12. Remove the final driven sprocket and the drive chain.

13. Disconnect the contact breaker point leads (yellow and blue) at the connectors.

14. Unscrew the nuts from the engine hanger bolts, and dismount the engine from the right side by raising it's rear slightly.
B. Engine Installation

1. Remount the engine in the reverse order of dismounting, however, attention should be given to the following points:
   - Install the engine from the right side and tighten the hanger bolts. The battery ground cable terminal is installed together with the rear hanger bolt.
   - Make sure that the generator cord and starting motor cord are not pinched when the left crankcase cover is installed.
   - Make sure that the two mufflers on each side are properly connected with the muffler connecting band.
   - Perform the following adjustments after the engine is installed.
     Clutch adjustment
     Drive chain slack adjustment
     Carburetor adjustment

Fig. 53 ① Battery ground cable

Fig. 54 ① Generator cord
         ② Starting motor cord

Fig. 55 ① Muffler connecting band
3. CYLINDER HEAD, CYLINDER AND PISTON

A. Disassembly

1. Turn the fuel cock to the “STOP” position, disconnect the fuel lines at the tank, and dismount the fuel tank.
2. Remove the exhaust pipe and muffler.
3. Disconnect the tachometer cable.
4. Disconnect the high tension cords at the spark plugs, unscrew six 6 mm screws and remove the breather cover.
5. Remove the tappet hole caps, left and right side covers, unscrew twelve 6 mm screws and six bolts, and remove the cylinder head cover.

Note:
- Loosen the screws and bolts uniformly to relieve the stress gradually.

6. Loosen the lock nut of the cam chain tension adjuster (leave the wrench on the nut), turn the screw fully (approximately 90°) clockwise, and then tighten the lock nut.
   In this condition the cam chain tensioner is not applying tension to the cam chain.

7. Unscrew two cam sprocket mounting bolts and remove the camshaft from the sprocket.
8. Remove the cam chain from the sprocket.
9. Separate the carburetor assembly from the cylinder head.

10. Unscrew the cam chain tensioner mounting bolt.

11. Unscrew twelve cylinder head mounting nuts and two 6 mm flange bolts, and remove the head. Loosen the nuts uniformly in the reverse order of tightening shown in Fig. 83.

12. Remove the cam chain guide from the cylinder by raising the cam chain guide slightly, and rotate the guide 90° and removing it toward the top. During this operation, do not drop the cam chain.

13. Unscrew the cam chain adjuster lock nut (Fig. 58) and remove the chain tensioner from the cylinder. To facilitate removal, raise the cylinder about 20 mm/1 in., and remove the cam chain tensioner.
14. Remove the cylinder. If the cylinder is tightly stuck pry
the cylinder loose with a screwdriver placed in the groove at the base of the
cylinder.

15. Remove the piston pin clip, piston pin, and the piston.

*Note:*
When removing the pin clip, exercise care
not to drop the clip into the crankcase.

16. Remove the piston rings.
17. Screw a 6 mm bolt into the rocker arm
shaft and remove the rocker arm shaft
from the cylinder head cover.

**B. Inspection**
1. Inspect the camshaft bearing surfaces.
Camshaft bearing surfaces should be smooth and shiny. If it is scratched or
excessively worn, it should be replaced.
2. Measure the height of the cam with a micrometer.
Replace the camshaft if beyond the serviceable limit.

3. Measure camshaft runout.
Support level both ends of the camshaft on V-blocks and with a dial gauge measure radial runout by rotating the shaft. Replace the camshaft if beyond the serviceable limit.

4. Also check the camshaft for scratch, wear and replace if necessary.

5. Measure cylinder diameter at the top, center and bottom in both the X and Y axes. Rebore the cylinder if beyond the serviceable limit at any point.
When reboring the cylinder, rebore it to fit one of the four standard oversize pistons available.
Standard oversizes are 0.25, 0.50, 0.75 and 1.00 mm (0.009, 0.019, 0.029 and 0.039 in.).

6. Measure piston diameter.
Measure the diameter at the piston skirt, 90° to the piston pin with a micrometer. Replace the piston if the diameter beyond the serviceable limit.
7. Measure piston ring end gap.
Insert the piston ring into the skirt of the cylinder so that it is squarely positioned, and measure the gap with a feeler gauge.

8. Measure piston ring side clearance.
Install the rings on the piston and measure the side clearance of the piston ring in the ring groove with a feeler gauge.

9. Measure the piston pin hole using an inside micrometer or cylinder gauge.
10. Inspect the piston for damage, distortion and excessive wear.

C. Reassembly
1. Install the rocker arm and the rocker arm shaft in the cylinder head cover.
Install the rocker arm shafts with the side having a hole facing outward.
2. Install the piston rings on the piston with the marking on the rings toward the top.

Note:
When installing new rings on the piston, roll the rings in the ring grooves to assure proper clearance. If the rings roll smoothly, the clearance is satisfactory.
Use piston rings of the same maker as a set.
3. Install the piston on the connecting rod with the piston pin and clips so that the ▲ mark on the piston head points toward the front (exhaust side) as shown in the figure.

Note:
Always use new pin clips.

4. Stagger the end gaps of the top, 2nd and oil rings 120° apart.
Install so that none of the gaps are on the piston boss axis or 90° away from it.

(Three-piece type oil ring)

a. When installing the oil ring, first place the spacer and then the rails in position.
b. The spacer and rail gaps must be staggered 2~3cm (0.783~1.181in.).

Note:
The gap of the oil ring refers to that of the spacer.

5. Install the cylinder gasket, two dowel pins (orifice valve) and two O-rings on the upper crankcase.

Note:
Before installing the dowel pin, blow compressed air through the hole to assure that it is not clogged.
6. Turn the crankshaft and place the piston base (Tool No. 07958-2500000) under No. 2 and 3 pistons, and install the piston ring compressors (Tool No. 07957-3230000) on the piston rings, and insert the pistons into the cylinder. When the No. 2 and 3 pistons have entered the cylinder, remove the bases and piston ring compressors. Next turn the crankshaft slightly and install the No. 1 and 4 pistons being careful not to expose the rings of the No. 2 and 3 pistons. Raise the cam chain at the same time.

7. With the cylinder held approx. 20 mm from the crankcase, install the cam chain tensioner in the cylinder, hold the tensioner down by hand and install the O ring, steel washer, and tighten the lock nut.

8. Insert the cam chain guide into the cylinder as shown in Fig. 81.

9. Install the cylinder head gasket, two dowel pins and two O-rings on the cylinder.
10. Place the cylinder head and hold the cam chain with a screw driver to prevent cam chain from dropping.

11. Tighten the twelve 8 mm nuts uniformly with the special tool (Tool No. 07906-3230000) to a torque of **2.0~2.2 kg-m. (14.46~16.63 ft-lbs)** in the sequence shown in Fig. 83.

   Next, install and torque two 6 mm flange bolts.

   Mount the cam chain tensioner on the cylinder head with the aluminum washer and 6 mm bolt.

   **Note:**
   Exercise care not to drop nuts or washers into the cylinder head as it will be difficult to remove them.

12. Hold the cam chain sprocket and cam chain together and slide the camshaft through them from the right side, and set it on the bearings in the cylinder head. Install the cam chain on the cam sprocket.

13. Adjustment of valve timing

   Remove the point cover, rotate the crankshaft in the clockwise direction and align the “T” (1.4) mark of the spark advance to the timing mark. Next, position the camshaft so that the center of the cutout notch on the right end of the camshaft is aligned to the cylinder head flange surface.

14. Mount the cam sprocket on the camshaft with two 7 mm bolts.

15. Mount the carburetor assembly on the cylinder head.

16. Install the two dowel pins and six sealing rubbers on the cylinder head.
17. Install the cylinder head cover with twelve 6 mm screws and six 6 mm bolts, and torque to \(0.8 \sim 1.2 \text{ kg-m} \) (\(5.78 \sim 8.67 \text{ lbs-ft}\)) so that torque difference is not over \(0.2 \text{ kg-m} \) (\(1.44 \text{ lbs-ft}\)).

**Note:**
- Insert fingers into the tappet hole cap opening and lift the valve tappet adjusting screw to check that they are properly meeting the valves.
- Use the six 6 mm copper washers as shown in Fig. 57.
- Install the head side cover set plate with washers mounted on both sides of the 6 mm screws (Chromium-plated copper washer on top and aluminum washer on bottom).

18. Install O-rings on the dowel pins of the the left and right side covers, and install the side covers on the cylinder head.

19. Install the breather cover with six 6 mm screws.

**Note:**
- High tension cord clips are mounted on both sides with the clips facing forward.

20. Adjust the cam chain by referring to page 12.

21. Adjust the tappets by referring to page 7.
4. VALVES AND VALVE SPRINGS

A. Disassembly
1. Remove the cylinder head by referring to section 3. A.
2. Compress the valve springs with a valve spring compressor (Tool No. 07957–3290000), remove the valve cotters, and the valves.

Note:
Do not compress the springs more than necessary. Compressing them excessively may damage the valve stem seals.

3. Drive the valve guide out of the cylinder head using the valve guide remover (Tool No. 07046–32301).

B. Inspection
1. Measure valve stem clearance.
   Insert the valve into the guide and measure the clearance in both the X and Y directions using a dial gauge. Replace the valve and guide in set if clearance beyond the serviceable limit.
   Drive the guide into the cylinder head using a valve guide driver (Tool No. 07942–3290100) and finish ream the guide to the proper size with the reamer (Tool No. 07984–0980000). Standard valve guide inside diameter for both the inlet and exhaust is 5.475~5.485 mm (0.2153 in.~ 0.2157 in.)
2. Check the valve seat contact width and if necessary recondition.
Apply a thin coat of red lead to the valve seat surface. Press the valve against the seat and rotate it to check if the contact width is uniform. If not, lap the valve, seat and again check the contact width. If necessary, recondition the valve seat using a valve seat grinder. Seat width 1.0~1.5 mm (0.039~0.059 in.).

Caution:
Use the valve seat grinder in accordance with the instruction manual.

3. Measure valve runout.
Place the valve on V-block and measure the runout of the valve with a dial gauge applied to the face of the valve while turning the valve. Replace the valve if the runout exceeds the serviceable limit.

4. Measure the valve spring.
Measure the free length of the valve spring with a vernier caliper.

5. Measure the flatness of the cylinder head.
Place a straight edge on the cylinder head surface and measure the clearance at several points with a feeler gauge. If there is a clearance of over the serviceable limit, lap the cylinder head surface on the surface plate using lapping compound or replace the head if it cannot be repaired.
C. Reassembly
1. Wash all of the component parts in kerosene and reassemble the parts in the reverse order of disassembly.

![Diagram of engine parts](image)

**Fig. 97** Component parts of the cylinder head

1. Exhaust valve  
2. Inlet valve  
3. 10×1.6 O ring  
4. Exhaust valve guide  
5. Inlet valve guide  
6. Valve spring outer seat  
7. Valve spring inner seat  
8. Valve stem seal  
9. Inner valve spring  
10. Outer valve spring  
11. Retainer  
12. Cotter  
13. Valve rocker arm shaft  
14. Valve rocker arm

**Note:**
When installing the valves, apply a liberal amount of oil on the valve stem.
2. Install the cylinder head in accordance with section 3. C.
5. Oil Pump and Oil Filter

The oil pump is a trochoïd type driven by the primary shaft. Screen and paper element filters are used to provide clean oil to the engine.

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**Fig. 98 Oil Lubricating Diagram**

1. Oil cleaner element  
2. Oil pump  
3. Relief valve  
4. Oil screen filter
A. Disassembly

**Oil Pump**

1. Drain the engine oil in accordance with section 2. A.
2. Remove the starting motor cover and the left crankcase cover.
3. Unscrew the 4 mm bolt and remove the pressure switch wiring. Next remove three 6 mm screws, and the oil pump.

4. Remove the cap and disassemble the relief valve and spring.

**Oil Screen Filter**

1. Drain the engine oil in accordance with section 2. A.
2. Unscrew ten 6 mm bolts from the oil pan. Remove the oil pan, and the oil screen filter can be removed.
**Oil Filter**

1. Drain the engine oil in accordance with section 2. A.
2. Unscrew the center bolt to remove the oil filter.

**B. Inspection**

1. Measure the clearance between the inner and outer rotors. Use a feeler gauge to measure the clearance between the rotors. If the clearance beyonds the serviceable limit, replace the pump.
2. Measure the clearance between the outer rotor and the pump body. Use a feeler gauge to measure the clearance between the outer rotor and the pump body. If the clearance beyonds the serviceable limit, replace the pump.

3. Inspect the operation of the relief valve. Make sure that the relief valve is not stuck in the pump body. Also check for any foreign objects which may be lodged between the valve and seat.
4. Inspect the screen filter. Wash and inspect the screen filter. Replace the filter if damaged.
C. Reassembly

**Oil Filter**

1. Insert the oil filter center bolt through the oil filter case and assemble the spring, spring seat and element. Screw the center bolt into the engine.

**Oil Screen Filter**

1. Mount the screen filter on the lower crankcase.
2. Mount the oil pan on the engine with ten 6 mm bolts.

**Oil Pump**

1. Insert the drive pump shaft into the oil pump body and install the drive pin into the shaft.
2. Align the outer and inner rotor punch marks and install into the pump body (the surfaces with the punch marks may be set to the pump body side or the pump cover side).

3. Install the 47 mm O-ring on the oil pump body and install the oil pump cover with three 6 mm screws.

4. Install the relief valve and spring into the oil pump body, and install the cap.
5. Install the two O-ring collars, two 14 mm O-rings, and a 47 mm O-ring into the oil pump body and then install the oil pump on the crankcase with three 6 mm screws.
6. Connect the pressure switch wires.
7. Install the left crankcase with four 6 mm screws, and the gear change pedal.
8. Install the starting motor cover.
6. CLUTCH

A. Disassembly

1. Drain the engine oil in accordance with section 2. A.
2. Remove the kick starter pedal.
3. Unscrew ten 6 mm screws and remove the R. crank case cover.
4. Unscrew the four clutch pressure plate mounting bolts, and remove the clutch pressure plate and four clutch springs.

5. Remove the clutch lifter joint piece.
6. Remove the 25 mm snap ring, shims (some engine may not have shims installed), and the clutch assembly from the main shaft.

7. Disassemble the clutch disc, clutch plate and clutch center from the clutch outer.
8. Remove the left crankcase cover.
9. Disconnect the clutch cable from the clutch lifter.
10. Unscrew the clutch adjuster lock bolt and remove the clutch adjuster from the left crankcase cover.

11. Pull out the clutch lifter rod.
B. Inspection

1. Measure the thickness of the friction disc. Measure the thickness with a vernier caliper and replace if beyond the serviceable limit.

2. Check the clutch plate for warp. Place the clutch plate on the surface plate and measure the amount of warp using a feeler gauge. If the warp beyonds the serviceable limit, replace the clutch plate.

3. Measure the clutch spring. Measure the free length of the clutch spring with a vernier caliper and replace if beyond the serviceable limit.

4. Inspect the rivets mounting the clutch outer to the driven gear for looseness, and replace the clutch outer if any of rivets are loose.

C. Reassembly

1. Assemble the clutch lifter rod into the main shaft so that the spherical end is toward the right side.

2. Apply grease to the clutch lifter and assemble it to the left crankcase cover together with the adjuster. Tighten the lock bolt and reconnect the clutch cable to the clutch lifter.

3. Install the clutch lifter rod, set the steel ball into the clutch lifter, and mount the left crankcase cover with four 6mm screws.
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