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Guides, Charts, And Harley-Davidson Reference Material

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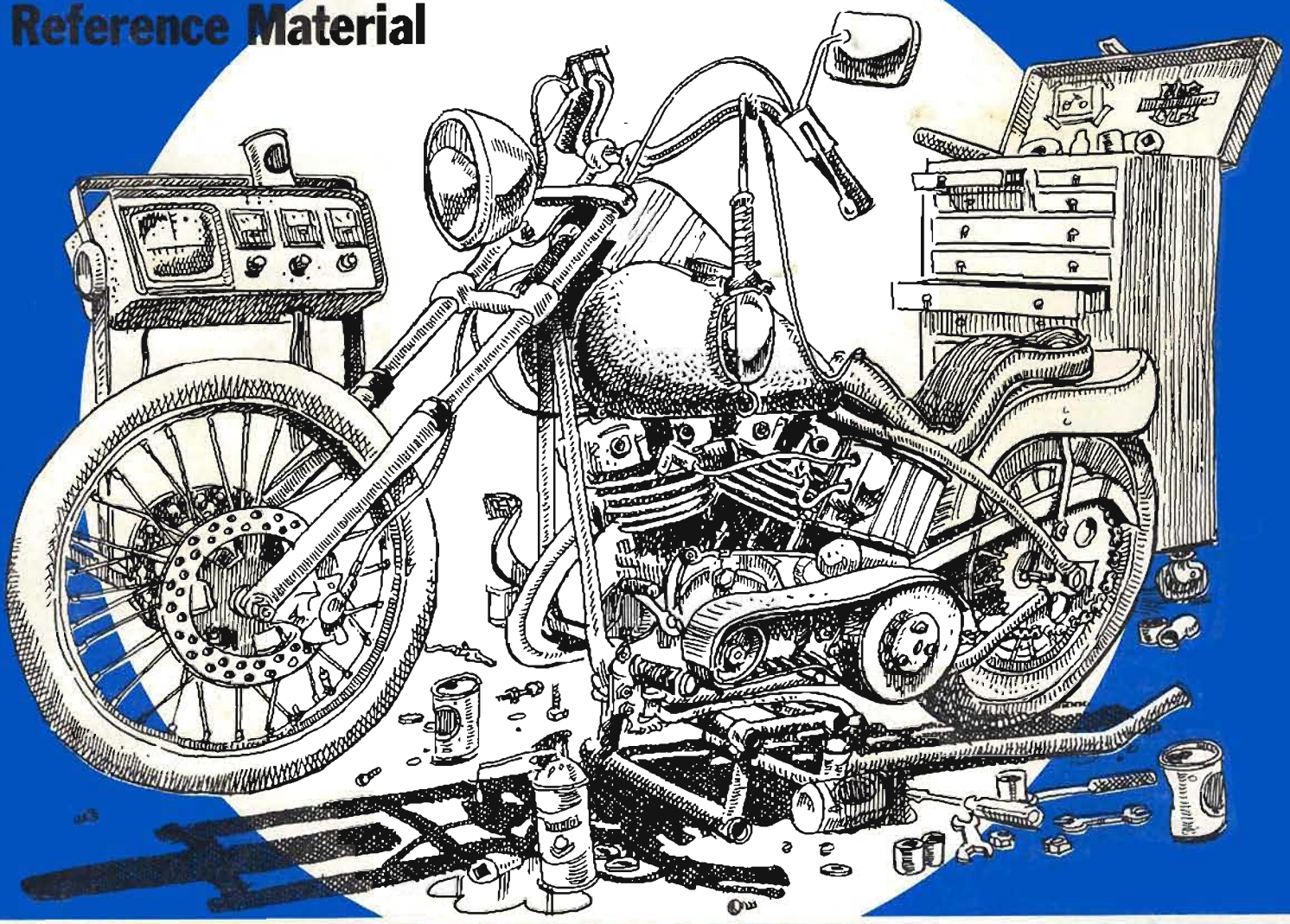
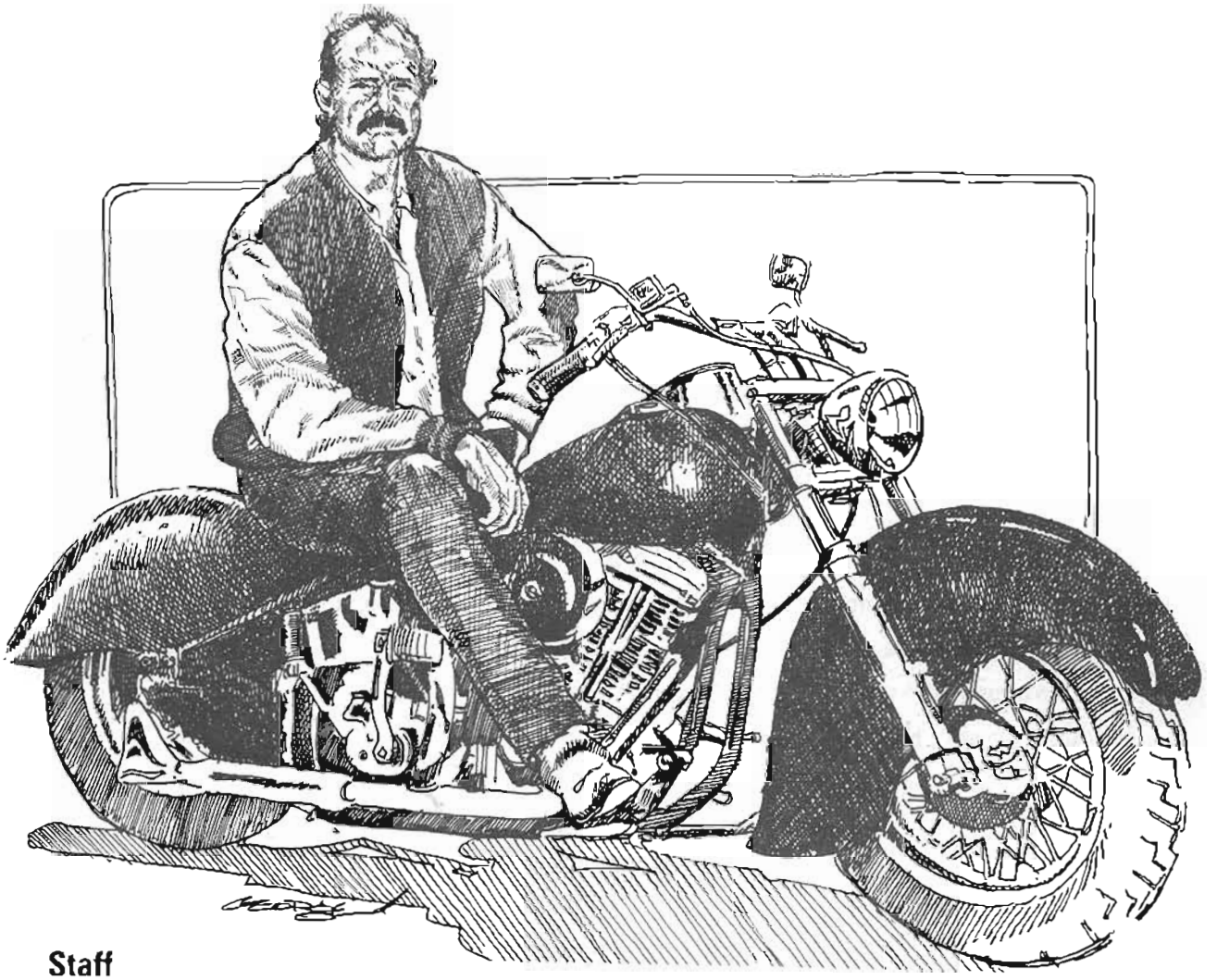


7 Years Of Technical Know-How From *Easyriders*

Shovelhead And Evolution Performance Info

Easyriders

TECH TIPS AND TRICKS, Volume II



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Special thanks to the staff of *Easyriders* and our great readers for the information that made this book possible.

Welcome

This here's our second attempt at a tech tip manual. The first one was a mess, but so many riders went for it, we decided to see if we could punch-out another one. Times have changed, though, and much of the basics were covered in the first edition. If, for some distant or remote reason, you can't find what yer lookin' for in this mishmash, try Volume I.

This book covers the shovelhead extensively with several hop-up suggestions, from turbos and strokers to nitrous installation and a basic Evolution power-boost proposition. We've got a couple of charts on plugs, tuning, and tires, and we've included a plethora of bullshit suggestions ranging from how to make a screwdriver magnetic to building a platform and how to make working on your bike easier. We're even showin' off stylish boot-lacing procedures.

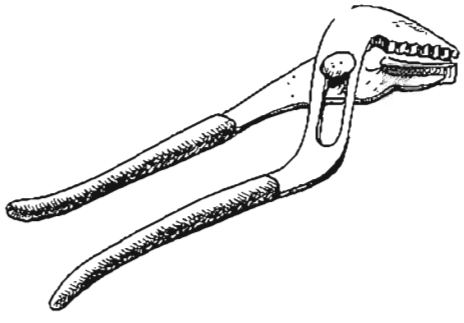
Maintenance? No one can hold a caliper to some of the service suggestions contained on this oil-absorbent toilet paper. Hell, there's stuff on how to adjust your carb, your chain, your tire pressure, your clutch, and your lifters. Upkeep's next with recommendations on tire use, wiring, belt drives, batteries, and oil bags.

Hell, this rag ain't half bad. Hope I can get a discount.

One solemn note. The brothers here in the garage decided to dedicate this to Hal Robinson (1928-1984), who painstakingly drew every illustration in the first volume and brought each article to life—there will never be another pen and ink artist like him . . . anywhere. He could make a bent bolt dance. We miss him. George Dilucca keeps the tradition alive throughout this book, though, doing one helluva job. His work shows tremendous respect for Hal.

Now get to work. Everybody's got to be on the road by the weekend!

—Renegade



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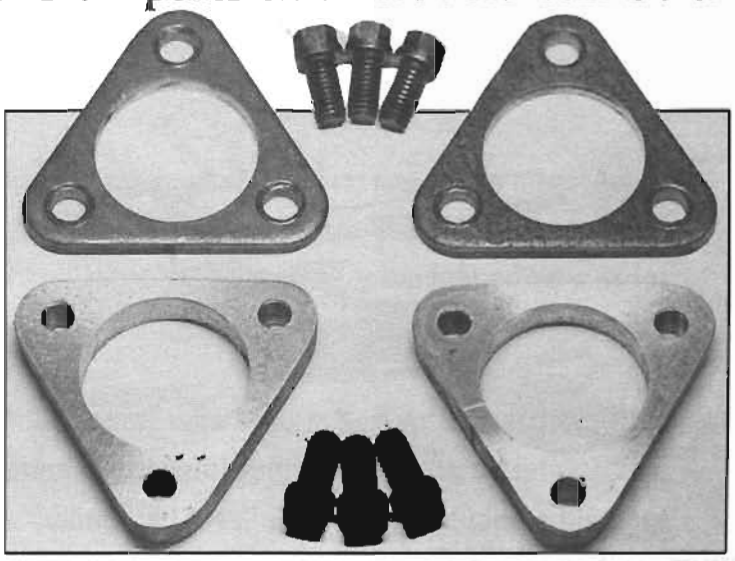
Exhausting Solutions

Keepin' exhaust in the pipes on pans and shovels can be a problem—until now



They say that Harley riders don't screw around when it comes to mechanical solutions. This is one helluva, heavy-duty example. Perry Kime at Flo Dynamics has been fixin' exhaust leaks for his brothers for decades. He got fed up with the tape and asbestos patch jobs. Wiring exhaust pipes to worn out manifolds is always a losing proposition. Studs that seem to fall out of shovelheads after a given number of miles, and never seem to get tight enough, are a constant drag. Besides the strain leaky exhaust can have on your mill, loose pipes are nothin' but trouble. So Perry applied some tried and blued automotive exhaust history to our American breed of bikes—the standard three-stud exhaust bracket system.

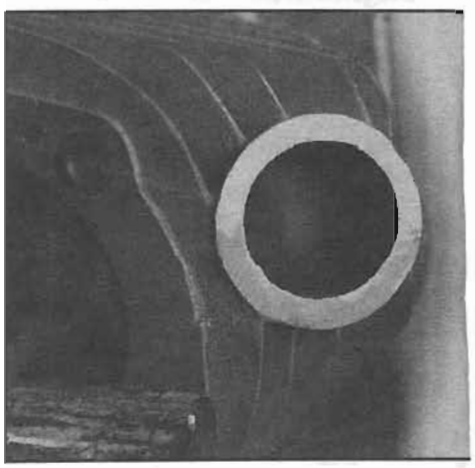
If you're in the midst of a rebuild, you can either send your heads to Perry, and have his experienced hands install these 356-grade alloy flanges (hardened for maximum strength and weld ability), or you can buy one of his kits—with templates for modifications, and complete, detailed instructions. The flanges may be welded on by a qualified welder with experience in aluminum castings, using a Heliarc machine *only*.

Following are excerpts from his instructions to give you the basic requirements for installing the Flo Dynamics kit.

Preparation of Panheads

Heads must be clean and free of oil and carbon especially in the area to be welded. Remove existing spigots with a hacksaw. A disc grinder can be used to finish the cut cleanly (see photo A), with grinder-roughed casting approximately ½ inch into the port. At a 45-degree angle grind a ⅛-inch area at the edge of the inside of the port for welding.

The next step requires a short, straight piece of 1 ¼-inch pipe approximately 4 inches long. Now take one flange assembly and line it up on the head, then insert the short pipe and hammer it in slightly. It will hold the flange in line. Check to be sure that the flange is flush against the head. The flange should rotate freely on the pipe. The location of each flange is important. Using a square on the rear head, line up the flange at 90 degrees to the head surface with the blue line on the 90-degree side of the flange as seen in photo B. Before welding, all areas to be welded should be roughed with a grinder, especially if the head has been glass-beaded. A short area on each flat side of the alloy flange must be welded first. Tack one side securely and check to be sure the flange is flush with the head. It may be necessary to use a hammer to make adjustments before completion of all three tacks. Now remove the short pipe and the steel flange and you are ready to finish welding. Perry's instructions recommend 200-plus amps for adequate penetration. The puddle should be approximately ½-inch wide on the inside of the flange and ¼-inch wide on each flat side of the outside flange. After the welds cool (naturally) it may be polished lightly.

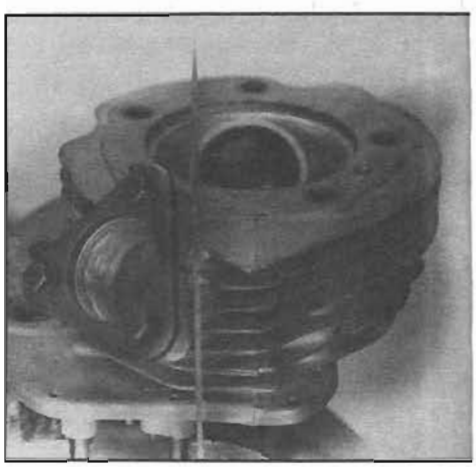


Location of the flange on the front head is done with the square as seen in photo C. Line the square up across the valve guide holes and the flange parallel to the head surface with the blue line against the square.

The preparations for shovelheads are identical except that there are no spigots to remove. His instructions go on to explain some minor clearance needed for the cylinders and exhaust pipe installation for both pans and shovels.

This isn't a lightweight modification, and the end result is a somewhat bodacious exhaust manifold system—but it works and is substantial enough to hold for years to come. It better work after you're forced to build a custom exhaust system and have it rechromed. For more information on either the $75 kit or the $150 service to have the flanges installed ($25 cleaning charge, if necessary), write Perry at: Flo Dynamics, 1150 Pike Lane, Oceano, CA 93445 or call (805) 481-6300.

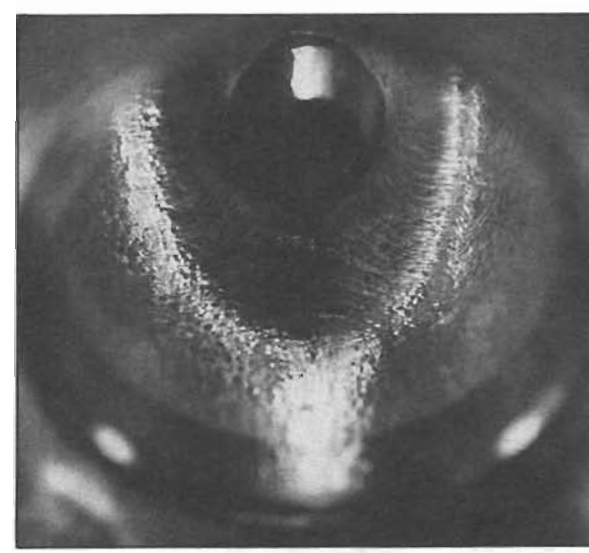
—Wrench

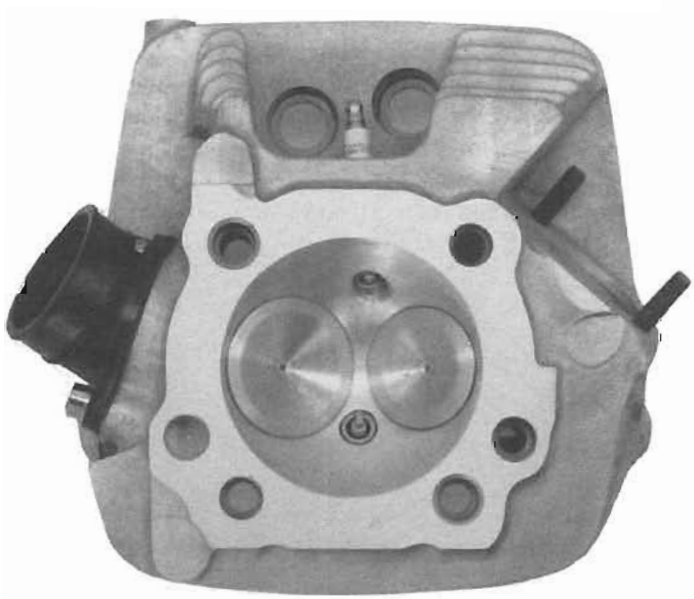


Go with the

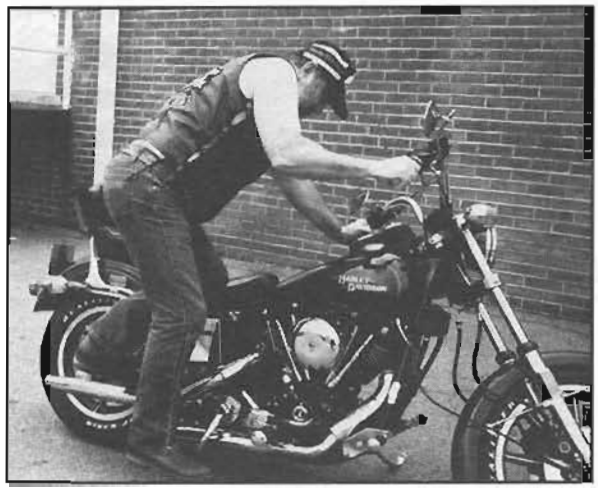
FLO DYNAMICS

After years of research and development we are pleased to announce a major breakthrough in the Hi Tech world of volumetric efficiency. This new "Tooled Finish" in the ports has increased the atomization significantly over the previously used polished effect. Along with our flow bench technique, increased flame travel and complete burning of the fuel, we can guarantee you more horsepower per dollar than anyone in the cylinder head business today. Our latest test case has achieved some amazing results: a 1989 Evolution 1340 with factory CV carburetor, a Crane cam and drag pipes. We did the heads with





all our trick stuff and topped it off with our dual plug ignition kit. After all the tuning was completed, using premium unleaded gasoline the cylinder head temperature was down by 20 degrees, detonation was completely gone, no plug fowling or hard starting, and the gas mileage was up. The motor pulled extremely hard through the entire RPM range. Dyno tests indicate consistently over 25 percent increase in horsepower at 5500 RPM. For technical info and prices on our headwork for your Harley Davidson contact FLO Dynamics, 1150 Pike Lane #2, Oceano, CA 93445, or call (805) 481-6300.



GARY'S "FIX-IT" FORUM

Did you ever wonder why some people have to buy a new BATTERY every Spring, while others seem to make theirs last forever? Like most things, BATTERIES last alot longer if you take care of them.

The most important things to look for are; **1.** Be sure to check the electrolyte level every day - if the level gets low in a short period of time, you may have a charging problem; **2.** Keep the BATTERY clean and free of dirt - especially around the terminals; 3. Keep the over-flow tube free of kinks or dirt build-up and be sure it stays attached to the battery; **4.** Your BATTERY cables have to be kept in good condition; **5.** When storing your bike for over 4 weeks, you need to get a BATTERY trickle charger to keep the **BATTERY** charged - it will discharge at about 2 amps per month.

With a little maintenance, you can save your BATTERY and your money.

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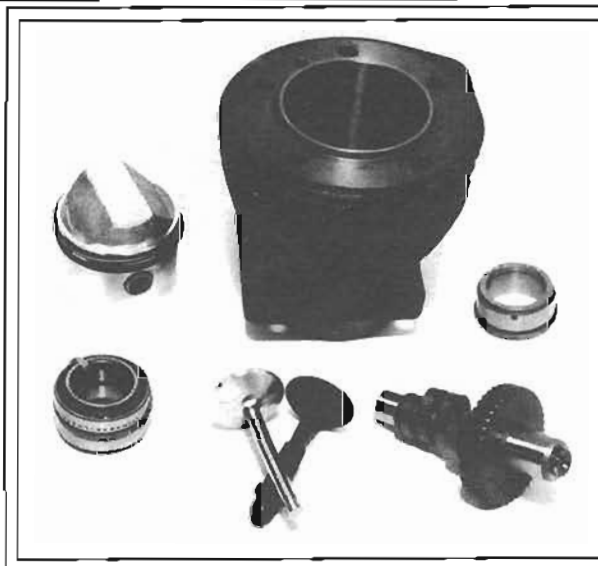

ENGINE PARTS FROM GARY BANG

If you've ever been out on the road, far from home, and experienced a motor problem, you know the true meaning of the word anxiety. You might not even be close to a franchised dealer, so it might not even be a matter of getting a factory part- you may be lucky to get the part to fix the problem period!

GARY BANG stocks a complete line of our own quality-tested ENGINE PARTS that are available to franchised and independent **DEALERS** throughout the U.S. and the world. And we can ship parts to any of our **DEALERS** fast.

GARY BANG has a 21 year tradition of providing a quality alternative to the original equipment. And we back it with our "Satisfaction Guaranteed" policy.

The next time you get in a tough spot with your motorcycle, think of **GARY BANG** first. We can get you going again fast.

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30062

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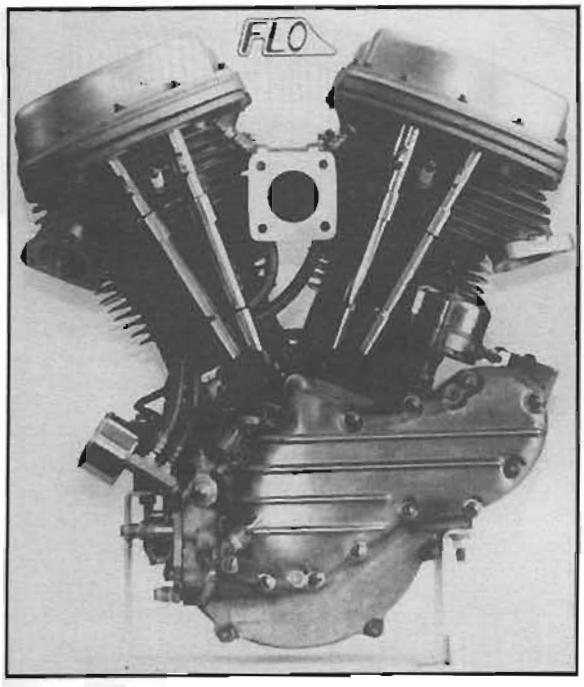
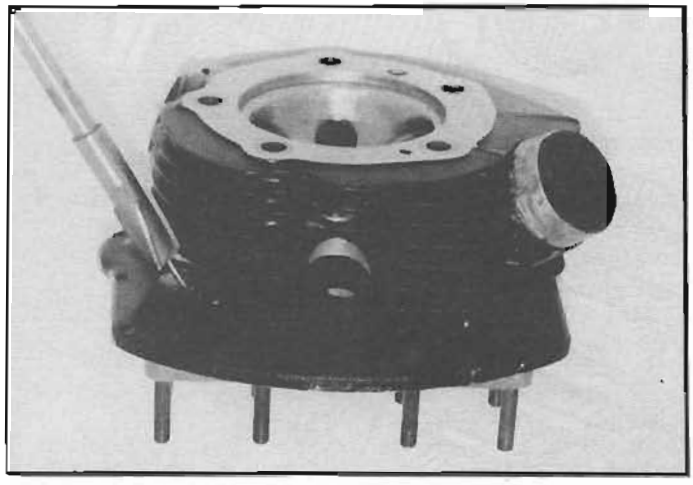
Tin Head Savers





Photos by Harry Kime

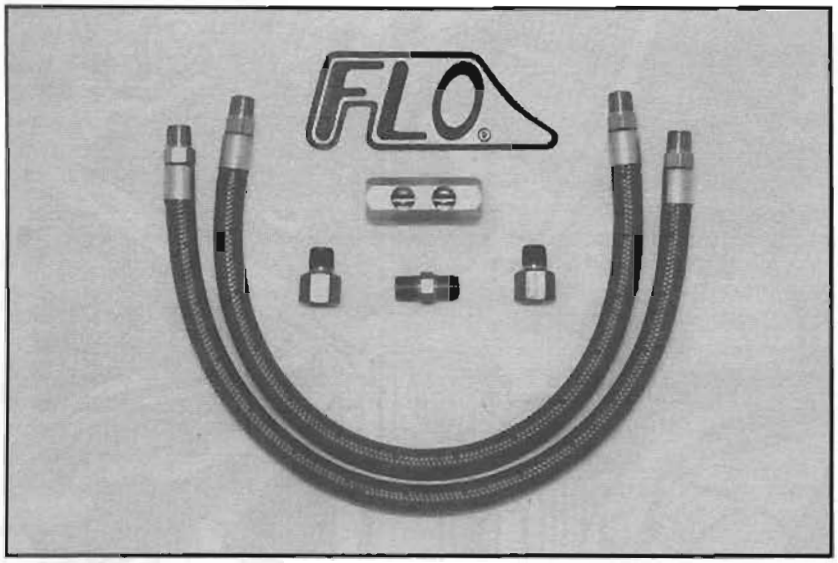
I used to eat heads on my panhead every six months, whether I needed to or not. Even after installing a late-model oil pump, 'bout six months would pass and a terrible squealing noise, like squeezing a rat's tail in a vise, would begin singin' inside my tin cans. After yankin' the head an pryin' the lifter blocks apart and generally replacing everything, six months later the next one would go. The extensive flip-flop maintenance got old, and I ultimately ran outside oilers.

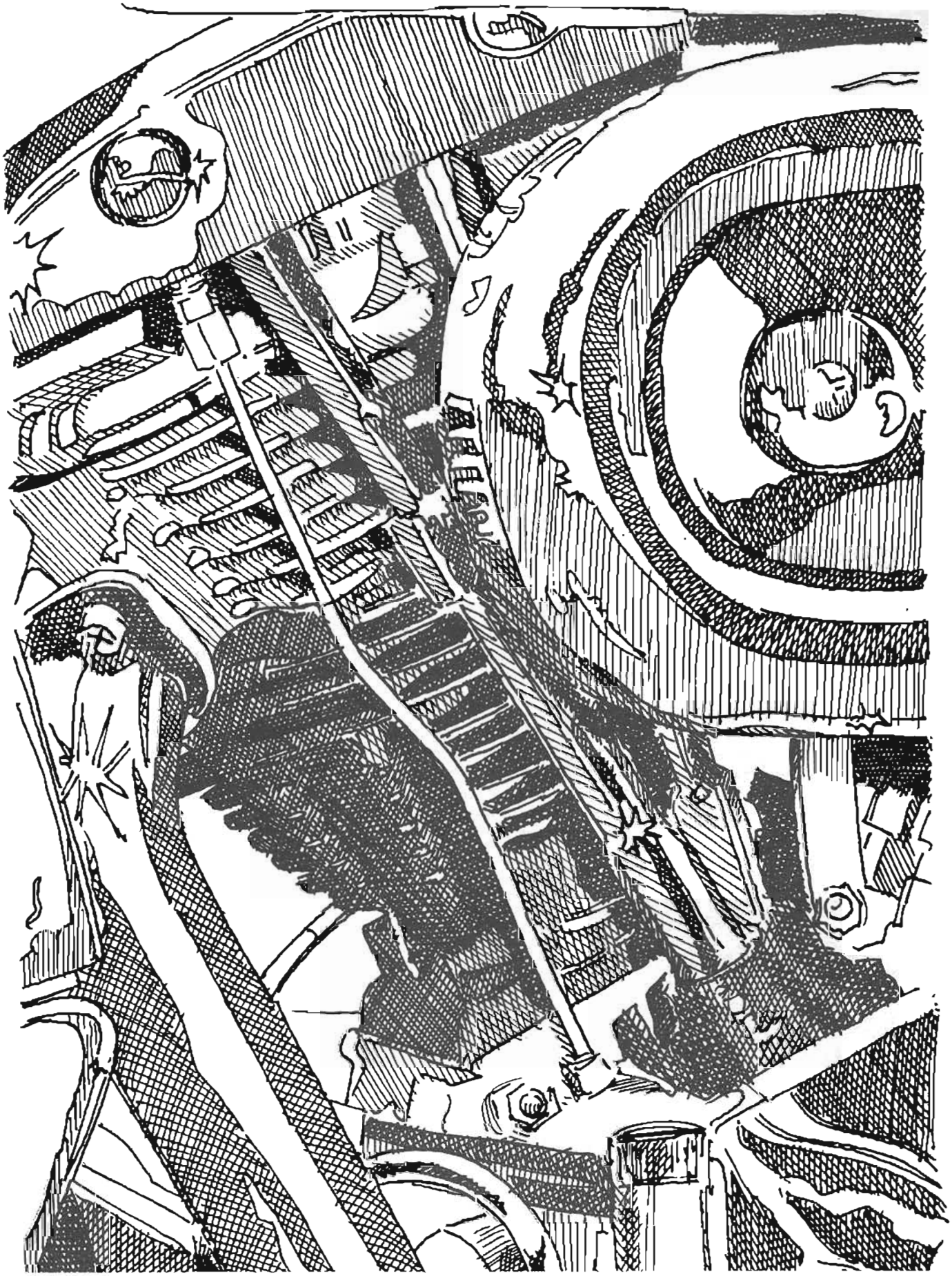
Now there's a kit developed by Perry Kime at Flo Dynamics in Oceano, California, specifically designed to save '48 to '60 panheads from an oiling system that routed the 60-weight through the cylinders directly adjacent to the combustion chamber, frying that slippery shit, until when it reached the heads the temp reached 100 degrees above the oil in the tank, and the viscosity dropped to less than 10-weight. After it destroyed the heads, this bronze-flaked oil returned to contaminate the oil in the tank.

Flo Dynamics designed the hoses, fittings, and machining procedures to install this outside oiler system for $150. The oil manifold (2024-T4 aluminum) for number four steel-braided oil lines (tested to 150 pounds) is designed to give the heads enough oil without flooding. Special jigs and fixtures were designed to drill and tap the heads, so they can guarantee this process will double the life expectancy of your valves and guides.

If squealing rocker arms and bent pushrods aren't your bag, you may want to ship those heads to Flo Dynamics (1150 Pine Lane. #2, Oceano, CA 93445) for a week and clean out your metalflake oil bag.

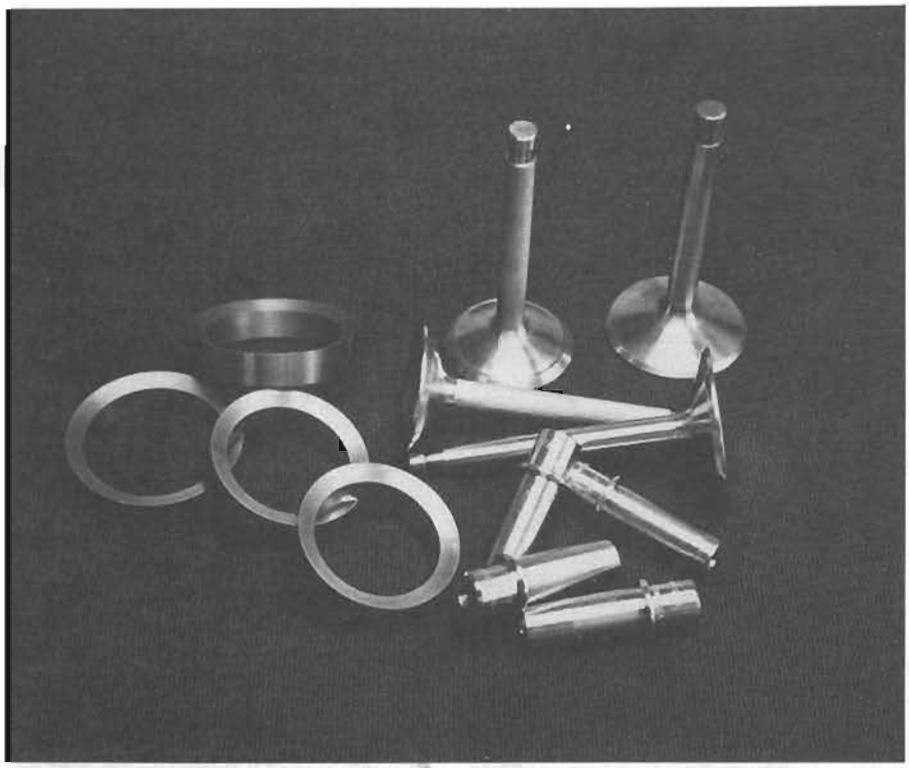
— Weed





Shovelheads: Making 'Em Last Part 1

By Joe Minton



These valves, seats, and guides from Branch Flowmetrics are made of the best modern materials. They will more than double the life of a shovelhead valve job.

There was a time when shovelhead engines were getting cammed, carbureted, piped, ported, and stroked all in the search for more power. Long life wasn't all that important. If ya got a bit carried away and broke something, well—there were more parts down at the Harley shop. That has changed. The shovelhead has been officially obsolete for six years now, and parts are beginning to get scarce. For instance, at the time this was being written (6/89), Harley had no cylinder heads for shovelhead engines.

Then too, Harley-Davidson's Evolution engine is far more advanced than shovelheads are. The Evo engine is smoother, cooler running, and stronger. It will make more power with a cam, new pipes, and a hot carb than you can get from a ported stroker shovelhead, and it will last longer. The Evolution is the largest single engine-improvement Harley has made in 50 years.

The success of the Evo engine has moved shovelhead-powered Harleys into the "keeper" category. More and more of us are returning our shovelhead engines to stock specs. We've gone from trying to make them fast—to making 'em last.

In this first segment, we will deal with getting maximum reliability out of the top end of the shovelhead engine.

You can build your shovelhead so that it will last many, many miles and make excellent power, too. Actually, you can make it better than it ever was originally. Near the end of its shovelhead production, Harley made parts changes that dramatically reduced oil consumption. They also improved ring and valve life. Those parts can be fitted to most any shovelhead. Also, there are some aftermarket pieces that are better than stock.

Lead-free gasoline has caused considerable anxiety among shovel owners. The rumor has been that the old valve seats would wear very rapidly when used with lead-free gasoline. The rumor was only about half right, but lead-free running is an issue and something can be done about the problem.

Many shovelheads have had their hydraulic tappets converted to solids in the attempt to get better cam action and more power. While solids may take advantage of more agressive cams, they also make more noise. Then too, those aggressive cams often result in high wear rates. More moderate, high-quality cams together with hydraulic tappets will give a wider powerband, quieter running, and much longer engine life.

PISTONS & RINGS:

Stock factory pistons are very good. They have skirts shaped so that they become round and fit the cylinders properly when the engine is running at normal operating temperature. Most aftermarket pistons do not fit as well at running temperatures and often have to be fitted rather loosely (.004-.005 inches). Such large clearances result in piston-slap and somewhat shorter life.

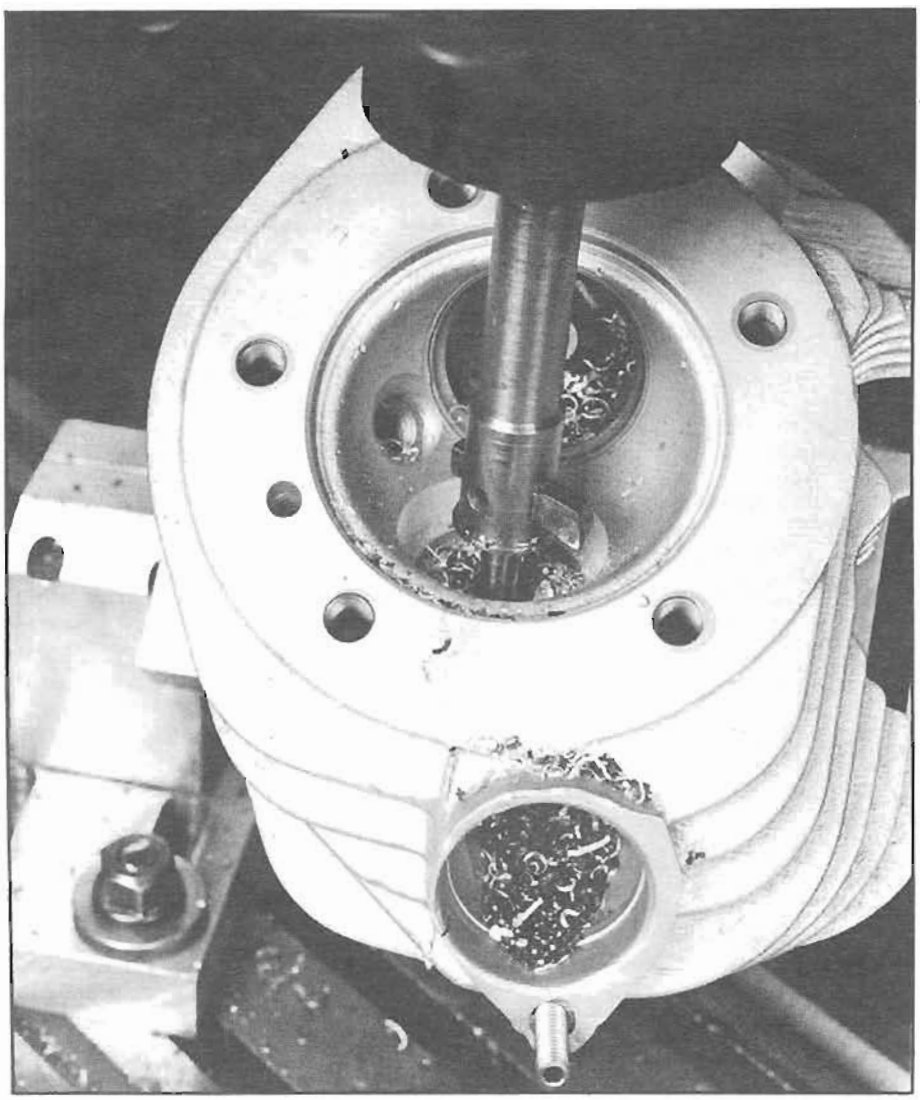
The shovelhead's semi-hemispherical combustion chamber shape isn't the best for today's unleaded gasolines and they have a tendency to detonate as a result. We could get away with high compression ratios back in the days of high-octane leaded gasoline, but no more. If you try to run 10-to-1 these days, you stand a good chance of detonating the tops right off your pistons. Lower

compression of 8-to-1 or so will allow you to run almost anything that'll burn. High compression will add a small amount of bottom-end power but you might have to use aviation gasoline to keep your engine together.

Near the end of the production life of the shovelhead (1982), Harley started using a piston ring set that did a much better job of oil control. That ring set (p/n 21920-83 for the standard size) will fit stock shovel pistons and you should use it.

Along with the new piston rings, the factory started fitting valve guide seals to their new cast iron guides to counteract a problem with excessive oil consumption. It seems that the shovelhead doesn't drain oil from the top end very well. Oil will collect in the rocker boxes and the level will rise above the top of the guides. When this happens, oil will get sucked into the engine between the guides and the valve stems.

When the new guides and seals are combined with late-vintage piston rings, typical oil consumption will be reduced from about one quart per every 500 miles to one per quart per every 1,500 miles. More importantly, the engine will run better. Plugs will last longer, the tendency to detonate will be reduced, and the pistons will stay cleaner.



Photos by Joe Minton

In this operation, Don Smith machines the old seat out and cleans the hole in preparation for the new valve seat. It is an exacting procedure best done by an experienced Harley machinist.

VALVES & SEATS:

The leaded gasoline we used to run had lubricating properties. The lead compound would plate out on the valve seats and act as a lubricant between the valves and seats. The life expectancy of the older shovelhead valves and seats is roughly halved when the engine is run with lead-free gasoline.

New, harder and longer-wearing valves and seats are available, from Harley and other sources. The Motor Company's valves (intake p/n 18075-81, exhaust p/n 18086-81) are very durable. However, these valves are nitrided and cannot be ground. Thus, if they ever do wear, you'll need to replace them. Harley's valve seats (intake p/n 18018-66, exhaust p/n 18017-66) are made of the latest lead-free material. The only possible problem with the factory valve seats is that they may not be large enough in diameter to fit a worn head.

New valve seats are difficult to install and should be inserted by a machinist with specialized tools and experience. We have three sources you can depend on. There may be a reliable shop near you that can fit seats, guides, and do a proper valve job. If not, consider one from our list.

Harley-Davidson itself overhauls shovelhead heads. They will fit their lead-free seats, valves, guides, seals, and springs. The complete factory overhaul will cost approximately $200 per head, when shipping costs are included.

There are some important limitations with the factory work, though. You will not get your original heads back; they are overhauled on an exchange basis. There is nothing wrong with their practice except that it results in a very high rejection rate. If one of your heads has a broken fin or

a gouge, it will be rejected. The factory is not in a position to fit oversized seats. If one of your heads needs a large-diameter seat, Harley will not be able to help you. Also, the Harley-Davidson overhaul service can take several weeks.

Jerry Branch of Branch Flowmetrics and Don Smith of Gordon's Motorcycle Madness both have an overhaul service that's somewhat more versatile than the factory's.

Branch is best known for his porting service but does a brisk business in head-overhauls as well. Branch will fit lead-free seats for $35 each. He also fits iron or Amco-45 valve guides for $9.95 each plus $6.00 each for installation. His stelite-tipped, chrome-stemmed valves run $24.95 each for intakes and $25.95 each for exhaust valves. Branch valves are made from the same material Cosworth used in their Formula I engines and it has proven to be almost indestructable. A Branch spring set, including alloy retainers, costs $45.50. Overhaul labor is $50 per head. The real bargain from Branch is the port work. For an additional $135 he'll port and polish a set of shovelheads. A complete job runs about $384 for parts and either $100 or $235 for labor. If you choose to get your heads done by Branch, you should go ahead with the port work. A Branch-ported shovelhead will make a lot more power without radical cams or other high-stress parts. It'll also run smoother and be more responsive.

Branch needs three to eight weeks for his overhaul service. The longest delay will be between November and June when his shop is loaded with head work.

Don Smith of Gordon's Motorcycle Madness also does complete head overhauls, much of which is custom. Don can fit seats and valves to just about any set of Harley heads, even if he has to weld them back together first. He uses the latest lead-free seat material from the Martin Wells Company, the same source as Jerry Branch and, I believe, the Harley factory use. Anyway, the material is first-rate. In addition to the 6 thousandths/inch interference fit between the seats and head, Don crimps the head material over the seat to make sure it will never come out.

Smith will fit either Manley or Precision Machine valves. He has used both for years and they have shown excellent reliability and low wear rates. He charges $40 each for valve seats installed. He will remove and replace valve guides for $6 each plus the cost of the guide. Like Branch, Don will fit either the good factory iron guides or those made from Amco-45 bronze. He will make oversized valve guides on a custom basis if a particular head has need of them. A valve job will cost another $30 for both heads. Glass beading is an additional $20.

Much of Don Smith's work is on older heads and he has learned much about reconstruction as a result. A head overhaul will be turned around in a maximum of two weeks' shop time. He does very nice work.

DETAILS:

Rocker arms should have all but a thou or so of their end play shimmed out. Some of the rattle common to shovelhead top ends is simply the rockers sliding back and forth on their pins. Evolution engine rockers are a snug fit in the rocker carrier and they don't rattle.

Make sure all gasket surfaces are flat. Careful use of a large and a medium-size, single-cut mill file can be used to remove burrs from cases. A piece of 320-grit, wet-or-dry sandpaper and a large piece of plate glass can be used to flatten heads and rocker boxes.

If you use a silicone rubber as a gasket dressing, be *very careful* about how much you use. Silicone rubber will clog oil passages and could cause your newly overhauled engine to melt down.

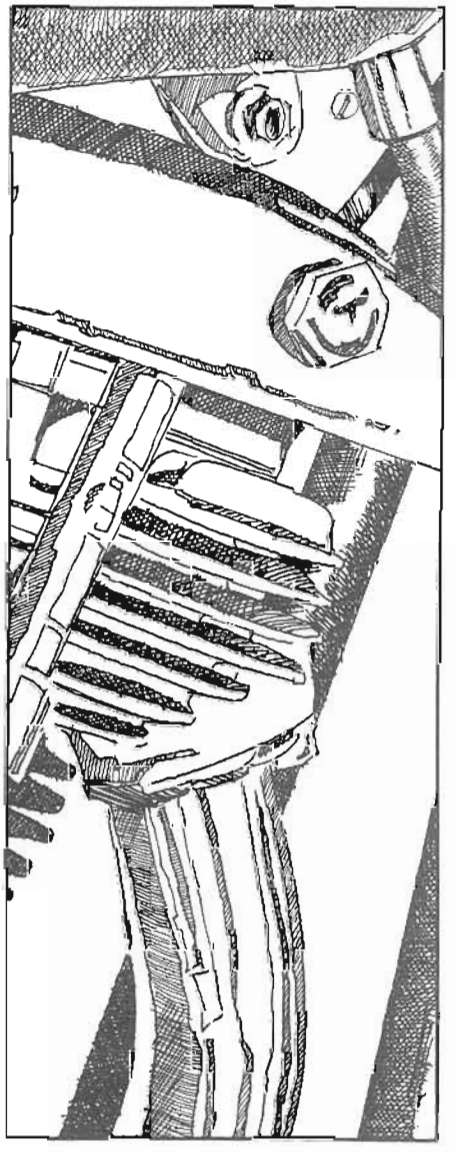
Ten years ago, an average shovel top end would need some serious attention about every 20,000 miles. A shovelhead top end built with the parts recommended will last a very long time—perhaps 50,000 miles.

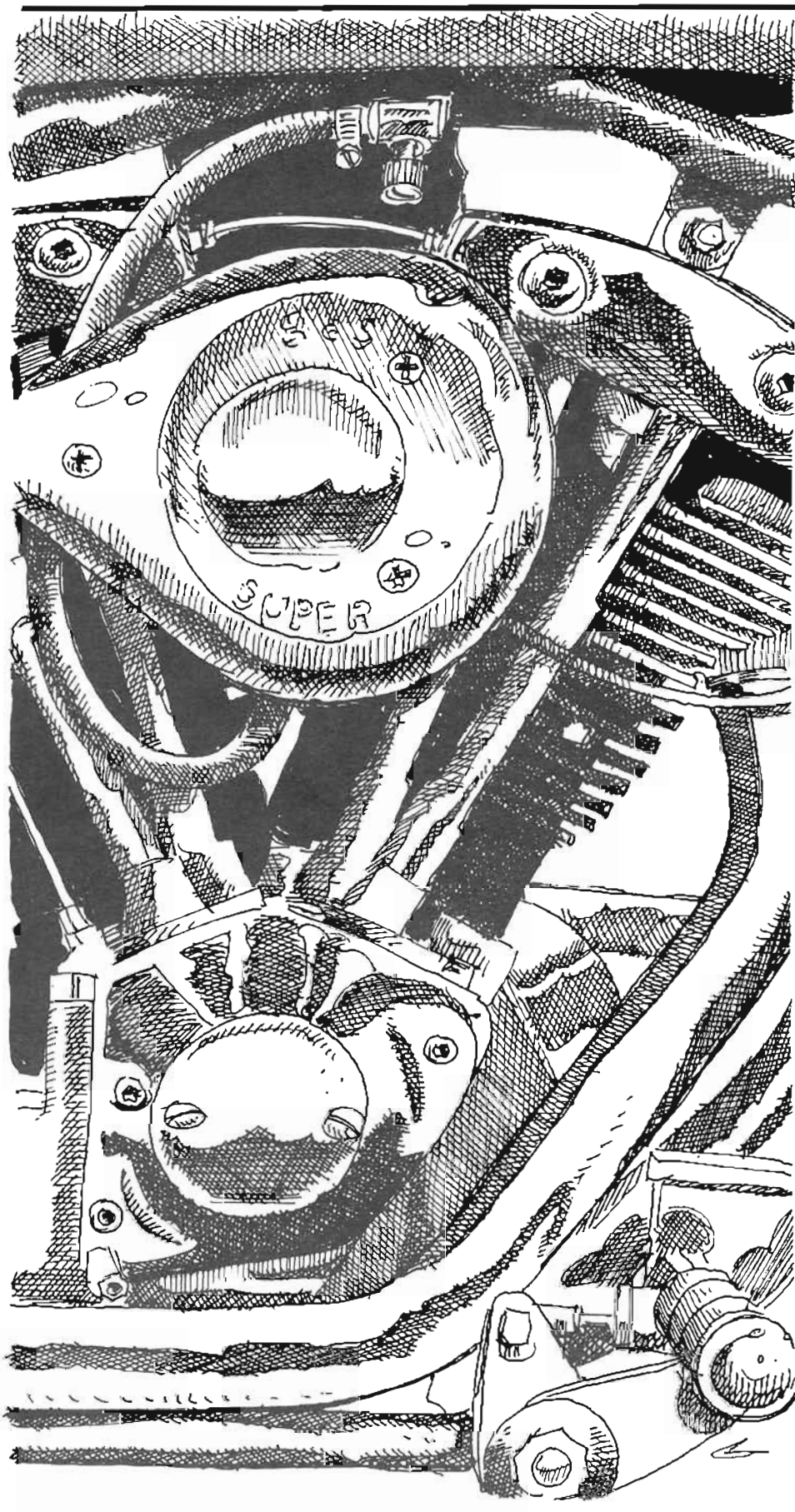
SOURCES:

Branch Flowmetrics
5556 Corporate Dr.
Cypress, CA 90630
(714) 827-1463

Gordon's Motorcycle Shop
1586 Morse, Bldg. 1
Ventura, CA 93003
(805) 642-3525

Harley-Davidson Motor Co.
3700 W. Juneau
Milwaukee, WI 53201
(414) 342-4680 ■





Shovelheads:

by: J. D. Chandler

Last month we published the first of several shovelhead engine articles. That first article dealt with the top-end, including pistons, valves and cams. This second article will cover the crank, oil pump and ignition. Our goal with these articles is to help you build a good-performing, quiet-running shovelhead engine that will last.

Long life has become a more important consideration. With that understanding, we have chosen parts that have proven themselves to be reliable and long-lived.

INSPECTION:

An important and often-overlooked part of any overhaul is inspection. Parts, including cases, that have been run long and hard can develop cracks that cannot be seen with the eye alone. Aluminum parts like cases can be inspected using a penetrant dye kit you can find at an aircraft supply store or can get through a Snap-On Tools dealer. These kits are easy to use and might save you some grief later.

Magnetic (Magnaflux) inspection is the best way to make sure steel or iron parts are free of cracks. This service requires special equipment and you will have to find someone with those tools and the experience to use them.

If you are rebuilding a well-used shovelhead engine, you really should get everything looked at. By the way, even new parts can be cracked. Consider it.

CRANKSHAFT:

Harley-Davidson has made important improvements in their crankshafts in recent years. Unfortunately, those

Making 'Em Last Part II

improvements came along after the shovelhead engine was out of production. There is nothing wrong with stock shovel cranks; it's just that there are better parts available from other companies.

Shovelhead flywheels are made of cast iron which can sort of wear out after a few rebuilds. Evo wheels are made of forged steel and the latest versions have one-piece wheels and spindles, making a three-piece crank compared to the shovelhead's five-piece crank. The tapered holes in the cast iron wheels will expand and make it difficult to get a really rigid and straight crank. A shovelhead that gets run hard can actually make its crank go out of true because the relatively soft iron wheels will deform and lose their grip on the tapered shafts and crank pin.

Although best known for their stroker kits, S&S Cycle has been making stock replacement forged steel flywheels for several decades. They also make high-strength rod assemblies and high-quality spindles. In fact S&S can furnish complete crank assemblies for nearly any Big Twin ever made.

Most mechanics would rather build a crank using S&S wheels than the stock iron ones. The steel wheels are more rigid and make it much easier to build a straight crank.

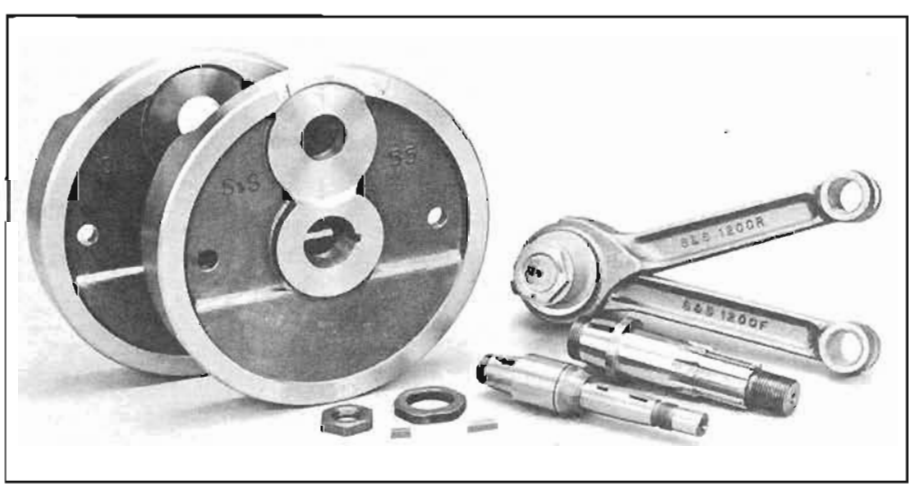
When you replace connecting rod bearings, including the pin, be careful about what you get. Stock factory parts are quite good, as are those from S&S. However, there have been some sub-standard crank pins circulating. Be careful.

If you do not have an experienced Harley engine man around to build a rod set, you might consider buying a fitted set from either Harley or S&S. Rod bearing set-up is critical and requires considerable skill. Just having the equipment isn't enough. Like I said, be careful.

How smoothly your engine runs depends more on the crankshaft than any other single engine sub-assembly. If the crank is crooked or out of balance, the engine will vibrate. There are tolerances for crankshaft straightness. Always try to hit the lowest numbers. The straighter the crank, the smoother the engine.

Crank balance—the proportion of ballast weight added to the crankshaft opposite the reciprocating mass of the piston assembly plus half of the connecting rod weight—is somewhat controversial in that not everyone agrees what the balance factor of a Harley Big Twin crank ought to be. For instance, Evolution cranks are balanced to 60 percent by the factory. (In other words, a weight equal to 60 percent of the combined weights of one piston assembly plus half the weight of the connecting rod is added to the crankshaft, on the side opposite the connecting rod and piston.) Engineers found that the rubber-glides liked 50 percent but the rigid-mount Softails ran better at 60. Since rubber glides are smooth no matter what, Harley balances all their engines to 60 percent to accommodate the rigid-mount bikes.

Many, many engine builders use 49- to 52-percent balance factors for shovelheads. Others, including S&S Cycle, have settled on 60 percent. The lower number tends to produce more high-frequency vibration which is harder to live with. The lower frequency vibes of the 60-percent crank are generally more tolerable.

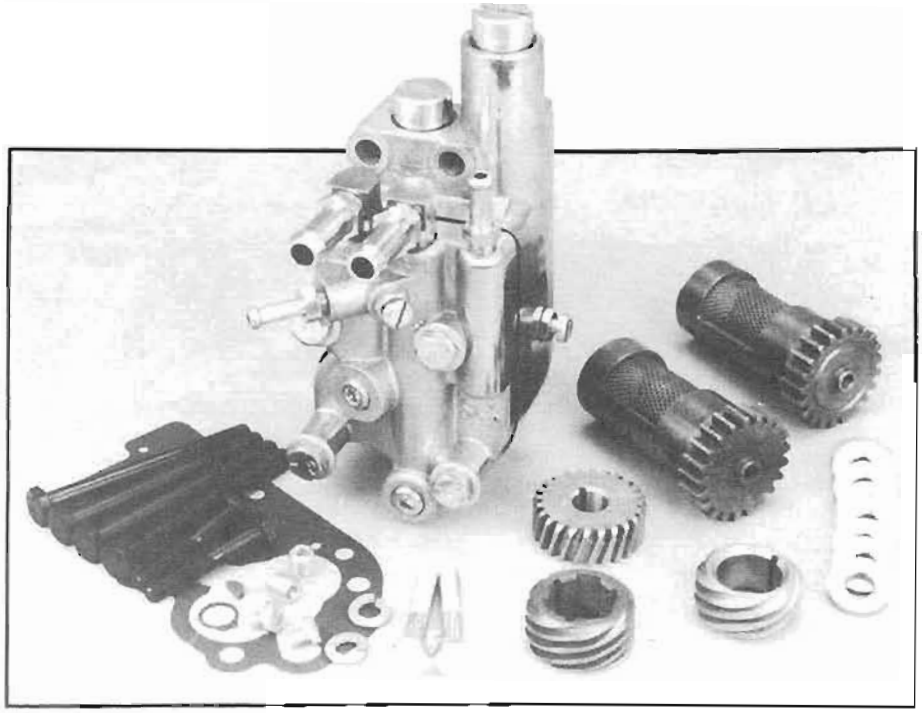


The same only better. The S&S flywheels are forged steel, and the spindles and connecting rods are stronger than stock components. These parts will build up into a stronger and longer-lasting crankshaft. They are at least as good as the latest factory shovelhead parts and much better than older ones.

OIL PUMP:

Shovelhead oiling systems were improved several times over the life of the design. The last pump, still used on the Evo motors, has a 33-percent greater oil delivery capacity than the early cast-iron pump did. This late (1981 and later) pump can and should be fitted to earlier shovelhead engines.

Late-model pumps aren't always available as assemblies from H-D, so a couple of companies have made their own. Both Custom Chrome and S&S Cycle can furnish late-style o.. pumps as well as a special drill fixture and instructions needed to install them on earlier shovelhead engines. S&S has had their version on the market for more than a year, and has sold a large



Photos by J.D. Chandler

The CCI oil pump is made in the same factory as the S&S unit is. Both are high-quality units. While S&S has more applications for their pump, the CCI pump is better-looking with its smooth lines and chromed finish. CCI's pump is a quality replacement for the expensive stocker.

number of them with no problems.

Both S&S and CCI pumps are well made but there are differences between them that you may find important. The CCI pump has a smoother shape and is chrome-plated. S&S does not chrome-plate their pumps and, indeed, warns against your doing so. S&S has gone to the trouble of producing six versions of their pump kit. The various kits will cover engines from 1936-vintage to the present.

Both the CCI and the S&S oil pumps cost only slightly more than half as much as a factory pump.

IGNITION:

Most shovelheads run on non-electronic, points-type ignitions. There's nothing wrong with that. The purely-electromechanical ignition has many advantages; it also has some important limitations. However, H-D's late electronic ignitions work a little better and are more reliable. Let's compare these two basic ignition systems.

Points-type ignitions have a couple of clear advantages: first, they can generally be repaired on the side of the road, with hand tools. Second, they don't cost as much. You can buy a complete advancer, points plate and points set from CCI for about $45. The stock Harley (electronic) black box will run you $153, and, you'll also need the $120 sensor plate!

Points ignitions have some disadvantages, too. First, they need constant attention. From the time you clean and set them, they will deteriorate in performance. Second, the advance mechanisms wear rapidly. That wear results in erratic timing and an unreliable advance-curve.

Current stock (Motorola) electronic ignitions have their strengths and weaknesses too. First the advantages: once timed, they stay timed. Period. The advance never changes because there is no mechanical advancer to wear out. If used with the latest high-performance Harley or Andrews Products coil, the electronic ignition will give a hotter spark.

Now for the disadvantages: if the box or sensor plate fails, you're parked. Sandpaper, pliers and screwdrivers won't help. A conversion to factory electronic ignition costs a bundle. The box, sensor and a coil will run something over $300 whereas a similar points set-up will cost under $100.

In my opinion, the electronic ignition as often as points do. They work better by providing a hotter spark and much more steady timing. While the points system can often be fixed on the side of the road, it will generally put you there in the first place because of its high wear-rate.

A word about sealants. There may be as many opinions about what sealant to use as there are engine builders. The silicone rubbers work but one has to be careful not to use too much, as the stuff can get loose and plug-up oil passages. Harley sells a Rolls-Royce product called Hylomar. Hylomar stays soft, and does not glue gaskets or cases together. It works well and I have used and preferred it for many years. Copper Coat and Gasgacinch work too.

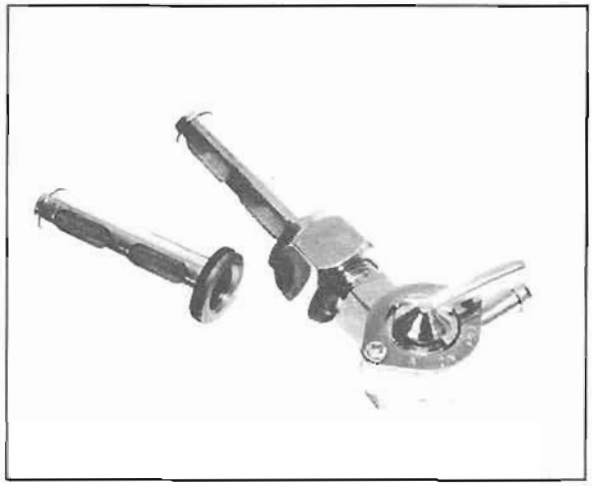
More important than what sealant you use is the finish of the parts you put it on. Everything needs to be smooth and flat. A large flat single-cut mill file is wonderful for getting the bumps off of heads, cylinders and cases. Use caution of course but spend the time to make sure the parts really fit together closely.

There will be some of you who choose to restore your shovelhead engine to factory specifications and we applaud that. After all, if some of us didn't keep our bikes stock, future Harley enthusiasts wouldn't have any idea what a factory shovel was. If, though, you want to go on riding your shovel, you should consider making improvements as you rebuild it.

A carefully built shovelhead engine, put together with the latest and best parts, will last longer than they ever did while still in production. Harley may have stopped building shovelhead motorcycles but other manufacturers have continued to improve the parts. You can actually make your motor better than Harley did.

Over the next few issues we will continue to cover, in detail, the major shovelhead motor parts. Also, we will talk about how these parts work. We will discuss hydraulic and solid tappets, their advantages and limitations. We'll take a look at engine bushings, breathers and rocker arms. An engine must stay clean inside if it is to last. Good air filters keep dirt off of the cylinder walls. Effective oil filters separate hard wear-particles from the oil and the moving parts. We'll take a hard look at both filter types.

There are many different shovelhead engine parts on the market, and it is sometimes tough to pick and choose. Our goal is to print information which you can use, to select the most appropriate pieces for your shovelhead motor. We want to help you keep these babies running for a long, long time. ■



GARY'S "FIX-IT" FORUM

When was the last time you looked at your PETCOCK FILTER (No, we're not talking about those cheap condoms you've been buying)? These are the filter screens that are inside the gas tank on your motorcycle.

These FILTERS are prone to blockage when motorcycles are stored during the winter from rust flaking inside the tank. It's easy to check these FILTERS - Drain the tank (always be careful draining gas), get a flashlight and inspect it, or remove the petcock from the tank and inspect the whole assembly.

This is also a good time to replace your fuel lines if they're hard or cracked, and be sure to use teflon tape to reseal threads if you took the petcock off the tank.

If you've been experiencing a fuel starvation problem, this is a good place to look before your take your carb apart!

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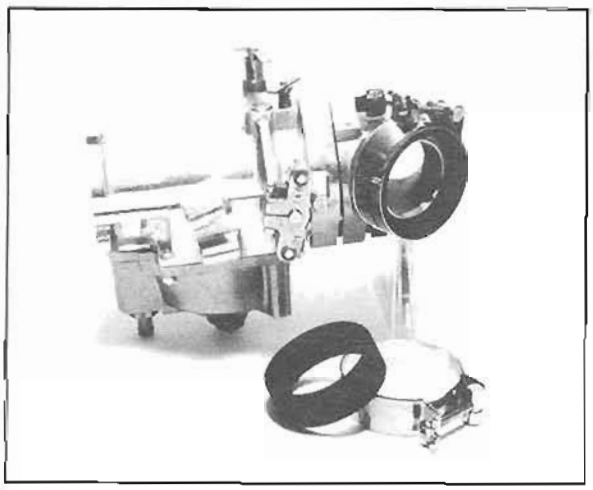

GARY'S "FIX-IT" FORUM

We all know people that subscribe to the theory that "More is better, and too much is just enough". One of the occasions when this theory doesn't apply, is when you're tightening intake manifold clamps.

Some people think that if there's the possibility that they have a manifold leak, all they have to do is crank the manifold clamp down harder. Actually, this makes the problem worse because it's easy to distort the o-ring or "rubber band" seal by over-tightening the clamp. Easy does it when tightening the clamps.

When you install new o-rings / seals, it's always a good idea to lubricate them to help them make the seal and to keep them from being pinched while tightening the clamps, and remember, don't torque the clamps down to 100 pounds.

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Shovelheads: Making 'Em Last — Part III

By J.D. Chandler

For good, lasting performance the Andrews "J" or "A" grind cams work well with standard hydraulic tappets.

There has been a long and unfortunate tradition of building engines with too much cam, too much carburetor and too much compression. As a result, there are many, many shovelhead motors that simply don't perform well in the rpm range where they spend most of their running time. A balanced selection of engine components is as important as cubic inches.

One shovelhead high-performance tradition is the solid lifter conversion. Like many traditions, this one contains more fancy than fact.

There is a bit of cushion or play in a hydraulic tappet, and to get proper valve action they require cams that open quickly. To get a hydraulic tappet to open a valve as effectively as would a solid one, the cam must have a little bump right at the beginning of its action.

Factory cams are rather mild and almost any increase in valve timing over stock will make more power. They open valves gently and don't keep them open all that long. Factory Big Twin cams are designed to run with hydraulic tappets. These cams have a little bump at the beginning of the valve-opening cycle. When you convert a set of hydraulic tappets to solids, the hydraulic cushioning effect is removed. The hydraulic cams bump, when used with solid lifters, opening the valves a bit sooner, and giving more cam duration. A solid lifter conversion has the effect of installing a slightly hotter cam.

There is a down-side to this, however. Solid lifters and hydraulic cams don't get along too well. That bump in the opening ramp of the hydraulic cam turns into a hammer blow when the tappets are solid. Solid tappets operating on a stock hydraulic cam may give more power but they will be noisy and very hard on the cam, tappets and

valves. Don't do it

Besides, a properly-matched hydraulic cam will result in better performance, longer life, low maintenance (none in fact), and make the valve train almost silent.

While there is truly no substitute for cubic inches to achieve more power, the same principle does not apply to cams. I believe that the single most common engine-building mistake is to install too much cam. Proper cam action (opening and closing points, lift, and acceleration) is determined by engine design characteristics and the intended rpm at which the engine will operate. You can't expect to get more power by simply installing a cam with more duration or lift. A hot cam pulls more power off the bottom end than it adds to the top. In fact you could install a cam that is so radical, your motor will never turn enough rpm to take advantage of it.

However, there are aftermarket cams that will improve engine performance over stock yet are easy on the valve gear. There are more moderate cams that will add power throughout the rpm range.

For the best power from 2,000 to 5,000 rpm, install a cam that has no more than 250 degrees of intake-valve duration. Hydraulic cams like Andrews' "J" or the higher-lift "A" will give a stock shovelhead engine all the air/fuel mixture it can use at these rpm. If your valves are free to open to .500-inch, consider the Andrews "2" cam. This cam opens the valves early, has lots of lift and short duration, and will give wonderful power from idle to redline. Crane makes two cams that will give similar performance. Their grind numbers H288 or H288-2 work very well, especially if you take advantage of Crane's adjustment feature and advance the cam.

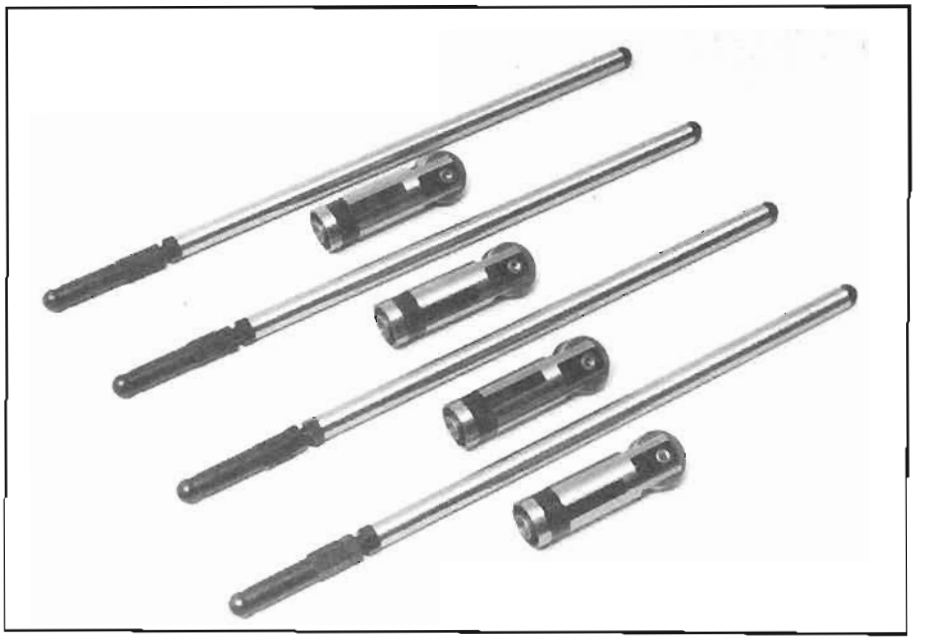
There are several companies offering alternate tappet and pushrod setups for shovelheads. Some are meant as light-weight solid conversions for high-performance motors Some are designed to keep the pushrods away from the pushrod tubes in motors with extremely high-lift cams. None of these special parts are needed for the cams recommended here.

There is nothing wrong with these parts; you just don't need them for a normal motor.

Since you will be building your shovelhead motor to last, you won't be revving it past about 5,500 rpm. As long as you're not trying to turn astronomical rpm, most valve gear problems will disappear. You won't experience hydraulic pump-up, which only occurs when pushrods flex or valves float from having too little spring pressure and/or a cam with too much initial acceleration. The cams mentioned above can be used with stock valve springs, tappets, and pushrods There is nothing wrong with any of the stock parts, as long as you aren't trying to reach very high rpm with radical cams

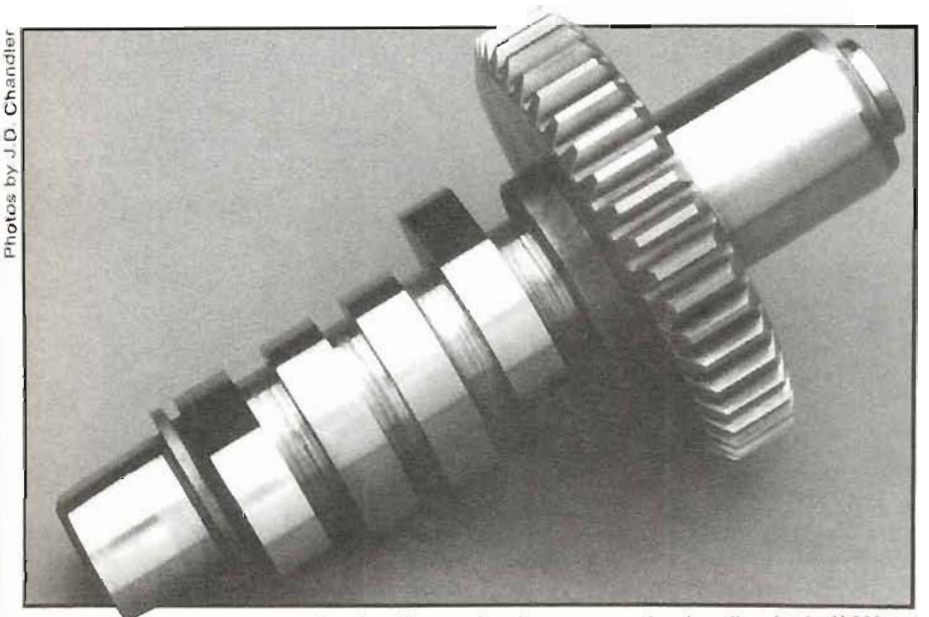
A mild hydraulic cam set-up with stock valve springs will wear very slowly and run quietly. The moderate cam-timing will also give your shovel motor a much wider and more useful power band This hydraulic-tappet and mild-cam combination will give excellent performance and long life.

You may very well find that your scooter will pull harder in a moderate speed, top-gear roll-on with one of these set-ups than it did with the old high-performance cam you took out. ■



The word is out: aftermarket hydraulic tappet kits keep shovelhead valve trains alive. This set is manufactured by Crane Cams.

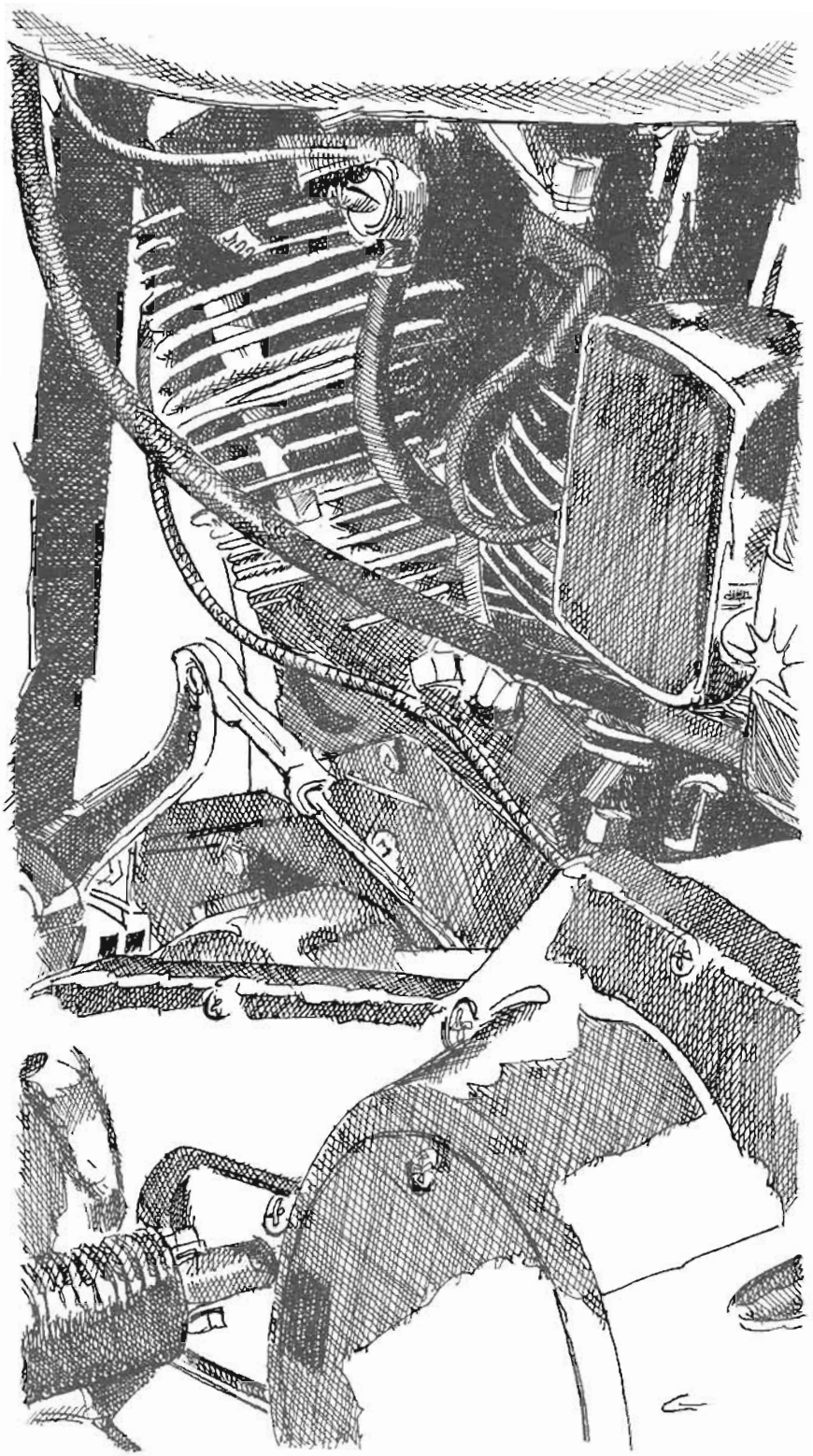
Photos by J.D. Chandler



Another all-around performance cam for shovelheads, the H-288 or H-288-2 cam from Crane Cams, Sold through Custom Chrome. (As used in the Easyriders Streamliner)

Keeping Shovelheads Alive—Part IV

Dirty motors don't run long.



This is the fourth and final in a series of articles devoted to making your shovelhead engine run well and last long. The first three installments were aimed at getting the best available parts inside your shovelhead motor, this one is dedicated to keeping dirt outside that motor.

Any engine can be quickly and thoroughly destroyed if it has dirt between its moving parts. Dirt particles are hard, harder than most engine metal. They are also rough and sharp-edged. However, what "dirt" is to an engine is a little different from what it is to us. Dirt particles so small they can only be seen with a powerful microscope, will grind an engine to junk within minutes of running.

If a piece of dirt gets between two moving pieces of metal, say a piston ring and its cylinder wall, damage will occur *if* the dirt particle is *bigger* than the space between the parts. If the particle is smaller than the space between two moving parts, they won't even notice its presence.

All the parts of your engine that move or rub against each other have oil between them. The thinnest oil film will still be about 11 microns (millionths of a meter) thick. Any piece of dirt that is smaller than the 11 microns will do no harm to those parts.

So, the trick is to limit the dirt that gets into your engine to particles that are less than 11 microns in diameter. The accepted standard in the filter business is 5 microns. I don't know why, it just is. Either way, the only readily available filter that will take out particles that small is the common paper-element screw-on filter (like those used on all the Evolution motors). The old OEM replaceable in-tank filters are only good for 40 microns; they just keep the rocks out.

For the sake of the life of your shovelhead motor, you should install a screw-on oil filter. Custom Chrome Inc. (CCI) offers three screw-on oil

filter conversion kits for various chassis configurations. Be sure that the filter you use has a low pressure relief valve. Harleys have low pressure oiling systems. If you use a car filter (high pressure) and it gets clogged, its pressure relief valve (built into every screw-on filter) might not work. Your engine wouldn't get any oil and you wouldn't get much farther down the road. Use only the filters designed for Harley motors. There is an important difference.

Additionally, you need to remember that since these filters only filter oil on its way back to the oil tank, any dirt that gets in the tank will probably find its way into your engine. So, you need to be careful about the oil you first put in the oil bag.

Be very sure that you pour only clean oil into the tank. This means that you keep your funnel really clean and that you wipe the tank filler with a clean cloth before you pour oil. I keep my funnel in a large Ziploc bag and my oil bottles in a sealed trash bag. If this sounds extreme, consider how small a five-micron hunk of dirt is: It would take more than 5,000 of them, side-by-side, to measure an inch!

If you wash your oil tank like H-D says you should, be very careful about how clean the solvent is. You could do more harm than good if the solvent is contaminated.

The other major source of dirt harmful to your engine is in the air it breathes. We've all seen dust in a shaft of light going through a darkened room. That's only what you can see. Think of how much microscopic dirt is floating around, too small to see but large enough to damage your engine. It takes a long time for a 20-micron particle of dirt to float down to the ground. If your motor's carb sucks it up, that particle could cause a lot of wear before it gets trapped by the oil filter you installed.

Most dirt particles that come in through a carb get blown out by the exhaust, without ever touching metal. However, if they do touch anything, chances are it will be the film of oil on the cylinder walls, where they'll stick. Large (10 micron or so) dirt particles trapped by the cylinder walls' oil film will cause wear all the way through your engine. The dirt will grind on the rings, cylinders, pistons and, when it works farther down, the bearings. By the time the oil filter traps it, that 20-micron piece of rock may have started a roller-bearing on the road to short life.

Some air cleaners will filter down to five microns, but not all of them. Also, only a few will both filter well and pass enough air to make real power. The late stock factory filters, with foam and plastic elements, will clean the air—and won't cost more than a couple of horsepower on a stock-port engine. The traditional S&S teardrop-shaped filter has a foam element, cleans adequately and passes more air than a stock air cleaner.

The very best is Harley's Screamin' Eagle series air cleaner kits. These kits use the excellent K&N Engineering cotton-cloth filter elements that have proven themselves so successful in off-road racing. It seems that the K&N material will filter out five-micron particles and allow plenty of air through at the same time. A free-flowing K&N element can be considerably smaller than a foam element that flows the same amount of air. H-D's Screamin' Eagle kits will fit all Keihin Harley carbs, including the new Sportster carb.

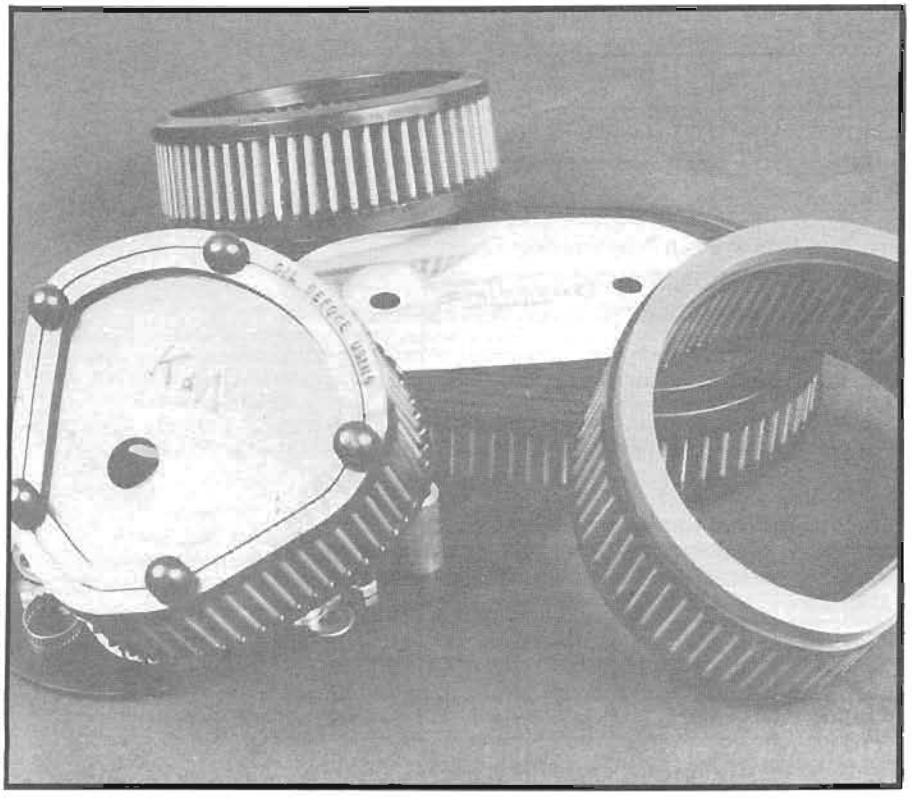
Neither the foam nor the cloth filter elements will work properly without being coated with oil. Most fine particle filtering is actually done by the oil. It is okay to let the filter elements get fairly dirty before you wash them. K&N even claims that their filters work a little better when they are coated with a layer of dirt. It seems that the dirt increases the filter area. You'll get best results if you use oil recommended by the filter maker; foam elements like thick, sticky oil, while the cloth ones work better with thin oil.

Small foam filters will generally limit top-end power, because they tend to be overly restrictive. However, I've tested cloth filters that didn't pass enough air because the chromed cover was too close to the filter element. Buy the largest foam or cloth filter you can live with and make sure it has at least ⅜-inch clearance between the element and the cover. If you have doubts, stick with the late factory filters, either stock or Screamin' Eagle versions.

The bottom line on all this is engine life. If you build your shovelhead motor as outlined in the past three articles, and keep it clean inside with high quality filters, it will last longer than any shovelhead you've ever owned. Period.

Next month we'll talk about engine oil—what it does, how it wears out, and how you can take care of it. Maybe we'll be able to help you choose the right oil for the way you ride.

—J.D. Chandler



Photos by J.D. Chandler

All these K&N pleated-cloth filters remove extremely fine dirt particles, yet pass all the air your motor needs. The kit is from Harley, the other filters are K&N replacements for stock Harley air boxes.

Spark Plug Charts

Spark Plug Information Chart

H-D Code #	H-D Part #	Champion #	Accel #	NGK #	Autolite #
2	32305-48A	H10C (was H11)	167	B4L	217
3	32303-47A	H10C (was H10)	167	B6L	996
3-4	32301-60	J12YC (was J12Y)	137	RS670-5	4275
4	32301-47A	H8C (was H8)	166	B6L	216
4R	31629-78	RH8			
4-5	32301-78A	L82YC (was L82Y)		BP7HS	4123
4R5	32301-80	RL82YC (was RL824)	453	BPR7HS	
5	32307-58	J6C (was J5)	124	B6S	303
5-6	32309-69	N12YC (was UN1ZY)	116	BP6ES	55
5A6	32310-77	N1ZYC (was N1ZY)	116	BP5ES	55
5R6	32312-77	RN1ZYC (was NR1ZY)	496	BPR5ES	4265
5RL	32312-78A	RN13LYC (was RN14LY)	997	2GR5C	
5A6A	32310-78	N1ZYC4	116	BP5ES	4265
5R6A	32312-78	RN1ZYC (was RN1ZY)	496	BPR5ES	4265
6R7	32314-83	RN7YC		BPR7ES	4252
6R12	32317-86	RA8HC (was RA8YC)	882	OPRTEA-9	64

Antique Spark Plug Information Chart

H-D Code #	H-D Part #	Champion #	Accel #	NGK #	Autolite #
2	32304-09A	D16			376
3	32302-09A	D14		A7	375
4	32300-09A	D9 (was D10)			373

Racing Spark Plug Information Chart

hot — cold

H-D Code #	H-D Part #	Champion #	Accel #	NGK #	Autolite #
	32301-6sr	B60R	1SA		2415
8	32301-62	N57R	1SB		2414
	NONE	N54R			2413
	NONE	N52R			2413

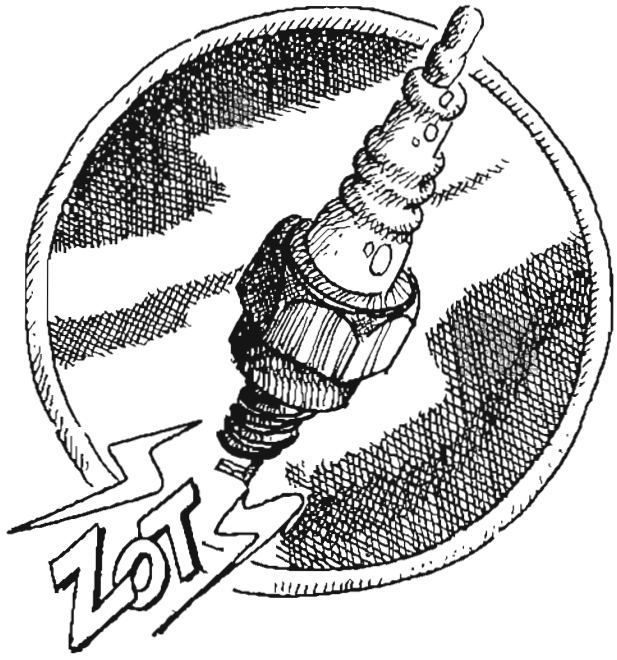
These are retracted gap type plugs. A special tool is required to adjust gap settings
Used on: all KR, KRTT, XLR, XLRTT, XR750, XR750T
Gap: .012"-.014" with old style dual fire magneto
.020"-.022" with new style single fire magneto

Spark Plug Application Gap Information

H-D Code #	Application	Gap
2	52-56 K, 57-78 XL 48-74 FL, FX	.025"-.030" (batt. ign.) 020" (mag. ign.) .025"-.030" (48-69) .028"-.033" (70-74)
3	52-56 K, 57-78 XL	.025"-.030" (batt ign.) .020" (mag. ign.)
3	48-74 FL,FX	.025"-.030" (48-69) .028"-.033" (70-74)
3-4	48-74 FL, FX	.025"-.030" (48-69) .028"-.033" (70-74)
4	52-56 K, 57-78 XL	.025"-.30" (batt. ign.) .020" (mag. ign.)
4	79 XL	.060" (elec. ign.)
4	48-74 FL, FX 48-74 FL,FX	.025"-.030" (48-69) .028"-.033" (70-74)
4R	79-85 XL	.038"-.043"
4-5	79-81 XL	.038"-.043"
4RS	79-85 XL	.038"-.043"
5	52-56 K, 57-78 XL	.025"-.030" (batt. ign.) .020" (mag. ign.)
5	58-74 FL, FX	.025"-.030" (58-69) .028"-.033" (70-74)
5-6	75-E77 FL, FX	.028"-033"
5A6	75-E78 FL, FX	.028"-.033"
5R6	L77-E78 FL, FX	.028"-.033"
5RL	L82-84 FL, L78-84 FX	.038"-.043"
5A6A	L78-79 FL	.038"-.043"
5R6A	L780E82 FL, L78-79 FX, 84-90 Big Twin Evo	.038"-.043" .038"-.043"
6R7	83-85 XR1000	.038"-.043"
6R12	86-90 XL	.038"-.043"

Antique #'s

H-D Code #	Application	Gap
2	24-47 Big Twin, 48 Flathead Big Twin, 48-55 45 models	025"-.030"
3	24-47 Big Twin, 48 Flathead Big Twin, 48-55 45 models	.025"-.030"
4	24-47 Big Twin, 48 Flathead Big Twin, 48-55 45 models	.025"-.030"
5	24-47 Big Twin, 48 Flathead Big Twin, 48-55 45 models	.025"-.030"



Notes.

This spark plug interchange information has been compiled from O.E.M. and spark plug manufacturer sources and is as complete and accurate as possible. However, it is only as accurate as the manufacturer's catalogs and my personal experience can make it. While working on it, several conflicting cross-references and applications were encountered. Always use prudence and common sense when choosing spark plug heat reanges and "reading" spark plugs for fuel mixture indications.

Some of the duplications in the aforementioned applications come from H-D's policy of listing optional heat ranges for various operating conditions. E.G., H-D plug #'s 2, 3, 3-4, 4, and 5 all may be used in 48-74 FL, FX models -- the difference is in the plug heat range. The **lower** the H-D code #, the hotter the plug (#2 hottest to #5 coldest). In other cases the duplications arise from H-D superceding one part # with another e.g.; plug #5-6 (32309-69) is superceded by #5A6 (32310-77).

Supercessions --

original #32309-69 replaced by 32310-77
original #32312-78 replaced by 32312-78A

Only resistor type spark plugs should be used in 1980 and later models. Ignition secondary circuit impedence must be of a certain value for proper operation and acceptable service life for the electric ignition module

Spark Plug Torques

12mm (aluminum head) 15 ft. lbs.
14mm (aluminum head-short reach) 15 ft. lbs.
14mm (aluminum head-long reach) 25 ft. lbs.
14mm (cast iron head) 30 ft. lbs.
18mm (aluminum head) 30 ft. lbs
18mm (cast iron head) 35 ft. lbs

The above information was contributed by:
Thompson's Cylinder Head Service Co., (617)326•8380

Tune-up specifications, all models, 1936-1990

Ignition System, circuit breaker.

Electronic

after 1980 -- air gap not adjustable.

1979 -- air gap .004 - .006 in.

Breaker point systems.

1971 - 78 -- points gap .018 in.

1959 - 70 -- points gap .020 in.

1936 - 59 -- points gap .022 in.

Ignition Timing

Side valve, 1936 - 47.

OHV (knuckle), 1936 - 47.

OHV (panhead), 1948 - 65.

OHV (shovel), 1966 - 78.

All big twins from 1936 to 1978 use conventional breaker point ignition. Correct timing for these models is 5 degrees BTDC at full retard and 35 degrees BTDC at full advance. See 1 and 2 in Figure 1.

XL models have a shorter piston stroke and, consequently, are timed 15 degrees BTDC at full retard and 45 degrees BTDC at full advance up to 1971. From 1972 to 1978, XL timing is 10 degrees BTDC (retard) and 40 degrees BTDC (full advance). After 1978, XL models use electronic ignition. See Figure 2. G/GA refers to Servi-Cars.

Correct timing is indicated by flywheel marks visible through an inspection port on the left side of the crankcase. Timing should be set with the circuit breaker in the full advanced position. The points should just break when the mark is in the position shown.

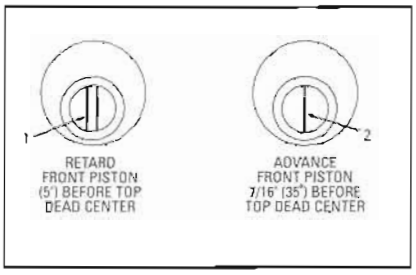


Figure 1

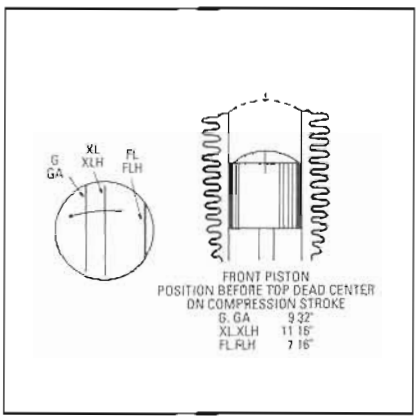


Figure 2

OHV (shovel, Evolution) with electronic ignition. See Figure 3.

retarded: 3 degrees BTDC.

advanced (automatic, maximum): 35 degrees BTDC at 2000 rpm.

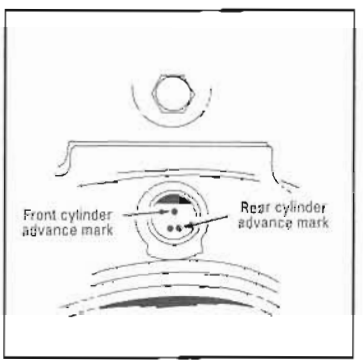


Figure 3

Tappet Clearance, engine cold.

Side valve engines:

intake .004 - .005 in.

exhaust .005 - .008 in.

OHV engines, 1936 - 47 (knuckle):

pushrods can be rotated freely by hand but cannot be moved up and down.

OHV engines, 1948 - 1965 (panhead, hydraulic):

adjust until pushrods have no up-and-down motion, then tighten three turns.

OHV engines, 1966 -- (shovel & Evo, hydraulic):

adjust until pushrods have no up-and-down motion, then tighten four turns.

Note: worn hydraulic lifters may remain noisy even after proper adjustment. If they do, tighten one more turn.

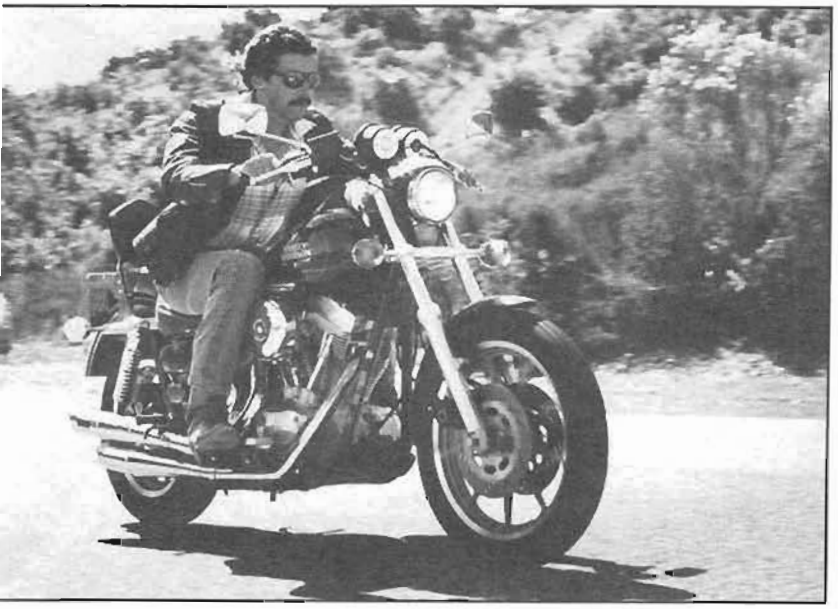
Forks, oil capacity, each tube:

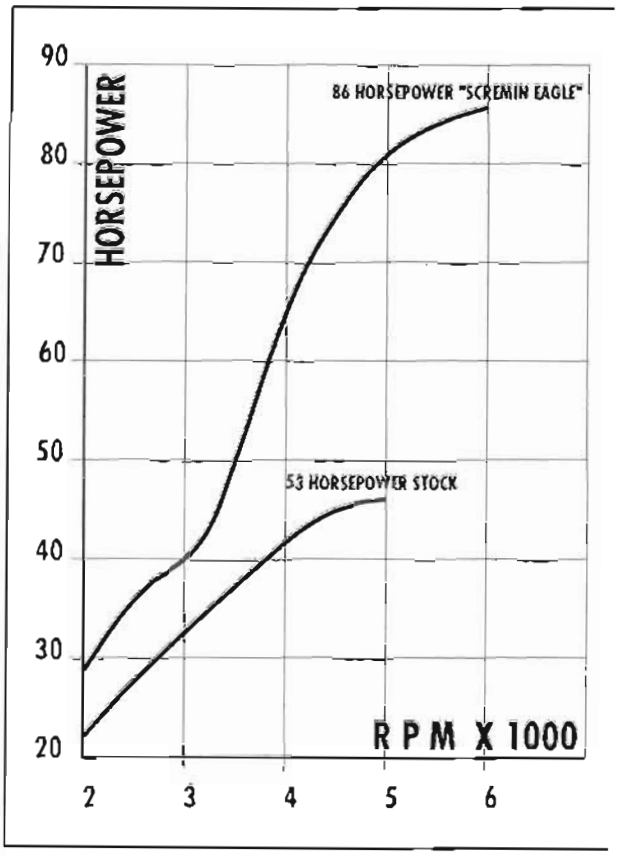
	wet (drained)	dry (disassembled)
Hydra Glide, Duo Glide, Electra Glide		
1949 - 69	6.5 oz.	7.0 oz.
XLH/XLCH (Sportster)		
1957 - 69	4.5 oz.	5 5 oz
XLH-XLCH-XLT-XLS-XLCR-XLX		
1970 - 72	5.5 oz.	6 5 oz
1973 - 83	5.0 oz.	6.0 oz.
1984 - 90	5.4 oz.	6.4 oz.
XLH 883 cc.		
1986 - 90	5 4 oz.	6 4 oz.
XLH 1100 c c.		
1987 - 90	5.4 oz.	6 4 oz.
XLH Hugger		
1988-90	9.0 oz	10.2 oz.
FLH-FLHS		
1970-1978 1/2	6.5 oz.	7.0 oz.
1978 1/2-90	7.75 oz.	8.5 oz.
FLT-FLT/C-FLHT/C		
1970 - 83	7.75 oz.	8.5 oz.
1984 - 90	10.5 oz.	11.5 oz.
FLST/C/F		
1986	11.5 oz.	12.5 oz.
FX-FXE-FXS		
1970 - 78 1/2	5 5 oz.	6.5 oz.
19878 1/2 - 82	5.0 oz.	6.0 oz.
FXEF		
1980 - 85	5.5 oz.	6.5 oz.
FXB - FXB		
1980 - 83	5 0 oz	6.0 oz.
1984 - 85	5 75 oz.	6.75 oz.
FXLR		
1987 - 90	9 2 oz.	10.2 oz.
FXR/FXRS		
1982 - 83	5.0 oz.	6.0 oz.
1984 - 87	6 25 oz.	7.0 oz.
1988 - 90	9.2 oz.	10 2 oz.
FXRSE		
1987	10.5 oz	11.5 oz.
FXRT-FXRD		
1983 - 87	7.0 oz	7.75 oz.
FXRT-FXRS/SP		
1988 - 90	10.5 oz	11.5 oz.
FXST/C-FXWG		
1980 - 84	9.25 oz.	10 oz.
1985 - 90	10.2 oz.	11.2 oz.

Freeway Blaster

FXRS hop up

By: J. D. Chandler





Part of today's reality is that new Harley motors have to be clean and quiet, which, in turn, means they don't make as much power as they could. For those of us who like to haul, er, go fast, the Evo motor can't be beat—especially after snorting some speedy parts. H-D's Parts and Accessories division has spent the past five years coming-up with some of that help, but the same can be accomplished with aftermarket equipment. This scooter recieved its speed with a combination of intake and cam and exhaust performance packages, that have been developed and tested to perform together.

The all-out engine parts include the new Screamin' Eagle II cam kit, the revised Screamin' Eagle carburetor kit, Harley's Kerker-made, two-into-two exhaust system and a special ignition coil and module with no rev limiter. The .050 shaved-off heads, by Andy Hansen of H.E.S. Products in Culver City, California, (213) 397-3195, made the big difference. They took the compression ratio from 8.5 to one, to 11.5 to one.

Our test bike, an '89 FXRS-Sp, made 53 horsepower when tested as a stocker on Kerker's dynomometer. With the Screamin' Eagle parts in place, the same motor put out 86 horsepower—a 62% increase! The modified motor made more torque at 2,000 rpm than the stocker did at maximum. The stocker made 62-foot pounds at 3,500 rpm. The Screamin' Eagle version made 89-foot pounds at 4,500—44% more.

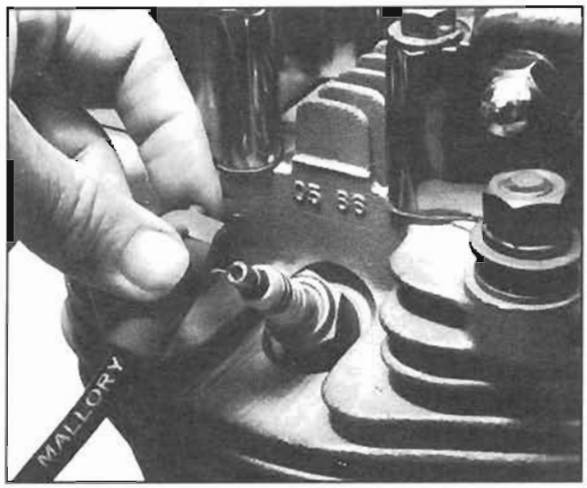
In a drag race between a stock Evo Harley and one modified with their Screamin' Eagle parts, the bro on the stocker would be left lookin' for a loose plug wire or somethin'. There's just no way he'd believe that he could get beat that bad an' not have somethin' wrong with his bike. There's just no denyin' half-again as much power!

By the way, the only tuning we had to do was go up one main jet size on the carb to accomodate pullin' the center baffle out of the Kerker pipes. The kits were bolt-ons, no guessin' an' no hassles.

Rider's Response

It's a damn ticket-getter. With the above modifications, this fireball has only two speeds: zero and anything above 80 mph. Off the line it's comfortable, but the added compression is already evident. Take it above 3,000 rpm and it comes unglued. The response is immediate, and the powerband seems unending.

I own a light EVO (465 pounds) with an Andrews EV-3 cam, modified exhaust, and a rebuilt Keihin carb. It runs as strong as I'd want a bike to run in this 55-mph era. Anything more would have me state hoppin' to dodge the warrants. —Wrench



GARY'S "FIX-IT" FORUM

Have you ever come out of your girlfriend's house at 2:00 am (ok, so she out-lasted you one time), tried to start your bike only to have one of the plugs foul so that it just barely runs? No tools - too dark to work on it - and your girl doesn't want to see your face anymore tonight?

One of the oldest tricks in the book is to pull the plug boot off the fouled plug just enough to let the spark arc between the plug wire terminal and the spark plug. We're not sure why it works (we think that lengthening the spark gap helps get the plug hotter faster), but it clears the fouled plug right-up, gets you homie, and we have another happy ending!

P.S. Before you attempt this little trick, be sure that your plug wires are in good shape (no cracks or exposed wire) or your bike will give you a bigger thrill than your girlfriend did!

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CANOGA PARK, CALIFORNIA 91305

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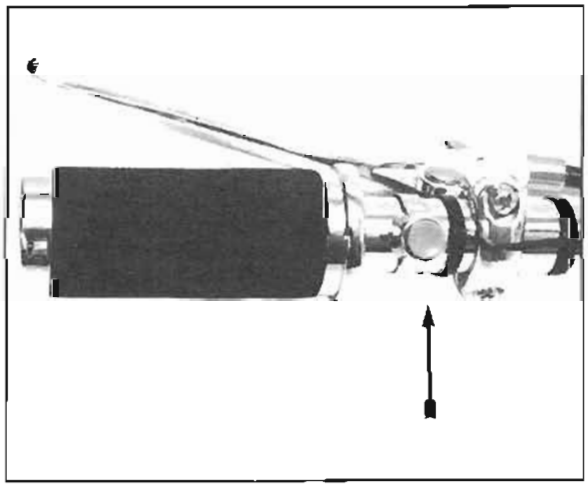
DEALER INQUIRIES WELCOMED



GARY'S "FIX-IT" FORUM

An item that is often over-looked doing custom work is when builders change the handlebars, or remove the stock switches, is to put a KILL BUTTON switch back on the handlebars.

It is absolutely necessary to have some type of run - stop switch located where you can kill the motor in an emergency. It's very easy to wire an early style dimmer switch or a basic horn / KILL BUTTON that can be operated with the rider's thumb Key switches by themselves (unless they're the dash-mount type) are not safe, because they're not usually located where they can be easily reached.

Ask anybody that has ever had a throttle hang-open how important a KILL BUTTON can be - without it, you could ruin your motor or life!

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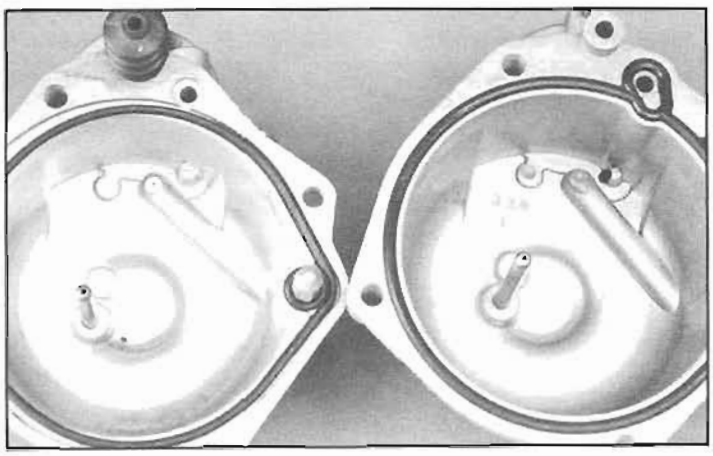
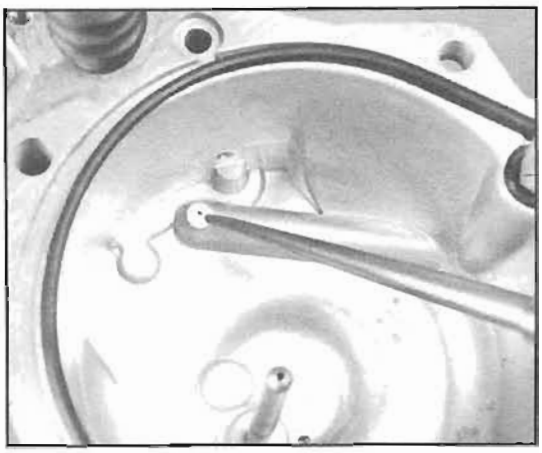
DEALER INQUIRIES WELCOMED

HOW TO PUT OUT THE FIRE IN YOUR CARB

"Hey, bro, your right knee's on fire!"

By J.D. Chandler





Late-model shovelheads backfire through their carbs. It can be embarrassin'. I mean, ya roll up beside a chick at a light and start hittin' on her. Just when she's breathin' heavy and about to park her cage and go for a putt on your scoot, a ball of fire rolls out of the velocity stack, burns your knee, stops the engine and — she's gone!

Maybe you don't know it, but some bureaucrapper in DC is laughin' his ass off just thinkin' about what he's done to you. The feds wanted clean air and they didn't care who they put out of business to get it. "Clean air" has cost the stock Sportster a couple of seconds in the quarter and burned the pants off a bunch of us.

Ya don't have to live with balls-o'-fire comin' out the wrong end of your 1980-or-later shovel's carb. It can be fixed — easy.

The backfiring, the slow warm-ups, and a lot of the lousy acceleration of late-model shovels and Sporties comes from EPA carburetion. By the time Harley got the carb so that Uncle Sugar was satisified, the fucker would barely pass gas. Like I said, though, you can fix that.

Harley can take some of the blame, too. They haven't had sense enough to look down the throat of their carbs to see if the accelerator pump feeds both jugs or just one. (It feeds just the rear one and you can fix that, too.)

If all this fixin' sounds like too much work, relax. You can do it inside of the time it'll take ya to sip your way through a six-pack.

First thing ya gotta do is take off the air cleaner and check out which way the accelerator pump jet is pointed. Turn the fuel on and open the throttle all the way. When you do that you'll see fuel squirt from the pump jet, through the carb and into the Y-manifold. If your carb is like every one of the fuckers I've worked with, all the gas from the pump jet will go into the rear cylinder. If ya haven't sucked down too many suds to see straight, figure how much you'll have to turn the pump jet to make it point into the center of the manifold. The pump jet is pressed into the float bowl and can be turned with a small wrench. Later, when ya have the float bowl off, you'll be able to turn the jet until it's right.

Scrape the empties off yer bench and lay down a clean rag to put the carb parts on. (Yer ol' lady might have one she's been savin' to wear to her mother's.) Take the float bowl off an' pay attention to where the accelerator-pump operating rod goes at both ends. It ain't no big deal if you look at where it goes before you drop it on the floor.

With the bowl off, you can get to the pump jet that's pressed into it. Now's the time to turn it as much as you think it needs to go. If, when you check it out later, it isn't just right, you can re-aim it in a few minutes now that ya know how.

Accelerator Pump: Turn the bowl over. Remove the piece bolted to the bottom of the float bowl. There'll be a rubber diaphragm and a coil spring under it. The spring goes between the diaphragm and the small part you just took off. You're gonna need the earlier version of this piece. Harley calls it "HOUSING, accelerator pump" and they give it part number 27364-76. It'll run ya under ten bucks and it replaces the piece of crap you got when you bought your scoot. Between this part and the changes you're about to make to the float bowl, you'll soon have a pre-EPA accelerator pump. Then when ya give yer Hog a boot in the butt, it'll move and not lay down on ya.

Now, turn the bowl back over so that you can look at its insides. See that little hole drilled on top of the accelerator-pump jet passage? That's part of the problem. That hole bleeds some of the pump's gas back into the bowl instead of getting it to the cylinders. You're gonna plug that fucker.

Before you mix a batch

Photos by J.D. Chandler

of epoxy, though, drill a hole (as shown in the photo) to feed gas to the new pump housing. Use a small drill no more than ⅛" in diameter. Be sure that you center the hole in the dimple on the bottom of the bowl. An O-ring (P/N 27360-76 — you'll need one) must seat around this hole and if you use a big drill or wander too much, you can screw it up. It really ain't no big deal if ya pay a little attention.

Mix the epoxy and put a drop over the tiny hole drilled by the factory. I use JB Weld. It works and won't run off or into the hole before it sets up. Set the bowl aside for the epoxy to cure.

When you put the carb back together, you'll have an accelerator pump that'll deliver more than twice what it would before. Instead of re-filling in three seconds through the wimpy hole you plugged, it'll do it faster that you can shut the throttle and get another run at it. Instead of bogging when you roll 'er on in top gear, yer scoot will haul ass!

Jetting:

Once the pump is straightened out, it's time to do something about getting gas into yer engine the rest of the time. The main reason for the backfiring through the carb is that the idle jet is too lean and the mixture-screw adjustment has made it even leaner. Not only that, but the fuckers in DC made Harley cover the idle-mixture screw with a plug. We're gonna fix both those problems — right now.

At the top and back of the carb, next to the mounting flange, there's a cast lug with a plug of aluminum in it. The idle-mixture screw is under that plug. Using the same drill bit ya used to make a hole in the float bowl, drill through the soft aluminum plug. If you go too far, ya might fuck up the screw, so put a piece of tape around the drill an eighth of an inch up from the tip to act as a marker. Drill through the center of the plug until you touch it with the tape. You can use the shank end of the drill to pry the plug out and expose the mixture screw.

Turn the carb over so you can get to the jets. Take the rubber plug out of the hole that the idle jet screws into. Use a small slot-type screwdriver to unscrew the idle jet. There will be a number on the jet (say, 50, for instance). Go to your Harley dealer and buy the next size up (or, in this case, a 52). These jets aren't listed in any one place and you might have to search through a couple of parts books to find what you need.

A lot of mechanics drill jets. That's a *second* choice because it ain't reliable. No two drilled holes are the same and it's easy as hell to make the one you have too big. If the jet's too big you can still get a good idle, but the off-idle response will suck. Your engine will load up and mileage will go completely to hell. Find the jet if you can. If you have to drill, get a drill bit that will just nick the hole and run it through with a pin vise instead of a drill motor.

Okay. You're almost done and it's time to put the carb together, get it on, and go out for another six-pack.

Put the new idle jet in and replace the rubber plug. Assemble the new pump jet housing onto the float bowl. Be sure that the spring is between the diaphragm and the pump jet housing, and that both the old and the new O-rings are in place.

Fit the float bowl to the carb body. You'll need to guide the accelerator-pump rod and its rubber boot into place as you install the float bowl. Check to see that the O-ring between the bowl and carb body is in its groove.

Be sure that the carb gasket (between the carb and manifold) is in good shape, or better yet, replace it. Before you bolt the carb on, run the mixture screw in until it bottoms (easy does it!) and back it out one-and-a-half turns. Bolt the carb on and hook up the cables and gas line.

Turn on the gas and check for leaks (there won't be any, but it looks good to say it on paper). Now, fucker, turn the throttle and just watch what happens! Remember how much gas it squirted before? Pretty different now, huh?

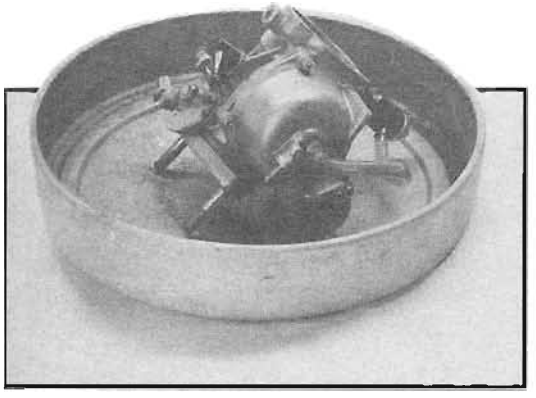
While you're drownin' your engine (and if you're not too fucked up to see), check where the pump is pointin'. If the gas stream isn't hitting the middle of the manifold and splattering into both jugs, take the float bowl off and move the jet a little more.

Fit the air cleaner and warm up the engine. When she's warm, adjust the mixture screw so that if you turn it either way, the idle speed drops. Or, putting it another way: You want to adjust the mixture screw for maximum idle speed. If the idle gets too high while you're doin' this, back it down with the speed screw over the throttle cables. Don't take all day doin' this, because if the engine gets too hot you won't get the adjustment right. Anyway, you'll want to recheck the mixture screw after you ride a few miles — just to be sure.

You just ain't gonna fuckin' believe you've got the same bike when you're through. It won't belch fire, it'll pull away smooth, and you'll have to get used to grabbin' the bars when you roll 'er on. ■


GRAB
BAG

Grab Bag



I'm gonna lay a double-whammy on you this month and give y'all some tech tips pertaining to cleaning and assembling. Though short and sweet, these little hints oughta ease some of the aggravations inherent to both building and restoring a ride to roadworthiness. And dig it — only one of 'em requires an investment of more than just your time. Let's knock that one off first.

Assembly Lube is insurance in a tube, available from most auto parts stores for $3-$5. You should use it on all bearing surfaces when assembling an engine or transmission. After replacing a bearing, bushing, shaft, or just about anything else, the most critical point in that part's life occurs at initial start-up when lubrication is most needed. Most manuals recommend assembly with motor oil, which is fine if the engine or tranny is going into service right away. However, if you're building a scooter part by part, and, say, the engine was done first, so that it winds up setting around waiting on chrome or paint, the time span between assembly and start-up allows the oil to run off the internal bearing surfaces right up to the moment when movement activates the oil pressure. Assembly Lube, on the other hand, is designed to stay on those surfaces until adequate oil pressure or an oil bath forces it out — at which point it mixes with the oil in the system.

For those of you who've had a 74 oil pump off to fix a keyway or a leaky gasket, this is great shit. When reassembling the oil pump body to the crankcases, a couple of dabs of Assembly Lube on the oil pump gears and shaft will stay put, unlike motor oil which continuously drips down the gasket surface, wiping out the sealant on the oil pump body gasket so that it leaks forever — or at least until you do it right.

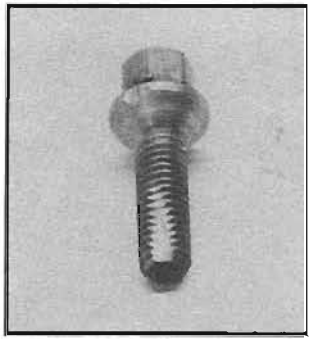
A word to the wise: Don't mistake Assembly Lube for wheel bearing grease. Once Assembly Lube get hot, it breaks down into a liquid that won't do shit for wheel bearings.

Okay, moving right along to the subject of cleaning. Before you have any engine or transmission parts plated or anodized, remember to remove all gasket material from any mounting surfaces. Contrary to popular belief, the chrome plater's stripping tanks do *not* remove every foreign particle from the pieces to be plated. Instead, what the stripping tank will do is etch the outline of any gasket material left on a mating surface — making it hell to remove and harder to seal the second time around.

One alternative to chrome plating is glass beading, something that nine times out of 10 will remove all foreign material from a metal surface. Trouble is, it leaves behind small grit that gets in everywhere, and I mean, everywhere. Every last iota of grit must be removed before assembly and that includes threaded holes. On most H-D engines and trannies, there are some oddball threads, particularly the ¼-24 thread of the lifter block, oil pump, timing cover, trans top, and mainshaft ball-bearing retaining-plate screws The best way to clean the grit out of these threaded holes is to run a tap through the hole while it's dry and then blow it out with compressed air. A less expensive way to go at it is to make your own clean-out tap using a hex-head lifter-block screw with some grooves cut down its length by use of either a file or a grinding wheel. The grooves provide a channel for the grit that's been loosened from the threads, enabling it to flow out as the screw is turned into the hole. Needless to say, this procedure should be done when the threads are dry or you'll find that moisture has allowed the grit to get pushed down to the bottom of the hole, making it all the more difficult to get out.

Now, how about those of you who'd like to clean grit out of oil passageways? No problem. A small-caliber guncleaning brush works wonders.

Sharp eyes are a definite asset in regard to this next tip, which has to do with converting some door-slammer's loss into your gain That's right — I'm taking hubcaps here. They make swell bench-top cleaning trays or small drain pans for when you jerk your oil pump or change the trans oil. They



can even be held under your cannister-type Harley oil filter at changing time. One of the best things about hubcaps — in addition to their availability along every stretch of roadway in America — is their nearly infinite variety of shapes and sizes. The one in the photo holds over a quart of liquid, is quite stable because of its flat bottom, and comes from a late-model Ford van — meaning that at four per vehicle, it's not outside the realm of possibility that you may encounter at least one of its three "littermates" some day.

Well, that's my word allotment for this month.

—Wrench


FWOOM

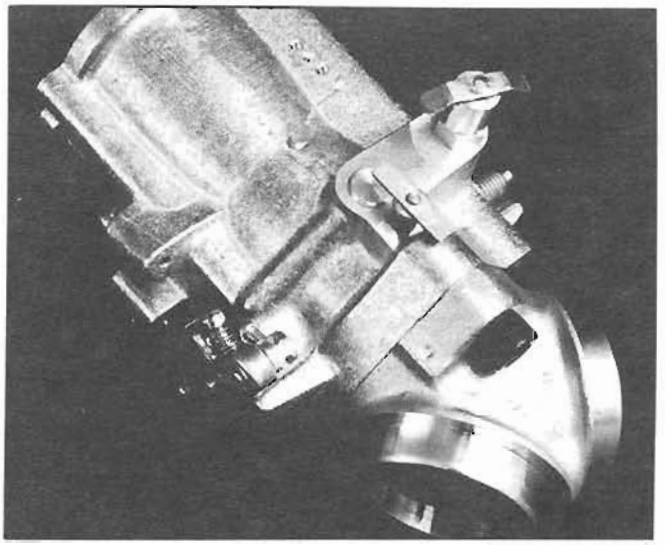
How To Tune the S&S Super Carb

By Joe Minton

The S&S Super is the most popular aftermarket carburetor in motorcycling. There are some very good reasons for this being true, the most important of which is that it is easy to tune. You don't have to be an experienced carb man to deal with the Super; you can make it perform quite well with only a little patience, a few parts, and some info about how they work.

The S&S is, in design concept, similar to the Keihin carburetor that has been standard on Harleys for the past 15 years. It has a fixed venturi that is controlled by a butterfly. It has two replaceable jets: the main and the intermediate. There is an adjustable idle mixture screw and a small separate enrichening system for cold starting. The S&S will flow much more air through its 1⅞-inch throat than the Keihin will through its 38-millimeter (1½-inch) one. Not only is the Keihin smaller, but it also has a restrictive choke plate in its mouth that further reduces air flow. On the other hand, the S&S lacks the Keihin's accelerator pump that can sometimes be useful, although it tends to add complication.

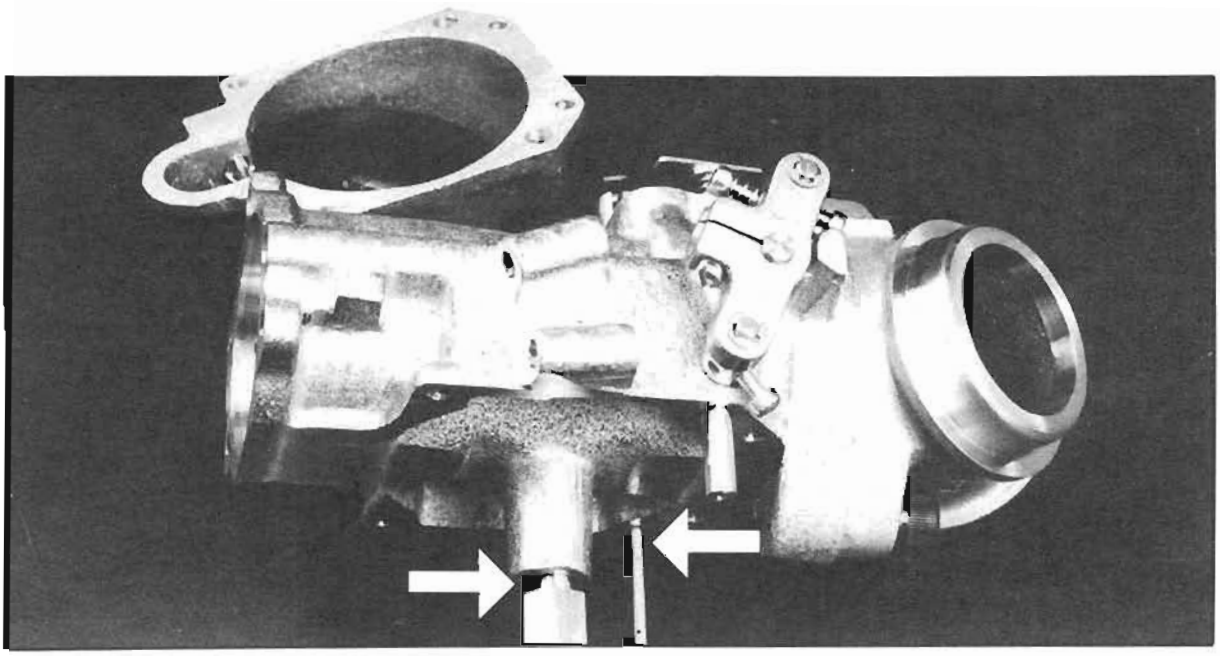
How well an S&S or any carburetor can be tuned is very much affected by the mechanical condition of the engine, as well as the cams, exhaust, and the state of tune. Leaking valves, worn-out piston rings, or a weak or out-of-time ignition will keep you from getting the carb right. One of the most common sources of frustration is a worn advance mechanism. If the return springs are weak and the advance is binding, the engine will tend to idle at 1,600 rpm or so and then fall off as the advancer finally returns to the idle position. Check the condition of your advancer. Before you start tuning the carburetor, be sure that the engine is sound; the carb must be done *last*.



The S&S Super — from a long line of high-performance American-made carburetors. It is simple, reliable, and easy to tune. The detail photo shows the idle mixture, speed, choke, and throttle controls.

Seemingly poor carburetor performance can often have another cause entirely. A cam that is too radical or a lousy exhaust system can make a carburetor—any carburetor—perform erratically. The S&S, being as large as it is, is somewhat more sensitive to poor cam or exhaust choice than the stock Keihin carb.

Some of us run straight pipes. They can drive a carburetor nuts, especially if they are too long. The most popular length is 40 inches. That length is also the worst possible choice from the performance point of view. You simply will not be able to make your S&S Super (or any other carb) work with 40-inch pipes, unless your standards of performance are very low. The 30-inch straight pipes are another matter. While it is unlikely that you will be able to get an engine with 30-inchers to carburet smoothly below 4,000 rpm, above that rpm it will match the best high performance systems avail-



Photos by Joe Minton

The arrows point to the intermediate and main jets (the main is at the bottom).

able. If you must run straight pipes, make them 30 inches long and don't expect too much below four grand.

Exhaust pipe diameter is another important factor in carburetor tuning. Harleys run best with the standard 1¾-inch diameter pipes. This has been proved over and again by many tuners, including S&S Cycle themselves. Two-inch pipes will make it virtually impossible to get good street manners from your S&S Super.

Those of us who modify our engines to make more power, often overcam them. A cam with too much timing will make good low speed carburetion difficult to achieve. Unless you bore and/or stroke your motor, chances are the best cam will have more lift than stock, but not a whole lot more timing. One thing is sure—a mild, high-lift cam will be easier on carb tuning than one that never closes.

So, if you are sure your engine is in good tune and good condition, and is equipped with a reasonable exhaust, let's get on with tuning your S&S.

There are three adjustments you will be working with: the idle mixture screw, the intermediate jet, and the main jet. The idle mixture screw does what its name implies—it sets the idle fuel mixture strength. The idle mixture screw gets its fuel from the intermediate jet. The intermediate jet can be a couple of sizes too large or too small, yet you will still be able to get a correct idle setting with the mixture screw.

The intermediate jet controls mixture strength mainly from just off-idle to roughly one-third throttle. There is a long overlap between its influence and the main jet's, and the intermediate jet has some effect even at full throttle and high rpm. You will select the intermediate jet to give the best off-idle and part-throttle response. Much more fuel will pass through this jet than will ever go through the main.

You will select the main jet for best full-throttle and high-rpm operation. It is the most effective jet, starting at about one-half throttle. The main jet is the easiest to choose and is best left for last.

Without meaning any insult, be sure that the Super is mounted correctly, that there are no air leaks, and that the throttle is adjusted for smooth, nonbinding operation.

Turn the idle mixture screw in until it seats and open it one-and-a-half turns. This should be fairly close to its final position and is a good starting place. NOTE: Be *very* careful about how hard you seat the mixture screw. The brass screw is tapered on the end, and this taper seats against the idle port in the aluminum body of the carburetor. If you force the screw, you will distort both the taper and the seat in the carburetor. The damage can be permanent and make it difficult to get a proper idle mixture.

Lift the starting enrichener rod and turn it so that it will stay up. Without opening the throttle, start the engine. If you open the throttle more than a very little when the enrichener is engaged, air will flow around the throttle butterfly instead of through the enrichener passage.

Warm the engine and adjust the idle speed for a smooth yet low rpm (about 900 to 1,100) idle. Without letting the engine get too hot, adjust the idle mixture screw in or out for maximum rpm. If the rpm climbs above 1,100 bring it down again with the idle speed screw. When you are finished, the idle speed should drop when you turn the mixture screw in either direction. There will usually be a mixture screw range of from a quarter- to a half-turn where the idle speed is not affected. Set the screw in the middle of this range.

The final position of the idle mixture screw is an

important clue as to whether or not the intermediate jet is the correct size. If best idle is obtained with the mixture screw set between one and one-and-a-half turns open, the intermediate jet is probably right. If the mixture screw has to be opened further for best idle, the intermediate is too small. If it must be at less than one turn, the intermediate is too large.

Now it's time for a ride. Chances are that after the idle mixture procedure, your Hog's combustion chambers are hotter than they normally will be, yet the oil and the rest of the engine are cooler than normal. If it runs okay, ride your bike moderately for a few miles to even out the temperatures. Now we will check out the intermediate jet.

If the intermediate jet is right or nearly right, and the engine is at full operating temperature, you will be able to pull away from a stop smoothly with moderate throttle settings. If the engine backfires through the carb or is very slow to warm up, the intermediate jet is too small, and you should go up one size (at a time). If the engine hesitates or emits black smoke from the exhaust when leaving a stop moderately, the intermediate jet is too large, and you should go down one or more sizes.

Each time you change the intermediate jet, you will have to make a minor readjustment of the mixture screw. A larger intermediate jet will require the mixture screw to be turned in a bit, while a smaller jet will bring it out slightly.

When both the intermediate jet and the mixture screw are right, your Hog will idle smoothly and pull away from a stop cleanly.

There will probably be two intermediate jets that will work well in your engine. One will be slightly rich and will give the best acceleration; the other will be slightly lean and give the best mileage. When you get the jetting this close, it is normally necessary to measure the mileage and ride the bike for a few days before you finally decide which intermediate jet to use. S&S Supers can give terrific mileage—sometimes in the 50s—yet can run down in the 30s if the intermediate jet is too rich. Most of us have a tendency to select a rather rich jet at first, so don't quit too soon.

There are a couple of methods to selecting the correct main jet, and both are fairly easy to follow.

The first method is fairly simple. Get up into third gear and accelerate through about 3,500 rpm, which is near enough to the peak torque rpm of most Harley motors. As the engine passes through this rpm range, quickly shut the throttle to the 7/8ths position. If the main jet is close, the motor will simply slow a little; it will continue to run smoothly and cleanly. If the jet is too big (rich), there will be a clear hesitation before it clears and continues to run evenly. The hesitation will be due to the engine loading up from a suddenly-rich mixture. Finally, if the jet is too small (lean), the motor will actually pick up power when you shut it down to 7/8ths throttle. This technique can get within one jet size of ideal.

The second method can be used either by itself or to refine the jetting selected by the first method. Get a friend to time you as you do 50 mph top-gear roll-ons through a distance of 300-400 yards. The best main jet is the one that gets you through the measured distance in the least time. Simple, and it works.

Keep in mind that altitude, temperature, and humidity all play a role in determining the correct jets. These factors won't be of much concern if you tune for the lean side on a cool, dry day at the altitude in which you plan to do most of your riding.

There are a couple of accessories made for the S&S Super that deserve some comment, neither of which are produced by S&S. There is an adjustable main jet that looks mighty inviting, especially to a rider who does a lot of climbing. There is also an accelerator pump kit for the Super.

The adjustable main jet is not a good idea, for the simple reason that it can be too easily adjusted to dangerously lean and can burn the motor down on the open road without any overt signs. This has happened to experienced riders, and the convenience isn't generally worth the risk. You may feel otherwise and may have been using one for some time; okay—just be very, very careful.

The accelerator pump sold by Cafe Company is something else. An accelerator pump will allow you to open the throttle further and more quickly without bogging or detonation. When the 1⅞ Super is mounted on a small engine like a Sportster, the accelerator pump is mighty nice to have. Large engines (90 inches or more) won't have much of a bogging problem in the first place, and the engine won't notice the pump that much. I like them and think that all nonracing carbs should have one.

One of the great strengths of the S&S Super is its simplicity. There just aren't that many parts, and they are easy to fiddle with and understand. The tuning procedure outlined above is all you will need to know to dial one in. If you ever manage to wear yours out, you can get it rebuilt by S&S for a reasonable fee. While it isn't the most sophisticated carburetor you can buy for your Hog, it is the easiest to live with and tune. It is a good, reliable carburetor, and there are literally tens of thousands who will agree. ■

TUNING H-D's KEIHIN CARBURETORS

By Joe Minton

Harley's been usin' Keihin carburetors for more than a dozen years now and most of us still don't know how to work with 'em. They aren't bad carbs, but they get tossed a lot an' there have been sound reasons for doing that, most of which have nothin' to do with how good the carb is or can be. Now we're gonna tell you how they work and how to make them better.

HOW IT WORKS

The stock Harley carburetor has two gas supply circuits: the idle system and the main system. Below about one-quarter throttle, the idle system supplies most of the gas your engine burns. Gradually, the main system begins to supply gas as the throttle is opened farther and the engine breathes more air and needs more gas to mix with it. By the time the throttle is fully open, the main jet controls all the gas entering the engine. Because these two systems are independent, they can be tuned separately and that's how we're gonna treat them.

Idle System: Description

You have two controls over the idle system: the size of the idle jet and the setting of the idle-mixture screw. The idle jet is located in the float bowl under the rubber plug next to the main jet and has a number stamped on it. The number indicates the size of the hole in hundredths of a millimeter; thus a number 60 jet is 60-hundredths of a millimeter in diameter. The difference in how much gas will pass through a 60 jet when compared to an 88 jet is substantial—the 88 will pass more than twice as much gas!

Just after gas passes through the idle jet, it's mixed with air and becomes an air-gas froth. This gas-air mixture is easier to control than gas alone and will start moving more quickly when the demand suddenly increases. The amount of air that gets mixed with the idle jet's gas is controlled by a drilled hole that is the idle's air jet.

The idle-mixture screw is located at the top of the carb, just before the mounting flange. Since roughly 1978, these mixture screws have been hidden underneath an aluminum plug (to keep us from adjusting our Hogs so they'll run right). You can get this plug out by carefully drilling a small hole through it (it's about 100-thou thick), then prying it out. Be careful not to drill into the screw underneath. A piece of tape wrapped around the drill bit an eighth of an inch from the tip will let you know when you've gone far enough.

The mixture screw controls how much of the gas-air froth gets into the engine when it's at a dead idle. If you look in the carb, you

can see a small hole directly underneath the idle-mixture screw. The screw has a tapered tip that enters the hole you see and limits how much gas froth gets through it. Getting a good idle mixture is as easy as fiddling with this screw until the engine runs clean and smooth. Things are a bit more complicated above idle, though.

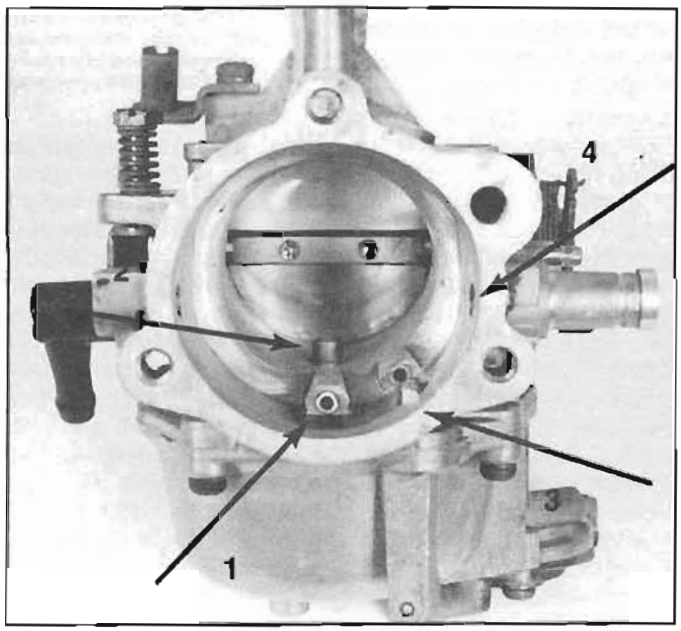
If you slowly open the throttle butterfly while you look at the area where the idle hole is, you'll be able to see a set of holes being uncovered by the throttle plate. Those holes are part of the transition circuit; they control the amount of gas that's added as the throttle is opened and before the main circuit fully takes control. The size, number, and position of these holes control the intermediate gas delivery (approx. ⅛ to ¼ throttle). Another control is the angle of the throttle plate itself. Different angles will uncover the intermediate holes at different throttle positions. You and I can't do a damned thing about either the holes or the angle of the plate, so if they aren't right for the needs of your engine, too bad. However, that rarely happens.

Idle System: Tuning

The idle jet can be wrong by a couple of sizes and still give a good idle. By turning the mixture screw you can make your engine idle with most any size idle jet. If the jet is wrong, though, off-idle performance will be awful. If the idle jet is too large, the engine will run rich as you roll the throttle open. If it's too small, the engine will "lean out."

If the jet's one size too rich, it's likely that it will still run okay, but the mileage will be down some and the transition from idle to throttle-open running won't be smooth. Two jets rich, and it'll load up, stagger, and blow black smoke.

One size lean will cause a hesitation as you slowly roll the throttle open. The mileage might be very good, but you'll probably find yourself using the accelerator pump a lot to get by the leanness on acceleration. Two sizes lean and the thing will buck and jump when it's cold and it might surge when you hold a steady throttle setting at cruising speed. Believe me, if your carb's idle jet is two sizes lean, you'll know something is wrong.



You're lookin' down the throat of a bored (40mm) and modified Keihin carb. The parts described in the text are: 1) the boss that needs to be modified (this one has been) so it won't mess up the vacuum signal to the main system spray bar; 2) the main system spray bar; 3) the tip of the accelerator-pump jet that's always pointed wrong; 4) the plugged hole where the choke shaft came through the carb (note that the mouth of the carb has been smoothed). This thing passes a lotta gas.

Before you can tell whether your carb's idle jet is the right one or not, you'll need to adjust the idle mixture. After warming your engine to normal running temperature, adjust the mixture screw until the idle's smooth and clean. If, while you're doing this, the idle speed creeps up, bring it down again with the speed screw. You can't get the idle mixture right with the engine running at two grand. The idle mixture will be correct if the engine idle speed drops when you turn the mixture screw either way.

The first time you do this, it'll probably take so much time that the engine will get too hot. So after you think the mixture adjustment is right, take a short ride to get the temperature back to normal and check the adjustment again.

One of the simplest ways to make a rough check for the correct idle jet is to count the number of turns the mixture screw must be opened to get a good idle. Keihins like to have their mixture screws ½ to 1¼ turns open. By the way, when you seat the mixture screw, do it gently or you can mess up the hole it seats in.

If you get best idle at less than the ½-turn open, the idle jet is too big. If it takes more than 1¼ turns, the jet will likely be too small. After you get the idle jet size right, you can refine the engine's response with the mixture screw. There'll be some leeway in the adjustment and you can use that to get the off-idle response just so.

When the idle jet is correct and the mixture screw is set properly, your Hog will idle smoothly and come off idle with no smoking or hesitation. Not only that, but it'll accelerate hard and get the best compromise between power and mileage.

Main System: Description

The main gas system is simpler than the idle system and easier to tune. Like the idle system, there's a supply of air that gets mixed with the gas coming through the main jet to make it easier to get things going when you open the loud handle. The main air jet is located in front of the main system's spray bar. Its that tube sticking out toward the air cleaner at the bottom of the carb's mouth. The main system spray bar sticks out of the floor of the carb in front of the butterfly and the main jet is screwed into the carb body just below the spray bar. Holes in the spray bar let air from the correction jet mix with the gas from the main jet.

When the flow of air through the throat of the carb is great enough, gas begins to flow out of this spray bar. The greater the air flow, the more gas that's pushed out of the spray bar by the pressure in the float bowl.

While it's simpler to talk about gas being "sucked" out of the spray bar, that isn't accurate and will get in the way of your under-

standing just how a carb really works. When air flows through your carb there's a pressure drop in the thoat. The faster the air moves, the greater the drop in pressure. It's the difference in pressure between the throat of the carb and the normal pressure in the float bowl that causes gas to flow out of the spray bar or idle holes. If you happen to pinch off the breather tube to your carb's float bowl, or point it into the wind, you can alter the pressure in the bowl and mess up the tune of your carb. A carb float-bowl breather should be in still air to make sure that it will work right.

Fuel begins to flow out of the main system's spray bar at about ⅛ throttle. It will now be delivered by both the idle system and the main system. As you open the throttle farther, the main system will deliver more of the gas needed, until at full throttle it delivers nearly all of it.

Remember that rubber plug I mentioned earlier? All the gas that goes through the Keihin carb must pass through the main jet first and the idle jet is fed by gas flowing through the main jet. If you leave that plug out, you'll bypass the main jet and your engine will run like it has the choke on, so be sure that plug is in place.

Both the main air-correction jet and the spray bar are fixed and you can't change them very easily. Your control over your engine's full-throttle mixture strength is with the replaceable main jet.

Main System: Tuning

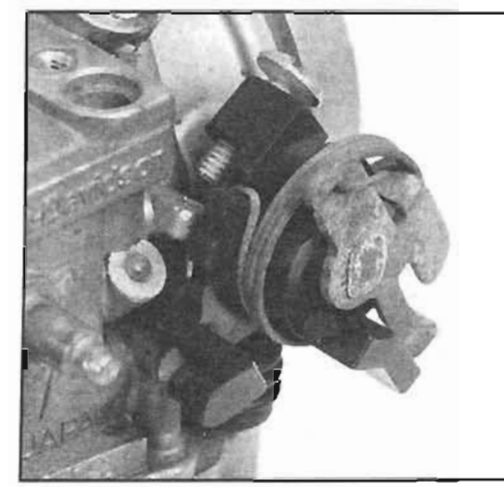
Find a place where you can get up to the national speed limit in safety. Put your scoot in a gear that will let it run near peak torque (3500-4500 rpm). As you accelerate at full throttle, suddenly shut down to ⅛ throttle. If the engine picks up speed, the main jet is too lean. If there's a hesitation before the engine clean up and runs smoothly, the jet is too large. If the engine simply slows down a bit, the jet is within one size of being right.

When you get your main jet to this point, the tuning gets a bit harder. Wait for a cool, dry day when the air is as thick as it's likely to be and make the same test again. If the jet you have falls between too rich and too lean, it should be all right, since few of us spend enough time at full throttle to worry about having the main jet perfect. If you want it just right, you can fiddle with sizes on either side of the one that seems right and if you truly notice a difference in response, speed, or mileage, go with the jet that gave it to you.

Harley does not have a complete line of main jets and you may have to drill a small one to get what you want. Jet-drilling isn't the best way to tune, so you should use factory jets when you can. However, if the next jet (up or down) is too big a jump, the drill will have to do.

Accelerator Pump: Description

All the Keihin carbs we've seen have worked much better after tuning the accelerator pump circuit. Remember how the amount of gas flowing out of the spray bar depends on the difference in pressure between the float bowl and the throat of the carb? And how that in turn depends on how fast the air is moving through the carb's throat? Well, when you open the throttle suddenly and the engine is running at low rpm, air moving through the wide-open carb will be goin' pretty slow. The pressure difference won't be very much and the damned thing will lean out, possibly so much that it won't get enough gas to run.



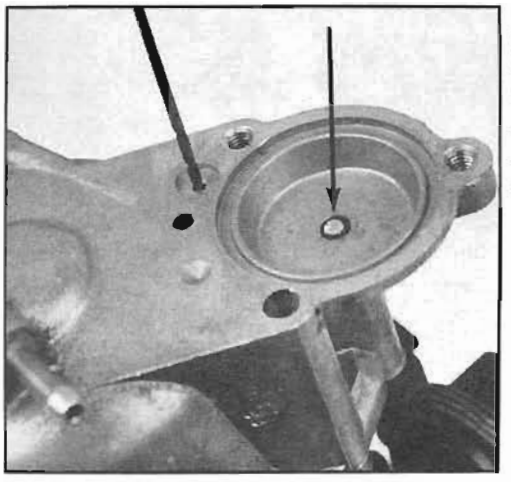
The drill bit shows where you have to drill the float bowl when you convert to the better, old-style accelerator pump and the arrow indicates the tip of the accelerator-pump rod. You should grind the rod so it's flush with the casting it sticks through.

Besides, when you open the throttle, you want power, not gas economy. The mixture strength that gives smooth running at cruise and good gas mileage is on the lean side and isn't best for maximum power. Between the normally lean cruisin' mixture and the fact that you are leaning it out more by yankin' the throttle open at low rpm, your engine isn't gonna work too well. That's where the accelerator pump comes in.

When you open the throttle from a low setting, the Keihin's accelerator pump forces gas into the throat of the carb. By the time the carb is at roughtly ¼-throttle the pump travel is used up and it's out of the circuit. At ¼-throttle, the velocity through the carb will be high enough so that the pump isn't needed.

The accelerator pump is operated by a rod attached to a spring-loaded bell crank mounted on the throttle butterfly shaft. When you open the throttle, the spring is wound up and forces the pump rod down. How far the rod travels determines how much gas is forced into the carb's throat. Early Keihins had a screw that could be moved to control the pump-rod throw and thus the amount of gas getting in the carb. Later carbs don't have the screw, but they still have the hole it went in. You can run a screw into the hole and get some control over how much the pump actually pumps.

The rod pushes on a rubber/fabric diaphragm mounted in the bottom of the float bowl. A series of passages and check valves



Photos by Joe Minton

By running a screw into the accelerator-pump crank like we did, you can adjust the amount of gas pumped into the carb's throat with each stroke. If the pump delivers too much fuel, the engine will load up when ya grab a handful at low rpm.

in the bowl let the action of the diaphragm take gas from the bowl and force it through the pump jet and into the throat of the carb.

How much gas gets pumped depends on the stroke of the rod and how far open the throttle was when you opened it the rest of the way. How fast the pump's gas is delivered to the carb depends on the strength of the spring pushing on the pump rod and the size of the pump jet. You can control the rod-throw, and therefore the volume, with the limit screw (or the one you install). You can control the rate of delivery with the size of the pump jet. The volume and delivery rate aren't the only things you can control, though. There are more important problems with virtually every Keihin accelerator pump.

Accelerator Pump: Tuning

Every pump jet leaves the factory pointed so that all the gas is squirted into the rear cylinder. That leaves the rear jug too rich and the front one too lean when you open the throttle. The pump jet is a press fit in the float bowl and is hex-shaped. You can turn it with a small wrench. Start by removing the air cleaner so you can see into the throat of the carb. Operate the throttle—*no smoking*—and watch where the pump jet delivers the gas. See what I mean?

Now, remove the bowl and turn the jet the amount you think it needs to point into the center of the back of the manifold. Reinstall the bowl and check the jet's direction. The gas should hit in the middle of the throttle plate or the center of the back of the "y" manifold. This small change will do much to make your bike pull smoother and more strongly from low rpm.

Many of you have trouble with your engine loading up when you're puttin' around town, but experience no problems at interstate speeds. While this can be due to incorrect tuning of the idle circuit, it can also be caused by the accelerator pump working all on its own. It seems that if the pump rod's too long, it'll jiggle the diaphragm and cause it to dribble gas out the pump jet and lie on the floor of the carb. If the rod length is adjusted so that it's flush with the bottom of the bloat bowl (when the throttle is closed, of course), that won't happen. Shortening the rod doesn't have any noticeable effect on the way the pump circuit works, other than getting rid of a problem you may or may not have. Do it.

There are two pump jet sizes: 60 and 80. Like the idle jet, the number is also the diameter of the jet orifice in hundredths of a millimeter. The 60 is better than the 80. I'm convinced that a 50 would be better still. The size of the jet determines how long it takes to deliver one squirt of gas. The bigger the jet, the shorter the squirt will last. Also, a small jet will spray its gas into the carb when the throttle is opened slowly, while the larger jets will let it dribble along the floor of the carb where it won't do a lot of good.

You can't buy either jet unless you buy a float bowl, and ya can't get the early (prior to '77) one anymore, which had the 60 jet. You can, though, solder up an 80 and redrill it. A #76 drill will give you about a size 50 jet. You might have to clean the solder out of the large hole with a drill, but it's no big deal.

Kiehins installed on Harleys since 1980 will not refill their accelerator pumps as quickly as those made earlier. The earlier pump would refill in about half a second; the new one takes three. The early pump will allow you to get by without the choke and will help you catch the engine if you let the clutch out too fast at a light. The main difference is the pump housing bolted over the diaphragm on the bottom of the float bowl. If you drill a 1/16-inch hole in the bowl of one of the new carbs and install the old pump housing, you can have the old-style accelerator pump. Old-style pump housing is available from Andrews Products as a kit with instructions, or get the part alone from your Harley dealer. This is a good thing. Do it.

Other Things:

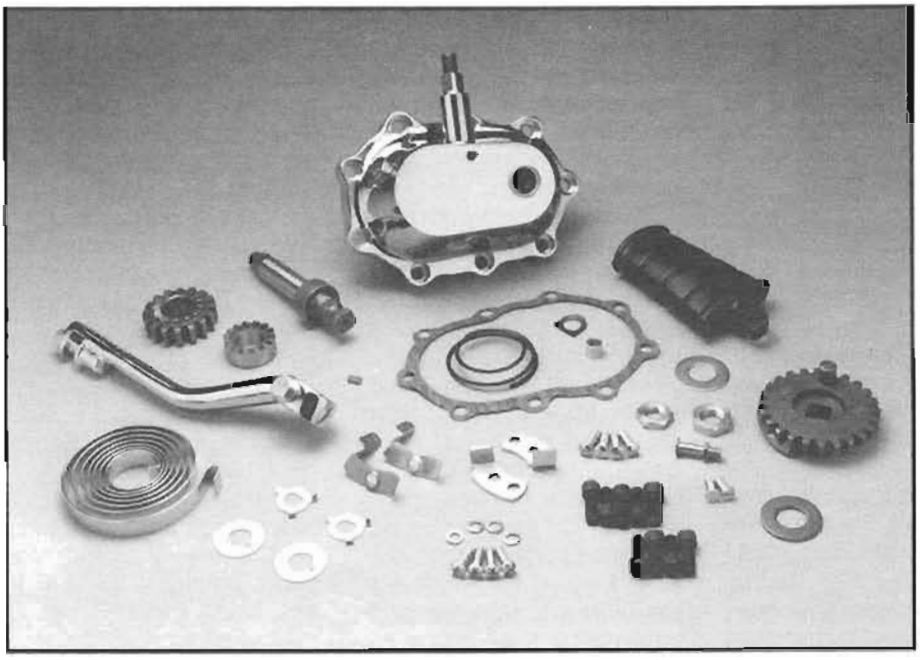
If you are overhauling a well-used Keihin, be sure that the mounting flange isn't warped. Check it against a flat surface such as a window and make it flat with a file or wet-or-dry paper on a flat surface. If you don't make it flat, it might leak air and drive you nuts from trying to figure out what's wrong.

Most of us overlook our carb's float level. If it isn't right, you won't be able to tune the carb. If the gas level is too far off specifications, the carb will be too lean or rich at low throttle settings and you won't be able to tune it out. Check the level—ya only have to do it once. You'll find a float level diagram and instructions in your factory shop manual.

The difference in performance between a stock carb and one that's had these changes made will blow your mind. Your scoot will start easier, warm up quicker, accelerate better, run smoother, and make more power. It's cheaper than buying another carb and bolts up with all the stock parts. ■

Just for Kicks

Hookin' up a kicker to yer button-start sled



Custom Chrome makes this heavy-duty kit to adapt a kicker to four-speed Big Twins. This unit (part #25-948) fits models from 1986 all the way back to 1936. It's available chromed or polished.

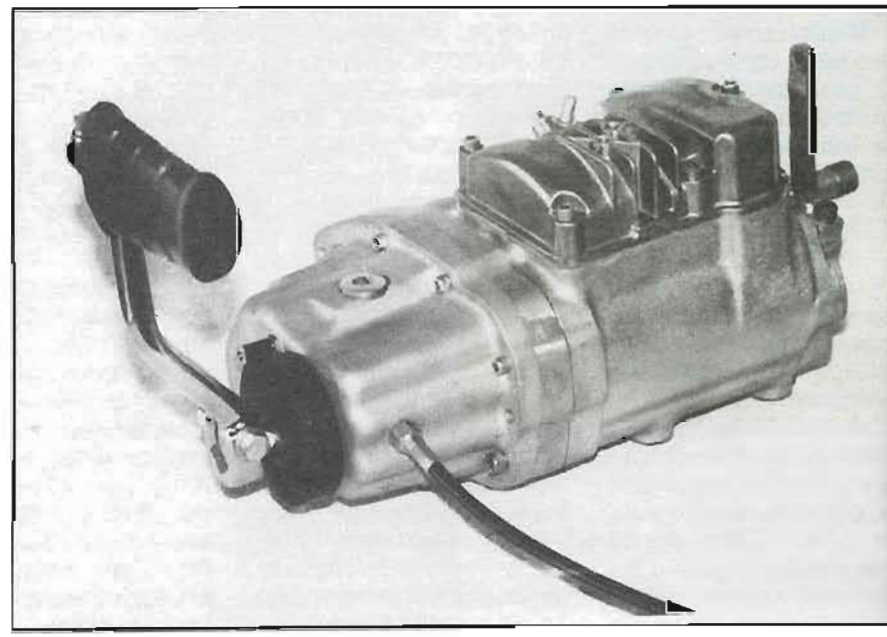
Accordin' to some people, when the Big Twin's electric-starter was introduced in '65, it was only one more thing that could go wrong. Bikes, they say, are s'posed to be kicked—just like footballs, politicians, and some cage drivers. Other folks, however, believe that the potential for headaches really started around '70, when the kicker was dropped altogether from the FLH.

The fact of the matter is, Harley's electric-starter works well, but it's just like any other system—if you don't take care of it and let the battery go dry, for example, or let the terminals get grungy, you're gonna have problems. Ya also gotta realize that even the best hardware ain't gonna live forever.

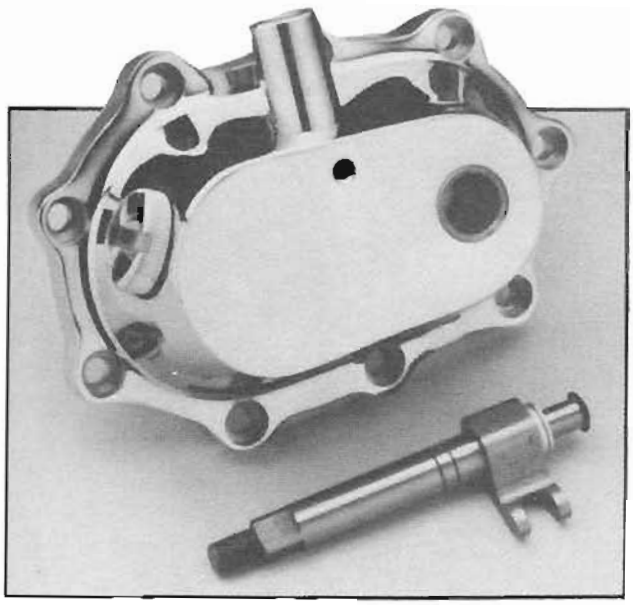
If you wanna add the traditional kicker back onto yer four-speed transmission, there are a lot of retailers to choose from: Chrome Specialties, Gary Bang, Rivera Engineering, Custom Chrome, and Drag Specialties. Retail prices for these kits are not outrageous—somewhere between $220 and $260. H-D hardware for the job costs around $450.

On the other hand, adapting a four-speed kicker to a five-speed tranny is another matter. Only two manufacturers currently sell kits, Grannys Trannys and Sputhe Engineering, and each uses a slightly different approach to the conversion. This is reflected in their price tags: the Grannys setup runs about $235, and Sputhe's asking $335 for their kit.

The main difference between the two revolves around the mainshaft: to install a kicker on a five-speed tranny, the mainshaft has to be lengthened. The Sputhe design uses a



Grannys Trannys, headed by Tom Black, offers kicker kits for five-speed transmissions only. Out of the box, they'll fit '87s and later; with a little more hardware, they will retro-fit to 1980s.



Photos by Mike Griffin

Custom Chrome offers this heavy-duty kickstart cover separately. It has a beefed-up kickshaft and finger. It's also available chromed or polished.

tions for models from 1979 to the present, including those with wet and dry clutches and belt drives.

A coupla final notes: some engines have electronic ignitions that require two continual engine revolutions before the spark kicks in—it's an anti-kickback feature. Kickstarting one of those would be a one-way ticket to Hernia City, so check with yer dealer before ya buy a kit. And don't forget to check for exhaust pipe clearance, too.

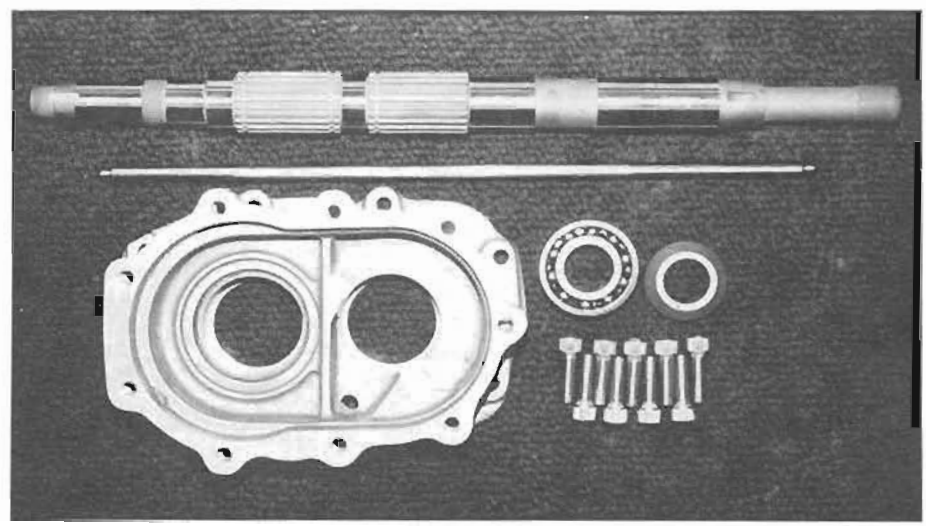
Done correctly, this conversion will give you the best of both worlds—the ease of an electric-start and the reliable backup of kickstarting.

—Bosco Haymaker

new, stronger, longer mainshaft, while the Granny's unit provides an extension for the stock mainshaft. Both kits come with their own kicker housings, pushrods, gaskets, and other internal hardware.

How hard are these kicker kits, whether for four- or five-speed transmissions, to install? Well, if you're not a master wrench, ya oughtta have somebody with some savvy help ya out, particularly if yer goin' with the Sputhe setup, which requires total disassembly of the transmission to install the new mainshaft.

The Grannys conversion is available for '87 and later Big Twins but can be retro-fitted back to '80 models without much sweat. Sputhe's hardware is made in several configura-



The Sputhe Engineering kicker kit includes a new mainshaft, pushrod, trapdoor, bearing, and other goodies to mate a four-speed kicker with a five-speed powerplant.

Gary Bang
Box 472
Canoga Park, CA 91303
(818) 341-8474

Chrome Specialties
3227 W. Euless Blvd.
Euless, TX 76040
(817) 540-1733

Custom Chrome
1 Jacqueline Ct.
Morgan Hill, CA 95037
(408) 778-0500

Drag Specialties
Box 9336
Minneapolis, MN 55440
(612) 935-1000

Rivera Engineering
6416 Western Ave.
Whittier, CA 90606
(213) 692-8944

Sputhe Engineering
11185 Lime Kiln Rd.
Grass Valley, CA 95949
(916) 268-0887

Grannys Trannys
Tom Black
Box 4637
El Monte, CA 91734
(818) 597-2822


WALK

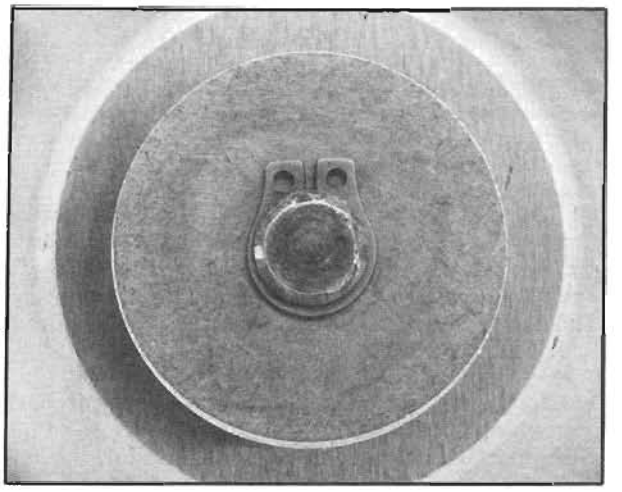
Transmission Clips

In 1976, the H-D factory changed throwout bearings in their Big Twin transmissions from the one-piece unit to a small needle bearing and oil slinger that attaches to the trans pushrod shaft with an open-end (E-ring) retaining clip.

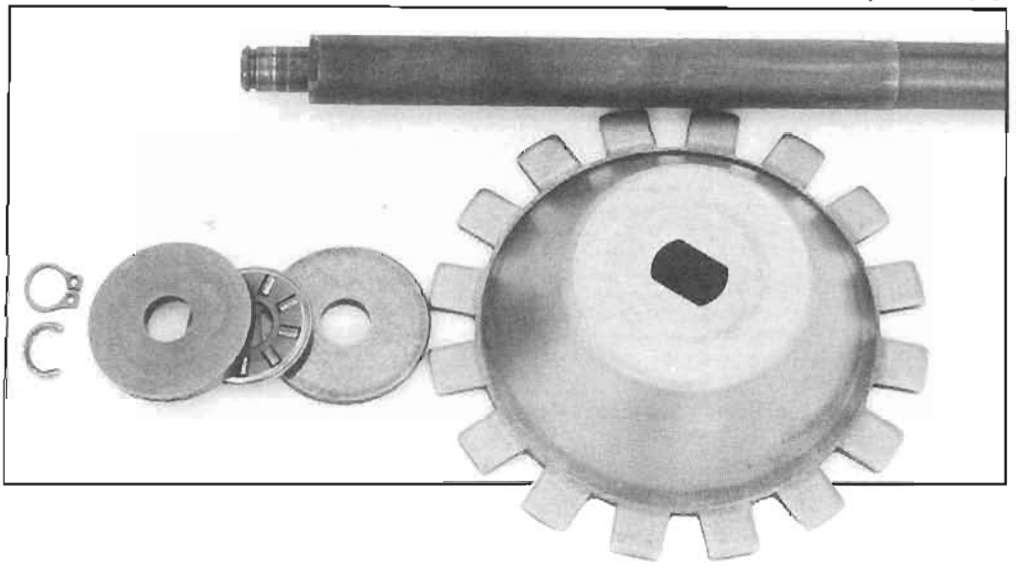
The problem is that this type of retaining clip tends to fall off at just the wrong moment. When this happens the needle bearing and the two races on the pushrod fall off along with the retaining clip, creating instant free play in the clutch lever. The clutch release fork in the trans side cover now pushes on the stamped sheet-metal oil slinger, and turns your trans into instant junk if allowed to go on.

The real pain in all this is that a new-style throwout bearing assembly runs about 38 to 40 bucks from the dealer. However, rest easy, there's a cure for this problem called an external retaining axially applied ring—in English, a clip with a closed end. Cliff, at H-D of Westminister, California, has been replacing the stock H-D retaining rings with the closed-end type every time he gets into a trans.

While we are on the subject of closed-end rings, you can also use them on your Big Twin tranny's shifter fork shaft.



Photos by Pete Chiodo



The factory uses the same type open-ended retaining ring here. Although retaining ring failure is pretty rare, it has happened, allowing the retaining ring to jam into the gears, or worse, letting the shaft creep out of the case into the rear drive chain and sprocket.

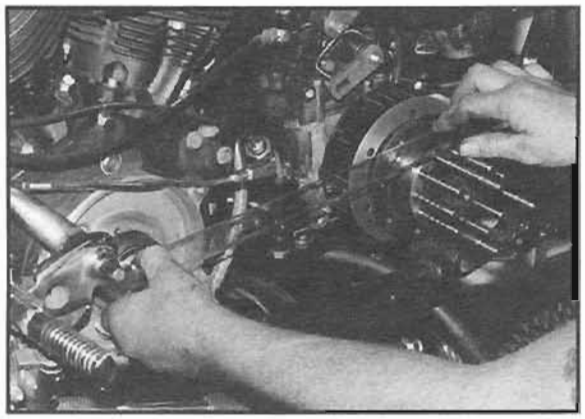
Any bearing supply house should have these external retaining rings, and some of the better hardware stores also stock 'em. For the trans pushrod, you'll need a ¼-in. retaining ring and for the shifter fork shaft you'll need an 11/32-in. ring.

—Wrench

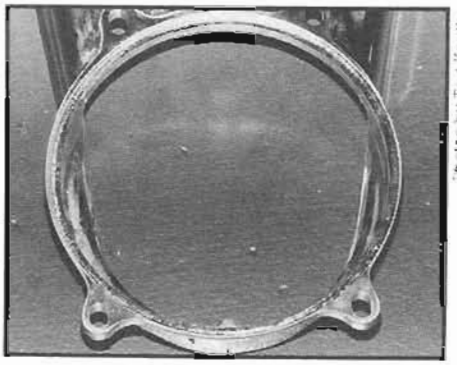
SQUARIN' AWAY YOUR DRIVELINE

Part II of Paroling Your Bike from the Chain Gang

by Tod Knuth



USING GLASS TO CHECK ALIGNMENT
Quite often, engine and transmission shafts are not parallel to one another; transmission needs alignment if glass rocks.



CLOSEUP OF INNER PRIMARY ALTERNATOR RING
Elongating or drilling larger alternator ring-mount holes and opening O-ring outside diameter allow minor belt or tranny adjustment.

Photos by Tod Knuth

CHECKING PULLEY CLEARANCE ON REAR WHEEL
Tire must not interfere with belt or rear pulley; clearance is checked by using a yardstick or string.

Whether you're running chains or belts, driveline alignment is critical. In Part I (*Easyriders*, October '88), we showed the modifications required to install dual belts. Here in Part II, Super Max* demonstrates a quick and easy method to align and break in a dual-belt setup. What's slick about this alignment procedure is that it'll also help all chain-driven bikes run better.

PRIMARY DRIVE

Phil Ross, owner of Super Max, has found during many installations that many engine and transmission shaft centerlines are not parallel or level to one another, so he feels it's mandatory to check transmission alignment on *all* driveline installations.

Start with the gearbox, transmission rear drive pulley, and clutch hub (free of grease, without bearings or bearing cage) mounted in the bike, without the inner primary. For a leveling device, use a flat, parallel surface about 1 inch by 15 inches by ¼-inch thick, like the piece of glass used in the photos.

Hold one end firmly on an engine spline and the other on the clutch hub bearing surface. You'll be able to gently rock the glass on the hub's bearing surface of the transmission if it's not level with the motor shaft. If the inboard edge of the glass moves, the kicker side of the transmission needs to be shimmed; if the outboard edge moves, the clutch side needs shimming.

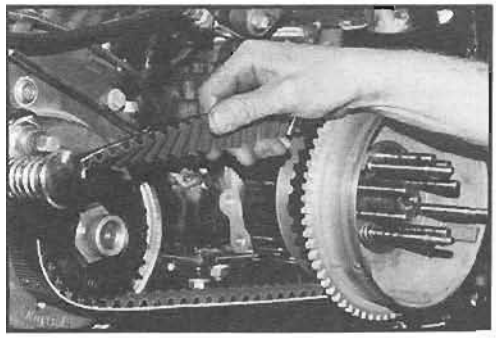
Place horseshoe-shaped shims as required until the glass lies flat on the clutch hub bearing surface with all but the fifth transmission bolt tightened. Then use a feeler gauge to measure the height of the gap at the fifth bolt hole, add .002 to .003 of an inch for "crush," and install a shim of that total thickness. Tighten her down.

Any mishandling, excessive force, or improper installation of a drive belt or chain will greatly reduce its life, no matter what brand it is. Most of the bad rap that belt drives get is actually due to simple mishandling or kinking of the belt before or during installation. Untwist a coiled belt as carefully as you would a bandsaw blade and *never* kink, fold, crimp, or severely bend it back or forth on itself. Gates Poly Chain belts, which are thicker and stiffer compared to rubber belts, are particularly vulnerable to damage of this type. Paint the edge of the belt (silver works great) in order to check belt alignment later.

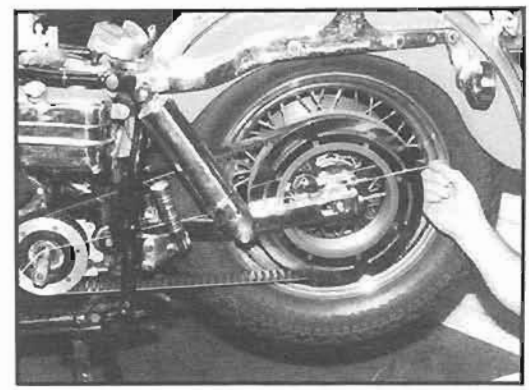
Dry-assemble the primary drive before installing the inner primary. Wrap the belt around the clutch shell and feed the motor pulley on the engine shaft as you slide the clutch shell into place on the hub. *Do not* impact the engine pulley on tapered shaft motors—60 pounds of hand-torque will get the job done. Roll the engine over a half-dozen times—the belt's edges shouldn't be rubbing anywhere. Look for gross misalignment, but don't be too critical, since a belt may seek a different path once the engine is started the first time. (See sidebar for adjustment specs.)

If everything looks good, remove the driveline and install the bearing in the support. Place the bearing in the freezer for a half-hour or more while you heat the support to 200 degrees in the oven. This will ease installation and help prevent damage to the bearing seal. Press in the bearing until it bottoms out, and make sure the support lies flat and parallel to the inner primary after installation.

Service and install the primary drive assembly, using service manual procedures, but leave the primary cover off if you can kickstart the bike. Safety-wire the two front bolts on early-model cast inner primaries, because they'd cause havoc if they backed out into the motor pulley or took a trip to the clutch hub area. Do



PRIMARY BELT FREE PLAY
Unlike rubber belts, Super Max/Gates belts get tighter at full operating temperature. If belt can be twisted 90 degrees without much effort while engine is cold, it has proper free play.



ALIGNMENT OF REAR PULLEYS
Align rear drive by using piece of string. When it touches both pulleys in two places, rear wheel and belt should run true.

not rely on the inner primary for proper alignment; it's all right if a belt touches the clutch shell all the way around—as long as it's not grinding at the flange or losing paint from the edge of the belt.

Kick the bike over a few revolutions while eyeballing the primary belt alignment. If everything looks right, start the bike. If the bike is electric-start, just turn the motor nut with a breaker bar and socket to check the belt before installing the primary cover and starting the bike.

REAR DRIVE

Following your service manual, service the swingarm bearings and install the swingarm and shocks. Make sure the final drive belt runs above and below the swingarm pivot. Install the rear wheel pulley on the wheel hub, making sure the inside of the pulley flange clears the tire; a quick way to check is with a yardstick or piece of string.

A rear-belt swingarm is wider, so the axle spacer needs to be changed. Hang the rear wheel in the swingarm with the caliper mount and drive belt. Slide everything against the right swingarm leg after passing the axle through the left leg of the swingarm. Use a machinist's caliper to measure the distance between the left hub bearing and the swingarm. You can fabricate a new spacer or use a couple of old stock spacers that have been welded together and machined to fit.

This simple procedure for aligning the rear driveline will work every time: Tie one end of a string somewhere in front and inboard of the outer flange on the tranmission drive pulley and hold the other end alongside the same flange on the wheel pulley. The axle should be very close to 90 degrees from the driveline when the string kisses the flange rims equally in two places on both pulleys as you pull the wheel straight to the rear.

Snug the axle adjusters up to this position and spin the rear wheel, checking to see if the belt rubs or touches anywhere. You've got it right if the sides of the belt don't touch the flanges on the rear pulley. (See sidebar for adjustment specs.) Tighten the rear axle.

CHECKIN' IT OUT

Go for a slow ride around the block and check for unusual noises, then look over the entire driveline to make sure it's tracking properly when you return. If everything looks okay, go for a short three-to-five-mile ride and carefully check the condition of both belts again. Pull the primary cover for a peek at the belt. A Gates belt should now be about a quarter-inch tighter, and the rear belt should be virtually unchanged from the cold adjustments. Check for any loss of paint on the edge of the primary belt and look for rubbing or other signs of misalignment on both belts.

Now go for a 15-to-20-mile ride and check the condition of both belts again when you return. Make absolutely sure the primary belt is running right by removing the cover a second time—remember, you don't have an oily mess to worry about.

It doesn't take a genius to realize that a dual-belt system eliminates chain-whipping vibrations, reduces driveline weight and friction, and also runs quieter and cooler. Properly installed belts should be almost maintenance-free during their lifetime, and they should roll up 5 to 10 times the mileage of chains. And the biggest bonus of all? They run clean because there's *no oil.*

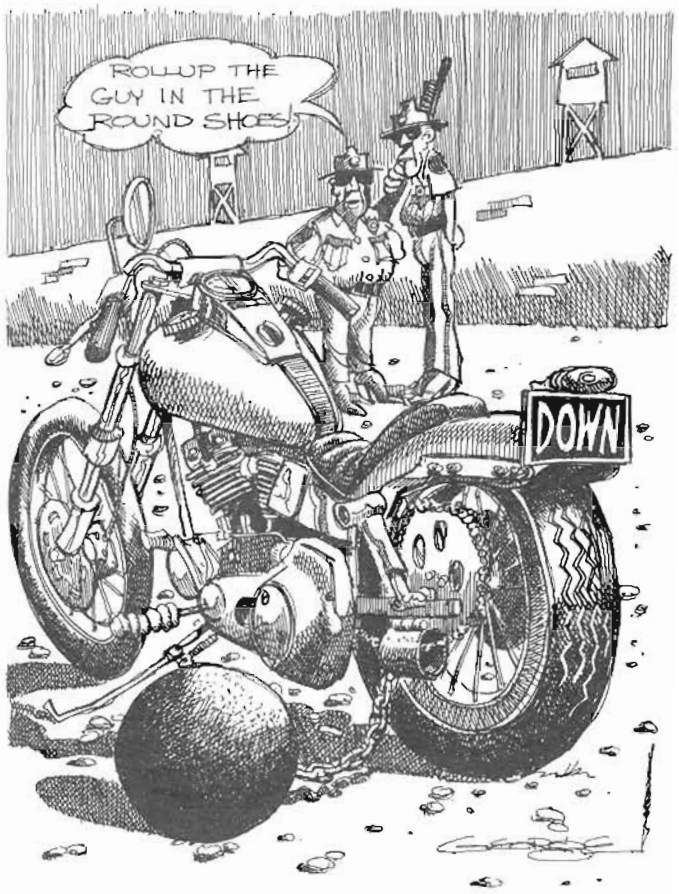
*Super Max, 200 South D. St., Porterville, CA 93257. (209) 782-8200

Gates Poly Chain Characteristics and Adjustment

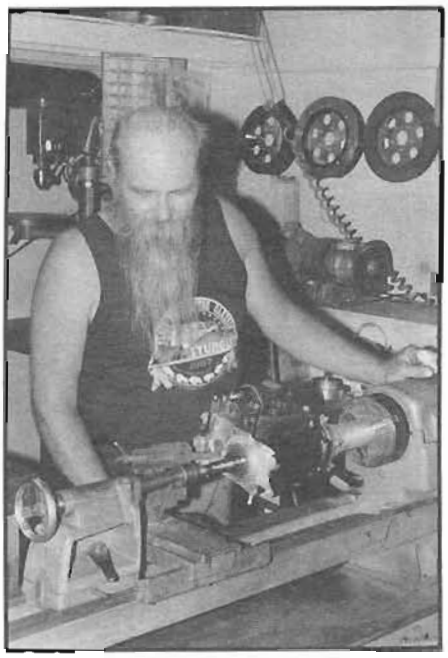
Don't be concerned if the belt appears too loose; these belts *must not be overtightened!* Unlike rubber belts, Gates belts tighten once they reach operating temperature (after 60 minutes of riding). Proper primary belt adjustment is one inch or more of free play when the belt is cold, and ½-inch when the belt is hot.

A simple way to check cold free play is to grab either run of the belt: the setting's about right if you can twist the belt about 90 degrees without too much effort. There will be a light flaking of the 2-mil plastic surface on the tooth side of the belt for the first 100 or 200 miles. This flaking should not be confused with the white powder flaking of misalignment or overtightening. If the belt turns a chalky white, it's too tight.

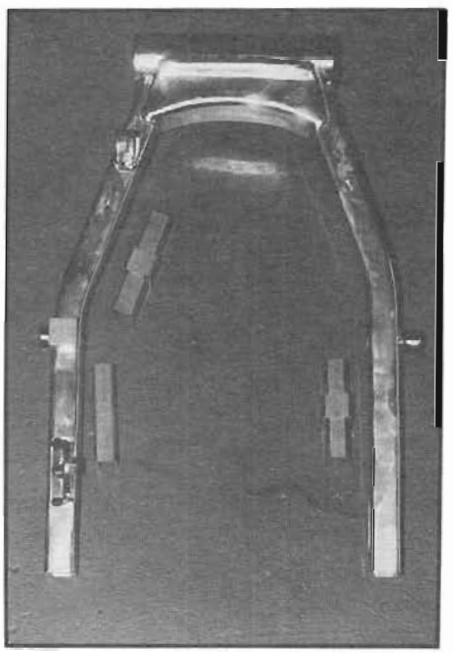
The bike should be on the ground and loaded with rider(s) when you're adjusting a Gates rear-drive belt. Move the axle adjusters equally until there's ½-inch to ¾-inch of free play in the belt for a cold adjustment.



Parole Your H-D from the Chain Gang



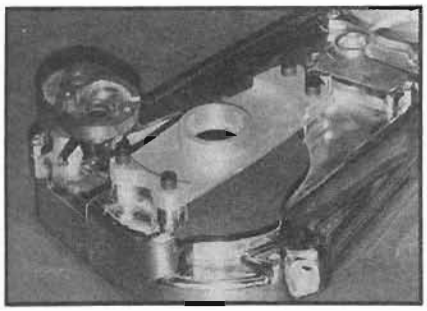
Phil Ross is a pioneer of belt-drive technology on Harleys. Here he demonstrates an easy way to turn down a tranny bearing boss without disassembling the transmission.



Your present swingarm can be modified with a kit, or you can obtain a chromed or unchromed replacement.

Upgrading your bike's rear chain to a belt drive may be easier than you think. It can be accomplished without a total teardown, and you don't need to be an ace Harley wrench to complete the task. It's a little more complicated than just swapping a few parts, however. If you lack the skills, tools, or willingness to tackle the changes yourself, you can send your parts to Super Max* or take them to a local machine shop for modifications.

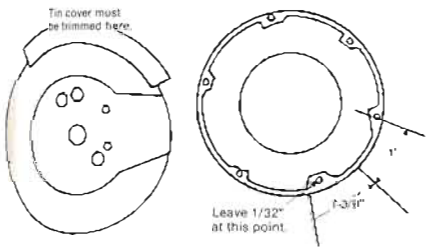
This segment covers the required modifications to the inner primary, swingarm, and gearbox. Next time we'll cover the adjustment, break-in, and troubleshooting of a rear belt drive, which may be different from what you're used to, but you'll find that Super Max's straightforward installation and alignment procedures can also be used to align a chain drive properly.



Inner primary must be opened up to clear rear belt and tranny pulley. Bearing support comes in "shorthorn" style, or "longhorn" for open primaries.

Tranny Modifications

Super Max's countershaft pulley requires only .010-inch clearance from the case, so no modifications or shaft changes are required on pre-1965 transmissions if you use a 1¼-inch final drive. All '65-'79 transmissions require disassembly, because the support arms for the inner primary interfere with the pulley, and the arms must be ground. Late '79-and-up 4-speed cases can have the bearing boss turned down to 2.900-inch OD while still assembled. A bit of additional grinding is required on the case and bearing support



Ratchet drum modifications are minor, but necessary to clear the belt.

web for the OD of the pulley, and the ratchet shifter drum will also have to be trimmed or ground slightly.

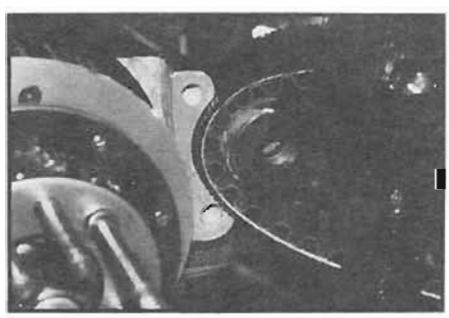
Swingarm Modifications

Now's the time to lower your shock mounts if you have ever considered it. Belts on tranny-to-rear-wheel ratios of 33/68 or 33/70 will usually hit the starter shaft, so you need to check the belt-to-shaft clearance if your bike is lower than stock. Super Max's 32/66 ratio "lowers" the belt with a near-stock final drive ratio of 2.06/1; their 32/68 combination gives you an H-D Sturgis 2.12/1 ratio.

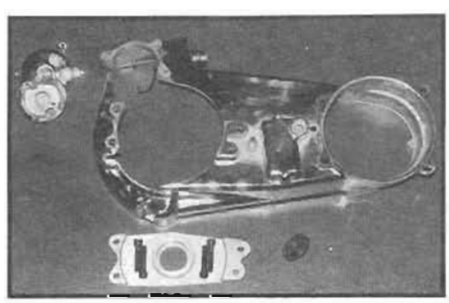
Square swingarms for chain-drive, 4-speed H-Ds will not clear any final belt drives now manufactured, but there are several ways to accomplish the necessary changes. You can either modify your present swingarm, using a kit from Super Max, or avoid the hassle by purchasing a new chromed or unchromed swingarm. Super Max swingarms are built wider and 1½ inch longer than stock and allow you to choose from six final drive ratios, using either H-D's stock 70-tooth or Super Max's 66- or 68-tooth wheel pulleys matched with their 32- or 33-tooth tranny pulley. Early round H-D swingarms can also be used for final belt-drive setups, but remember you must also convert to a disc rear brake. A qualified frame fabricator can widen the swingarm and mount the disc brake anchor without too much trouble.

Inner Primary Modifications

Inner primaries on '65 to '84 H-D chain-driven Big Twins must be modified with a 6½-inch circular opening and the removal

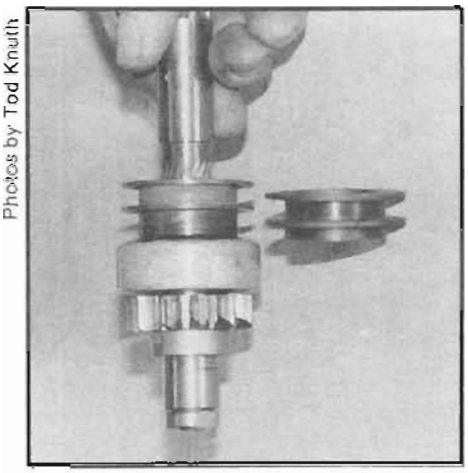


Grinding away a bit of swingarm mounting ear will allow for later belt removal without having to move the transmission.



Super Max's modification service makes all the necessary changes, or you can go to your local machinist. Note that Super Max adds a third boss to the starter for more strength.

Photos by Tod Knuth



A modified starter Bendix keeps activating fingers clear of the drive belt.

of two areas on either side of the rear bearing support to clear the tranny pulley and rear belt. These modifications may discourage a few, but they *can* be performed by hand. A modified starter collar moves the starter Bendix fingers outboard enough to clear the belt, and a "shorthorn" output shaft bearing support is available to fit inside the modified inner primary housing. (A "longhorn" version is also available for open-drive setups). Super Max offers a complete bolt-on modification service for the inner primary, which features a third mounting boss and bolt to give the starter housing additional support.

Frame Modifications

You must grind or file the drive-side swingarm mounting ear along the forward inboard corner to allow the rear belt to slip between the ear and transmission support during any future belt removal.

Oil Line Modifications

Oil line routing to '65 to '84 dry-clutch inner primary will no longer be airtight. Later wet-diaphragm clutch models can be converted to the earlier dry-clutch style. Chain oil feed at the oil pump is shut down and the line is removed. The sucker line is removed from the primary and the opening is plugged, then the in-line T is replaced with a straight connector. The lower end breather line from the engine case (just inboard of the oil pump) is vented to the outer atmosphere via a case breather filter (a K&N #62-1000 vent filter is a good choice). —Tod Knuth

*Super Max, 200 South D. St., Porterville, CA 93257. (209) 782-8200


PROFIL
SELF
WADDAFUCK!
CHUNKA!

How To Set Up Your Big Twin Evolution Clutch

by Joe Minton

Harley's Evolution clutches are better than the old ones in many ways. In other ways, they aren't as good. What they certainly are, though, is different. Anyone who wants to get the best performance out of his Evolution clutch will need to know how to treat it and how to set it up.

The new Evolution Big Twin clutch has a lot less surface area than the old one. Harley claims that the new clutch will handle more torque, which is probably true. I have done extensive work with the Evolution Big Twin on Jerry Branch's dyno, where we made more torque than the factory ever saw. The stock clutch was more than good enough.

But handling torque from the engine isn't the same as being able to withstand drag race starts or power shifts. The difference is heat. The reduced surface area in the new clutch means it will get too hot just that much faster when it is being slipped. The cure is easy and in two steps; don't push cages with your Evo scooter (the CHP tries to), or get a set of higher heat capacity friction plates.

Harley sells them—(p/n 37931-84, $12.75 per plate—you need six), as does Barnett Tool and Engineering, 9920 Freeman Ave., Santa Fe Springs, CA 90670, (p/n HOP-9, $54.00). The Barnett clutch has an important advantage over both of Harley's—it will significantly reduce clutch drag.

Harleys have seldom been great shifters—you can hear them clunk for blocks. The main reason for the familiar clunk and the occasionally hard-to-find neutral is clutch drag.

As you pull the clutch lever in, the pressure plate is moved away from the clutch pack by the pushrod running through the center of the mainshaft. The friction plates, driven by the clutch basket, are essentially locked together with the steel inner plates which drive the input shaft. The act of pulling the clutch lever doesn't force the outer friction and inner steel plates apart; it merely removes the force of the clutch spring. If the friction and steel plates are, for any reason, stuck to one another, the clutch ain't gonna let go. Ideally, they will separate in a smooth, predictable way as you release the pressure holding them together by pulling the clutch lever. Ideal isn't the way things usually are, though.

When you lift the pressure plate from the steel and friction plates, you only move it about an eighth of an inch away. If any of the components—pressure, friction, or steel plates—are warped, part of your clutch lever lift will go toward overcoming the warping. Given enough warping, you will use the whole lift and still not get the pressure plate completely away from the clutch plates. So if you have damaged your bike's clutch plates by overheating them, the clutch may drag simply because its plates are warped more than the travel of the clutch release and cannot get free of one another.

Another possible source of clutch drag is the primary chain. If you happen to overtighten the chain, it will pull the clutch basket off-center and cause the plates to drag against one another. There must be free play in the chain at all times. It will be less when the engine, primary, and transmission are at operating temperature than when they are cold. Your shop or owner's manual will give you the range of slack that is acceptable. Generally, they will call for at least one quarter of an inch of free play, in the center of the chain run, when the engine is hot.

Oil that is too thick will tend to stick the friction and steel plates together. STP will stick them so hard that the clutch will completely lock up. The clutch would like to see oil that is thin, like automatic transmission fluid. The chain, on the other hand, prefers thick and gooey gearbox oil, thank you. Evolution Big Twins have a separate and sealed primary oil supply. Because of this, Harley has been able to develop an oil that will take care of both the chain and clutch without having to worry about its effect on the engine. They use a mixture of petroleum and synthetic oils that give the protection of gear oil, yet is thin like engine oil (it's about a 10W-40). The chain, sprockets, and clutch discs all get what they need.

Part of how well a clutch lets go when it's told to is determined by the material its friction plates are made from. A compromise has to be reached between easy release and holding power. The stock Harley friction material for the Evolution Big Twins is okay on

hold, but not too good at release. The Barnett clutch friction material will not only hold harder and deliver more torque, but it will also release more easily. It will withstand much, much more abuse as well.

Okay, if you have Harley's primary oil, straight plates, and friction material that releases well, you should have a great shifting Evo Hog, right? Well, maybe. There's a little more to it yet.

The shifting dogs on Harley transmission gears are undercut. That makes them stay in gear and helps complete a sloppy shift by pulling the gears firmly into engagement. The undercutting also makes it hard to shift the gears out of engagement if there is a load on them. A dragging clutch will keep the undercut gears loaded and make shifting clunky and uncertain. So, while it is the gearbox that is making the noise, it is the drag of the clutch that causes it.

Both the Evolution Big Twin and Sportster clutches uses diaphragm springs instead of coils (as found in the older designs). The main reason for the switch to a diaphragm spring was compactness. It must be adjusted correctly for best results, though.

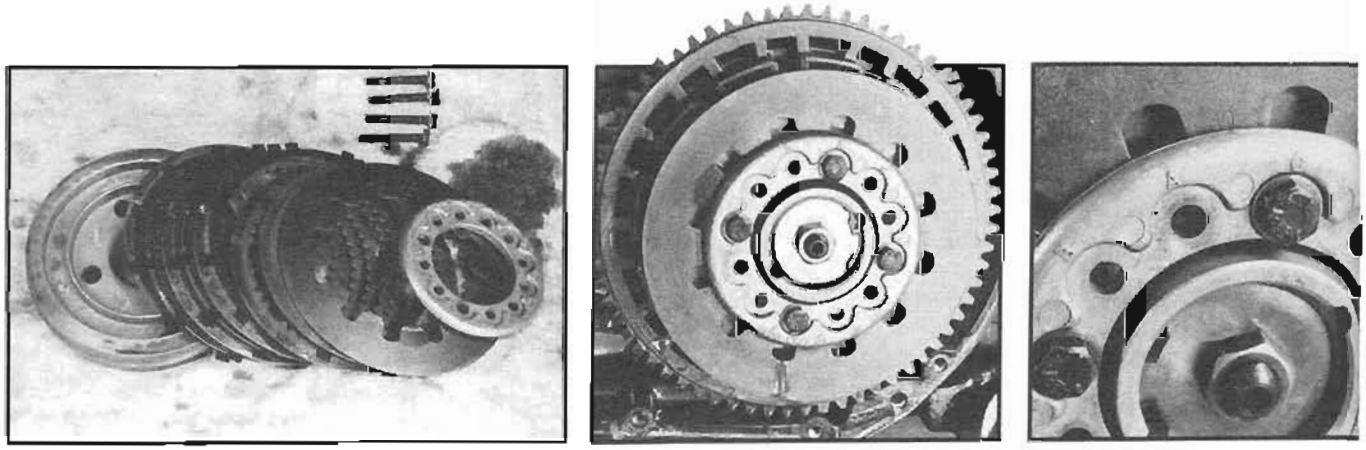
According to the factory shop manual, when you place a straightedge across the spring (see photo), there should be no more than a .010 inch gap between the ruler and the spring, in either the center or at the edges. If there is more, the spring will not be pressing on the clutch pack enough, and it might slip.

An incorrectly adjusted spring will also affect how the clutch lever feels when you use it. The only difference between an Evolution clutch lever that is easy to pull and one that seems to be harder halfway through is the spring adjustment. A perfect setup will have the spring flat. If the spring is dished out, it will be harder to pull the lever. A dished-in spring will be easier and better, within the 0.10 limit.

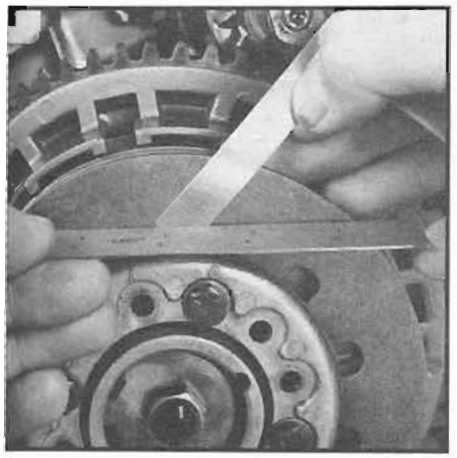
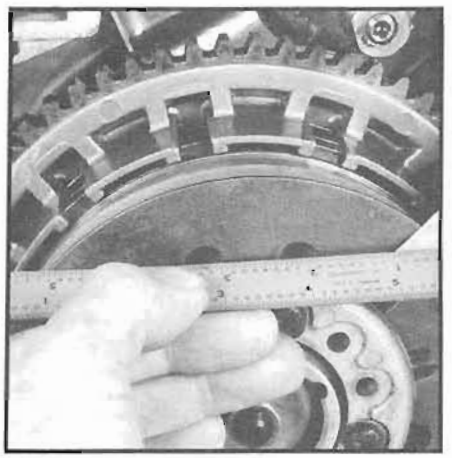
How much the clutch spring is compressed (when you aren't pulling the lever) is determined by which set of holes you use when you bolt on the adjuster plate (see photo). The holes are marked "A," "B," and "C." The "C" hole set compresses the spring the least amount and "B" the most. Ideally, one of these hole sets will compress the spring so that it is perfectly flat.

If your Evo's spring happens to have acceptable clearance between the straightedge and the spring's edges with one set of holes and between its center and the straightedge with another set, use the holes that will give the clearance in the center (dished-out). This will make the clutch lever easier to pull and will eliminate that hard spot halfway through the lever's travel. It won't affect the clutch's torque capacity at all.

Once you get the spring right, it's time to set up the adjusting screw and cable. First, turn the cable adjuster in about as far as it will go (this app-



Harley's Evolution clutch is sure different from the traditional one. It'll handle more torque, but not more heat. The left photo shows all the parts of the new clutch. Center a shot of the assembly; notice the automotive-style diaphragm spring. The aluminum collar that compresses the spring (right photo) also adjusts the spring shape, which critical for best clutch feel and performance.


Clutch spring shape can be measured with ordinary tools. Note that the four spring retaining bolts are fitted through holes with a letter—either A, B, or C. These hole sets preload the spring different amounts, changing its shape. Best lever feel results when the spring is flat or slightly dished (left photo). The large contact area of the new clutch hub eliminates wear and the sticking between the plates and hub.

fies to '87 models, too). Loosen the locknut and run the screw in until you feel the friction from its trying to operate the clutch. Back the screw out a half-turn or so and run it in again a couple of times to make sure you know where the adjuster takes up all the free play. You should be able to feel when the clutch adjuster touches the pushrod.

Be sure there is still play in the clutch cable some more and run the when you feel the screw bottom. If there isn't, loosen the cable adjuster screw in again. Now, back the adjuster screw out 3/4 of a turn and tighten the locknut.

The best positioning of the clutch lever is where it gives you the most control over the clutch. There is no one correct lever adjustment; we all have different hands and will prefer that the clutch begin to engage at different lever positions. Set the clutch lever where you like it.

There must always be some free play in the cable, hot or cold, just so you can be sure that it is fully engaged. The farther out the lever is when the clutch begins to engage, the freer the clutch will be when the lever is pulled all the way to the grip. That will help give smoother shifts but may be clumsy to use. If, on the other hand, the lever has too much free play, the clutch will drag, and shifting will be lousy. Find your own compromise.

Finally, lube the cable; that will sometimes give as much shifting improvement as all the rest of the things you have done.

When we're riding, we don't think of how far we are pulling the clutch lever when we shift. We just pull it and shift. If most of that pulling effort is used to overcome the friction of a sticky cable, then we won't actually move the lever very far, and the clutch will not be fully disengaged—clunky shifts. If your bike's cable is dry now, you'll be surprised at how much better your shifts will be after you lube it.

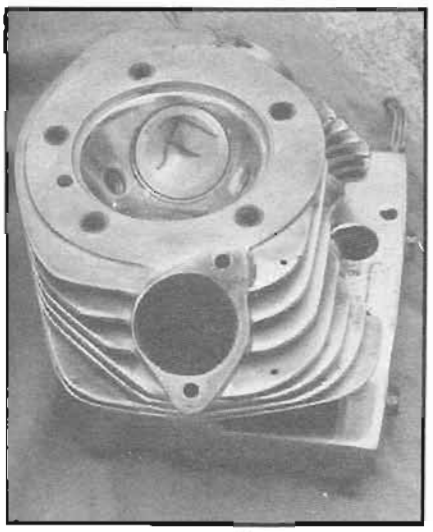
When you loosen the clutch cable to adjust the clutch, go ahead and take it off at the lever end. Prop the cable up so that it is vertical. Wrap some tape around the end of the sheath to form a funnel. Now fill the funnel with primary oil and let it run down into the cable. Light oil seems to work better than heavy engine oil; the heavy stuff just makes for friction in the system. You should do this every 5,000 miles.

If your Evolution Big Twin is like most that I have worked on, the majority of the clutch adjustments mentioned here will be correct from the factory. However, I have yet to find one that is perfect in all respects. If you will take the time to go through the procedure, your bike will almost certainly shift better. If you're gonna drag race or you want the best possible clutch release, install the Barnett friction plate set, do the setup, and ride. ■


AGENDA

Getting Blown

by Rogue



Heads welded and drilled for two-bolt exhaust pipe.

Turbocharging is probably the most misunderstood V-twin modification. Basically, a turbo forces a more powerful air-fuel charge into the combustion chamber. More explosion – more power – *faster.*

Turbos work by two impellers (similar to fan blades) being driven on a shaft: the exhaust spins the shaft, and the impellers compress the air-fuel mixture and force it through the intake manifold.

A turbo also increases horsepower under heavy engine load: the increased exhaust gas volume increases turbo speed and sucks more air to meet the demand, allowing the engine to burn fuel more efficiently, increasing horsepower, and improving cylinder scavenging, thus creating better fuel economy.

If engine load is light, the lower volume of exhaust gas decreases the turbine speed, reducing fuel consumption and engine strain. Since the turbo is driven by exhaust that's normally lost, there's no engine power loss—and it still sounds like a Harley.

On the average, you can expect a performance increase of 50 to 75 percent—with some major modifications, increases of 100 to 200 percent have been claimed. More on that later.

The amount of boost you can safely run depends on your compression ratio. Generally, compression over 9:1 is *not recommended*; 9:1 will handle 5 pounds of boost at the most; 8:1 or 8.5:1 will usually handle up to 7 pounds of boost—and occasionally 10 pounds for *very short* periods of time—on unleaded high-test gasoline. Running more than 10 pounds of boost will necessitate O-ringing your cylinders.

If you get detonation (what some people call octane ping—sounds like little guys in there with hammers) on hard acceleration, your boost is too high. There are a few things you can do with your timing and advance curve to correct some of it, if it's not too much.

But 5 to 7 pounds of boost on a Harley motor will make you pay serious attention: basically, you'll accelerate like you were in the next-lower gear.

After you've ridden with a turbo for a while and have gotten over the fun of having all that horsepower there on tap, you'll find you can run through about ¾ of your rpm range on just the carb: if you want the power, twist it, and the boost is there.

I've been working on turbos for more than 25 years, usually on big trucks and diesels, but a turbo is a turbo; the only difference is that the ones we're talking about are smaller.

There are a few things to seriously consider before putting a turbo on your machine:

1. The motor must be in good shape and be able to handle it—pistons, rings, valves, etc.—because if it's not, the added pressure put into the cylinder will leak or blow-by.

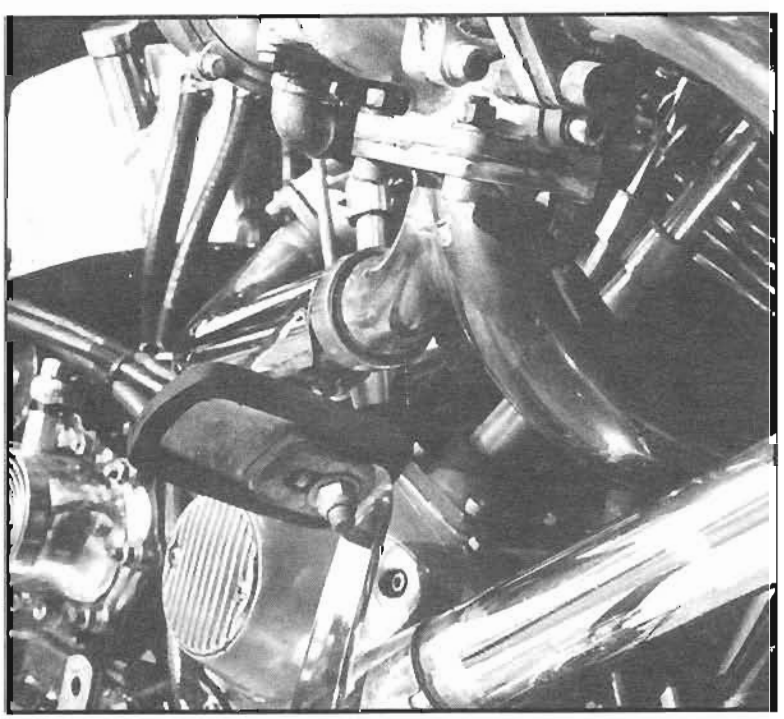
2. Forget what you already know about making a motor run on a carb (think *compressor*, for lack of a better description).

3. Use the right size turbo for your motor. Big is definitely not better here. Until a few years ago, this was somewhat of a problem. Now, with car manufacturers using turbos on a lot of their small engines, they're readily available and affordable. There are a couple of places where you can buy a ready or custom-made setup, but this is the expensive way to go. Another option: build the system yourself. With a little planning, some shopping around, and a welder, it's not hard to do—and then the price drops.

I was turned on to an old Corvair turbo. In '82 I rebuilt it and installed it on my 86-inch shovelhead. The turbo came off a 140-inch motor and was a little big and heavy, but it worked. As long as the stock shovelhead gaskets worked, I was getting 2-to-3 pounds of boost in second gear and up. When the gaskets would blow, the bike still ran okay, but I couldn't get any boost.

I ran a lot of different carbs and ended up using a Keihin, which gave plenty of power and 50 miles per gallon on the highway. I ran the unit all over the country for two years, with no problem other than blowing a gasket once in a while. Eventually, however, the old-style carbon seal in the turbo started to go, so I removed the unit, but I was impressed with the power increase and wanted more. Solution: the right-size turbo and some minor changes.

There are a number of good small turbos on the market, but after talking to Larry Johnson of L&V Engine in St. Petersburg, Florida, I decided to go with an I.H.I. RHB 52. The deciding factors were that it was small, lightweight, and had better

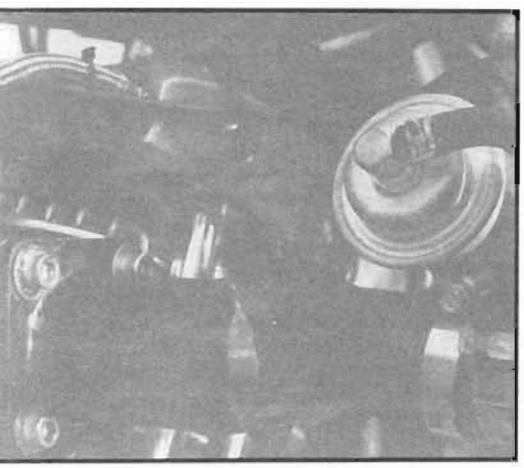


Exhaust manifold and refabricated pipe.

response time, full-floating-sleeve nitrided bearings, superior oil seal structure (piston-ring type), and an advanced compressor-wheel design.

The factors used in determining what size I.H.I. to use included the size of engine (93 inches), cam (Leineweber Turbo Cam), and that I'd eventually be running 12 to 15 pounds of boost. Also, the type of wastegate (safety device to stop over-boost) was extremely important—the I.H.I. had one built in.

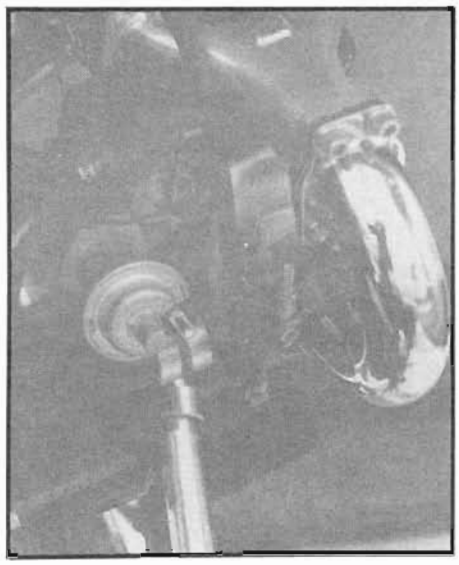
The I.H.I. unit will fit everything from a stock 74-cubic-inch Harley to well over a 100-incher. It is light for a turbo, weighing only about seven or eight pounds, and it will put out more boost than you'll probably want to use—so you definitely want a wastegate.



Intake manifold.

Since the turbo runs off the exhaust, a few changes were made. While the heads were off for a dual-spark-plug conversion, the exhaust ports were built up with heli-arc so that two bolts, instead of one, could be used to hold the exhaust pipes secure. (When doing this, be careful—the heads should be bolted solid to a steel plate to keep them from warping during welding. Also, the bolt-holes cannot be installed directly opposite each other; they need to clear the top cylinder fin. You can grind a small amount out of the top fin in this area and not hurt anything.) Since I made this change, there hasn't been a gasket failure to date.

When routing the exhaust pipes from the heads to where the turbo will mount, some important factors need to be considered: the fuel-air outlet of the turbo should not be lower than the intake between the heads. You don't want any low spots where fuel could collect. Also, you need to figure clearance for the gas tank—and for your legs to reach the forward controls, etc.



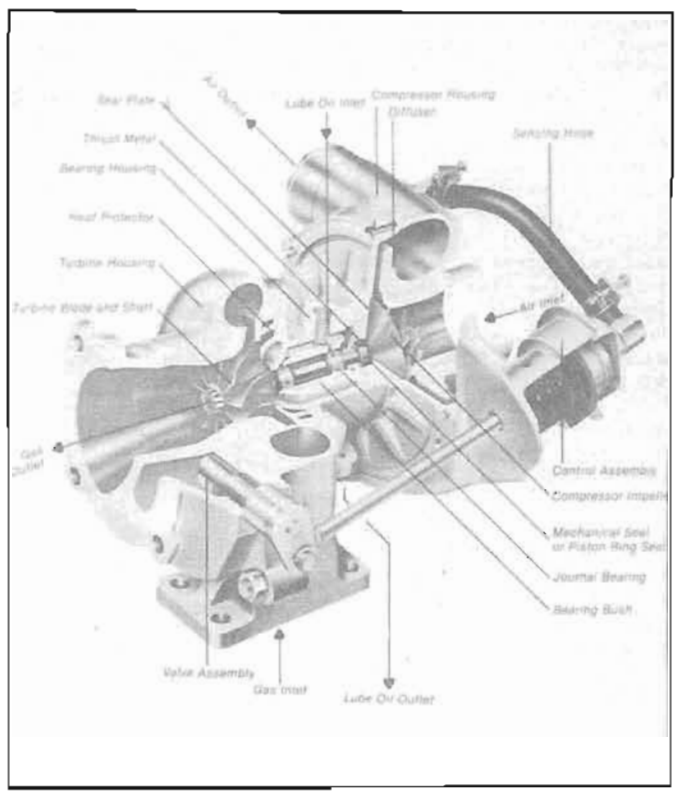
Rear view of turbo at the air cleaner, showing after-oiler and plumbing.

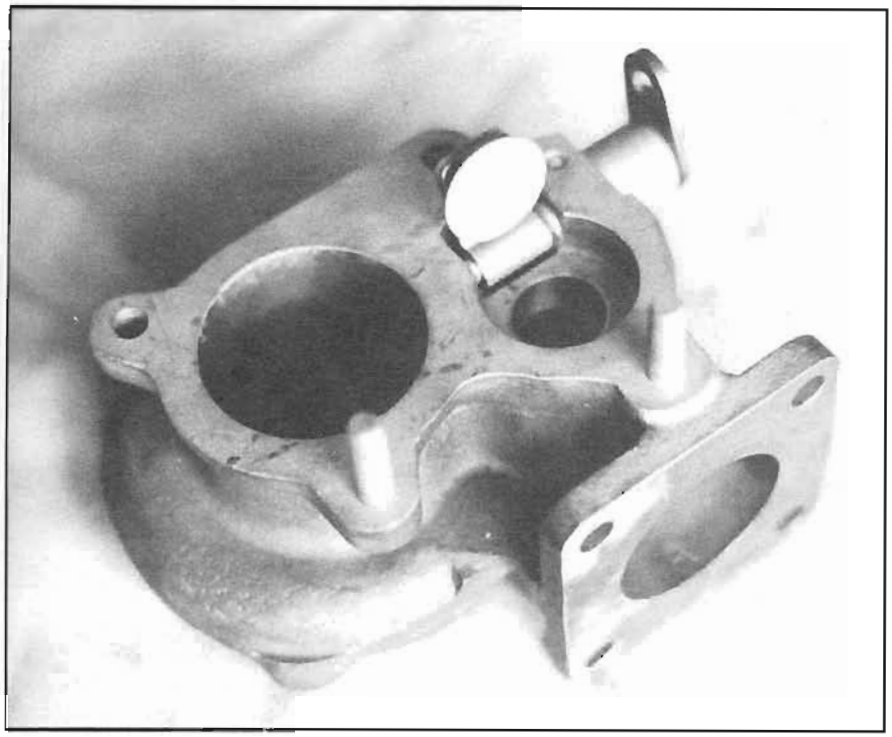
I've built numerous exhaust systems and have found no noticeable difference with pipes being the same length from exhaust manifold or head to turbo. This gives you the flexibility to mount the turbo forward. When mounting the turbo, make sure to leave room for pushrod adjustment without sticking the turbo so far out that it affects balance.

Actually, making the exhaust can be done rather easily. Using the turbo gasket for a template, make new plates to mount to the head exhaust port, using two bolts and a plate to mount the turbo. The plate should be at least ⅜-inch thick. Needless to say, these plates need to be flat, smooth, and of good-quality steel, because they will be gasket surfaces. Any leaks in this part of the system will seriously limit your boost.

If you don't have a tubing or pipe-bender that can bend what you need without crimping or wrinkling your pipe, go to your local hot-rod shop. Hooker, the people who make header systems, sell short pre-bent sections in just about any size or radius you could want—and their pipes are nice and smooth.

Bolt the flanges to the heads, leaving them just loose enough to slip a piece of 1¾-inch exhaust up into your port. There's a slight curve here. Line it up, tack-weld in place, remove, and weld it. Put both flanges back in place and bolt securely. Slide a piece of 1 ⅝-inch tubing inside, line it up, and tack-weld. Continue fitting your pieces together until you have everything where you want it. I suggest you make one pipe with a slip-fit—it sure makes it a lot easier to take off or put on. Following the direction of flow, always slide the primary pipe inside the secondary pipe; it limits the chance of an exhaust leak. The two pipes from the heads are





Photos by Rogue

View of the built-in wastegate.

joined together at the turbo mounting plate, making a collector.

When your exhaust is fully welded and back in place, mount the turbo to the flange. If all's going well, you'll have figured everything out and it'll be where you want it. Use an SU carb adapter manifold to clamp to your heads' intake ports. This will give you a 2-inch intake at the flange.

Most of the books I've read suggest a plenum chamber or surge tank between the turbo and the intake manifold. I've made and tried a number of these and haven't found any to my liking. I made a connector out of flanged 2-inch tubing, with 90-degree bends for turbulence, and stepped down to 1 ¾-inch tubing so it could be joined to the turbo unit with turbo hose. (Note: Don't use radiator hose or regular hose, because gasoline will eat it away.) This type of intake has given me the best response and performance; the motor idles below 800 rpm, pulls strongly through the full rpm range, and has yet to produce what's called "turbo lag."

The exhaust pipe coming out of your turbo is usually around 2 or 2½ inches round, depending on what turbo unit you use. On the I.H.I. or other turbos with built-in wastegates, you need to make sure that the hole relieving your exhaust gas is large enough. What the wastegate does is release or divert your exhaust pressure at a certain boost to slow down your turbo speed. If the turbo unit you use does not have a built-in wastegate, you can buy an external one and add it to your system. They usually cost between $150 and $200, so a turbo with a built-in wastegate, even if it cost a few dollars more, may actually be cheaper.

The type of wastegate you use has to be taken into consideration when making your final exhaust. I've found that a pipe about 2 feet long and 2½ inches around works well most of the time. Figure your clearances and start with this length. Should you decide you want something longer or just want to experiment, you can do so by adding extensions.

I would suggest using the carb that you have on your bike now; it'll save you money, and usually all that'll be required is to lean it out one jet size all the way through. This rule applies to any carb you may choose to use. Run it a little, check spark plug color, and adjust the jetting.

The fuel inlet side of the turbo is round and also uses turbo hose. I've tried some commercially made flanges with molded hose and have found they crack after a while. So I made a flange and tube out of aluminum, and it worked well.

If you decide to use a carb like a Keihin and run it straight off the turbo, be sure to make a strong support bracket. Leg clearance is usually a factor here.

Right now I'm running a Weber, and because of its size, I had to run it above the turbo. Again, I used a welder and tubing from Hooker. It's working well, but because it's above my fuel petcock, I had to use a small electric fuel pump. I believe mine came off a Ford Courier, but they are available at any auto parts store.

Because of how a turbo works, you don't want a long-duration cam. A stock cam will work, and there are usually many around, for cheap or for free. If you've got the money, I strongly recommend a turbo cam. Right now I'm using a turbo cam made by Leineweber, and I like it better than the others I've tried. If you have a naturally aspirated engine (one using a carb and fuel being sucked into the combustion chamber), it's understandable that you'd want a long-duration cam. The longer the valve is open, the more fuel you get into the combustion chamber. Bigger explosion· more power. On a turbo, you're forcing an air-fuel mixture into the combustion chamber, and you want the valves to close as soon as possible to retain this charge.

Oiling is big-time important. A turbo will spin a lot faster than your engine—some well over 100,000 rpm—so good, clean oil (and plenty of it) is needed. Your turbo will last a long time with enough oil, but if there's not enough, look out. I have reworked my oil pump to give 10 pounds at idle and 20 to 25 pounds going down the road (these are readings with the engine hot). This pressure gives the turbo plenty of oil.

The turbo is fed off the oil pump at the oil-pressure-sending unit, using 3/16-inch hose. Return is gravity-fed, using ¾-inch hose returning into the cam side of the motor case. The block must be drilled and tapped to do this; take the cam cover off and make sure no metal pieces remain in the engine. Oil is a major factor on reliability—make sure you install an oil filter and cooler.

There are also a couple of other things that will help prolong your turbo's life. Don't let it idle for long periods of time. After running at road speed, let it idle for just a *short* time before shutting off. A pre-oiler and/or after-oiler will send small amounts of oil to the turbo without the engine running. You can buy a kit or make one. Do this and your turbo will last as long as your engine—or longer.

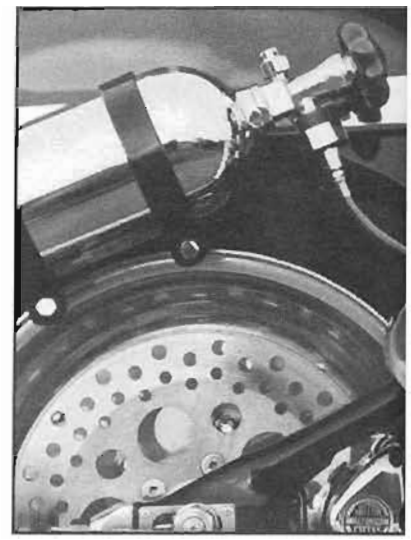
Normally, on a small-boost motor, you won't have to change the timing, but you can retard it slightly by timing it with the timing mark in the very front of the timing hole. This will help slow down detonation if you're running a little more boost than you should be.

This is just the beginning. Changes in compression ratio, ignition advance, curve, head gaskets, etc., will make it haul ass even more. More on turbos in the future.

If you have any questions about turbocharging your Harley, you can write to Rogue here at the magazine or at Box 184, Melbourne, FL 32902.

Other experts in the field of turbos for Harleys include Pharoah, at All-Arizona Welding & Machine, 703 W. Main St., #2, Mesa, AZ 85201, (602) 835-0822; and RB Racing, 1625 W. 134th St., Gardena, CA 90249, (213) 515-5831.

Nasty Nitrous



A clean, compact nitrous setup

Riding a stock-engined Harley? Betcha at one time or another you've wished you were straddling a tall stroker with inches galore, or maybe you've wondered how your sled might fly with a turbo—or even better, a blower supercharger.

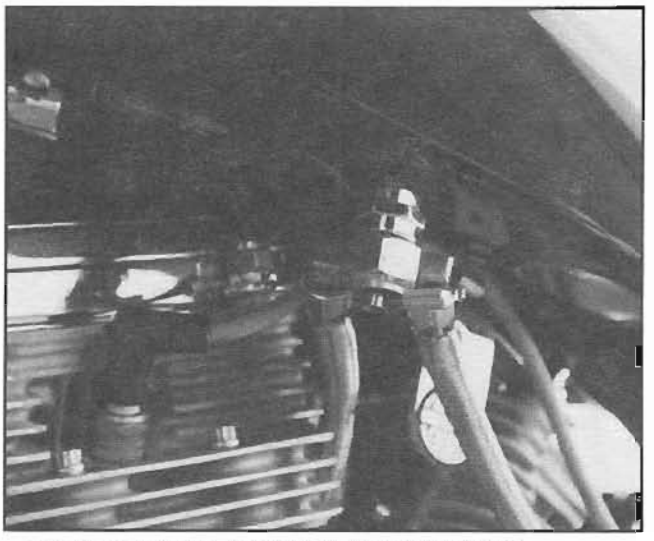
All these ideas are really great until you check out the price tags. If the cost of a turbo or a blower doesn't knock you down, a stroker motor will lighten your wallet by more than a coupla grand. The question is, just how often do you really need that extra punch? Most of the time you're just cruisin', and it's only now and then that you wish you were ridin' a balls-out bike.

Truth is, you can gain more than 50 horsepower instantaneously by bolting on a bottle. No, not Scotch or even Jack Daniel's, but nitrous. Nitrous oxide is an odorless, colorless gas that was first used in the 1800s for medical purposes, and since then has been referred to as laughing gas. During World War II, chemists discovered its explosive nature, and it was used to boost the gasoline engines in aircraft. A few years later, nitrous found its way to the local dragstrips.

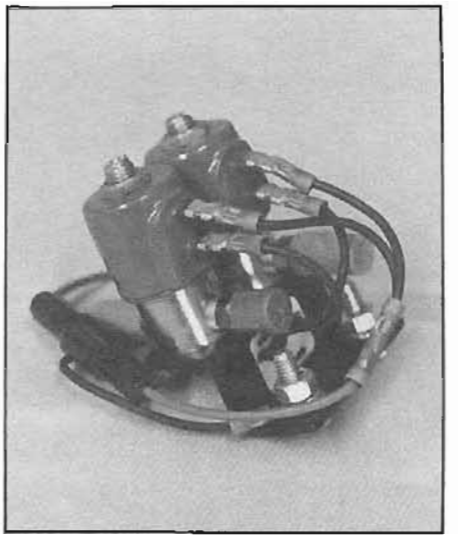
Your motor's output is determined by the amount of oxygen it can assimilate. Nitrous oxide is not a fuel, but it will "hold" a flame, so it actually acts as an oxygen-releasing agent, increasing the explosion effect of gasoline in the combustion chamber. The oxygen separates from the nitrous oxide when the temperature hits 572 degrees Farenheit. Even more energy is obtained through the liberation of a large amount of heat by the reversion of the nitrous oxide into oxygen and nitrogen. It is with the free oxygen that extra fuel is burned to gain more horsepower. In a nutshell: a nitrous system provides more fuel-air mixture at the push of a button.

It is relatively simple to set up a nitrous system on your scoot. First, you need a dual-outlet, high-flow petcock. One line goes to your carb, while the other line leads to an electric fuel pump. The fuel pump leads to the fuel solenoid. A line from your nitrous tank leads to the nitrous solenoid. You then run parallel lines from each solenoid to your intake manifold. The best system is one where the lines are Y-ed into the intake, but are run individually into opposite sides of the intake. This is a cleaner setup.

With the plumbing complete, let's look at the ease of wiring. An "arming switch" arms the system by activating the fuel pump. A secondary



You'll need a dual-outlet, high-flow petcock to go with the flow.



Solenoids act as "gates" for the feed lines.

switch, when punched, actually activates the system. You throw the secondary switch only when you're in a full-throttle position. (This secondary switch can be a micro-type switch activated by full throttle, or it can even be set up with your horn button.)

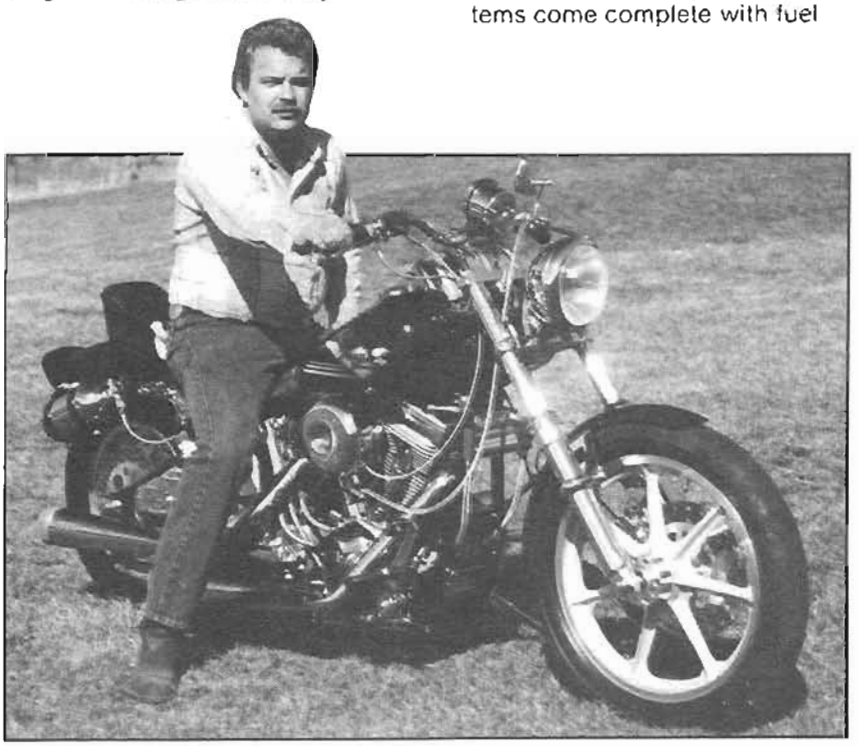
Once the system's installed, you'll find yourself cruisin' the boulevards, seeking prey. By flipping the arming switch on, you'll be ready for anything on two or four wheels; with a flick of the wrist and an additional 50+ horsepower to grab the pavement, you can blow the spokes off your competition. You'll get about 10 thrills per bottle.

A company that works with nitrous is Full-Blast Engineering. (info below). Since the installation of the fogger nozzles into the intake can be tricky, you'll probably want them to do this for you. The systems come complete with fuel pump, solenoids, and hoses. A variety of secondary switches is also available to meet your individual requirements.

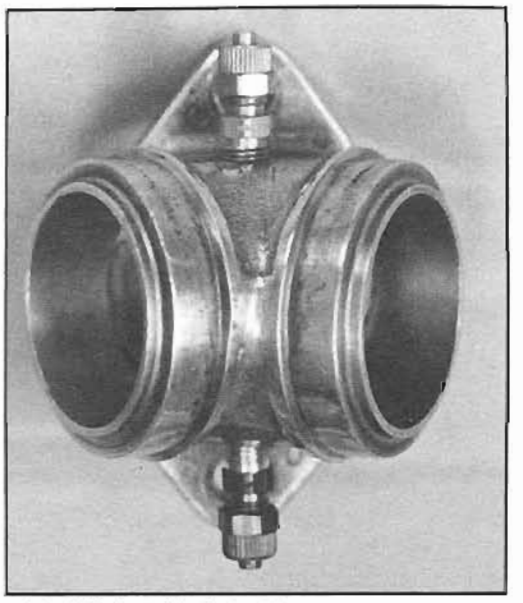
For more information on nitrous setups, write or call:

Full-Blast Engineering 3204 S. Walts
Sioux Falls, SD 57105
(605) 332-2659

—Kirk



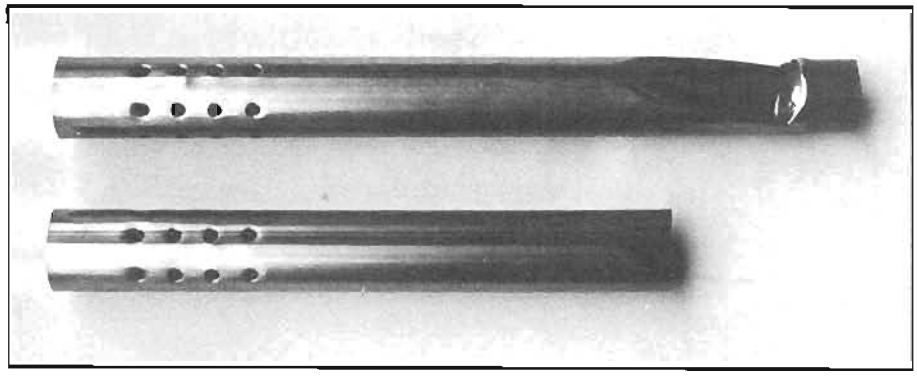
A nitrous oxide setup can give you a quick boost of 50 or more horsepower.



Manifold adapted for the fast blast.


BUMP
BUMP

Evo Big Twin Power Trip



Photos by Mike Griffin

High horsepower means the engine's gotta breathe. Lopped exhaust baffles help a lot.

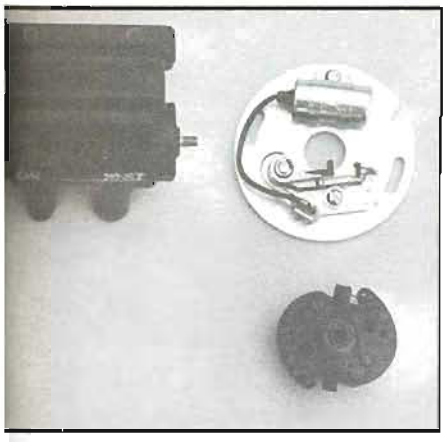
It's frustrating; you fork over all yer precious dough on a new Evo Big Twin, only to find out it's no faster than your ol' shovelhead.

This is progress?

Not for nine grand it ain't.

But hold on, because there are modifications — simple shit — that'll make it scream.

But first, a word of caution: monkeying around with smog controls on street-ridden machines is *not* cool with The Man, so later on don't say we didn't warn ya.



Get rid of that stock ignition; it won't turn past 5200 rpm. Replace it with a breaker-points system.

These modifications will yield an honest 27 percent (about 24 horsepower) power gain from the strangled, California-issue '88 Big Twin, and about 20 percent (about 12 horsepower) more power from the other 49 states' Evos. These figures translate into an estimated six-and-a-half-to-ten bike-lengths lead at the end of the quarter-mile, with ETs in the high 13s — good numbers in any book.

But the real beauty of this hop-up is its simplicity, because it only involves changing carb jets, ignition, and exhaust pipes.

This performance package was developed by Carl Morrow, of Carl's Speed Shop in Southern California's Santa Fe Springs. Morrow does the job for about $400, including parts and labor, which ain't bad, considering the pipes and ignition alone cost more than $200. For a mechanic of average skill, the job described here might take a couple of hours.

Let's start with the pipes. These are aftermarket items that Morrow modifies by lopping 4¼ inches off the intake end of the internal baffle. The baffle and pipe are then drilled through and bolted to secure the baffle.

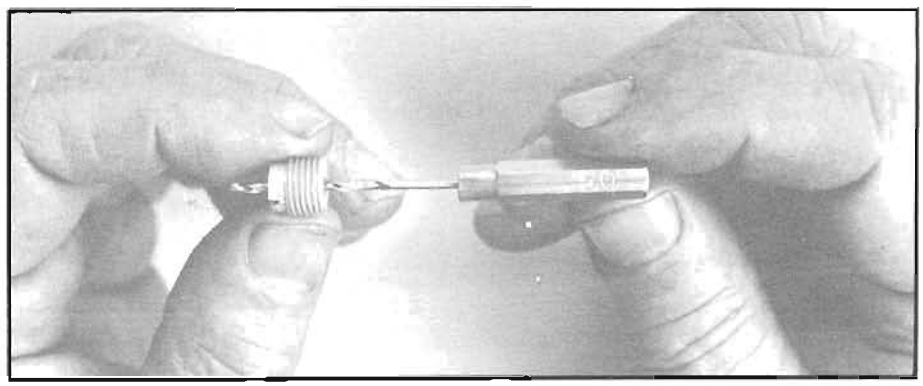
The stock transistorized ignition is a real hindrance to performance, mostly because it automatically retards the spark at 5200 rpm, causing the engine to stop accelerating. This unit is replaced by the stock H-D points-type ignition, which allows revs to 6500 rpm. Morrow favors this mechanical-advance ignition over H-D's non-rev #32428-86 module because the breaker-points sparker is: 1) inexpensive (Andrews coil is $38, plus about $40 for the rest of the system. The H-D module costs about $140 total); 2) reliable; 3) easy to get points for (just ask for the Blue Streak points made for the in-line Chevy six); 4) wholly predictable; and 5) Morrow feels the ignition-points setup delivers crisper throttle response. Oh, yeah, the stock H-D plugs are replaced with the colder Champion N12YC plugs. (The stock H-D equivalent carries an RN14LY designation.)

The final step is to enrich the carburetor. Here, the main jet aperture is enlarged from a stock #52 to #50 (that's right, the smaller the number, the larger the holes), while the slow jet is enlarged from #77 to #75. This resizing is normally done with jet drills.

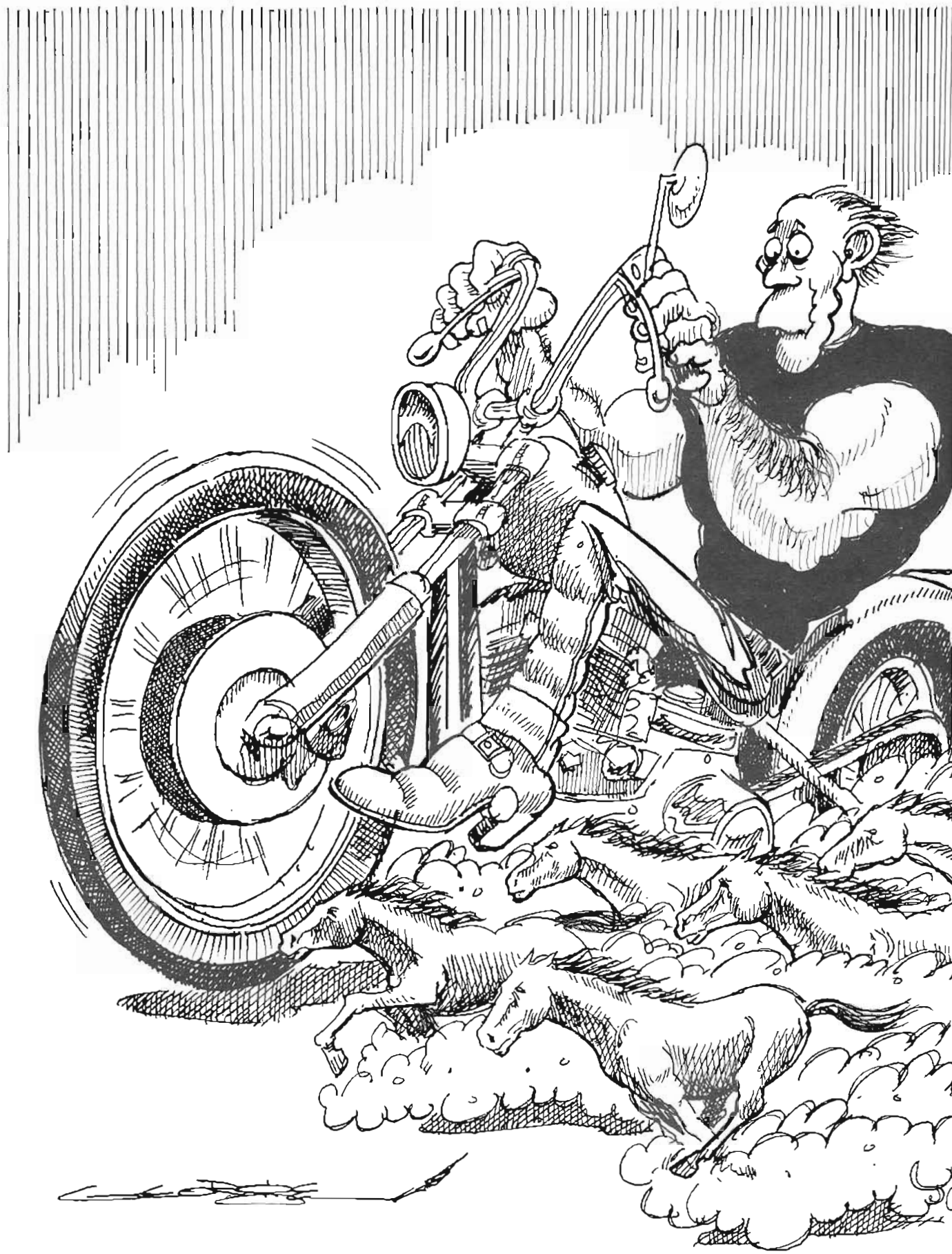
How does this otherwise stock Big Twin perform? To say very well is an understatement, mostly because power is increased over the whole rpm spectrum, not just on the top end. Also, the engine will now grab revs in a much quicker, yet smoother, fashion.

And that's it — simple, reasonably inexpensive, and very effective. Modify your scooter to these specs, and you won't believe it's the same bike.

—Bosco Haymaker



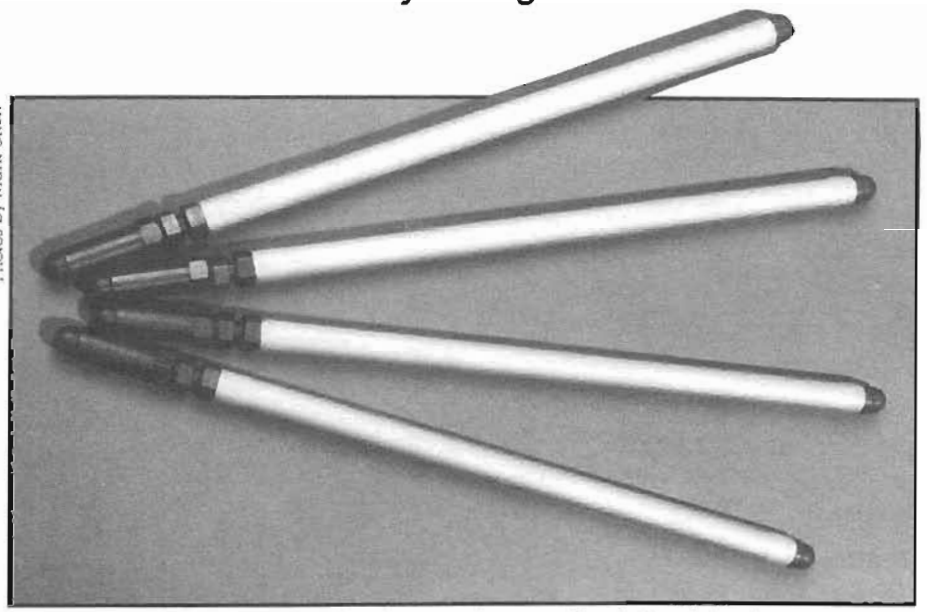
The main and slow jets must be enlarged a couple of steps. You can do this with jet drills.



STREET GUTS

Unleashing the Evo's hidden horses is easier than you might think.

Photos by Mark Chen



Adjustable pushrods will make top-end reassembly a helluva lot easier.

It's been said that the cam is the heart and soul of the four-stroke engine. Your sled's mechanical personality can be altered from its laid-back, stoplight-to-stoplight chugging to a hot-tempered, high-revving violence... simply by changing the camshaft.

Nowhere is the response to a hotter cam more evident than in Harley's Evolution engines, both the Sportster and the 80-cubic-inch. We'll stick with the 80 for now and leave the Sporty to be discussed in a later issue.

What we're going to do is install a very responsive but perfectly street-competent Andrews Evo #3 cam (about $138) and adjustable Andrews pushrods (Andrews part #292110, about $40).

We're not going to describe the wrench-twirling procedure in detail, because all that info can be found in the shop manuals, but there are two important points you should know. First, although the Evo engines are similar to their shovelhead counterparts, their camshafts are not interchangeable. Evo lifter blocks also have different tappet angles than the shovels, so cross-swapping can result in piston-to-valve interference and major repair bucks.

Installing these goodies doesn't take a long time if you follow the directions supplied by the Andrews folks. Carl Morrow of Carl's Speed Shop in Santa Fe Springs, California, let us use his facilities for the job, but a garage or workshop, reasonably equipped with tools, is all you need to turn the trick.

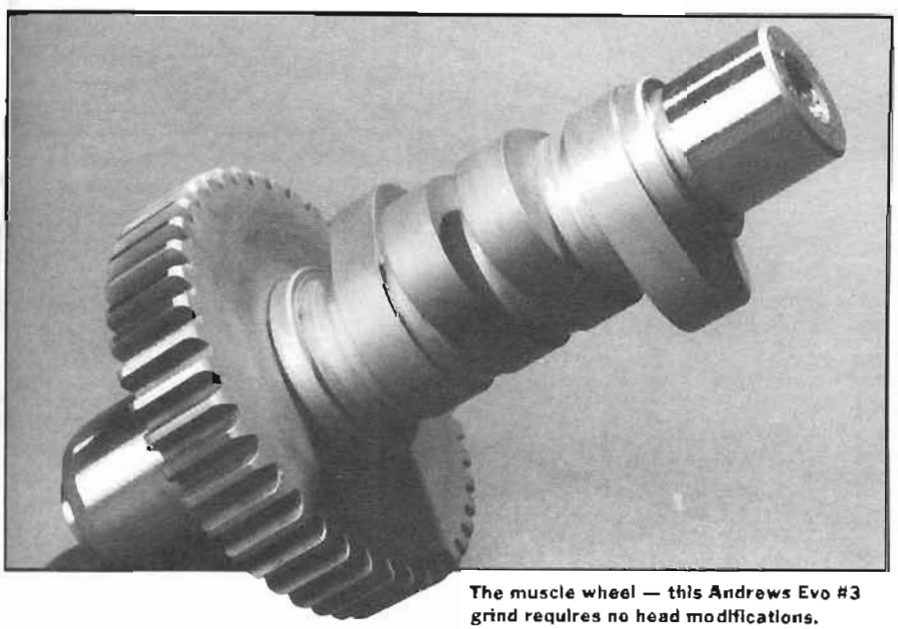
The teardown is simple. Remove the fuel tank and rocker box top covers. Each rocker arm must also be removed to get at the stock pushrods. (Incidentally, the adjustability of the Andrews pushrods will make reassembly much easier than it would be with nonadjustable units.) You'll also have to remove the ignition cover to get the stock cam out.

Andrews Products makes several high-performance street cams. Their Evo #1 and Evo #3 grinds can be used with no head changes, but the wilder Evo #5 and Evo #7 grinds require some top end modifications to accommodate the greater valve lift. Stock springs can be used for all four grinds.

Fine-tuning the reassembled engine's carburetion is not very difficult. For the Evo #3 grind changeover, Andrews suggests #65 slow jets and #170 main jets as starting points for dialing in stock H-D Keihin carbs. They also recommend their Andrews high-flow accelerator pump (part #269050) to help low- and mid-range throttle response.

A final note: stock Evo engines come from the factory with a rev limiter. It automatically retards the spark at 5,200 rpm and stops the engine from accelerating. This will cripple your newly cammed engine, which is now capable of delivering explosive power at 6,000 rpm. You can get around this by replacing the stock sparker with either a different electronic ignition module or a mechanical points-type ignition.

--Bosco Haymaker

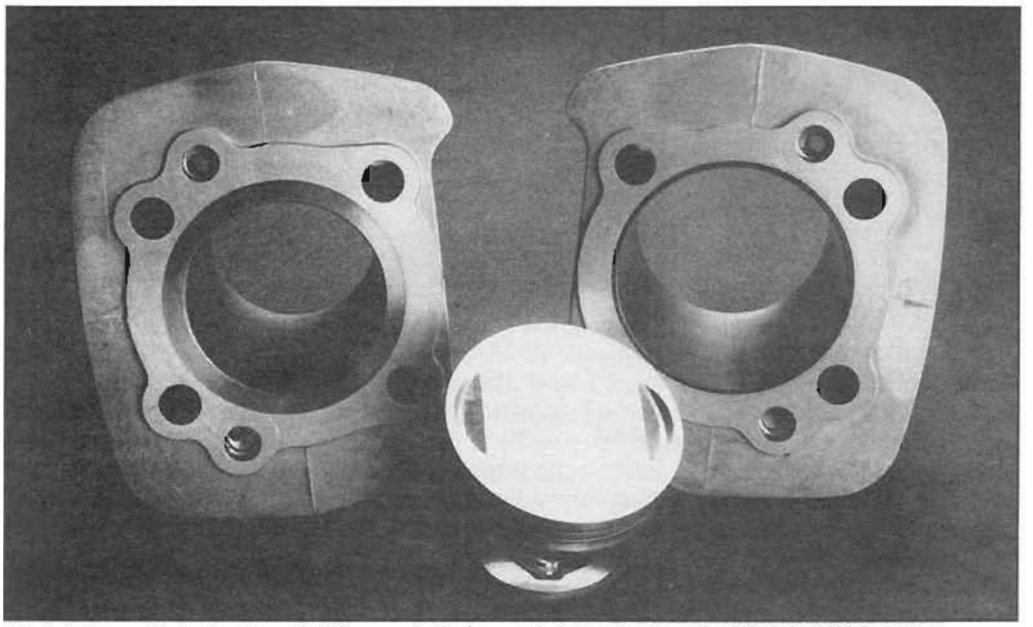


The muscle wheel — this Andrews Evo #3 grind requires no head modifications.

THE 883/1200 CONVERSION

Power On A Budget

By Joe Minton



This photo demonstrates the dramatic difference in the bore and pision sizes from the 883 to the 1200 Sportster.

The 883 Evolution Sportster has a good handling chassis, the best single disc brake around, and it is smooth. Our purpose here is to show you how to convert the 883 into a 1200cc screamer. You'll also get a motor that is as reliable as stock and won't have to cost all that much, either.

The modifications we will recommend are simple and easier to do than a valve job. They mostly consist of replacing some of the stock parts with other genuine Harley pieces, or modifying the ones that came on the motorcycle.

The 883 Sportster was originally designed to be as large as 1200cc. The difference is in the bore size. An 883 has a 3-inch bore while the 1200's is 3 1/2 inches, the same as the Big Twin. When Harley decided to make the 883, they simply used the same cylinder casting with a thicker iron alloy liner. It is about 3/8-inch thick. One can bore an 883 cylinder to 3.5 inches and still have a perfectly strong and stable cylinder.

Harley makes a 1200 conversion kit for the 883. The kit contains a set of their standard 3.5-inch bore 1200 pistons, rings and pins and a complete set of gaskets. These pistons are the same as Harley fits to its 1200 Sportster and they are of the highest quality. It also has a set of instructions on how to open-up the combustion chambers to lower the modified engine's compression ratio to about 9 to 1. We, at Bartel's Performance Products, have found that this is not necessary if the recom-mended ignition changes are also made.

A 10.8 to 1 compression ratio 1200 conversion will run circles around the more conservative Harley version H-D's way is a little cheaper, though the cost of modifying the chambers is less than a set of coils and a new ignition module.

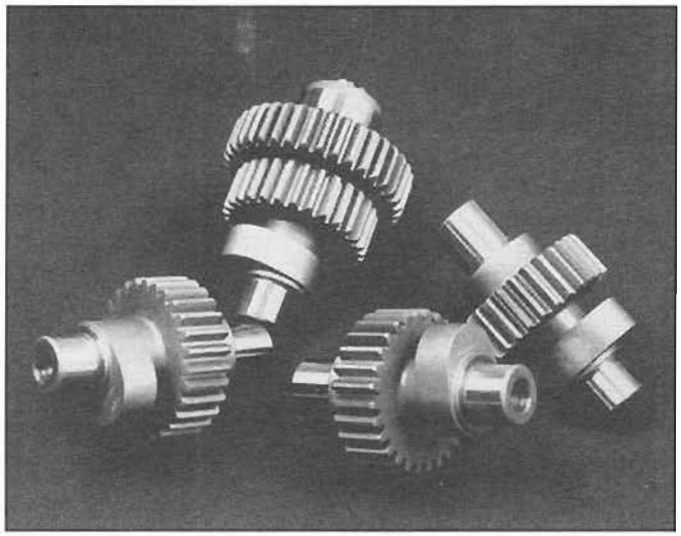
In order to support the high (10.8 to 1) compression ratio that results from boring an 883 to make it into a 1200, you will need to modify the heads to take two plugs per cylinder A special set of coils (HES, 4156 Mildred Ave., Los Angeles, CA, 90066, (213) 397-3195) will also be required. An ignition module from the 1200 Sportster will provide the correct advance curve and total advance for this engine.

If you have an Evo Sportster made between 1986 and 1987, your fixed-venturi Keihin carb will need to be bored from 36 to 40mm and modified to get rid of the EPA madness and the restrictive choke plate.

Sportsters made in 1988 or later will need their Keihin CV (constant velocity) carburetors modified to slightly richen the mixtures at less than half throttle. Both carb types should have a Harley "Screamin' Eagle" air cleaner assembly fitted in place of the restrictive stock unit.

Cams are sort of optional. The stock Sportster cams work better at high rpm than any of the stock Big Twin cams, and you will get enormous bottom and mid-range power with them. However, other, more aggressive cam sets will give much greater mid to top-end power. These cams will take away a bit of the low rpm power delivered by the mild stock set. Real power will start at 2,500 or so instead of 1,500. While the stock cams will sign-off at about 5,800 to 6,000 rpm, the hotter cams will continue to build power to 6,500 when the rev-limiter shuts everything down. By the way, 6,500 is a good safe red line for this engine. It will run for years if it is held at or below 6,500.

I recommend any of the three following cam sets for the 883/1200 conversion. They are all manufactured by Andrews Performance Products and are of the highest quality. First, the Bartels BP140 Sportster cam set. These cams were designed especially for the 883/1200 conversion and take advantage of the air flow and displacement characteristics



Andrews cams designed for the power of the 1200.

of the converted engine. Second, the Andrew's Products V8 cam set. The V8s are the result of a collaboration between myself and John Andrews; they consist of V4 intake lobes with V6 exhaust lobes. The timing of the lobes is different from either the V4s or V6s. Finally, Harley's bolt-in Sportster set; these cams are identical to the Andrew's V4 cams.

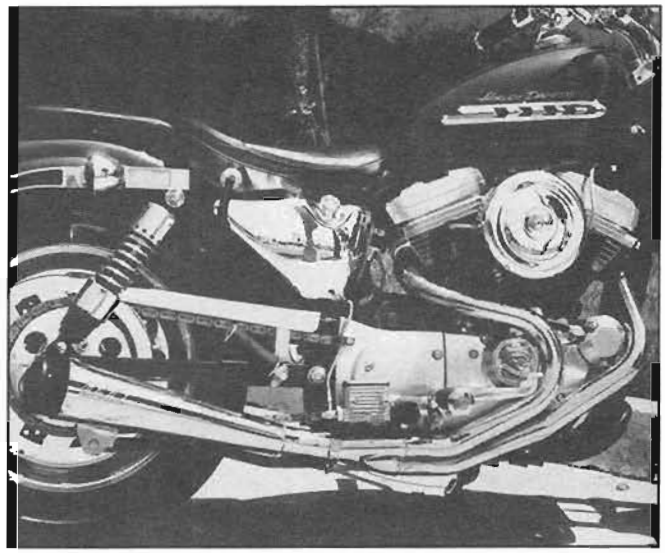
The Bartels BP140 cams (Bartels Performance Products, 9461 Jefferson Blvd., Culver City, CA, 90232, (213) 842-8081, FAX (213) 842-8083) will give the widest power band and the most mid-range. They begin to really work at about 2,000 rpm and carry the 883/1200 through to its 6,500 rpm cut-off. This is most responsive of the three cam sets and makes the best street motor. The Andrews (Andrews cams are available from any Harley dealer who will order them) V8 cams begin to work at about 2,800 and would carry the engine to 7,500 if it had large valves and extensive port work. I have built 93 horsepower motors with these cams. They have too much timing for optimum performance in the stock-port 883/1200 conversion though. Harley's cams will work about the same as the Andrews V8s with the same power band but a little less of it. The Harley cams tend to make the engine run a bit hotter than the V8s, which is what we developed the V8s to overcome.

Finally, you will need a new exhaust system. The stock mufflers are extremely restrictive and you'll never make much power with them. Harley's shorty dual slip-on mufflers are as good as any of the other similar mufflers, however, because of their size and restricted air flow, they will limit how much power you will get out of the 883/1200 conversion at higher rpm.

The best power makers are the Bartels, SuperTrapp (any Harley dealer), and Jardine (available from Branch Flowmetrics, 5556 Corporate Dr., Cypress, CA, (714) 827-5340) 2-into-1 exhaust systems. These systems will make more top-end power than shorty duals and much, much more mid-range power. Harley's Kerker-made accessory dual exhaust system lacks the mid-range punch of the others. The SuperTrapp and Jardine, which uses SuperTrapp plates, exhausts will make the most power with 21 plates. Eighteen plates will cost only about two horsepower but will be considerably quieter. The Bartels pipe makes its best power with the tuning sleeve removed.

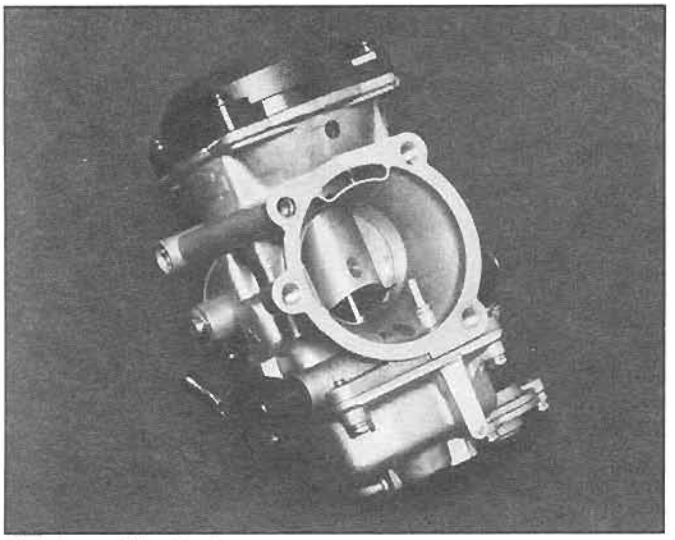
The stock Keihin carburetor is a fine instrument. It can be improved by boring it and by removing the choke plate in its mouth. With these and some tuning changes, it is perfect for the 1200 conversion engine. By removing the choke plate and by boring the 36mm stock Sportster carb to 40mm, the amount of air it will pass is increased by nearly 25 percent. More than enough to handle the air flow capabilities of the stock intake ports and the 1200cc displacement. HES will bore your Sportster carb, install the correct slow speed and main jets, remove the choke plate, install one of the old-style, large-flow accelerator pumps, and put in one of their special-made accelerator pump jets. They also include two alternate main jets. The HES pump jet has a smaller outlet hole and will get the fuel into the throat of the carb even when you move the throttle slowly. The HES carb service retails for $70 plus shipping and is an exceptional deal for a virtually new carb. Turn around of this job is less than two weeks and usually less than one.

The newer Keihin CV carb is even better than the old one. It will flow more air and make more power than even the bored version of the older carb. It is more responsive too. However, it is tuned very lean at less than quarter throttle and needs modification to work as well as it can.



Supertrapp Exhaust systems are adjustable to the engine power band demands.

You will need to remove .0004 to .0005 of an inch from the diameter of the needle beginning at the point where the taper starts and ending about .4 of an inch above that point. When you replace the needle in the slide, use a .020



Harley's new CV carburator.

to .030-inch washer to raise the needle a bit. There are two holes in the slide, one for the needle, and one between the carb throat and the vacuum chamber above the slide. Run a #31 or #32 drill through the vacuum hole, slightly enlarging it. This will make the slide and therefore the carb respond more quickly. Remove the soft aluminum plug over the mixture screw and re-adjust the screw for best idle with a warm engine. You will need a larger main jet (generally between a #155 and #165). Harley doesn't have any non-stock jet sizes but you can use Bing jets available from: Bing Agency Inc, P.O. Box 148, Fremont, NE, 68025, (402) 727-5896.

Now that you are familiar with the components, lets talk about putting them together in your motor.

You will need to find someone to bore your stock cylinders out to fit the 1200 pistons. Harley's boring recommendations will give you .002 of an inch between the pistons and cylinders. H-D insiders and my own experience say that the pistons can be fitted much tighter than that. I use .001. It works fine and with a reasonable break-in will give maximum piston and ring life. If you can't find someone to do the boring, HES can do the job.

While the stock gaskets that come with the Harley conversion kit are okay, there are better ones. Stock gaskets will often leak when the engine is cold and the cylinders have not yet grown and fully clamped the gaskets. Part of the problem is that the stock gaskets crush after they are installed, and the heads will not be as tight as they need to be. Simply over-torquing the head bolts won't solve the problem.

Both HES and Bartels supply copper head gaskets and aluminum base gaskets. The HES head gaskets use a copper ring inside an aluminum gasket while the Bartels' head gaskets are solid copper. Both use a dead-soft aluminum base gasket that is less likely to leak than the original Harley gasket.

Dual plugging Harleys is very popular and there may be many who have the tools and abilities to do the job. However, we don't know who all of them are. If you don't have someone who can do the job properly, we recommend that you send your 883 heads to HES for the work. Andy Hansen has built the tooling and can do the work in a reasonable time. Ignition is perhaps the most critical part of our conversion. If you do not dual-plug your 883/1200, you will have detonation problems. HES also supplies an excellent dual-coil kit to fit the Sportster.

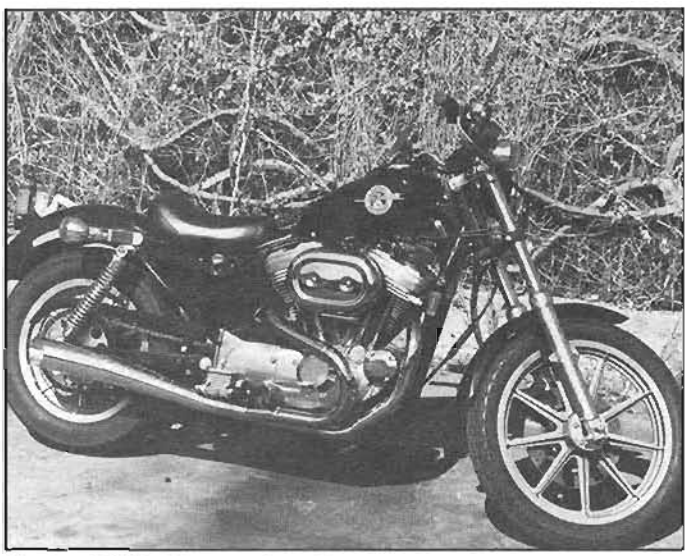
Harley's 1200 Sportster ignition module (part # 32410-87) reaches 28 degrees of advance at about 4,200 rpm whereas the stock 883 module reaches 35 degrees at 6,000. The 883 module advances the timing much more slowly and gets in the way of torque and engine response in the mid-range. Use the 1200 module and set the timing to 28 degrees (as per the shop manual for the 1200).

The 883/1200 you can build, using the parts recommended, will make about 68 horsepower (75 to 80 with the cams and a set of the good pipes). A stock 883 makes 44 horsepower. That is, at the least, a 54 percent gain in power. You can get as much as 80 percent more power than a stock 883.

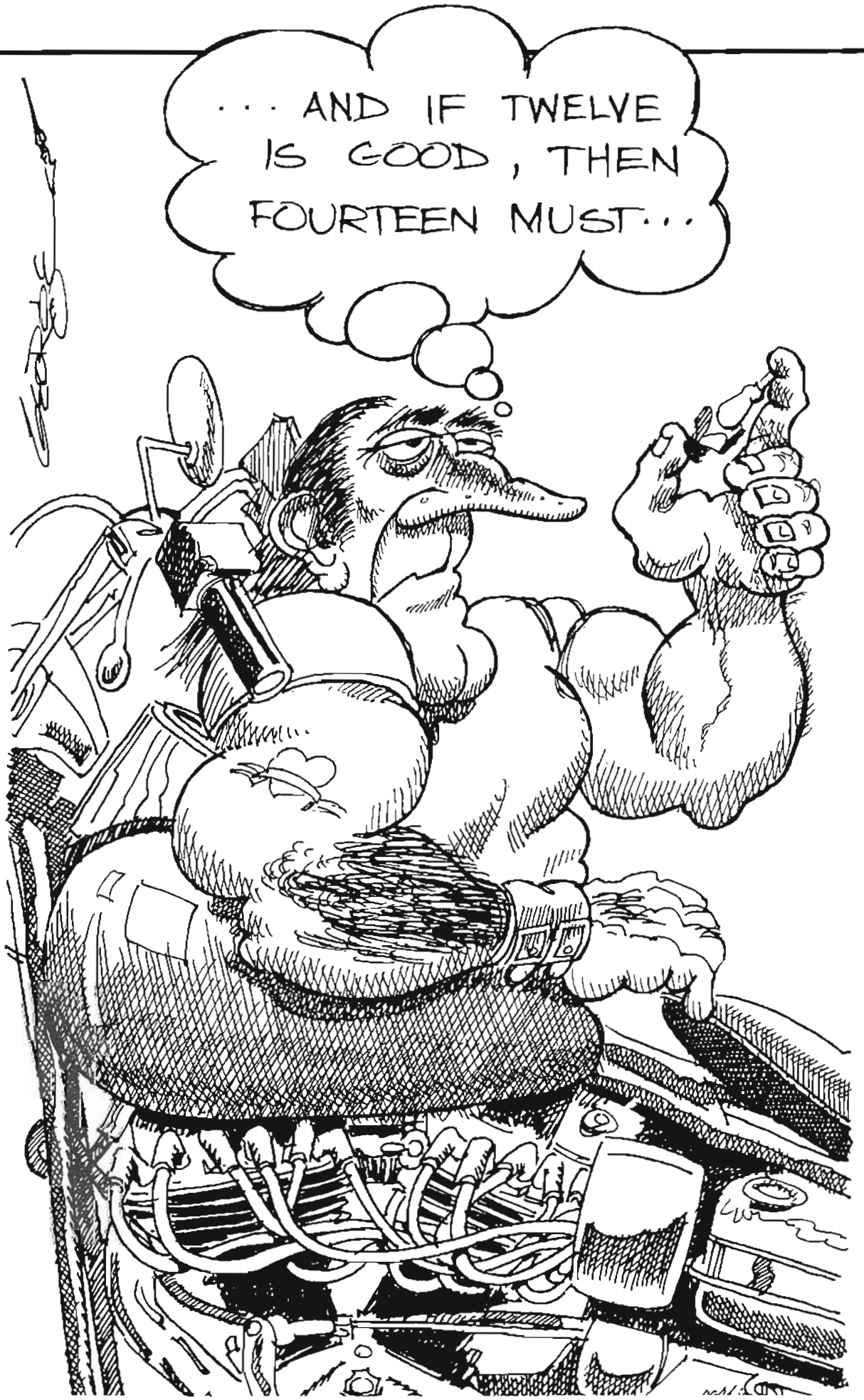
The torque improvement is even greater; peak power is limited by the amount of air that can get through the smaller 883 ports and valves. The limited flow tends to cut the top-end power more than it will peak torque, which always occurs at a lower rpm. A set of 8ranch-ported heads will bring the power peak up to around 90 to 93 horsepower. Imagine that.

All this may sound a bit complicated, and maybe it is. But, if you follow our formula, you will have a brutally fast 1200, one that will out-run a factory 1200. It will carburet cleanly, make power at every useful rpm, and it will be, if anything, more tractable than it was before you made the changes.

Hot engines have the reputation of being rough running, difficult to start, and not much fun below some astronomical rpm. That reputation is based mainly on bad tuning. If the cams, carb, pipe, and ignition are correct, a hopped-up engine like our 883/1200 can be as good or better than a stock engine in every way. ■



Here's a HES/Bartels conversion with Bartels' exhaust system.

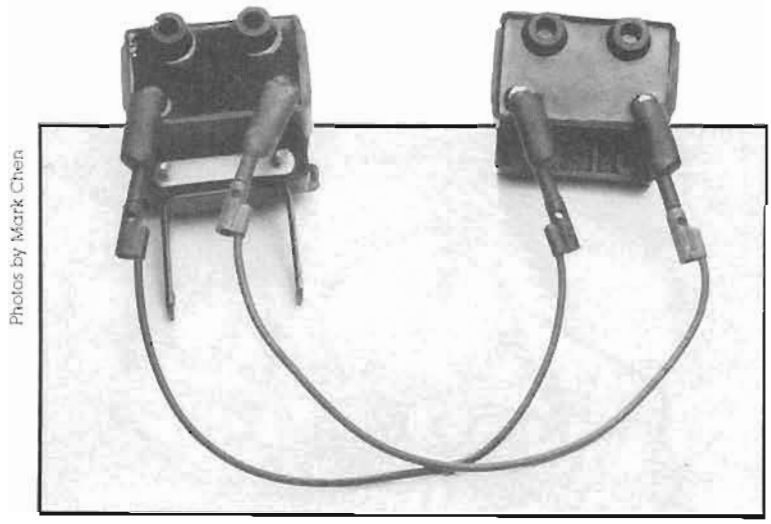

. . . AND IF TWELVE IS GOOD, THEN FOURTEEN MUST. . .

Dual-Plug Electronics

After the plugs are in place, what's next?

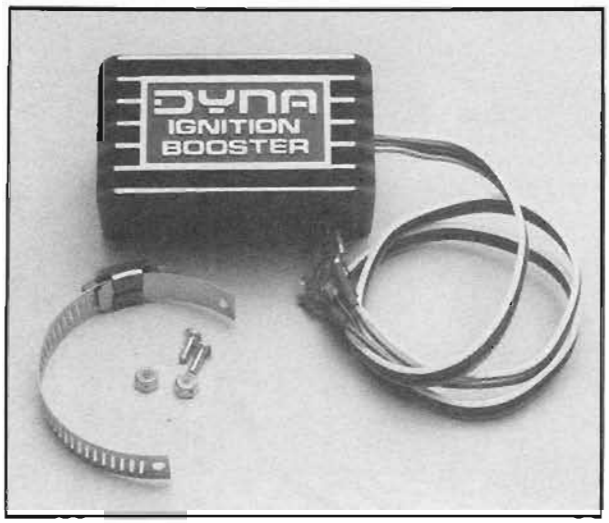
The hot setup for today's V-twins, faced with unleaded, low-octane fuels, is runnin' dual spark plugs on each head. Several companies and shops will carefully drill your heads and install inserts for the proper plugs, but what's next? Do you just dig deep for another coil?

Well, that's the big question this morning, since I'd like to go for a putt before noon. So natch, when I don't know shit about what I'm doing, I call someone who's on top of it. I rang up a bro who's been knee-deep in grease and intricate devices to make H-Ds tear up the pavement faster for close to 20 years. Andy Hansen from Harley Engine Specialists (HES) has been researching stacked coils, burnt points, fried electronic ignitions, and poor spark at the plugs ever since this hop-up became the latest craze.

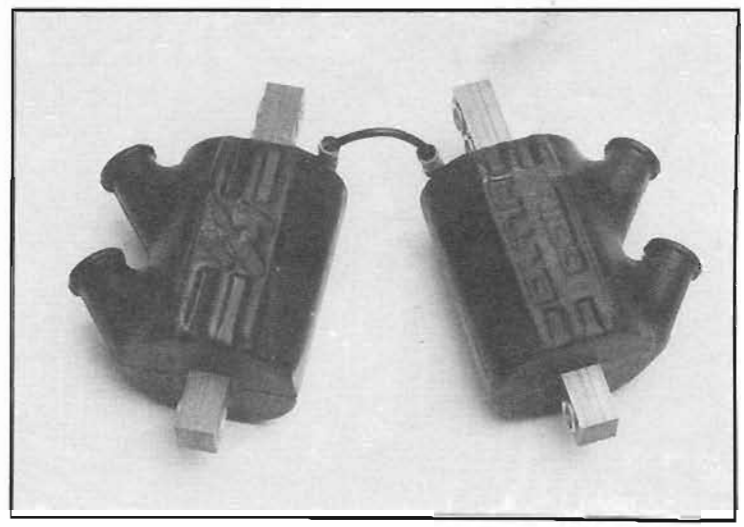


Photos by Mark Chen

Photo #1: stock coils wired in parallel.



The Dyna ignition booster, a must for a dual setup using mechanical breaker points.



These Dyna coils will keep the spark crackling the way it should.

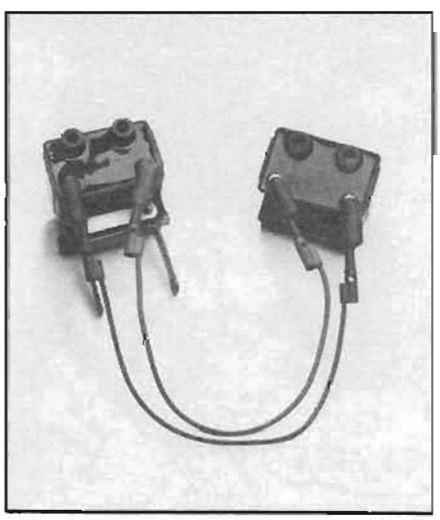


Photo #2: stock coils wired in series.

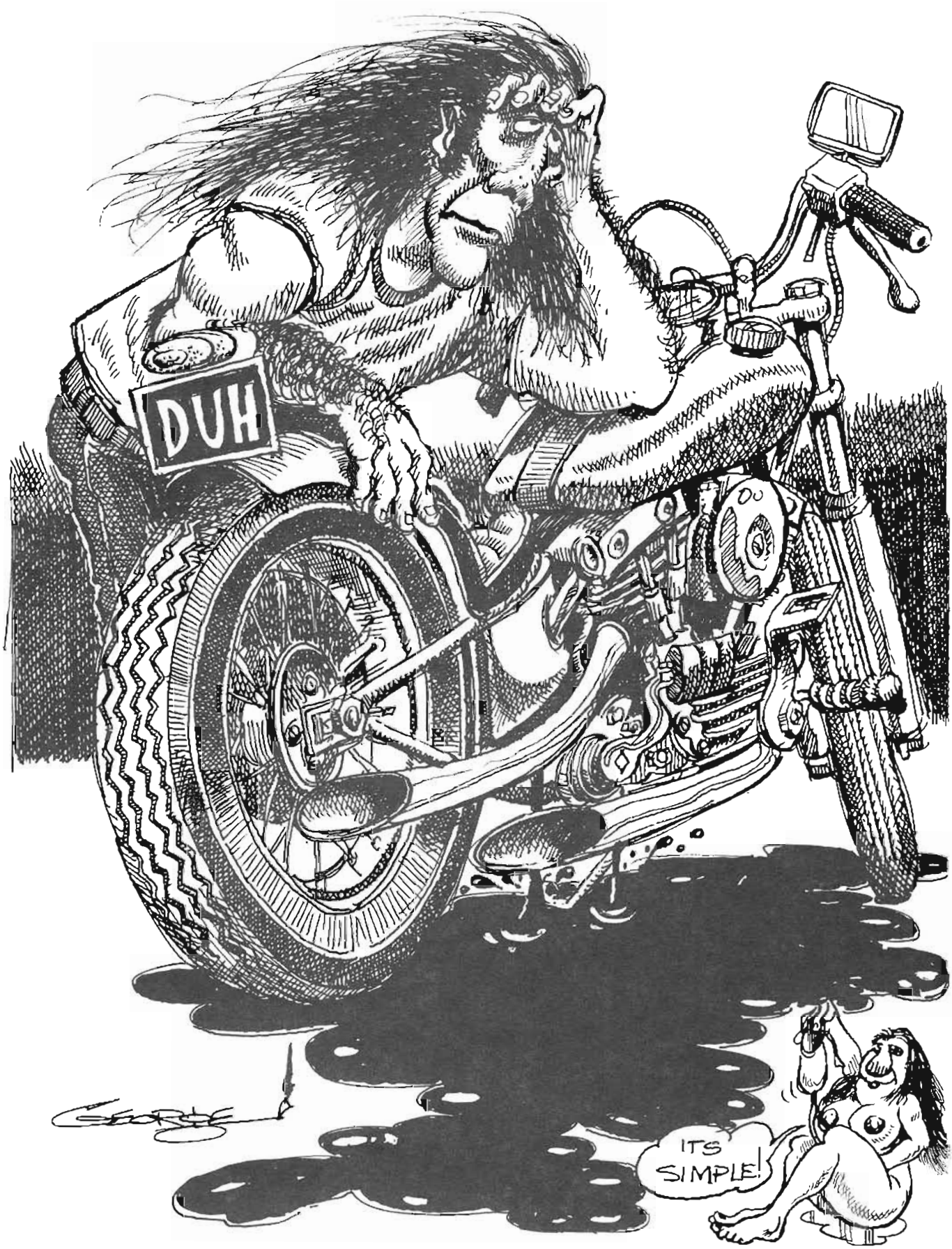
I'm gonna lay Andy's words of wisdom on ya. If you have an electronic ignition with a stock three-ohm coil and you wire another coil in series, you'll have six ohms pulling against the straining electronic ignition, and you'd have to be pushing 24 volts. If you wire the coils in parallel, the voltage will be fine, but the resistance will be cut in half and your spark'll go to shit.

Photos #1 and #2 show stock coils connected in both series and parallel. If you took readings with an ohmmeter, you'd see the problems your ignition system would face with these hookups. What you need is a three-ohm total load on your stock electronic ignition. The Dyna coils (shown) produce the right resistance when connected in series.

The other doodad shown is a Dyna ignition booster, to be used with dual coils and a standard mechanical-points ignition system. This single-breaker-points ignition booster must be used with either Dyna coils or coils having at least three ohms of total primary resistance. A pair of stock mechanical-points coils won't cut it, because at the most you'll only get 2½ ohms when they're wired in parallel; this'll pit your points, change the timing, and overheat the mill — bad news all the way around.

There it is. Now that I have the plugs in place and the heads torqued down properly, my never-say-die flathead ought to fuckin' scream.

— Feeler Gauge


DUH
ITS SIMPLE!

Douche Her Out

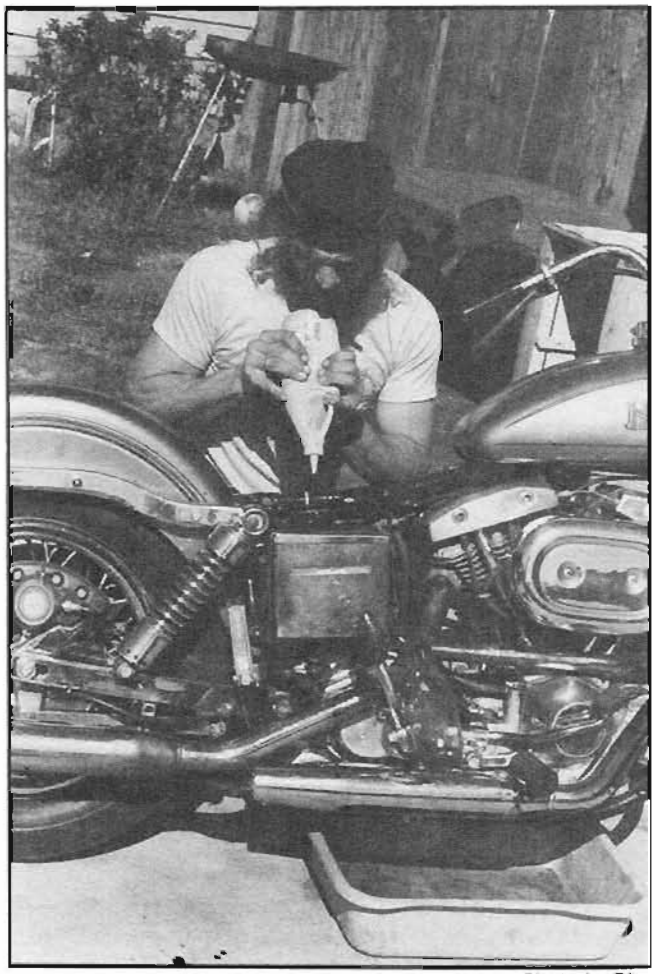


Photo by Rip

The best thing ya can do for your bike is to keep clean oil in her. Oil needs to be changed frequently and the oil filter should be changed whenever the old oil is being evicted, otherwise the old shitty filter oil will contamiante the fresh stuff.

Bear in mind that the engine holds five or six ounces that you can't do anything about without a lot of hassle. By that, I mean you could take off the return line, start the bike and pump out the dirty oil that's in the crankcase, but you'll never get all of it out because of residual adherence to various parts inside the engine. So before you get started, make sure you have fresh, clean oil in the system to push out the old crud.

It's also a good idea to douche out the oil bag periodically. My old H-D manual says to clean the bag with every other oil change and to change the oil itself at 2000-mile intervals. (Hey, quit snivelin' — it ain't *that* big a deal.)

Now, here's a tip from bother Chuck Cardinal of Muscoy, California, that may help you bros who live in colder regions of the country, particularly when it's time to service your scoots come spring. After draining the oil tank, Chuck removes the oil line going to F (feed line) on his shovelhead oil pump. He then fills up a plastic bottle with kerosene and puts the end of the feed line into a clear, clean bottle to catch the sludge and accumulated settlement.

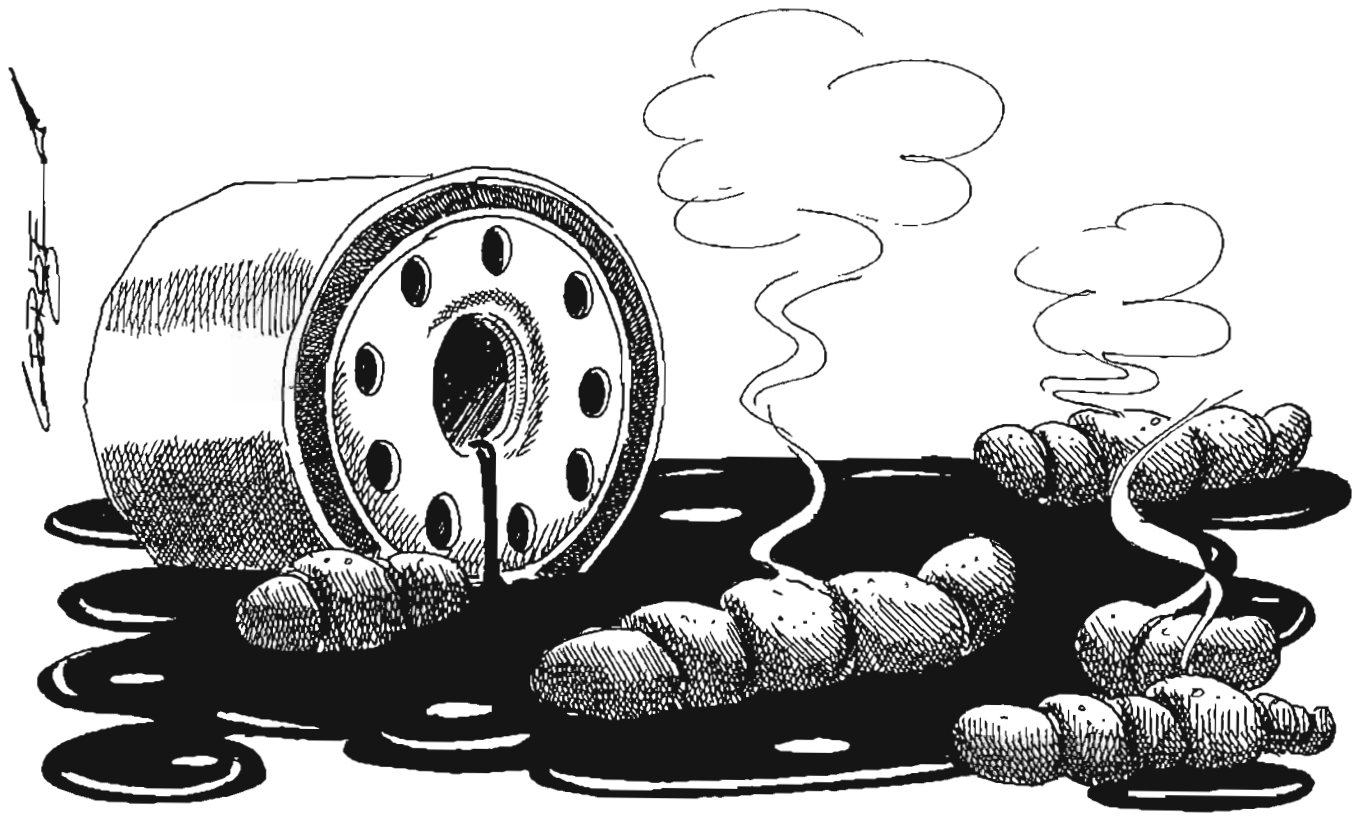
In this cleaning operation, he uses a plastic bottle that's previously held gear oil because the spout is small and pointed, enabling him to direct the stream of pressure to the corners of the bag when squeezing the bottle. A word of caution here: The bottle holding the solvent should be a soft plastic, because most solvents will eat the shit outta hard plastic. One that's previously contained a petroleum product works best.

Chuck says that when he's short on bucks, he uses gasoline or fuel from a camping store in place of kerosene (diesel will do the trick, too), and that no matter what you use, you should allow sufficient time for the solvent to evaporate before putting in the clean oil. If you've got compressed air handy, you've really got it made, particularly in terms of blowing the crud outta the oil tank filter assembly.

While we're on the subject of air, if you've got it, take off the other oil lines and blow them out, and check the ends of the rubber to see if they need to be trimmed or perhaps even replaced. Remember, though, when you tuck them back in around the seat post, don't let them touch the exhaust pipe — route them so they have plenty of room.

Oh, yeah, one last item: Don't forget to check your oil tank drain plug before starting up your bike.

—Rip



OIL FILTERS: What You Need to know

By Joe Minton

Every Harley should have an oil filter. Period. The reason is clear enough—an engine running clean oil will last longer than one pumping rocks through its bearings.

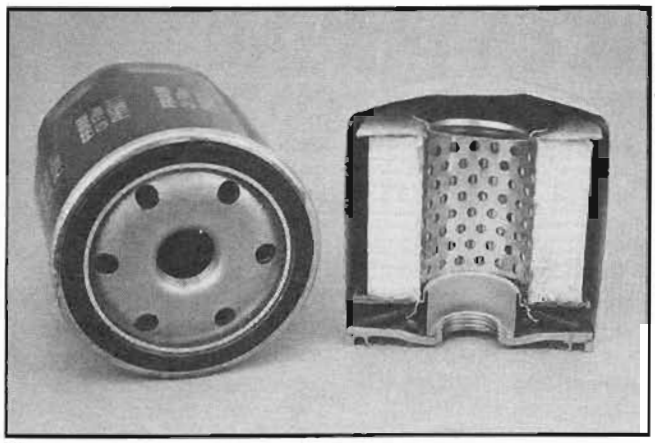
Harleys are more sensitive to dirty oil than your average V-8 car engine Most of the engines running in cars, airplanes, and even lawn mowers use plain bearings to support their crankshafts and connecting rods. These are significantly more tolerant of dirt in their oil than the roller-and-needle bearings used by Harley.

You know those bearing-insert shells that fit into rods and crank bearings in car engines? Well, the only reason they're there is to catch the dirt that can get into their lubricating oil. When a piece of dirt (rock) that's larger than the thickness of the oil film gets into a plain bearing, it gets pushed into the soft lining of the bearing shell, stays there, and does no harm. On the other hand, the same rock caught between the rollers and races of a roller bearing will cause irrevocable damage. Roller bearings are about as hard as steel can get and won't give way if something gets between a roller and its race. A piece of dirt can cause microscopic cracks (spalling) within the roller and race steel. When there are enough of these cracked places in a bearing, the cracks begin to join together and pieces of the race or roller will begin to fall out. That's what produces those tiny pits that you see in an old bearing or one that's been run with dirty oil.

Modern screw-on oil filters are nearly perfect. First, they'll take out any potentially harmful particles of dirt. And if you put so much crud though them that they get completely clogged, a blow-off valve inside 'em will open and let oil pass. Sure, it'll be dirty oil, but that's better than no oil at all. Then, once you've used up one of these little wonders, you toss it and screw on a new one.

Only it's not *quite* as simple as that. While you can use almost any filter that'll fit the threads of your filter mount and also seal against its surface, you just may be setting yourself up for trouble. Roller bearings, like those in a Harley engine, don't need much oil pressure to operate. They don't need much volume, either. On the other hand, plain bearing engines need both large-flow volume and high pressure. So while you can use a filter designed for a car engine and get away with it, it's with this proviso: You'll only get away with it most of the time.

Harleys have two oil pumps, one to force oil through the engine and one to push it back into the oil tank. With the exception of the new Evolution Sportster engine, all Harley oil filters are fitted into the oil-return line.



Photos by Joe Minton

Oil enters a filter through the small holes surrounding the threaded center-mounting hole. After passing though the resin-impregnated-paper filter material, it flows out the center hole and - hopefully - into your engine. This particular filter is an auto filter with an anti-reverse valve (rubber flap).

The return pump won't produce much pressure. It'll get the oil through a filter, the lines, and into an oil tank, but it won't overcome the blow-off valve of a typical automotive oil filter. Therefore, if you use a filter designed for a car and let it clog, your engine will stop pumping oil back to the tank. As a result, it'll stay in the engine, your engine will begin to smoke, and you'll think you've blown your engine all to hell—at least until you figure out what really has happened.

The lowest part of your Hog's engine is its crankcase. The oil that's gone through the bearings falls to the bottom of the engine or is scraped off the flywheels and gets picked up by the return (scavenge) pump. It's difficult to mount the oil filter lower than the return-oil pickup of the engine (although the latest FL filters are mounted that way) and that fact can cause a minor problem.

If you use a large-volume automotive oil filter and mount it so that its opening is horizontal or pointed down, it'll drain its oil back into the engine when you park your bike for a few hours. While that doesn't present a real danger to your engine, it can cause the sucker to smoke until the oil is pumped back out of the engine.

Neither the drain-back nor the smoke will damage your engine, as long as the filter's in the oil-return line. Of course, when you mount a filter, it should *always* be in the return line. Imagine what would happen if you had a filter in the feed line and it became clogged. The smoke you'd get then would definitely be permanent!

The new Sportster has its filter between the engine and the pressure-side of the pump, thus oil from the pump goes through the filter on its way to the engine. If that filter were to get clogged and the bypass valve didn't open because you'd mounted an automotive filter—well, your engine would be history.

The Evolution Sporty's oil filter is mounted horizontally. An automotive filter will let the oil it contains drain back into the engine when its sets. Because the Sportster's oil pump is a low-volume design like all other Harleys, it'll take a long time (maybe more than a minute) for the filter to refill. Time during which your engine won't be getting any oil from the pump. Instant history.

A genuine Harley-Davidson oil filter, or one made to Harley's specs, has both a low-pressure bypass valve (7-9 psi) and an anti-drain-back valve built into it. You can screw one of these onto any Harley, Evolution Sportster included, and know that all the bases are covered.

Besides the factory filters, which are made by Purolator, the only other filter we were able to find that met all H-D requirements is one made by Fram. The Fram (p/n PH6011) is made specifically for Harleys and replaces the earlier PH46 filter that they sold for Harleys.

I don't mean to scare you out of using regular car filters, it's just that you should know what *could* happen if you aren't careful. Now let's take a look at how things really tend to go. It isn't likely that you'll ever clog a filter, if for no other reason than this: If you're the sort to install a filter in the first place, you aren't likely to leave it on long enough to let it clog. Besides, you'd have to let the oil go for a long time before it would be worn enough to start accumulating sufficient crud to clog the filter. If you've installed a filter, you're probably reasonable diligent about changing your oil, too.

There's really no great advantage to using a big oil filter. True, a large-capacity filter will hold more oil and increase your engine's total oil supply. Equally true, the extra oil and the filter hanging out in the breeze might cause the oil to run a bit cooler than it would with a smaller filter or no filter at all. However, Harleys seldom have an oil-temperature problem. They need only enough oil to fill the system, with a little left over for normal usage and to take up the slack of cold oil sticking to the inside of a cold engine.

Because of Harley's low oil-flow rates, the extra area of a large filter is sorta wasted. Cars might pump as much as three times the amount of oil through one of their filters in a given time as a Harley would. That same filter on a Hog engine should never produce a pressure-drop problem unless you run it for the life of your bike.

Harley filters screw onto a ¾-20 thread, which is smaller than most large car filter thread sizes, but you should be able to get an adapter from a performance-oriented auto-parts store. A filter-thread adapter is a thin-walled tube that's threaded on the inside to screw over the Harley filter-mount stub and is also threaded on the outside to match the larger car filters. Using one of these, you can mount a filter big enough to hold almost as much oil as the tank itself.

In the final analysis, the worst that's going to happen if you use a car filter on anything other than one of the new Sportster is that either your engine will sump up, foul the plugs, and park you, or it'll smoke for a while when you first start it up. On the plus side, you might save a buck on a discounted car filter and you'll almost always get away with it. Overall, however, it's easier to use a Harley-type filter in the first place. As Mom always says, "If it's worth doing at all, it's worth doing right." ■

Purple Haze It Ain't

Not all of us are as lucky as brother Curly, one of the staffers here. What I mean is that he's got a new Softail and the rest of us are riding our pieced-together iron. Oh, well, I like mine better even though his rides so much smoother.

Anyway, we were rapping about his scoot the other day and I asked him if he'd had any trouble with it. "No, not to speak of," he replied. Then he went on to mention that his bike was an early one, built in 1983, and that when he was servicing the battery at the 5000-mile mark, he noticed it had a groove worn in it where the positive battery cable was rubbing against it.

To eliminate the friction, he first re-routed the positive cable around behind and up through the back so it wouldn't rub anymore. Then he put a rubber donut between the battery box and the battery, thinking that would take care of the problem.

But, no, it wasn't to be. When he went back to check the battery acid level at the 7500-mile point, he found out that it didn't have an overflow tube. Instead of the hot acid from the battery running out the puke tube to the ground, it had puked all over the frame and onto Curly's chrome horseshoe oil bag. He was pissed, but decided not to let a little acid ruin his day.

He solved the problem by wedging another rubber donut on the other side of the battery. Now the battery doesn't rock and roll in the battery box and throw off the puke tube. He also found a better overflow tube, a rubber one off an older electric-start battery. Curly trimmed the end of the rubber hose, pushed it onto the battery, and then applied black silicone around the battery and hose.

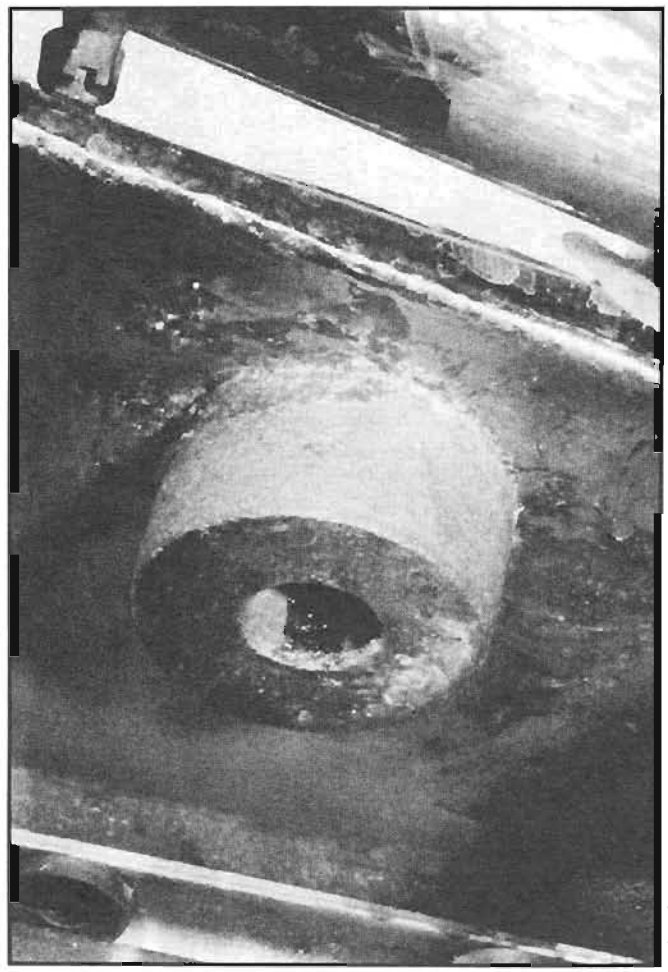


Photo by Rip

If you do this, better remember to never block the end of the hose since the acid has to have someplace to go. Block ing it off will made the acid run out around the caps, so it'll get on the top of the oil bag and rear fender, to say nothing of what it will do to a motorcycle seat, Levi's, etc. Get the picture? Curly said he found the rubber donuts he used behind an appliance store. It seems that they originally came off the bottom of a new washing machine!

Any thick hunk of rubber, such as a heel from a pair of old boots will do. Just trim it to fit, and space out the battery equally on both sides.

Curly's racked up 10,500 miles as of this writing. Yeah, he rides a lot, the lucky dude.

—Cowboy Bob

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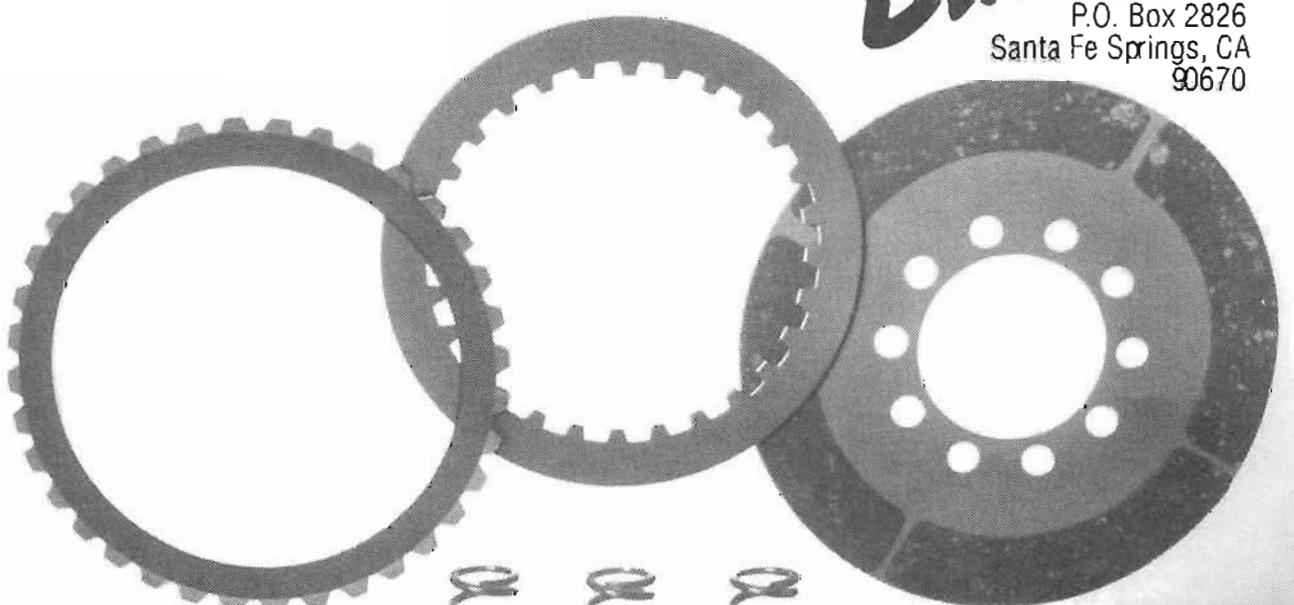
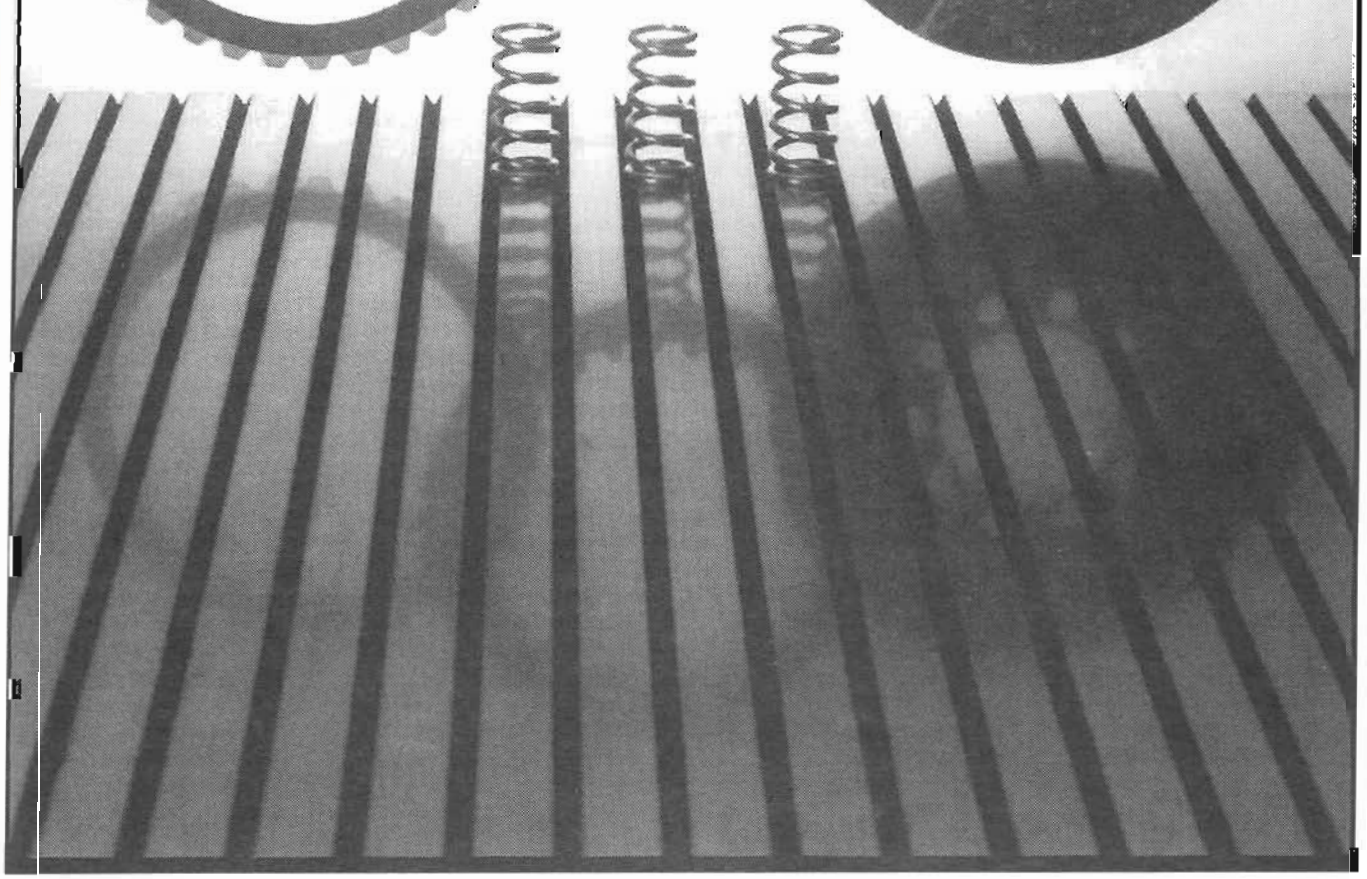




LET THERE BE LIGHT

IT'S NICE TO KNOW WHERE YOU'RE GOIN'.

By Joe Minton

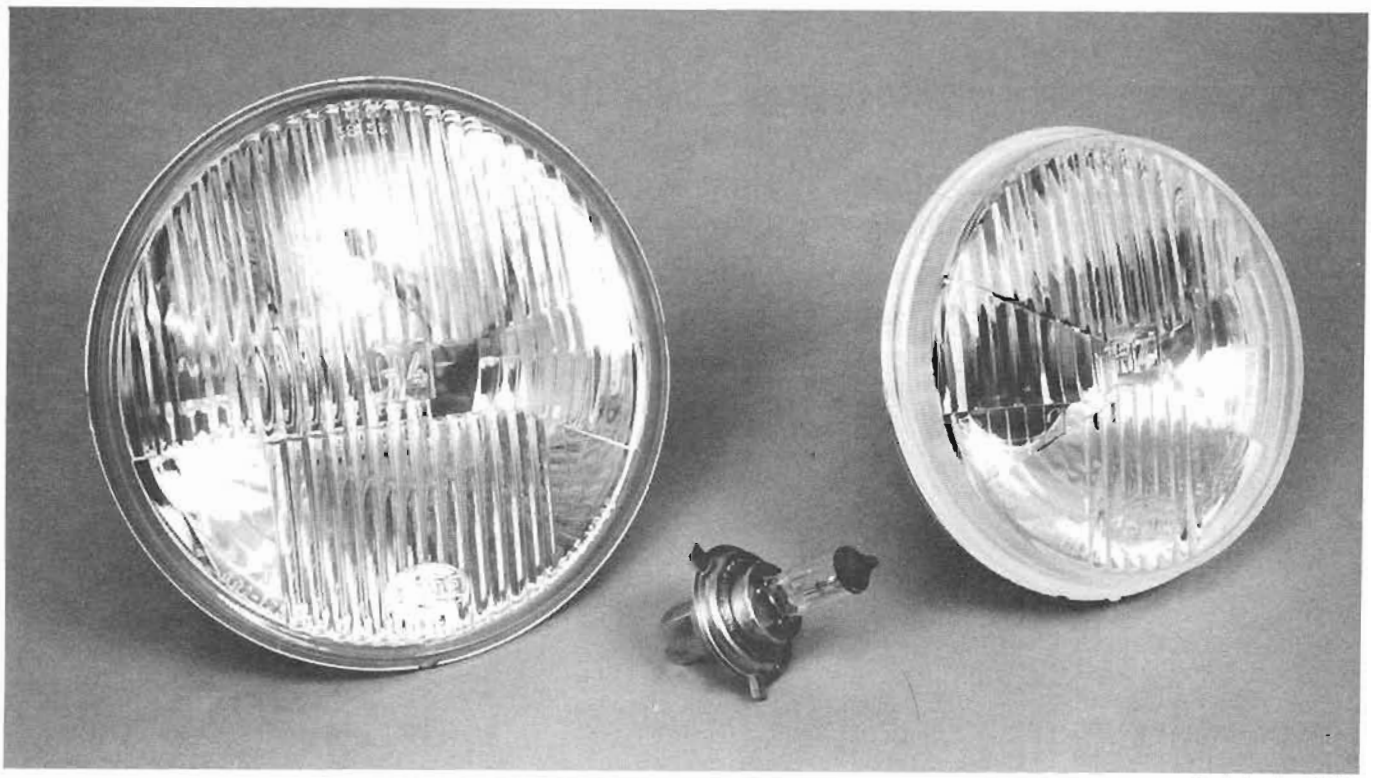


Photo by Joe Minton

Maybe you've noticed there's been a revolution in lighting. For a couple of decades our government's very own Department of Transportation (DOT) sat on its lighting standards and let the Europeans make the world a safer place to ride in when it's dark. We were left to squint into oncoming lights that blinded us but didn't adequately light the road for the poor bastard on the other end of 'em.

The DOT's standards have finally been improved and Harleys now come equipped with lights that are nearly as good as what the Europeans had 20 years ago. Any Harley built prior to 1984 will most likely have lights made to the old standard and they should be replaced with the later type. If you have a Hog that left the factory during the past couple of years, you have pretty good European-style lights to ride by. Even those, though, can be made better — if you don't mind bendin' the rules a little.

The European lights are superior for several reasons. Among these, the standard use of brighter bulbs, ones that *stay* brighter for a longer time, is particularly noteworthy. Light from these bulbs is captured by a higher-quality reflector and is then passed through a very well-engineered lens. European headlights put more light where it will do the most good. The light pattern of the modern headlamp, on low beam, won't blind oncoming traffic, but instead puts that light on the road.

Low beams are social lights. They let you sorta see okay, but they aren't much good unless there's other lighting around. A Hog running on low beam in the dark countryside had best be going fairly slow if the rider (you, pal) expects to be able to stop before hitting something in the road. If you spend most of your time in the city, on the other hand, almost any lamp will do for low-beam lighting.

When you read an ad for headlights from Hella, Bosch, or Cibie, you'll see plenty of copy about beam spread, side lighting, and anti-glare. The ads tend to run on at some length about low-beam performance and then offhandedly mention that the high beam will reach the better part of a mile! All that talk about low-beam performance is just to let you know that The Man won't bother you if you put a set of Hellas on your cage, as long as you stay off the real reason for buying them in the first place — the high beam.

High beam is where these things live. An old-style sealed beam will provide enough light to let you go about 50mph on a dark road and still be able to stop before you hit something lying in your way. The H4 headlight on a Harley FXRS is good for 65mph or so. If you get one of the "slightly illegal" off-road lamps and run a 100-watt bulb in it, you can motor at more than 80mph and still stop safely (at least I can).

Let's talk about what's illegal and what you can get away with. According to the DOT, bulbs aren't to be over 55 watts on low beam and 60 watts

high beam. That doesn't mean that you can't get brighter ones. Osram, Phillips, and, I'm sure, others make H4 bulbs with 55-watt low-beam filaments and 100-watt high-beam filaments. There are also 70/75- and 80/100-watt H4 bulbs available. By the way, the H4 designation merely refers to the bulb's physical configuration; all H4 bulbs will fit any lamp made for H4s, but won't fit ones made for an H3.

Headlights such as the Hellas in our photo do such a good job of controlling low-beam light that you're not likely to get any official hassle if you run a big bulb. I've been using an 80/100-watt bulb in my FXRT for more than a year with no trouble, not even a flash of high beams from approaching cages. For those of us who run in city lights most of the time, an 80-watt low beam is a waste of electricity. Besides, high-watt filaments don't last as long (there has to be a downside to everything). A 55-watt low beam is sufficient most of the time, but a 100-watt high beam is the right stuff all the time.

There's quite a variety of H4 headlamps available. Hella makes three different 7-inch lamps: one for cars, one for motorcycles, and one that's illegal to run on the street — which, of course, is the one that's most interesting. Standard cage and motorcycle lamps have slightly different beam patterns, with the cage's lamp directing the low beam a bit more to the side than the bike lamp. The off-road headlamp lets more light out on both low and high beam. Hella's normal motorcycle high beam will reach 4700 feet down the road; their off-road model (Hella #70470) punches through to 5400 feet. That 700-foot difference lets you add about 20mph to your safe high-beam cruising speed. This off-road lamp is the one I've been using, with no problems, in town.

Those of you who run the small 5¾-inch light can get an H4 from Hella, Bosch, or Cibie, but naturally, this smaller lamp won't lay as much light on the road as the 7-inch model. It will, however, certainly outperform any 7-inch sealed beam sold.

As important as having one of these modern beauties, is pointing it in the right direction. If you haven't ever done what I'm about to recommend, you'll find it damn near impossible to understand just how much difference correct aim makes when you're running on high beam. Forget the standard directions about how to aim a high beam by using a wall. That particular method has nothing to do with your *riding* needs. I ride out to a dark place, sit on the bike with the suspension set where I want it for riding, and then set the high beam so that I can see the road clearly as far as possible. You'll be surprised at how much difference a small angle change makes in terms of how far the light will reach. It's easy to run the high beam too high in an effort to make things out at an extreme distance; resist the temptation. You want to see *clearly*, as far as you can, on the roadway. When you aim too high, you may think you're seeing farther and maybe so — maybe far enough but not clear enough. Use your own judgment.

When you have the high beam right for best visibility, the low beam will fall into place. Unless you have a headlamp from Japan. The Japanese dip their low beams more than the rest of the world. If you adjust a Japanese high beam for best vision, the low beam will point at the ground and be almost useless. If, on the other hand, the low beam is the one you adjust, the high beam will point at the sky. Stick with European H4 headlamps.

I've used a 100-watt bulb on both high- and low-output generator Sportsters with no charging problems. Any late-model alternator Harley can support at least a 55/60-watt H4 bulb. If you can get your hands on an ammeter that measures both ways from zero, you can determine whether your generator bike can run an H4. Connect the ammeter in series with the battery and ground wire to the battery. Temporarily connect an H4 bulb in place of your normal light. Turn on your ignition and lights, and note which way the meter reads. Kick-start the engine (current flow through an electric starter will fry the meter), and slowly rev it while watching the meter. It should reach break-even (zero amps) at a lower rpm than you normally ride. If it doesn't, you won't be able to run the high-watt bulb until you do something about your charging system.

While you're installing your new H4, please consider the rest of your scoot's lights. Have you been running the same taillight bulb for a year or longer, or more than 10,000 miles? If so, you oughta replace it. Under the best of circumstances, bulbs get old and burn out; they get old real fast on the back of a rigid Harley from all those power pulses poundin' away on their tiny filaments. Since you have only one light between you and the cager behind you, it just might be a good idea to make sure the one you have is fresh and willing.

Bulbs burn out because of a poor connection more often than from age or vibration damage. A combination of normal vibration and poor contact between a bulb and its holder can kill a bulb faster than anything short of a hammer. Vibration causes a bulb to be turned off and on very rapidly and since it's the shock of being turned on that most damages a bulb, such treatment greatly shortens its life. Each time you change bulbs clean the contacts with a pencil eraser or cloth soaked in contact cleaner, and be sure there's enough tension on the connection between the bulbs and their contacts in the holders. A little attention, at regular intervals, will go a long way toward keeping potential disaster off your tail. ■


BIG
O
ZAP

BATTERIES

Things You Need to Know

By Joe Minton

Chances are your Harley has a battery, and if that battery fails — you'll be parked. That gruesome possibility need never arise if you know how to take care of your bike's battery. They aren't mysterious gadgets that depend on the phases of the moon to function. They're actually brewing pots that store energy in a chemical compound and release it as electricity upon demand. Modern batteries are reliable and completely predictable if given the right care. That care is amazingly easy to administer — and when you understand how batteries work and what can go wrong with them, making your Hog's battery perform and last will be a snap.

A fully charged battery contains a considerable amount of energy that is stored in the form of a lead compound. Given the chance, this lead compound will release its stored energy and turn into plain lead and lead sulphate. That chance comes when you connect an ignition coil, light bulb, or starter motor across the battery's terminals. When you connect that light bulb, a chemical reaction starts in the battery. All that energy I mentioned isn't just sitting there as electrical energy, it is locked-up in chemistry. It takes time for the conversion to take place and for all those tiny electrons to free themselves and run through the bulb's filament, heat it, and make it glow. The most advanced batteries can convert chemical energy to electrical energy very quickly.

Have you ever ground on a starter until the motor began to slow down? Did you then wait a minute for the battery to recover and then grind some more? There is a simple explanation for the battery's recovery after a short rest. When a battery is hooked to a big load, such as a starter motor, it will convert its chemical energy to electricity as fast as it can. This rapid discharge rate causes bubbles of hydrogen and oxygen to form on the plates. Since the diluted sulphuric acid surrounding the battery's plates is an essential part of the energy-conversion process, those bubbles keep it away from the plates and slow the conversion. When you let the battery rest, at least some of the bubbles break away from the plates and expose them to more acid that, in turn, increases the rate at which the battery can deliver electrical energy.

The total amount of energy that a battery can store is largely determined by how much lead it contains. The more lead, the more energy the battery will store. A battery's storage capacity is expressed in ampere hours, a measure of how long it will deliver current before the voltage drops too far. The way that engineers determine a battery's amp-hour rating is a bit complex, but they are all tested and rated in the same way, allowing you to compare one brand and size with another. Remember, it is the amount of lead in a battery that gives it the amp-hour rating.

How fast a battery can deliver energy is mainly a function of how much area its plates have. When you are operating your bike's starter motor, the current (amps) demand is very high and the battery has to make its chemical/electrical conversion equally fast if it is to deliver the electricity needed. At relatively low current demands (lights or ignition), the conversion takes place throughout the body of the lead plates and there is time for the acid to circulate through the plates. That starter motor, however, needs 150 or so amps and there isn't time for the acid to do its thing deep in the interior of the plates. Everything happens at or very near the surface of the plates. The greater the plates' surface, the more amps the battery can deliver before its voltage drops too far.

Whenever you put a load across a battery, its voltage will drop. If you demand too much from the battery, the voltage will drop too far. Most of us are familiar with that experience of having our bike's engine start just as we released the starter button. The current demand of the starter was so great that the voltage dropped too low to operate the ignition. When you let off the starter, however, the voltage immediately went up and the ignition fired, starting the engine. This is also why a bike with a low battery might start when pushed, but not when turned over with the much surface area as possible while still providing a starter motor.

A premium battery design such as the Yuasa "CX" series (made in America) and used by Harley-Davidson has about as

They all come in boxes shaped just the same, but there are differences. Batteries vary in quality and performance. They are complicated to make well, but are simple to care for. It pays in reliability and life to give them regular maintenance.

battery that is strong enough for motorcycle use. Yuasas have a couple of other tricks too. Earlier I mentioned that a battery's ability to deliver current can be affected by the formation of gas bubbles on its plates. Well, it seems that the rate at which these bubbles are formed is affected by a metal called antimony, which is normally alloyed with lead to make it stronger. The presence of antimony in the plates causes the rapid formation of bubbles when the current demand is high. Yuasa has eliminated the antimony and has replaced it with calcium. The Yuasa calcium/lead battery used by Harley will crank the Big-Twin over faster and longer than other batteries the same size.

The positive and negative plates of a battery are layered — that is, there will be a positive plate first, then a negative one, and so on. These plates must be separated (insulated) from one another. The insulating material must also let acid and current flow freely between and plates. The thinner the insulation, the easier that chemistry can occur. Also, thinner plates take less room and allow more acid or more plates in the same space. You already know why more plates are better (if you have an electric starter). Let's look at why more acid is better.

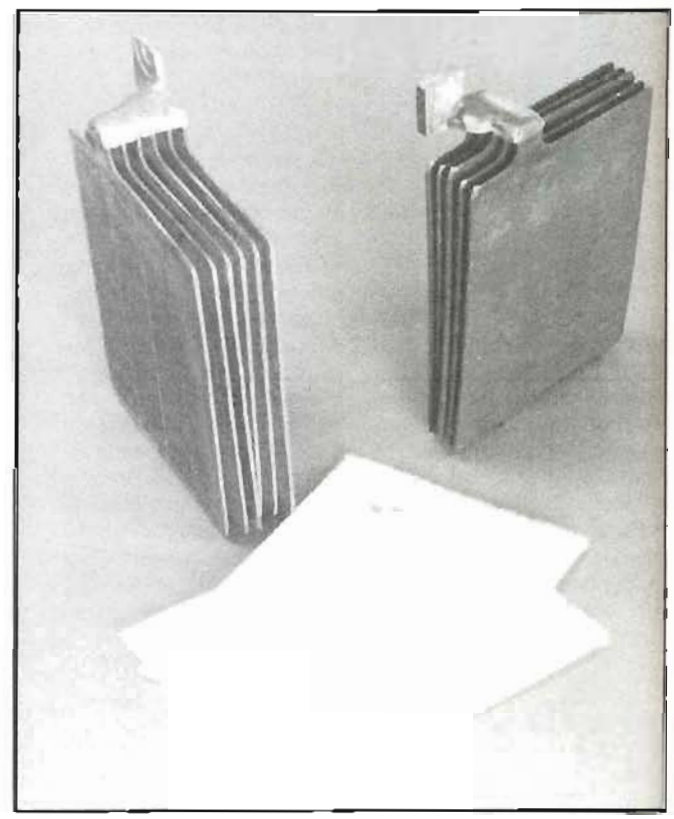
Sulphation

The great killer of batteries is sulphation This refers to the lead sulphate that will form over the plates in a battery if it is left sitting after fully discharged. This coating will insulate the lead plates from the action of the acid and will destroy the battery. A battery with a small acid volume will sulphate very quickly after it is discharged. Also, letting the acid volume fall so low that the tops of the plates are exposed will cause the exposed portions to sulphate. The more acid, the more slowly sulphation occurs. Its greater acid volume to plate volume is why an automobile battery is less likely to be damaged by sulphation if left in a discharged state. A small motorcycle battery can be ruined in less than a week if it is left discharged during warm weather. The Harley OEM battery has a chemical additive in its plate separators that reduces the rate of sulphation by three times. Unlike conventional batteries, this Harley OEM (Yuasa-CX) battery can be fully restored — even if it is fully sulphated — if charged at a very low rate for 80 hours.

If you never let your bike's battery become discharged, it won't sulphate and you won't have to worry about that particular problem. You can avoid a dead and sulphated battery simply by keeping it charged. During riding season you'll be running your scoot enough to ensure that the battery will have a 100 percent charge. The trouble comes when your bike is parked for long periods.

A battery will slowly discharge while it's just sitting around. How fast this happens is a matter of design and chemistry.

Again, the Harley battery has high internal resistance and a chemical additive that slows the rate of internal discharge. It will take about three times longer to run itself down than an older, more conventional battery will. Some bikes have small electrical leaks even when the key is off, some of them also have clocks

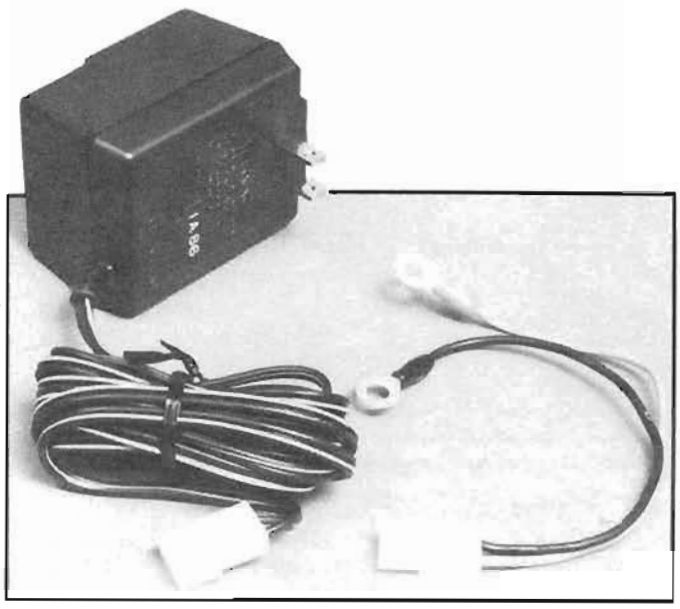


Without the support of the battery case and separators, these plates would shake apart in seconds. Modern batteries are tough and have high output, but only because they have been continuously developed for more than 100 years.

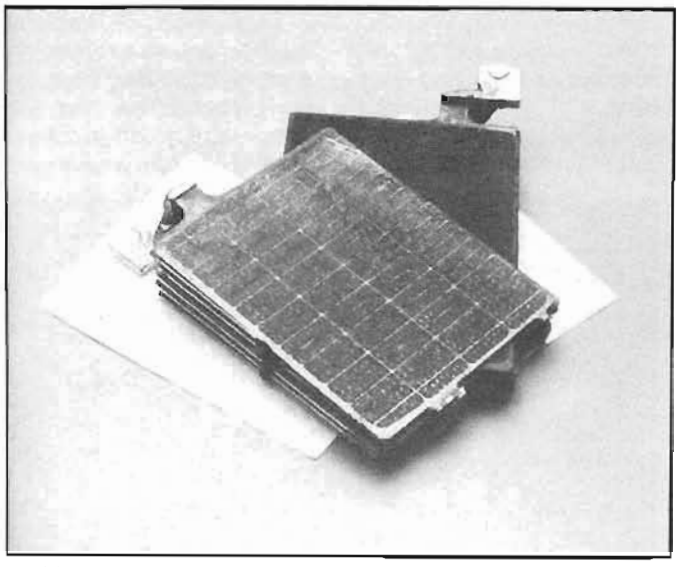
Both the leak and the clock will run a battery flat in time. The answer to long-term storage is to trickle-charge the battery. And that brings us to the subject of charging.

A battery should not be charged at over one-tenth its rated capacity. If your Hog's battery is rated at 19 ampere-hours, you should not charge it at more than 1.9 amps. Charging it at a higher rate can lead to damage from heat build-up and excessive gassing.

Photos by Joe Minton



This special charger for motorcycles will not over-charge your bike's battery and can be left connected for a day at a time. The connector and short battery terminal wires let you leave the charger wires on the battery.



Positive and negative plates alternate like those shown here. The white material under them is the separators that support and insulate them from the other

You can, of course, charge it at a lower rate.

The small charger shown in the photo is made by Yuasa and was designed just for this. All you have to do is mount the small harness onto your bike's battery and plug the charger in every now and then. For instance, if your bike is going to sit for the winter, you can leave the charger plugged in overnight once a week. If you have been using the starter a lot, but didn't get much of a chance to ride very far, the battery will probably be partially discharged and you can bring it back up by plugging in the charger overnight. Because of the low charge rate (.5 amp or less), this charger will not over-charge a Harley-size battery and will not cause an excessive rate of gassing even if left on longer than necessary to fully charge your battery.

How can you tell if your battery needs charging? The easiest way is with a hydrometer. The simple hydrometer sold by Yuasa for motorcycle batteries is fine. I have been using one for about ten years with good results. Any hydrometer will do, but the Yuasa has a couple of advantages: It is small and will work on the amount of acid it can suck out of a motorcycle battery. Furthermore, it fits into a sealed tube that, if kept clean, can be stored in your toolbox. When all the balls float, the battery is fully charged. One down is read as a 75 percent charge, two down 50

New Batteries And Bikes

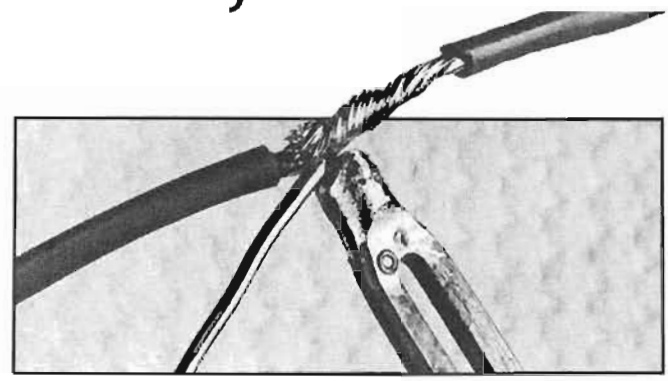
This is gonna make a lot of dealers mad and the battery companies happy: When you buy your new Harley, insist that it gets a new, freshly filled and charged battery. Many bikes sit around on showroom floors with batteries that were filled with acid, used to start the engine, and then left to sit — and sulphate. You bought a new bike, you should get a new battery. Most of the electrical trouble new bike-owners have is not caused by their inexperience (starting problems), but rather by batteries that left the dealer's place discharged and maybe sulphated. The same goes for buying a new battery. You may be in a hurry to get back on the road, but if you can find the time to let a newly filled battery spend a night on the trickle charger, you can make it last *twice* as long as it might otherwise. Some dealers fill batteries and keep them on a trickle charger, such as the excellent Christy charger, and that is fine. If the battery was charged and kept up after filling, it will be perfect. Just be sure — after all, it's your money

The Bottom Line

Batteries become fairly complex gadgets if you are an engineer who's trying to make them work better. They are not complex from the user's (that's you and me, pal) stand point. They need to be filled properly with common battery acid when they are new, and they have to be kept charged and topped off with clear drinking water or distilled water. If you store your bike, get a charger and use it every couple of weeks during storage. Don't charge the battery at a rate higher than one-tenth its total capacity. Do these things and that sucker will last for three or four years — though they do wear out eventually — and give fine service during that time. Let them sit and they will die, just like your scooter will.■

SOLDER UP, SOLDIER

by Joe Minton



You should feed solder into the joint between the gun and wires.

Most electrical failures happen where wires get connected to something. It is much more likely that you will get parked because your alternator, regulator, ignition switch, or some other component fails. One of the more common ways that wires fail is for the wire to break at the end of a solder joint.

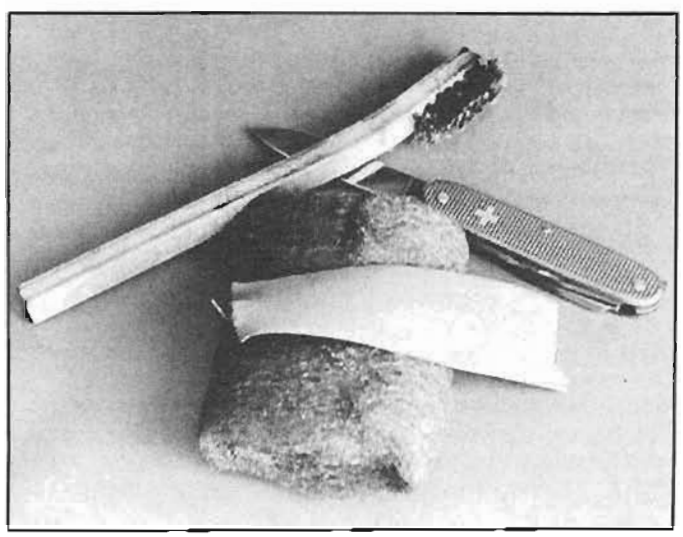
The quality of a solder joint and the way in which the wire leading from that joint is supported can mean the difference between having no problem and having a broken wire. Well supported and properly executed solder joints will seldom give any trouble. A good solder joint is actually easier to do than a bad one. We're gonna show you how.

The single most important factor in good soldering is cleanliness. It isn't the only one, though. Vibration, together with a poorly soldered and supported wire, can lead to a break where the solder and the wire meet. Too much solder and heat can be as bad for a sound connection as too little solder or not enough heat. Things need to be done just so.

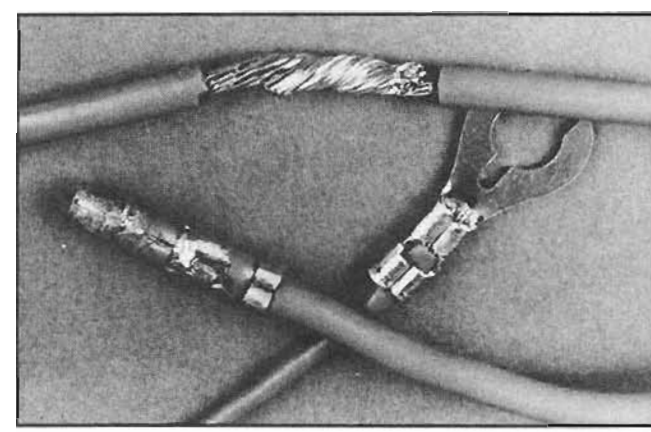
Of all the things you can do while soldering, the most important is protecting your eyes. Wear glasses of some kind. It is no exaggeration to say that one small drop of solder in your eye can blind it—forever. A piece of wire that springs away from a joint while the solder is still molten will toss drops of solder, any one of which can blind you.

Good soldering isn't difficult. Like nearly everything else, it's simply a matter of knowing what is important and getting some practice.

The solder we use for electrical connections is a mixture of tin and lead. The most common mixtures will have 40, 50, or 60 percent tin, with the rest being lead. All three will melt at 361 degrees F but will flow at different temperatures. The most common tin/lead mixture, 60/40, will flow at 370°, 50/50 flows at 420°, and 40/60 at 460°. The 60/40 will tend to give a cleaner solder joint and one that can be finished more quickly.



Tools to get things clean enough to solder.



Soldered, crimped/soldered, and crimped connections.

As you can see, solder melts at a much lower temperature than any metal we would use it on. By definition, soldering is the joining of two metals by melting another metal onto them without melting either of the pieces being joined. Brazing is soldering at temperatures over 800°. Welding, of course, is the joining of metals by actually melting them.

Most of the time we will be soldering parts that are copper, like wires, to terminals, but copper wires can be easily soldered to steel. Ordinary solder won't stick to aluminum or stainless steel, which need special solders and fluxes.

The technique of soldering centers on cleanliness. Not the sort of cleanliness you get when you wash your hands, but chemical cleaniness, right down to the bare, nonoxidized metal. Iron oxide (rust) won't stick to solder, and neither will copper oxide.

There are several simple ways to get wires clean enough to solder. They can be scrubbed clean with a wire brush to steel wool. They can also be sanded or scraped clean. The purpose of these operations is to get the parts ready for the flux.

Flux chemically cleans and protects the surfaces to be joined as they heat to soldering temperatures. While plumbers use something like battery acid to help them join copper pipes, that acid should never be used to solder electrical equipment. The acid will wick up the wires, under the insulation, and

Photos by Joe Minton

Get a good soldering gun, some resin-core solder, and a little non-acid flux—you're on your way.

corrode the wires into junk. In fact, all you will likely ever need comes in the middle of ordinary resin-core solder.

As resin-core solder melts, it releases the flux that is, like its name implies, derived from tree sap. The resin melts, runs ahead of the solder, and cleans the surface of the wires, keeping it covered from the air until the solder can wick along behind it. If a surface is reasonably clean when you start, the resin will ensure a solid bond between solder and the parts it joins. The trick in using solder is to apply it to the surfaces to be joined as soon as they are hot enough to melt it. More on that in a minute.

The main reason electrical wire has many strands is not to simply make it easy to move around, although that is an important one; it is to reduce the chance of the wire breaking due to vibration. Now maybe your Hog doesn't shake, but everyone else's does, and copper wire can't take too much of that sort of thing. Many small strands of wire can withstand much, much more of the flexing that goes along with vibration than a single wire can.

When you solder a multistrand wire to something, you make a part of it, at the end, into a large solid, wire—one that is much more sensitive to the effects of vibration. Now you know why wires tend to break next to a solder joint. There are two ways to get around this problem, actually three. First, don't let the solder run too far up the wire strands. Second, support the wire so that any flexing or vibration isn't concentrated at the wire/solder joint. The third way? Use a well designed crimp-on connector if you can, one that grabs the insulation as well as the strands of wire itself.

The best soldering iron to use for virtually any work you'll need to do on your motorcycle is the Weller 550 soldering gun or its equivalent.

Okay, now let's go over soldering a joint (not rolling one). First, of course, make sure that the wires or connectors are clean, really clean. Second, wrap the wires around each other or the connector, or in some other way support the joint so that it will not move as the solder cools.

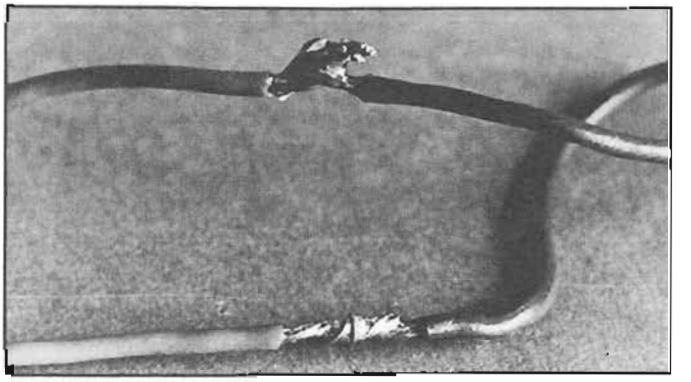
Get out your pound of resin core 60/40 solder (.032" diameter is best) along with the Weller iron. Make sure that the screws that hold the replaceable tips in the soldering iron are tight, so the joint is good. Check the condition of the tip of the gun; if it is dirty, heat the gun and clean the hot tip with a piece of steel wool or small wire brush (remember the glasses), then add solder to the tip to make sure it is coated with solder (tinned).

Heat the gun before you touch it to the work. As you touch the tip of the gun to the joint, melt a little solder into the junction of the soldering gun tip and the wires. This will melt some of the resin onto the joint, which will then run ahead of the flowing solder, cleaning the wires as it goes. As soon as the first solder melts between the tip of the gun and the joint, pull the solder away and continue to heat the joint with the gun until it becomes hot enough to make the solder flow.

As soon as the bit of solder you melted onto the joint begins to flow, add more solder and feed it into the joint until the entire joint is coated. Now, pull the solder away and leave the gun's tip on the joint for another second or so. Pull the gun away and let the joint cool without shaking it. If the solder joint is moved as the solder cools, you may get a bad connection—one that will not pass electricity all that well and one that can be shaken apart quickly by all those Big Twin power pulses. A really good solder joint will have all the wires coated with solder, yet you will be able to see the individual strands.

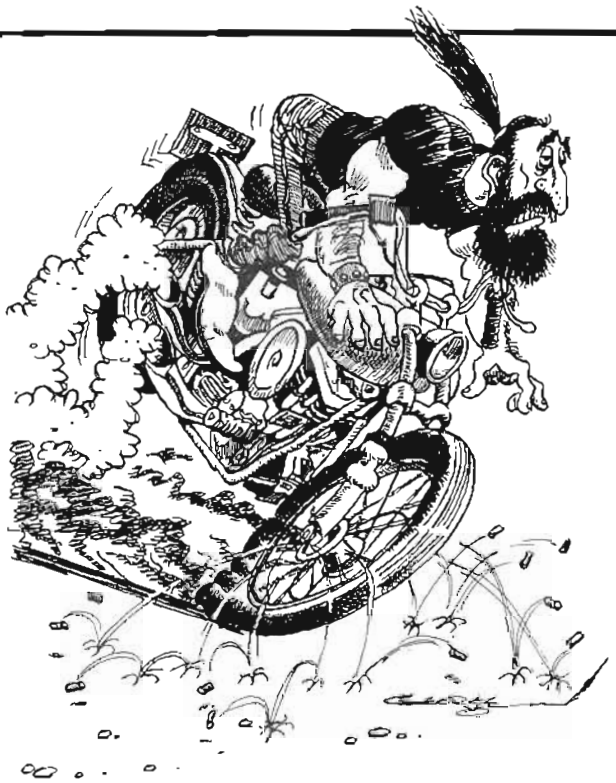
There are three mistakes that you are likely to make if you are new at this soldering business: too much solder, not enough heat, and too much heat. Too much solder can hide a joint that didn't get hot enough to make the solder flow around the parts to be joined. Too much heat will let the solder flow too far up the strands of wire and raise the likelihood that they will fail from vibration.

A sound solder joint isn't always enough to ensure reliability; the wires leading away must be supported so that the weight and shaking of a wire won't be concentrated at the junction between the individual strands and where they are soldered together to form one large wire. Never put tension on a soldered wire. There should always be some slack or loose wire leading away from a soldered joint. You can make it look great if you form a small loop or spiral (pigtail) out of the wire next to the joint.



Solder joints, one good an' one bad. The upper example was rushed an' didn't get hot enough.

A sound, reliable solder joint is of thing a beauty. When you get the feel of it, you'll be able to forget about bad joints. You'll know it was done right, because you did it yourself. ■



WHEEL BEARING HOW-TO

Set-Up and Maintenance of Harley Wheel Bearings.

By Joe Minton

Most of us take our Harleys' wheel bearings for granted; we use and ignore them. Once in a while some of us will be reminded of our neglect in dramatic fashion; we'll come to a grinding and expensive halt in some place the telephone company never heard of.

While a Hog's tapered roller wheel bearings are tough and way bigger than they have to be, they can be destroyed by dirt or incorrect set-up. Harley's tapered roller wheel bearings are capable of handling much more load and will last longer than equal-sized ball bearings. However, a typical ball bearing, as used in motorcycle wheels, sets its own side-to-side play, and a pair of them are cheaper and easier to install in a wheel. Tapered rollers are the better bearings but need some careful set-up. If you make sure your bike's bearings have the right end play, then clean and propely lubricate them, they will last as long as you will have any use for them. Even if you can ignore yer bike's wheel bearings for 50,000 miles and get away with it, knowing that they are right will add to your riding confidence — and that's worth a few hours of your garage time.

The outer races of your Harley's wheel bearings are pressed into the hub with their more open side facing out. The distance between them is set by the shoulders they seat against in the hub. When you install the inner races, which also carry the rollers and cages, the distance between the inner races is set by a spacer that rides on the axle. That spacer, along with how much you tighten the axle nut, determines how much free play there will be in the whole wheel bearing assembly. Correct free play is vital. It determines how long the bearings will last, how your bike will feel when you ride it and, in extreme cases, how safe you will be.

While tapered wheel bearing spacing problems are rare, damage from dirt and inadequate lubrication are not. Even a short ride will collect some grit around the greasy edges of your bike's wheel bearing seals. If you then direct a stream of high velocity water (car wash or garden hose) at the junction of the seal and the spacer it rides on, you might very well drive some of that dirt into the bearing. It happens many times every day. Some greases can be displaced by water, so even if you only drive water into your bearings, they can be damaged by running dry.

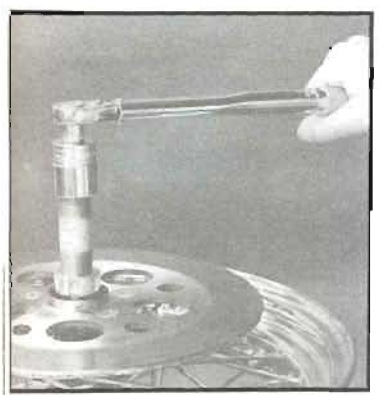
If you wash your bike with a garden hose, get one of those hand sprinkler fittings that sends out a fan-shaped pattern of water, and don't use so much pressure.

Some seals work better than others. Most late-model Harley wheels use seal part number 47519-83A. This is a superior seal, and if it is the right one for your bike's wheels, *you should use no other!* There are some after-market single-lip seals that will pass dirt and water with relative ease, and you should avoid them.

You must be careful when you select a grease for your Hog's wheel bearings, too. There is a natural tendency to think of thick grease as being better than thin grease. You know — the dark brown stuff that you have to cut out of the can in chunks. It just has to stay where ya put it, right? Right. The problem is: you might put it in and all over the bearings, but they will push it out of the way as they roll

around, and it will be too thick to suck back in behind the rollers as they go by. This will let the bearings run dry and destroy themselves.

The best grease for your Harley's wheel bearings is the rather ordinary Lithium grease found in service station lube racks all over the country. The



Axle nut must be torqued correctly when measuring end play.

reason it is ordinary is because it works best in most applications. The Harley factory used it when they built your bike, and they strongly recommend that you continue to use it. They have spent considerable time testing greases for their wheel bearings and have found that general-purpose Lithium chassis grease is best. In addition to staying in the bearings better than thicker greases, Lithium chassis grease is more water-resistant than some of the other "trick" greases. It stays put and repels water. Use it.

Now that I have you worried about the health of your bike's wheel bearings, let's go through the procedures of cleaning, lubing and setting their end play.

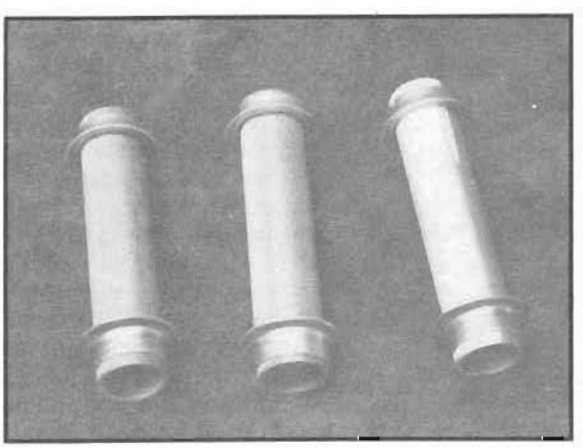
Before you start, read the appropriate section of your factory shop manual and familiarize yourself with the removal and replacement procedures.

If you are going to check the end play of your bearings, you will need a set-up similar to the one shown in the accompanying photos. Not many of us have a snake and dial indicator set, so you may have to have the end play of your bike's wheel bearings checked and set by a shop. You may be surprised by how many motorcycle shops don't know how to make this vital check. If you can't find a mechanic with the tools and the knowledge, look for a friendly machinist; he will have the tools and knowledge. Bearing end play will seldom have to be checked or set more than once, but you should check it the first time you regrease your wheels.

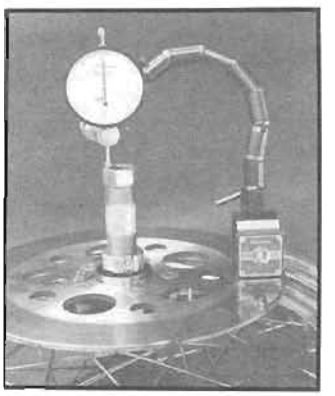
Cleanliness is important any time you work with bearings, and you should clean — really clean — a place on your bench for the work at hand. Get some cleaning solvent with a clean brush. Have an aerosol can of contact cleaner handy, and collect some clean rags or paper towels. Before you remove either wheel, wash the dirt away from the bearing and seal areas.

Remove the wheel and lay the parts out so that you can be sure of getting things back together right Use a large round shanked flat-blade screwdriver to pry the seals out of the hub. Catch the flat-blade under the bottom edge of the seal and rest the round shank on the opposite side of the hole. Gently pry the seal out. It may take a second bite once the seal starts to move, but it will come out fairly easily. The round shank of a large screwdriver will not usually distort the edge of the bearing hole. Just the same, be careful about the edge of the hole. If you think the screwdriver might deform the edge, put something between the shank and the edge of the hole to spread the load. Something thin, strong, and pliant, like an ice cream stick, will do the job.

After you pull the seal and before you remove the inner race, carefully wipe any grit from around the hole with a paper towel or clean rag. Remove and wash the inner race with clean solvent and mark both it and the wheel with a magic marker, so that you will be able to put it back with its mated outer



H-D makes wheel bearing spacers in three lengths. One of them should make things right.



A set-up like this is needed to measure the bearing end play.

race. Wipe the grease off the outer race. Repeat for the other side.

Use a magnifying glass to look for pits or score marks in the outer race and rollers. If either rollers or race are damaged, the bearing must be replaced. Chances are, if you find any damage, it will be rust. While rust may leave what appears to be only a stain, it will have ruined the bearing, and any rusty bearing should be replaced.

Use the same glass to inspect the running surfaces of the bearing spacers that the seals run on. If they are badly pitted or have rough surfaces, they will eat your seals and let water and dirt in. The factory seals have a coil spring behind the inner lip that helps keep it tight against the spacer. In addition, there is an outer lip that does much to keep water and dirt away from thee all-important inner sealing lip. If the space between these lips is filled with grease, it is unlikely that you will have any trouble with dirty or washed-out bearings.

Since bearings seldom need replacing, I will deal with how to remove and replace outer races at the end of the article instead of right here

After you have assured yourself that your bike's bearings are okay,

reassemble the bearings in the wheel with only a light coat of oil. You should never let bearings mate without at least some oil between them. Install the axle, spacers, and one additional spacer long enough to let you torque the axle nut. As you can see in the photos, I used a 2½ inch long, 3/4-inch pipe close nipple as a spacer for the rear wheel assembly of my Softail. Whatever you choose for a spacer, it should be fairly square on the ends.

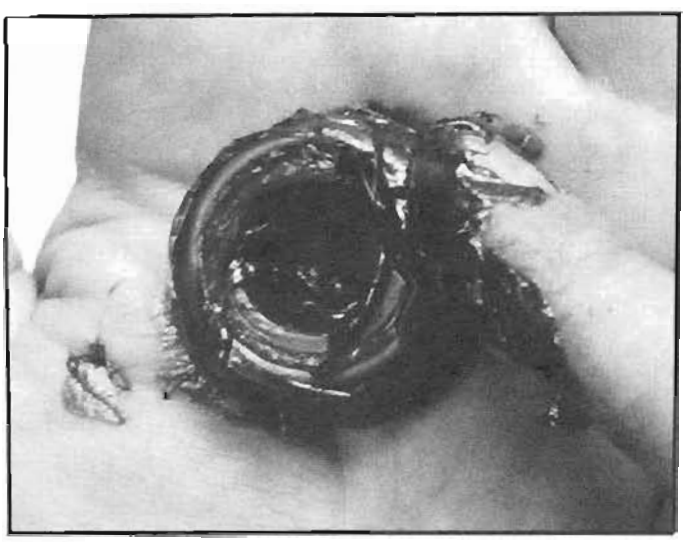
Torque the axle nut to factory specs. This can be anywhere from 45 to 65 foot-pounds. The torque is important. The bearings' end play will be affected by how tight the axle nut is. The end play can vary by 3 or 4 thousandths of an inch, depending on the torque applied to the axle nut. The only way to be sure is to use a torque wrench. Most of us will go through our entire motorcycle careers without one of these tools and do okay. Still, it is an important tool and one that you really ought to have if you can manage it.

Set up a dial indicator so that you can measure the movement of the axle in the wheel. As you can see in the photos, I mounted a magnetic snake on the disc and indicated off the axle end. Move the wheel or axle to and fro along the axis of the axle, and read the bearing end play on the dial indicator. It is important that the bearing races be essentially free of grease when you do this, so that the end play can be easily read. Even a light film of grease will mask the play and give false readings on the dial indicator.

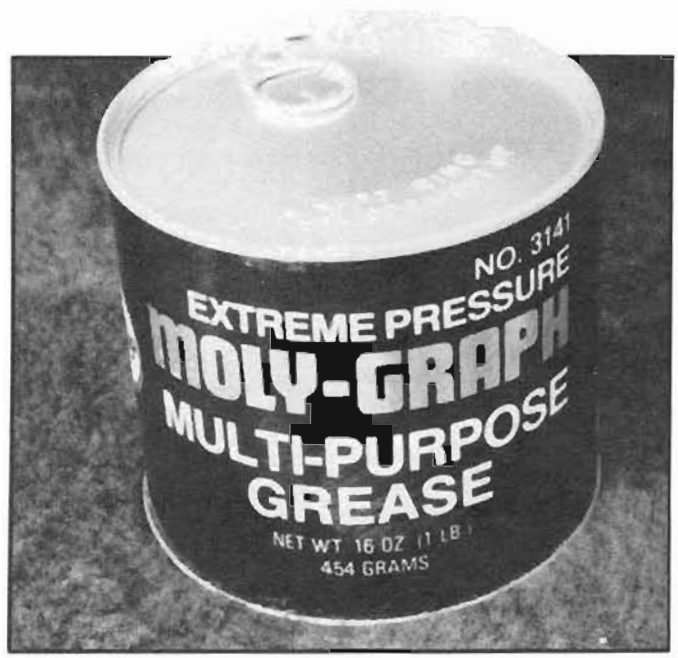
The factory calls for .004 to 0.18 inches of total bearing free play. If it is less or more, the inner spacer will need to be replaced. Harley makes three lengths of inner spacer for its late wheels. You should be able to get your wheel's bearings right with one of them. It might be tempting to try and trim a too-long (too much end play) spacer on a lathe. Won't work. The factory spacers are case hardened and must be ground.

Performance Machine can supply inner spacers made of tubing that can be trimmed to length on a lathe.

Now, with the bearing end play all set, it is time to repack the bearings, install the seals, and put yer bike back together.



Work grease in thoroughly and make sure everything is clean.



First, clean everything. Wash your hands. Get any signs of dirt off the moving parts. Wash the bearings down with contact cleaner and carefully wipe them dry with paper towels.

The grease you use must be clean. Sta-Lube sells Lithium chassis grease in sealed one-pound containers. One of the nice touches of the Sta-Lube product is that they actually tell you some important things about the grease in the can with a little chart on the label. For instance, Sta-Lube states what the soapy base is and gives the grease a water-repellent rating. You want *Lithium* and *excellent*. A grease gun is a good way to keep grease clean, provided, of course, the gun was clean when you loaded it and that you keep the delivery tip clean.

Work grease into the grooves of the seals that you've kept sealed in their packages until just now. Always use new seals. Lightly grease the spacers that the seals run on. Most of us ruin new seals by forgetting to properly lube them. The grease you give them now is all they're ever going to get.

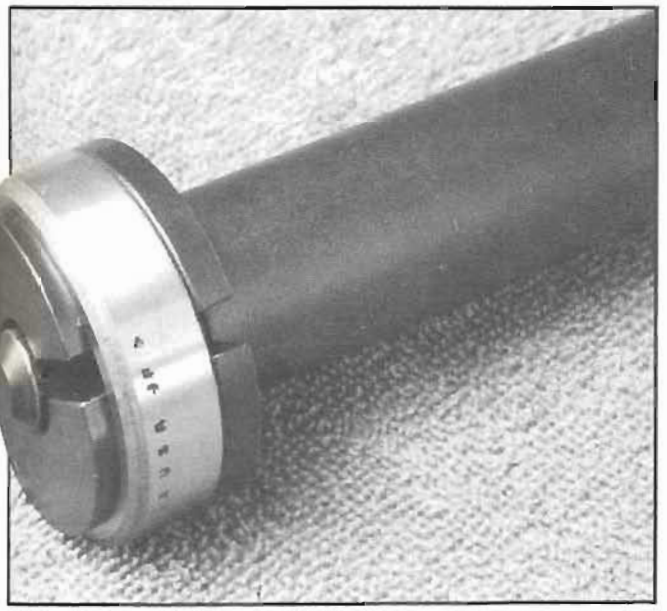
Pur the inner race assemblies back in their outer races (don't forget the inner spacer!). Position the seals and start them with your thumbs. Use a big (clean) hammer to gently tap them in flush with the hole. Some Harley wheels need the seals set below the top of the bearing hole. There is no special tool available, and you will have to drive them in with a hammer and punch. If you are careful

and use a ruler to make sure that the seals are set in evenly from the top of the hole, things will be okay. It is important that the seals are square with the holes. Take your time and don't rush through this important step.

Before you reinstall the wheel, clean the axle, spacers, washers, and nuts. Coat them with a film of oil or grease. I have used an anti-rust lubricant made by Kal-Gard for years and recommend it highly. The product is "30-30." It is an aerosol, comes in a big blue can, and can be used for lubricating and rust-proofing just about any part of your motorcycle. Any time I remove a nut, bolt, or any part that can suffer from corrosion, I spray it with 30-30. My bike's nuts and bolts stay new-looking and don't corrode in place. This is good stuff.

Except for bolting the wheels back on your bike, you are finished. Your Hog will be ready for another year or so of rolling down that road, and at least you won't have to wonder about the condition of the wheel bearings. After a couple of times through this bearing regreasing procedure, you will find it routine and easy to do. It is certainly worth the time and trouble. Peace of mind always is.

Earlier, I said I would tell you how to remove and replace outer races. Here goes. You will need a Harley special tool for this job (see photo). I know that many mechanics remove outer races with a punch and hammer; however, the correct tool works so well that even the most adept wrench will be converted once he uses it. Harley sells the wheel bearing R&R tool in two parts: Part No. HD-33071 "Wheel Bearing Race Remover and Installer" and Part No. HD-33416 "Universal Driver Handle." Your dealer can get these for you.



H-D makes this outer race driver. Nice tool — you oughta get one.

If your hubs are aluminum, you will need a source of heat. I use a single element hot plate or propane torch. Don't use a welding torch unless you have considerable self-control. After you install the bearing driver tool (it is tight and will be hard to work with after the hub is hot), gently heat the aluminum hub with the hot plate or torch until water will just sizzle on its surface. This will loosen the outer bearing in the hub and let you drive it out with very little effort. Aluminum can be damaged fairly easily, and driving the bearing outer races through a cold hub can make them permanently loose. You should have the new race ready when you drive the old one out; that way, you won't have to reheat the hub.

If you put the new outer race in your freezer and then take it out just in time to install it, the race will almost fall in the heated hub, and a light tap with the hammer will make sure it is seated.

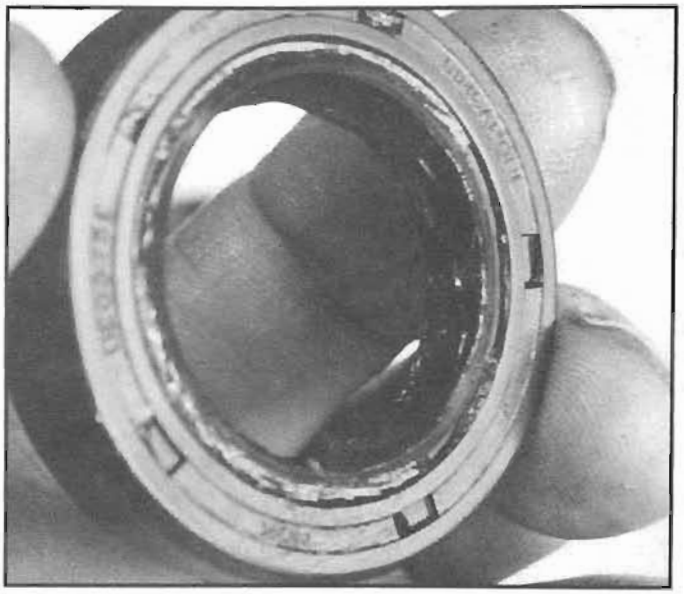
When you use the special tool, be sure that you hold it square and hit it square. You can distort the hole if you really try. Also, a big hammer swung slowly works better than a small one moving fast. I have used a three-pound, one-hand sledge for years, with excellent results.

Proper support for the hub is important while you drive the new bearings back into it. A piece of wood and the garage floor is the best combination I have found. You will be able to clearly hear and feel the difference in the driving tool and hammer when the race seats. The pitch of the hammer-blow's sound will suddenly rise, and the blow will feel harder through both the tool and hammer handles.

If you buy the special Harley tool and use heat, you will be a leg-up over most professional mechanics. You will be doing it better and with less trouble. If you are a professional mechanic, this tool and procedure will let you do a better job in less time.

Wheel bearing maintenance is ignored much too often. It is imporant, and you should either learn to do it or make sure that it gets done at regular intervals by someone who is capable of doing it correctly. You take care of your scoot, and it'll take you where you want to go. ■

Photos by Joe Minton



The seal needs to be packed with grease, same as the bearing.

SPACED OUT

Recently, while heading to a Raider's game at the Coliseum, my scooter developed a strange noise in the rear section. Moving to the left of the seat, I turned the throttle loose and looked back under my arm at the rear axle. The lock washer and nut were still on it, but the axle was spinning with the back wheel — an unnerving sight to say the least. After using the front brake to stop, I whipped out my trusty 12-inch crescent wrench, thinking that all I needed to do was tighten the axle nut. Which I did. But before I'd gone 10 feet I came to a sudden realization: This wasn't gonna get it. As soon as the bike started moving, the axle started doing its thing again, rotating with the wheel. The hub was hot as hell and smoke was coming out around the seals. Shit, fuck, piss. I pushed the scoot to the nearest filling station and called the ol' lady.

Looking it over the next morning, I found the problem. Just as suspected, the spacer was tightened into the swingarm. Fuck-ups like this make me feel like a fucking genius. Who's to blame? Me, of course — and that otherwise trusty 12-inch crescent wrench.

What happens is that after over-tightening the axle nut, the wheel spacer is driven into the slot, crushing the thin wall tubing of the later swingarms. By that, I'm referring to Harley's light disc-brake swingarms, put in production in 1973, not the classy heavier-cast models of years gone by.

To repair or replace the swingarm, the axle has to be removed. Sometimes, as in this case, it isn't an easy task. It called for the biggest, heaviest hammer and drift pin in the house. The reason for this is that there's beaucoup heat generated in that area. Consequently, things have a tendency to weld themselves to each other.

Okay, moving right along, here's the drill. Check the spacer in the hub and make sure it's the proper one and that it isn't damaged. Look over the races and bearings in the wheel very closely. If either is discolored, replace 'em; if the bearings are pitted or rattle unnecessarily, replace 'em. Pack the new ones with high-temperture bearing grease, the kind made for disc brakes. Of course, the seals should also be replaced. And don't forget, when replacing bearings, check the manual for the proper clearance for your wheel.

Now for the easy part. Find an old Harley spacer, one with nearly the same inside diameter as the newer model. The one I found in my stash was left over from when the old pan was around. The older wheel spacer can be machined on a lathe to the proper distance. (Lengths vary according to the type of swingarm.) Sturgis models have a longer spacer due to the rear belt. The main object is to find a spacer with a shoulder that will fit against the swingarm. (See picture.) If you're handy with a hacksaw and flat file, possibly you can do it yourself, thereby saving a few bucks. The reason for using the older pan spacer is that since it's larger, it can't possibly be tightened into the swingarm unless ya really try. The book calls for 50 pounds of torque on the axle nut. Believe it — that's all you need.

If you're having trouble adjusting the secondary chain, check the left inside area of the swingarm, at the axle mount, to see if that ain't the problem. Never buy a swingarm if the area around the axle is pushed in, because you just may be buying someone else's problem. A damaged swingarm can be welded and ground to look like new, but I've got my doubts about how well or how long they'll hold up. My skepticism is based on the great heat that could crystalize the metal and lead to fatigue if not welded right. If that does happen, there's the distinct possibility that the left side will go south on ya. Particularly if there's great stress put on it, such as from doing a wheelie or peeling out. —Beercan

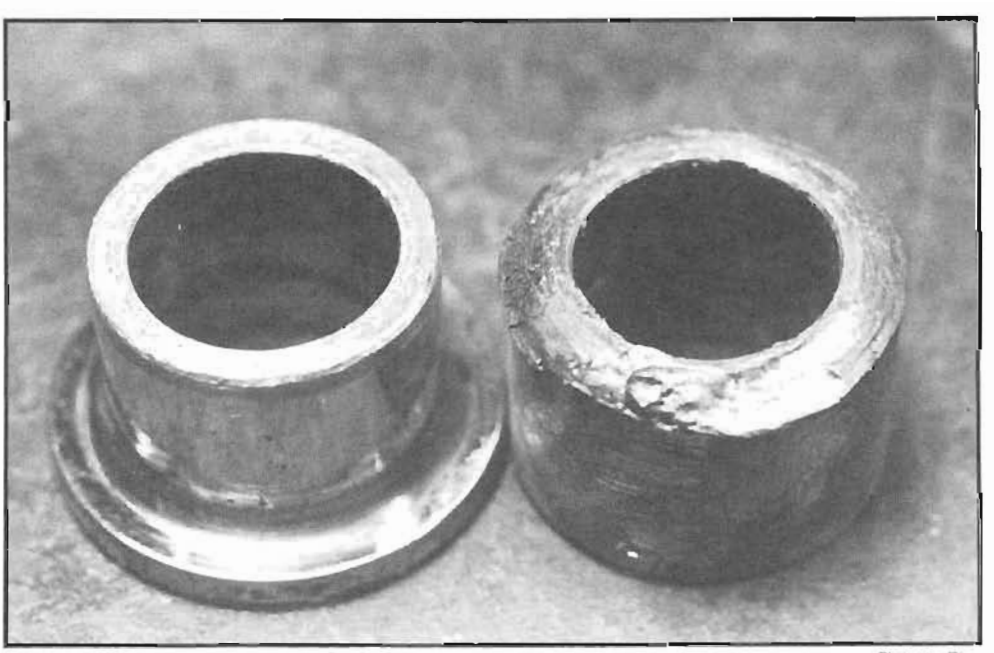


Photo by Rip

Fork Her

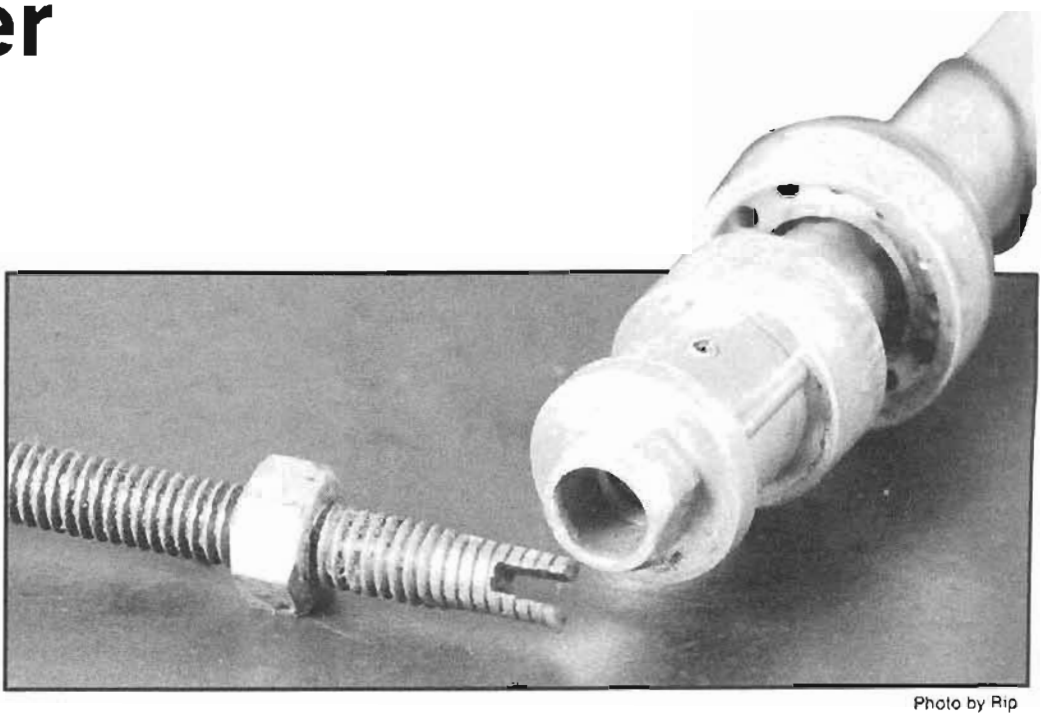


Photo by Rip

Has this ever happened to you? Let's say ya have a '73 or later narrow glide front end. And let's say the seals are shot and letting the fluid come out. After letting it go for a while, ya finally decide your hemorrhoids would feel better if ya took care of the problem.

So you jack up your ride and take off the front wheel. Then ya drop one leg out of the triple clamps, put it on a table, and go to disassemble it. For the sake of this article, let's say you have never taken one of these babies apart before. You look it over and decide that it's just like the older wide ya had when ya was puttin' a pan.

Wrong. The hydraulic unit doesn't have an end unit that fits into the slider. In other words, when ya put your (metric) allen wrench inside the slider to take the tubes apart, all it does is spin. Well, don't panic, bro, there's nothing to it if you'll just take a few minutes and make yourself this simple tool for assembling and disassembling the hydraulic unit from the front end. What we have here is a piece of all-thread purchased at a hardware store. The length is determined by the length of the tubes on your scoot. The end of the all-thread is slotted so it will fit inside the hydraulic unit.

The hydraulic unit has a roll pin that the slot on the all-thread straddles, holding the unit as you back off the allen-hold on the other end of the unit. I welded a broken shock stud to the other end of the all-thread, but any piece of scrap will work just fine.

The all-thread comes 5/16" in diameter. Take a file and grind it down a bit so it's skinnier and easier to get into the hydraulic unit. Cut the slot at least 1/4 inch deep and make it about 3/16 inch wide. If you have an old hydraulic unit lying around, use it to fit the all-thread.

Now, most all-thread is very soft. What you can do to make it a bit harder is heat the end and then dip it into some water. Let it cool and then take a hacksaw to it. If you can see that it's cutting real easy, stop and heat it up again. Don't get it too hot or the end will drop off and you'll have to start all over. Of course, if you have a long piece of 5/16" round stock, use it instead, because it should be harder than the all-thread.

After cleaning up all the components and putting in a new seal, use your new tool to reassemble the front legs. Put in 6 oz. of Harley type B fluid. Try it — you'll like it and your butt will thank you.

—Rip


SHIT! I NEVER SAW IT BEFORE.

Chains:

A little work'll save a lot of walkin'

By J.D. Chandler

There are a few bros who only look at their rear chain when it's lying on the ground about a quarter-mile behind their scooters. Yeah, I know, it's happened to me, too. Doesn't have to happen, though. With a little lookin', wrenchin', and greasin', you can make your scoot's rear chain last longer than anybody will believe. Instead of wonderin' when you're gonna get stuck 40 miles from East Bum-Fuck, you can *know* it ain't gonna happen to you!

If your scoot's chain is gonna last, there are some things that it'll need. Chains don't just set there an' keep themselves company. They take a heliuva beating everytime ya turn the loud handle on your stroker, but get this: That ain't when things are the worst for yer chain.

Did ya ever lock up the rear wheel (like in front of a left-turning cage) an' have the tire start jumpin' around like a cat in heat? That's when your scoot's chain gets its ass kicked. That hoppin' tire really gets a run at the slack in the chain and when it reaches the end, it'll give the chain a jerk like Diamond never intended. Notice I mentioned slack. Too much slack in a chain lets it jerk around so it'll whip up an' down. Each time it gets to the end of its slack, the rollers and pins will meet each other like hammers. Those hammers, by the way, are beating their way to your wallet.

While too much slack is a bummer, a tight chain will wipe out the bearings in yer gearbox an' rear wheel — another bummer. So is insufficient lube.

All yer Hog's power has to go through its chain's pins an' bushings. The sprocket teeth an' rollers are pretty big compared to the pins and bushings inside the rollers. All that space between the teeth an' rollers makes life kinda easy for them. It also makes it easy for you to see when they're dry an' need lubin'. If ya wait till the rollers are dry, the pins inside will really be hurtin'. What ya wanna do is make lubin' your chain a regular thing. Don't wait till it squeaks, rattles, or drags on the road.

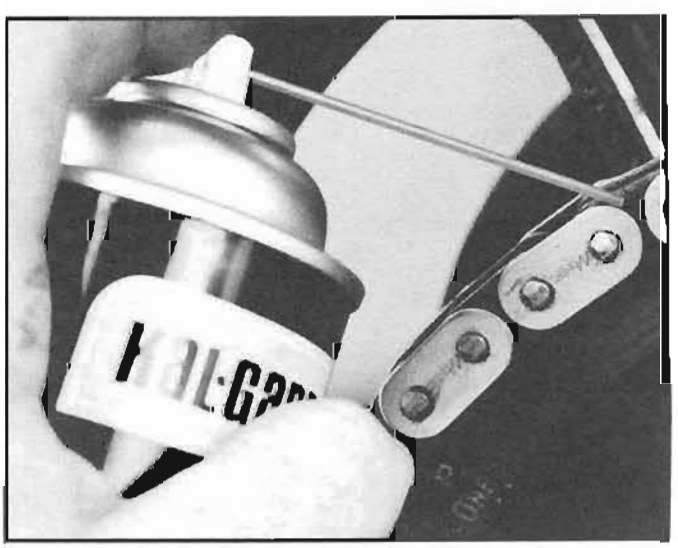
A lot of ya are ridin' Harleys with chain oilers — turn 'em off. There's a better way. Engine oil isn't good chain lube. It won't stay on long enough to do much besides wash the dirt off. Since ya ain't gonna put your chain in a can and bathe it in oil (chain cases look like shit), ya gotta use a lube that'll stay on when you're makin' a long run. Somethin' that'll get in between the pins an' bushings — and stay there.

A while back, one of the dirt rags tested a bunch of chain lubes. It was a pretty good test. One brand, Kal-Gard's Chain Kote, came in both first and second. Seems Kal-Gard private-labeled it to someone else and the two brands of the same stuff won! Well, there's nothin' like makin' sure. Chain Kote goes on thin, penetrates into the pins an' bushings, then it sets up, sticks, and stays put.

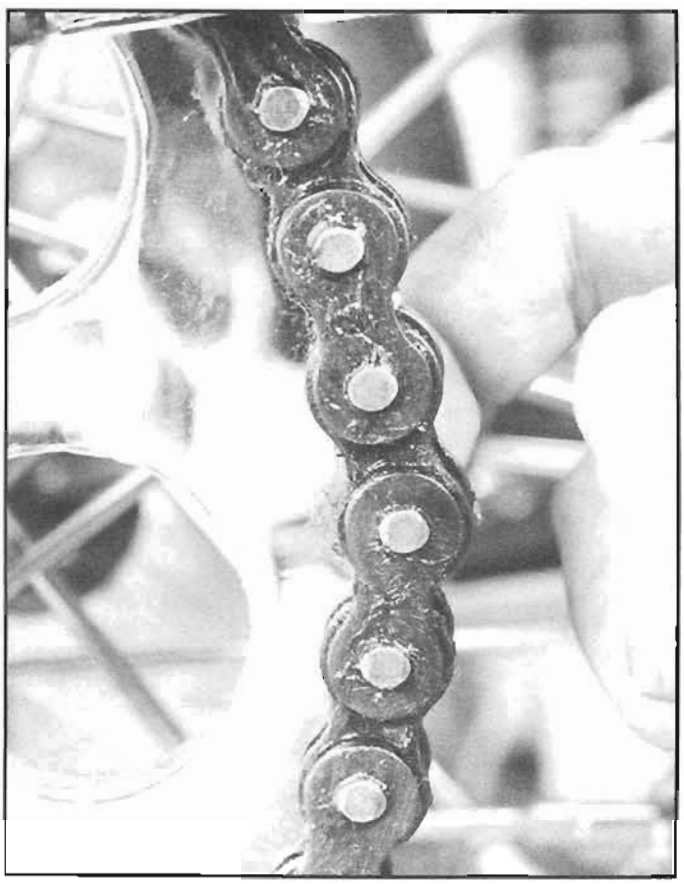
It has Moly (MoS_2) in it an' genuinely makes chains last longer, though it needs to be put on right or it'll end up stickin' to your colors as hard as it'll stay on the chain. Any chain lube that sets up should be put on *after* a putt, not before. That gives it time to penetrate an' do its thing.

Remember, the place ya want the lube is between the pins an' bushings. The way ya make sure it gets there is by sprayin' it between the plates on both sides of the chain. First ya use yer Ezy-Lift to get the rear wheel up in the air. As ya turn the wheel, spray the Chain Kote between the inner an' outer side plates. After the master link has gone by once or twice, switch to the other side of the chain and spray some more. Don't worry about getting too much lube on the outside, just see that ya get plenty on the inside. And don't bother too much about the rollers, you'll get enough on them just tryin' to soak the lube into the side plates.

Any lube you can see on the outside of the plates (an' most of what ya can see on the rollers), isn't doin' diddly. If it's on the outside of the chain, it'll soon be on the outside of you. So, what ya do is spray on the lube, let it set, an' then wipe off as much as ya can with a rag dampened with solvent — gasoline (be careful!) or WD-40. Anything ya can wipe off with a damp rag wrapped around the chain is just there to catch dirt an' end



Squirtin' lube all over the outside of yer chain won't help much — it's gotta get inside. All them Harley power-pulses go through the pins and bushings inside the chain.



This sprocket was cut wrong an' it's gonna take the chain out in a few thousand miles. Sorry, bro, but there ain't very many good chain wheels bein' made these days, includin' the factory's — which this one is.

up on your back. A chain lubed an' cleaned this way will look an' work like new. And, it'll stay that way much longer than you'd think.

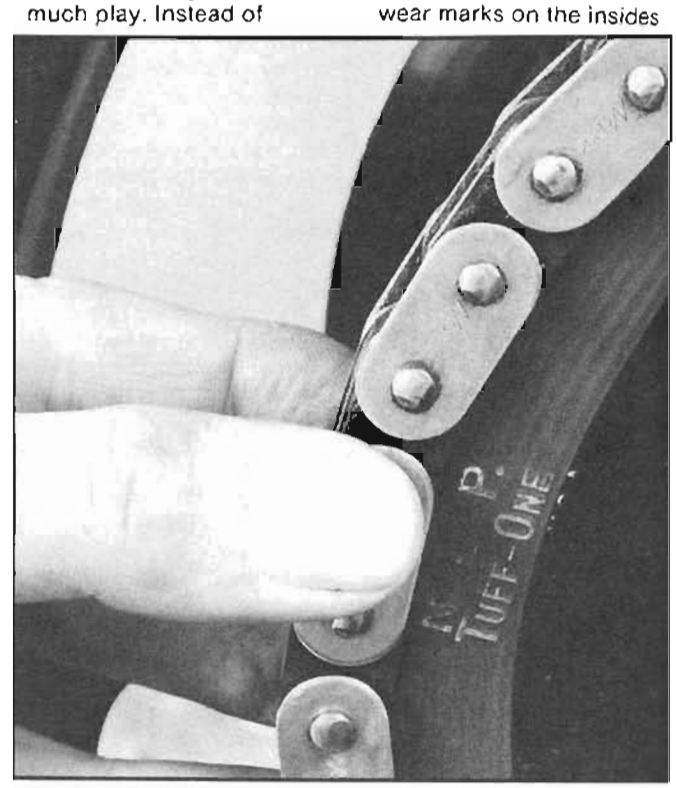
After ya lube an' wipe yer chain, an' before ya take it off the stand, check its adjustment. Remember, if it's too loose it'll beat itself to death without any further help from you or the loud handle. If it's too tight it'll take out the bearings, so get it right. It's easy enough to do. When a chain is at its tightest, it needs about a quarter-inch of free play. All you have to do is find out when it's at its tightest.

If yer ride is a hardtail, turn the wheel while you push the chain up and down to find the tight spot and then give it a quarter-inch. A swingarm bike will need a little more attention before ya can be sure the adjustment is right. As a swingarm bike's rear wheel moves, its chain gets looser an' tigher. This happens because the arm doesn't pivot on the center of the countershaft sprocket. A swingarm bike's chain will be tightest when the rear axle, the countershaft's center, and the pivot for the swingarm are all in line. The very first time ya do a swingarm chain adjustment, you'll need to go to a bit more trouble.

Take off one shock an' compress the rear suspension till the axle, arm pivot, and countershaft all line up. Now, with the chain in its tightest spot, lay in a quarter-inch of free play. Let the wheel down an' note how much play the chain has (it'll be more than a quarter-inch). From now on, ya can just find the chain's tight spot and give it that much play. Instead of wonderin' if there's enough slack, you'll *know*.

A well-lubed and adjusted chain will last a long time — unless it's runnin' crooked or the sprockets are worn out or just not cut right to begin with. A misaligned chain will rub on the sides of the sprockets, get hot, and wear out. You can check your scoot's chain an' sprockets for alignment by lookin' at 'em. Park the bike so its front wheel is straight. Bend down so ya can see both the sprockets and the chain. If the sprockets aren't in line, the chain will have a dog-leg in its run. A chain runnin' with such an offset will have wear marks on the insides of the side plates; polished side plates are a sign of sprockets that are outta line.

You can check for a crooked rear wheel by sightin' along the wheel, and, as you move from side to side, watchin' the bike as the front wheel moves out from behind

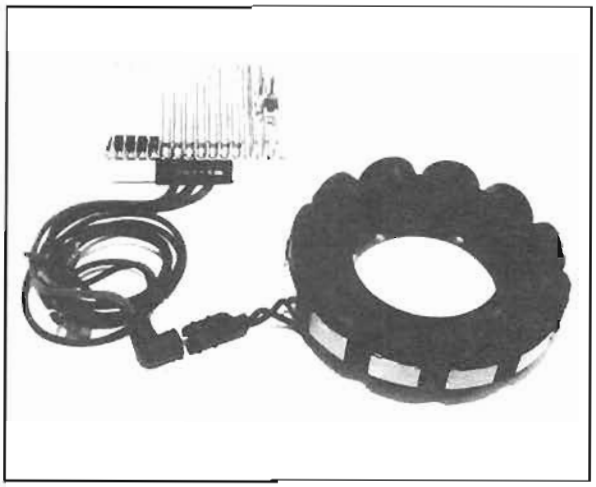


When the sprocket's cut right an' the chain is new, ya won't be able to pull the chain away more'n a quarter of a tooth. A new chain on a bad chain wheel is a waste of money.

the rear one. You'll be able to tell if the rear wheel is crooked by the way it looks when you do this. Another sign of a crooked rear wheel is wear on only one side of the chain's inner side plates. If yours is crooked, loosen the axle, move the adjusters until it's fixed, an' tighten the axle back down. Ya only have to do this one time. Once ya have it lined up, you can keep it that way by turning both adjusters the same amount next time ya tighten the chain.

The best an' easiest way to tell if ya need new sprockets is to test them with a new chain. Wrap the chain around the sprocket and try to pull it away from the sprocket halfway 'round. If ya can pull a new chain more than a quarter-tooth away from the sprocket, the sprocket is history. New factory H-D sprockets, by the way, are cut so loose that they qualify as worn out when they leave Milwaukee. Hardly anyone else does any better, either.

By this time it may seem like takin' care of a chain an' sprockets isn't worth the trouble. If ya had to go through all this every time ya went for a putt, it might not be. Fact is, once ya have a good chain and good sprockets that are lined up, adjusted, an' lubed, it's easy to keep 'em that way. Just spray on some lube when ya get back to the garage, wipe off the excess, and relax. Now that yer chain an' sprockets are gonna last, you'll have more money for suds. Probably more important, though, is the fact that ya won't ever have to bend down to pick yer scoot's chain up off the ground when you're 40 miles from East Bum-Fuck. ■



GARY'S FIX-IT FORUM

One area that you might look at the next time that you start having charging problems, are the plugs for the voltage regulator and the stator.

It is absolutely essential that these plugs are securely joined together and that they are kept clean from oil and dirt. On late-model motorcycles, the factory provides several types of retainers that prevent these plugs from vibrating loose. These retainers are also available from the aftermarket.

One of the signs that the plugs have been loose is if the pins have burn marks on them - the spark has been arcing from one side to the other.

Charging problems are hard enough to diagnose without worrying about a good connection. Lots of good regulators and and stators have been tossed needlessly because of this problem.

Check this out and do the "tighten-up".

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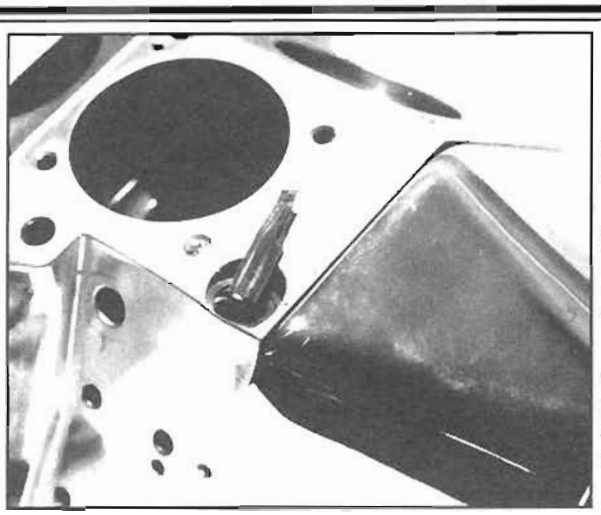

GARY'S "FIX-IT" FORUM

CHANGED ANY CRANKCASE OIL SCREENS RECENTLY ?

One of the most over-looked maintenance items involved in the process of changing the oil on 1970-up 74", 80" models is the crankcase oil screen.

This screen is used in the hole next to the rear tappet block, and just above the the oil pump on the right-side case. If the screen becomes blocked by debris, and all the oil coming from the oil pump must go by this screen to get to the top-end, it can restrict the oil pressure and keep the rockers, tappets, etc. from getting the correct amount of lubrication.

Blockage of this screen from contamination is one of the leading causes of "tappet noise". The tappets require the full measure of oil pressure to keep the hydraulic units pumped-up, to keep the tappet assemblies from galling in the guides, and then keeping the oil pressure moving on up to the various top-end components.

One of the foremost repair manuals states that this filter should be inspected every 6 months, or every 2,500 miles.

The crankcase screen is so vital to the oil pressure flow of the system, that for the minimal cost of the screen, you may want to make these a standard replacement item when you change your oil .

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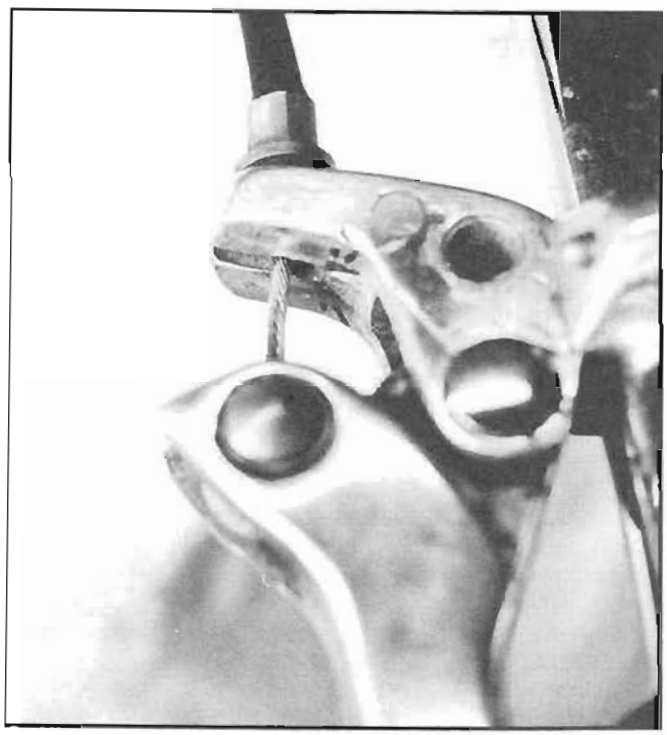
DEALER INQUIRIES WELCOMED

CABLES: HOW TO LUBE, ADJUST, AND MAKE 'EM LAST

By Joe Minton



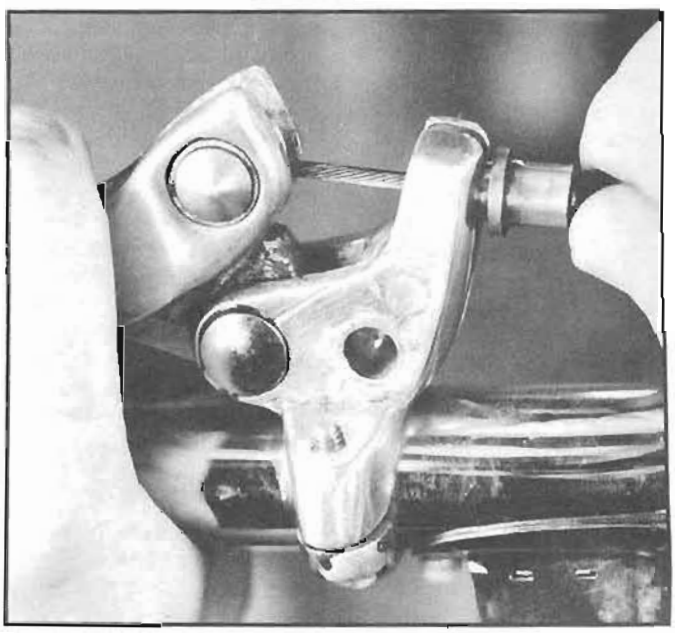
When ya set up yer levers an' cables, ya need to be sure that the inner cable doesn't rub on the holder. It'll wear through, break, an' leave yer ass parked.

Some bros spend a lotta time makin' sure there ain't any oil or grease on the outside of their scoots, but not as many take the trouble to put grease and oil where it needs to be — on the inside. While there are a number of places that a bike needs lubin' in order to do its best and be reliable, this month we're gonna work on gettin' cables slippery and adjusted right.

About half the bum shifts most of us get are caused by a dragging clutch cable or one that isn't adjusted the way it needs to be. A stiff throttle cable makes small throttle changes hard to do smoothly; ya tend to jerk the throttle as the dry cable sticks and slips when it's pulled. I can hear it now: "How can a clutch cable cause a bad shift?" Glad ya asked.

When ya check yer scoot's clutch action in the garage, ya look at the lever and pull it all the way in. Same thing when ya initially drop into first gear at a light. After you're under way though, that all changes. While you're lookin' out for cages an' potholes, ya tend not to pay particular attention to how ya clutch an' shift. After all, you've been doin' it for a long time an' shiftin' sorta comes natural. Outta habit, we all pull on the clutch lever an' shift.

The difference between how we pull the clutch lever on the road an' in the garage is what makes a lubed cable important. When ya shift outta habit, you don't pull the lever in all the way; ya pull with a certain amount of effort. If the clutch cable is stiff from lack of lube, that effort ya make during a shift won't pull the lever very far. The clutch plates



You can get the clutch cable off without messin' with the adjustment. Ya pull the lever to the bar an' grab the outer cable. As you let the lever out, pull the outer cable away.

won't get lifted as far as they should and won't separate the way they should either. Now, with the clutch draggin', ya ain't gonna get any almighty great shift. In fact, ya may just grind a pound.

Lube that clutch cable an' it'll move easier, move farther when ya shift, an' separate the plates more completely A whole bunch of clutches have been overhauled when a teaspoon of oil was all that was needed! Oh, yeah, one other thing, a lubricated cable will last longer, too.

Throttle cables that are sticky tend to make ya look bad. When you're tryin' to make that little compensation for a long hill or when ya just want a little more speed, a jerkin' throttle cable is a real pain in the ass. Worse, a throttle cable that only moves in jerks can give yer ol' lady an attitude — an' maybe whiplash. Same as with the clutch cable, a lubed an' adjusted throttle cable makes life easier. You'll get a smooth ride and ya won't have to think about gettin' parked because the damn thing broke. If ya start lookin' at yer scoot's cables with an eye to keepin' em adjusted an' greased, ya won't get surprised by a broken one when you're on the road.

Before we get into how to lube yer cables and which lube to use, let's take a look at what makes 'em break an' how to keep it from happenin'. I've never seen a cable break in the middle. They break at the ends and they break there either because the end fittings aren't turnin' in the levers or because the cable strands are rubbin' across somethin' that bends or cuts on 'em. Either way, all the trouble comes at the ends.

When a cable end fitting is sticking in the lever, the cable has to flex right at the fitting when it's pulled. Just like a piece of baling wire, it'll break after it's flexed enough times. Occasionally, the end fittings get hung up on a burr or somethin', but most stick because there ain't no lube to let 'em turn. Those new cables with the self-lubin' plastic sleeves don't break very often, but even they can use some greasin' now an' again.

Some custom lever assemblies let the cable inners rub on the edge of the slot in the lever bracket. It isn't so much that the rubbin' breaks the cables as the fact that the cable has to flex (that damn word again!) sharply over the edge of the slot — something that'll eventually cause the strands to break.

Ya wanna make sure yer bike's cables don't rub on *anything* between where they leave the sheath and where they join the end fitting. Ya also wanna be certain

Make a funnel outta tape, pour some engine oil in it, an' have a beer while it flows into the cable.

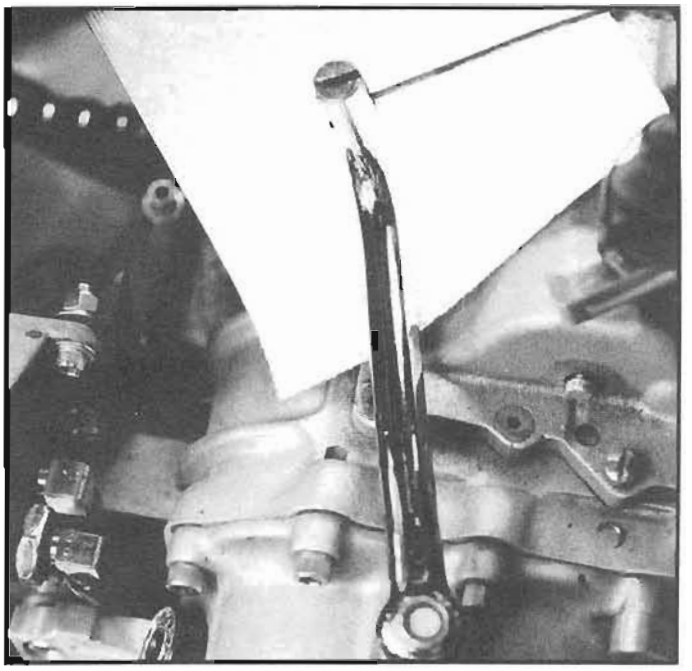
that the end fitting is free to turn in the lever. Now let's get on with lubin' yer scoot's cables.

The kinda lube ya use is almost as important as actually usin' it. It seems that clutch cables work best with oil about as heavy as 20-50W engine oil. Throttle cables, on the other hand, feel sluggish with that oil and work better with somethin' light like WD-40 or automatic transmission fluid. It doesn't matter what oil you use as long as it's not heavy enough to ruin the feel or so light that it runs out the bottom of the cable.

So now that ya know ya gotta have oil in yer cables, how do ya get it in? Easy. If ya use WD-40 in the throttle cable, ya just squirt it down the cable after taking the top off the throttle housing so ya can get to it. The clutch really isn't much more trouble. First, ya loosen the adjustment enough to make gettin' the cable out of the lever easy. Remove the cable an' arrange it so it points more or less straight up. Now, make a funnel out of tape on the end of the cable sheath. Ya can use electrical tape, racer tape, or whatever ya have. Fill the funnel with engine oil and let it run into the cable.

When ya put the clutch cable back on, give the end fitting and the lever pivot a shot of chain lube Kal-Gard chain lube will set up into a grease that'll stay on the job till ya remember to do it again. On the throttle side, squirt

Photos by J.D. Chandler



If yer scoot has the room, the cable an' the arm should form a 90-degree angle when the clutch lever is halfway to the handlebar.

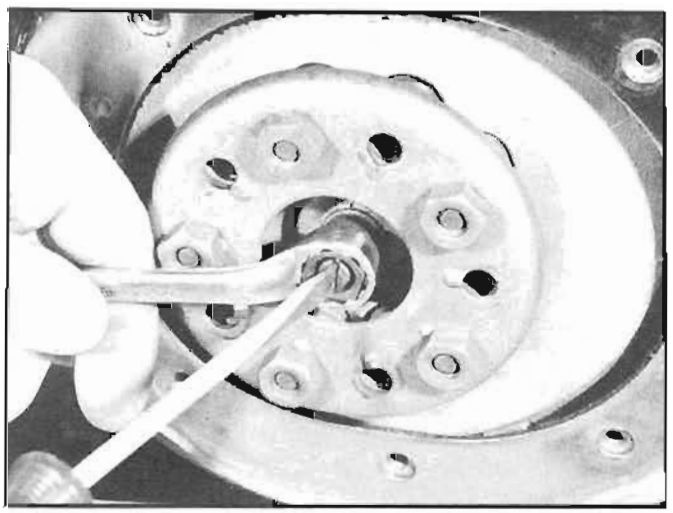
a little of the WD-40 in between the handlebar an' the throttle barrel.

If ya do all this to yer cables every couple of thousand miles, ya won't have any trouble with 'em, at least not the kind that'll park ya. The lubing will keep things smooth an' easy and the regular inspection will let ya catch a fraying cable before it has ya shiftin' without a clutch.

Harley clutches are so tough that they can be used to handle a load of nitro in a drag racer. That don't mean shit, though, if your Harley's clutch doesn't work right. A draggin' clutch, or one that engages too quickly, is another pain in the ass we can all do without. There is, however, a way to get your bike's clutch just so, an' we're gonna tell ya about it.

There are two clutch adjustments on yer Harley and both have gotta be right if you're gonna get the most out of the clutch. How you adjust the pushrod affects how easy the clutch is to pull, an' how you adjust the cable determines where the lever is when it starts to engage.

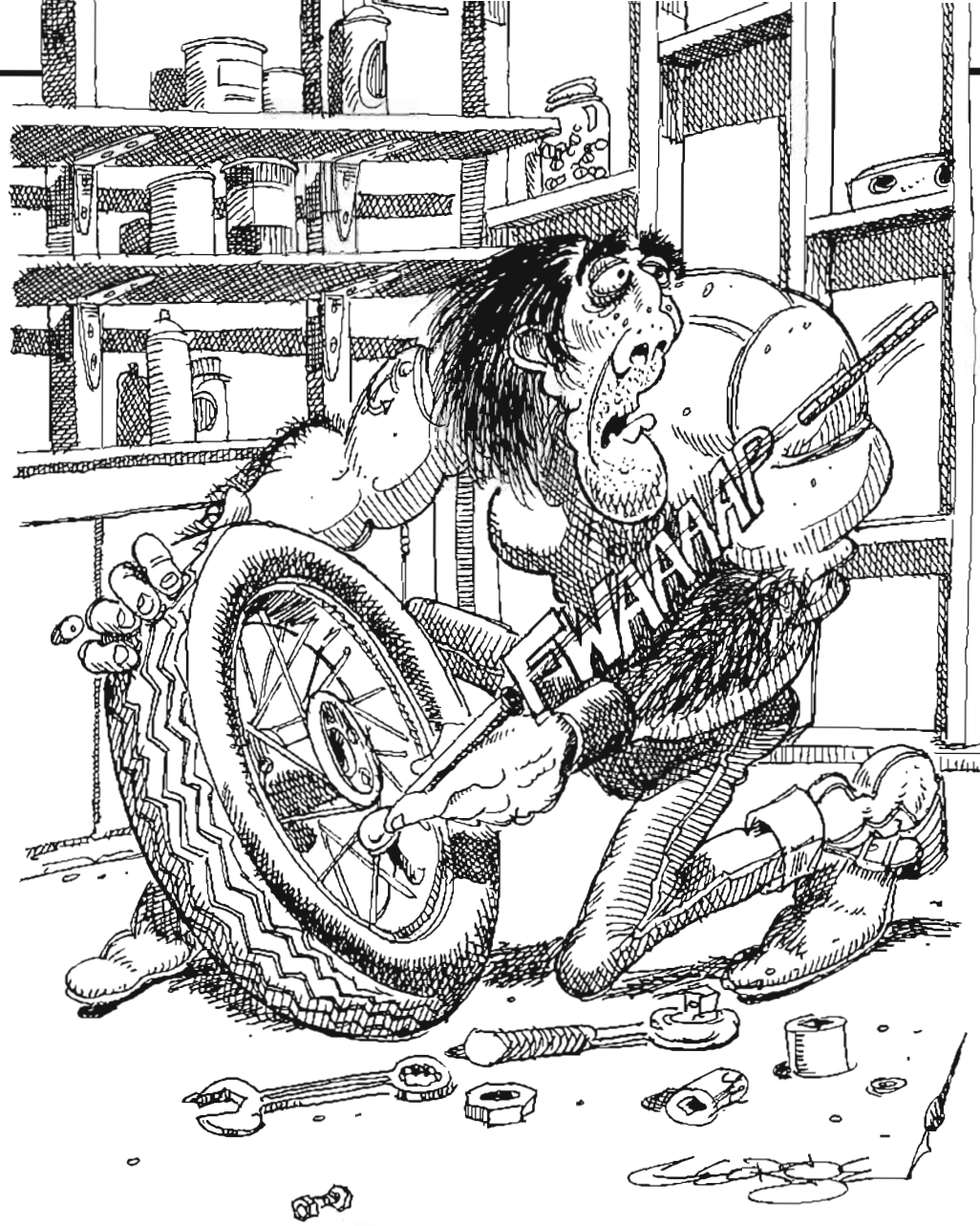
Let's start with gettin' the pushrod right. First ya loosen the cable adjustment so there's plenty of play in the lever. Now take off the derby cover an' adjust the play in the pushrod until the "release lever" at the top of the tranny is almost 90 degrees to the cable when ya pull the play out of the cable. What ya just did was make sure the release lever was in the best position with the cable for nice an' easy an' complete clutch action. Replace the derby cover an' we'll go on to the cable adjustment. Now that the clutch release lever is in the best place for operatin' the clutch, all ya gotta do is get the cable adjusted to suit yerself. Ya know that ya gotta have free play in the cable, hot or cold, so be sure there is some when you're through. Adjust the cable till there's just a little play. Start yer scoot an' adjust the cable until the clutch starts to engage right where it feels best to you. As long as there's free play in the cable an' the release lever's where it oughta be, ya can put the clutch lever where you feel most comfortable with it.



Ya can't adjust only the cable to make the clutch feel an' work right. Both the pushrod an' the cable have to be in the right place.

The throttle cable adjustment is even easier. Most bros like the throttle to have as little play as possible. With a "tight" well-lubed throttle cable, its action begins to feel like an extension of the rider's will — I'm talkin' bitchin'. All ya gotta do is take most of the play out of the cable without takin' so much out that the carb gets opened when ya turn the bars.

That's it. Ya just did the two things that'll make yer clutch an' throttle work best for you. The clutch adjustment at the tranny is best for maximum leverage an' the adjustment for the cable is best for yer hand. The throttle is now smooth an' there's damned little slack to take up before ya get action. Not only that, but the look-see ya gave the cables when ya oiled 'em added the extra measure of confidence that comes only with knowin' everything is right. After all, ya don't wanna come to a sudden halt next to the bro with the broken chain 40 miles outside of East Bum-Fuck — except to give the bastard a hand. ■



HOW MUCH AIR?

GET IT RIGHT — YOU'LL SAVE BUCKS AN' YER ASS

By J.D. Chandler

I know what you're thinkin'. You're thinkin' that ya already know ya gotta have air in yer tires to ride an' ya know where an' how to put it, so why are we wastin' yer time tellin' ya now? Right? Right. Well, bro, read on. By the time ya get to the end of this piece, you're gonna be in a hurry to have a look at yer scoot's licorice donuts.

We all know about how air holds our rims up offa the ground. We know that too much air can cause skidding an' lousy tire wear. An' we know that too little air can make a bike wobble around and give lousy tire wear, too. What ya may not know is just how important the right amount of air can be an' just how much the air in yer tires can affect yer safety an' the quality of yer ride.

One of the problems with tires is that ya can't tell everything by how they look. I mean, they're all mostly black an' round and have tread. Ya can't see the cord (at least ya *shouldn't* see any cord), ya can't tell just what's in the rubber by lookin', and ya can't tell for sure how the tire you're thinkin' about buyin' is gonna work on yer scoot. It isn't that there's a lot of 'em out there that're gonna hurt ya, it's just that they're different, an' choosin' the right one can make a real difference in how yer bike works.

A bunch of ya ride

A tire's load and pressure limits are cast into its sidewalls and they go together. If ya load the tire to its maximum weight, you gotta use the max air pressure. If you run less load, ya can use less air. If ya stay around 65mph, you can raise the maximum load rating by about 25 percent. Runnin' temperatures are the key here. How much a tire can handle depends on both the speed and the weight it has to carry. Oh, yeah — you'll need to balance yer tires if ya wanna get what ya paid for; a balanced tire will last longer and it'll ride smoother, too.

rigids. The tire ya put on the back can make yer ride or break yer back. There are some tires that are so stiff they'll have ya stoppin' fer a break *before* ya run yer peanut tank outta gas. Tires that have been made for heavyweight touring have to stand up under more weight than Godzilla can lift. They have stiff sidewalls and rigid, sometimes belted, treads. These fuckers were meant to be put on air-cushioned, overloaded Ma & Pa & the Kitchen Sink tourers. Stick one on yer 500-pound chop an' you're gonna get shorter by a couple of inches. Unless ya intend to carry more than you'd put in the club's pickup, there ain't no need to fuck with stiff touring tires.

Like I said, ya can't necessarily tell by lookin', but it'll help. If the tire ad you're eyeballin' shows Ma, Pa, an' the Kitchen Sink, chances are that tire is gonna be stiff. If it's belted, if the sidewalls are hard to bend in yer hand, if the tread is real thick — it'll probably run stiff.

Let's name some names an' talk about them. The stiffest tire ya can buy right now is a Dunlop — any Dunlop. Mind ya, Dunlop makes fine tires. They have sport tires that'll let ya drag yer ears on the ground before they'll dump yer ass there, an' they have touring tires that'll go farther than anything short of what folks put on trucks. But they ride stiff an' Dunlop knows it. If, however, ya have late suspension an' ya want the best miles or road-racing traction, ya can't do better. Carlisles, like the Dunlops, are made in the USA and are good touring tires, but they're touring tires built to take the loads of a loaded FL, so they're stiff, too. It's the Germans who've found a way to get long life, traction, and a good ride.

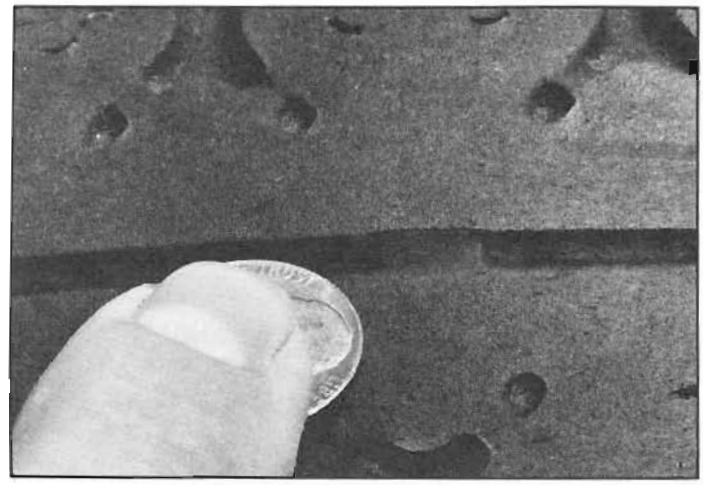
There's nothin' that'll ride like a Continental K112 rear tire. Though ya can take one of these suckers and wad it up in yer hand like an inner tube, when it's full of air it'll still be plenty stiff enough for the bike — while providing an incomparable ride. Runnin' a close second in the ride department are Metzler ME99s. Both Continental and Metzler tires will last nearly as long as the heavy touring tires and stick better than most. If you're gonna put yer ass on a rigid, ya can't go wrong with either one.

As important as tire construction is to ride and handling, air pressure is more so. If yer tires are either under- or over-inflated, ya can have lots of trouble beyond poor tire life, whereas within specified pressure limits, you can actually tune yer tires' pressure for the best ride an' handlin'. Let's look at handling first.

A big part of a bike's stability comes from its tires. When ya look at a new scoot's owner's manual, you'll find a couple of tire-brand recommendations based on stability testing. Harley engineers must approve what the company puts on their bikes when they go out the door. Even the best tires may not work on a particular bike; bike and tire have to be matched. Chances are, any set of tires ya choose will work on yer bike, but choose wrong and you'll have a wobble or weave at high speed. It's a good idea to stick to premium tires when ya buy and a helluva good idea to check with your bros to see what their experiences have been with the set of tires you're lookin' at.

Pressure recommendations are derived from two standards; the load the tire has to carry and stability. Ya should never run less than about 24 pounds, even on the lightest scoot. Anything less will let the tire flex from side to side too much and give ya high-speed wobble. The more weight a tire has to carry the more pressure it needs. Most tires have an upper pressure limit of about 42 pounds (it's printed on the side of the tire). When you're carryin' a lot of weight yer bike's tires flex more every time they turn. That flexin' causes heat build-up, an' heat is the mortal enemy of tire life and even safety.

Speakin' of heat, there's a lot of bullshit about tire-speed ratings goin' around an' we'd like to



Photos by J.D. Chandler

You'll need a new tire when the wear bar is flush with the tread surface or the tread depth is equal to the width of a new nickel. While ya might get away with runnin' a tire till it's bald, you are takin' a chance on eventually slidin' yer ass down the road.

shed some light on the subject. Tire-speed ratings are really heat ratings. When ya see a V-rated tire, you're lookin' at rubber that's supposed to be safe to ride on all day at 150 mph or more, fully loaded, and with maximum pressure. That V-rated tire isn't a damned bit better than a 112 mph "S" tire when it comes to traction, life, or anything else. All they're tryin' to tell ya is that ya can ride an "H" tire at 130 mph and a "V" tire at 150 mph. For the kind of ridin' most of us do, an S-rated tire is just fine. The reason that "V" tires cost more is that the manufacturers can get it — an' there are more inspection steps for the tire to clear. Such tires are only better if you're gonna try to do three times the double nickel — for an hour.

Tires are designed to flex enough to put the tread in good contact with the ground. If ya fuck with the pressure too much, you'll mess up the shape of the tread when it meets road surface. It ain't that tires won't work over a range of different pressures, it's just that there are limits an' you should know about 'em. If ya stay within 24 to 42 pounds an' go up in pressure as ya pick up speed or weight, you'll be okay.

To get the best possible ride out o' yer scoot, you've gotta play around with the pressures some, especially at the rear. Within the limits, ya can change pressures, ride, an' change 'em again until ya get the combination of ride and control ya like. If ya never go real fast, ya can run lower pressures an' get the best ride, but if ya intend to spend much time above Uncle Sugar's double-nickel, ya oughta run the air up — just to be safe.

Speakin' of pressure, how do you know how much ya have? Everybody makes pressure gauges; some are good and some ain't. After testing a bunch of gauges, Dunlop decided to buy a pencil-style model from Syracuse Gauge in New York. They say that the Syracuse gauges are completely accurate and reliable. They don't cost a bunch, either. Ya can get one from yer Snap-on dealer for about three and a half bucks.

Perhaps ya have a late scoot with tubeless tire wheels. Run tubes in 'em. Sure, tubeless tires work all right, but they're a bitch to fix on the side of the road. If ya have a tube in yer tires, ya can patch the fuckers when they pick up a nail an' put air back in em. Ever try to get a tubeless tire seated on the side of the road? Run tubes. Oh, yeah, the tire guys tell us that tubeless tires run cooler and last longer. What they don't say is that that's true only at maximum load and speed. There can be a 25-degree difference in tread temperature at 130 mph between tubed and tubeless tires. Down at 65 mph, however, there's no detectable difference in runnin' temperature or life.

Now, go out an' check for nails an' staples (the most common cause of flats). Yank 'em out — if the tire goes flat, at least you'll be in the garage near the beer. Now look for cracks in the tread an' sidewalls. Small ones don't mean much, but if they're deep and if ya can see the cord, do somethin' quick. A new tire is cheaper than a trip to the emergency room. While we're on the subject of new tires, let's talk about how to decide when it's time to part with some of yer hard-earned. Ya don't want to wait till the damned thing is bald, though we both know that ya can probably get away with it most of the time. But a bald tire won't stick on wet roads an' it won't do much for high-speed stability, either. The tire companies agree that ya oughta get new rubber when the thinnest part o' the tread is a 1/16-inch deep. Ya can check it out by buying a tread-depth gauge (Sears has one), or ya can simply use a nickel. When yer tire's tread depth gets to be equal to the width of a new nickel's edge, it's time to start lookin' for a bargain on a new shoe for yer scoot. Nowadays, The Man demands that tires have wear bars that begin to show when it's time to replace the tire. Like a lotta shit, though, those bars aren't all that consistent. The nickel will do just fine — an' it's only a nickel.

Finally, pull out yer tire gauge an' check the pressures. If you're like most of us, you've probably lost track of how long it's been since ya last looked. It ain't a bad idea to do this routine every week until ya have a feel for just how fast yer scoot's tires lose pressure. Take the time to mess with the pressures. You'll almost certainly end up with a better ride and more important, you'll know yer tires are right. Call it confidence or call it security, it doesn't really matter. Either one will give ya freedom an' that's what this is all about. ■

Dunlop and Metzeler Tire Charts

Metzeler Tire Chart

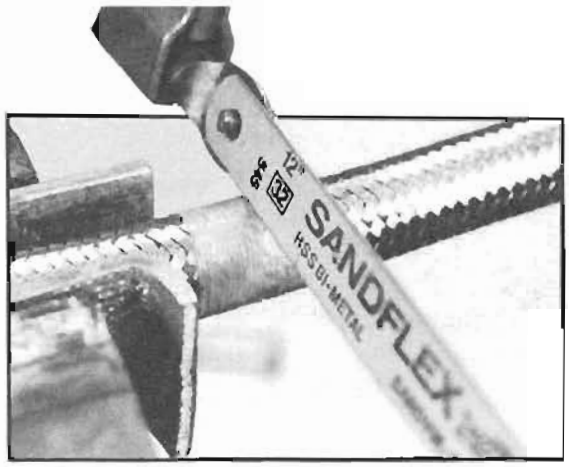
Model	Front Tire Size	Rear Tire Size
XLH 883, XLH 1000, XLH 1100 (Sportster) XLH 1200 (Sportster) XLS 1000 (Roadster) XLX 1000, XR 1000, FXE, FXR (Super Glide), FXEF, FXEF (Fat Bob), FXS, FXSB, FXRS (Low Rider), FXRS FXR (Super Glide II), FXB (Sturgis), FXRD (Grand Touring) FXRT (Sport Glide)	3.25-19 or 100/90-19	130/90-16
FXLR (Low Rider) FXST (Soft Tail) FXWG (Wide Glide)	80/90-21	130/90-16
FLH, FLHS, FLHT, FLHTSC (Electra Glide), FLT, FLHT, FLTC (Tour Glide), FLST (Heritage Softail), FLSTF (Fat Boy)	130/90-16	130/90-16

Dunlop Tire Chart

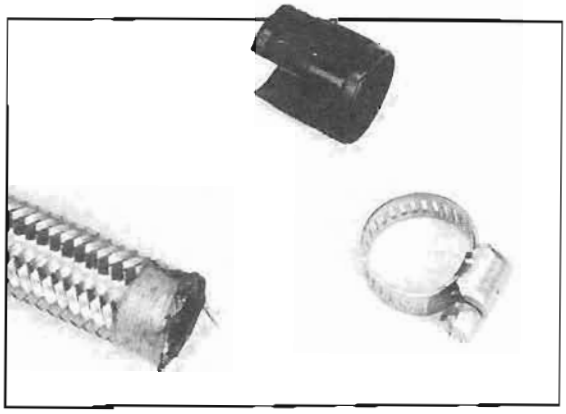
Model #	Model Name	Rim Size Front	Rim Size Rear	Original Equipment Replacement Front	Rear	P.S.I. Front	P.S.I. Rear	K491 Elite Front	Rear	P.S.I. Front	P.S.I. Rear	K591 Elite SP Front	Rear	P.S.I. Front	P.S.I. Rear	Custom RWL Front	Rear	P.S.I. Front	P.S.I. Rear
XLH 883 (86-88)	Sportster-Hugger	2.15x19	3.00x16	K181 MJ90-19TL	K181 MT90-16TL	30	32	*MM90H-19TL	*MT90HB-16TL	30	36	100/90V-19TL	130/90V-16TL	30	32	K391 100/90V-19TL	K391 130/90V-16TL	30	32
XLH 883 (87,88)	Sportstor DeLuxe	2.50x19	3.00x16	K181 MJ90-19	K181 MT90-16	30	32	N/A	*MT90HB-16		36	N/A	130/90V-16		32				32
XLH 1000 (81-85)	Sportster	2.50x19	3.00x16	K181 MJ90-19	K181 MT90-16	30	32	N/A	*MT90HB-16		36	N/A	130/90V-16		32				32
XLH 1000 (82)	Sportster	2.15x19	3.00x16	K181 MJ90-19	K181 MT90-16	30	32	*MM90H-19	*MT90HB-16	30	36	100/90V-19	130/90V-16	30	32	K391 100/90V-19	K391 130/90V-16	30	32
XLS 1000 (82)	Roadster	2.50x19	3.00x16	K181 MJ90-19	K181 MT90-16	30	32	N/A	*MT90HB-16		36	N/A	130/90V-16		32				
XLS 1000 (81,82)	Roadster	2.15x19	3.00x16	K181 MJ90-19	K181 MT90-16	30	32	*MM90H-19	*MT90HB-16	30	36	100/90V-19	130/90V-16	30	32	K391 100/90V-19	K391 130/90V-16	30	32
XLS 1000 (83-85)	Roadster	2.15x19	3.00x16	K181 MJ90-19TL	K181 MT90-16TL	30	32	*MM90H-19TL	*MT90HB-16TL	30	36	100/90V-19TL	130/90V-16TL	30	32	K391 100/90V-19TL	K391 130/90V-16TL	30	32
XLX 1000 (83-85)		2.15x19	3.00x16	K181 MJ90-19TL	K181 MT90-16TL	30	32	*MM90H-19TL	*MT90HB-16TL	30	36	100/90V-19TL	130/90V-16TL	30	32	K391 100/90V-19TL	K391 130/90V-16TL	30	32
XR 1000 (83-85)		2.15x19	3.00x16	K391 100/90V-19TL	K391 130/90V-16TL	30	32	*MM90H-19TL	*MT90HB-16TL	30	36	100/90V-19TL	130/90V-16TL	30	32	K391 100/90V-19TL	K391 130/90V-16TL	30	32
XLH 1100 (86,87)	Sportster	2.15x19	3.00x16	K181 MJ90-19TL	K181 MT90-16TL	30	32	*MM90H-19TL	*MT90HB-16TL	30	36	100/90V-19TL	130/90V-16TL	30	32	K391 100/90V-19TL	K391 130/90V-16TL	30	32
XLH 1200 (88)	Sportster	2.15x19	3.00x16	K291 MM90H-19TL	K291TMT90S-16TL	30	36	*MM90H-19TL	*MT90HB-16TL	30	36	100/90V-19TL	130/90V-16TL	30	32	K391 100/90V-19TL	K391 130/90V-16TL	30	32
FXE 80 (81-84)	Super Glide	2.50x19	3.00x16	K181 MJ90-19TL	K181 MT90-16	30	32	N/A	*MT90HB-16		36	N/A	130/90V-16		32				32
FXEF 80 (81)		2.15x19	3.00x16	K181 MJ90-19TL	K181 MT90-16	30	32	*MM90H-19	*MT90HB-16	30	36	100/90V-19	130/90V-16	30	32	K391 100/90V-19	K391 130/90V-16	30	32
FXE (85)	Fat Bob	2.50x19	3.00x16	K181 MJ90-19TL	K181 MT90-16	30	32	N/A	*MT90HB-16		36	N/A	130/90V-16		32				32
FXLR (87,88)	Low Rider Custom	2.15x21	3.00x16	F-Rib MH90-21	K291T MT90-16	30	36	N/A	*MT90HB-16		36	N/A	130/90V-16		32				32
FXS 80 (81,82)	Low Rider	2.15x19	3.00x16	K181 MJ90-19	K181 MT90-16	30	32	*MM90H-19	*MT90HB-16	30	36	100/90V-19	130/90V-16	30	32	K391 100/90V-19	K391 130/90V-16	30	32
FXSB 80 (83-85)	Low Rider	2.15x19	3.00x16	K181 MJ90-19TL	K181 MT90-16TL	30	32	*MM90H-19TL	*MT90HB-16TL	30	36	100/90V-19TL	130/90V-16TL	30	32	K391 100/90V-19TL	K391 130/90V-16TL	30	32
FXST 80 (84-88)	Soft Tail	2.15x21	3.00x16	F-Rib MH90-21	K181 MT90-16	30	32	N/A	*MT90HB-16		36	N/A	130/90V-16		32				32
FXSTC (87,88)	Soft Tail Custom	2.15x21	3.00x16	F-Rib MHJ90-21	K291TMT90S-16	30	36	N/A	*MT90HB-16		36	N/A	130/90V-16		32				32
FXRS 80 (82)	Super Glide II	2.15x19	3.00x16	K181 MJ90-19TL	K181 MT90-16	30	32	*MM90H-19	*MT90HB-16	30	36	100/90V-19	130/90V-16	30	32	K391 100/90V-19	K391 130/90V-16	30	32
FXRS 80 (83-88)	Low Rider	2.15x19	3.00x16	K291T MM90H-19TL	K291TMT90S-16 TL	30	36	*MM90H-19TL	*MT90HB-16TL	30	36	100/90V-19TL	130/90V-16TL	30	32	K391 100/90V-19TL	K391 130/90V-16TL	30	32
FXRS-SP (88)	Sport Edition	2.15x19	3.00x16	K291T MM90H-19TL	K291TMT90S-16 TL	30	36	*MM90H-19TL	*MT90HB-16TL	30	36	100/90V-19 TL	130/90V-16TL	30	32	K391 100/90V-19TL	K391 130/90V-16TL	30	32
FXR 80 (82,83)	Super Glide II	2.50x19	3.00x16	K181 MJ90-19	K181 MT90-16	30	32	N/A	*MT90HB-16		36	N/A	130/90V-16		32				32
FXR 80 (86-88)	Super Glide	2.15x19	3.00x16	K291T MM90H-19TL	K291TMT90S-16 TL	30	36	*MM90H-19TL	*MT90HB-16TL	30	36	100/90V-19TL	130/90V-16TL	30	32	K391 100/90V-19TL	K391 130/90V-16TL	30	32
FXB 80 (81,82)	Sturgis	2.15x19	3.00x16	K181 MJ90-19	K181 MT90-16	30	32	*MM90H-19	*MT90HB-16	30	36	100/90V-19	130/90V-16	30	32	K391 100/90V-19	K391 130/90V-16	30	32
FXWG 80 (81-86)	Wide Glide	2.15x21	3.00x16	F-Rib MH90-21	K181 MT90-16	30	32	N/A	*MT90HB-16		36	N/A	130/90V-16		32				32
FXRD 80 (86)	Grand Touring	2.15x19	3.00x16	K291T MM90H-19TL	K291TMT90S-16 TL	30	36	*MM90H-19TL	*MT90HB-16TL	30	36	100/90V-19TL	130/90V-16TL	30	32	K391 100/90V-19TL	K391 130/90V-16TL	30	32
FXRT 80 (83,84)	Sport Glide	2.15x19	3.00x16	K291T MM90S-19TL	K291TMT90S-16 TL	30	36	*MM90H-19TL	*MT90HB-16TL	30	36	100/90V-19 TL	130/90V-16TL	30	32	K391 100/90V-19TL	K391 130/90V-16TL	30	32
FLST, FLSTC (87,88)	Heritage-Classic	3.00x16	3.00x16	K291T Rib MT90S-16	K291TMT90S-16	36	40												
FLH, FLH-C 80 (81,82)	Electra Glide	3.00x16	3.00x16	K291T Rib MT90S-16	K291TMT90S-16	36	40												
FLH 80 (83,84)	Electra Glide	3.00x16	3.00x16	K291T Rib MT90S-16TL	K291TMT90S-16 TL	36	40												
FLT, FLT-C 80 (81,82)	Electra Glide	3.00x16	3.00x16	K291T Rib MT90S-16	K291TMT90S-16	36	40												
FLHS (88)	Electra Glide Sport	3.00x16	3.00x16	K291T Rib MT90S-16TL	K291TMT90S-16 TL	36	40												
FLT, FLT-C 80 (83-88)	Tour Glide	3.00x16	3.00x16	K291T Rib MT90S-16TL	K291TMT90S-16 TL	36	40												
FLHT, FLHT-C 80 (83-88)	Electra Glide	3.00x16	3.00x16	K291T Rib MT90S-16TL	K291TMT90S-16 TL	36	40												

HOSES

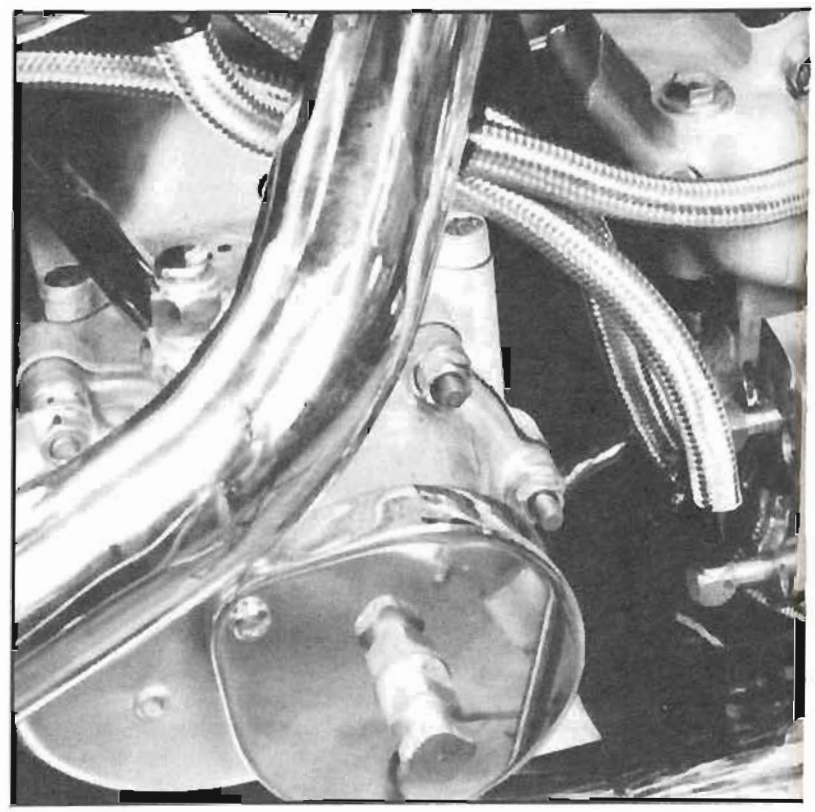
By Joe Minton



Make sure your cut is perpendicular to the hose.



Russell components — simple, yet effective.



The finished result: a flashy and functional setup.

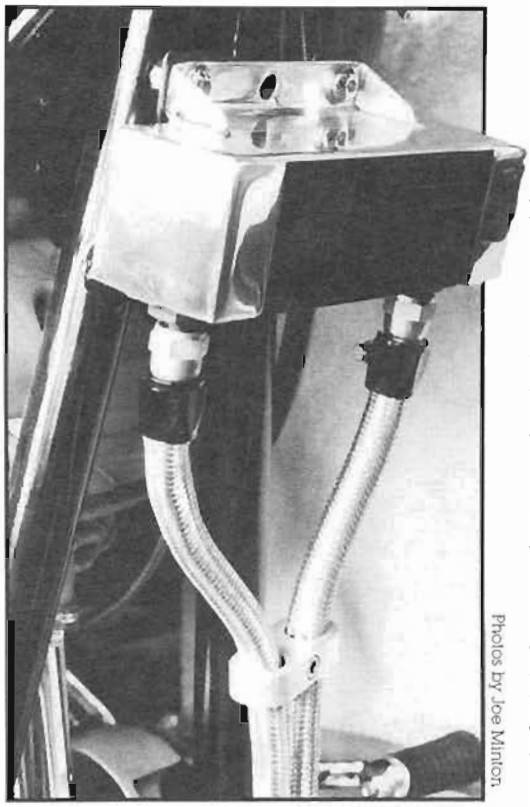
Stainless braided oil hoses look great. It isn't just that they sparkle and shine, which they do, but they add a missing dimension to any Harley. Those gently shining hoses visually bind a bike's engine with its accessories and show their relationship. The oil tank and oil cooler reveal their connection with the engine and make the whole thing seem somehow more important and solid. Then, too, not only do stainless hoses look good, but they work.

Ordinary rubber hoses will pass oil okay and, if cared for and replaced every couple of years, will give perfectly reliable service. They've done it for decades. That doesn't mean there isn't something better, though. There is also the possibility that the rubber hose you buy at your local auto parts store may not be all that great for handling hot oil. The hose sold as fuel line will take being exposed to engine oil, but you must be careful of the quality. Like so many other things these days, cheap and inferior foreign-made hose is showing up in discount auto parts stores. Ya gotta be careful what you buy!

When you get a set of stainless hoses on your Hog, there'll be one less thing to worry about. The stainless steel braid is just about bulletproof, you won't have to worry about a sharp edge cuttin' into an oil hose an' parking you somewhere out there on the road. The braided steel sheath greatly strengthens the joint between the fitting and hose, and it reduces the chance of the hose cracking at that point. Inside the tough braided sheath is some of the best-quality rubber hose that can be made. It is certainly tougher and more durable than the automotive oil or gas line.

This braided line business got its start in the military. Bros who had spent time serving their country had a chance to see how it could be done — when money didn't matter. Until a few years ago, the only way to get braided lines on yer bike was to bite the financial bullet and spring for genuine AN-type (aircraft) fittings and go to all the trouble of getting them on the tank an' engine. Russell Performance Products, 6301 E. Alondra, Paramount, CA 90723, has taken care of the cost and fitting problems with their line of shrouded clamp-on end fittings.

These parts look like AN fittings and have the reliability of stainless hose clamps. They are an excellent compromise between the very costly and trou-



Photos by Joe Minton

Stainless lines also dress up your cooler's appearance.

blesome AN-types and the plain, low-tech look of hose clamps. Mind you, the common stainless hose clamp is a very reliable item. It just doesn't look as good as it works. Russell's answer to the problem was to make covers for the hose clamps that look like AN fittings. They work, look good, and keep the sharp ends of the braid away from working fingers.

Russell has two somewhat different hose lines available: Street-Flex and Pro-Flex. The Street-Flex hose is the easier to use, because it is more flexible. The Pro-Flex has thicker rubber walls, and the stainless braid is heavier and stiffer. I consider the Pro-Flex to be too much trouble to deal with; the strength of the Street-Flex is plenty good enough.

Now that you've decided to go ahead, here's what's needed to do the work: enough Russell hose, the clamps and shrouds that go with it, and a few accessories. You'll need some of that nylon reinforced tape used to wrap packages. Hardware stores and even supermarkets have it. The tape will be used to keep the ends of the braid from unravelling when it is cut. You'll also need a few tiewraps to tie the hoses out of the way of paint and aluminum parts.

If you happen to have a die grinder or Dremel Tool, get a thin cutoff wheel for the grinder or some Dremel's thin abrasive discs for the Dremel. These are best for cutting through the braid. The alternative is a 32-tooth hacksaw blade. The blade will leave a rougher end, but it will do the job. A little WD-40 or oil to lube the hose clamps and a screwdriver to tighten them will take care of the rest of it.

The work itself is not difficult. If you are like I was, you'll be intimidated by the whole thing at first. That'll be gone by the time you cut the second hose, when you realize how easy it really is. First thing to do is to get familiar with which hoses go to what fittings and decide how you want to route the braided lines. A little time spent threading the Russell hose between the tank and pump fittings, to see how they lie and how they look, will be time well-spent.

Be very careful where you run the hoses. Whereas conventional hoses could get cut rather easily by corners and edges, these braided stainless muthas will cut into your bike's paint, and even the metal itself. Be careful about routing, and use tiewraps in the appropriate places.

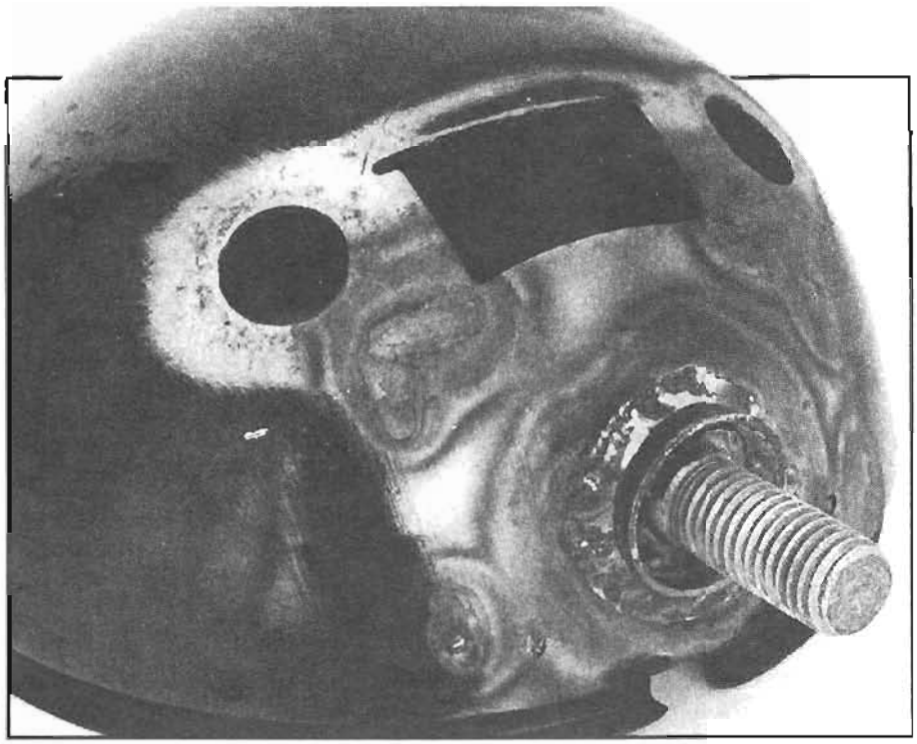
After you get a feel for where the hoses are going, install the one that will be most covered by the others after they are all in place. Slide one end in place. Route the hose and mark the cutting place at the other end with two turns of the nylon tape. Cut through in the middle of the tape; be sure that the cut is square with the hose, and don't hurry the cut. Too much speed with one of the abrasive wheels will burn the hose and make a rougher cut. Too much pressure against the hacksaw blade will tear the braid more than is necessary.

Clean the crud left from cutting off the ends of the hose. Slide a clamp and shroud over one end and install it on the correct fitting. As you tighten the clamp, make sure that the opening in the shroud and the screwhead of the clamp is where you want it to be (out of sight). Most of us over-tighten hose clamps. Run them in until they are tight but not until the hose starts to squeeze out around the edges of the clamp. Run the hose to where it has to go and install the other clamp and shroud.

Take a look at things, just to be sure. Then fit the rest of the hoses in the sequence that will make the job easiest. Apply tiewraps where they need to be to keep the lines out of contact with painted and aluminum parts.

You're done — except for standin' back to admire the effect. After that, you can forget about yer oil lines. They're history. ■

Fix It First



Photos by Pete Chiodo

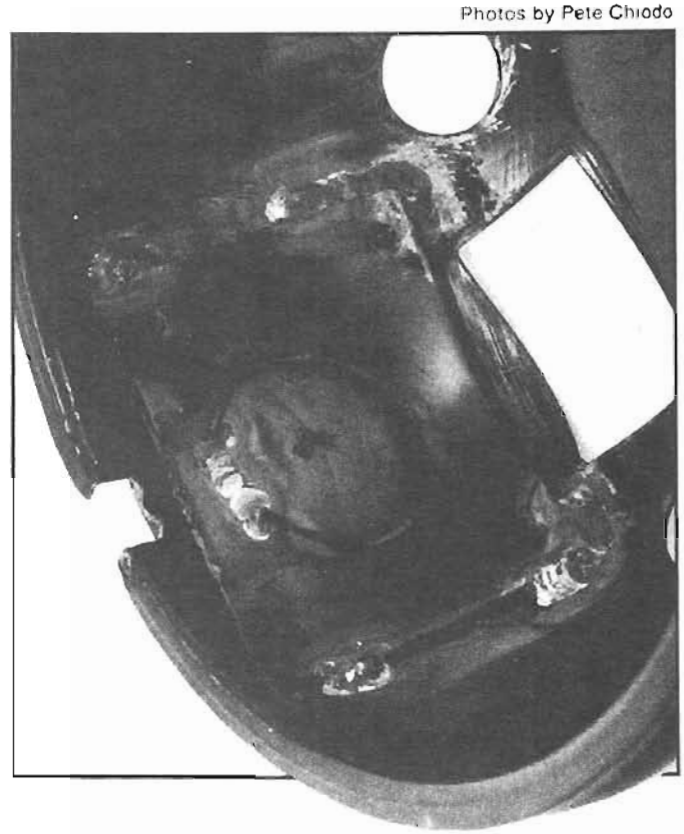
Don't fix it till it breaks. Sounds simple enough to me, but then again, I'm always simple-minded. One thing does puzzle me, though. Do you fix it when it starts to break or wait until the damn thing falls off? In the case of this headlight bucket, it was fixed before it fell off, while it was merely on its way south.

These buckets are infamous for vibrating apart around the mounting bolt and the factory assembly leaves something to be desired. For instance, inside the bucket there's a reinforcing place, approximately 1¾" by 2¼". It's spot-welded on each corner to the bucket and there's a carriage bolt running through the plate and the bucket for the headlight shield mount. Once the carriage bolt is in place, an adjustment collar is slid over it from outside the bucket, and a special die is used to cut the square corners off the bolt and mash them down to retain the collar.

While this may look good on paper, it just doesn't hold up that well on the road. Fixing the headlight bucket itself is fairly easy. First you weld the existing cracks in the bucket and then you braze the reinforcing plate and carriage bolt inside the bucket before brazing the adjustment collar on the outside, as shown in the photos.

But I've saved the best part for last. Removing the headlight bucket from the bike is an extreme pain in the butt. And once the damn thing is removed, it looks like every wire on the entire bike starts and stops inside it. With patience and a wiring diagram — and perhaps a chemically induced sense of calm — the job can be completed in the course of one very long afternoon. However, one can't help thinking how much better it would be if the necessity of doing it never occurred. And you can take it from me — thoughts along those lines don't make the time involved fly by any faster.

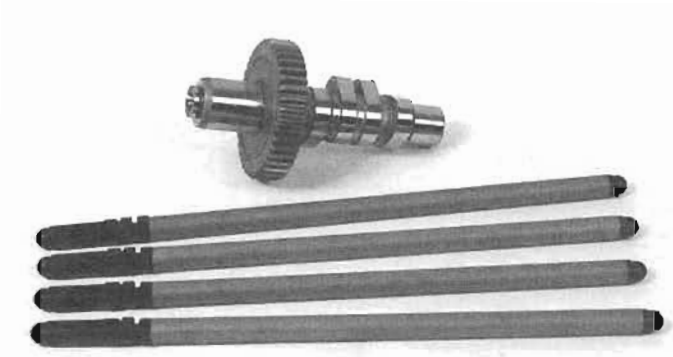
—Wrench



ANDREWS

CAMS & KITS • GEARS • PUSHRODS • VALVE SPRINGS

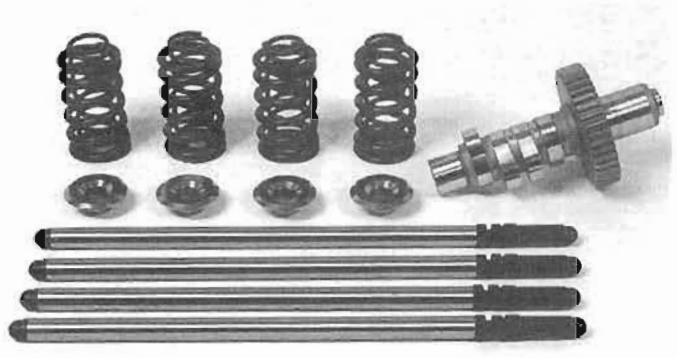
EVOLUTION 80 CAM KITS - (ALUMINUM PUSHRODS)



EV-80 camshafts and pushrods are available with either aluminum or steel pushrods. Standard cam kit includes 4 adjustable aluminum pushrods. Cams in this group bolt into any EV-80 engine and combined with pushrods are a great addition for street or touring bikes.

PART# 292115 (Standard EV kit, aluminum pushrods)
For kit pricing to apply, one camshaft **must be purchased** with each kit. EV13, EV27, EV3, or EV46 cam should be ordered with kit.

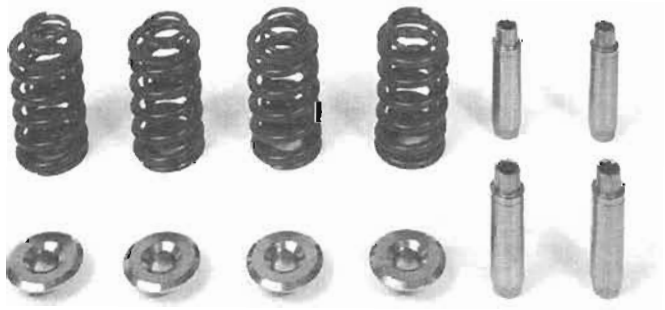
EVOLUTION 80 CAM KITS - (STEEL PUSHRODS)



High lift EV kit includes 4 adjustable chrome moly steel pushrods, 4 titanium high lift spring collars and 4 inner and outer springs. Steel pushrods are super rigid for high RPM performance. Titanium collars add +.050 spring travel over stock. For modified engines to 6000+ RPM.

PART #292225 (High lift EV kit, steel pushrods)
For kit pricing to apply, one camshaft **must be purchased** with each kit. EV 59 or larger cam should be ordered for kit pricing to apply.

EVOLUTION VALVE GUIDES, COLLARS AND SPRINGS



EV valve springs, upper collars and valve guides are available as individual piece parts and fit all Evolution engines.

PART #294150 (High lift springs) includes 4 inner and 4 outer springs.

PART #293110 (Titanium collars) includes 4 pieces in a set.

NEW FOR 1996! (Valve guides)
PART #294511 (+.001 oversize)
PART #294512 (+.002 oversize)
Material is alloy cast iron.

Special cams can be made to order with extra high lifts, 2 front head set-ups, etc. Call for information!

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Stop It

Couple o' hydraulic tips and recommendations

I just got a new ride. Well, not a new ride, but new to my ol' bones. And since I don't want to call the builder every time I need to know something about the ride, I called Perry at Performance Machine to find out about the new brake fluids and a couple of tips on adjustment. Since he builds some of the best brakes available for scooters, he's got the answers locked into his creative cavity.

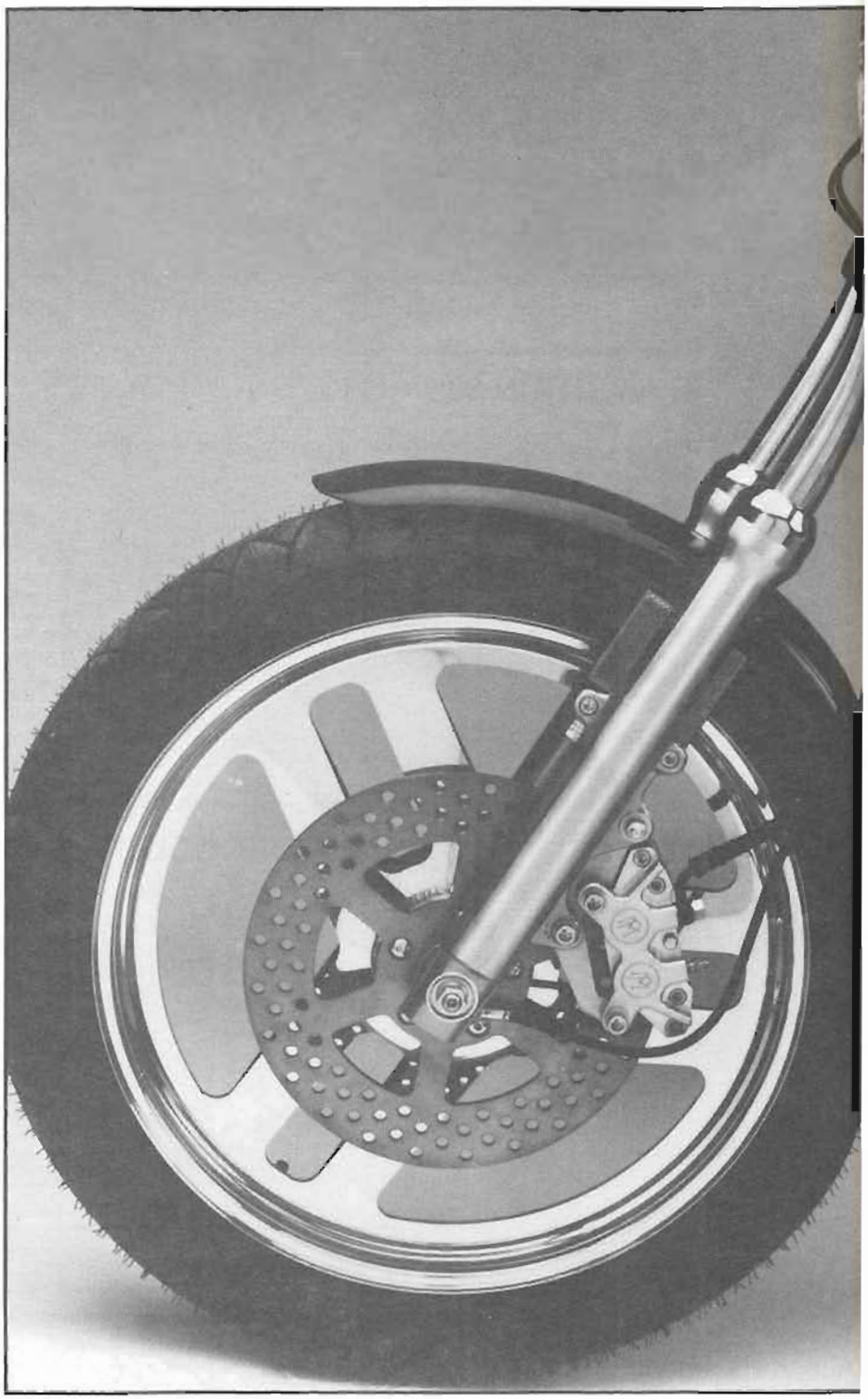
First, I needed to know what kinds of brake fluid to use. According to Perry, Dot 5 works fine in his units and is recommended for all new Harleys But if you have doubts always use Dot 3—unless you're building an antique or show bike. Dot 5 is less toxic and won't damage finishes, but it can have a tendency to aerate and under heat build-up the bubbles can merge, form one bubble and cause the brakes to leave town. But don't mix grades.

Dots 3 and 4 are usually compatible, but not always. If you're not sure what's in your master cylinder, take a drop of your brake fluid and drop it into the cylinder. If it's not compatible, it will probably sink or float on the surface. Don't try to mix 'em.

Perry went on to give me some adjustment recommendations. Seems that if you even adjust your chain, and your calipers are locked into place, your brake pads may take some time readjusting to the disc again. Your brakes may be a taste sluggish for a while—so no burnouts immediately after a chain adjustment or installing a new tire, axle, or whatever. Also, if your brakes persist in being spongy, take the wheel off and place a straight edge across the disc. If it has warped from heat or use, the brake action won't be as positive. Shit can it and get a new one.

A lot of what Perry pointed out specifically applies to calipers that are mounted solidly. If they're allowed to float, they have more flexibility to run parallel to the pucks. Keep that in mind when you're designing your next ride.

And finally, service the master cylinder once in a while. Dirty or badly worn pistons and clogged passages can cause pressure to build up and the



brakes to drag—or just stop the scoot when ya least expect it. Make sure you assemble the piston and parts in the right order, to keep the passages to the reservoir open, and don't adjust the plunger too tight. There should always be some play between the plunger and the piston. For Performance Machine brakes, (which are adjusted properly) serious braking should take place with piston movement of 3/8 of an inch or less. That's action shortly after the reaction.

For more information on disc brakes call (213) 634-6532 and ask for one of their new catalogs—you're gonna hafta stop sometime.

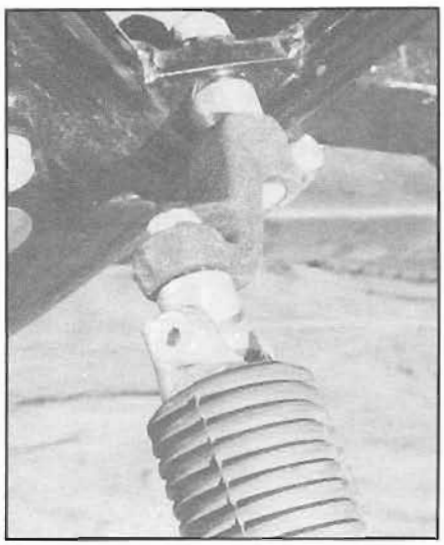
—Wrench

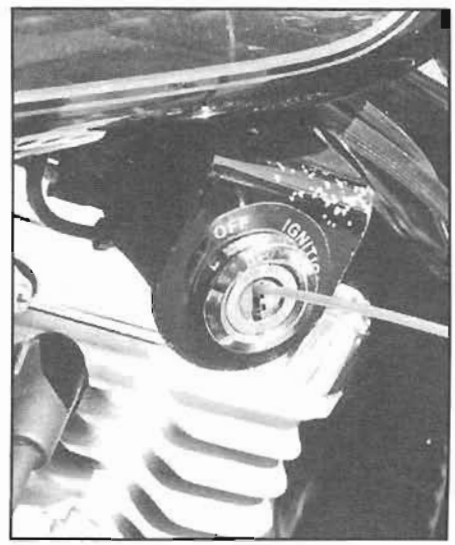
Photo by J. D. Chandler

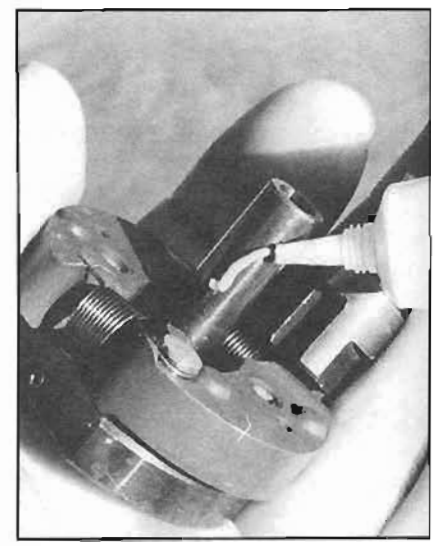
LUBE IT & MAKE IT LAST

Grease is okay, 'long as it's in the right places.

BY J.D. Chandler







When parts vibrate they move, and if they're not bolted firmly together, they'll move against one another. Even the slightest relative movement will result in wear unless vibrating parts are kept apart by an oil or grease film. A dry-film lubricant applied between parts like the folding footpeg and the ignition lock shown in the first two photos will virtually eliminate wear between those parts and others like them. Harley's points cam grease will save that part and your money.

If the movin' parts of your bike don't touch, there won't be any wear—period. That's the idea behind grease an' oil. You prevent parts from wearin' by putting something slick between 'em. We all know that ya gotta change oil; the 70-weight in yer engine every couple of thousand miles an' the gearbox, too. What's easy to forget is that everything else that moves needs lubin', too.

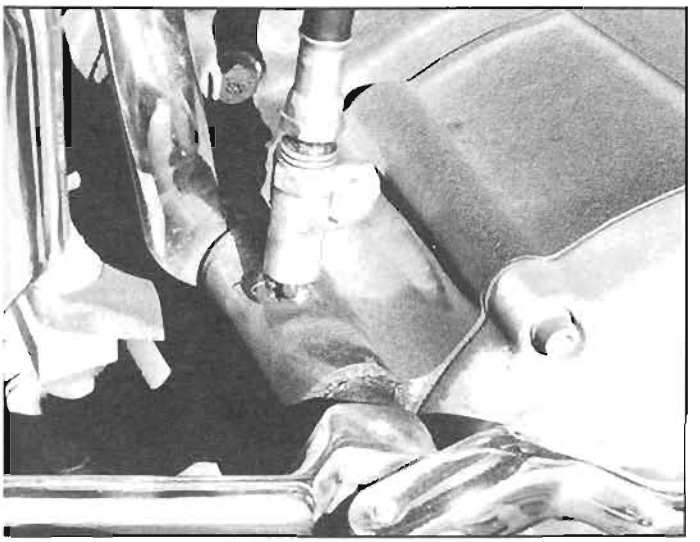
For instance, ya may not think about a folding footpeg as bein' somethin' that moves other than when ya want it to. Fact is, them Harley power pulses make anything move that can. The rusty shit that creeps out from under the joint edges of the footpeg used to be footpeg metal—and if there'd been some lube in there, it would still be footpeg metal.

See, whenever most metal parts are rubbed together, even by vibration, without there bein' any oil between 'em, they'll wear. A microscopic welding action occurs that'll stick two bare parts together an' then they'll get torn up as the parts continue to move an' the tiny welds are broken. Everytime this happens some of the movin' parts are worn away and turned into the rusty shit previously mentioned.

Oil or grease keeps the components of things like folding footpegs separated by a very thin film of lubricant so that the parts slide over one another instead of sticking and tearing. However, oil does more than lubricate. If it's the right stuff, it'll keep things from corrodin', too. British riders, for example, used to spray their new bikes with a mixture of wax and oil, similar to our Cosmoline. Their sleds didn't look like much that way, but after a decade of bein' ridden every day in the rain, rust-free scoots could be found under the coating of oil that had been held on by the wax. Now, I admit that Cosmoline is ugly shit an' most of us couldn't hack smearin' it all over our scoots just to keep the smog off. That's okay, though, 'cause there are better ways to keep yer bike from wearin' its parts.

The ideal lube for most chassis parts will go on thin enough so that it'll get down inside without you having to take 'em apart. It should then thicken and form a grease that'll stay put. It'd be nice, too, if it wouldn't collect dirt. After all, the only thing worse than no oil is a mixture of oil and filth, because you can lap valves with that shit. Fortunately, there are a couple of products on the market that go on easy, do the job, and repel grime. You've all seen LPS in auto parts stores and the occasional supermarket. Well, LPS-2 penetrates and then dries to a lubricating, rust-preventing film of waxy oil. Sure, it takes a few hours for all this to occur, but that doesn't mean ya can't ride yer scoot until it does. The other product that'll do the same thing, and do it faster (one minute), is 30-30 by Kal-Gard, which you'll find in motorcycle shops. Not only does 30-30 dry faster than LPS-2, but the manufacturer claims—surprise—that it's a better rust-preventative, too.

Both these lubes work real well on things like switches, fuel valves, an' parts that corrode easily, like scratched or unplated nuts and bolts. Ya don't want to squirt either one down a cable, though. Cables move a lot an' need to be lubed with somethin' that'll flow back in after it's pushed aside by a movin'



There is only one danger in using grease: If dirt gets in it, it'll be worse for yer bike's movin' parts than no grease at all. Keep it clean and in a sealed container, like a grease gun. There ain't been a bike greased to death yet, so use it—often.

part—in other words, oil. 30-30 won't handle high pressures in small areas, say, a clutch cable runnin' through a cable sheath an' tuggin' on a set of drag-race Barnett clutch springs. Put light oil in yer cables. Heavy oil causes too much drag and makes ya miss shifts an' such. Don't worry—light oil stays put well enough in cable usage.

Grease collects dirt, so it shouldn't be used out where dirt can get at it. It's true, you can lube yer clutch and brake levers with grease, but you'll have to take 'em apart or use a lotta contact cleaner everytime ya relube 'em, so you'd be much better off by using a setting chain lube. This means you should steer clear of those chain lubes that are nothing more than engine oil in a spray can. Go with Kal-Gard or Bell-Ray. They both set up into a sticky grease that's slow to collect dirt and will wash away the next time ya squirt some more at whatever it is you're tryin' to keep lubed.

Grease ain't nothin' but oil held in a gelatin-like matrix of metallic soap strands. Like the gelatin in Jell-O holds water, the metallic soap in grease holds the oil in place. Once ya know that, it's easy to see why some of yer scoot's parts are best served by grease. Parts that are located behind seals and aren't pressure-fed oil, like wheel bearings, get grease. It'll hold the lubricatin' oil in one place for a long time.

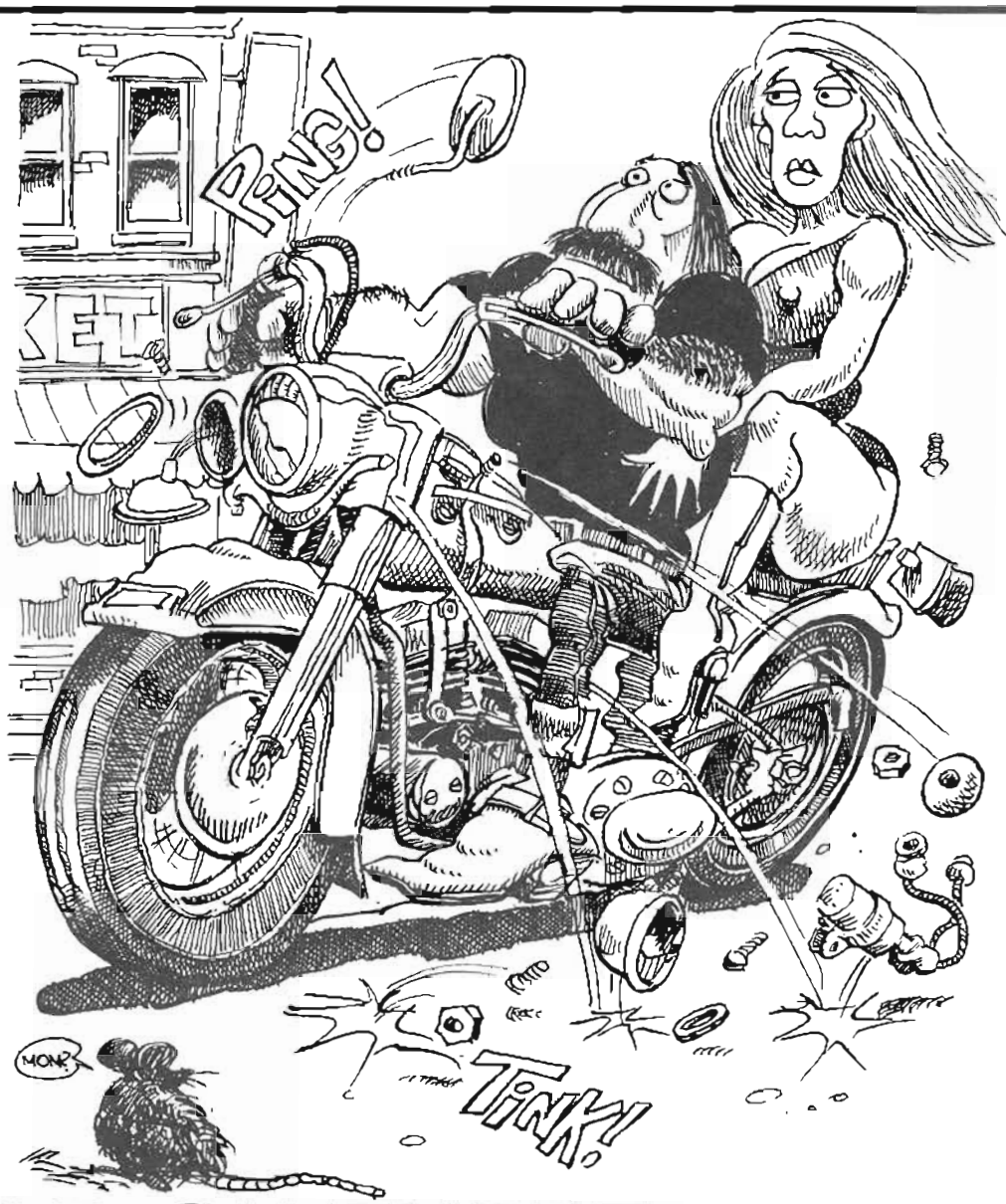
There are a lotta different greases to choose from. Most of the differences exist in the manufacturers' sales pitches. They'd like to convince ya that ya better use their particular product or yer teeth will fall out. In fact, tough, some *are* better than others for most of the needs of the typical motorcycle. Scoots just don't need exotic greases for their wheel bearings or anything else other than the rear chain. Plain ol' chassis grease will do.

All right, now that I've got ya with a can of 30-30 in one hand, chain lube in the other, and yer foot in a bucket of grease, let's talk about where to put 'em and when. Ya know how ya inevitably find rust an' corrosion when ya take out a bolt or an axle? That comes from washin' out the oil whenever ya clean yer scoot or ride in the rain. If you'll spray a coat of 30-30 over every bolt, nut, and axle when ya have 'em apart, you won't have any more rust or corrosion covertly taking over when you're not looking. Bolts an' nuts coated with this stuff will stay put, the lube won't make come apart, and when ya want to take 'em off, they won't be rusted in place.

Use 30-30 or LPS-2 to protect metal wherever there's a crack that soap, water, or air can get in. I even spray it into the joint between spokes and nipples so they won't rust and jam if I ever need to tension or remove one of 'em. Remember, both these lubes dry and stay put for a long time. Both products will keep hard-to-reach parts protected almost as if they'd been painted.

Now, don't let me give ya the idea that ya have to reach for the lube everytime ya park yer scoot. Ya can keep all yer scoot's movin' parts in good shape by simply givin' them a bit of attention each time ya drain the oil bag. If you're like me, ya drop the oil from yer scoot about every couple of thousand miles. Make it a routine to do some other lubing at the same time. While checkin' the cable adjustments, squirt some chain lube into the pivot areas of the levers and wipe away the excess with a rag. And be generous—ya want to wash the dirt out along with the old lube. Grab the can of 30-30 an' give the switches a shot, along with parts like yer foot-pegs pivots and the seat plunger—anything that moves under the influence of those power pulses. Every other oil change out to be accompanied by a cable lubin'.

If ya spend an hour or so lookin' for things on your scoot to lube, and if ya make it a regular habit, you'll be ahead in a couple of ways. First, just by lookin' you'll know—in detail— what sorta shape your bike is in and you'll be able to catch any problems before they catch you. Second, everything will work much better. Clutch, throttle, fuel valve, kick starter—they're all gonna work easily and smoothly. Intimate knowledge of your scoot's overall physical condition just can't be overrated. Imagine not having to wonder (at least not so much) if a weekend putt is gonna be trouble-free. Bein' in the wind is bitchin'. Knowin' you're gonna stay there is freedom. ■



HOLD ON THERE:

Loctite and the one-piece Harley

By Joe Minton

Motorcyles vibrate more than cars do and can shed nuts and bolts like tr ee leaves because of it. There was a time (it's still with us) when a roll of baling wire was a desirable part of any rider's on-the-road tool kit. While baling wire may not be as strong as a proper bolt, at least it won't vibrate off. The answer, of course, is not to find the best baling wire and learn how to use it, but to prevent your bike from shaking its nuts and bolts off onto the road in the first place.

To understand how nuts and bolts come loose, it helps to know how they stay tight. When you tighten (torque) a nut or bolt, you actually deform the material in the bolts, the nut, and any parts that are being clamped together by them. Virtually any solid material, especially metals, will resist being deformed by pressing back like a spring. This spring action tries to force the tightened bolt out of the hole. It doesn't do so because the high friction between the threads of a nut/bolt combination won't let them move — most of the time. Some locking devices, such as the common split-lock washer, act to increase this spring tension and make it harder for the bolt to unscrew by digging into the surfaces they're clamped between.

If, for some reason, the spring force of the bolt and the object it's clamping is released, the bolt will be free to unscrew itself and fall out of the hole. If the bolt or the material being clamped yield — that is, if they stop

springing back against the clamping action of the bolt — the bolt will come loose. That can happen if the bolt or any of the parts it's clamping are too soft (weak) for the loads being placed on them. You may have noticed that most of the bolts you've had trouble with have been the ordinary hardware-store variety. Hard, strong bolts that are clamping hard and rigid parts rarely vibrate loose. The mild steel bolt you used to clamp a mild steel fender with is more likely to be added to the collection along the shoulders of American roads than are the nuts that hold the crankpin in the flywheels of your Harley's crankshaft.

Before you go out and replace all your bike's nuts and bolts with high-tech (expensive), hardened alloy pieces, consider this: It won't do any good if the parts these technological wonders are going to clamp are the same old mild steel or soft aluminum. Maybe the harder bolt will add some edge, but it won't entirely eliminate the basic problem.

Earlier I stated that motorcycles shake a lot and that vibration was the major cause of loose screws. Let's look at that. The vibration we feel is the result of rapid back-and-forth movement. It is the actual starting and stopping of that movement that we feel as vibration. If the parts doing this moving are held together with bolts (like the engine is), the bolts and the joints being held by them will be loaded much more than if the same assembly of parts wasn't moving.

The same vibration that can sometimes give you double-vision and your passenger no further need of your services can shake a bolted-up assembly so much that the parts will actually deform permanently (bend). We usually think of bending in terms of a bent nail or a tank with a dent in it. If you overtighten a screw so that it mashes an aluminum case out of shape, you have bent the aluminum just as surely as if you took a hammer to it. Vibration can do that, too. What's the answer? There are several.

Stronger materials will resist bending better than weaker ones. Use high-strength, hard bolts, nuts, and washers. Use large washers between steel and aluminum surfaces; the larger contact area will help support the soft aluminum and more severe vibration will be needed to bend it. Use proper torque. A bolt that isn't tight enough will need little excuse to come loose. One that's been overtightened may be damaged (bent) and can stretch with simple, normal loading. Use an anti-vibration device of some sort.

The first anti-vibration device was probably invented at about the same time as the second nut and bolt was made. Threaded fasteners have been coming loose for as long as machinery has been with us and more time has probably been spent trying to keep them tight than designing the parts they hold together. We're all aware of some of the gadgets used to keep things tight: the star washers, split-lock washers, wedge washers, safety wire, nylon inserts, and glue. We've all used split-lock washers and they work fine, but they also gouge the metal of the bolt and part. Besides, glue is more reliable.

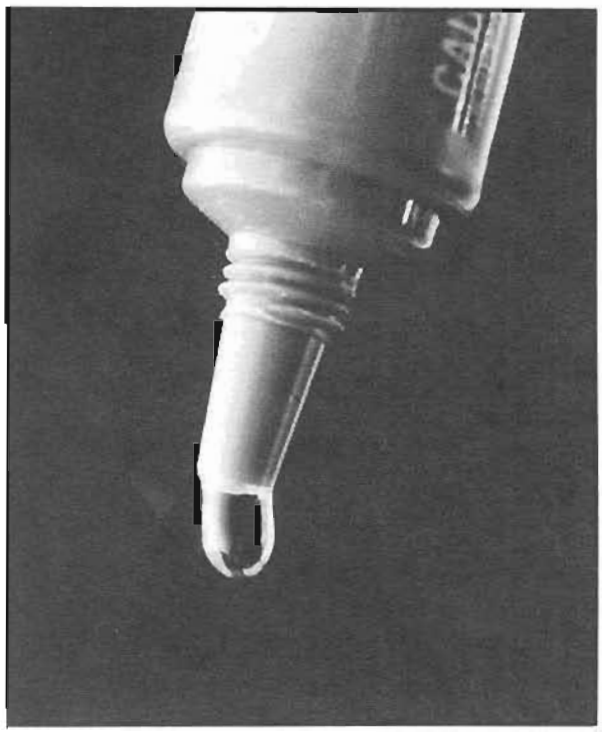
Glue. Are any of you old enough to remember seeing dirt-track racers with all their screws covered with bright yellow 3M Weatherstrip cement (aka gorilla snot)? It was ugly, but it worked. The reason it worked was that the glue remained pliable and firmly attached to both the screw and the part it was trying to hold onto the side of the engine or frame. Although it worked just fine, none of us would put it on our chromed cases and into the hole in the end of a sockethead screw. The 3M had to be smeared on the outside of a fastener, because it depended on the evaporation of solvent to harden and become effective. It also had a limited life; it would eventually get too hard and crack away from the parts it was stuck to. Gasoline would also attack it and make it fail. Racers used it with great success, but they replaced it quite often. The rest of us laughed at how dirt-track racers appeared as though they had a disease, and then went out and tightened our bolts before we ventured home. The invention of Loctite has changed all that.

Loctite was developed by Vernon Krieble, a retired professor of chemistry, who, instead of simply selling the idea and getting on with his retirement, plowed his live savings into finding a suitable application for the remarkable plastic he'd discovered. He wasn't the only believer. Krieble's son Robert gave up his own career to assist in the endeavor. As important as it was to develop the plastic so that it would actually hold threaded parts together reliably, it was equally important to protect Krieble's patents. Not only the big chemical firms but the dreaded Japanese tried to find ways around Krieble's patents. The professor, who died in 1980, was tough and the company still is. If you wanna rip 'em off, you'll have to walk over their cold corporate body to do so.

Loctite is a liquid plastic material that will change its nature and become solid when it's put someplace where there's no air. That single characteristic is the key to Loctite's success. A drop of Loctite placed on the threads of a bolt will temporarily cement the bolt's threads and those in the hole together. It'll provide the same action as the split-lock washer without damage to the parts. It's also proven to be more reliable than mechanical locking devices.

While this sounds simple, it isn't. Loctite isn't just a trick plastic with some food coloring in it. It's a complicated product and has changed continuously over the years as the chemists at Loctite have improved and found new uses for its properties.

I've used Loctite on bolts, nuts, and screws since the mid-sixties. That early material was brittle, wouldn't stick too well to oily parts, and had a rather short shelf life. If you left it lying around for a few months, it would fail to set and you wouldn't know until you'd pulled a screw out — or, until the screw fell out on its own — that you'd used stuff that had "gone bad." Over the years I've continued to use Loctite and I buy the old 3M only



A drop of the right Loctite compound on each of your bike's nuts and bolts will keep them from dropping onto the ground. Harley-Davidson uses it on threads all over its motorcycles. Not only does it save them money during assembly and later, too, from fewer warranty claims, but it almost eliminates the need for lock washers. For the average Hog that'll be in the wind for decades, the wear and tear of hard steel lock washers becomes important.

to glue rubber to metal.

The Loctite thread-locking compounds you can find today in almost any auto parts store are much better than they were even five years ago. Although it's still important to clean the threads you intend to apply Loctite to, the material will tolerate a little oil. Its shelf life is at least a year, in my experience. There are now several grades of Loctite, each of which has been developed to do its intended job as well as possible. The material has become more reliable about holding threaded objects together, while at the same time, it's easier to separate them when necessary.

As important as continued development has been to the success of Loctite, product support has been just as important. Loctite was hard to sell to the metals industry when it first came out. It was pretty hard to convince engineers that a drop of plastic would do a better job than a good, hefty lock washer. The people at Loctite learned to try hard and never got over it. Their willingness to solve problems for people in order to get their business has kept Loctite ahead of its competition and has, without doubt, made its products better than they otherwise would have been. All this may sound like an ad for the company.

It is. Loctite is one company that deserves its success. They have something that works and they keep trying to make it work better.

How To Use It

Loctite is easy to use.

1. Clean the threads of the nut, bolt, or screws you're going to put Loctite on. Be sure to clean the hole, too.
2. Use the appropriate Loctite compound for the job at hand.
3. Torque the bolt, etc., as you normally would.
4. Keep track of *which* bolts you've treated with Loctite

Now, let's go over these rules indiviudally.

Loctite, like any glue, works best when the surfaces it's to adhere to are clean. If the threads are coated with oil, the Loctite will try to stick to the oil. Normal contact cleaner is an excellent cleaner. In fact, almost anything that will wash the oil off will do, but a spray can of contact cleaner is the most convenient. The aerosol cans that Loctite sells for cleaning threads is the same material (1-1-1 trichloroethane) as most contact cleaners; they'll all get the oil off the surfaces to be treated. If the threads are filled with carbon, rust, or undesirable dirt (crud), brush them with a wire toothbrush or wire wheel.

There are a number of Loctite products that are useful to a Harley owner. First, I'll deal with the most useful thread-locking compounds. There are two that you should have and a third that's real handy. The first two of these compounds can be broken loose with normal wrenches. The third may need heat and will really hold a bolt, bearing, or stud.

The first is Loctite's Number 242 Threadlocker (unfortunately, they're all called Threadlocker, so you'll have to remember the number). No. 242 is blue in color and is meant to hold ¼- to ¾-inch-diameter bolts firmly in place. This material will hold case screws firmly without being a threat to your engine's fragile aluminum threads when you later remove the screw. It's also best for the bolts and nuts that generally hold your bike together. You'll use 242 most often, so get the larger bottle instead of the small tube.

The second Loctite material I've found to be very useful is the Number 290 Threadlocker, which was developed to use on nuts and bolts that have already been tightened. You can literally go around your bike placing

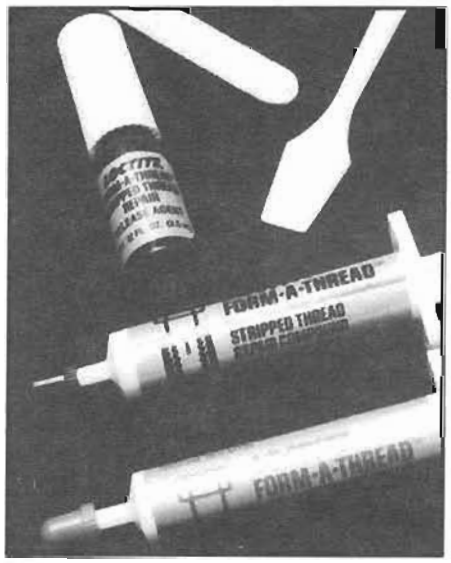
drops of this material on the joints between the various nuts and bolts and it will first penetrate into and then lock the threads. If you can't remember whether or not you used 242 when you assembled a bolt or screw, you can put a drop of 290 on just to be sure. Why not use 290 all the time? No reason not to. The 242 will take up the clearance between a set of loose fasteners better than the 290 will, but that's seldom a problem. However, the 290 will drip off a bolt before it's screwed into the hole and that makes it less convenient than the thicker 242. You need both of them.

Color-coded red, Loctite's Number 271 is much stronger and is labeled: HIGH STRENGTH HEAT OR SPECIAL TOOLS REQUIRED FOR DISASSEMBLY. Loctite aims this adhesive at securing loose studs, bearings, and bushings. It will also hold Harley engine-mounting bolts against all those power pulses we know and love so well. If you find that a bearing race has gotten a bit loose in a case or wheel, 271 is the stuff to use. It will take up the clearance between the bearing and case and keep it from turning in use. I've used Loctite 271 for this purpose for years and it's stopped bearings from working loose every time. If it weren't so hard to get it out later, I would always assemble bearings with Loctite.

You'll have to pay close attention to the numbers on the little tubes from Loctite. All of the products mentioned come in red tubes and the numbers aren't all that plain to see. The 242 compound is blue and it's the one you'll use most. The thinner 290 is green. The high-strength 271 should be used only when you have a loose part you want to stick *permanently* in place — or if there's a large bolt that could have a vibration problem, such as an engine mounting bolt. These three Loctite products can ensure that you'll never again have to walk along the road looking for the threaded fastener that just parked you.

A fourth Loctite product, PST pipe sealant, has also found a permanent place in my toolbox. PST is a Teflon-filled version of the Threadlocker compounds, meant to take the place of Teflon tape in hydraulic fittings. Like the compounds already described, PST sets up after assembly and seals at least as well as Teflon tape. It is easier to use and looks better, too. While it's still wet, you can wipe off the excess and get a neat-looking joint. PST can be used on oil pump fittings, fuel tank fittings, or anywhere a threaded fitting must resist leakage.

Well, there you have it. Loctite is everything it claims to be and it will eliminate virtually all vibration-related problems you might have with threaded fasteners (nuts and bolts). All you have to do is use it on all your bike's critical nuts and bolts. Clean them before you put it on, use one drop only, and relax — it's handled.



Photos by Joe Minton

FORM-A-THREAD:

Loctite's Latest

We've all had to face the problem of a stripped hole in some part that simply can't be ignored. You can't get away with running a generator with only one bolt holding it on. Then, too, there's the cam cover-screw hold that's stripped and leaks oil. Either of these problems can be solved with a thread insert or by welding the hole up and starting over. Not too many of us want to take the engine apart to weld up one cover-screw hole and maybe the stripped generator mounting thread threatens today's Sunday ride. On the one hand, there's a problem of convenience and on the other, there's a need for speed. And don't forget, in order to be able to repair a wide range of stripped holes, you'll need many bucks' worth of thread-repair tools. Loctite has a simple and effective answer to all these problems.

Form-A-Thread is a new product from Loctite and it promises to be another major success for them. By following some simple and clear instructions, you can repair a stripped hole in any metal and torque a bolt into it in less than an hour. Loctite claims that proper use of the kit will give a threaded hole up to 80 percent of the strength of the original metal. They also claim that the new hole will be as reliable and long-lived as the original was (or should have been).

The Form-A-Thread kit consists of two tubes of thread-repair compound that get mixed 50:50, a bottle of mold-release compound, a wooden mixing stick, and a plastic application spatula. Loctite says that the kit ($5.95) will repair from one to three holes. I feel that you'll be able to fix five or six ¼-inch holes with one kit.

The kit isn't epoxy but is a modified acrylic more nearly like the other Loctite products. That may not be important except it indicates that the Loctite repair kit isn't just another version of metal-filled epoxy. The fact that you can use normal torque on the bolt after a 30-minute cure time is remarkable. This stuff is strong. Loctite asks only that you don't try to hold cranks or heads together with it.

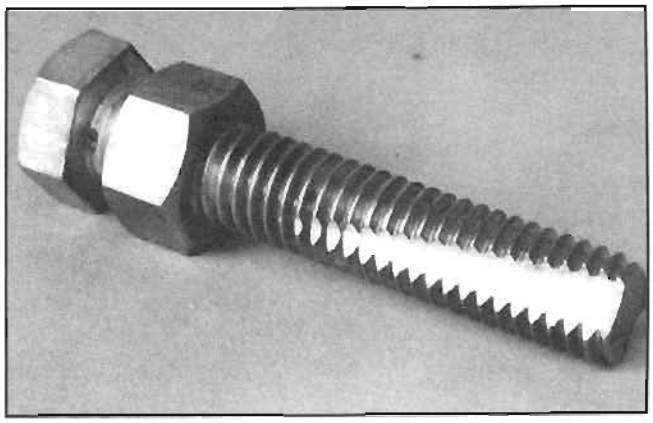
The kit is easy to use. After you've cleaned the stripped hole and the good (new) bolt you intend to use in it, paint a thin coat of the mold-release compound on the threads of the bolt. Squirt out equal volumes of the two mixes onto a clean surface and mix them with the wooden stick. Ladle the stuff into the hole and screw the coated bolt in after it. Let everything stand for 20 minutes or so. You will have about five minutes to work after you mix the two materials, so have everything ready when you stir them together.

This one kit, setting on the shelf over your bench, can replace a fortune in thread-repair tools and parts. You could even take it with you on a trip — it's small enough and weighs just a little more than air. Nice product. ■

The Fix-It Four

Quickies for unexpected breakdowns

THREAD CHASER FROM A BOLT OR NUT



We've all experienced the same horrible sinking feeling when a bolt suddenly gets hard to turn while it's halfway into or out of a hole. You know you're in trouble and you suspect you've got a stripped hole on your hands. Yet most of the time the threads will only be partly destroyed and can be salvaged—that is, if you've got a way of straightening them out.

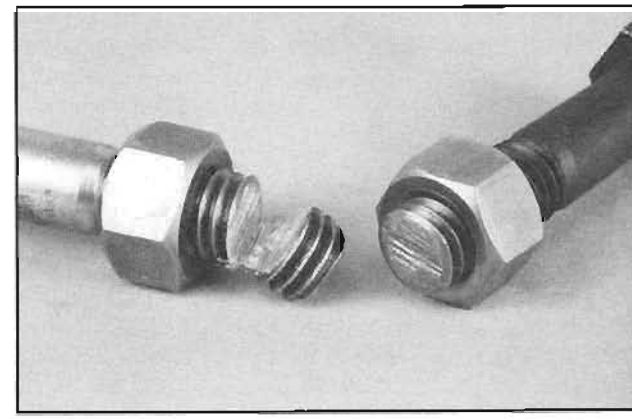
Say you're lucky enough to have the correct tap lying around. Then it's a simple matter of running it into the hole, fitting a new screw or bolt, and that's it. Not all of us have taps and dies, however, and even those who do won't necessarily have them all. Take heart—there's a way you can get out of that bad situation without taps and dies, using a new bolt and a file or grinder. See, a bolt can make a good thread chaser, actually working better than a tap because it isn't as sharp and thus will follow the path of the damaged treads better

Here's how you do it. Get another bolt just like the one that damaged the threads in your engine case or whatever. (The first bolt has almost certainly gotten fucked up, too, and no longer has the clean, sharp threads it had originally.) Now grind or file a notch like the one shown in the photo, then back the nut off the bolt to clean the edges of the notch.

Clean the damaged hole and lightly oil the thread chaser you've just made. Carefully run it in and out of the hole. Then clean the hole again and use a new bolt when you reassemble things. Don't forget that even though the chased hole may look fine, it isn't as strong as it was, so be careful about how you tighten the new bolt.

Although most damaged threads are going to be in aluminum cases, an occasional stud or some other hard-to-replace male member will suffer damaged threads. In that situation a hard nut with its threads notched can be used to chase the threads and save the part.

SHORTENING BOLTS



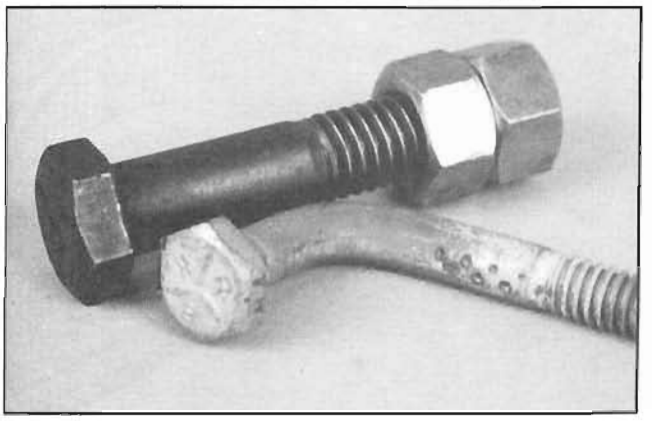
You've lost a bolt somewhere between when ya took it out and when ya started (finally) putting your bike back together. What's worse is the fact that you're out of time. It's Saturday night and you're supposed to be ridin' tomorrow. The scooter shop, the hardware store, and every other place and person ya can think of is either closed or out partying. Not only that, but ya know that if ya don't take yer ol' lady for a putt tomorrow, she's gonna be talkin' a variation on that little sticker on yer tank—No Butt, No Putt. All you've got, besides a growin' attitude, is a bolt that's too long for the place ya need to put it. That's okay, it's all you need.

We all know you can cut a bolt down to length, but no matter how many times ya cut a short one it'll still be too short. The problem isn't cutting the bolt, it's making it work after you've finished with it, because a bolt end not finished properly will be a real bitch to start. You've got to remove those burrs that result from the cutting process, otherwise the bolt either won't start or it'll cut the hell outta the threads it's meeting. If, for instance, the cut end is left square (no starting bevel), it's going to take a saint to get it going—and ya know where that leaves ya.

First thing ya gotta do is run a nut onto your too-long bolt. Next, put the bolt in a vise or something that'll hold it firmly while ya hacksaw it to length, leaving a little for finishing. File or grind the end square and smooth, then file a small bevel at the end as a starting taper. After that, use a wire brush or some similar device to remove as much as the sawing and filing flash as you can from the end threads. Run the nut off the bolt and remove any burrs it raises.

Done. Unless you cut the damn thing too short.

ALLEN WRENCHES FROM NUTS & BOLTS



Sure, ya have a set of allen wrenches, but, well. . .ya may not have the one ya need in the place ya need it at the time ya need it. Sometimes you can make a temporary allen wrench from a bolt, a couple of nuts, and a socket.

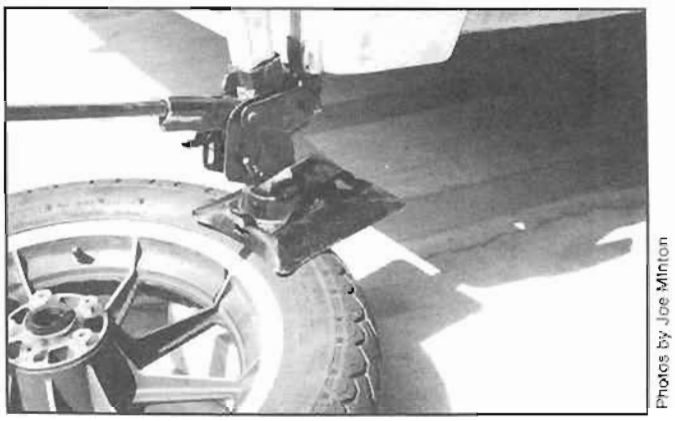
If ya have to get one into tight quarters and can get to some serious heat, you can bend a long bolt into an L-shape allen wrench.

If ya have a bolt with a head size that fits the allen bolt ya want to loosen, you can run a couple of nuts firmly together on its threads and use a wrench or socket to turn it. Turn the nut nearest the head of the bolt when you're loosening and the farther one when tightening. You should be aware that the bolt ya use to do this trick will certainly not be anywhere near as strong as a real allen wrench, so easy does it. A good hard rap with a punch and hammer against the head of the bolt you're trying to loosen will often help.

Late-model Hog forks have hex-shaped sockets in the end of their damper rods. These hex sockets are metric (17 millimeters for the small fork) and a bolt/nut assembly is perfect for holding a damper rod while a twiddle the bolt out of the bottom of the fork leg. Use tape to hold the bolt in the socket, then use all the extensions ya have to let the whole mess reach down into the fork and engage the top of the damper rod. It works and you'll never again have to mess with a damper rod that spins when ya try to remove its fixing bolt.

Should you need to bend a normal-looking allen wrench out of a long bolt, be careful about how you do it. Heat the bolt only as much as needed to bend it, because too much heat will really weaken it and make it more likely to break when you use it.

GETTIN' THE TIRE OFF



Photos by Joe Minton

Harley's been usin' safety-bead rims for decades. They work, too—H-Ds don't lose their tires when the tires go flat. Problem is, the damn things are a pain to remove when ya want 'em off. Some serious flat-getters take a large C-clamp with 'em on the road whenever they've got the room, but most of us don't and therefore a flat can put us real close to disaster.

Next time you're parked with a flat and no tools to pry the sucker off the rim, try getting a cager to stop for you—no, not for a ride. Ya want to use his or (better her bumper and the cage it's attached to. As the photo shows, the weight of the cage can be used to mash the tire off yer rim. Now, while this appears easy, there are a couple of things you have to watch out for. When ya lay a late-model Harley rear wheel on the ground, it's gonna rest on either the disc or the sprocket. If your bike is a belt-drive, ya want to be sure you're not putting any pressure on the drive sprocket, because it's an aluminum casting and isn't all that strong against side loads. The disc is tougher, but its smooth surface finish is crucial in regard to how well your brake works. If you've gotta choose between laying the wheel on its drive sprocket or disc, go with the disc but put something down to keep that disc surface from getting scratched.

Remember, none of these parts will take the pressure of a car jack. You'll have to support the rim with a piece of wood or something else that'll take the load of the jack and spread it over as much of the rim as possible. ■

Fittin' The High Tech To The Traditional

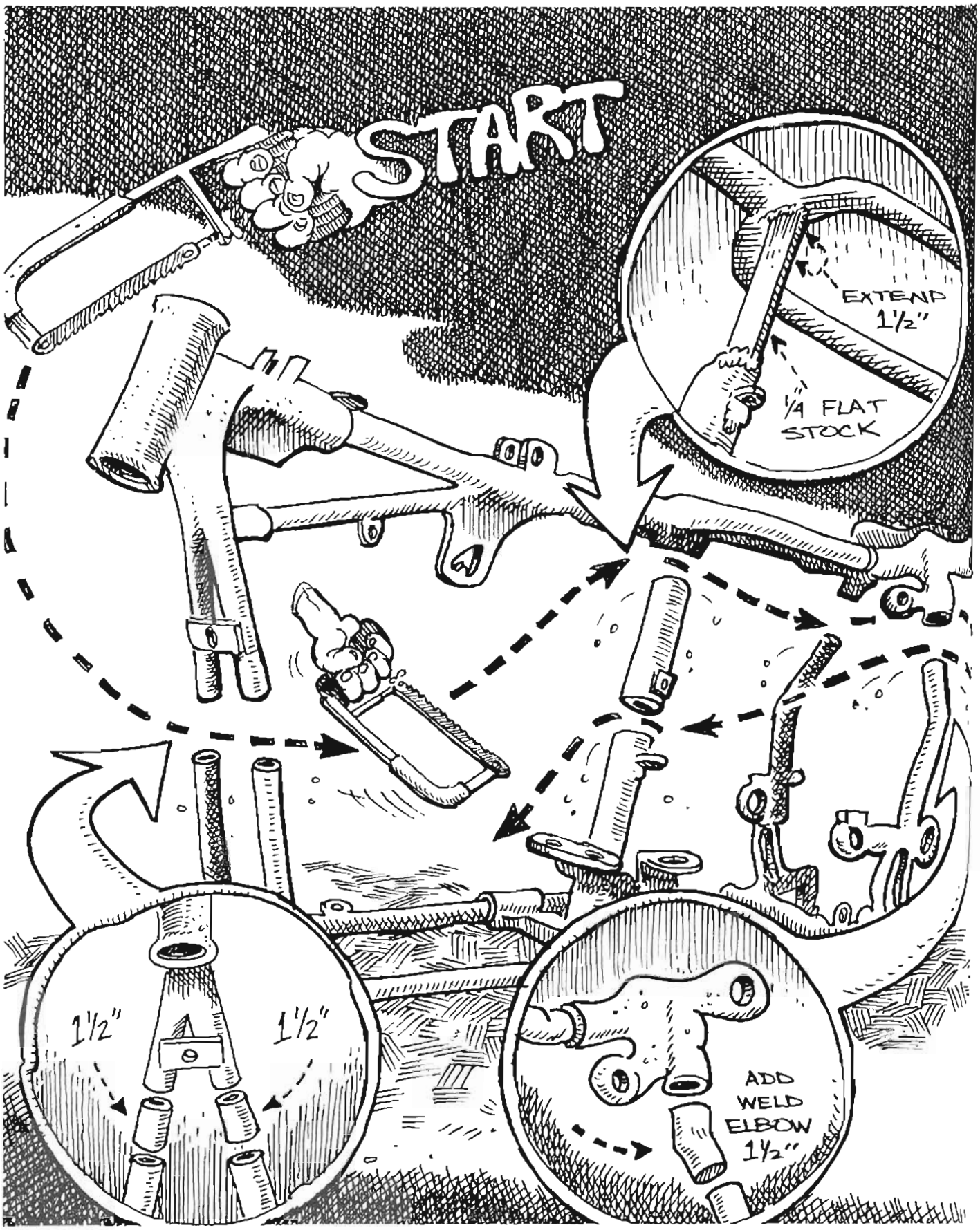


Photo by Mac Medley

So, with hacksaw in hand and plenty of experience in mind, he cut his frame in half.

Hey, ever thought about havin' an Evo top end on that shovel of yours, or slappin' an Evo mill in that classic FLH frame? Well, sonuvabitch, if we didn't run into a brother who's worked on just that kind of modification in his shop, Southern Cycle, in Amarillo, Texas. And being the gracious Southern gentleman that he is, James White gave us the opportunity to share a work bench fulla secrets about his Hybrid Glide.

James has been personalizing scooters for his brothers for over six years while his wife of 12 years, Anita, runs the shop's business aspects (the only way to go). The sanitary road Evo you see here is his. It's specifically designed for the long haul. A couple of years ago, he decided to take on the task of altering the classic, heavy-duty FXE frame to fit the newer mill. He had two reasons: one was simple economics. New bikes are expensive. The other was pure aesthetics. He had never been a big fan of the new frame styles. So, with hacksaw in hand and plenty of experience in mind, he cut his frame in half. Zap.

After he sliced the sucker in two, he cut just below the front tank mounts, just under the seat casting on the seat post, and above the oil tank mount (that piece was gonna be shitcanned anyway). And at the doglegs in the back, he raised the top of that sucker 1 1/2 inches. Seemed like a lot, but it gave him the clearance needed for the heads, plus enough space to polish the rocker boxes under the tanks and take the top off the tranny (if he needed to).

James filled the front tubes with high-quality tubing (or you can also use machined, hollow inserts). Then he replaced the seat post section with flat strap. (like we did years ago when slippin' shovelheads into rigid frames). And he stretched the back legs with weld els. But that ain't all. The frame was then welded solidly back together by Clayton at A&H Machine. But unless he wanted the belly of his babe scrapin' the ground, he needed to run a 4-inch-over front end and replace the 12-inch stock shocks with '58-'72, 13 1/2-inch shocks. The reason for the longer shocks is that, if the stock ones are run, the rear chain will gnaw at the starter housing. But if he was running a kicker and wanted the low look, he'd run the stock bouncers. Or adjust the height by moving the swingarm mounts forward. With the support of his brothers in the Southern Monarchs MC during long nights in the back of the shop, the job was complete.

Because James travels a bunch, and packs heavy when he does, he needed the extra clearance. He also suggests that if ya want to run your stock coil in the original position, weld a coupla 5/16 fine-threaded nuts to the 1/4-inch strap that replaced the seat post.

James has been a specialist at massaging frames, as well as complete scooters through passel of riding seasons, so if you have any questions about his Hybrid Glide, call him at Southern Cycle, (806) 372-3635. And tell Anita she's doin' a helluva job—she keeps everyone in the proper spirits. Or, send him a buck and a half and he'll mail you the detailed instructions. Southern Cycle, 2600 West 6th, Amarillo, TX 79106. —Wrench

BIKE BENCH

Everybody appreciates a good strong workbench when building or fixing their scooters. Let's face reality — it's a lot easier to overhaul your carb if it's on a bench than if it's spread out all over the floor (and you wind up chasing the choke butterfly screws out of some crack in the concrete). Besides that, the lighting is better the closer you get to the ceiling.

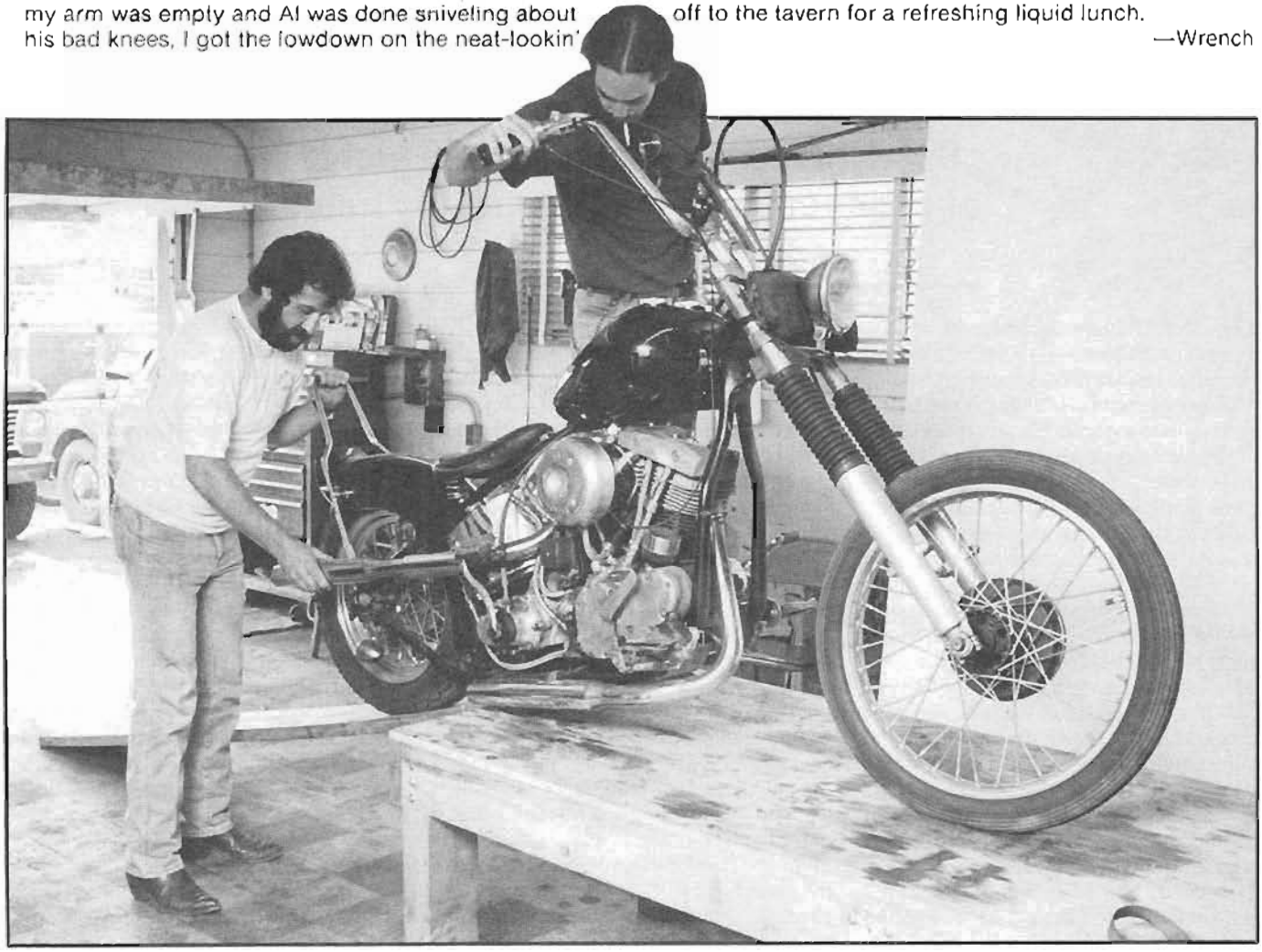
A few weeks ago, while making the rounds, I swung by a partner's shop to pick up on a taillight bulb. As I peered in the window to see if I could catch him up to no good, I saw a set of handlebars 7 feet off the ground. This needed a little closer look, so I knocked once and let myself in. My partner, Al, had his scooter on a homemade bike bench and was casually adjusting his belt drive. To see Al working was almost enough for a coronary, but what really intrigued me was the bench his bike was parked on. After half the 12-pack under my arm was empty and Al was done sniveling about his bad knees, I got the lowdown on the neat-lookin' bench Al had constructed.

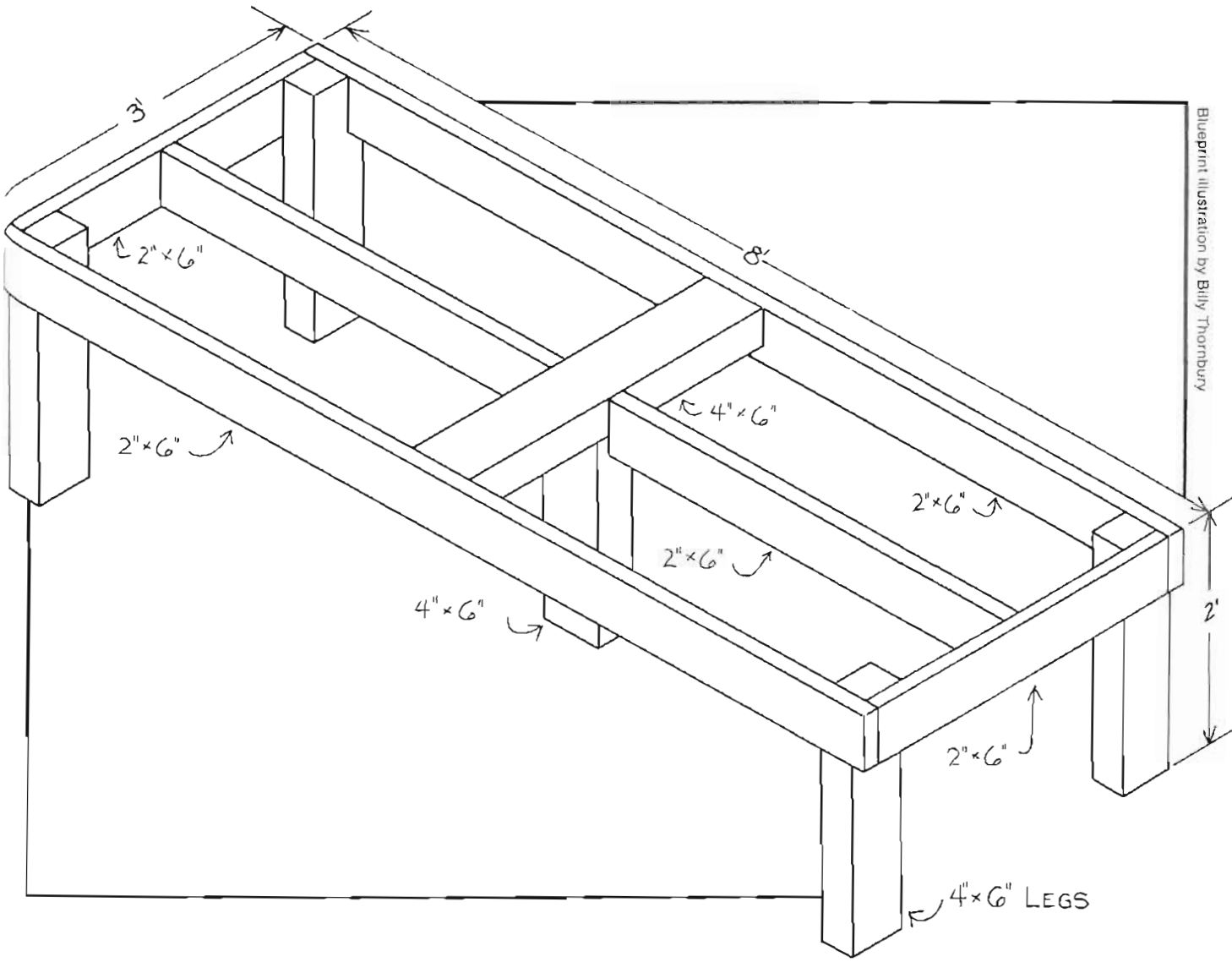
As it turned out, he had to buy only two pieces of lumber and the necessary assembly hardware. Everything else was made from lumber lying around the shop, or picked up here and there. Al figures that if someone went out and bought all new wood and hardware, it would probably cost around $80. The two pieces that won't be so easy to scrounge up are the piece of 3/4-inch plywood for the top and the 2x10 for the on-and-off ramp.

I'm sure that some of the more enterprising bros out there can come up with some equally good ideas for their own bike benches, or maybe they already have ones of their own. If any of you readers have a bench you've built that's different from this one, I'd sure like to see it and pass any interesting ideas on to the bros.

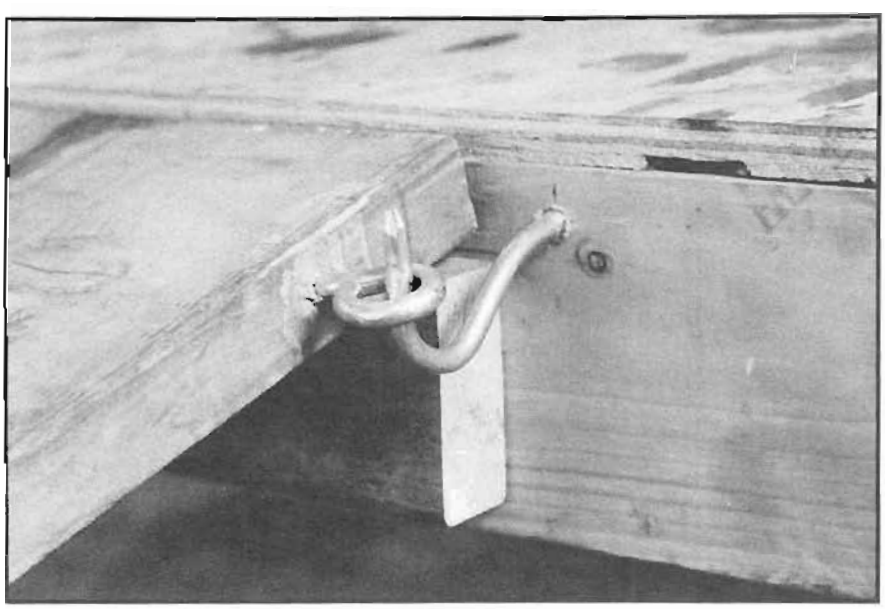
Well, as the clock on the wall sounds the hour, I'm off to the tavern for a refreshing liquid lunch.

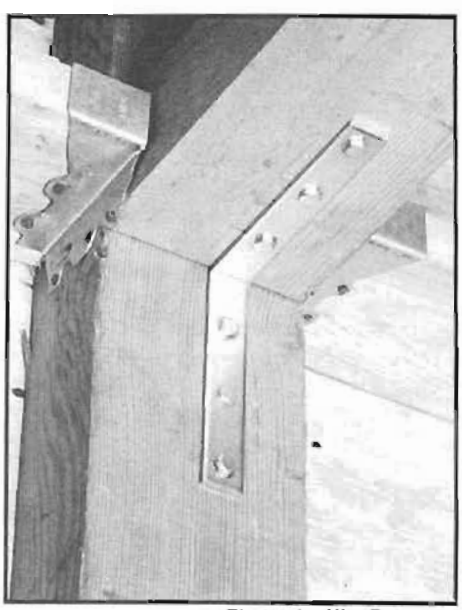
—Wrench





Blueprint illustration by Billy Thornbury





Photos by Kim Peterson

THE FANTASTIC FOUR

There's some information you brothers really ought to know to walk with the righteous, and through Snake's research, we're prepared to unveil a few little-known secrets of biker lore on these here pages.

Voltage Intensified

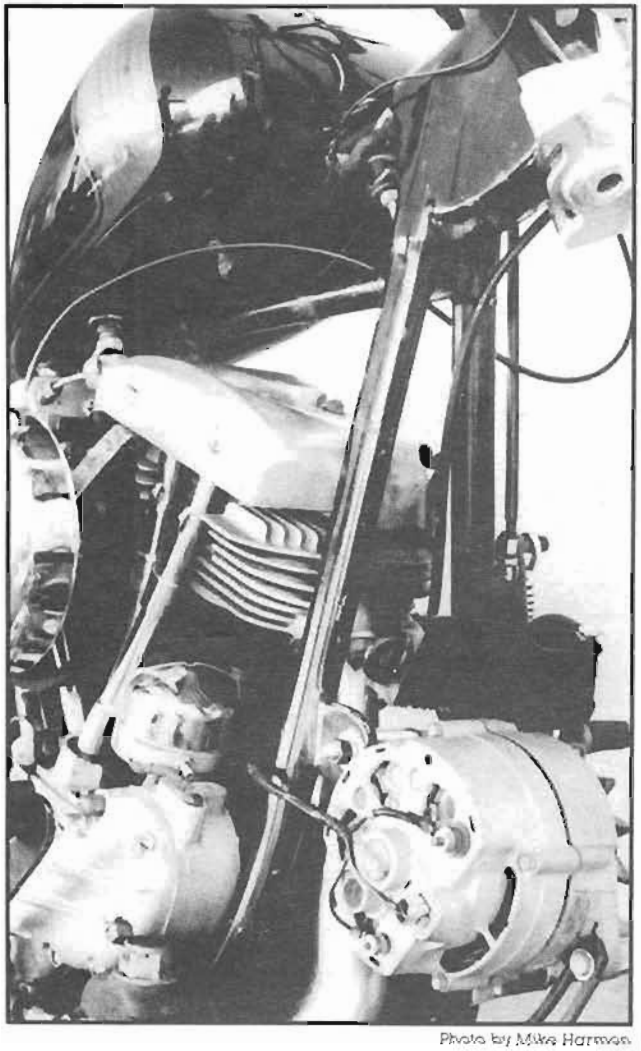


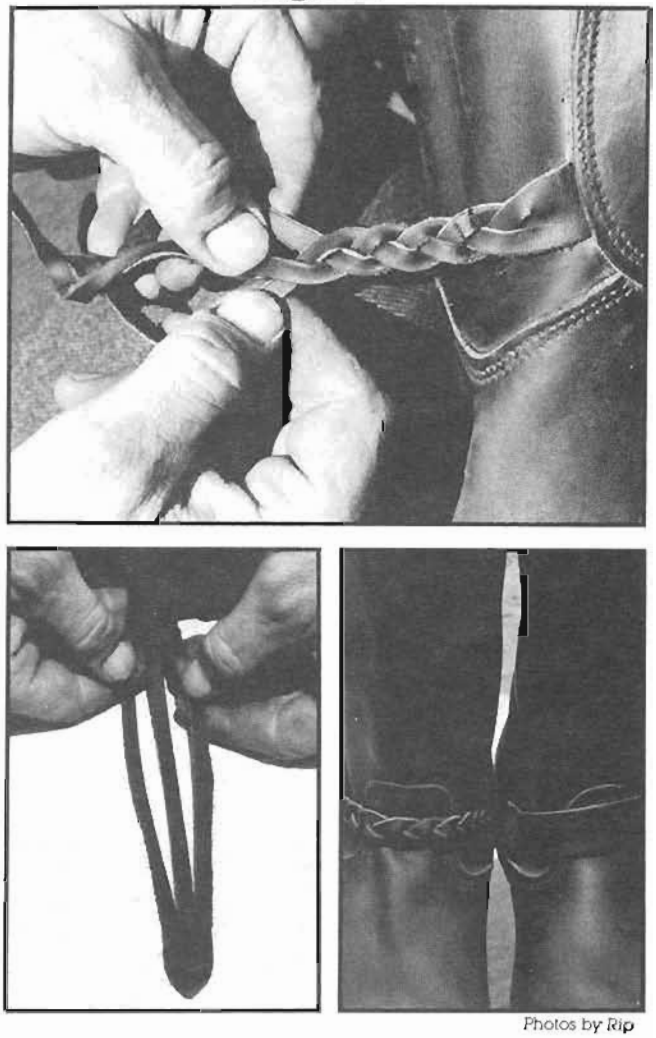
Photo by Mike Harmon

About 1977, when six-volt systems only lasted a week to 10 days and H-D regulators needed a smack from time to time to keep the contact points from frying, Mike Harmon stole an idea from a cop trike in Mesa, Arizona. If a cop trike could charge itself with an auto alternator, why couldn't a 74?

It might be the ugliest alternative to a dead battery, but if you're interested in running a microwave in your saddlebags or a CD player with 60-watt speakers and a graphic equalizer, it might help.

—Weed

Angel Braid



Photos by Rip

This little effort separates the men from the boys. Rip and a bro in Yucaipa, California, just off the edge of the desert, nearly severed a couple of digits, trying to get the razor through the rawhide in the blazin' sun.

Ya take yer boot strap and divide it into three equal widths, then draw careful lines along the length, from one end to either a half-inch from the holes or to a half-inch from the other end of the strap. Then slice that mutha as carefully as ya unstrapped yer girlfriend's bra the first time — with just enough finesse so as not to lose yer fingers.

Then braid the sucker like ya do yer beard when yer deep into a bottle o' whiskey — and yer cool.

—Wilburn Roach

Carburetor Wrenches

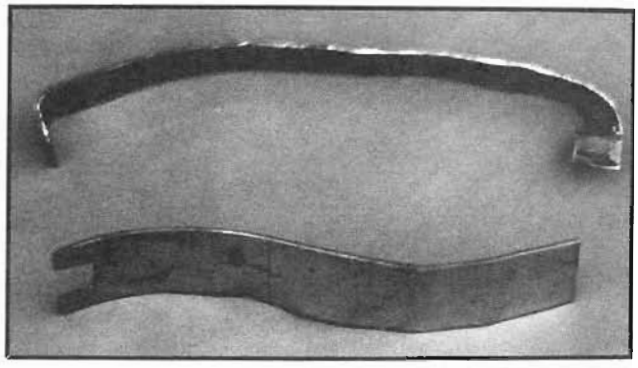


Photo by Rip

They say that necessity is the mother of invention. That being the case — well, out of necessity, I'm the mutha who invented this open-end wrench. You see, I'm the proud owner of one of those fat bikes with five-gallon tanks, and it seems that between those fat tanks and these fat fingers on my hand, I just can't seem to reach the mixture needle on the carb when I want to.

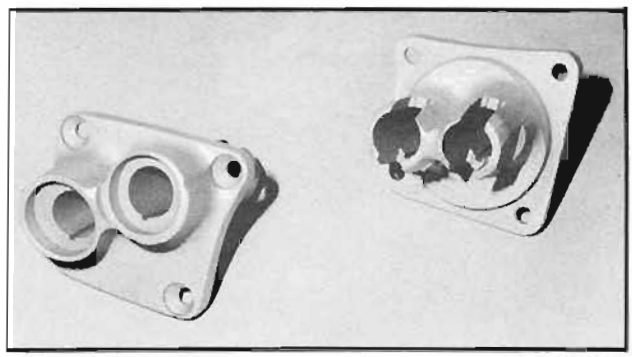
I used to have to take the chrome carb cover and the inner backing plate off, adjust the carb where I thought it should go, and put all the shit back on. Most of the time I then discovered that the mixture was too rich. Take all the crap back off, readjust the carb, and put the covers back — only to discover that the mixture was now too lean! Shit, fuck, piss!

Well, I finally stopped and told myself: "Self, you are smarter than any machine. Why don't you make yourself an open-end wrench?" So I did. It's taken me a lot longer to write this drivel than it did to make the wrench. As you can see, it's sorta S-shaped and has a slot on the end. The slot is 3/8" wide. To make one of these simple tools, find yourself a piece of thin strap, five or six inches in length — something you can bend with a little pressure. I cut the slot first, then bent the strap to fit.

With this wrench, you can get about half a revolution at each turn. Be sure never to overtighten the idle-adjusting needle or low-speed mixture needle. Be extra careful; otherwise, you'll ruin the needle or, worse yet, ruin the seat.

—Rip

A Little-Known Lifter Stool



Photos by Jake

Jake, who resides in a dusty machine shop in Wellesley, Massachusetts, sent in this hard-to-imagine bit of trivia. Seems that for late 1952 and all 1953 panheads, the factory went the light alloy route with lifter blocks, valve covers, and pushrod tubes.

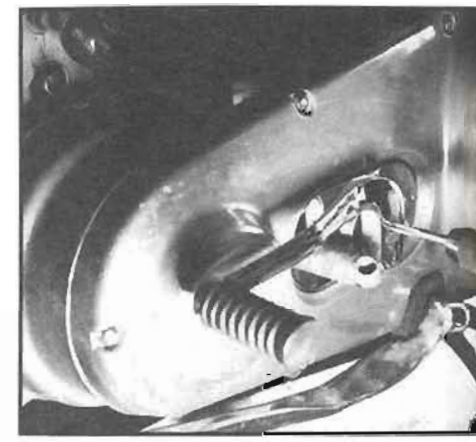
The lifter stools didn't last like the steel jobs, but for race freaks they were substantially lighter and expanded at the same rate as the cases, which are also aluminum.

If you're after a set of these, don't run 'em with hydraulics unless ya sleeve 'em with steel and don't forget to drill the oil passages for hydraulics.

—Snake

The Fearsome

Footloose and Shiftless



While doing some prep work on my Fat Bob, I jammed down on the shift lever and felt it slip. Sure enough, it was moving on the shaft, even with the bolt tight. Pretty fucked situation — I was due to leave on a run the next morning with the local crazies.

I started to check alternatives:

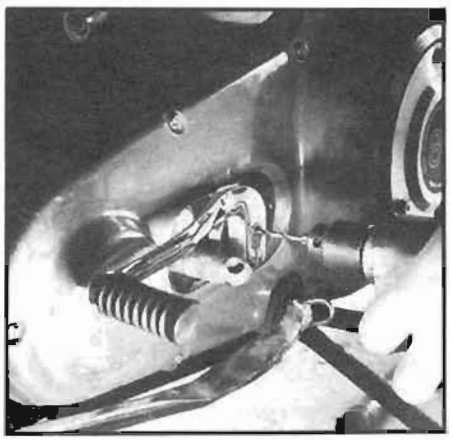
1. Buy new parts and put them in, but that meant spending time taking off the inner primary and spending money for parts. Time *and* money — when I didn't have either.

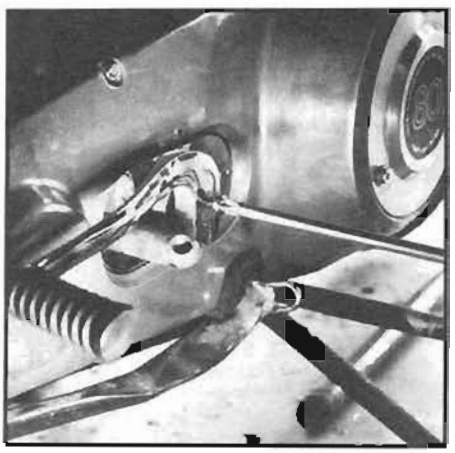
2. Put shim stock around the shaft and tighten the shit out of the pinch bolt. I didn't have any confidence in that one, having seen it fail in the past.

3. Try an idea I've had in my head for more than 20 years, which might be faster and cheaper and would require only simple tools.

Naturally, I chose alternative three. It worked so well, I decided to share it. Here is how it's done:

Four





Photos by The Pope

Put the bike in neutral, get the lever where you want it to be forever, then tighten it, but not all the way. Save another grunt for the last. Just tighten it enough to hold still while you drill. Then remove the footpeg.

Jam a screwdriver or bar between the cases and the back of the lever, so it won't move in when you drill. Center-punch the sucker. Starting with a 1/8" bit, drill a hole as deep as the lever is wide (see Figure 1). Go up in 1/16" steps, and stop at 13/64".

Tap the hole with a 1/4"-20 N.C. and finish it with a bottom or plug tap (see Figure 2), or snap off the end of the tapered tap and make your own plug tap. Remove the lever, clean the chips away, and replace it, lining up the new hole. Put in the screw, then tighten the pinch bolt one last grunt.

I have 10,000 miles on mine, and it's still working. I think it's better than stock.

—The Pope

You Guess

Listen, are you waiting for your latest issue, and the mailman looks at you as if you were a rabid dog? Have you been waiting for a check so long your car was repossessed? Does your narc neighbor get all your mail except for the hand-delivered indictments?

Well then, shit, get out of your sleeping bag and go build a mailbox every mailman in town will be talking about — 'cept don't weld it to the fence, 'cause then ya can't take it with ya when you move. Shit, it still pisses me off.

—Weed

Motor Mount Shim

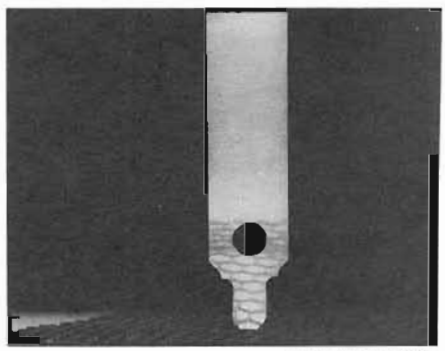


Photo by Mark Chen

Did you torque down your new mill to your rear motor mounts, only to discover a gap between the front mounts and your new frame? This tidbit from Tom Craft in Kerrville, Texas, may be the answer.

It's a Chevrolet starter shim, available at most auto supply stores, and it'll fit under Big Twin motor mounts. They are available in several thicknesses and beat the shit out of cutting beer cans and fingers to make shims.

Flexible Ground Cable

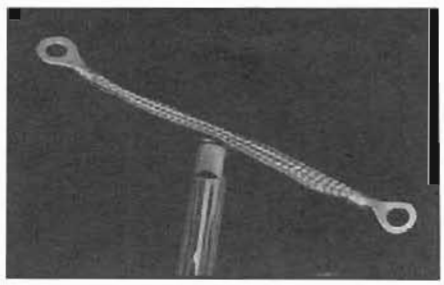


Photo by Mark Chen

As you probably know, the stock ground cable on an FX is rigid in construction, mounted with a 180-degree bend. With the battery mounted in rubber, undue stress and strain is placed on the battery post and mounting bolt, especially on a side-mounted battery terminal. This makes for leakage around the post, causing corrosion, or the bolt can come loose, which can cause electrical problems.

With a braided ground cable, the cable flexes — no strain on the post, and the bolt stays tight and clean.

It's fuckin' wonderful.

—The Right Connection

GARY'S "FIX-IT" FORUM

Before you take-off on your next long distance trip with your late model motorcycle, one of the areas of preparation that deserves close attention are the **wheel bearings.**

We recommend that these be inspected by a very competent mechanic, and that these be inspected at sooner intervals than the factory recommended service checks. When these are serviced, always use new wheel seals and retaining rings, and most importantly, make sure that the wheel bearings have the correct **end-play.**

These should be checked every 5 to 8 thousand miles, or before any long trip. Correct end-play for FLT, FXRT is 0.002 to 0.006". All other models should be 0.004 to 0.018". If you have the right dial gauge indicator you can check the end-play. Otherwise, take it to a mechanic.

When making your plans for a hassle-free ride, be sure to check this very important maintenance item.

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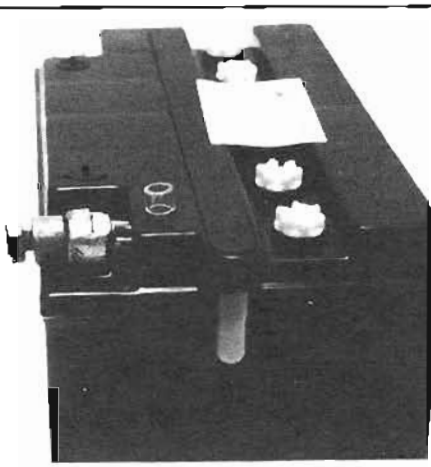
DEALER INQUIRIES WELCOMED



GARY'S "FIX-IT" FORUM

Is your girl friend tired of wrecking her fingernails helping you get your battery terminal hardware started when putting a battery in your motorcycle.

One of the easiest ways to get the screws started is to cut two 1/8" pieces of battery vent tube and put them between the battery and the terminal nuts before you put the battery into position in the tray. This holds the nuts in position while you start the screws from the outside of the motorcycle. Makes battery hook-ups a snap.

Another handy service tip from the folks that stock parts to keep your Harley Davidson motorcycle going.

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DEALER INQUIRIES WELCOMED

Magnetic Screwdriver

"Ever dropped a screw into your oil tank or down your carb while working on your bike? Ruined your whole day, right? Well, picture this. While riding with friends one day, one of them began experiencing a slipping clutch. We stopped so that he could adjust it. Being a little on the Gumby side, my friend dropped a derby cover screw down into the primary. Naturally, since we're talking full-dressed motorcycle, the primary cover wasn't going to just snap off — not with crossover pipe, boot board, etc., in the way. That's when I decided to display my magnetic screwdriver trick.

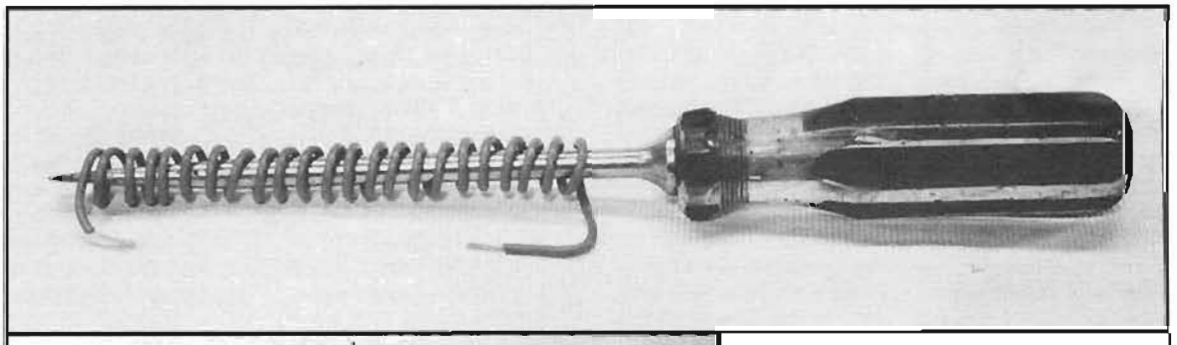
"The first thing you need is a piece of electrical wire about two feet long. If no wire's at hand, you can rob a piece from a turn signal or some other non-essential accessory on your bike. Now, coil the wire tightly around the entire length of the screwdriver shank, leaving two or three inches extra at each end. During the next step of this procedure both the screwdriver and wire are going to get exceedingly hot, so use an old rag or gloves to protect your hands.

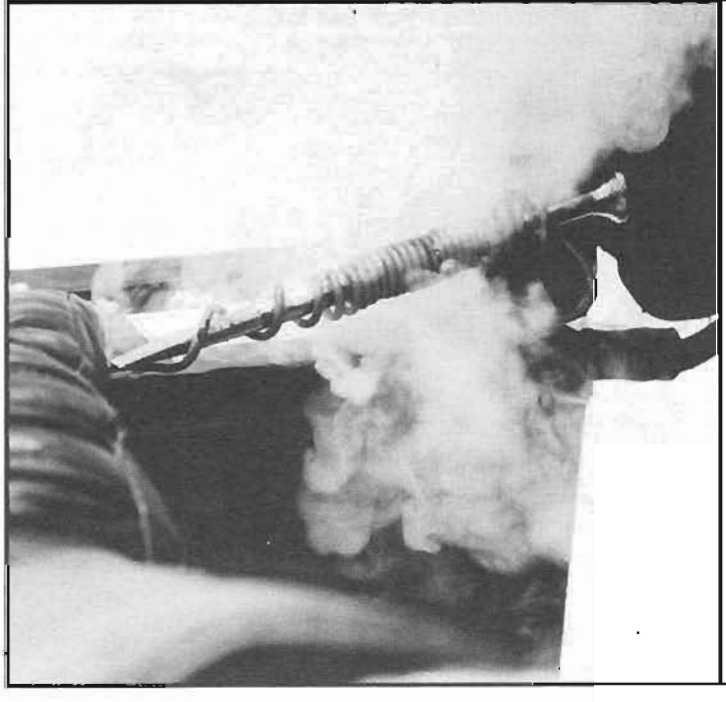
"Touch one end of the wire to the positive terminal of the battery, then the other end to the negative terminal. Hold them there only long enough to smoke the plastic coating — approximately five seconds. After it cools, take the wire off and you'll have yourself a fairly strong magnetic screwdriver. Stick it down wherever it's needed and you'll be able to fish that screw right out."

That's the story as I heard it from Steve Allstaedt, a mechanic at Ventura H-D. For the sake of the accompanying photos, I removed the battery from a Low Rider and set it on a bench before putting this scheme to the acid test. The only hitch that occurred took place because of the buddy who'd stopped by to hold the wire and screwdriver. He (who'll remain nameless) neglected to remove the wire when it started smoking, thereby burning the wire to cinders. Despite this, the thing still made one hell of a magnetized screwdriver, able to pick a putty knife up off the bench. In other words, it worked great.

One word of caution, though. If your bike has a late-model electronic ignition, disconnect the wires on the positive side of the battery before magnetizing your screwdriver. That way you'll avoid burning out your ignition modual.

—Wrench

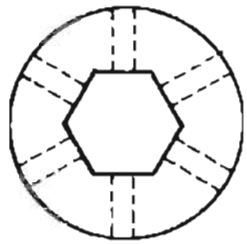




When I got to mounting the stainless tins on my adjustable Wide Glide, I ran into a slight problem. Couldn't find any short enough stainless bolts, which meant I had to buy long ones and hacksaw them. This, of course, usually plays hell with the threads (and your temper) where you make the cut. My dear ol' dad watched me fuck up three bolts before saying, "Why don't you put a nut on it, cut it, then dress off the end of the bolt with a hand file? It'll act as a die when you back it off over your cut." Sure as shit, the ol' man was right. Since then, I've used this trick a zillion times and it works on any thread. It not only saves a lotta trips to the hardware store, it's a lot cheaper than a set of dies when you're short of cash. Thanks, Dad, ya done me right.

—G. Besser

SAFETY-WIRING



Safety-wiring was first brought to us by the aviation industry. So, what's safety-wiring? Well, it's the art of making sure that nuts, bolts and line fittings don't leave their assigned spots before you're ready for them to leave.

Motorcycle racers picked up the art of safety-wiring a long time ago, for use on all critical parts of their bikes, such as engine and transmission mounts, brakes, fuel and oil lines. The pounding these race bikes took could loosen any fastener sooner or later, making for an embarrassing situation.

Around the middle of 1970, the factory —as in Harley-Davidson — started safety-wiring two of the inner primary bolts on their Big Twins. These two bolts are right behind the alternator.

Safety wire is usually stainless steel and comes in various diameters for different size applications. Harley-Davidson uses .036 wire on their bikes. To use safety wire, you must have the bolts or nuts and fittings drilled for wiring. These pre-drilled bolts can be bought in most good hardware or surplus stores, or you can drill the bolts yourself.

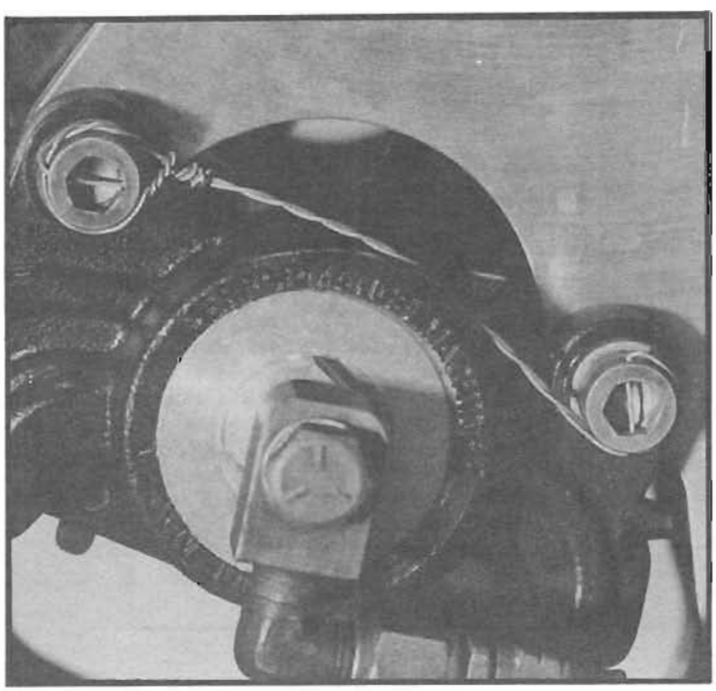
If you are going to drill your own bolts, it's best to have a drill press, but a hand-held drill will work — it just takes a little longer. On allen-head bolts, it's best to drill straight through the head; on regular hex-head bolts, it's best to drill past a corner of the bolt head. The same would go for drilling out a nut or line fitting.

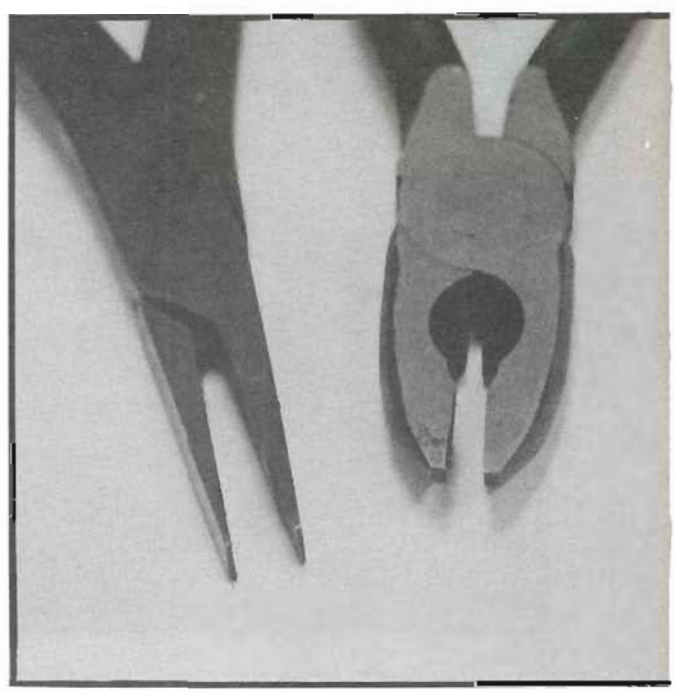
Once you have bolts that are drilled and installed, you can safety-wire. There are two basic ways to do this. The first way, shown in one of the photos, is to wire two bolts together. The second way is to wire a bolt to something stationary, like a bracket or cylinder fin.

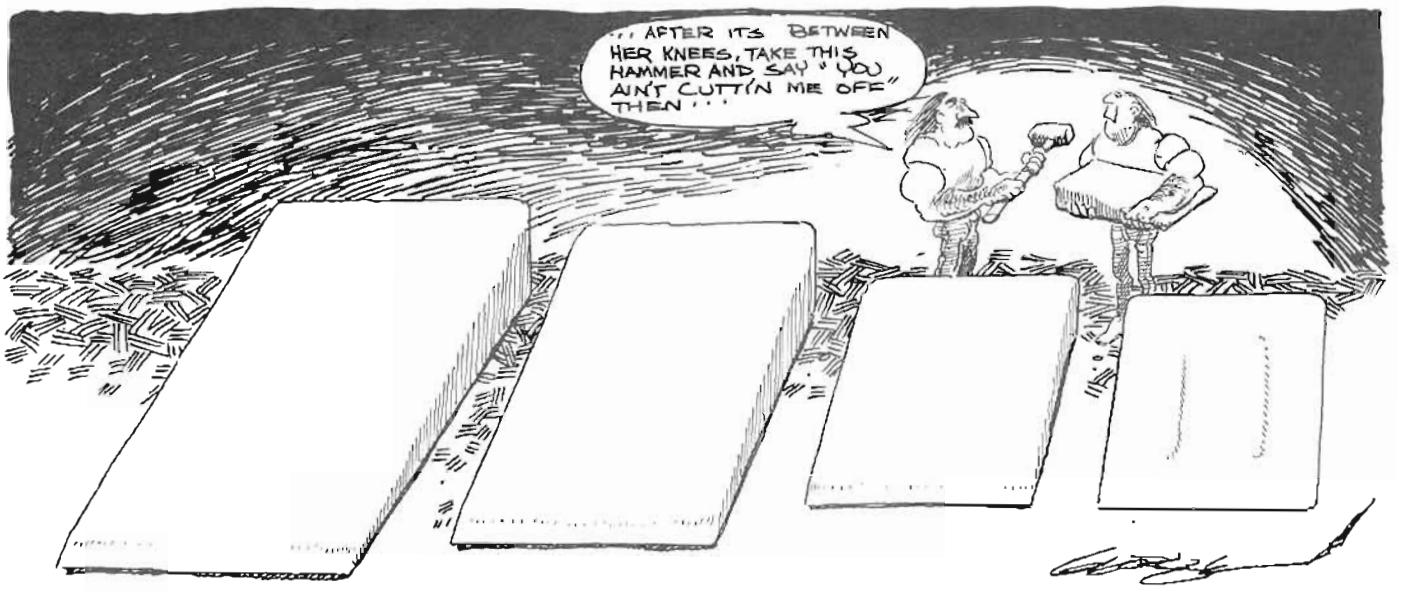
To start wiring, pass the wire through the bolt and even up the wire's ends. Next, using safety-wire pliers or a pair of duck-bill pliers, twist the wire together till it reaches the second bolt. You should keep in mind that right-hand threaded bolts turn clockwise to tighten, so when you pull the wire to your next bolt, the wire should wrap clockwise from the first bolt. This will maintain pressure on the first bolt to keep it tight and prevent it from backing out. The same goes for the second bolt. Once you've twisted the wire to it, thread the wire through the second bolt head so that when you're finished twisting the wire, it will prevent the second bolt from backing out. After you've wired the second bolt, twist the wire completely, double it back over the wire connecting the two bolts, and snip off the excess.

Safety-wiring isn't hard to do: it just requires a little patience and a few hand tools — the rest is up to you. Thanks to Roy Du Bach and Ken Lyon for this tech tip.

Later,
Wrench







BREAK 'EM DOWN OR WEDGE IT IN HER

These four objects in the picture are trueing tools for when you're trying to true up a set of flywheels. The plastic won't split or crumble like wood will. And they won't mar the flywheels like steel does. The larger wedges need to have the ends cut off so they won't hit the crankpin. A hacksaw, band saw, or carpenter's wood saw will do the job nicely. These wedges are sold under different brand names, come in assorted colors, and are readily available at small engine repair shops. Look for shops that sell chain saws.

The smaller wedges can be used to break the bead down on a stubborn tire. As many of us know, when you're out on the road, many filling stations don't want to fool with motorcycle tires and most generally we have to break them down ourselves. A Volkswagen tube will work on a 16-inch tire and a cold patch works better than a hot patch. The glue used inside a tubeless tire and a small patch will generally take care of any problem ya might have with a puncture.

I have to thank Billy Bullshit, a Grateful Dead road man trainee, for this information — and that ain't no bullshit. The smaller wedge can fit easily in a tool pouch. What you do is drive the wedge in between the tire and rim with your trusty 12-inch crescent wrench. Do both sides and then pull out the tube. It helps to leave a little air in it as you're putting it back on. That way, it won't bunch up and it won't be as easily pinched. Put some soap around the tire and around the rim. A little WD-40, Vaseline, or whatever is handy works better than nothing at all. I always carry a small tube of K-Y Jelly on the road. Ya never knwo what you'll come across. —Rip

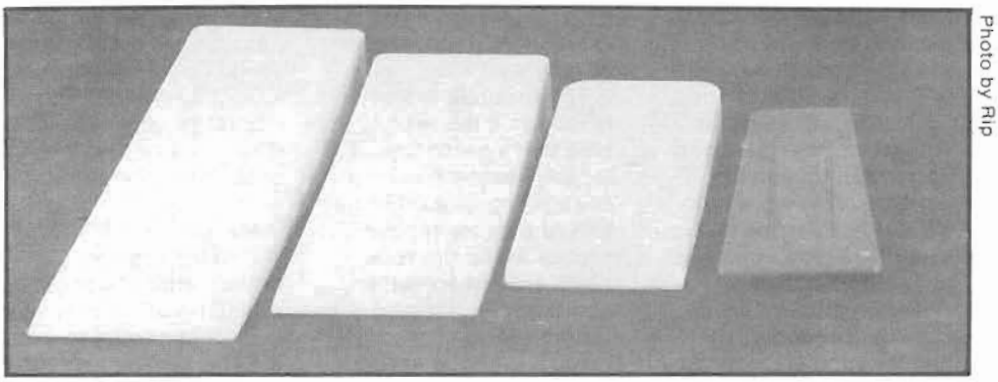


Photo by Rip

The Tow-Home Blues

By Richard Ries

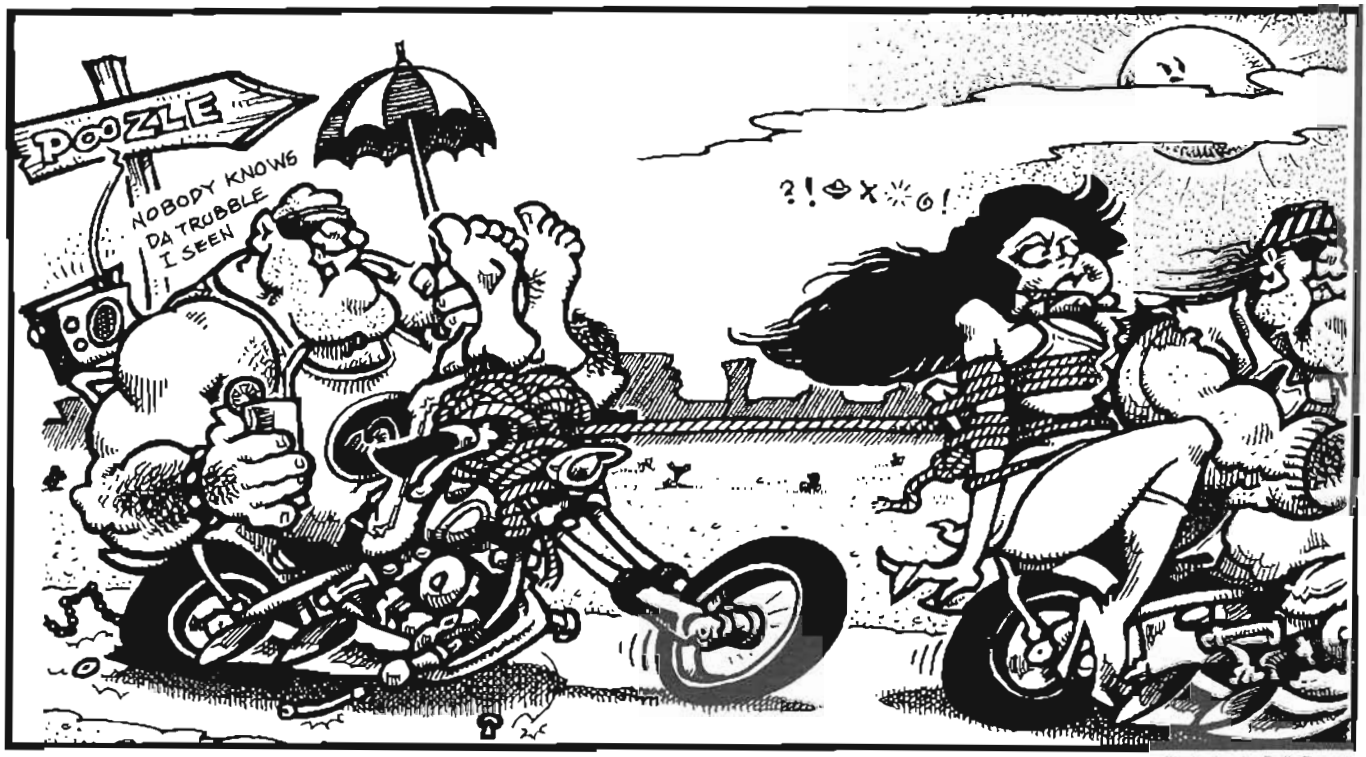


Illustration by Duffy Duggan

It'll happen to you someday — you'll be puttin' down the road and *blam* — your Hog will take a dump. You find out it can't be fixed there. Leavin' a bike beside the road, even chained up, while you go for help is a good way to run up a heavy parts bill. And no way to get hold of anyone with a truck. The only answer is to tow the bitch.

Keepin' fifteen feet of rope in the saddlebags just for such emergencies is a good idea. Nylon is best. It won't rot, and it's stretchiness takes up shock so you won't be jerked around like a junebug on a string when the tow vehicle takes off. A ⅜-inch nylon rope has a working strength of about 800 pounds, which should be enough to tow the dresser, yourself, and the ol' lady's fat ass.

The first rule of towing is not to tie the rope to the bike that's being towed! If for any reason you lose control, you'll want to get free of the tow vehicle pronto. Wrap the rope twice around something and hold the free end with your hand.

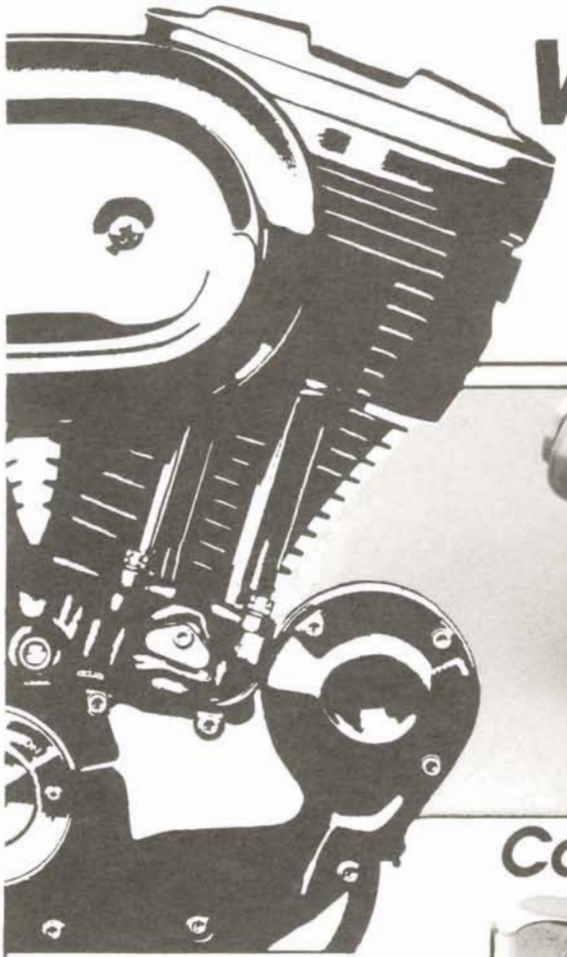
Wrap the rope around something strong where it's least likely to affect handling. The middle of the handlebars, between the risers, is a good place. So is either the steering head of the frame or a front down tube. Just find something solid on the front of the bike that's as close to the centerline as possible, where the rope can slide free without snagging on anything if you let go of your end. Check to see that the rope doesn't rub the front tire when you turn.

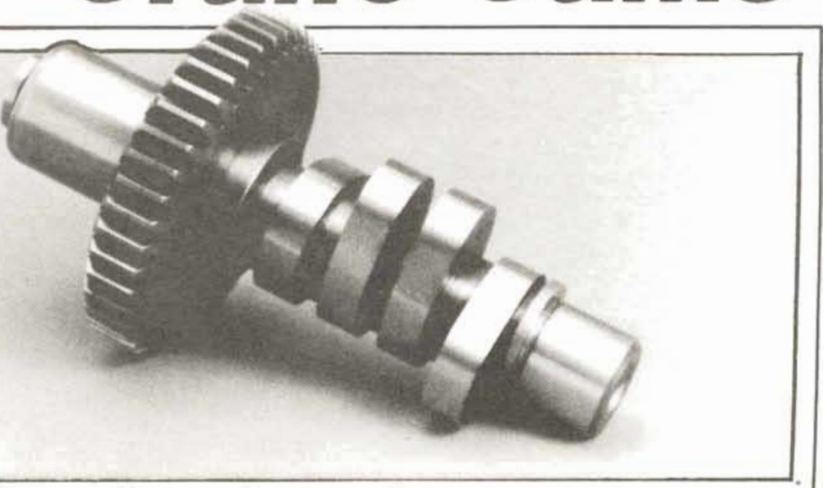
Make sure that the person in the tow vehicle understands the second rule: *Go easy!* Especially if they're in a truck or car. If the tow vehicle is another bike, tie the rope low on his frame so your partner doesn't get yanked onto his side every time the slack comes outta the rope.

Keep the slack outta the rope by using your brakes. In fact, if the tow vehicle is a bike, he shouldn't have to use his brakes at all. You should do the stopping for both of you.

And, oh yeah — if you're feeling charitable one day and decide to tow in a rice jockey and his ride, you should probably drop the chain. Lots of rice grinders use engine-driven pumps to oil the tranny. If you tow one of these with the engine off, all those dry gears meshin' together will have the guy stopping at the Hondasaki shop for a transmission rebuild. What if he's got a shaft drive? Call a truck for him from the next town. ■

Wake Up Your Bike With Crane Cams





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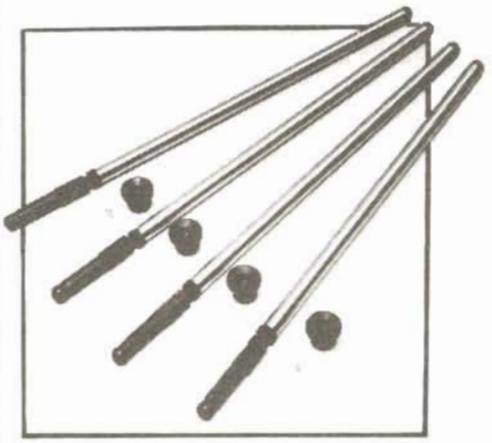

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