top of valve stem as shown in Fig. 117. Locate No. 1 piston at TDC and zero the dial indicator, then turn crankshaft counterclockwise until dial indicator reading is approximately 7.0 mm (0.275 inch). Turn on fuel supply to pump and move throttle control lever to high speed position. Note that fuel should flow from No. 1 delivery valve holder. Slowly turn crankshaft clockwise to locate exact point at which fuel stops flowing, which is start of injection. Pump timing is correct if dial indicator reading is between 3.55-3.88 mm (0.140-0.153 inch) at this point. This is specified timing setting of 21½°-22½° BTDC.

If pump timing is incorrect, remove pump drive gear cover plate from timing gear case. Loosen two cap screws attaching pump drive coupling (3–Fig. 121) to drive gear (1). Rotate drive coupling fully counterclockwise in slotted mounting holes while holding drive gear from moving. Make sure that crankshaft is positioned at correct setting as outlined above. Turn on fuel and observe fuel flowing from No. 1 delivery valve holder. While applying counterclockwise pressure on pump drive gear to remove backlash, slowly move drive coupling clockwise to locate exact point at which fuel stops flowing from delivery valve holder. Tighten drive coupling retaining cap screws to 25-29 N·m (19-22 ft.-lbs.) torque being careful not to disturb timing setting.

Note that pump drive coupling to drive gear timing marks (S–Fig. 121), if present, should be aligned when pump is correctly timed. If timing marks are not present, or if they are no longer aligned, use a chisel to mark the coupling and gear for future timing reference.

Reinstall delivery valve and spring. Tighten delivery valve holder to 39-44 N·m (29-32 ft.-lbs.) torque.

Models 1500-1700-1710-1900-1910-2110

62. **REMOVE AND REINSTALL.** To remove injection pump, proceed as follows: On all models except 1710, drain engine coolant and remove radiator. On 1500, 1700 and 1900 models, remove timing gear case as outlined in paragraph 35. On 1710, remove the injection pump gear cover plate from timing gear case. On 1910 and 2110 models, remove hydraulic pump and filter as an assembly, then remove cover plate from front of timing gear case. On all models, rotate crankshaft until timing marks on pump drive gear and idler gear are aligned as shown in Fig. 123. Make an alignment mark (S) on oil pump drive coupling and gear if no marks are present. Remove retaining nut, drive gear and coupling from pump shaft.

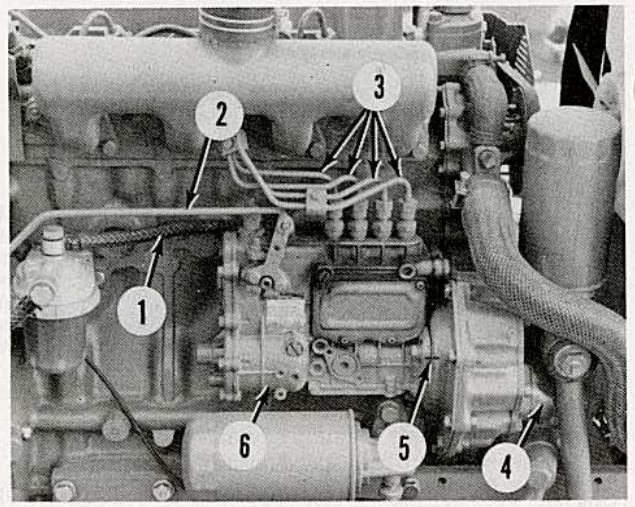

Fig. 122–Scribe alignment marks (5) on pump flange and mounting plate before removing injection pump on 1500, 1700, 1710, 1900, 1910 and 2110 models. (Model 2110 shown.)
1. Fuel inlet line
2. Throttle rod
3. Injector lines
4. Hydraulic pump assy.
5. Alignment marks
6. Injection pump assy.

Disconnect fuel inlet line (1–Fig. 122) and injector lines (3). Plug all openings to prevent entry of dirt. Disconnect throttle control rod (2). Scribe alignment marks (5) on pump mounting flange and mounting plate to assist in installation of pump. Remove pump mounting screws and withdraw injection pump assembly.

Installation of injection pump is the reverse of removal procedure. However, if injection pump, drive coupling or timing gears are renewed, time pump to engine as outlined in paragraph 63. Tighten injection pump gear retaining nut to 39-44 N·m (29-33 ft.-lbs.) torque. Bleed air from system as outlined in paragraph 56.

63. **PUMP TIMING.** The injection pump timing must be checked if the injection pump or any of the drive components are renewed.

To check pump timing, shut off fuel supply and disconnect No. 1 (front) injector line from delivery valve holder on pump. Remove No. 1 delivery valve holder (1–Fig. 115), spring (2) and delivery valve piston (3), then reinstall delivery valve holder and tighten snugly.

Rotate crankshaft clockwise until No. 1 piston is on compression stroke and TDC mark (2–Fig. 116) on crankshaft pulley is aligned with timing pointer (1). Then, turn crankshaft counterclockwise approximately 30°. Turn on fuel supply to pump and move throttle lever to full speed position. Note that fuel should flow from No. 1 delivery valve holder. Slowly turn crankshaft clockwise to locate exact point at which fuel stops flowing, which is start of injection. Pump timing should be correct if the first mark (3) on crankshaft pulley is aligned with pointer (1) at this point.

The following pump spill timing procedure may also be used to check pump timing if there is any doubt about accuracy of crankshaft pulley timing marks. On 1500, 1700 and 1900 models, the following procedure must be used when installing a new pump and adjusting timing. Remove valve rocker cover. Rotate crankshaft until No. 1 piston is on compression stroke and timing mark (2) on crankshaft pulley is aligned with pointer (1). Remove valve spring from one of the No. 1 cylinder valves and allow the valve to rest on top of the piston. Position a dial indicator on top of the valve stem as shown in Fig. 117. Locate No. 1 piston at TDC and zero the dial indicator, then turn crankshaft counterclockwise until dial indicator reading is approximately 7.0 mm (0.275 inch). Turn on fuel supply and move throttle control lever to high speed position. Note that fuel should flow from No. 1 delivery valve holder. Slowly turn crankshaft clockwise to locate exact point at which fuel stops flowing and observe dial indicator reading. Pump timing is correct if dial indicator reading is within the following specified range.

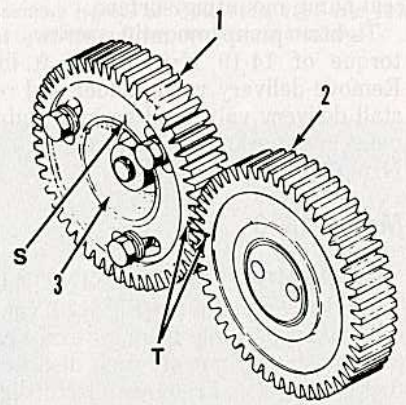

Fig. 123–Align timing marks (S and T) on pump drive gear (1), idler gear (2) and drive coupling (3) when installing injection pump on 1500, 1700, 1710, 1900, 1910 and 2110 models.

Model	Indicator Reading	Crankshaft Degrees
1500	5.1-6.0 mm (0.200-0.236 in.)	23-24
1700	3.87-4.67 mm (0.152-0.183 in.)	20-22
1710	4.12-4.49 mm (0.162-0.177 in.)	22½-23½
1900	5.24-5.60 mm (0.206-0.220 in.)	26-27
1910	5.28-5.73 mm (0.208-0.225 in.)	23½-24½
2110	5.28-5.73 mm (0.208-0.225 in.)	23½-24½

If pump timing is incorrect, adjust as follows: On 1500, 1700 and 1900 models, remove radiator, hydraulic pump and timing gear case. On 1710 models, remove pump drive gear cover plate from timing gear case. On 1910 and 2110 models, remove radiator, hydraulic pump and pump drive gear cover plate. On all models, loosen cap screws attaching pump drive coupling (3–Fig. 123) to pump drive gear (1), then rotate coupling counterclockwise to end of slotted holes in drive gear. Make certain that crankshaft is positioned at correct setting as outlined above. Turn on fuel and observe fuel flowing from No. 1 delivery valve holder. While applying counterclockwise pressure on pump drive gear to remove backlash, slowly turn pump drive coupling clockwise to locate exact point at which fuel stops flowing. At this point, tighten drive coupling retaining cap screws to 25-29 N·m (19-22 ft.-lbs.) torque being careful not to disturb timing setting.

Note that pump drive coupling to drive gear timing marks (S–Fig. 123) should be aligned when pump is correctly timed. If timing marks are not present, or if they are no longer aligned, use a chisel to mark the coupling and gear for future timing reference.

Reinstall delivery valve and spring. Tighten delivery valve holder to 30-35 N·m (22-26 ft.-lbs.) torque.

ENGINE SPEED ADJUSTMENT

Models 1100-1110-1200-1300

65. To adjust engine speed, first start engine and operate until warm. Move throttle lever to slow idle detent position. Engine speed should be 750-850 rpm. If low idle speed is incorrect, loosen locknuts and turn throttle control rod turnbuckle (3–Fig. 125) as required until correct speed is obtained.

Move throttle control lever to maximum speed position and observe engine rpm. Maximum no-load speed should be 2750-2800 rpm for 1100, 1110 and 1200 models, or 2900-2950 rpm for 1300 models. To adjust maximum speed, loosen locknut and turn stop bolt (Fig. 125) as required until correct maximum speed is obtained.

Models 1210-1310-1500-1510-1700-1710-1900-1910-2110

66. To adjust engine speed, first start engine and operate until warm. Move throttle lever to slow idle detent position. Engine speed should be 750-850 rpm on all models. If low idle speed is incorrect, loosen locknuts and turn throttle control rod turnbuckle (Fig. 126) as required until correct speed is obtained.

Move throttle control lever to maximum speed position. Maximum no-load speed should be as follows:

Model	High Idle Rpm
1210	2850-2900
1310	2950-3000
1500	2650-2700
1510	3000-3050
1700	2600-2650
1710	2825-2875
1900	2900-2950
1910	2650-2700
2110	2650-2700

To adjust maximum speed, turn control arm stop screw (1–Fig. 127, 128 or 129) as required until correct speed is obtained. Be sure that foot throttle pedal does not travel below the upper surface of foot step plate.

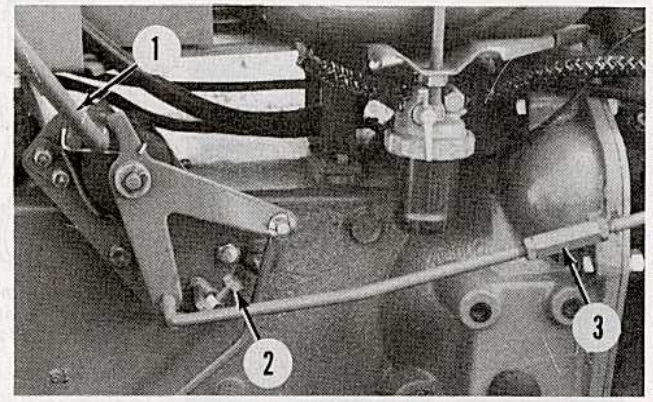

Fig. 125–View of throttle linkage typical of 1100, 1110, 1200, 1210 and 1300 models. Refer to text for adjustment procedure.

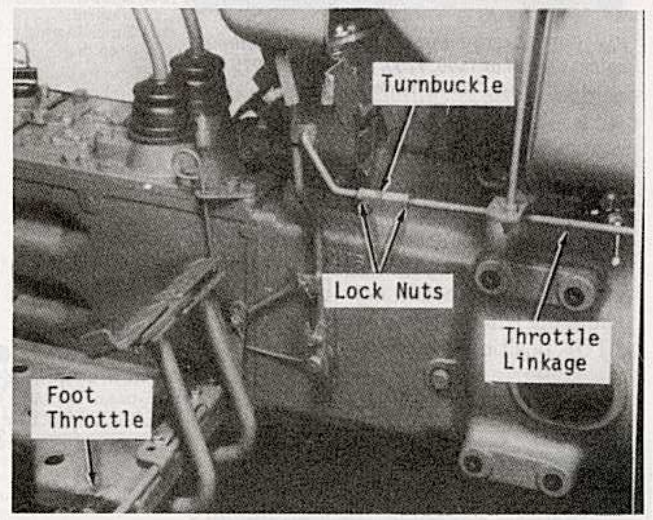

Fig. 126–View of throttle linkage typical of 1310, 1500, 1510, 1700, 1710, 1900, 1910 and 2110 models. Refer to text for adjustment procedure.

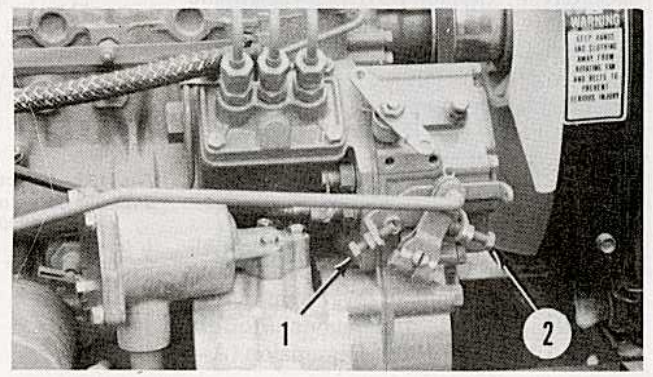

Fig. 127–View of throttle linkage adjustment points typical of 1210 and 1310 models.
1. High idle stop screw
2. Shut-off stop screw