

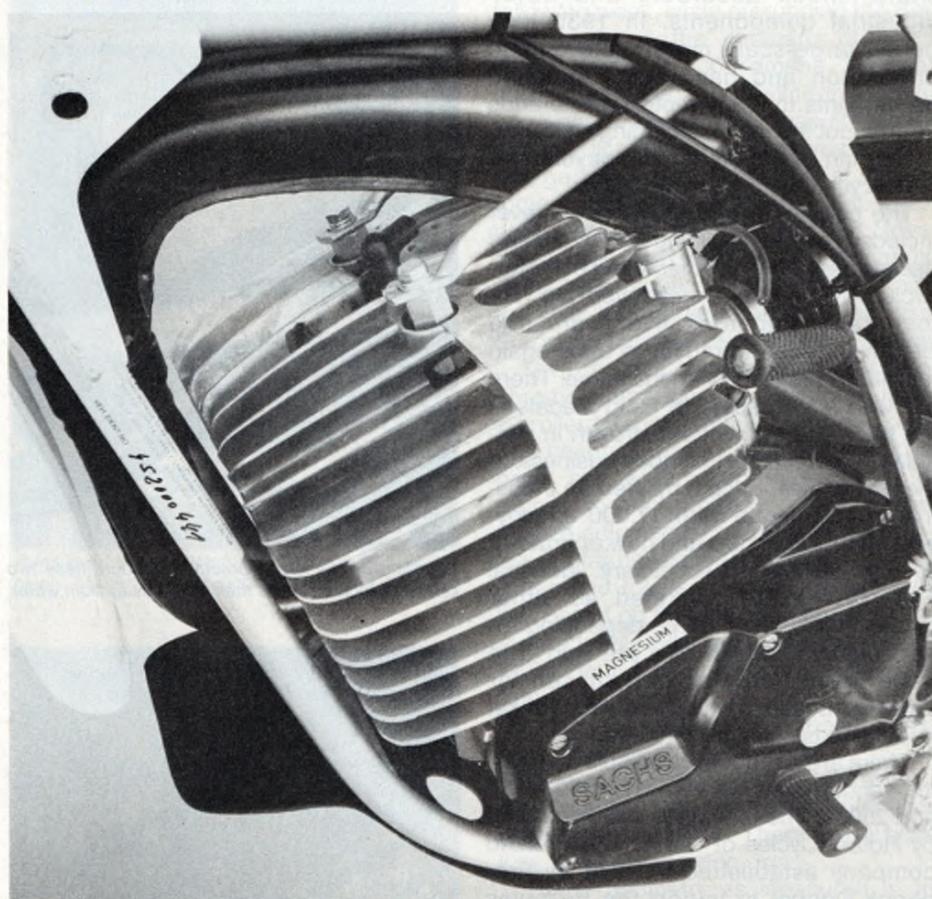


## Cycle Test

# HERCULES GS175

• If you thought it would take a Japanese manufacturer to threaten the rule of Penton/KTM and Husky in off-road competition, guess again. From Europe, where the ISDT was invented and housewives know about berms, comes a superb new enduro racer from the West German industrial giant, Fichtel & Sachs. The bike is a Hercules and it's ideal for Six-Day-type events, enduros and fast trail riding. It has power, handling, top-flight components, a seven-speed gearbox, simple maintenance, pricing below the competition, reliability, technical innovation and it's very, very fast. A few wrinkles stop it from dethroning Penton right now, but when the factory makes certain changes, the GS 175 could become the best bike in its class. Most certainly it puts the Japanese farther from the top in the true enduro category, the only area in motorcycling they do not dominate.

Newness and durability characterize the GS—letters which stand for "enduro" in Europe. The bike was first built in 1975, so its design and materials are the latest. Underlying both is a concern for strength and reliability as evidenced by incredible engine finning, tapered-roller swing-arm bearings, a double-cush drive-line, chrome-moly frame, etc. Everywhere you look the design is just a little heftier than it needs to be. Part of this arises from the intention of Hercules to use the same chassis for 175, 250 and Open class engines, like Penton and Husky do. Hercules also recognizes that the bike will suffer extraordinary tortures while negotiating trails at Gold Medal speeds, and tank-like



PHOTOGRAPHY: DALE BOLLER

It's got a seven-speed gearbox and a pair of mystery exhaust ports. Billy Uhl won seven Gold Medals on a GS in U.S. Qualifiers. MX models are here too. In short, Sachs is back!

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construction results. A minor penalty for the near-unbreakable package is 268 pounds of wet weight—17 pounds more than a 175 Penton and 64 above a Honda MR175. These pounds detract slightly from performance, but they guarantee the reliability displayed by Billy Uhl's 175 Hercules, which won seven Golds in seven tries in the 1976 Qualifier Series.

What is a Hercules and who are Fichtel & Sachs? Anyone familiar with dirt bikes remembers Sachs and DKW lightweights, which won dozens of desert races and the Baja 1000 three times before high pricing forced the U.S. distributor to drop them in 1974. The motors in these bikes were built by Fichtel & Sachs, while the chassis and assembly work was handled by Hercules. The same is true for the 175 GS.

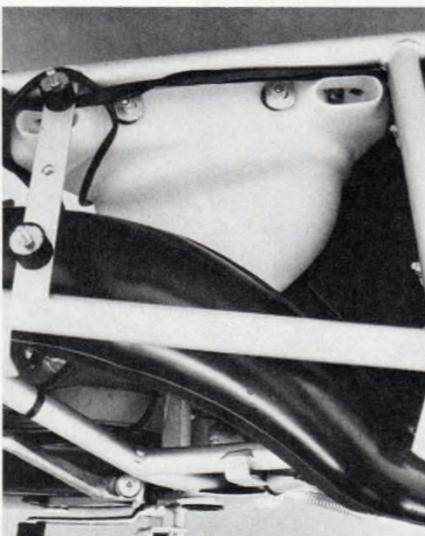
Fichtel & Sachs, known simply as Sachs, was founded in 1895 as a producer of engines, clutches, transmissions, shock absorbers and other industrial components. In 1930 they began large-scale motorcycle engine production and have since supplied powerplants to many motorcycle brands throughout the world, including Hercules, a German company in the bicycle and motorcycle business since 1882.

The colorful history of Hercules never included engine building—only chassis design, assembly and marketing of motorcycles. When WW II destroyed the factory, rebuilding took five years and Hercules turned to racing to once again familiarize the world with the name. There followed a long string of Gold Medals at the ISDT and tremendous growth in Hercules' motorcycle and moped business. In the mid-Sixties, Sachs, by then an industrial conglomerate with 17,000 employees, bought Hercules and now operates it as a wholly-owned subsidiary. Identical motorcycles are marketed as either Sachs, Hercules or DKW, depending on the country in which they are sold. The trade name Hercules was chosen for America because the Hercules-Wankel street bike is currently marketed here.

There are six models available in America—enduro and MX versions in 125, 175 and 250cc. The machines are distributed by Rotary Cycles of U.S.A., a Cleveland company established in 1974 by Frederick Dengel to import the Hercules Wankel. Mr. Dengel came to America from Austria 16 years ago. As the first KTM importer, he was instrumental in introducing John Penton to the Austrian KTM factory, where Pentons are now manufactured. This year, Rotary Cycles will distribute approximately 1400 Hercules dirt bikes to 140 dealers East of the Mississippi only. Plans call for a merger late in 1976 between Rotary Cycles and Hercules, at which time a factory distributorship will be set up in Los Angeles to serve the West.



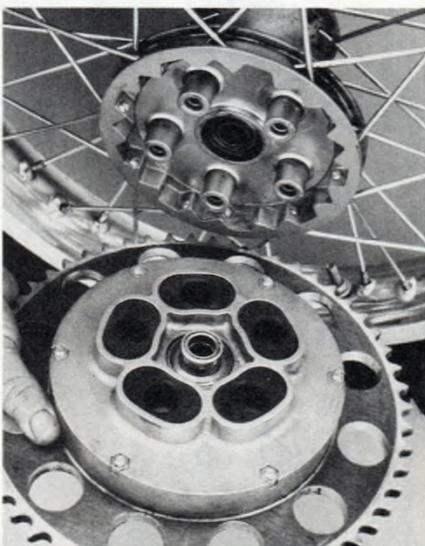
Frame is strong and rigid, but heavy. Optional centerstand greatly simplifies maintenance, costs \$24.



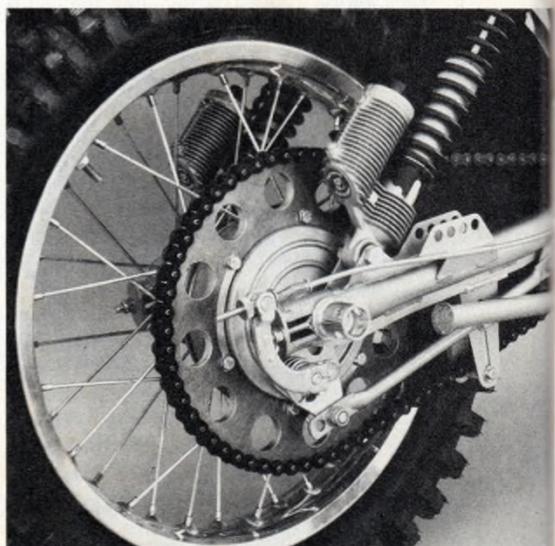
Excellent plastic airbox breathes through these two openings located under the seat far away from water.



Airbox features water baffles, a drain, Twin Air filter and large volume in front of the carburetor.



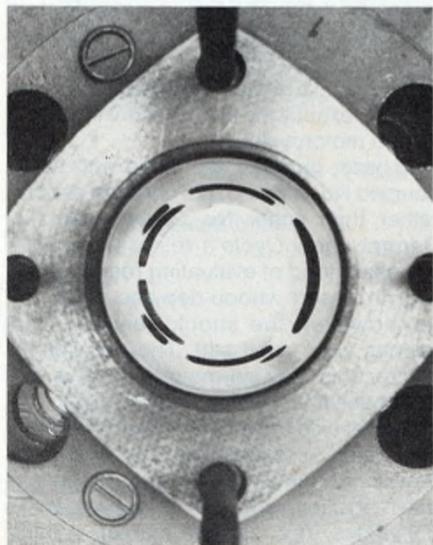
Rubber cushions in hub reduce loads on gearbox. Note angular buttresses for straight-pull spokes.



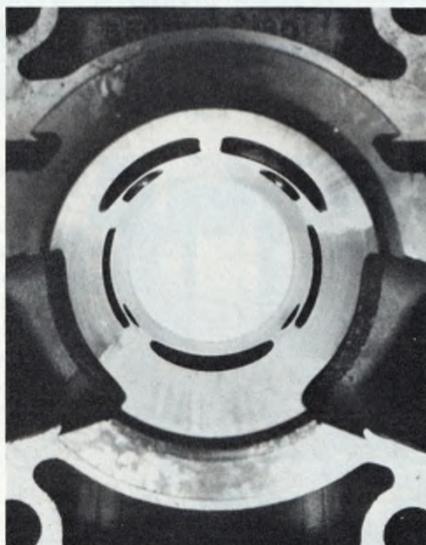
Extra hole in brake-stay arm locates backing plate properly as axle is moved rearward to adjust chain.



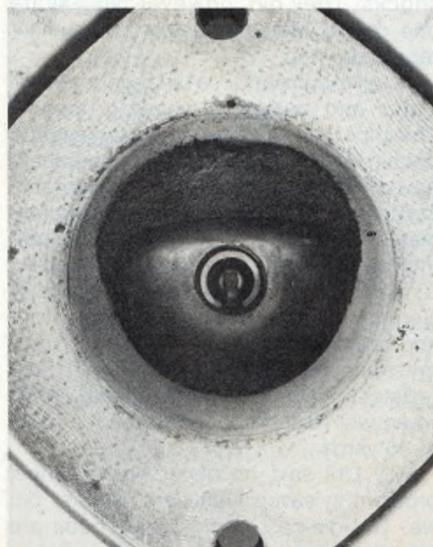
Engine sits high in frame out of harm's way. A tough plastic skid plate adds protection and deflects mud.



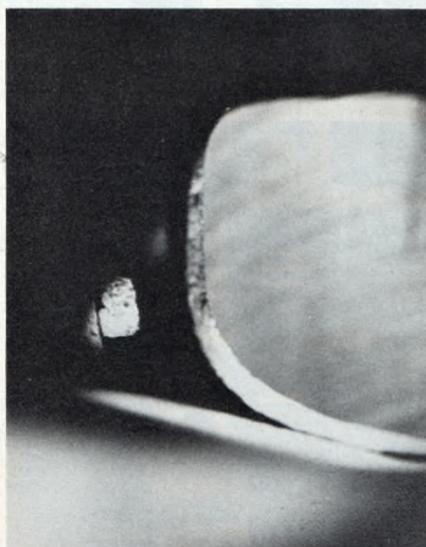
Holes in each corner of picture are for studs which clamp cylinder to cases. Four more studs hold head.



Transfer openings may look small but time/area is plenty. Mystery exhaust ports are at 5 and 7 o'clock.



Layer of carbon proves effectiveness of D-shaped combustion chamber in reducing heat near exhaust.



We've never seen tiny windows next to the exhaust port like this before. See text for further information.

Hercules currently employs 1500 people. In 1976 they will build 5000 competition dirt bikes, over 100,000 mopeds and 230,000 bicycles. It is the second-largest and second-oldest motorcycle firm in Europe. With the seven-speed series Hercules has probably released the most immediately competitive new-model line in history.

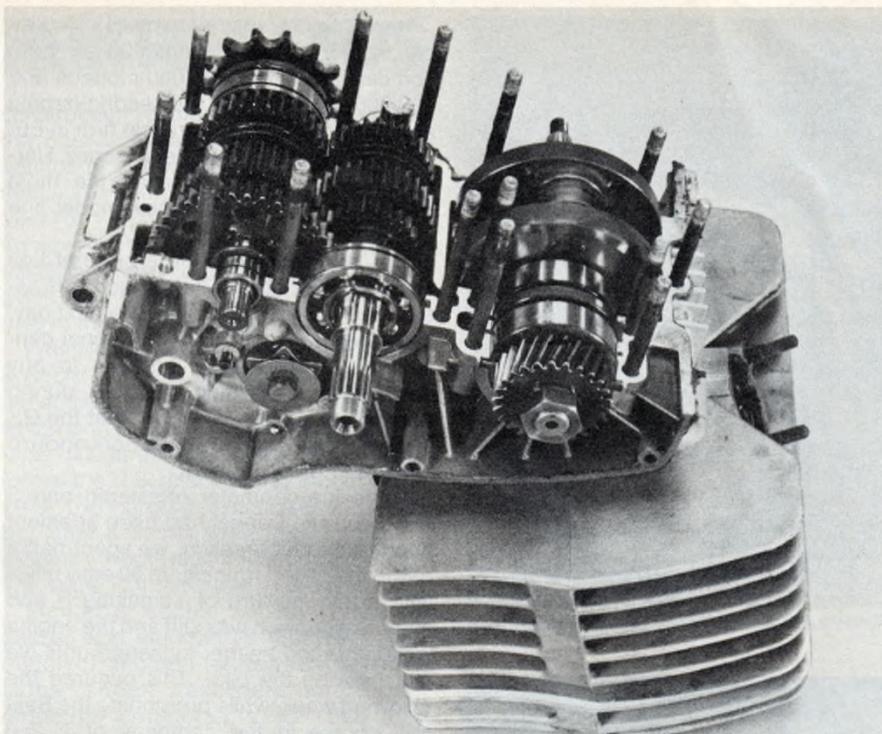
Our test bike arrived in a crate at Los Angeles International Airport and was assembled and photographed the next day. It was stock except for the optional centerstand, a worthwhile addition to any trailbike. In examining the bike during photography it became clear that the GS is a no-nonsense competition enduro aimed at Penton's throat.

Since the odometer registered only 3 miles and Mr. Dengel had been adamant about a careful break-in, we spent half a day in the desert running up 90 easy miles with a 20:1 mixture of Yamalube R and ethyl. Suspension was stiff and the engine was tight, and neither loosened until we quit babying the bike. This occurred the following week, while prerunning the Baja 500 course in the company of a 250 Husky and an IT400 Yamaha. The Hercules rarely reached its limit in keeping up. Indeed, the harder it was ridden the better it got. The engine thrives on revs, the gearbox doesn't flinch at heavy-footed clutchless shifts and suspension gets good when the road gets bad. Speed doesn't seem to perturb it. Outright abuse didn't break it. In the course of 400 miles the bike kept getting better as the usual European tightness was massaged away.

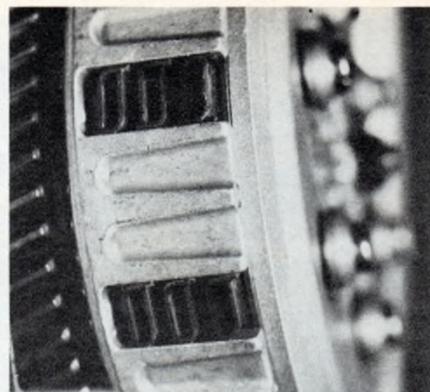
The chassis uses heavily-gusseted chrome-moly tubing and features tapered-roller bearings at the swing-arm pivot. The bearings are encased within a dust-proof and waterproof housing that requires no maintenance. Their preload may be adjusted by a simple procedure if lateral play develops. The main advantage of tapered rollers is effectively unlimited life. Based on their performance as automobile wheel bearings, a set should last 75,000 to 100,000 miles on the Hercules. They are superior to plain bushings, which wear quickly, and needle rollers which self-destruct if penetrated by dirt. The Hercules system offers a lateral thrust face, slightly more swing-arm rigidity and virtually eternal life. There is no better way to mount a swing arm.

Frame geometry as measured in the *Cycle* shop is 28.5 degrees of rake and just under 5 inches of trail. This combination, along with excellent Metzeler tires, delivers uncanny steering accuracy. The bike can be aimed precisely by levering the bars, sliding the rear end or leaning. There is no response without input, and no over-reaction.

The front suspension is Ceriani's latest leading-axle fork with 8.25 inches of travel and magnesium sliders. When new they were extremely reluctant to move unless jolted by a large bump; the little stuff beat



With practice engine can be out of the frame and this far down in only 25 minutes. Note huge pair of main bearings adjacent to the flywheel and 14 studs which double-bolt each transmission and crankshaft bearing.



L-shaped tangs on the six driving plates will not notch the alloy clutch basket as straight tangs usually do.

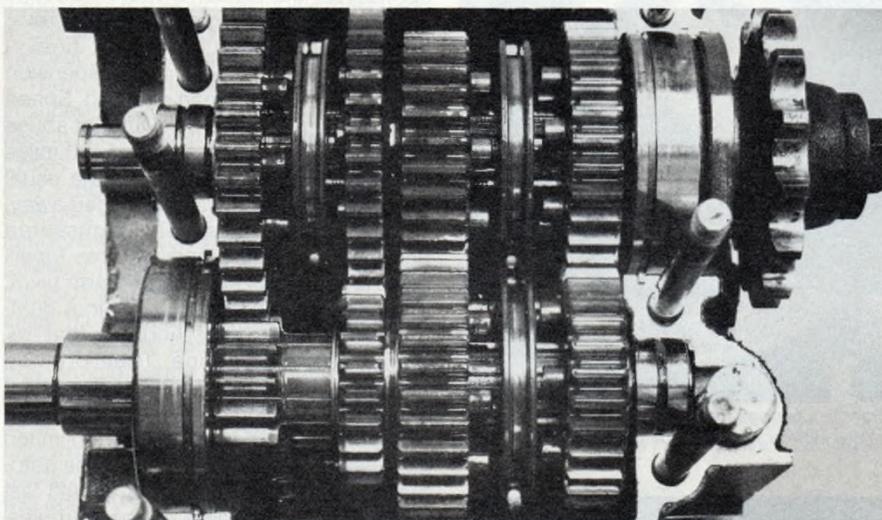
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you to death. Flushing out the legs with solvent, adding new oil and greasing the seals reduced stiction considerably and the fork began using most of its travel with regularity. It still took a solid nudge to start the slider moving—and the rider absorbed the difference. There's no question that the fork works best at fast speeds in rough terrain—exactly the environment intended for the motorcycle.

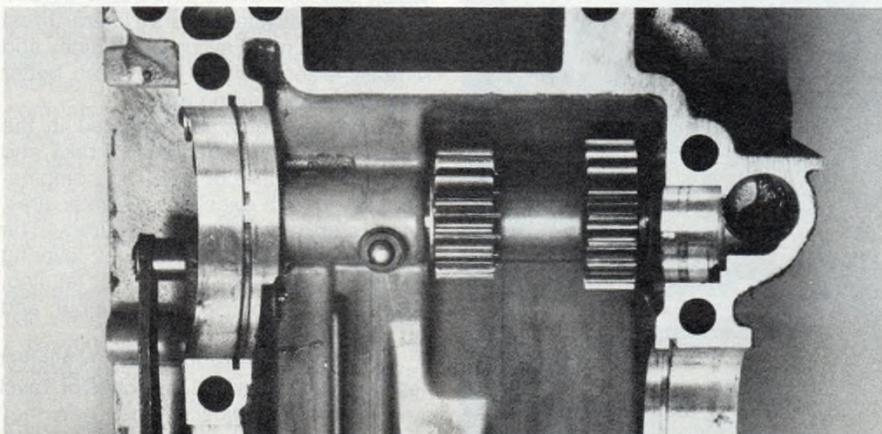
In back, our bike was fitted with stiffly damped No. 3 Marzocchi nitrogen shocks rather than softer No. 2s because Mr. Dengel knew *Cycle's* testers are 200-pounders fond of evaluating rear suspension in desert whoop-dee-dos. Even for us, however, the shock damping and springs were a bit stiff. The rebuildable Marzochis may be mounted in five different positions, which result in  $5\frac{3}{4}$  to  $7\frac{1}{4}$  inches of axle travel. This variable mounting system is exactly like the one on a Penton. Shock action felt best in the lay-down position, where wheel movement is 5.9 inches. The rear end reacted consistently, stayed straight in the rough and put the motor's power on the ground without a lot of wheelspin in spite of stiffish shocks. They did, however, aggravate one of the Hercules' major problems—rear brake hop.

On all rough surfaces the rear brake will clatter and cause the wheel to bounce. The importer is aware of the problem and certain of the Qualifier Team members have tried cures, some with considerable success. The problem can be cured completely on future models with a fully-floating backing plate which is already rumored to be on the drawing board in Germany. Otherwise, brake action front and rear rivals that of a Penton for progressive feel, stopping power and fade resistance. Dragging either brake lightly when wet restores its performance in 30 or 40 yards.

Billy Uhl said he never had a wheel problem in seven Qualifiers. Neither did we. The die-cast conical alloy hubs are light, handsome, strong and set up so you can tighten the axles without pinching the



This is the main four-pair cluster. The idler pair (below) is permanently geared to it. Three sliding discs transmit power to the shafts by engaging dogs on the constantly meshed, free-spinning gears.



This idler pair is constantly meshed to the lower right two gears above. It is a one-piece unit located in the bottom of the sump and spins on needle bearings. Three of the seven speeds drive through it via sliding discs.



### HERCULES 175 GS ENDURO

Price, suggested retail ..... \$1490

Tire, front ..... 3.00-21 Metzeler MX-Enduro  
 rear ..... 4.00-18 Metzeler MX-Enduro

Brake, front ..... .95 x 5.5 in. (24 x 140mm)  
 rear ..... .95 x 5.5 in. (24 x 140mm)

Brake swept area ..... 32.8 sq. in. (211 sq. cm.)

Specific brake loading ..... 13.04 lbs./sq. in.

Engine type ..... Two-stroke piston-port single

Bore and stroke ..... 60mm x 61mm

Piston displacement ..... 171cc

Compression ratio ..... 11.5:1

Carburetion ..... 1; 34mm; Bing

Air filtration ..... Twin-Air wet foam

Ignition ..... Motoplat CDI

Bhp @ rpm ..... 21.04 @ 8500 (actual)

Torque @ rpm ..... 14.20 @ 7/7500 (actual)

Rake/Trail ..... 28.5°/4.9 in. (124mm)

Mph/1000 rpm, top gear ..... 9.0 mph

Lubrication ..... Premix

Fuel capacity ..... 2.9 gal. (11 liter)

Transmission oil capacity ..... 1.48 qt. (700cc)

Electrical power ..... 6V, 35W lighting coil

Primary transmission ..... Helical gear 2.60:1

Secondary transmission . 5/8 x 3/8 Jwis chain 14/55 3.93:1

Gear ratios, overall ..... (1) 32.39 (2) 22.28 (3) 16.76  
 (4) 13.18 (5) 11.34 (6) 9.87 (7) 8.52

Wheelbase ..... 55.5 in. (1397mm)

Seat height ..... 35 in. (90cm)

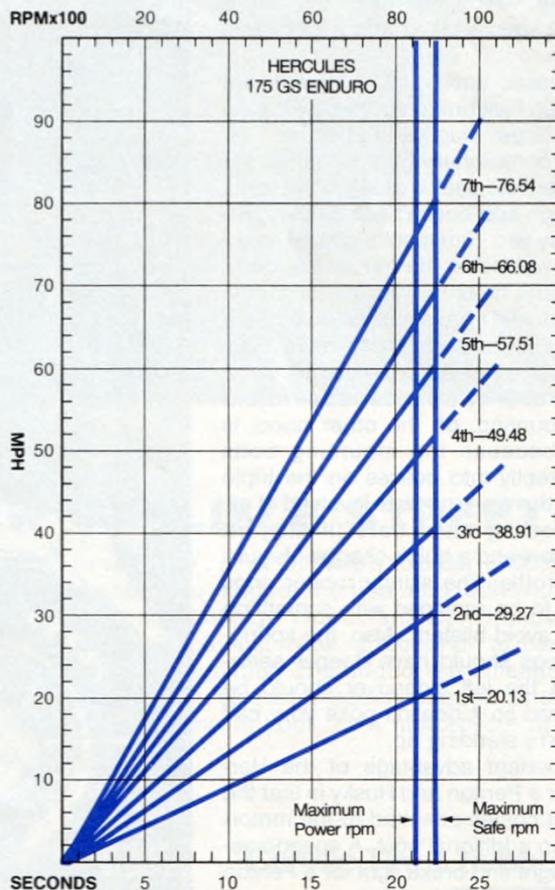
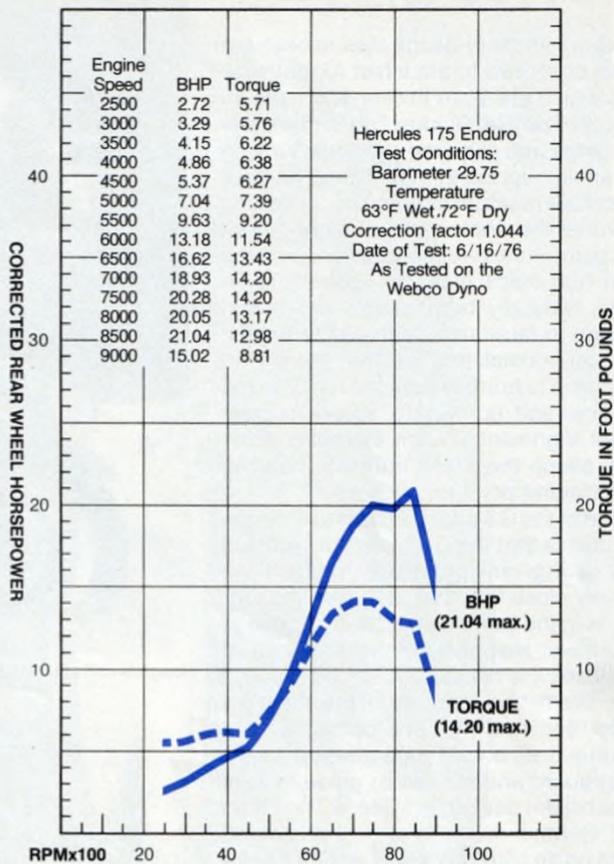
Ground clearance ..... 10 in. (25.4cm)

Curb weight ..... 268 lbs. (121.6kg)

Test weight ..... 428 lbs. (194kg)

Instruments ..... VDO speedometer with odometer  
 resettable both ways by tenths

Average fuel consumption ..... 25-32 mpg



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bearings. Medium-gauge steel spokes are laced cross-two to the latest Akront alloy rims which are 2mm thicker and have an improved profile. Our test bike suffered no rim dings and required only one turn on the spoke nipples in 400 miles. The right side of the rear hub required no tightening because the spokes are straight-pull at that point. A steel-reinforced flange on the front hub helps maintain spoke tension there. Naturally both wheels are quick-change to facilitate a four-minute flat fix. Our only complaints are that there's no rim clamp in front, though the rim is drilled for one, and no way to assure correct wheel alignment in back. Hercules didn't even stamp the swing arm with notches as a starting point for alignment.

One of the GS's most impressive design features is that the countershaft sprocket and swing-arm pivot are located extremely close together, and that the rear axle is in the same plane. Thus, in spite of long-travel suspension, only one inch of chain slack is necessary. Not being used to such a tight setting, we let the chain get sloppy and it ate most of a footpeg nut and an inner case boss. Proper tension joins a large guard and adjustable guide to form an excellent final drive system. The chain is a German-made  $\frac{3}{8}$  x  $\frac{3}{8}$  Jwis, which spins on an alloy sprocket thick as a nine-dollar steak. The countershaft is secured on a taper, which will never slip, but it requires a special puller and a lot of time to remove.

Both plastic unbreakable fenders are the German Falk brand as used by Maico. They are large, tough and effective. The front one occasionally bumps the header pipe. A Denfield seat is nicely contoured, soft enough and doesn't get slippery. It's secured by two 13mm bolts which thread into nuts welded to the frame. Ironically, the gas tank mounts with similar 13mm bolts but doesn't have nuts welded to the frame. A mechanic must have two wrenches to remove it, a feature not in the best interests of trailside repair. Handlebar mounting, on the other hand, is brilliant because the mounting bolts thread directly into bosses on the triple clamp so there are no nuts involved at all. Natural-feeling steel bars fit Magura power levers and a quick-change Magura  $\frac{1}{4}$ -turn throttle. The skinny rubber grips will have to be replaced with something heftier to avoid blisters. Also, the spring-loaded pegs should have deeper serrations and the left sidecover should be recontoured so it doesn't poke your calf when you're standing up.

An important advantage of the Hercules over a Penton and Husky is that the enduro kit comes attached to the motorcycle at no additional cost. A speedometer, headlight and brake light for a Penton costs \$95 extra and you have to install them. Like all enduro kits on off-road



*Rough terrain and high speed bring out the worst in most bikes, but it's just the opposite with the new Hercules.*



bikes, the one on the GS is functional only to the point of meeting Six Day requirements—the lights are feeble and the horn has perpetual laryngitis. An exception is the always-excellent VDO speedometer which is securely rubber-mounted and gear-driven off the front wheel. Another neat GS enduro feature is four threaded bosses on the top of the gas tank for easy mounting of an accessory tool pouch.

The Hercules GS has quite an engine. It incorporates design features which rival the most advanced motorcycle engineering in the world, and it makes enough power to rip down a trail at extraordinary speed. Peak output on the Webco dyno is a relatively mild 21.04 horsepower at 8500 revs, 1.64 hp less than a 175 Penton but, 7.13 more than a Honda MR175. The GS produces 19-or-more hp for 2000 revs at the gut of its powerband and has a seven-speed gearbox, so there is virtually no situation that can't be handled by the motor itself or a poke at the shift lever.

Why seven speeds? Mr. Dengel doesn't have a specific answer but offers an interesting theory that makes John Penton responsible. John has long espoused the theory that a single motorcycle with enough gearbox speeds could be used for all forms of off-road competition. To this end he asked the Sachs factory to develop a motor with eight speeds (he was using Sachs engines in his Pentons at the time). Sachs began the project (Penton later switched to KTM engines) and the current seven-speed series resulted—an eight-speed gearbox was deemed unnecessary, too expensive and overly complicated.

It's debatable whether the GS really needs its seven speeds. The transmission is a marvelous marketing gimmick and a slick piece of engineering, but the engine has enough midrange to get along with six speeds, or even five. But there are some real advantages in seven. Overdrives in sixth and seventh gear guarantee adequate ratios between 65 and 85 mph. This is important for desert events and street sections in the ISDT. The remaining five speeds do the work of four (and sometimes three) gears in other transmissions, so the ratios at trail speeds are quite close. This means: (1) instant acceleration is always available at the shift lever; (2) upshifting to eliminate wheelspin doesn't usually bog the engine; (3) downshifting to utilize engine braking doesn't usually skid the rear wheel; (4) there's no ground speed that falls between available gear ratios. A good rider can use these subtle advantages in many ways. A beginning rider will not be frustrated by the gearbox because it doesn't need to be used constantly—the engine will usually handle a situation that ideally would require a shift. This trait even benefits the expert when his left foot is occupied away from the shift lever.

Occasional missed shifts from first to second gear mar an otherwise perfect



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gearbox. One-out-of-twenty times the lever hangs up in neutral when trying for second. It usually happens when accelerating hard, and careful use of the clutch doesn't help. A possible explanation offered by the Rotary Cycles Service Department sounds logical. Apparently the shifting drum is cut extra-deep between first and second gear to accommodate a neutral indicator on domestic street bikes, and the shifting fork follower gets hung up in the added depth. If improper machining is the culprit, Sachs should have no problem in curing this defect. When they do, they'll have a super tranny because all its other gears shift fast and sure, with or without the clutch, with or without the throttle, 100 percent of the time.

Transmission design is positively inspired. There are not seven gearsets, as might be expected; this would make the engine too wide or the gears too skinny. Instead, there are four permanently meshed pairs of large gears. The secret lies in a clever pair of idler gears (on a jackshaft in the sump) meshed with two of the gears on the mainshaft. Three shifting forks controlled by a rotary drum slide three slotted engaging discs in and out of dogs on the gears. Power is transmitted by utilizing combinations of the four main gearsets and the two idlers, which are used in second, fourth and seventh gear. Each gear spins on needles and the shafts have huge ball bearings at the clutch and drive sprocket. Unfortunately the shifting mechanism is controlled by a complicated linkage which employs a long pawl to rotate the drum. This system is less precise and more subject to wear than a gear-activated drum. Sachs must also design a new transmission breather because the present one drools oil on the back half of the motorcycle.

Alloy cases split horizontally which is of great benefit to maintenance (and production). Fourteen studs double-bolt a total of four transmission bearings and three huge crankshaft ball bearings—one on the ignition flywheel side and two on the drive side. The crankshaft is pressed around a one-piece rod and features full-circle flywheels. A long-skirt, flat-top piston employs a single hard-chromed Dykes ring and moves in a pressed-in steel liner surrounded by 20 yards of fins. Not even a Can-Am or Penton has more finning area. The beautiful shell-mold cylinder and head castings are heavy, but effective at quelling heat as proved by head temperatures refusing to exceed 375 degrees during the dyno run. (Many bikes crowd the danger zone at 450 degrees when pushing out peak power.) The Hercules runs so cool that it will easily produce its peak horsepower all day long—even in a sandwash on a hot day. For an air-cooled two-stroke to stabilize its peak-power temperature at 375 degrees on the dyno is virtually unparalleled in motorcycling. This characteristic, combined with general durability throughout

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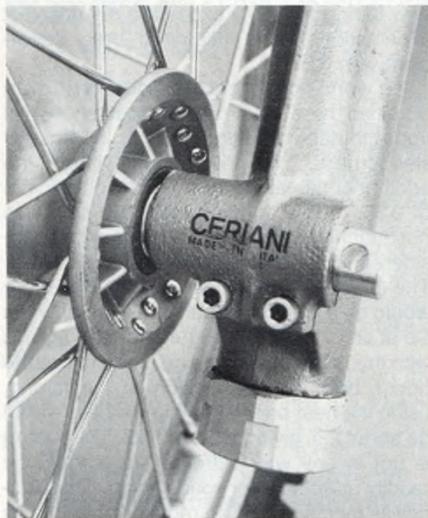
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the engine, will make the Sachs powerplant extremely difficult to break and greatly extend its life between rebuilds.

Another reason for cool running is a D-shaped head design which locates the combustion area toward the cooler intake side of the piston so temperature there will match the high levels found on the exhaust side. This eliminates uneven piston temperatures which invite seizures.

Cylinder porting has several deviations from the norm. A 34mm Bing carburetor feeds the crankcase through a standard bridged intake, but instead of huge main transfers and rows of boost ports, the Sachs uses small, carefully-aimed transfers which improve the scavenging pattern and help keep crankcase pressures high. Then there's the mysterious ports we call "exhaust boosters" for want of official nomenclature. They are smallish holes on either side of the exhaust window which empty into carefully-contoured channels in the exhaust port. We



have never seen these supplemental exhaust ports in a two-stroke before, and can only surmise that they direct exhaust back-pressure into the path of the incoming charge as a means of preventing it from escaping out the exhaust port.

Three 17mm bolts secure the engine in the frame—two on the bottom and one through an elaborate anti-flex mounting plate in back. The factory has recently added head-steadies, but their fingernail grip on the head studs is not effective.

The primary drive is another place where Hercules seems willing to sacrifice efficiency for reliability. Instead of straight-cut spur gears which offer very little friction, the GS has helical primary gears, which rob fractionally more power but are much stronger. The primary drive is part of the slickest clutch in motorcycling. The design employs bent L-section tangs on the driving plates so they bear against the aluminum basket with enough surface area to completely eliminate the usual notching wear. Along with seven steel driven plates, the six fiber-faced

drivers provide a wide, progressive friction point which doesn't fade with abuse. A really simple and tough clutch activation system puts the more complicated rack-and-pinion/ramp-and-ball designs to shame. The clutch cable simply rotates a 5/8-inch diameter vertical shaft with a flat machined on its side. The flat pushes the clutch rod with a light squeeze of the handlebar lever. The six clutch springs may be adjusted perfectly merely by bottoming the slotted head bolts which hold them. No trouble and no slip. To protect the transmission from excessive loads imposed by speed shifts and jump landings, the clutch hub has eight built-in rubber-donut shock absorbers which work in conjunction with a rubber cush system in the rear hub—another example of reliability insurance.

In all cases, hot or cold, the GS never failed to start in one or two kicks. Sachs wisely incorporated primary starting, a rarity among European engines. Once fired, the various churns and whirs inside the engine are amplified by the cylinder fins to a somewhat annoying level. A bulky muffler with no spark arrester meets off-road sound requirements but leaves plenty of two-stroke splatter. Vibration is something else that some riders will find irritating, but the level isn't any greater than that on a Can-Am or Penton.

After break-in we ran the GS on 32:1 Yamalube R, and both the engine and the oil performed flawlessly. Excellent mileage averaging about 28 MPG easily gives a safe 75-mile range from the 2.9-gallon tank. At one point we rode 89.3 brisk miles and there was still a half-inch of gas sloshing in the tank.

With the engine spinning between 65 and 8500 revs where horsepower is always over 19, the motorcycle is fast and powerful. Throttle response becomes part of the steering package and suddenly the whole motorcycle is in harmony. From the saddle it's hard to believe the GS is a 175 and it's hard to believe that anyone, even on a 400, could pass it.

Knowing the bike is so durable and that its engine won't heat up past 375 degrees, a rider can hang it out at speed on a goat trail with added confidence. Sometimes the bike's weight—a source of its durability—interferes, such as when trying to loft the front wheel over an obstacle. But in general the GS can deliver whatever an expert needs. Right now it isn't quite as fast or powerful as a Penton, but at \$1490 it's \$175 cheaper, and that gives the factory a lot of cushion for catching up.

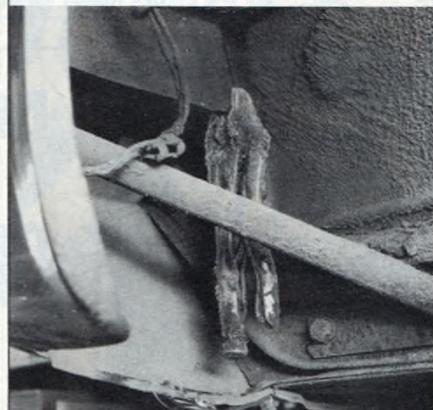
By building a Six Day bike, Hercules became committed to the stiffest set of machine requirements in motorcycling. A perfect first effort is not possible and not expected. But future versions have the potential to be staggering. In fact, there's no question that Hercules can build the finest production off-road bike in the world simply by refining the GS. That's how good it is right now. ●

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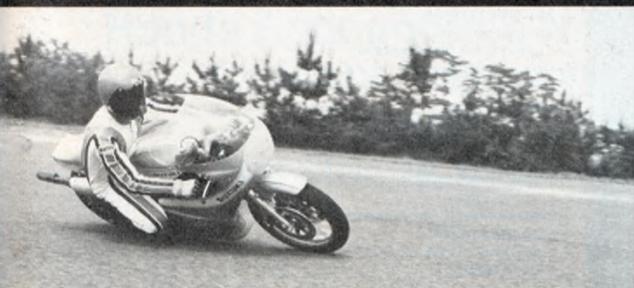
# Cycle

SEPTEMBER 1976 • 75 CENTS

14277



**WORLD PREMIERE:  
750 SUZUKI 4-STROKE FOUR  
7-SPEED HERCULES ENDURO**



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*This Month's Cover:* Captured in full flight is Suzuki's newest pavement bike and one of *Cycle's* most important exclusives. The GS750 has four cylinders, four carburetors and four strokes, and it all adds up to the finest 750 you can buy. Photography by Dale Boller.

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