
SERVICE MANUAL



Radiators & Oil Coolers

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Section 1

SERVICE MANUAL

MESABI[®]

RADIATORS & CORES

**Please read and follow
instructions carefully
before installing the
MESABI[®] Core.
For further instructions,
prints are enclosed
with packaging.**

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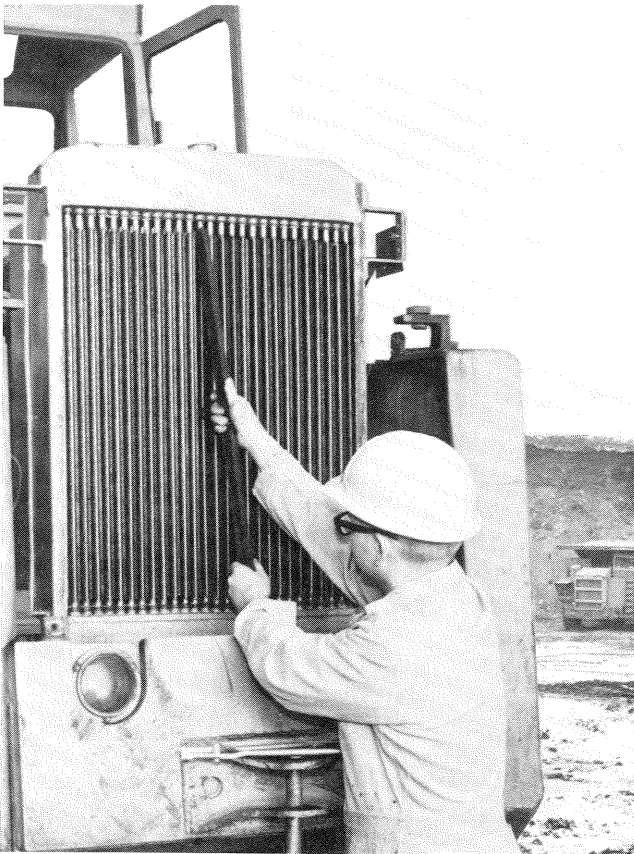
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APRIL 1993

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Quick and Simple Service

Whether down from a puncture, or for maintenance, MESABI® Cores can be quickly and simply returned to service.

The MESABI Radiator Core design eliminates the threat of costly equipment downtime due to damaged radiators caused by punctures, vibration, pounding, or thermal expansion.

MESABI Radiator Cores are comprised of a series of individually replaceable cooling tubes instead of a single vulnerable core. The tubes are locked in header plates with rubber seals. The rubber seals give MESABI Cores the distinctive features for which they are known worldwide.

First, the seals absorb vibration that can crack the rigid soldered seams of conventional cores. Second, they allow tubes to be removed or replaced for cleaning or repair.

MESABI Radiator Cores combat equipment downtime because they are designed for rugged working conditions and if damaged, to be repairable back to 100 percent cooling efficiency.

MESABI® Core Removal From Crate and Installation Into Tanks

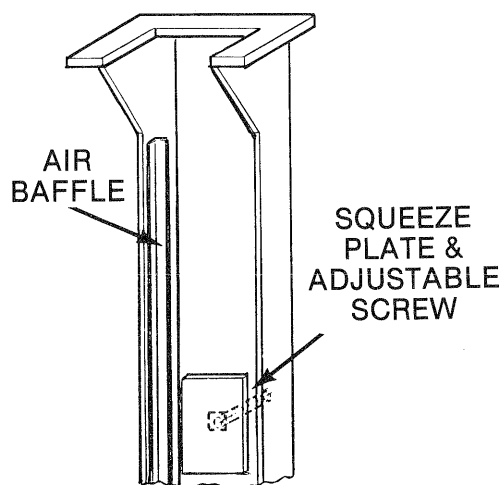
1. Stand crate in a vertical position.
2. Dismantle crate and expose core.
3. Remove shipping supports (furnished with all two-piece cores except Caterpillar).
Note: Side members are furnished with most Caterpillar cores, so shipping supports are not necessary.
4. Refer to enclosed blueprint for possible additional assembly instructions.
5. See tag on header plate denoting top of core and fan side.
6. See side member preparation, page 4, before proceeding.
7. Insert side members into position on core. (If two-piece core, refer to print for further instructions.)
8. See gasket installation, page 4, before proceeding.
9. Put the top tank in position and fasten, using the bolt straps and side members. Note: If the core has a center tank, fasten the center tank to the side member as shown on the L&M print.
10. Entire assembly can then be lifted by the top tank. It is advisable not to leave the assembly suspended any longer than is necessary to place in position on the bottom tank.

CAUTION: Do not slide or drag the unprotected core in a standing position. This could result in damage to the ends of the cooling tubes. We recommend standing the core on a board when moving.

Side Member Preparation

NOTE: In cores of 30 inches or more in height, there should be at least one inch of clearance between the MESABI Core and the side members. The core depends on flexibility for its long life, and therefore, must have room to flex.

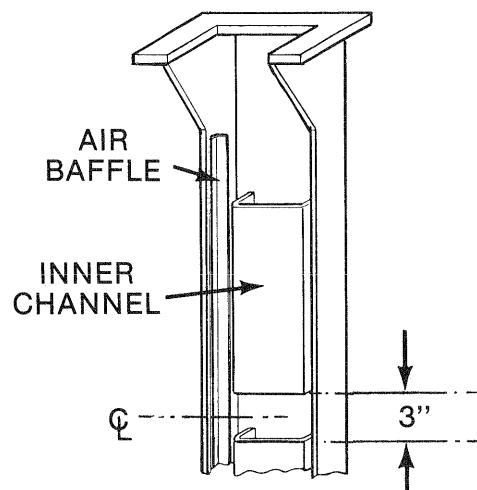
1. When installing a MESABI Core, be sure to remove the squeeze plates from the side members which are required only for the conventional radiator cores (see drawing below).
2. It is necessary to also remove the air baffles if applicable (see drawing below).



3. It may be necessary to remove all or part of the inner channel. This depends on the side clearance as noted above and also whether it is a one-piece or two-piece core.

NOTE: on a two-piece core, if the side clearance is adequate; it will be necessary to remove only a 3-inch portion of the inner channel to provide proper clearance for center tank installation (see drawing below).

4. Please refer to enclosed blueprint for additional instructions.



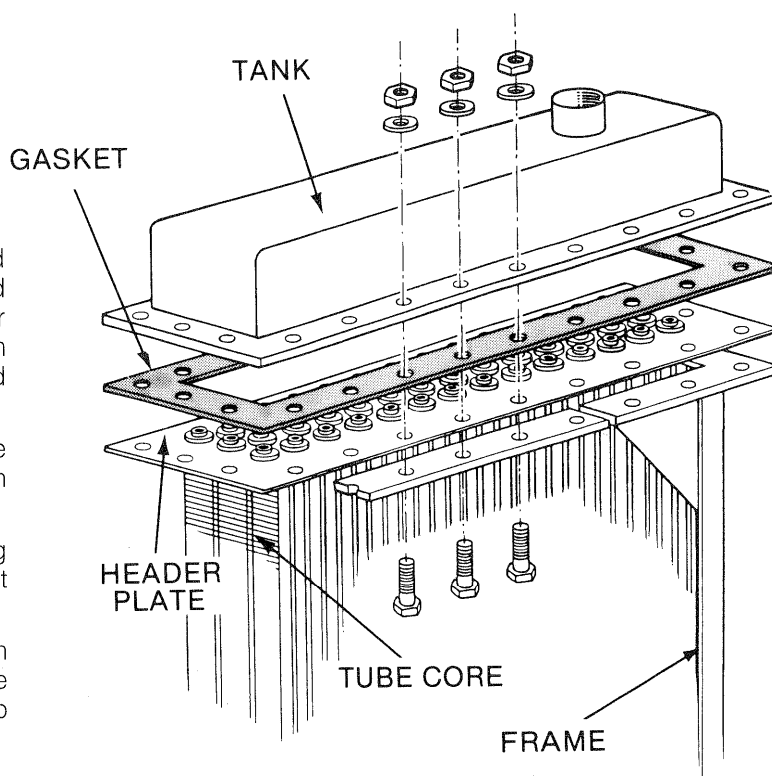
MESABI® Core Radiator-Tank Gasket Installation

When installing gasket between header plate and tank, be sure header plate and tank are free from old gasket material and foreign material. A scraper should be used to clean old gasket material from sealing surface. A portable wire buffing wheel should be used to polish sealing surface.

Before installing gasket, a light coating of grease on both sides of gasket should be applied to soften gasket and provide better sealing.

Caution should be taken to avoid overtightening bolts, which could cause material to squeeze out from mating surfaces.

NOTE: Silicone or gasket sealer may be used on ends of tank—caution must be taken not to use excessive amounts as damage could result to engine or radiator.



Standard Parts Of A Typical MESABI® Radiator Core

Core Components

Each standard MESABI Radiator Core consists of the following components. Use the exploded view on facing page for reference.

1. **Tube plates** - One top and one bottom tube plate, each containing rubber seals inserted into the tube plate.
2. **Tubes** - The listed number of individual tubes which are inserted between top and bottom tube plates at the specified height.
3. **Steel tube stays** - used to interlock tubes. Although steel stays are no

longer used in L&M Radiator's manufacturing process, there are still many cores in service that use the stay.

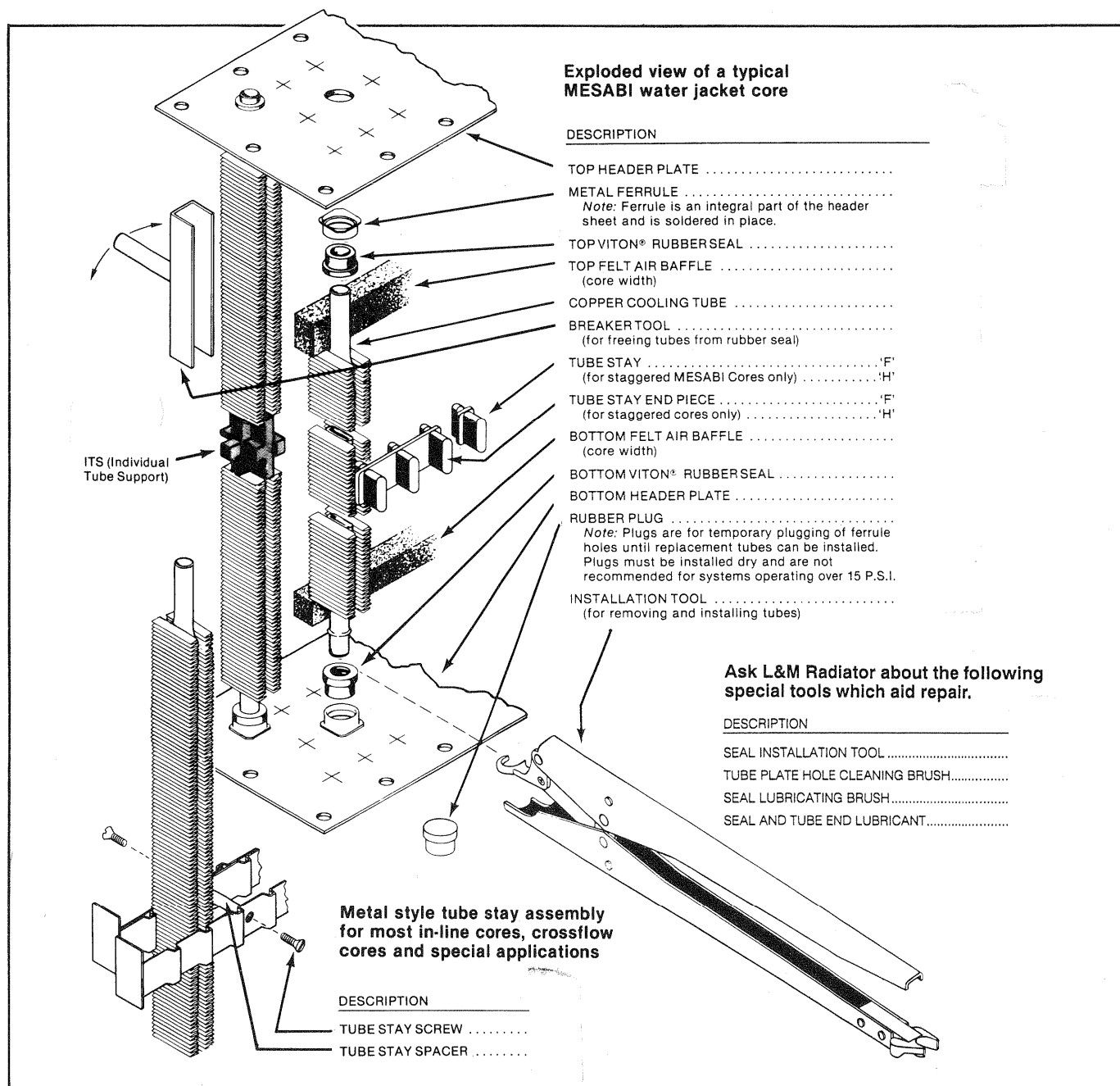
4. **Rubber tube stays** - Current production standards include one tube stay in cores 21 1/2" high and above. Older style cores (pre January 1993) 37 1/2" high and above use two tube stays. Special applications may still use two tube stays.

5. **ITS™ (Individual Tube Support)** - The ITS support system is used in some applications up to 59 1/2" high. See page 8 in this manual for further details.

6. **Gaskets** - One top and one bottom gasket for bolt-on radiator cores.

7. **Center Tank Kit** - necessary for all two-piece cores, (i.e.: one core stacked upon another with an intermediate center tank). Some center tank core styles have been superseded by ITS cores.

8. **Side members** - generally furnished with Caterpillar cores when determined to be necessary. When bolted into position, side members provide a rigid radiator framework.



MESABI® Core Radiator - Tube Removal and

Removing MESABI® Tubes

To assist in the removal of MESABI tubes, if possible, heat the tubes and seals with hot water; then, loosen the tube by using Breaker Tool as shown in **Fig. 1**. Preferably, the Breaker Tool should be placed at top and bottom, not at middle, when freeing tube from seal. (Contact L&M Radiator for other methods used to break the tubes loose from the seals.)

After tube is free, place upper jaw of installation Tool around the round portion of tube, just below the flattened portion. Place lower jaw so that taper of jaw seats between seal and metal ferrule, as shown in **Fig. 2**, not on top of seal. Squeeze handles of tool together and raise tube only enough to clear bottom seal. Put down tool and swing tube out just far enough to allow tube to be pulled down and out of its top seal, as shown in **Fig. 3**.

Remove all tubes in the row, repeating the above procedure.

Installing MESABI® Tubes

IMPORTANT: Before inserting new or original tubes into header plates, new rubber seals must be installed.

After removing old seals, tube holes should be cleaned of any foreign debris. A McMaster Carr Chuck Grip 3/4" brush #6300ST42 (L&M P/N 64092) placed in an electric or air drill can be used for this purpose. Place new seals in the clean holes. Seals can be immersed in warm water to ease installation into the plate. Then, using a small hammer, gently tap each seal down so that the shoulder of each seal is tight against the metal ferrules on the header plate.

Before the original tubes are reinstalled, the tube ends must be clean of foreign material. L&M recommends buffing the tube ends with a polishing wheel (Grainger #5A725 - use Qty. 5 together) and a copper polishing compound (Grainger #3W769).

If the debris cannot be removed by buffing, L&M recommends the use of a wire wheel (Milwaukee #08234, 6" diameter, .008 wire diameter or similar style). Care should be taken not to mar the tube end. After using the wire wheel, buffing the tube ends, as described earlier, will ease the installation of the tubes into the tube plates.

L&M recommends the use of a lubricant distributed by L&M, (L&M P/N 64217), to coat the inner hole of each seal with a 3/4" diameter soft bristle brush, and the outside ends of each tube. (Small amounts of petroleum jelly or mineral oil can also be used.) Then, starting at the end of one of the rows of holes, push the top end of a tube (the top end of a tube is the end with the longest round section) into the top header plate seal, as shown in **Fig. 4**. Center bottom end of tube into respective seal in the bottom header plate. Then, push tube down and into seal until the formed bead is seated into the locking groove of the bottom seal. This may be done by grasping tubes by hand and pulling tube downward until seated, or by using Installation Tool, new style. This tool has a semicircular form on end of handle. Place this end on the formed bead of the tube and push downward until seated, as shown in **Fig. 5**. Now, complete the row of tubes. Precaution should be taken to make sure formed bead is seated into bottom seal, and that the tubes are straight and aligned to assure maximum air flow.

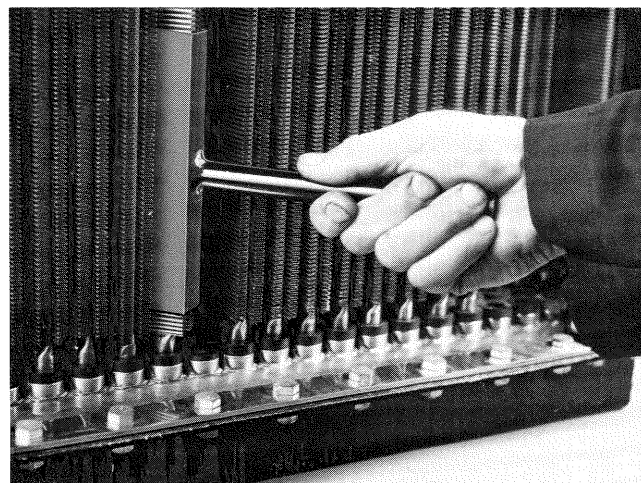


Fig. 1

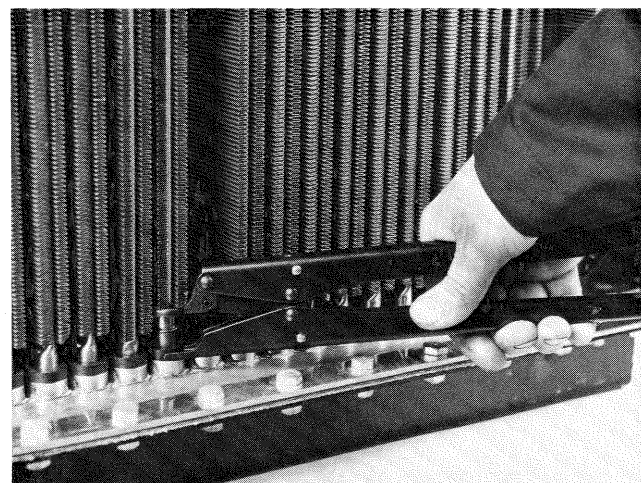


Fig. 2

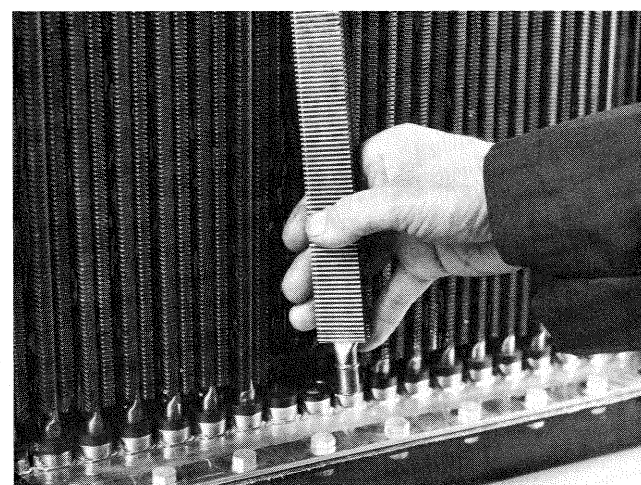


Fig. 3

Replacement



Fig. 4

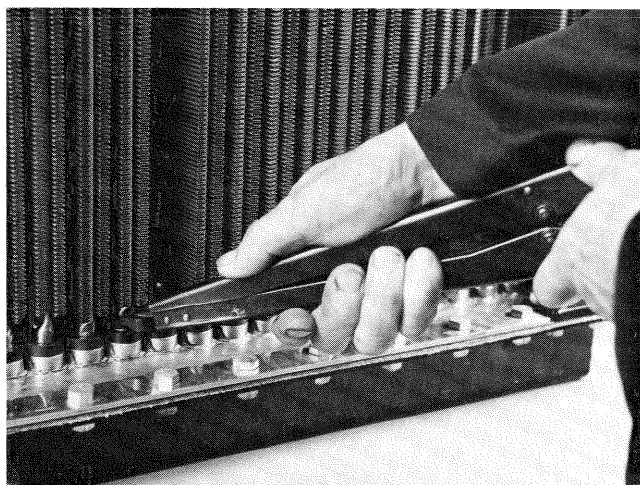


Fig. 5

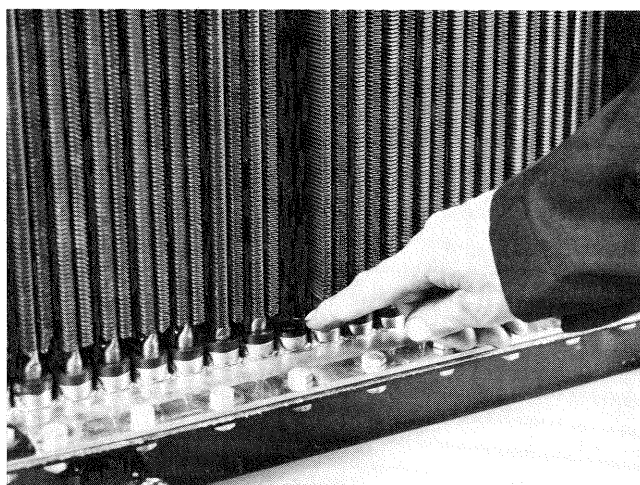


Fig. 6

Individual rubber tube stays and, in some cases, tube stay ends are necessary to interlock the tubes. Stays should be installed between each row of tubes as illustrated in the standard parts section on page 5 and on the enclosed print and parts list.

Install succeeding rows, as per previous procedure. Always make sure that top and bottom felt baffles are reinstalled, for reference, the top felt baffle is larger than bottom baffle.

Precaution should be taken to be certain that tubes are centered correctly in seals. When properly lubricated and centered, tubes are easily installed, and no scuffing or tearing of the rubber seals occur. Such scuffing and tearing could result in the seal leaking.

NOTE: MESABI Cores are designed so that they can be made serviceable if replacement tubes are not available. Special rubber plugs, may be placed in ferule holes until replacement tubes can be installed. See **Fig. 6**. Please note plugs must be installed dry and are not recommended for systems operating over 15 P.S.I.

Core With Centertanks

When repairing cores with centertanks, the tubes and seals must be removed completely from the top core before disassembling the bottom core. This is to allow tubes in the bottom core to be raised high enough to swing clear of the bottom header plate. Also, care should be exercised when removing tubes from lower core, as when tubes are in a completely raised position, the upper end may extend into the plate above and, when tube is swung out, it can bind, bending the upper end.

When reassembling, lower core should be completed before proceeding with top core.

External Cleaning

To maintain efficiency and assure maximum life of a MESABI core, reasonable care must be taken when cleaning.

For general external cleaning, a high pressure hot water washer can normally be used. **Epoxy coated cores must be cleaned with care** to assure the coating is not damaged. See page 10 for further detail. Test your method on a portion of a single tube first.

Most radiator shops use a hot alkaline soap or caustic soda in their boil-out tanks with chemical additives which attack solders. If a MESABI tube is soaked in such a solution, the solder bond between the finning and tube will be adversely affected. If it is known that the particular solution used is not harmful to solder, then it will not hurt the finning solder used on the MESABI tube. Be sure to rinse the cleaned tube/core in clean water after removing from the boil-out tank.

If there is any doubt about the cleaning method to be used, try the method on a portion of a single tube first, or contact an L&M manufacturing facility.

Note: Internal cleaning may be necessary. See page 9 in this manual. Contact L&M Customer Service for recommendations.

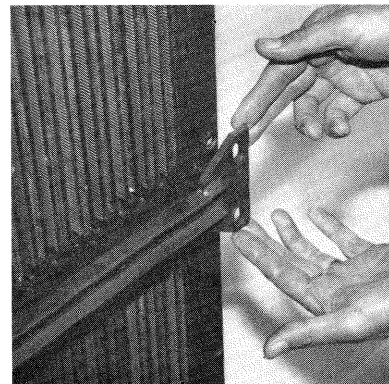
ITS™ Tube Removal and Replacement

In general, the tube removal and replacement sequence demonstrated on pages 6 and 7 of this Service Manual apply to the ITS™ core. However, before beginning tube removal and replacement, carefully review these specific instructions:

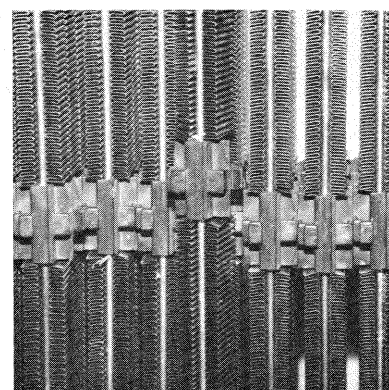
- First remove the support bar as shown in **Photo A**. All MESABI ITS cores have support bars, and although the designs are different, they are all fastened to the side member with bolts. For minor repairs, remove only that side you are working on.
- The breaker tool can be used to loosen the tubes (see Figure 1, page 6). However, care should be taken not to damage the tube or the ITS support with excessive twisting. NOTE: Position the tool close to the top or bottom of the tube.
- Use the L&M installation and removal tool in the same manner as described in paragraph 2 and Figure 2 on page 6 of this manual. Note in **Photo B** on this page that the tube should be raised high enough so that the interlocking ITS tab clears the adjacent dovetail groove, and also so that the bottom of the tube clears the bottom seal.
- Pull the tube towards you and firmly downward, using a gentle twisting action to free the tube from the top seal. Again, care should be taken so that the top of the tube does not bend or kink. (Note hand location in **Photo C**.)
- The procedure for cleaning the tube ends and tube holes, as well as installation of new seals, is described on Page 6 of this Service Manual (Installing MESABI Tube). Each time a tube is removed, we recommend the replacement of the seals.
- Installation of the tube is basically the same as described and illustrated on page 6 and 7. However, there are some points that are specific to the ITS design. Refer to the illustration under "General Description" which shows the interlocking system of the ITS. Note that the front tab of the ITS should face the front (opposite the fan side) of the core and the side tab should be to your right. The tube should be pushed far enough into top header plate to allow clearance for the ITS tabs at the center, and tube end at the bottom seal. As shown in **Photo D**, use your hands to initially guide the tube ends into the bottom seal, and the ITS tabs into the dovetail slots. Once in place, use the end of the installation tool (see Figure 5, page 7) to properly seat the tube into the bottom seal.
- Now install the support bars, the support bar part number has been stamped on the outside face. Use the L&M Radiator Technical Drawing and Parts List for proper installation. Using a rubber mallet, gently tap the bar into place and secure to the side member.

Ordering Parts

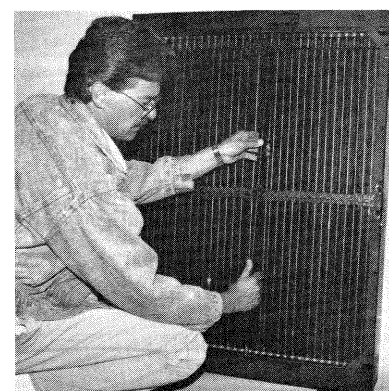
MESABI ITS core parts are listed on the printed Parts List included with each ITS core. Parts may be ordered from the L&M Radiator plant nearest you, listed on the back page of this Service Manual.



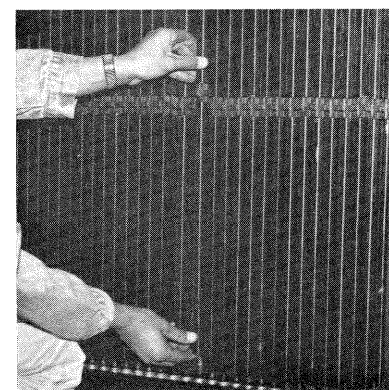
A.



B.



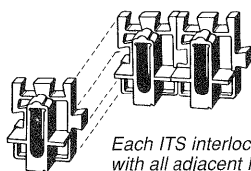
C.



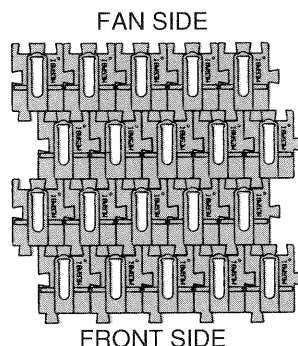
D.



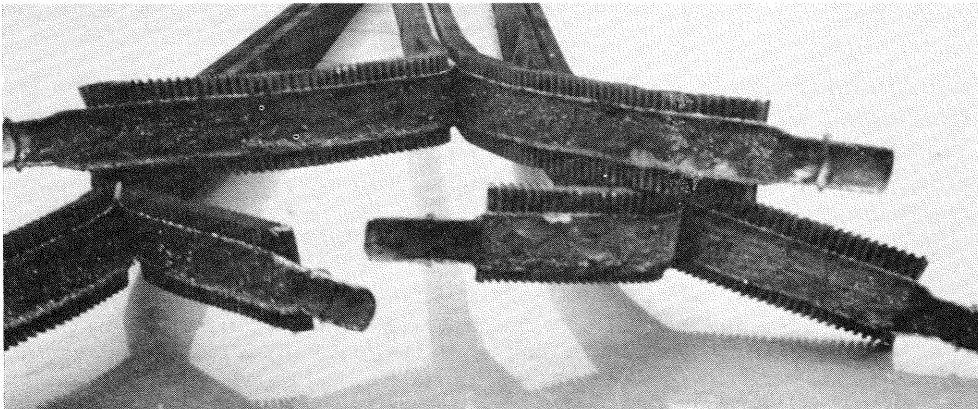
Support bars engage outside rows of ITS. Methods of attaching to frame may vary.



Each ITS interlocks with all adjacent ITS.



Subject: Silicate Gel



Mesabi tubes can be easily checked for silicate or mineral drop outs.

Silicate gel continues to be a problem in the cooling systems throughout our industry. The problem can be caused by any of the following, alone or in combination:

1. Antifreeze

Antifreeze is high in silicates. High silicate antifreezes were designed to protect the aluminum components in automobile engines. More and more of this type of antifreeze ends up in heavy-duty engines where it can cause problems.

2. Antifreeze Greater Than 65% Concentration

With antifreeze at a concentration of greater than 65% and with low water in the system, the silicates can't be held in suspension.

3. Supplemental Coolant Additives

These additives may be overcharged in the system. They contain silicate, and they contribute to the silicate level and dropout problem when too much is used.

4. Water Source

If the water source is high in total dissolved solids and has high levels of calcium and magnesium present, the silicate is precipitated, making a bad water problem worse.

Ultimately, the responsibility for maintaining the coolant rests with the owner/operator. The design of the MESABI® Core allows the owner/operator to monitor the system by removing 3 or 4 tubes in the radiator and cutting them open for inspection (consult L & M Radiator for tube removal instructions if the procedure is unfamiliar). The tubes should be removed from the air inlet side of the core, a few inches in from both

edges, from both lower and upper core. The tube is then split for inspection (see photo).

Silicate gel adheres to cold surfaces so it is seen in the radiator first. We suggest the contaminant be analyzed and the proper corrective action taken. We have seen instances where the problem is not only silicate but other contaminants as well. The earlier the problem is detected, the better chance you will have of correcting it. The Penray Companies, Inc. (NALPREP 2001 or 2015) and Fleetguard (RESTORE) have products that can be used to flush out the system.

For further help, we suggest you contact:

- a. Your DDC Service Representative
- b. Your Cummins Service Representative
- c. The Penray Companies Inc.
North: 1-800-322-2143
South: 1-800-241-6053
- d. Fleetguard Inc. Technical Service
Coolant Hot Line: 1-800-521-4005

Subject: Corrosion

Service life and overall efficiency of finned heat exchanger cores can be greatly affected by the environment that they work in. Harsh marine and industrial environments tend to corrode uncoated fins and solder joints. Corrosion products enhance the accumulation of dirt, which reduces overall system efficiency.

L&M Radiator offers an epoxy coating on our MESABI cores to combat corrosive environments.

Application:

The epoxy coating is applied per manufacturer's recommended specifications. The tubes are thoroughly and evenly coated, providing maximum protection to the fin and joint areas.

Cleaning:

Epoxy coated cores must be cleaned with care to assure the coating is not damaged. We recommend that you test your cleaning method on a portion of a single tube first.

1. A high pressure hot water washer can normally be used. Use a "fresh" water supply. Water temperature should not exceed 180 degrees F. Do not steam clean. The nozzle should be kept approximately 12 inches away from the core.
2. Wash the core thoroughly and methodically, starting at the top and working towards the bottom. Do not wash in one area for extended periods. The core will be clean when the water exiting the core is clean.
3. Blow off excess water with air.

Do not allow the core to be soaked or immersed in caustic solutions. If there is any doubt about the cleaning method, please contact L&M Radiator's Customer Service Department.

Epoxy coatings applied by L&M Radiator are not meant for submergent duty. It is the best practical coating that we are aware of for harsh atmospheric environments. L&M Radiator does not warrant against corrosion, but this coating, properly cared for, will help increase the service life and efficiency of your cooling system.

General Safety and Maintenance Instructions

To assure the overall safe operation of your L&M Radiator assembly the following procedures should be followed:

1. All safety guards must be in place during operation.
2. The duty cycle and prevailing conditions should be considered when establishing inspection and maintenance schedules. Severe duty or corrosive conditions should increase frequency of inspection and maintenance accordingly. Inspections should occur at least as often as components are lubricated.
3. Component manufacturers' instructions and maintenance manuals have been attached and should be followed.
4. In addition to, or along with Step 3 above, minimal inspection should include the following steps if indicated components are present:
 - *Visually check the fan while running for unusual vibration, pulsing air flow, blades that appear not to be tracking consistent with the remaining blades, or other abnormalities.*
 - *With the fan stopped and the power source locked in the off position:*
 - a. Check all guards to assure that they are in place and in good serviceable condition. Order replacements or repair as indicated.
 - b. Check the fan for damage, dirt build up, loose or missing assembly bolts or mounting bolts, etc.
 - c. Check fan and/or idler shafts for signs of wear component movement, and the presence of associated lock nuts, etc.
 - d. Check fan and/or idler bearings for signs of wear or movement, loose or missing bolts, loose or missing locking mechanisms, etc.
 - e. Check all sheaves and belts for signs of wear and proper mounting.
 - f. Check electric motor for loose or missing hold down or assembly bolts.
5. Check that pressure cap is functioning properly and remaining system for leaks or deterioration.
6. Please refer to additional L&M Service Bulletins included.

L&M RADIATOR supplies the total package.



- Oil Coolers
- Cab Heaters
- Radiator Cores
- Radiator Shutters
- Engine Cooling Radiators
- RTTS® Tube and Shell Heat Exchangers
- Exchange MESABI® Radiators for Caterpillar Folded Cores

MESABI® CORE-RELATED PRODUCTS

• Radiator Tanks and Custom Frameworks

Radiator components include: top tanks, bottom tanks, side members, shrouds, and guards.

These components can be supplied for most any MESABI radiator as a replacement part.

• Sandblast Guards

MESABI sandblast guards are designed specifically for MESABI cores and protect the core with virtually no loss in cooling.

Related Products

- Radiator caps
- Pressure release valves
- Necks
- Overflow hose
- Sight glass gauges

Complete Cooling Systems:

A very experienced engineering department is available to design custom cooling packages. Consult factory.

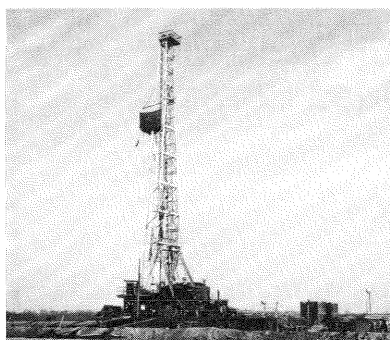
MESABI® RADIATOR AND CORE 48-MONTH WARRANTY

L&M Radiator warrants the Mesabi Core and framework manufactured by L&M for a period of 18 months from date of invoice. Under this warranty, our obligation is limited to the repair or replacement (at our option) of products or parts manufactured by L&M that are proven to be defective in workmanship or material. L&M further warrants the Mesabi Core against seal leakage during normal use for 48 months from date of invoice on new cores with Viton® seals installed. Damage or leakage due to accidents, misuse, or corrosion is not warranted.

Warranty on components not manufactured by L&M Radiator shall be that of the individual manufacturers. Individual manufacturers operational and maintenance requirements must be met and their policies regarding shipment and inspection of claimed defective parts will apply.

L&M is not liable for consequential or incidental damages or costs. Consult factory before proceeding with warranty claims. This warranty supersedes all previously published warranties.

We solve big heat transfer problems around the world.



Parts shipped within 48 hours from four plants around the world.

MESABI Radiator Cores, oil coolers and related cooling components are marketed on a factory direct basis from four L&M Radiator plants around the world.

L&M Radiator is able to give exceptional service to users and OEMs because all service is controlled at the manufacturer level. In emergencies, we can ship complete radiator cores or parts within 48 hours. On

site technical and engineering assistance is available nearly anywhere in the world within a few days notice.

L&M Radiator is proud to provide both old and new customers around the world with products known for quality and dependability since 1957.

L&M Radiator manufacturing facilities and parts depots are located in the following countries:

UNITED STATES

L&M Radiator, Inc.
1414 East 37th Street
Hibbing, Minnesota 55746 U.S.A.
Telephone: (218)263-8993
FAX: (218)263-8234

L&M Radiator, Inc.
6966 Market Street
El Paso, Texas 79915 U.S.A.
Telephone: (915)779-3866
FAX: (915)779-3195

MEXICO

L y M de Mexico S.A. de C.V.
Calle De La Plata Y Los Nogales
Parque Industrial
Apartado Postal 763
Hermosillo, Sonora, Mexico
Telephone: (62)51-04-80
FAX: (62)51-04-38

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L&M Radiator Pty. Ltd.
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W.A. 6101, Australia
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 **L&M RADIATOR**

Section 2

SERVICE MANUAL



ALUMINUM TUBE AIR TO OIL COOLERS

**Please read and follow
instructions carefully
before installing the
MESABI® Aluminum Tube
Oil Cooler.**

**For further instructions,
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Quick and Simple Service

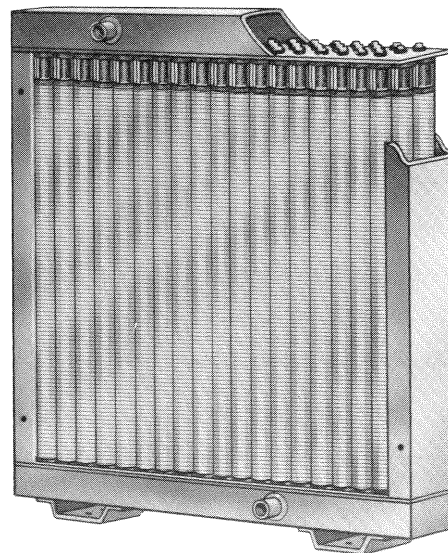
Whether down due to physical damage or for maintenance, MESABI® Aluminum Tube Air to Oil Coolers can be quickly and simply returned to service.

MESABI Oil Coolers use the replaceable tube concept and are similar in design to MESABI core engine radiators. They differ in that cooling tubes are lightweight aluminum with integral circular finning rolled from the tube wall.

Turbulators are placed in tubes to increase heat-transfer rate and are removable for cleaning.

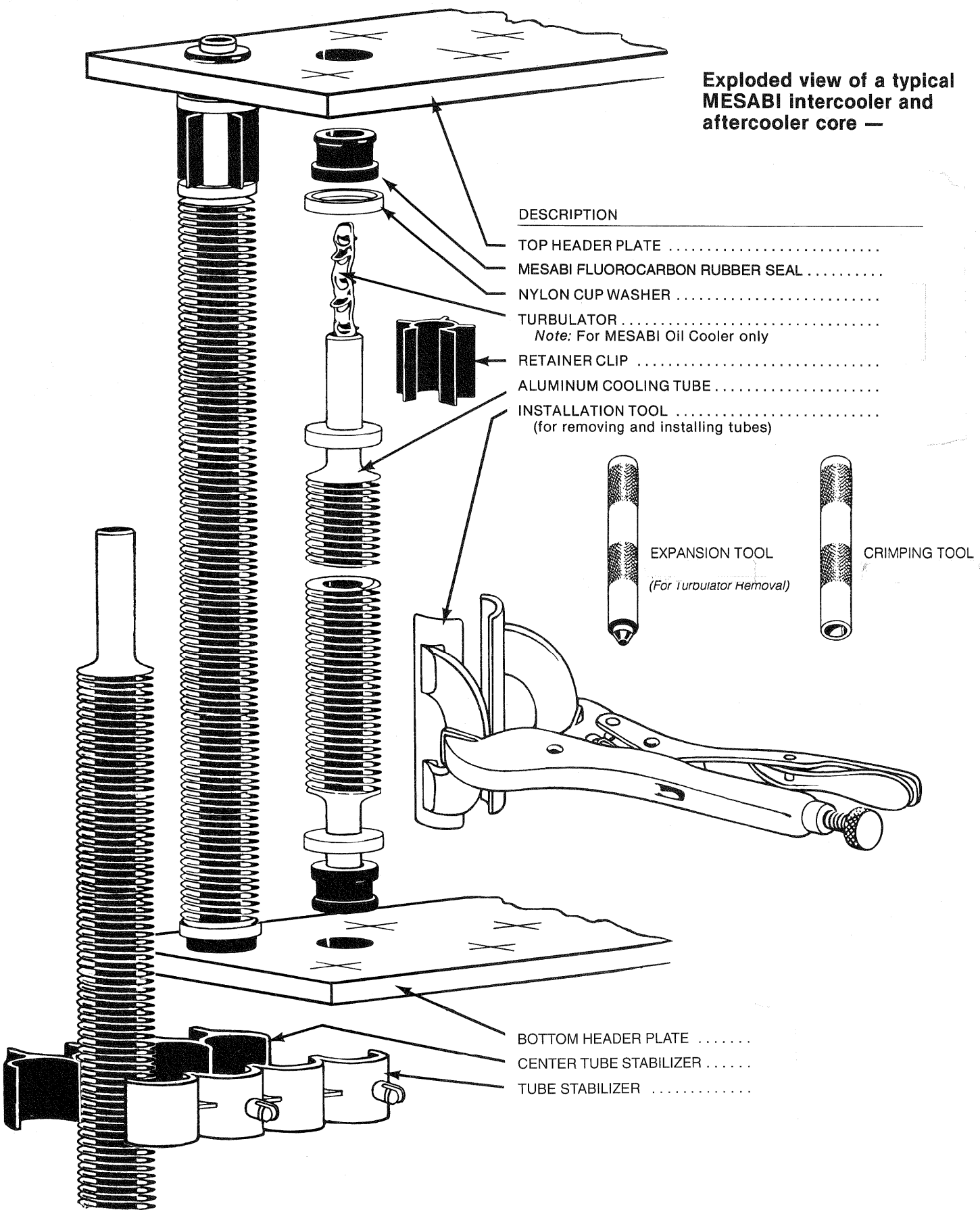
Tubes are held in header sheets with MESABI fluorocarbon rubber seals; a retainer clip at top of the tube locks in place.

Removal of tubes for replacement or cleaning is accomplished in much the same manner as with MESABI core engine radiators.



MESABI® Oil Coolers

MESABI® Aluminum Tube Air to Oil Cooler – Standard Parts



MESABI® Aluminum Tube Air to Oil Cooler –

EXTERNAL CLEANING

MESABI Aluminum Tube Air to Oil Cooler

To maintain efficiency and assure maximum life of a MESABI Aluminum Tube Oil Cooler, reasonable care must be taken when cleaning.

For general external cleaning, a high pressure hot water washer, up to 1200 PSI, can be used. Unlike conventional cores, you can and should get right up next to the core with the wand. Starting from the air exit side, place the high pressure washer nozzle next to the fin, concentrating on a small area, slowly working from the top down. Make sure you spray straight into the core, not at an angle. Continue washing until the exit water is free of dirt. Repeat from the opposite side.

In some cases it may be best to blow out any dry dirt with a high pressure (up to 1200 PSI) air gun prior to washing core with the high pressure hot water washer. If there is any doubt about the cleaning method to be used, try the method on a portion of a single tube. If there is any doubt about the cleaning method to be used, try the method on a portion of a single tube first, or contact an L&M manufacturing facility.

Many radiator shops use a hot alkaline soap or caustic soda in their boil-out tanks with chemical additives. Soaking in high pH solutions may damage the aluminum alloy depending on the exact characteristics of the solution. Solutions that are either too alkaline ($\text{pH} > 9.0$) or too acid ($\text{pH} < 5.0$) are not recommended.

Removing MESABI Tubes

After thorough cleaning, as described above, blow dry the core section, then remove retainer clips from top portion of tube, as shown in **Fig. 1**.

With Installation Tool No. 42146, grasp center portion of tube, as shown in **Fig. 2**. Rotate the tool, so as to break the tube free from the seal then raise the tube only enough to clear lower seal and swing tube out just far enough to allow tube to be pulled down and out of its upper seal, as shown in **Fig. 3**.

Remove all tubes in the row, repeating the above procedure.

Installing MESABI Tubes

IMPORTANT: Before inserting new or original tubes into header plates, new seals must be installed.

After removing old seals, tube holes should be cleaned of any foreign debris. A McMaster Carr Chuck Grip 3/4" brush #63005T42 (L&M P/N 64092) placed in

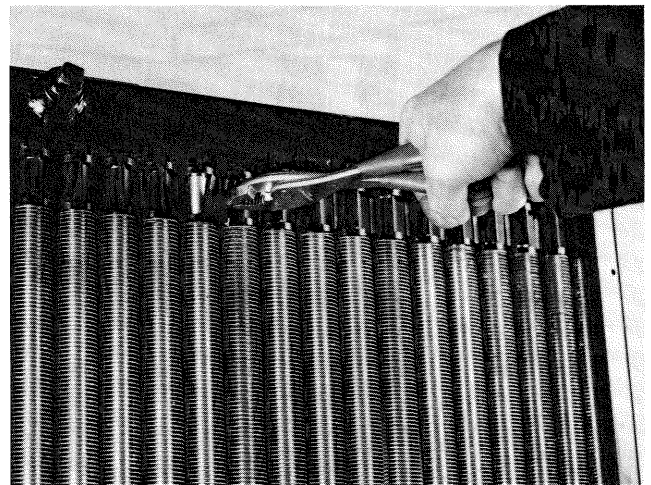


Fig. 1

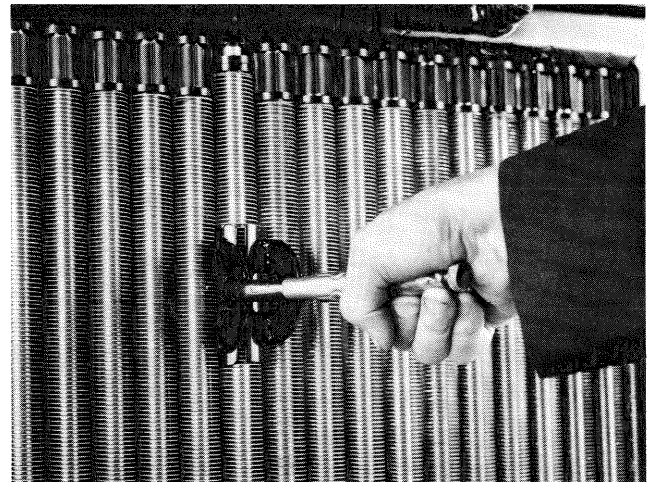


Fig. 2

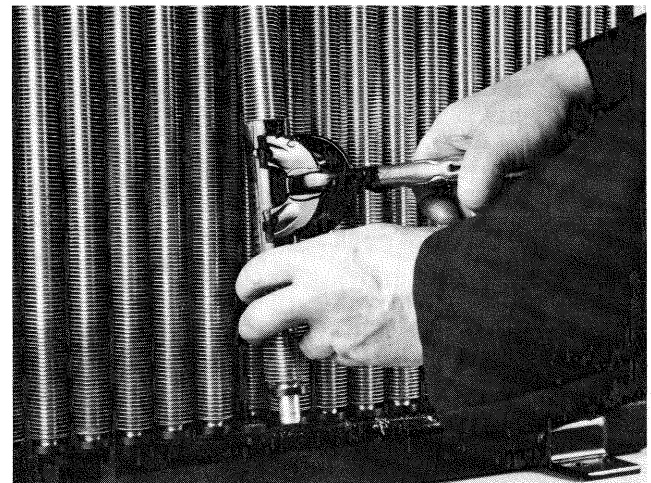


Fig. 3

Tube Removal and Replacement

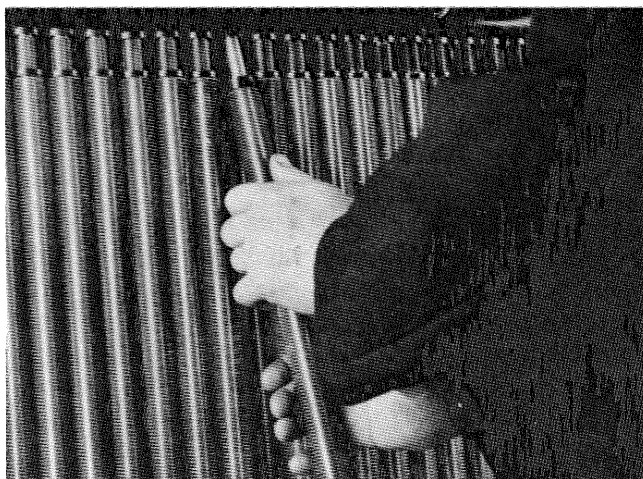


Fig. 4

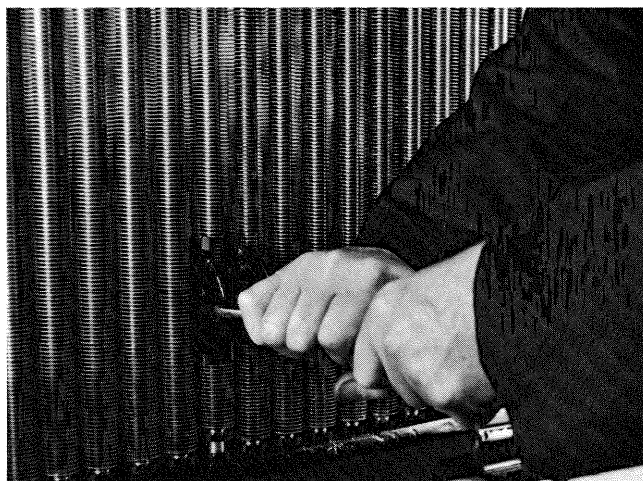


Fig. 5

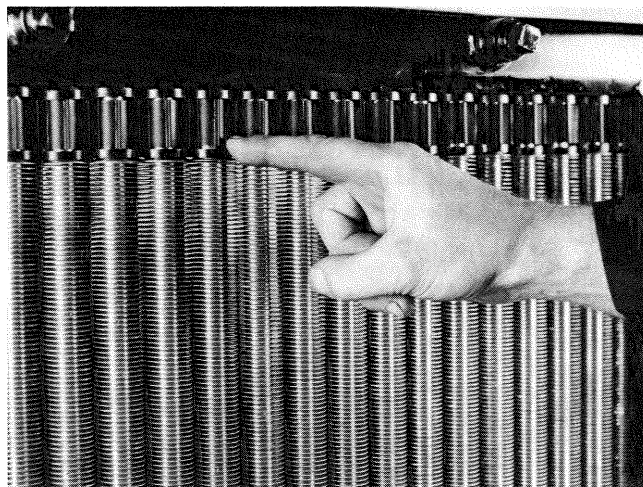


Fig. 6

an electric or air drill can be used for this purpose.

Note: Caution must be taken when cleaning aluminum header plates not to damage hole surface finish.

Be sure to clean the inside of the tanks out with air before installing seals. Place new seals in the clean holes. Then, using a small hammer, gently tap each seal down so that the shoulder of each seal is tight against the header plate.

Before original tubes are reinstalled, tube ends must be clean of foreign material. A fine grit emery cloth or buffing wheel can be used. Precaution should be taken when buffing so as to not mar tube. Make sure the tube ends are wiped clean prior to installation.

Coat the inner hole of each seal and the outside ends of each tube with a small amount of #10 hydraulic oil or petroleum jelly. Cupped washers should be installed as shown in the exploded view on page 3, prior to installing tubes. Starting at the end of one of the rows of holes, push the top end of a tube (the top end of the tube is the end with the longest unfinned section) into one upper header plate seal, as shown in **Fig. 4**. Place center bottom end of tube into respective hole in the bottom seal. Push tube down and into seal until the washer is located on top of the lower seal. This may be done by grasping tubes by hand and pulling tube downward until seated, or by using Installation Tool, new style as shown in **Fig. 5**. **Note:** Be sure tube is properly centered in the seal before pushing the tube in place or seal damage could result.

Reinstall retainer clip between upper two washers, as shown in **Fig. 6**. Make sure wings on retainer clips are parallel with each other to block bypassing air.

On some oil coolers (typically when tubes are longer than 35 inches) tube stabilizers will be required. Before starting a second row of tubes, place the center tube stabilizer, in position. Stabilizers should be lined up with the support bar location. Proceed with installation of the next row of tubes, using same procedure as when installing first row.

Remember that a center tube stabilizer should be located *BETWEEN* each row of tubes before starting another row of tubes.

When tubes are completely installed, fasten tube stabilizer, with support bracket to side members.

MESABI® Oil Cooler – Internal Cleaning

In cases where it is necessary to clean the inside of the oil cooler, the following procedure can be used.

Remove all the tubes and seals from the oil cooler as described on page 4. Flush the inside of the tanks with a high pressure washer (a mild soap can be used but rinse thoroughly). Blow the excess water out with air and make sure the tanks are dry. The tube holes should be clean and dry.

Next remove the turbulators from the tube with the tools shown in **Fig. 1**.

Note that the tube ends have been crimped at each end to secure the turbulator inside the tube. Also note that there is a long, unfinned portion of the tube and a short, unfinned portion.

Place the tube end on a piece of hard industrial rubber as shown in **Fig. 2**. Holding the tube upright, insert tool

in the end of the tube (see **Fig. 3**), with a hammer lightly tap the tool forcing the end of the tube open just far enough to allow removal of the turbulator. (Care must be taken not to mushroom the tube ends). Open both ends in this manner.

Remove the turbulator by pulling it out of the long, unfinned end of the tube with a needle nose pliers. Note that the tabs of the turbulator are facing downward. See **Fig. 4**. (Care should be taken not to kink the turbulators.)

Clean and flush the tube with a high pressure washer. Blow off with air and make sure tubes are thoroughly dry.

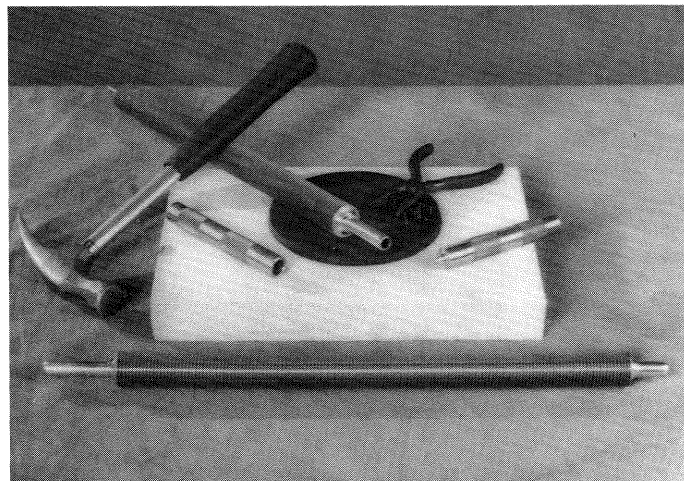


Fig. 1

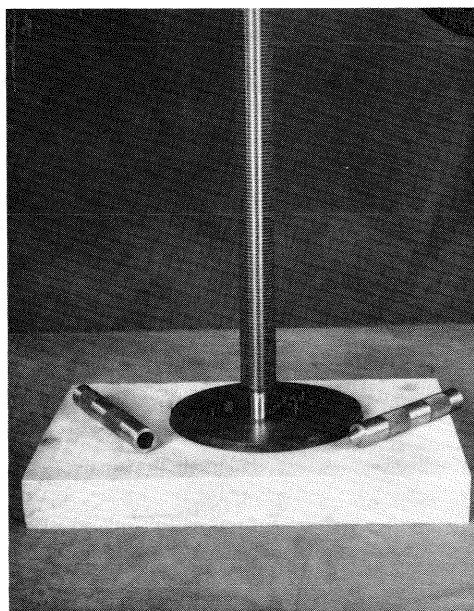


Fig. 2



Fig. 3

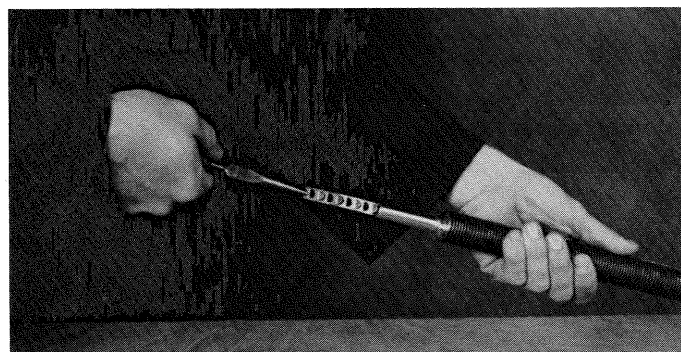


Fig. 4

Replace the turbulator by pushing the turbulator through the short, unfinned end of the tube (see **Fig. 5**). Push the turbulator far enough into the tube to allow for recripping.

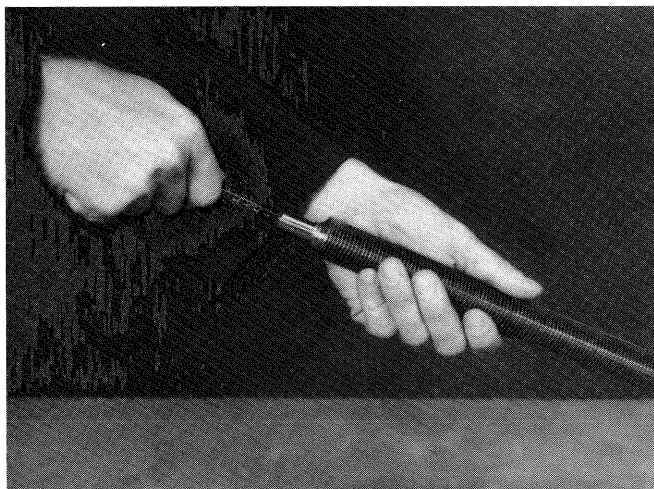


Fig. 5

Note: Depending on tolerances "pushing" the turbulator into the tube may cause kinking. An alternative would be to use a piece of wire with a hook on the end. The turbulator can be pulled into place from the long unfinned end of tube.

Crimp both ends of the tube using tool and a hammer (see **Fig. 6**). Lightly tap, forcing the end closed far enough to hold the

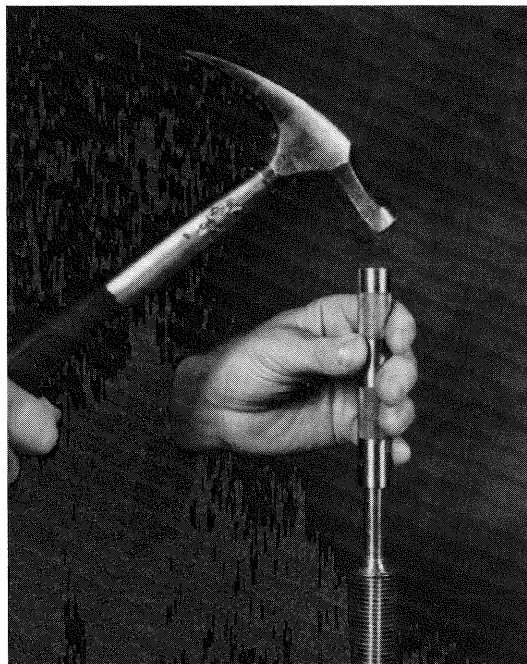


Fig. 6

turbulator securely in place. (Again, care should be taken not to mushroom the tube ends.)

Finally, check the tube ends for burrs, etc. Lightly buff the tube ends or use a fine emery cloth to remove any debris. Make sure the tube ends are wiped clean prior to installing. Follow the installation procedures on pages 4 and 5 to complete the job.

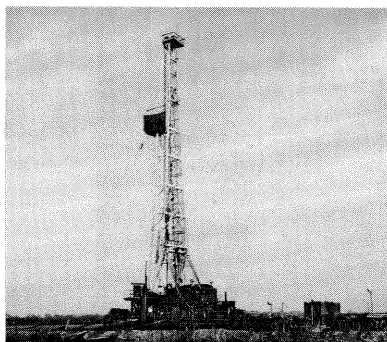
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