INSTRUMENT GROUP

SECTION "A"

SECTION "B"

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INSTRUMENTS
COMBINATION STARTING AND IGNITION SWITCH
R-110 to RF-210 (Delo-Remy No. 1116501)

When the switch key is turned to the left, all accessories and gauges are "ON" except the ignition which is "OFF". When the switch key is turned half way to the right, the accessories and ignition are both "ON". Turning the ignition switch key to the extreme right will engage the starting switch and complete the electrical circuit between the battery and the starting motor so that the pinion engages the flywheel ring gear and cranks the engine.

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INSTRUMENTS

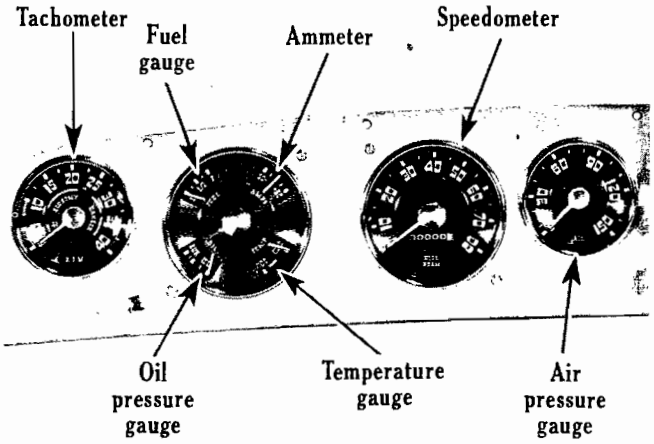

Fig. 1

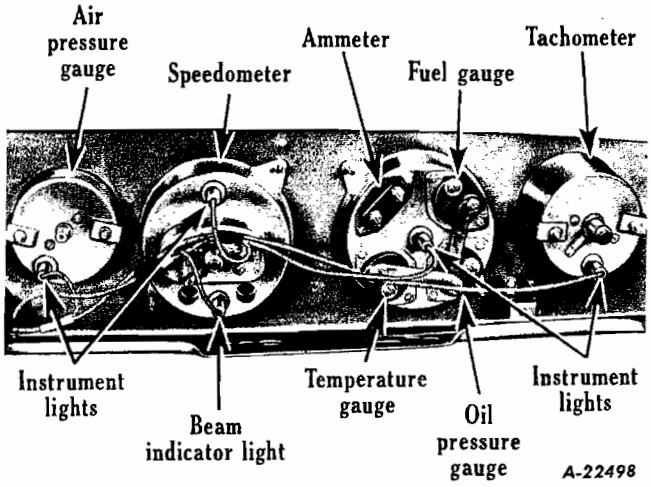

Fig. 2

General Description

Fig. 1 illustrates location of instruments on dash panel. Fig. 2 illustrates the rear view of the same instruments and panel assembly as in Fig. 1.

The fuel gauge, oil pressure gauge, and water temperature gauge are electrically operated and consist of a sender and receiver (dash) unit.

Diagrams (Figs. 3 to 9 inclusive) illustrate the major parts of each unit and the principle of operation. An optional source of supply of instruments is established at the factory and the new truck may be equipped with instruments that come to rest in the upper range when the switch is turned to "OFF" position. In these instances, the details of operation of the unit are similar. The illustrations will apply in either case except for direction of travel after switch is turned to "OFF" position.

Service Instructions.

The following units require no adjustment or maintenance other than keeping the electrical connections tight. Due to the intricate construction no attempt should be made to repair or calibrate these units. IF UNIT FAILURE OCCURS, REPLACE WITH A NEW UNIT. However, no unit should be removed until a thorough check has been made of wiring, sender units, condenser, etc. for a short, otherwise, a new unit will also burn out.

Coil
Ammeter
Starter switch
Ignition switch
Circuit breaker
Stop light switch
Electrical tachometer
Magnetic starting switch
Headlight sealed beam unit
Headlight dimmer switch
Fuel gauge and fuel tank sender unit
Oil pressure gauge and engine sender unit
Water temperature gauge and engine sender unit

CAUTION: Always have ignition switch in "OFF" position when changing or working on instruments to avoid the possibility of a short circuit, which will damage instruments. Both sender and receiver units must be of same type. Do not use a sender unit of one manufacturer with a receiver unit of another, or vice versa.

Fuel Gauge Operation (King-Seeley)

When fuel tank is empty (Fig. 3) the two contacts in fuel tank sender unit are just touching. With the ignition switch on, current flows through the circuit, warming up the heater wires which causes the bi-metals to bend, and

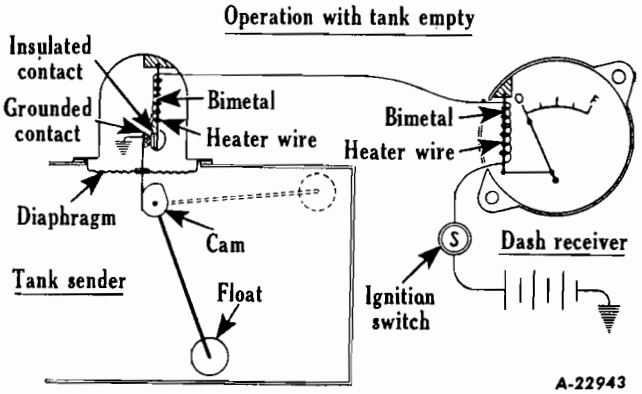

Fig. 3 - Gas Gauge - Tank Empty.

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bending of bi-metal in tank sender unit opens the contacts and circuit is broken--the heater wire then cools and the bi-metal returns to its former position. Contact is then again made and the procedure is repeated at the rate of approximately once per second.

Since both heater wires are in the same circuit, a similar slight bending of the bi-metal in the dash receiver unit occurs, which is just sufficient to make the needle register zero.

When tank is filled with gasoline (Fig. 4) the action of the float and cam pushes the grounded contact against the insulated bi-metal contact, bending the bi-metal in the tank sender unit.

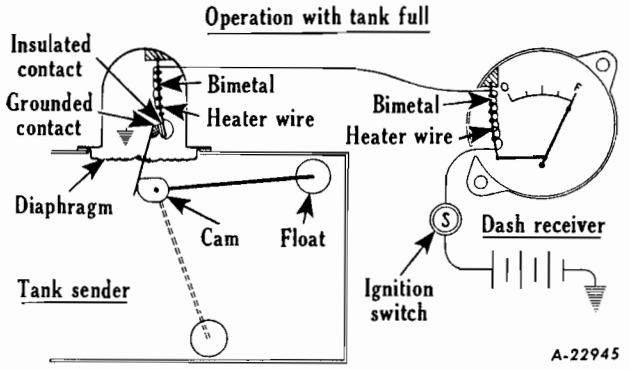

Fig. 4 - Gas Gauge - Tank Full.

Now if the ignition switch is on, the action described in the preceding paragraphs occurs but because the bi-metal is already under strain a much greater amount of current is required to bend the bi-metal sufficiently to break contact in this position. A similar greater bending of the bi-metal in the dash receiver unit occurs and this action pulls the needle over to the full point.

The movement of the needle in any position caused by the make-and-break of the circuit is so minute that it can not be detected.

Oil Pressure Gauge Operation (King-Seeley)

The operation of the oil pressure gauge sender unit is similar to the fuel gauge sender unit except that instead of a cam, a diaphragm is used as a means of moving the grounded contact. The dash receiver units operate exactly the same. NOTE: Should the oil pressure gauge indicate pressure lower than normal, the engine sender unit and dash unit should be checked prior to looking further for the trouble (Fig. 5).

In some instance low oil pressure reading on the gauge can be corrected by changing the position of the engine unit. This unit is normally assembled with the small depression in the cover at the top.

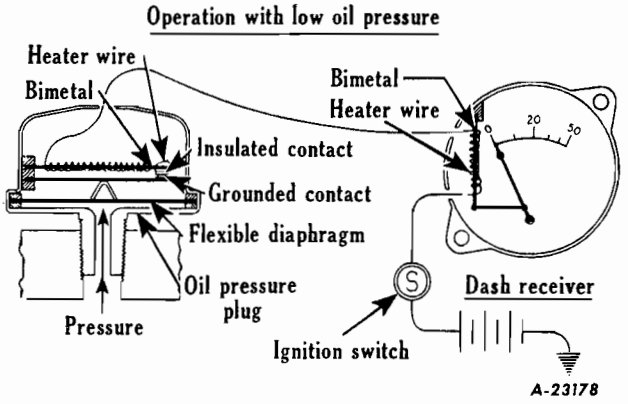

Fig. 5 - Oil Pressure Gauge - No Pressure.

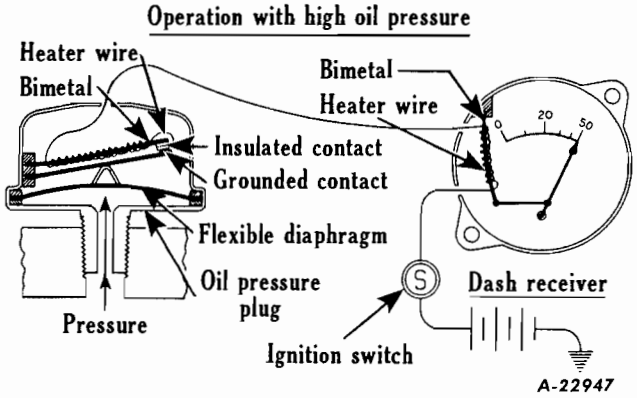

Fig. 6 - Oil Pressure Gauge - With Pressure.

Note in Fig. 6 that the deflection of the diaphragm pushed the grounded contact against the insulated bi-metal contact, bending the bi-metal in the sender unit.

Water Temperature Gauge Operation (King-Seeley)

The engine sender unit consists of a fixed grounded contact, so positioned that the bi-metal against which it presses is bent mechanically. At low temperatures (Fig. 7) considerable heat is required to make this bi-metal bend away from the grounded contact. With the temperature of the engine-cooling water

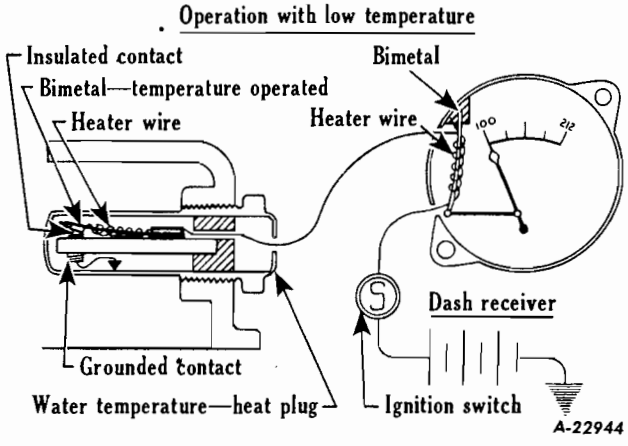

Fig. 7 - Water Temperature Gauge - Cold.

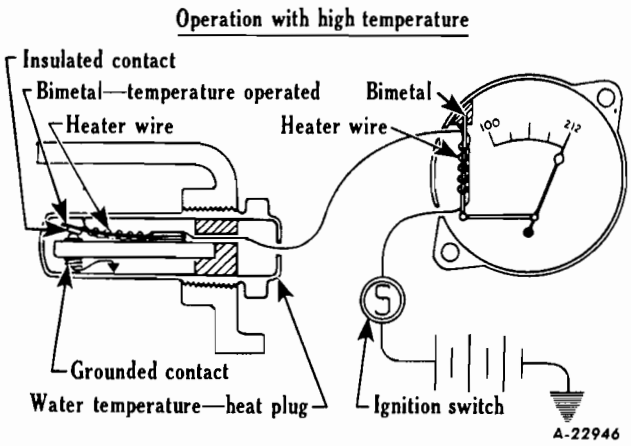

Fig. 8 - Water Temperagure Gauge - Hot.

low, all this heat must be generated electrically, and this same current flowing through the heater wire of the dash receiver creates an equal amount of heat there and a resultant bending of the dash receiver bi-metal, causing the pointer to show a low temperature reading.

As the water temperature rises, its heat aids in bending the sender bi-metal--less heat is generated electrically, the resultant bending of the bi-metal in the receiver is less, resulting in higher temperature readings (Fig. 8).

The following service instructions apply to fuel level, oil pressure or water temperature gauges.

IMPORTANT: Do not disconnect instruments with ignition switch "ON" as there is danger of causing a short circuit which will damage instruments. Always turn ignition switch "OFF" before changing or working on instruments.

NOTE: If it is necessary to replace the receiver unit, because it has been burned out, then check wiring, sender unit, and condenser, if any, for a short, and correct this condition, otherwise, new receiver unit will also burn out. A short in the gauge circuit is easily recognizable because it will cause receiver unit to over-read and in most cases beyond full scale.

Equipment Necessary for Checking Gauges

1. One new fuel tank unit. If there is any question about the new tank unit being correct, then hook it up in series with a receiver unit known to be satisfactory, and apply 6 volts of current. Operate tank unit by hand and see if receiver unit reads zero with tank unit float in bottom position and full with tank unit float in top position.

2. Two ten-foot lengths of insulated wire equipped with clip terminals at each end.

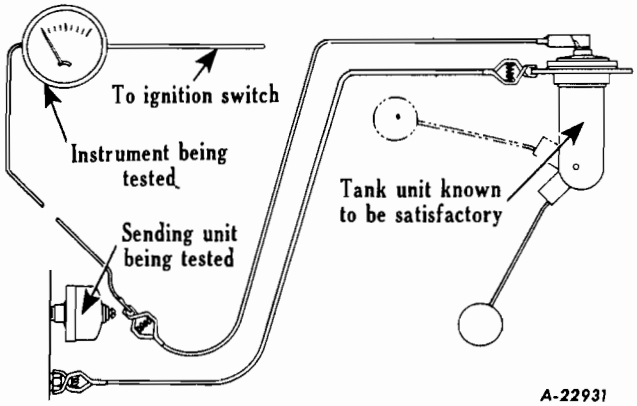

Fig. 9 - Method of checking gauges.

These long lengths will in practically all instances permit individual making check to sit in seat of truck and observe gauge being checked.

Method of Checking Gauges

(IMPORTANT: No units should be removed from truck until check has been completed which shows such units to be damaged or defective.)

1. Disconnect sender unit being checked and hook in tank unit as shown in Fig. 9. Turn on ignition switch and operate float rod of tank unit by hand. With float of tank unit at bottom position, receiver unit being checked should register at bottom mark on dial. Next, move float rod up to top position, then receiver unit being checked should move to top mark on dial (allow one minute for receiver to come to rest).

   NOTE: Exceptions to this are the oil pressure and water temperature gauges. The oil pressure gauge should register at the RUN mark with the float rod at top position. This is the mark just below the top mark on this gauge. The water temperature gauge should register at the HOT mark.

2. If receiver unit operates correctly, then check sender unit on truck to see if it is properly grounded. Also (a) if truck is radio-equipped check condenser on sender unit. If condenser is shorted, it will cause receiver unit to overread. When replacing condenser, it is preferable to use one of .10 or .20 micro-farad capacity, but up to .50 can be used if necessary to cut out radio interference. (b) If ground and condenser are satisfactory, then replace sender unit and check to see if this has corrected the difficulty.

3. If receiver does not operate or fails to operate correctly then check wire lead to receiver unit. Do this by attaching one end

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of a ten-foot length of wire to the terminal of the receiver unit to which sender unit wire was attached. Ground the other end of the ten-foot lead and turn on the ignition switch. If the gauge operates now and did not operate with the regular wire connection, the wiring is at fault and must be replaced.

If wiring is satisfactory then replace receiver unit and check again with tank unit.

Do not attempt the repair or calibration of any receiver or sending unit in the field as this is not practical. Replacement with a new unit is the only practical means of servicing these gauges.

Speedometer

The speedometers used on L-Line trucks are of the magnetic-type.

A speedometer is used on a vehicle to indicate speed in miles per hour as shown by the pointer on face dial, and to record distance traveled by means of an odometer. The speedometer is driven through a flexible shaft connected to a set of gears in the vehicle transmission. These gears are designed for the particular vehicle model and take into consideration the tire size and rear axle ratio. The flexible shaft, which connects the transmission driven gear to the speedometer, consists of an outer casing and inner core.

The odometer usually records up to 99,999 miles before it automatically returns to zero. The extra wheel on the right side of the odometer is known as the tenth dial, replacing the old type trip odometer, and records every tenth of a mile.

There are occasions when, due to change in axle ratios or tire sizes, it is necessary to make compensating corrections in the speedometer drive gear. For method of speedometer adapter calculations, see following Section "B", Instruments.

Tachometer

A tachometer is installed on a vehicle to record engine r.p.m. speeds and enables the driver to keep engine within efficient operating range.

The magnetic type tachometer is installed at the factory on all Super Red Diamond Engines. It is driven by a flexible shaft connected to the vehicle distributor shaft by means of a drive joint or adapter and records the r.p.m. from the distributor shaft onto the face dial through a magnetic field within the unit.

There are two additional types of tachometers available, namely, centrifugal, with a maximum r.p.m. hand, and electrical.

The centrifugal tachometer works on the weight-type governor principle and is driven from the distributor shaft in the same manner as the magnetic type. The centrifugal type also has a maximum r.p.m. hand on the tachometer head to record maximum speed of engine.

The electric tachometer is a two-unit combination consisting of transmitter and tachometer head. The head is mounted on the instrument panel and the transmitter on engine side of dash. The transmitter name plate provides a cover for an easily replaceable standard flash-light battery which supplies a fixed voltage to guarantee 2% overall accuracy. The current requirement is so small that the battery will give a normal service of approximately six months. The electric tachometer receives electrical impulses from the distributor through the transmitter and records the r.p.m. in this manner.

Tachometer Flexible Shaft

A complete flexible shaft consists of two major assemblies. A flexible outer casing with nuts and ferrules at both ends and a wire-wound flexible inner coil assembly with squared ends or crimped-on tips. The core diameter and end connections vary for different applications.

One end of the flexible shaft is attached to the instrument (speedometer or tachometer) and the other end is attached to the transmission or power take-off point. The flexible inner core transmits the power from the take-off, while the outer casing is held rigidly in place at each end by the ferrules and nuts.

Repairing Tachometer Flexible Shaft

Disconnect both ends of the shaft and remove from vehicle. Pull the core out of the casing and check for kinks by rolling on a flat surface. If a flat surface is not available, take an end in each hand and roll core between fingers. In either case a core kink will show up as a "hop" at the kinked point. Never reuse a kinked core, because it will cause fluctuation of the speedometer or tachometer point. Also check for frayed spots by running it loosely through your finger. Do not reuse a frayed core. Kinked or frayed core usually indicates a casing with very sharp bend. CAUTION: Under no circumstances should a casing have less than a six-inch radius bend.

Lubricating Tachometer Flexible Shaft

Thoroughly clean the core and casing. Apply a thin coat of graphite impregnated non-hardening grease evenly over the core ONLY. Hold the casing with one hand and feed the core with lubricant into casing. CAUTION: Never fill or pack the casing with grease. Periodical lubrication of the flexible shaft is recommended to avoid premature failure.

METHOD OF SPEEDOMETER ADAPTER CALCULATION

There are occasions when, due to changes in axle ratios, or tire size, it is necessary to make compensating corrections in the speedometer drive.

Parts catalogs list available speedometer adapters and the one chosen should most closely coincide with the calculated results.

The following formulae are based on new tire radii when correctly inflated and properly loaded, and should prove helpful in selecting speedometer adapter equipment.

Problem	Formulae
(A) Error in speedometer indication	$\frac{\text{Actual distance traveled}}{\text{Speedometer reading}} \times \text{*Present adapter ratio} = \text{Required adapter ratio.}$ *NOTE: If no adapter in present hook-up - disregard in calculations. EXAMPLE: Actual distance traveled: 5 miles Speedometer reading: 6 miles *Present adapter ratio: 1.200 Formula is then: $\frac{5}{6} \times *1.200 = .9996$ Required adapter ratio.
(B) Axle ratio has been changed.	$\frac{\text{Old axle ratio}}{\text{New axle ratio}} \times \text{*Present adapter ratio} = \text{Required adapter ratio.}$ *NOTE: If no adapter in present hook-up - disregard in calculations. EXAMPLE: Old axle ratio: 5.285-1 New axle ratio: 6.16-1 *Present adapter ratio: 1.155 Formula is then: $\frac{5.285}{6.16} \times *1.155 = .9909$ Required adapter ratio.
(C) To find tire revolutions per mile.	$\frac{10084}{\text{Loaded tire radius in inches}} = \text{*Tire rev. per mile.}$ *Deduct 1% for high pressure tires, or 1-1/2% for balloon tires. NOTE: See CT-350 for tire radius specifications. EXAMPLE: Constant figure: 10084 Loaded tire radius of 7.50-20 tire: Formula is then: $\frac{10084}{17.3} = 582$ $582 - 1\text{-}1/2\% = 573$ Tire rev. per mile.
(D) Tire size has been changed.	$\frac{\text{Old tire rev. per mile}}{\text{New tire rev. per mile}} \times \text{*Present adapter ratio} = \text{Required adapter ratio.}$ NOTE: If no adapter in present hook-up - disregard in calculations. EXAMPLE: Old tire rev. per mile (7.00-20): 573 New tire rev. per mile (9.00-20): 525 *Present adapter ratio: 1.155 Formula is then: $\frac{573}{525} \times *1.155 = 1.260$ Required adapter ratio.
(E) Tire size and axle ratio both changed.	$\frac{\text{*Present adapter ratio} \times \text{old tire rev. per mile} \times \text{old axle ratio}}{\text{New tire rev. per mile} \times \text{new axle ratio}} = \text{Required adapter ratio.}$ NOTE: If no adapter in present hook-up - disregard in calculations. EXAMPLE: *Present adapter ratio: 1.155 Old tire rev. per mile (7.00-20): 573 Old axle ratio: 5.285 New tire rev. per mile (9.00-20): 525 New axle ratio: 6.16-1 Formula is then: $\frac{*1.155 \times 573 \times 5.285}{525 \times 6.16} = 1.081$ Required adapter ratio.
(F) To check adapter if tire diameter, axle ratio, and speedometer drive and driven gears are known.	$\frac{\text{Loaded tire radius} \times 0.1 \times \text{number teeth in driven gear}}{\text{Axle ratio} \times \text{number teeth in drive gear}} = \text{Adapter ratio.}$ NOTE: See CT-350 for tire radius specifications. EXAMPLE: Loaded tire radius (9.00-20): 18.9 Constant figure: 0.1 Number of teeth in speed driven gear: 14 Axle ratio: 6.16-1 Number of teeth in speed drive gear: 4 Formula is then: $\frac{18.9 \times 0.1 \times 14}{6.16 \times 4} = 1.073$ Adapter ratio.

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