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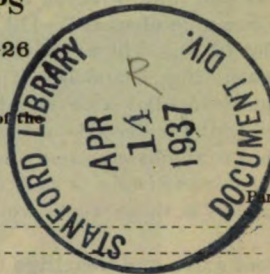
TECHNICAL REGULATIONS
No. 1220-5

WAR DEPARTMENT,
WASHINGTON October 28, 1936.

SIGNAL CORPS

REEL UNIT RL-26

Prepared under direction of
Chief Signal Officer



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SECTION I

GENERAL USE AND DESCRIPTION

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1. **Purpose.**—Reel unit RL-26 is a transportable wire-laying and recovery device primarily intended for either temporary or permanent installation in, and operation from, a variety of vehicles such as trucks, wagons, etc., although the unit may be operated on the ground should occasion warrant.

2. **Characteristics.**—All component parts of the reel unit RL-26 are assembled in one skid unit which may be quickly installed in many types of vehicles, physical displacement being the limiting factor. The capacity of the unit is two 1-mile reels DR-5 of wire W-110 (or equivalent twisted pair field wire) mounted in position for unreeling or reeling in the wire. The individual reels are readily replaceable. The wire may be unreeled from either reel or from both simultaneously and means are provided for braking the individual reels to prevent overspinning. The wire may be reeled in on either reel or on both simultaneously at the rate of about six miles per hour. It may also be reeled in on either reel when the gas engine is at rest, by means of the hand crank provided. Holes are provided in the skid and framework by means of which lag screws or bolts may be used to fasten the unit in position in the rear of a vehicle.

3. **Description.**—Reel unit RL-26 consists of a framework upon which are mounted a gasoline engine, axles for two reels DR-5, transmission features incorporating certain clutches which may be operated by means of hand levers for connecting the engine shaft to the reel axles, and two loading cradles for the purpose of facilitating the insertion or removal of the reels. The relative location of the two reels, upon installation, is shown in figure 2. It will be noted that one reel is located to the rear and above the other reel. These reels and their respective axles will be referred to hereinafter as the upper reel or axle and the

lower reel or axle. The outline of the unit is irregular but the overall dimensions are approximately 40 inches long, 39 inches wide, and 33 inches high. The weight of the unit, without reels, is 346 pounds. Since one reel, DR-5, containing one mile of wire W-110, weighs 170 pounds, the unit fully loaded with two miles of wire will weigh 686 pounds.

4. Frame (figs. 1 and 7).—The frame consists of an aluminum alloy base and two aluminum alloy side members. A skid frame of tubular pipe section is attached to the under side of the base to facilitate handling. The side members are bolted to the base and are braced across two sections of their upper portions. The shape of the frame is such that the unit will not be obstructed by the rear wheel guards in those trucks where the wheel guards project into the truck body proper.

5. Reel axles and bearings (figs. 1, 3, and 10).—The reel axles, figure 1, (6) and (7), are designed to receive and drive the reel DR-5. These axles are provided

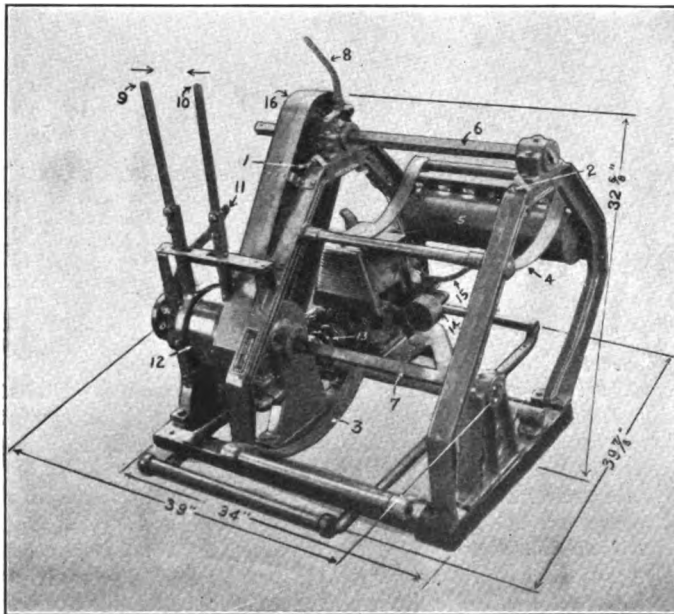


FIGURE 1.—Reel unit RL-26.

with dirt-proof bearings in which the actual bearing surfaces are entirely inclosed. The axle is inserted through a square hole in the bearing, through the square hole of the reel, and through the opposite bearing, after which the axle is held in position by means of a spring operated latch which engages in a recess in the square axle shaft. The axle is tapered at one end so as to facilitate insertion through the various square holes. It will be found that this taper tends to align the bearings as the axle is forced through. In removing either reel axle it is necessary to disengage the latch while withdrawing the axle. The latches referred to are shown in figure 2, (11) and (12) and figure 3, (1) and (2). The tool (fig. 2, (8)) is intended to facilitate withdrawal of the reel axles by insertion in hole (9) or (10).

6. Transmission (fig. 1).—The gas engine drive is connected to the reel axles by means of a transmission system in which are incorporated a main clutch and a

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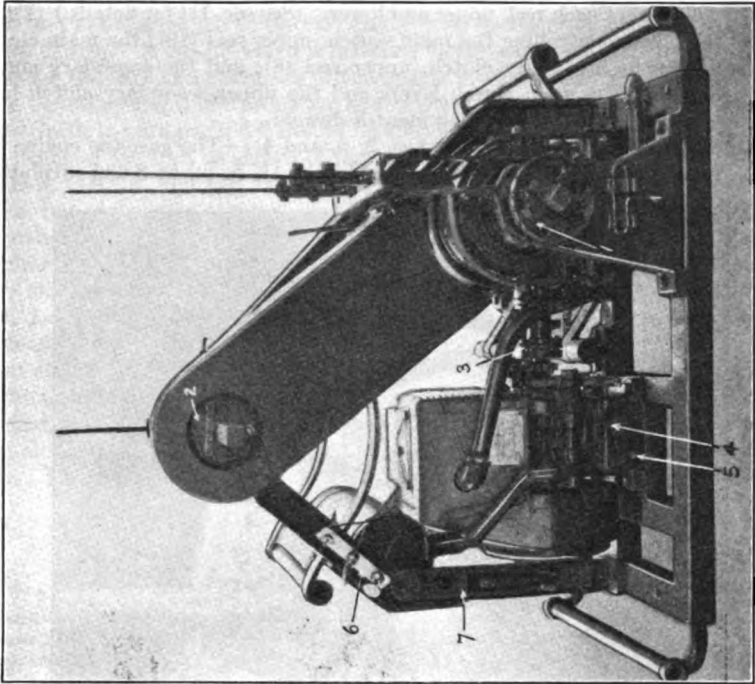


FIGURE 3.—Side view of reel unit RL-26 showing gas engine.

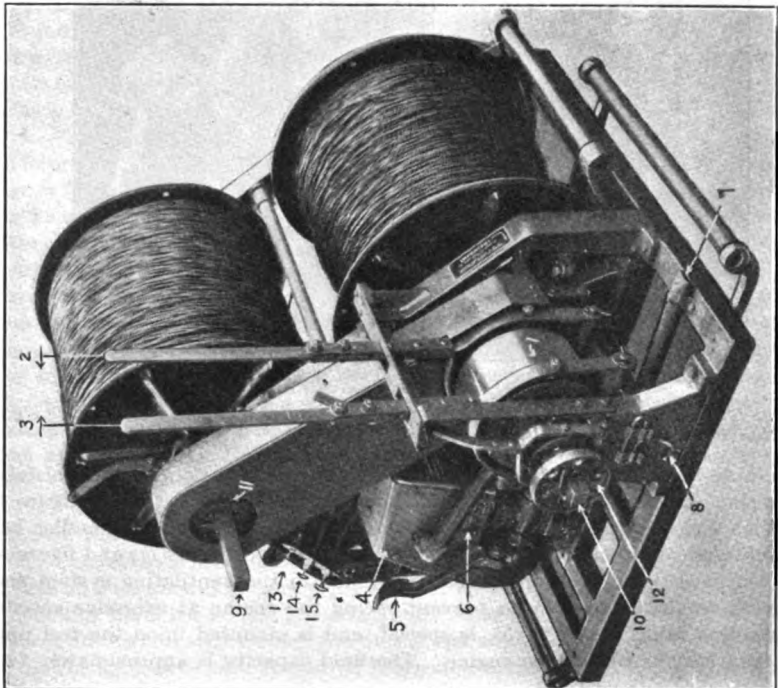


FIGURE 2.—Reel unit RL-26 with reels DR-5 installed.

secondary clutch for each reel, upper and lower. (See sec. III for details.) Figure 1 shows the levers controlling the main clutch, upper reel (10); the main clutch, lower reel (9); the secondary clutch, upper reel (8); and the secondary clutch lower reel (11). The main clutch levers and the upper secondary clutch lever may be collapsed or removed in shipment if desired.

7. **Gasoline engine** (sec. II and figs. 2, 3, and 4).—The gasoline engine is a Lauson, type RAY-843, air-cooled unit, rated at $1\frac{1}{2}$ h. p., at 3,600 revolutions

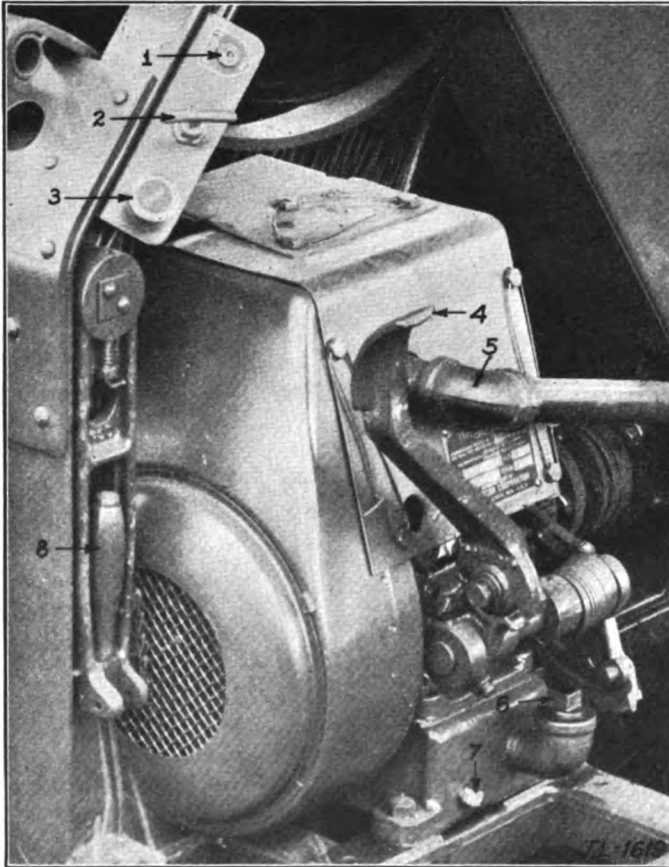


FIGURE 4.—Gas engine of reel unit RL-26.

NOTE.—This figure is an enlarged detail of figure 4 of the instruction book issued by the Signal Corps Laboratories, July 10, 1934.

per minute, and manufactured by the Lauson Corporation, New Holstein, Wisconsin. The engine is complete with foot starter, figure 2, (5) and figure 4, (4), Wico magneto, and Donaldson air cleaner. The conventional muffler has been replaced by an equivalent pipe section, figure 2, (6) and (7), and figure 4, (5). An air driven governor has been installed in the ventilating system and connected to the carburetor to prevent racing the engine at excessive speeds. The gasoline tank, figure 1, (5), is special, and is mounted upon the reel unit proper, rather than upon the engine. The fluid capacity is approximately two

gallons. The connection to the carburetor is by means of oil-proof rubber tubing, figure 1, (15). A cut-off valve is installed in the gas line at the tank. Instructions for the care and operation of the engine are contained in section II. However, before attempting to start the engine every precaution regarding lubrication as set forth in paragraph 6 *d* should be observed. A control panel is mounted on the frame of the unit as shown in figure 2, (13), (14), and (15), figure 3, (6), and figure 4, (1), (2), and (3). With reference to figure 4, (1) is the ignition switch, (2) is the carburetor throttle, and (3) is the carburetor choke (primer). The throttle control and the priming control are operated by pulling out to accelerate or choke, respectively. The throttle control may be set in any desired position by a slight turn of the control handle in a clockwise direction.

8. **Loading cradles** (fig. 1, (3) and (4)).—Loading cradles are provided for both the upper and lower reels. These cradles are intended to facilitate replacement of reels and as an aid in alining the square reel axle holes with the bearings in the process of inserting the reel axle. The reel is placed in the cradle and the cradle lifted by grasping the handle bar until approximate alinement of the bearings and reel hole has been attained, after which the reel axle is thrust into position. The tool, figure 2, (8), is intended as an aid in withdrawing the reel axles.

SECTION II

EMPLOYMENT

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9. **Installation** (figs. 5, 6, and 7).—*a. Stationary installation.*—A typical ground installation is shown in figure 5. The unit is being used for recovering wire, the gas engine being used as a power source. It will be noted that the operator has both main clutches and both secondary clutches engaged and the wire is being reeled in on both reels simultaneously.

b. Vehicular installation.—A typical installation of the unit in a truck is shown in figure 7. The reason for the peculiar contour of the base of the unit as shown in figure 1 is so that the reel unit will clear the truck rear right wheel guard. In such an installation the unit should be securely fastened to the floor of the truck or other vehicle by means of lag screws or bolts through the holes provided for that purpose in the base and skid frame. Various other arrangements for fastening the unit securely in a manner to withstand hard road usage will probably occur to the users. When mounted in an escort or other wagon, as in the truck application, the unit should be securely fastened to the floor of the wagon by means of lag screws or bolts. It will probably be necessary to locate the unit so that it projects over the tail gate a short distance. This is done in order that the side boards of the wagon will not interfere with the removal and insertion of the lower reel axle. Sufficient clearance is provided to permit of cranking the engine by foot.

10. **Lubrication.**—It is imperative that lubrication of the various moving parts of the unit and of the engine be given frequent attention.

a. The reel axle bearings are equipped with commercial oil cups for lubrication. These oil cups should be filled with cylinder oil at regular intervals, the frequency depending upon the service given the unit. The grade of oil will depend to some extent on the climate in which the unit is operated.

b. The sprocket chain should be lubricated occasionally with graphite grease

c. The reel unit transmission (housing and inclosed worm and worm gear) requires particular attention with regard to lubrication. The correct transmission oil must be used and a proper level of this oil must be maintained. In general the oil required is automobile transmission oil as used under conditions comparable to automobile usage. In summer (above 32° F.) use automobile transmission oil SAE No. 160 (600-W). In winter (below 32° F.) use automobile transmission oil SAE No. 90. Never use an oil thinner than SAE No. 90. SAE No. 90 is recommended for winter use, as a heavier oil when cold will impose excessive load upon the transmission and engine, making engine starting difficult.

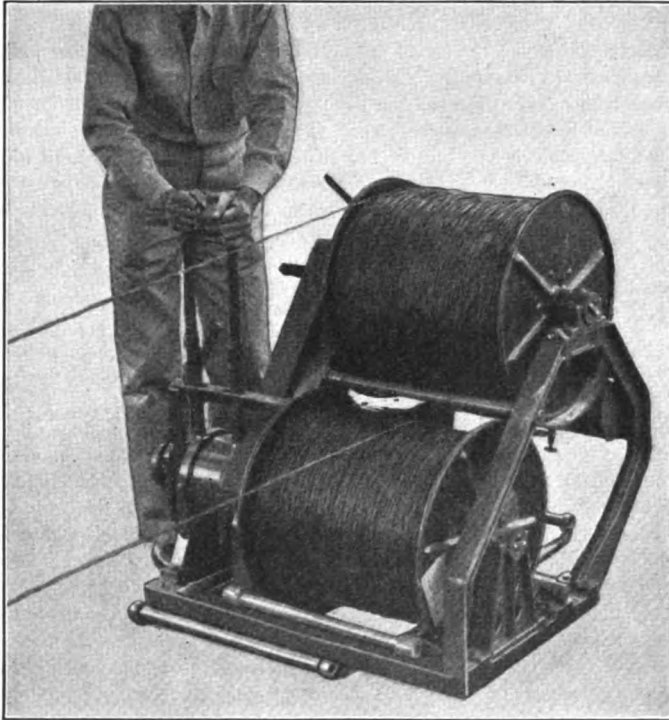


FIGURE 5.—(Ground installation of reel unit RL-26.

In figure 8 the transmission oil filler spout is (1) and the filler spout plug (2). The head of this plug is painted red. The drain plug (3) is painted blue. The oil shall be maintained to a level that can be seen by looking down into the filler spout with plug removed and engine not running. The filler plug and drain plug should be firmly in position during operation.

d. The gasoline engine requires the care and maintenance characteristic of all gasoline engines. The most important consideration is correct lubrication. The crank case (oil reservoir) has a capacity of approximately one pint of oil. The oil filler plug is painted red and is shown in figure 3, (4) and figure 4, (6). The drain plug is painted blue and is shown in figure 3, (5) and figure 4, (7). The following general rules if strictly observed will insure proper lubrication of the engine. (See also par. 18.)

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(1) Be sure the oil reservoir (crank case) is filled up to the filler plug. Use Mobiloil "A" or SAE No. 30 for all air temperatures above 32° F. Use Mobiloil Arctic or SAE No. 20-W for all air temperatures below 32° F.

(2) Inspect oil level frequently during operation, stopping the engine for that purpose. Add new oil as required to maintain the filler spout full. These inspections should occur at least every hour.

(3) Drain and refill with new oil every 30 hours of operation.

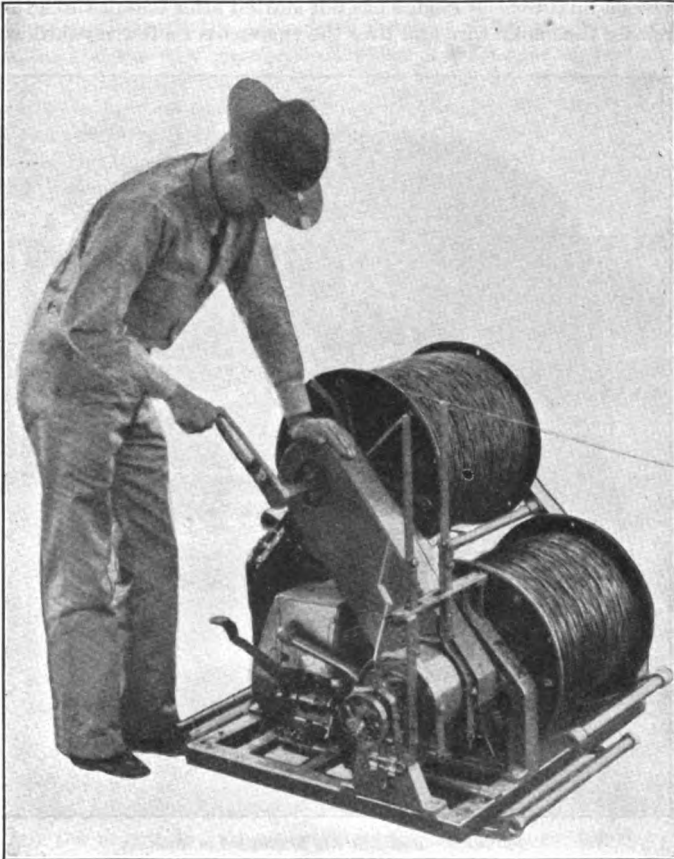


FIGURE 6.—Recovering wire on upper reel of reel unit RL-26 by hand crank.

11. Operation of the engine.—When starting any new engine, or any engine which has been standing for some time, make the following check-ups:

a. See that there is enough fuel in the fuel tank. Use every precaution to prevent dirt of any kind from getting into the fuel as it will clog up the fuel line, screen, and carburetor jets.

b. See that oil is up to proper level in crankcase. See paragraph 10 for grade of oil. If the engine has been standing idle for a long period of time, the working parts may have become dry and it is therefore advisable to idle the engine a few minutes before applying the load, so that all parts may become properly lubricated.

c. Open valve in gasoline line and allow carburetor float chamber to fill.

d. The engine should now be ready to start.

e. Pull the carburetor choke wire out and crank the engine. It will usually start at once, when choke should be immediately released, then pulled just far enough to prevent backfiring or popping back through the carburetor until the engine warms up.

f. Never permit the choke to remain closed after the engine starts or when the engine is running. This will cause an excess of raw fuel to be drawn into the cylinder, resulting in dilution of the crankcase oil or possibly stopping engine due to an over-rich mixture. If engine has not started after two or three turns of the starter, release the choke wire and turn the engine over a few revolutions to draw

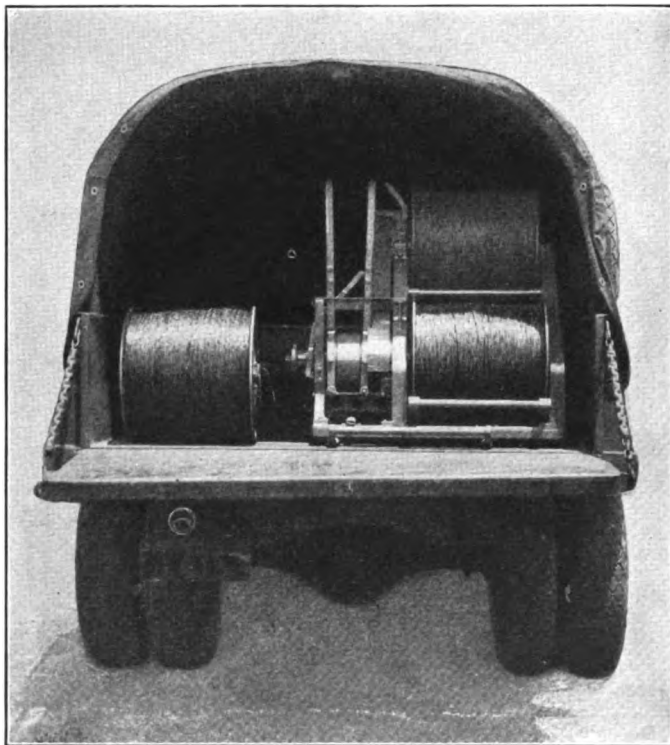


FIGURE 7.—Reel unit RL-26 installed in truck.

in an explosive mixture of fuel and air and clear the cylinder of an over-rich mixture. Again put on the choke and proceed as before.

g. Stop engine by means of magneto cut-out switch. Never use carburetor needle valve for stopping.

h. Type RAY engines are equipped with Tillotson carburetors having only one adjustment, the needle valve for fuel regulation. Adjust when engine is under load and avoid over-rich mixture.

12. Operation of the reel unit.—a. *Laying wire.*—Assuming that the reel unit has been fastened to the floor of the truck body by means of either lag screws or bolts, remove the individual reel axles and install one reel DR-5 filled with wire in each of the loading cradles. By lifting the cradles to the proper height the reel axles can then be inserted and latched in place. Disengage both of the

main clutches and engage both secondary clutches. Both reels are now ready for wire laying operations. The main clutches may be used to brake the reels and prevent over-spinning.

b. Recovering wire.—(1) *By engine.*—When it is desired to recover wire using the gasoline engine as a prime mover, first be sure that the oil reservoir is full and that all precautions have been observed as outlined in paragraph 10. Mount one empty reel DR-5 on each of the axles. Secure one end of each of the two field wires to be recovered to the two reels, respectively. Disengage both main clutches and engage the secondary clutches. The gasoline engine may now be started and the wire recovered on either or both reels by performing the following operations in sequence:

- (a) Operate the ignition switch on the control panel to the "ON" position.
- (b) Pull out the priming knob to its full extent.
- (c) Advance the throttle by pulling out the accelerator knob.
- (d) Crank the engine with a quick thrust of the foot on the foot starter pedal.

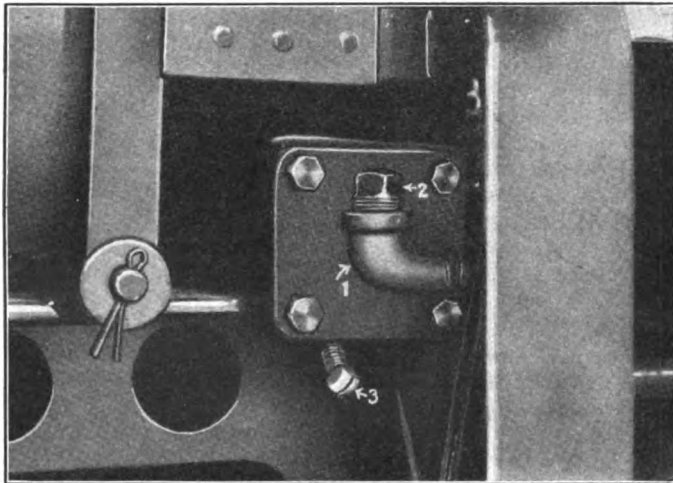


FIGURE 8.—Transmission oil-filler spout and drain plug.

(e) When the engine starts, depress the priming knob immediately and adjust until smooth operation is secured.

(f) Permit the engine to run several minutes before subjecting it to load in order that it may be properly warmed up. Do not race the engine.

(g) Operate the main clutches and regulate the speed of wire recovery by manipulating the engine throttle. A light pressure on the levers is sufficient to hold the clutches engaged.

(h) An operator should at all times be alert at the main clutch levers to be in readiness to disengage the clutches in an emergency. The personnel who may be guiding the wire upon the reels should keep about 50 feet away from the reel unit. *These precautions are necessary to safeguard against injury to the personnel guiding the wire. In no circumstances should the clutch levers be tied in the engaged position.*

(2) *By hand.*—In figure 6 the operation of recovering wire on the upper reel by means of the hand crank is shown. Figure 3, (7) and figure 4, (8) show the location of the hand crank when not in use. The upper reel secondary clutch

being disengaged, the operator is turning the axle and reel directly, without the additional load of the sprockets, chain, and main clutch driven side. Therefore, in recovering wire by means of the hand crank furnished for this purpose, be sure that the secondary clutches are disengaged.

SECTION III

DETAILED FUNCTIONING OF PARTS

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13. Transmission system.—(See figs. 1, 2, 3, 5, and 9.) The gas engine drive is connected to the reel axles by means of a transmission system in which there are incorporated two expansion friction clutches (referred to hereafter as main clutches) and two additional positive splined sleeve clutches (referred to hereafter as secondary clutches).

14. Coupling.—Tracing this transmission system from the engine shaft in the order of occurrence, the engine shaft is coupled to the drive shaft through a flexible coupling, figure 1, (13) and figure 3, (3), the purpose of which is to permit of minor variations in alinement between the two shafts and provide for the removal of interchangeability of engines.

The drive shaft enters a dirt proof and oil retaining gear housing in which a worm is machined as a part of the steel shaft. Ball bearings are provided for the shaft on each end of the worm. The worm engages a bronze worm wheel. The ratio between the worm and worm wheel is twenty-four to one; that is, twenty-four revolutions of the worm result in one revolution of the worm wheel. It is imperative that the gear housing be kept filled to the proper level with the correct grade of oil as specified in paragraph 10c. If this precaution is not observed, the gears will overheat in operation and excessive wear occur. *Actual gear destruction will result from improper lubrication.*

15. Main clutches.—The worm wheel is directly connected to the clutch drum (fig. 1, (12) and fig. 2, (1)). This drum acts as the driving side of the main clutch and rotates whenever the engine is operating. The main clutch drum is provided internally with two expanding driven assemblies each contiguous to its own engaging surface or section within the drum. These two driven assemblies are independent of each other. The driven clutch assemblies are identical in construction. Each consists of two semicircular members which may be expanded into engagement with the driving drum by means of two diametrically opposite tapered members which act to wedge apart the semicircular members. The tapered members are manipulated by means of the shifting levers (fig. 2, (2) and (3)). One of the driven clutch assemblies is connected through a secondary clutch to drive the lower reel axle; and the other driven clutch assembly is connected to drive the upper reel axle through a driving sprocket, a chain, a driven sprocket, and a secondary clutch. A guard or cover is provided for the sprockets and chain (fig. 1, (16)). The lower reel clutch is controlled by the lever, figure 2, (3), and the upper reel clutch is controlled by the lever, figure 2, (2). Figure 5 shows the lever positions for engagement of both clutches simultaneously. For individual operation the same relative position applies.

16. Secondary clutches.—a. A secondary clutch is provided for the upper reel axle in order that the load of the chain may be removed from the upper reel

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axle when hand cranking is resorted to. This clutch consists of means for connecting the secondary driving sprocket to the upper reel axle or disconnecting same. In reeling in wire by hand crank drive, this clutch should be disengaged to remove the unnecessary load of the sprocket chain, and main clutch driven

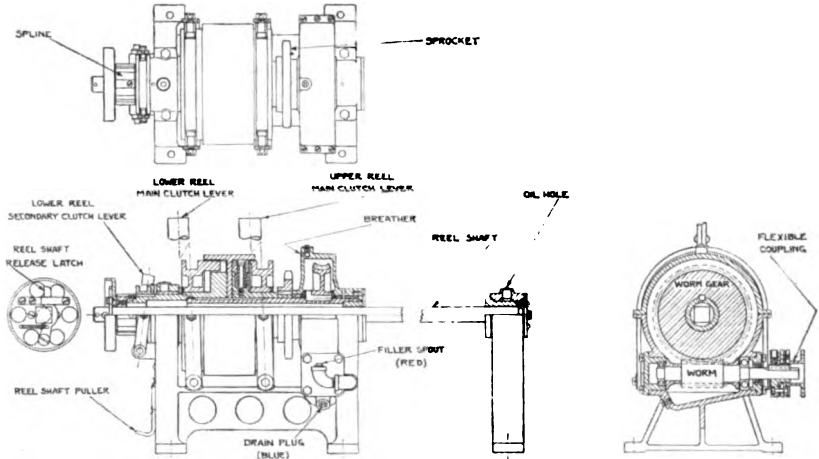


FIGURE 9.—Transmission system of reel unit RL-26.

side. When the gas engine is used to drive the upper reel axle, the secondary clutch must be engaged. This clutch is positive, as differentiated from friction types, and consists of means for shifting a splined sleeve (an internally keyed or toothed sleeve) into engagement with the driving sprocket hub, or out of en-

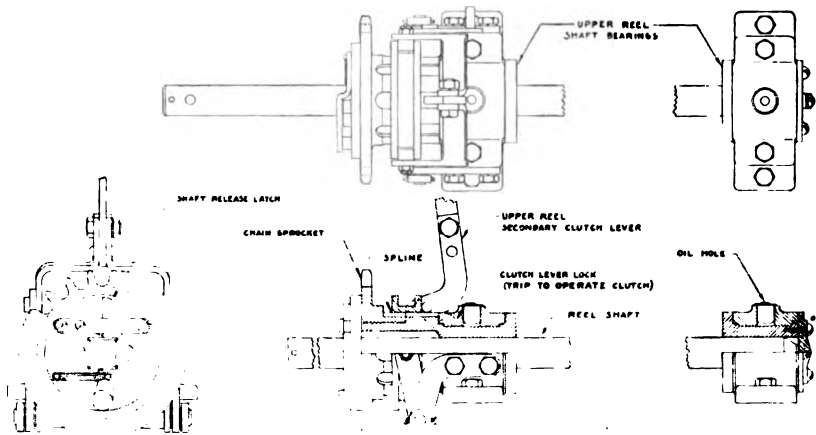


FIGURE 10.—Upper reel secondary clutch of reel unit RL-26.

agement with that hub. The splined sleeve transmits the drive to the upper reel axle, or disengages the drive from that axle dependent upon the position of the sleeve (that is whether in mesh or not in mesh). The position of the sleeve is controlled by the lever, figure 1, (8). For smooth engagement the chain should be driving the sprocket.

b. A similar secondary clutch is provided for the lower reel axle, the lever being shown in figure 1, (11).

17. **Sprocket chain.**—The sprocket chain should be lubricated occasionally as described in paragraph 6b. This chain has been adjusted to the correct tension by the manufacturer but after a certain amount of use it is conceivable that the chain may require tightening. To tighten the chain loosen the upper reel bearing frame bolts and adjust the bearing by means of the set screw, figure 1, (1), after which the set screw and bearing bolts should be locked into position. It is imperative that the same operation on the opposite upper reel bearing be performed by means of set screw, figure 1, (2), otherwise the two reel bearings will be out of alinement.

SECTION IV
SERVICING AND REPAIR

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18. **Lubricants.**—*a.* For proper engine lubrication a high-grade, well-refined oil is essential. As a guide to the proper viscosity or body, the lubrication charts of the reputable oil companies should be consulted. In general, the viscosities listed below will be found suitable for varying atmospheric and service conditions:

(1) *Summer.*—Heavy duty (service involving full load for long periods), 55 to 65 seconds at 220° F., SAE No. 30.

(2) *Summer.*—Average duty (service involving intermittent full loading or sustained partial loads), 47 to 52 seconds at 210° F., SAE No. 20.

(3) *Winter.*—(Where engines are exposed to atmospheric temperatures.) Never use a heavier oil under these conditions, 47 to 52 seconds at 210° F., SAE No. 20.

b. The viscosity of an oil is simply a measure of its body or thickness. The SAE viscosity numbers classify oils according to viscosity but not according to any other property. The company supplying the oil is responsible for the quality of its product.

c. With every filling of the fuel tank also replenish the oil supply in the base of the engine bringing the oil level up to the proper level.

d. The oil reservoir should be kept full to the top of filler fitting.

19. **Changing oil.**—*a. Draining.*—(1) It is essential that the oil pan be drained and refilled with fresh oil at regular intervals of every 30 hours of operation. The oil gradually accumulates small particles of dust, grit, and metal which cause wear to the bearing surfaces. The oil is thinned by unburned fuel which passes by the pistons. Oil should be drained when the engine is hot. Always allow engine to drain completely.

(2) If kerosene is used, some will be trapped in the pockets of the crankcase and when new oil is added this kerosene will dilute the fresh oil and impair its lubricating qualities. Draining the oil while warm will accomplish all that flushing with kerosene can do in the removal of sediment. Finally refill the oil reservoir with fresh oil to the proper level.

b. *Removing sludge.*—The oil in the base also becomes contaminated with sediment resulting from metallic wear, carbon flaking, and grit drawn in through the carburetor where air cleaner is not used. Under winter conditions, with a cold crank case, a certain amount of water will collect in the oil reservoir. This is due to condensation of the water in the gases that pass the rings. With dirty

oil, this water will form a gummy emulsion and clog the oil strainer and pump valves. This sludge if allowed to remain will cause trouble. If used oil shows signs of thickening, the engine should be removed from the base and the last trace of the formation removed. The oil pump and strainer screen should also be thoroughly washed at this time. Do not use cotton or wool waste for cleaning as particles from same may stick to the screen and other parts and eventually clog up the oil passages in the lubricating system.

20. Replacement of fuel pipe.—The flexible fuel pipe is equipped with a permanent coupling at carburetor end and a permanent L at the gas tank end. This complete assembly should be considered as a replaceable unit and no attempt made in the field to separate the pipe tubing from the integral coupling details. In replacement of the gas line the carburetor strainer head screw should be removed and the strainer head with the fuel pipe raised from the carburetor sufficiently to permit unscrewing the carburetor strainer head from the fuel pipe coupling. The fuel pipe may then be unscrewed as a unit from the fuel tank valve (or stopcock) and the strainer head replaced on the carburetor. The installation of a new fuel pipe is made in the reverse order to the process described; that is, remove carburetor strainer head, screw fuel pipe into tank valve, screw strainer head into fuel pipe coupling, position strainer head on carburetor, and lock in place with holding screw. Care must be taken throughout not to injure the strainer screen.

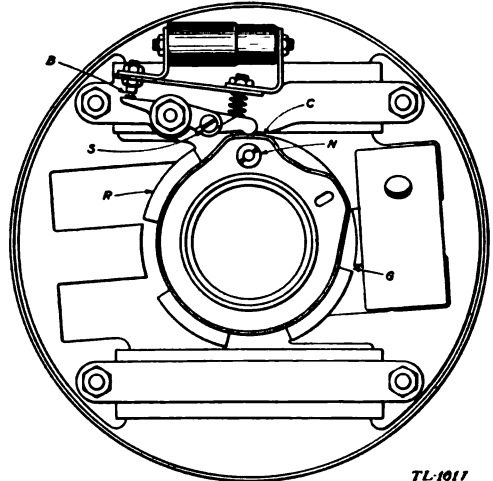


FIGURE 11.—Breaker contact adjustment.

21. Ignition system.—*a. Care of WICO magneto used on RAY engine.*—(1) See that high tension wire has not deteriorated and become oil soaked causing a short at some point.

(2) See that the stopping switch wire has not become shorted at some point, especially where it fastens to switch screw.

(3) If the trouble cannot be located at the above points it will be necessary to remove the blower housing and flywheel from the engine to get at the magneto.

(4) Examine the breaker points. If they are worn or pitted dress the faces with a fine file to make them come squarely together.

(5) Check the maximum opening of the breaker points; this should be from 0.007 to 0.010 inch with the maximum at 0.010 inch.

b. Adjusting breaker points (fig. 11).—Turn rotor assembly *R* to bring the highest point of the cam *C* in contact with breaker lever causing breaker points *B* to open to the maximum distance. Loosen the adjusting screw *S* on breaker lever and insert a feeler gage or some other strip of metal 0.010 inch thick between the breaker points. Holding the points together with the gage between them, tighten up adjusting screw *S*. The maximum distance the breaker points open should now be equal to the thickness of the gage or 0.010 inch.

c. Setting the timing of magneto.—Turn rotor assembly *R* in right hand direction until cam just starts to open the breaker points. Take note of the gap at *G*.

The corner of the rotor notch should have traveled away from the pole shoe in the coil a distance of $\frac{3}{4}$ inch. If this gap distance is greater than $\frac{3}{4}$ inch, loosen the cam adjusting nut *N* and shift cam around until this gap is the right distance at the moment when the breaker points begin to open. Tighten the adjusting nut *N*. Replace flywheel, being careful that the key in crankshaft engages properly in keyseat of flywheel. Replace blower housing, etc. If after the above check-up and adjustments have been made the magneto still fails to function it will be necessary to send to repair depot.

22. Engine trouble chart.—

a. Engine hard to start.—

- | | |
|--|---------------------------------------|
| (1) No gasoline in tank. | (11) Valve seats bad. |
| (2) Gasoline flow obstructed. | (12) Valve sticking. |
| (3) Water in fuel supply. | (13) Improper timing. |
| (4) Loose or defective wiring. | (14) Defective magneto: |
| (5) Spark plug cracked. | (a) Breaker points worn or pitted. |
| (6) Spark plug fouled. | (b) Breaker points out of adjustment. |
| (7) Improper gas mixture. | (c) Breaker cam out of time. |
| (8) Throttle valve stuck. | (d) Switch wire shorted. |
| (9) Throttle rod loose or out of adjustment. | (e) High tension wire shorted. |
| (10) Intake manifold leaking. | |

b. Engine missing.—

- | | |
|---|---|
| (1) Spark plug fouled. | (7) Manifold gasket leaking. |
| (2) Spark plug cracked. | (8) Valves warped or broken. |
| (3) Spark plug gap wrong (correct gap .025 inch). | (9) Valves or tappets sticking. |
| (4) Defective wiring. | (10) Valve tappets improperly adjusted (correct clearance .008 inch to .010 inch when hot). |
| (5) Ignition breaker points sticking. | |
| (6) Cylinder head gasket leaking. | |

c. Engine overheating.—

- | | |
|---|------------------------|
| (1) Spark retarded too far. | (4) Improper timing. |
| (2) Carburetor choke valve partly closed. | (5) Valves leaking. |
| (3) Improper gas mixture. | (6) Oil badly diluted. |
| | (7) Lack of oil. |

d. Engine lacks power.—

- | | |
|--------------------------------|---------------------------------|
| (1) Valve seats worn. | (6) Muffler stopped up. |
| (2) Piston rings weak or worn. | (7) Governor or throttle loose. |
| (3) Piston rings sticking. | (8) Oil badly diluted. |
| (4) Improper gas mixture. | (9) Air cleaner needs cleaning. |
| (5) Improper timing. | |

e. Engine knocks.—

- | | |
|-------------------------------|-----------------------|
| (1) Carbon in cylinder. | (6) Motor overheated. |
| (2) Loose main bearing. | (7) Tight piston. |
| (3) Loose rod bearing. | (8) Loose flywheel. |
| (4) Worn piston and cylinder. | (9) Lack of oil. |
| (5) Loose valve tappets. | |

f. Faulty carburetion.—

- | | |
|-------------------------------------|----------------------------|
| (1) Carburetor improperly adjusted. | (5) Shut off valve closed. |
| (2) Valve leaking. | (6) Using too much fuel. |
| (3) Intake manifold leaking. | (7) Water in fuel. |
| (4) Gaskets leaking. | (8) Sediment in fuel tank. |

- g. Excessive smoke from exhaust.—*
- (1) Too much oil in crankcase.
 - (2) Carburetor needle valve open too far.
 - (3) Carburetor float sticking or leaking.
 - (4) Lubricating oil too thin to seal piston.
 - (5) Worn bearings.
- h. Explosion in muffler.—*
- (1) Ignition too late.
 - (2) Weak spark.
 - (3) Exhaust valve holding open.
 - (4) Exhaust valve warped.
- i. Explosion in carburetor or intake manifold.—*
- (1) Gas mixture too lean.
 - (2) Intake valve sticking.
 - (3) Intake tappet sticking.
 - (4) Intake valve spring weak.
 - (5) Intake manifold leaking.
 - (6) Intake valve warped or broken.
 - (7) Intake tappet set too close.
 - (8) Incorrect timing.
 - (9) Cylinder head gasket leaking.
- j. Poor compression.—*
- (1) Valves not seating.
 - (2) Valves sticking.
 - (3) Valve tappets sticking.
 - (4) Valve tappets set too close.
 - (5) Piston rings worn or weak.
 - (6) Piston rings broken.
 - (7) Piston rings sticking.
 - (8) Loose spark plug.
 - (9) Cylinder head loose.
 - (10) Cylinder head gasket leaking.
 - (11) Oil too thin to seal piston.
 - (12) Scored cylinder.
 - (13) Worn piston and cylinder.
 - (14) Cracked spark plug.

SECTION V

SUPPLEMENTAL DATA AND LISTS OF PARTS

Parts list of reel unit RL-26 (less engine).....	Paragraph 23
Parts list of Lawson engine.....	24

23. Parts list of reel unit RL-26 (less engine).

Number required for each reel unit	Number recommended for depot stock for each 100 reel units in service	Name of item	Signal Corps drawing and detail nos.	Equivalent Leach Co. drawing and detail nos.
FRAME				
1	20	Base.....	SC-D-1628 det. 1..	1000R det. 1.
1	10	Bracket.....	SC-D-1629 det. 2..	1002R det. 1.
1	10	Bracket.....	SC-D-1630 det. 3..	1003R det. 1.
2	10	Bearing.....	SC-D-1631 det. 4..	1011R det. 3.
1	5	Shaft.....	SC-D-1631 det. 5..	1029R det. 3.
1	5	Shaft.....	SC-D-1631 det. 6..	1029R det. 1.
2	10	Spacer.....	SC-D-1631 det. 7..	1029R det. 2.
2	10	Lift assembly.....	SC-D-1631, 2 ea., det. 8, 1 ea., det. 9.	1027R, 2 ea., det. 1, 1 ea., det. 2.
1	5	Crank block.....	SC-D-1631 det. 10..	1026R det. 3.
1	5	Clamp.....	SC-D-1631 det. 11..	1035R det. 2.
2	10	Tank clamp.....	SC-D-1631 det. 12..	
1	5	Brace.....	SC-D-1632 det. 13..	1034R det. 1.
1	20	Nameplate.....	SC-D-1632 det. 14..	1040R det. 1.
1	10	Instruction plate.....	SC-D-1632 det. 15..	1040R det. 2.

Number required for each reel unit	Number recommended for depot stock for each 100 reel units in service	Name of item	Signal Corps drawing and detail nos.	Equivalent Leach Co. drawing and detail nos.
SKID				
1	5	Skid assembly	SC-D-1633	1016R.
1	5	Side pipe and cleat assembly, right side.	SC-D-1633, 1 ea., det. 1, 2 ea., det. 4.	1015R, 1 ea., det. 2, 2 ea., det. 1.
1	5	Side pipe and cleat assembly, left side.	SC-D-1633, 1 ea., det. 1, 2 ea., det. 4.	1015R, 1 ea., det. 2, 2 ea., det. 1.
2	10	End pipe and corner joints assembly.	SC-D-1633, 1 ea., det. 2, 2 ea., det. 3.	1015R, 1 ea., det. 3, and 1008R, 2 ea., det. 1.
TRANSMISSION				
1	5	Transmission assembly	SC-D-1634	1046R.
1	5	Transmission base	SC-D-1635 det. 1	1001R det. 1.
1	5	Gear housing cap	SC-D-1636 det. 2	1001R det. 2.
1	5	Bearing cap	SC-D-1636 det. 3	1001R det. 3.
1	20	Bearing liner	SC-D-1636 det. 4	1006R det. 2.
1	10	Bearing stand	SC-D-1636 det. 5	1006R det. 1.
1	10	Washer	SC-D-1636 det. 6	1038R det. 1.
1	20	Washer	SC-D-1636 det. 7	1038R det. 2.
1	20	Washer	SC-D-1636 det. 8	1038R det. 3.
1	20	Washer	SC-D-1636 det. 9	1038R det. 4.
1	40	Worm gear	SC-D-1637 det. 10	1017R det. 1.
1	10	Worm	SC-D-1637 det. 11	1017R det. 2.
1	5	Collar	SC-D-1637 det. 12	1039R det. 13.
1	5	Collar	SC-D-1637 det. 13	1039R det. 14.
1	5	Thrust plate	SC-D-1637 det. 14	1010R det. 3.
1	5	Thrust plate	SC-D-1637 det. 15	1011R det. 2.
1	200	Bushing	SC-D-1637 det. 16	1013R det. 3.
1	200	Bushing	SC-D-1637 det. 17	1041R det. 1.
1	40	Bushing	SC-D-1637 det. 18	1041R det. 2.
1	10	Sprocket	SC-D-1637 det. 19	1018R det. 2.
2	100	Washer	SC-D-1639 det. 20	972.
1	5	Clutch drum	SC-D-1638 det. 21	1009R.
2	40	Shipper block	SC-D-1638 det. 22	1011R det. 1.
1	10	Clutch shoe sleeve	SC-D-1638 det. 23	1010R det. 2.
1	10	Clutch shoe sleeve	SC-D-1638 det. 24	1010R det. 1.
4	100	Clutch shoe	SC-D-1638 det. 25	1013R det. 1.
4	200	Shipper shoe	SC-D-1638 det. 26	1013R det. 2.
1	20	Clutch spline	SC-D-1639 det. 27	1020R det. 2.
1	5	Lock plate	SC-D-1639 det. 28	1014R det. 2.
1	50	Reel shaft	SC-D-1639 det. 29	1026R det. 1.
1	100	Shaft puller	SC-D-1639 det. 30	1035R det. 1.
2	50	Shaft puller spring	SC-D-1639 det. 31	1036R det. 5.
4	40	Clutch shoe screw	SC-D-1639 det. 32	1039 det. 12.
4	80	Clutch shoe spring	SC-D-1639 det. 33	1036R det. 2.
4	1,000	Lock screw	SC-D-1639 det. 34	1039R det. 10.
2	20	Pin	SC-D-1639 det. 35	1039R det. 15.
2	200	Gasket	SC-D-1639 det. 36	1037R det. 1.
4	200	Gasket	SC-D-1639 det. 37	1037R det. 2.
1	200	Gasket	SC-D-1640 det. 38	1037R det. 3.
1	5	Support (main clutch)	SC-D-1640 det. 39	1033R det. 3.
1	5	Guide (main clutch)	SC-D-1640 det. 40	
4	20	Lever half (main clutch)	SC-D-1640 det. 41	
2	10	Handle (main clutch)	SC-D-1640 det. 42	

Number required for each reel unit	Number recommended for depot stock for each 100 reel units in service	Name of item	Signal Corps drawing and detail nos.	Equivalent Leach Co. drawing and detail nos.
TRANSMISSION— Continued				
1	5	Stirrup.....	SC-D-1640 det. 43.	
1	5	Lever arm.....	SC-D-1640 det. 44.	
1	20	Spring.....	SC-D-1640 det. 45.	
1	5	Catch.....	SC-D-1640 det. 46.	
2	10	Shipper shaft.....	SC-D-1641 det. 47.	1028R det. 3.
1	5	Shipper shaft.....	SC-D-1641 det. 48.	1028R det. 4.
4	200	Shipper shoe screw.....	SC-D-1641 det. 49.	1039R det. 11.
1	50	Key.....	SC-D-1641 det. 50.	
1	20	Spring guide.....	SC-D-1641 det. 51.	
TOP REEL SHAFT CLUTCH				
3	30	Bearing cap.....	SC-D-1643 det. 1.	1005R det. 1.
2	200	Bushing.....	SC-D-1643 det. 2.	1012R det. 2.
2	20	Arbor stop.....	SC-D-1643 det. 3.	1014R det. 1.
1	10	Bearing.....	SC-D-1643 det. 4.	1007R det. 1.
1	10	Bearing.....	SC-D-1643 det. 5.	1007R det. 2.
1	25	Bushing.....	SC-D-1643 det. 6.	1012R det. 1.
1	10	Sprocket.....	SC-D-1644 det. 7.	1018R det. 1.
2	10	Clutch ring.....	SC-D-1644 det. 8.	1020R det. 1.
1	5	Lock plate.....	SC-D-1644 det. 9.	1019R det. 1.
2	20	Latch.....	SC-D-1644 det. 10.	1019R det. 2.
2	20	Latch guide.....	SC-D-1644 det. 11.	1019R det. 3.
2	20	Pin.....	SC-D-1644 det. 12.	1039R det. 3.
2	20	Pin.....	SC-D-1644 det. 13.	1039R det. 2.
2	200	Screw.....	SC-D-1644 det. 14.	1039R det. 1.
2	500	Spring.....	SC-D-1644 det. 15.	1036R det. 4.
2	20	Spacer.....	SC-D-1644 det. 16.	1039R det. 5.
2	20	Collar.....	SC-D-1644 det. 17.	1039R det. 8.
1	5	Bracket.....	SC-D-1645 det. 18.	1030R det. 1.
1	5	Bracket.....	SC-D-1645 det. 19.	1030R det. 2.
1	5	Pawl.....	SC-D-1645 det. 20.	1030R det. 4.
1	5	Handle.....	SC-D-1645 det. 21.	1039R det. 4.
1	5	Stud.....	SC-D-1645 det. 22.	1039R det. 9.
1	5	Shaft.....	SC-D-1645 det. 23.	1028R det. 2.
1	5	Handle.....	SC-D-1645 det. 24.	1030R det. 3.
1	5	Lever arm.....	SC-D-1645 det. 25.	1032R det. 2.
1	5	Lever arm.....	SC-D-1645 det. 26.	1032R det. 1.
4	200	Block.....	SC-D-1645 det. 27.	1039R det. 7.
4	200	Screw.....	SC-D-1645 det. 28.	1039R det. 6.
1	50	Arbor.....	SC-D-1646 det. 29.	1026R det. 2.
1	5	Spacer.....	SC-D-1646 det. 30.	1028R det. 1.
CHAIN GUARD				
1	10	Chain guard complete.....	SC-D-1647.....	
1	5	Filler.....	SC-D-1648 det. 6.	1025R det. 6.
1	5	Filler.....	SC-D-1648 det. 7.	1025R det. 5.

Number required for each reel unit	Number recommended for depot stock for each .100 reel units in service	Name of item	Signal Corps drawing and detail nos.	Equivalent Leach Co. drawing and detail nos.
COUPLING				
1	50	Coupling complete.....	SC-D-1649.....	1024R.
1	5	Connecting hub.....	SC-D-1650 det. 1..	1024R det. 2.
1	5	Connecting hub.....	SC-D-1650 det. 2..	1024R det. 2.
2	10	Driving hub.....	SC-D-1650 det. 3..	1024R det. 1.
2	100	Disk, coupling.....	SC-D-1650 det. 4..	1149R.
4	100	Screw.....	SC-D-1650 det. 5..	1039R det. 16.
4	100	Screw.....	SC-D-1650 det. 6..	1039R det. 17.
2	10	Dowel.....	SC-D-1650 det. 7..	1024R det. 3.
2	100	Key.....	SC-D-1650 det. 8..	
CHAIN				
1	100	Chain.....	SC-D-1624 det. 8..	1045R det. 77.
1	100	Connector links.....	SC-D-1624 det. 8..	1045R det. 77.
TANK, FUEL				
1	10	Tank, fuel.....	SC-D-1654.....	
1	30	Flexible fuel pipe assembly.	SC-D-1654 det. 9, 10, and 11.	
1	20	Cock, fuel tank shut off.	SC-D-1654 det. 12.	
1	100	Cap, fuel tank.....	SC-D-1654 det. 6, 7, and 8.	
MISCELLANEOUS				
1	5	Panel.....	SC-D-1653 det. 1..	1042R det. 1.
1	10	Choke control.....	SC-D-1653 det. 2..	1044R det. 3.
1	10	Throttle control.....	SC-D-1653 det. 3..	1044R det. 2.
1	10	Switch with plate.....	SC-D-1653, 1 of det. 4 and 1 of det. 8.	1044R det. 1.
1	10	Ground wire.....	SC-D-1624 det. 14.	
1	50	Crank GC-4.....	SC-D-923.....	1023R.
1	10	Exhaust pipe.....	SC-D-1652 det. 1..	
1	10	Nipple $\frac{3}{8}$ " x $2\frac{1}{2}$ ".....	SC-D-1651 det. 5..	
1	5	Nipple $\frac{3}{8}$ " x $1\frac{1}{4}$ ".....	SC-D-1634 det. 73.	1045R det. 62.
1	10	Elbow $\frac{3}{8}$ " x 90°.....	SC-D-1651 det. 4..	
1	5	Elbow $\frac{3}{8}$ " x 90°.....	SC-D-1634 det. 74.	1045R det. 61.
1	5	Street elbow $\frac{3}{8}$ " x 90°.....	SC-D-1634 det. 75.	1045R det. 60.
1	50	Pipe plug $\frac{3}{4}$ ".....	SC-D-1634 det. 76.	1045R det. 65.
1	50	Pipe plug $\frac{1}{4}$ ".....	SC-D-1634 det. 77.	1045R det. 64.
1	50	Pipe plug $\frac{1}{8}$ ".....	SC-D-1634 det. 78.	1045R det. 63.
2	20	Taper pins #4 x 2 inches long.	SC-D-1627 det. 17.	
1	40	Key.....	SC-D-1634 det. 71.	
1	10	Bearing SKF #6304.....	SC-D-1634 det. 65.	1045R det. 73.
1	10	Bearing SKF #6203.....	SC-D-1634 det. 66.	1045R det. 72.
1	20	Oil seal, perfect #13724.....	SC-D-1634 det. 67.	1045R det. 74.
4	100	Oil hole cover, GITS #GB526.	SC-D-1634 det. 68.	1045R det. 75.
15''	5 lb	Packing.....	SC-D-1634 det. 72..	

24. Parts list of Lauson engine.

Number required per unit	Number recommended per 100 units	Name of item	Signal Corps drawing and detail nos.	Lauson part nos.
1	10	Lauson engine	SC-D-1651	RAY-843.
1	10	Connecting rod complete		RA1014-1.
1	20	Piston pin bushing		RA48.
2	20	Ring, piston pin retaining		RA23.
2	40	Bolt, connecting rod		RA89.
2	40	Washer, connecting rod bolt		RA94.
2	40	Nut for connecting rod bolt		5M.
1	20	Piston		RA5.
1	40	Piston ring		RA14.
	20	Piston ring plus 0.005"		RA14.
1	40	Oil scraper ring		RA484.
1	40	Oil ring		RA111.
1	10	Piston pin		RA27.
1	2	Crankshaft assembly		RA1008-2.
1	5	Crankshaft		RA24B.
1	5	Timing gear on crankshaft		RA12.
1	20	Timing gear pin		RA103.
1	3	Oil pump piston assembly		RA1067-1.
1	2	Oil pump assembly		RA1046-2.
1	2	Base assembly		RA1000-2.
1	1	Crankcase end plate assembly.		RA1076-3.
1	10	Starter retard gear (see note on SC-D-1651).		RA274.
1	25	Intermediate starter gear assembly.		RA1089.
1	100	Starter retard gear spring		RA280.
1	10	Stud starter retard gear		RA277.
1	100	Spring intermediate gear		RA287.
1	5	Gear starter assembly		RA1082-2.
1	10	Breather assembly		RA1077-2.
1	2	Cylinder assembly		RA1078-5.
1	10	Intake valve		RA20A.
1	50	Exhaust valve		RA66A.
2	10	Intake and exhaust valve cap.		RA50.
2	50	Valve spring		RA57A.
2	20	Valve lifter		RA65A.
6	60	Head stud		RA68A.
2	20	Valve cup		RA72.
2	30	Valve guide		RA197A.
1	60	Spring cover gasket		RA217A.
2	100	Valve cap key		RA258A.
1	5	Starter gear assembly		RA1082-2.
1	100	Starter return spring	SC-D-1652 det. 2	
1	5	Starter bracket		RA189A.
1	50	Starter sector		RA271.
1	2	Cylinder head		RA4B.
1	1	Flywheel		RA13A.
1	30	Head gasket		RA114A.
1	50	End plate gasket		RA121A.
1	50	Bearing housing gasket		RA126.
1	50	Base gasket		RA132B.
2	50	Felt washer, retaining		RA133.
2	50	Felt washer		RA167.
1	10	Carburetor #MS74B		RAY202B.
1	50	End plate gasket		RA246A.

Number required per unit	Number recommended per 100 units	Name of item	Signal Corps drawing and detail nos.	Lauson part nos.
6	60	Head stud washer	-----	RA261.
1	50	Gear on crankshaft (see note on SC-D-1651).	-----	RA275.
1	10	Intermediate gear stud	-----	RA276.
1	20	Intake pipe gasket	-----	RA293.
1	20	Carburetor gasket	-----	RA295.
1	5	Magneto #288	-----	RA358B.
1	500	Spark plug	-----	RA359.
1	20	Breather body gasket	-----	RA397A.
2	24	Cotter pin	-----	4P-03.
1	5	Pipe plug—oil drain	-----	2Z.
1	5	Pipe plug—oil filler	-----	4Z.
3	20	Cap screw	-----	5C-06.
1	24	Cotter pin	-----	8P-03.
2	24	Lockwasher, $\frac{3}{16}$ " non-link	-----	
2	10	Woodruff key	-----	AY-04.
1	10	SAE nut, $\frac{1}{2}$ "	-----	8K.
2	10	Cap screw, $\frac{3}{8}$ " x $\frac{1}{2}$ " long	-----	6D12.
2	10	SAE nut $\frac{3}{8}$ "	-----	6K.
2	24	Lockwasher, $\frac{3}{8}$ " non-link	-----	
4	24	Nut—castellated	-----	5K.
6	24	Nut—full	-----	5K.
1	5	SAE—full nut	-----	9K.
2	24	Lockwasher, non-link	-----	4W.
4	20	Hexagon screw	-----	4G-06.
4	20	Hexagon screw	-----	4C-04.
4	24	Screw	-----	4AM4.
1	10	Matched needle and seat	-----	04050.
1	5	Float bowl cover assembly	-----	04048.
1	10	Float bowl cover gasket	-----	01845.
1	10	Inlet connection	-----	03453.
1	10	Adjusting screw	-----	03076.
1	10	Rotor assembly	-----	RA5005.
1	20	Breaker arm assembly	-----	RA5004.
1	20	Stationary contact point with nut.	-----	RA5015.
1	10	Condenser	-----	RA5016.
1	10	Bushing	-----	RA5025.
1	10	Spring	-----	RA5026.
1	20	High tension cable	-----	RA5014.
-----	10	Tool for putting on and taking off magneto rotor.	-----	RAY575.

[A. G. 062.12 (4-29-36).]

BY ORDER OF THE SECRETARY OF WAR:

MALIN CRAIG,
Chief of Staff.

OFFICIAL:

E. T. CONLEY,
Major General,
The Adjutant General.