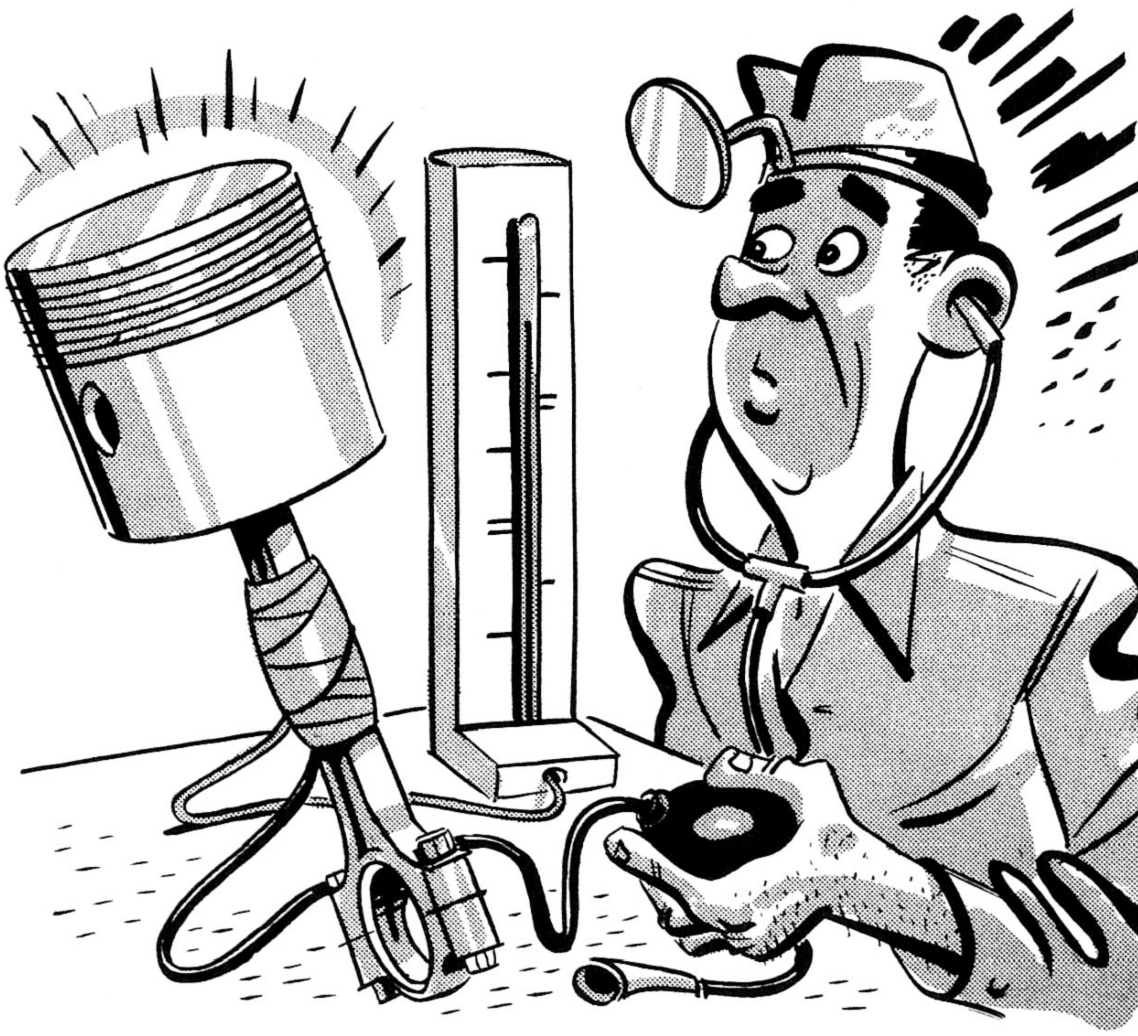
SERVICE REFERENCE BOOK

THE LOWDOWN
ON
HIGH OIL CONSUMPTION



Prepared by

CHRYSLER CORPORATION

PLYMOUTH • DODGE • DE SOTO • AND CHRYSLER DIVISIONS

Vol. 1 No. 2

TECH SEZ:

Maybe you're one of those fellows who hates to get into an oil consumption case because you never know just what you're going to find.

Maybe it'll be a nice clean job—just a matter of putting in a set of rings—and everything works swell. One of those "good luck" jobs.

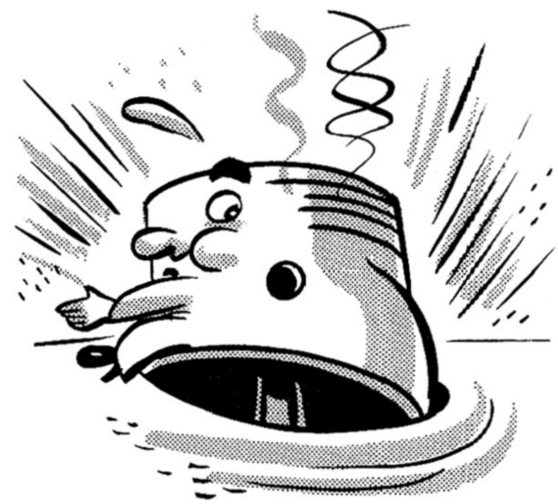
But . . . you knew the minute you first saw that blue smoke coming out of the tail pipe that the job was burning oil. And, you could remember another job you had like that, that didn't turn out to be a "good luck" job. You sweated blood over it . . . only to have it come back later, smokin' just as bad as ever. That's when you started cussin' . . . and scratchin' your head for the reason why that job turned sour.

Well . . . you needn't back away from those ring jobs any more. Here's some dope right from ringside . . . and it'll help you pick out those little points that might jump up and bite you after the job has been turned out.

LET'S GO BACK TO THE BEGINNING . . .

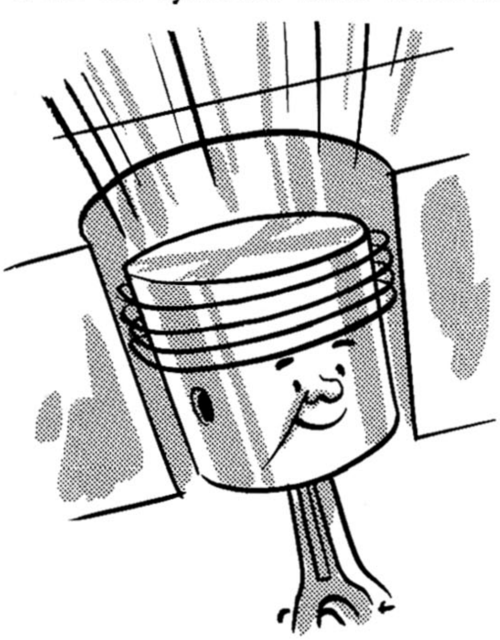
First of all . . . why do we have to have rings on a piston?

That's easy—rings seal the power of combustion so it won't be wasted . . . so the full force of the power will be used to drive the piston downward on the power stroke. And . . . rings prevent oil from getting up into the combustion chamber.



If the piston was fitted tight enough to provide an effective seal, it would stick as soon as it became hot. When you pour about 3000 degrees of heat on the head of that piston better than 1500 times a minute, it gets pretty hot. And we all know that heated metal expands. So . . . the piston has to be fitted loose enough to give it room to expand and not seize to the cylinder wall.

Also . . . even if the piston didn't seize, the friction developed would wear the cylinder wall. Then the piston wouldn't fit tight enough to seal the force of combustion, and the power would be lost.



So that's why we have to use rings . . . first of all, to take up the clearance between the upper part of the piston and the cylinder wall, and second, to provide a flexible seal that will follow the tapered shape of the cylinder wall after it has worn a little and still keep the force of combustion above the piston.

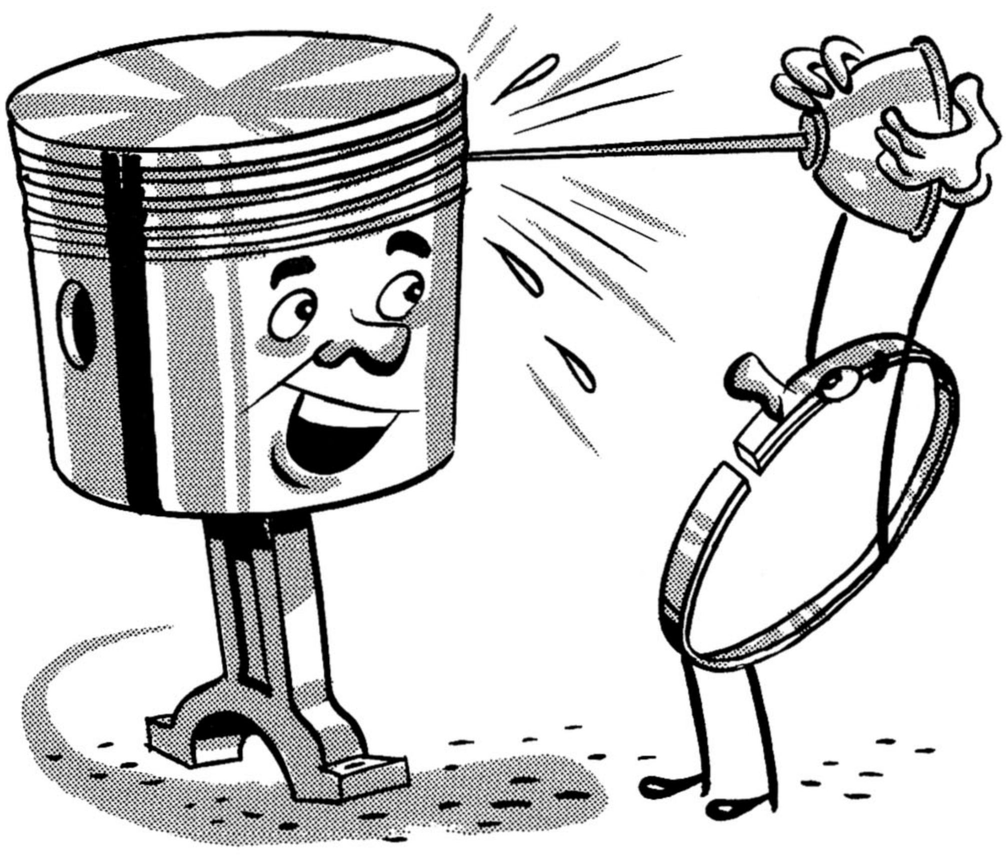
WHAT ABOUT THE OIL CONTROL RINGS?

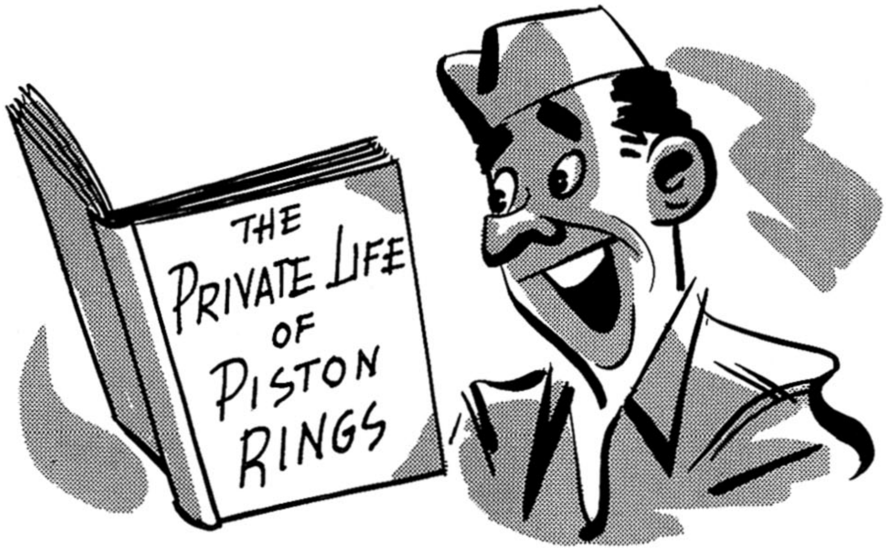
So far we've been talking about compression rings. What good are the oil rings if the prime purpose of piston rings is to seal combustion?

Well, we've got to lubricate those rings if we expect them to last any length of time. But getting them lubricated is the easiest part of the job. There's plenty of oil thrown on the cylinder walls by the rod bearings, and there's a pretty heavy oil mist in the crankcase most of the time. So, they get plenty of lubrication.

The problem is to control the amount of oil that reaches the compression rings. And that's where the oil control rings come in.

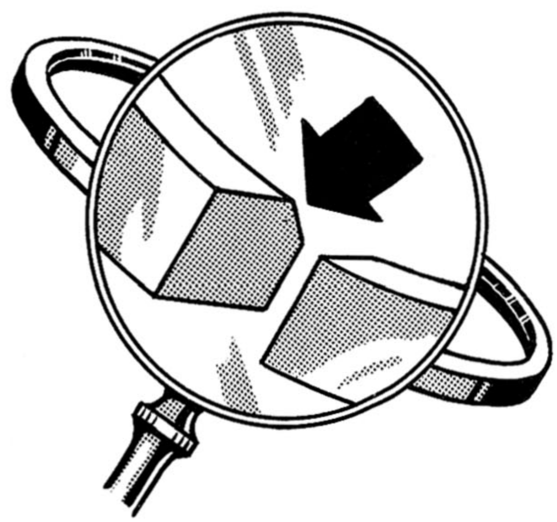
Their job is to control the amount of oil which reaches the compression rings . . . to give them just enough but not too much.

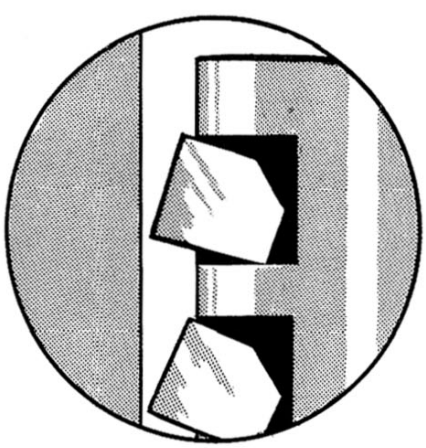




Now that we know *what* the rings are supposed to do, let's take a peek through the cylinder wall and see *how* they do it.

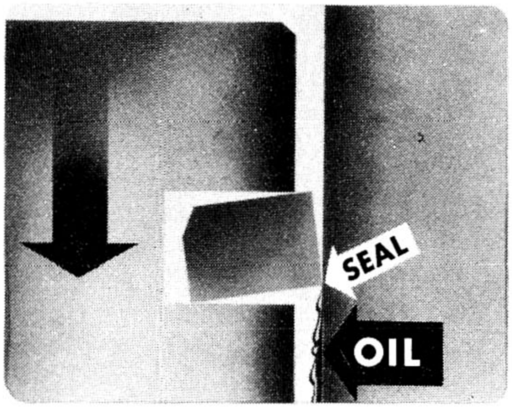
COMPRESSION RINGS. The first thing you notice about these compression rings is that the inner edges are grooved or cut off on the upper side. Maybe you've wondered why. Well, it's very simple. That cut causes the ring to twist or turn up like the sides of a saucer when it is installed in the cylinder. And that's good . . .





because it provides a better combustion seal, and better oil control. Here's how.

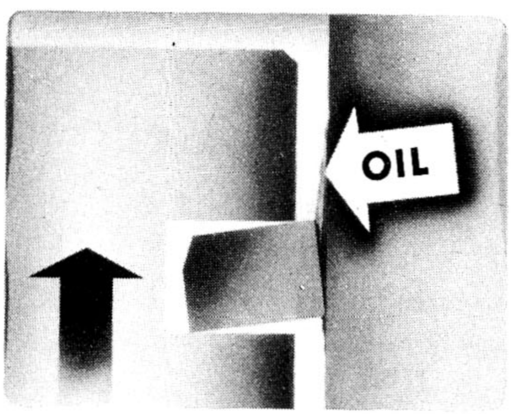
When that ring is installed on the piston, the cut-off edge is *always* placed toward the *top* of the piston. If you put it in upside down, you'll soon know it! Spark plugs will foul and the



engine will blow blue smoke out of the tail pipe like nobody's business! When the ring is compressed and installed in the bore it twists, so just the lower outer corner contacts the cylinder wall.

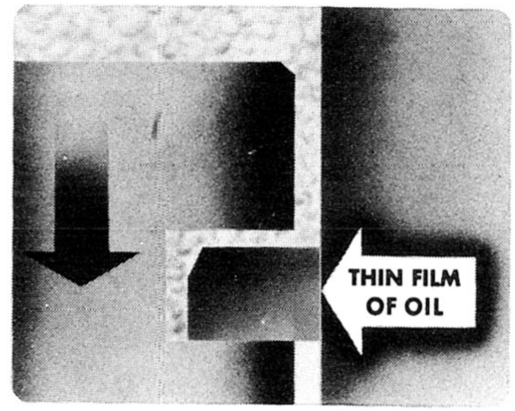
The piston is going down on its intake stroke when we first see it through the cylinder wall. The compression rings are twisted . . . the lower outer edges are riding on the cylinder wall. Notice how those edges wipe the oil off the wall! Work just like that hamburger turning gadget Tech talked about in the film, don't they?

And that's good . . . because it's during the intake stroke that oil has a tendency to be drawn up past the rings and into the combustion chamber. That's because there is a partial vacuum above the piston during the intake stroke. But the oil can't get up . . . those edges are wiping it down . . . cleaning the wall.



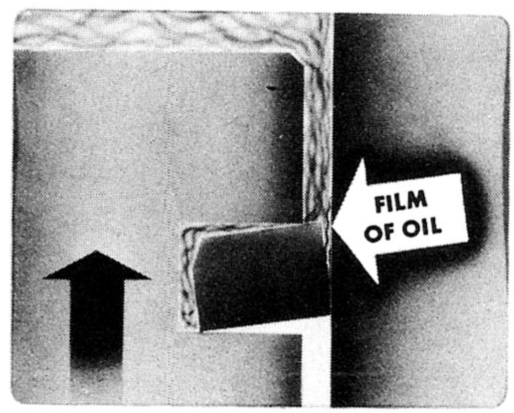
Now the piston is going up on the compression stroke. The lower edges of the rings are still riding the cylinder wall, but they're not wiping the oil off . . . they're riding *over* what little oil is left on the wall. But notice that ring as the piston nears the top of its stroke! Compression pressure is beginning to be felt, and the rings are flattening out.

By the time it reaches the top of the stroke, the rings are completely flattened out, and the full face of each ring is contacting the cylinder wall.



Then comes the fireworks! The spark plug fires, and combustion pressure builds up immediately. It keeps the rings flattened out . . . gets in the piston grooves and in behind the rings, forcing them against the cylinder wall. So the piston goes down on its power stroke with the full face of each compression ring flat against the cylinder wall.

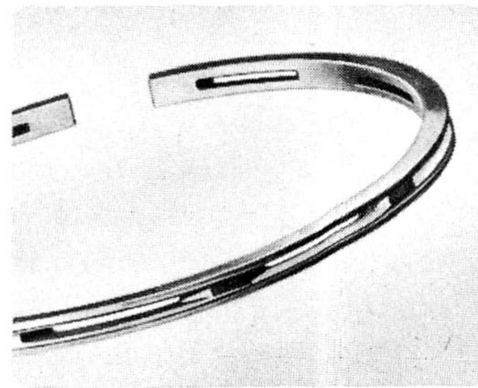
Just before the piston reaches the bottom of its stroke, the exhaust valve opens. This relieves the combustion pressure. Instantly the compression rings twist again. The piston moves up on its exhaust stroke, and the lower edges of the rings ride up the cylinder wall.



But . . . they don't do much toward wiping the oil off. Instead, they act just like the hamburger turning gadget when the cook was spreading the grease around on the hot-plate. The rings are spreading the oil evenly over the surface of the cylinder wall . . . and lubricating themselves in the process.

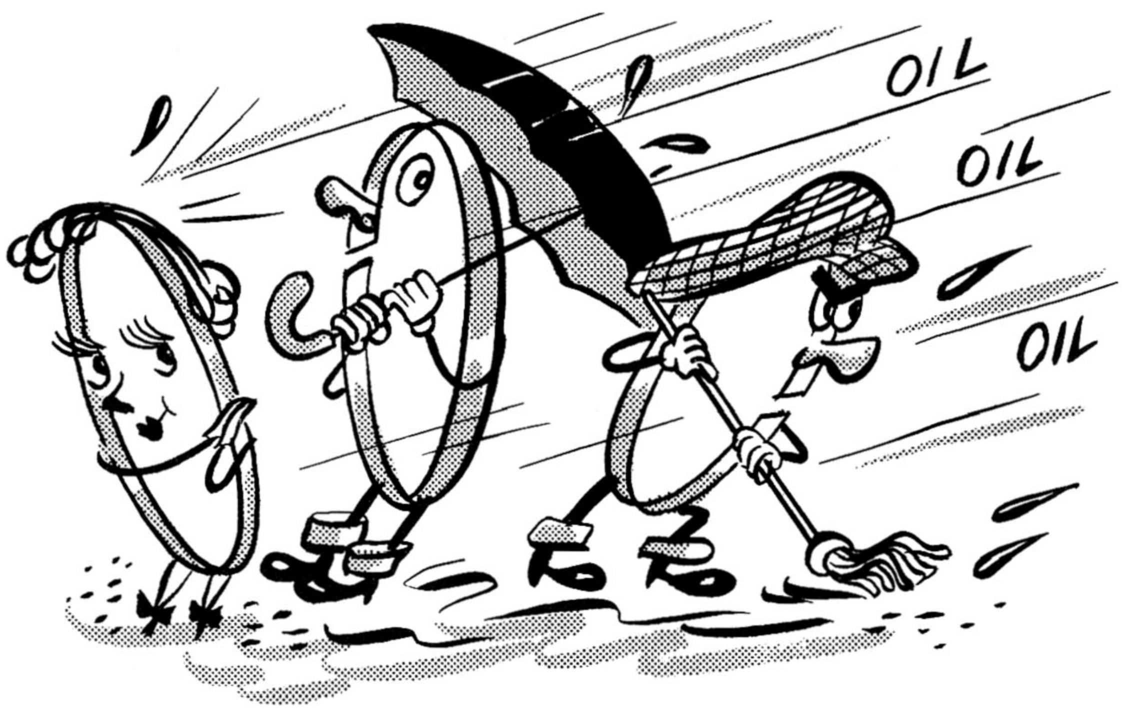
Then the piston starts down again on its intake stroke, and the whole process repeats itself.

OIL CONTROL RINGS—These rings form the first line of defense against excessive oil consumption. You'll notice that each ring has two narrow contact faces, with oil slots between them. Those two edges contact the cylinder wall and control the amount of oil which reaches the upper compression rings.



Any army backs up its first line of defense with a second line . . . that's why we back up the first (or bottom) oil control ring with a second oil control ring. It is necessary for some oil to get up to the compression rings, but not too much. Therefore, the second oil ring takes care of the excess oil that gets past the first ring, permitting only the right amount to get up on the compression rings.

When the narrow edges of the oil control rings wipe off the oil, that oil squeezes through the oil slots between the edges of the rings and returns to the crankcase through the oil drain holes in the piston.



(THAT'S A $64 QUESTION)

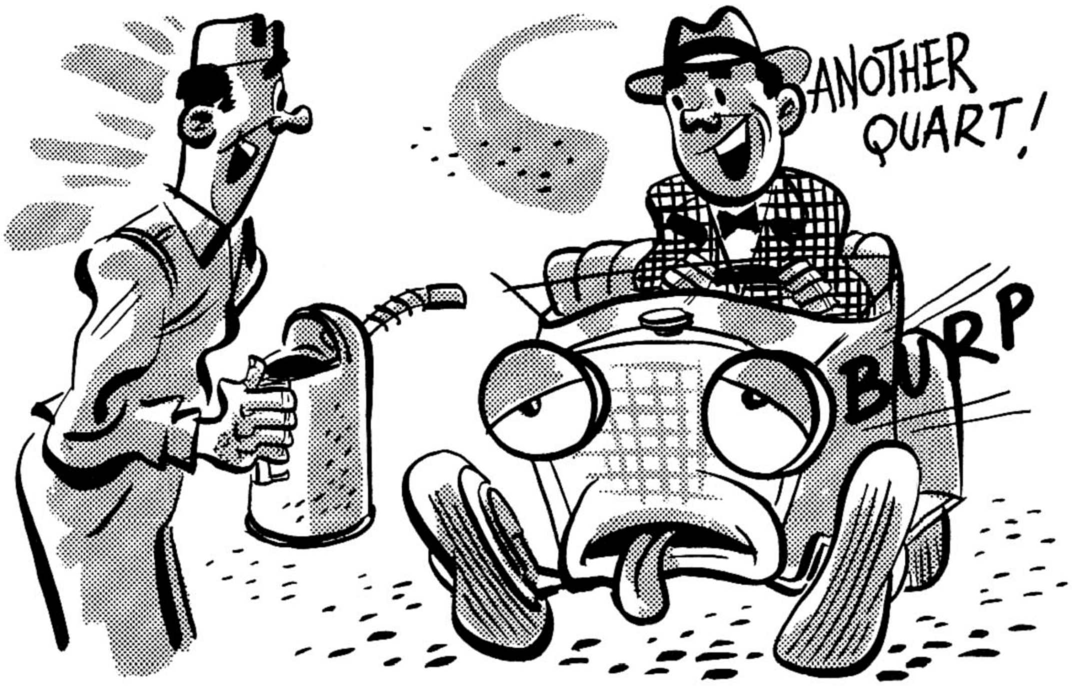
The first answer that pops into your mind is "poorly seated rings." And in a great many cases you'd be right.

But there are other causes, and they have to be eliminated before you go to the trouble of pulling the head and pan, and examining the rings.

For example, it is possible to use a lot of oil if the owner has a habit of running with too much oil in the crankcase. Some owners seem to feel that a lot of oil will do a better job than just enough

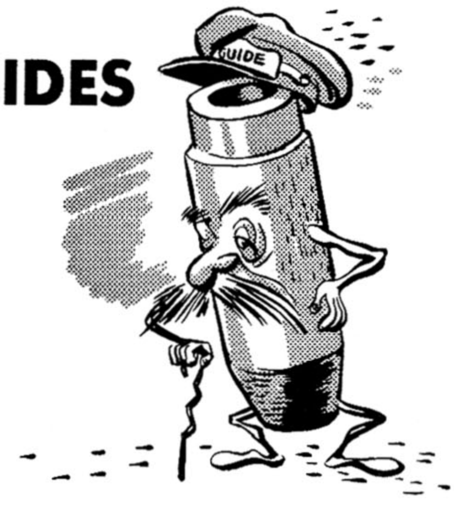
oil. That isn't true . . . and the dip stick is a gauge designed to guide the owner as to the amount of oil in the crankcase.

This dip stick used to have a "running level" mark just below the "full" mark. Many owners thought oil should be added when the level was below the "full" mark. There wasn't room for a quart, but they had it put in anyway. That made the level too high, and that extra oil was promptly wasted.



Then the dip stick was changed . . . it now has an "add oil" mark. When the level in the crankcase reaches that mark you're supposed to add not more than one quart of oil. That brings the level up to the normal running level. The new type dip stick should help to cut out some of the complaints of excessive oil consumption.

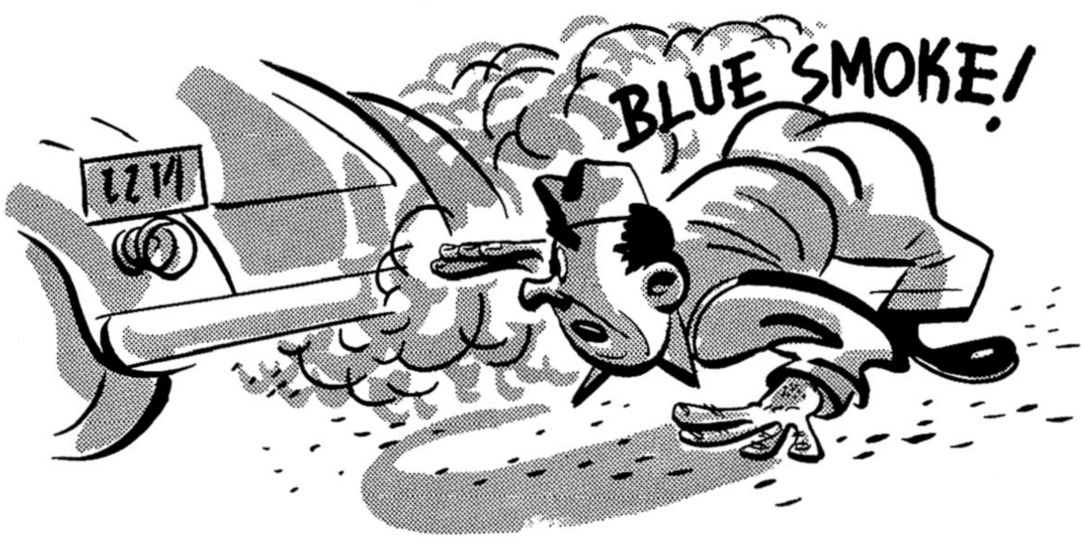
WORN VALVE GUIDES



Another source of excessive oil consumption is worn intake valve guides. They're quite a factor in engines with high mileages. When that intake valve opens, the vacuum created in the combustion chamber will draw quite a lot of oil up through the valve guide and into the chamber.

WORN OR IMPROPERLY SEATED RINGS

This is probably the main cause of excessive oil consumption. Its indication is the cloud of blue smoke which comes from the exhaust immediately following deceleration. In other words, if you speed the engine up to about 40 miles per hour, let it drop down to idle speed and then suddenly open the throttle, you'll get a cloud of blue smoke out of the exhaust.



Don't confuse the blue smoke of oil burning with the dirty black smoke of an over-rich fuel mixture.

WHAT DOES THE COMPRESSION TEST SHOW?

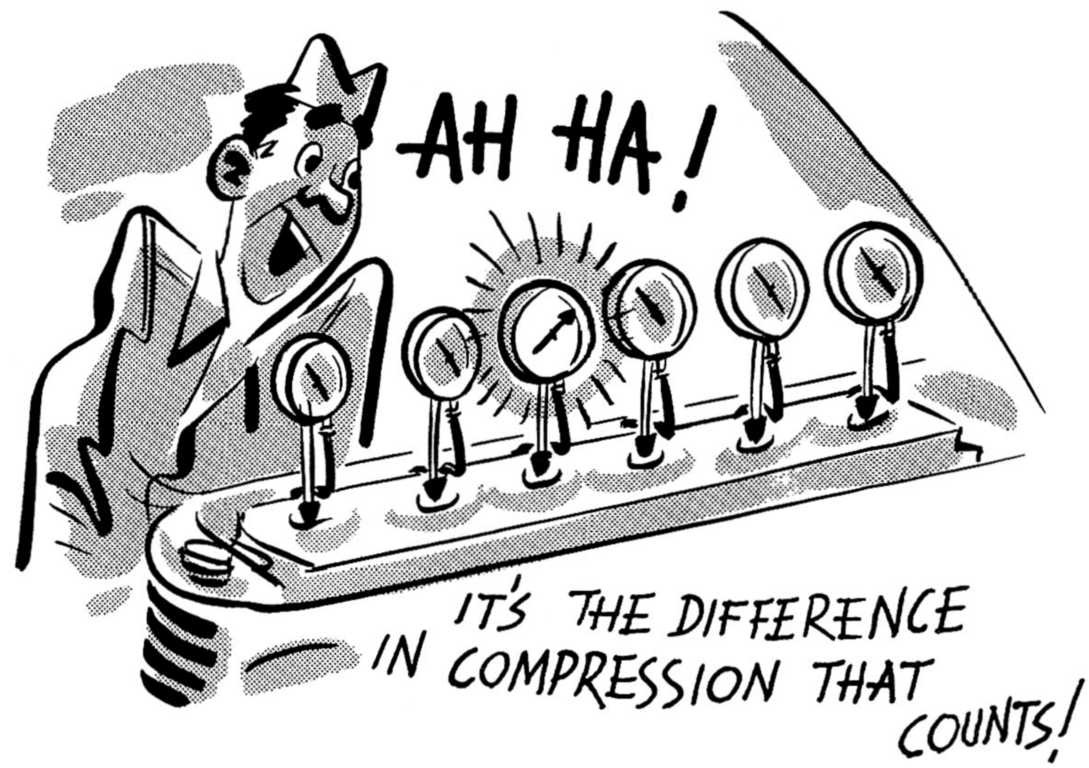
You may be pretty sure that rings are causing the trouble in a particular job because of the blue smoke and presence of oil in the end of the tail pipe. But . . . make a compression test of each cylinder before you pull the job down.

That compression test will show definitely that it is the rings if the compression pressure comes up on a par with the other cylinders when you squirt about a tablespoonful of oil on the head of the piston.

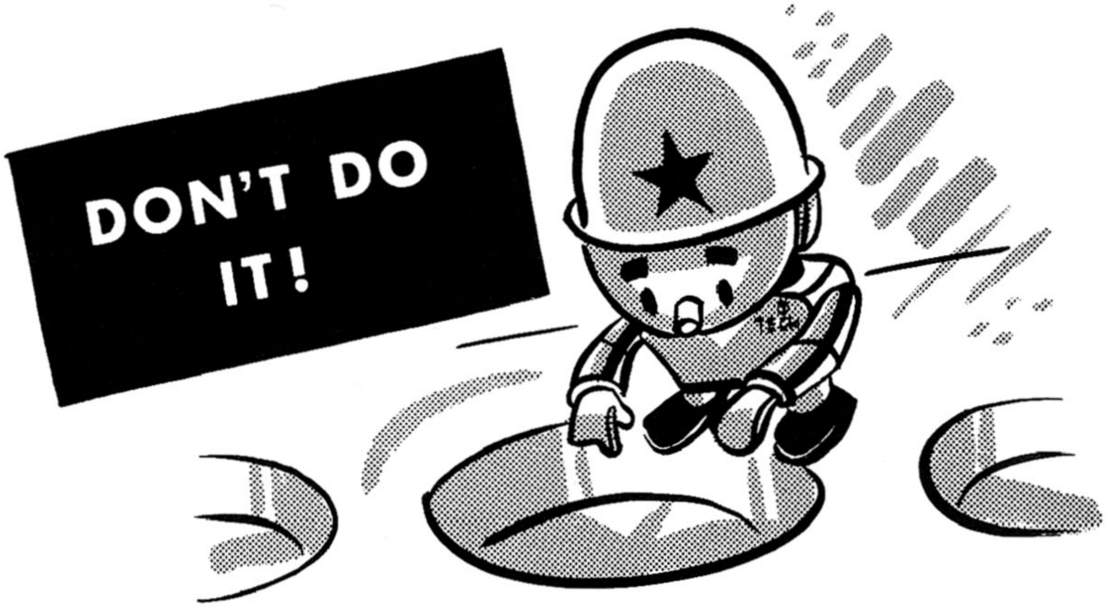
The oil will seep down around the compression rings and form a temporary seal that will hold compression long enough to prove that the rings were leaking before the oil was added.

If the compression pressure in a particular cylinder doesn't come up to the others after the oil is added, you had better start looking elsewhere for your trouble. You may have a valve sticking or not seating tightly, letting the compression pressure leak out. You may have a head gasket blown, which will do the same thing. If the head gasket is blown between two adjacent cylinders, the compression reading for each cylinder will be abnormally low, and you can usually hear the air leaking from one to the other.

The important thing to remember about using compression readings as a clue to ring failure is not necessarily a comparison of the present readings with those given in the engine specifications. Rather, it is the *difference* in the compression reading of one cylinder as compared with the compression readings of the other cylinders.



Let's suppose, for example, that an engine started out with a compression pressure of 100 pounds per square inch at cranking speed. When you test it after many thousands of miles of operation, the compression reading may be down to 75 pounds. But . . . if each cylinder shows a variation of less than 10 pounds from the high of 75 pounds, that engine will still continue to run pretty well. It won't have the power and pep it had when new, but it'll run pretty evenly. That condition is *not* an indication that there is ring trouble . . . it is simply an indication that a certain amount of wear has taken place, and that the wear is pretty uniform in all cylinders.

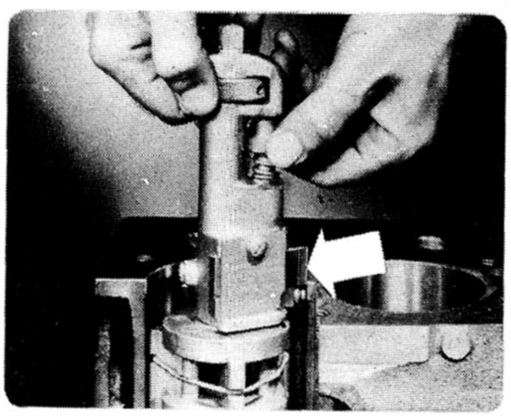


Don't push those pistons up through the block without first removing the ridge at the top of the cylinder!

Maybe that ridge doesn't look like much, but remember, the top ring has a sharp edge. If there is *any* ridge on the cylinder, that edge will bump it instead of sliding over it. You're almost sure to crack the ring land if you try to force the piston out over that ridge.

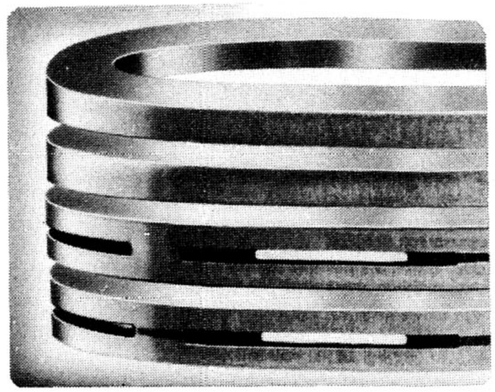
And if you don't take it out, the new ring will bump against that ridge and cause a knock. Might even break the ring or the piston.

So, get out the ridge reamer and cut that ridge out of the cylinder before you try to remove the piston. And stuff some oily rags down on the head of the piston before you start reaming . . . if you don't, you'll have a lot of nice grinding compound resting on that top ring. Then, when you push the piston out, that grinding material will make some nice deep scratches on the cylinder wall, and you're in for trouble.



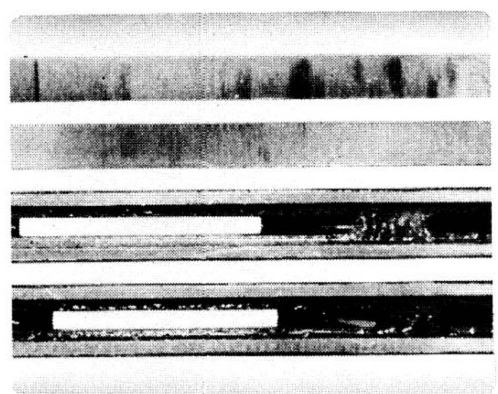
Cover the valves, too. Some of them are open, and if some of the cuttings get into the intake valve ports, they'll be drawn into the cylinder the first time that piston goes down on its intake stroke, and again you'll have a scored cylinder. Keep it clean, and you'll keep out of trouble!

WHAT RINGS LOOK LIKE AFTER SERVICE

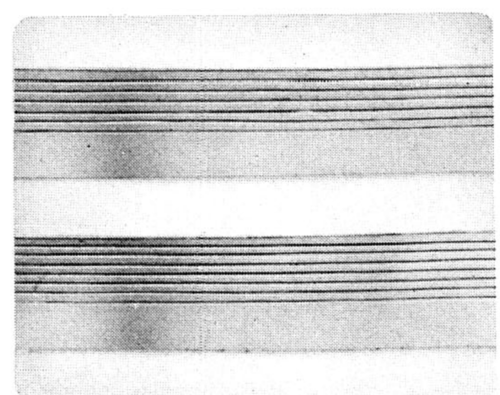


The rings illustrated here are good examples of excessive wear after the car has been driven a lot of miles.

The compression rings are worn over the entire face. But . . take a look at the oil control rings! The original seating edges have worn right down to the base of the ring.



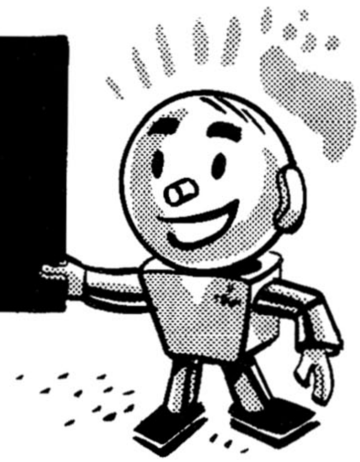
The rings in this illustration had a hard time. They're scuffed and worn. This is what happens when the driver has a lead foot. Those vertical scuff marks are made by particles of metal which have seized to the cylinder wall and then scratched the rings as they rotated on the piston.



Here are some rings which were removed from an engine after approximately 10,000 miles of service. The horizontal tool marks are still plainly visible, and the lower edge of the compression ring has taken on a polish.

There is no reason why these rings should have been replaced. They would have given the owner a good many thousand miles of first class service.

THE REPLACEMENT STORY



When it comes to fitting new rings, either standard or oversize, certain points must be given proper attention. For instance . . .

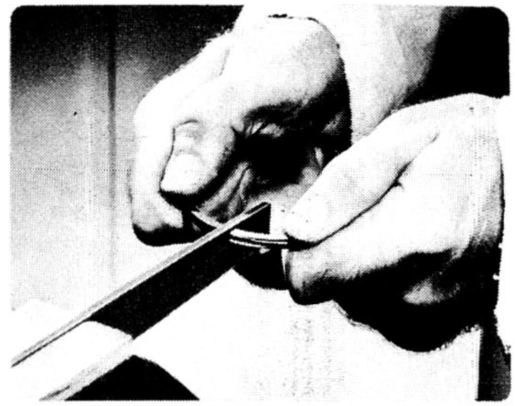
Gap—This is the space between the ends of the ring when it is fitted in the lower part of the cylinder. We all know that a cylinder wears more at the top than it does at the bottom, and therefore the ring is always fitted in the lower area of the ring travel.

The gap is important because it allows room for the ring to expand when hot. If a sufficient gap is not allowed, the ends of the ring will butt and the ring will either score the cylinder wall, or break.

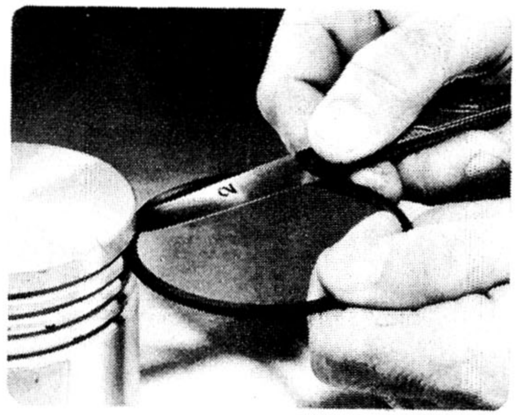
The easiest way to get the ring in proper position in the cylinder, when measuring the gap, is to push it down with the piston. Place the ring in the top of the cylinder . . . turn the piston upside down and push it down the cylinder. This pushes the ring down, and you're sure the ring is level. Then you can check the gap and know that the ring isn't cocked in the cylinder. The gap must be within the limits shown in the specifications for that car . . . usually between .007 and .015 inches.

If you use the correct size ring, as determined by measuring the cylinder at the lower end of the ring travel area, the chances are you won't have to do anything to the ring to make it have the right gap.

But . . . if you do have to file the ends of the ring to get the right gap, don't spread the ring more than necessary. Clamp a fine mill file in a vise, and rub both ends of the ring against it at the same time, as shown here. Then, be sure to remove the burrs with a fine oil stone so they won't scratch the cylinder wall.

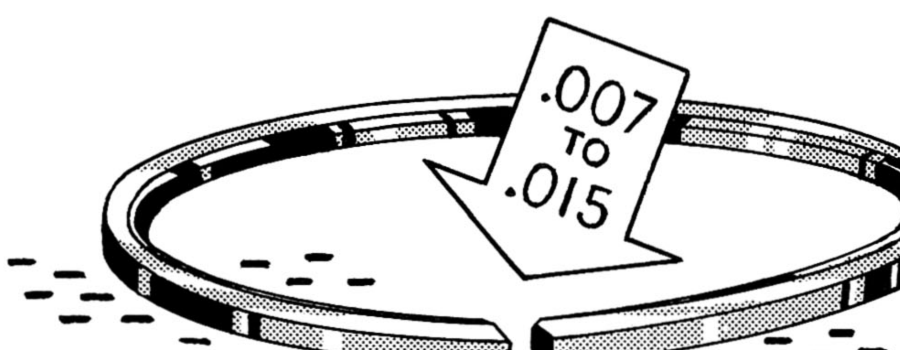


GROOVE CLEARANCE



Remember in the first part of this book, we talked about the action of the ring—how it twisted sort of saucer-shaped under certain conditions? Well, that's one reason why you have to be careful of the clearance between the ring and the ring lands. The ring has to have room enough to twist, and also to expand and contract freely.

The danger, however, comes from having too much clearance rather than not enough. If there is too much clearance, the ring will batter the sides of the ring lands, and then it won't work properly. If the ring lands get battered, you have to replace the pistons.



CYLINDER WALL

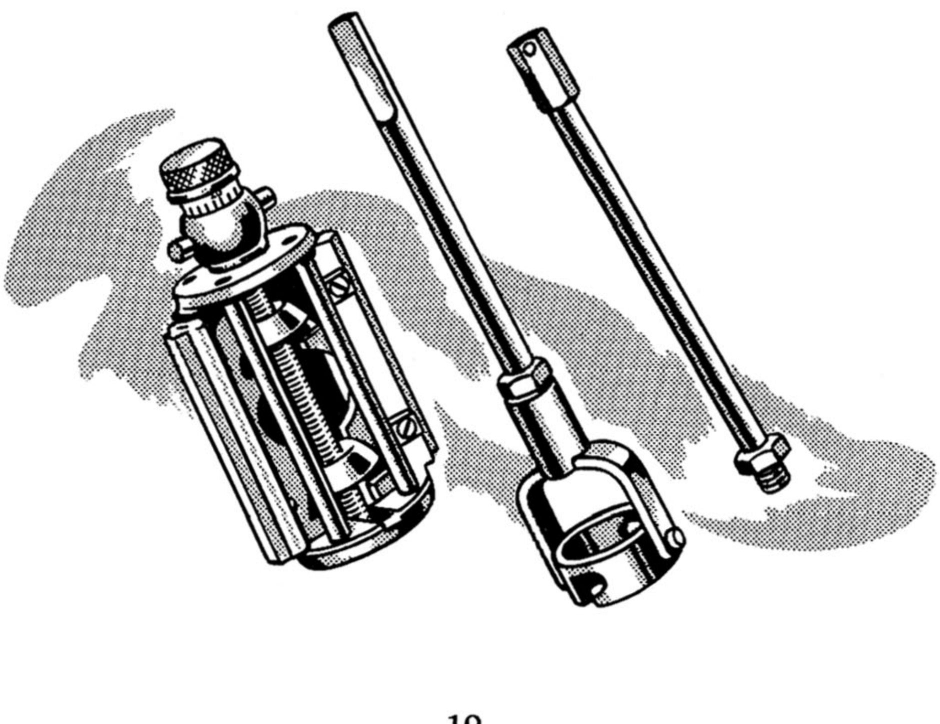
After an engine has seen lots of service, the cylinder walls may become glazed or take on a highly polished surface. Before new piston rings are installed, it may be advisable to remove this glazed surface. At the same time this will remove any small particles of metal which may have become welded to the wall. Occasionally you may open up an engine and find the cylinders have a dark gray appearance rather than the bright finish you've been used to. These are chemically treated cylinders whereby the surfaces are etched to form numerous tiny pockets for oil. Because of this treatment there is less likelihood of small particles of metal becoming welded to the wall. So, whenever you replace rings in one of these engines, don't use the glaze removing tool unless there is definite evidence of a pile-up of metal because you're likely to cut out these small pockets which were put there for a purpose.

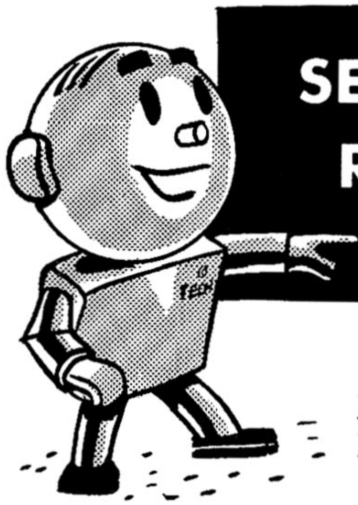
The MoPar Oil Saver ring set, with the expanders behind the rings, will seat on this glazed surface without the necessity of roughing up the finish. Some mechanics may be in the habit of always using a glaze removing tool when they replace rings. If you have been in the habit of doing that, it's all right . . . but it isn't necessary with the MoPar ring set.

On the other hand if the cylinders are scuffed, or if there are particles of metal welded to the wall, they'll have to be smoothed out before new rings are installed.

That doesn't mean you've got to take out half the thickness of the cylinder wall to remove the high spots where metal has piled up due to scuffing. It simply means that you should run a hone or some other glaze removing tool down through the cylinder a couple of times. And the abrasive surfaces of that tool must be *very fine grit.* You simply want to smooth up that wall a little . . . not remove metal. A spring-loaded hone will follow the taper of the cylinder wall, but if you have to true up the bores you'll find a fixed adjustment hone will do the job satisfactorily.

If the walls look bad you can sometimes save them by using a fixed adjustment hone to remove enough metal to clean them up. Be careful not to take out so much that you have to install oversize pistons.





SELECTING THE RIGHT RING FOR THE JOB

MoPar supplies Oil Saver ring sets and Oil Master ring sets for service replacement.

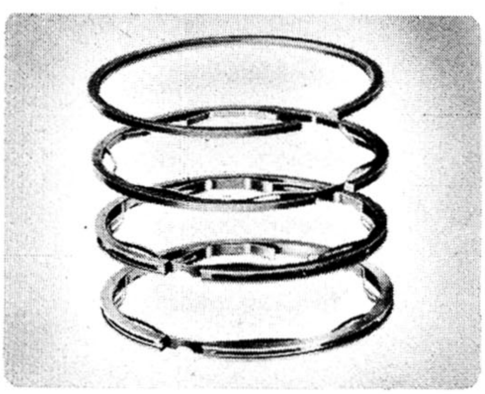
Perhaps you sometimes wonder which ring to use for a particular job. Don't just toss a coin, with "heads" representing Oil Saver rings and "tails" representing Oil Master rings!

Here's how to tell which ring set to use:

When you have a job to correct excessive oil consumption, and the cylinders measure less than .005 in. taper, *use the Oil Saver ring set.*

When you have reconditioned the cylinders and fitted new pistons, *use the Oil Saver ring set.*

Let's take a look at this Oil Saver ring set. The two compression rings and the two oil control rings are similar to the standard production rings. The difference in the Oil Saver ring set over the production ring set is that the Oil Saver combination uses a spring steel expander behind the second compression ring and the two oil control rings. Those expanders give a little more ring tension against the cylinder wall and insure that the rings will follow the taper of the wall closely.



NOTE

The new MoPar Oil Saver Ring set will not have an expander behind the bottom oil ring. And—the bottom oil ring will be the production type ring instead of the type now supplied in the package.

The new MoPar Oil Saver Ring set is for use in cylinders which have been reconditioned. It can also be used in cylinders that have no more than .0015 inch taper. If the cylinders have greater taper, use the MoPar Oil Master Ring set.

The Oil Master ring set uses an expander behind the second compression ring and the upper oil ring. The lower oil ring is composed of two *steel* rings which are held in their proper places in the groove by a spacer between them, and by an expander behind them.

The Oil Master ring combination is pretty severe, and is intended for use only in those cases of poor cylinder condition where the taper runs up to as high as .030 inches, and the owner won't spend the money for a re-bore job and new pistons. Don't ever use it in a new job, or one with less than .0015 in. taper. If you do it will dry the job up too much, and increase the rate of wear of the cylinder walls.

Above all, take every possible precaution to keep the engine clean while you're working on it. Dirt is the worst enemy of an engine. If it gets into the cylinders or the intake valve ports, it is sure to cause trouble.

So clean out the oil pan before you button the job up . . . and clean everything else you can think of that might let dirt get into the engine. Clean the air cleaner . . . the crankcase breather . . . your hands . . . rags . . . tools . . . in other words, clean everything!

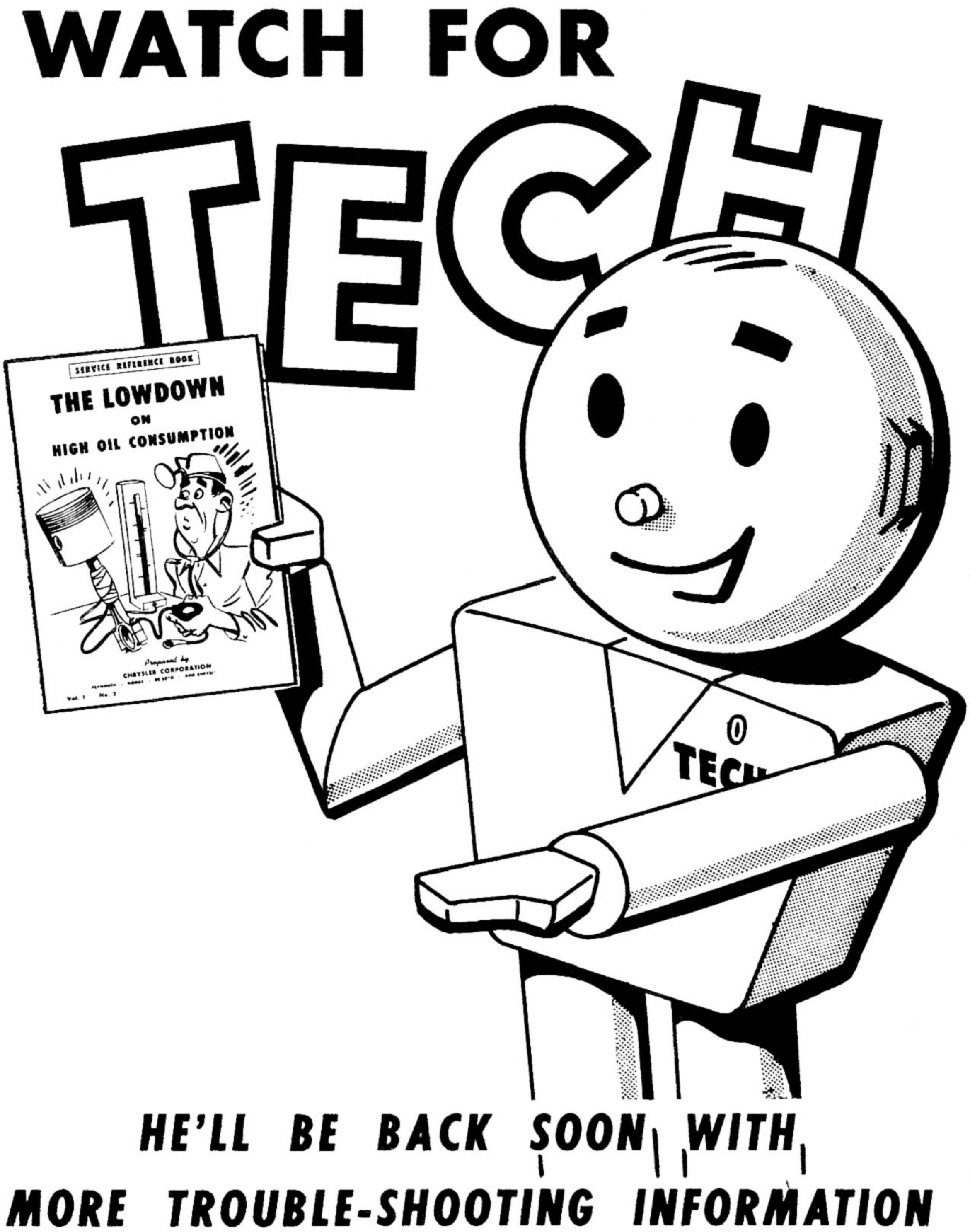
CHECK THOSE ROD BEARINGS

Don't let your good job be spoiled by loose rod bearings. Take a good look at them before you put the pan on. If they're loose, there's a good chance that they will throw off so much oil your new rings won't be able to handle it. Better call the boss and have him sell the owner new bearings. There's no sense in spending good money for new rings and not taking care of the source of the oil the rings are to handle. Rings alone can't stop excessive oil consumption under those conditions.

TABLE OF PISTON RING CLEARANCES
AND
CYLINDER HEAD BOLT TENSION

CAR MAKE and MODEL	PISTON RINGS				CYLINDER HEAD BOLT (pound-feet)	
	Side Clearance			Gap		
	Compression		Oil Control	Compression and Oil Control	Cap Screws	Stud Nuts
	Upper	Intermediate				
PLYMOUTH 1940-47	.002-.004	.002-.004	.001-.0025	.007-.015	65-70	55-60
CHRYSLER 1940-47	.002-.004	.002-.004	.001-.0025	.007-.015	65-70*	
DE SOTO 1940-47	.002-.004	.002-.004	.001-.0025	.007-.015	65-70*	
DODGE 1940-47	.002-.004	.002-.004	.001-.0025	.007-.015	65-70*	

*For plain head cap screws. Tighten cupped head cap screws to 67.5 to 72.5 pound-feet.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