bracket, Head Lamp			2
06-6	1	03609-AB	Tail Lamp	GL	910400	1
06-6	2	VT-4052	Wire Assembly, Light	AL	53787	1
06-6	5	04599-AB	Clip, Wire (For 3/8" bolt)			1
06-6	6	02457-AB	Clip, Wire (For 1/2" bolt)			1

0607 HEAD LAMP AND TAIL LAMP

06-7	18	VT-57	Body Assembly, Head Lamp	GL	921853	2
06-7	23		Bracket, Head Lamp			2
06-7	21		Screw, Cap, Hex. Hd. 5/16 x 1" N.C.			4
06-7	25		Nut, Hex. 5/16" N.C.			4
06-7	24		Washer, Lock 5/16"			4
06-7	13		Bulb, 32 C.P., 6-8V, S-C	GL	110183	2
06-7	12		Gasket	GL	919238	2
06-7	11		Lens	GL	914992	2
06-7	10		Molding	GL	914484	2
06-7	9		Screw	GL	132982	2
06-7	22		Nut, Hex. 3/8" — 16	GL	120377	2
06-7	14		Reflector	GL	921852	2
06-7	16		Screw	GL	121749	4
06-7	17		Nut	GL	120622	2
06-7	15		Washer	GL	138530	2
06-7	16		Screw	GL	121749	2
06-7	15		Washer	GL	138530	2
06-7	19		Washer, Bevel	GL	914489	2
06-7	20		Washer, Lock 3/8"	GL	103211	2
06-7	3		Body Assembly, Tail Lamp	GL	911500	1
06-7	4	Bulb, 3 C.P., 6-8V, S.C.	GL	115428	1	
06-7	5	Glass, Outlook	GL	911506	1	
06-7	7	Glass, Ruby Semaphor	GL	911505	1	
06-7	1	Nut	GL	120367	2	
06-7	8	Spring Ring, Lens Retaining	GL	913243	1	
06-7	2	Washer	GL	103319	2	
06-7	6	Washer, Cork	GL	911508	1	

GROUP 07 — TRANSMISSION GROUP

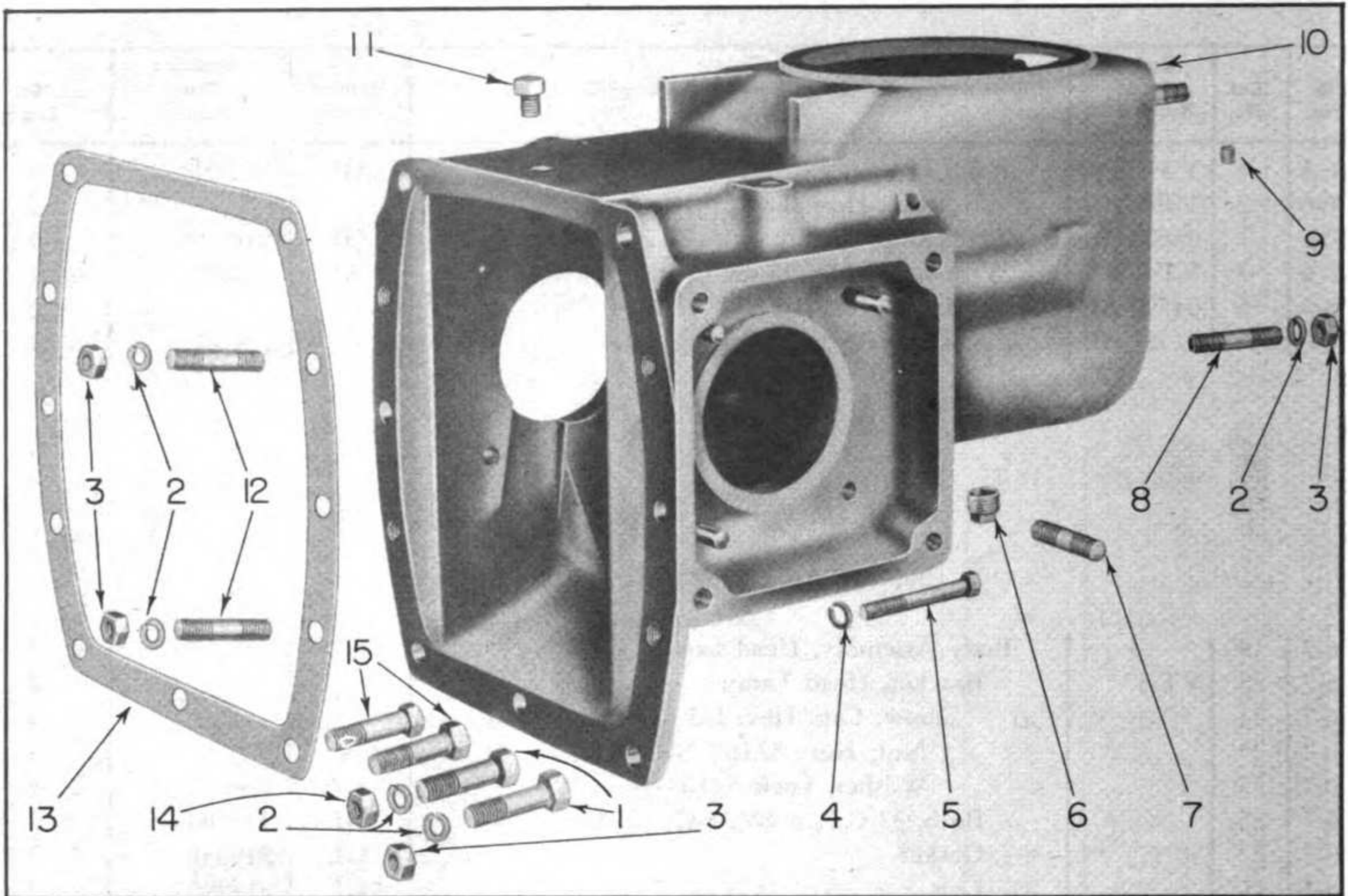


FIG. 07-1 — 0701 TRANSMISSION CASE

GROUP 07 — TRANSMISSION GROUP

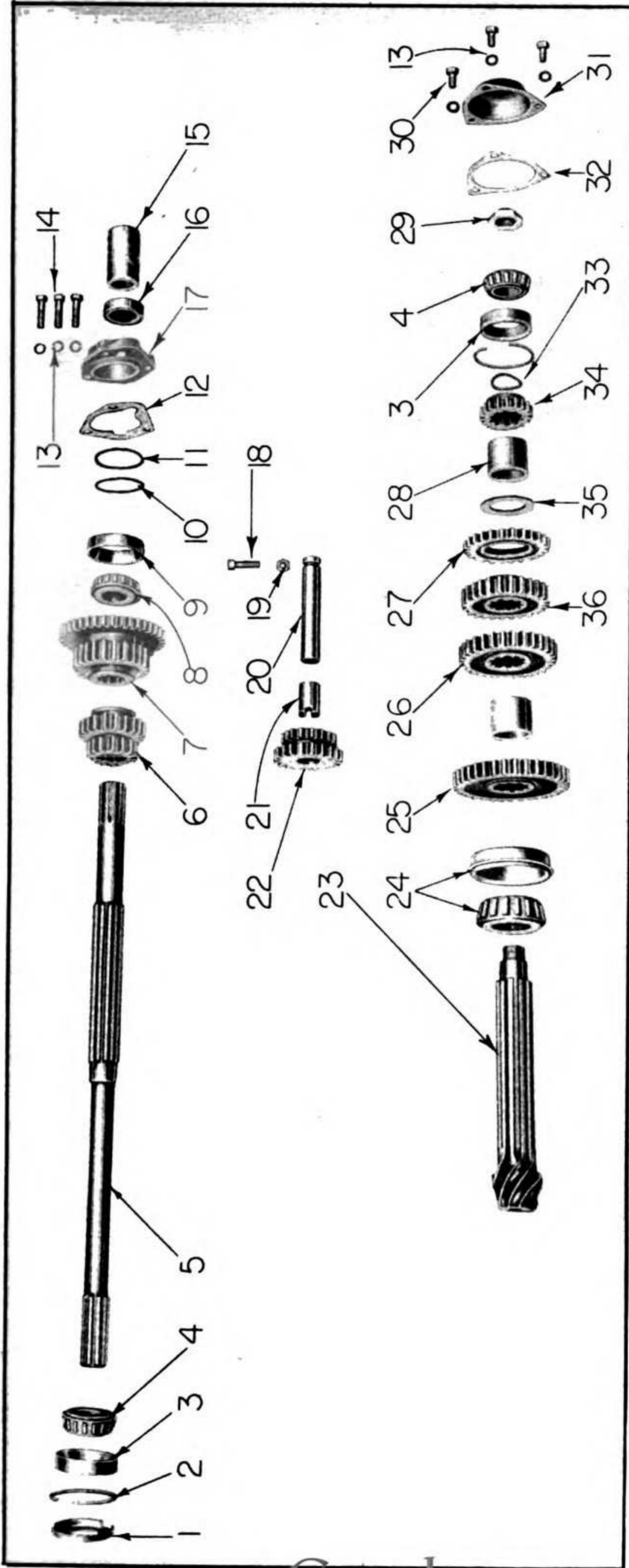


FIG. 07-2 — 0702 TRANSMISSION SHAFT AND GEARS

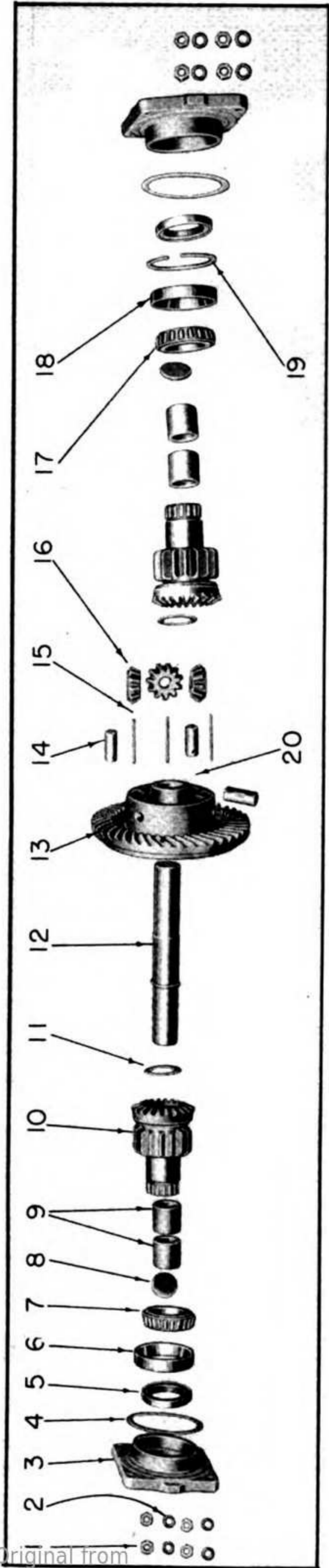


FIG. 07-3 — 0703 DIFFERENTIAL

GROUP 07 — TRANSMISSION GROUP

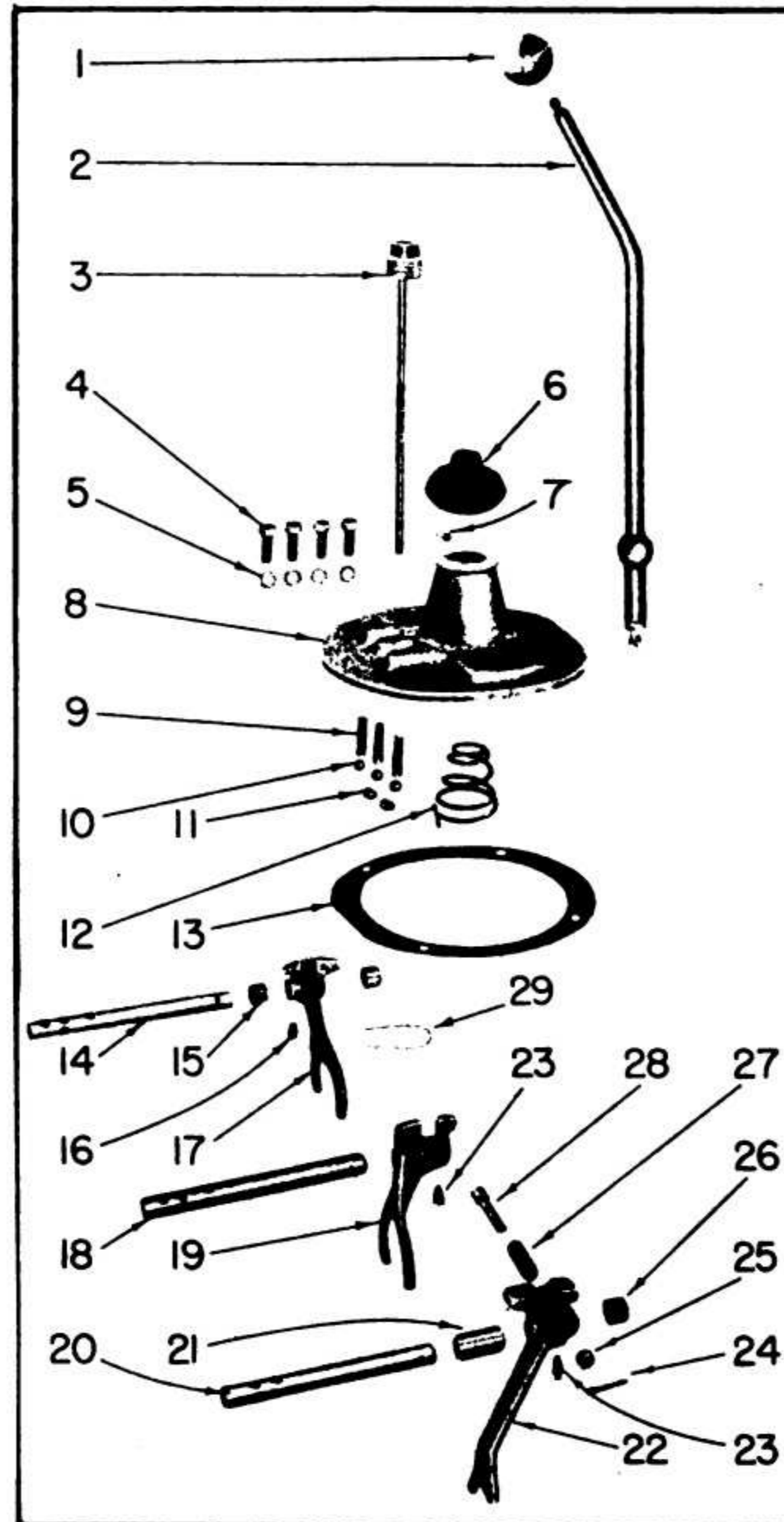


FIG. 07-4 — 0704 GEAR SHIFT

0701 TRANSMISSION CASE

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
07-1	10	VT-241	Case, Transmission			1
07-1	15	VT-3503	Bolt, Ground Body	LMS	VT-3503	2
07-1	3		Nut, Hex. 5/8" N.F.			2
07-1	2		Washer, Lock 5/8"			2
07-1	5		Bolt, Hex. Hd. 1/2 x 3-3/4" N.C.			1
07-1	4		Washer, Lock 1/2"			1
07-1	1		Bolt, Hex. Hd. 5/8 x 2-1/4" N.C.			2
07-1	14		Nut, Hex. 5/8" N.C.			2
07-1	2		Washer, Lock 5/8"			2
07-1	13	VT-3508	Gasket, Rear Axle Housing	VG	RD-13741-CI	1
07-1	6		Plug, Pipe 3/4"			1
07-1	9		Plug, Slotted Pipe 1/4"			2

GROUP 07 — TRANSMISSION GROUP

0701 TRANSMISSION CASE (continued)

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
07-1	11		Screw, Cap, Hex. Hd. 5/8 x 3/4" N.C.			1
07-1	7	VT-3546	Stud 1/2 x 2-1/2"	WSR	VT-3546	8
07-1	12	VT-3716	Stud 5/8 x 2-1/2"	WSR	VT-3716	4
07-1	3		Nut, Hex. 5/8" N.F.			4
07-1	2		Washer, Lock 5/8"			4
07-1	8	VT-4138	Stud, 5/8 x 2-7/8"	CCS	VT-4138	4
07-1	3		Nut, Hex. 5/8" N.F.			4
07-1	2		Washer, Lock 5/8"			4

0702 TRANSMISSION SHAFT AND GEARS

07-2	31	VT-3415	Cap, Countershaft Front Bearing			1
07-2	32	VT-3411	Gasket, Countershaft Front Bearing	VG	RD-13695-C1	1
07-2	30		Bolt, Hex. Hd. 3/8 x 1" N.C.			3
07-2	13		Washer, Lock 3/8"			3
07-2	23	VT-3410	Pinion, Countershaft and Bevel Drive	CE	G448	1
07-2	3	VT-2097	Cup, Bearing	TIM	14276	1
07-2	4	VT-2112	Cone, Bearing	TIM	14119-A	1
07-2	24	VTA-645	Cup, Bearing, and Cone w/Snap Ring	TIM	4C	1
07-2	34	VT-4125	*Gear, High Countershaft			1
07-2	25	VT-3418	Gear, Low Countershaft — 35 Teeth			1
07-2	27	VT-205	Gear, Oil Slinger — 32 Teeth			1
07-2	26	VT-3417	Gear, 2nd Countershaft			1
07-2	36	VT-3714	Gear, 3rd Countershaft			1
07-2	29	VT-2061	Nut, Countershaft Adjusting	CE	4599	1
07-2	28	VT-3425	Spacer, Countershaft Gear			1
07-2	35	VT-3412	Washer, Oil Slinger Retaining	WWM	VT-3412	1
07-2	33	VT-3414	Washer, Spring	BWN	VT-3414	1
07-2	5	VT-3400	Shaft, Main Drive			1
07-2	17	VT-208	Cap, Mainshaft Bearing			1
07-2	14		Bolt, Hex. Hd. 3/8 x 1-1/2" N.C.			3
07-2	13		Washer, Lock 3/8"			3
07-2	12	VT-3722	Gasket, Mainshaft Bearing Cap	VG	RD-13711-C1	1
07-2	3	VT-2097	Cup, Bearing	TIM	14276	1
07-2	4	VT-2112	Cone, Bearing	TIM	14119-A	1
07-2	9	VT-3403	Cup, Bearing	TIM	15244	1
07-2	8	VT-3404	Cone, Bearing	TIM	15120	1
07-2	1	VT-2052	Cup, Mainshaft Front Oiling			1

GROUP 07 — TRANSMISSION GROUP

0702 TRANSMISSION SHAFT AND GEARS (continued)

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
07-2	6	VT-3407	Gear, 1st and 2nd Mainshaft			1
07-2	7	VT-4126	*Gear, 3rd and 4th Mainshaft			1
07-2	2	VT-2067	Ring, Bearing Retainer Snap, C.S. & M.S.	CE	4597	2
07-2	16	VT-3401	Seal, Mainshaft Oil	CM	VT-3401	1
07-2	10	VT-3453	Shim, Mainshaft Bearing Cap .005"			—
07-2	11	VT-3454	Shim, Mainshaft Bearing Cap .010"			—
07-2	15	VT-2130	Sleeve, Clutch Shaft			1
07-2	20	VT-3406	Shaft, Reverse Idler			1
07-2	21	VT-3409	Bushing, Reverse Idler Gear	CGB	VT-3409	1
07-2	22	VTA-353	Gear, Reverse Idler, w/Bushing			1
07-2	18		Screw, Dog Point Set 3/8-16 x 1-1/4"			1
07-2	19		Nut, Hex. Jam 3/8" N.C.			1

* On all vehicles before #4929571, replace both VT-4125 and VT-4126 when replacement of either is required.

0703 DIFFERENTIAL

07-3	3	VT-169	Carrier, Differential Shaft Bearing			2
07-3	18	VT-2136	Cup, Bearing	TIM	382	1
07-3	17	VT-3435	Cone, Bearing	TIM	387	1
07-4	6	VT-3463	Cup, Bearing	TIM	28623	1
07-3	7	VT-3464	Cone, Bearing	TIM	28682	1
07-3	1		Nut, Hex. 1/2" N.F.			8
07-3	19	VT-3477	Ring, Snap	EAT	VT-3477	1
07-3	5	VT-3465	Seal, Differential Oil	CM	VT-3465	2
07-3	4	VT-3480	Shim, Differential Bearing .005"			8
07-3	4	VT-3481	Shim, Differential Bearing .010"			4
07-3	2		Washer, Lock 1/2"			8
07-3	12	VT-3457	Shaft, Differential			1
07-3	10	VTA-421	Gear, Differential Side, w/Bushings (VAIW-3 only)			2
07-3	10	VTA-417	Gear, Differential Side, w/Bushings (VAIW-4 only)			2
07-3	9	VT-3765	Bushing, Differential Side Gear	CC	A1712-5	4
07-3	20	VTA-408	Gear Assembly, Differential Ring			1
07-3	13	VT-3421	Gear, Differential Ring — 43 Teeth	CE	6440	1
07-3	15	VT-3458	Pin, Differential Pinion Shaft			3
07-3	16	VTA-419	Pinion, Differential, w/Bushing			3
07-3		VT-3769	Bushing	CG	SO-16-900	3
07-3	14	VT-3459	Pinion Pin, Differential	LG	VT-3459	3
07-3	8	VT-3479	Plug, Welch 1-3/4" Dia.	WWM	VT-3479	2
07-3	11	VT-4103	Shim .010"			—

GROUP 07 — TRANSMISSION GROUP

0703 DIFFERENTIAL (continued)

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
07-3	11	VT-3994	Washer, Differential Center Wheel Thrust .089"	SDF	VT-3994	—
07-3	11	VT-3456	Washer, Differential Center Wheel Thrust .094"	SDF	VT-3456	—
07-3	11	VT-3820	Washer, Differential Center Wheel Thrust .099"	SDF	VT-3820	—
07-3	11	VT-3821	Washer, Differential Center Wheel Thrust .104"	SDF	VT-3821	—
07-3	11	VT-4101	Washer, Differential Center Wheel Thrust .109"	SDF	VT-4101	—
07-3	11	VT-4102	Washer, Differential Center Wheel Thrust .119"	SDF	VT-4102	—

0704 GEAR SHIFT

07-4	8	VT-207	Cover, Control			1
07-4	4		Bolt, Hex. Hd. 3/8 x 1" N.C.			4
07-4	5		Washer, Lock 3/8"			4
07-4	13	VT-3452	Gasket, Control Cover	VG	RD-13726-C2	1
07-4	2	VT-3906	Lever, Gear Shift	CE	5985	1
07-4	1	VT-2018	Ball, Gear Shift Lever	CE	2750	1
07-4	6	VT-2017	Cover, Gear Shift Lever Dust	CE	1300	1
07-4	7	VT-2016	Pin, Shift Lever Pivot	CE	1054	1
07-4	3	VTA-352	Rod, Dip Stick			1
07-4	12	VT-2019	Spring, Gear Shift Support	CE	1483	1
07-4	9	VT-2006	Spring, Mesh Lock	CE	1844	3
07-4	10		Ball, Steel 3/8" Dia.			3
07-4	11	VT-2000	Plug, Interlock	CE	1463	2
07-4	18	VT-3442	Rod, 1st and 3rd Shift			1
07-4	19	VT-3449	Fork, 1st and 3rd Shift			1
07-4	23	VT-2012	Screw, Shift Fork Lock	CE	1566	1
07-4	29	VT-2015	Wire, Lock	CE	1553	1
07-4	14	VT-3443	Rod, 2nd and 4th Shift			1
07-4	17	VT-3450	Fork, 2nd and 4th Shift			1
07-4	16	VT-2013	Screw, Shift Fork Lock	CE	3069	1
07-4	29	VT-2015	Wire, Lock	CE	1553	1
07-4	15	VT-3447	Spacer, 2nd and 4th Shift Rod	WER	P9331	2
07-4	20	VT-3444	Rod, Reverse Shift			1
07-4	22	VT-3451	Fork, Reverse Shift			1
07-4	28	VT-2011	Plunger, Reverse Latch	CE	1042	1
07-4	25		Nut, Cast. 5/16" N.F.			1
07-4	24		Pin, Cotter 1/16 x 1/2"			1
07-4	27	VT-2010	Spring, Reverse Latch Plunger	CE	1043	1
07-4	23	VT-2012	Screw, Shift Fork Lock	CE	1566	1
07-4	29	VT-2015	Wire, Lock	CE	1553	1
07-4	21	VT-3448	Spacer, Reverse Shift Rod — Long	WER	P9330	1
07-4	26	VT-3446	Spacer, Reverse Shift Rod — Short	WER	VT-3446	1

GROUP 10 — FRONT AXLE GROUP

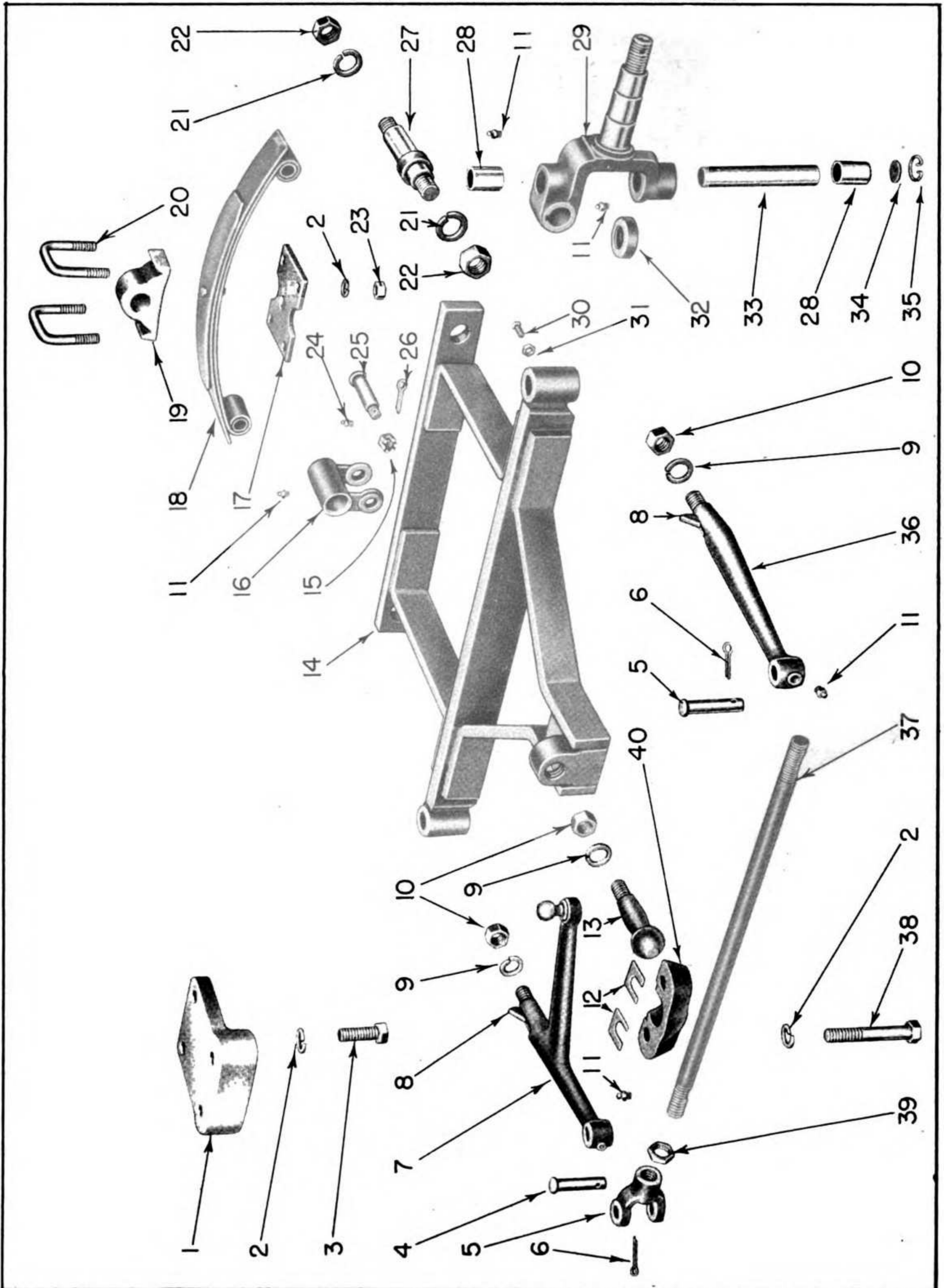


FIG. 10-1 — 1001 FRONT AXLE

GROUP 10 — FRONT AXLE GROUP

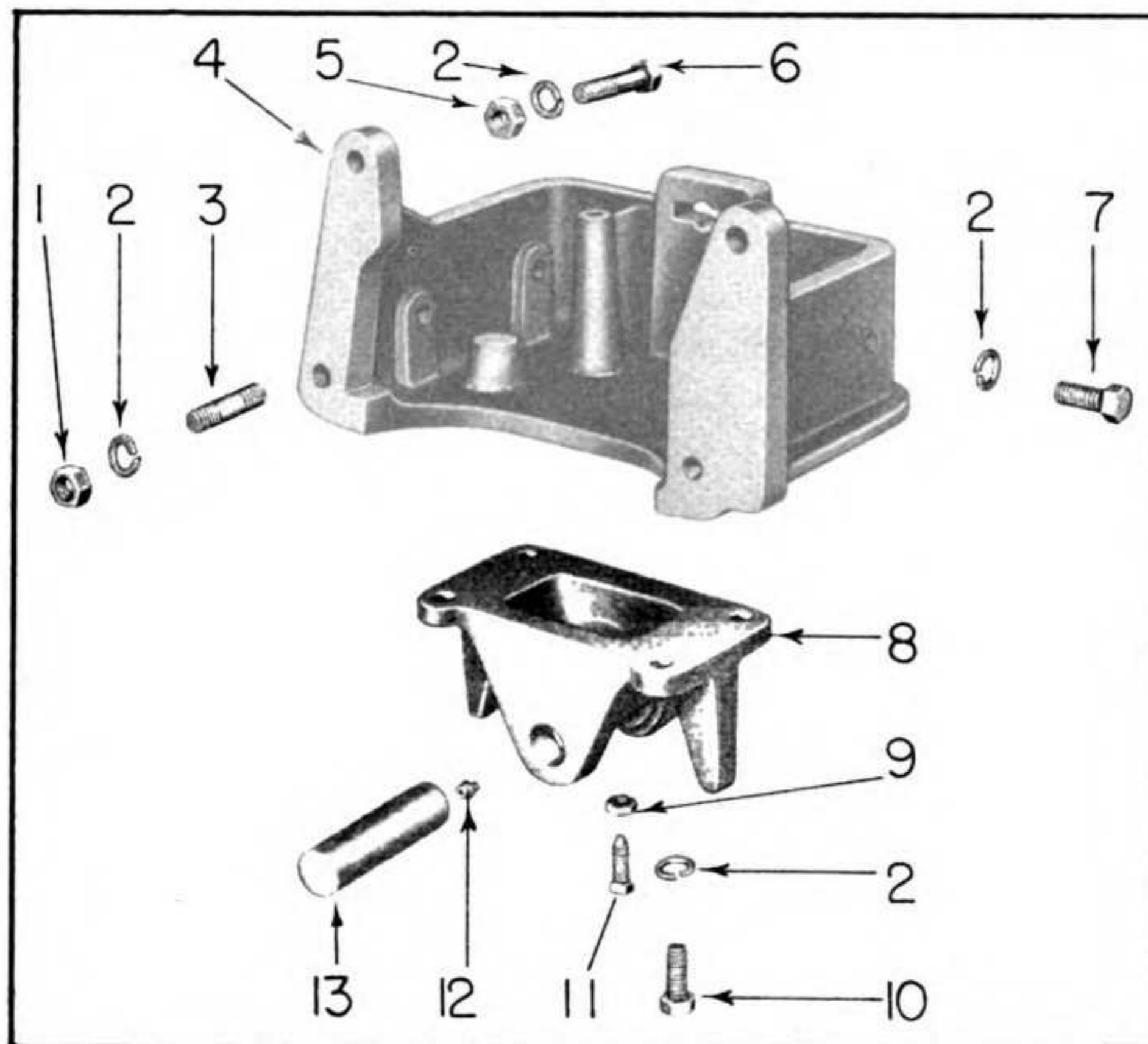


FIG. 10-2 — 1002 FRONT END MOUNTING ASSEMBLY

1001 FRONT AXLE

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
10-1	7	VTA-445	Arm, Steering L H.			1
10-1	11		Fitting, Grease, Str. 1/8" P.T.			1
10-1	8		Key, Woodruff #15			1
10-1	10		Nut, Hex. 3/4" N.F.			1
10-1	9		Washer, Lock 3/4"			1
10-1	36	VT-3878	Arm, Steering R. H.			1
10-1	11		Fitting, Grease, Str. 1/8" P.T.			1
10-1	8		Key, Woodruff #15			1
10-1	10		Nut, Hex. 3/4" N.F.			1
10-1	9		Washer, Lock 3/4"			1
10-1	14	VTA-665	Frame Assembly, Front			1
10-1	27	VT-3870	Pin, Shackle Hanger			2
10-1	22		Nut, Hex. 1" N.F.			4
10-1	16	02507-AB	Shackle			2
10-1	25	02509-AB	Bolt, Shackle Hanger			2
10-1	24		Fitting, Grease, Elbow 90°, 1/8" P.T.			2
10-1	15		Nut, Cast. 5/8" N.F.			2
10-1	26		Pin, Cotter 1/8 x 1-1/4"			2
10-1	11		Fitting, Grease, Str. 1/8" P.T.			2
10-1	21		Washer, Lock 1"			4
10-1	13	01443-AB-2	Radius Rod Pivot Ball			1
10-1	10		Nut, Hex. 3/4" N.F.			1
10-1	9		Washer, Lock 3/4"			1
10-1	30		Screw, Set. Sq. Hd., Cup Point 3/8x3/4" N.C.			2
10-1	31		Nut, Hex. Jam 3/8" N.C.			2

GROUP 10 — FRONT AXLE GROUP

1001 FRONT AXLE (continued)

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
10-1	1	VT-224	Socket, Radius Rod Pivot Ball			1
10-1	40	4766-A	Cap, Ball Socket			1
10-1	3		Screw, Cap, Hex. Hd. 5/8 x 1-3/4" N.C.			2
10-1	2		Washer, Lock 5/8"			2
10-1	38		Screw, Cap, Hex. Hd. 5/8 x 4" N.C.			2
10-1	2		Washer, Lock 5/8"			2
10-1	12	VT-4134	Shim .0209"			—
10-1	12	VT-4135	Shim .0120"			—
10-1	29	VT-4008	Spindle, L. H.			1
10-1	29	VT-4009	Spindle, R. H.			1
10-1	32	VT-3984	Bearing, Thrust	TIM	T-101	2
10-1	28	5332-A	Bushing, Spindle	NFE	90-10	4
10-1	33	04639-AB	Pin, King			2
10-1	34	04640-AB	Disk, Spindle			4
10-1	11		Fitting, Grease, Str. 1/8" P.T.			4
10-1	35	04641-AB	Ring, Spindle Snap	EAT	04641-AB	4
10-1	18	VTA-693	Spring, Front	TSC	VTA-693	1
10-1	19	4801-A	Block, Spring Pivot			1
10-1	17	02792-AB	Plate, Spring			1
10-1	20	VT-4050	U-Bolt, Spring			2
10-1	23		Nut, Hex. Jam 5/8" N.C.			8
10-1	2		Washer, Lock 5/8"			4
10-1	37	VT-3882	Tie Rod			1
10-1	39		Nut, Hex. Jam 3/4" N.F.			2
10-1	5	VT-2452	Yoke End, Tie Rod			2
10-1	4	0763-AB	Pin, Tie Rod Yoke End			2
10-1	6		Pin, Cotter 1/8 x 1"			2

1002 FRONT END MOUNTING ASSEMBLY

10-2	4	VT-222	Bracket, Front Axle			1
10-2	8	VT-223	Bracket, Spring Mounting			1
10-2	13	02513-AB	Pin, Front Axle Pivot			1
10-2	12		Fitting, Grease, Str. 1/8" P.T.			1
10-2	10		Screw, Cap, Hex. Hd. 5/8 x 1-3/4" N.C.			4
10-2	2		Washer, Lock 5/8"			4
10-2	11	01498-AB	Screw, Set, Pivot Pin			1
10-2	9		Nut, Hex. Jam 1/2" N.C.			1
10-2	7		Screw, Cap, Hex. Hd. 5/8 x 1-1/4" N.C.			4
10-2	2		Washer, Lock 5/8"			4
10-2	6		Screw, Cap, Hex. Hd. 5/8 x 3" N.C.			2
10-2	5		Nut, Hex. 5/8" N.C.			2
10-2	2		Washer, Lock 5/8"			2
10-2	3	VT-3716	Stud 5/8 x 2-1/2"	WSR	VT-3716	2
10-2	1		Nut, Hex. 5/8" N.F.			2
10-2	2		Washer, Lock 5/8"			2

GROUP 11 — REAR AXLE GROUP

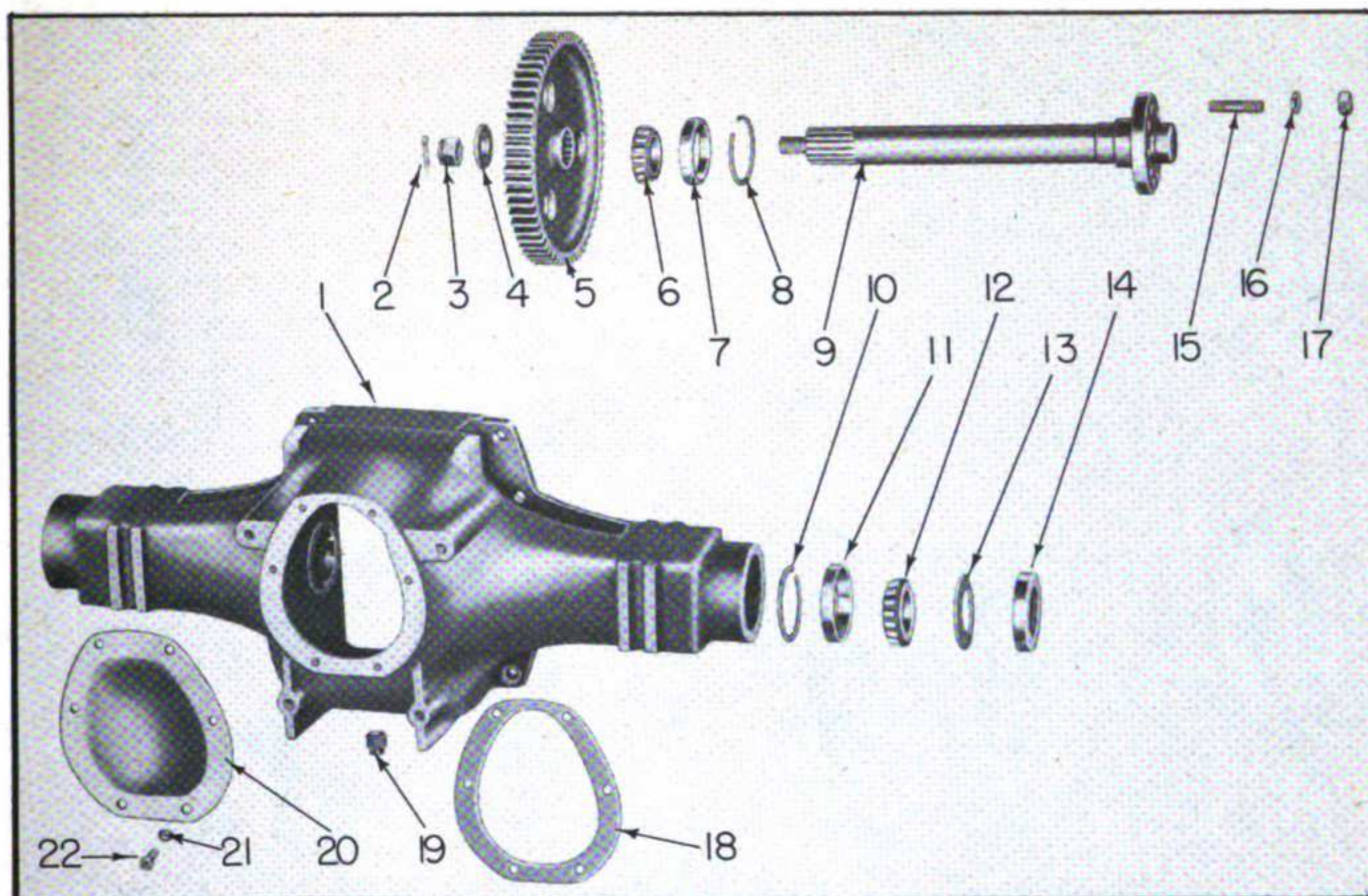


FIG. 11-1 — 1101 REAR AXLE AND HOUSING

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
11-1	1	VT-231	Housing, Rear Axle			1
11-1	1	VTA-473	Housing, Rear Axle w/Bearings, Cups, and Plug			1
11-1	20	VT-3604	Cover, Rear			1
11-1	22		Screw, Cap, Hex. Hd. 3/8 x 3/4" N.C.			6
11-1	21		Washer, Lock 3/8"			6
11-1	11	VT-2136	Cup, Bearing	TIM	382	2
11-1	12	VT-2137	Cone, Bearing	TIM	389-A	2
11-1	7	VT-3434	Cup, Bearing	TIM	362	2
11-1	6	VT-3433	Cone, Bearing	TIM	368	2
11-1	19		Fitting, Plug, Sq. Hd. Std. Pipe 3/4"			1
11-1	18	VT-3528	Gasket, Axle Housing Rear Cover	VG	VT-3528	1
11-1	14	VT-3749	Oil Seal	CM	80	2
11-1	10	VT-3477	Ring, Snap	EAT	VT-3477	2
11-1	8	VT-3500	Ring, Snap — Rear Axle Inner Bearing	EAT	VT-3500	2
11-1	13	VT-4049	Washer, Tension			2
11-1	9	VT-4301	Shaft, Rear Axle			2
11-1	5	VT-3725	Gear, Final Drive (VAIW-3 only)			2
11-1	5	VT-3422	Gear, Final Drive (VAIW-4 only)			2
11-1	3		Nut, Plain, Slotted 1" N.F.			2
11-1	2		Pin, Cotter 1/8 x 1-1/2"			2
11-1	15	VT-3907	Stud, 5/8 x 2-5/8" (VAIW-3 only)	CCS	VT-3907	10
11-1	15	VT-4271	Stud, 5/8 x 3-13/16" (VAIW-4 only)	CCS	VT-4271	10
11-1	17		Nut, Hex. 5/8" N.F.			10
11-1	16		Washer, Lock 5/8"			10
11-1	4	VT-3499	Washer, Final Drive Gear Take-Up	WWM	VT-3499	2

GROUP 12 — BRAKE GROUP

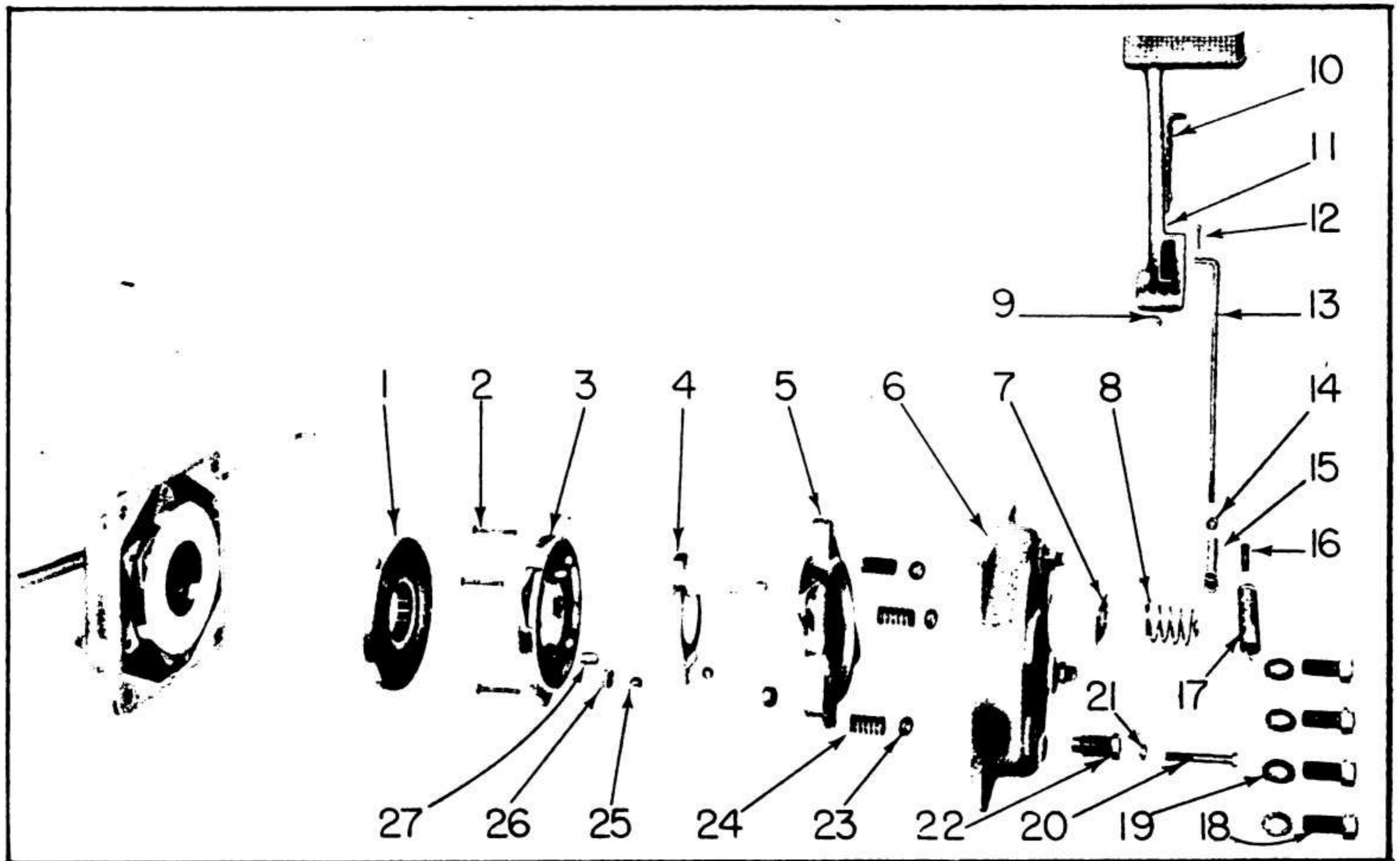


FIG. 12-1 — 1201 BRAKE ASSEMBLY

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
12-1	6	VT-168	Cover, Differential Brake			2
12-1	4	VT-197	Actuating Lever, L. H.	ASM	6316-L	1
12-1	4	VT-196	Actuating Lever, R. H.	ASM	6316-R	1
12-1	17	VT-4003	Brake Return Spring	GI	VT-4003	2
12-1	7	VT-3775	Cover, Brake Housing			2
12-1	16	V-13836	Pin, Clevis	NLW	V-13836	2
12-1	22	VT-3701	Screw, Adjusting	ASM	6365	6
12-1	20		Bolt, Hex. Hd. 5/16 x 2-1/4" N.C.			6
12-1	21		Washer, Lock 5/16"			6
12-1	8	VT-3776	Spring, Brake Cover	ASW	142006	2
12-1	25		Ball, Steel 1/2" Dia.			12
12-1	18		Bolt, Hex. Hd. 5/8 x 1-1/2" N.C.			8
12-1	19		Washer, Lock 5/8"			8
12-1	3	VT-198	Disk, Primary	ASM	6311	2
12-1	2	VT-2601	Pin, Spring	ASM	352	6
12-1	24	VT-2599	Spring, Separating	ASM	446	6
12-1	23	VT-2600	Washer, Spring Retainer	ASM	455	6
12-1	26	VT-3699	Inserts — Ball Type 3/4"	ASM	231	16
12-1	27	VT-3698	Plunger	ASM	6320	4
12-1	5	VT-195	Power Plate, L. H.	ASM	6306-L	1
12-1	5	VT-194	Power Plate, R. H.	ASM	6306-R	1
12-1		VTA-667	Kit, Brake — 4 Linings, 30 Rivets			1
12-1	1	VTA-406	Middle Ring Assembly (Complete with Lining and Rivets)	ASM	6376	2

GROUP 12 — BRAKE GROUP

1201 BRAKE ASSEMBLY (continued)

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
12-1	11	VTA-662	Pedal and Catch, Brake			1
12-1	10	VT-4084	Brake Catch			1
12-1	9		Fitting, Grease, Str. Drive 1/4"	LEC	5029	1
12-1	13	VT-4137	Rod, Brake			2
12-1	14		Nut, Hex. 5/16" N.F.			2
12-1	12		Pin, Cotter 3/32 x 3/4"			2
12-1	15	VR-2695	Yoke End, Adjusting	NLW	VR-2695	2

GROUP 13 — WHEEL GROUP

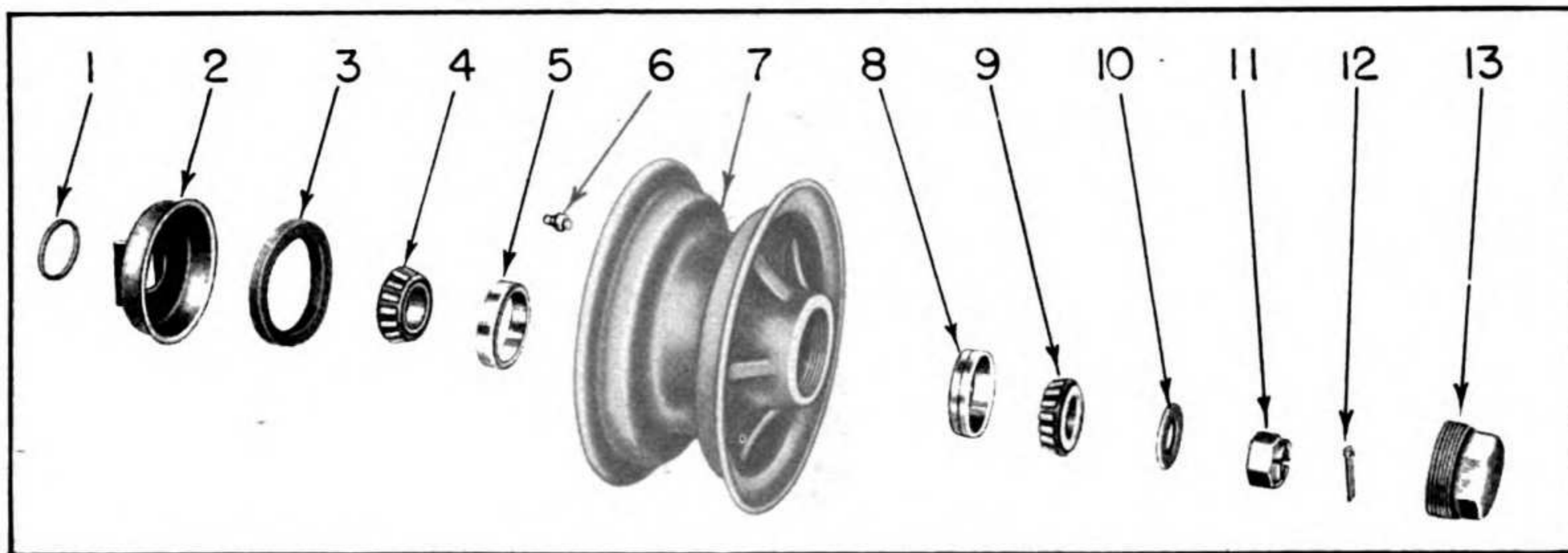


FIG. 13-1 — 1301 FRONT WHEEL ASSEMBLY

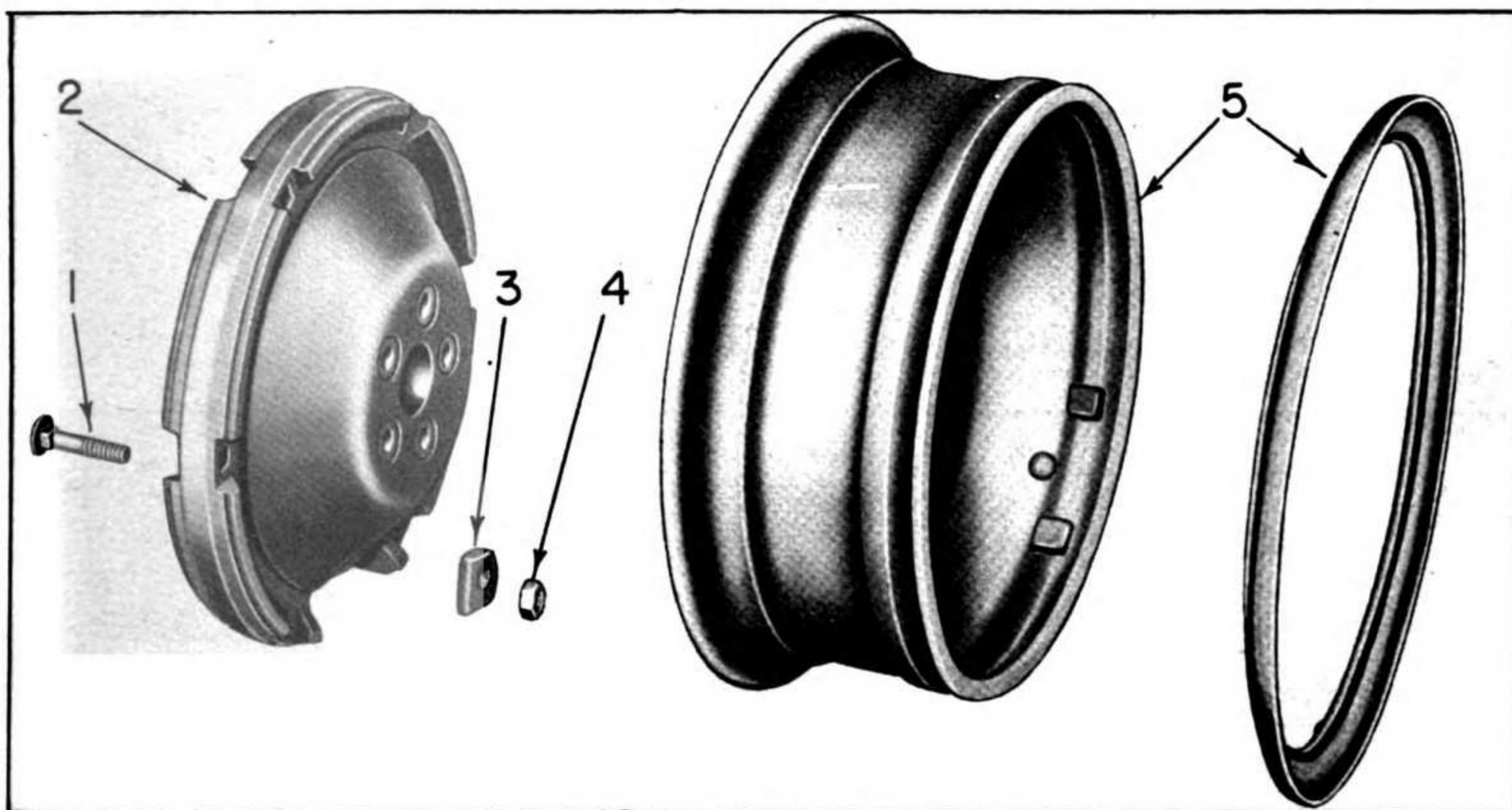


FIG. 13-2 — 1302 REAR WHEEL AND RIM

GROUP 13 — WHEEL GROUP

1301 FRONT WHEEL ASSEMBLY

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
13-1	11		Nut, Hex. Cast. 1" N.F.			2
13-1	12		Pin, Cotter 1/8 x 1-1/2"			2
13-1	2	2514-AA	Retainer for Front Wheel Hub, Felt			2
13-1	1	05823-AB	Retainer, Seal	WRC	05823-AB	2
13-1	3	05824-AB	Washer, Felt	WFW	05824-AB	4
13-1	10		Washer, Plain 1"			2
13-1	7	VTA-472	Wheel (4.00 x 9), Front (Complete with Bearings, Cups, and Grease Fitting)			2
13-1	5	03765-AB	Cup, Bearing — Inner	TIM	02820	2
13-1	4	03766-AB	Cone, Bearing — Inner	TIM	02877	2
13-1	8	01461-AB	Cup, Bearing — Outer	TIM	14274	2
13-1	9	01462-AB	Cone, Bearing — Outer	TIM	14125-A	2
13-1	6		Fitting, Grease, Str. 1/8" P.T.			2
13-1	13	04554-AB	Hub Cap	MW	04554-AB	2

1302 REAR WHEEL AND RIM

13-2	5	VT-4018	Rim and Ring (5.50F x 16LTS)	GT	803772	2
13-2	2	VT-278	Wheel, Rear (15" Dia.)			2
13-2	1		Bolt, Carriage 1/2 x 2-1/2" N.C.			12
13-2	3	VT-4017	Clamp, Rim	GT	801381	12
13-2	4		Nut, Hex. 1/2"	GT	35	12

NOTE: Quantities Listed in Sub Group 1302 are for VAIW-3 Only, for VAIW-4 Double Quantities.

GROUP 14 — STEERING GROUP

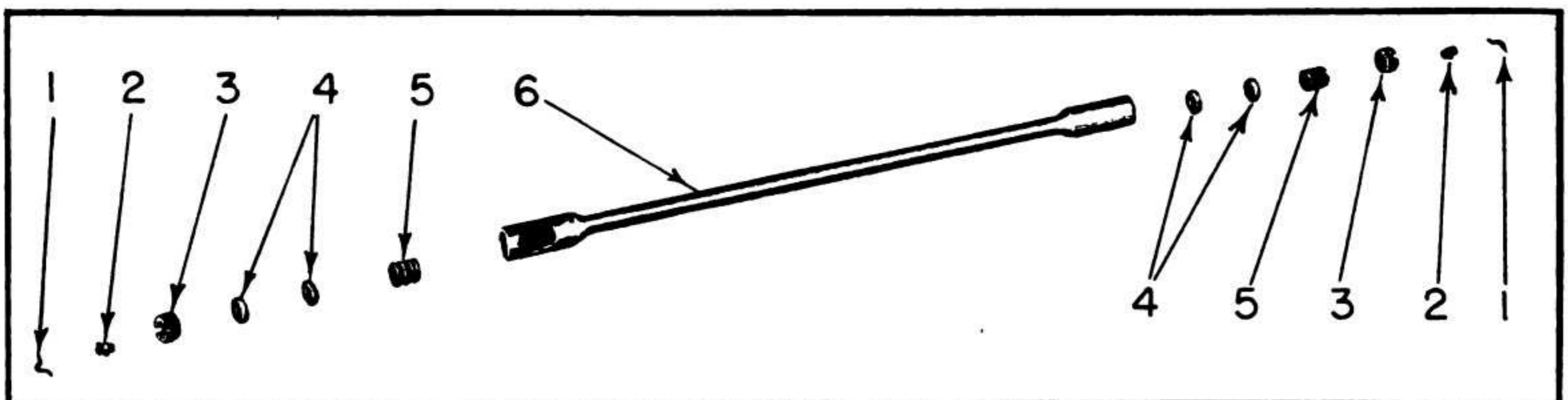


FIG. 14-1 — 1401 DRAG LINK

GROUP 14 — STEERING GROUP

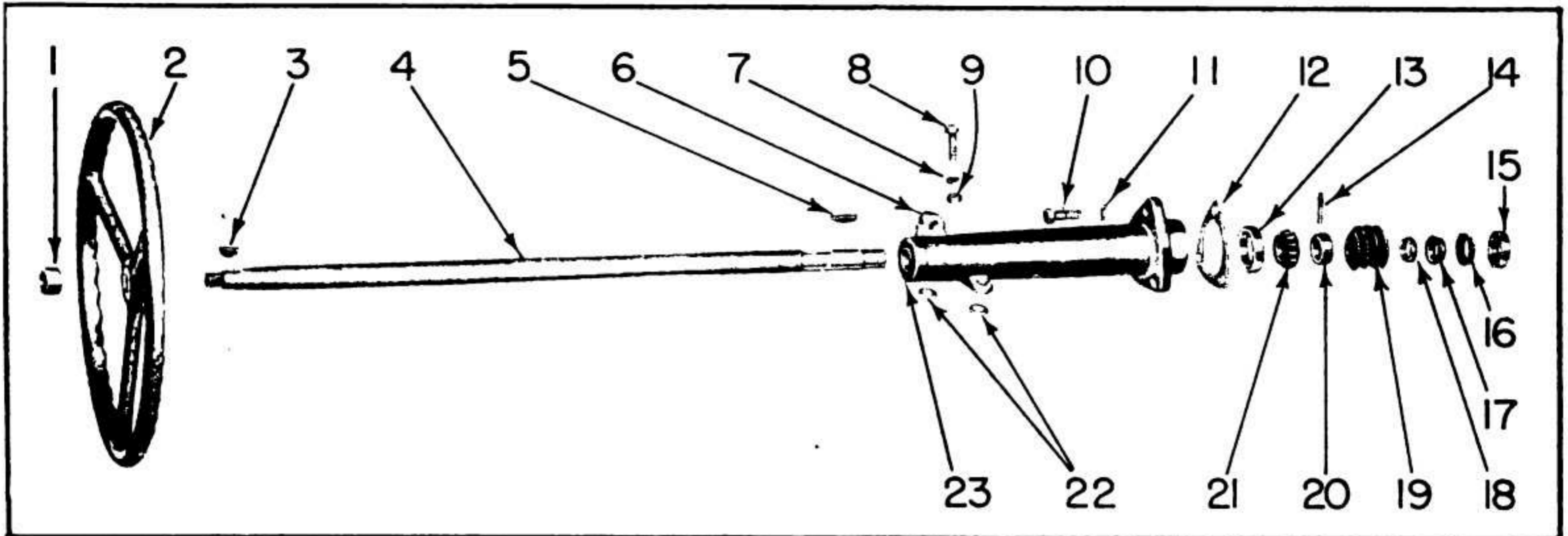


FIG. 14-2 — 1402 STEERING COLUMN

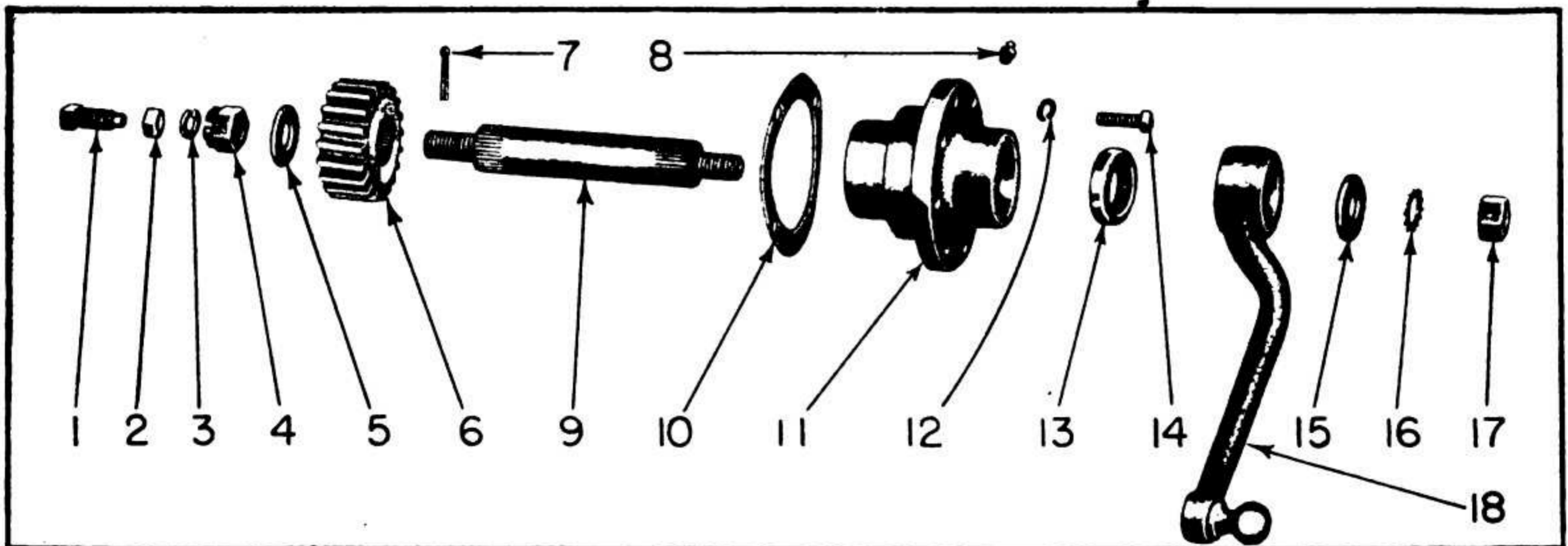


FIG. 14-3 — 1403 STEERING ADJUSTING SLEEVE AND ARM

1401 DRAG LINK

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
14-1	6	VTA-447	Drag Link (Complete)	TP	16-D551	1
14-1	6	VT-3887	Drag Link	TP	VT-3887	1
14-1	4	04314-AB	Bearing	TP	16-DB29	4
14-1	3	04313-AB	Screw, Adjusting	TP	16-DB23	2
14-1	2		Fitting, Grease, Elbow P.T. 1/8" 90°	LEC	5408	2
14-1	1	04312-AB	Lockwire	TP	16-DM1	2
14-1	6	04315-AB	Spring	TP	16-DS1	2

GROUP 14 — STEERING GROUP

1402 STEERING COLUMN

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
14-2	6	VTA-688	Column, Steering, w/Bushing			1
14-2	23	VT-4010	Bushing, Steering Column	CC	A-1351-4	1
14-2	8		Screw, Cap, Hex. Hd. 3/8 x 1-1/4" N.C.			2
14-2	9		Nut, Hex. 3/8" N.C.			2
14-2	7		Washer, Lock 3/8"			2
14-2	10		Screw, Cap, Hex. Hd. 1/2 x 1-1/2" N.C.			3
14-2	11		Washer, Lock 1/2"			3
14-2	12	VT-4044	Shim, Steering Column .005"			—
14-2	12	VT-4045	Shim, Steering Column .010"			—
14-2	22		Washer, Wrought 3/8"			6
14-2	4	VT-3871	Shaft, Steering			1
14-2	15	07165-AB	Cup, Bearing	TIM	13C	1
14-2	17	07164-AB	Cone, Bearing	TIM	12CB	1
14-2	16	07163-AB	Cage, Bearing	TIM	11BC	1
14-2	13	VT-4038	Cup, Bearing	TIM	15520	1
14-2	21	VT-4039	Cone, Bearing	TIM	15580	1
14-2	3		Key, Woodruff #15			1
14-2	5		Key, Woodruff #127			1
14-2	1		Nut, Hex. 3/4" N.F.			1
14-2	18	VT-3884	Spacer, Steering Worm — Lower			1
14-2	20	VT-3883	Spacer, Steering Worm — Upper			1
14-2	14		Pin, Groove Type #3, 1/4 x 1-1/2"			1
14-2	2	VT-4051	Steering Wheel	SL	VT-4051	1
14-2	19	02764-AB	Steering Worm			1

1403 STEERING ADJUSTING SLEEVE AND ARM

14-3	1		Screw, Set, Sq. Hd. Flat Point 5/8 x 2" N.C.			1
14-3	2		Nut, Hex. Jam 5/8" N.C.			1
14-3	3		Washer, Lock 5/8"			1
14-3	9	VT-3542	Shaft, Steering Arm			1
14-3	17		Nut, Hex. 3/4" N.F.			1
14-3	4		Nut, Hex. Cast. 7/8" N.F.			1
14-3	7		Pin, Cotter 1/8 x 1-1/4"			1
14-3	18	VTA-448	Steering Arm Assembly, Rear			1
14-3	16		Washer, (Shakeproof) External Teeth 3/4"			1
14-3	5	02856-AB	Washer, Steering Arm Shaft			1
14-3	15	VT-3582	Washer, Steering Arm Shaft	WWM	VT-3582	1
14-3	6	VT-4046	Worm Wheel			1
14-3	11	VT-252	Sleeve, Worm Wheel Adjusting			1
14-3	8		Fitting, Grease, Str. Drive 1/4"			1
14-3	10	VT-4043	Gasket, Worm Wheel Adjusting Sleeve	VG	DD-1543-CI	1
14-3	13	VT-2233	Oil Seal, Steering Gear Housing	CM	VT-2233	1
14-3	14		Screw, Cap, Hex. Hd. 3/8 x 1-1/4" N.C.			4
14-3	12		Washer, Lock 3/8"			4

GROUP 15 — FRAME AND BRACKETS GROUP

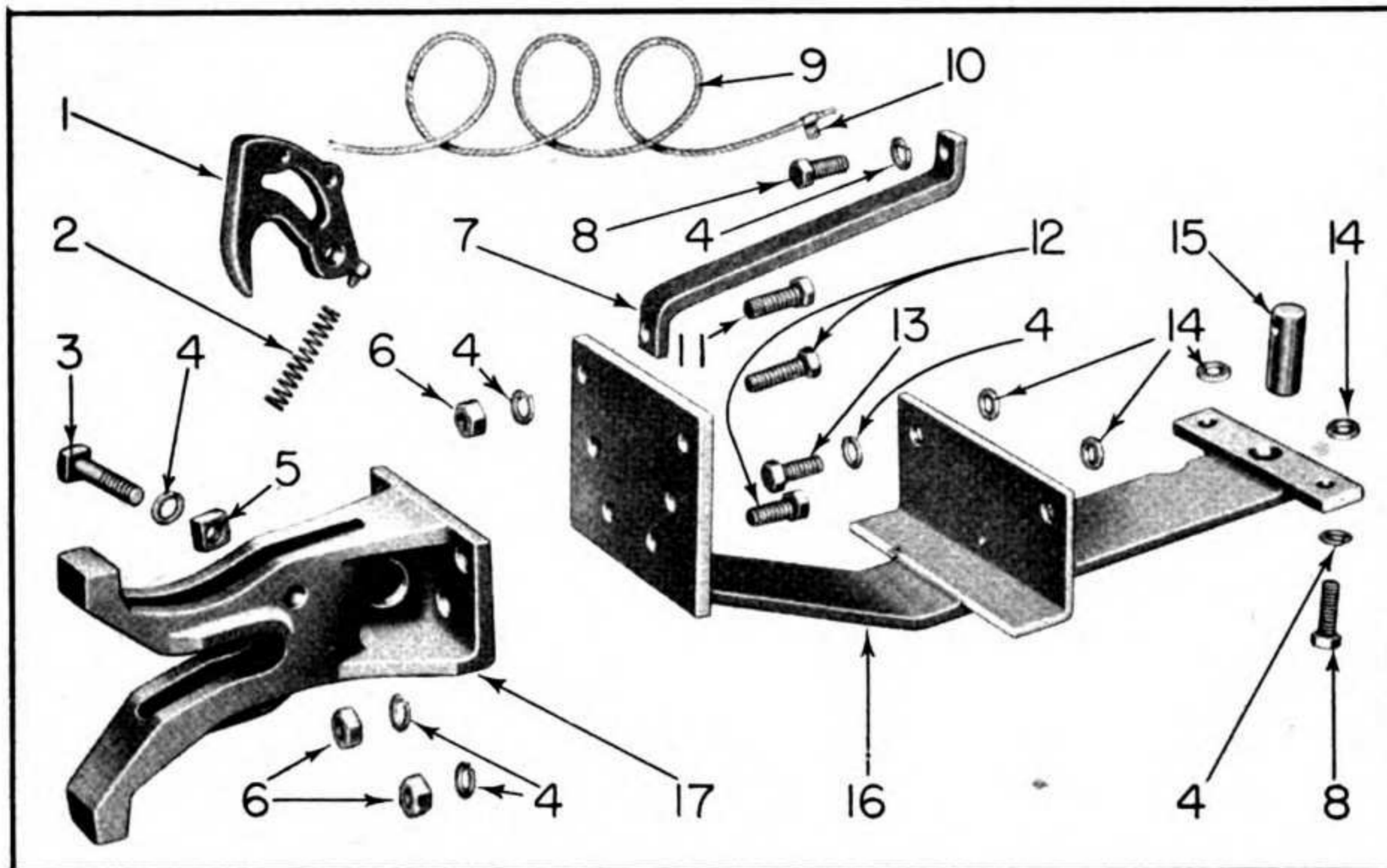


FIG. 15-1 — 1501 COUPLER

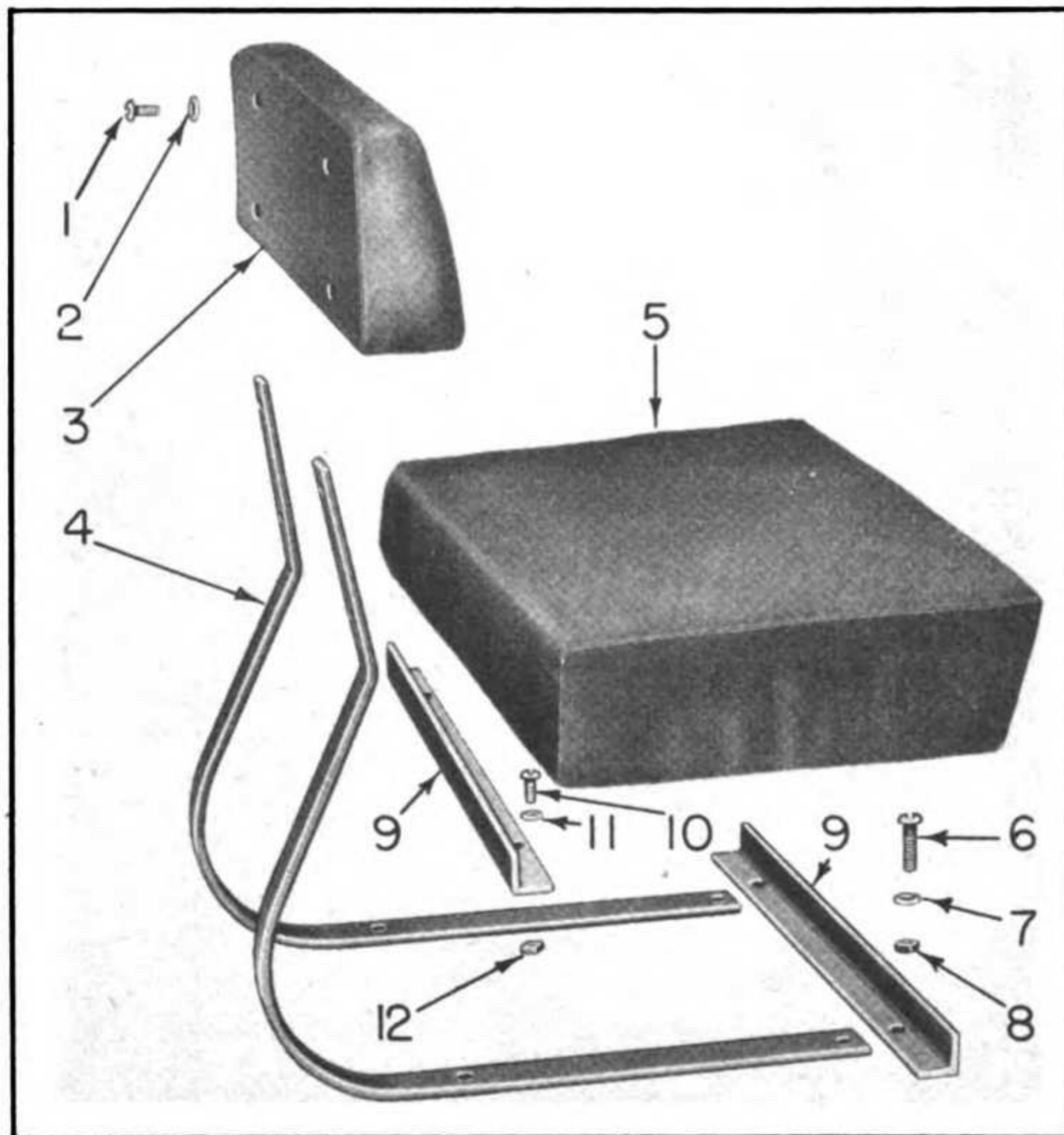


FIG. 15-2 — 1502 SEAT ASSEMBLY

GROUP 15 — FRAME AND BRACKETS GROUP

1501 COUPLER

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
15-1	17	VT-4122	Coupler Jaw	MUM.	P-1261-8	1
15-1	3		Bolt, Mach. 5/8 x 3" N.C.			1
15-1	5		Nut, Sq. 5/8" N.C.			1
15-1	4		Washer, Lock 5/8"			1
15-1	1	VT-4123	Coupler Dog	MUM	P-1262-4	1
15-1	9	VT-4111	Rope, Coupler			1
15-1	10	VT-4110	Clip, Coupler Rope			1
15-1	2	VT-4124	Spring, Coupler Dog	MUM	P-3121-2	1
15-1	16	VTA-707	Support Assembly, Rear Drawbar			1
15-1	7	VT-3942	Brace, Drawbar Upper			2
15-1	8		Screw, Cap, Hex. Hd. 5/8 x 1-3/4" N.C.			2
15-1	4		Washer, Lock 5/8"			2
15-1	11		Screw, Cap, Hex. Hd. 5/8 x 2" N.C.			2
15-1	6		Nut, Hex. 5/8" N.C.			2
15-1	4		Washer, Lock 5/8"			2
15-1	15	VT-3482	Pin, Drawbar			1
15-1	13		Screw, Cap, Hex. Hd. 5/8 x 1-1/4" N.C.			2
15-1	4		Washer, Lock 5/8"			2
15-1	14		Washer, Plain 5/8" (Spacer)			—
15-1	8		Screw, Cap, Hex. Hd. 5/8 x 1-3/4"			2
15-1	4		Washer, Lock 5/8"			2
15-1	14		Washer, Plain 5/8" (Spacer)			—
15-1	12		Screw, Cap, Hex. Hd. 5/8 x 2-1/4" N.C.			4
15-1	6		Nut, Hex. 5/8"			4
15-1	4		Washer, Lock 5/8"			4

1502 SEAT ASSEMBLY

15-2	4	VT-3889	Brace, Back			2
15-2	3	VTA-695	Back-rest	ADN	VTA-695	1
15-2	1		Bolt, Stove, Rd. Hd. 1/4 x 1" N.C.			4
15-2	2		Washer, Lock 1/4"			4
15-2	9	VT-3890	Bracket, Seat			2
15-2	10		Screw, Mach. Rd. Hd. 3/8 x 1" N.C.			4
15-2	12		Nut, Sq. 3/8" N.C.			4
15-2	11		Washer, Lock 3/8"			4
15-2	6		Screw, Mach. Rd. Hd. 5/16 x 2-1/2" N.C.			4
15-2	8		Nut, Sq. 5/16" N.C.			4
15-2	7		Washer, Plain 5/16"			4
15-2	5	VTA-696	Cushion	ADN	VTA-696	1

GROUP 17 — HOOD, FENDERS, AND MISC. SHEET METAL GROUP

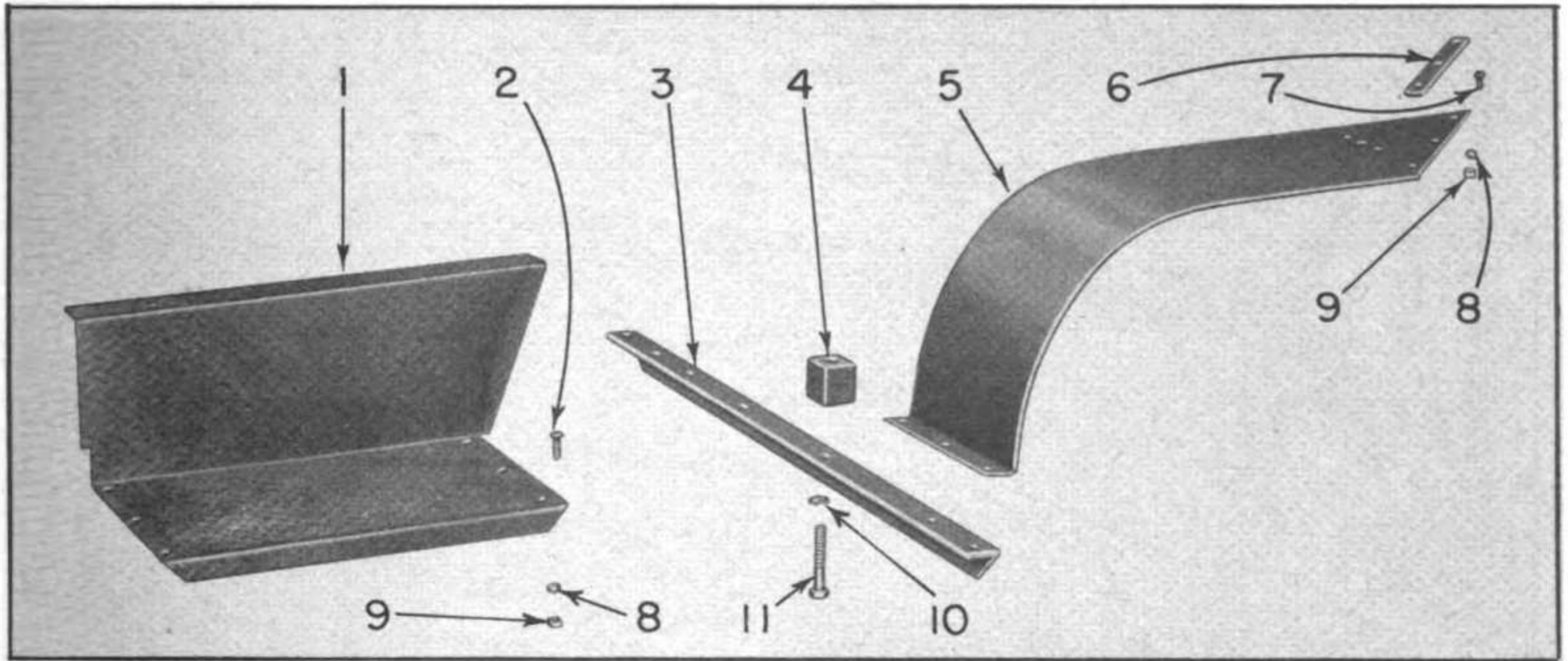


FIG. 17-1 — 1701 RUNNING BOARD AND FRONT FENDERS

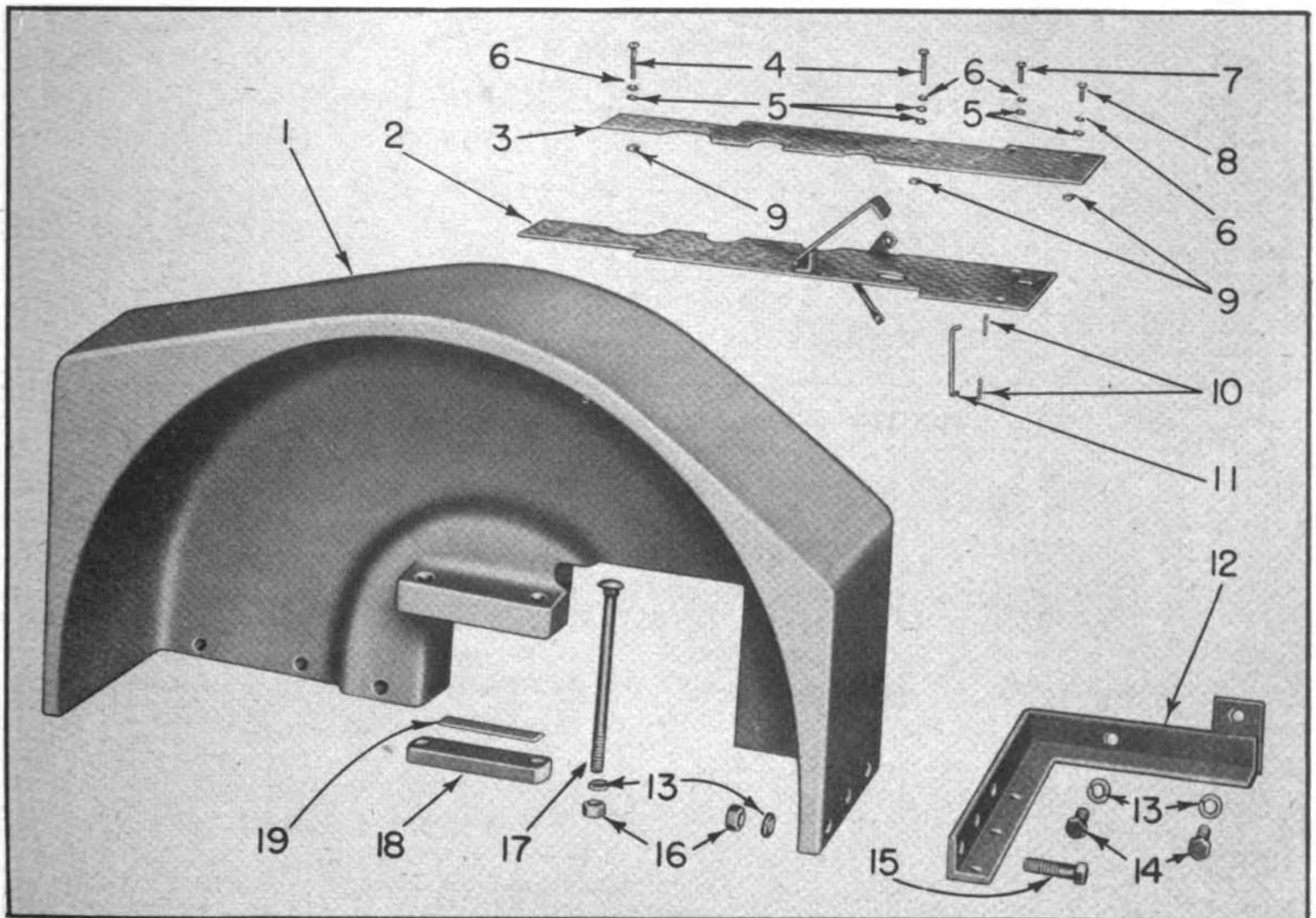


FIG. 17-2 — 1702 REAR FENDERS AND STEP PLATES

GROUP 17 — HOOD, FENDERS, AND MISC. SHEET METAL GROUP

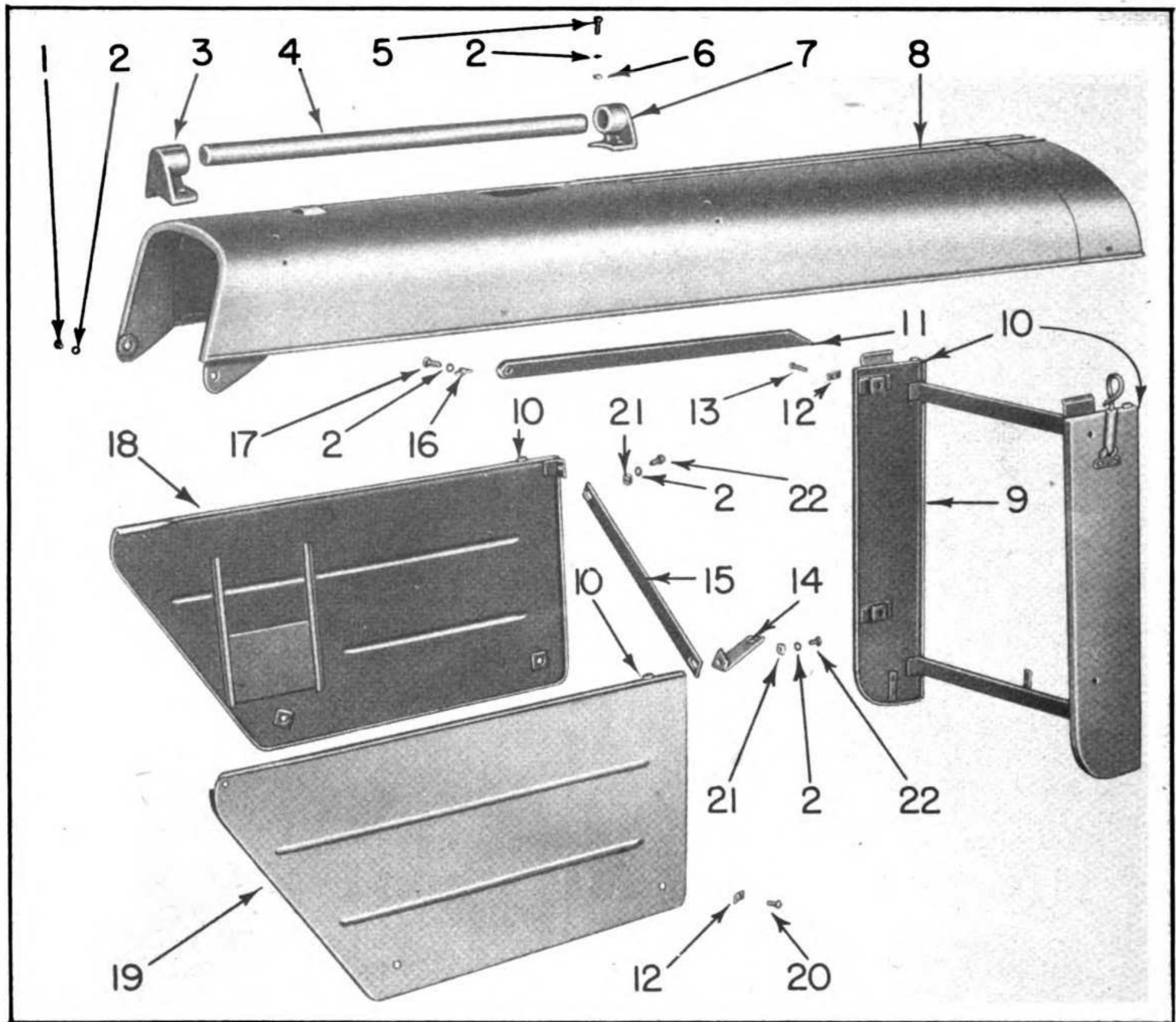


FIG. 17-3 — 1703 HOOD AND PANEL ASSEMBLY

GROUP 17 — HOOD, FENDERS, AND MISC. SHEET METAL GROUP

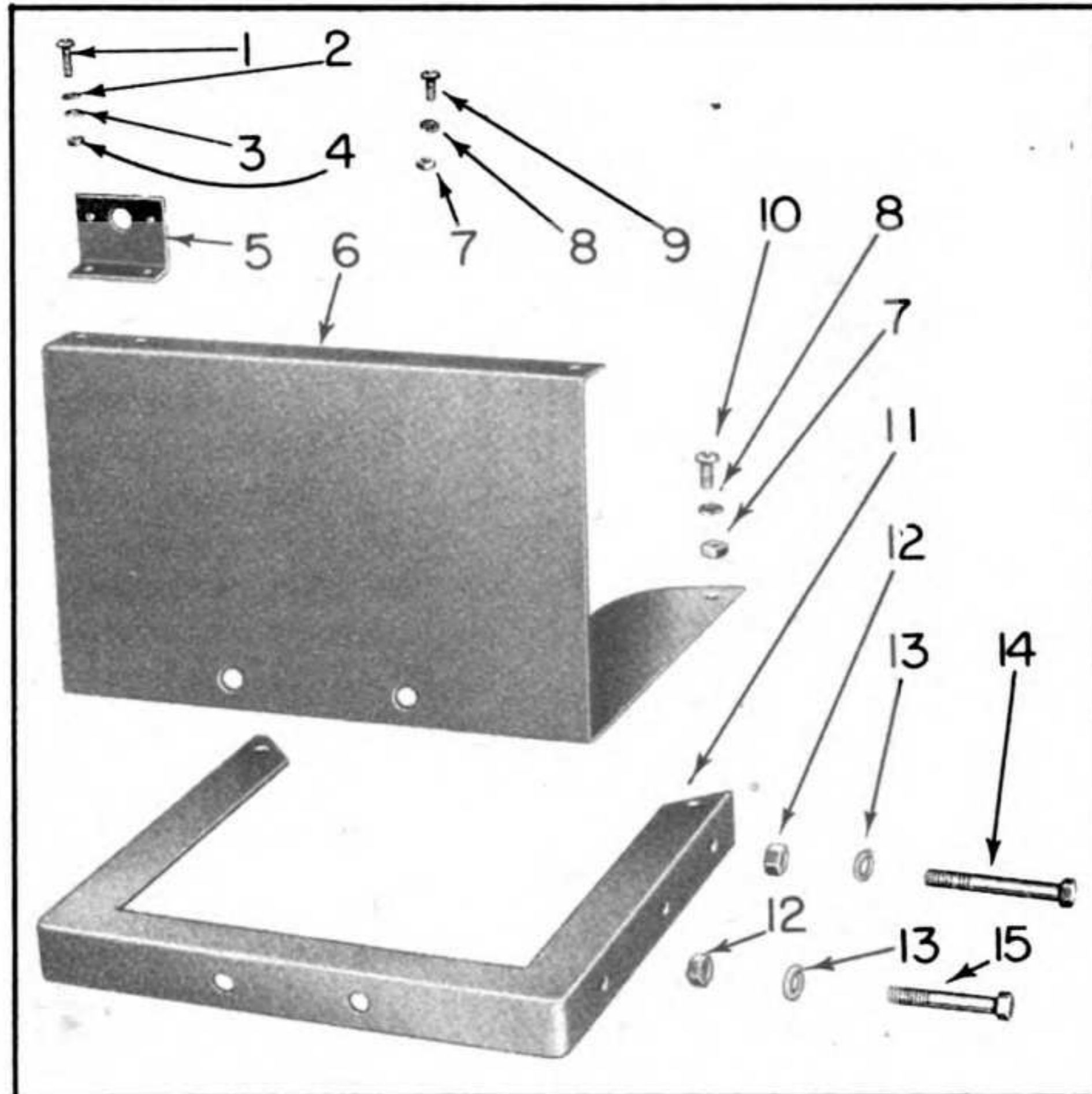


FIG. 17-4 — 1704 TOOL BOX ASSEMBLY

1701 RUNNING BOARD AND FRONT FENDERS

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
17-1	5	VTA-685	Fender, Front L.H.			1
17-1	5	VTA-684	Fender, Front R.H.			1
17-1	6	VT-4130	Clamp Strap, Front Fender			2
17-1	7		Bolt, Mach. Sq. Hd. 3/8 x 1" N.C.			6
17-1	9		Nut, Sq. 3/8" N.C.			6
17-1	8		Washer, Lock 3/8"			6
17-1	1	VT-3915	Running Board L.H. (VAIW-3 only)			1
17-1	1	VT-3914	Running Board R.H. (VAIW-3 only)			1
17-1	2		Screw, Mach. Rd. Hd. 3/8 x 1" N.C. (VAIW-3 only)			11
17-1	9		Nut, Sq. 3/8" N.C. (VAIW-3 only)			11
17-1	8		Washer, Lock 3/8" (VAIW-3 only)			11
17-1	1	VT-277	Running Board L.H. (VAIW-4 only)			1
17-1	1	VT-276	Running Board R.H. (VAIW-4 only)			1
17-1	2		Screw, Cap, Hex. Hd. 1/2 x 3" N.C. (VAIW-4 only)			8
17-1	9		Nut, Hex. 1/2" N.C. (VAIW-4 only)			8
17-1	8		Washer, Lock 1/2" (VAIW-4 only)			8
17-1	3	VT-4262	Support, Running Board Front			1
17-1	4	VT-248	Spacer, Running Board Front Support			2
17-1	11		Screw, Cap, Hex. Hd. 5/8 x 3-1/2" N.C.			2
17-1	10		Washer, Lock 5/8" N.C.			2

GROUP 17 — HOOD, FENDERS, AND MISC. SHEET METAL GROUP

1702 REAR FENDERS AND STEP PLATES

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
17-2	12	VTA-683	Brace, Rear Fender Front, L.H. (VAIW-3 only)			1
17-2	12	VTA-682	Brace, Rear Fender Front, R.H. (VAIW-3 only)			1
17-2	12	VTA-783	Brace, Rear Fender Front, L.H. (VAIW-4 only)			1
17-2	12	VTA-782	Brace, Rear Fender Front, R.H. (VAIW-4 only)			1
17-2	14		Screw, Cap, Hex. Hd. 5/8 x 1-1/2" N.C.			4
17-2	13		Washer, Lock 5/8"			4
17-2	15		Screw, Cap, Hex. Hd. 5/8 x 2-1/4" N.C.			6
17-2	16		Nut, Hex. 5/8" N.C.			6
17-2	13		Washer, Lock 5/8"			6
17-2	1	VT-251	Fender, Rear L.H. (VAIW-3 only)			1
17-2	1	VT-250	Fender, Rear R.H. (VAIW-3 only)			1
17-2	1	VT-275	Fender, Rear L.H. (VAIW-4 only)			1
17-2	1	VT-274	Fender, Rear R.H. (VAIW-4 only)			1
17-2	17		Bolt, Carriage 5/8 x 9" N.C.			4
17-2	16		Nut, Hex. 5/8" N.C.			4
17-2	13		Washer, Lock 5/8"			4
17-2	18	VT-4032	Clamp, Fender			2
17-2	19	VT-4133	Shim, Fender Mounting .0598"			—
17-2	19	VT-4132	Shim, Fender Mounting .1345"			—
17-2	3	VTA-709	Step Plate Assembly L.H.			1
17-2	8		Screw, Mach. Rd. Hd. 1/4 x 1/2" N.C. (VAIW-3 only)			1
17-2	9		Nut, Sq. 1/4" N.C. (VAIW-3 only)			1
17-2	6		Washer, Lock 1/4" (VAIW-3 only)			1
17-2	5		Washer, Plain 1/4" (VAIW-3 only)			1
17-2	7		Screw, Mach. Rd. Hd. 1/4 x 5/8" N.C.			1
17-2	6		Washer, Lock 1/4"			1
17-2	5		Washer, Plain 1/4"			1
17-2	4		Screw, Mach. Rd. Hd. 1/4 x 1-1/2" N.C.			2
17-2	9		Nut, Sq. 1/4" N.C.			2
17-2	6		Washer, Lock 1/4"			2
17-2	5		Washer, Plain 1/4"			4
17-2	2	VTA-451	Step Plate Assembly R.H.			1
17-2	11	VT-2438	Rod, Foot Feed			1
17-2	10		Pin, Cotter 1/16 x 1/2"			2
17-2	8		Screw, Mach. Rd. Hd. 1/4 x 1/2" N.C. (VAIW-3 only)			1
17-2	9		Nut, Sq. 1/4" N.C. (VAIW-3 only)			1
17-2	6		Washer, Lock 1/4" (VAIW-3 only)			1
17-2	5		Washer, Plain 1/4" (VAIW-3 only)			1
17-2	7		Screw, Mach Rd. Hd. 1/4 x 5/8" N.C.			1
17-2	6		Washer, Lock 1/4"			1
17-2	5		Washer, Plain 1/4"			1
17-2	4		Screw, Mach. Rd. Hd. 1/4 x 1-1/2" N.C.			2
17-2	9		Nut, Sq. 1/4" N.C.			2
17-2	6		Washer, Lock 1/4"			2
17-2	5		Washer, Plain 1/4"			4

GROUP 17 — HOOD, FENDERS, AND MISC. SHEET METAL GROUP**1703 HOOD AND PANEL ASSEMBLY**

Fig. No.	Rel. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
17-3	9	VTA-692	Grille Side Assembly			1
17-3	10	VT-3991	Cushion, Hood	HEE	VT-3991	2
17-3	13		Screw, Mach. 1/4 x 1-1/4" N.C.			4
17-3	12		Nut, Speed #160			4
17-3	8	VTA-679	Hood Assembly			1
17-3	4	VT-3902	Hand Rail			2
17-3	1		Screw, Cap, Hex. Hd. Self-Tapping (Shakeproof) 1/4 x 5/8"			2
17-3	2		Washer, Lock 1/4"			2
17-3	7	VT-228	Socket, Hand Rail Front			2
17-3	5		Screw, Cap, Hex. Hd. 1/4 x 3/4" N.C.			4
17-3	6		Nut, Hex. 1/4" N.C.			4
17-3	2		Washer, Lock 1/4"			4
17-3	3	VT-229	Socket, Hand Rail Rear			2
17-3	5		Screw, Cap, Hex. Hd. 1/4 x 3/4" N.C.			4
17-3	6		Nut, Hex. 1/4" N.C.			4
17-3	2		Washer, Lock 1/4"			4
17-3	11	VT-3641	Support, Hood			1
17-3	17		Screw, Mach. Rd. Hd. 1/4 x 1" N.C.			1
17-3	16		Nut, Wing 1/4" N.C.			1
17-3	2		Washer, Lock 1/4"			1
17-3	18	VTA-656	Side Sheet Assembly L.H.			1
17-3	10	VT-3991	Cushion, Hood	HEE	VT-3991	1
17-3	20		Screw, Mach. 1/4 x 3/4" N.C.			2
17-3	12		Nut, Speed #160			2
17-3	22		Screw, Mach. Rd. Hd. 1/4 x 5/8" N.C.			1
17-3	21		Nut, Sq. 1/4" N.C.			1
17-3	2		Washer, Lock 1/4"			1
17-3	19	VTA-708	Side Sheet Assembly R.H.			1
17-3	10	VT-3991	Cushion, Hood			1
17-3	15	VT-3632	Brace, Hood			1
17-3	14	VT-3863	Brace, Side Sheet			1
17-3	22		Screw, Mach. Rd. Hd. 1/4 x 5/8" N.C.			1
17-3	21		Nut, Sq. 1/4" N.C.			1
17-3	2		Washer, Lock 1/4"			1
17-3	20		Screw, Mach. 1/4 x 3/4" N.C.			2
17-3	12		Nut, Speed #160			2

GROUP 17 — HOOD, FENDERS, AND MISC. SHEET METAL GROUP**1704 TOOL BOX ASSEMBLY**

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
17-4	11	VT-3922	Support, Tool Box Sheet			1
17-4	15		Screw, Cap, Hex. Hd. 5/8 x 3-3/4" N.C.			4
17-4	12		Nut, Hex. 5/8" N.C.			4
17-4	13		Washer, Lock 5/8"			4
17-4	14		Screw, Cap, Hex. Hd. 5/8 x 4-3/4" N.C.			2
17-4	12		Nut, Hex. 5/8" N.C.			2
17-4	13		Washer, Lock 5/8"			2
17-4	6	VT-4093	Tool Box Sheet			1
17-4	5	VT-4078	Bracket, Tail Light			1
17-4	1		Screw, Mach. Rd. Hd. 3/8 x 2" N.C.			2
17-4	4		Nut, Sq. 3/8" N.C.			2
17-4	2		Washer, Lock 3/8"			2
17-4	3		Washer, Plain 3/8"			2
17-4	9		Screw, Mach. Rd. Hd. 1/4 x 5/8" N.C.			1
17-4	7		Nut, Sq. 1/4" N.C.			1
17-4	8		Washer, Lock 1/4"			1
17-4	10		Screw, Mach. Rd. Hd. 1/4 x 3/4" N.C.			2
17-4	7		Nut, Sq. 1/4" N.C.			2
17-4	8		Washer, Lock 1/4"			2

GROUP 21 — BUMPER GUARD GROUP

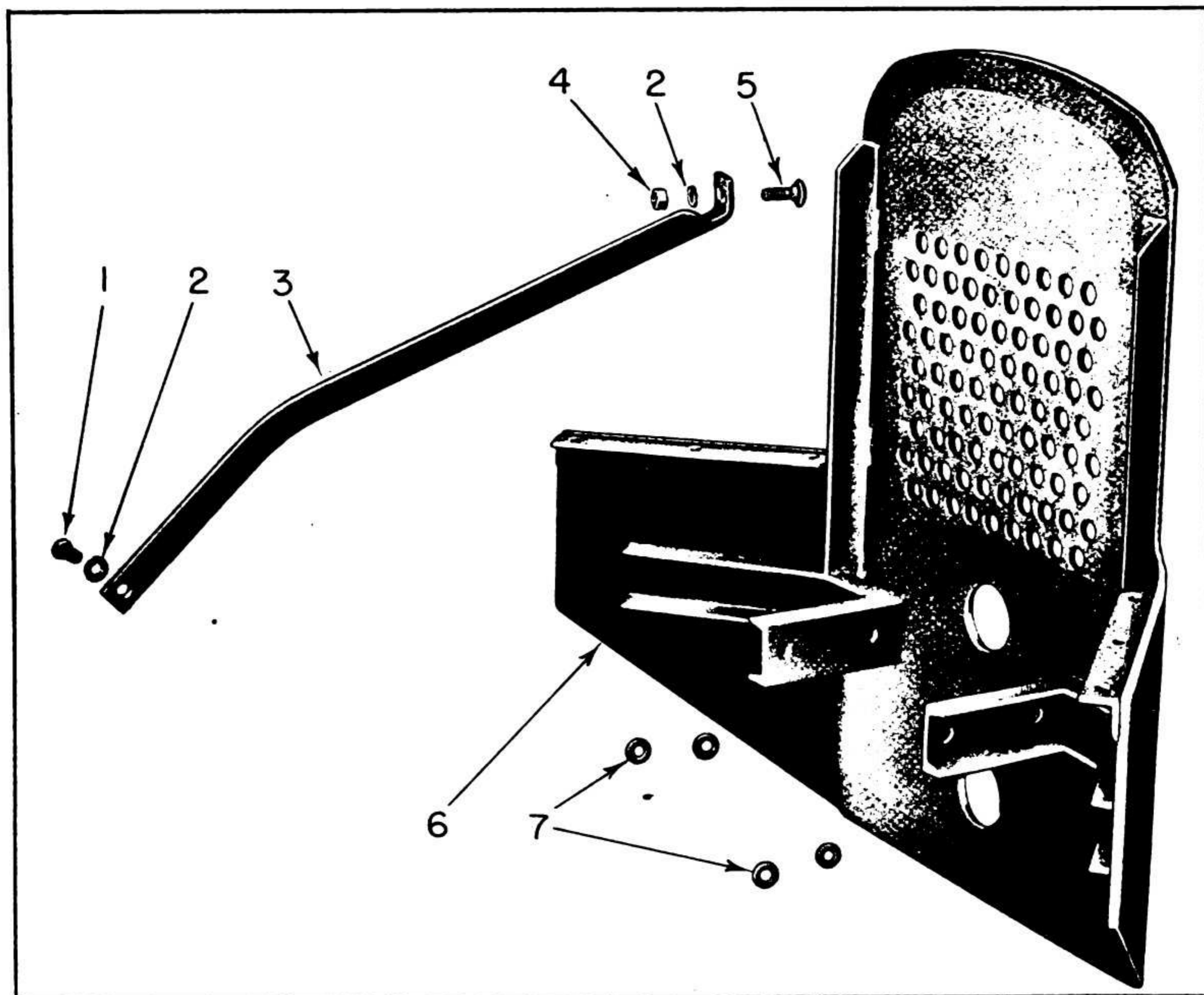


FIG. 21-1 — 2101 FRONT BUMPER ASSEMBLY

Fig. No.	Ref. No.	Case Part Number	Nomenclature	Vendor's Code	Vendor's Part Number	No. Req'd.
21-1	6	VTA-456	Bumper-Grille			1
21-1	3	VT-3939	Brace, Bumper, Upper L.H.			1
21-1	3	VT-3938	Brace, Bumper, Upper R.H.			1
21-1	5		Bolt, Carriage 5/8 x 2-1/2" N.C.			2
21-1	4		Nut, Hex. 5/8" N.C.			2
21-1	2		Washer, Lock 5/8"			2
21-1	1		Screw, Cap, Hex. Hd. 5/8 x 1-1/2" N.C.			2
21-1	2		Washer, Lock 5/8"			2
21-1	7		Washer, Plain 3/4" (Spacer)			4

GROUP 23 — STANDARIZED PARTS GROUP

Description	Quan. Used	Description	Quan. Used
BOLTS		NUTS (continued)	
BOLT, carriage, 1/2 x 2-1/2" N.C.	12	NUT, hex. jam, 3/8" N.F.	1
BOLT, carriage, 5/8 x 2-1/2" N.C.	2	NUT, hex. jam, 3/4" N.F.	2
BOLT, carriage, 5/8 x 9" N.C.	4	NUT, hex. jam, #12—24	2
BOLT, hex. hd., 1/4 x 11/16" N.C.	4	NUT, 3/8" — 16 x 1/4" high.....	2
BOLT, hex. hd., 1/4 x 1/2" N.C.	2	NUT, 7/16" — 20 x 1/4" high.....	1
BOLT, hex. hd., 1/4 x 1-1/4" N.C.	1	NUT, pal-nut, 1/2" — 20.....	6
BOLT, hex. hd., 1/4 x 1-3/4" N.C.	1	NUT, plain, slotted, 1" N.F.....	2
BOLT, hex. hd., 3/8 x 1" N.C.	9	NUT, speed, #160.....	8
BOLT, hex. hd., 3/8 x 1-1/4" N.C.	3	NUT, sq., #10—24	1
BOLT, hex. hd., 3/8 x 1-1/2" N.C.	3	NUT, sq., 3/8"	1
BOLT, hex. hd., 3/8 x 2-3/4" N.C.	1	NUT, sq., 1/4"	3
BOLT, hex. hd., 1/2 x 3-3/4" N.C.	1	NUT, sq., 5/16"	2
BOLT, hex. hd., 5/8 x 1-1/2" N.C.	8		
BOLT, hex. hd., 5/8 x 2-1/4" N.C.	2	PINS	
BOLT, hex. hd., 5/16 x 3/4" N.C.	7	PIN, cotter, 1/16 x 1/2"	2
BOLT, hex. hd., 5/16 x 2-1/4" N.C.	6	PIN, cotter, 1/16 x 3/4"	2
BOLT, hex. hd., 5/16 x 1-1/4" N.F.	2	PIN, cotter, 1/8 x 1"	2
BOLT, machine, 5/8 x 3" N.C.	1	PIN, cotter, 1/8 x 1-1/4"	5
BOLT, machine, rd. hd., 1/4 x 1/2" N.C.	2	PIN, cotter, 1/8 x 1-1/2"	2
BOLT, machine, rd. hd., 1/8 x 1/2" N.C.	2	PIN, cotter, 3/16 x 1-1/2"	1
BOLT, machine, sq. hd., 3/8 x 1" N.C.	6	PIN, cotter, 3/32 x 3/4"	14
BOLT, machine, sq. hd., 3/8 x 1-1/4" N.C.	1	PIN, groove type #3, 1/4 x 1-1/2".....	1
BOLT, stove, rd. hd., 1/4 x 1" N.C.	4	PIN, taper, #00—3/4".....	4
		PLUGS	
FITTINGS		PLUG, hubbard, 1/2"	2
FITTING, elbow P.T. 3/16 x 1/8".....	2	PLUG, hubbard, 1"	1
FITTING, grease, elbow, drive 1/4" x 67-1/2°.....	1	PLUG, pipe, 1/8"	2
FITTING, grease, elbow, P.T. 1/8 x 90°.....	4	PLUG, pipe, 3/4"	1
FITTING, grease, str. drive 1/4".....	4	PLUG, pipe, slotted, 1/8"	1
FITTING, grease, str. P.T. 1/8".....	10	PLUG, pipe, slotted 1/4".....	2
FITTING, pipe plug, 1/4".....	2	PLUG, pipe, sq. hd., 3/4".....	1
FITTING, pipe plug, 3/4".....	1	PLUG, std., pipe, 1/8".....	1
		SCREWS	
KEYS		SCREW, attach., fil. hd., #10—32 x 1/2".....	4
KEY, Morten Hi Pro #808.....	2	SCREW, attach., fil. hd., #10—32 x 3/8".....	4
KEY, Woodruff #5.....	2	SCREW, attach., fil. hd., #10—32 x 5/16".....	1
KEY, Woodruff #6.....	2	SCREW, attach., rd. hd., #6—32 x 3/16".....	1
KEY, Woodruff #15.....	4	SCREW, bdg. hd., #8—32 x 7/16".....	1
KEY, Woodruff #127.....	1	SCREW, bdg. hd. #10-32 x 3/16".....	1
		SCREW, cap, hex. hd., 1/4 x 1/2" N.C.....	4
NUTS		SCREW, cap, hex. hd., 1/4 x 3/4" N.C.....	8
NUT, cast., 5/16" N.F.....	1	SCREW, cap, hex. hd., 5/16 x 1" N.C.....	4
NUT, cast., 5/8" N.F.....	2	SCREW, cap, hex. hd., 5/8 x 1-1/4" N.C.....	6
NUT, sq., #10—32.....	2	SCREW, cap, hex. hd., 5/8 x 1-1/2" N.C.....	6
NUT, hex., #10—32.....	6	SCREW, cap, hex. hd., 5/8 x 1-3/4" N.C.....	10
NUT, hex., 3/8"—16	2	SCREW, cap, hex. hd., 5/8 x 2" N.C.....	2
NUT, hex., 5/8"	4	SCREW, cap, hex. hd., 5/8 x 2-1/4" N.C.....	10
NUT, hex., 1/2"	12	SCREW, cap, hex. hd., 5/8 x 2" N.C.....	2
NUT, hex., 3/8" N.F.	6	SCREW, cap, hex. hd., 5/8 x 3-1/2" N.C.....	2
NUT, hex., 5/8" N.F.	26	SCREW, cap, hex. hd., 5/8 x 3-3/4" N.C.....	4
NUT, hex., 5/16" — 24.....	2	SCREW, cap, hex. hd., 5/8 x 4" N.C.....	2
NUT, hex., 5/16" N.F.	7	SCREW, cap, hex. hd., 5/8 x 4-3/4" N.C.....	2
NUT, hex. cast., 1" N.F.	2	SCREW, cap, hex. hd., 3/8 x 3/4" N.C.....	6
NUT, hex. cast., 7/8" N.F.	1		
NUT, hex. jam, 5/16" N.F.	9		

GROUP 23 — STANDARIZED PARTS GROUP

Description	Quan. Used	Description	
SCREWS (continued)		WASHERS (continued)	
SCREW, cap, hex. hd., 3/8 x 1" N.C.....	8	WASHER, plain (spacer), 5/8".....	
SCREW, cap, hex. hd., 3/8 x 1-1/4" N.C.....	6	WASHER, plain (spacer), 3/4".....	
SCREW, cap, hex. hd., 1/2 x 1-1/2" N.C.....	3	WASHER, (shakeproof) external teeth, 3/4".....	
SCREW, cap, hex. hd., 1/2 x 2" N.C.....	1	WASHER, (shakeproof) external teeth, 5/16".....	
SCREW, cap, hex. hd., 1/2 x 3" N.C.....	8	WASHER, (shakeproof) internal teeth, 1/4".....	
SCREW, cap, hex. hd., s-t, 1/4 x 5/8".....	2	WASHER, (shakeproof) #10.....	
SCREW, dog point set, 3/8—16 x 1-1/4".....	1	WASHER, wrought, 5/16".....	
SCREW, fil. hd., #6—32 x 5/32".....	1	WASHER, wrought, 3/8".....	
SCREW, fil. hd., #8—32 x 5/16".....	4		
SCREW, fil. hd., #8—32 x 1/2".....	1		
SCREW, flat fil. hd., 1/4 x 5/8".....	5		
SCREW, hex. hd., #6—32 x 5/16".....	1		
SCREW, lock, fil. hd., #8—32 x 3/16".....	1		
SCREW, machine, 1/4 x 1-1/4" N.C.....	4		
SCREW, machine, 1/4 x 3/4" N.C.....	2		
SCREW, machine, fil. hd., #10—24 x 1/2".....	1		
SCREW, machine, rd. hd., 1/4 x 1/2" N.C.....	2		
SCREW, machine, rd. hd., 1/4 x 3/4".....	5		
SCREW, machine, rd. hd., 1/4 x 5/8 N.C.....	5		
SCREW, machine, rd. hd., 1/4 x 1" N.C.....	1		
SCREW, machine, rd. hd., 1/4 x 1-1/2" N.C.....	4		
SCREW, machine, rd. hd., 5/16 x 1".....	2		
SCREW, machine, rd. hd., 5/16 x 2-1/2" N.C.....	4		
SCREW, machine, rd. hd., 3/8 x 1" N.C.....	15		
SCREW, machine, rd. hd., 3/8 x 1-1/4" N.C.....	1		
SCREW, machine, rd. hd., 3/8 x 2" N.C.....	2		
SCREW, rd. hd., #8—32 x 7/16".....	1		
SCREW, rd. hd., #8—32 x 3/8".....	3		
SCREW, rd. hd., #10—32 x 1-1/2".....	1		
SCREW, rd. hd., #10—32 x 5/16".....	2		
SCREW, set, sq. hd., cup point, 3/8 x 3/4" N.C.....	2		
SCREW, set, sq. hd., flat point, 5/8 x 2".....	1		
WASHERS			
WASHER, (internal shakeproof), 3/8".....	3		
WASHER, lock, #6.....	3		
WASHER, lock, #10.....	15		
WASHER, lock, #12.....	2		
WASHER, lock, 1/4".....	50		
WASHER, lock, 1/2".....	21		
WASHER, lock, 3/8".....	81		
WASHER, lock, 3/4".....	3		
WASHER, lock, 3/16".....	1		
WASHER, lock, 5/8".....	94		
WASHER, lock, 5/16".....	32		
WASHER, lock, 7/16".....	5		
WASHER, lock, 1".....	4		
WASHER, plain, #6.....	1		
WASHER, plain, #8.....	1		
WASHER, plain, #10.....	1		
WASHER, plain, 1/4".....	13		
WASHER, plain, 1/2".....	15		
WASHER, plain, 3/8".....	8		
WASHER, plain, 5/16".....	8		
WASHER, plain, 1".....	2		
WASHER, plain, 1-1/8".....	1		
WASHER, plain, 5/16".....	4		

GROUP 25 — BEARING CHART

Major Unit	Type	Case Part Number	Manufacturer's Part Number	Group	No. Req'd.
DIFFERENTIAL					
Differential Left Bearing Cone	Roller	VT-3464	TIM 28682	0704	1
Differential Left Bearing Cup	Roller	VT-3463	TIM 28623	0704	1
Differential Right Bearing Cone	Roller	VT-3435	TIM 387	0704	1
Differential Right Bearing Cup	Roller	VT-2136	TIM 382	0704	1
ENGINE CLUTCH					
Engine Clutch Release Bearing	Thrust	VT-2119	AB A-899-2	0201	1
Engine Clutch Bearing Cone	Roller	VT-2112	TIM 14119-A	0201	2
Engine Clutch Bearing Cup	Roller	VT-2097	TIM 14276	0201	2
FRONT AXLE					
Front Axle Bearing	Thrust	VT-3984	TIM T-101	1001	2
FRONT WHEEL					
Front Wheel Inner Bearing Cone	Roller	03766-AB	TIM 02877	1301	2
Front Wheel Inner Bearing Cup	Roller	03765-AB	TIM 02820	1301	2
Front Wheel Outer Bearing Cone	Roller	01462-AB	TIM 14125-A	1301	2
Front Wheel Outer Bearing Cup	Roller	01461-AB	TIM 14274	1301	2
GENERATOR					
Generator Bearing	Ball	(AL X-441)	N.D. #203	0601	1
GOVERNOR					
Governor Rocker Shaft Bearing	Needle	F400S-204	TR B-610	0304	1
REAR AXLE					
Rear Axle Inner Bearing Cone	Roller	VT-3433	TIM 368	1101	2
Rear Axle Inner Bearing Cup	Roller	VT-3434	TIM 362	1101	2
Rear Axle Outer Bearing Cone	Roller	VT-2137	TIM 389-A	1101	2
Rear Axle Outer Bearing Cup	Roller	VT-2136	TIM 382	1101	2
STEERING COLUMN					
Steering Column Bearing Cage	Thrust	07163-AB	TIM 11-BC	1402	1
Steering Column Lower Bearing Cone	Thrust	07164-AB	TIM 12-CB	1402	1
Steering Column Lower Bearing Cup	Thrust	07165-AB	TIM 13-C	1402	1
Steering Column Upper Bearing Cone	Roller	VT-4039	TIM 15580	1402	1
Steering Column Upper Bearing Cup	Roller	VT-4038	TIM 15520	1402	1
TRANSMISSION					
Transmission Countershaft Front Bearing Cone	Roller	VT-2112	TIM 14119-A	0702	1
Transmission Countershaft Front Bearing Cup	Roller	VT-2097	TIM 14276	0702	1
Transmission Countershaft Rear Bearing Assembly	Roller	VTA-645	TIM 4C	0702	1
Transmission Mainshaft Front Bearing Cone	Roller	VT-3404	TIM 15120	0702	1
Transmission Mainshaft Front Bearing Cup	Roller	VT-3403	TIM 15244	0702	1
Transmission Mainshaft Rear Bearing Cone	Roller	VT-2112	TIM 14119-A	0702	1
Transmission Mainshaft Rear Bearing Cup	Roller	VT-2097	TIM 14276	0702	1
WATER PUMP					
Water Pump Bearing	Ball	Y-13073	N.D. TT502	0502	2

ALPHABETICAL INDEX

Description	Sub Group	Description
A		
ACTUATING LEVER, L.H.....	1201	BODY, oil pump.....
ACTUATING LEVER, R.H.....	1201	BODY, oil pump (complete assembly).....
ADAPTER, temperature gage.....	0605	BOLT and torsion spring assembly.....
AIR CLEANER	0106	BOLT, connecting rod.....
AMMETER	0605	BOLT, control handle tension.....
ANTI-SQUEAK, fuel tank.....	0303	BOLT, gear cover (3/8 x 1-1/4").....
ARM, advance.....	0603	BOLT, gear cover (3/8 x 1-7/8").....
ARM ASSEMBLY, breaker plate.....	0603	BOLT, gear cover (3/8 x 2-3/4")
ARMATURE ASSEMBLY, generator.....	0601	BOLT, gear cover (3/8 x 3-1/4").....
ARMATURE ASSEMBLY, starting motor.....	0602	BOLT, ground body.....
ARM, steering, L.H.....	1001	BOLT, ground body.....
ARM, steering, R.H.....	1001	BOLT, oil pan assembly.....
		BOLT, rocker arm bracket.....
		BOLT, rocker arm shaft bracket.....
		BOLT, shackle hanger.....
		BOLT, thru.....
		BOWL, fuel strainer.....
		BRACE, back
		BRACE, bumper, upper L.H.....
		BRACE, bumper, upper R.H.....
		BRACE, drawbar upper.....
		BRACE, hood
		BRACE, rear fender front L.H. (VAIW-3 only)
		BRACE, rear fender front R.H. (VAIW-3 only)
		BRACE, rear fender front L.H. (VAIW-4 only)
		BRACE, rear fender front R.H. (VAIW-4 only)
		BRACE, side sheet.....
		BRACKET AND SUPPORT, fuel tank (front)..
		BRACKET AND SUPPORT, fuel tank (rear)....
		BRACKET, clutch unit.....
		BRACKET, choker
		BRACKET, front axle.....
		BRACKET, generator
		BRACKET, headlight
		BRACKET, seat
		BRACKET, speed control lever.....
		BRACKET, spring mounting.....
		BRACKET, tail light.....
		BRACKET, valve rocker arm.....
		BRACKET, valve rocker arm shaft center.....
		BRAKE CATCH
		BRAKE RETURN SPRING.....
		BRUSH, grounded
		BRUSH, insulated
		BRUSH, main
		BRUSH, third
		BULB, 32 C.P., 6-8 V, S-C.....
		BULB, 3 C.P., 6-8 V, S-C.....
		BUMPER ASSEMBLY, front.....
		BUSHING, camshaft — center.....
		BUSHING, camshaft — front.....
		BUSHING, camshaft — rear.....
		BUSHING, crankshaft pilot.....
		BUSHING, differential pinion.....
		BUSHING, differential side gear.....
		BUSHING, insulating
		BUSHING, ins., term. stud.....
		BUSHING, ins., term. stud.....
		BUSHING, ins., post, inner.....
B		
BACK-REST	1502	
BALE ASSEMBLY, fuel strainer.....	0303	
BALL and socket.....	0302	
BALL BEARING, complete.....	0502	
BALL, gear shift lever.....	0704	
BALL, valve spring.....	0106	
BAND COVER.....	0601	
BAND COVER.....	0602	
BASE ASSEMBLY, distributor.....	0603	
BATTERY	0604	
BATTERY BOX ASSEMBLY.....	0604	
BEARING	0601	
BEARING	0602	
BEARING	1401	
BEARING, absorbent bronze.....	0603	
BEARING, ball, S.A.E. #203.....	0601	
BEARING, connecting rod.....	0103	
BEARING, connecting rod (complete set, stand- ard size).....	0103	
BEARING, connecting rod (complete set, .020 undersize)	0103	
BEARING, crankshaft — center lower.....	0103	
BEARING, crankshaft — center upper.....	0103	
BEARING, crankshaft — front lower.....	0103	
BEARING, crankshaft — front upper.....	0103	
BEARING, crankshaft — rear lower.....	0103	
BEARING, crankshaft — rear upper.....	0103	
BEARING, governor rocker shaft.....	0304	
BEARING, main crankshaft (complete set, standard size).....	0103	
BEARING, main crankshaft (complete set, .020 undersize)	0103	
BEARING, release	0201	
BEARING, thrust	1001	
BELLOWS, seal.....	0502	
BELT, fan.....	0502	
BLOCK, spring pivot.....	1001	
BODY ASSEMBLY, head lamp.....	0607	
BODY ASSEMBLY, tail lamp.....	0607	

ALPHABETICAL INDEX

Description	Sub Group	Description	Sub Group
BUSHING, oil pump body.....	0105	COIL, field, lower left.....	0602
BUSHING, piston pin.....	0103	COIL, field, lower right.....	0602
BUSHING, reverse idler gear.....	0702	COIL, field, upper left.....	0602
BUSHING, rocker arm.....	0102	COIL, field, upper right.....	0602
BUSHING, speed control lever.....	0302	COIL, ignition	0604
BUSHING, spindle	1001	COLLAR, crankshaft starting jaw.....	0103
BUSHING, steering column.....	1402	COLUMN,(steering, w/bushing.....	1402
BUTTON, horn.....	0605	CONDENSER	0603
C			
CABLE — battery to starter switch.....	0604	CONE, bearing.....	0201
CABLE — distributor to coil.....	0604	CONE, bearing.....	0702
CABLE — generator to ammeter and light switch.....	0604	CONE, bearing.....	0702
CABLE — light switch to horn button.....	0605	CONE, bearing.....	0702
CABLE — #1 and #4 spark plugs.....	0604	CONE, bearing.....	0703
CABLE — #2 and #3 spark plugs.....	0604	CONE, bearing.....	0703
CABLE — starter to starter switch.....	0604	CONE, bearing.....	1101
CAM AND STOP PLATE, 4 cyl., R.H.....	0603	CONE, bearing.....	1101
CAMSHAFT	0104	CONE, bearing.....	1402
CAP	0301	CONE, bearing.....	1402
CAP ASSEMBLY	0603	CONE, bearing — inner.....	1301
CAP, ball socket.....	1001	CONE, bearing — outer.....	1301
CAP, brass pipe 1/8" P.T.....	0501	CONNECTING ROD ASSEMBLY.....	0103
CAP, countershaft front bearing.....	0702	CONNECTOR, field coil.....	0602
CAP, crankshaft bearing — center.....	0103	CONNECTOR, terminal post.....	0603
CAP, front bearing.....	0105	CONTACT, breaker	0603
CAP, fuel, safety unit.....	0303	CONTACT, plunger.....	0603
CAP, inlet	0107	CONTACT SET, service.....	0603
CAP, mainshaft bearing.....	0702	CONTROL ROD, ignition switch.....	0605
CAP, oil filler.....	0102	COUPLER DOG.....	1501
CAP, radiator	0501	COUPLING ELBOW, compression, P.T. 5/16 x 1/8"	0303
CAP, rear bearing and filler block.....	0103	COUPLER JAW.....	1501
CARBURETOR	0301	COVER, brake housing.....	1201
CARBURETOR BODY	0301	COVER, control	0704
CARRIER	0703	COVER, comm. end.....	0601
CARRIER, bearing.....	0201	COVER, crankcase	0101
CASE, transmission.....	0701	COVER, cylinder head.....	0102
CHAMBER, air cleaner.....	0107	COVER, differential brake.....	1201
CHOKER SWIVEL.....	0301	COVER, felt wick.....	0601
CHOKER, wire assembly.....	0605	COVER, flywheel	0201
CLAMP	0401	COVER, gear, and water pump body.....	0101
CLAMP ASSEMBLY, tail pipe.....	0401	COVER, gear shift lever dust.....	0704
CLAMP, fender	1702	COVER, governor inspection.....	0304
CLAMP, muffler (VAIW-3 only).....	0401	COVER, oil pump.....	0105
CLAMP, muffler (VAIW-4 only).....	0401	COVER, rear	1101
CLAMP, rim	1302	COVER, spark plug	0102
CLAMP RING ASSEMBLY, battery.....	0604	COVER, timing hole	0201
CLAMP STRAP, front fender.....	1701	CRANKCASE	0101
CLIP, choker bracket.....	0301	CRANKCASE (oil pump assembly included)....	0101
CLIP, contact arm spring.....	0603	CRANKSHAFT ASSEMBLY	0103
CLIP, coupler rope.....	1501	CRANKSHAFT ASSEMBLY	0103
CLIP, wire (for 3/8" bolt).....	0606	CUP, air cleaner.....	0107
CLIP, wire (for 1/2" bolt).....	0606	CUP AND NUT, fuel strainer.....	0303
CLUTCH PLATE ASSEMBLY.....	0202	CUP, bearing.....	0201
COIL ASSEMBLY, field, left.....	0601	CUP, bearing.....	0702
COIL ASSEMBLY, field, right.....	0601	CUP, bearing.....	0702
		CUP, bearing.....	0702
		CUP, bearing.....	0703
		CUP, bearing.....	0703
		CUP, bearing.....	1101
		CUP, bearing.....	1101

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Description	Sub Group	Description	Sub Group
GEAR, crankshaft — 24 teeth.....	0103	I	
GEAR, differential ring — 43 teeth.....	0703		
GEAR, differential side, w/bushing (VAIW-3 only).....	0703	IGNITION SWITCH ASSEMBLY.....	0605
GEAR, differential side, w/bushing (VAIW-4 only).....	0703	IGNITION SWITCH BOX with nut.....	0605
GEAR, distributor drive.....	0603	IMPELLER, water pump.....	0502
GEAR, driven, oil pump — 9 teeth.....	0105	INSERTS — ball type 3/4".....	1201
GEAR, driven, oil pump drive — 24 teeth.....	0105	INSERT, valve seat.....	0102
GEAR, driver, oil pump — 9 teeth.....	0105	INSTRUMENT PANEL.....	0605
GEAR, final drive (VAIW-3 only).....	1101	INSULATION, field connection, generator.....	0601
GEAR, final drive (VAIW-4 only).....	1101	INSULATION, field connection, starting motor.....	0602
GEAR, high countershaft.....	0702	INSULATION, term. post, inner.....	0603
GEAR, low countershaft — 35 teeth.....	0702		
GEAR, 1st and 2nd mainshaft.....	0702	J	
GEAR, 3rd and 4th mainshaft.....	0702		
GEAR, oil slinger.....	0201	JAW, crankshaft starting.....	0103
GEAR, oil slinger — 32 teeth.....	0702	JET (economizer).....	0301
GEAR, reverse idler, w/bushing.....	0702	JET (idle).....	0301
GEAR, ring — 96 teeth.....	0103	JET (power).....	0301
GENERATOR.....	0604		
GLASS, outlook.....	0607	K	
GLASS, ruby semaphor.....	0607		
GREASE CUP, 1/8".....	0603	KIT, brake.....	1201
GRILLE SIDE ASSEMBLY.....	1703	KIT, carburetor gasket.....	0301
GROMMET, ignition cable.....	0102	KIT, carburetor repair.....	0301
GROMMET, ignition cable.....	0604	KIT, clutch.....	0202
GROMMET, light cable.....	0605	KIT, water pump.....	0502
GUARD, oil.....	0601		
GUIDE, valve stem.....	0102		
H			
HAND RAIL.....	1703	L	
HEAD ASSEMBLY, comm. end.....	0602		
HEAD ASSEMBLY, drive end.....	0602	LEAD ASSEMBLY.....	0601
HEAD ASSEMBLY, partial, c.e.....	0601	LEAD, ground.....	0601
HEAD, drive.....	0602	LENS.....	0607
HEAD, drive end.....	0601	LEVER, clutch.....	0202
HEAD, fuel strainer.....	0303	LEVER, hand control.....	0302
HEADLIGHT.....	0606	LEVER, hand speed control.....	0302
HOLDER, brush, comm. end head assembly.....	0602	LEVER, gear shift.....	0704
HOLDER, brush, main brush plate.....	0601	LEVER, governor control.....	0304
HOLDER, brush, third brush plate.....	0601	LEVER, speed control.....	0302
HOLDER, field coil.....	0601	LINE, fuel.....	0303
HOLDER, spark plug wire.....	0102	LINE, oil gage.....	0605
HOLDER, spark plug wire.....	0604	LINER, cylinder — 3-1/4" bore.....	0103
HOOD ASSEMBLY.....	1703	LINING, plate.....	0202
HORN.....	0604	LINK, foot control (long).....	0302
HOSE, air cleaner.....	0107	LOCK, valve spring retainer.....	0102
HOSE, upper radiator.....	0501	LOCKWIRE.....	1401
HOSE, water pump inlet.....	0501		
HOUSING, rear axle, w/bearings, cups, and plugs.....	1101		
HOUSING with inlet tube.....	0106		
HUB CAP.....	1301		
HUB, fan.....	0502		

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Description	Sub Group	Description	Sub Group
M			
MIDDLE RING ASSEMBLY	1201	PIPE, muffler tail	0401
MOLDING	0607	PIPE, oil pump suction	0104
MUFFLER	0401	PIN, clevis	0201
		PIN, clevis, differential brake cover	1201
N		PIN, clevis, governor control rod	0302
NEEDLE, idler adjusting	0301	PIN, clevis, yoke end	0302
NEEDLE, power	0301	PIN, crankcase	0101
NIPPLE, spark plug cable	0604	PIN, differential pinion shaft	0703
NIPPLE, starting terminal	0604	PIN, dowel, partial head assembly	0601
NOZZLE	0301	PIN, drawbar	1501
NUT, adjustment flange	0502	PIN, front axle pivot	1002
NUT, armature shaft	0601	PIN, king, spindle	1001
NUT, connecting rod	0102	PIN, lever pivot	0202
NUT, crankshaft bearing cap	0103	PIN, piston	0103
NUT, countershaft adjusting	0702	PIN, shackle hanger	1001
NUT, cylinder head	0102	PIN, shift lever pivot	0704
NUT, flywheel	0103	PIN, spring, choker swivel	0301
NUT, fuel line	0303	PIN, spring, disk	1201
NUT, headlight body	0607	PIN, str., camshaft	0104
NUT, intake and exhaust manifold	0108	PIN, str. oil pump body	0104
NUT, oil gage line	0605	PIN, str., oil pump gear and shaft	0104
NUT, oil pump body	0105	PIN, tie rod yoke end	1001
NUT, rear wheel	1302	PINION, countershaft and bevel drive	0702
NUT, reflector	0607	PINION, differential w/bushing	0703
NUT, tail light body	0607	PINION PIN, differential	0703
NUT, upper race and shaft assembly	0304	PISTON	0103
		PISTON ASSEMBLY	0103
O		PISTON ASSEMBLY with rings	0103
OILER	0601	PISTON with liner — one matched set	0103
OIL SEAL	1101	PISTON with liner — set of four	0103
OIL SEAL, steering gear housing	1403	PLATE ASSEMBLY, breaker	0603
		PLATE ASSEMBLY, clutch pressure (complete)	0202
P		PLATE ASSEMBLY, seal	0603
PACKING, choker swivel	0301	PLATE BREAKER	0603
PACKING, cylinder liner	0103	PLATE, camshaft thrust	0103
PACKING, rear bearing filler block	0103	PLATE, main brush	0601
PACKING, throttle shaft and stop	0301	PLATE, third brush	0601
PAN ASSEMBLY, oil	0101	PLUG, carburetor	0301
PEDAL AND CATCH, brake	1201	PLUG, carburetor	0301
PEDAL, clutch	0201	PLUG, drain, oil pan	0101
PEDAL, clutch	0201	PLUG, drain valve, crankcase	0101
PIPE, exhaust	0401	PLUG, fuse	0102
		PLUG, governor inspection cover	0304
		PLUG, hubbard, crankcase	0101
		PLUG, intake and exhaust manifold	0108
		PLUG, interlock, mesh lock spring	0704
		PLUG, pipe, crankcase	0101
		PLUG, rocker arm	0102
		PLUG, valve, oil filter	0106
		PLUG, welch, differential shaft	0703
		PLUNGER	1201
		PLUNGER, reverse latch	0704
		POST, terminal #10-32 x 15/16"	0603
		POWER PLATE, L.H.	1201
		POWER PLATE, R.H.	1201
		PULLEY, drive, armature	0601
		PULLEY, fan drive	0103

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Description	Sub Group	Description	Sub Group
Q			
QUILL, clutch bearing carrier.....	0201	ROD, oil gage.....	0101
R		ROD, push	0104
RACE, lower.....	0304	ROD, reverse shift.....	0704
RADIATOR	0501	ROD, 1st and 3rd shift.....	0704
RADIUS ROD PIVOT BALL.....	1001	ROD, 2nd and 4th shift.....	0704
RATCHET SPRING ASSEMBLY, high speed....	0301	ROPE, coupler.....	1501
REFLECTOR	0607	ROTOR	0603
REINFORCEMENT, instrument panel.....	0605	RUNNING BOARD, L.H. (VAIW-3 only).....	1701
RELAY ASSEMBLY, cutout.....	0601	RUNNING BOARD, R.H. (VAIW-3 only).....	1701
RETAINER AND SEAL, crankshaft oil seal.....	0103	RUNNING BOARD, L.H. (VAIW-4 only).....	1701
RETAINER, bearing	0601	RUNNING BOARD, R.H. (VAIW-4 only).....	1701
RETAINER, felt washer, cupped.....	0601	S	
RETAINER, felt washer, flat.....	0601	SCREEN, fuel strainer.....	0303
RETAINER FOR FRONT WHEEL HUB, felt..	1301	SCREW, adjusting, clutch pressure plate.....	0302
RETAINER, oil relief spring.....	0105	SCREW, adjusting, differential brake cover.....	1201
RETAINER, packing	0301	SCREW, adjusting, drag link.....	1401
RETAINER RING	0304	SCREW, attaching	0603
RETAINER, seal	1301	SCREW, camshaft thrust plate.....	0104
RETAINER, throttle shaft and stop.....	0301	SCREW, cap, clutch to flywheel.....	0202
RETAINER, valve spring.....	0102	SCREW, choker bracket	0301
RETAINER, valve stem gasket.....	0102	SCREW, choker bracket	0301
RETAINER, water pump snap ring.....	0502	SCREW, choker bracket	0301
RIM AND RING.....	1302	SCREW, choker fly.....	0301
RING, bearing retainer snap, c.s. and m.s.....	0702	SCREW, choker swivel.....	0301
RING, dowel	0101	SCREW, governor stop adjusting.....	0302
RING, piston — 1/4" oil ring.....	0103	SCREW, headlight body.....	0607
RING, piston — 1/8" taper face.....	0103	SCREW, hex. hd. dog point set.....	0502
RING, retainer, piston pin.....	0103	SCREW, high speed ratchet spring.....	0301
RING, set of 16 (for complete engine).....	0103	SCREW, molding	0607
RING, seal reinforcement — large.....	0502	SCREW, pole shoe	0601
RING, seal reinforcement — small.....	0502	SCREW, pole shoe	0602
RING, seal snap.....	0502	SCREW, reflector	0607
RING, snap	0201	SCREW, retainer, water pump bearing.....	0502
RING, snap	0201	SCREW, rocker arm adjusting.....	0102
RING, snap, armature.....	0601	SCREW, set, pivot pin.....	1002
RING, snap, differential shaft bearing carrier....	0703	SCREW, shift fork lock.....	0704
RING, snap, rear axle housing.....	1101	SCREW, shift fork lock.....	0704
RING, snap, rear axle inner bearing.....	1101	SCREW, shift fork lock.....	0704
RING, spindle snap	1001	SCREW, spring, head.....	0602
RING, water pump bearing snap.....	0502	SCREW, spring, shaft.....	0602
RIVET, brush holder.....	0602	SCREW, throttle body	0301
RIVET, gear	0603	SCREW, throttle body	0301
ROCKER ARM ASSEMBLY, L.H.	0102	SCREW, throttle fly.....	0301
ROCKER ARM ASSEMBLY, R.H.	0102	SCREW, throttle shaft and stop.....	0301
ROCKER ARM, governor.....	0304	SEAL ASSEMBLY, water pump.....	0502
ROD, brake	1201	SEAL BELLOWS	0502
ROD, clutch pedal	0201	SEAL CARBON	0502
ROD, dip stick.....	0704	SEAL, crankshaft oil — front.....	0103
ROD, foot feed.....	1702	SEAL, differential oil	0703
ROD, governor control.....	0302	SEAL, fan drive pulley dust.....	0103
ROD, hand control.....	0302	SEAL felt governor shaft dust.....	0304
ROD, light switch.....	0605	SEAL, felt, starter and motor block.....	0604
		SEAL, mainshaft oil	0702
		SEAL, oil	0201

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Description	Sub Group	Description	Sub Group
SEPARATOR	0304	SPACER, valve rocker arm bracket.....	0102
SHACKLE	1001	SPACER, water pump ball bearing.....	0502
SHAFT AND LEVER, choke.....	0301	SPINDLE, L.H.....	1001
SHAFT AND PINION	0602	SPINDLE, R.H.....	1001
SHAFT ASSEMBLY, rocker arm.....	0102	SPRING	1401
SHAFT brake	0201	SPRING, arm assembly.....	0603
SHAFT, clutch, main drive.....	0201	SPRING AND STOP, return.....	0202
SHAFT, differential	0703	SPRING, brake cover.....	1201
SHAFT, drive	0603	SPRING, brush	0602
SHAFT, float lever.....	0301	SPRING, brush, insulated.....	0601
SHAFT, governor rocker.....	0304	SPRING, brush, grounded	0601
SHAFT, main drive.....	0702	SPRING, choker swivel.....	0301
SHAFT, oil pump drive.....	0105	SPRING, choker fly	0301
SHAFT, reverse idler	0702	SPRING, clutch	0202
SHAFT, rocker arm	0102	SPRING, clutch	0202
SHAFT, steering	1402	SPRING, clutch pedal rod.....	0201
SHAFT, steering arm	1403	SPRING, contact	0603
SHAFT, water pump drive.....	0502	SPRING, coupler dog.....	1501
SHIM, .010"	0703	SPRING, drive	0602
SHIM, .0209"	1001	SPRING, foot feed.....	0302
SHIM, .0120"	1001	SPRING, front	1001
SHIM, clutch quill .003".....	0201	SPRING, gear shift support.....	0704
SHIM, clutch quill .005".....	0201	SPRING, governor	0302
SHIM, crankshaft thrust .008".....	0103	SPRING, hand speed control lever.....	0302
SHIM, crankshaft thrust .002".....	0103	SPRING, idler adjusting needle.....	0301
SHIM, differential bearing .005".....	0703	SPRING, mesh lock	0704
SHIM, differential bearing .010".....	0703	SPRING, oil pressure relief.....	0105
SHIM, fender mounting .0598".....	1702	SPRING, power needle.....	0301
SHIM, fender mounting .1345".....	1702	SPRING, reverse latch plunger.....	0704
SHIM, mainshaft bearing cap .005".....	0702	SPRING, retaining, third brush plate.....	0601
SHIM, mainshaft bearing cap .010".....	0702	SPRING RING, lens retaining.....	0607
SHIM, oil pump.....	0105	SPRING, seal	0502
SHIM, steering column .005".....	1402	SPRING, governor	0302
SHIM, steering column .010".....	1402	SPRING SET, governor weight.....	0603
SHOE, pole.....	0602	SPRING, third brush.....	0601
SIDE SHEET ASSEMBLY, L.H.....	1703	SPRING, throttle shaft and stop.....	0301
SIDE SHEET ASSEMBLY, R.H.....	1703	SPRING, valve	0102
SLEEVE, clutch shaft.....	0702	SPRING, valve	0106
SLEEVE, compression coupling.....	0303	SPRING, valve rocker arm shaft.....	0102
SLEEVE, compression coupling.....	0605	STARTING MOTOR.....	0602
SLEEVE, worm wheel adjusting.....	1403	STARTING MOTOR.....	0604
SNAP RING, cam retaining.....	0603	STEP PLATE ASSEMBLY, L.H.....	1702
SOCKET, hand rail front.....	1703	STEP PLATE ASSEMBLY, R.H.....	1702
SOCKET, hand rail rear.....	1703	STEERING ARM ASSEMBLY, rear.....	1403
SOCKET, radius rod pivot ball.....	1001	STEERING WHEEL	1402
SPACER	0102	STEERING WORM.....	1402
SPACER, bearing thrust	0602	STOP, governor control.....	0302
SPACER, cam	0603	STRAINER	0301
SPACER, countershaft gear.....	0702	STRAINER, fuel.....	0303
SPACER, crankshaft thrust.....	0103	STRAP, battery to ground.....	0604
SPACER, cylinder head cover.....	0102	STRAP, fuel tank (front).....	0303
SPACER, governor rocker arm thrust.....	0304	STRAP, fuel tank (rear).....	0303
SPACER, reverse shift rod — long.....	0704	STRAP, generator adjusting.....	0604
SPACER, reverse shift rod — short.....	0704	STUD, crankcase 5/16" Dia. x 1-3/4" Lg.....	0101
SPACER, running board front support.....	1701	STUD, crankcase 3/8" Dia. x 1-1/8" Lg.....	0101
SPACER, 2nd and 4th shift rod.....	0704	STUD, crankcase 3/8" Dia. x 1-1/4" Lg.....	0101
SPACER, steering worm — lower.....	1402	STUD, crankcase 1/2" Dia. x 2" Lg.....	0101
SPACER, steering worm — upper.....	1402	STUD, crankcase 1/2" Dia. x 2-1/2" Lg.....	0101
SPACER, valve rocker arm.....	0102	STUD, crankcase 1/2" Dia. x 3-1/8" Lg.....	0101

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V			
STUD, crankcase 1/2" Dia. x 3-11/16" Lg.....	0101	VALVE, fuel strainer.....	0303
STUD, crankcase 1/2" Dia. x 4" Lg.....	0101	VALVE, oil pressure relief.....	0105
STUD, crankcase 1/2" Dia. x 6" Lg.....	0101	VENTURI	0301
STUD, crankcase 5/8" Dia. x 2-7/8" Lg.....	0101		
STUD, cylinder head 3/8 x 1-3/4"	0102		
STUD, cylinder head 3/8 x 4-5/8"	0102		
STUD, cylinder head 3/8 x 5"	0102		
STUD, flywheel	0103		
STUD, front axle bracket.....	1002		
STUD, gear cover 1/4" Dia. x 7/8" Lg.....	0101		
STUD, gear cover 3-1/8" Dia. x 1" Lg.....	0101		
STUD, oil filer.....	0101		
STUD, rear axle shaft (VAIW-3 only).....	1101		
STUD, rear axle shaft (VAIW-4 only).....	1101		
STUD, spark plug cover.....	0102		
STUD, special, valve rocker arm bracket.....	0102		
STUD, transmission case 1/2 x 2-1/2"	0701		
STUD, transmission case 5/8 x 2-1/2"	0701		
STUD, transmission case 5/8 x 2-7/8"	0701		
STUD, terminal	0601		
STUD, valve rocker arm bracket.....	0102		
SUPPORT ASSEMBLY, rear drawbar.....	1501		
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SUPPORT, running board front.....	1701		
SUPPORT, tool box sheet.....	1704		
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SWITCH, light — less rod.....	0605		
SWITCH, starting	0605		
W			
		WASHER, adjusting screw.....	0202
		WASHER, advance arm thrust.....	0603
		WASHER, bevel, headlight, body.....	0607
		WASHER, cork, tail light body.....	0607
		WASHER, crankshaft thrust.....	0103
		WASHER, differential center wheel thrust .089"	0703
		WASHER, differential center wheel thrust .094"	0703
		WASHER, differential center wheel thrust .099"	0703
		WASHER, differential center wheel thrust .104"	0703
		WASHER, differential center wheel thrust .109"	0703
		WASHER, differential center wheel thrust .119"	0703
		WASHER, felt, drive end head.....	0601
		WASHER, felt, front wheel hub.....	1301
		WASHER, felt, seal plate assembly.....	0603
		WASHER, final drive gear take-up.....	1101
		WASHER, headlight body	0607
		WASHER, ins., term. stud, inner.....	0601
		WASHER, ins., term. stud, inner.....	0602
		WASHER, ins., term. stud, outer.....	0601
		WASHER, ins., term. stud, outer.....	0602
		WASHER, ins.,(term. post.....	0603
		WASHER, intake and exhaust manifold.....	0108
		WASHER, intake and exhaust manifold.....	0108
		WASHER, lock, armature shaft.....	0601
		WASHER, lock, choker swivel.....	0301
		WASHER, lock, drive head.....	0602
		WASHER, lock, headlight body.....	0607
		WASHER, lock, high speed ratchet spring as- sembly	0301
		WASHER, lock, oil pan.....	0101
		WASHER, lock, shaft and pinion.....	0602
		WASHER, lock, throttle fly.....	0301
		WASHER, lock, thru bolt #10.....	0601
		WASHER, oil pump body.....	0105
		WASHER, lower drive shaft thrust.....	0603
		WASHER, oil slinger retaining.....	0702
		WASHER, plain, crankshaft bearing cap.....	0103
		WASHER, plain, filler block cap.....	0103
		WASHER, plain, power needle.....	0301
		WASHER, plain, upper race and shaft assembly..	0304
		WASHER, reflector	0607
		WASHER, spring, pinion.....	0702
		WASHER, spring retainer	1201
		WASHER, steering arm shaft.....	1403
		WASHER, steering arm shaft.....	1403
		WASHER, tail light body.....	0607
		WASHER, tension, rear axle housing.....	1101
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TAIL LIGHT.....	0606		
TANK, fuel.....	0303		
TAPPET, valve.....	0104		
TERMINAL, field coil assembly, left.....	0601		
TERMINAL, field coil, upper right.....	0602		
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TERMINAL, lead assembly	0601		
TERMINAL, lead assembly	0601		
THROTTLE BODY.....	0301		
THROTTLE FLY.....	0301		
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U			
U-BOLT, spring.....	1001		
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WASHER, valve rocker arm bracket.....	0102
WASHER, valve rocker arm bracket.....	0102
WATER PUMP KIT.....	0502
WEIGHT, governor.....	0603
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WHEEL, rear.....	1302
WICK, cam sleeve felt.....	0603
WICK, felt.....	0601
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WIRE—ammeter to light switch.....	0604
WIRE—ammeter to starter switch.....	0604
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WIRE, ignition switch ground.....	0605
WIRE, lock, 1st and 3rd shift fork.....	0704
WIRE, lock, 2nd and 4th shift fork.....	0704
WIRE, lock, reverse shift fork.....	0704
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YOKE END, adjusting, clutch pedal rod.....	0201
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6SA-101	0103	55-231	0301	14315-AB	1401
6TG-101	0101	55-243	0301	14404-AB	0102
7TC-215	0101	63-125	0301	14554-AB	1301
8UK-205	0502	78-299	0301	31322	0303
8UO-202	0103	78-322	0301	32275	0303
9NC-101	1015	82-16	0301	32276	0303
10EC-204	0103	95-40	0301	32277	0303
10EC-205	0103	99-7	0301	32278	0303
10-2450	0301	179-35	0301	32279	0303
12AK-203	0502	180-B	0501	34219	0303
12CH-208	0304	227-831	0301	A6001-338	0102
13-839	0301	2514-AA	1301	A600L-202	0103
14-169	0301	2516-AA	0102	C600D-206	0103
15-7	0301	2517-AA	0102	D600-0-200	0103
15-8	0301	4766-A	1001	D600A-201	0103
15-33	0301	4801-A	1001	D600C-204	0103
15-42	0301	5332-A	1001	D600C-206	0103
15LG-202	0103	01443-AB-2	1001	D600G-283	0502
15-233	0301	01461-AB	1301	D600K-232	0103
15-285	0301	01462-AB	1301	D600K-256	0502
15-343	0301	01498-AB	1002	D600K-257	0502
15-443	0301	01554-AB-1	0302	E600A-215	0102
16-4	0301	02457-AB	0605	F-199A-400	0103
16-80	0301	02507-AB	1001	F199A-4001A	0103
16-449	0301	02509-AB	1001	F199A-4001E	0103
16-491	0301	02513-AB	1002	F400E-303	0108
24-A43	0301	02764-AB	1402	F-400L-219	0105
24-262	0301	02792-AB	1001	F400S-204	0304
24-340	0301	02856-AB	1402	F600A-214	0103
24-247	0301	03601-AB1	0605	F600A-242	0102
24-489	0301	03609-AB	0605	F600A-343	0103
24-501	0301	03765-AB	1301	F600A-355	0103
26-637	0301	03766-AB	1301	F600G-312	0103
27-144	0301	03990-AB1	0303	F600K-272	0502
27-154	0301	04312-AB	1401	F600K-273	0502
28-49	0301	04313-AB	1401	IG-1324C	0603
29-81	0301	04314-AB	1401	IGP-3028FS	0603
29-92	0301	04595-AB	0604	IGW-139	0603
30-600	0301	04599-AB	0605	R-600B-223	0103
32-27	0301	04639-AB	1001	R800G-204	0103
43-33	0301	04640-AB	1001	UB-110	0108
43-554	0301	04641-AB	1001	V-13836	1201
44-38	0301	05753-AB1	0102	V4B-101	0101
44-39	0301	05759-AB	0102	VR-2695	0201
46-473	0301	05760-AB	0102	VR-2695	1201
47-589	0301	05823-AB	1301	VT-7	0201
49-101-L	0301	05824-AB	1301	VT-34	0201
49-145	0301	07163-AB	1402	VT-57	0606
49-158	0301	07164-AB	1402	VT-57	0607

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VT-124	0103	VT-277	1701	VT-2180	0502
VT-126	0104	VT-278	1302	VT-2199	0303
VT-127	0104	VT-315	0502	VT-2233	1403
VT-128	0108	VT-2000	0704	VT-2249	0605
VT-130	0102	VT-2006	0704	VT-2265	0605
VT-131	0102	VT-2010	0704	VT-2268	0605
VT-132	0103	VT-2011	0704	VT-2330	0604
VT-136	0103	VT-2012	0704	VT-2333	0604
VT-137	0102	VT-2013	0704	VT-2334	0604
VT-138	0102	VT-2015	0704	VT-2335	0604
VT-139	0603	VT-2016	0704	VT-2336	0604
VT-140	0304	VT-2017	0704	VT-2337	0604
VT-141	0103	VT-2018	0704	VT-2340	0605
VT-142	0105	VT-2019	0704	VT-2343	0605
VT-148-1	0102	VT-2052	0702	VT-2365	0605
VT-148-1-A	0102	VT-2061	0702	VT-2386	0604
VT-148-1-C	0102	VT-2067	0201	VT-2398	0302
VT-149-2	0101	VT-2067	0702	VT-2435	0302
VT-158	0105	VT-2097	0201	VT-2438	1702
VT-157	0105	VT-2097	0702	VT-2452	1001
VT-168	1201	VT-2102	0702	VT-2485	0202
VT-169	0703	VT-2105	0302	VT-2493	0605
VT-194	1201	VT-2108	0605	VT-2599	1201
VT-195	1201	VT-2109	0605	VT-2600	1201
VT-196	1201	VT-2111	0201	VT-2601	1201
VT-197	1201	VT-2112	0201	VT-2784	0101
VT-198	1201	VT-2112	0702	VT-3200-1	0103
VT-201	0302	VT-2115	0201	VT-3201-1	0103
VT-205	0702	VT-2116	0201	VT-3201-2	0103
VT-207	0704	VT-2117	0201	VT-3203	0103
VT-208	0702	VT-2119	0201	VT-3204	0103
VT-212	0302	VT-2123	0201	VT-3205	0103
VT-219	0401	VT-2124	0605	VT-3206	0103
VT-222	1002	VT-2130	0702	VT-3212	0104
VT-223	1002	VT-2136	0703	VT-3213	0104
VT-224	1001	VT-2136	1101	VT-3214	0104
VT-228	1703	VT-2137	1101	VT-3215	0102
VT-229	1703	VT-2160	0202	VT-3215-1	0102
VT-231	1101	VT-2161	0202	VT-3217	0102
VT-234	0201	VT-2162	0202	VT-3220	0103
VT-238	0302	VT-2163	0202	VT-3221	0105
VT-241	0701	VT-2164	0202	VT-3223	0105
VT-245	0201	VT-2165	0202	VT-3225	0103
VT-248	1701	VT-2166	0202	VT-3226	0105
VT-250	1702	VT-2167	0202	VT-3228	0102
VT-251	1702	VT-2168	0202	VT-3229	0106
VT-252	1403	VT-2173	0202	VT-3230	0103
VT-274	1702	VT-2174	0202	VT-3231	0304
VT-275	1702	VT-2176	0201	VT-3232	0102

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VT-3234	0102	VT-3434	1101	VT-3560	0501
VT-3235	0102	VT-3435	0703	VT-3561	0604
VT-3236	0104	VT-3400	0702	VT-3581	0501
VT-3237	0102	VT-3442	0704	VT-3582	1403
VT-3238	0102	VT-3443	0704	VT-3587	0604
VT-3239	0104	VT-3444	0704	VT-3588	0605
VT-3240	0304	VT-3446	0704	VT-3589	0106
VT-3241	0102	VT-3447	0704	VT-3590	0106
VT-3242	0102	VT-3448	0704	VT-3593	0301
VT-3243	0101	VT-3449	0704	VT-3596	0605
VT-3245	0101	VT-3450	0704	VT-3604	1101
VT-3246	0102	VT-3451	0704	VT-3611	0107
VT-3247	0105	VT-3452	0704	VT-3613	0302
VT-3248	0101	VT-3453	0702	VT-3619	0605
VT-3250	0103	VT-3454	0702	VT-3620	0605
VT-3252	0105	VT-3456	0703	VT-3632	1703
VT-3254	0105	VT-3457	0703	VT-3641	1703
VT-3255	0105	VT-3458	0703	VT-3666	1201
VT-3259	0304	VT-3459	0703	VT-3671	0501
VT-3260	0103	VT-3463	0703	VT-3672	0302
VT-3261	0103	VT-3464	0703	VT-3675	0101
VT-3266	0304	VT-3465	0703	VT-3682	0102
VT-3272	0304	VT-3466	0602	VT-3698	1201
VT-3273	0304	VT-3466	0604	VT-3699	1201
VT-3277	0501	VT-3467	0601	VT-3701	1201
VT-3280	0302	VT-3467	0604	VT-3709	0302
VT-3284	0304	VT-3470	0102	VT-3711	0302
VT-3287	0102	VT-3470	0604	VT-3714	0702
VT-3288	0304	VT-3477	0703	VT-3716	0701
VT-3291	0102	VT-3477	1101	VT-3716	1002
VT-3298	0105	VT-3478	0201	VT-3718	0604
VT-3312	0102	VT-3479	0703	VT-3722	0702
VT-3328	0105	VT-3480	0703	VT-3725	1101
VT-3401	0702	VT-3481	0703	VT-3726	0101
VT-3403	0702	VT-3482	1501	VT-3727	0302
VT-3404	0702	VT-3499	1101	VT-3749	1101
VT-3406	0702	VT-3500	1101	VT-3765	0703
VT-3407	0702	VT-3503	0701	VT-3769	0703
VT-3409	0702	VT-3508	0701	VT-3771	0604
VT-3410	0702	VT-3528	1101	VT-3774	0102
VT-3411	0702	VT-3533	1501	VT-3774	0604
VT-3412	0702	VT-3534	0604	VT-3775	1201
VT-3414	0702	VT-3535	0604	VT-3776	1201
VT-3415	0702	VT-3536	0604	VT-3792	0302
VT-3417	0702	VT-3542	1403	VT-3812	0107
VT-3418	0702	VT-3544	0604	VT-3820	0703
VT-3421	0703	VT-3545	0102	VT-3821	0703
VT-3422	1101	VT-3546	0701	VT-3824	0107
VT-3425	0702	VT-3547	0604	VT-3825	0107

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VT-3863	1703	VT-4079	0605	VTA-336	0304
VT-3864	1401	VT-4084	1201	VTA-345	0304
VT-3870	1001	VT-4087	0401	VTA-352	0704
VT-3871	1402	VT-4090	0401	VTA-353	0702
VT-3878	1001	VT-4092	0401	VTA-375	0303
VT-3882	1001	VT-4093	1704	VTA-382	0302
VT-3883	1402	VT-4100	0302	VTA-388	0605
VT-3884	1402	VT-4101	0703	VTA-406	1201
VT-3887	1401	VT-4102	0703	VTA-408	0703
VT-3889	1502	VT-4103	0703	VTA-417	0703
VT-3890	1502	VT-4110	1501	VTA-419	0703
VT-3902	1703	VT-4111	1501	VTA-421	0703
VT-3903	0201	VT-4122	1501	VTA-427	0605
VT-3906	0704	VT-4123	1501	VTA-445	1001
VT-3907	1101	VT-4124	1501	VTA-447	1401
VT-3910	0201	VT-4125	0702	VTA-448	1403
VT-3914	1701	VT-4126	0702	VTA-450	0201
VT-3915	1701	VT-4130	1701	VTA-451	1702
VT-3922	1704	VT-4132	1702	VTA-456	2101
VT-3938	2101	VT-4133	1702	VTA-462	0604
VT-3939	2101	VT-4134	1001	VTA-463	0605
VT-3942	1501	VT-4135	1001	VTA-465	0101
VT-3947	0302	VT-4136	0201	VTA-472	1301
VT-3984	1001	VT-4137	1201	VTA-473	1101
VT-3991	1703	VT-4138	0101	VTA-474	0201
VT-3994	0703	VT-4138	0701	VTA-557	0103
VT-4001	0603	VT-4144	0106	VTA-561	0103
VT-4001	0604	VT-4145	0106	VTA-576	0302
VT-4003	1201	VT-4146	0106	VTA-581	0604
VT-4007	0303	VT-4147	0106	VTA-618	0501
VT-4008	1001	VT-4262	1701	VTA-632	0101
VT-4009	1001	VT-4271	1101	VTA-634	0303
VT-4010	1402	VT-4272	0401	VTA-635	0303
VT-4017	1302	VT-4301	1101	VTA-645	0702
VT-4018	1302	VTA-10	0201	VTA-648	0401
VT-4032	1702	VTA-11	0202	VTA-656	1703
VT-4038	1402	VTA-12	0202	VTA-662	1201
VT-4039	1402	VTA-20	0303	VTA-663	0101
VT-4043	1403	VTA-22	0303	VTA-665	1001
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VT-4045	1402	VTA-185	0303	VTA-668	0202
VT-4046	1403	VTA-319	0103	VTA-679	1703
VT-4049	1101	VTA-325	0105	VTA-682	1702
VT-4050	1001	VTA-326	0101	VTA-683	1702
VT-4051	1402	VTA-327	0102	VTA-684	1701
VT-4052	0606	VTA-330	0105	VTA-685	1701
VT-4053	0106	VTA-331	0103	VTA-688	1402
VT-4054	0606	VTA-332	0105	VTA-690	0301
VT-4065	0107	VTA-333	0101	VTA-692	1703

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