

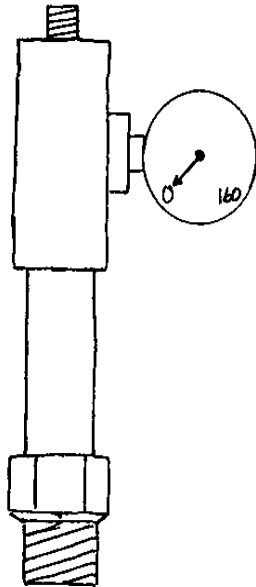
By WALTER LOLELIGER

TECH. TIPS: For those who do it the first time.

Rebuilding the cylinder head of a straight six Maserati engine. Problem: Engine overheated, (firerings leaked into cooling water) also oily residue in radiator (rubber gasket leaked oil into cooling water and to exterior). No water in oil, but white steam escaped through crankcase breathing tube. Reason for overheating: seized water pump bearing.

Investigation Technique:

With engine cold, remove one sparkplug from each cylinder. Disconnect ignition cables, fill radiator with water and leave cap open. Turn engine by hand with a small crowbar through the slots in the crank pulley. With a large screwdriver in No. 1 cylinder find top dead center at compression stroke, if you are not sure its the compression stroke you can remove the ignition cap and check that the rotor points'to No. I cylinder.



Water pressure test  
gauge from hardware  
store

112 in copper tubing

brazed to bottom of old  
sparkplug

Insert the gadget shown above and use a 100 PSI source to pump air into cylinder No. 1. Watch how quickly the air escapes, and listen with a 2 ft. fuel hose to see if it escapes through the intake or exhaust valve or blows by the piston rings. Watch to see if the water level in the radiator rises and/or bubbles escape. Make notes on the findings and readings. Proceed with the other cylinders in

firing order (1-5-3-6-2-4), applying constant pressure of 100 PSI to each.

Representative Findings:

Cyl. No.	1	2	3	4	5	6
Resistance	85 PSI	85 PSI	20 PSI	5 PSI	30 PSI	35 PSI
Remarks	no valve leaks	no valve leaks	leaks through intake and radiator	no valve leaks	leak through intake	leak through intake
	with oil in cycle 100 PSI			60 PSI		

Other findings:

No. 3 cylinder has scars in the cylinder wall.

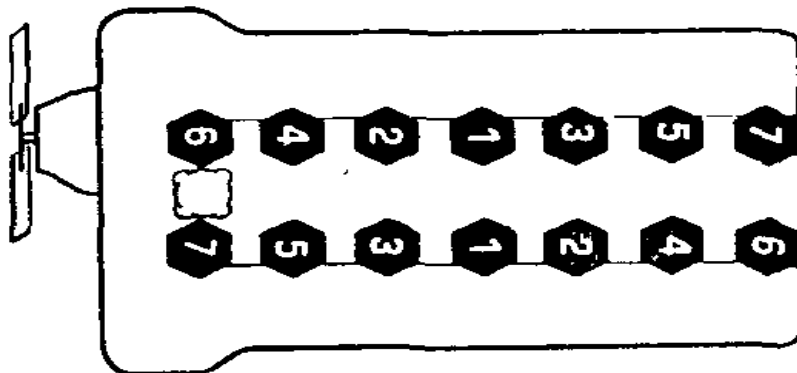
No. 4 cylinder is a mystery (bad ring?).

Cylinder lead Removal:

The following steps should be performed.

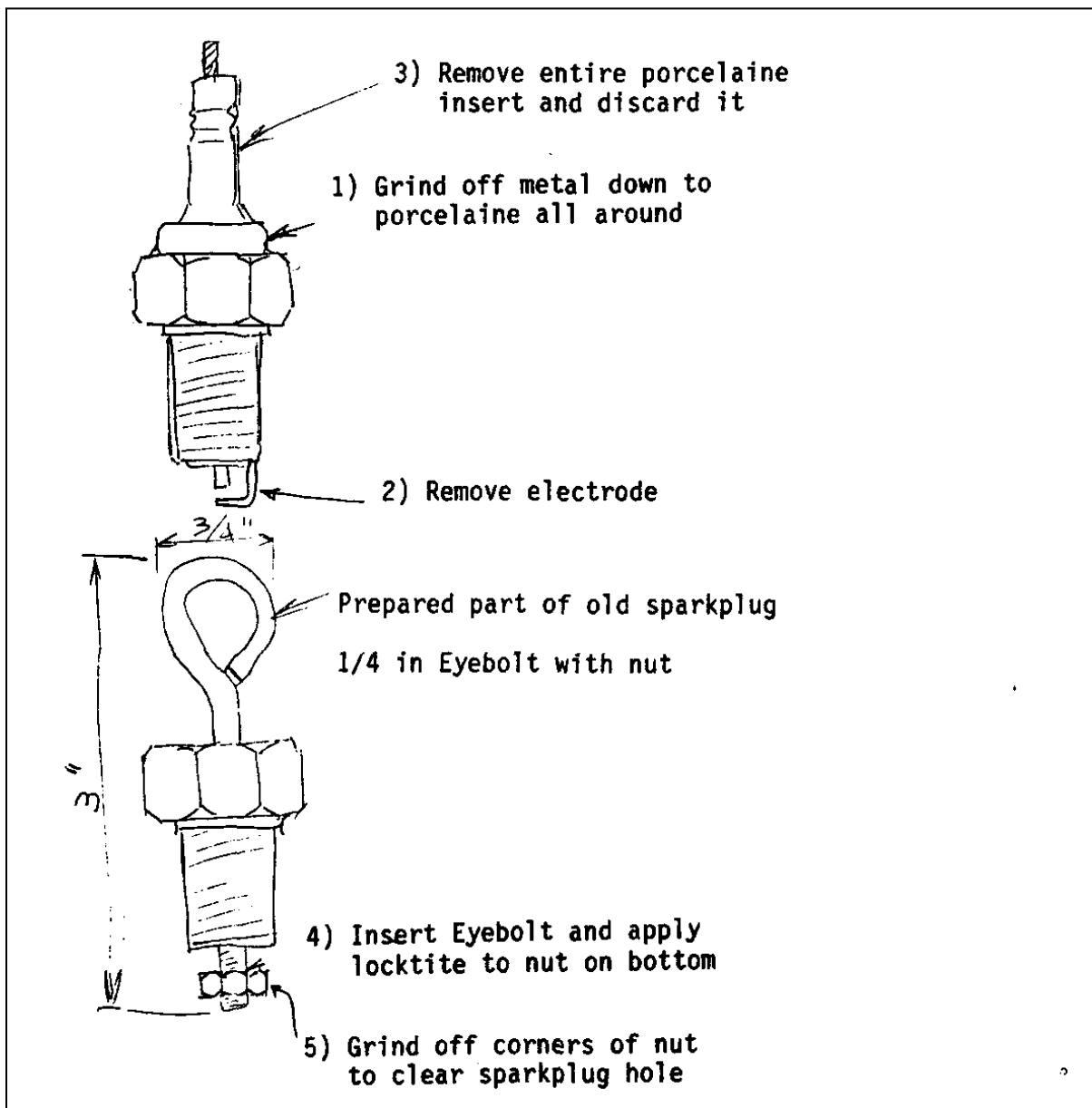
- 1) Remove hinge pins and hood. Disconnect wire for light on inside of hood.
- 2) Drain coolant.
- 3) Disconnect battery.
- 4) Disconnect water outlet flange on front of cylinder head.
- 5) Remove sparkplug wire harness.
- 6) Remove sparkplugs.
- 7) Remove cam covers.
- 8) Disconnect tachometer drive from exhaust cam.
- 9) Remove nuts and washers from intake manifold. Leave carburetor linkage and cables connected.
- 10) Pull complete intake manifold back from head enough to clear studs.
- 11) Remove nuts and washers from exhaust manifold and oil dipstick.
- 12) Remove dipstick assembly.
- 13) Pull exhaust manifold back from head enough to clear studs.

- 14) Turn engine by hand slowly and watch for cam timing marks. (see drawing).  
Line them up and look for the timing chain link, if you don't see it go around one more time and it should appear somewhere near the top.
- 15) Check where the No. 1 piston is at that point. It should be at top dead center (TDC) at either the end of exhaust stroke and beginning of intake, or at the end of compression stroke. No. 6 cylinder should be the opposite.
- 16) Loosen chain tightener: remove 19mm nut and lockwasher and large flat washer. Insert 5 mm screw in locating pin and extract pin. Turn index disc counterclockwise to remove tension.
- 17) Remove timing chain link, be careful not to drop the small clip or the link inside the engine, especially watch the two inner linkplates. Have some wire ready before removing the chain link. Try to tie the chain together with it as far down in the engine as possible, so that it doesn't jump over the bottom sprocket. Tie the wire to a stud, so the *whole* thing doesn't fall inside the *block*.
- 18) On early models only, disconnect the oil pressure lines from the cylinder head on both sides.
- 19) Remove two 14 mm nuts and washers on front flange of cylinder head, near chain passage.
- 20) Remove the cylinder head nuts in sequence as shown, but

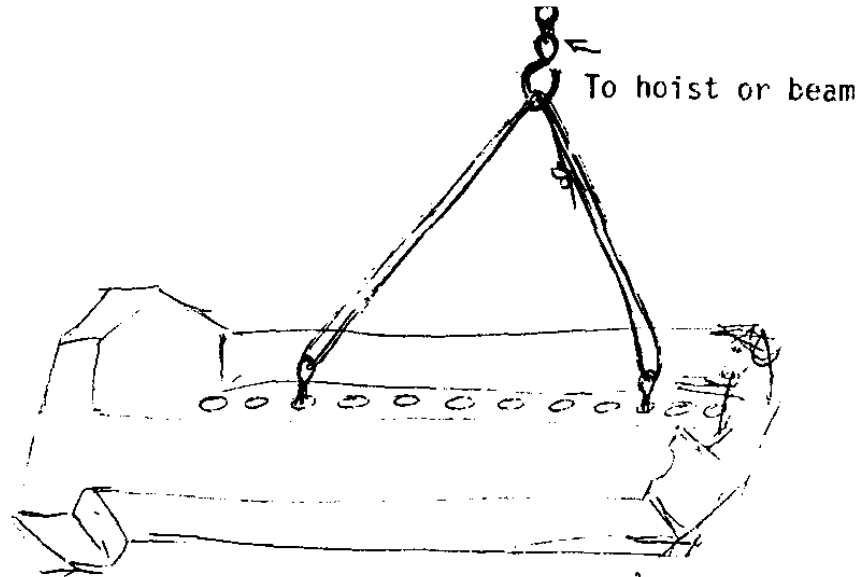


Assembly tightening sequence *Disassembly use reverse order*  
only loosen them 1/4 turn at the time until they are  
all  
loose. This reduces the risk of distortion. Note:  
get an  
extra long 19 m socket for the two nuts on the very  
front, otherwise you'll chew up the nuts. Apply plenty  
of  
WD-40 or equiv. to the end of the studs projecting  
through the head. They are probably very corroded due  
to contact with the alloy head.

21) Make two fixtures from two old sparkplugs as follows:



22) Insert those fixtures in No. 2 and 5 cylinders and make loop with 1/4" nylon rope 5 ft. long as shown.



23) I pulled my front end up about 5" on a hoist to apply tension to the head as shown. You also can jack up the front end 5", then tie the head as shown to a *beam* on the ceiling of your garage. Then remove the jack (keep the wheels still on the ground!) to apply tension.

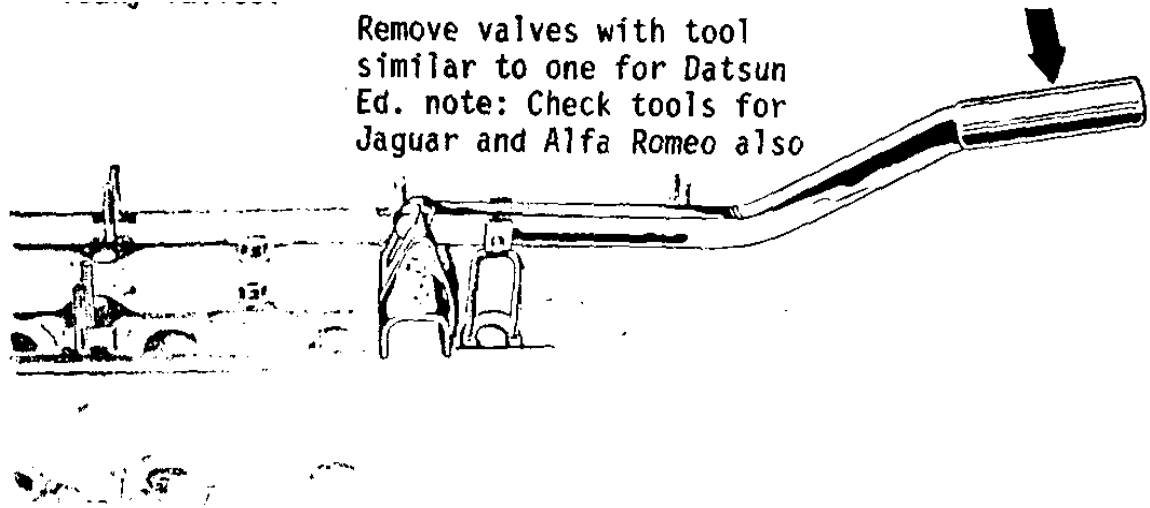
24) After soaking the studs generously with WD-40 or equiv. (in my case 3 days) use 12" of a 2 x 2 lumber and 5 lb. hammer and tap each side along the inside of the head between the studs while still applying WD-40. it eventually will come loose. Don't try to pry it loose with a screwdriver or a crowbar. When removing the head don't drop the little BB's and spacers for the rubber gasket into the crankcase.

#### Cylinder Head Disassembly and Repair:

Have 12 containers ready and mark them No. I intake, No. I exhaust, etc. and keep all disassembled parts in order to avoid possible problems later. Mark each valve using a felt pen or electric engraver with the cylinder No.

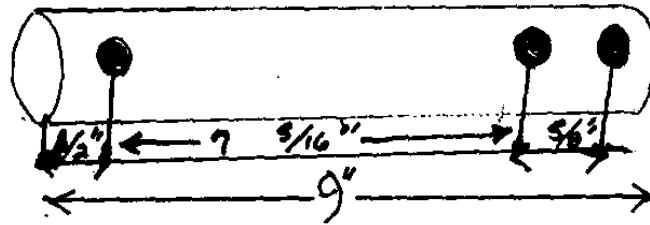
Inspect head surface and check the surface for abnormalities, unevenness, warp, bad corrosion and burned (blow-by) areas. When cleaning the surface don't scratch the alloy. Plug up the cavity at the timing chain and the rear end of the block with a rag. Plug up the oil passage holes in the block and the head with 1/4" wood dowel. *Clean head of carbon and grease with a wire brush and solvent.*

Turn the head upside down, insert sparkplugs, and fill each compression cavity with solvent and check for leaky valves.

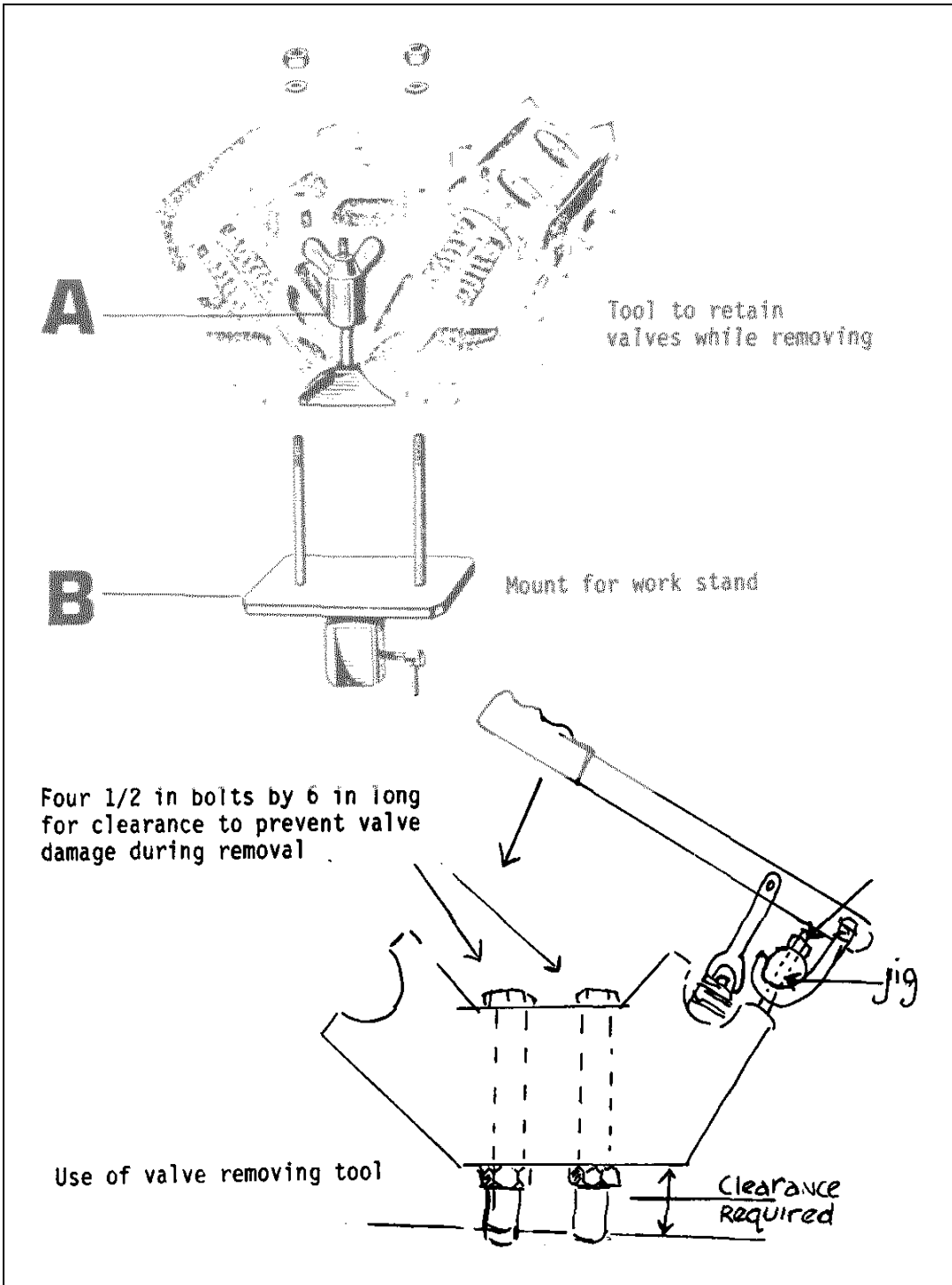


To use the Datsun tool, a jig is required as shown

Three holes, 3/8 in diameter



1 in electrical conduit  
steel tubing by 9 in long



- 2) If the head needs to be machined, you have to remove 'the lower 8 mm studs on the exhaust side.





4) Check for worn valve guides. *Now may be the time to replace them, including the new and improved teflon seals (available from Al Bertoni).*

- 5) Check the valve spacer discs (shims) for worn spots and have them ground smooth on a surface grinder, or call me and I can do it for you. (Also if you need them ground to a certain thickness to obtain the correct valve clearance)
- 6) Check cam bearings and bearing surfaces for grooves and wear.
- 7) When assembling coat parts with a light film of light grease.

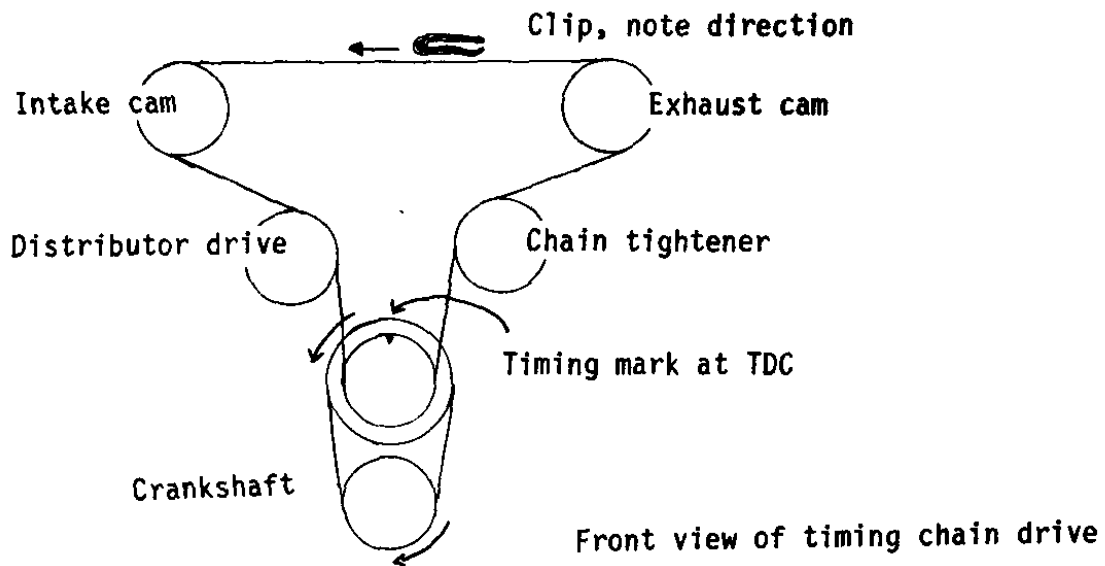
#### Valve Clearance Adjustment:

When checking valve clearance with the cylinder head removed, always have only one camshaft installed at a time, otherwise you will damage open valves from the opposite side when turning the camshaft. Therefore, for final assembly make sure that the cam timing marks are pointing to the mark on the front camshaft bearing cap for each cam before tightening them down. Don't try to turn them anymore after this point. The torque for camshaft bearing nuts is 22 ft/lbs.

#### Head/Block Reassembly:

- 1) **When everything is ready to be reassembled, both head and block sealing surfaces should be clean and free of carbon.**
- 2) Lay the new rubber gasket dry on the block, placing the BB's and flat spacers in position, making sure they don't drop inside the engine. Some people use grease to hold them in place, I prefer crazy glue (just a tiny drop).
- 3) Place the new copper fire rings on each cylinder and center them carefully.
- 4) Now turn the crankshaft by hand until piston No 1 moves about 2 cm (3/4") downward. In this position none of the open valves should interfere with any piston.
- 5) Grease the 14 studs, place the head carefully on the block and tap it down.
- 6) Torque the head in three stages to specs. the sequence as shown on drawing.  
Ist stage 35 ft/lbs.  
2nd stage 66 ft/lbs.  
3rd stage 98 ft/lbs.
- 7) Move crankshaft back (ccw locking from front) to TDC of cylinder No. 1. you should see the timing mark on the bottom sprocket facing up

- 8) Check for absolute TDC with dial gauge in No. 1 cylinder.
- 9) Mount the chain to the camshaft sprockets, making sure the cams are still in their marked timing position and the distributor rotor is pointing to cylinder No. 1.
- 10) Install the chain link (with its three loose plates) and clip as shown on drawing.



- 11) Tighten chain as follows: Install center unit on chain tightener, tighten clockwise to 1.085 ft/lbs (13 inch/lb), insert locking pin in the matching holes of the indexing discs. Remove center nut, install large washer, lock washer and center nut. This method usually doesn't work because there is no room for a torque wrench. Here is what the manual says: tighten hard with a 19 mm open end wrench, check which holes line up, then loosen so that the 5th holes backward line up and insert the locking pin. If you drop that pin like me and try to retrieve it you say: (censored, ed).
- 12) Turn the engine by hand and make sure there is no unusual friction or interference on pistons, valves, etc., then fit new gaskets on cam covers and O-rings at the end caps. O-rings are available at any seal supply store No-131BN70 (not available in auto part stores). Now just pray that it doesn't overheat anymore!

Good luck

Walter Loeliger

