TM 5-9585

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

CONVEYOR
DRAG TYPE PILER
SELF-PROPELLED
CRAWLER MOUNTED
GASOLINE DRIVEN
35 FT LONG, 75 TON
PER HR CAPACITY
BARBER-GREENE MODEL 689
(LESS ENGINE)

DEPARTMENT OF THE ARMY • *MARCH 1956*

AGO 10200B—April

SAFETY PRECAUTIONS

When unloading the conveyor from a carrier, using a ramp, attach a snubbing line to the frame of the machine in the tie point rings to avoid the possibility of the machine "getting away" down the ramp.

Do not fill the fuel tank while the engine is running. Gasoline spilled on a hot engine may vaporize and ignite.

When handling gasoline, always provide a metallic contact between the container and the tank. This will prevent a spark from being generated as gasoline flows over the metallic surfaces.

Never run the conveyor without oil pressure showing on the engine oil gage.

Make sure the choke valve is wide open when the engine is running at operating temperature.

Devices such as a governor to control engine speed, air cleaner, and oil filter are provided to prolong the engine life. Failure to maintain them in operating condition or to replace them when they become inoperative will result in greatly decreased engine life.

When using the electrical starter to start the engine, if the engine fails to start in 15 seconds allow a minute interval between attempts.

When using the starting crank to start the engine, keep the thumb on the same side of the handle as the fingers to avoid injury should the engine kick. Never attempt to spin the crank.

When operating in extreme cold, do not stop the engine until it has run long enough to warm the oil in the crankcase and vaporize any moisture which may have condensed when the engine was last stopped. The time necessary to warm the engine will depend upon the air temperature.

If the engine overheats because of lack of coolant, allow it to cool before filling the radiator; otherwise there is danger of cracking the block. If it is necessary to fill the radiator before the engine has cooled, be sure to fill it very slowly with the engine running at fast idling speed.

No. 5-9585
TECHNICAL MANUAL

DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., *13 March, 1956*

CONVEYOR, DRAG TYPE, PILER, SELF-PROPELLED, CRAWLER MOUNTED, GASOLINE DRIVEN, 35 FT LONG, 75 TON PER HR CAPACITY, BARBER-GREENE MODEL 689 (LESS ENGINE)

CHAPTER 1
INTRODUCTION

Section I. GENERAL

1. Scope

This manual is published for the use of the personnel to whom this conveyor is issued. It contains information on the operation and organizational maintenance, and field and depot maintenance of the conveyor as well as a description of the major units and their function in relation to other components of the materiel. It applies only to the Barber-Greene Model 689.

Note. It is requested that any errors or suggestions for improvement of this manual be brought to the attention of The Commandant, The Engineer School, Fort Belvoir, Va., ATTN: TECES–TP. Direct communication is authorized.

2. Record and Report Forms

The following maintenance record forms 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 9–77 (Job Order Register).

e. DA Form 9–79 (Parts Requisition).

f. DA Form 9–81 (Exchange Part or Unit Identification Tag).

g. DA Form 285 (Accident—Report of Individual Accident).

h. DA Form 446 (Issue Slip).

i. DA Form 447 (Turn-in-Slip).

j. DA Form 460 (Preventive Maintenance Roster).

k. DA Form 464 (Work Sheet for Preventive Maintenance and Technical Inspection of Engineer Equipment).

l. DA Form 468 (Unsatisfactory Equipment Report).

m. DA Form 478 (Organizational Equipment File).

n. DA Form 811 (Work Request and Job Order).

o. DA Form 867 (Status of Modification Work Order).

p. DD Form 6 (Report of Damaged or Improper Shipment).

q. DD Form 110 (Vehicle and Equipment Operational Record).

r. DD Form 518 (Accident-Identification Card).

s. Standard Form 91 (Operator's Report of Motor Vehicle Accident).

Section II. DESCRIPTION AND DATA

3. Description

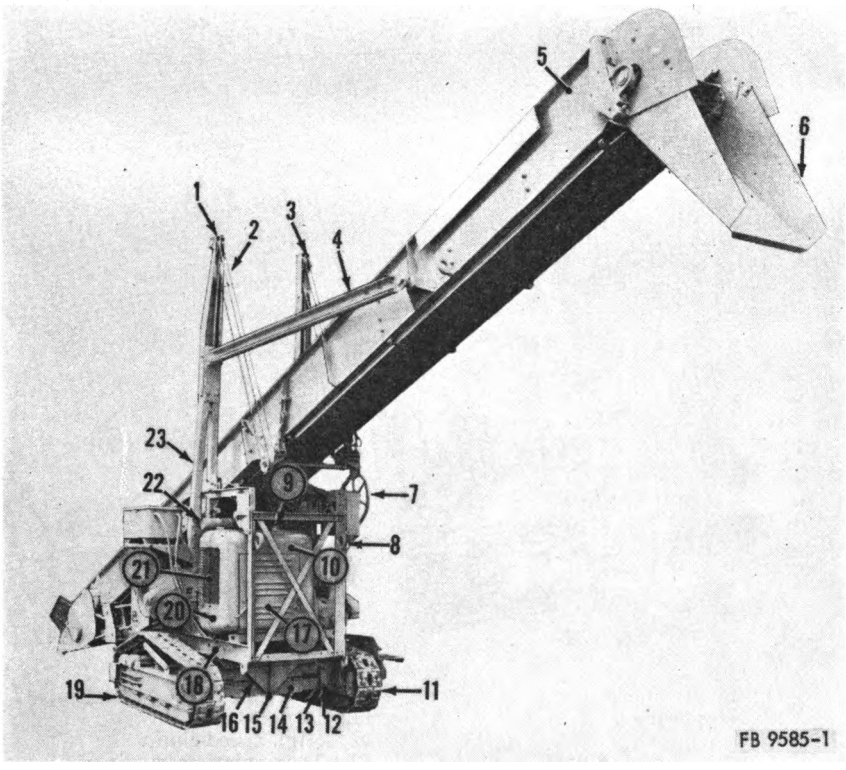
a. General Information. The conveyor, Barber-Greene Model 689 is a self-contained unit mounted on two crawler tracks (11, fig. 1) and (19) complete with all controls, switches, and indicators necessary for normal operation. The engine is enclosed in a housing at the head end or unloading side of the unit. Removable side panels (17) in the engine housing give access to the engine and engine accessories. The engine housing is supported on an angle framework mounted on the crawler unit. The main frame (18) supports the shaft transmission housing (13, fig. 2), the lower push arm (11), and the lower mast (23, fig. 1). The conveyor uses an engine to drive a jackshaft. The jackshaft engages the crawler clutch shaft through either a high speed chain (12, fig. 2) or gear drive. The flight line and hoist line are driven off the jackshaft. The crawler oscillating shaft is driven off the crawler clutch shaft by the crawler drive chain (15). The crawler tracks are driven off the oscillating shaft. The conveyor boom (5, fig. 1) is raised and lowered on the mast by the power hoist (5, fig. 2). The flight line roller chain (8) drives the flights (7), carrying the material up the conveyor boom. The material being conveyed is loaded at the foot end and discharged at the head end.

b. Engine. The engine is a Continental Model FS162–6008, a four-cylinder, water-cooled, L-head type, gasoline unit. Accessories necessary to adapt the basic engine to this application are covered in this manual.

c. Conveyor. The engine transmission provides three forward and one reverse speed to the jackshaft. A high speed lever (17, fig. 2) is used to disengage the gear drive between the jackshaft and crawler clutch shaft and to engage the chain drive to double the crawler track speed. The boom foot end can be raised or lowered manually with the hand hoist wheel (7, fig. 1). An automatic throwout mechanism disengages the engine transmission clutch when the boom has traveled to its maximum height.

4. Identification

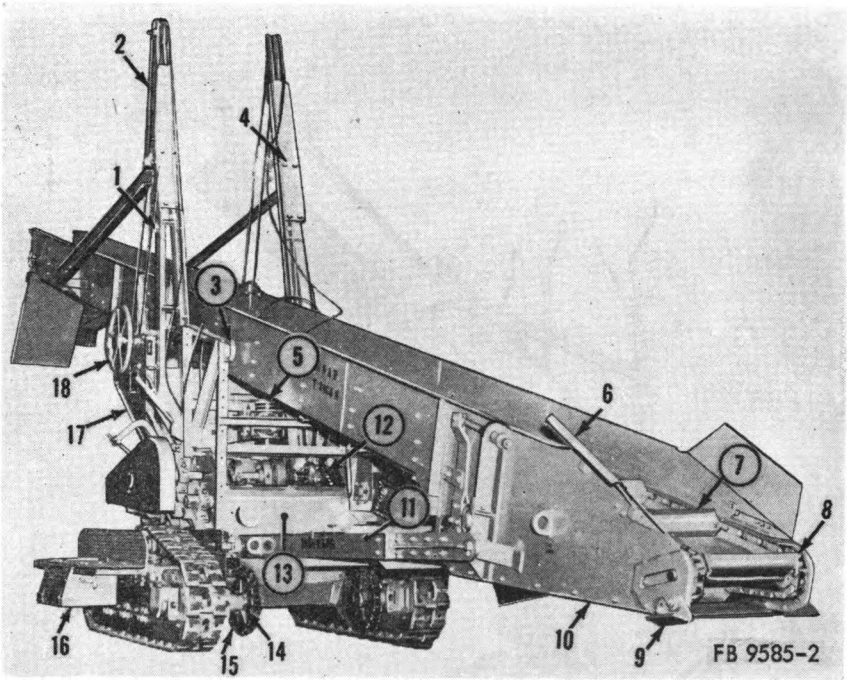
The conveyor has five identification plates. The Corps of Engineers identification plate (3, fig. 3), located on the hand hoist



1	Right upper mast	12	Shaft
2	Mast cable	13	Bracket
3	Left upper mast	14	Bar
4	Right upper push arm	15	Center pivot shaft
5	Boom	16	Angle
6	Spout	17	Side panel
7	Hand hoist wheel	18	Main frame
8	Lifting rings	19	Right crawler track
9	Fuel tank cap	20	Radiator shell
10	Engine housing cover	21	Engine radiator grill
11	Left crawler track	22	Muffler
		23	Lower mast

Figure 1. Conveyor, three-quarter left front view.

housing (4) on the left side of the conveyor, gives the official nomenclature, the manufacturer's name, the model number, and the serial number of the equipment. The transportation data plate (5), located to the right of the Corps of Engineers identification plate, gives the overall and shipping dimensions, shipping weight, shipping cubage, and number of lifting rings. A caution plate (9), located to the right of the hand hoist wheel (6) on the main frame angle (10), gives a warning on lubrication of the anti-friction bearings used on this equipment. A manufacturer's identification plate (8) is located to the left of the caution plate.



1	Lower mast	10	Foot end
2	Upper mast	11	Lower push arm
3	Lifting ring	12	High speed chain
4	Upper mast bolts	13	Transmission housing
5	Power hoist	14	Crawler drive sprocket
6	Hopper side plates	15	Crawler drive chain
7	Flight	16	Toolbox
8	Flight line roller chain	17	High speed lever
9	Foot end shoe	18	Hand hoist wheel

Figure 2. Conveyor, three-quarter right rear view.

5. Differences in Models

This manual covers only the Barber-Greene Model 689 conveyor.

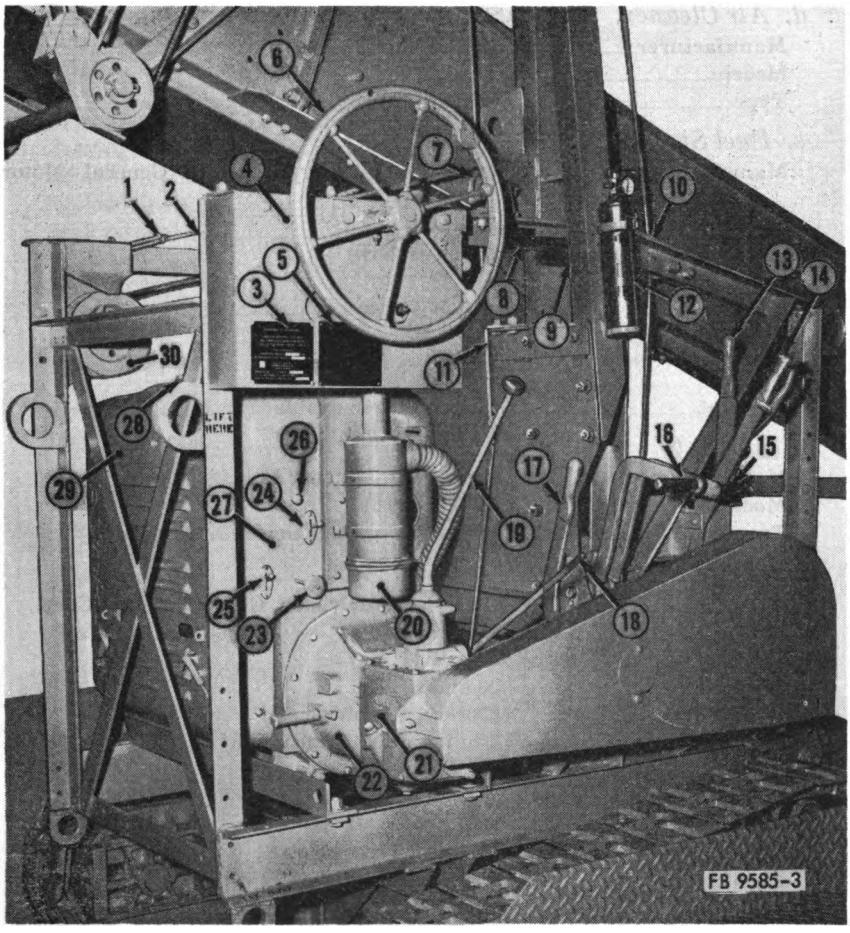
6. Tabulated Data

a. General.

Manufacturer	Barber-Greene Co.
Model	689
Type	Conveyor, drag type, piler, selfpropelled, crawler-mounted, gasoline driven, 35-ft long, 75 ton-per-hr capacity.

b. Engine.

Manufacturer	Continental Motors Corp.
Model	FS162–6008
Type	L-head
Fuel	Gasoline



1	Cable clamp	16	Left crawler steering clutch lever
2	Cable	17	Flight line clutch lever
3	Identification plate	18	Master clutch lever
4	Hand hoist housing	19	Transmission shift lever
5	Transportation data plate	20	Air cleaner
6	Hand hoist wheel	21	Transmission
7	Mast sheave	22	Clutch housing
8	Manufacturer's identification plate	23	Starter button
9	Caution plate	24	Choke lever
10	Main frame angle	25	Throttle lever
11	Clutch throwout rod	26	Ignition button
12	Fire extinguisher	27	Instrument and control panel
13	Power hoist clutch lever	28	Radiator filler cap
14	High speed lever	29	Hood top
15	Right crawler steering clutch lever	30	Cable drum

Figure 3. Controls and nameplates.

c. Carburetor.

Manufacturer	Marvel Schebler
Model	TSX–526
Type	Updraft

d. Air Cleaner.

Manufacturer	Donaldson Co., Inc.
Model	A5330
Type	Oil bath

e. Fuel Strainer.

Manufacturer	A.C. Spark Plug Division, General Motors Corp.
Model	854018
Type	Sediment bowl

f. Oil Filter.

Manufacturer	Fram Corp.
Model	7407
Type	F 21P2
Element	Cartridge, removable

g. Magneto.

Manufacturer	Fairbanks, Morse & Co.
Model	FMXE4B16F
Type	Impulse coupled, shielded

h. Generator.

Manufacturer	Delco-Remy Division, General Motors Corp.
Model	1105973
Type	24 volt
Output	20 amps
Rotation	Clockwise at drive end
Control	3-unit voltage and current regulator
Poles	2
Brushes	2
Bearings	Ball
Ground polarity	Positive
Field coil draw	0.94 to 1.02 amps at 24 volts
Cold output	18 amps, 26 volts at 1900 rpm

i. Voltage Regulator.

Manufacturer	Delco-Remy Division, General Motors Corp.
Model	1118782
Type	3-unit voltage and current regulator
Volts	24
Voltage regulator:	
Air gap	0.075 in.
Voltage setting (open circuit).	27.5 to 29.5 volts
Current regulator	
Air gap	0.075 in.
Current setting	16 to 20 amps
Cutout relay	
Air gap	0.017 in.
Point opening	0.032 in.
Closing voltage	24 to 27 volts

j. Electrical Starter.

Manufacturer	Delco-Remy Division, General Motors Corp.
Model	1108594

Type	24 volt
Rotation	Clockwise viewed from drive end
Poles	4
Brushes	4
Drive	Overrunning clutch
Bearings	Sleeve bearings
Control	Manual operated switch
No-load draw	23.5 volts, 35 amps, 2500 rpm
Stall torque	19.1 volts, 265 amp, 19 lb-ft min

k. Tachometer.

Manufacturer	Stewart-Warner Corp.
Model	
Type	Mechanical, camshaft driven

l. Hour-Meter.

Manufacturer	John W. Hobbs Corp.
Model	MI–225
Type	24 volt electric

m. Ammeter.

Manufacturer	A.C. Spark Plug Division, General Motors Corp.
Model	1501407

n. Water Temperature Gage.

Manufacturer	A.C. Spark Plug Division, General Motors Corp.
Model	1512741, sending unit. 1512825, thermo gage unit.

o. Oil Pressure Gage.

Manufacturer	A.C. Spark Plug Division, General Motors Corp.
Model	1507879, engine unit. 1508141, oil gage assembly.

p. Engine Performance.

Governed speed	1400 rpm
Horsepower	20 hp at governed speed

q. Dimensions and Weight.

Overall length	37 ft, 6 in.
Overall width	7 ft, 9 in.
Overall height	22 ft, 3 in.
Shipping length	37 ft, 6 in.
Shipping width	7 ft, 9 in.
Shipping height	10 ft, 10½ in.
Weight	12,500 lb.

r. Capacities.

Fuel tank	10¾ gal.
Crankcase	4½ qt.
Air cleaner	½ pt.
Cooling system	15 qt.

CHAPTER 2
OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

7. New Equipment

a. General (fig. 3). For shipment, the conveyor foot end is raised off the ground and the upper mast is lowered to give greater clearance. The machine is blocked and tied on a flatcar and the head and foot ends are braced with timbers and secured with flat steel strapping bands. The blocking is nailed to the bed of the carrier and the steel strapping is nailed to the bed and sides. The clutch throwout rod (11) is disconnected from the arm on the upper mast.

b. Unloading.

(1) Remove all steel strapping, tie cables, bracing, and blocking securing the conveyor to the flatcar.

(2) If a crane or hoist with a rated capacity of 7 tons or more is available, proceed as follows:

(*a*) Attach heavy-duty lifting cables or chains to the four lifting rings (8, fig. 1) and (3, fig. 2) at both front and rear of the main frame (18, fig. 1). Hook the cables or chains to a crane or overhead hoist.

(*b*) Install spreader bars between the loops of the two cable or chain slings to prevent damage to the conveyor operating controls and superstructure while lifting.

(*c*) Lift the conveyor from the carrier and lower it to a spot near the operating point. Remove the cables or chains.

(3) If an overhead crane or hoist is not available, proceed as follows:

(*a*) Build a ramp of timbers and blocking to support the unit weight of 12,500 pounds. Build the ramp wider than the width of the conveyor crawlers.

(*b*) Perform instructions listed in *c*, *e*, and *f* below.

(*c*) Start the engine and allow it to warm up (par. 27*a* through *g*).

(*d*) Drive the conveyor down the ramp (par. 29).

Caution: If the ramp is steep or the footing bad, attach a snubbing line to the frame of the machine in the tie point rings, to avoid the possibility of the machine "getting away" down the ramp.

c. Removal of Preservative Compounds, Lubricants, and Devices.

(1) Remove preservative tape from the following:
- (*a*) Air cleaner (20, fig. 3).
- (*b*) Muffler (22, fig. 1).
- (*c*) Fuel tank cap (9).
- (*d*) Radiator filler cap (28, fig. 3).
- (*e*) Radiator grill (21, fig. 1).
- (*f*) Engine housing openings.
- (*g*) Openings in the clutch housing (22, fig. 3).
- (*h*) Instrument panel gages.
- (*i*) Choke and throttle levers (24) and (25).
- (*j*) Starter and ignition button (23) and (26).
- (*k*) Master clutch and engine transmission shift levers (18) and (19).
- (*l*) All housing panel joints.
- (*m*) All exposed machined surfaces.
- (*n*) Identification plates (3, 5, 8, and 9, fig. 3).

(2) Remove preservative from the following:
- (*a*) Exposed screw threads, pins, linkages, and springs.
- (*b*) Polished metal surfaces and machined surfaces.

(3) Remove protective paper wrapping from the tools.

(4) Remove all tags from the machine.

(5) Remove preservatives from the engine crankcase, oil filter and radiator.

(6) Flush and drain preservative lubricant from the transmission and power hoist worm-gear housings.

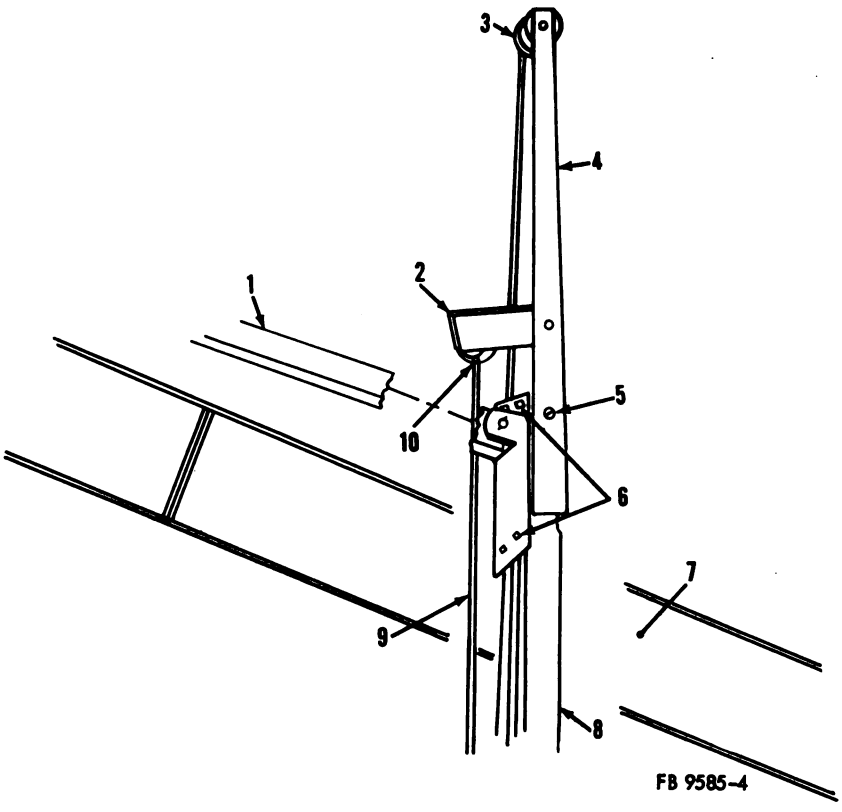
d. Assembly (fig. 4).

(1) Swing the upper mast (4) up into position being careful that the cables are reeved properly.

(2) Secure the upper mast to the lower mast (8) with the 10 machine bolts (5) and (6), lockwashers, and nuts; tighten the two nuts on the machine bolt (5) on each side of the mast.

(3) Connect the clutch throwout rod (9) to the arm (2) on the upper mast with a pin (10) and cotter pin.

Caution: The automatic throwout rod must be installed before raising the conveyor boom with the power hoist.



1 Upper push arm
2 Arm
3 Sheave
4 Upper mast
5 Machine bolt, rd hd, ¾" x 2" NC (2 rqr)
6 Machine bolt, hex hd, ¾" x 5½" NC (8 rqr)
7 Boom
8 Lower mast
9 Clutch throwout rod
10 Pin

Figure 4. Mast and clutch throwout rod installation.

e. Inspection.

(1) Inspect the conveyor boom for secure mounting to the push arms and the main frame of the conveyor. Make sure all nuts are tight and that there is a lockwasher at each attaching point.

(2) Inspect the controls; operate each control to check for free movement.

(3) Inspect the unit for loss or damage due to improper packing or handling during shipment.

(4) Check the adjustment of the crawler clutches. If the clutch does not engage with a definite snap, adjust the clutch (par. 141*a*).

f. Service.

(1) Lubricate the unit as directed in LO 5–9585.

(2) Service the unit as directed in paragraph 46*c*.
(3) Fill the radiator with the proper coolant for the temperature to be encountered.
(4) Fill the fuel tank with the proper grade of gasoline.

8. Used Equipment

a. Inspection. Inspect the unit as directed in paragraph 7*e* above; in addition, perform the following checks:

(1) Inspect the unit visually for any defects, shortages, or incorrect assembly.
(2) Check all the engine accessories to make certain they are firmly mounted.
(3) Examine all electrical leads for loose connections or worn spots.
(4) Check the fuel and oil lines for possible kinks or leaks.
(5) Check the hoses of the cooling system for cracks or leaks.
(6) Inspect the spark plugs for damage; set the spark plug gap for 0.025-inch.
(7) Inspect the generator and electrical starter brushes; replace if worn to one-half their original size.
(8) Inspect the magneto breaker points; set at 0.015-inch gap. Replace points if worn or pitted.
(9) Inspect the generator and fan drive belt; correct tension will allow ½-inch deflection of the belt midway between the generator and fan pulleys. Adjust the tension, if necessary. Replace belt if worn, frayed, or cracked.
(10) Inspect the mounting of the engine to the main frame; tighten all mounting nuts.
(11) Inspect the tension and condition of the roller chains. Adjust the tension of the jackshaft drive chain (par. 96*d*), crawler drive chain (par. 125*f*), flight line drive chains (par. 101*d*), and the conveyor drive chain (par. 103*e*(9)). Repair or replace damaged chains.

b. Service. Service the unit as directed in paragraph 7*f*.

Section II. CONTROLS AND INSTRUMENTS

9. General

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

10. Ignition Button
(fig. 3)

a. Location. The ignition button (26) is located at the upper left section of the instrument and control panel (27).

b. Purpose. It provides a means of grounding the magneto to stop the engine. Push the button in to ground the magneto.

11. Choke Lever
(fig. 3)

a. Location. The choke lever (24) is located below and to the right of the ignition button on the instrument and control panel (27).

b. Purpose. It provides a means of regulating the amount of air entering the carburetor air intake. Pushing down the choke lever reduces the amount of air entering the carburetor.

12. Throttle Lever
(fig. 3)

a. Location. The throttle lever (25) is located at the lower left side of the instrument and control panel (27).

b. Purpose. It provides a means of regulating the engine speed. Pulling up on the throttle lever partially closes the throttle valve and reduces the engine speed.

13. Starter Button
(fig. 3)

a. Location. The starter button (23) is located on the lower left side of the instrument and control panel (27).

b. Purpose. It provides a means of engaging the electrical starter. Push the button in to engage the starter; hold the button in until the engine starts.

14. Transmission Shift Lever
(fig. 3)

a. Location. The transmission shift lever (19) is located at the top of the transmission (21).

b. Purpose. It provides a means of shifting the transmission gears.

15. Master Clutch Lever
(fig. 3)

a. Location. The master clutch lever (18) is located on the side of the clutch housing (22).

b. Purpose. It provides a means of engaging the engine clutch. Push the master clutch lever toward the engine to engage the clutch.

16. Flight Line Clutch Lever

(fig. 3)

a. Location. The flight line clutch lever (17) is located to the right of the master clutch lever (18), between the master clutch lever and the crawler steering clutch levers (15) and (16).

b. Purpose. It provides a means of engaging the flight line clutch. Push the lever towards the engine to engage the flight line clutch; pull it away from the engine to disengage the flight line clutch.

17. Crawler Steering Clutch Levers

(fig. 3)

a. Location. The crawler steering clutch levers (15) and (16) are located to the right of the flight line clutch lever (17).

b. Purpose. They provide a means of engaging the crawler clutches or the crawler brakes. Push the levers up to engage the crawler clutches; push down to disengage the clutches and engage the crawler brakes.

18. High Speed Lever

(fig. 3)

a. Location. The high speed lever (14) is located to the right of the crawler steering clutch levers (15) and (16) on the crawler clutch shaft housing.

b. Purpose. It provides a means of disengaging the gear drive between the jackshaft and crawler clutch shaft and engaging a chain drive, giving twice the normal operating speed to the crawler. Pull the lever away from the machine to engage the high speed chain drive.

19. Power Hoist Clutch Lever

(fig. 3)

a. Location. The power hoist clutch lever (13) is located to the right of the high speed lever (14).

b. Purpose. It provides a means of raising and lowering the conveyor boom, using the engine drive. Pull out the lever to engage the power hoist clutch and raise or lower the conveyor boom.

20. Boom Hand Hoist Wheel

(fig. 3)

a. Location. The boom hand hoist wheel (6) is located above the engine instrument and control panel (27).

b. Purpose. It provides a mean of manually raising and lowering the foot end of the conveyor boom. Turning the hoist wheel counterclockwise raises the foot end.

21. Ammeter

(fig. 5)

a. Location. The ammeter (16) is located at the lower right of the instrument and control panel (1).

b. Purpose. It indicates the rate of charge or discharge of the battery, in amperes.

c. Normal Readings. When the engine is operating normally and the battery is not fully charged, the ammeter should read between 12 and 18 amperes. If the ammeter registers a discharge while the engine is operating, it indicates abnormal generator operation.

22. Water Temperature Gage

a. Location. The water temperature gage is located on the instrument and control panel.

b. Purpose. It indicates the temperature of the coolant in the engine cooling system in degrees F (fahrenheit).

c. Normal Readings. When the engine is operating normally, the gage should register 180°. A temperature indication of 200° or over indicates that the engine is overheated. When overheated, stop the engine and check the coolant level, the operation of the engine thermostat, and the flow of coolant through the cooling system.

23. Oil Pressure Gage

a. Location. The oil pressure gage is located on the instrument and control panel.

b. Purpose. It indicates the pressure of the lubricant in the engine crankcase in psi (pounds per square inch).

c. Normal Readings. Oil pressure should rise immediately when the engine is started and remain at 20–30 psi. If the oil pressure is low, stop operation and check the oil level and the condition of the gage and sending unit.

24. Tachometer

(fig. 5)

a. Location. The tachometer (3) is located on the right side of the instrument and control panel (1), above the ammeter.

b. Purpose. It indicates the engine rpm (revolutions per minute) in hundreds.

c. Normal Reading. When the engine is operating under load, the governed speed is 1400 rpm, or 14 on the tachometer dial.

1 Instrument and control panel
2 Transmission shift lever
3 Tachometer
4 Hourmeter
5 Safety throwout guide plate
6 Lower mast
7 Right crawler steering clutch lever
8 Left crawler steering clutch lever
9 U-bolt, ¼" (2 rqr)
10 Spring plate
11 Rod
12 Pivot shaft
13 Flight line clutch lever
14 Master clutch lever
15 Flight line lever rod
16 Ammeter
17 Grease cup
18 Transmission case
19 Clutch housing
20 Clutch housing hand hole cover
21 Starter button
22 Throttle lever
23 Choke lever
24 Ignition button

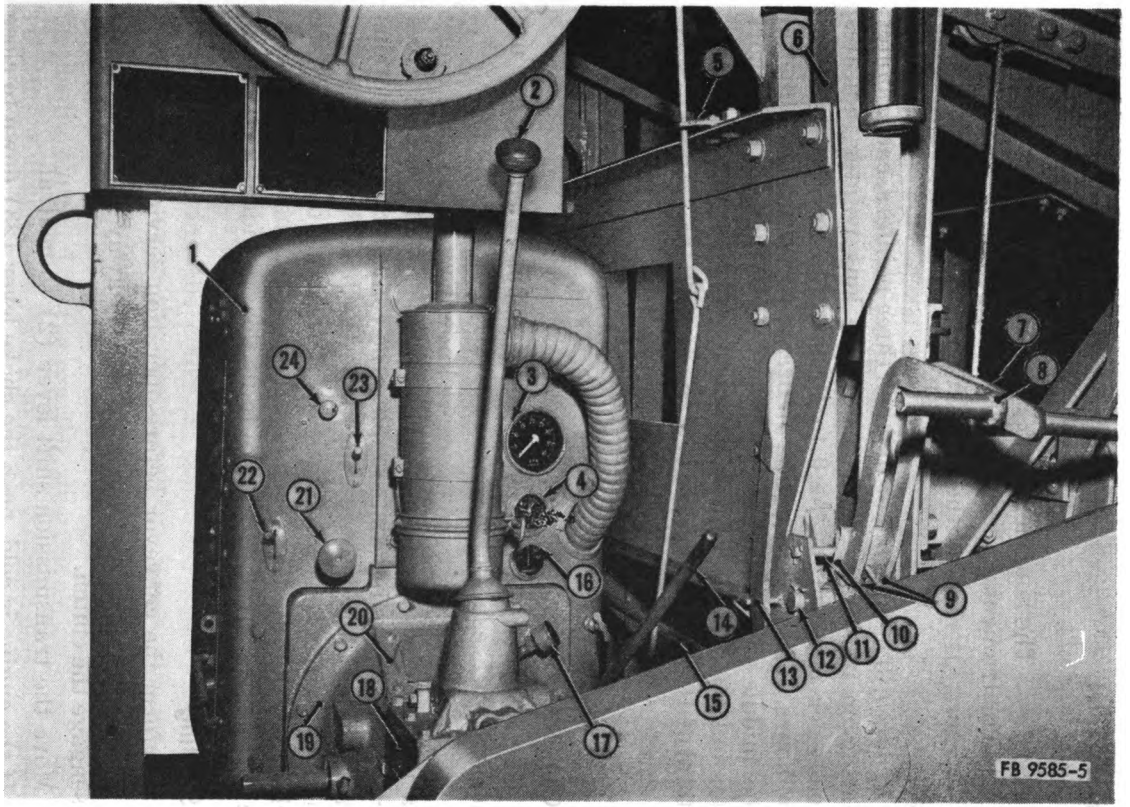


Figure 5. Controls and levers.

25. Hourmeter

(fig. 5)

a. Location. The hourmeter (4) is located below the tachometer (3) on the instrument and control panel (1).

b. Purpose. It records the time in hours that the engine is in operation.

c. Reading. The hourmeter dial has three pointers, each pointer indicating on its own circular scale. The long pointer indicates 10 hours per numeral on the 0 to 10 outer dial scale, or a total of 100 hours. The middle pointer indicates 100 hours per numeral on the middle dial scale, or a total of 1,000 hours. The short pointer indicates 1,000 hours per numeral on the inner dial scale, or a total of 10,000 hours.

Section III. OPERATION UNDER USUAL CONDITIONS

26. General

a. The instructions in this section are published for the use of the personnel responsible for the operation of this conveyor.

b. It is essential that the operator know how to perform every operation of which the conveyor is capable. This section gives instructions on starting and stopping the conveyor; basic motions of the machine; and 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 application.

27. Starting

a. Perform the conveyor before-operation services (par. 46*c*).

b. Pull the master clutch lever (14, fig. 5) away from the engine to disengage the clutch.

c. Move the transmission shift lever (2) to neutral.

d. If the engine is cold, push the choke lever (23) down to close the choke valve.

e. Pull out the engine ignition button (24).

f. To start the engine with the electrical starter:

(1) Push in the starter button (21) and hold it in. As soon as the engine starts, release the button.

Caution: If the engine fails to start in 15 seconds, allow a minute interval between attempts.

(2) If the engine does not start after several attempts, push up the choke lever about halfway after the engine has turned over a few times.

(3) As soon as the engine starts, adjust the choke lever so that the engine runs smoothly. Push down the throttle lever (22) to permit the engine to run at governed speed.

Note. As the engine starts and warms up, gradually push the choke lever up, opening the choke valve, until the choke lever is all the way up. In warm weather, the choke lever may not be needed. At all times, use the choke lever as little as possible.

g. To start the engine with the hand starting crank:

(1) Insert the crank through the opening below the radiator grill.

(2) With the crank in position, pull up with a steady pull.

Caution: When using the starting crank, keep the thumb on the same side of the handle as the fingers to avoid injury should the engine kick. Never attempt to spin the crank.

(3) Operate the choke and throttle levers in the same manner as when starting the engine with the electrical starter (*f* above).

28. Stopping

a. Pull up the throttle lever (25, fig. 3); operate the engine at reduced speed for 5 minutes.

b. Push the ignition button (26) in toward the engine to stop the engine.

c. Perform the after-operation services (par. 46*f*).

29. Operating Details

a. When moving the conveyor, shift the engine transmission into first gear; move the steering clutch levers (15, fig. 3) and (16) toward the machine to engage the crawler clutches. Move the master clutch lever (18) slowly toward the engine to engage the master clutch. Use the crawler steering clutch levers to steer the unit. Engage both levers to drive straight ahead; engage the right lever to engage just the right crawler track to turn the conveyor toward the left, or engage the left lever to engage the left crawler track to turn the conveyor toward the right.

b. When loading with the conveyor, use only the crowding, or first speed.

c. When moving into a pile of material, slide the boom foot end along the ground on the foot end shoe (9, fig. 2). This insures picking up all material. If there is some material at the bottom of the pile that is undesirable, raise the boom foot end with the hand hoist to clear this material.

d. Always move into the pile with the flight line running.

e. The truck being loaded must follow the conveyor to have the discharge from the spout (6, fig. 1) hit at the proper point for distributing the load in the truck.

f. Move the foot end into the pile only as far as necessary to pick up a sufficient amount of material. When the material caves in, disengage the crawler clutches to allow the excess material to be carried away.

g. Raise the foot end off the ground when the machine is maneuvering.

30. Movement to a New Location

a. Movement to a New Location Over a Short Distance.

(1) With the engine operating and the transmission shift lever (2, fig. 5) in reverse, lower the boom by pulling the power hoist clutch lever (13, fig. 3) toward the operator until the boom rests on the mast angle.

(2) Raise the foot end of conveyor by turning the boom hand hoist wheel (6) counterclockwise.

(3) Shift the main transmission into first gear and engage the crawler clutches and brakes (7 and 8, fig. 5), as required, to maneuver the machine. Where the ground is level, the higher transmission ratios may be used for greater speed.

(4) Upon arriving at the new location, raise the boom by moving the power hoist clutch lever away from the engine, or toward the operator, to raise the mast; lower the foot end to the ground with the boom hand hoist wheel.

b. Movement to a New Location Over a Long Distance.

(1) Move the conveyor to the point of shipment, as directed in *a* above.

(2) If an overhead hoist or crane having a rated capacity of 7 tons or more is available, proceed as follows:

(*a*) Attach heavy-duty lifting cables or chains to the lifting rings (8, fig. 1) and (3, fig. 2) at the front and rear of the main frame. Hook the cables or chains to the crane or overhead hoist.

(*b*) Install spreader bars between the loops of the slings to prevent damage to the conveyor operating controls and superstructure while it is being lifted.

(*c*) Lift the conveyor onto the carrier.

(3) If an overhead hoist or crane is not available, proceed as follows:

(*a*) Construct a ramp of timbers and heavy boards. Place

4 x 4-inch or larger timbers against the side or end of the carrier, spaced the width of the conveyor crawlers. Support the timbers at the carrier end on upright posts. Cover the timbers with 2-inch planking.

Note. The ramp must be constructed to support the unit weight of 12,500 lbs.

(*b*) Drive the conveyor up the ramp to the bed of the carrier.

(4) Block the unit on the carrier, making sure to block under the head and foot ends of the boom.

(5) Transport the conveyor to the new location. Unload as directed in paragraph 7*b*.

Section IV. FIRE EXTINGUISHER

31. Description

The fire extinguisher is either the carbon tetrachloride type or the carbon dioxide type. Refer to TM 5–687 or TM 9–1799 for a complete description of the fire extinguisher.

32. Operation

a. Carbon Tetrachloride Type.

(1) *General.* Turn the handle to the left to unlock. Direct the opposite end of the extinguisher at the base of the flame and pump the handle. For burning liquids, direct the stream at the side of the container and above the surface of the liquid.

(2) *Testing.*

(*a*) Test the extinguisher for proper operation by turning the handle to the left and pumping while directing the stream of fluid into a clean and thoroughly dry glass jar.

(*b*) If the operation is smooth, remove the hexagon filler cap and pour the discharged liquid back into the fire extinguisher.

(*c*) Make sure the extinguisher is full. Install the filler cap and lock the handle.

***Caution*:** A poisonous gas is generated by the contact of carbon tetrachloride with heated surfaces. Never use a carbon tetrachloride fire extinguisher in a closed room. Provide adequate ventilation before re-entering a closed space where carbon tetrachloride has been used.

b. Carbon Dioxide Type.

(1) *General.* Pull the locking pin from the trigger, breaking

the sealing wire. Hold cylinder in an upright position. By raising or lowering the discharge horn, direct the discharge at the base of the flame, and work upward.

(2) *Testing.* Check the extinguisher for amount of charge by weighing. The empty and full weights are stamped on the valve body.

Section V. OPERATION UNDER UNUSUAL CONDITIONS

33. Operation in Extreme Cold (Below 0° F.)

a. General. Operation of the conveyor in subzero temperatures requires special precautions and extra servicing from both operation and maintenance personnel if poor performance or total failure is to be avoided. Use lubricants and coolants recommended for prevailing temperatures.

b. Storage and Handling of Gasoline. In cold weather, condensation of moisture in the air will cause water to accumulate in tanks, drums, and containers. This water will freeze and form ice crystals that will clog fuel lines and carburetor jets unless the following precautions are taken:

(1) Use filter paper or other type of strainer when filling fuel tank or transferring fuel from one container to another.

(2) Remove ice and snow from the fuel tank filler cap and dispensing equipment before filling the tank.

(3) Keep the fuel tank as full as possible at all times. This will prevent an excessive amount of moist air from entering the tank.

c. Lubrication. Lubricate the unit as directed for cold weather in LO 5–9585.

d. Engine Electrical System.

(1) Replace ignition magneto breaker points that are pitted or burned (par. 79*b*). Replace the cam felt wick if dry or hard. Make sure the magneto leads are secure. Proper adjustment of the breaker points is 0.015-inch at full separation.

(2) Remove the spark plugs and reduce the normal gap between the electrodes from 0.025- to 0.020-inch. Pretest plugs for defective insulators or electrodes. Keep plugs free of ice and moisture.

e. Cooling System. Check the coolant with a hydrometer. If the solution is not correct for the prevailing temperature, add antifreeze in the proportion dictated by the prevailing temperature as indicated in table I.

Table I. Antifreeze Solutions

Freezing Points, Composition and Specific Gravities of Military Antifreeze Materials

Lowest expected ambient temp 0°F.	Pints of inhibited glycol per gal of coolant[1]	Compound, antifreeze, Arctic[2]	Ethylene glycol coolant solution specific gravity at 68°F.[3]
+20	1½	Issued full-strength and ready mixed for 0° to —65° F. temperatures for both initial installation and replenishment of losses.	1.022
+10	2		1.036
0	2¾		1.047
—10	3¼		1.055
—20	3½		1.062
—30	4		1.067
—40	4¼		1.073
—50, —60, —75	Arctic antifreeze preferred.	DO NOT DILUTE WITH WATER OR ANY OTHER SUBSTANCE.	

[1] Maximum protection is obtained at 60 percent by volume, that is 4.8 pints of ethylene glycol per gallon of solution.

[2] Military Specification MIL–C–11755 Arctic type, nonvolatile antifreeze compound is intended for use in the cooling system of liquid-cooled internal combustion engines for protection against freezing primarily in Arctic regions where the ambient temperature remains for extended periods of time close to —40°F. or drops below, to as low as —90°F.

[3] Use an accurate hydrometer. To test hydrometer, use one part ethylene glycol type antifreeze to two parts water. This should produce a hydrometer reading of 0°F.

Note. Fasten a tag near the radiator filler cap indicating the type of antifreeze.

f. Cleanness. Keep the conveyor free of accumulated ice or snow. Wipe the area surrounding lubrication points clean and dry before lubricating.

g. Shelter. Cover the unit with a tarpaulin when not in operation, or store in a shed or building.

h. Starting.

(1) Start the engine in the usual manner.

Note. Do not stop the engine until it has run long enough to warm the oil in the crankcase and vaporize any moisture which may have condensed when the engine was last stopped. The time necessary to warm the engine will depend upon the air temperature.

(2) When operating in extreme cold, the pressure may exceed the normal pressure, especially during the warmup period.

(3) Allow the engine to run at reduced speed to warm up to operating temperature. Then push down the throttle lever and allow the engine speed to increase to the governed speed.

(4) When the engine has reached operating temperature and is operating at governed speed, the conveyor clutches can be engaged and the engine load increased.

i. Metal Parts.

(1) Keep the operator's platform, controls, flight line, and hopper free of ice, clean, and dry. Clean around the moving chains and sprockets to prevent any material freezing and causing trouble the next time the machine is operated.

(2) Check all drive chains regularly; adjust as required. Chains become brittle at low temperatures; correct adjustment will help prevent breakage.

34. Operation in Extreme Heat

a. General. When operating in extreme high temperatures, efficient cooling and adequate lubrication are vitally important.

b. Lubrication. Lubricate as directed in LO 5–9585.

c. Cooling System.

(1) Drain and flush the cooling system in accordance with current directives.

(2) Make sure the radiator screen and grill are clean and unobstructed. Remove engine side panels.

(3) If excessive overheating occurs, check the engine thermostat.

35. Operation Under Dusty or Sandy Conditions

a. Inspection and Lubrication. Operation under sandy or dusty conditions will require more frequent inspections and lubrication. Fine sand or dust has a tendency to penetrate into bushings. Because of this, accumulations of sand or dust must be removed at frequent intervals. Clean the area around all lubrication points thoroughly with an approved cleaning solvent before lubricating.

b. Cooling System. Keep the radiator cores, screen, and grill free of dust or sand to keep the engine from overheating. Drain and flush radiator frequently; refill with clean soft water.

c. Fuel System. Take all necessary precautions to prevent sand or dirt from entering the fuel tank. Service the fuel filter and air cleaner as often as necessary to keep dust and sand from the fuel system.

d. Engine Side Panels. Keep engine side panels closed.

36. Operation in Areas of High Humidity

a. Keep the engine cooling system clean and filled with clean fresh water; use soft water where available. Stop engine immediately if it becomes overheated, and allow to cool before replenishing coolant and starting the engine.

b. Locate the unit for maximum ventilation; keep the radiator screen grill clean and unobstructed. Remove engine side panels.

c. Protect exterior surfaces from moist air by replacing paint on all painted surfaces (par. 44). Coat exposed parts of polished steel or other ferrous metal with a standard issue rustproofing material, if available, or a light coat of grease to prevent moisture in the air from settling on the surfaces and causing rust to form.

37. Operation at High Altitude

a. Engine Fuel. Due to the rarefied condition of the air, the amount of fuel entering the carburetor must be decreased to provide the same proportion of fuel and air entering the engine combustion chamber. Turn in the carburetor main jet adjusting screw until the engine runs smoothly.

b. Ventilation. Provide adequate ventilation as the engine is more likely to overheat at high altitudes.

38. Operation Near Salt Water

a. Coat exposed parts of polished steel or other ferrous material with a standard issue rust proofing material, if available, or a

light coat of grease to prevent moisture in the air from settling on the surfaces and causing rust to form.

b. After starting the unit, allow it to run at least 30 minutes at governed speed to evaporate any condensation or moisture that might be present in the engine crankcase or that has been built up during the first 5 or 10 minutes of running. This procedure should be followed in order to keep the engine in the best possible condition with minimum maintenance. Always allow the engine to idle for 3 to 5 minutes before stopping.

CHAPTER 3
ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. ORGANIZATIONAL TOOLS AND EQUIPMENT

39. General

Tools required to perform organizational maintenance on the conveyor are standard mechanic's hand tools.

40. Tool and Publications Set

Tools required by the operator for maintenance of the conveyor are listed in appendix II.

41. Special Organizational Maintenance Tools and Equipment

No special organizational tools or equipment are necessary for maintenance of the conveyor by organizational personnel.

Section II. LUBRICATION AND PAINTING

42. General Lubrication Information

LO 5–9585 prescribes first and second echelon lubrication maintenance for this conveyor. Instructions therein are mandatory. The lubrication order is to be carried with the equipment at all times.

43. Detailed Lubrication Information

a. Care of Lubrication Equipment. Keep lubrication equipment in a place where it will be safe from damage and free from dirt and dust.

b. Cleaning. Be sure to wipe clean all surfaces surrounding the points of application before applying the lubricant. Use an approved cleaning solvent to clean or wash the nearby surfaces. Do not use gasoline for this purpose.

c. Points of Application. The points of application are identified in LO 5–9585. Apply the lubricant indicated on the lubrication order key.

d. Operation After Lubrication. The conveyor requires no break-in run after lubrication. After each engine crankcase oil

LUBRICATION ORDER **LO 5-9585**

24 June 1955

CONVEYOR, DRAG TYPE, PILER, SELF-PROPELLED, CRAWLER MOUNTED, GASOLINE DRIVEN, 35 FT LONG, 75 TON PER HR CAPACITY, BARBER-GREENE MODEL 689

Reference: TB 5-9585-1

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

Clean fittings before lubricating.

Relubricate after washing or fording.

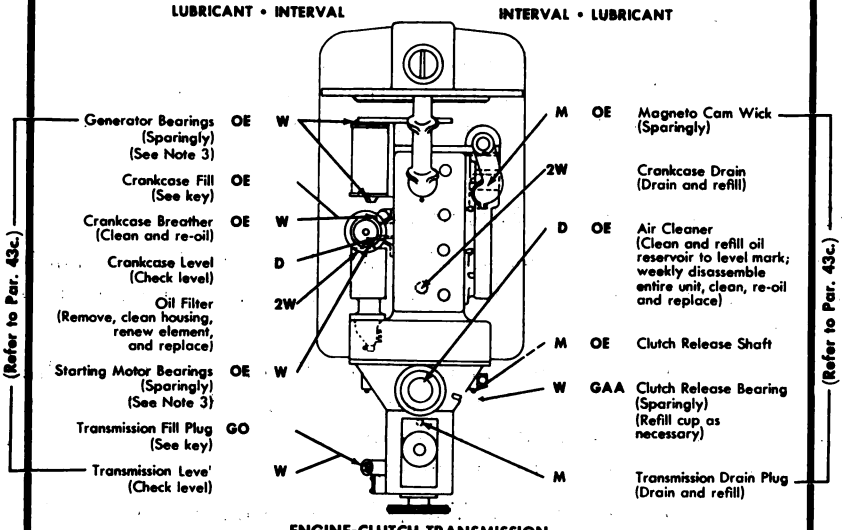
Clean parts with SOLVENT, dry cleaning, or with OIL, fuel, Diesel. Dry before lubricating.

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 TEMPERATURES			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
Crankcase	4 qts				
Air Cleaner	¼ qt	OE 30 or 9250	OE 10 or 9110	OHA	W—Weekly
Other Points					
GO—LUBRICANT, Gear, Universal		GO 90	GO 75	GO—S	2W—Two Weeks
Transmission	3 qts				
Boom Power Hoist	½ qt				
GAA—GREASE, Automotive and Artillery.					M—Monthly
OHA—OIL, Hydraulic, Aircraft, Petroleum Base.					
CW—LUBRICANT, Exposed Gears, Chain, and Wire Rope.					



ENGINE-CLUTCH-TRANSMISSION

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Figure 6. Lubrication order.

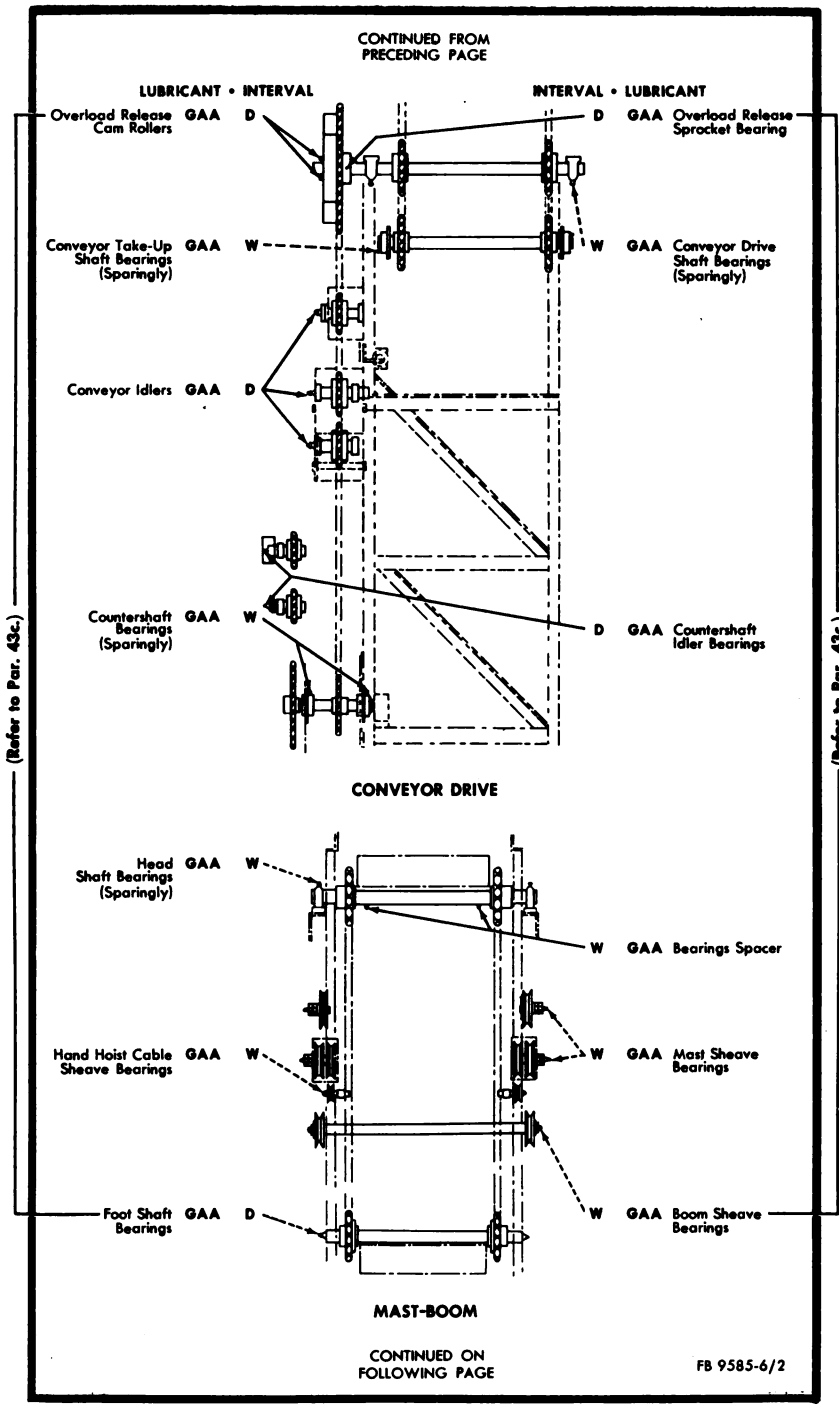

Figure 6—Continued.

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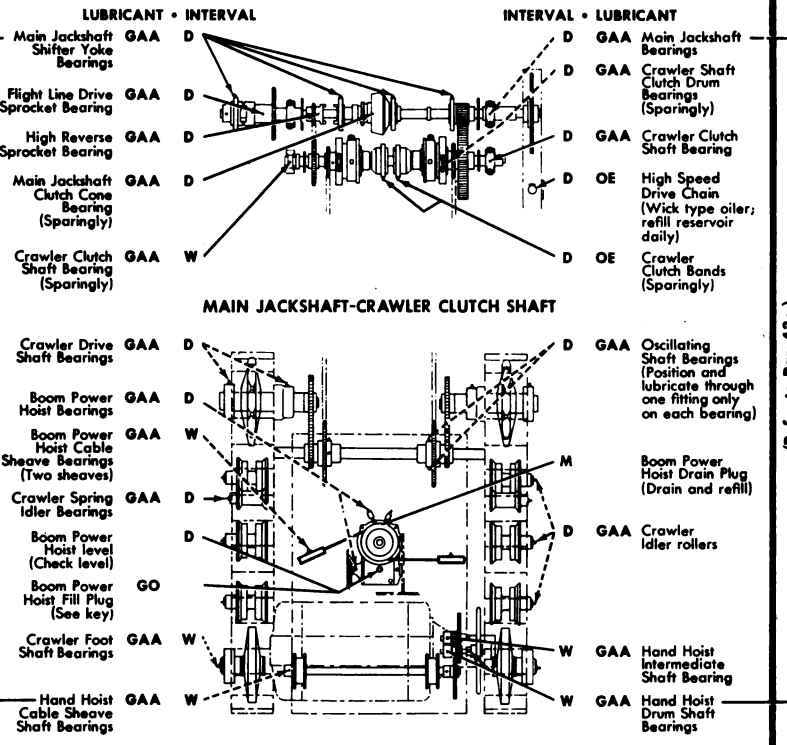


(Refer to Par. 43c.)

(Refer to Par. 43c.)

NOTES:

1. COLD WEATHER—WHEN WINTERIZATION KIT IS NOT AVAILABLE. ENGINE CRANKCASE—Every 3 days drain crankcase; refill to "FULL" mark with OE 10. Add 1 qt . of gasoline. Run engine 5 minutes to mix. Mark the new level on the gage for future reference. CAUTION: Every ½ day check level and fill to "FULL" mark with OE 10. If engine is to be shut down for ½ day or more, add 1 qt . of gasoline to reach new level mark. Operate engine for 5 minutes to mix. NOTE: OIL, fuel, Diesel, may be used as a temporary diluent, but 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.—Remove the lubricants prescribed in the key for above—10°F. Clean parts with SOLVENT, dry cleaning, and drain crankcase. Relubricate with lubricant indicated in the key for below—10°F. temperatures.

3. LIFE SEALED TYPE BEARINGS—When equipped with life sealed type bearings or oil impregnated bushings, no lubrication is required. CAUTION: Do not clean in solvent; wipe with oil dampened cloth only.

4. EXPOSED GEARS—Weekly, lubricate all exposed gears with CW.

5. OIL CAN POINTS—Weekly lubricate throttle, choke, and governor linkages, sliding jaws, control lever bearings, links, pins, chains, and all other exposed threads with OE.

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

FB 9585-6/3

Figure 6—Continued.

change, operate the engine for 5 minutes. Stop the engine and check the oil level; add oil if necessary.

e. Air Cleaner (fig. 7). Disassemble the entire air cleaner weekly during normal operation. When operating in extremely sandy or dusty conditions, service air cleaner daily, or oftener if an accumulation of dirt or sludge ½-inch deep appears in the bottom of the oil cup (3).

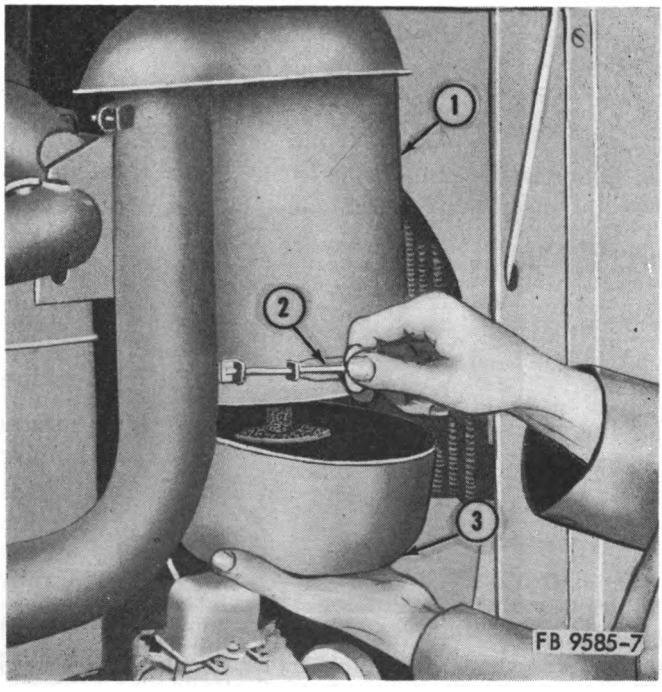
(1) Loosen the clamp bolt (2) until the oil cup is loose from the body (1); remove the oil cup. Pour out the old oil and clean the oil cup, making sure to remove any sludge or thick accumulation.

(2) Examine the lower end of the filter screen in the body of the air cleaner and remove any foreign matter that may adhere to the screen.

(3) Refill the oil cup with fresh oil up to the oil level bead (LO 5–9585).

(4) Reassemble the air cleaner. Check the hose and hose clamp connections. The efficiency of the air cleaner is dependent upon airtight connections.

(5) Monthly, completely disassemble, clean, and reassemble the air cleaner (par. 70).



1 Body 2 Clamp bolt 3 Oil cup

Figure 7. Servicing the air cleaner.

f. Oil Filter (fig. 8). Replace the oil filter element (1) every 2 weeks during normal operation.

(1) Remove the drain plug (6) from the bottom of the filter body asembly (2) and drain the oil into a container; discard the used oil.

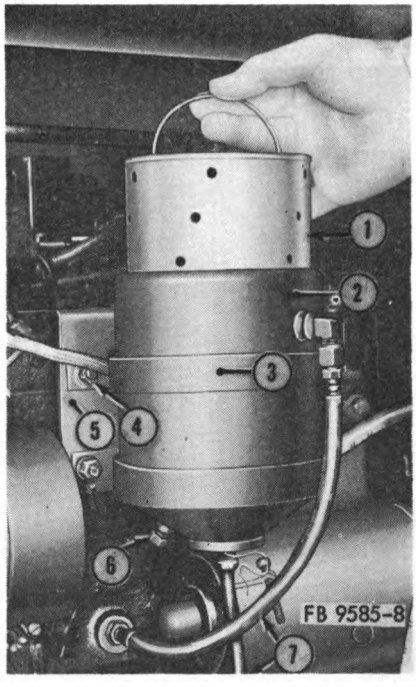
(2) Loosen the cap screw and remove the cover; lift out the oil filter element (1). Discard the oil filter element and the cover gasket.

(3) Flush out the filter body assembly with an approved cleaning solvent until all accumulated dirt and sludge is removed; dry thoroughly.

(4) Install a new oil filter element and cover gasket and secure the cover to the filter body assembly with a cap screw.

(5) Replace the drain plug in the bottom of the filter body assembly.

(6) Operate the engine and check the oil level. Add oil to replace that removed in cleaning the oil filter (LO 5–9585).



1 Filter element
2 Filter body assembly
3 Strap
4 Nut, hex
5 Mounting bracket
6 Drain plug
7 Flexible hose

Figure 8. Servicing oil filter.

44. Painting

a. Remove old paint from areas on which the paint has worn or chipped by scraping or sanding. Wipe clean with a rag dampened with an approved cleaning solvent; dry thoroughly.

b. Remove the fire extinguisher, batteries, and fan drive belt.

c. Remove all roller chains and wire cables.

d. Mask the following:

(1) Identification and instruction plates.
(2) Instruments, dials, controls, levers, and openings in instrument, and control panel.
(3) Air cleaner opening.
(4) Fuel tank cap vent hole.
(5) Wires, shielding, and spark plugs.
(6) Fuel strainer bowl.
(7) Exhaust muffler opening.
(8) Governor control spring.
(9) All exposed threads, fittings, and wires.
(10) Shifter yoke and jaw clutch assembly at the end of the jackshaft.
(11) Transmission breather.
(12) Openings in the conveyor shaft transmission housing.
(13) The pawl and openings around the boom hand hoist wheel.
(14) Teeth of all sprockets and sprocket wheels.
(15) High speed lever latch rod and spring.
(16) All grease fittings and all exposed shaft end bearing points.

e. Refer to TM 9–2851 for general painting instructions.

Section III. PREVENTIVE MAINTENANCE SERVICES

45. General

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

46. Operator 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 any supporting members or connections and must determine whether the unit is in good condition, correctly as-

sembled, secure, or excessively worn. Any mechanical condition which may result in further damage to the unit must be corrected before the equipment is operated.

(1) The inspection for "good condition" is usually an external visual inspection to determine whether the unit is damaged beyond safe or serviceable limits, or to determine if it is in such a condition that damage will result from the operation. The term "good condition" is further defined as: not bent or twisted; not chafed or burned; not broken or cracked; not bare or frayed; not dented or collapsed; not torn or cut; adequately lubricated.

(2) Inspection of a unit to see that it is "correctly assembled" is usually an external visual inspection to determine whether it is in its normal assembled position in the equipment.

(3) Check of a unit to determine if it is "secure" is usually an external inspection, a hand-feel, or a pry-bar or wrench check for looseness in the unit. Such an inspection should include brackets, lockwashers, locknuts, locking wires, or cotter pins used in the assembly.

(4) "Excessively worn" means worn close to or beyond serviceable limits, a condition likely to result in a failure if replacement of the affected parts is not made before the next scheduled inspection.

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. Any deficiences must be corrected or reported to the proper authority before the unit is put into operation.

(1) *Fuel.* Check the fuel supply. See that the tank is full. Check reserve supply of fuel and replenish, if necessary.

(2) *Engine crankcase oil.* Check oil level in engine crankcase. Check reserve supply of lubricants and replenish, if necessary. See LO 5–9585.

(3) *Cooling system.* Check coolant level in radiator. Add coolant, if necessary. When filling a cold radiator containing antifreeze, allow room for expansion.

(4) *Leaks, general.* Check for leaks, paying particular attention to engine oil, fuel, and coolant connections. Look

for signs of leaks under the unit. Correct any leaks or report them to the proper authority.

(5) *Crawler treads.* Visually inspect the crawler treads for sag on each side; adjust if necessary. Check the treads for loose or missing bolts and nuts. See that the rollers are free of stones, mud, and ice.

(6) *Fire extinguisher.* Inspect fire extinguisher for good condition, full charge, and secure mounting. Do not discharge any of contents.

(7) *Lubrication.* Inspect the unit for signs of insufficient lubrication.

(8) *Chains.* Check the tension and condition of the high speed drive chain, power hoist drive chain, reversing countershaft drive chain, conveyor drive chain, flight line chain, and crawler drive chains. Inspect the sprockets for broken teeth.

(9) *Visual inspection.* Make a visual inspection of the entire unit for cracks, breaks, or loose or missing bolts or nuts. Check for any tampering or damage that may have occurred since the unit was last operated. Make sure that all engine accessories are properly mounted, adjusted, in good operating condition, and that all connections are secure. Check operation of the engine clutch lever. Make sure the guards are in place over the chains.

(10) *Start engine.* Disengage the engine clutch. Open the fuel shutoff valve. Set the throttle control at about one-fourth open. Pull the ignition button to the ON position. If the engine is cold, push down on the choke control all the way to fully choke the engine. Push the starter button IN; release the starter button as soon as the engine starts. Adjust the choke control as the engine warms up, using only as much choke as necessary for smooth running of the engine. Push down the throttle control to permit the engine to run at governed speed.

(11) *Instruments.* Check the oil gage reading for normal oil pressure. Pressure may rise while the engine is cold or it may drop below normal at idling speed when the engine is warm. If the oil pressure gage shows an unusual drop or no pressure, stop the engine immediately and report the condition to the proper authority. Coolant temperature should show a gradual rise during warm-up period until it registers 160° to 180° F. The ammeter should show in the CHARGE range.

(12) *Start equipment.* Make sure the boom is in a clear spot with the foot end raised, and that the hopper and flight line are not overloaded. Engage the flight line clutch lever, and slowly engage the engine clutch to check the operation of the flight line. Engage the left and right steering levers and check the operation of the crawler clutches and brakes. Engage the high speed lever and check the operation of the unit at high speeds. Engage the power hoist lever and check the operation of the power hoist. Disengage the levers if improper operation is noticed; correct deficiency or report to the proper authority.

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.

(1) *Instruments.* Check all gage readings frequently. The ammeter should show in the CHARGE range. If the ammeter shows full DISCHARGE, if the oil pressure gage shows an unusual drop from the normal range of 20 to 40 psi or no pressure, or if the coolant temperature gage rises above 180° F, stop operation until failure is corrected.

(2) *Unusual operation.* Check for unusual operation such as overheating, misfiring, or smoking. Make sure the engine clutch holds the load without slipping and releases properly. Make sure the steering levers and operating controls do not slip, and that they release properly. See that the conveyor belt is running true on the rollers and that the tension is properly adjusted. Report any irregularity immediately to the proper authority.

(3) *Unusual noises.* Check for any unusual noises, such as power unit backfiring, knocking, or other foreign noises. If unusual noises are noticed, stop operation immediately and report the condition to the proper authority.

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

(1) *Clearing flight line.* If the pile shows any tendency to collapse or freezing weather is likely, move the conveyor out of the pile and operate until the flight line is free of material.

(2) *Strainer.* Check the fuel strainer at the bottom of the

fuel tank for water and sediment; clean strainer screen and bowl, if necessary.

(3) *Fuel.* Check fuel supply in tank. Add fuel, if necessary.

(4) *Engine crankcase oil.* After engine has stopped for a few minutes, check oil level in engine crankcase. Refill to indicated mark on oil gage. See LO 5–9585.

(5) *Cooling system.* Check coolant level in engine radiator. Add coolant, if necessary.

Caution: If the engine overheats because of lack of coolant, allow it to cool before filling the radiator; otherwise there is danger of cracking the block. If it is necessary to fill the radiator before the engine has cooled, be sure to fill it very slowly with the engine running at a fast idling speed.

(6) *Chains.* Check the tension and condition of the high speed drive chain, flight line chain, and crawler drive chains. Inspect the sprockets for broken teeth.

(7) *Leaks, general.* Check for fuel, coolant, and lubricant leaks. Check for evidence of leaks at hoses, fuel line fittings, and gear housings. Correct unsatisfactory condition or report it to the proper authority.

(8) *Visual inspection.* Make a visual inspection of the entire unit, checking for cracks, breaks, loose or missing bolts, nuts, or parts. Make sure all parts are securely mounted.

f. After-Operation Services. To make sure the equipment is ready to operate at any time, the following services must be performed by the operator or crew immediately after any operating period of 8 hours or less. All deficiences must be corrected or reported to the proper authority.

(1) *Shutdown precautions.* Be sure to empty the flight line and hopper before shutdown in freezing weather. Back out of the pile and disengage the engine clutch to stop the flow of power to the conveyor. Place the engine throttle in idling position, and allow the engine to idle for a few minutes before stopping to allow even cooling of the engine. Stop the engine.

(2) *Fuel.* Check fuel supply in tank. Add fuel, if necessary. Close fuel shutoff valve.

(3) *Engine crankcase oil.* After the engine has been stopped for a few minutes, check the oil level in engine crankcase. Refill to indicated mark on oil level gage. Refer to LO 5–9585.

(4) *Cooling system.* Check coolant level in radiator. Add coolant, if necessary. Change coolant if it is contaminated. If coolant is oily, report condition to the proper authority. If antifreeze is used, check the freezing point. When adding antifreeze, mix solution thoroughly by running the engine.

(5) *Air cleaner.* Remove air cleaner cup and check for sediment in bottom of cup. If necessary, drain and wash cup with an approved cleaning solvent. Refill cup to indicated level with engine oil.

(6) *Fuel filter.* Remove the clean sediment bowl if it contains water or dirt, and check the screen. See that gasket is in good condition before reinstalling bowl.

(7) *Tools and equipment.* See that all tools and equipment assigned to the conveyor are in serviceable condition, clean, and properly stowed in the toolbox.

(8) *Lubrication.* Lubricate as required. Refer to LO 5–9585.

(9) *Clean equipment.* Use an approved cleaning solvent to remove all dust, dirt, and old grease and oil from the engine, accessories, and engine housing parts. Check radiator air passages and remove any accumulated foreign matter which may prevent proper cooling. Remove all excess material from the flight line, hopper, and the crawlers. Remove excess grease and oil from the conveyor transmission housing and other parts of the machine.

(10) *Visual inspection.* Make a visual inspection of the entire unit, checking for fuel, oil, or water leaks, and for cracks, breaks, loose or missing bolts, nuts, or parts. Make sure all parts are securely mounted.

(11) *Protection.* See that engine side panels are in place and fastened properly. If freezing weather is expected, see that cooling system is protected with antifreeze solution.

(12) *Fire extinguisher.* Check the condition of the fire extinguisher for full charge, and secure mounting. Do not discharge any of contents.

47. Maintenance and Safety Precautions

a. Make sure drive chains do not rub against the chain guards.

b. Make sure gear covers and chain guards are in place and secure.

c. Keep electrical equipment clean and dry.

d. Engage clutches carefully. Sudden engagement causes undue strain on the equipment.

e. Always disengage the master clutch before engaging the operating controls.

f. Do not allow hot material to remain on the belt for more than two or three minutes. Always run hot material off the belt before stopping the conveyor.

g. Never attempt to lubricate or service the conveyor when the engine is in operation.

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

i. Do not overgrease the antifriction bearings; seals may be damaged, allowing dirt to enter.

j. Always wipe fittings before lubrication to prevent dirt from being pumped into the bearings.

k. Always correct or report any mechanical deficiences that may result in further damage to the unit if operation is continued.

48. Organizational Maintenance

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

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

c. The preventive maintenance services to be performed at these 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 Form 464. These numbers appear in either second, third, or both columns, as an indication of the interval at which the service is to be performed.

Technical inspection	Service		
	Monthly	Weekly	
			GENERAL
1	1	1	*Before-operation services.* Check and perform services listed in paragraph 46*c*.
2	2	2	*Lubrication.* Inspect the entire unit for missing or damaged lubrication fittings, lines, and cups, and for indications of insufficient lubrication. Record the lubrication order number and its date of publication in the spaces provided on DA Form 464.
3	3	----------	*Tools and equipment.* Inspect condition of all tools and equipment assigned to the unit. Check condition and mounting of toolboxes or compartments.
	3	----------	See that all tools and equipment assigned to the unit are clean, serviceable, and properly stowed or mounted. See that toolboxes or compartments are in good condition and that they close and fasten properly.
4	4	4	*Fire extinguisher.* Check carbon tetrachloride type for full charge and secure mountings. See if there is any corrosion. Inspect carbon dioxide (CO_2) 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	*Publications.* See that a copy of this technical manual, LO 5–9585, TB 5–9585–1, and DA Form 285 are on the unit and in serviceable condition.
6	6	6	*Appearance.* Inspect the general appearance of the unit, paying special attention to cleanliness, legibility of identification markings, and condition of paint.
	6	6	See that deficiencies noticed are corrected and uncorrected deficiencies are reported to the proper authority.
7	7	----------	*Modifications.* See if all available modification work orders applying to this unit have been completed and recorded on DA Form 478.

Technical inspection	Service		
	Monthly	Weekly	
			ENGINE ACCESSORIES
14	14	14	*Crankcase, breather.* Inspect crankcase for leaks. Make sure crankcase breather is clean and securely mounted.
	14	14	Correct or report any oil leaks. Clean the breather, if necessary.
15	15	15	*Oil filter.* Inspect the oil filter and connections for leaks while the engine is running.
	15	15	Service the oil filter (par. 43*f*), if necessary. After servicing, check carefully for leaks while engine is running.
16	16	16	*Radiator.* Inspect the radiator for leaks, obstructions in core air passages, and loose mounting bolts. Check all cooling system hoses for leaks, deterioration, and loose connections. Check operating temperature and condition of coolant. If coolant temperature of engine remains below 160° F. or rises above 180° F. during operation, engine thermostat may be defective. If antifreeze is used, check the freezing point of the coolant.
	16	16	Drain, flush, and refill the cooling system if coolant is contaminated. Clean core air passages. Replace any damaged or defective cooling system hoses and gaskets. See that all mounting bolts and connections are tight. Protect the coolant from freezing, and record its freezing point on DA Form 464.
17	17	17	*Water pump, fan, and shroud.* Inspect water pump, fan, and shroud for loose mounting and assembly cap screws. Inspect for misalined fan blades and shroud, and check pump for leaks.
	17	17	Tighten or replace loose or missing mounting and assembly cap screws. Aline fan blades and shroud, if necessary. Replace a leaking pump with a new or reconditioned unit, or report unsatisfactory condition to the proper authority.
18	18	18	*Belts and pulleys.* Inspect for excessively worn, cracked, or frayed fan belt. Check belt tension; check condition and alinement of pulleys. Belts are properly adjusted when they can be deflected without undue pressure from ¾ to 1 inch at a point midway between the pulleys that are farthest apart.
	18	18	Adjust the tension of the belt (par. 77*h*), if necessary. Replace belt if frayed or badly

Technical inspection	Service		
	Monthly	Weekly	
			worn. Aline pulleys, if necessary. Replace broken or cracked pulleys, or report unsatisfactory condition to the proper authority.
19	19	19	*Oil pressure relief valve.* Check to make sure oil pressure of the engine is adequate; record the pressure in the space provided on DA Form 464. Report unsatisfactory condition to the proper authority.
20	20	20	*Governor and linkage.* Check the governor adjustment. If the engine surges when running at top speed without load, the governor is out of adjustment.
	20	20	If the engine surges when running at top speed, adjust the surge adjustment screw (par. 72*d*(2)).
			FUEL SYSTEM
38	38	38	*Fuel pump and housing.* Inspect pump and lines for leaks. Check for loose mounting and assembly screws.
	38	38	Tighten any loose screws and connections. Replace defective pump with new or reconditioned pump (par. 69).
39	39	39	*Carburetor and linkage.* See if all carburetor mounting and assembly screws and nuts are in place and secure. Check flexibility and operation of linkage.
	39	39	Tighten any loose mounting and assembly screws and nuts. Replace worn or damaged linkage connections. Adjust idle adjusting needle (par. 71*d*) for best low-speed operation.
40	40	40	*Filters.* Examine for leaks and loose connections, and for dirt or water in the sediment bowl.
	40	40	Service the fuel strainer (par. 68*a*).
41	41	41	*Air cleaner.* Inspect the air cleaner for loose connections. Check condition and level of oil in cup.
	41	41	Service the air cleaner (par. 43*e*). See LO 5–9585. Make sure there are no air leaks between the air cleaner and the carburetor.
43	43	43	*Tank, cap, and gasket.* Inspect 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 renew leaky tank (par. 67) or damaged gasket or connections.

Technical inspection	Service		
	Monthly	Weekly	
44	44	44	*Fuel lines.* Check the fuel lines for leaks, loose connections, and damage.
	44	44	Repair or replace (par. 66) damaged or collapsed fuel lines. Tighten loose connections. Report all uncorrected deficiencies to the proper authority.
			ELECTRIC SYSTEM
46	46	46	*Spark plugs.* Inspect spark plugs for dirty or cracked insulators.
	46	46	Clean dirt and oil from spark plug insulators.
	46	----------	Remove and clean spark plugs and adjust point gap (par. 84*d*). Replace defective plugs. See that plugs and gaskets are in good condition before they are replaced.
47	47	47	*Battery.* Inspect the battery case for cracks, leaks, loose holddown bolts or clamps, and for dirt and corrosion on top of the battery. Check for loose cable connections and for corroded or damaged terminals and cables. Check level of electrolyte; check specific gravity and record reading on DA Form 464. Readings from 1.275 to 1.300 indicate a fully charged battery. Readings from 1.200 to 1.225 and below indicate a battery more than half discharged.
	47	47	Clean all dirt and corrosion off tops of the battery, posts, cables, and terminals. Replace damaged cables. Apply a thin film of lubricant over terminals after they are clamped tight. Add clean water, if needed, but do not overfill. If freezing temperatures prevail, battery must be charged long enough to mix solution thoroughly. See that battery is securely mounted, that caps are tight, and vent holes are open.
48	48	48	*Generator and starter.* Inspect generator and starting motor for loose mounting bolts and external wire connections.
	48	48	Inspect commutators and brushes for wear, dirt, and oil deposits. See if brushes are free in their holders and if brush wires are secure. Replace brushes if they are worn to less than ½ of their original length. See that generator and starting motor are securely mounted. Replace brushes (par. 75*a*) and clean commutators (par. 75*c*), if necessary. See that brush lead connections are tight and that

Technical inspection	Service		
	Monthly	Weekly	
			brushes are free in their holders and make good contact with commutators.
49	49	49	*Magneto.* 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 (par. 79*a*), if necessary. Replace points (par. 79*b*) if they are burned or pitted. Apply a drop of lubricant to the breaker cam wick, as needed. Do not add lubricant to oil-impregnated parts. Thoroughly dry all parts before reaassembly.
50	50	50	*Wiring, switches.* Inspect wiring for oil-soaked or frayed insulation, broken wires, and loose or corroded connections. Check operation of switches.
	50	50	Replace defective switches and wires. See that connections are clean and tight. See that all switches and wiring conduits are securely mounted. Replace or report defective or damaged switches and external wiring.
51	51	51	*Voltage regulator.* Check voltage regulator for proper operation and secure mountings. See that wire connections are tight. The regulator should allow an appreciable charge to go into the battery after the starter is used. After the battery is fully charged, the ammeter should read only a slight charge.
	51	51	Tighten any loose or replace any missing mounting screws. Replace regulator (par. 78) if it is defective.
			CONTROL SYSTEM
57	57	57	*Gages.* Inspect receiving units of the water temperature and oil pressure gages for good condition, secure mounting, and proper operation.
	57	57	Tighten any loose mounting screws and connections. Replace damaged or defective gages (pars. 87 and 89).
58	58	58	*Meters.* Inspect ammeter, hourmeter, tachometer, and the sending units of the water temperature and oil pressure gages for good condition, secure mounting, and proper operation.
	58	58	Tighten any loose mounting screws and connections. Replace damaged or defective meters (pars. 83, 82, 81).
62	62	62	*Levers, linkage.* Inspect condition of master clutch, flight line clutch, high speed, and

Technical inspection	Service		
	Monthly	Weekly	
			power hoist clutch levers and see if all parts are securely mounted and operate properly. Check lever linkage for excessively worn or missing connecting pins or locking pins.
	62	62	Tighten loose parts and replace defective parts. Refer uncorrected deficiency to the proper authority.
64	64	64	*Gear housing.* Inspect the power hoist gear housing for secure mounting and leaks.
	64	64	Tighten loose mounting and case bolts. Refer uncorrected deficiency to the proper authority.
68	68	68	*Drum, cables.* Inspect power hoist and hand hoist cable drums for loose mounting, and for excessive wear and damage. Inspect cables for excessive wear, kinks, and broken or frayed strands and for loose mounting at anchor points.
	68	68	See that cable drums are in good condition and securely mounted. Replace cables (pars. 106 and 119) if they are worn or damaged.
			FRAME AND MOUNTINGS
80	80	80	*Frame.* Check frame for bent members, breaks, cracks, and broken welds, and for loose or missing bolts and nuts.
	80	80	See that any cracks, breaks, or broken welds are repaired before further damage results. Tighten or replace loose or missing bolts and nuts.
			CRAWLER ASSEMBLY
87	87	87	*Track assembly.* Check the track links and T-head pins for cracks, breaks, loose or missing parts, and for defective operation.
	87	87	Replace excessively worn or damaged track links and T-head pins (par. 124). See that all lockpins are in place and secure.
88	88	88	*Idlers and rollers.* Inspect the rollers for loose mounting bolts and excessive wear or damage.
	88	88	Report excessively worn or damaged rollers. Tighten any loose mounting bolts.
89	89	89	*Track tension.* Check the track tension. When the sag in the crawler track links from the spring takeup idler to the crawler traction wheel exceeds 3 inches on either side of the unit, tighten the crawler tread.
	89	89	Adjust the track tension (par. 124*d*), if necessary.

Technical inspection	Service		
	Monthly	Weekly	
90	90	90	*Frame.* Inspect the crawler frame for cracks, broken welds, and loose or missing mounting bolts or nuts.
	90	90	Tighten or replace any loose or missing bolts and nuts. Pay particular attention to the mounting bolts securing the frame to the axles.
91	91	91	*Sprockets.* Check the sprockets for secure mounting, excessive wear, and damage. Check the crawler drive chains for tension. Check the sprockets for secure mounting.
	91	91	Adjust crawler drive chain tension (par. 125*f*), if necessary. Replace damaged sprockets; replace keys if worn.
			DRIVE SYSTEM
93	93	93	*Main transmission.* Inspect main transmission case for leaks, and for loose mounting and assembly bolts and nuts. Check for any unusual gear noise during operation.
	93	93	Tighten any loose mounting and assembly bolts and nuts. If transmission leaks, is noisy, or is damaged, refer the unsatisfactory condition to the proper authority.
94	94	94	*Drive sprockets and chains.* Check the sprockets for excessive wear and damage. Check the chains for excessive wear, cracked or broken links, and improper adjustment.
	94	94	Adjust chain tension (pars. 125*f*, 136*d*, 96*d*, and 103*e*(9)), if necessary. Repair or replace worn or damaged chains or sprockets.
95	95	95	*Master clutch.* Check the master clutch to see if it grabs or chatters while being engaged, or slips when fully engaged. Clutch adjustment is correct when a distinct pressure is required on the clutch lever to engage the clutch.
	95	95	Adjust clutch (par. 98*a*), if necessary. If clutch slips, grabs, or chatters when properly adjusted, refer unsatisfactory condition to the proper authority.
96	96	96	*Steering clutches.* Check the steering levers for condition, operation, and adjustment of clutches. The clutches should knuckle in with a definite snap, and hold in the operating position without slipping.
	96	96	Remove any oil or grease from the linings and drums. Adjust clutches (par. 141*a*), if

Technical inspection	Service		
	Monthly	Weekly	
			necessary. If adjustment does not correct deficiencies, report to the proper authority.
97	97	97	*Jaw clutches.* See that the jaw clutches are adjusted to fully engage and fully disengage. Check clutch jaws, shifter yoke, and control linkage for cracks or missing parts.
	97	97	Adjust clutch linkage (pars. 115*f* and 117*f*), if necessary, and see that all pins and bolts are in place and secure. Report excessively worn parts to the proper authority.
98	98	98	*Hoist operating clutch.* Check condition, operation, and adjustment of power hoist cone clutch. Clutch should handle the load without slipping when fully engaged.
	98	98	See that all connecting pins, bolts, and holding spring are in place and are secure. Remove any oil or grease from lining and drum. Adjust clutch linkage (par. 118*f*), if necessary. Replace the lining before worn to such an extent that rivets may contact the drums before next inspection period. If adjustment does not correct deficiencies, report to the proper authority.
101	101	101	*Steering or travel brakes.* See if brakes hold crawlers when turning on level ground. Be sure bands are free of grease and oil.
	101	101	See that all springs, bolts, pins, and cotter pins are in place and secure. Remove oil or grease from lining and drums and adjust brakes (par. 141*b*), if necessary. Replace bands if lining is worn to the extent that rivets may contact the drums before next inspection period.
103	103	103	*Primary drive gears.* Inspect the gears for excessive wear or other damage. Check for unusual noises during operation.
	103	103	Report excessively worn or damaged gears to the proper authority.
105	105	105	*Bearings and shafts.* Inspect the conveyor transmission bearings on the main jackshaft and the crawler clutch shaft for signs of worn bearings and misalined shafts. Check for loose mountings.
	105	105	Tighten any loose bearing cap bolts. Report any other deficiencies noticed to the proper authority.
115	115	115	*Hoist assembly (power).* Check for proper operation. Check for loose drive chain, chain guard, and cable drums. Check for leaks.

Technical inspection	Service		
	Monthly	Weekly	
	115	115	See that housing and drums are tight. Report deficiencies to the proper authority.
117	117	117	*Boom and mast assembly.* Inspect the conveyor boom frame and the mast for loose bolts and nuts, and see that any cracks or breaks are repaired before further damage results. See that mast and boom sheaves are securely mounted. See that mast foot pins are secure. Inspect flights and flight line chains for wear, cracks, and general condition. Check for debris in flight line chains and tracks. Inspect cables for excessive wear, kinks, or broken strands. Check the safety throwout arm adjustment; the safety throwout should operate when the angle the boom makes with the ground increases to 36° maximum.
	117	117	Tighten or replace loose or missing bolts and nuts. Clean debris from boom. Adjust flight line chain tension (par. 101*d*), if necessary. See that mast and boom are in good condition and secure. Report any deficiency to the proper authority.

Section IV. TROUBLESHOOTING

49. Use of Troubleshooting Section

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the conveyor or any of its components. Each trouble symptom 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 in chapter 4 (pars. 143 to 206) pertain to operations that are the responsibility of the field and depot maintenance personnel. Organizational maintenance personnel should not proceed without proper authority.

50. Engine Fails to Start

Probable cause	*Possible remedy*
Fuel Supply tank empty	Fill tank; crank engine until carburetor primes.
Dirt, gum, or water in fuel line	Clean fuel line (par. 66).
Fuel strainer clogged	Clean fuel strainer (par. 68).
Over-choking	If carburetor is flooded, place ignition toggle switch in OFF position, open choke, and crank with the starting crank until excess fuel is expelled from cylinders.

Probable cause	*Possible remedy*
Carburetor out of adjustment	Adjust carburetor (par. 71*d*).
Carburetor clogged	Clean carburetor (pars. 151–154).
Dirty or damaged spark plugs	Remove, clean, inspect, adjust, and install (par. 84).
Grounded high tension lead	Locate ground; repair or replace high tension lead.
Defective magneto	Replace magneto (par. 79*c*, *d*, and *e*).
Magneto breaker points burned, pitted, or out of adjustment.	Replace breaker points and set to 0.015-inch gap (par. 79*b*).
Capacitor in magneto open or shorted.	Replace capacitor.
Improper ignition timing	Set timing (par. 79*e*).

51. Engine Stops

Probable cause	*Possible remedy*
Fuel tank empty	Fill fuel tank.
Dirt, gum, or water in fuel system	Check fuel supply source for purity. Clean fuel line (par. 66), fuel tank (par. 67), fuel strainer (par. 68), and carburetor (pars. 151–154).*
Engine overheated	Provide adequate ventilation. Open side panels. Check cooling system and engine thermostat (par. 34).
Faulty ignition leads	Check the wiring for cracks, chafed, or oil-soaked leads, and for loose connections; replace defective leads and tighten loose connections.
Defective magneto	Replace magneto (par. 79*c*, *d* and *e*).

52. Engine Generator Fails to Charge

Probable cause	*Possible remedy*
Brushes sticking or worn	Replace burned or worn brushes (par. 77*a*).
Open armature circuit	Replace defective armature (pars. 159–162).*
Shorted armature circuit	Replace defective armature (pars. 159–162).*
Open field coil circuit	Replace defective field coil and frame assembly (pars. 159–162).*
Shorted field coil circuit	Replace defective field coil and frame assembly (pars. 159–162).*
Generator grounded	Replace generator (par. 77*c*, *g* and *h*).
Dirty commutator	Clean commutator (par. 77*b*).

53. Engine Electrical Starter Fails to Start Engine

Probable cause	*Possible remedy*
Brushes sticking or worn	Replace brushes (par. 75*a*).
Defective or loose connection	Tighten or replace connections.

* See note in paragraph 49.

Probable cause	*Possible remedy*
Battery delivers insufficient voltage	Recharge or replace battery (See TM 9–2857).
Battery leads loose, corroded, or defective.	Check battery leads. Replace defective parts. Clean corroded connections. Tighten connections.
Defective starter switch	Replace starter switch.
Defective electrical starter	Inspect electrical starter; replace (par. 75), or repair (pars. 166–169).*
Electrical starter turns but does not turn engine.	Inspect over-running clutch; replace defective parts (pars. 166–169).*

54. Engine Operates but Conveyor Flight Line Does not Move, or Moves Erratically

Probable cause	*Possible remedy*
Slipping engine master clutch	Adjust engine master clutch (par. 98*a*).
Worn or oily master clutch plate	Replace and adjust (pars. 176–180).*
Broken sprocket teeth in the drive system.	Replace damaged sprocket.
Worn or broken chains in conveyor drive system.	Repair or replace broken chain.
Damaged engine transmission	Repair or replace transmission (pars. 181–183).*
Bent clutch shifter shafts	Replace shifter shaft (pars. 176–180).*
Damaged drive shaft	Replace shaft (pars. 185–190).*
Spring release sprocket adjustment incorrect.	Adjust the spring release sprocket (par. 104*b*).
Broken clutch jaws in flight line clutch.	Replace clutch jaws (pars. 185–190).*
Flight line clutch lever or linkage bent or broken.	Repair or replace damaged lever and linkage (par. 115).
Master clutch disengaged by automatic throwout.	Lower boom.
Boom foot crowding too fast in hard material.	Shift transmission to a lower speed.
Jackshaft drive chain tension incorrect.	Adjust jackshaft drive chain tension (par. 96*d*).

55. Conveyor Stalls, Stopping Engine

Probable cause	*Possible remedy*
Damaged or binding flights	Replace damaged flights (par. 105).
Debris between flights and dust guard of boom or in drive chains.	Remove debris from the boom and drive chains.
Flight line drive chain adjustment incorrect.	Check flight line drive chain adjustment (par. 101*d*); adjust where necessary.
Clutch brakes tight	Adjust clutch brakes (par. 141*a*).

* See note in paragraph 49.

Probable cause	*Possible remedy*
Flight line stuck in hard or frozen material.	Loosen up the material.
Debris in crawler track	Remove debris from crawler track.

56. Boom Power Hoist Does Not Operate

Probable cause	*Possible remedy*
Power hoist clutch lever or linkage bent or broken.	Replace damaged lever and linkage (par. 118).
Power hoist clutch adjustment incorrect.	Adjust the power hoist clutch (par. 118*f*).
Power hoist clutch lining worn or damaged.	Replace clutch lining (pars. 185–189).*
Power hoist drive chain broken	Repair or replace the drive chain (par. 135).

57. Engine Operates, Crawler Treads do Not Move

Probable cause	*Possible remedy*
Broken crawler drive chains	Repair or replace the crawler drive chains (par. 132).
Crawler tread frozen to ground	Break tread loose with pinch bars.
Broken or damaged shafts in crawler drive system.	Replace broken or damaged shafts (pars. 125, 126, and 127).
Bent or broken crawler clutch levers or linkage.	Repair or replace the damaged levers or linkage (par. 116).
Broken sprocket teeth in crawler drive system.	Replace damaged sprocket (pars. 125 and 197–199).*
Broken gear teeth in engine transmission.	Replace damaged gear (pars. 181–184).*
Crawler clutches not adjusted properly.	Adjust crawler clutch (par. 141*a*).
Crawler clutches worn	Replace worn clutch parts (pars. 191–196).*

58. Excessive Vibration and Noise

Probable cause	*Possible remedy*
Engine loose on mounting	Tighten engine mounting.
Roller chain adjustments incorrect	Check roller chain tensions; adjust if necessary (pars. 101*d*, 125*f*, 132*b*, 96*d*, and 103*e*(9)).
Frame misalined	Correct misalinement of frame and realine the shafts. Do not proceed without proper authority.
Operating speed excessive	Operate at correct transmission speed.
Loose fittings, rivets, bolts, cable, and boom plates.	Tighten all loose fittings, rivets, bolts, cable, and boom plates.
Spring release sprocket adjustment incorrect.	Adjust the spring release sprocket (par. 104*b*).

* See note in paragraph 49.

Section V. RADIO SUPPRESSION

59. Definition of Suppression

Radio noise suppression is the elimination or minimizing of electrical disturbances within the equipment which, when radiated, interfere with radio reception and disclose the location of the equipment to sensitive electrical detectors.

60. Source of Interference

Spark plugs, high tension leads from the magneto to the spark plugs, magneto breaker points, battery charging generator, and poor electrical connections between components of the engine electrical system are sources of electrical interference.

61. Methods Used to Suppress Interference

a. The ignition button (24, fig. 5) is enclosed in a metal shield which is grounded to the instrument and control panel by internal-external tooth lockwashers.

b. The voltage regulator is enclosed in a metal shield which is grounded to the instrument and control panel by internal-external tooth lockwashers.

c. A bond strap grounds the engine to the engine frame. Internal-external tooth lockwashers are used at the connections of the strap to the engine and to the frame to insure good electrical contact.

d. The high tension leads, the generator-to-voltage regulator leads, and the ignition button-to-magneto lead are enclosed in braided, tinned, copper shielding which is grounded to the engine and engine frame.

e. A capacitor is connected to the generator armature terminal and grounded to the generator frame; another capacitor is connected to the ammeter terminal and grounded to the instrument and control panel.

f. The spark plugs are self-shielded.

62. Effects of Suppression

There is no interference from equipment satisfactorily suppressed for radiated and conducted interference over a frequency range of 0.35 through 100.0 megacycles at a distance of 5 feet from the unit.

63. Suppression System Testing

a. Install a battery-powered radio receiver in good operating condition not more than 5 feet from the conveyor. A wide band

receiver covering the frequency range of 0.35 to 100.0 megacycles is preferred.

b. Start equipment and tune receiver. Turn receiver volume control to maximum, and select three widely separated frequencies for listening. Use frequencies that are free of signals from strong carriers so that the receiver will be in its most sensitive operating condition.

c. Start the engine; operate the engine throttle lever and listen to the receiver speaker or headset. A regular clicking sound, which varies with engine speed and ceases the instant the ignition is shut off, is caused by the ignition circuit.

d. Systematically replace suppression components in the circuit, testing after the replacement of each component to see if the trouble has been eliminated.

64. Suppression Component Replacement

a. General. Suppression components must be replaced with identical parts. Use internal-external tooth lockwashers in the same positions as on the original assembly. The bonding between the shielding over the wires and the connection points on the frame must be replaced as on the original assembly.

b. Generator Capacitor.

(1) Remove the engine left side panel (17, fig. 1) from the engine housing.
(2) Remove the nut and lockwasher securing the capacitor lead to the generator armature terminal post.
(3) Remove the machine screw and lockwasher securing the capacitor to the generator frame; remove the capacitor.
(4) Position a new capacitor on the generator frame; secure with a machine screw and lockwasher.
(5) Position the capacitor lead on the generator armature terminal post; secure with a lockwasher and nut.
(6) Install the engine left side panel.

c. Ammeter Capacitor.

(1) Remove the engine right side panel.
(2) Remove the nut and lockwasher securing the capacitor lead to the ammeter terminal post.
(3) Remove the machine screw and lockwasher securing the capacitor to the instrument and control panel; remove the capacitor.
(4) Position a new capacitor on the instrument and control panel; secure with a machine screw and lockwasher.
(5) Position the capacitor lead on the ammeter terminal; secure with a lockwasher and nut.
(6) Install the engine right side panel.

Section VI. ENGINE FUEL SYSTEM

65. Description

a. General (fig. 9). The engine fuel system consists of a fuel tank (1), fuel lines (9), (12) and (14), fuel strainer (15), fuel pump (10), carburetor (7), and air cleaner (6). A governor is used to control the carburetor throttle valve during normal operation.

b. Fuel Tank (fig. 9). The fuel tank (1) is mounted inside the engine housing. The filler opening of the tank has a strainer screen insert. A drain plug (3) is provided in the bottom of the tank.

c. Fuel Strainer (fig. 9). The fuel strainer (15) is the glass bowl type. It is mounted between the fuel tank (1) and fuel pump (10). A shutoff valve (16) is provided in the upper portion of the fuel strainer.

d. Air Cleaner (fig. 9). The air cleaner (6) is an oil bath type. The air passes through the oil, forming an oil spray that clings to dust particles and carries them down into the oil cup. A cap on the top of the stack serves to prevent the entry of rain or debris into the air cleaner.

e. Fuel Pump (fig. 9). The fuel pump (10) is mounted on the engine crankcase. It is the diaphragm type, with a rocker arm operated by the engine camshaft. It serves to pump fuel to the carburetor.

f. Carburetor (fig. 9). The carburetor (7) is an up-draft, venturi type. It has a main adjusting needle and an idle adjusting needle.

g. Governor (fig. 10). The governor is the centrifugal flyweight type enclosed in a housing (3) mounted on the engine gear cover. The governor gear (4) is driven by the engine cam gear. As the engine speed increases, the governor weights are moved outward by centrifugal force. The governor weighs push a sleeve as they move outward; the sleeve bears against a fork connected to the governor takeoff lever (1). An external spring (2) opposes weights. The takeoff lever is connected to the carburetor throttle lever.

66. Fuel Lines

(fig. 9)

a. Removal.

(1) Remove the engine right side panel.

(2) Close the fuel shutoff valve (16).

1 Fuel tank
2 Fuel tank cap
3 Fuel tank drain plug
4 Hose clamp
5 Flexible hose
6 Air cleaner
7 Carburetor
8 Elbow
9 Flexible fuel line
10 Fuel pump
11 Pipe nipple
12 Fuel line
13 Three-way valve
14 Flexible fuel line
15 Fuel strainer
16 Shutoff valve

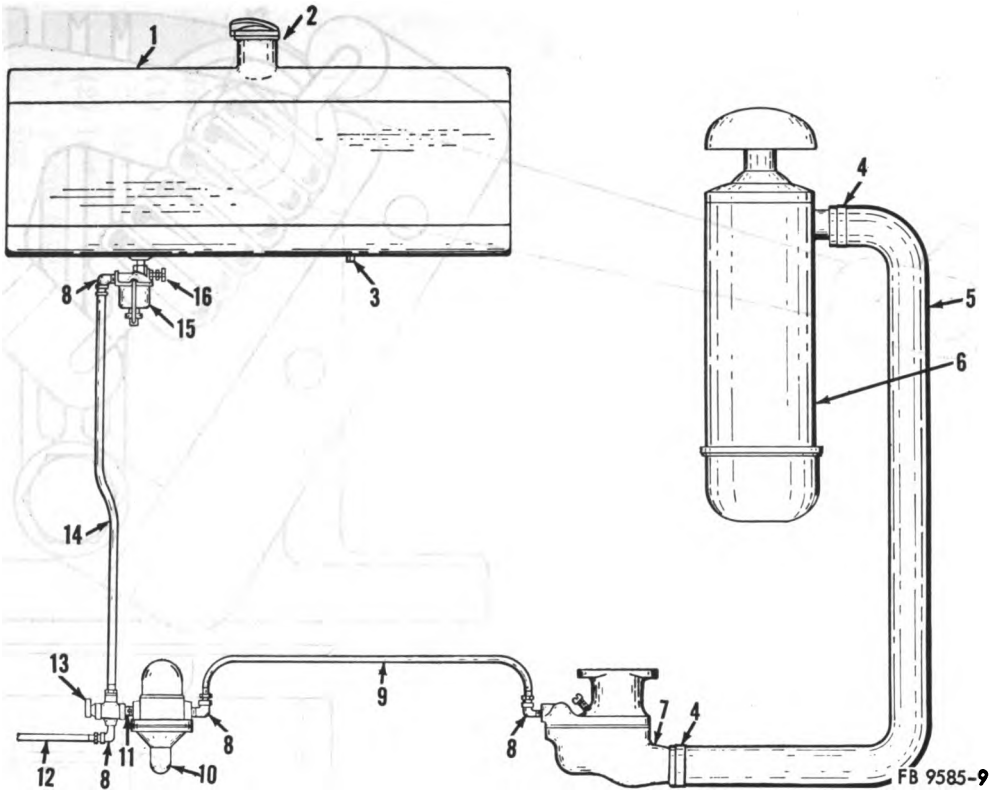
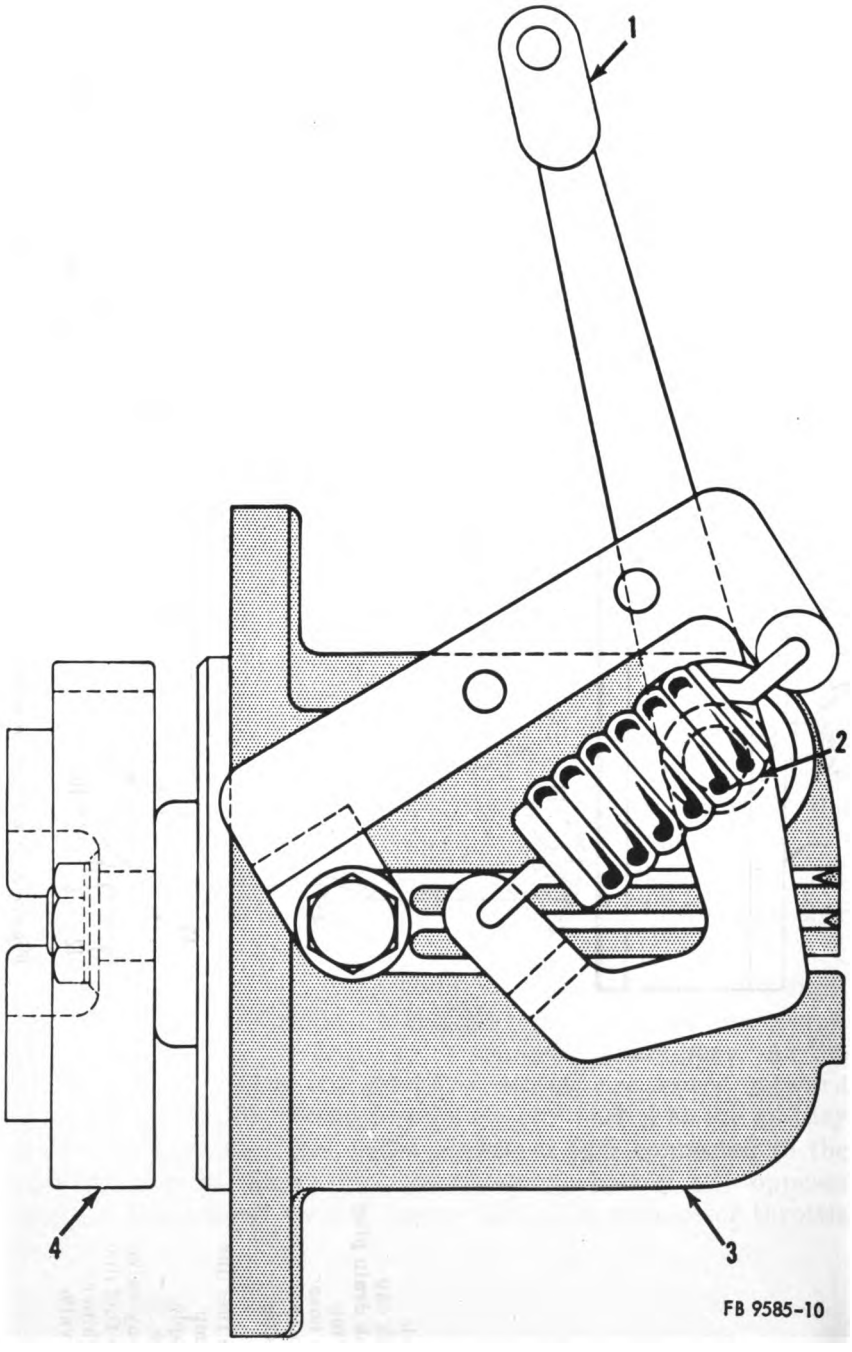


Figure 9. Fuel system schematic diagram.



1 Takeoff lever
2 Spring
3 Housing
4 Gear

Figure 10. Governor, external view.

(3) Disconnect the flexible fuel line (14) at the elbow (8) in the fuel strainer (15) and at the three-way valve (13).

(4) Disconnect the flexible fuel line (9) at the elbows (8) in the fuel pump (10) and carburetor (7); remove the flexible hose.

(5) Disconnect the outside-source fuel line (12) from the instrument panel and the elbow (8) at the three-way valve (13).

(6) Remove the pipe elbows (8) from the fuel strainer, fuel pump, and carburetor.

(7) Remove the three-way valve and the pipe nipple (11) from the fuel pump (10).

b. Cleaning and Inspection.

(1) Clean the flexible fuel lines with a cloth dampened with an approved cleaning solvent; dry thoroughly.

(2) Wash all other parts with an approved cleaning solvent; dry thoroughly.

(3) Blow air through the fuel lines and fittings to clear them.

(4) Inspect the fuel lines and connectors for cracks, breaks, or other damage; replace if damaged.

(5) Inspect the fittings for wear, broken threads, or other damage; replace if damaged.

c. Installation.

(1) Install the pipe nipple (11) and three-way valve (13) in the inlet opening of the fuel pump (10).

(2) Install an elbow (8) in the outlet openings of both fuel pump (10) and fuel strainer (15), and in the inlet opening of the carburetor (7).

(3) Connect a flexible fuel line (9) between the elbows in fuel pump (10) and carburetor (7).

(4) Connect a flexible fuel line (14) between the elbow (8) in the fuel strainer and the three-way valve (13).

(5) Connect the outside-source fuel line (12) between the instrument panel and the elbow (8) in the three-way valve (13).

(6) Open fuel shutoff valve (16).

(7) Install the engine right side panel.

67. Fuel Tank

a. Removal.

(1) Remove the engine left side panel (17, fig. 1) and right side panel.

1 Fuel tank
2 Machine screw, fil hd, ¼" x ⅜" NC (1 rqr)
3 Lockwasher, ⅜" (1 rqr)
4 Gasket retainer
5 Cap
6 Gasket
7 Holddown strap
8 Liner
9 Machine screw, fil hd, $\frac{5}{16}$" x 1¼" NC (4 rqr)
10 Lockwasher, external tooth, $\frac{5}{16}$" (12 rqr)
11 Plain washer, $\frac{5}{16}$" (12 rqr)
12 Fuel tank support
13 Machine screw, fil hd, $\frac{5}{16}$" x ⅝" NC (8 rqr)
14 Pipe plug, ⅜" (1 rqr)

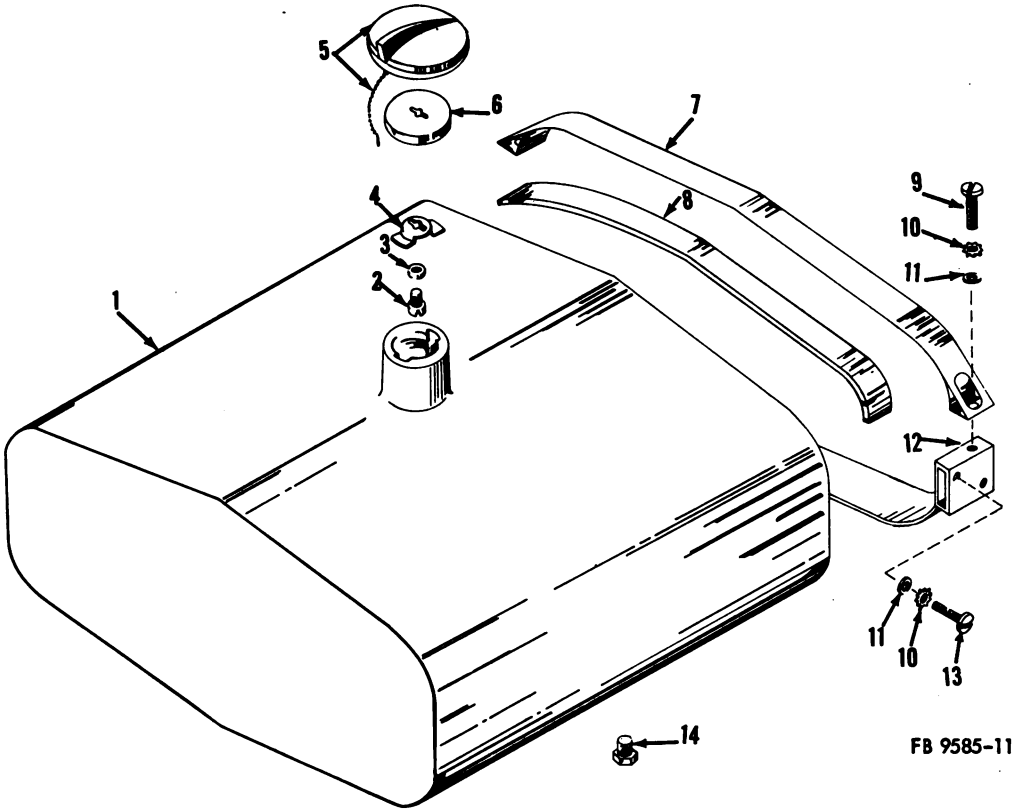


Figure 11. Fuel tank, exploded view.

(2) Remove the pipe plug (14, fig. 11) from the bottom of the fuel tank (1) and drain the fuel into a clean container.

(3) Disconnect the flexible fuel line (14, fig. 9) from the fuel strainer (15).

(4) Loosen the clamp securing the muffler (22, fig. 1) to the exhaust pipe.

(5) Remove the 14 machine screws securing the engine hood top (29, fig. 3) to the radiator shell (20, fig. 1) and to the instrument and control panel (27, fig. 3); remove the assembled hood top and fuel tank.

(6) Remove the eight machine screws (13, fig. 11), external tooth lockwashers (10), and plain washers (11) securing the two fuel tank supports (12) to the sides of the hood top; remove the assembled fuel tank supports and holddown straps from the hood top.

(7) Remove the four machine screws (9), external tooth lockwashers (10), and plain washers (11) securing the fuel tank holddown straps (7) to the two tank supports; remove the four tank supports, holddown straps, and felt liners (8).

b. Disassembly (fig. 11)

(1) Unscrew the fuel tank cap (5) and loosen the sheet metal screw securing the chain of the cap to the fuel tank; remove the cap.

(2) Remove the machine screw (2) and lockwasher (3) securing the gasket retainer (4) to the fuel tank cap; remove the gasket retainer and gasket (6).

(3) Remove the assembled nipple and fuel strainer (15, fig. 9) from the bottom of the fuel tank.

c. Cleaning and Inspection.

(1) Install the pipe plug in the bottom drain opening of the fuel tank; close the fuel strainer opening. Fill the tank half full of an approved cleaning solvent; shake and allow to settle a few minutes before pouring out the solution. Remove the pipe plug and run approved cleaning solvent through the tank until it comes out clear and clean.

(2) Clean the exterior of the fuel tank with a cloth dampened with an approved cleaning solvent; dry thoroughly.

(3) Clean all the other parts except the felt liners with an approved cleaning solvent; dry thoroughly.

(4) Inspect the fuel tank for cracks, dents, damaged seams, weak or rusted spots, or other damage. Repair a slightly

damaged fuel tank by rewelding broken seams or patching weak or cracked spots; replace the fuel tank if damaged beyond repair.

Caution: Thoroughly steam clean the tank before welding, making sure all traces of fuel have been removed. Use live steam for a period of 45 minutes; then dry out the tank with clean, dry, compressed air. Fill the tank with water before welding.

(5) Inspect all parts for worn or broken threads, dents, breaks, or other damage; replace if damaged.

d. Reassembly (fig. 11)

(1) Screw the pipe plug (14) in the bottom drain of the fuel tank.

(2) Install the fuel strainer and nipple in the bottom of the fuel tank.

(3) Install the gasket (6) and gasket retainer (4) in the fuel tank cap (5); secure with a machine screw (2) and lockwasher (3).

(4) Secure the chain of the cap to the fuel tank by installing the sheet metal screw.

e. Installation.

(1) Position the four felt liners (8, fig. 11), tank supports (12), and holddown straps (7) around the fuel tank (1); secure with the four plain washers (11), external tooth lockwashers (10), and fillister head machine screws (9).

(2) Install the assembled fuel tank and supports in the engine hood top with eight plain washers (11), external tooth lockwashers (10), and machine screws (13).

(3) Position the engine hood top (29, fig. 3) on the radiator shell (20, fig. 1) and instrument and control panel (27, fig. 3); secure with 14 machine screws.

(4) Tighten the clamp securing the muffler (22, fig. 1) to the exhaust pipe.

(5) Connect the flexible fuel line (14, fig. 9) to the fuel strainer (15).

(6) Install the left and right side panels.

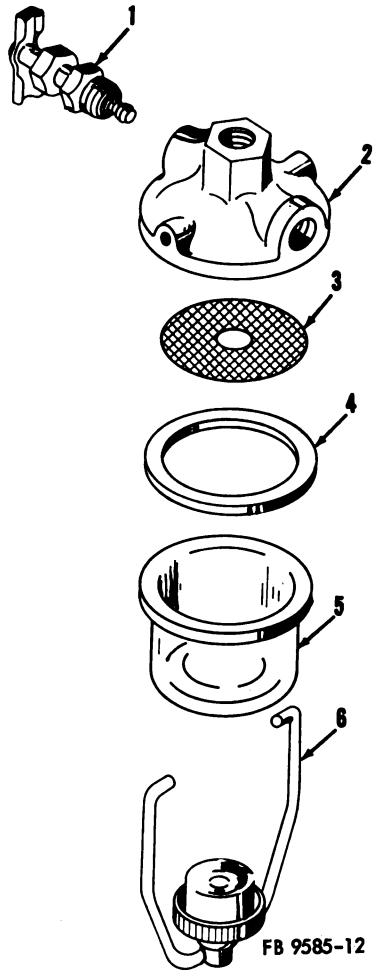
(7) Fill the fuel tank and install the fuel tank cap.

68. Fuel Strainer

a. Service.

(1) Remove the engine right side panel.

(2) Close the shutoff valve (16, fig. 9) in the strainer cover.



1 Shutoff valve
2 Body
3 Screen
4 Gasket
5 Bowl
6 Bail

Figure 12. Fuel strainer, exploded view.

(3) Loosen the nut on the bail (6, fig. 12); swing the bail to one side and remove the sediment bowl (5), gasket (4), and screen (3).

(4) Clean any sediment from the sediment bowl and foreign material from the screen. Inspect the gasket; replace if serviceability is in doubt.

(5) Install the screen, gasket, and sediment bowl; secure with the bail and tighten the bail nut.

(6) Open the fuel shutoff valve (16, fig. 9) and check for leaks.

(7) Install the engine right side panel.

b. Removal (fig. 9).

(1) Remove the engine right side panel.

(2) Remove the fuel tank drain plug (3) from the bottom of the fuel tank (1); drain the fuel into a clean container.

(3) Disconnect the flexible fuel line (14) from the fuel strainer (15).

(4) Remove the fuel strainer from the fuel tank.

(5) Remove the elbow (8) from the fuel strainer.

c. Disassembly (fig. 12).

(1) Remove the bowl, gasket and screen (*a*(3) and (4) above).

(2) Remove the shutoff valve (1).

(3) Remove the bail from the body (2).

d. Cleaning and Inspection (fig. 12).

(1) Wash all parts with an approved cleaning solvent; dry thoroughly.

(2) Clean any sediment from the sediment bowl (5), and inspect the bowl for chipping, cracks, breaks, or other damage; replace if damaged.

(3) Inspect the screen (3) for clogged or broken mesh, or other damage; replace if rusted or damaged.

(4) Inspect all other parts for worn threads, cracks, breaks, bends, or other damage; replace if damaged.

(5) Replace the gasket (4).

e. Reassembly (fig. 12).

(1) Install the bail (6) in the body (2).

(2) Install the fuel shutoff valve (1) in the body.

(3) Install the screen (3), gasket (4), and sediment bowl (5) (*a*(5) above).

f. Installation (fig. 9).

(1) Install the elbow (8) in the fuel strainer (15).

(2) Install the fuel strainer in the fuel tank.

(3) Connect the flexible fuel line (14) to the elbow in the fuel strainer.

(4) Install the fuel tank drain plug (3) in the bottom of the fuel tank.

(5) Fill the fuel tank with fuel; install the fuel tank cap.

(6) Install the engine right side panel.

69. Fuel Pump

(fig. 9)

a. Removal.

(1) Remove the engine right side panel.

(2) Make sure the three-way valve (13) is turned to shutoff flow from both outside source and the fuel tank.

(3) Disconnect the flexible fuel line (9) from the fuel pump (10); remove the elbow (8) from the pump.

(4) Remove the two nuts and lockwashers securing the fuel pump to the studs in the engine crankcase; remove the fuel pump and the fuel pump gasket.

(5) Remove the fuel pump from the nipple (11) at the three-way valve.

b. Cleaning and Inspection.

(1) Clean the exterior of the fuel pump with a cloth dampened with an approved cleaning solvent; dry thoroughly.

(2) Replace the fuel pump gasket.

(3) Inspect the fuel pump for dents, cracks, breaks, or other damage; if damaged, replace the fuel pump or refer to higher authority.

(4) Inspect the studs in the engine crankcase for worn threads or other damage; replace if damaged.

c. Installation.

(1) Install the fuel pump (10) on the nipple (11) at the three-way valve (13).

(2) Position the fuel pump (10) and fuel pump gasket on the studs in the engine crankcase, making sure the rocker arm of the fuel pump seats on a cam of the camshaft. Secure with two lockwashers and nuts.

(3) Install an elbow (8) in the fuel pump and connect the flexible fuel line (9) to the elbow.

(4) Position the three-way valve to provide flow from the fuel tank or an outside source, as desired.

(5) Replace the right side panel.

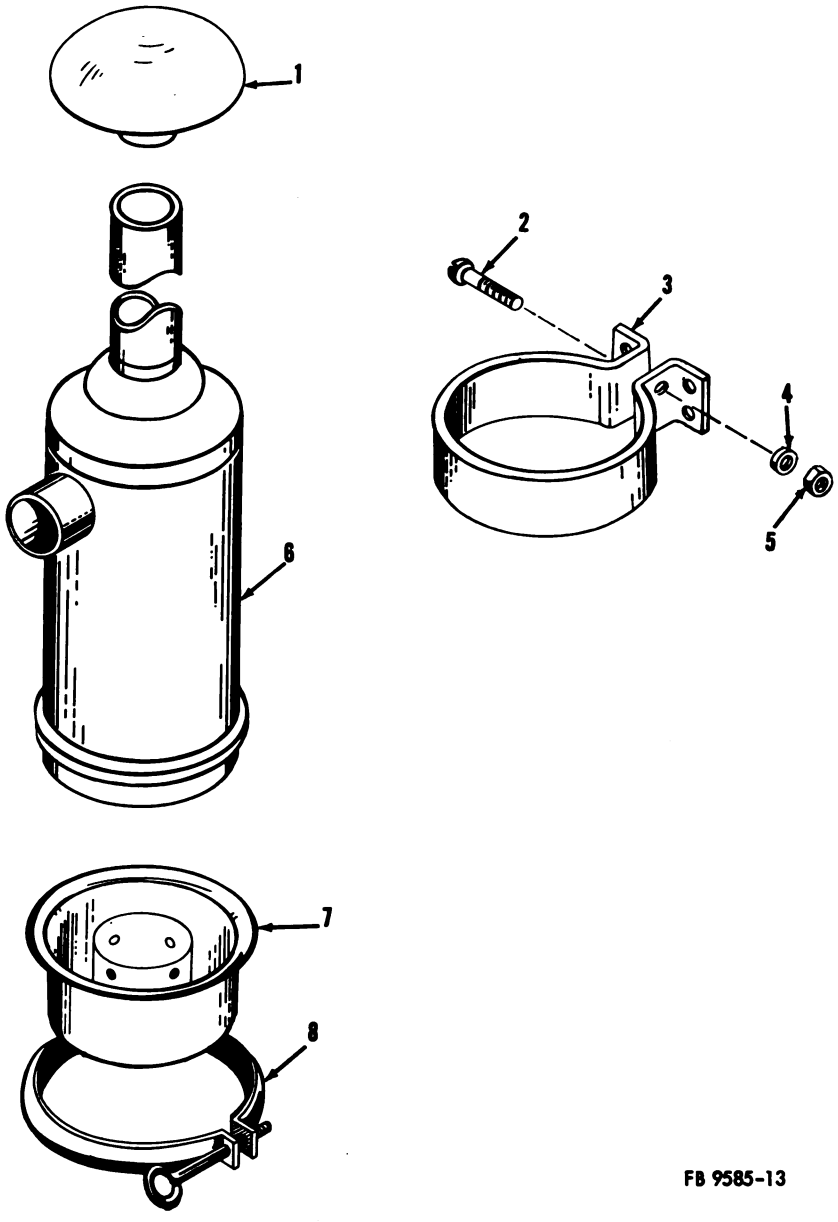
70. Air Cleaner

a. Removal.

(1) Remove the engine right side panel.

(2) Loosen the two hose clamps (4, fig. 9) securing the flexible hose (5) to the carburetor air intake and the air cleaner air outlet; remove the flexible hose.

(3) Remove the four nuts, lockwashers, plain washers, and machine screws securing the two braces (3, fig. 13) to the instrument and control panel; remove the assembled air cleaner and braces.



1 Airstack cap
2 Machine screw
3 Brace
4 Lockwasher
5 Nut
6 Body
7 Cup
8 Retaining ring

Figure 13. Air cleaner, exploded view.

(4) Remove the two nuts (5), lockwashers (4), and machine screws (2) clamping the braces to the air cleaner; remove the two braces.

b. Disassembly (fig. 13).

(1) Loosen the bolt of the retaining ring (8) and remove the cup (7) from the air cleaner. Remove the retaining ring.

(2) Remove the air stack cap (1) from the air cleaner.

c. Cleaning and Inspection.

(1) Wash all the parts except the flexible tube hose with an approved cleaning solvent; dry thoroughly. Wipe all sludge out of the cup.

(2) Wipe the flexible hose with a dry cloth.

(3) Inspect the air stack cap for dirt, chaff, or other debris that may have gathered on the screen at the air entrance opening; remove any debris. Inspect the screen and cap for breaks, bends, dents, or other damage; repair or replace if damaged.

(4) Inspect all parts for rust, dents, cracks, breaks, or other damage; replace if damaged.

d. Reassembly (fig. 13).

(1) Install the air stack cap (1) on the air cleaner body (6).

(2) Fill the oil cup (7) to the oil level mark as directed in LO 5–9585.

(3) Install the oil cup on the air cleaner; secure by installing the retaining ring (8) and tightening the bolt.

e. Installation.

(1) Install two braces (3, fig. 13) around the air cleaner; secure with two machine screws, lockwashers, and nuts.

(2) Position the air cleaner on the instrument and control panel; secure the braces with four machine screws, plain washers, lockwashers, and nuts.

(3) Install the flexible tube hose (5, fig. 9) on the air cleaner outlet, through the instrument and control panel, and on the carburetor inlet; secure by tightening the two hose clamps (4).

(4) Install the engine right side panel.

71. Carburetor and Controls

a. Removal (fig. 9).

(1) Remove the engine right side panel.

(2) Turn the three-way valve (13) to shut off the fuel supply from both the fuel tank and outside source.

(3) Loosen the hose clamp (4) securing the flexible hose (5) to the carburetor; remove the flexible hose from the carburetor air intake.

(4) Disconnect the fuel line (9) from the elbow (8) in the carburetor.

(5) Remove the elbow (8) from the carburetor.

(6) Remove the yoke end screw securing the governor-to-carburetor control rod to the carburetor throttle lever.

(7) Loosen the setscrew and remove the choke control wire from the carburetor choke lever swivel.

(8) Loosen the swivel screw and remove the throttle control wire from the idling control lever. Remove the idling control lever from the engine.

(9) Remove the two nuts and lockwashers securing the carburetor to the manifold; remove the carburetor and the carburetor gasket.

(10) Remove the nut and lockwasher securing the ball joint to the governor lever; remove the assembled governor-to-carburetor control rod and ball joint.

(11) Remove the ball joint and jam nut from the governor-to-carburetor control rod.

b. Cleaning and Inspection.

(1) Wipe the outside of the carburetor with a cloth dampened with an approved cleaning solvent; dry thoroughly.

(2) Wash all other parts with an approved cleaning solvent; dry thoroughly.

(3) Inspect the carburetor for cracks, breaks, or visible damage; refer a damaged carburetor to the proper authority.

(4) Replace the carburetor gasket.

(5) Inspect all other parts for cracks, breaks, worn threads, bends, or other damage; replace if damaged.

c. Installation (fig. 9).

(1) Install the jam nut and ball joint on the threaded end of the governor-to-carburetor control rod.

(2) Position the assembled control rod and ball joint on the governor lever; secure with a nut and lockwasher.

(3) Position the carburetor gasket and carburetor on the studs in the engine intake manifold; secure with two lockwashers and nuts.

(4) Install the idling control lever on the engine. Secure the throttle control wire in the swivel of the idling control lever; secure by tightening the swivel screw.

(5) Install the choke wire in the carburetor choke lever swivel; secure by tightening the setscrew.

(6) Install the governor-to-carburetor control rod on the carburetor throttle lever; secure with a yoke end screw.

(7) Install the elbow (8) in the carburetor (7).

(8) Install the air cleaner-to-carburetor flexible hose (5) on the carburetor air intake; secure by tightening the hose clamp (4).

(9) Connect the flexible fuel lines (9) to the carburetor.

(10) Operate the choke and throttle controls to see that the carburetor choke and throttle valves open fully and close completely. Adjust the length of the choke and throttle controls by loosening the swivel screws and repositioning the wires, if necessary. Adjust the length of the governor-to-carburetor control rod to obtain the correct throttle valve opening and closing positions by removing the yoke end screw and turning the rod in or out of the ball joint. Reinstall the yoke end on the carburetor throttle lever.

(11) Open the three-way valve (13) to allow fuel to flow to the carburetor (7).

(12) Install the engine right side panel.

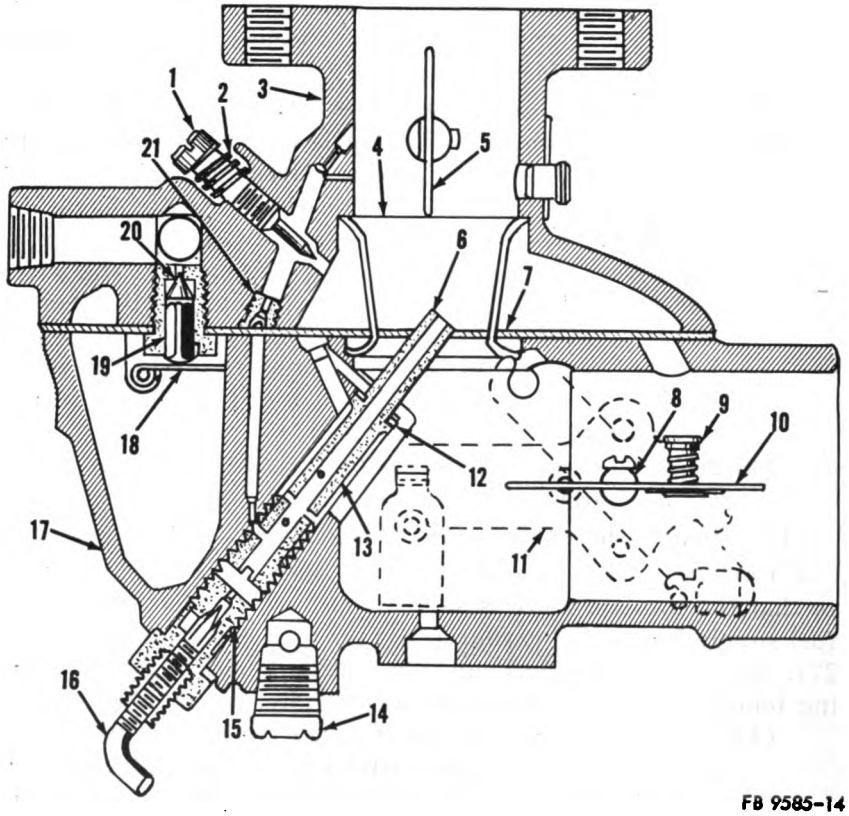
d. Carburetor Adjustment (fig. 14). Set the throttle stop screw so that the throttle valve is slightly open. Make certain that the fuel supply line to the carburetor is open. Start the engine (par. 27). After the engine has run sufficiently to bring it up to operating temperature, open the choke valve fully.

(1) *Idle adjustment.* To set the low speed or idle adjustment, set the throttle control lever in slow idle position, and adjust the throttle stop screw for the correct engine idle speed. (On a new, stiff engine this speed must be slightly higher than required for a thoroughly run-in engine). Turn the idle adjusting needle (1) clockwise until the engine begins to falter or roll, then turn the needle counterclockwise until the engine runs smoothly.

Note. It is better that the idle adjustment be slightly too rich than too lean.

(2) *Load adjustment.* The power or load adjustment is made with the engine running at governed speed under load. Turn the power adjusting needle (16) to the right, or clockwise, a little at a time until the power drops appreciably. Then turn the needle to the left, or counterclockwise, until the engine picks up power and runs smoothly. This will give an economical part throttle mixture, and, due to the economizer action, the proper power mixture

for full throttle operation. With variations in temperature or fuels it may be necessary to richen the load adjustment mixture by backing out the power adjusting needle, a small amount at a time, until good acceleration of the engine under load is obtained.



1	Idle adjusting needle	11	Choke bracket
2	Spring	12	Nozzle gasket
3	Throttle body	13	Accelerating well
4	Venturi	14	Drain plug
5	Throttle valve	15	Power jet
6	Nozzle	16	Power adjusting needle
7	Gasket	17	Fuel bowl
8	Choke lever and shaft	18	Float lever
9	Relief valve	19	Float valve
10	Choke valve	20	Float valve seat
		21	Idle jet

Figure 14. Carburetor, cross sectional view.

72. Governor

(fig. 10)

a. Removal.

(1) Remove the engine right side panel.

(2) Remove the nut and lockwasher securing the ball joint

of the governor-to-carburetor control rod to the governor takeoff lever (1).

(3) Remove the two cap screws, lockwashers, one plain washer, governor gasket plate, and governor flange gasket securing the governor to the gear cover; remove the governor and the governor gasket.

b. Cleaning and Inspection.

(1) Wipe the outside of the governor with a cloth dampened with an approved cleaning solvent; dry thoroughly.

(2) Inspect the governor for cracks, breaks, distortion, or other damage; refer to the proper authority if damaged.

(3) Discard the governor flange gasket.

c. Installation.

(1) Position a new gasket and the governor on the engine gear cover; rotate the governor housing slightly to mesh the gears. Secure to the gear cover with a lockwasher and cap screw on the bottom, and the governor flange gasket, governor gasket plate, a plain washer, lockwasher, and cap screw through the top flange.

(2) Position the ball joint on the governor takeoff lever (1); secure with a lockwasher and nut.

(3) Adjust the length of the governor-to-carburetor control rod, if necessary (par. 71*c*(10)).

(4) Adjust the governor, if necessary (*d* below).

(5) Replace the engine right side panel.

d. Governor Adjustment. Adjust the governor for engine speed and surge with the length of the governor-to-carburetor control rod properly set (par. 71*c*(10)), as follows:

(1) Increase or decrease governor spring tension by means of the spring adjusting screw to regulate engine speed; increase tension to increase speed, and decrease tension to decrease speed.

(2) If the engine surges, or the governor does not hold the engine at a constant speed, turn the surge adjustment screw until the surging stops. For closest regulation, this screw should be kept as short as possible without causing surge.

Section VII. ENGINE ELECTRICAL SYSTEM

73. Description

The electrical system of the engine consists of two 12-volt storage batteries (15, fig. 15), an electrical starter (10), generator (13), voltage regulator (12), magneto (1), ignition switch (4),

hourmeter (21), ammeter (8), and spark plugs. The water temperature and oil pressure gages (22) and (23) are also electrically operated. A tachometer is mounted on the instrument and control panel.

a. Batteries. Two 12-volt batteries, of three cells each, are installed in the battery box and connected in series to provide 24 volts for operating the engine electrical system.

b. Electrical Starter. The electrical starter is a 24-volt, four-pole, compound-field type that electrically cranks the engine for starting. A manually operated shift lever engages the overrunning clutch pinion with the engine flywheel ring gear and simultaneously closes the switch contacts to energize the motor and turn the pinion.

c. Starter Button (fig. 3). The starter button (23) is connected to the electrical starter shift lever by a rod and moves the shift lever to the cranking position when the button is pushed in toward the instrument and control panel.

d. Generator. The generator has an adjustable mounting for V-belt tension adjustment. A fan is keyed to the shaft to provide air cooling; the fan and V-belt are shielded by an engine fan shroud. The generator is of the heavy duty, two brush, shunt type.

e. Voltage Regulator. The voltage regulator is composed of three units; a voltage regulator, current regulator, and a relay. The voltage regulator adjusts the generator voltage output to the load requirements of the circuit. The current regulator is a current limiting device that prevents the generator from exceeding its specified maximum current rating. The relay opens the circuit when current flows from the battery to the generator, stopping the discharge of the battery through a slow or stopped generator.

f. Magneto. The magneto produces and distributes a high voltage charge to the spark plugs. An impulse coupling embodied in the magneto automatically retards the spark when starting. The magneto is timed to the engine so that the spark will be delivered to the spark plug in each cylinder just before that cylinder piston reaches top dead center.

g. Ignition Button (fig. 5). The ignition button (24) is located on the instrument and control panel. It is connected to the ignition switch which serves to ground out the magneto to stop the engine.

h. Tachometer (fig. 5). The tachometer (3) is mounted on the instrument and control panel. The tachometer flexible shaft is driven by a gear in the distributor adapter which is driven by a gear on the camshaft. The tachometer indicates the engine speed in rpm.

1 Ignition magneto
2 High tension lead
3 Magneto-to-ignition button lead
4 Ignition button
5 Ground lead
6 Pressure switch
7 Capacitor
8 Ammeter
9 Starter handle
10 Electrical starter
11 Ammeter-to-voltage regulator lead
12 Voltage regulator
13 Generator
14 Capacitor
15 Battery
16 Battery ground cable
17 Battery jumper cable
18 Oil pressure gage sending unit
19 Battery-to-electrical starter cable
20 Water temperature gage sending unit
21 Hourmeter
22 Water temperature gage
23 Oil pressure gage

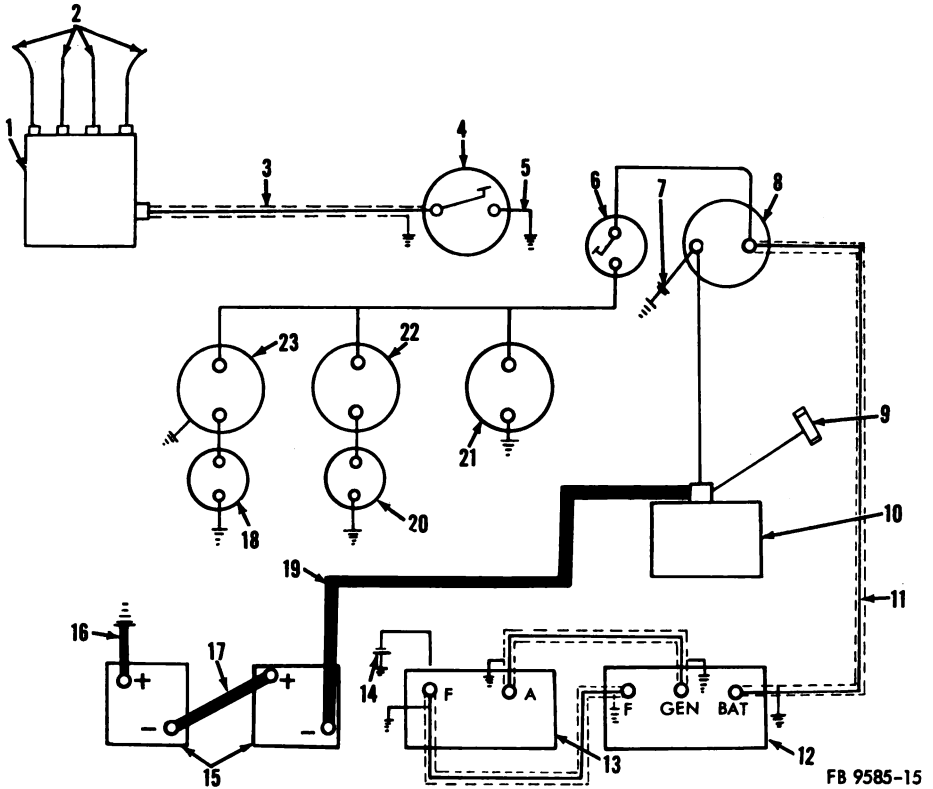


Figure 15. Schematic wiring diagram.

i. Hourmeter (fig. 5). The hourmeter (4) is located on the instrument and control panel. It records the time, in hours, that the engine has been in operation. A pressure switch in an oil line closes when the oil pressure reaches 4-pounds pressure, actuating the hour-meter; when the oil pressure drops below 4-pounds pressure, the switch opens, stopping the hour-meter.

j. Ammeter (fig. 5). The ammeter (16) is connected in the electrical circuit between the batteries and the generator. It measures the battery rate of charge or discharge.

k. Spark Plugs. The spark plugs are the self-shielded type. The high voltage of the magneto jumps the gap between the electrodes of the spark plug, producing a spark that ignites the fuel-air mixture in the engine cylinder.

74. Batteries and Battery Box (fig. 16)

a. Removal.

(1) Remove the padlock from the hasp (3) and open the battery box cover (2).

(2) Remove the three hex nuts and lockwashers securing the two clamps and the plate to the studs in the battery box (1); remove the clamps and plate.

(3) Disconnect the battery cable negative terminal clamp from the battery negative terminal post, and the battery cable positive terminal clamp from the battery positive terminal post.

(4) Disconnect the jumper cable terminal clamps from the battery terminal posts; remove the jumper cable.

(5) Remove the battery cable terminal clamps from the ends of the battery cables.

(6) Remove the two nuts securing the box connectors (6) to the battery box (1). Remove the assembled battery cables, flexible conduit, and box connectors from the battery box.

(7) Remove the battery ground cable from the ground screw and the battery negative cable from the switch terminal of the electrical starter.

(8) Remove the two storage batteries.

(9) Remove the four nuts, lockwashers, and bolts (4) securing the feet of the battery box (1) to the battery box shelf plate (5); remove the battery box.

(10) Remove the four nuts, lockwashers, and bolts (10) securing the battery shelf plate mounting brackets (8) to the

main frame (9). Remove the two shelf plate mounting brackets.

b. Disassembly.

(1) Remove the three nuts securing the three studs in the battery box; remove the three studs.

(2) Remove the four nuts, lockwashers, and bolts (7) securing the battery shelf plate to the shelf plate mounting brackets (8); remove the shelf plate.

c. Cleaning and Inspection.

(1) Wipe the battery cables with a dry cloth.

(2) Clean and inspect the batteries as directed in TM 9–2857.

(3) Wash all other parts with an approved cleaning solvent; dry thoroughly.

(4) Inspect the battery electrical leads for wear, breaks, or corrosion at the terminal ends, frayed or oil-soaked insulation, or other damage. Inspect the cable terminals for wear, cracks, corrosion, stripped threads, or other damage. Replace worn or damaged parts.

(5) Inspect all other parts for dents, cracks, bends, breaks, worn threads, or other damage; repair or replace if damaged.

(6) Wire brush the battery terminals and coat with standard-issue wiring protective compound.

d. Reassembly.

(1) Position the three studs inside the battery box (1); secure with the three nuts.

(2) Position the battery shelf plate (5) on the battery shelf plate mounting brackets (8); secure with four bolts (7), lockwashers, and nuts.

e. Installation.

(1) Position the assembled battery shelf plate mounting brackets (8) and shelf plate (5) on the main frame (9); secure with four bolts (10), lockwashers, and nuts.

(2) Position the battery box on the shelf plate; secure the feet of the box to the shelf with four bolts (4), lockwashers, and nuts.

(3) Install the two storage batteries in the battery box (1) with the positive terminal of one battery and the negative terminal of the other battery at the center of the box.

(4) Install the box connectors (6) of the assembled battery cables and flexible conduit through the battery box open-

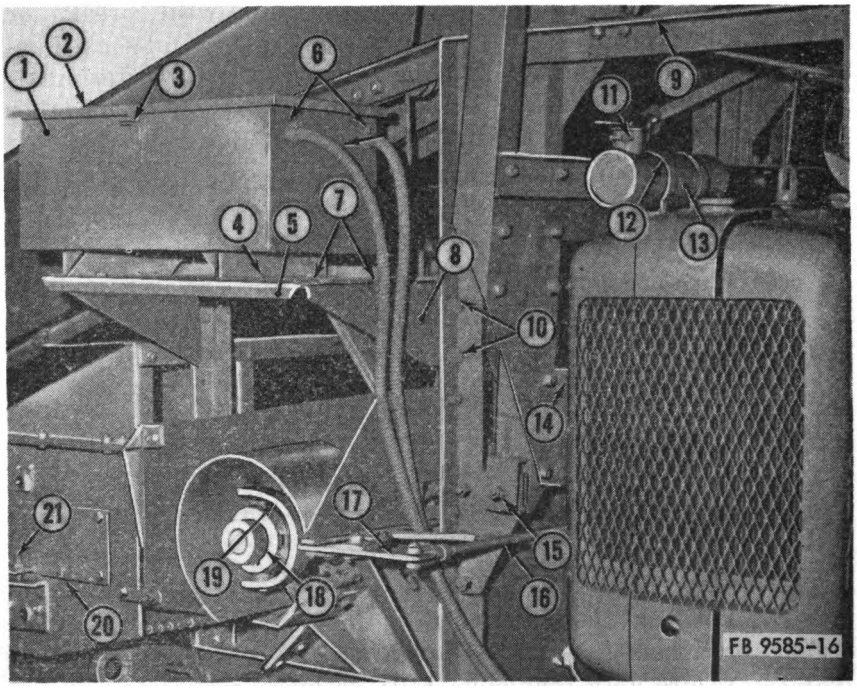
ings; secure with two nuts. Install the battery cable terminal clamps on the ends of the battery cables.

(5) Connect the battery jumper cable to the positive terminal post of one battery and to the negative terminal post of the other battery at the center of the box.

(6) Connect one end of the positive battery cable to the free positive terminal post of one battery, and the other end to a nut or screw on the engine block. Connect one end of the negative battery cable to the free negative terminal of the other battery and the other end to the switch terminal on the electrical starter.

(7) Position two clamps and the plate on the studs in the battery box; secure with three lockwashers and nuts.

(8) Close the battery box cover (2) and install the padlock in the hasp, locking the battery box.



1 Battery box
2 Battery box cover
3 Hasp
4 Machine bolt, ½" x 1¼" NC (4 rqr)
5 Shelf plate
6 Box connector
7 Machine bolt
8 Mounting bracket
9 Frame
10 Bolts
11 Muffler rain cap
12 Muffler bracket
13 Muffler
14 Brace
15 Pivot bolt
16 Lever rod
17 Yoke arm
18 Jackshaft
19 Shifter yoke
20 Cover plate
21 Adjusting screw

Figure 16. Battery box, radiator, and crawler track.

75. Electrical Starter

(fig. 17)

a. Replacing Electrical Starter Brushes.

(1) Remove the engine left side panel.

(2) Disconnect the battery negative cable from the manually operated starter switch terminal (3); tape the end of the battery cable to avoid short-circuiting.

(3) Remove the cover band (1).

(4) Remove the screws and lockwashers securing the brushes (11) to the brush holders; remove the brushes.

(5) Blow dirt off the brushes with clean, dry, compressed air.

(6) If the brushes are oil-soaked, or worn to one-half their original length, replace the brushes.

(7) Position the new brushes in the brush holders; secure with lockwashers and screws.

(8) Install the cover band on the electrical starter.

(9) Connect the battery negative cable to the starter switch terminal.

(10) Install the engine left side panel.

b. Cleaning Electrical Starter Commutator.

(1) Remove the electrical starter from the engine (*c* below).

(2) Remove the cover band and lift the brushes off the commutator (12).

(3) Clean a dirty or slightly glazed commutator by holding a strip of 00 sandpaper on the end of a woodblock against the commutator while turning the armature slowly. Blow all dust from the commutator after cleaning with clean, dry, compressed air.

(4) Lower the brushes to rest on the commutator and install the cover band.

(5) Install the starting motor on the engine (*e* below).

c. Removal.

(1) Remove the engine left side panel and disconnect the battery cable (*a*(1) and (2) above).

(2) Remove the cotter pin and plain washer securing the starter rod to the shift lever (4); remove the starter rod.

(3) Remove the three cap screws and lockwashers securing the electrical starter to the flywheel housing; remove the electrical starter.

d. Cleaning and Inspection.

(1) Clean the outside of the electrical starter with a cloth dampened with an approved cleaning solvent; dry thoroughly. Make sure that the solvent does not enter the starter.

(2) Inspect the starter switch terminal for corrosion or damaged threads. Clean the terminal with a wire brush and apply a small amount of standard-issue wiring protective compound.

(3) Remove the cover band and inspect the brushes. Replace brushes that are oil-soaked, dirty, or worn to one half their original length as directed in *a* above.

(4) Check the brush spring tension by hooking a spring scale to the brush holder. Pull the brush holder away from the commutator and measure the tension as the brush leaves the commutator. The correct tension is between 24 and 28 ounces.

(5) Clean a dirty or glazed commutator as directed in *b* above. Install the cover band.

(6) If the electrical starter is visibly damaged, the brushes do not seat on the commutator, or the commutator is rough, pitted, or out-of-round, refer the electrical starter to the proper authority.

e. Installation.

(1) Position the electrical starter on the flywheel housing; secure with three lockwashers and cap screws.

(2) Position the starter rod in the hole of the shift lever (4); secure with a washer and cotter pin.

(3) Connect the battery cable and install the engine left side panel.

76. Starter Button

a. Removal.

(1) Remove the engine left side panel.

(2) Remove the cotter pin and plain washer securing the starter rod to the starter shift lever (4, fig. 17).

(3) Remove the assembled starter rod and button (23, fig. 3) from the instrument and control panel (27); remove the button from the rod.

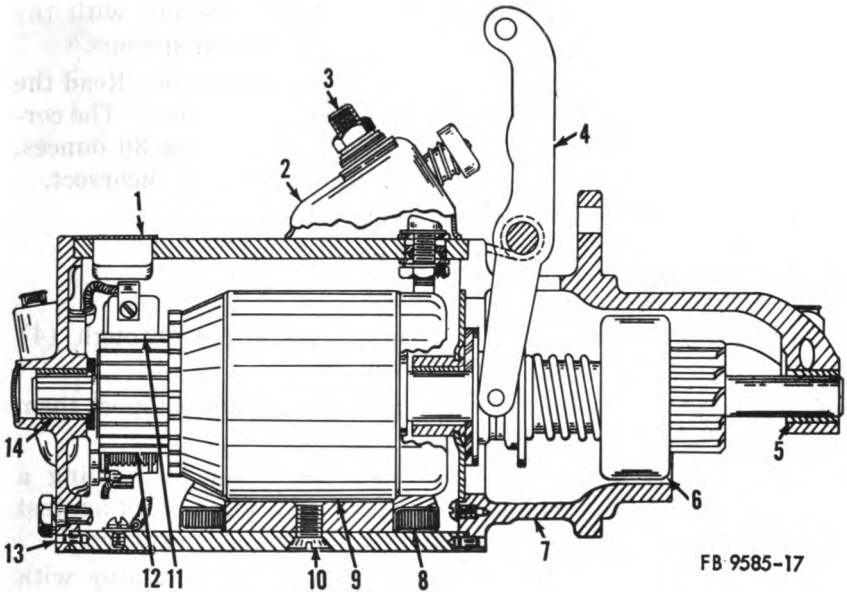
b. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent; dry thoroughly.

(2) Inspect the parts for wear, cracks, breaks, bends, or other damage; replace if damaged.

c. Installation.

(1) Install the starter button (23) on the starter rod; install the assembled button and rod through the instrument and control panel (27).



1	Cover band	8	Field winding
2	Starter switch	9	Armature
3	Starter switch terminal	10	Pole shoe screw
4	Shift lever	11	Brush
5	Sleeve bearing, drive end	12	Commutator
6	Drive	13	Commutator end frame
7	Drive housing	14	Sleeve bearing commutator end

Figure 17. Electrical starter, cross sectional view.

(2) Hook the rod in the opening of the starter motor shift lever (4, fig. 17); secure with a plain washer and cotter pin.

(3) Install the engine left side panel.

77. Generator
(fig. 18)

a. Replacing Generator Brushes.

(1) Remove the engine left side panel.

(2) Remove the cover band from the generator.

(3) Remove the screws and lockwashers securing the brush leads to the brush holders; lift the brush springs and remove the brushes.

(4) Blow off the brushes with clean, dry, compressed air.

(5) If the brushes are dirty, oil-soaked, or worn to half their original length, replace with new brushes.

(6) Install the new brushes in the brush holders with the beveled faces turned to seat squarely on the commutator.

Secure the brush leads to the brush holders with the screws and lockwashers. Lower the brush springs.

(7) Measure the brush spring tension with a scale. Read the tension just as the brush leaves the commutator. The correct brush spring tension is between 24 and 30 ounces. Replace the brush springs if the tension is incorrect.

(8) Install the generator cover band.

(9) Install the engine left side panel.

b. Cleaning Generator Commutator.

(1) Remove generator from the engine (*c*(1) through (4) below) and remove the cover band.

(2) Lift the brushes from the commutator and support them in a raised position.

(3) Clean a dirty or discolored commutator by holding a piece of 00 sandpaper on the end of a wood block against the commutator while turning the armature slowly.

(4) Blow all abrasive and dirt from the commutator with clean, dry, compressed air.

(5) Seat the brushes on the commutator.

(6) Install the generator cover band and install the generator on the engine (*g*(4) through (9) below).

c. Removal.

(1) Remove the engine left side panel.

(2) Disconnect the electrical leads from the terminals of the generator. Tape the ends of the electrical leads from the voltage regulator to avoid short-circuiting. Tag the leads to facilitate reassembly.

(3) Remove the cap screw (3), internal-external tooth lockwasher (4), and generator adjusting strap clip (5) securing the generator to the adjusting strap (2). Tilt the generator toward the engine and slip the V-belt from the generator pulley.

(4) Remove the two nuts (9), four internal-external tooth lockwashers (8), and two cap screws (11) securing the generator to the generator bracket (6); remove the generator.

(5) Remove the generator adjusting strap mounting cap screw (3) and two internal-external tooth lockwashers (4) securing the generator adjusting strap to the engine; remove the adjusting strap.

(6) Remove the three nuts (10) and internal-external tooth lockwashers (4) securing the generator bracket to the

three studs (7) in the engine crankcase; remove the generator bracket.

(7) Remove the V-belt from the fan and crankshaft pulleys.

d. Disassembly.

(1) Remove nut and washer securing the generator pulley to the generator shaft; remove the generator pulley and key.

(2) Remove the capacitor (12) and capacitor lead (1) from the generator.

e. Cleaning and Inspection.

(1) Clean the outside of the generator with a cloth dampened with an approved cleaning solvent; dry thoroughly. Make sure the solvent does not enter the generator.

(2) Wipe off the capacitor and the V-belt with a cloth dampened with an approved cleaning solvent; dry thoroughly.

(3) Wash all other parts with an approved cleaning solvent; dry thoroughly.

(4) Inspect the generator for cracks or other visible damage; replace or refer to proper authority if damaged.

(5) Remove the generator cover band.

(6) Inspect the brushes; replace brushes that are dirty, oil-soaked, or worn to half their original length, as directed in *a* above.

(7) Clean a dirty or discolored commutator as directed in *b* above.

(8) If the brushes do not move freely in the brush holders, or if the commutator is rough, pitted, has high mica, or is out-of-round, refer the generator to the proper authority.

(9) Inspect the generator cover band; repair or replace if it does not fit tightly. Install the cover band.

(10) Inspect the generator terminals for corrosion or damage; wire brush the terminals and apply a little standard issue wiring protective compound.

(11) Test the capacitor on a conventional capacitor tester; replace if the capacitor is leaking or inoperative.

(12) Inspect the adjusting strap for wear in the slot, distortion, or other damage; replace if damaged.

(13) Inspect the V-belt for wear, fraying, or other damage; replace if damaged.

(14) Inspect the electrical leads for breaks, kinks, worn or oil-soaked insulation, replace defective parts.

(15) Inspect the studs in the engine crankcase for worn threads or other damage; replace if damaged.

(16) Inspect all parts for cracks, bends, worn threads, or other damage; replace if damaged.

f. Reassembly.

(1) Install the capacitor (12) and capacitor lead (1).

(2) Position the key in the generator shaft; install the generator pulley on the shaft and key. Secure with a washer and nut.

g. Installation.

(1) Position the V-belt around the engine fan and crankshaft pulleys.

(2) Position the generator bracket (6) on the studs (7) in the engine crankcase; secure with the three internal-external tooth lockwashers (4) and nuts (10).

(3) Position the adjusting strap on the engine; secure with a mounting cap screw (3) and two internal-external tooth lockwashers (4).

(4) Position the generator between the arms of the generator bracket; secure with the two cap screws (11), four internal-external tooth lockwashers (8), and two nuts (9), but do not tighten.

(5) Tilt the generator toward the engine and slip the V-belt over the generator pulley. Fasten the generator to the adjusting strap with a cap screw (3), internal-external tooth lockwasher (4), and generator adjusting strap clip (5); do not tighten the cap screw.

(6) Adjust the V-belt tension as directed in *h* below.

(7) Connect the electrical leads to the terminals of the generator. Refer to figure 15.

(8) Polarize the generator before starting the engine by disconnecting the lead from the regulator field terminal and momentarily touching this lead to the regulator battery terminal. This allows a flash of current to flow through the generator field windings to polarize the generator. Connect the regulator field terminal lead.

Caution: The generator must be polarized whenever the leads to the generator or regulator have been removed or any adjustments have been made to either the regulator or generator. Failure to do this may cause severe damage to the regulator due to vibration, heavy arcing, or burning of the contact points.

(9) Install the engine left side panel.

h. Generator V-Belt Adjustment.

(1) Loosen the two nuts (9) and the cap screw (3) securing

the generator and generator adjusting strap clip (5) to the strap.

(2) Adjust the position of the generator on the adjustment strap until the V-belt can be deflected ½-inch at the center of the span between any two pulleys by finger pressure.

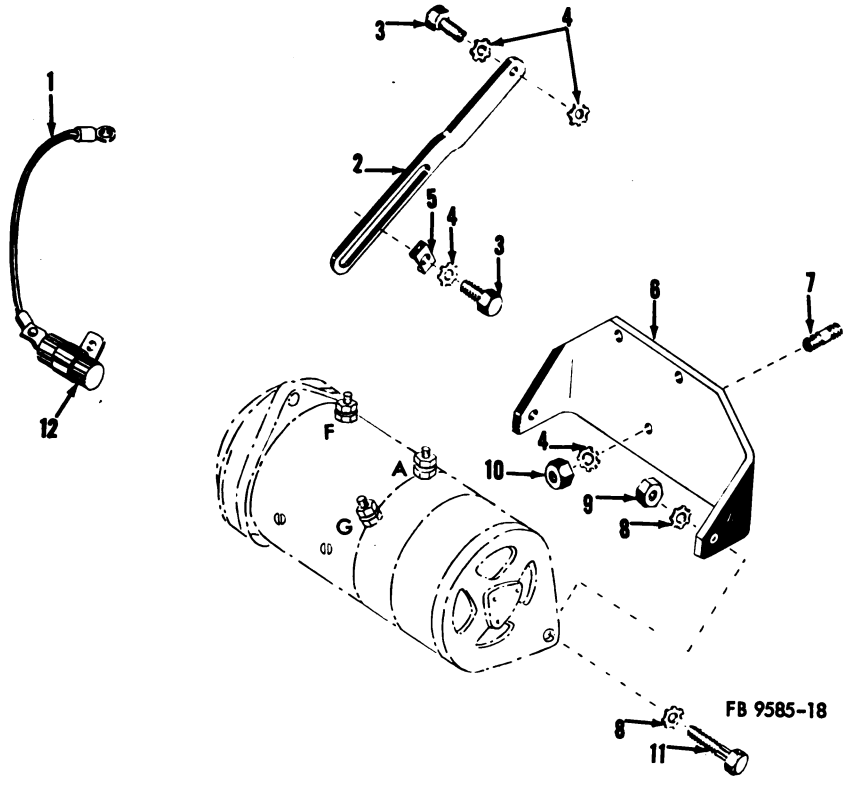
(3) When the belt tension is correct, secure the adjustment by tightening the cap screw (3) and the two nuts (9) securing the generator to the generator bracket.

78. Voltage Regulator

a. Removal.

(1) Remove the engine left side panel.

(2) Remove the leads from the regulator terminals and tape



1	Capacitor lead	7	Stud
2	Adjusting strap	8	Lockwasher, internal-external tooth
3	Mounting cap screw	9	Nuts
4	Lockwasher, internal-external tooth	10	Nut
5	Strap clip	11	Cap screw
6	Generator bracket	12	Capacitor

Figure 18. Generator mounting, exploded view.

the end of the electrical lead from the ammeter to avoid short-circuiting. Tag the leads to facilitate reassembly.

(3) Disconnect the shielding of the generator-to-voltage regulator leads from the regulator.

(4) Remove the three machine screws and internal tooth lockwashers securing the voltage regulator to the instrument and control panel; remove the voltage regulator.

b. Cleaning and Inspection.

(1) Clean the outside of the voltage regulator with a cloth dampened with an approved cleaning solvent; dry thoroughly.

(2) Inspect the voltage regulator for visible damage; replace if damaged.

(3) Inspect the electrical leads for breaks, kinks, damaged or oil-soaked insulation, and corroded terminals; replace defective leads.

(4) Wire brush the terminals of the voltage regulator and apply a little standard-issue wiring protective compound.

(5) Inspect machine screws for damaged threads; replace if damaged.

c. Installation.

(1) Position the voltage regulator on the instrument and control panel; secure with three internal tooth lockwashers and machine screws.

(2) Secure the shielding of the generator-to-voltage regulator leads to the voltage regulator.

(3) Connect the leads to the voltage regulator terminals. Refer to figure 15.

(4) Polarize the generator (par. 77*g*(8)).

(5) Install the engine left side panel.

79. Ignition Magneto

a. Breaker Point Adjustment.

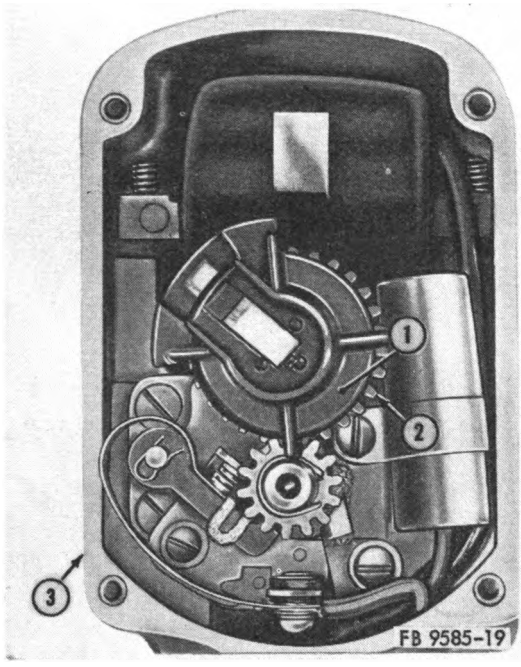
(1) Remove the engine right side panel.

(2) Check the breaker point gap as follows:

(*a*) Remove the four end cap screws securing the end cap and vent assembly to the magneto frame (3, fig. 19); remove the assembled end cap and vent assembly.

(*b*) Lift the distributor rotor (1) from the distributor gear assembly (2).

(*c*) Turn the drive shaft by hand cranking the engine slowly until the two contact points are fully separated.



1 Distributor rotor 2 Distributor gear 3 Frame

Figure 19. Ignition magneto with end cap and vent assembly removed.

Use a feeler gage (1, fig. 20) to check the gap between the contact point of the contact support assembly (7) and the contact point of the breaker arm point and contact assembly (9). The correct gap is 0.015-inch.

(3) If adjustment is necessary, proceed as follows:

(*a*) Loosen the contact support locking screws (5) and (8).

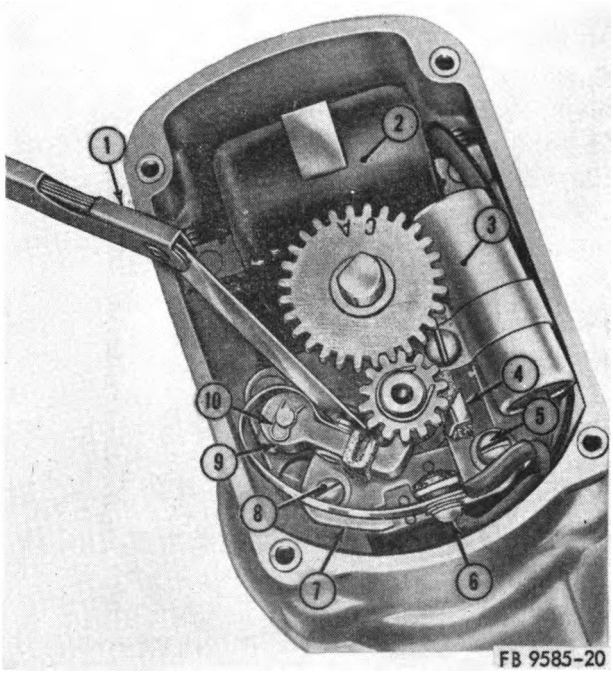
(*b*) Insert a screw driver in the horizontal slot on the contact support assembly (7) and move the contact support assembly as shown in figure 21 in or out until the correct gap is obtained. Secure the contact support assembly in the correct position by tightening the contact support locking screws (5) and (8).

(*c*) Recheck the breaker point gap with a feeler gage; readjust if the gap is not correct.

(4) Install the distributor rotor (1, fig. 19) on the distributor gear assembly (2).

(5) Position the assembled end cap and vent assembly on the frame (3); secure with four end cap screws.

(6) Install the engine right side panel.



1 Feeler gage
2 Magneto winding
3 Capacitor
4 Cam felt wick and holder assembly
5 Contact support locking screw
6 Breaker arm terminal screw
7 Contact support assembly
8 Contact support locking screw
9 Breaker arm point and contact assembly
10 Fulcrum pin snap ring

Figure 20. Checking breaker point adjustment.

b. Breaker Point Replacement (fig. 20).

(1) Remove the distributor rotor (*a*(1) and (2) (*a*) and (*b*) above).

(2) Remove the breaker arm terminal screw (6) and lockwasher securing the spring end of the breaker arm point and contact assembly (9) and the leads of the magneto winding (2) and capacitor (3) to the contact support assembly (7).

(3) Remove the fulcrum pin snap ring (10) and lift the breaker arm point and contact assembly off the fulcrum pin.

(4) Remove the contact support locking screws (5) and (8) securing the contact support assembly (7) and the cam felt wick and holder assembly (4) to the bearing support assembly; remove the contact support assembly and the cam felt wick and holder assembly.

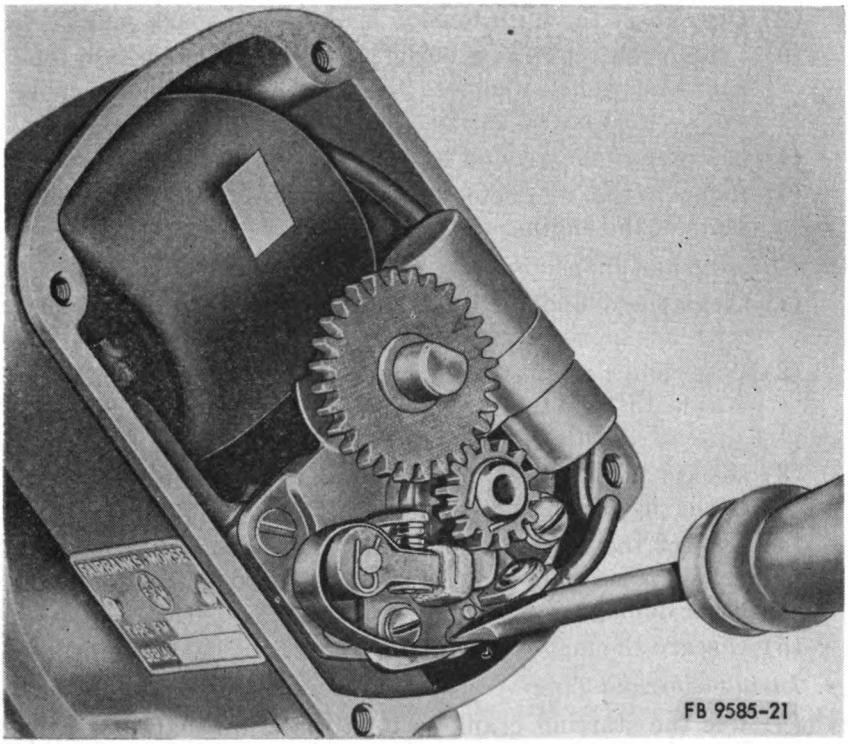


Figure 21. Adjusting breaker point gap.

(5) Replace the contact support assembly and the breaker arm point and contact assembly.

(6) Install the new contact support assembly (7) on the bearing support assembly. Position a cam felt wick and holder assembly (4) on the contact support assembly (7) with the felt wick riding on the cam. Secure the contact support assembly and the cam felt wick and holder assembly with two contact support locking screws (5) and (8).

(7) Install a breaker arm point and contact assembly (9) on the fulcrum pin; secure with a fulcrum pin snap ring (10).

(8) Secure the spring arm of the breaker arm point and contact assembly and the leads of the capacitor (3) and magneto winding (2) to the contact support assembly with a breaker arm terminal screw (6) and lockwasher.

(9) Check and adjust the breaker point gap as directed in *a* above.

c. Removal.

(1) Remove the engine right side panel.

(2) Disconnect the high tension leads at the spark plugs.

(3) Loosen the four cable outlet nuts securing the high tension leads to the magneto; remove the high tension cable seals, cable outlet ferrules, and cable outlet nuts.

(4) Disconnect the ground lead at the ignition switch.

(5) Remove the magneto and gasket from the front end plate of the engine.

d. Cleaning and Inspection.

(1) Clean the outside of the magneto with a cloth dampened with an approved cleaning solvent; dry thoroughly.

(2) Wipe off the high tension leads and high tension cable seal with a cloth dampened with an approved cleaning solvent; dry thoroughly.

(3) Inspect the magneto for visible damage; if damaged refer to the proper authority.

(4) Inspect the high tension leads for bends, kinks, frayed or worn insulation or shielding, corroded terminals, or other damage; replace if damaged.

(5) Discard the magneto gasket.

e. Installation and Timing.

(1) Use the starting crank to turn the crankshaft until the No. 1 piston is in firing position, and the DC timing mark (1, fig. 22) on the flywheel is in line with the flywheel pointer.

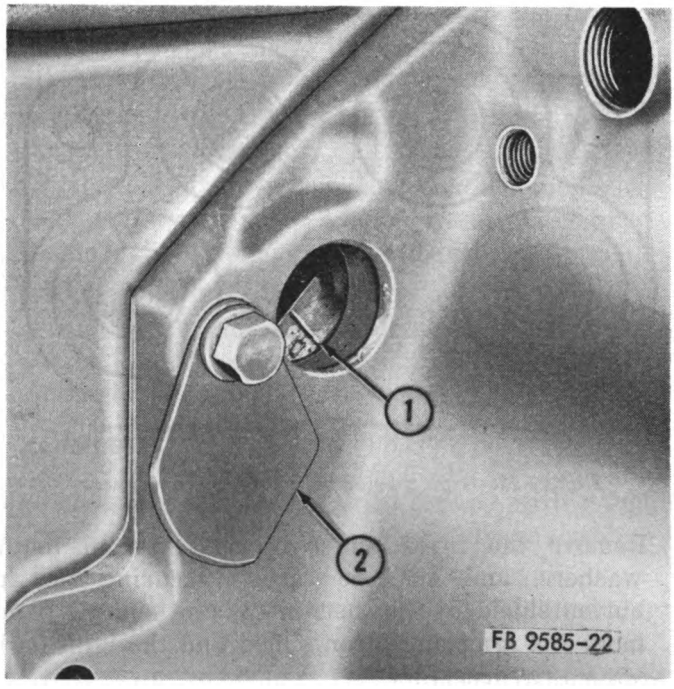
(2) Remove the four end cap screws securing the end cap and vent assembly to the magneto frame (3, fig. 19); remove the assembled end cap and vent assembly.

(3) Turn the magneto distributor rotor in reverse of operating direction until the electrode is in the correct position for firing No. 1 cylinder.

(4) Position the magneto, with a new gasket, on the engine front end plate; install lockwashers and nuts on mounting studs, but do not tighten.

(5) Connect one cable of a timing indicator to the ground terminal of the magneto and the other cable to the magneto frame. With the magneto mounting nuts slightly loose, rotate the magneto on the engine end plate until the timing indicator indicates the breaker points are just opening. Hold the magneto in this position, and tighten the mounting nuts. Disconnect the timing indicator.

(6) Position the assembled end cap and vent assembly on the magneto frame (3); secure with four end cap screws.



1 Flywheel timing mark 2 Engine timing hole cover

Figure 22. Flywheel timing mark.

(7) Connect the ground lead of the magneto to the ignition switch.

(8) Place a cable outlet nut, cable outlet ferrule, and high tension cable seal on each of high tension cables, and install the cables in the openings at the top of the magneto cover. Secure by tightening the cable outlet nuts. Make sure each lead is inserted into the magneto opening as far as possible.

(9) Connect the high tension leads to the spark plugs, following the sequence shown in figure 23, with the spark plug for the No. 1 cylinder connected to the cable opening marked 1, the No. 2 cylinder connected to the cable opening marked 2, and so on.

(10) Install the engine right side panel.

80. Ignition Button

a. Removal.

(1) Remove the engine left side panel (17, fig. 1).

(2) Remove the electrical leads from the terminals of the ignition button (26, fig. 3).

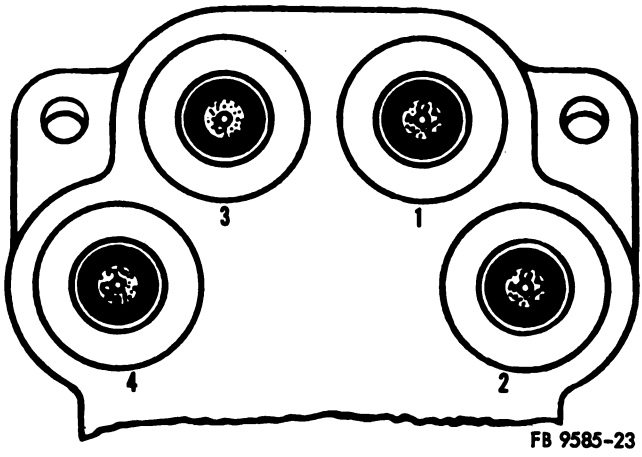


Figure 23. High tension lead outlets on magneto.

(3) Remove the three nuts, internal-external tooth lockwashers, and machine screws securing the ignition button shield to the instrument and control panel. Remove the ignition button shield and the ignition button.

b. Cleaning and Inspection.

(1) Wipe the ignition button with a cloth dampened with an approved cleaning solvent; dry thoroughly.

(2) Inspect the button shield and button for cracks, dents, breaks, or other damage; replace if damaged.

(3) Inspect the terminals for corrosion; wire brush the terminals and apply a little standard-issue wiring protective compound.

(4) Inspect the electrical leads for bends, kinks, breaks, and for worn or oil-soaked insulation; replace defective parts.

c. Installation.

(1) Position the ignition button and ignition button shield on the instrument and control panel; secure with three machine screws, internal-external tooth lockwashers, and nuts.

(2) Connect the electrical leads to the terminals of the ignition button.

(3) Install the engine left side panel (17, fig. 1).

81. Tachometer

a. Removal and Disassembly.

(1) Remove the engine right side panel.

(2) Disconnect the tachometer drive flexible casing and core from the tachometer drive adapter.

(3) Remove the two nuts, lockwashers, and the mounting bracket securing the tachometer to the instrument and control panel; remove the assembled tachometer and the tachometer drive flexible casing and core.

(4) Disconnect the tachometer drive flexible casing and core from the tachometer.

(5) Remove the screw and lockwasher securing the assembled tachometer drive adapter to the distributor adapter; remove the tachometer drive adapter.

b. Cleaning and Inspection.

(1) Wipe the outside of the tachometer and the tachometer drive flexible casing with a cloth dampened with an approved cleaning solvent; dry thoroughly.

(2) Clean all other parts with an approved cleaning solvent; dry thoroughly.

(3) Inspect the tachometer drive flexible casing and core for cracks, kinks, breaks, or other damage; replace if damaged.

(4) Inspect the tachometer for visible damage; replace if damaged.

(5) Inspect the tachometer drive adapter for visible damage; replace if damaged.

(6) Inspect all nuts and screws for worn threads or other damage; replace if damaged.

c. Reassembly and Installation.

(1) Position the tachometer drive adapter on the distributor adapter, making sure to mesh both parts of coupling. Secure the tachometer drive adapter to the distributor adapter with a screw and lockwasher.

(2) Position the tachometer on the instrument panel and secure with the mounting bracket, two lockwashers, and nuts.

(3) Connect the tachometer flexible casing and core to both the tachometer and the tachometer drive adapter.

(4) Install the engine right side panel.

82. Hourmeter and Pressure Switch

(fig. 5)

a. Removal.

(1) Remove the engine right side panel.

(2) Disconnect the leads from the terminals of the hourmeter (4) and tape the end of the lead from the oil pressure switch. Tag the leads to facilitate reassembly.

(3) Remove the three nuts, lockwashers, and machine screws securing the hourmeter to the instrument and control panel (1); remove the hourmeter.

(4) Disconnect the leads from the terminals of the hourmeter pressure switch; tape the ends of the lead from the ammeter. Tag the leads to facilitate reassembly.

(5) Remove the hourmeter pressure switch from the oil line in the engine crankcase.

b. Cleaning and Inspection.

(1) Clean the hourmeter and pressure switch with a dry cloth. Wire brush the terminals and apply a little standard-issue wiring protective compound.

(2) Inspect the hourmeter and pressure switch for visible damage; inspect the terminals for corrosion or damaged threads. Replace if defective.

(3) Inspect the hourmeter and pressure switch electrical leads for breaks, kinks, oil-soaked insulation, or other damage; replace if damaged.

c. Installation.

(1) Install the hourmeter pressure switch in the oil line.

(2) Position the hourmeter on the instrument and control panel; secure with the three machine screws, lockwashers, and nuts.

(3) Connect the electrical leads to the terminals of the hourmeter and pressure switch. Refer to figure 15.

(4) Install the engine right side panel.

83. Ammeter
(fig. 5)

a. Removal.

(1) Remove the engine right side panel.

(2) Disconnect the electrical leads from the terminals of the ammeter (16) and tape the end of the lead from the starter switch to avoid short-circuiting. Tag the leads to facilitate reassembly.

(3) Remove the two nuts, lockwashers and mounting clamp securing the ammeter to the instrument and control panel; remove the ammeter.

b. Cleaning and Inspection.

(1) Clean the ammeter with a dry cloth. Wire brush the terminals and apply a small amount of standard-issue wiring protective compound.

(2) Inspect the ammeter for visible damage. Inspect the ammeter terminals for corrosion or damaged threads; replace if defective.

(3) Inspect the ammeter electrical leads for breaks, kinks, oil-soaked insulation, or other damage; replace if damaged.

c. Installation.

(1) Position the ammeter (16) on the instrument and control panel; secure with the ammeter mounting clamp, two lockwashers, and nuts.

(2) Connect the electrical leads from the starter switch, voltage regulator, and oil pressure switch to the ammeter terminals. Refer to figure 15.

(3) Install the engine right side panel.

84. Spark Plugs

a. Checking for Spark. To check the efficiency of the spark delivered to the spark plugs, disconnect one of the high tension leads from its spark plug and hold the lead so that the terminal is 1/8-inch away from the cylinder head. With the ignition switch in the ON position, turn over the engine until a spark occurs. It should jump the gap, giving a hot intense spark.

b. Removal.

(1) Remove the engine right side panel.

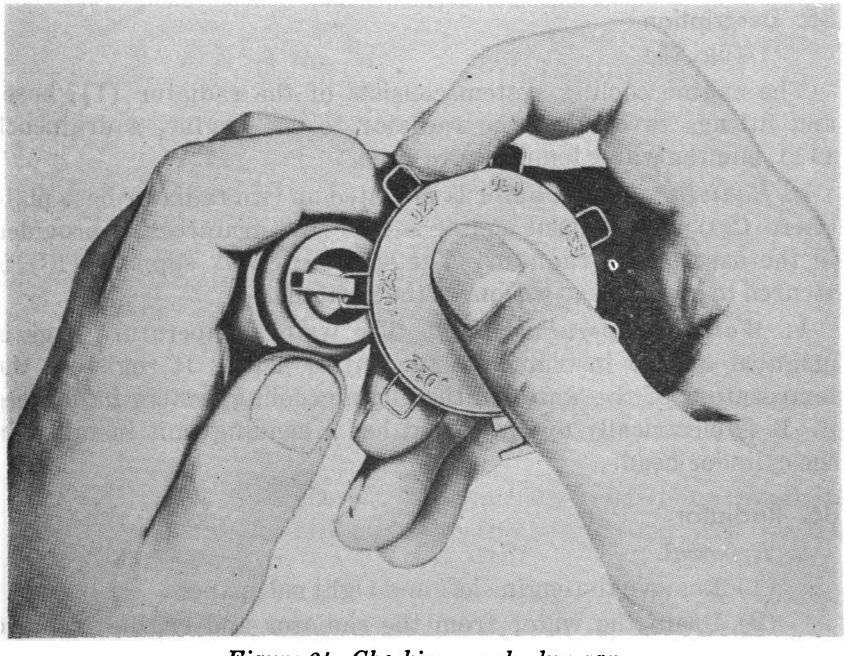


Figure 24. Checking spark plug gap.

(2) Remove all dirt or other foreign matter from around the spark plugs.
(3) Disconnect the high tension leads from the spark plugs.
(4) Unscrew the spark plugs from the cylinder head; remove the spark plugs and gaskets.

c. Cleaning and Inspection. Clean the spark plugs with a conventional spark plug cleaner. If a cleaner is not available, clean as much of the carbon deposits as possible from the electrodes and insulators. Take care not to damage the insulators. If the insulators are chipped or damaged in any way, or if the electrodes are badly burned, replace the spark plugs.

d. Checking Spark Plug Gap (fig. 24). Check the gap between the spark plug electrodes with a wire feeler gage. The gap must be 0.025-inch. Regap by bending the grounded electrode if necessary.

e. Installation.
(1) Install the spark plugs and gaskets in the cylinder head openings. Tighten the spark plugs until seated, then turn down one-quarter turn more.
(2) Connect the high tension leads to the spark plugs.
(3) Install the engine right side panel.

Section VIII. ENGINE COOLING SYSTEM

85. Description (fig. 25)

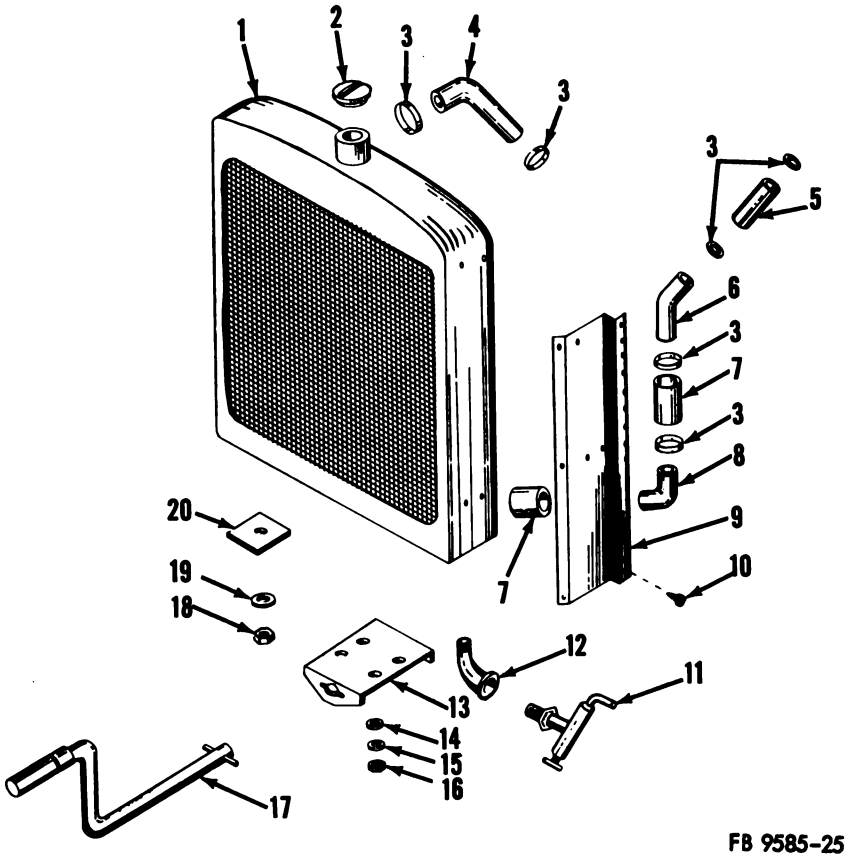
The engine cooling system consists of the radiator (1), hoses and fittings to connect the radiator to the engine, a draincock (11), and the water temperature gage.

a. Radiator. The radiator is mounted on two radiator base plate liners (20) on the front engine support. A draincock is provided in the base of the radiator. The starting crank support (13) is secured to studs in the bottom of the radiator.

b. Water Temperature Gage. The water temperature gage is mounted on the instrument and control panel. It registers the temperature of the water in the engine cooling system in degrees F. It is electrically operated and has a sending unit installed in the cylinder head.

86. Radiator

a. Removal.
(1) Remove the engine left and right side panels.
(2) Drain the water from the radiator and engine; remove the radiator cap (2, fig. 25).



FB 9585-25

1	Radiator	11	Draincock
2	Cap	12	Elbow
3	Hose clamp	13	Crank support
4	Elbow	14	Plain washer
5	Hose	15	Lockwasher
6	Elbow	16	Nut
7	Hose	17	Starting crank
8	Elbow	18	Nut, hex, ½" NC (2 rqr)
9	Radiator shell wing	19	Lockwasher, ½" (2 rqr)
10	Screw, self-tapping, ¼" x ⅜" NC (12 rqr)	20	Liner

Figure 25. Radiator, exploded view.

(3) Remove the seven machine screws securing the hood top and the fuel tank to support the weight of the top and tank.

(4) Remove the screws, lockwashers, and plain washers securing the fan guard to the fan shroud; remove the fan guard.

(5) Remove the 16 self-tapping screws securing the radiator shell to the radiator shell wings (9, fig. 25); remove the radiator shell.

(6) Loosen the eight hose clamps (3) and remove the water line hoses (5) and (7) and elbows (4), (6), and (8).

(7) Remove the two nuts (18) and lockwashers (19) securing the radiator to the front engine support; remove the assembled radiator and the two liners (20).

b. Disassembly (fig. 25).

(1) Remove the 12 self-tapping screws securing the fan shroud to the radiator (1). Remove the fan shroud.

(2) Remove the eight self-tapping screws securing the left and right radiator shell wings (9) to the radiator; remove the left and right radiator shell wings.

(3) Remove the four nuts (16), lockwashers (15), and plain washer (14) securing the starting crank support (13) to the radiator; remove the starting crank support.

(4) Remove the draincock (11) and elbow (12) from the radiator.

c. Cleaning and Inspection.

(1) Clean the exterior of the radiator with an approved cleaning solvent; clean the interior of the radiator in accordance with current directives.

(2) Wipe off all hoses with a dry cloth.

(3) Wash all other parts with an approved cleaning solvent; dry thoroughly.

(4) Use a stream of clean, dry, compressed air in a direction opposite to the normal air flow to clean all dirt or foreign particles from the radiator fins and screen. If necessary, complete the cleaning with a brush, taking care not to bend or damage the radiator tubes or fins.

(5) Inspect the radiator for evidence of leaks, bends, cracks, damaged fins, possible obstructions, or other damage; repair any leaks and straighten bent fins, tubes, or shrouding. Replace a badly damaged radiator.

(6) Inspect the hoses for cracks, breaks, dryness, or other signs of deterioration; replace defective hoses.

(7) Inspect the fan guard for cracks, breaks, distortion, or other damage; replace if damaged.

(8) Inspect the studs in the radiator for worn or damaged threads or other damage; replace studs if damaged.

(9) Inspect all other parts for cracks, breaks, bends, rust, heavy scale deposits, worn threads, or other damage; replace if damaged.

d. Reassembly (fig. 25).

(1) Install the elbow (12) and the draincock (11) in the bottom of the radiator (1).

(2) Position the starting crank support (13) on the studs in the bottom of the radiator; secure with four plain washers (14), lockwashers (15), and nuts (16).

(3) Position the left and right radiator shell wings (9) on the radiator sides; secure with eight self-tapping screws (10).

(4) Position the fan shroud on the radiator; secure with the 12 self-tapping screws.

e. Installation.

(1) Position the two radiator base plate liners (20) and the assembled radiator on the front engine support; secure with two lockwashers (19) and nuts (18).

(2) Assemble the elbows (4), (6), and (8) and hoses (5) and (7) for the inlet and outlet lines. Install the lines between the radiator and the engine water inlet and outlet openings. Tighten the hose clamps (3).

(3) Position the radiator shell between the radiator shell wings; secure with 16 self-tapping screws.

(4) Position the fan guard on the fan shroud, and secure the fan guard to the fan shroud with 11 plain washers, lockwashers, and screws.

(5) Remove the blocking from the hood top (29, fig. 3); secure the hood top to the radiator shell with seven machine screws.

(6) Install the engine left and right side panels.

(7) Fill the radiator with the proper coolant for the prevailing temperature (par. 33*e*); install the radiator cap.

87. Water Temperature Gage

a. Removal.

(1) Remove the engine left and right side panels.

(2) Drain the engine coolant into a clean container until the coolant in the engine is below the location of the water gage sending unit in the cylinder head.

(3) Disconnect the electrical leads from the terminals of the water temperature gage sending unit and the water temperature gage. Tag the leads to facilitate reassembly.

(4) Remove the sending unit from the cylinder head.

(5) Remove the two nuts, lockwashers, and mounting bracket securing the water temperature gage to the instrument and control panel; remove the temperature gage.

b. Cleaning and Inspection.

(1) Wipe off the water temperature gage sending unit and the water temperature gage with a cloth dampened with an approved cleaning solvent; dry thoroughly.

(2) Inspect both units for dents, cracks, breaks, damaged threads, wear, or other damage; replace if damaged.

(3) Inspect the electrical leads for breaks, kinks, cracks, broken, frayed, or oil-soaked insulation, or other damage; replace if damaged.

(4) Wire brush the terminals and apply a little standard-issue wiring protective compound.

c. Installation.

(1) Position the water temperature gage on the instrument and control panel; secure with the mounting bracket, two lockwashers, and nuts.

(2) Install the water temperature gage sending unit in the engine cylinder head.

(3) Connect the electrical leads to the terminals of the water temperature gage and water temperature gage sending unit. Refer to figure 15.

(4) Install the engine left and right side panels.

(5) Fill the radiator with the coolant previously drained from the engine.

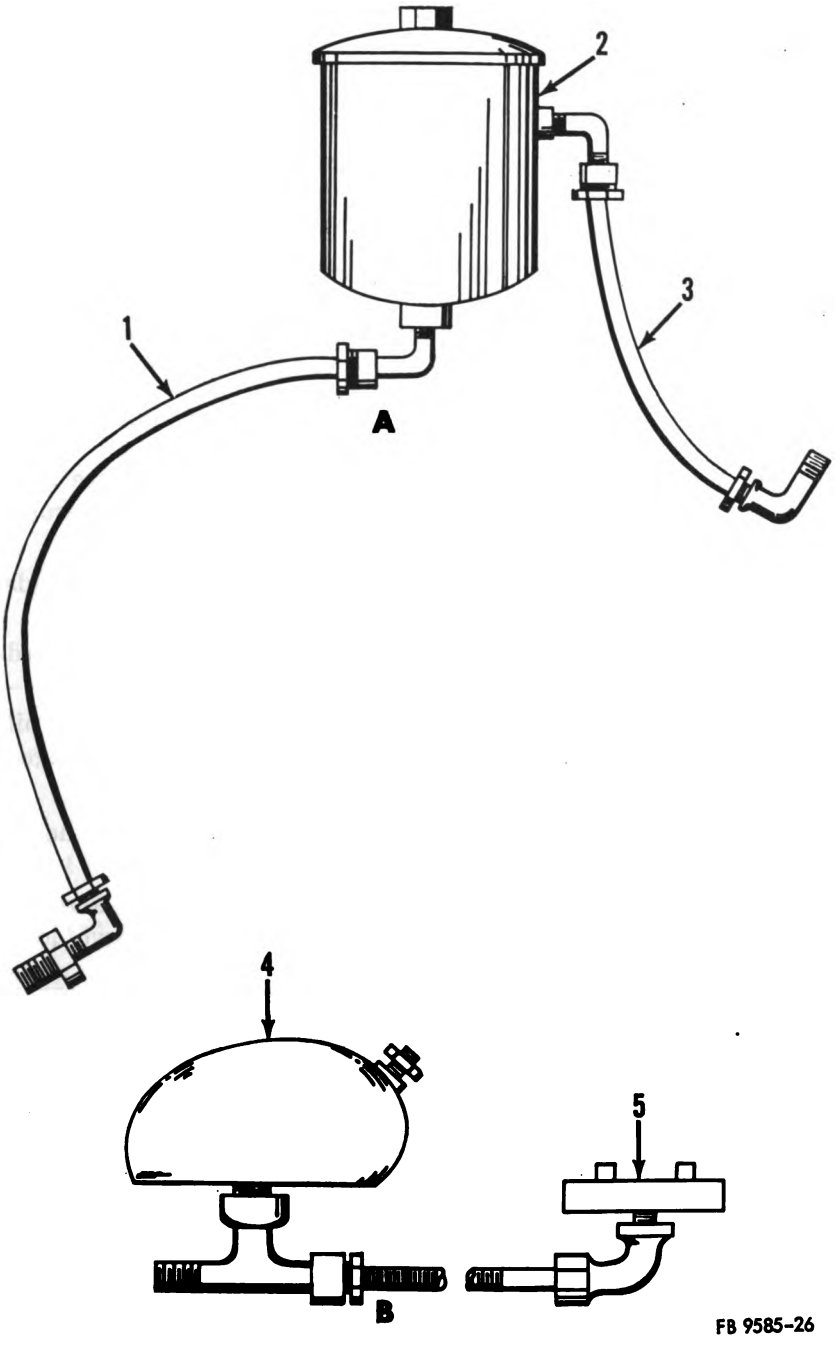
Section IX. ENGINE LUBRICATION SYSTEM

88. Description
(fig. 26)

The engine is lubricated by an oil pump described in the engine manual. The external oil system consists of an oil filter (2) and lines (1) and (3) and a pressure gage. A pressure switch to actuate the hourmeter is also installed in the system.

a. Oil Pressure Gage. The oil pressure gage is mounted on the instrument and control panel. It is electrically operated by a sending unit (4) located in an oil line.

b. Oil Filter. The oil filter (2) is located on the left side of the engine. The removable cartridge separates and removes the dirt, dust, and foreign particles that collected in the oil. The cartridge must be changed before it is saturated with dirt and can no longer keep the engine oil clean. Dirty oil will result in injury to the engine.



1 Inlet line
2 Oil filter
3 Outlet line
4 Oil pressure gage sending unit
5 Hourmeter pressure switch

Figure 26. Engine lubrication system, schematic.

89. Oil Pressure Gage

(fig. 26)

a. Removal.

(1) Remove the engine left and right side panels.

(2) Disconnect the electrical leads from the terminals of the oil pressure gage and oil pressure gage sending unit (4). Tag the leads to facilitate reassembly.

(3) Remove the two nuts, lockwashers, and the mounting bracket securing the oil pressure gage to the instrument and control panel; remove the oil pressure gage.

(4) Remove the oil pressure gage sending unit from the tee on the right side of the engine crankcase.

b. Cleaning and Inspection.

(1) Wipe the oil pressure gage and the oil pressure gage sending unit with a cloth dampened with an approved cleaning solvent; dry thoroughly.

(2) Inspect both instruments for corrosion, damaged threads, or visible damage; replace if damaged.

(3) Wire brush the terminals and apply a little standard-issue wiring protective compound.

(4) Inspect the electrical leads for breaks, kinks, burns, oil-soaked insulation, or other damage; replace if damaged.

c. Installation.

(1) Install the oil pressure gage sending unit (4) in the tee on the right side of the engine.

(2) Position the oil pressure gage on the instrument and control panel; secure with a mounting strap, two lockwashers, and nuts.

(3) Connect the electrical leads to the terminals of the oil pressure gage and oil pressure gage sending unit. Refer to figure 15.

(4) Install the engine left and right side panels.

90. Oil Filter

a. Removal (fig. 8).

(1) Remove the engine left side panel.

(2) Remove the drain plug (6); drain the oil into a container. Discard the used oil. Disconnect the inlet and outlet flexible hoses (7) from the elbows in the oil filter and the engine crankcase; remove the flexible hoses.

(3) Remove the four nuts (4), lockwashers, and machine screws, securing the two oil filter straps (3) to the oil

filter bracket (5); remove the assembled oil filter and straps.

(4) Remove the fittings from the oil filter and the openings in the crankcase.

(5) Remove the oil filter bracket from the studs in the crankcase.

b. Disassembly (fig. 27).

(1) Remove the cap screw (1) securing the gasket (2), cover (3), gasket (4), and cover spring (5) to the top of the filter body (8); remove the cover, both gaskets, and the cover spring.

(2) Remove the nut (12), lockwashers (11), and machine bolts (9) securing the straps (10) to the filter body; remove the two straps.

(3) Remove the cartridge (6) and spacer (7) from the inside of the filter body.

c. Cleaning and Inspection (fig. 27).

(1) Clean the exterior of the oil filter and the flexible hoses with a cloth dampened with an approved cleaning solvent; dry thoroughly.

(2) Clean all other parts except the gaskets (2) and (4) and the oil filter cartridge (6) with an approved cleaning solvent; dry thoroughly.

(3) Blow clean, dry, compressed air through the oil lines.

(4) Discard the oil filter cartridge (6) and gaskets (2) and (4).

(5) Inspect all other parts for cracks, breaks, leaks, damaged threads, or other damage; replace if damaged.

(6) Inspect the studs in the engine for distortion, worn threads, or other damage; replace if damaged.

d. Reassembly (fig. 27).

(1) Install the spacer (7) and cartridge (6) inside the filter body (8).

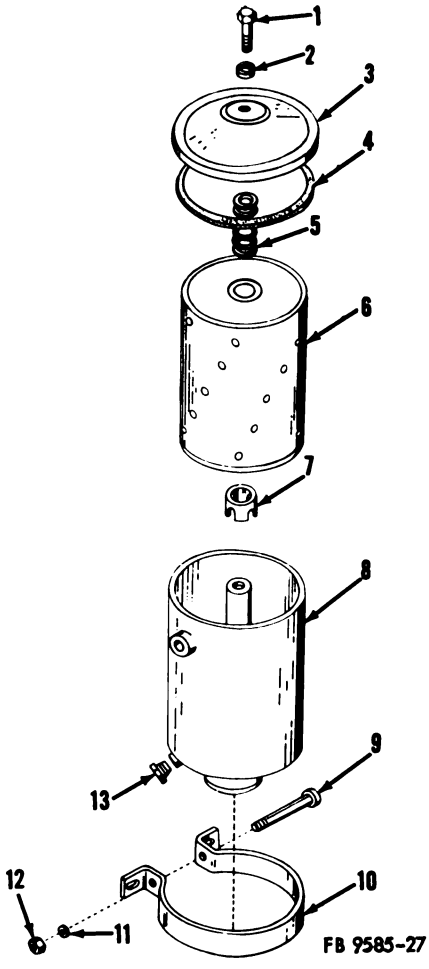
(2) Install the cover spring (5), gasket (4), cover (3), and gasket (2) on the top of the filter body (8); secure with the cap screw (1).

(3) Install two straps (10) around the filter body; secure with two bolts (9), lockwasher (11), and hex nuts (12).

(4) Install the drain plug (13) in the bottom of the filter body.

e. Installation.

(1) Install the oil filter bracket (5, fig. 8) on the studs in the engine.



1 Cap screw
2 Cap screw gasket
3 Cover
4 Cover gasket
5 Cover spring
6 Cartridge
7 Spacer
8 Body
9 Bolt
10 Strap
11 Lockwasher
12 Nut
13 Drain plug

Figure 27. Oil filter, exploded view.

(2) Install the fittings in the inlet and outlet openings of the oil filter and the engine crankcase.

(3) Install the assembled oil filter and straps on the oil filter bracket; secure with four machine screws, lockwashers, and nuts.

(4) Install the inlet and outlet flexible hoses between the fittings in the oil filter and the crankcase.

(5) Check the oil level in the engine crankcase after the engine has been in operation for a few minutes; add oil if necessary (LO 5–9585).

(6) Install the engine left and right side panels.

Section X. ENGINE EXHAUST SYSTEM

91. Description

a. Muffler. The exhaust gases from the engine pass through the exhaust manifold and the exhaust pipe into the exhaust muffler (13, fig. 16). The muffler is mounted on the the engine hood top (29, fig. 3) and has a rain cap (11, fig. 16) on the outlet. The muffler is designed to reduce the noise from the engine exhaust. The muffler is clamped to the exhaust outlet pipe.

b. Exhaust Pipe. The exhaust pipe extends from the engine exhaust manifold outlet opening through the engine hood top.

92. Muffler

a. Removal.

(1) Loosen the clamp screw on the clamp securing the muffler (13, fig. 16) to the exhaust outlet pipe.

(2) Remove the engine right side panel.

(3) Remove the four nuts, lockwashers, plain washers, and machine screws securing the two muffler support brackets (12) to the engine housing hood top (29, fig. 3); remove the assembled muffler and support brackets from the hood top.

(4) Remove the two nuts, lockwashers, and machine screws clamping the two muffler support brackets to the muffler; remove the muffler support brackets and spacers.

b. Cleaning and Inspection.

(1) Clean the exterior of the muffler with a wire brush; remove all dirt and rust.

(2) Clean all other parts with an approved cleaning solvent; dry thoroughly.

(3) Inspect the muffler and the rain cap for burned or rusted spots, holes, cracks, or other damage. Replace a damaged muffler.

(4) Inspect all other parts for cracks, breaks, distortion, worn threads, or other damage; replace if damaged.

c. Installation.

(1) Position the two muffler support brackets (12, fig. 16) around the muffler (13); insert the two spacers and

clamp securely with two machine screws, lockwashers, and nuts.

(2) Position the assembled muffler and muffler support brackets on the hood top (29, fig. 3); secure with four machine screws, plain washers, lockwashers, and nuts.

(3) Install the engine right side panel.

(4) Tighten the clamp securing the muffler to the exhaust outlet pipe.

93. Exhaust Outlet Pipe Assembly

a. Removal.

(1) Remove the muffler (par. 92*a*(1) through (3)).

(2) Remove the two nuts and plain washers securing the exhaust outlet pipe to the studs in the engine exhaust manifold. Remove the exhaust outlet pipe and gasket.

b. Cleaning and Inspection.

(1) Clean the exterior of the exhaust pipe with a wire brush; remove all dirt and rust.

(2) Inspect the exhaust outlet pipe for burned or rusted spots, holes, cracks, or other damage; replace if damaged.

(3) Discard the gasket.

c. Installation.

(1) Position a new exhaust pipe gasket and the exhaust outlet pipe on the exhaust manifold studs; secure with two plain washers and nuts.

(2) Install the muffler (92*c*(1) through (4)).

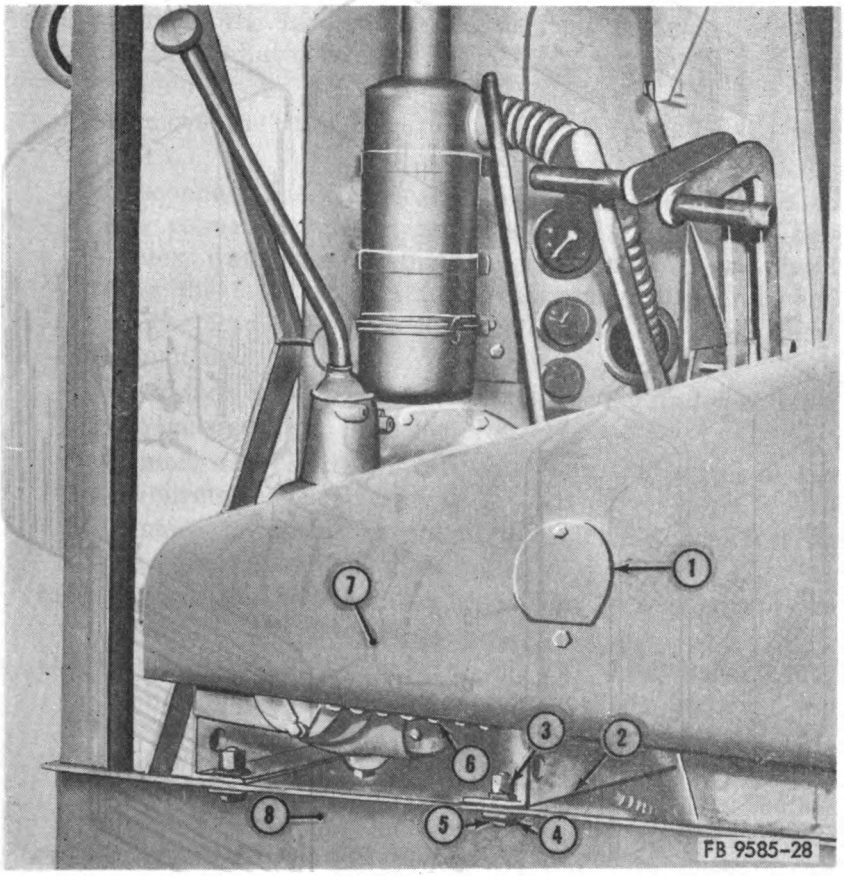
Section XI. ENGINE HOUSING, ENGINE, AND SUPPORTS

94. Description

a. Housing (fig. 3). The engine housing supports the fuel tank and muffler, and protects the engine and engine accessories from the elements. The instrument and control panel (27) at the rear of the engine mounts the engine instruments, gages, and the operating controls. The side panels are removable and are provided with fasteners and lugs for locking. The radiator shell is mounted on the front engine support; the instrument and control panel is mounted on the flywheel housing.

b. Engine. The engine and its accessories, except the batteries, are enclosed in the housing. The engine is a Continental Model FS162–6008, four-cylinder, water-cooled, gasoline type. A clutch and transmission are mounted at the rear of the engine.

c. Engine Supports (fig. 28). The front and the rear engine supports are secured to two angles or sills (2) under the engine. The sills have slotted holes at the points where they are secured to the frame (8) to allow adjustment of the position of the engine to supply the correct tension to the jackshaft drive chain (6).



1 Cover plate
2 Engine sill
3 Nut, hex
4 Wedge washer
5 Machine bolt
6 Jackshaft drive chain
7 Chain guard
8 Main frame

Figure 28. Engine mounting.

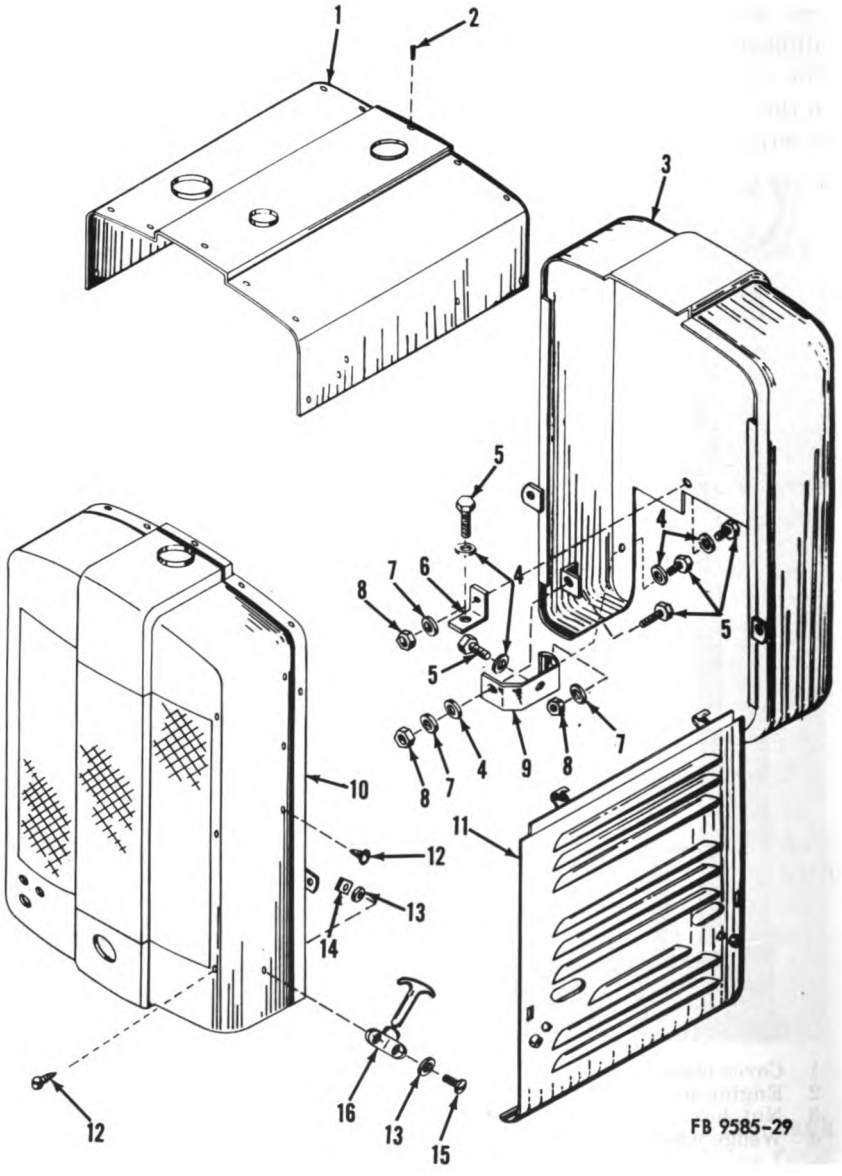
95. Housing

a. Removal.

(1) Remove the engine left and right side panels (11, fig. 29).

(2) Remove the muffler (par. 92*a*(1) through (3)).

(3) Close the fuel shutoff valve (16, fig. 9); disconnect the fuel line (14). Open the fuel shutoff valve and drain the fuel into a clean container.



1 Hood top
2 Screw, self-tapping, ¼" x ½" (14 rqr)
3 Instrument and control panel
4 Plain washer, ⅜" (20 rqr)
5 Cap screw, hex hd, ⅜" x ⅞" NC (20 rqr)
6 Bracket
7 Lockwasher, ⅜" (20 rqr)
8 Nut, hex, ⅜" NC (20 rqr)
9 Bracket
10 Radiator shell
11 Side panel
12 Screw, self-tapping, ¼" x ⅜" (16 rqr)
13 Lockwasher, No. 10 (16 rqr)
14 Nut, hex, No. 10 (8 rqr)
15 Machine screw, rd hd, $\frac{5}{16}$" x ½" NC (8 rqr)
16 Side panel fastener

Figure 29. Engine housing, exploded view.

(4) Remove the 14 screws (2, fig. 29) securing the engine hood top (1) to the radiator shell (10) to the instrument and control panel (3); remove the assembled hood top and fuel tank.

(5) Remove the 16 screws (12) securing the radiator shell to the radiator wings (9, fig. 25); remove the radiator shell.

(6) Remove the starter button and rod (par. 76*a*(2) and (3)).

(7) Disconnect the electrical leads from the terminals of the voltage regulator, ignition switch, hourmeter, ammeter, water temperature gage, and oil pressure gage. Tag the leads to facilitate reassembly. Tape the end of the lead from the electrical starter to avoid short circuiting.

(8) Disconnect the tachometer flexible casing and core from the tachometer.

(9) Remove the choke control wire from the swivel of the carburetor choke lever.

(10) Remove the throttle control wire from the swivel on the idling control lever.

(11) Remove the flexible tube hose from the carburetor air inlet.

(12) Remove the eight nuts (8, fig. 29), lockwashers (7), plain washers (4), and cap screws (5) securing the instrument and control panel (3) to the brackets (9), and the two cap screws (5) plain washers (4) securing the bracket (6) to the flywheel housing; remove the assembled instrument and control panel and the bracket.

(13) Remove the four cap screws (5) and plain washers (4) securing the bracket (9) to the flywheel housing; remove the bracket.

b. Disassembly (fig. 29).

(1) Remove the fuel tank from the hood top (par. 67*a*(6) and (7)).

(2) Remove the eight hex nuts (14), 16 lockwashers (13), and eight machine screws (15) securing the four side panel fasteners (16) to the radiator shell (10) and instrument and control panel (3); remove the side panel fasteners.

(3) Remove the two nuts (8), lockwashers (7), plain washers (4), and cap screws (5) securing the brackets (6) to the instrument and control panel (3); remove the brackets.

(4) Remove the voltage regulator, ignition switch, hourmeter, ammeter, water temperature gage, oil pressure gage, tachometer, and air cleaner from the instrument and control panel.

(5) Remove the four nuts, lockwashers, and machine screws securing the choke and throttle controls to the instrument and control panel; remove the choke and throttle controls.

c. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent; dry thoroughly.

(2) Inspect all parts for cracks, bends, rusted spots, worn threads, dents, or other damage; repair or replace if damaged beyond repair.

d. Reassembly (fig. 29).

(1) Install the choke and throttle controls in the openings of the instrument and control panel (3); secure with four machine screws, lockwashers, and nuts.

(2) Install the voltage regulator, ignition switch, hourmeter, ammeter, water temperature gage, oil pressure gage, tachometer, and air cleaner on the instrument and control panel.

(3) Position the brackets (6) on the instrument and control panel; secure with two cap screws, plain washers, lockwashers, and nuts.

(4) Position the four side panel fasteners on the radiator shell and instrument and control panel; secure with eight machine screws, 16 lockwashers, and eight nuts.

(5) Install the fuel tank on the hood top (par. 67*e*(1) and (2)).

e. Installation.

(1) Position the four brackets (9), (fig. 29) on the sides of the flywheel housing; secure with four cap screws (5) and plain washers (4).

(2) Position the instrument and control panel (3) on the flywheel housing; secure with eight cap screws (5), lockwashers (7), plain washers (4), and nuts (8) in the side brackets, and two cap screws and plain washers in the top brackets.

(3) Install the flexible hose on the carburetor air inlet.

(4) Install the throttle control wire in the swivel of the idling control lever.

(5) Install the choke control wire in the swivel of the carburetor choke lever.

(6) Connect the tachometer flexible casing and core to the tachometer.
(7) Connect the electrical leads to the terminals of the oil pressure gage, water pressure gage, ammeter, hourmeter, ignition switch, and voltage regulator. Refer to figure 15.
(8) Install the starter button and rod (par. 76*c*(1) and (2)).
(9) Position the radiator shell (10) on the radiator wings (9, fig. 25); secure with the 16 screws (12, fig. 29).
(10) Position the assembled hood top (1) and fuel tank on the radiator shell and instrument and control panel; secure with the 14 screws (2).
(11) Connect the fuel line (14, fig. 9) to the fuel strainer (15). Open the fuel shutoff valve. Fill the fuel tank.
(12) Install the muffler (par. 92*c*(1) through (4)).
(13) Install the engine left and right side panels (11, fig. 29).

96. Engine
(fig. 28)

a. Removal.
(1) Remove the left and right side panels.
(2) Remove the battery cables from the electrical starter terminal and the ground screw. Tape the ends of the cables to avoid short circuiting. Tag the cables to facilitate reassembly.
(3) Slide the cover plate (1) from the opening in the middle of the chain guard (7); remove the two nuts, lockwashers, and machine screws securing the internal brace to both sides of the chain guard; remove the brace.
(4) Remove the two nuts, lockwashers, plain washers, and machine bolts securing the chain guard to the transmission seal plate and the three nuts, lockwashers, plain washers, and machine bolts securing the chain guard to the main frame; remove the chain guard.
(5) Loosen the locknut securing the thrust bolt attached to the main transmission housing; back up the thrust bolt and the locknut.
(6) Remove the machine bolt, wedge washer, lockwasher, and nut securing the keeper plate to the main frame at the radiator end of the engine; remove the keeper plate.
(7) Remove the nut, lockwashers, and machine screw securing the automatic clutch throwout lever to the clutch shifter shaft; remove the throwout lever and key.
(8) Move the engine on the main frame (8) to loosen the jackshaft drive chain (6). Remove the cotter pin secur-

ing the chain offset link; remove the jackshaft drive chain from the sprockets.

(9) Remove the four nuts (3), lockwashers, plain washers, wedge washers (4), and bolts (5) securing the sills (2) to the main frame.

(10) Construct a platform large enough to accomodate the engine.

(11) Jack up the engine, and place two planks lengthwise under the sills (2) to which the engine is secured; use rollers or slide the engine along the planks from the conveyor main frame (8) to the platform.

(12) Use a hoist or jacks to raise the engine from the sills; remove the six nuts, lockwashers, and machine bolts securing the sills to the front engine support and to the flywheel housing. Remove the sills and lower the engine to the platform.

b. Cleaning and Inspection.

(1) Wash all parts with an approved cleaning solvent; dry thoroughly.

(2) Inspect all parts for wear, cracks, bends, worn threads, or other damage; replace if damaged.

c. Installation.

(1) Position the two sills (2) on the front engine support and the flywheel housing; secure with six machine bolts, lockwashers, and nuts.

(2) Use planking and rollers, if available, and skid or roll the engine through the opening in the side of the conveyor frame.

(3) Position the engine sills (2) so that the holes in the sills are alined with the holes in the main frame (8); install the four machine bolts (5), wedge washers (4), plain washers, lockwashers, and nuts (3). Do not tighten the nuts.

(4) Place the jackshaft drive chain (6) over the sprockets. Connect the ends of the chain at the offset link with the pin, and secure the pin with the cotter pin.

(5) Install a key in the keyway of the clutch shaft and install the safety throwout lever on the clutch shifter shaft and key; secure with a machine screw, lockwasher, and nut.

(6) Adjust the jackshaft drive chain (*d* below).

(7) Position the chain guard (7) over the jackshaft drive chain and secure to the main frame with the three machine bolts, plain washers, lockwashers, and nuts. Secure

to the transmission seal plate with two machine bolts, plain washers, lockwashers, and nuts.

(8) Position the internal brace inside the chain guard and secure to each side of the guard with the two machine screws, lockwashers, and nuts. Cover the handhole with the cover plate (8).

(9) Connect the battery cables to the ground screw and the electrical starter terminal. Refer to figure 15.

(10) Install the left and right side panels.

d. Jackshaft Drive Chain Adjustment.

(1) Loosen the four nuts (3) in the engine sills (2), and the two bolts in the seal plate around the transmission shaft. Loosen the two bolts securing the chain guard (7) to the transmission seal plate.

(2) Remove the keeper plate at the radiator end of the engine.

(3) Loosen the locknut and turn the thrust bolt attached to the main transmission until the jackshaft drive chain can be deflected 1-inch at a midpoint between the sprockets. Make sure the engine is square with the frame and the sprockets are alined.

(4) Secure the adjustment by tightening the four nuts (3) in the engine sills (2). Install the keeper plate at the radiator end.

(5) Secure the transmission seal plate with two bolts.

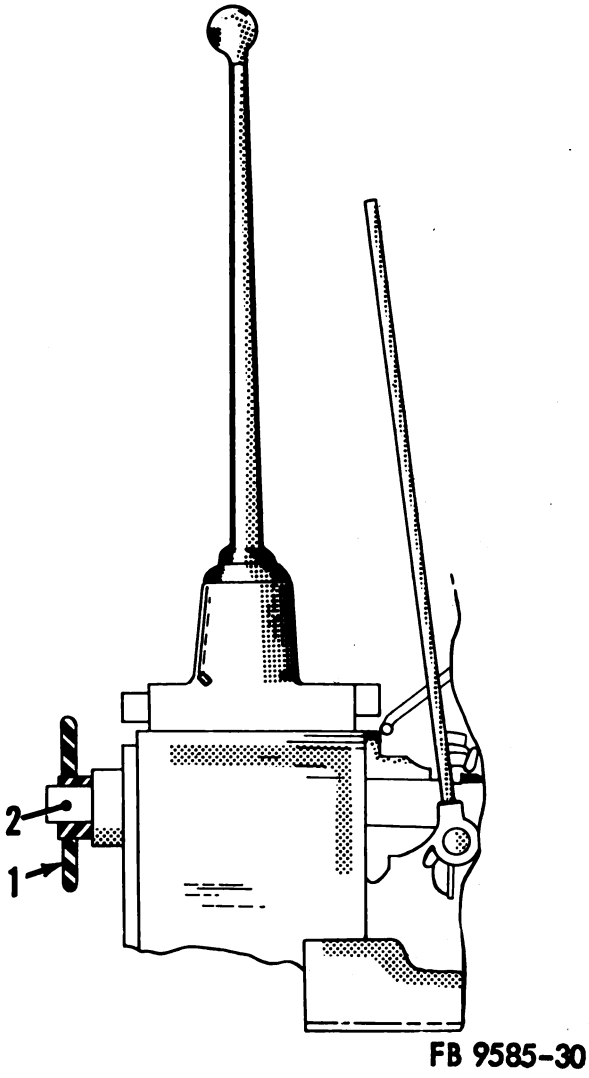
(6) Tighten the two bolts securing the chain guard (7) to the transmission seal plate.

Section XII. MASTER CLUTCH AND TRANSMISSION

97. Description

a. Master Clutch (fig. 3). The clutch lever (18) is on the right side of the clutch housing (22). It provides a means of disconnecting the engine drive from the transmission. The automatic throwout rod (11) is connected to the master clutch at the clutch shaft and disengages the clutch when the boom has been raised far enough to trip the throwout rod.

b. Transmission. The transmission (21, fig. 3) is bolted to the master clutch housing. The gear ratios are selected by the shift lever (19) in the standard gear shift positions with one reverse, three forward speeds, and a neutral position. The sprocket (1, fig. 30) on the transmission output shaft (2) drives the jackshaft drive chain.



1 Sprocket 2 Output shaft

Figure 30. Transmission sprocket and shift lever.

98. Master Clutch

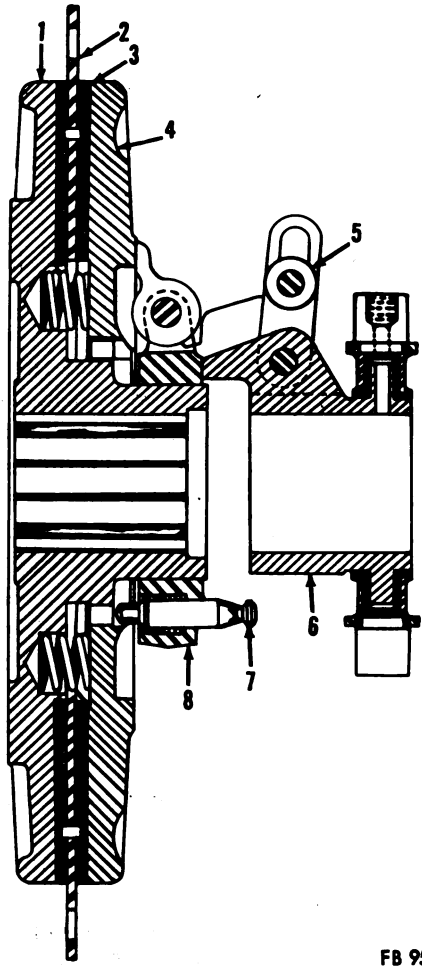
a. Master Clutch Adjustment (fig. 31). Ajust the engine clutch if it disengages, slips, or heats during operation. A new or repaired clutch will require several adjustments while "wearing in".

Caution: Do not attempt to adjust the clutch with the engine running.

(1) Remove the two screws securing the handhole cover on the clutch housing; remove the cover.

(2) Engage the clutch and rotate the clutch shaft with the engine hand crank until the adjusting lockpin (7) can be reached. Disengage the clutch. Pull the adjusting lockpin out, and turn the adjusting yoke (8) clockwise until the lockpin engages the next hole in the clutch floating plate (4). Engage the clutch and if further adjustment is required repeat the procedure.

(3) When satisfactory adjustment has been attained, position the handhole cover on the clutch housing; secure with the two screws.



1 Hub and back plate
2 Driving plate
3 Friction disk
4 Floating plate
5 Finger lever
6 Sliding sleeve
7 Adjusting lockpin
8 Adjusting yoke

Figure 31. Clutch, cross sectional view.

b. Clutch Linkage Removal (fig. 32).

(1) Remove the two nuts (8) and the plain washer (7) from the throwout rod (3); remove the throwout lever (5) from the throwout rod.

(2) Remove the nut, lockwasher, and machine screw securing the throwout lever (5) to the shifter shaft (6). Remove the throwout lever and the key.

(3) Remove the nut, lockwasher, and machine screw securing the master clutch lever (4) to the shifter shaft; remove the clutch lever and the key.

c. Cleaning and Inspection.

(1) Clean the outside of the clutch housing with an approved cleaning solvent; dry thoroughly.

(2) Clean all other parts with an approved cleaning solvent; dry thoroughly.

(3) Inspect the clutch housing for cracks, leaks, breaks, bent shafts, or other damage; refer to the proper authority if damaged.

(4) Inspect all other parts for cracks, breaks, bends, worn threads, wear or other damage; replace if damaged.

d. Clutch Linkage Installation (fig. 32).

(1) Position the throwout lever (5) on the throwout rod (3); install the plain washer (7) and two hex nuts (8).

(2) Position the key in the keyway of the shifter shaft (6); install the master clutch lever (4) on the key and the shifter shaft. Secure with a machine screw, lockwasher, and nut.

(3) Position a key in the remaining keyway of the shifter shaft; install the throwout lever (5) on the key and the shaft. Secure with a machine screw, lockwasher, and nut.

99. Transmission Sprocket
(fig. 30)

a. Removal.

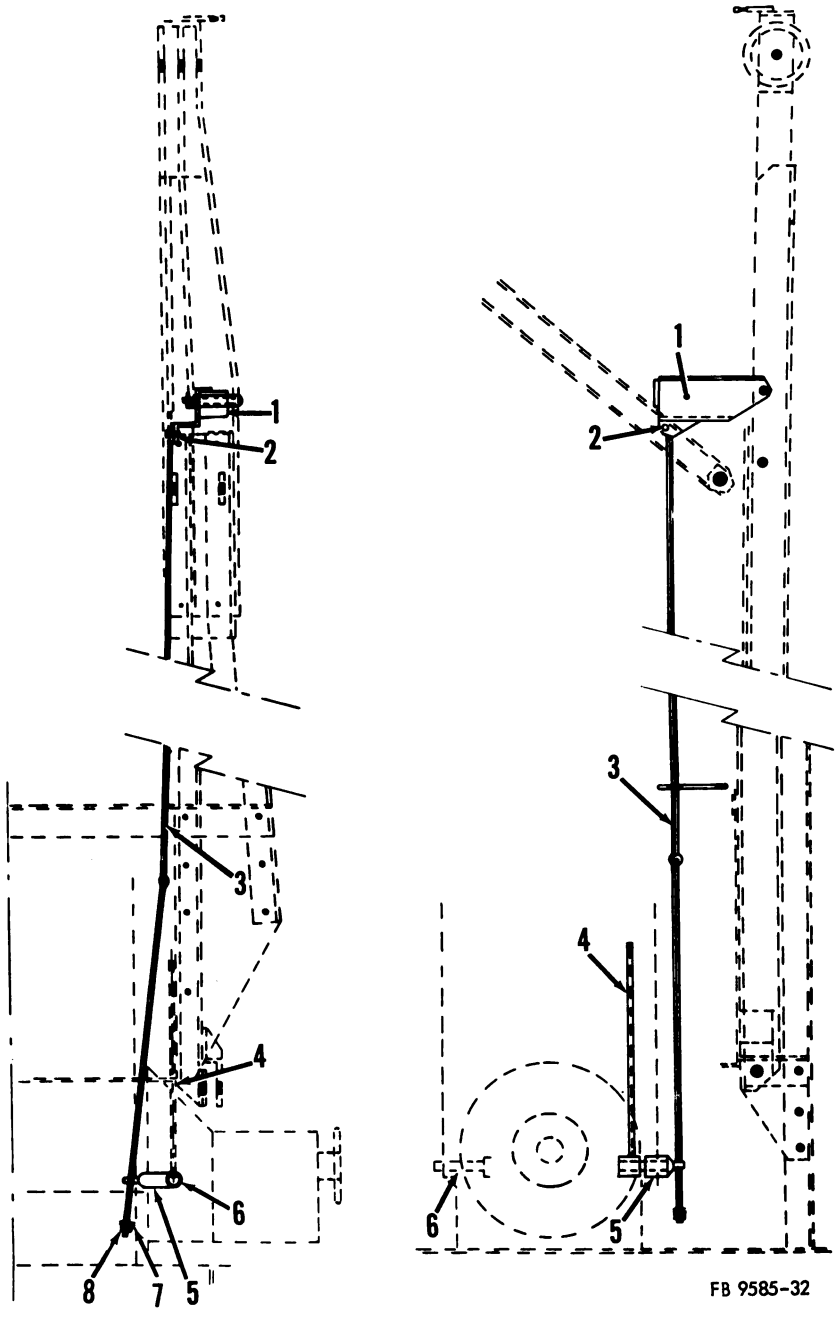
(1) Remove the jackshaft drive chain guard (par. 96*a*(3) and (4)).

(2) Remove the cotter pin securing the chain offset link; remove the jackshaft drive chain from the sprockets.

(3) Loosen the setscrew and use a puller to remove the sprocket (1) and the key from the transmission output shaft (2).

b. Cleaning and Inspection.

(1) Clean the outside of the transmission housing with an approved cleaning solvent; dry thoroughly



1 Arm
2 Rivet, button hd
3 Throwout rod
4 Clutch lever
5 Throwout lever
6 Shifter shaft
7 Plain washer
8 Nut, hex

Figure 32. Clutch lever and automatic throwout.

(2) Clean all other parts with an approved cleaning solvent; dry thoroughly.

(3) Inspect the sprocket for teeth that are cracked, broken, or worn unevenly; inspect the hub for cracks, wear, scoring or other damage. Replace the sprocket if damaged.

(4) Inspect the key for cracks, scoring, breaks, or other damage; replace if damaged.

c. Installation.

(1) Install the key in the keyway of the transmission output shaft (2), and install the sprocket (1) on the shaft and key; secure with a setscrew.

(2) Install the jackshaft drive chain (par. 96*c*(4)).

(3) If necessary, adjust the jackshaft drive chain (par. 96*d*).

(4) Install the chain guard (par. 96*c*(7) and (8)).

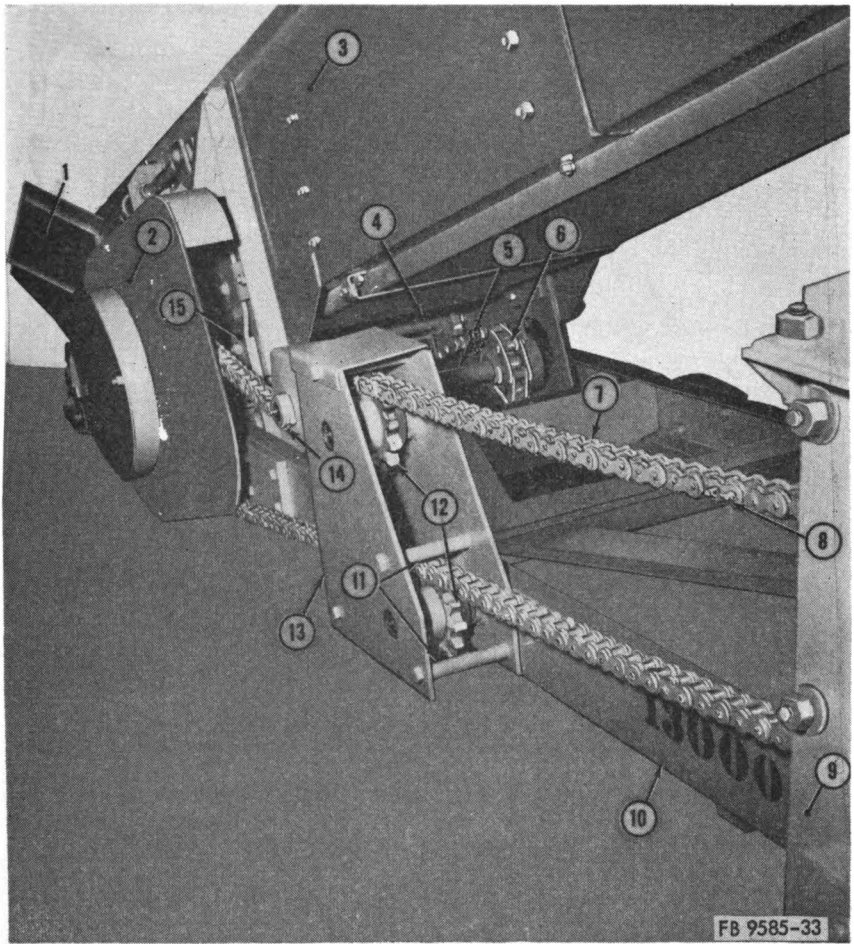
Section XIII. CONVEYOR BOOM ASSEMBLY

100. Description

a. General. The conveyor boom (5, fig. 1) houses the flight line chain and flights which convey the material from the foot hopper, formed by the hopper side plates (1, fig. 33), to the head end and unloads the material through the spout (6, fig. 1). The flight line consists of an endless chain and bucket system powered from the conveyor transmission by the conveyor drive chains (7, fig. 33). The conveyor drive chain has takeup idler sprockets (12) which serve to keep the drive chain tight with the boom raised or lowered. The boom is suspended on cables reeved over sheaves at the top of the mast. The foot end of the boom is held out from the main frame by the lower push arms (10). The upper push arms hold the upper part of the boom to the mast. The power hoist raises or lowers the boom by winding the cables on the hoist drive. The foot end of the boom is raised off the ground by the hand hoist wheel (18, fig. 2).

b. Foot End Shaft (fig. 34). The foot end shaft (5) is installed in the foot end (3) and is held in place with keepers (4) at the ends. A spacer bearing (7) is attached to the bed plate (6) at the foot end. The two sprockets (8) rotate freely on the foot shaft. The flight line chains (2) drive the flights (1).

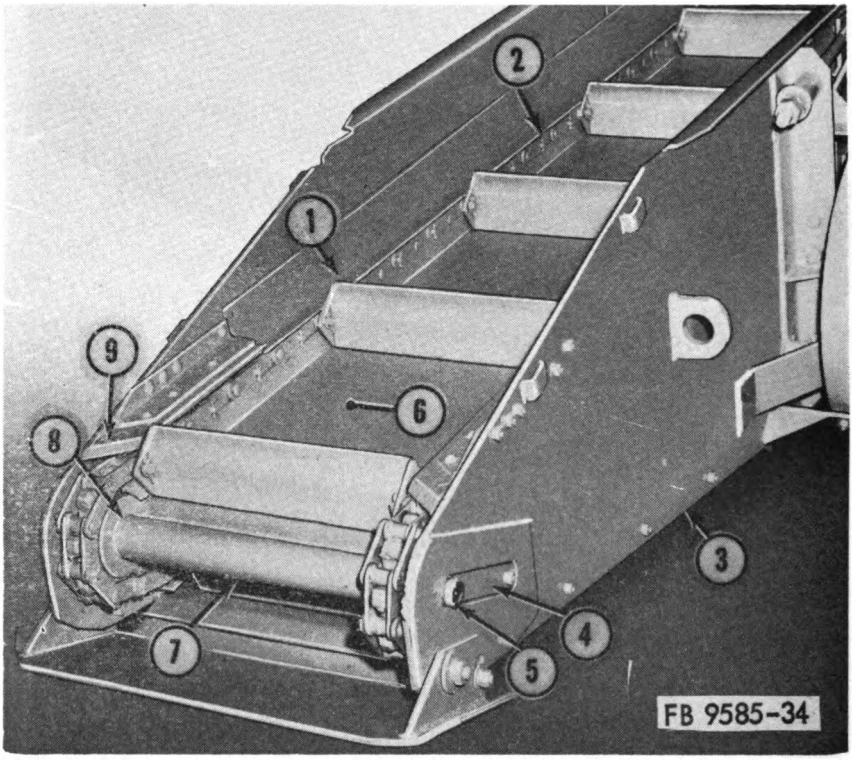
c. Head Shaft (fig. 35). The head shaft (7) rotates in pillow block bearings (8) mounted on the boom end plates (10) at the end of the upper section of the boom frame. The sprockets are keyed to the shaft and equalize the chain load on the two flight line chains.



1 Hopper side plate
2 Guard
3 Side plate
4 Drive shaft
5 Takeup shaft
6 Flight line chain
7 Conveyor drive chain
8 Converting link
9 Reversing countershaft housing
10 Lower push arm
11 Pipe spacer
12 Idler sprockets
13 Plate
14 Collar
15 Takeup arm

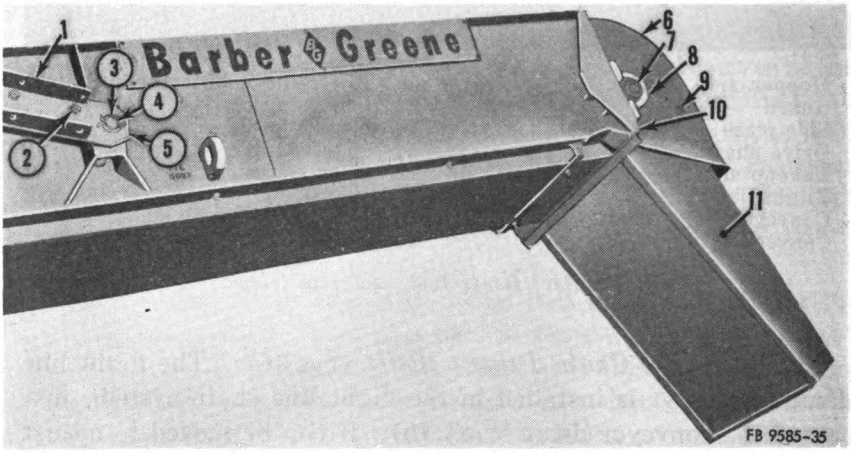
Figure 33. Boom foot end, rear view.

d. Flight Line Chain Takeup Shaft (fig. 36). The flight line takeup shaft (3) is installed in the flight line chain system, just back of the conveyor drive shaft (9). It can be moved to adjust the tension of the flight line chain (23) by means of the takeup arms (7), rods (8), and the adjusting nuts (11). The takeup shaft sprockets (2) are keyed to the takeup shaft. Two shaft mounting bearings are installed at the ends of the takeup arms.



1 Flight
2 Flight line chain
3 Foot end
4 Keeper
5 Foot end shaft
6 Bed plate
7 Spacer bearing
8 Foot end sprocket
9 Chain stripper knives

Figure 34. Foot end, front view.



1 Upper push arm
2 Nut
3 Washer
4 Shaft
5 Cotter pin
6 Head plate
7 Head shaft
8 Bearing
9 Nut
10 Boom end plate
11 Spout

Figure 35. Head end and spout, bottom view.

1 Boom side plate
2 Takeup sprocket
3 Takeup shaft
4 Nut
5 Bolt
6 Clip
7 Takeup arm
8 Takeup rod
9 Conveyor drive shaft
10 Pillow block bearing
11 Nut
12 Foot end
13 Hopper side plate bracket
14 Foot shaft
15 Nut
16 Foot end shoe
17 Keeper
18 Nut
19 Tie-down
20 Cotter pin
21 Shaft
22 Takeup shaft bearing
23 Flight line chain
24 Plate
25 Nuts
26 Lower push arm
27 Support bar

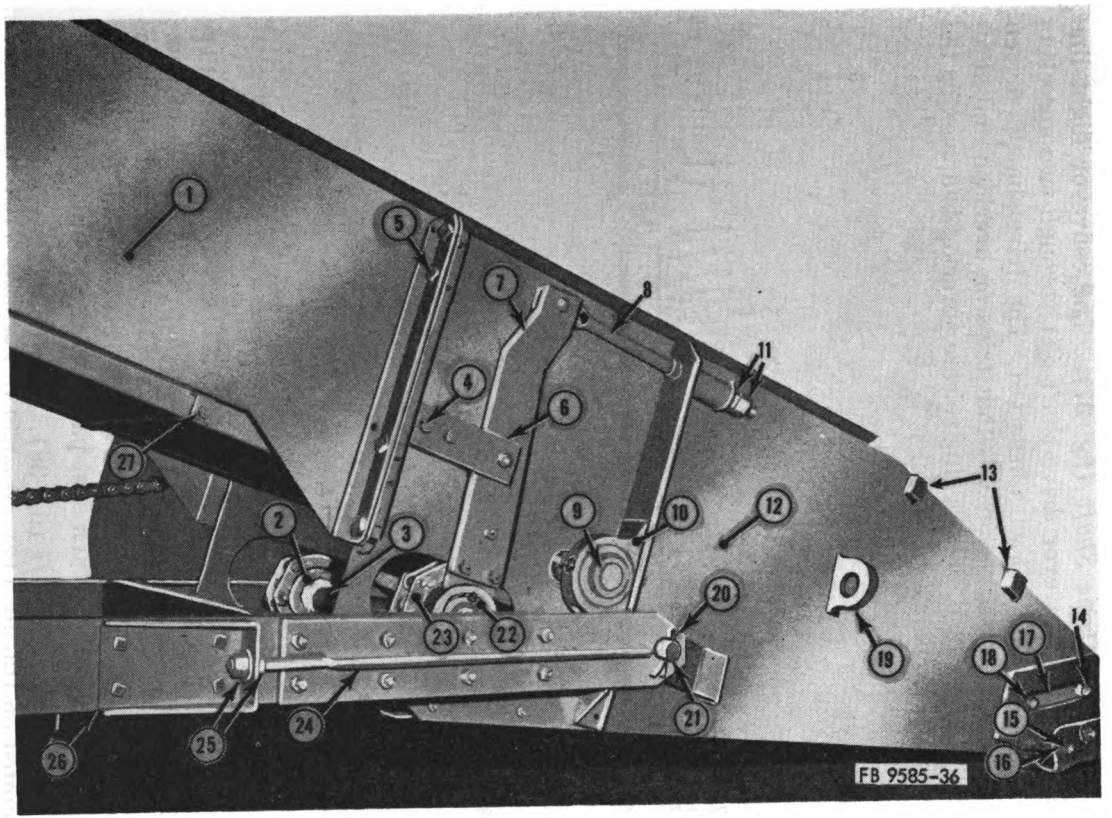
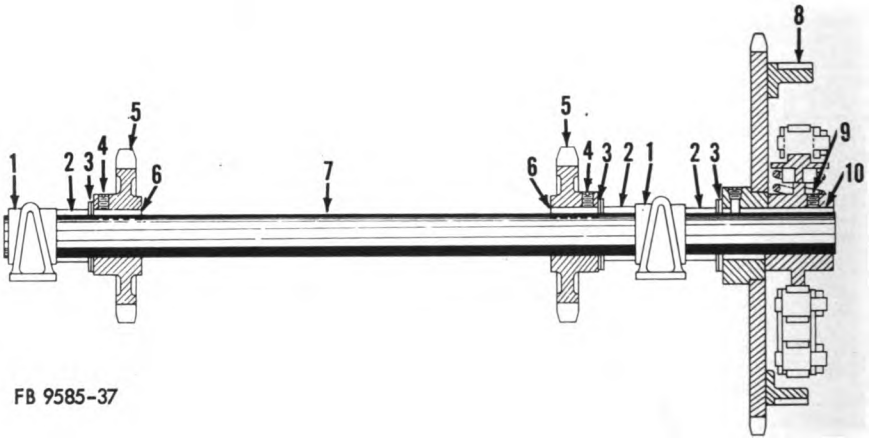


Figure 36. Boom foot end and takeup shaft.

e. Conveyor Drive Shaft (fig. 37). The conveyor flight line is driven by the conveyor drive shaft (7) through two sprockets (5) secured to the shaft with keys (6). The drive shaft is driven by a spring release sprocket (8) that trips on overload and automatically resets itself. The spring release sprocket is driven by the conveyor drive chain.



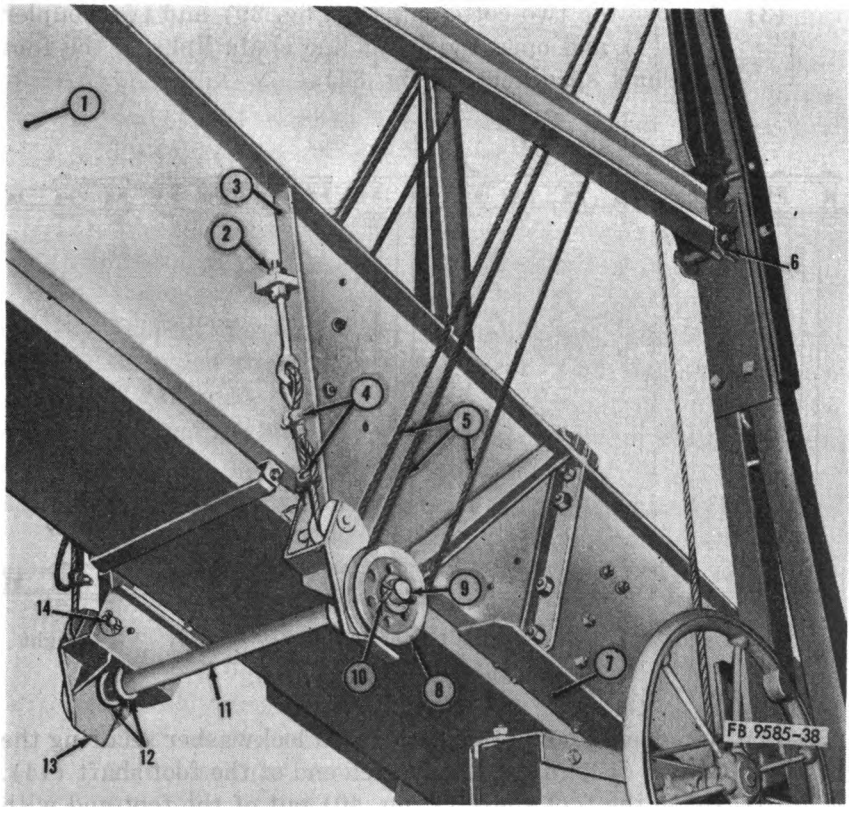
1	Bearing	6	Key
2	Pipe spacer	7	Shaft
3	Plain washer	8	Spring release sprocket
4	Setscrew	9	Setscrew
5	Sprocket	10	Key

Figure 37. Conveyor drive shaft assembly.

f. Flights and Flight Chain (fig. 34). The conveyor flights (1) convey the material from the foot end hopper to the head end. The flights slide on the boom bed plates (6) as they are pulled up the boom by the chains (2). The flights return to the foot end in the area between the return dust pans and the bed plates.

g. Boom Sheave Shaft (fig. 38). The boom sheave shaft (11) is mounted on U-bolts (12) attached to brackets (13). The cable sheaves (8) turn on the shaft and are secured by washers (9) and cotter pins (10). The small cable sheaves turn on shafts (14) mounted in the support brackets. The brackets are bolted to the boom intermediate section (1).

h. Frame. The boom (5, fig. 1) houses the flights (7, fig. 2) and can be raised and lowered by the power hoist and attaching cables (2, fig. 1). The foot end (10, fig. 2) houses the conveyor drive shaft (7, fig. 37), flight line chain takeup shaft (3, fig. 36), and the foot shaft (14), and slides on the ground on the shoe (16). Two hopper side plates (6, fig. 2) are installed in the mounted brackets (13, fig. 36) on each side of the foot end. The head end



1	Boom intermediate section	8	Sheave
2	Eyebolt nut	9	Washer
3	Bracket	10	Cotter pin
4	Cable clamp	11	Boom sheave shaft
5	Cable	12	U-Bolts
6	Pin	13	Bracket
7	Boom guide	14	Shaft

Figure 38. Boom sheave shaft.

of the boom supports the spout (11, fig. 35) and the head shaft pillow block bearings (8, fig. 35). The spout bolt, securing the top of the spout to the head end can be placed in any one of four holes, giving the spout four positions with respect to the boom.

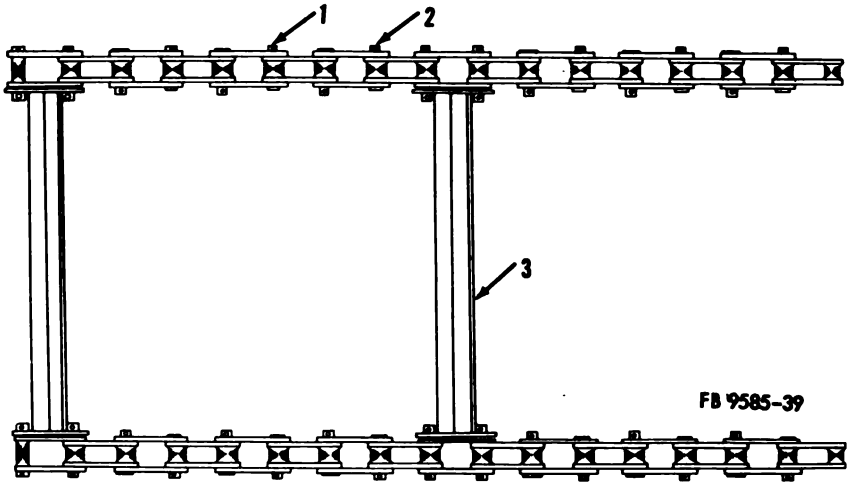
101. Foot End Shaft

a. Removal and Disassembly.

(1) Lower the boom to rest on the mast angle and raise the foot end off the ground with the hand hoist wheel (18, fig. 2). Stop the engine.

(2) Loosen the outer nuts and turn the inner nuts (11, fig. 36) to loosen the tension of the flight line chain (23).

(3) Remove the two cotter pins (2, fig. 39) and two coupler pins (1) and open the flight line chain links at the foot end shaft sprockets (8, fig. 34).

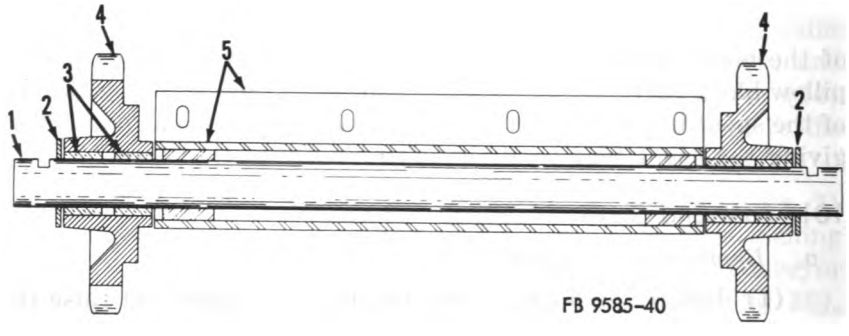


1 Coupler pin 2 Cotter pin 3 Flight

Figure 39. Flights and chain.

(4) Remove the nut (18, fig. 36) and lockwasher securing the keeper (17) in the slot in each end of the foot shaft (14).

(5) Drive the foot shaft (1, fig. 40) out of the foot end with a length of pipe or a bar with an outside diameter slightly less than the foot shaft diameter. Do not damage the grease fittings in the ends of the foot shaft. Remove the two washers (2) and the two assembled sprockets (4) and bushings (3).



1 Foot shaft
2 Washer
3 Bushing
4 Sprocket
5 Spacer bearing

Figure 40. Foot end shaft, cross sectional view.

(6) Remove the two grease fittings from each end of the foot shaft.

(7) Remove the four nuts, lockwashers, plain washers, and machine screws securing the spacer bearing (5) to the bed plate, remove the assembled spacer bearing and bushings.

b. Cleaning and Inspection.

(1) Wash the parts with an approved cleaning solvent; dry thoroughly. Make sure the lubrication holes are clean and open.

(2) Inspect the shaft for cracks, bends, breaks, scoring, damaged threads, worn slots, or other damage; replace if damaged.

(3) Inspect the sprockets for worn, broken, or chipped teeth, or other damage; replace if damaged.

(4) Inspect the two bushings in each sprocket and the two in the spacer bearing for wear, scoring, out-of-round, or other damage; press out the bushings and install new bushings, if damaged.

(5) Inspect all other parts for cracks, bends, breaks, wear, or other damage; replace if damaged.

c. Reassembly and Installation.

(1) Position the spacer bearing on the bed plate; secure with four machine screws, plain washers, lockwashers, and nuts.

(2) Install the two grease fittings in the ends of the foot shaft.

(3) Install the two washers (2, fig. 40) and the two assembled sprockets (4) and bushings (3) on the foot end shaft (1) as it is driven through the foot end side plate and through the bushings in the spacer bearing (5). Do not damage the fittings when driving the shaft. Use a pipe or bar, with an outside diameter a little less than the foot shaft diameter, and a soft mallet to drive in the foot end shaft.

Note. When installing the foot end shaft, make sure the slots are turned toward the keepers.

(4) Install the two keepers (17, fig. 36) in the slots in the foot shaft; secure to the side plates with two lockwashers and nuts (18).

(5) Place the flight line chain (23) over the foot shaft sprockets and connect the ends of the chain with the two coupler pins (1, fig. 39) and cotter pins (2).

(6) Adjust the flight line chain tension (*d* below).

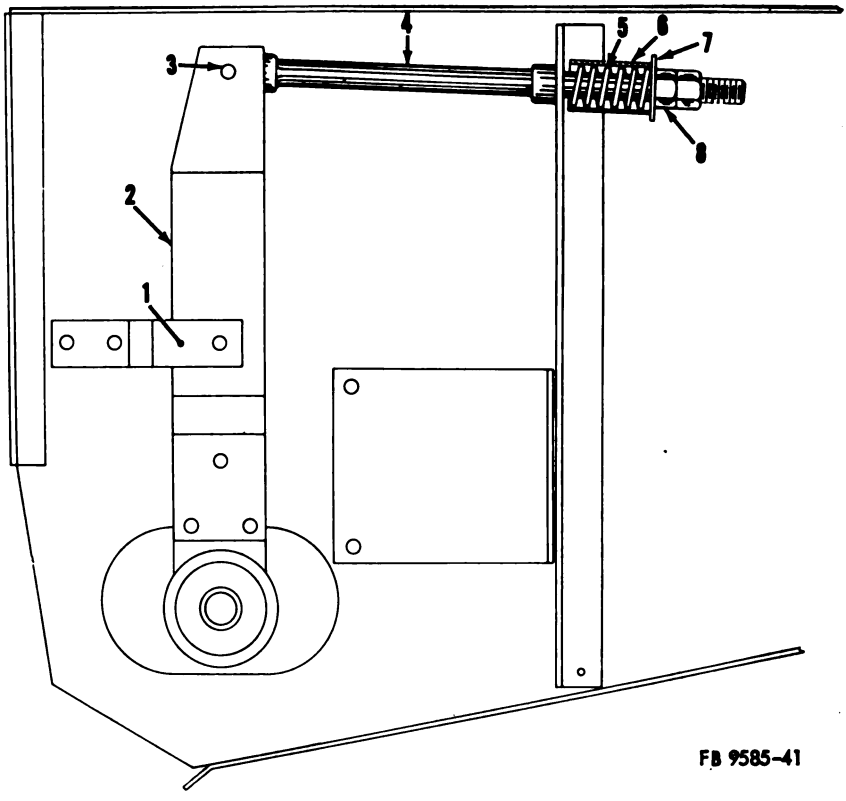
(7) Lubricate as directed in LO 5–9585.

d. Flight Chain Tension Adjustment (fig. 41).

(1) Loosen the outer nuts (8) on each side of the boom.

(2) Tighten the inner nuts until the flight line chain will not slip off the sprockets and drives smoothly. Make sure to adjust both sides equally.

(3) Secure the adjustment by tightening down the outer nuts.



1 Clip
2 Takeup arm
3 Clevis pin
4 Rod
5 Spring
6 Tubing
7 Washer
8 Nut

Figure 41. Conveyor takeup shaft and arm assembly.

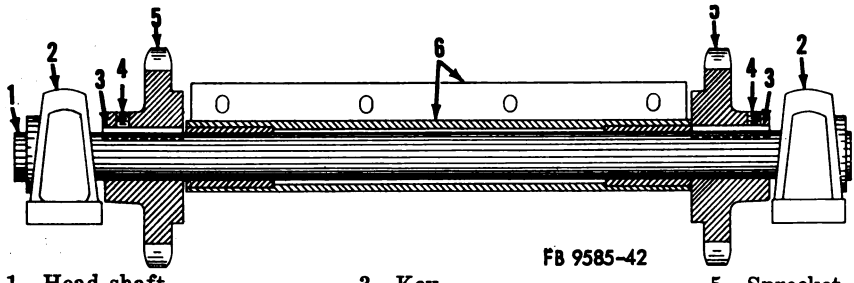
102. Head Shaft

a. Removal.

(1) Lower the boom to a convenient height for working on the head shaft. Use a truck bed or build a platform to work on.

(2) Remove the two nuts (9, fig. 35), lockwashers, and bolts securing the spout (11) to the left and right head plates (6); remove the spout.

(3) Remove the two nuts, lockwashers, plain washers, and machine bolts securing the left and right head plates to the left and right skirt plates.
(4) Remove the six nuts, lockwashers, and bolts securing the left and right head plates (6) to the boom head frame; remove the left and right head plates.
(5) Tie the flight line chain to the boom frame with heavy wire at each side of the sprocket to prevent the opened chain from slipping down inside the boom.
(6) Loosen the flight line chain tension and open the flight line chain links at the head shaft sprockets (par. 101*a*, (2) and (3)).
(7) Remove the four nuts, lockwashers, plain washers, and machine bolts securing the two pillow block bearings (8) to the plate (10).
(8) Remove the four nuts, lockwashers, plain washers, and machine screws securing the bearing (6, fig. 42) to the top end of the bed plate; remove the assembled head shaft from the boom.



1 Head shaft
2 Bearing
3 Key
4 Setscrew
5 Sprocket
6 Bearing

Figure 42. Head shaft assembly.

b. Disassembly (fig. 42).
(1) Remove the pillow block bearings (2) from the ends of the head shaft (1).
(2) Loosen the two setscrews (4); remove the two sprockets (5) from the shaft. Remove the sprocket keys (3).
(3) Remove the bearing (6) from the shaft.
(4) Remove the lubrication fittings from the pillow block bearings.

c. Cleaning and Inspection (fig. 42).
(1) Clean all the parts except the pillow block bearing (2) with an approved cleaning solvent; dry thoroughly.
(2) Wipe the outside of the pillow block bearings with a cloth dampened with an approved cleaning solvent; dry thoroughly.

(3) Inspect the bearing (6) for wear, cracks, breaks, bends, scoring, out-of-round, or other damage; replace if damaged.

(4) Inspect the sprockets (5) for chipped, worn, or broken teeth, damaged keyway or bore, or other damage; replace if damaged.

(5) Inspect the head shaft for cracks, breaks, bends, wear, scoring on the bearing surfaces, damaged keyways, or other damage; replace if damaged.

(6) Inspect the pillow block bearings for wear, scoring, out-of-round, cracks, breaks, or other damage; replace if damaged.

(7) Inspect all other parts for cracks, breaks, worn threads, or other damage; replace if damaged.

d. Reassembly (fig. 42).

(1) Install the lubrication fittings in the pillow block bearing (2).

(2) Install the bearing (6) on the head shaft (1).

(3) Position the keys (3) in the keyways of the shaft and install the sprockets (5) on the shaft and key. Make sure equal clearance exists between the sprockets, the bearings, and the pillow block bearings. Tighten the setscrews (4) in the sprockets.

(4) Install the pillow block bearing (2) on the shaft. Measure the centerline distance between the pillow block bearing mounting holes on the head end of the boom and install the pillow block bearings on the shaft with the same distance between the mounting holes in the bearings. Make sure the bearings are centered on the shaft.

e. Installation.

(1) Position the assembled head shaft on the top end of the boom; secure the bearing (6, fig. 42) to the top bed plate with four machine bolts, plain washers, lockwashers, and nuts.

(2) Position the two pillow block bearings (8, fig. 35) on the boom end plate (10); secure with the four machine bolts, plain washers, lockwashers, and nuts.

(3) Connect the ends of the flight line chain over the shaft sprockets with the two coupler pins (1, fig. 39); secure with two cotter pins (2).

(4) Install the left and right head plates (6, fig. 35) on the boom head frame; secure with six machine bolts, lockwashers, and nuts.

(5) Secure the left and right skirt plates to the left and right head plates with two machine bolts, plain washers, lockwashers, and nuts.

(6) Remove the tie wires from the flight line chain.

(7) Position the spout (11, fig. 35) on the top end of the boom; secure with two machine bolts, lockwashers, and nuts (9).

Note. The spout can be installed in four positions, depending on which hole in the left and right head plate is used. Install the spout in the same position as before disassembly. The second hole from the bottom of the head plates is used for most operating conditions.

(8) Adjust the flight line chain tension (par. 101*d*).

(9) Lubricate as directed in LO 5–9585.

103. Flight Line Chain Takeup Shaft

a. Removal.

(1) Remove the six nuts (3, fig. 43), lockwashers, and machine bolts securing the drive chain guard (5) to the brackets (2), (4), and (10) on the boom foot end (11); remove the drive chain guard.

(2) Loosen the locknut on the spring (8) and back off the adjusting nut to loosen the tension on the conveyor drive chain (7).

(3) Remove the cotter pins from connecting link in the conveyor drive chain; open the chain and remove it from the drive sprocket (6).

(4) Remove the four nuts (8, fig. 41), two washers (7), tubing (6), and springs (5) from the rods (4).

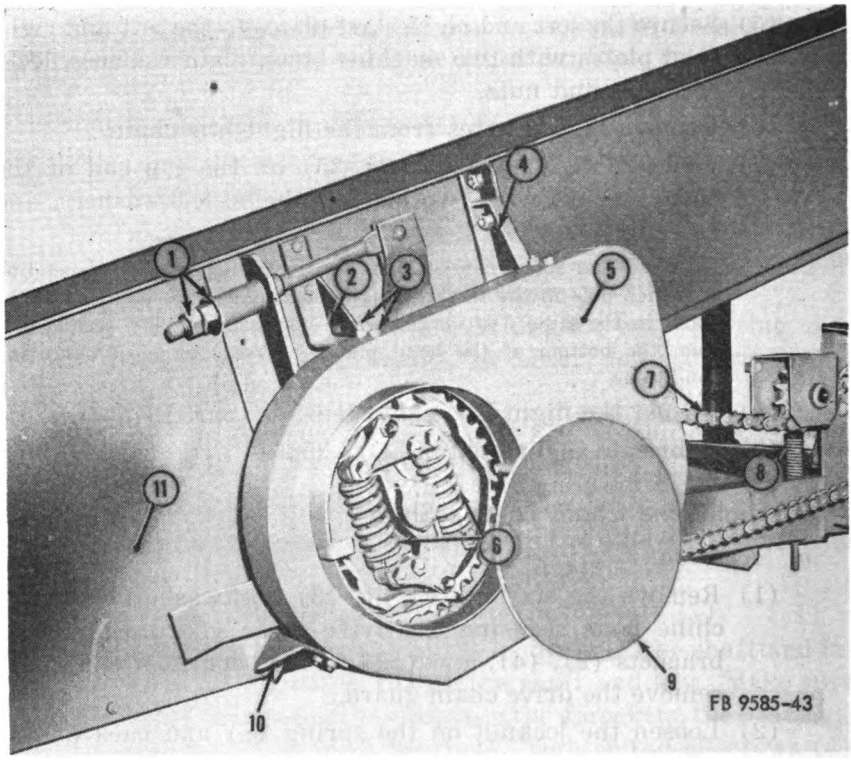
(5) Remove the cotter pins and clevis pins (3) securing the rod to the takeup arm (2); remove the rod.

(6) Remove the two cotter pins (20, fig. 36) securing the plates (24) to the shaft (21); remove the shaft and lower the push arm (26) to the ground.

(7) Block under the takeup shaft; remove the nuts (4) and lockwashers securing the takeup arm clips (6) to the boom.

(8) Remove the six nuts, lockwashers, and machine bolts securing the takeup arms (7) to the bearing holders; remove the assembled takeup arms and takeup arm clips.

(9) Remove the flight line chain (23) from the takeup shaft sprockets (22); remove the assembled takeup shaft and bearing holders.



1 Adjusting nut
2 Bracket
3 Nut
4 Bracket
5 Conveyor drive chain guard
6 Conveyor drive sprocket
7 Conveyor drive chain
8 Spring
9 Cover
10 Bracket
11 Foot end

Figure 43. Conveyor drive sprocket and guard.

b. Disassembly (fig. 44).

(1) Loosen the setscrews securing the bearings (1) to the takeup shaft (6); remove the assembled bearings (1) and bearing holders (2).

(2) Remove the retaining ring securing the bearings in the holders; remove the bearings.

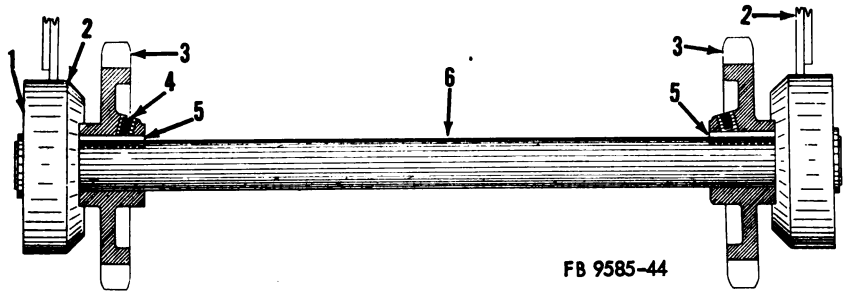
(3) Loosen the setscrews (4) and remove the sprockets (3) and the keys (5) from the takeup shaft (6).

(4) Remove the lubrication fittings from the bearings.

c. Cleaning and Inspection.

(1) Wash all the parts except the bearings with an approved cleaning solvent; dry thoroughly.

(2) Check bearings for smooth and free rotation of balls in their races, pitting, corrosion, or discoloration due to burning, replace if defective.



1 Bearing
2 Bearing holder
3 Sprocket
4 Setscrew
5 Key
6 Takeup shaft

Figure 44. Takeup shaft, cross sectional view.

(3) Inspect the parts for wear, cracks, breaks, bends, damaged threads, or other damage. Replace if damaged.

d. Reassembly (fig. 44).

(1) Install the lubrication fittings in the bearings (1).

(2) Position the bearings in the bearing holders (2); secure with the retaining rings.

(3) Position the key (5) on the keyway of the takeup shaft (6). Install the sprocket (3) on the shaft and key; secure by tightening the setscrew (4).

(4) Install the assembled bearings and bearing holders on the takeup shaft; secure by tightening the setscrew.

e. Installation.

(1) Block the assembled takeup shaft in position and install the flight line chain (23, fig. 36) over the sprockets (2).

(2) Position the assembled takeup arms (7) and clips (6) on the bearing holders; secure with six machine bolts, lockwashers, and nuts (4).

(3) Secure the takeup arm clips to the boom with four bolts, lockwashers, and nuts (4); remove the blocking from under the takeup shaft.

(4) Block the lower push arms (26) so that the holes in the ends of the plates (24) are alined with the holes in the bracket on the boom foot end (12). Install the shaft (21); secure with two cotter pins (20). Remove the blocking.

(5) Position the two rods (4, fig. 41) through the holes in the angles on the foot end and on the takeup arms (2); secure to the takeup arms with two clevis pins (3) and cotter pins.

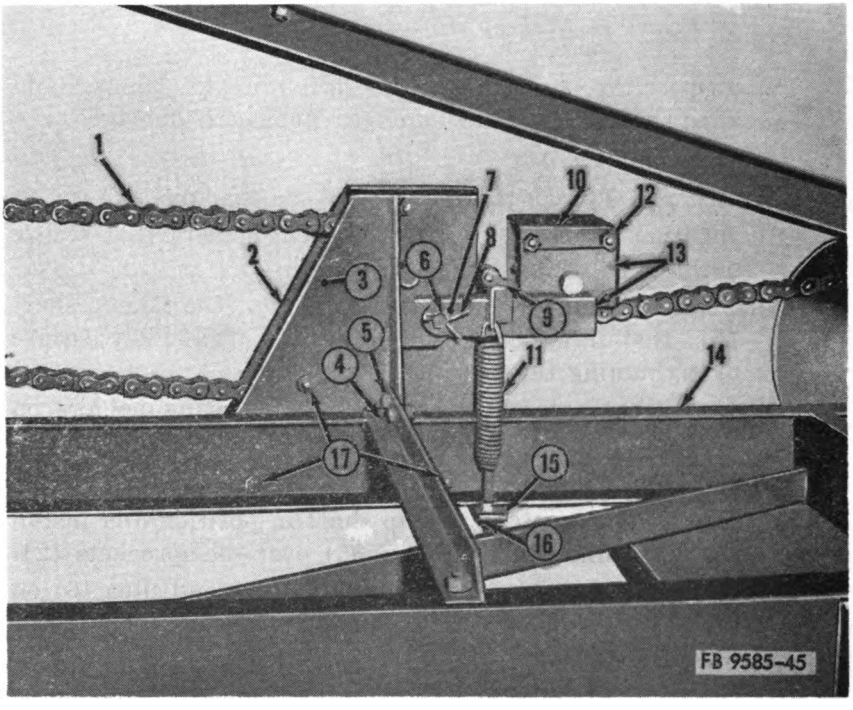
(6) Install the springs (5), tubing (6), plain washers (7),

and four nuts (8), on the two rods. Do not turn the nuts down on the rod.

(7) Adjust the flight line chain tension (par. 101*d*).

(8) Place the conveyor drive chain (7, fig. 43) over the conveyor drive sprocket (6); connect the ends of the chain with a connecting link and cotter pins.

(9) Adjust the tension of the conveyor drive chain (1, fig. 45) by turning the takeup nut (16) until the spring (11) has been stretched 1½-inches; secure the adjustment by tightening the locknut.



1 Conveyor drive chain
2 Outer plate
3 Takeup idler bracket
4 Angle
5 Machine bolts
6 Clevis pin
7 Washer
8 Cotter pin
9 Spring bracket
10 Cover plate
11 Extension spring
12 Machine bolts
13 Pivot arm
14 Lower push arm
15 Takeup bar
16 Takeup nut
17 Machine bolts

Figure 45. Conveyor takeup idler adjustment.

(10) Position the drive chain guard (5, fig. 43) on the brackets (2), (4), and (10); secure with six machine bolts, lockwashers, and nuts (3).

(11) Close the cover (9) of the handhole opening.

104. Conveyor Drive Shaft

a. Spring Release Sprocket Testing (fig. 43).

(1) Anchor the flight line to prevent movement.

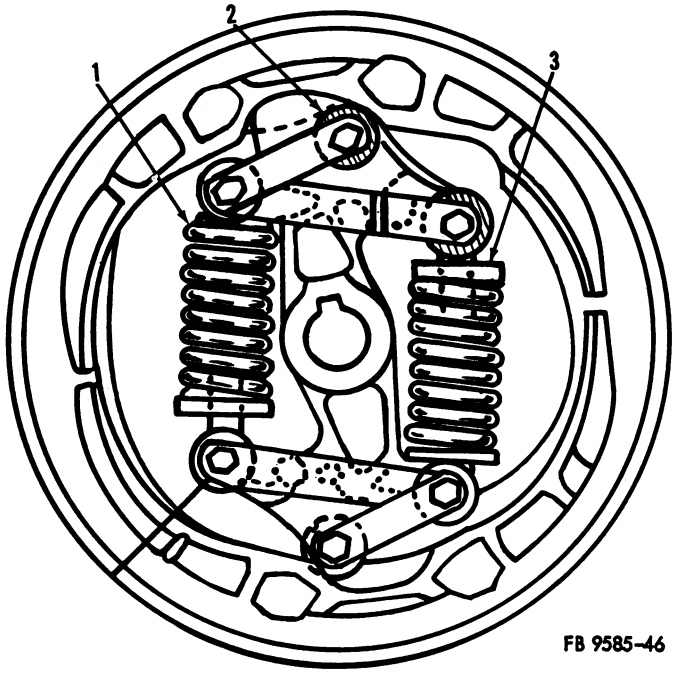
(2) Shift the engine transmission into first gear; engage the engine clutch.

(3) The spring release sprocket (6) should trip on the overload before stalling the engine. If the sprocket does not trip and release, adjust the tension (*b* below).

b. Spring Release Sprocket Adjustment.

(1) Open the cover (9, fig. 43) of the conveyor drive chain guard (5).

(2) Turn the spring loaded cam unit to the position shown in (fig. 46).



1 Spring 2 Roller 3 Spring retainer

Figure 46. Spring release sprocket.

(3) Remove the locking wire from the two adjustable spring retainers (3).

(4) Turn the adjustable spring retainers to increase the spring pressure on the rollers (2) if the release sprocket has been tripping too easily. Decrease the pressure if the load has been stalling the engine. Turn down both spring retainers equally.

Caution: Never collapse the springs (1) to a point where the coils are compressed completely. The extreme pressure may cause serious damage.

(5) Secure the adjustment by installing the lockwire.

c. Removal and Disassembly.

(1) Remove the conveyor drive chain guard; loosen the tension on the conveyor drive chain and remove the drive chain (par. 103*a*(1) through (3)).

(2) Loosen the tension on the flight line chain by backing off the adjusting nuts (1, fig. 43).

(3) Loosen the setscrew (9, fig. 37) securing the assembled spring release sprocket (8) on the shaft; remove the assembled spring release sprocket and key (10).

(4) Block up to support the drive shaft.

(5) Remove the four nuts, lockwashers, and bolts securing the two pillow block bearings (1) to the angles on the boom and the two setscrews securing the bearings to the shaft; remove the pillow block bearings, pipe spacers (2), and washers (3) from the shaft.

(6) Loosen the setscrews (4) in the drive shaft sprockets (5); remove the sprockets and the keys (6).

(7) Remove the drive shaft.

d. Cleaning and Inspection.

(1) Wipe the pillow block bearing and the spring release sprocket with a cloth dampened with an approved cleaning solvent; dry thoroughly.

(2) Clean all other parts with an approved cleaning solvent; dry thoroughly.

(3) Inspect all parts for wear, cracks, breaks, bends, damaged threads, or other damage; replace if damaged.

(4) Inspect the drive shaft for wear, cracks, breaks, bends, damaged keyways, or other damage; replace if damaged.

e. Reassembly and Installation (fig. 37).

(1) Install the drive shaft (7) in the boom foot end.

(2) Install the keys (6) in the keyways of the shaft. Install the sprockets (5) on the keys and the shaft.

(3) Install flight line chain over the sprockets.

(4) Install a washer (3), pipe spacer (2), and pillow block bearing (1) on each end of the shaft; secure the bearings to the angles on the boom with the four machine bolts, lockwashers, and nuts.

(5) Make sure the sprockets are alined and tighten the setscrews.

(6) Install a pipe spacer (2) and washer (3) on the shaft extension on the right side of the conveyor. Position a key (10) in the keyway of the shaft; install the assembled spring release sprocket (8) on the key and the shaft. Secure by tightening the setscrew (9).

(7) Adjust the tension of the flight line chain (par. 101*d*).

(8) Position the conveyor drive chain on the spring release sprocket.

(9) Adjust the tension of the conveyor drive chain (par. 103*e*(9)).

(10) Install the conveyor drive chain guard (par. 103*e*(10) and (11)).

105. Flights and Flight Line Chain

a. Removal.

(1) Lower the boom with the power hoist and raise the foot end with the hand hoist wheel.

(2) Remove the conveyor drive chain guard and chain (par. 103*a*(1) through (3)).

(3) Loosen the tension on the flight line chain (par. 101*a*(2)).

(4) Remove four cotter pins (2, fig. 39) from four coupler pins (1), and open one link in the flight line chain at the takeup sprockets (2, fig. 36).

(5) Pull the entire flight line chain from the boom at the foot end.

b. Disassembly (fig. 39). Remove the cotter pins (2) securing the flights (3) to the chains, and remove the flights from the chain.

c. Cleaning and Inspection.

(1) Clean the flights and the flight line chains with an approved cleaning solvent; dry thoroughly.

(2) Inspect the flights for wear, cracks, breaks, bends, distortion, enlarged holes, or other damage. Repair or replace the damaged flights.

(3) Inspect the flight line chains for worn, cracked, or broken pins, side bars, coupler pins, links, and rollers. Replace any broken bars, links, rollers, and pins; replace the entire chain if badly damaged.

(4) Immerse the flight line chain in light oil; wipe off the excess oil.

d. Reassembly (fig. 39). Position a flight (3) on every eighth flight line chain link; secure with cotter pins (2).

e. Installation.

(1) Feed the end of the flight line chain into the return track at the spout with the flights inverted until the chain ends reach the drive sprockets (5, fig. 37). Position the chains around the drive sprockets and bring the ends of the chains over the takeup sprocket (2, fig. 36). Wire the ends of the chains to the takeup shaft.

(2) Feed the remaining end of the flight line chain over the head end shaft sprocket and down the chute to the foot end. Run the ends of the chains around the sprockets (8, fig. 34) on the foot shaft and feed the chain into the foot end lower return track until the ends of the chain reach the takeup sprocket.

(3) Connect the ends of the chain at the takeup sprocket with four coupler pins (1, fig. 39); secure with the four cotter pins (2).

(4) Adjust the tension of the flight line chain (par. 101*d*).

(5) Install the conveyor drive chain and adjust the chain tension (par. 103*e*(9)).

106. Boom Sheave Shaft

a. Removal (fig. 38).

(1) Lower the boom to rest on the mast angle.

(2) Remove the two nuts (2) to release tension on the cables (5). Remove the cables from the outer sheaves (8). Open the cable clamps (4) and remove the end of the cable from the eyebolt. Remove the thimble.

(3) Remove the 12 nuts, lockwashers, and machine bolts securing the angles of the brackets (3) to the boom; remove the assembled boom sheave shaft and brackets.

b. Disassembly (fig. 47).

(1) Remove the cotter pins and washers (2) securing the large sheaves (3) to the shaft (1); remove the large sheaves.

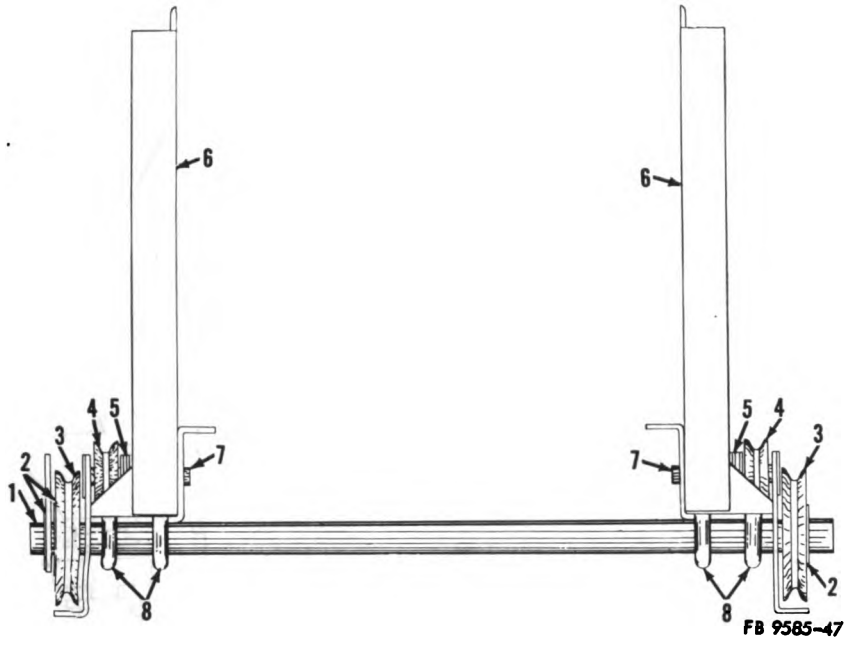
(2) Remove the cotter pins securing the two small sheave shafts (7) to the brackets (6); remove the shafts, washers (5), and sheaves (4).

(3) Remove the nuts securing the eyebolts to the brackets (6); remove the eyebolts.

(4) Remove the nuts and the U-bolts (8) securing the sheave shaft to the brackets; remove the sheave shaft.

c. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent; dry thoroughly.



1	Boom sheave shaft	5	Washer
2	Washer	6	Bracket
3	Sheave	7	Shaft
4	Sheave	8	U-bolt

Figure 47. Boom sheave shaft, cross sectional view.

(2) Inspect all parts for cracks, breaks, bends, wear, or other damage; replace if damaged.

d. Reassembly (fig. 47).

(1) Position the sheave shaft (1) on the brackets (6); secure with four U-bolts (8) and nuts.

(2) Install the eyebolts in the sheave shaft brackets (6); secure with two nuts.

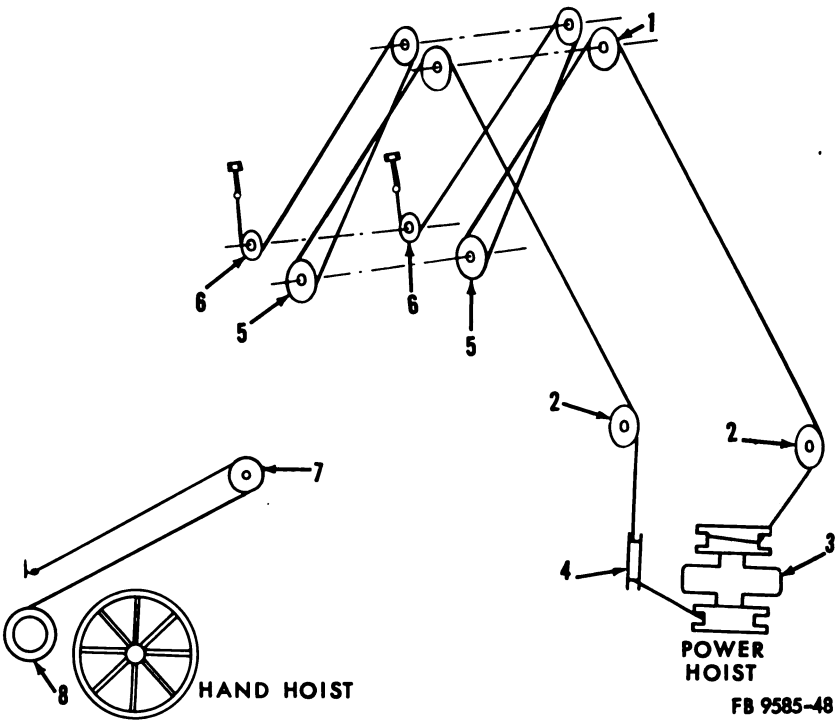
(3) Position the small sheaves (4) in the brackets; install the small shafts (7) and secure with washers and cotter pins.

(4) Position the large sheaves (3) on the ends of the sheave shaft; secure with washers (2) and cotter pins.

e. Installation.

(1) Position the assembled sheave shaft (11, fig. 38) and brackets (3) on the boom (1); secure with 12 machine bolts, lockwashers, and nuts.

(2) Reeve the cables around the sheaves (1), (2), (4), (5), and (6, fig. 48). Make sure the cables are properly installed around the sheaves at the top of the mast.



1 Mast top sheaves
2 Main frame small sheave
3 Power hoist
4 Main frame large sheave
5 Boom sheave shaft large sheave
6 Boom sheave shaft small sheave
7 Mast sheave
8 Hand hoist cable drum

Figure 48. Cable reeving.

(3) Thread the cables through the eyebolts over a rope thimble; secure the ends with two cable clamps (4, fig. 38). Turn the nuts on the eyebolts down to make the cables taut. Tighten each cable evenly.

107. Boom

a. Removal.

(1) Lower the boom to rest on the mast angle and remove the cables from the boom sheave shaft (par. 106*a*(2)).

(2) Block securely under the boom foot end and loop chains or cables through the boom lifting rings. Hook a crane or chain hoist into the chain or cable slings.

(3) Remove the conveyor drive chain guard (par. 103*a*(1)).

(4) Remove the lower push arm from the foot end of the boom (par. 103*a*(6)).

(5) Remove the drive chain (par. 103*a*(2) and (3)).

(6) Remove the cotter pins (5, fig. 35) securing the upper push arms (1) to the shaft (4) through the boom; remove the washers and the shaft. Lower the ends of the upper push arms to rest on the frame.

(7) Remove the boom from the conveyor.

b. Disassembly.

(1) Remove the flights and flight line chain (par. 105(*a*) and (*b*)).

(2) Remove the foot end shaft (par. 101*a*(4), (5)).

(3) Remove the head shaft (par. 102*a*(2), (7), and (8)).

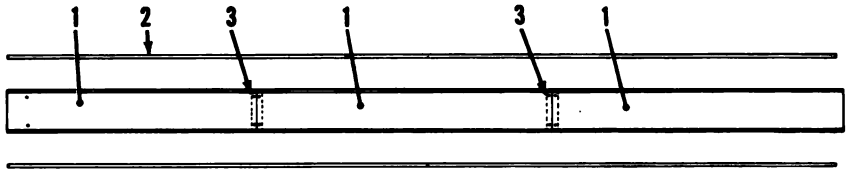
(4) Remove the flight line takeup shaft (par. 103*a*).

(5) Remove the conveyor drive shaft (par. 104*c*).

(6) Remove the boom sheave shaft (par. 106*a*(2) and (3)).

(7) Remove the 12 nuts, lockwashers, and machine bolts securing the six support bars (27, fig. 36) to the return pan brackets and the return dust pan at the head end; remove the support bars and the assembled return dust pans.

(8) Remove the eight nuts, lockwashers, and machine bolts securing the return dust pans (1, fig 49) to the splice plates (3); separate the return dust pans and remove the splice plates.



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1 Return dust pan 2 Wearing bar 3 Splice plate

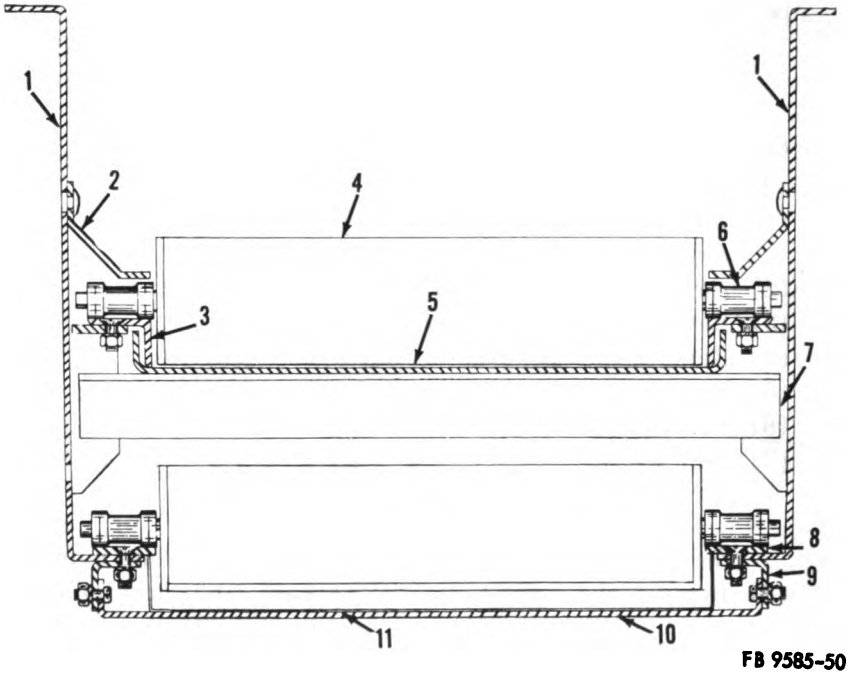
Figure 49. Return dust pans and wearing bars.

(9) Remove the two nuts, lockwashers, and machine bolts securing the top support bar to the return dust pan at the head end; remove the top support bar.

(10) Remove the nuts, lockwashers, and machine bolts securing the two boom guides (7, fig. 38) to the boom side plates; remove the two boom guides.

(11) Remove the nuts, lockwashers, and machine bolts securing the wearing bars (8, fig. 50) and the return pan brackets (9) to the side plates (1); remove the wearing bars and return pan brackets.

(12) Remove the nuts, lockwashers, and carriage bolts securing the skirt plates (2, fig. 50) to the side plates (1) of the boom; remove the skirt plates.



1 Side plate
2 Skirt plate
3 Track angle
4 Flight
5 Bed plate
6 Chain link
7 H-frame
8 Wearing plate
9 Return pan bracket
10 Return pan support bar
11 Return pan

Figure 50. Skirt plates, bed plates, and track angles.

(13) Remove the nuts, lockwashers, and machine bolts securing the track angles (3) to the H-frames (7); remove the track angles.

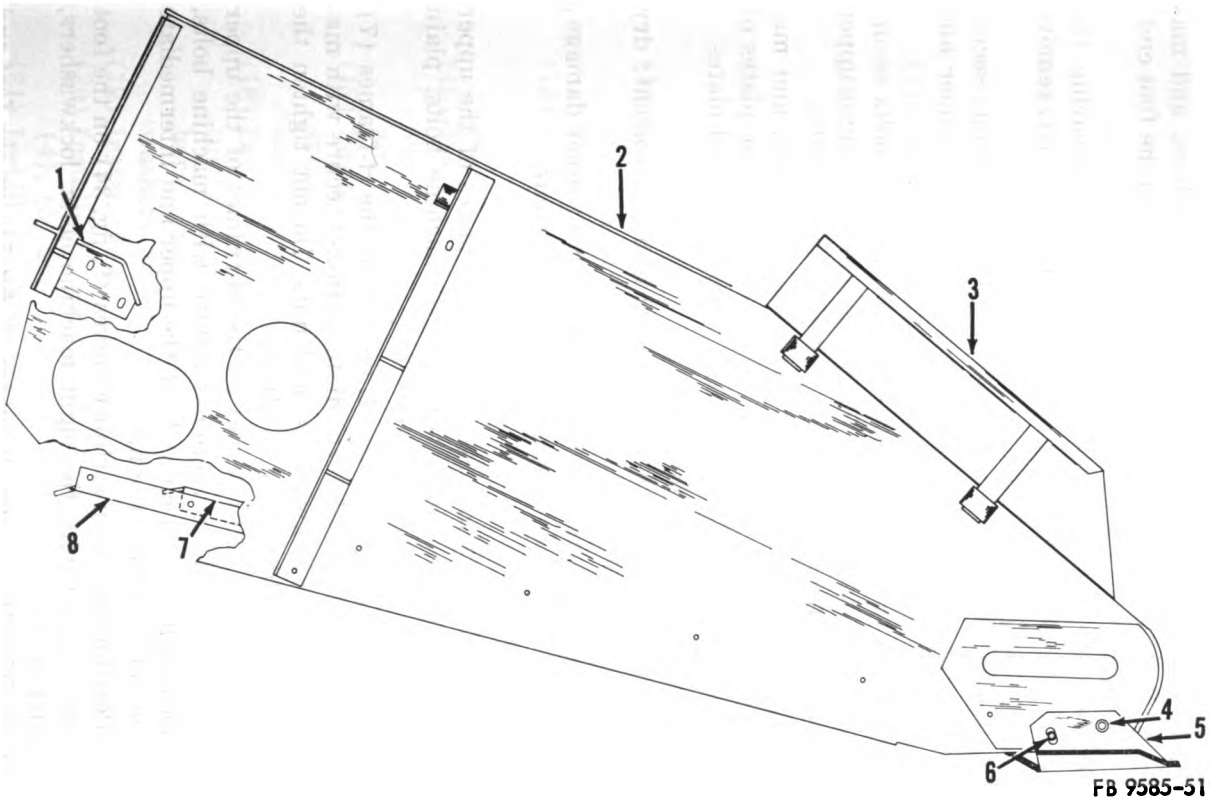
(14) Remove the nuts, lockwashers, and machine bolts securing the bed plates (5) to the splice plates; remove the bed plates and splice plates.

(15) Remove the nuts, lockwashers, plain washers, and machine bolts securing the foot end to the intermediate section; remove the foot end and shims.

(16) Remove the nuts, lockwashers, plain washers, and machine bolts securing the upper section to the intermediate section; remove the upper section.

(17) Remove the hopper side plates (3, fig. 51) from the foot end.

(18) Remove the nuts, lockwashers, plain washers, pipe spacers (4), and machine bolts securing the foot end shoe (5) to the foot end; remove the foot end shoe.



1 Track guide
2 Foot end
3 Hopper side plate
4 Pipe spacer
5 Foot end shoe
6 Pipe spacer
7 Track angle
8 Bottom plate

Figure 51. Foot end, shoe, and hopper plates.

(19) Remove the nuts, lockwashers, plain washers, and machine bolts securing the track guides (1) to the foot end; remove the track guides from the foot end.

(20) Remove the nuts, lockwashers, and bolts securing the chain stripper knives (9, fig. 34) to the foot end; remove the chain stripper knives.

(21) Remove the nuts, lockwashers, and machine bolts securing the cross braces to the H-frames in the upper and intermediate sections; remove the cross braces.

(22) Remove the nuts, lockwashers, and machine bolts securing the H-frames (7, fig. 50) to the side plates in the upper and intermediate sections; remove the H-frames.

(23) Remove the nuts, lockwashers, plain washers, and machine bolts securing the head plates to the side plates of the boom in the upper section; remove the head plates.

c. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent; dry thoroughly.

(2) Inspect all parts for wear, bends, rust, or other damage; repair or replace if damaged beyond repair.

d. Reassembly.

(1) Position the head plates on the side plates of the upper section of the boom; secure with machine bolts, plain washers, lockwashers, and nuts.

(2) Position the side plates (1, fig. 50) on the H-frames (7) of the upper and intermediate sections; secure with machine bolts, lockwashers, and nuts. Do not tighten the bolts until the section is alined.

(3) Position the cross braces on the H-frames of the upper and intermediate sections; secure with machine bolts, lockwashers, and nuts. Aline the upper and intermediate sections; tighten the nuts.

(4) Position the chain stripper knives (9, fig. 34) on the foot end; secure with the eight machine bolts, lockwashers, and nuts.

(5) Position the two track guides (1, fig. 51) on the foot end (2); secure with four bolts, plain washers, lockwashers, and nuts.

(6) Position the track angles (7) and the bottom plates (8) in the foot end; secure with the machine bolts, lockwashers, and nuts.

(7) Position the foot end shoe (5) on the foot end (2); secure with the machine bolts, pipe spacers (4), plain washers, lockwashers, and nuts.

(8) Install the hopper plates (3) on the foot end.
(9) Assemble the upper section to the intermdeiate section; secure with machine bolts, plain washers, lockwashers, and nuts.
(10) Assemble the foot end to the intermediate section; secure with machine bolts, plain washers, lockwashers, and nuts. Install shims as necessary to aline the intermediate section and the foot end.
(11) Position the bed plates (5, fig. 50) on the splice plates; secure with machine bolts, lockwashers, and nuts.
(12) Position the track angles (3) on the H-frames (7) in the boom; secure with machine bolts, lockwashers, and nuts.
(13) Position the skirt plates (2) on the side plates (1) of the boom; secure with carriage bolts, lockwashers, and nuts.
(14) Position the wearing bars (8, fig. 50) and the return pan brackets (9) on the side plates of the boom; secure with machine bolts, lockwashers, and nuts.
(15) Position the two boom guides (7, fig. 38) on the boom side plates; secure with machine bolts, lockwashers, and nuts.
(16) Position the top support bar on the return dust pan at the head end; secure with machine bolts, lockwashers, and nuts.
(17) Position the three return dust pans (1, fig. 49) on the splice plates (3); secure with machine bolts, lockwashers, and nuts.
(18) Install the return dust pans on the boom; secure the return dust pans to the boom by installing the six support bars. Secure the support bars with machine bolts, lockwashers, and nuts.
(19) Install the boom sheave shaft (par. 106*e*(1)).
(20) Install the conveyor drive shaft (par. 104*e*(1), (2), (4), (5) and (6)).
(21) Install the flight line takeup shaft (par. 103*e*(1) through (3)).
(22) Install the head shaft (par. 102*e*(1) through (7)).
(23) Install the foot end shaft (par. 101*c*(1), through (4)).
(24) Install the flights and flight line chain (par. 105*e*(1) through (3)).

e. Installation.
(1) Lift the boom into position on the conveyor.
(2) Install the lower push arm on the boom (par. 103*e*(4)).

(3) Install and adjust the conveyor drive chain (par. 103*e*(8) and (9)).

(4) Install the conveyor drive chain guard (par. 103*e*(10) and (11)).

(5) Position the upper push arms (1, fig. 35) on the boom. Install the shaft (4); secure with washers and cotter pins (5).

(6) Reeve the cables over the mast and boom sheaves; secure the cables (par. 106*e*(2) and (3)).

(7) Adjust the flight line chain (par. 101*d*).

Section XIV. MAST

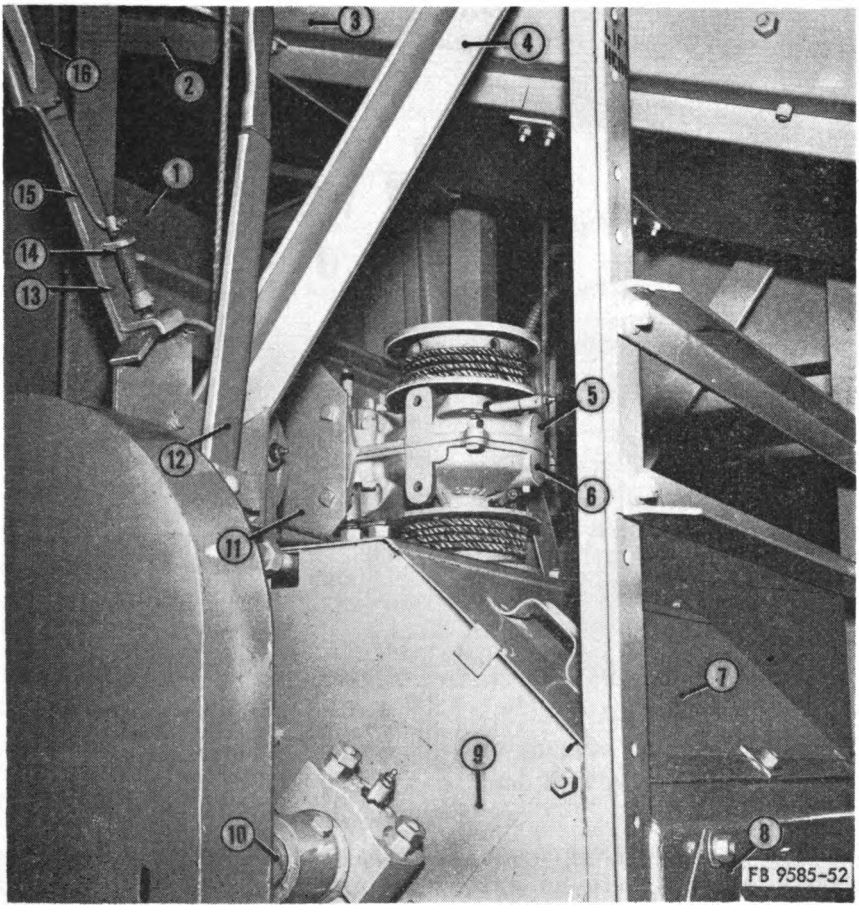
108. Description

a. Mast. The mast is pinned to the conveyor main frame to allow it to tilt slightly as the boom is raised and lowered. The mast consists of two vertical legs, one on either side of the boom. Each side is composed of an upper mast (2, fig. 2) and a lower mast (1) which are connected at pivot points. The upper mast is lowered by removing five bolts to compact the unit when slipping or transporting it. A brace plate joins the two sides of the lower mast and has an angle at the top which supports the weight of the boom (3, fig. 52) when the boom is lowered. Two sheaves are mounted at the top of each side of the upper mast. The cables used to raise and lower the boom are reeved over the mast top sheaves. The hand hoist cable is reeved around a sheave mounted on each side of the lower mast. There is a cutout in the brace plate to give access to the power hoist drive chain.

b. Upper Push Arms (fig. 1). The upper push arms (4) are separately attached to the boom (5) at one end and the upper mast (1) and (3) on the remaining end. They form a rigid support for the upper boom that pivots at both ends, allowing the boom to move up and down freely.

c. Conveyor Takeup Idler Assembly (fig. 53). The conveyor takeup idler assembly (6) is mounted midway on the lower push arm (9) on the side opposite the operator. The upper and lower runs of the conveyor drive chain (8) roll over idler sprockets (5). A third sprocket (3) rides on the upper drive chain run, under spring tension, and can be adjusted to tighten the conveyor drive chain.

d. Lower Push Arm (fig. 36). The lower push arm (26) is connected to the main frame and to the boom foot end with shafts at both ends. This forms a rigid support for the lower end of the



1 Mast angle
2 Boom guide
3 Boom
4 Main frame
5 Power hoist upper housing
6 Power hoist lower housing
7 Sliding door
8 Handhole cover
9 Shaft transmission housing
10 Crawler clutch shaft
11 Power hoist bracket
12 Power hoist clutch lever
13 High speed lever
14 Spring
15 Rod
16 Grip latch

Figure 52. Mast, shaft transmission, and power hoist.

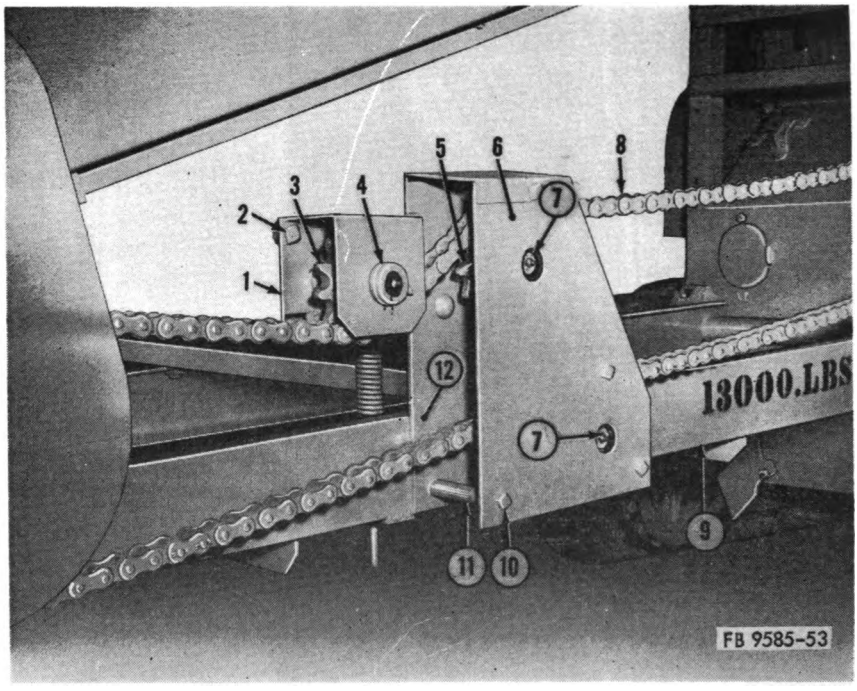
boom that pivots freely as the boom is raised and lowered. The lower push arm is bolted to a plate (24) on each side. On the operator's side, a takeup rod on the plate can be adjusted to aline the boom.

109. Mast

a. Removal.

(1) Remove the boom (par. 107*a*).

(2) Hook a chain or cable through both sides of the mast; move



1 Pivot arm
2 Bolt
3 Sprocket
4 Collar
5 Idler sprocket
6 Conveyor takeup assembly
7 Shaft
8 Conveyor drive chain
9 Lower push arm
10 Bolt
11 Pipe spacer

Figure 53. Conveyor takeup idler assembly.

a crane or hoist into position. If a crane or hoist is not available, rig up a tripod or A-frame to lift the mast. Hook the lifting device into the chain or cable sling. Hold the mast in place.

(3) Remove the cotter pin and pin (10, fig. 4) securing the safety throwout rod (9) to the safety throwout arm (2); remove the safety throwout rod from the mast.

(4) Remove the two nuts, lockwashers, and machine bolts securing the safety throwout guide plate (5, fig. 5) to the mast (6); remove the safety throwout guide plate.

(5) Remove the two cable clamps (1, fig. 3) at the ends of the hand hoist cable (2); remove the hand hoist cable from the sheaves of the mast.

(6) Remove the fire entinguisher (12, fig. 3) from the fire extinguisher bracket.

(7) Remove the nuts, lockwashers, and machine bolts securing the two lower mast sections to the brace plate (14,

fig. 16) ; lift the assembled mast high enough to clear the conveyor frame and remove the mast.

(8) Remove the two cotter pins and pivot bolts (15) securing the brace to the bracket on the main frame (9) ; remove the brace.

b. Disassembly.

(1) Remove the four nuts, lockwashers, and five machine bolts (4, fig. 2) securing each upper section to the lower sections; remove the two upper mast sections.

(2) Remove the four nuts (5, fig. 54), two lockwashers (6), and machine screws (1) securing the four sheaves (4) in both upper mast sections; remove the four sheaves and eight washers (2).

(3) Remove the four nuts (5), two lockwashers (6), and machine screws (7) securing the two sheaves (4) in the lower mast sections; remove the sheaves and washers (2).

(4) Remove the lubrication fittings from the sheave machine screws.

c. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent; dry thoroughly.

(2) Inspect the bushings in the sheaves for wear, scoring, out-of-round, or other damage. Remove and replace with new bushings if damaged.

(3) Inspect the mast sections and brace plate for broken or cracked welds, cracks, breaks, or other damage. Reweld broken welds and repair cracks; replace parts damaged beyond repair.

(4) Inspect all other parts for wear, damaged threads, cracks, breaks, or other damage; replace if damaged.

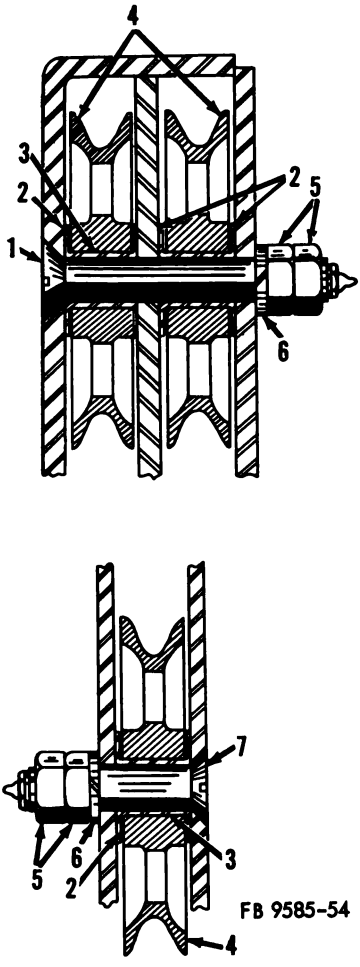
d. Reassembly (fig. 54).

(1) Install the lubrication fittings in the sheave machine screws (1) and (7).

(2) Position the two sheaves (4) and four washers (2) in the lower mast sections; secure with two machine screws (7), lockwashers (6), and four nuts (5).

(3) Position the four sheaves and eight washers in the two upper mast sections; secure with two machine screws (1), lockwashers (6), and four nuts (5).

(4) Position the upper mast sections on the lower mast sections; secure with 10 machine bolts, eight lockwashers, and nuts.



1 Machine screw, flat hd, ¾" x 5" NC (2 rqr)
2 Washer
3 Bushing
4 Sheaves
5 Nut, hex hd, ¾" NC (8 rqr)
6 Lockwasher, ¾" NC (4 rqr)
7 Machine screw, flat hd, ¾" x 3½" NC (2 rqr)

Figure 54. Mast sheaves, cross sectional view.

e. Installation.

(1) Position the brace (14, fig. 16) on the main frame; secure with two pivot bolts (15) and cotter pins.

(2) Sling a cable or chain through the two upper mast sections. Hook a crane or hoist into the lifting loop. If a crane is not available, rig up an A frame or tripod to lift the mast. Lift the mast over the conveyor frame to its position on the brace. Do not remove the lifting device. Secure the lower mast sections to the brace with machine bolts, lockwasher, and nuts.

(3) Position the fire extinguisher (12, fig. 3) in the fire extinguisher bracket.

(4) Reeve the hand hoist cable (2) around the mast sheaves (7) and the cable drum (30); secure the ends of the cable with two cable clamps (1). Remove the lifting device.

(5) Position the safety throwout guide (5, fig. 5) on the mast (6); secure with two machine bolts, lockwashers, and nuts.

(6) Position the safety throwout rod (9, fig. 4) on the safety throwout arm (2); secure with a pin (10) and cotter pin.

(7) Install the boom (par. 107*e*).

(8) Lubricate as directed in LO 5–9585.

110. Upper Push Arms

a. Removal.

(1) Lower the boom (3, fig. 52) to rest on the mast angle (1).

(2) Remove the two cotter pins, washers, and pins (6, fig. 38) securing the upper push arms to the mast.

(3) Remove the two cotter pins (5, fig. 35), washers (3), and shafts (4) securing the upper push arms to the boom; remove the upper push arms.

b. Disassembly (fig. 35). Remove the nuts (2), lockwashers, and machine bolts securing the connecting arms to the ends of the upper push arms (1); remove the connecting arms.

c. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent; dry thoroughly.

(2) Inspect all parts for wear, cracks, breaks, or other damage; reweld broken welds or replace if damaged beyond repair.

d. Reassembly (fig. 35). Position the connecting arms on the upper push arms (1); secure with the machine bolts, lockwashers, and nuts (2).

e. Installation.

(1) Position the assembled upper push arms on the boom; secure with two shafts (4), washers (3), and two cotter pins (5).

(2) Position the remaining ends of the upper push arms on the lower mast; secure with two pins (6, fig. 38), washers, and cotter pins.

111. Conveyor Takeup Idler Assembly

a. Removal (fig. 45).

(1) Remove the conveyor drive chain (par. 103*a*(2) and (3)).

(2) Unhook the extension spring (11) from the spring bracket (9) on the pivot arm (13).

(3) Remove the two nuts, lockwashers, and machine bolts (17) securing the idler bracket (3) to the lower push arm (14), and the two nuts, lockwashers, and machine bolts (5) securing the idler bracket to the angle (4); remove the assembled idler bracket and two pipe spacers from the lower push arm and angle.

b. Disassembly.

(1) Remove the cotter pin (8, fig. 45), washer (7), and clevis pin (6) securing the pivot arm (13) to the idler bracket (3); remove the pivot arm from the idler bracket.

(2) Remove the safety wire securing the setscrew in the collar (4, fig. 53); remove the setscrew.

(3) Remove the two nuts, lockwashers, and machine bolts (12, fig. 45) securing the cover plate (10) to the pivot arm; remove the cover plate.

(4) Remove the sprocket (3, fig. 53) from the sprocket shaft.

(5) Remove the two nuts (16, fig. 45) securing the extension spring (11) to the takeup bar (15) on the lower push arm (14); remove the spring.

(6) Remove the four nuts, lockwashers, machine bolts (10, fig. 53), pipe spacers (11) securing the outer plate (2, fig. 45) and cover plate (10) to the idler bracket (3); remove the outer plate and the cover plate from the idler bracket.

(7) Remove the wires from the setscrews securing the collars on the sprocket shafts; loosen the setscrews and remove the two collars (4, fig. 53) and sprockets (5) from the shafts.

c. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent; dry thoroughly.

(2) Inspect the idler sprockets for worn, chipped, or broken teeth, or other damage; inspect the bushings for wear, scoring or out-of-round. Replace the sprockets or bushings if damaged.

(3) Inspect all parts for worn threads, cracks, breaks, or other damage; replace if damaged.

d. Reassembly.

(1) Install the two sprockets (5, fig. 53) on the sprocket shafts (7) in the idler bracket (3, fig. 45); secure by installing the two collars (4, fig. 53), tightening the setscrews, and installing new safety wires.

(2) Position the cover plate (10, fig. 45) and the outer plate (2) on the idler bracket (3) with the four pipe spacers (11, fig. 53) between the plates; secure with four machine bolts (10), lockwashers, and nuts.

(3) Install the sprocket (3) on the sprocket shaft in the pivot arm (1).

(4) Install the cover plate (10, fig. 45) on the pivot arm; secure with the two machine bolts (12), lockwashers, and nuts.

(5) Tighten the setscrew in the collar (4, fig. 53); install a new safety wire.

(6) Position the pivot arm (13, fig. 45) and washer (7) on the idler bracket; secure with a clevis pin (6) and cotter pin (8).

(7) Hook the extension spring (11) to the spring bracket (9).

e. Installation.

(1) Position the assembled idler bracket (3, fig. 45) on the lower push arm and angle (4); secure to the angle with two machine bolts (5), lockwashers, and nuts, and to the lower push arm with two pipe spacers, machine bolts (17), lockwashers, and nuts.

(2) Secure the extension spring (11) to the takeup bar (15) on the lower push arm (14) with two hex nuts (16).

(3) Install the conveyor drive chain (par. 103*e*(8) through (10)).

112. Lower Push Arm

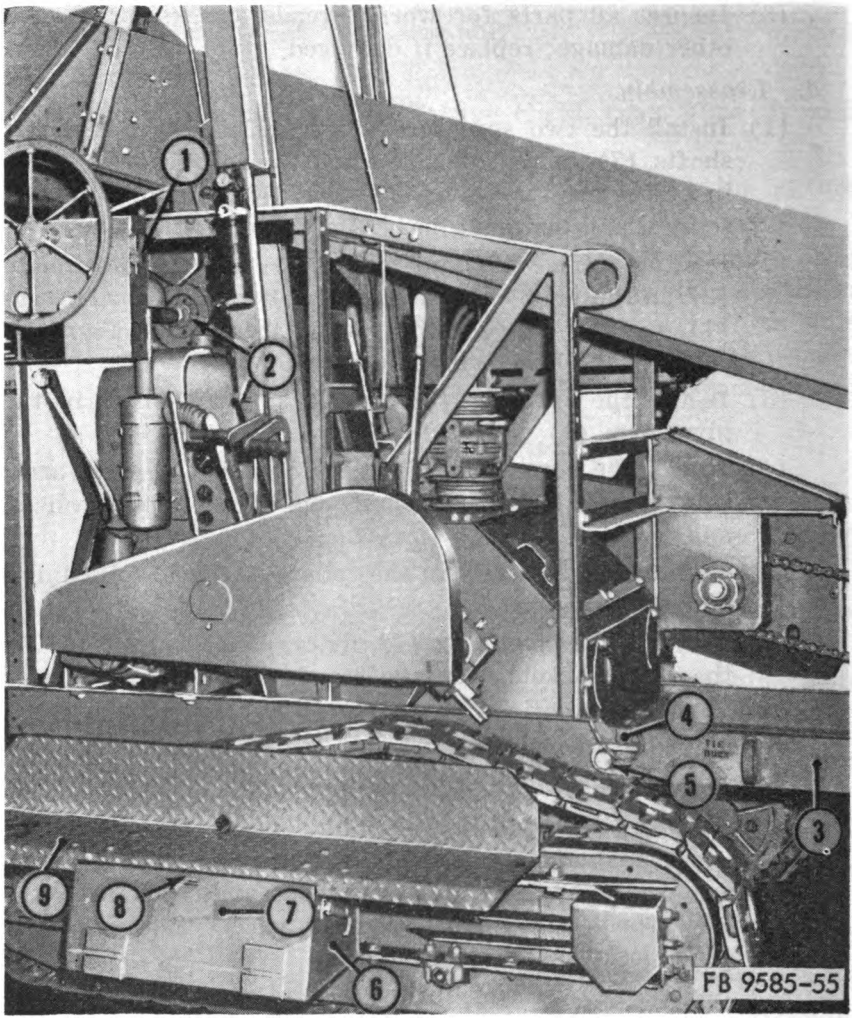
a. Removal.

(1) Lower the boom to rest on the mast angle.

(2) Block the front of the foot end shoe to prevent the boom from moving.

(3) Remove the lower push arms from the boom (par. 103*a*(1) through (3), (5), and (6)).

(4) Remove the two saddle pins (4, fig. 55) securing the lower push arm shaft (5) to the main frame of the con-



1 Hand hoist pawl
2 Hand hoist cable drum shaft
3 Lower push arm
4 Saddle pin
5 Lower push arm shaft
6 Toolbox
7 Toolbox door
8 Toolbox hasp
9 Operator's platform

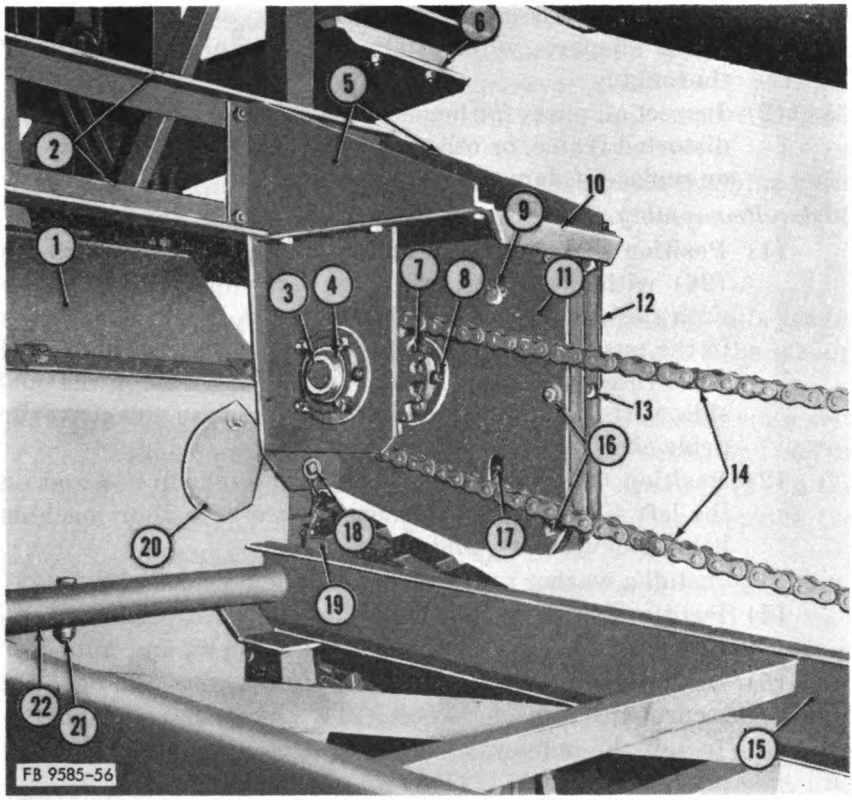
Figure 55. Conveyor, operator's side.

veyor; remove the assembled lower push arm and conveyor takeup idler.

b. Disassembly.

(1) Remove the conveyor takeup idler bracket from the lower push arm (par. 111*a*).

(2) Remove the nut, lockwasher, and bolt (21, fig. 56) securing the lower push arm shaft in the pipe (22) of the push arm; remove the shaft.



1	Conveyor transmission cover	12	Channel plate
2	Main frame angle	13	Machine bolt
3	Reversing countershaft	14	Conveyor drive chain
4	Bearing	15	Lower push arm
5	Plate	16	Nut
6	Battery shelf bracket	17	Idler shaft
7	Sprocket	18	Machine bolt
8	Lubrication fitting	19	Saddle pin
9	Idler shaft	20	Handhole cover
10	Plate	21	Bolt
11	Housing	22	Spacer pipe

Figure 56. Conveyor reversing countershaft sprocket.

(3) Remove the nuts, lockwashers, and machine bolts securing the angle (4, fig. 45) to the push arm; remove the angle.

(4) Remove the nuts (25, fig. 36) and washer securing the rod of the plate (24) to the bracket on the push arm (26).

(5) Remove the four nuts, lockwashers, and machine bolts securing the takeup bracket to the lower push arm; remove the takeup bracket.

(6) Remove the 16 nuts, lockwashers, and machine bolts securing the plates (24) to the lower push arms; remove the plates.

c. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent; dry thoroughly.

(2) Inspect all parts for bends, cracks, breaks, cracked welds, distorted frame, or other damage; reweld damaged welds or replace if damaged beyond repair.

d. Reassembly.

(1) Position the plates (24, fig. 36) on the lower push arms (26) with the plate that has the takeup rod on the side with the slotted holes in the push arm. Secure the plates to the push arm with 16 machine bolts, lockwashers, and nuts. Insert the machine bolts with the heads on the outside of the plate on the right side, to clear the conveyor drive chain.

(2) Position the takeup bracket over the takeup rod and on the left side of the push arm; secure with four machine bolts, lockwashers, and nuts.

(3) Install a washer and nut (25) on the takeup rod.

(4) Position the angle (4, fig. 45) on the lower push arm; secure with two machine bolts, lockwashers, and nuts.

(5) Install the lower push arm shaft in the pipe (22, fig. 56); secure with a machine bolt (21), lockwasher, and nut.

(6) Install the conveyor takeup idler bracket on the lower push arm (par. 111*e*(1)).

e. Installation.

(1) Position the lower push arm (15, fig. 56) on the conveyor main frame and secure with two saddle pins (19).

(2) Install the lower push arm on the boom (par. 103*e*(4)).

(3) Install and adjust the tension of the conveyor drive chain (par. 103*e*(8) and (9)).

(4) Install the drive chain guard (par. 103*e*(10) and (11)).

113. Reversing Countershaft and Housing

a. Removal.

(1) Remove the six nuts (16, fig. 56), plain washers, and machine bolts (13) securing the channel plate (12) to the housing (11); remove the channel plate.

(2) Remove the six nuts, plain washers, and machine bolts securing the two support plates (5) to the top plate (10), and the four nuts, plain washers, and machine bolts securing the support plates to the main frame angles (2); remove the two support plates.

(3) Turn the adjusting screw (21, fig. 16) to loosen the tension of the countershaft drive chain. Remove the cotter

pin and pin from the countershaft drive chain; open the chain and remove it from the sprockets.

(4) Loosen the tension of the conveyor drive chain (14, fig. 56) (par. 103*a*(2)); open the chain and remove it from the sprocket (7).

(5) Remove the four nuts, plain washers, and machine bolts (18) securing the housing to the main frame; remove the assembled housing and shafts.

b. Disassembly (fig. 56).

(1) Remove the two nuts, washers, and machine bolts securing the takeup bracket to the housing; remove the takeup bracket.

(2) Loosen the setscrew in the collar of the takeup sprocket; remove the idler shaft (17), takeup sprocket, and collar.

(3) Remove the cotter pin securing the idler shaft (9) in the housing. Loosen the setscrew in the collar; remove the idler shaft, idler sprocket, and collar.

(4) Remove the eight nuts, lockwashers, and machine bolts securing the two assembled bearing covers and bearings (4) to the housing; loosen the setscrews in the bearings and remove the outer assembled bearing cover and bearing from the reversing countershaft (3).

(5) Remove the four nuts, lockwashers, and machine bolts securing the cover plate (20, fig. 16) to the housing; remove the cover plate.

(6) Remove the reversing countershaft (3, fig. 56), conveyor drive sprocket (7), countershaft sprocket, and remaining assembled bearing and bearing cover from the housing.

(7) Remove the adjusting screw (21, fig. 16) and two nuts from the housing.

(8) Remove all lubrication fittings (8, fig. 56).

(9) Remove the bearing from the bearing cover.

c. Cleaning and Inspection.

(1) Clean all parts except bearings with an approved cleaning solvent; dry thoroughly.

(2) Clean and inspect the bearings as directed in paragraph 126*c*.

(3) Inspect all the sprockets for cracked or chipped teeth, wear, cracks, or other damage; replace if damaged.

(4) Inspect the shafts for distortion, wear of the bearing surfaces, or other damage; replace if damaged.

(5) Inspect all other parts for worn or damaged threads, cracks, dents, breaks, or other damage; replace if damaged.

d. Reassembly.

(1) Install the bearings (4, fig. 56) in the bearing covers.

(2) Install the adjusting screw (21, fig. 16) and two nuts in the housing.

(3) Install an assembled bearing and bearing cover, the countershaft sprocket, conveyor drive sprocket (7, fig. 56), and reversing countershaft (3) in the housing (11).

(4) Position the cover plate (20, fig. 16) on the housing; secure with four machine bolts, lockwashers, and nuts.

(5) Position the bearing covers on the housing; secure with eight machine bolts, lockwashers, and nuts; tighten the setscrews in the bearings.

(6) Install the idler shaft (9, fig. 56) through the housing, idler sprocket, and collar; secure with a cotter pin. Aline the sprockets and tighten the setscrew in the collar to secure the alinement.

(7) Install the takeup shaft through the housing takeup, idler sprocket (17) and collar. Aline the sprockets and tighten the setscrew in the collar to secure the alinement.

(8) Position the takeup bracket on the housing; secure with two machine bolts, washers, and nuts.

(9) Install all lubrication fittings (8).

e. Installation.

(1) Position the assembled reversing countershaft housing (11, fig. 56) on the main frame; secure with four machine bolts (18), plain washers, and nuts.

(2) Install the conveyor drive chain (14) around the conveyor drive sprocket (7), close the chain and adjust the chain tension as directed in paragraph 103*e*(9).

(3) Install the countershaft drive chain around the sprockets. Close the chain, and adjust the chain tension by turning the adjusting screw (21, fig. 16).

(4) Position the two support plates (5, fig. 56) on the top plate (10) of the housing and main frame angles (2); secure with 10 machine bolts, plain washers, and nuts.

(5) Position the channel plate (12) on the housing; secure with six machine bolts (13), plain washers, and nuts (16).

(6) Lubricate as directed in LO 5–9585.

Section XV. CONTROLS AND LINKAGES

114. Description

a. Flight Line Clutch Lever. The flight line clutch lever (13, fig. 5) is connected to the flight line clutch by the lever rod (15) and

the yoke arm (17, fig. 16). The lever rod extends from the flight line clutch lever across the main frame to the yoke arm which is pivoted at its midpoint. The yoke and jaw clutch assembly is mounted on the end of the jackshaft (18).

b. Crawler Steering Clutch Levers. The crawler steering clutch levers (7) and (8, fig. 5) turn on the pivot shaft (12) and are normally maintained in a neutral position by the spring plate (10) engaging the rod (11). The levers are connected to rods that extend to the center of the main frame where they, in turn, connect linkage extending into the conveyor shaft transmission housing (13, fig. 2). The steering clutch levers operate the crawler clutches and the two brake bands on the crawler clutch shaft.

c. High Speed Lever (fig. 3). The high speed lever (14) has a grip latch and two positions on the quadrant. In the low speed position the jackshaft drives the crawler clutch shaft through gears with approximately a 1-to-4 ratio. In the high speed position the jackshaft drives the crawler clutch shaft through a chain drive with a 1-to-2 ratio. The high speed lever is connected through a tie arm to two yokes in the shaft transmission that disengage the gear drive before engaging the chain drive to prevent damaging the gears when shifting from one speed to the other.

d. Power Hoist Clutch Lever (fig. 3). The power hoist clutch lever (13) connects to linkage which operates the power hoist cone clutch on the jackshaft. The cone clutch, when engaged, drives the power hoist through sprockets and a connecting chain. The power hoist is self-locking.

e. Boom Hand Hoist Wheel. The boom hand hoist wheel (6, fig. 3) turns a gear train consisting of two small and two large pinion gears through an intermediate shaft to the cable drum shaft (2, fig. 55). The two hand hoist cable drums are keyed to the cable drive shaft. A pawl (1), accessible at the right side of the hand hoist housing, locks the handwheel. The hand hoist drums are connected to the mast by cables. Turning the hand hoist wheel tilts the mast, and so raises or lowers the foot end of the boom off or on the ground.

115. Flight Line Clutch Lever

a. Removal.

(1) Unhook the lever rod spring from the lever rod (16, fig. 16) and the spring tension adjusting plate. Note the hole used in the adjusting plate.

(2) Remove the two cotter pins, and the two clevis pins at the ends of the lever rod (16). Remove the lever rod from the yoke arm (17) and the flight line clutch lever (13, fig. 5).

(3) Remove the nut, lockwasher, and bolt securing the flight line clutch lever to the bracket on the main frame; remove the flight line clutch lever.

(4) Remove the cotter pin and the clevis pin securing the yoke arm (17, fig. 16) to the supporting angle and the brace.

(5) Remove the two nuts, lockwashers, and machine bolts securing the two halves of the yoke arm (17); separate the two halves and remove them from the flight line jaw clutch yoke.

b. Disassembly (fig. 16).

(1) Remove the two clevis yoke ends from the lever rod. Remove the two nuts.

(2) Remove the two nuts, lockwashers, and machine bolts securing the two halves of the shifter yoke (19) to the jaw clutch; remove the two halves.

c. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent; dry thoroughly.

(2) Inspect all parts for cracks, breaks, wear, bends, or other damage; repair or replace if damaged beyond repair.

d. Reassembly (fig. 16).

(1) Install the two halves of the shifter yoke (19) on the jaw clutch and secure with two machine bolts, lockwashers, and nuts.

(2) Install the two nuts and the two clevis yoke ends on the lever rod (16).

e. Installation.

(1) Position the two halves of the yoke arm (17, fig. 16) on the shifter yoke; secure with two machine bolts, lockwashers, and nuts.

(2) Position the yoke arm on the supporting angle and brace; secure with a clevis pin and cotter pin.

(3) Position the flight line clutch lever (13, fig. 5) on the bracket on the main frame; secure with the machine bolt, lockwasher, and nut.

(4) Position the lever rod (16, fig. 16) between the end of the flight line clutch lever and the end of the yoke arm; secure with two clevis pins and cotter pins.

(5) Hook the lever rod spring on the lever rod and in the same hole on the spring tension adjusting plate noted on disassembly.

(6) Adjust the flight line clutch lever (*f* below).

f. Adjustment.

(1) Adjust the tension of the lever rod spring for proper operation of the flight line clutch lever by placing the end of the spring in the proper hole in the spring tension adjusting plate.

(2) Adjust the length of the flight line clutch lever rod at the clevis yoke ends so that the jaw clutch engages fully and disengages fully.

116. Crawler Steering Clutch Levers

a. Removal.

(1) Remove the two cotter pins securing the rod (11, fig. 5) to the bracket on the main frame; remove the rod.

(2) Remove the four nuts, lockwashers, and U-bolts (9) securing the spring plate (10) to the two steering clutch levers (7) and (8); remove the springs.

(3) Remove the cotter pins and clevis pins (12, fig. 57) securing the steering clutch levers (10) to the clutch lever rod yoke ends (3).

(4) Remove the two cotter pins and the steering lever pivot shaft (8) securing the two steering clutch levers to the bracket on the main frame; remove the steering clutch levers.

(5) Remove the cotter pins and rivets (1) securing the clutch lever rod yoke ends to the shifter arms (2) and (19); remove the clutch lever rods (7) and (13) from the shifter arms.

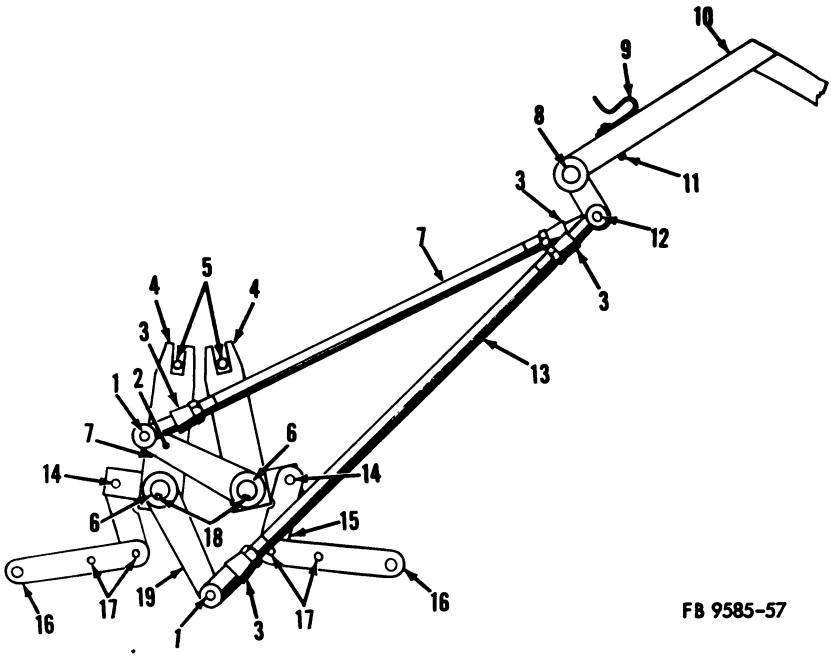
(6) Remove the two nuts, plain washers, lockwashers, and bolts clamping the two shifter arms to the clutch shifter yoke rods (6); remove the two shifter arms and the two keys (18) from the clutch shifter yoke rods.

(7) Remove the sliding door (7, fig. 52) from the conveyor shaft transmission housing.

(8) Remove the two nuts, plain washers, pipe spacers (6, fig. 58), and machine bolts (5) securing the brake band assemblies to the brake link bars (16, fig. 57); remove the brake links from the brake band assemblies.

(9) Remove the cotter pins and rivets (17) securing the bars (16) to the support brackets; remove the brake link bars from the support brackets.

(10) Remove the cotter pins and rivets (14) securing the bars (15) to the clutch shifter yoke arms (4); remove



1	Rivet, button hd, ½" x 1¾" (2 rqr)	11	U-bolt
2	Shifter arm	12	Clevis pin
3	Rod yoke end	13	Clutch lever rod
4	Clutch shifter yoke arm	14	Rivet, button hd, ½" x 1⅝" (2 rqr)
5	Clutch yoke	15	Bar
6	Clutch shifter yoke rod	16	Bar
7	Clutch lever rod	17	Rivet, button hd, ½" x 1¼" (4 rqr)
8	Clutch lever pivot shaft	18	Key (2 rqr)
9	Spring	19	Shifter arm
10	Steering clutch lever		

Figure 57. Steering clutch levers and linkage.

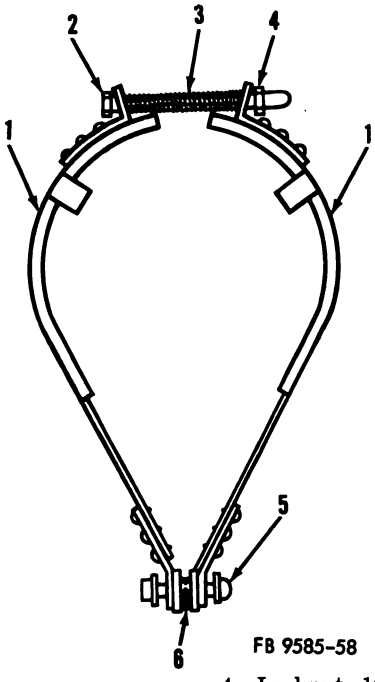
the assembled bars and brake links from the clutch shifter yoke arms.

(11) Loosen the setscrews in the collars on the clutch shifter yoke rods (6) and in the hubs of the clutch shifter yoke arms (4). Drive the clutch shifter yoke rods out of the hubs of the yoke arms; remove the keys (18), clutch shifter yoke arms, collars, and clutch shifter yoke rods.

b. Disassembly (fig. 57).

(1) Remove the cotter pins and rivets securing the bars (15) to the bars (16); separate the bars.

(2) Loosen the locking nuts and remove the yoke ends (3) and the locking nuts from the clutch lever rods (7) and (13).



1 Brake band
2 Machine bolt, hex hd, ½" x 6" NC (2 rqr)
3 Coil spring
4 Locknut, ½" NC (2 rqr)
5 Machine bolt, hex hd, ⅜" x 2½" NC (2 rqr)
6 Pipe spacer

Figure 58. Brake band assembly.

c. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent; dry thoroughly.

(2) Inspect all parts for wear, cracks, bends, or other damage; repair by welding, if possible. Strighten bent rods and replace parts damaged beyond repair.

d. Reassembly (fig. 57).

(1) Install the locking nuts and the yoke ends (3) on the clutch lever rods (7) and (13).

(2) Position the bars (15) on the bars (16) and secure with the rivets (17) and cotter pins.

e. Installation.

(1) Position the clutch shifter yoke rods (6) in the support brackets in the transmission housing and install the collars, keys, (18), and the clutch shifter yoke arms (4) on the yoke rods; secure by tightening the setscrews.

(2) Position the bars (15) on the clutch shifter yoke arms (4) ; secure with two rivets and cotter pins.

(3) Position the bars (16) in the support brackets; secure with rivets and cotter pins.

(4) Position the brake link bars on the brake band assemblies; secure with machine bolts (5, fig. 58), pipe spacers (6), plain washers, and nuts.
(5) Install the sliding door (7, fig. 52) on the conveyor shaft transmission housing.
(6) Position the two shifter arms (2) and (19, fig. 57) on the clutch shifter yoke rods (6) and the keys (18); secure with the machine bolts, plain washers, lockwashers, and nuts.
(7) Position the clutch lever rod yoke ends (3) on the shifter arms (2) and (19); secure with rivets (1) and cotter pins.
(8) Position the steering clutch levers (10) on the bracket on the main frame; install the pivot shaft (8) and secure with two cotter pins.
(9) Position the flat springs (9) on the steering clutch levers; secure with two U-bolts (11), lockwashers, and nuts.
(10) Install the rod (11, fig. 5) in the bracket on the main frame; secure with two cotter pins.
(11) Position the lever rod yoke ends (3, fig. 57) on the steering clutch levers (10); secure with clevis pins (12) and cotter pins.
(12) Adjust the steering levers for proper operation by lengthening or shortening the lever rods (7) and (13).

117. High Speed Lever
(fig. 52)

a. Removal.
(1) Remove the sliding door (7) from the conveyor shaft transmission housing.
(2) Remove the cotter pin and the rivet securing the yoke end on the pivot arm to the bottom of the high speed lever (13).
(3) Remove the cotter pin and the rivet securing the power hoist clutch lever (12) to the lever quadrant.
(4) Remove the two nuts, lockwashers, and machine bolts securing the lever quadrant to the angle on the main frame; remove the assembled high speed lever and quadrant.
(5) Remove the nuts, lockwashers, plain washers, and machine bolts securing the tie arm to the yoke arms; remove the pipe spacers and the assembled tie arm and pivot arm.
(6) Remove the two nuts, lockwashers, and machine bolts securing the two halves of the yoke arms; separate the

halves of the yoke arms. Mark pairs to facilitate reassembly.

(7) Remove the two nuts, lockwashers, and bolts securing each yoke arm bracket to the angles at the bottom of the conveyor shaft transmission housing; remove the assembled remaining halves of the yoke arms and the brackets. Mark the yoke arms and brackets to facilitate reassembly.

b. Disassembly.

(1) Remove the cotter pin and rivet securing the high speed lever (13) to the quadrant; remove the assembled high speed lever and grip latch (16).

(2) Remove the cotter pins securing the link rod (15) to the grip latch and the plunger; remove the link rod.

(3) Remove the cotter pin and rivet securing the grip latch to the lever handle; remove the grip latch.

(4) Remove the pin securing the collar to the plunger; remove the collar, spring, and plunger.

(5) Remove the cotter pin and rivet securing the pivot arm to the tie arm; remove the pivot arm.

(6) Remove the yoke end and locking nut from the pivot arm.

(7) Remove the cotter pin and rivets securing the brackets to the yoke arms; remove the yoke arms.

c. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent; dry thoroughly.

(2) Inspect the spring for weak or broken coils or other damage; replace if damaged.

(3) Inspect all other parts for wear, bends, breaks, cracks, or other damage; repair or replace if damaged.

d. Reassembly.

(1) Position the mounting brackets on the yoke arms; secure with rivets and cotter pins.

(2) Install the locking nut and the yoke end on the pivot arm.

(3) Position the pivot arm on the tie arm; secure with a rivet and cotter pin.

(4) Assemble the spring (14) and collar on the plunger between the brackets of the high speed lever (13); secure the collar to the plunger with a pin.

(5) Position the grip latch (16) on the high speed lever; secure with a rivet and cotter pin.

(6) Position the link rod (15) between the grip latch and the plunger; secure with two cotter pins.

(7) Position the quadrant on the high speed lever; secure with a rivet and cotter pin.

e. Installation.

(1) Position the assembled halves of the yoke arms and brackets on the angles at the bottom of the conveyor shaft transmission housing; secure each with two machine bolts, lockwashers, and nuts.

(2) Position the matching half of each yoke arm on the half attached to the mounting bracket, engaging the sliding shifters on the jackshaft between the yoke arm halves; secure each with two machine bolts, lockwashers, and nuts.

(3) Position the yoke arms on the tie arm; secure with machine bolts, plain washers, pipe spacers, lockwashers, and nuts.

(4) Position the high speed lever quadrant on the angle on the main frame; secure with the two machine bolts, lockwashers, and nuts.

(5) Position the power hoist clutch lever (12) on the lower quadrant; secure with a rivet and cotter pin.

(6) Position the pivot arm yoke end on the bottom of the high speed lever (13); secure with a rivet and cotter pin.

(7) Adjust the high speed lever linkage (*f* below).

(8) Install the sliding door (7) on the conveyor shaft transmission housing.

f. High Speed Lever Adjustment.

(1) Remove the sliding door (7) from the conveyor shaft transmission housing cover.

(2) Remove the cotter pin and rivet securing the pivot arm yoke end to the bottom of the high speed lever (13); slide the yoke end from the lever.

(3) Loosen the locknut. Turn the yoke end to adjust the length of the rod so that the gears are fully disengaged when the high speed lever is pulled away from the engine and locked in the high speed position, and fully engaged when the high speed lever is pushed toward the engine and locked in the normal position. When the gears are meshed the jaw clutch must be fully open. Allow enough play in the linkage so that there is no possibility of the gear teeth jaw clutch jaws touching at the same time. Tighten the locknut.

(4) Position the yoke on the end of the high speed lever; secure with a rivet and cotter pin.

(5) Install the sliding door on the conveyor shaft transmission housing cover.

118. Power Hoist Clutch Lever
(fig. 59)

a. Removal.

(1) Remove the cotter pin and the rivet securing the yoke end (12) to the bottom of the power hoist clutch lever (13); remove the yoke end from the lever.

(2) Remove the cotter pin and the rivet (14) securing the power hoist clutch lever hoist clutch lever to the quadrant (15); remove the power hoist clutch lever.

(3) Remove the sliding door (6) from the conveyor shaft transmission housing.

(4) Remove the nut, lockwasher, two plain washers, and machine bolt securing the pivot arm to the yoke arm; remove the pivot arm and the pipe spacers.

(5) Remove the two nuts, lockwashers, and machine bolts securing the short half of the yoke arm to the remaining half; remove the short half of the yoke arm.

(6) Remove the two nuts, lockwashers, and machine bolts securing the mounting bracket to the angle at the bottom of the shaft transmission housing; remove the assembled mounted bracket and the yoke arm.

b. Disassembly.

(1) Remove the cotter pin and rivet securing the long half of the yoke arm to the mounting bracket; remove the long half of the yoke arm.

(2) Remove the yoke end (12) and nut from the pivot arm (11).

c. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent; dry thoroughly.

(2) Inspect all parts for cracks, breaks, wear, worn threads, or other damage; repair or replace if damaged.

d. Reassembly.

(1) Install the nut and yoke end (12) on the pivot arm (11).

(2) Position the long half of the yoke arm on the mounting bracket; secure with a rivet and cotter pin.

e. Installation.

(1) Position the assembled yoke arm and mounting bracket on the angle at the bottom of the shaft transmission housing; secure with two machine bolts, lockwashers, and nuts.

(2) Position the short half of the yoke arm on the long half of the yoke arm, engaging the shifter in the center of

the jackshaft between the two halves of the yoke arm; secure with two machine bolts, lockwashers, and nuts.

(3) Position the pivot arm on the yoke arm; secure with a machine bolt, two plain washers, pipe spacers, a lockwasher, and nut.

(4) Install the sliding door (6) in the conveyor shaft transmission housing.

(5) Position the power hoist clutch lever (13) on the quadrant (15); secure with a rivet (14) and cotter pin.

(6) Position the pivot arm yoke end (12) on the bottom of the power hoist clutch lever; secure with a rivet and cotter pin.

(7) Adjust the power hoist clutch lever (*f* below).

f. Power Hoist Clutch Lever Adjustment.

(1) Remove the sliding door (6) from the conveyor shaft transmission housing.

(2) Remove the cotter pin and rivet securing the pivot arm yoke end (12) to the bottom of the power hoist clutch lever (13); slide the yoke end from the lever.

(3) Loosen the locknut. Turn the yoke end to adjust the length of the rod so that the power hoist clutch is fully disengaged when the power hoist clutch lever is pushed in toward the engine. Tighten the locknut.

(4) Position the yoke end at the bottom of the power hoist clutch lever; secure with a rivet and cotter pin.

(5) Install the sliding door in the conveyor shaft transmission housing.

119. Boom Hand Hoist Wheel

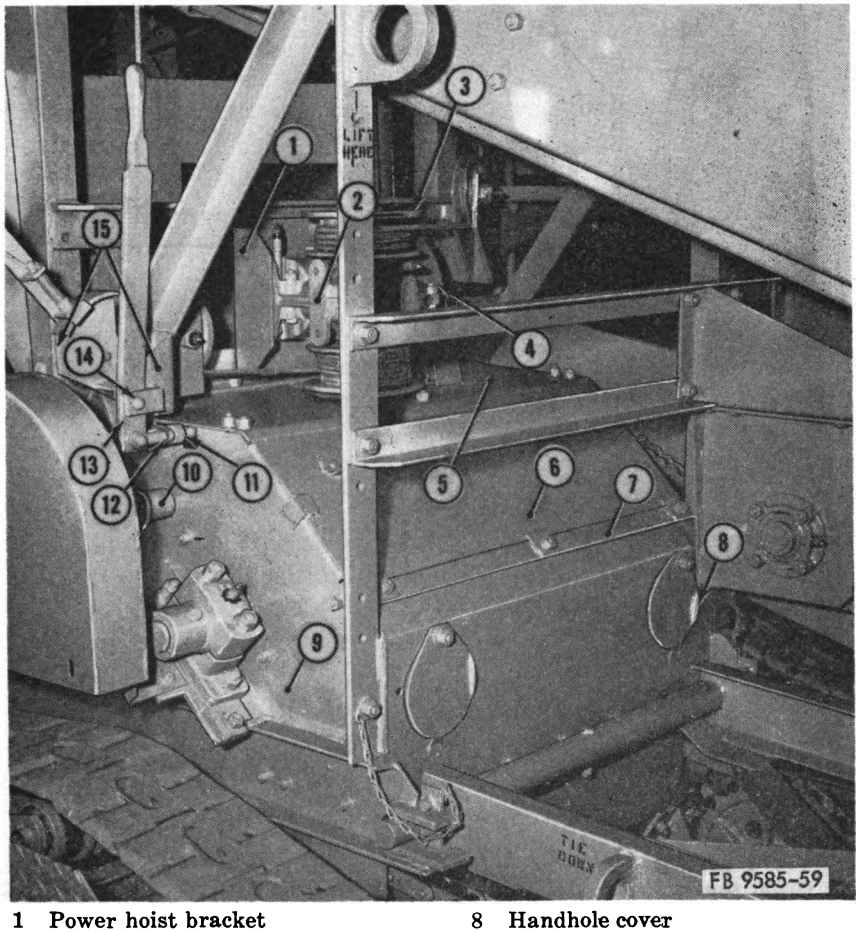
a. Removal (fig. 60).

(1) Lower the foot shoe of the boom to the ground and allow slack in the cables between the mast sheaves and the hand hoist cable drums.

(2) Remove the four cable clamps securing the ends of the hand hoist cables; remove the cables.

(3) Remove the machine screws, machine bolt, lockwashers, nuts, and fillers securing the rear bearing bracket (8) to the angle of the main frame; remove the rear bearing bracket.

(4) Remove the machine bolts, lockwashers, nuts, and fillers securing the hand hoist housing cover (1) and housing (4) to the main frame; remove the assembled hand hoist.



1 Power hoist bracket
2 Power hoist
3 Cable drum
4 Power hoist chain guard
5 Top plate
6 Sliding door
7 Bar
8 Handhole cover
9 Side plate
10 Jackshaft
11 Pivot arm
12 Yoke end
13 Power hoist clutch lever
14 Rivet
15 Quadrant

Figure 59. Shaft transmission housing.

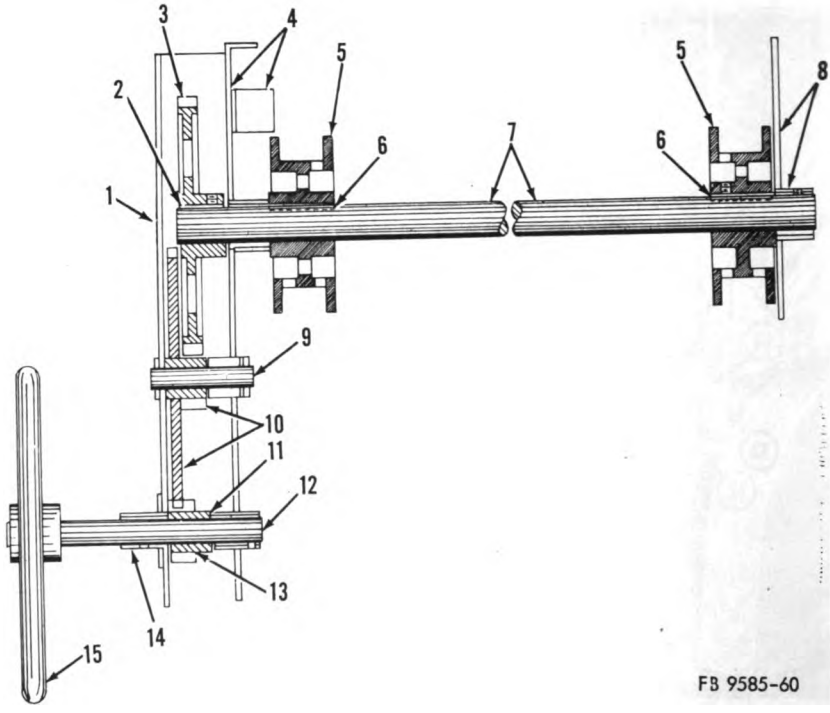
b. Disassembly.

(1) Remove the two cotter pins and pawl rod from the housing; remove the pawl (1, fig. 55).

(2) Loosen the setscrews in the handwheel (15, fig. 60); remove the handwheel from the shaft and remove the key.

(3) Remove the two bolts, lockwashers, and nuts securing the bearing (14) to the hoist housing cover (1); remove the bearing.

(4) Remove the two machine bolts, lockwashers, and nuts securing the cover to the housing; remove the cover.



1	Hoist housing cover	8	Bearing bracket
2	Key	9	Idler shaft
3	Gear	10	Gear
4	Hoist housing	11	Key
5	Drum	12	Shaft
6	Key	13	Pinion
7	Drum shaft	14	Bearing
		15	Handwheel

Figure 60. Hand hoist assembly, cross sectional view.

(5) Loosen the setscrew securing the hand hoist shaft pinion (13) to the hand hoist shaft, and drive the shaft out from the back of the housing cover. Remove the pinion and key (11).

(6) Remove the cotter pin holding the idler shaft (9) in the housing, and drive the idler shaft from the back of the housing; remove the gear (10).

(7) Loosen the setscrew securing the gear (3) to the drum shaft (7), and drive the shaft out through the back cover; remove the gear (3) and key (2).

(8) Loosen the setscrews securing the cable drums (5) to the cable drum shaft (7); remove the cable drums and keys (6).

(9) Remove all lubrication fittings.

c. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent; dry thoroughly.

(2) Inspect all bushings for wear, scoring, out-of-round, or other damage; replace damaged bushings.

(3) Inspect the gears for wear, chipping, cracked teeth, or other damage; replace if damaged.

(4) Inspect all parts for cracks, breaks, worn threads, or other damage; replaced if damaged.

d. Reassembly.

(1) Install all the lubrication fittings.

(2) Position the idler shaft (9, fig. 60) and the gear (10) in the housing; secure by installing a cotter pin.

(3) Install the keys (6) in the keyways of the cable drum shaft (7). Install the cable drums (5) on the cable drum shaft and keys; secure by tightening the setscrews.

(4) Position the cable drum shaft in the hand hoist housing (4) and position the key (2) in the keyway of the shaft; install the gear (3) on the shaft and key. Secure by tightening the setscrew.

(5) Position the cover (1) on the housing; secure with two machine bolts, lockwashers, and nuts.

(6) Slide the shaft (12) through the housing with the pinion (13) in place; secure the pinion to the shaft by tightening the setscrew.

(7) Position the bearing (14) on the cover; secure with two bolts, lockwashers, and nuts.

(8) Place a key in the shaft, and position the handwheel (15) on the shaft; secure with setscrews.

(9) Position the pawl rod through the pawl (1, fig. 55) and housing; secure with two cotter pins.

e. Installation.

(1) Position the hand hoist housing cover and hand hoist housing on the angles of the main frame; secure with the machine bolts, lockwashers, nuts, and fillers.

(2) Position the rear bearing bracket over the cable drum shaft and on the main frame; secure with three machine screws, a machine bolt, lockwashers, fillers, and nuts.

(3) Reeve the cables around the sheaves of the main frame and the cable drums (fig. 48). Secure the ends of the cables with four cable clamps.

(4) Adjust the hand hoist cable (*f* below).

f. Hand Hoist Cable Adjustment.

(1) Loosen the cable clamps at the anchoring loops and adjust the length of the cables to equalize the tension of the cables.

(2) The cable length must be sufficient to lower the boom foot shoe to rest on the ground.

Section XVI. OPERATOR'S PLATFORM AND TOOLBOX

120. Description

a. Operator's Platform (fig. 55). The operator's platform (9) is a formed angle of firm tread plate mounted on angles bolted to the top of the crawler housing. It provides a firm footing at a level that allows the operator to conveniently reach all the operating levers and controls.

b. Toolbox (fig. 55). The toolbox (6) is an enclosed metal box mounted under the operator's platform, with a hinged door (7) and a hasp (8) so that the box can be locked.

121. Operator's Platform (fig. 55)

a. Removal. Remove the four nuts, lockwashers, bevel washers, and machine bolts securing the platform mounting angles to the crawler frame; remove the assembled operator's platform and toolbox (6) from the crawler frame.

b. Disassembly.

(1) Open the toolbox door (7).

(2) Remove the four nuts, lockwashers, and machine bolts securing the toolbox top to the operator's platform (9); remove the toolbox from the platform.

c. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent; dry thoroughly.

(2) Inspect all parts for cracks, bends, or other damage; repair if damaged.

d. Reassembly.

(1) Position the toolbox (6) below the operator's platform (9); secure with four machine bolts, lockwashers, and nuts.

(2) Close the toolbox door (7).

e. Installation. Position the assembled operator's platform (9) and toolbox (6) on the crawler housing on the operator's side;

secure with four machine bolts, bevel washers, lockwashers, and nuts.

122. Toolbox
(fig. 55)

a. Removal. Remove the toolbox from the operator's platform (par. 121*b*).

b. Disassembly. Remove the four nuts, lockwasher, and machine screws securing the two hood fasteners to the sides of the toolbox (6); remove the hood fasteners.

c. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent; dry thoroughly.

(2) Inspect all parts for cracks, rusted spots, distortion, or other damage; repair if damaged or replace if damaged beyond repair.

d. Reassembly. Position the two hood fasteners on the sides of the toolbox (6); secure with four machine screws, lockwashers, and nuts.

e. Installation. Install the toolbox (par. 121*d*).

Section XVII. CRAWLERS

123. Description
(fig. 61)

a. General. The weight of the unit is supported on the lower portion of the crawler tracks (1) by six flanged rollers (22) mounted on the bottom of each crawler frame (15). The upper rims of the track are held in tension by rollers (5) mounted on the takeup spring arms (8). Crawler track tension adjustment is provided by bolts (16) that position the takeup bearings (17) on the crawler frame.

b. Track. The crawler tracks (1) are composed of individual 10-inch crawler links (23) which can be removed for repair or replacement. The links are connected by T-head pins, locked with cotter pins.

c. Crawler Frame. The crawler frames (15) are attached to the main frame at the foot end through the oscillating shaft (4) and at the head end by the oscillating axle. The crawler frames are of double channel construction and support the drive and idler sprocket bearings, oscillating shaft bearings, roller shafts, and oscillating axle brackets.

d. Drive Sprockets and Shafts. The drive sprockets (3) are driven by the crawler drive chains from the oscillating shaft sprockets, and turn the drive shafts and the crawler drive sprockets (26). The drive shafts are supported by four cone roller bearings.

e. Takeup Wheels and Shafts. The takeup wheels (12) support the crawler tracks at the head end of the crawler frames and can be adjusted on the crawler frame to take up the slack in the crawler tracks. The takeup bearings (17) slide in the crawler frame channels.

f. Flanged Rollers. The flanged rollers (22) are mounted on shafts (19) secured to the bottom of the crawler frame channels with U-bolts and keepers (18).

g. Spring Takeup. The track compression spring (7) supports the upper section of the track by pressing the 4-inch roller (5) against the inside of the track. The roller is mounted on the takeup spring arm (8) secured to the crawler frame.

h. Oscillating Axle. The oscillating axle is constructed of 1-inch bars and ⅜-inch angles, assembled as a parallelogram, and is attached to the main frame by pivot shafts in the center of the axle. The parallelogram construction prevents any "toeing in" of the crawlers, maintains definite vertical alinement of the crawlers, and relieves bending stress on the pivot shafts.

124. Track

a. Removal.

(1) Block both crawlers to prevent movement.

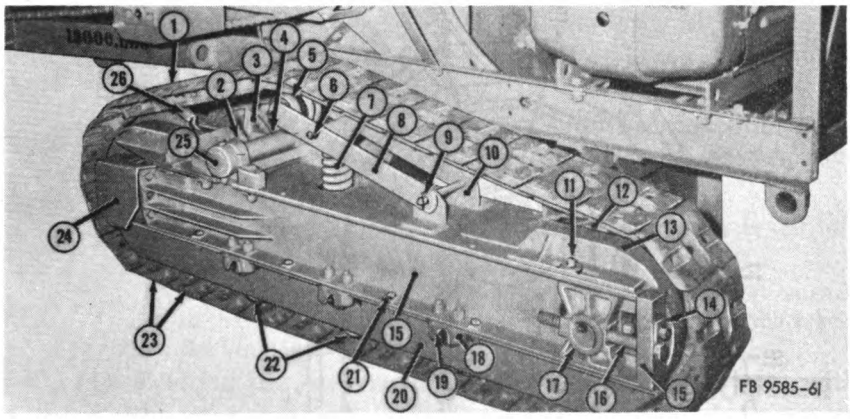
(2) Loosen the track by loosening the keepers (14, fig. 61), the takeup guard plate nuts (11), and backing up the two adjusting bolts (16).

(3) Remove the cotter pins and drive out the T-head pins (21, fig. 62) to open both tracks. It is recommended that the track be opened at the drive sprocket and a pry bar be used in such a fashion as to remove the tension caused by the weight of the track. Remove the tracks from the roller (5, fig. 61) and sprockets and lay it on the ground.

(4) Use a hoist, crane, or jacks to lift the conveyor frame until the crawler rollers are clear of the track; lift one side of the conveyor at a time. Remove the tracks from the crawlers.

b. Cleaning, Inspection, and Repair.

(1) Clean the track with an approved cleaning solvent or steam; dry thoroughly.



1 Crawler track
2 Pilot axle casting
3 Drive chain sprocket
4 Oscillating shaft
5 Roller
6 Shaft
7 Spring
8 Takeup spring arm
9 Shaft
10 Angle bracket
11 Nut, hex
12 Takeup wheel
13 Takeup end guard
14 Keeper
15 Crawler frame
16 Machine bolt, hex hd, 1" x 12" NC (4 rqr)
17 Takeup bearing
18 Keeper
19 Roller shaft
20 Guard plate
21 Machine bolt
22 Flanged rollers
23 Crawler link
24 Guard
25 Collar
26 Crawler drive sprocket

Figure 61. Crawler track.

(2) Inspect the track for cracks, breaks, wear, or other damage. Repair a damaged track by removing the cotter pins and T-head pins securing a damaged or worn link; replace the link. Replace damaged T-head pins or cotter pins.

c. Installation.

(1) Lift the conveyor, one side at a time, and position the tracks under the flanged rollers (26, fig. 62). Lower the conveyor frame until the crawler rollers touch the track; be sure the rollers engage the track links properly. It is recommended that the track be so placed that the connection can be made at the drive sprocket.

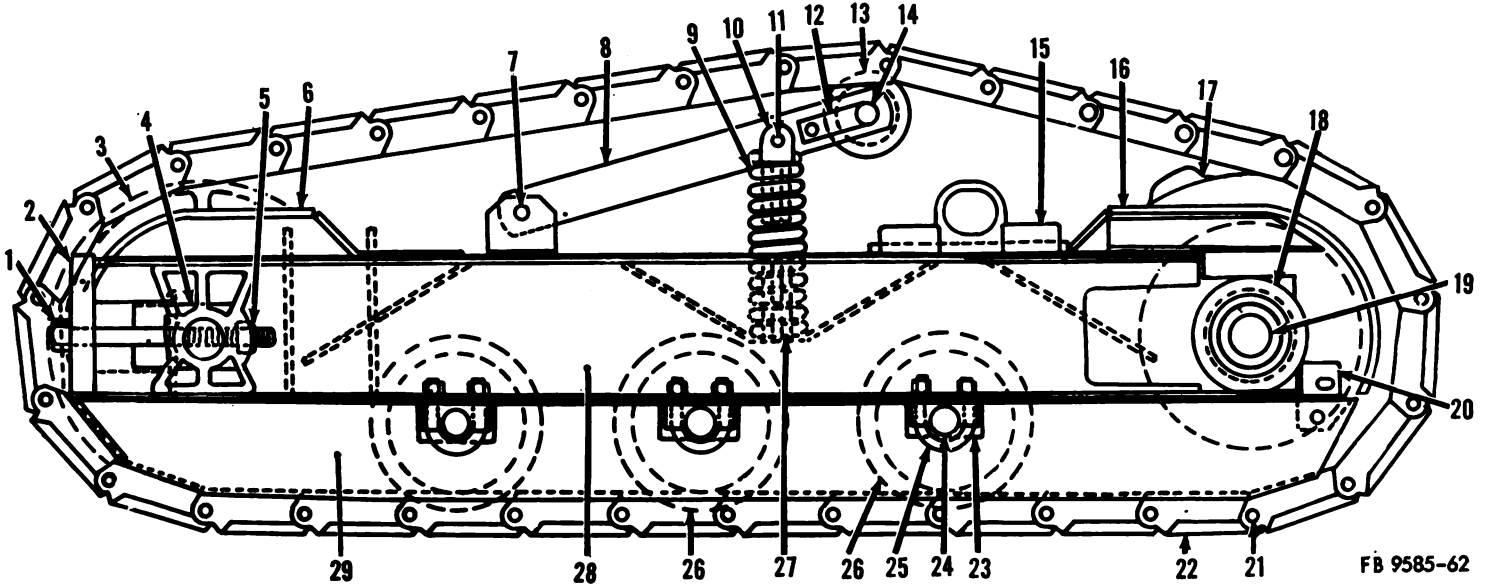
(2) Install the track around the drive sprocket (17), roller (13), and around the takeup wheel (3). Pry the track together and connect the track links with T-head pins and cotter pins.

(3) Adjust the track tension (*d* below).

(4) Remove all blocking.

d. Track Adjustment (fig. 61).

Note. The crawler tracks should be kept loose if they are working in loose material. The sag in the track, measured midway between the spring



1	Takeup bolt	8	Spring takeup arm	15	Pilot axle casting	22	Link
2	Takeup stop block	9	Compression spring	16	Drive end guard	23	Keeper
3	Takeup wheel	10	Spring seat	17	Drive sprocket	24	Roller shaft
4	Takeup bearing	11	Shaft	18	Bearing cap	25	U-bolt
5	Nut, sq, 1" (2 rqr)	12	Keeper	19	Drive shaft	26	Flanged roller
6	Takeup end guard	13	Spring takeup roller	20	Small angle	27	Spring retainer
7	Shaft	14	Shaft	21	T-head pin	28	Crawler frame

29 Guard plate

Figure 62. Crawler parts.

takeup roller (5) and the takeup wheel (12), should not exceed 3 inches at any time.

(1) Loosen the two nuts (11) securing the takeup end guards (13) to the frames (15).

(2) Remove the nuts, lockwashers, and the machine bolts securing the keepers (14) to the crawler frames; remove the keepers.

(3) Turn the adjusting bolts (16) until the crawler track has the desired amount of slack.

Note. It is very important to take up the same amount on each side so that the takeup shaft is parallel to the width of the track, and the bearings are not misalined.

(4) Position the keepers on the crawler frames; secure with the two machine bolts, lockwashers, and nuts.

(5) Tighten the two nuts on the takeup end guards to secure the adjustment.

125. Crawler Frame

a. Removal.

(1) Remove the assembled operator's platform and toolbox (par. 121*a*).

(2) Loosen the crawler drive chains by loosening the eight bolts securing the pilot axle castings (2, fig. 61) to the crawler frames.

(3) Remove the cotter pins securing the links of the crawler drive chains; open the drive chains and remove the final drive chains.

(4) Block and install jacks under the main frame of the conveyor. Jack the main frame up enough to take the weight load of the conveyor off the crawler pilot axle casting and the oscillating axle bracket.

(5) Remove the cotter pins and the four shafts (12, fig. 1) securing the two bars (14) of the oscillating axle to the bracket (13) on the crawler frame.

(6) Remove the two nuts, lockwashers, plain washers, and machine bolts securing the center pivot shafts (15) of the bars of the oscillating axle to the angle (16) at the center of the main frame; remove the pivot shafts. Remove the oscillating axle.

(7) Remove the nuts, lockwashers, and machine bolts securing the collars (25, fig. 61) to each end of the oscillating shaft; remove the collars.

(8) Remove the nuts, lockwashers, bevel washers, plain washers, and machine bolts securing the pilot axle casting (2)

to the crawler frame (15); remove the pilot axle casting, keeper plates, shim plates, and washers from the oscillating shaft (4).

(9) Remove the two crawlers.

b. Disassembly.

(1) Remove the crawler tracks (par. 124*a*).

(2) Remove the two cotter pins and shaft (7, fig. 62) securing the spring takeup arm (8) to the crawler frame (28); remove the assembled takeup arm and roller (13).

(3) Remove the nuts, lockwashers, and two machine bolts securing the keepers (14, fig. 61) to the crawler frame; remove the keepers.

(4) Remove the nuts, lockwashers, plain washers, and machine bolts securing the crawler takeup end guard (6, fig. 62) to the crawler frame; remove the takeup end guard.

(5) Remove the nuts (5) and takeup bolts (1) securing the takeup bearings (4) and takeup shafts in the crawler frame; remove the bearings, shafts, takeup wheel (3), and washers.

(6) Remove the nuts, lockwashers, and bolts securing the small angle (20) and the guard (24, fig. 61) to the bearing cap and the frame; remove the angle and guard.

(7) Remove the nuts, lockwashers, and bolts securing the drive end guard (16, fig. 62) to the crawler frame and to the guard plate (29); remove the drive end guard.

(8) Remove the nuts, lockwashers, and machine bolts securing the bearing caps (18) to the crawler frame; remove the assembled crawler drive sprocket shaft from the crawler frame.

(9) Remove the nuts, lockwashers, bevel washers, and machine bolts securing the guard plates to the frame; remove the guard plates.

(10) Remove the 12 nuts, lockwashers, bevel washers, and U-bolts (25) securing the flanged roller shafts (24) and keepers (23) to the crawler frame; remove the flanged rollers and keepers.

c. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent; dry thoroughly.

(2) Inspect all parts for cracks, bends, distorted frame, or other damage; repair broken welds or replace if damaged beyond repair.

d. Reassembly.

(1) Position the assembled flanged rollers (26, fig. 62) on the crawler frame (28); secure with keepers (23), U-bolts (25), bevel washers, lockwashers, and nuts.

(2) Position the guard plates (29) on the frame; secure with machine bolts, bevel washers, lockwashers, and nuts.

(3) Install the assembled crawler drive sprocket shaft (19) in the crawler frame; position the bearing caps over the shafts and secure with machine bolts, lockwashers, and nuts.

(4) Position the drive end guards (16) on the crawler frames and guard plates; secure with the machine bolts, lockwashers, and nuts.

(5) Install the small angles (20) and the guards (24, fig. 61) on the frames; secure with machine bolts, lockwashers, and nuts.

(6) Install a takeup wheel (3, fig. 62), takeup shaft, and the two takeup bearings (4) in each crawler; secure with takeup bolts (1) and nuts (5).

(7) Position the takeup end guards (6) on the crawler frames; secure with machine bolts, plain washers, lockwashers, and nuts.

(8) Position the keepers (14, fig. 61) loosely on the takeup stop block (2, fig. 62) on the frame; install the machine bolts, lockwashers, and nuts.

(9) Position the assembled spring takeup arms (8) and roller (13) on the crawler frame; secure with shafts (7) and the cotter pins.

(10) Install the crawler track (par. 124*c*).

e. Installation.

(1) Position the conveyor over the two crawlers, blocked just above the crawlers, with the oscillating shaft engaging the oscillator shaft drive chains and resting just above the crawler frame.

(2) Install washers, pilot axle castings (2, fig. 61), and collars (25) on each end of the oscillating shaft (4); secure the collars with machine bolts, lockwashers, and nuts.

(3) Install the shim plates and pilot axle casting on the crawler frame; secure with keeper plates, plain washers, machine bolts, bevel washers, lockwashers, and nuts.

(4) Position the assembled oscillating axle on the angle (16, fig. 1) in the center of the main frame; secure with two pivot shafts (15), machine bolts, plain washers, lockwashers, and nuts.

(5) Position the bars (14) of the oscillating axle between the crawler frame brackets (13); secure the bars to the brackets with shafts (12) and cotter pins.

(6) Remove the blocking and the jacks from under the main frame.

(7) Place the crawler drive chains over the crawler drive sprockets (14, fig. 2), and connect the ends of the chains with links and cotter pins.

(8) Adjust the tension of the crawler drive chain (*f* below).

f. Crawler Drive Chain Adjustment.

(1) Loosen the bolts securing the pilot axle castings (15, fig. 62) to the crawler frame; swing out the keeper plates, revealing the shim plates on both sides of the pilot axle castings.

(2) To tighten the drive chain, remove shims from the side nearest the compression spring (9), and force them into position on the opposite side of the pilot axle bearings until the chains are at the proper tension.

(3) Replace the shim keeper plates and tighten the bolts securing the pilot axle castings.

(4) Loosen the drive chains by reversing the above procedure.

126. Drive Sprockets and Shafts

a. Removal.

(1) Open the tracks at the crawler drive sprockets (par. 124*a* (1) through (3)).

(2) Jack up the unit to lift the drive sprockets (17, fig. 62) clear of the track links (22).

(3) Remove the assembled drive sprocket shafts from the crawler frames (par. 125*b*(6) through (8)).

b. Disassembly (fig. 63).

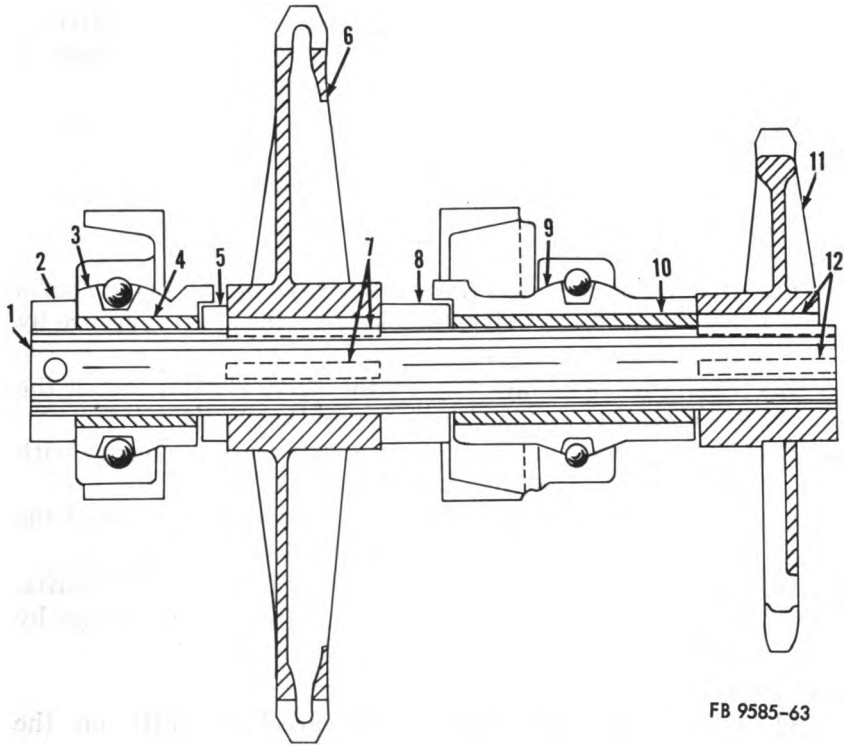
(1) Loosen the setscrews securing the drive sprockets (11) to the drive shafts (1); remove drive sprockets and keys (12).

(2) Remove the inner bearings (9) and bushings (10) from the drive shafts; remove the collars (8).

(3) Remove the nuts, lockwashers, and machine bolts securing the collars (2) to the drive shafts; remove the collars.

(4) Remove the bearings (3) and bushings (4) from the drive shafts; remove the collars (5).

(5) Loosen the setscrews securing the crawler drive sprockets (6) from the drive shafts; remove the drive sprockets and the keys (7).



1	Drive shaft	7	Key
2	Collar	8	Collar
3	Bearing	9	Bearing
4	Bushing	10	Bushing
5	Collar	11	Drive sprocket
6	Drive sprocket	12	Key

Figure 63. Crawler drive sprocket shaft, cross sectional view.

c. Cleaning and Inspection (fig. 63).

(1) Clean all parts except the ball bearings with an approved cleaning solvent; dry thoroughly.

(2) Clean and inspect ball bearings as follows:

(*a*) Place the ball bearings in a wire basket and immerse the basket in an approved cleaning solvent to loosen accumulated dirt and grease; dry thoroughly, and dip in light oil.

(*b*) Check bearings for free and smooth rotation of balls rotation. Reclean the bearings or replace.

(*c*) Inspect the bearing balls for pitting, corrosion, discoloration due to burning, and distortion of the cages; replace if defective.

(*d*) Inspect the bearing races for bends, dents, or out-of-round inner bore or outer race; replace if defective.

(3) Inspect the bushings (4) and (10) for wear, scoring, or out-of-round; replace damaged bushings.

(4) Inspect the sprockets for wear on the teeth, cracks, or other damage; replace if damaged.

(5) Inspect all parts for wear, cracks, or other damage; replace if damaged.

d. Reassembly (fig. 63).

(1) Install the keys (7) in the keyways of the drive shafts (1). Install the drive sprockets on the shafts; secure by tightening the setscrews.

(2) Position the collars (5) on the drive shafts; install the bearings (3) and bushings (4) on the shafts.

(3) Position the collars (2) on the drive shafts; secure with machine bolts, lockwashers, and nuts.

(4) Position the collars (8) on the drive shafts; install the inner bearings (9) and bushings (10) on the shafts.

(5) Install the keys (12) in the keyways of the drive shafts. Install the drive sprockets (11) on the shafts; secure by tightening the setscrews.

e. Installation.

(1) Install the assembled drive sprocket shafts on the crawler frame (par. 125*d*(3) through (5)).

(2) Lower the crawler to engage the sprocket teeth in the track links.

(3) Connect the track at the crawler drive sprocket (par. 124*c*).

(4) Lubricate as directed in LO 5–9585.

127. Takeup Wheels and Shafts (fig. 64)

a. Removal and Disassembly.

(1) Open the crawler tracks in front of the takeup wheels (par. 124*a*(1) through (3)).

(2) Jack up the unit to lift the takeup wheels clear of the track links.

(3) Remove and disassemble the takeup wheel shafts (2), bearings (1), wheels (4), and washers (3) (par. 125*b* (3) through (5)).

(4) Remove the lubrication fittings.

b. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent; dry thoroughly.

(2) Inspect all other parts for worn threads, cracks, or other damage; replace if damaged.

c. Reassembly and Installation.

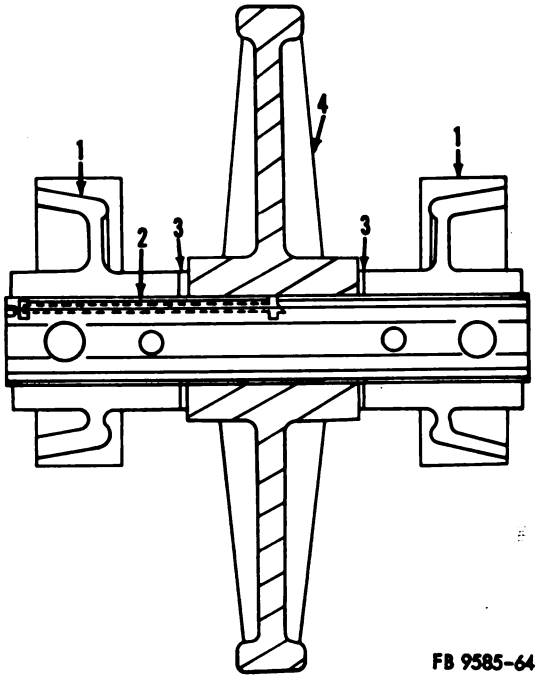
(1) Install the lubrication fittings in the shafts (2).

(2) Reassemble and install the takeup wheel shafts (par. 125*d*(6) through (8)).

(3) Lower the unit to contact the takeup wheel.

(4) Connect the tracks at the takeup wheel (par. 124*c*(2) through (4)).

(5) Lubricate as directed in LO 5–9585.



1 Takeup bearing
2 Takeup wheel shaft
3 Washer
4 Takeup wheel

Figure 64. Takeup wheel shaft, cross sectional view.

128. Flanged Rollers

(fig. 62)

a. Removal and Disassembly.

(1) Remove the crawler track (par. 124*a*).

(2) Remove the guard plate (29).

(3) Jack and block the unit, and remove the U-bolts (25) and keepers (23).

(4) Remove the flanged rollers (26) and shafts (24) (par. 125 *a* and *b*).

(5) Remove the lubrication fittings from the roller shafts (24).

b. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent; dry thoroughly.

(2) Inspect the flanged rollers (26) for wear, cracks, or other damage; replace if damaged.

(3) Inspect all other parts for worn threads, cracks, or other damage; replace if damaged.

c. Reassembly and Installation.

(1) Install the lubrication fittings in the roller shafts (24).

(2) Install the flanged rollers and shafts (par. 125*d* and *e*).

(3) Install the guard plate (29).

(4) Install the crawler track (par. 124*c*).

(5) Lubricate as directed in LO 5–9585.

129. Spring Takeup Roller

(fig. 62)

a. Removal.

(1) Loosen the tension of the crawler tracks (par. 124*a*(1) and (2)).

(2) Block under the tracks to relieve tension on the takeup rollers.

(3) Remove the cotter pins securing the shafts (7); remove the assembled spring takeup arms (8) and rollers (13) and the compression springs (9).

b. Disassembly.

(1) Remove the cotter pins and the shafts (11) securing the spring seats (10) to the arms (8); remove the spring seats.

(2) Remove the two nuts, lockwashers, machine bolts, and the two keepers (12) securing the takeup roller shafts (14) to the arms; remove the two keepers and the arms from the takeup roller shafts.

(3) Remove the takeup rollers (13) and the lubrication fittings from the shafts.

(4) Remove the spring retainers (27).

c. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent; dry thoroughly.

(2) Inspect the spring (9) for cracked, weak, or distorted coils, or other damage; replace if damaged.

(3) Inspect all other parts for wear, cracks, or other damage; replace if damaged.

d. Reassembly.

(1) Install the spring retainers (27).

(2) Install the lubrication fittings and the spring takeup rollers (13) on the roller shafts (14).

(3) Position the spring takeup arm (8) on the roller shaft (14); secure with keepers, machine bolts, lockwashers, and nuts.

(4) Position the spring seats (10) on the arms; secure with shafts (11) and cotter pins.

e. Installation.

(1) Position the assembled takeup arms and rollers on the brackets on the crawler frame with the compression springs (9) between the spring retainers on the frames and the spring seats on the takeup arms. Secure the arms with shafts (7) and cotter pins.

(2) Remove the track blocking and adjust the track tension (par. 124*d*).

(3) Lubricate as directed in LO 5–9585.

130. Oscillating Axle

a. Removal.

(1) Block the crawlers to prevent movement.

(2) Block and jack under the main frame channels at the head end and raise the main frame to remove the conveyor load from the oscillating axle.

(3) Remove the assembled oscillating axle (par. 125*a*(5) and (6)).

b. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent; dry thoroughly.

(2) Inspect all parts for wear, bends, cracks, or other damage; repair or replace if damaged.

c. Installation.

(1) Install the oscillating axle (par. 125*e*(4) and (5)).

(2) Remove the jacks and the blocking from under the main frame.

(3) Remove the blocking from the crawlers.

Section XVIII. DRIVE CHAINS AND GUARDS

131. Description

(fig. 65)

a. Crawler Drive Chains. The crawler drive chains (10) connect the sprockets on the oscillating shaft (9) with the sprockets on the crawler drive shafts (11).

b. High Speed Chain. The high speed chain (5) drives the crawler clutch shaft (6), when the drive between the gears (22) and (21) is disengaged, and approximately doubles the crawler clutch shaft rotation speed.

c. Oscillating Shaft Drive Chains. The oscillating shaft drive chains (8) connect the crawler clutch hub sprockets to the intermediate sprockets mounted on bushings on the oscillating shaft (9).

d. Power Hoist Drive Chain. The power hoist drive chain (3) connects the power hoist drive sprocket with the power hoist cone clutch on the jackshaft (4) through an opening in the conveyor transmission housing cover.

e. Countershaft Drive Chain. The countershaft drive chain (7) connects the jackshaft (4) to the reversing countershaft (13), traveling over two idler sprockets to reverse the direction of rotation of the countershaft.

f. Jackshaft Drive Chain. The jackshaft drive chain (24) drives the jackshaft (4) from the transmission output sprocket (25).

g. Conveyor Drive Chain. The conveyor drive chain (14) connects the reversing countershaft (13) with the conveyor boom spring release sprocket (16). The slack in the chain is taken up by the conveyor takeup idler mounted on the lower push arm of the conveyor boom.

132. Crawler Drive Chains

a. Removal.

(1) Relieve the tension on the crawler drive chain (par. 125*a* (2)), if necessary; remove the chain from the crawler drive sprocket (par. 125*a*(3)).

(2) Open the handhole covers on the conveyor shaft transmission housing and remove the crawler drive chains from the sprockets on the oscillating shaft.

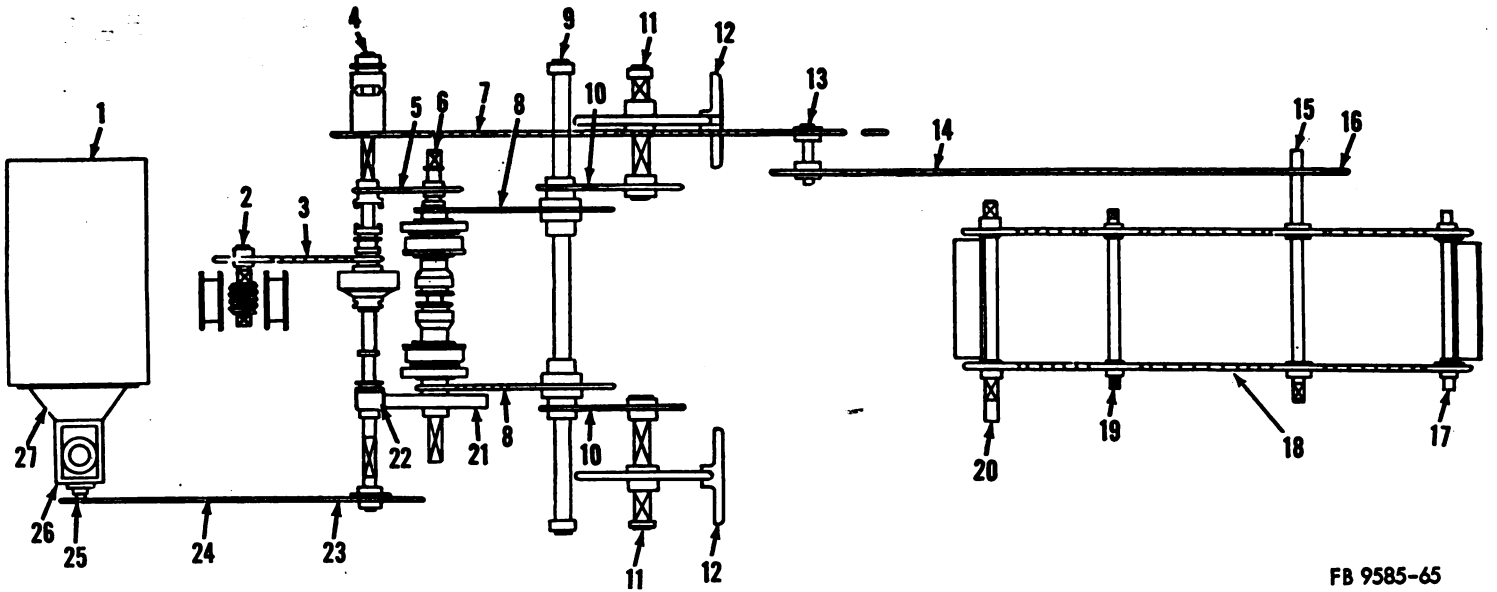
b. Cleaning, Inspection, and Repair.

(1) Clean the crawler drive chains with an approved cleaning solvent; dry thoroughly.

(2) Inspect the chain for broken or loose roller pins and bushings, broken or worn rollers, and for broken or bent link plates. Replace broken links or rollers; replace the chain if a number of links or rollers are damaged.

(3) Repair the chain by replacing damaged links or rollers as follows:

(*a*) Remove the cotter pins securing the roller pins in the pin link to be removed.



1 Engine
2 Power hoist
3 Power hoist drive chain
4 Jackshaft
5 High speed chain
6 Crawler clutch shaft
7 Countershaft drive chain
8 Oscillating shaft drive chain
9 Oscillating shaft
10 Crawler drive chain
11 Crawler drive sprocket shaft
12 Track
13 Countershaft
14 Conveyor drive chain
15 Conveyor drive shaft
16 Spring release sprocket
17 Foot end shaft
18 Flight line chains
19 Takeup shaft
20 Head end shaft
21 Crawler clutch shaft drive gear
22 Jackshaft drive gear
23 Jackshaft sprocket
24 Jackshaft drive chain
25 Transmission output sprocket
26 Transmission
27 Clutch

Figure 65. Conveyor drive system.

(*b*) Drive the roller pins through the links and link plates.

(*c*) Install a connecting link through the end rollers of the chain if a link plate is being replaced. Install an offset link and a cotter pin link if a roller is being replaced. Install a roller link and two cotter pin links if a complete link is being replaced.

(4) Immerse the crawler drive chains in light oil; wipe off excess oil.

c. Installation.

(1) Install the crawler drive chains around the sprockets on the oscillating shaft, and bring the ends over the crawler drive sprockets.

(2) Connect the ends of the crawler drive chains and adjust the tension, if necessary (par. 125*f*).

(3) Close the handhole covers on the shaft transmission housing.

133. High Speed Chain

(fig. 52)

a. Removal.

(1) Slide the door (7) from the shaft transmission housing.

(2) Remove the cotter pins from the double cotter pin link and drive the pins through the links and link plates; remove the high speed chain from the sprockets on the jackshaft and crawler clutch shaft (10).

b. Cleaning, Inspection, and Repair.

(1) Clean and inspect the chain as directed in (132*b*(1) and (2)).

(2) Replace links or rollers as follows:

(*a*) Grind off the riveted ends of the roller pins securing the damaged link.

(*b*) Drive the roller pins through the links and link plates.

(*c*) Install a cotter pin connecting link through the end rollers of the chain if link plates are being replaced. Install an offset link and a cotter pin link if a roller is being replaced. Install a roller link and two cotter pin links if a complete link is being replaced.

(3) Immerse the high speed chain in light oil; wipe off excess oil.

c. Installation.

(1) Install the high speed chain around the sprockets on the jackshaft and the crawler clutch shaft (10). Install a cotter pin connecting link between the chain ends, and secure with a link plate and cotter pins.

(2) Install the sliding door (7) on the shaft transmission housing.

134. Oscillating Shaft Drive Chains (fig. 52)

a. Removal.

(1) Open the sliding door (7) and the handhole covers (8) on the shaft transmission housing.

(2) Remove the cotter pins and pins from the offset links; open the chains.

(3) Remove the oscillating shaft drive chains from the sprockets on the crawler clutch shaft (10) and oscillating shaft.

b. Cleaning, Inspection, and Repair. Clean, inspect, and repair the chain as directed in paragraph 132*b*.

c. Installation.

(1) Install the oscillating shaft drive chains around the sprockets on the crawler clutch shaft (10) and oscillating shaft; secure the ends of the chains with pins and cotter pins in the offset links.

(2) Adjust the tension of the crawler drive chain (par. 125*f*), if necessary.

(3) Close the sliding door (7) and handhole covers (8) on the shaft transmission housing.

135. Power Hoist Drive Chain (fig. 59)

a. Removal.

(1) Slide the door (6) from the conveyor shaft transmission housing. Remove the two nuts, lockwashers, plain washers, and machine bolts securing the power hoist chain guard (4) to the housing top plate (5); remove the chain guard.

(2) Remove the cotter pin and pin from the offset link; open the chain.

(3) Remove the power hoist drive chain from the sprockets on the male half of the power hoist cone clutch, and on the power hoist wormshaft.

b. Cleaning, Inspection, and Repair. Clean, inspect, and repair the chain as directed in paragraph 132*b*.

c. Installation.

(1) Install the power hoist drive chain around the power hoist sprocket, and around the sprocket on the male half of the power hoist cone clutch.

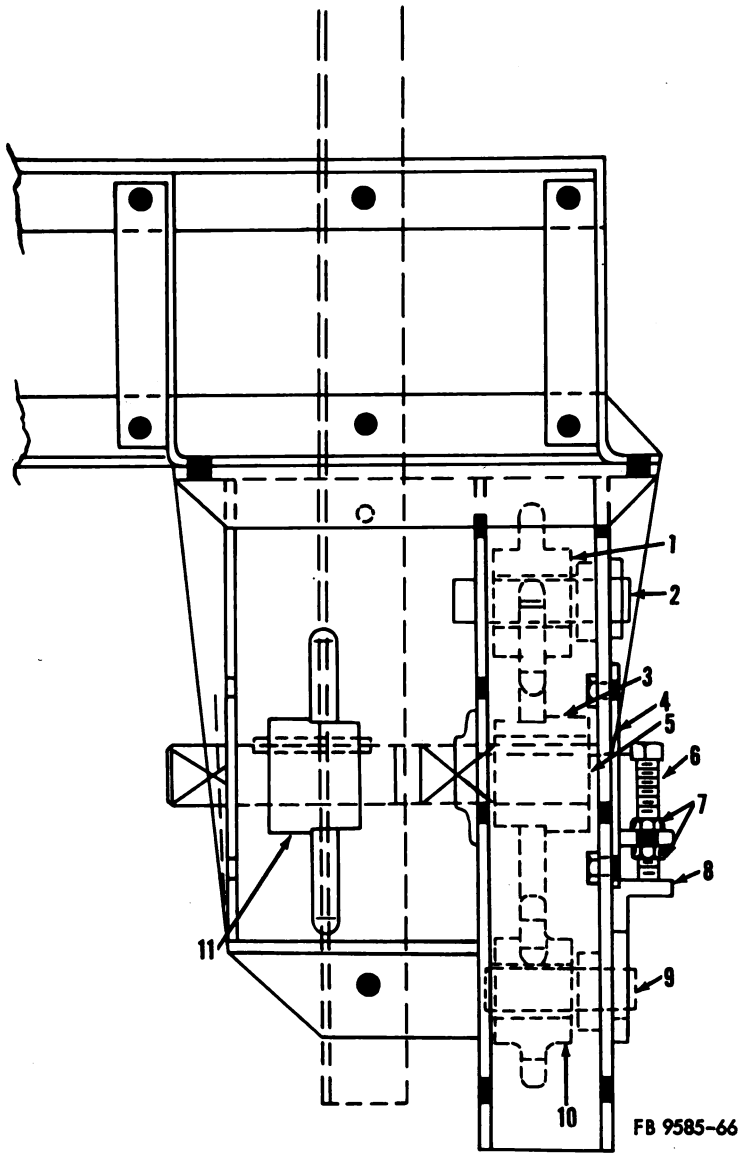
(2) Connect the ends of the chain with a pin and cotter pins in the offset link.
(3) Position the power hoist chain guard (4) on the conveyor shaft transmission housing top plate (5); secure the two machine bolts, plain washers, lockwashers, and nuts.
(4) Install the door (6) on the conveyor shaft transmission housing.

136. Countershaft Drive Chain

a. Removal.
(1) Drive the flight line until the countershaft drive chain offset link is in a convenient position.
(2) Remove the nuts, lockwashers, and machine bolts securing the intermediate drive guard to the conveyor frame; remove the intermediate drive guard.
(3) Remove the six nuts, lockwashers, and machine bolts securing the channel plate (12, fig. 56); remove the plate from the countershaft housing (11).
(4) Loosen the locknuts (7, fig. 66) and back up the adjusting screw (6) to loosen the tension of the countershaft drive chain.
(5) Remove the cotter pin and pin from the offset link in the countershaft drive chain; open the chain.
(6) Remove the chain from the sprockets on the jackshaft, countershaft (5), top idler shaft (2), and adjustable idler shaft (9).

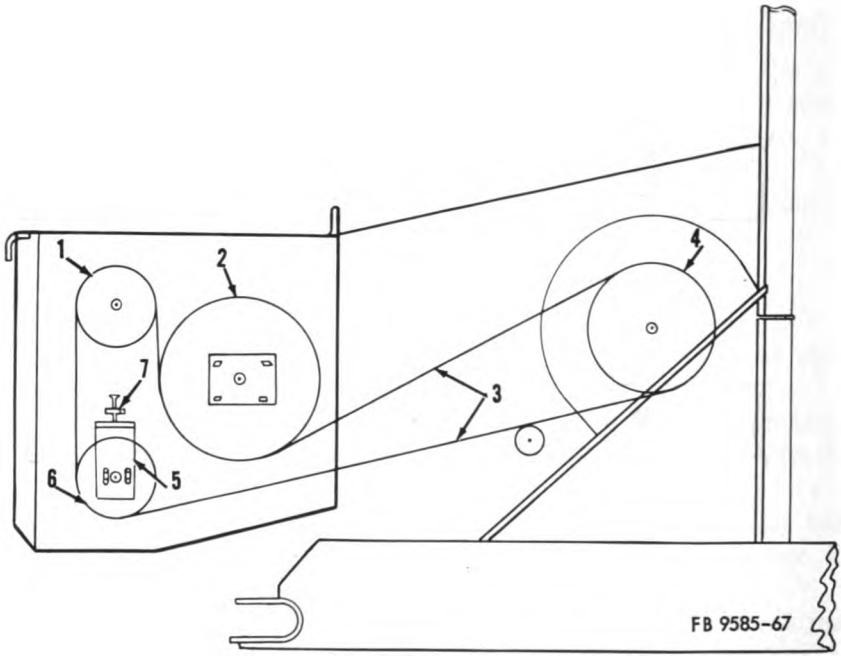
b. Cleaning, Inspection, and Repair. Clean, inspect, and repair the countershaft drive chain as directed in paragraph 132*b*.

c. Installation.
(1) Install the countershaft drive chain around the sprocket on the jackshaft, the countershaft sprocket (3, fig. 66), the idler sprocket (1), and the adjustable sprocket (10), as shown in figure 67.
(2) Install the offset link; secure the ends of the chain with the pin and the cotter pins.
(3) Adjust the tension of the countershaft drive chain (*d* below).
(4) Position the channel plate (12, fig. 56) on the countershaft housing; secure the plate to the two sides of the housing with the six machine bolts, lockwashers, and nuts.
(5) Install the intermediate drive guard on the conveyor frame and secure the guard to the frame with the machine bolts, lockwashers, and nuts.



1 Idler sprocket
2 Idler sprocket shaft
3 Countershaft sprocket
4 Cover plate
5 Countershaft
6 Adjusting screw
7 Locknut
8 Takeup bracket
9 Adjustable idler shaft
10 Adjustable sprocket
11 Countershaft sprocket

Figure 66. Reversing countershaft and takeup idler.



1 Idler sprocket
2 Countershaft sprocket
3 Countershaft drive chain
4 Jackshaft sprocket
5 Takeup bracket
6 Adjustable idler sprocket
7 Adjusting screw

Figure 67. Countershaft drive chain installation.

d. Countershaft Drive Chain Tension Adjustment (fig. 67).

(1) Loosen the locking nut and turn the adjusting screw (7) until the countershaft drive chain can be deflected ½-inch at a point midway between the jackshaft sprocket (4) and adjustable idler sprocket (6).

(2) Tighten the locking nut on the adjusting screw to secure the adjustment.

137. Jackshaft Drive Chain

a. Removal.

(1) Remove the chain guard over the jackshaft drive chain (par. 96*a*(3) and (4)).

(2) Remove the jackshaft drive chain (par. 96*a*(5), (6), and (8)).

b. Cleaning, Inspection, and Repair. Clean, inspect, and repair the chain as directed in paragraph 133*b*.

c. Installation.

(1) Install the jackshaft drive chain (par. 96*c*(4)).

(2) Adjust the tension of the jackshaft drive chain (par. 96*d*).

(3) Install the jackshaft drive chain guard (par. 96*c*(7) and (8)).

138. Conveyor Drive Chain

a. Removal.

(1) Remove the conveyor drive chain guard and chain (par. 103*a*(1) through (3)).

(2) Remove the conveyor drive chain from the takeup idler assembly on the lower push arm, and from the sprocket on the reversing countershaft.

b. Cleaning, Inspection, and Repair. Clean, inspect, and repair the chain as directed in paragraph 133*b*.

c. Installation.

(1) Install the conveyor drive chain around the sprocket (7, fig. 56) on the countershaft, and pull the ends of the chain through the takeup assembly (6, fig. 53).

(2) Install the conveyor drive chain and chain guard (par. 103*e*(8) and (10)).

(3) Adjust the tension of the conveyor drive chain (par. 103*e* (9)).

Section XIX. CONVEYOR SHAFT TRANSMISSION

139. Description

a. Jackshaft. The jackshaft (10, fig. 59) is mounted in the conveyor shaft transmission housing (9, fig. 52) and extends outside of the transmission housing where it is supported on two sleeve bearings mounted in pillow blocks on the conveyor main frame (4). The jackshaft is powered by the jackshaft drive chain and sprocket, mounted outside of the transmission housing. It drives the crawler clutch shaft (10) through either a gear or a chain drive inside the housing, the drive being selected by the high speed lever (13). The power hoist and countershaft are also chain driven off the jackshaft.

b. Crawler Clutch Shaft (fig. 52). The crawler clutch shaft (10) is powered by the jackshaft, and transmits power through the two band clutches, the two sprockets, and the oscillating shaft drive chains to the sprockets on the oscillating shaft. The crawlers are individually engaged through the band clutches and drive chains with the crawler steering clutch levers. The crawlers are individually braked by the brakes, which are part of the band clutches, also with the crawler steering clutch levers. The crawler clutch shaft is supported at each end with a split sleeve type bearing and ball bearing.

c. Housing (fig. 52). The jackshaft and the crawler clutch shaft are enclosed by the conveyor shaft transmission housing (9), the lower part of which is composed of plates welded to the main frame of the conveyor and extending below the main frame to partially enclose the oscillating shaft. The conveyor transmission housing cover is directly over the jackshaft and the crawler clutch shaft, and may be removed to give access to the linkages and other parts of the transmission. A sliding door (7) and handhole covers (8) provide access to the shafts to adjust the clutches, brakes, and linkages.

140. Jackshaft Input Sprocket

a. Removal.

(1) Remove the jackshaft drive chain guard (par. 96*a*(3) and (4)).

(2) Open the jackshaft drive chain (par. 96*a*(5), (6), and (8)) and remove it from the jackshaft sprocket.

(3) Loosen the setscrews on the sprocket hub; remove the sprocket and sprocket key.

b. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent; dry thoroughly.

(2) Inspect the sprocket for worn, cracked, or broken teeth, and for worn or cracked hub; inspect the key for wear, cracks, or other damage. Replace damaged parts.

c. Installation.

(1) Position the key in the keyway of the jackshaft; install the sprocket on the key and jackshaft. Secure by tightening the setscrews.

(2) Install the jackshaft drive chain around the sprocket on the jackshaft; complete the chain installation (par. 96*c*(4)).

(3) Adjust the jackshaft chain tension, if necessary (par. 96*d*).

(4) Install the jackshaft drive chain guard (par. 96*c*(7) and (8)).

141. Crawler Clutch Shaft

a. Clutch Adjustment. The crawler clutches should not be allowed to slip; adjust them tightly enough to remain engaged when the steering levers are placed in the operating position.

(1) Engage the clutch by pushing the steering clutch lever toward the unit.

(2) Open the shaft transmission housing sliding door and handhole covers. Loosen the locknut on the adjusting bolt.

(3) Disengage the clutch.

(4) To tighten the clutch, turn the adjusting nut about one-quarter turn and re-engage the clutch. Check to make sure the clutch remains engaged.

(5) If the clutch slips or disengages, repeat (4) above until the adjustment is correct.

(6) Tighten the locknut to secure the adjustment. Install the shaft transmission sliding door and handhole covers.

b. Brake Adjustment. Be sure the brake bands are free of grease.

(1) Open the shaft transmission sliding door and handhole covers.

(2) Loosen the half nut (4, fig. 58) on the brake adjusting bolt (2) and turn the inside nut down ½ to ¾-turn.

(3) Check the brake operation. Repeat the procedure directed in (2) above until braking is correct.

Note. Do not tighten brakes more than is necessary to brake each crawler when turning on level ground.

(4) Install the shaft transmission door and handhole covers.

142. Shaft Transmission Housing

a. Removal.

(1) Slide the door (7, fig. 52) from the shaft transmission housing.

(2) Remove the two nuts, lockwashers, plain washers, and machine bolts securing the two round handhole covers (8) to the shaft transmission housing (9); remove the handhole covers.

(3) Remove the two nuts, lockwashers, plain washers, and machine bolts securing the power hoist chain guard (4, fig. 59) to the top plate (5) of the housing; remove the chain guard.

(4) Remove the three nuts, lockwashers. and machine bolts securing the lower guide bar (7) to the shaft transmission housing; remove the lower guide bar.

(5) Remove the three nuts, lockwashers, and machine bolts securing the upper guide bar to the shaft transmission housing; remove the upper guide bar.

(6) Remove the 10 nuts, lockwashers, and machine bolts securing the top plate to the shaft transmission housing; remove the top plate.

(7) Remove the 10 nuts, lockwashers, and machine bolts securing the side plates to the shaft transmission housing; remove the side plates.

b. Cleaning, Inspection, and Repair.

(1) Clean all parts with an approved cleaning solvent; dry thoroughly.

(2) Inspect all parts for cracks, breaks, bends, or other damage. Repair slight damage by welding or straightening; replace if damaged beyond repair.

(3) Inspect the parts of the housing welded to the main frame. Reweld broken welds; replace parts damaged beyond repair.

c. Installation (fig. 59).

(1) Position the side plates (9) on the shaft transmission housing; secure with 10 machine bolts, lockwashers, and nuts.

(2) Position the top plate (5) on the shaft transmission housing; secure with 10 machine bolts, lockwashers, and nuts.

(3) Position the upper guide bar on the top plate; secure with the three machine bolts, lockwashers, and nuts.

(4) Position the bottom guide bar (7) on the shaft transmission housing; secure with the three machine bolts, lockwashers, and nuts.

(5) Position the power hoist chain guard (4) on the top plate of the shaft transmission housing; secure with two machine bolts, plain washers, lockwashers, and nuts.

(6) Position the two handhole covers (8) on the handholes in the shaft transmission housing; secure with two machine bolts, plain washers, lockwashers, and nuts.

(7) Install the sliding door (6) in the shaft transmission housing.

CHAPTER 4
FIELD AND DEPOT MAINTENANCE

Section I. INTRODUCTION

143. General

Instructions in this chapter are published for the use of maintenance personnel responsible for third and higher echelons of maintenance of the conveyor. They contain information on maintenance which is beyond the scope of the tools, equipment, or supplies normally available to using organizations.

144. Procedure

Complete disassembly, repair, and reassembly of each major unit or system comprising the conveyor are described. Before proceeding with overhaul, check to see that replacement parts are available.

Section II. TOOLS AND EQUIPMENT

145. General

Tools and equipment required to perform field and depot maintenance on the conveyor are standard mechanics hand tools and the standard group of depot shop equipment such as pullers, presses, and so on.

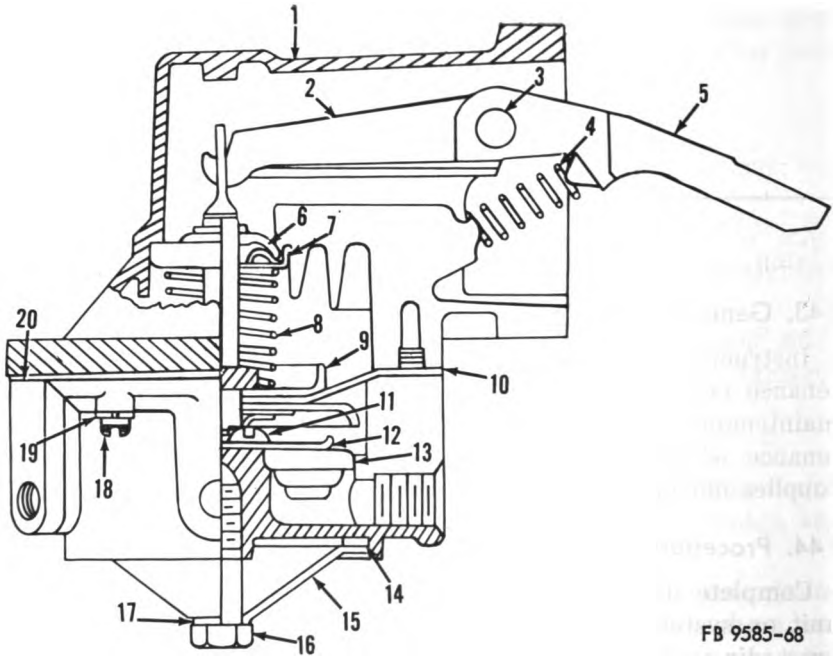
146. Special Tools

No specially designed tools are necessary for repair of the conveyor.

Section III. FUEL PUMP

147. Description
(fig. 68)

The fuel pump is a diaphragm type that operates as the result of the motion of the rocker arm (5) on a cam of the camshaft. The fuel pump is mounted on the engine crankcase in an inverted position. As the rocker arm and link (2) lift the plunger rod connected to the diaphragm (10), the diaphragm is pulled upward, lowering the pressure between the diaphragm and the inlet valve (13), opening the inlet valve and drawing the fuel into the fuel



1	Body	11	Valve retainer screw
2	Link	12	Valve retainer
3	Link pin	13	Valve
4	Rocker arm spring	14	Gasket
5	Rocker arm	15	Cover plate
6	Oil seal	16	Cover plate screw
7	Oil seal retainer	17	Screw gasket
8	Diaphragm spring	18	Cover screw
9	Spring retainer	19	Lockwasher
10	Diaphragm	20	Cover

Figure 68. Fuel pump, cross section.

pump. When the action of the rocker arm on the cam pushes the diaphragm down, the pressure between the diaphragm and the valves is increased, closing the inlet valve, opening the outlet valve, and forcing the fuel pump out the outlet valve. This cycle is repeated at the engine camshaft speed.

148. Disassembly
(fig. 68)

a. Remove the fuel pump (par. 69*a*).

b. Make matching marks with a file or tool across the intersection of the fuel pump cover (20) and body (1). Remove the six cover screws (18) and lockwashers (19) securing the cover (20) to the body; remove the assembled cover.

c. Unhook the pull rod of the diaphragm (10) from the link

(2). Remove the assembled diaphragm, diaphragm spring (8), and spring retainer (9).

d. Remove the diaphragm spring and spring retainer from the diaphragm.

e. File off the riveted end of the link pin (3) and remove the washer. Drive out the link pin securing the rocker arm (5) and link to the body; remove the rocker arm, link, and rocker arm spring (4).

f. File off the staked burs on the inside of the body; use a hooked tool and remove the oil seal (6) and the oil seal retainer (7). Take care not to damage the seal seat.

g. Remove the cover plate screw (16) and gasket (17) securing the cover plate (15) to the cover; remove the cover plate, cover plate gasket (14), and screen.

h. Remove the valve retainer screw (11) securing the valve retainer (12) to the cover; remove the valve retainer, two valves (13), and gaskets. Note the position of the valves in the recesses of the body.

149. Cleaning and Inspection

a. Clean all metal parts with an approved cleaning solvent; dry thoroughly.

b. Discard the oil seal, all gaskets, and the diaphragm and rocker arm springs.

c. Inspect all parts for wear at contact points or holes, worn threads, distortion, cracks, breaks, or other damage; replace damaged parts.

150. Reassembly

(fig. 68)

a. Install the two gaskets and valves (13) in the body recesses; make sure to install the valves in the positions noted at disassembly. Position the valve retainer (12) in the body; secure with the valve retainer screw (11).

b. Position the screen, cover plate gasket (14), and cover plate (15) on the cover; secure with a screw gasket (17) and cover plate screw (16).

c. Install a new oil seal (6) in the retainer (7). Install the assembled oil seal and retainer in the recess of the body; secure by staking the lip of the retainer in four places. Make sure the large cupped surface of the oil seal is downward.

d. Position the link (2) and the rocker arm (5) in the body (1); secure by driving in the link pin (3). Install a washer on the

end of the pin and peen the end. Install a rocker arm spring (4) between the rocker arm and the body, seating the spring on the boss of the body.

e. Soak the diaphragm in clean kerosene. Place the body in a soft jawed vise with the flange upward. Install the diaphragm spring (8) and retainer (9) on the oil seal and retainer in the body; push the pull rod of the diaphragm (10) through the spring retainer, spring, oil seal retainer, and oil seal. Hook the end of the pull rod to the link.

f. Position the assembled cover on the body, matching the marks made before disassembly. Move the rocker arm until the diaphragm is flat across the body flange. Install the six lockwashers (19) and cover screws (18), tightening just enough to engage.

g. Move the rocker arm to the opposite position; tighten the cover screws.

h. Install a pressure gage in the pump outlet opening and operate the rocker arm. The pump should indicate a pressure on the gage. If the pump does not indicate a pressure, the valves may have been inserted upside down or the pump was incorrectly assembled. If the pressure reading falls off rapidly, the pump is leaking or defective.

i. Install the fuel pump (par. 69*c*).

Section IV. CARBURETOR

151. Description

The carburetor is an updraft, single-venturi type with a straight through air intake. The carburetor has a fuel supply system, idle system, high speed system, choke system, and back suction economizer system.

a. Fuel Supply System. The fuel supply to the carburetor is controlled by a float and float valve that keeps the fuel level in the fuel bowl (17, fig. 14) at a constant height throughout the operating range of the engine.

b. Idle System. The idle system controls the flow of fuel at idle speed and at slow speeds until the throttle is opened wide enough to allow the power fuel feed system to function.

c. High Speed System (fig. 14). The high speed system employs a power jet (15) with an adjusting needle (16) to govern the fuel flow at engine operating speeds. Fuel is drawn through the jet by the air flow through the venturi (4). The air flow increases as the throttle valve (5) is opened toward the wide open

position, resulting in additional fuel being supplied to the engine as the speed is increased.

d. Back Suction Economizer System. To provide maximum economy at part throttle operation, the economizer system provides a back suction air passage between the bore in the throttle body and the fuel bowl chamber.

e. Carburetor Choke System (fig. 14). The choke valve (10) restricts the amount of air entering the carburetor, increasing the suction on the nozzle (6) so that additional fuel will be drawn into the manifold.

152. Carburetor Disassembly

a. Remove the carburetor (par. 71*a*(1) through (9)).

b. Remove the four screws securing the throttle body (3, fig. 14) to the fuel bowl (17); remove the fuel bowl and gasket (7) from the throttle body.

c. Remove the pin securing the float lever (18) to the lever bracket on the throttle body; remove the assembled float and lever.

d. Remove the float valve (19) and the venturi (4).

e. Remove the float seat (20) and gasket.

f. Remove the idle jet (21) from the throttle body.

g. Remove the idle adjusting needle (1) and spring (2).

h. Remove the two machine screws securing the throttle valve (5) to the throttle shaft; remove the throttle valve and the assembled throttle shaft and lever.

i. Remove the throttle shaft packing retainer (5, fig. 69) and the packing (4) from the throttle body (2). Force the retainer out with a small screwdriver or punch.

j. Remove the power adjusting needle assembly (16, fig. 14) and gasket.

k. Remove the main nozzle (6) and the gasket (12).

l. Remove the drain plug (14).

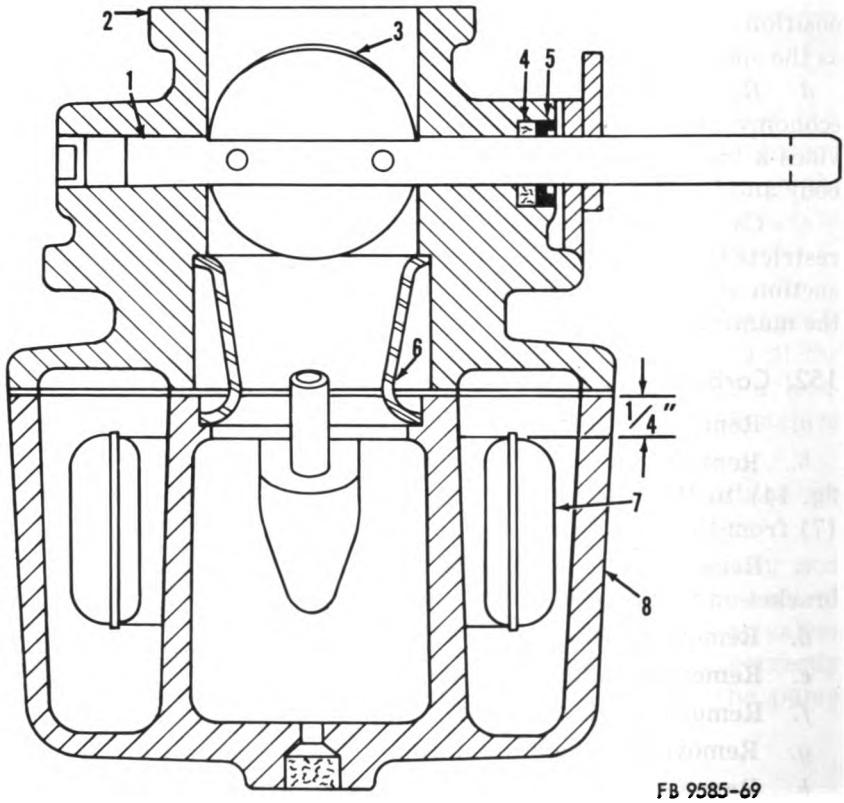
m. Remove the two machine screws securing the choke valve (10) to the choke shaft; remove the valve and the assembled choke lever and shaft (8). Remove the return spring from the choke shaft.

n. Remove the machine screw securing the choke bracket (11) to the fuel bowl; remove the choke bracket.

o. Remove the choke shaft packing from the fuel bowl.

153. Carburetor Cleaning and Inspection

a. Clean all metal parts with an approved cleaning solvent; dry thoroughly.



1 Throttle shaft
2 Throttle body
3 Throttle valve
4 Shaft packing
5 Packing trainer
6 Venturi
7 Float
8 Fuel bowl

Figure 69. Carburetor, cross section.

b. Blow out all small holes and channels in the throttle body and fuel bowl with compressed air. Reverse the flow of air in all passages to remove all carbon and dirt.

Note. Never use a wire or drill to clean carburetor passages or jets.

c. Inspect the float valve and the float valve seat for worn or grooved surfaces; replace the valve and seat if worn or damaged.

d. Inspect the idle adjusting needle and the power adjusting needle for worn or grooved surfaces or other damage; replace if worn or damaged.

e. Inspect the throttle shaft for excessive looseness between the shaft and the throttle body; replace the assembled shaft and lever if the shaft is loose.

f. Inspect the float to make sure it is not loaded with gasoline, worn at the float axle or at the float needle contact point, or otherwise damaged; replace if damaged.

g. Inspect the throttle body and the fuel body for cracks, wear, worn threads, or other damage; replace if damaged.

h. Inspect all parts for wear, cracks, bends, or other damage; replace if damaged.

i. Discard the gaskets, packings, and packing retainer.

154. Carburetor Reassembly

a. Assemble new throttle shaft packing (4, fig. 69) and a new retainer (5) on the throttle shaft (1). Insert the throttle shaft in the carburetor and tap lightly until the retainer is flush with the face of the throttle body (2).

b. Position the throttle valve (3) in the throttle bore with the angle identification mark facing the flange face of the carburetor. Tap the valve lightly to center it in the throttle bore; secure to the throttle shaft with two machine screws.

d. Install the idle jet (21, fig. 14).

d. Install the idle adjusting needle (1) and spring (2). Set the needle one turn from the seat for a preliminary setting.

e. Install a new gasket and new float valve seat (20).

f. Install the venturi (4), a new float valve (19), and a new gasket (7).

g. Install the assembled float (7, fig. 69) and lever (18, fig. 14) on the lever bracket in the throttle body; secure with the float lever pin.

h. Invert the throttle body and set the floats level, using bending tool M–8. Adjust the distance from the top of the gasket on the throttle body to the nearest edge of the float to ¼-inch as shown in figure 69.

i. Install the packing in the choke shaft bore of the fuel bowl (8, fig. 69).

j. Position the choke bracket (11, fig. 14) on the fuel bowl (17); secure with a machine screw.

k. Place the return spring on the choke shaft; install the assembled choke shaft and lever in the fuel bowl. Hook the return spring over the choke bracket.

l. Position the choke valve (10) on the choke shaft; tap lightly to center the valve in the bore. Secure the choke valve to the shaft with two machine screws.

m. Install the drain plug (14).

n. Install a new gasket (12) and the nozzle (6).

o. Install a new gasket and the power adjusting needle (16). Open the needle one turn from the seat for a preliminary setting.

p. Invert the throttle body and lower the assembled fuel bowl over the float, allowing the venturi (4) to guide the two castings into position. Secure with four bowl cover screws.

q. Install the carburetor (par. 71*c*(3) through (12)).

Section V. GOVERNOR

155. Description

The governor is the flyweight type in which the increasing speed of the governor gear (1) and shaft (6) causes the weights (2) to move outward. This centrifugal force is translated into movement of the sleeve (3) against the fork (4) which in turn, actuates the takeoff shaft (5) and lever. The governor lever is joined to the carburetor throttle lever with a ball joint and governor-to-carburetor rod.

156. Governor Disassembly
(fig. 71)

a. Remove the governor (par. 72*a*).

b. Remove the hex nut (36) and lockwasher (35) securing the gear (34) to the shaft (29); remove the gear and woodruff key (30).

c. Remove the machine screw (31) securing the housing base (33) to the housing (4); remove the assembled housing base, shaft, weights (23), sliding sleeve (22), and ball bearing (21).

d. Remove the assembled sleeve and ball bearing and the assembled housing base and ball bearing (32) from the shaft.

e. Remove the machine screw (31) securing the ball bearing to the housing base (33); remove the ball bearing.

f. Press the ball bearing (21) from the sliding sleeve.

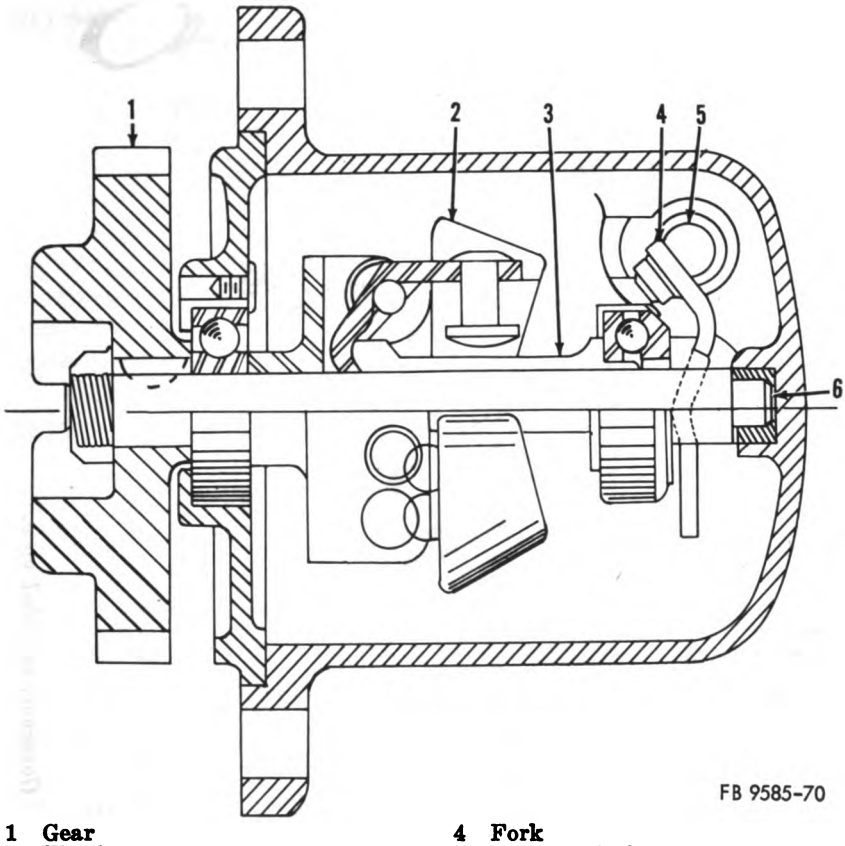
g. Remove the two cotter pins (27) from the two pins (26) securing the weights (23) to the yoke (28); remove the two weights.

h. Remove the two stop machine screws (24) and lockwashers (25) from the yoke.

i. Drive out the spring pin (38) securing the yoke to the shaft; remove the yoke.

j. Disengage the spring (14) from the eyebolt (13) and the pivot lever (17).

k. Remove the hex nut (11) securing the eyebolt to the takeoff lever (12); remove the assembled eyebolt and hex nut. Remove the remaining hex nut.



1 Gear
2 Weight
3 Sleeve
4 Fork
5 Takeoff shaft
6 Shaft

Figure 70. Governor, cross section.

l. Remove the shoulder screw (15) securing the pivot lever to the housing; remove the pivot lever and washer (16).

m. Remove the two machine screws (20) and external tooth lockwashers (19) securing the fork (18) to the takeoff shaft (9); remove the fork.

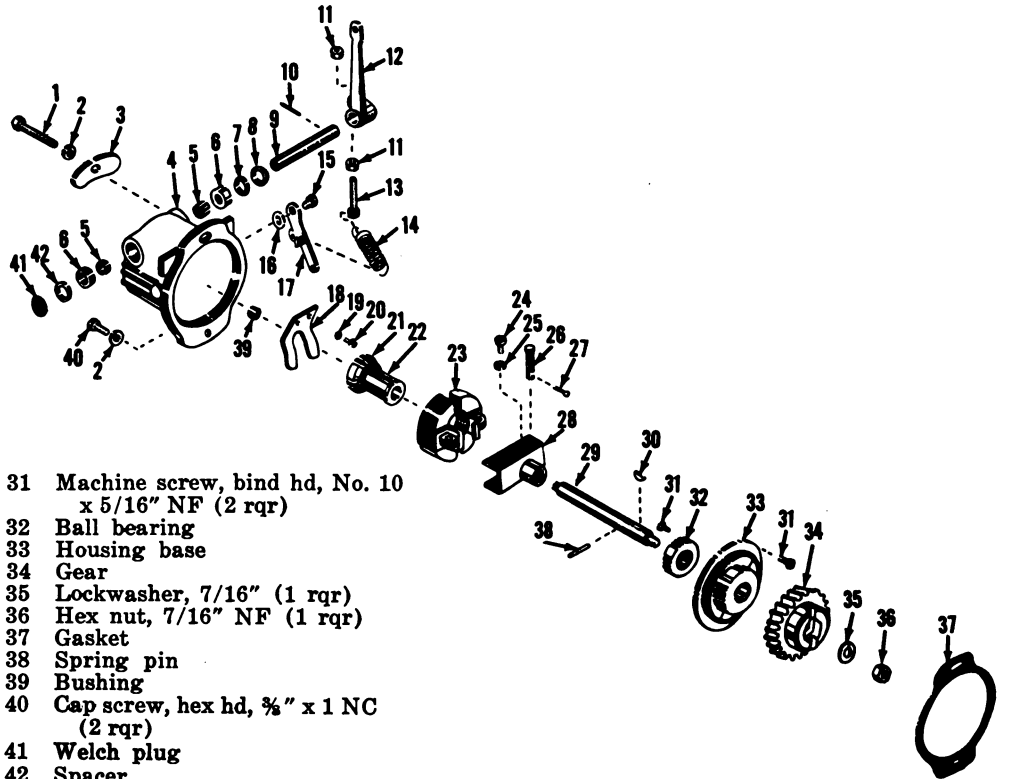
n. Remove the assembled takeoff lever (12) and shaft and the two spacers (5) from the housing.

o. Drive out the spring pin (10) securing the takeoff lever to the shaft; remove the takeoff lever.

p. Insert a rod of slightly smaller diameter than the shaft through the takeoff shaft hole; drive the Welch plug (41) from the housing. Drive out the spacer (42) and ball bearing (6) from the same side.

q. Similarly drive out the oil seal (8), spacer, and ball bearing from the opposite side of the housing.

1 Cap screw, hex hd, ⅜" x 3¼" NC (1 rqr)
2 Lockwasher, ⅜" (2 rqr)
3 Washer
4 Housing
5 Spacer
6 Ball bearing
7 Spacer
8 Oil seal
9 Takeoff shaft
10 Spring pin
11 Hex nut, 5/16" NF (2 rqr)
12 Takeoff lever
13 Eyebolt, 5/16" x 2¾" NF (1 rqr)
14 Spring
15 Shoulder screw
16 Washer
17 Pivot lever
18 Fork
19 Lockwasher, external tooth, No. 10 (2 rqr)
20 Machine screw, fil hd, No. 10 x ⅜" NF (2 rqr)
21 Ball bearing
22 Sleeve
23 Weight
24 Machine screw, fil hd, No. 12 x ¼" NC (2 rqr)
25 Lockwasher, No. 12
26 Pin
27 Cotter pin
28 Yoke
29 Shaft
30 Woodruff key



31 Machine screw, bind hd, No. 10 x 5/16" NF (2 rqr)
32 Ball bearing
33 Housing base
34 Gear
35 Lockwasher, 7/16" (1 rqr)
36 Hex nut, 7/16" NF (1 rqr)
37 Gasket
38 Spring pin
39 Bushing
40 Cap screw, hex hd, ⅜" x 1 NC (2 rqr)
41 Welch plug
42 Spacer

Figure 71. Governor, exploded view.

157. Governor Cleaning, Inspection, and Repair (fig. 71)

a. Clean all metal parts except the ball bearings (6), (21), and (32) with an approved cleaning solvent; dry thoroughly.

b. Clean and inspect the ball bearings as directed in paragraph 126*c*(2).

c. Inspect the bushing (39) inside the housing for wear, scoring, out-of-round, or other damage. If there is evidence of wear or damage, tap the bushing and insert a screw as an extractor; remove the damaged bushing. Press in a new bushing and lubricate with a drop of oil.

d. Inspect the fork (18) and the thrust surface of the ball bearing (21) for wear; replace if worn.

e. Inspect the pin holes in the yoke (28) and weights (23) for signs of wear; replace if worn.

f. Inspect the gear for breaks, cracks, wear, damaged teeth; or other damage; replace if worn or damaged.

g. Inspect all other parts for cracks, breaks, wear, worn or damaged threads, or other damage; replace if damaged.

h. Discard the gasket (37).

158. Governor Reassembly (fig. 71)

a. Install the ball bearing (6), spacer (42), and Welch plug (41) in the counterbore of the housing (4); seat the plug with a sharp blow of the ball end of a ball peen hammer.

b. Install the ball bearing, spacer (7), and oil seal (8) in the counterbore at the opposite side of the housing.

c. Position the takeoff lever (12) on the takeoff shaft (9); secure to the shaft with the spring pin (10).

d. Install the shaft through the oil seal, spacer, and ball bearing until it is visible inside the housing; slip the spacers (5) on the shaft and seat the shaft in the bearing on the opposite side of the housing.

e. Position the fork (18) on the takeoff shaft; secure with two external tooth lockwashers (19) and machine screws (20).

f. Position the washer (16) and pivot lever (17) on the housing (4); secure with the shoulder screw (15).

g. Install a nut (11) on the eyebolt (13); install the eyebolt in the takeoff lever. Secure with the remaining nut.

h. Fully install the two lockwashers (25) and stop machine screws (24) in the yoke (28).

i. Position the weights (23) in the yoke; secure with two pins (26) and cotter pins (27).

j. Position the assembled yoke and weights on the shaft (29); secure with a spring pin (38).

k. Position the ball bearing (32) in the housing base (33); secure with a machine screw (31).

l. Press the ball bearing (21) on the sliding sleeve (22).

m. Install the assembled ball bearing and sleeve and the assembled ball bearing and housing base on the shaft. Install the assembly in the housing, seating the end of the shaft in the bushing (39); secure with a machine screw (31).

n. Place the woodruff key (30) in the keyway of the shaft and install the gear (34) on the shaft and key; secure with a lockwasher (35) and hex nut (36).

o. Hook the end of the spring (14) between the pivot lever and the eyebolt.

p. Install the governor and adjust if necessary (par. 72*c* and (d)).

Section VI. GENERATOR

159. Description

The generator is a 24-volt, insulated, ventilated, two brush shunt unit treated for fungus and corrosion resistance. The armature is ball bearing mounted at both the drive and commutator ends. Both ball bearings are sealed. A fan assembly mounted on the armature shaft provides air cooling for the generator.

160. Generator Disassembly

a. Remove the generator (par. 77*c*(2) through (4)).

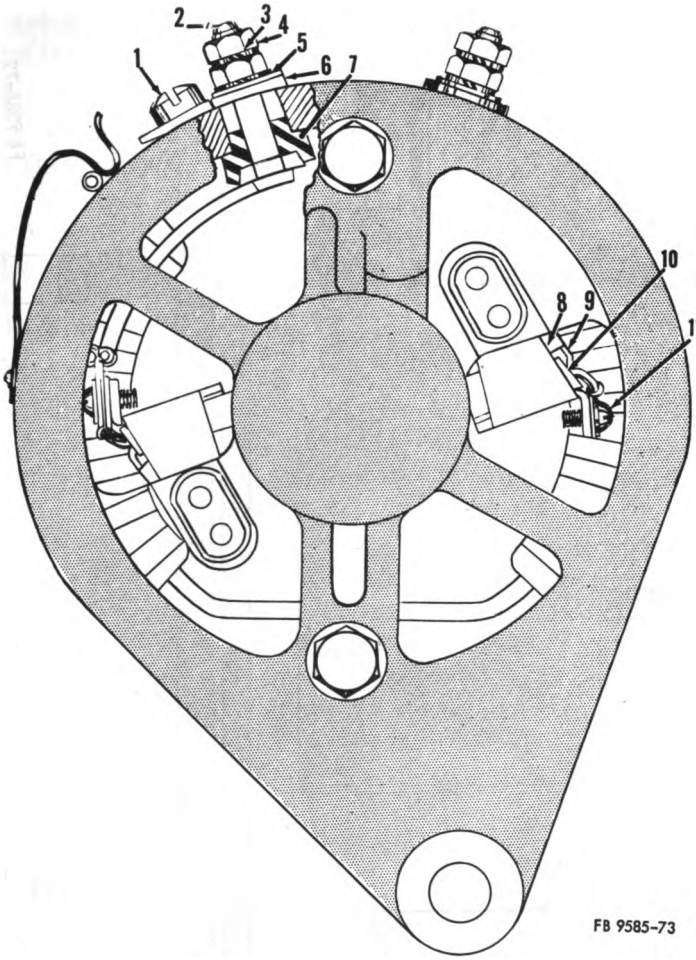
b. Remove the hex nut (15, fig. 72) and lockwasher (14) securing the fan assembly and spacer collar (12) to the shaft of the armature (3) at the drive end; remove the fan assembly, spacer collar, and woodruff key (13).

c. Remove the two through bolts (19) and lockwashers (20) securing the end bell (8) and commutator end frame (1) to the field frame (4); remove the end bell and commutator end frame.

d. Remove the three ball bearing retainer plate screws and lockwashers (18) securing the ball bearing retainer plate (10) to the end bell; remove the ball bearing retainer plate, flat washer (16), generator spacer (17), and the ball bearing (11).

e. Remove the cover band (2) from the field frame.

f. Remove the four hex nuts (4, fig. 73), terminal stud lockwashers (3), two flat washers (5), and washer insulators (6)

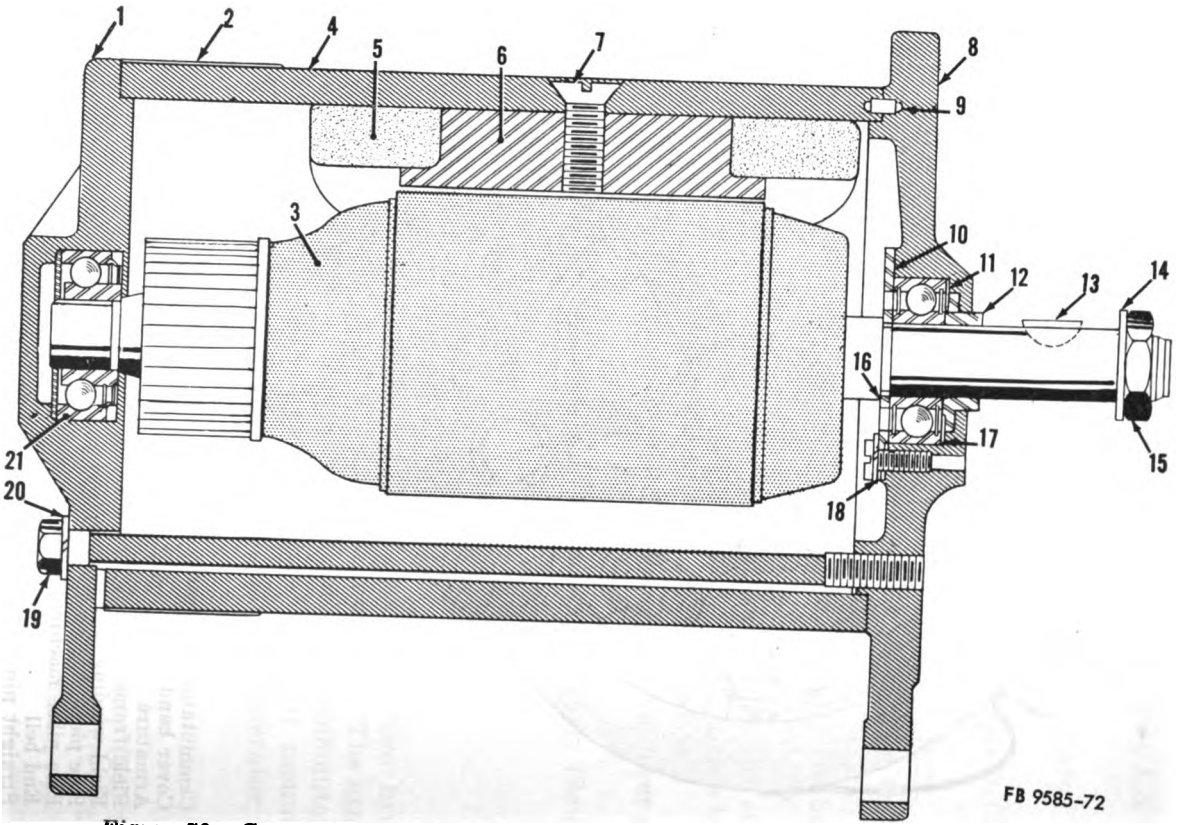


1	Commutator end frame	12	Spacer collar
2	Cover band	13	Woodruff key
3	Armature	14	Lockwasher, 11/16" (1 rqr)
4	Field frame	15	Hex nut
5	Field winding	16	Flat washer
6	Pole piece	17	Generator spacer, drive end
7	Pole piece machine screw	18	Screw and lockwasher
8	End bell	19	Through bolt
9	Straight pin	20	Lockwasher
10	Ball bearing retainer plate	21	Ball bearing, commutator end
11	Ball bearing, drive end		

Figure 72. Generator, cross section.

from the terminal studs (2) protruding through the top of the field frame.

g. Remove the two screws and lockwashers (11) securing the electrical leads and the electrical contact brushes (10) to the tension levers; remove the electrical leads, terminal studs, and



1 Machine screw and lockwasher
2 Terminal stud
3 Terminal stud lockwasher
4 Hex nut, No. 12 NC (4 rqr)
5 Flat washer
6 Washer insulator
7 Bushing insulator
8 Tension lever
9 Brush spring
10 Electrical contact brush
11 Screw and lockwasher

Figure 73. Generator, commutator head, cut-away view.

electrical contact brushes. Remove the bushing insulators (7) from the field frame.

h. Remove the brush springs (9) from the tension levers.

i. Remove the ball bearing (21, fig. 72) from the commutator end frame (1).

j. Remove the two pole piece machine screws (7) securing the pole pieces (6) and field windings (5) in the field frame; remove the pole pieces and field windings.

161. Generator Cleaning, Inspection, and Repair

a. Cleaning.

(1) Clean the field frame (4, fig. 72), cover band (2), commutator end frame (1), end bell (8), and the fan assembly with an approved cleaning solvent; dry thoroughly with clean, dry, compressed air.

(2) Wipe the armature (3) with a cloth dampened with an approved cleaning solvent. Sand the commutator with No. 00 sandpaper. Do not handle the commutator. Clean all dirt from between the commutator bars, but do not damage or form burs on the bars or on the mica. Blow all loose dirt from the armature with clean, dry, compressed air.

(3) Clean all metal parts with an approved cleaning solvent; dry thoroughly.

b. Inspection.

(1) Using a test probe set (fig. 74) consisting of a lamp in series with two test points and connected to a 110-volt lighting circuit, check the field windings for grounds and open windings as follows:

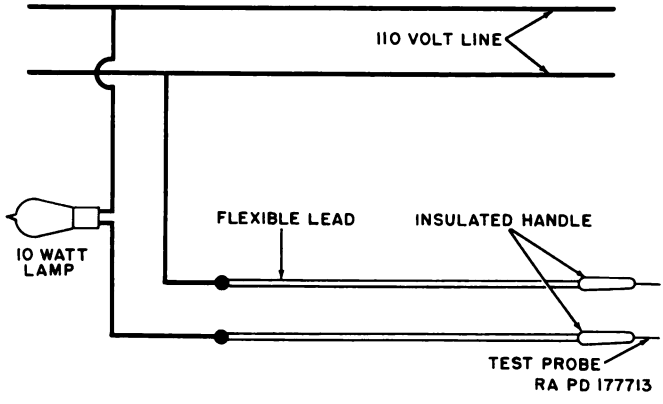


Figure 74. Test probe set.

(*a*) Touch the probes to the two leads of each winding. If the lamp fails to light, the winding is open. Replace an open winding.

(*b*) Install the field windings (5, fig. 72) and pole pieces (6) in the field frame (4); secure with the pole piece machine screws (7).

(*c*) Touch one test probe to the field lead terminal stud and the other to the frame. The windings are grounded if the lamp lights; replace a grounded winding.

(2) Inspect the generator armature (3) to make sure all coils are properly pressed into coil slots, and are soldered to commutator risers; replace generator armature if windings are loose or unsoldered at the commutator.

(3) Inspect the shaft of the armature for wear; replace if scored, or if the diameter at the commutator end or at the drive end is less than 0.6681-inch.

(4) Inspect the commutator; repair as directed in *c* below if rough, worn, or out-of-round. Place the generator armature in V-blocks and check the concentricity of the commutator with a dial indicator; turn down the commutator if the eccentricity exceeds 0.001-inch. Replace the generator armature if the commutator diameter is less than 1.650-inches.

(5) Place the generator armature in V-blocks and use a test probe set to check for grounds. Touch one probe to the shaft or core and the other probe to the commutator segment risers, in turn. Do not touch probes to brush or bearing surfaces. If the lamp lights, the generator armature is grounded and should be replaced.

(6) Test for open armature circuits by touching the probes to the risers on a pair of adjacent commutator bars. Replace the generator armature if the circuits are open, as indicated by the lamp not lighting. Repeat this test on every pair of adjacent commutator bars.

(7) Test for a shorted generator armature by installing the generator armature on a growler (fig. 75). Hold a thin steel strip above the armature shaft and rotate the generator armature slowly. If a short is present, the steel strip will be magnetized and vibrate; replace a shorted generator armature.

(8) Inspect the commutator end frame (1, fig. 72) for cracks or distortion; replace if damaged.

(9) Inspect the tension levers (8, fig. 73) for distortion or other damage; replace if damaged.

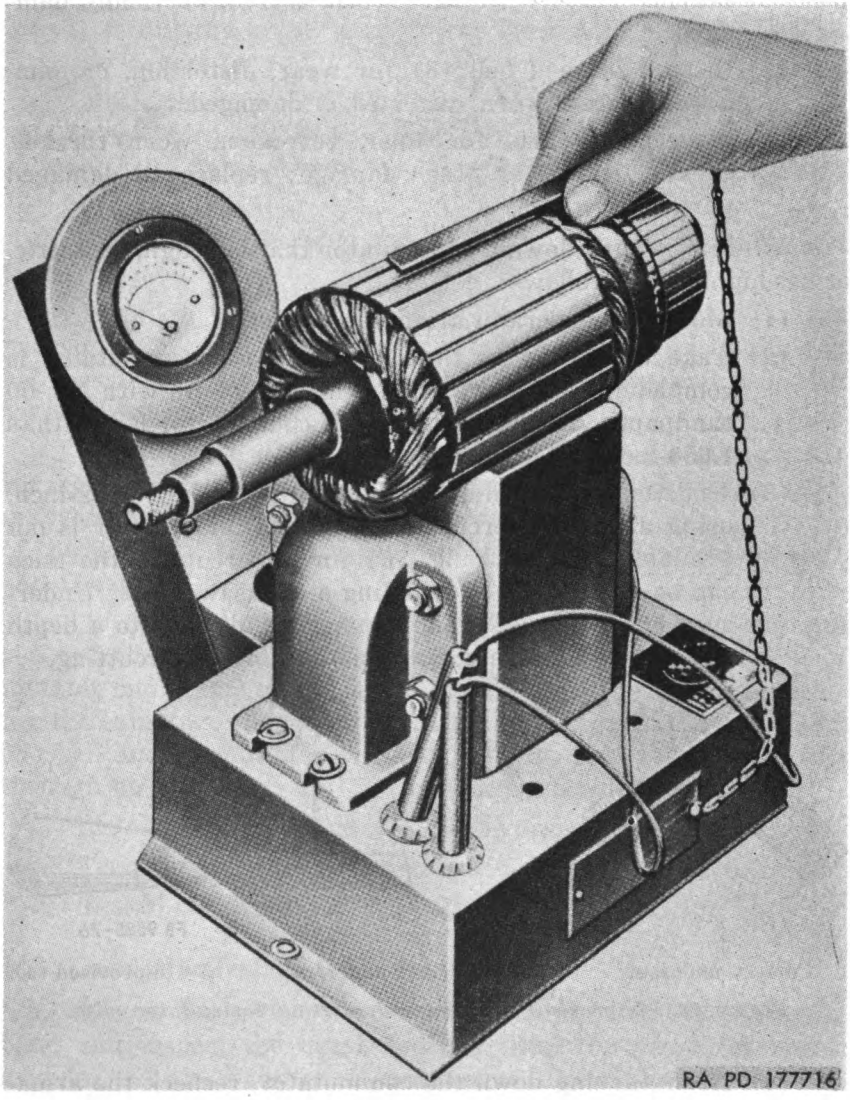


Figure 75. Checking armature for shorts.

(10) Inspect the cover band (2, fig. 72) for fit on the field frame; straighten the band to fit the frame tightly or replace the band.

(11) Inspect the electrical contact brushes (10, fig. 73) for wear, chipping, or oil-soaked condition; install the brushes in the tension levers (8) and check that they slide freely. Replace brushes that are chipped, oil-soaked, bind, or are worn to less than ½-inch in length.

(12) Inspect the ball bearings for wear; replace the commutator end ball bearing (21, fig. 72) or the drive end ball

bearing (11) if they are worn, scored, or visibly damaged.

(13) Inspect the end bell (8) for wear, distortion, or damage; replace if worn, distorted, or damaged.

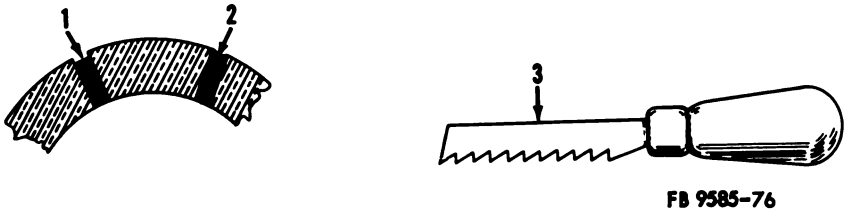
(14) Inspect all parts for wear, corrosion, worn threads, breaks, cracks, or other damage; replace all damaged parts.

c. Repair. Turn down a commutator that is rough, eccentric, or has high mica as follows:

(1) Mount the generator armature in a lathe.

(2) Take light cuts on the lathe until the commutator is completely cleaned up, then remove all burs with No. 00 sandpaper. Replace armature if commutator is less than 1.650-inches in diameter.

(3) Undercut the commutator mica to a depth of 1/32-inch, using a mica undercutter. If a mica undercutter is not available, a tool (3, fig. 76) for undercutting the mica can be improvised by grinding a hacksaw blade. Undercut (1), clean and square, removing all mica to a depth of 1/32-inch is the correct method for undercutting.



1 Correct undercut 2 Incorrect undercut 3 Improvised tool

Figure 76. Improvised tool for undercutting commutator mica.

(4) After turning down the commutator, recheck the armature for grounds, open circuits, and shorts as directed in *b* (5) through (7) above.

162. Generator Reassembly

a. Position the two field windings (5, fig. 72) in the field frame (4). Install the two pole pieces (6) and secure with the pole piece machine screws (7)

Note. Use a pole shoe spreader when installing the pole pieces.

b. Install the two electrical contact brushes (10, fig. 73) in the tension levers (8); secure by installing the brush springs (9).

c. Position the terminal stud (2) and lead on the ungrounded brush; secure the brush leads to the tension levers with screws and lockwashers (11).

d. Place the two terminal studs through the openings in the field frame; secure with two bushing insulators (7), washer insulators (6), flat washers (5), four terminal stud lockwashers (3), and hex nuts (4).

e. Install a ball bearing (21, fig. 72) in the commutator end frame (1).

f. Install a generator spacer (17), ball bearing (11), flat washer (16) and a ball bearing retainer plate (10) in the end bell; secure the ball bearing retainer plate to the end bell with three screws and lockwashers (18).

g. Position the drive end of the shaft of the armature (3) through the assembled drive frame. Install the spacer collar (12), and the fan assembly with the woodruff key (13) in the keyway of the shaft and the fan assembly; secure with a lockwasher (14) and a hex nut (15).

h. Install the commutator end of the assembled armature and end bell through the field frame, and install the assembled commutator end frame on the commutator end of the armature, seating the armature shaft in the ball bearing. Secure the assembled end bell and commutator end frame to the field frame with two through bolt lockwashers (20) and through bolts (19).

i. Install the cover band (2) on the assembled field frame.

j. Test the generator as directed in paragraph 163 below.

k. Install the generator (par. 77*g*(4) through (9)).

163. Generator Testing

a. Mount the generator on a test stand. Remove the cover band and inspect the brush seating. Run the generator under load to seat the brushes, if necessary. Allow the generator to cool before testing.

Note. The following tests will not give correct results unless the brushes seat correctly and the generator is cool.

b. If the generator is producing no output, check as follows:

(1) Inspect the commutator for burned bars. If bars are burned, an open field winding is indicated; replace the open winding.

(2) Raise the grounded brush from the commutator and touch one probe of a test probe set (fig. 74) to the insulated brush terminal and the other to the field frame. If the light lights, the generator is grounded.

(3) Raise both brushes from the commutator and check the field windings, commutator, brush holders, and field terminal to locate the ground; replace grounded part.

(4) If the ground cannot be located, remove the field windings and check for an open circuit (par. 161*b*(1)).

(5) If the field windings are not open, check the generator armature for a short circuit (par. 161*b*(7)).

c. If the generator output is low or unsteady, check as follows:

(1) Check the brush springs for proper tension (par. 77*a*(7)); correct tension is between 24 to 32 ounces. Replace the brush springs if the tension is not correct.

(2) Inspect the commutator; if it is dirty, out-of-round, or has high mica, repair as directed in paragraph 161*c*.

(3) Check for opens or grounds in the armature circuit (par. 161*b*(5) and (6)).

d. If the generator output is excessive, check as follows:

(1) Disconnect the field terminal and operate the generator at medium speed. If the output drops off, the regulator is faulty; repair or replace the voltage regulator.

(2) Operate as in (1) above. If the output remains excessive, check to see if the field windings in the generator are grounded at the pole pieces, leads, or terminals.

e. If the generator is noisy, check for loose mounting, loose fan assembly, worn or dirty ball bearings, or improperly seated brushes.

Section VII. VOLTAGE REGULATOR

164. Description

The voltage regulator (fig. 77) consists of a voltage regulator unit, current regulator unit, and cutout relay unit.

a. Voltage Regulator (fig. 78).

(1) The voltage regulator has two windings assembled on a single core. A shunt winding consisting of many turns of fine wire is shunted across the generator, and a series winding of a few turns of relatively heavy wire is connected in series with the generator field circuit when the regulator contact points are closed.

(2) The windings and core are assembled into a frame. A flat steel armature is attached to the frame by a flexible hinge so that it is just above the end of the core. The armature contains a contact point which is just beneath a stationary contact point. When the voltage regulator

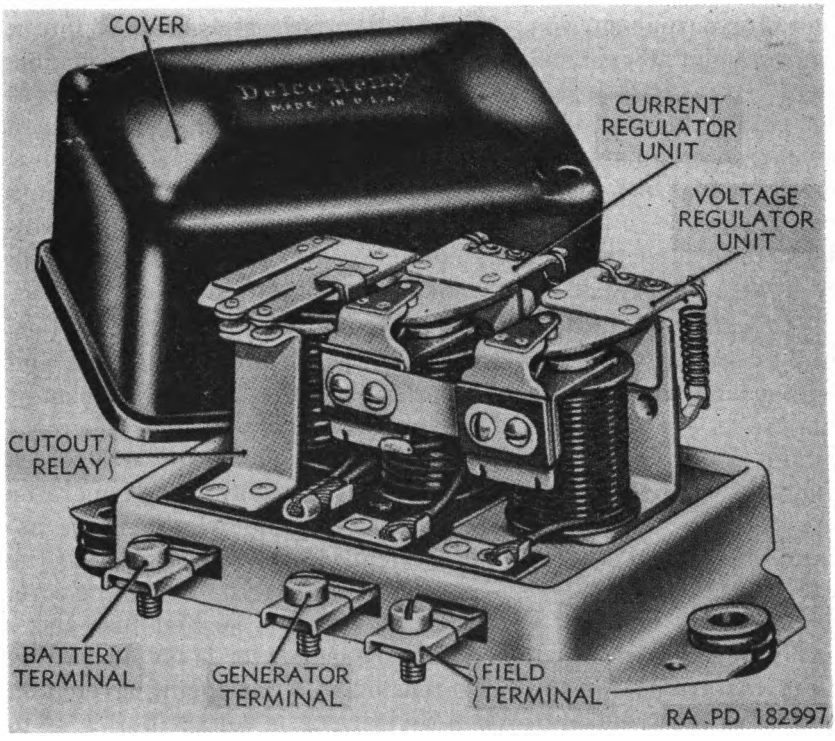


Figure 77. Voltage regulator with cover removed.

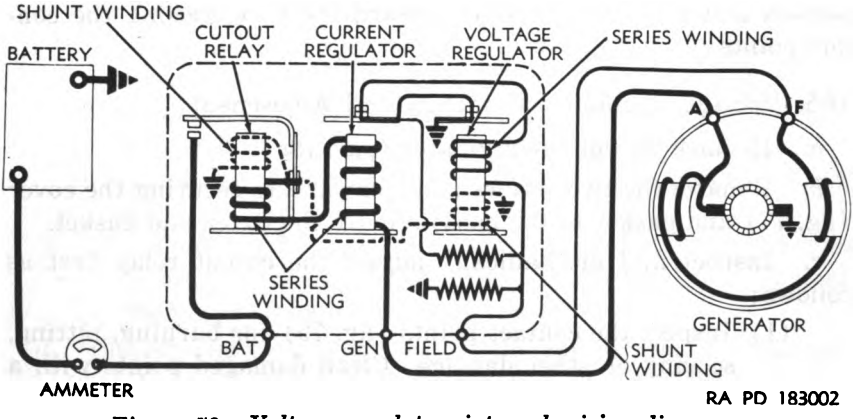


Figure 78. Voltage regulator, internal wiring diagram.

is not operating, the tension of two spiral springs holds the armature away from the core so that the points are in contact and the generator field circuit is completed to ground through them.

b. Current Regulator (fig. 78). The current regulator has a series winding of a few turns of heavy wire that carries all the

generator output current. The winding core is assembled into a frame. A flat steel armature is attached to the frame by a flexible hinge so that it is just above the core. The armature has a contact point which is just below a stationary contact point. When the current regulator is not operating, the tension of two spiral springs holds the armature away from the core so that the points are in contact. In this position, the generator field circuit is completed to ground through the current regulator contact points in series with the voltage regulator contact points.

c. Cutout Relay (fig. 78). The cutout relay has two windings on one core; a series winding of a few turns of heavy wire, and a shunt winding consisting of many turns of fine wire. The shunt winding is shunted across the generator so that the generator voltage is impressed across it at all times. The series winding is connected in series with the charging circuit so that the generator output passes through it. The relay core and windings are assembled into a frame. A flat steel armature is attached to the frame by a flexible hinge so that it is centered just above the core. The armature has one contact point which is located just above the stationary contact point. When the generator is not operating, the points are held open by the tension of a flat spring riveted on the side of the armature. When the generator voltage builds up to a value great enough to charge the battery, the magnetism induced in the relay core is sufficient to overcome the armature spring tension and pull the armature toward the core, closing the contact points.

165. Voltage Regulator Inspection and Adjustment

a. Remove the voltage regulator (par. 78*a*).

b. Remove the two screws and lockwashers securing the cover (fig. 77) and gasket to the base; remove the cover and gasket.

c. Inspect and mechanically adjust the cutout relay first as follows:

(1) Inspect the contact points (fig. 79) for burning, pitting, scoring or other damage. Clean damaged points with a clean, thin, fine-cut, contact file. Do not file more than necessary.

Caution: Do not use the contact file for other metals. Never use sandpaper or emery cloth to clean the points.

(2) Place a finger on the armature directly above the core and press until the contact points just close.

(3) Use a feeler gage to measure the air gap between the armature and the center of the core with the points just touching. The air gap should be 0.017-inch.

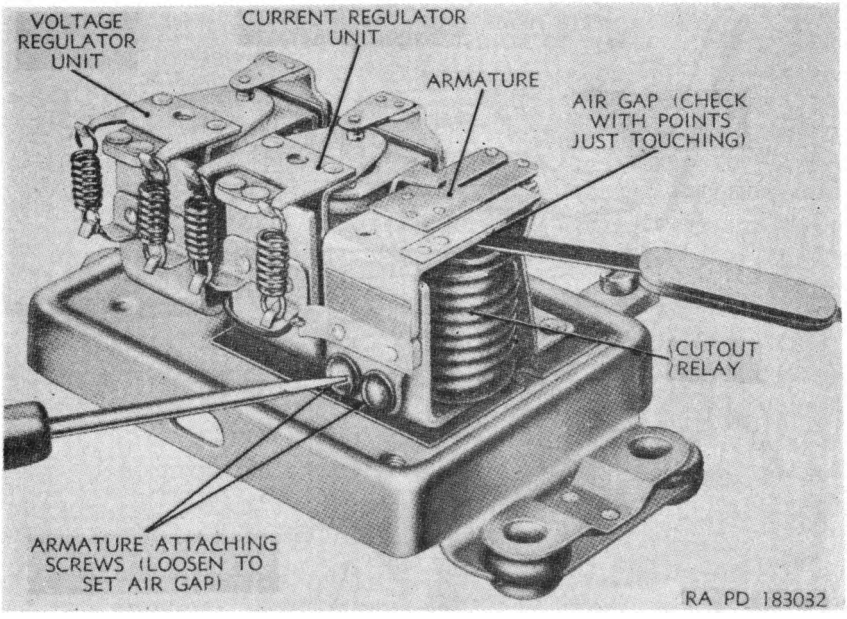


Figure 79. Cutout relay air gap check and adjustment.

(4) If necessary, adjust to the proper value by loosening the two adjusting screws (fig. 79) securing the stationary contact bracket, raise or lower the bracket as necessary. Tighten the adjustment screws to secure the adjustment.

Caution: Be sure both points are accurately alined and that both close simultaneously.

(5) Use a feeler gage to measure the gap between the contact points (fig. 80). The gap should be 0.032-inch.

(6) Bend the upper armature stop to give the proper contact gap.

Caution: Do not break the winding lead or the connection securing the winding lead to the lower part of the upper armature stop.

d. Inspect and electrically adjust the cutout relay as follows:

(1) Place the voltage regulator on a test stand. Connect a generator of the same type as is used on the conveyor to the armature and field leads of the voltage regulator as shown in figure 81. Mount the voltage regulator on the test stand in the same position as it mounts on the engine.

Caution: Do not connect a battery to the voltage regulator while testing.

(2) Operate the voltage regulator on the test stand for 30 minutes at the normal generator operating speed of

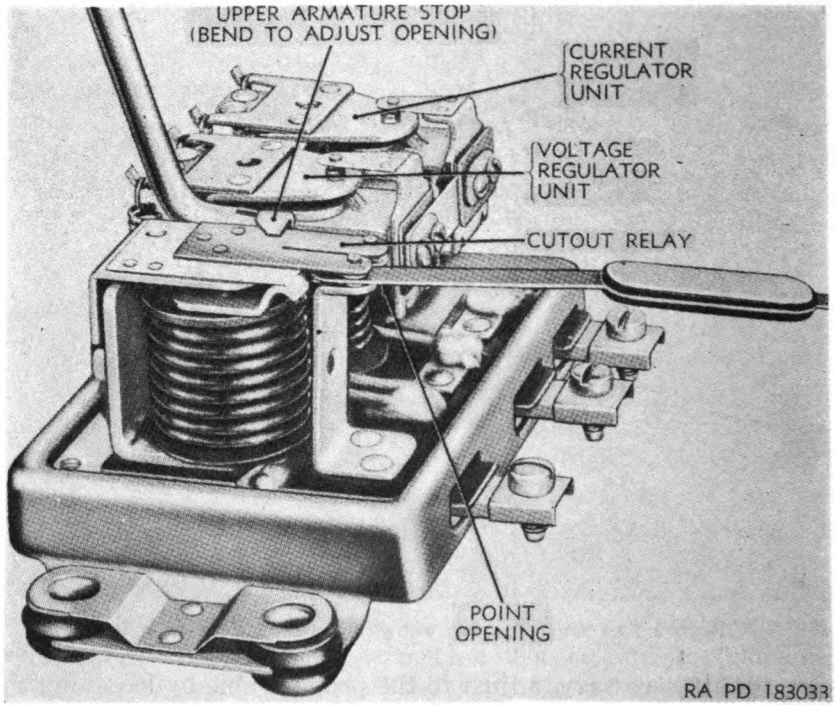


Figure 80. Cutout relay point opening check and adjustment.

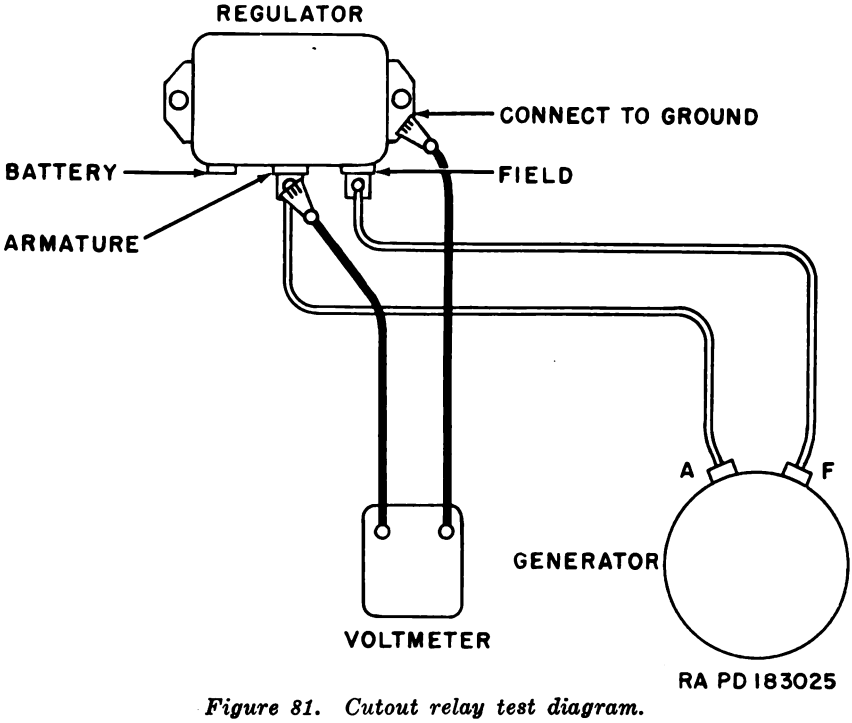


Figure 81. Cutout relay test diagram.

2000 rpm to bring the voltage regulator up to normal operating temperature.

Note. The voltage regulator must be at operating temperature in order that proper values be obtained. If the voltage regulator is allowed to cool during the test procedures, run the generator and voltage regulator as specified above before continuing the test.

(3) Connect a voltmeter between the armature terminal and the ground connection as shown in figure 81.

(4) Start the generator, then slowly increase its speed.

(5) Note the voltage at which the cutout relay points close; it should be between 24 and 27 volts.

(6) If the closing voltage is too high, turn the adjusting screw counterclockwise to decrease the closing voltage. If the closing voltage is too low, turn the adjusting screw clockwise to increase the closing voltage. Refer to figure 82. Adjust to make the closing voltage as close to 25.5 volts as possible.

(7) After each adjustment, decrease the generator speed and manually open the cutout relay points momentarily. This will cause the voltage to drop so that the effect of residual magnetism in the relay core is nullified. Increase

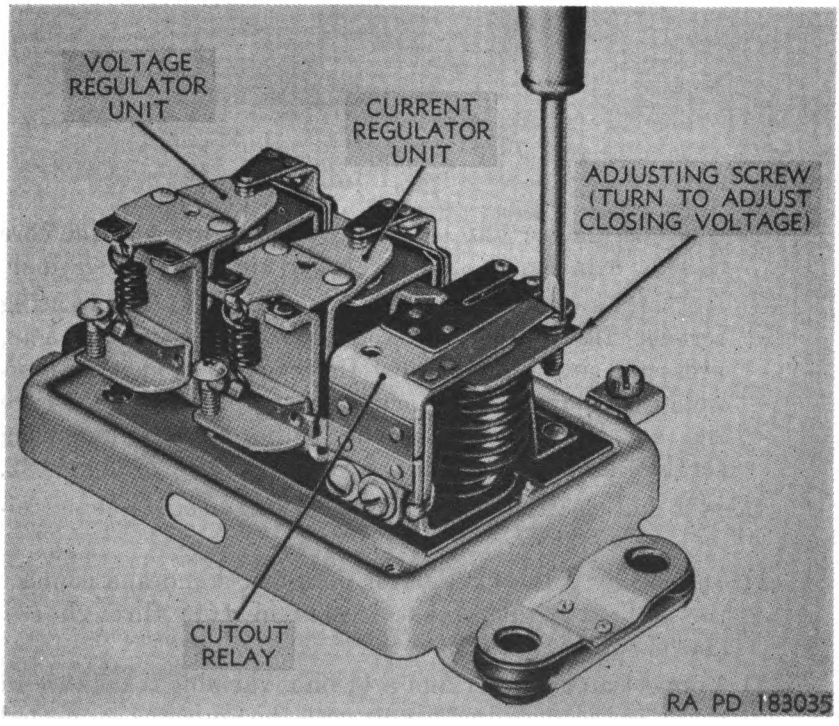


Figure 82. Adjusting cutout relay closing voltage.

the generator speed and check the closing voltage again. Repeat this procedure until the closing voltage is correct.

e. Inspect and adjust the voltage regulator air gap as follows:

(1) Place a finger in the center of the voltage regulator armature; push down until the contact points open, then release pressure until the points just close.

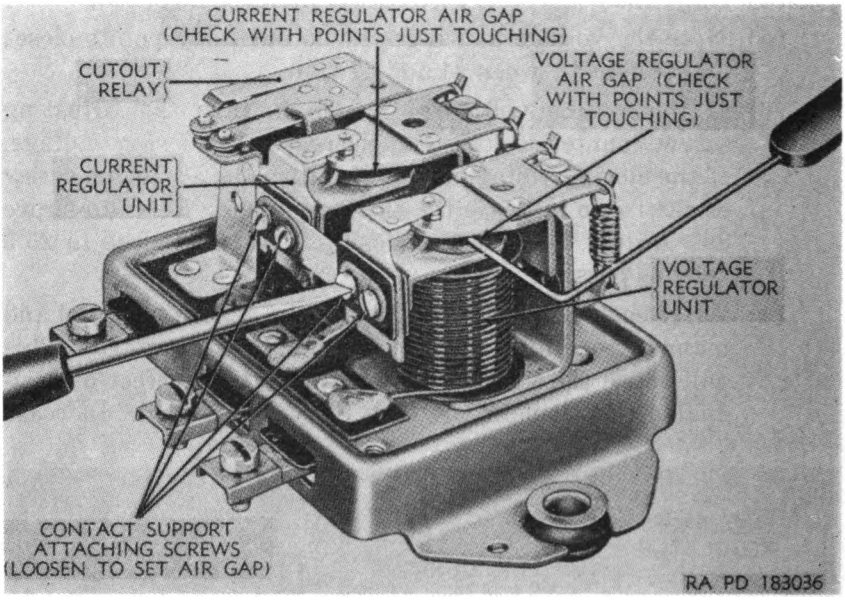


Figure 83. Voltage regulator.

(2) Measure the air gap between the armature and the core as shown in figure 82; the proper air gap is 0.075-inch.

(3) To adjust the air gap, loosen the contact mounting screws. Insert a gage of the proper size in the air gap, press the armature against the gage to hold it in position, and move the contact bracket up or down. Secure the adjustment by tightening the contact mounting screw. Be sure the contacts are alined. Refer to figure 82.

f. Inspect and electrically adjust the voltage regulator as follows:

(1) Install the voltage regulator on a test stand and connect the voltage regulator as directed in *d*(1) through (3) above.

(2) Connect an ammeter and a ¼ ohm variable resistance in series in the charging circuit with the ammeter connected to the regulator battery terminal. Refer to figure 84.

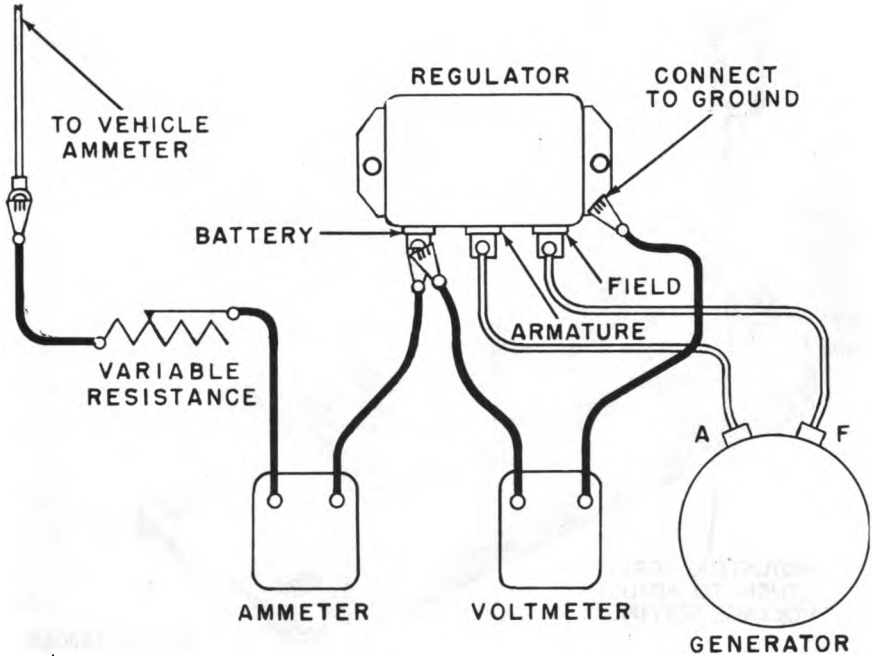


Figure 84. Voltage regulator test diagram.

(3) Start the generator and operate at 2000 rpm.

(4) Adjust the generator output until 8 to 10 amperes are flowing in the charging circuit and the regulator is at operating temperature with cover on. Retard generator speed until the cutout relay points open and the voltage is reduced to 6 volts. Bring the generator back to speed and note the voltage setting.

(5) The correct voltage setting should be between 27.5 and 29.5 volts.

(6) Adjust the voltage setting as close to 28.5 as possible by turning the adjusting screw clockwise to increase the voltage setting and counterclockwise to decrease the voltage setting. Refer to figure 85.

g. Inspect and adjust the current breaker air gap in the same manner as directed in *e* for the voltage regulator. The correct air gap is 0.075-inch.

h. Inspect and adjust the current setting of the current regulator as follows:

(1) Install the voltage regulator on a test stand as directed in *d* above.

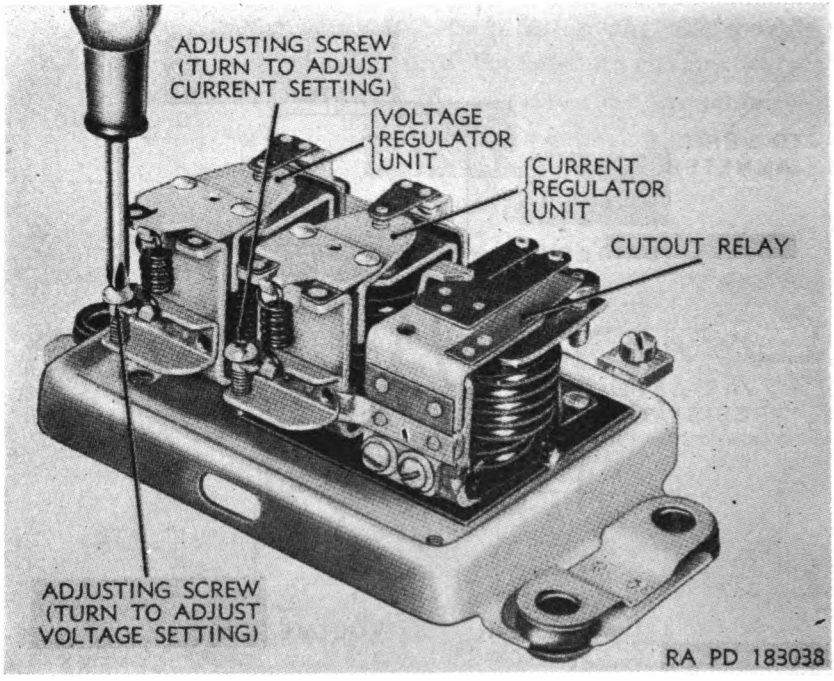


Figure 85. Adjusting regulator unit setting.

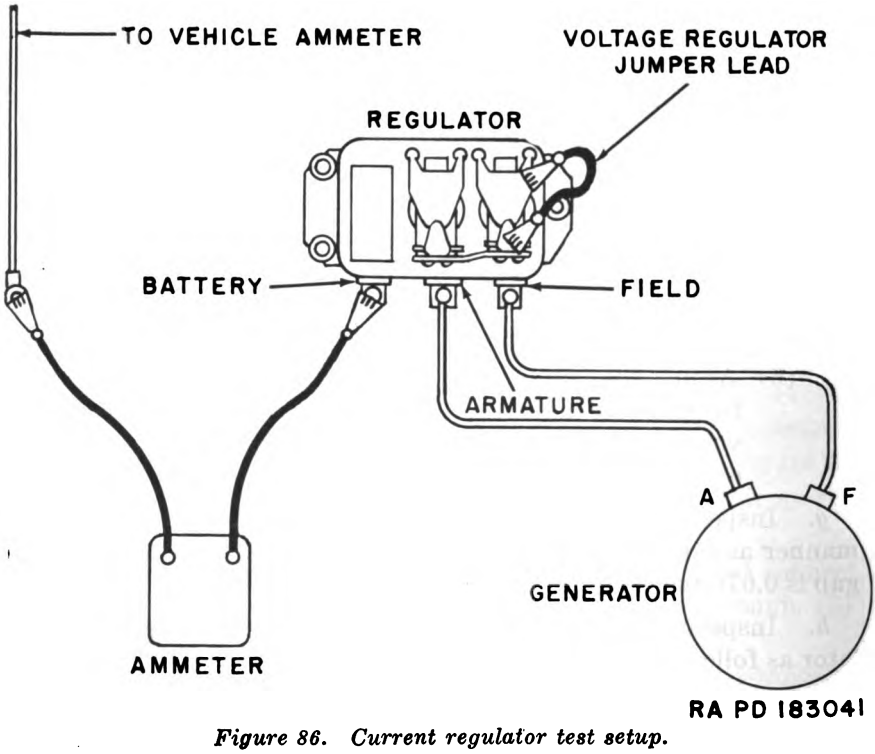


Figure 86. Current regulator test setup.

(2) Connect a generator of the same type as used on the conveyor to the regulator field and armature terminals. Connect an ammeter in series between the regulator battery terminal and the battery. Connect a jumper lead between the voltage regulator contact points to make the voltage regulator inoperative. Refer to figure 86.

(3) Operate the generator at 2000 rpm and note the reading on the ammeter. The correct current setting is between 16 and 20 volts.

(4) Adjust the current setting by turning the adjusting screw (fig. 85) clockwise to increase the voltage setting and counterclockwise to decrease the voltage setting.

(5) Adjust the current setting to 18 amps.

i. Position the gasket and cover (fig. 77) on the voltage regulator; secure with two screws and lockwashers.

j. Install the voltage regulator on the engine (par. 78*c*).

Section VIII. ELECTRICAL STARTER

166. Description

a. The electrical starter converts the electrical energy of the battery into mechanical power, and transmits this power to the engine through an overrunning clutch drive (6, fig. 17). The electrical starter consists of a field frame in which the field windings (8) are installed, an armature (9) that rotates in the magnetic field, the commutator end frame (13) that supports the commutator brushes (11) and armature, the drive housing (7) that secures the electrical starter to the engine, and the overrunning clutch drive.

b. The four pole shoes are part of the magnetic path from the frame to the armature, and are securely attached to the frame by the pole shoe screws.

c. The field windings, consisting of coils of insulated copper wire, produce the magnetic field which is conducted through the pole shoes and the frame.

d. The laminated steel armature core completes the magnetic circuit. It has insulated copper conductors embedded lengthwise in slots in the armature core, and connected to a commutator consisting of a number of copper segments insulated from each other and from the armature shaft. The armature shaft turns in sleeve bearings (5) and (14) at each end of the starter. Four brushes mounted on the commutator end frame (13) make electrical contact with the revolving commutator.

e. The electrical starter has a manually operated overrunning clutch drive (6) which is shifted by pushing the starter control button (21, fig. 5). The starter button and rod move the starter shift lever (4, fig. 17), which shifts the clutch pinion into mesh with the flywheel ring gear just before closing the electrical circuit in the starter switch (2). When the engine starts, the overrunning clutch permits the drive pinion on the flywheel ring gear to run free. This protects the armature from excessive speed during the brief interval that the drive pinion remains in mesh with the engine flywheel.

167. Electrical Starter Disassembly
(fig. 87)

a. Remove the electrical starter (par. 75*c*).

b. Remove the two switch attaching screws (39) and switch attaching screw lockwashers (30) securing the starter switch (34) and the switch side insulators (33) to the field frame (14); remove the starter switch and the switch side insulators.

c. Remove the switch terminal nut (38), switch terminal lockwasher (37), and the switch terminal plain washer (36) from the starter switch terminal (35).

d. Remove the cover band (15) from around the field frame.

e. Remove the brush lead to field screw (31) and lockwasher (30) securing the brush and field connector lead (32) and the brush connector lead (27) to an insulated brush (18).

f. Remove the two through bolts (24) and through bolt lockwashers (25) securing the assembled commutator end frame (21) and the assembled field frame to the drive housing (4); remove the assembled commutator end frame and the assembled field frame from the drive housing.

Note. The armature will remain in the drive housing. Take care not to damage the armature shaft or commutator, or to scrape the armature windings when removing the field frame.

g. Remove the four brush screws (16) securing the brush connector lead (27), brush ground leads (17), and brushes (18) to the brush holders (19); remove the brushes from the brush holders.

h. Detach the hook end of the brush spring (20); remove the brush holders and the brush springs from the pins on the frame assembly.

i. Remove the two ground lead screws (29) and lockwashers (28) securing the brush ground leads to the frame; remove the brush ground leads.

j. Remove the commutator end oiler (26) from the commutator end frame and the drive end oiler (5) from the drive housing.

k. Remove in the order named, the terminal stud nut (44), terminal stud plain washer (41), terminal stud insulated washer (42), two terminal stud insulated washers (43), the terminal stud insulated washer (42), terminal stud plain washer (41), and the field terminal stud (40) from the field frame.

l. Mark the position of the pole shoes (12) and field windings (10) and (11) in the field frame. Remove the four pole shoe screws (13) securing the pole shoes and field windings in the field frame; remove the pole shoes and field windings.

m. Remove the brush lead to field screw (31) and lockwasher (30) securing the brush and field connector lead (32) to the field windings; remove the brush and field connector lead.

n. Remove the brake washer (58) from the commutator end of the armature.

o. Remove the shift lever stud nut (2), shift lever stud lockwasher (3), shift lever spring (7), shift lever spring support (8), and the shift lever stud (9) securing the shift lever (1) to the drive housing.

p. Remove the two center bearing screws (55) and center bearing screw lockwashers (54) securing the assembled center bearing (53) and center sleeve bearing (56) and the assembled armature to the drive housing; remove the assembled armature, center bearing, and the shift lever.

q. Remove the armature brake packing (52), the assembled lockwire (51), collar (50), spring (49), and drive assembly (48), oilless bushing (47), and the split steel bushing (46) from the armature.

r. Remove the lockwire (51) securing the collar (50) and spring (49) to the drive assembly (48); remove the collar and spring.

168. Electrical Starter Cleaning and Inspection

a. Cleaning.

(1) Clean a slightly dirty or discolored commutator with No. 00 sandpaper; blow all sand out of the starter with clean, dry, compressed air. Remove all dirt from between the commutator bars.

(2) Clean the field frame with an approved cleaning solvent; dry thoroughly.

Note. Do not soak the field windings, insulation, or brushes in cleaning solvent.

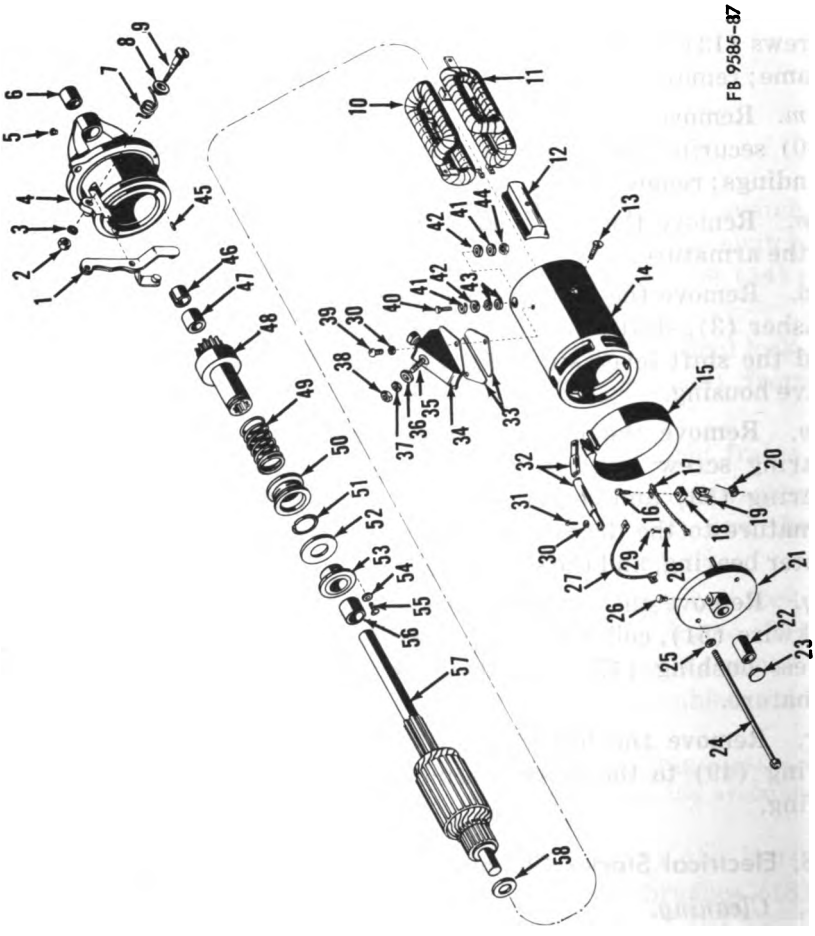


Figure 87. Electrical starter, exploded view.

1 Shift lever
2 Shift lever stud nut
3 Shift lever stud lockwasher
4 Drive housing
5 Oiler, drive end
6 Sleeve bearing, drive end
7 Shift lever spring
8 Shift lever spring support
9 Shift lever stud
10 Field winding
11 Field winding
12 Pole shoe
13 Pole shoe screw
14 Field frame
15 Cover band
16 Brush screw
17 Brush ground lead
18 Brush
19 Brush holder
20 Brush spring
21 Commutator end frame
22 Sleeve bearing, commutator end
23 Expansion plug
24 Through bolt
25 Through bolt lockwasher
26 Oiler, commutator end
27 Brush connector lead
28 Lockwasher
29 Ground lead screw
30 Lockwasher
31 Brush lead to field screw
32 Brush and field connector lead
33 Switch side insulator
34 Starter switch
35 Starter switch terminal
36 Switch terminal plain washer
37 Switch terminal lockwasher
38 Switch terminal nut
39 Switch attaching screw
40 Field terminal stud
41 Terminal stud plain washer
42 Terminal stud insulated washer
43 Terminal stud insulated washer
44 Terminal stud nut
45 Dowel pin
46 Split steel bushing
47 Oilless bushing
48 Drive assembly
49 Spring
50 Collar
51 Lockwire
52 Armature brake packing
53 Center bearing
54 Center bearing screw lockwasher
55 Center bearing screw
56 Center sleeve bearing
57 Armature
58 Brake washer

Figure 87—Continued.

(3) Clean the commutator end frame assembly with an approved cleaning solvent; dry thoroughly.

(4) Clean the armature shaft and all other metal parts with a brush dipped in an approved cleaning solvent; dry thoroughly.

b. Inspection.

(1) Inspect the armature shaft bearing surfaces; replace armature if the bearing surfaces are worn, scored, or out-of-round.

(2) Inspect the splines on the armature (57, fig. 87) and in the drive assembly (48); replace the armature or the drive assembly if the splines are worn, rounded, chipped, or damaged.

(3) Inspect the armature to make sure all windings are pressed into the core slots and are soldered to the com-

mutator risers. Resolder if necessary, using rosin core solder for a low resistance connection. Never use acid core solder on electrical connections.

(4) Inspect the commutator for roughness or out-of-round. Measure the commutator run-out with a dial indicator. Turn down a commutator that is out-of-round by 0.003-inch, or worn, as follows:

(*a*) Place the armature in a lathe mounted on the shaft bearing seats.

(*b*) Take light cuts until the commutator is cleaned up.

(*c*) Undercut the commutator mica (par. 161*c*).

(*d*) Remove all burs from the commutator with No. 00 sandpaper.

(*e*) Recheck the commutator run-out with a dial indicator.

(5) Place the armature on a growler and hold a thin steel strip above the core. Turn the armature slowly. If the armature is shorted, the strip will be magnetized and vibrate. If a short is present, inspect the commutator risers and bars for copper chips or solder that may be shorting between the bars. If a short cannot be found and corrected, replace the armature.

(6) Using a test probe set (fig. 74), check the armature for ground by touching one probe of the test set to the armature core and the other probe to the riser of each commutator segment in turn. If a ground is present, the lamp will light. Do not touch probes to bearing or brush surfaces. Do not handle the commutator. Replace the armature if grounded.

(7) Test the field windings for open circuits by touching one probe of a test probe set to the inlet terminal and the other probe to the outlet terminal of each field winding. If the test lamp lights, the winding is open. Replace an open winding.

(8) Test the field frame and the field windings for grounds by installing the field windings in the field frame and touching one probe of a test probe set to the terminal stud and the other probe to an unpainted part of the field frame. Make sure the leads are not in contact with the frame when testing. If a ground is present, remove the field windings from the frame. Inspect for open windings or other damage; replace a damaged part.

(9) Inspect the commutator end frame (21, fig. 87) for cracks or distortion. Inspect the brush holders (19) for bent

or distorted shapes. Inspect the brush holders (19) for bent or distorted shapes. Inspect brush springs (20) for corrosion or distortion. Replace defective parts.

(10) Inspect the brushes (18) for wear or other damage. If the brushes are worn to less than 5/16-inch, replace the brushes.

(11) Place the armature in a padded vise and install the brake washer (58). Install the four brushes in the brush holders and install the assembled brush holders and springs on the pins of the commutator end frame (21). Install the assembled end frame on the commutator end of the armature shaft. Measure the tension of the brushes against the commutator with a spring gage. It should be between 24 and 28 ounces; replace the brush springs if the tension is not correct.

(12) Feel for side play of the commutator end frame (21) on the armature shaft; replace the sleeve bearing (22) in the frame assembly if side play is perceptible. Install a new expansion plug (23) after replacing the sleeve bearing.

(13) Inspect the drive end sleeve bearing (6) in the drive housing for wear, scoring, or other damage. Press out the bearing and replace if damaged.

(14) Inspect the center sleeve bearing (56) in the center bearing (53) for wear, scoring, or other damage; press out the bushing and replace if damaged.

(15) Assemble the overrunning clutch drive mechanism on the armature drive end. Make sure the drive assembly slides freely on the armature splines. Turn the pinion. The clutch should release and the pinion turn smoothly, although not necessarily freely. Reverse the direction and rotate the pinion again. The clutch should lock immediately. If the clutch action is sluggish or restricted, replace the overrunning clutch drive mechanism.

(16) Inspect the dowel pin (45) in the drive housing; if damaged, remove the dowel pin and replace.

(17) Inspect all other parts for cracks, breaks, corrosion, distortion, worn threads, or other damage; replace damaged parts.

169. Electrical Starter Reassembly (fig. 87)

a. Position the spring (49) and collar (50) on the drive assembly (48); secure with a lockwire (51).

b. Apply a light film of oil to the armature drive end shaft and install the center bearing (53), the armature brake packing (52), drive assembly (48), oilless bushing (47), and split steel bushing (46) on the drive end of the armature (57).

c. With the shift lever (1) engaging the collar, position the assembled armature and drive in the drive housing (4); secure with the two center bearing screws (55) and center bearing screw lockwashers (54).

d. Secure the shift lever to the drive housing with a shift lever stud (9), shift lever spring support (8), shift lever spring (7), shift lever stud lockwasher (3), and the shift lever stud nut (2).

e. Position the pole shoes (12) and the field windings (10) and (11) in the field frame (14), matching the marks made before disassembly. Dip the pole shoe screws (13) in boiled linseed oil and install them with a conventional pole shoe screwdriver.

Note. Install spreaders between the pole shoes when installing the pole shoes and field coils in the field frame.

f. Secure the brush and field connector lead (32) to the field winding (10) with the brush lead to field screw (31) and lockwasher (30).

g. Install a terminal stud plain washer (41), terminal stud insulated washer (42), and two terminal stud insulated washers (43) on the terminal stud (40). Install the terminal stud through the field frame and field coil terminal and secure with an insulated washer (42), plain washer (41), and a nut (44).

h. Install an oiler (26) in the commutator end frame (21) and an oiler (5) in the drive housing (4).

i. Install the brush springs (20) and the brush holders (19) on the pins on the commutator end frame (21); engage the hook end of the brush springs in the frame assembly.

j. Install the two brush ground leads (17) and two brushes (18) on the two opposite brush holders; secure with two brush screws (16).

k. Install the two brushes on the remaining two brush holders, connecting the brushes with the brush connector lead (27) and securing the brush connector lead and the brushes to the brush holders with two brush screws.

l. Secure the remaining end of each brush ground lead (17) to the end frame with a ground lead screw (29) and lockwasher (28).

m. Test the two insulated brushes connected by the brush connector lead (27) for grounds by touching one probe of a test set to either brush holder and the other probe to the frame assembly.

If the lamp lights, the brush is grounded and the frame assembly should be replaced.

n. Install the commutator end brake washer (58) on the armature.

o. Install the assembled field frame over the assembled armature, with the dowel pin in the drive housing in the hole in the field frame. Install the assembled end frame on the field frame; secure with two through bolts (24) and lockwashers (25).

Note. Strike the frame assembly and drive housing with a soft hammer when tightening the through bolts to aline the armature shaft in the sleeve bearings.

p. Install the brush and field connector lead (32) to an insulated brush and the insulated brush connector lead (27) between the two insulated brushes; secure with the brush lead to field screw (31) and lockwasher (30).

q. Install the cover band (15) around the field frame.

r. Position the switch side insulators (33) and starter switch (34) on the field frame; secure with the two switch attaching screws (39) and switch attaching screw lockwashers (30).

s. Install the switch terminal plain washer (36), switch terminal lockwasher (37), and the switch terminal nut (38) on the starter switch terminal.

t. Test the electrical starter before installation (par. 170).

u. Install the electrical starter (par. 75*e*).

170. Electrical Starter Testing

a. Test the electrical starter on a bench for the no-load amperage and speed as follows:

(1) Connect a 300-ampere ammeter, carbon pile rheostat, and a 24-volt battery in series with the electrical starter terminal (35) and with the starter frame. Connect a voltmeter between the electrical starter terminal stud and the starter frame.

(2) Adjust the voltage to 23.5 volts and read the ammeter. The correct reading is 35 amperes, maximum.

(3) Hold a hand tachometer against the drive end of the armature shaft while operating at 23.5 volts. The correct speed is 2500 rpm, minimum.

(4) If the amperage is higher than the specified value, or if the speed is low, look for evidence of armature binding or for shorts within the electrical starter.

(5) If the amperage and the speed are both low, look for high resistance connections at the terminal stud, field windings, or brushes.

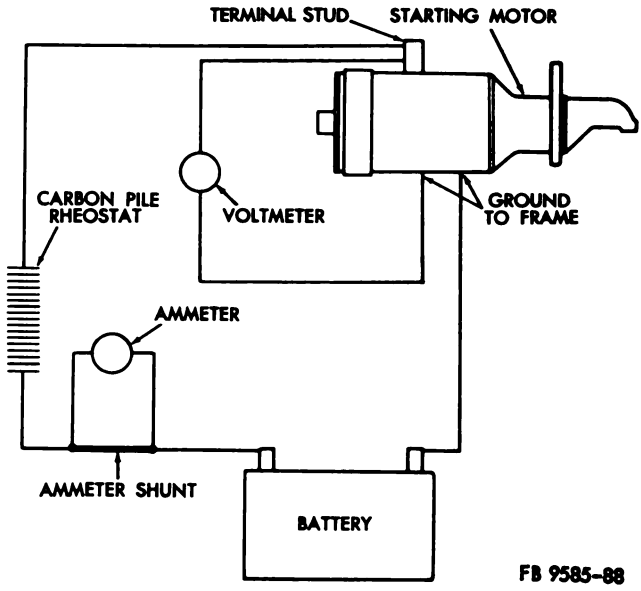


Figure 88. Electrical starter test hookup.

b. Measure the electrical starter stall current and lock torque as follows:

(1) Connect a high current carrying carbon pile rheostat or variable resistance in series with the battery and ammeter in the test circuit (fig. 88).
(2) Clamp the electrical starter down and mount a torque arm and tension gage on the drive pinion of the starter.
(3) Adjust the ammeter shunt so the ammeter has capacity to handle the stall current of 265 amperes.
(4) Close the circuit and adjust the voltage to 19.1 volts.
(5) The stall torque is the product of the tension gage reading multiplied by the length of the torque arm in feet. The correct stall torque is 19 pound-feet.
(6) If the ammeter reading is above 265 amperes and the stall torque is low, look for shorts or improper assembly of the electrical starter.
(7) If the ammeter reading and the stall torque are both low, look for high resistance connections at the field windings, armature, or brushes.

Section IX. IGNITION MAGNETO

171. Description

a. The ignition magneto is designed to produce and distribute to the spark plugs, correctly timed electric spark discharges of

sufficient intensity to fire the cylinder of the engine. An impulse coupling automatically retards the timing of the ignition spark at low engine speeds to prevent engine backfiring, and intensifies the spark to provide easier starting. The impulse coupling disengages at higher speeds.

b. The ignition magneto is radio shielded by enclosing the entire unit in a grounded metal frame, equipped with special venting ports. Threaded bushings are provided for connection to the flexible woven metal shielding used to shield the high tension leads.

172. Ignition Magneto Disassembly
(fig. 89)

a. Remove the ignition magneto (par. 79*c*).

b. Remove the four machine screws (65) and (67) securing the end cap and vent assembly (66) to the frame (32); remove the end cap and vent assembly and the end cap to frame gasket (68).

c. Remove the distributor rotor (10) from the top of the distributor gear (11).

d. Remove the machine screw (42) and lockwasher (41) securing the lead from the capacitor (38), the lead of the magneto winding (36), and one end of the breaker arm point and contact assembly (14) to the contact support assembly (47); remove the capacitor lead, winding lead, and the spring end of the breaker arm point and contact assembly from the contact support assembly.

e. Remove the fulcrum pin snap ring (13) securing the breaker arm point and contact assembly to the fulcrum pin on the bearing support assembly (18); remove the breaker arm point and contact assembly.

f. Remove the machine screw (40) and lockwasher (39) securing the capacitor (38) to the bearing support assembly; remove the capacitor.

g. Remove the machine screw (46), lockwasher (45), and the primary ground screw plate washer (44) securing the cam felt wick and holder assembly (43) and one end of the contact support assembly (47) to the bearing support assembly; remove the cam felt wick and holder assembly.

h. Remove the machine screw (50), lockwasher (49), and primary ground screw plate washer (44) securing the contact support assembly (47) to the bearing support assembly; remove the contact support assembly.

i. Remove the rotor gear snap ring (15) securing the magnetic rotor gear (16) to the short end of the magnetic rotor (21); remove the magnetic rotor gear.

j. Remove the four machine screws (17) securing the bearing support assembly (18) to the frame (32); remove the assembled bearing support assembly and distributor gear (11).

k. Remove the distributor shaft snap ring (19) securing the distributor gear and distributor gear thrust washer (12) to the bearing support bracket; remove the distributor gear and distributor gear thrust washer.

l. Loosen the two setscrews (25) securing the magneto winding (36) in the frame; remove the magneto winding.

m. Remove the nut and lockwasher securing the impulse coupling shell (33) to the drive end of the magneto rotor; remove the impulse coupling shell and impulse coupling drive spring (34).

n. Use a bearing puller to remove the impulse coupling (35) from the shaft of the magnetic rotor; remove the key (22), oil slinger baffle disk (28), cork retaining washer (27), rotor drive end seal (29), and impulse coupling washer (30) from the drive end of the magnetic rotor assembly.

o. Remove the rotor drive end snap ring (31) securing the magnetic rotor (21) in the frame; remove the magnetic rotor assembly.

p. Remove the rotor drive end bearing snap ring (23) and press the rotor drive end ball bearing (24) out of the frame.

q. Remove the impulse coupling stop pin (26) from the frame by turning clockwise.

r. Remove the three machine screws (2) securing the magneto cover (1) and end cap cover gasket (69) to the end cap and vent assembly (66); remove the magneto cover and end cap cover gasket.

s. Remove the two machine screws (57) securing the vent hoods (56) and vent screens (55) to both sides of the end cap (66) and vent assembly; remove the vent hoods and vent screens.

t. Remove the ground cable outlet nut (60) securing the ground cable ferrule (61), ground cable insulator washer (62), ground cable terminal (63), and ground cable terminal insulator (64) to the end cap and vent assembly (66); remove the ground cable ferrule, ground cable insulator washer, ground cable terminal, and ground cable terminal insulator.

u. Remove the hex nut (59), lockwasher (58), and flat washer (6) securing the ground terminal strip guide (54), primary ground strip (53), strip (3), primary ground screw bushing (4),

primary ground screw flat washer (6), and machine screw (5) inside the end cap vent assembly; remove the machine screw, primary ground screw plate washer, primary ground screw bushing strip, primary ground strip, and ground terminal strip guide.

v. Remove the four machine screws (8) and lockwashers (7) securing the distributor block (52) in the end cap and vent assembly; remove the distributor block.

w. Remove the lead rod assembly (9) and electrical contact brush (51) from the distributor block.

173. Ignition Magneto Cleaning and Inspection

a. Clean all metal parts except ball bearing (24) with an approved cleaning solvent; dry thoroughly.

Note. Make sure the electrical contact brush (51), insulation, or varnish does not come in contact with cleaning solvent.

b. Clean all nonmetal parts with a clean, dry, cloth and clean, dry, compressed air.

c. Clean and inspect the ball bearing (24) as directed in paragraph 126*c*(2).

d. Install the electrical contact brush (51) in the distributor block (52). Check for freedom of movement and for sufficient length to insure contact with the center of the distributor rotor electrode; replace if continued serviceability is in doubt.

e. Inspect distributor block electrodes; use a lint free cloth to remove any corrosion or carbon dust. Inspect the distributor block for cracks, breaks, or other damage; replace if damaged.

f. Check the capacitor (38) on a capacitor tester; replace if inoperative, leaking, or damaged.

g. Inspect the breaker arm point and contact assembly (14) and contact support assembly (47) for burning, pitting, or corrosion of the contact points; replace if burned, pitted or corroded.

Note. In an emergency, contact points can be dressed with a fine, flexible carborundum stone. The stone should be thin enough to dress the contact points in their assembled position on the breaker arm point and contact assembly and contact support assembly.

h. Inspect the distributor rotor (10) for wear of the electrode, for tightness to the distributor gear (11), or other damage; replace if damaged.

i. Inspect the rotor bearing (37) and distributor bearing (48) for out-of-round, pitting, burning, scoring, or other damage; press or drive the bearings out of the bearing support assembly (18) and replace if damaged.

j. Inspect the rotor drive end ball bearing (24) for scoring, pitting, burning, out-of-round, rough or catchy operation, or other damage; replace if damaged.

Figure 89. Ignition magneto, exploded view.

1 Magneto cover
2 Machine screw, fil hd, No. 8 x ½" (3 rqr)
3 Strip
4 Primary ground screw bushing
5 Machine screw, oval hd, No. 6 x 7/16" NC (1 rqr)
6 Flat washer, No. 6 (2 rqr)
7 Lockwasher, No. 8 (4 rqr)
8 Machine screw, oval hd, No. 8 x 1/8" NC (4 rqr)
9 Lead rod assembly
10 Distributor rotor
11 Distributor gear
12 Distributor gear thrust washer
13 Fulcrum pin snap ring
14 Breaker arm point and contact assembly
15 Rotor gear snap ring
16 Magnetic rotor gear
17 Machine screw, flat hd, No. 8 x 3/8" NC (4 rqr)
18 Bearing support assembly
19 Distributor shaft snap ring
20 Rotor gear pin
21 Magnetic rotor
22 Key
23 Rotor drive end bearing snap ring
24 Rotor drive end ball bearing setscrew, 1/4" x 7/8" NC (2 rqr)
26 Impulse coupling stop pin
27 Cork retaining washer
28 Oil slinger baffle disk
29 Rotor drive end seal
30 Impulse coupling washer
31 Rotor drive end snap ring
32 Frame
33 Impulse coupling shell
34 Impulse coupling drive spring
35 Impulse coupling
36 Magneto winding
37 Rotor bearing
38 Capacitor
39 Lockwasher, No. 8 (1 rqr)
40 Machine screw, oval hd, No. 8 x 1/4" NC (1 rqr)
41 Lockwasher, No. 6 (1 rqr)
42 Machine screw, oval hd, No. 6 x 5/16" NC (1 rqr)
43 Cam felt wick and holder assembly
44 Primary ground screw plate washer
45 Lockwasher, No. 8 (1 rqr)
46 Machine screw, oval hd, No. 8 x 3/8" NC (1 rqr)
47 Contact support assembly
48 Distributor bearing
49 Lockwasher, No. 6 (1 rqr)
50 Machine screw, oval hd, No. 6 x 3/8" NC (1 rqr)
51 Electrical contact brush
52 Distributor block
53 Primary ground strip
54 Ground terminal strip guide
55 Vent screen
56 Vent hood
57 Machine screw, rd hd, No. 6 x 3/8" NC (2 rqr)
58 Lockwasher, No. 6 (1 rqr)
59 Hex nut, No. 6 NC (1 rqr)
60 Ground cable outlet nut
61 Ground cable ferrule
62 Ground cable insulator washer
63 Ground cable terminal
64 Ground cable terminal insulator
65 Machine screw, fil hd, No. 10 x 1-1/8" NC (2 rqr)
66 End cap and vent assembly
67 Machine screw, fil hd, No. 10 x 5/8" NC (2 rqr)
68 End cap to frame gasket
69 End cap cover gasket

Figure 89—Continued.

k. Inspect the magnetic rotor (21) and frame (32), in which the magnetic rotor assembly revolves, for burs, chips, metal particles, or other foreign matter that would hinder free movement.

l. Test the magneto winding (36) on a coil tester for shorts or opens; replace if shorted or open.

m. Inspect the distributor gear (11) and the magnetic rotor gear (16) for worn, broken, or chipped teeth; replace if the teeth are damaged.

n. Inspect the rotor gear pin (20) in the magnetic rotor (21) for damage; replace the pin if damaged.

o. Inspect the cam felt wick and holder assembly (43). If the wick is dry or hard, replace the assembly.

p. Inspect all other parts for cracks, breaks, worn threads, corrosion, distortion, or other damage; replace all damaged parts.

174. Ignition Magneto Reassembly

a. Install the distributor block (52, fig. 89) to the end cap and vent assembly (66); secure with four machine screws (8) and lockwashers (7).

b. Install the lead rod assembly (9) and electrical contact brush (51) in the distributor block.

c. Install the ground terminal strip guide (54), primary ground strip (53), strip (3), and primary ground screw bushing (4) on the inside of the end cap and vent assembly (66); insert the machine screw (5) and flat washer (6) and secure to the outside of the end cap and vent assembly with a flat washer (6), lockwasher (58), and hex nut (59).

d. Install a vent screen (55) and vent hood (56) on each side of the end cap and vent assembly; secure each with a machine screw (57).

e. Install a ground cable terminal insulator (64), ground cable terminal (63), ground cable insulator washer (62), and a ground cable ferrule (61) on the end cap and vent assembly; secure with a ground cable outlet nut (60).

f. Install the end cap cover gasket (69) and magneto cover (1) on the end cap and vent assembly; secure with three machine screws (2).

g. Press the rotor drive end ball bearing (24) in the frame (32); secure with the rotor drive end bearing snap ring (23).

h. Install the magnetic rotor (21) in the frame through the rotor drive end ball bearing; secure with a rotor drive end snap ring (31).

i. Install the impulse coupling washer (30), rotor drive end seal (29), cork retaining washer (27), and the oil slinger baffle disk (28) on the drive end of the magnetic rotor; position the key (22) in the shaft keyway and press the impulse coupling (35) on the drive end of the magnetic rotor.

j. Install the impulse coupling drive spring (34) in the im-

pulse coupling shell (33). Install the assembled impulse coupling shell on the drive end of the magnetic rotor; secure with a lockwasher and nut. Hook the free end of the impulse coupling drive spring in the slotted hub of the impulse coupling.

k. Install the magneto winding (36) in the frame; secure by tightening the two setscrews (25).

l. Install the distributor gear thrust washer (12) on the hub of the distributor gear (11) and install the assembled distributor gear in the bearing support assembly (18); secure with a distributor shaft snap ring (19).

m. Install the assembled bearing support assembly (18) and distributor gear over the short end of the magnetic rotor; secure to the frame with four machine screws (17).

n. Position the contact support assembly (47) on the bearing support assembly; secure with a machine screw (50), lockwasher (49), and a primary ground screw plate washer (44).

o. Install the cam felt wick and holder assembly (43) on the contact support assembly (47); secure the cam felt wick and holder assembly and remaining end of the contact support assembly to the bearing support assembly (18) with a machine screw (46), lockwasher (45), and primary ground screw plate washer (44).

p. Install the breaker arm and contact assembly (14) on the fulcrum pin of the bearing support assembly; secure with a fulcrum pin snap ring (13).

q. Position the capacitor (38) on the bearing support assembly; secure with a lockwasher (39) and machine screw (40).

r. Install the magnetic rotor gear (3, fig. 90) on the magnetic rotor with the cutout on the inside diameter over the rotor gear pin, and the red tipped marked tooth (2) meshing with the "C" stamped on the distributor gear (1); secure with a rotor gear snap ring (4).

s. Install the spring of the breaker arm point and contact assembly (14, fig. 89), condenser lead, and the winding lead on the terminal lug of the contact support assembly; secure with a lockwasher (41) and machine screw (42).

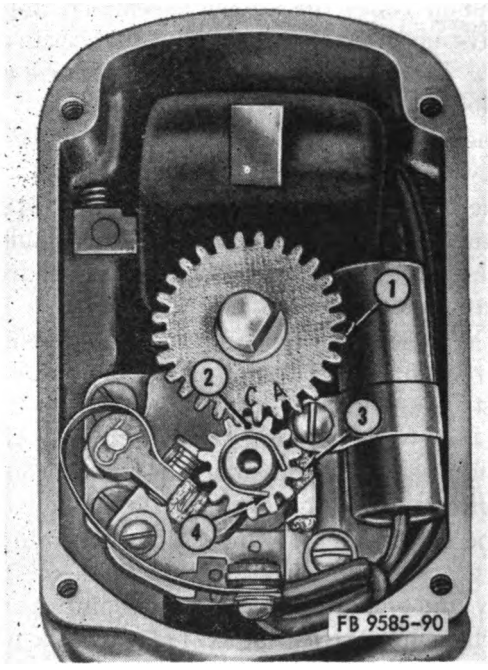
t. Check the breaker point gap; adjust as necessary (par. 79*a*).

u. Install the distributor rotor (10) on the distributor gear.

v. Position the end cap to frame gasket (68) and the assembled end cap and vent assembly on the assembled frame; secure with four machine screws (65) and (67).

w. Install the ignition magneto (par. 79*e*).

x. Check the engine timing; retime if necessary (par. 79*e*).



1 Distributor gear
2 Marked tooth
3 Magnetic rotor gear
4 Rotor gear snap ring

Figure 90. Ignition magneto internal timing marks.

Section X. ENGINE CLUTCH AND CLUTCH BRAKE

175. Description

The engine clutch is of the twin disk type; it is operated by the master clutch lever (18, fig. 3). It is automatically disengaged by the clutch throwout rod (11) when the boom reaches its maximum height. When the clutch is engaged, the sliding sleeve (6, fig. 31) is pushed in toward the clutch driving plate (2) and friction disks (3) causing the four finger levers (5) to press against the floating plate (4). The floating plate and hub and back plate (1) are compressed to fit tightly against the driving plate between them. The clutch is disengaged when the pressure is released on the floating plate. The driving plate is gear driven, and the floating plate hub and back plate are keyed to the clutch output shaft. When the clutch lever is moved to the disengaged position, a brake on the clutch output shaft is engaged.

176. Engine Clutch and Clutch Brake Removal

a. Remove the jackshaft drive chain guard (par. 96*a*(3) and (4)).

b. Remove the jackshaft drive chain (par. 96*a*(5), (6), and (8)).

c. Remove the clutch automatic throwout lever and the clutch lever from the clutch shaft (par. 98*b*(1) through (3)).

d. Build a platform or place blocking under the clutch and transmission so they can be slid off the engine.

e. Remove the 12 cap screws securing the clutch housing to the engine; remove the assembled clutch housing, with clutch installed, and the transmission from the engine. Pull the clutch and transmission straight outward, away from the engine.

f. Remove the four machine screws securing the clutch handhole cover (20, fig. 5) to the clutch housing (19); remove the handhole cover.

g. Remove the cotter pin, shaft nut, and washer from the end of the clutch shaft.

h. Disconnect the flexible hose (18, fig. 91) from the elbow (17) in the clutch cone collar (15) and from the elbow in the clutch housing.

i. Pull the assembled clutch from the clutch shaft.

j. Remove the brake sleeve, key, and brake lining from the clutch shaft.

k. Remove the grease pipe fitting, pipe coupling, and the grease cup (17, fig. 5) from the clutch housing.

l. Remove the two shifter shafts and the shifter fork from the clutch housing.

Note. Do not remove the clutch housing and clutch shaft from the transmission unless the transmission is being overhauled.

177. Engine Clutch Disassembly (fig. 91)

a. Remove the nuts (16), collar washers (14), and bolts (13) securing the halves of the clutch cone collar (15); remove the collar.

b. Remove the eight snap rings (6) and pins (12) securing the lever links (11) to the sliding sleeve (10) and the finger levers (7); remove the lever links.

c. Remove the four snap rings (6) and pins (9) securing the finger levers (7) to the adjusting yoke (8); remove the finger levers.

d. Pull the adjusting lock pin (20) out to disengage it from the gear teeth in the floating plate (5); turn the adjusting yoke (8) counterclockwise to remove it from the clutch hub and back plate (1), freeing the floating plate and the assembled driving plate (4) and friction disks (3) and the release springs (2).

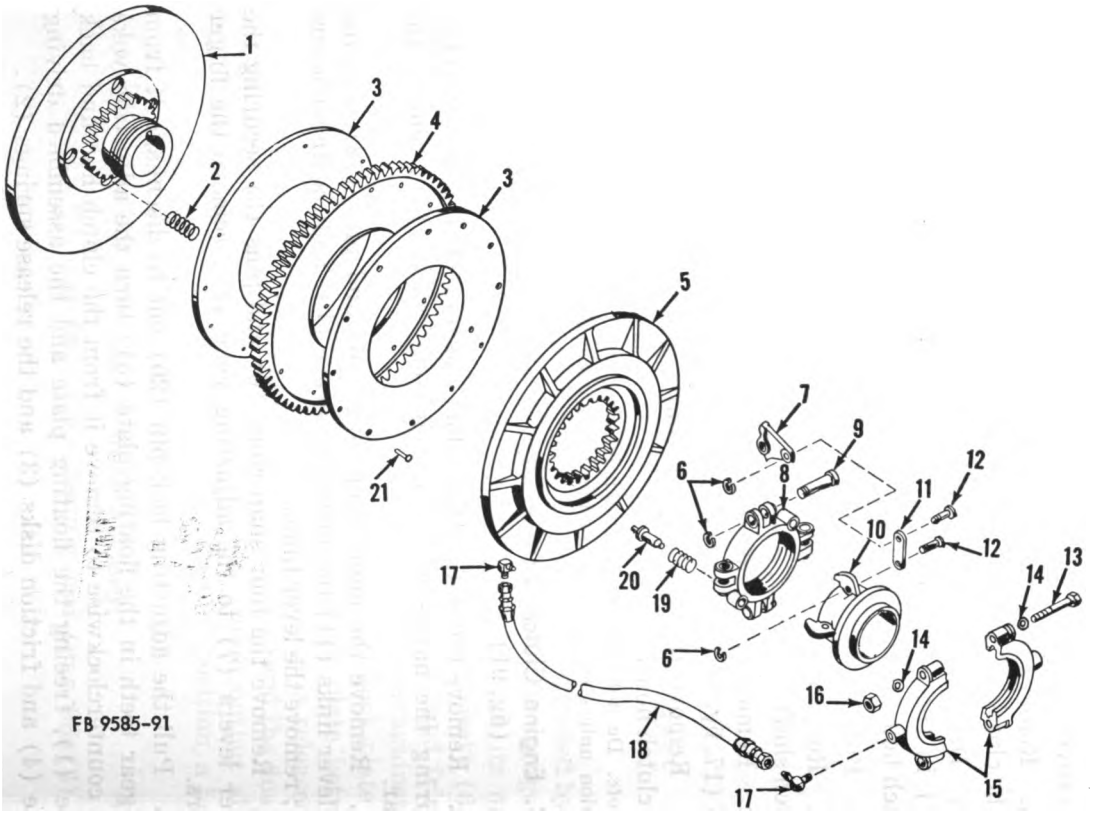


Figure 91. Engine clutch, exploded view.

1 Hub and back plate
2 Release spring
3 Friction disk
4 Driving plate
5 Floating plate
6 Snap ring
7 Finger lever
8 Adjusting yoke
9 Clutch lever pin
10 Sliding sleeve
11 Lever link
12 Lever link pin
13 Machine bolt
14 Collar washer
15 Cone collar
16 Nut
17 Elbow
18 Flexible hose
19 Adjusting lock pin spring
20 Adjusting lock pin
21 Rivet

e. Remove the adjusting lock pin (20) and the lock pin spring (19) from the adjusting yoke.

f. Remove the elbows (17) from the cone collar and clutch housing.

178. Engine Clutch and Clutch Housing Cleaning and Inspection (fig. 91)

a. Wash all metal parts thoroughly with an approved cleaning solvent; dry thoroughly. Clean dirt and grease from clutch driving plate friction disks (3) and brake lining by wiping with a clean cloth and approved cleaning solvent; do not immerse the friction disks in solvent.

b. Inspect all parts for wear, cracks, or breaks; replace as necessary.

c. Inspect the assembled driving plate (4) and friction disks (3) for uneven wear, broken or worn teeth, grease soaking, or other damage. Replace the assembled driving plate and friction disks if damaged.

d. Inspect the cone collar (15) for bends, dents, wear, or other damage; replace if damaged or if the groove has worn in excess of $\frac{1}{32}$-inch.

e. Inspect the brake lining; replace if worn.

179. Engine Clutch Reassembly (fig. 91)

a. Install the assembled driving plate (4) and friction disks (3) and the release springs (2) on the hub and back plate (1). Install the floating plate (5) on the hub of the hub and back plate, using care to aline the spring seats with the release springs.

b. Position the finger levers (7) in the adjusting yoke (8); secure with pins (9) and snap rings (6).

c. Install the spring (19) and adjusting lock pin (20) in the adjusting yoke. Pull the lock pin outward, and install the adjusting yoke on the hub and back plate; turn the yoke clockwise on the threaded hub.

d. Install two lever links (11) on the ends of each finger lever; secure with pins (12) and snap rings (6). Position the sliding sleeve (10) with the lever link bosses between each pair of lever links; secure with lever link pins and retaining rings.

e. Position the two halves of the cone collar (15) on the sliding sleeve; secure with two bolts (13), four collar washers (14), and two nuts (16).

f. Install the elbows (17) in the clutch housing and cone collar.

180. Engine Clutch and Clutch Brake Installation

a. Install the shifter fork and two shifter shafts in the clutch housing.

b. Install the grease cup (17, fig. 5), pipe coupling, and pipe fitting in the clutch housing.

c. Install the brake lining, key, and the brake sleeve on the clutch shaft.

d. Install the assembled clutch on the clutch shaft; engage the lugs on the cone collar (15, fig. 91) with the clutch shifter fork.

e. Connect the flexible hose (18) to the elbows (17).

f. Install the washer, shaft nut, and cotter pin on the clutch shaft.

g. Position the assembled engine clutch and transmission on the engine flywheel housing. Take care to seat the clutch shaft. Secure the clutch housing to the engine with 12 cap screws.

h. Remove the hoist or any blocking from under the clutch and transmission.

i. Install the clutch lever and automatic throwout lever on the clutch shaft (par. 98*d*(2) and (3)).

j. Install the jackshaft drive chain (par. 96*c*(4)).

k. Adjust the jackshaft drive chain (par. 96*d*).

l. Install the jackshaft drive chain guard (par. 96*c*(7) and (8)).

m. Adjust the engine master clutch (par. 98*a*).

Section XI. TRANSMISSION

181. Description

The transmission is enclosed in the transmission case (18, fig. 5) which is mounted to the clutch housing (19) at the operator's side of the conveyor. It receives engine power directly through the clutch shaft and drive gear (36, fig. 92) which is ball bearing mounted inside the transmission case. The drive gear engages the countershaft drive gear (37), which is keyed to the countershaft (24) with a woodruff key (31), turning the countershaft. The transmission has the conventional H-type shift, with three speeds forward and one reverse. In the high-speed position, the high-speed shifting yoke (7) moves the high-speed sliding gear (61) on the splined mainshaft (21) until it engages the mainshaft drive gear, causing the mainshaft to turn at the same speed as the clutch shaft. In the second speed position, the high-speed shifting yoke moves the high-speed sliding gear in the opposite direc-

tion on the mainshaft until it engages the countershaft second speed gear (34). The countershaft second speed gear is also keyed to the countershaft, and drives the high-speed sliding gear and mainshaft. In the low speed position, the low and reverse speed shifting yoke (9) moves the low and reverse mainshaft sliding gear (10) towards the clutch until it engages the countershaft low speed gear (33). The countershaft low speed gear drives the low and reverse mainshaft sliding gear and the mainshaft. In the reverse speed position, the low and reverse speed shifting yoke moves the low and reverse mainshaft sliding gear in the opposite direction until it engages in the reverse idler gear (29, fig. 93) mounted on the reverse idler shaft (31). The countershaft reverse speed gear (29, fig. 92) drives the reverse idler gear, which in turn drives the low and reverse mainshaft sliding gear and the mainshaft. This combination of three gears working together reverses the direction of the mainshaft. A sprocket is mounted on the output end of the mainshaft to drive the jackshaft drive chain. An oil filler plug (36, fig. 93) is located on the left side of the transmission, and an oil drain pipe plug (38, fig. 92) is located beneath the transmission.

182. Transmission Disassembly

a. Remove the pipe plug (38, fig. 92) from the bottom of the transmission case (32); drain the lubricant from the case.

b. Remove the assembled transmission and clutch housing (45) from the engine and remove the assembled clutch and the clutch brake parts from the clutch shaft (par. 176).

c. Remove the five clutch housing nuts (43) and clutch housing lockwashers (42) securing the clutch housing (45) to the transmission case; remove the clutch housing.

d. Move the gear shift lever (1) to the neutral position.

e. Remove the center control cover cap screws (13, fig. 93) and center control cover washers (39) securing the center control cover (7) to the transmission case; lift the assembled control cover and the center control cover gasket (11, fig. 92) from the transmission case.

f. Remove the two pipe plugs (12, fig. 93) holding the two position finder springs (11) and position finder steel balls (9) in place in the center control cover; remove the position finder springs and steel balls.

g. Remove the two long thimbles (13, fig. 92) from the center control cover.

h. Mark the position of the shifting yokes (7) and (9) on the shifting yoke bars (10, fig. 93) and (40) and remove the two shift-

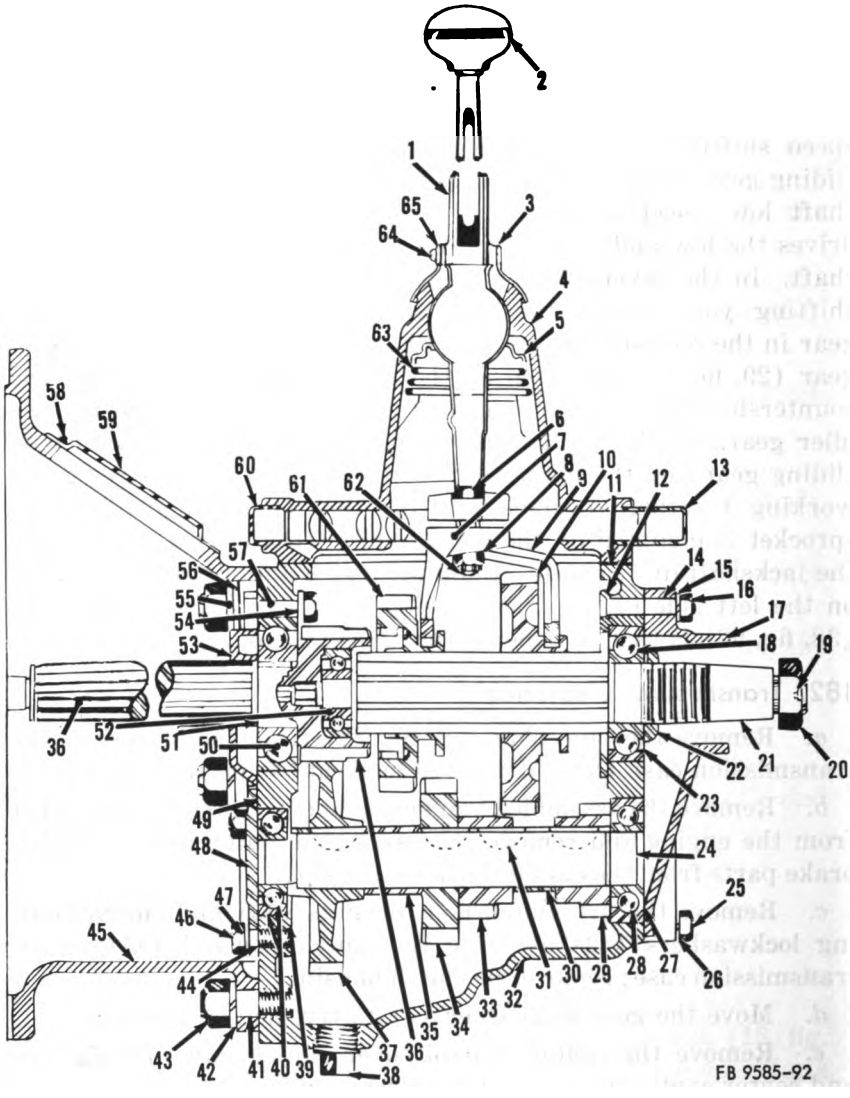


Figure 92. Transmission, cross section.

ing yoke cotter pins (62, fig. 92), shifting yoke castle nuts (8), and shifting yoke cap screws (6) securing the shifting yokes to the yoke bars (10, fig. 93) and (40); drive the yoke bars out of the center control cover one at a time from the end where the long thimbles were removed. Do not lose the two short thimbles (60, fig. 92) and remaining steel ball as the yoke bars are removed.

Note. One of the bars will always move. If one does not drive out of the center control cover readily, try the remaining one.

1 Gear shift lever
2 Gear shift lever ball
3 Gear shift lever bell
4 Center control cover
5 Lever washer
6 Shifting yoke cap screw
7 High-speed shifting yoke
8 Shifting yoke castle nut
9 Low and reverse speed shifting yoke
10 Low and reverse mainshaft sliding gear
11 Center control cover gasket
12 Mainshaft rear bearing retainer plate
13 Long thimble
14 Rear bearing cover cap screw
15 Rear bearing cover lockwasher
16 Rear bearing cover nut
17 Rear bearing cover
18 Mainshaft rear ball bearing
19 Mainshaft cotter pin
20 Mainshaft castle nut
21 Mainshaft
22 Mainshaft rear locknut
23 Mainshaft rear locknut clip
24 Countershaft
25 Countershaft rear bearing cover cap screw
26 Countershaft rear bearing cover lockwasher
27 Rear bearing cover gasket
28 Countershaft rear ball bearing
29 Countershaft reverse speed gear
30 Low and reverse gear spacer
31 Woodruff key
32 Transmission case
33 Countershaft low speed gear
34 Countershaft second speed gear
35 Countershaft drive and second speed gear spacer
36 Clutch shaft and drive gear
37 Countershaft drive gear
38 Pipe plug
39 Countershaft bearing spacer
40 Countershaft front ball bearing
41 Clutch housing stud
42 Clutch housing lockwasher
43 Clutch housing nut
44 Countershaft front bearing cover gasket
45 Clutch housing
46 Countershaft front bearing cover cap screw
47 Countershaft front bearing cover lockwasher
48 Countershaft front bearing cover
49 Front bearing cover gasket
50 Drive gear ball bearing
51 Drive gear bearing snap ring
52 Mainshaft pilot ball bearing
53 Front bearing cover
54 Front bearing retainer washer
55 Front bearing retainer nut
56 Front bearing retainer lockwasher
57 Front bearing retainer cap screw
58 Clutch handhole cover cap screw
59 Clutch handhole cover
60 Short thimble
61 High-speed mainshaft sliding gear
62 Shifting yoke cotter pin
63 Lever spring
64 Lever bell cap screw
65 Lever bell lockwasher

Figure 92—Continued.

i. Remove the high-speed shifting yoke and low and reverse speed shifting yoke from the center control cover.

j. Remove the gear shift lever ball (2) from the gear shift lever (1).

k. Remove the lever bell cap screw (64) and lever bell lockwasher (65) securing the gear shift lever bell (3) to the center control cover; remove the lever bell.

l. Remove the lever spring (63) and lever washer (5) securing

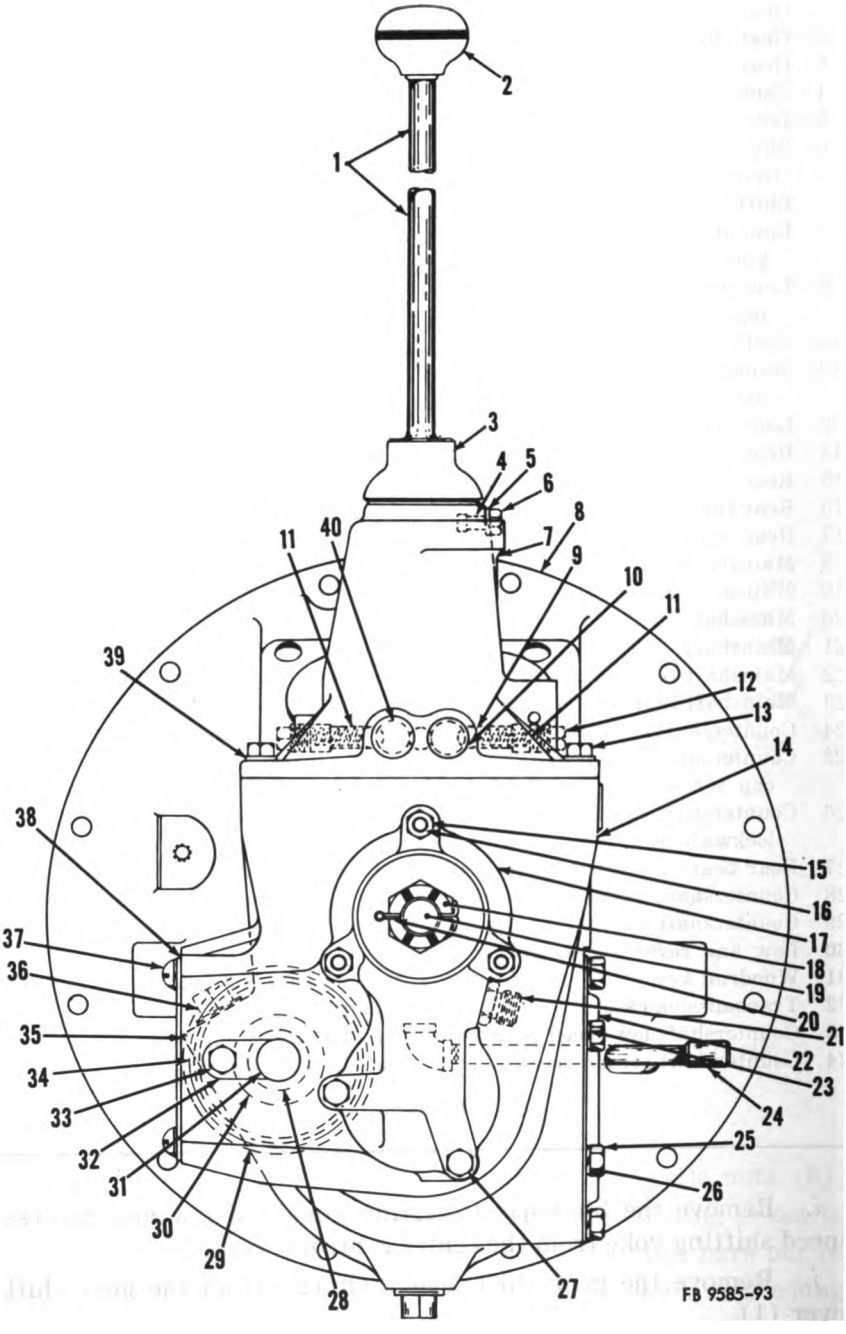


Figure 93. Transmission, rear view.

1 Gear shift lever
2 Gear shift lever ball
3 Gear shift lever bell
4 Gear shift lever pivot pin
5 Gear shift lever pivot pin lockwasher
6 Gear shift lever pivot pin nut
7 Center control cover
8 Clutch housing
9 Steel ball
10 Low and reverse yoke bar
11 Position finder spring
12 Pipe plug
13 Center control cover cap screw
14 Transmission case
15 Rear bearing cover nut
16 Rear bearing cover bolt
17 Rear bearing cover
18 Mainshaft castle nut
19 Mainshaft
20 Mainshaft cotter pin
21 Hole plug
22 Power takeoff cover
23 Power takeoff cover gasket
24 Clutch grease cup
25 Power takeoff cover nut
26 Power takeoff cover lockwasher
27 Countershaft rear bearing cover cap screw
28 Reverse gear bushing
29 Reverse idler gear
30 Reverse idler shaft thrust washer
31 Reverse idler shaft
32 Idler shaft lock
33 Idler shaft lock cap screw
34 Reverse idler cover gasket
35 Reverse idler cover
36 Pipe plug, filler
37 Reverse idler cover cap screw
38 Reverse idler cover lockwasher
39 Center control cover washer
40 High-speed yoke bar

Figure 93—Continued.

the gear shift lever in the center control cover from the bottom of the control cover; remove the gear shift lever.

m. Remove the gear shift lever pivot pin nut (6, fig. 93) and the gear shift lever pivot pin lockwasher (5) securing the gear shift lever pivot pin (4) in the center control cover; remove the pivot pin.

n. Remove the three rear bearing cover nuts (16, fig. 92), rear bearing cover lockwashers (15), rear bearing cover cap screws (14), the two countershaft rear bearing cover cap screws (25), and countershaft rear bearing cover lockwasher (26) securing the rear bearing cover (17) to the transmission case; remove the rear bearing cover and rear bearing cover gasket (27).

o. Remove the hole plug (21, fig. 93) from the rear bearing cover.

p. Pull the assembled mainshaft (21, fig. 92), mainshaft rear locknut (22), mainshaft rear locknut clip (23), and mainshaft rear ball bearing (18) from the transmission case, leaving the sliding gears inside the case. Pull the mainshaft sharply to free it from the mainshaft pilot ball bearing (52).

q. Remove the mainshaft rear locknut and rear locknut clip securing the rear ball bearing to the mainshaft; remove the ball bearing.

r. Take the low and reverse mainshaft sliding gear (10), high-speed mainshaft sliding gear (61), mainshaft rear bearing retainer plate (12), and pilot ball bearing out of the transmission case from the top of the case.

s. Remove the power takeoff cover nuts (25, fig. 93), power takeoff cover lockwashers (26), and power takeoff cover cap screws securing the power takeoff cover (22) to the transmission case; remove the power takeoff cover and power takeoff cover gasket (23).

t. Remove the front bearing retainer nuts (55, fig. 92), front bearing retainer lockwashers (56), front bearing retainer cap screws (57), and front bearing retainer washers (54) securing the front bearing cover (53) to the transmission case; remove the front bearing cover and front bearing cover gasket (49).

u. Remove the assembled clutch shaft and drive gear (36), drive gear bearing snap ring (51), and drive gear ball bearing (50) from the transmission case.

v. Remove the drive gear bearing snap ring securing the drive gear ball bearing to the clutch shaft and drive gear; remove the ball bearing from the clutch shaft and drive gear.

w. Remove the reverse idler cover cap screws (37, fig. 93) and reverse idler cover lockwashers (38) securing the reverse idler cover (35) to the transmission case; remove the reverse idler cover and reverse idler cover basket (34).

x. Remove the idler shaft lock cap screw (33) and idler shaft lockwasher securing the idler shaft lock (32) to the transmission case; remove the idler shaft lock.

y. Remove the assembled reverse idler shaft from the transmission case.

z. Remove the reverse idler shaft thrust washer (30) from the reverse idler shaft (31).

aa. Remove the assembled reverse idler gear (29) and reverse gear bushing (28) from the reverse idler shaft.

ab. Remove the oil filler pipe plug (36) from the transmission case.

ac. Remove the countershaft front bearing cover cap screws (46, fig. 92) and countershaft front bearing cover lockwashers (47) securing the countershaft front bearing cover (48) to the transmission case; remove the countershaft front bearing cover and countershaft front bearing cover gasket (44) from the transmission case.

ad. Drive the countershaft (24) to the rear and remove the countershaft rear ball bearing (28), countershaft reverse speed

gear (29), woodruff key, and the low and reverse gear spacer (30).

ae. Tilt the countershaft inside the transmission case and remove it through the top of the case.

af. Remove the countershaft front ball bearing.

ag. Remove the countershaft bearing spacer (39), drive gear (37), drive and second speed gear spacer (35), second speed gear (34), low speed gear (33), and woodruff keys (31) from the countershaft.

183. Transmission Cleaning and Inspection

a. Clean all parts except ball bearings with an approved cleaning solvent; dry thoroughly.

b. Clean and inspect the ball bearings as directed in paragraph 126*c*(2).

c. Inspect the reverse gear bushing (28, fig. 93); replace if cracked, scored, worn, out-of-round, or otherwise damaged.

d. Inspect all gears for worn, chipped, or broken teeth; replace if damaged.

e. Inspect the mainshaft (21, fig. 92) for worn, chipped, or broken splines; replace if damaged.

f. Discard the mainshaft cotter pin (19), shifting yoke cotter pins (62), center control cover gasket (11), rear bearing cover gasket (27), front bearing cover gasket (49), and countershaft front bearing cover gasket (44).

g. Inspect the four woodruff keys (31) for wear or other damage; make sure they seat firmly in keyways of the countershaft. Replace if damaged.

h. Inspect the five clutch housing studs (41) for wear, looseness, or other damage; tighten if loose or replace if damaged.

i. Inspect the position finder springs (11, fig. 93) and lever spring (63, fig. 92) for proper tension, wear, or other damage; replace if damaged.

j. Inspect all other parts for cracks, breaks, bends, damaged threads, wear, or other damage; replace if damaged.

184. Transmission Reassembly

a. Install the three woodruff keys (31, fig. 92) in the keyways of the countershaft while installing the low speed gear (33) second speed gear (34), drive and second speed gear spacer (35), drive gear (37), and the bearing spacer (39) on the countershaft (24).

b. Install the countershaft front ball bearing (40) on the countershaft.

c. Lower the assembled countershaft into the transmission case (32) from the top; push it out the rear of the transmission case and install the low and reverse gear spacer (30), woodruff key, reverse speed gear (29), and countershaft rear ball bearing (28) on the countershaft. Install the assembled countershaft in the transmission case with both ball bearings seated in the case.

d. Position the countershaft front bearing cover gasket (44) and countershaft front bearing cover (48) on the transmission case; secure with countershaft front bearing cover cap screws (46) and countershaft front bearing cover lockwashers (47).

e. Install the oil filler pipe plug (36, fig. 93) in the transmission case.

f. Install the assembled reverse idler gear (29) and reverse gear bushing (28) on the reverse idler shaft (31).

g. Install the reverse idler shaft thrust washer (30) on the reverse idler shaft.

h. Install the assembled reverse idler shaft in the transmission case. The reverse idler gear will engage the countershaft reverse speed gear.

i. Position the idler shaft lock (32) on the transmission case; secure with the idler shaft lock cap screw (33) and idler shaft lockwasher.

j. Position the reverse idler cover gasket (34) and reverse idler cover (35) on the transmission case; secure with the reverse idler cover cap screws (37) and reverse idler cover lockwashers (38).

k. Position the drive gear ball bearing (50, fig. 92) on the clutch shaft and drive gear (36); secure with the drive gear bearing snap ring (51).

l. Install the assembled clutch shaft and drive gear, drive gear bearing snap ring, and drive gear ball bearing in the transmission case.

m. Position the front bearing cover gasket (49) and front bearing cover (53) on the transmission case; secure with the front bearing retainer cap screws (57), washers (54), lockwashers (56), and nuts (55).

n. Position the power takeoff cover (22, fig. 93) and power takeoff cover gasket (23) on the transmission case; secure with the power takeoff cover cap screws, lockwashers (26), and nuts (25).

o. Install the mainshaft rear ball bearing (18, fig. 92) on the mainshaft; secure with the mainshaft rear locknut clip (23) and mainshaft rear locknut (22).

p. Place the mainshaft halfway through the opening in the rear of the transmission case, and install the mainshaft rear bearing retainer plate (12), high-speed mainshaft sliding gear (61), low and reverse mainshaft sliding gear (10), and mainshaft pilot ball bearing (52) on the mainshaft; install the assembled mainshaft and gears in the transmission case so the mainshaft pilot ball bearing seats in the clutch drive gear and the outer edge of the rear ball bearing is flush with the outside of the transmission case. The low and reverse sliding gear should be between the countershaft low speed and reverse speed gear, and the high speed sliding gear should be between the countershaft second speed gear and drive gear. Both the mainshaft and clutch shaft will turn freely and independently if the mainshaft is installed correctly.

q. Install the hole plug (21, fig. 93) on the rear bearing cover (17).

r. Position the rear bearing cover gasket (27, fig. 92) and rear bearing cover on the transmission case; secure the rear ball bearing, rear bearing retainer plate, and rear bearing cover to the transmission case with three rear bearing cover cap screws (14), rear bearing cover lockwashers (15), rear bearing cover nuts (16), the two countershaft rear bearing cover cap screws (25), and countershaft rear bearing cover lockwashers (26).

s. Position the gear shift lever pivot pin (4, fig. 93) in the center control cover (7); secure with the gear shift lever pivot pin lockwasher (5) and gear shift lever pivot pin nut (6).

t. Position the gear shift lever (1, fig. 92) in the center control cover from the bottom of the cover; secure with the lever washer (5) and lever spring (63).

u. Position the gear shift lever bell (3) on the center control cover; secure with the lever bell lockwasher (65) and lever bell cap screw (64).

v. Install the gear shift lever ball (2) on the gear shift lever.

w. Install one steel ball (9, fig. 93) between the two shifting yoke bars (10) and (40) and place the assembled yoke bars and steel ball part of the way in the center control cover from the front of the control cover. The high-speed yoke bar should be on the right side as you face the top front of the control cover. Slide the high-speed yoke bar through the high-speed shifting yoke (7, fig. 92) into the other side of the center control cover, and the low and reverse speed yoke bar through the low and reverse speed shifting yoke (9) and into the other side of the control cover. The end of the gear shift lever must be between the shifting yoke bars.

x. Secure the two shifting yokes in their proper places on the shifting yoke bars with the shifting yoke cap screws (6), shifting yoke castle nuts (8), and shifting yoke cotter pins (62).

y. Install the two long thimbles (13) and the two short thimbles (60) in the openings of the center control cover.

z. Position the two remaining steel balls and two position finder springs (11, fig. 93) in the center control cover; secure with two pipe plugs (12). The gear shift lever should seat firmly in the four speed positions and move sidewise in the neutral position. Move the gear shift lever to the neutral position.

aa. Position the center control cover gasket (11, fig. 92) and the assembled center control cover on the transmission case; secure with the center control cover cap screws (13, fig. 93) and center control cover washers (39). The high-speed shifting yoke must fit over the high-speed mainshaft sliding gear, and the low and reverse speed shifting yoke must fit over the low and reverse speed mainshaft sliding gear. With the gear shift lever in the neutral position, both the clutch shaft and the mainshaft should turn freely and independently of one another.

ab. Position the clutch housing on the transmission case; secure with five clutch housing lockwashers (42, fig. 92) and clutch housing nuts (43).

ac. Install the assembled clutch and the clutch brake parts on the clutch shaft and install the assembled transmission and clutch on the engine (par. 180).

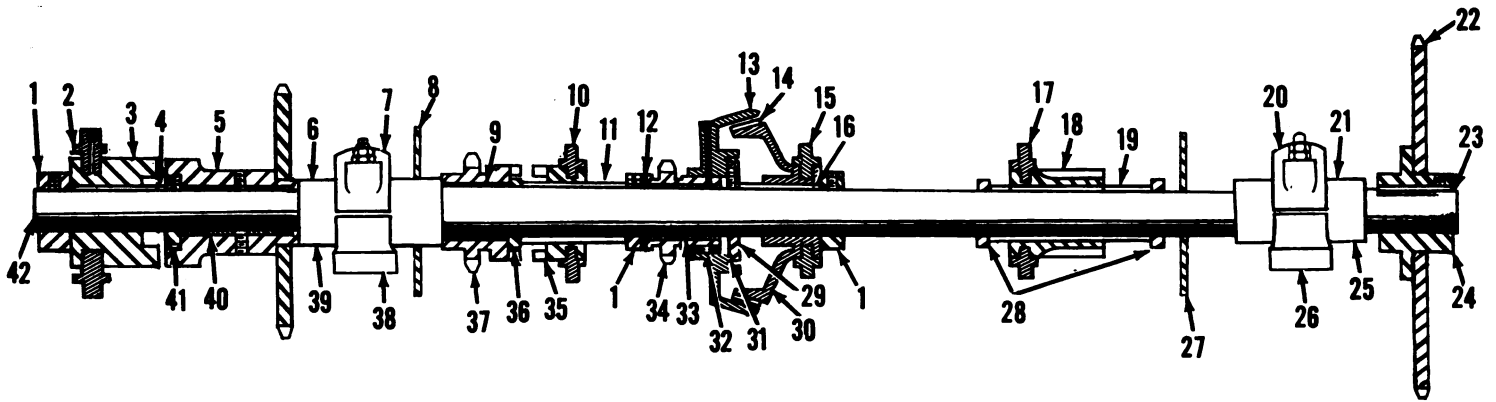
ad. Install the pipe plug (38) in the bottom of the transmission case.

ae. Lublicate as directed in LO 5–9585.

Section XII. JACKSHAFT

185. Description (fig. 94)

The jackshaft (42) is mounted on two split sleeve bearings; it drives the crawler clutch shaft through the gear (18) which is engaged with a gear on the crawler clutch shaft. Moving the high-speed lever to the engaged position disengages the gear drive, and engages the high speed sprocket (37) through the jaw clutch (35), to chain drive the crawler clutch shaft at a higher speed. The power hoist is driven by the chain from the cone clutch sprocket (34). The reversing countershaft is driven by the chain on the sprocket (5).



1	Collar	12	Washer	23	Key	33	Bushing
2	Shifter	13	Cone clutch	24	Sprocket hub	34	Sprocket
3	Jaw clutch	14	Lining	25	Bearing, lower half	35	Jaw clutch
4	Key	15	Shifter	26	Bearing base	36	Collar
5	Sprocket	16	Key	27	Cover plate	37	Sprocket
6	Bearing, upper half	17	Shifter	28	Collar	38	Bearing base
7	Bearing cap	18	Gear	29	Collar	39	Bearing, lower half
8	Cover plate	19	Key	30	Cone clutch	40	Bushing
9	Bushing	20	Bearing cap	31	Felt washer	41	Collar
10	Shifter	21	Bearing, upper half	32	Key	42	Jackshaft
11	Key	22	Sprocket				

Figure 94. Jackshaft, cross section.

186. Jackshaft Removal

a. Remove the jackshaft drive chain guard (par. 96*a*(3) and (4)).

b. Remove the jackshaft drive chain from the jackshaft sprocket (par. 96*a*(5), (6), and (8)).

c. Remove the yoke arm (17, fig. 16) from the flight line jaw clutch (par. 115*a*(4) and (5)).

d. Remove the countershaft drive chain and guard (par. 136*a*).

e. Remove the power hoist chain (par. 135*a*).

f. Remove the shaft transmission housing (par. 142*a*(4) through (7)).

g. Remove the high speed lever linkage (par. 117*a*(5) through (7)).

h. Remove the power hoist clutch linkage (par. 118*a*(4) through (6)).

i. Remove the jackshaft input sprocket (par. 140*a*(3)).

j. Remove the high-speed chain (par. 133*a*(2)).

k. Remove the jam nuts and plain nuts securing the bearing caps (7, fig. 94) and (20) to the bearing bases (26) and (38); remove the bearing caps and the upper halves of the bearings (6) and (21) from the bearing bases. Mark the position of the ends of the split sleeve bearings on the jackshaft.

l. Remove the assembled jackshaft from the shaft transmission housing.

m. Remove the bearing bases from the main frame; remove the lower halves of the bearings (25) and (39) from the bearing bases.

187. Jackshaft Disassembly

(fig. 94)

a. Loosen the setscrews in the collars (28) securing the keys (19) and the assembled gear and shifter (17) to the jackshaft; remove the assembled gear and shifter, keys, and the collars.

b. Loosen the setscrews in the collar (1) securing the key (16) and the male half of the cone clutch (30) to the jackshaft; remove the collar, key, and assembled male half of the cone clutch, lining, and shifter (15).

c. Loosen the setscrews in the collars (29) and (1) securing the assembled female half of the cone clutch (13) and sprocket (34) to the jackshaft; remove the collars, felt washers (31), washer (12), and the assembled female half of the cone clutch assembly and sprocket.

d. Remove the assembled shifter (10) and jaw clutch (35) and the keys (11).

e. Loosen the setscrews in the collar (36) securing the sprocket (37) to the jackshaft; remove the collar and sprocket.

f. Loosen the setscrews in the collar (1) securing the key (4) and assembled shifter (2) and jaw clutch (3) on the jackshaft; remove the collar, key, and assembled shifter and jaw clutch.

g. Loosen the setscrews in the collar (41) securing the sprocket (5) to the jackshaft; remove the collar and sprocket.

h. Remove the nuts, lockwashers, and machine bolts securing the halves of the shifters (2), (10), (15), and (17); separate the halves and remove the shifters.

i. Remove the lubrication fittings from the shifters, sprockets, and the cone clutch.

188. Jackshaft Cleaning and Inspection (fig. 94)

a. Clean all metal parts with an approved cleaning solvent; dry thoroughly.

b. Wipe the lining (14) on the male half of the cone clutch (30) with a cloth dampened with an approved cleaning solvent; dry thoroughly. Do not soak the clutch lining in solvent.

c. Inspect the cone clutch lining for oil-soaking, wear, or other damage; replace if damaged.

d. Inspect the teeth of the sprockets (5), (22), (34), and (37) for wear, chips, cracks, or other damage; replace if damaged.

e. Inspect the split sleeve bearings for cracks, bends, wear, scoring, or other damage; replace if damaged.

f. Inspect the bushings (9), (33), and (40) in the sprockets for wear, cracks, scoring, or other damage; replace if damaged.

g. Inspect the keys and the keyways in the jackshaft for wear, cracks, or other damage; replace damaged parts.

h. Inspect the gear (18) for worn, chipped, or broken teeth; replace if damaged.

i. Discard the felt washer (31).

j. Inspect all parts for wear, cracks, bends, worn threads, or other damage; replace if damaged.

189. Jackshaft Reassembly (fig. 94)

a. Install the lubrication fittings in the shifters, sprockets, and cone clutch.

b. Position the shifters (2), (10), (15), and (17) around the clutches (3), (35), and (30) and gear (18); secure with machine bolts, lockwashers, and nuts.

c. Position the sprocket (5) and the collar (41) on the jackshaft; secure the collar by tightening the setscrew so that when the sprocket fits over the collar, the opposite face of the sprocket is alined with the mark indicating the split sleeve bearing edge.

d. Install the key (4) in the shaft keyway and slide the jaw clutch (3) on the jackshaft and key. Position the collar (1) on the jackshaft; secure by tightening the setscrews. Make sure sufficient clearance exists between the jaws of the jaw clutch and sprocket.

e. Position the sprocket (37) and the collar (36) on the jackshaft. Secure the collar by tightening the setscrew so that when the sprocket fits tightly against the collar, the opposite face of the sprocket is alined with the mark indicating the split sleeve bearing edge.

Note. Check the distance between the sprockets (5) and (37) by installing a half of the split bearing (6) or (39).

f. Install the keys (11) in the shaft keyways and install the jaw clutch (35) on the jackshaft and keys.

g. Install the collar (1), washer (12), the assembled female half of the cone clutch (13) and sprocket (34), a new felt washer (31), and the collar (29) on the jackshaft. Position the collar (1) against the key (11); secure the collars by tightening the setscrews.

h. Install the key (16) in the keyway of the jackshaft; install the assembled male half of the cone clutch (30) and lining (14) on the jackshaft and key. Position the collar (1) against the cone clutch; secure by tightening the setscrew. Check that clearance exists between the male and the female parts of the clutch when the male half is moved along the key.

i. Install the collars (28), keys (19), and gear (18) on the jackshaft and position the collars at each end of the key; secure by tightening the setscrews.

190. Jackshaft Installation

a. Install the bearing bases (26, fig. 94) and (38) on the main frame; install the lower halves of the split bearings (25) and (39) in the bearing bases.

b. Install the assembled jackshaft on the bases on the main frame.

c. Install the upper half of the split bearings (6) and (21). Position the bearing caps on the bearing bases; secure with nuts and jam nuts.

d. Install the high-speed chain (par. 133*c*(1)).

e. Install the jackshaft input sprocket (par. 140*c*(1)).

f. Install the power hoist clutch linkage (par. 118*e*(1) through (3)); adjust the linkage (par. 118*f*(2) through (4)).

g. Install the high-speed lever linkage (par. 117*e*(1) through (3)); adjust the linkage (par. 117*f*(2) through (4)).

h. Install the shaft transmission housing (par. 142*c*(1) through (6)).

i. Install the power hoist chain (par. 135*c*).

j. Install the countershaft drive chain and chain guard (par. 136*c*); adjust the chain tension (par. 136*d*).

k. Install the yoke arm (17, fig. 16) on the flight line clutch (par. 115*e*(1) and (2)).

l. Install the jackshaft drive chain (par. 96*c*(4)); adjust the chain tension (par. 96*d*).

m. Install the jackshaft drive chain guard (par. 96*c*(7) and (8)).

n. Lubricate as directed in LO 5–9585.

Section XIII. CRAWLER CLUTCH SHAFT

191. Description
(fig. 95)

The crawler clutch shaft is supported on a split bearing (2) and (22) on one end and a bearing (15) at the other end. The input power gear (6), sprocket (12), and the two clutch friction bands (19) and cones (20) are keyed to the crawler clutch shaft (1). The crawler drive sprockets (7) are sleeve bushing mounted on the shaft; the clutch hub and brake drums (18) are keyed to the sprocket clutch hub assembly. The crawler clutches are the friction band type.

192. Crawler Clutch Shaft Removal

a. Remove the countershaft drive chain and chain guard (par. 136*a*).

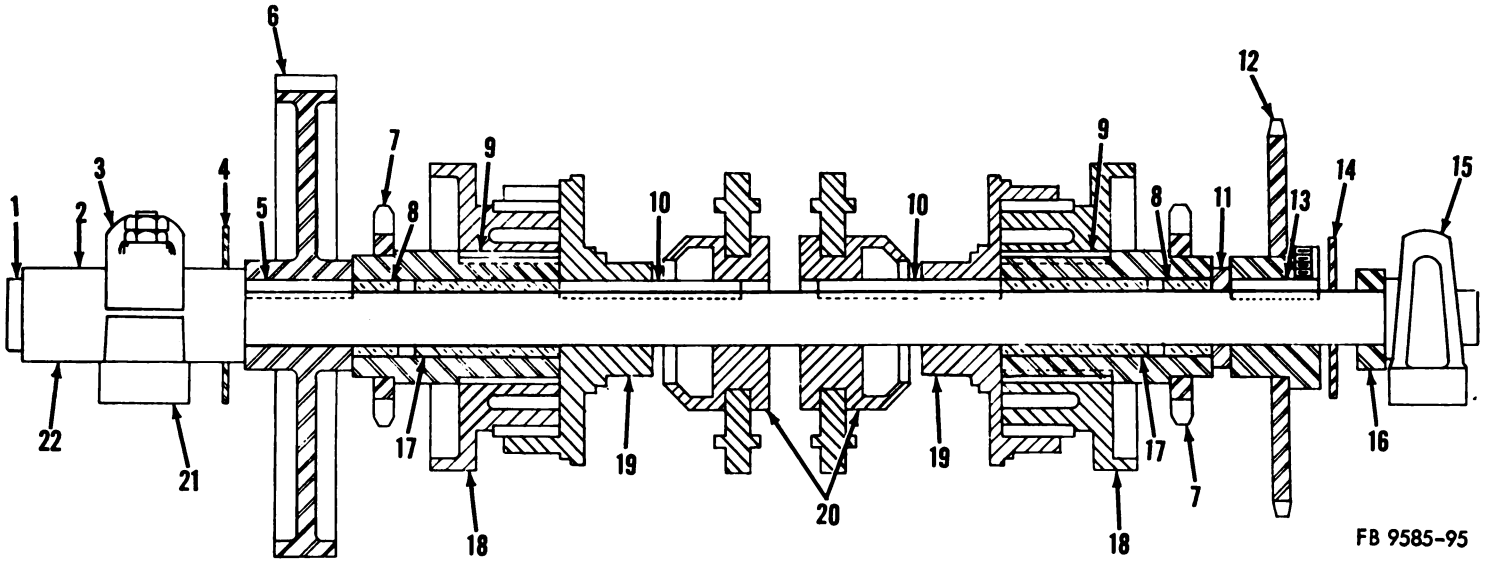
b. Remove the shaft transmission housing (par. 142*a*(4) through (7)).

c. Remove the high-speed chain (par. 133*a*(2)).

d. Remove the nuts, lockwashers, machine bolts (2, fig. 58), and two coil springs (3) from the two brake bands (1) above the crawler clutches.

e. Remove the oscillating shaft drive chains (par. 134*a*(2) and (3)).

f. Remove the nuts and jam nuts securing the bearing cap to the bearing base (21, fig. 95); remove the bearing cap and the upper half of the bearing (2).



1	Crawler clutch shaft	7	Sprocket	13	Key	18	Clutch hub and brake drum
2	Bearing, upper half	8	Bushing	14	Plate	19	Clutch friction band
3	Bearing cap	9	Key	15	Bearing	20	Clutch cone
4	Plate	10	Key	16	Collar	21	Bearing base
5	Key	11	Spacer	17	Bushing	22	Bearing, lower half
6	Gear	12	Sprocket				

Figure 95. Crawler clutch shaft, cross section.

g. Remove the nuts, lockwashers, and the machine bolts securing the bearing (15) to the main frame.

h. Remove the assembled crawler clutch shaft from the transmission housing.

i. Remove the nuts, plain washers, pipe spacers (6, fig. 58), and machine bolts (5) securing the brake bands to the brake linkage; remove the brake bands.

j. Remove the bearing base (21, fig. 95) from the main frame; remove the lower half of the split bearing (22) from the base bearing.

193. Crawler Clutch Shaft Disassembly (fig. 95)

a. Loosen the setscrews in the collar (16) and remove the pillow block bearing (15) and collar (16) from the crawler clutch shaft (1).

b. Loosen the setscrews securing the sprocket (12) to the shaft; remove the sprocket, key (13), and spacer (11).

c. Remove the assembled sprocket (7) and clutch hub and brake drum (18) from the shaft.

d. Remove the two clutch friction bands (19), clutch cones (20), and the keys (10) from the crawler clutch shaft.

e. Remove the assembled sprocket (7) and clutch hub and brake drum (18) from the crawler clutch shaft.

f. Remove the gear (6) and key (5) from the shaft.

g. Remove the nuts, lockwashers, and machine bolts securing the halves of the shifter yokes to the clutch cones (20); remove the shifter yokes.

h. Remove the clutch hubs and brake drum (18) from the sprockets (7); remove the keys (9).

i. Remove any lubrication fittings.

194. Crawler Clutch Shaft Cleaning and Inspection (fig. 95)

a. Clean all metal parts of the crawler clutch shaft assembly except the ball bearing (15) with an approved cleaning solvent; dry thoroughly.

b. Clean and inspect the ball bearing as directed in paragraph 126*c*(2).

c. Wipe the friction surfaces of the friction bands with a cloth dipped in an approved cleaning solvent; dry thoroughly.

d. Inspect the friction surfaces of the brake drums and the clutch drums for scoring, grooving, uneven wear, or other damage; replace if worn or damaged.

e. Inspect the teeth on the sprockets (7) and (12) for wear, chips, cracks, or other damage; replace if damaged.

f. Inspect the bushings (8) and (17) in the sprockets for wear, cracks, scoring, out-of-round, or other damage; replace if damaged.

g. Inspect the keys and the keyways for cracks, wear, or other damage; replace damaged parts.

h. Inspect the gear (6) for worn, chipped, or broken teeth; replace if damaged.

i. Inspect all parts for cracks, worn threads, wear, or other damage; replace if damaged.

195. Crawler Clutch Shaft Reassembly (fig. 95)

a. Install any lubrication fittings.

b. Install the clutch hubs and brake drums (18) on the sprockets (7) and keys (9).

c. Position the halves of the shifter yokes on the clutch cones (20), and secure the halves with machine bolts, lockwashers, and nuts.

d. Install the key (5) in the keyway in the crawler clutch shaft (1) and install the gear (6) on the shaft and key.

e. Install one assembled sprocket (7) and clutch hub and brake drum (18) on the crawler clutch shaft.

f. Install the keys (10) in the keyways of the crawler clutch shaft; install the clutch friction bands (19) and clutch cones (20) on the shaft and keys.

g. Install the assembled sprocket (7) and clutch hub and brake drum (18) on the crawler clutch shaft.

h. Install the spacer (11) on the shaft; install the key (13) in the shaft keyway. Install the sprocket (12) on the shaft and key; secure by tightening the setscrew.

i. Install the collar (16) on the shaft, and install the bearing (15) on the shaft.

j. Check that the clutches move and the clutches and brakes engage and disengage properly.

196. Crawler Clutch Installation

a. Install the bearing base (21, fig. 95) on the main frame; install the lower half of the split bearing (22) in the bearing base.

b. Install the brake bands in the shaft transmission housing on the brake band linkages; secure with machine bolts (5, fig. 58), pipe spacers (6), plain washers, and nuts.

c. Install the assembled crawler clutch shaft in the shaft transmission housing, seating the shaft in the split bearing and positioning the bearing (15, fig. 95) on the main frame. The teeth of the gear (6) should engage the teeth of the gear (18, fig. 94) on the jackshaft, and the clutch shifter yokes on the clutch cones (20, fig. 95) should engage the clutch shifter yoke arms beneath the crawler clutch shaft. Position the brake bands around the brake drums.

d. Secure the bearing (15) to the main frame of the conveyor with machine bolts, lockwashers, and nuts.

e. Position the upper half of the split bearing (2) on the lower half (22) and the bearing cap (3) on the bearing base (21); secure with nuts and jam nuts.

f. Install the oscillating shaft drive chains (par. 134*c*(1)).

g. Adjust the tension of the crawler drive chain (par. 125*f*) if necessary.

h. Install the two coil springs (3, fig. 58) in the brake bands; secure the brake bands on the brake drums with machine bolts (2), lockwashers, and nuts.

i. Install the shaft transmission housing (par. 142*c*(1) through (6)).

j. Install the high-speed chain (par. 133*c*(1)).

k. Install the countershaft chain and chain guard (par. 136*c*); adjust the chain tension (par. 136*d*).

l. Adjust the crawler clutches and brakes (par. 141).

m. Lubricate as directed in LO 5–9585.

Section XIV. OSCILLATING SHAFT

197. Description (fig. 61)

The oscillating shaft extends through the openings in the main frame below the main frame channels and through the pilot axle castings (2) on the top of the crawler frames (15). The pilot axle castings are provided with shim plates and keeper plates for adjustment of the crawler drive chains. The double sprockets on the oscillating shaft turn freely on sleeve bushings.

198. Oscillating Shaft Removal and Disassembly (fig. 96)

a. Remove the operator's platform, crawler drive chains, oscillating axle, and crawlers (par. 125*a*).

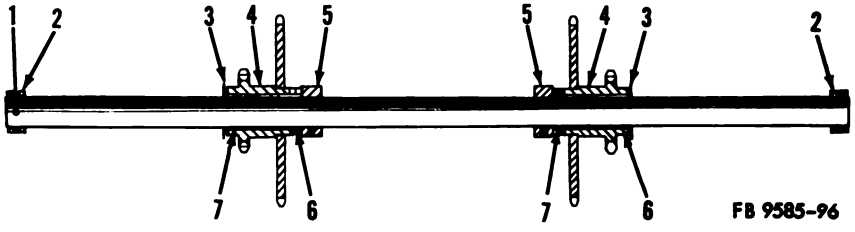
b. Remove the setscrews securing the collars (2) at each end of the oscillating shaft (1); remove the collars.

c. Loosen the two setscrews in the frame-mounted bearings at both ends of the shaft.

d. Remove the oscillating shaft drive chain (par. 134*a*(2) and (3)).

e. Remove the setscrews from the two oscillating shaft collars (5).

f. Slide the shaft from the machine, taking care not to drop the sprockets (4) and collars (5) as they become free of the shaft.



1 Oscillating shaft
2 Collar
3 Frame
4 Sprocket
5 Collar
6 Bushing
7 Bushing

Figure 96. Oscillating shaft, cross section.

199. Oscillating Shaft Cleaning and Inspection

a. Clean all parts with an approved cleaning solvent; dry thoroughly.

b. Inspect the teeth of the sprockets for wear, cracks, breaks, or other damage; replace if damaged.

c. Inspect the bushings (6) and (7) for wear, scoring, or out-of-round; remove and replace damaged bushings.

d. Inspect all parts for cracks, breaks, bends, wear, or other damage; replace damaged parts.

200. Oscillating Shaft Reassembly and Installation (fig. 96)

a. Slide the occillating shaft (1) into position on the machine, meanwhile installing the sprockets (4) and collars (5). Position the sprockets with the small-sprocket section toward the outside of the machine, and the collars between the sprockets.

b. Tighten the two setscrews in each of the frame-mounted bearings at both ends of the shaft.

c. Install collars (2) at both ends of the shaft; secure with setscrews.

d. Aline the sprockets (4) with the sprockets on the crawler clutch shaft; position the collars (5) against the sprockets and secure by tightening the collar setscrews.

e. Install the oscillating shaft drive chains (par. 134*c*(1)).

f. Install the crawlers, oscillating axle, and crawler drive chains (par. 125*e*(1) through (7)); adjust the tension of the crawler drive chains and oscillating shaft drive chains (par. 125*f*).

Section XV. POWER HOIST

201. Description (fig. 59)

The power hoist (2) is mounted on the horizontal main frame angles above the shaft transmission housing. The hoist consists of a worm and gear enclosed in a split housing. The wormshaft is driven by the sprocket and chain from the clutch on the jackshaft. The gear drives two cable drums (3) mounted on each end of the gear shaft. The cables from the drums are reeved over large and small sheaves attached to the main frame of the conveyor and the mast sheaves.

202. Power Hoist Removal

a. Lower the boom to rest on the mast angle; raise the foot end with the hand hoist wheel. Block under the foot end.

b. Remove the cables from the boom sheave shafts (par. 106*a*(2)).

c. Remove the power hoist cables from the mast sheaves, from the sheaves on the main frame, and from the cable drums. Wind the cable on a drum while removing.

Caution: Handle wire cable carefully. It can whip and strike with great force, causing severe or even fatal injury to personnel. Always use gloves when handling cable.

d. Remove the power hoist chain guard from the shaft transmission housing (par. 135*a*(1)).

e. Remove the power hoist chain (par. 135*a*(2) and (3)).

f. Remove the two nuts, lockwashers, plain washers, and machine bolts securing the upper part of the hoist bracket(1, fig. 59) to the upper angle on the main frame.

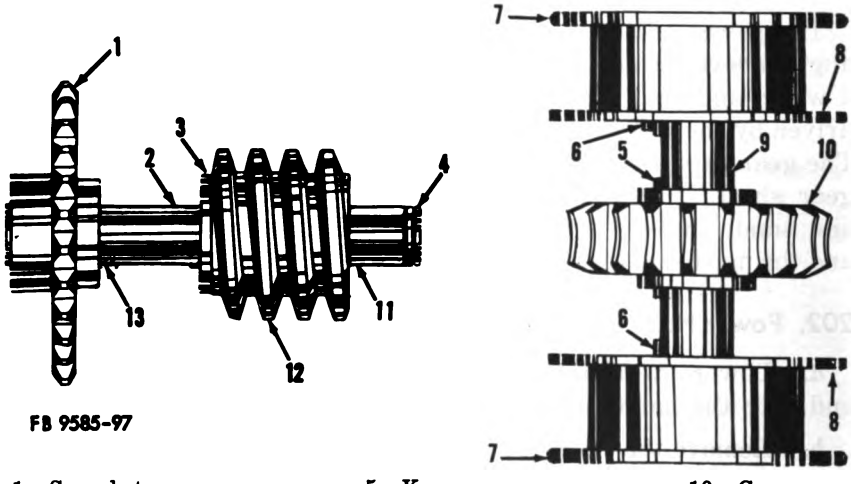
g. Remove the four nuts, lockwashers, and machine bolts securing the hoist bracket to the main frame angles; remove the assembled power hoist and bracket from the conveyor.

203. Power Hoist Disassembly

a. Remove the eight nuts, lockwashers, and machine bolts securing the power hoist upper and lower housing (5, fig. 52) and (6) to the bracket (11); remove the bracket from the housing.

b. Remove the drain plug and drain the lubricant from the power hoist housing.

c. Remove the six nuts, lockwashers, and machine screws securing the upper housing to the lower housing; separate the two halves of the power hoist housing. Remove the assembled drums (7, fig. 97) and gear (10) and the assembled sprocket (1) and worm (12).



FB 9585-97

1	Sprocket	5	Key	10	Gear
2	Sprocket shaft	6	Key	11	Taper key
3	Washer	7	Drum	12	Worm
4	Thrust washer	8	Drum plate	13	Key
		9	Drum shaft		

Figure 97. Power hoist parts.

d. Remove the two cable drums from the power hoist drum shaft (9); remove the keys (6).

e. Remove the eight machine screws, lockwashers, and nuts securing the drum plates (8) to the drums (7); remove the drum plates.

f. Remove the gear (10) from the drum shaft (9); remove the key (5).

g. Remove the input sprocket (1) from the sprocket shaft (2); remove the key (13).

h. Remove the washer (4) from the sprocket shaft.

i. Remove the taper key (11) securing the worm (12) to the sprocket shaft; remove the worm and the washer (3).

j. Remove any lubrication fittings.

204. Power Hoist Cleaning and Inspection (fig. 97)

a. Clean all parts with an approved cleaning solvent; dry thoroughly. Make sure the mating surfaces of the housing are clean.

b. Inspect the teeth of the sprocket (1), worm (12), and gear (10) for wear, chips, cracks, or other damage; replace if damaged.

c. Inspect the keyways and keys for wear, cracks, or other damage; replace damaged parts.

d. Inspect all parts for wear, cracks, damaged threads, or other damage; replace if damaged.

e. Discard the housing gasket.

205. Power Hoist Reassembly

a. Install lubrication fittings.

b. Install the taper key (11, fig. 97) in the keyway in the sprocket shaft (2); position the washer (3) and install the worm (12) on the shaft and key.

c. Install the washers (4) on the sprocket shaft.

d. Install the key (13) in the keyway of the sprocket shaft; install the sprocket (1) on the shaft and key.

e. Install the key (5) in the keyway of the drum shaft (9); install the gear (10) on the shaft and key.

f. Position the drum plates (8) on the drums (7); secure with the eight machine screws, lockwashers, and nuts.

g. Install the keys (6) in the keyways of the drum shaft; install the drums (7) on the drum shaft and keys.

h. Position the assembled sprocket shaft (2) and assembled drum shaft (9) between the housing halves. Use a new gasket between the housing halves; secure with six machine screws, lockwashers, and nuts.

i. Install the drain plug in the housing.

j. Position the assembled power hoist on the power hoist bracket (11, fig. 52); secure with the eight machine bolts, lockwashers, and nuts.

206. Power Hoist Installation

a. Position the power hoist and bracket (1, fig. 59) on the angles of the main frame; secure with four machine bolts, lockwashers, and nuts.

b. Secure the upper part of the hoist bracket to the upper angle on the main frame with two machine bolts, plain washers, lockwashers, and nuts.

c. Install the power hoist chain (par. 135*c*(1) and (2)).

d. Install the power hoist chain guard (par. 135*c*(3) and (4)).

e. Install the cables on the boom sheave shafts (par. 106*e*(2) and (3)).

f. Lubricate as directed in LO 5–9585.

CHAPTER 5

SHIPMENT, LIMITED STORAGE, AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

207. Limited Storage

a. Inspection. Inspect the conveyor as directed in paragraph 48.

b. Cleaning and Painting. Clean and paint the conveyor as directed in paragraph 44.

c. Complete Lubrication. Lubricate the conveyor as directed in LO 5–9585.

d. Protection in Storage.

(1) Clean the external surfaces of the conveyor crawlers, boom, main frame, mast, cables, sheaves, power unit, chains, and operating controls. Coat the exterior surfaces of the conveyor operating controls, cables, chains, sprocket teeth, boom bed plates, and cable drums, and all unpainted and unprotected surfaces with preservative compound or heavy grease.

(2) Make sure that the removable door, housing covers, handhole covers, engine side panels, and hopper side plates are in position on the unit.

(3) Fill the cooling system with water and rust preventive. Drain and fill with antifreeze solution prior to freezing weather. Refer to paragraph 33*e*.

(4) Apply preservative engine oil to the carburetor and governor linkage, the carburetor adjusting screw, and all exposed screw threads.

(5) Charge the batteries fully; check the level of the electrolyte and refill, if necessary.

(6) Check all tools and pack in the toolbox with suitable packing material.

(7) Store the unit in a building when possible.

e. Inspection in Storage.

(1) Inspect the unit for damage, rusting, water accumulation, or loss of parts.

(2) Inspect the base of the radiator, the hose lines, and the

bypass line for leaks; replace all leaking parts or report the condition to the proper authority.

(3) Inspect the fuel tank and fuel lines for leaks; replace or report all leaking parts to the proper authority.

(4) Inspect the area around the power hoist, engine transmission, and the engine oil pan for lubricant leaks; correct leaks or report the condition to the proper authority.

(5) Perform the preventive maintenance and technical inspections (par. 48) on the unit when it is placed in storage and every 30 days thereafter. Enter the maintenance and inspection procedures on DA Form 464, Work Sheet for Preventive Maintenance and Technical Inspection of Engineer Equipment.

f. Exercising During Storage.

(1) Perform the before-operation services (par. 46*c*).

(2) Operate the unit in storage at least once every 10 days.

(3) Operate the unit long enough to bring the engine to its operating temperature and to lubricate the bearings.

(4) Perform the after-operation services (par. 46*f*).

208. Domestic Shipment

a. General.

(1) Prepare the unit for shipment as directed in paragraph 207*a* through *d*.

(2) Lower the boom, raise the foot end, and move the conveyor to the point of shipment (par. 30*a*(1) through (4)).

b. Hoisting and Handling. Move the conveyor to the carrier (par. 30*b*(2) and (3)).

c. Packing and Blocking.

(1) Block around the crawlers and under the foot end and head end of the conveyor. Spike the blocks to the floor of the carrier.

(2) Install cables or chains through the tie-down rings on the main frame, lower push arms, foot end, and upper section of the boom. Secure the cables or chains to the carrier.

(3) Wire the hopper side plates to the boom.

Section II. DEMOLITION OF THE CONVEYOR TO PREVENT ENEMY USE

209. General

When capture or the abandonment of the conveyor to an enemy 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 conveyors and all corresponding repair parts.

210. 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 will further destroy the unit.

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

(1) A 2-pound charge in the shaft transmission.
(2) A 2-pound charge in the engine housing.

Note. The above charges are the minimum requirement for this method.

(3) A 1-pound charge on the transmission.
(4) A 2-pound charge in the return dust pan of the boom foot end under the middle of the drive shaft.
(5) A 1-pound charge on the top of each crawler.

b. Demolition by 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 conveyor, to destroy the following:

(1) Ignition magneto, carburetor, generator, and electrical starter.
(2) Shaft transmission gears, clutches, linkage, sprockets, and chains.

Note. The above steps are the minimum requirement for this method.

(3) All instruments and controls on the engine and the operating controls.
(4) Engine block and radiator.
(5) Fuel lines and flexible hoses.
(6) All cables.

211. Other Demolition Methods

If the situation prohibits employing either of the preferred methods, use the following, either singly or in combination:

a. Demolition by Weapons Fire. Fire on the conveyor with the heaviest weapons available.

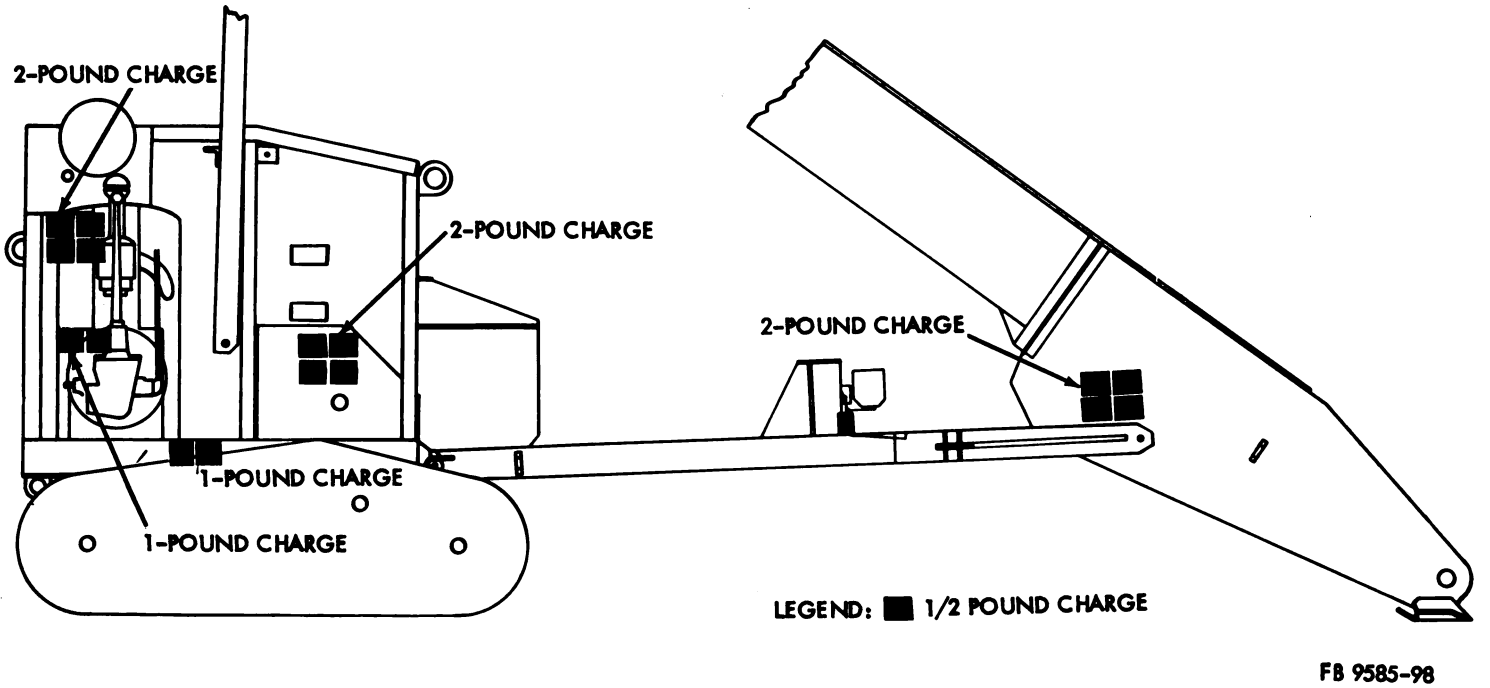


Figure 98. Placement of charges.

b. Demolition by Scattering and Concealment. Remove all easily accessible vital parts such as the carburetor, ignition magneto, generator, electrical starter, voltage regulator, batteries, hoses, fittings, controls, and instruments from the engine, and the control levers, linkages, sprockets, and chains from the conveyor, and scatter them through dense foliage, bury them in dirt or sand, or throw in a lake, stream, well, or other body of water.

c. Demolition by Burning. Pack rags, clothing, or canvas under and inside the engine housing, inside the conveyor transmission housing, and around the crawlers. Saturate this packing with gasoline, oil, or Diesel fuel and ignite.

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

e. Demolition by Misuse. Perform the steps listed below to make the unit inoperative.

(1) Disconnect the governor and throttle control linkage from the carburetor.

(2) Drain the engine crankcase.

(3) Cut the fan V-belt.

(4) Fill the shaft transmission housing, the boom return dust pans, and foot end dust pan with sand, gravel, stones, and metal parts.

(5) Misaline the jackshaft, crawler clutch shaft, and the oscillating shaft.

(6) Drain the transmission and drop in nuts, bolts, sand, and debris.

(7) Drain the power hoist and drop in sand, metal chips, and debris.

(8) Run the engine at full speed with all levers in operating position; run until failure occurs.

212. Training

All operators should receive thorough training in the destruction of the conveyor. 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. For this reason it is necessary that operators be thoroughly familiar with all methods of destruction and be able to carry out demolition instructions without reference to this or any other manual.

APPENDIX I

REFERENCES

1. Accessory Equipment

TM 5–687 Inspection and Preventive Maintenance Services for Fire Protection Equipment and Appliances.
TM 9–2857 Storage Batteries, Lead Acid Type.
TM 9–1799 Ordnance Maintenance: Fire Extinguishers.

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 5–9585 Conveyor, Drag Type, Piler, Self Propelled, Crawler Mounted, Gasoline Driven, 35 Ft Long, 75 Ton Per Hr Capacity, Barber-Greene Model 689.
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 Engineer Equipment.

5. Preventive Maintenance

TB 5–9585–1 Preventive Maintenance Services: Conveyor, drag type, piler, self propelled, gasoline driven, crawler mounted, 35 ft long, 75 tph capacity, Barber Greene Model 689 (Less Engine).
TB 5–5421–1 Preventive Maintenance Services: Engine, Gasoline, Continental, Mdl. FS–162.
TM 5–505 Maintenance of Engineer Equipment.

6. Publication Indexes

DA Pam 108–1 Index of Army Motion Pictures, Television Recordings and Film Strips.

DA Pam 310–1	Index of Administrative Publications.
DA Pam 310–2	Index of Blank Forms.
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.
ENG 1	Introduction.

7. Supply Publications

ENG 3–13	List of Current Issue Items, Federal Class 13.
ENG 3–41	List of Current Issue Items, Federal Class 41, Hand Tools.
ENG 7, 8 & 9–9585	Organizational Allowance, Field & Depot Maintenance, Initial Stock Guide, Depot Stock Guide for Repair & List of all Service parts.

8. Training Aids

FM 21–8	Military Training Aids.
FM 5–25	Explosives and Demolitions.

APPENDIX II

TOOL AND PUBLICATION SET

The tools listed herein are those required to perform the operator maintenance services of the conveyor. In order that a surplus of tools are not supplied, and to insure proper accounting is maintained, the set will be requisitioned as a separate item as indicated in ENG 7, 8 & 9–9585.

Engineer Stock No.	Nomenclature	Quantity
	Department of the Army Supply Manual, ENG 7, 8 & 9–9585.	
13–5496.050.400	OILER: steel; rd; 1/2 pt capacity; 4 in. spout; FS RR–0–376; Type I.	1
41–4140.016.250	GUN, lubricating; lever type; hand operated; Alemite; 16 oz; No. 1056 SE; with extension and hydraulic coupling No. 6638.	1
41–4277.200.150	HAMMER, machinist's: FS GGG–H–86; ball peen; class I; Type L; handled; 1 1/2 lb.	1
41–5976.300.080	PLIERS, combination: slip joint; 8 in.; FS GGG–P–471; Type F.	1
41–9587.500.400	WRENCH, adjustable; crescent type, single head; open end; heavy duty; FS GGG–W–631; Type I; 1 5/16 opening x 12 in. long.	1
41–9619.500.100	WRENCH, construction: 15–deg angle; 1 5/8 in. nominal opening; 21 in. approx. length; Billings and Spencer No. P910ZAO or equal.	1
41–9735.600.020	WRENCH, set screw: Allen; NS 41W15; Type XVII; style A; single; short arm series; 3/16 in. hex size; 15/16 x 2 3/4 in. arm length.	1

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[AG 413.8 (18 Jan 56)]

By Order of *Wilber M. Brucker*, Secretary of the Army:

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Chief of Staff.

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      Maint Co (2)
    5–262R, Hq & Hq Co,
      Engr Maint & Sup
      Gp (2)
    5–267R, Engr Depot
      Co (2)
    5–278R, Engr Depot
      Maint Co (2)
    5–279R, 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.

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