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MATERIALS HANDLING EQUIPMENT

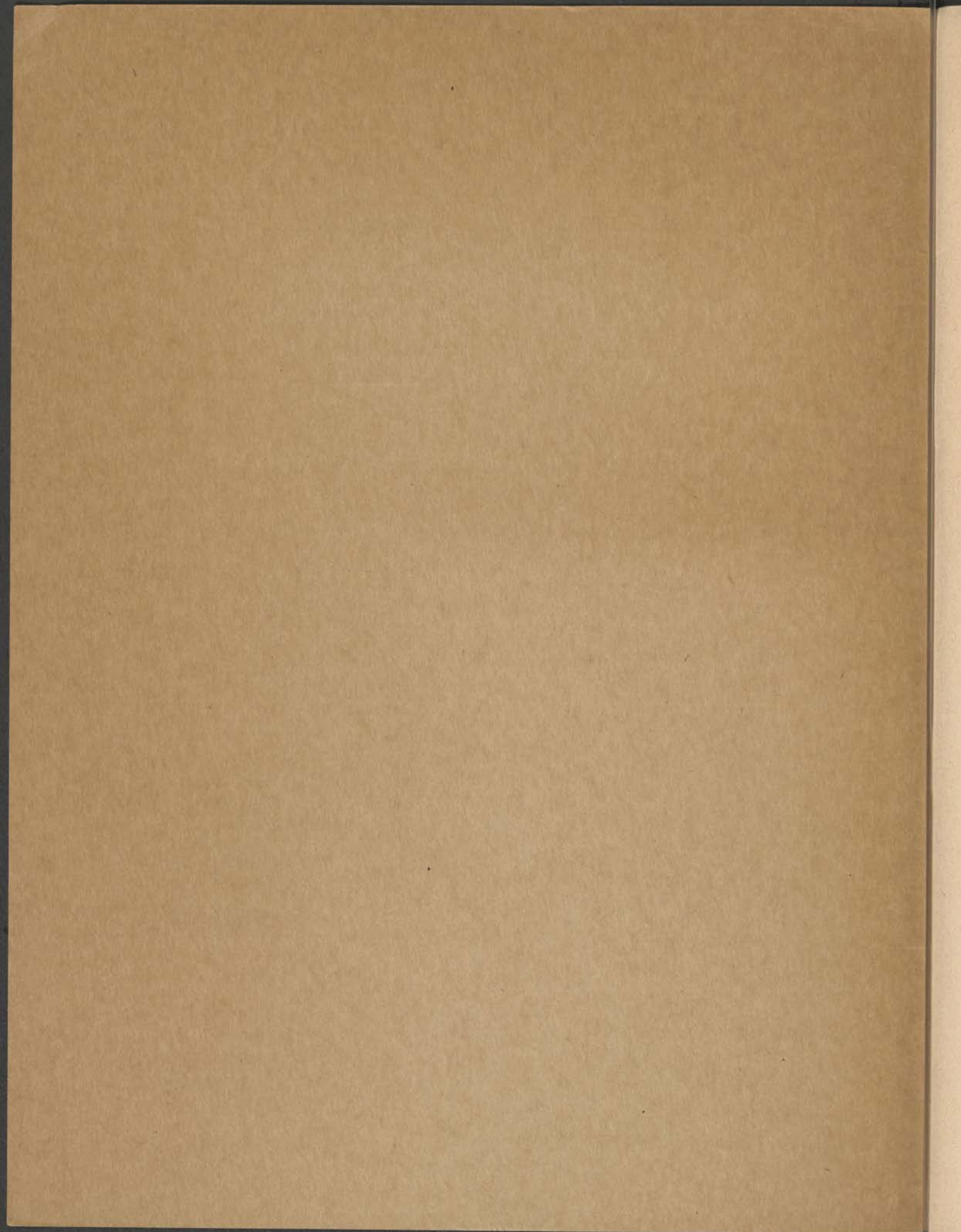
PLATFORM TRUCKS

WHEELED WAREHOUSE CRANES

AND STRADDLE TRUCKS

WAR DEPARTMENT • DECEMBER 1945

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TM 21-302A

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AND TRAINING
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PLATFORM TRUCKS
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AND STRADDLE TRUCKS



WAR DEPARTMENT

• DECEMBER 1945

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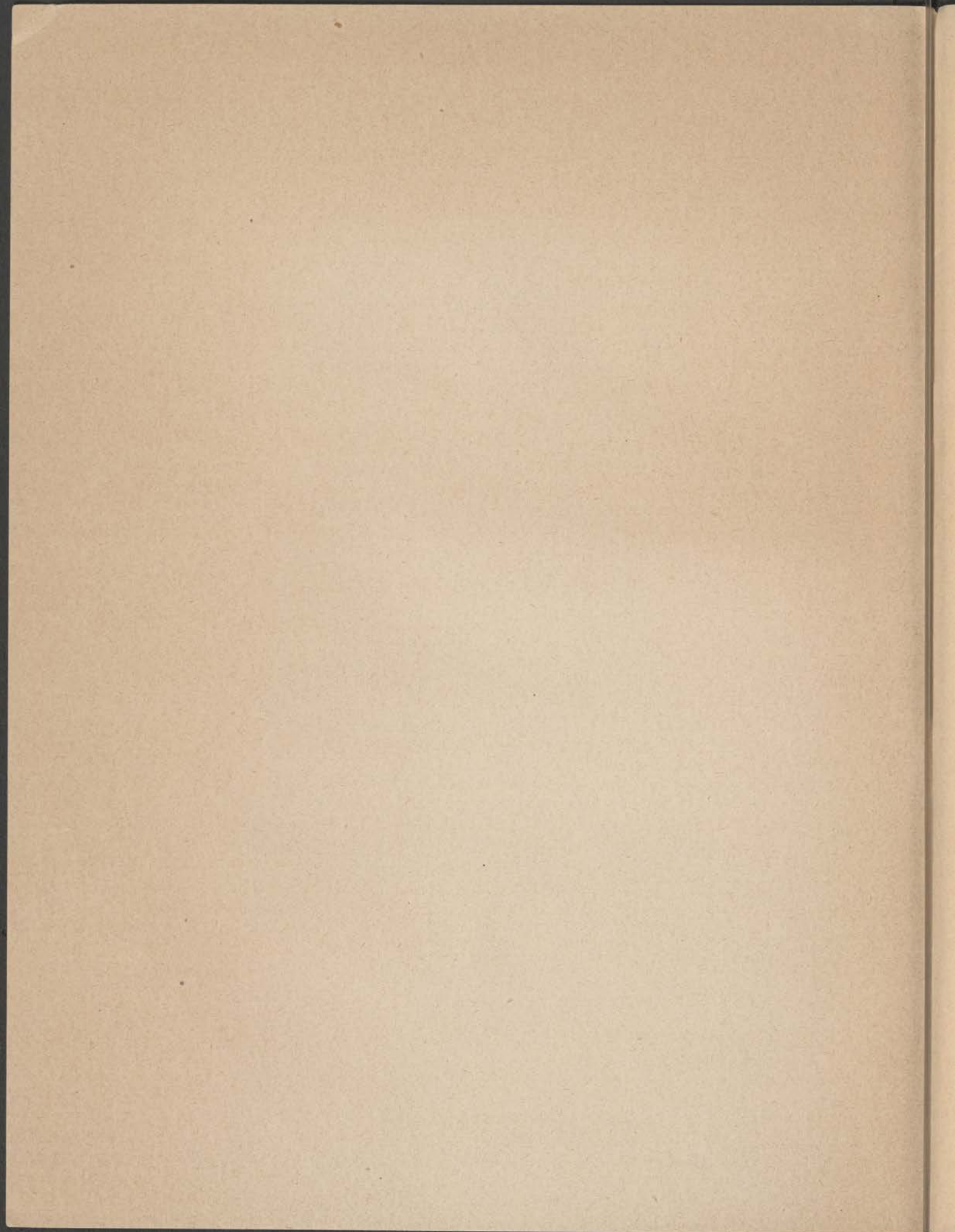
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SECTION I

PURPOSE AND SCOPE

1. Relation to TM 21-302

This manual is supplementary to TM 21-302 and should be used together with that manual. This manual is devoted almost entirely to specific training procedures for operators of platform trucks, wheeled warehouse cranes, and straddle trucks. Information in TM 21-302 on selecting the trainee; instruction, planning, and student orientation; on-the-job training; and operator responsibility has not been duplicated. Instruction herein regarding safety and maintenance is limited to directions not covered by TM 21-302.

2. Operating Instructions

Inasmuch as this is a general training manual, it is impossible here to give details of operation for every type of platform truck, wheeled warehouse crane, and straddle truck. Consequently the operating instructions included in this manual are to be

regarded only as typical of those a trainee should receive, and not as definite directions for the operation of every item of equipment. Instructors must avail themselves of all Technical Manuals, Lubrication Orders, and other War Department publications pertaining to the particular items of equipment being used, and must follow the operating and maintenance instructions set forth therein.

3. Preventive Maintenance Services

Operators must be trained in the preventive maintenance services discussed in section V of this manual and in section II, chapter 6, TM 21-302. "Before-operation service" may be effectively explained at the very outset of operator training. "During-operation service" and "after-operation service" may be explained at appropriate times during the training program.

SECTION II

TRAINING PROCEDURE: OPERATORS OF PLATFORM TRUCKS

4. Types and Sizes of Platform Trucks

A platform truck is a self-propelled, power-operated vehicle, with a load platform supported by the entire wheelbase. The truck is most valuable on short hauls, where its heavy carrying capacity (2,000 to 20,000 pounds) can be used to greatest advantage. Platform trucks may be operated by a gasoline engine, an electric battery, or a combination of gasoline and electric power. In trucks equipped with such a combination, a gasoline engine drives the generator which furnishes power for the electric motors operating the truck. The small number of gasoline-electric platform trucks in use in Army installations makes it inadvisable to include operating instructions for such models in this manual. The principal types of platform trucks are as follows:

a. **STATIONARY PLATFORM.** The simplest type of platform truck is a load carrier with a stationary platform. Since the truck cannot load itself, it can be used only for transporting materials placed on the platform.

b. **LOW-LIFT PLATFORM.** A second type of platform truck is equipped with a platform which may be raised from 2 to 6 inches above its resting platform. A truck of this type is consequently self-loading and may be used to pick up, transport, and set down supplies loaded on a skid.

c. **HIGH-LIFT PLATFORM.** A third type of platform truck is equipped with a high-lift platform, which on some models may be raised as high as 10 feet. A truck of this type is consequently self-loading and may be used to pick up, transport, and tier supplies loaded on a skid.

5. Platform Trucks, Gasoline (figs. 1 and 2)

a. **STARTING.** The first step in teaching the operation of a platform truck is to explain to trainees the manner of starting the vehicle.

(1) Before mounting the truck, the operator (as part of the before-operation service) inspects for the following:

- (a) Adequate supply of gasoline.
- (b) Adequate supply of oil.
- (c) Adequate supply of water.
- (d) Tires in good condition.
- (e) Fire extinguisher present, filled, and securely mounted.
- (f) Ignition-system wiring secure.
- (g) Hood securely fastened.

Note: When checking the gasoline, oil, and water supply, the operator should examine the equipment for leaks and seepage.

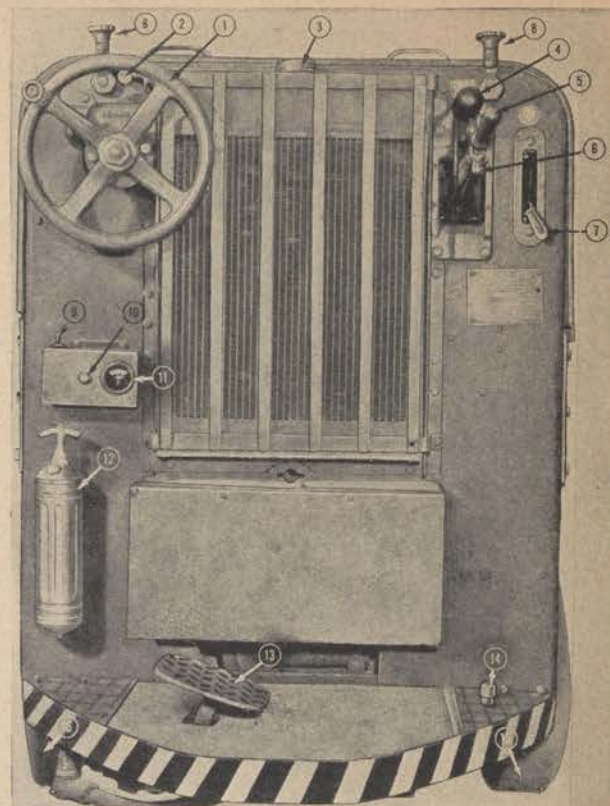
(2) Before starting the truck, the operator determines the following:

- (a) Gearshift and clutch lever is neutral.
- (b) Speed shift lever is low.
- (c) Lift control lever in neutral.
- (d) Brake pedal working properly.
- (e) Horn working properly.

(3) To start and warm up the engine, the operator follows these steps:

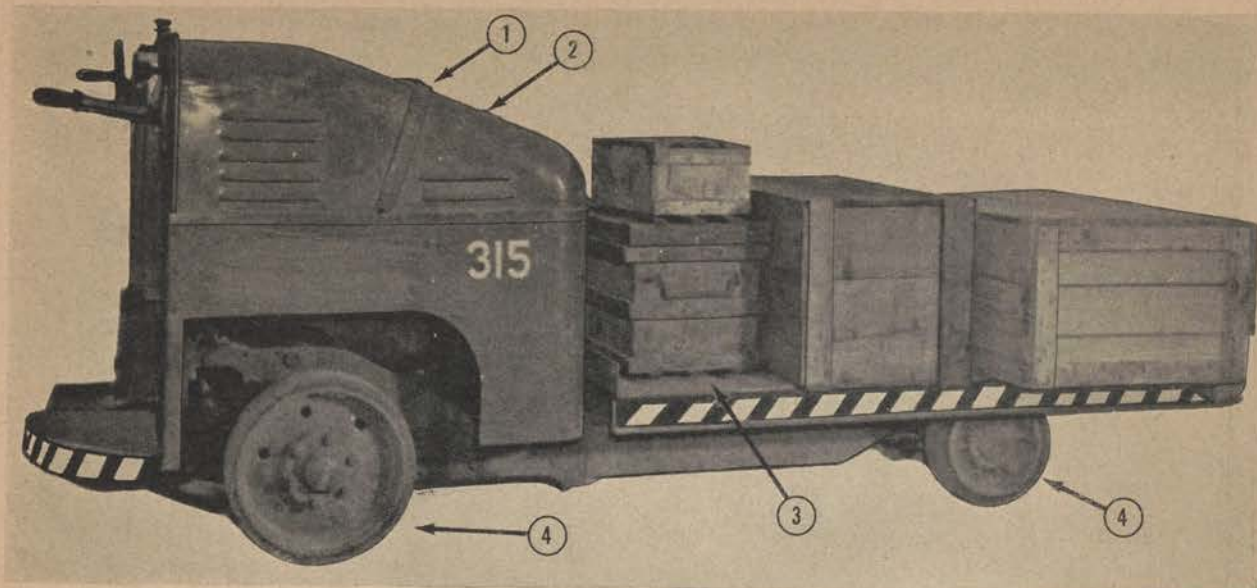
- (a) Pull out choke.
- (b) Turn on ignition.
- (c) Press starter.
- (d) Operate throttle.
- (e) Push in choke gradually.
- (f) Check battery charging rate.

(This should be near 15 amperes when engine is accelerated. If the ammeter shows a lower or higher rate, call supervisor.)



- | | |
|-------------------------------|---------------------|
| ① Steering wheel | ⑨ Ignition |
| ② Choke | ⑩ Starter |
| ③ Water | ⑪ Ammeter |
| ④ Speed shift rod | ⑫ Fire extinguisher |
| ⑤ Gear shift and clutch lever | ⑬ Brake pedal |
| ⑥ Throttle | ⑭ Horn button |
| ⑦ Lift control lever | ⑮ Tires |
| ⑧ Hood clamps | |

Figure 1. Typical gasoline-powered platform truck, rear view.



① Gasoline.
② Oil.

③ Platform.
④ Tires.

Figure 2. Typical gasoline-powered platform truck, side view.

(g) Test lift mechanism for proper operation.

b. STOPPING. To stop the truck, the operator follows these steps:

- (1) Apply brake by releasing pedal.
- (2) Put gearshift and clutch lever in neutral.
- (3) Turn off ignition (if truck is to be parked).

c. DRIVING FORWARD AND BACKWARD. The operator steers the truck with his left hand and operates controls with his right. To drive forward or backward, the operator follows these steps:

- (1) Put gearshift and clutch lever into forward or reverse.
- (2) Engage clutch by putting gearshift and clutch lever in the "up" position.
- (3) Step on brake pedal to release brake.
- (4) Accelerate engine.
- (5) Before shifting from forward to reverse (or vice versa), and before changing speeds, stop the truck and bring gearshift and clutch lever to neutral, in the "up" position.

d. TURNING LEFT OR RIGHT. A platform truck is normally steered by all four wheels. To turn left or right, when the truck is traveling in either forward or reverse, the operator turns the steering lever or wheel in the desired direction.

e. USING THE LIFT. If the truck is equipped with a lifting platform, the platform is raised and lowered by a power take-off from the truck engine. The platform is operated by means of a lift-control lever.

(1) To lift the platform, move the control lever to the "lift" position. Operate the engine at approximately half speed to lift the load.

(2) To stop the platform at any point and to

hold the load in an elevated position, place the control lever in neutral.

(3) To lower the platform, move the control lever to the "lower" position. Operate the engine at approximately half speed and lower the platform under power.

6. Platform Trucks, Electric (fig. 3)

a. STARTING. (1) Before mounting the truck, the operator (as part of the before-operation service) inspects for the following:

- (a) Tires in good condition.
- (b) Electric wiring secure.
- (c) Hood securely fastened.
- (d) Tools and equipment present and clean.

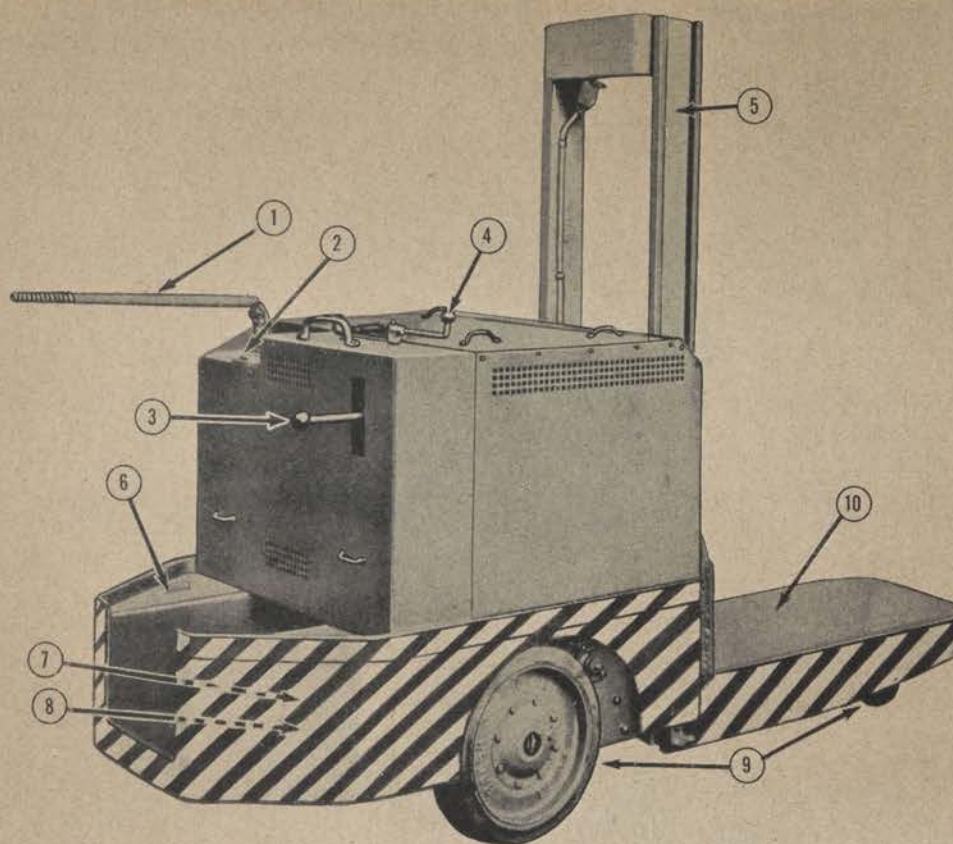
(2) Before starting the truck, the operator determines the following:

- (a) Speed controller in neutral.
- (b) Lift controller in neutral.
- (c) Brake pedal working properly.
- (d) Horn working properly.

(3) If the inspections in (1) and (2) above, show that the truck is in proper condition, the operator turns on the controller circuit key and tests the speed controller and brake by operating the truck a few feet in forward and reverse. At the same time he may check the steering of the truck and also test the operation of the lift mechanism if the truck is equipped with this.

b. STOPPING. To stop the truck, the operator follows these steps:

- (1) Apply brake by releasing pedal.
- (2) Put speed controller in neutral.



- | | |
|---------------------------|------------------------|
| ① Steering lever. | ⑥ Tools and equipment. |
| ② Controller circuit key. | ⑦ Brake pedal. |
| ③ Speed controller. | ⑧ Horn button. |
| ④ Lift controller. | ⑨ Tires. |
| ⑤ Mast. | ⑩ Platform. |

Figure 3. Typical battery-electric platform truck.

(3) Turn-off ignition (to stop gasoline engine of gasoline-electric truck).

c. DRIVING FORWARD AND BACKWARD. The operator steers the truck with his left hand and operates controls with his right. To drive forward or backward, the operator follows these steps:

(1) Put speed controller in low speed forward or reverse, depending on direction of travel desired. (If truck has separate controller, shift this to forward or reverse before shifting speed controller.)

(2) Step on brake pedal to release brake.

(3) Advance speed controller to appropriate contact, depending on load and traveling conditions.

d. TURNING LEFT OR RIGHT. To turn left or right, when the truck is traveling in either forward or reverse, the operator moves the steering tiller or wheel in the direction of the turn.

e. USING THE LIFT. If the truck is equipped with a lifting platform, the platform is operated by means of a lift-control. To stop the platform at any point and to hold the load in an elevated position, the operator places the controller in neutral.

7. Training in Operation

a. ELEMENTARY OPERATION. After the trainee understands the use of the various operating controls of the platform truck, he begins to practice actual operation. (See par. 30, TM 21-302.) When he is able to operate the truck satisfactorily in a clear space, he proceeds to the next steps in the training program.

b. USE OF THE MAZE AND THE OBSTACLE COURSE. When properly adapted, the maze and the obstacle course described in paragraph 31, TM 21-302, may be used for training operators of platform trucks. Because many models of platform trucks have greater over-all length than the average fork lift truck or towing tractor, aisle widths in both the maze and the obstacle course will usually have to be adjusted. Proper aisle widths for training on platform trucks of any length can be determined easily by the instructor.

c. USE OF PRACTICE BOXCAR. The practice boxcar described in paragraph 32, TM 21-302, may be used in training operators of platform trucks.

d. **OPERATING PRECAUTION.** Observe the following safety precautions in the operation of platform trucks:

- (1) Never permit anyone to ride on the platform truck.
- (2) Be certain that the load is well balanced on the platform before moving the truck.
- (3) Always watch the load when raising or lowering it.
- (4) Never overload the truck or pick up a load that is not properly stacked.
- (5) Always drive the truck with the platform lowered. (To speed materials handling, an experienced operator may raise the platform when approaching a column of supplies.)
- (6) Before entering a boxcar, be certain that the car plate is properly and securely placed.
- (7) Never lift a load which extends dangerously above the mast of the truck.
- (8) For general safety rules and precautions, see paragraphs 47 to 50, inclusive, TM 21-302.

8. Capacity of Platform Trucks

The capacity of a platform truck is the weight of the load which may be carried on the platform, or raised if the platform is of the lift type. A statement of its capacity should be clearly visible on each platform truck. The operator must know the maximum capacity of the truck before he begins training in materials handling and must be careful never to overload the vehicle.

9. Training in Moving and Storing Supplies

a. **TRAINING AIDS.** The instructor should have available in the training area the following training aids:

- (1) Dummy boxes, barrels, or crates of supplies light enough to be placed on the truck by man-handling.
- (2) Empty skids.
- (3) Skids loaded with supplies of various weights and dimensions.

b. **TRAINING IN MOVING SUPPLIES.** (1) After the trainee has demonstrated his ability to drive the empty truck through the maze and the obstacle course and into and out of the practice boxcar, he repeats these operations with supplies loaded on the platform of the truck. Dummy supplies used should be similar in shape to those encountered in actual storage practice, so that the trainee may learn the additional difficulties of maneuvering with a loaded platform.

(2) The trainee next practices lifting, transporting, and placing empty skids and skidloads of supplies. He must learn to pick up the load carefully, making certain that the platform extends far enough under

the skid for proper balance. (See fig. 4.) Training in moving skidloads includes operating the truck through the maze and the obstacle course and into and out of the boxcar.



Figure 4. Before moving a platform truck, the operator makes certain that the load is properly stacked and well-balanced on the platform.

c. **TRAINING IN STORING SUPPLIES.** Supplies loaded on skids may be tiered by a high-lift platform

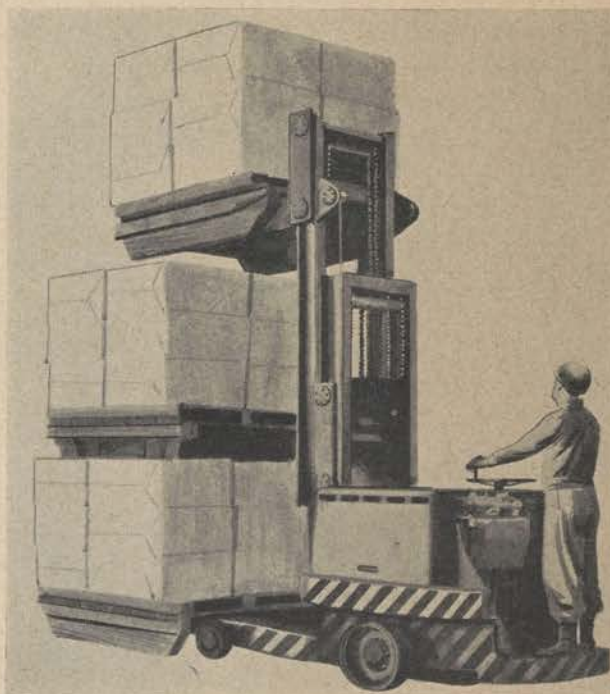


Figure 5. Supplies stored on skids may be tiered by a high-lift platform truck.

truck. Consequently, if such a truck is available, the trainee must learn finally to tier loaded skids. (See fig. 5.) In connection with such training in storage, the operator must be acquainted with the information in paragraph 34, TM 21-302. Training should include, in general, the maneuvers described in paragraph 37, TM 21-302, adapted to fit the mechanical structure of the platform truck.

10. Training in Handling Platform Truck for Special Jobs

Although every job for which the platform truck is used is in a sense "special," there may be in each depot particular problems in truck operation which

arise from the nature of the materials handled. For example, in one depot it may be an occasional practice to move very long boards or pieces of pipe on a platform truck. Such materials handling, requiring unusual care on the part of the operator, would constitute a special job under the meaning of this paragraph. In another depot, operators of platform trucks may be required at times to handle hazardous commodities or to operate the truck under other unusual circumstances. When trainees have practiced all standard operating procedures, the instructor should complete the training program by requiring each trainee to practice any such unusual assignment which he may encounter in the depot.

SECTION III

TRAINING PROCEDURE: OPERATORS OF WHEELED WAREHOUSE CRANES

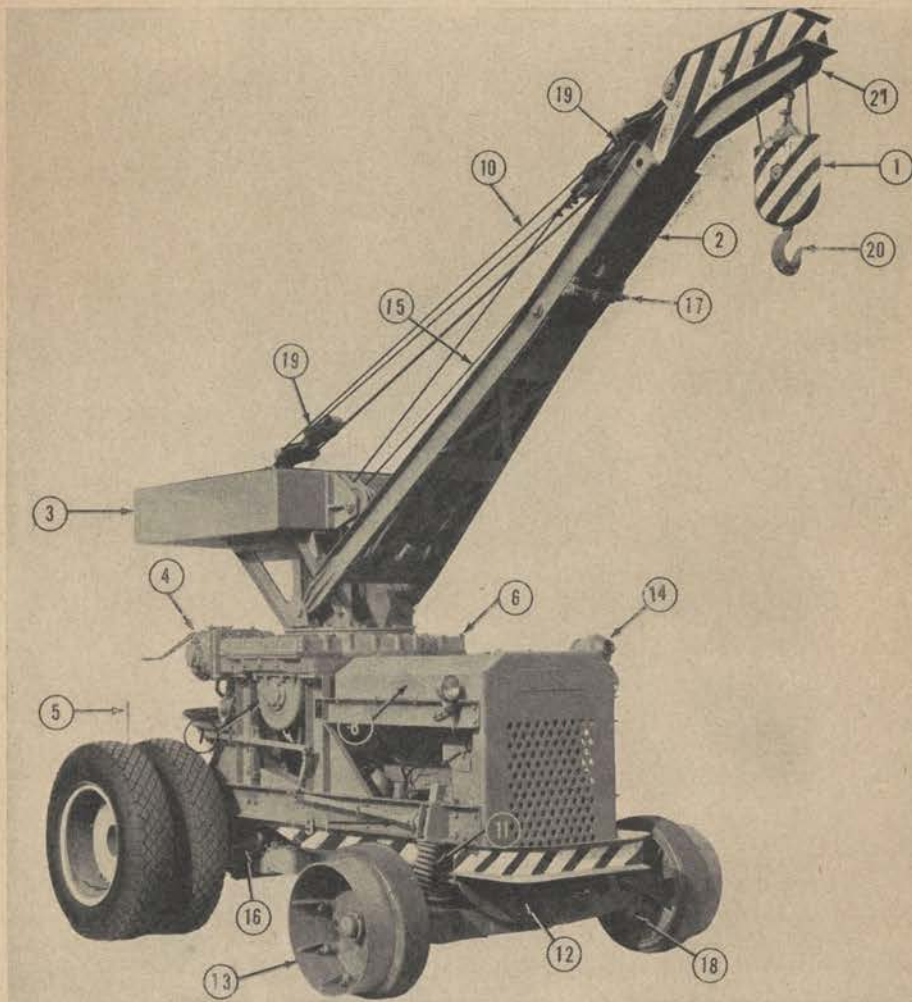
II. Types and Sizes of Wheeled Warehouse Cranes

a. **GENERAL.** A wheeled warehouse crane consists of a lifting boom mounted on a wheeled, power-driven chassis. Cranes used in the average warehouse normally do not have a capacity exceeding 10,000 pounds. The crane may be operated by a gasoline engine, an electric battery, or a combination of gasoline and electric power. In cranes equipped with such a combination, a gasoline engine drives the

generator which furnishes power for the electric motors operating the crane.

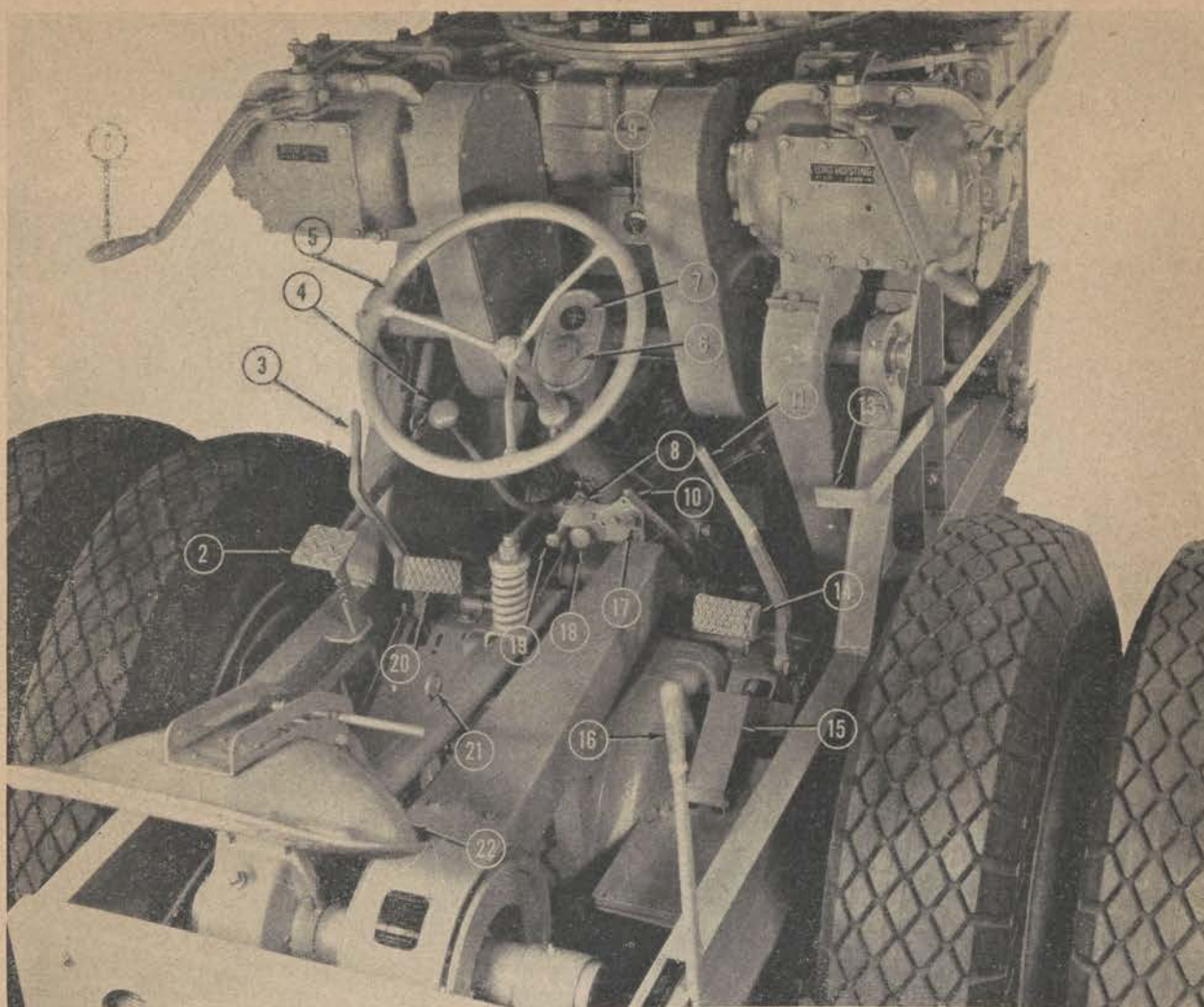
b. **FIXED BOOM CRANE.** Cranes may be classified further according to the type of boom with which they are equipped. A fixed or rigid boom is one which is mounted on the crane chassis in such a manner that it can be raised or lowered, but cannot be moved from side to side.

c. **SLUING BOOM CRANE.** A sluing boom is one which is mounted so that it can be turned on its



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| ① Block. | ⑫ Bolster. |
| ② Boom. | ⑬ Front wheel extension. |
| ③ Counterweight box. | ⑭ Muffler. |
| ④ Hoist clutch. | ⑮ Hoist cable. |
| ⑤ Topping winch control lever. | ⑯ Hand brake drum cover. |
| ⑥ Turntable housing. | ⑰ Boom extension rack and pinion. |
| ⑦ Hoist winch cable drum. | ⑱ Knuckle. |
| ⑧ Fuel tank. | ⑲ Boom topping sheaves. |
| ⑨ Stabilizer control linkage. | ⑳ Hook. |
| ⑩ Topping cables. | ㉑ Hoist sheave. |
| ⑪ Spring. | |

Figure 6. Typical gasoline-powered wheeled warehouse crane.



- ① Slung control lever.
- ② Hoist brake pedal.
- ③ Left-hand brake lever.
- ④ Gear shift lever.
- ⑤ Steering wheel.
- ⑥ Light switch.
- ⑦ Ammeter.
- ⑧ Choke control rod.
- ⑨ Oil pressure gauge.
- ⑩ Governor hand control lever.
- ⑪ Right-hand brake lever.

- ⑫ Hoist control lever.
- ⑬ Stabilizer control lever.
- ⑭ Foot brake pedal.
- ⑮ Accelerator pedal.
- ⑯ Topping winch control lever.
- ⑰ Magneto ignition switch.
- ⑱ Side power take-off control rod.
- ⑲ Starter button.
- ⑳ Engine clutch pedal.
- ㉑ Rear power take-off control rod.
- ㉒ Seat.

Figure 7. Operating controls of typical gasoline-powered wheeled warehouse crane.

base, as well as raised and lowered. The boom may be full-revolving or may swing only a certain number of degrees to left and right.

12. Wheeled Warehouse Cranes, Gasoline (figs. 6 and 7)

a. **STARTING.** The first step in teaching the operation of a wheeled warehouse crane is to explain to trainees the manner of starting the vehicle.

(1) Before mounting the crane, the operator (as part of the before-operation service) inspects for the following:

- (a) Adequate supply of gasoline.

- (b) Adequate supply of oil.
- (c) Adequate supply of water.
- (d) Tires in good condition.
- (e) Fire extinguisher present, filled, and securely mounted.
- (f) Ignition-system wiring secure.
- (g) Hoist cable secure.
- (h) Topping cable secure.
- (i) Hook-up cable, chains, and stretchers present and in good condition.

Note: When checking the gasoline, oil, and water supply, the operator should examine the equipment for leaks and seepage.

(2) Before starting the crane, the operator determines the following:

- (a) Driving gears in neutral.
- (b) Hoist, topping, and sluing control levers in neutral.

(c) Brake pedal working properly.

(d) Horn working properly.

(e) Lights working properly.

(3) To start and warm up the engine, the operator follows these steps:

(a) Pull out choke.

(b) Turn on ignition.

(c) Press starter.

(d) Operate throttle.

(e) Push in choke gradually.

(f) Check oil pressure gauge reading. (If pressure is below normal, shut off engine and call supervisor.)

(g) Check battery charging rate.

(This should be near 15 amperes when engine is accelerated. If the ammeter shows a lower or higher rate, call supervisor.)

(4) When the engine is warmed up, the operator performs the following tests:

(a) Test operation of hoist.

(b) Test operation of topping mechanism.

(c) Test operation of sluing mechanism.

(d) Test operation of driving clutch, driving

gears, and brakes by operating crane a few feet in forward and in reverse.

b. STOPPING. To stop the crane the operator follows these steps:

(1) Apply foot brake.

(2) Disengage driving clutch and shift driving gears to neutral.

(3) Turn off ignition and set hand brake (if crane is to be parked).

c. DRIVING FORWARD AND BACKWARD. (1) To drive the crane forward or backward, the operator follows these steps:

(a) Disengage driving clutch and shift driving gears into low speed forward or reverse.

(b) Engage driving clutch and accelerate engine.

(2) It is sometimes necessary to shift to a lower speed while the crane is moving. Before the engine labors and before speed is reduced, the operator should shift to a lower gear by double-clutching, as follows:

(a) Disengage driving clutch.

(b) Shift driving gears into neutral.

(c) Engage driving clutch and accelerate engine.

(d) Disengage driving clutch.

(e) Shift driving gears into lower speed.

(f) Engage driving clutch and feed gasoline.

(3) The operator should also practice double-clutching in shifting from a lower to a higher speed.

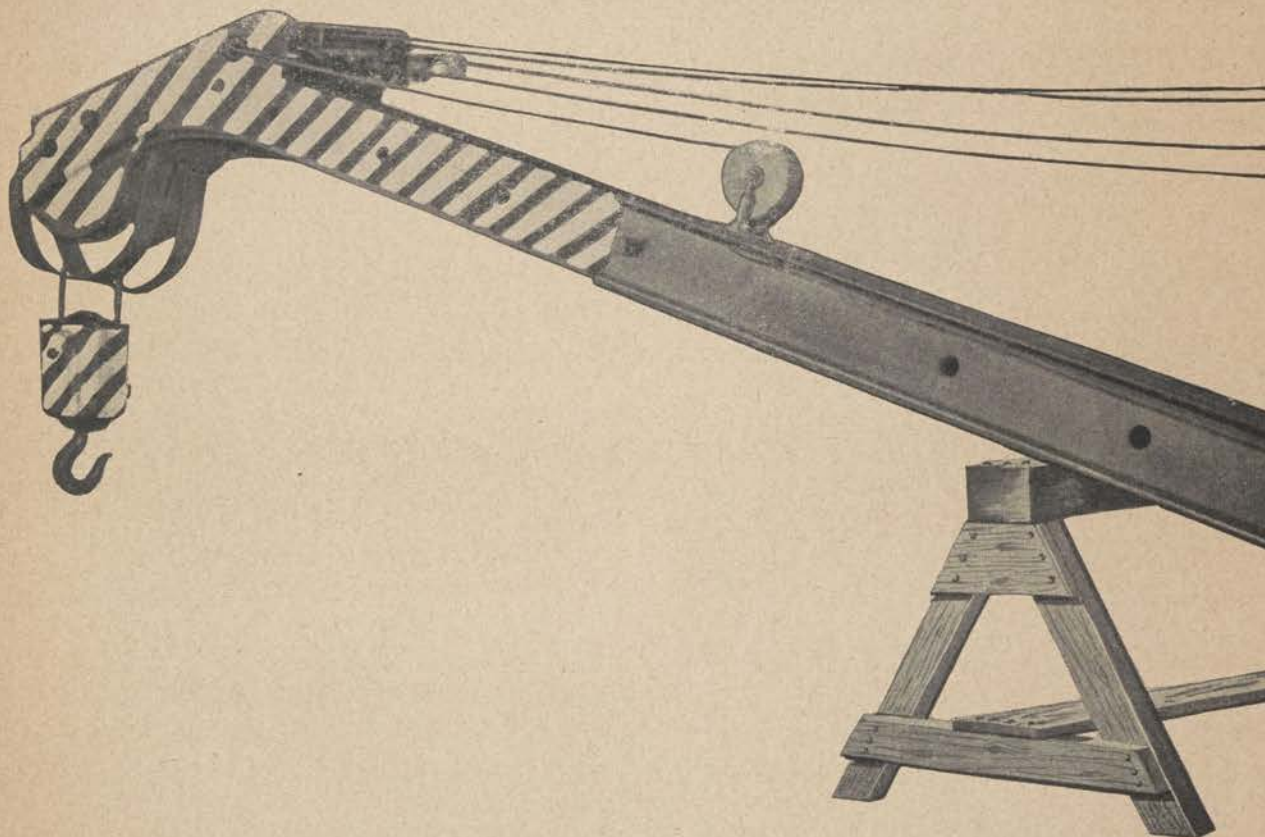


Figure 8. To change the length of a telescopic boom, the crane operator first lowers the boom onto a rigid support and releases the tension of the cables.

The procedure is the same for shifting to a higher gear, except that the engine is not accelerated while the gears are in neutral.

d. **TURNING LEFT AND RIGHT.** A gasoline-powered crane employs either front- or rear-wheel steering, so designed that to turn left or right when the crane is being driven forward, the operator turns the steering wheel in the direction of the turn; when the crane is being driven in reverse, the operator also turns the steering wheel in the direction of the turn.

e. **USING THE HOIST.** The hoist, or block, (fig. 6) is raised and lowered by the hoist cable, operated by the hoist control lever (fig. 7). Power for operating the hoist is transferred from the crane engine.

f. **USING THE BOOM.** (1) *Fixed boom.* (a) The boom is topped, that is, raised or lowered, by the topping cable, operated by the topping winch control lever. (See fig. 7.) Power for topping the boom is transferred from the crane engine.

(b) If the boom is telescopic, it can be lengthened or shortened by hand. To change the length of the boom, the operator first lowers the boom onto a rigid support, so that the weight is taken off the cable. (See fig. 8.) The pins which hold the sliding part of the boom in place may then be removed, the length of the boom adjusted, and the pins replaced.

(2) *Sluing boom.* (a) A sluing boom, like a fixed boom, is topped by the topping cable, operated by the topping winch control lever. (See fig. 7.) If the boom is telescopic, its length is adjusted in the same manner as the length of the fixed boom. (See (1)(b) above.)

(b) The boom is slued, or turned, by the operation of the sluing control lever. (See fig. 7.) Power for sluing the boom is transferred from the crane engine.

13. Wheeled Warehouse Cranes, Electric (figs. 9 and 10).

a. **STARTING BATTERY-ELECTRIC CRANE.** (1) Before mounting the crane, the operator (as part of the before-operation service) inspects for the following:

- (a) Tires in good condition.
- (b) Hoist cable secure.
- (c) Topping cable secure.
- (d) Electric wiring secure.
- (e) Hook-up cable, chains, and stretchers present and in good condition.

(2) Before starting the crane, the operator determines the following:

- (a) Speed controller in neutral.
- (b) Hoist controller in neutral.
- (c) Topping controller in neutral.
- (d) Sluing controller in neutral.

(e) Brake pedal working properly.

(f) Horn working properly.

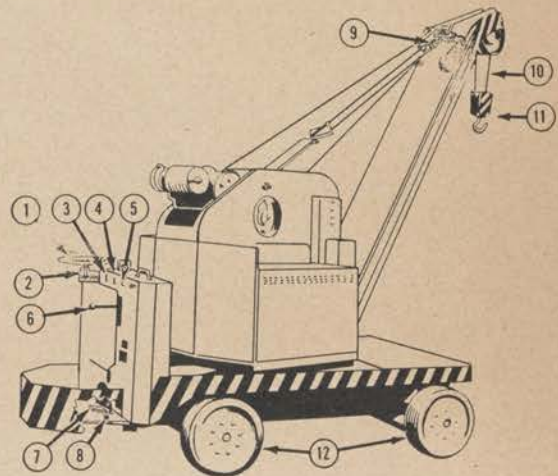
(3) If the inspection in (1) and (2) above show that the crane is in proper condition, the operator turns on the controller circuit key and performs the following tests:

(a) Test operation of hoist.

(b) Test operation of topping mechanism.

(c) Test operation of sluing mechanism.

(d) Test speed controller and brake by operating crane a few feet in forward and in reverse.



- | | |
|---------------------------|------------------|
| ① Steering wheel. | ⑦ Brake pedal. |
| ② Controller circuit key. | ⑧ Horn button. |
| ③ Sluing controller. | ⑨ Topping cable. |
| ④ Topping controller. | ⑩ Hoist cable. |
| ⑤ Hoist controller. | ⑪ Hook. |
| ⑥ Speed controller. | ⑫ Tires. |

Figure 9. Typical battery-electric wheeled warehouse crane.

b. **STARTING GASOLINE-ELECTRIC CRANE.** (1) Before mounting the crane, the operator (as part of the before-operation service) inspects for the following:

- (a) Adequate supply of gasoline.
- (b) Adequate supply of oil.
- (c) Adequate supply of water.
- (d) Tires in good condition.
- (e) Hoist cable secure.
- (f) Topping cable secure.
- (g) Fire extinguisher present, filled, and securely mounted.
- (h) Electric wiring secure.
- (i) Hook-up cable, chains, and stretchers present and in good condition.

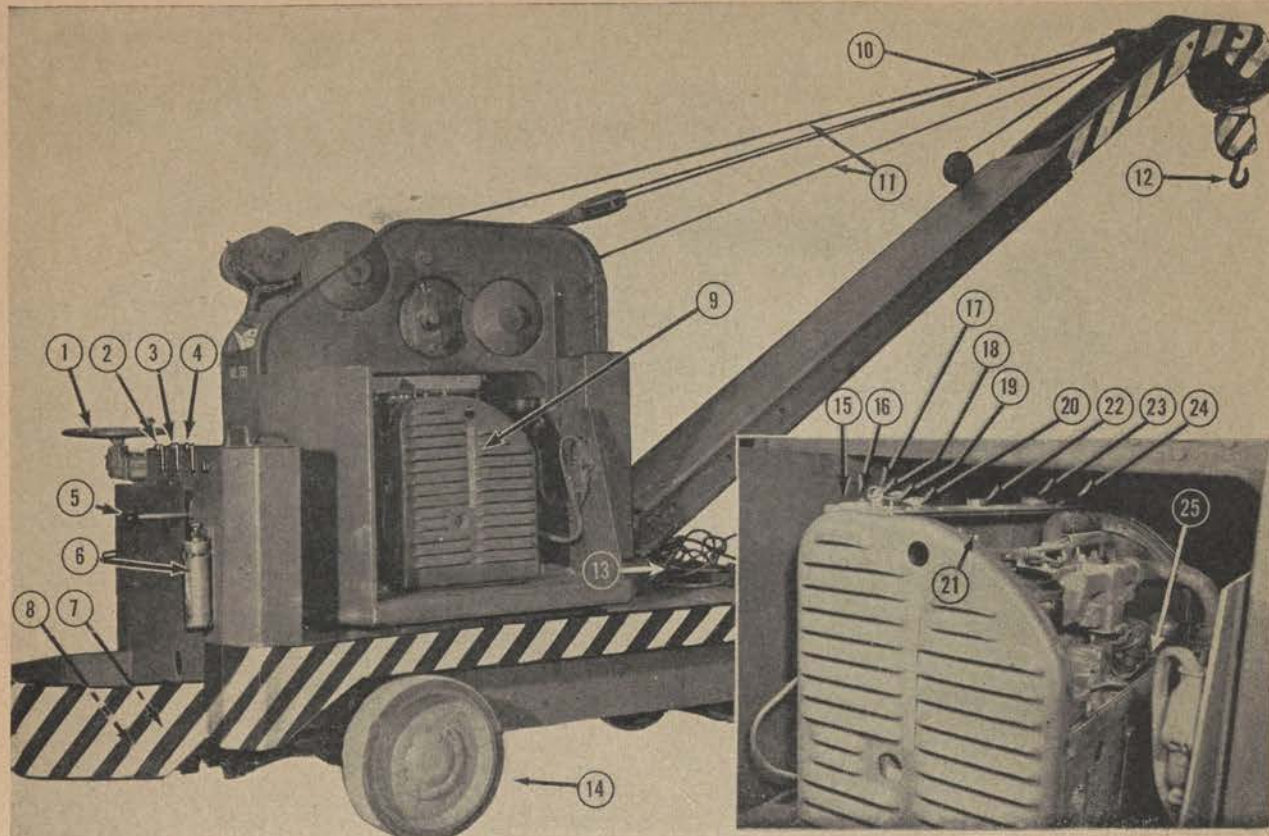
Note: When checking the gasoline, oil, and water supply, the operator should examine the equipment for leaks and seepage.

(2) Before starting the crane, the operator checks the points listed in a (2) above.

(3) To start and to warm up the engine, the operator follows these steps:

(a) Turn off idling control relay.

(b) Turn on ignition.



- ① Steering wheel.
- ② Sluing controller.
- ③ Topping controller.
- ④ Hoist controller.
- ⑤ Speed controller.
- ⑥ Fire extinguisher.
- ⑦ Brake pedal.
- ⑧ Horn button.
- ⑨ Power unit.
- ⑩ Topping cable.
- ⑪ Hoist cable.
- ⑫ Hook.
- ⑬ Chains and equipment.

- ⑭ Tires.
- ⑮ Ammeter.
- ⑯ Starter.
- ⑰ Ignition.
- ⑱ Choke.
- ⑲ Throttle.
- ⑳ Oil pressure gauge.
- ㉑ Idling control relay.
- ㉒ Fuel gauge.
- ㉓ Gasoline.
- ㉔ Water.
- ㉕ Oil.

Figure 10. Typical gasoline-electric wheeled warehouse crane.

(c) Operate throttle.

(d) Press starter.

(e) Check battery charging rate.

(Ammeter should show near 15 amperes when engine is accelerated. If rate is lower or higher, call supervisor.)

(f) Turn on idling control relay.

(g) Warm up engine thoroughly before attempting to operate crane.

(4) After the gasoline engine is thoroughly warmed up, the operator again mounts the crane and performs the tests listed in a (3) above.

c. STOPPING. To stop the crane, the operator follows these steps:

(1) Release brake pedal to apply brake.

(2) Put speed controller in neutral.

(3) Turn off ignition (to stop gasoline engine of gasoline-electric crane).

d. DRIVING FORWARD AND BACKWARD. The operator steers the crane with his left hand and operates controls with his right. To drive forward or backward, the operator follows these steps:

(1) Put speed controller on starter contact (forward or reverse, depending on direction in which crane will be operated).

(2) Put speed controller on low contact (forward or reverse).

(3) Step on brake pedal to release brake.

(4) Advance speed controller to high contact, unless crane is carrying load.

e. TURNING LEFT AND RIGHT. The crane is usually designed so that to turn to the left or right, driving in forward or reverse, the operator turns the steering wheel in the direction of the turn.

f. USING THE HOIST. The hoist, or block, is raised and lowered by the hoist cable, operated by

the hoist controller. To raise the block of the cranes illustrated in figures 9 and 10, the operator moves the controller to the left. To lower the block, he moves the controller to the right. To stop and hold the block at any desired height, the operator places the hoist controller in neutral.

g. USING THE BOOM. (1) *Fixed boom.* (a) The boom is topped, that is, raised and lowered, by the topping cable, operated by the topping controller. To raise the boom of the cranes illustrated in figures 9 and 10, the operator moves the controller to the left. To lower the boom, he moves the controller to the right. To stop and hold the boom at any desired height, the operator places the topping controller in neutral.

(b) If the boom is telescopic, it can be lengthened or shortened by hand, as described in paragraph 12 f(1)(b).

(2) *Sluing boom.* (a) A sluing boom is topped in the manner described in (1)(a) above. If the boom is telescopic, its length is adjusted in the same manner as the length of the fixed boom as described in paragraph 12 f(1)(b).

(b) The boom is slued, or turned, by the operation of the sluing controller. To slue the boom of the cranes illustrated in figures 9 and 10 to the left, the operator moves the controller to the left. To slue the boom to the right, he moves the controller to the right. To stop and hold the boom at any position, the operator places the sluing controller in neutral.

14. Training Area and Training Aids

a. The area for training operators of wheeled warehouse cranes may be either indoors or outdoors, but cranes with solid tires normally should not travel over extremely rough surfaces. The area must be large enough to provide ample space for maneuvering the crane and the boom without endangering persons, buildings, or equipment. Lines should be drawn or markers placed on the floor or ground, indicating exactly where supplies are to be placed in training.

b. In addition to the load cable, chains, and stretchers which may be considered accessories to the crane, the instructor should have available in the training area the following training aids:

(1) Dummy crates, boxes, barrels, pipe, or other typical supplies or equipment normally moved by crane.

(2) Heavy supplies or equipment of varying dimensions, normally moved by crane.

15. Training in Operation

After the trainee understands the use of the various controls which operate the crane, he begins to practice actual operation.

a. ELEMENTARY OPERATION. The trainee first starts the cranes properly, making all required inspections (pars. 12a and 13a and b), and then drives it slowly about the training area. As the instructor directs, the trainee stops and starts the crane, drives forward and backward, turns left and right, and maneuvers into various positions.

b. TRAINING WITH HOIST. (1) When the trainee has demonstrated his ability to maneuver the crane satisfactorily, the instructor demonstrates the use of the hoist. (See pars. 12e and 13f.) The trainee should have little difficulty in learning elementary operation of the hoist, but should practice raising and lowering the block until he is able to stop it easily at any desired height.

(2) When the trainee begins to handle controls which operate the hoist and the topping mechanism, all of the applicable safety precautions and regulations should be explained to him. (See d below.)

c. TRAINING WITH BOOM. (1) *Fixed boom.* (a) After the instructor demonstrates the method of topping the boom (pars. 12f and 13g), the trainee practices this operation until he is able to move the boom quickly and easily to any desired position. He may then combine practice with the boom and practice with the hoist, placing the block on the exact spots indicated by the instructor.

(b) Experienced operators are sometimes able to top the boom and raise the block at the same time, but this should not be attempted by the trainee.

(2) *Sluing boom.* (a) In addition to learning the manner of topping the boom, the trainee must also learn proper use of the slue, if the boom is of the sluing type.

(b) The boom should be slued slowly and carefully, particularly if there is a load on the block. The operator must avoid jerky movement of the boom, in order to prevent the load from swinging dangerously and to save undue wear on the crane.

d. OPERATING PRECAUTIONS. Observe the following safety precautions in the operation of wheeled warehouse cranes:

(1) Allow no one but the hook-up man to ride the crane.

(2) In both indoor and outdoor travel, carry the boom low enough so that there is no danger of its striking rafters, light fixtures, telephone wires, and similar obstructions.

(3) Never overload the crane or pick up a load until satisfied that it may be carried safely.

(4) Take instructions from the hook-up man only.

(5) If it is necessary to cross a shallow ditch, cross at a right angle to the ditch. (See fig. 12.)

(6) Avoid backing the crane down an incline

unless there is a substantial load on the block. (See par. 17c(3).)

(7) Be alert for other workers at all times. Never move the crane, the boom, or the hoist until certain that no person is in danger of injury.

(8) For general safety rules and precautions, see paragraphs 47 to 50, inclusive, TM 21-302.

(9) Allow no one to ride the hook or the load.

16. Capacity of Wheeled Warehouse Cranes

a. The lifting and carrying capacity of the crane is usually stated as the maximum weight which may be lifted when the boom is raised as nearly upright as possible. (If the boom is telescopic, maximum capacity is obtained when the boom is at its shortest length.) As the boom is lowered toward the horizontal position, or as its length is extended, capacity decreases sharply.

b. Safe carrying capacity also decreases if the crane must travel over rough or uneven ground.

c. A load chart showing the capacity of the crane under all circumstances should be visible on the crane. The trainee must be aware of the factors

which influence capacity of the crane and must understand that its maximum capacity is not its capacity under all circumstances.

17. Training in Actual Crane Operations

a. GENERAL. (1) After the trainee has demonstrated his ability to maneuver the crane satisfactorily and to handle all controls, he begins training in actual materials handling. It is necessary at this point for a helper or hook-up man to work with the crane operator, or for the instructor to act as hook-up man himself. The crane operator and a hook-up man will normally work as a team in all crane operations and it is important for the crane operator to learn early in his training that he must rely for instructions only on the hook-up man and not on any other workers. (See fig. 11.) It is often necessary for the crane operator and the helper to communicate by hand signals to avoid confusion. For standard crane signals see paragraph 60, TM 5-225.

(2) During the first practice in materials handling, it is preferable for the trainee to use empty crates or similar dummy supplies (par. 14), so that

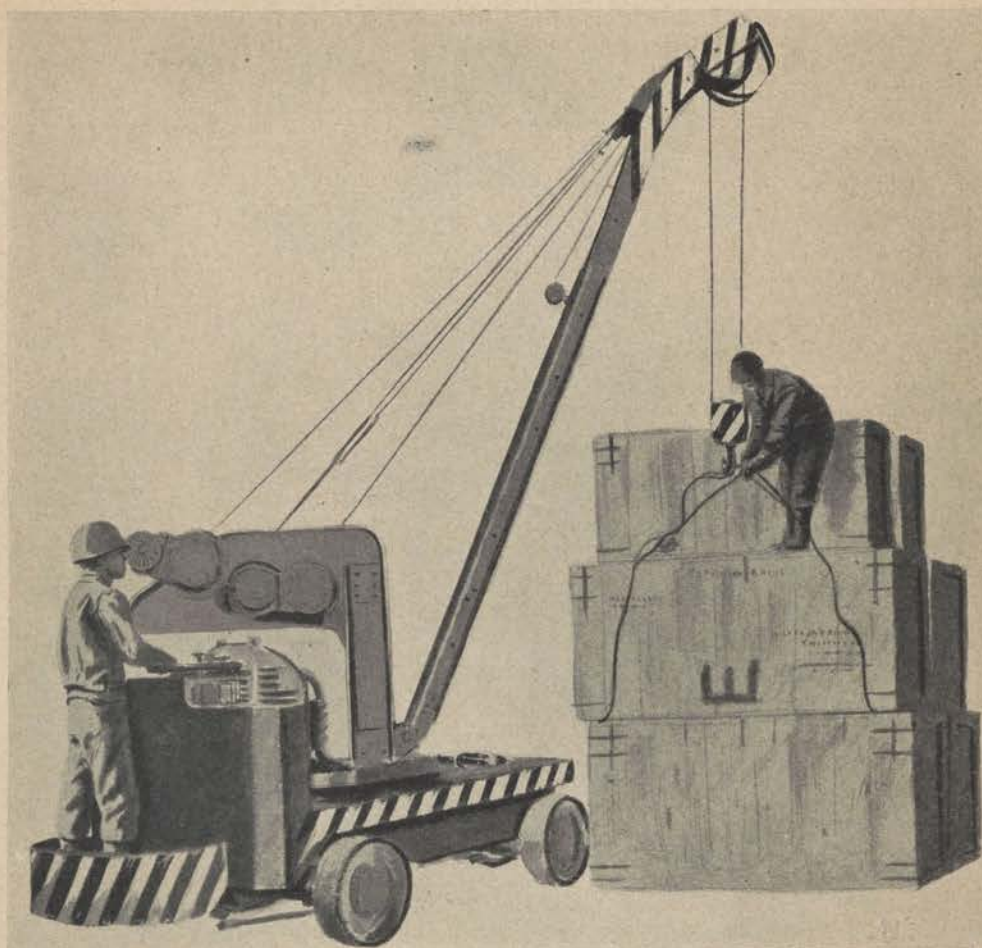


Figure 11. The crane operator and the hook-up man work together as a team. The operator receives instructions for maneuvering the crane only from the hook-up man.

there will be little danger to persons or equipment. When the trainee has demonstrated his ability to move these items, he then repeats the steps in actual materials handling (*b*, *c*, and *d*, below), using heavy supplies of varying dimensions.

b. PICKING UP THE LOAD. (1) The first step in actual materials handling with the crane is to learn to pick up a load. At the direction of the hook-up man, the crane operator maneuvers the crane into position (using the sluing mechanism if necessary), and adjusts the boom and the hoist so that the load can be properly attached to the hook. (See fig. 11.) The hook must always be centered over the load. In order to save undue wear on the boom, a load should not be attached with the boom in the horizontal position. Raising a load from this position may easily cause damage to the boom and to other parts of the crane. When the load is attached, the trainee raises the hoist, swinging the load clear. If it is desirable or necessary, he may then raise the boom. If the boom is raised before the hoist, however, the load will be dragged along the ground, floor, or lower tier of supplies. Neither the hoist nor the boom should be raised so high that the chains tighten or the block comes against the boom head, interfering with operation.

(2) If the crane can be equipped with outrigger jacks, use a jack whenever the boom must be slued to a dangerous degree in picking up a load. With the boom slued far to one side, the jack is attached to the side to prevent the weight of the load from upsetting the crane.

c. MOVING THE LOAD. When the load is lifted clear, it may be moved in either of two ways, or both, depending on the type of crane in use and the distance to be covered.

(1) If the crane has a sluing boom and if the load is to be moved only within the circumference of the slue, it is not necessary to move the crane itself. The boom is simply slued to the proper position and the load is ready for placing.

(2) If the crane has a rigid boom or if the load is to be carried farther than the sluing boom can reach, it is necessary to move the crane. The crane should not be moved until both the hoist and the boom are adjusted for traveling, in order to reduce the swing of the load.

(a) The crane should travel slowly and smoothly, avoiding sudden turns and stops.

(b) If it is necessary to cross a shallow ditch, the crane should cross at a right angle to the ditch, with the boom held in the direction of travel, as illus-

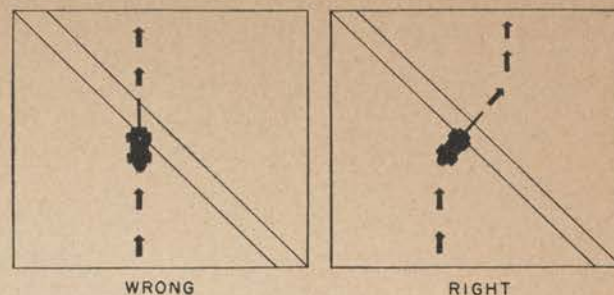


Figure 12. For safety, a crane crosses a shallow ditch at a right angle, with the boom held in the direction of travel.

trated in figure 12, in order to avoid the danger of tipping over.

(c) While the crane is traveling, the operator must not allow the load to swing too far. A swinging load causes severe strain on all parts of the crane.

(d) The hook-up man normally rides the crane and gives any necessary instructions concerning travel.

(3) Never back the crane down an incline if this can be avoided. When it is necessary to back the crane down an incline, lower the boom to approximately 8 feet above the ground and have a substantial load on the block. These precautions will prevent the crane from toppling over backward.

d. PLACING THE LOAD. (1) To place the load, the operator maneuvers the crane into position, uses the slue if necessary, and lowers the load by use of the topping mechanism and block.

(2) The operator centers the load directly over the spot where it is to be placed and then lowers the block. A load should not be placed through use of the boom alone. Holding the load near the horizontal position puts a severe strain on all parts of the crane.

(3) The hook-up man and, if necessary, other helpers guide the load into position as the crane operator lowers it.

18. Training in Handling Crane for Special Jobs

As in training operators of platform trucks (par. 10), the instructor should complete the training program for crane operators by instruction in handling the crane for any special jobs and under any unusual circumstances which may be encountered in the depot. For example, it may be common practice in the depot to use cranes to load and unload freight cars or to equip cranes with special rigging for particular jobs. If this is so, the trainees should practice the necessary maneuvers and should understand the special difficulties and danger involved.

SECTION IV

TRAINING PROCEDURE: OPERATORS OF STRADDLE TRUCKS

19. Types and Sizes of Straddle Trucks

A straddle truck is a gasoline-operated load carrier designed to pick up, move, and place a load, such as a pile of lumber, by straddling it. Straddle trucks are built in a variety of sizes, ranging in capacity to a maximum of 30,000 pounds. The hoist mechanism of the truck may be either of the following types:

a. RIGID SHOE TYPE. A hoist mechanism which moves only in a straight vertical manner is said to be of rigid shoe construction. Trucks of this type have a relatively short wheelbase and turning radius.

b. SWINGING SHOE TYPE. A hoist mechanism which moves inward and outward as well as vertically is said to be of swinging shoe construction. The swing of the shoes may be automatic with the raising and lowering of the hoist or may be controlled by a separate mechanism.

20. Operation of Straddle Trucks

(figs. 13 and 14)

a. STARTING. (1) Before mounting the truck, the operator (as part of the before-operation service) inspects for the following:

- (a) Adequate supply of gasoline.
- (b) Adequate supply of oil.
- (c) Adequate supply of water.
- (d) Tires in good condition.
- (e) Battery in good condition.
- (f) Brake lines secure.
- (g) Drive chains secure.
- (h) Hoist shoes up far enough for safe operation of truck.

(i) Hoist shoes in outer position (if hoist has swinging shoes).

Note: When checking the gasoline, oil, and water supply, the operator should examine the equipment for leaks and seepage.

(2) Before starting the truck, the operator determines the following:

- (a) Lights working properly.
- (b) Horn working properly.
- (c) Gears in neutral.
- (d) Hoist lever in neutral.

(3) To start the truck and warm up the engine, the operator follows these steps:

- (a) Pull out choke.
- (b) Turn on ignition.

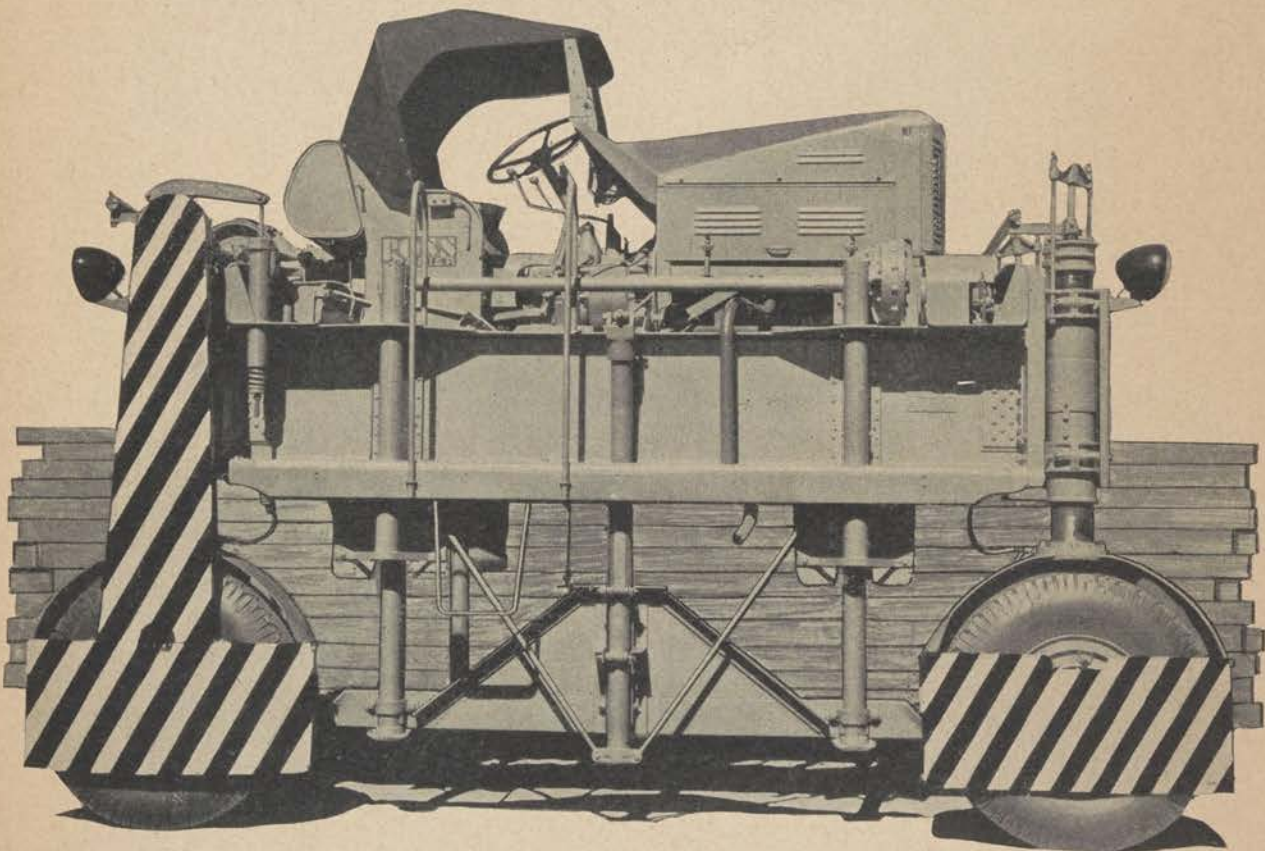
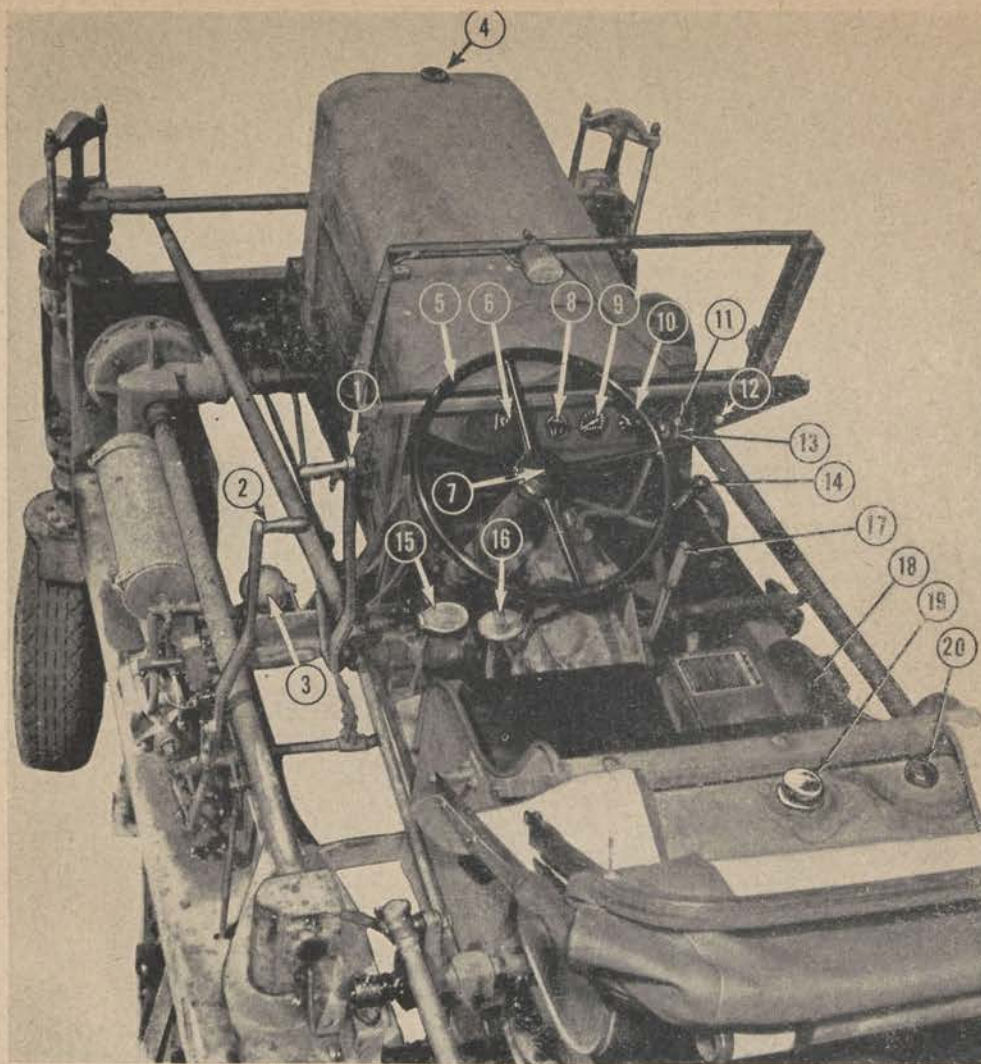


Figure 13. Typical straddle truck, side view.



- | | |
|-------------------|---------------------------------------|
| ① Hoist lever. | ⑪ Ignition. |
| ② Booster lever. | ⑫ Starter. |
| ③ Guide light. | ⑬ Speed gear lever. |
| ④ Water. | ⑭ Direction gear lever. |
| ⑤ Steering wheel. | ⑮ Clutch pedal. |
| ⑥ Light switches. | ⑯ Brake pedal. |
| ⑦ Horn. | ⑰ Hand brake. |
| ⑧ Oil gauge. | ⑱ Control buttons for swinging shoes. |
| ⑨ Speedometer. | ⑲ Gasoline. |
| ⑩ Ammeter. | ⑳ Gasoline gauge. |

Figure 14. The operating controls of a typical straddle truck.

- (c) Press starter.
- (d) Operate throttle.
- (e) Push in choke gradually.
- (f) Check oil pressure gauge reading.
(If pressure is below normal, shut off engine and call supervisor.)
- (g) Check battery charging rate.
(This should be near 15 amperes when engine is accelerated. If ammeter shows a lower or higher rate, call supervisor.)
- (h) Test hoist for proper operation.
- b. STOPPING. To stop the truck, the operator follows these steps:

- (1) Apply foot brake.
- (2) Shift gears into neutral.
- (3) Set hand brake.
- (4) Turn off ignition (if truck is to be parked).
- c. DRIVING FORWARD AND BACKWARD. (1) A typical straddle truck is equipped with two gear shift levers, one controlling direction and the other speed. To drive the truck forward or backward the operator follows these steps:
- (a) Shift direction gear lever into forward or reverse.
- (b) Disengage clutch.
- (c) Shift speed gear lever into low.

- (d) Release hand brake.
- (e) Engage clutch slowly.
- (f) Disengage clutch and shift speed gear lever into higher speeds.

(g) Move truck forward and/or backward for a few feet to test brakes and steering.

(2) It is sometimes necessary to shift to a lower speed while the truck is moving. Before the engine labors and before speed is reduced, the operator should shift to a lower gear by double-clutching as follows:

- (a) Disengage clutch.
- (b) Shift gears into neutral.
- (c) Engage clutch and accelerate engine.
- (d) Disengage clutch again.
- (e) Shift into lower speed.
- (f) Engage clutch and accelerate engine.

(3) Do not shift from forward to reverse or from reverse to forward without first bringing the truck to a complete stop.

d. **TURNING LEFT AND RIGHT.** The straddle truck is equipped with four-wheel steering. To turn the truck, the operator simply turns the steering wheel in the direction of the turn. Although steering the truck when it is carrying a long and awkward load is sometimes very difficult, in the preliminary training the instructor should simply make certain that the trainee knows how to operate the truck.

e. **USING THE HOIST.** (1) Because power to operate the hoist comes from the truck engine, the engine must be running while the shoes are raised or lowered.

(2) The hoist is controlled either by a lever, which is moved to "raise" and "lower" positions, or by switch buttons. An automatic cut-out is provided to release the power and apply the brakes when the load is bound in the truck or when the shoes reach the extreme upper or lower positions.

(3) A "booster" lever is provided to furnish additional power for the hoist when needed.

(4) If the truck is equipped with swinging shoes, the swinging action may be controlled by a separate lever or it may be automatic with the raising and lowering of the shoes.

21. Training Area and Training Aids

a. Any large, open, outdoor area may be used as a training area for operators of straddle trucks. Because the truck is designed principally as a lumber carrier, a lumber storage yard will serve very well as a training area.

b. The only training aids necessary are several piles of lumber or pipe, stacked so that they may be handled by the straddle truck. The material handled by a straddle truck is normally stacked on stools

(bolsters), as illustrated in figure 15. In handling the load, the shoes of the truck engage the ends of these stools. If possible, one short and one long load should be available for use in training. The operator practices first with the short load and later with the longer one in order to gain experience maneuvering the truck under difficult conditions.

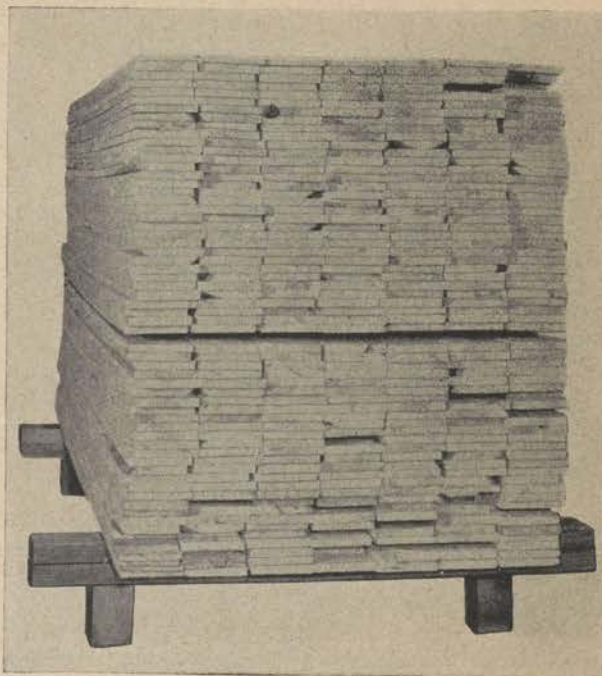


Figure 15. Material to be handled by a straddle truck is normally stacked on stools (bolsters).

22. Training in Operation

a. **ELEMENTARY OPERATION.** The trainee starts the truck properly, making all required inspections (par. 20a), and drives it slowly about the training area. As the instructor directs, the trainee starts and stops the truck, drives forward and backward, turns left and right, and maneuvers into various positions.

b. **TRAINING WITH HOIST.** (1) When the trainee has proved his ability to maneuver the truck, the instructor demonstrates the use of the hoist. (See par. 20e.)

(2) When the trainee begins practice with the hoist, all of the applicable safety precautions should be explained to him. (See c below.)

(3) The trainee should practice operation of the hoist until he is thoroughly familiar with the use of all controls.

c. **OPERATING PRECAUTIONS.** Observe the following safety precautions in the operation of straddle trucks:

(1) When the truck is not loaded, always carry the hoist shoes up to avoid striking any obstruction.

(2) Drive only on solid, level ground. Should

the truck become mired, it is usually better to wait until it can be pulled out rather than to risk more serious difficulty by continuing in an attempt to drive out under power.

(3) Because of the construction of the truck, visibility on the right side is poor and it is difficult for the operator to see objects close to the truck at the front or rear. Before placing truck in motion, sound horn vigorously. Drive cautiously at all times to lessen the risk of accidents.

(4) Avoid making a sudden stop when the truck is loaded.

(5) For general safety rules and precautions, see paragraphs 47 to 50, inclusive, TM 21-302.

23. Capacity of Straddle Trucks

A statement of its capacity should be clearly visible on the straddle truck. Operators should be aware of the capacity of any truck before attempting to use it in materials handling and should be careful never to overload the truck.

24. Training in Actual Straddle Truck Operations

a. PICKING UP THE LOAD. (1) Before the straddle truck can pick up a load, the load must be properly stacked on stools. (See par. 21*b*.) The stack must not be too high or too wide for the truck to handle and its weight must not exceed the maximum capacity of the truck.

(2) Before attempting to drive the truck over a load, the operator must make certain that the hoist shoes are down and, if the shoes are of the swinging type, that they are swung outward.

(3) The truck must be driven carefully over the load and stopped so that the hoist shoes are midway along the sides of the load. (See fig. 13.)

(4) With the engine operating (in neutral gear), the operator first swings the hoist shoes into contact with the stools on which the load is stacked and then engages the hoist. (If the swing of the shoes is automatic with the hoist, or if the truck has rigid shoes, simply engaging the hoist will raise the load.) If necessary, the booster lever is used to assist raising the load.

b. MOVING THE LOAD. (1) When the load is securely in position, the operator may move the

truck, either forward or backward as desired. When the load is to be carried a considerable distance, the truck is naturally driven forward.

(2) The truck must be driven only over solid, level ground. Hitting an obstruction may spill the load or cause serious damage to the truck.

(3) A load which extends ahead or behind the truck may create many difficulties in maneuvering the truck. The trainee must drive with extreme care until he learns to judge the distance necessary for turning.

(4) When loaded, the truck must never be stopped suddenly. A sudden stop may cause the load to slide out from the carriage of the truck and result in a serious accident or, at best, in a scattered load.

(5) The trainee first practices moving a relatively short load and later a longer and more difficult one.

c. PLACING THE LOAD. The trainee practices placing the load in positions designated by the instructor. The following points should be covered in this phase of operator training:

(1) The load should not be dropped to the ground, but should be lowered slowly under power.

(2) If the truck is equipped with swinging shoes which do not swing out automatically as the hoist is lowered, the operator must swing the shoes outward before driving away from the load.

(3) The operator must avoid placing a load in such a position that he cannot drive the truck away from it. For example, a careless operator may maneuver a loaded truck into a limited space, drop the load, and then find that he cannot back the truck far enough to turn it and drive away.

25. Training in Handling Straddle Truck for Special Jobs

Operators of straddle trucks, like operators of platform trucks and wheeled warehouse cranes (pars. 10 and 18) should complete their training by practice in handling the truck for special jobs and under unusual circumstances. For example, if uncommonly long pieces of lumber are occasionally carried by the truck, or if it must at times operate in unusually restricted areas, trainees should practice operation under these difficulties and should understand the problems and dangers involved.

SECTION V

MAINTENANCE

26. General

a. Preventive maintenance inspections and services for platform trucks, wheeled warehouse cranes, and straddle trucks are performed in substantially the same manner as those for fork lift trucks and towing tractors described in paragraphs 51 through 53, TM 21-302. *Detailed procedures for inspections, lubrication, and service of each particular vehicle must be performed in strict accordance with the provisions of the Technical Manual (or Technical Bulletin) and the Lubrication Order pertaining to that vehicle, whenever such publications are available.*

b. Operators of platform trucks, wheeled warehouse cranes, and straddle trucks are responsible for maintenance under the provisions of paragraph 52a, TM 21-302.

c. Second-echelon maintenance of platform trucks, wheeled warehouse cranes, and straddle trucks is performed in accordance with the provisions of paragraph 53, TM 21-302, with the following change in the scheduling of services for all items of materials handling equipment: All preventive maintenance services are now performed on a calendar basis, instead of a basis of operating hours or fuel consumption. Appropriate second-echelon maintenance of the equipment involved is therefore performed weekly and monthly. Such maintenance services should be recorded on WD AGO Form 460 (Preventive Maintenance Roster).

27. Before-operation Service

Before-operation service, items 1 through 25 on WD Form 48 (par. 52b, TM 21-302), constitutes a check of the vehicle before it is put in service. It is the duty of the operator to determine if the vehicle is in condition to perform any task to which it may be assigned. Upon completion of the service, the operator should report results promptly to the designated individual.

28. During-operation Service

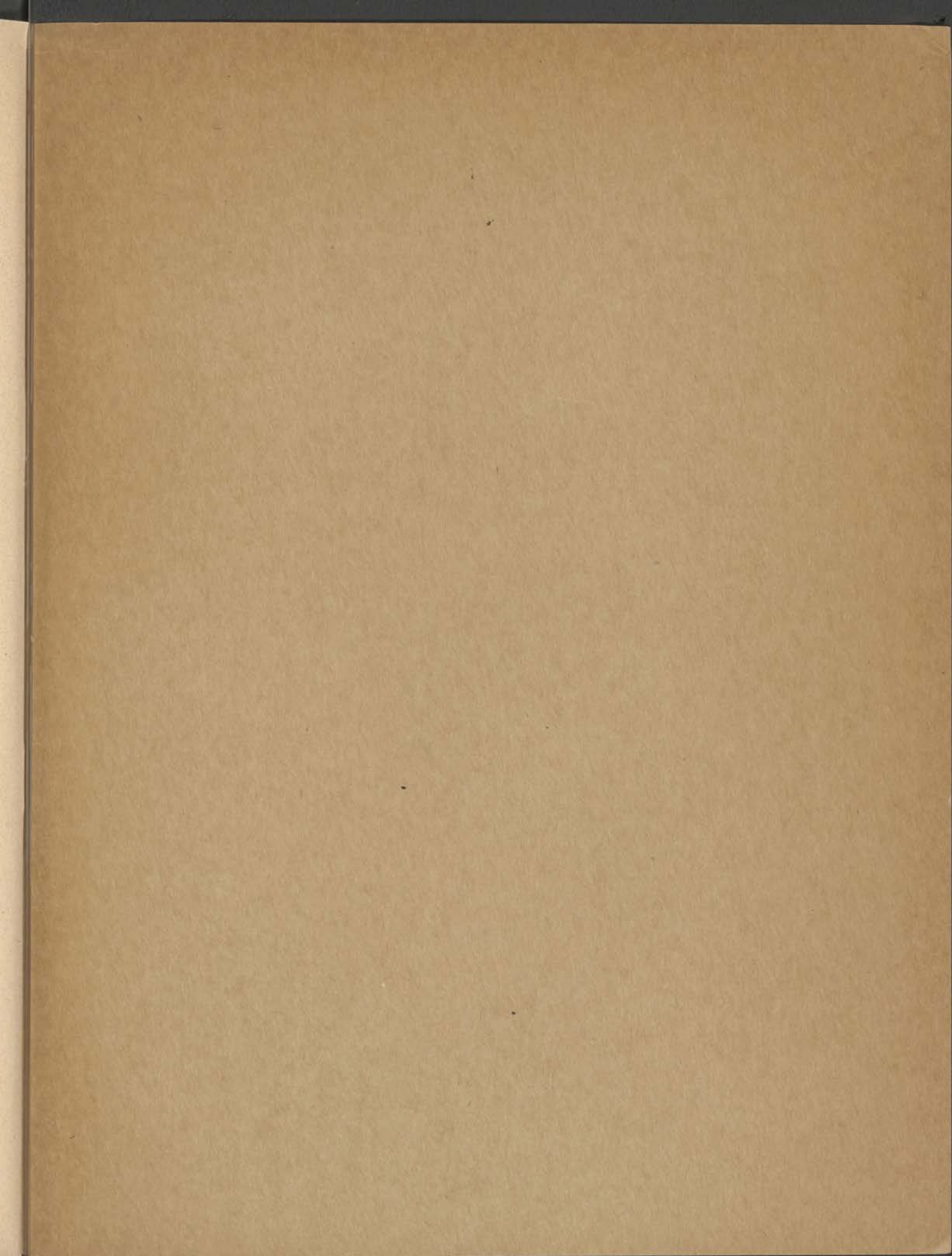
During-operation service, items 27 through 37 on WD Form 48 (par. 52 b, TM 21-302), consists of observing the listed items and investigating any indications of serious trouble. The operator should correct deficiencies as soon as possible or report them to higher authority.

29. After-operation Service

After-operation service, items 54 through 87 on WD Form 48 (par. 52b, TM 21-302), is normally the most important phase of preventive maintenance. This service is performed by the operator and the maintenance mechanic, who inspect the vehicle thoroughly and correct any defects or deficiencies which they are permitted to handle.

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