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# TM 5-1161

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

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## DISTRIBUTOR WATER

100.7  
TRUCK-MOUNTED  
1000 GALLON CAPACITY  
GASOLINE-DRIVEN

ROSCO MODEL MOE  
(LESS ENGINE) (LESS TRUCK)

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## **SAFETY PRECAUTIONS**

Shut down the engine before filling the fuel tank.

Always provide a metallic contact between the container and tank when filling the fuel tank.

Be sure the pump is filled with water before starting the engine.

Always lift the fifth wheel up in its traveling position when not being used or when driving backwards.

Do not attempt to operate the engine without the shroud in place.

Do not race a cold engine.

When the pump is in operation do not leave the discharge valve closed for long periods.

During freezing weather drain the pump and tank immediately after use. Flush out the pump housing, suction, and discharge lines with clean water. After draining the pump run the engine a few minutes to throw all water off the impeller.

Always set the handbrake and chock the wheels when the water distributor is parked on an incline.

Always keep pump and suction screens clean.

Always keep the catwalk and rear platform clean and dry.

Follow the signal bell indications when performing an operation.

When pump has not been used for considerable time prime the pump head.

Use only a soft cast iron shear pin at the center of the spraybar.

**DISTRIBUTOR, WATER, TRUCK MOUNTED, 1,000 GALLON CAPACITY, GASOLINE DRIVEN, ROSCO MODEL MOE (LESS ENGINE) (LESS TRUCK)**

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# CHAPTER 1

## INTRODUCTION

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### Section I. GENERAL

#### 1. Scope

*a.* These instructions are published for the use of the personnel to whom this distributor is issued. They contain information on the operation and organizational maintenance of the water distributor as well as a description of the major units and their functions in relation to other components of the materiel. They apply only to the Rosco distributor, Model MOE.

*b.* References to other applicable publications are included in the appendix.

#### 2. Record and Report Forms

The maintenance record forms listed in *a* through *t* below will be used in the maintenance of this equipment.

*a.* DA Form 5-13, *Spot Check Inspection Report of Organizational Maintenance of Engineer Equipment.*

*b.* DA Form 5-14, *Annual Technical Inspection Report of Engineer Equipment.*

*c.* DA Form 9-71, *Locator and Inventory Control Card.*

*d.* DA Form 9-75, *Daily O Dispatching Record of Motor Vehicles.*

*e.* DA Form 9-77, *Job Order Register.*

*f.* DA Form 9-79, *Parts Requisition.*

*g.* DA Form 9-81, *Exchange Part of Unit Identification Tag.*

*h.* DA Form 285, *Accident.*

*i.* DA Form 446, *Issue Slip.*

*j.* DA Form 447, *Turn-in-Slip.*

*k.* DA Form 460, *Preventive Maintenance Roster.*

*l.* DA Form 464, *Work Sheet for Preventive Maintenance and Technical Inspection of Engineer Equipment.*

*m.* DA Form 468, *Unsatisfactory Equipment Report.*

*n.* DA Form 478, *Organizational Equipment File.*

*o.* DA Form 518, *Accident-Identification Card.*

*p.* DA Form 811, *Work Request and Job Order.*

*q.* DA Form 867, *Status of Modification Work Order.*

- r. DD Form 6, *Report of Damaged or Improper Shipment*.
- s. DD Form 110, *Vehicle and Equipment Operational Record*.
- t. Standard Form 91, *Operator's Report of Motor-Vehicle Accident*.

## Section II. DESCRIPTION AND DATA

### 3. Description

a. *General Information.* The Rosco Model MOE 1,000 gallon capacity water distributor (figs. 1, 2, and 3), mounted on a 5-ton, 6 x 6, truck chassis, is equipped with a suitable power unit consisting of a Gorman-Rupp self-priming centrifugal pump (4, fig. 2) and a four-cylinder, gasoline-driven, air-cooled engine (6), a 24-foot folding spraybar assembly (14, fig. 1), and all necessary hose and attachments to permit the machine to handle satisfactorily the various operating functions for which it is designed and used.

- (1) This 1,000-gallon capacity water distributor is designed and built for use on all types of soil stabilization, soil, cement, or any other type of road, airport, or other surface construction when it is desirable to bring the soil up to its proper moisture content with a positive and accurate distribution of water over large areas.
- (2) This water distributor may also be used for applying water to naturally dusty areas such as encountered in dry or sandy terrain.
- (3) This unit can be used as an all-purpose power pumping unit for the unloading and transferring of water or various other liquids having a viscosity or weight similar to that of water from one outside source to another.
- (4) This unit can also be used as a water transport vehicle for auxiliary or emergency fire fighting. For use in fire fighting, a multiple discharge manifold may be added to the discharge piping on the machine and several lines of hose can be used at one time.

b. *Tank.* The water distributor tank (6, fig. 1) is a 1,000-gallon steel unit, oval in shape, and equipped with a contents gage (7), access manhole (8), and necessary piping to connect the power pumping unit (10). The tank has a catwalk (3) on each side so the operator will have ample room to encircle the tank to look for leaks or maintain necessary upkeep without difficulty. The tank is mounted on a substantial frame, designed to fit the truck with sufficient structural strength to support the power unit, loaded tank, spraybar, and crew.

c. *Power Unit.* A power unit consisting of a Gorman-Rupp self-priming centrifugal pump mounted integrally with a four-cylinder, four-cycle, air-cooled gasoline-driven engine and all necessary piping, enables this vehicle to perform its primary functions, and to supply

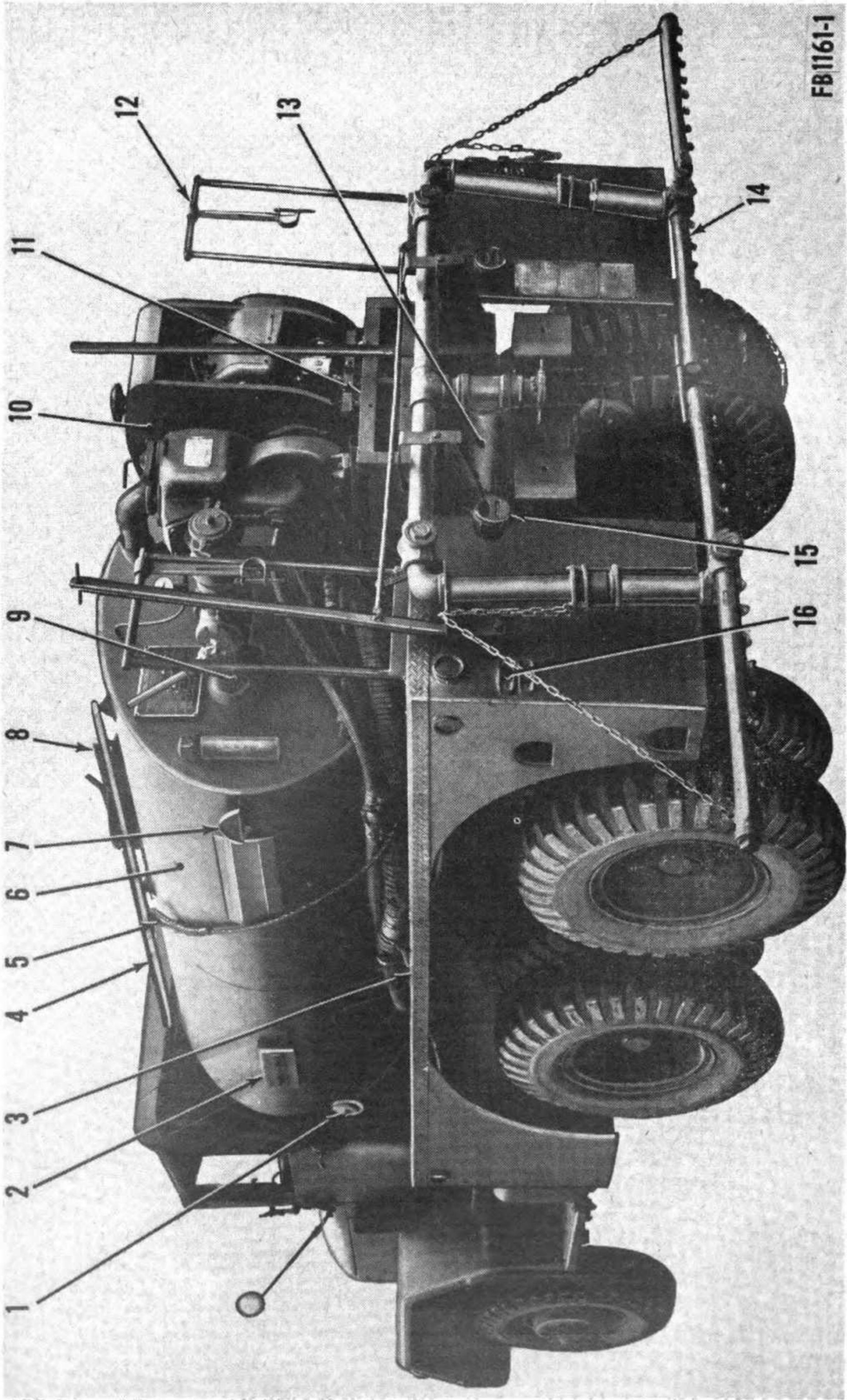
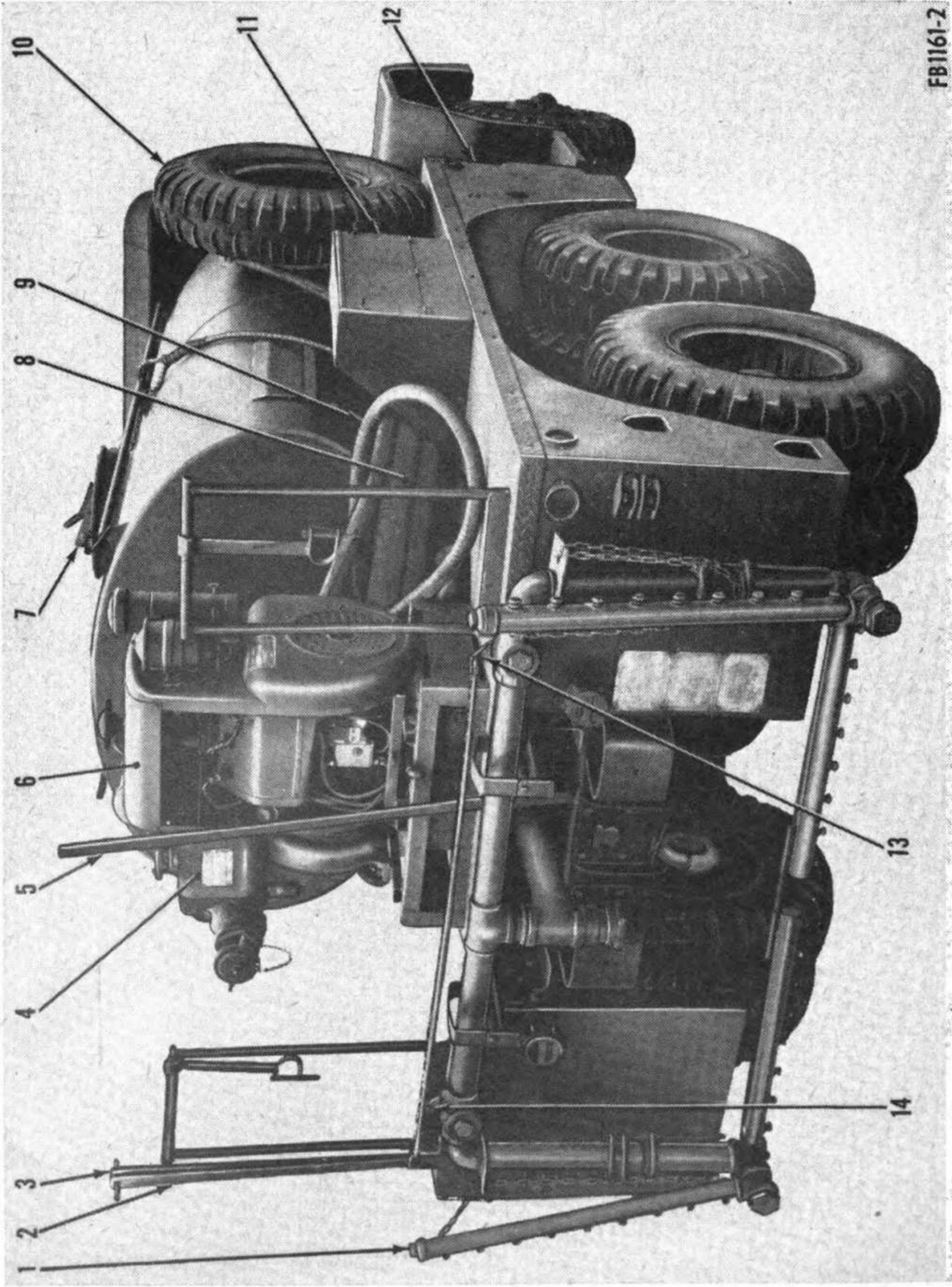


Figure 1. Left rear view of distributor.

- |   |                       |    |                               |
|---|-----------------------|----|-------------------------------|
| 1 | Signal gong           | 9  | Suction piping                |
| 2 | Tire mounting bracket | 10 | Power pumping unit            |
| 3 | Catwalk               | 11 | Power pumping unit base       |
| 4 | Handrail              | 12 | Operator's platform handrail  |
| 5 | Lifting sling         | 13 | Discharge piping              |
| 6 | Tank                  | 14 | Spraybar assembly             |
| 7 | Tank contents gage    | 15 | Taillights                    |
| 8 | Manhole               | 16 | Clearance and blackout lights |

Figure 1—Continued.



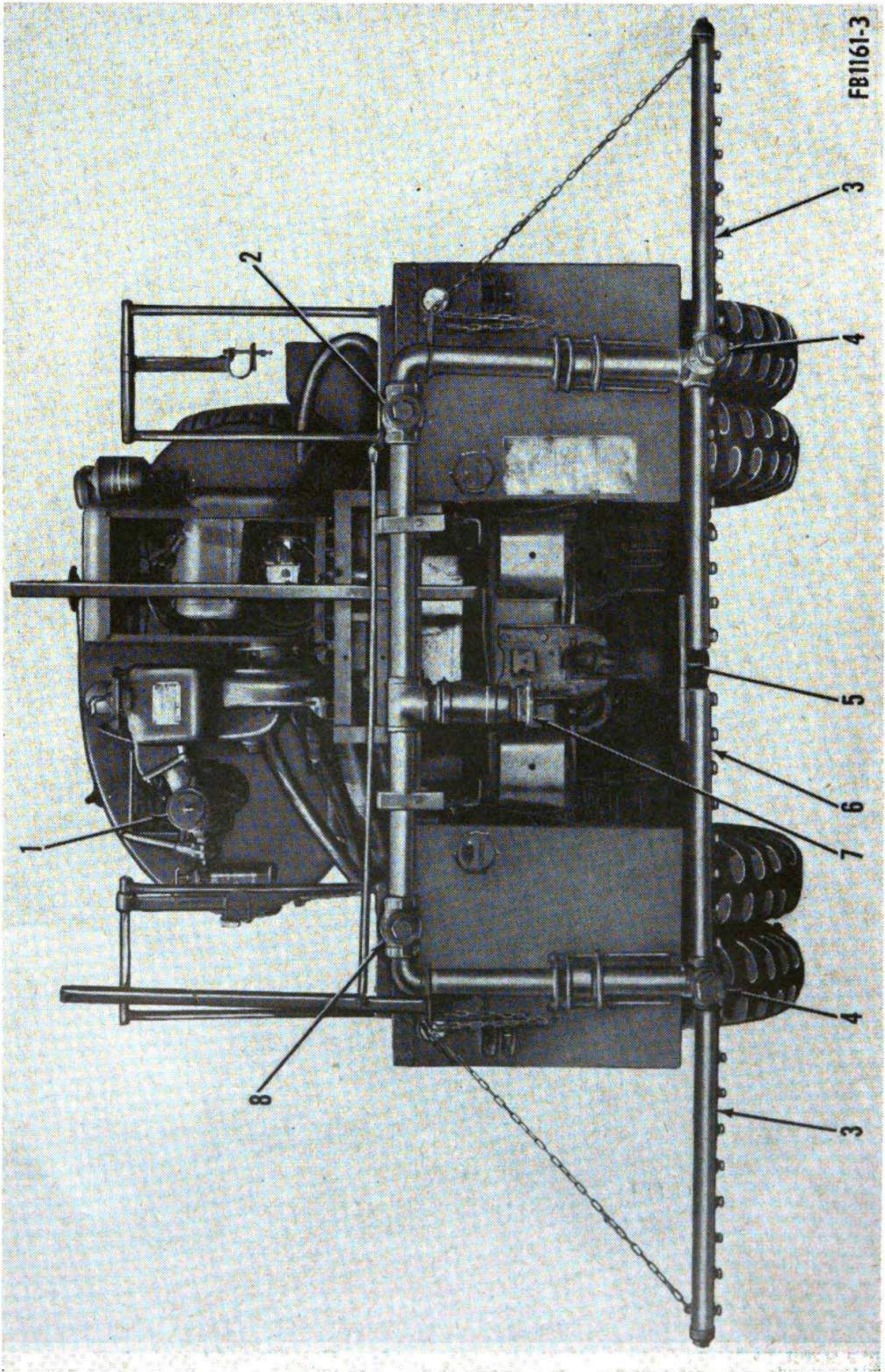
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Figure 2. Right rear view of distributor.



- |   |                                       |    |                                  |
|---|---------------------------------------|----|----------------------------------|
| 1 | Folding spraybar section              | 7  | Manhole cover                    |
| 2 | Handle for right spraybar valve lever | 8  | Suction and discharge hose       |
| 3 | Handle for left spraybar valve lever  | 9  | Handspraying hose                |
| 4 | Pump                                  | 10 | Spare wheel and tire             |
| 5 | Shifting lever                        | 11 | Toolbox                          |
| 6 | Engine                                | 12 | Catwalk skirting                 |
|   |                                       | 13 | Valve control lever (right side) |
|   |                                       | 14 | Valve control lever (left side)  |

*Figure 2—Continued.*



FB1161-3

Figure 3. Spraybar view.

- |   |                               |   |                                   |
|---|-------------------------------|---|-----------------------------------|
| 1 | Suction hose connection       | 5 | Shear pin                         |
| 2 | Spraybar header valve (right) | 6 | Spraybars                         |
| 3 | Folding spraybar              | 7 | Discharge hose connection         |
| 4 | Folding spraybar valve        | 8 | Spraybar header valve (left side) |

*Figure 3—Continued.*

water under various selected pressures to the spraybar or discharge hose, without the aid of auxiliary priming devices.

*d. Spraybar.* Two folding 12-foot spraybars (14) divided into two control sections of 6 feet each, are mounted on the rear of the vehicle. Two bars are stationary and connected at the center with a shear pin (5, fig. 3) and two bars (3) fold, pivoting on swivel joints. The spraybar is split at the center of the stationary spraybars, and the ends are sealed, allowing for either right or left control of water from the operator's platform. The shear pin provides protection from obstacles accidentally hitting or loading beneath or against the spraybar. The pin will shear and prevent damage to the unit's piping assembly. Placing the two folding spraybars in the upright or vertical position will automatically cut off the supply of water to the folded spraybars. The entire spraybar is designed to shift laterally on a parallel plane with the ground. This shifting feature enables the operator to move the bar to follow the edges of the road.

*e. Tachometer.* A fifth-wheel type tachometer is supplied with this unit and is mounted under the truck cab. It is raised or lowered by a lift cable controlled by a lift ring attached to the truck instrument panel. The lift cable is at the under side of the instrument panel in the cab. A direct-reading odometer type head fastened or bolted to the front side of the instrument panel is used to give a correct reading of the rate of truck travel.

#### **4. Identification**

(fig. 4)

The water distributor has four identification plates. The plate containing the operating instructions (A) is located on the rear of the water tank next to the fire extinguisher. The plate containing the lift attachment diagram (B) is located on the rear right skirt of the distributor frame. The transportation data plate (C) is located on the rear right skirt of the distributor frame. The Corps of Engineers identification plate (D) is located on the rear right skirt of the distributor frame. When requisitioning spare parts for this equipment specify the Department of the Army registration and serial numbers and the engine serial number.

#### **5. Differences in Models**

This manual pertains to the Rosco Model MOE water distributor, less engine, less truck, only. The maintenance procedures for the truck upon which the unit is mounted are not covered in this manual.

## OPERATING INSTRUCTIONS

**LOAD** -- FILL DISTRIBUTOR TANK WITH WATER FROM EXTERNAL SOURCE

1. REMOVE CAP "D" ATTACH SUCTION HOSE
2. PLACE VALVE "A" IN POSITION I
3. CLOSE VALVES "C"
4. OPEN WIDE VALVE "B"
5. START ENGINE

**TRANSFER** -- PUMP WATER FROM ONE OUTSIDE SOURCE TO ANOTHER.

1. REMOVE CAP "D" ATTACH SUCTION HOSE
2. PLACE VALVE "A" IN POSITION I
3. CLOSE VALVES "C"
4. CLOSE VALVE "B"
5. ATTACH TRANSFER HOSE TO EITHER CAP "E" OR "F"
6. START ENGINE

**HANDSPRAYING** -- USING WATER IN TANK FOR FIRE FIGHTING ETC.

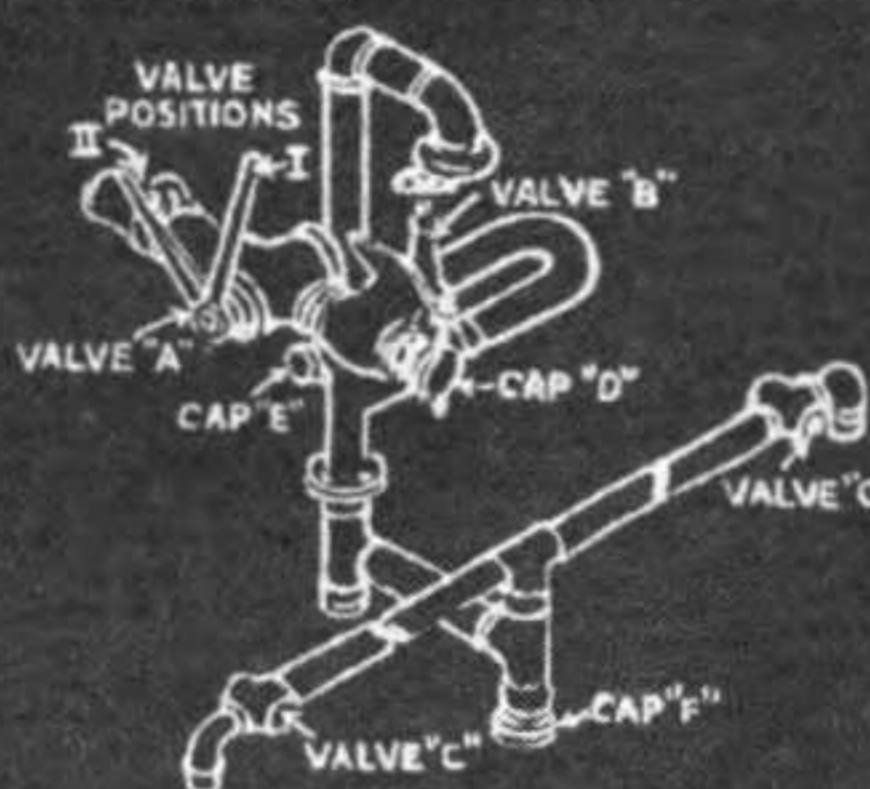
1. REMOVE CAP "E" ATTACH DISCHARGE HOSE AND NOZZLE
2. PLACE VALVE "A" IN POSITION II
3. CLOSE VALVE "C"
4. CLOSE VALVE "B" OR THROTTLE FOR VARIOUS PRESSURES.
5. START ENGINE

**SPRAYING** -- WATER FROM TANK THROUGH VARIOUS LENGTHS OF SPRAYBAR AT VARIOUS RATES OF PREDETERMINED DISTRIBUTION.

1. PLACE VALVE "A" IN POSITION II
2. CLOSE VALVE "B" OR THROTTLE FOR VARIOUS PRESSURES
3. START ENGINE
4. OPEN VALVES "C" TO BEGIN SPRAYING.

**GRAVITY DRAIN OR SPRAY** -- EMPTY WATER IN TANK EITHER THROUGH SPRAYBAR OR GRAVITY OUTLET.

1. PLACE VALVE "A" IN POSITION I
2. OPEN VALVE "B"
3. REMOVE CAP "F" OR OPEN VALVES "C" TO DRAIN THROUGH BAR.



**PRIMING PUMP** IF MACHINE HAS BEEN INOPERATIVE A LENGTH OF TIME IT MAYBE NECESSARY TO REMOVE PRIMING COVER ON TOP OF PUMP AND FILL WITH WATER TO PRIME PUMP.

**STARTING ENGINE** -

1. CHECK GASOLINE AND OIL LEVELS.
2. PULL OUT CHOKE-THROTTLE CONTROLS.
3. PUSH IN IGNITION SWITCH.
4. CRANK ENGINE
5. AFTER ENGINE STARTS, PUSH IN CHOKE
6. RUN AT GOVERNED SPEED FOR PUMPING


**Rosco** MODEL MOE

A

## LIFT ATTACHMENT DIAGRAM FOR DISTRIBUTOR, WATER, MODEL MOE, TRUCK MOUNTED 1000 GAL: RATED CAPACITY

ATTACH  
LIFTING HOOK  
AT POINTS "A"

MAX. LOAD PER LIFTING  
EYE, 10,000 POUNDS

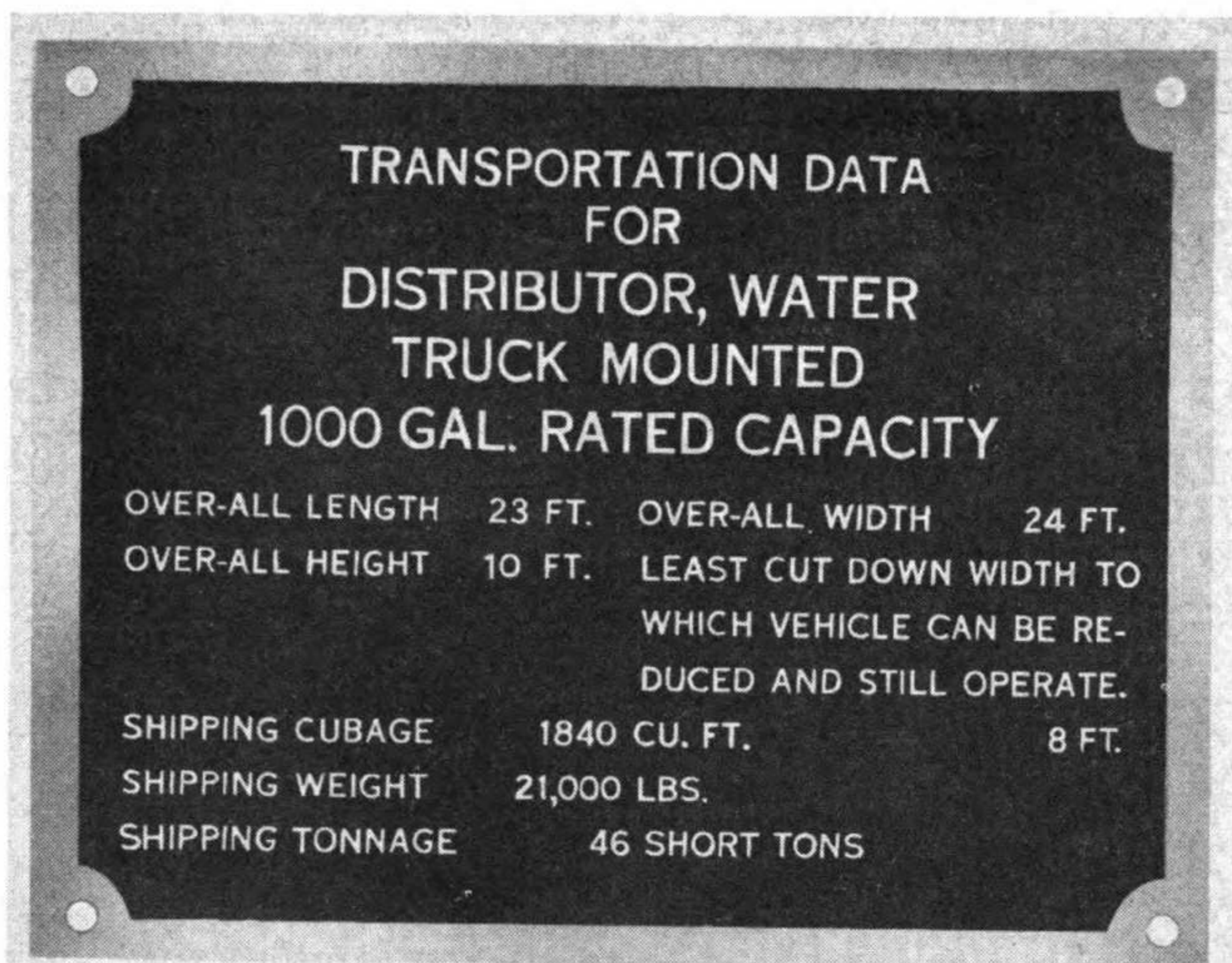


ROSCO MANUFACTURING CO. MINNEAPOLIS

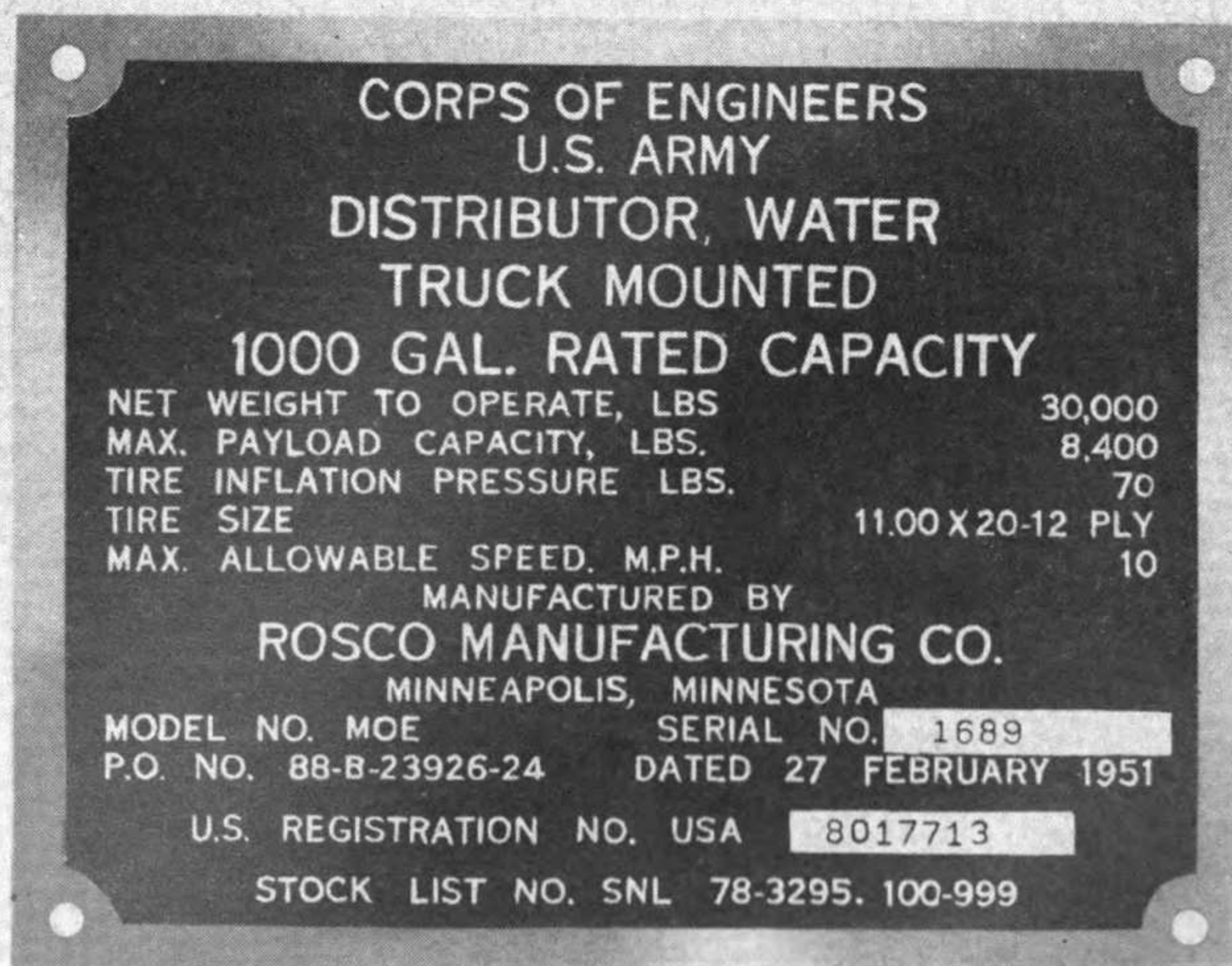
B

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A Operating instructions  
 B Lift attachment diagram  
 Figure 4. Identification plates.



**C**



**D**

**FB1161-4/2**

- C Transportation data plate
- D Corps of Engineers plate

*Figure 4—Continued.*

## 6. Tabulated Data

### a. General.

Manufacturer.....	Rosco Manufacturing Co.
Model.....	MOE
Type.....	Combination gravity and pressure spray
Mounting.....	Truck, 5 ton, 6 x 6 Model M61 4 cyl- inder gasoline engine

### b. Engine.

Manufacturer.....	Wisconsin Motor Corp.
Model.....	VE4
Type.....	Air-cooled

### c. Water Pump.

Manufacturer.....	Gorman-Rupp Co.
Model.....	WAC14X
Type.....	Self-priming, centrifugal

### d. Engine-Accessories.

#### (1) Air cleaner.

Manufacturer.....	Donaldson
Model.....	Lo 97505
Type.....	Oil bath

#### (2) Carburetor.

Manufacturer.....	Zenith
Model.....	161
Type.....	Updraft float

#### (3) Governor.

Manufacturer.....	Wisconsin Motor Corp.
Type.....	Centrifugal flyball.

#### (4) Magneto.

Manufacturer.....	Fairbanks-Morse Co.
Model.....	FM-XVE4B7G
Type.....	Shielded high tension

#### (5) Fuel pump and strainer.

Manufacturer.....	Blackstone Manufacturing Co.
Model.....	GI-195
Type.....	Diaphragm

### e. Performance.

Pump capacity.....	160 gpm (gallons per minute)
--------------------	------------------------------

### f. Capacities.

Water tank.....	1,000 gal.
Fuel tank.....	10 gal.
Air cleaner.....	½ pt.

### g. Size and Weight.

Length, overall.....	23 ft.
Width, overall.....	24 ft.
Width with spraybar folded.....	8 ft.
Height, overall.....	10 ft.
Weight.....	21,000 lbs.
Tire pressure, truck.....	70 lbs.
Tire pressure, tachometer.....	15 lbs.
Suction pipe.....	4-in.
Discharge pipe.....	1½ and 3 in.
Transfer pipe.....	3 in.

## CHAPTER 2

# OPERATING INSTRUCTIONS

### Section I. SERVICE UPON RECEIPT OF EQUIPMENT

#### 7. New Equipment

*a. General.* The water distributor is shipped uncrated or unboxed from the factory on a flatcar. The unit is thoroughly processed and adequately blocked and strapped to the flatcar, as shown in figure 5, to insure arrival in good condition.

*b. Unloading.*

- (1) Detach all anchor wires and remove the blocking.
- (2) Attach hoist lifting cables to the towing hooks on the front bumper and to the lifting brackets on each side of the truck frame. With the cable sling hooked securely and arranged properly, lift the unit and lower it to the ground.

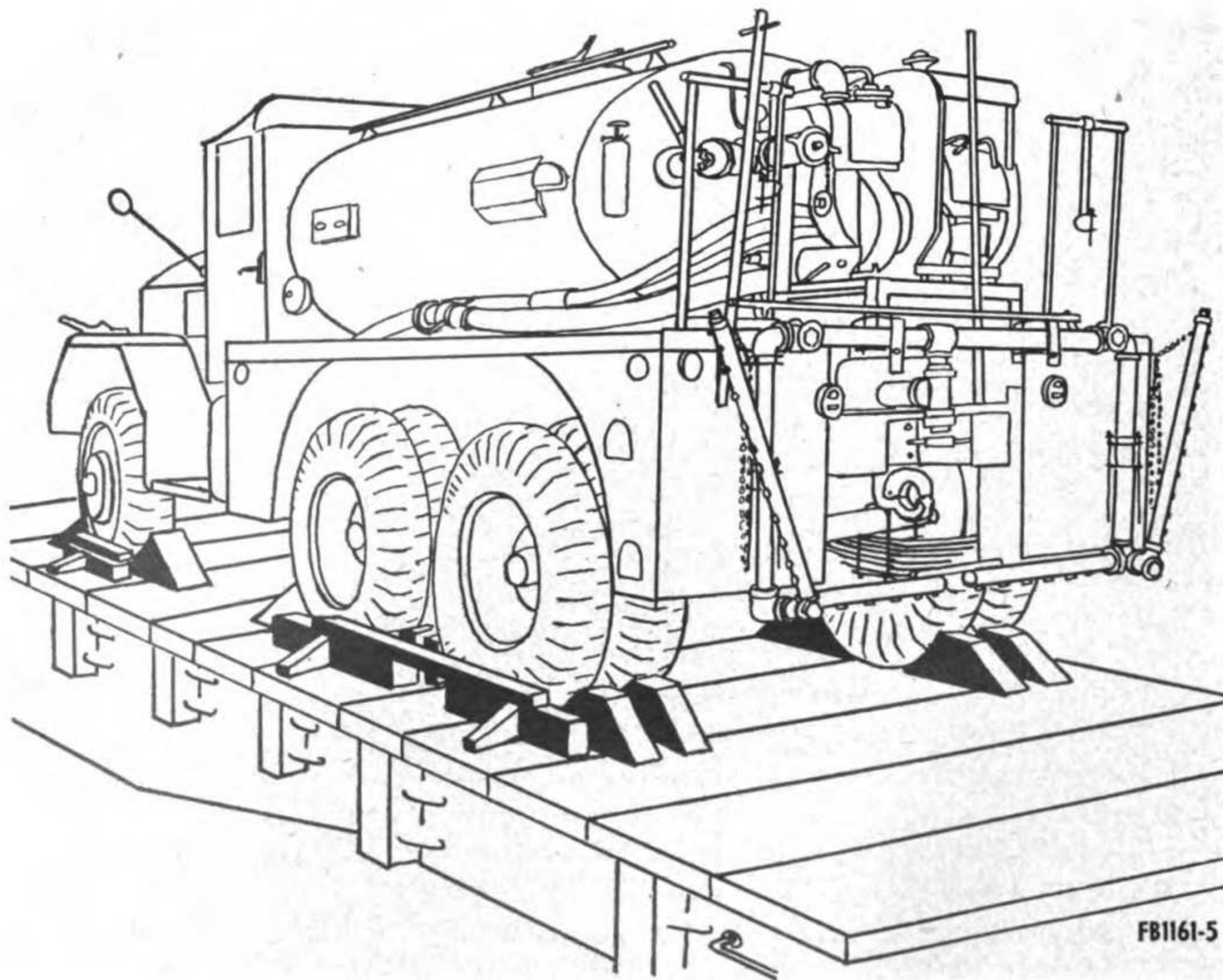


Figure 5. Shipment of distributor.



- (3) Where hoisting equipment is not available, it will be necessary to construct a wooden ramp at one end of the car and slowly roll the truck down the ramp using the vehicle's brakes to ease it down the ramp.

*c. Uncrating.* Use the packing list to see that all equipment is received and that it is undamaged. Remove tape seal from toolbox and suction and discharge ports, and check throughout the control system for parts that may be taped. Remove all tape, fastening wire, or braces that may interfere with the operation in removing the unit from its means of conveyance.

*d. Removal of Preservative Compounds, Lubricants, and Devices.* Use an approved cleaning solvent to remove rust-preventive compound. Remove preservative tape from the following items: Lights and reflectors, engine muffler, suction and discharge hose ends, flexible rubber piping, pump pressure gage and steadying valve, engine crankcase drain, fuel tank cap, signal bell, spraybar operating levers, spraybar nozzle piping, manhole cover, engine shroud, engine crankcase breather cap.

*e. Assembling.* The water distributor is shipped completely assembled. The suction hose and discharge hose are carried in brackets mounted on the distributor tank.

*f. Inspection.*

- (1) Make a complete inspection to see if the required tools, spare parts, catalogs, accessories, and attachments are accounted for after removal of the unit from the flatcar.
- (2) Check the vehicle and engine visually for loss or damage which may have occurred during removal or shipment.
- (3) Check the tires for proper inflation of 70 pounds for truck tires and 15 pounds for fifth-wheel tire.
- (4) Use the engine crank, and with the ignition switch in the OFF position, crank the engine to be sure that the pistons and bearings are free.
- (5) Check the cooling shroud over the engine flywheel and make sure it has not been dented or otherwise damaged in shipment.
- (6) Inspect the housing, muffler, air cleaner, and fan screen for visible damage. Remove the engine house doors and inspect the magneto, spark plug wires, and oil filter for damage.
- (7) Examine the pump and the pump connections for visible signs of damage. Inspect the pump pressure gage for damaged or broken glass.
- (8) Visually inspect all piping, lines, hoses, and extensions for cracks or damage, loose connections, or missing parts.
- (9) Inspect the spraybar and nozzles for damage. Be sure the operator's platform is secure and not damaged.

- (10) Inspect the water tank, level gage, and skirting for signs of damage.
- (11) Test the signal bell for proper operation.
- (12) Lower and raise the fifth wheel to see if the cable is secure and working, and spin the wheel to determine that the cable and recorder are working. Lower wheel to midway ground position and hoisted travel position.

*g. Service.*

- (1) Lubricate the water distributor as directed in paragraph 48.
- (2) Perform the preventive maintenance services as described in paragraph 51*c*.
- (3) Fill the gasoline tank.
- (4) Mount the fire extinguisher on the left rear side of the water tank.

*h. Water Distributor Setting-Up Instructions.*

- (1) When pumping water from streams, drive the unit as close as possible to the source of supply.
- (2) When power-pumping, the unit should be in a level position.
- (3) Keep the suction lift as low as possible and the suction line as short as possible.
- (4) Use the proper length spraybar extensions according to the type job encountered.
- (5) Set supply valve to the spraybar at the proper quantity per square yard, taking into consideration the type of terrain to be watered down.
- (6) Be sure the fifth wheel is lowered to the metering position.

## **8. Used Equipment**

Used equipment requires the same inspection and service as new equipment. Perform the operations in paragraph 7, taking particular care to inspect for worn or damaged parts which may cause serious damage to the unit.

## **Section II. CONTROLS AND INSTRUMENTS**

### **9. General**

This section describes, locates, illustrates, and furnishes the operator, crew, or driver sufficient information about the various controls and instruments for the proper operation of the materiel.

### **10. Tank Contents Gage**

*a. Location.* The contents gage (7, fig. 1) is located on the left side at the rear of the tank.

*b. Purpose.* The gage tells the operator the approximate amount of water remaining in the tank.

## 11. Pressure Gage

(fig. 6)

*a. Location.* The pressure gage is located on the upper part of the discharge piping, just below the second elbow of the discharge pipe, which is mounted to the pump.

*b. Purpose.* The gage indicates pressure in pounds per square inch on the water being discharged to the spraybar or hose.

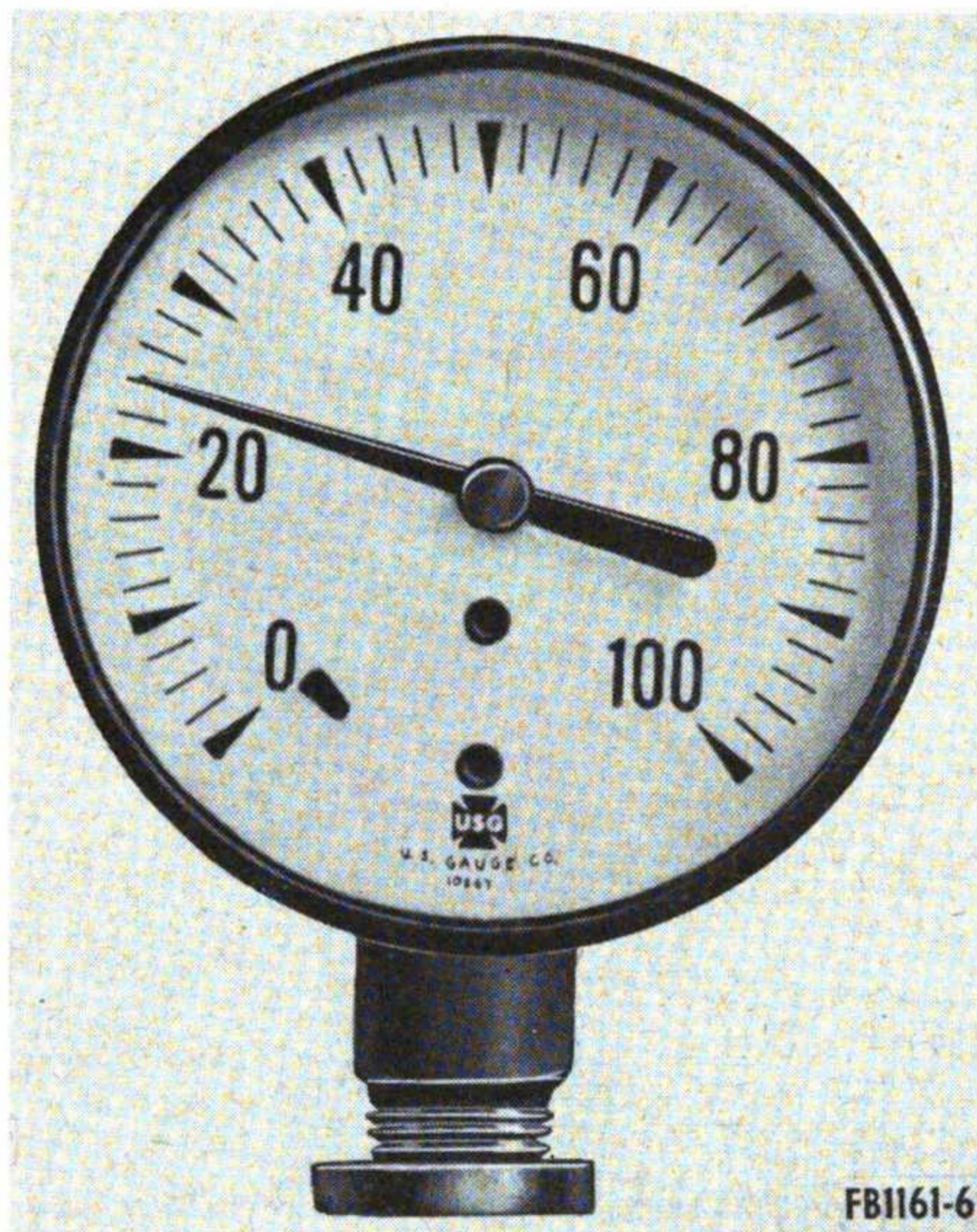


Figure 6. Pressure gage.

## 12. Measuring Stick

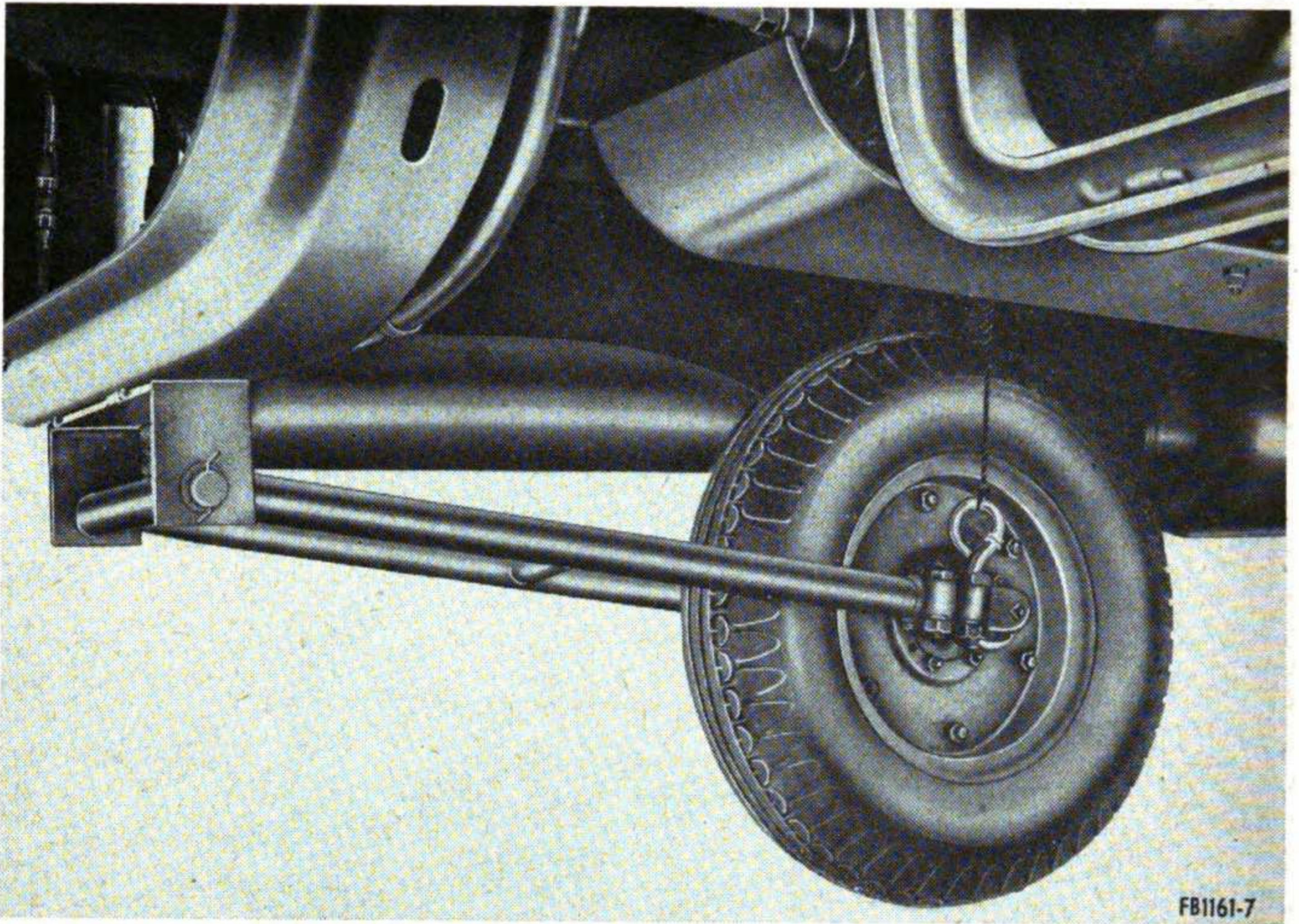
*a. Location.* The measuring stick is carried in either of the two hand rails (4, fig. 1) on top of the water tank.

*b. Purpose.* The measuring stick is used to determine the accurate amount of water in the tank.

## 13. Tachometer and Fifth Wheel

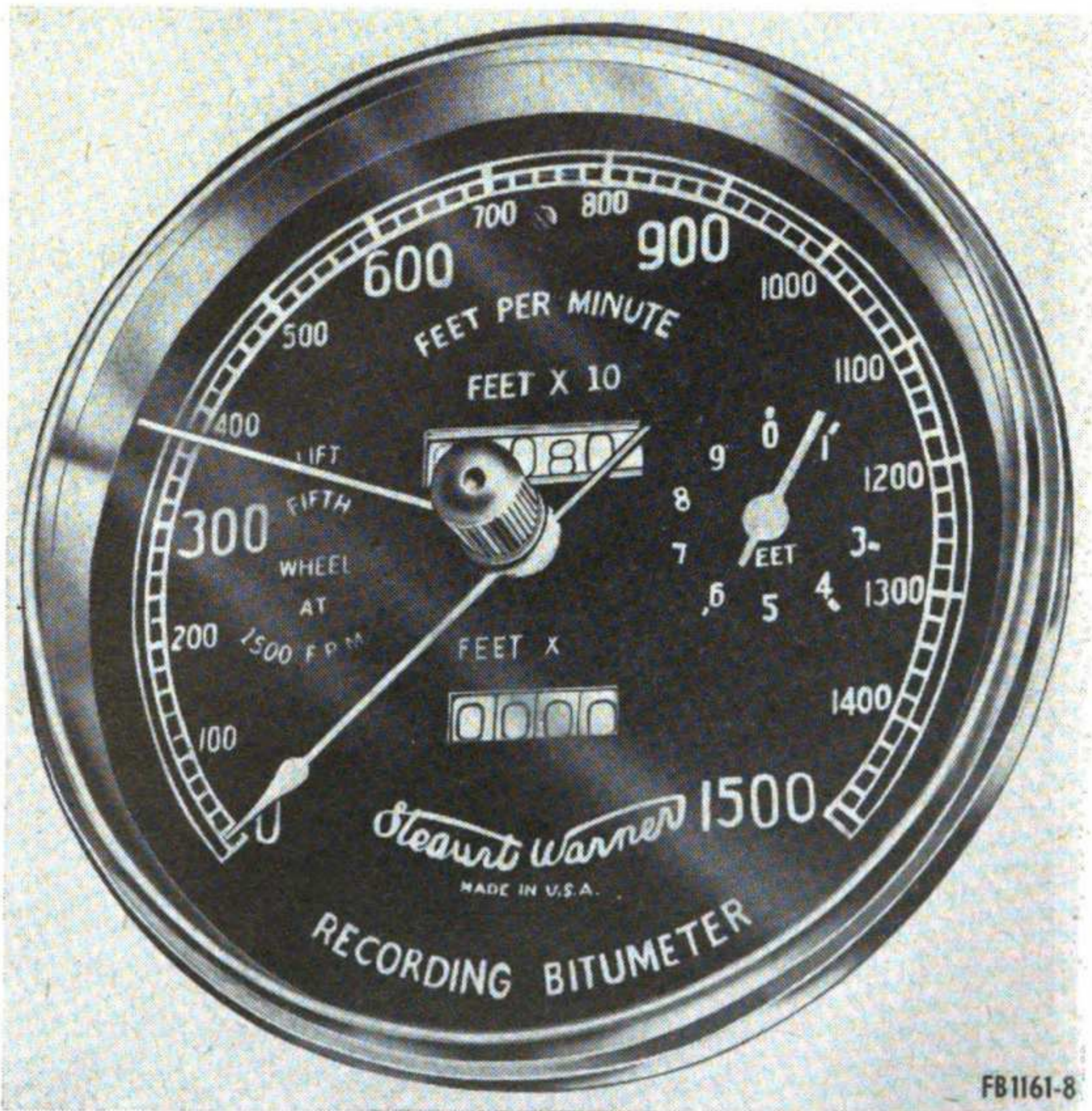
*a. Location.* The fifth wheel tachometer (fig. 7) unit is located at the center of the chassis directly below the cab floor. The recording head (fig. 8) is mounted in the interior of the cab, bolted to the front side of the instrument board, and the control cable and hook is located in the cab.

*b. Purpose.* The tachometer is used to keep the operator accurately informed on the distance traveled in feet per minute so the proper quantity of water will be properly distributed in that particular job.



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Figure 7. Fifth wheel tachometer.



FB1161-8

Figure 8. Recording head.

## 14. Suction Valve

(fig. 9)

*a. Location.* The suction valve is located in the suction line at the center point of the pipe assembly from the pump to the tank.

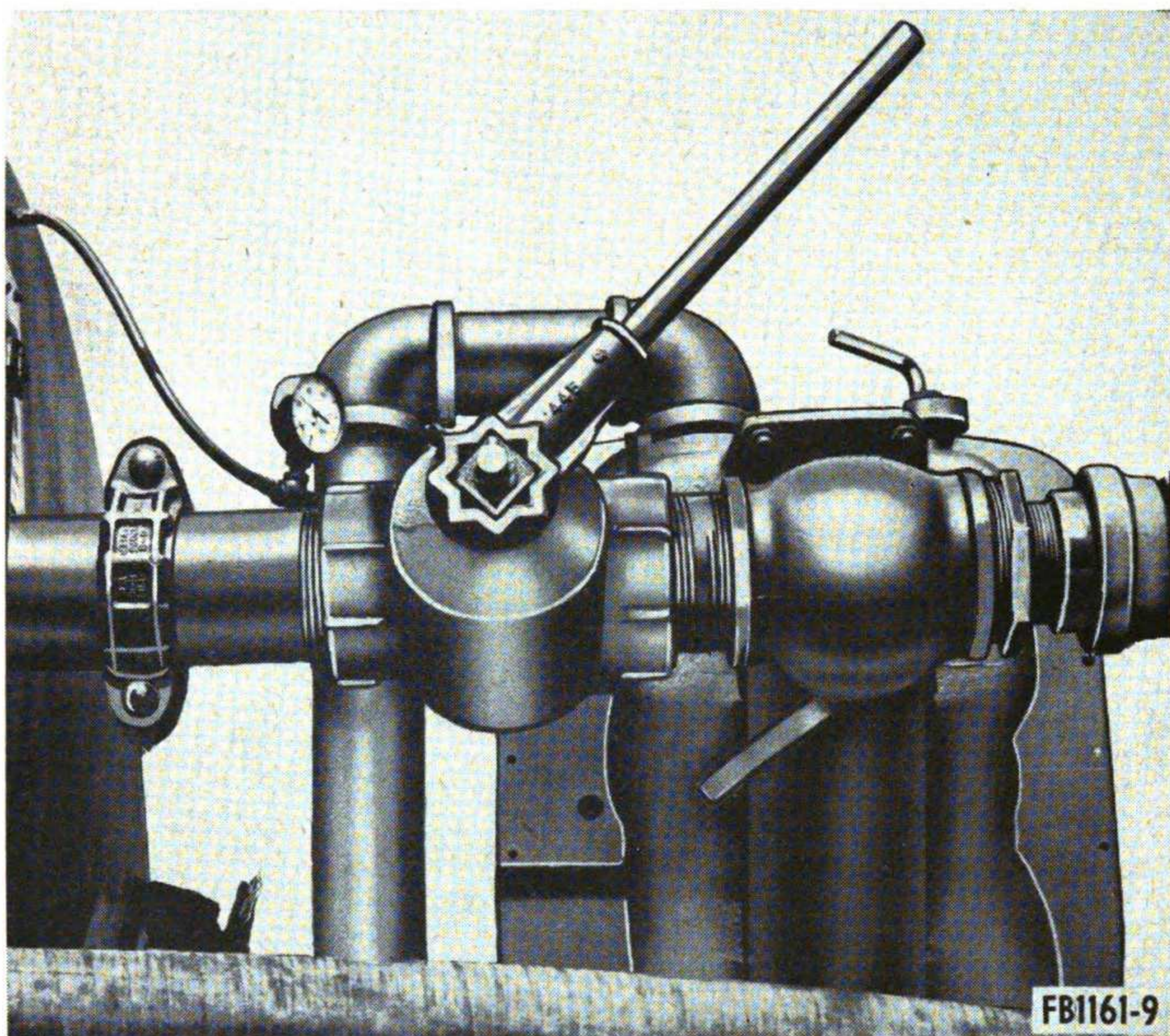


Figure 9. Suction valve.

*b. Purpose.* The suction valve is used to control the suction line from the tank to the suction side of the pump.

## 15. Pressure Regulating Valve

(fig. 10)

*a. Location.* The pressure regulating valve is located in the discharge line above the circular mounting base for the discharge pipe and behind the lower center of the engine.

*b. Purpose.* The pressure regulating valve is used to control the amount of water being delivered to the spraybar or discharge hose, as well as controlling the gravity drain of water in the tank to either the spraybar or gravity outlet. This valve, in conjunction with the two valves in the spraybar assembly, also controls the entry of water into the tank when using the power pumping unit for transferring and loading operations.

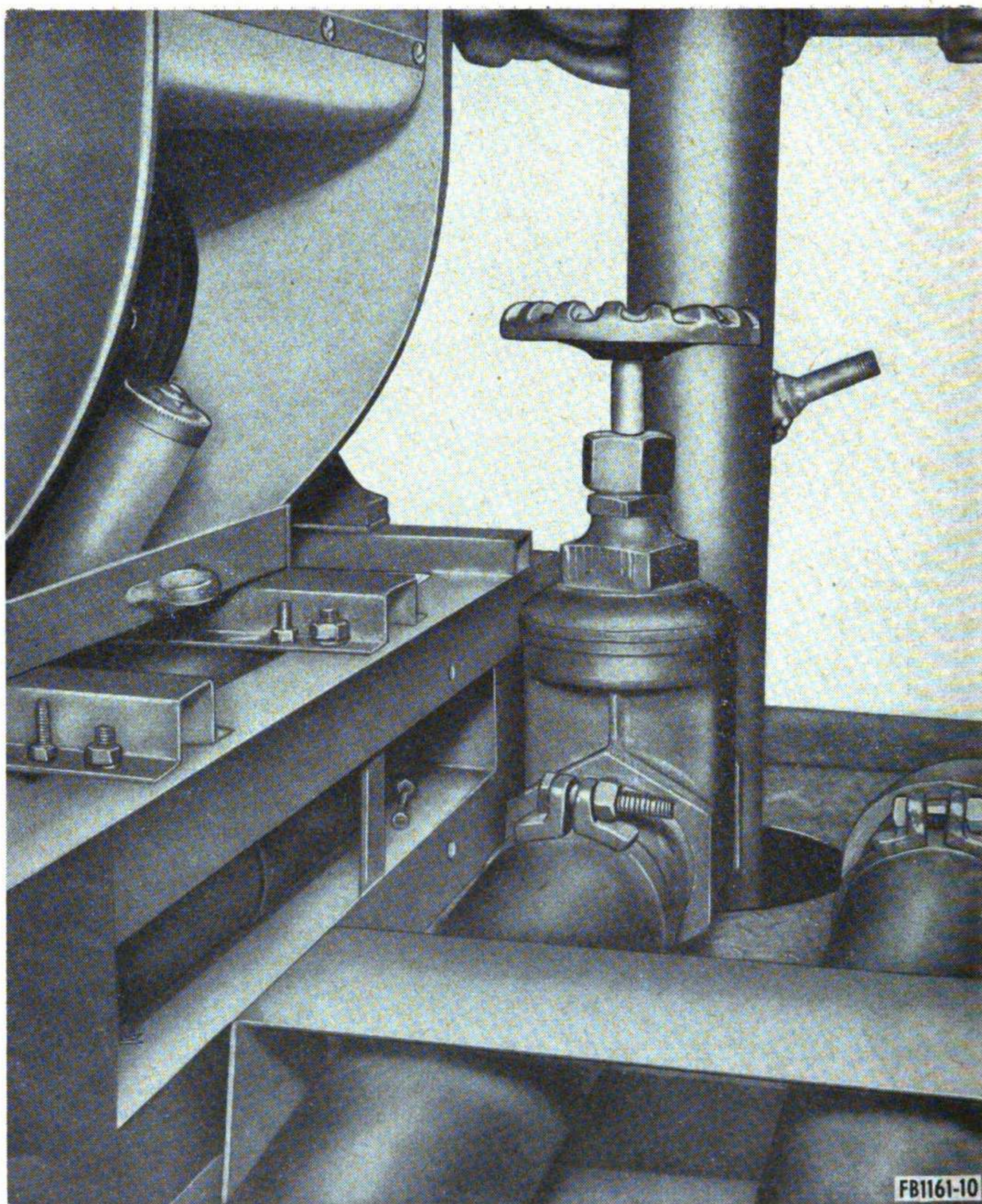


Figure 10. Pressure regulating valve.

## 16. Spraybar Supply Valves

*a. Location.* The two spraybar supply valves (2 and 8, fig. 3) are located in the upper spraybar support piping one at each elbow end.

*b. Purpose.* The two valves which are controlled by the levers (2 and 3, fig. 2) are used to control the flow of water to each section of the spraybar. They can both be used at the same time, or used independently of one another.

## 17. Extension Cutoff Valves

*a. Location.* The two spraybar cutoff valves (4, fig. 3) are located in the bottom of the two stationary vertical or upright pipes that lead from the upper supply piping.

*b. Purpose.* These valves allow the water to enter the extended sections of the spraybar and shut off the supply when the sections are swiveled into the vertical or clearance position.

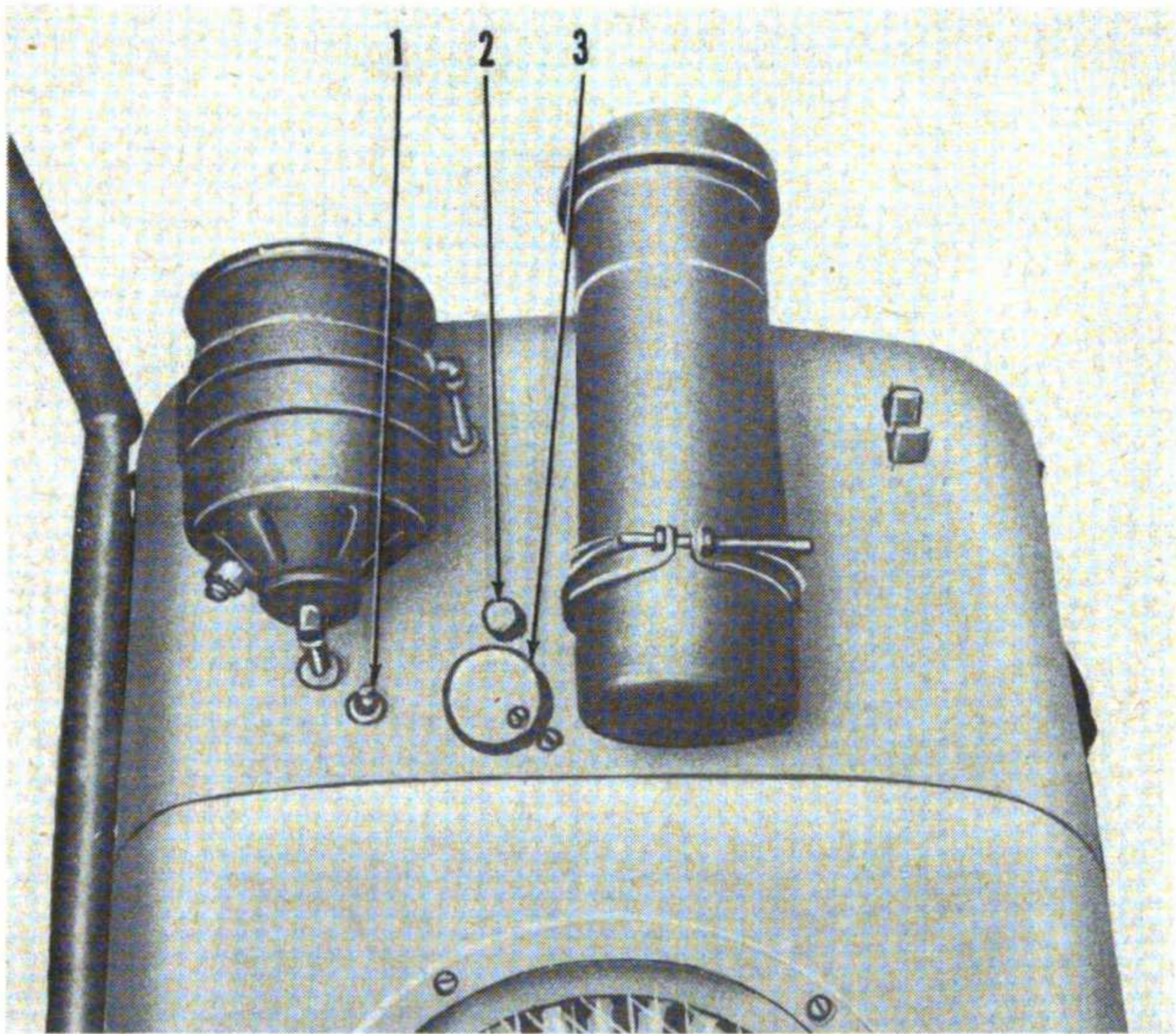
## 18. Signal Bell

*a. Location.* A signal bell (1, fig. 1) is located on the left lower side of the tank just back of the truck cab. It is operated by a pull cord that runs to the rear of the truck.

*b. Purpose.* The purpose of the signal bell is to maintain two-way contact between the truck driver and operator.

## 19. Engine Governor

*a. Location.* The governor is mounted on the timing gear cover and is of the centrifugal flyball type. The governor variable speed control (3, fig. 11) is mounted on the housing frame above the flywheel shroud.



1 Ignition switch

2 Choke

3 Variable speed control

*Figure 11. Engine controls.*

*b. Purpose.* The governor controls the carburetor throttle opening to maintain constant engine speed under varying load conditions. The governor also acts as a safety device to prevent excessive engine speeds from developing. The governor is driven by the camshaft gear and rotates at crankshaft speed.

## 20. Ignition Switch

*a. Location.* The ignition switch (1, fig. 11) is mounted on the engine housing to the left of the governor control above the flywheel shroud.

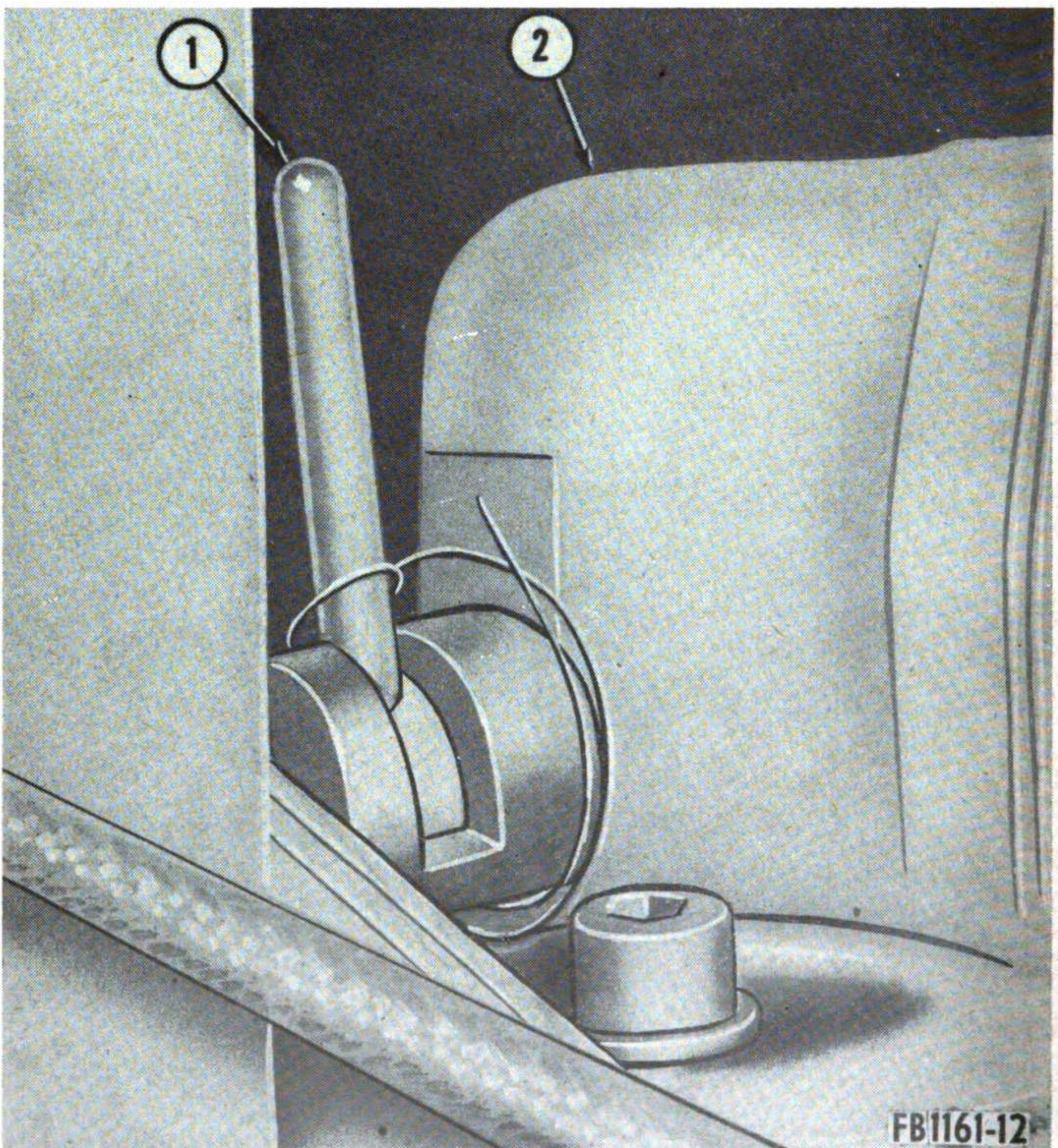
*b. Purpose.* The ignition switch is used to make and break the ignition circuit to start or stop the engine.

## 21. Fuel Pump Priming Lever

(fig. 12)

*a. Location.* The fuel pump priming lever (1) is located on the side of the engine fuel pump adapter (2).

*b. Purpose.* This lever is used to prime manually the fuel pump with fuel.



1 Fuel pump priming lever

2 Fuel pump adapter

*Figure 12. Fuel pump priming lever.*



## 22. Choke

*a. Location.* The choke control (2, fig. 11) is located on the housing above the governor control.

*b. Purpose.* The choke is used to obtain a rich fuel-air mixture for starting. The choke should be opened as the engine warms up.

## 23. Shifter Lever

*a. Location.* The shifter lever (5, fig. 2) is located to the right of the center swivel piping, which is connected vertically to the upper horizontal piping.

*b. Purpose.* This shifter lever is used to adjust the spraybar laterally (left to right or vice versa) with the curb line or marker line which may vary considerably in the distance in which the water distributor may cover.

## 24. Engine Crank Handle

*a. Location.* The crank handle is mounted on the front of the pump engine to the right of the air cleaner.

*b. Purpose.* The crank handle is used to start the pump engine by hand cranking.

### Section III. OPERATION UNDER USUAL CONDITIONS

## 25. General

*a.* The instructions in this section are published for the information and guidance of the personnel responsible for the operation of the water distributor.

*b.* It is essential that the operator know how to perform every operation of which the machine is capable. This section gives instructions on the starting and stopping the machine, instructions on the basic motions of the machine, and instructions on how to coordinate the basic motions to perform the specific tasks for which the machine is designed. Since nearly every job presents a different problem, the operator may have to vary the given procedure to fit the individual job.

## 26. Priming Pump

It is frequently necessary to prime the pump if the unit has been inoperative for a considerable period of time, or is being started for the first time. Prime the pump as follows:

*a.* Turn the clamp bar screw on top of the pump housing, unhook the clamp bar, and remove the cover plate.

*b.* Fill the priming chamber with sufficient water to seal the pump impeller, and install the cover plate.

*c.* Tighten the cover plate with the clamp bar and screw.

## 27. Starting

*a.* Refer to paragraph 51*c* for before-operation services to be performed.

*b.* Pull out the choke (2, fig. 11).

*c.* Push in the ignition switch (1).

*d.* Start the engine by inserting the crank and pulling up briskly in a clockwise direction. If the engine does not start on the first pull of the crank, re-engage the crank and repeat the operation.

**Caution:** Do not attempt to spin the engine with the starting crank.

*e.* Push the choke in after the engine has warmed up.

*f.* Set the governor variable speed control (3) for the desired speed.

*g.* Prime the pump if necessary (par. 26) by removing the plate on top of the pump head and filling the self-priming chamber with sufficient water to seal the pump impeller.

*h.* Set the valves in the proper position for the desired operation.

## 28. Stopping

*a.* Allow the engine to run slightly faster than idling speed a few minutes before stopping it.

*b.* Stop the engine by pulling the ignition switch (1, fig. 11) out.

*c.* Immediately close the discharge gate valve in order to retain a head of liquid in the pump and the suction line.

*Note.* If liquid runs out of the pump case and suction line, it will be necessary to prime the pump when the pump is next started.

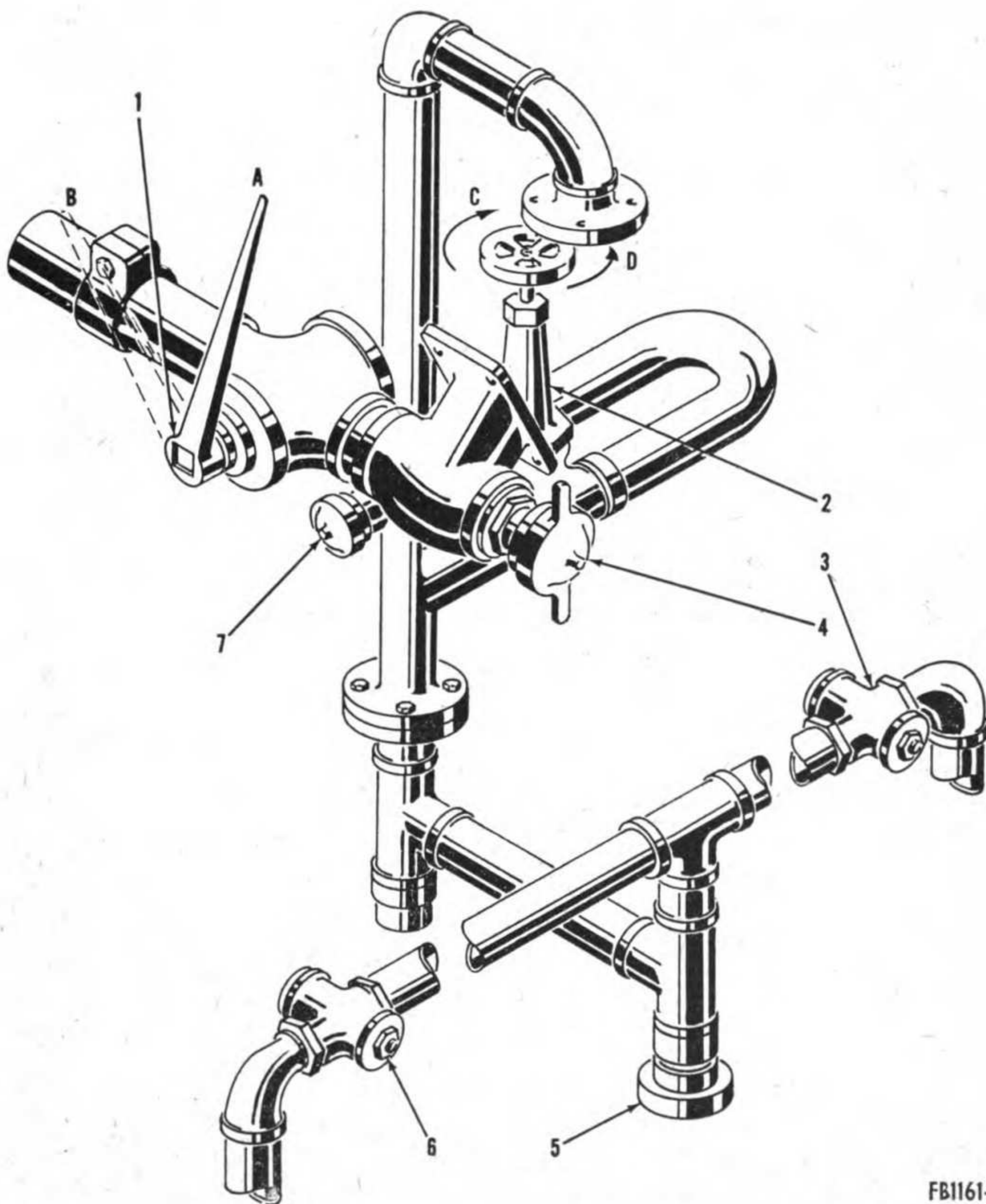
*d.* Allow the water to drain from the spraybar piping and then close the levers.

## 29. Loading

To fill the distributor tank with water from an exterior source, such as, a stream, pond, lake, or tank, using the power pumping unit:

*a.* Remove the cap (4, fig. 13) on the suction outlet of the suction strainer and attach the necessary length of 3-inch rubber suction hose supplied with the unit, making sure that all of the connections and joints are tight. Any leaks on this suction line will greatly decrease the suction ability of the pumping unit. The maximum lift to be expected with this unit with the suction line free of all leaks, is approximately 20 feet. In order to prevent debris from being taken into the suction hose along with the water, an expanded metal strainer is provided to be placed on the end of the suction hose, as shown in figure 14.

*b.* Place valve lever for the suction valve (1, fig. 13) in the position A, which closes off the suction line from the tank and permits the pump suction to pull through the suction hose attached to outlet at (4).



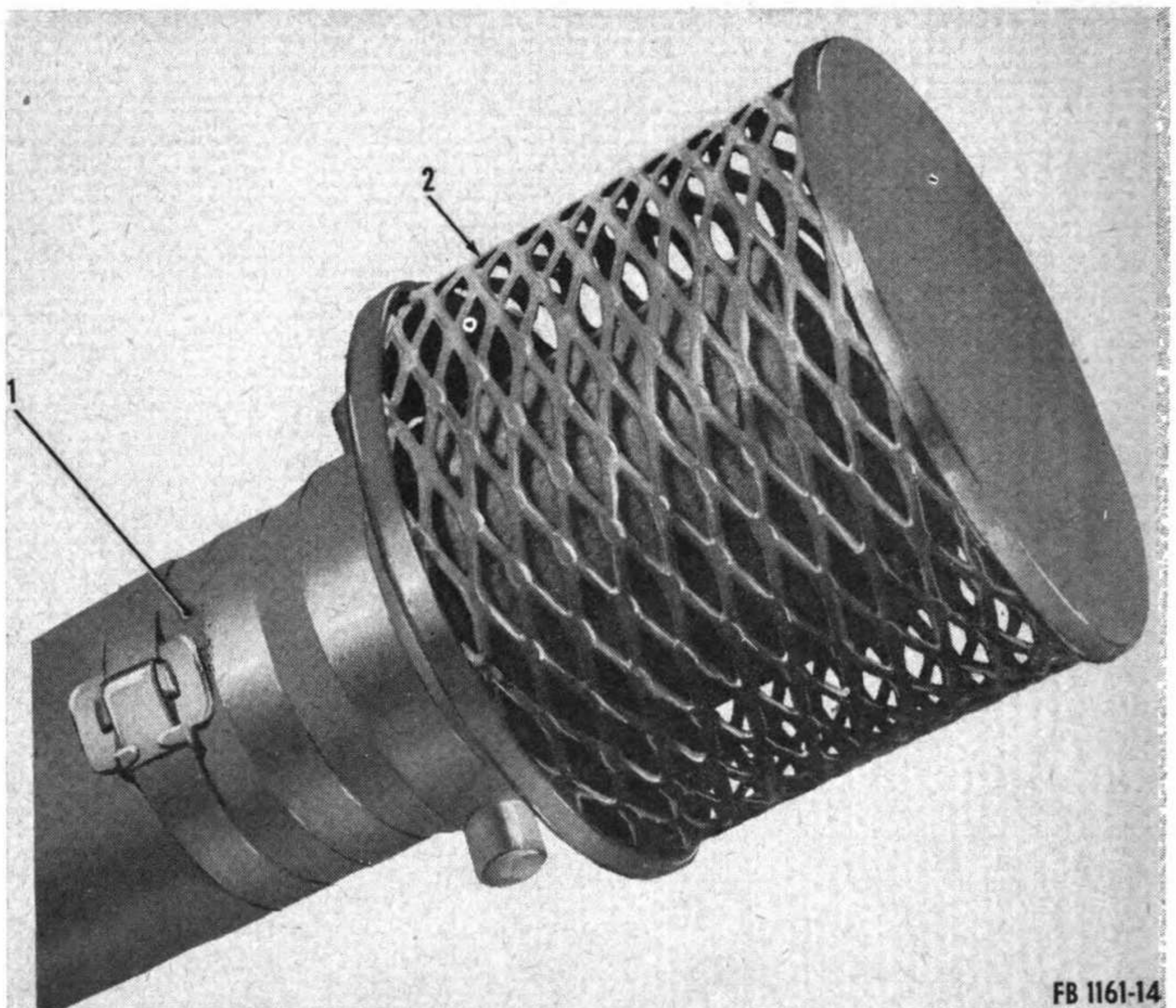
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- |                        |                                  |
|------------------------|----------------------------------|
| 1 Suction valve        | 5 Cap for transfer discharge     |
| 2 Discharge valve      | 6 Upper spraybar valve           |
| 3 Upper spraybar valve | 7 Discharge cap for handspraying |
| 4 Suction valve cap    |                                  |
- A Suction position of suction valve  
 B Discharge position of suction valve  
 C Close position of discharge valve  
 D Open position of discharge valve

Figure 13. Valve and piping diagram.

c. Close the upper spraybar valves (3 and 6), or the 2½ inch straight-way valves, located on the spraybar header. By closing these valves, water is prevented from draining out of the spraybar while filling the distributor tank.

d. Open wide the 3-inch gate valve (2) on the discharge piping line, to permit the water being pulled into the pump to be discharged



1 Hose

2 Strainer

*Figure 14. Suction hose debris strainer.*

into the tank. Any partial closing of this valve will greatly decrease the ultimate loading time of the distributor.

e. When the above valves have been positioned as described, the engine should be started and allowed to run at the governed speed to load the tank in the quickest possible time. If all valves have been positioned properly, the suction strainer is clean, all suction piping is tight, and the pump and engine are in good running order, the machine should load itself in about 8 minutes or at about 125 gallons per minute with the 3-inch gate valve open wide. The quantity of water loaded into the tank may be determined by the tank contents gage mounted on the left side of the tank toward the rear. The use of the measuring stick is an alternative method of determining the quantity of water in the tank. Open the manhole cover and drop the end of the stick to the bottom of the tank. Hold the measuring stick in a vertical position as shown in figure 15, lift it out, and read the figure at the wet mark.

### **30. Transfer or Fire Fighting**

The power pumping unit of the distributor may be used to transfer or pump water from one outside source to another, as for fire fight-

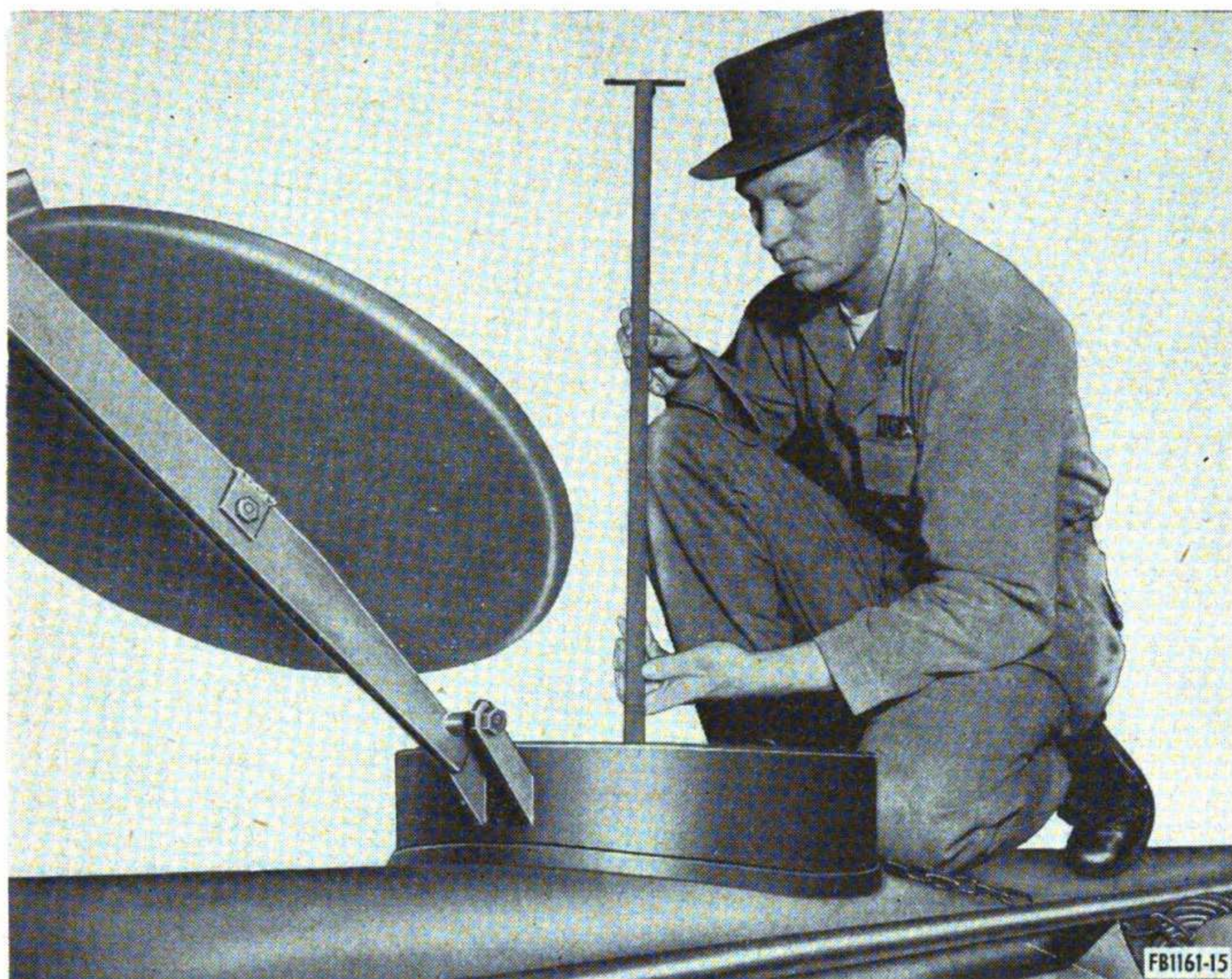


Figure 15. Using the measuring stick.

ing or some other purpose, without the water entering the tank as shown in figure 16.

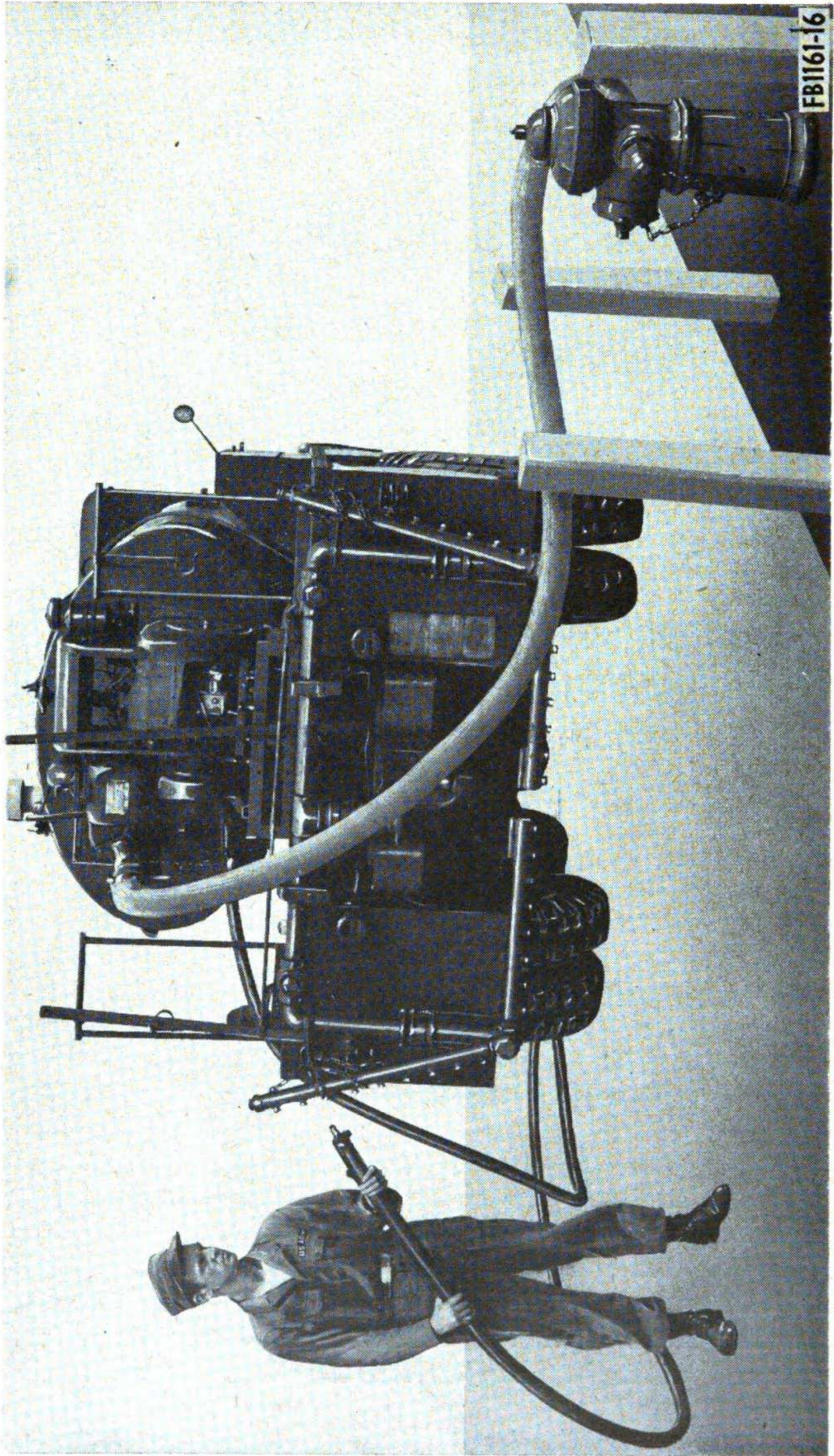
*a.* Remove cap (4, fig. 13) on the suction outlet of the suction strainer, attach the necessary length of 3-inch rubber suction hose supplied with the unit, making sure that all of the connections and joints are tight, to prevent suction leaks which will greatly decrease the potential lift of the pump.

*b.* Place the 4-inch suction valve in position A which closes off the suction line from the distributor tank and permits the pump suction to pull through the suction hose attached to the suction outlet.

*c.* Close the 2½-inch valves (3 and 6) located on the spraybar header. By closing these two valves water is prevented from entering the spraybar while filling the distributor tank.

*d.* Close the 3-inch gate type valve (2) on the discharge piping which will prevent water from entering the tank. Any throttling of this valve on the transferring operation will allow water to enter the tank and will consequently decrease the amount of water being transferred.

*e.* Attach a 1½-inch hose to the discharge outlet which holds cap (7) located on the lower end of the discharge piping. If a greater discharge volume is required a 3-inch hose can be attached to outlet



*Figure 16. Fire fighting with outside source of water.*

at the cap at point where spraybar assembly seats on discharge piping (5).

*f.* When the above described valves have been correctly positioned and the required hoses attached securely to the outlets being used, the engine should be started and allowed to run at the governed speed to obtain the maximum pumping capacity of the power unit.

### **31. Hand Spraying With Filled Tank**

To use the water in the tank under pressure from the power pumping unit for fire fighting or any other spraying purposes which might arise proceed as follows:

*a.* Remove cap (7, fig. 13) on the discharge piping line and attach the supplied 1½-inch discharge hose to the outlet, or if a larger volume hose is desired a 3-inch discharge hose may be attached at the outlet after cap (5) is removed.

*b.* Place the 4-inch suction valve (2) in the open position so that the water will be drawn from the tank. This is position B as shown on the piping line drawing.

*c.* Close the two 2½-inch valves (3 and 6) located on the spraybar header, which prevents water being delivered to the spraybar.

*d.* Close the gate valve, on the discharge line.

*e.* When the above valve positions have been made, start the power pumping unit and run at the governed speed for maximum pump delivery. The discharge valve can be throttled after the pump is running to the desired pressure as shown on the gage on the discharge piping.

### **32. Ground Spraying**

Water may be applied from the distributor tank to the ground, using the power pumping unit to maintain the correct application pressure, through the spraybar of any required length from 3 to 24 feet. The correct application desired is determined from the application charts supplied in this manual which indicate the correct pressure and feet per minute travel of the truck to give various rates of delivery in gallons per square yard while using spraybar lengths of from 3 to 24 feet in increments of 1 foot.

*a.* Place the suction valve (1, fig. 13) in the open position B so that material will be pumped from the tank to spraybar.

*b.* Close the 3-inch gate valve on the discharge piping to obtain maximum pressure at the spraybar. After starting engine it will be necessary to throttle this valve to obtain the correct pressure reading on the gage for the application rate to be supplied.

*c.* Start the power unit engine and run at the full governed speed to obtain the maximum pumping capacity. Throttle 3-inch gate valve as above described to obtain the desired pressure.

*d.* To begin spraying, open two 2½-inch valves, located on the header of the spraybar by pulling the two control levers on the left side rear of the operating platform of the machine. For operation from this platform, a shift lever is also supplied which enables the operator to move the spraybar assembly 7 inches to either side, off the center, to follow a line or make alinement of the spraybar.

### **33. Gravity Drain or Spray**

The water in the tank may be emptied by gravity, through either the spraybar or hose outlets. If this load of water is desired to be directed to some particular source a suitable hose can be connected to the smaller hose outlet or the spraybar can be used for the purpose if only a dust-laying treatment is desired. However, any degree of accuracy is impossible with this type of water application.

*a.* Place the 4-inch suction valve (1, fig. 13) in position A which shuts off the suction line from the tank to the suction side of the pump, and will prevent water entering the pump.

*b.* Open wide the 3-inch gate type valve on the discharge piping to permit a full flow of water from the tank. This valve can be throttled, if so desired, to control the amount of water being drained from the tank.

*c.* Remove cap at large hose outlet (5) and attach suitable 3-inch discharge hose, or allow water to drain directly on to the ground. If it is desired to drain the tank of water through the spraybar by gravity for a dust-laying operation, do not remove cap at large hose outlet, but open valves (3 and 6) on the header pipe of the spraybar assembly as described under spraying (par. 32*d*).

### **34. Pressure Adjustment**

*a.* After the machine has started spraying, the pressure must be adjusted to correspond with that specified for the particular application rate. This adjustment is made by turning the handle on the 3-inch gate valve on the discharge piping at the rear of the engine, or between the engine and the tank head.

*b.* By watching the pressure gage mounted on the discharge piping also, opening this 3-inch valve will proportionately decrease the pressure in the discharge line by bypassing the water back into the tank; thus decreasing the volume of water delivered to the spraybar. Any pressure desired can be obtained, within the limits of the pumping unit, by either opening or closing this valve.

### **35. Explanation of Application Procedure and Charts**

The controlled application of specific quantities of water over a given area is dependent upon three major variables; pressure, truck speed, and spraybar length. If the pressure is maintained at a fixed



rate and the orifice in the nozzles remain unchanged the machine will discharge the same amount of water in the same length of spraybar in the same length of time, regardless of small variances in the pump speed as the surplus water discharged by the pump is returned to the tank through the bypass or throttling valve. Knowing the amount of water discharged per minute through each nozzle at either 20 or 30 pounds pressure and the number of spraybar nozzles used in any specified length of spraybar, it is possible, by varying the speed of the truck in feet per minute, to apply any reasonable amount of water accurately to the ground at a predetermined gallonage per square yard rate.

### **36. Use of Application Charts**

*a.* The application charts (figs. 17, 18, 19, and 20) following this procedure, are divided into two groups; namely the 20 psi (pounds per square inch) and the 30 psi gage pressure. These charts have been further divided into spraybar lengths from 3 to 24 feet on the 20 psi charts and 3 to 21 feet on the 30 psi charts. This shorter length on the 30 psi charts is necessitated by the fact that at 30 pounds the discharge capacity of the pump is exceeded on lengths of spraybar over 21 feet.

*b.* Generally speaking, it is advisable to use the 20 psi charts for all light applications and the 30 psi charts on all heavier applications to permit a more satisfactory operating speed on the truck travel.

*c.* The application rate in US gallons per square yard and the width of spraybar necessary being predetermined, it is then necessary for the operator to find the following two unknowns by using the supplied application charts:

- (1) Select the pressure group as indicated by the above suggestion (20 psi for light applications and 30 psi for heavy applications).
- (2) The various spraybar lengths are indicated at the bottom center of the oval in large figures. Select the one corresponding to the width of strip to be applied and follow the curve indicated until meeting the line running out from the center which corresponds to the specified rate of application. Then read the correct truck speed in feet per minute, which is indicated in the truck cab to the truck operator by the tachometer head.

### **37. Application Example**

*a.* Application rate .4 gallon per square yard, width of strip or spraybar to be used 9 feet.

*b.* With the above two required known factors and using the application guide charts, on the 20 psi chart, follow the 9-foot curve until it

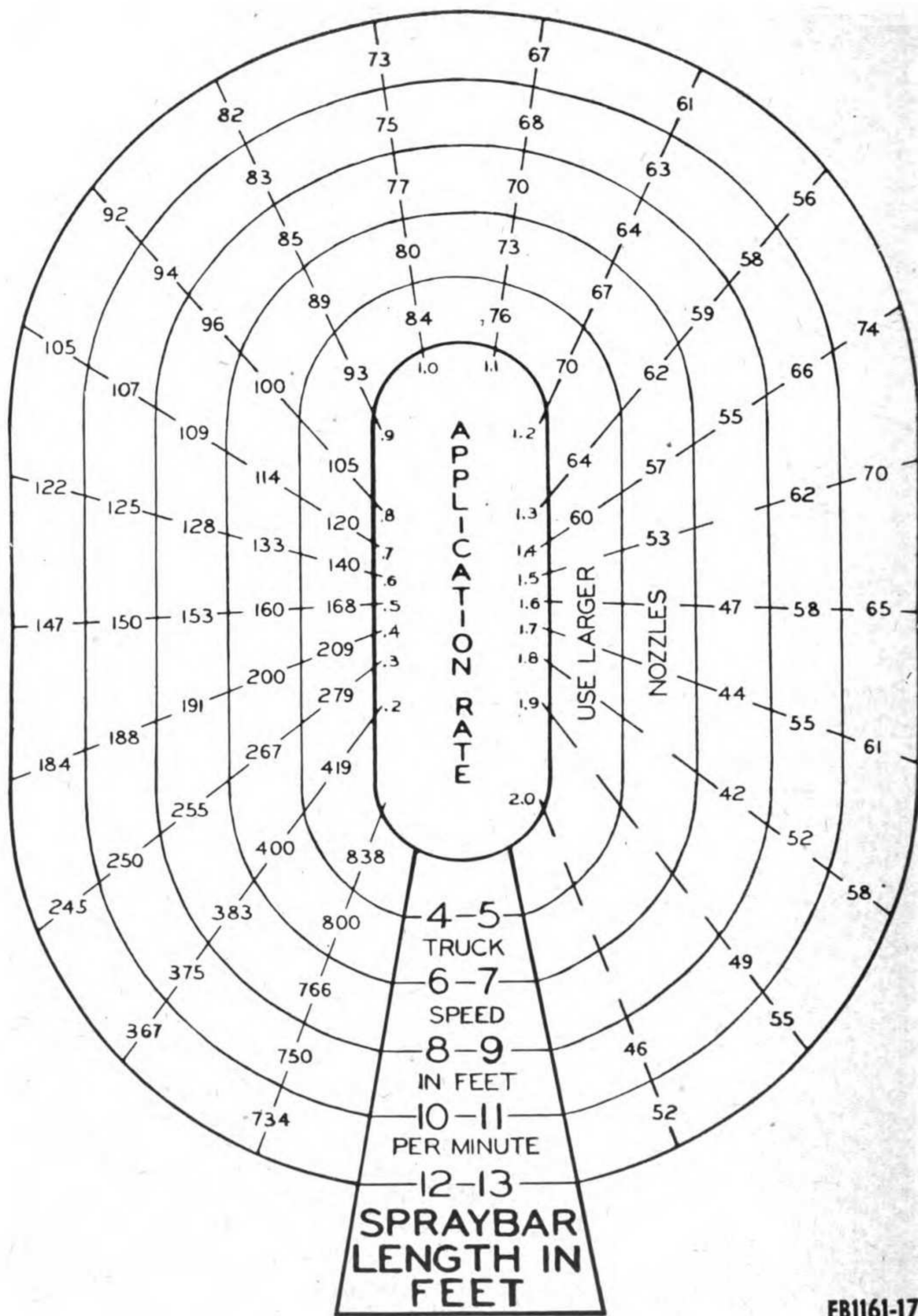
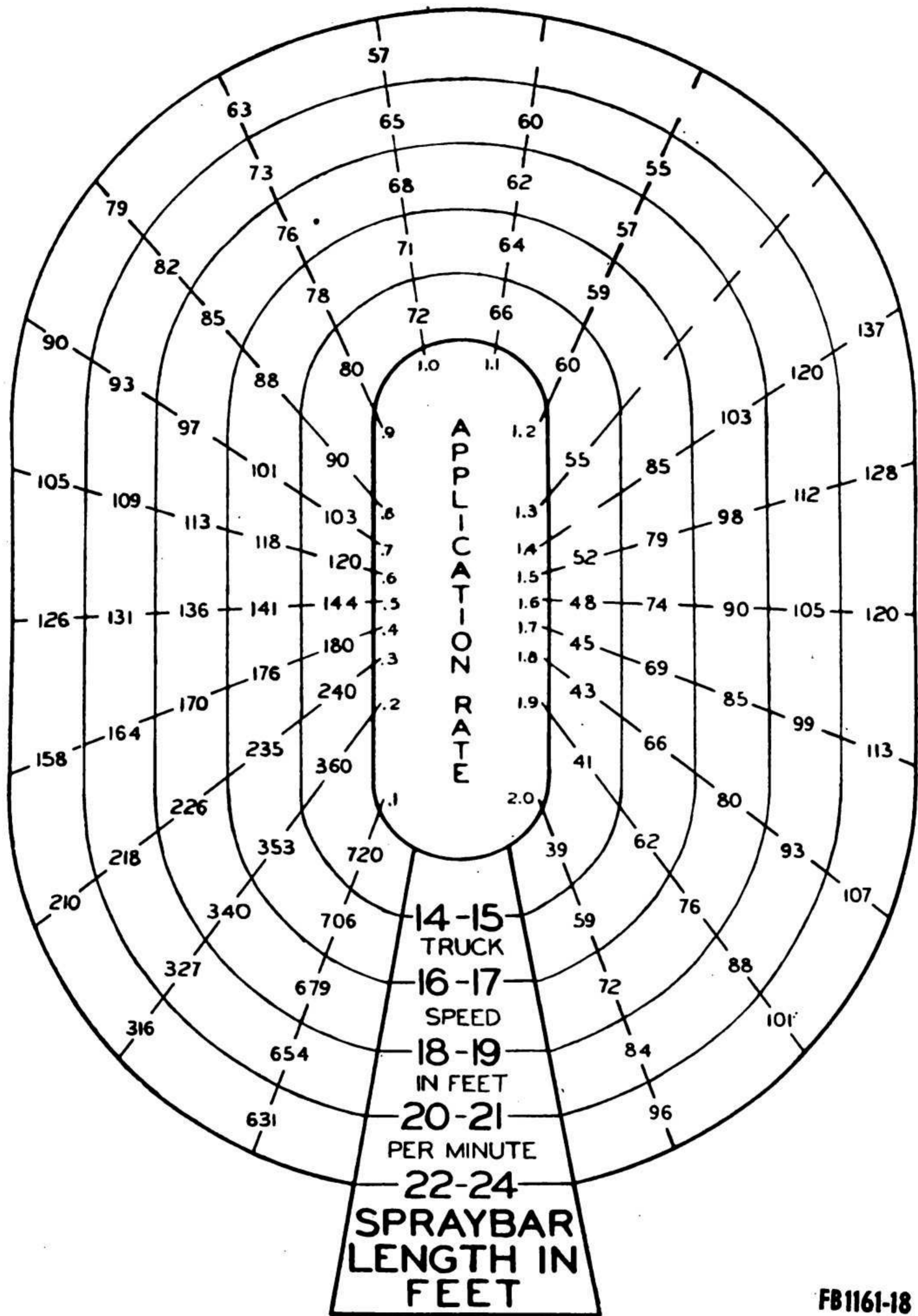


Figure 17. Application charts (20 pounds pressure).

intersects the line running out from the center marked .4 which is the application rate, and read 191 the truck speed in feet per minute.

c. Assuming the above conditions to be the same except that the width of strip or spraybar is 18 feet instead of the above 9 feet, follow the curve marked 18 until meeting the line out from .4 and read 170, which is the truck speed in feet per minute.



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Figure 18. Application charts (20 pounds pressure).

### 38. Movement to New Location

Before moving to the new location, perform the operations listed below. The water distributor can then be driven under its own power to the selected area for operations.

- a. When moving the water distributor any great distance drain the tank.

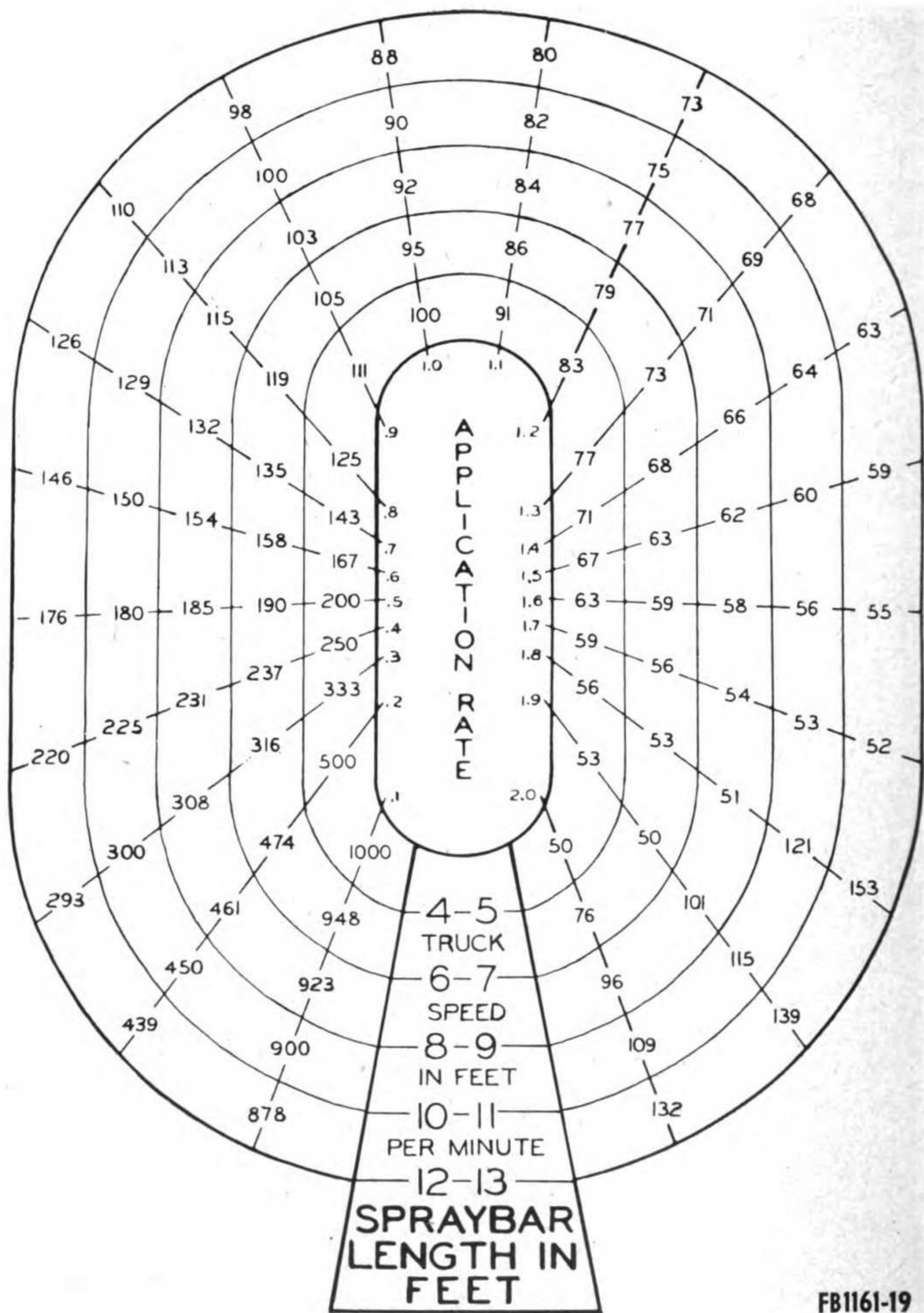
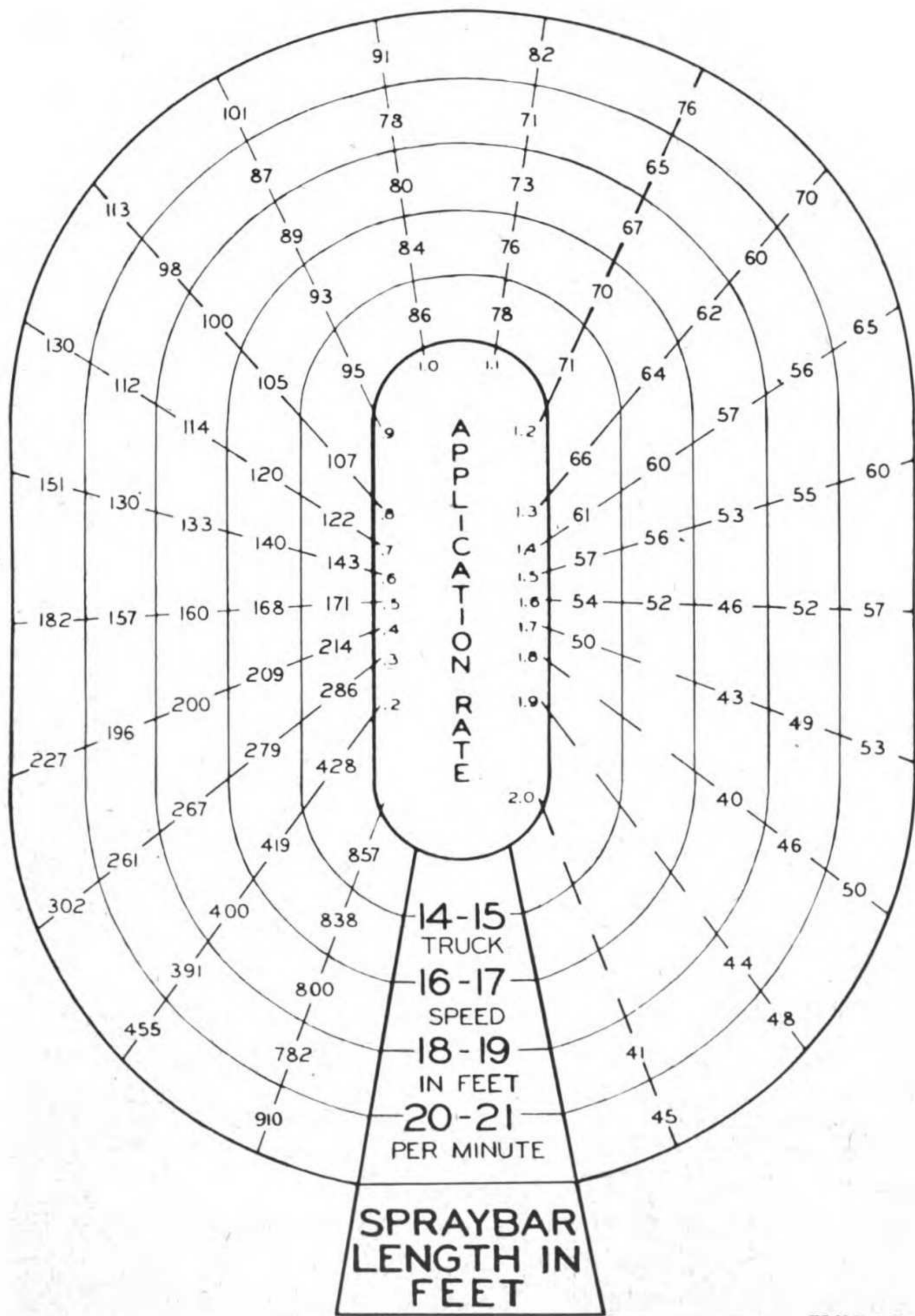


Figure 19. Application charts (30 pounds pressure).

b. Drain the pump by removing the drain plug. Then replace plug. Before draining the pump, flush it out by pumping clean water through it for a period of 10 minutes.

c. Remove and drain the suction and discharge hoses (if used in operation) and place them in the clamps provided for them on the catwalk.



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Figure 20. Application charts (30 pounds pressure).

- d. Remove and clean the strainer in the suction pipe.
- e. Clean the hose suction screen.
- f. See that all cleanout or extension cover caps are in place and secure on the suction and discharge outlets.
- g. Drain the pump engine fuel tank (if movement is for a long distance).

h. Remove the fuel pump dome and lift out the filter screen. Carefully clean the screen. Replace the fuel pump dome.

i. Start the engine and allow it to idle until it stops. This will drain the carburetor.

j. Clean the exterior of the engine and pump.

k. To return the equipment to service, fill the pump engine fuel tank if it was drained, and perform the procedures for the particular operation to be performed.

### **39. Operation of Accessory Equipment**

The water distributor is mounted on a 5-ton, 6 x 6 truck chassis, ordnance Model M61, which is covered in TM 9-837 for operation and maintenance.

## **Section IV. OPERATION UNDER UNUSUAL CONDITIONS**

### **40. Operation in Extreme Cold**

a. In freezing weather, the tank should be drained each time it is stopped for an extended length of time. The water tank can be drained by removing the large drain cap at the bottom of tank or by attaching a 3-inch hose to the discharge piping.

b. Drain the pump by removing the drain plug in the bottom left side of the pump. After the flow has stopped from the drain hole, the engine should be operated until all the water is emptied from the impeller by centrifugal force. This will help prevent a thin film of ice from forming between the edge of the impeller and the wear plate which would seize or freeze the impeller and prevent the pump from re-starting.

c. Open all the valves in the spraybar system and allow the water to drain out of piping nozzles and drain ports in the swivel joints of the piping.

d. It is advisable if possible to pump a small quantity of specified oil through the pump, piping, and spraybar assembly. Refer to the lubrication order on cold-weather notes.

e. If a heated garage or even an unheated shelter of some sort is located not too great a distance from operation, use it in freezing weather. This will prevent the caking and accumulation of frozen debris or ice which will hinder the unit from functioning or operating properly.

### **41. Operation in Extreme Heat**

a. *Pumping Unit.* When operating in extremely high temperatures, efficient cooling, adequate and proper lubrication, and cleanness are vitally important. Check the cooling system frequently to make sure that air circulation is not impaired or obstructed in any manner. Make sure the flywheel fins and air shrouds are clean.

*b. Special Lubricant.* Refer to the lubrication order for proper lubricants.

*c. Information Publications.* Instructions for preparation and operation of engineer equipment under tropical conditions are available in TB ENG 58.

*d. Truck.* For operation of the truck in extreme heat, refer to TM 9-837.

## **42. Operation in Desert Areas**

*a. General.* The action of the hot, desert sun can contribute to deterioration of rubber, fabric, leather, and painted parts of the water distributor and the desert wind, carrying dust and sand particles, will cause excessive wear in the mechanical working parts through the abrasive action of these particles.

*b. Operating Under Sandy Conditions.*

- (1) Clean all lubrication points with an approved solvent before applying lubricants. Check the crankcase oil level and the air cleaner frequently.
- (2) Remove the accumulation of sand and dust at frequent intervals. Inspect the flywheel fins and the air shroud frequently for clogging. Clean the shroud screen of all collected debris.
- (3) Take all precautions to prevent sand from entering the fuel tank. Keep the tank and containers clean and tightly capped. Service the fuel filter as often as necessary to keep the bowl free of grit and sand.
- (4) Inspect the air cleaner as necessary, especially if operating in extreme dust. Make sure the oil is at proper level, and that it does not contain foreign matter.
- (5) Check the crankcase oil level often, and refill as necessary. In extreme dust it will be necessary to change oil more frequently than specified in the lubrication order.

*c. Truck.* For operation of truck under dusty or sandy condition refer to TM 9-837.

## **43. Operation in High Humidity or Near Salt Water**

When operating in high humidity or near salt water, precautions must be taken to prevent corrosion and rust, and to keep water out of the fuel system.

*a.* Keep the entire unit well painted to prevent corrosion and rust due to moisture.

*b.* Keep the fuel tank and containers as full as possible to reduce condensation of moisture. Drain accumulated water from the fuel tank at regular intervals.

*c.* If salt water was used in the operation, flush and drain the entire system with clean, fresh water after each operating period.

## CHAPTER 3

# ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

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### Section I. SPECIAL ORGANIZATIONAL TOOLS AND EQUIPMENT

#### 44. General

The tools and equipment that are required to perform the organizational maintenance on the water distributor are common mechanic's hand tools.

#### 45. Operator Maintenance Tools

No operator maintenance tools exist as such. Operator maintenance on the water distributor will be accomplished with the tools carried on the truck on which the distributor is mounted.

#### 46. Special Tools

No special tools or equipment are required by the using organization for maintaining the water distributor.

### Section II. LUBRICATION AND PAINTING

#### 47. General Lubrication and Painting Information

a. Lubrication Order 5-1161 prescribes first and second echelon lubrication maintenance for the Water Distributor, Rosco Model MOE. Lubrication Order 5-5193 prescribes lubrication procedure for the Wisconsin VE4 and VF4 air-cooled engine.

b. A lubrication order is issued with each item of equipment and is to be carried with it at all times. The lubrication order shown in figure 21 is a reproduction of the approved lubrication order for this materiel.

c. Lubrication orders prescribed approved first and second echelon lubrication procedures. The instructions contained therein are mandatory.

#### 48. Detailed Lubrication Information

a. *Care of Lubricants.*

(1) *Storage.* Keep all lubricants in sealed and airtight containers. Clean all lubrication equipment such as grease guns



# LUBRICATION ORDER

# LO 5-1161

8 February 1955

## DISTRIBUTOR, WATER, TRUCK MOUNTED, 1000 GALLON CAPACITY, GASOLINE DRIVEN, ROSCO MODEL MOE

References: TB 5-1151-1, TM 5-5193, TB 5-5193-1, LO 5-5193.

Intervals given are maximums for normal 8-hour day operation. For abnormal conditions or activities, intervals should be shortened to compensate.

Clean fittings before lubricating.

Relubricate after washing or fording.

Clean parts with SOLVENT, dry-cleaning, or OIL, fuel, Diesel. Dry before lubricating.

Lubricate points indicated by dotted arrow shafts on both sides of equipment.

Drain crank and gear cases only when hot after operation; replenish and check level when cool.

— KEY —

LUBRICANT	CAPACITY	EXPECTED TEMPERATURE			INTERVALS
		Above +32°F	+32°F to -10°F	Below -10°F	
OE—OIL, Engine Heavy Duty		OE 30 or 9250	OE 10 or 9110	See Note 1	D—Daily W—Weekly 2W—Two weeks S—Semi-annually
Crankcase	4 qts				
Air Cleaner	½ qt				
Oil Can Points		OE 30 or 9250	OE 10 or 9110	OHA	
GAA — GREASE, Automotive and Artillery.					
WP — GREASE, Lubricating, Automotive and Industrial.					

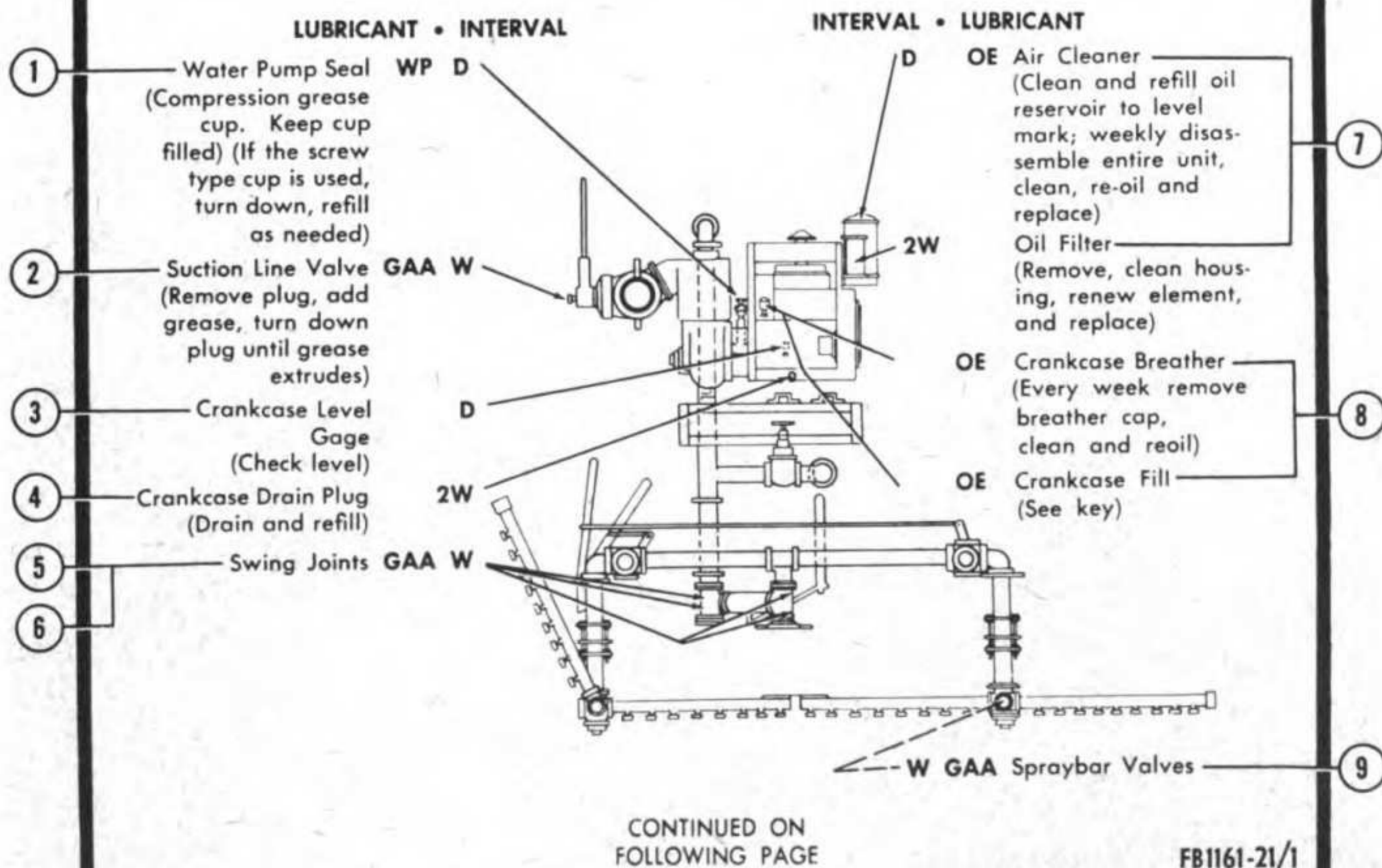
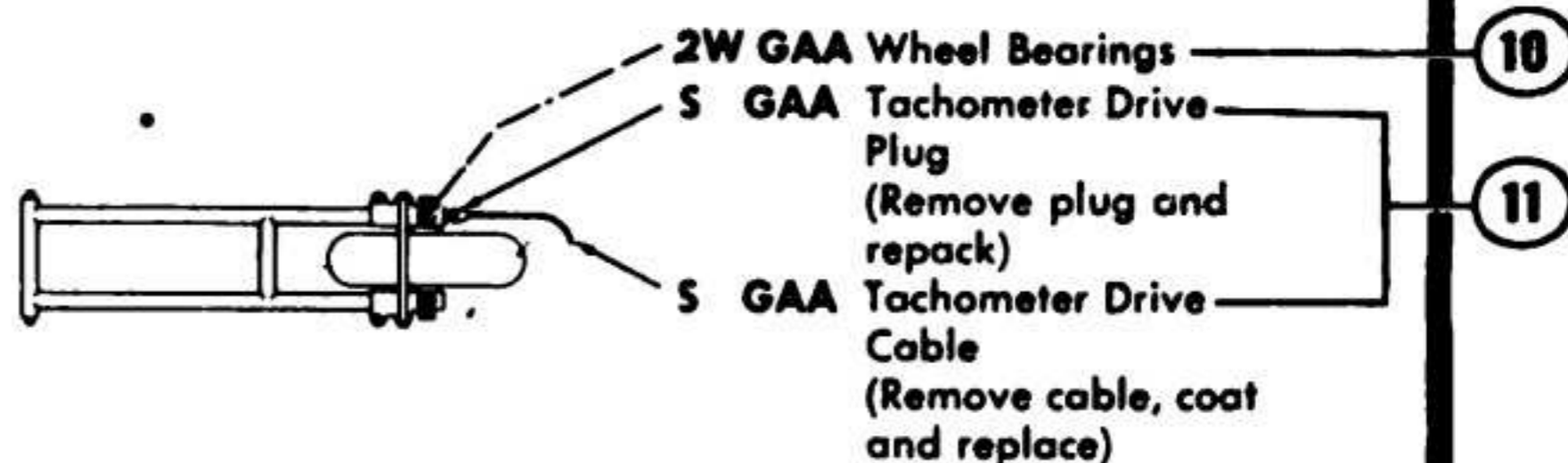


Figure 21. Lubrication Order.



**NOTES:**

1. **COLD WEATHER** (When winterization kit is not available) Every 3 days drain crankcase and refill to "Full" mark with OE 10. Add 1 qt of gasoline and run engine 5 minutes to mix. Mark the new level on the oil gage for future reference. **CAUTION:** Every 1/2 day check level and fill to "Full" mark with OE 10. If engine is to be shut down for 1/2 day or more, add 1 qt of gasoline to reach new level mark and run engine 5 minutes to mix. **NOTE:** OIL, fuel, Diesel may be used as a temporary diluent only when sufficient gasoline is not available.

**WARNING:** Diluent used is inflammable; do not service equipment near heater or open flame.

2. **FOR OPERATION OF EQUIPMENT IN PROTRACTED COLD TEMPERATURES BELOW -10° F** — Clean parts with SOLVENT, Dry Cleaning. Re-lubricate with lubricants indicated in the key for below -10° F.

3. **OIL CAN POINTS** — Weekly lubricate throttle controls, hinges, pivot points on spraybar valve, lateral motion levers, linkages and guide rollers for spraybar with OE.

4. **DO NOT LUBRICATE** — Magneto. Copy of this Lubrication Order will remain with the equipment at all times; instructions contained herein are mandatory and supersede all conflicting lubrication instructions dated prior to the date of this Lubrication Order.

BY ORDER OF THE SECRETARY OF THE ARMY:

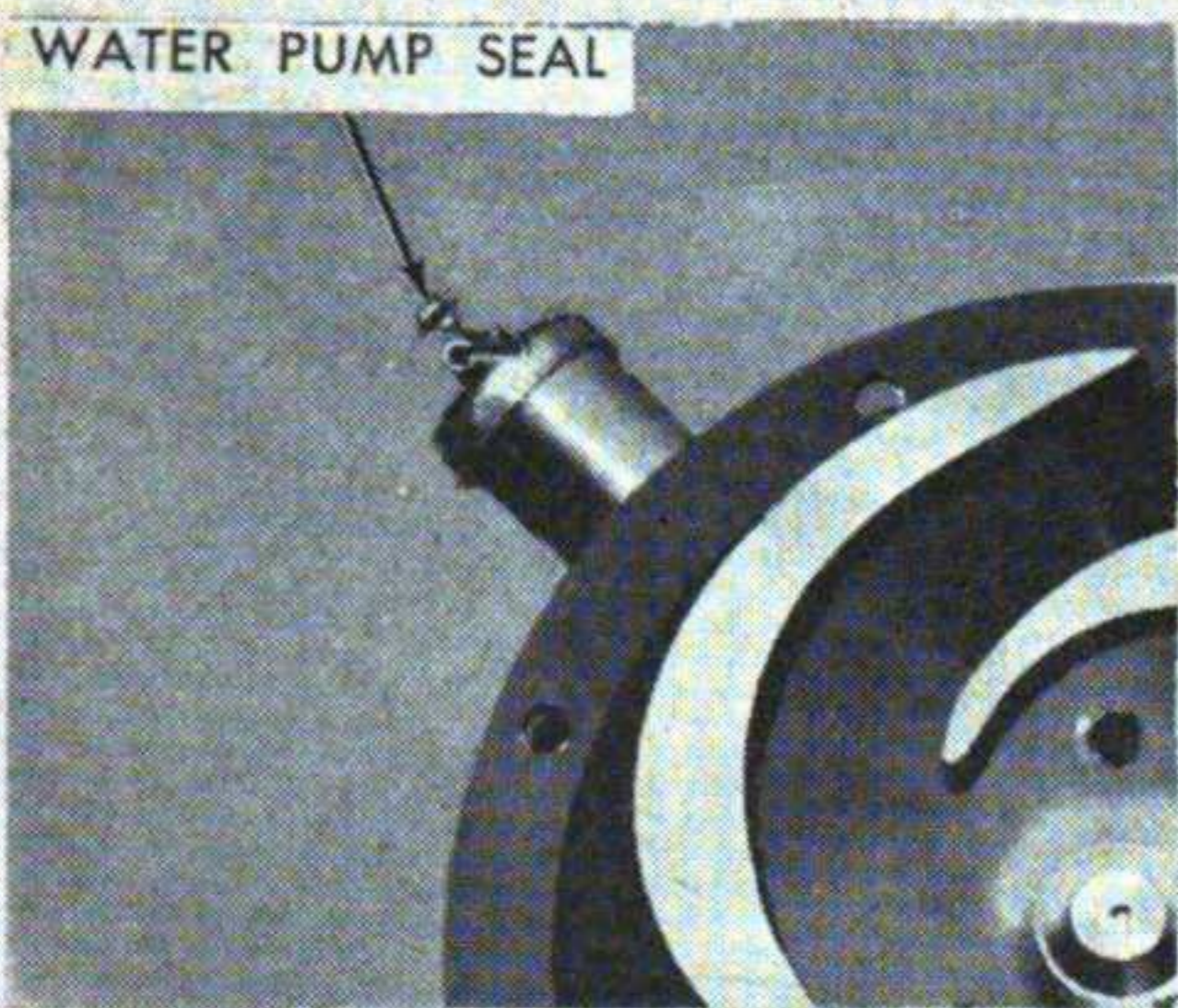
M. B. RIDGWAY,  
General, United States Army,  
Chief of Staff.

OFFICIAL:

JOHN A. KLEIN,  
Major General, United States Army,  
The Adjutant General.

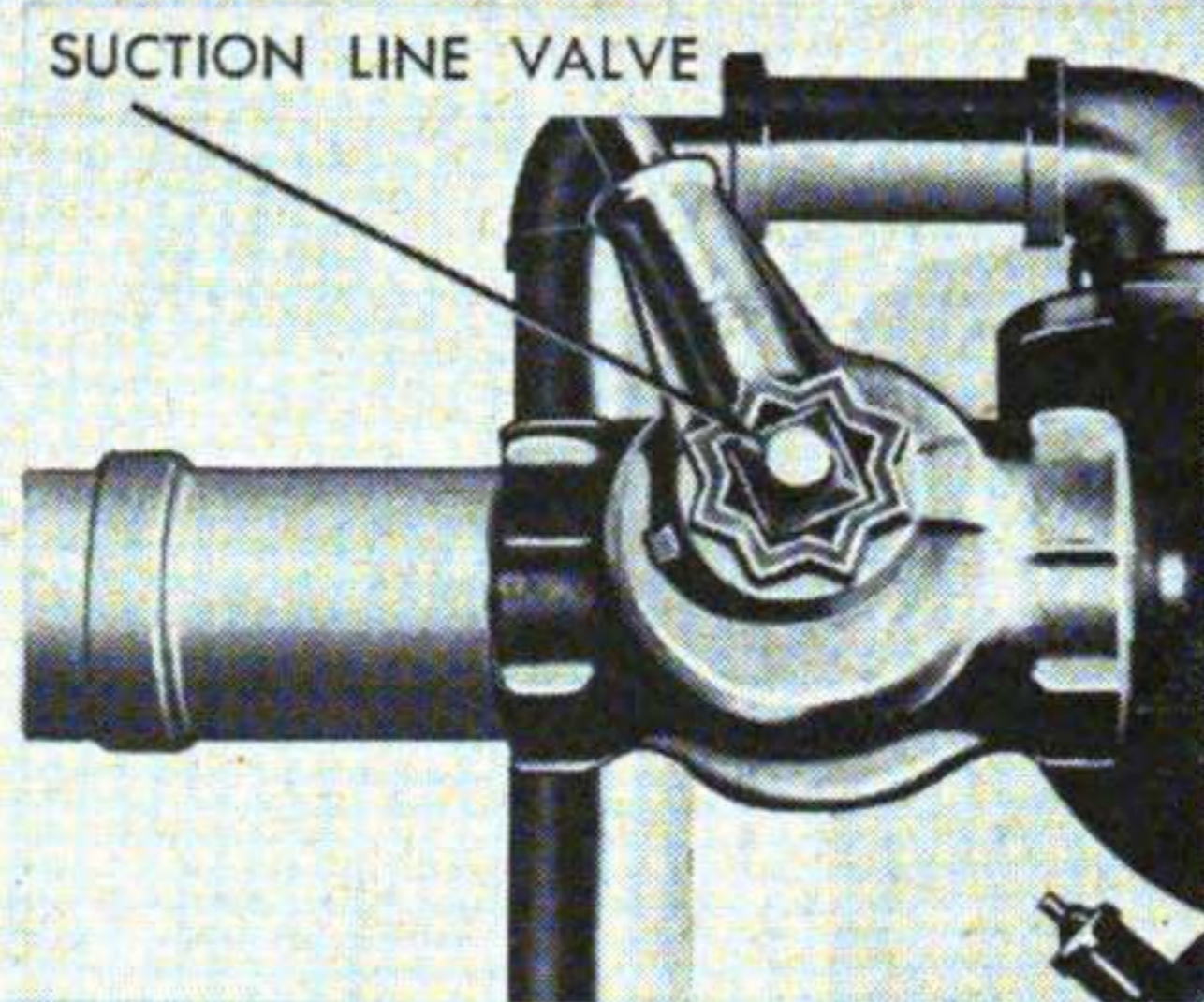
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Figure 21—Continued.



WATER PUMP SEAL

REFERENCE 1: Keep cup filled.



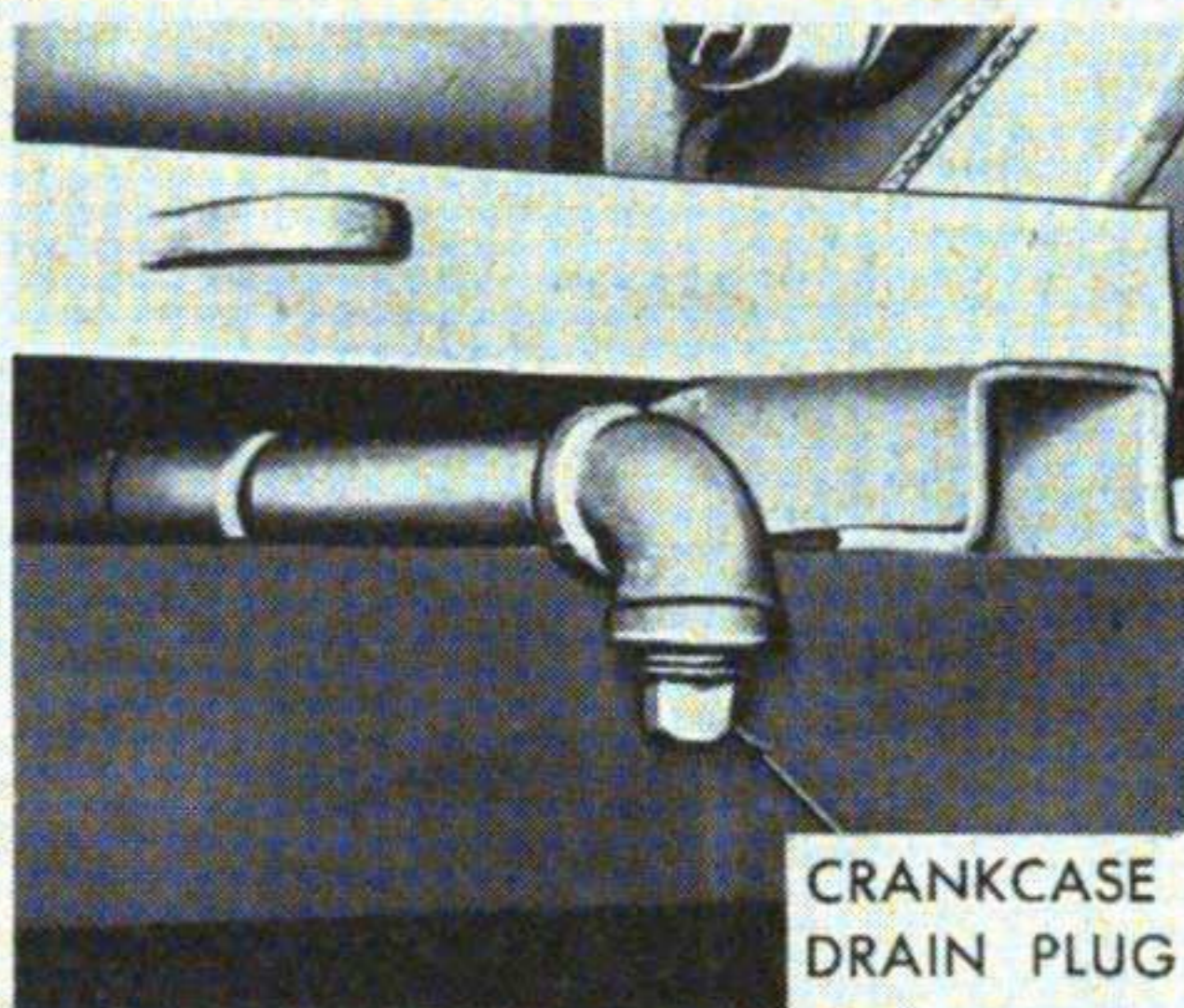
SUCTION LINE VALVE

REFERENCE 2: Remove plug, add grease, turn down plug until grease extrudes.



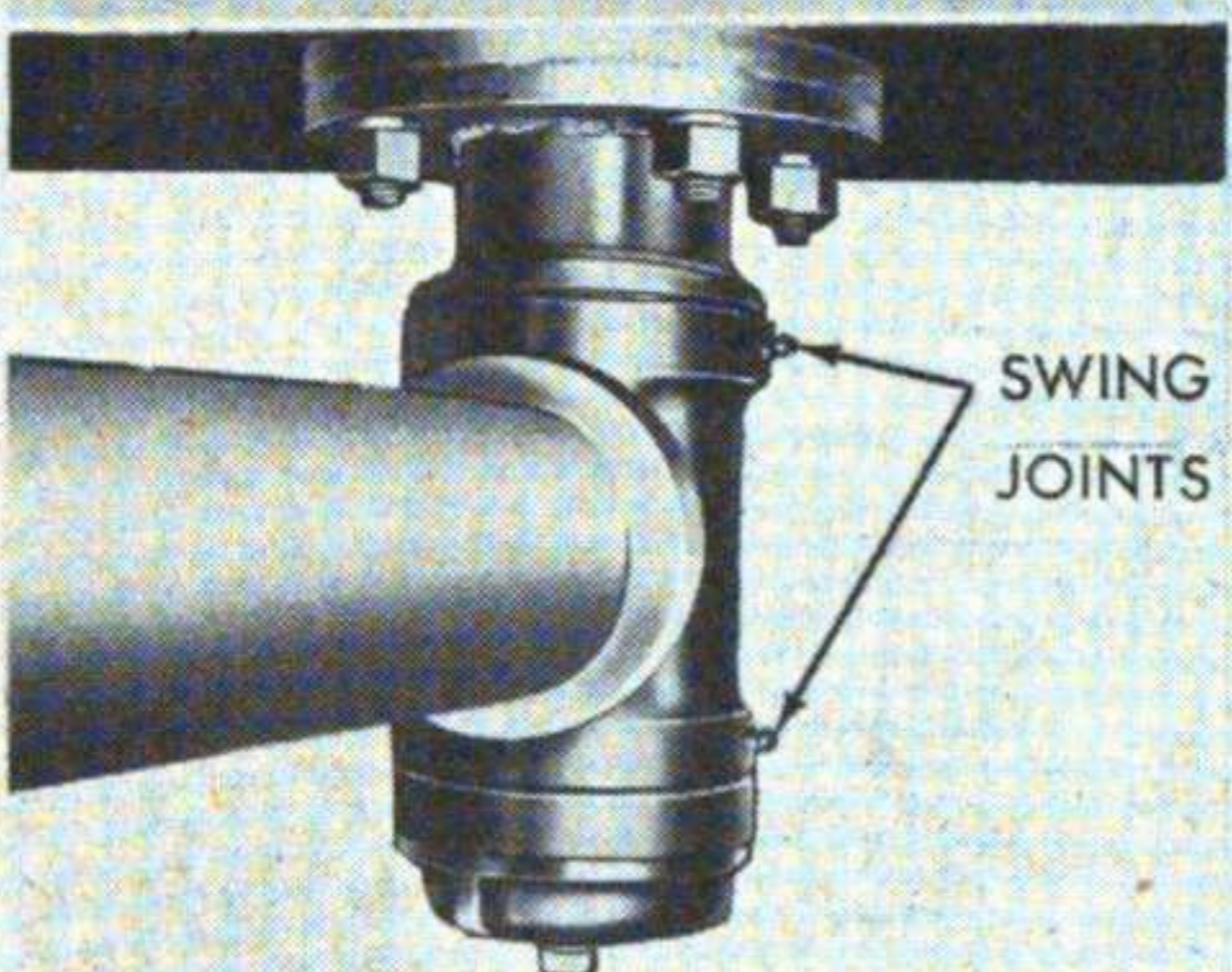
CRANKCASE LEVEL GAGE

REFERENCE 3: Check level.



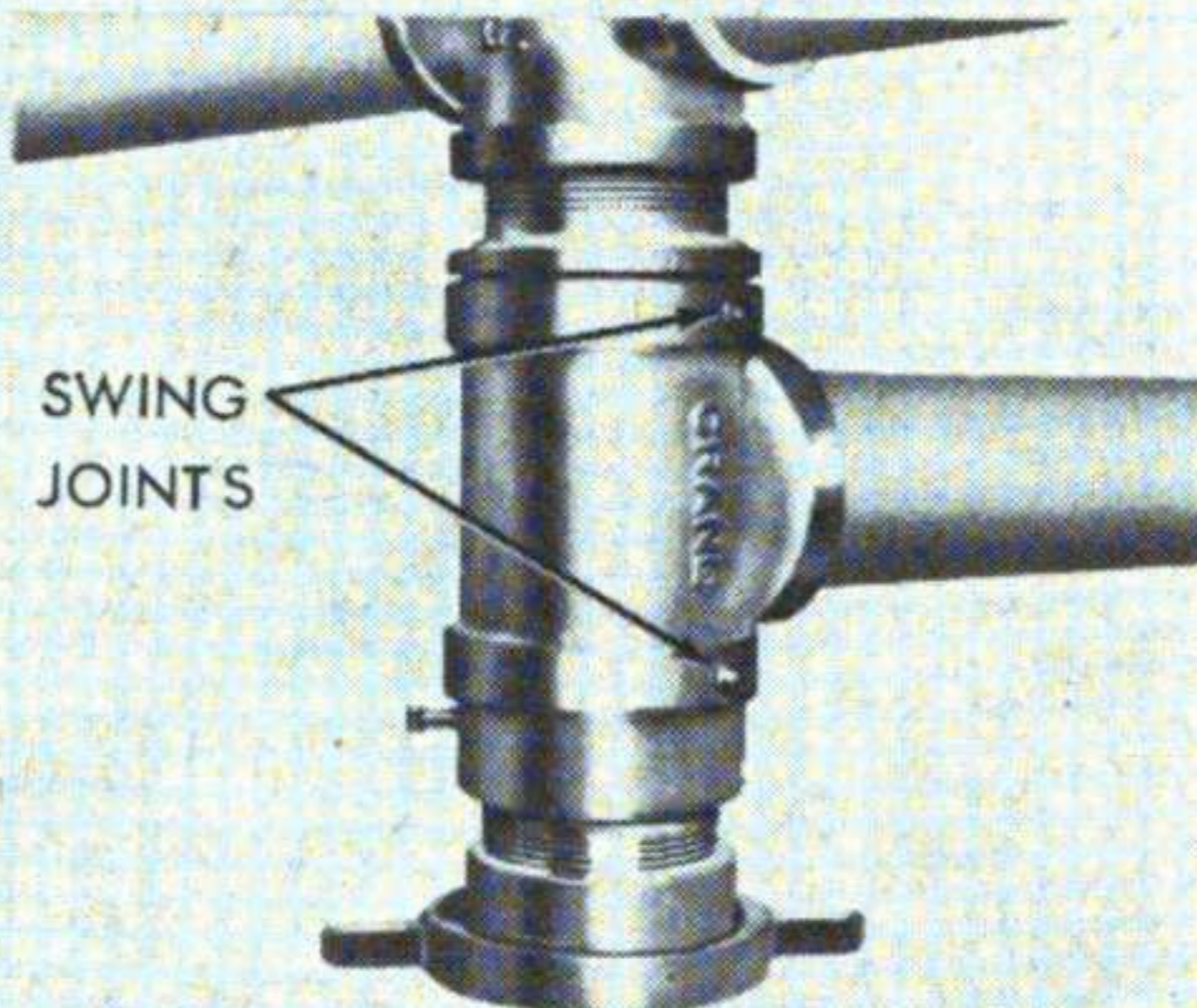
CRANKCASE DRAIN PLUG

REFERENCE 4: Drain and refill.



SWING JOINTS

REFERENCE 5: Use grease gun.

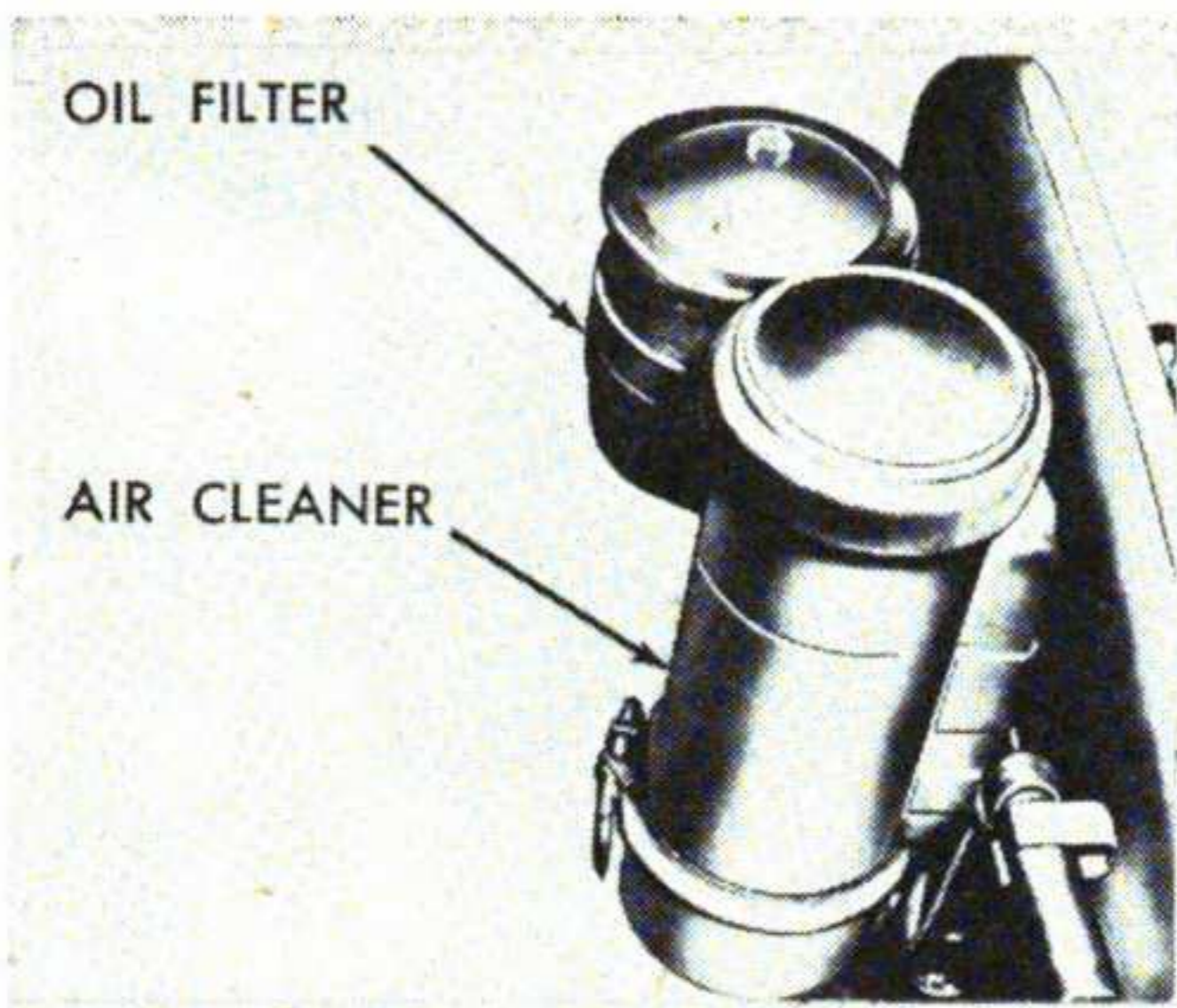


SWING JOINTS

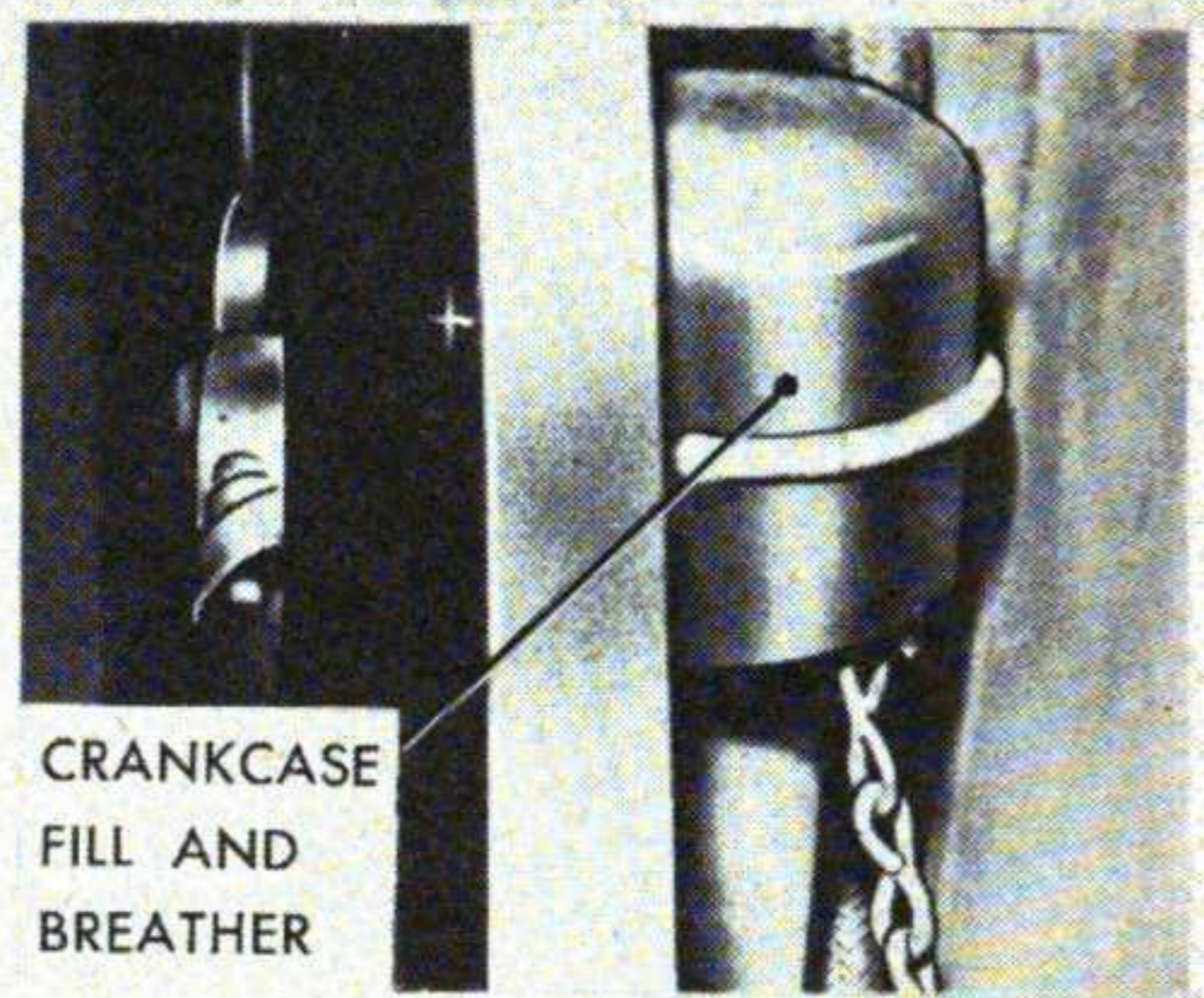
REFERENCE 6: Use grease gun.

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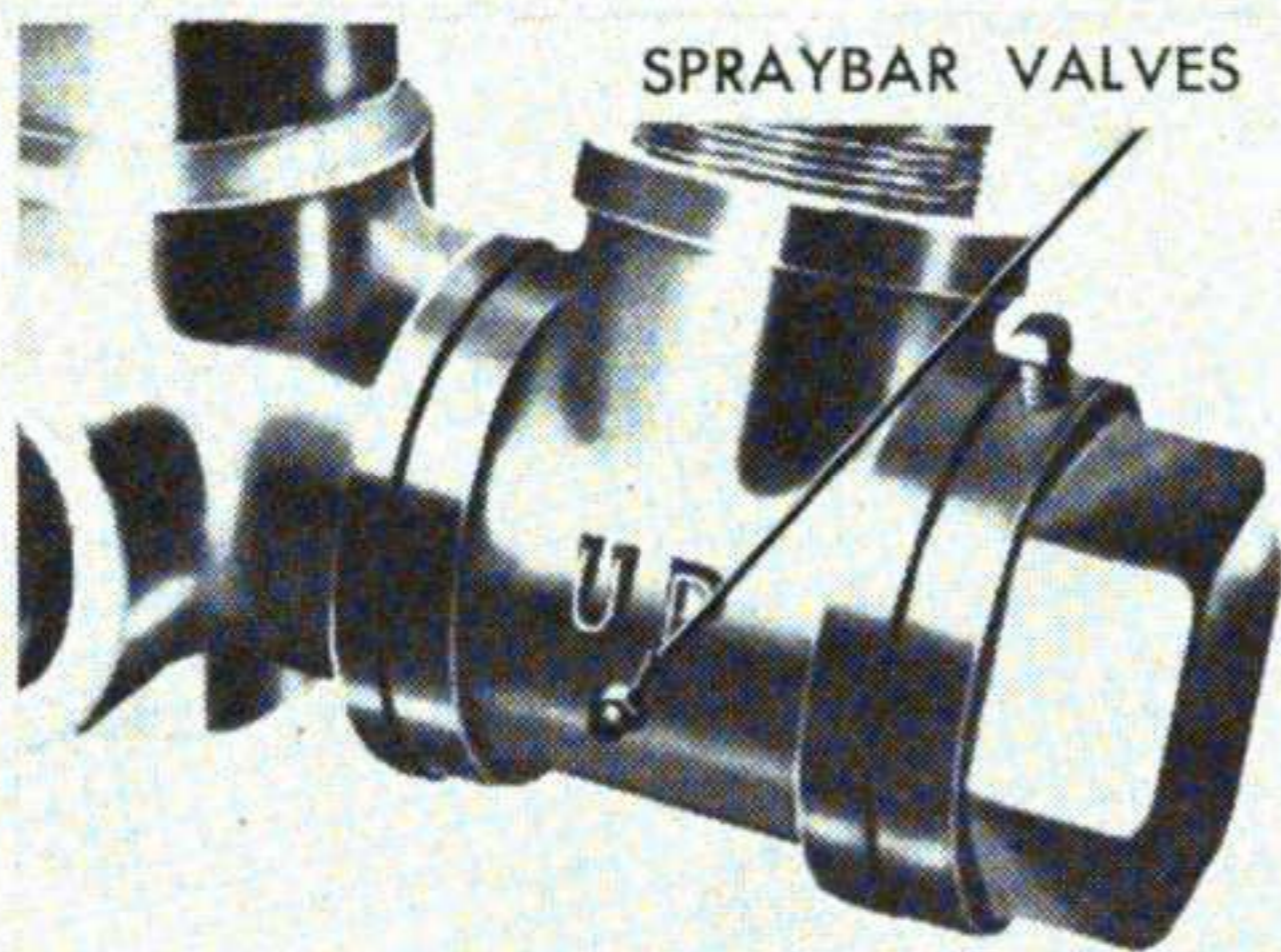
Figure 21—Continued.



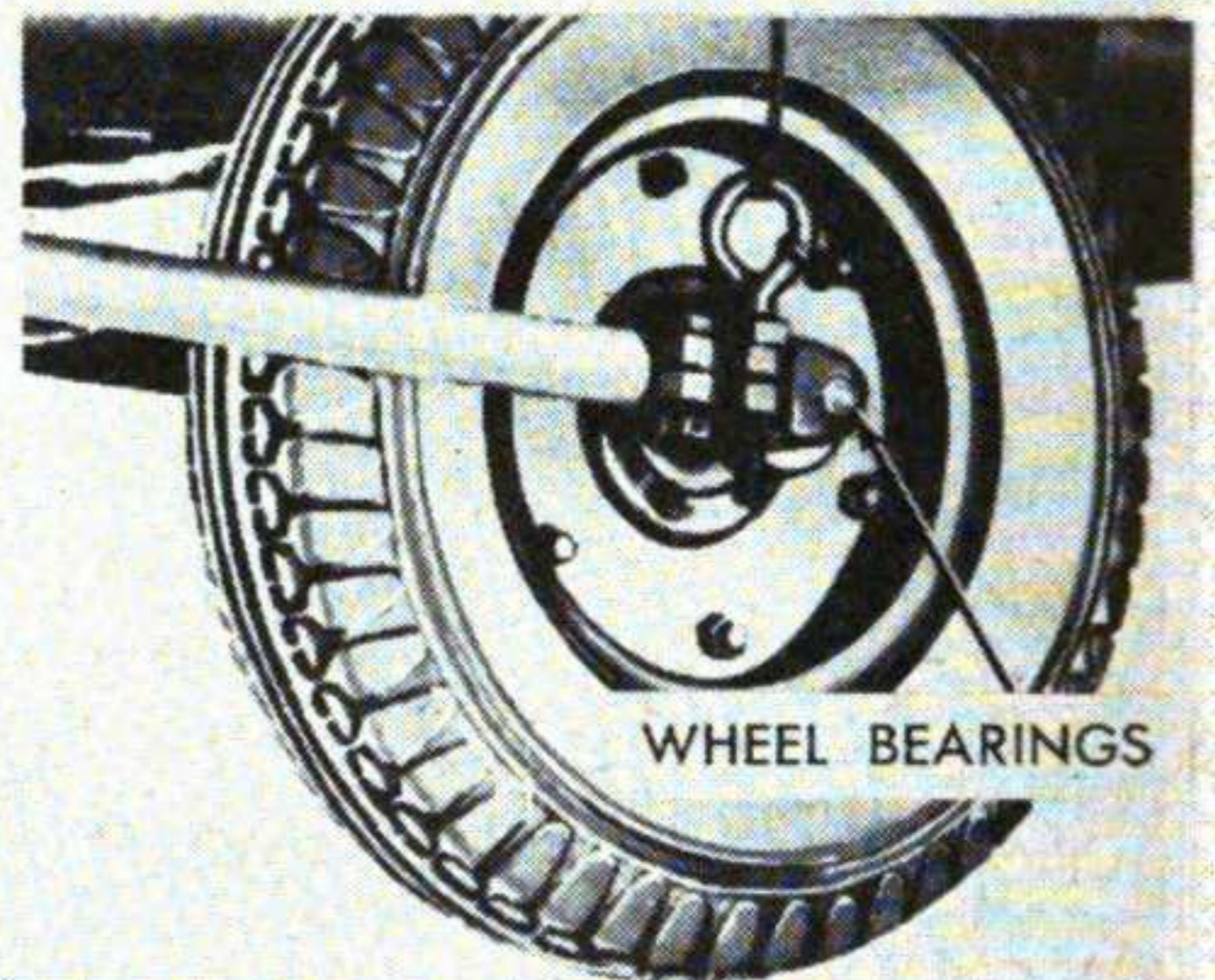
REFERENCE 7: Clean and refill oil in air cleaner; remove and renew oil filter element.



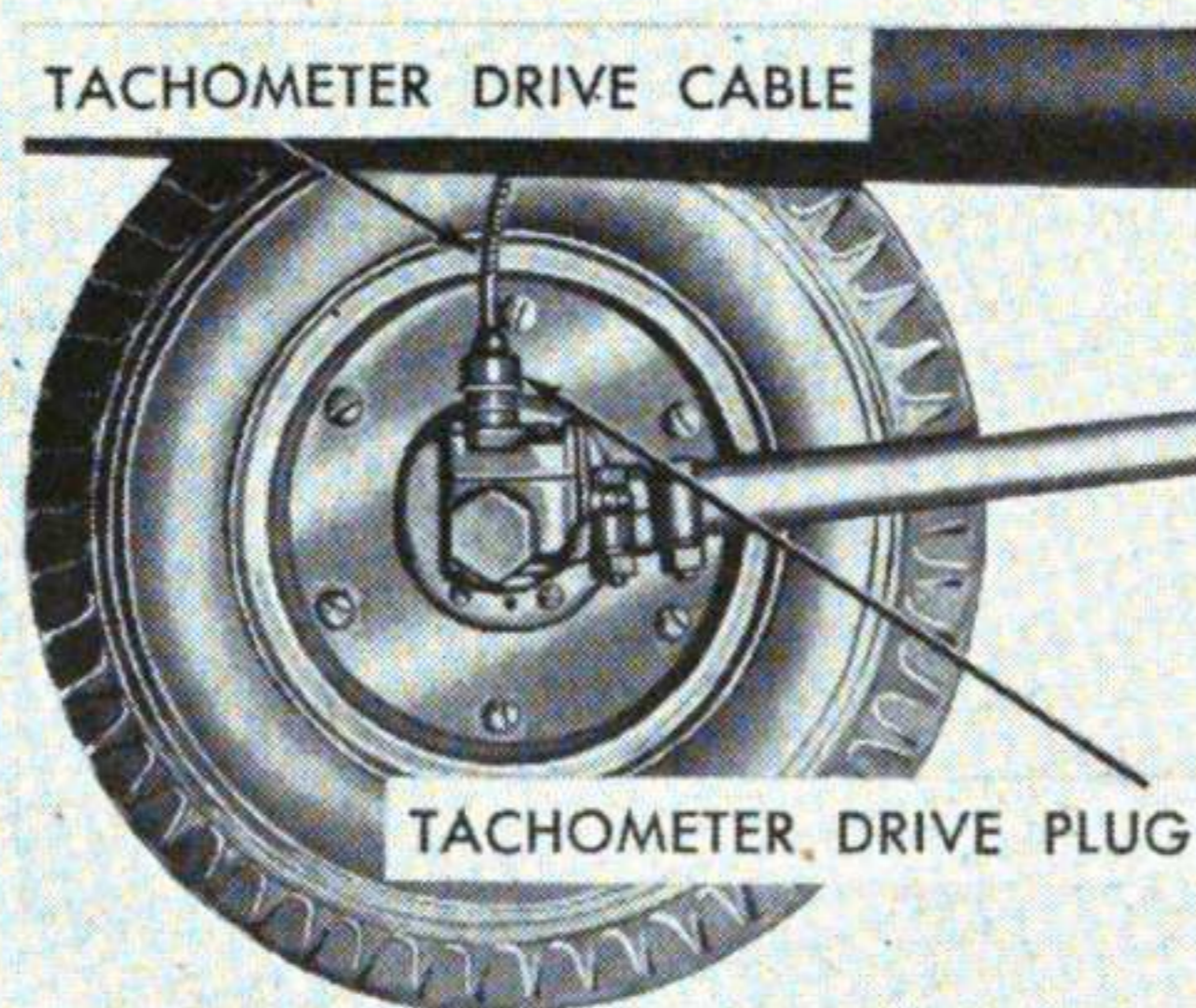
REFERENCE 8: Refill. Clean breather and reoil.



REFERENCE 9: Use grease gun.



REFERENCE 10: Use grease gun.



REFERENCE 11: Remove drive plug and re-pack; remove cable, coat and replace.

FB1161-21/4

Figure 21—Continued.

and oilcans periodically while in storage, to prevent the formation of a dusty film which tends to settle on greasy or oily surfaces.

- (2) *Handling.* Whenever possible, conduct the lubrication operations in a protected area. Wipe oilcans and grease containers clean before they are opened and protect them from dust or debris while their covers are removed. Clean lubrication equipment with an approved cleaning solvent and carefully dry it before and after use.

*b. Points of Application.* Follow the detailed lubrication instructions given beneath each lubrication point illustration and apply the lubricant indicated for the equipment.

*c. Cleaning.* Before lubricating, clean all points of lubrication and areas around these points with approved cleaning solvent. Dry thoroughly with a lint-free cloth before applying lubricants. Reclean and wipe after lubrication.

*d. Lubrication Notes.*

- (1) Service intervals specified on the lubrication order are for normal operating conditions. Reduce these intervals when operating under adverse conditions such as sand, dust, or mud. When operating in torrid or frigid zones refer to the lubrication order.
- (2) Lubricants are specified in the key in accordance with three temperature ranges; above  $+32^{\circ}$  F. from  $+32^{\circ}$  F. to  $-10^{\circ}$  F., and below  $-10^{\circ}$  F. The change in the grades of lubricant used are determined by maintaining a close check on the operation of the equipment during the change-over periods in accordance with the weather forecast data. Improper functioning of the equipment may be caused by the wrong type or grade of lubricant. Ordinarily it will be necessary to change grade of lubricant only when air temperatures are consistently in the next higher or lower range.

*e. Air Cleaner.*

- (1) *Removal and disassembly.*
  - (a) Remove the cup from the air cleaner by unscrewing oil cup clamp assembly as shown in figure 22.
  - (b) Remove oil from cup.
  - (c) Loosen the hose clamp behind the front end engine panel at the air cleaner pipe end of the air cleaner-to-carburetor hose.
  - (d) Remove the support screw (2, fig. 23) and the four screws holding the air cleaner to the front end engine panel, and pull the air cleaner away and place it on a workbench or some convenient working surface.

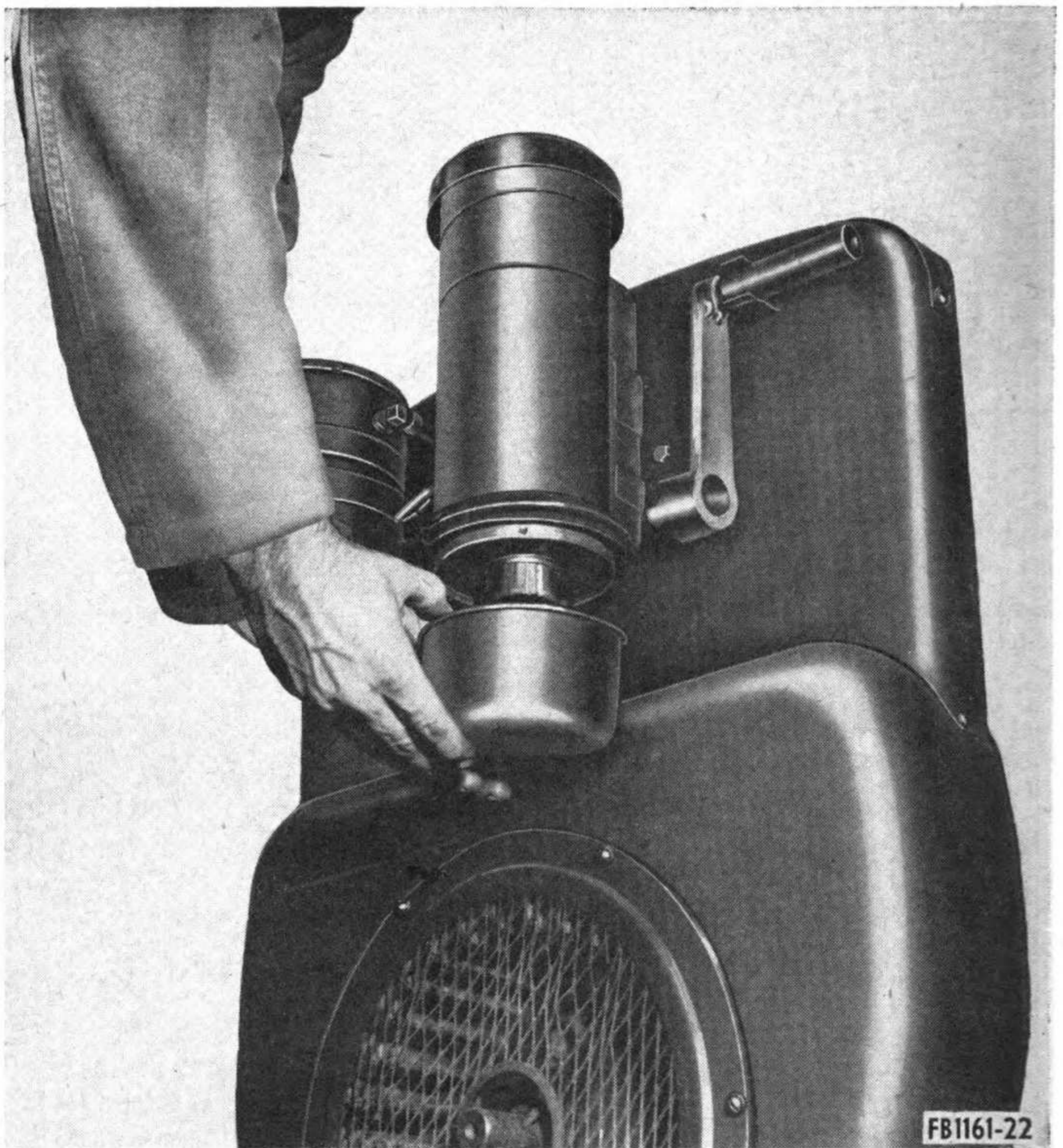


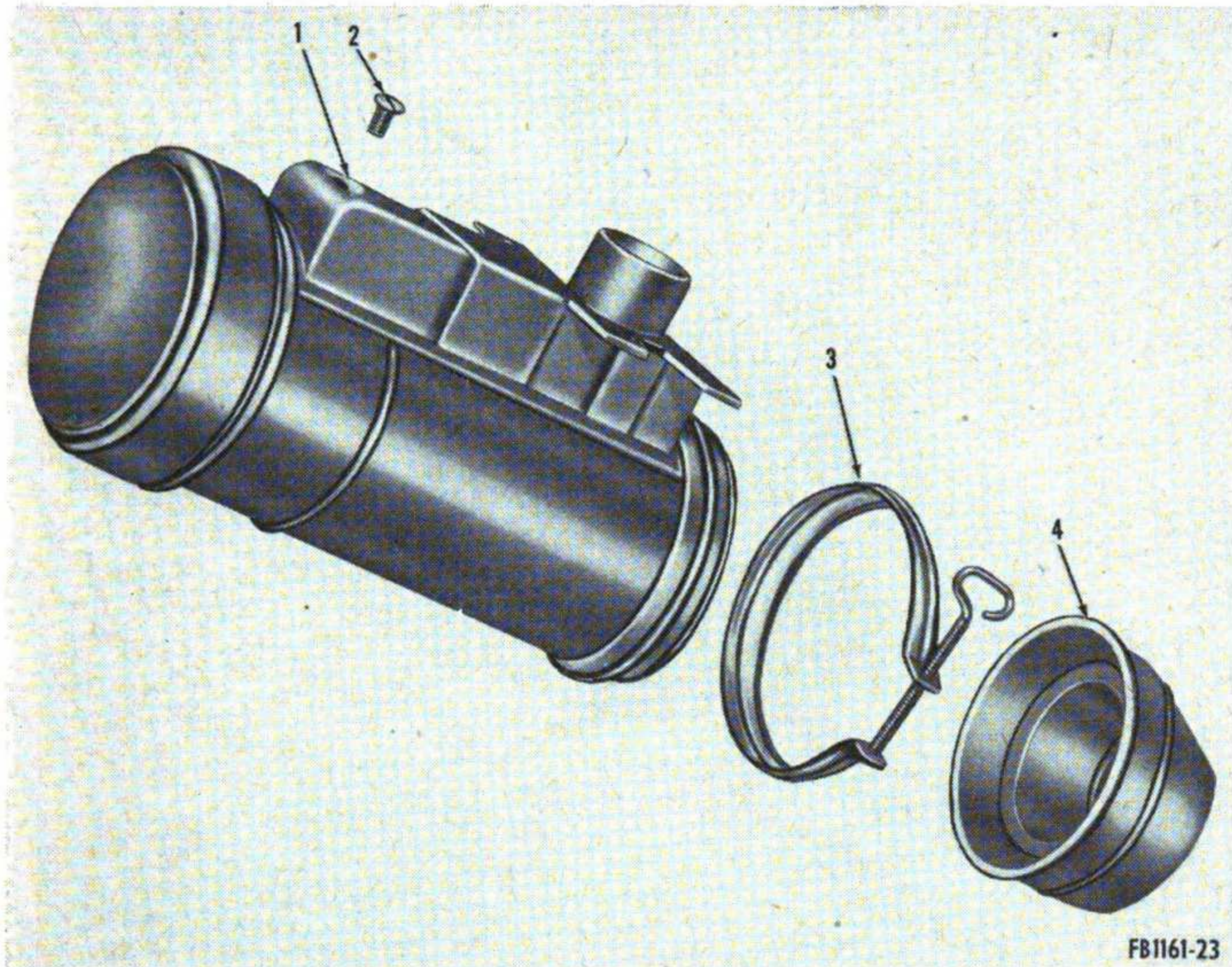
Figure 22. Air cleaner changing.

(2) *Cleaning and inspection.*

- (a) Wash all metal parts with cleaning solvent; wipe out the inside of the oil cup.
- (b) Inspect parts for breakage, cracks, or distortion which may affect air flow through the cleaner; repair or replace defective parts.
- (c) Inspect hose clamp for rust or improper size and the mounting and support screws for damaged threads or broken lockwasher. Check hose for cuts or deterioration. Replace defective parts.
- (d) Check gasket for breaks or deterioration and replace if necessary.

(3) *Assembly and installation.*

- (a) Place the air cleaner pipe end into carburetor-to-air cleaner hose.



- |   |                  |   |                |
|---|------------------|---|----------------|
| 1 | Air cleaner body | 3 | Clamp assembly |
| 2 | Screw            | 4 | Oil cup        |

Figure 23. Air cleaner, exploded view.

- (b) Then insert and tighten the mounting and support screws holding air cleaner to front engine panel.
- (c) Tighten the carburetor hose clamp.
- (d) Refill the oil cup to the proper level with clean oil, as specified in the lubrication order.
- (e) Place oil cup (4) and clamp assembly (3) on the air filter body and tighten clamp screw.

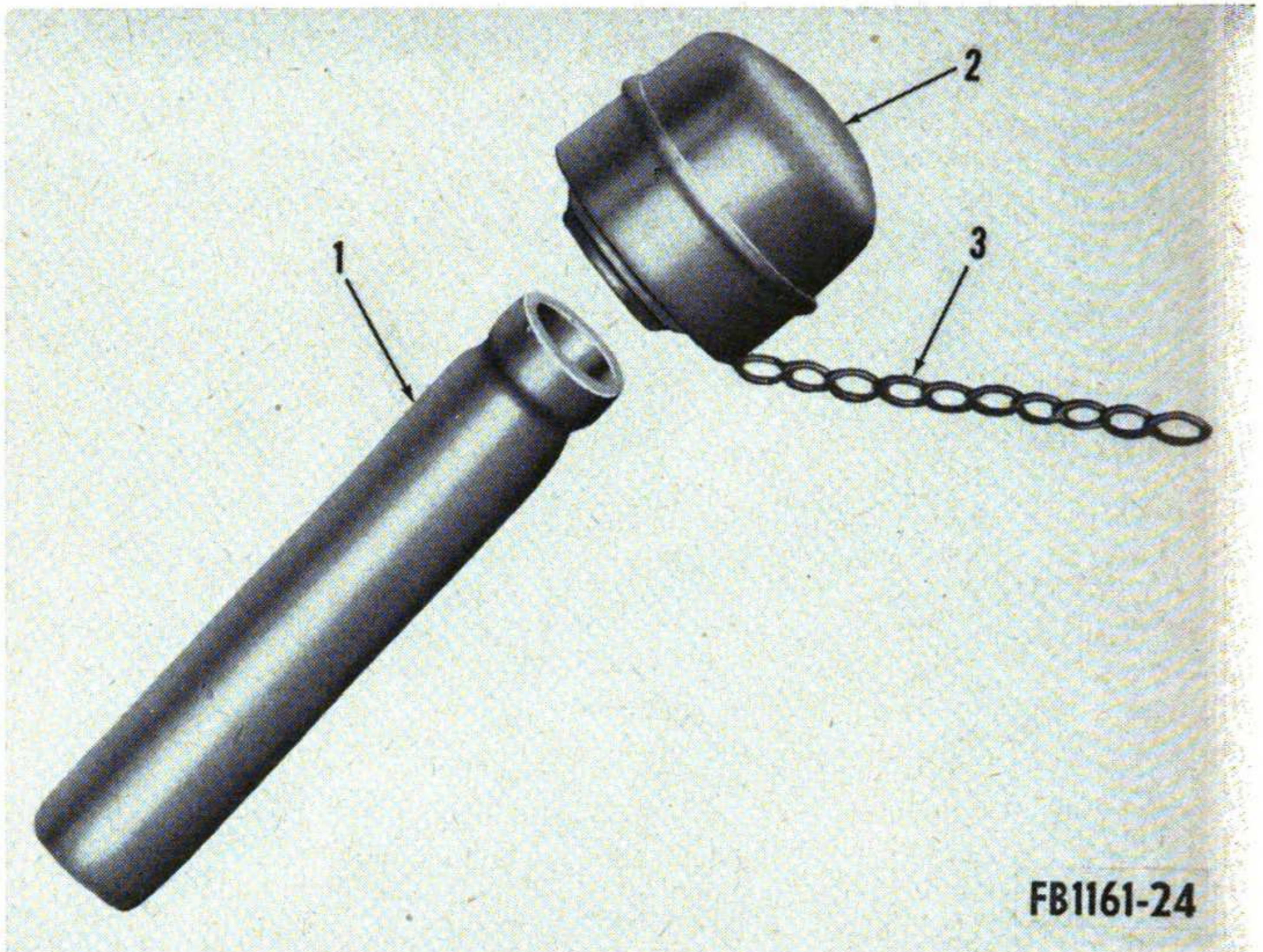
f. *Crankcase Breather* (fig. 24).

- (1) Remove the breather cap (2, fig. 24) by pulling it off the breather pipe (1).
- (2) Drop the cap in an approved cleaning solvent to clean the filtering material.
- (3) Examine breather cap for dents. Check to see that the part of the cap which engages tightly with the breather pipe is not out-of-round.
- (4) Replace the breather cap on the pipe.

g. *Oil Filter*.

(1) *Removal and disassembly.*

- (a) Remove the cap screw and washer from the oil filter cover as shown in figure 25 and remove the cover and gasket.



1 Pipe

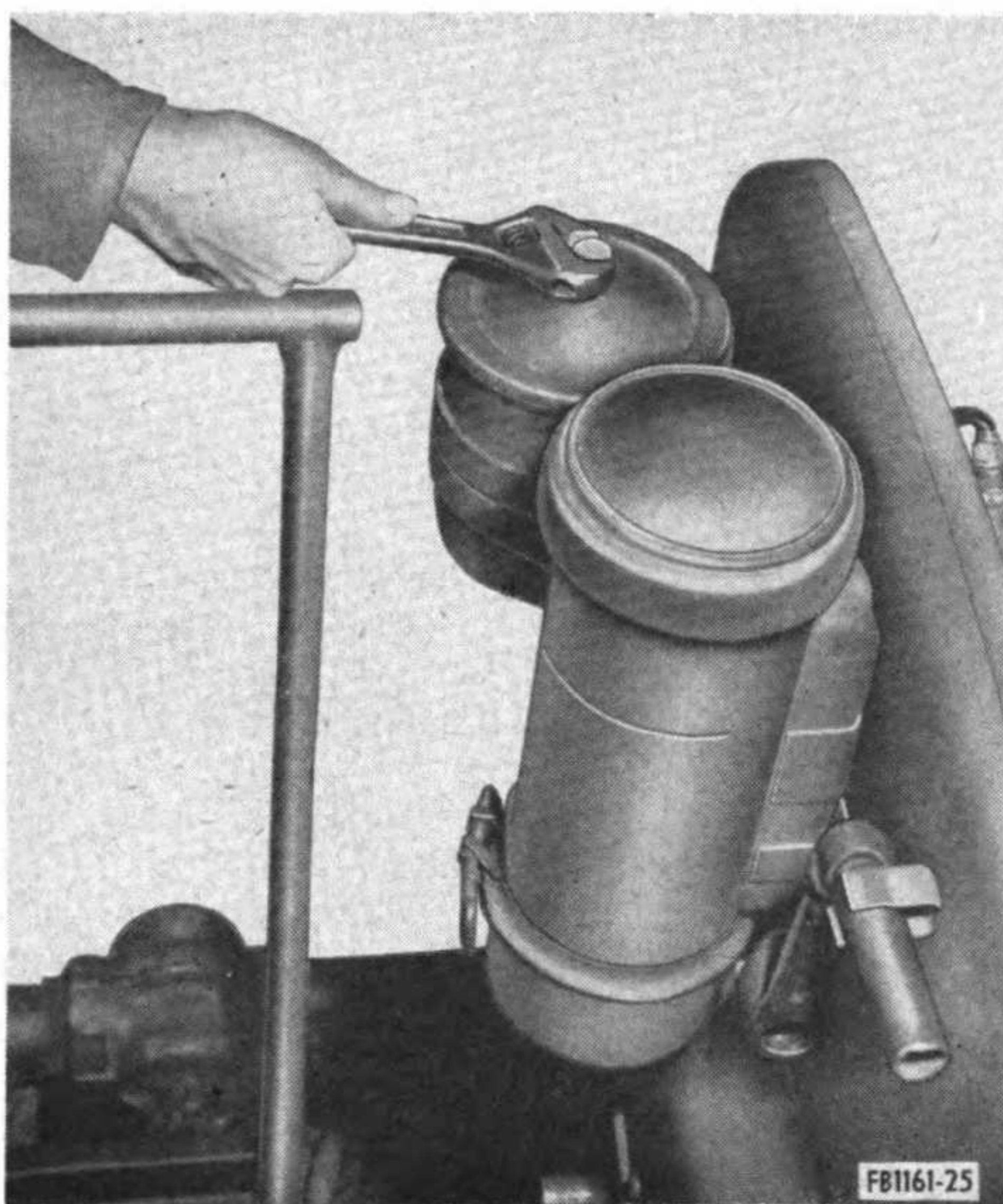
2 Cap

3 Chain

Figure 24. Crankcase breather.

- (b) Remove drain plug (13, fig. 26) and drain sludge out of the filter body (8).
- (c) Lift out cartridge (6).
- (d) Unscrew line connection ferrules at the oil filter.
- (e) Unscrew fastening screws, holding the oil filter clamps (9 and 12) on the front end engine panel and lift off.
- (f) Remove clamps (9 and 12) from filter body.
- (2) *Cleaning and inspection.*
  - (a) Inspect the cap screw and drain plug for stripped threads. Check oil line connections also for stripped threads.
  - (b) Check to see that gasket has not deteriorated.
  - (c) See if cover is bent or out-of-round.
  - (d) Clean interior and exterior of body and cover with an approved cleaning solvent.
  - (e) Examine the cover spring for breakage and clean.
- (3) *Reassembly and replacement.*
  - (a) Replace clamps (9 and 12) on the oil filter body (8) and remount on front end engine panel.
  - (b) Screw in drain plug (13) and reconnect filter with oil lines.
  - (c) Replace the filter cartridge if necessary. (See Lubrication Order 5-1161).



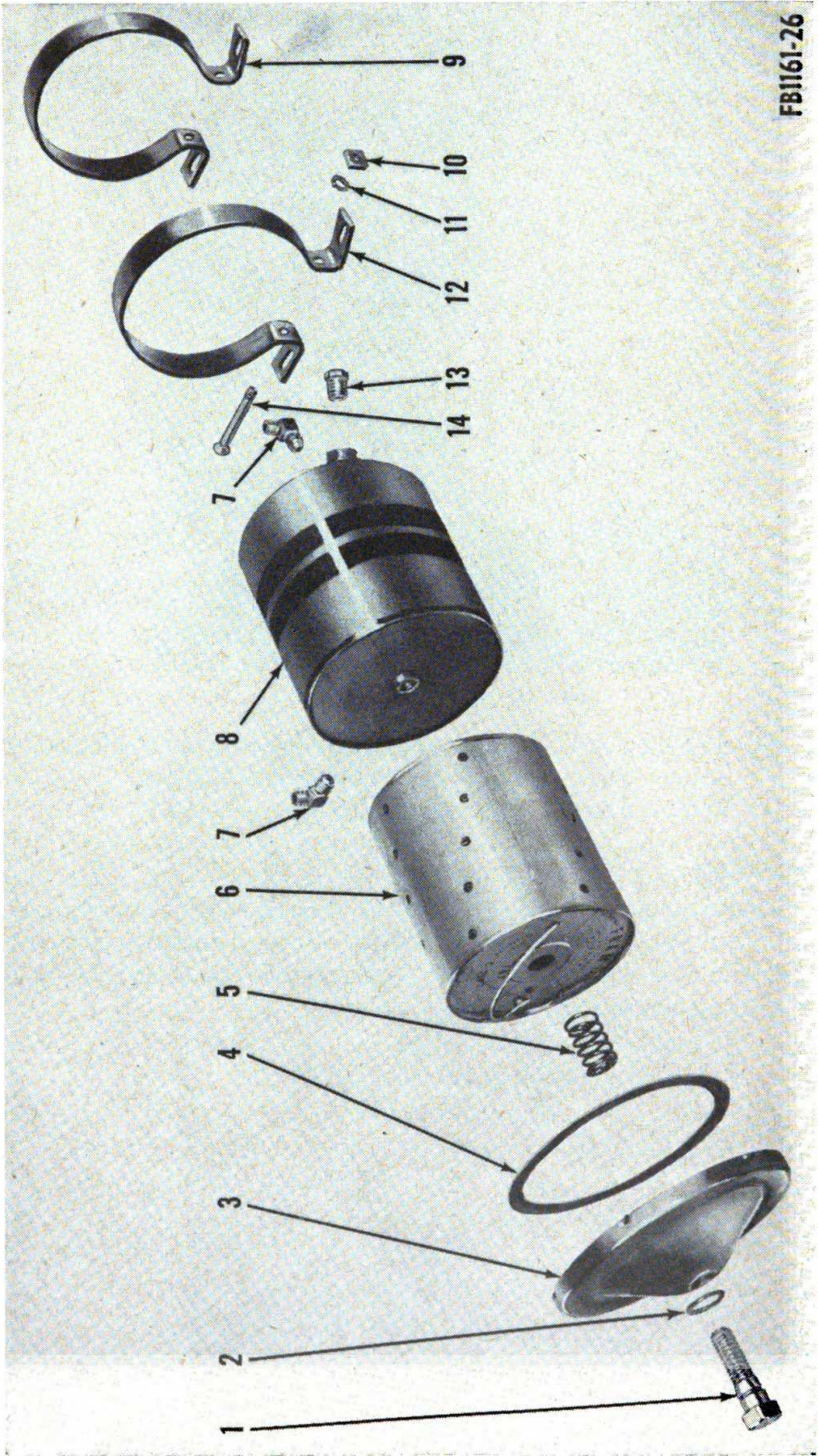


*Figure 25. Removal of oil filter.*

- (d) Place gasket (4) in cover; place cap screw and lockwasher in cover with spring placed on inside end of screw.
- (e) Fit cover on the filter and tighten the cap screw.

#### **49. Painting**

For instructions on the preparation of materials for painting and type of materials used, refer to TM 9-2851. Use the instructions most applicable to this water distributor in the type climate and/or conditions the unit has to work under.



FBI161-26

Figure 26. Oil filter, exploded view.

1 Bolt  
2 Washer  
3 Cap  
4 Gasket  
5 Spring

6 Cartridge  
7 Elbow fitting  
8 Filter body  
9 Clamp  
10 Nut

11 Lockwasher  
12 Clamp  
13 Drain plug  
14 Clamp screw

*Figure 26—Continued.*

## Section III. PREVENTIVE MAINTENANCE SERVICES

### 50. General

The operator or crew of this distributor and the organizational maintenance personnel must perform their preventive maintenance services regularly, to make sure the water distributor operates well and to lessen the chances of mechanical failure.

### 51. Operator, Driver, or Crew Maintenance

*a. Inspections.* Inspections must be made before operation, during operation, at halt, and after operation, as described in this section. All inspections of assemblies, subassemblies, or parts must include all supporting members or connections and must determine whether the unit is in good condition, correctly assembled, secure, or excessively worn. Any mechanical condition which may result in further damage to the unit must be corrected before the equipment is operated. Refer to TM 5-505 for definition of inspection terms.

*b. Reporting Deficiencies.* The operator will report all deficiencies on DD Form 110.

*c. Before-Operation Services.* The following services will be performed to determine if the condition of the equipment has changed since it was last operated and to make sure the equipment is ready for operation. All deficiencies must be corrected or reported to the proper authority before the unit is put into operation.

- (1) *Tampering.* See if the unit has been tampered with or damaged.
- (2) *Equipment setting.* Check equipment setting. It should be level and on a firm foundation. When pumping from an outside source, place equipment close to the supply source. Set the handbrake and chock the wheels. See that all piping and hose connections are clean and secure. When operating as a spraying unit, set the spraybar at proper height for clearance and shift whole spraybar unit to align with the curb line or marker. Add the maximum practical spraybar extensions the area's width will allow. Be sure the fifth wheel is lowered to the ground position before proceeding with the operation.
- (3) *Fuel.* Check pump engine fuel supply. See that the tank is full. Check reserve supply of fuel and replenish if necessary.
- (4) *Oil.* Check oil in engine crankcase. Add oil if necessary.
- (5) *Water (tank).* Load the water distributor tank from water source with as clean water as possible. Be sure strainer is in the suction hose. When filling water into manhole be sure the source supplying the water or fluid has a strainer.

*Note.* Clean strainers. Check and clean frequently when pumping dirty or sludgy water.

- (6) *Lubrication.* Refer to paragraph 48 for detailed lubrication information.
- (7) *Leaks, general.* Check entire unit for leaks, paying particular attention to pump fuel lines, water tank covers, and lines and joints and their respective connections. Check pump housing, hose couplings, and impeller shaft seal for leaks.
- (8) *Visual inspection.* Make a visual inspection of the entire unit. Check for broken or damaged parts and loose or missing bolts and nuts. Check for cracked or deteriorated hoses.
- (9) *Starting.* Refer to paragraph 27.

*d. During-Operation Services.* The operator is responsible for correcting or reporting unusual sounds or odors, deficiencies in performance, or other signs of abnormal operation. He will perform the following specific services:

- (1) *Pump pressure gage.* Check pump pressure gage readings. At normal operating speeds, the pressure should be either 20 or 30 psi (pounds per square inch) depending on the type of service.
- (2) *Tachometer recorder.* The readings on the tachometer face range from 0-1500 feet per minute. Set the static pointer to feet desired to be traveled by the water distributor and according to application charts (pars. 35 and 36).
- (3) *Water tank capacity gage.* Check the gage for sufficient water supply to complete operation.
- (4) *Nozzles.* Check for even flow of water from all nozzles on the spraybar piping.
- (5) *Unusual operation.* Check for any unusual operation, such as engine overheating, abnormal vibration in the pump, or the pump not delivering full volume. Report any irregularities to the proper authority.
- (6) *Unusual noises.* Check for any unusual noises in engine or pump. Stop the operation if any unusual noise is noticed and correct or report the noise to the proper authority.

*e. At-Halt-Services.* During halts, even for short periods, the operator should make a general check of the equipment and correct or report all deficiencies noticed, in addition to performing the following specific duties:

- (1) *Fuel.* Check fuel. Add if necessary.
- (2) *Oil.* Check oil level in engine crankcase. Add oil if necessary.

- (3) *Leaks.* Check the entire unit for leaks, paying particular attention to hoses and couplings, impeller shaft seal, and engine fuel lines and connections.
- (4) *Visual inspection.* Make a visual inspection of the unit. Check for broken or damaged parts, loose or missing assembly bolts and nuts, and deterioration of hoses and lines.
- (5) *Mounting of parts and accessories.* Check security of attachment of hoses and spraybar extensions in storage racks to prevent loss or damage.

*f. After-Operation Services.* To insure that the equipment is ready to operate at all times, the operator must perform the following services immediately after an operating period of 8 hours or less. All deficiencies must be corrected or reported to the proper authority.

(1) *Shutdown precautions.*

- (a) Allow engine to operate at slightly faster than idling speed for a few minutes before shutting down.
- (b) When freezing temperatures are expected, drain the pump each time it is stopped for any length of time, by removing the drain plug in the bottom of casing. Flush out the piping system with a specified oil recommended by the lubrication order.
- (c) Open the drain plugs at all the swivel joints of spraybar to allow collected debris or water to drain.
- (d) In normal weather, allow the pump to keep a head of water so the necessity of priming will be eliminated.
- (e) See that the levers for spraybar valves are in the closed position.

(2) *Fuel and oil.* Check and refill all the tanks.

(3) *Clean equipment.*

- (a) Remove engine covers and check for accumulated dust and dirt in the engine shrouds, and in the V of the cylinders. Remove dirt or dust.
- (b) Remove all dirt and grease with a wire brush from the entire unit, with an approved cleaning solvent.
- (c) Use steam pressure, if available, to remove sticky deposits on exterior of unit.
- (d) Clean flywheel fins and screen by removing screen fastened to shroud.

(4) *Tools and equipment.* See that all tools and equipment assigned to the water distributor are in serviceable condition, clean, and properly stowed or mounted.

(5) *Lubrication.* Refer to the current lubrication order or paragraph 48.

(6) *Strainers.* Remove and clean the basket strainer in the suction line. Clean the extension suction hose strainer.

- (7) *Fuel pump.* Remove fuel pump dome. See that the screen is clean and that the gasket is in good condition before replacing dome.
- (8) *Air cleaner.* Remove and wash in an approved solvent. Refill with clean oil.
- (9) *Fire extinguisher.* Check condition of fire extinguisher and inspect for full charge, proper working order, and secure mounting.
- (10) *Visual inspection.* Make a visual inspection of the entire unit. Check for leaks, loose or missing bolts and nuts, and bent, cracked, or broken parts. Check the engine air shroud for dents which would restrict the normal flow of air.
- (11) *Protection.* Fold up the spraybar and extensions in the travel position. Keep water distributor in a heated shelter if available during freezing temperatures.

## **52. Maintenance Precautions**

- a.* Always correct or report any mechanical deficiencies that may result in damage to the unit if operation is continued.
- b.* Always fold up extensions on spraybar after use.
- c.* Always use the proper size and type shear pin for the spraybar.
- d.* Never attempt to move unit to a new location without folding up spraybar extensions.
- e.* Clean all suction and discharge lines frequently.
- f.* Do not attempt to operate the pump with a clogged line.
- g.* Always use the suction line strainer to prevent the entry of foreign matter into the pump or spraybar.
- h.* When long spraybars are used, see that the support chains are installed.

## **53. Organizational Maintenance**

*a.* Organizational preventive maintenance is performed by the organizational maintenance personnel, with the aid of the operator, at weekly and monthly intervals. The weekly interval will be equivalent to 60 hours of use. The monthly interval will be equivalent to 4 weeks, or 240 hours, of use, whichever occurs first.

*b.* The technical inspection column is provided for the information and guidance of personnel performing the technical inspection, and constitutes the minimum inspection requirements for the equipment.

*c.* The preventive maintenance services to be performed at those regular intervals are listed and described below. The numbers appearing in the columns opposite each service refer to a corresponding number appearing on DA Form 464, and indicate that a report of the service should be made at that particular number on the form.

These numbers appear in either the second, third, or both columns, as an indication of the interval at which the service is to be performed.

Technical inspection	Service		
	Monthly	Weekly	
1	1	1	<i>Before-operation services.</i> Check and perform services listed in paragraph 51c.
2	2	2	<i>Lubrication.</i> Inspect entire unit for missing or damaged lubrication fittings and for indications of insufficient lubrication. Record the lubrication order number and date of publication on the form.
3	3	3	<i>Tools and equipment.</i> Inspect condition of all tools and equipment assigned to the distributor. Check condition and mounting of toolbox and compartment.
	3	3	See that all tools and equipment assigned to the water distributor are clean, serviceable, and properly stowed or mounted. See that toolbox and compartments are in good condition and that they close and fasten properly.
4	4	4	<i>Fire extinguisher.</i> Check carbon tetrachloride type for full charge and secure mounting. See that there are no signs of corrosion. Inspect carbon dioxide (CO <sub>2</sub> ) type for insecure mounting, kinked or damaged hose, and missing or broken seal. If the seal is missing or broken, the extinguisher should be weighed to determine the amount of charge. The empty and full weights are stamped on the body. Check date of last hydrostatic test stamped on the cylinder, just below the neck. It should not exceed 5 years.
	4	4	See that all extinguisher deficiencies are corrected or reported to the proper authority.
5	5	5	<i>Publications.</i> See that a copy of this technical manual, LO 5-1161, and TB 5-1161-1 on preventive maintenance services are on the equipment and in serviceable condition. DA Form 285 must be included on all self-propelled equipment.
6	6	6	<i>Appearance.</i> Inspect the general appearance of the unit, paying particular attention to cleanness, legibility of identification markings, and condition of the paint.
	6	6	Correct or report all deficiencies noticed.
7	7	7	<i>Modifications.</i> See if all available modification work orders applying to this water distributor have been completed and recorded on DA Form 478.
15	15	15	<i>Oil Filter.</i> Inspect the oil filter assembly and connections for leaks while the engine is running.
	15	15	Service the oil filter as specified in the lubrication order. After servicing, check carefully for leaks while the engine is running.
17	17	17	<i>Shroud.</i> Check the condition and mounting of fan and shroud.



Technical inspection	Service		
	Monthly	Weekly	
	17	17	Tighten or replace loose or missing bolts. Replace dented or damaged shroud or flywheel fins.
20	20	20	<i>Governor and linkage.</i> Check the governor adjustment. If the engine surges when running at top speed without load, the governor may be out of adjustment.
	20	20	Adjust governor if necessary (par. 76).
38	38	38	<i>Fuel pump.</i> Inspect fuel pump and lines for leaks. Check for loose mounting and assembly screws.
	38	38	Tighten any loose screws and connections. Replace defective pump with a new or reconditioned one (par. 72).
39	39	39	<i>Carburetor and linkage.</i> See that all carburetor mounting and assembly bolts and screws are in place and secure. Check flexibility and operation of linkage.
	39	39	Tighten any loose mounting and assembly bolts and screws. Replace worn or damaged linkage connections (par. 75).
41	41	41	<i>Air cleaner.</i> Inspect air cleaner for loose connections. Check condition and level of oil in bowl.
	41	41	Service air cleaner as specified in the current lubrication order. Make sure there are no air leaks between the air cleaner and carburetor, such as bent or collapsed piping.
43	43	43	<i>Fuel tank, cap, and gasket.</i> Inspect frame and mounting of fuel tank. Check tank, gasket, and connections for leaks.
	43	43	See that tank is securely mounted, air vent open, and filler cap clean and tight fitting. Repair or replace leaky or damaged gaskets and connections.
44	44	44	<i>Fuel line.</i> Check the fuel lines for leaks, loose connections, and damaged or collapsed lines.
	44	44	Repair or replace damaged or collapsed fuel lines (par. 74). Tighten loose connections. Report all uncorrected deficiencies to the proper authority.
46	46	46	<i>Spark plugs.</i> Inspect spark plugs for dirty or cracked insulators.
	46	46	Clean dirt, water, or oil from spark plug. Use a cleaning solvent if necessary, and dry properly.
	46	46	Remove and clean spark plugs and adjust point gap. See that plugs and gaskets are in good condition before they are reinstalled (par. 81).
49	49	49	<i>Magneto.</i> Inspect distributor cap and rotor for cracks, burned contacts, and corroded terminals.
	49	49	Clean or replace distributor cap and rotor and adjust breaker points if they are badly burned or pitted (par. 78).
50	50	50	<i>Wiring and ignition switch.</i> Inspect all wiring for oil-soaked, cracked, or frayed insulation; broken wires; and loose or corroded connections. Test ignition switch.
	50	50	Replace defective wires or switches (par. 79). See that connections are clean and tight. See that all switches and wires are securely mounted.

Technical inspection	Service		
	Monthly	Weekly	
52	52	52	<i>Lights.</i> Check the operation of all clearance lights and inspect them for loose mounting bolts or screws, defective bulbs, and cracked or broken lenses.
	52	52	Tighten or replace loose or missing screws or bolts. Replace defective bulbs and cracked or broken lenses (par. 102).
57	57	57	<i>Gages.</i> Inspect pump pressure gage on the discharge piping for cracked or broken glass. Check the water gage for bent or warped indicator arm or pointer.
	57	57	See that all gages are securely mounted. Replace damaged or defective gages.
58	58	58	<i>Recording tachometer.</i> Inspect tachometer for cracked or broken glass, loose mounting screws and cable, and defective operation.
	58	58	Tighten or replace loose or missing mounting screws. Replace damaged or defective tachometer
59	59	59	<i>Discharge valve.</i> Inspect discharge gate valve in pump discharge pipe at rear of engine, for proper setting and operation.
	59	59	Adjust discharge valve to increase or decrease the amount of water desired for operation.
60	60	60	<i>Pump, water.</i> Check for leaks at pump drive shaft. Inspect piping for leaks.
	60	60	Tighten loose connections and mountings.
62	62	62	<i>Levers, and linkage.</i> Inspect all levers for loose or missing mounting bolts and screws and for defective operation. Check lever linkage for worn or missing connecting pins or locking pins.
	62	62	Tighten or replace any loose or missing bolts, screws, and pins. Replace all bent or broken rods and connecting pins.
75	75	75	<i>Signal bell.</i> Inspect the signal bell clapper and cables for proper operation from cab and rear platform. Check for loose or damaged parts, and security of mounting.
	75	75	Repair or replace broken, damaged, or missing parts.
80	80	80	<i>Frame.</i> Inspect for cracks, breaks, broken welds, and for loose and missing bolts.
	80	80	Tighten or replace all loose or missing bolts. See that cracks, breaks, and broken welds are repaired before further damage results.
84	84	84	<i>Lifting cables.</i> Inspect for security of mountings, cleanliness, rust, or corrosion. Inspect splices for loosening and eyes for tightness and wear. Cable must not be kinked and must be free from frayed or broken strands.
	84	84	Repair or replace defective cable or mountings.
160	160	160	<i>Spraybars, piping, and valves.</i> Inspect spraybars, extensions, swivel joints, piping, and valves for leaks, damage, and insecure mounting. Determine if valves open and close properly, do not leak, and that packing nuts are properly adjusted. Inspect water flow from all nozzles for even flow and correct pattern.

Technical inspection	Service		
	Monthly	Weekly	
	160	160	Repair or replace all damaged or worn parts. Report all deficiencies not corrected to the proper authority.
161	161	161	<i>Tank (mounting)</i> . Check tank for leaks. Determine if tank is clean. See that tank capacity gage registers correctly and is not sticking. Inspect for security of tank mounting to frame and tightness of bolts.
	161	161	Repair leaks and clean tank if necessary; Report all deficiencies not corrected to the proper authority.
162	162	162	<i>Fifth wheel and drive</i> . Inspect fifth wheel for security of attachment and damage to angle drive or drive cable. Inspect the fifth wheel drop cable for proper action. Inspect tire for low air pressure, wear, cuts, embedded foreign material, and missing valve caps. Correct air pressure is 15 pounds.
	162	162	Service fifth wheel angle drive and drive cable as specified in the current lubrication order. Replace or repair damaged parts.
184	184	184	<i>Impeller shaft and seal</i> . Inspect pump shaft and impeller for looseness and damaged parts.
	184	184	Correct or replace loose or damaged parts. Lubricate pump seal as required in the current lubrication order.
185	185	185	<i>Pump housing</i> . Inspect pump housing for cracks and damage. Check for defective impeller shaft seals, flanges, and gaskets. Check for loose or missing assembly bolts and nuts.
	185	185	Tighten or replace loose, missing, or broken studs, bolts, and nuts. Replace defective gaskets. Install a new impeller shaft seal if necessary. Weld cracks or minor breaks. Replace pump housing if beyond repair.
203	203	203	<i>Piping, valves and fittings</i> . Check all piping valves and fittings to see that they are properly supported and do not leak. Determine if valves open and close properly, do not leak, and that packing is properly adjusted.
	203	203	Repair or replace any damaged or worn parts. Report to the proper authority any deficiencies not corrected.

## Section IV. TROUBLESHOOTING

### 54. Use of Troubleshooting Section

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the water distributor or any of its components. Each trouble symptom stated is followed by a list of probable causes of the trouble. The possible remedy recommended is described opposite the probable cause.

*Note.* All references in this section to paragraphs 106 through 129, pertain to operations that are the responsibility of the field and depot maintenance personnel. Organizational maintenance personnel should not proceed without proper authority.

## 55. Engine Fails to Start

<i>Probable cause</i>	<i>Possible remedy</i>
Lack of fuel.	Fill fuel tank and operate fuel pump priming lever to prime fuel pump.
Carburetor flooded.	Turn ignition off and wait several minutes for excess fuel to dissipate.
Fuel lines clogged.	Remove and clean fuel lines (par. 74).
Ignition cable wet or oil-soaked.	Dry wet cable; replace oil-soaked cable (par. 79).
Defective spark plugs.	Test—remove plugs, ground them to engine and check spark while cranking. Clean, adjust, or replace (par. 81).
Faulty magneto.	Test—remove wire from spark plug, hold it ¼-inch from body of spark plug, crank and check for spark. Repair or replace (par. 78).

## 56. Pump Fails to Prime

<i>Probable cause</i>	<i>Possible remedy</i>
Leak in suction line.	Check for leaks and tighten all loose connections.
Insufficient liquid in priming chamber.	Fill pump volute to the top.
Excessive suction lift.	Reduce suction lift by moving pump to a lower position.
Grease seal leaking.	Replace grease seal (refer to paragraph 85).
Pump running too slow.	Adjust governor to increase engine speed (par. 76).
Clogged suction line or strainer.	Remove suction line and strainer and clean.

## 57. Pump Fails to Deliver Rated Capacity

<i>Probable cause</i>	<i>Possible remedy</i>
Worn or damaged impeller.	Replace impeller (par. 84).
Valve in suction line partially closed.	Open suction valve.
Engine not running at rated speed.	Increase engine speed.
Air leak in the suction line.	Check for leaks and tighten all connections.
Lining of hose collapsed.	Replace hose.
Basket strainer in suction line clogged.	Remove strainer and clean.

## 58. Noisy Pump Operation

<i>Probable cause</i>	<i>Possible remedy</i>
Pump and engine not alined correctly.	Correct alinement.
Pump or engine holddown bolts loose or missing.	Tighten or replace bolts and nuts.
Impeller loose on shaft.	Tighten impeller (par. 84).
Worn pump bushings.	Replace bushings (par. 84).
Grease seal defective.	Replace seal (par. 85).

## 59. Little or No Water From Spraybar

<i>Probable cause</i>	<i>Possible remedy</i>
Pump fails.	See paragraph 27.
Spraybar valves closed.	Open valves.
Tank empty.	Fill tank.
Line strainer clogged.	Remove and clean.
Spray nozzles clogged.	Clean or replace.
Main valve closed.	Open valve.

## 60. Fifth Wheel Does Not Lower

<i>Probable cause</i>	<i>Possible remedy</i>
Wheel frame binding or bent.	Remove wheel frame, straighten, and reinstall (par. 97).
Drop cable caught.	Inspect cable and free from the obstruction.

## 61. Recording Tachometer Does Not Register

<i>Probable cause</i>	<i>Possible remedy</i>
Fifth wheel does not fully lower.	See paragraph 60.
Drive cable broken.	Replace cable (par. 97).
Gear in angle drive broken.	Replace angle drive assembly (par. 97).
Recording tachometer.	Replace recording tachometer (par. 95).

## 62. Recording Tachometer Pointer Whips

<i>Probable cause</i>	<i>Possible remedy</i>
Cable improperly lubricated.	Remove old grease and add new. (Refer to LO 5-1161).
Fifth wheel not in full contact with ground.	Lower completely.

## 63. Tank Contents Gage Stuck

<i>Probable cause</i>	<i>Possible remedy</i>
Bent dial shaft.	Take out and straighten or replace (par. 95).
Bent pointer.	Straighten or replace (par. 95).
Packing nut too tight or jammed.	Loosen and replace string graphite (par. 95).

## 64. Water Tank Leaks

<i>Probable cause</i>	<i>Possible remedy</i>
Manhole cover packing worn, cut, or broken.	Replace the packing.
Tank gage packing leaking.	Replace packing or dial assembly (par. 95).
Waterproofing compound around openings or joints allows rusting and leakage.	Refer to TM 9-850 on refinishing surfaces and waterproofing.

## Section V. RADIO SUPPRESSION

### 65. Definition of Suppression

Radio noise suppression is the elimination or minimizing of engine electrical disturbances within the equipment which interfere with

radio reception and disclose the location of the engine and its associated equipment to sensitive electrical detectors.

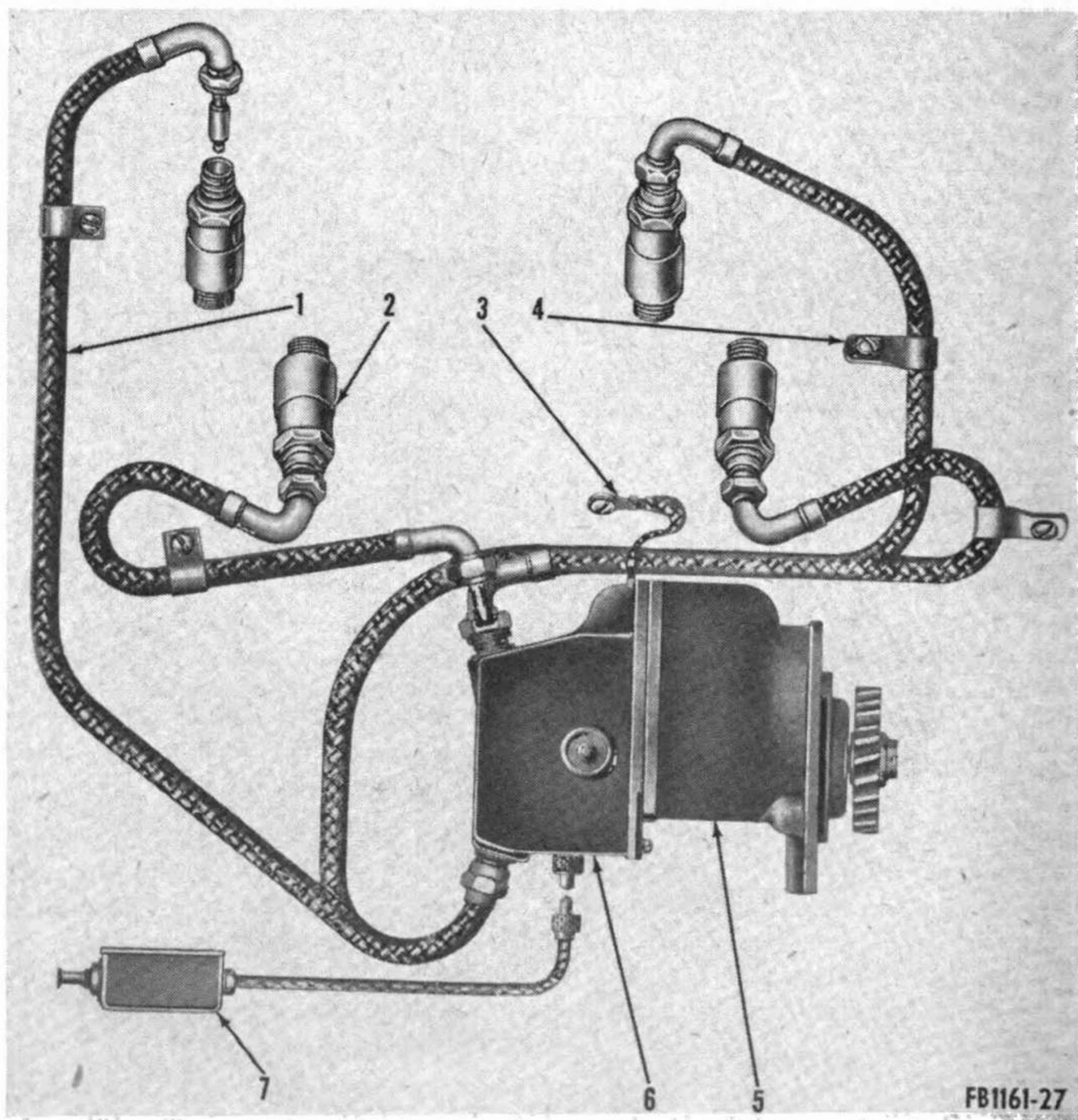
## 66. Source of Interference

Spark plugs, high tension wires from the magneto to the spark plugs, magneto breaker points, and poor electrical joints between adjacent parts on the engine frame are sources of electrical interferences.

## 67. Methods Used to Suppress Interference

(fig. 27)

The magneto (5) is completely metal inclosed. It is internally suppressed and has a capacitor-type ground connection built in. The ignition cables (1) are completely covered with double-braided shield,



- 1 Spark plug cable
- 2 Shielded spark plug
- 3 Ground strap
- 4 Cable clip

- 5 Magneto
- 6 Magneto cap
- 7 Ignition switch box

Figure 27. Radio suppression.

a full cone coat ferrule at the magneto end, and a soldered-on type elbow at the spark plug end. The ignition wires are of the copper-conductor, neoprene-jacket-type, which is impervious to attack by fungi. The ignition wire shields are attached to the engine at convenient points by means of metal clips (4) which assist in grounding the shielding loom and providing mechanical rigidity. The spark plugs (2) are completely shielded and internally suppressed.

## **68. Effects of Suppression**

Radio noise suppression is considered satisfactory when no interference is detected over the frequency range of 0.35 to 100.0 megacycles at a distance of 5 feet from the unit.

## **69. Testing of Suppression System**

*a.* Install a battery-powered radio receiver in good operating condition not more than 5 feet from the water distributor. A wide-band receiver covering the frequency range of 0.35 to 100.0 megacycles is preferable.

*b.* Start the engine, turn the receiver volume control to maximum, and tune through three widely separated frequencies while listening. Use frequencies that are free from signals with strong carriers so that the receiver will operate at its most sensitive condition.

*c.* Operate engine throttle and listen to the receiver speaker or headset. A regular clicking sound, which varies with engine speed and ceases when the ignition is shut off is caused by the ignition circuit.

*d.* The interference can be traced to its source by inspecting the components and systematically replacing the suppression devices in the unit and repeating the check in *a*, *b*, and *c* above after replacement of each part until the interference is no longer heard.

## **70. Suppression Component Replacement**

*a. General.* When replacing suppression components, only identical-part replacement must be made, as correct replacement is vital to proper interference suppression. Do not attempt to substitute parts unless the substitution is authorized in an official supply catalog.

*b. Replacement of Components.*

- (1) Replace spark plugs (par. 81).
- (2) Replace spark plug cables (par. 80).
- (3) Replace magneto (par. 78).
- (4) Replace ignition switch (par. 79).

## **Section VI. ENGINE FUEL SYSTEM**

### **71. Description**

The engine fuel system consists of an underslung fuel tank, fuel pump, fuel pump adapter, and hand primer, carburetor, air cleaner,

and suitable lines and connections for the engine. Fuel passes from the tank to the fuel pump where it is picked up and filtered. The fuel pump is driven by the camshaft of the engine and forces the fuel into the carburetor. A hand primer lever on the fuel pump adapter enables the operator to hand prime the carburetor for immediate starting, especially in cold weather or with a new or reconditioned engine. The air cleaner removes dust and grit from the air before it enters the carburetor. The air is filtered through the screen in the upper section, and the grit and dust accumulate in the oil cup in the bottom section. When properly adjusted to atmospheric conditions the carburetor mixes fuel and air in the proper proportions for the engine to burn.

## **72. Fuel Pump, Fuel Pump Adapter, and Hand Primer**

### *a. Removal.*

- (1) Unscrew exhaust muffler and remove top cover of engine house.
- (2) Disconnect the tank-to-pump fuel line (9, fig. 28) by unscrewing the fitting (8).
- (3) Disconnect the carburetor-to-pump fuel line (2).
- (4) Remove the two mounting screws (16) holding the fuel pump adapter (20) to the engine and remove the adapter, adapter gasket, and fuel pump.
- (5) Remove the bolts (12) and washers (13) holding the fuel pump to the adapter, and remove the fuel pump and gasket (14).

### *b. Disassembly of Fuel Pump.*

- (1) Remove pulsator dome bolt (4) and pulsator dome gasket (5).
- (2) Remove pulsator dome (3) and gasket.
- (3) Remove screen from the fuel head (6).

### *c. Disassembly of Fuel Pump Adapter and Hand Primer.*

- (1) Unscrew the hand priming lever (19).
- (2) Remove the spring (17) and priming shaft (18).

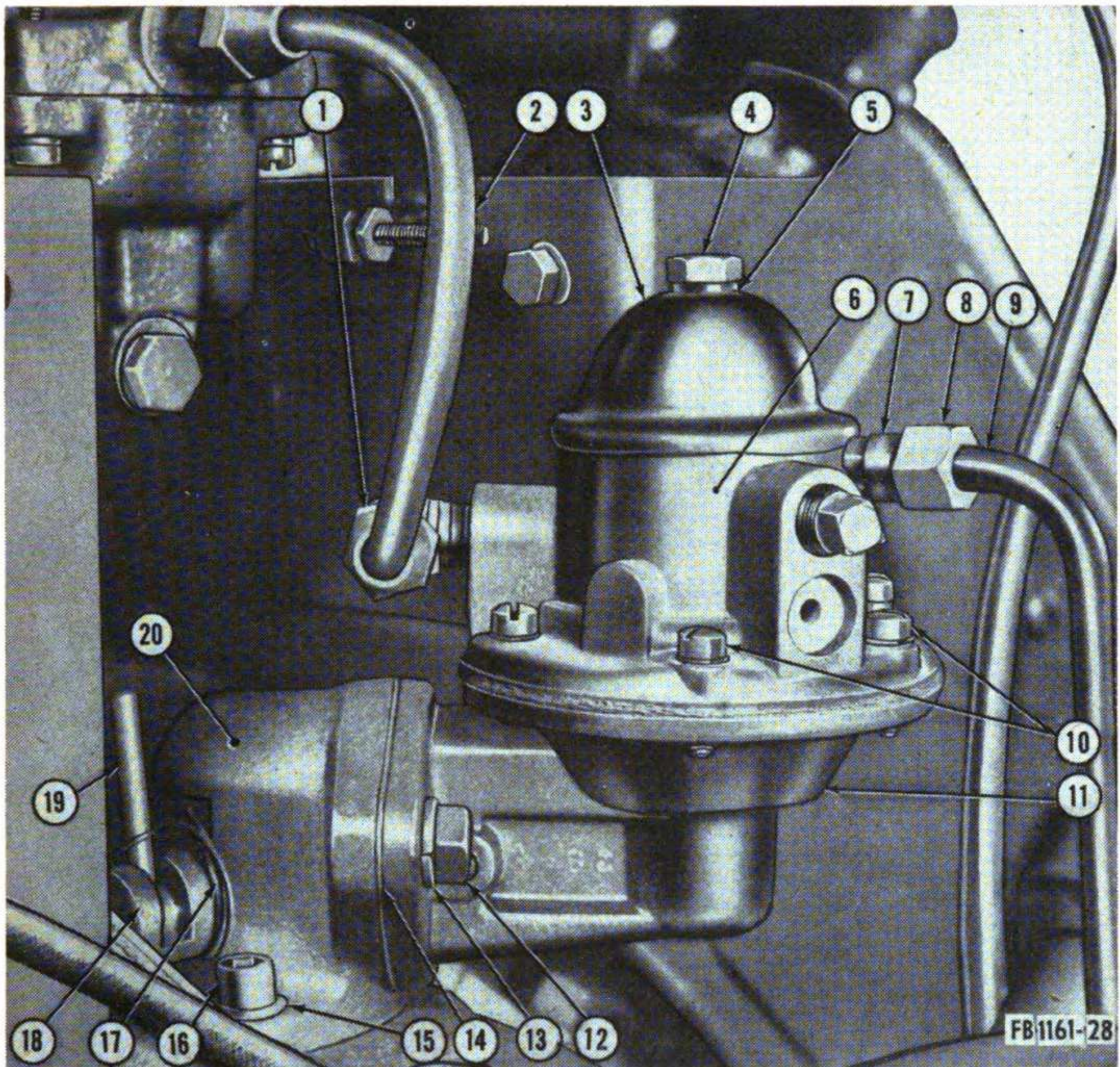
### *d. Cleaning and Inspection.*

- (1) Wash the fuel pump screen in an approved cleaning solvent, and dry thoroughly, with compressed air, if available.
- (2) Wash all other parts in an approved cleaning solvent and dry thoroughly.
- (3) Inspect for stripped threads, cracks, or breaks; replace faulty parts.
- (4) Inspect priming spring for sufficient tension to return handle to a vertical position.

### *e. Reassembly of Fuel Pump Adapter and Hand Primer.*

- (1) Insert the priming shaft (18) in the adapter casting, so that the thread appears in the slot.





- |                                |                     |
|--------------------------------|---------------------|
| 1 Fuel line ferrule            | 11 Mounting bracket |
| 2 Carburetor-to-fuel pump line | 12 Bolt             |
| 3 Pulsator dome                | 13 Washer           |
| 4 Pulsator dome bolt           | 14 Gasket           |
| 5 Dome gasket                  | 15 Washer           |
| 6 Fuel head                    | 16 Cap screw        |
| 7 Fuel line fitting            | 17 Spring           |
| 8 Ferrule on fuel tank line    | 18 Shaft            |
| 9 Pump-to-tank fuel line       | 19 Priming handle   |
| 10 Screw                       | 20 Adapter          |

*Figure 28. Fuel pump and adapter.*

- (2) Install the spring (17) in position.
- (3) Screw the priming handle (19) into the shaft and hook the spring over the lever.

*f. Reassembly of Fuel Pump.*

- (1) Place the screen on the fuel head, and install the gasket and pulsator dome (3).
- (2) Secure with the gasket (5) and dome bolt (4).

*g. Installation.*

- (1) Position the fuel pump and gasket (14) on the adapter and secure with the two bolts (12) and washers (13).
- (2) Place the pump, adapter, and adapter gasket in position on

- the engine, and secure with the two cap screws (16) and washers (15).
- (3) Connect the carburetor-to-fuel pump line (2) and the fuel pump-to-fuel tank line (9).
  - (4) Install the engine housing top cover and screw in the exhaust muffler.

### **73. Fuel Tank and Engine Removal**

#### *a. Removal.*

- (1) Drain the fuel in the tank into a clean container placed under the drain outlet.
- (2) Remove the pump body (par. 83) and impeller and shaft seal (par. 84).
- (3) Disconnect the tank-to-fuel pump line.
- (4) Remove the eight bolts, nuts, and lockwashers holding the base of the engine to the frame on the rear of the distributor.
- (5) Unscrew the four nuts from the studs attached to the straps holding the fuel tank in place.
- (6) With a sling passed through each channel in the engine base, lift the engine from its mounting as shown in figure 29.
- (7) Lift the fuel tank up out of the straps.

#### *b. Cleaning and Inspection of Fuel Tank.*

- (1) Flush out the fuel tank with an approved cleaning solvent.
- (2) Turn tank upside down to shake out any dirt or scale in the tank.
- (3) Inspect for leaks, dents, stripped threads, and wear at points of contact with straps. Replace worn or deteriorated pads used to cushion tank.
- (4) Repair or replace fuel tank if defective. Do not weld or patch tank unless proper precautions are taken to prevent damaging combustion, such as draining fuel and filling with water.
- (5) Inspect fuel tank cap to see that vent is open and the gasket in good condition.

#### *c. Installation.*

- (1) Install the fuel tank on the straps in the engine base frame.
- (2) Ease the engine down into place on the frame so that the holes line up.
- (3) Remove the lifting slings and secure the engine with the eight bolts, nuts, and lockwashers.
- (4) Place the four nuts on the strap studs and tighten.
- (5) Connect the fuel tank-to-fuel pump line.
- (6) Install the pump and shaft seal (pars. 83 and 84).

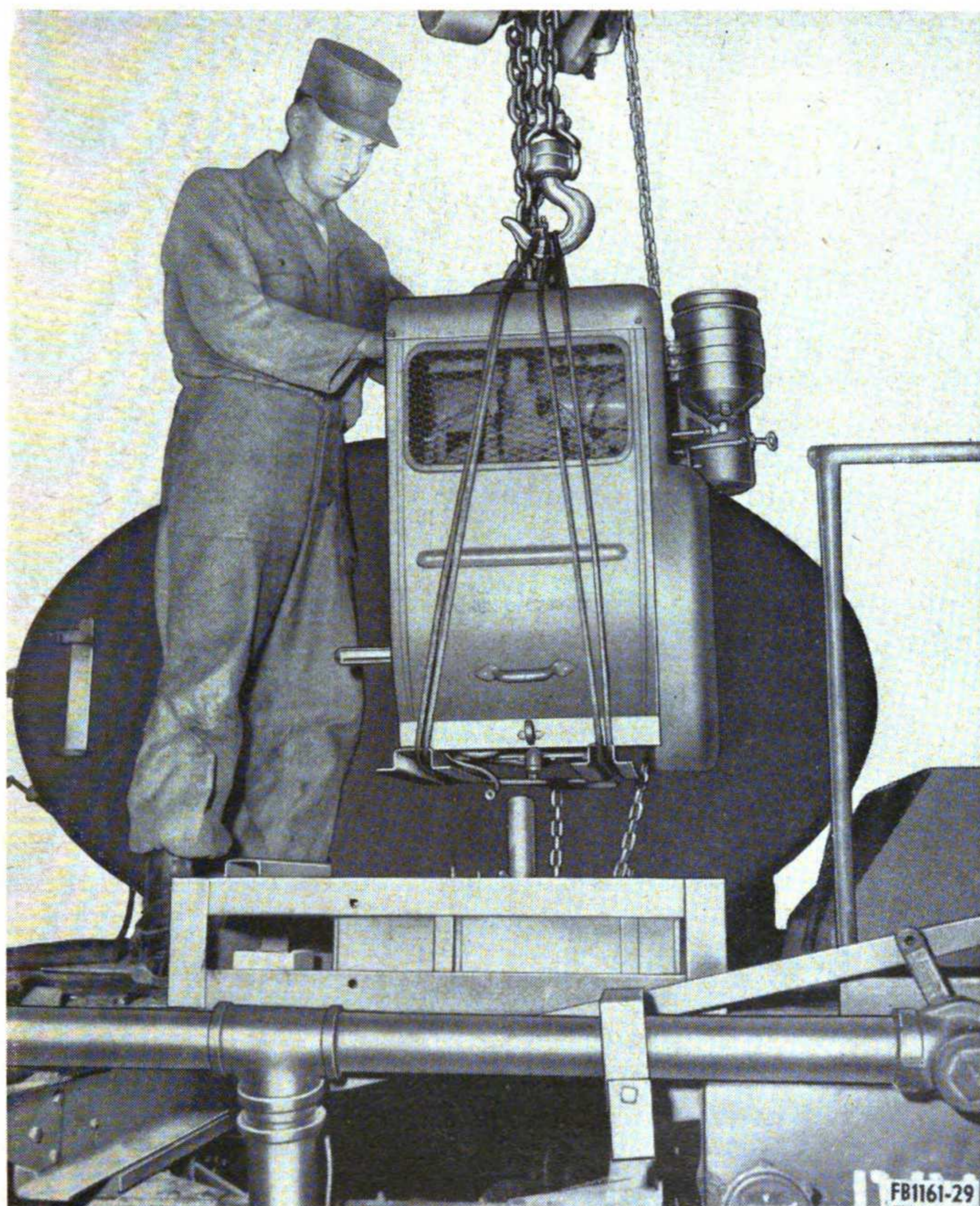


Figure 29. Lifting engine off frame.

## 74. Fuel Lines

### a. Removal.

- (1) Unscrew exhaust muffler and remove engine housing top cover.
- (2) Disconnect the fuel tank-to-fuel pump line (9, fig. 28) at the fuel tank and at the fuel pump end and remove the tubing.
- (3) Disconnect the fuel pump-to-carburetor fuel line and remove the copper tubing.

### b. Cleaning and Inspection.

- (1) Blow out fuel lines with compressed air, if available, holding finger or plug at one end to see if there are any air leaks at the bends in the tubing.

- (2) Check for stripped threads, damaged fittings, and severe kinks; replace fittings or lines if these conditions exist.

*c. Installation.*

- (1) Place the fuel tank-to-pump line (9) in position and tighten the ferrules.
- (2) Place the pump-to-carburetor fuel line (2) in position and connect the fittings.
- (3) Install the engine housing top cover and screw in the exhaust muffler.

## **75. Carburetor**

*a. Removal.*

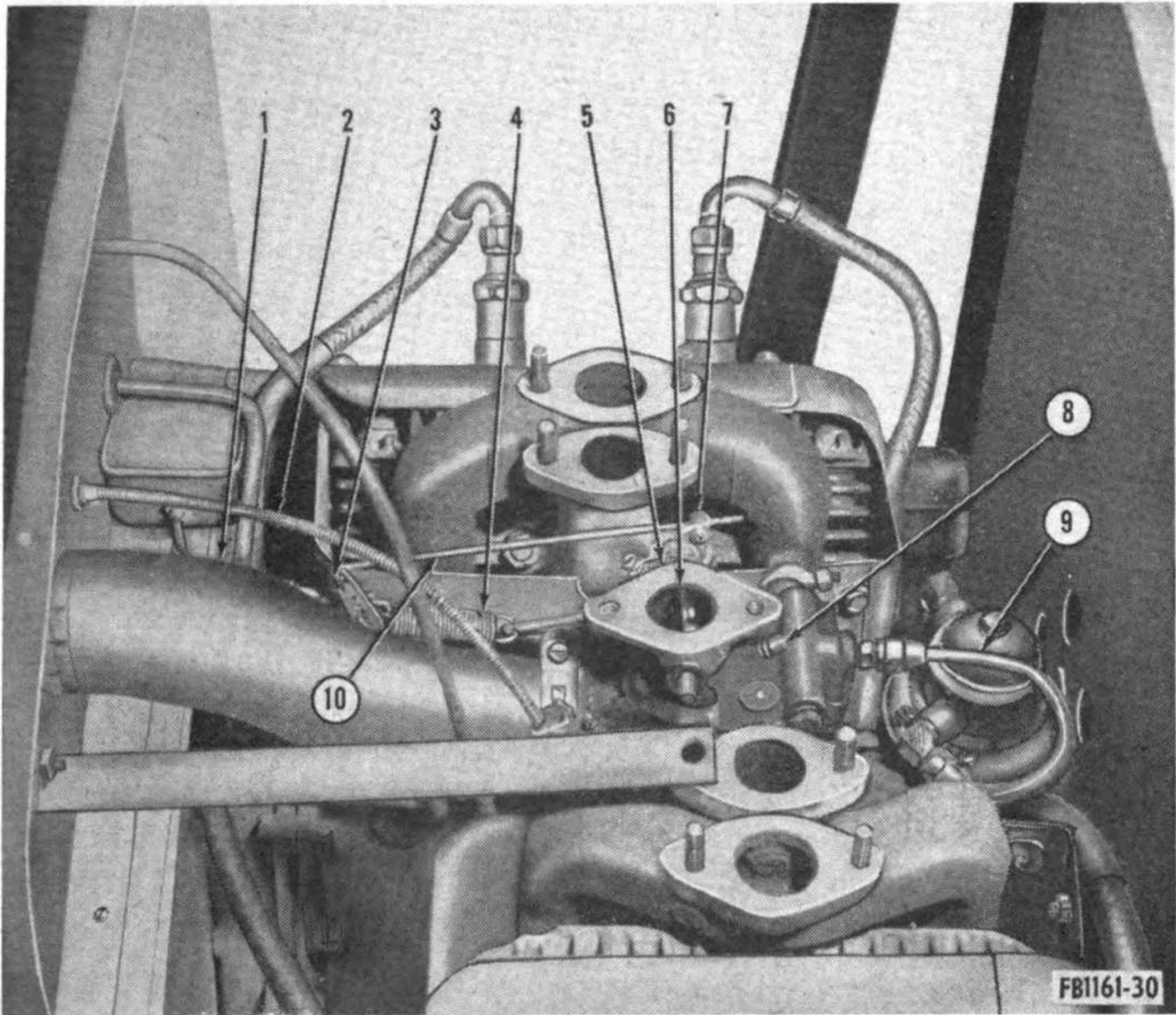
- (1) Unscrew the muffler cap from the engine.
- (2) Remove the engine top cover by removing the screws holding it to the front and rear end panels.
- (3) Loosen the screws holding the clamp on the air cleaner-to-carburetor hose (1, fig. 30); remove the hose and clamps.
- (4) Disconnect the fuel pump-to-carburetor fuel line (9); remove the fuel line.
- (5) Loosen the choke wire (2) by unscrewing the setscrew at the lower swivel lever end of choke assembly.
- (6) Loosen choke tube clamp screw and push choke control lever forward.
- (7) Unhook the governor spring from the governor lever (3) and remove the cotter pin holding the throttle control rod (10) to the governor lever.
- (8) Remove the two lockwashers and cap screws holding carburetor to the manifold.
- (9) Remove the carburetor and carburetor gasket by dropping carburetor away from manifold and sliding to position to lift carburetor out.

*b. Cleaning and Inspection.*

- (1) Clean the carburetor with an approved cleaning solvent and dry thoroughly with compressed air if available or a lint-free rag.
- (2) Inspect for loose, missing, or damaged parts; check gaskets and gasket surfaces for good condition.
- (3) Tighten any loose jet plugs and body screws. Do not tamper with the carburetor adjusting screws. Replace damaged or missing parts or gaskets.

*c. Installation.*

- (1) Place carburetor and gasket in position under upper part of manifold and secure to the manifold with the two cap screws and lockwashers.



- |   |                 |    |                              |
|---|-----------------|----|------------------------------|
| 1 | Air-intake hose | 6  | Butterfly valve              |
| 2 | Choke wire tube | 7  | Throttle control lever       |
| 3 | Governor lever  | 8  | Idle adjusting needle        |
| 4 | Governor spring | 9  | Carburetor-to-fuel pump line |
| 5 | Carburetor      | 10 | Throttle control rod         |

*Figure 30. Carburetor, with upper part of manifold removed.*

- (2) Screw control rod (10) into control lever (7) and connect the other end to the governor lever (3) with cotter pin.
- (3) Install governor spring (4) to governor lever.
- (4) Place choke control wire through choke tube and clamp it securely. Insert the choke wire in the hole in the choke lever swivel and tighten screw.
- (5) Connect the fuel pump-to-carburetor line (9) and tighten fitting.
- (6) Place air cleaner-to-carburetor hose (1) in position to connect air cleaner to carburetor. Tighten clamp.
- (7) Place top cover of engine housing in position and secure to front and rear end panels with screws.
- (8) Screw muffler onto exhaust.

*d. Adjustment.*

- (1) *Idle adjustment.* Any adjustment to the carburetor should be done while the engine is warm and carburetor is mounted in its functioning position. The idle adjusting needle (8, fig.

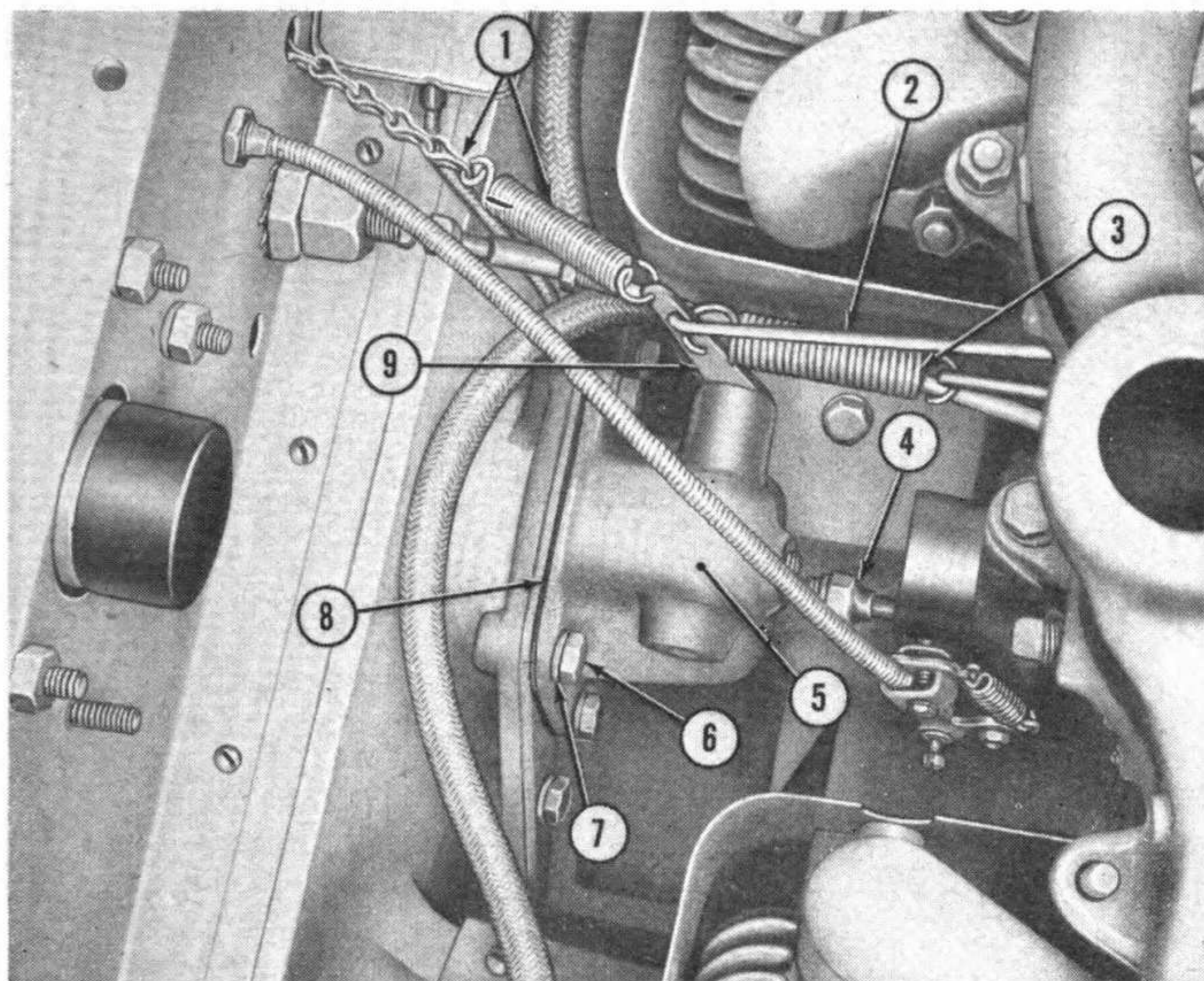
- 30) in the idle air passage controls the suction on the idle jet and thereby the idle mixture. Idle adjustment is as follows:
- (a) Using a screwdriver, turn the slotted end of the idle adjusting needle clockwise. This causes a greater suction with a smaller amount of air and therefore a richer mixture.
  - (b) Turn the screwdriver in the slotted end of the idle adjusting needle counterclockwise, or away from the seat, to increase the amount of air and reduce the suction. This delivers a leaner mixture.
  - (c) Turn idle adjustment needle clockwise until the engine falters or about stops from richness of mixture, then turn it until the engine runs smoothly.
- (2) *Throttle control adjustment.* Refer to throttle control adjustment in governor assembly (par. 76).
  - (3) *Choke control adjustment.* Choke control adjustment is made by a screw at the engine end of the choke control assembly. Loosen choke wire and set choke butterfly (6, fig. 30). The choke is completely open or should be when choke control on panel is completely closed. Be sure when adjusting the mixture the choke is wide open.

## 76. Governor

*a. Description.* The governor is a centrifugal flyball type and controls the carburetor throttle opening to maintain constant engine speed under varying engine load conditions. The governor also acts as a safety device to prevent excessive engine speeds from developing. The governor is driven by the camshaft gear and rotates at crankshaft speed.

*b. Removal.*

- (1) Unscrew the exhaust muffler, and remove the screws holding the top canopy of the engine and remove the canopy.
- (2) Disconnect the spark plug cable and loom assemblies from the spark plugs.
- (3) Remove the screws and lockwashers on each side of the cylinder head shrouds and remove the shrouds.
- (4) Loosen the screws holding the clamps on the air cleaner-to-carburetor hose (1, fig. 30) and remove the hose and clamps.
- (5) Disconnect the throttle control rod (2, fig. 31) from the governor control level (9) by removing the cotter pin.
- (6) Disconnect the speed control chain and spring assembly (1) from the governor control lever.
- (7) Disconnect the governor spring (3) from the governor control lever.
- (8) Disconnect the oil line at the connection (4) from the governor housing and move it so it will not obstruct removal of the governor housing.



- |   |                          |
|---|--------------------------|
| 1 Speed control chain and spring assembly | 5 Governor housing       |
| 2 Governor-to-throttle control rod        | 6 Cap screw              |
| 3 Governor spring                         | 7 Lockwasher             |
| 4 Oil line connection                     | 8 Gasket                 |
|   | 9 Governor control lever |

Figure 31. Governor, installed view.

- (9) Remove the four cap screws (6) and lockwashers (7) securing the governor housing to the engine; remove the governor housing and gasket (8) by pulling back to free governor gear from mounting pin in gear cover.

*c. Installation.*

- (1) Using a new gasket between the gear cover and governor housing, install the governor assembly on the stationary pin on the gear cover. Make sure the governor gear engages with the camshaft gear.
- (2) Secure the governor housing with the four cap screws (6) and lockwashers (7).
- (3) Connect the oil line to the fitting on the governor housing.
- (4) Connect the governor spring (3) to the governor control lever (9).
- (5) Connect the governor-to-throttle control rod (2) to the governor control lever with the cotter pin.
- (6) Install the air cleaner-to-carburetor hose (1, fig. 30) with clamps.

- (7) Install the cylinder head shrouds and fasten with the screws and lockwashers.
- (8) Connect the spark plug cables and loom assemblies to the spark plugs.
- (9) Install the engine housing top cover and screw in the exhaust muffler.

*d. Adjustment.* If the engine surges when running at top speed without load, the governor may be out of adjustment. To adjust the governor, remove the governor-to-throttle control rod (2, fig. 31) with the engine stopped, from the next-to-the-top hole in the governor control lever (9). Remove the governor spring (3) from the next hole down in the lever. Move the carburetor linkage manually by pushing the governor-to-throttle control rod toward the governor as far as it will go. This opens the carburetor throttle wide. In this position the bent end of the governor-to-throttle control rod should just fit into the next-to-the-top hole in the governor lever. If necessary, adjust the length of the governor-to-throttle control rod by screwing it out of the throttle lever on the carburetor. Connect the governor-to-throttle control rod to the governor lever and secure it with a cotter pin. Reconnect the governor spring in the hole just below the governor-to-throttle control rod.

## **Section VII. ENGINE ELECTRICAL SYSTEM**

### **77. Description**

The engine electrical system consists of a flange-mounted radio-shielded magneto (5, fig. 27), shielded ignition cables (1), shielded spark plugs (2), and a shielded ignition switch.

### **78. Magneto**

#### *a. Removal.*

- (1) Disconnect spark plug cables (1, fig. 32), ignition switch wire (9), and ground strap (2) from the magneto.
- (2) Remove the two nuts (5), star lockwashers, plain washer, and cap screw (8) securing the magneto (7) to the engine. Remove the magneto and magneto flange gasket (3).

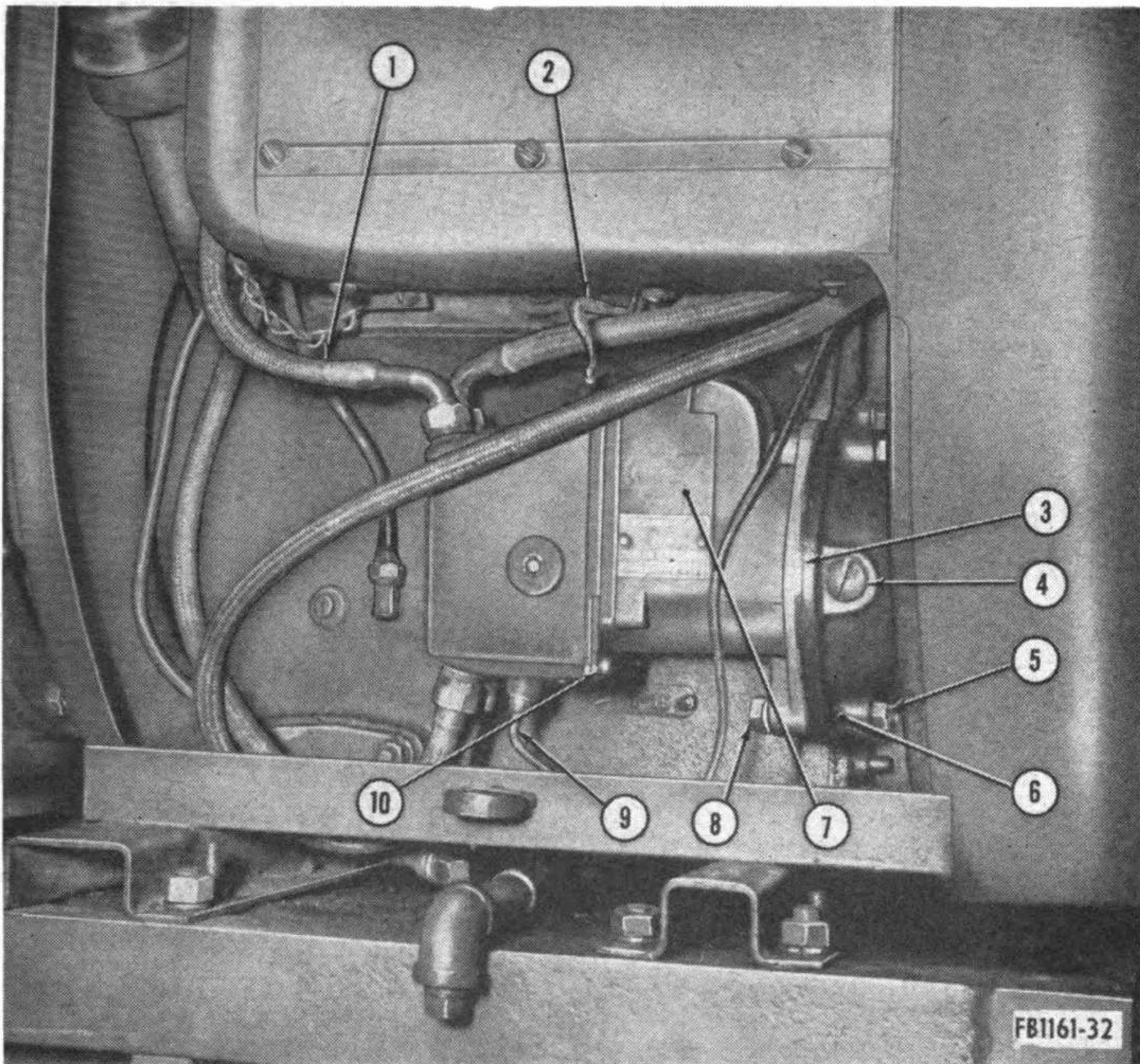
#### *b. Cleaning and Inspection.*

- (1) Clean the exterior of the magneto with approved cleaning solvent.
- (2) Inspect for loose screws and missing or damaged parts; repair or replace damaged parts and tighten loose screws.
- (3) Inspect flange gasket and replace if torn or deteriorated.

#### *c. Installation and Timing.*

- (1) Remove the six screws and lockwashers securing the flywheel screen to the flywheel shroud. Remove the shroud.





- |                     |                        |
|---------------------|------------------------|
| 1 Spark plug cables | 6. Magneto mount       |
| 2 Ground strap      | 7 Magneto              |
| 3 Flange gasket     | 8 Cap screw            |
| 4 Inspection plug   | 9 Ignition switch wire |
| 5 Nut               | 10 End cover screws    |

Figure 32. Magneto, installed.

- (2) Remove the spark plug from the No. 1 cylinder (see timing diagram, (fig. 33)); turn the engine over slowly until air blows out of the No. 1 spark plug hole, indicating that this cylinder is on compression stroke.
  - (3) Continue turning until the marked flywheel van (fig. 33) is in line with the mark on the flywheel shroud.
  - (4) Remove the inspection plug (4, fig. 32) from the timing-gear housing and install the magneto so that the marked tooth on the magneto gear is visible through the opening.
  - (5) Secure the magneto (7) with the cap screw (8), plain washer, star lockwashers, and two nuts (5).
  - (6) Connect the spark plug cables (1), ignition switch wire (9), and ground strap (2) to the magneto.
- d. Cleaning Magneto Breaker Points.*
- (1) Remove the four screws (10, fig. 32) and lockwashers securing the end cap to the magneto.

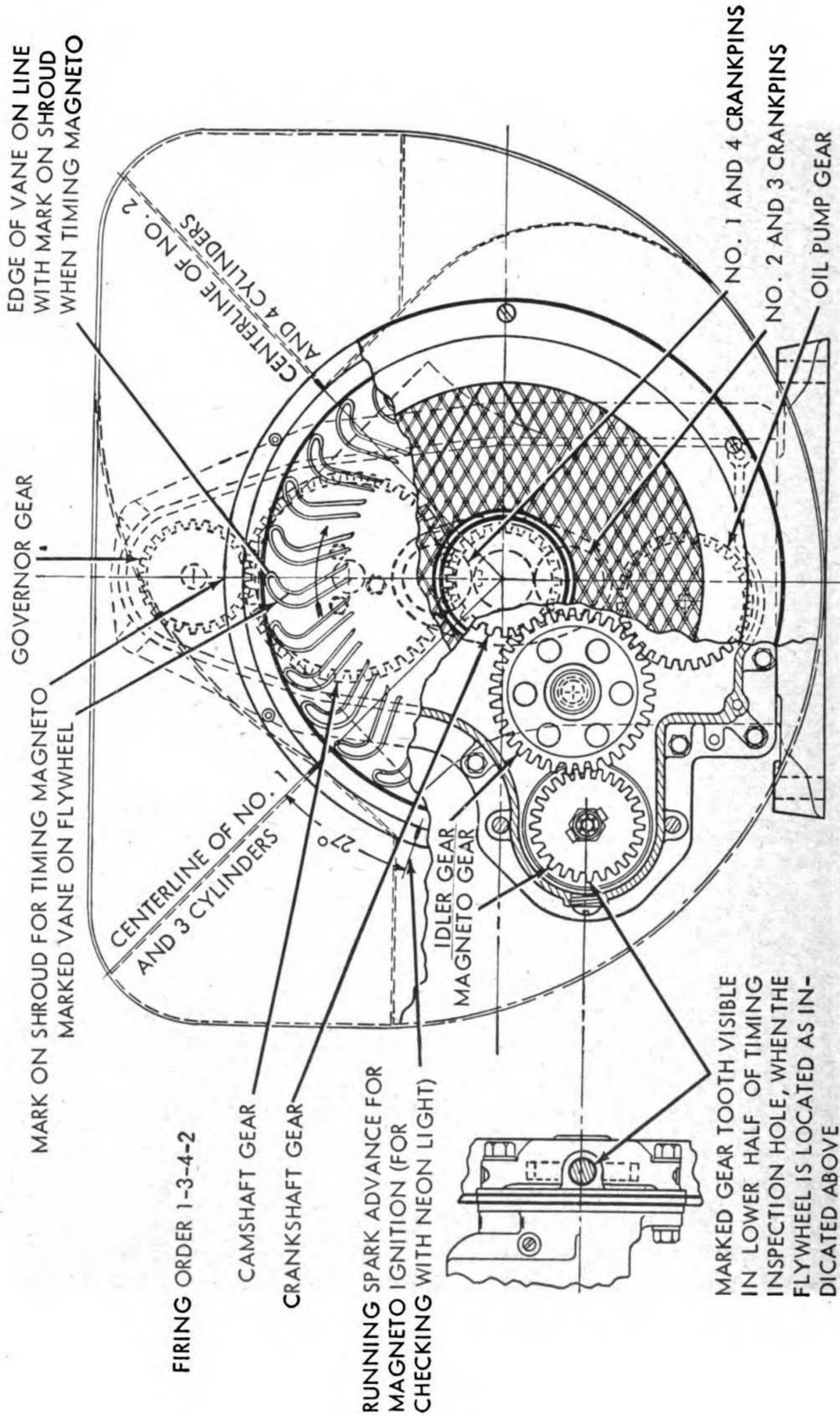


Figure 33. Engine timing marks.

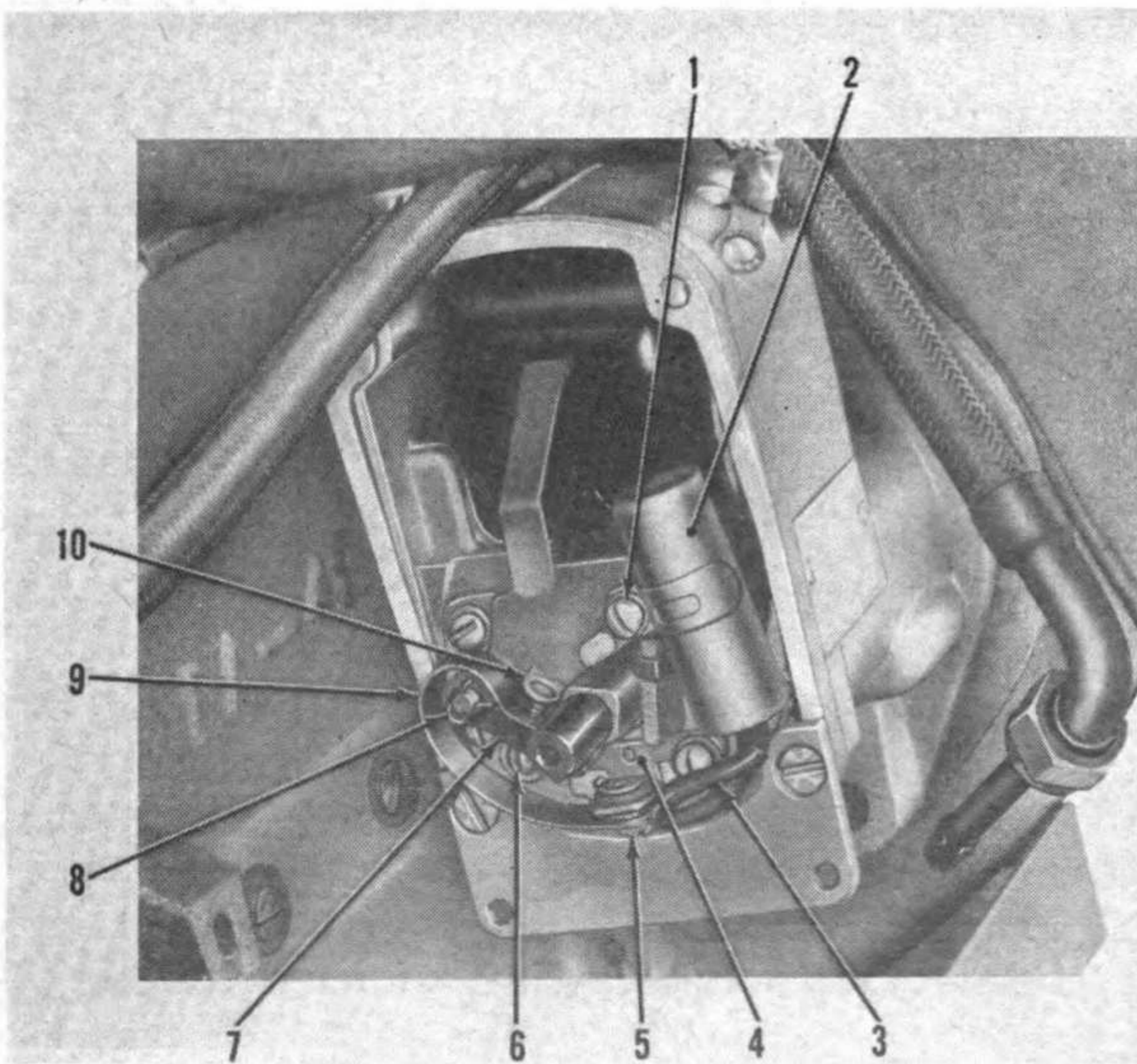
- (2) Carefully remove the end cap and gasket with ignition cable and loom assembly in place. Remove the distributor rotor.
- (3) Inspect breaker points (7 and 10, fig. 34) for pitting and burning; if badly pitted, replace (*f* below).
- (4) If breaker points are rough only, file smooth with a breaker-point file and adjust (*e* below).

*e. Adjusting Magneto Breaker Points.*

- (1) Crank the engine slowly until the breaker arms (7 and 10) are fully open; measure the point clearance with a feeler gage as shown in figure 35.
- (2) Breaker-point clearance should be 0.015 inch; adjust by loosening the locking screws (6), inserting a screwdriver in the horizontal slot at the bottom of the contact support (4), and turning. Secure with the locking screws.

*f. Replacing Magneto Breaker Points.*

- (1) Remove terminal screw (5) and lockwasher; remove the snap ring (8) and breaker arm (7).
- (2) Remove the two locking screws (6), lockwashers, and plain washers securing the contact support (4); remove the support.



- |                   |                              |
|-------------------|------------------------------|
| 1 Capacitor screw | 6 Locking screw              |
| 2 Capacitor       | 7 Movable breaker arm        |
| 3 Capacitor lead  | 8 Snap ring                  |
| 4 Contact support | 9 Movable breaker arm spring |
| 5 Terminal screw  | 10 Stationary breaker arm    |

*Figure 34. Magneto breaker points.*

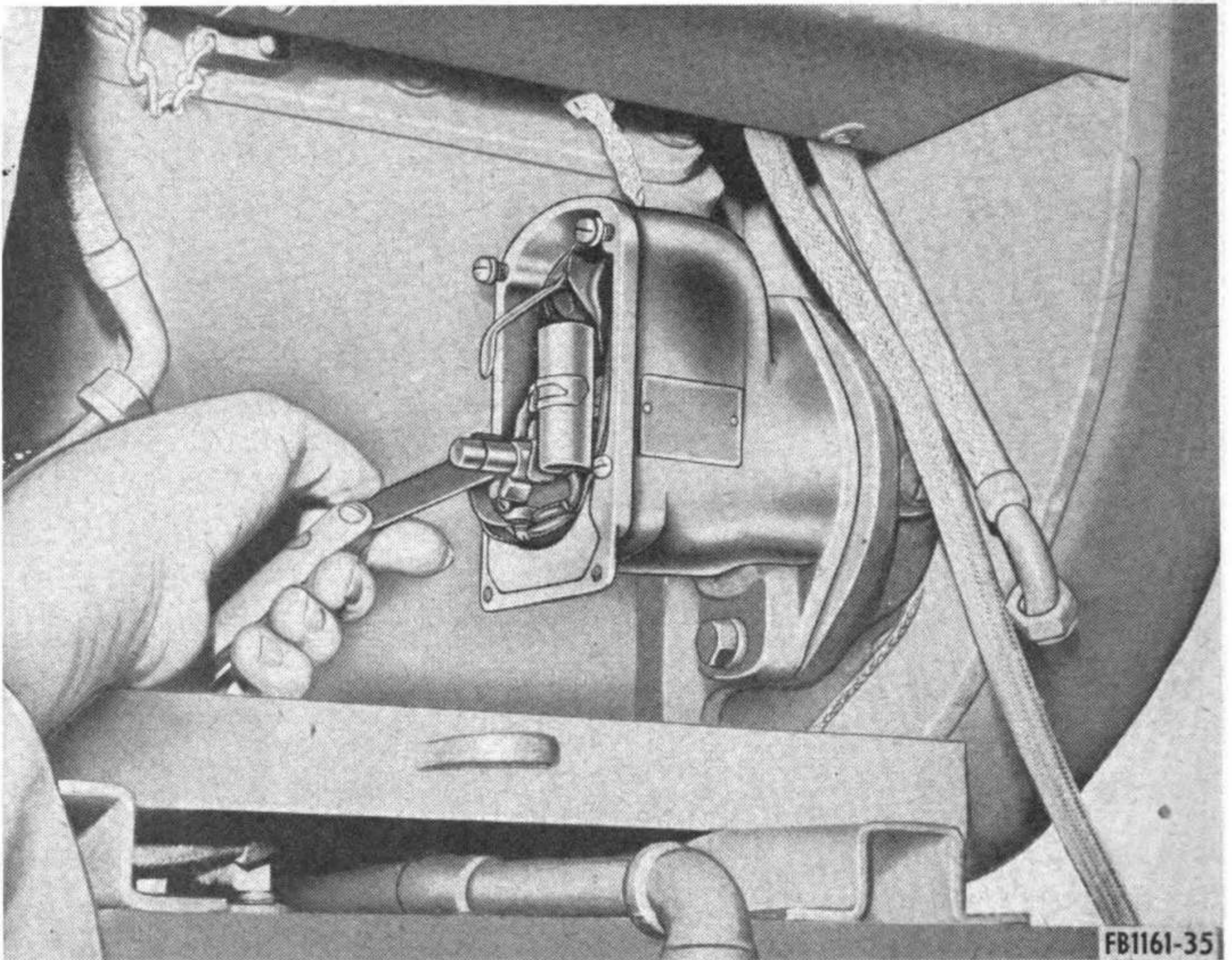


Figure 35. Checking magneto breaker points.

- (3) Install new contact support; secure with two screws, lockwashers, and plain washers. Install new breaker arm and secure with snap ring.
- (4) Hold breaker arm spring and capacitor lead (3) in position; install terminal screw (5) and lockwasher.
- (5) Adjust breaker points (*e* above).

## 79. Ignition Switch

### *a. Removal.*

- (1) Disconnect the ignition switch wire (9, fig. 32) at the magneto.
- (2) Unscrew the panel nut holding switch in its place.
- (3) Take off the switch tag marked ON and OFF.
- (4) Push the switch button through the engine front end panel.

### *b. Disassembly.*

- (1) Pry out the switchbox cover.
- (2) Remove the screw, lockwasher, and washer from the ignition switch.
- (3) Remove the nut and lockwasher from the ground wire assembly.
- (4) Pull out the wire assembly and the switch.

### *c. Cleaning and Inspection.*

- (1) Clean the parts with a cloth dampened with approved cleaning solvent.

- (2) Inspect for stripped threads, damaged insulation or shielding, and corrosion. Replace damaged parts or defective switch.

*d. Reassembly.*

- (1) Place a star lockwasher over the threaded portion of the switch; push the handle of the switch through the hole in the switchbox.
- (2) Push the ground wire assembly through the hole into the switchbox, and install the lockwasher and nut which hold the wire assembly in place.
- (3) Connect the wire assembly to the switch using the screw, brass washer, and lockwasher.
- (4) Place the switchbox cover in position.

*e. Installation.*

- (1) Push the switch handle through the hole provided in the engine front end panel.
- (2) Place the switch tag over the threaded portion of the switch and screw the panel nut tight against the panel.
- (3) Connect the magneto end of the ground wire (9) assembly to the magneto.

## **80. Spark Plug Cables**

*a. Removal.*

- (1) Mark with chalk or soap stone or tie a tag on the spark plug cable (1, fig. 32) with the spark plug number.
- (2) Unscrew the ignition cable at the magneto (7) and spark plugs.
- (3) Remove the cable clips (4, fig. 27) and carefully pull out the ignition cables.

*b. Disassembly.*

- (1) Pull the insulated connector off the spark plug end of each cable.
- (2) Pry open the contact clip terminal at the magneto end of each cable and remove the terminal.
- (3) Pull the cable out from the inside of the radio suppression loom cover.

*c. Cleaning and Inspection.*

- (1) Wipe and clean off the parts with a cloth dampened with approved cleaning solvent.
- (2) Inspect wires for cuts, damaged, or deteriorated insulation. Replace if these conditions exist.
- (3) Check terminals for corrosion and poor contact. Scrape with emery cloth or sandpaper any corrosion deposits; if pitted badly, replace clips.

- (4) Check loom connections for stripped threads or damage to the shielding. Replace defective parts.

*d. Reassembly.*

- (1) Attach pulling or cable puller wire to end of cable wire and pull through the flexible loom.
- (2) Replace terminals and connectors.

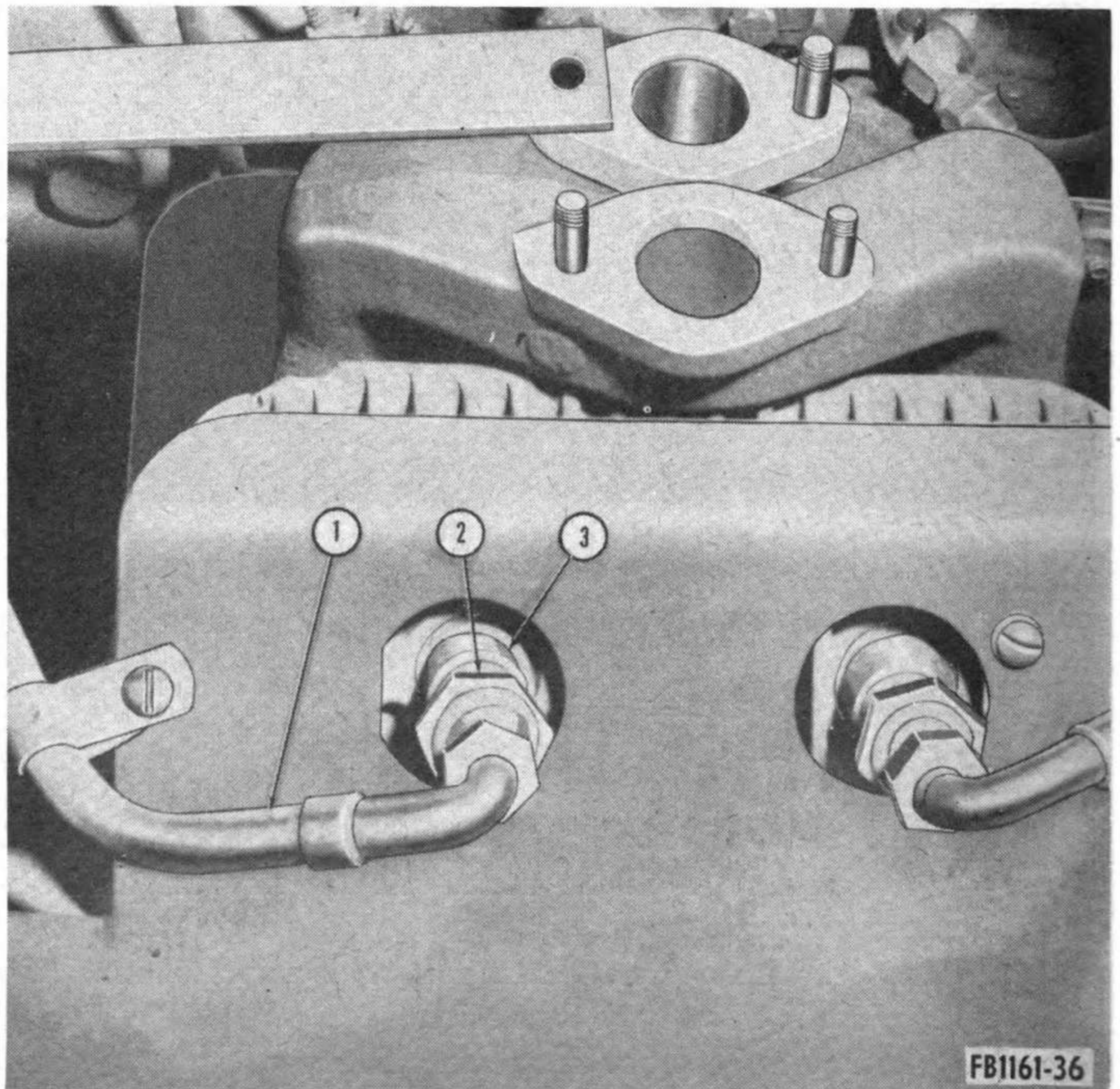
*e. Installation.*

- (1) Place each cable in its correct position in magneto; and on its respective spark plug which is numbered on magneto face.
- (2) Insert the cable clips into spark plugs and magneto and screw the shield nuts tight.

## 81. Spark Plugs

*a. Removal.*

- (1) Disconnect the spark plug cables (1, fig. 36) from the spark plugs by removing shield nuts (2) and pulling cable clips clear of insulated spark plugs.



1 Spark plug cable

2 Shield nut

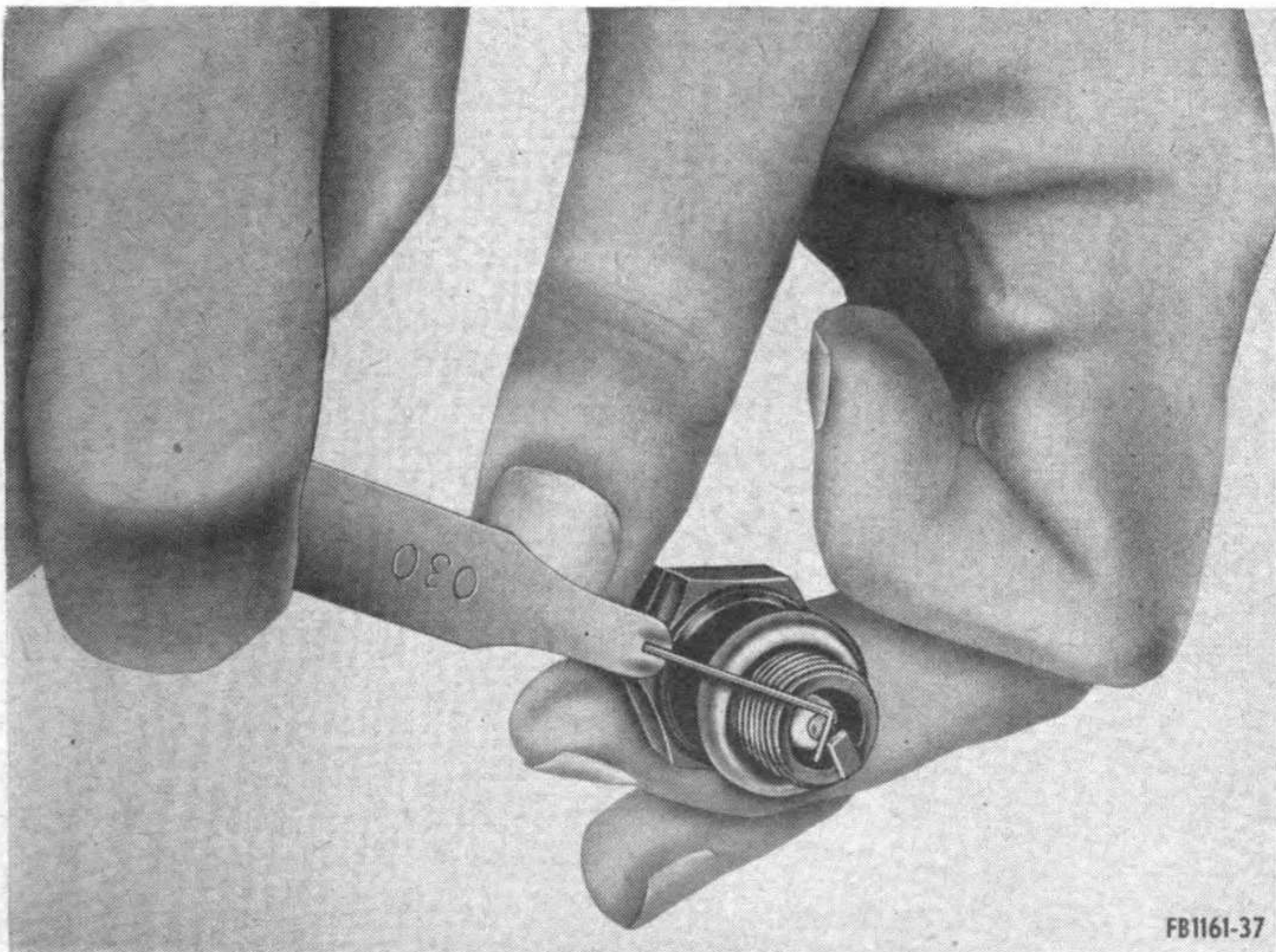
3 Shield

*Figure 36. Spark plugs.*

- (2) Remove the spark plugs and spark plug gaskets from the cylinder head using a spark plug wrench.

*b. Cleaning and Inspection.*

- (1) Wipe off any dirt that may have accumulated on the outside of the spark plug.
- (2) Scrape and remove the carbon from the electrodes and inside of spark plug. Use caution so as not to crack, chip, or damage porcelain.
- (3) Inspect for cracked insulator, burned electrodes, or damaged threads; replace if these conditions exist.
- (4) Check the spark plug gap as shown in figure 37. The proper gap setting is 0.030 inch.
- (5) The spark plug adjustment can be made by bending the side electrode. (Never attempt to bend center electrode.)



*Figure 37. Checking the spark plug gap.*

*c. Installation.*

- (1) Place a new gasket on each spark plug.
- (2) Screw the spark plug into the cylinder finger-tight.
- (3) Tighten with proper torque wrench to about 25 to 30 foot-pounds of pull on wrench.
- (4) Insert the cable clips into the top of shielded spark plug.
- (5) Tighten the shield nut (2) attached to the shielded loom.

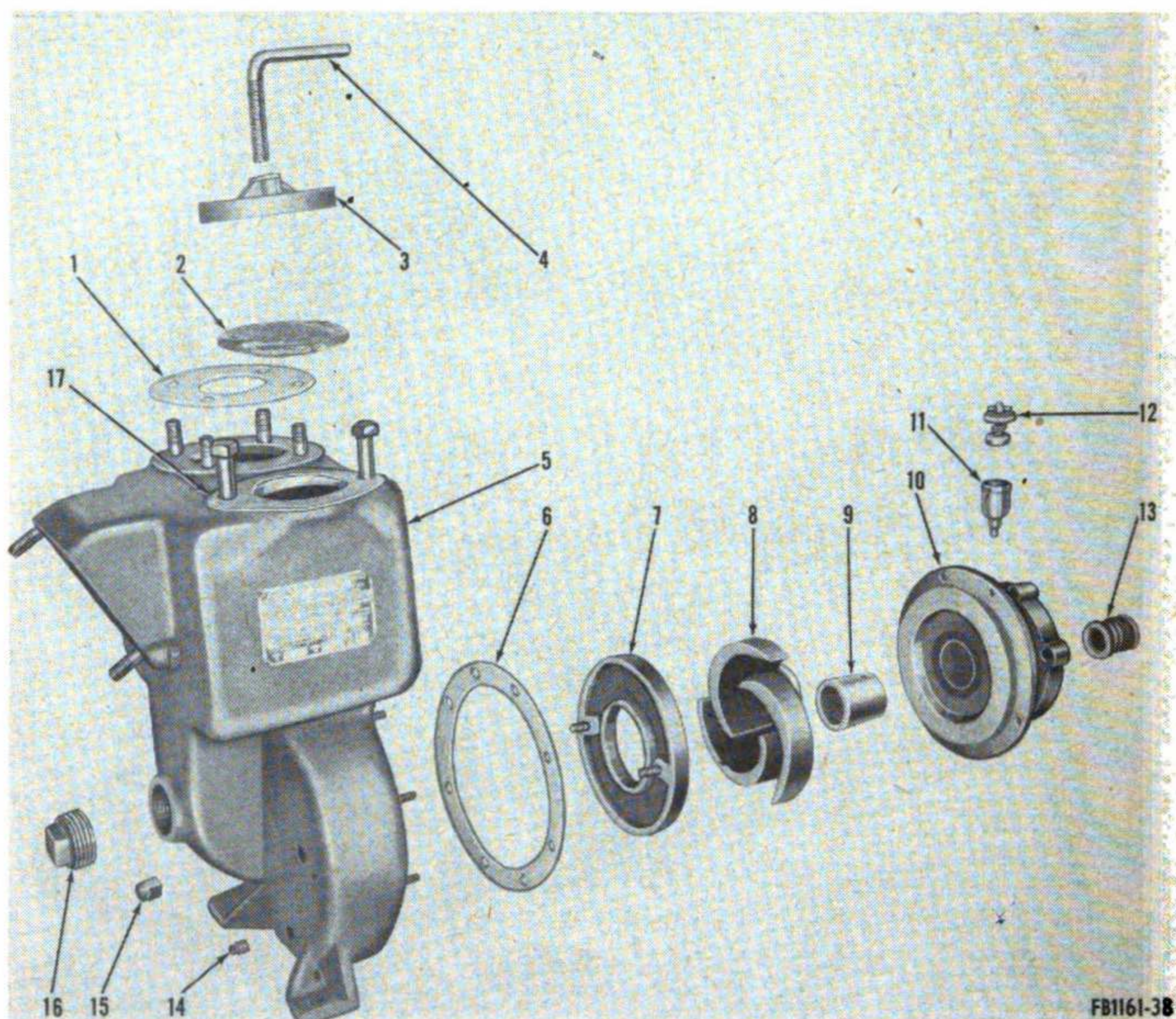
## Section VIII. PUMP ASSEMBLY

### 82. Description

(fig. 38)

a. A self-priming, centrifugal pump, is used on the water distributor. The pump assembly consists of an intermediate housing (10), pump volute (5), impeller (8), wear plate (7), and grease seal (13). The intermediate housing is bolted to the end of the crankcase with four  $\frac{7}{16}$ -inch bolts and is bolted to and connected at the other end to the pump body by eight  $\frac{1}{2}$ -inch studs, nuts, and lockwashers.

b. The pump body at the bottom houses the impeller and wear plate. The impeller blades rotate and supply the flow of water by suction through to the discharge port. The wear plate is used to allow the maximum amount of water to be used in this chamber without unnecessary loss of suction. The impeller is screwed on the crankshaft and



- |   |                  |    |                                  |
|---|------------------|----|----------------------------------|
| 1 | Discharge gasket | 10 | Intermediate                     |
| 2 | Cover            | 11 | Compression grease retainer body |
| 3 | Clamp bar        | 12 | Compression grease retainer cap  |
| 4 | Clamp bar screw  | 13 | Shaft seal                       |
| 5 | Volute           | 14 | Drain plug                       |
| 6 | Gasket           | 15 | Wear plate nut                   |
| 7 | Wear plate       | 16 | Cleanout plug                    |
| 8 | Impeller         | 17 | Priming hole gasket              |
| 9 | Seal housing     |    |                                  |

Figure 38. Pump exploded.



the wear plate is held in place in the pump body with two 1/2-inch studs, nuts, and lockwashers, which are tightened on the outside of the pump housing. A priming chamber is at the top of the pump body which should be filled with water when starting operation. The pump legs are bolted to the platform bed with two 1/2-inch bolts, nuts, and lockwashers set on shims to the proper height with the engine crankshaft, so that the pump will function properly.

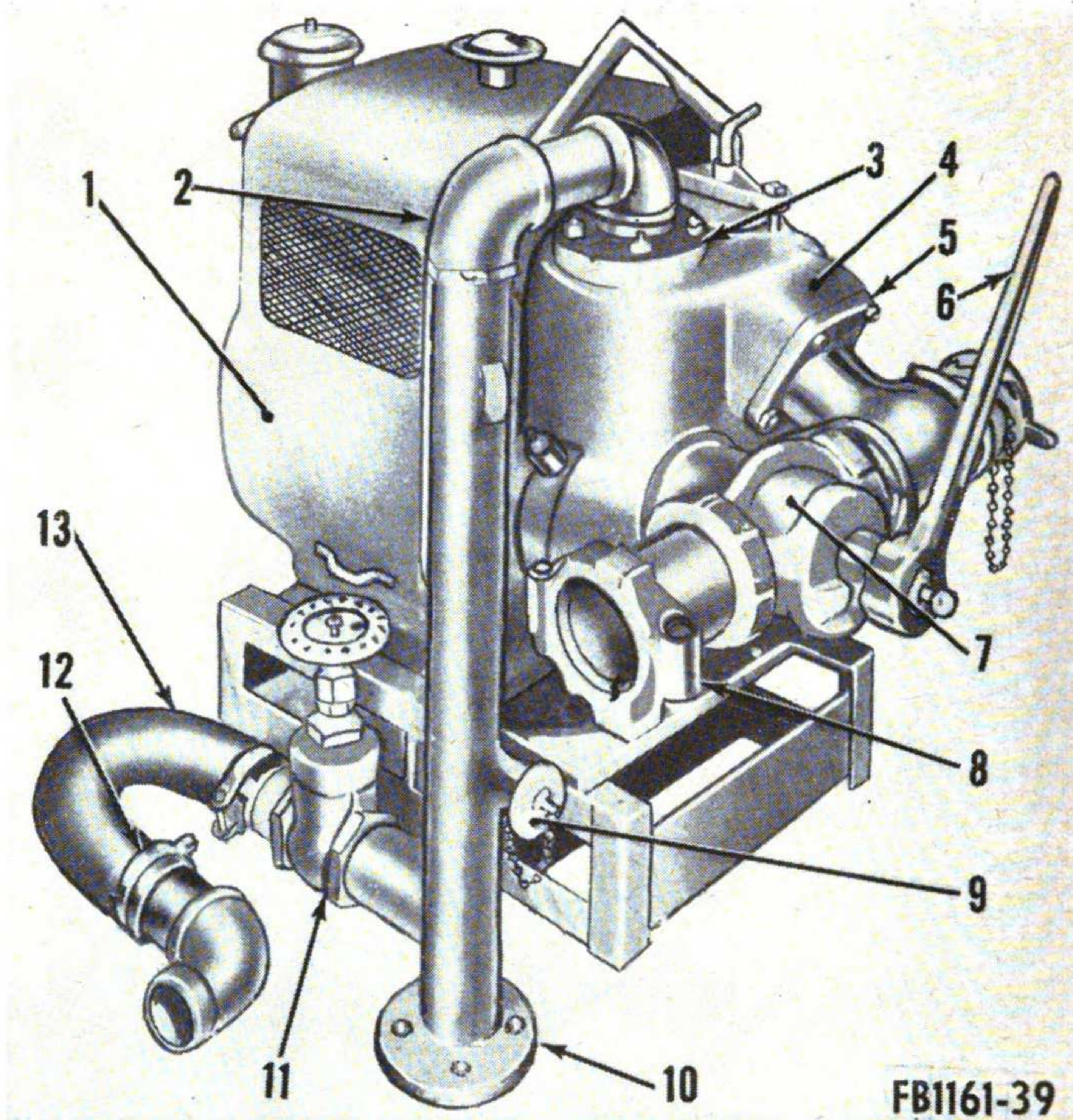
### 83. Pump Volute Body

#### *a. Removal.*

- (1) Drain out the water tank by removing the plug at the bottom of tank.
- (2) Disconnect the bolted clamp coupling (8, fig. 39) fastening the suction piping to the water tank pipe.
- (3) Disconnect the coupling (12) holding the discharge pipe (2) to the water tank pipe (13).
- (4) Remove the suction valve pipe and assembly (7) from the four studs holding the flange (5) against the pump (4) by removing the nuts and lockwashers. Be careful not to damage suction check valve.
- (5) Remove the four nuts and lockwashers holding discharge piping flange (3) to top of the pump.
- (6) Remove the four bolts, nuts, and lockwashers holding the bottom discharge flange (10) to the spraybar swivel piping.
- (7) Remove the discharge piping from the pump and place to one side.
- (8) Remove the eight nuts (4, fig. 40) and lockwashers that hold the pump intermediate (3) to the pump volute (1) as shown in figure 40.
- (9) Remove the two bolts and nuts holding pump feet to the platform bed.
- (10) Place a cable or rope around pump as shown in figure 41; lift the unit slightly and using wood block, force the intermediate from the pump volute as shown in figure 41.
- (11) Carefully remove the pump volute to avoid damage to the impeller which is exposed by the removal.

#### *b. Disassembly.*

- (1) Remove the gasket (1, fig. 38) from the discharge port.
- (2) Remove the clamp bar screw (4) holding the clamp bar (3) and cover (2). Remove the clamp bar, cover, and gasket.
- (3) Remove the cleanout plug (16) and drain plug (14).
- (4) Unscrew the two wear plate nuts (15) and then, using a block of wood, tap out the two tight-fitting studs on the wear plate. Remove the wear plate (7).



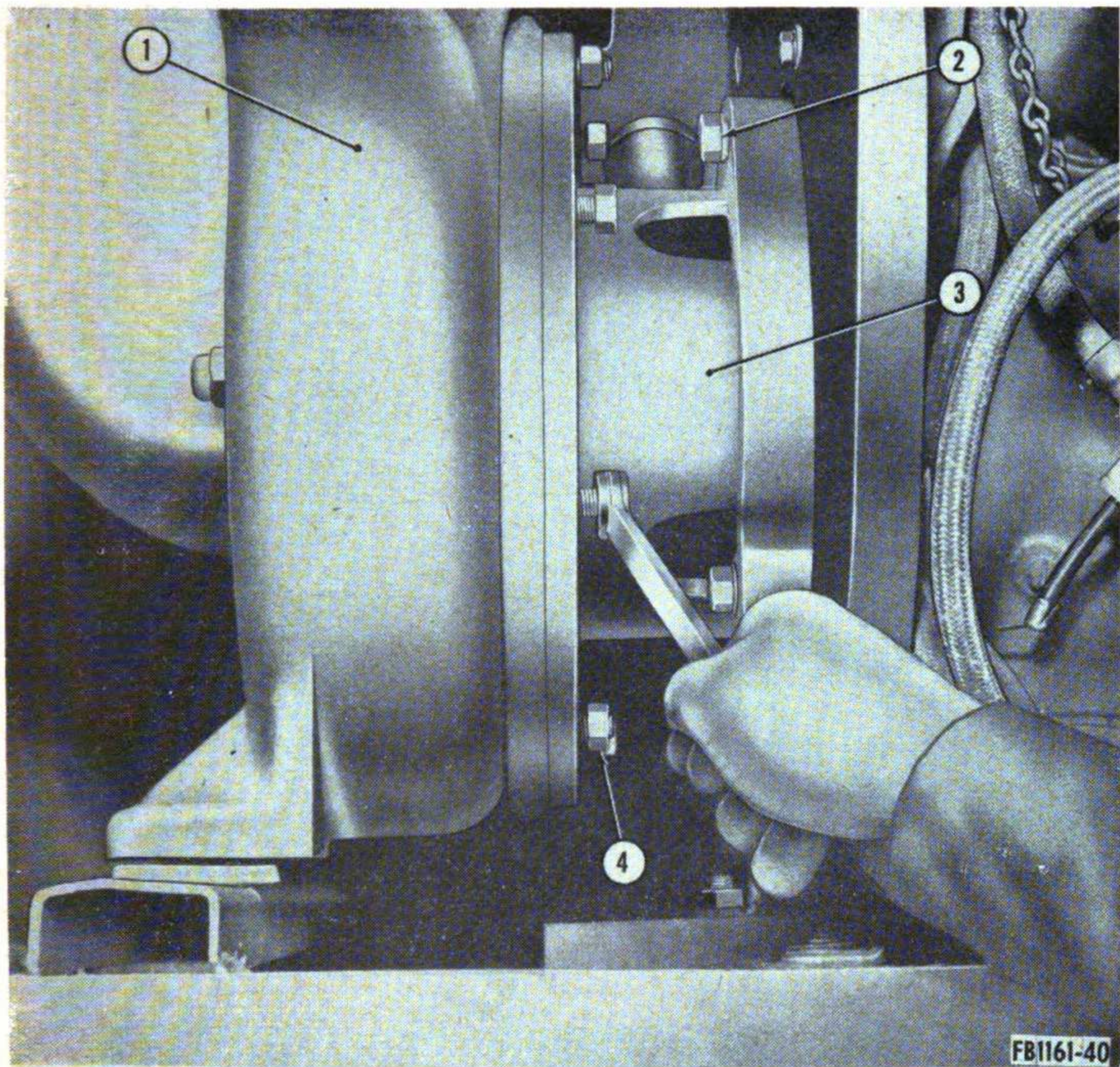
FB1161-39

- |                    |                            |
|--------------------|----------------------------|
| 1 Engine           | 8 Coupling                 |
| 2 Discharge piping | 9 Handspraying hose outlet |
| 3 Discharge flange | 10 Discharge flange        |
| 4 Pump             | 11 Bypass valve            |
| 5 Suction flange   | 12 Clamp coupling          |
| 6 Lever            | 13 Hose piping to tank     |
| 7 Suction valve    |                            |

Figure 39. Piping connections to pump.

*c. Cleaning and Inspection.*

- (1) Clean the suction and discharge chambers with a steam pressure hose.
- (2) If steam hose is not available use an air hose to remove the scale and loose particles.
- (3) Scrape off with a putty knife all gasket surfaces lightly, and clean surfaces with an approved cleaning solvent and dry thoroughly.
- (4) Remove any rust with a wire brush.
- (5) Replace torn or damaged gaskets and remove any cement or adhesive which may have been used in assembly.



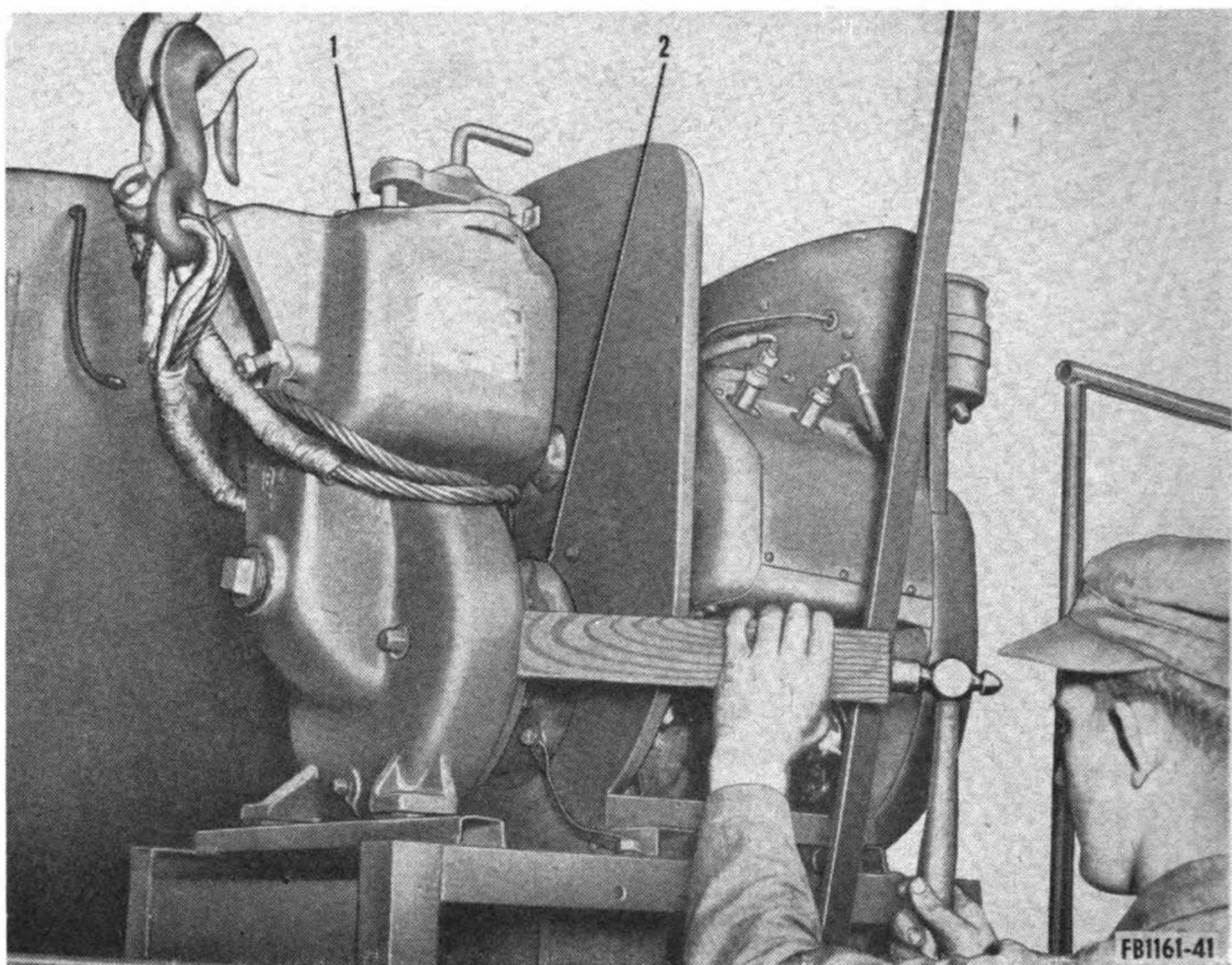
- |                                     |                             |
|-------------------------------------|-----------------------------|
| 1 Pump                              | 3 Intermediate              |
| 2 Intermediate-to-engine cap screws | 4 Intermediate-to-pump nuts |

*Figure 40. Removing intermediate-to-pump nuts.*

- (6) Clean the suction, discharge, and priming flange surfaces before replacing gaskets.
- (7) Inspect the suction, discharge, and priming surfaces for nicks, grooves, or defects which may cause a leak.
- (8) Inspect and see that the clamp and screw threads for the priming hold cover are clean and in proper operating condition.
- (9) Clean all parts and refer to TM 5-2851 for preparation for refinishing.
- (10) Inspect thoroughly the stud threading at the suction and discharge ports for stripped threads or bent studs.
- (11) Inspect the entire pump body for cracks or damage.

*d. Reassembly.*

- (1) Install the cleanout plug (16) in the suction chamber.
- (2) Install the drain plug (14) in the discharge chamber.
- (3) Install the wear plate by tapping the two studs into the holes in the pump volute and screwing on the nuts (15).



1 Pump volute

2 Intermediate

*Figure 41. Separating pump volute and intermediate.*

- (4) Install the priming cover (2), gasket (17), clamp bar (3), and clamp bar screw (4).

*e. Installation.*

- (1) Sling a rope or cable around the pump body and hoist up into its place.
- (2) Lower the pump body till it is in perfect alinement with the impeller and intermediate holes. Slide it into its position.
- (3) Place the proper amount of shims under the pump feet.
- (4) Replace gasket and the eight nuts holding intermediate to pump body.
- (5) Tighten the eight nuts and lockwashers securely and equally.
- (6) Insert the two bolts, nuts, and lockwashers holding the pump to the platform bed.
- (7) Tighten the two bolts and nuts holding pump to bed.
- (8) Install the bottom discharge flange (10, fig. 39) to the spray-bar swivel piping using the four bolts, nuts, and lockwashers.
- (9) Connect the discharge piping flange (3) to the discharge port placing the flange and gasket over the studs and securing with the nuts, and lockwashers.
- (10) Attach the discharge piping (2) to the water tank piping (13) by connecting at the coupling (12).

- (11) Install the suction valve and piping (7) to the pump by placing the flange (5) over the studs and securing with the nuts and lockwashers.
- (12) Connect the suction piping to the piping from the water tank at the coupling (8).

## 84. Impeller and Wear Plate

### a. Removal.

- (1) Remove the pump body as described in paragraph 83a which exposes the impeller.
- (2) The impeller is screwed onto the shaft with a right-handed thread. To remove the impeller, first place a hardwood block on the end of one of the impeller vanes and strike the wood block a sharp blow with a heavy hammer as shown in figure 42. This will loosen the impeller so that it can be screwed off by hand.

*Note.* Do not hit impeller vanes without using a wooden block.

- (3) Remove the wear plate from pump body as instructed in paragraph 83b.

### b. Cleaning and Inspection.

- (1) Clean the wear plate and impeller of all scale and dirt.
- (2) Inspect the impeller and wear plate for wear, damage, and for cracked or broken vanes that may interfere with the

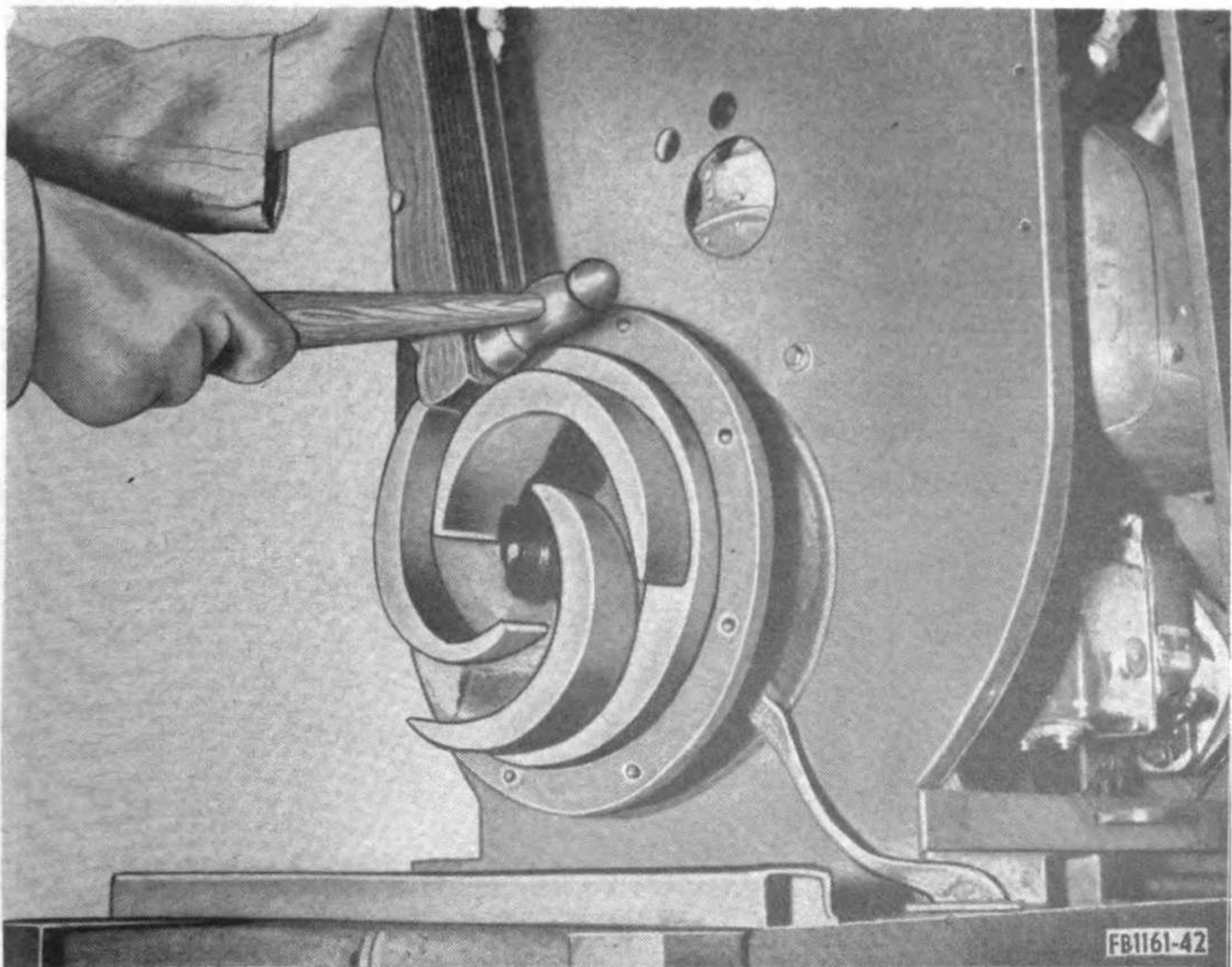


Figure 42. Removing the impeller.

proper function and maximum pumping capacity for which the pump is built.

- (3) Measure the impeller and the wear plate clearance with a feeler gage, and if worn  $\frac{1}{32}$  inch, replace wear plate. If the clearance is greater than  $\frac{1}{32}$  inch it may be necessary to replace both the impeller and the wear plate.

*c. Installation.*

- (1) Screw the impeller on the crankshaft extension.
- (2) Install the wear plate as described in paragraph 83*d*.

## **85. Intermediate Housing and Shaft Seal**

*a. Removal.*

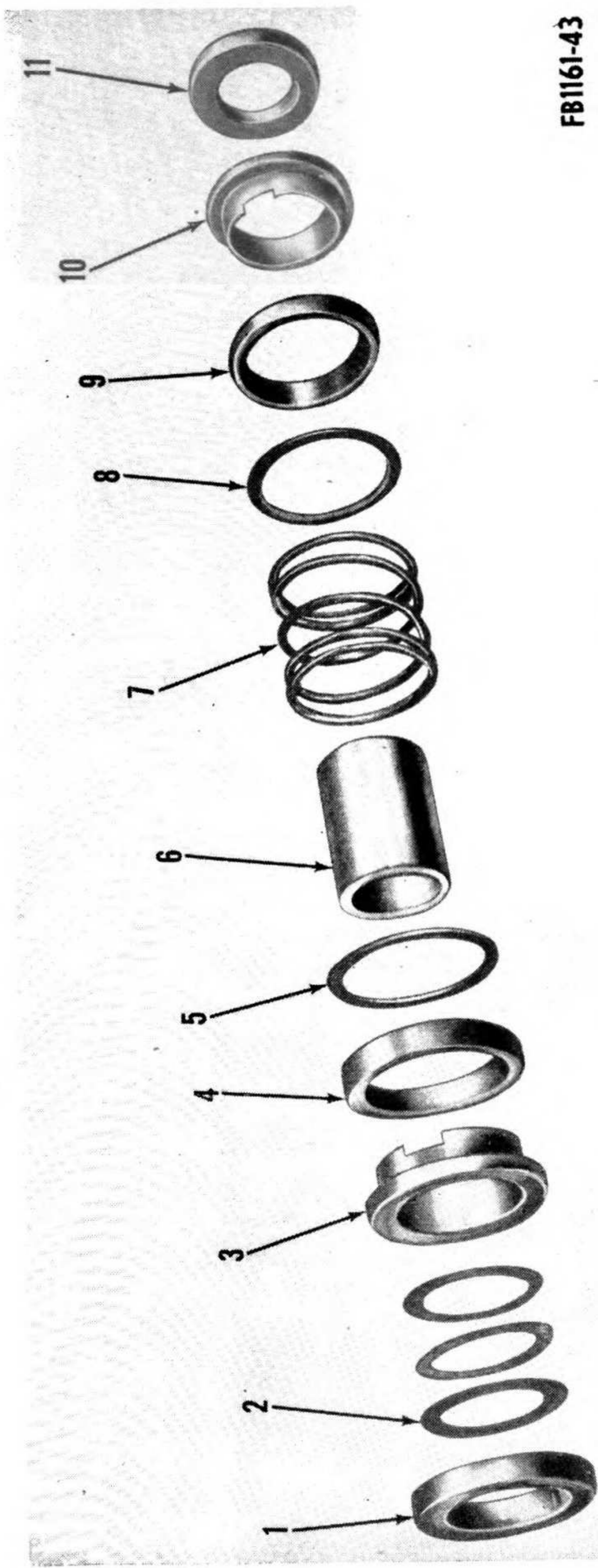
- (1) Remove the pump body (par. 83*a*).
- (2) Remove the impeller (par. 84*a*).
- (3) Remove the intermediate housing by unscrewing the four cap screws (2, fig. 40) that hold the intermediate housing to the crankcase of the engine.
- (4) The pulling of the intermediate away from the crankshaft may leave the seal on the crankshaft; if not, the seal can be removed with a stiff wire hooked on the end or pushed out with a steel rod or screwdriver.

*b. Disassembly.*

- (1) Remove by unscrewing the spring pressure grease retainer (11, fig. 38) from intermediate.
- (2) Remove spacing shims (2, fig. 43) for adjusting impeller clearance.
- (3) Remove the seal ring (1).
- (4) Remove the bronze seal cone (3).
- (5) Remove the neoprene packing ring (4) on bronze seal cone.
- (6) Remove the plain washer (5) between spring and neoprene packing.
- (7) Remove compression spring (7).
- (8) Remove the second plain washer (8).
- (9) Remove the second neoprene packing (9), from bronze seal cone.
- (10) Remove the second bronze seal cone (10).
- (11) Remove the spacer sleeve (6).
- (12) Remove second sealing ring (11).
- (13) Press out the brass liner in the intermediate.

*c. Cleaning and Inspection.*

- (1) Clean all parts in an approved cleaning solvent.
- (2) Clean the crankshaft and the interior of the intermediate where the brass bushing is pressed in.
- (3) Clean the grease seal spacer sleeve.



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- 1 Seal ring
- 2 Spacing shims
- 3 Seal cone
- 4 Packing ring
- 5 Washer
- 6 Spacer
- 7 Spring
- 8 Washer
- 9 Packing ring
- 10 Seal ring
- 11 Seal cone

*Figure 43. Shaft seal.*

- (4) If the paint on the exterior of the intermediate housing is peeling and rust spots are noticed, remove them with a wire brush and repaint.
- (5) Clean out any caked and dirty grease in the compression cup and tube.
- (6) Inspect the grease seal assembly for bent, worn, or missing parts, replace defective parts.
- (7) Inspect the tension of the compression spring. Replace if weak.
- (8) Inspect the intermediate housing for cracks or damage.
- (9) Inspect the hole in the intermediate housing for blocked passage; remove cause of blocked passage if condition exists.

*d. Reassembly.*

- (1) Slip the first seal ring (11) on the engine shaft up against the shoulder of the shaft. Make sure the chamfered edge of the seal ring is against the shaft shoulder.
- (2) Slide the long spacer sleeve (6) against the first seal ring; spread a little grease on all contact flat surfaces.
- (3) Grease lightly the inner bearing surfaces of the bronze seal cone (10) and slide the seal cone over the spacer against the seal ring.
- (4) Press the neoprene packing ring (9) on the seal cone up against the seal cone shoulder.
- (5) Slide the flat washer (8) on the spacer and up against the neoprene packing ring.
- (6) Slide the compression spring (7) against the washer.
- (7) Slide the second neoprene packing ring (4) on the second bronze seal cone (3) against shoulder; slip second flat washer (5) against the neoprene packing ring.
- (8) Lightly grease the inner bearing surface of the cone and slip the assembly on crankshaft against spring.
- (9) Slide the final seal ring (1) in place.
- (10) Press the brass bushing (9, fig. 38) into the intermediate housing; make sure the grease hole in the bushing is aligned with grease hole in the intermediate housing.
- (11) Insert and screw grease retainer (11) into the intermediate.
- (12) Install the compression grease retainer cap (12) by screwing on the grease tube.

*e. Installation.*

- (1) Slip the intermediate housing over the assembled grease seal and secure to engine crankcase with four cap screws (2, fig. 40) and lockwashers; tighten cap screws equally.
- (2) Replace the three washer shims (2, fig. 43) against the final seal ring (1).
- (3) Install the impeller (par. 84c).
- (4) Install the pump body (par. 83e).



## 86. Suction Check Valve

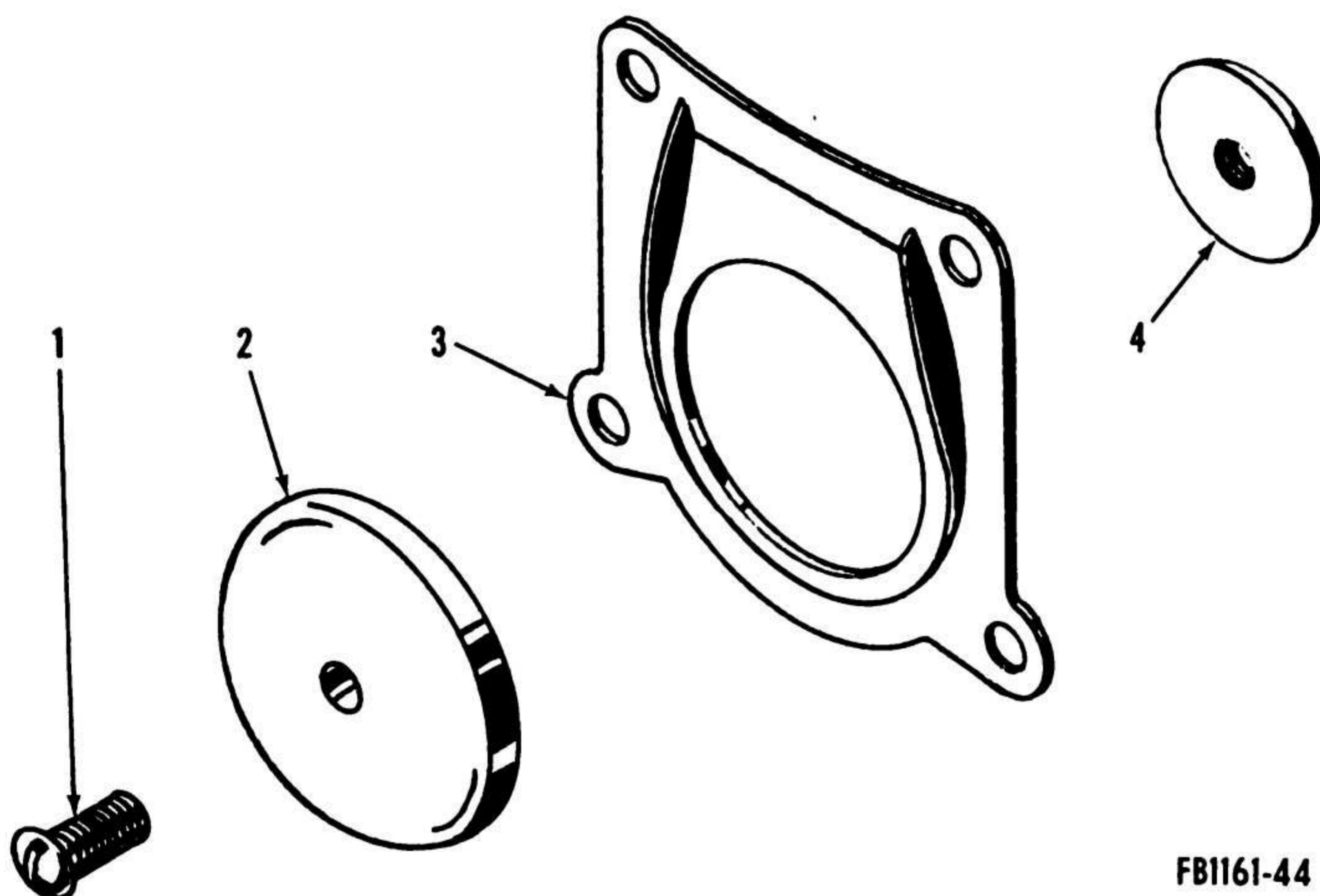
*a. Description.* The suction check valve is a flap hinge-type valve (3, fig. 44) which is part of the suction flange gasket. The flap is weighted with two weights, the larger (2) on the inside and the smaller (4) on the outside, held together on the flap with one screw (1).

### *b. Removal.*

(1) Remove the suction valve and piping (par. 83a).

(2) Remove the suction check valve assembly from the suction port studs.

*c. Disassembly.* Remove the screw holding weights (2) and (4) together on the gasket.



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1 Screw  
2 Valve weight, large

3 Check valve and gasket  
4 Valve weight, small

Figure 44. Suction check valve.

### *d. Cleaning and Inspection.*

(1) Clean the weights, remove all rust, and wipe the check valve rubber clean.

(2) Clean the gasket surfaces on the pump chamber flange.

(3) Inspect the valve flap for deterioration or cracks which may cause faulty seating.

### *e. Reassembly.*

(1) Place the larger weight (2) on the inside toward the pump.

(2) Insert the screw (1) through the larger weight and screw the smaller weight (4) to it.

*f. Installation.*

- (1) Place the holes in the gasket-and-valve combination over the suction chamber studs.
- (2) Install the suction valve assembly and piping (par. 83e(11) and (12)).

## **Section IX. SPRAYBAR ASSEMBLY AND VALVES**

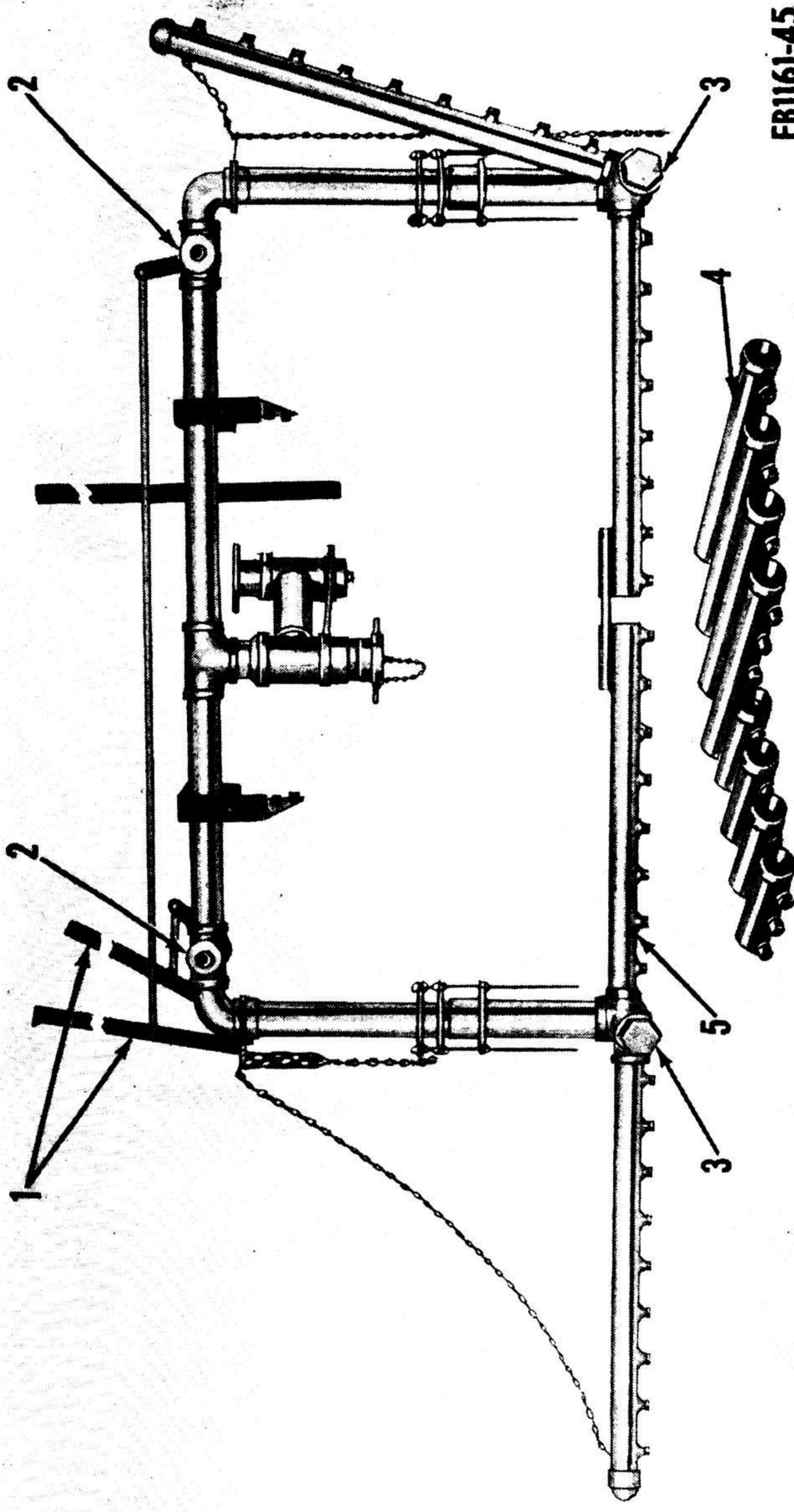
### **87. Description**

The cylindrical control valves are of the straight-way type. The 4-inch, two-way suction valve (7, fig. 39) is used to control the suction line from the tank proper to the suction side of the pump. It is necessary to have this valve positioned correctly on all of the five basic machine functions. The 3-inch gate valve (11) located on the platform back of the power unit is used to control the amount of pressure being delivered to the spraybar or discharge hose, as well as controlling the gravity drain of water in the tank to either the spraybar or gravity outlet. This valve, also acts as a bypass valve, allowing overflow to enter the water tank. Pressure in the system is controlled by opening or closing of this valve. This valve in conjunction with the two header bar valves (2, fig. 45), also controls the entry of water into the tank when using the power pumping unit for transferring and loading functions. The 2½-inch straight-way valves (2) located on the header bar, control the entry of water into the spraybar (5). The extension spraybar valves (3) are controlled by lifting manually. Lifting the extensions up shuts the water off and letting them down allows water to enter the extensions for spraying.

### **88. Spraybar and Control Valves**

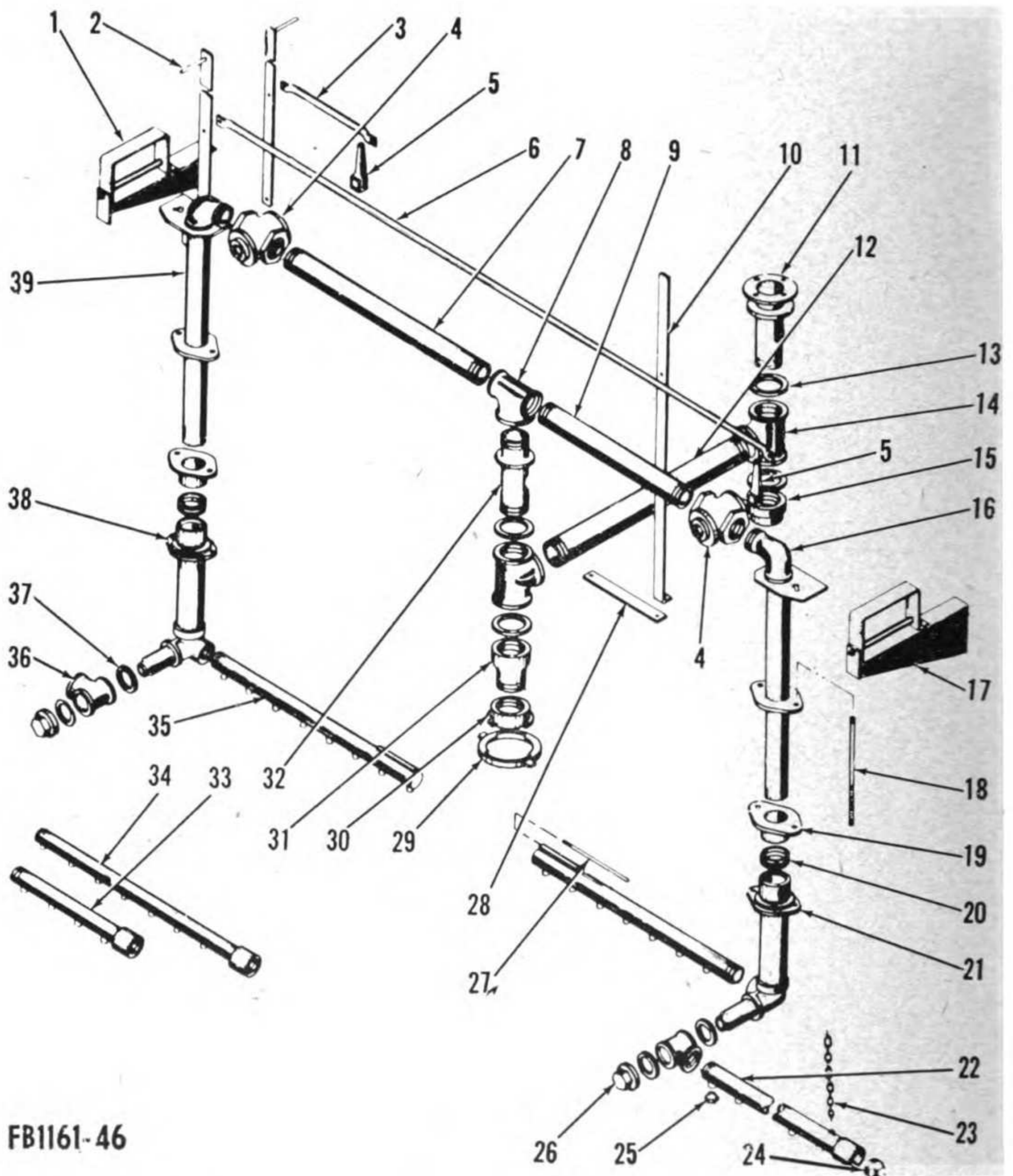
*a. Removal of Spraybar Assembly.*

- (1) Remove connecting links (3, fig. 46) and (6) from the valve handles (5) by removing the cotter pins. Remove links from levers (2) by removing cotter pins and clevis pins from link yokes. Remove shift lever (10) from under swivel piping by disconnecting link.
- (2) Lift the spraybar assembly slightly to take the weight of the assembly off the rubber-hose-covered bolts in the two guide hangers (1 and 17) on the rear of the truck.
- (3) Remove the bolt from each hanger and remove the top piece.
- (4) Block and support the discharge pipe (1, fig. 47) leading out from under the operators platform to the spraybar assembly.
- (5) Remove the setscrew (6) holding the adjustable outlet fitting (5) to the bottom of the lower tee in the center of the rear of the truck.
- (6) Remove the cap (4) and faucet end (3) on the bottom of the fitting and remove the fitting and washer.



- 1 Control levers for header valves
- 2 Spraybar header valve
- 3 Extension cutoff valves
- 4 Spraybar extensions
- 5 Spraybar

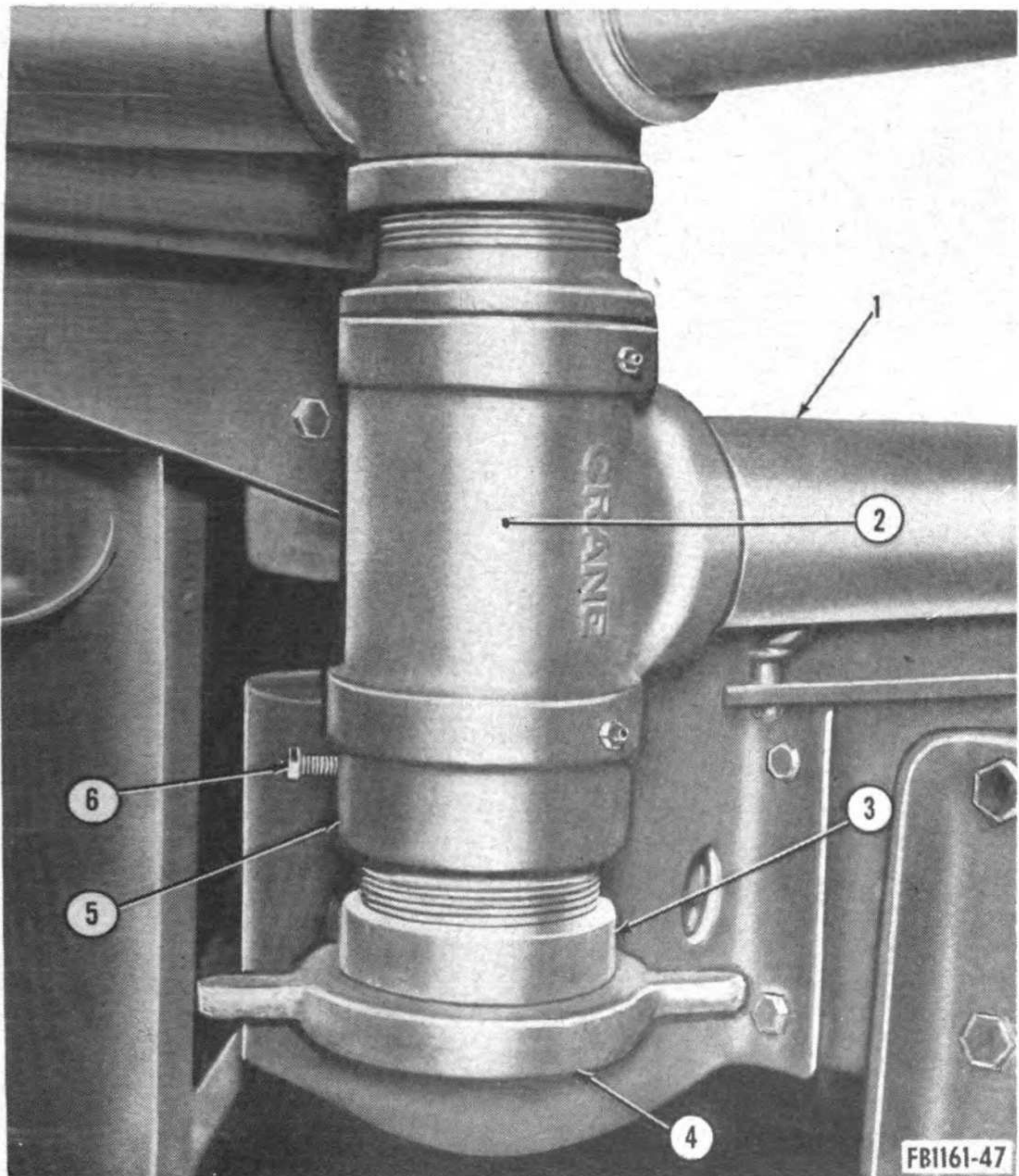
Figure 45. Spraybar assembly.



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- |    |                      |    |                                 |
|----|----------------------|----|---------------------------------|
| 1  | Left hanger          | 21 | Right outer sleeve              |
| 2  | Valve control levers | 22 | Spraybar extension              |
| 3  | Short link           | 23 | Chain                           |
| 4  | Header valve         | 24 | End plug                        |
| 5  | Valve handle         | 25 | Nozzle                          |
| 6  | Long pipe            | 26 | Cap (2 rqr)                     |
| 7  | Pipe                 | 27 | Shear pin                       |
| 8  | Tee                  | 28 | Shift link                      |
| 9  | Pipe                 | 29 | Cap                             |
| 10 | Shift lever          | 30 | Faucet end                      |
| 11 | Hinge pipe           | 31 | Adjustable outlet fitting       |
| 12 | Pipe                 | 32 | Shift spindle                   |
| 13 | Gasket (4 rqr)       | 33 | Spraybar extension              |
| 14 | Shift tee (2 rqr)    | 34 | Spraybar extension              |
| 15 | Drain cap            | 35 | Spraybar center section (2 rqr) |
| 16 | Right sleeve         | 36 | Collar (2 rqr)                  |
| 17 | Right hanger         | 37 | Gasket (4 rqr)                  |
| 18 | Threaded rod         | 38 | Left outer sleeve               |
| 19 | Gland sleeve (2 rqr) | 39 | Left sleeve                     |
| 20 | Packing (2 rqr)      |    |                                 |

Figure 46. Spraybar assembly, exploded view.



- |                    |                             |
|--------------------|-----------------------------|
| 1 Discharge piping | 4 Cap                       |
| 2 Pipe tee         | 5 Adjustable outlet fitting |
| 3 Faucet end       | 6 Setscrew                  |

*Figure 47. Union of spraybar and discharge piping.*

- (7) Support the spraybar assembly on the shoulders of two people and remove it from the tee as shown in figure 48.
- (8) Carry the spraybar assembly to a convenient place to remove header valves from spraybar assembly.
- (9) Separate the upper and lower spraybar sections by removing the nuts from rods (18) on the top of the gland sleeves (16 and 39, fig. 46).
- (10) Pull the sleeves (4, fig. 49) of the upper piping out of the bottom section.
- (11) Unscrew the adjusting nut (1) and locknut (2) and separate the gland sleeve (5) and outer sleeve (6).

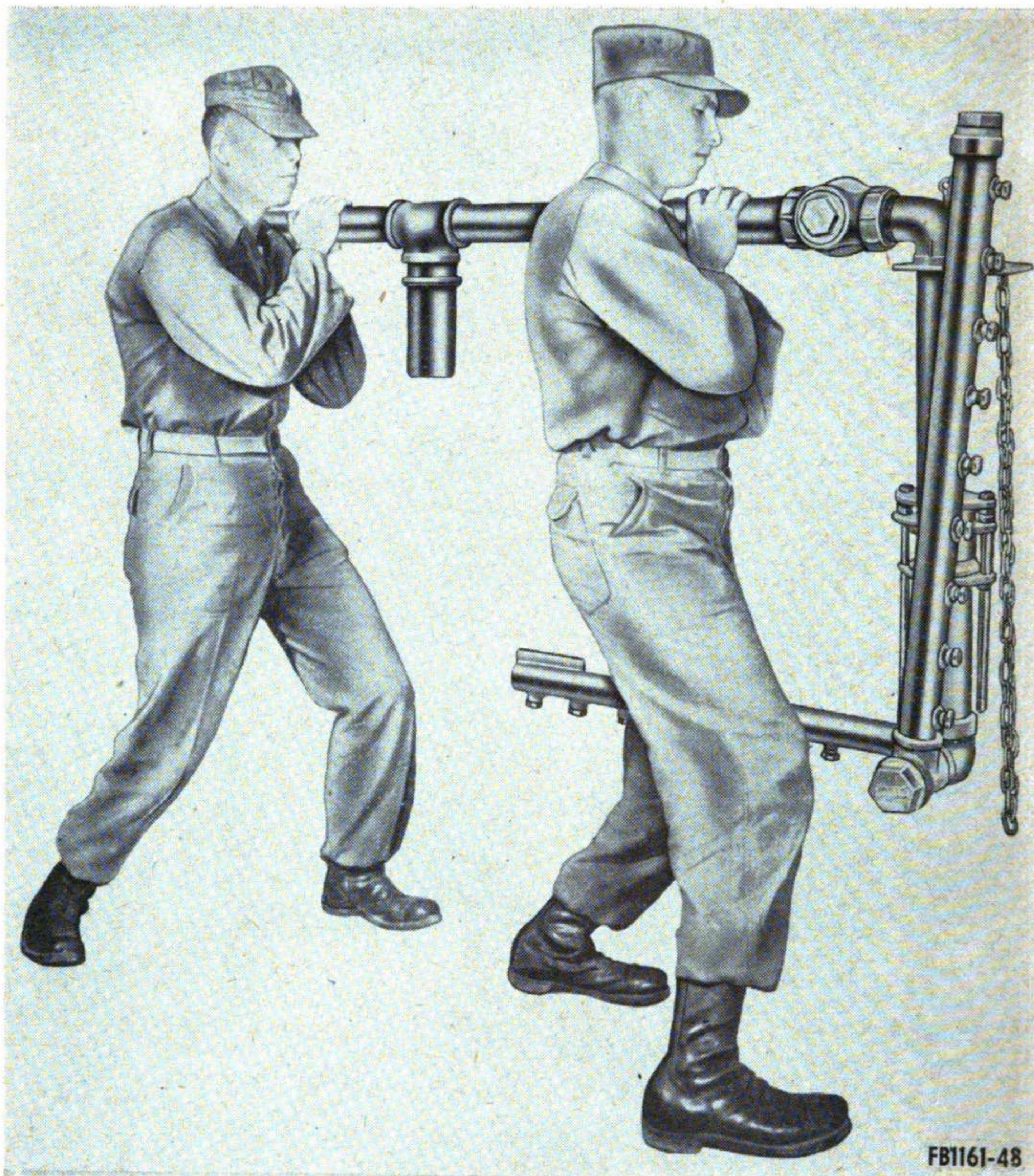


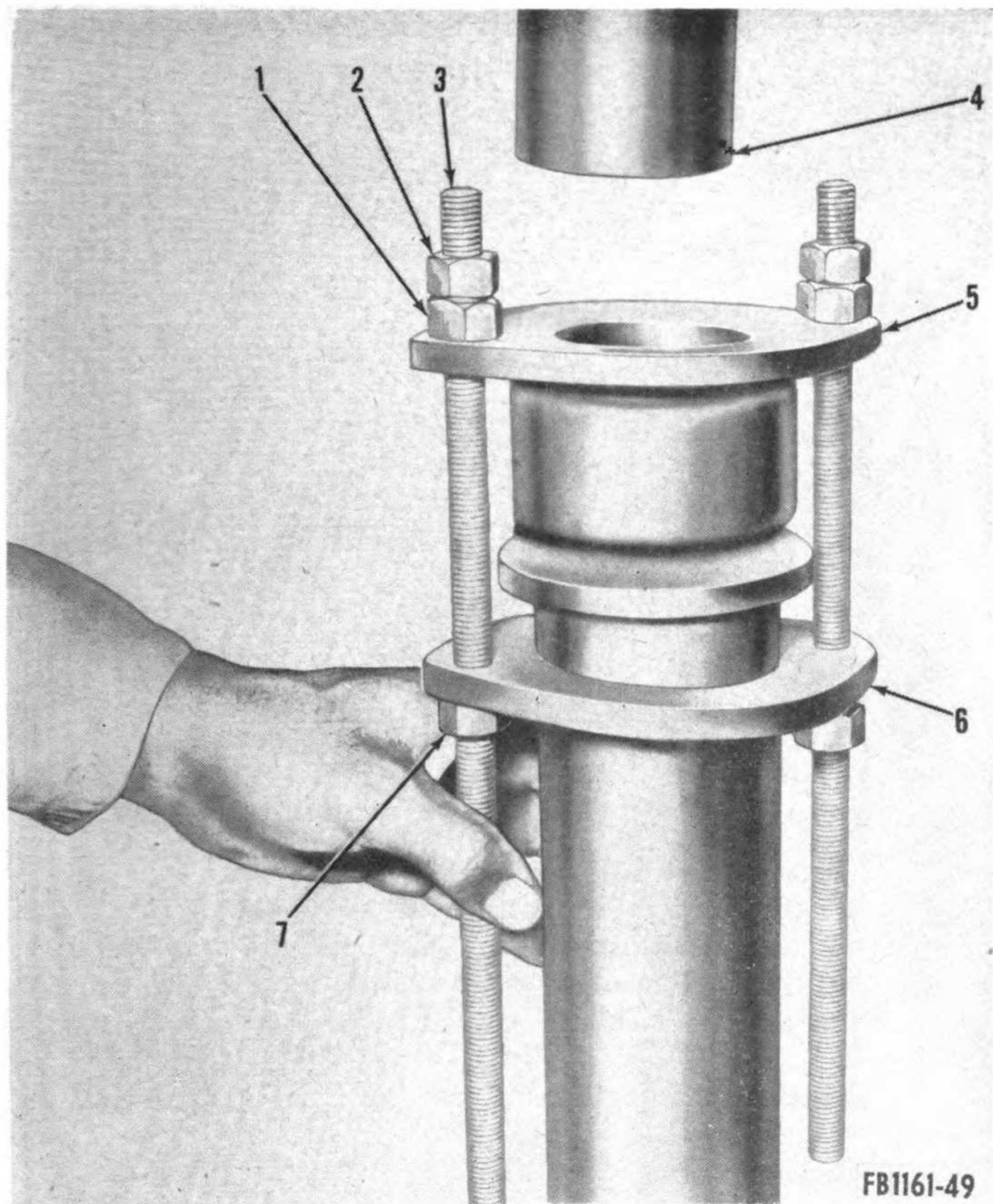
Figure 48. Lifting off spraybar assembly.

*b. Removal of Header Valve.*

- (1) Place the piping on the floor across a block of wood as shown in figure 50 and unscrew the spraybar header valve (4) with the aid of heavy duty Stillson wrenches from the rest of the upper section of the spraybar piping (2).
- (2) After removing the valve from the piping, place it in the jaws of a vise for disassembly.

*c. Disassembly of Header Valves.*

- (1) Use penetrating oil on all threaded parts.
- (2) Unscrew setscrew (6, fig. 51); remove lever (5) from end of cylinder (3).
- (3) Unscrew and remove threaded plug (1), spring (2), and gasket.
- (4) Press out the cylinder on a screw press as shown in figure 52.



- 1 Adjusting nut
- 2 Locknut
- 3 Rod
- 4 Upper sleeve

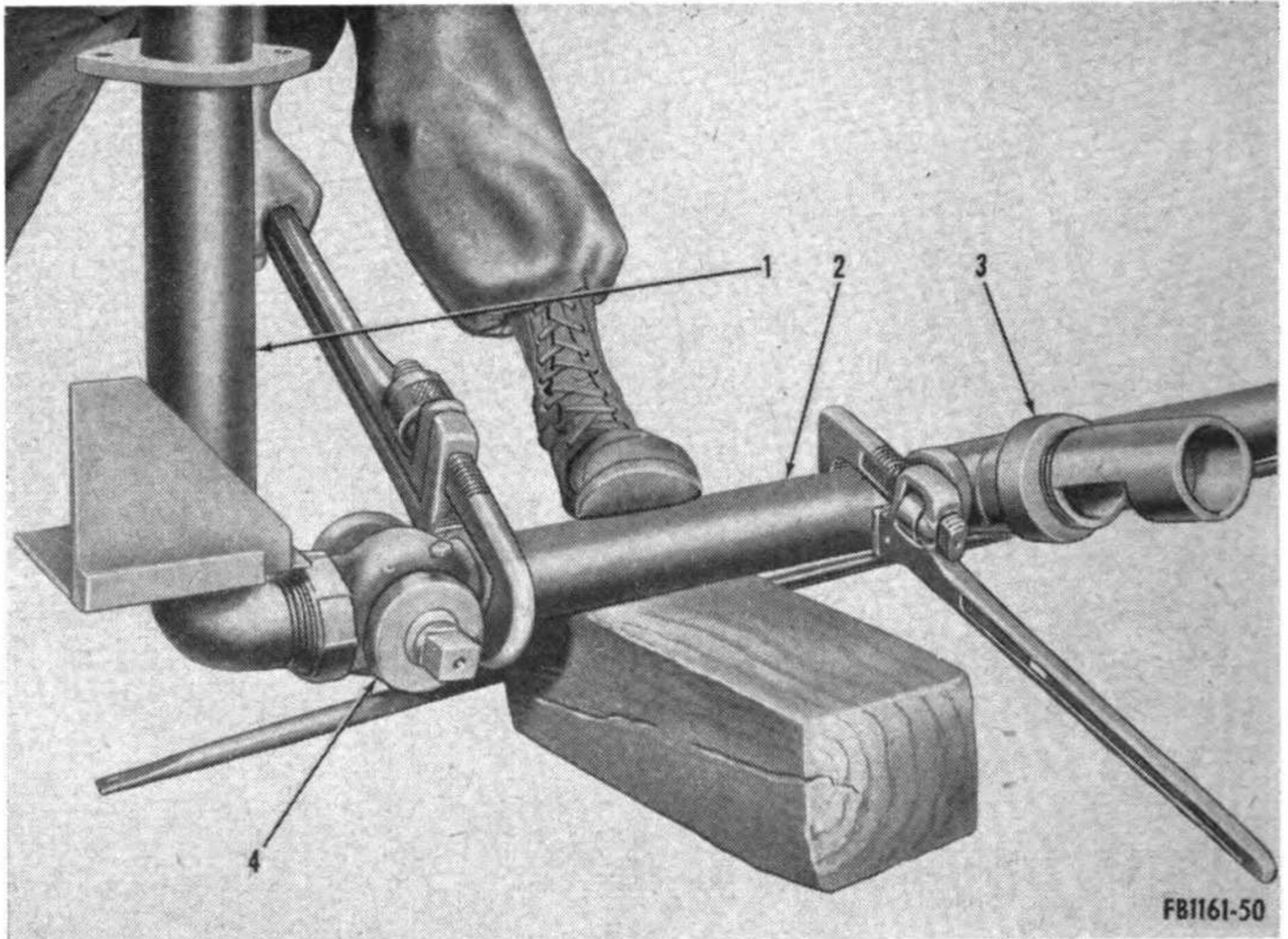
- 5 Gland sleeve
- 6 Outer sleeve
- 7 Locknut

Figure 49. Separating lower and upper spraybar sections.

(5) Remove the lubrication wick located in lever end of valve cylinder.

*d. Cleaning and Inspection of Header Valves.*

- (1) Clean and flush the interior of plug valve and rinse all the parts in an approved cleaning solvent.
- (2) Clean the grease hole and grooves in the valve plug of all hardened grease and inspect for obstructed passage.
- (3) Inspect threads for damage or dirt that may interfere with the plug cap being screwed in properly.



- |                         |                         |
|-------------------------|-------------------------|
| 1 Upper sleeve          | 3 Shift spindle         |
| 2 Upper spraybar piping | 4 Spraybar header valve |

Figure 50. Removing spraybar header valve from piping.

*e. Reassembly of Header Valves.*

- (1) Press cylinder (3, fig. 51) into valve body (4).
- (2) Replace gasket and tension spring (2) in threaded plug (1).
- (3) Spread white lead on all threads and screw threaded plug into the valve body until outside flat of plug is even with valve body.
- (4) Replace grease wick and pipe plug in square end of plug valve.
- (5) Replace valve lever (5) on square head of cylinder and tighten setscrew.

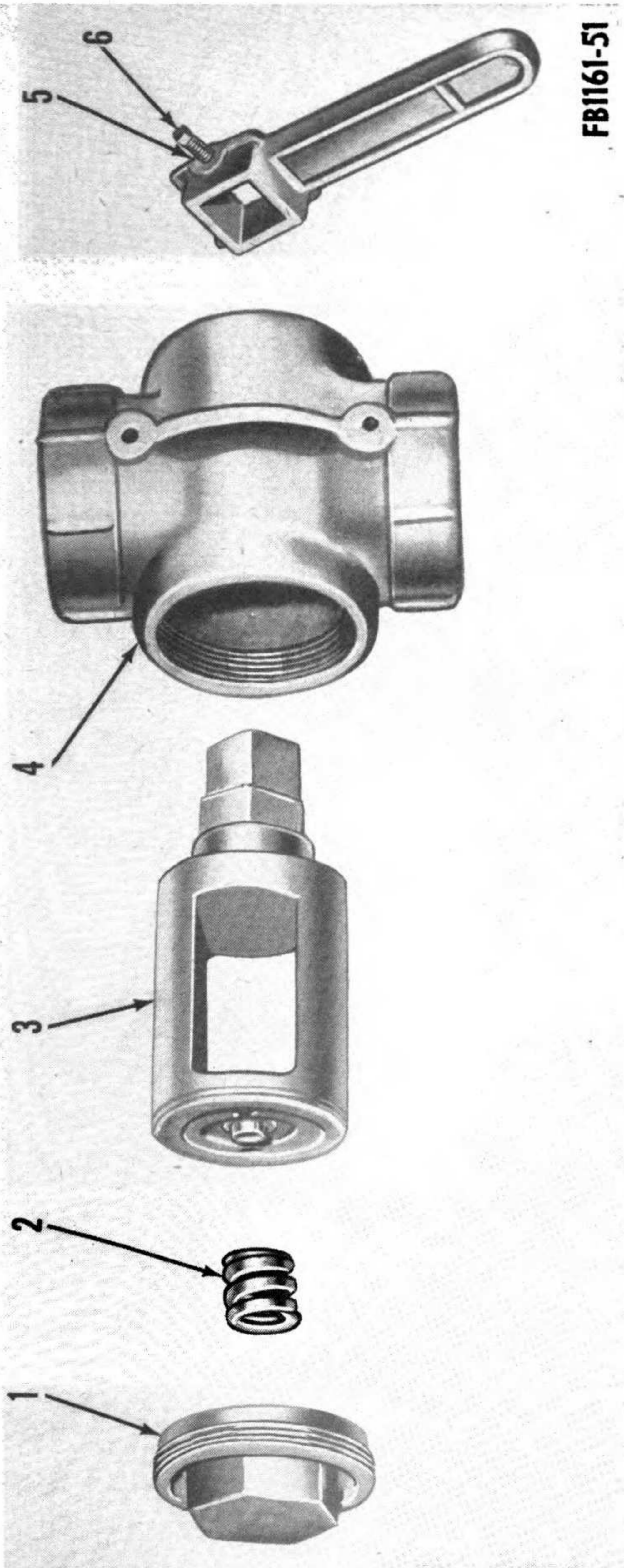
*f. Installation of Header Valves.*

- (1) Screw valve body (4) on header piping (2, fig. 50); make sure the valve body is screwed on tight and plug end of valve, when installed, is facing away from the truck. Apply white lead on all threads.
- (2) Screw the vertical piping (1) and elbow on the opposite end of valve body (4), until it is tight and in the proper up and down position.

*g. Installation of Spraybar Assembly.*

- (1) Lift the upper section of the spraybar assembly onto the hanger braces, inserting the shift spindle (32, fig. 46) and gasket (13) into the pipe tee (2, fig. 47).





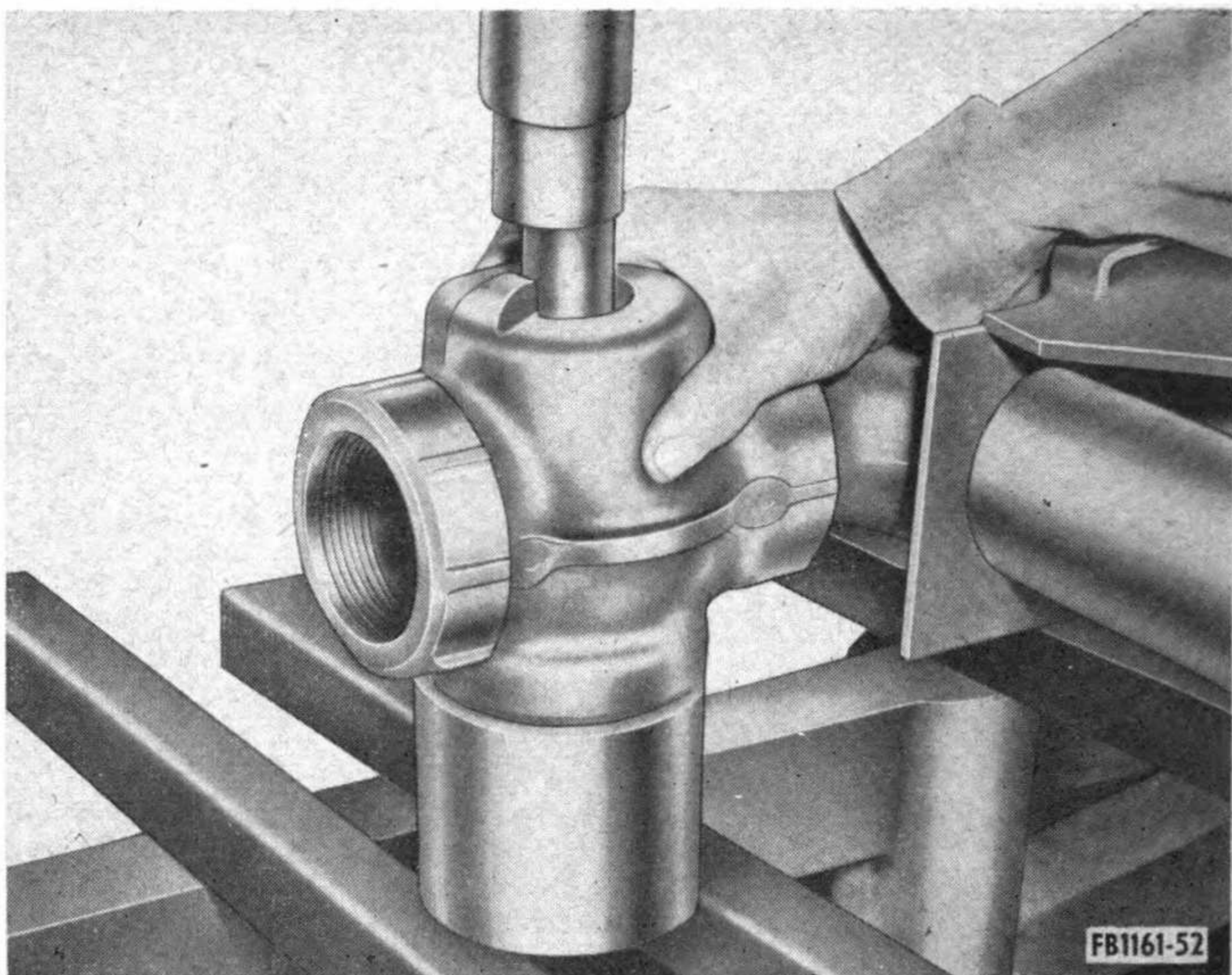
FBI161-51

5 Valve lever  
6 Setscrew

3 Valve cylinder  
4 Valve body

1 Threaded plug  
2 Spring

Figure 51. Spraybar header valve.



*Figure 52. Pressing cylinder out of header valve.*

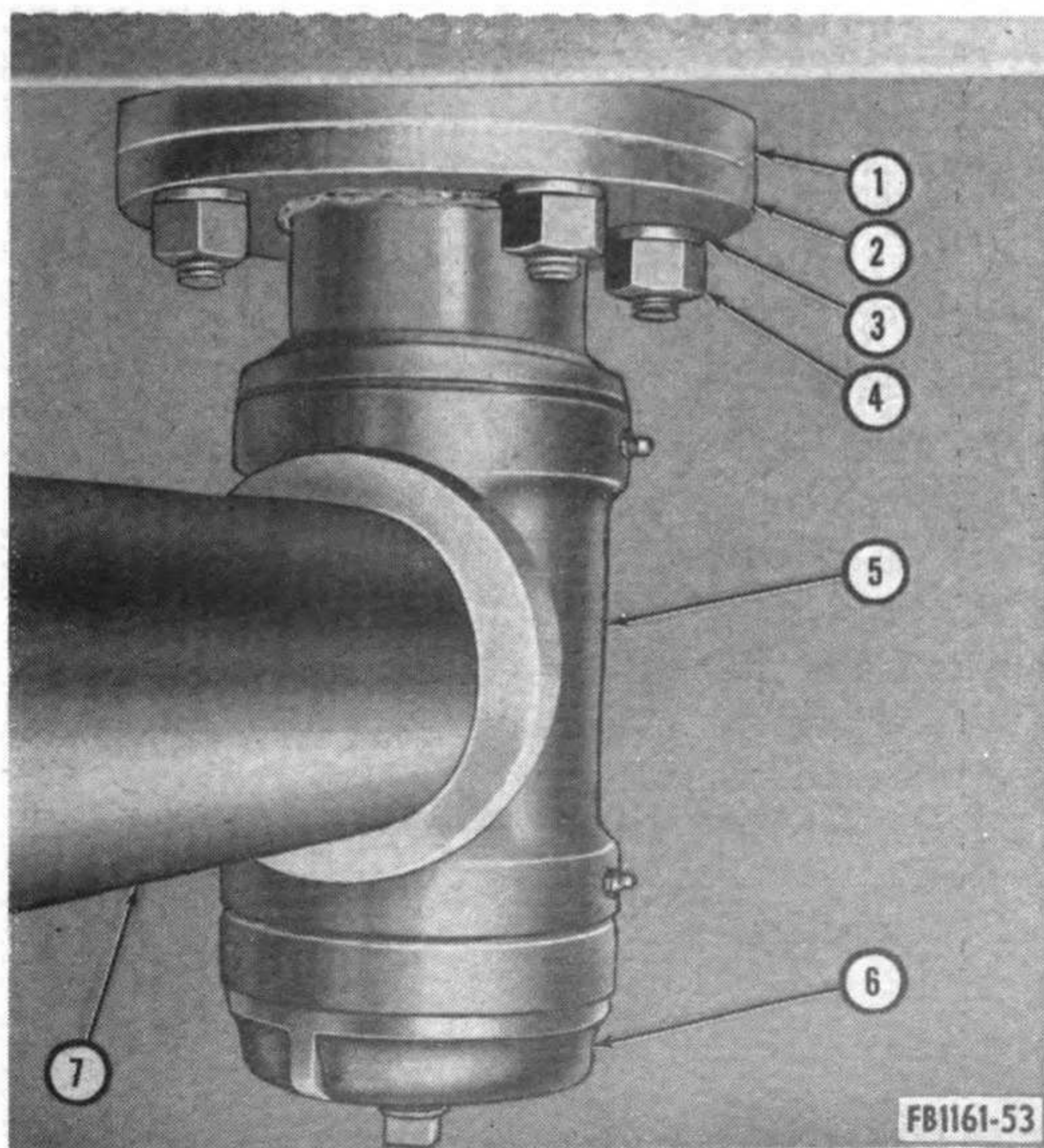
- (2) Place the top part of the hangers (1 and 17, fig. 46) over the upper header pipes, and insert the long bolts through the holes in the hangers.
- (3) Install the gasket and screw the adjustable fitting (5, fig. 47) onto the shift spindle. Insert the setscrew (6).
- (4) Screw the faucet end (30, fig. 46) onto the adjustable fitting and then install the cap (29).
- (5) Connect the shifter lever rod (10) to the under side of swing pipe by inserting washer and cotter pin. Apply a little grease to linkage.
- (6) Connect the two valve handles (5) to the links (3) and (6) and secure with cotter pin. Connect links to control levers by inserting clevis pin and cotter pin.
- (7) Wind graphite packing (20) in recess in section between the gland sleeve (19) and outer sleeve (21). Insert lower section with the spraybar into the gland sleeve.
- (8) Insert the threaded adjusting rods (3, fig. 49) into upper flange holes and put two nuts (1 and 2) on and tighten in place.
- (9) Insert the lower section over the sleeve (4) of the upper section and secure with the nut on the rod.
- (10) Replace the chain in eye on spraybar in the slot in the bracket provided for it near the top of platform.

- (11) The same installation procedure is used for the opposite side.
- (12) Insert the shear pin (27, fig. 46) in the center of both spray-bar sections.
- (13) Insert cotter pin in hole in welded tube holding shear pin and open.

## 89. Swivel Assembly

### a. Removal and Disassembly.

- (1) Disconnect the shifter lever rod (10, fig. 46) under the swivel pipe.
- (2) Remove the four bolts, nuts, and lockwashers holding swivel flange (2, fig. 53) against discharge pipe flange (1).
- (3) Remove the gasket between the two flanges.
- (4) Remove the cap (29, fig. 46), faucet end (30), adjustable outlet fitting (31), and gasket (13) from the pipe tee at the other end of the piping (7, fig. 53).
- (5) This allows the swivel assembly to be removed from the spraybar header piping and discharge piping.
- (6) Unscrew the cap (6) and remove the cap and gasket.



- |                         |                     |
|-------------------------|---------------------|
| 1 Discharge pipe flange | 5 Swivel piping tee |
| 2 Swivel flange         | 6 Cap               |
| 3 Lockwasher            | 7 Swivel piping     |
| 4 Nuts                  |                     |

Figure 53. Swivel piping tee and flange.

- (7) Remove the hinge pipe (11, fig. 46) and gasket (13) from the tee.
- (8) Place all parts on a workbench for cleaning and inspection.

*b. Cleaning and Inspection.*

- (1) Inspect the inner pipe for gummed condition and eliminate condition by using an approved cleaning solvent on the surface. Wipe and dry thoroughly.
- (2) Inspect all threads for damage or rust.
- (3) Inspect grease grooves in the T-swivel casting for caked condition or sharp edges that may cause a cutting effect on bearing surfaces. Remove the caked grease or file down sharp edges if the condition exists.
- (4) Inspect pipes, collars, and T-swivels for cracked condition.
- (5) Inspect for missing or broken alemite fittings in T-swivels.
- (6) Inspect the four swivel joint gaskets for cracked, broken, or deteriorated condition; replace if necessary.

*c. Reassembly and Installation.*

- (1) Screw the two shift tees (14, fig. 46) on the long swivel pipe.
- (2) Place the swivel pipe and the shift tees on a plate or level bench with the open end of tees in a vertical position; if the pipe and tees do not set level, adjust the tees till the pipe assembly is in proper alinement. Center punch or mark with a file the position of tee and pipe at the spraybar header end and remove this tee from pipe.
- (3) Place gasket (13) on tee and insert tee into shift spindle (32).
- (4) Place second gasket against bottom of tee and screw the adjustable outlet pipe (31) on the shift spindle tight against the tee.
- (5) Screw the faucet end (30) on the adjustable fitting.
- (6) Screw the end cap (29) and chain on the faucet end.
- (7) Place the gasket on hinge flange pipe (11) and insert the hinge flange pipe into the tee.
- (8) Place second gasket against the tee and screw the drain cap (15) on the end of the hinge pipe.
- (9) Slip the pipe under the rear platform, screw the pipe and the one assembled end in the tee leading to header pipes.
- (10) Screw the pipe till it is tight and matches the punch mark or other markings on pipe and tee.
- (11) Replace the gasket on hinge pipe and insert the four bolts and tighten the four nuts (4, fig. 53) and lockwashers (3) to the discharge pipe.
- (12) Connect the shifter lever rod (10, fig. 46), clevis pin, and cotter pin.

## 90. Pressure Regulating Valve

### *a. Removal and Disassembly.*

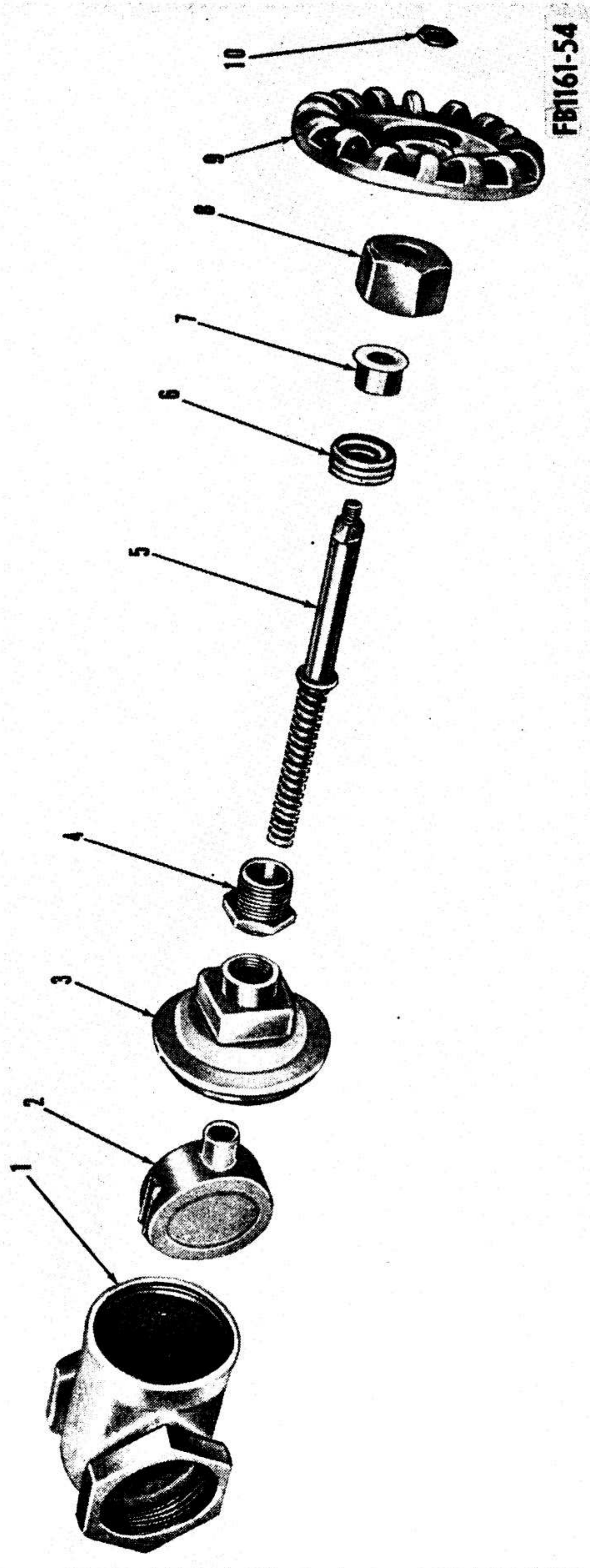
- (1) Unfasten the clamp on the hose attached to the nipple in the gate valve.
- (2) Unscrew nut (10, fig. 54) holding handle (9); pry handle off the valve stem (5).
- (3) Unscrew the packing nut (8) from the fitting (4) and remove the packing (6) and gland (7).
- (4) Unscrew the fitting (4).
- (5) Unscrew the cap (3).
- (6) Remove the valve stem (5) and gate valve (2) and then remove the stem from the gate valve.
- (7) Use a pipe wrench to remove the valve body (1) from discharge pipe.

### *b. Cleaning and Inspection.*

- (1) Inspect graphite packing for deterioration and worn condition.
- (2) Inspect the packing nut valve stem hole for oblong wear caused by a bent valve stem.
- (3) Check square hole in handle for unusual wear which may prevent gate being properly closed or opened.
- (4) Check for damaged or stripped thread through valve assembly; replace any badly defective threaded parts or run tap or die over threads.
- (5) Check valve stem for bent or ridge-worn condition; replace if this condition exists.
- (6) Check valve body seat and valve for nicks or damage that may interfere with the function of the valve.
- (7) Clean all parts with an approved cleaning solvent.

### *c. Assembly and Installation.*

- (1) Install and screw valve body (1) on the discharge pipe and tighten till the valve body is in the upright position.
- (2) Replace the gate valve (2) and screw the valve stem (5) into the gate valve.
- (3) Screw cap (3) in valve body (1) and fitting (4) into cap.
- (4) Install packing ring (6) on valve stem.
- (5) Insert the packing gland (7) in the packing nut and slide on the valve stem and tighten.
- (6) Slip valve handle (9) on the valve stem and screw the nut (10) down to tighten valve handle.
- (7) Replace rubber hose and tighten hose clamp to the nipple in the valve body.



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- 1 Valve body
- 2 Gate
- 3 Cap
- 4 Fitting
- 5 Stem
- 6 Packing
- 7 Gland
- 8 Nut
- 9 Handle
- 10 Nut

Figure 54. Pressure control valve, exploded.

## 91. Suction Valve Assembly

### *a. Removal.*

- (1) Remove the suction valve assembly from the pump as instructed in paragraph 83*a*(2) and (4).
- (2) Remove from machine and place suction pipe in a large vise on a bench to disassemble the valve, as shown in figure 55.

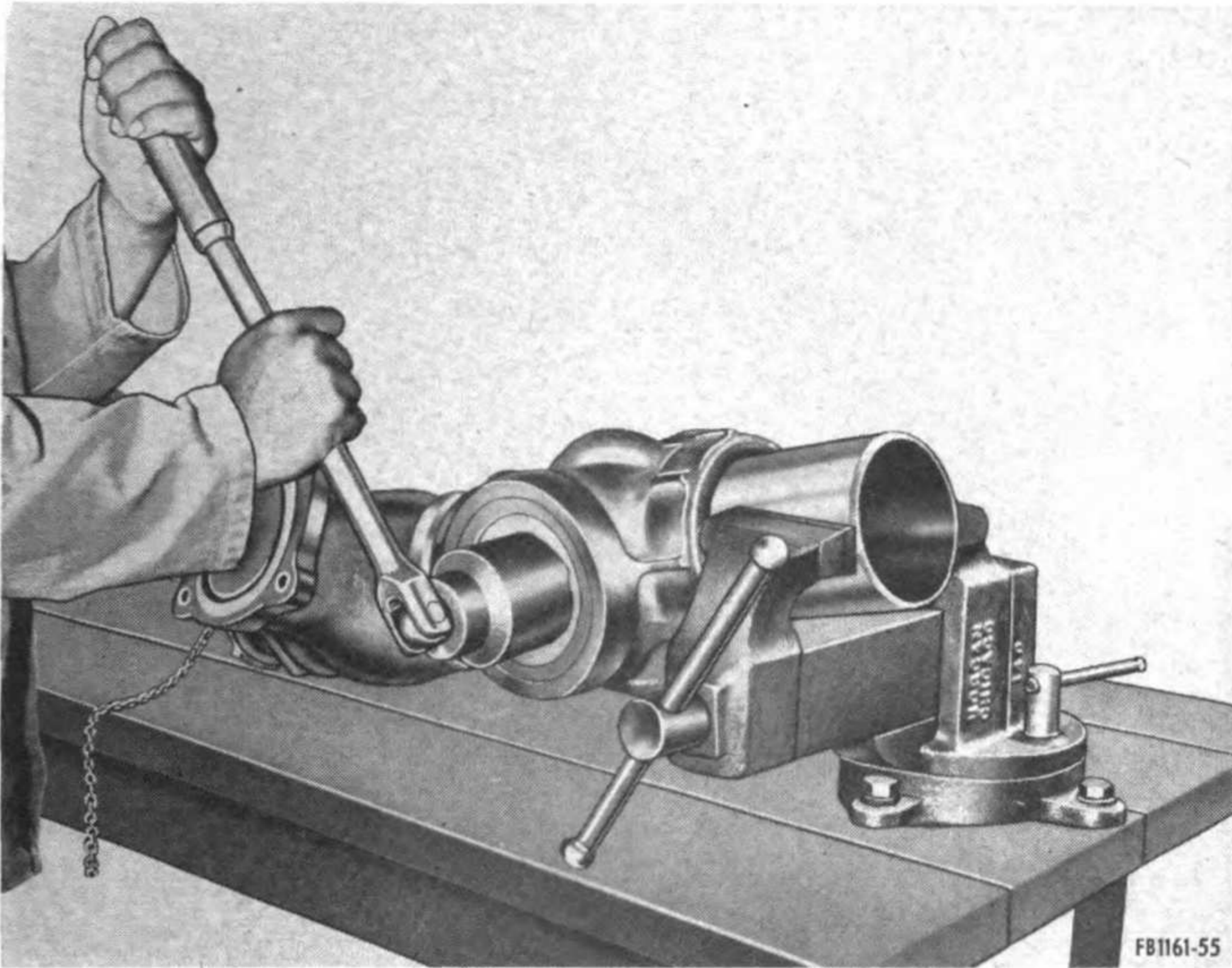
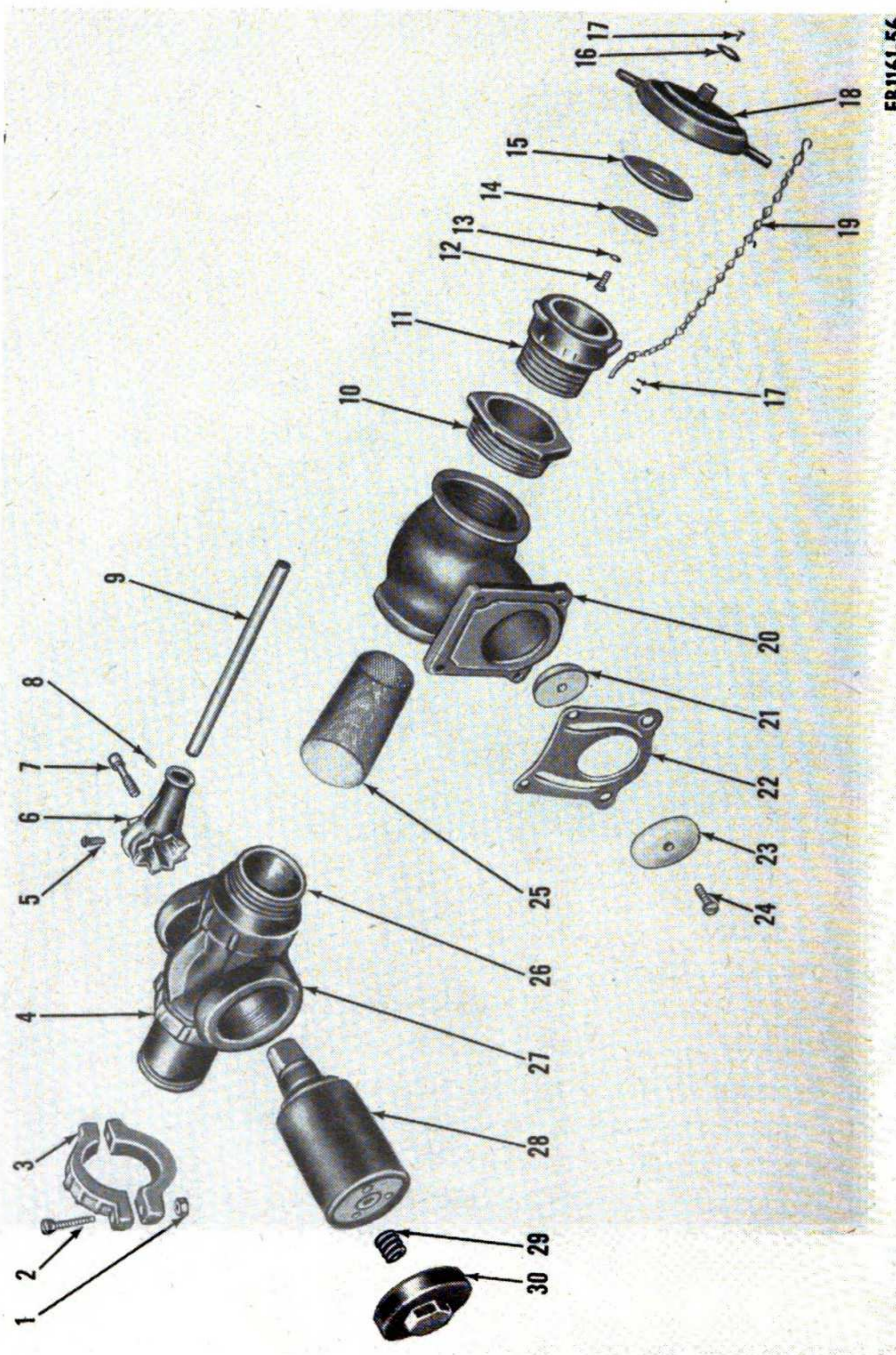


Figure 55. Suction valve in vise for disassembly.

### *b. Disassembly.*

- (1) Remove setscrew (5, fig. 56) holding valve lever (6) to valve cylinder extension and remove lever and handle (9).
- (2) Remove the straight pipe (4) at the coupling end by unscrewing from the valve body.
- (3) Remove the screws (17) holding the chain to the cap and faucet end and remove the chain.
- (4) Remove the faucet end (18), and then unscrew the screw (12) to remove the washers (13) and (14) and seal (15) from the cap.
- (5) Unscrew the faucet end (11) and reducer bushing (10).
- (6) Remove the suction strainer (25) from the tee (20).
- (7) Unscrew the tee (20) from the reducer bushing (26) and then unscrew the bushing from the valve body (27).
- (8) Unscrew the cap (30) and remove the spring (29).



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Figure 56. Suction valve, exploded.



- |    |                        |                          |  |
|----|------------------------|--------------------------|--|
| 1  | Coupling nut           |                          |  |
| 2  | Coupling bolt          |                          |  |
| 3  | Coupling               |                          |  |
| 4  | Straight pipe          |                          |  |
| 5  | Setscrew               |                          |  |
| 6  | Valve lever            |                          |  |
| 7  | Screw plug             |                          |  |
| 8  | Screw                  |                          |  |
| 9  | Valve lever handle     |                          |  |
| 10 | Reducer bushing        |                          |  |
| 11 | Faucet end             |                          |  |
| 12 | Screw                  |                          |  |
| 13 | Washer                 |                          |  |
| 14 | Washer                 |                          |  |
| 15 | Seal                   |                          |  |
| 16 | Washer                 |                          |  |
| 17 | Chain fastening screws |                          |  |
| 18 | Faucet end cap         |                          |  |
| 19 | Chain                  |                          |  |
| 20 | Tee                    |                          |  |
| 21 |                        | Small check valve weight |  |
| 22 |                        | Gasket                   |  |
| 23 |                        | Large check valve weight |  |
| 24 |                        | Check valve screw        |  |
| 25 |                        | Suction valve strainer   |  |
| 26 |                        | Reducer bushing          |  |
| 27 |                        | Valve body               |  |
| 28 |                        | Valve cylinder           |  |
| 29 |                        | Spring                   |  |
| 30 |                        | Cap                      |  |

*Figure 56—Continued*

- (9) Press the valve cylinder (28) out of the valve body by means of a hydraulic press or screw press.
  - (10) Remove the screw (7) holding lubrication stick in suction valve.
- c. Cleaning and Inspection.*
- (1) Clean and flush the interior of the suction valve and rinse all parts in an approved cleaning solvent.
  - (2) Clean the grease hole of all hardened grease and inspect for blocked passage.
  - (3) Inspect the threads for damage.
  - (4) Inspect the valve and the valve gasket. Replace the valve and gaskets if worn or damaged.
- d. Reassembly.*
- (1) Press the valve cylinder (28) back into the valve body (27).
  - (2) Install the washer, spring (29), and cap (30) on the valve body.
  - (3) Screw the reducer bushing (26) back into the valve body.
  - (4) Install valve lever (6), secure with setscrews (5). Install the screw (7) holding the lubrication stick in the suction valve. Insert handle (9) secure with screw (8).
  - (5) Screw the tee (20) onto the reducer bushing (26).
  - (6) Insert the strainer (25) in the tee.
  - (7) Screw in the reducer bushing (10) to the tee, and then install the faucet end (11).
  - (8) Install the seal (15) and two washers (13) and (14) in the cap (18) and fasten with screw (12).
  - (9) Install the cap on the faucet end and connect the chain (19) to the two parts with the screws (17).
  - (10) Screw in straight pipe (4) into valve body (27).
- e. Installation.* Refer to paragraph 83e(11) and (12).

## **Section X. TANK ASSEMBLY AND FRAME**

### **92. Description**

The tank assembly consists of a 1,000-gallon steel tank, an access manhole, a contents gage, and necessary piping to connect the pumping unit. The 18-inch manhole has a weatherproof, leak-proof cover, and a quick-acting lever-type latch for easy opening and closing. The tank is spot-welded to the steel frame which in turn rests on wooden sleepers and is bolted, through angle brackets, to the truck chassis. The tank contents gage, located on the left rear of the tank, is acted upon by a float inside the tank.

### **93. Tank and Frame**

*a. Cleaning.* Always keep the tank assembly and frame free of dirt and grease.

*b. Inspection and Repair.* Inspect the spot welds holding the tank to the frame, and if any cracks or breaks are found report the condition to the proper authority. If any leaks in the tank are noticed also report them for repair by higher echelon.

## 94. Manhole Cover

### *a. Removal and Disassembly*

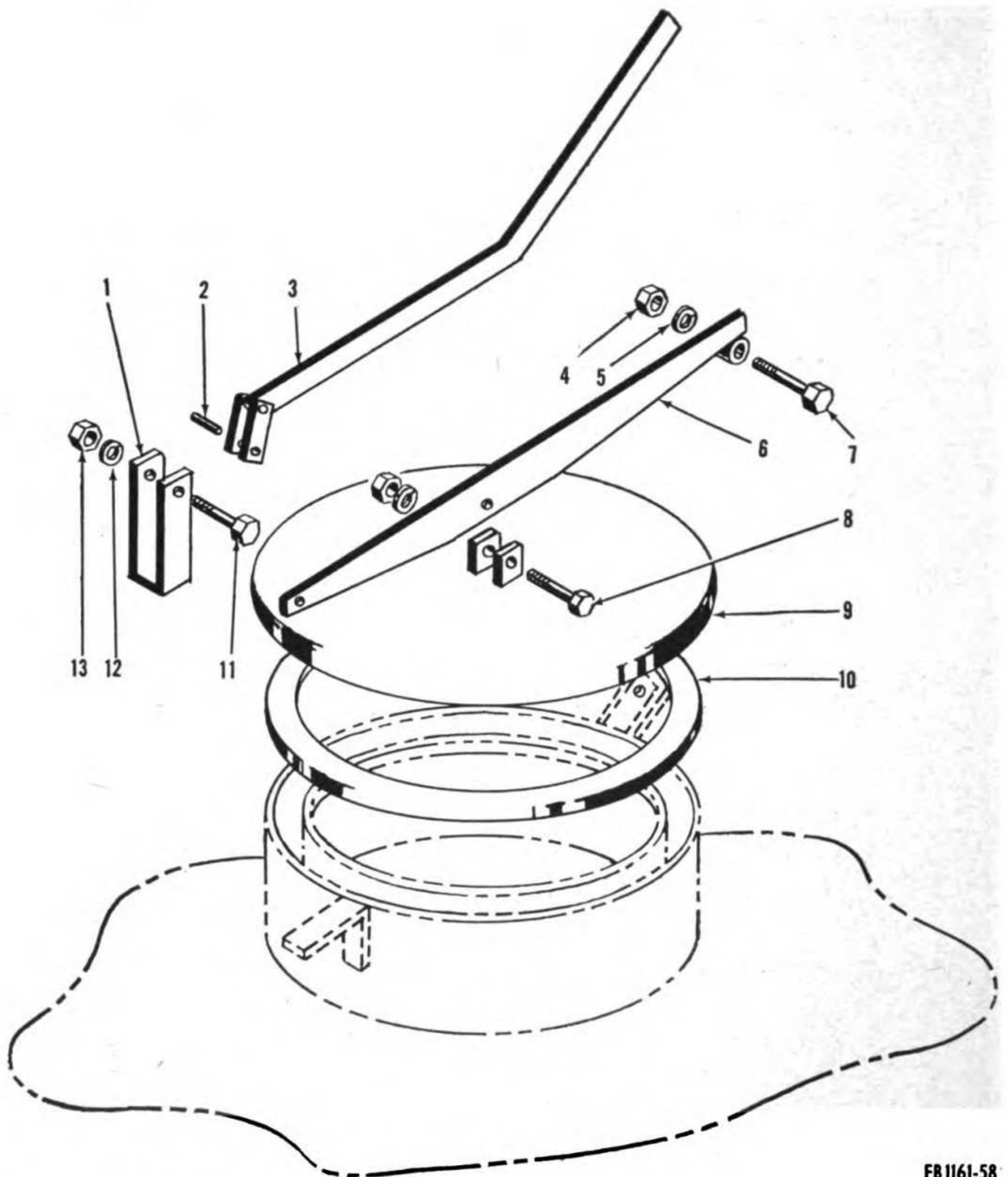
- (1) Open the manhole cover completely as shown in figure 57, by bringing lockdown lever forward and releasing the clamping down action of the cover on the manhole.
- (2) Unscrew the nut (4, fig. 58) and lockwasher (5) from the bolt (7) and lift cover assembly from the manhole.
- (3) Remove nut (13) and lockwasher (12) from bolt (11) and pull out bolt to separate lockdown strap (1) from lockdown lever (3).
- (4) Drift out pin (2) and remove lockdown lever from cover assembly.
- (5) Remove nut and lockwasher from bolt (8) and separate cover and lockdown bar.

### *b. Inspection and Cleaning.*

- (1) Inspect the bar assembly and lockdown lever for bent condition.
- (2) Inspect the bolts, nuts, links, and pins for wear, damage, bends, or missing parts. Replace if necessary.



Figure 57. Removing manhole cover from tank.



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- |   |                      |    |            |
|---|----------------------|----|------------|
| 1 | Cover lockdown strap | 8  | Bolt       |
| 2 | Pin                  | 9  | Cover      |
| 3 | Lockdown lever       | 10 | Packing    |
| 4 | Nut                  | 11 | Bolt       |
| 5 | Lockwasher           | 12 | Lockwasher |
| 6 | Lockdown bar         | 13 | Nut        |
| 7 | Bolt                 |    |            |

Figure 58. Manhole cover assembly, exploded.

(3) Inspect the packing ring for deteriorated or worn condition. Replace if worn or deteriorated.

*c. Installation and Assembly.*

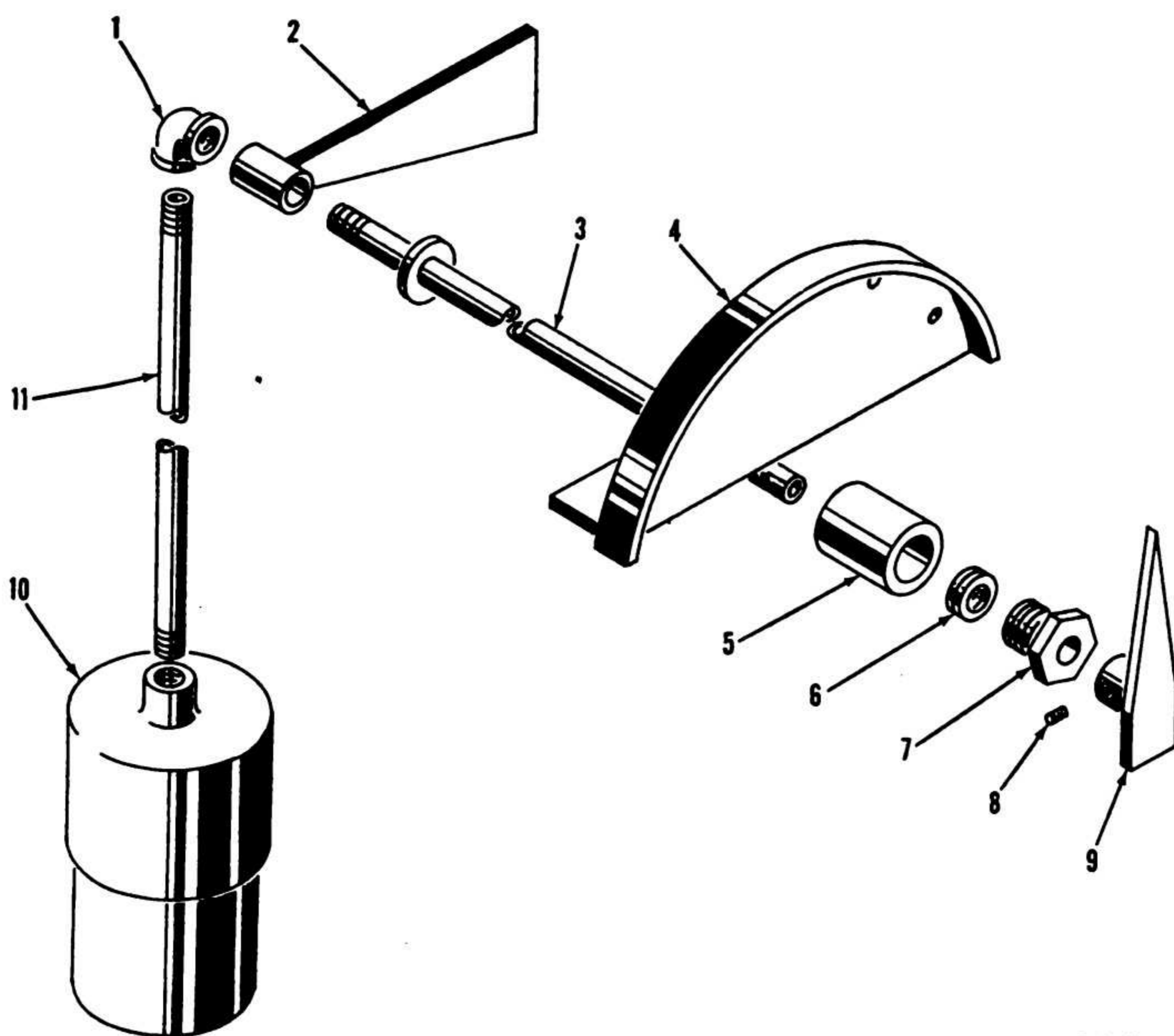
- (1) Put back lockdown bar (6) on cover by replacing bolt, lockwasher, and nut.
- (2) Put lockdown lever (3) on cover assembly and secure with pin (2).
- (3) Using the bolt, nut, and lockwasher, put the lockdown strap (1) on the lockdown lever.

- (4) Secure entire manhole cover assembly to the tank by fitting bolt (7), nut (4), and lockwasher (5) through the manhole cover hinge and hinge straps on tank.

## 95. Tank Contents Gage

### a. Removal and Disassembly.

- (1) Remove setscrew (8, fig. 59) and pull dial indicator (9) off upper arm (3).
- (2) Reach in the water tank and unscrew the lower arm (11) from the elbow. Lift the lower arm with the float (10) attached to it out of the tank. Unscrew the float from the arm.
- (3) Unscrew the elbow (1) from the upper arm and take it out of the tank. Now pull the assembly of the upper arm out of the tank.



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- |                                  |                    |
|----------------------------------|--------------------|
| 1 Elbow                          | 7 Packing nut      |
| 2 Support bracket                | 8 Setscrew         |
| 3 Upper arm                      | 9 Pointer assembly |
| 4 Dial                           | 10 Tank gage float |
| 5 Collar (part of tank assembly) | 11 Lower arm       |
| 6 Packing                        |                    |

Figure 59. Tank contents gage.

4. Remove packing nut (7) and remove packing from the collar (8) which is part of the case.

*b. Inspection and Cleaning.*

1. Inspect to see that pipe threads are not stripped.
2. Remove rust spots from any part of assembly with a wire brush.
3. Clean packing while re-assembling pipe assembly.

*c. Reassembly and Adjustment.*

1. Place the upper arm (1) through the collar (2) in the tank and wind new graphite spray packing on the arm.
2. Screw in packing nut (7) and then secure the indicator (9) on the end of the upper arm with the setscrew (8).
3. Reattach tank and screw down (3) on end of upper arm (3).
4. Join the flange of the lower arm and place this assembly in the tank and on the elbow.

## **Section XI. TACHOMETER ASSEMBLY AND FIFTH WHEEL**

### **96. Description**

The fifth-wheel type tachometer is located at the center of the chassis directly below the cab floor and indicates the amount of travel in feet per minute of the truck. It is lowered to the ground only when it is to be used, and rises retracted when the truck is moving to or from the operation. The fifth wheel is provided with a lifting cable located in the truck cab for easy lifting by the truck operator. The fifth wheel should never be left on the ground while backing the truck, as this will tend to break the drive cable from the wheel to the recording head. A recording odometer-type tachometer head is mounted on a special bracket which is attached to the truck dashboard. It is within view of the truck operator who must maintain the rate of travel as accurately as possible in feet per minute, as indicated by the application chart. The success of the proper application is dependent upon the ability of the truck operator to maintain this accurate and consistent rate of travel while the sprayer is functioning.

### **97. Fifth Wheel**

*a. Removal and Disassembly.*

1. Disconnect the lift cable from the lift bolt (1, fig. 60) located on the bearing support at the wheel.
2. Disconnect the flexible drive shaft (8) from the drive joint (13) and tachometer head (7) using extreme care to keep all parts clean.

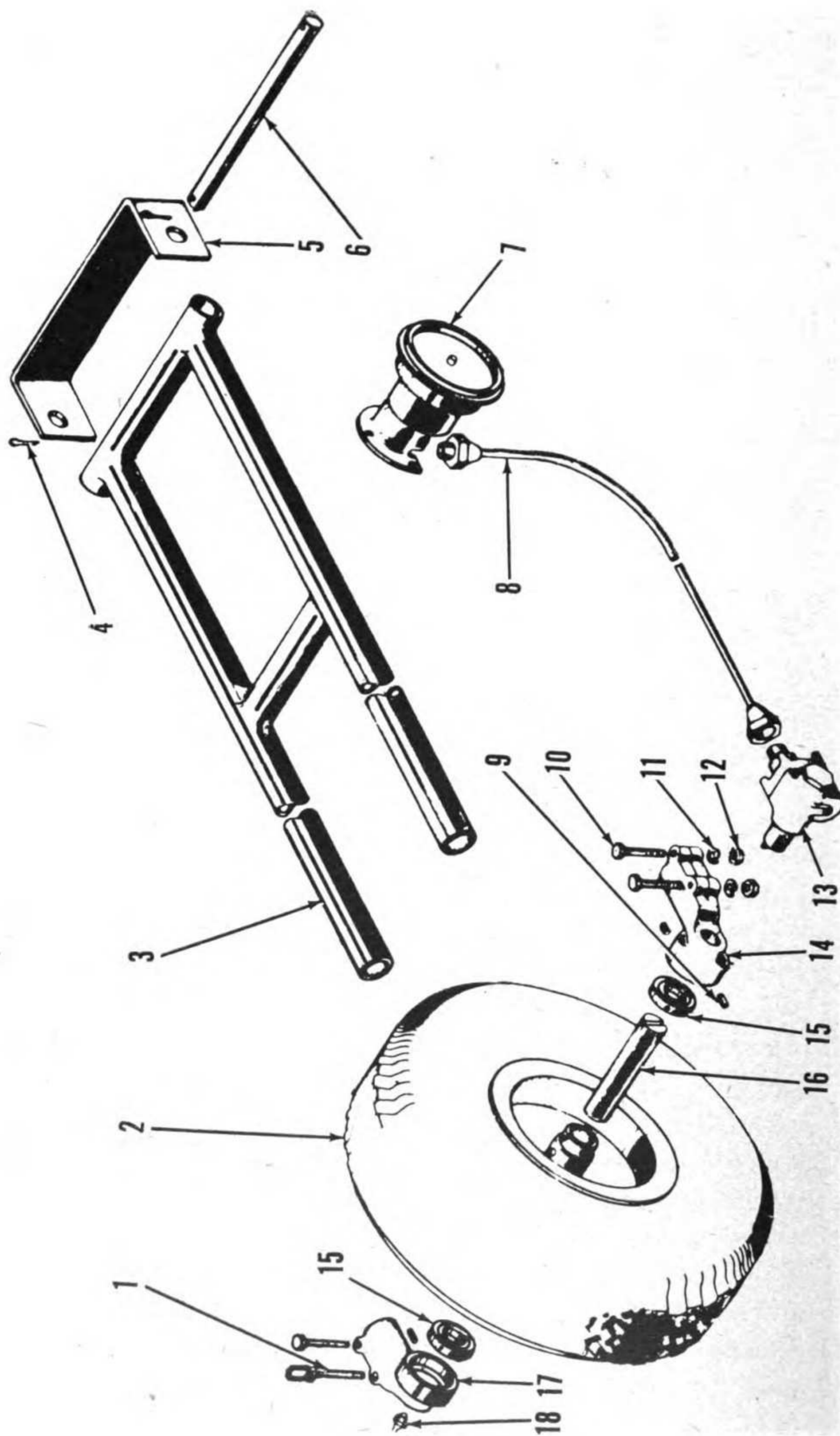
- (3) Remove the cotter pin (4) from the fork pivot bar (6) and pull the shaft from the wheel fork mounting bracket (5). This will free the fork and wheel assembly from the truck.
- (4) Remove the three bolts (10) from the two bearing supports (14 and 17) and remove the wheel fork (3) from the wheel assembly.
- (5) Slack off the setscrew (9) in the bearing support, and remove the tachometer drive joint (13).
- (6) Slack off the setscrews in both bearing cones and remove the bearing supports with both bearings from the axle drive shaft (16).
- (7) Remove the axle drive shaft from the wheel by slacking off the two setscrews in wheel hub. The axle may now be pushed from the wheel.
- (8) Remove the bearings (15) from the bearing supports.

*b. Inspection and Cleaning.*

- (1) Clean all parts thoroughly, removing all dirt and grease. Bearings should be cleaned with an approved solvent. Remove the inner core from the flexible drive shaft and clean thoroughly with an approved solvent.
- (2) Check all bearings for broken balls and damaged, pitted, or broken races.

*c. Reassembly.*

- (1) Pass the axle drive shaft (16) through the hub of the wheel and tighten the two setscrews sufficiently to hold it in place.
- (2) Press a bearing (15) into each of the bearing supports (14 and 17) and place the bearings on the axle shaft (16).
- (3) Place the bearing supports on the ends of the wheel forks (3) and lock in place with four bolts (10), lockwashers (11), and nuts (12).
- (4) Lock the wheel in position on the axle shaft with two setscrews, and lock the bearing cones to the shaft with setscrews.
- (5) Install the tachometer drive joint (13) and lock in place. Make sure that the tongue and groove of the drive joint and axle shaft match.
- (6) Place the cross tube of the fork in the fork bracket (5); install the fork pivot bar (6), and secure with the cotter pins (4).
- (7) Attach one end of the flexible drive shaft (8) to the drive joint and the other end to the tachometer head (7). Make sure the shaft is properly lubricated before attaching.
- (8) Attach the lift cable to the lift bolt (1).



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Figure 60. Fifth wheel.



- |   |                             |    |                      |    |                  |
|---|-----------------------------|----|----------------------|----|------------------|
| 1 | Lift bolt                   | 7  | Tachometer head      | 13 | Drive joint      |
| 2 | Tire and tube               | 8  | Flexible drive shaft | 14 | Bearing support  |
| 3 | Wheel fork                  | 9  | Setscrew             | 15 | Ball bearing     |
| 4 | Cotter pin                  | 10 | Bolt                 | 16 | Axle drive shaft |
| 5 | Wheel fork mounting bracket | 11 | Lockwasher           | 17 | Bearing          |
| 6 | Fork pivot bar              | 12 | Nut                  | 18 | Grease fitting   |

*Figure 60—Continued.*

## **Section XII. CATWALK, SKIRTING, AND PUMP UNIT FRAME**

### **98. Description**

The catwalk, extending around the sides of the water tank, provides a convenience walk for the operator to perform some of the duties and maintenance in connection with the water distributor. The frame which supports the water tank, and is secured to the truck chassis, also carries the brackets which hold the catwalk. The catwalk skirting plates, and the pump unit platform are bolted to this frame and bracket assembly.

### **99. Cleaning and Inspection**

*a.* Inspect to see that all plates are firmly bolted. Remove and replace any bolts or nuts with stripped threads.

*b.* Replace any plates which have been greatly dented.

*c.* Clean dirt and grease from the catwalk continually so as not to cause accidents such as slipping of the operator or crew members on the catwalk.

*d.* See that the guard rail is secure.

*e.* Inspect for cracked welds in the pump unit frame and report to proper authority.

## **Section XIII. LENSES AND LIGHTS**

### **100. Description**

*a.* There are four amber and four red reflectors mounted at the four corners of the skirting assembly. The reflector lenses provide a clear light-reflecting marker for the unit for safe night travel.

*b.* The unit has four clearance lights (two amber and two red) and four blackout lights (two amber and two red), in addition to the regular vehicle lighting equipment.

### **101. Reflector Lenses**

*a. Removal.* Remove the two screws and remove the frame, lens, and gasket.

*b. Installation.* Position new lens and gasket on the unit. Install frame and secure with two screws. Do not overtighten the screws, as distortion of the frame will break the lens.

### **102. Lights**

*a. Replacement of Bulb.* Remove the two screws securing the frame to the base. Then remove the frame, lens, lens clip, and gasket. Install a new bulb, and install the gasket, lens clip, lens and frames.

*b. Replacement of Unit.* Remove bulb (*a* above). Remove screws, nuts, and lockwashers securing the base. Pull base out and disconnect the wire lead to the bulb socket. Then connect the wire lead to the new bulb socket. Install the base on the unit and secure with the screws, nuts, and lockwashers. Install remainder of assembly (*a* above).

## **Section XIV. HOSES, SUCTION STRAINER, AND HAND- SPRAYING NOZZLE**

### **103. Suction and Discharge Hoses**

*a.* The unit is equipped with two 3-inch suction hoses and one 1½-inch discharge hose. The use of the hoses is explained in paragraphs 29–32. When not in use the hoses are stowed on the distributor as shown in figure 1.

*b.* Inspect the hoses periodically for indications of porosity, cuts, bruises, and loose or damaged couplings. Remove and replace defective sections of hoses (fig. 61).

### **104. Suction Strainer**

*a.* A suction strainer (7, fig. 61) is provided to be used on the suction hose to keep foreign matter from entering and clogging the system.

*b.* Remove the strainer and clean frequently, preferably after each operation.

### **105. Hand Spraying or Fire-Fighting Nozzle**

*a.* A 1½-inch nozzle (1, fig. 61) is provided for attachment to the 1½-inch discharge hose for fire-fighting or hand-spraying. The nozzle is carried in the toolbox when not in use.

*b.* Keep the nozzle clean at all times and replace the gasket (2) when necessary.

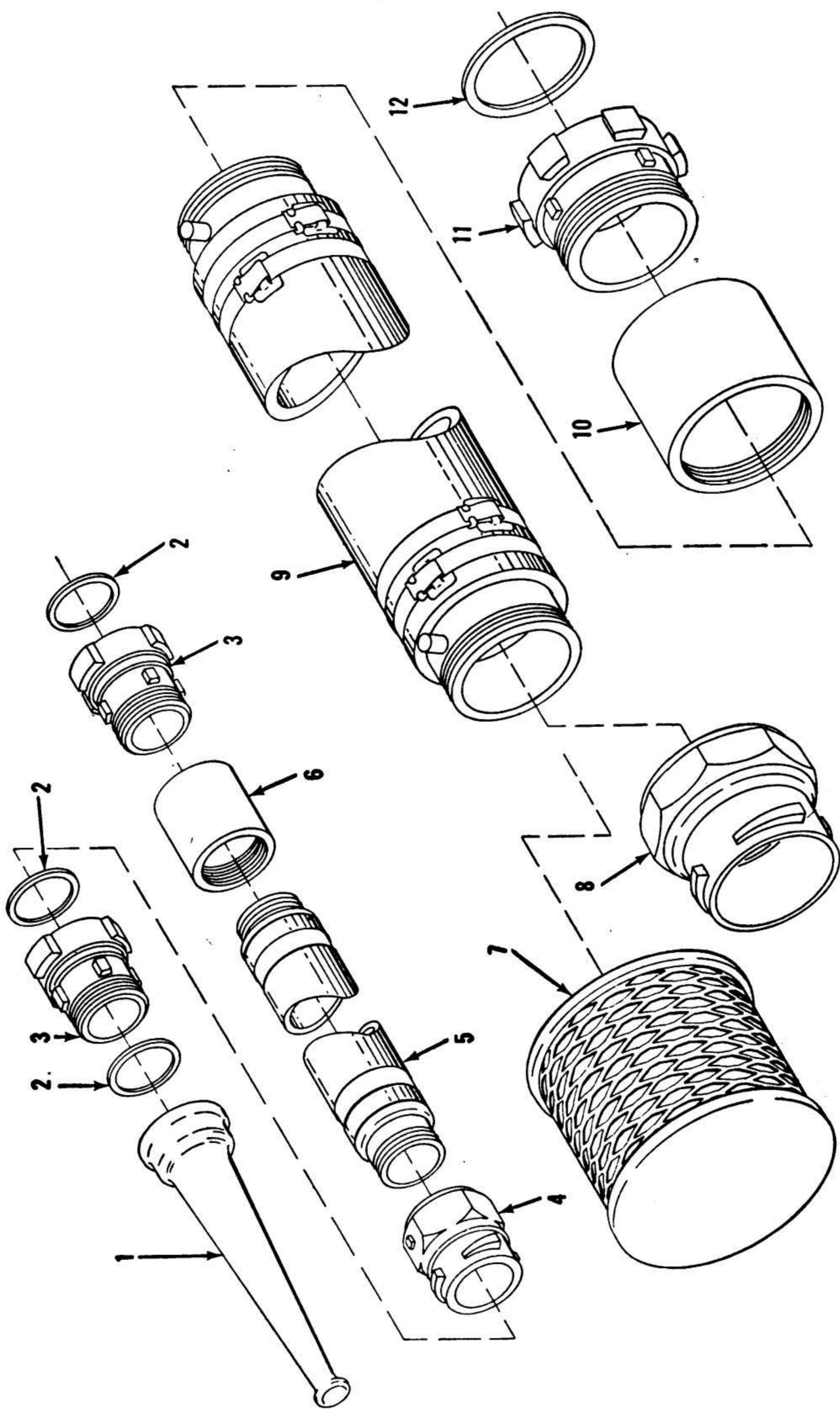


Figure 61. Suction and discharge hoses, suction strainer, and fire nozzle.

- |   |                   |   |                   |    |                 |
|---|-------------------|---|-------------------|----|-----------------|
| 1 | Fire nozzle       |   |                   |    |                 |
| 2 | Rubber gasket     |   |                   |    |                 |
| 3 | Male faucet end   |   |                   |    |                 |
| 4 | Female faucet end | 7 | Suction strainer  | 10 | Coupling pipe   |
| 5 | Discharge hose    | 8 | Female faucet end | 11 | Male faucet end |
| 6 | Pipe coupling     | 9 | Suction hose      | 12 | Rubber gasket   |

*Figure 61—Continued.*

## **CHAPTER 4**

### **FIELD AND DEPOT MAINTENANCE**

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#### **Section I. INTRODUCTION**

##### **106. General**

Instructions in this section and in succeeding sections of this chapter are published for the use of maintenance personnel responsible for third and higher echelons of maintenance of the Rosco, Model MOE, 1,000-gallon, truck-mounted water distributor. They contain information on maintenance which is beyond the scope of the tools, equipment, or supplies normally available to using organizations.

##### **107. Procedure**

The following sections describe the complete disassembly, repair, and reassembly of each major unit or system comprising the Rosco Water Distributor. Before proceeding with overhaul, check to see that replacement parts are available.

#### **Section II. TOOLS AND EQUIPMENT**

##### **108. General**

The tools and equipment as listed in this section are those that are required to perform field and depot maintenance on the water-distributor. Operator maintenance tools and equipment and common mechanic's handtools have not been enumerated in this section. No specially designed tools or equipment are necessary for field and depot maintenance.

##### **109. Field and Depot Maintenance Tools and Equipment**

The tabulation in table I contains only the tools and equipment necessary to perform the operations illustrated and/or described in this chapter. This table is included for information only and is not to be used for requisitioning tools or equipment.

Table I. Field and Depot Maintenance Tools and Equipment

Item	Paragraph reference	Use
Tool set, carburetor.....	115 and 117.....	Disassembly and assembly of carburetor.
Puller, general purpose.....	111.....	Disassembly of magneto.
Press, arbor.....	111 and 113.....	Disassembly and reassembly of magneto.

### Section III. MAGNETO

#### 110. Description

The magneto is of the induction type and is shielded to prevent radio interference. It is mounted to the engine by a standard flange-mounting. Electrical energy is provided by the magneto for the ignition system by a rotor which is permanently magnetized, and is used to direct the magnetic field flow through the coil windings, first in one direction, then in the other. The winding is stationary, and a lead goes from it to the magneto distributor. The magneto end cap is all metal, and has an insulated distributor block fitted into it. Special outlets are provided for the high-tension leads so that connection can be made to the shielded ignition cables. A pushbutton ground terminal is located on the lower side of the end cap. In addition an auxiliary terminal is provided to connect a ground wire from the magneto to a remote grounding switch. The magneto is equipped with a drive gear mounted directly on the impulse coupling. The gear is a slip fit on the coupling nut since movement of the gear with respect to the coupling nut and rotor shaft occurs during the impulse period. Impulse coupling pawls on the coupling hub engage stop pins in the magneto frame during operation at slow speeds and momentarily delays movement of the rotor. With rotation of the coupling the pawls slip off of the pins to provide the impulse of the rotor shaft and rotor. When the engine picks up speed the pawls do not engage the pins and allow free rotation of the complete impulse coupling unit.

#### 111. Magneto Disassembly

*a.* Remove the magneto from the engine (par. 78*a*).

*b.* Unscrew the two screws and lockwashers (2, fig. 62) and two screws (34) and lockwashers (35) holding the end cap (1) to the frame (12), and remove the cap and gasket (11). Place the screws and washers in the tapped holes of the frame for safekeeping.

*c.* Set the gear in a vise with wooden jaws or jaws covered with copper plate; remove the impulse coupling nut lockwire (23); and then fit a coupling wrench into the slots of the coupling nut (24) and

remove it by turning counterclockwise. (A standard  $\frac{7}{8}$ -inch hex wrench may also be used to remove the coupling nut).

*d.* After removing the nut, remove the drive gear (26) from the impulse coupling bushing (25), and then remove the bushing.

*e.* Place the mounting flange of the frame in a vise, and grasp one of the lugs of the impulse coupling shell (27) with a pair of pliers; remove the shell by turning and pulling with the pliers, being careful not to stretch the drive spring (28). If the spring does not come loose with removal of the shell, pry it from the hub (29) with a screwdriver.

*f.* Press or pull off the impulse coupling hub (29) from the magnetic rotor shaft; remove the rotor-to-impulse coupling key (61); and then remove the oil slinger baffle disk (30), rotor shaft seal outer washer (31), rotor shaft seal (32), and rotor shaft seal inner washer (33).

*g.* Remove the impulse coupling pins (14 and 15).

*h.* At the other end of the rotor shaft, pull off the distributor rotor (54); then remove the two screws (37) securing the end cap extension plate (38) to the frame and remove the plate.

*i.* Remove the support and condenser screw and lockwasher (60) securing the condenser (48) and cam wick and holder (47) to the bearing support (46), and remove wick and holder.

*j.* Remove the terminal screw (50) and lockwasher (49), and remove the condenser, then remove the breaker arm snap ring (55), and remove the breaker arm (56).

*k.* Remove the contact support lock screw (57), lockwasher (49), and washer (58). Remove the pivot screw (53), lockwasher (52), and washer (51); remove the contact support (59).

*l.* Using a screwdriver of exactly the right size if possible, remove the two setscrews (13) holding the coil (10) in the frame, and remove the coil.

*m.* Remove the three screws and lockwashers (60) holding the bearing support (46) in the frame, and remove the bearing support from the shaft with the outer bearing race of the bearing (44) and the bearing support felt seal (45) intact.

*n.* Pull the rotor shaft (42) with bearings (39 and 44), seals (41 and 43), and shim (40) intact from the frame (12).

*o.* Press off the rotor drive end ball bearing (39), and then remove the rotor shaft shim (40) and rotor bearing seal (41). Press off the rotor cam end ball bearing (44), and then remove the seal (43).

*p.* Remove the outer race of the bearing (44) from the bearing support (46) with a race puller, and remove the bearing support felt seal (45). Remove the outer race of bearing (39) from the frame in the same manner. In each case grip the part holding the race in a vise.



*q.* From the magneto cap (1), remove the distributor block (3) by unscrewing the four screws (62) and lockwashers (52).

*r.* Remove the primary ground switch strip assembly from the end cap, by removing the nut (70), lockwasher (49), washer (58), and screw (6). Remove the bushing (7), primary ground switch strip (8), and ground switch insulation strip (9).

*s.* Remove the ground switch pushbutton by unscrewing the ground outlet nut and lifting out the pushbutton assembly.

*t.* Remove the high tension lead (4) and coil lead brush and spring (5).

*u.* Remove vent screen quickies (69) and vent screen washers (68), and withdraw vent screen rivet (63) with vent screen gasket (64), vent screen shield (65), vent screen (66), and vent shield screen gasket (67).

## **112. Magneto Cleaning and Inspection**

*a.* Test the coil following removal of it from the magneto frame. Test it on a reliable coil-tester. On the Eisemann coil tester the primary draw of the coil is 1.6 amperes when tested according to directions. Replace with a new identical coil if necessary.

*b.* Test the condenser on a reliable condenser tester for shorts, opens, and leakage, and for capacitance, which for the condenser lies between 0.17 and 0.21 mfd.

*c.* Inspect the ball bearings for pits and scoring; they must rotate freely and be free of roughness. Check the fit of the races on the rotor shaft and in the bearing support and frame. Wipe bearings with a clean, lint-free cloth. Replace faulty bearings complete with races.

*d.* Clean the bearing plate thoroughly with an approved cleaning solvent before replacing outer race. Remove old grease in the sleeve bearing grease reservoir, and fill with new grease before reassembly.

*e.* Check the magnetic rotor shaft for wear and damage; remagnetize if necessary.

*f.* Check the contact points for pitting, pyramiding, corrosion, or wear; replace if necessary.

*g.* Check breaker arm fulcrum pin on bearing support plate for wear or looseness; replace if necessary.

*h.* Check distributor rotor for looseness or cracks; replace if necessary.

*i.* Check distributor block for corrosion, cracks, or wear; replace if necessary.

*j.* Replace the felt cam wick and holder if dirty or oil-saturated.

*k.* Check drive gear for wear, chipped teeth, and fit on impulse coupling bushing.

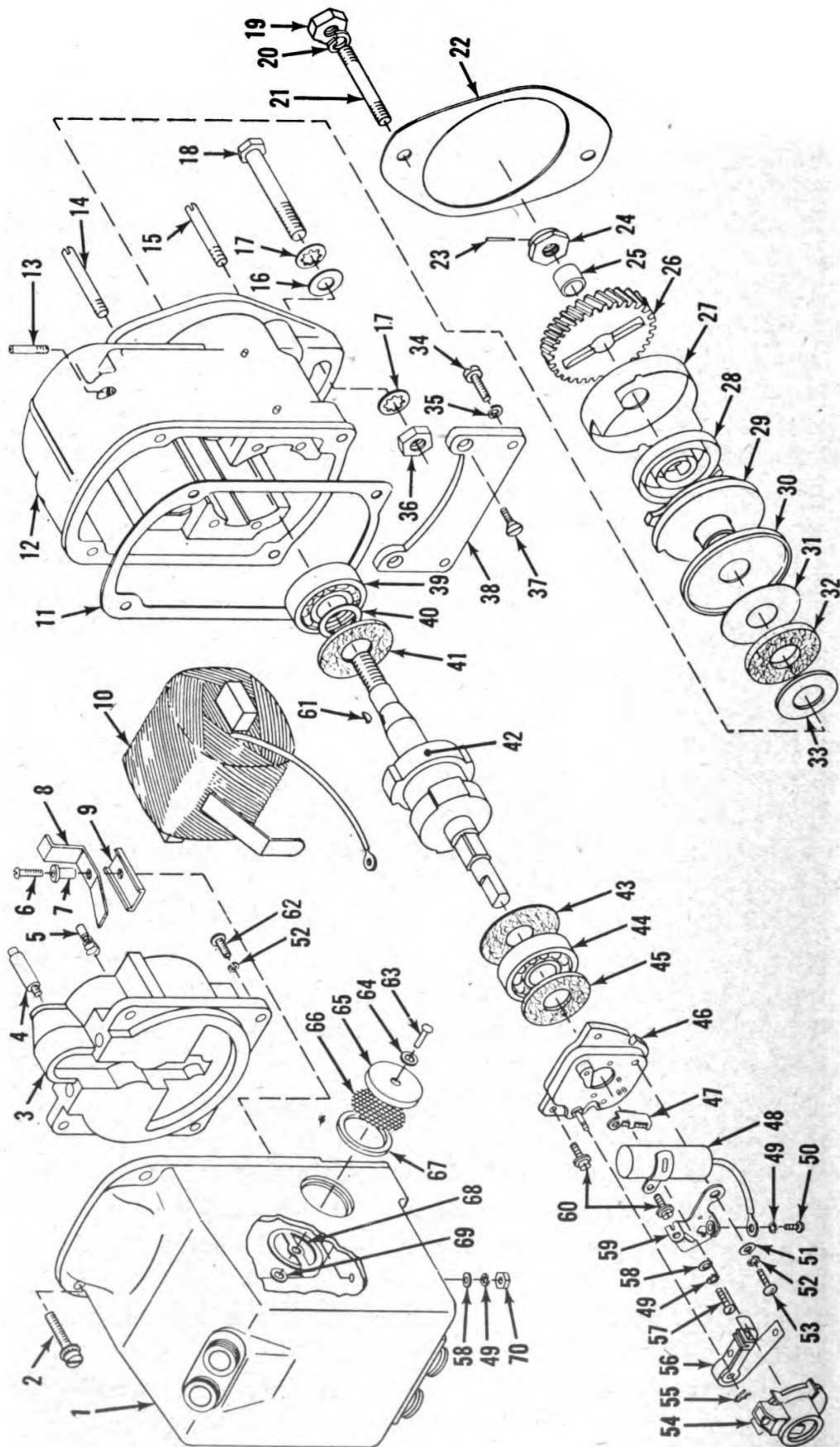


Figure 62. Magneto, exploded view.

- |    |                                |    |                               |    |  |
|----|--------------------------------|----|-------------------------------|----|--|
| 1  | End cap                        | 25 | Impulse coupling bushing      | 49 | Lockwasher                                 |
| 2  | End cap screw and lockwasher   | 26 | Drive gear                    | 50 | Screw                                      |
| 3  | Distributor block              | 27 | Impulse coupling shell        | 51 | Contact support screw washer               |
| 4  | High tension lead              | 28 | Impulse coupling drive spring | 52 | Lockwasher                                 |
| 5  | Coil lead brush and spring     | 29 | Impulse coupling hub          | 53 | Screw                                      |
| 6  | Screw                          | 30 | Oil slinger baffle disk       | 54 | Distributor rotor                          |
| 7  | Primary ground screw bushing   | 31 | Rotor shaft seal outer washer | 55 | Breaker arm fulcrum pin snap ring          |
| 8  | Primary ground switch strip    | 32 | Rotor shaft seal              | 56 | Breaker arm                                |
| 9  | Ground switch insulation strip | 33 | Rotor shaft seal inner washer | 57 | Screw                                      |
| 10 | Coil                           | 34 | Screw                         | 58 | Support plate                              |
| 11 | End cap-to-frame gasket        | 35 | Lockwasher                    | 59 | Contact support                            |
| 12 | Frame                          | 36 | Nut                           | 60 | Support and condenser screw and lockwasher |
| 13 | Coil bridge setscrew           | 37 | Screw                         | 61 | Rotor-to-impulse coupling key              |
| 14 | Impulse coupling pawl stop pin | 38 | End cap extension plate       | 62 | Screw                                      |
| 15 | Impulse coupling pawl stop pin | 39 | Rotor drive end ball bearing  | 63 | Vent screen rivit                          |
| 16 | Washer, plain                  | 40 | Rotor shaft shim              | 64 | Vent rivet gasket                          |
| 17 | Lockwasher, internal tooth     | 41 | Rotor bearing seal            | 65 | Vent screen shield                         |
| 18 | Cap screw                      | 42 | Magnetic rotor and shaft      | 66 | Vent screen                                |
| 19 | Nut                            | 43 | Cam end rotor bearing seal    | 67 | Vent shield screen gasket                  |
| 20 | Lockwasher                     | 44 | Rotor cam end ball bearing    | 68 | Vent screen washer                         |
| 21 | Magneto mounting stud          | 45 | Bearing support felt seal     | 69 | Vent screen quickie                        |
| 22 | Magneto flange gasket          | 46 | Bearing support               | 70 | Nut  |
| 23 | Impulse coupling nut lockwire  | 47 | Cam wick and holder           |    |  |
| 24 | Impulse coupling nut           | 48 | Condenser                     |    |  |

Figure 62—Continued.

*l.* Clean the impulse coupling in approved cleaning solvent and wipe dry before reassembly. No oil or grease should be put on the hub plate.

*m.* Inspect the spring-loaded coil lead brush for wear and to see that the spring is not bent or broken.

*n.* Inspect all gaskets and clean surfaces or replace, if necessary.

### **113. Magneto Reassembly**

*a.* Install the vent screen (66, fig. 62) with gasket (67), shield (65), gasket (64), rivet (63), vent screen washers (68), and vent screen quickies (69).

*b.* Install the high tension lead (4) and the coil lead brush and spring (5) in the distributor block (3); then install the distributor block in the end cap, and secure with the four screws (62) and lockwashers (52).

*c.* Install ground switch pushbutton assembly in the end cap and secure with the outlet nut.

*d.* Install the primary ground switch strip (8) and the ground switch insulation strip (9) in the end cap, and secure with the primary ground screw bushing (7), screw (6), washer (58), lockwasher (49), and nut (70).

*e.* Push the outer race of bearing (39) into the frame (12) as far as possible by hand; then place the frame in a press and center a small support block on the outer race and place a brass cap between the support block and the press screw; make sure the pressure will be perpendicular and turn down the screw until the race is completely within the frame recess.

*f.* Place the rotor bearing seal (41) and shim (40) on the shaft (42), and then press the bearing (39) on the shaft. Place the rotor bearing seal (43) on the shaft and then press the bearing (44) on the shaft. Lubricate bearings with approved lubricant.

*g.* Push the assembled shaft into the frame seating bearing (39) into its outer race.

*h.* Place the bearing support felt seal (45) in the bearing support (46) and press in the outer race of bearing (44). Press the assembly over the ball bearing assembly and secure with the four screws and lockwashers (60).

*i.* Install the coil (10) in the frame, and secure with the two set-screws (13), which hold the coil bridge laminations, using a screw-driver of exactly the right size, if possible.

*j.* Install the contact support (59) on the bearing support using the screw (57), lockwasher (49), and washer (51) on the holddown side; then install screw (53), lockwasher (52), and washer (51) on the pivot side; do not tighten.

*k.* Install the breaker arm (56) on the fulcrum pin on the bearing support and secure with snap ring (55).

*l.* Install the condenser (48) and the cam wick and holder (47) to the bearing support using screw and lockwasher (60). Lubricate wick (47) with a light oil.

*m.* Fasten the breaker arm spring and condenser and coil lead in position on the contact support with the terminal screw (50) and lockwasher (49).

*n.* Adjust the breaker points to have exactly 0.015-inch opening at full separation. Adjust by turning the rotor shaft to separate contacts at highest point. Then back off screws (53 and 57), and insert a screwdriver in the slot in the contact support (59). Pivot the contact support between the two small bosses on the bearing support (46) and adjust the points to 0.015-inch clearance. Then tighten screws (53 and 57), and take a final measurement.

*o.* Install the end cap extension plate (38), and secure with the screws (37); and then push the distributor rotor (54) on the shaft.

*p.* Install the impulse coupling pawl stop pins (14 and 15).

*q.* Install the rotor shaft seal inner washer (33), rotor shaft seal (32), rotor shaft seal outer washer (31), and oil slinger baffle disk (30) on the shaft (42).

*r.* Insert the drive spring (28) in the impulse coupling shell (27), and anchor the outside end in the round socket (be sure the spring is coiled in the right direction).

*s.* Connect the hub assembly (29) and the inside end of the drive spring and wind the spring one full turn; then push the hub in place.

*t.* Assemble the completed coupling to the shaft, keying it in position with key (61).

*u.* Place the bushing (25) on the shaft and assemble the magneto drive gear (26) to the coupling lugs so that when the distributor rotor is in firing position for No. 1 cylinder, the prick punch mark on the face of the gear is adjacent to the upper pawl stop pin. Secure with nut (24) and lockwire (23).

*v.* During the starting period of the engine, the coupling pawls engage the pawl stop pins four times per revolution in order to provide the impulse action which intensifies the ignition sparks. The operation of the coupling can be checked by slowly turning the drive gear by hand in a clockwise direction and noticing the engagement, windup, and release for each pawl and stop pin. The impulse feature continues to function until an engine speed of 500 rpm is reached, after which centrifugal force is sufficient to keep the pawls from engaging the stop pins with the result that the coupling serves as an individual drive member.

*w.* Install the end cap (1) to the frame (12) using a new gasket, and secure with the upper cap screws and lockwashers (2) and the lower two screws (34) and lockwashers (35).

*x.* Install the magneto (par. 78).

## Section IV. CARBURETOR

### 114. Description

The carburetor is of the updraft, single-venturi design, and is comprised of the following basic systems: fuel supply system; idle system; high speed system; economizer system; and choke system. The fuel supply system consists of the threaded fuel inlet, the fuel valve seat, fuel valve, float, and fuel bowl. The fuel travels through the fuel valve seat and passes around the fuel valve and into the fuel bowl. The level of the fuel in the fuel chamber is regulated by the float through the control of the fuel valve. The idle system consists of the idle discharge port, idle air passage, idle adjusting needle, idle jet, and fuel passage. The high speed system controls the fuel mixture at part throttle speeds and at wide open throttle. This system consists of a venturi, controlling the maximum volume of air admitted into the engine; the main jet, which regulates the flow of fuel from the float chamber to the main discharge jet; the well vent, which maintains uniform mixture ratio under changing suction and engine speeds; and a main discharge jet, which delivers the fuel into the air stream. The economizer system consists of a "milled" slot in the throttle shaft, which acts as a valve to open or close the system; a vacuum passage from the throttle bore to the slot in the throttle shaft; and a vacuum passage from the slot in the throttle shaft to the fuel bowl. The choke system consists of a valve mounted on a shaft located in the air entrance and operated externally by a lever mounted on the shaft. The choke valve is of a semiautomatic type.

### 115. Carburetor Disassembly

a. *Removal From Engine.* Refer to paragraph 75a.

b. *Separate Carburetor Bodies.*

- (1) Remove the pipe plug (29, fig. 63) from the side of the throttle body (3).
- (2) Remove the four assembly screws (27) and lockwashers (28) which attach the throttle body (3) to the fuel bowl (23) and separate the two units.

c. *Disassembly Throttle Body.*

- (1) Remove float axle as follows:
  - (a) Press screwdriver against float axle (16) at slotted side of the float hinge bracket and force through hinge bracket.
  - (b) Remove float axle completely with fingers from opposite side and remove the float (15).
- (2) Remove the fuel needle valve (14).
- (3) Remove the assembly gasket (17) from the machined surface of the throttle body.
- (4) Remove the venturi (18).

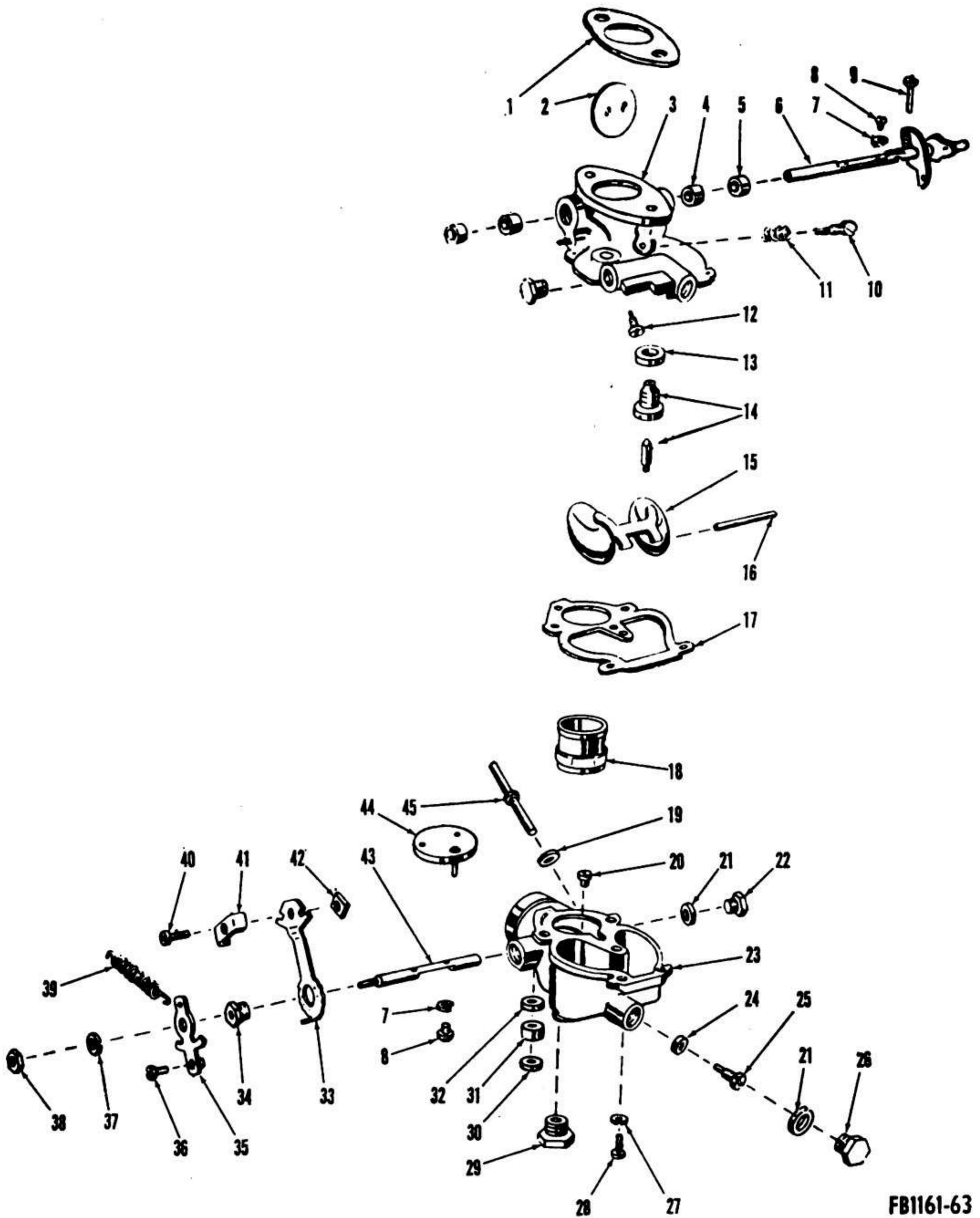
- (5) Remove the fuel valve seat (14) and fibre washer (13) from machined surface of throttle body using a fuel valve seat wrench.
- (6) Remove the idle jet (12) from the passage in the machined surface of the throttle body near fuel valve seat using a small screwdriver.
- (7) Remove the idle adjusting needle (10) and friction spring (11) from the side of the throttle body.
- (8) Remove the throttle plate (2), screws (8), lockwashers (7), shaft and stop assembly (6), and throttle clamp lever as follows:
  - (a) Unscrew throttle stop screw (9) until threaded end is flush with lever (6).
  - (b) Make match-marks with a file on throttle body and all levers to act as a guide to reassemble these parts in the same position as removed.
  - (c) Loosen throttle clamp lever screw and remove lever from shaft.
  - (d) File off riveted or peened end of the throttle plate screws (8).

*Note.* When such screws are riveted or peened, the threaded end of the two screws must be filed flat before removal to avoid breakage or stripping of the threads in the shaft. In some cases it may be necessary to use a small ( $\frac{1}{4}$  inch) round file and cut slightly below the surface of the shaft because of a slight counterbore around a screw hole. Be sure to avoid striking and cutting the side of the throttle body bore or the throttle plate when filing the screws.

- (e) Remove the screws (8) and lockwashers (7) and pull out the throttle plate (2).
- (f) Remove the throttle shaft and stop lever assembly (6) from the throttle body.
- (9) Remove the throttle shaft packing and packing retainer (5) from the throttle body shaft holes as follows:
  - (a) Screw a  $\frac{5}{16}$  inch fine-thread taper tap into packing retainer (5) until it is firmly seated.
  - (b) Insert a long punch or rod through opposite shaft hole and drive punch against the end of the tap until retainers (5) are free of the body. Remove both shaft packings (4). (Repeat operation for other packing and retainer.)

*d. Disassemble Fuel Bowl Body.*

- (1) Remove the passage plug (26) and plug washer (21) from the bottom of the fuel bowl body.
- (2) Remove the drain plug (hex) (29) from outside bottom of fuel bowl using plug wrench.
- (3) Remove main jet (25) and fibre washer (24) from threaded passage in bottom side of fuel bowl with main jet wrench.



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Figure 63. Carburetor, exploded.

- (4) Remove main discharge jet (45) and fibre washer (19) from center of large opening in machined surface of fuel bowl with a main discharge wrench.
- (5) Remove well vent jet (20) from the center of the large opening in the machined surface of the fuel bowl with a small screwdriver.
- (6) Disassemble choke as follows:
  - (a) Remove the lever return spring (39) from the choke lever (35) and choke bracket (33).
  - (b) Make match-marks with a file on the choke bracket (33), fuel bowl (23), and lever (35) to act as a guide to reassemble these parts in the same position as removed.



1	Flange gasket	24	Main jet fibre washer
2	Throttle plate	25	Main jet
3	Throttle body	26	Main jet passage plug
4	Shaft packing washer (2)	27	Body screw lockwasher
5	Shaft packing retainer (2)	28	Body screw
6	Throttle shaft and lever	29	Pipe plug (2 rqr)
7	Plate screw lockwasher	30	Drain felt retainer
8	Throttle plate screw	31	Drain felt washer
9	Throttle stop screw	32	Intake drain washer
10	Idle adjusting needle	33	Choke bracket
11	Idle needle spring	34	Choke bracket screw
12	Idle jet	35	Choke lever
13	Fuel valve seat washer	36	Choke lever swivel screw
14	Fuel valve and seat	37	Choke shaft lockwasher
15	Float	38	Choke shaft nut
16	Float axle	39	Choke lever return spring
17	Bowl-to-body gasket	40	Tube clamp screw
18	Venturi	41	Tube clamp
19	Discharge jet fibre washer	42	Tube clamp nut
20	Well vent jet	43	Choke shaft
21	Plug washer	44	Choke plate
22	Choke shaft hole plug	45	Discharge jet
23	Fuel bowl		

Figure 63—Continued

- (c) Remove the choke shaft nut (38) and lockwasher (37) using the main discharge wrench.
- (d) Remove the choke lever (35).
- (e) Remove the choke bracket screw (34) and remove the choke bracket (33).
- (f) Remove the shaft hole plug (22) and the fibre washer (21).
- (g) Remove the choke plate screws (8) and lockwashers (7) and remove the choke shaft (43) and choke plate (44).

*Note.* Some models of the Zenith 161-J series carburetor employ choke shaft packing washers and packing washer retainers in the choke shaft holes around the choke shaft. The disassembly of these packing washers and retainers should be performed in the same manner as in the disassembly of the throttle body (c(9) above.

## 116. Carburetor Cleaning and Inspection

### a. Cleaning Parts.

- (1) Clean all metal parts thoroughly with an approved cleaning solution and rinse in an approved solvent.
- (2) Blow out all passages in the air intake and fuel bowl casting and the throttle body.

*Note.* Be sure all carbon deposits have been removed from the throttle bore and idle port. It is advisable to reverse flow of compressed air in all passages to insure that all dirt has been removed. Never use a wire or drill to clean out jets.

*b. Inspection of Parts.*

- (1) *Float assembly.* Replace float assembly if loaded with gasoline, damaged, or if float axle bearing is worn excessively. Inspect top side of float lever for wear where it contacts fuel valve needle. Bear in mind that such wear can affect the float level.
- (2) *Float axle.* Replace the float axle if any wear can be visually detected on the bearing surface.
- (3) *Fuel valve seat and needle assembly.* Always replace fuel valve seat and needle because both parts wear and may cause improper float level.
- (4) *Idling adjusting needle and spring.* Inspect point of needle. This must be smooth and free of ridges.
- (5) *Throttle plate.* Inspect plate for burrs or damaged edges. Never clean a throttle plate with a buffing wheel or sharp instrument.
- (6) *Choke plate.* Inspect for bends, burrs, or damaged edges.
- (7) *Choke shaft.* Check bearing surface for wear; see that the shaft is straight.
- (8) *Gaskets.* Replace all gaskets and fibre washers every time the carburetor is disassembled.
- (9) *Throttle shaft.* Replace the throttle shaft if it shows evidence of wear on the bearing surfaces.

## **117. Carburetor Reassembly**

*a. Fuel Bowl Body.*

- (1) Reassemble choke as follows:
  - (a) Install the two choke shaft packings if a part of the carburetor unit, and retainers in the fuel bowl body as follows, using bushing driver tool.
    1. Assemble packing and retainer and place completed assembly on bushing driver tool with packing facing small end of the tool.
    2. Insert small end of tool into the choke shaft hole; start retainer into the counterbore in body and lightly drive retainer into body until it is flush with the machined surface.
  - (b) Insert the choke shaft (43) into the fuel bowl (23).
  - (c) Insert the choke plate (44) into the fuel bowl.

*Note.* Be sure the choke plate is located in the same position in the fuel bowl air intake as regards the poppet valve as when it was disassembled.
  - (d) Install choke plate screws (8) and lockwashers (7), using a small screwdriver.
  - (e) Install the shaft hole plug (22) and the fibre washer (21) and tighten.

- (f) Place the choke bracket (33) against the boss on the fuel bowl and install the choke bracket screw (34) and tighten.
- (g) Place the choke lever (35) on the choke shaft (43) and install the choke shaft nut (38) and lockwasher (37) using main discharge wrench.
- (h) Attach the choke lever spring (39) to the choke bracket (33) and the choke lever (35).

*Note.* Use the match-marks put on the choke lever, choke bracket, and fuel bowl during disassembly to properly align the choke assembly during reassembly.

- (2) Install main discharge jet (45) and fiber washer (19) in fuel bowl and tighten firmly with main discharge wrench.
- (3) Install the well vent jet (20) in fuel bowl and tighten with a small screwdriver.
- (4) Install main jet (25) and fiber washer (24) in large threaded passage beneath the fuel bowl, using main jet wrench.
- (5) Install the drain plug (hex) in threaded passage bottom of fuel bowl using plug wrench.
- (6) Install hex plug (26) and washer (21).

#### *b. Throttle Body.*

*Note.* Any throttle body of a Zenith 161 series carburetor can have throttle shaft bushings installed to return it to factory specifications as regards fit of throttle shaft. If the fit of the throttle shaft is sloppy in the throttle body and it is desired to use the same throttle body for reassembly of the carburetor, then, it is absolutely necessary to install throttle shaft bushings. A poorly fitting throttle shaft upsets idling of the engine, for the throttle plate will not be correctly located in reference to the idle discharge port, and also it is possible for additional air to be admitted into the throttle body around the shaft which will also tend to upset the idle. The following procedure should be adhered to properly install throttle shaft bushings in the carburetor.

- (1) Install the throttle shaft bushings as follows:

*Note.* To properly rebush the throttle body of the carburetor it is necessary to have available the proper counterbore reamer and line reamer and the bushing driver tool needed to install the new bushing. After the new throttle shaft bushing is in place it will be necessary to redrill the economizer restriction which is located in the cover and the channel from the throttle body bore into the throttle shaft hole. The throttle body should not be rebushed if the extent of the wear on the throttle body and shaft does not warrant it. However, if rebushing is necessary follow procedure below:

- (a) Place a suitable center in the drill press bed with one throttle shaft hole on this center. Bring the spindle down until the counterbore reamer contacts the opposite shaft hole. The reamer in this instance is of a diameter to result in a press fit for the outside diameter of the throttle shaft bushing.

- (b) With the casting still in place as described in (a) above, set the stop on the press to the length of the bushing. This will give you the approximate setting of the spindle travel.
- (c) The hole is then counterbored to accommodate the bushing.
- (d) A throttle shaft bushing is driven into place using the proper bushing driver tool.
- (e) Ream this bushing with the line reamer. Use the opposite shaft pole as a "pilot" to "aline" the line reamer in the bushing.
- (f) Now turn the casting over and prepare the opposite hole to take the bushing. It will be necessary to reset the stops on the spindle again as described before. Then counter-bore the hole.
- (g) Drive the second throttle shaft bushing into position.
- (h) Then line ream the inside diameter as the final machining operation; the casting is now ready for reassembly.

*Note.* A lathe may be substituted for the drill press in performing the counterboring and line reaming operations.

- (2) Install the two new throttle shaft packings (4) and retainers (5) in throttle body as follows; using a bushing driver tool.
  - (a) Assemble packing (4) and retainer (5) and place the completed assembly on the bushing driver tool with packing facing the small end of the tool.
  - (b) Insert the small end of tool into the throttle shaft hole, start retainer (5) into the counterbore of the body (3), and lightly drive retainer into body until it is flush with the machined surface.

*Note.* The packing retainer must be flush with the machined surface or slightly below to avoid striking throttle lever.

- (3) Install the throttle shaft and stop lever assembly (6), throttle plate (2), screws (8), and lockwashers (7) as follows:
  - (a) Insert the throttle shaft and stop lever assembly (6) in the throttle body (3).
  - (b) Rotate the throttle shaft (6) to wide open position, insert throttle plate (2), and rotate to closed position holding the plate in position with fingers.
  - (c) Start throttle plate screws (8) and lockwashers (7) and tighten with small screwdriver, being sure that the throttle plate (2) is properly centered in the throttle body bore.

*Note.* The screw holes in the throttle plate are off center. Start the side of the throttle plate, with the shortest distance between the screw holes and beveled edge, into the shaft first. The throttle plate is made with two opposite edges beveled to fit the throttle body bore when the plate is closed. The throttle plate will not close tightly if installed upside down. To properly center the plate in

the throttle body bore, start the screws in the shaft and with the plate closed, tap on the mounting flange side. Pressure on the plate must be maintained with the fingers until the screws are tightened. When properly installed, the side of the throttle plate farthest away from the mounting flange will be aligned with the idle port when the plate is closed.

- (4) Install throttle clamp lever in the same position as removed. Refer to match-marks placed on lever and throttle body during disassembly.
- (5) Install idle adjusting needle (10) and friction spring (11) in the threaded passage on the side of the throttle body. Seat lightly with screwdriver and back out  $1\frac{1}{4}$  full turns.
- (6) Install idle jet (12) in counterbored passage in the machined surface.
- (7) Install fuel valve seat (14) and fibre washer (13) using fuel valve seat wrench.
- (8) Place new throttle body-to-fuel bowl gasket (17) on the machined surface of the throttle body.
- (9) Install fuel valve needle (14) in the seat followed by float (15) and float axle (16).
- (10) Check position of float assembly for correct measurement as follows:
  - (a) With throttle body assembly in an inverted position, viewed from the free end of the float (15), the float bodies must be centered and at right angles to the machined surface as shown in figure 64. The float setting is measured from the machined surface (no gasket) of cover to top side of float bodies at the highest point. This distance shall be  $1\frac{5}{32}$ -inch plus or minus  $\frac{3}{64}$ -inch.
  - (b) To increase or decrease distance between the float body and the machined surface use a pair of long-nosed pliers and bend the lever close to the float body. Replace with a new float if the position is off more than  $\frac{1}{16}$  inch.
- (11) Insert venturi (18) in throttle body bore, large opening first.

*c. Assemble Carburetor Bodies.*

- (1) Assemble the two completed bodies (3 and 23) and the four screws (27) and lockwashers (28) and tighten screws evenly and firmly.
- (2) Install the hex plug (29) in the threaded passage in the throttle body.
- (3) Hold the throttle lever (6) in a closed position and turn the throttle stop screw (9) until it just contacts the stop on the body (3); then turn the screw in  $1\frac{1}{2}$  additional turns.

*d. Install carburetor to engine. Refer to paragraph 75c.*

*e. Adjust carburetor. Refer to paragraph 75d.*

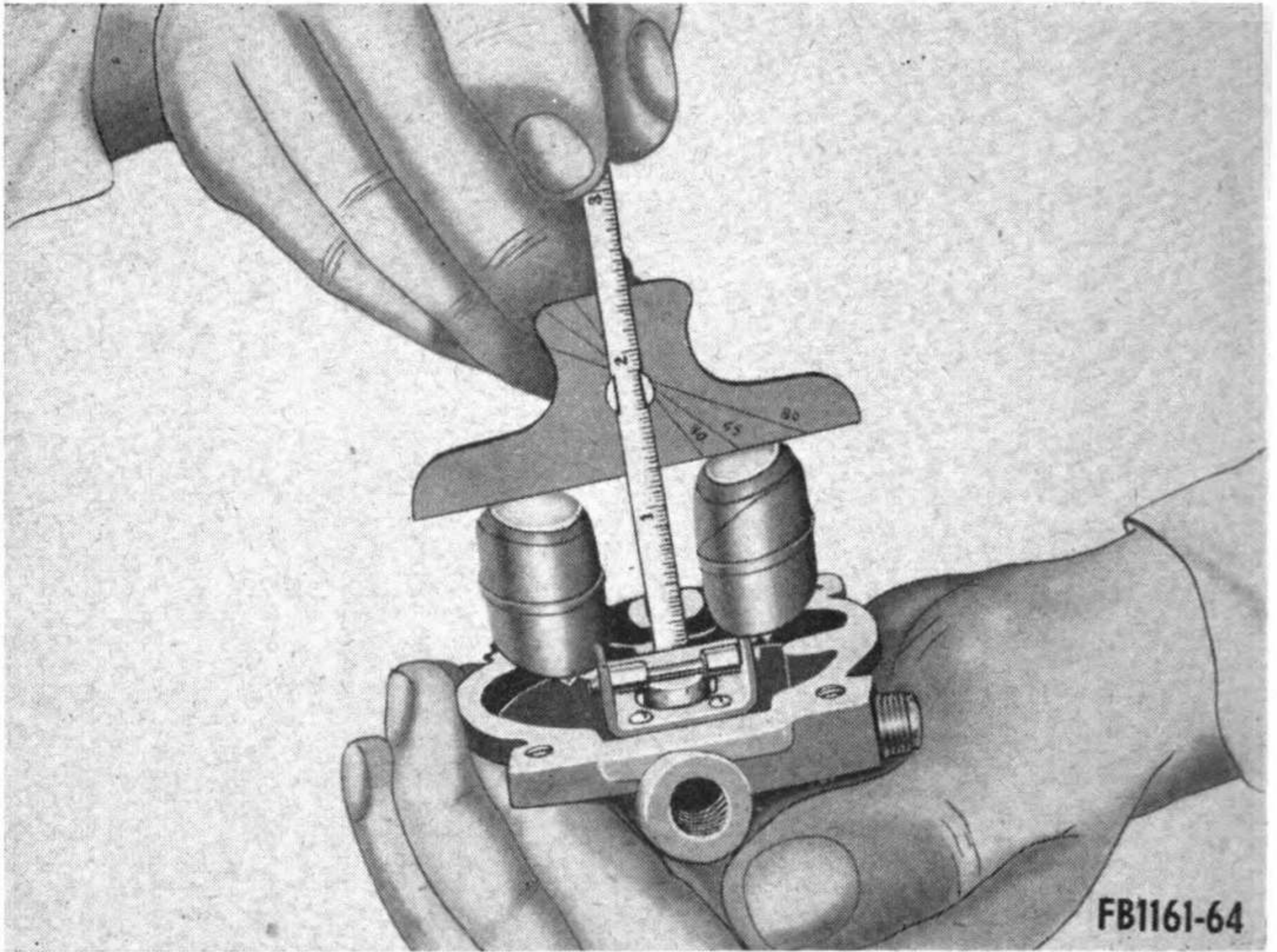


Figure 64. Measuring the float setting.

## Section V. FUEL PUMP

### 118. Description

The fuel pump contains a flexible diaphragm which pumps fuel from the fuel tank to the carburetor. The diaphragm is pulled down by a linkage connected to the engine camshaft, and this draws fuel into the pump. The diaphragm is forced up by a spring, pushing fuel into the carburetor. One suction and one discharge valve are used.

### 119. Fuel Pump Disassembly

- a. Remove fuel pump from engine (par. 72a).
- b. With a file make an indicating mark on the fuel head (8, fig. 65) and mounting bracket (23) so they can be reassembled in the right position.
- c. Remove the dome bolt (1) and the dome (3), as well as the dome gasket (4) and the filter screen (5).
- d. Remove the six screws (6) and lockwashers (7); lift off the fuel head.
- e. Remove the three valve plate screws (14) from the fuel head (8); remove the valve plate (13), valves (11) and valve springs (10), valve plate gasket (12), and valve spring retainer (9).
- f. To disconnect the diaphragm (15) from the link (20), hold the link up by pressing down on the rocker arm and pressing the diaphragm down and away from the link.

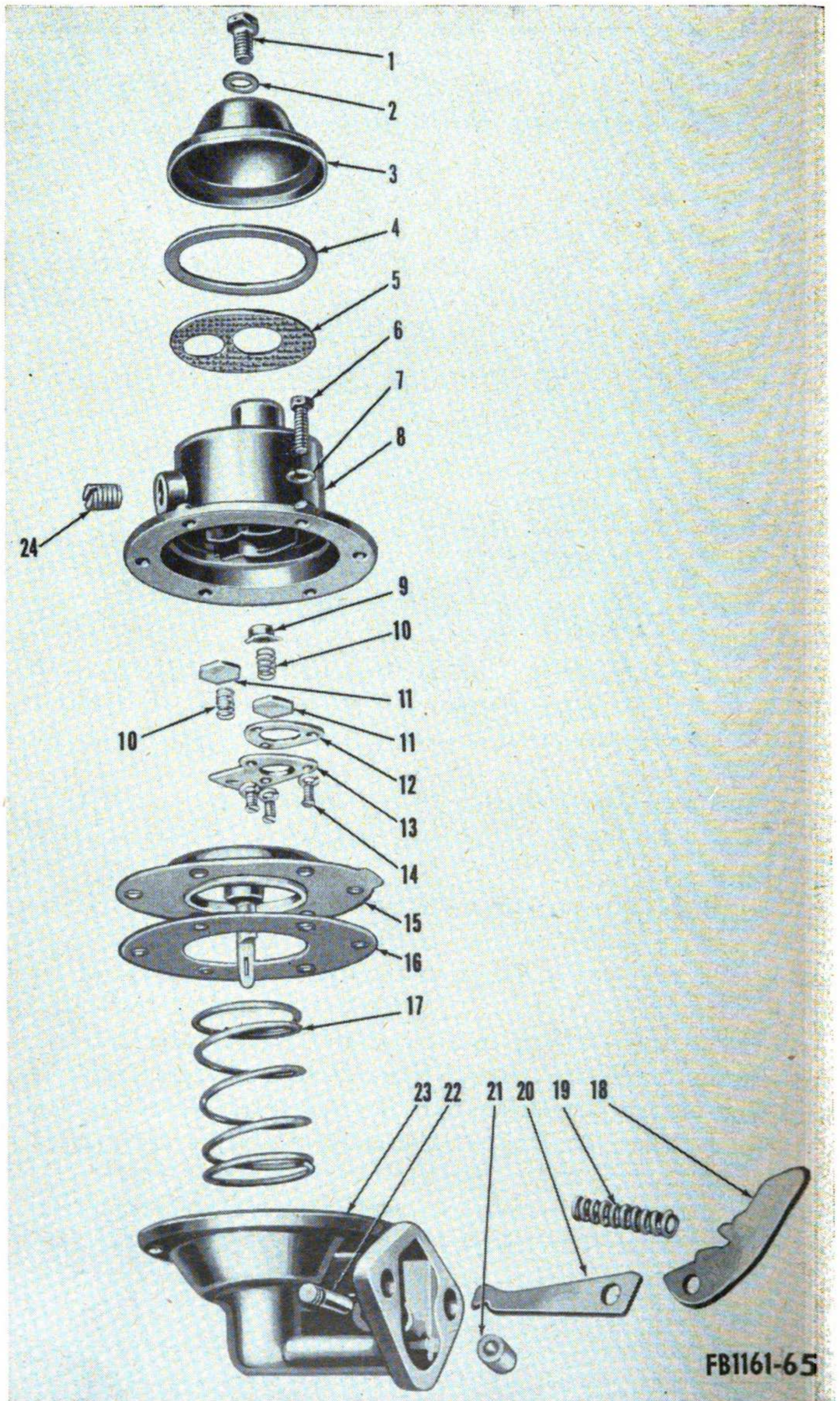


Figure 65. Fuel pump, exploded.

1 Dome bolt	13 Valve plate
2 Dome bolt gasket	14 Valve plate screws
3 Dome	15 Diaphragm
4 Dome gasket	16 Gasket
5 Filter screen	17 Diaphragm spring
6 Assembly screws	18 Rocker arm
7 Lockwasher	19 Rocker arm spring
8 Fuel pump head	20 Link
9 Valve spring retainer	21 Bushing
10 Valve spring	22 Rocker arm pin
11 Valve	23 Mounting bracket
12 Valve plate gasket	24 Pipe plug

Figure 65—Continued.

*h.* Push up on the rocker arm (18) enough to hold the diaphragm level, and install the fuel head on the mounting bracket, lining up the marks made prior to disassembly, and just starting the six screws (6) and lockwashers (7). Push the rocker arm up as far as it will go, and tighten the screws.

*i.* Install the fuel pump and fuel pump adapter (par. 72*c*).

## Section VI. GOVERNOR

### 122. Description

The centrifugal flyball governor rotates on a stationary pin in the timing-gear cover, and is driven off the camshaft gear at crankshaft speed. Flyweights are hinged to the lugs on the drive gear, and have pins which bear against the sliding sleeve, moving it back and forth as the flyweights move in or out. A bearing on the end of the sleeve transmits the motion of the sleeve to the governor lever, which is connected to the carburetor throttle lever. A spring connected to the governor lever tends to hold the flyweights in, and hold the carburetor throttle open. As engine speed increases, centrifugal force in the flyweights acts against the spring and closes the throttle to a point where engine speed will be maintained practically constant under varying load conditions.

### 123. Engine Governor Disassembly

- a.* Remove the governor from the engine (par. 76*a*).
- b.* Lift out gear (12, fig. 66) with flyweight attached.
- c.* Lift flyweights (11) and remove thrust sleeve and bearing (8).
- d.* Drive out the flyweight fulcrum pins (10) after removing cotter pins.
- e.* Press out gear bushing (13) from gear (12).
- f.* From the governor housing remove the straight fitting (20) and the pipe plug (4).



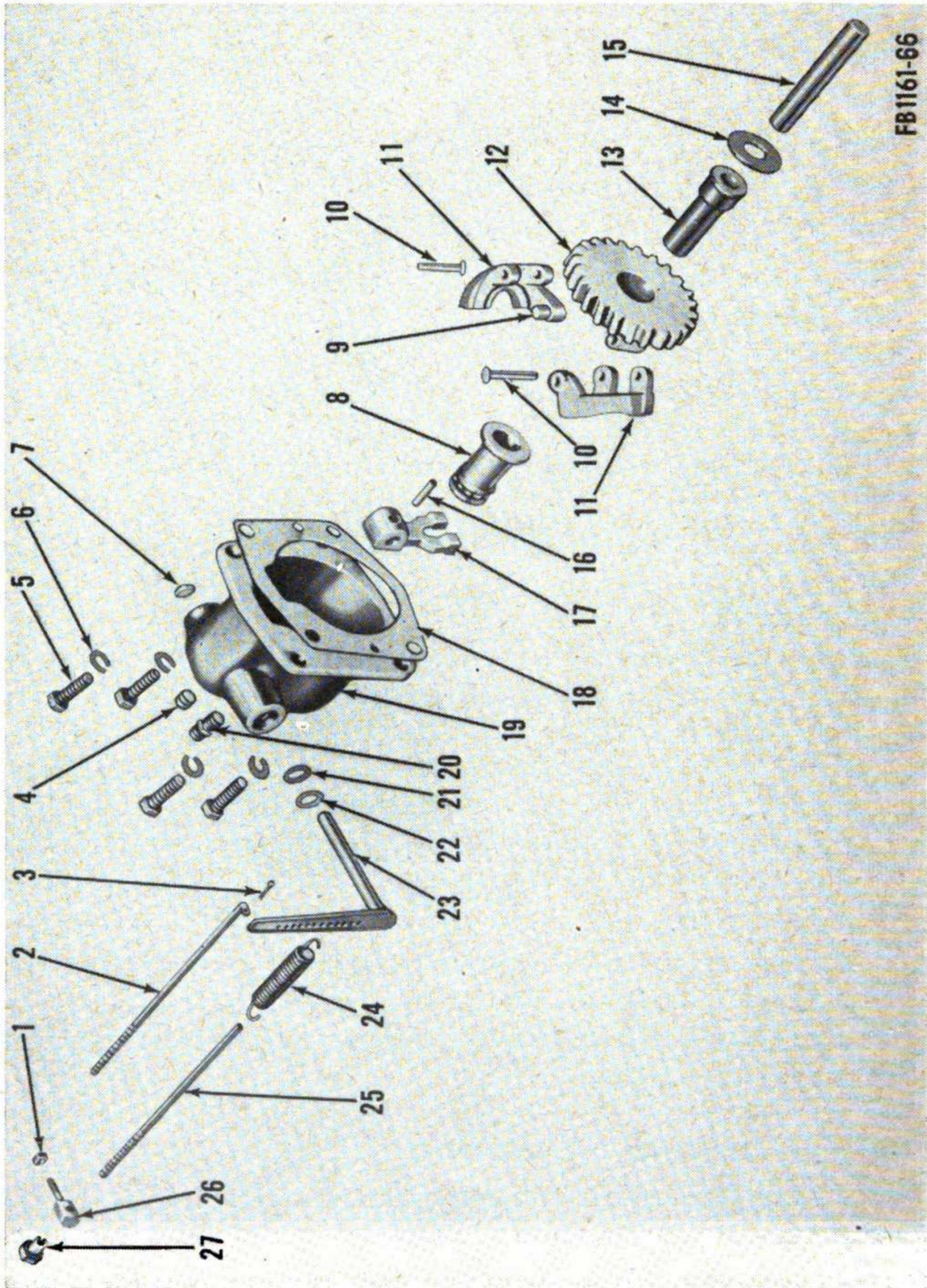


Figure 66. Governor, exploded view.

- |    |                           |    |                           |
|----|---------------------------|----|---------------------------|
| 1  | Nut                       | 15 | Governor drive shaft      |
| 2  | Governor control rod      | 16 | Taper pin                 |
| 3  | Cotter pin                | 17 | Yoke                      |
| 4  | Pipe plug                 | 18 | Housing gasket            |
| 5  | Cap screw                 | 19 | Housing                   |
| 6  | Lockwasher                | 20 | Straight fitting          |
| 7  | Expansion plug            | 21 | Cross shaft seal          |
| 8  | Thrust sleeve and bearing | 22 | Cross shaft seal retainer |
| 9  | Thrust pin                | 23 | Cross shaft and lever     |
| 10 | Flyweight fulcrum pins    | 24 | Governor spring           |
| 11 | Flyweight                 | 25 | Governor adjusting screw  |
| 12 | Drive gear                | 26 | Adjusting screw pin       |
| 13 | Gear bushing              | 27 | Adjusting screw nut       |
| 14 | Bushing washer            |    |                           |

*Figure 66---Continued.*

*g.* Reach into the housing and pull out the yoke taper pin (16) from the yoke (17).

*h.* Pull out the cross shaft and lever (23), and with it the cross shaft seal retainer (22) and the cross shaft seal (21).

*i.* Drift out the governor drive shaft (15) from the gear cover.

## **124. Governor Cleaning, Inspection, and Repair**

*a.* Clean all parts in an approved cleaning solvent, and dry thoroughly.

*b.* Inspect the face of the thrust sleeve (at the opposite end from the bearing) to see if there is excessive wear.

*c.* Turn the bearing on end of the thrust sleeve to see if balls are worn out-of-round, and turning is no longer smooth; replace if defective.

*d.* Check the face of the gear bushing to see if it is worn through contact with the washer; replace if necessary.

*e.* Slip the gear bushing on the shaft and determine whether there is too loose a fit. (A sliding fit of 0.0015 is proper.) Replace one or both items.

*f.* Check the ends of the pivot pins which engage with the thrust sleeve to see if they have become rough, worn, or otherwise defective.

*g.* Reassemble the flyweights on the gear with the flyweight fulcrum pins and move each flyweight to see if the fulcrum pins have become worn enough to cause looseness. Replace pins or flyweights if necessary.

*h.* Check the yoke for signs of roughness or cracks.

*i.* Inspect the condition of the oil line fitting to make sure there is no leak at this point; replace if necessary.

*j.* Cut out a new governor housing gasket to replace the old one. The distance in the travel of the thrust sleeve is predetermined; and the thickness of the gasket is a factor in maintaining this correct travel distance. Any cut that may be taken on the face of the thrust sleeve will increase this travel. A slightly thicker gasket or shims should be used to compensate for this change.

## **125. Governor Reassembly**

*a.* Drift the governor drive shaft (15, fig. 66) in the engine gear cover and replace the bushing washer (14) on the shaft.

*b.* Install the cross shaft and lever (23) along with the cross shaft seal (21) and cross shaft seal retainer (22) in the housing.

*c.* Install the expansion plug (7).

*d.* Install the pin (16) in the yoke (17).

*e.* Install the straight fitting (20) and the pipe plug (4) in the governor housing.

*f.* Press the gear bushing (13) into the drive gear (12).

*g.* Reassemble the flyweight assembly by securing the flyweights (11) to the gear with the flyweight fulcrum pins (10) and placing the cotter pins in the fulcrum pins.

*h.* Slip the thrust sleeve and bearing (8) over the flyweights on to the gear bushing (13) so that the thrust pins (9) engage the back flange of the sleeve.

*i.* Install the flyweight assembly on the shaft (15) in the engine gear cover.

*j.* Install the governor on the engine (par. 76*b*).

*k.* Adjust the governor linkage (par. 76*d*).

## **Section VII. TANK, CATWALK AND SKIRTING**

### **126. Tank Removal**

*a.* Remove piping on water distributor as covered in paragraphs 88 and 89.

*b.* Remove water distributor pump (par. 83).

*c.* Remove engine and fuel tank (par. 73).

*d.* Remove engine and pump base (11, fig. 1) by removing nuts, bolts, and washers holding it through the platform to the upper distributor frame.

*e.* Unbolt the handrails on the rear platform and remove. Unbolt the toolbox (11, fig. 2) and remove from the catwalk.

*f.* Remove spare wheel (10) and spare wheel bracket. Remove hose lines (8).

*g.* Disconnect the rear truck taillights (15, fig. 1). Disconnect the clearance and blackout lights (16) from the rear fender and from the front skirting (12, fig. 2).

*h.* Unbolt the sections of skirting around the catwalk and remove from the catwalk.

*i.* Unbolt the sections of catwalk from the catwalk brackets and remove.

*j.* Unsnap and drop the ends of the wire rope sling.

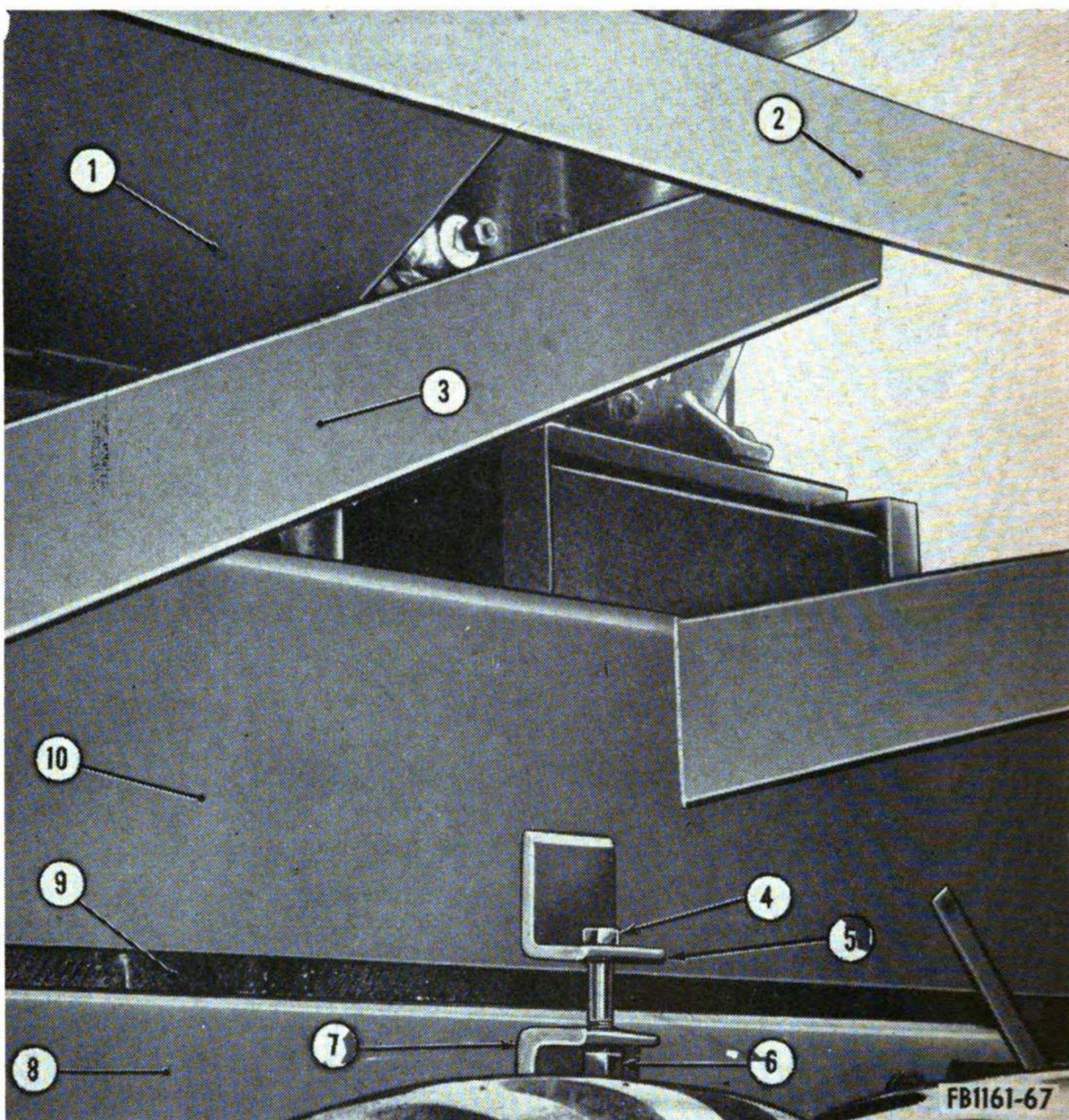
*k.* Remove the manhole assembly (par. 94).

*l.* Remove the bolts (4, fig. 67) and nuts (6) which clamp together the pairs of brackets (5 and 7) holding tank frame (10) to the distributor chassis (8).

*m.* Prepare a suitable base of timbers on which to set the tank, near the distributor.

*n.* Bring a crane to the site to lift the tank and the tank frame off the distributor chassis.

*o.* Use a lifting bar of at least 1-inch diameter, fabricated so that the crane hook will lift at the center of balance. Slip the bar into the tank manhole and center it. Make sure the bar is wider than the manhole yet can be inserted.



- |                       |                       |
|-----------------------|-----------------------|
| 1 Tank                | 6 Nut                 |
| 2 Catwalk beam        | 7 Lower clamp bracket |
| 3 Catwalk bracket     | 8 Chassis             |
| 4 Bolt                | 9 Wood sleeper        |
| 5 Upper clamp bracket | 10 Tank frame         |

Figure 67. Frame, chassis, and catwalk brackets.

*p.* Lift the tank up and off and set it down on the prepared bed of timbers.

## 127. Tank Cleaning, Inspection and Repair

*a. Cleaning.* Steam clean the interior of the tank thoroughly, being sure to clean the corners and each side of the central bulkhead. Clean the catwalk brackets with a wire brush.

*b. Inspection.*

- (1) Inspect the spot welds which hold the tank to the frame for breaks or cracks.
- (2) Inspect the interior of the tank for rusting.
- (3) Check to see that the bulkhead is securely welded to the tank interior and that the welds are unbroken.

(4) Check the condition of the catwalk brackets for rust.

*c. Repair.*

(1) Perform the necessary welding on those welds which are broken or cracked, either in the tank, or at the spot welds holding tank to frame, or at welds which hold catwalk brackets to frame, or small clamping bracket to the frame.

(2) Use a wire brush on those places where rust is evident preparatory to painting.

(3) Recoat with rustproof paint those places where there is none, due either to wear or wire brush cleaning.

## **128. Tank Installation**

*a.* Reassemble manhole cover assembly (par. 94).

*b.* Using the crane and lifting bar used to remove the tank, lift the tank and place it back on the chassis, on the wood sleepers, using care to guide it so that the clamping brackets of the tank frame are alined with the clamping brackets of the chassis.

*c.* Replace the bolts (4, fig. 67), nuts (6), and washer which clamp together the pairs of brackets (5 and 7) holding the tank frame to the distributor chassis.

*d.* Lift the ends of the wire rope slip and snap them into position on the tank.

*e.* Bolt the sections of catwalk on the catwalk brackets.

*f.* Re-bolt the sections of skirting around the catwalk.

*g.* Connect the rear truck tail lights (15, fig. 1). Connect the clearance and black out lights (16) at the rear fender and at the front skirting (12, fig. 2).

*h.* Install the spare wheel bracket on the tank body and place spare wheel and tire (10) back on the bracket.

*i.* Bolt the toolbox (11) on the catwalk and the handrails on the rear part of the catwalk which is used as the operator's platform.

*j.* Bolt the frame (11, fig. 1) which serves as the base for the engine and pump back on the operator's platform at the rear of the truck.

*k.* Install engine and fuel tank on the engine-pump base (par. 73).

*l.* Install pump on the engine-pump base (par. 83).

*m.* Install piping and valves on the water distributor as covered in paragraphs 88 and 89.

## **129. Skirting and Catwalk Disassembly and Maintenance**

*a.* Remove catwalk sections and skirting sections (par. 128).

*b.* Clean the sections with water and a stiff brush.

*c.* Inspect for rust on catwalk and skirting sections.

*d.* Inspect nuts, and bolts for stripped threads.

*e.* Clean rust spots with a wire brush and replace any panels that require it. Replace needed nuts, bolts, washers.

*f.* Replace catwalk and skirting sections (par. 128).

## Section VIII. ENGINEERING DATA

### 130. Magneto

Breaker-point clearance..... 0.015 inch

### 131. Spark Plug

Gap..... 0.030 inch

Torque wrench pull..... 25-30 foot-pounds

### 132. Centrifugal Pump

Clearance between wear plate and impeller..  $\frac{1}{32}$  inch

### 133. Carburetor

Float setting.....  $1\frac{5}{32} \pm \frac{3}{64}$  inch

### 134. Governor

Sliding fit of gear bushing on shaft..... 0.0015 inch

---

## CHAPTER 5

# SHIPMENT, LIMITED STORAGE, AND DEMOLITION TO PREVENT ENEMY USE

### Section I. SHIPMENT AND LIMITED STORAGE

#### 135. Limited Storage

*a. Inspection.* Inspect the entire unit thoroughly in accordance with the instructions contained in paragraph 53.

*b. Cleaning and Painting.*

(1) *Cleaning.* If possible, steam clean the entire distributor or wash all external surfaces with an approved cleaning solvent. Do not allow the solvents to contact rubber or fabric parts. Use compressed air, if available, to dry all parts thoroughly. Make sure all water or solvent is removed from all recesses.

(2) *Painting.*

(a) *Preparation for painting.* After cleaning and drying but before painting make certain that the existing paint on the distributor or parts has not deteriorated and that the surface has not rusted. Clean rust off with a wire brush or sandpaper. Then paint all exposed metal surfaces except polished and machined surfaces. Take care to prevent paint from striking and entering the screens or orifices of filters and air cleaners. Keep paint away from valves, spraybar nozzles, and the pump engine.

(b) *Painting.* Refer to TM 9-2851 for painting instructions.

(3) *Tank.* Recoat the interior of the tank if necessary with an approved rust preventive.

(4) *Wire rope.* Clean the surface of wire rope and coat with preservative, CWIIB, SN 14-L-181-25; if not available, type P-1 preservative, crater compound, or heavy grease will be used.

*c. Complete Lubrication.* Refer to the lubrication instructions (par. 48) for the distributor unit and TM 9-837 for the truck.

*d. Protection in Storage.*

(1) *Usual Conditions.*

(a) Pump all water out until the tank is delivering no more water to the pump; then remove the drain plug at the



- bottom of the pump and drain the pump completely. Replace the drain plug.
- (b) Remove caps at each end of the discharge piping, leading to the spraybar assembly and the caps at the swivel joints, and allow water to drain; replace caps.
  - (c) Secure in place with wire the spraybar extensions, suction and discharge hoses, water tank measuring stick, and toolbox lid.
  - (d) Fill the fuel tanks of both the truck and pump engine, if the unit is to be stored out of doors.
  - (e) Close all canopies and doors and lash a protective covering over the pump engine.
- (2) *Unusual conditions.* If the unit is to be stored outdoors in an area subject to extreme heat, cold, humidity, snow or rain, or sand and dust, special precautions must be taken to protect the unit, in addition to the precautions listed in (1) above. Apply preservative tape to the lights, reflectors, engine muffler, suction and discharge hose strainers and ends, and the pressure gage. Seal the engine house with tape, and cover the magneto with tape.

### **136. Domestic Shipment**

*a. General.* Prepare the water distributor as described in paragraph 135.

*b. Method of Shipment.* This unit may be shipped in end door boxcars or on flatcars, the latter being preferable.

*c. Loading.* It is recommended that the water distributor be driven completely assembled under its own power when being placed on a flatcar.

*d. Blocking.* When the truck is in the right position on the flatcar, nail 12 beveled blocks (about 24 x 12 x 6) to the floor of the car in front and behind each wheel. Place six straps (10 gage x 1 band iron) over the axles and nail to the floor. No disassembly is necessary when shipping in either type of car.

## **Section II. DEMOLITION OF THE WATER DISTRIBUTOR TO PREVENT ENEMY USE**

### **137. General**

When capture or the abandonment of the water distributor is imminent, the responsible unit commander makes the decision either to destroy the unit or to render it inoperative. Based on this decision, orders are issued which cover the desired extent of destruction. Whatever method of demolition is employed, it is essential to destroy the same vital parts of all water distributors and all corresponding repair parts.

## 138. Preferred Demolition Methods

Explosives and mechanical means, either alone or in combination, are the most effective methods to employ. Listed below are the vital parts in order of priority of demolition for each preferred method. In each case, completion of the first two steps will render the unit inoperative. Completion of the additional steps listed will further destroy the unit.

*a. Explosives.* Place as many of the following charges as the situation permits and detonate them simultaneously with detonating cord and a suitable detonator.

*Note.* Refer to TM9-837 for demolition methods for the truck.

- (1) A 2-pound charge inside the water tank.
- (2) A 2-pound charge at the pump-to-engine coupling.

*Note.* The above charges are the minimum requirements for this method.

- (3) A 1/2-pound charge at the pressure regulating valve.
- (4) A 1-pound charge wedged between each of the two right rear dual tires.

*b. Mechanical Means.* Use sledge hammers, crowbars, picks, axes, or any other heavy tools which may be available, together with the tools normally included with the water distributor, to destroy the following:

- (1) Engine magneto.
- (2) Pump housing.

*Note.* The above steps are the minimum requirements for this method.

- (3) Piping valves.
- (4) Engine valves.
- (5) Water tank.

## 139. Other Demolition Methods

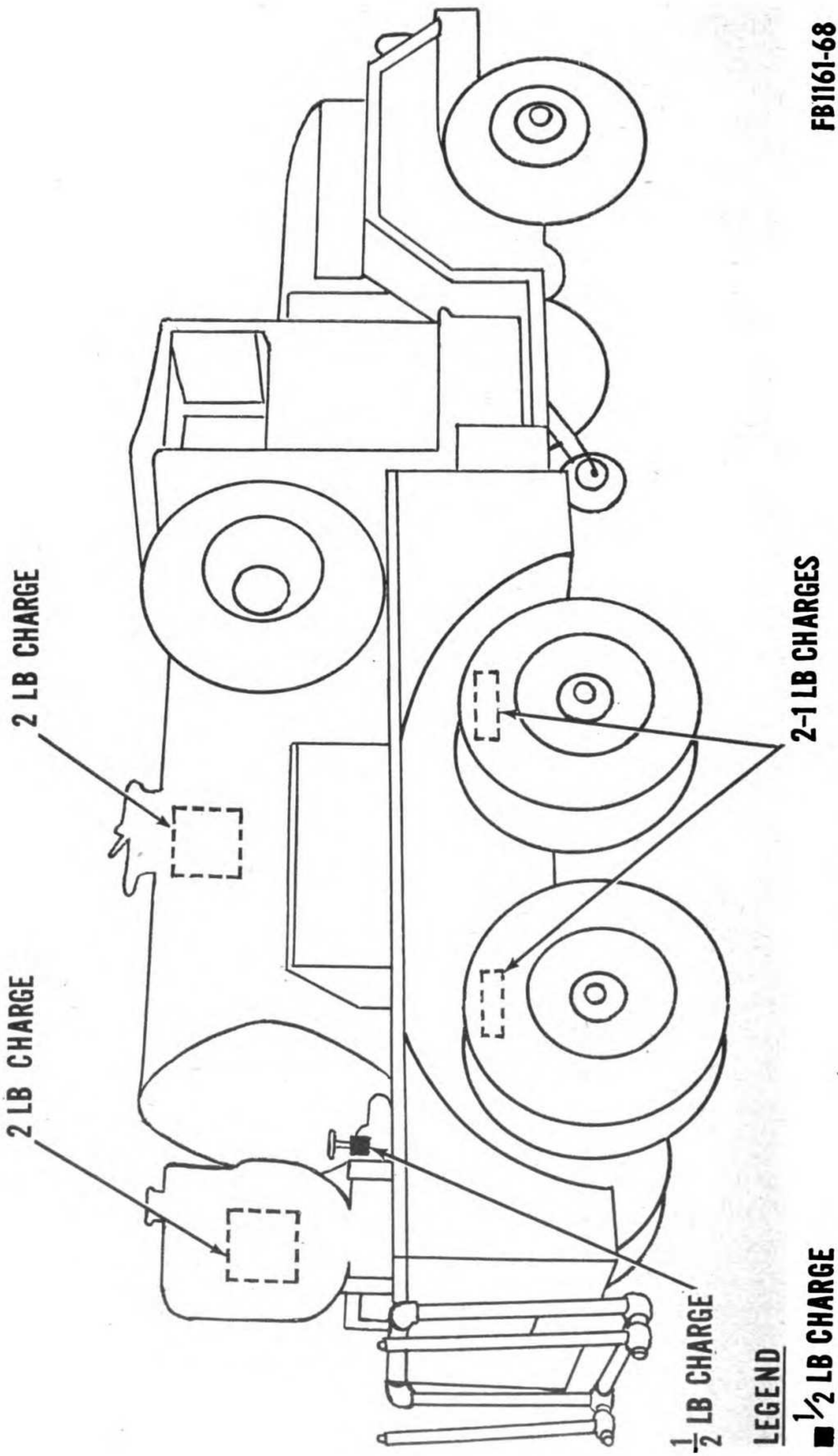
If the situation prevents the use of either of the preferred methods, use the following, either singly or in combination.

*a. Weapons Fire.* Fire on the water distributor with the heaviest weapons available.

*b. Scattering and Concealment.* Remove all easily accessible vital parts, such as magneto, carburetor, and water valve parts, and scatter them through dense foliage, bury them in dirt or sand, or throw them in a lake, stream, well, or other body of water.

*c. Burning.* Pack rags, clothing, or canvas under and around the unit. Saturate this packing with gasoline, oil, or diesel fuel, and ignite.

*d. Submersion.* Totally submerge the unit in a body of water to afford some water damage and concealment. Salt water will do the greatest damage to metal parts.



FB1161-68

Figure 68. Placement of charges.

*e. Collision.* Set steering and allow unit to run under its own power into a ditch, tree, wall, or over a cliff or embankment.

*f. Misuse.* The steps listed below will make the unit inoperative:

- (1) Drain oil from engine.
- (2) Fill gasoline tank and oil crankcase with sand or dirt.
- (3) Remove the pump priming cover and fill with sand, dirt, small tools, or debris.
- (4) Adjust the throttle on the engine to run at full speed until failure occurs.

## **140. Training**

All operators should receive thorough training in the destruction of the water distributor. Simulated destruction, using all the methods listed above, should be included in the operator training program. It must be emphasized in training that demolition operations are usually necessitated by critical situations, when the time available for destruction is limited and be thoroughly familiar with all methods of destruction and be able to carry out demolition instructions without reference to this or any other manual. (Refer to FM 5-25.)

## APPENDIX

### REFERENCES

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#### 1. Accessory Equipment

- TM 9-837 5-Ton, 6 x 6, Cargo Truck M41, M54, and M55; Cargo Van Truck M64; Chassis Truck M40, M61, M63, and M139; Dump Truck M51; Medium Wrecker Truck M62; and Tractor Truck M52
- TM 5-5193 Wisconsin Air-Cooled, Heavy-Duty Engine; Instruction Book and Parts List, Models VE4 and VF4

#### 2. Dictionaries of Terms and Abbreviations

- SR 320-5-1 Dictionary of United States Army Terms
- SR 320-50-1 Authorized Abbreviations

#### 3. Lubrication and Painting

- LO 5-1161 Distributor, Water, Truck Mounted, 1000 Gallon Capacity, Gasoline Driven, Rosco Model MOE (Less Engine) (Less Truck)
- TM 9-2851 Painting Instructions for Field Use

#### 4. Preparation for Export Shipment

- TB 5-9711-1 Preparation of Corps of Engineers Equipment for Oversea Shipment
- TB 5-9713-1 Preparation for Export, Spare Parts for Corps of Engineers Equipment

#### 5. Preventive Maintenance

- TB 5-1161-1 Distributor, Water, Truck Mounted, 1000 Gallon Capacity, Gasoline-Driven, Rosco Model MOE (Less Engine) (Less Truck)

#### 6. Publication Indexes

- DA Pam 108-1 Index of Army Motion Pictures, Television Recordings, and Filmstrips
- DA Pam 310-1 Index of Administrative Publications
- DA Pam 310-3 Index of Training Publications

- DA Pam 310-4    Index of Technical Manuals, Technical Regulations, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders
- DA Pam 310-25    Index of Supply Manuals, Corps of Engineers
- SM ENG 1        Introduction

## **7. Training Aids**

FM 21-8    Military Training Aids

## **8. Demolition**

FM 5-25    Explosives and Demolition

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[AG 451.7 (6 June 55)]

BY ORDER OF THE SECRETARY OF THE ARMY:

M. B. RIDGWAY,  
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ing TOE's:  
5-48A, Engr Sup Point Co  
(2)  
5-157, Engr Fld Maint Co (2)  
5-262, Hq & Hq Co, Engr  
Maint-Sup Gp (2)  
5-267, Engr Depot Co (2)  
5-278A, Engr Depot Maint  
Co (2)  
5-279A, Engr Parts Depot  
Co (2)

NG: State AG (6); units—same as Active Army except allowance is one copy to each unit.

USAR: None.

For explanation of abbreviations used, see SR 320-50-1.