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TM 9-795

WAR DEPARTMENT TECHNICAL

M4-07

HEAVY WRECKING TRUCK M1 (SERIES 1 AND 2)

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WAR DEPARTMENT TECHNICAL MANUAL

TM 9-795

SGV TD

HEAVY WRECKING
TRUCK M1
(SERIES 1 AND 2)



WAR DEPARTMENT

31 AUGUST 1942

WAR DEPARTMENT
Washington 25, D. C., 31 August 1942

TM 9-795, Heavy Wrecking Truck M1, is published for the information and guidance of all concerned.

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BY ORDER OF THE SECRETARY OF WAR:

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Chief of Staff.

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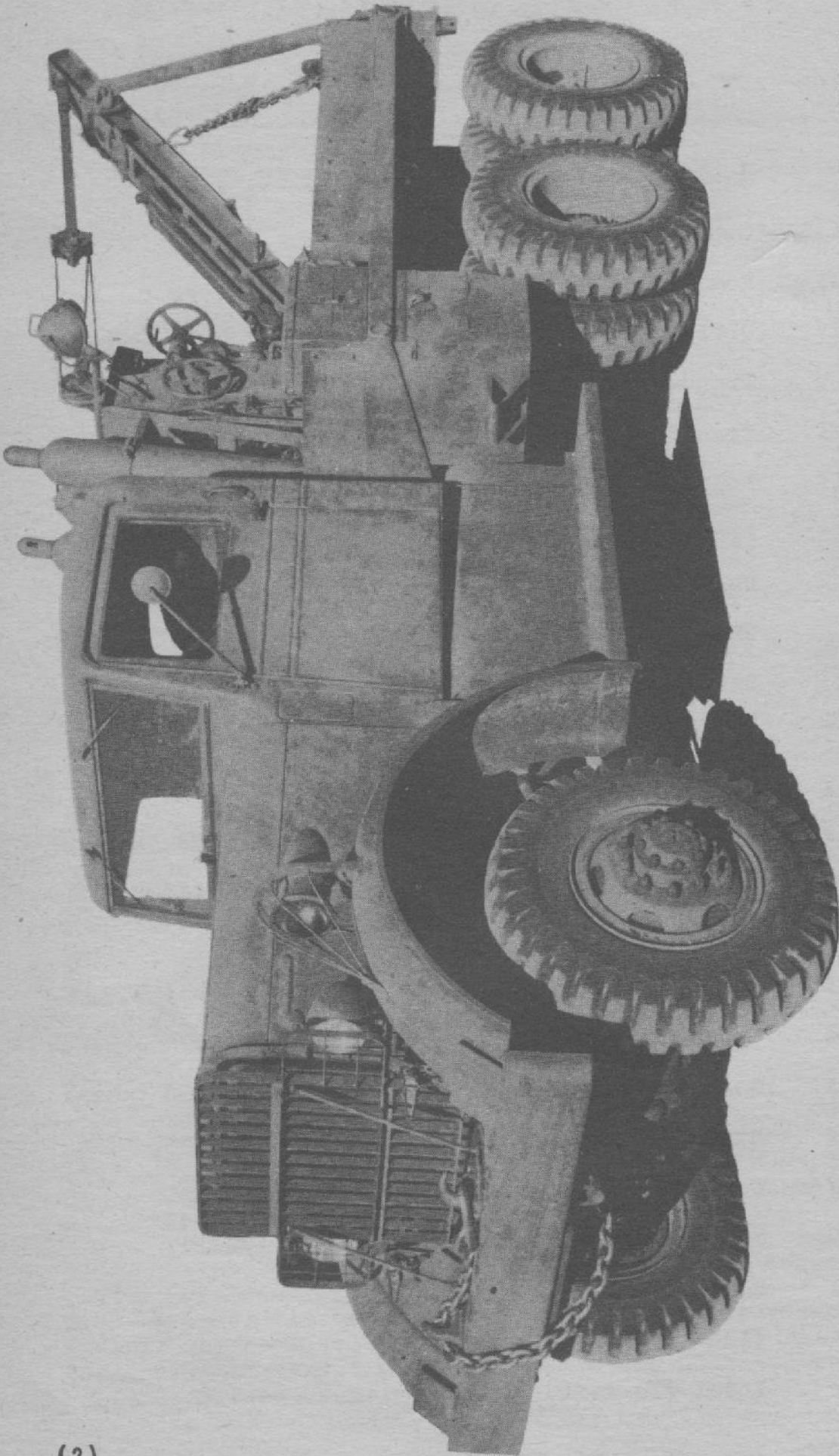
(For explanation of symbols, see FM 21-6.)

HEAVY WRECKING TRUCK M1

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GENERAL OPERATION AND CONTROLS



3/4 LEFT FRONT VIEW COMPLETE VEHICLE, FULLY EQUIPPED

Illustration 1-1

HEAVY WRECKING TRUCK M1

1-2

Section I

GENERAL OPERATION AND CONTROLS

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1. PURPOSE

- a. This manual is published for the information and guidance of the using arms and services.
- b. In addition to a description of the heavy wrecking truck M1 (Series 1, Ward La France and Series 2, Kenworth and Ward La France), this manual contains technical information required for the identification, use and care of the materiel.
- c. Disassembly, assembly, and such repair as may be handled by using arms personnel may be undertaken only under the supervision of an officer or chief mechanic.
- d. All cases where the nature of the repair, modification, or adjustment is beyond the scope or facilities of the unit, the responsible ordnance service should be informed so that trained personnel with suitable tools and equipment may be obtained.

2. SCOPE

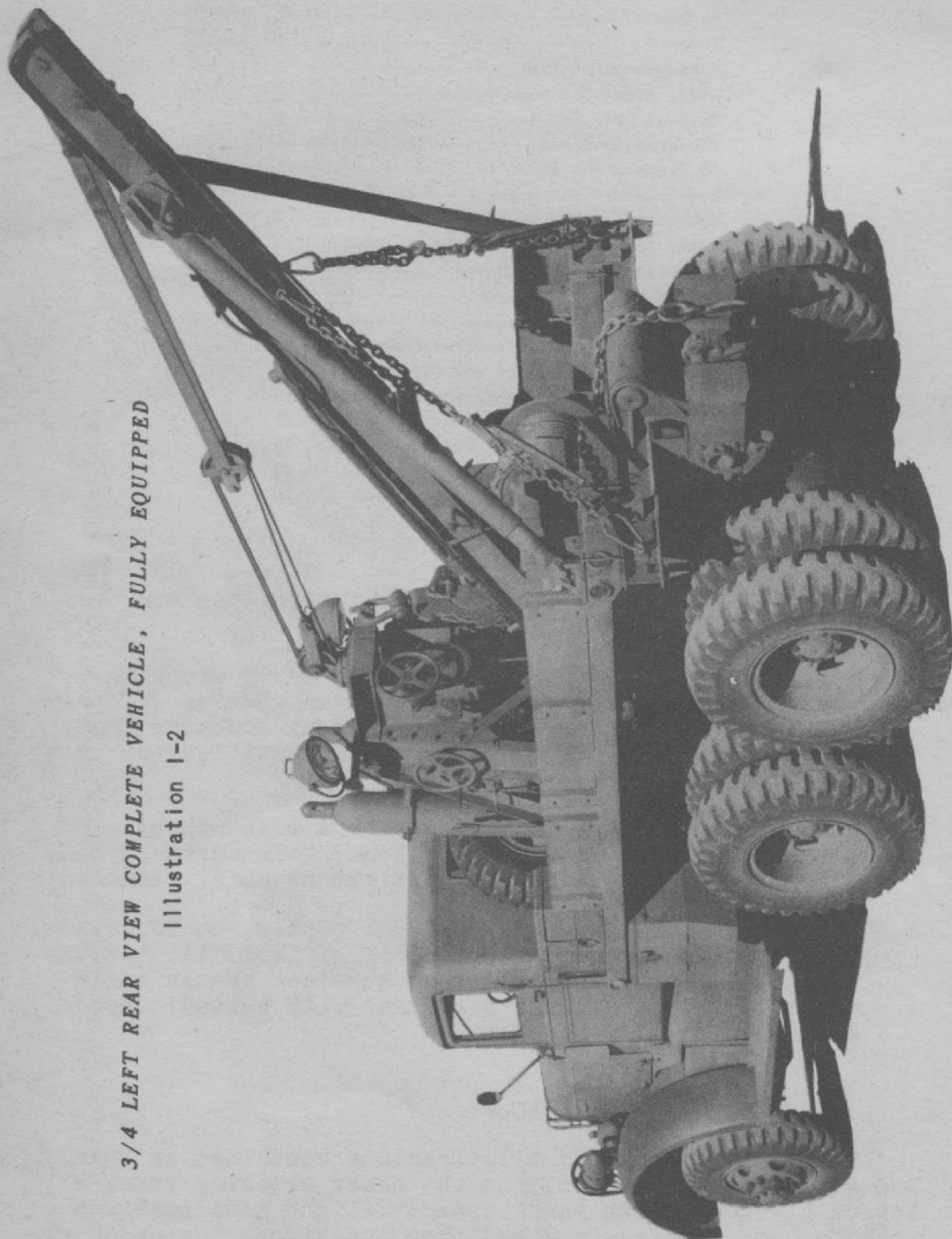
The instructions and illustrations contained in this manual are based primarily on the heavy wrecking truck M1, Series 2, of Kenworth manufacture. Slight modifications in body, sheet metal, and radiator constitute the major differences between the Ward La France and Kenworth trucks.

(3)

3.

ARRANGEMENT OF TEXT

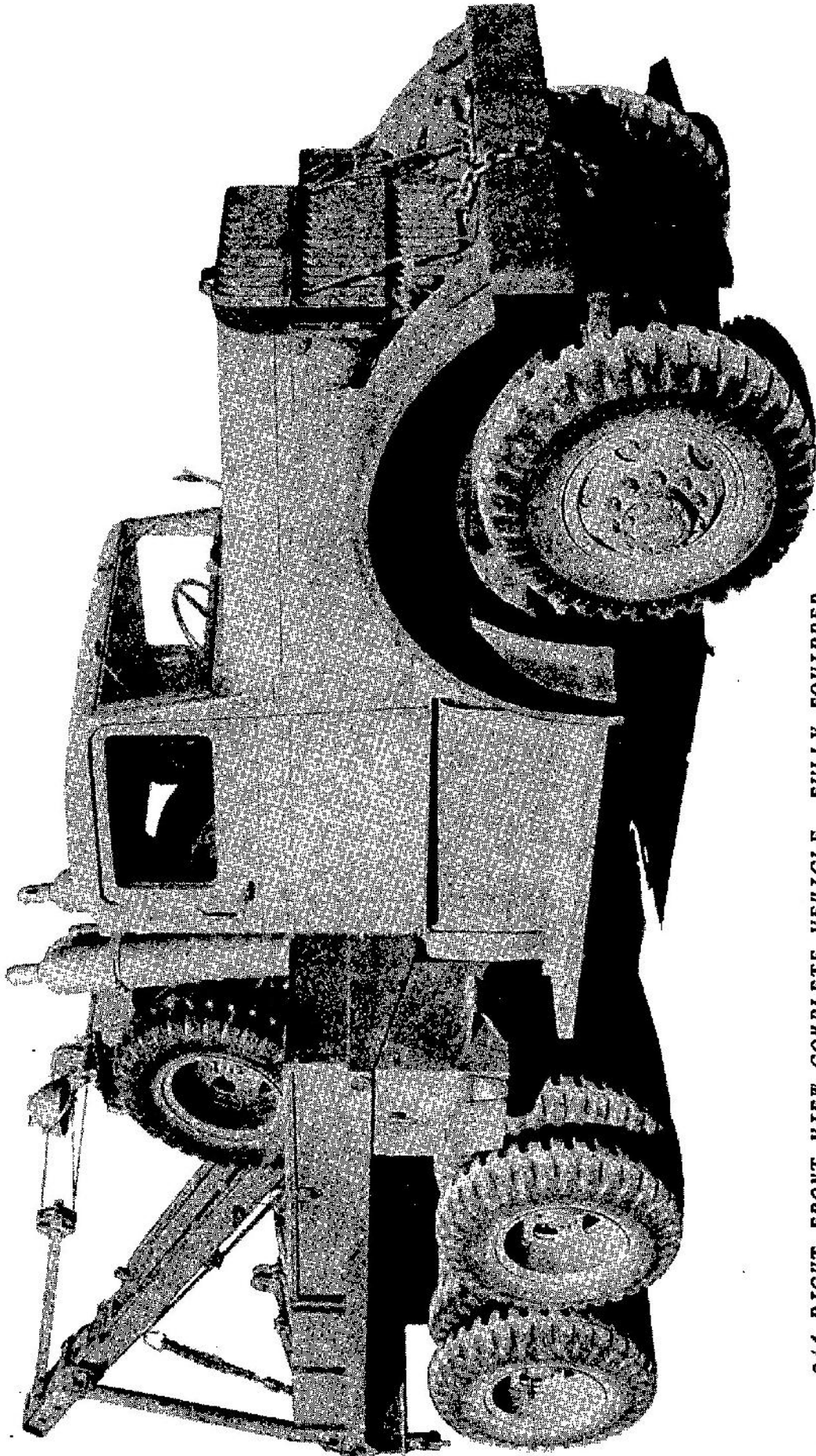
Included in the text are descriptions of the major units, group assemblies, functional systems and instructions with reference to the operation, inspection, lubrication, service diagnosis and cause.



3/4 LEFT REAR VIEW COMPLETE VEHICLE, FULLY EQUIPPED

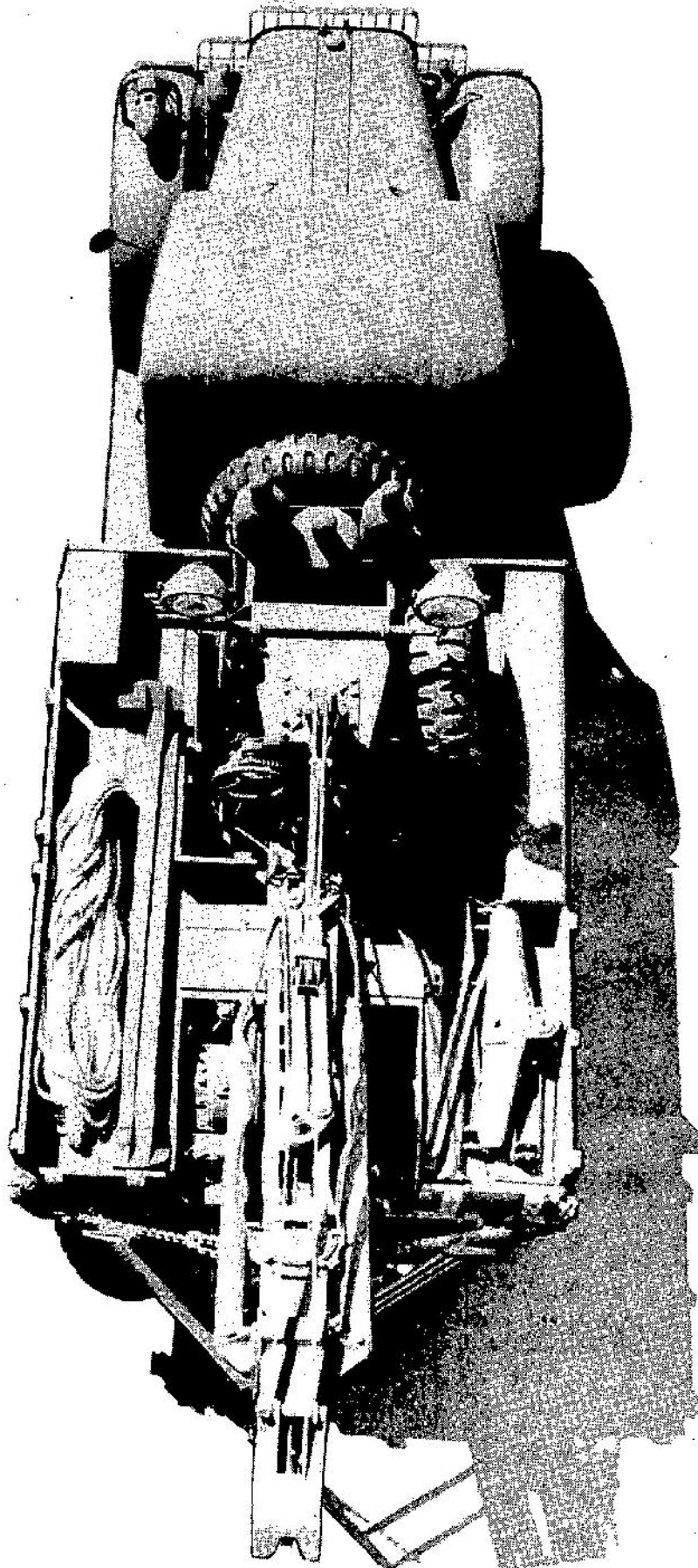
Illustration 1-2

HEAVY WRECKING TRUCK M1



3/4 RIGHT FRONT VIEW COMPLETE VEHICLE, FULLY EQUIPPED
Illustration 1-3

GENERAL OPERATION AND CONTROLS

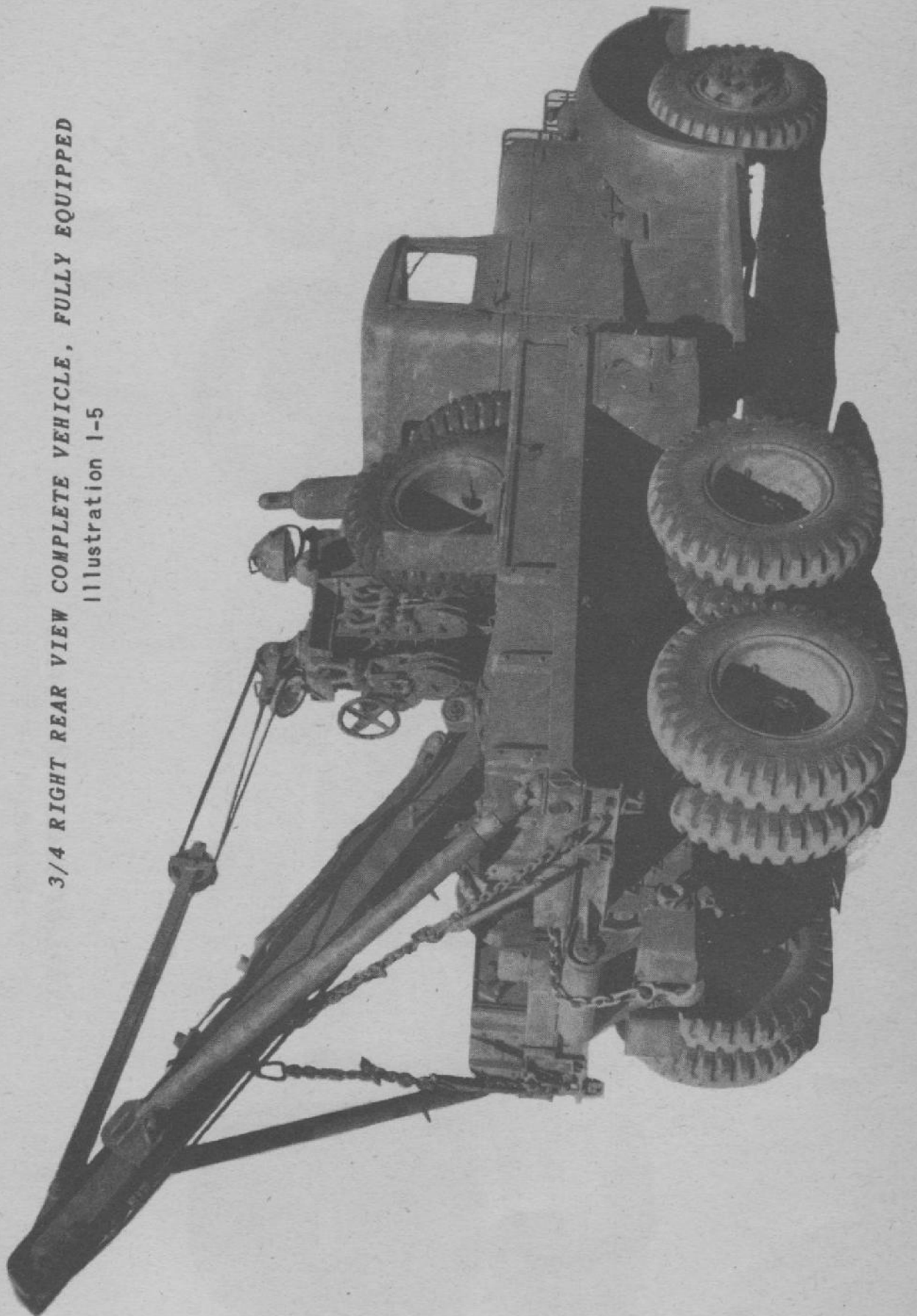


TOP VIEW COMPLETE VEHICLE, FULLY EQUIPPED
Illustration 1-4

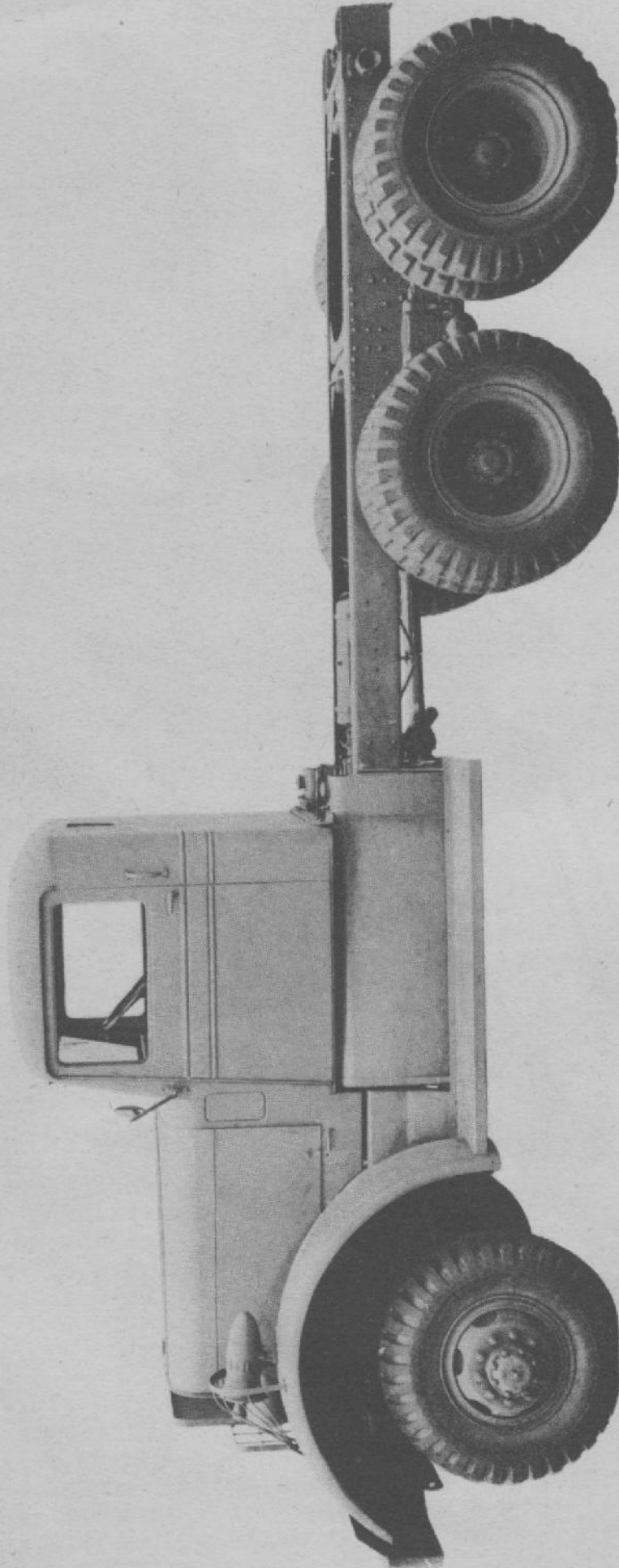
HEAVY WRECKING TRUCK M1

3/4 RIGHT REAR VIEW COMPLETE VEHICLE, FULLY EQUIPPED

Illustration 1-5

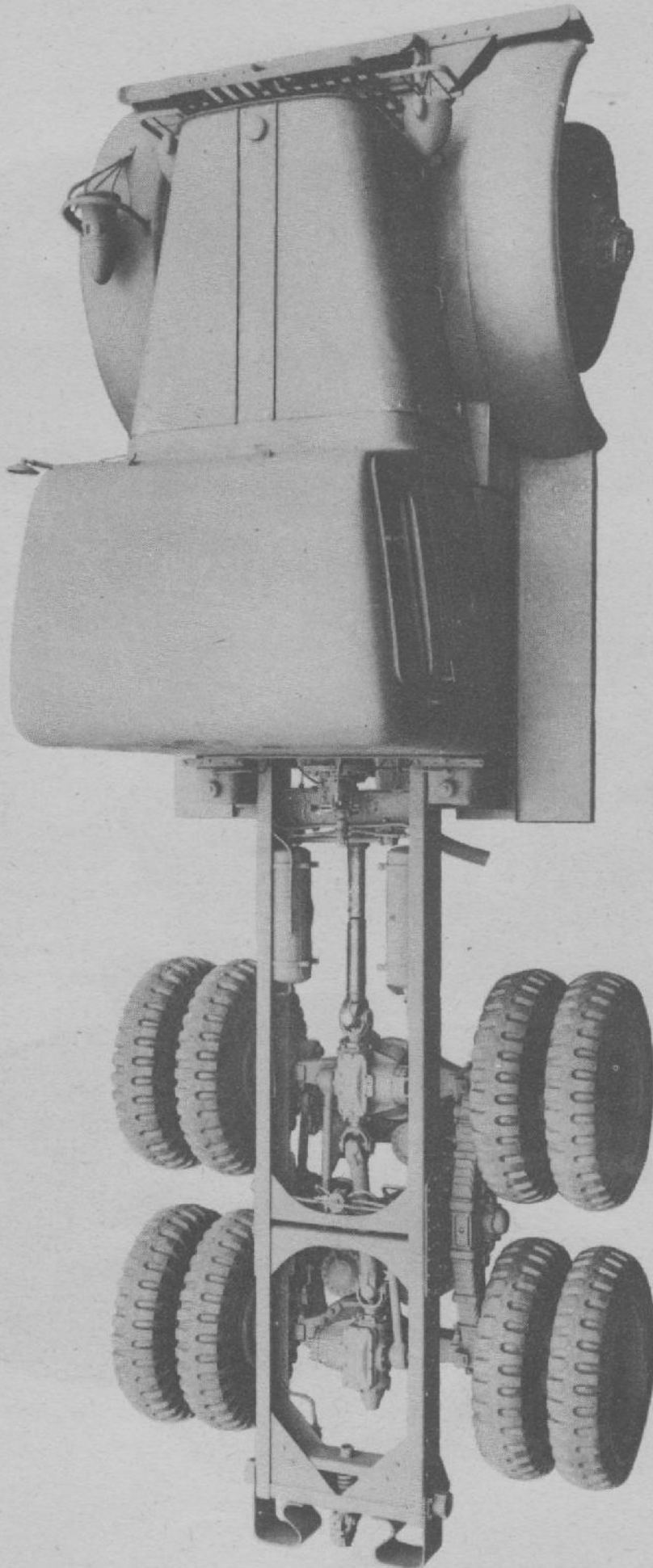


GENERAL OPERATION AND CONTROLS



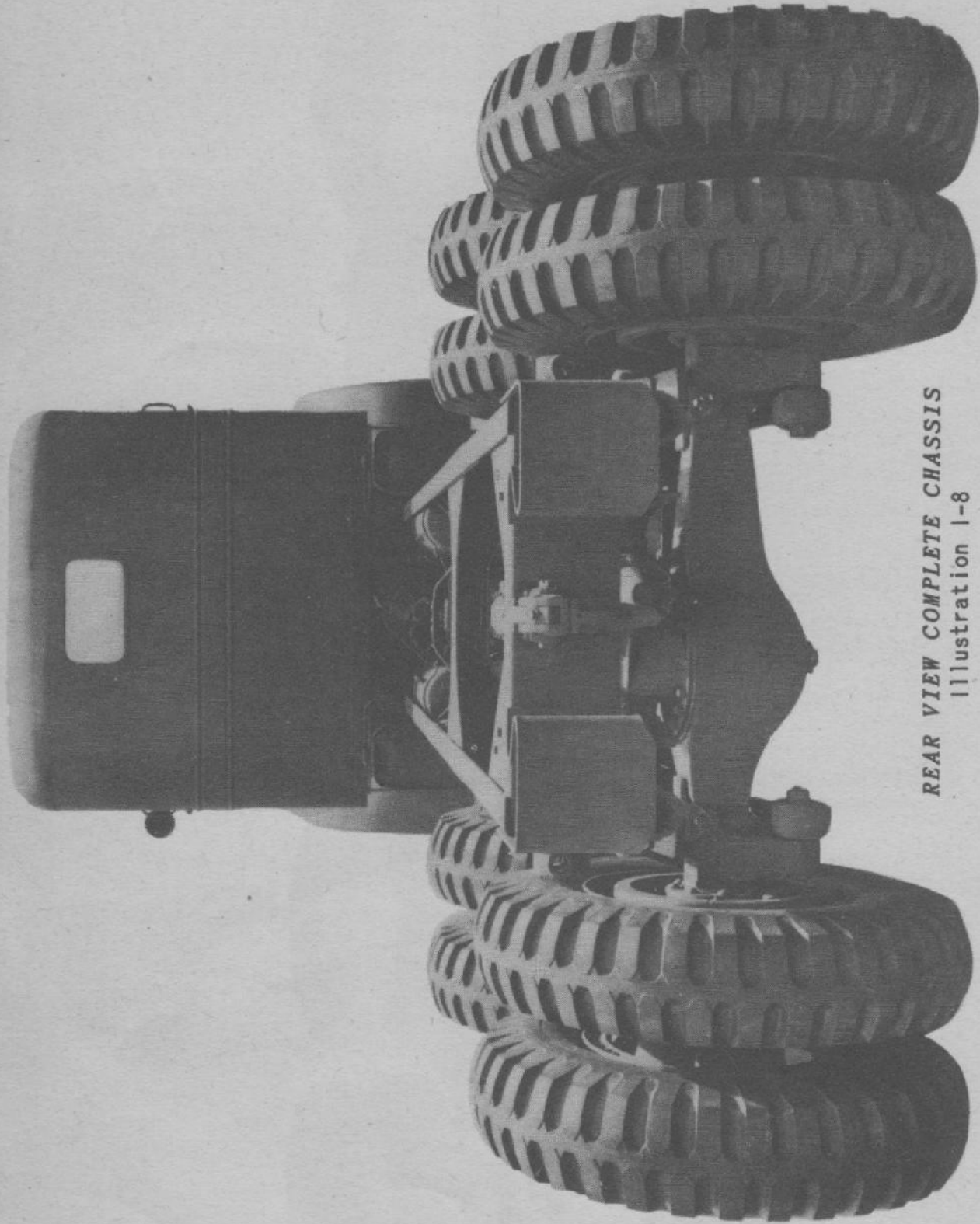
COMPLETE CHASSIS ELEVATION
Illustration 1-6

HEAVY WRECKING TRUCK M1



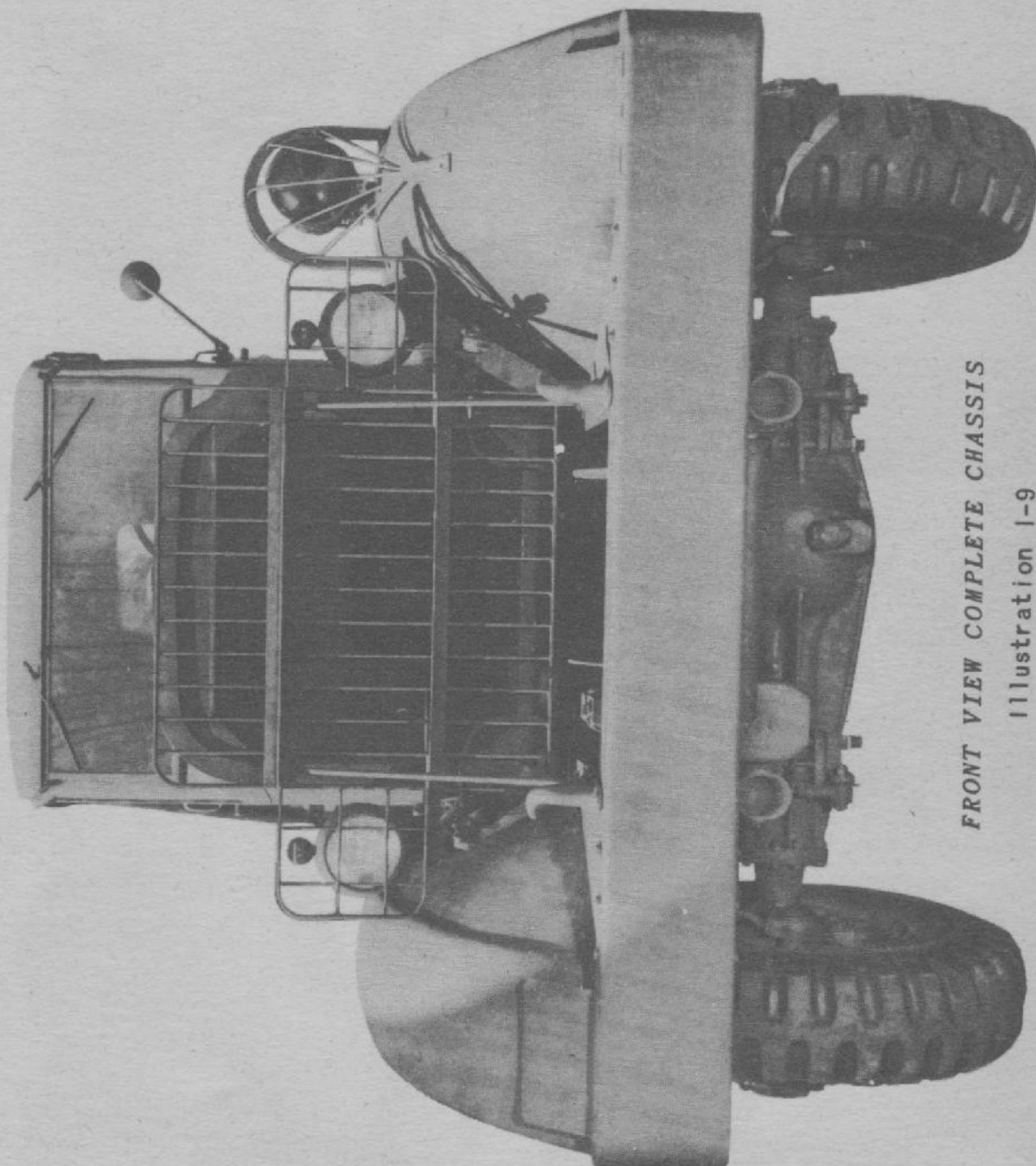
COMPLETE CHASSIS PLAN VIEW
Illustration 1-7

GENERAL OPERATION AND CONTROLS



REAR VIEW COMPLETE CHASSIS
Illustration 1-8

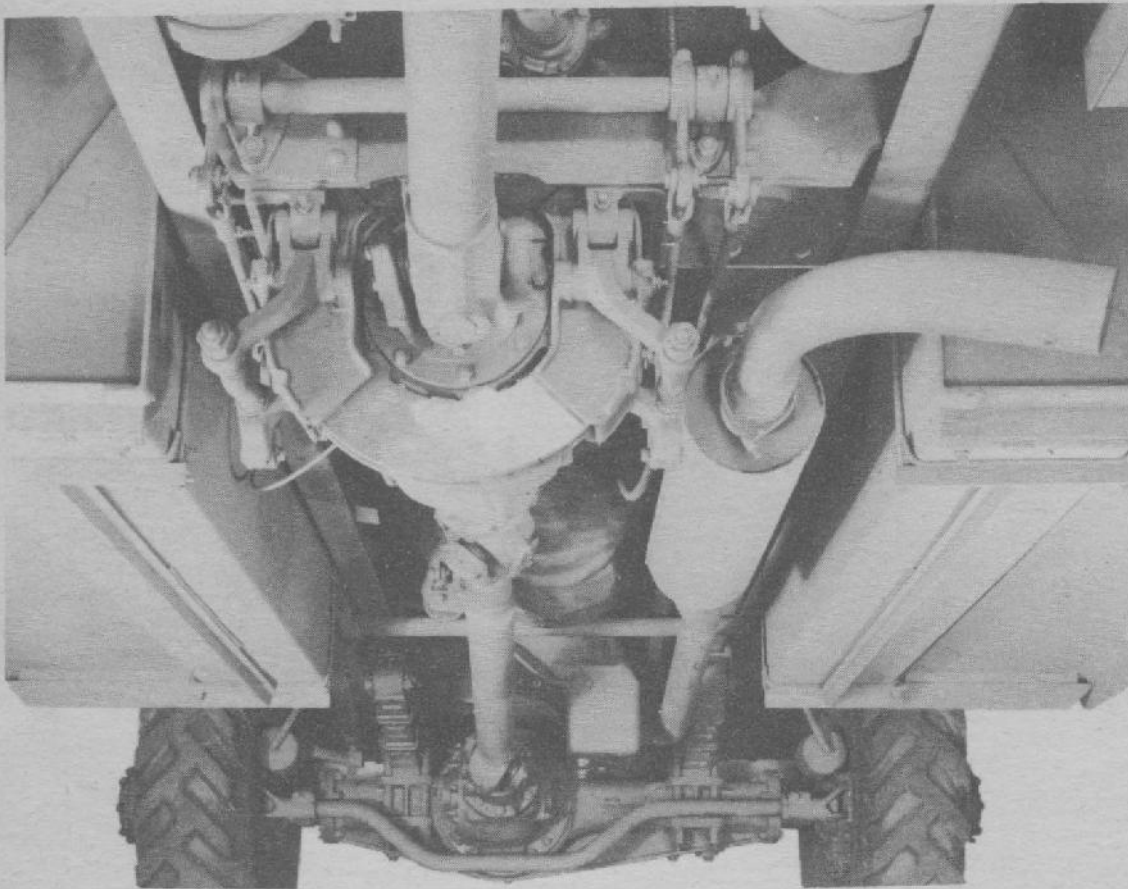
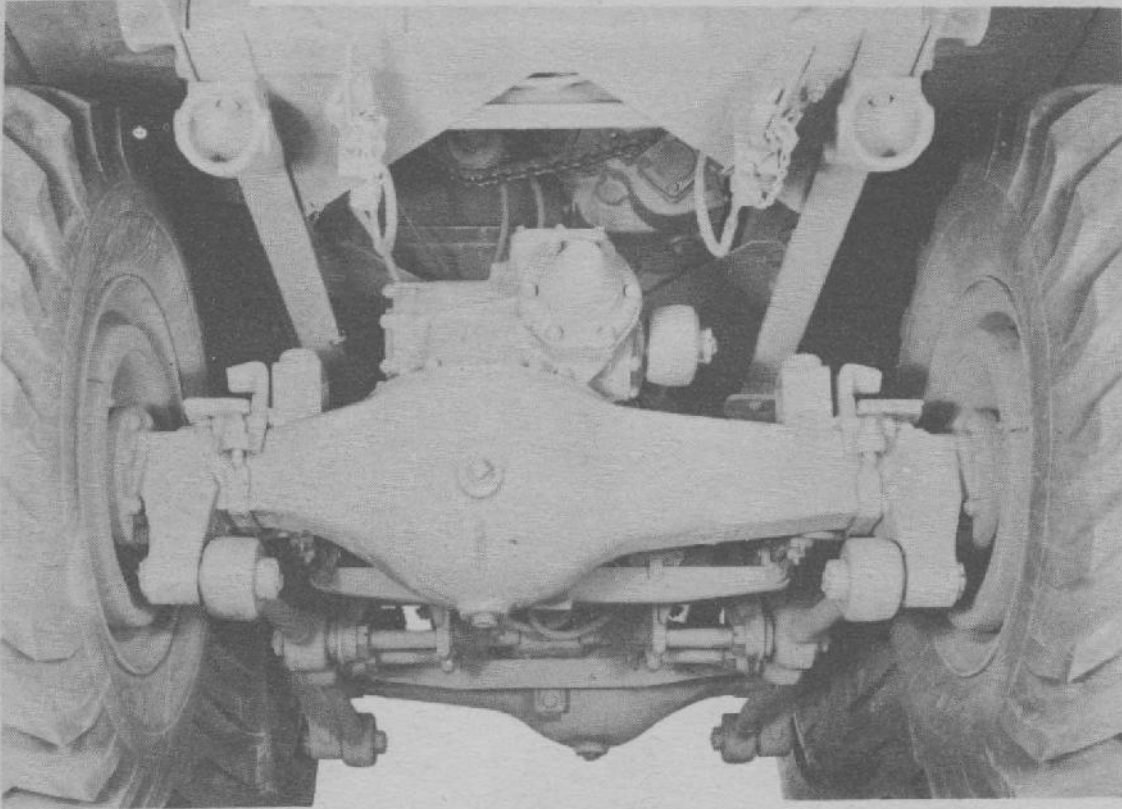
HEAVY WRECKING TRUCK M1



FRONT VIEW COMPLETE CHASSIS

Illustration 1-9

GENERAL OPERATION AND CONTROLS



BOTTOM VIEW COMPLETE CHASSIS

Illustration 1-10

HEAVY WRECKING TRUCK M1

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MODEL IDENTIFICATION

4. The model and serial number affords a positive means of identification of the truck as a whole and each component part, for example: Transmission, front axle, etcetera.

<u>Chassis:</u>	Stamped on right frame siderail directly above front spring shackle bracket.
<u>Chassis:</u>	Plate, Seat Riser, right side.
<u>Engine:</u>	Plate, Crankcase, right side.
<u>Front Axle:</u>	Stamped on plate on front of axle housing.
<u>Rear Axle (Center):</u>	Stamped on front side housing bowl directly under drive unit.
<u>Rear Axle (Rear):</u>	Stamped on rear side of housing bowl directly under drive unit.
<u>Transmission:</u>	Plate on right side of case.
<u>Transfer Case:</u>	Stamped on left side of case.
<u>Starting Motor:</u>	Plate on main frame.
<u>Generator:</u>	Plate on main frame.
<u>Distributor:</u>	Plate on housing.
<u>Magneto:</u>	Plate on housing.
<u>Regulator:</u>	Plate on cover.
<u>Steering Gear:</u>	Stamped on top of lower housing.
<u>Air Compressor:</u>	Plate on left side of crankcase.
<u>Front Winch:</u>	Plate on right side top of worm gear housing.
<u>Rear Winch:</u>	Plate on left side top of worm gear housing.
<u>Crane:</u>	Plate on left main leg.
<u>Crane Gear Box:</u>	Plate on right side top.

GENERAL DATA
KENWORTH MODEL 570

5.

Chassis

Wheelbase:	181-3/8"
Weight:	27,330 Lbs.
Length overall:	276"
Width overall:	100-3/4"
Height:	122"
Ground Clearance:	12"
Fording Depth:	48"
Limiting Factor:	Carburetor

Engine

Model:	22-R
Manufacturer:	Continental Motors
No. Cylinders:	6
Bore:	4 1/2"
Stroke:	5 1/4"
Piston Displacement:	501 Cubic Inches
Governed Speed:	2400 RPM

Capacities (U. S. Measures)

Front Axle:	8 Quarts
Rear Axle:	7 Quarts each axle
Engine Oil (Refill):	10 Quarts
Fuel (2 Tanks):	100 Gallons Total (3 quarts - Ward La France)
Radiator:	40 Quarts
Transfer Case:	2 1/2 Quarts
Transmission:	12 Quarts
Steering Gear:	3 Quarts

Tires

Size:	11:00 x 20
Air Pressure:	70 Lbs.

6.

BREAKING-IN SPEED

No vehicle must be worked hard or the engine raced until it is thoroughly warm. Do not drive a new vehicle faster than thirty miles per hour for the first 500 miles. Keep the engine speed down during this period well below the governed speed regardless of gear position.

GENERAL OPERATION AND CONTROLS

OPERATOR'S NOTES

7. TO PREPARE THE TRUCK FOR SERVICE

A. Radiator

Fill the radiator with clean, soft water until it comes out of the overflow pipe. During cold weather cover the lower part of the radiator sufficiently to maintain an operating temperature of the engine at 160° to 180° F. For continuous cold weather use an anti-freeze solution. (For instruction see Section 17).

B. Fuel Tanks

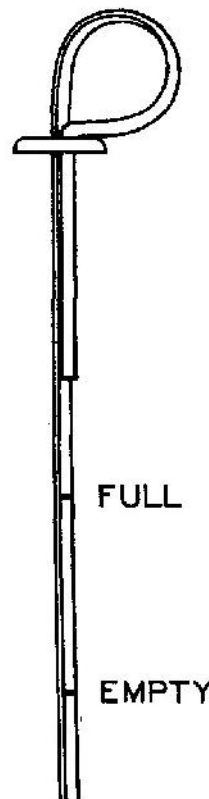
Fill the tanks with fuel. Never have the engine running or be adjacent to an open flame while filling the fuel tanks. The metal filler spout should remain in contact with the fuel tank when pouring in fuel to offset the possibility of static electricity igniting the gasoline.

C. Battery

Fill with pure distilled water to 3/8" above the plates. Keep open flames away from the battery to avoid the possibility of explosion. (See Electrical Section 15).

D. Engine Oil

Fill the crankcase to the "Full" mark on the bayonet gauge and double-check the dash instrument. The engine should be stopped when oil is put into it and the level ascertained. The bayonet gauge should be removed, wiped off and the level checked, as in this manner there will be no possibility of a false level being indicated. (See Lubrication Section 2 for proper viscosity).



OIL BAYONET GAUGE

Illustration 1-11

TO PREPARE THE TRUCK FOR SERVICE (Cont.)

E. Tires

Examine tires and make sure that they are inflated to the recommended pressure. (See Section 10 for proper inflation pressures).

F. Front Axle

Check oil level through level plug. (For proper lubricant and level plug location, see Lubrication Section 2).

G. Rear Axles

Check oil level in both rear axles through level plug. (For proper lubricant and level plug location, see Lubrication Section 2).

H. Transmission

Check lubricant level through oil level plug. (For proper lubricant and level plug location see Lubrication Section 2).

I. Transfer Case

Check oil level through plug. (For proper lubricant and level plug location see Lubrication Section 2).

J. Chassis

Thoroughly lubricate chassis. (For complete instructions see Lubrication Section 2).

K. Brakes

Drain air pressure reservoir of all condensation. This is preferably done with pressure in the tank. (See Section 14 on Brakes).

L. Crane Assembly

Thoroughly lubricate winches and crane. Check oil level in crane gear boxes in accordance with Section 2 on Lubrication.

HEAVY WRECKING TRUCK M1

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8. HOW TO START THE ENGINE

A. Before Starting Engine (At start of day's operation)

1. Check radiator water level. Add clean, soft water until it runs out of the overflow pipe.
2. Investigate condition of fan belt and adjustment. (See Illustration No. 17-2).
3. Check engine oil level. Add oil as necessary to bring up to "Full" mark on bayonet gauge. (See Illustration No. 1-11).
4. Check for fuel and oil leaks.
5. Investigate tire condition and see that they are properly and evenly inflated. (See Section 10, Wheels & Tires).
6. Check fuel supply.
7. Check lights and horn to make sure they are working properly.

B. To Start Engine

1. Pull hand brake lever back to set brakes.
2. Put transmission gear shifting lever in neutral position as indicated on shifting diagram. (See Illustration No. 1-12).
3. Pull out hand throttle about 1/2". This is not necessary if the engine is warm.
4. Pull out choke control about half way. This is not necessary if the engine is warm. In extremely cold weather pull choke control out all the way. Push button in as soon as engine starts to the best running position and all the way in as soon as the engine runs evenly without aid of the choke.
5. Turn ignition switch to "B&M" position. (See Illustration No. 15-7, Section No. 15).
6. Depress clutch pedal and hold it there until engine starts.
7. Step on the starter switch. Release immediately when the engine starts. Do not run starting motor for more than thirty seconds at any one time.

HOW TO START THE ENGINE (Cont.)

8. After the engine has started look at the instruments. Make certain that the oil gauge is registering engine oil pressure, ammeter is indicating generator action and air compressor is building up pressure in reservoir.
9. Never race the engine to warm it up. Run at about 750 RPM.
10. Listen for any sounds that would indicate improper condition in any unit.

9. HOW TO START THE VEHICLE

1. Push clutch pedal down to disengage engine from transmission.
2. Move transmission gear shift lever as far to the right as possible with the latch depressed and forward as far as it will go. (See Shifting Diagram Illustration No. 1-12).
3. Move transfer case shift lever as far forward as it will go or as far back as possible, as indicated by the road and load condition. (See Illustration 1-13)
4. Release hand brake lever and move as far forward as possible.
5. Depress foot accelerator to speed up engine sufficiently to pick up the load.
6. Release clutch pedal slowly and depress the accelerator pedal to prevent the engine from stalling and to pick up road speed.
7. As the truck road speed increases release the accelerator pedal and depress the clutch pedal simultaneously, then move the gear shift lever through neutral into the next higher gear.
8. Repeat the procedure outlined in Items 5, 6 and 7 until the highest gear ratio available is attained. (See Shifting Diagram, Illustration No. 1-12).

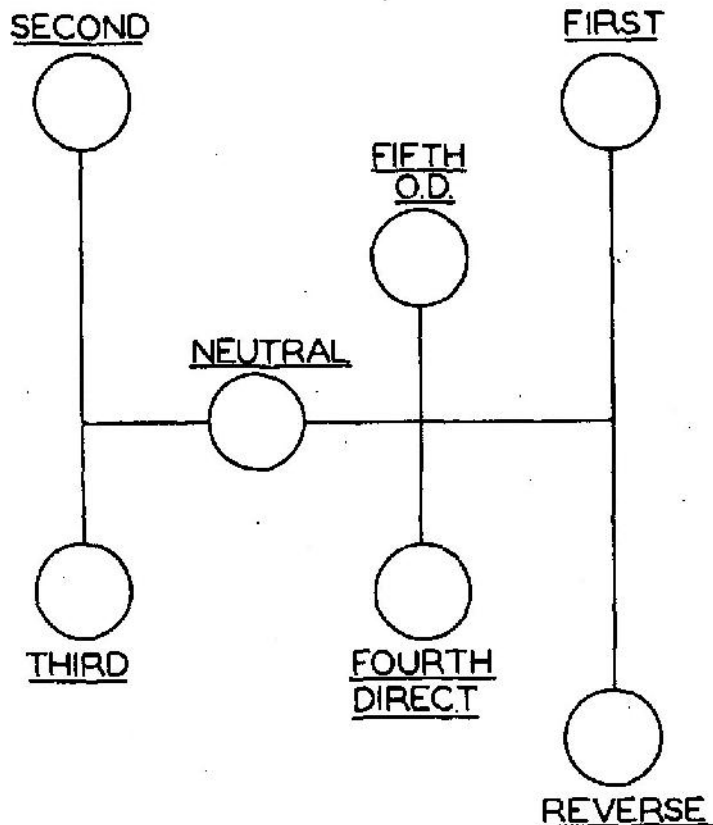
10. AFTER THE TRUCK HAS STARTED

1. Be alert for any unusual noises or poor performance.
2. Frequent glances at the instrument panel are necessary to investigate the amount of oil pressure,

AFTER THE TRUCK HAS STARTED (Cont.)

generator charging rate, engine water temperature, air pressure and fuel level.

FULLER TRANSMISSION MODEL-5-A-620



GEAR-SHIFT
LEVER-POSITIONS

Illustration I-12

II. TO SHIFT TO A LOWER SPEED

1. Always shift to a lower speed before the engine begins to labor or the vehicle loses appreciable road speed. Shifting from a higher to a lower speed is one of the indications of good driver ability. This is best accomplished by the "double-clutch" method. Following is a table of maximum road speeds. A thorough knowledge of these speeds will help to determine the maximum speed at which a shift can be made to a lower speed.

TO SHIFT TO A LOWER SPEED (Cont.)

TRANSMISSION	TRANSFER CASE	MAXIMUM ROAD SPEED MILES-PER-HOUR
First	High Range	5
Second	High Range	10
Third	High Range	20
Fourth	High Range	35
Fifth Overdrive	High Range	45

TRANSMISSION	TRANSFER CASE	MAXIMUM ROAD SPEED MILES-PER-HOUR
First	Low Range	1.9
Second	Low Range	3.9
Third	Low Range	8.0
Fourth	Low Range	14.0
Fifth Overdrive	Low Range	18.0

Note for example that the maximum road speed permissible at which the operator can shift from Fourth to Third in the low range is 8 miles per hour. Gear changes from a higher to a lower speed should be made as follows:

- (a) Depress the clutch pedal and release the throttle at the same instant.
- (b) Move transmission gear shift lever to neutral position and at the same time accelerate the engine to governed speed with the clutch engaged.
- (c) Disengage the clutch and as the gear speeds are synchronized shift to the next lower speed (do not apply excessive pressure to the shift lever).
- (d) Engage the clutch and depress the accelerator pedal to attain the desired road speed. Know the speed of your engine by its sound so that you can make your gear shifts at the right instant when the transmission and engine speeds are synchronized. Shifting can be accomplished without gear clashing if the operator will familiarize himself with the vehicle.

12.

DRIVING DOWN HILL

In general it is advisable to go down hill in the next lower gear than would be used to ascend the same hill. Remember that the engine governor is not effective in controlling the engine speed when the engine is used as a brake in descending hills.

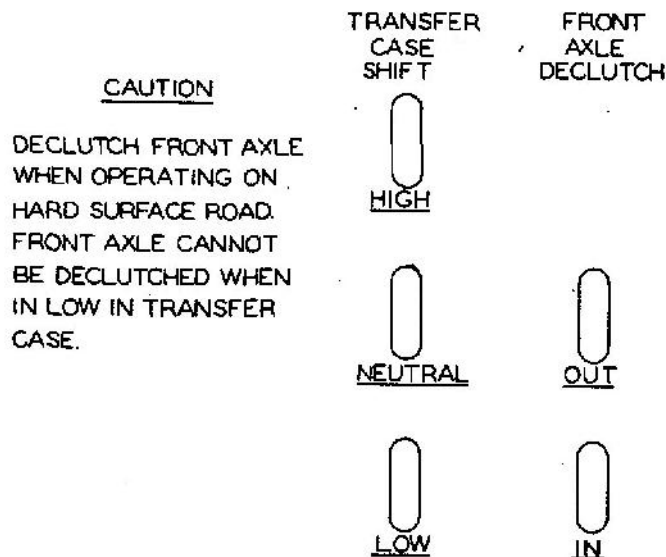
HEAVY WRECKING TRUCK M1

13-14

13. TO SHIFT INTO REVERSE

1. Bring the vehicle to a complete stop before attempting to shift into reverse.
2. Disengage the clutch.
3. Move the gear shift lever as far to the right as possible with the latch depressed and then to the rear as far as it will go.
4. Engage the clutch and at the same time depress the accelerator to the desired engine speed to keep the engine from stalling.

14. HOW TO CONTROL THE TRANSFER CASE

WISCONSIN TRANSFER CASE MODEL T-77-3-3

**GEAR-SHIFT
LEVER-POSITIONS**

Illustration 1-13

Instructions for controlling the transfer case are as follows:

1. To shift the transfer case from high range to low range, the truck must be at a standstill or operating at a slow speed.
2. Engage the front axle.
3. Push the clutch pedal in and move the transfer case shift lever into neutral position.

HOW TO CONTROL THE TRANSFER CASE (Cont.)

4. Move the transfer case shift lever as far to the rear as possible. If the vehicle is in motion before this shift from neutral to the low range is made release the clutch pedal and accelerate the engine to approximately double the relative speed of the truck. Until the operator familiarizes himself with the operation of the vehicle this shift should not be made with the truck in motion.
5. If this shift is made with the truck in motion, after the engine has been accelerated, with the clutch engaged, again push in the clutch and move the shift lever as far to the rear as possible into the low range position. (See Illustration 1-13).
6. Engage the clutch and accelerate the engine to the desired road speed at the same time.
7. To shift the transfer case from the low range to the high range (a) push in the clutch pedal, (b) move the shift lever forward through the neutral position into the high range as far forward as it will go. (c) Make this shift slowly and without any excessive pressure on the shift lever. (d) Release the clutch and accelerate the engine to the desired speed at the same time.

Note:

The transfer case shift lever and the front axle control lever are so arranged that the transfer case cannot be shifted into the low range except when the front axle is engaged. This is done in order that any heavy work placing strain on the driving members will be distributed over the three axles. The high range of the transfer case can be used with the front axle engaged or disengaged.

For high speed operation on hard surfaced roads the front axle should be disengaged.

Engage the front axle only when needed. Its use is to be avoided as much as possible. Front axle engagement, wherever good traction conditions exist, causes excessive tire wear, gear failure and high drive unit temperature.

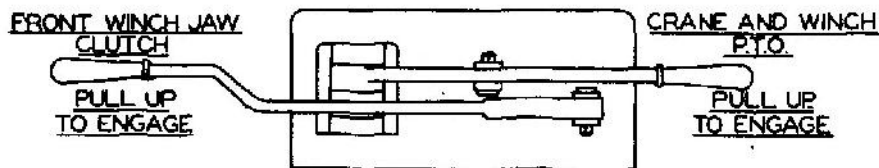
Remember that front axle engagement does not increase power, it actually decreases it. Traction only is increased by front axle engagement.

Never wait until vehicle is stalled before engaging front axle. Engage the front axle before proceeding into bad spots. Keep the vehicle moving at an even speed. The front axle is an auxiliary traction device to be used only when conditions make its use necessary and before getting stalled, for lack of traction and not lack of power.

15. FRONT AXLE ENGAGEMENT AND DISENGAGEMENT

1. To engage or disengage the front axle with the transfer case in the high range it is only necessary to move the front axle declutching lever into the desired position. (See Illustration 1-13). It is not necessary to disengage the clutch, and the shift is easier to make when the truck is in motion.
2. To disengage the front axle with the transfer case in the low range it is first necessary to shift the transfer case into neutral. With the front axle disengaged the truck must then be operated in the high range as long as the front axle remains disengaged.

16. OPERATION OF POWER ACCESSORY CONTROLS



CRANE AND WINCH
SHIFT POSITIONS

Illustration 1-14

1. Put the transfer case in neutral position (See Illustration 1-13).
2. Push in the clutch pedal.
3. Pull up on power take-off lever (See Illustration 1-14).
4. Shift the main transmission shift lever into the desired speed. (See Illustration 1-12).
5. Engage the clutch.
6. To disengage the power take-off press down the clutch and press lever down as far as it will go.

OPERATION OF POWER ACCESSORY CONTROLS (Cont.)

7. To engage the front winch jaw clutch proceed as follows:
 - (a) Power take-off must be engaged as outlined in Items 1, 2, 3 and 4.
 - (b) Lift up on the winch jaw clutch lever.
 - (c) Engage the clutch.
8. To disengage the front winch jaw clutch release the clutch, pushing the jaw clutch lever down as far as it will go.

CAUTION:

No one should tamper with the power accessory control levers unless he is familiar with the power driven equipment.

NOTE:

For complete information on the operation of power driven equipment refer to Section 18, Body & Crane.

17.

HOW TO STOP THE TRUCK

1. Remove foot from accelerator pedal and apply the brakes.
2. Release the clutch when vehicle speed has been reduced to engine idling speed.
3. Move the transmission shift lever into neutral position.
4. Apply the hand brake only after the vehicle has come to a complete stop.

HEAVY WRECKING TRUCK M1

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18. GENERAL INFORMATION ON MAINTENANCE

- A. The scope of maintenance and repairs by the crew and other units of the using arms is determined by the ease with which the job can be accomplished. This depends, of course, upon the time and tools available to do the job, the nature of the terrain, weather conditions, concealment, shelter, proximity to hostile fire, and skill of personnel. All of the conditions are variable and no exact system of procedure can be described or followed.
- B. The definitions given below are included in order that the operation name may be correctly interpreted by those doing the work.
- (1) Service. - Consists of cleaning, lubricating, tightening bolts and nuts, and making external adjustments of sub-assemblies and controls.
 - (2) Repair. - Consists of making repairs to, or replacement of a part, sub-assembly or assembly that can be accomplished without completely disassembling the sub-assembly or assembly, and does not require heavy welding or riveting, machining, fitting and/or aligning.
 - (3) Replace. - Consists of removing the part, sub-assembly or assembly from the vehicle and replacing it with a new or reconditioned or rebuilt part, sub-assembly or assembly, whichever the case may be.
 - (4) Rebuild. - Consists of completely reconditioning and placing in serviceable condition any unserviceable part, sub-assembly or assembly of the motor vehicle including welding, riveting, machining, fitting, aligning, assembling and testing.
- C. Personnel of the using arm or service are authorized to perform the following maintenance operations.
- (1) Engine.

Cylinder head, replace.	Valves, cover, replace.
Manifolds, replace.	Valve springs, replace.
Tune up.	Valve tappets, adjustment.
Valves, clean carbon light grinding.	Valves, replace.
 - (2) Cooling System.

Fan assembly, replace.	Radiator, replace.
Fan belt, adjust or replace.	Temperature gauge, replace.
Hose or pipe, replace.	Thermostat, replace.
Radiator, clean and flush.	Water pump, repack.

(27)

GENERAL INFORMATION ON MAINTENANCE (Cont.)

(3) Oiling System.

Oil filter, replace.	Oil pan, replace.
Oil gauge, replace.	Oil pressure, adjustment.
Oil lines, external clean or replace.	Oil strainer, clean or replace.
Oil lines, internal flushing.	Oil viscometer, replace.

(4) Fuel System.

Air cleaner, clean or replace.	Fuel pump, replace.
Carburetor, replace.	Fuel tank, clean or replace.
Fuel pipes and connections, repair.	Fuel gage, replace.

(5) Electrical System.

Ammeter, replace.	Magneto, coil, condenser, and spark plugs, replace.
Battery, replace, charge and service.	Ignition harness assembly, replace.
Battery cables, replace.	Starting motor, replace.
Breaker contacts, replace and adjust.	Starting motor, spring (Bendix) replace.
Generator, replace.	Switch, ignition or lighting and starting, replace.
Head-lamp, adjust or replace (H1 types).	Voltage regulator, replace.
Horn, adjust or replace.	

(6) Cab and body.

Body, replace.	Windshield, replace.
Body, floors, hood and doors, repair.	Windshield, wipers, replace.

(7) Transmission, transfer case and clutch.

Clutch, pedal, adjustment.	Transmission, shift levers, replace.
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(8) Chassis running gear.

Brakes, adjust.	Shock absorbers and linkage, replace.
Brakes, cylinder, replace.	Shock absorbers, service.
Brakes, shoe assembly, replace.	Steering gear, assembly, replace.
Brakes, vacuum, booster, replace.	Steering gear, assembly, adjust.
Drag lines and parts, replace or adjust.	Steering knuckle arm, replace.

GENERAL INFORMATION ON MAINTENANCE (Cont.)

(8) Chassis running gear. (Cont.)

Fenders, replace.	Wheel alignment toe-in, adjust.
Oil seals, replace.	Wheel bearings, adjust and replace.
Propeller shaft, replace.	Wheel grease retainers, replace.
Running boards, replace.	

(9) Winch assembly.

Winch cable, replace.

(10) Miscellaneous.

Cleaning.	Speedometer, replace.
Lubrication.	Tire casings and tube, replace.
Muffler and ex. pipe, replace.	Wheels, replace.
Painting.	Tire chains, repair.

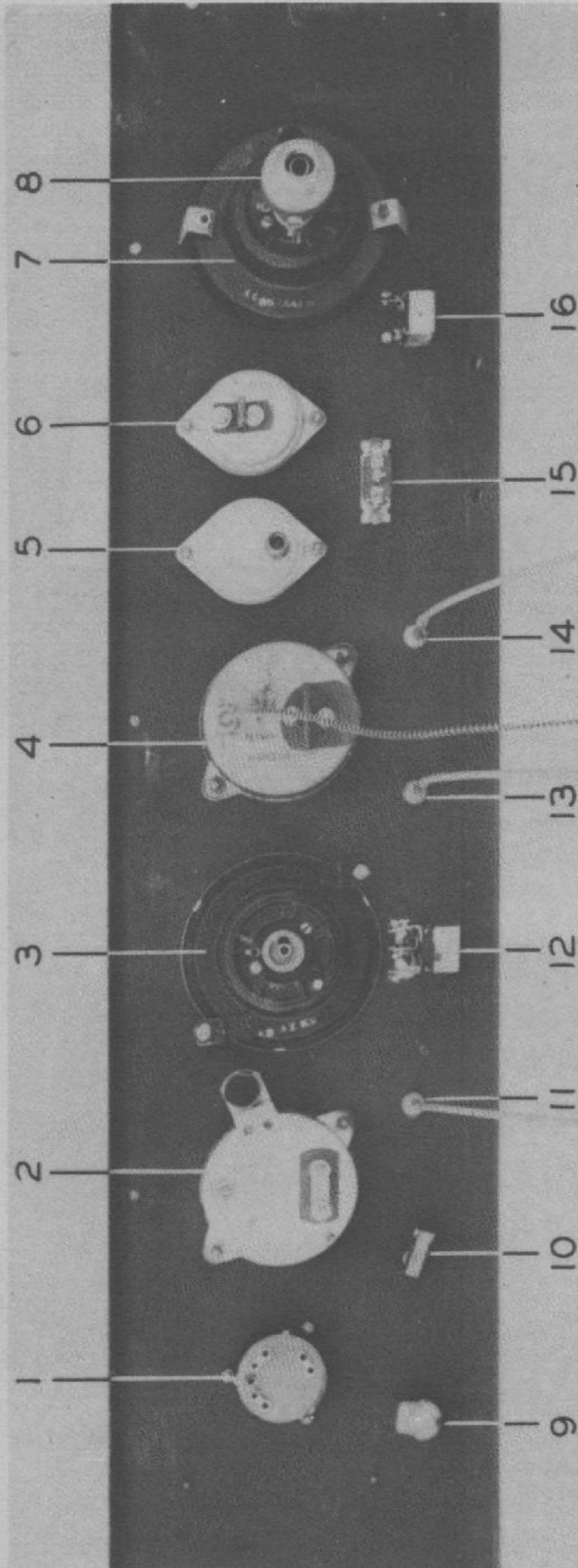
19. PROPER OPERATION REQUIRES:
1. A thorough knowledge of lubrication. (See Section 2)
 2. Understanding of simple "trouble-shooting" of ignition and fuel system.
 3. Knowing the sound of the various units when they are operating properly.
 4. Not over-speeding the vehicle, especially going down hill. Serious damage to engine may result.
 5. Not racing the engine or engaging the clutch too quickly so as to exert a great amount of strain on the clutch, the unit power transmission, transfer case, drive line and driving axles.
 6. Keeping the truck at a constant speed when in heavy ground.
 7. Watching closely the instruments provided in the panel, particularly the air pressure, oil pressure, ammeter and temperature gauge.
 8. Not proceeding into a spot where heavy going will be encountered without bringing the truck to a complete stop and engaging the front axle. Also, putting the transfer case in underdrive. This is a very difficult shift to make and should be done while the chassis is standing still.
 9. Always disengaging the front axle when operating light on the highway.
 10. Not clashing gears in the transmission or transfer case. Investigate the reason for failure to shift easily and quietly.
 11. Never using First and Reverse gears to rock the chassis back and forth in an effort to work it out of a hole. Doing this usually results in working the truck deeper into mud or sand. Use the winches.
 12. Remembering that air pressure applied to the brakes is never lost until the brakes are fully released. When slowing down or coming to a complete stop, setting the brakes at the desired position and holding them there until the truck has stopped or slowed down the required amount. Avoiding application and release of the brakes more often than necessary, as one application is enough to slow down or stop the truck. Never "fanning" the brakes except when slowing down from high road speeds.

HEAVY WRECKING TRUCK M1

PROPER OPERATION REQUIRES: (Cont.)

13. Never using the emergency brake to slow down or bring the truck to a stop either loaded or unloaded. This was provided for parking only or for use in emergencies. Not applying hand brake until truck has come to rest.
14. Not trying to force the chassis into a sharper turning angle by jerking on the steering wheel, as this only results in damage to the steering gear.
15. Never steering by the spokes or hub of the steering wheel.
16. Keeping the truck clean, as this is of great importance in helping to discover defects and assists in ease of servicing, lubrication and tightening of the chassis.

GENERAL OPERATION AND CONTROLS

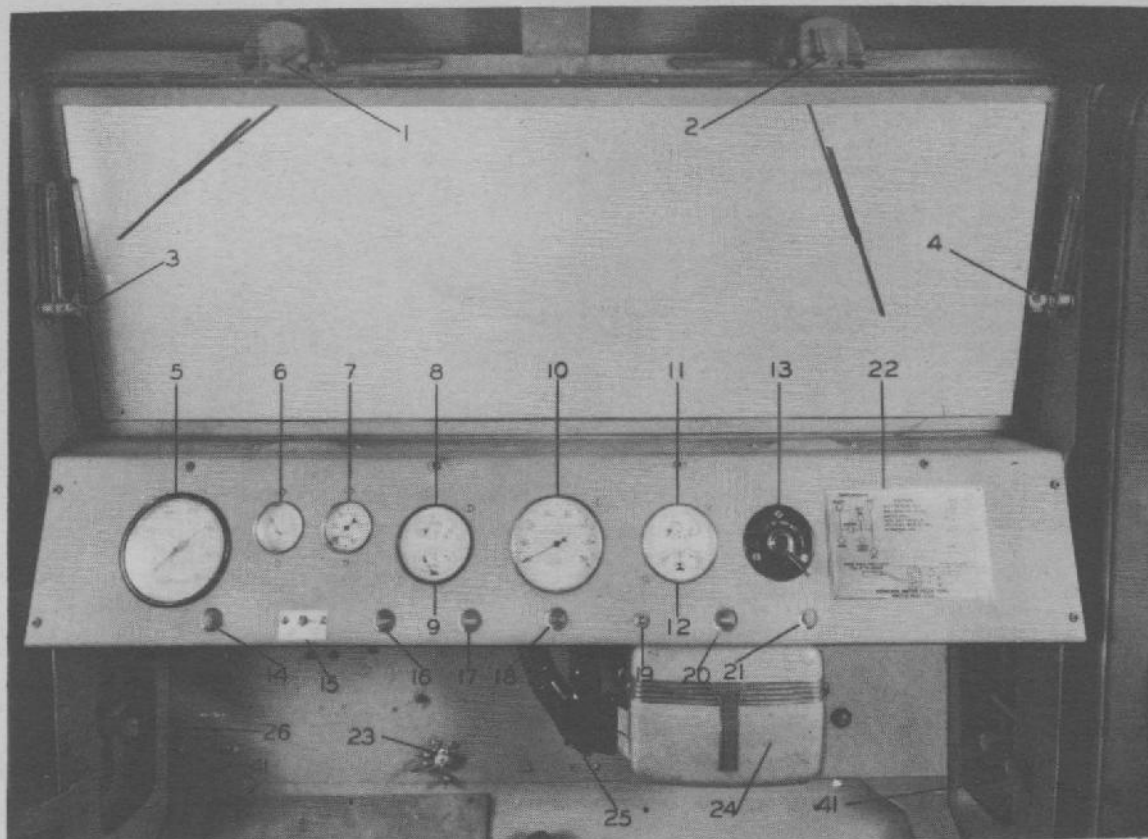


BACK OF INSTRUMENT PANEL

Illustration 1-15

- | | | | |
|----|--------------------------------|-----|-----------------------------|
| 1. | Ignition Switch | 9. | Heater switch |
| 2. | Oil pressure gauge and ammeter | 10. | Siren light switch |
| 3. | Speedometer | 11. | Throttle control |
| 4. | Temperature and Fuel gauge | 12. | Blackout switch |
| 5. | Air gauge | 13. | Choke control |
| 6. | Oil level gauge | 14. | Spark control |
| 7. | Tachometer | 15. | Fuel tank gauge switch |
| 8. | Tachometer governor | 16. | Auxiliary stop light switch |

HEAVY WRECKING TRUCK M1

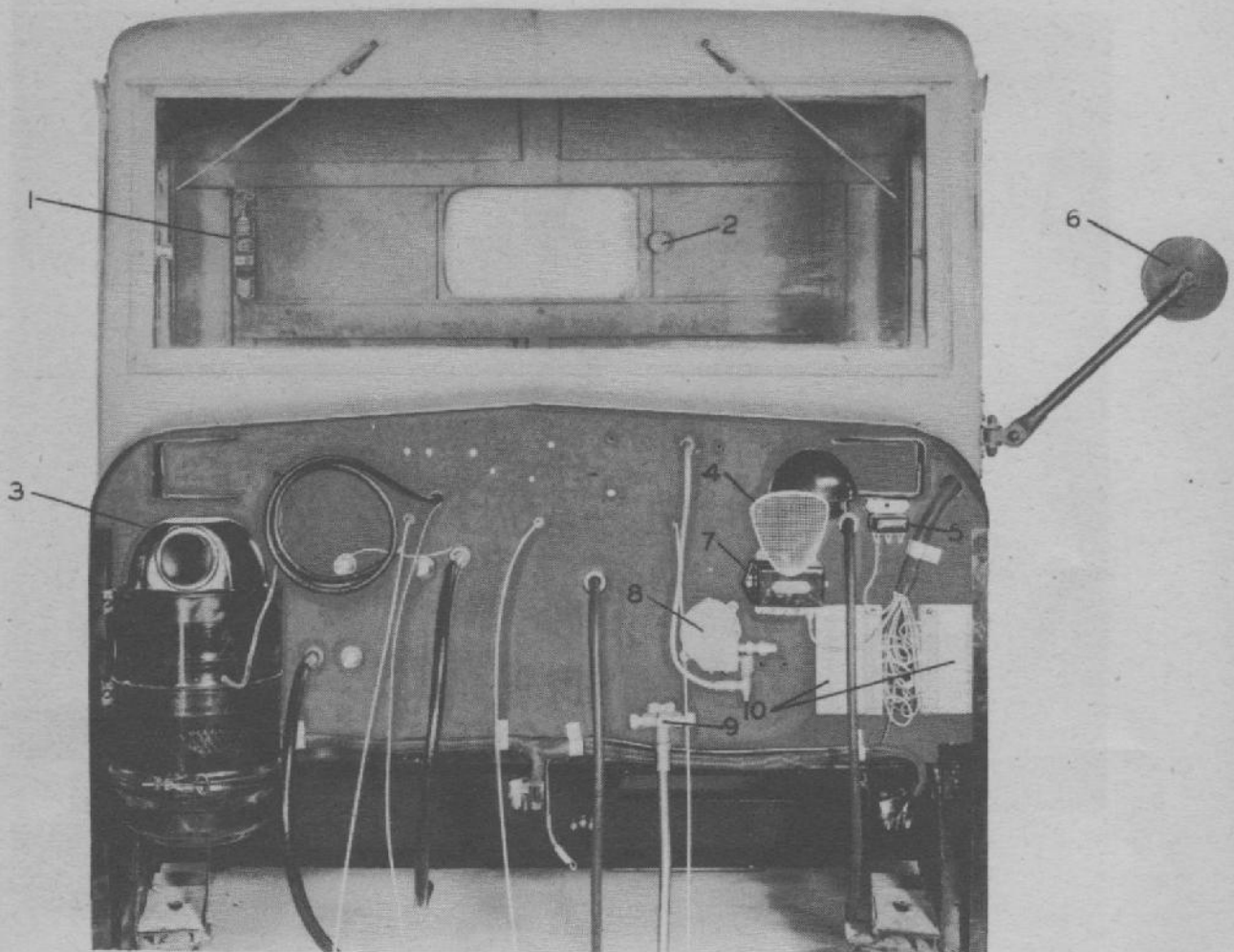


INSTRUMENT PANEL

Illustration I-16

1. Windshield Swipe (Left-hand).
2. Windshield Swipe (Right-hand).
3. Windshield Quadrant Wing Nut (Left).
4. Windshield Quadrant Wing Nut (Right).
5. Tachometer.
6. Oil Level Gauge.
7. Air Pressure Gauge.
8. Water Temperature Gauge.
9. Fuel Gauge.
10. Speedometer.
11. Oil Pressure Gauge.
12. Ammeter.
13. Ignition Switch.
14. Auxiliary Stop Light Switch.
15. Fuel Gauge Switch.
16. Spark Control.
17. Choke Control.
18. Lighting Switch.
19. Siren Light Switch.
20. Throttle Control.
21. Heater Switch.
22. Shifting Diagram Plate.
23. Two-Way Fuel Valve.
24. Heater.
25. Defroster Control.
26. Cowl Ventilator.
41. Door Stop.

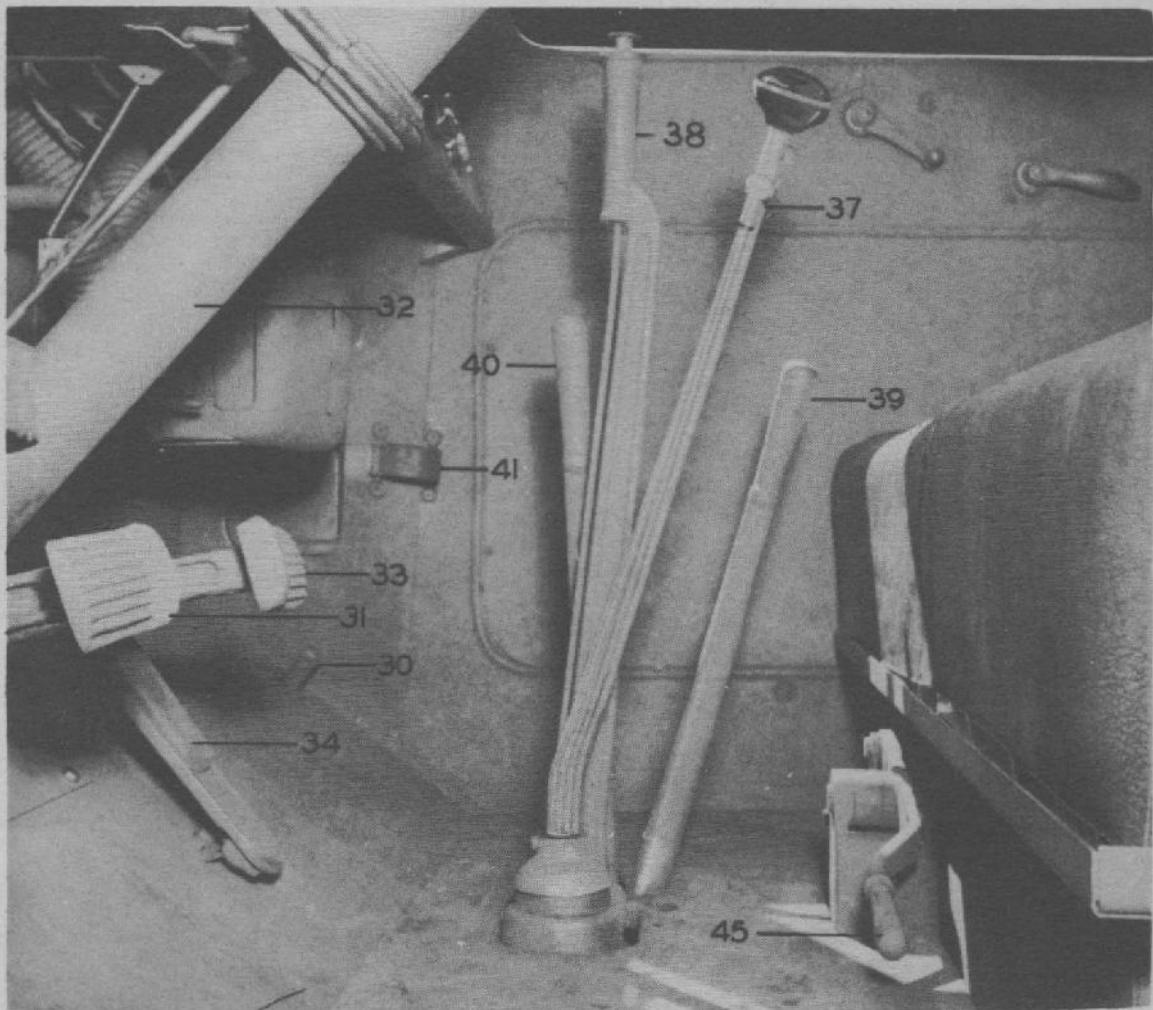
GENERAL OPERATION AND CONTROLS



FRONT OF DASH
Illustration 1-17

1. Fire Extinguisher.
2. Rear Window Control.
3. Air Cleaner.
4. Horn.
5. Horn Relay.
6. Rear Vision Mirror.
7. Regulator.
8. Air Governor.
9. Fuel Tank Valve.
10. Terminal Blocks.

HEAVY WRECKING TRUCK M1

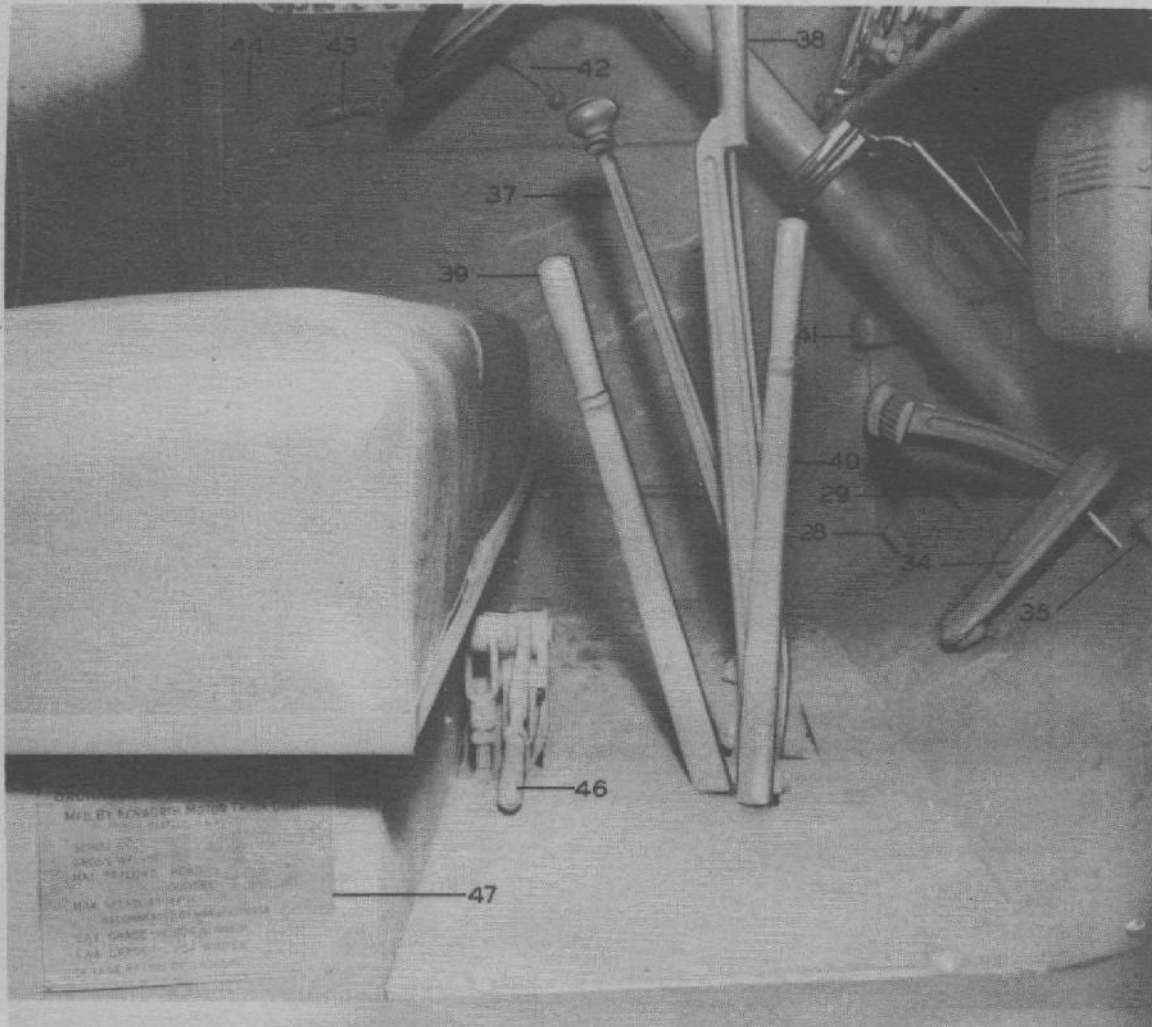


DRIVER COMPARTMENT CONTROLS (VIEWED FROM LEFT)

Illustration 1-18

- 30. Siren Switch (Rider Side).
- 31. Clutch Pedal.
- 32. Steering Gear.
- 33. Brake Pedal.
- 34. Accelerator Pedal.
- 37. Transmission Gear Shift Lever.
- 38. Hand Brake.
- 39. Transfer Case Shift Lever.
- 40. Front Axle Declutch Lever.
- 41. Door Stop.
- 45. Forward Winch Control Lever.

GENERAL OPERATION AND CONTROLS



DRIVER COMPARTMENT CONTROLS (VIEWED FROM RIGHT)
 Illustration I-19

- 28. Dimmer Switch.
- 29. Siren Switch (Driver Side).
- 34. Accelerator Pedal.
- 35. Starter Switch Button.
- 36. Horn.
- 37. Transmission Gear Shift Lever.
- 38. Hand Brake.
- 39. Transfer Case Shift Lever.
- 40. Front Axle Declutch Lever.
- 41. Door Stop.
- 42. Window Regulator Handle.
- 43. Door Handle.
- 44. Door Lock.
- 46. Crane and Winch Power Take-Off Control Lever.
- 47. Identification and Capacity Plate.

HEAVY WRECKING TRUCK M1

20. INSTRUMENT AND CONTROL SIGNIFICANCE

*Reference numbers refer to Illustrations
Nos. 1-16, 1-18 and 1-19 only.*

1. Windshield Swipe (Left-hand):- Pull button out to start, push in to stop.
2. Windshield Swipe (Right-hand):- Pull button out to start, push in to stop.
3. Windshield Quadrant Wing Nut (Left):- For locking windshield in open position.
4. Windshield Quadrant Wing Nut (Right):- For locking windshield in open position.
5. Tachometer:- Indicates engine R.P.M. Over-speeding engine will cause buzzer to cut-in.
6. Oil Level Gauge:- Indicates the oil level in the engine crankcase.
7. Air Pressure Gauge:- Indicates the pressure in the air reservoir. Normal pressure, 90 Lbs. If the pressure drops below 45 Lbs. stop and investigate. (See Section 14, Brakes).
8. Water Temperature Gauge:- Indicates the engine water temperature. Normal temperatures range from 160° F to 180° F. If temperature reaches 212° F. investigate the reason for over-heating, as serious damage may result to the engine. (See Section 17, Cooling).
9. Fuel Gauge:- Registers the amount of fuel. "F" indicates Full, "E" Empty. Tank capacity 50 Gals. each tank.
10. Speedometer:- Indicates the road speed in miles per hour. Do not exceed the maximum speed of 45 miles per hour.
11. Oil Pressure Gauge:- Registers in pounds the pressure of the oil circulating through the engine. Normal pressure at idling, 15 Lbs. Normal pressure at 2000 R.P.M., 40 Lbs. If indicator drops to "0" stop immediately and investigate the cause. (See Section 3, Engine).
12. Ammeter:- Indicates the direction of current flow. Zero to Plus 45 amperes indicates battery is being charged. Zero to Minus 45 indicates battery is being discharged. If ammeter continues to show a discharge investigate the cause. (See Electrical Section 15).
13. Ignition Switch:- Turn to right for "On", left for "Off"

INSTRUMENT AND CONTROL SIGNIFICANCE (Cont.)

14. Auxiliary Stop Light Switch:- In position gives conventional stop light operation; pulled out causes stop light to burn constantly.
15. Fuel Gauge Switch:- This two-way toggle switch gives fuel level readings in either tank. Right for right-hand tank, left for left-hand tank.
16. Spark Control:- Pull out to retard spark, push in to advance. Normal driving position is pushed in all the way.
17. Choke Control:- Pull out to start when the engine is cold. This control shuts off the air to the carburetor, giving a richer mixture. Push in when the engine starts. Do not run with the choke partially out at any time. Do not use to start when engine is warm.
18. Lighting Switch:- This is a three-position push-pull switch. In position is "Off"; first out position is "Blackout"; second out position is "Service". (See Illustration 15-12).
19. Siren Light Switch:- Press toggle switch to right to turn "On"; press to left for "Off".
20. Throttle Control:- Pull out to open the throttle. This control gives the operator an accurate fuel setting for starting. Push in to close.
21. Heater Switch:- Rheostat switch rotates clockwise. Heater motor speed decreases as switch is rotated to the right.
22. Shifting Diagram Plate:- Indicates the various lever positions for control of transmission, transfer case and front axle declutching and engagement.
23. Two-Way Fuel Valve:- For selecting fuel tank from which supply is to be drawn. "Up" on pointer connects left-hand tank, "Right" on pointer connects right-hand tank. (See Illustration 16-2).
24. Heater:- Self-explanatory.
25. Defroster Control:- Lever up is "On"; lever left is "Off".
26. Cowl Ventilator (Left):- Push lever forward to open and back to close.
27. Cowl Ventilator (Right):- Push lever forward to open and back to close.

INSTRUMENT AND CONTROL SIGNIFICANCE (Cont.)

28. Dimmer Switch:- Operated by the left foot raises and lowers the headlight beam for city and country driving. Dim the lights to oncoming traffic.
29. Siren Switch (Driver Side):- Depress "On"; release "Off".
30. Siren Switch (Rider Side):- Depress "On"; release "Off".
31. Clutch Pedal:- Used to disengage the engine from the transmission. Do not engage quickly when the transmission is in gear. Do not operate the vehicle while resting foot on the clutch pedal as this will cause abnormal release bearing wear and damage to the clutch facings.
32. Steering Gear:- Self-explanatory.
33. Brake Pedal:- Pressing down this pedal applies air to all wheel brake assemblies. Do not drive with foot resting on this pedal, as air will be applied to the brake assemblies causing the brakes to drag and lining to wear.
34. Accelerator Pedal:- Controls the amount of fuel delivered through the carburetor to the engine and the road speed.
35. Starter Switch Button:- Pressing down on this button completes the circuit between the battery and the starter. The starter pinion engages the flywheel gear, cranking the engine. Release immediately after the engine starts. Do not use starter for longer than thirty seconds at one time.
36. Horn:- The horn button is located in the center of the steering column and is connected to an electric horn. A good driver does not use the horn unnecessarily.
37. Transmission Gear Shift Lever:- This lever gives the operator a selection of various gear ratios for five forward speeds and one reverse. (See Illustration 1-12).
38. Hand Brake:- Pull to rear as far as possible to set the brake. Do not use this brake for service. This lever operates the disc type emergency brake on the propeller shaft. Before moving the vehicle release the latch and move forward as far as possible to release the brake.

INSTRUMENT AND CONTROL SIGNIFICANCE (Cont.)

39. Transfer Case Shift Lever:- Move the shift lever forward to place the transfer case in high range, center position for neutral, and move it all the way back for low speed range. (See Illustration 1-3).
40. Front Axle Declutch Lever:- Press forward to declutch the front axle; pull back to engage the front axle. (See Illustration 1-13).
41. Door Stop (Right-hand and Left-hand):- Self-explanatory.
42. Window Regulator Handle (Left-hand):- Driver control to raise and lower the door glass.
43. Door Handle (Left-hand):- Inside remote control handle to operate the door latch.
44. Door Lock (Left-hand):- Self-explanatory.
45. Forward Winch Control Lever:- This lever engages the forward winch only. Pull up to engage, down to disengage. (See Illustration 1-14).
46. Crane and Winch Power Take-Off Control Lever:- This lever controls the forward and rear winch and crane power delivery. Pull up to engage, down to disengage. (See Illustration 1-14).
47. Identification and Capacity Plate:- Self-explanatory.

Section II

LUBRICATION AND INSPECTION

TITLE	Paragraph No.
Lubrication	21
Inspection	22

21.

LUBRICATION

A. General.- Lubrication is an essential part of preventive maintenance determining to a great extent the serviceability of parts and assemblies. Lubrication or the lack of it, influences materially repairs and operation, and is one of the most important factors affecting dependable service and useful vehicle life. Illustrations 2-1, 2-2, 2-3, and 2-4 on the following pages are lubrication charts reproduced from Lubrication Guides 24 and 80.

B. Detailed Lubrication and Service Instructions.

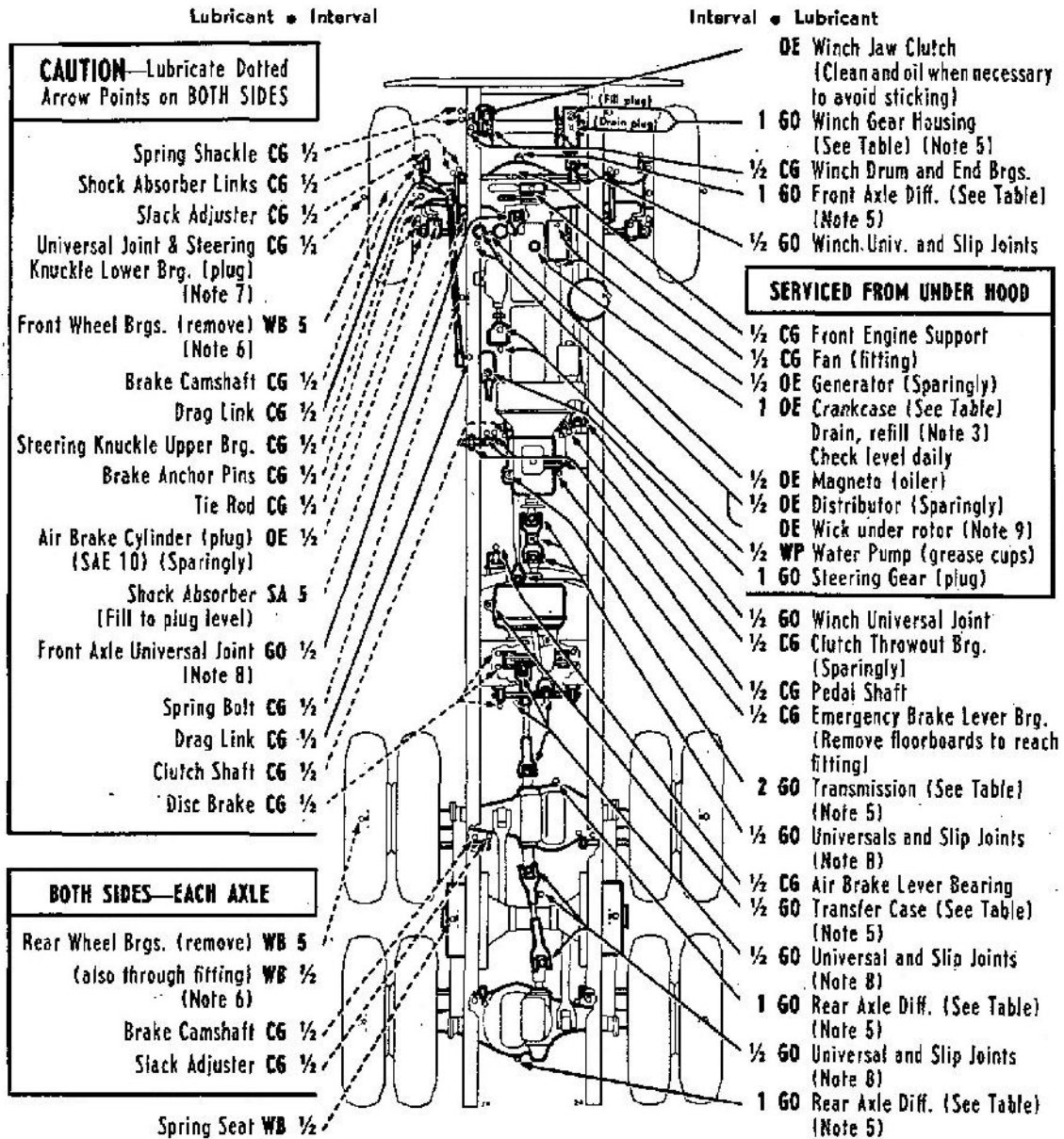
- (1) Air Cleaner. Proper maintenance of air cleaner is essential to prolong engine life.
- (2) Crankcase. In hot weather or when engaging in heavy duty, fill crankcase with OIL, Engine, SAE 50, if available. Check level hourly under extreme conditions.
- (3) Oil Seals. All oil seals in double reduction front axle must be inspected periodically and replaced if undue wear is apparent.
- (4) Wheel Bearings (Front).
 - (a) Remove driving plate by removing drive shaft stud nuts and drive shaft retainers at the end of the shafts. Loosen plate by means of two puller screws. Straighten bent segment of lock and remove both lock nut and bearing adjustment nut.
 - (b) Remove bearings, wash out old grease with SOLVENT, Dry-cleaning, and repack with GREASE, General Purpose No. 2.
 - (c) Replace bearings and bearing nut, using new lock nut. Tighten bearing nut, spin wheel slowly until wheel begins to bind, then back off $1/3$ turn, until wheel spins freely without end play.
 - (d) Bend segment of lock nut over both the adjusting nut and lock nut to prevent shift in its position. Replace driving plate and retainers.

- (5) Wheel Bearings (Rear).
 - (a) Remove stud nuts around axle shaft drive plate. Pull out axle shaft being careful not to lose split taper dowel that acts as lock on axle shaft driving studs.
 - (b) Put jack under housing, raise wheel, wipe grease from end of housing tube and lock nuts. Take off outer lock nut and remove locking washer and inner adjusting nut. Removal of wheel may be facilitated by sliding soapy board or steel plate under tire.
 - (c) Lower the jack until wheel rests lightly on the board or plate. Remove outer bearing and ease wheel off on soapy surface.
 - (d) Clean all old grease from outer and inner bearings and inside of wheel hub. Repack the space in the hub between the two cups covering the bearings with GREASE, General Purpose No. 2, 1/2 to 3/4 full.
 - (e) Replace wheel and slide on tube end, pressing it tightly into hub. Tighten inner adjustment nut against outer bearing until wheel begins to bind when rotated. Back off nut sufficiently to permit wheel to spin freely without end play.
 - (f) Replace lock and outer lock nut. Tighten and lock. Check all oil seals and replace if necessary.
- (6) Tandem Rear Axle (M1). Lubricate spring seats with GREASE, General Purpose No. 2, packed around bearings at end of connecting tube.
- (7) Hoist. Lubricate crane and equipment at time of truck lubrication as indicated on guide.
- (8) Air Brake Reservoirs (M1, Series 2). Drain daily through drain cocks to remove condensate.

C. Reports and Records.

- (1) Reports. If lubrication instructions are closely followed, proper lubricants used, and satisfactory results are not obtained, a report will be made to the Ordnance officer responsible for the maintenance of the materiel.
- (2) Records. A complete record of lubrication servicing will be kept for the materiel in the Motor Book.

LUBRICATION AND INSPECTION



- CAUTION**—Lubricate Dotted Arrow Points on BOTH SIDES
- Spring Shackle CG ½
 - Shock Absorber Links CG ½
 - Slack Adjuster CG ½
 - Universal Joint & Steering Knuckle Lower Brg. (plug) (Note 7) CG ½
 - Front Wheel Brgs. (remove) (Note 6) WB 5
 - Brake Camshaft CG ½
 - Drag Link CG ½
 - Steering Knuckle Upper Brg. CG ½
 - Brake Anchor Pins CG ½
 - Tie Rod CG ½
 - Air Brake Cylinder (plug) (SAE 10) (Sparingly) OE ½
 - Shack Absorber (Fill to plug level) SA 5
 - Front Axle Universal Joint (Note 8) GO ½
 - Spring Bolt CG ½
 - Drag Link CG ½
 - Clutch Shaft CG ½
 - Disc Brake CG ½

- BOTH SIDES—EACH AXLE**
- Rear Wheel Brgs. (remove) (also through fitting) (Note 6) WB 5
 - Brake Camshaft CG ½
 - Slack Adjuster CG ½

- DE Winch Jaw Clutch (Clean and oil when necessary to avoid sticking)
- 1 GO Winch Gear Housing (See Table) (Note 5)
- ½ CG Winch Drum and End Brgs.
- 1 GO Front Axle Diff. (See Table) (Note 5)
- ½ GO Winch, Univ. and Slip Joints

- SERVICED FROM UNDER HOOD**
- ½ CG Front Engine Support
 - ½ CG Fan (fitting)
 - ½ OE Generator (Sparingly)
 - 1 OE Crankcase (See Table) Drain, refill (Note 3) Check level daily
 - ½ OE Magneto (oil)
 - ½ OE Distributor (Sparingly)
 - DE Wick under rotor (Note 9)
 - ½ WP Water Pump (grease cups)
 - 1 GO Steering Gear (plug)

- ½ GO Winch Universal Joint
- ½ CG Clutch Throwout Brg. (Sparingly)
- ½ CG Pedal Shaft
- ½ CG Emergency Brake Lever Brg. (Remove floorboards to reach fitting)
- 2 GO Transmission (See Table) (Note 5)
- ½ GO Universals and Slip Joints (Note 8)
- ½ CG Air Brake Lever Bearing
- ½ GO Transfer Case (See Table) (Note 5)
- ½ GO Universal and Slip Joints (Note 8)
- 1 GO Rear Axle Diff. (See Table) (Note 5)
- ½ GO Universal and Slip Joints (Note 8)
- 1 GO Rear Axle Diff. (See Table) (Note 5)

KEY

LUBRICANTS	
OE—OIL, Engine SAE 30	WB—GREASE, General Purpose No. 2
GO—LUBRICANT, Gear, Universal SAE 90	WP—GREASE, Water pump Heavy
CG—GREASE, General Purpose No. 1 (above +32°) No. 1 or No. 0 (+32° to +10°) No. 0 (below +10°)	SA—SHOCK ABSORBER FLUID

INTERVALS
½— 500 MILES
1— 1,000 MILES
2— 2,000 MILES
5— 5,000 MILES
CHECK DAILY Crankcase and Air Cleaner

LUBRICATION CHART

HEAVY WRECKING TRUCK M1 (WARD LA FRANCE - SERIES 1)

Illustration 2-1

HEAVY WRECKING TRUCK M1

21

TABLE OF CAPACITIES WITH RECOMMENDATIONS AT TEMPERATURES SHOWN

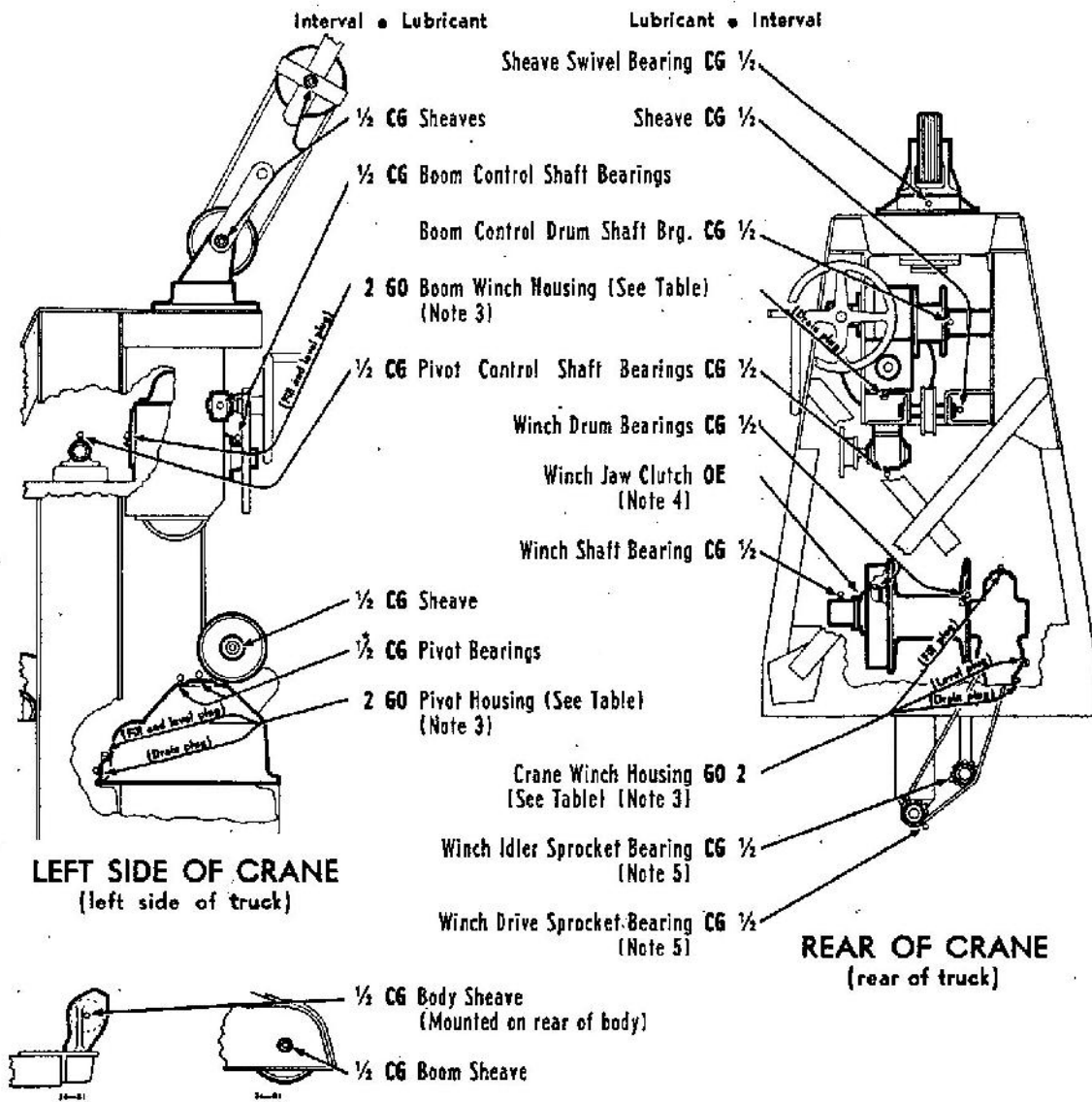
	Capacity	Above +32°	+32° to +10°	+10° to -10°	Below -10°
		OE SAE 30 (Note 3)	OE SAE 30 or 10	OE SAE 10	Refer to Sec. XIX
Crankcase	10 qt.	GO SAE 90	GO SAE 90 or 80	GO SAE 80	
Transmission	12 qt.				
Differential (front)	8 qt.				
Differentials (rear, each)	7 qt.				
Transfer Case	3 qt.				
Winch Gear Case	2 qt.				
Crane Winch Trans.	1½ qt.				

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

COLD WEATHER: For Lubrication and Service below -10°, refer to **Sec. XIX.**

- FITTINGS**—Clean before applying lubricant. Lubricate until new grease is forced from the bearing. **CAUTION:** Lubricate chassis points after washing truck.
- AIR CLEANERS**—(Engine) Check level and refill oil cup to bead level daily with OE. Drain, clean and refill every 50 to 500 miles, depending on operating conditions. Every 1,000 miles, also remove air cleaner and wash all parts. (Air Compressor) Every 2,000 miles, wash curled hair, dry and reoil with OE.
- CRANKCASE**—Drain only when engine is hot. Refill to FULL mark on gage. Run engine a few minutes and recheck oil level. **CAUTION:** Be sure pressure gage indicates oil is circulating. See Table.
- INTERVALS** indicated are for normal service. For extreme conditions of speed, heat, water, mud, snow, rough roads, dust, etc., change crankcase oil and lubricate more frequently.
- GEAR CASES**—Check level every 500 miles, add lubricant if necessary. Check with truck on level ground. Drain, flush and refill at end of first 250 miles; thereafter as indicated at points on guide. When draining, drain immediately after operation.
- WHEEL BEARINGS** (Front and rear)—Remove wheel, clean and repack bearings. (Rear) Remove plug on wheel hub, located opposite fitting, and lubricate through fitting until new grease is forced from plug hole. **CAUTION:** Replace plug.
- UNIVERSAL JOINTS** (Front wheels)—Remove plug in center of wheel hub and insert fitting. Remove level plug in rear of joint and fill through fitting to level of level plug hole. **CAUTION:** After lubricating, replace plug.
- UNIVERSAL JOINTS AND SLIP JOINTS** (Except winch units)—Apply lubricant to joint until it overflows at relief valve and to slip joint until lubricant is forced from end of slip joint.
- DISTRIBUTOR**—Wipe distributor breaker cam lightly with CG and lubricate breaker arm pivot with OE sparingly every 500 miles.
- CABLE CONTROLS**—Lubricate 5 cable control conduit fittings, located under truck at each clutch end of conduit, with CG every 500 miles.
- OIL FILTER**—Renew filter element when oil becomes dirty. After renewing element, refill crankcase to FULL mark on gage. Run engine a few minutes and recheck oil level.
- OIL CAN POINTS**—Lubricate throttle and spark control rod ends, accelerator cross shaft, pintle hook, clevises, with OE every 500 miles.
- POINTS REQUIRING NO LUBRICATION**—Springs, Tandem Drive Axle Torque Rods and Spring End Platforms, Rear Wheel Brake Anchor Pins, Starter and Compressor.

LUBRICATION AND INSPECTION



KEY

LUBRICANTS	
OE—OIL, Engine SAE 30	CG—GREASE, General Purpose No. 1 (above +32°)
GO—LUBRICANT, Gear, Universal	No. 1 or No. 0 (+32° to +10°)
	No. 0 (below +10°)

INTERVALS
1/2— 500 MILES
2—2,000 MILES

LUBRICATION CHART

GAR WOOD CRANE (HEAVY WRECKING TRUCK M1 - SERIES 1)

Illustration 2-2

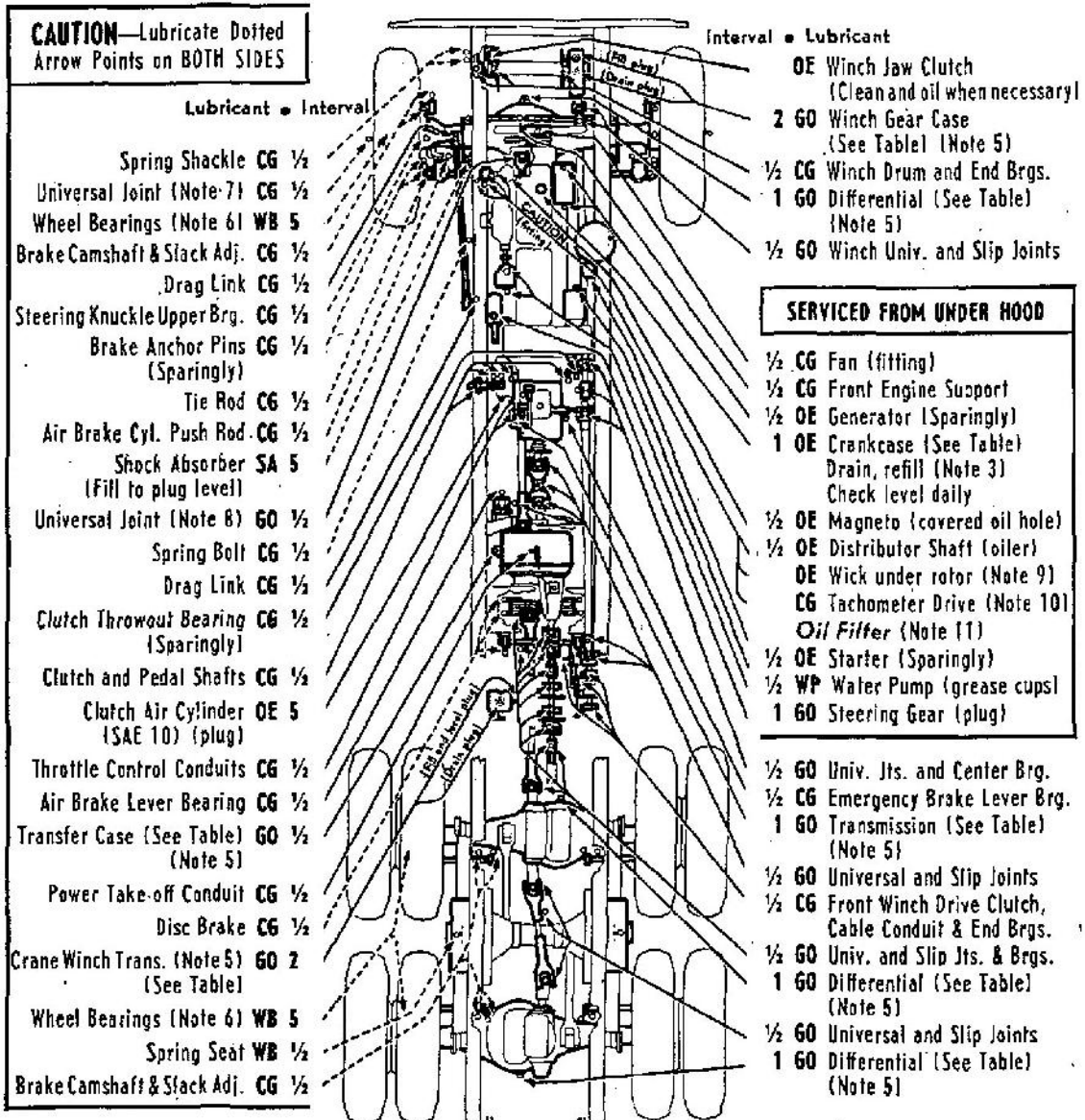
TABLE OF CAPACITIES WITH RECOMMENDATIONS AT TEMPERATURES SHOWN

	Capacity	Above +32°	+32° to +10°	+10° to -10°	Below -10°
Boom Winch Gear Case	2 qt.	} GO SAE 90	} GO SAE 90 or 80	} GO SAE 80	} Refer to Sec. XIX
Crane Winch Gear Case	2 qt.				
Pivot Gear Case	4 qt.				
Rear Winch Gear Case	4½ qt.				
Rear Winch Transmission	2 qt.				

NOTES Additional Lubrication and Service Instructions on Individual Units and Parts **NOTES**
COLD WEATHER: For Lubrication and Service below -10°, refer to **Sec. XIX.**

1. **FITTINGS**—With the exception of the pivot bearings which are enclosed, lubricate until new grease is forced from the bearing. **CAUTION:** Lubricate after washing truck.
2. **INTERVALS** indicated are for normal service. For extreme conditions of speed, heat, water, snow, dust, etc., lubricate more frequently.
3. **GEAR CASES** — Check level every 500 miles, add lubricant if necessary. Check with truck on level ground. Drain, flush and refill at end of first 500 miles; thereafter as indicated at points on guide. When draining, drain immediately after operation.
4. **WINCH JAW CLUTCH** — If sliding clutch sticks, wash and recoil with OE.
5. **WINCH IDLER AND DRIVE SPROCKET BEARINGS** — Lubricate from under chassis.
6. **POINTS REQUIRING NO LUBRICATION** — Cables and Winch Drive Chains.

LUBRICATION AND INSPECTION



KEY

LUBRICANTS	
<p>OE—OIL, Engine SAE 30</p> <p>GO—LUBRICANT, Gear, Universal SAE 90</p> <p>CG—GREASE, General Purpose. No. 1 (above +32°) No. 1 or No. 0 (+32° to +10°) No. 0 (below +10°)</p>	<p>WB—GREASE, General Purpose No. 2</p> <p>WP—GREASE, Water pump</p> <p>SA—SHOCK ABSORBER FLUID, Heavy</p>

INTERVALS
1/2— 500 MILES
1—1,000 MILES
2—2,000 MILES
5—5,000 MILES
CHECK DAILY
Crankcase and Air Cleaner

LUBRICATION CHART
HEAVY WRECKING TRUCK M1
(KENWORTH AND WARD LA FRANCE SERIES 2)

Illustration 2-3

HEAVY WRECKING TRUCK M1

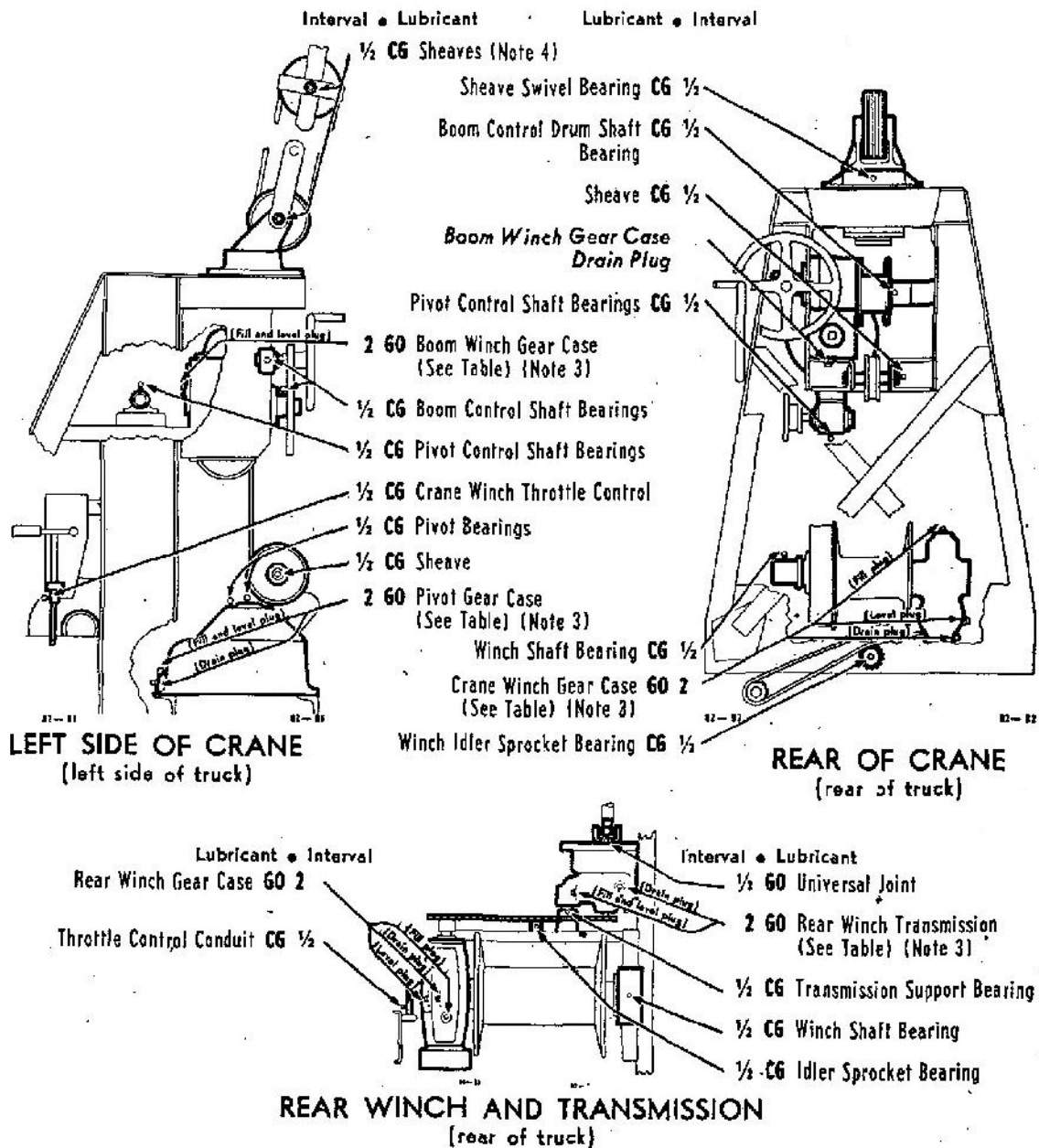
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TABLE OF CAPACITIES WITH RECOMMENDATIONS AT TEMPERATURES SHOWN

	Capacity	Above +32°	+32° to +10°	+10° to -10°	Below -10°
Crankcase	10 qt.	OE SAE 30	OE SAE 30 or 10	OF SAE 10	Refer to Sec. XIX
Transmission	12 qt.	GO SAE 90	GO SAE 90 or 80	GO SAE 80	
Differential (front)	8 qt.				
Differentials (rear, each)	7 qt.				
Transfer Case	3 qt.				
Winch Gear Housing	2 qt.				

NOTES Additional Lubrication and Service Instructions on Individual Units and Parts **NOTES**
COLD WEATHER: For Lubrication and Service below -10°, refer to **Sec. XIX.**

- FITTINGS**—Clean before applying lubricant. Lubricate until new grease is forced from the bearing. **CAUTION:** Lubricate after washing truck.
- AIR CLEANERS**—(Engine) Check level and refill oil cup to bead level daily with OE. Drain, clean and refill every 50 to 500 miles, depending on operating conditions. Every 1,000 miles, also remove air cleaner and wash all parts. (Air Compressor) Every 2,000 miles, wash curled hair, dry and oil with OE.
- CRANKCASE**—Drain only when engine is hot. Refill to FULL mark on gage. Run engine a few minutes and recheck oil level. When available, SAE 50 will be used for above 90° or under heavy duty conditions. **CAUTION:** Be sure pressure gage indicates oil is circulating. See Table.
- INTERVALS** indicated are for normal service. For extreme conditions of speed, heat, water, mud, snow, rough roads, dust, etc., change crankcase oil and lubricate more frequently.
- GEAR CASES**—Check level every 500 miles, add lubricant if necessary. Check with truck on level ground. Drain, flush and refill at end of first 250 miles; thereafter as indicated at points on guide. When draining, drain immediately after operation.
- WHEEL BEARINGS**—Remove wheel, clean and repack bearings.
- UNIVERSAL JOINTS** (Front wheels)—Remove plug in center of wheel hub and insert fitting. Remove level plug in rear of joint and fill through fitting to level of level plug hole.
- CAUTION:** After lubricating, replace plug.
- UNIVERSAL JOINTS AND SLIP JOINTS** (Except winch drive shaft units)—Apply lubricant to joint until it overflows at relief valve, and to slip joint until lubricant is forced from end of slip joint.
- DISTRIBUTOR**—Wipe distributor breaker cam lightly with CG and lubricate breaker arm pivot with OE sparingly every 500 miles.
- TACHOMETER DRIVE**—Provided with grease cup or fitting. **CAUTION:** If fitting is provided, do not use, as lubricant may be forced into and seriously damage the distributor.
- OIL FILTER**—Renew filter element when oil becomes dirty. After renewing element, refill crankcase to FULL mark on gage. Run engine a few minutes and recheck oil level.
- OIL CAN POINTS**—Lubricate throttle and spark control rod ends, accelerator cross shaft, pintle hook, air compressor fulcrum pin, clevises, with OE every 500 miles.
- POINTS REQUIRING NO LUBRICATION**—Springs, Tandem Drive Axle Torque Rods and Spring End Platforms, Rear Wheel Brake Anchor Pins, Shock Absorber Links, Drive Chains, and Compressor.



KEY

LUBRICANTS	
G0—LUBRICANT, Gear, Universal	CG—GREASE, General Purpose
	No. 1 (above +32°)
	No. 1 or No. 0
	(+32° to +10°)
	No. 0 (below +10°)

INTERVALS
1/2— 500 MILES
2—2,000 MILES

LUBRICATION CHART

GAR WOOD CRANE (HEAVY WRECKING TRUCK M1 - SERIES 2)

Illustration 2-4

TABLE OF CAPACITIES WITH RECOMMENDATIONS AT TEMPERATURES SHOWN

	Capacity	Above +32°	+32° to +10°	+10° to -10°	Below -10°
Boom Winch Gear Case	2 qt.	GO SAE 90	GO SAE 90 or 80	GO SAE 80	Refer to Sec. XIX
Crane Winch Gear Case	2 qt.				
Pivot Gear Case	4 qt.				

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

COLD WEATHER: For Lubrication and Service below -10°, refer to Sec. XIX.

1. **FITTINGS**—With the exception of the pivot bearings, which are enclosed, lubricate until new grease is forced from the bearing. **CAUTION:** Lubricate after washing truck.
2. **INTERVALS** indicated are for normal service. For extreme conditions of speed, heat, water, snow, dust, etc., lubricate more frequently.
3. **GEAR CASES**—Check level every 500 miles, add lubricant if necessary. Check with truck on level ground. Drain, flush and refill at end of first 500 miles; thereafter as indicated at points on guide. When draining, drain immediately after operation.
4. **SHEAVES**—Also lubricate boom sheave, located at end of boom, with CG through fitting every 500 miles.
5. **POINTS REQUIRING NO LUBRICATION**—Cables and Winch Drive Chains.

22.

INSPECTION

- A. General. - To insure mechanical efficiency it is necessary that the vehicle be systematically inspected at regular intervals in order that defects may be discovered and corrected before they result in serious damage.
- (1) If cracks should develop in castings or other metal parts they can be discovered at the completion of a run by the dust and oil deposits on exterior or interior surfaces.
 - (2) The Chief of Ordnance should be advised through the local Ordnance Officer of any chronic troubles, technical failures, or unsatisfactory operation of any part or unit. Any suggestions for the improvement of the inspection procedure based on actual operating experience should likewise be forwarded so that all units may benefit.
 - (3) Reports will contain the following:
 - (a) Identity of vehicle and component assembly: The ordnance designation of vehicle and component, including the U.S. Registration Number and Ordnance Serial Number. The name of the manufacturer and the manufacturer's designation, including the model, type, and serial number. The length of service in miles or hours. The date on which the affected component assembly was installed in the vehicle.
 - (b) Description of failure, defect or improper functioning: The name of the place and date of failure. The manner in which the component is damaged, defective or improperly functioning, setting forth the attending circumstances and known causes of the failure, defect or improper functioning, together with pertinent drawings, photographs, sketches, and sample specimens.
 - (c) Remedial action taken: The present location of the replaced or defective parts. The source of the parts used in making the repairs or replacements. The source of labor used in making the repairs or replacements, if other than ordnance personnel.
 - (4) A separate report will be made for each failure, unless there are a number of identical failures to be reported. In that event, a single report may be submitted, providing each vehicle involved is identical. The local ordnance officer will

INSPECTION (Cont.)

forward reports to the Office, Chief of Ordnance. These reports should not be addressed to an Arsenal, Manufacturer or Contractor, unless such action is specifically authorized.

- (5) The defective or broken material that has been replaced and reported by this procedure must be held pending disposal instructions from the Office, Chief of Ordnance.

B. Daily prestarting inspection.

- (1) Before starting engine.
- (a) Check fuel supply; crankcase engine oil level; water or antifreeze in radiator; and water level in battery.
 - (b) Examine surface under vehicle for evidence of leaks.
 - (c) Check engine for loose parts, electrical connections, and fuel and oil lines for leaks.
 - (d) Inspect tires for proper inflation and casing injuries.
 - (e) Inspect front axle and steering linkage for broken parts.
 - (f) Inspect lights and horn for operation.
 - (g) Check tools and equipment for presence.
 - (h) Check connection and condition of towed load, if any.
 - (i) Be sure all transmissions and power take-offs are in neutral.
 - (j) Be sure valve in air-brake storage tank is closed.
- (2) After starting engine.
- (a) Check fan operation.
 - (b) Check engine for loose parts and unusual noises.
 - (c) Note proper functioning of instruments on dash as engine comes to operating temperature.
 - (d) Check operation of windshield wiper.

INSPECTION (Cont.)

- (e) As the vehicle is moved, check operation of clutch, transmission, steering and brakes.

C. Daily inspection during operation.

- (1) During operation the driver should be alert to detect abnormal functioning of the engine. He should be trained to detect unusual engine sounds or noises. He should glance frequently at the instruments on the dash to be sure the engine is functioning properly.
- (2) Only under exceptional circumstances should a vehicle be operated after indications of trouble have been observed. When in doubt the engine should be stopped and assistance obtained. Inspection during operation applies to the entire vehicle and should be emphasized throughout the driving instruction period.

D. Daily inspection at the halt.

- (1) At each halt the operator should make careful inspection of the vehicle to determine its general mechanical condition. Minor defects detected during the march together with defects discovered at the halt should be corrected during the halt or proper disposition of the vehicle should be made so that unnecessary delay may be avoided and major failure prevented.
- (2) A suitable general routine is as follows:
 - (a) Allow the engine to run a short time and listen for unusual noises. If unusual sounds or knocks are heard with the engine running and the vehicle stopped and clutch disengaged, the sound is originating from the engine assembly.
 - (b) Look under the vehicle for fuel, oil and water leaks.
 - (c) Check engine oil (after engine has stopped a few minutes), fuel and water supply.
 - (d) Inspect tires for inflation, cuts, embedded objects, and indications of faulty wheel alignment. Note condition of chains, if used.
 - (e) Feel brake drums, hubs, and gear cases for evidence of overheating.

HEAVY WRECKING TRUCK M1

22

INSPECTION (Cont.)

- (f) Inspect the lights, if traveling at night with lights.
- (g) Inspect the condition of the towed load if any.

E. Daily inspection after operation. - At the conclusion of the day's operation an inspection similar to that made at halt but more thorough and detailed should be made. The inspection should be followed by the necessary preventive maintenance. If defects cannot be corrected, they should be reported promptly to the Chief of Section or other designated individual. A suitable routine is as follows:

- (1) Check all items included in the inspection at the halt, testing lights in all cases. Be sure to check tire pressure to 70 lbs.
- (2) Raise the hood and look for loose, missing, or broken parts and indications of improper operation. Examine grease seals for evidence of failure or over-lubrication.
- (3) Check axles, steering gear and linkage, and springs for condition, alignment, and attachment.
- (4) Examine propeller shaft and brake linkage for condition, worn, lost, and broken parts or foreign material wrapped around the shaft. Check body bolts, tighten or replace as required. Check tools and equipment and secure replacements, if necessary.
- (5) Drain condensed water from air-brake storage tank.

F. Weekly or 250 mile inspection. - The following inspection is made once a week or after 250 miles of operation, whichever occurs first. This inspection should be made in addition to the routine daily inspections.

- (1) Clean batteries and tighten terminals, if loose.
- (2) Add distilled water to bring level of electrolyte $\frac{3}{8}$ in. above plates.
- (3) Check gasoline and oil lines for breaks, loose connections, and evidence of chafing.
- (4) Drain and clean fuel filter. If extensive water or dirt is observed, drain out and clean fuel tanks. Service air cleaner. Do not overfill with oil.

INSPECTION (Cont.)

- (5) Check air induction system for leaks. Check and adjust all control linkage for wear, free operation, and missing cotter pins. See that full travel of the controls is obtained.
 - (6) Check all flexible conduits for breaks and worn sections.
 - (7) Check free travel of clutch pedal. See that fenders are not dented or broken and that they are tightly bolted to the bracket.
 - (8) See that the hood is not damaged and that holding devices and brackets are tight.
 - (9) Tighten all loose mounting bolts and replace any missing bolts on the brush guards, bumpers, and brackets.
 - (10) Examine cab for general condition, operation of windows, door hinges, door latches, upholstery, etc.
 - (11) Examine steering knuckles and hubs of driving axle and look for leaks of lubricant from the housing.
 - (12) Examine shock absorbers, arm linkage, and security of mounting. Check security of mounting of transfer case to frame and tighten or replace loose or missing bolts. Tighten generally, screws of axle housing, transmission, transfer case, and hubs, and replace any that are missing.
 - (13) Examine and tighten axle flange and wheel nuts.
 - (14) Clean vehicles, generally, and clean engine and accessories of oil and dirt.
 - (15) Check proper lubrication by removing level plugs from all driving axles, transmission, transfer case, and gear cases.
 - (16) Check engine oil level and cooling water level.
 - (17) Inflate tires to 70 pounds using a gage. Do not attempt to inflate tires while they are excessively hot.
- G. Thousand mile inspection. - This inspection is to be performed every thousand miles or monthly whichever occurs first. In addition to the daily and weekly inspection, the following will be made:
- (1) Clean engine with dry-cleaning solvent

INSPECTION (Cont.)

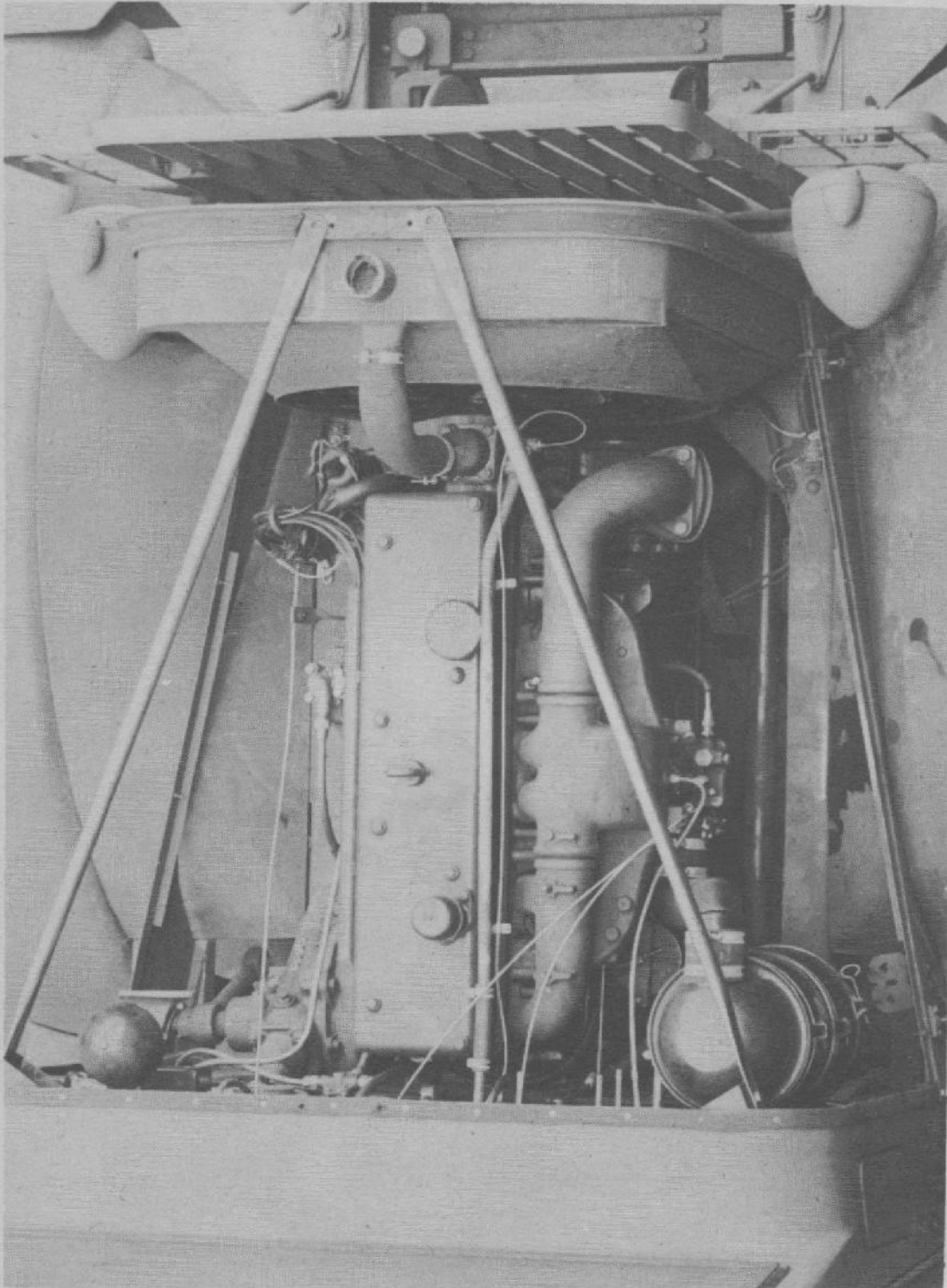
- (2) Remove and check all spark plugs. Replace, if necessary.
 - (3) Check valve clearances.
 - (4) Tune up engine.
 - (5) Inspect carburetor for flooding and replace, if necessary.
 - (6) Inspect magneto breaker points and reset to proper gap.
 - (7) Inspect points for pitting. If points show ash-colored burning, have the condenser checked.
 - (8) Check compression of each cylinder. Cylinders must be hot.
 - (9) Remove window straps of starter and generator and inspect brushes, commutator, and general internal appearance. If brushes need replacing or if other repairs are indicated, replace the unit.
 - (10) Check all nuts securing engine accessories and tighten, if necessary.
 - (11) Check oil level in transmission and transfer cases and other gear cases. Lubricate the vehicle throughout, complying with the Lubrication Guide.
 - (12) Check, and where necessary, replace or exchange unit accessories such as headlights, batteries, sirens, generators, wiring, harness, etc.
 - (13) Road test the vehicle. Check operation of all equipment on vehicle such as winch chain, etc.
- H. Technical inspection. - In addition to the above inspection, the semi-annual or 6000 mile inspection is to be performed and recorded on WDQMC Form No. 260 and necessary maintenance operations performed.

LUBRICATION AND INSPECTION

OPERATOR'S NOTES

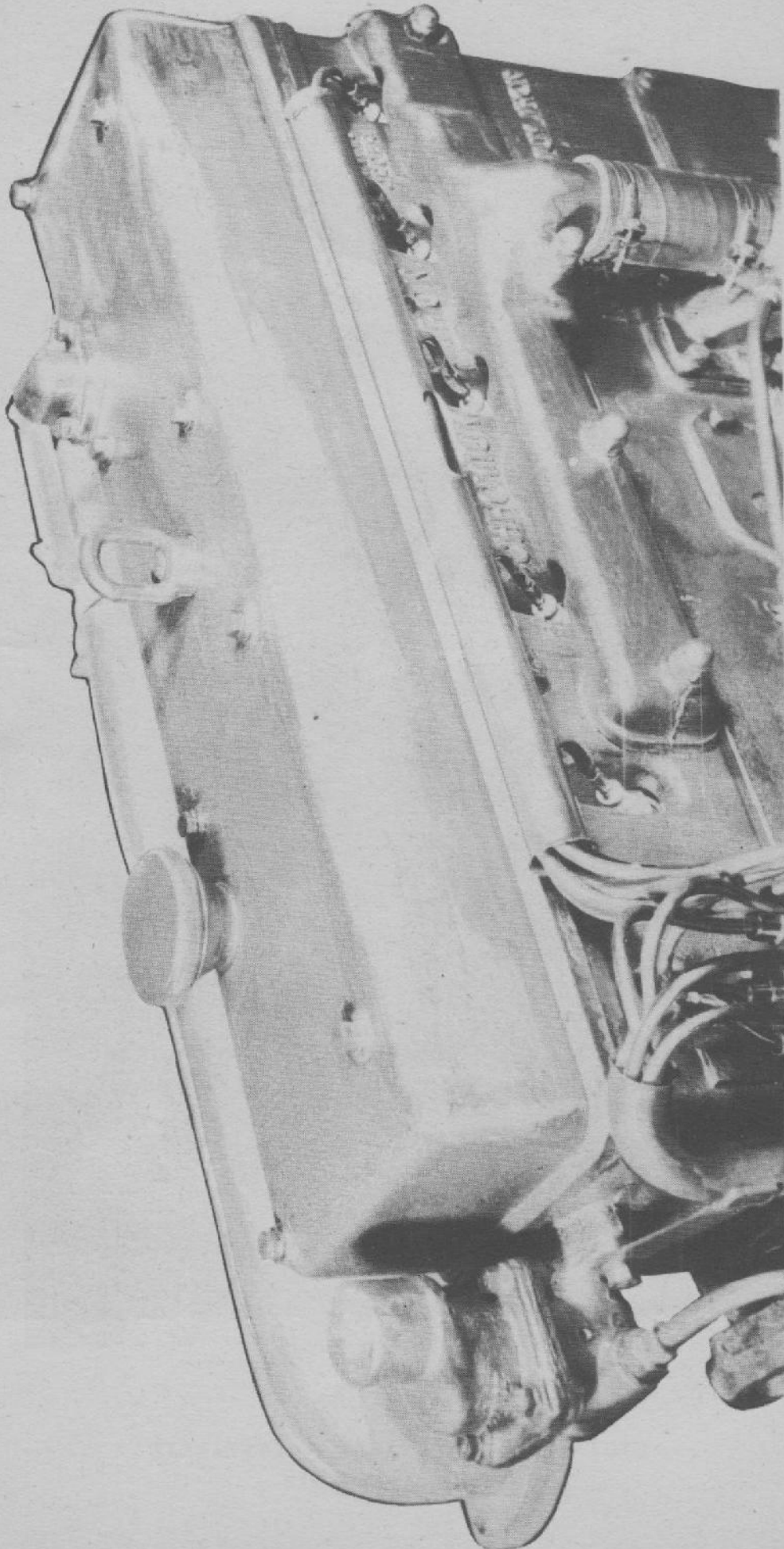
Lined area for operator notes.

ENGINE



TOP OF ENGINE - INSTALLED
Illustration 3-1

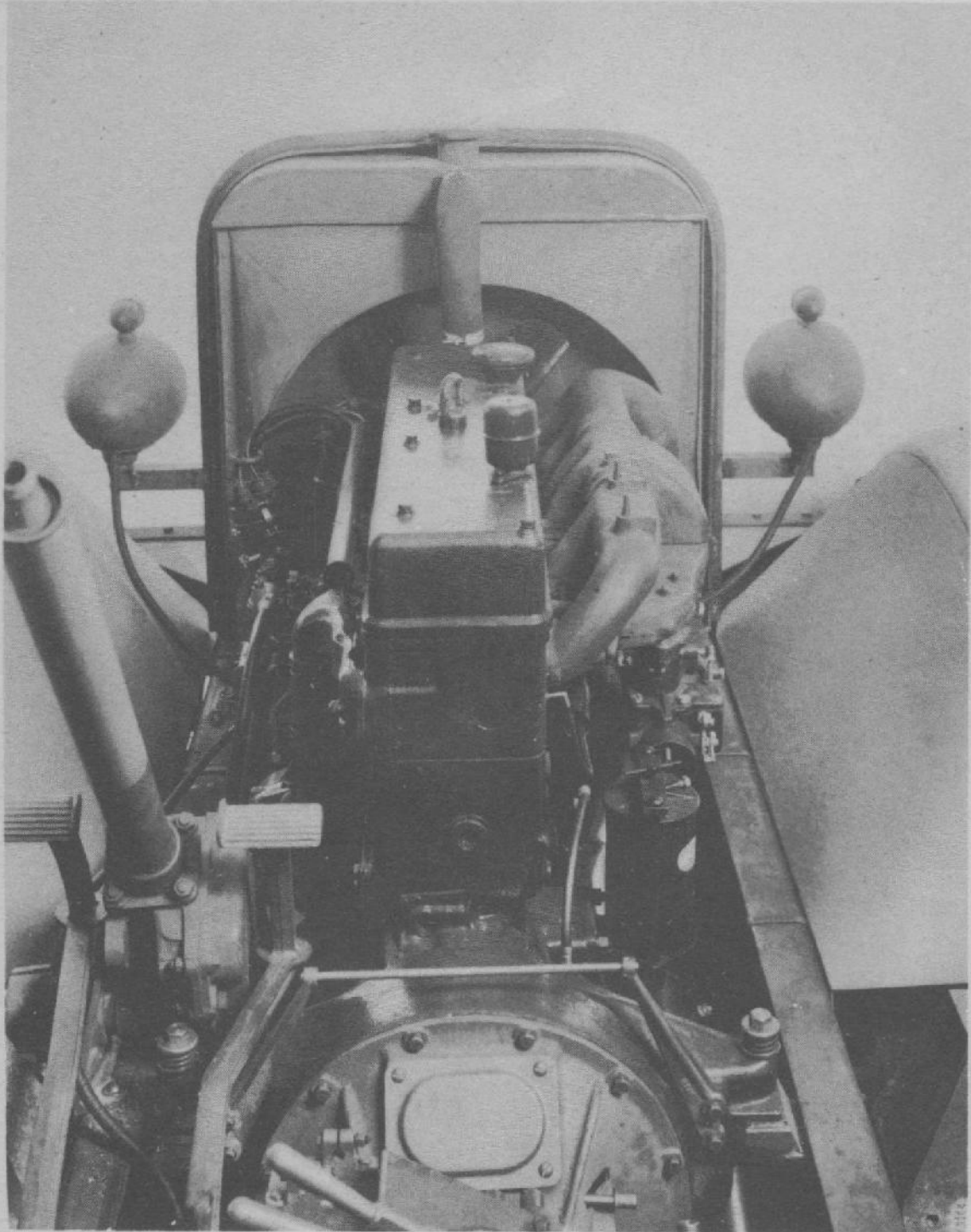
HEAVY WRECKING TRUCK M1



ENGINE ASSEMBLY - TOP

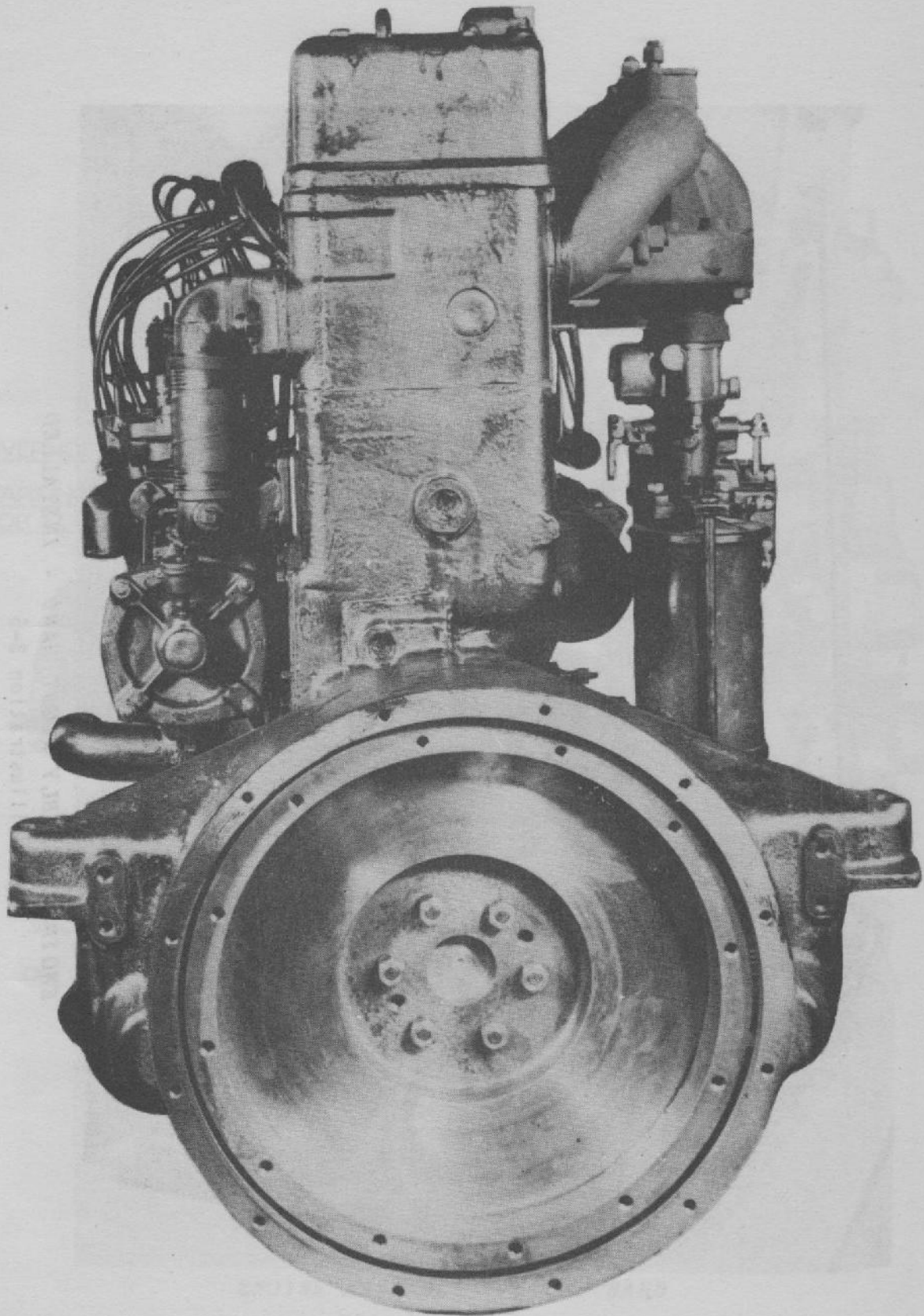
Illustration 3-2

ENGINE



ENGINE ASSEMBLY REAR - INSTALLED
Illustration 3-3

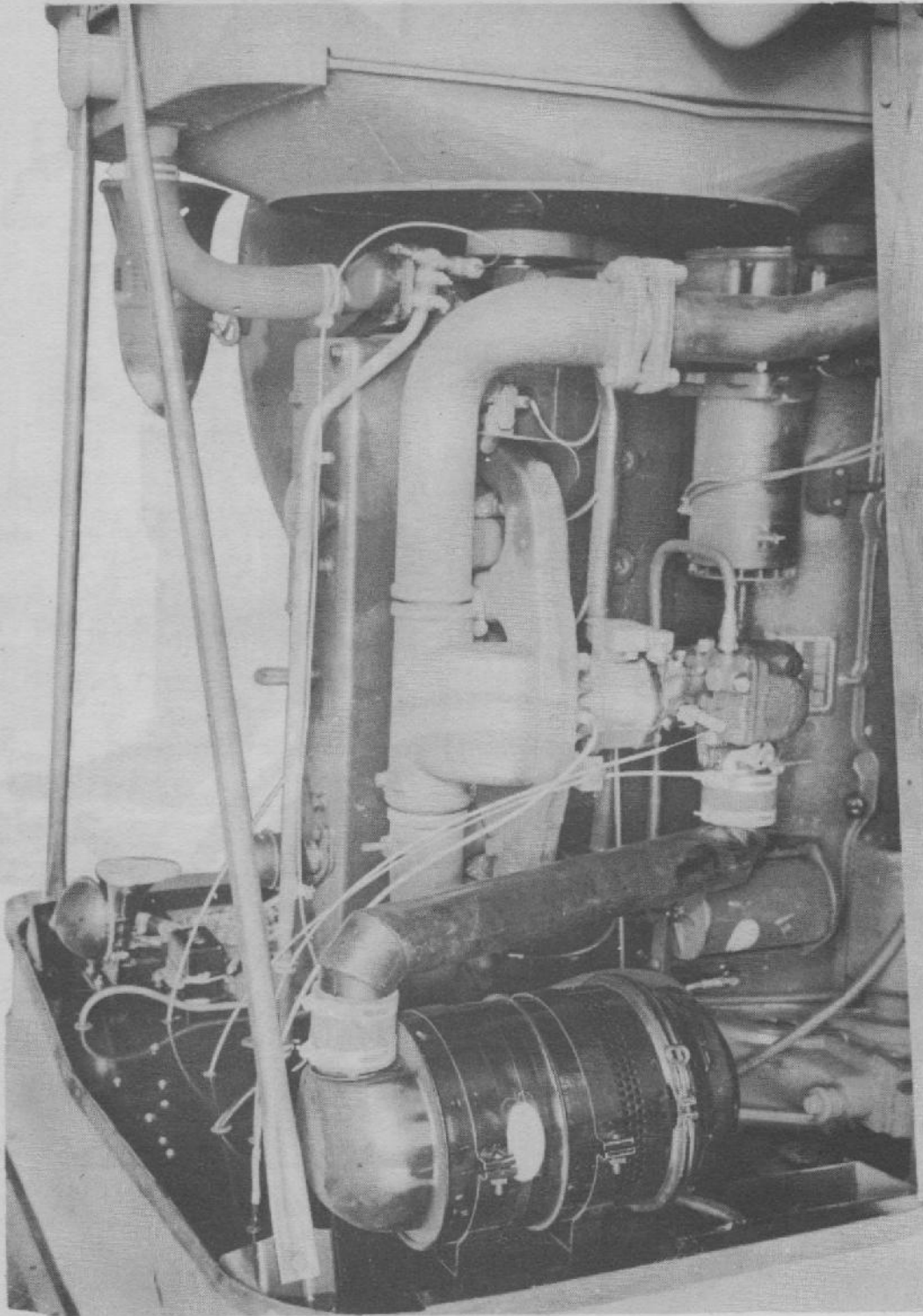
HEAVY WRECKING TRUCK M1



ENGINE ASSEMBLY - REAR

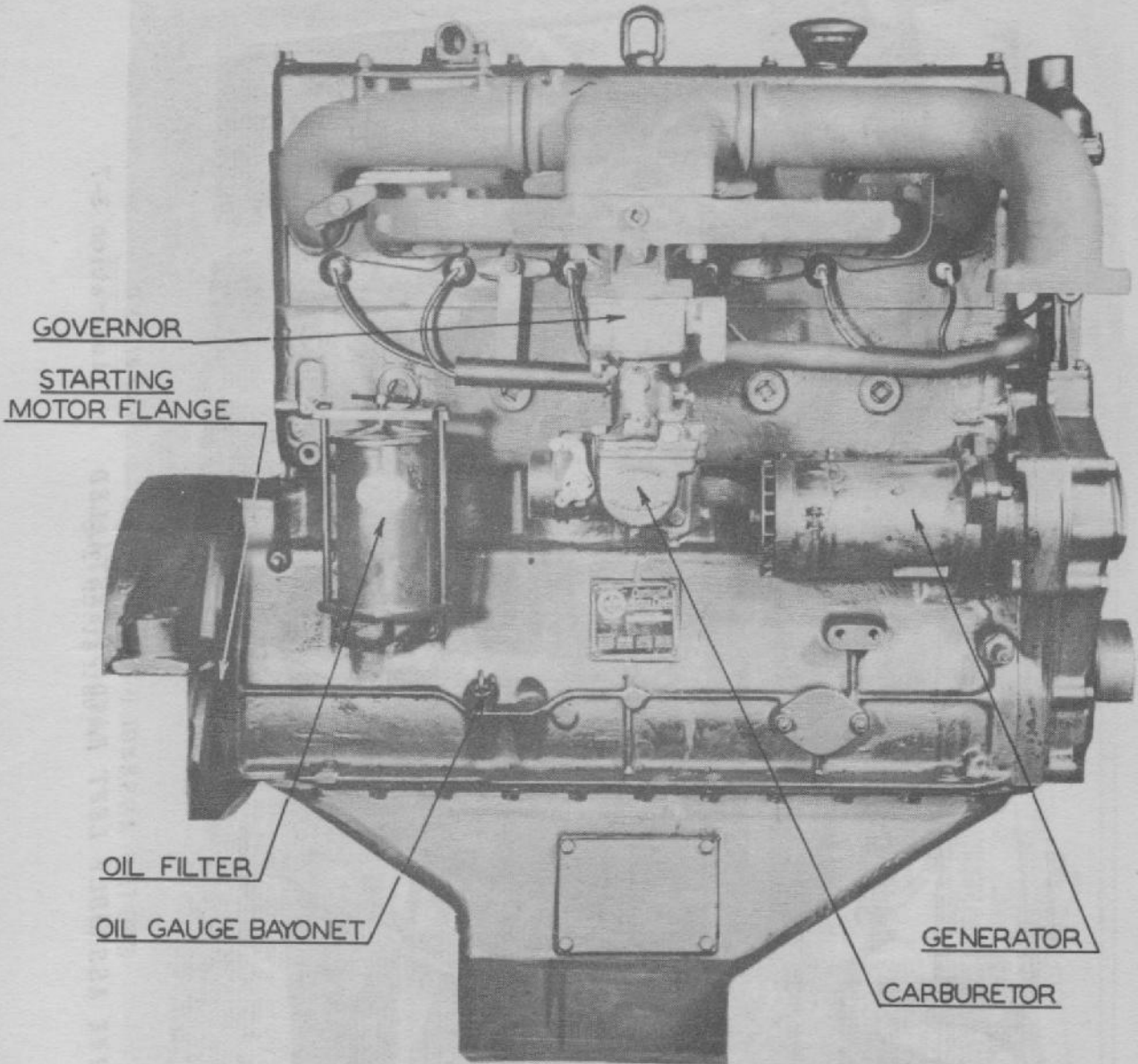
Illustration 3-4

ENGINE



ENGINE ASSEMBLY RIGHT HAND - INSTALLED
Illustration 3-5

HEAVY WRECKING TRUCK M1



ENGINE ASSEMBLY - RIGHT HAND
Illustration 3-6

ENGINE

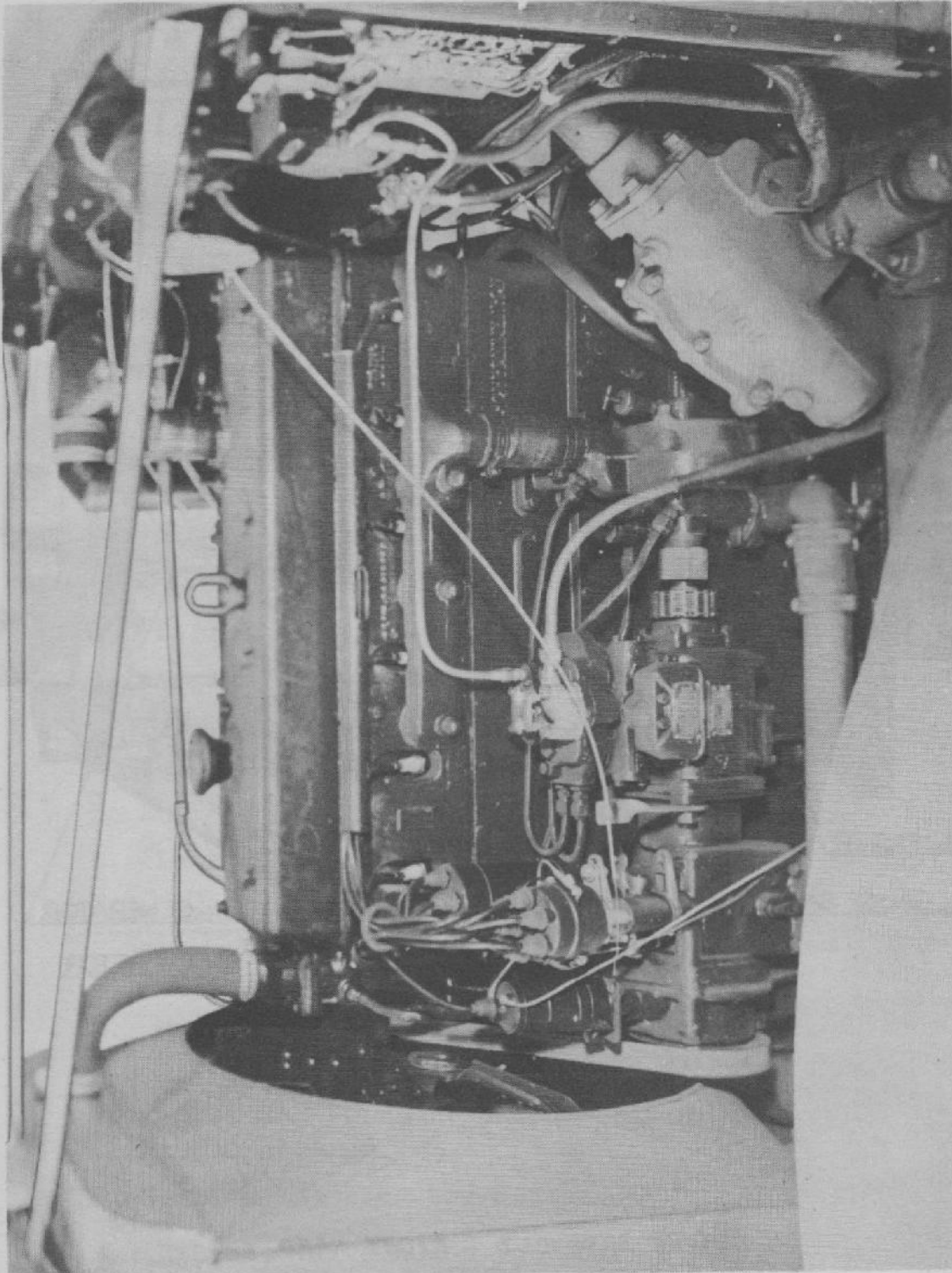
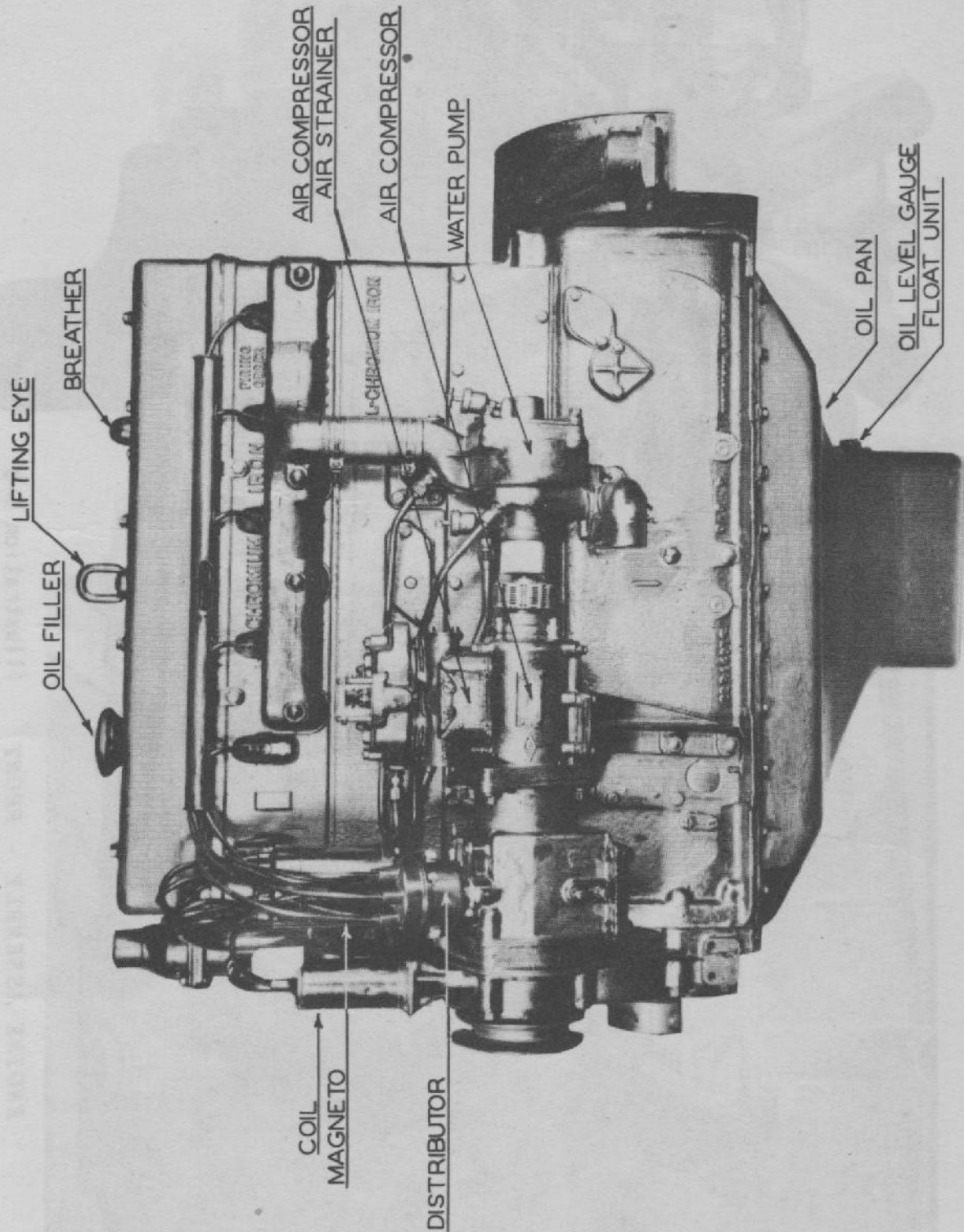


Illustration 3-7

ENGINE ASSEMBLY LEFT HAND - INSTALLED

HEAVY WRECKING TRUCK M1



ENGINE ASSEMBLY - LEFT HAND SIDE Illustration 3-8

ENGINE

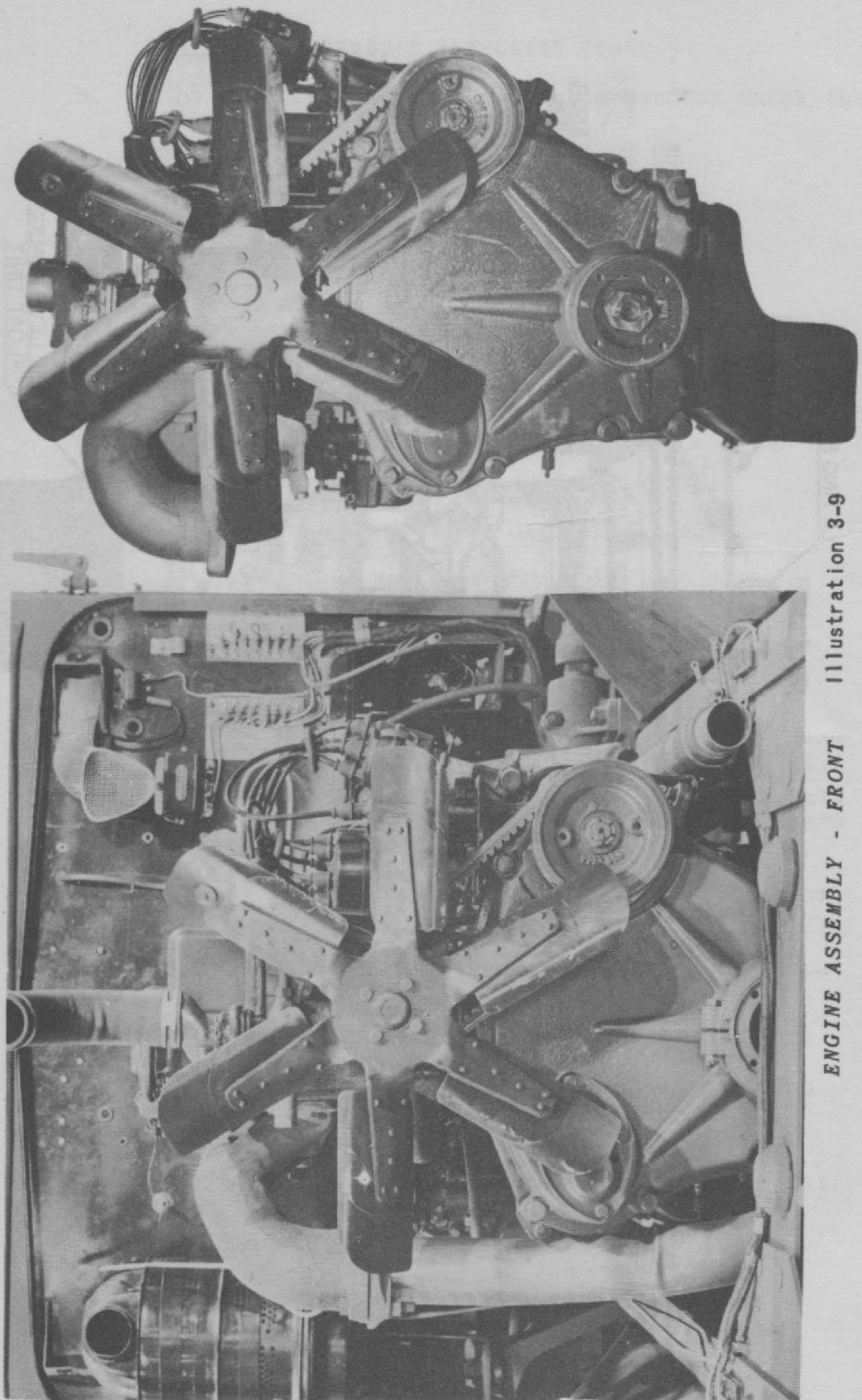
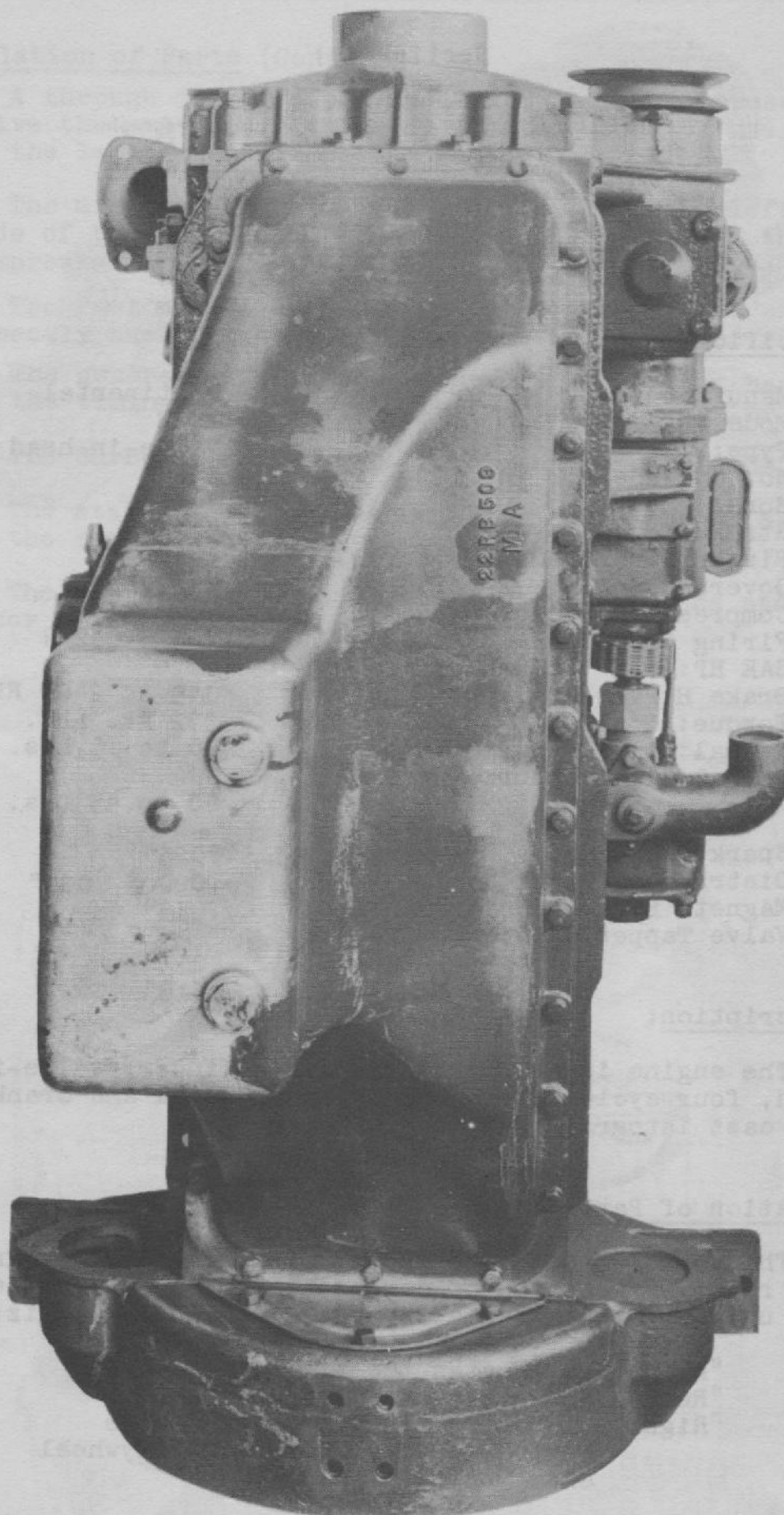


Illustration 3-9

ENGINE ASSEMBLY - FRONT

HEAVY WRECKING TRUCK M1



ENGINE ASSEMBLY - BOTTOM

Illustration 3-10

Section III
ENGINE

TITLE	Paragraph No.
Specifications	23
Description	24
Relation of Parts	25
Service Diagnosis and Cause	26
Vapor Lock	27
Caution	28

23. Specifications:

Manufacturer:	Continental
Model:	22-R
Type:	Valve-in-head
No. Cylinders:	Six
Bore:	4½"
Stroke:	5¼"
Piston Displacement (Cu.In.):	501
Governed Speed:	2400 RPM
Compression Ratio:	5.23:1
Firing Order:	1-5-3-6-2-4
SAE HP:	48.6
Brake H.P.:	145 at 2400 RPM
Torque:	372 Ft. Lbs.
Normal Oil Pressure (Idle):	10 to 15 Lbs.
Normal Oil Pressure (Operating RPM):	40 to 45 Lbs.
Spark Plug Gap:	.025"
Distributor Point Gap:	.020 ± .002"
Magneto Breaker Point Gap:	.015"
Valve Tappet Clearance (Hot)	
Intake:	.013"
Exhaust:	.018"

24. Description:

The engine is a Continental six-cylinder, valve-in-head, four-cycle unit. The cylinder block and crankcase are cast integral in a single block.

25. Relation of Parts:

The terms "Front" and "Rear" of an engine, designating the relative position of component parts, follow the common usage of those terms as applied to engines, viz:

- "Front" designates the timing gear end.
- "Rear" designates the flywheel end.
- "Right" and "Left" is applied when the engine is viewed from the flywheel end.

The air compressor is mounted on the left hand side directly back of the timing gear case at the front end of the engine.

Relation of Parts (Cont.)

A through drive is provided through the compressor to drive the water pump which is located about $3/4$ way back on the left hand side of the engine.

The distributor and magneto are also on the left hand side of the engine and are mounted just ahead of the air compressor.

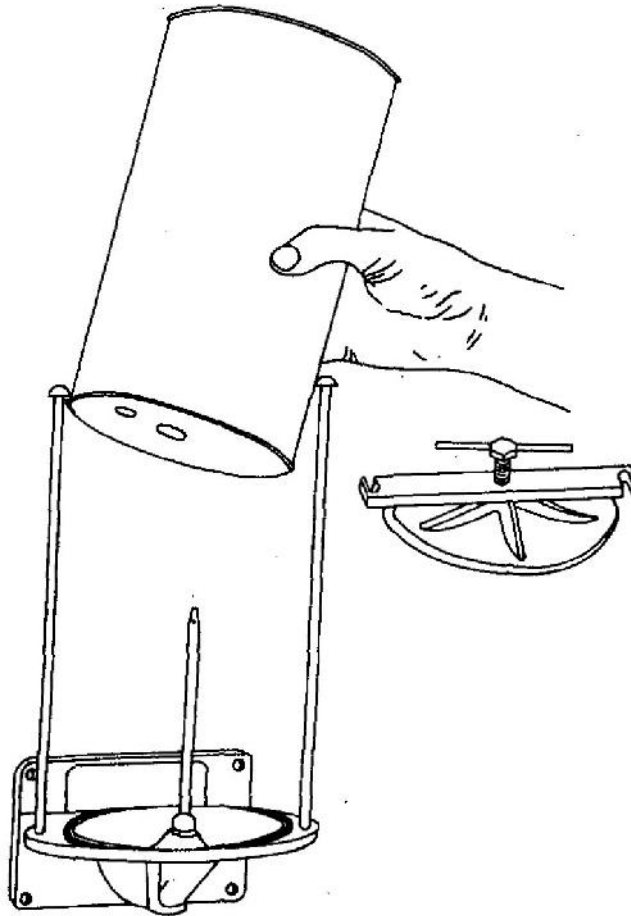
The fuel pump is mounted near the rear of the engine directly back of the water pump on the left hand side.

The generator is flange mounted on the right hand side of the timing gear case at the front of the engine.

The carburetor is on the right hand side of the engine

The starting motor is mounted in the flywheel housing at the rear of the right side of the engine.

The oil filter is mounted directly above the starting motor at the right rear side of the engine.



OIL FILTER CARTRIDGE REPLACEMENT

Illustration 3-11

Relation of Parts (Cont.)

The fan is belt-driven at the front of the engine.

26.

SERVICE DIAGNOSIS AND CAUSE

1. Engine will not Start - Spark Test Indicates No Spark:

A. The ammeter on the instrument panel will prove a valuable aid in localizing a defect in the circuit which results in no spark. If the ammeter shows no discharge it is an indication that the primary circuit is interrupted and the current is not permitted to complete the circuit to the battery.

- (a) Ignition switch is defective.
- (b) Loose connections from starter switch to ammeter.
- (c) Loose connections from ammeter to ignition switch.
- (d) Breaker points in distributor are not closing.
- (e) Breaker points are excessively burned or pitted.
- (f) Primary wire from ignition switch to coil and from coil to distributor may be broken or connections loose.
- (g) Defective ignition coil

B. Normal ammeter reading - needle operates between 2 and 5 amperes discharge while starter is cranking the engine. When ammeter reading is normal with slight oscillation it indicates that the primary circuit is complete, therefore, checking should be confined to the secondary circuit as follows:

- (a) High tension wire from coil to distributor may be broken or grounded.
- (b) Defective ignition coil.
- (c) Defective condenser.
- (d) Defective distributor rotor.
- (e) Defective distributor cap.
- (f) Corroded high tension terminals either at coil or distributor cap.
- (g) Dampness in distributor.

SERVICE DIAGNOSIS AND CAUSE (Cont.)

- (h) High tension wiring may be wet.
- C. Ammeter indicates abnormal discharge - more than 2 to 5 amperes. This condition is an indication that a short exists in the primary circuit. This can occur in the ammeter, the ignition coil, or the distributor, as follows:
- (a) Wire from ammeter to ignition switch and from ignition switch to ignition coil may be shorted or grounded.
 - (b) Primary winding in ignition coil may be shorted.
 - (c) Distributor points may not be opening.
 - (d) Condenser may be shorted or grounded.
 - (e) Breaker arm in distributor may be grounded.
2. Engine Will Not Start - Spark Test Indicates Weak Spark:
- A. Distributor points may be burned or badly pitted.
 - B. Loose electrical connections throughout the circuit causing high resistance.
 - C. High tension wires may be defective or wet.
 - D. Weak ignition coil.
 - E. Weak distributor condenser.
 - F. Defective distributor cap.
 - G. Defective distributor rotor.
 - H. Broken rotor brush.
3. Engine Will Not Start - Spark Test Indicates Good Spark. This eliminates the ignition system and the fuel system should be checked as follows:
- A. If inspection reveals gasoline is present in the carburetor, check:
 - (a) Carburetor may contain dirt or water.
 - (b) Carburetor may be flooded through excessive use of choke.
 - (c) Choke control may not be operating.

SERVICE DIAGNOSIS AND CAUSE (Cont.)

- B. If no gasoline is reaching the carburetor check the following:
- (a) Fuel lines may be plugged.
 - (b) Fuel pump may be inoperative.
 - (c) Vent in fuel tank cap may be plugged.
 - (d) Tank fuel line may be kinked.
 - (e) Tank fuel line may have air leak.
4. Engine Mis-fires, Continues Mis-firing in One or More Cylinders:
- A. Faulty spark plugs. Check the following:
- (a) Is recommended type plug being used?
 - (b) Spark plugs may be dirty.
 - (c) Spark plug gap may be too great.
 - (d) Porcelain may be cracked.
- Note:- If color of porcelain that into the combustion chamber is light brown, spark plug is of correct type. If porcelain is black, spark plug is too cold - use a hotter spark plug. If porcelain is white, spark plug is too hot - use a colder plug.
- B. If faulty spark plugs have been eliminated, check the following:
- (a) High tension wires from distributor to spark plugs may be grounding.
 - (b) Distributor cap may be defective.
 - (c) Cylinders may have insufficient compression.
5. Engine Runs Unevenly - Erratic Mis-firing:
- A. Uneven operation at idling speeds. Check the following:
- (a) Faulty spark plugs.
 - (b) Spark plug gaps are adjusted too wide.
 - (c) Ignition coil is defective.

SERVICE DIAGNOSIS AND CAUSE (Cont.)

- (d) Condenser defective.
 - (e) Distributor breaker points improperly adjusted.
 - (f) Distributor breaker points sticking.
 - (g) Valve mechanism in poor condition.
 - (h) Valve sticking open.
 - (i) Weak valve spring.
 - (j) Incorrect tappet clearance.
 - (k) Defective cylinder head gasket.
 - (l) Uneven cylinder compression.
- B. Uneven engine operation at high speeds. Check the following:
- (a) Weak valve springs.
 - (b) Weak distributor breaker arm spring.
 - (c) Breaker points adjusted too wide.
 - (d) Breaker points adjusted too close.
 - (e) Incorrect type of spark plugs.
 - (f) Spark plug gap adjusted too wide.
 - (g) Spark plug gap adjusted too close.
6. Sharp Pinging Noise When Picking Up Speed or Pulling Hard:
- A. Distributor timing not set properly.
 - B. Excessive carbon in engine.
 - C. Improper grade of fuel.
7. Sharp Hollow Slapping Sound When Engine is Pulling on Level Ground or in Cold Condition:
- A. Worn piston
8. Light Knock When Engine is Running Idle:
- A. Loose wrist pin.

SERVICE DIAGNOSIS AND CAUSE (Cont.)

9. Dull Regular Knock in Engine in Time With Engine Crankshaft Speed:
 - A. Loose connecting rod bearing.
10. Dull Heavy Pound in Time with Crankshaft Speed:
 - A. Worn or burned out main bearing.
 - B. Loose flywheel.
 - C. Excessive clearance in front mounting yoke.
11. Light Clicking or Tapping Noise:
 - A. Valve tappets out of adjustment.
 - B. Weak valve springs.
 - C. Stuck valve.
12. Intermittent Squeak or Squeal:
 - A. Loose fan belt.
13. Continuous Squeak or Squeal:
 - A. Dirty generator commutator.
 - B. Glazed generator brushes.
 - C. Lack of lubrication in generator.
 - D. Lack of lubrication in water pump.
 - E. Lack of lubrication in distributor.
14. Loud Exhaust Noise:
 - A. Blown exhaust gasket.
 - B. Muffler blown out.
 - C. Exhaust pipe broken.
15. Popping, Spitting and Spark Knock:
 - A. Valves adjusted too close.
 - B. Exhaust valve heads too thin.
 - C. Excessive carbon.
 - D. Weak valve springs.

SERVICE DIAGNOSIS AND CAUSE (Cont.)

- E. Hot spot in cylinder head.
 - F. Valves not properly seated.
 - G. Valve timing early.
 - H. Poor fuel.
 - I. Broken spark plug porcelain.
16. Steaming and Hissing:
- A. Insufficient water in radiator.
17. Engine Over-heats:
- A. Late timing.
 - B. Water pump not working.
 - C. Lack of Oil.
 - D. Air cleaner plugged.
 - E. Radiator covered too much.
 - F. Over-supply of anti-freeze.
 - G. Plugged or restricted cooling system.
 - H. Loose or missing fan belt.
 - I. Insufficient water in radiator.
18. Engine Refuses to Stop When Switch is Turned Off:
- A. Excessive carbon in engine.
 - B. Exhaust valve heads too thin.
 - C. Hot spot in cylinder head.
 - D. Over-heated engine.
 - E. Defective ignition switch.
19. Engine Stalls When Idle:
- A. Cold engine.
 - B. Idle adjustment set too low.
 - C. Spark plug gaps too wide.

SERVICE DIAGNOSIS AND CAUSE (Cont.)

D. Distributor breaker point gap too great.

20. Excessive Vibration in Engine:

A. Loose engine mounting supports.

B. Cylinders not firing properly.

C. Loose flywheel.

21. Lack of Power:

A. Loss of compression.

B. Valves not seating.

C. Valve timing not correct.

D. Late ignition spark.

E. Plugged muffler.

F. Hand brake applied.

G. Air leaks at intake manifold.

H. Dragging brakes.

I. Slipping clutch.

J. Defective fuel pump.

K. Air cleaner restricted.

L. Weak valve springs.

M. Excessive cylinder wear.

N. Valves sticking.

O. Error in tire rolling radii.

22. Excessive Oil Consumption:

A. Worn or broken piston rings.

B. Piston ring slots plugged with carbon.

C. Cylinder bores out of round.

D. Cylinder bores excessively tapered.

E. Improper grade of oil.

SERVICE DIAGNOSIS AND CAUSE (Cont.)

- F. Oil level too high.
 - G. Oil leaks at gaskets and seals.
 - H. Loose bearings.
23. Low Oil Pressure:
- A. Improper grade of oil.
 - B. Oil pump screen clogged.
 - C. Loose bearings.
 - D. Oil pump not functioning properly.
 - E. Excessive wear in oil pump.
 - F. Loose oil line connections.
24. No Oil Pressure:
- A. Defective oil gauge.
 - B. Insufficient oil in engine.
 - C. Oil screen clogged.
 - D. Broken pressure line.
 - E. Stripped oil pump gears.
25. Black Smoke Coming Out of Exhaust Pipe:
- A. Too rich a carburetor mixture.
 - B. Excessive carbon in engine.
 - C. Loose piston rings.
 - D. Excessive piston and ring clearance.
26. Blue Smoke Coming Out of Exhaust Pipe:
- A. Too much oil in the crankcase.
 - B. Excessive piston ring wear.
27. Smoke Coming From Under the Hood:
- A. Short in wiring.
 - B. Engine too hot.

SERVICE DIAGNOSIS AND CAUSE (Cont.)

- C. Excessive oil in the engine.
 - D. Poor engine condition.
28. Odor of Gasoline:
- A. Leaking fuel lines.
 - B. Leaking fuel pump diaphragm.
29. Odor of Burning Rubber:
- A. Short circuit in electrical units.
 - B. Wiring in contact with manifold.
30. Odor of Burning Oil:
- A. Over-heated engine.
 - B. Dry accessory bearing, such as fan.
31. Engine Will Not Start - Refuses to Rotate:
- A. Loose battery connections.
 - B. Corroded battery connections.
 - C. Discharged battery.
 - D. Cable to starting motor grounded.
 - E. Defective starting motor.
 - F. Starter drive gear refuses to engage.
 - G. Broken drive gear spring or bolt.
 - H. Flywheel starter teeth broken.
 - I. Flywheel gear loose on flywheel.
 - J. Engine frozen (extreme cold).
 - K. Pistons stuck.

27.

VAPOR LOCK

Definition: When a portion of the fuel system becomes filled with gasoline, vapor is causing either partial or total disruption of fuel flow to the carburetor.

Diagnosis: Vapor Lock causes the gasoline level in the carburetor float bowl to become low or even dry. This causes a lean mixture and can be identified by the

VAPOR LOCK (Cont.)

following:

- (a) Lack of power on full throttle.
- (b) Flat spots on part throttle.
- (c) Stalling on idle.
- (d) Inability to start hot engine.
- (e) Reduced engine speed because of lean mixture.

Heat Source: The fuel pump is the greatest offender and derives heat from the following sources:

- (a) Heat conducted from the crankcase and camshaft.
- (b) Heat received from splashing of hot oil.
- (c) Heat received from under-hood air.

28. CAUTION

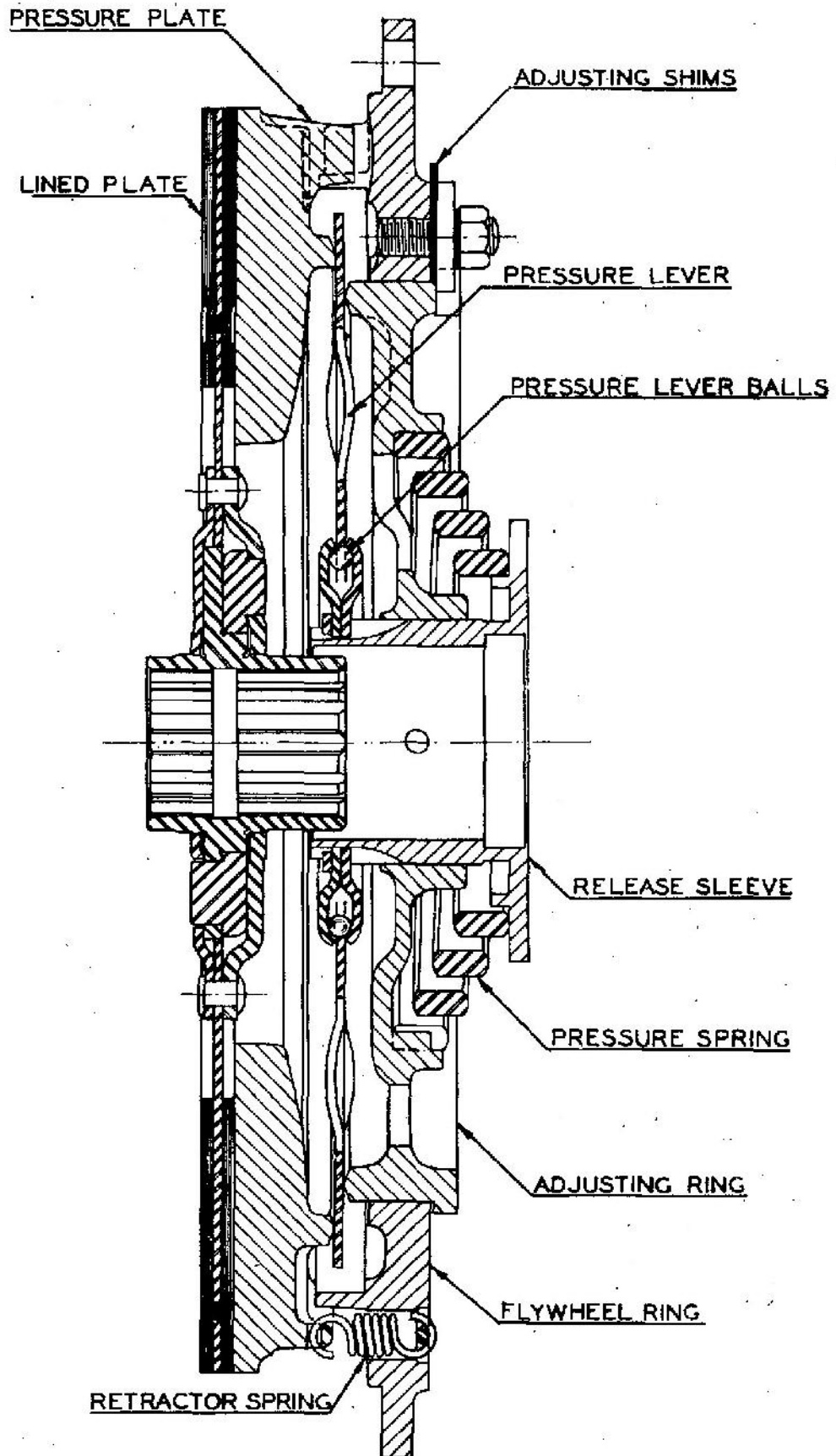
1. Do not race the engine.
2. Do not lug the engine - shift to a lower gear.
3. Watch the instruments that indicate engine operating condition.
4. Remember the governor has no effect on controlling engine speed when using it as a brake.
5. Do not abuse the equipment.

HEAVY WRECKING TRUCK M1

OPERATOR'S NOTES

Lined area for operator's notes.

CLUTCH



CLUTCH ASSEMBLY

Illustration 4-1

Section IV
CLUTCH

TITLE	Paragraph No.
Specifications _____	29
Description _____	30
Service Diagnosis and Cause _____	31
Caution _____	32

29. Specifications:

Manufacturer:	W. C. Lipe
Size:	14"
Type:	Single-Plate, Dry Disc
Pressure Spring:	Helical
Number Used:	One

30. Description:

The clutch serves as a means of applying engine power to the power transmission system of the vehicle consisting of the transmission, propeller shafts, transfer case, axle driving units, axle shafts and wheels. It allows the engine to pick up the load gradually. When disengaged it forms a disconnecting link between the engine and power transmission group.

Twenty pressure levers hinged on ball bearings are so placed in the unit that the centrifugal force of the spinning clutch aids the pressure spring when the clutch is engaged.

Engagement is obtained from a pressure plate which moves in the same plane as the flywheel face, contacting and clamping between the pressure plate and the engine flywheel the lined driven member. It is held in this tightly engaged position by the pressure spring acting upon the hinged levers.

31. SERVICE DIAGNOSIS AND CAUSE

1. Slipping:

- (a) Improper adjustment.
- (b) Weak spring.
- (c) Worn lining.
- (d) Lining oil-soaked.
- (e) Lined plate sticking.
- (f) Misalignment.

SERVICE DIAGNOSIS AND CAUSE (Cont.)

2. Grabbing:

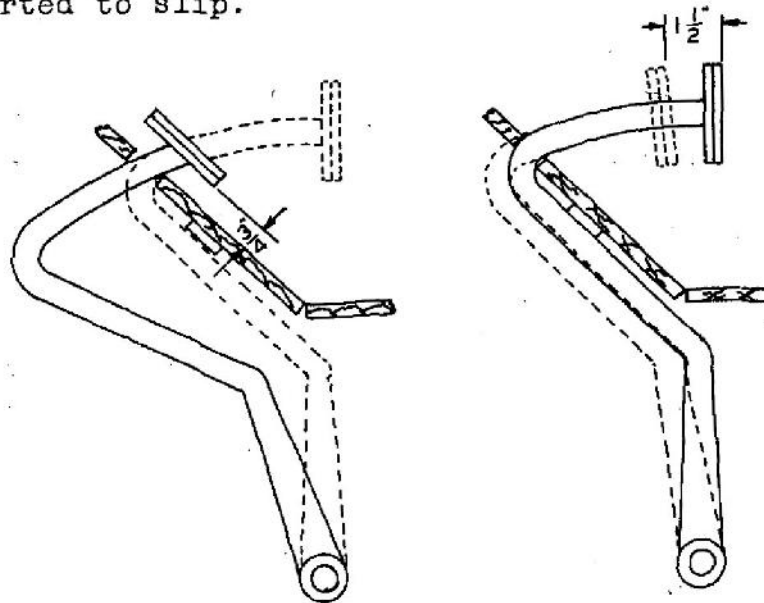
- (a) Oil on lining.
- (b) Lined plate sticking.
- (c) Worn spline on clutch gear.
- (d) Loose engine mounting.

3. Rattling:

- (a) Weak retractor springs.
- (b) Loose flywheel ring bolts.
- (c) Poorly centered release yoke.

32. CAUTION

- 1. Do not operate vehicle with foot resting on the clutch pedal.
- 2. Do not engage clutch quickly, placing a shock load on the power transmission units.
- 3. Do not delay having the clutch adjusted once it has started to slip.



CLUTCH PEDAL CLEARANCES

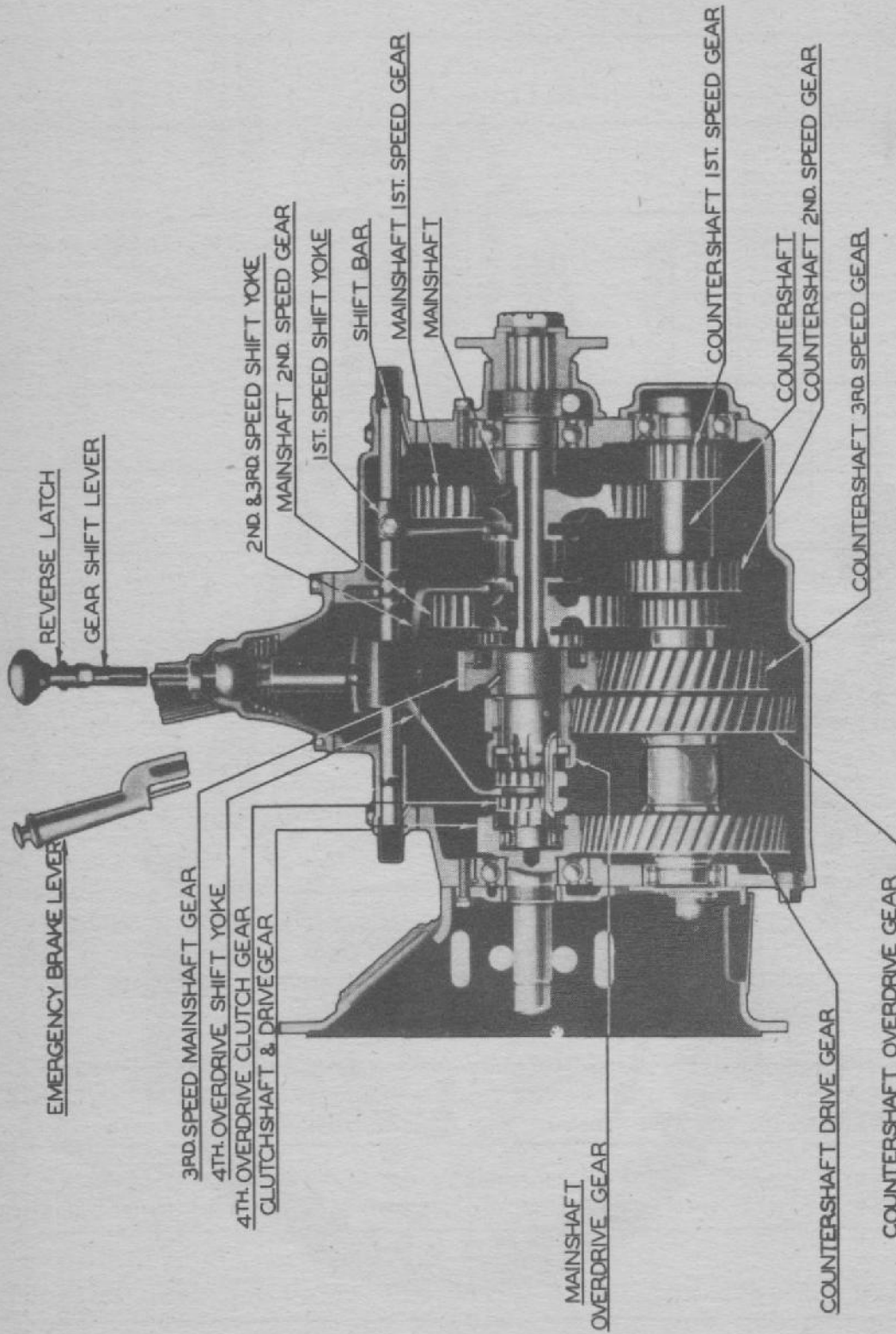
Illustration 4-2

- 4. When at least $3/4$ " of free movement of clutch pedal with clutch engaged can no longer be felt have clutch readjusted. When pedal pad strikes toeboard have clutch readjusted.

HEAVY WRECKING TRUCK M1

OPERATOR'S NOTES

TRANSMISSION



TRANSMISSION
Illustration 5-1

HEAVY WRECKING TRUCK M1

33-34

Section V TRANSMISSION

TITLE	Paragraph No.
Specifications	33
Description	34
Service Diagnosis and Cause	35
Caution	36

33. Specifications:

Manufacturer:	Fuller Manufacturing Co.
Model:	5A-620
<u>Ratios</u>	
First:	7.07:1
Second:	3.50:1
Third:	1.72:1
Fourth:	1.00:1
Fifth:	.776:1
Reverse:	7.11:1

Bearings

Clutch release bearing:	BCofA	CTDS-76
Countershaft front:	Hyatt	1307-TS
Countershaft rear:	MRC	309-MFG
Main drive gear:	MRC	310-MFG
Mainshaft Pilot:	Norma Hoffman	R130-LL
Mainshaft rear:	MRC	310-SG
Reverse Idler:	Hyatt	95732

Lubricant Capacity: 12 Quarts

34. Description:

The transmission is, in effect, in combination with the axle, a series of axle ratios that provide the truck with the various ability factors required to meet varying conditions of operation.

The transmission is a unit-power gear box having five speeds forward and one reverse. The transmission is direct on fourth with an overdrive in fifth speed.

The gears are shifted manually by a conventional gear shift lever and a diagram of the gear shift lever positions is shown in Illustration 1-12.

Third, fourth and fifth gears are constant mesh helical gearing and are engaged by sliding clutches. First, second and reverse are spur sliding gears.

The clutching gears are driven through a splined shaft. The clutch shaft is supported in the transmission case and in the flywheel on ball bearings. The mainshaft pilot

Description (Cont.)

bearing is carried on a straight roller and the rear of the mainshaft is supported by a ball bearing. The countershaft is supported at the front by a straight roller bearing and the rear of the countershaft is mounted in a ball bearing. The reverse idler is supported on two straight roller bearings.

35. SERVICE DIAGNOSIS AND CAUSE

Noise which seems to originate in the transmission is frequently found to be caused by some other part of the chassis driving mechanism. These noises may originate in the engine, the propeller shafting, the rear axle or in the disc brake and is, in turn, reflected into the transmission which merely acts as a sound box for the noise. Therefore, before any service work is done on the transmission a thorough check should be made to endeavor to isolate the noise at its actual source. After investigating and eliminating other causes, the following may apply:

1. Transmission noisy:

- (a) Lubricant not of proper viscosity.
- (b) Insufficient lubricant.
- (c) Transmission out of alignment with clutch housing.
- (d) Transmission loose on clutch housing.
- (e) Clutch housing loose on engine.
- (f) Gears have excessive lash.
- (g) Mainshaft gears loose on splines.
- (h) Countershaft gears loose on shaft.
- (i) Worn bushings in gears.
- (j) Worn bearings on shafts.
- (k) Main drive gear worn and out of alignment.

2. Transmission hopping out of gear:

- (a) Weakened shift poppet springs.
- (b) Gears only partially engaged.
- (c) Worn gear bushings.
- (d) Transmission out of alignment.
- (e) Tapered gear teeth from improper shifting.

SERVICE DIAGNOSIS AND CAUSE (Cont.)

(f) Worn bearings, causing shaft misalignment.

3. Lubricant Leaks:

(a) Worn or damaged oil seals.

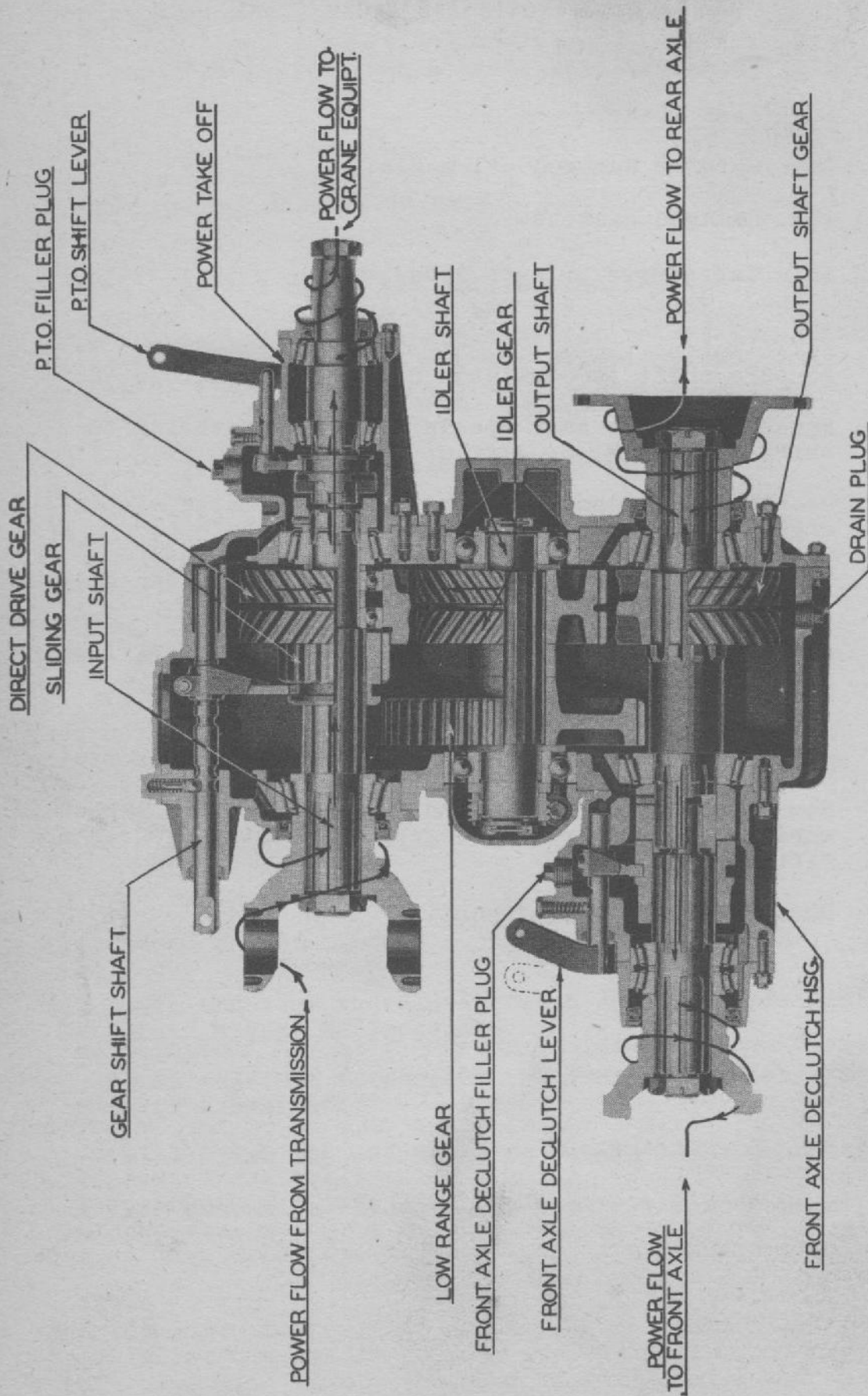
(b) Damaged gaskets.

(c) Cap screws or nuts loose.

36. CAUTION

1. Be sure shift is completed before engaging clutch.
2. Synchronize the gear speeds before endeavoring to shift into gear.
3. Do not shock load the gear train by erratic clutch engagement.
4. Select the proper gear with which the load can be easily started and moved.
5. Shift from gear quickly so that coast side loads with only partial tooth engagement are avoided.
6. Do not force the unit into gear by means of the gear shift lever to overcome poor gear selection or timing.
7. Remember that First, Second and Reverse shifts require more gear shift lever movement than Third, Fourth and Fifth.
8. Do not abuse the equipment.

TRANSFER CASE



TRANSFER CASE Illustration 6-1

HEAVY WRECKING TRUCK M1

37-38

Section VI
TRANSFER CASE

TITLE	Paragraph No.
Specifications _____	37
Description _____	38
Service Diagnosis and Cause _____	39
Caution _____	40

37. Specifications:

Manufacturer: Wisconsin Axle Division
 Model: T77-3-3
 Gear Ratio (High Range): 1.00:1
 Gear Ratio (Low Range): 2.55:1

Bearings

Input shaft forward:	Timken 59200 Cone 59412 Cup
Input shaft rear:	Timken 3782 Cone 3732 Cup
High range gear bearings: ND	1209
Idler shaft fwd. bearings: ND	1311
Idler shaft rear bearings: ND	1409
Output shaft fwd. bearings: Timken	33225 Cone 33472 Cup
Output shaft rear bearings: Timken	59200 Cone 59412 Cup
Declutching shaft bearings: Timken	385-A Cone 382-A Cup
Power Take-off shaft bearings:	Timken 342-S Cone 332 Cup

38. Description:

The transfer case is mounted behind the transmission through which the front and rear axles are driven. A declutching device is attached for engagement and disengagement of the front axle. Also mounted on the transfer case is a power take-off assembly for driving the front winch, rear winch and crane. It provides the necessary offset to permit driving the front axle. An additional speed reduction is provided in the transfer case and the selection of the high range gear or low range gear is made by means of a control lever in the cab.

The main drive shaft, driven shaft, power take-off and declutching unit shaft are mounted on tapered roller bearings. The idler shaft is mounted on ball bearings. The gearing in the low range is spur gear driven while the gearing in the high range is of herringbone design.

39. SERVICE DIAGNOSIS AND CAUSE

The transfer case is frequently blamed for noise that originates elsewhere in the chassis for which the transfer case is merely acting as a sound box. Before doing any work on the transfer case remove all doubt that the noise actually exists in this unit.

1. Noise in Transfer Case:

- (a) Worn bearings.
- (b) Faulty gearing.
- (c) Improper lubricant.
- (d) Low lubricant level.
- (e) Misalignment.

2. Slips out of Gear:

- (a) Shift rod poppet spring weakened or broken.
- (b) Shift rod poppet ball sticking.
- (c) Partial gear engagement.
- (d) Worn or loose bearings.

3. Lubricant Leaks:

- (a) Worn or damaged oil seals.
- (b) Damaged gaskets.
- (c) Cap screws or nuts loose.

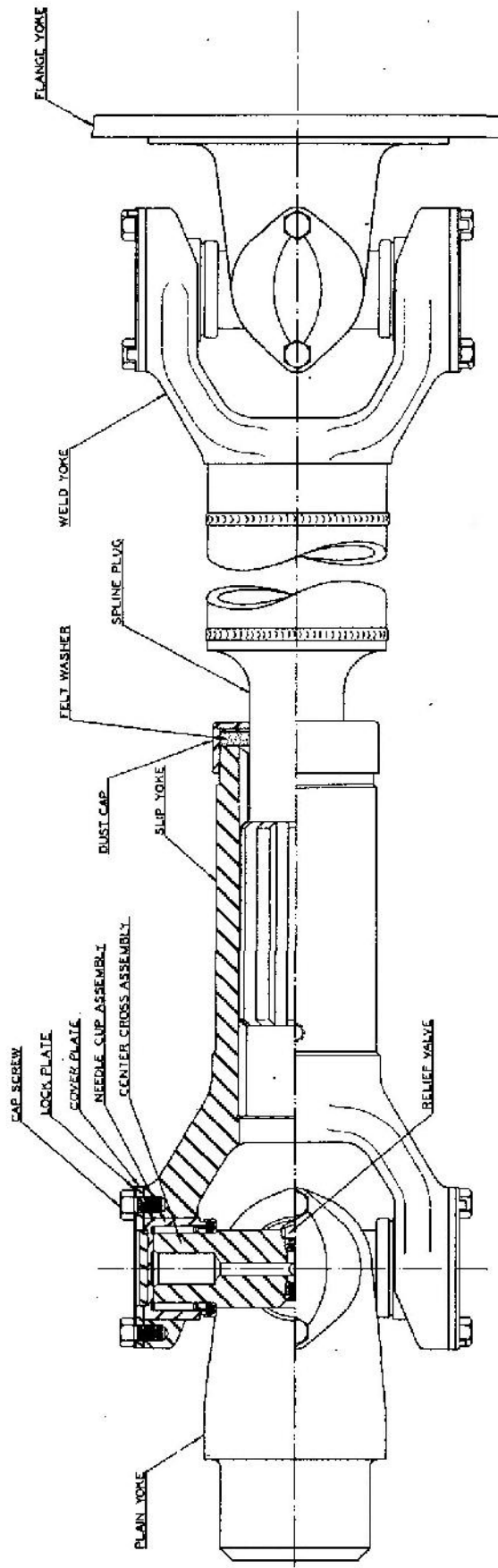
40. CAUTION

- 1. If lubricant has been drained pour a half pint of gear oil into the power take-off to insure bearing lubrication. (See Section 2, Lubrication, for proper type and viscosity).
- 2. If lubricant has been drained pour half a pint of gear oil into the front axle declutch to insure bearing lubrication. (See Section 2, Lubrication, for proper type and viscosity).
- 3. Do not endeavor to use underdrive in transfer case unless front axle is engaged.
- 4. Always bring truck to a complete stop before engaging front axle.

SERVICE DIAGNOSIS AND CAUSE (Cont.)

5. Before proceeding where heavy going will be encountered bring truck to a complete stop, engage front axle and put transfer case in low range.
6. Always disengage front axle when operating on the highway.
7. Do not use too much pressure on the shift lever to shift transfer case.
8. Slight clutch engagement is frequently necessary to engage power take-off and declutching unit to cause shaft rotation for easy engagement.
9. Do not abuse the equipment.

PROPELLER SHAFTS



PROPELLER SHAFT
Illustration 7-1

HEAVY WRECKING TRUCK M1

41-42

Section VII
PROPELLER SHAFTS

TITLE	Paragraph No.
Specifications _____	41
Description _____	42
Service Diagnosis and Cause _____	43
Caution _____	44

41. Specifications:

Manufacturer:	Blood Bros.
Shaft Series:	7-N
No. Shafts :	3
Shaft Series:	6-N
No. Shafts :	1

TRANSMISSION TO TRANSFER CASE

Series:	6-N
Length, Normal overall:	18-3/4"
Compression:	3/8"
Extension:	3/8"

TRANSFER CASE TO FRONT AXLE

Series:	7-N
Length, Normal overall:	61-3/16"
Compression:	1 1/2"
Extension:	1 1/2"
Tubing Diameter, O.D.:	3 1/2"

TRANSFER CASE TO CENTER AXLE

Series:	7-N
Length, Normal overall:	51-31/32"
Compression:	1"
Extension:	5 1/4"
Tubing Diameter, O.D.:	3 1/2"

INTERAXLE ASSEMBLY

Series:	7-N
Length, Normal overall:	38-3/16"
Compression:	1/2"
Extension:	2 1/2"
Tubing Diameter, O.D.:	3 1/2"

42. Description:

There are four propeller shafts used on this vehicle. The propeller shafts consist of a tubular shaft with a permanent joint and a slip joint on each end. The slip joint permits any variation in length between the various units connected caused by the flexing of the springs or oscillation of the rear axle assembly while the truck is

Description (Cont.)

in motion. The propeller shaft between the transmission and transfer case, because of its short length, is of the solid type.

Briefly, the universal joint or propeller shaft joint consists of two yokes, flexibly connected by a one-piece center cross, mounted on needle bearings supported in the yokes.

The center crosses are drilled lengthwise to each bearing assembly to form an oil way for lubricating purposes from the center of the cross. Relief valves are also provided in each journal to prevent over-lubrication and damage to the oil seals.

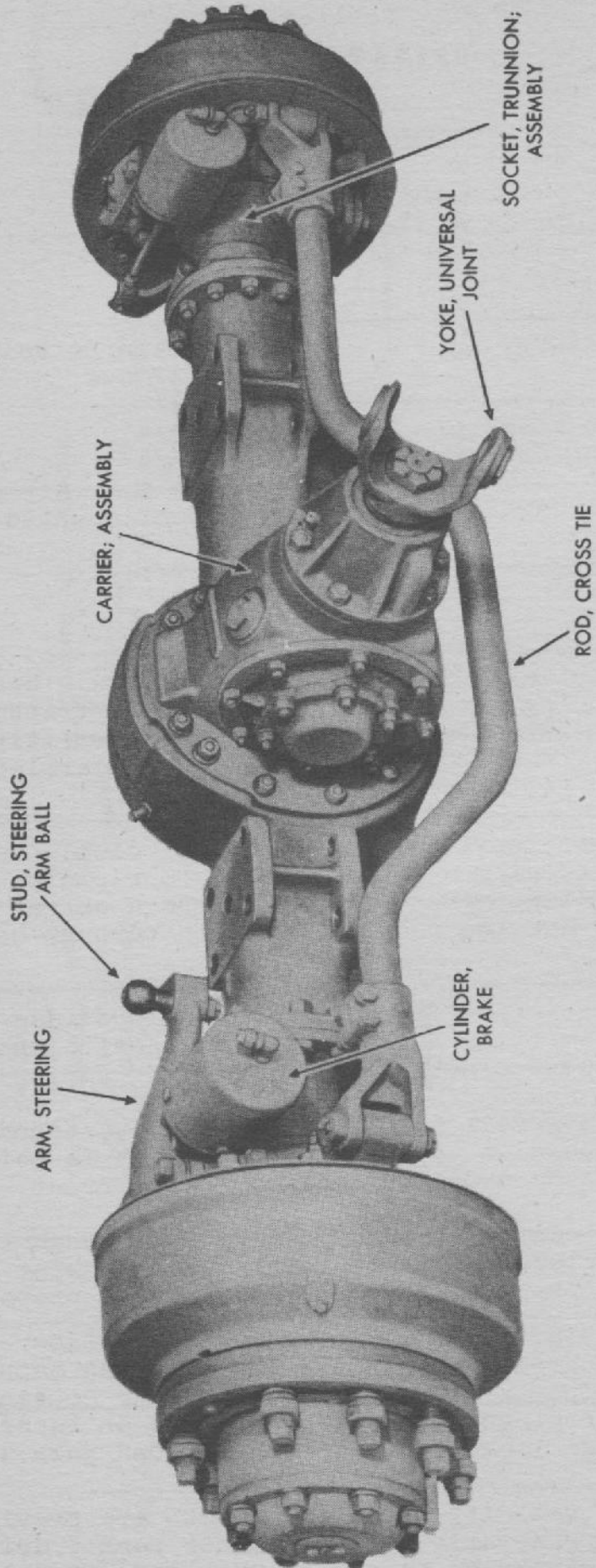
43. SERVICE DIAGNOSIS AND CAUSE

1. Constant Vibration in Time With Propeller Shaft Rotation:
 - (a) Propeller shaft improperly assembled.
 - (b) Center crosses not in alignment.
 - (c) Worn needle bearings.
2. Sharp Click Upon Starting Forward or Reversing:
 - (a) Loose companion flange or end yoke.
3. Excessive Oil Leaking:
 - (a) Worn or damaged oil seals.

44. CAUTION

1. Never endeavor to weld a broken shaft. A new shaft should always be installed.
2. Never continue to operate the vehicle with excessive shaft vibration.
3. Never allow the end yokes to remain loose on units.
4. Keep companion flange bolts securely tightened.

FRONT AXLE



FRONT AXLE ASSEMBLY
Illustration 8-1

Section VIII
FRONT AXLE

TITLE	Paragraph No.
Specifications _____	45
Description _____	46
Specifications _____	47
Explanation of Alignment Terms _____	48
Service Diagnosis and Cause _____	49

45. Specifications:

Manufacturer:	Timken-Detroit Axle Co.
Model:	F-3200-W
Track:	72 $\frac{1}{2}$ "
Tie Rod Diameter:	1- $\frac{3}{4}$ "
Steering Arm Ball Diameter:	1- $\frac{3}{4}$ "
Brake Size:	17 $\frac{1}{4}$ x 4, Air-operated
Driving Unit:	Front mounted, double reduction
Ratio:	8.27:1

46. Description:

The front axle is of the driving type. Specially designed steering knuckles are provided to transmit driving torque. The axle shafts themselves transmitting only driving and braking torque, the load is carried by the cast center member.

The driving unit is a conventional double reduction assembly employing a high traction four-pinion differential. The first reduction is through a set of spiral bevel gears and the second reduction through helical spur gears.

High traction differential gearing provides added torque transmitting ability to the opposite wheel when one wheel lacks traction and spins.

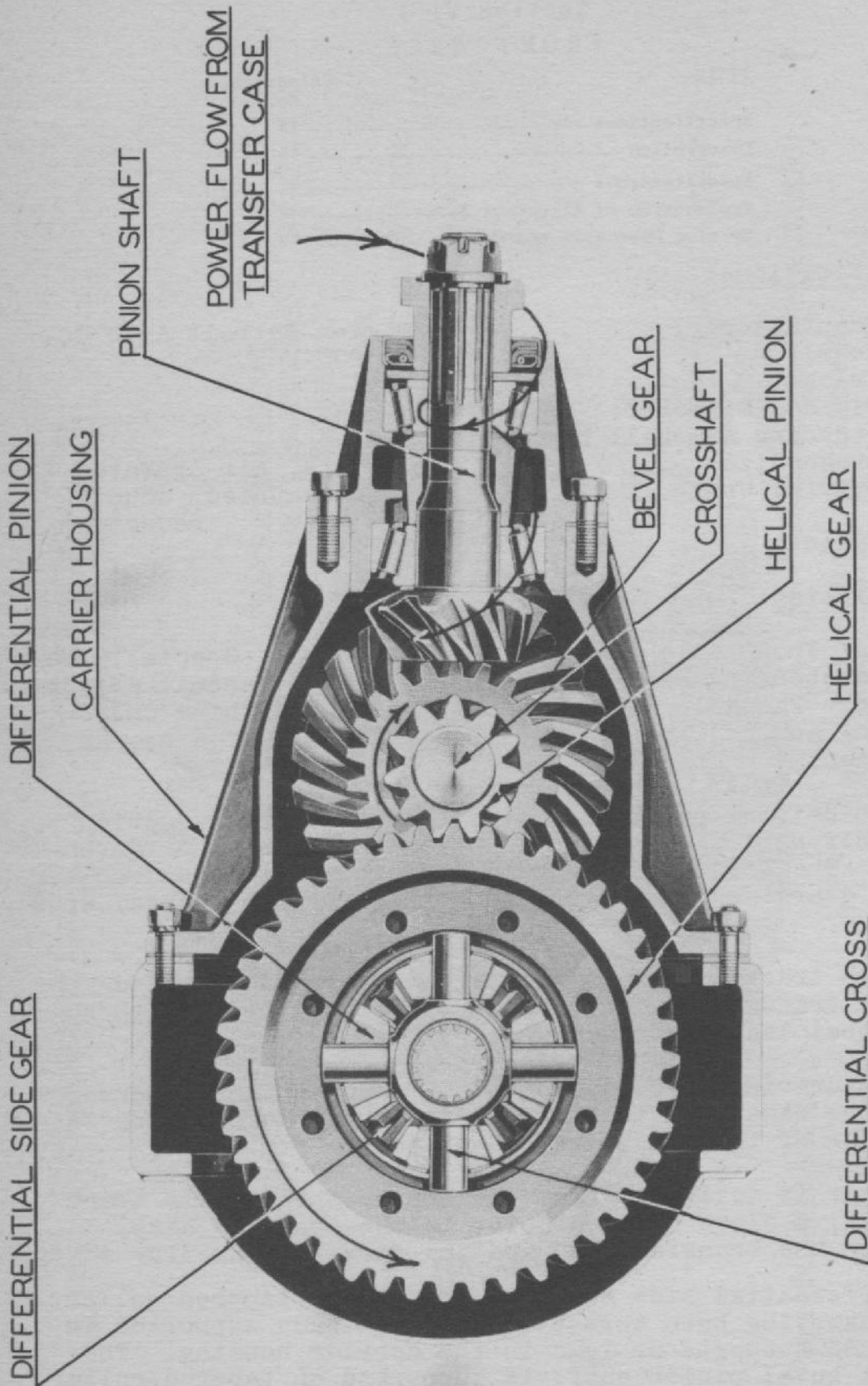
The driving unit is mounted in a conventional manner with the exception that the pinion shaft is pointing to the rear of the truck instead of to the front.

Power is delivered from the engine through the transmission, a close coupled joint to the transfer case, through the transfer case and the forward propeller shaft.

Differential side bearings are Timken tapered roller type carrying both thrust and radial loads supported in machined supports or legs in the carrier housing. The spiral bevel pinion shaft is supported on tapered roller type bearings locked in place by the end yoke and pinion shaft nut.

Constant velocity universal joints are provided at each end of the front axle. These joints permit driving torque to be transmitted by the front wheels and permit steering.

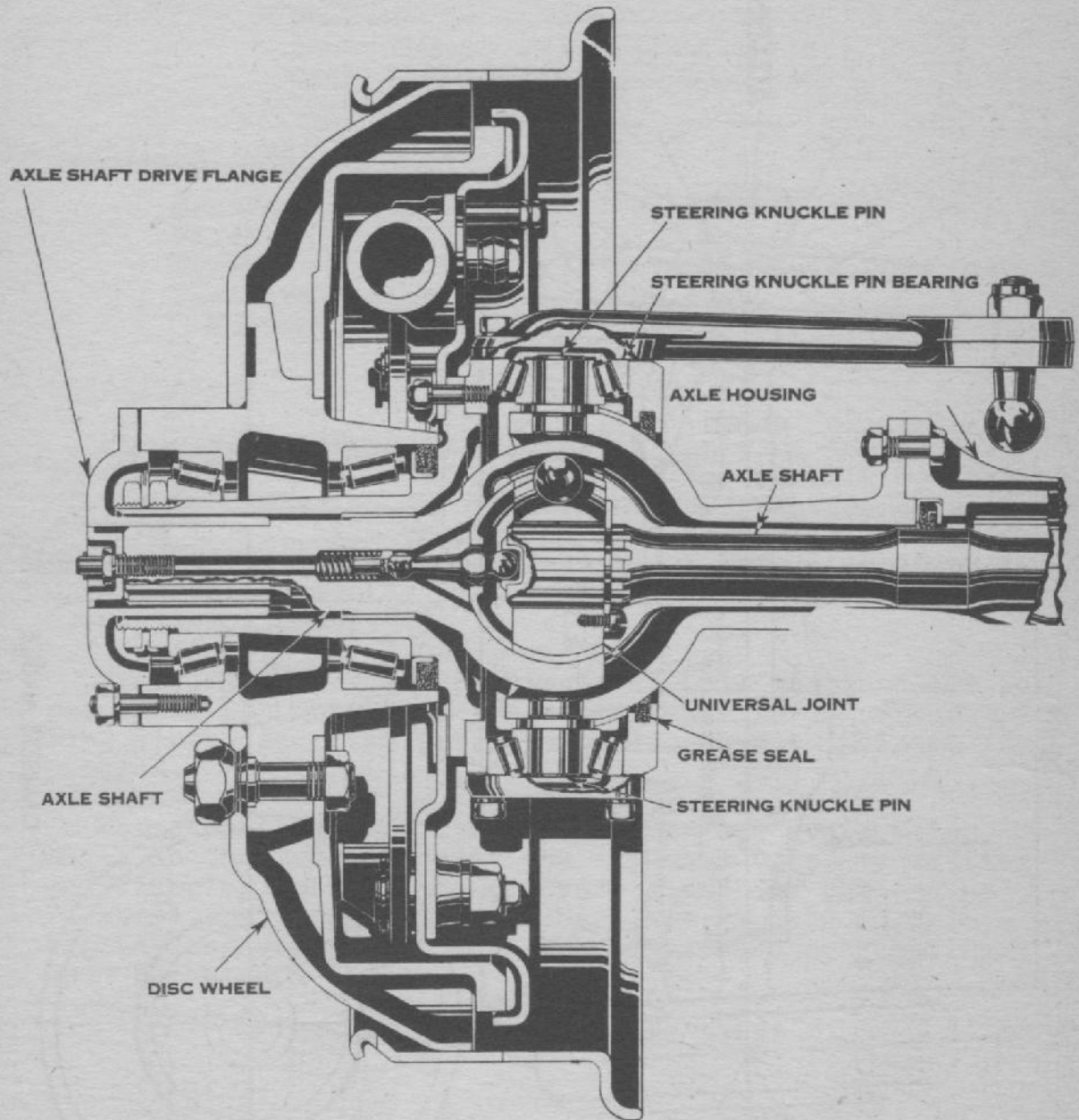
FRONT AXLE



FRONT AXLE DRIVING UNIT

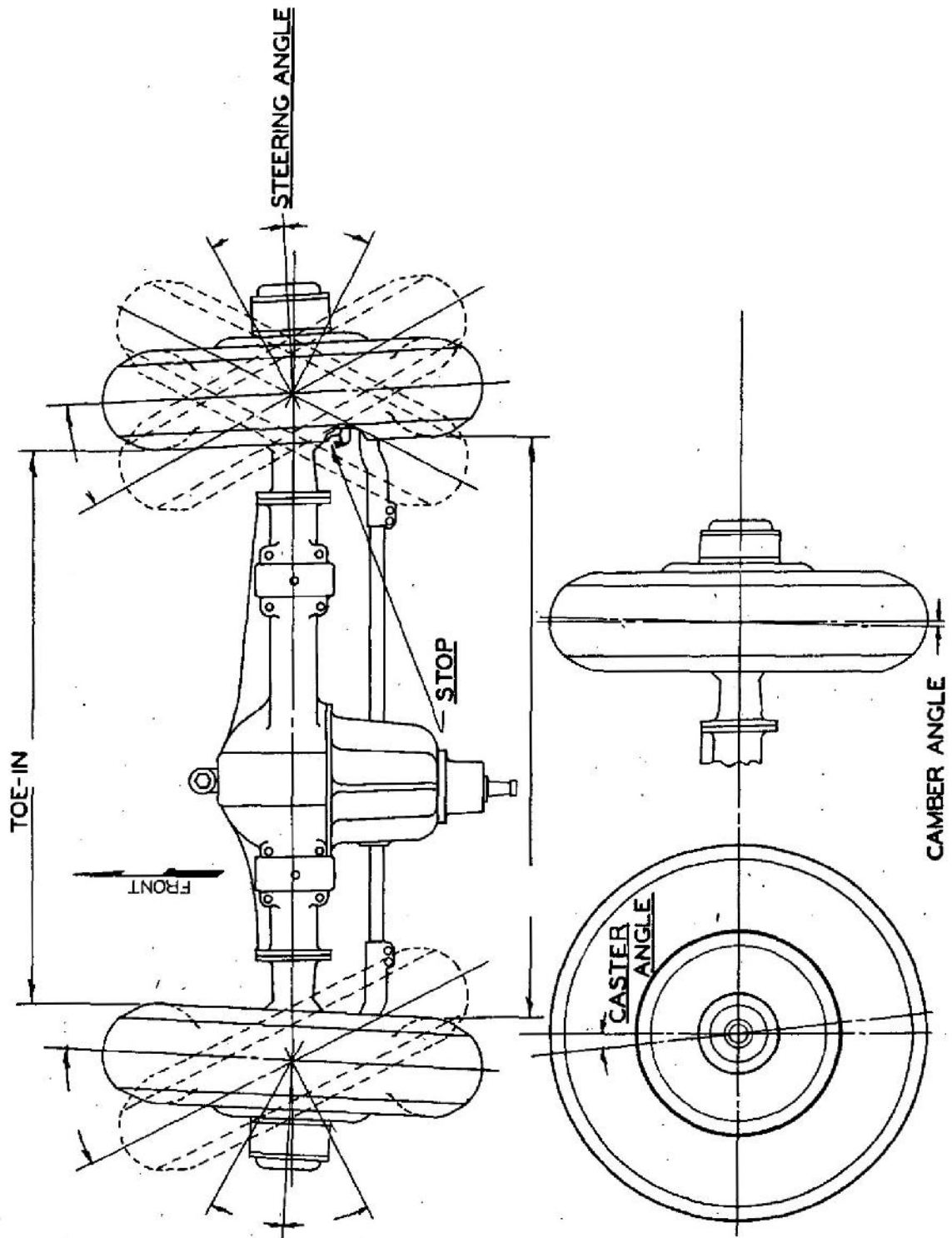
Illustration 8-2

HEAVY WRECKING TRUCK M1



FRONT-DRIVE AXLE
Illustration 8-3

FRONT AXLE



FRONT AXLE WHEEL ALIGNMENT
Illustration 8-4

Description (Cont.)

Engage the front axle only when needed. Its use is to be avoided as much as possible. Front axle engagement, wherever good traction conditions exist, causes excessive tire wear, gear failure and high drive unit temperature.

Remember that front axle engagement does not increase power, it actually decreases it. Traction is increased by front axle engagement.

Never wait until vehicle is stalled before engaging front axle. Engage the front axle before proceeding into bad spots. Keep the vehicle moving at an even speed. The front axle is an auxiliary traction device to be used only when conditions make its use necessary and before getting stalled, for lack of traction and not lack of power.

A control lever is located in the cab to engage and disengage the front axle. This axle must be engaged when the transfer case is in the low range and where heavy ground or loading is encountered.

FRONT AXLE ALIGNMENT

47. Specifications:

Camber:	0°
Caster:	5°
Toe-in:	1/4" Plus or minus 1/16"
Turning Angle (Inside Wheel):	28°
Turning Angle (Outside Wheel):	25°

Proper alignment of front wheels must be maintained to insure steering ease and satisfactory tire mileage.

48. Explanation of Alignment Terms:

Camber:- Front wheel camber is the inclination of the wheel from the vertical plane. Camber is built into this axle.

Caster:- Front axle caster is the inclination of the top knuckle bearing toward the front or rear of the vehicle. Caster is achieved by tapering the spring seats or the use of tapered shims between the spring and axle center member.

Toe-in:- Toe-in is the setting of the front wheels closer together in front of the axle than in the rear. It is secured by lengthening and shortening the front axle tie rod.

Steering Geometry:- The mechanics of keeping the front wheels in proper relative alignment as wheels are turned to the right or left from the straight-ahead position.

FRONT AXLE ALIGNMENT (Cont.)

Zero, Negative, Reverse or Positive Camber or Caster are just what the words imply.

Zero Caster:- The vertical position of the knuckle bearings without any inclination to front or rear.

Negative or Reverse Caster:- The top knuckle bearing inclining further toward the front of the truck than the lower knuckle bearing.

Positive Caster:- The top knuckle bearing inclining further to the rear of the truck than the lower knuckle bearing.

Zero Camber:- Wheels are perpendicular to a level floor or base line and parallel to each other vertically.

Negative or Reverse Camber:- An inclination of the top of the wheels toward the center of the vehicle.

Positive Camber:- An outward inclination of the top of the wheels.

Note:- Camber and Caster are measured in terms of degrees. Toe-in is measured in fractions of inches. (For detail of alignment See Illustration 8-4).

49. SERVICE DIAGNOSIS AND CAUSE

1. Lubricant Leaks:

- (a) Worn or damaged oil seals.
- (b) Loose stud nuts and cap screws.
- (c) Lubricant level carried too high.
- (d) Breathers plugged with dirt.

2. Hard Steering:

- (a) Lack of lubrication.
- (b) Adjustments too tight in steering gear or linkage.
- (c) Improper toe-in.
- (d) Tires improperly inflated.
- (e) Error in rolling radius.
- (f) Excessive caster.

SERVICE DIAGNOSIS AND CAUSE (Cont.)

3. Wandering:

- (a) Tight steering gear or linkage.
- (b) Tire inflation unequal.
- (c) Tire sizes (R&L) unequal.
- (d) Axle shifted on springs.
- (e) Loose bearing adjustments.
- (f) Too little caster.
- (g) Too much or too little camber.
- (h) Too much or too little toe-in.
- (i) Broken springs.
- (j) Bent or deflected axle center member.

4. Uneven Tire Wear:

- (a) Low inflation pressure.
- (b) Excessive camber.
- (c) Wheels out of balance.
- (d) Incorrect alignment.

5. Low Speed Shimmy (Generally exists below 30 miles per hour)

- (a) Incorrect tire pressure.
- (b) Loose linkage or bearing adjustments.
- (c) Too much caster.
- (d) Steering gear loose.
- (e) Tie rod or draglink ends loose.
- (f) Steering arms loose.

6. High Speed Wheel Tramp (Generally exists above 30 miles per hour)

- (a) Wheels out of balance.
- (b) Shock absorbers inoperative.

SERVICE DIAGNOSIS AND CAUSE (Cont.)

7. Back Lash:

- (a) Loose axle flanges.
- (b) Excessive axle shaft spline looseness.
- (c) Excessive clearance in steering universal joints.
- (d) Excessive clearance in propeller shaft joints.
- (e) Loose universal joint yokes.
- (f) Excessive bevel gear and pinion clearance.

8. Constant Hum:

- (a) Drive unit out of adjustment.
- (b) Worn or loose bearings.

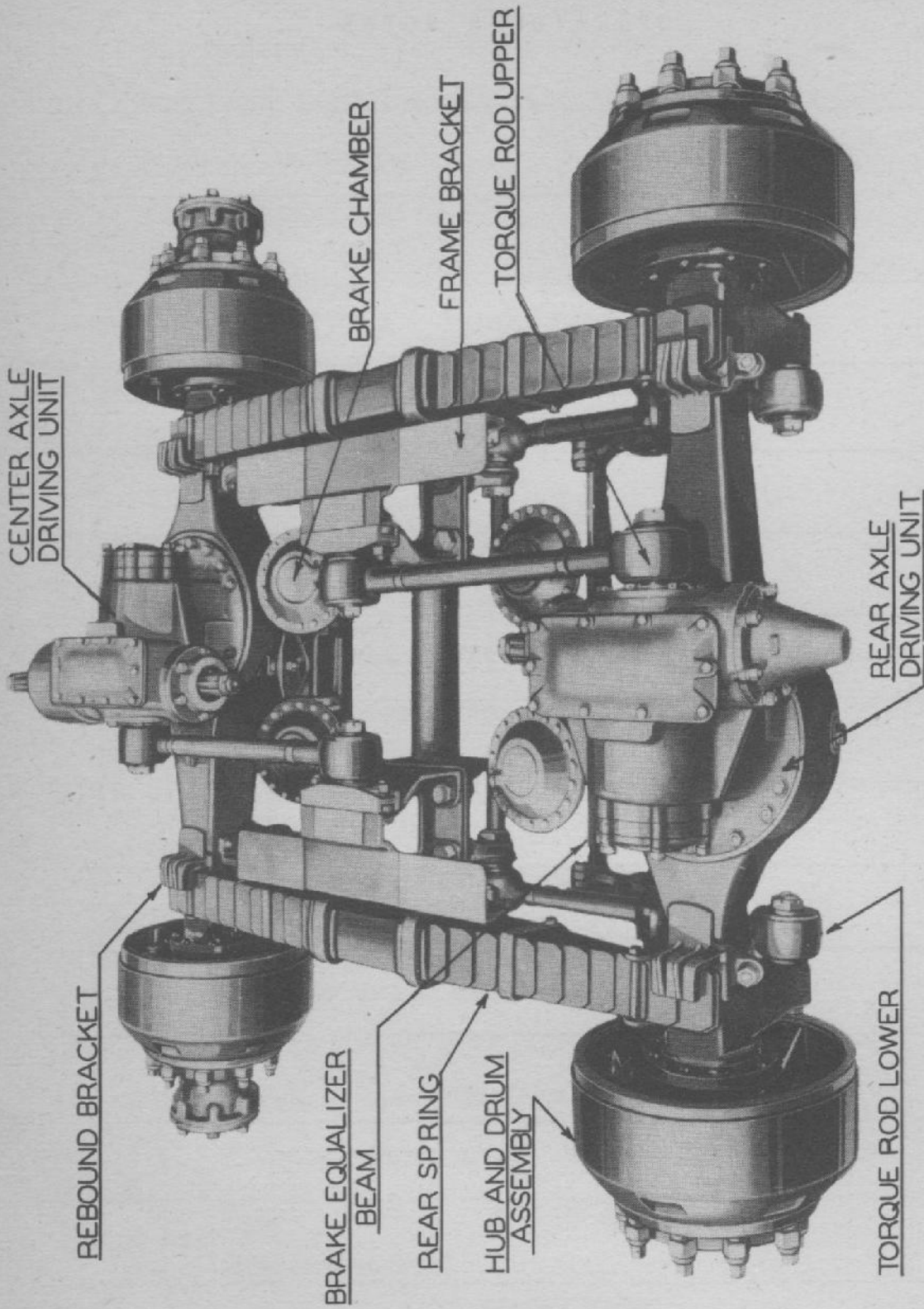
9. Coasting Hum:

- (a) Pinion set too far out.
- (b) Loose pinion adjustment.
- (c) Worn or loose bearings.

10. Pulling Hum:

- (a) Worn or loose bearings.
- (b) Pinion set too far in.

REAR AXLE



REAR AXLE ASSEMBLY
Illustration 9-1

Section IX
REAR AXLE

TITLE	Paragraph No.
Specifications _____	50
Description _____	51
Service Diagnosis and Cause _____	52

50. Specifications:

Manufacturer:	Timken-Detroit Axle Company
Model:	SD-3000-PA
Type:	Tandem Drive
Drive:	Double Reduction
Ratio:	8.27:1
Housings:	Malleable castings
Axle Shaft Diameter:	2 $\frac{1}{4}$ " , 16-Spline
Track:	74 $\frac{7}{8}$ "
Brake Size:	16 $\frac{1}{2}$ x 6, Air-operated

51. Description:

This vehicle is equipped with two rear driving axles that are incorporated into a unit by a system of torque rods and a spring suspension that maintain alignment and equalize the load respectively.

The parallel torque rod system maintains the vertical position of the axles regardless of their relative positions, eliminates the possibility of weight transfer and maintains correct spacing and alignment. Torque rods are provided with spherical rubber pivot ends.

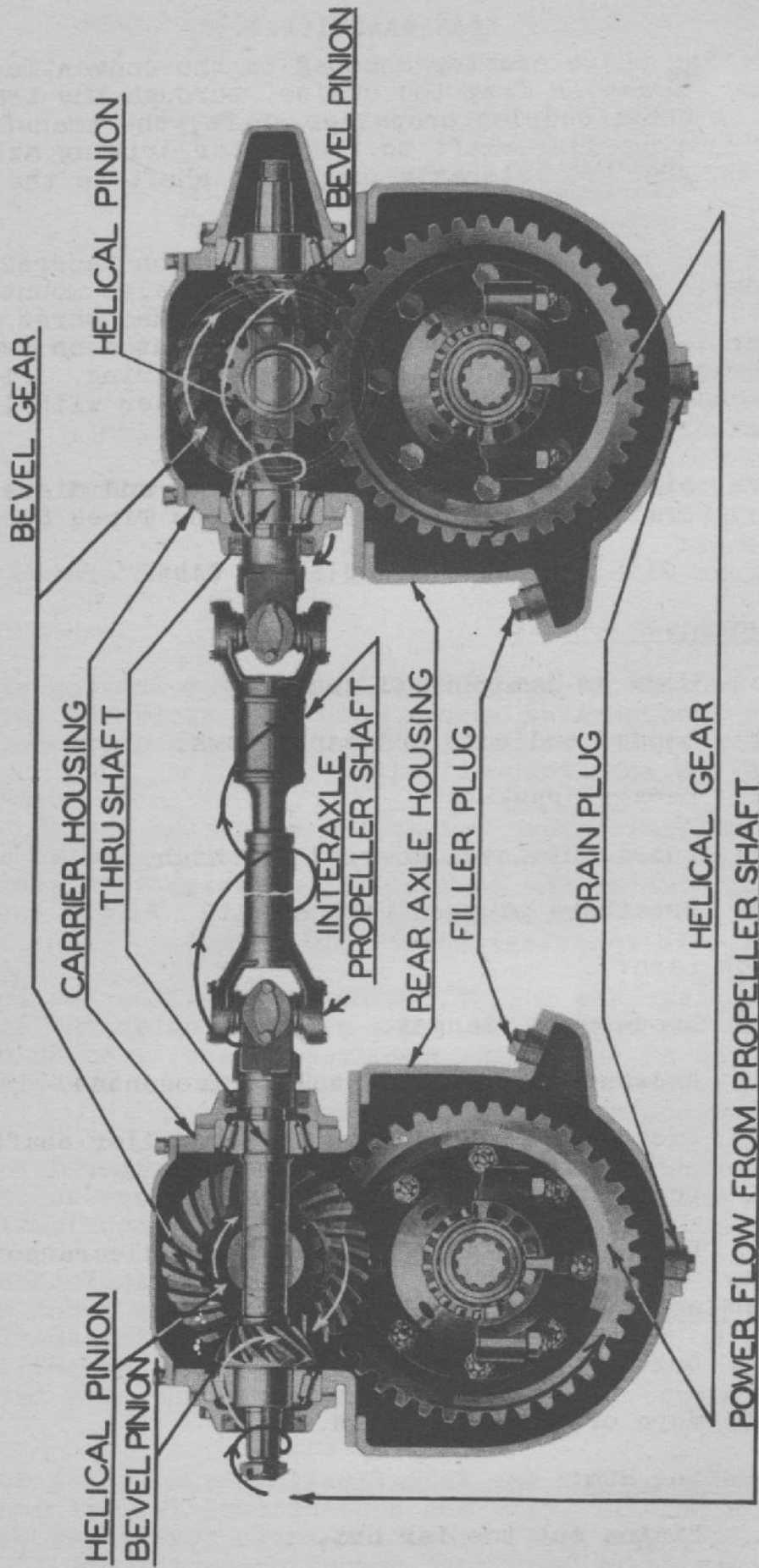
The springs are full-floating and equalize the load between the two rear axles. The seats on which the springs are mounted at the center are free to oscillate on the tubular crossmember which is attached to the chassis frame by two supporting brackets.

The spring seats are mounted on Timken tapered roller bearings and are the only points in the entire suspension system needing lubrication (See Section 2, Lubrication).

The SD double reduction "Through-drive" indicates direct transmittal of engine torque from the front driving axle to the rear driving axle. The pinion shafts of both axles are connected by an intermediate propeller shaft. Torque is always transmitted to the axle having tractability.

The axles are of the full-floating type, using double reduction driving units and conventional four-pinion differentials. The first reduction is through a set of spiral bevels and the final reduction is through helical spur gears.

REAR AXLE



REAR AXLE DRIVING UNITS
Illustration 9-2

REAR AXLE (Cont:)

Driving units are top mounted in the conventional manner. Drive is from the engine, through the transmission, a short coupled propeller shaft, the transfer case and rear propeller shaft to the center driving axle and then through the interaxle propeller shaft to the rear axle.

The pinion shaft is straddle-mounted on tapered roller bearings. The differential assembly is also mounted on tapered roller bearings located in machined bores of the carrier housing. The cross shaft is mounted on two tapered bearings and one straight roller bearing. Pinion shaft ends on both units are 2" in diameter with 10 splines.

Tire sizes must be carefully watched and diameters kept uniform to avoid "Wheel fight" (See Tires Section 10).

52. SERVICE DIAGNOSIS AND CAUSE

1. Lubricant Leaks:

- (a) Worn or damaged oil seals.
- (b) Loose stud nuts and cap screws.
- (c) Damaged gaskets.
- (d) Lubricant level carried too high.
- (e) Breathers plugged with dirt.

2. Back Lash:

- (a) Loose axle flanges.
- (b) Excessive axle shaft spline looseness.
- (c) Excessive clearance in the propeller shaft joints.
- (d) Loose universal joint yokes.
- (e) Excessive bevel gear and pinion clearance.

3. Constant Hum:

- (a) Driving units out of adjustment.
- (b) Worn or loose bearings.

4. Coasting Hum:

- (a) Pinion set too far out.
- (b) Loose pinion adjustment.

SERVICE DIAGNOSIS AND CAUSE (Cont.)

(c) Worn or loose bearings.

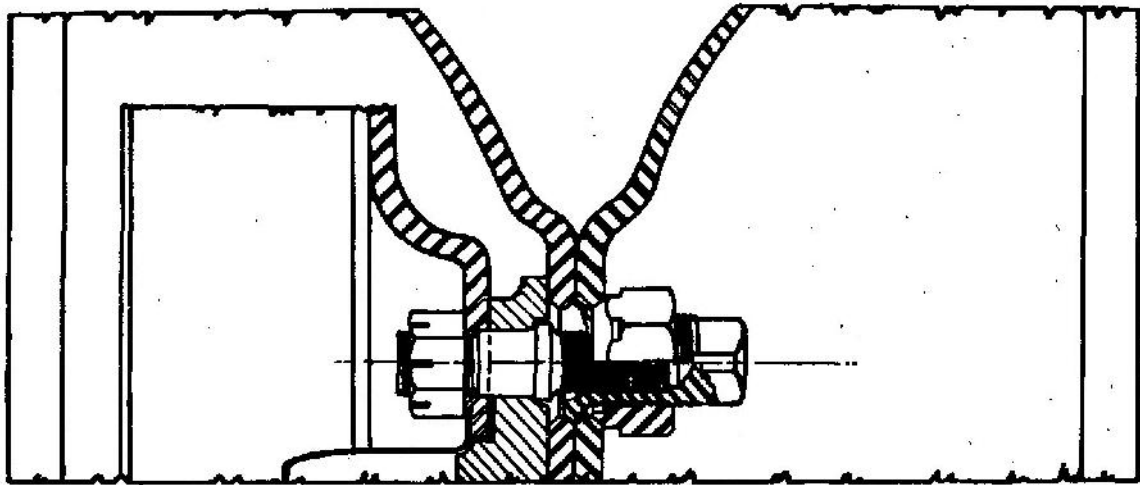
5. Pulling Hum:

(a) Worn or loose bearings.

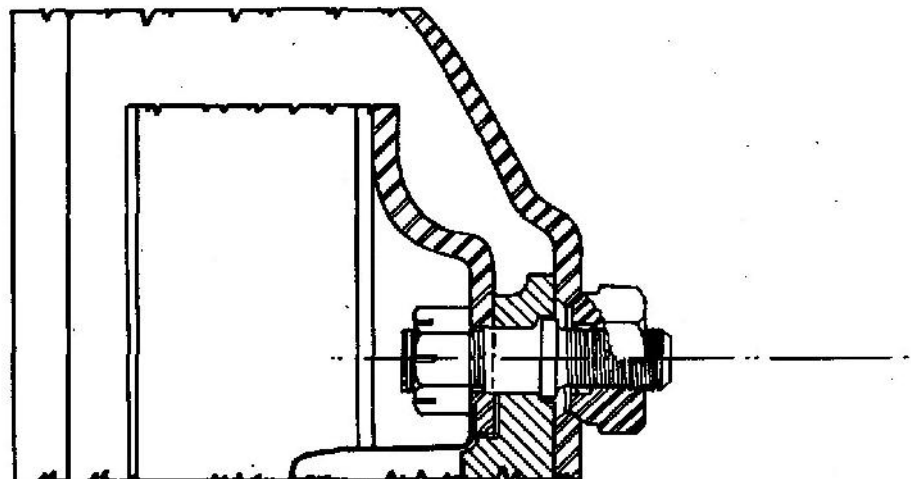
(b) Pinion set too far in.

(c) Loose pinion adjustment.

WHEELS & TIRES



DUAL WHEEL APPLICATION



SINGLE WHEEL APPLICATION

Illustration 10-1

HEAVY WRECKING TRUCK M1

53-54

Section X
WHEELS & TIRES

WHEELS

TITLE	Paragraph No.
Specifications; Wheels _____	53
Description _____	54
Caution _____	55
Specifications; Tires _____	56
Description _____	57
Rolling Radius _____	51

53. Specifications:

Manufacturer:	Budd Wheel Company
Part No.:	32457
Type:	10-Hole Disc
Size:	20 x 9.10
Bolt Circle:	11 $\frac{1}{4}$ "
Dish:	7"
Side Ring:	21863-E7
Rim:	Firestone "R"

54. Description:

The wheels as installed on this vehicle are interchangeable front and rear. The hubs are so designed that dual wheels may be installed on the front axle hubs as well as the rear without alteration.

Right and left hand threads are used on all the wheel studs to insure the cap nuts staying tight.

In mounting the hubs on the chassis, in replacing the studs or nuts, or in tire replacement right hand studs must be used on hubs with the wheel mounting surface facing the right side of the vehicle. Left hand studs must be used on hubs with the wheel mounting surface facing the left side of the vehicle. Right and left sides are seen by the operator facing the direction of travel. All studs and nuts are plainly marked "R" and "L" and must be so used.

To avoid wheel damage resulting from accidental loosening the wheel stud nuts should be tightened daily for the first 500 or 1000 miles of service to offset any "setting-in" of the clamping surfaces.

Wheels must be clean. It is wise always to examine the wheels at the counter-sunk holes, the faces of the disc and hub flanges where they bear together to insure their being free from dirt, grease and excess paint. The presence of foreign matter will prevent proper bearing and create high spots which are likely to cause loosening.

WHEELS (Cont.)

The rear dual wheels are of the double cap nut type (see Illustration 10-1). The inner dual wheel is individually secured by the sleeve shaped inner cap nut. This inner cap nut must be securely tightened before the outer wheel or outer nuts are installed. The outer wheel is independently held by the outer nuts.

Normal service calls for single front wheels and when so used the wheel is held in position by a single set of nuts. A length of pipe to serve as an extension for the standard wrench handle is advisable for tightening the wheel stud nuts. When tightening dual wheels proceed in the following manner:

- (a) Loosen the outer cap nut. This is the six-sided nut.
- (b) Tighten the inner cap nut. This is the four-sided nut.
- (c) Re-tighten the outer cap nut.

55. CAUTION

1. After fifty miles of operation under load check the wheel stud cap nuts for tightness.
2. When installing dual mounted wheels so position them on the studs with the inner valve stem in a different circumferential position than the outer valve stem to facilitate tire inflation.
3. Keep the wheel bearing surfaces and the cap nut counterbores clean and free of paint.
4. Do not grease or oil the stud cap nuts.
5. In mounting wheels or tightening cap nuts do not proceed around the circle, but in a criss-cross fashion.
6. Always back off the outer cap nut at least two full turns before attempting to tighten the inner nuts.
7. It is advisable that the wheel being tightened be jacked up.

TIRES

56. Specifications:

Size:	11:00 x 20
Ply:	12
Tread:	Non-directional
Inflation Pressure:	70 Lbs.

TIRES (Cont.)

57. Description:

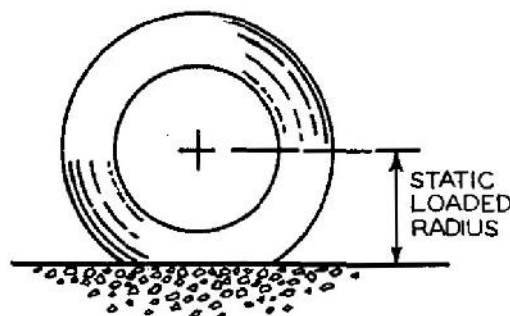
The tires on this vehicle have non-directional tread design. That is, the tread pattern is very similar on each side of the center line of the tread. These tires can be installed and run in either direction on any wheel.

One of the most important factors for safe, economical and efficient motor truck operation is systematic and correct tire maintenance. Correct inflation is one of the most important items of tire maintenance. Under-inflation and over-inflation will damage the fabric, rubber, bead, contour and at the same time cause serious damage to the power transmitting units. Over-inflation causes more rapid wear by concentrating the wear on the center portion of the tread and causes the driving wheels to bounce and spin with resultant increased wear.

58.

ROLLING RADIUS

The most essential item in tire life, as well as overall vehicle maintenance, performance and the saving in fuel consumption on two and three axle drive vehicles such as this unit, is to use tires on all wheels of each axle so that the static loaded radius will be within plus or minus 1/8" from the center of the driving axle shaft to the ground when the vehicle is at rest on a level surface. (See Illustration 10-2).



STATIC LOADED RADIUS

Illustration 10-2

Axles embody the necessary mechanism to deliver the power from the propeller shaft to the wheels. This mechanism consists of a final drive gear set, an axle shaft for each wheel and a differential assembly. When turning a corner it is necessary that the outer wheel turn faster

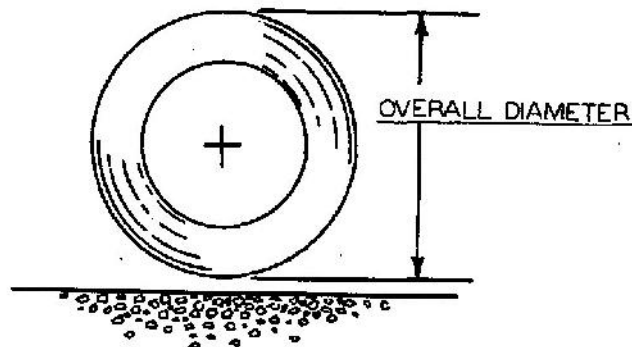
ROLLING RADIUS (Cont.)

than the inner and the differential assembly makes this possible.

The differential assembly is composed of two side gears and four pinions which act as a speed balancing device between the two axle shafts. It is primarily designed to balance the power between the two axle shafts. It is also called upon to function as a speed balancing unit for momentary periods when turning corners, but not for continuous operation. To have the right hand drive wheel turn more revolutions per mile than the left hand is undesirable because it throws the differential into constant rotation.

Variation because of tire condition and inflation causes one wheel to turn more revolutions per mile than the other, thereby placing an added duty upon the differential assembly. It is therefore desirable to have both rear wheels turning at the same speed and this calls for the loaded radius of the tires, right and left, to be equal.

Multiplying this matter of tire radius by three and adding to it the fact that the three axles are connected together solidly by propeller shafts, it is therefore vital that all six wheels rotate at the same speed. This means that the loaded radius of the tires must be the same, within the allowable error, all the way around the vehicle.



OVERALL TIRE DIAMETER

Illustration 10-3

Circumference and overall diameter are satisfactory measurements for matching or selecting sets or spares. Overall diameter and circumference are not the most desirable, however. (See Illustration 10-3). Any error in the rolling radii greater than $1/8$ " is not permissible.

ROLLING RADIUS (Cont.)

The rolling radius of a tire is the dimension taken from the center of the axle shaft to the ground.

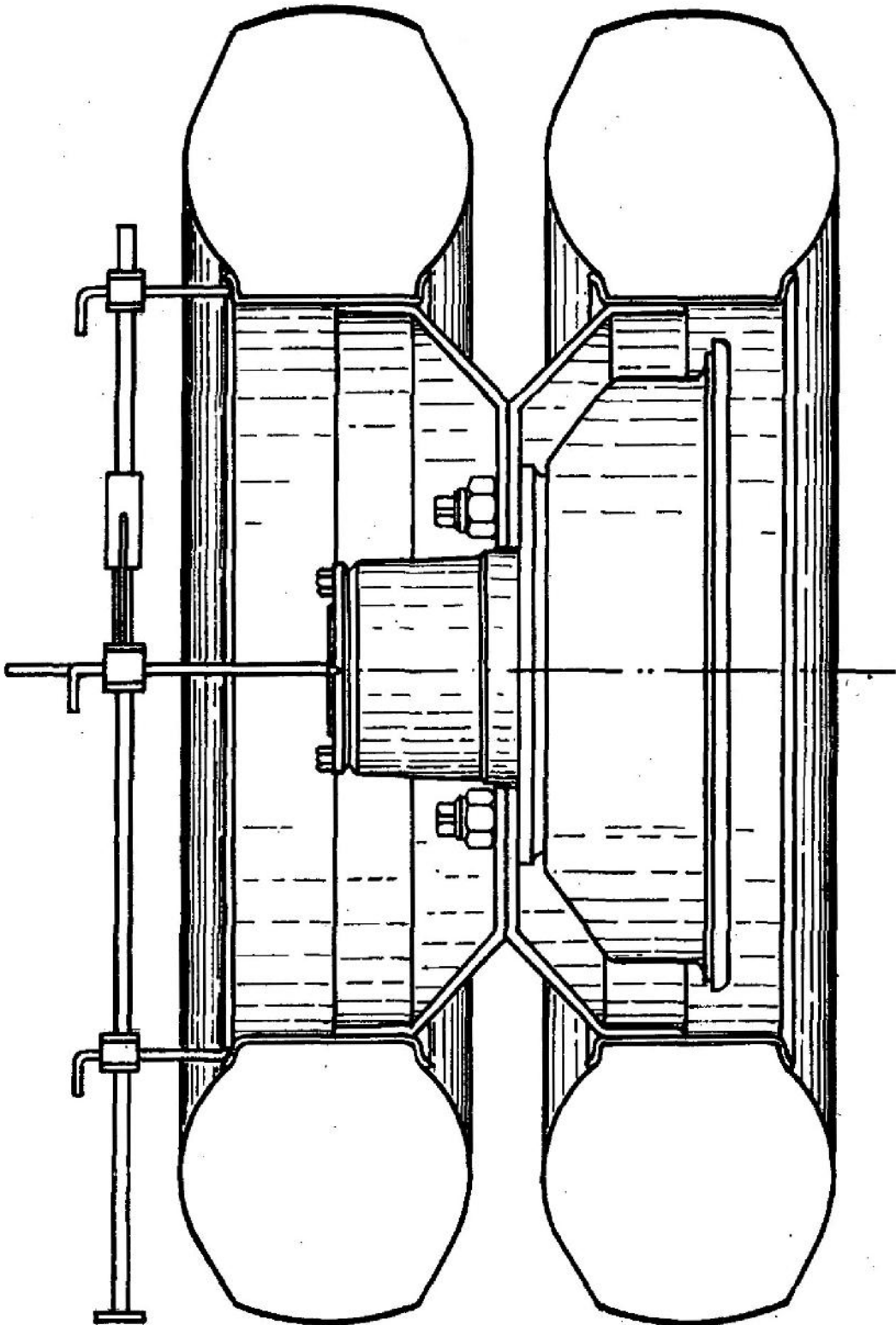
Because the axles are connected solidly a difference in the rotative speeds or tire revolutions per mile cannot exist. The reason for this is that the rear axles try to over-run each other or slow each other up and, by the same token, over-run the front axle or endeavor to slow it up. The result of this action is called "Wheel fight". When this condition exists the flexible tire tread slips on the highway, the propeller shafting endeavors to wind up (as do the axle shafts), the gear tooth surfaces are loaded up to extremely high pressures and bearings are overloaded, all resulting in excessive tire wear and driving mechanism maintenance.

High tooth pressures squeeze all the lubricant from between the tooth surfaces, resulting in metal to metal contact and has the effect of scoring or, if severe enough, gouging out the steel on the gear teeth. Tire treads are scuffed or sawed off.

Checking tire inflation alone is not sufficient. It is necessary to maintain the same loaded radius on all the tires on all the axles for best overall results. To secure the best possible set-up proceed as follows:

1. The tires for any unit should be checked for circumference with a measuring tape and the tires matched in sets. This holds true if used tires are installed. Do not, under any circumstances, install new tires on one drive axle and leave partially worn tires on the remaining two axles.
2. Inflate the tires to the recommended pressure (70 Lbs.).
3. Check the loaded radius by measuring from a flat, level surface on which the truck is standing to the center line of the axle. Suitable gauges are available or are easily fabricated for this purpose (see Illustration 10-4).
4. When measurements exceed the maximum allowable limits of plus or minus $1/8$ " adjust this distance by changing the tire inflation pressure. Do not endeavor to match tires of greatly varying conditions by adjusting inflation pressures.
5. When a suitable rolling radius gauge is not available or a level spot on which to locate all the tires on all axles at the same time proceed as follows:
 - (a) Measure the overall tire diameter of all the tires. The greatest allowable error should be

WHEELS & TIRES



APPLICATION OF ROLLING RADIUS GAUGE

Illustration 10-4

HEAVY WRECKING TRUCK M1

58-59

ROLLING RADIUS (Cont.)

within plus or minus $1/4$ ". A caliper may be used for this measurement.

- (b) Measure the circumference of all the tires. The maximum allowable variation in circumference must be held within $3/4$ ". A steel tape is best for measuring the circumference of the tires.

59. CAUTION

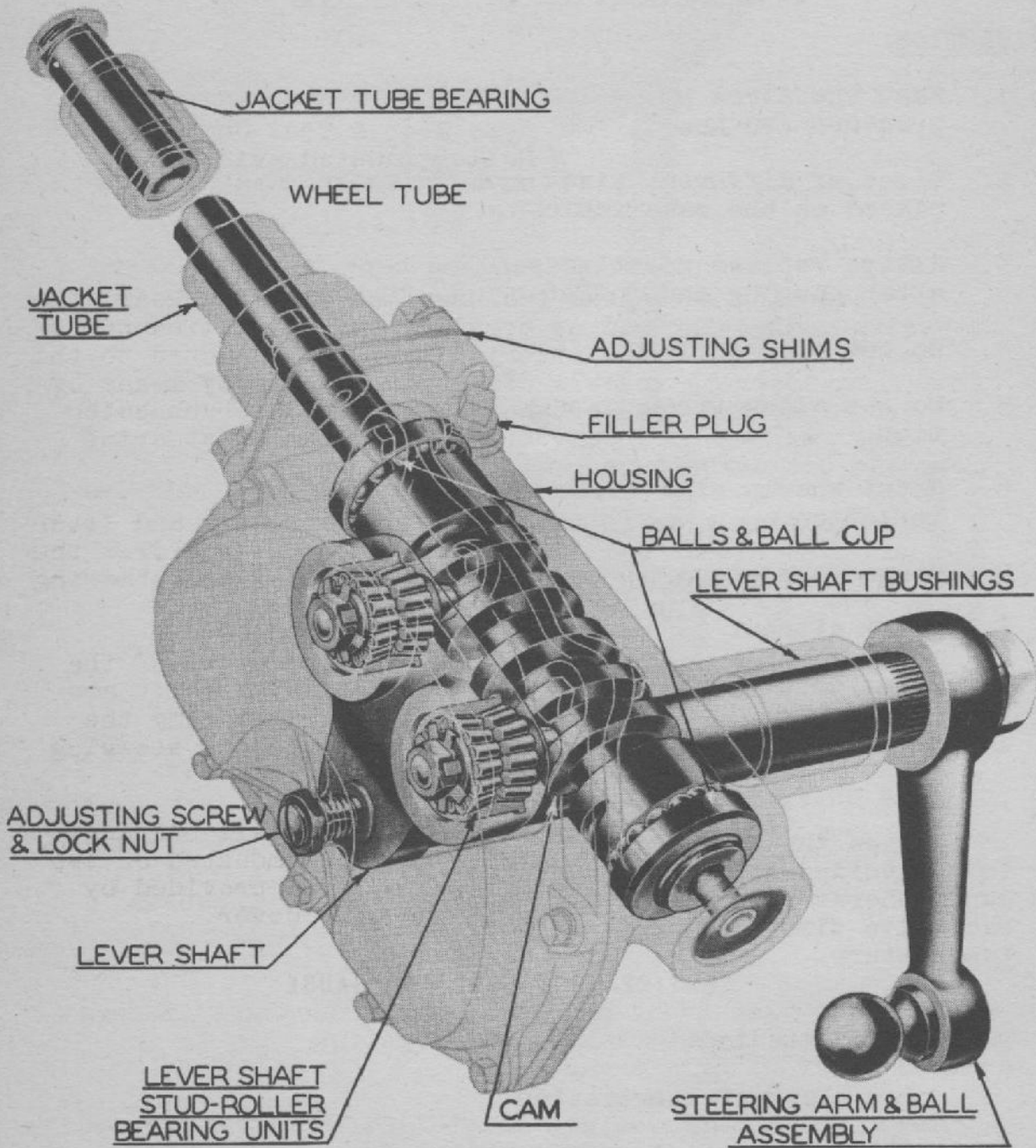
1. Keep the tires properly inflated to the recommended pressure (70 Lbs.).
2. Tires of different sizes and condition should not be placed on the same vehicle.
3. Always replace positive sealing caps on valve stems after gauging and inflating the tires.
4. Do not over-inflate.
5. Do not allow tires to run in an under-inflated condition.
6. Mount wheels with valve stems opposite to permit easy inflation.
7. Gauge your stops to eliminate tire skidding.
8. Start without jerking to avoid wheel spinning.
9. Remember that high speed increases tread wear.
10. KEEP THE ROLLING RADIUS OF ALL THE TIRES ON ALL THREE AXLES WITHIN PLUS OR MINUS $1/8$ " FROM THE CENTER OF THE AXLE SHAFT TO THE GROUND.

Engage the front axle only when needed. Its use is to be avoided as much as possible. Front axle engagement, wherever good traction conditions exist, causes excessive tire wear, gear failure and high drive unit temperature.

Remember that front axle engagement does not increase power, it actually decreases it. Traction only is increased by front axle engagement.

Never wait until vehicle is stalled before engaging front axle. Engage the front axle before proceeding into bad spots. Keep the vehicle moving at an even speed. The front axle is an auxiliary traction device to be used only when conditions make its use necessary and before getting stalled, for lack of traction and not lack of power.

STEERING GEAR



STEERING GEAR ASSEMBLY

STEERING GEAR ASSEMBLY
Illustration 11-1

Section XI
STEERING GEAR

TITLE	Paragraph No.
Specifications _____	60
Description _____	61
Service Diagnosis and Cause _____	62
Caution _____	63

60. Specifications:

Manufacturer:	Ross Gear & Tool Company
Type:	Roller mounted twin lever
Model:	T-74

61. Description:

The steering mechanism includes the steering gear, the steering connecting rod or draglink and the allied parts of the front axle. The steering gear is connected to the left hand steering knuckle of the front axle by means of the draglink, and the left hand wheel is interconnected with the right hand wheel through a system of steering arms and the cross tube.

The steering gear in this unit is of the cam and lever design. The names "Cam" and "Lever" are derived from the names of the actuating and actuated parts of the steering gear. The operating action is as follows:

When the cam is turned left or right by means of the steering wheel the studs mounted in the lever shaft are moved through the groove of the cam, thus rotating the lever shaft and providing angle movement to the steering arm.

The cam is mounted between two sets of ball bearings and is shim adjusted. The lever shaft is mounted on two bronze bushings and backlash is removed or provided by means of a screw and locknut in the side cover.

62. SERVICE DIAGNOSIS AND CAUSE

1. Hard Steering:

- (a) Lack of lubrication.
- (b) Worn steering gear parts.
- (c) Improper adjustment.

2. Road Shock:

- (a) Steering linkage too tight.

SERVICE DIAGNOSIS AND CAUSE (Cont.)

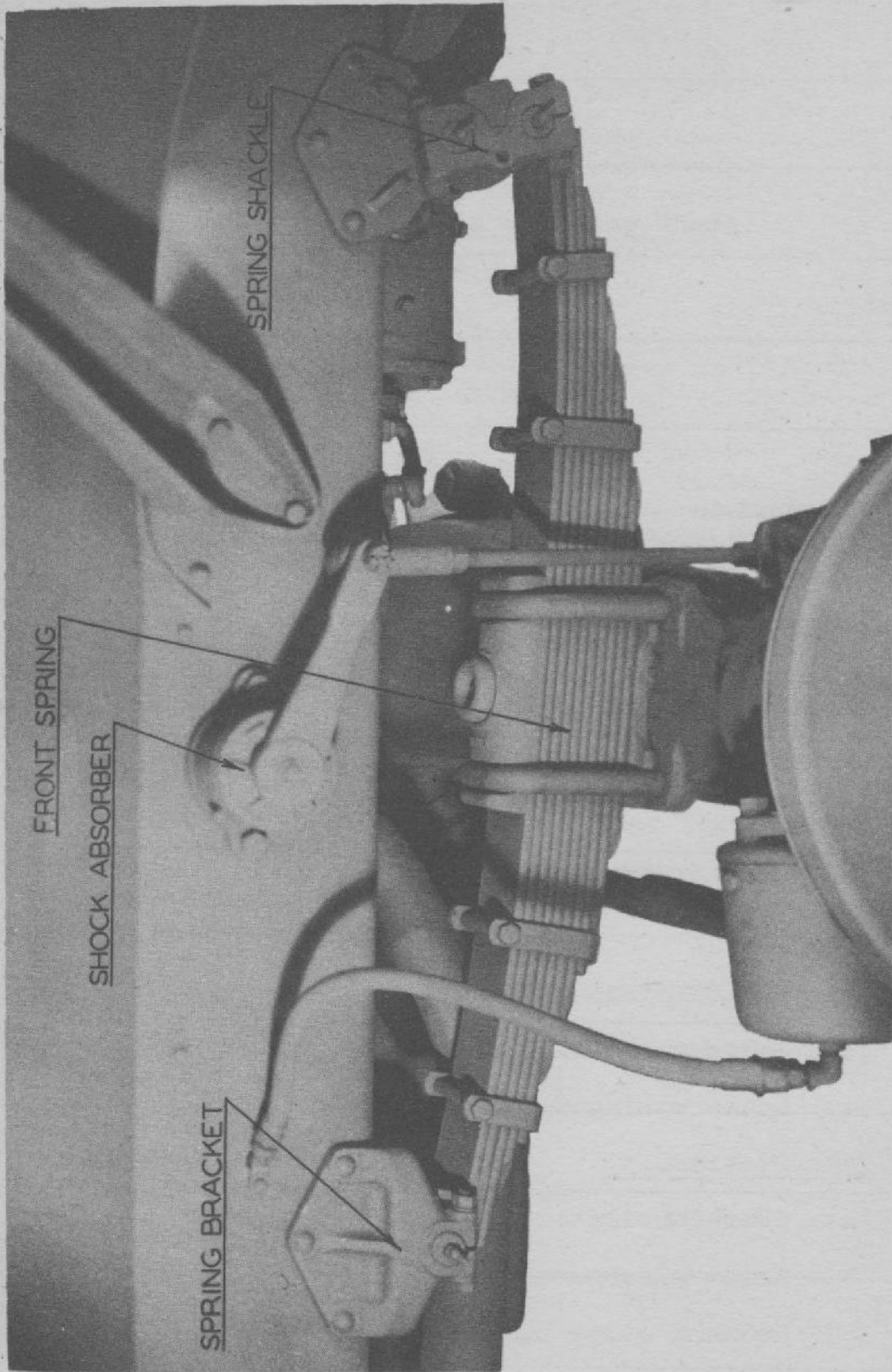
3. Excessive Drag in Steering Gear:
 - (a) Inadequate lubrication.
 - (b) Improper lubricant.
 - (c) Gear adjusted too tight.
4. Catch or Roughness Felt in Steering Wheel:
 - (a) Chipped cam.
 - (b) Cracked cam bearings.
 - (c) Damaged lever shaft studs..
5. Rattle in Steering Gear:
 - (a) Improperly assembled jacket tube bearing.
 - (b) Broken jacket tube bearing.

Note:- See Front Axle Service Diagnosis and Cause, Section 8, for steering troubles.

63. CAUTION

1. Keep steering gear tight in frame bracket.
2. Do not under any circumstances change location of steering gear upper bracket.
3. If being towed make certain wheels are pointing in the direction of intended travel.

SPRINGS



FRONT SPRING INSTALLATION
Illustration 12-1

Section XII SPRINGS

FRONT SPRINGS

TITLE	Paragraph No.
Specifications; Front Springs	64
Description	65
Service Diagnosis and Cause	66
Specifications; Rear Springs	67
Description	68

64. Specifications:

Center to center of eye:	42"
Center of eye to center of seat:	21"
Width:	3"
No. Rebound Clips:	4
No. Leaves:	10
Thickness:	3/8"
Bushing Diameter, Inside:	1-1/4"

65. Description:

The front springs are the semi-elliptic type and are connected to the frame side rails by shackles and riveted spring brackets. They are secured to the front axle by U-bolts and nuts. Four rebound clips are provided for guarding against excessive rebound.

66. SERVICE DIAGNOSIS AND CAUSE

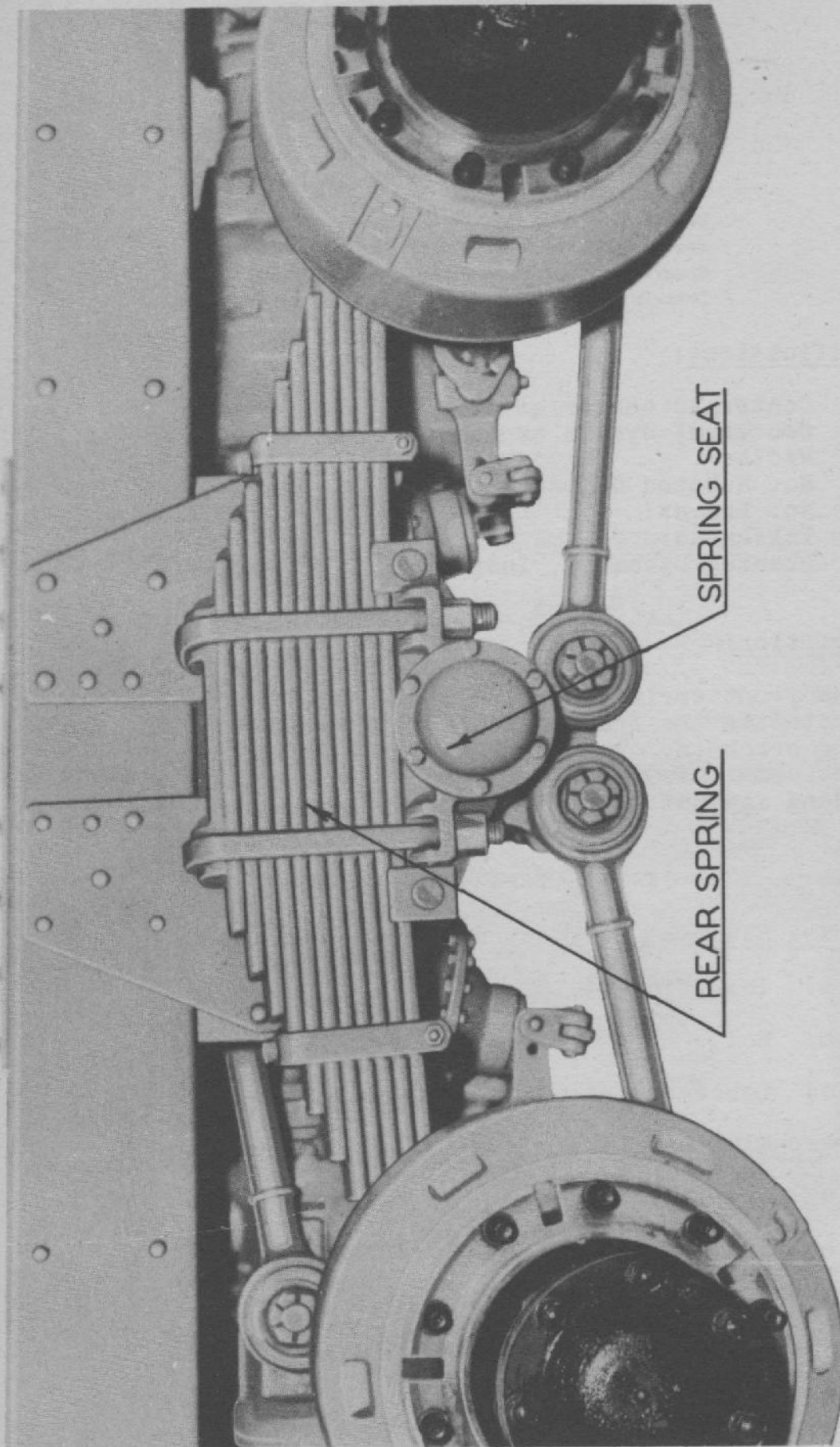
1. Hard Riding:

- (a) Insufficient lubrication.
- (b) Bolts in shackle or bracket frozen.
- (c) Loose spring clips or U-bolts.

2. Over-Flexibility:

- (a) Over-lubricated.
- (b) Shock absorbers inoperative.
- (c) Rebound clips broken.

SPRINGS



SPRING MOUNTING
Illustration 12-2

HEAVY WRECKING TRUCK M1

67-68

REAR SPRINGS

67. Specifications:

Length:	56 $\frac{1}{4}$ "
End to seat center, each end:	28 $\frac{1}{4}$ "
Width:	4"
No. Rebound Clips:	4
No. Leaves:	13
Thickness:	7/16"

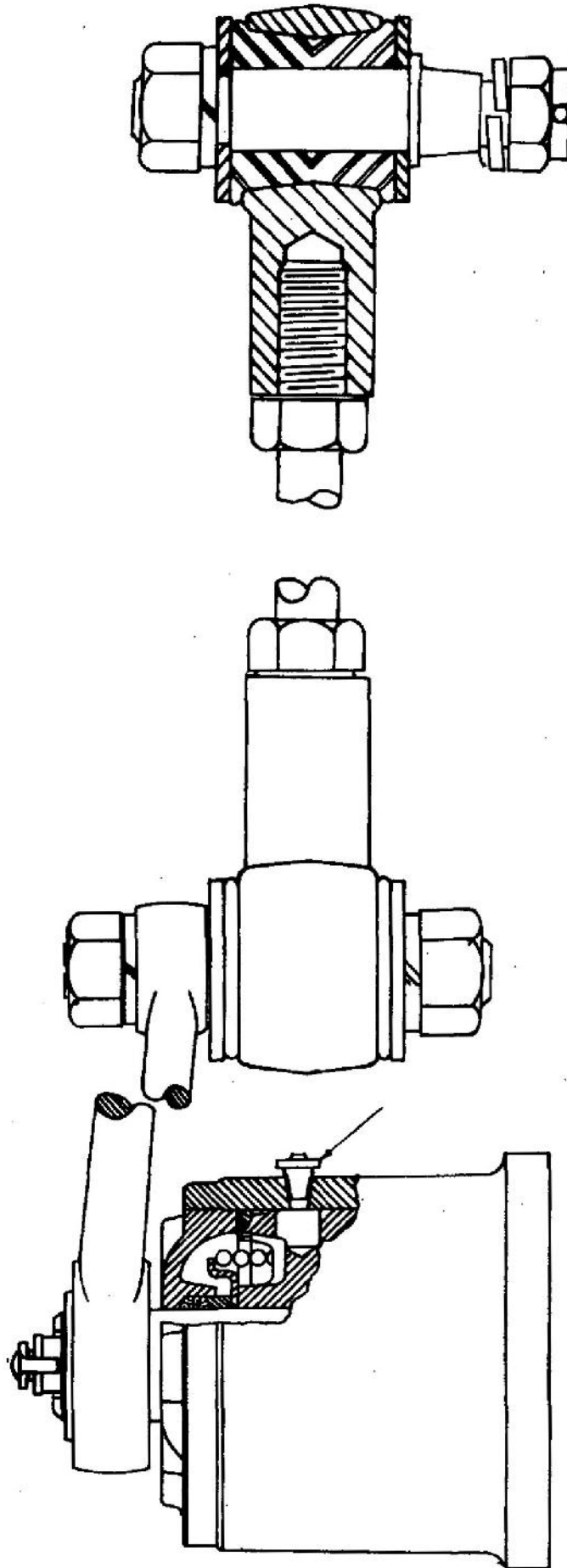
68. Description:

The rear axle spring suspension is known as the full-floating, load-equalizing type. The rear springs are the inverted, semi-elliptic type. The ends of the springs rest on the hardened plates provided for that purpose attached to the axle housing. The springs are attached to the truck chassis by means of spring seats that are free to rotate on a common, central, tubular member which is attached to the frame by supporting brackets.

The spring ends being free to float on the axle housing pads are not affected by the contour of the road surface. Lateral movement of the springs is restricted by the secured position of the roller bearing mounted spring seats.

The torque rods perform the function of maintaining the vertical position of the axles regardless of their relative positions and eliminate the possibility of weight transfer and maintain correct spacing and alignment. The torque rods are provided with spherical rubber pivot ends.

SHOCK ABSORBERS



SHOCK ABSORBER

Illustration 13-1

HEAVY WRECKING TRUCK M1

69-71

Section XIII
SHOCK ABSORBERS

TITLE	Paragraph No.
Specifications _____	69
Description _____	70
Caution _____	71

69. Specifications:

Manufacturer: Houde Engineering Corp'n.
Model: BBH
Type: Hydraulic

70. Description:

The shock absorbers used on this vehicle provide a smoother ride by dampening the spring vibrations as the vehicle runs over obstructions in the road. Shock absorbers are provided at the front springs only.

The instruments themselves are heavy duty double acting and inter-connect the frame and front axle through draglink assemblies.

The working chamber is divided into two equal sections by a stationary wing. A moving wing is oscillated by the arm or lever. The chamber is filled with special shock absorber fluid. In the stationary wing are located two automatic check valves which permit the fluid to flow freely in one direction but are so constructed and arranged that they permit only a retarded flow of fluid the instant the flow direction of the fluid is reversed.

The working chambers must be kept completely filled with fluid and this is accomplished by the addition of an auxiliary chamber in which the oil must be replenished at regular intervals. A replenishing plug is provided on the top of the shock absorber for easy replenishment.

Both ends of the drag links have rubber bushings and require no lubrication.

71. CAUTION

1. Do not use oil, glycerine or substitutes for shock absorber fluid.
2. Inspect the fluid level every 5,000 miles.

BRAKES

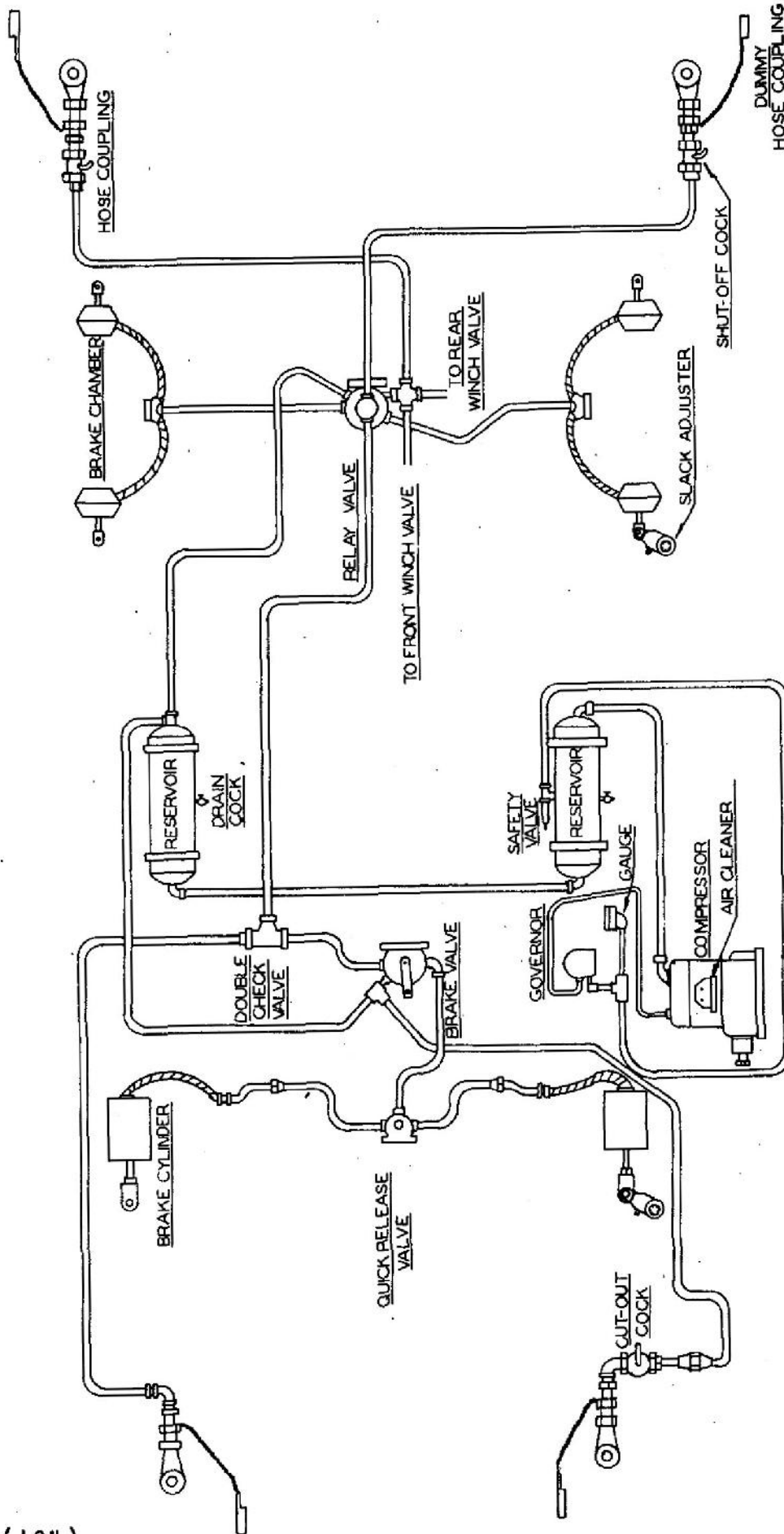
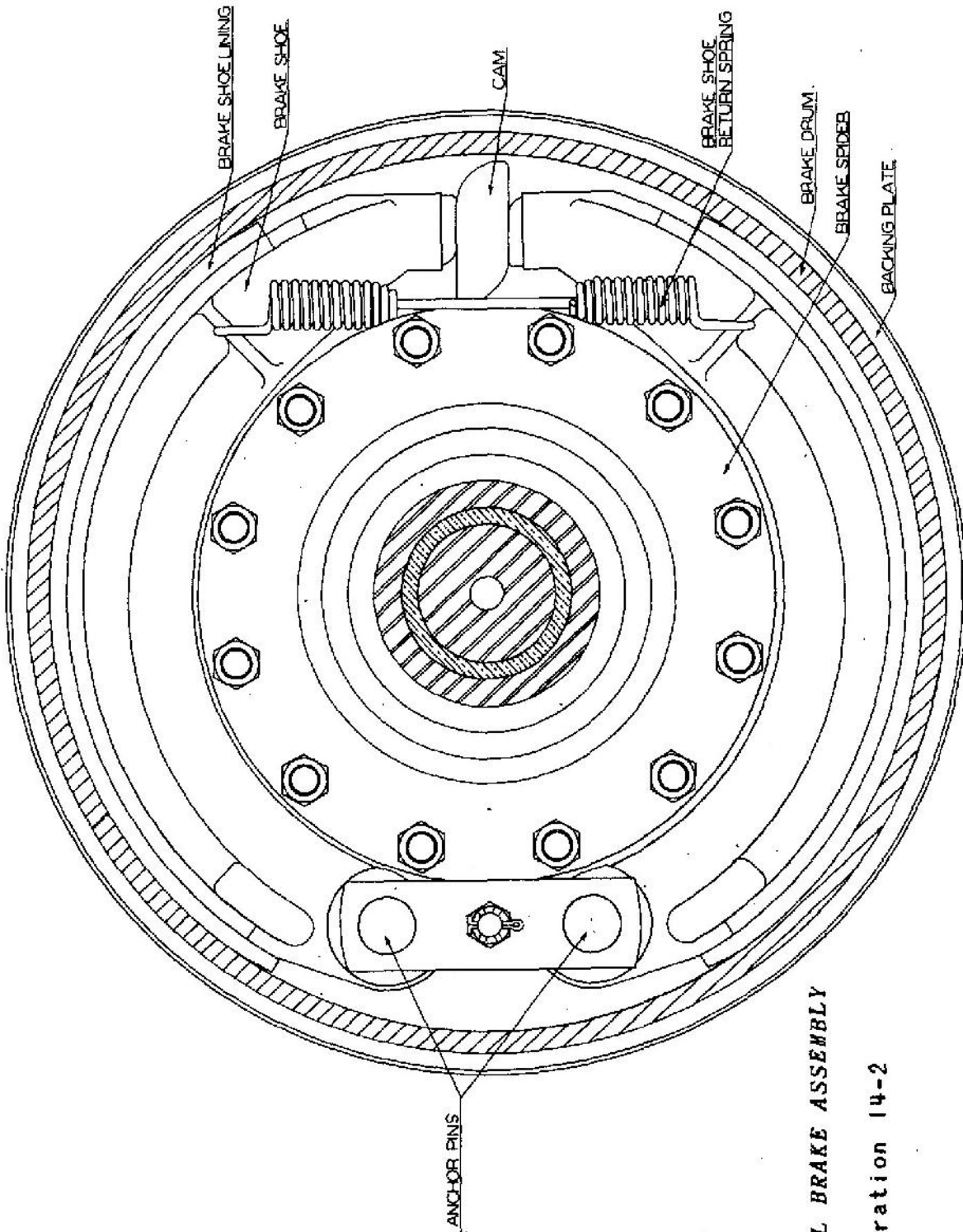


DIAGRAM-PIPING-AIR BRAKES
Illustration 14-1

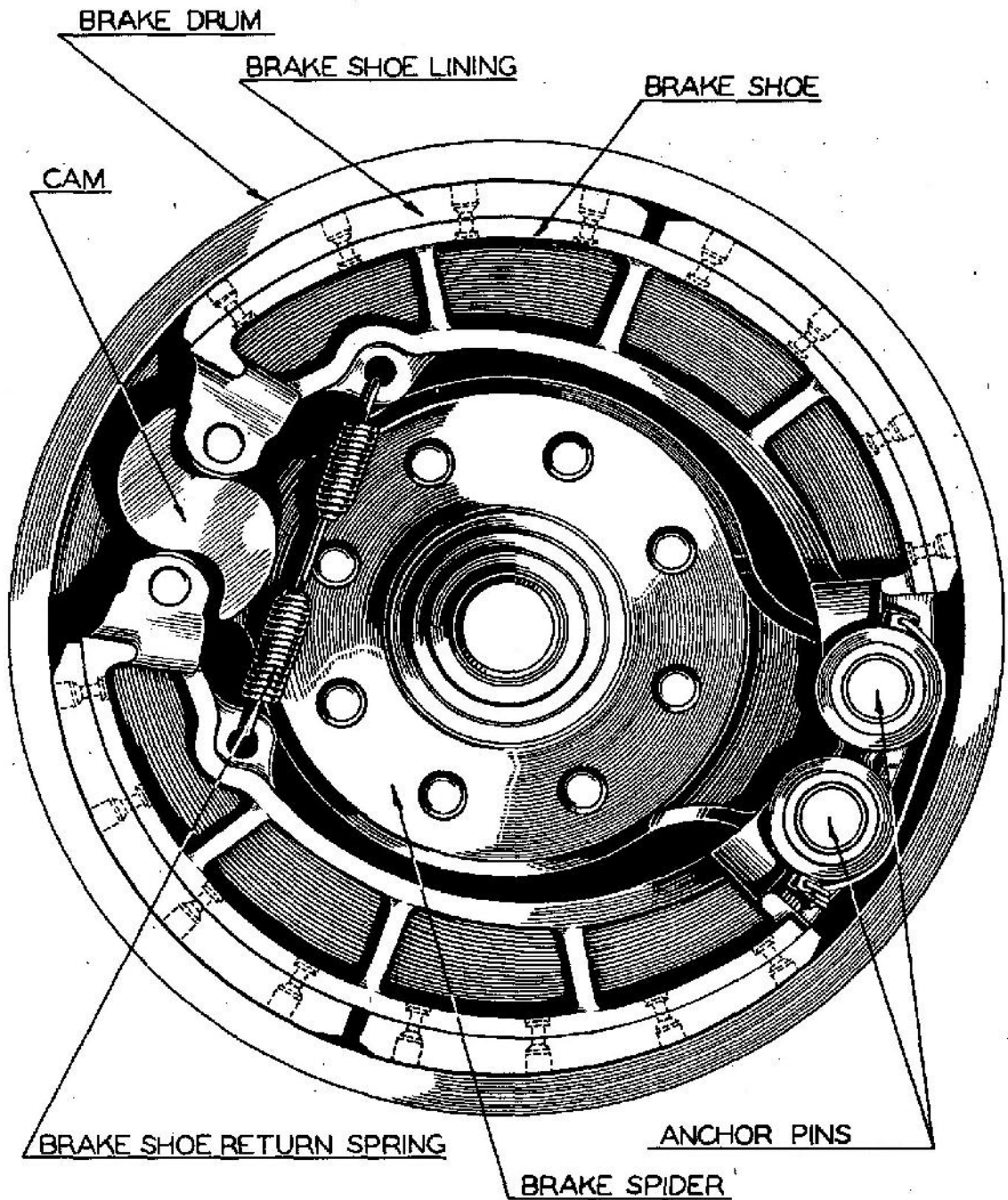
HEAVY WRECKING TRUCK M1



FRONT WHEEL BRAKE ASSEMBLY

Illustration 14-2

BRAKES



REAR WHEEL BRAKE ASSEMBLY

Illustration 14-3

HEAVY WRECKING TRUCK M1

72-73

Section XIV
BRAKE SYSTEM

TITLE	Paragraph No.
Specifications	72
Description	73
Function of Air Brake Units	74
Driver Inspection	75
Service Diagnosis and Cause	76
Specifications; Hand Brake	77
Description	78
Caution	79

72. Specifications:Manufacturer:

Axle Equipment:	Timken-Detroit Axle Co.
Air Equipment:	Bendix-Westinghouse

Type: Air

Brake Size:

Front:	17 $\frac{1}{4}$ " x 4
Rear:	16 $\frac{1}{2}$ " x 6

No. Shoes per Assembly: 2

Air Compressor Capacity: 7 $\frac{1}{4}$ Cu.Ft. per Min. at 1250 RPM

Front Brake Cylinder:

Diameter:	4 $\frac{1}{2}$ "
Maximum Stroke:	2 $\frac{1}{2}$ "

Rear Brake Chamber:

Diameter:	9-3/16"
Maximum Stroke:	2 $\frac{1}{4}$ "

Normal Air Pressure: 90-100 Lbs.

Minimum Reservoir Pressure: 45 Lbs. (If air pressure drops below 45 Lbs. stop and investigate)

73. Description:

This vehicle is equipped with Bendix-Westinghouse air brake equipment and Timken axle brake assemblies on all six wheels. Trailer connections are provided at both the front and rear of the truck for towing purposes.

The air brake system is divided into two general groups, namely the mechanical portions which include shoes, drums, cams, anchors, camshafts, slack adjusters, and the air control division which includes the air compressor, governor, application valve, safety devices, chambers, reservoir and connecting lines.

Description (Cont.)

The function of the air brake operating system is the use of the energy of compressed air to provide the mechanical force necessary to expand the brake shoes against the brake drums when the brakes are applied to bring the vehicle to rest. Compressed air can best be defined as a large volume of air that has been forced into a smaller space.

The operation of the air brake system may be observed in detail by referring to Illustration 14-1.

This air brake system consists of a number of devices that are connected by tubing lines which can be classified as air compression and control devices. Their function is to build up, maintain, control and distribute air pressure and to convert its energy into the mechanical force necessary to apply and release the brakes.

Air brakes are applied and released in exactly the same manner as any mechanical or hydraulic brake. The brakes are applied by depressing the brake pedal or released by releasing the brake pedal which controls a specially constructed brake valve.

With the brake pedal in the released position the intake valve is closed, sealing the air pressure in the reservoir, while the exhaust valve is held open and all air pressure in the brake operating chambers and lines is exhausted to atmosphere, only atmospheric pressure remaining in these devices and lines.

The more the brake pedal is depressed the greater the amount of air delivered to the operating chambers and the greater the mechanical force being applied to the brake shoes.

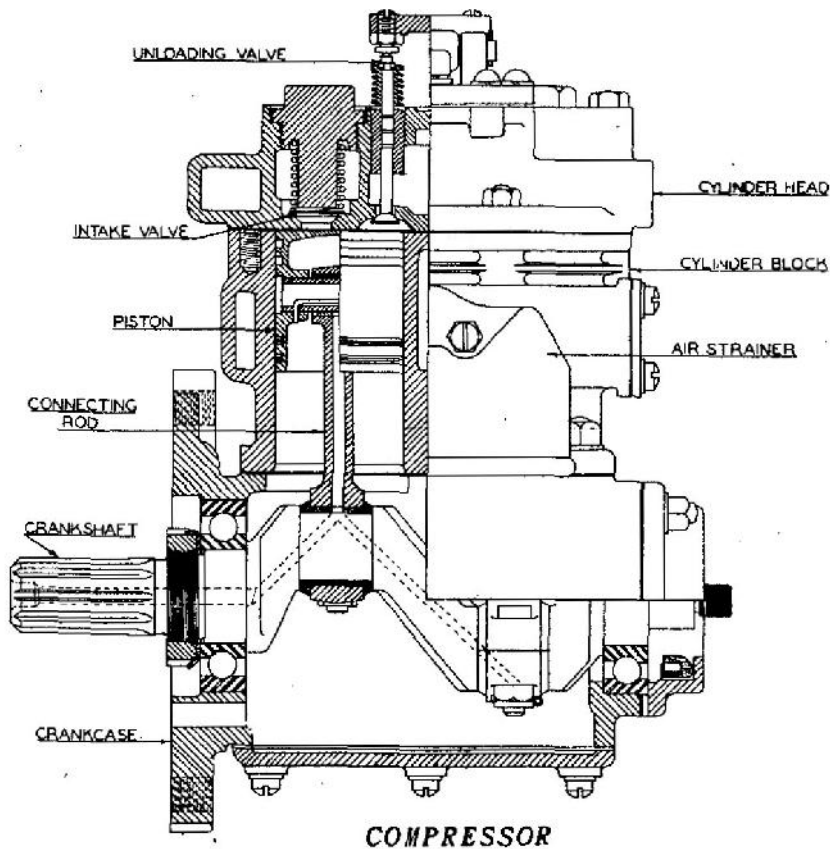
The stopping distance of an air braked vehicle depends upon the amount of air pressure built up in the brake cylinders and chambers which, in turn, is controlled by the distance the brake pedal is depressed. This means of graduated control of the amount of air pressure, by application of the brake pedal, enables the driver to stop the vehicle rapidly or as gradually as conditions of traffic, load or road demand.

The air brake system has a large reserve volume of air in case of an emergency which affords several brake applications should the truck, engine or air compressor become inoperative.

Do not "fan" the brakes. This is a dangerous practice, causes the compressor to work harder than necessary and cuts down the reserve air supply.

74.

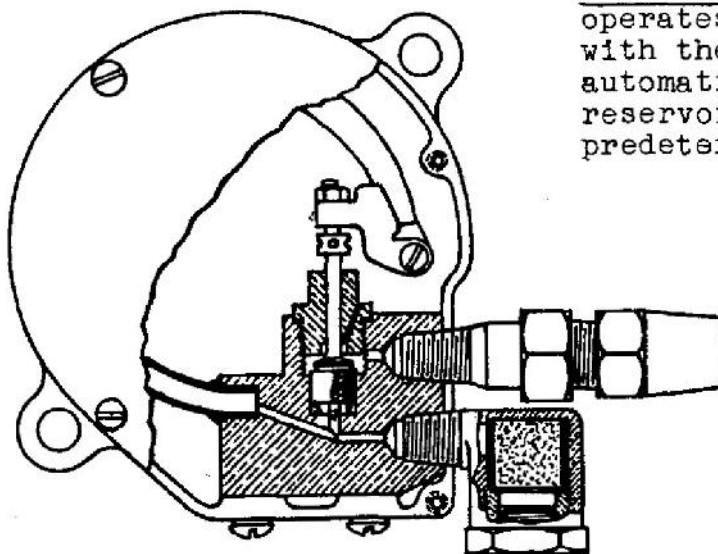
FUNCTION OF AIR BRAKE UNITS



COMPRESSOR
Illustration 14-4

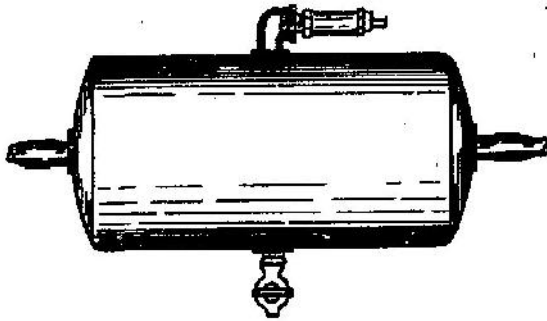
Compressor:- The function of the air compressor is to build up and maintain the air in the reservoirs at the pressure required to operate the various devices.

Governor:- The governor operates in conjunction with the compressor and automatically limits the reservoir pressure to a predetermined range.



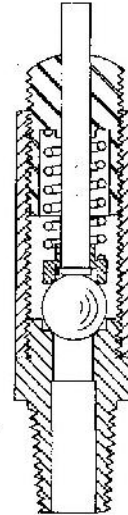
GOVERNOR
Illustration 14-5

FUNCTION OF AIR BRAKE UNITS (Cont.)

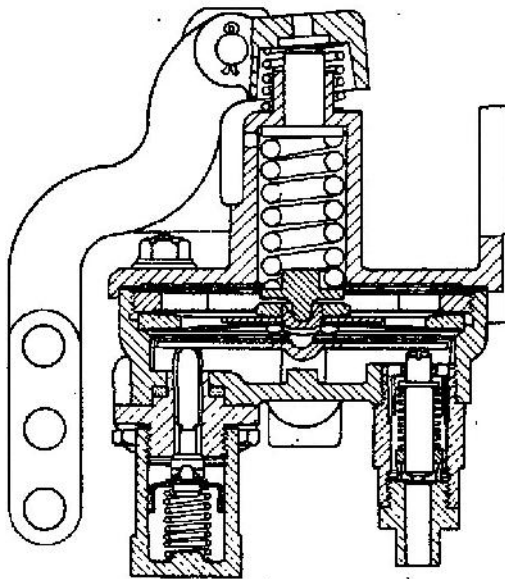


RESERVOIR
Illustration 14-6

Safety Valve:- The safety valve is designed so that when the reservoir pressure exceeds 150 lbs. per square inch the air pressure is automatically released to atmosphere.



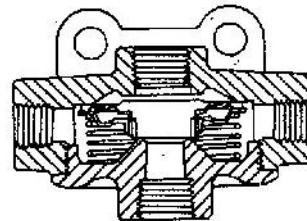
SAFETY VALVE
Illustration 14-7



BRAKE VALVE
Illustration 14-8

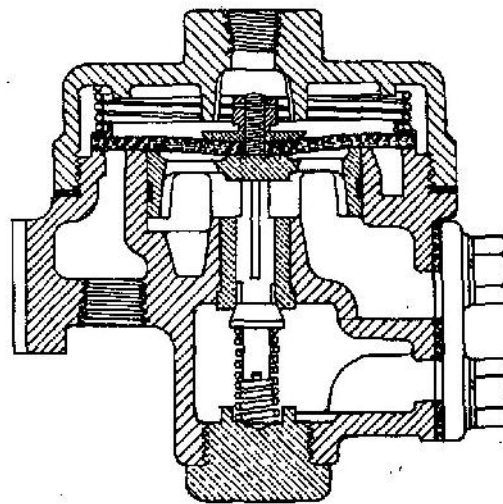
Brake Valve:- The brake valve provides the driver with an easily operated, finely graduated means of applying and releasing the brakes.

Quick Release Valve:- The quick release valve speeds up the release of air pressure from the front brake cylinders.



QUICK-RELEASE VALVE
Illustration 14-9

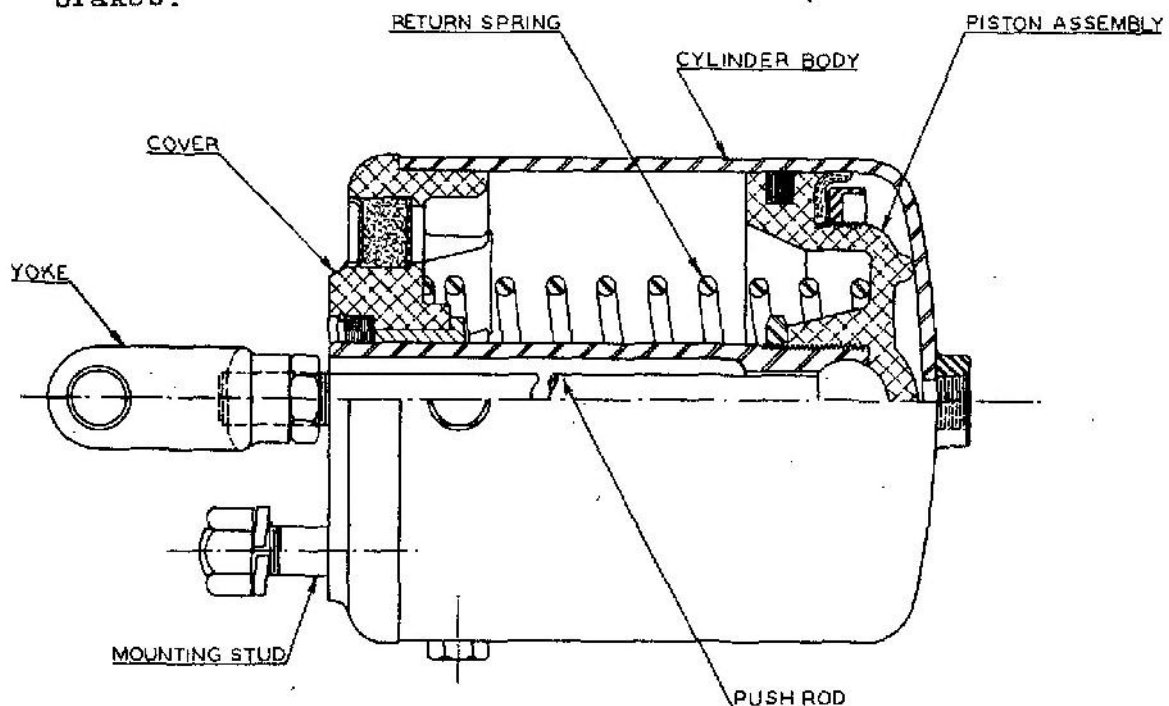
FUNCTION OF AIR BRAKE UNITS (Cont.)



RELAY VALVE

Illustration 14-10

Relay Valve:- The relay valve functions as a relay station to speed up the application and release of the rear brakes.

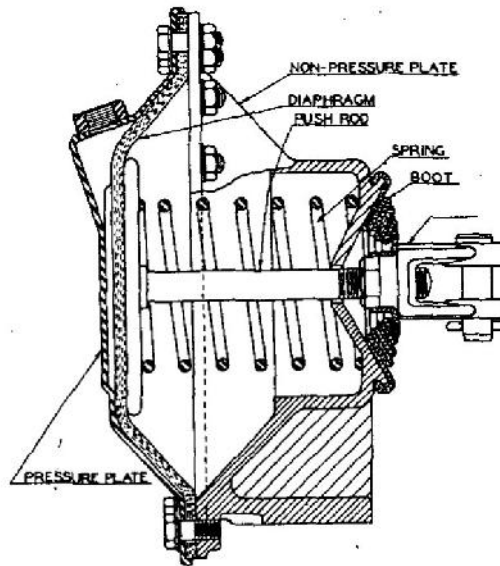


BRAKE CYLINDER

Illustration 14-11

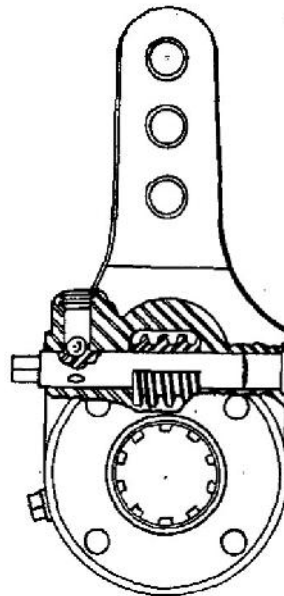
Brake Cylinder (Front):- The function of the brake cylinder is to convert the energy of compressed air into mechanical force.

FUNCTION OF AIR BRAKE UNITS (Cont.)



REAR AXLE BRAKE CHAMBER
Illustration 14-12

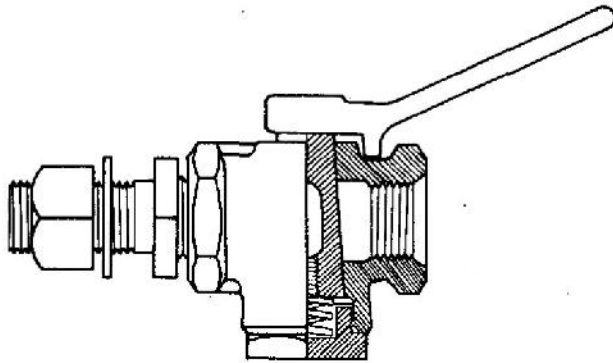
Brake Diaphragms (Rear):- The function of the brake diaphragm is to convert the energy of compressed air into mechanical force.



SLACK ADJUSTER
Illustration 14-13

Slack Adjuster:- The slack adjuster serves as a brake lever during normal brake application and also provides an easy method of brake adjustment.

FUNCTION OF AIR BRAKE UNITS (Cont.)

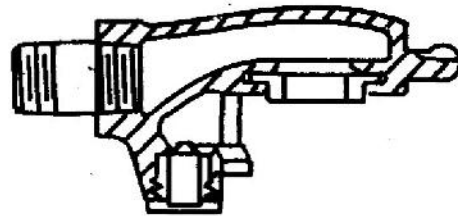


Cut-out Cock:- The cut-out cock provides a means of shutting off the air pressure to the hose lines used for towing purposes.

CUT-OUT COCK

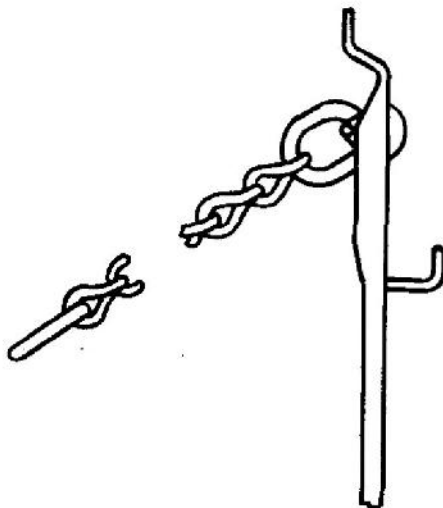
Illustration 14-14

Hose Coupling:- The hose coupling provides a means for connecting air hoses for towing purposes.



HOSE COUPLING

Illustration 14-15



Dummy Couplings:-

Dummy couplings perform the function of keeping all dirt and moisture out of the hose connections when not being used for towing purposes.

DUMMY COUPLING

Illustration 14-16

75.

DRIVER INSPECTION

1. Drain each reservoir daily. This removes any condensation collected from the reservoir. Condensation, if permitted to accumulate in the tubing lines or air brake units, will cause corrosion, rust and generally decrease the efficiency and service life of the air brake system.
2. Check tubing connection fittings and devices for air leaks.
3. Make sure that the dummy hose couplings are in place when towing connections are not in use.

76.

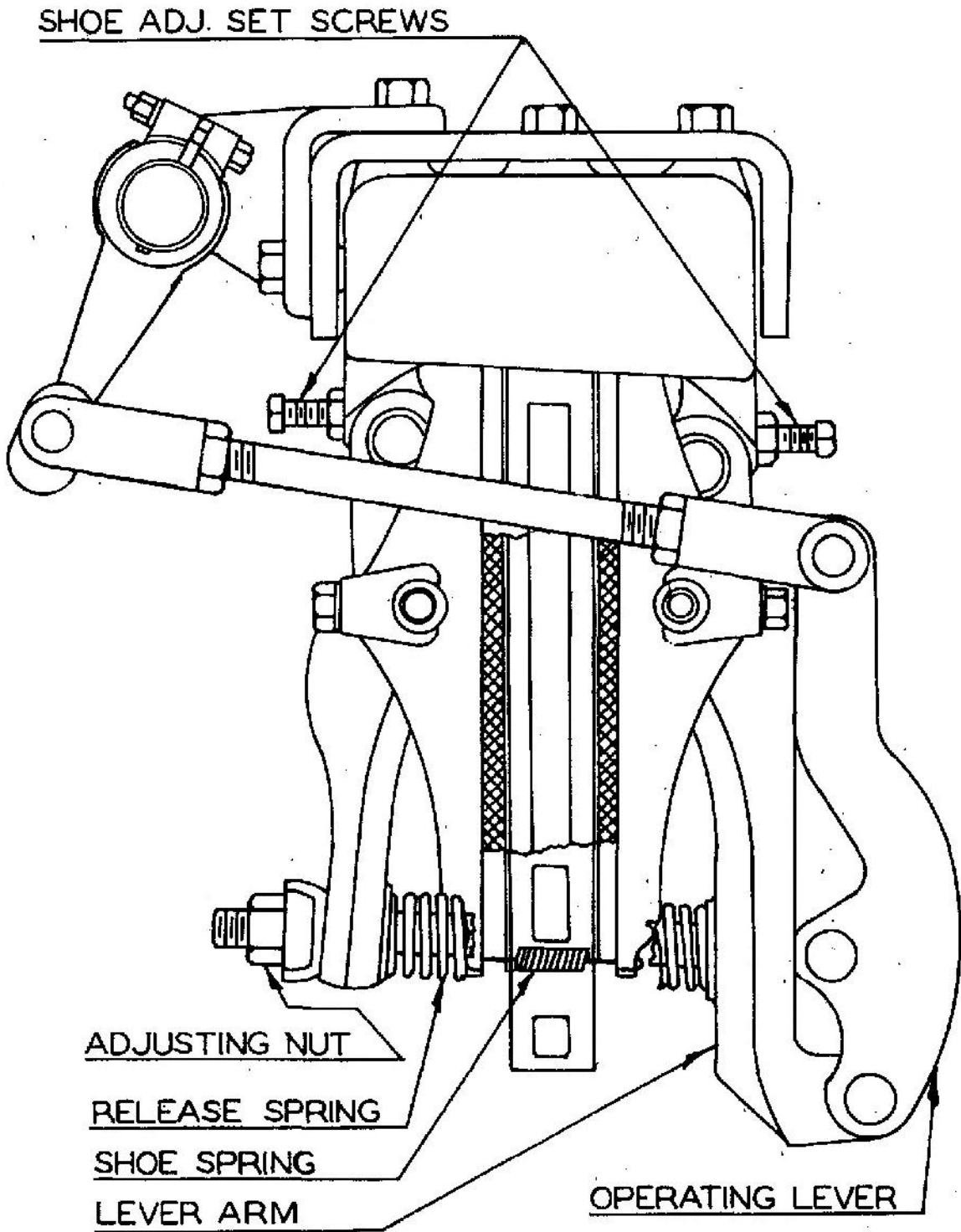
SERVICE DIAGNOSIS AND CAUSE

1. Slow Pressure Build-up in Reservoirs:
 - (a) Leaking application or brake valve.
 - (b) Leaking compressor discharge valve.
 - (c) Leaking lines or connections.
 - (d) No clearance on unloader valves.
 - (e) Clogged air cleaner.
 - (f) Worn piston and rings, carbon in discharge line.
2. Quick Loss of Reservoir Pressure when Motor is Stopped:
 - (a) Worn and leaking compressor discharge valves.
 - (b) Tubing or connections leaking.
 - (c) Leaking valves.
 - (d) Leaking governor.
3. Compressor Not Unloading:
 - (a) Broken unloader diaphragm.
 - (b) Too much clearance on unloader valves.
 - (c) Restriction in line from governor to unloader.
 - (d) Governor not operating.
4. Slow Brake Application:
 - (a) Low brake line pressure (Brake valve to chambers).

SERVICE DIAGNOSIS AND CAUSE (Cont.)

- (b) Brake chamber push rod travel excessive.
 - (c) Restriction in line.
 - (d) Leaking brake chamber diaphragm.
 - (e) Brake lining or drum condition.
 - (f) Leaking brake valve diaphragm.
5. Slow Brake Release:
- (a) Brake valve lever not returning fully to stop.
 - (b) Binding cam or cam shafts.
 - (c) Brake chamber push rod travel excessive.
 - (d) Restriction in tubing or hose.
 - (e) Improper seating of valves.
6. Inefficient Brakes:
- (a) Low brake line pressure.
 - (b) Excessive push rod travel on brake chambers.
 - (c) Lining and drum condition.
 - (d) Brake chamber diaphragm leaking.

BRAKES



CABLE BRAKE

Illustration 14-17

HEAVY WRECKING TRUCK M1

77-79

HAND BRAKE

77. Specifications:

Manufacturer:	American Chain & Cable Co.
Model:	65D-17588
Type:	Four-shoe disc
Diameter:	16"

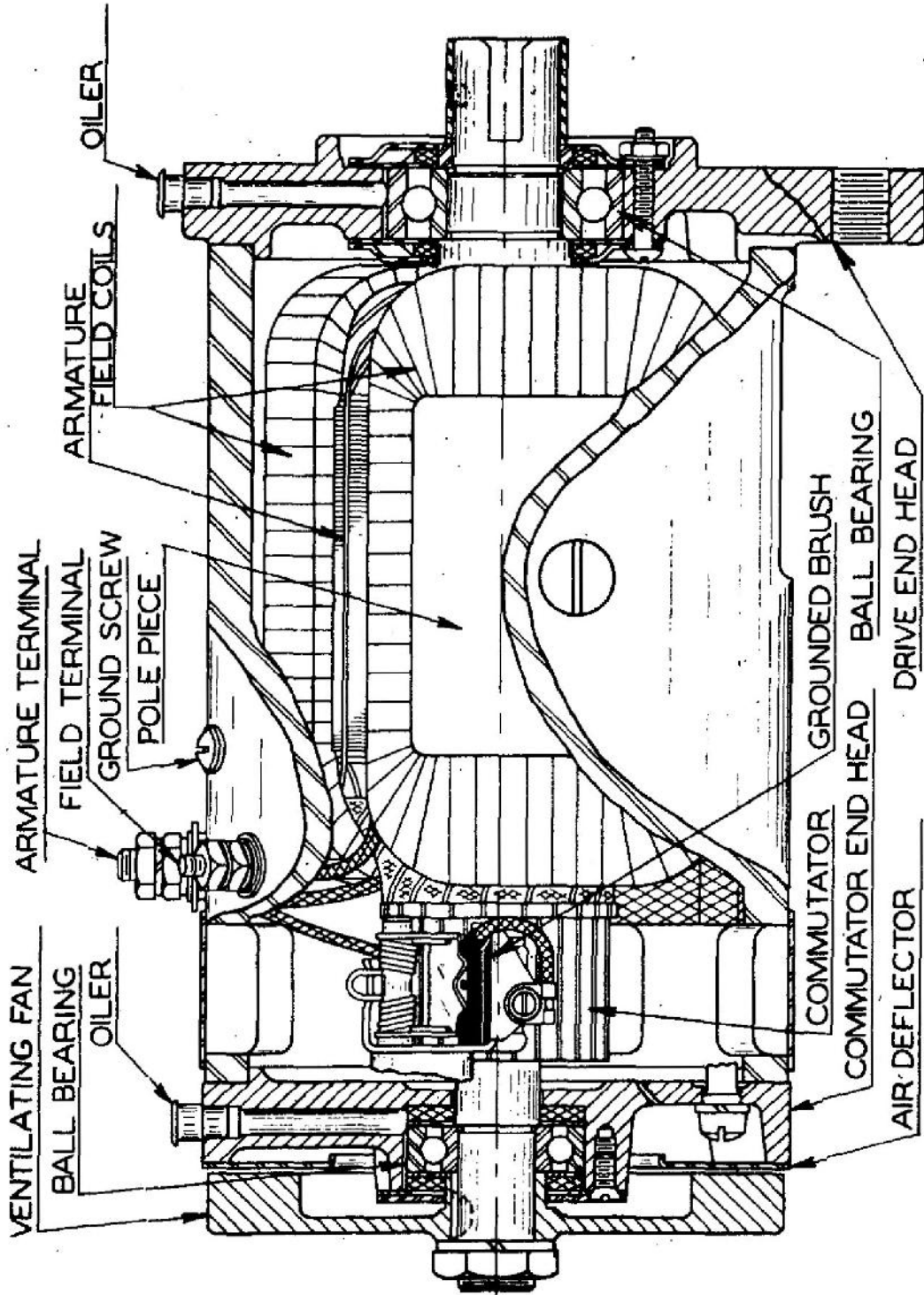
78. Description:

The hand brake is of the four-shoe disc brake type. It is mounted on a frame crossmember at the rear of the transfer case. The disc is attached to the propeller shaft companion flange on the rear output shaft of the transfer case. The brake shoes are mounted on pins in brackets attached to the crossmember. The brake is operated by the hand lever in the cab.

79. CAUTION

1. This brake should not be used to decelerate the truck. It is for parking only.
2. The brake should not be used to hold the truck when the front winch, rear winch or crane is being operated. Use the service brake latch for this.

ELECTRICAL



GENERATOR

Illustration 15-1

Section XV
ELECTRICAL EQUIPMENT

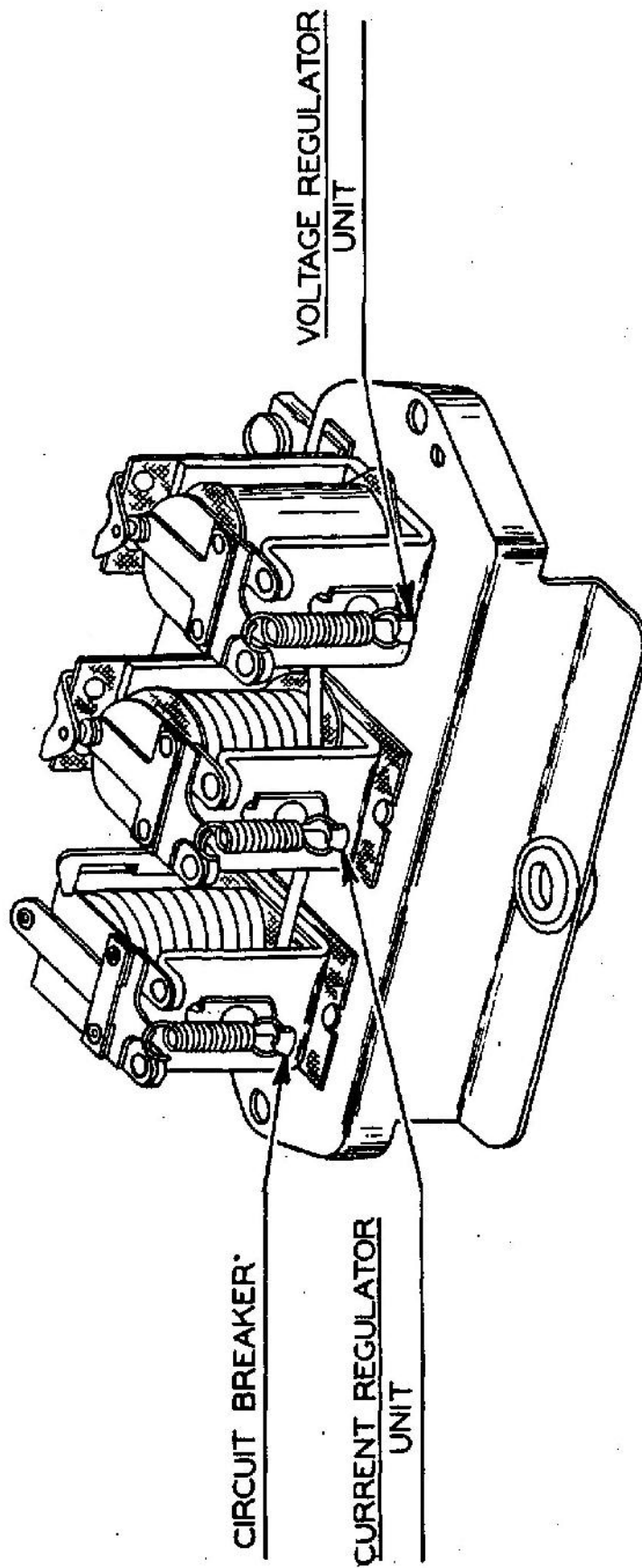
TITLE	Paragraph No.
Specifications; Generator	80
Description	81
Specifications; Regulator	82
Description	83
Service Diagnosis and Cause	84
Caution	85
Specifications; Starting Motor	86
Description	87
Service Diagnosis and Cause	88
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Specifications; Distributor	90
Description	91
Service Diagnosis and Cause	92
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Specifications; Horn	101
Description	102
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Description; Wiring	104
Specifications; Headlights	105
Description	106
Specifications; Tail Lights	107
Description	108
Specifications; Searchlight	109
Description	110
Specifications; Siren Light	111
Description	112
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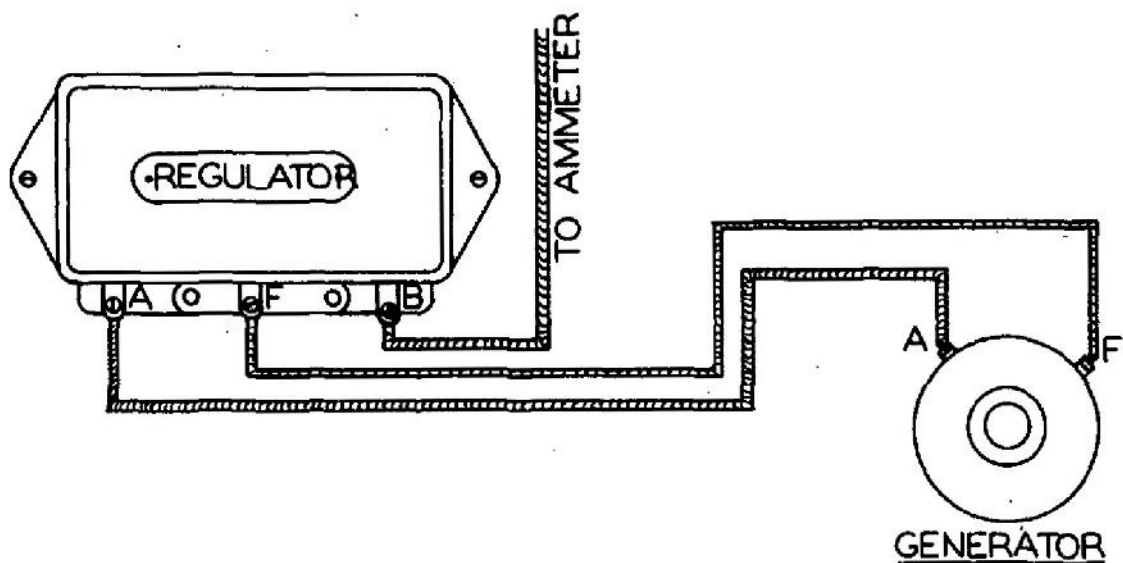
GENERATOR

80. Specifications:

Manufacturer:	Electric Auto-Lite Company
Model:	GEH-4806
Voltage:	12
Output:	17 Amperes Max. at 1125 RPM
Cut-in Speed:	855 RPM
Rotation:	Clockwise from Drive End

ELECTRICAL





GENERATOR-REGULATOR
WIRING CIRCUIT

Illustration 15-2

81. Description:

In the generator and control system is included the generator, regulator, battery and ammeter.

The generator is a device for changing mechanical energy into electrical energy. The generator is mounted on the right side of the engine, gear driven from the engine timing gear train. It is a shunt-wound current and voltage controlled, two-brush, force-ventilated unit.

REGULATOR

82. Specifications:

Manufacturer:	Electric Auto-Lite Company
Model:	VRS-4004B
Voltage:	12
Capacity:	16-18 Amperes Maximum

83. Description:

The regulator consists of a circuit breaker which opens and closes the circuit between the generator and battery, a voltage control unit which controls the voltage built up within and the voltage output of the generator, and a current control unit which controls the current output to the battery built up by the generator.

The voltage control unit and the current control unit respond automatically to the condition of the battery and their action is reflected in the amount of output by the generator.

Note:- For wiring circuit see Illustration 15-2, Page 15-2.

84. SERVICE DIAGNOSIS AND CAUSE

1. Fully Charged Battery and Low Charging Rate:
 - (a) Indicates the generator and voltage regulator units are functioning properly. To verify, turn off the ignition switch and operate starter for 30 seconds. Then start motor and the charging rate should increase.
2. Fully Charged Battery and High Charging Rate:
 - (a) Voltage regulator set too high.
 - (b) Voltage regulator points stuck.
 - (c) Voltage regulator points out of adjustment.
 - (d) Defective winding in voltage regulator unit.
 - (e) A direct short between the generator charging circuit and generator field circuit, either in regulator or generator.
3. Low Battery and Low or No Charging Rate:
 - (a) Voltage regulator set too low.
 - (b) Current regulator set too low.
 - (c) Grounded fields in generator.
 - (d) Shorted armature in generator.
 - (e) Stuck brushes in generator.

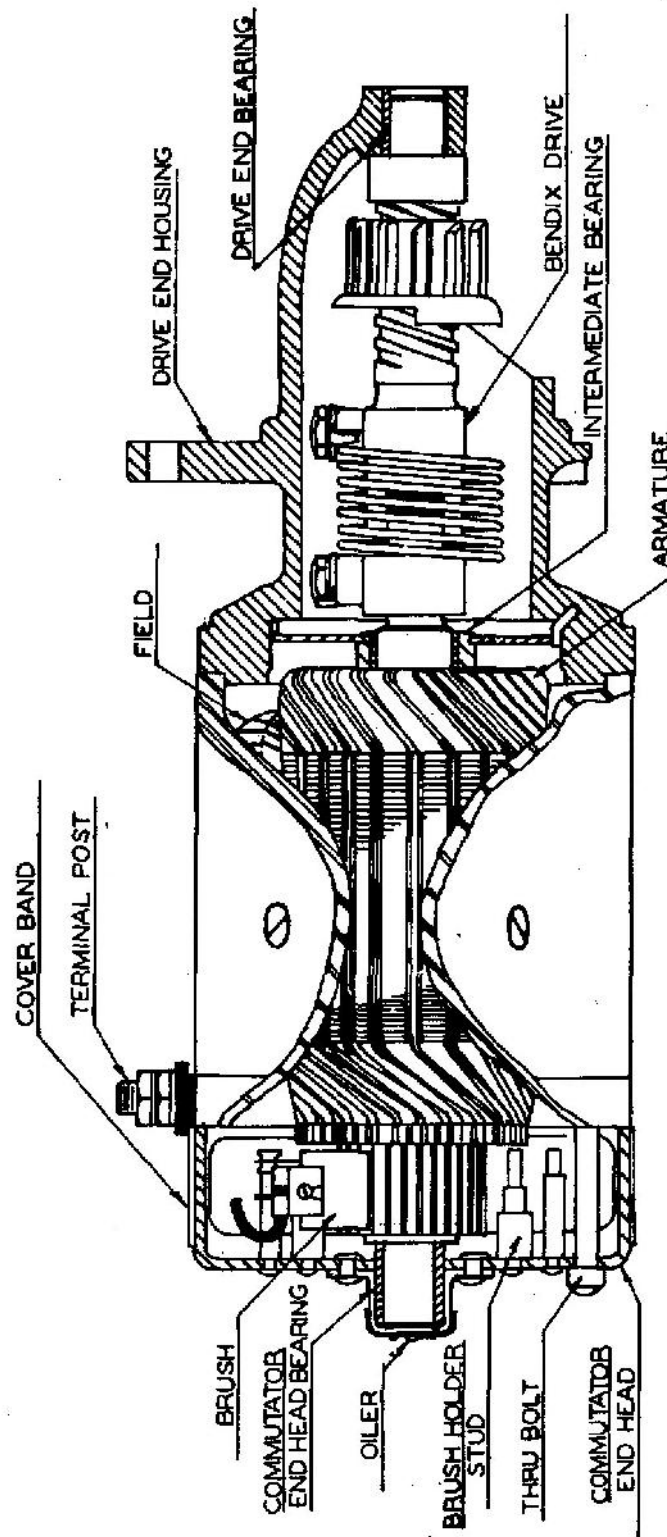
SERVICE DIAGNOSIS AND CAUSE (Cont.)

- (f) Worn out generator brushes.
- (g) Shorted fields in generator.
- (h) Grounded armature.
- (i) Grounded brush holders.
- (j) Poor ground connection at generator, regulator or battery due to loose mounting bolts, paint, grease, or loose or defective wiring.
- (k) Resistance units or winding in the regulator burned or open.
- (l) Open circuit in wiring.
- (m) Loose connections between voltage regulator and generator.
- (n) Poor battery ground.
- (o) Corroded battery terminals.

85. CAUTION

1. Never close the regulator contact points by hand.
2. Never close regulator or relay points by hand.
3. Never use emery cloth to dress commutator on generator. Use only 00 sand paper for this purpose.
4. Never oil commutator to eliminate squeaking brushes.
5. Never alter adjustments of regulator as this should be done by an experienced person with proper instruments.

ELECTRICAL



STARTING MOTOR
Illustration 15-4

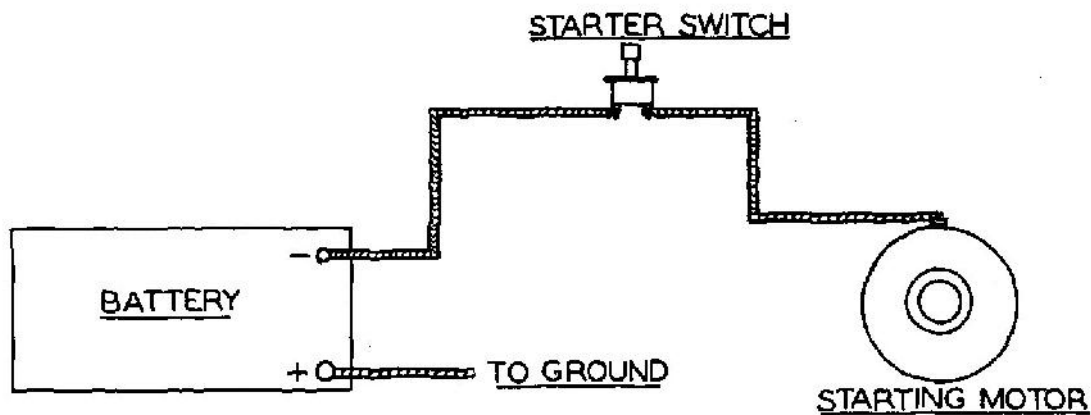
HEAVY WRECKING TRUCK M1

86-88

STARTING MOTOR

86. Specifications:

Manufacturer:	Electric Auto-Lite Company
Model:	MAS-4003
Voltage:	12
Rotation:	Clockwise from Drive End
Current Draw:	35 Amperes, Free-running



STARTER WIRING CIRCUIT
Illustration 15-5

87. Description:

The starting motor is a 12-volt, four-pole, four-brush unit, driving through a Bendix assembly to the flywheel ring gear.

The starting motor circuit consists of the starting motor, battery and starter switch.

88. SERVICE DIAGNOSIS AND CAUSE

1. Stepping on Starter Button With No Response:
 - (a) Burned contacts in starter switch.

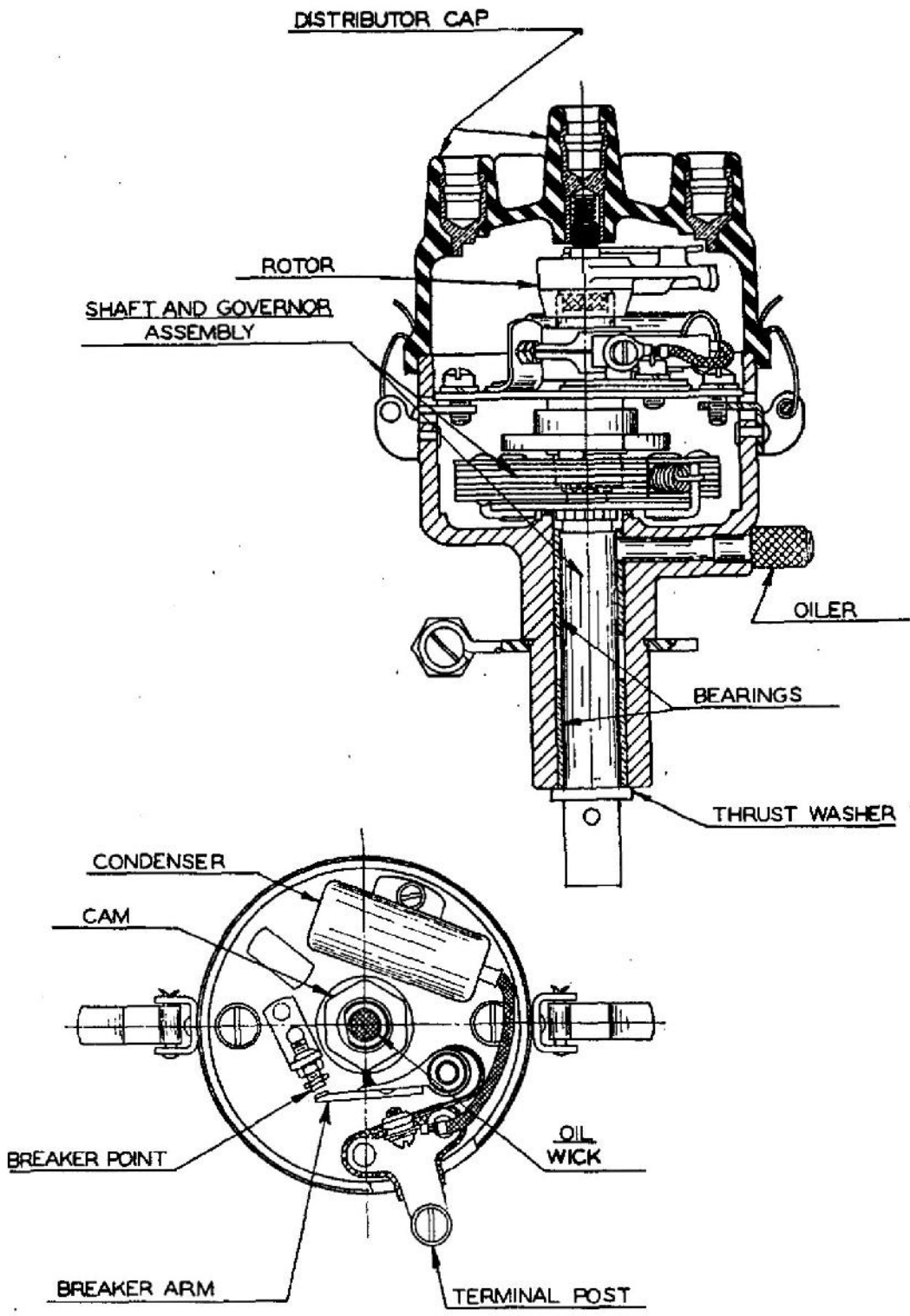
SERVICE DIAGNOSIS AND CAUSE (Cont.)

- (b) Loose battery cable and starter cable connections.
 - (c) Loose or corroded battery terminals.
 - (d) Open circuit in starting motor.
 - (e) Burned commutator on starting motor armature.
 - (f) Dead battery.
 - (g) Grounded fields in starting motor.
 - (h) Grounded or shorted armature in starting motor.
 - (i) Grounded brush holders in starting motor.
2. Sharp Thud or Click Without Rotation of Engine:
- (a) Bendix assembly stuck in flywheel ring gear.
- Note:- TO REMOVE STUCK BENDIX FROM FLYWHEEL
PLACE TRANSMISSION IN HIGH GEAR AND ROCK
VEHICLE BACKWARDS. NEVER ROCK FORWARD, AS THIS
WILL TEND TO JAM THE ASSEMBLY TIGHTER INTO THE
FLYWHEEL.
3. Whirring Noise But Engine Not Turning Over:
- (a) Broken Bendix spring or bolts.

89. CAUTION

1. Never use emery cloth for cleaning starter commutator. Use only 00 sand paper.
2. Never use more than a 12-volt battery on the starter.
3. Never step on starter button while the motor is running.
4. Do not operate starter for more than 30 seconds at one time. Allow unit to cool between starter applications.

HEAVY WRECKING TRUCK M1



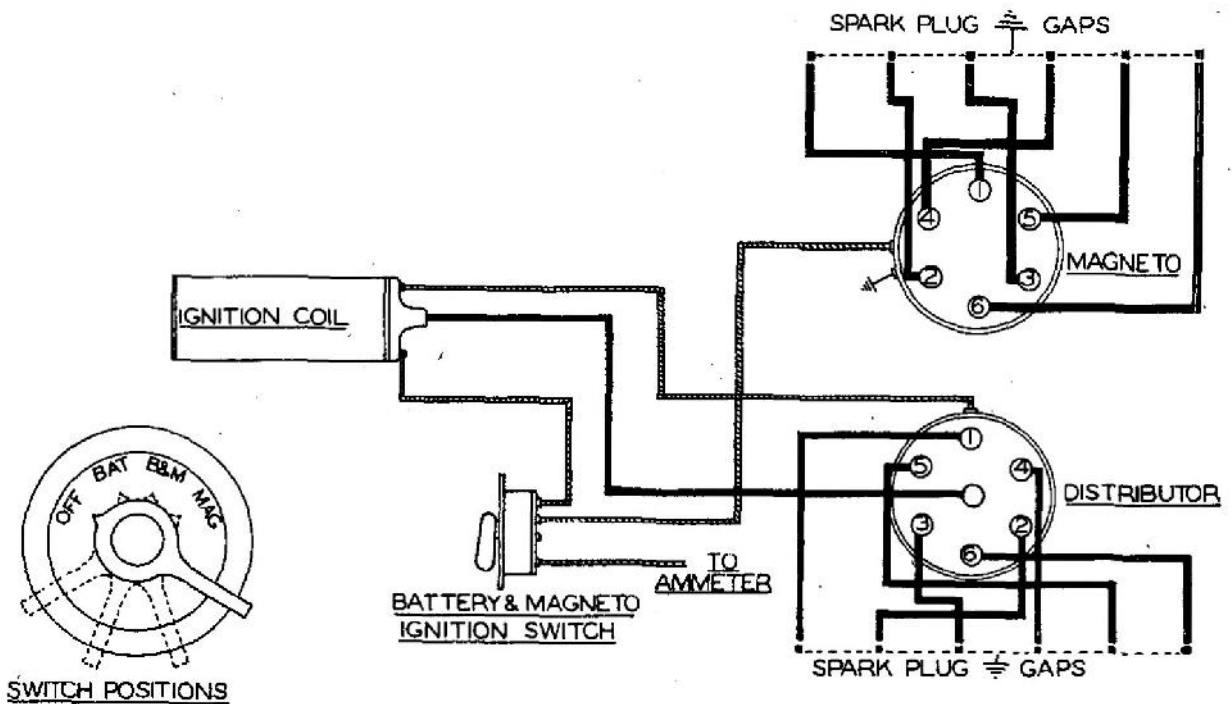
DISTRIBUTOR

Illustration 15-6

DISTRIBUTOR

90. Specifications:

Manufacturer:	Electric Auto-Lite Company
Model:	IGC-4054D
Advance Control:	Manual and Automatic
Drive:	Gear driven through Accessory shaft.
Rotation:	Counter clockwise viewed from Top End



BATTERY & MAGNETO WIRING CIRCUIT
Illustration 15-7

91. Description:

The distributor is mounted back of the timing case in the accessory housing on the left side of the engine.

Under normal running conditions the spark hand control
(158)

Description (Cont.)

should be left in the "pushed-in" position, which is full advance. When starting the motor, or under excessive loads, the spark may be retarded by pulling out on the manual control.

The ignition system furnishes high voltage spark at the correct instant to the correct cylinder spark plug. It consists of a source of power in the battery or generator, the ignition coil, condenser, distributor leads and spark plugs.

92.

SERVICE DIAGNOSIS AND CAUSE

1. Mis-Firing of High Tension Spark:

- (a) Cracked distributor cap.
- (b) Cracked rotor.
- (c) Grounded or shorted condenser.
- (d) Burned or corroded distributor points.
- (e) Corroded high tension terminals in distributor cap.
- (f) Grounded or shorted high tension wiring.
- (g) Corroded high tension wire in coil connection.
- (h) Distributor points set too close.
- (i) Distributor points set too wide.
- (j) Worn bushings in distributor shaft assembly which will cause cam to open points irregularly.
- (k) Badly worn cam which will cause points to open irregularly.
- (l) Weak contact arm spring.
- (m) Ignition coil broken down.
- (n) Poor contacts in ignition switch.
- (o) Loose wiring connections.
- (p) Low battery voltage.

2. No Spark To Plugs:

- (a) Dead coil.

SERVICE DIAGNOSIS AND CAUSE (Cont.)

- (b) Grounded out or shorted condenser.
 - (c) Burned distributor points.
 - (d) Rubbing block worn down on distributor breaker arm so that points will not open.
 - (e) Stripped distributor gears.
 - (f) Open connection in ignition circuit.
 - (g) Grounded distributor points.
 - (h) Open connection in high tension lead from coil to distributor cap.
3. Good Spark to Plugs but Continuous Missing:
- (a) Broken porcelain in spark plug.
 - (b) Fouled spark plug.

93. CAUTION

1. Do not change distributor timing as it may throw the magneto and distributor out of synchronization.

HEAVY WRECKING TRUCK M1

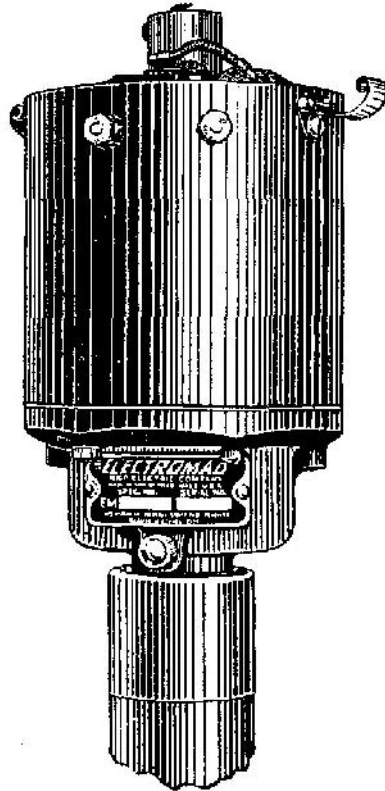
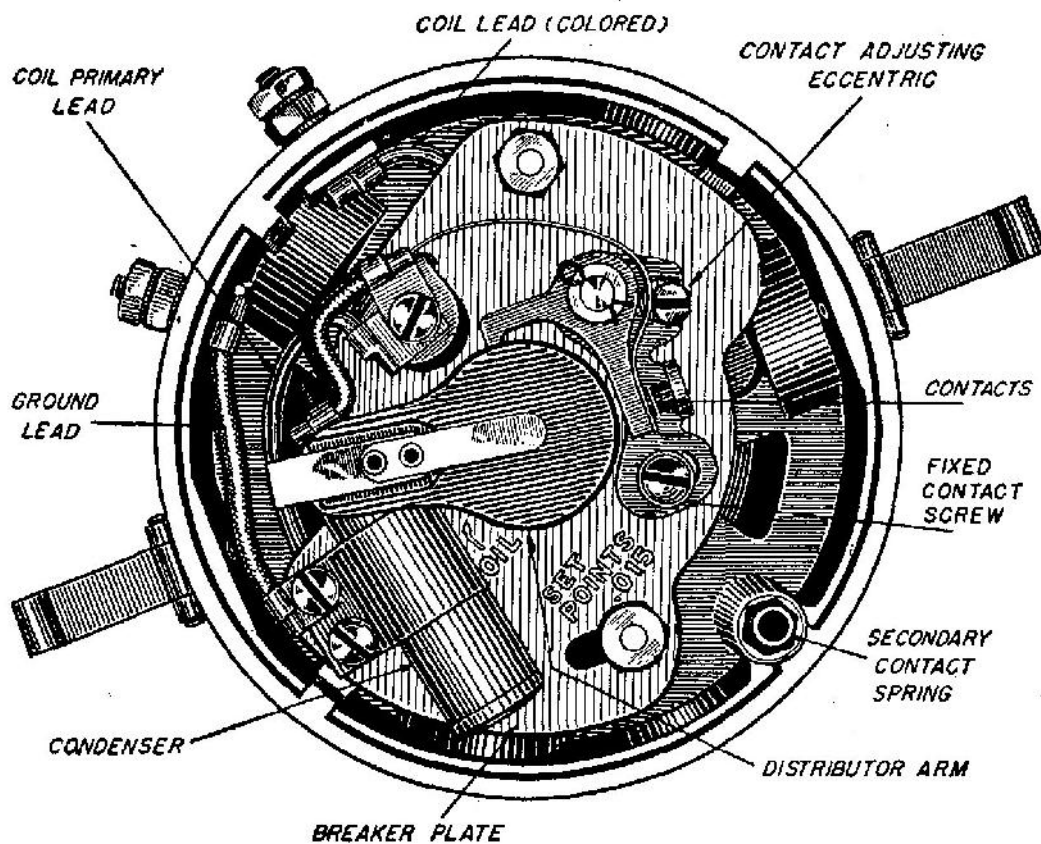


Illustration 15-8



MAGNETO, BREAKER PLATE

Illustration 15-9

MAGNETO

94. Specifications:

Manufacturer:	Wico Electric Company
Model:	EM-1428
Rotation:	Clockwise from Cap End

95. Description:

The magneto is a distributor type vertical mounting unit with built-in impulse coupling and without automatic advance.

Note:- For magneto wiring circuit see Illustration 15-7, Page 157.

96. SERVICE DIAGNOSIS AND CAUSE

1. Mis-Firing of High Tension Spark:

- (a) Cracked magneto distributor cap.
- (b) Cracked rotor.
- (c) Grounded or shorted condenser.
- (d) Burned or corroded distributor points.
- (e) Corroded high tension terminals in magneto distributor cap.
- (f) Grounded or shorted high tension wiring.
- (g) Worn bearings in magneto shaft assembly, causing cam to open points irregularly.
- (h) Badly worn cam, causing points to open irregularly.
- (i) Weak contact arm spring.
- (j) Broken down coil winding.
- (k) Poor contacts in magneto ignition switch.
- (l) Loose wiring connections.

2. No Spark to Plugs:

- (a) Broken down magneto winding.
- (b) Grounded out or shorted condenser.

SERVICE DIAGNOSIS AND CAUSE (Cont.)

- (c) Burned magneto points.
 - (d) Rubbing block worn down on magneto breaker arm so that points will not open.
 - (e) Stripped magneto drive gears.
 - (f) Grounded connection in magneto wiring circuit.
 - (g) Grounded magneto points.
3. Good Spark to Plugs but Continuous Missing:
- (a) Broken porcelain in spark plug.
 - (b) Fouled spark plug.

97. CAUTION

1. Do not change magneto timing as it may throw the magneto and distributor out of synchronization.

BATTERY

98. Specifications:

Manufacturer:	Exide (Electric Storage Battery Company)
Model:	6XH-25-3S
Capacity:	168 Ampere hours at 6-hour rate
Voltage:	12

99. Description:

The battery is a six-cell, 12-volt unit. The negative terminal is on the right of the battery and the positive terminal is on the left of the battery.

CAUTION

1. If the battery has been emptied for shipment purposes it should be filled with electrolyte. For all other purposes fill with pure distilled water $3/8$ " over the top of the plates.
2. Do not allow corrosion to build up on battery terminals. As soon as any corrosion is apparent wash the terminals off with a solution of soda and hot water.

HORN

101. Specifications:

Manufacturer:	Delco-Remy (Delco-Remy Division of General Motors Corp'n.)
Model:	1880978
Type:	Vibrator
Voltage:	12

102. Description:

The horn is a vibrator type unit operated by the horn button through a relay which carries the current from the ammeter to the horn.

103. CAUTION

1. Do not change the adjustment of the vibrator as this must be done by an experienced person having the proper specifications for setting.

HEAVY WRECKING TRUCK M1

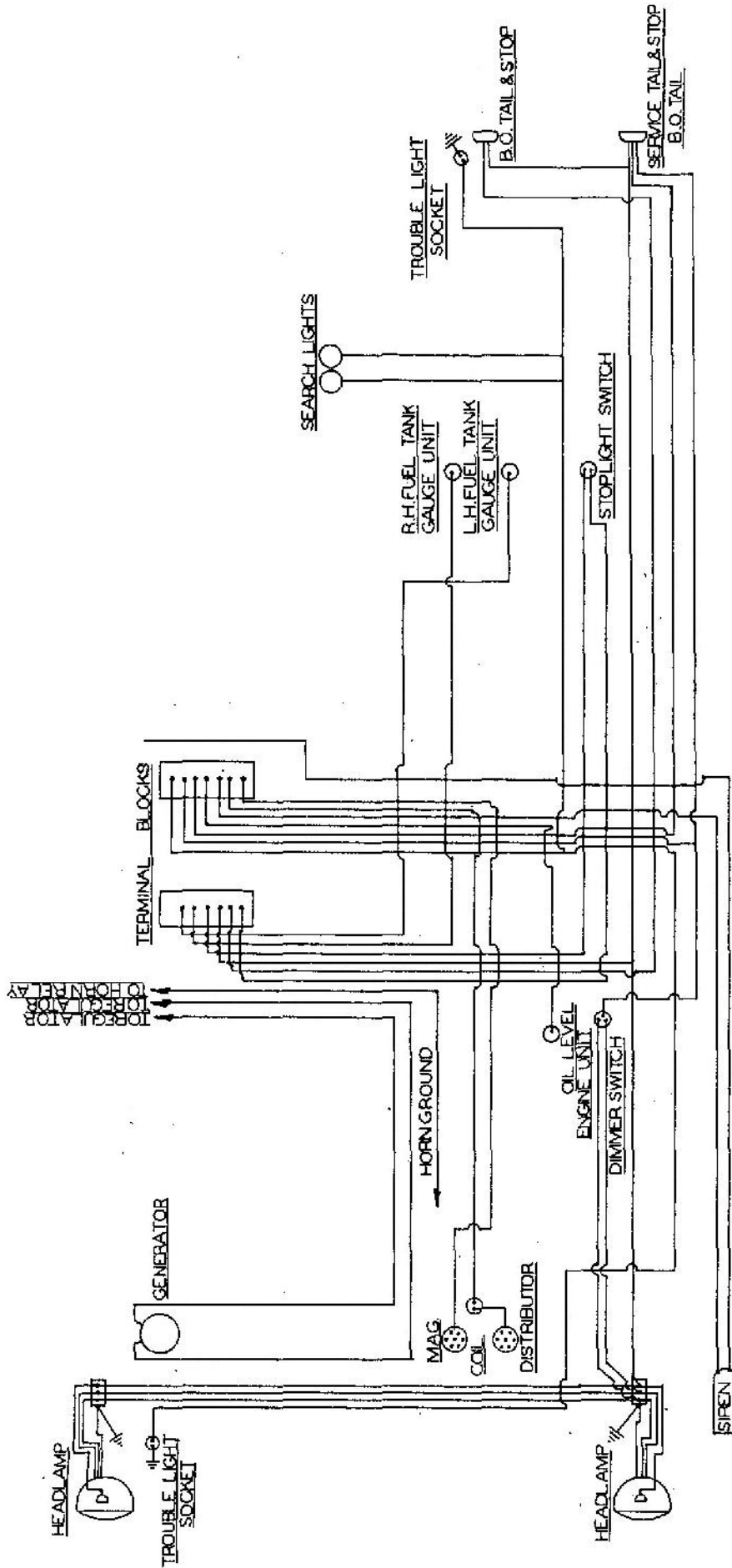


DIAGRAM-CHASSIS WIRING
Illustration 15-10

ELECTRICAL

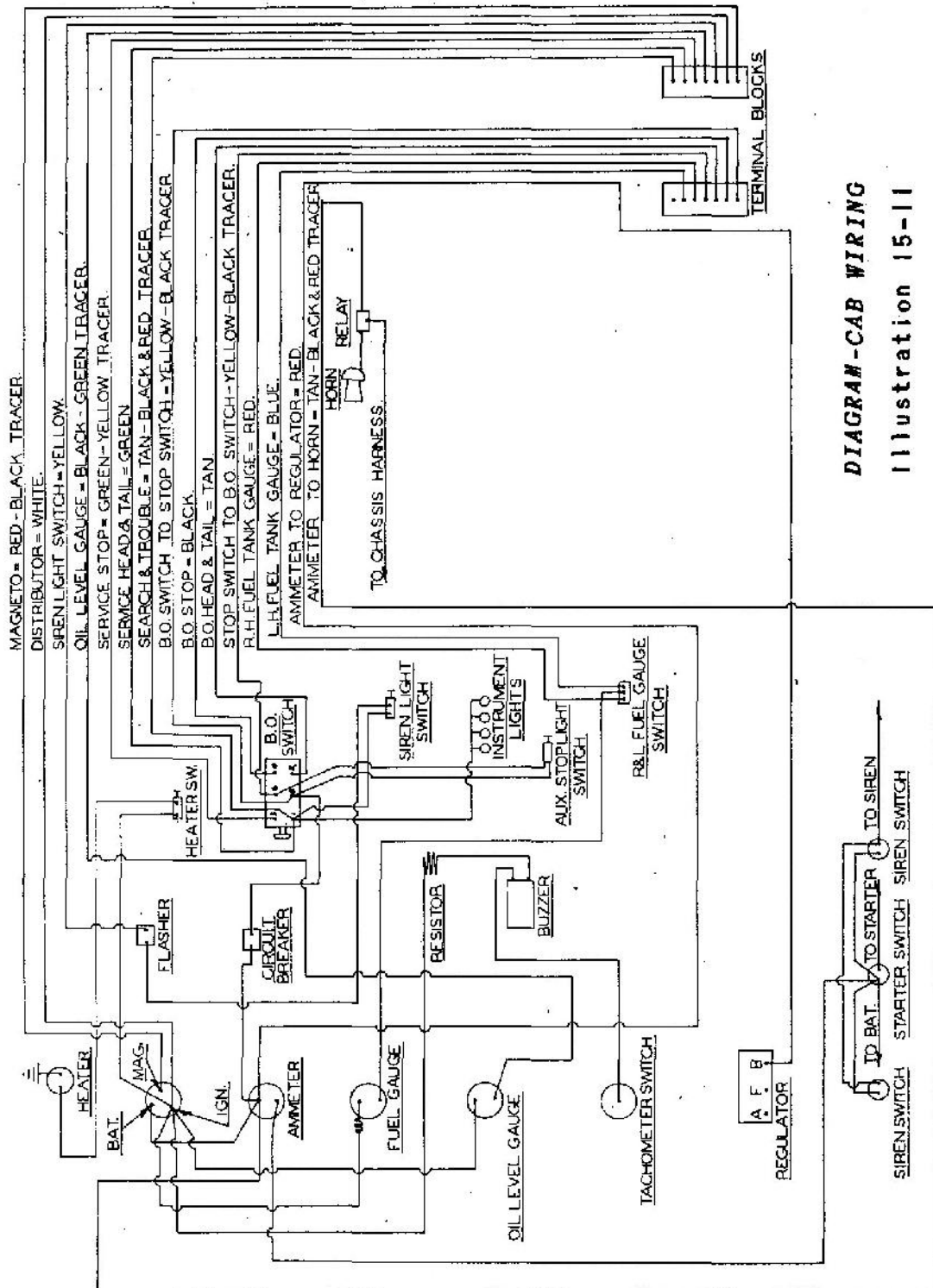
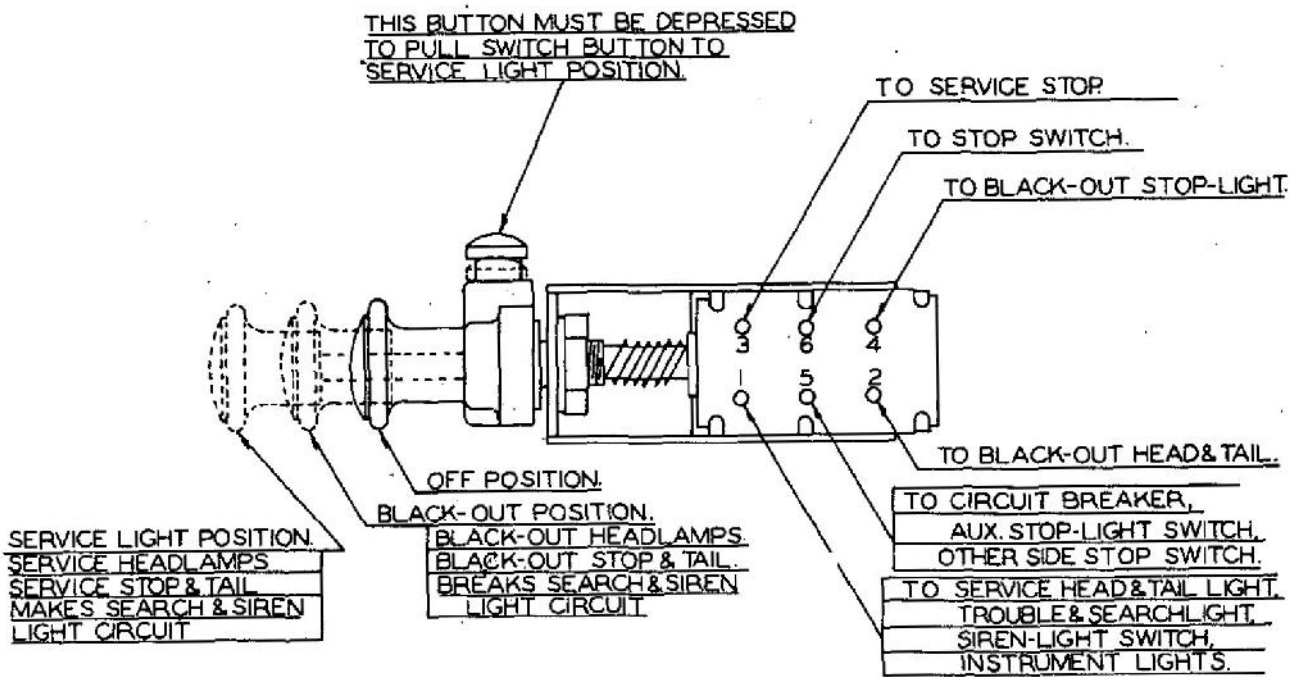


DIAGRAM - CAB WIRING
 Illustration 15-11

WIRING

104. Description:

The electrical wiring consists of two harnesses. One harness is attached to the cab and includes all wiring necessary for the cab wiring circuit. The other harness is attached to the chassis and includes all of the wiring on the chassis. These two harnesses are connected by two terminal blocks mounted on the left hand lower, outer side of the dashboard of the cab. The wires are all made up in different code colors which may be readily referred to for their identification in the wiring diagram.



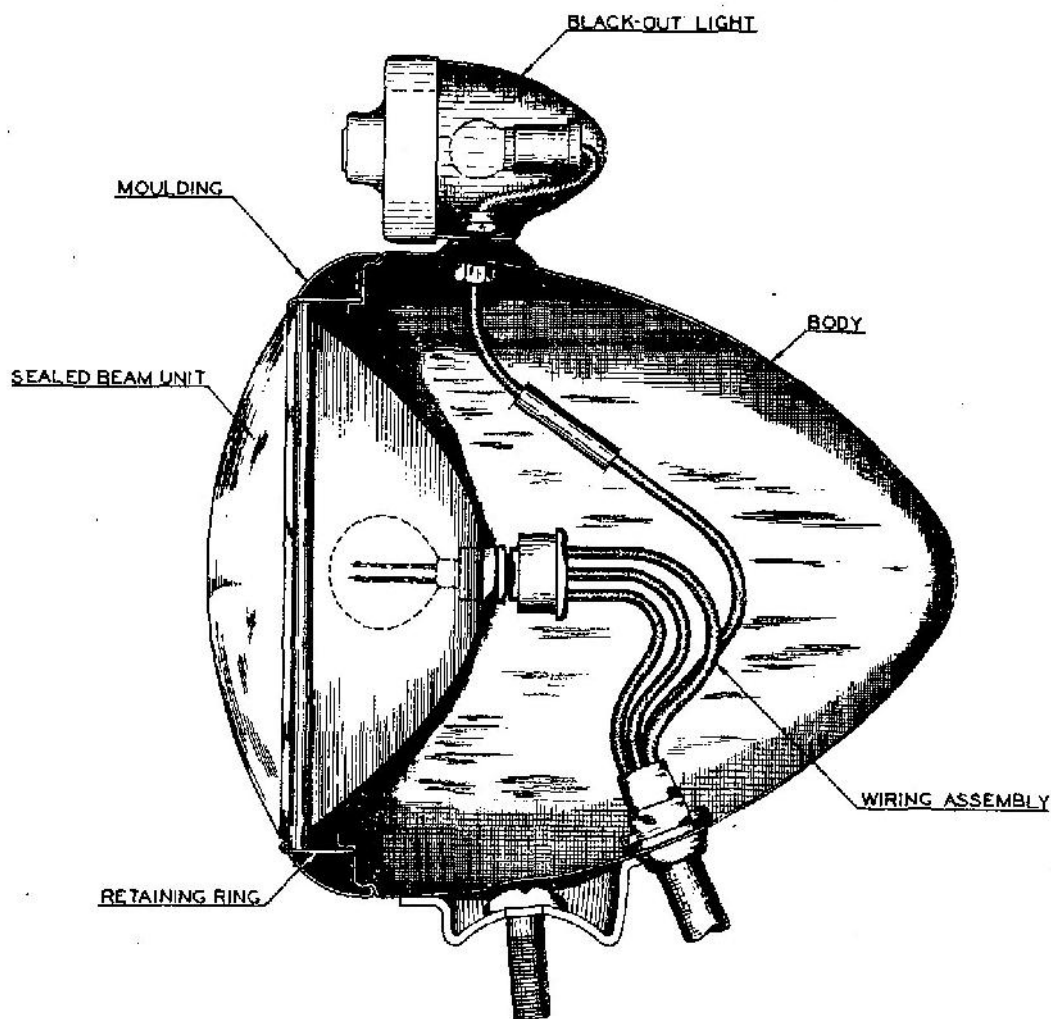
BLACK-OUT SWITCH POSITIONS & HOOK-UP

Illustration 15-12

HEADLIGHTS

105. Specifications:

Manufacturer:	Guide (Guide Lamp Division of General Motors Corp'n.)
Model:	1011-N
Type:	Combination Service and Blackout
Voltage:	12



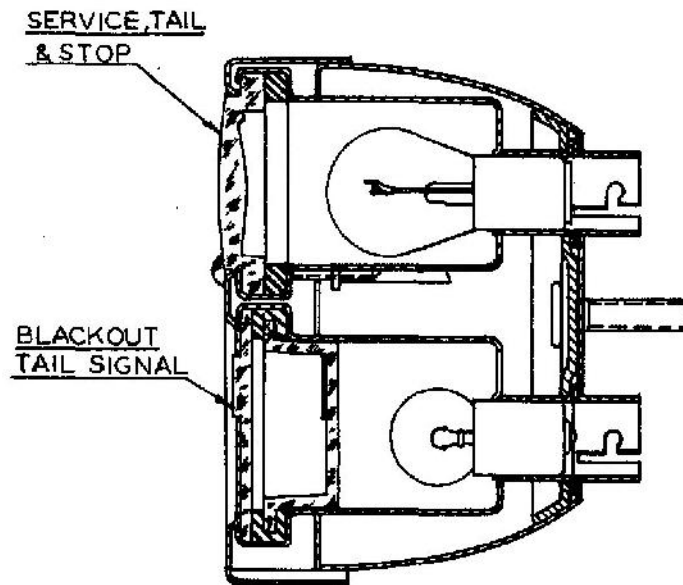
HEAD AND BLACK-OUT LAMP
Illustration 15-13

106. Description:

The headlight consists of one sealed beam unit with high and low beam and one blackout lamp mounted on top of the headlight shell for blackout use. There are four wires connecting the headlights, one for the blackout lamp, one each for the high and low beam, and one ground wire.

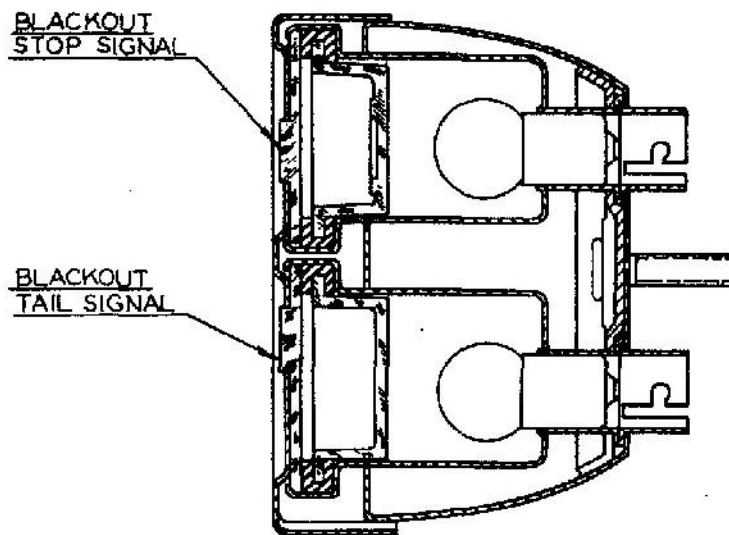
(168)

HEAVY WRECKING TRUCK M1



**BLACKOUT TAIL & SERVICE
STOP LAMP ASSEMBLY**

Illustration 15-14



BLACK-OUT TAIL & STOP LAMP ASSEMBLY

Illustration 15-15

TAIL LIGHTS

107. Specifications:

Manufacturer:	Guide (Guide Lamp Division of General Motors Corp'n.)
Model:	3012-C (Left-hand) 3012-D (Right-hand)
Type:	Service & Blackout (Left-hand) Blackout only (Right-hand)
Voltage:	12

108. Description:

The left-hand combination stop and tail light consists of a double filament globe in the upper half which is used as a service stop light and service tail light. The lower half is a blackout tail light only. There are two sockets for connecting this light, the upper one a double socket for the service stop and tail light and the lower one a single socket for the blackout tail light.

The right-hand combination stop and tail lamp consists of a blackout stop unit in the upper section and a blackout tail light unit in the lower section. There are two sockets for connection, the upper one a single socket for connecting the blackout stop and the lower one a single socket for connecting the blackout tail lamp.

SEARCHLIGHT

109. Specifications:

Manufacturer:	Dietz (R. E. Dietz Co.)
Model:	600-OD
Voltage:	12

110. Description:

The searchlights are mounted through the base and are movable in any direction. 12-volt, single-contact light globes are used. Connection is made by a single contact socket in the rear of the searchlight shell.

SIREN LIGHT

111. Specifications:

Manufacturer:	Sterling Siren & Fire Alarm Co.
Model:	20 (Siren)
Voltage:	12

SIREN LIGHT (Cont.)

112. Description:

The siren light is contained in the forward portion of the siren and is covered by a red lens held on by a conventional mounting rim. Electrical connection is made by a lead extending from the lower portion of the siren.

INSTRUMENT LIGHTS

113. Description:

The instrument lights consist of one harness to which are attached four instrument lights for illuminating the instrument panel.

FUEL SYSTEM

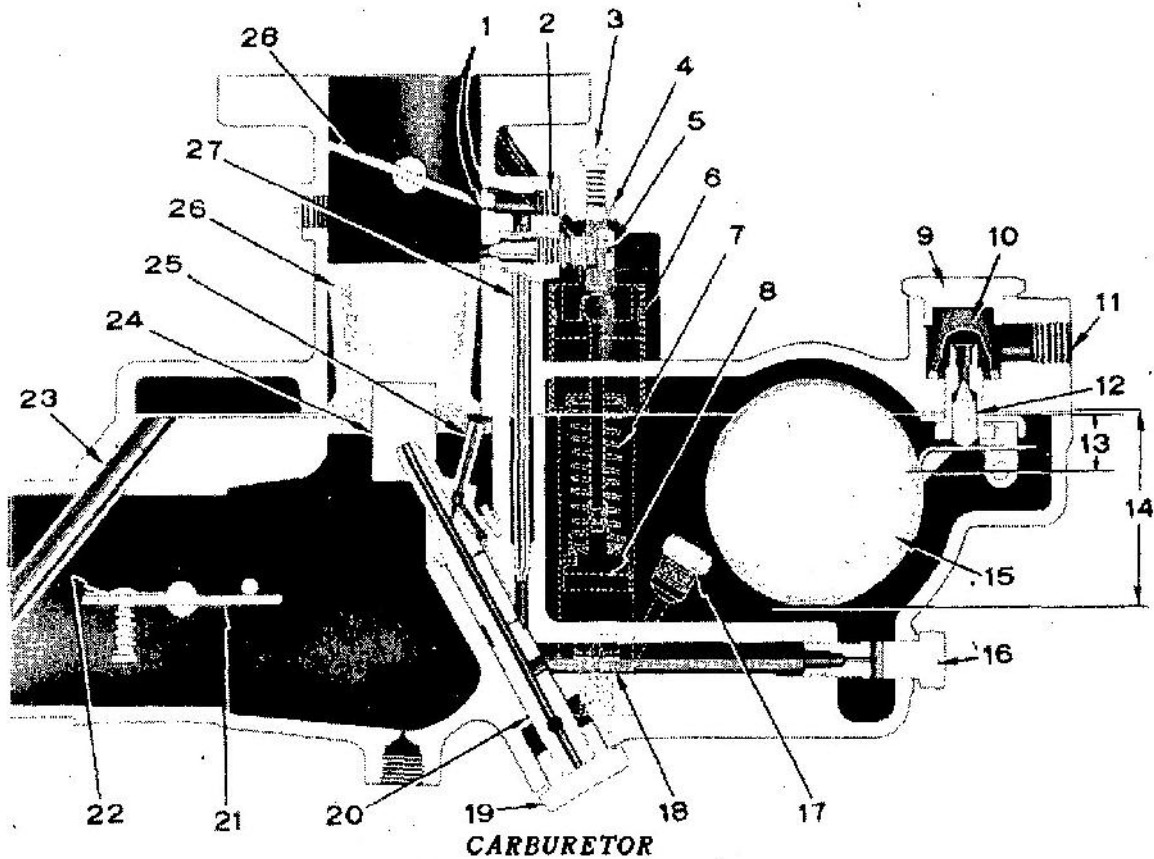


Illustration 16-1

1. Idle Discharge Holes
2. Idle Discharge Plug
3. Pump Adjustment Screw
4. Pump Adjustment Lock Screw
5. Idle Needle Valve
6. Vacuum Piston
7. Accelerating Pump Spring
8. Accelerating Pump Piston
9. Strainer Plug
10. Strainer
11. Gasoline Inlet
12. Float Needle Valve and Seat
13. Fuel Level
14. Float Setting
15. Float
16. Metering Jet
17. Check Valve
18. Combination Power and Pump By-Pass Jet
19. Main Discharge Jet Nut
20. Main Discharge Jet
21. Choke Valve
22. Choke Poppet Valve
23. Vent Tube
24. Small Venturi
25. High Speed Bleed
26. Large Venturi
27. Idle Tube
28. Throttle Valve

Section XVI
FUEL SYSTEM

114.

TITLE	Paragraph No.
Fuel System	114
Specifications; Carburetor	115
Description	116
Specifications; Fuel Pump	117
Description	118
Specifications; Air Cleaner	119
Description	120
Specifications; Governor	121
Description	122
Specifications; Fuel Tanks (2)	123
Service Diagnosis and Cause	124
Caution	125

The fuel system on this vehicle consists of the controls, fuel gauges, fuel tanks, fuel lines, fuel pump, governor, carburetor and air cleaner.

The fuel stored in the fuel tank is drawn through the lines by the pump and forced into the carburetor where it is mixed with clean air coming through the air cleaner in the proper quantities before being delivered to the engine manifold.

CARBURETOR

115. Specifications:

Manufacturer:	Stromberg
Model:	SF-4
Type	Updraft

116. Description:

This carburetor is the plain tube updraft type with a fixed main jet and a vacuum controlled accelerating pump. The main jet determines the maximum amount of fuel which may be obtained for high speed operation. The Venturi size controls the volume of the air stream through the carburetor. The necessary jets required for idling, power, economy and bridging between jets are provided.

FUEL PUMP

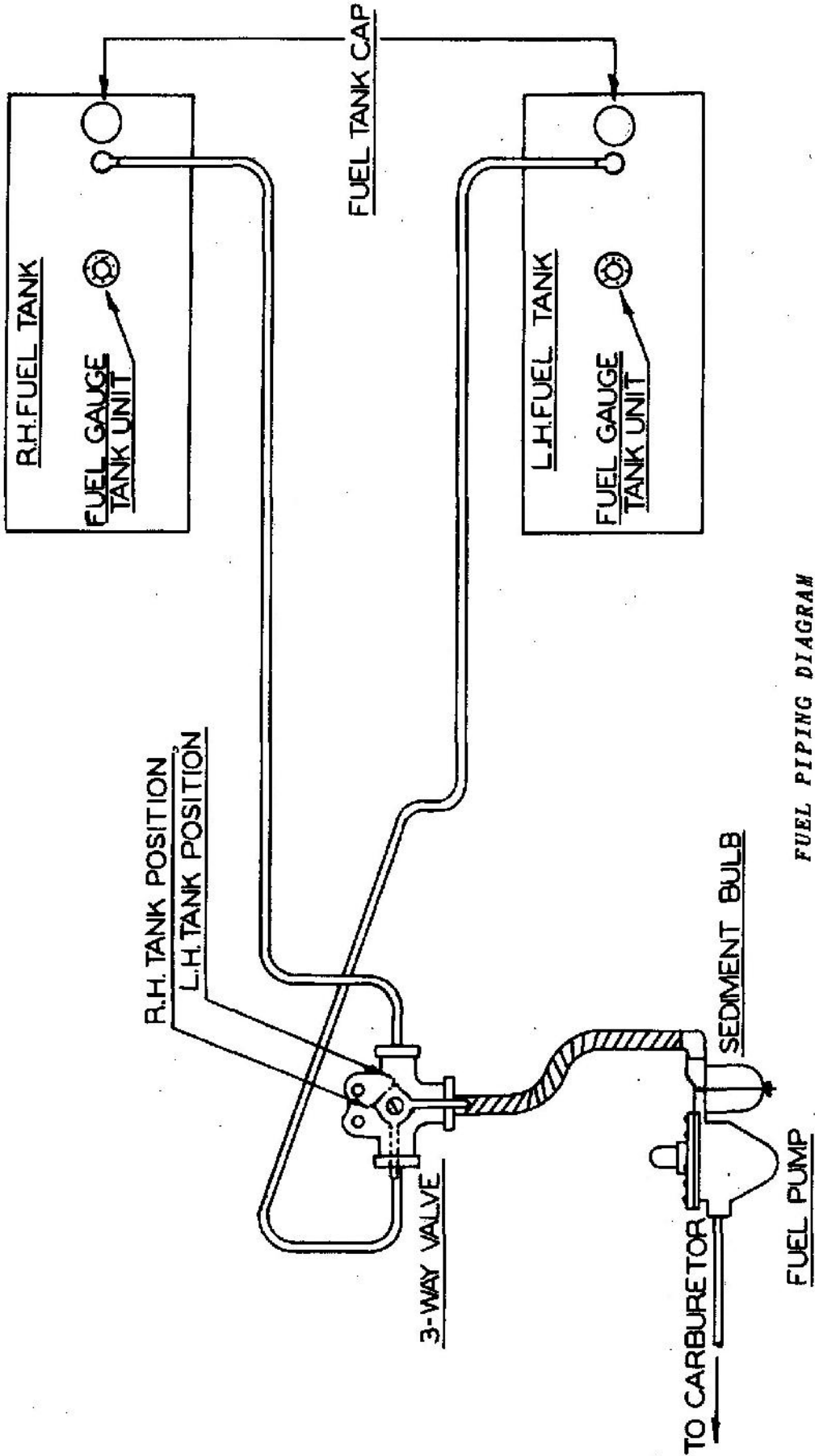
117. Specifications:

Manufacturer:	A.C. Spark Plug Division
Series:	"D"
Part Number:	1537561

118. Description:

The fuel pump is of the diaphragm type, attached to the engine block, and is mechanically operated through a

FUEL SYSTEM



FUEL PIPING DIAGRAM
Illustration 16-2

HEAVY WRECKING TRUCK M1

FUEL SYSTEM (Cont.)

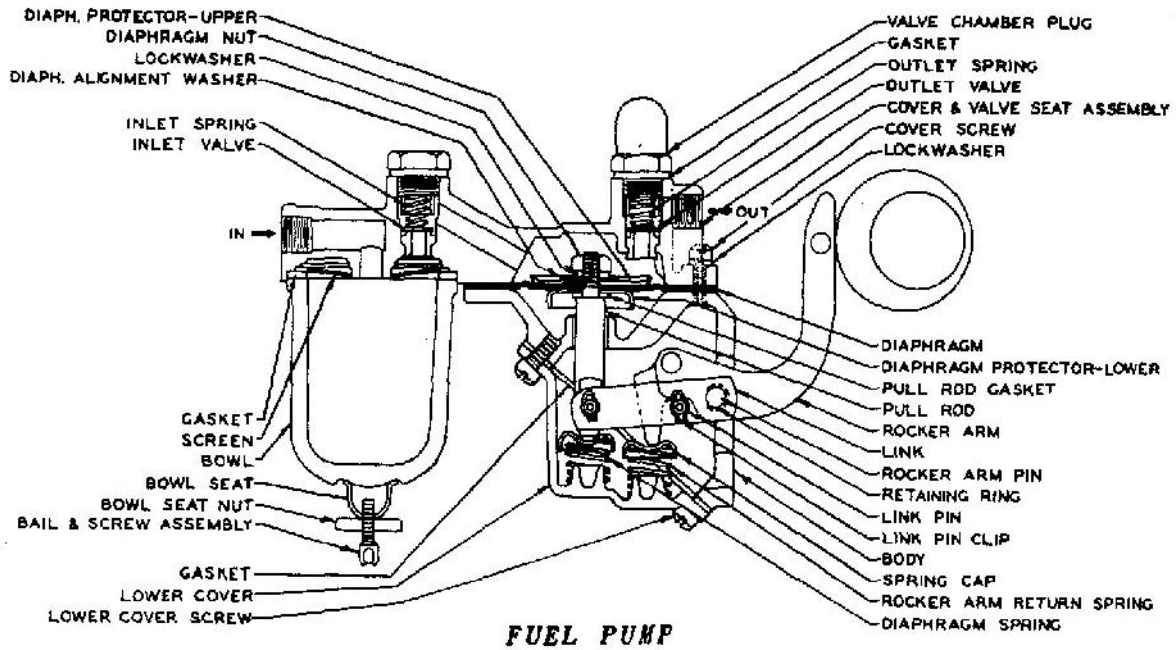
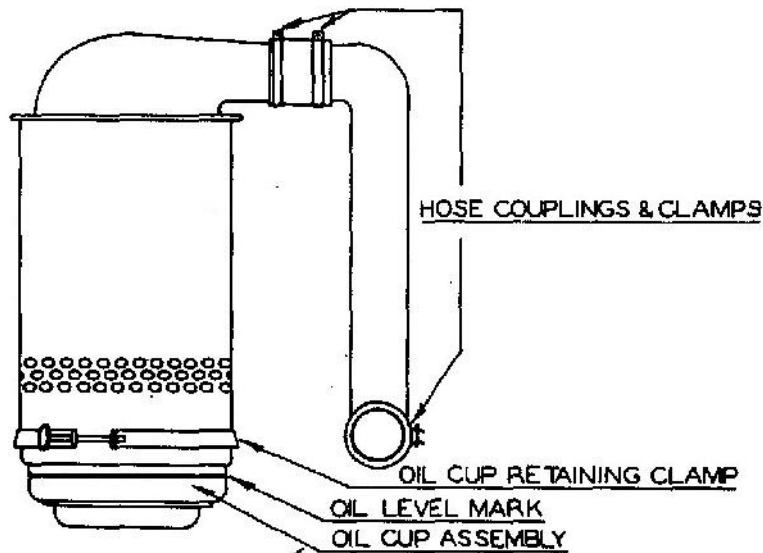


Illustration 16-3



AIR CLEANER ASSEMBLY

Illustration 16-4

FUEL SYSTEM (Cont.)

lever arm which contacts an eccentric on the engine camshaft. The diaphragm is composed of several layers of specially treated cloth that is oil and gasoline resistant. On the downward stroke of the diaphragm a vacuum is created in the pump chamber, drawing the fuel from the tanks. The upward stroke expels the fuel from the pump to the carburetor float bowl.

AIR CLEANER

119. Specifications:

Manufacturer:	Donaldson
Model:	E-900

120. Description:

GOVERNOR

121. Specifications:

Manufacturer:	C. M. Hoof Company
Model:	H-40-H

122. Description:

The governor is of the velocity type. It is mounted between the engine intake manifold and the carburetor. The velocity of the air past a butterfly valve in the governor closes this valve shutting off the supply of air and gasoline to the engine. The normal position of the governor butterfly is maintained by a cantilever type spring.

FUEL TANKS (2)

123. Specifications:

Manufacturer:	Kenworth Motor Truck Corp'n.)
Capacity:	100 Gallons
Location	Each frame side rail back of cab.

124. SERVICE DIAGNOSIS AND CAUSE

1. Excessive Fuel Consumption:
 - (a) Improper carburetor adjustment.
 - (b) High float level.
 - (c) Dirty air cleaner.
 - (d) Fuel leaks.
 - (e) Choke control stuck partially closed.
 - (f) Excessive idling.
 - (g) Improper engine temperature.
 - (h) Brakes dragging.
 - (i) Under-inflation of the tires.
 - (j) Error in the rolling radius.
 - (k) Poor engine condition.
2. Fast Idling:
 - (a) Improper control adjustment.
 - (b) Control sticking.
3. Engine Misses on Acceleration:
 - (a) Spark plugs not properly adjusted.
 - (b) Valves not properly adjusted.
 - (c) Accelerating jet partially plugged.
 - (d) Accelerating pump valve sticking.
4. Engine Dies:
 - (a) Improper idling adjustment.
 - (b) Dirty idling jet.
5. Low Fuel Pressure:
 - (a) Fuel pump diaphragm broken.
 - (b) Air leaks in fuel line connections.
 - (c) Air leak at fuel pump bowl.
 - (d) Worn fuel pump linkage.

SERVICE DIAGNOSIS AND CAUSE (Cont.)

6. Engine Will Not Start:
 - (a) Plugged fuel lines.
 - (b) Air leaks at fuel lines and filter.
 - (c) Bent or kinked fuel lines.
 - (d) Dirty fuel pump screen.
 - (e) Broken fuel pump linkage.
 - (f) Broken diaphragm return spring.
 - (g) Punctured fuel pump diaphragm.
7. Leakage at Carburetor Bowl:
 - (a) Fuel leakage at carburetor.
 - (b) Defective needle valve seat.
 - (c) Loose carburetor jet.
 - (d) Damaged gaskets.
 - (e) High float level.
 - (f) Loose connections.
8. Leakage at Fuel Pump Diaphragm:
 - (a) Loose cover screws.
9. Leakage at Fuel Pump:
 - (a) Worn or damaged gaskets.
 - (b) Sediment bowl loose.
 - (c) Loose fuel line connections.

Note:- For definition of Cause and Diagnosis of Vapor Lock refer to Section 3, Engine.

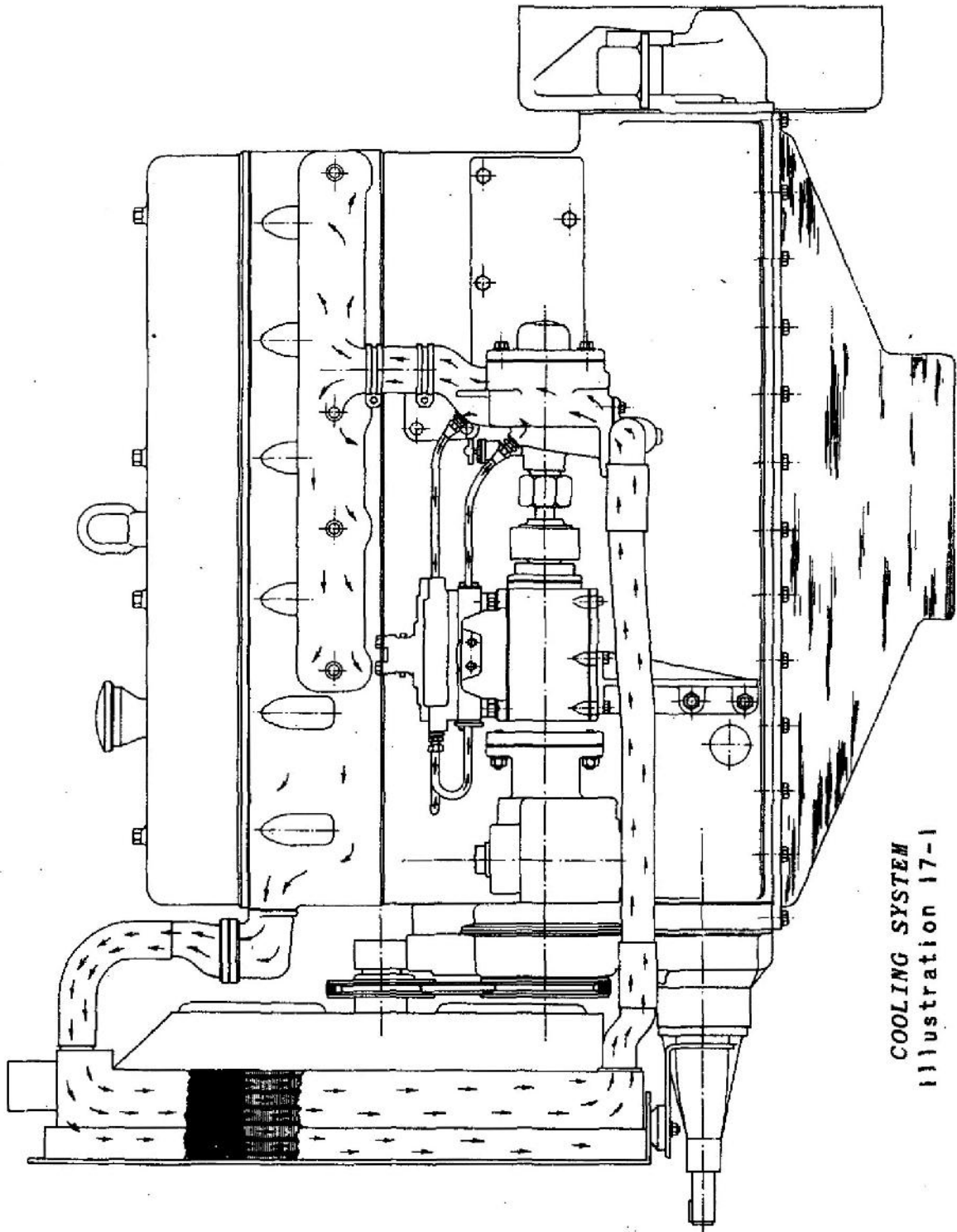
125. CAUTION

1. Do not run with the choke partially closed.
2. Do not use choke when engine is warm.
3. Do not use choke excessively.

CAUTION (Cont.)

4. Do not tamper with carburetor adjustments.
5. Do not fill air cleaner above indicated oil level.
6. Keep air cleaner connections tight.
7. Always have the filler hose metal end in contact with the fuel tank when filling.
8. Keep all open flame away from fuel.

COOLING SYSTEM



COOLING SYSTEM
Illustration 17-1

Section XVII
COOLING SYSTEM

TITLE	Paragraph No.
Specifications _____	126
Description _____	127
Fan Belt Adjustment _____	128
Cold Weather Protection _____	129
Service Diagnosis and Cause _____	130
Caution _____	131

126. Specifications:

<u>Cooling System Capacity:</u>	40 Quarts
 <u>Radiator</u>	
Manufacturer:	Perfex
Frontal Area:	815 Square Inches
Tubing Spacing:	7/16"
Number Fins per Inch:	12
Number Tubes:	5 Rows .
 <u>Fan</u>	
Manufacturer:	Schwitzer-Cummins
Model:	B111046
Size:	22", 6-Blade
 <u>Belt</u>	
Manufacturer:	Dayton Rubber Co.
Part Number:	S4594
Type:	"V"
Width:	1-1/16"
Outside Circumference:	41"
 <u>Water Pump</u>	
Manufacturer:	Continental
Type:	Centrifugal

127. Description:

The units which comprise the cooling system include the radiator shell and core, thermostat, temperature indicator, water pump, fan and belt, radiator mounting, engine water fittings and hose.

Water is drawn from the bottom of the radiator through the lower radiator hose into the suction side of the pump and is forced through the engine cylinder block and cylinder head water jackets. The water is returned through the upper hose connection to the radiator where it is cooled by the action of the fan drawing air through the radiator core fins.

Radiator:- The radiator is of the conventional fin and tube design having a frontal area of 815 square inches.

Description (Cont.)

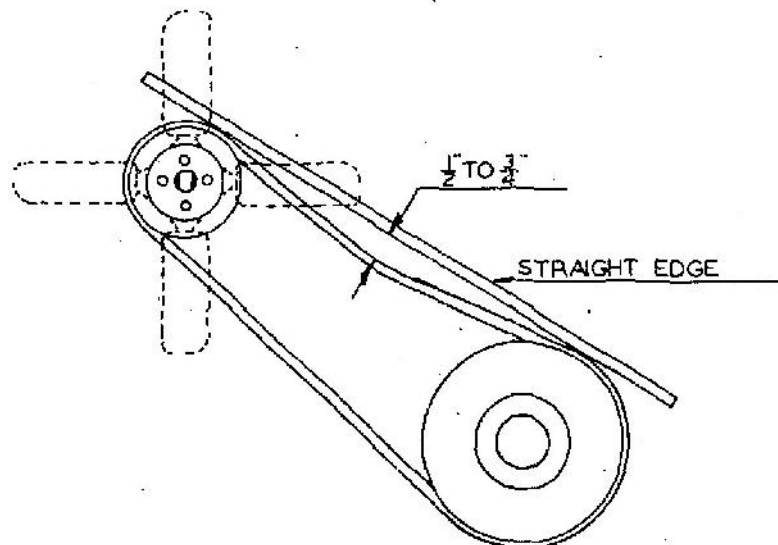
Thermostat:- The thermostat is located in the cylinder head water outlet and its function is to assist in holding the water temperature within a definite range. This unit restricts the flow of water into the radiator until a predetermined temperature is reached.

Temperature Indicator:- The temperature indicator is mounted on the instrument panel and indicates the temperature of the water in the cooling system.

Water Pump:- The water pump is located on the left side of the engine. It is driven through the air compressor by means of a coupling.

Fan and Belt:- The fan is bracketed to the engine. It is tapered roller bearing equipped, has six blades and is 22" in diameter and belt driven.

Radiator Mounting:- The radiator is secured to the shell and the shell is mounted on rubber buttons to a frame crossmember.



FAN BELT ADJUSTMENT

Illustration 17-2

128.

FAN BELT ADJUSTMENT

To adjust the fan belt loosen the clamping nut on the rear of the fan assembly mounting bracket. Pull fan assembly as a unit away from the driving pulley, i.e., towards the right side of the engine, and securely tighten nut. With correct adjustment a light pressure on the fan belt midway between the pulleys should cause from 1/2" to 3/4" deflection. Do not adjust the fan belt too tightly.

(182)

129. COLD WEATHER PROTECTION

1. Cover the indicated portion of the radiator to keep the engine temperature at normal (160° F. to 180° F.)
2. Test the radiator solution frequently with a hydrometer to check the anti-freeze properties. Remember that alcohol, if used as an anti-freeze solution, evaporates, and sufficient alcohol must be added to replace the loss.
3. Vehicle finish is softened and damaged by alcohol solutions and vapors and should be flushed off immediately with a large quantity of cold water without rubbing or wiping.
4. For additional cold weather instructions see Sec. XIX.

130. SERVICE DIAGNOSIS AND CAUSE

1. Overheating:
 - (a) Lack of water.
 - (b) Loose fan belt.
 - (c) Belt bottoming in pulley.
 - (d) Thermostat stuck closed.
 - (e) Water pump inoperative.
 - (f) Cooling system clogged.
 - (g) Incorrect ignition timing.
 - (h) Brakes dragging.
 - (i) Error in tire rolling radius.
 - (j) Radiator core air passages clogged.
2. Engine Running Cold:
 - (a) Thermostat remaining open.
 - (b) Radiator core requires partial covering.
3. Loss of Cooling Liquid:
 - (a) Leaking hose connections.
 - (b) Defective water pump seal.

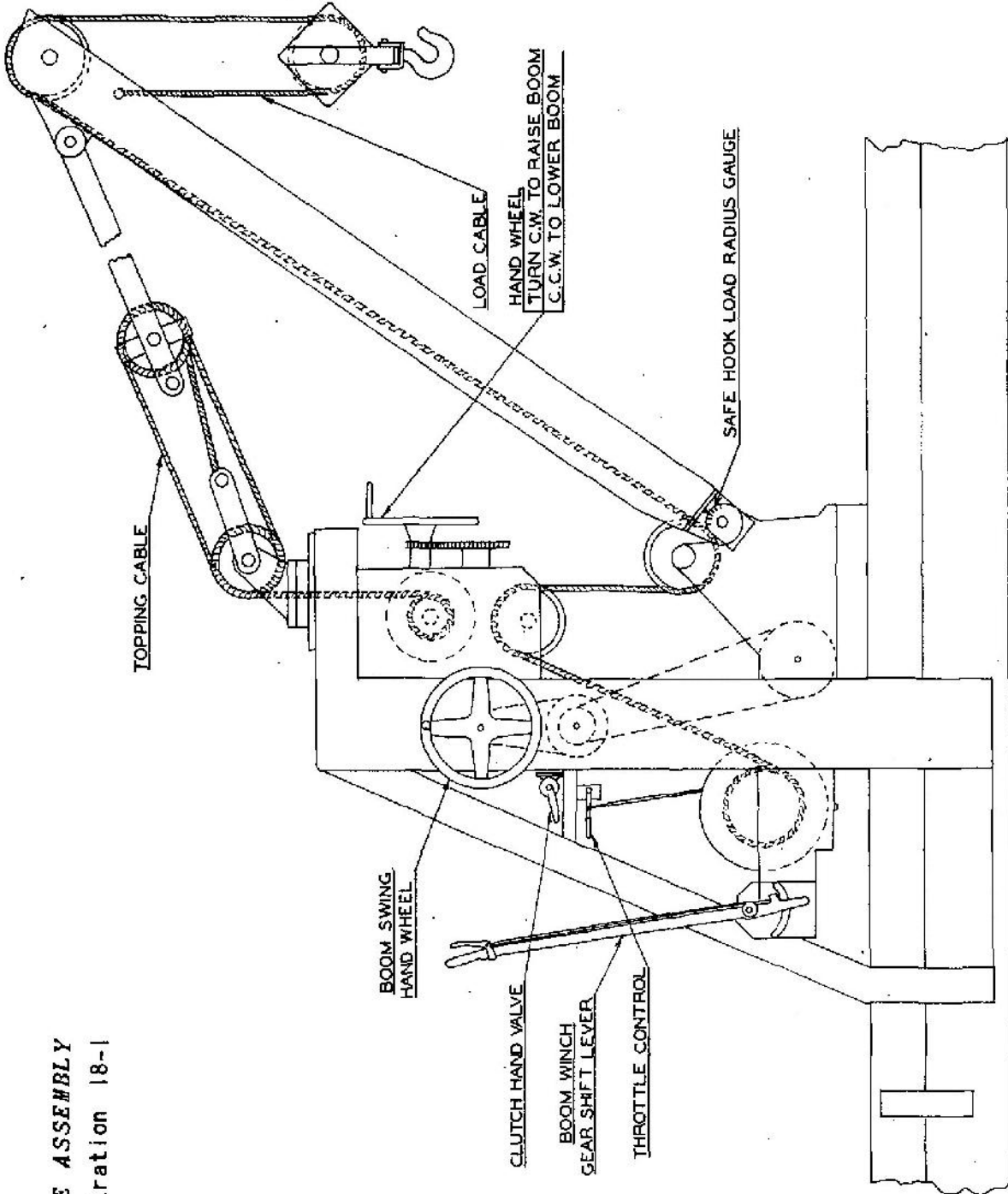
SERVICE DIAGNOSIS AND CAUSE (Cont.)

(c) Leaking radiator core.

131. CAUTION

1. Keep the radiator filled with clean, soft water.
2. Whenever cooling system is drained be sure the cylinder block as well as the radiator is empty. Two drain cocks are provided, one on the lower radiator hose connection on the bottom of the water pump and one at the right rear corner of the engine block. It is advisable to run the engine for a few seconds at a fast idle to make certain that all water is out of the cooling system. When drain cocks are open it is well to push a wire into them unless there is a good flow and likewise again after the water stops to be sure the cooling system is entirely drained and that the drain cock is not plugged.
3. When filling the cooling system close both drain cocks (one on lower hose connection on bottom of water pump and one on right rear corner of the cylinder block).
4. Do not overfill radiator when anti-freeze solution is being used, as normal expansion of heated water causes the level in the radiator to rise, with subsequent loss of the anti-freeze solution.
5. Cold water should never be poured into the cooling system when the engine is hot. Any sudden change in temperature may cause damage to the cylinder head, engine block, etc.
6. During freezing weather, if anti-freeze solutions are not used, the entire cooling system should be drained when the truck is not in use, as described above.
7. Where temperatures reach 32° F. or colder cooling solutions which will not freeze must be used.
8. Keep the hose connections tight.
9. Examine the water pump daily for excessive leaks around the packing gland.
10. If the cooling system is frozen solid place the vehicle in a warm place until it is thoroughly thawed out. Under no circumstances should the engine be run when the cooling system is frozen solid.
11. Remove radiator cap when draining cooling system to assure proper drainage.

HEAVY WRECKING TRUCK M1



CRANE ASSEMBLY
Illustration 18-1

BODY & CRANE

Section XVIII BODY & CRANE

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HEAVY WRECKING TRUCK M1

132-133

BODY & CRANE

132. SpecificationsCRANE

Manufacturer: Gar Wood Industries, Inc.
 Model: US-5
 Capacity: 20,000 Lbs.
 Swinging Arc: 180°

Boom Cable

Length: 33'6"
 Size: 1/2" - Hemp center

Crane Winch

Manufacturer: Gar Wood Industries, Inc.
 Model: 2C607K

Crane Winch Cable

Length: 100'
 Size: 5/8" - Hemp center

Front Winch

Manufacturer: Gar Wood Industries, Inc.
 Model: 3U615
 Capacity: 20,000 Lbs. direct pull

Front Winch Cable

Length: 300'
 Size: 5/8" - Steel center

Rear Winch

Manufacturer: Gar Wood Industries, Inc.
 Model: 5M713K
 Capacity: 47,500 Lbs.

Rear Winch Cable

Length: 350'
 Size: 3/4" - Steel center

133. Description

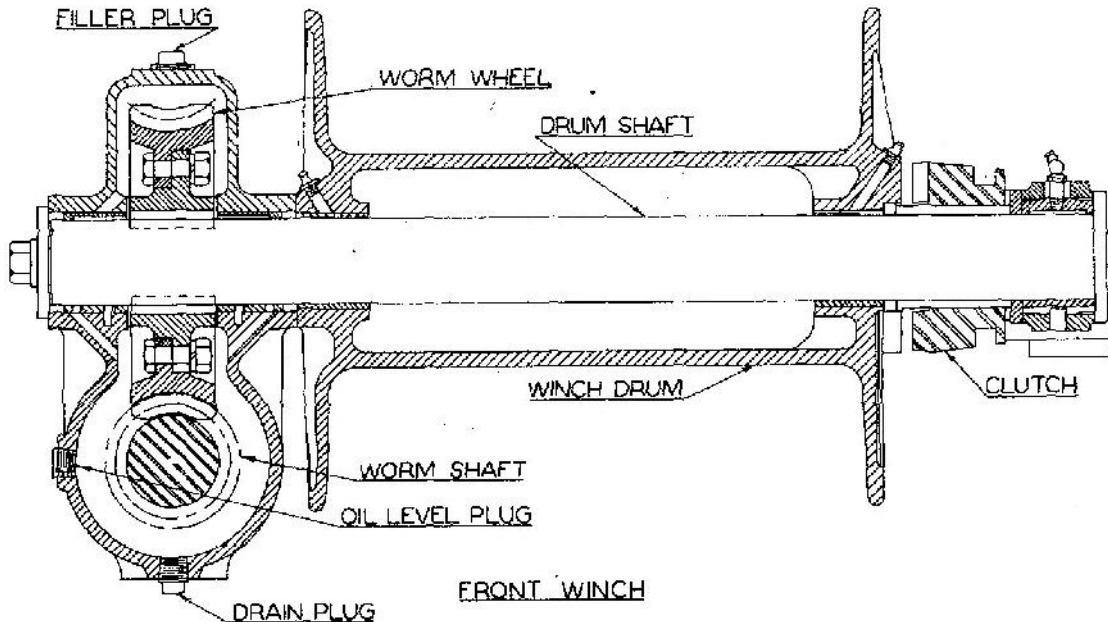
CRANE

The crane on this vehicle is the single boom type, so constructed that the boom can be raised or lowered and swung through an arc of 180°. Raising, lowering and swinging of the boom are manual operations.

Two sets of adjustable jack legs are provided to support the boom and vehicle for capacity lifts. Lifting is accomplished by a power driven winch, controlled from the body of the vehicle.

An automatic wormshaft brake is installed on each winch. Its purpose is to hold the load in any position the winch has placed it when the transmission is shifted into neutral or after the pin has sheared.

The topping cable, for raising and lowering the boom, is 1/2" hemp center wire rope, 33'6" long. The lifting or loading cable provided is 5/8" in diameter, preformed plough steel, 100' long, and is equipped with a lift hook and single sheave block on one end.



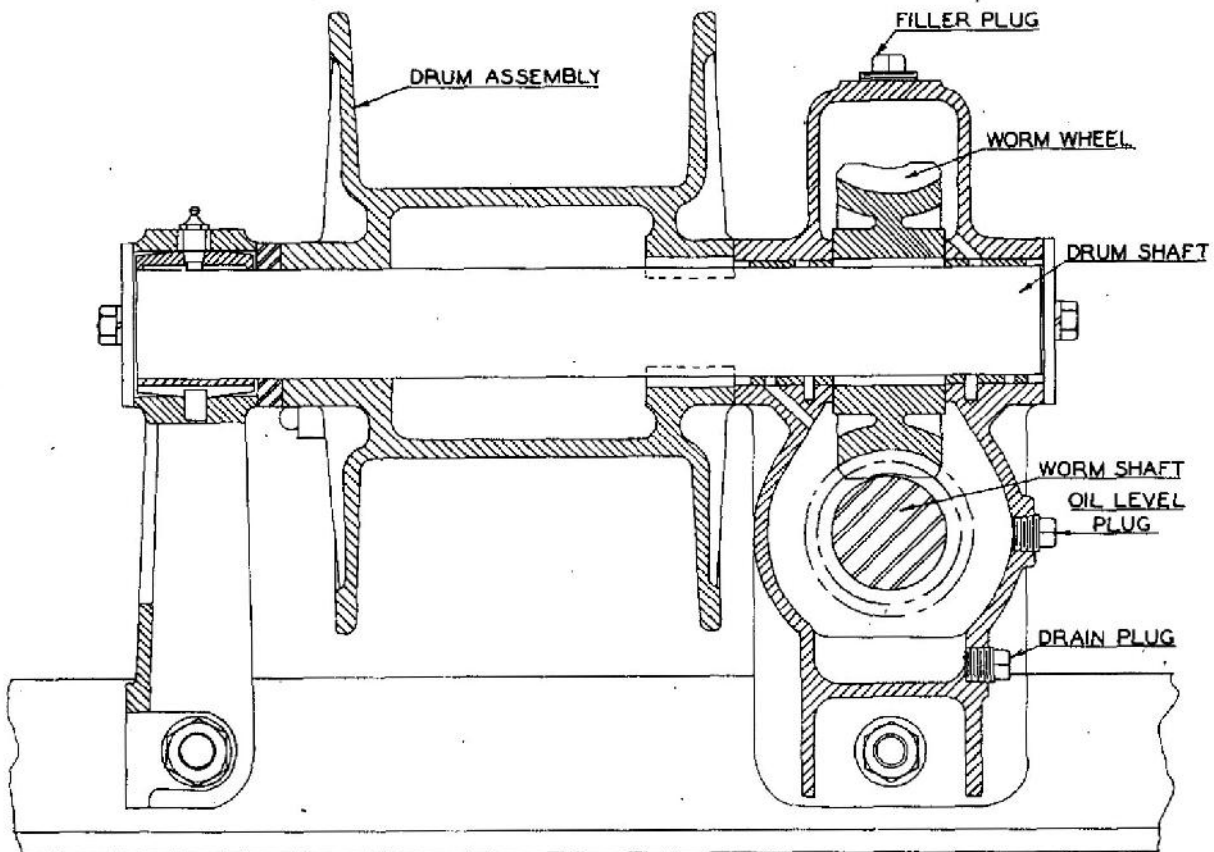
FRONT WINCH

Illustration 18-2

FRONT WINCH

34. Description

The front winch is power driven from the transi power take-off through a lay shaft and has a direct pull capacity of 20,000 Lbs. The front winch is to be used for light recovery operations only, or to assist the truck in recovery operations by forming a front end anchor when the rear winch is being used, or to pull the truck itself out if it becomes mired. The cable is 5/8" x 300' with 4' chain and hook attached.



REAR WINCH ASSEMBLY

Illustration 18-3

REAR WINCH

135. Description

The rear winch is power driven from the transfer case power take-off through a two-speed and reverse gear box. It has a direct pull capacity of 47,500 Lbs. The winch cable is $\frac{3}{4}$ " in diameter, preformed plough steel, 350' long. To this cable is attached a $6\frac{3}{4}$ " chain and hook.

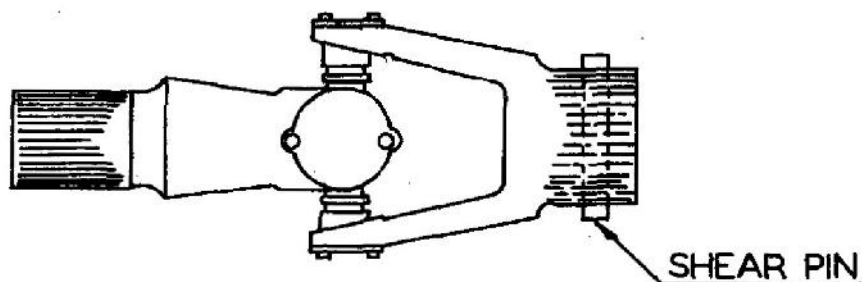
136.

WINCHES - GENERAL

Each winch (Crane, Front and Rear) has a separate set of controls. They can be used in conjunction with one another or singly. Operation of each will be covered individually.

In one yoke of each propeller shaft is installed a shear pin. This shear pin acts as a safety fuse to prevent overloading the winches. In the event a load is imposed on any winch beyond its rated capacity the pins will shear, thereby protecting the winch affected. This shear pin for each winch is located as follows.

Front Winch:	In hub of plain yoke immediately to the rear of the winch worm gear housing.
Rear Winch:	In hub of worm drive sprocket.
Crane Winch:	In hub of worm drive sprocket.



WINCH UNIVERSAL JOINT SHOWING SHEAR PIN

Illustration 18-4

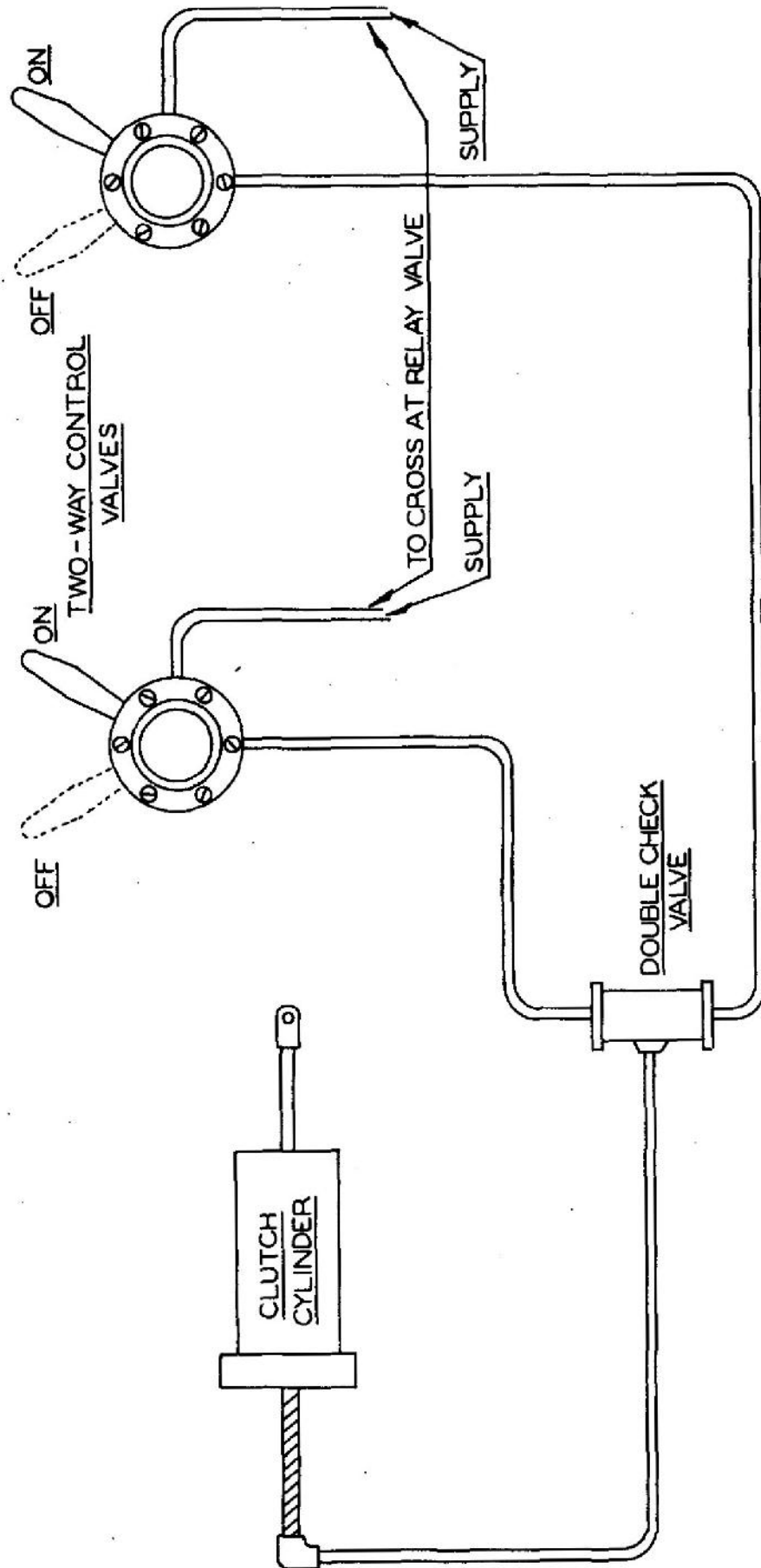
To Replace Shear Pin:

- (1) Realign holes in yoke and shaft.
- (2) Drive out the remains of sheared pin with a hammer and punch.
- (3) Install new pin.

137. CAUTION:

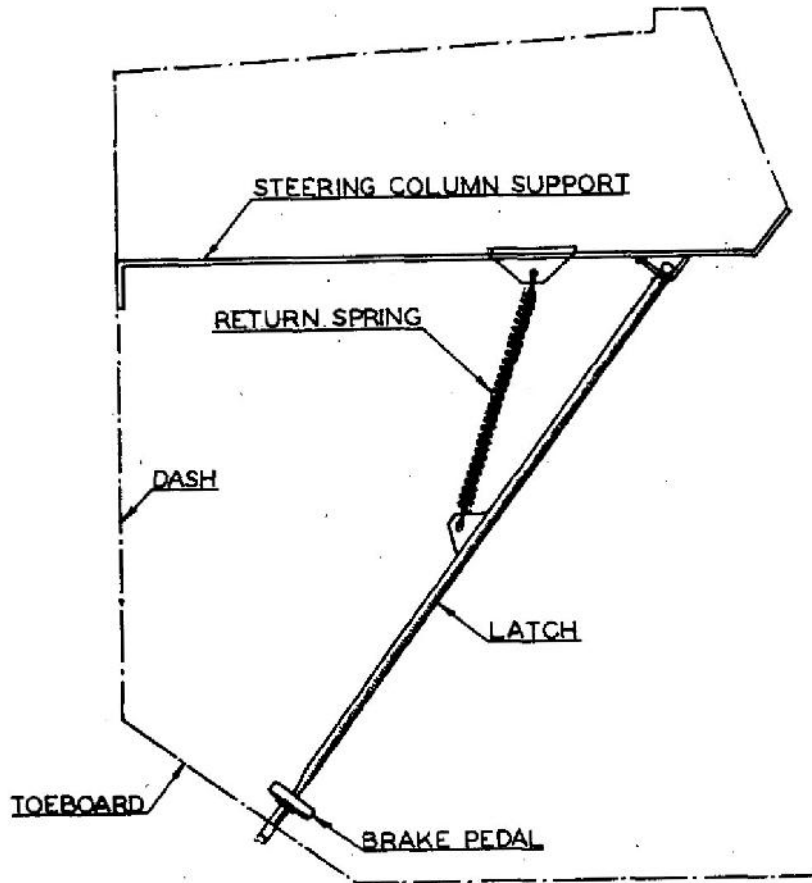
- (1) Do not use other than standard shear pins provided in equipment.

HEAVY WRECKING TRUCK M1

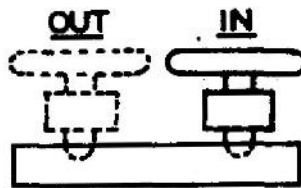


AIR CLUTCH PIPING DIA.
Illustration 18-5

BODY & CRANE

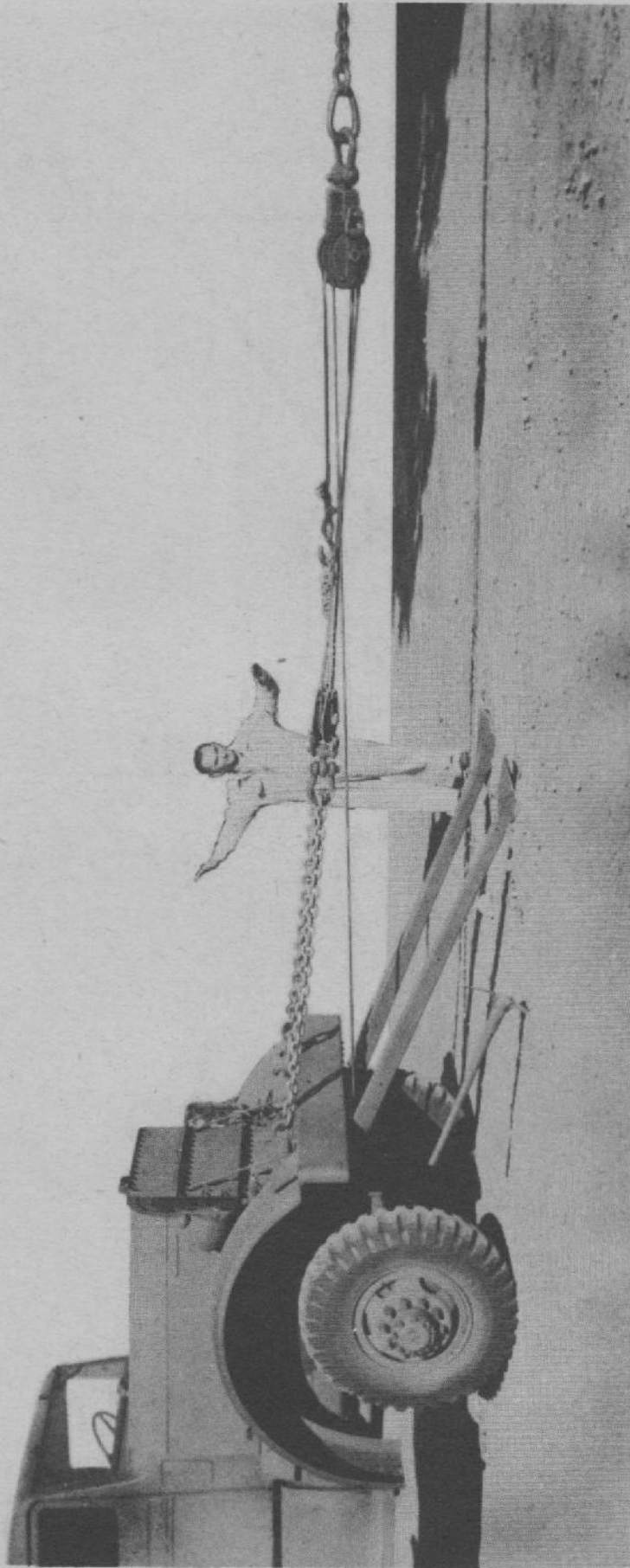


SERVICE BRAKE LATCH
Illustration 18-6



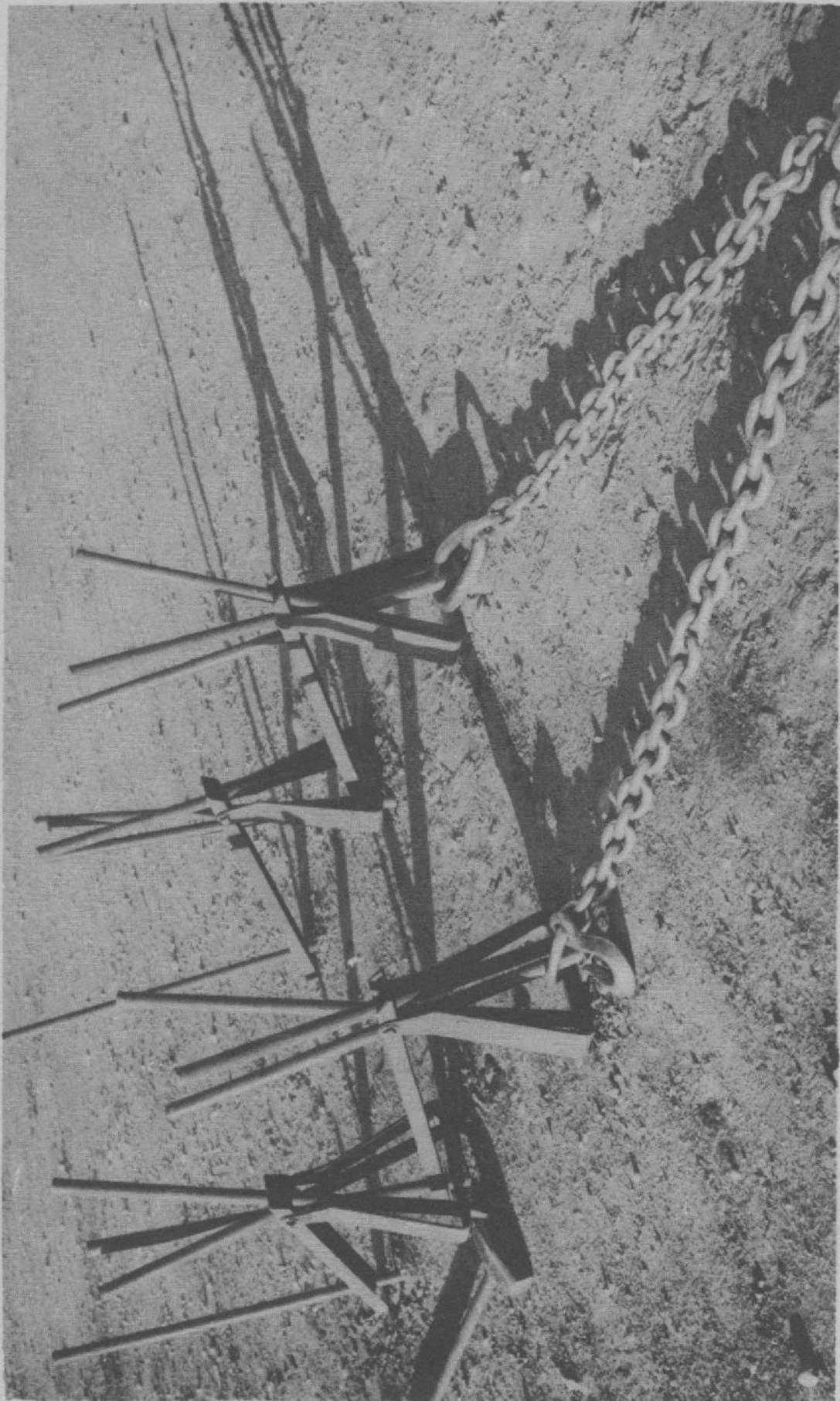
FRONT WINCH ENGAGEMENT
Illustration 18-7

HEAVY WRECKING TRUCK M1



FRONT WINCH RECOVERY
Illustration 18-8

BODY & CRANE



ANCHOR STAKE POSITIONING Illustration 18-9

FRONT WINCH OPERATION**138. Vehicle Positioning**

Positioning the vehicle at the object of recovery for front winch recovery must be made in the proper manner. The vehicle must be in alignment with the object of recovery in order to insure proper winding of the cable on the winch drum. Any angularity will result in an unequal fleet angle and resultant cable scrubbing, open winding, and piling up of turns at changes in layers.

Conditions permitting, the vehicle should be a minimum of 60 feet from the object of recovery when two double sheave snatch blocks are used. Single sheave snatch blocks and one single sheave snatch block will require more distance between the vehicle and the object of recovery.

Alignment of the vehicle at the object of recovery can best be made by sighting along the top hood hinge when approaching the object of recovery.

139. Preparation for Recovery

- (a) Start the engine.
- (b) Lock the service brakes with the latch provided.
(See Illustration 18-6).
- (c) Release the hand brake.
- (d) Release the clutch.
- (e) Place the transmission in reverse gear.
- (f) Shift the power take-off into gear.
- (g) Engage the front winch jaw clutch (See Illus. 1-14).
- (h) Engage front winch sliding clutch (See Illus. 18-7).
- (i) Engage the engine clutch slightly to ease off the tension on the winch cable.
- (j) Unhook the winch cable from the tow hook.
- (k) Engage the clutch so that the operator in front can walk out with the winch cable to the object of recovery.
- (l) When sufficient cable is unwound release the engine clutch.
- (m) Shift the transmission into neutral.

FRONT WINCH OPERATION (Cont.)

- Note:- (1) To engage the power take-off and front winch jaw clutch it is frequently necessary to engage the engine clutch slightly to cause shaft rotation to permit easy engagement.
- (2) The operator walking out with the cable to the object of recovery should hold the cable as taut as possible to prevent the cable remaining on the drum from unwinding.
- (3) The speed of the cable payout is controlled by the engine speed.
- (4) The front winch is equipped with a sliding jaw clutch, hand operated at the winch itself. It is locked in the position of engagement or disengagement by raising and lowering the knob which inserts the pin into the hole provided in the positioning plate. When the jaw clutch is disengaged the drum is in free wheeling; engaged, the drum is locked in working position. It is recommended that the jaw clutch be engaged at all times in order to assure the cable's not becoming loose on the winch drum. Any cable wound on a drum should be wound coil to coil and layer to layer as tightly as possible so that when any load is placed on the cable the coils of one layer will not imbed themselves in the coils of another layer, thereby damaging the cable.

(n) Attach hook to object of recovery.

140. Recovery

- (a) Wherever possible the snatch blocks provided with the equipment should be used to relieve the load on the cable and equipment. For light loads a straight pull or a one-part line is satisfactory. For medium loads use a two-part line. For medium-heavy loads use a three-part line. For heavy loads use a four-part line.

Note:- (1) All heavy work should be done with the rear winch.

- (b) When hook-up is made to item of recovery, proceed

FRONT WINCH OPERATION (Cont.)

as follows:

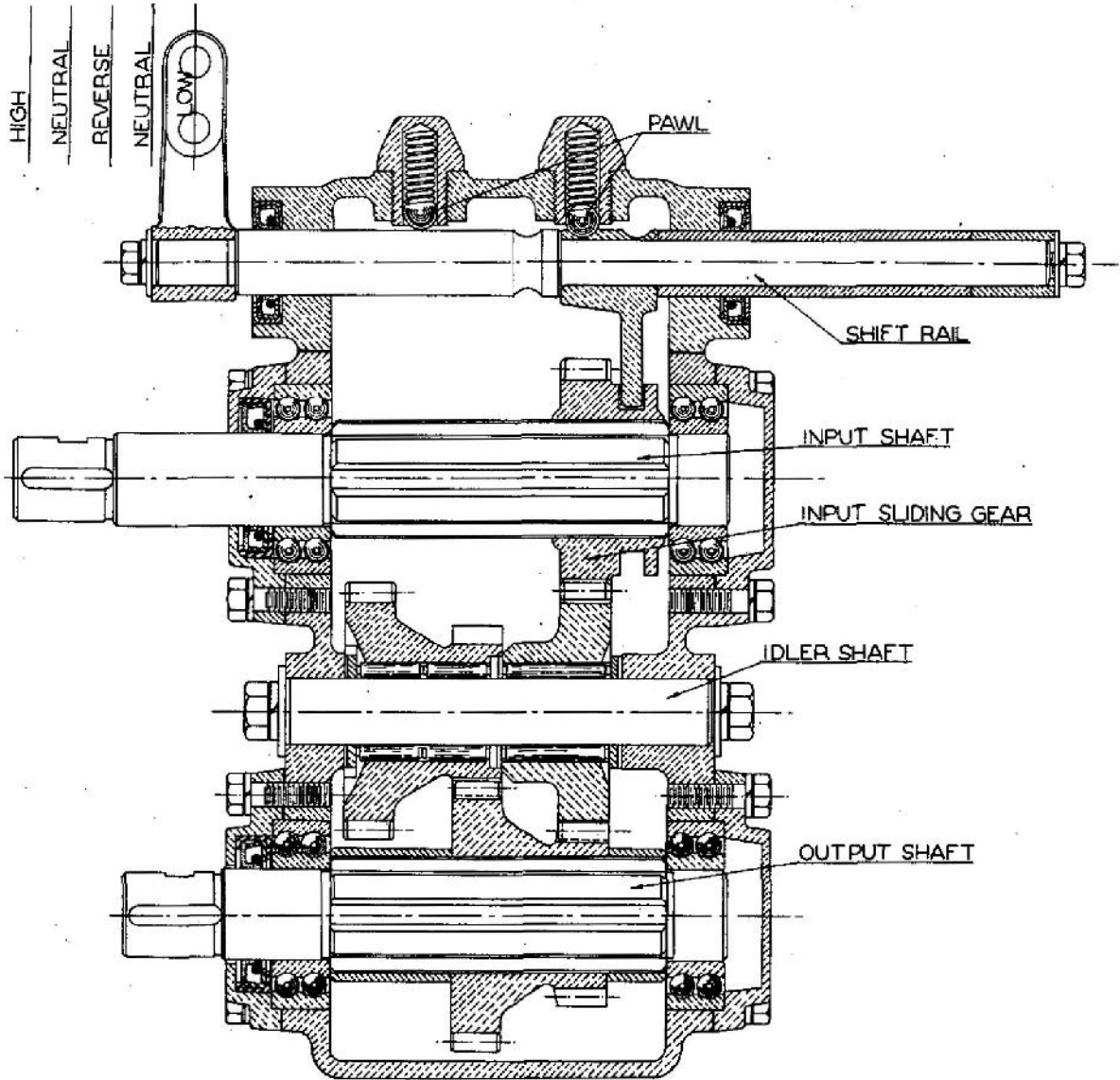
- (1) Start the engine.
- (2) Lock the service brakes with latch provided. (See Illustration 18-6).
- (3) Release the hand brake.
- (4) Release the engine clutch.
- (5) Shift the transmission into a speed suitable to the load. For heavy loads use First gear; for medium loads use Second gear; for light loads use Third gear. Select a gear low enough so that the load can be moved safely and without jerking.
- (6) Engage the power take-off.
- (7) Engage the winch jaw clutch (See Illus. 1-14).
- (8) Engage front winch sliding clutch (See Illustration 18-8).
- (9) Signal the Ground Operators that the load is ready to be moved.
- (10) Engage the engine clutch carefully, at the same time stepping on the foot accelerator to keep the engine from stalling.

141. CAUTION: Select a gear in the transmission with which the object of recovery can be started and moved easily.

142. To Stop the Winch

- (a) Disengage the clutch.
- (b) Release the accelerator.
- (c) Shift the transmission into neutral.
- (d) Disengage the power take-off.
- (e) Disengage the winch jaw clutch.

BODY & CRANE



CRANE GEAR BOX
Illustration 18-10

143.

PERMISSIBLE LIFTS

Illustration No. 18-11 shows the required set-up of truck equipment for a capacity load of 10,000 Lbs.

- (a) Body jacks in position.
- (b) Boom sway chains disconnected, permitting swinging load through 180° arc if vehicle is on level ground.

Note:-(1) Load cannot be transported with this arrangement.

Illustration No. 18-12 shows the positioning of the equipment to lift a capacity load of 10,000 Lbs.

- (a) Boom jacks connected to body corners.
- (b) Boom is positioned so that load cable is 48" to the rear of the vehicle.

Note:-(1) The load may be transported with this arrangement.

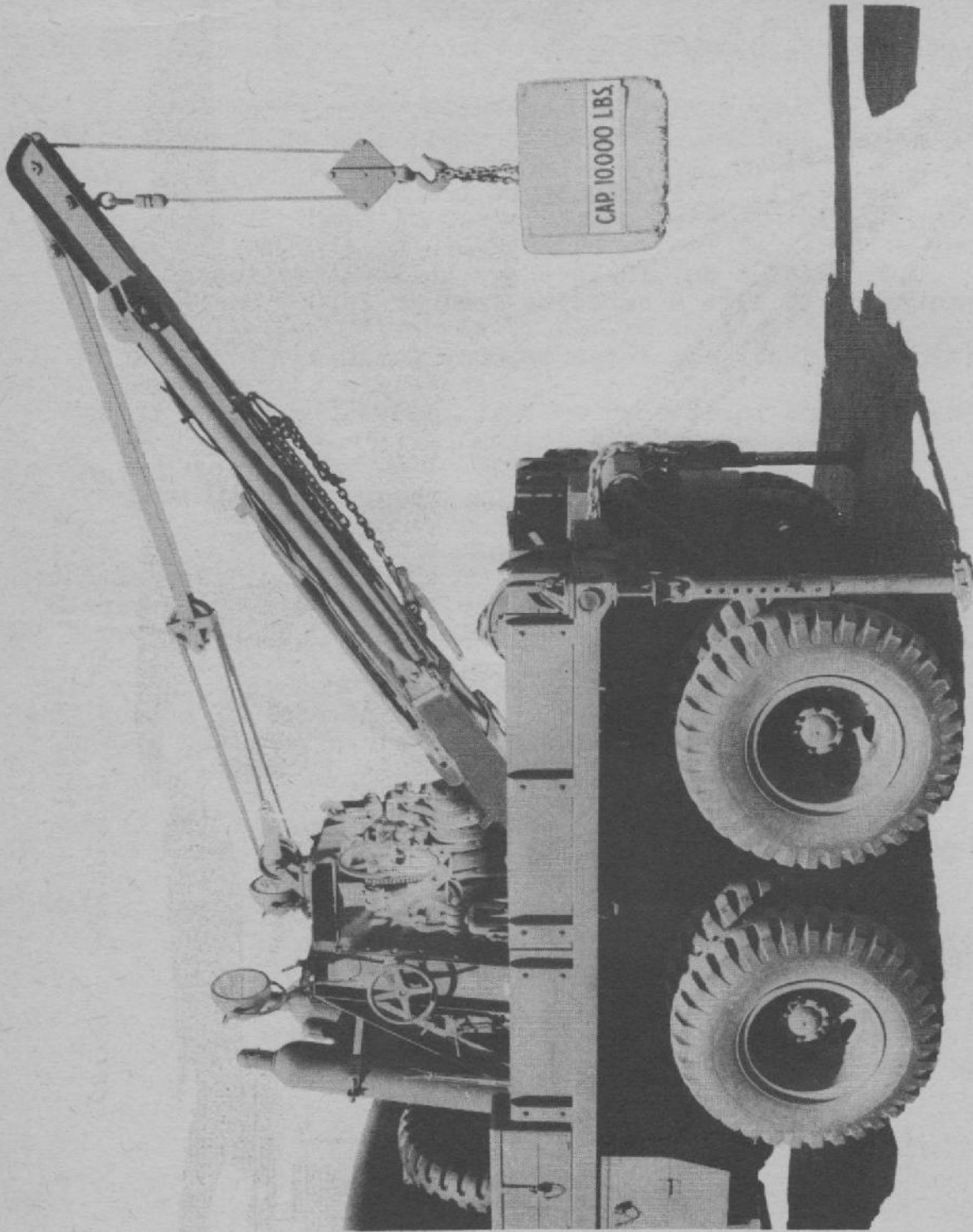
(2) Always slack off the topping cable slightly to assure the boom load's being carried on the telescoping boom jack pins.

(3) As an added safeguard, before transporting the load with this arrangement, attach the sway chains in the rings provided at the body corners.

Illustration No. 18-13 shows positioning of the truck equipment to lift a capacity load of 20,000 Lbs.

- (a) Body jacks in position.
- (b) Boom jacks extended to the ground.
- (c) Sway chains disconnected.
- (d) Double ground plate under boom jacks.

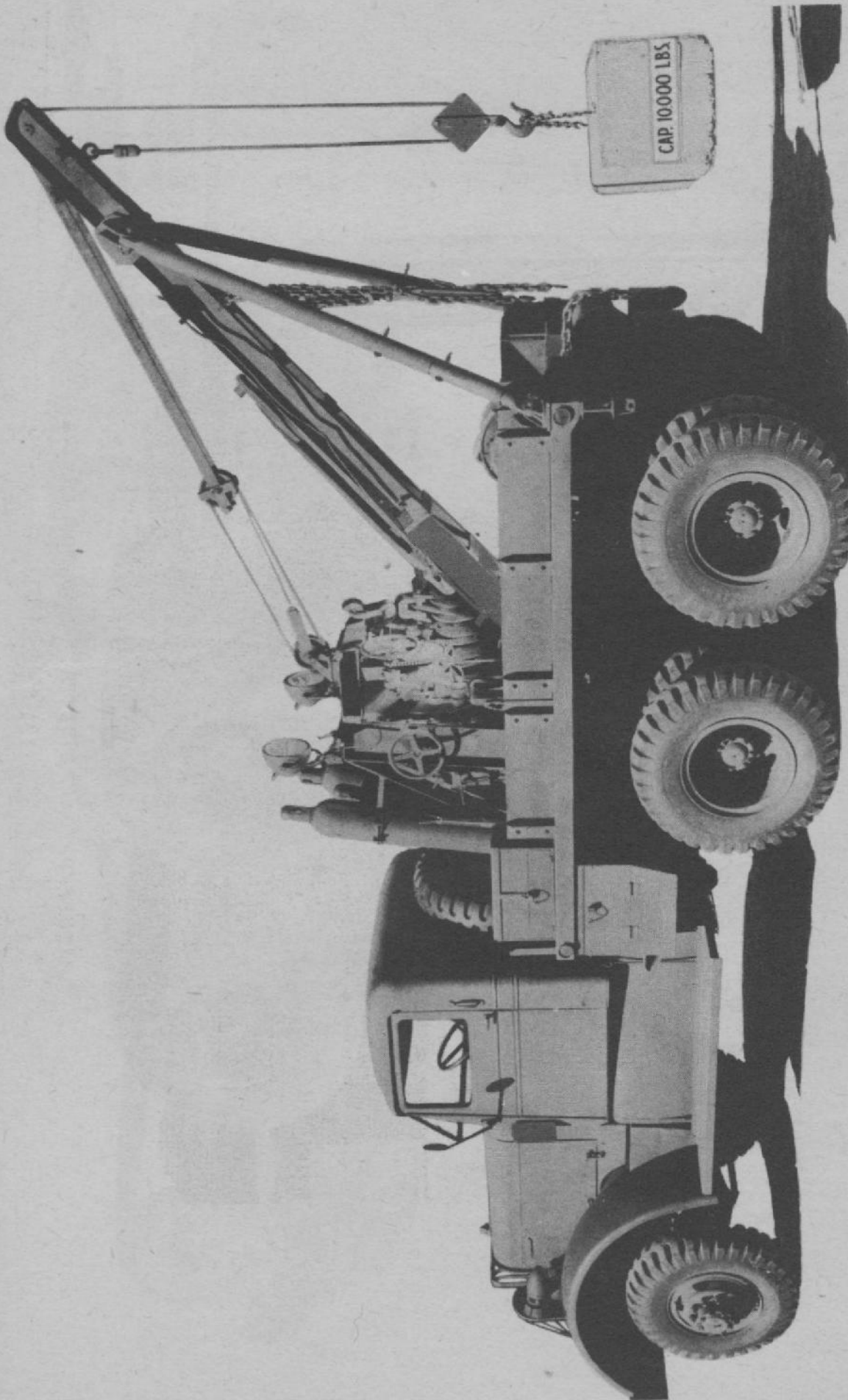
BODY & CRANE



EQUIPMENT ARRANGEMENT - 10,000 LBS. LIFT

Illustration 18-11

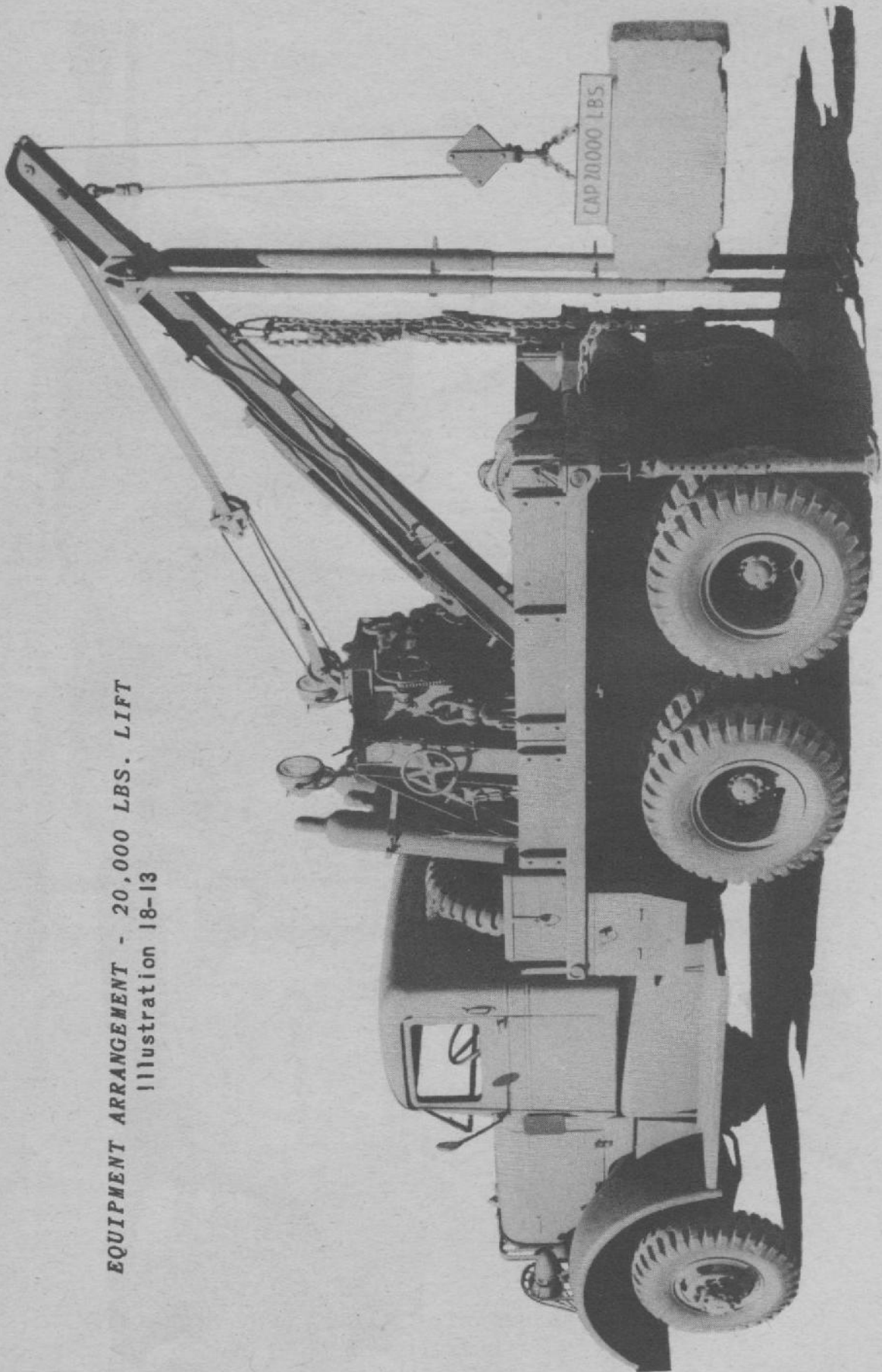
HEAVY WRECKING TRUCK M1



EQUIPMENT ARRANGEMENT - 10,000 LBS. LIFT AND TRANSPORT

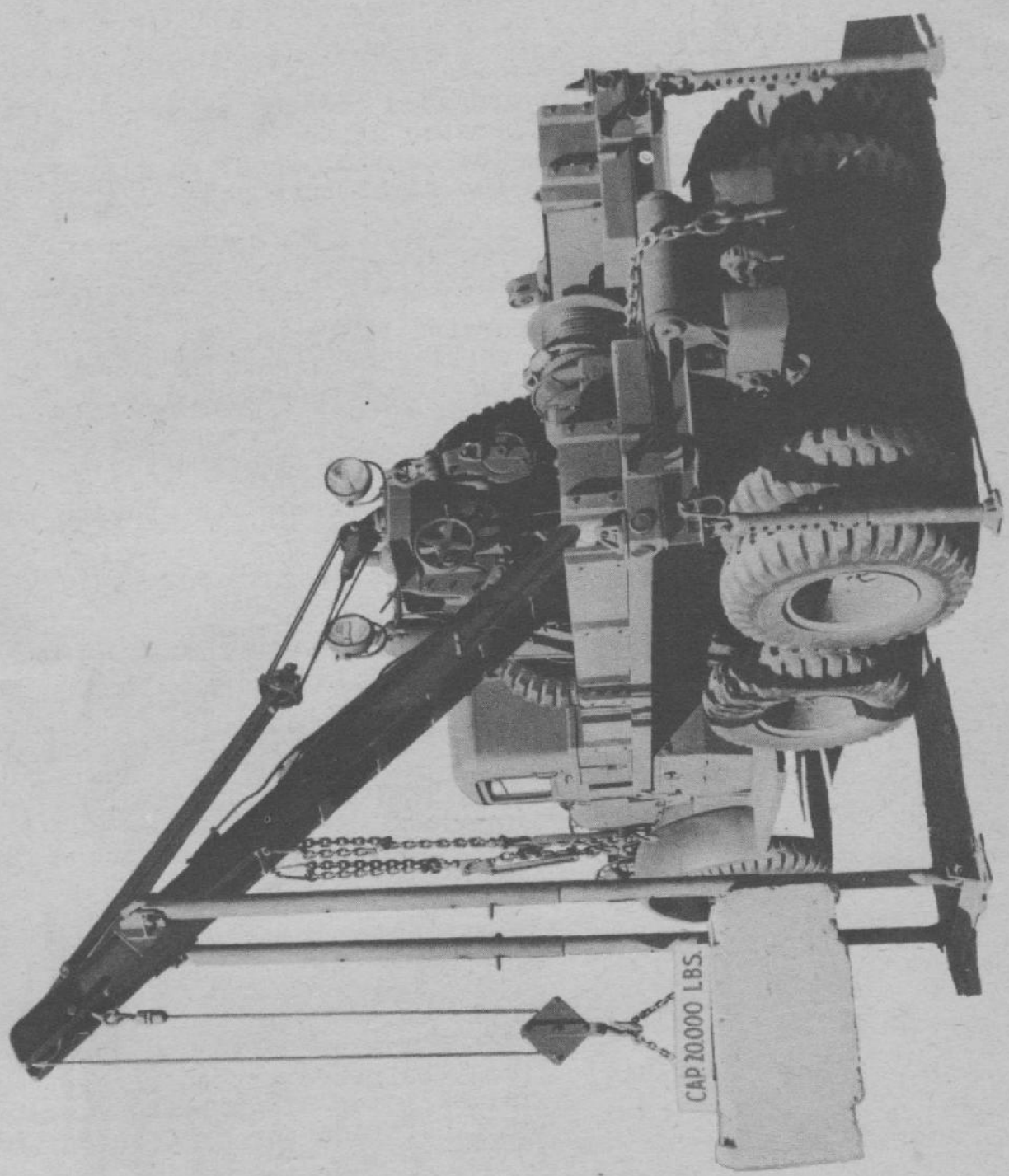
Illustration 18-12

BODY & CRANE



EQUIPMENT ARRANGEMENT - 20,000 LBS. LIFT
Illustration 18-13

HEAVY WRECKING TRUCK M1



EQUIPMENT ARRANGEMENT - 20,000 LBS. SIDE LIFT
Illustration 18-14

CRANE OPERATION

144. Controls(a) Boom Swing:

The boom can be operated through an arc of 180°. This is a hand operated control. To swing the boom to the left turn the control wheel counter-clockwise. To swing boom to the right turn control wheel clockwise.

(b) Boom Raising and Lowering:

This is a hand operated control. To raise the boom turn the control wheel clockwise. To lower the boom turn the control wheel counter-clockwise.

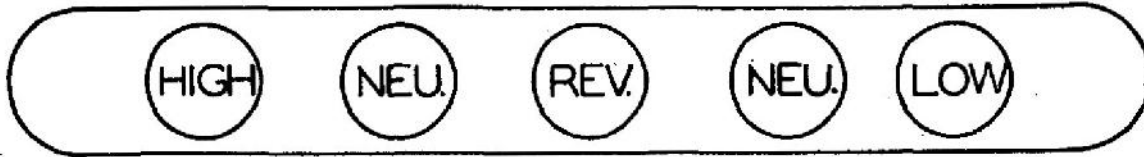
(c) Crane Winch:

The crane winch is power driven. To operate the power winch proceed as follows:

- (1) Start the engine.
- (2) Lock the service brakes with the latch provided. (See Illustration 18-6).
- (3) Release the emergency brake.
- (4) Disengage engine clutch.
- (5) Shift the truck transmission into second gear.
- (6) Shift the transfer case into neutral.
- (7) Engage the power take-off.
- (8) Engage engine clutch.

Note:-(1) It may be necessary to engage the engine clutch slightly to cause shaft rotation for free engagement.

- (2) This completes all items necessary in the cab. All further controls are made from the truck body.
- (9) Open the air clutch valve to disengage the engine clutch. Pull control handle up.



CRANE & REAR WINCH SHIFT DIAGRAM

Illustration
18-15

- (10) Shift the crane winch transmission into reverse.
- (11) Close the air clutch valve to engage engine clutch and release the cable chain hook from the rear bumperette. Push valve control handle down.

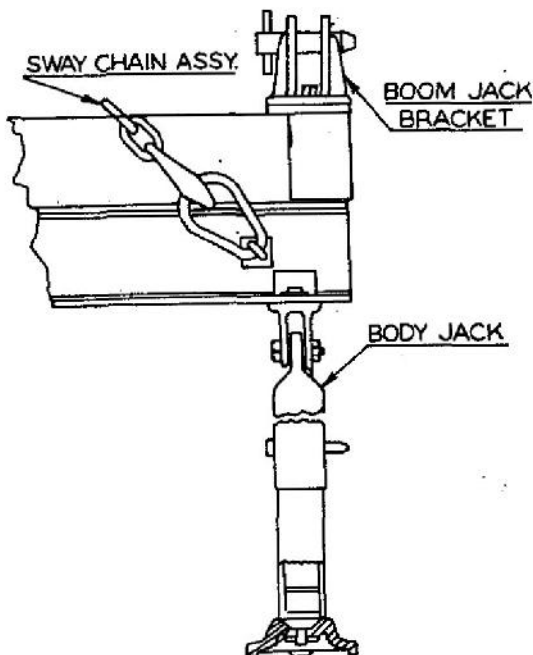
Note:-(1) The speed of cable pay-out is controlled by the engine speed. When paying out cable the Ground Operator should keep the cable as taut as possible to prevent any loosening of the cable on the winch drum.

- (2) When sufficient cable has been paid out open the air clutch valve to disengage clutch. Pull control handle up.

(d) Engine Throttle Remote Control:

- (1) Pull control handle up to open throttle.
- (2) Push control handle down to close throttle.

145. Body Jacks



Body jacks are provided for taking the lift load off the chassis when attached to rear corners of the body. Insert pins in the holes of the telescoping body of the jacks in the desired position. If solid footing is not available use body jack ground plates. (See Illustration 18-16)

BODY JACKS

Illustration 18-16

CRANE OPERATION (Cont.)

146. Boom Jacks

Boom jacks must be attached to the boom and body corners for all towing operations. Boom jacks are telescoping and, for capacity lifts with the crane, the boom jacks must be extended to the ground. If the ground is soft and does not afford good footing some suitable means will have to be provided to prevent the ground plates from sinking. A double ground plate is carried in the truck body for use with the boom jacks.

147. Lifting Object of Recovery

When the boom jacks and body jacks are arranged in accordance with the operation to be performed and the crane cable hooked to the load the operator proceeds as follows:

- (1) Start the engine.
- (2) Lock the service brakes with the latch provided. (See Illustration 18-6).
- (3) Release the emergency brake.
- (4) Disengage the clutch.
- (5) Shift the truck transmission into second gear.
- (6) Engage the power take-off.
- (7) Shift transfer case into neutral.
- (8) Engage the engine clutch.

Note:-(1) It may be necessary to engage the engine clutch slightly to cause shaft rotation for easy engagement.

- (2) This completes operations in the cab of the vehicle. All further operations and controls are in the truck body.
- (9) Open the air clutch valve. Pull control handle up to disengage engine clutch.
- (10) Shift the crane winch gear box into high or low gear, depending on load to be raised.
- (11) Open the engine throttle to accelerate the engine. Pull control handle up.

CRANE OPERATION (Cont.)

- (12) Close the clutch air valve to engage the engine clutch.

148. After Lift has been Completed

- (1) Close the air clutch valve to disengage the engine clutch. Push control handle down.
- (2) Close engine throttle. Push control handle down
- (3) Shift the crane transmission into neutral.
- (4) Shift the truck transmission into neutral.
- (5) Disengage the crane and winch power take-off.

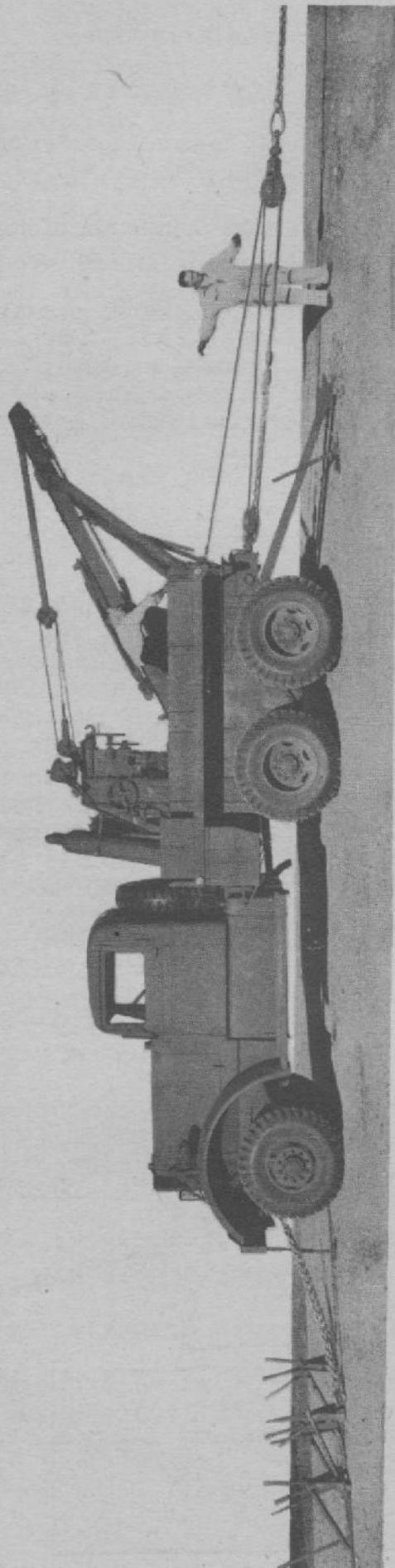
149. To Lower the Load

- (1) Start the engine.
- (2) Lock the service brakes with the latch provided. (See Illustration 18-6).
- (3) Release the emergency brake.
- (4) Disengage clutch.
- (5) Shift the truck transmission into second gear.
- (6) Shift the power take-off into mesh.
- (7) Engage the engine clutch.

Note:-(1) It may be necessary to engage the engine clutch slightly to cause shaft rotation for free engagement.

- (2) This completes the operations in the cab of the vehicle. All further operations and controls are in the truck body.
- (8) Open the air clutch valve to disengage engine clutch. Pull control handle up.
- (9) Shift the crane winch transmission into reverse.
- (10) Close the air clutch valve to engage the engine clutch. Push control handle down.

BODY & CRANE



REAR WINCH RECOVERY

Illustration 18-17

CRANE OPERATION (Cont.)

150. After Load is Lowered

- (1) Open the air clutch valve to disengage the clutch. Pull control handle up.
- (2) Shift the crane winch transmission into low gear.
- (3) Close the air clutch valve to engage the engine clutch. Push control handle down.
- (4) Hook cable hook into boom and carefully tighten.

151. Boom Sway Chains

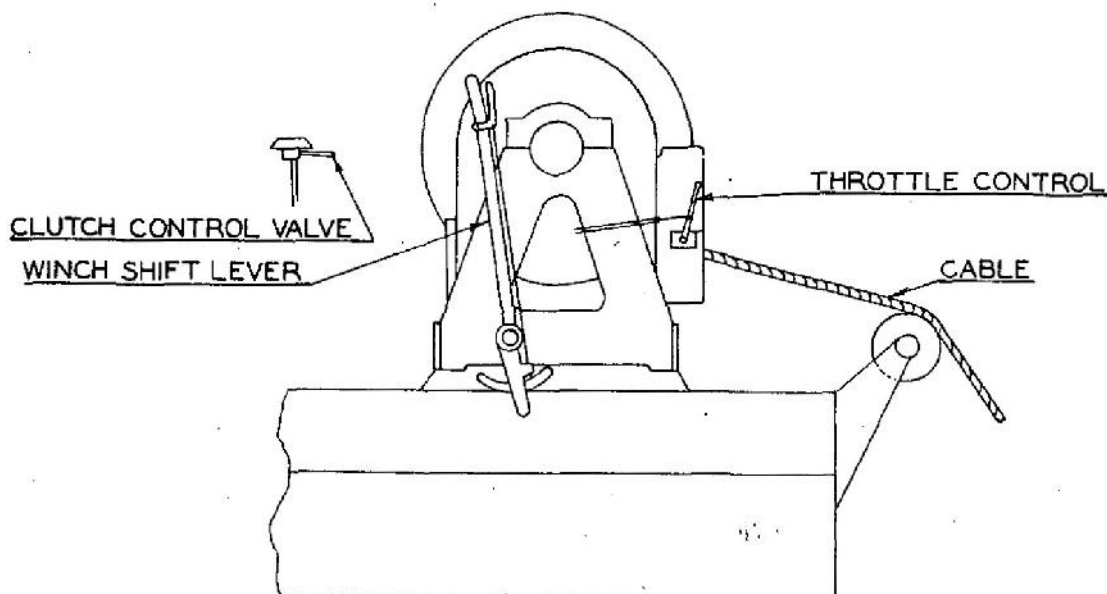
Whenever the truck is operated over the road, loaded or not, the boom sway chains should be hooked to the boom and the corners of the body to prevent the boom from swinging free. Damage will result to the boom swinging worm and gear if boom is allowed to sway.

REAR WINCH OPERATION

152. Vehicle Positioning

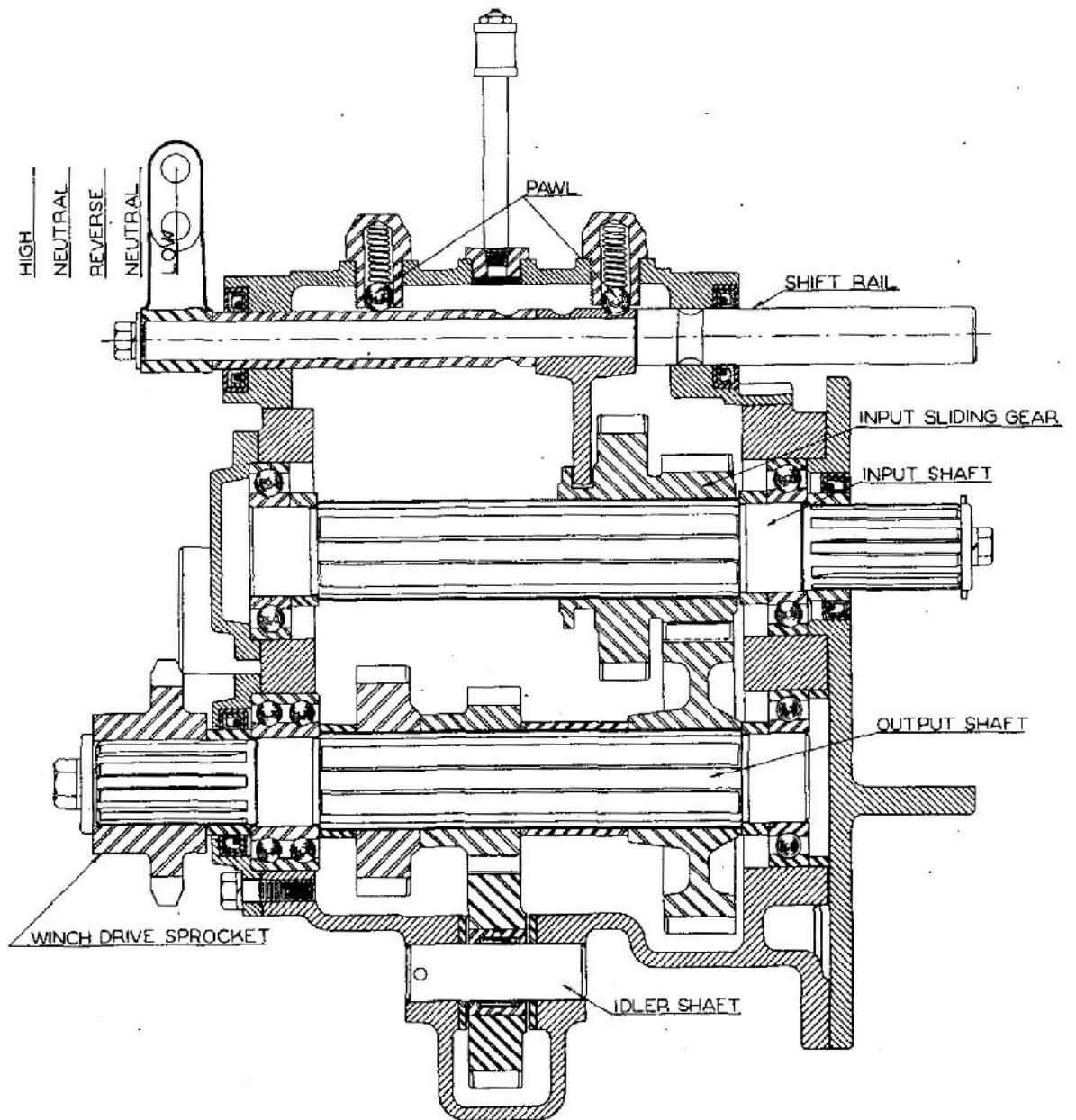
Align the vehicle with the object of recovery. Do this in such a manner that the cable will not be working at an angle. A longitudinal line through the center of the truck, if continued, should bisect the object of recovery.

Conditions permitting, the vehicle should be at least 60 feet from the object of recovery when multiple sheave



REAR WINCH ASSEMBLY
Illustration 18-18

BODY & CRANE



REAR WINCH GEAR BOX

Illustration 18-19

REAR WINCH OPERATION (Cont.)

snatch blocks are used in the line. When single snatch blocks are used the distance between the vehicle and the object of recovery must be greater. Alignment and positioning of the vehicle is as important an operation as the actual recovery.

Once the truck controls in the cab have been set all operation and control of the rear winch is carried on in the body of the vehicle.

153. Preparation for Recovery with Rear Winch

- (a) Start the engine.
- (b) Lock the service brakes with latch provided. (See Illustration 18-6).
- (c) Release the hand brake.
- (d) Release the clutch.
- (e) Shift the vehicle transmission into second gear.
- (f) Shift the transfer case into neutral.
- (g) Engage the power take-off.
- (h) Engage the clutch.

Note:- (1) Slight engagement of the clutch may be necessary to cause shaft rotation for easy engagement.

(2) This completes the operations in the cab of the vehicle. All further operations and controls are in the truck body.

- (i) Swing angle sheave support to one side to clear the cable, if installed.
- (j) Open the air clutch valve to disengage the clutch. Throw handle to right.
- (k) Shift the winch transmission into reverse.
- (l) Close the clutch air valve just long enough to slack the chain, then open immediately. Throw handle to left.
- (m) Unhook the cable chain.
- (n) Pay out cable to the object of recovery, having the ground operator hold the cable as taut as possible.

REAR WINCH OPERATION (Cont.)

- (o) When sufficient cable has been paid out open clutch air valve. Throw handle to right.
- (p) Shift winch transmission into neutral.

Note:-(1) Speed of pay-out is governed by remote control engine throttle at the winch. Push control lever back to increase engine speed, forward to close throttle.

154. Recovery

- (a) Wherever possible snatch blocks provided with the equipment should be used to relieve the load on the cable and the truck. For light loads a one-part line is satisfactory. For medium loads use a two-part line, for medium-heavy loads use a three-part line and for heavy loads use a four-part line. (See Illustrations 18-26 and 18-27).

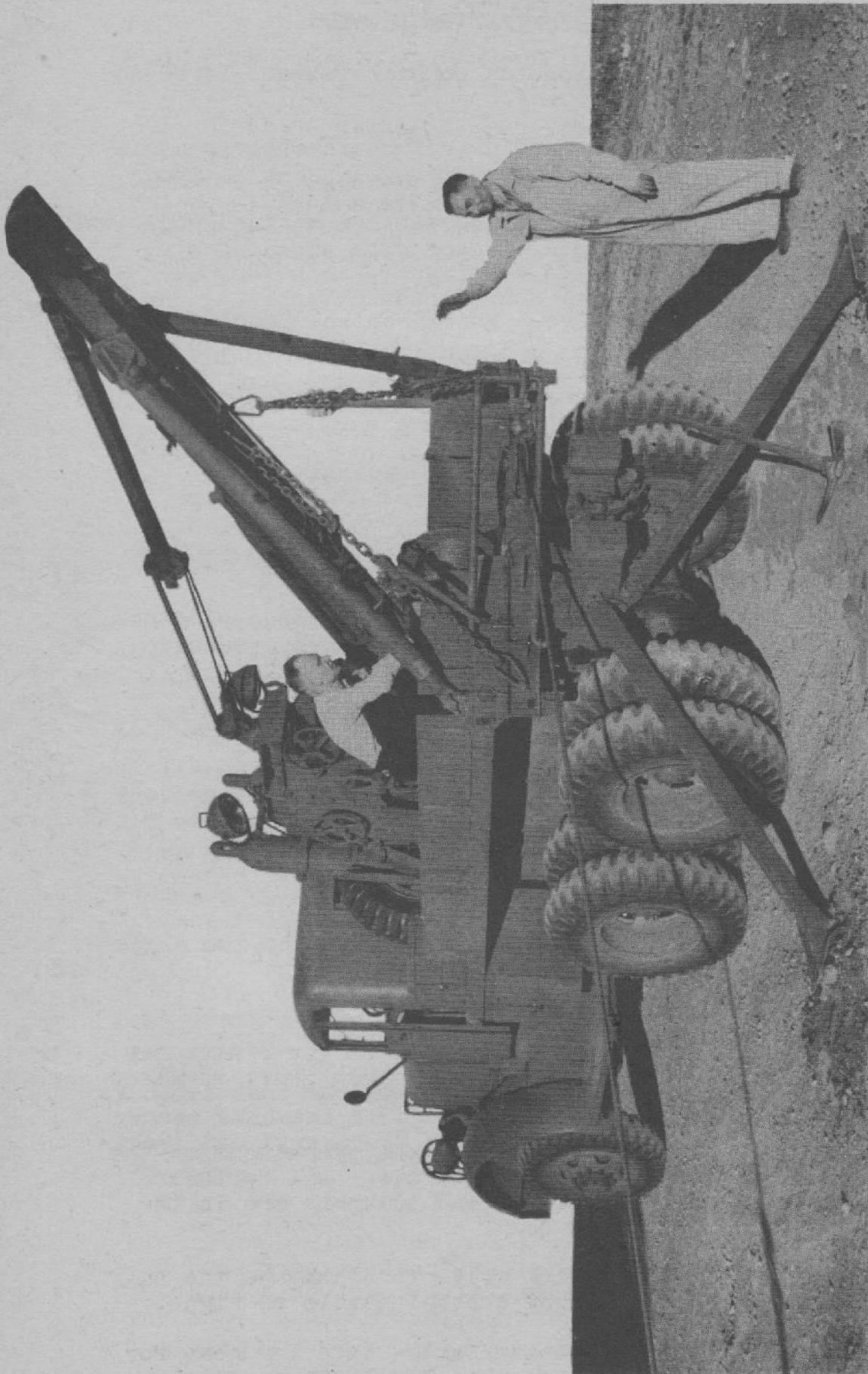
When hook-up is made to the object of recovery proceed as follows:

- (1) Start the engine.
- (2) Lock service brake with latch provided. (See Illustration 18-6)
- (3) Release hand brake.
- (4) Release clutch.
- (5) Shift the truck transmission into second speed.
- (6) Shift transfer case into neutral.
- (7) Engage the power take-off.
- (8) Engage the clutch.

Note:-(1) Slight engagement of the clutch may be necessary to cause shaft rotation for easy engagement.

- (2) This completes the operations in the cab of the vehicle. All further operations and controls are in the truck body.
- (9) Open the air clutch valve to disengage the engine clutch. Throw control handle to right.
- (10) Shift the winch transmission into low gear for heavy loads or high gear for light loads.

HEAVY WRECKING TRUCK M1



REAR WINCH ANGLE RECOVERY
Illustration 18-20

REAR WINCH OPERATION (Cont.)

- (11) Close the air clutch control valve. Throw control handle to left.
- (12) Accelerate the engine. Push throttle control handle to rear.
- (13) Draw the object of recovery to desired position.

155. To Stop the Winch

- (a) Open air clutch valve. Throw control handle to right.
- (b) Pull throttle control handle forward to close engine throttle.
- (c) Shift winch transmission into neutral.
- (d) Disengage the power take-off.
- (e) Disengage the unit transmission.

Note:-(1) After removing cable from object of recovery it should be cleaned, rewound, and secured to rear bumperette.

156. Angle Recovery with Rear Winch

Angle recovery should not be made if it is at all possible to so position the vehicle that straight recovery can be made. In the event that it is impossible to position the vehicle for straight recovery proceed as follows:

- (a) Position the angle sheave support in body brackets.
- (b) Attach one single sheave snatch block to the angle support.
- (c) Secure ground spades at the rear of the frame to prevent the truck from being pulled sideways.

Note:-(1) Rigging the cable with the snatch blocks provided can be made in the same manner as indicated under "Recovery" and "Vehicle Positioning".

157. Heavy Recovery Operation

All heavy recovery operations must be performed by the rear winch. The service brakes will not be adequate to hold the truck in position when the object of recovery is being pulled in.

REAR WINCH OPERATION (Cont.)**Heavy Recovery Operation (Cont.)**

In order to stabilize the vehicle attach the spades provided in the sockets at the rear of the frame. (See Illustration 18-17). Attach the front winch cable to a tree or utility pole. Where no natural anchorage is convenient the ground anchors should be used in series to form a suitable anchorage in lieu of a stationary object. Attach the front winch cable to the stakes and draw cable tight. Disengage front winch jaw clutch.

158. CAUTION:

- (1) The anchor line for the front winch should have at least as many snatch blocks as the recovery line.
- (2) If the truck is in a dangerous position always anchor vehicle with the front winch cable to some stable object.

159. SECURING WINCH CABLES AFTER RECOVERY

To secure winch cables on winch drums after recovery and prevent cable from sagging or loosening proceed as follows:

Front Winch Cable

Wind cable chain around front tow hooks and secure chain hook over tow hook. Tighten cable carefully with aid of ground operator until slack is taken up.

Crane Winch Cable

Secure lifting hook of crane cable into boom channel tie strap. Tighten cable carefully until slack is taken up.

Rear Winch Cable

Wind cable chain around rear bumperettes and secure cable hook over bumperette. Tighten cable carefully until slack is taken up.

160. CAUTION:

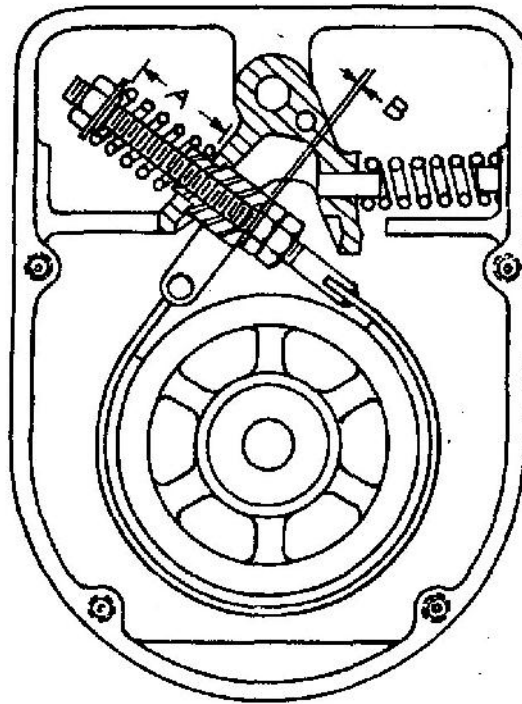
- (1) When rewinding cable on winch drum place load on cable to make certain it is wound tightly.
- (2) Cable must be wound tightly on drum, coil to coil, so each succeeding layer will not jam between preceding coils.

SECURING WINCH CABLES AFTER RECOVERY (Cont.)

- (3) Wind cable slowly and evenly for best results.
- (4) Do not use a hammer on cable to move coils closer together. Use a block of wood.
- (5) Use care when tightening cable after securing.

161.

AUTOMATIC WORMSHAFT BRAKE ADJUSTMENT



WINCH WORMSHAFT AUTOMATIC SAFETY BRAKE

Illustration 18-21

Each winch is equipped with an automatic safety brake. The object of this brake is to prevent the load from overhauling the worm gearing or, in other words, to hold the load in any position the winch has placed the load, when the winch transmission is shifted into neutral or the shear pins have sheared. Operation of this brake is entirely automatic. Adjustment is made as follows: (See Illustration 18-21)

- (a) Remove brake case cover.
- (b) Tension "B" should be 1/8" when sleeve is pushed into rocker as far as possible.
- (c) Tighten nut 1/2 turn to increase tension on spring "A". Set up lock nut and test. Do not set up

AUTOMATIC WORMSHAFT BRAKE ADJUSTMENT (Cont.)

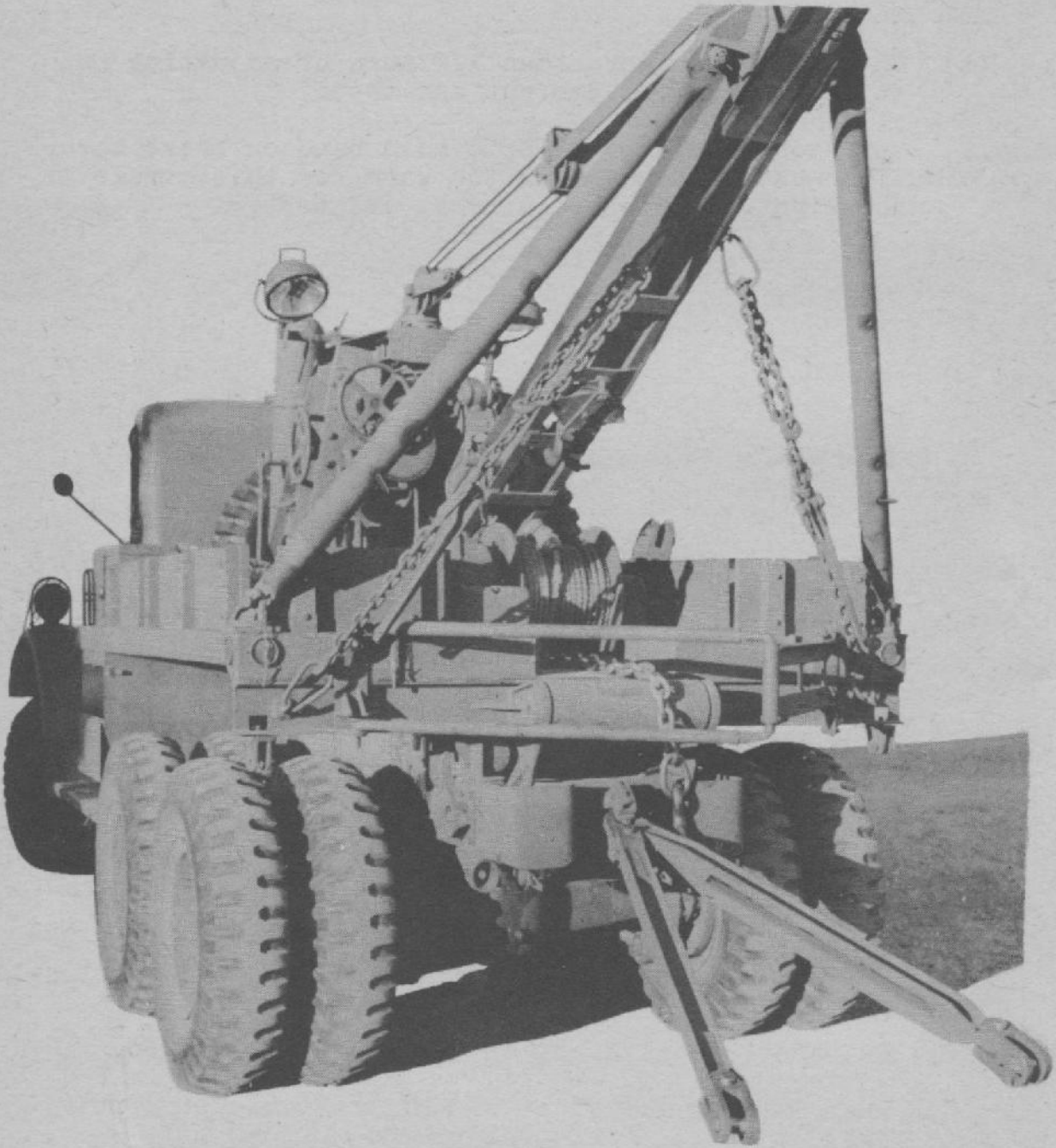
spring tension more than 1/2 turn each time.

(d) Replace cover.

162. CAUTION:

- (1) Do not tighten more than 1/2 turn of adjusting nut at one time. Set jam nut and test.
- (2) Operator should be able to hold hand on brake cover after use. If cover is too warm for this, brake is too tight. Loosen adjustment and test.

BODY & CRANE



TOW BAR ATTACHMENT

Illustration 18-22

TOWING

163. LIGHT OR MEDIUM TANK

To tow a light or medium tank, hook up as follows:

- (1) Attach tow bar to vehicle pintle hook.
- (2) Attach tow bar clevises to tank tow lugs with pins provided.

164. CAUTION:

- (1) When backing up care should be taken not to cramp the vehicle at too sharp an angle.

165. HALF-TRACK OR 2½ TON CARGO

To carry the front end of half-track or cargo trucks and tow over any terrain, hook up as follows:

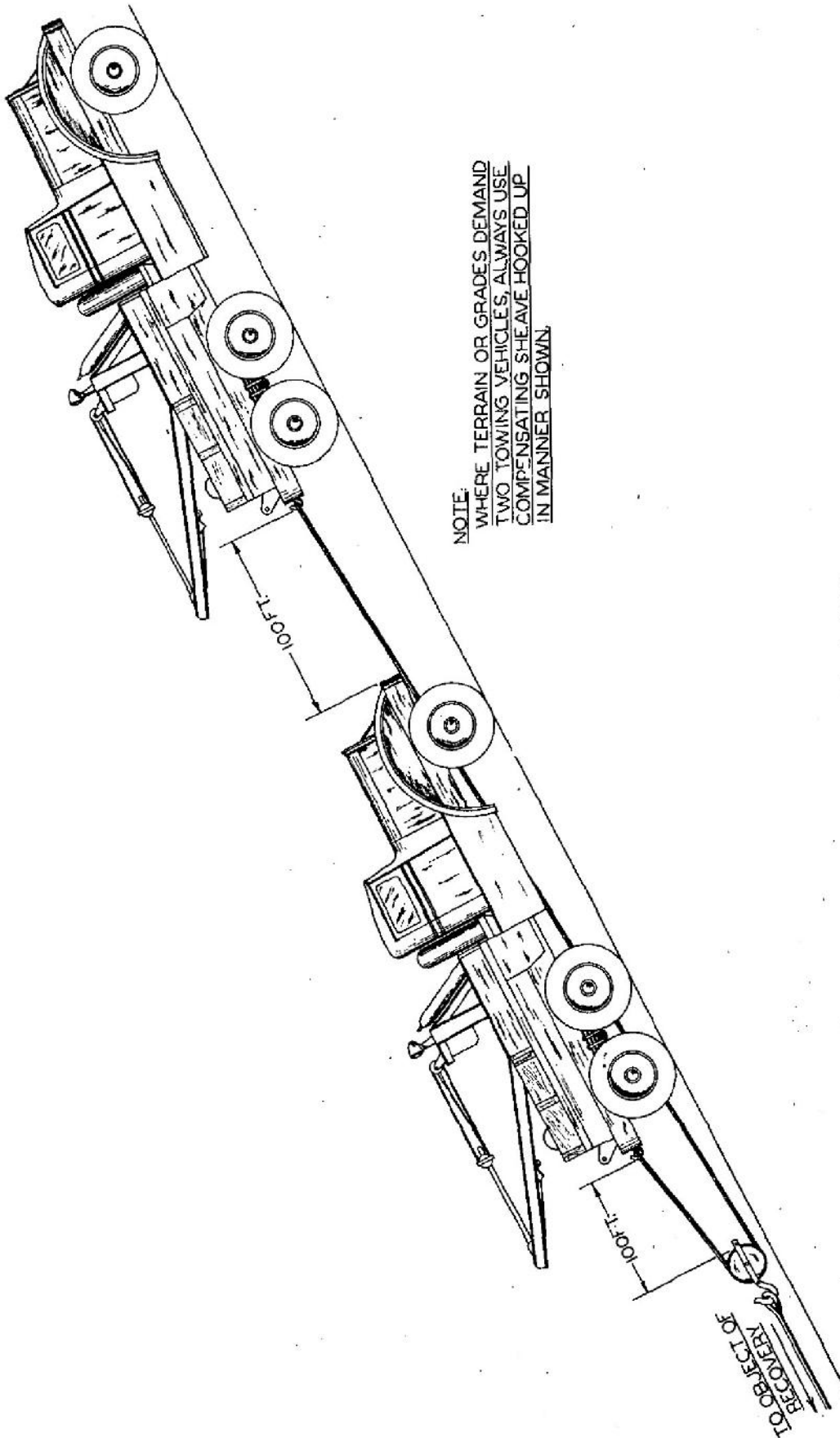
- (1) Attach the tow bar to the vehicle pintle hook.
- (2) Place the tow bar clevises over the tow hooks on front of the vehicle being towed.
- (3) Insert crow bar from the truck equipment through the tow bar clevis holes. The bar should be sufficiently long to go through both clevises of the tow bar.
- (4) Wrap a chain from the truck equipment around the crow bar and bumper to prevent the clevises climbing over the tow hooks.

166. CAUTION:

- (1) Attaching the tow bar, even though the front end is being carried, it is advisable to stabilize the vehicle being towed. This eliminates any dangerous fore and aft or side to side sway of the vehicle on the end of the crane cable.
- (2) Release the brakes on the vehicle being towed.
- (3) When lifting the front end of the vehicle do not lift it over 12" off the ground.
- (4) Put the transmission of vehicle being towed in neutral.

Note:-(1) No driver is required in the vehicle being towed providing the front end is lifted.

BODY & CRANE



NOTE:
WHERE TERRAIN OR GRADES DEMAND
TWO TOWING VEHICLES, ALWAYS USE
COMPENSATING SHEAVE HOOKED UP
IN MANNER SHOWN.

DUAL TRUCK RECOVERY
Illustration 18-23

TOWING (Cont.)

167. DUAL TRUCK TOWING OPERATIONS

When grades or terrain make it impossible to tow the object of recovery with one vehicle a dual truck hook-up can be made as indicated in Illustration 18-23.

Dual truck towing operation cannot be successfully accomplished without a compensating snatch block between the two towing vehicles to balance the pull.

- (1) Hook one end of the compensating cable in the pintle hook of the lead wrecker.
- (2) Run the cable underneath the second wrecker through a snatch block and up to the pintle hook on the second wrecker.

168. CAUTION:

- (1) Do not hook up closer than shown in Illustration 18-23.

169. USE OF AIR CONNECTIONS

When towing any vehicle equipped with air brakes a flexible air hose assembly is provided in each unit to hook up the air brake system of the vehicle being towed, provided that unit is unable to provide its own air supply. Air connections are provided at the front and the rear of the wrecker. Secure one flexible hose assembly from the wrecker tool equipment and one from the vehicle being towed to connect the service and emergency lines between the two vehicles. The air connections are labeled "Service" and "Emergency". Hook up the hose connections from service to service and from emergency to emergency.

Open the cutout cocks at the couplings on both the wrecker and the truck being towed. Control of the brakes then rests in the towing truck. Each time the brakes are applied on the towing truck, brakes are also applied on the vehicle being towed.

Air connection outlets are provided with dummy couplings which must always be in place when the flexible hose assemblies are not hooked up to keep out dirt and moisture.

170. CAUTION:

- (1) Support hose connections to prevent dragging.

171.

TANK USE OF WHIFFLETREE AND TOW BAR

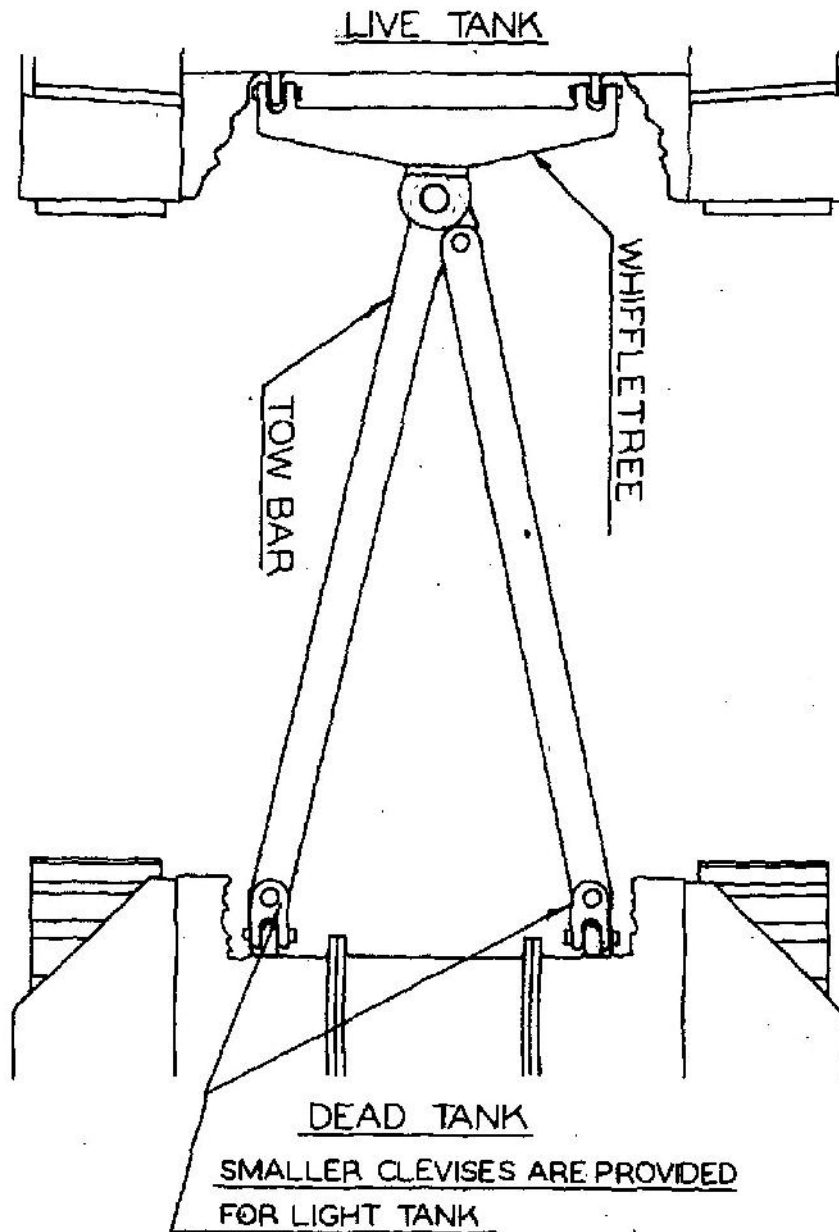
**WHIFFLETREE AND TOW BAR ATTACHMENT**

Illustration 18-24

In Illustration 18-24 is shown the method of attaching and utilizing the whiffletree and tow bar provided with the vehicle. Towing shackles are mounted on each corner of the hull of the vehicle about 20" from the ground, two in the front and two in the rear. These shackles provide a quick method of attaching the whiffletree and tow bar. The tow bar is mounted on the crane boom and the whiffletree lies loose in the body. The whiffletree should always be connected to the live tank and the tow bar to the inoperative tank and the two connected together as shown in the illustration.

(222)

CABLES

172. REASON FOR CABLE LUBRICATION

Wire cables are lubricated during fabrication. This initial lubrication is not sufficient to last the useful life of the cable. Periodic applications of a good grade of oil or grease must be made. The lubricant should be free from acids and alkalies, should have sufficient adhesive strength to stay on the cable, should be able to penetrate between the wires and strands, should be non-soluble under the conditions prevailing where the cable operates, and should resist oxidation.

The importance of periodical lubrication is apparent when considering that a wire cable is a machine of many moving parts. Each time the cable bends or straightens, the wires in the strands and the strands in the cable must slide on each other. This requires a film of lubricant on each moving part.

The second important reason for lubricating cables is to prevent corrosion of the wires and deterioration of the hemp center.

Cables must be cleaned before they are lubricated. Cleaning may be accomplished by wire brushes or compressed air. Remove all foreign material and old lubricant from the valleys between the strands and the spaces between the outer wires. The lubricant may be brushed onto the cable, applied by passing the cable through saturated waste or by passing the cable through a trough or box of lubricant. This is preferably done at a point where the cable opens slightly from bending.

If the cable is not used for an appreciable length of time it should be cleaned, lubricated and protected from the weather.

173. CORRECT METHOD OF WINDING FIRST LAYER ON DRUM

When winding the first layer of cable on the winch drum it should be started from the side which causes the coils on the drum to hug together. This tends to produce a uniform and closely wound first layer which, in turn, tends toward uniformity of successive layers. It also results in an even wind of the coils of the first layer on the drum when the cable is rewound after the load has been slacked off and then picked up.

When a cable is wound on a smooth drum in the wrong direction the coils tend to spread apart and the second layer of coils wedge themselves between the open coils, causing irregular winding and damage to the cable from crushing and abrasion. The proper direction for winding

CORRECT METHOD OF WINDING FIRST LAYER ON DRUM (Cont.)

the first layer on a smooth drum is determined by standing behind the drum and looking along the path the cable travels. Determine first whether the cable is right lay or left lay. On right lay cables the winding rotates to the right while receding from the observer when viewed from above. Left lay cables rotate to the left.

For an over-wind of right lay cables start at the left side of the drum and coil the first layer toward the right. For an under-wind start at the right and wind toward the left.

For an over-wind of left lay cables start at the right and wind to the left. For an under-wind start at the left and wind to the right.

174. SAFEGUARDS TO LONGER CABLE LIFESheave Condition:

Inspect the sheaves occasionally for being corrugated, worn to one side, out of round, for having broken flanges and defective bearings. Sheave surfaces should be smooth, unbroken, round and in alignment at all times. Conditions mentioned will cause the cable to whip, jump the sheaves and cut the cable.

Drum Condition:

If a groove is worn in the surface of the drum, the drum should be remachined or resurfaced with a plate. Any groove of the drum will cause poor winding and excessive cable abuse.

Fleet Angle:

The fleet angle is the included angle between the cable in its position of greatest travel across the drum to a line perpendicular to the drum axis from the center line of the first sheave. Keep the fleet angle at an absolute minimum to prevent scrubbing, open winding and piling up of turns on the end of the drum at layer changes.

Winding the First Layer:

The winding of the first layer of a multiple layer drum must be made in the manner described under the heading of "Correct Method of Winding First Layer on Drum".

Rollers:

Keep the rollers turning by keeping the bearings free and well lubricated at all times. Any cut or worn

SAFEGUARDS TO LONGER CABLE LIFE (Cont.)

rollers should be replaced or resurfaced.

Care of New Cable:

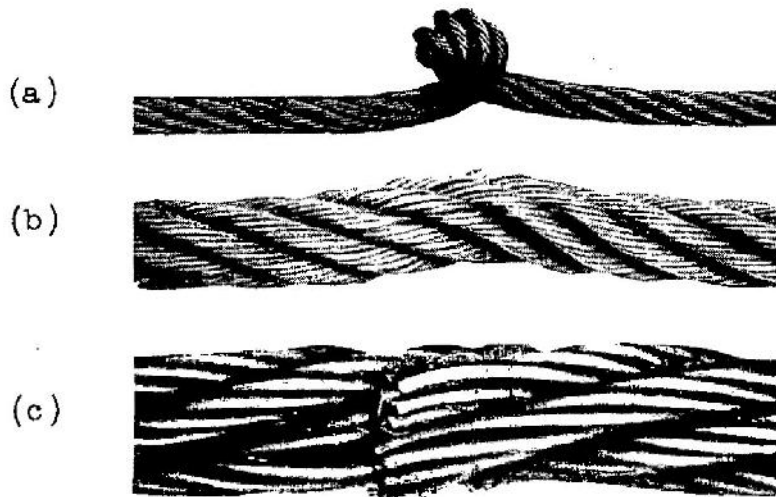
Run a new cable through its normal operating cycle several times under a light load. This gives the cable a chance to adjust itself gradually to operating conditions.

Kinking:

A kink in a wire cable, no matter how developed, will greatly reduce its life. Careful and proper handling to insure freedom of kinks will materially lengthen cable life. Every kink requires a starting loop, - do not allow the cable to form a small loop. However, if a loop forms and is removed before a load is placed on the cable a kink will be avoided. Once the kink has been formed the cable is permanently damaged and is of little value. The strands and wires being damaged will break up quickly at the point of kink.

EFFECTS OF KINKING

Illustration 18-25



- (a) Indicates cable badly kinked.
- (b) Same cable with kink partially removed. Note, however, that cable is permanently injured and will not give maximum service.
- (c) Illustrates cable which has failed due to excessive kinking.

Acid and Fumes:

Wire cable should be protected from acid and acid fumes. Whenever cable has been subjected to acid or acid fumes it should be immediately cleaned with plenty of water and relubricated.

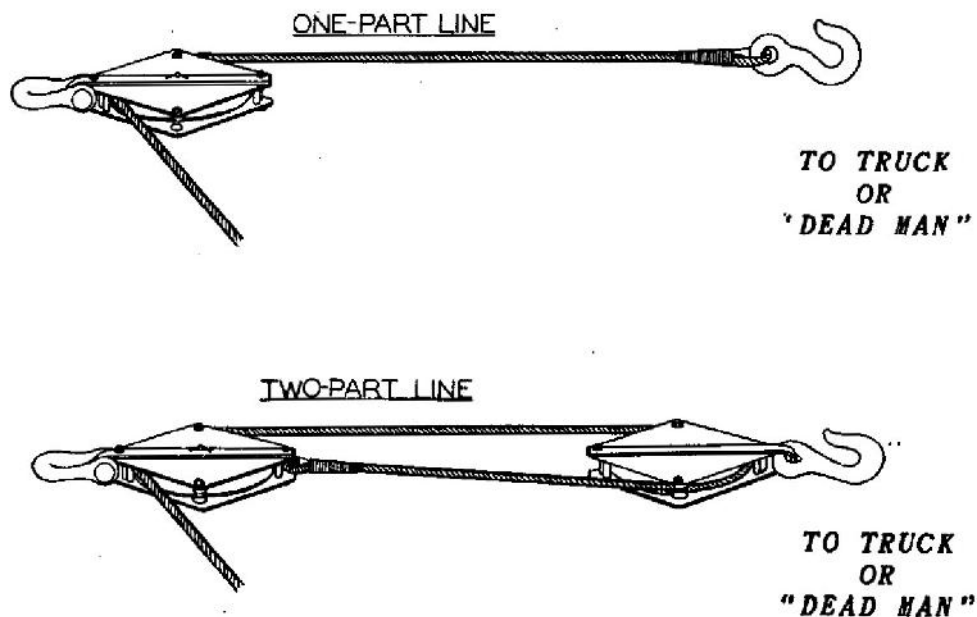
Sudden Stresses:

Sudden stresses caused by jerking the cable may exceed the strength of the cable and break it. Jerks which do not break the cable cause rapid deterioration and shorten cable life. When picking up or moving a load these sudden jerks may equal a value several times the weight of the load to be lifted or the resistance of the object to be moved. Loads should always be gradually applied and the rate of recovery kept as uniform as possible.

175.

SNATCH BLOCK RIGGING

When the object of recovery is lifted or moved by multiple line rigging, using the sheave snatch blocks provided, the object to be recovered is more easily lifted or moved. At the same time the load on the cable is reduced in proportion to the number of lines used. A one-part line load on the cable is the same as the supported load. A one-part line is the use of only one single sheave snatch block. A two-part line is the use of two single sheave snatch blocks. The load on the cable is just one-half the supported load with a two-part line. (See Illustration 18-26).

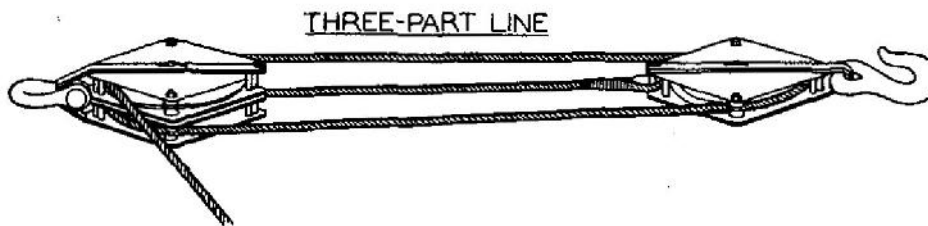


SNATCH BLOCK RIGGING

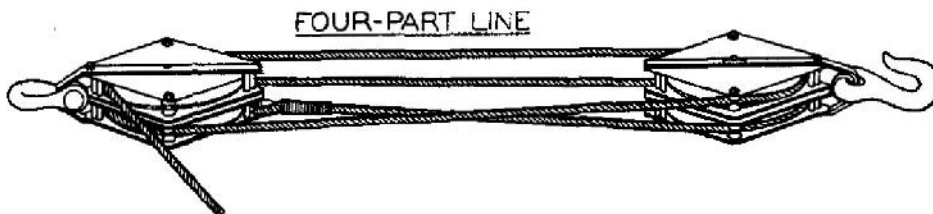
Illustration 18-26

SNATCH BLOCK RIGGING (Cont.)

A three-part line is the use of one double sheave snatch block and one single sheave snatch block. The load on the cable is just one-third the supported load. On a four-part line, using two double sheave snatch blocks, the load on the cable is just one-fourth the supported load. (See Illustration 18-27).



TO "DEAD MAN" ONLY



TO "DEAD MAN" ONLY

SNATCH BLOCK RIGGING

Illustration 18-27

176. CAUTION: Never anchor a three or four-part line to the truck; always anchor to a "Dead Man".

Section XIX
COLD WEATHER OPERATION

TITLE	Paragraph No.
General	177
Gasoline for Low Temperatures	178
Engine Lubrication	179
Transmission, Differentials, and Final Drives	180
Chassis Lubricants	181
Protection of Cooling Systems	182
Electrical Systems	183
General Instructions	184
Starting and Operation	185
Cold Weather Accessories	186

177.

GENERAL

- A. The operation and maintenance of automotive vehicles at low temperatures involve factors which do not exist at normal temperatures, and operators must spend more time in protective maintenance. Failure to give this extra service will result in actual damage, unnecessary and unwarranted expense, and failure to start.
- B. "Low temperatures" have been divided into two ranges: -10° F. to -30° F., and below -30° F. Engines and lubricants undergo changes in their physical properties below -30° F. In many cases, accessory equipment for supplying heat to engine, fuel, oil and intake air is required.

178.

GASOLINE FOR LOW TEMPERATURES

- A. Selection. - The winter class of motor fuel procured under U.S. Army Specification 2-103, latest issue will be used.

CAUTION: A positive metallic contact must be maintained between fuel container and gasoline tank unless both fuel tank and container are independently grounded.

- B. Fuel troubles. - The formation of ice crystals from small quantities of water in the fuel sometimes causes considerable trouble. The following precautions should be followed to keep water out of the fuel tank:

- (1) Strain the gasoline through a suitable strainer.
- (2) Insofar as possible, always keep the fuel tanks full. This will reduce condensation of water from the free air space above the fuel.
- (3) Add 1/2 pint of denatured alcohol to a tank of gasoline. The alcohol will absorb the water and prevent it from freezing.

GASOLINE FOR LOW TEMPERATURES (Cont.)

- (4) Do not store fuel in old drums unless they have been thoroughly cleaned.
- (5) Never pump fuel drums dry when filling vehicle fuel tanks: allow about four inches of fuel to remain. This residue can later be transferred to a settling tank. If time is not an urgent consideration, do not pump fuel from drum to vehicle until it has settled for sixteen hours after filling or moving. Keep portable fuel pumps clean and protected from snow and frost.
- (6) When a drum has been opened, be sure that the opening is covered or the bung replaced to prevent snow, frost, or other foreign matter from entering. Store drums in a covered building or cover them with a tarpaulin.

179.

ENGINE LUBRICATION

- A. Engine lubrication at temperatures above -10° F. is covered in paragraph 21 and in the Lubrication Guide. The following instructions are intended to supplement this information and apply only to instances where the temperature falls below -10° F. for long periods.
- B. Several methods of keeping engine oil sufficiently fluid for proper lubrication at temperatures below -10° F. are listed below. Preference should be given to the different methods in the order listed according to the facilities available.
 - (1) Keep the vehicle in heated enclosure when it is not being operated.
 - (2) When engine is stopped, drain crankcase oil while it is hot and store in a warm place until vehicle is to be operated again. If warm storage is not available, heat the oil before reinstalling. (Avoid overheating the oil; heat only to the point where the bare hand can be inserted without burning.) **TAG THE VEHICLE IN A CONSPICUOUS PLACE IN THE DRIVING COMPARTMENT TO WARN PERSONNEL THAT CRANKCASES ARE EMPTY.**
 - (3) If vehicle must be kept outdoors and the oil cannot be drained, cover the engine with a tarpaulin. About three hours before engine is to be started, place fire pots under the tarpaulin. The Van Prag, Primus type, or other type blowtorch, and ordinary kerosene lanterns may be used.
 - (4) Dilute the engine oil with gasoline.

HEAVY WRECKING TRUCK M1

179-182

ENGINE LUBRICATION (Cont.)

- (5) The table given below shows the quantities of diluent to be added to the engine oils prescribed on the Lubrication Guides for use at -10° F. These quantities of diluent will form mixtures for satisfactory starting at the temperatures indicated:

	-10° F. TO -30° F.	BELOW -30° F.
GASOLINE	$\frac{1}{2}$ QT. TO EACH 4 $\frac{1}{2}$ QTS. OF ENGINE OIL	1 QT. TO EACH 5 QTS. OF ENGINE OIL

180. TRANSMISSION, DIFFERENTIALS, AND FINAL DRIVES

Below -15° F., dilute the lubricants prescribed for use at -10° F. with 10% gasoline. If circumstances preclude dilution of the lubricants, heat the gear cases with a blowtorch. Play the torch lightly over the entire gear case; do not concentrate the heat in one spot.

181. CHASSIS LUBRICANTS

- A. Chassis, wheel bearing and other lubricants prescribed for use at -10° F. will furnish satisfactory lubrication at temperatures as low as -30° F. For sustained temperatures below -30° F., use GREASE, lubricating, special, or GREASE, O.D. No. 00, if the former is not available.
- B. Greases normally used cannot be applied at temperatures below 0° F. except in heated buildings. In an emergency, when heated buildings are not available, use oil, and inspect and relubricate frequently.

182. PROTECTION OF COOLING SYSTEMS

- A. Ethylene glycol (Prestone) is preferred for use as an antifreeze solution. If ethylene glycol is not available, the other materials shown in the table may be used. The table on the following page shows the quantity of antifreeze needed to make a gallon of solution which will not freeze at the indicated temperatures.

COLD WEATHER OPERATION

FREEZING POINT	PINTS ETHYLENE GLYCOL (PRESTONE) PER GALLON OF SYSTEM CAPACITY	*PINTS, G. P. A. RADIATOR GLYCERINE PER GALLON OF SYSTEM CAPACITY	PINTS DENATURED ALCOHOL PER GALLON OF SYSTEM CAPACITY
10°F	2	3	2½
0°F	2½	3	3
-10°F	3	3½	3½
-20°F	3½	4	4
-30°F	4	5	5
-40°F	4½	-	5½
-50°F	4½	-	6
-60°F	5	-	6½
-70°F	5	-	-

*G. P. A. DENOTES GLYCERINE PRODUCERS ASSOCIATION.

183.

ELECTRICAL SYSTEMS

- A. Generator and starter. - Inspect the brushes, commutators, and bearings. See that the commutators are clean. The large surges of current which occur when starting a cold motor require good contact between brushes and commutators.
- B. Wiring. - Inspect and clean all connections, especially the battery terminals. Care should be taken that no short circuits are present.
- C. Coil. - Check coil for proper functioning.
- D. Distributor. - Clean thoroughly, and clean or replace points. Set gap and check condition of the points frequently. In cold weather, the current is heavier and the points may pit and burn more than usual.
- E. Spark Plugs. - Clean, test, and replace if necessary. If it is difficult to make the engine fire, reduce the gap .005 inch more than that recommended. This will make sparking easier at the reduced voltages likely to prevail.
- F. Timing. - Check carefully. Care should be taken that the spark is not unduly advanced or retarded.

ELECTRICAL SYSTEM (Cont.)

- G. Batteries. - The efficiency of batteries decreases sharply with decreasing temperatures, and becomes practically nil at -40° F. Do not try to start the engine with the battery when it has been exposed to temperatures below -30° F. unless the battery is heated. See that the battery is always fully-charged at the end of the day's operation. (Hydrometer reading between 1.275 and 1.300.) A fully-charged battery will not freeze at temperatures likely to be encountered even in Arctic climates, while a fully-discharged battery will freeze and rupture at 5° F.
- H. Lights. - Inspect the lights carefully.
- I. Before every start, see that there is no ice on the spark plugs, wiring, or other electrical equipment.

184.

GENERAL INSTRUCTIONS

- A. Be sure that no heavy grease or dirt has been left on the starter throw-out mechanism. Heavy grease or dirt may keep the gears from meshing or cause them to remain in mesh after the engine starts running and ruin the starter.
- B. The choke control must be pulled all the way out to secure the air-fuel ratio required for cold weather starting. Check the butterfly valve to see that it closes all the way and otherwise functions properly.
- C. Carburetors which give no appreciable trouble at normal temperatures may not operate satisfactorily at low temperatures. A fuel pump which will deliver enough gasoline at normal starting speeds of 400 rpm may have leaky valves or diaphragm which will prevent it from delivering a sufficient quantity of fuel at cranking speeds of 30 to 60 rpm. Another source of trouble is the float needle valve which, although a close fit, must move freely. Different expansions of the metals used in the two parts may cause the needle valve to stick at extremely low temperatures.
- D. At temperatures below -10° F. do not use oil in air cleaners. The oil will congeal and prevent the easy flow of air. At temperatures below -30° F., remove the air cleaners. Ice and frost formations on the air cleaner screens may cause an abnormally high intake vacuum and an overrich mixture.
- E. Inspect the vehicle frequently. Shock resistance of metals, or resistance against breaking, is greatly reduced at extremely low temperatures. Operation of the vehicle on hard, frozen ground causes strain and

GENERAL INSTRUCTIONS (Cont.)

jolting which will result in loosening or breaking of bolts and nuts.

- F.. Remove or by-pass oil filters at temperatures below -30° F., because the viscous oil will not flow freely through them.
- G. Disconnect speedometer and tachometer cables at the drive end when vehicles are to be operated at temperatures of -30° F. and below. These cables often fail to work properly at these temperatures, and sometimes break due to excessive drag caused by stiffness of the lubricant in the cable.
- H. Fuel system. - Remove and clean sediment bulb, strainer, etc., at frequent intervals.

185.

STARTING AND OPERATION

A. Temperatures from -10° F. to -30° F.

- (1) It is possible to start gasoline engines with batteries at temperatures as low as -30° F., if the engines are properly lubricated and in good mechanical condition.
- (2) Prior to attempting a start, see that everything is in readiness so that the engine will start on the first trial. Try to avoid having the engine fire a few times and then stop. Water is one of the products of combustion. In a cold engine, this water may form a frost and make it impossible to start without heating the engine to above 32° F. Prolonged efforts to start will wear down the battery.
- (3) Pull the choke lever all the way out for starting, and keep it partially pulled out until the engine has warmed up. In a cold engine, only the lightest components of the gasoline vaporize, and for this reason a very rich mixture is necessary.
- (4) Turn the engine over as rapidly as possible when attempting a start. All engines have a "critical cranking speed", that is, the engine must be turned over at a certain rate of speed before any start at all is possible. For engines in good mechanical condition, this critical rate of speed may vary from 40 to 70 rpm. Below this speed, the fuel pump fails to deliver fuel fast enough.
- (5) After the engine is started, idle it at low speed until warmed up sufficiently to run smoothly.

STARTING AND OPERATION (Cont.)

B. Temperatures below -30° F.

- (1) Cover engine with tarpaulin, tent, or portable shed. Place oil stoves, fire pots, or four or five ordinary kerosene lanterns under the covering about three hours prior to the time a start is to be made.
- (2) Keep the vehicles in sheltered areas shielded from wind. Cold winds increase starting difficulties.
- (3) It is possible for ice to collect in the fuel line. If the engine does not appear to be getting enough fuel, heat the fuel line lightly, but be alert for fires.

- C. Stopping. - Increase engine speed before turning off ignition. Then turn off ignition and release throttle at the same time. As the engine coasts to a stop, it will blow out all the residual products of combustion, including water vapor, and leave only air and gasoline vapor in the engine.

186.

COLD WEATHER ACCESSORIES

A number of the most commonly used accessories have been mentioned in the preceding sections. These, together with other accessories and attachments used successfully in northern climates, are summarized below. The use of these accessories is not mandatory. They are given only as suggestions and are to be employed at the discretion of officers in charge of the materiel.

- A. Tarpaulins, tents, or collapsible sheds for covering vehicles, particularly the engines.
- B. Fire pots, Primus type, or Van Prag blow-torches, ordinary blow-torches, oil stoves, or kerosene lanterns for heating vehicles.
- C. Extra batteries and facilities for changing batteries quickly are aids in starting.
- D. Steel drums and suitable metal stands for heating crankcase oil.
- E. Insulation of the fuel line to help prevent ice formation inside the line.
- F. Radiator covers can be improvised locally, and help to keep the engine running at normal temperatures.

Section XX

MATERIEL AFFECTED BY GAS

TITLE	Paragraph No.
Protective Measures _____	187
Cleaning _____	188
Decontamination _____	189
Special Precautions for Automotive Materiel _____	190

187. PROTECTIVE MEASURES

When materiel is in constant danger of gas attack, unpainted parts must be lightly coated with oil. Instruments are included among the items to be protected in this manner from chemical clouds or chemical shells. Materiel not in use should be kept covered and protected as far as possible.

188. CLEANING

All unpainted metal parts of materiel that have been exposed to any gas except mustard and lewisite must be cleaned as soon as possible with dry cleaning solvent or denatured alcohol and wiped dry. All parts should then be coated with engine oil or cosmoline.

189. DECONTAMINATION

For removal of liquid chemicals (mustard and lewisite) from materiel the following steps should be taken:

(a) Protective Measures. (1) A complete suit of impermeable clothing and a service gas mask will be worn. Immediately after removal of the suit a thorough bath with soap and water, preferably hot, must be taken. If any skin areas have come in contact with mustard or any gets into the eyes or the vapor inhaled it is imperative that complete first aid measures be given within twenty to thirty minutes after exposure. (2) Garments exposed to mustard should be decontaminated. If impermeable clothing has been exposed to vapor only it may be decontaminated by hanging it in the open air, preferably in sunlight, for several days. Steaming for two hours also may be used to clean garments. If impermeable clothing has been contaminated with liquid mustard six to eight hours steaming is required.

(b) Procedure. (1) Commence freeing material of dirt through the use of sticks, rags, etcetera, which must be burned or buried immediately after this operation. (2) If the surface of material is coated with grease or heavy oil this must be removed before decontamination is begun. Dry cleaning solvent or other available oil solvents should be used with rags attached to ends of sticks. Following

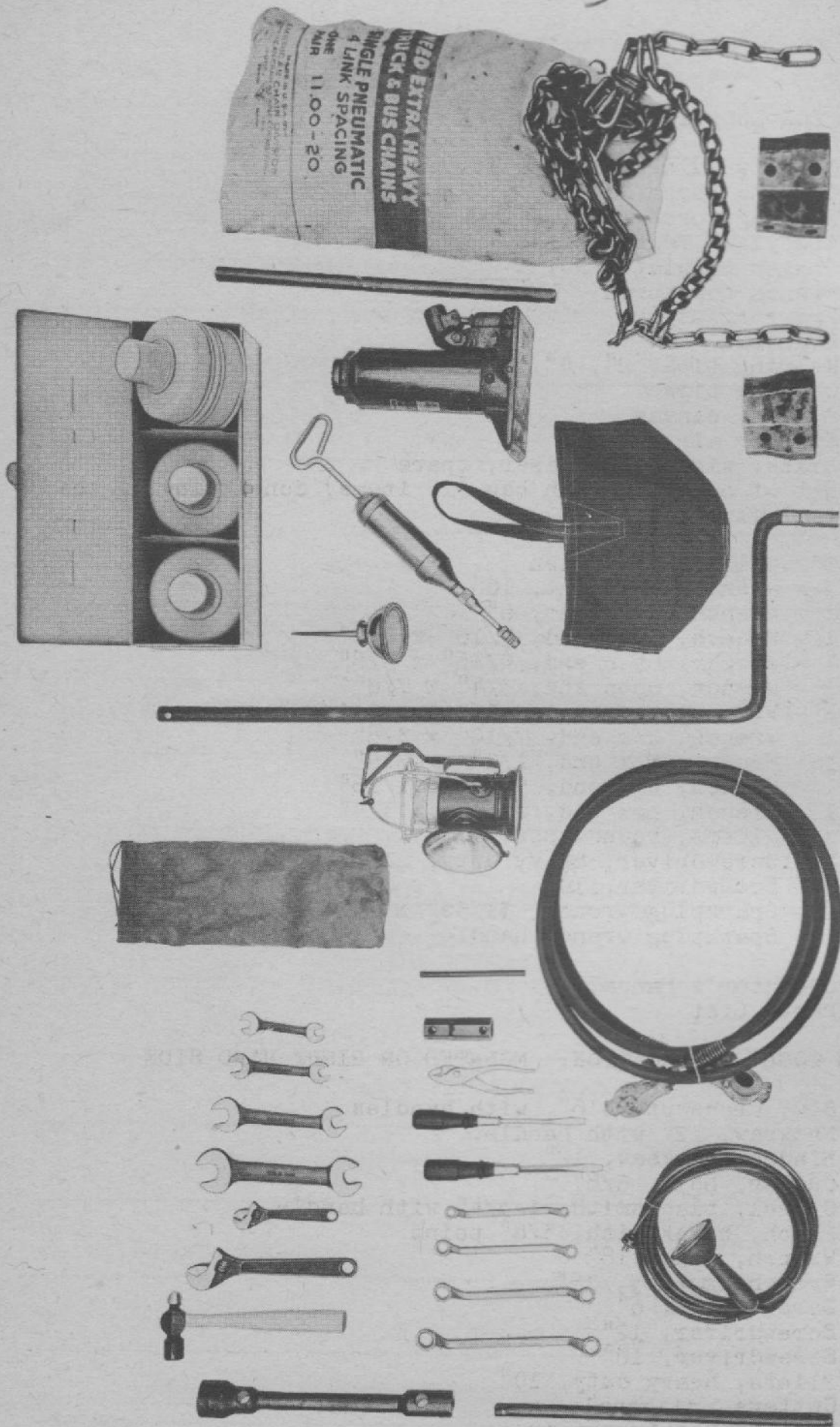
DECONTAMINATION (Cont.)

this, decontaminate painted surfaces with bleaching solution, mixing one part water with one part decontaminating agent (chloride of lime). Swab this solution over all surfaces, wash off, dry, and oil all surfaces. (3) All unpainted metal parts and instruments exposed to mustard or lewisite must be decontaminated with AGENT, decontaminating, non-corrosive. Mix one part solid to 15 parts solvent (acetylene tetra-chloride). If this is not available use warm water and soap. Bleaching solution must not be used because of its corrosive action. Coat all metal surfaces lightly with engine oil. (4) In the event chloride of lime is not available material may be temporarily cleaned with large volumes of hot water. This, however, does not thoroughly clean and will remain a source of danger until properly decontaminated. All mustard washed from material in this manner lies unchanged on the ground necessitating that the contaminated area be plainly marked with warning signs.

190. SPECIAL PRECAUTIONS FOR AUTOMOTIVE MATERIEL

- (a) When vehicles have been subjected to a gas attack with the engine running the air cleaner should be removed, thoroughly flushed with dry cleaning solvent and refilled with the proper grade of oil.
- (b) Contaminated seat cushions should be discarded.
- (c) Washing driving compartments thoroughly with bleaching solution is the most that can be done in the field. Operators should be alert, when running under high temperature conditions, for slow vaporization of mustard or lewisite.
- (d) Exterior surfaces of vehicles should be decontaminated with bleaching solution. Repainting may be necessary.

TOOLS & EQUIPMENT



TOOL KIT
Illustration 21-1

HEAVY WRECKING TRUCK M1

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Section XXI

191. TOOLS & EQUIPMENT

TOOL BOX LOCATION: UNDER SEAT

- 2 - Coils welding hose, 50 Ft.
- 1 - Cutting torch No. _____
- 1 - Welding torch
- 1 - Acetylene regulator No. _____
- 1 - Oxygen regulator No. _____
- 1 - Wrench for torch
- 1 - Pr. goggles
- 1 - Lighter
- 4 - Welding tips, 2", 4", 6", 8"
- 2 - Cutting tips
- 1 - Bucket, canvas
- 1 - Trailer air hose
- 1 - Blade, windshield wiper, spare
- 1 - Kit of hand tools in bag (16 items) consisting of the following:
 - 1 - Hammer, ball pien
 - 1 - Wrench, Crescent, 10"
 - 1 - Wrench, Crescent, 6"
 - 1 - Wrench, open end, 7/16" x 1/2"
 - 1 - Wrench, open end, 9/16" x 5/8"
 - 1 - Wrench, open end, 3/4" x 7/8"
 - 1 - Wrench, open end, 15/16" x 1-1/16"
 - 1 - Wrench, box end, 7/16" x 3/8"
 - 1 - Wrench, box end, 1/2" x 9/16"
 - 1 - Wrench, box end, 5/8" x 11/16"
 - 1 - Wrench, box end, 25/32" x 3/4"
 - 1 - Pliers, round nose, 6"
 - 1 - Screwdriver, heavy duty, 11"
 - 1 - Screwdriver, 10"
 - 1 - Sparkplug wrench, 31/32" x 1-1/32"
 - 1 - Sparkplug wrench handle

- 1 - Operator's Manual
- 1 - Parts List

LONG TOOL BOX LOCATION: MOUNTED ON RIGHT HAND SIDE

- 1 - Saw, crosscut, 4'6", with handles
- 1 - Hacksaw, 12" with handle.
- 12 - Blades, hacksaw, 12"
- 1 - Cutter, bolt, 5/8"
- 1 - Chisel, blacksmith, 1-3/4" with handle
- 1 - Punch, blacksmith, 3/8" point
- 1 - Wrench, pipe, 18"
- 1 - Wrench, monkey, 18"
- 1 - Screwdriver, 6"
- 1 - Screwdriver, 12"
- 1 - Screwdriver, 18"
- 1 - Pliers, heavy duty, 10"
- 1 - Cutters, diagonal
- 1 - Hammer, straight claw

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LONG TOOL BOX LOCATION: MOUNTED ON RIGHT HAND SIDE (Cont.)

- 6 - Pins, shear, rear winch
- 5 - Pins, shear, front winch
- 6 - Pins, shear, crane winch
- 1 - Saw, hand

TOOL BOX LOCATION: RIGHT SIDE UNDER BODY

- 6 - Clamps, wire rope, 3/4"
- 6 - Clamps, wire rope, 5/8"
- 6 - Thimbles, 3/4"
- 6 - Thimbles, 5/8"
- 2 - Shackles, round pin anchor
- 1 - Hook for chain of cable
- 1 - Vise, 5"
- 2 - Jacks, 8-ton
- 1 - Grease gun, 9 oz.
- 1 - Wrench, Budd wheel, with handle
- 2 - Wrenches, wheel bearing

TOOL BOX LOCATION: LEFT SIDE UNDER BODY

- 3 - Pr. tire chains, non-skid, 11:00 x 20
- 2 - Chains, tow, 12 Ft.

TOOL BOX LOCATION: REAR BODY

- 1 - Rope block, double
- 1 - Rope block, single
- 1 - Crank, motor
- 2 - Shovels, "D" handle
- 2 - 10 Lb. sledges, with handles
- 1 - Pick mattox, with handle
- 2 - Bars, crow, pinch point, 7/8" x 30"
- 2 - Bars, wrecking, 3/4" x 30"
- 2 - Chisels, 1" x 24"
- 1 - Axe, single bit, with handle

TOOL LOCATION: MOUNTED ON TRUCK

- 2 - Snatch blocks, double, 8"
- 2 - Snatch blocks, single, 8"
- 1 - Cable, tow, with carrying brackets
- 2 - Bars, crow, 1-1/4" x 60"
- 1 - Bar, tow
- 1 - Hand tool box and tools (101 items) complete with lock No. _____ and two keys, consisting of the following:
 - Extra Small Series, 1/4" Square Drive
 - 1 - Handle bar
 - 1 - Hinged offset
 - 1 - 3/16" Single hex socket

HEAVY WRECKING TRUCK M1

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Extra Small Series, 1/4" Square Drive (Cont.)

- 1 - 7/32" Single hex socket
- 1 - 1/4" Single hex socket
- 1 - 9/32" Single hex socket
- 1 - 5/16" Single hex socket
- 1 - 11/32" Single hex socket
- 1 - 3/8" Double hex socket
- 1 - 7/16" Double hex socket
- 1 - Plastic case

Small Series, 3/8" Square "Lock-on" Drive

- 1 - Free wheeling ratchet
- 1 - Speeder handle
- 1 - 10" Extension
- 1 - Handle bar
- 1 - Hinged offset
- 1 - Screw driver
- 1 - Universal joint
- 1 - Grip extension
- 1 - 5/16" Single hex socket
- 1 - 3/8" Double hex socket
- 1 - 7/16" Double hex socket
- 1 - 1/2" Double hex socket
- 1 - 9/16" Double hex socket
- 1 - 5/8" Double hex socket
- 1 - 11/16" Double hex socket
- 1 - 3/4" Double hex socket
- 1 - 1/2" Double hex universal joint socket
- 1 - 9/16" Double hex universal joint socket
- 1 - 5/8" Double hex universal joint socket

Standard Series, 1/2" Square "Lock-on" Drive

- 1 - Universal joint
- 1 - Screw driver
- 1 - 6" Extension
- 1 - Hinged offset
- 1 - Handle bar
- 1 - 10" Extension
- 1 - Free wheeling ratchet
- 1 - Brace handle
- 1 - 7/16" Double hex socket
- 1 - 1/2" Double hex socket
- 1 - 9/16" Double hex socket
- 1 - 19/32" Double hex socket
- 1 - 5/8" Double hex socket
- 1 - 11/16" Double hex socket
- 1 - 3/4" Double hex socket
- 1 - 25/32" Double hex socket
- 1 - 13/16" Double hex socket
- 1 - 7/8" Double hex socket
- 1 - 15/16" Double hex socket
- 1 - 1" Double hex socket
- 1 - 1-1/16" Double hex socket

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Standard Series, 1/2" Square "Lock-on" Drive (Cont.)

- 1 - 3/8" Double square socket
- 1 - 7/16" Double square socket
- 1 - 1/2" Double square socket
- 1 - 9/16" Double square socket
- 1 - 5/8" Double square socket
- 1 - 3/4" Double square socket
- 1 - 1/2" long Double hex socket
- 1 - 9/16" long Double hex socket
- 1 - 5/8" long Double hex socket
- 1 - 3/4" long Double hex socket
- 1 - 13/16" long Double hex socket
- 1 - 7/8" long Double hex socket
- 1 - 1" long Double hex socket
- 1 - 1-1/8" long Double hex socket

Heavy Duty Series, 3/4" Square "Lock-on" Drive

- 1 - Ratchet
- 1 - 8 1/2" Extension
- 1 - Handle bar
- 1 - Hinged offset
- 1 - 1-1/8" Double hex socket
- 1 - 1-1/4" Double hex socket
- 1 - 1-3/8" Double hex socket
- 1 - 1-7/16" Double hex socket
- 1 - 1-1/2" Double hex socket

Heavy Duty Series, 3/4" Square "Lock-on" Drive

- 1 - 1-5/8" Double hex socket
- 1 - 1-3/4" Double hex socket
- 1 - 1-13/16" Double hex socket

Short Double Offset Box-Type Wrenches

- 1 - 3/8" & 7/16" Double hex
- 1 - 1/2" & 9/16" Double hex
- 1 - 5/8" & 11/16" Double hex

Long Double Offset Box-Type Wrenches

- 1 - 3/4" & 25/32" Double hex
- 1 - 13/16" & 7/8" Double hex
- 1 - 15/16" & 1" Double hex

Tappet Open-End Wrenches

- 2 - 1/2" & 9/16" Tappet wrenches
- 2 - 5/8" & 11/16" Tappet wrenches
- 2 - 3/4" & 7/8" Tappet wrenches

Open-End Wrenches

- 1 - 5/16" & 3/8" O.E. wrench
- 1 - 7/16" & 1/2" O.E. wrench

HEAVY WRECKING TRUCK M1

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Open-End Wrenches (Cont.)

- 1 - 9/16" & 5/8" O.E. wrench
- 1 - 11/16" & 13/16" O.E. wrench
- 1 - 3/4" & 7/8" O.E. wrench
- 1 - 15/16" & 1" O.E. wrench

Ignition Open-End Wrenches

- 1 - 13/64" & 15/64" Ign. wrench
- 1 - 7/32" & 1/4" Ign. wrench
- 1 - 9/32" & 5/16" Ign. wrench
- 1 - 11/32" & 3/8" Ign. wrench
- 2 - Quick release chains
- 6 - Padlocks No. _____ with three keys
- 1 - Oil can
- 1 - Acetylene tank No. _____
- 2 - Oxygen tanks Nos. _____
- 1 - Block, square, 8", for crane
- 2 - Extra pins for boom legs
- 1 - Extinguisher, Fire gun

TOOL LOCATION: LOOSE IN TRUCK BODY

- 1 - 300' x 1" Manila rope
- 1 - Ground plate, double, for boom legs
- 2 - Jacks, body
- 1 - Directional angle pull bracket
- 2 - Spades and legs
- 2 - Anchors, Holmes, 4 pieces, with 14 stakes
- 1 - Whiffletree with attachments

AMENDMENT #1

TOOL BOX LOCATION: UNDER SEAT

- 1 - Gloves, pr. asbestos
- 2 - Flare, kits (Dietz)
- 2 - Lanterns, electric (Delta)

LONG TOOL BOX LOCATION: MOUNTED ON RIGHT HAND SIDE

- 1 - Lamp, trouble assembly

TOOL BOX LOCATION: REAR BODY

- 1 - Jack, hydraulic, 30-ton

TOOL BOX LOCATION: REAR UNDER FLOOR

- 1 - Rope, Manila, 50' x 3/8"
- 1 - Rope, Manila, 100' x 3/4"

HEAVY WRECKING TRUCK M1

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Section XXII
STORAGE AND SHIPMENT

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STORAGE

192. Limited Storage

Included in this category are vehicles ready for immediate service but not to be used for less than thirty days. Fuel and oil to be retained in maximum capacity of vehicles. Batteries remain installed and charged. Vehicles thoroughly cleaned and lubricated before being placed in storage. Brakes not set and gear shift levers in neutral.

193. Indefinite Storage

Cooling System

Cooling system drained.

Open petcock at right rear corner of engine block.

Open petcock at bottom of water pump.

Fuel System

Fuel pump drained.

Carburetor drained.

Fuel tanks drained.

Engine run to use up fuel.

Storage Battery

Storage battery removed and recycled every thirty days.

Miscellaneous

Vehicle tagged, indicating what repairs are required before being returned to service.

Electrical equipment removed and wrapped in oil paper.

Indefinite Storage (Cont.)

Engine mechanical accessories such as carburetors and fuel pumps should also be removed, wrapped in oil paper and packed in a box. Each box must be properly identified.

Tires removed and wrapped in burlap, paper or cloth and stored vertically side by side.

Tubes to be deflated, removed from casings, cleaned, stored in pasteboard cartons, taking care to make certain they are loosely folded.

Rubber parts should receive an application of rubber lubricant recommended by quartermaster.

Crankcases to be drained and flushed with a light oil other than kerosene. Use about 1/2 pint heavy mineral oil poured into each cylinder and distributed by cranking the engine.

Oil, grease, or graphite placed in threads of the spark plug holes.

All openings plugged with tapered, fitted wood plugs.

(a) Storage Conditions:- Vehicles will be stored in closed buildings or covered sheds, if available. In lieu thereof, cover by tarpaulins. Storage surface should be solid, free from crushed rock, deep dust, and oil surfacing, and properly drained. Vehicles should be raised and blocked to keep the tires off the ground. If not completely serviced and maintained, each vehicle is tagged to indicate what repairs are required before it is returned to service.

(b) Drainage:- Fuel tanks are drained and the openings are plugged. The cooling system is drained also, and all drain cocks are opened and cleaned with a wire to insure removal of sediment that may block the flow of water. A light oil should be placed in the water pump.

(c) Equipment:- (1) Fire extinguishers. - Carbon tetrachloride types of fire extinguishers must be kept filled with liquid to avoid decomposition and deformation of the cork seats and washers therein. Water is permissible in stored extinguishers in lieu of regular extinguisher liquid in emergencies only. (2) Tools and accessories should be repainted and regreased as necessary.

VEHICLE PREPARATION FOR SHIPMENT

194. SHIPMENT BY RAIL:

(a) General Procedure. In case of shipment of individual vehicles, or where the organization does not accompany its transportation, vehicles are turned over to the quartermaster for shipment. In such a case the quartermaster is responsible for furnishing the necessary personnel and material for loading and blocking equipment. Vehicles are usually shipped on flat cars (36 to 60 feet long), gondolas (36 to 60 feet long), or special box cars (50 feet long) designed for the handling of motor vehicles. Automobile cars or flat cars with wooden floors are the most desirable types because of the ease of loading and blocking.

(b) Preparation of Railroad Cars. Transportation must be inspected to determine if the cars are in suitable condition to carry the load safely to its destination. Sound floors are required. All loose nails, debris, and projections not an integral part of the car and the prescribed blocking must be removed.

(c) Preparation of Vehicles for Loading. If troops are not traveling with their vehicles, all loose property and tools should be packed and secured in boxes, and hoods should be sealed down with car seals.

- (1) When motor vehicles are shipped individually, fuel is drained from tanks. When vehicles are shipped with troops, draining of fuel is not required and unloading will be expedited.
- (2) Tires should be inflated to at least 10 pounds above normal pressure in order to avoid sagging or shifting of motor vehicles in blocks.
- (3) Radiators should be drained when there is a possibility of freezing during shipment.
- (4) Batteries should be disconnected.
- (5) Seat cushions should be secured against the weather. Doors should be closed and latched.
- (6) Recheck the following items:

Cooling System

Cooling system drained.

Open petcock at right rear corner of engine block.

VEHICLE PREPARATION FOR SHIPMENT (Cont.)

Open petcock at bottom of water pump.

Fuel System

Fuel pump drained.

Carburetor drained.

Fuel tanks drained.

Engine run to use up fuel.

Storage Battery

Positive cable disconnected and taped.

Positive cable tied away from battery.

Tires

Inflated 10 pounds above normal pressure.

Miscellaneous

Ignition switch off.

Gear shift levers in neutral.

Emergency brake set.

Hood closed and sealed.

Cushions secured.

Doors secured.

Key tied to steering wheel.

Tagged for destination.

Exposed metal surfaces oiled or cosmol

Loose parts and tools boxed.

SHIPMENT BY WATER

With certain modifications, preparations of the vehicles are the same as indicated for rail shipment. Special attention must be given to rust prevention, however. All exposed, unpainted material and working parts must be thoroughly greased. All engines should be turned over several times every three days. Under severe conditions such as deck loading engines should be flushed with oil through spark plug openings.

HEAVY WRECKING TRUCK M1

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Section XXIII
REFERENCES

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196.

STANDARD NOMENCLATURE LISTS

- A. Truck, wrecking, heavy, M1(Ward La France)SNL G-116
- B. Cleaning, preserving, and lubricating materials SNL K-1

Current Standard Nomenclature Lists are as tabulated here. An up-to-date list of SNL's is maintained as the "Ordnance Publications for Supply Index."

OPSI

197.

EXPLANATORY PUBLICATIONS:

- A. Cleaning, preserving, and lubricating materials TM 9-850
- B. INSPECTION AND MAINTENANCE
- Fire prevention, safety precautions, accidents TM 10-360
- Echelon system of maintenance TM 10-525
- Motor transport inspection TM 10-545
- Maintenance and care of pneumatic tires TM 31-200
- C. STORAGE AND SHIPMENT
- Storage of motor vehicle equipment AR 850-18
- Loading of mechanized and motorized army equipment on open top railroad equipment--Association of American Railroads
- D. AUTOMOTIVE MATERIAL
- The internal combustion engine TM 10-570
- Automotive electricity TM 10-580
- Automotive brakes TM 10-565
- Fuels and carburetion TM 10-550
- E. MISCELLANEOUS
- List of training publications FM 21-6
- Motor transport FM 25-10
- Military motor vehicles AR 850-15
- Electrical fundamentals TM 1-455
- The motor vehicle TM 10-510
- Reference data FM 5-35

198. TRAINING FILMS AND FILM STRIPS

A. LUBRICATION

Lubrication	FS 10-39
The story of automotive lubrication	TF 25-76

B. INSPECTION AND MAINTENANCE

The motor vehicle driver, first echelon maintenance	TF 11-558
First echelon of maintenance	FS 10-53
Second echelon of maintenance	FS 10-54
Inspection of motor vehicles	FS 10-58

C. AUTOMOTIVE MATERIAL

Gasoline motors	TF 10-166
Ignition and a spark plug	TF 25-152
Internal combustion engines	FS 1-15
The internal combustion engine	FS 10-42
Fuels and carburetion	FS 10-44
Storage battery	FS 10-61

A.G. 062.11 (7-28-42).

BY ORDER OF THE SECRETARY OF WAR

G. C. MARSHALL,

Chief of Staff.

OFFICIAL:

J. A. ULIO,

MAJOR GENERAL,

THE ADJUTANT GENERAL.

DISTRIBUTION: X

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ILLUSTRATION LIST

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