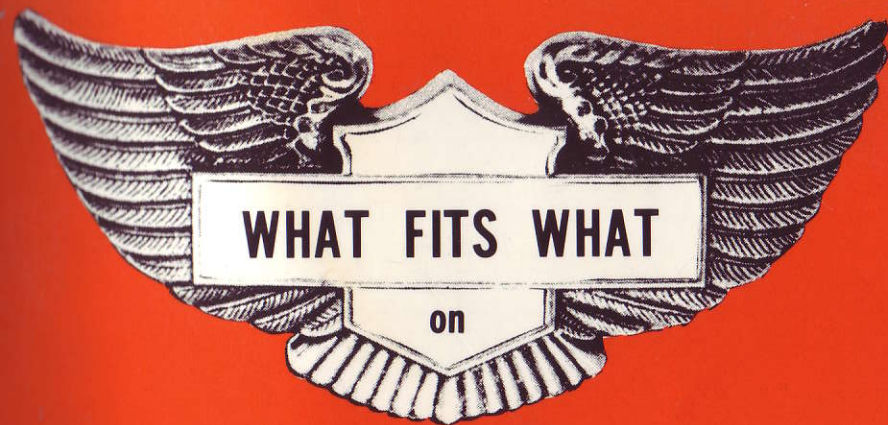


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WHAT FITS WHAT on HARLEY DAVIDSON Mike Arman / Kurt Heinrichs ISBN# 0-933078-11-0

Sixth Edition; Includes 1983 Models!



HARLEY - DAVIDSON MOTORCYCLES

Parts Interchangeability – Performance Modifications

1936 thru 1983

Mike Arman and Kurt Heinrichs

ISBN# 0-933078-11-0

Not A Harley Davidson Publication

READ THIS FIRST!

This manual is a parts interchangeability and high performance engine modification manual for Harley-Davidson V-twins. It covers from the mid 1930's to and including 1983. It tells you what square pegs will fit into what round holes, or how to make them do so with a minimum of yelling, screaming, and pulling out of hair. This will enable you to build a motorcycle from a stack of more-or-less unrelated parts. This will also assist you to build your motorcycle for the most available horsepower, the most reliability, or somewhere in between. This is NOT a workshop manual, and is to be used in conjunction with the correct manual for your cycle. We have deliberately left out the complete history of Harley-Davidson, photographs of every model and every year, ranting and raving either for or against most anything, and other such trash. We feel that this would be a duplication of information available elsewhere, and would raise the price of the book by making it bigger than it needs to be.

All information in this book is presumed to be accurate to the best of the authors' knowledge. We assume no responsibility for any broken parts, either yours, or on the motorcycle. Comments, hints, further information, hate mail, proposals (obscene or otherwise), etc., are welcomed by us, and may be included, with a credit, in subsequent editions of this manual.

We hope the information in our little book will be worth many times its purchase price when you advance upon your Harley, wrench in hand.

Thank you,
Mike Arman
Kurt Heinrichs

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ISBN # 0-933078-11-0

READ THIS FIRST!

Disclaimer:

While the authors and the publisher have done their best to be sure that all the information in this book is accurate, we assume no responsibility for errors of fact or omission. In addition, since we have no control over the quality of your workmanship, the condition of your motorcycle, or your skill and circumstances in riding it, you assume full responsibility for the results of any modifications to your motorcycle. If you bust it or yourself, we're sorry, but not liable.

The Harley Davidson Motor Company, Inc. has not authorized, produced, or sponsored this publication, and is not responsible for its contents.

A FEW VERY, VERY BASICS:

What the hell is it?

'Flatheads' built 1909 to 1973. Side valve engines of 45, 55, 74, or 80 cu. in. displacement.

'Knuckleheads' built 1936 to 1947 in 61 or 74 cu. in. sizes.

'Panheads' built 1948 to 1965 in 61 or 74 cu. in. sizes.

'Generator Shovelheads' built 1966 to 1969. 74 cu. in. only.

'Alternator Shovelheads' 74 cu. in. 1970 to 1980, and increased to 80 cu. in. displacement 1978½ to date.

'Sportster' 1957 to date in 55 or 61 cu. in. sizes.

'K model' or **'Flathead Sportster'** built 1952 to 1956 (except 45 cu. in. KR to 1969). 45 or 55 cu. in. ('Flathead Sportster': Kind of a lame term, but everyone knows what it refers to.)

Playing by the numbers:

Here we are making the wild assumption that the numbers on the cases are those actually put there by the Harley people in Milwaukee or in York. In (and on) many cases this is like betting that the earth is flat. These guidelines are fairly accurate, but there are rare, legitimate exceptions. Remember also that many things may have happened in the forty years or so since this particular bike left the factory, and that a 'wrong' set of numbers may really be OK. (And on the other hand . . .) So be *very* careful. Harley has used four numbering systems for the cycles covered in this book.

First System: Mid 1930's thru and including 1961.

Engine number location: Left crankcase half on raised pad between the cylinders. The pad is just under the top case bolt.

Frame number location: No frame number used. This has been a source of endless troubles. When in doubt, a *stamped in* number *may* be a serial number, but a *cast in* number, even if indented, but especially if raised, *is not!* This situation applies to most Harleys through 1969.

Sample: 36E3947

The first two numbers are the year. The letter (or letters, up to four) tell you the model. The last numbers, four or five of them, are the sequential production number. 36E3947 is a 1936 61 cu. in. OHV; a low compression Knucklehead.

Second system: 1962 thru 1969

This works the same as the first system except that the first digit of a four digit sequential production number will be even if the year is even, or odd if the year is odd. If the s.p.n. is five digits long the first two will be even in even years, and odd in odd years.

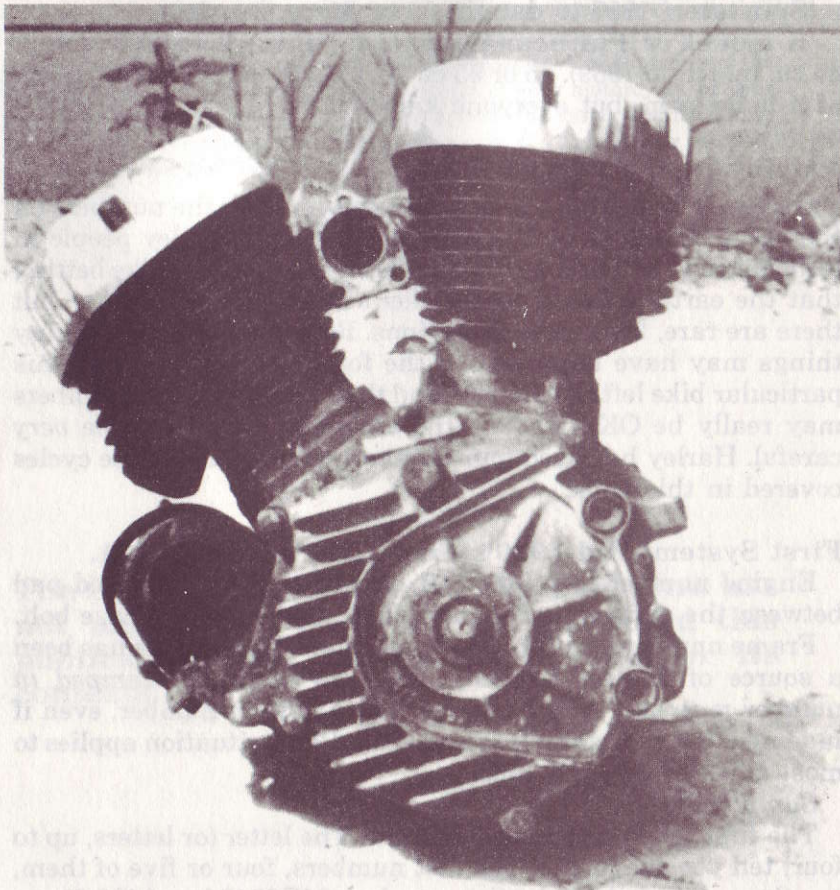
Sample: 64FL6772 OK

Sample: 68XLCH2371 OK

Sample: 67FL4125 Go To Jail

Sample: 69FLH15779 OK

Sample: 64XLH3112 Go To Jail

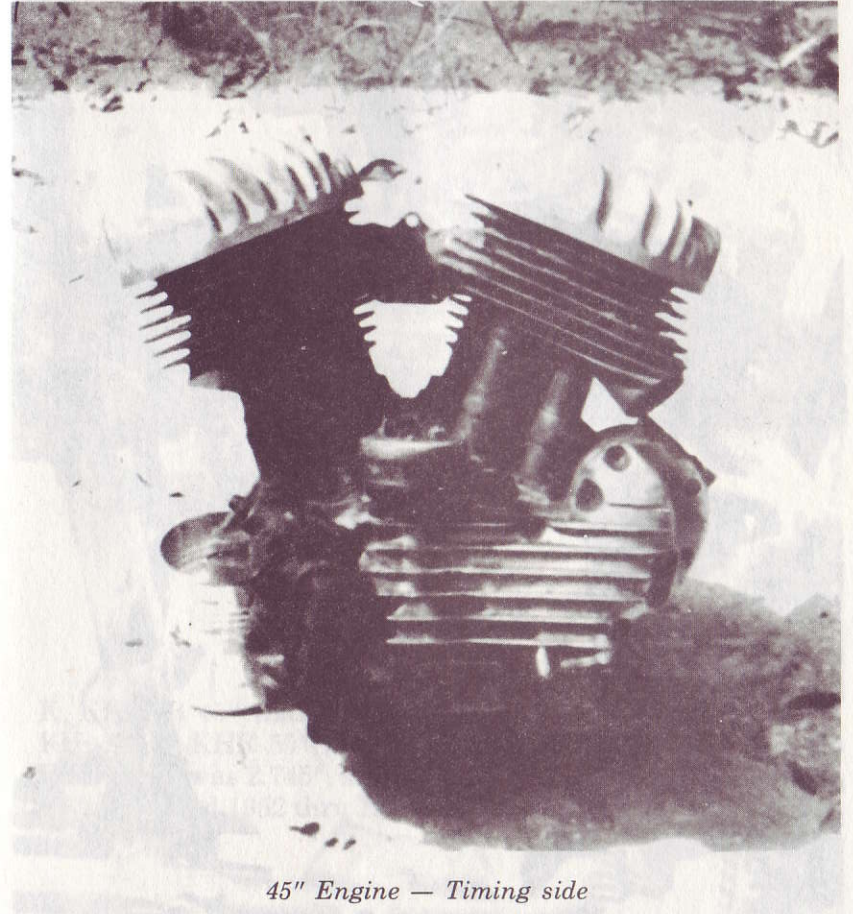


45" Engine — Drive side

Letter codes for first and second systems:

- W Standard version, 45 cu. in. flathead
- WL High compression version, ditto
- WLA Military version, ditto
- WLDR Sport version, ditto
- WR Factory Racer, ditto

A few zillion of these were produced from about the time the Vikings invented mead (1936, anyway) thru 1951. These were all solo (non-trike) motorcycles with a bore of 2.745" and a stroke of 3 & 13/16".



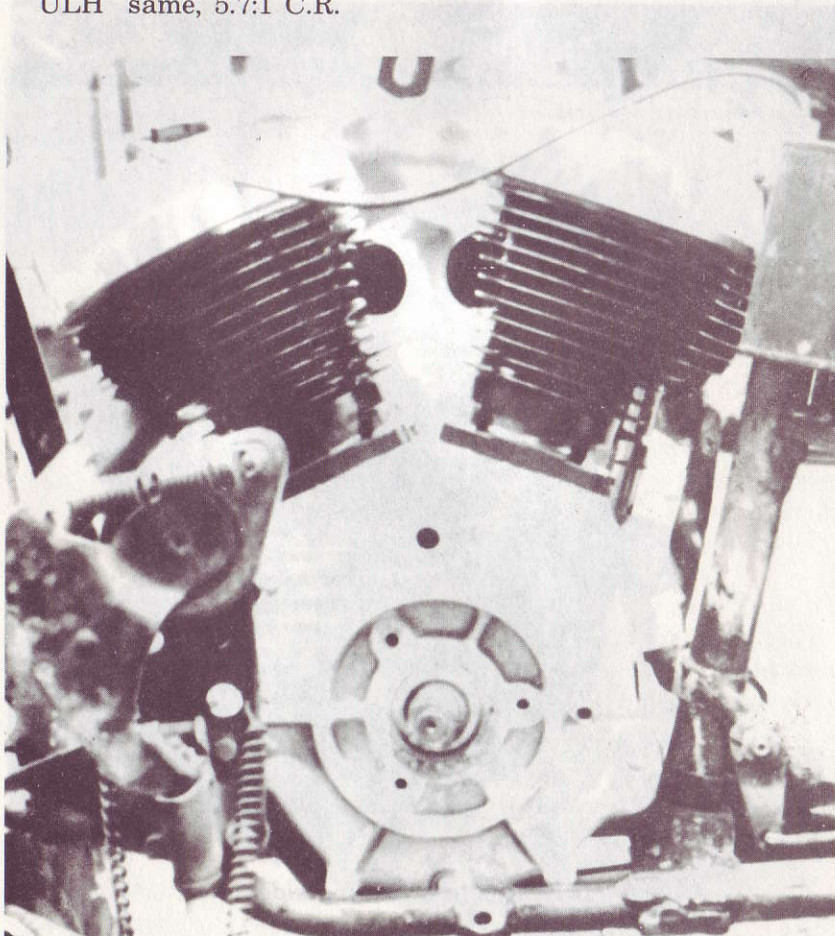
45" Engine — Timing side

Contrary to popular rumor, there are NOT several thousand of these in cosmoline at some Army Surplus depot for \$12.95 each. Sorry.

- G 45" trike
- GL same
- GA 45" trike, no tow bar (yawn)
- GE 45" trike, electric start, 1964 and later

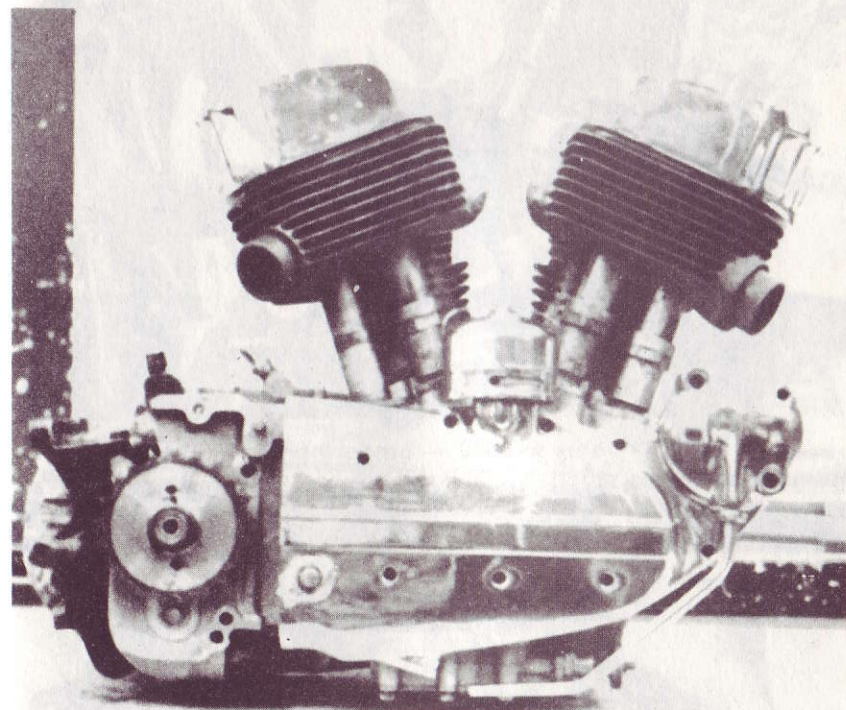
These were produced from 1932 thru 1973 as the 'Servi-car'. Their engine is slightly milder than that of the 45" solo bike discussed above.

- U 74" Side Valve, 5.0:1 Compression ratio
- UL same, 5.5 to 1 C.R.
- UH 80" SV, 5.2:1 C.R.
- ULH same, 5.7:1 C.R.



74" - 80" Flathead — Drive side

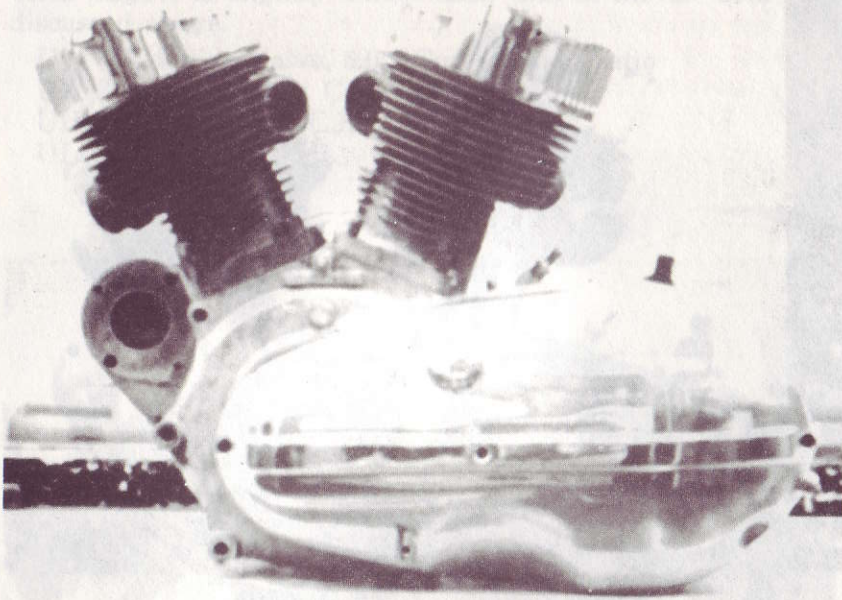
The stroke on all these engines is $4 \frac{9}{32}$ " (4.281"). The bore of the 74" SV from 1937 thru 1948 is $3 \frac{5}{16}$ " (3.3125"). The bore of the 80" SV is 3.422", or $3 \frac{7}{16}$ ". The last year of production for these was 1948.



KH Engine — Timing side

- K, KK, KR 45" flathead Sportster
- KH, KHK, KHR 55" flathead Sportster

Bore on all was 2.745", stroke on 45": $3 \frac{13}{16}$ ", stroke on 55", $4 \frac{9}{16}$ ". Produced 1952 thru 1956, except KR to 1969, as previously noted.



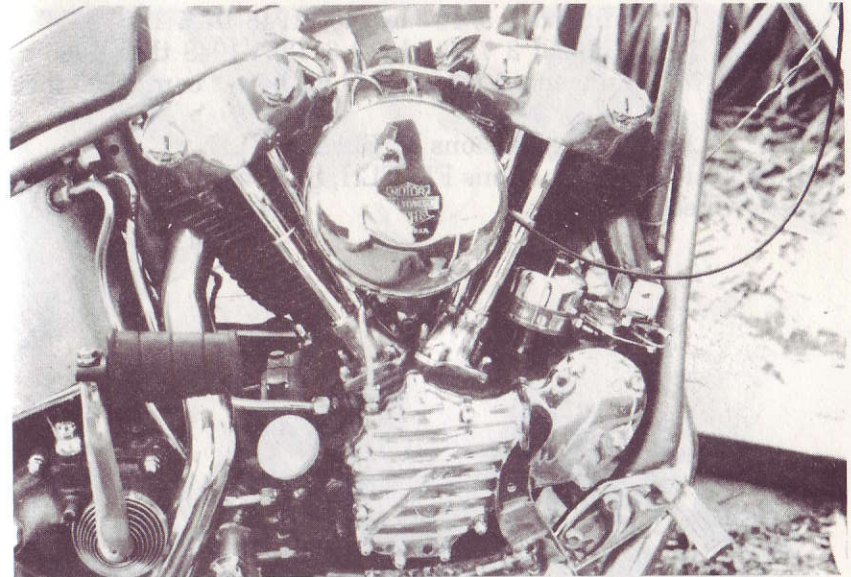
KH Engine — Clutch side

E 61" Knucklehead, 6.5:1 C.R., 3 5/16" (3.3125") bore by 3.5" stroke. 1936 thru 1947.

EL 61" Knucklehead, 7.0:1 C.R., same bore/stroke/years as above.

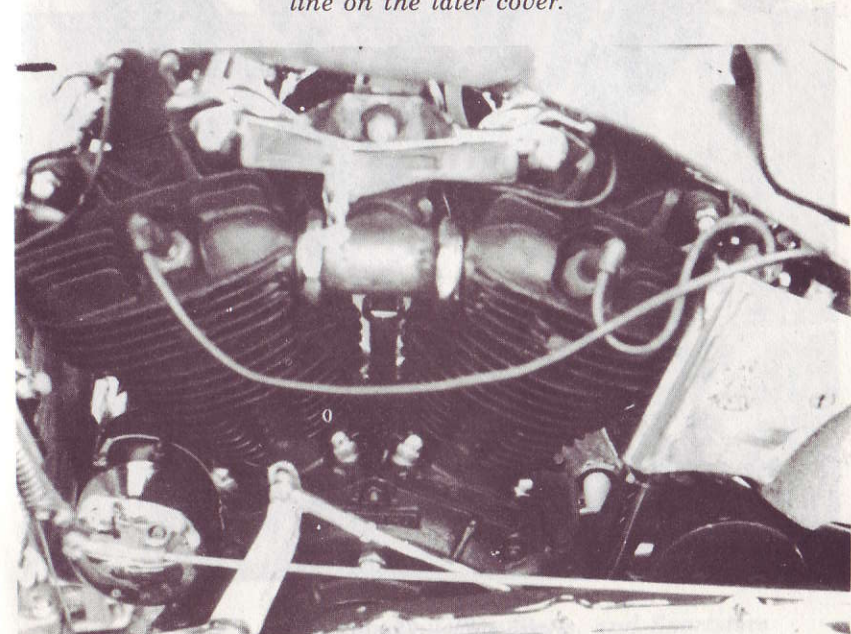
F 74" Knucklehead, 6.6:1 C.R., 3 7/16" (3.422") bore by 3 31/32" (3.968") stroke. 1941 thru 1947.

FL 74" Knucklehead, 7.0:1 C.R., same bore/stroke/years as above.



Knucklehead — Timing side

Note the oil line on the top rear of the timing cover: To use a Panhead timing cover on your Knuckle, you must install this oil line on the later cover.

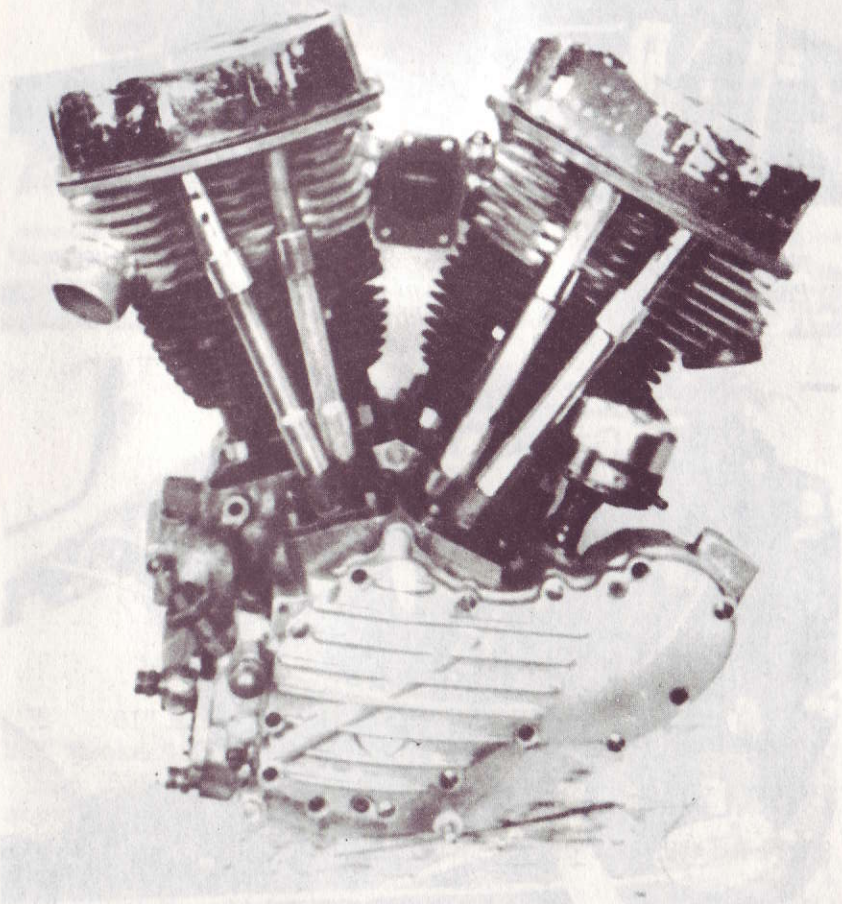


Knucklehead — Clutch side

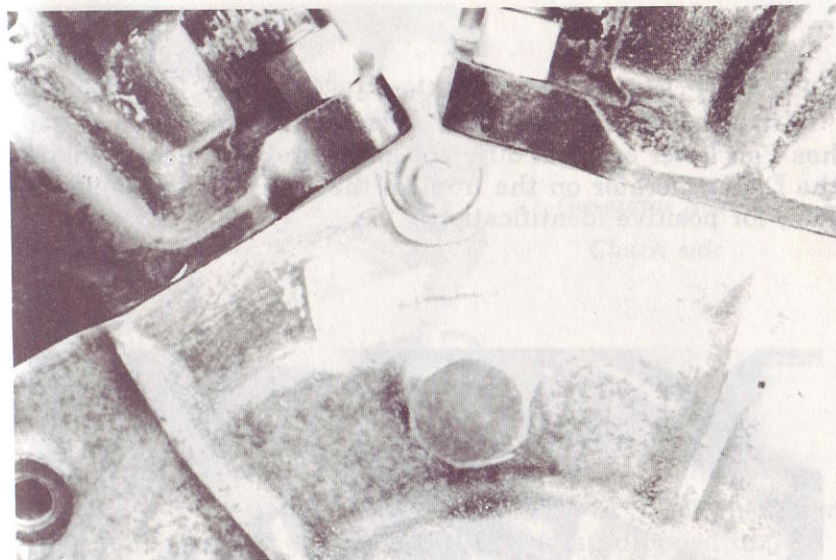
EL 61" Panhead 3 5/16" by 3.5" 1948 thru 1953
 FL 74" Panhead 3 7/16" by 3 31/32" 1948 thru 1965
 FLH 74" Panhead with higher C.R., hotter cam. 1955 thru 1965

FLP, FLHP Police versions of FL and FLH.

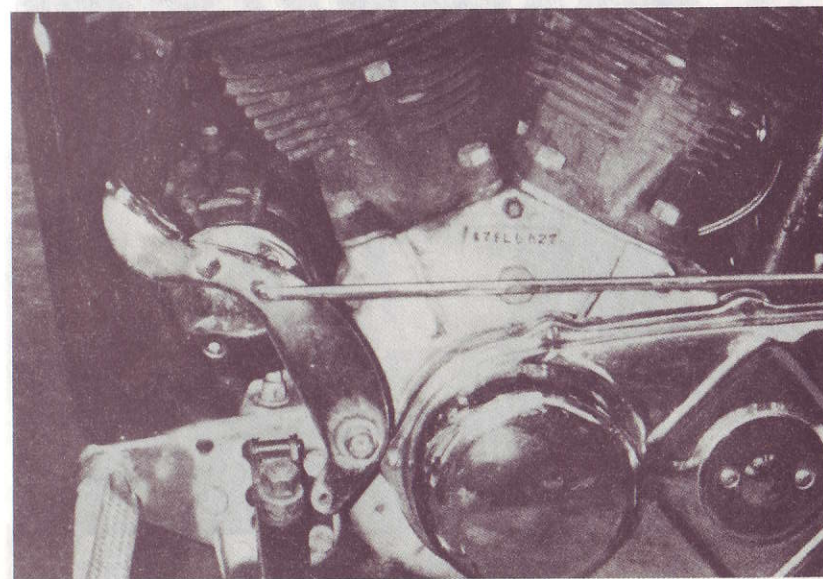
Note that the designations FL, FLH, FLP, and FLHP are still in use. Check the year.



Panhead — Timing side

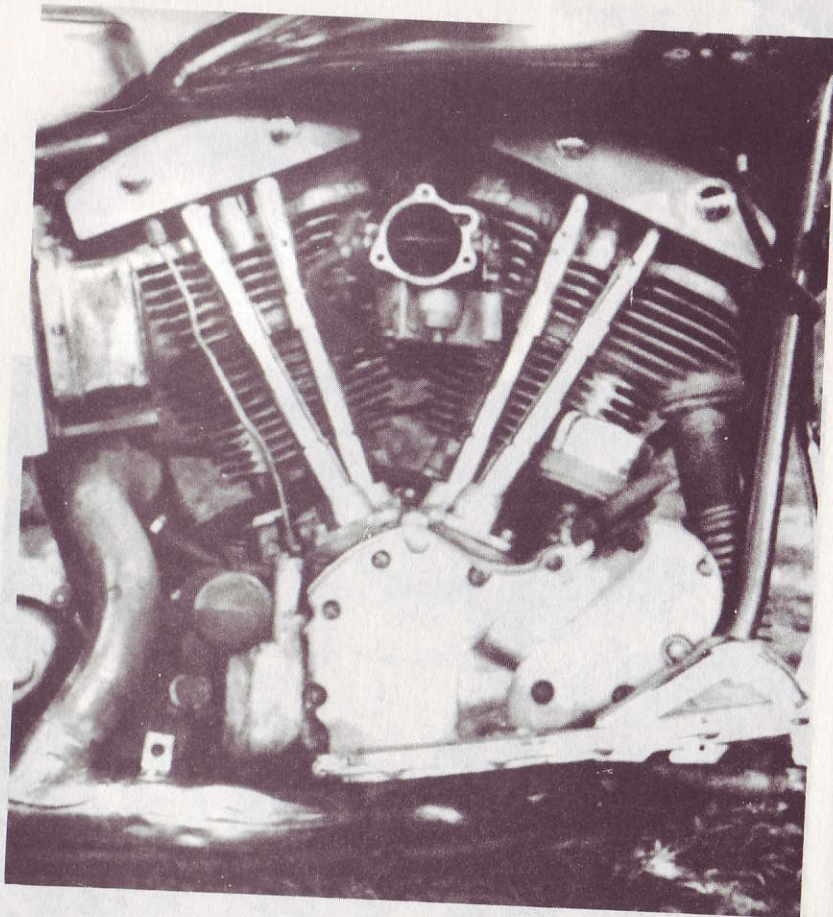


Bad(!) numbers on a Panhead

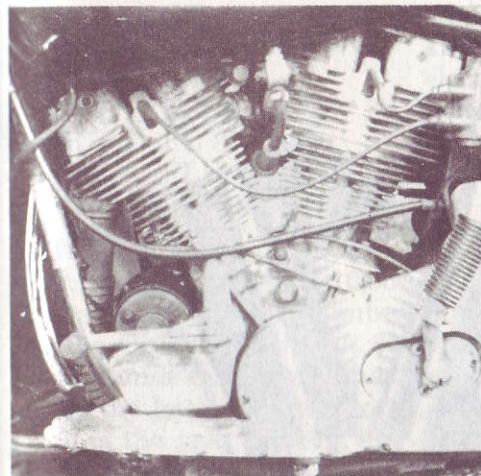


Early style numbers on Knuckles, Pans, and Sportsters

FL, FLH, FLP, FLHP 1966 thru 1969
 'Generator Shovelhead', bore and stroke unchanged from Pan,
 has Pan lower end, but different heads and cylinders. Look for
 the D.C. generator on the front of the crankcase, same as the
 Pan, for positive identification.



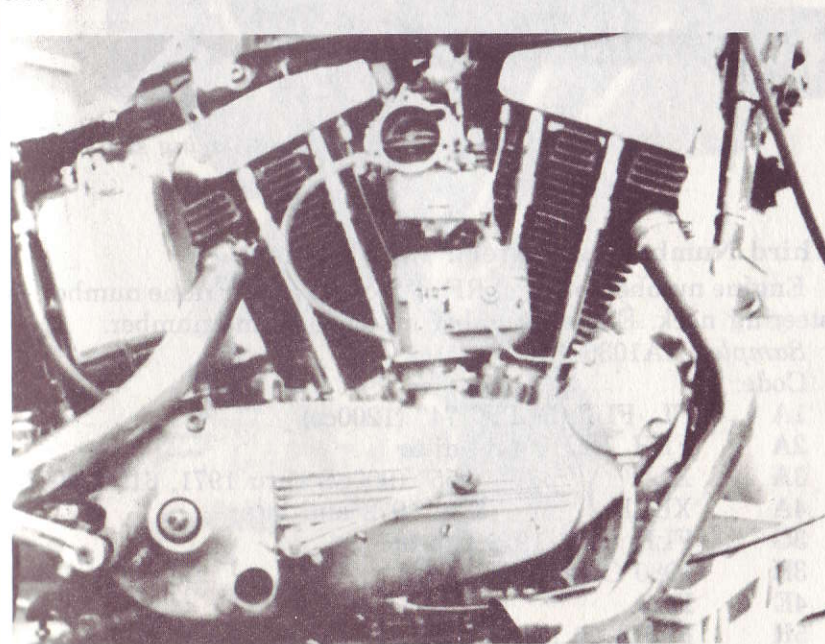
Generator Shovel — Timing side



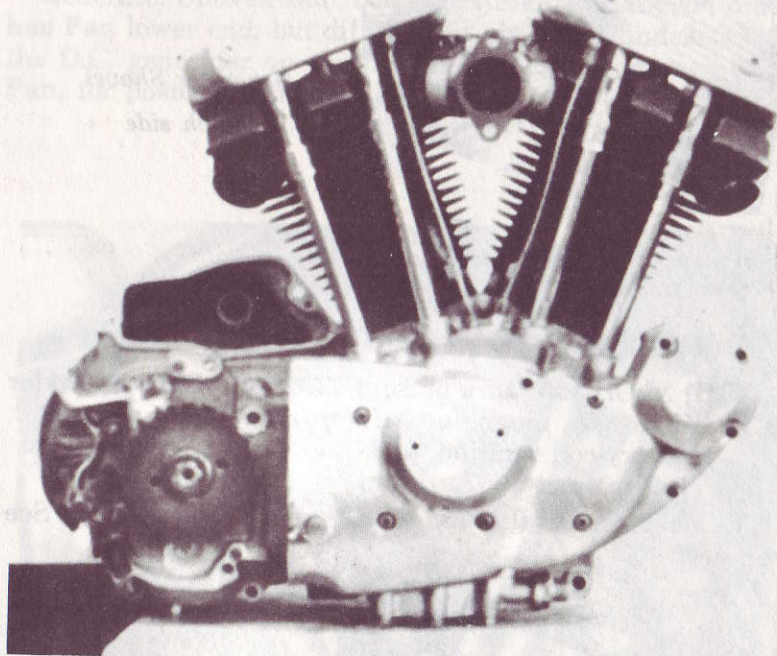
*Generator Shovel
 Clutch side*

XL, XLH, XLCH 1957 thru present. 55" & 61" OHV Sportster
 XLCH Kick start, magneto ignition (mag dropped in 70)
 XLH Battery-coil ignition, kick start to 1967,
 electric start 1967 and up

NOTE: Most Harleys through 1969 have no frame number. See
 above.



Early (900cc) Sportster — Timing side



1971 900, and later 1000cc Sportster — Timing side

Third Numbering System: 1970 to 1980

Engine number location RF of R crankcase. Frame number on steering neck. Engine number matches frame number.

Sample: 1A10367H3

Code:

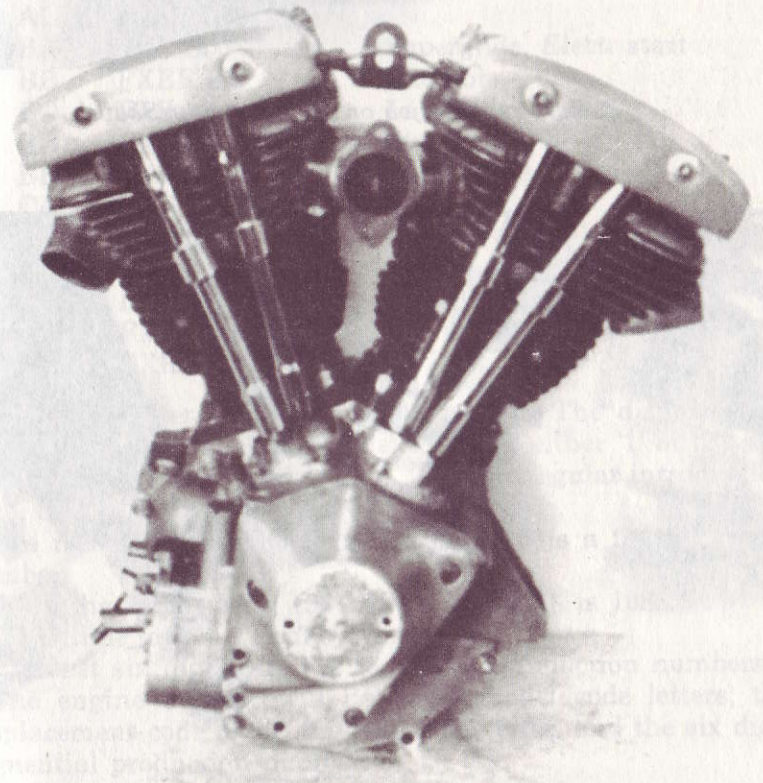
- | | | |
|----|-----------------------|--|
| 1A | FL, FLP, FLPF | 74" (1200cc) |
| 2A | FLH, FLHP | ditto |
| 3A | XLH |) — (55" (900cc) thru 1971, 61" (1000cc)
in 1972 and later |
| 4A | XLCH | |
| 3G | FLH 80 & 1979 Classic | |
| 3H | 1980 Classic | |
| 4E | XLS | |
| 5H | FLHS 80 | |

5A	GE	electric start servi-car
2C	FX	kick start Super Glide
9D	FXE	electric start Super Glide
7F	XLCR	factory cafe racer
6H	FL 80	7H FLH 1200 Police
9H	FLH 80	8H FLH 1200 Shrine
2H	CLE (Sidecar)	1K FLH 80 Shrine

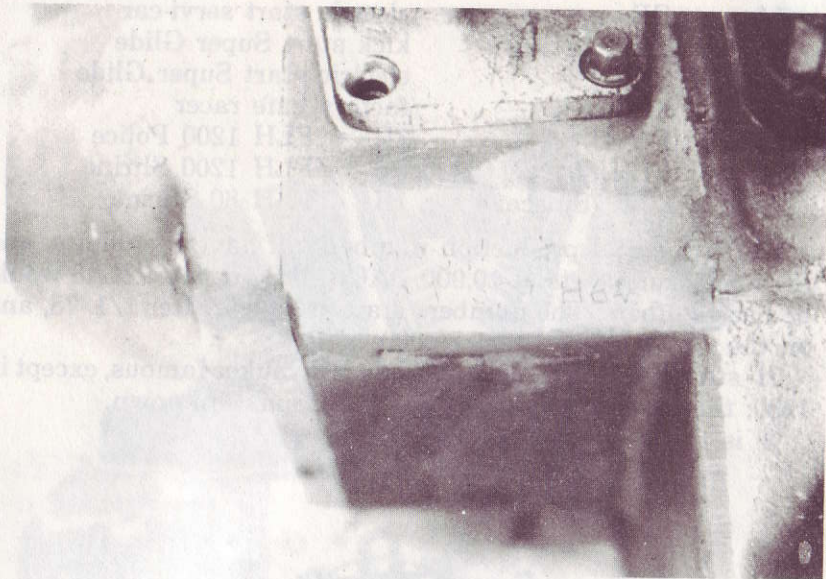
The sequential production number will have five digits, and the model run starts at 10,000. 3AO6721H3 or 3A6721H3 would be bad numbers. The numbers start at 60,000 after 1/1/78, and on the CLE they start at 80,000.

'H' stands for the bike that made Milwaukee famous, except in 1980; the letter changes to 'J', for reasons unknown.

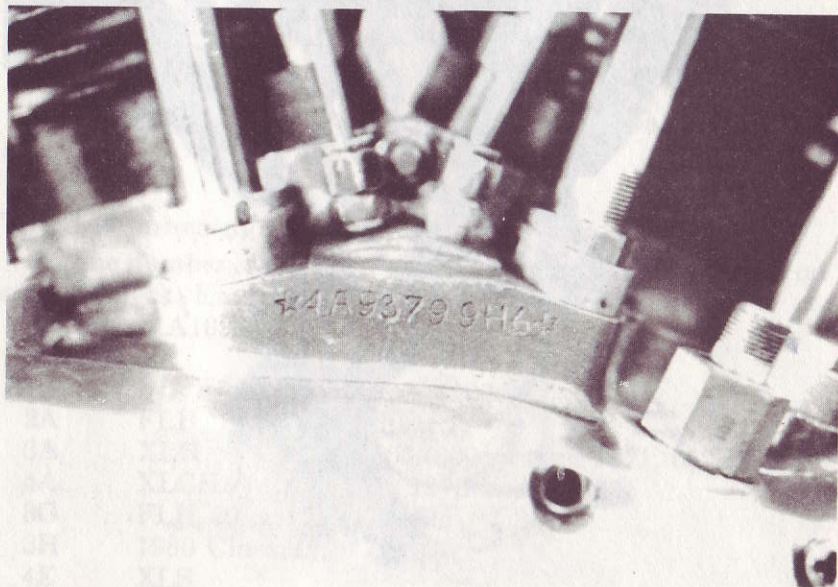
'3' is the year: 1973.



Alternator Shovel — Timing side



Factory number job on an Alternator Shovel



Late Sportster numbers

Fourth Numbering System: 1981 to date

1981 and later serial numbers have 17 ! digits on the frame, and ten on the engine. All the Harleys we are interested in start with 1 HD 1. The first '1' is country of origin, U.S.A. You know what the HD stands for or you haven't been paying attention. The second '1' is H-D's code for 'Heavyweight Motorcycle'. The next two letters are the model code.

AA	FLH 80	
AB	FLH Police Std	
AC	FLH Shrine	
AD	FLH Classic	
AG	AD with Sidecar	
AH	FLH Police Deluxe	
AJ	80 Heritage	
AK	FLHS 80	
AL	Shrine, No SC	
BA	FXE 80	Superglide, Elect. start
BB	FXEF 80	Fat Bob
BC	FXS 80	Low Rider
BD	FXB 80	Sturgis
BF	FXWG 80	Wide Glide
CA	XLH, XL	
CB	XLS	
DA	FLT	
DB	FLT-C	
EA	FX	
EB	FXR	

The next letter (K) is the displacement. The displacement letters are K=80", H=61". The next digit is either '1' or '2', and tells the model introduction date. '1' is the regular introduction date, and '2' is a mid-year introduction date.

The next digit can be 1 to 9, or X, and is a factory check number.

'B' is the model year; 1981. 'C' is 1982, 'D' is 1983.

'Y' is that town in Pennsylvania.

The last six digits are the sequential production numbers.

The engine number will have the model code letters, the displacement code letter, the year code letter, and the six digit sequential production number.

Now that all that is settled, a complete frame number will look like this:

1 HD 1 AA K 11 BY 000000

The complete engine number looks like this:
AAKB 000000

Now we know where we are starting from.

ENGINES

45" G and W Models

Does not include K models. These are the small flatheads.

The 45" engine is fairly simple and had only detail improvements from the first ones that concern us, the new style 1937 models, to the last ones, in 1973.

Bore and stroke are unchanged, so all pistons, rod sets, crankpins, and flywheels will interchange 1937 to 1973. In 1939 the position of the rods was switched to overcome an oiling problem. On engines to 1939 the forked rod is the front rod, and the plain rod is the rear rod. On engines 1939 and later, the forked rod is the rear rod, and the plain one is the front. You can assemble the engine either way, but you should go with the late pattern. Since very little was changed, it is a fairly safe bet that if someone offers you a box of assorted year 45" parts, they will all fit together and probably even run.

There are a few cautions though. Don't mix heads: use either two alloy heads or two cast iron heads unless you like gambling with burnt pistons until you get the spark plug heat ranges sorted out on your newly bi-sexual engine. A number stamped on the side of the head indicates the C.R. '5' is low compression, and '6' is high compression: 5.6:1 (Wow!). Don't mix up cam sets either. A front exhaust cam from a WR with a rear inlet cam from a GA in the same engine will drive you batty when you go to tune the scooter. If you want a bit more poke, put in a full set of K model cams. KR, and 57 thru 70 Sportster cams can be used if you resize or replace the timing cover cam bushings and install the needle bearings in the inner case. You can use K and Sportster tappets, but not the guide blocks. 45" guide blocks have a triangular flange with three mounting holes.

WR and XL cams don't work well in 45s. They won't drive the oil pump, and the cam bearings are different. A set of KK cams, however, will fit, and they do add a little extra punch.

Any *timing case* mount distributor or magneto from a Sportster will fit 1937 thru 1973 45" models with no mods. A Fairbanks front mount unit (from WR, KR, or XR) will fit the hole, but you'll have many adapting problems and no lights, so this is not really a practical modification.

There are two carburetor/manifold combinations for the 45". Bad: M-16 or M-18: 1" bore Linkert and manifold to fit. Good: 1 1/4" Linkert M-88, or any other 1 1/4" Linkert, and manifold to fit.

D.C. Linkert and Tillotson carburetors also appear on 45s, and are stock on later trikes.

Some 1930s vintage flywheels have the oil holes in a different place than later models, and thus require a special crankpin. There is also a keyway on the mainshaft side of the wheels. Be careful, and take a good look at what you've got!

Some magazines have featured a how-to-do-it on something called a '45 Magnum', this being Sportster top ends on a 45" case. Don't do it. The result is a loud, expensive noise from the greatly overstressed lower end, the immediate cessation of all forward motion on the part of the motorcycle, and dents in the gas tank when the unhappy owner bangs his head against it in frustration. It is much easier and cheaper to buy a Sportster in the first place.

If you are really, legitimately in the motorcycle business, full time, a shop, licenses, a tax number, and so forth, a good source of 45" parts CHEAP is Dixie Distributing in Columbus, Ohio. They are wholesale only, so be prepared to convince them that you are real, and please don't try to if you're not.

K Models: The Flathead Sportster

The 1952 and 1953 K and KK models differ primarily in porting, compression ratios, and cam specifications; the KK uses roller cam bearings. As before, don't run a K head with a KK head, or two K cams with two KK cams, unless you run K cams for *both* inlets and KK cams for *both* exhausts.

The 1954 thru 1956 KH was greatly modified. Stronger barrels and a new style transmission access door (a running change in 1955) were among the changes. Most 1957 thru 1976, and some 1977 and up Sportster lower end and transmission parts will fit.

This includes con rods, crankpins, tappets, main and rod bearings, cams, timing covers (70 and back only), pinion shafts, oil pumps and their drive gears 1955 thru 77, motorsprocket shafts (but not the motorsprocket itself unless you change the primary chain, outer clutch hub, the clutch, and some associated parts - all this because the pitch of the primary chain is different), and so forth.

While you could put a 1955 KH oil pump on your 1968 Sportster, this will probably puke the engine. It will fit, but since the gears are lots smaller, it pumps lots less oil. Sportster oil pumps on KH models, however, are a good thing.

One of the rare cases that 'earlier' really is 'better' is that KH flywheels in an XL gives you an econo stroker. If you do this you will have to make new timing marks on the flywheels. The KH is timed at 19/64" BTDC, while the Sportster runs best at 11/16" BTDC. Leaving the old marks and setting the timing to them will result in perpetually retarded ignition, and you will be giving away a chunk of the horsepower you just built.

The KH trans access door won't fit the Sportster unless you remove and modify the two steel alignment pins on the door. KH pins are tapered, while XL pins are not. You should be using the Trock iron door anyway.

K and Sportster kick shafts and outer kick covers swap 1954 to 1970 with no problems.

K and Sportster inner clutch hubs are the same from 1954 to 1970. The outer clutch hub for the K runs on a needle bearing, and the kickstart ratchet gear plate is not the same as Sportster. You can use the new hub if you also use both gears, the entire kickstart assembly, a Sportster clutch, a new primary chain, and a front sprocket to fit. (Warning: There are two kickstarter ratchet gear/plate assemblies. The early, fine tooth unit belongs on your enemy's bike: It's a knee-buster. Use the late, coarse tooth setup on *your* bike.) The clutch release mechanism is the same 1954-1970. The pawl carriers interchange — parts and complete — 1952 thru 1980 with the exception of 1970 and 1971, which only fit themselves.

While K and Sportster lifters interchange 1952 thru 1980, the adjusters are different. Early lifters had three lightening holes drilled in them. If you plan to use late XL lifters, it might appear to be a good idea to drill the three holes in them, too. DON'T do it: The later lifters have much thinner walls, and will break.

K and Sportster cams sort of interchange 54 - 70 except that the rear intake cam won't fit. The K cam gear is narrower, and

the center portion of the gear is cut out somewhat deeper. Forget about pressing the K gear onto the Sportster cam: the K gear and cam are one solid part. With the Sportster cam, everything will work, but the timing cover will not close by about 1/8", and gasket goo won't help you here. Do it this way: Mill about .040" off the face of the bushing in the timing cover, and .040" off the face of the cam bushing flange in the engine case. Now take .060" off the inboard bearing shoulder of the cam. Be sure to remove .125" from the inboard end of the cam or the flywheels will hit it. Set the cam end float .005" to .010".

Now the bad news: Sportster cams have much less lift than K cams. This means your K will run, but not real well.

All this sounds like an extreme pain in the butt, but if you are building a K out of a big basket it may be the only game in town.

If you desire a K timing cover on your Sportster, you will need to find some 1/8" cam shims.

KH cams in a Sportster will give you lots of problems since the KH cams have .175" more lift than the XL cams. A quick way to tell KH cams from Sportster cams is to look at the back of the lobe. K cams are marked K, KK, or KH. Sportster cams are marked XL, P, or PB, and Q for 1980 and later Sportsters.

Sportster and K rear motor mounts will interchange even though the later mounts have only two bolt holes on top.

Later primary covers will fit if you drill and tap the existing bosses (warning: not in all years) in the crankcase casting for 1/4" by 20 fasteners. Some aftermarket covers don't have room for the compensating sprocket; you'll have to run a solid sprocket instead.

Many K parts will not fit KH models. The flywheel/rod/pinion shaft/motor sprocket shaft set will not swap either way, and barrels won't either. The 45" K jugs have only a shallow rod relief at the bottom of the sleeve, while the KH jugs have a much deeper one and a notch to clear the longer stroke. At the least, you'll need a set of 5/16" stroker plates and will have trouble with intake manifold alignment. The crankcases will interchange, but try to use the KH or KHK cases with the transmission access door instead of the 52 - 53 and some 54 cases which were door-less and weaker.

K heads will fit a KK, a KH, or a KHK.

K and KK barrels carry different part numbers, due primarily to different porting.

All kickstarter assemblies and most transmission parts are interchangeable but be sure to use *unmixed* gear sets. There are

several gear sets for K, KH, and KHK models, and the bits don't mix.

The K mainshaft fits 52 - 56 except KH and KHK after engine number 1465. K and KK countershafts will not fit KH and KHK models.

Clutches interchange as do non-compensating motor sprockets 1952 thru 1956. Compensating sprockets only fit 1954 thru 1956.

Tappets 1952 thru 1956 are identical except for 1953 KK and 1956 KHK models which tappets are lightened and are therefore neater.

The Big Flatheads, U, UL, UH, ULH

Again, almost everything fits almost everything else. All 1937 thru 1948 lower ends are interchangeable. Build them with the forked rod to the rear and the plain one to the front. You may have to remove the crankcase mouth plates for rod clearance on very early models.

The 1937, 38, and 39 timing covers have no fins on them, but will bolt to all other years.

On U and UL models (74") the 3 5/16" bore cylinders can be overbored .125" to 3 7/16" as per the UH and ULH, but you are going to have some pretty thin cylinder walls. Instead, when you get to the last 74" oversize, contact Los Angeles Sleeve Co. and buy a sleeve to get the jugs re-sleeved back to the stock 74" bore size so you can start over.

There are two types of telescoping valve spring cover. The early types screwed down to the lifter blocks, while the later types are spring loaded. You must use a screw type valve spring cover with a screw type guide block, and a spring tube with a spring block. No one says you can't have both types on one engine, though.

There are 8! types of cylinder/cylinder head sets. The older type had 7 head bolt holes, and the newer type has 9. Both types come in either iron or alloy, and the 7 bolt heads will not fit the 9 bolt jugs, and vice versa. All four of these possible combinations came in high or low compression. As on 45s, a number stamped on the side of the head indicates the compression ratio. Don't mix compression ratios on the same engine if you can possibly avoid it, even though the difference between 5.0:1 and 5.7:1 isn't very much.

You could run an alloy 7 bolt head/jug set on the front and an alloy 9 bolt head/jug set on the back, and not get into too much trouble. Same as on 45s, run iron-iron or alloy-alloy head sets only, and don't mix compression ratios on the same engine either. This has been done, and it does work, but try to avoid it if you possibly can.

Note that 1936 thru 1939 big flatheads and 61" OHVs used the VL small type crankpin with .250" rollers as standard.

If you desire to swap flywheels from an SV to an OHV engine, or the other way, be advised that the timing marks are in different positions. All Big SV engines time at 11/32" BTDC, and all 61 & 74 OHV engines time at 7/16" BTDC. THIS IS IMPORTANT! Advanced timing burns pistons, and retarded timing loses HP. If you are not sure about the accuracy or appropriateness of your timing marks on a mix-and-match engine, by all means check them out!

Knuckleheads

The first Knucklehead (1936) was a 61" OHV twin. 1936 to 1947 61" models use a stepped crankpin ala the 74" and 80" Flatheads. The 61" heads will fit the 74" cylinders. The combustion chambers are slightly smaller, so you will gain a little in compression ratio. Alas, you will lose this marginal HP boost because the 61" head has smaller, more restrictive ports.

If you want to use the 3 31/32" stroke 74" flywheels with 3 5/16" bore 61" cylinders, you must make a 1/4" thick spacer plate to go under the jugs or the pistons will hit the heads when you try to kick over the engine. Further leaping up and down upon the kick-starter avaieth one not in the least. Make the plates using a base gasket as a pattern. Note that early EL manifolds won't work with these spacer plates.

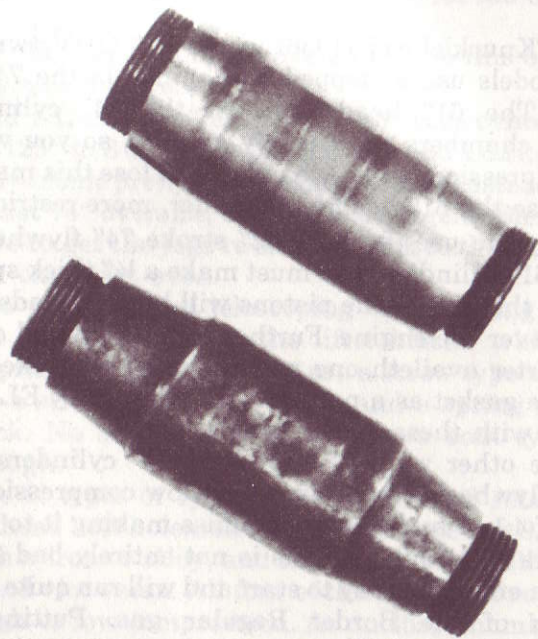
Going the other way, 3 7/16" bore 74" cylinders with 3 1/2" stroke 61" flywheels results in a very low compression ratio on the order of 4:1 or so: The pistons miss making it to the tops of the cylinders by about 1/4". This is not entirely bad since a low compression engine is easy to start and will run quite happily on even South of the Border Regular gas. Putting in high compression pistons will restore your compression ratio to normal. (Huh?)

In the bottom end, Panhead flywheels thru 1954 fit BUT: 61" flywheels are 1/8" smaller in diameter than 74" flywheels. 61"

flywheels in a 74" crankcase may upon occasion require you to build up the oil scraper plate behind the rear cylinder to prevent the rear cylinder from over-oiling.

Old Flatheads and Knuckleheads circa 1940 used no oil control rings. Instead, they have a cast web in the crankcase mouth that clears the rod by about 1/4". You can use these cases with or without an oil control ring piston set. These older engines also had the rods reversed from current practice. The Flatheads to 1939 and the OHVs to 1940 had the forked rod as the front and the plain rod as the rear. Flatheads 1939 and later, and OHVs 1940 and later have the forked rod as the rear rod, and the plain rod as the front rod. Assemble all engines this way.

To reverse your rods, you'll have to trim back about half of the cast in webs in the crankcase mouth, and be very sure to use the proper oil control rings.



*Tapered vs. stepped crank pin
(The reason the tapered pin is shorter is because this one is out of a Sportster)*

Remember the stepped crankpin in the 61" Knuckle and the 74" and 80" Flatheads? The 74" Knuckle uses a tapered crankpin which is much stronger, and can be made to fit with a little machine work on the flywheels. You will need your two old flywheels, a new taper style pin, and a right or left new style flywheel for the machinist to look at so he can tell exactly what you want done to your flywheels (pointing and grunting is insufficient). Obviously, you should try to borrow the taper style flywheel since it only needs to be looked at and will not be modified in any way.

Mention to the machinist that the new crankpin must seat fully in the flywheels (Be polite: He may have done 200 of these last week.) and check that it does when you get it all back. Your old conrods and bearings, if they are good, will work just fine with the new taper style pin.

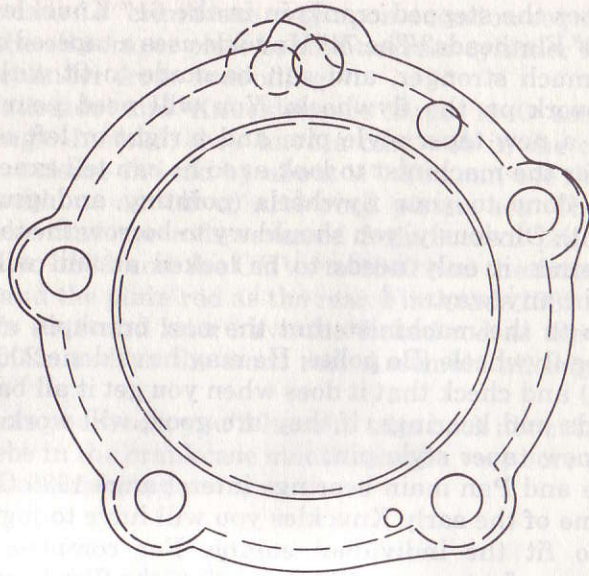
Knuckle and Pan main bearings interchange 1936 thru 1953, but in some of the early Knuckles you will have to juggle some spacers to fit the individual engine. For complete bearing information, refer to pages 132 thru 135 of the 'Panhead Service Manual.'

Early Panhead (1948 thru 1953) timing covers will fit a Knuckle if you unplug the plugged upper oil gallery for the top oil line. Later Panhead and early Shovel (1954 thru 1969) timing covers will fit if you change the pinion shaft bushing to the old pre-54 type and unplug the aforementioned oil line as well. If you are lazy, broke, or don't give a damn (or all three), you could put a tee fitting under the oil pressure sender and take your top end oil from the third leg of the tee. This isn't exactly crude, but it's a reasonable facsimile.

Help For Ailing Knucklehead Cylinders

Replacing Knucklehead cylinders with Panhead cylinders can be done as follows:

1. Get three Pan cylinders: a junk one, and the two that you will use.
2. Saw the top off the bad one right under the top fin. This becomes a pattern. Do not try to use a head gasket for the pattern as this will get you into much trouble.
3. Bolt the pattern to one of the Knuckle heads and make it tight. Four of the five bolts will fit, but the fifth bolt will be out of line by about half its width. Make a note of which one by



Solid line is outline of Pan head gasket. Dotted line is outline of Knuckle head gasket. The bolt that is out of line is at the top of the illustration. The other four bolt holes line up exactly. The two smaller holes (at two and five o'clock) are the oil passages in the Pan jug.

spraying paint through the hole, and then remove the pattern.

4. Using Loctite Kleen and Prime, clean the hole in the head and one head bolt. (Next time don't use quite so much paint to mark the hole.) Make sure the threads in the head and the threads on the bolt are *really* clean or the Loctite won't work. Carefully apply Loctite RED (Stud and Bearing Mount), install and **TIGHTEN!**, **GRUNT!** the head bolt.

5. Do the other head while you are waiting for the Loctite to cure. Don't rush it. Make sure it is fully hard.

6. Saw the bolt off flush with the head surface. **VERY CAREFULLY** file the end of the bolt smooth. Whatever you do, don't mess up the gasket surface! Be careful.

7. Put the pattern back on, using spacers or washers between the bolt heads and the template so that the template can be tightened against the cylinder just as though it were a complete cylinder.

8. On a drill press, **NOT A HAND DRILL**, using the template as a guide, and making sure the head is level, drill a 25/64" hole to the same depth as the other holes.

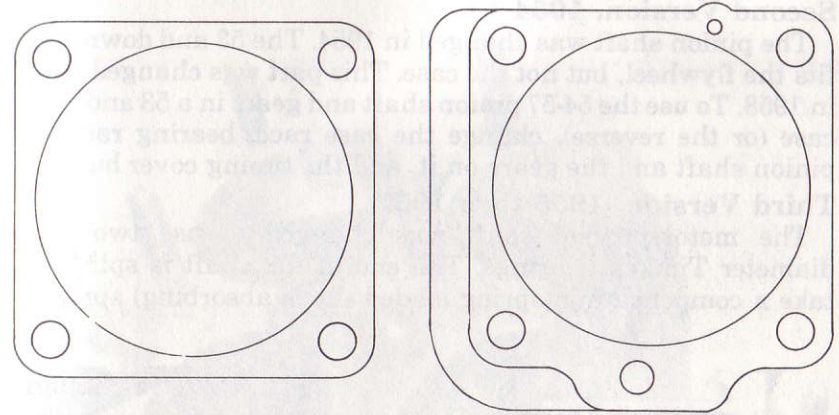
9. Remove the template and tap all the head bolt holes 7/16" x 20 to accept Panhead head bolts since the 7/16" x 24 Knucklehead bolts simply do not exist any more.

10. Return to step 3, and repeat from there for the other head.

11. Scribe the outline of a Knucklehead base gasket on each of your Panhead cylinders, then grind off the excess metal.

12. Take the Panhead cylinders to a machine shop and have the lip on the top milled off. Mention that this is a gasket surface! so the machinist will be extra neat and careful.

13. Assemble, using 3/16" stroker plates since Pan jugs are that much shorter than Knuckle jugs, and ride away!



Base gasket outlines

Knucklehead front and rear are the same (left) and have no oil holes. Panhead base gaskets (right) are different: Large outline is rear, small outline is front. Cylinder stud spacing and crankcase mouth openings are the same on Knuckles and Pans.

If you want to run Panhead or Shovelhead heads and cylinders on your Knuckle, change the lifter stools and do some grinding on the base of the rear cylinder so it will all fit together.

Alas, Knucklehead lower ends will not accept Panhead cams because the rocker arm ratios are different and not adaptable. The ratios are 1 to 1 for Knuckles, 1.65 to 1 for Pans, and 1.5 to 1 for Shovels. All 61" and 74" Knucklehead cams will interchange.

1953 and back timing gears, distributor drive gears, generator drive gears, as well as 1953 and back pinion gears, pinion shafts, and motorsprockets will fit 74" Knuckleheads back to 1941.

Panheads 1948 thru 1965

There are several versions of this engine, so if you are building from a basket you will have to be careful.

First Version, or Early. 1948 thru 1953

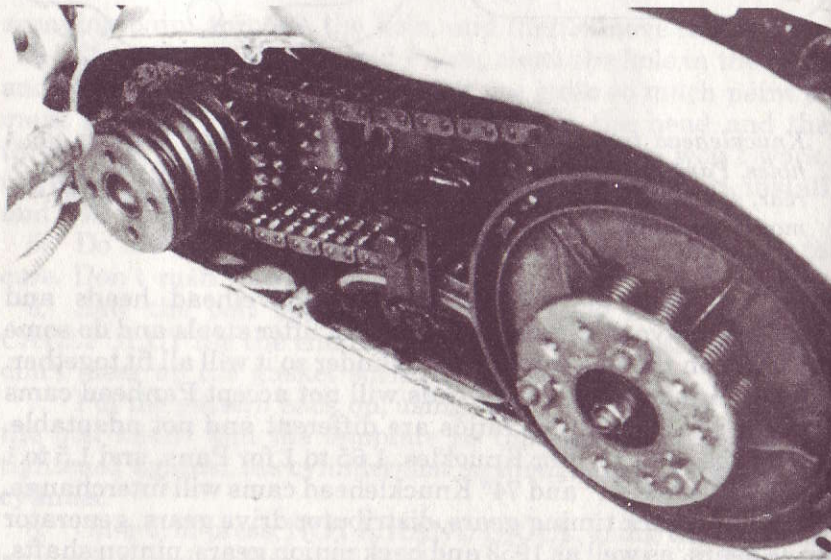
All 61" Panheads are 'Early' since the last one was built in 1953. All 61" and 74" parts can be interchanged. If you want 74" barrels and flywheels on your 61" cases, go to it, but watch your oil scraper plate clearances. (Hi-yo Dremel!)

Second Version. 1954

The pinion shaft was changed in 1954. The 53 and down shaft fits the flywheel, but not the case. This part was changed again in 1958. To use the 54-57 pinion shaft and gears in a 53 and down case (or the reverse), change the case race, bearing race, the pinion shaft and the gears on it, and the timing cover bushing.

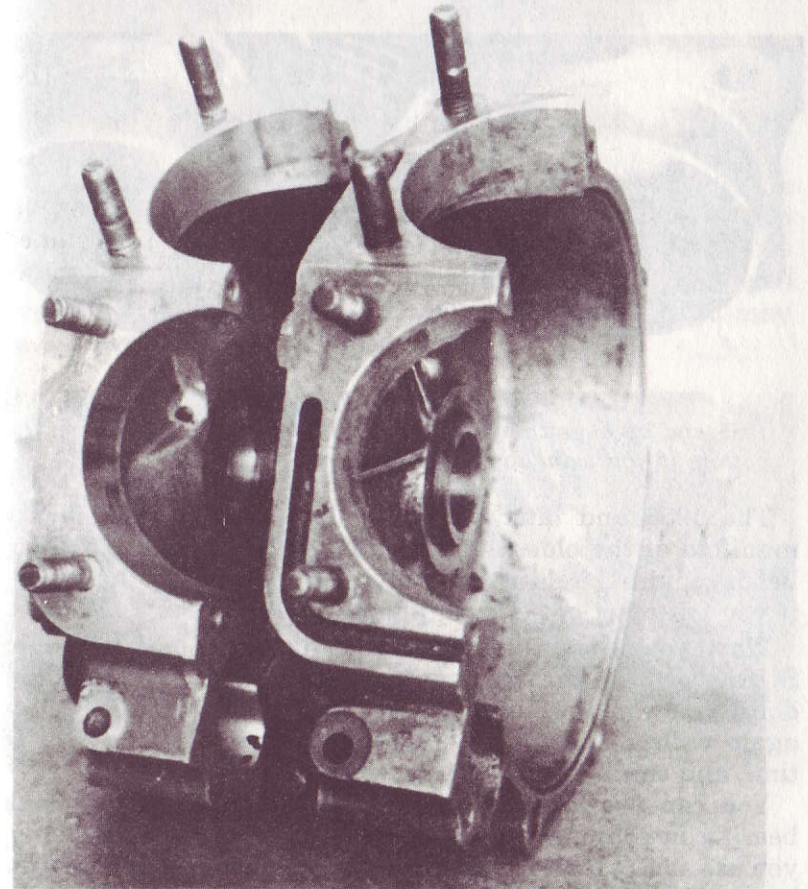
Third Version. 1955 thru 1957

The motorsprocket shaft was changed to use two large diameter Timken bearings. The end of the shaft is splined to take a compensating (spring loaded shock absorbing) sprocket.



Compensating sprocket

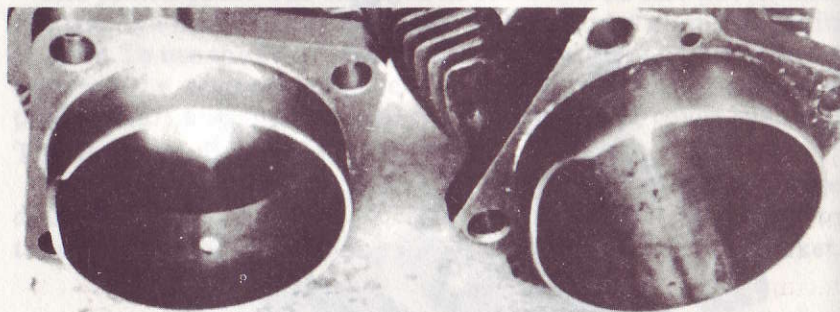
The new shaft's part number is 24001-56. (Old number 24001-30.) Note that the end number is 56 even though the part was introduced in 1955. The reason is that the early 55 shafts used the old taper, and the new ones the new taper, hence the new number in mid-year. The taper at the flywheel end is larger, and the left case is changed to take the larger bearings. You must use the LH flywheel, the new style shaft, and the LH case as a set. This set will fit older engines, but you must modify the oiling system slightly. Engines thru 1954 return the oil from the top end back to the crankcase by draining it through a drilled passage in the cylinder and down through a matching hole in the case.



*Early vs. late cases
1955 and up has no channel on the cylinder base flange*

Engines 1955 and up divert this oil so it sprays the piston skirt through a hole drilled through the inside of the barrel. After the oil sprays the piston skirt it drops into the crankcase. Late jugs on an early case are no problem as the oil returns equally well either way. Early jugs on a late case require you to drill the return hole in the barrel or there will be no oil return from the top end. When you have filled the pan covers with oil at full oil pressure you will then have an oil leak to end them all!

The hole is $\frac{1}{4}$ " in diameter, $1 \frac{5}{32}$ " from the lip of the cylinder to the center of the hole. Drill from the outside of the jug through the vertical oil return passage, and into the bore. Plug the outside hole with a spot of weld or a setscrew, and touch up the bore with a flex-hone or sandpaper.



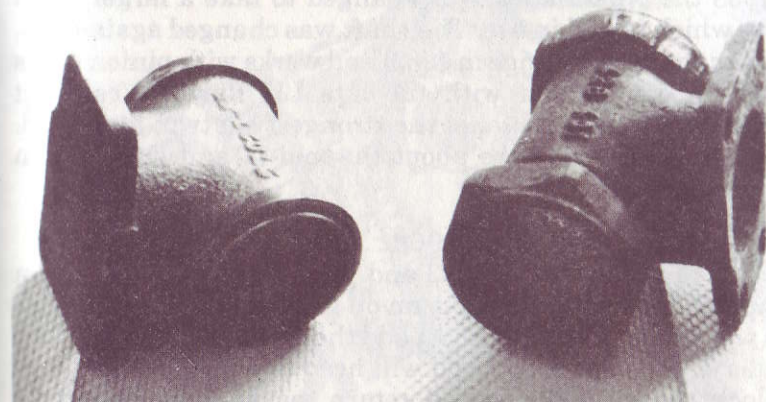
Early vs. late Pan jugs

1955 and up have the hole in the cylinder wall; $15/32$ " from the bottom if you want to drill your own

The 1955 and later models replace the 'plumber's' intake manifold of the older models with the 'O' ring type. Old style heads require the old style manifold, or you can use the new style if you get a set of screw-in adaptors.

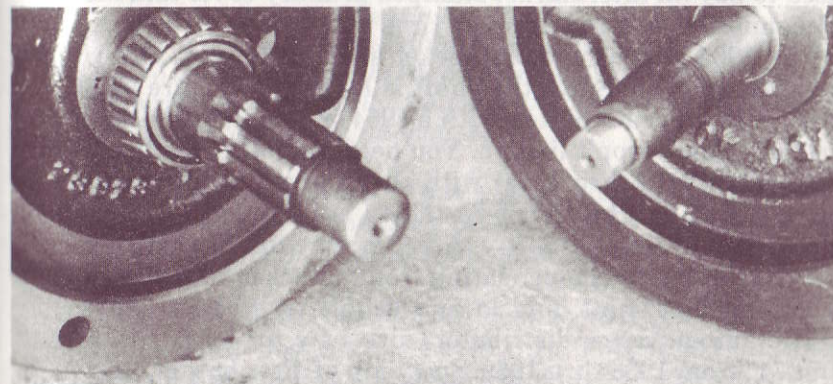
When you are working up a really wild mix-n-match engine, be SURE you have the right gaskets with the right oil holes. If you don't, you won't be oiling correctly and you'll get to do it all over again with a stack of new (\$\$\$) parts. The trick is to take your time and think it through, not just slap it together.

You can use a 55 and later left case with the big Timken bearing in conjunction with a 54 or older right case as long as you use a 55 or later left flywheel. Watch your pinion shaft/main bearing combinations. The 48-53 shaft and bearing is one type, and 54-57 is another. You could use a 48 shaft in a 55 right case,



'Plumber's' vs. 'O' ring inlet manifolds

but be prepared to change case races. All 48 thru 53 LH cases are interchangeable. The LH case/LH flywheel set is identical from 1955 thru 1964, and the LH flywheel itself is the same 1955 thru 1980. Watch this though: The balance factor was changed during 1973 from 50% to 60%. If you mix flywheels, you may have to have the set rebalanced.



Skinny old type motor sprocket shaft vs. fat new type

Fourth Version. 1958 thru 1962

In 1958 the pinion shaft was changed to take a larger main bearing which is still in use. The shaft was changed again in 73, (used thru the taper change in 1982) and works with pinion gears to date. In conjunction with the late LH flywheel/case set introduced in 1955, this makes the strongest big twin lower end. You're going to hear more about the mid-77 and later pinion gears on page 37.

Fifth Version. 1963 thru 1964

Oil feed to the heads on 1963 and 1964 models is through an external oil line which taps into an oil gallery in the case. These heads will fit any Panhead if you add the oil line and tap into the oil gallery. On 48-54 Pans, you will need to use 55 or later jugs OR block the oil *feed*, not oil return, passages in the older cylinders. External oil feed plus internal oil feed is too much of a good thing and won't work.

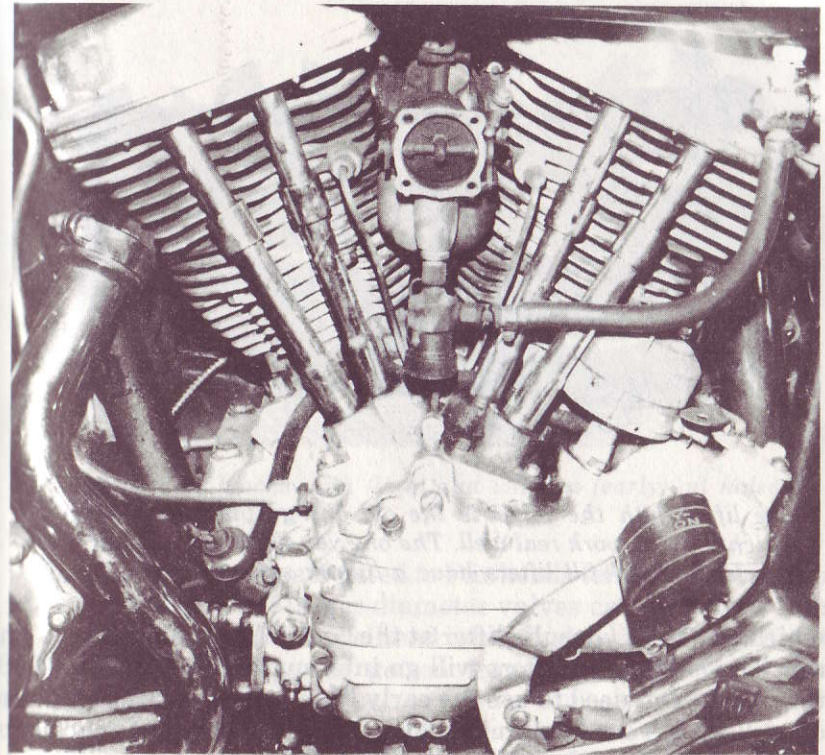
Sixth and Last Version. 1965

The 1965 Electra-Glide (electric start) got a modified left case and a modified primary cover. Primary covers interchange in the following year groups: 1935 thru 1954, 1955 thru 1964, and 1965 thru 1980. If you have a 55 or later left case you can use it with a 65 and up right case. The 65 and up primary cover will not fit, though. If you are running a 65 and up transmission you need to buy an aftermarket stamped primary cover and install a transmission bearing support ring.

The 1965 and up motorsprocket shaft is longer, and is part number 24001-65. Since the shaft is longer, if you are using the later shaft in combination with a 1964 or older transmission, the primary chain won't line up. You need to replace the mainshaft #35040-50 (1930 thru 1964) with the slightly longer mainshaft having part number 35039-65. There is yet a longer mainshaft which you will meet shortly. A better way to solve this problem is to mount a non-compensating front sprocket *backward* on the motorsprocket shaft, and lo and behold, everything lines up!

The auto-advance distributor, also new for 1965, fits all 61" and 74" from 1936 thru 1969. Speaking of distributors, from 1958 thru 1964 a dual point-dual coil setup was used. This allowed more accuracy in setting the timing, but is a case of technological overkill. The engine simply does not rev high enough to need this sort of finesse. Switch to the single point-single coil setup. What you don't have can't break.

Cams fit 48 thru 69 and can be identified by a mark on the



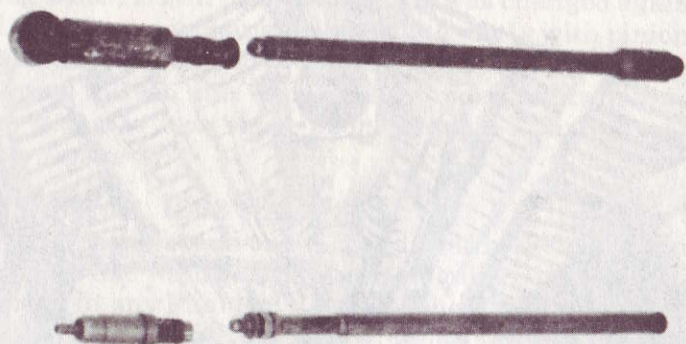
Outside Oiler Pan — Timing side

The oil fitting directly between the lifter stools supplies oil to the heads. To use outside oiler heads on older engines, run the oil line to the heads from the same location as the Knucklehead oil line tap-off in the top picture on page 9.

front cam lobe. No mark (That's your thumbprint, Gomer!) means FL, a small 'H' means FLH, and a '61' means EL. The progression is EL, FL, FLH from mild to wild (or less mild, anyway).

A 65 thru 69 timing cover will fit back to 48 if you also change the pinion shaft bushing to the 48 thru 53 type. 63 and later timing covers are finless. Make sure that no oil holes are covered or plugged by either the cover or the gasket during this operation.

The 48 thru 54 valve lifters were solid and the pushrods had a hydraulic lifter unit at the top. This did not work real well: Oil will not run uphill, but has to be pumped there, under protest. In 1955, Harley-Davidson switched to a more conventional type



The lifter with the roller is the old anti-gravity oiling system which did not work real well. The one you want is the other one. The latest quick-fill lifters have a lighter spring.

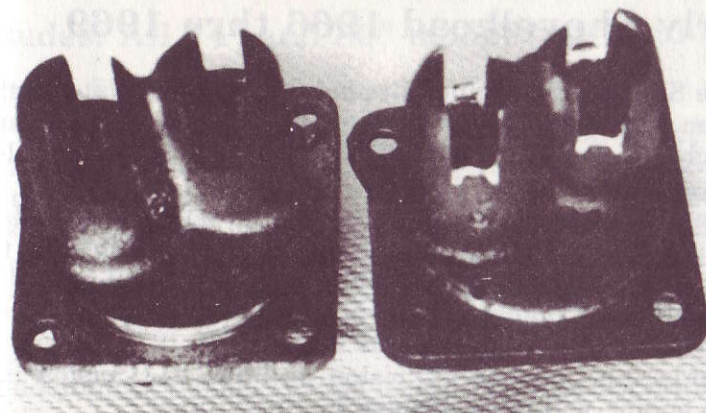
which has the hydraulic lifter at the bottom, and which is still in use. The early solid lifters will go into any 61" or 74" from 1948 thru 1980. You need to use the early lifter guide block or plug the oil gallery in your later guide blocks. The best way to do this is to tap the holes and Loctite in an 8-32 Allen set screw.

Working the other way, late hydraulic lifters can be used in an early engine if you use the late guide blocks AND drill the extra oil feed holes in the case. After all, hydraulic lifters gotta have oil to work, you know.

There are four types of lifter guide block screws. Three of them are 1/4" x 24 thread, and one is 1/4" x 20 thread. #1 is an Allen screw. Don't use it: It results in broken guide blocks. #2 is a taper base 6 point, and #3 is a taper base 12 point. These are OK thru 1976. 1977 gets the 1/4" x 20 thread per inch flat base screw, which is also a 12 point. Be sure you know which thread you've got lest you strip out the holes in the crankcase.

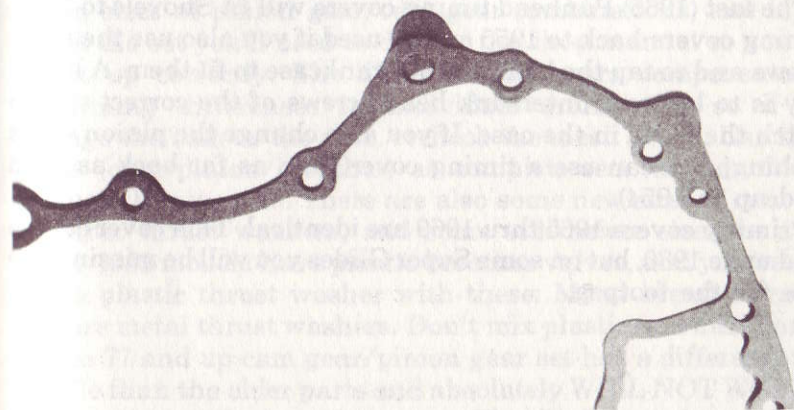
Late 76 and on guide blocks use an 'O' ring seal instead of a cork ring. You'll need the matching lower pushrod tube cover, and if you'd like an 'O' ring on top, too, get the upper pushrod tube cover in the new style as well. Note that you can use cork seals on an 'O' ring tube, but the 'O' rings won't work on a cork seal tube.

Valves in all Panheads are the same size (1 3/4") but valve springs differ in that FLH springs are much stiffer.



Lifter guide blocks with (late) and without (early) oil holes

The bronze valve seats fitted to Panheads tend to go away in a hurry. 1/16" and 1/8" larger diameter valves can be gotten from Harley, or you can fit Shovelhead intake valves. If you want new valve seats, they can be gotten from and fitted by various aftermarket suppliers.



Note the difference between a 48-62 Panhead timing cover gasket with the hump, and the 63-65 Outside Oiler Panhead timing cover gasket with the hole! Minor, but important!

Early Shovelhead 1966 thru 1969

The Shovelhead engine introduced in 1966 is a late Panhead bottom end with a new style top end. The heads and cylinders interchange from 1966 thru 1979, and all 66 thru 69 Shovel lower end parts fit all other 66 thru 69 Shovels.

You should know that the 1966 heads do NOT have larger ports or valves than later years, so don't pay extra for these parts at the swap meet. (Another good story shot to hell.)

1966 thru 69 Shovels have the same bore and stroke as 74" engines back to 1941. Pistons fit 1948 to 1973 and reverse, remembering that one FL piston and one FLH piston in the same engine will make for one unhappy tuner.

Shovel and Pan exhaust valves are the same size, but Shovel intake valves are 1 15/16" versus 1 3/4" for the Pan intake valve. This means that Shovel exhaust valves will fit a Pan, but the later intake valves will not. Valve guides are unchanged 1948 thru 1979.

Valve springs, keepers, and collars are the same from 1948 thru 1969. Don't use old, used springs. They get tired, and the valve float point comes down drastically. They're cheap. Buy new ones.

Cams interchange 1948 thru 1969.

The last (1965) Panhead timing covers will fit Shovels to 1969. Timing covers back to 1955 can be used if you also use the early screws and re-tap the holes in the crankcase to fit them. A better way is to locate countersunk head screws of the correct size to match the holes in the case. If you also change the pinion shaft bushing, you can use a timing cover from as far back as 1936 (and up to 1954).

Primary covers 1965 thru 1969 are identical. This cover can be used up to 1980, but on some Super Glides you will be missing the hole for the footpeg.

Alternator, or Late Shovelhead

Includes: All 74" and 80" models, 1970 to date

Bottom End

In 1970, the change from the D.C. generator to the A.C. generator (incorrectly called an alternator, but everyone including Harley-D. does it) required major changes to the crankcases, although most internal parts were left unchanged. If you have a pre-70 Hog and just gotta have an alternator, talk to Cal Products about their Alternator Knucklehead crankcase half: Not cheap, but worth it. For smaller budgets, see the electrical section for an out.

In addition to the big change in 1970, many other lower end parts have been changed in various subtle and devious ways, so the statement 'Yeah, this fits a Shovel' is no guarantee that it will fit *your* Shovel.

The pinion shaft fits 1958 thru 1972, and 1973 thru 1982 (Tapers changed in 1982. See below). 1958 thru 1969 pinion gears sport two timing marks, while later gears sometimes have only one. To use early gears in a late case, use the mark that lines up with the cam timing mark, and ignore the other one.

In late 77, the cam/cam gear/pinion gear/breather gear/breather valve setup was changed. The pinion gear is now matched by mesh depth to the cam gear. There are seven color coded sizes of pinion gear/cam gear combinations, and if you break the set you'll need to dig out the shop manual so you can set it up correctly. The different size gears compensate for machining differences in individual crankcases, so if you change the cam or the case, recheck the mesh depth. Use these parts (cam/pinion/breather) as complete sets, and don't mix early with late parts. There are also some new sizes of cam and breather thrust washers, and some still newer sizes for 1982. Some 1982 models have plastic breather valves, and you have to use a plastic thrust washer with these. Metal breather valves require metal thrust washers. Don't mix plastic and metal parts.

The 77 and up cam gear/pinion gear set has a different tooth profile than the older parts and absolutely WILL NOT WORK in conjunction with the older gears. They'll fit together, but will grind themselves to junk in about a week, filling your engine with metal chips. You can identify the new parts by looking for a machined groove on the outside face of the cam gear (25523-77),

and by the narrower gear teeth on the pinion gear (24010-77), which are about half the width of the teeth on the 24010-54 gear it replaces.

Try not to use INA cam bearings. They've got problems.

Flywheels will fit 1955 thru 1981, but since the balance factor was changed in 1973 from 50% to 60%, you cannot use a 1966 RH flywheel with a 1975 LH flywheel unless you have the set rebalanced. This, by the way, is no big deal.

For 1982, the flywheels, crank pin, pinion shaft, and motor sprocket shaft got their tapers changed in an effort to commonize (their description) machining requirements. Old taper and new taper parts *will not work* together without machine work, so don't even try. Make very sure that what you've got and what you're getting are really the same, unless you feel like swapping the whole expensive assembly or have a real good deal on idle lathe time.

In 1973, the big ends of the rods got a larger and healthier roller bearing which uses an aluminum cage and somewhat shorter rollers than the old bearing. It replaces the earlier big end bearing on all older engines if you use the whole device, and don't try to mix any new and old parts.

If you're building an engine, use a one-oil-hole crankpin. The three-oil-hole pin over-oils the bearings, and they skid instead of rolling, especially if you're using very heavy oil like SAE 70. Yes, you can have too much oil! Exception: If you're building a hot-rod engine and the instructions with the rod set (or whatever) say to use a different part, *do it their way!* These people have blown up lots of engines and spent lots of money determining exactly what works with their individual collection of parts. When all else fails, read the instructions.

The motorsprocket shaft in 1970-71 models is #24001-70. After 1971, it is 24001-72, and the taper and the nut inside the flywheel are larger. (Also see 1982 taper change, above.) Both are used with the same main bearing and in conjunction with the 34037-70 transmission mainshaft (chain alignment, remember?).

Pistons and Cylinders

On 1/1/78 the big twin cylinder castings were changed so that both the 74" and the 80" could use the same basic casting. (The 80" cylinder just has a bigger hole in it.) The base flange is thicker, so you'll need longer studs and the factory supplied new type triangular base washers (install them with the 'up'

markings up) to put these jugs on older models.

In 1981, the 74" engine was discontinued, so all new big twins are now 80". 1982 big twins have a pair of short rubber hoses between the lifter blocks and the cylinder bases. These provide a way to keep the top ends dried out, and reduce excessive oil consumption sometimes encountered on late model big twins. To use these parts on earlier engines, simply block off the applicable holes. 1983 cylinders don't use these any more: The oil pressures and distributions in the engine have been changed, eliminating the need for the hoses and fittings. If your engine has these fittings, be sure that the front elbow (or block-off plug) has not been screwed in so far that it will be struck by the rapidly descending piston skirt. Ouch! Harley sells a little spacer that fits under the elbow to guard against this. Another way to get in trouble here is to screw the elbow in with the piston at BDC or thereabouts. This will lock up the engine quite nicely, damaging the piston in the process. Trying to start the engine by kicking, electric start, or even run-and-jumping will be remarkably unproductive and frustrating.

1973 saw spiral lock wrist pin retainers for the big twin. Also, the connecting rods were shortened by .030", which required that the wrist pin be relocated a like amount for 1973 and later pistons. These pistons will be marked with a -73 suffix part number stamped into the crown. Old pistons in a late engine will give you low compression, but if you put new pistons on an old engine, (more likely) they will give higher compression, and may strike the valves. Check piston to valve clearance with the valve (do all four) fully open. You want at least .040", and more is better. Also check the piston skirt to flywheel clearance.

1977 brought us the snap ring wrist pin lock pistons in the FL and XL. They are stamped '7' or '77' on the crown or have a cast in '77' inside the skirt. You can use a spiral lock in any piston that originally used a 'C' clip, but don't use a snap ring in an older piston since the groove is a touch too narrow.

From 1980, a set of 7.25:1 pistons for the 80" models is available. This is a blessing in these days of poor quality, expensive gasoline. The pin has been raised .030", and the crown lowered .055". Identify these pistons by their very smooth crown.

Cylinder Heads

1966 thru 1979 cylinder heads are virtually unchanged and can be interchanged without comment. In 1980, cast iron valve

guides were introduced, replacing the steel guides used from 1948 thru 1979. The first (now obsolete) type of cast iron guides are 1 19/32" long by 5/8" in diameter. You can use heads with these guides on earlier models if you fit a set (four) of 18222-79 lower valve spring seats. In 1981, a new type of cast iron valve guide was fitted, still 5/8" diameter, but about 2" long. These are far superior to the shorter cast iron guides. In addition, these come with valve guide seals: Highly recommended. The seals require a new, thinner valve collar for operating clearance. (Guess what happens if you try to use a thick collar with valve seals?)

You can get special guides from H-D which allow you to use valve guide seals in older engines. The lower ends of the guides fit the old heads, while the tops of the guides fit the new seals. Warning: Attempting to install the seals without using the special guide tool (comes in the kit) will destroy them. If you're only doing one engine, let your dealer do it.

More complexity: The old steel guides are quite hard, and require valves with comparatively soft stems. The new cast iron guides are softer, and require harder valve stems. The penalty for mixing incompatible parts is severe and rapid wear. Valves for use in cast iron guides have either a hard chrome or a black stem. These valves, by the way, are made by Eaton (U.S.A.) or Nittan (J*p*n!). Valves for use in steel guides are just plain old valves, and the stem is the same color as the back of the head.

The current recommended clearances for cast iron guides are:

No seals: (not advised)

Inlet: .0025" to .0035" Exhaust: .0035" to .0045"

With seals:

Inlet: .0009" to .0026" Exhaust: .0014" to .0031"

The current recommended clearances for aftermarket bronze guides, on which you can't use seals anyway, are .001" to .003". You won't have to worry about sticking valves, but these guides do wear out a little faster than cast iron ones.

There is a new type of valve spring set for FL models, and it fits older models. It is paint coded with orange, yellow, or red, and you may not mix new springs with old springs coded silver or white. Inner and outer must be used as a matched set.

There are now three types of head gasket. The best (and newest) is made of a material called 'Cling-rite 1000' which works quite well and should be used if at all possible. Second choice is the blue teflon gasket. Don't use the old nubby grey gasket unless you're building a rat bike and want to install oil

leaks from the start.

To improve frame clearance, 1980 and later heads have one short stud. Early rocker boxes on late heads (or reverse) will require you to change this stud.

1981 models have a new carburetor which promises less smog, and probably less horsepower. Actually, it's the 1980 carburetor with a shorter idle mixture screw with a plug over it (top of the carb, same as last year) to keep us from poisoning the air by our non-EPA approved attempts to make our motorcycles run better. If you think we are suggesting that you remove the plug (no big trick) and adjust the idle properly, why shame on you!

H-D is offering a performance carb kit which fits 1975 thru early 1978 models with the 3 1/2 gallon gas tank. It's #27154-78.

Oil Pump Notes

Up to 1980, there were five big twin oil pumps; 48 thru 67, 68 thru 72, early 73, mid 73, and late 73 thru 1980. The early pumps will work on any pre-73 engine, and any of the three 73 pumps will work on any big twin 1973 thru 1980. DON'T cross the line, though. You will be very sorry, and much poorer.

To identify the pumps, hold them with the screw cap tower facing up, and the gasket surface facing you. Examine the slightly curved oil passage at the top left.

The 72 pump has a small hole at the bottom, and a round hole at the top.

The early 73 pump has no hole at the bottom, and an oval hole slightly down from the top.

The mid 73 pump has a domed cap instead of a flat one.

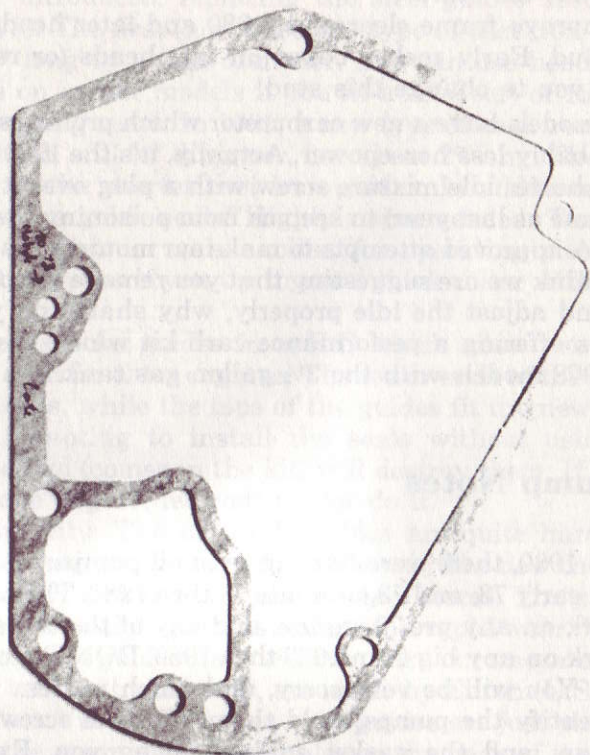
The late 73 pump has a flat cap again, and a single hole in the middle of the passageway.

You MUST check the gaskets, ALL the oil holes, and the torque specs VERY carefully if you remove, replace, or swap oil pumps.

The oil pump driveshaft keys, pump drive gear, and pump snap rings are unchanged 1948 thru 1980. The pump body and the pump gears were changed in 1968, and again in 1972.

1980 Classic oil pumps are painted black, but are otherwise unchanged.

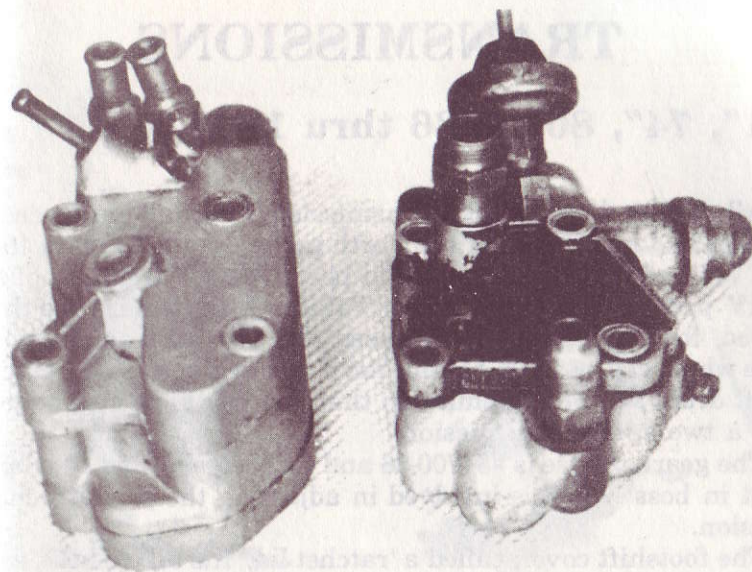
Just to keep us on our toes (or maybe to keep us guessing), in 1981, there were several small but significant changes made in



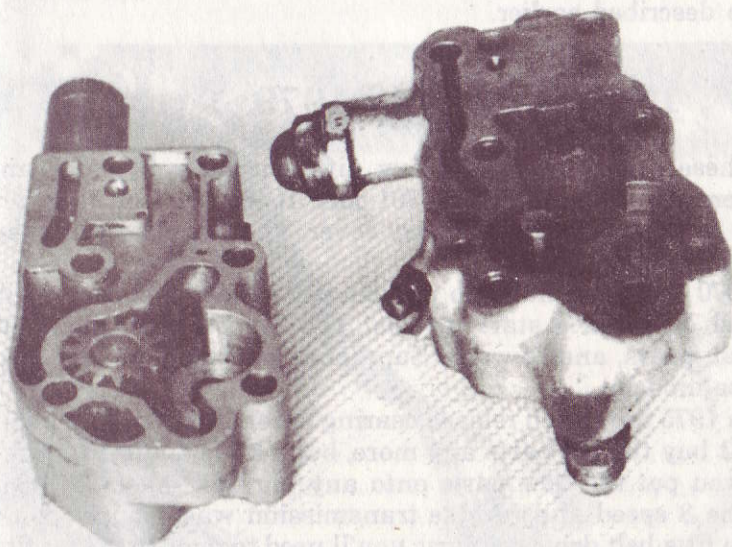
Shovel timing cover gasket 70-72 has no center hole in the group of three. This is a 73 and up gasket.

● **WARNING!!** 70-72 timing covers will not interchange with 73-up timing covers!! If you do, you will have no oil to the rods. This will make you **VERY** unhappy. ●

the oil pumps on some of the newer models. In general, use the 1981 pump on 1981 models, and the (correct) older pump on older models. the change appears to be in the pump body and gaskets. If you have a 1981 oil pump that you **must** use on a 1980 or earlier model, buy a 26222-73 pump body, and transfer all your 1981 pump internal parts to it. There is also a crankcase conversion lurking in the expensive, dark corners of your dealer's parts book, so be warned. These changes apply primarily to the FLH-80, Classic, FXB, FXS, and FXWG models (and FXR in 1982), so please be careful if you start switching oil pumps.



*Early and Late oil pumps
The aluminum pump is the late one;
the cast iron pump is the old style.*



TRANSMISSIONS

61", 74", 80" 1936 thru 1964

All 61" and 74" OHV transmission internal parts, cases, shifter and kick cover, and so forth interchange 1936 thru 1964. All 74" and 80" SV transmission bits do also, but not all of the OHV parts will fit SV models. Take note that there are three speed, four speed, and three speed plus reverse transmissions. The whole gearbox is a bolt-in, but if you do not have the correct shift drum for the transmission that you just built up, you may get a two speed transmission.

The gearbox case is #34700-36 and can be identified by a large cast in boss which is involved in adjusting the primary chain tension.

The footshift cover, called a 'ratchet lid,' fits all of these, even though it came out in 1952.

The original mainshaft is #35040-50, and fits from 1941 thru 1964. If you use a 1965 thru 69 engine with this transmission, you will need to install mainshaft #35039-65, or use the reversed sprocket trick described earlier. If you use a 1970 or later engine, you need mainshaft #34037-70, and the add on bearing plate, also described earlier.

74", 1965 thru Late 1979

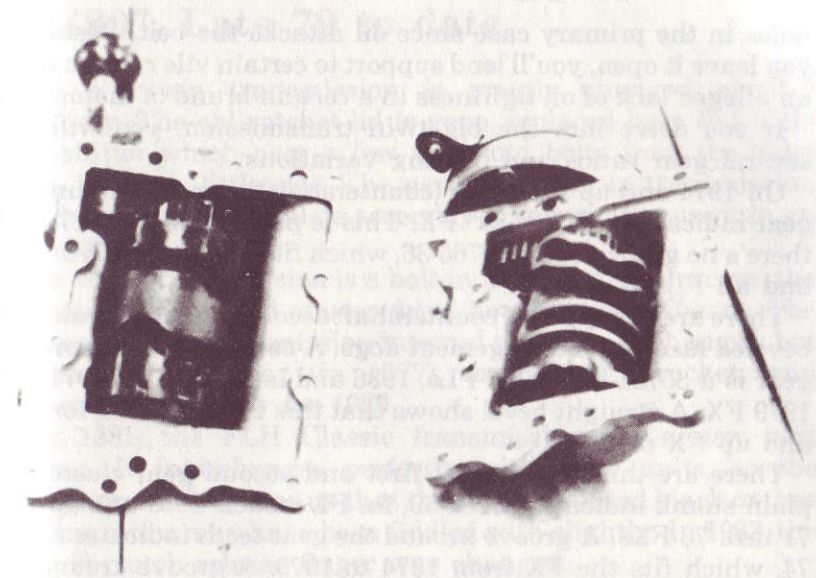
These gearboxes use a few different internal parts and a different case which is #34701-65A. It has cast on tabs which bolt to the cast inner primary cover. The mainshaft discussion above applies.

1970 and later have no provision for the kickstarter gears or pedal on electric start models. You'll need older style parts: pedal, gears, and cover, or Superglide parts to add kick start to these models.

In 1975 the clutch release bearing assembly was changed. You can't buy the old parts any more, but a kit is available that will let you put the new parts onto any big twin back to 1936.

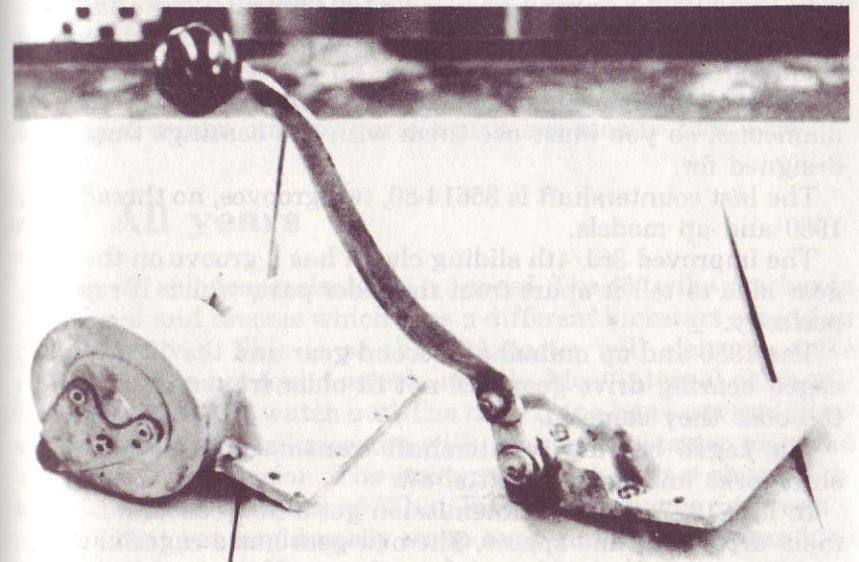
The 3 speed and reverse transmission was dropped 1/1/78.

To fit a belt drive primary, you'll need to remove the tee fitting in the oil pressure line between the case and tank, and plug the



Ratchet lid (R)

The lid with the hand shift knob has the old type shift drum which interchanges perfectly with the other, new type. Hand shift trans cover on left.



Ratchet lid (L) vs hand shift cover (R)

TRANSMISSIONS

holes in the primary case since oil attacks the belt. Besides, if you leave it open, you'll lend support to certain vile rumors about an alleged lack of oil tightness in a certain brand of motorcycle.

If you delve into the big twin transmission, you will find several gear ratios and bearing variations.

On 1974 and up first gear (countershaft), a groove around the gear indicates a 74" or 80" FX. This is part number 35717-74. If there's no groove, it's a 35765-36, which fits 71 thru 73 FX models and all FLs.

There are two types of countershaft second gears. Examine the beveled face of the engagement dogs. A curved bevel means this gear is a 35751-36, for all FLs, 1936 and later, and the 1971 thru 1979 FX. A straight bevel shows that this is a 35751-79, for 1980 and up FX models.

There are three mainshaft first and second gear clusters. A plain shank indicates 35282-59, for FL models 1959 and up, and 71 thru 73 FXs. A groove around the gear teeth indicates 35282-74, which fits the FX from 1974 to 1979. A groove around the shank indicates 35282-79, for 1980 and up FX models.

Since things invariably happen in threes, let's talk about the three countershafts. The oldest one is 35614-65 which has threads on one end and a groove on the other. It is used with 44 loose roller bearings on 1977 and earlier models.

In early 1977 a number of caged needle bearings were added to replace the fall-apart loose bearing collection. The caged-bearing countershaft (35614-76) has a groove on both ends in addition to the threads on one end. There is .006" difference between shaft diameters, so you must use them with the bearings they were designed for.

The last countershaft is 35614-80, two grooves, no threads, for 1980 and up models.

The improved 3rd/4th sliding clutch has a groove on the high gear side to tell it apart from the older part, which it replaces perfectly.

The 1980 and up mainshaft second gear and the 1977 and up caged bearing drive gear will not fit older transmissions than the ones they came in.

The caged bearing countershaft transmission also got new shift forks and a new shift shaft.

In late 1977, the 74" transmission got a new case, and a new main drive gear and spacer. The new gear has a caged bearing, and the spacer is not keyed on.

74"/80", Late 79 to date

The big twin transmission is greatly changed about - outwardly. The old ratchet lid is gone, replaced by a flat plate style shifter which uses a few nuts and bolts from the older setup, but very little else. The new 1979 and up transmission must be used as a complete assembly if you want to use it in an older bike.

The whole transmission is a bolt-in, even though the case, the shift mechanism, and starter drive housing are different. The vast majority of transmission internal parts are unchanged, but the main drive gear (in 1977), mainshaft sprocket, and countershaft are new for 1980.

For 1981, the FLH Classic transmission got a new part number. It interchanges perfectly with older units, so the number probably warns us that the case is painted black or that the gear ratios may have been fiddled with slightly. In 1983, the (ready?) clutch release finger was changed.

The conversion to belt drive on later models is simple, but there is one caution. The belt drive inner and outer primary covers have different part numbers than their chain drive counterparts, but the prices and the pictures in the parts books are the same. This means that you *may* be able to reuse the old primary covers instead of buying new ones, but you might have to modify them slightly first. Check all the clearances around the belt and sprockets before you nail it shut and roar off. This way, you'll only need to buy the belt, both sprockets, and a bunch of minor interior parts which are mostly hardware.

45" All years

The 45" solo transmission is a 3 speed. The 45" trike gearbox is a 3 speed and reverse which uses a different kickstart extension and sidecover. This is so the kickstarter will clear the trike frame, and is not found on solo models. Most internal parts will interchange BUT watch out! The trike trans has a reverse gear!

1964 and later trikes came with an electric starter mounted atop the transmission. The starter drives the outer clutch hub.

In previous editions of What Fits What, it was incorrectly stated that you could easily swap back and forth between kick and electric start. You can't, and we apologize for any problems we may have caused on this.

FRAMES

Rigid Frames thru 1948 Knucklehead and Flathead

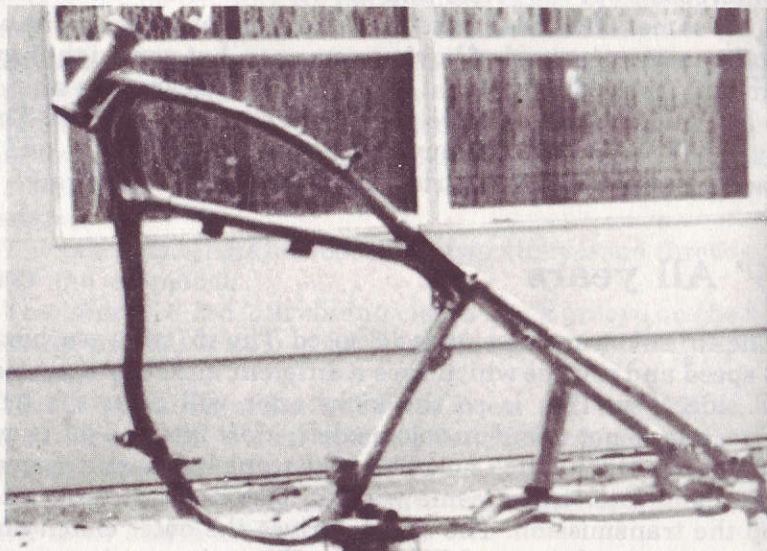
The Knucklehead frame has straight front down tubes, a straight top motor mount, and no fork lock on the steering neck. Flathead frames are virtually identical.

All 1936 thru 1947 61" and 74" Knuckleheads will fit this frame. All 1937 thru 1948 74" and 80" Flatheads will fit with a slight modification to the top motor mount.

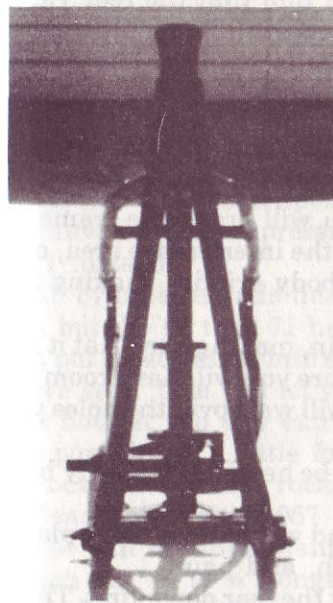
Pan and Shovel engines will not fit unless the top tube and seat post tube are notched about 1/4" for clearance.

This is a torch, hammer, and welder operation. If you try to bend these frames cold, you will break something and then you will be VERY upset.

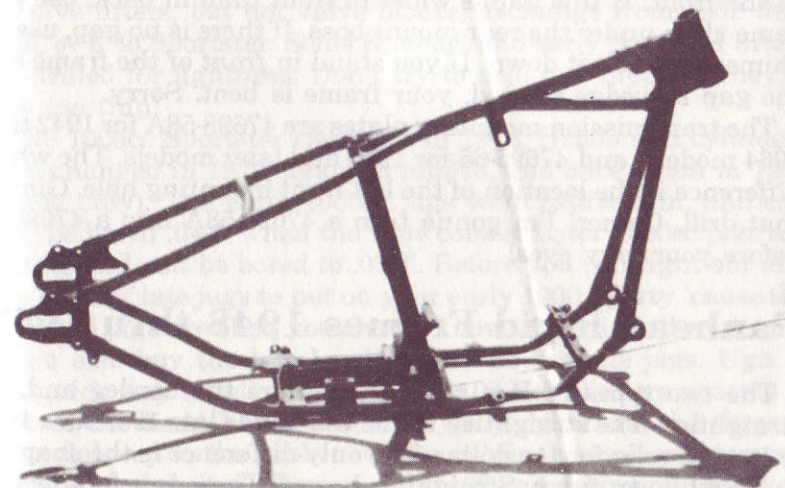
Lay the frame on its side and place the engine in it. The areas of interference will be close to the junction of the top tube and the



This is a VL frame, which is almost identical to a 45" frame



*Knucklehead frame
Front view*



Knucklehead frame

seat post tube. On Panheads you will find that the rear valve cover hits at the top rear and that the 'D' ring hits a little lower down. You will get corresponding results with a Shovelhead. Chalk the areas of interference, and remove the engine. You will need a friend: They're heavy.

For a quick and dirty job, heat the interference areas cherry red and SLOWLY tap them back with a big hammer. If you get hasty or are cheap with the heat you will crack the frame.

To do it right, cut out (torch) 2/3 of the interference area, and clean up the remaining third with a body grinder, making the edges smooth.

Check this by trying the engine again, making sure that it fits flat on the mounts and also making sure you will have room for the 1/4" or 3/16" steel cover plates you will weld over the holes you have cut in the frame.

Note that the top motor mount must be heated and slowly bent to the correct position.

Pull the engine again, then make and weld in the cover plates for the holes. Grind the welds smooth, and paint.

When you bolt the engine down, bolt the rear down first. Then, standing (or kneeling) *beside* the frame, look at the front mount. See if there is a gap between the engine mount boss and the frame. If the gap is parallel, use an engine case shim #24795-48 in the front. If this gap is wider in front than in back, use this same shim under the rear mount boss. If there is no gap, use no shims: Just bolt it down. If you stand in *front* of the frame and the gap is wedge shaped, your frame is bent. Sorry.

The transmission mounting plates are 47698-58A for 1942 thru 1964 models, and 47695-65 for 1965 and later models. The whole difference is the location of the left front mounting hole. Gimme that drill, Gomer! I'm gonna turn a 47698-58A into a 47695-65 before your very eyes!

Panhead Rigid Frames 1948 thru 1957

The two types of Pan rigid frames are the bowleg and the straightleg. The straightleg frame was made late 1955 thru 1957 only, and sells for top dollar. The only difference is the shape of the front down tubes: Straight or bowed. There is a fork lock in the steering neck of these frames. All 61", 74", and 80" engines, OHV, side valve, no valve, Pans, Knuckles, Shovels, you name it, will fit these frames with no other changes than slight modifications to the curved top motor mount.

Sportster

Top End

All 1957 thru 1971 Sportsters are 3" bore and 3 13/16" stroke. All have a 9.0:1 compression ratio except the 1957 XL which had 7.5:1 instead.

All cylinder barrels interchange 1957 thru 1971. All heads do too, but the 69 thru 71 heads have 1 15/16" intake valves. You can put these valves into an older head by cutting a larger intake valve seat. This will let you save an otherwise puked head, but will not get you any extra horsepower unless you also enlarge the port throat a little for better gas-air mixture flow.

Rocker boxes and rocker arms interchange 1957 to date.

Head bolts from 1957 thru mid-73 are 9/16" hex six point. These will not interchange with the later 7/16" 12 point bolts, which are 1/2" to 3/4" longer, even though the shank diameter is unchanged at 7/16".

Pushrods are unchanged 1957 to date, and the pushrod tubes are unchanged 1957 thru mid-79, when the Sportster also got the 'O' ring seals and their new type pushrod tubes.

Valve lifters, but not valve blocks, exchange from 1952 thru 1983, or K to Sportster. Some K model and early Sportster lifters are drilled for lightness. Don't try to drill late tappets: They're way too thin!

The 1000cc Sportster came out in 1972. Heads and cylinders were changed in 1972, again in mid-73, and once again in 1980 (heads only). The early 1000cc jugs were rather thin, and can only be bored .040" when the time comes. Later 1000cc jugs are thicker and can be bored to .070". Before you run right out and buy a set of late jugs to put on your early 1000 Sporty 'cause the thin wall jugs are shot, you should know that this will work only if you also buy the late heads to match the late jugs. Ugh.

A quick way to tell early and late 1000cc cylinders apart is to look at the head bolt threads. In early cylinders, the threads come right up to the gasket surface, while they are countersunk about 1/2" on late jugs. The latest (late 82 and on) cylinders have a number of fine grooves on the gasket surface. H-D calls this a 'phonograph' finish, and it is normal and O.K.

There is no way that the four head and jug combinations, 900, early 1000, mid, and late 1000, can be combined to make a 1000

out of your 900. The bolt spacing is ever-so-slightly (but sufficiently) different to prohibit this particular setup.

There were some new head/rocker box combinations for 1980, but the set will bolt onto Sportsters after mid-73 with no problems, as long as you also use the late valve guides and the thinner upper valve collar and lower valve spring seat.

There are two types of rocker shaft caps. One has an allen drive (late), and the other has a screwdriver slot drive (early). They won't interchange because the threads are different.

Late rocker shafts, which are better, are one piece with the collar, while the earlier shafts have a separate collar. You can swap shafts, and *then* you can swap shaft caps, as long as the set matches.

In 1977 all twins got new style pistons which use circlips instead of spiral locks to retain the wrist pin. The new pistons are stamped '7' or '77' on the crown, or have '77' cast in under the skirt. You can use spiral locks on old or new pistons, but the circlip works properly **ONLY** on the new ones. It has a curved face and a flat face, and should be installed with the flat face out and the gap at 6 or 12 o'clock, or it will probably come out. (What's your engine worth?)

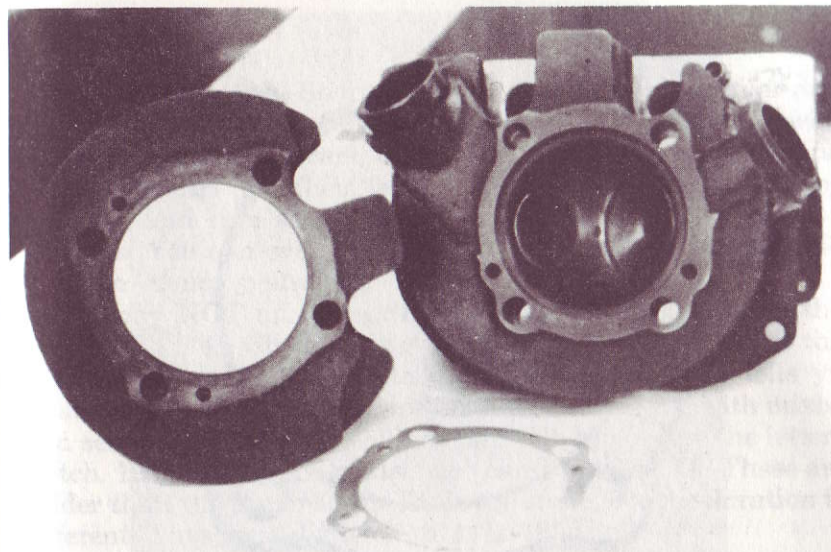
The 1982 XL uses lower compression (about 8.0:1) pistons and a new, thicker head gasket. The new gasket is .043" thick, and can replace the old .016" thick gasket (back to 1974) if you also use extra pushrod tube washers as required. Later editions of the thin 1000cc head gaskets have elongated oil holes for better register.

Clearances for H-D cast pistons are now .003" to .004", with a .007" wear limit. You should follow the manufacturer's clearance recommendations for aftermarket forged pistons: They are *not* the same, so *read the instructions!*

If you have to bore one cylinder and do not want to bore the other one, your engine will run quite happily as long as the mismatch is .030" or under.

Valve stem clearances for cast iron guides are now .0015" to .0035" inlet, and .0035" to .0045" exhaust. The iron guides are supplied undersized, and you must ream them to fit after they are installed.

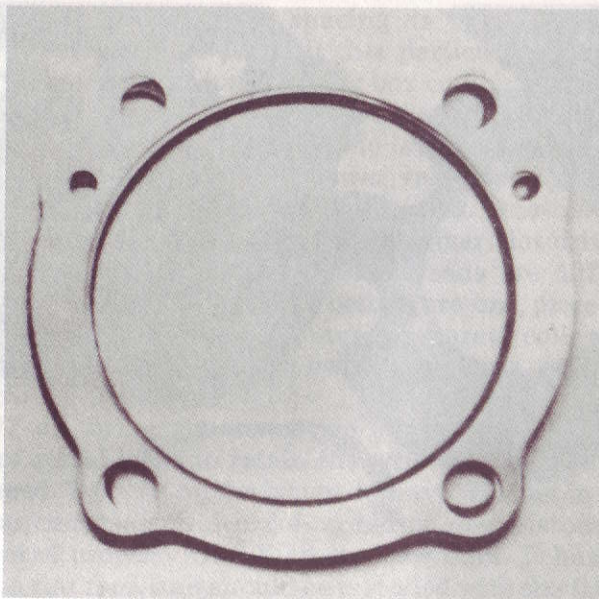
If you really, really have to, you can put a 1000cc top end on your 900, but it really isn't worth the trouble. The problem is that the 1000cc bore is 3 3/16", and the cylinder base stud spacing is wrong. If you're gonna be stubborn, here's how: Pull your engine, and strip it bare. Remove the cylinder base studs, Heli-



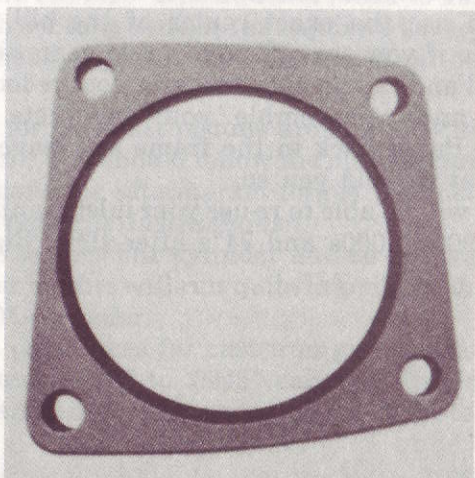
*Sportster top end
They all look the same, but . . .*

arc the holes shut, and mill the resultant mess flat. Enlarge the crankcase mouth to take the larger cylinder base spigot, being sure that you use the exact center of the old hole as your reference since if you are off, your valve gear will not line up correctly. Drill and tap the new holes for your re-located cylinder base studs, and re-assemble your complete engine and transmission. Put it back in the frame and have a good time. Remember that we told you so.

Oh yes, you will be able to re-use your inlet manifold. They are the same on 900s, 1000s and 74"s after 1966. Big deal.



900cc head gasket is the smallest, early 1000cc in the middle, and late (mid-73, up) is the largest. No interchangeability here.



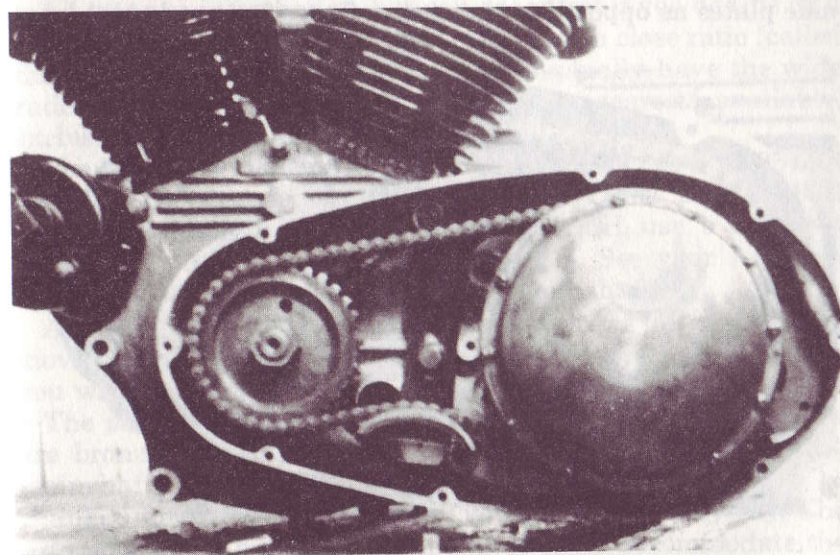
*900 and 1000cc base gaskets
1000cc is bigger and will not fit 900s without mucho work!*

Lower End

The 1957 thru 1970 Sportster lower ends are very similar and you will find that most parts will interchange. You can swap crankcases, timing covers, clutch assemblies, motor sprockets, primary chains and their tensioners, flywheels, pinion, motor sprocket, and cam shafts, crankpins, main bearings, and rod bearings. You can even put KH flywheels into a Sportster and build an economy stroker.

You may NOT mix cam SETS! Cams are numbered on the back: 1, 2, 3, 4, with #1 being the rear exhaust cam. After the number there will be a letter or letters that/which tells ya what'cha got: 1XL, 1PB, 2P, for instance. An engine with mixed cam sets may run, but it will not run well. Make sure the letters match. 1980 and up XL models use cams marked 'Q'. These are milder than the P cams: The lift is the same, but the duration is different. These will fit back to 1971.

In 1971 the new style lower end came out. While it is very similar to the older models, it is not identical. The 1971 is still a 900. But: The clutch assembly, primary cover, crankcase halves (unless used as a set), timing covers, ignition system, and cams are new and will not fit the older models.



Early Sportster clutch

1972 thru 1976 1000cc Sportsters use the 1971 and of course later lower end so the above information applies to them too. 1973 and later crankcases have no speedometer drive, and are thus stronger than earlier cases.

Oil pumps interchange from 1957 to 1976. The older ones are stud mounted, and the later ones are bolt mounted, but the pumps themselves are essentially identical. If you have a choice, use the newer pump as it has a much higher flow rate.

Compensating sprockets are not used from 1976 on, but you can put one on if you want to.

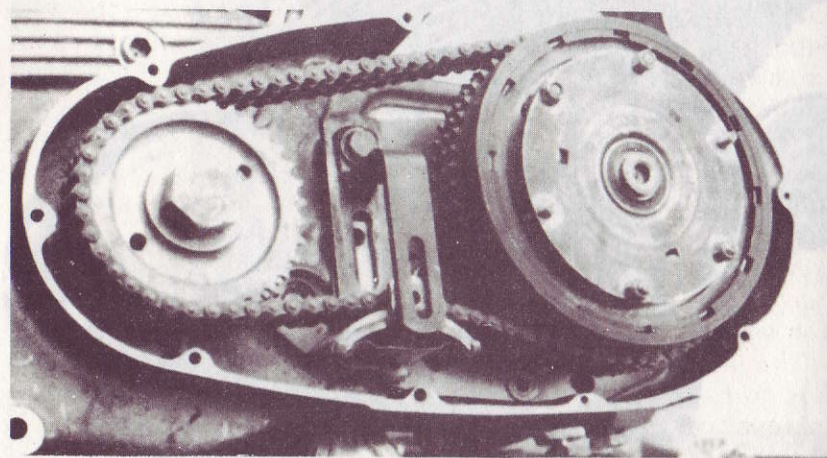
1977 brought us another new crankcase on the Sportster. The new oil pump, 1977 and on, will not interchange with earlier models. The new chain tensioner and matching primary cover also will not fit earlier models.

There is a hollow crank pin on 1980 Sportsters and XLS's, which will fit the earlier models with no other changes. (See taper change, above.)

1977 up pinion gears have six splines, and are a slip fit on the shaft.

The XL gearcase breather is changed from mid 1981, but will fit back to 1979 models if you use the correct generator slinger washer.

The newest hairpin primary chain tensioner spring (79) retrofits back to 1977. 1977 and later primary chains have oval side plates as opposed to the earlier figure-8 shaped side plates.



Late Sportster clutch

Main bearings 77 and up won't fit 76 or older.

1979 steel clutch plates are improved over earlier models. The holes and notches are now staggered, which reduces the plate's tendency to warp. These new plates will fit back to 1971.

1980 and up gearcase covers won't fit 71-79 models. In 1981, there was a running change to a new cover with an -81 part number, and an allen bolt in the old shifter hole. You can use the old cover on a new case if you use the old gasket, but the new gasket, identified by a long oil slit at the top, will *not* work on older models.

As of 3/81, the flywheel tapers were 'commonized' in the interests of production efficiency. The FL and XL flywheel sets after that date, consisting of the flywheels, crankpin, pinion shaft, and motor sprocket shaft, will not interchange with earlier parts except as a complete set. When you are comparing old parts with new, the new crankpin has a smaller keyway, and only one oil hole instead of three. The new pinion shaft has a smaller keyway, a relocated oil hole, and the pinion shaft bearing's inner race is part of the shaft. The new motor sprocket shaft has no keyway, and the shoulder at the base of the shaft is thinner.

Transmission

All trannys interchange, but you are safest if you do this as a unit. 1970 and older models often came with a close ratio (called the 'C' box) gearset, while later models usually have the wide ratio gearsets. There were a total of four gearsets available, exclusive of racing parts.

The 'C' box is made up as follows: All models use a 35695-60R gear on the countershaft. 1959-69 XLCH use a 37450-60R mainshaft. 1967-70 XLH and 1970 only CH use a different mainshaft no longer available from H-D. See your Andrews dealer. 1971 and up use a 37445-71R mainshaft.

A better bet than the 'C' box is the Andrews 'M' ratio which moves third closer to high. Be sure to tell Andrews exactly what you want, and exactly what it is going into.

The parts common to all gearsets are shifter forks (late ones are bronze), shifter fork shafts, pawl and carrier assemblies, mainshafts, and countershafts. The access door should be changed for a Trock iron door if you are in here anyway. The trap door got a mid-year change in 1977 (to accommodate the new shifter assembly), and won't interchange back.

Kickstart ratchet gears were changed in 1971. The 57-70 gears require the 57-70 bushing, and the 71 and up gears require the 71 and up bushing. The kickstart lever and shaft were changed in 1979. Use these late parts on any bike back to 1957, since they work much better than the older parts. Set the end play between .001" and .007", with toward .001" being the preferred direction.

Use the 1979 sprocket cover, too. It is less breakable than earlier ones.

In mid-79 the countershaft sprocket, the clutch gear, and the clutch gear shim were shuffled around a bit to improve fourth gear engagement. These changes can be made to earlier transmissions since the old clutch gear can be modified to work with the thinner shim and thicker sprocket hub.

A little later in 79, the trap door got a bearing retention snap ring which further improved shifting and reduced clutch slippage. Unfortunately, this will not fit earlier models. If you have an early XL model in which the main drive bearing has become loose, you can shim it and take up the slack with an oil ring expander rail from your spare parts box.

Sportster Parting Shots

For 1981, the Sportster got a new, sealed carburetor similar to that on the big twin, and amenable to the same tuning information. There were also some trim changes and a new sprocket cover.

The new tubular frame, which is supposed to really help the handling, is outside the scope of this book.

ELECTRICAL

The 65A series 12 volt generator will work with either the H-D regulator #74510-64, or the Bosch regulator #74511-65. With the H-D regulator, the 'A' terminal of the generator goes to the 'Gen' terminal of the regulator, 'F' goes to 'F', and 'Bat' goes to the battery.

The Bosch regulator is a bit more tangled. The 'A' terminal on the generator goes to the 'D+' on the regulator. 'D' on the regulator goes to ground. You get to connect it since there is no

internal connection in the regulator. 'DF' on the regulator goes to the generator's 'F' terminal. 'B+' on the regulator goes to the 'Bat' terminal on the ignition switch. '61' on the regulator connects to a #32727-63 capacitor which lets you eliminate the battery. If you use a battery, connect it to the 'B+' regulator terminal.

The 58 and 61 series generators are 6 volt and must be used with the #74510-59 regulator. 'A' to 'A', 'F' to 'F', 'Bat' to 'Bat' on the ignition switch, with another wire from 'Bat' to either the positive terminal of the battery, or to the #32727-63 capacitor if you don't want to run a battery.

On all non-electric start systems, you can put a 15 amp fuse in the ground lead of the battery.

Unfortunately, there is no inexpensive way to convert your DC system to the later AC system. (Cal Products [see address list] makes a crankcase half that will let you build an alternator Knucklehead, but it ain't cheap.) On generator models you can use a 6 or 12 volt VW generator (with the correct VW regulator) if you use an S.I.E. adaptor plate (Address in back of book). Use a junkyard or rebuilt generator instead of a new one since the new one is ungodly expensive. When a VW generator dies, it's a \$25 deal, while all you get from H-D for \$25 is a horselaugh. The VW generator works better, makes more power (amperage), and is rather more reliable, too.

If you've got a few more bucks to spend, think seriously about a complete replacement generator from Drag Specialties or Custom Chrome.

If you are afflicted with a three brush generator and want a two brush, be sure to change the regulator as well. A better bet might be to re-read the preceding two paragraphs and act accordingly.

The Delco-Remy part number for the three brush relay is #1116752 if you want to order it through your local auto parts store, or you might try Gary Bang.

If you are working with a 1936 thru 1952 three brush (32E), or old style two brush (32E2 or 32E2R), you will have no mechanical difficulties in swapping one for the other, but remember to use the correct regulator. You can use a 1954 or earlier Chevrolet regulator, but you must re-set the spring tension in it since the H-D generator puts out far less power than the automobile generator.

When you are swapping generators from one type of engine to another (i.e. OHV to SV), or very late to very early, you must

watch for two things: Drive gears, and mounting bolt hole diameters on the cases.

The bolts that hold the later generators on are larger than those on the older generators. If you encounter this minor problem, just drill the case holes to fit. DON'T get chips in the engine!!

Generator drive gears should match to what's in your engine rather than whatever happens to come on the new generator. SV engines have an oil slinger on the generator drive gear which may interfere with parts in the case in an OHV engine. The slinger can be removed, but it would be better to stick with the gear that matches the engine. On SV engines, you MUST use the SV drive gear since it incorporates the drive mechanism for the crankcase breather.

The later gears are held onto the generator shaft by a nut, while the older gears are pinned to the shaft. This is no sweat, since the nut will retain the old style gear on the new style shaft very nicely. It is not likely that you will want to use an older style generator on a new engine, since the old generators are strictly el stinko, while the newer ones are only horrible. Sportster, 74, and some SV engines have generator drive gears that differ by one tooth; count your (gear) teeth!

The 74" alternator stator/rotor set was changed in 1975. As a complete set either early or late parts fit 1970 thru 1980, 74" and 80".

Early stators have a four pin plug, and late ones have a two pin plug. Alternators to and including 1979 put out 16 amps (192 watts). 1980 alternators have stronger magnets in the rotor, and put out 18 amps (216 watts). You could put a 1980 rotor over a 1976-1979 stator and get 18 amps output. Some 1977 Superglides used one new style part and one old style part from the stator/rotor set and got 13 amps (156 watts).

The newest regulator will work with any two pin stator, but you'll have to modify the plug. The newest alternator rotor is different, and to celebrate this and the 22 amps (264 watts) the combination puts out, the stator and the regulator got sex change operations, and now the stator has the socket and the black box has the plug. (That's *very* Freudian. Stay tuned for a complete analysis in the 267th edition of What Fits What.)

1979 and later Sportsters have a new regulator, and the 1980 XLS has a coat of black paint on the generator. The 1982 XL gets a new generator under that new coat of black paint. Made by Hitachi (the generator, not the paint), it puts out 13 amps. It uses

a drive gear with a -63A part number, and will fit back to 1958 models. The new generator also uses a new type of solid state regulator which will not work with the 65A generator. The older solid state regulator will work, but you'll only get 10 amps output. 10 amps is adequate for a bare bike, but if you have lots of extra lights, a stereo, power ash trays, and so on (on a Sportster?), you'll be in trouble.

The electronic ignition systems for the Sportster and the big twins are a bolt on to earlier models. You will need to buy all bits, including the ignition coil and spark advance unit. As of 1/1/80, the price for part number 32609-78, Electronic Ignition Conversion Kit, was \$74.95.

If you go this route, make *sure* you get the 1980 Magnavox ignition module, since the earlier Prestolite wasn't too hot. With electronic ignition you MUST use resistor core wire — *not* the orange silicon solid center stuff — or the black box will become confused and stop working, whereupon you will run since the bike won't.

An interesting note is that the big twin ignition cover is riveted shut, at the behest of the EPA, and thus you cannot adjust the timing properly (assuming you're interested in maximum performance and not overly concerned about smog) unless you drill out the rivets and replace them with screws. Since this is an electronic ignition, once it is set correctly, it will remain set correctly, so you could put new rivets back in if you so desire. Unless you want to take off the pinion cover someday, that is.

On Sportsters, the ignition module has been changed again. There is one for 80-81 models, another for 82 models, and yet another for 1983 models.

In 1981, the Sportster got a new starter motor/drive assembly which interchanges with the older models, and is reputed to be much easier to work on. In 1982, this happy state of affairs ended when the Sportster got a geared starter motor which required changes in the crankcase castings. Therefore, 1982 and later starters will only fit on 1982 and later crankcases. To remove this new starter, you have to remove the primary cover, since the two allen bolts that hold the starter on are inside. Once off, you'll need metric tools to work on it, which may give you a hint of its origins (Not Germany).

There's a new regulator, and new end covers and bearings for the generator, the internals of which seem to have remained the same.

GO FASTERS

Engines That Will Stay Together. (Maybe)

If you want to go fast, you will need several things: Money, to be a good mechanic or able to pay one, more money, lots of expensive parts, still more money, time, care, and infinite patience, still more money yet, and above all, even more money still yet or so.

Strokers run about a third as long and blow up about three times as calamitously (read 'expensively') as stockers. You'll need money to build it in the first place, money to keep it running, and money to put it back together after it explodes in a shower of bent aluminum, hot oil, sparks, and profanity. All of this is cheap compared to say, airplane racing or legal fees.

We strongly suggest that you stick with name brand parts, like S & S, or Truett & Osborn. There are several good reasons for this. First, the parts not only work as advertised when installed correctly, but also come with complete, detailed instructions to make sure you are able to install them correctly. Second, if you manage to get into trouble anyway, you can call them up and they will always do their damndest to help you along. (No, we don't own any of their stock, and no, they don't send us free parts.)

NOTICE! ALWAYS read all the instructions, information, and data provided by the manufacturers of the speed equipment you are about to install! They know a whole lot more about their product and how to make it work properly in your motorcycle than either we or you do. Doing it right the first time is greatly preferable to a loud explosion (or explosions, if you're really stubborn) which will demolish your engine, your checkbook, and your composure, all at once.

Ready? Turn the page.

#1 (Panheads) 84" Reliable Street Engine

S & S or Truett & Osborn (T&O's flywheels arrive unbalanced: You have to get it done and pay for it yourself. If you don't, you will become unbalanced.) 4½" stroker flywheels.

S & S, TRW, Venolia, or Forgedtrue STROKER pistons. Don't try to be cheap and use stock pistons with stroker plates under the jugs. Choose your replacement pistons with a compression ratio of 9.5:1 or less.

Sifton 486S cam, and Sifton lifters, pushrods, valve springs, keepers, and collars.

Most Panheads are in desperate need of valve seats. Here is your chance to put in ⅛" oversize valves.

Using a Dremel, clean the ports up, but don't play Jerry Branch unless you ARE Jerry Branch. Cleaning the ports is a great help for the Panhead's breathing capabilities.

Use a 38mm or a 40mm Mikuni or a late Bendix carburetor. The S & S carb is trick, but is not really needed on an engine that displaces only 84 cubic inches.

If you can possibly afford them, buy the Andrews first, second, and third gear sets. They do more good for less money than anything else you can do for your drive train.

#2 (Pans and Shovels) 84" Locomotive Engine

If you are running a sidehack, weigh 300 plus pounds, have an ol' lady even bigger than that, and are going on a LONG trip with all of the above (through Mexico), or if you just like neck-snapping acceleration from 1500 rpm in top gear, this engine is for you.

Build #1, but use 7.5:1 or 8.0:1 C.R. pistons. You can use the stroker plates and FL pistons for this.

Use a 38mm Mikuni, or a Bendix, and use a stock FLH or Sifton 412 cam. Use stock valve sizes.

#3 (Shovel preferred, could use a Pan.) 88-90" HOT Street Engine, reliability somewhat marginal

4³/₄" stroke flywheels

9.0:1 C.R. pistons. If you're greedy, use 9.5:1 or 10:1 C.R. pistons MAXIMUM, but the 9.0:1 pistons really work the best.

Sifton 468S or Andrews 'B' grind cam

Sifton springs, lifters, pushrods

S & S Super carb

Stock size valves are O.K. in Shovels, but you need to use Manley stainless steel valves. In the Pan, use 1/8" larger Manley valves, and cut the valve seats to match.

The heads should be ported, cleaned up, and matched to the inlet manifold by someone who *knows* what he is doing.

You must use Andrews gears, a Barnett clutch with their Heavy Duty springs, and expect to wash or throw out your underwear a lot. If you have any money at all left, send your heads to Jerry Branch.

#4 (Shovel Only) 101" Yakasaki Eater, Super Duper Price-No-Object Red/White/Blue Berserker Revenge Death Machine Short Fuse Time Bomb Special

This one will not last very long, but it sure is a blast while it does run — and it DOES run!

3⁵/₈" Axtell big bore cylinders

5" stroke S & S flywheels

S & S or Carrillo steel rods

Andrews 'C' cam, or Sifton, S & S equivalents

Andrews or Sifton valve springs, retainers, lifters

Manley valves

S.T.D. engine cases (*you were told* this would cost \$\$\$\$)

Heads to Jerry Branch, tell him what you're doing

Barnett clutch and springs

The whole Andrews transmission package

Warning #1: Use a good, strong frame. This one will bend some flimsy chopper frames double (with you in the middle).

Warning #2: HOLD ON TIGHT! When you ride this one, screaming will do you no good at all.

Warning #3: Notice that no compression ratios or fuels are specified. If you're playing in this league, you have our best wishes.

How To Make The OHV Harley (All Of Them) Run Right: Step by Step To More H.P., Longer Life, And Happiness

Start by taking the engine out and apart. Clean everything to the eat-off-it stage.

Polish the piston crowns and smooth any sharp corners around the valve reliefs. Make sure the oil return holes in and around the oil ring groove are clean and clear. Remove any flash you find. Smooth the edges of the piston skirt with #600 emery paper. Mask the ring grooves, and have the piston skirt glass beaded. The slightly rough surface aids oil retention.

Handle pistons carefully. If you drop one, it can be imperceptibly bent and eccentric which will give you all kinds of subtle, hard to diagnose grief such as seizures, broken piston skirts, and incorrect clearances at several places around the bore.

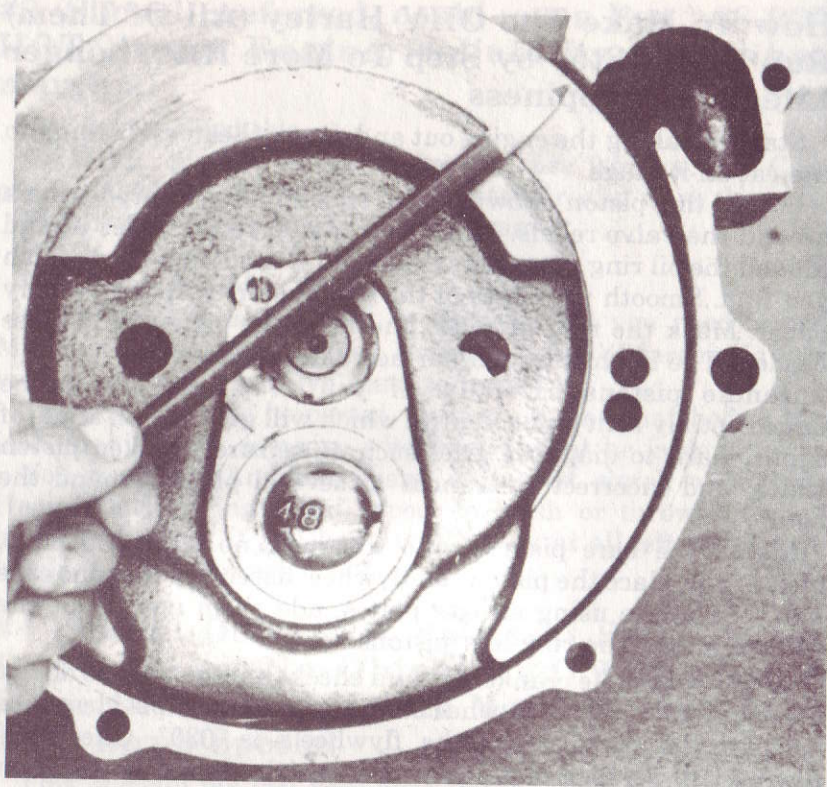
Install the bare pistons onto the rods, no wrist pin clips, please, and place the piston-rod-flywheel assembly into one case half. If you are using stroker plates, add them now. Slide the cylinders over the ring-less pistons.

Slowly rotate the crankshaft and check that the pistons do not hit each other or the flywheels. Minimum allowable clearance between the pistons and the flywheels is .030". Check the flywheel to scraper plate clearance which should be between .020" and .040". Use a porting grinder, a Dremel, or if you are not brave, a file to achieve these clearances.

If you are using stroker plates, be very, very sure that their oil holes line up with the oil holes in the cases, the jugs, and both of the gaskets.

Now for the cylinder heads: Strip them bare and send them out to be glass beaded. When they get back, they will be clean and much easier to work with.

At this point a few words on porting are in order. You are looking into the ports of your beloved Harley, and you are seeing with dismay all the lumps, bumps, rough spots, and casting nerds left there by the uncaring slobs who built it. (Note: This is no longer true. The guys who now build it do care, but if they had to clean up every lump, bump, rough spot, and casting nerd, no one could afford to buy the bikes!) The idea strikes you that while you are cleaning the ports up, you will enlarge and reshape them a bit for a little extra horsepower. Under the theory 'if some is good, then more is better, and too much should be just enough'



The oil scraper plate

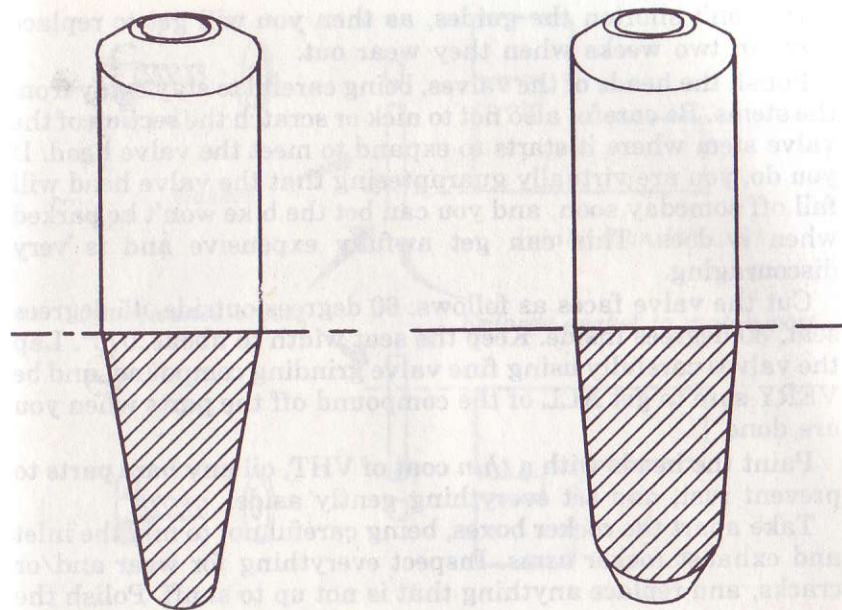
your cylinder heads will soon have ports resembling the business end of a 16" naval cannon. Guess what? You blew it!

Yes, your subway tunnel sized ports will undoubtedly flow more air than the stock ports, but only at 475,000 R.P.M. This is about 470,000 rpm past the red-line, and your engine blew sky high quite some time ago.

Now you get to go buy two new heads, and do it this way:

Buy, borrow, or (ahem) otherwise acquire a porting grinder. A Dremel will work, but is slow. Make a sanding mop by first cutting a 1" slot in a 6" piece of 5/16" or so aluminum rod, and then winding emery cloth around the rod until you have a ball of emery. Check the direction of rotation of your grinder, since if you wind the emery backwards, when you hit the switch, the emery will promptly unwind. Rats.

Use this tool to polish the combustion chambers until they are like glass. Next, carefully smooth the irregularities in the



Tapered valve guide (Left) vs stock valve guide (Right). Taper only the portion of the guide that extends into the port (shaded area). Do NOT shorten the guide. On engines with hot cams be sure the valve collar does not hit the top of the guide when the valve is fully open. You may have to shorten the top of the guide somewhat to get the required minimum clearance of 1/8", and also counterbore the bottom of the guide .040" to a depth of 1/4".

exhaust ports with a rotary file tip. Round and smooth the valve guide bosses as well.

Don't enlarge the ports yet. Clean the mouth of the exhaust port, keeping it smooth, and all the lines continuous. A rippled port is no good at all. Now, using your sanding mop, mirror finish the inside of the exhaust port. Again, restrain yourself from playing Jerry Branch unless you are Jerry Branch. The penalty for this is that you will go slower, and maybe even ruin the cylinder head.

The intake ports get smoothed and polished, but not tapered. Attach the intake manifold to one head and polish the head-manifold joint until it is virtually invisible. Do the same with the other head, then polish the rest of the inside of the manifold so it is smooth and shiny.

Put your new valve guides in a drill press, and taper them with a file. (Awright! Awright! Not all of us have a lathe and a taper attachment!) Taper only the exposed portion that sticks into the

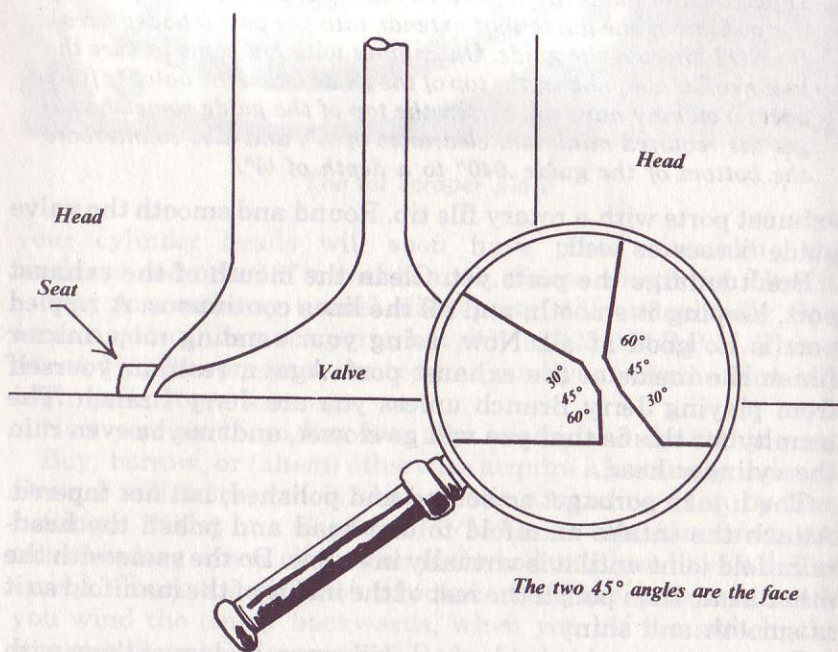
port. Don't shorten the guides, as then you will get to replace them in two weeks when they wear out.

Polish the heads of the valves, being careful to stay away from the stems. Be careful also not to nick or scratch the section of the valve stem where it starts to expand to meet the valve head. If you do, you are virtually guaranteeing that the valve head will fall off someday soon, and you can bet the bike won't be parked when it does. This can get awfully expensive and is very discouraging.

Cut the valve faces as follows: 60 degrees outside, 45 degrees seat, 30 degrees inside. Keep the seat width to about .070". Lap the valves carefully using fine valve grinding compound, and be VERY sure to get ALL of the compound off the parts when you are done.

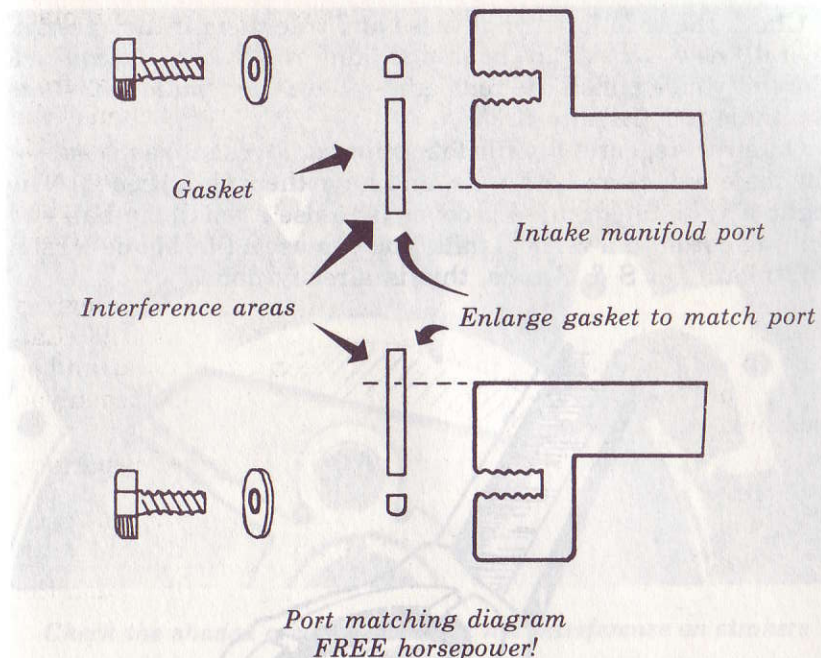
Paint the heads with a *thin* coat of VHT, oil any bare parts to prevent rust, and set everything gently aside.

Take apart the rocker boxes, being careful not to mix the inlet and exhaust rocker arms. Inspect everything for wear and/or cracks, and replace anything that is not up to snuff. Polish the



The two 45° angles are the face

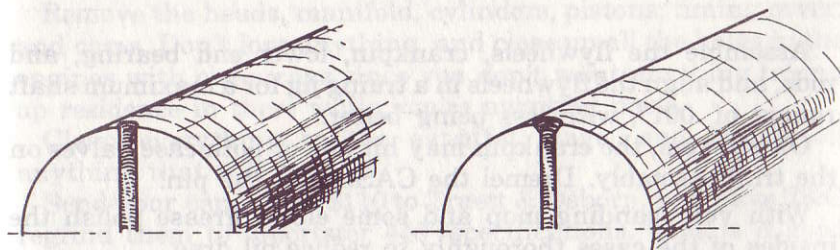
Three angle valve job



rocker arms paying special attention to the rocker shaft bosses. DO NOT grind the rocker arm in an attempt to lighten it. The result will be an instant el busto. Polishing the rocker arms removes nicks and scratches which propagate into cracks and then fractures. Smooth is beautiful.

Sportster, Pan, and Shovel Lower End

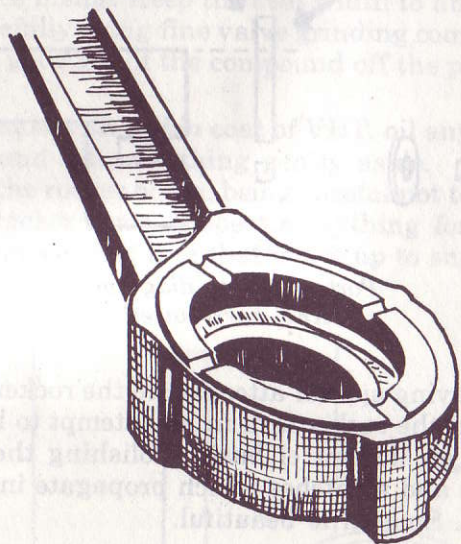
The crankpin should be perfectly smooth, and you should chamfer the edges of the oil holes if they are not so already.



Cross section of crankpin with stock, unchamfered oil hole (left), and modified with chamfered oil hole (right).

Check the rods for straightness and true them if they need it. Install new wrist pin bushings and rod races if required. Carefully side polish the rods, and relieve the female rod where the male rod fits into it.

On strokers, carefully file four oiling grooves into each side of the male rod, clean both rods, and have them shot peened. (The right way to make these grooves is to use a small tip ball end milling cutter in a vertical mill. You can use a file, but be careful and neat.) On S & S rods, this is already done.



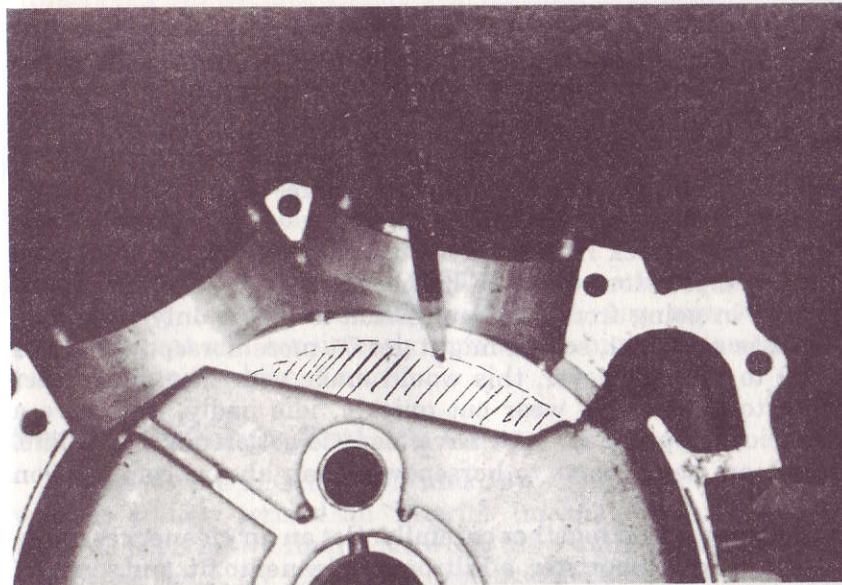
Four oiling grooves cut into flank of female rod 90° apart, about .050" deep, about .070" wide (not too critical) Smooth the edges! You don't want a fatigue crack to start here!

Assemble the flywheels, crankpin, lower end bearing, and rods, and align the flywheels in a truing jig for a maximum shaft runout of .001", with less being better.

On strokers, the crankpin may hit one or both case halves on the trial assembly. Dremel the CASE, not the pin!

With your sanding mop and some elbow grease polish the insides of the cases thoroughly to reduce oil drag.

When you assemble your engine, work even more slowly and carefully than you normally do. Everything must be



Check the shaded area for crankpin nut interference on strokers

scrupulously clean and absolutely right in a high performance engine, or it will last only a few seconds instead of reaching the ripe old age of a few minutes before it explodes.

\$300 to a (High) 12 Second Sportster Every Time

Tired of getting your late model Sportster blown into the weeds by a horde of Yakasakies? You can thank Uncle in his drive to make us lead safer lives for our own good. Strike a blow for freedom (and dust those ring-dings) as follows:

Remove the heads, manifold, cylinders, pistons, timing cover, and cams. Don't lose anything, and close up all the holes in the engines with clean rags since you don't want anything taking up residence in there while you're awaiting parts.

Clean everything to the eat-off-it stage, and lightly oil anything that will rust.

Send your cams with \$110 to Truett & Osborn, and have T&O regrind them to 'Sportster 440' specifications. This is a good profile for a hot street Sportster.

While T&O are grinding away, inspect and measure all the bits and pieces you've got. Recondition or replace any part that

is not in top condition. Replace the valve springs without even bothering to check them. Get a set of bronze valve guides. These cost a little more, but they work lots better and last much longer.

Refer back to the comments on top end work, and be so guided. You will find the piston treatment, valve angles and seat widths, and porting/polishing information there. Don't forget to go through the rocker boxes as well.

Stay with stock Harley-Davidson pistons. If you **MUST** have more compression, don't go higher than 10:1. The horsepower gained in going from 6:1 compression to 10:1 is only 10% or so. Stock is about 9:1, so you might get 7% more horsepower if you went to 12:1. However, this would make your new giant-killer hard to start (oof!), wear out quickly, idle badly, and have a voracious appetite for expensive, hard to get premium gasoline. There are better ways to horsepower than absurd compression ratios.

Put the top end together carefully. Get an air cleaner case for a 1975 or earlier Sportster, a Filtron air cleaner to fit, and some $\frac{3}{8}$ " (9/16" hex) nuts. The nuts go between the cover and the backing plate, and in conjunction with the Filtron, help your engine to inhale deeply. Make sure that the carb-to-manifold gasket does not restrict the airflow. Trim it back if it does.

When your cams come back from T&O, spread Moleblynum Disulfide assembly lube on the cam faces. (Crane makes it.) Set your cam end float .005" to .010", following the instructions in your service manual. (Your manual may say to use .001" to .006". This has been changed. Trust us.) Looser is better than tighter, but do not exceed .010".

Everyone, but *everyone* has their very own opinion about exhaust systems, and this is ours: For a street Sportster the old style tapered shorty Sportster mufflers with the solid center baffle bashed out provide a reasonably quiet and very efficient system. Since you have just destructed your exhaust system, you will now have to re-jet your carburetor. Start with a main jet two sizes larger than stock, and work from there.

If you are lucky enough to have access to an engine dyno, by all means pay the man! On the dyno you can 'dial in' your carburetion in half an hour — to perfection! — instead of pissing off your neighbors for a week and still having miserable results. While you are playing, try a 19 or 20 tooth countershaft sprocket.

The Keihin carburetor is best deported back to Japan. Get a Bendix, or if you can afford it, the S & S Super, model B. 1980 Keihins can be made to work with some fiddling with the jets

and a different air cleaner.

The 1980 XL Keihin is a 34mm instead of a 38mm, which change helps the low end torque (yay!) and reduces emissions (boo!). Facing this mounted carburetor, you will see a round hole, larger than the air cleaner screw hole, at the upper right corner. This is an air passage. If your new super custom chrome air cleaner blocks this hole the bike will run very poorly. Therefore, drill your air cleaner to match.

You have now spent about \$300 (less the carb swap), and if you've done the job carefully and right, you now have a Sportster that will consistently turn in the high 12s, assuming you can ride the bike. Enjoy!

Sorry Shifting, And Its Cure

Thanks to the D.O.T., 1975 and 1976 Sportsters came with what is politely termed an 'interim' (means 'We'll make this work as soon as we figure out what they want from us.') shift and brake setup. By following these instructions, your bike can be made to shift and stop as God and Harley-Davidson intended it to.

Brakes: Buy one each of the following parts:

(If you have a 1977 or later, no conversion is possible, but you don't need it since it works properly to start with.)

42410-52	brake pedal
42549-52	cross shaft
42281-35A	spring, switch
42269-30	brake clevis pin
42253-67	brake rod
42426-58 or 42427-52	pedal spring
(whichever fits best)	
42282-35A	stud
42423-52	spring pin
$\frac{1}{4}$ -28 x $\frac{7}{8}$ "	bolt & nut
$\frac{1}{16}$ " x $\frac{1}{2}$ "	cotter pin
$\frac{1}{4}$ -28 x 1"	bolt
$\frac{5}{16}$ " x $1\frac{1}{2}$ "	bolt & nut

You already have the brake rod adjusting nut.

This part of the procedure takes about two hours. Use grease on all moving parts. Don't be cheap on nuts and bolts. Your brakes **MUST** work. If you are not concerned over the safety of your own rear end, what about the rear end of the sweet young thing on the pillion pad? Get good hardware!

Shifter: Buy one each of the following parts:

- 34628-54A shaft - shift lever
- 34600-71 shifter assembly
- 34035-52 oil seal for shift shaft
- 34037-52 bushing for shift shaft

Remove the transmission as follows: Complete primary drive including chain and clutch, countershaft sprocket, four 5/16" NC bolts holding the trans access door.

Using a SOFT hammer, gently tap the countershaft and remove the transmission as a unit. Do not lose any of the 23 roller bearings which will fall out at this time. Count 'em to make sure you have all of them, and set them aside.

Punch out the blanking plug in the right case and install the 34037-52 bushing.

Try the shifter shaft. If it won't go in and turn easily you need to have the bushings reamed at the local Hog dealer. (Boy, does that sound easy! Only thing is, you will have to truck or trailer your scooter there 'cause it's all took apart.)

If your shifter forks are worn, now is the time . . .

This is also the time for a Trock iron access door. If you run hard, you need one.

Use a little vaseline to hold the 23 roller bearings where you want them while you put the tranny back in.

What to do with the left over parts? Sell them to the squirrel who just fell down and bent his all to hell!

Instant 80"

Part #16175-78, \$450.00, as of 1/1/80.

Presto-Change-o-Panhead-to-Shovel-o.

Expensive, but easy: Buy one each of the following:

- 16484-66B front cylinder
- 16492-66B rear cylinder
- 16700-66A front head
- 16702-66A rear head
- 17500-66 rear rocker box
- 17502-66 front rocker box

Buy two:

FL or FLH pistons. Matching compression!

All valves, springs, keepers, collars, rings, oil lines, pushrods, pushrod covers, etc., etc., to fit.

Smelling salts time: about \$1000 from the Hawg shop.

However: The going rate from the local chopper shop or the used parts dealer is about \$3 - 400: a little better. Jammer sells these parts, too. They're not Harley-Davidson's castings, but if you are willing to be a little less than a little less than tolerant, you can save a bundle.

To actually do it, other than just bolting everything up, you must drill and tap the oil gallery in the timing cover. If you don't want to drill, get a Knucklehead timing cover: The hole is already there. If you do drill your own, take the cover off the engine and clean it out carefully when you're done. Those chips will raise hell with your engine, and you will then have to buy a new everything.

Handy Spec Chart 45"

Piston to wall clearance:	.....	.001-.002 using H-D pistons
	.....	.003-.004 using aftermarket pistons
Ring end gap:	.....	.010-.020
Ring side clearance:	.....	.004
Piston to head clearance:	.....	1/16 to 3/32 at TDC
Piston pin to con rod bushing:	.....	.001
Con rod bearings -DRY-:	.....	.0005-.001 loose
Pinion shaft bushing -DRY-:	.....	.0005-.001
Main bearing clearance -DRY-:	.....	.008-.012
Motor sprocket shaft to main bearing -DRY-:	.....	.0005-.001 loose
Flywheel assy: side play in crankcase:	.....	.012-.014
Cam gears:	.....	in bushings: .0005-.001
	.....	end float: .001-.005
Tappet to guide block:	.....	.0005-.001
Stem to guide:	.....	.0035-.0055
Point gap:	.....	.022
Timing: All (except KH)	.....	11/32 BTDC
	.....	KH models 19/64 BTDC
Valve clearances cold: W models:	.....	.005 in., .007 ex.
K & KH:	.....	.004 in., .010 ex.

Big Twin Thru 1965 Handy Spec Chart

Piston to wall clearance w/H-D pistons or other pistons having expander bridge:	.....	.001-.0015
	.....	wear limit .006
Aftermarket <i>non-racing</i> pistons:	.....	.003-.004
Racing pistons:	.....	refer to manufacturer's specs.
Cylinder max taper or out of round:	.....	.002

Valve stem max runout:	.....	.0035
Exhaust valve to guide clearance (wear limit):	.....	.006-.008
Inlet valve to guide clearance (wear limit):	.....	.004-.006
Ring end gap:	.....	.010-.020
Ring land side clearance, compression:	.....	.004-.005
Ring land side clearance, oil control:	.....	.003-.005
'U' flex oil ring overlap:	.....	11/32
Valve margins, min:	.....	.015 in., .030 ex.
Valve springs:	FL outer FL inner FLH outer FLH inner	
Free:	1 13/16 1 15/32 1 21/32 1 25/64	
Installed:	1 13/32 1 1/4 1 3/8 1 3/16	
Valve seat angle:	.....	45 degrees
Valve seat width:	.....	1/16-3/32
Wrist pin to bushing:	.....	.0005-.001
Head bolt torque (new type bolts):	.....	65 ft lbs
Head bolt torque (old type bolts):	.....	50 ft lbs
Rocker shaft to bushing:	.....	.002 max
Rocker arm end play:	.....	.004-.012
Tappet to tappet guide:	.....	.008 limit
Timing cover bushing to camshaft:	.....	.004 max
Cam to roller bearing:	.....	.004 max
Cam end bearing surface max wear or runout:	.....	.003
Cam end float:	.....	.005-.010
Flywheel end float,	.....	1948-1954: .012
.....	.....	1955-1965: .006
Rod running clearance:	.....	.0005-.001
Rod side shake w/new dry parts:	..... Front:	.025-.035 max
.....	..... Rear:	barely perceptible
.....	..... side play at top	.001-.006
Max shake at top of rod, used parts:	.....	3/32
Flywheel max runout:	.....	.001
Distributor drive gear to shaft:	.....	.0025 max
Breather gear end play:	..	.001-.005 (gasket compresses .006)
Con rod side play between flywheels:	.....	.005-.025
Timing gear end float:	.....	.003-.007
Generator gear (idler) end play:	.....	.003-.007
Pinion shaft to cover bushing:	.....	.004 wear limit
Note: All 74 SV, 61 and 74 OHV thru 1947 use the above specifications except as follows:		
Cold valve clearances:	..... SV:	.005 in., .007 ex.
.....	..... OHV:	.001 in., .002 ex.
Timing marks:	..... SV:	11/32 BTDC
.....	..... OHV:	7/16 BTDC

Handy Sportster Spec Chart

Piston to wall w/H-D pistons:	.....	.003
.....	.....	wear limit .006
Aftermarket <i>non racing</i> pistons:	.....	.003-.004
Racing pistons:	.....	Refer to manufacturer's specs.
Ring end gap:	.....	.010-.020
Valve stem max. runout or out of round:	.....	.002-.003
Minimum valve spring free length:	. . 1 3/8 outer, 1 15/16 inner	
Intake valve to bronze or steel guide:	.....	.0035 max
Exhaust valve to bronze or steel guide:	.....	.0045 max
Refer to text for cast iron guide clearance specifications.		
Rocker shaft to bushing:	.....	.001-.0025
Head bolt torque:	.....	65 ft lbs
Wrist pin to bushing:	.....	.002
Ring side clearance:	.....	.0035-.005
Timing cover cam bushing to cam:	.....	.003 max
Cam end float (looser is better):	.....	.005-.010, .010 is max*
Tappet to tappet guide block:	... .0005-.001 (wear limit .008)	
Rod clearance:	.....	.0005-.001
Rod side shake at top w/new, dry parts:	.....	.020-.031
Camshaft needle bearing to cam:	.....	.004 max
Rod side clearance between flywheels:	.....	.005-.025
Max flywheel runout on shafts:	.....	.001
Timing:	.....	11/16 BTDC
Valve clearance, engine dead cold: Pushrods should spin freely, but have no vertical movement.		

*.010 is not critical. This specification is a recent change.

ADDRESS LIST

Note 1: These addresses are furnished as a convenience only. We make no warranty whatsoever as to the quality or the serviceability of any product or service. (But we try not to steer you wrong.)

Note 2: The (*) after the zip code means that this address was checked and verified as of June, 1987. More than half of these have changed over the years!

Andrews Products Inc.

5212 Shapland Ave.
Rosemont, IL 60018 (*)

Barnett Tool & Engineering

Wholesale only. See your dealer.

Cal Products

(High performance crankcases)
Route 2, Box 414
East Jordan, MI 49727 (*)

Crane Engineering/HP Sales

530 Fentress Blvd.
Daytona Beach, FL 32014 (*)
(Crane MoS2 assembly lube,
or at any good speed shop)

Jammer

27771 Avenue Hopkins
Valencia, CA 91355 (*)

Jerry Branch Flowmetrics

7501 Village Dr.
Buena Park, CA 90621

Los Angeles Sleeve Co.

8311 Chetle Ave.
Santa Fe Springs, CA 90670 (*)

Manley Performance Engineering

13 Race St.
Bloomfield, NJ 07003 (*)

S & S Cycle, Inc.

Box 215
Viola, WI 54664 (*)

Service Dept. Co.

(Source of H-D special tools)
1111½ Hwy 54 E.
Zephyrhills, FL 34248 (*)

SIE Choppers

1459 Pembroke
Wheaton IL 60187 (*)
(VW generator to HD cases adapter
is no longer available.)

Sifton Products

943 Bransten Rd.
San Carlos, CA 94070 (*)

STD, Inc.

P.O. Box 3583
Chatsworth, CA 91313 (*)

Truett & Osborn

3345 East 31st St., South
Wichita, KS 67216

Trock Cycle Specialties

RR2 Box 415G French Rd
Hampshire, IL 60140 (*)

Warren Machine

(Carillo rods)
33041 Calle Perfecto
San Juan Capistrano, CA 92675

Additional copies of **What Fits What** may be ordered from:
M. Arman Publishing, Inc.
P.O. Box 785
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Here's a listing of every special tool you'll need, with photographs, detailed instructions, where to get them, and how much to pay. Save yourself time, money, and upsetment.

Covering all the pullers, gauges, reamers, lappers, drivers, and other trick tools that you need, it also warns you about the ones you don't need and shouldn't buy.

Here are tools for the top end, bottom end, transmission, chassis, driveline, and non-specific tools as well.

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By Stan Shenton

Originally published in England, and long unavailable, here are all the secrets of speed tuning for 500, 650, and 750 (twins and triples!) Triumph motorcycles. This is the real thing, written by the man who's been there! It covers the engine from top to bottom, carburetors, exhaust, transmission, clutch, suspension, brakes, wheels and tires (excuse me: Tyres), and more. Best of all, it's things you can do without spending a fortune! Make your Triumph faster, safer, and more reliable with this first class, absolute MUST book for any Triumph owner.

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By Carl McClanahan, edited by Mike Arman

If you want to go fast, *really fast*, without spending a bunch of money, this book is for you! It contains years and years of painstakingly learned speed secrets for the Big Twin and the Sportster. You can do *everything* in this book for under \$500. Carl holds dozens and dozens of records, and he tells it all, right here.

Edited by Mike Arman, you will find it packed with information, easy to understand, and even fun to read. There are about 80 pictures, diagrams, and graphs.

8½" by 11", 56 pages, illustrated, softcover \$9, plus \$1 for postage and handling.

Unauthorized Flat Rate Schedule for Harley-Davidson Motorcycles

By John Bolender

Time is money, and here's how much! If you're a shop, you need a flatrate book as a guide to determine how much to charge for your work: You don't want to give it away, and you don't want to gouge, either. If you're a rider, you need one to get an idea of how much this particular repair is going to cost so you can keep your budget in balance (or at least somewhere near it).

This book covers the Big Twins and the Sportsters, and it is from actual experience, not by guess n' by golly. It was written by John Bolender, who manufactures a complete and excellent line of special tools specifically for use on Harleys, so he ought to know. (And he does!)

Now here's a promise: Until you need it, this will be the dullest book you ever saw. It doesn't even have any pictures! However, when you *do* need it (and you will, bro, you will), it will become verrrry interesting indeed!

This is a strange one: 26 pages, 8½ by 11 inches, and *unbound* so you can put it in your own durable 3-ring binder with sheet protectors and use it forever!

\$6, plus \$1 for postage and handling.

Panhead Service Manual

By You-Know-Who, in Milwaukee

This an accurate reprint of the genuine, hard to get original article! The Panhead Service Manual, covering 1948 thru 1957 Big Twins is available again. This is the factory information, from specification sheets, service bulletins, "Shop Dope" releases, lubrication charts, frame dimension diagrams, engine rebuilding specifications, and on and on and on. In fact, its 224 illustrated 8½ by 11 pages of on and on and on. This book has always been tough to find, and sold at a premium price even for used copies. Well, here it is, new, hot off the press, immediately available, and priced right!

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Special thanks to Jim's Harley Davidson of Mendon, Ohio, for the 1981 through 1983 changes information. We've also had help from a fellow named Dahlke in Wisconsin, an ABATE member in Melbourne, Florida, whose name we just can't make out, a guy from L.A. who signs himself "The Flathead F**kup", and from A.J. Cooper, in (ready?) Woy Woy, Australia.

Special thanks also to all our loyal readers over the last few years. Your continued enthusiasm makes all this worthwhile, and in fact, possible.