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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE TRADEMARK TRIAL AND APPEAL BOARD

Proceeding	91177156
Party	Plaintiff H-D Michigan, Inc.
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Signature	/Jonathan Gelchinsky/
Date	06/26/2008
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE TRADEMARK TRIAL AND APPEAL BOARD

H-D MICHIGAN, INC., Opposer v. BRYAN BROEHM, Applicant.	Opposition No.: 91177156 Mark: Serial No.: 78896325 Filed: May 30, 2006

PART 3 OF OPPOSER'S NOTICE OF RELIANCE NO. 7

(EXHIBITS 8 - 9)

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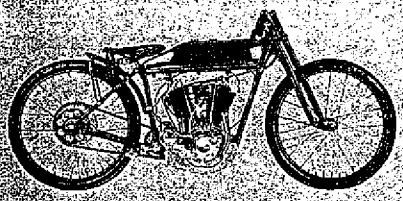
H-D Michigan, Inc. v. Bryan Broehm
Serial No. 78896325

Mark:

Exhibit 8



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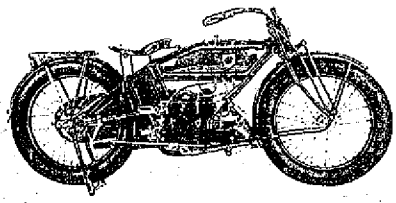

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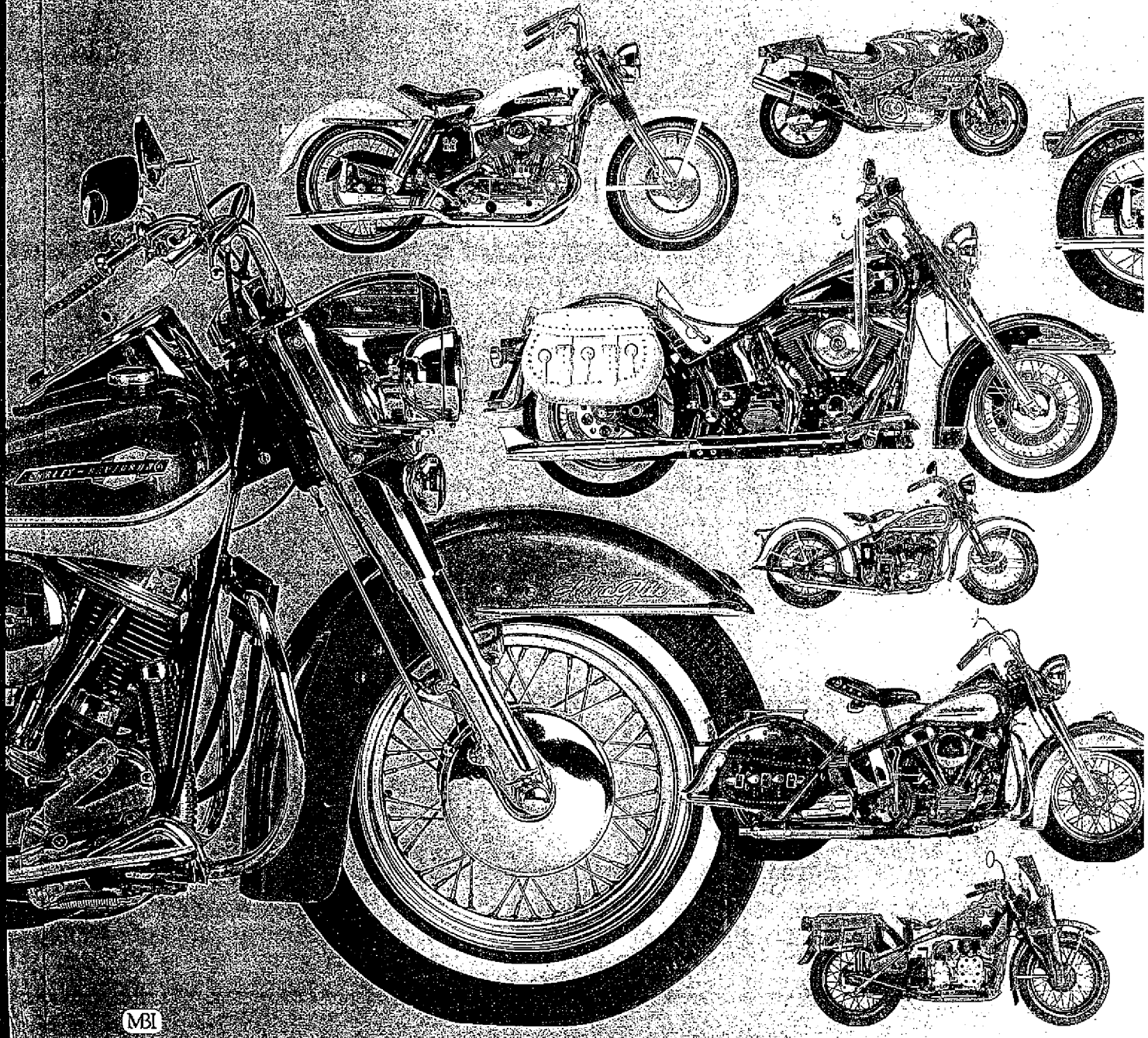
A MODEL-BY-MODEL HISTORY OF THE AMERICAN MOTORCYCLE



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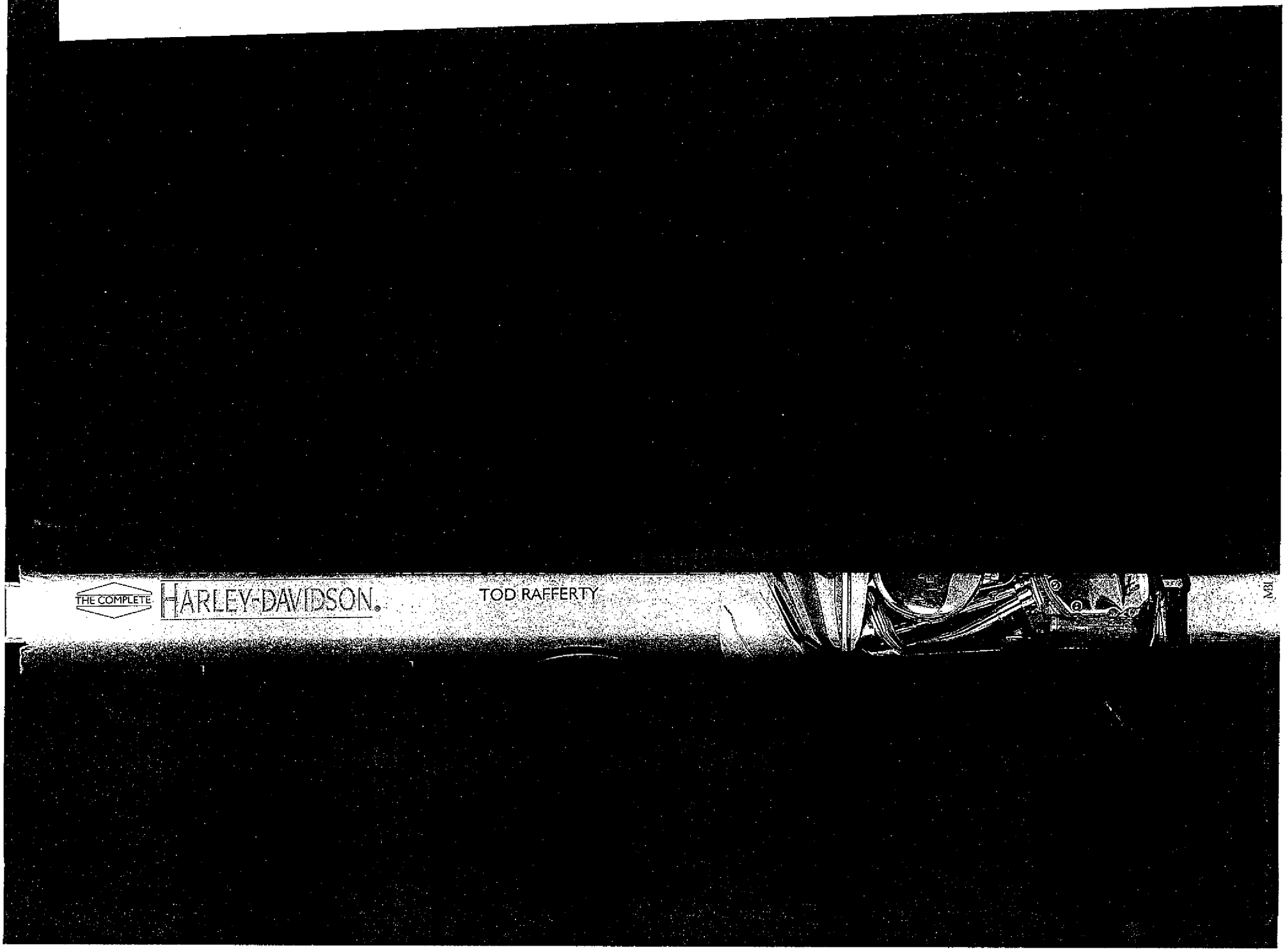
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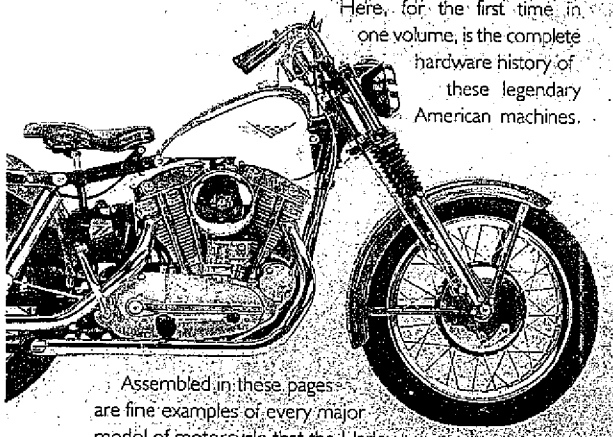
THE COMPLETE HARLEY-DAVIDSON.

The Harley-Davidson Motor Company has been building motorcycles since 1903. In that period the Milwaukee firm has produced more than 140 models, and in the process it has established itself as one of the great symbols of modern American culture. The name, the culture, the look...all are unmistakable. Harley can justly claim to have elevated the motorcycle to almost mythic status, and to have created one of the great popular icons of our age.

Here, for the first time in one volume, is the complete hardware history of these legendary American machines.

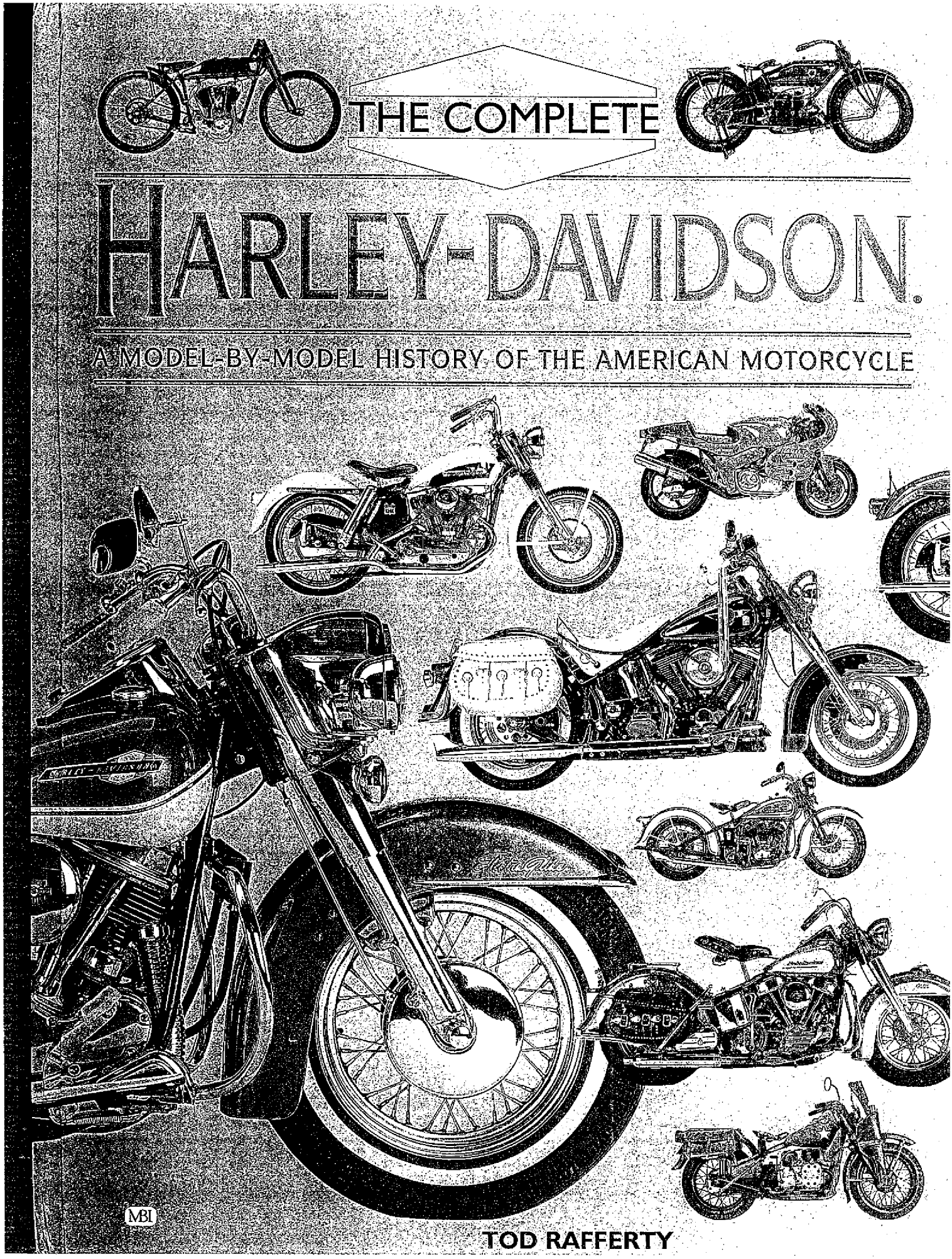


Assembled in these pages are fine examples of every major model of motorcycle that the Harley-Davidson Motor Company has ever made. The majority of the motorcycles illustrated have been photographed specifically for this book, and feature machines that are in a superb state of restoration.

Shown in these pages are the first single-cylinder machines, the early twins, the stout 750cc flatheads and the brawny 61ci (1000cc) overhead-valve Knuckleheads. In 1948 the Knucklehead gave way to the ohv Panhead engine, while the 883cc Sportster appeared in the 1950s as the line expanded, concurrent with the two-stroke singles and middleweight four-strokes from Aermacchi.

With the motorcycle boom of the 1960s the Panhead yielded to the Shovelhead, which grew to 80 cubic inches (1340cc) in size. The Sportster-based XR 750 ruled the dusty ovals of dirt-track racing, and challenged the world in road-racing. The 1200cc Super Glide models expanded the production roster, and factory customs grew in number and frequency. Then, after Harley-Davidson nearly failed as a business, the new Evolution-engined models of the 1980s put Milwaukee back in the contest. The legend was reborn.

Author Tod Rafferty has delved deep into the records to research this story and to ensure that details such as specifications, colors, production numbers, dates etc. are as accurate as possible. His text is complemented by a superb selection of color photographs that document visually Harley-Davidson's fascinating lineage. The result is a book that stands as a fitting tribute to the world's most famous motorcycle marque.



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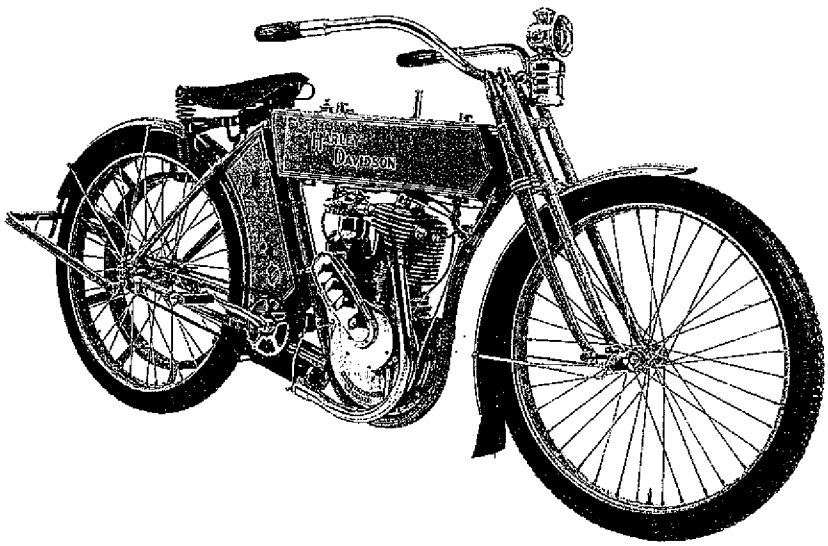
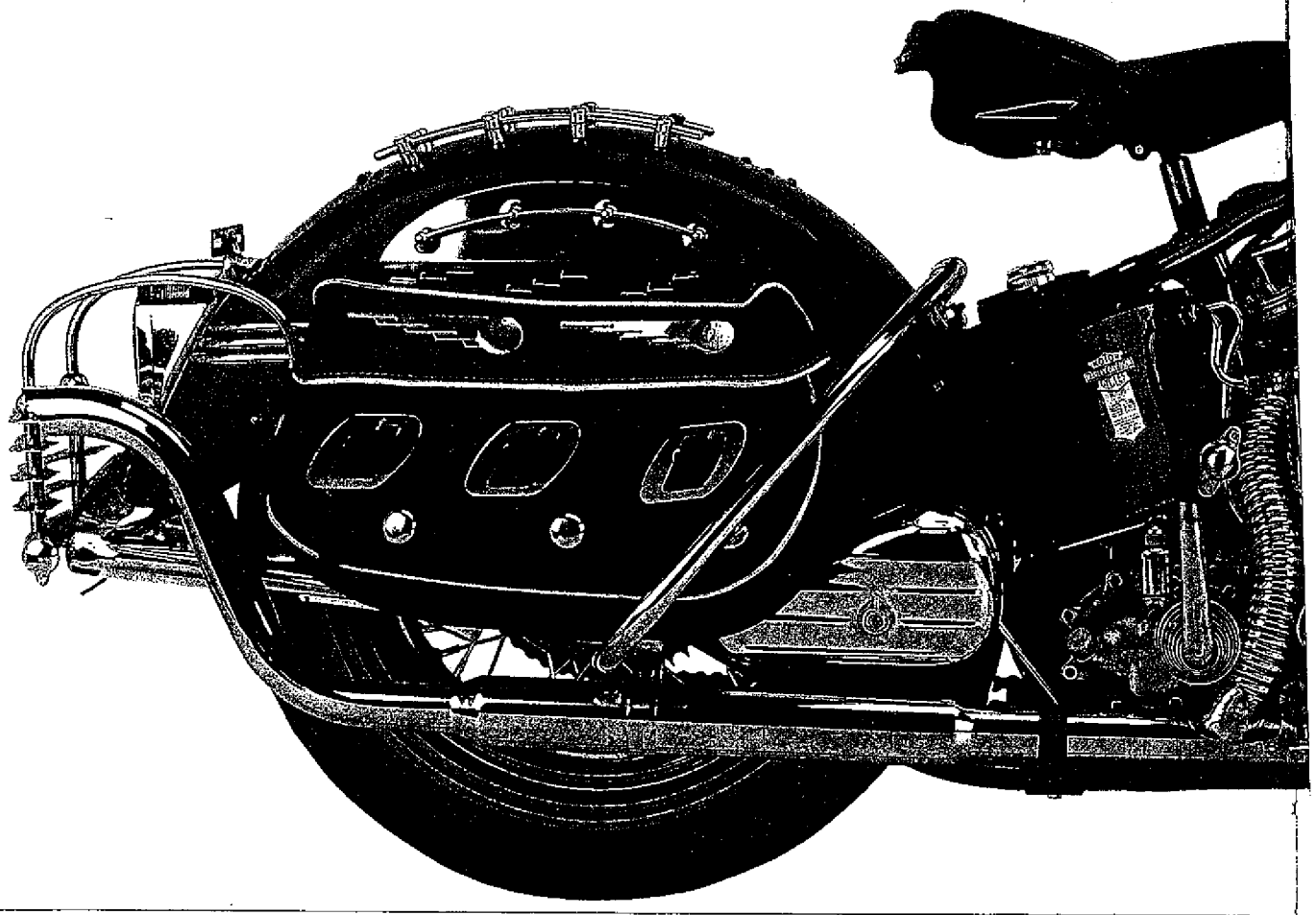


In memory of
Dorothy Jean
1917-1996



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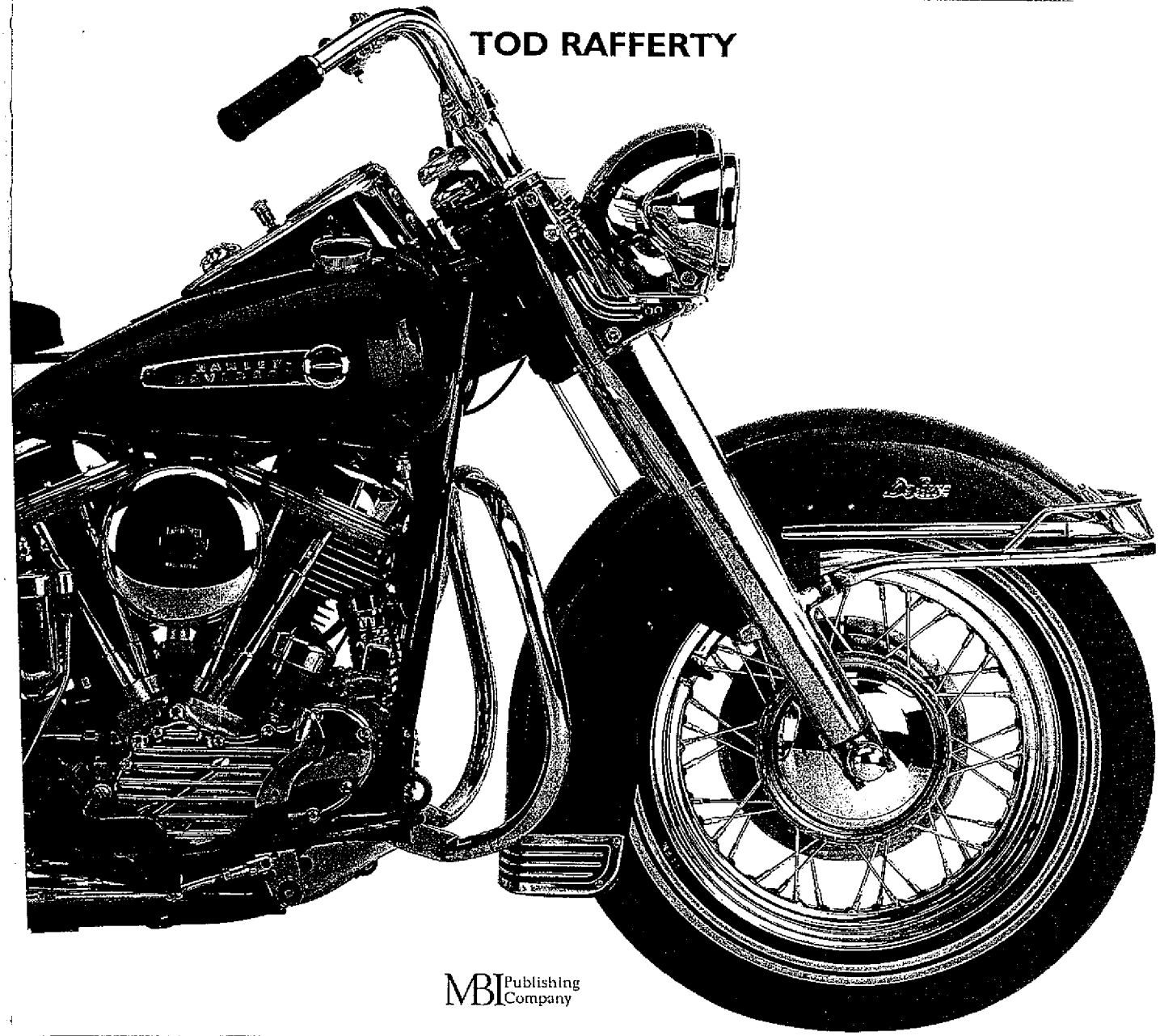

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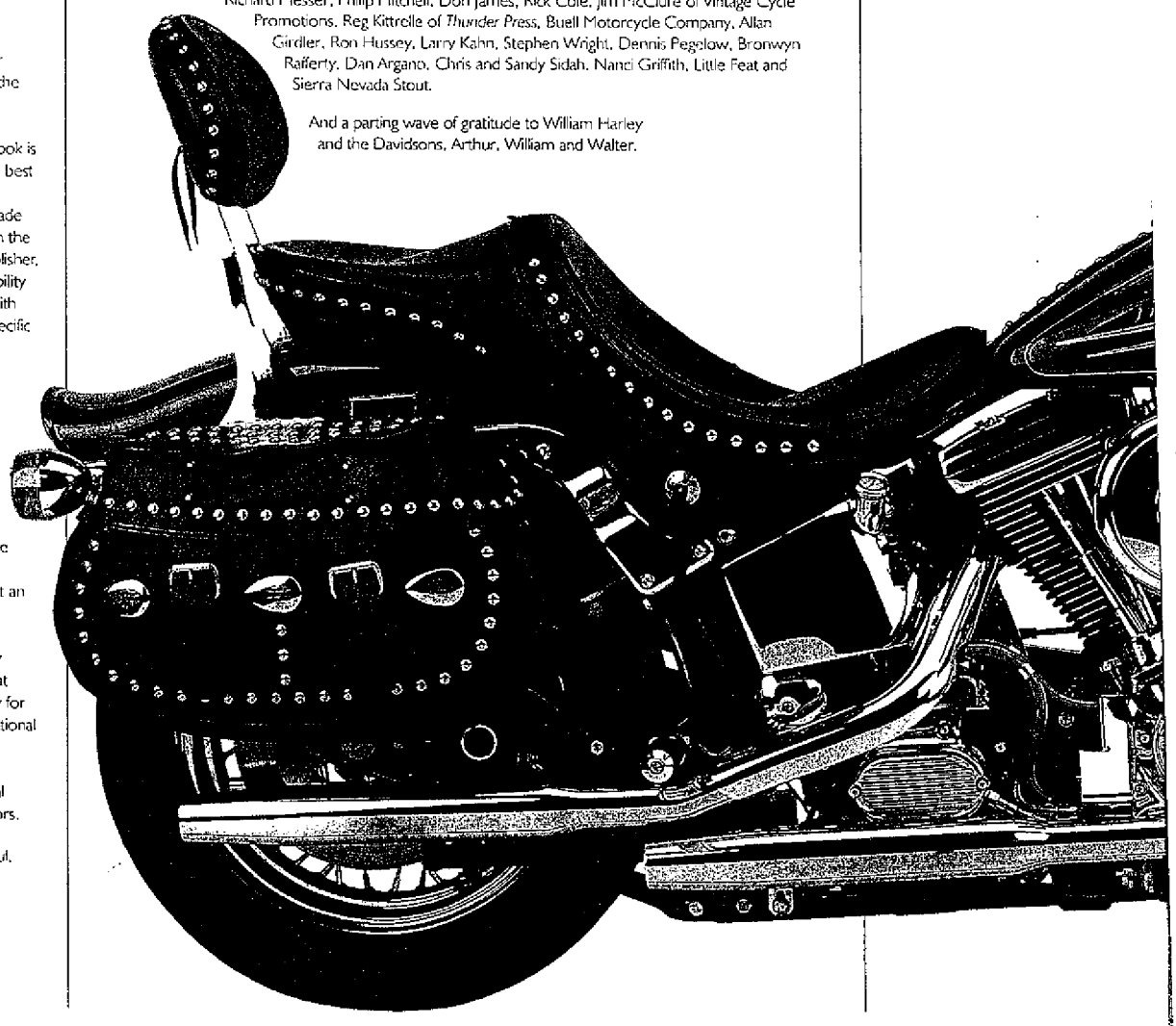


The Author

TOD RAFFERTY has been riding and racing motorcycles for 35 years. ("But I got a late start," he adds.) His previous book *Harley-Davidson: The Ultimate Machine* (CLB Publishing) was published in 1994 and appeared in English, Italian, French and German editions. Though primarily a dirt rider, the author keeps a sport bike for the road and hopes to add a touring motorcycle "if this book does well."

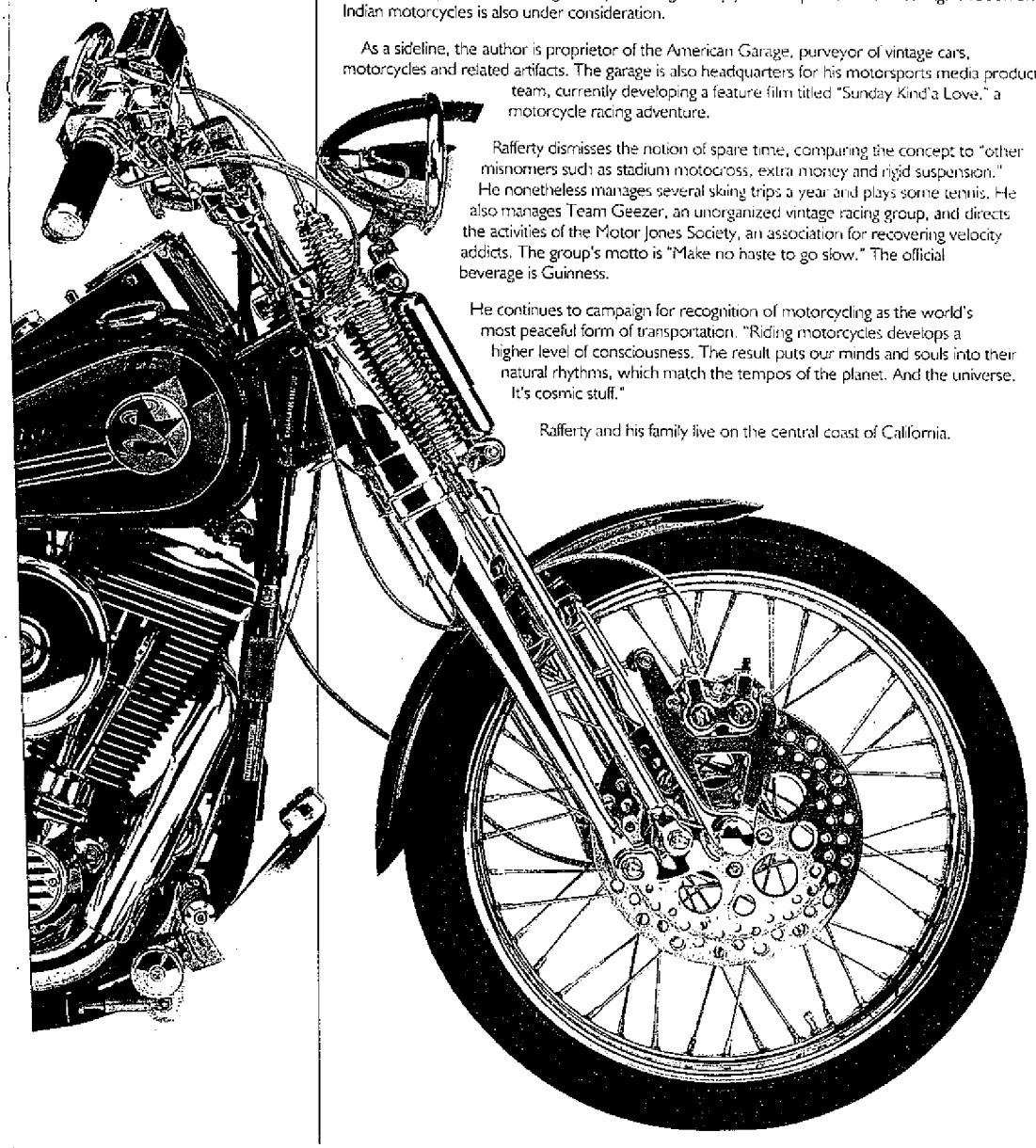
His other works in progress include *Harley Memorabilia*, a historical compilation of H-D collectibles, and *The Harley-Davidson Racing History* covering "ninety years of speed, skill and daring." A book on Indian motorcycles is also under consideration.

As a sideline, the author is proprietor of the American Garage, purveyor of vintage cars, motorcycles and related artifacts. The garage is also headquarters for his motorsports media production team, currently developing a feature film titled "Sunday Kind'a Love," a motorcycle racing adventure.

Rafferty dismisses the notion of spare time, comparing the concept to "other misnomers such as stadium motocross, extra money and rigid suspension." He nonetheless manages several skiing trips a year and plays some tennis. He also manages Team Geezer, an unorganized vintage racing group, and directs the activities of the Motor Jones Society, an association for recovering velocity addicts. The group's motto is "Make no haste to go slow." The official beverage is Guinness.

He continues to campaign for recognition of motorcycling as the world's most peaceful form of transportation. "Riding motorcycles develops a higher level of consciousness. The result puts our minds and souls into their natural rhythms, which match the tempos of the planet. And the universe. It's cosmic stuff."

Rafferty and his family live on the central coast of California.



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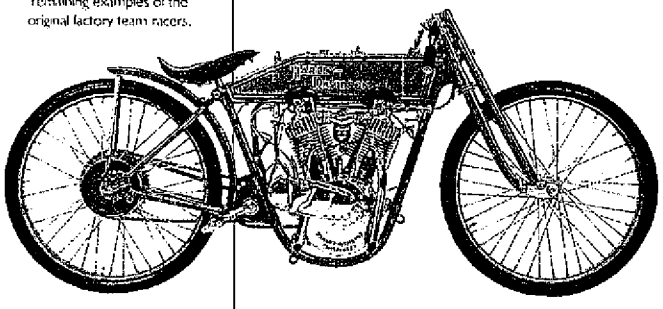
Below: This is an extremely rare motorcycle - a 1915 Model 11K, one of the very few remaining examples of the original factory team racers.



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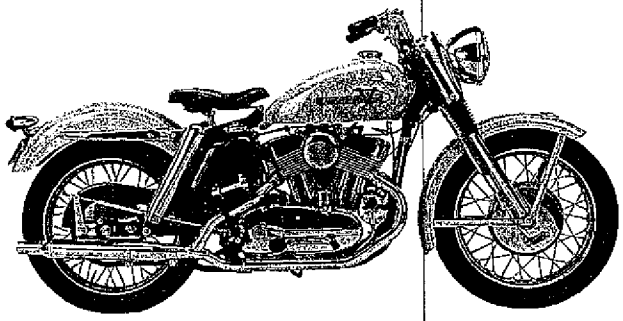

Above: A 1955 KH, which was a longer stroke K model. Engine displacement was 54 cubic inches (883cc); top speed 95mph (153km/h).

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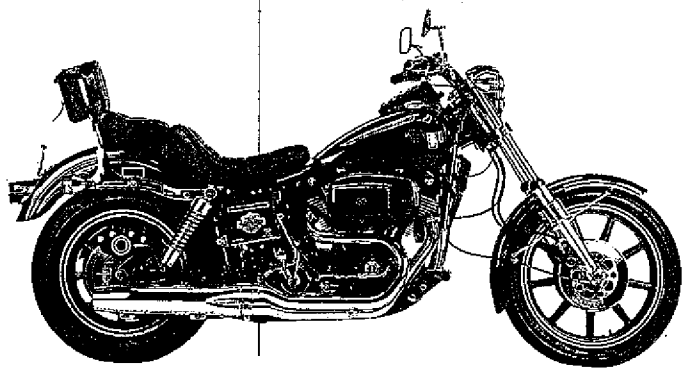

CHAPTER FOUR

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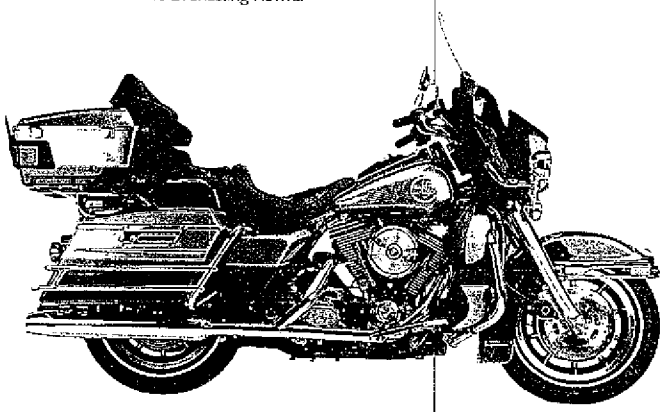

Above: A 1995 Ultra Classic Electra Glide, Milwaukee's first fuel-injected tourer. Electronic cruise control is also standard.

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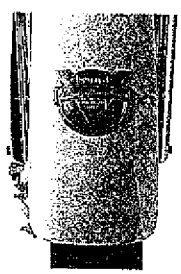
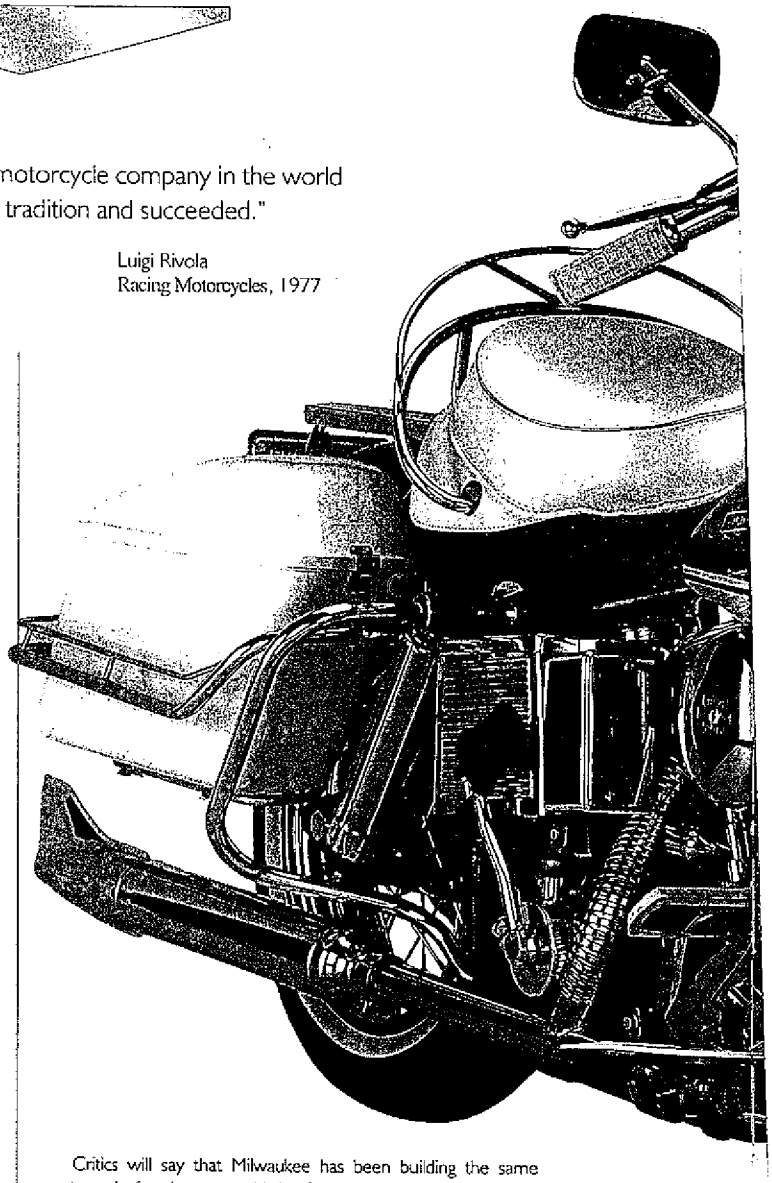


INTRODUCTION

"Harley-Davidson is the only motorcycle company in the world that gave its highest priority to tradition and succeeded."

Luigi Rivola
Racing Motorcycles, 1977



The motorcycle, a mechanized version of the horse, developed concurrently with the automobile, the motorized wagon. For reasons of safety, comfort and practical carrying capacity, most Americans put the wagon before the horse.

The steam locomotive preceded the motorcycle by a century, but it was more industrial elephant than iron horse. With the manufacturing economy of the twentieth century came the opportunity for personal transportation, and just about any young fellow or woman with some incentive could afford to go motoring on their own. And when Henry Ford made the motorcar obtainable for the average laborer, the motorcycle took a divergent path both socially and economically. A narrower path, to be sure, and the one less traveled.

The popularity of motorcycling in the 1920s faded with the Great Depression, but was revived in the mid-1930s. American riders could have the V-twin of their choice: the Indian of Springfield, Massachusetts or the Harley-Davidson from Milwaukee, Wisconsin. Available in any size, so long as it was large.

Hundreds of talented and enterprising young men had sought their fortunes in the new industry of the early 1900s. But four of them emerged as the dominant forces by the 1920s: George Hendee and Oscar Hedstrom of Indian Motocycles and William Harley and Arthur Davidson. Indian had a headstart by several years. As the market for the new machines grew, young Harley and Davidson called in the latter's big brothers and became The Harley-Davidson Motor Company. This book documents the hardware history of their enterprise.

We have included capsule histories on the design, engineering and manufacturing of all major Harley models from 1903 to the present. The most significant entries include the motorcycle's mechanical specifications, available colors, price and the number manufactured. Not in all cases are these figures absolutely accurate, but most are pretty damn close. Some records didn't survive as history, some figures were simply never recorded.

As a model history, this book represents the work of the pioneers in the motorcycle sport. From Bill Harley and the Davidson brothers to Bill Ottaway and the racers of the Harley Wrecking Crew; from Dud Perkins, Tom Sifton and Trev Deely to the second generation of Harleys and Davidsons; from Dot Robinson and the Motor Maids to Dick O'Brien and the third and fourth generations of Davidsons, the motorcycles pictured in these pages reflect the craft and enthusiastic commitment of all those who chose to make their careers in "the greatest sport on wheels."

Harley-Davidson was a family business for some 65 years. After ten years as part of a manufacturing conglomerate, the Milwaukee firm returned to private ownership in 1981. Throughout the years of boom and bust, Harley-Davidson was known almost exclusively as the builder of large, air-cooled V-twin engines, powering mostly large, heavyweight motorcycles. This remains true today.

Critics will say that Milwaukee has been building the same motorcycle for about two-thirds of the century. Fans, and stockholders, will say that's just fine.

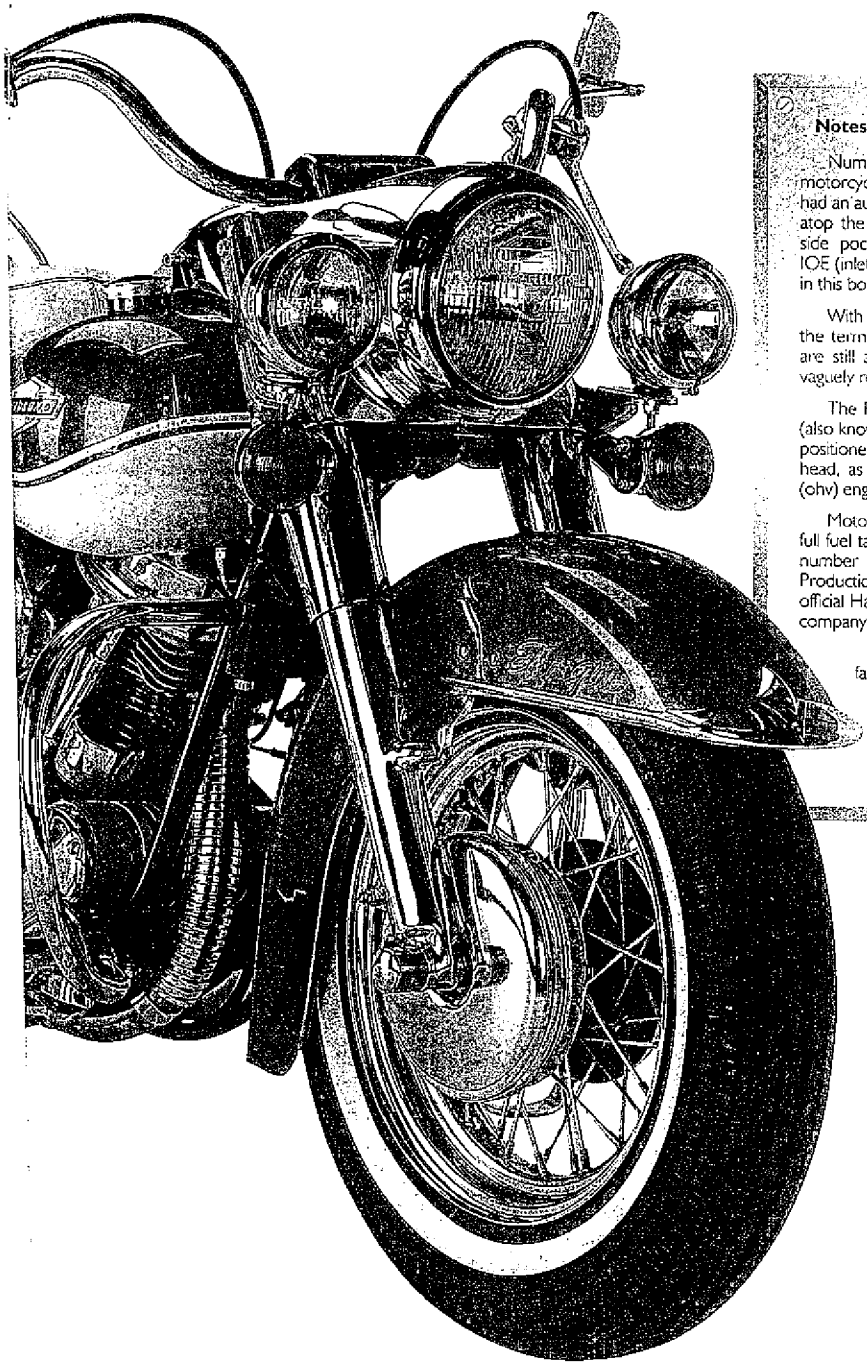
This book cites the significant single-cylinder machines produced by Harley-Davidson, including the two-strokes and imported Aermacchi singles. But the bulk of this compendium features the V-twin as it spans 88 years of evolutionary change and development. The design principles have changed little over the years, but the engineering and construction are thoroughly contemporary.

And while some view the big-inch V-twin as an anachronism, others see it as the fundamental soul of motorcycling.

One thing is certain; no other motorcycle company, regardless of engine design, has been building motorcycles for 94 years.

Tod Rafferty
Atascadero, California 1996

INTRODUCTION



Notes on Terms, Numbers and Specifications

Numerous terms and names have been attached to motorcycle engines over the years. The early engines had an automatic, or atmospheric, or suction intake valve atop the cylinder, and a mechanical exhaust valve in a side pocket. These were designated pocket-valve or IOE (inlet-over-exhaust) engines. The latter term is used in this book.

With the arrival of mechanical intake valves in 1911, the term F-head describes the engine type. The valves are still arranged in the same fashion, but the system vaguely resembled the letter F and the label stuck.

The F-head is not to be confused with the Flathead (also known as the side-valve). This engine has the valves positioned parallel on the side of the cylinder and the head, as you might expect, is flat. The overhead valve (ohv) engine puts both valves at the top of the cylinder.

Motorcycle weights in the specifications include a half-full fuel tank. The production numbers cited refer to the number of motorcycles built for that model year. Production numbers, prices and colors were drawn from official Harley-Davidson publications and provided by the company archives.

Disputes and disagreements over some facts and figures are inevitable. Documented corrections, revisions and clarifications are welcomed, and will be incorporated in subsequent printings should they be warranted.

TR fax: 805/466-8248 e-mail: traff@telis.org

1903-05 SINGLE

SPECIFICATIONS
ENGINE/DRIVETRAIN
Engine: IOE single
Displacement: 24.74ci (405cc)
Bore & stroke: 3 x 3.5in (76 x 89mm)
Horsepower: Approx. 3
Carburetion: Approx. 0.88in (22mm)
Transmission: Direct drive
Final drive: Leather belt
Brake: Rear coaster
Battery: 6-volt
Ignition: Coil/points

CHASSIS/SUSPENSION
Frame: Steel, single downtube
Suspension: None
Wheelbase: 51in (129.5cm)
Weight: 178lb (81kg)
Fuel capacity: 1.5gal (5.7lt)
Oil capacity: 2qts (1.9lt)
Tires: 28 x 2.5in (71 x 6.35cm)
Top speed: Approx. 35mph (56km/h)
Color: Black, gold striping
Number built: 38
Price: $200

1903-05 SINGLE

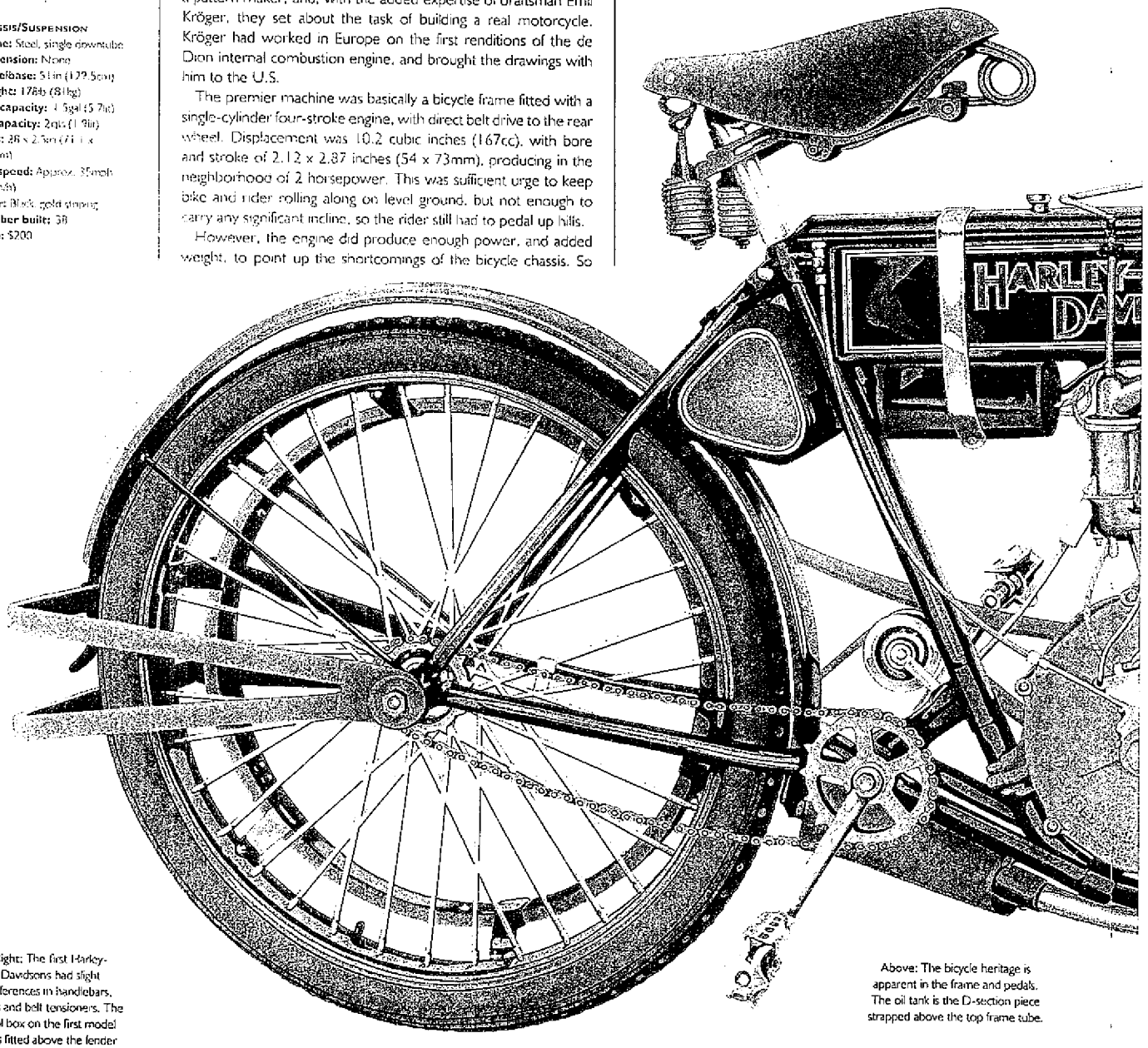
The first prototype Harley-Davidson was actually begun in 1901. Since both William S. Harley, 21, and Arthur Davidson, 20, worked full-time for the same company, the after-hours project would consume most of the next two years. At the time, neither young man had any grand plans for a manufacturing company. Their first object, in fact, had been to produce an outboard motor, in order to reach their favorite fishing spots more easily. But soon they were captivated by the challenge of this newfangled device called a motorcycle. And their abilities, plus the support of friends and family, were to cast their futures in iron and steel. In 1903 they became The Harley-Davidson Motor Company.

Like many other pioneer motorcycle builders, William Harley had begun in the bicycle business. Arthur Davidson had trained as a pattern maker, and, with the added expertise of draftsman Emil Kröger, they set about the task of building a real motorcycle. Kröger had worked in Europe on the first renditions of the de Dion internal combustion engine, and brought the drawings with him to the U.S.

The premier machine was basically a bicycle frame fitted with a single-cylinder four-stroke engine, with direct belt drive to the rear wheel. Displacement was 10.2 cubic inches (167cc), with bore and stroke of 2.12 x 2.87 inches (54 x 73mm), producing in the neighborhood of 2 horsepower. This was sufficient urge to keep bike and rider rolling along on level ground, but not enough to carry any significant incline, so the rider still had to pedal up hills.

However, the engine did produce enough power, and added weight, to point up the shortcomings of the bicycle chassis. So William and Arthur returned to the drawing table in search of both added power and durability. The second engine had bore and stroke of 3 x 3.5 inches (76 x 89mm) for a displacement of 24.74 cubic inches (405cc). The flywheel was more than twice the diameter of the original. Bill Harley designed a stronger loop frame to accommodate the new engine, and the first genuine Harley-Davidson motorcycle was born.

Arthur's older brothers, Walter and William Davidson, soon came to play larger roles in the company's fortunes. Arthur had sent a letter about the project to Walter, then working in Kansas as a machinist for the railroad. Returning to Milwaukee in April of 1903 for the wedding of eldest brother William, Walter was also afflicted with motorcycle fever. He immediately took a job with the local railroad and devoted his spare time to the company.



Right: The first Harley-Davidsons had slight differences in handlebars, seats and belt tensioners. The tool box on the first model was fitted above the fender behind the rear frame section.

Above: The bicycle heritage is apparent in the frame and pedals. The oil tank is the D-section piece strapped above the top frame tube.

1903-05 Single
Owner – Harley-Davidson Motor Co.
Milwaukee, Wisconsin
Illustration from photo courtesy of
Harley-Davidson Archives

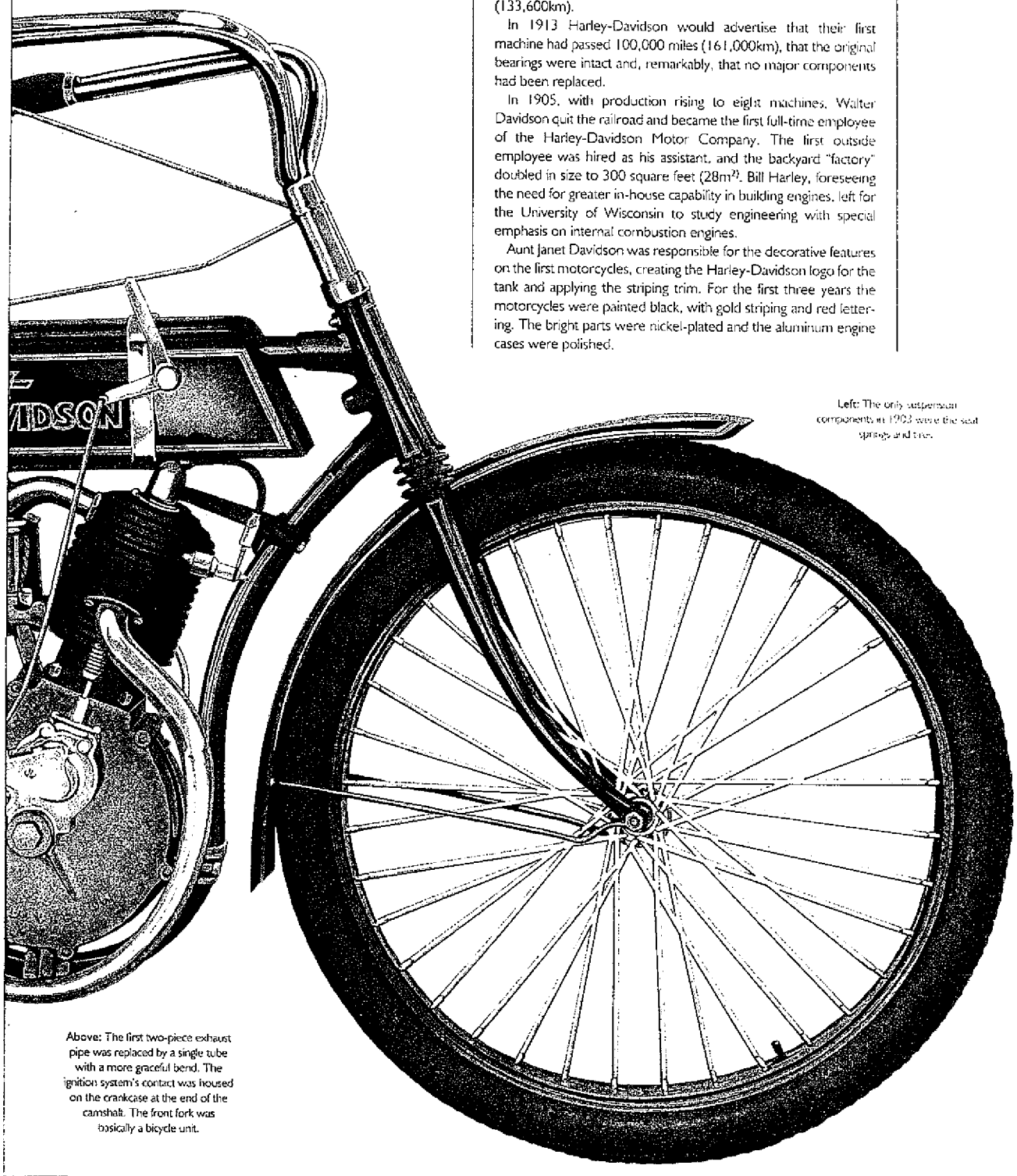
Below: Early throttle controls featured a system of rods and levers between the handlebar and home-made carburetor.

Records on the early production numbers are sketchy. According to historian Jerry Hatfield, the second prototype and two production models were begun in 1903. The latter two were completed in 1904, and one was bought by a Mr. Meyer, who rode it for 6,000 miles (9,660km) before selling it to George Lyon. At 21,000 miles (33,800km) it was purchased by a Dr. Webster, who later sold it to Louis Fluke, who later transferred it to George Sparrow. The five owners brought the mileage to 83,000 (133,600km).

In 1913 Harley-Davidson would advertise that their first machine had passed 100,000 miles (161,000km), that the original bearings were intact and, remarkably, that no major components had been replaced.

In 1905, with production rising to eight machines, Walter Davidson quit the railroad and became the first full-time employee of the Harley-Davidson Motor Company. The first outside employee was hired as his assistant, and the backyard "factory" doubled in size to 300 square feet (28m²). Bill Harley, foreseeing the need for greater in-house capability in building engines, left for the University of Wisconsin to study engineering with special emphasis on internal combustion engines.

Aunt Janet Davidson was responsible for the decorative features on the first motorcycles, creating the Harley-Davidson logo for the tank and applying the striping trim. For the first three years the motorcycles were painted black, with gold striping and red lettering. The bright parts were nickel-plated and the aluminum engine cases were polished.



Left: The only suspension components in 1903 were the seat springs and tires.

Above: The first two-piece exhaust pipe was replaced by a single tube with a more graceful bend. The ignition system's contact was housed on the crankcase at the end of the camshaft. The front fork was basically a bicycle unit.

1906-07 SINGLE

SPECIFICATIONS
ENGINE/DRIVETRAIN
Engine: IOE single
Displacement: 26.8ci (440cc)
Bore & stroke: 3.125 x 3.5in (79.4 x 89mm)
Horsepower: Approx. 4
Carburetion: Schebler
Transmission: Direct drive
Final drive: Leather belt
Brake: Rear coaster
Battery: 6-volt dry cell
Ignition: Coil/points

CHASSIS/SUSPENSION
Frame: Steel, single downtube
Suspension: Dual spring fork
Wheelbase: 51in (129.5cm)
Weight: 185lb (84kg)
Fuel capacity: 1.5gal (5.7lit)
Oil capacity: 2qts (1.9lit)
Tires: 28 x 2.25 in (71.1 x 5.7cm)
Top speed: Approx. 40mph (64km/h)
Colors: Black; renault gray
Number built: 200
Price: $210

1906-07 SINGLE

By 1906 The Motor Company was well on its way to prosperity, which everyone agreed was just around the corner. Production increased to 50 motorcycles, and the first color option appeared on the order forms. Renault gray was the new hue, complemented by carmine red lettering on the tank and red pinstriping.

With new paint came a new nickname, and advertising slogan, for the Harley-Davidson motorcycle: The Silent Gray Fellow. Motorcycling was already straining for respectability, and Milwaukee meant to lead the way as a responsible manufacturer. The business had grown quickly, and Harley-Davidson was busy on all fronts, with research on new ideas and designs, a national advertising campaign and the first real factory on Chestnut Street, which would later become Juneau Avenue.

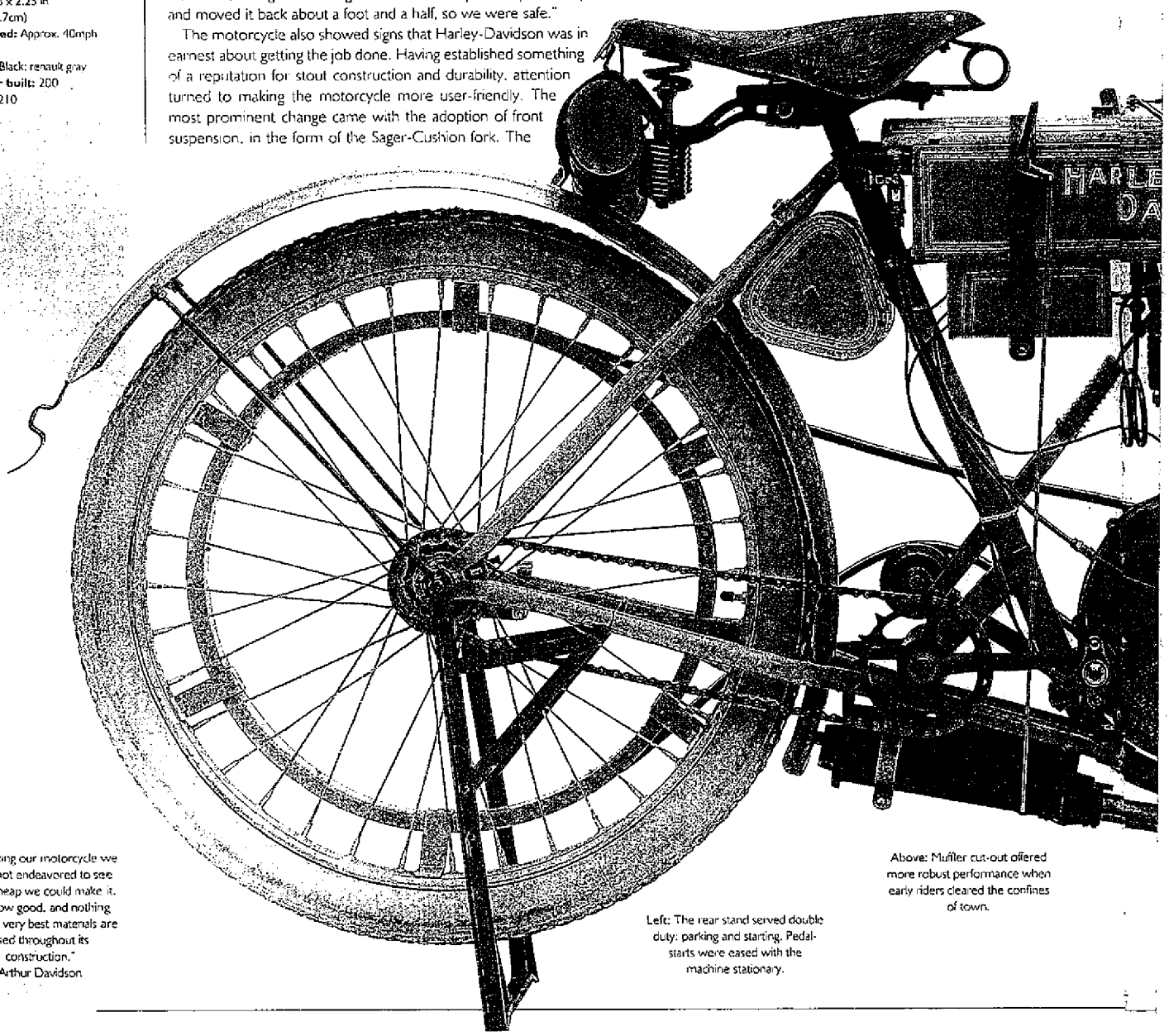
Building the bikes in a backyard shed was over. The new facility offered nearly 2,400 square feet (222m²) of work space. When the structure had been framed, the builders were informed that it was encroaching the railroad right-of-way by about a foot (30cm). This was according to surveyors employed by the railroad, which then wielded considerable authority. "So," according to Walter Davidson, "we got about eight or ten fellows, picked up the shop and moved it back about a foot and a half, so we were safe."

The motorcycle also showed signs that Harley-Davidson was in earnest about getting the job done. Having established something of a reputation for stout construction and durability, attention turned to making the motorcycle more user-friendly. The most prominent change came with the adoption of front suspension, in the form of the Sager-Cushion fork. The dual-spring, leading link assembly helped smooth the rutted and rocky roads and absorbed a portion of the impact heretofore delivered to the rider.

With improved handling came a corresponding boost in power. An eighth-inch (0.32cm) increase in the cylinder bore brought displacement to 26.8 cubic inches (440cc), and the invigorating top speed of 45mph (72km/h). In 1907 production jumped to 154 motorcycles, and the Harley-Davidson Motor Company was incorporated, with sales of $35,000 in stock limited to the 18 employees.

Arthur and Walter Davidson quit their regular jobs to devote their full efforts to the family business. Their older brother William soon followed suit, and was appointed vice president and works manager. Bill Harley was chief engineer and treasurer, Arthur Davidson became sales manager and secretary, and Walter Davidson was the company's first president.

Walter and William Davidson were the most mechanically minded of the founding four, and paid close attention to the newest techniques in manufacturing and assembly. Together they went to Chicago to learn oxy-acetylene welding and trained their employees in the latest methods. Arthur was busy setting up a



"In making our motorcycle we have not endeavored to see how cheap we could make it, but how good, and nothing but the very best materials are used throughout its construction."
Arthur Davidson

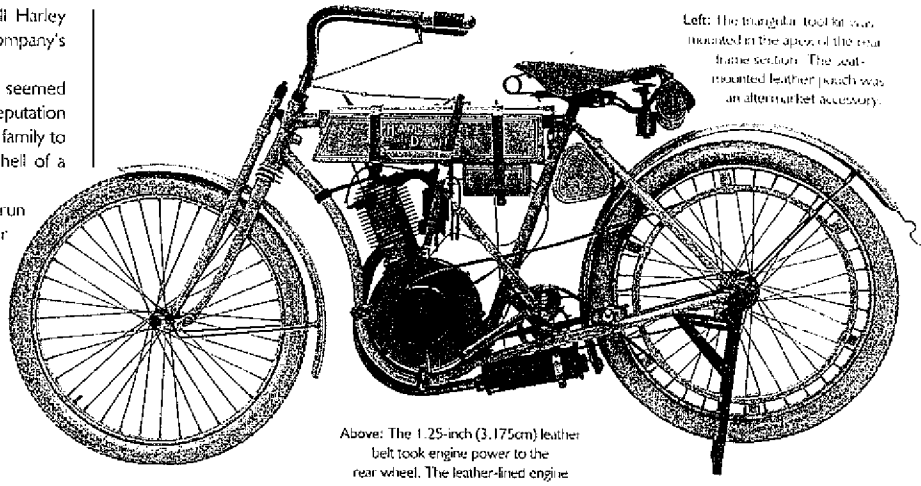
Left: The rear stand served double duty: parking and starting. Pedal-starts were eased with the machine stationary.

Above: Muffler cut-out offered more robust performance when early riders cleared the confines of town.

national network of Harley-Davidson dealers, while Bill Harley took time from his studies to start on the design of the company's first V-twin engine.

But it was Walter Davidson, the middle brother, who seemed to suddenly develop a talent that would gain a national reputation for the young company. The first of the Scots' immigrant family to be born in the U.S.A., Walter turned out to be one hell of a motorcycle rider.

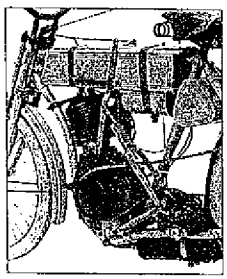
At the age of 30, Walter entered a 2-day endurance run from Chicago, Illinois to Kokomo, Indiana and back. After more than 400 miles (650km) only three of the 27 riders finished with perfect scores, Walter among them. Endurance would become a key word in the Harley-Davidson sales brochure, the first of which was also produced in 1907.



Left: The triangular tool kit was mounted in the apex of the rear frame section. The seat-mounted leather pouch was an aftermarket accessory.

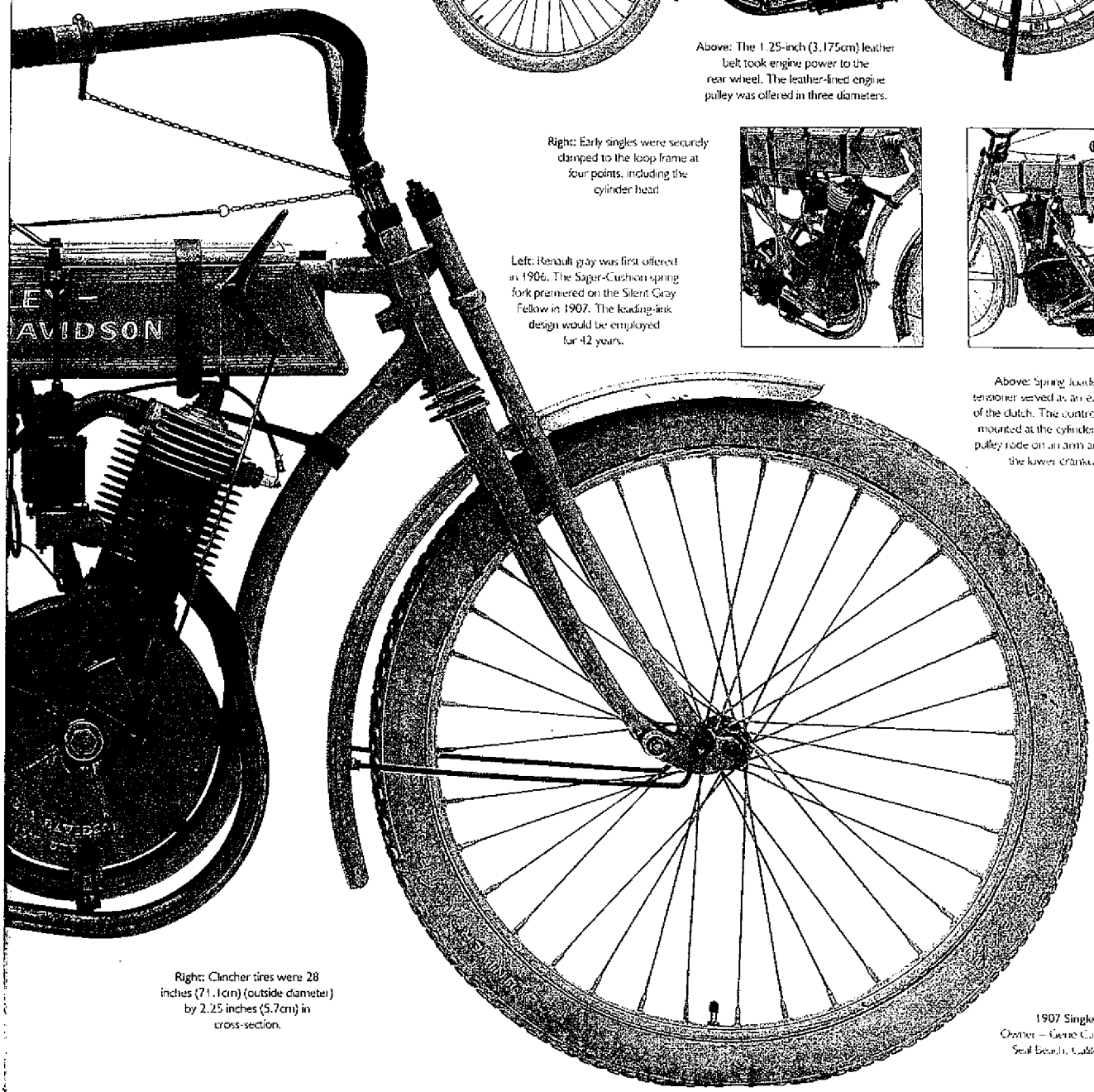
Above: The 1.25-inch (3.175cm) leather belt took engine power to the rear wheel. The leather-lined engine pulley was offered in three diameters.

Right: Early singles were securely damped to the loop frame at four points, including the cylinder head.



Left: Renault gray was first offered in 1906. The Sager-Cushion spring fork premiered on the Silent Gray Fellow in 1907. The leading-link design would be employed for 42 years.

Above: Spring-loaded belt tensioner served as an early version of the clutch. The control lever was mounted at the cylinder base; the pulley rode on an arm anchored to the lower crankcase.



Right: Clincher tires were 28 inches (71.1cm) (outside diameter) by 2.25 inches (5.7cm) in cross-section.

1907 Single
Owner — Gene Calabrese
Seal Beach, California

1908 MODEL 4 SINGLE

Specifications
Engine/Drivetrain
Engine: IOE, single
Displacement: 26.8in (340cc)
Bore & stroke: 3.125 x 3.5in (79 x 89mm)
Horsepower: Approx. 4
Carburetion: Schebler
Transmission: Direct drive
Final drive: Leather belt
Brake: Rear coaster
Battery: 6 volt dry cell
Ignition: Coil/points

Chassis/Suspension
Frame: Steel, single downtube
Suspension: Dual spring fork
Wheelbase: 51in (129.5cm)
Weight: Estimated 185lb (84kg)
Fuel capacity: 1.5gal (5.7lt)
Oil capacity: 2qts (1.9lt)
Tires: 28 x 2.5in (71.1 x 6.35cm)
Top speed: Approx. 40mph (64km/h)
Colors: Black, renault gray
Number built: 450
Price: $210

A NEW SINGLE MODEL

The Harley-Davidson Motor Company now employed 18 full-time workers. And Bill Harley had apparently made considerable progress in designing the V-twin.

Officially, the 2-cylinder Harley didn't appear until 1909. But somehow a fellow named Harvey Bernard got hold of one engine in 1908, and wedged it into a single chassis. This became a matter of record when Harvey won the Algonquin, Illinois hillclimb in July. Milwaukee admitted to no chicanery in the deal, and to this day the story of Harvey Bernard and his backyard special remains shrouded in mystery.

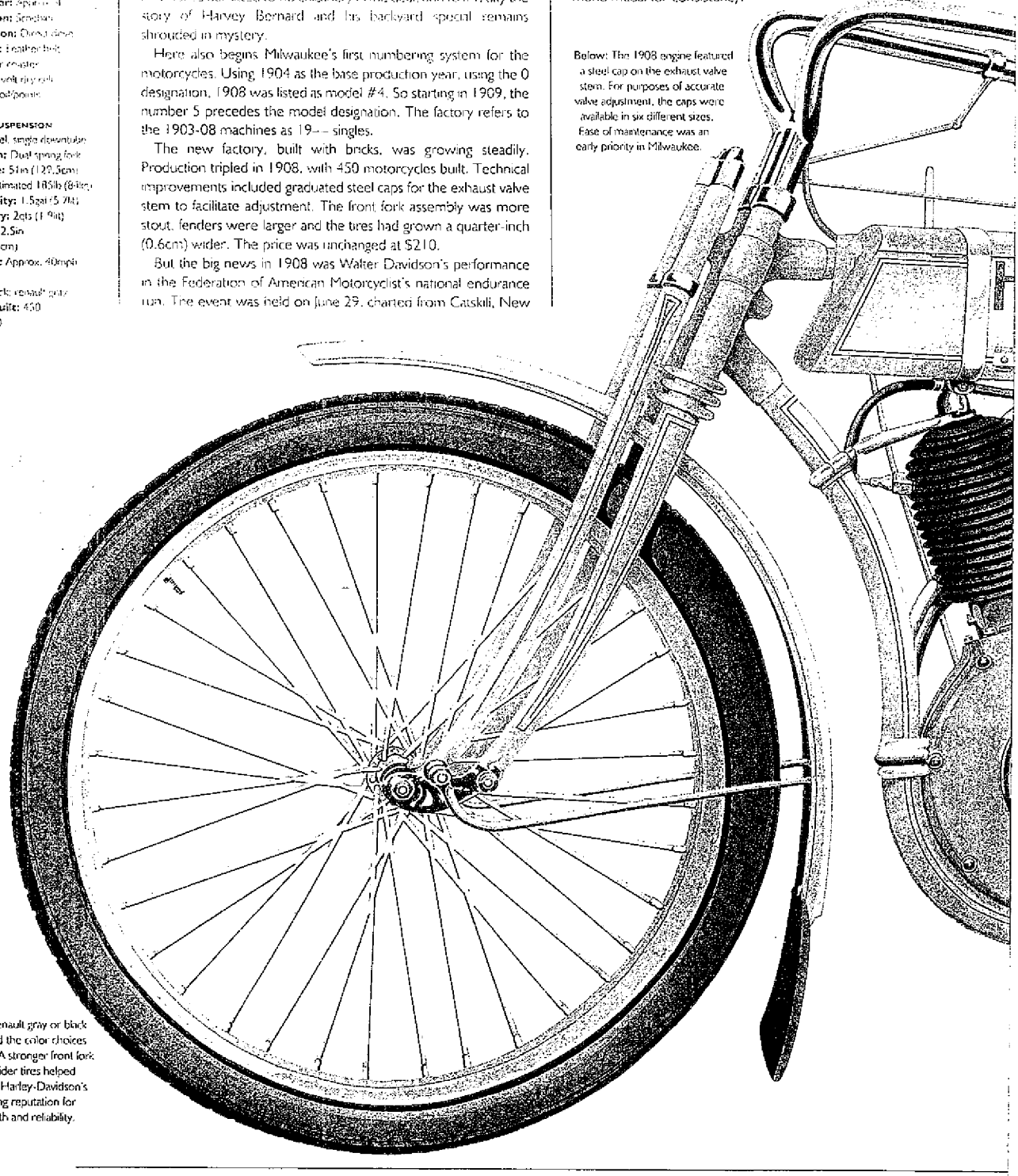
Here also begins Milwaukee's first numbering system for the motorcycles. Using 1904 as the base production year, using the 0 designation, 1908 was listed as model #4. So starting in 1909, the number 5 precedes the model designation. The factory refers to the 1903-08 machines as 19-- singles.

The new factory, built with bricks, was growing steadily. Production tripled in 1908, with 450 motorcycles built. Technical improvements included graduated steel caps for the exhaust valve stem to facilitate adjustment. The front fork assembly was more stout, fenders were larger and the tires had grown a quarter-inch (0.6cm) wider. The price was unchanged at $210.

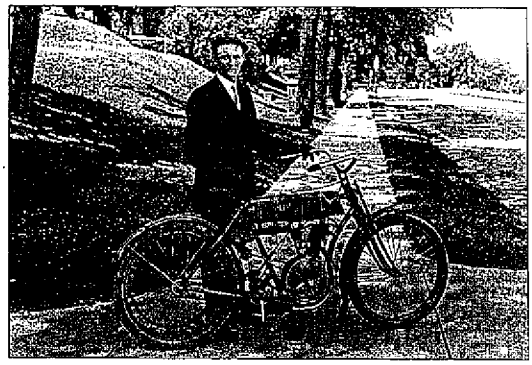
But the big news in 1908 was Walter Davidson's performance in the Federation of American Motorcyclist's national endurance run. The event was held on June 29, charted from Catskill, New York to New York City, a distance of 175 miles (282km). There were five Harley-Davidsons among the 61 starters, representing 17 manufacturers. Walter Davidson was listed as number 35.

Walter later noted that many entrants had 4-wheeled support vehicles carrying spare parts. He packed no spares, but finished the first leg with a perfect score. On day two, with the field whittled to 46 riders, he completed the 190-mile (306km) Long Island loop without losing any points. Davidson finished the meet with the maximum 1,000 points, and received the special diamond medal for consistency.

Below: The 1908 engine featured a steel cap on the exhaust valve stem. For purposes of accurate valve adjustment, the caps were available in six different sizes. Ease of maintenance was an early priority in Milwaukee.



Right: Renault gray or black remained the color choices for 1908. A stronger front fork and wider tires helped enhance Harley-Davidson's growing reputation for strength and reliability.



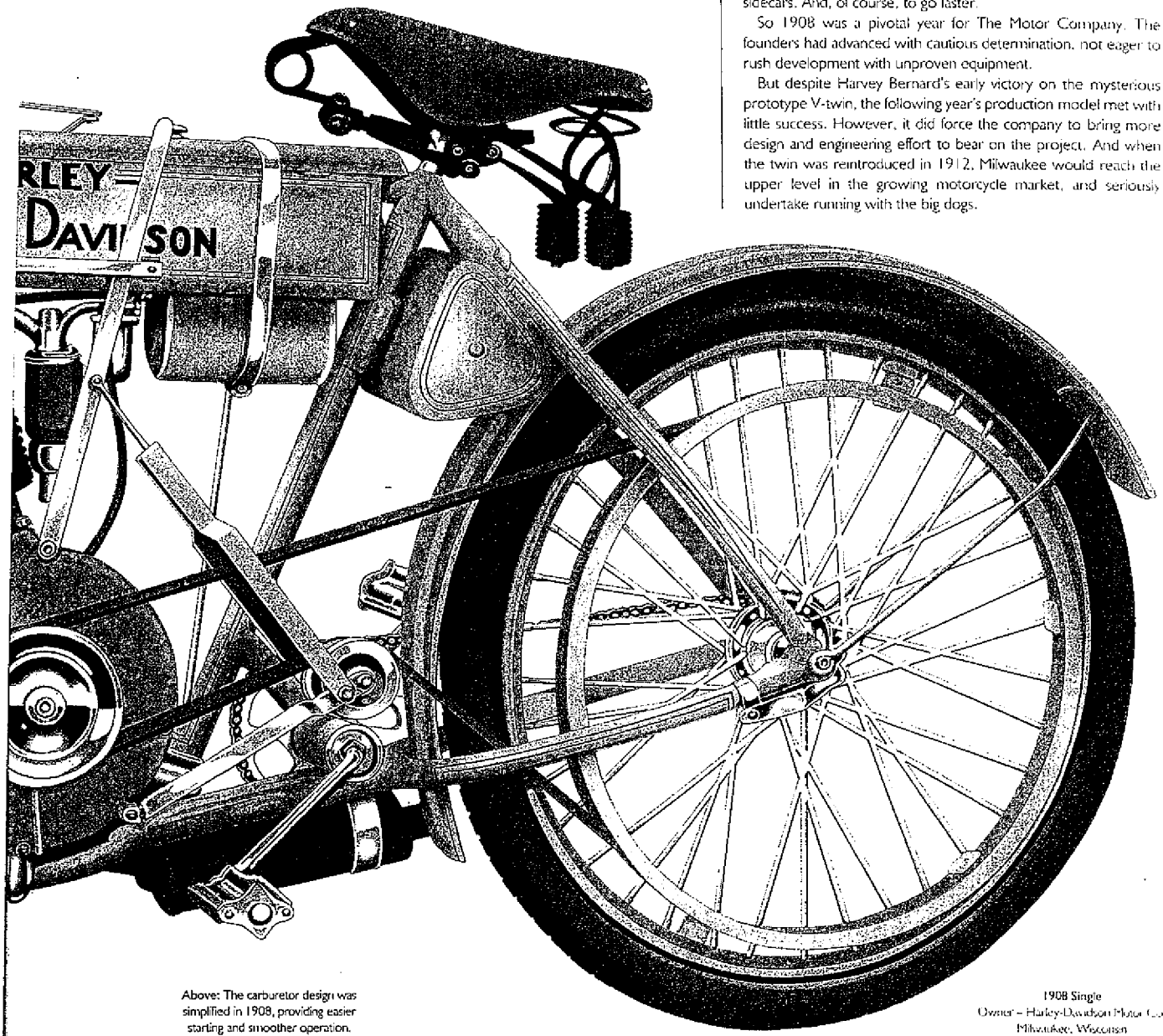
Right: Walter Davidson captured the attention of the motorcycle press with his perfect score in the New York national endurance run. The following year, Harley-Davidson sales nearly tripled.
Photograph © Harley-Davidson Motor Company

The impact of Walter's victory on Harley-Davidson sales was significant. Sales picked up in mid-year, and 450 machines were sold in 1908. In 1909 the company sold more than 1,100 motorcycles, and the figure jumped to over 3,100 in the following year. Milwaukee had turned the corner, and waiting there was Prosperity.

Despite this satisfactory turn of events, the founders knew that they would soon need a more powerful machine to compete with the twins and fours on the market. Indian, Excelsior, Merkel, Peugeot, Thor, Minerva and Reading-Standard all had twin-cylinder models, and the newly popular sport of board-track racing was bringing them plenty of publicity. Bill Harley had completed his work at the university, and turned his full effort to completing the V-twin engine which would appear in 1909. Americans wanted more horsepower to climb hills, carry passengers and pull sidecars. And, of course, to go faster.

So 1908 was a pivotal year for The Motor Company. The founders had advanced with cautious determination, not eager to rush development with unproven equipment.

But despite Harvey Bernard's early victory on the mysterious prototype V-twin, the following year's production model met with little success. However, it did force the company to bring more design and engineering effort to bear on the project. And when the twin was reintroduced in 1912, Milwaukee would reach the upper level in the growing motorcycle market, and seriously undertake running with the big dogs.



Above: The carburetor design was simplified in 1908, providing easier starting and smoother operation. The spring mechanism was deleted from the belt-tensioner yoke. Pedal starting was still standard procedure.

1908 Single
Owner – Harley-Davidson Motor Co.
Milwaukee, Wisconsin
Illustration from photo courtesy of Harley-Davidson Archives

1909 MODEL 5A SINGLE

Specifications
Engine/Drivetrain
Engine: IOE single
Displacement: 30.16ci (494cc)
Bore & stroke: 3.31 x 3.5in (84 x 89mm)
Horsepower: 4.3
Carburetion: Schebler
Transmission: Direct drive
Final drive: Leather belt
Brake: Rear coaster
Battery: 6-volt dry cell
Ignition: Battery/coil or magneto

Chassis/Suspension
Frame: Steel, single downtube
Suspension: Fixed spring fork
Wheelbase: 56.5in (143.5cm)
Weight: 235lb (107kg)
Fuel capacity: 1.5gal (5.7lit)
Oil capacity: 2qts (1.9lit)
Tires: 28 x 2.5in (71.1 x 6.35cm)
Top speed: 45mph (72km/h)
Colors: Black; renault gray
Number built: 54 (totals: 1,222 singles; 27 twins)
Price: $210 (battery), $250 (magneto)

After five years in the motorcycle business, Harley-Davidson was ready to take its place as an industry leader. The combined strategies of cautiously deliberate development, a network of trustworthy dealers and increased advertising were beginning to pay off.

The single, now designated the model 5, was the basic version; with battery and 28-inch (71cm) wheels, it was still priced at $210. The 5A pictured here, equipped with a Bosch magneto, was a hefty $40 more and only 54 were built. The factory also offered B and C models (battery or magneto) with 26-inch (66cm) wheels for shorter-legged riders.

The engine was slightly more powerful. With bore and stroke of 3.31 x 3.5 inches (84 x 89mm), displacement was up to 30.16 cubic inches (494cc) and a rating of 4.3 horsepower. Top speed was about 45mph (72km/h).

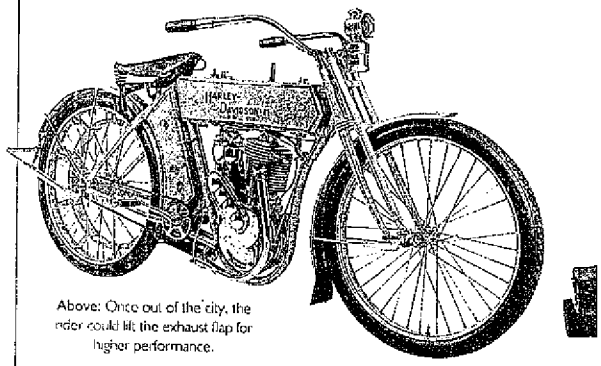
The big, if not necessarily good, news was the arrival of the much-anticipated V-twin. The 45-degree inline twin was built on a beefed up bottom end, with the magneto gear-driven off the crankshaft. The 3 x 3.5 inch (76 x 89mm) bore and stroke put displacement at 49 cubic inches (810cc). Rated at 7 horsepower, the 5D was reportedly good for 65mph (105km/h).

But at the price of $325, with no drive belt tensioner, the new twin didn't perform as Milwaukee had hoped. The engine was not easy to start, and the atmospheric inlet valves were at odds with the crankcase pressures of a V-twin. Only 27 of the twins were built, of which only two are known to remain in existence today.

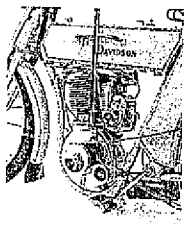
The battery-equipped single accounted for the bulk of production in 1909, with more than 1,030 manufactured. The factory produced only 90 singles fitted with the magneto.

Linkage control rods for the throttle and spark advance had been replaced by wires routed through the handlebars. The oil tank was no longer strapped above the fuel tank. The new twin backbone frame carried a single tank with shared compartments; 1.5 gallons (5.7lit) for fuel and 2 quarts (1.9lit) of oil. The oil was delivered to the engine with a drip-feed line equipped with a sight glass. Wheelbase, as a result of development on the twin, had grown to 56.5 inches (143.5cm).

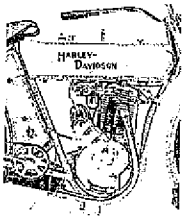
The Milwaukee motorcycles also received new styling touches in 1909. The longer fuel tank was tapered at both ends, and fitted flush with the rear downtube. The space between the rear fender and frame held a fitted compartment for tools, parts and riding accessories. The color choices remained renault gray or piano finish black.



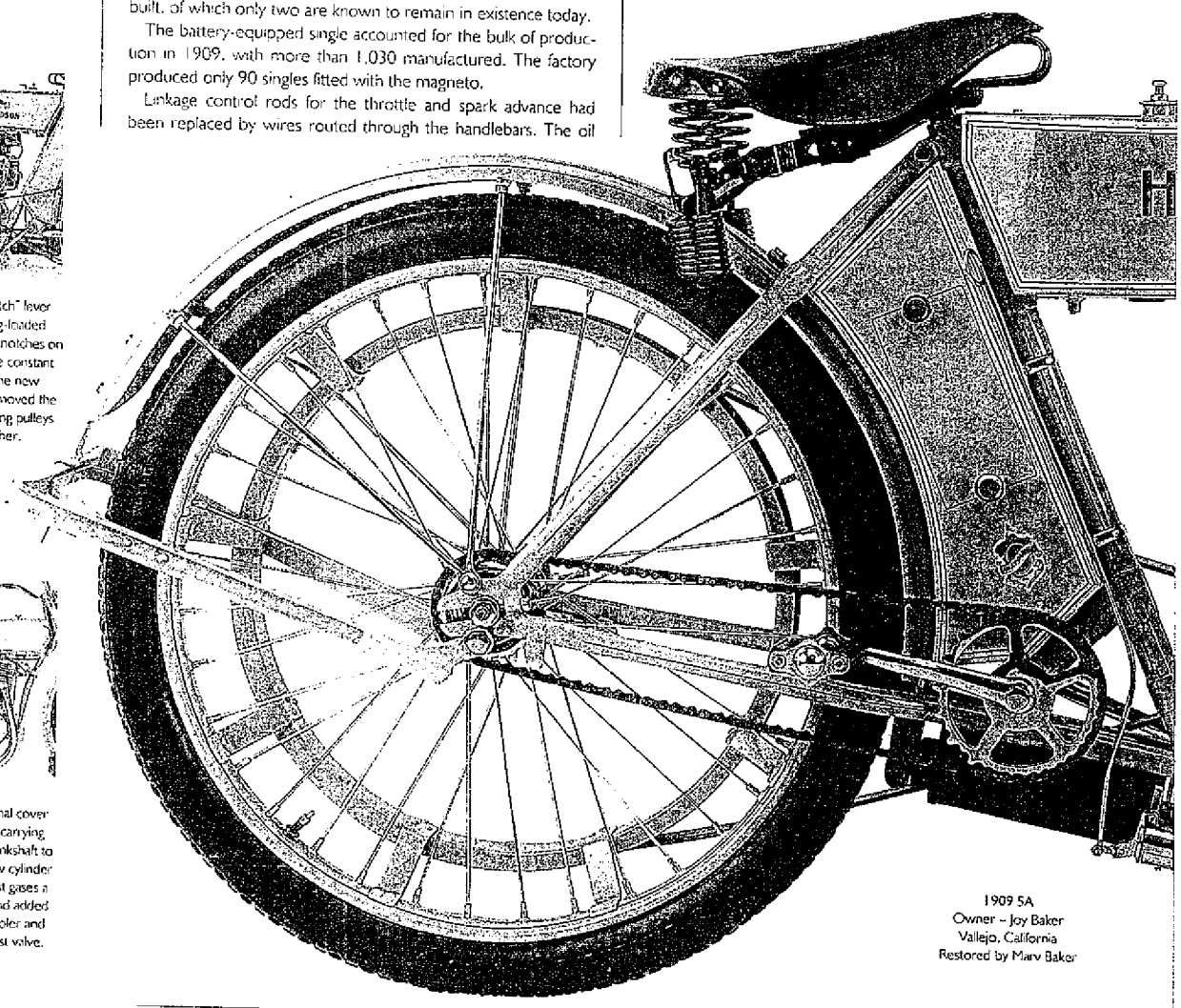
Above: Once out of the city, the rider could lift the exhaust flap for higher performance.



Above: The "clutch" lever featured a spring-loaded thumb release and notches on the gate to ensure constant belt tension. The new simplified system moved the drive and tensioning pulleys closer together.

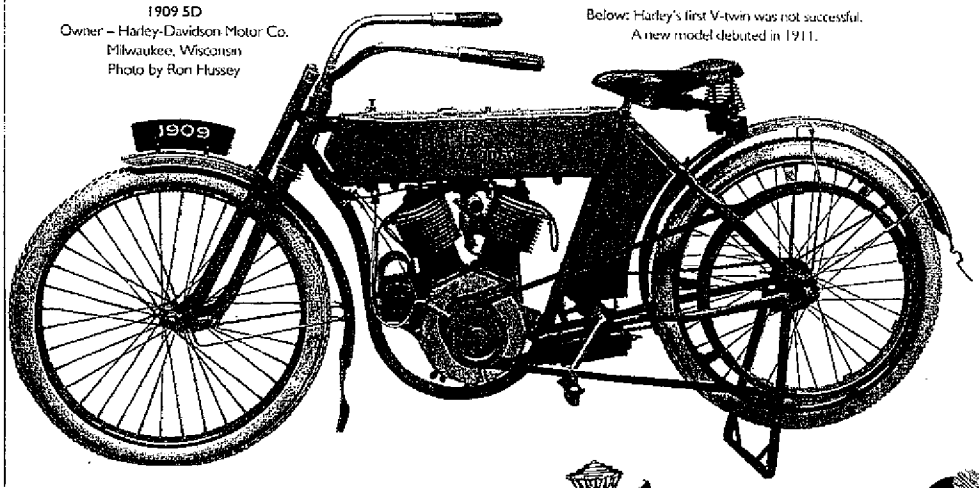


Above: The diagonal cover houses four gears carrying power from the crankshaft to the magneto. A new cylinder casting gave exhaust gases a more direct exit, and added finning meant a cooler and longer-lived exhaust valve.

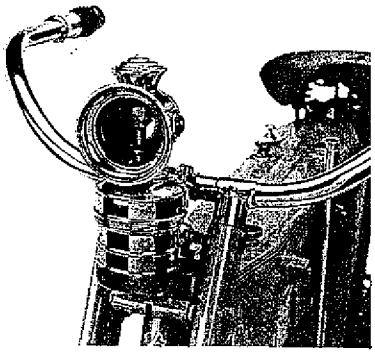


1909 5A
Owner – Joy Baker
Vallejo, California
Restored by Marv Baker

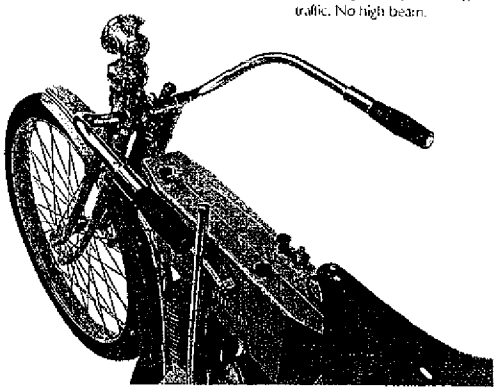
1909 5D
Owner – Harley-Davidson Motor Co.
Milwaukee, Wisconsin
Photo by Ron Hussey



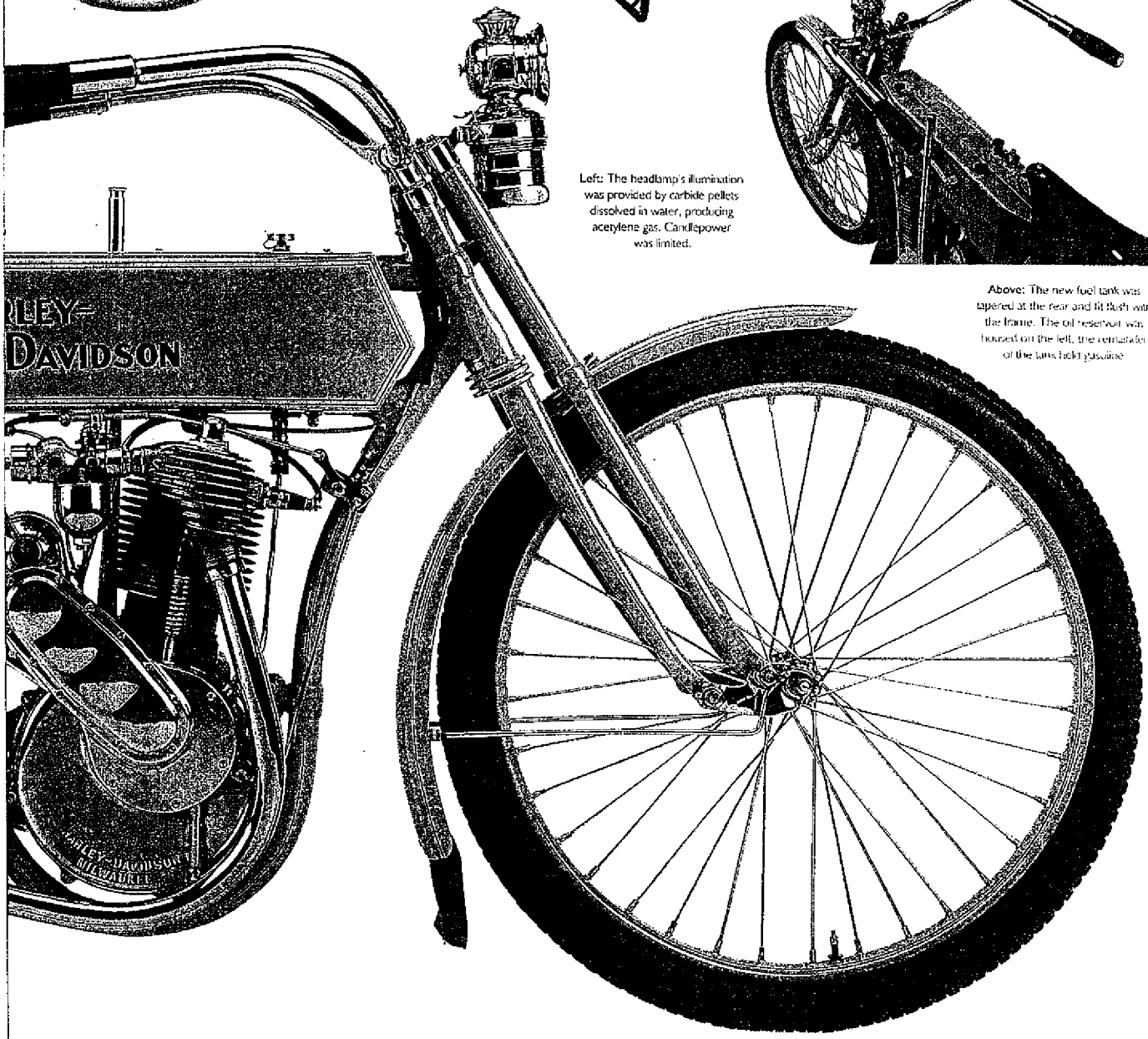
Below: Harley's first V-twin was not successful. A new model debuted in 1911.



Above: Early lighting offered at least a chance of being seen by oncoming traffic. No high beam.



Above: The new fuel tank was tapered at the rear and fit flush with the frame. The oil reservoir was housed on the left, the remainder of the tank held gasoline.



Left: The headlamp's illumination was provided by carbide pellets dissolved in water, producing acetylene gas. Candlepower was limited.

1911 MODEL 7D

Specifications
Engine/Drivetrain
Engine: IOE 45° V-twin
Displacement: 49.48ci (810cc)
Bore & stroke: 3 x 3.5in (76 x 89mm)
Horsepower: 6.5
Carburetion: Schebler
Transmission: Direct drive
Final drive: 1.75in (44mm) leather belt
Brake: Rear coaster
Ignition: Bosch magneto

Chassis/Suspension
Frame: Steel, single downtube
Suspension: Dual spring fork
Wheelbase: 56.5in (143.5cm)
Weight: 295lb (134kg)
Fuel capacity: 2.5gal (9.5lit)
Oil capacity: 1gal (3.8lit)
Tires: 28 x 2.5in (71.1 x 6.35cm)
Top speed: 60mph (97km/h)
Color: Renault gray
Number built: Unknown
Price: $300

MODELS 6 AND 7 (1910-11)

The singles went largely unchanged in 1910, but for the addition of an idler arm, allowing the rider to let the engine idle without disengaging the belt. Black paint was no longer offered, so all the Silent Gray Fellows were now gray. The V-twin was absent from the line, undergoing redesign for its reappearance in 1911.

But despite Milwaukee's disappointment with the results of its first twin, the overall picture for 1910 was hardly grim. The factory had grown to nearly 10,000 square feet (930m²), 149 workers were employed and production nearly tripled.

In four years there had been no increases in price. But in 1910, for the first time, a special model appeared on the roster. The 6E stock racer was priced at $275. A few 6E models, prototypes of the revised twin, were sold to bona fide racing customers.

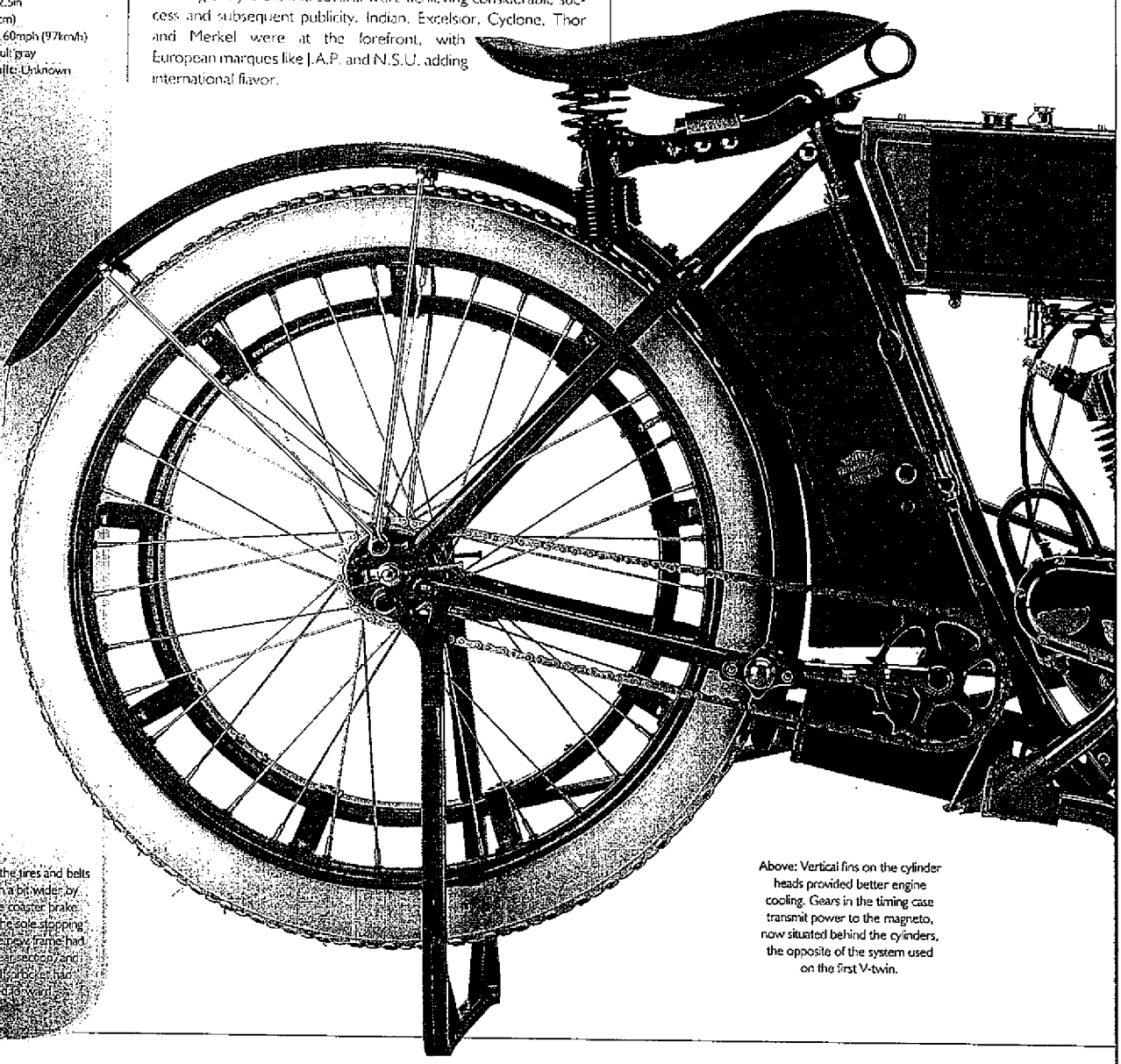
Racers, and race-minded dealers, had for four years been badgering Milwaukee to produce a competition model. By 1909 the American motorcycle racing scene was booming, with board-track motordromes popping up all over the country, and fairground tracks hosting two-wheelers as well as equestrians.

Some half dozen manufacturers were building racing V-twins and singles by then, and several were achieving considerable success and subsequent publicity. Indian, Excelsior, Cyclone, Thor and Merkel were at the forefront, with European marques like J.A.P. and N.S.U. adding international flavor.

The more conservative elements in Milwaukee management (Arthur and Walter Davidson) were not interested in a factory-supported Harley-Davidson racing team. But pressure from customers, and the sentiments of Bill Harley and William Davidson, did result in the limited production of competition mounts built for sale to privateer racers. Only a few of the 3,168 motorcycles made for 1910 were racers, and no twins were put on the market.

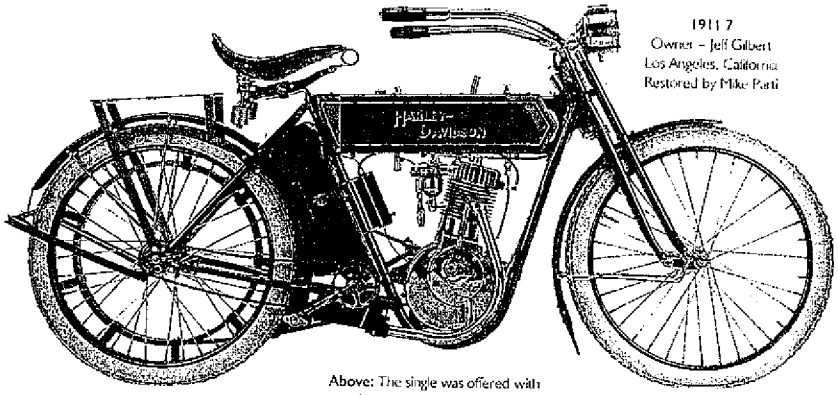
However, the V-twin was back in 1911. Displacement remained at 49ci (810cc), but the new engine featured mechanical intake valves and a belt tensioner. Horsepower was rated at 6.5, just over two more ponies than the single. The cylinder heads on both singles and twins now had vertical rather than horizontal finning. The new twin's frame was reinforced and slightly lower than the original, and the front downtube was now straight on both the single and twin. Frames and bodywork remained gray, but broad striping in red or dark gray had replaced the pin stripes of earlier years.

Production numbers for 1911 are missing from the factory archives. Some early records were destroyed by a flood. Historian



Right: Both the tires and belts had grown a bit wider by 1911. The coaster brake remained the sole stopping device. The new frame had a longer rear section, and the pedal sprocket had moved forward.

Above: Vertical fins on the cylinder heads provided better engine cooling. Gears in the timing case transmit power to the magneto, now situated behind the cylinders, the opposite of the system used on the first V-twin.



1911 7
Owner – Jeff Gilbert
Los Angeles, California
Restored by Mike Patti

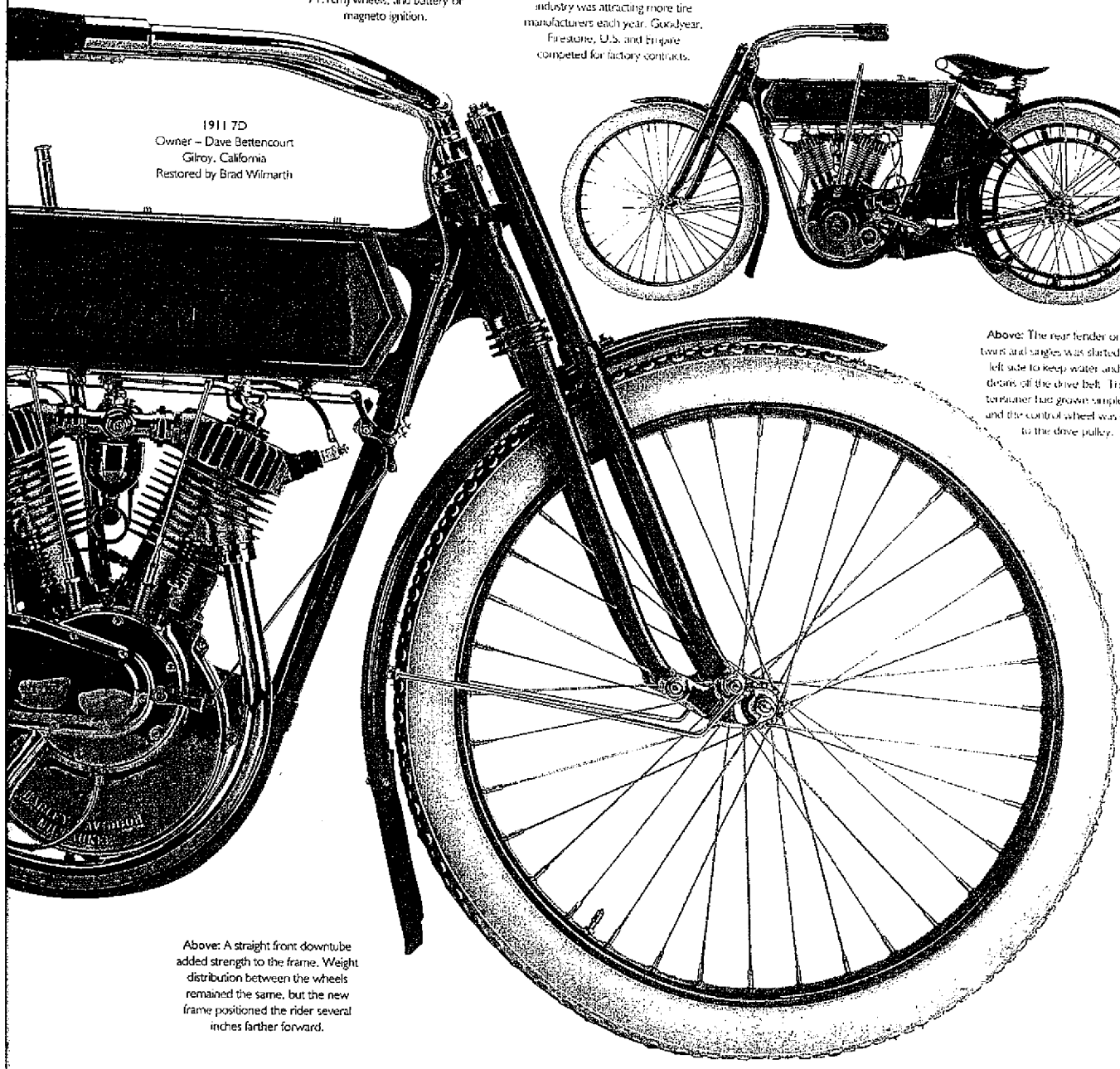
Above: The single was offered with either 26- or 28-inch (66 or 71.1cm) wheels, and battery or magneto ignition.

Above: The growing motorcycle industry was attracting more tire manufacturers each year. Goodyear, Firestone, U.S. and Empire competed for factory contracts.

Jerry Hatfield quotes records that put total production for 1911 as 5,625. How many were V-twins is unknown.

It is known that the new twin, designated 7D, was a considerable improvement over the 1909 version. The motorcycle was stronger, lower, more powerful, ran smoother and handled better. But the price was daunting at $300. Buyers could choose from a number of established twins with more displacement for less money, or from several four-cylinder marques. Competition in the marketplace was stiff.

Then, at mid-year, Indian stunned the sporting motorcycle world with a 1-2-3 victory sweep at the prestigious Isle of Man race. At Harley-Davidson the pressure, from within and without, to build a high performance machine grew apace. Feedback from dealers and racing privateers pointed the way. More horsepower! they pleaded, and chain drive to put the power to the ground. And for 1912, Milwaukee would make it so.



1911 7D
Owner – Dave Bettencourt
Gilroy, California
Restored by Brad Wilmarth

Above: The rear fender on both twins and singles was slanted on the left side to keep water and road debris off the drive belt. The belt tensioner has grown simpler yet, and the control wheel was closer to the drive pulley.

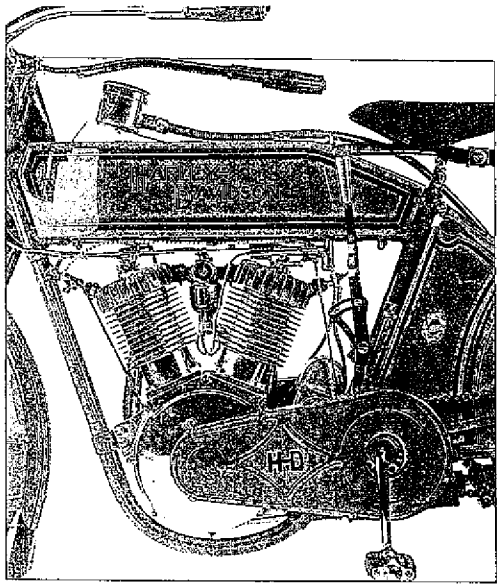
Above: A straight front downtube added strength to the frame. Weight distribution between the wheels remained the same, but the new frame positioned the rider several inches farther forward.

1912 MODELS X8D AND E

The events of 1911 worked to make the following year a biggie in the motorcycle industry. Not necessarily in terms of production numbers, but in significant changes that would firmly set patterns for the future.

The racing push had actually begun in 1910, when Milwaukee began touting wins of privateers throughout the country. One flyer cited the Harley-Davidson singles that had finished 1-2 in the Denver to Greeley Road race. "Defeating the Time of the Fastest Double Cylinder Entry by Nearly Ten Minutes." The tagline was, "The Harley-Davidson Makes Good Because It Is Made Good". The road from Denver to Greeley was surely no stretch of smooth pavement in 1910, and top speed only counted if the engine didn't blow or the rider wasn't thrown off. So steady, reliable power and sturdy construction could win the day, which Milwaukee was proud to proclaim.

Prompted by Indian's success, the factory made numerous improvements to the motorcycles for 1912. (Note should be taken that Indian held technical superiority over its 1911 competitors at The Island. Most machines were still direct belt drive, while the 1,000cc Indian V-twin was a two-speed with chain drive.



Above: The lever adjacent to the tank operated Harley-Davidson's first clutch, located in the rear wheel hub.

1912 MODEL X8D AND E

Specifications
Engine/Drivetrain
Engine: IOE 45° V-twin
Displacement: 60.32ci (989cc)
Bore & stroke: 3.5 x 3.3125in (89 x 84mm)
Horsepower: 8
Carburetion: Schebler
Transmission: Direct drive
Clutch: Rear hub
Final drive: Belt (X8D) or chain (X8E)
Brake: Rear coaster
Ignition: Bosch magneto

Chassis/Suspension
Frame: Steel, single downtube
Suspension: Dual spring fork
Wheelbase: 56.5in (143.5cm)
Weight: 312lb (141.5kg)
Fuel capacity: 2.5gal (9.5lt)
Oil capacity: 1gal (3.8lt)
Tires: 28 x 2.5in (71 x 6.35cm)
Top speed: 65mph (105km/h)
Color: Renault gray
Number built: 1,618
Price: $285

1912 MODEL X8A

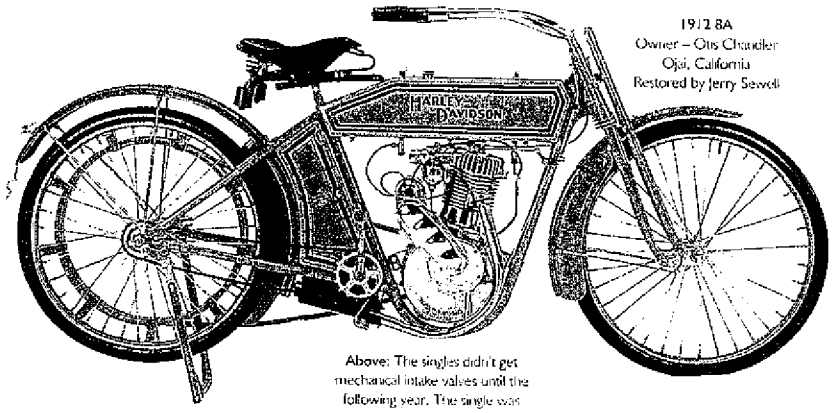
Specifications
Engine/Drivetrain
Engine: IOE single
Displacement: 30.16ci (494.28cc)
Bore & stroke: 3.5 x 3.3125in (89 x 84mm)
Horsepower: 4.3
Carburetion: Schebler
Transmission: Direct drive
Clutch: Rear hub
Final drive: Belt
Brake: Rear coaster
Ignition: Bosch magneto

Chassis/Suspension
Frame: Steel, single downtube
Suspension: Dual spring fork
Wheelbase: 56.5in (143.5cm)
Weight: 245lb (111kg)
Fuel capacity: 2.5gal (9.5lt)
Oil capacity: 1gal (3.8lt)
Tires: 28 x 2.5in (71.1 x 6.35cm)
Top speed: 50mph (80km/h)
Color: Renault gray
Number built: 545
Price: $225

Right: "Our claims that the Harley-Davidson is the cleanest, most silent, most comfortable, and the most economical motorcycle made, are rather broad, but can easily be verified. Its extreme cleanliness is due to the fact that all moving parts requiring oil are enclosed."

1912 X8E
Owner – Jeff Gilbert
Los Angeles, California
Restored by Mike Parti

Above: A nine-inch (23cm) spring in the rear downtube helped isolate the rider from bumps. It was known variously as the original Ful-Floeting, or Floteing, seat, or spring suspension seat post.



1912 8A
Owner – Otis Chandler
Ojai, California
Restored by Jerry Sewell

Above: The singles didn't get mechanical intake valves until the following year. The single was available with or without the rear hub clutch, which the factory called "free wheel control."

much better suited to the demands of the 37-mile/60km circuit.) The new Harley-Davidson frame was lower, the result of shortening the rear downtube and angling the top crosstube forward of the seat. This put the rider closer to the center of the machine, with an easier reach to the handlebars.

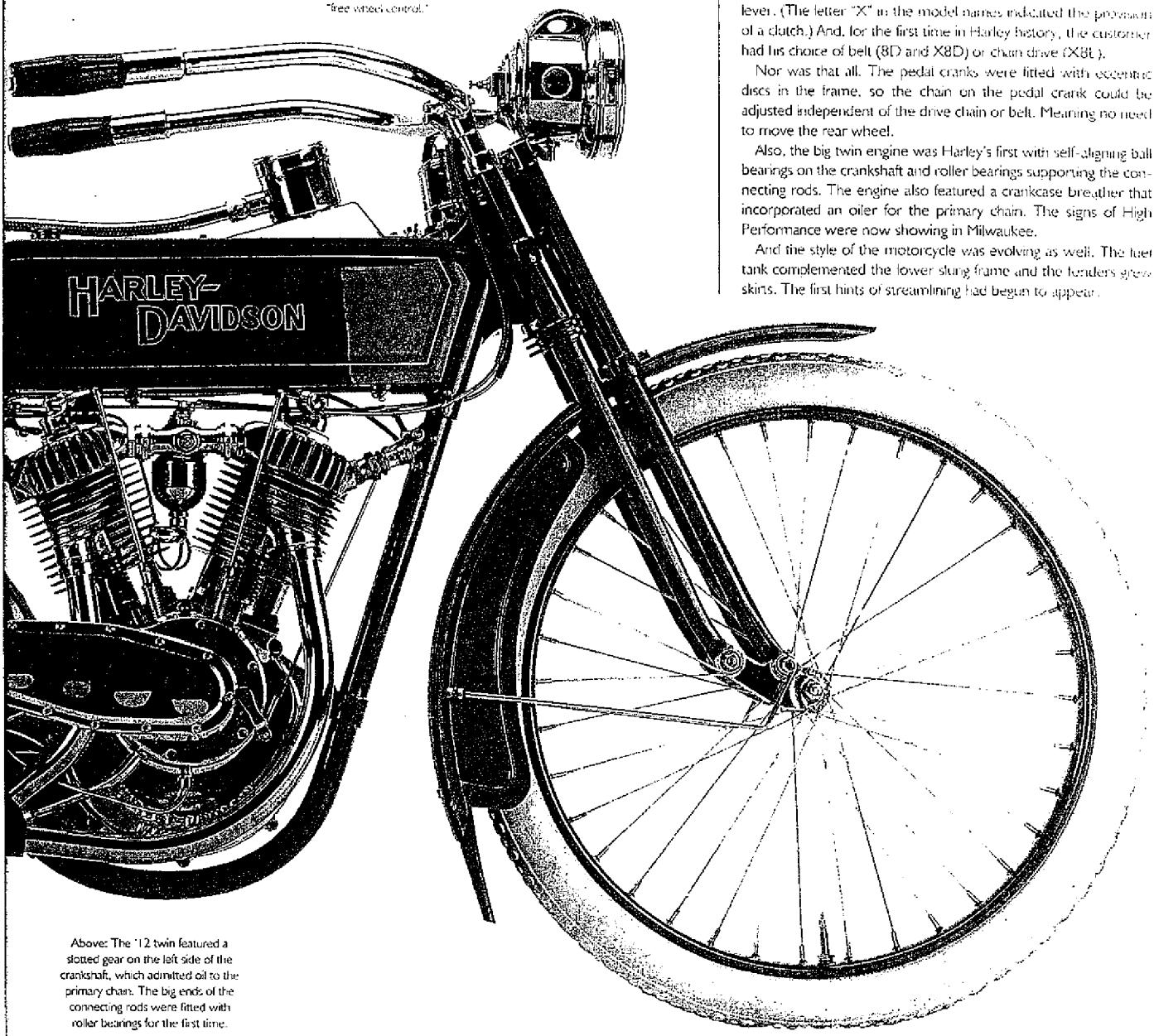
Comfort was further enhanced by the introduction of the Ful-Floeting Seat, and with it the advent of Kute Speling. The frame's rear downtube was fitted with a long spring below the seat post. The saddle itself was still sprung, but now the whole assembly had four inches (10cm) of suspension travel. The new chassis enhanced not only the roadholding capabilities of the machine, but also the likelihood the rider would stay attached to it at speed.

And speeds were up, because the V-twin was now offered in a 60.32 cubic-inch (989cc) version with close to eight horsepower. This E model was $10 more than the standard 6.5-horsepower twin, but with it came Harley-Davidson's first clutch. "Free wheel control," developed by William Harley and associate Henry Melk, was a rear wheel hub-mounted clutch operated by a left side hand lever. (The letter "X" in the model names indicated the provision of a clutch.) And, for the first time in Harley history, the customer had his choice of belt (8D and X8D) or chain drive (X8L).

Nor was that all. The pedal cranks were fitted with eccentric discs in the frame, so the chain on the pedal crank could be adjusted independent of the drive chain or belt. Meaning no need to move the rear wheel.

Also, the big twin engine was Harley's first with self-aligning ball bearings on the crankshaft and roller bearings supporting the connecting rods. The engine also featured a crankcase breather that incorporated an oiler for the primary chain. The signs of High Performance were now showing in Milwaukee.

And the style of the motorcycle was evolving as well. The fuel tank complemented the lower slung frame and the fenders grew skirts. The first hints of streamlining had begun to appear.



Above: The '12 twin featured a slotted gear on the left side of the crankshaft, which admitted oil to the primary chain. The big ends of the connecting rods were fitted with roller bearings for the first time.

1913 MODEL 9A

Specifications
Engine/Drivetrain
Engine: IOE single
Displacement: 34.4cid (564.89cc)
Bore & stroke: 3.31 x 4in (84 x 102mm)
Horsepower: 4.5
Carburetion: Schebler
Transmission: Direct drive
Final drive: Belt (9A) or chain (9B)
Brake: Rear coaster
Ignition: Bosch magneto

Chassis/Suspension
Frame: Steel, single downtube
Suspension: Dual spring fork
Wheelbase: 56.5in (143.5cm)
Weight: 316lb (143kg)
Fuel capacity: 1.5gal (5.68lit)
Oil capacity: 3.5qts (3.3lit)
Tires: 28 x 2.75in (71.1 x 7cm)
Top speed: 50mph (80.1mph)
Color: Renault gray
Number built: 1,510
Price: $290

MODEL 9A

Although the new V-twin outsold the single in 1912, the less expensive thumper still figured strongly in the motoring mix. Prosperity or not, not everyone could afford the big bike, and the single remained trustworthy and serviceable.

And it was larger. For 1913 Harley-Davidson announced what would come to be called the "5-35" motor: 5 horsepower and 35 cubic inches (565cc). The price was up to $290, for belt (9A) or chain drive (9B), which was $60 less than the V-twin (9E). Its instant popularity had bumped the price of the big-inch twin from $285 to $350.

Of course the single had benefited from the development work devoted to its big brother. Mechanically operated intake valve, lighter alloy piston and improved carburetion were included in the package. And the factory now balanced the flywheel, rod and piston as an assembly, gaining smoother engine operation.

The color choice remained gray, and all models were fitted with 28 x 2.75-inch (71.1 x 7cm) tires. The single still carried its oil supply in a compartment within the fuel tank. The bicycle pedals also remained, but the single now featured the rear hub clutch. Starting was still a matter of pedaling while on the centerstand, or pushing and running alongside.

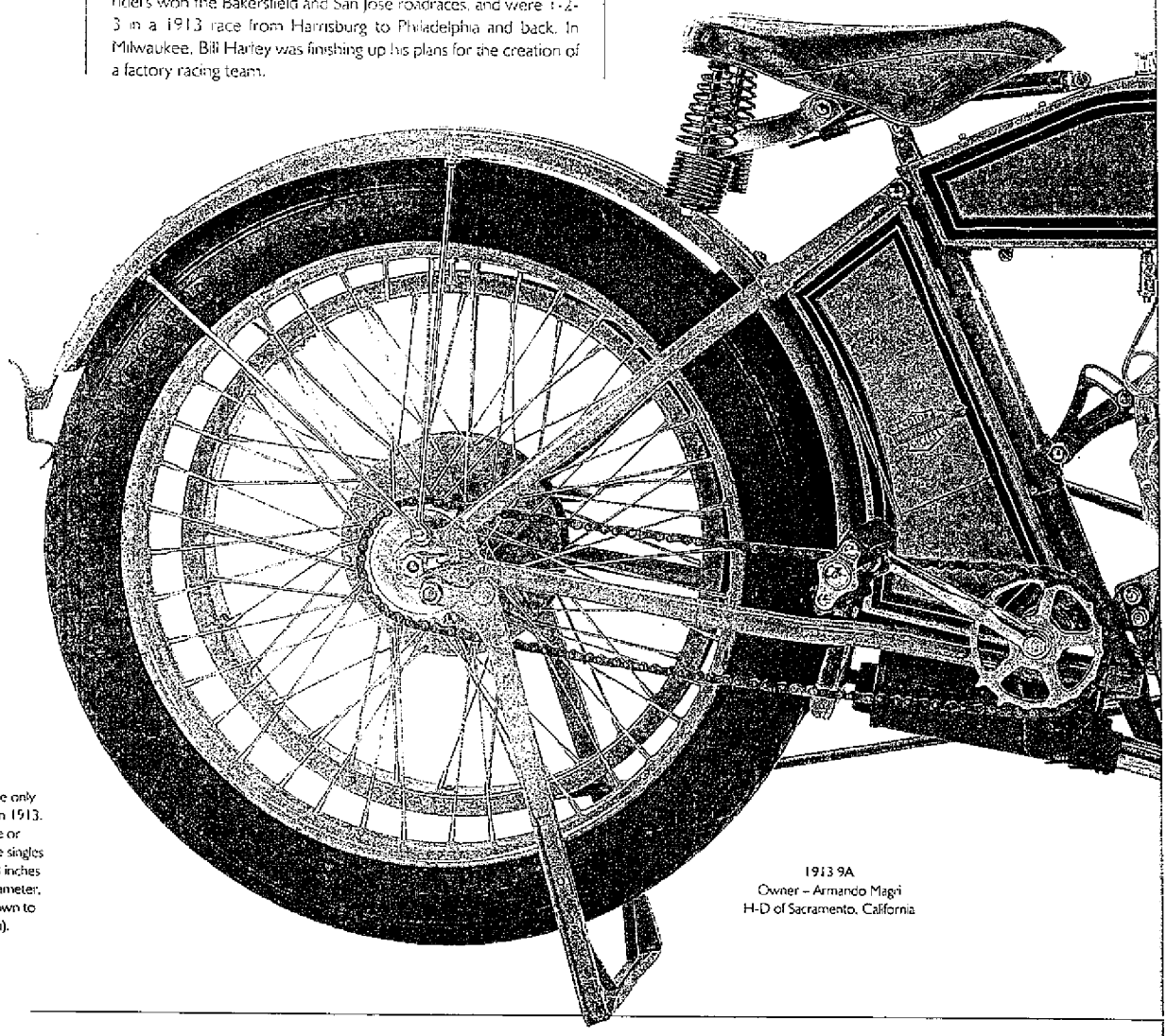
The 5-35 soon proved itself on the road and in amateur racing around the country, and the 61-inch (1000cc) V-twin had also been posting winning results in major events in 1912. Harley riders won the Bakersfield and San Jose roadraces, and were 1-2-3 in a 1913 race from Harrisburg to Philadelphia and back. In Milwaukee, Bill Harley was finishing up his plans for the creation of a factory racing team.

Phase One of the plan was to hire Bill Ottaway as manager of the racing department and, ultimately, the racing team. Ottaway had worked as a development engineer for Thor Motorcycles, built by the Aurora Automatic Machine Tool Company of Aurora, Illinois. He had worked on Thor's 61-inch (1000cc) V-twin racer, which was outgunned by the Indian twin introduced in 1912, featuring four overhead valves per cylinder. The racing game was heating up nicely.

Milwaukee's official racing department wouldn't be announced until the following year, but work was obviously underway in advance. That included plans for Milwaukee's own 8-valve V-twin, which would become far and away the most expensive motorcycle Harley-Davidson had yet offered for sale.

In its first ten years, Harley-Davidson advanced with deliberate caution in developing new motorcycles. Nearly 100 other domestic manufacturers had come and gone in that time, and the founders were determined that if only a few builders were to survive in the business, they would be among them. Other companies might choose to experiment with new designs and materials, or invest in expensive tooling for limited production racers, and Milwaukee would take note of the results. And respond only if and when they considered it necessary.

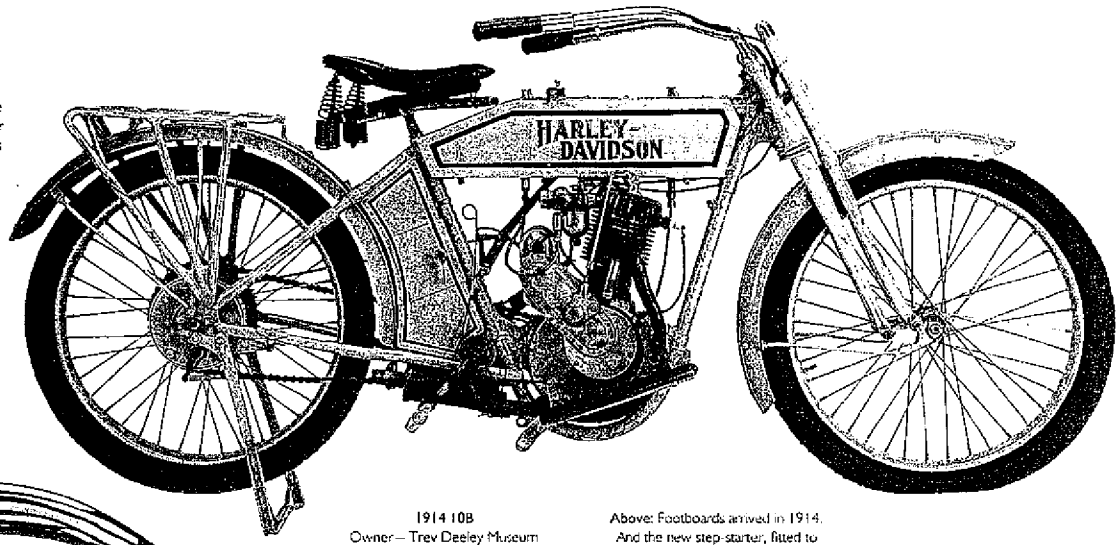
Production and profits were up in 1913, with 12,966 motorcycles built. Two items headed the development list: more horsepower and more gears. Both were forthcoming.



Right: The 9A was the only model with belt drive in 1913. Tires (U.S., Empire or Goodyear) on both the singles and twins were still 28 inches (71.1cm) in outside diameter, but the width had grown to 2.75 inches (7cm).

1913 9A
Owner – Armando Magri
H-D of Sacramento, California

Right: Both the belt and chain drive singles were equipped with the rear hub clutch. The luggage carrier was optional equipment.



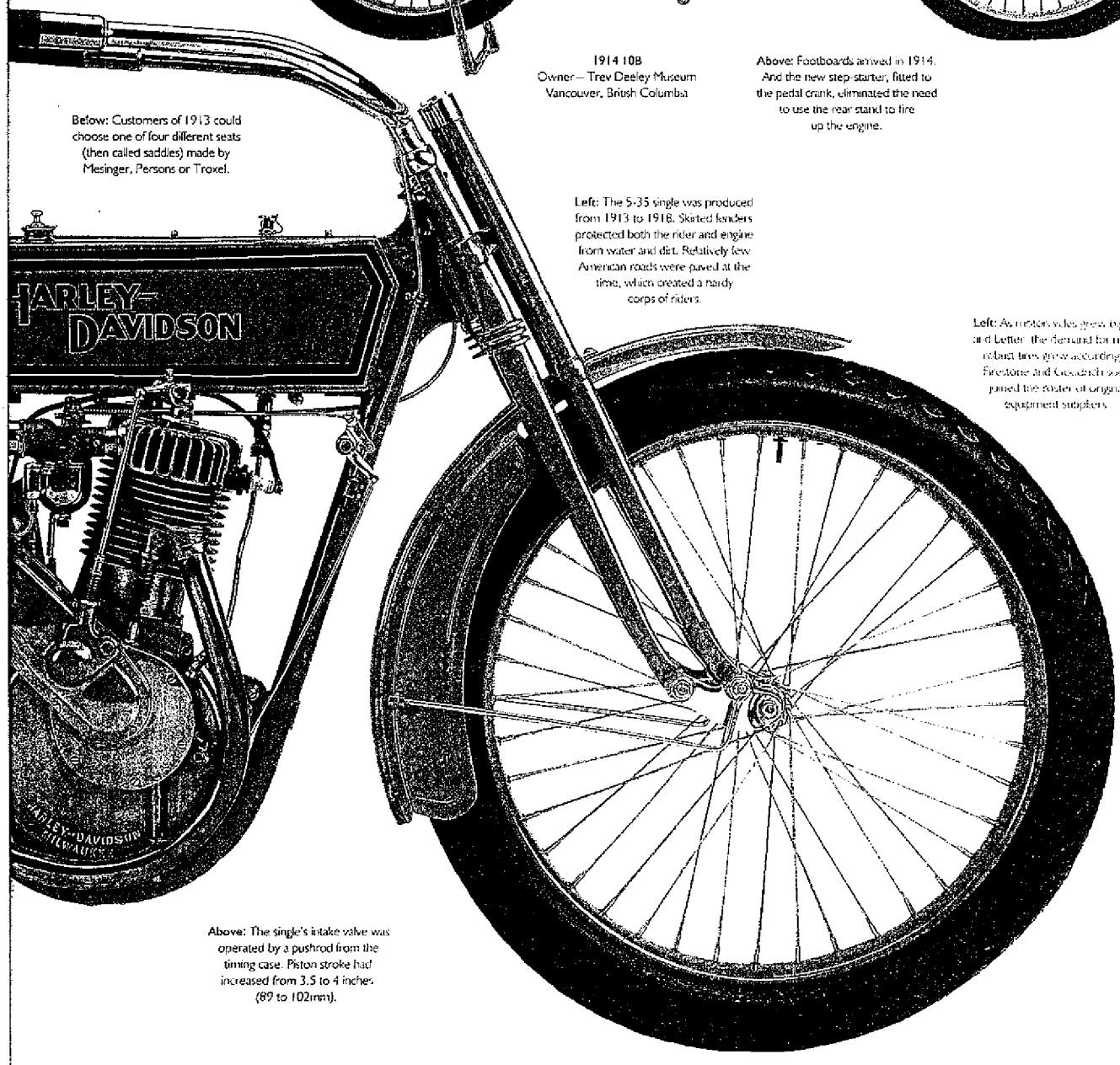
1914 10B
Owner—Trev Deeley Museum
Vancouver, British Columbia

Above: Footboards arrived in 1914. And the new step-starter, fitted to the pedal crank, eliminated the need to use the rear stand to fire up the engine.

Below: Customers of 1913 could choose one of four different seats (then called saddles) made by Mesinger, Persons or Troxel.

Left: The 5-35 single was produced from 1913 to 1918. Skirted fenders protected both the rider and engine from water and dirt. Relatively few American roads were paved at the time, which created a hardy corps of riders.

Left: As motorcycles grew bigger and better, the demand for more robust tires grew accordingly. Firestone and Goodrich soon joined the roster of original equipment suppliers.



Above: The single's intake valve was operated by a pushrod from the timing case. Piston stroke had increased from 3.5 to 4 inches (89 to 102mm).

MODEL 10F (1914) AND 17K RACER (1915)

1914 MODEL 10F

SPECIFICATIONS
ENGINE/DRIVETRAIN
Engine: F-head 45° V-twin
Displacement: 49.48ci (810.83cc)
Bore & stroke: 3.0 x 3.5in (76.2 x 89mm)
Compression ratio: n/a
Horsepower: 6.5
Transmission: 2-speed
Primary drive: Chain
Final drive: Chain
Brake: Rear coaster
Ignition: Magneto

CHASSIS/SUSPENSION
Frame: Steel, single downtube
Suspension: F: Dual spring fork
Wheelbase: 56.5in (143.5cm)
Weight: 310lb (140.6kg)
Fuel capacity: 2.5gal (9.46lit)
Oil capacity: 4qts (3.79lit)
Tires: 28 x 3.0in (71.1 x 7.62cm)
Top speed: 65mph (105kmh)
Color: Harley-Davidson gray
Number built: 7,956
Price: $285

Motorcycle technology Milwaukee-style took several more leaps in 1914. Two-speed transmissions, step-starters, footboards, enclosed valve springs and primary chains, and sidecars all debuted as the popularity of motorcycling boomed.

Harley-Davidson enjoyed a considerable measure of this mushrooming market, but was forced to share it with at least three other entrepreneurs of the age. They were George Hendee at Indian, Ignatz Schwinn of Excelsior, and the Henderson brothers, who built Ace Motorcycles. And there was one other motoring mogul in rapid rise at the time, Henry Ford.

Automobiles, like motorcycles, were still hand-made, but the advent of moving assembly lines boosted car production enormously. The mass production of motorcycles would be forever limited by the affordability of cars, and two-wheelers began the shift to sport and recreational machines rather than primary transportation. The competition for a market share of the smaller pie had grown intense.

Despite its well-deserved reputation for sturdy equipment and reliable performance, Harley-Davidson was losing the public popularity contest generated by motorcycle racing. If the machines were to be cast forever in the sporting mode, then the successful builder was obliged to meet the requirements of the sporting rider. At the same time, the Milwaukee faction knew that the touring and Sunday-putt riders would always outnumber the young daredevils. So the task was to provide motorcycles for both.

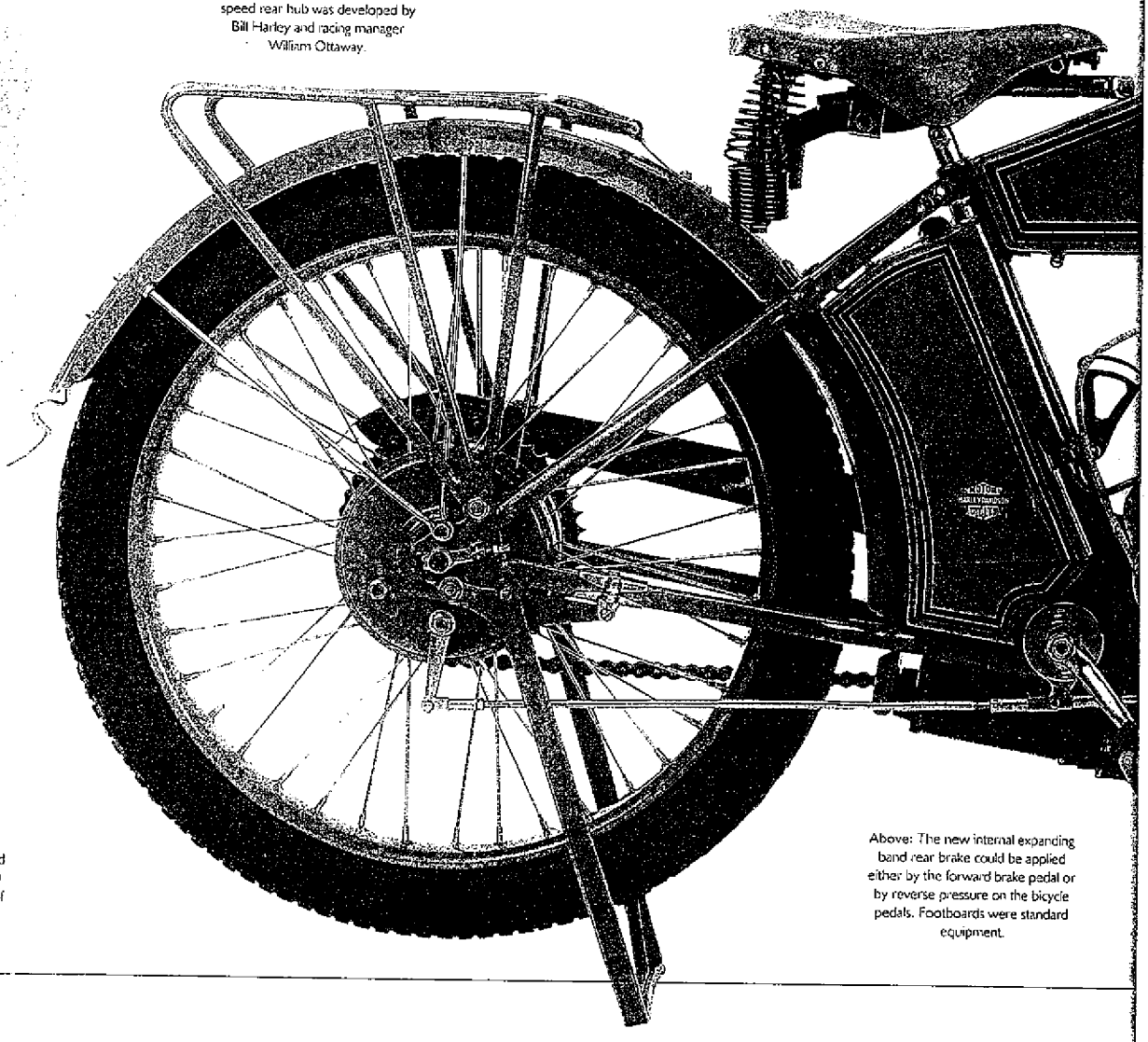
The combined appeals of horsepower and operating ease were addressed differently by the industry leaders. The contest pitted the V-twins of Indian and Harley-Davidson against the inline fours from Henderson. The four was smooth and powerful, but more expensive to manufacture and maintain. The V-twins were less smooth but reliable, and acquitted themselves well in uses where top speed mattered little. Economics would eventually decide in the twins' favor, but the fours remained an option into the late 1920s.

Both Milwaukee and Springfield were banking on the V-twin's popularity. And Indian was forcing Harley's hand by providing sport racers to the public at low prices, and by sponsoring talented riders in closed circuit and cross country competitions. The biggest, literally, thorn in Milwaukee's side was the formidable Irwin G. "Cannonball" Baker. A large and powerful man, Baker was the dominant long-distance rider of the era. And he generated headlines for the sport and the builders of his winning machines.

Harley-Davidson had decided to first challenge the Indian team on the racetrack. The racer, designated the K model, was based

Below: Production models were all equipped with luggage carrier and Free Wheel Control. The two-speed rear hub was developed by Bill Harley and racing manager William Ottaway.

Below: The Ful-Floeting seat was also standard on all models.

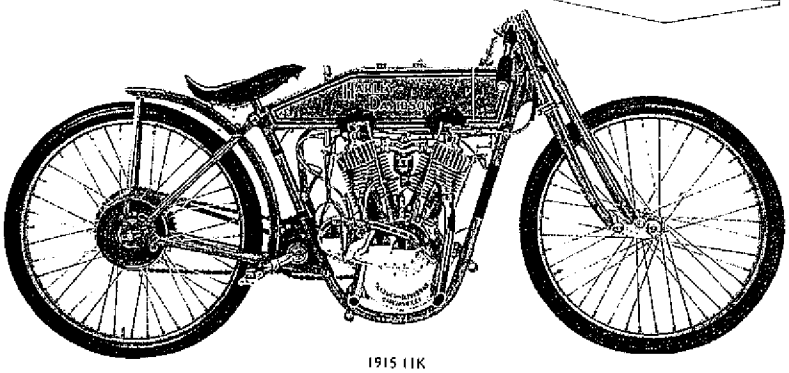


By 1914 the U.S. Postal Service had nearly 5,000 Harley-Davidsons for mail delivery. Milwaukee supplied the British military with 350 motorcycles at the advent of World War I.

Above: The new internal expanding band rear brake could be applied either by the forward brake pedal or by reverse pressure on the bicycle pedals. Footboards were standard equipment.

on the model 10E, a direct chain drive, 61-inch (1000cc) V-twin. The race motors were marked by an M preceding the engine number. A handful were built for 1914, and by the following year Milwaukee had a brace of eight racing models in the catalog – six twins and two singles. Of the 16,427 production machines built for 1914, more than 13,000 were twins.

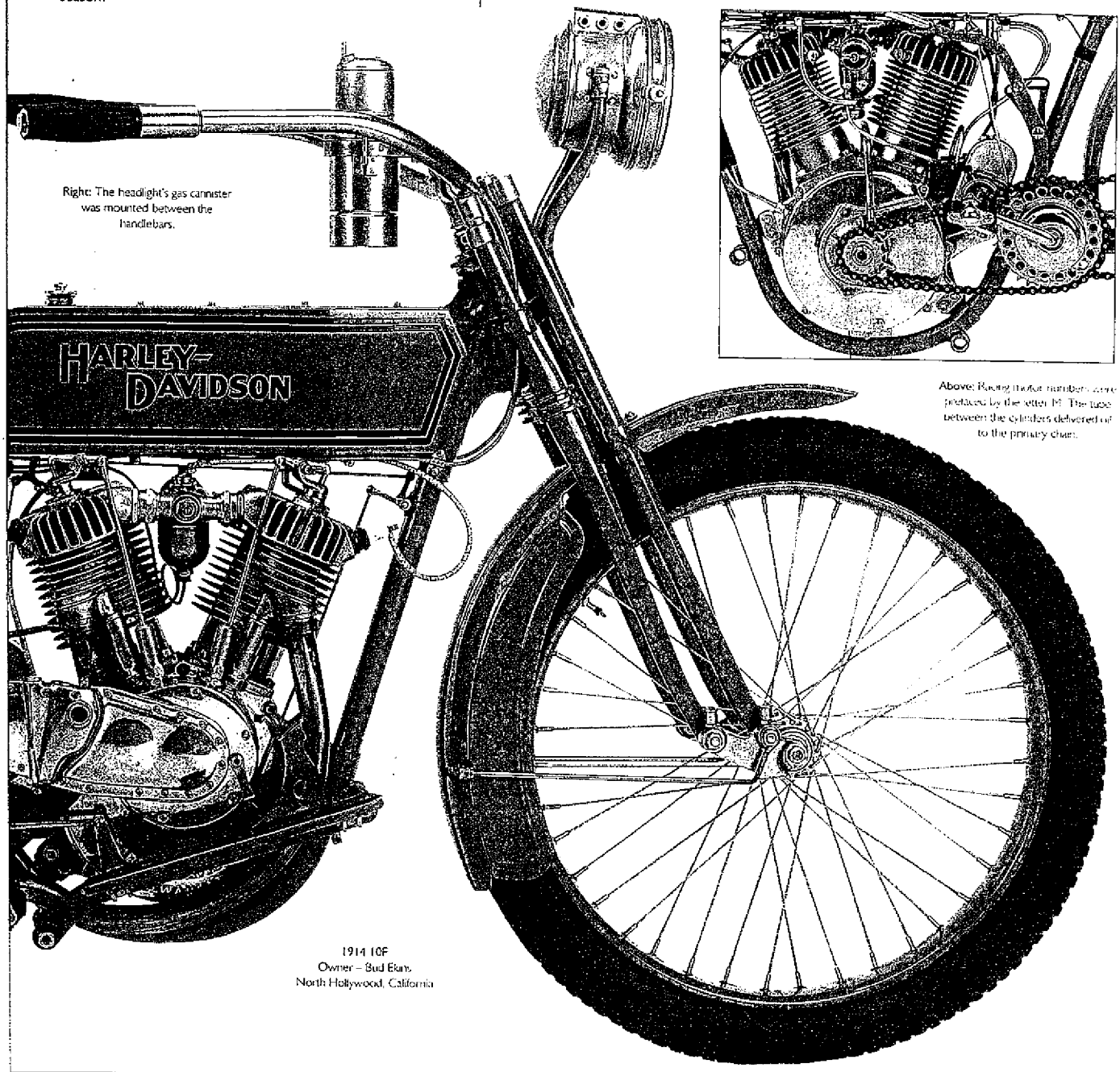
The showdown for racing supremacy was at hand. Although the first factory team bikes could match the Indians for top speed, reliability was not so high on the scale. These were long races, 200 to 300 miles (320 to 480km), and the Harleys suffered engine and driveline failures. However, the team did win one national championship race at Birmingham, Alabama in 1914, and the Harley Wrecking Crew would be in full battle trim for the 1915 season.



1915 11K
Owner – Daniel Statnekov
Portugal, New Mexico

Above: Racing motor numbers were prefaced by the letter M. The tube between the cylinders delivered oil to the primary chain.

Right: The headlight's gas cannister was mounted between the handlebars.



1914 10F
Owner – Bud Ekins
North Hollywood, California

MODEL 11J (1915), MODEL 16J (1916) AND SIDECAR

MODEL 16J (1916)

SPECIFICATIONS
ENGINE/DRIVETRAIN
Engine: F-head 45° V-twin
Displacement: 60.33ci (987.67cc)
Bore & stroke: 3.31 x 3.5in (84 x 89mm)
Horsepower: 11 @ 3,000 rpm
Carburetion: Schebler
Transmission: 3-speed
Primary drive: Chain
Final drive: Chain
Brake: Rear drum
Battery: 6-volt
Ignition: Coil/points

CHASSIS/SUSPENSION
Frame: Steel, single downtube
Suspension: F, Leading link spring fork
Wheelbase: 59.5in (151.1cm)
Weight: 325lb (147.4kg)
Fuel capacity: 2.75gal (10.4lt)
Oil capacity: 5pts (2.4lt)
Tires: 28 x 3in (71.1 x 7.62cm)
Top speed: 60mph (97km/h)
Color: Harley-Davidson gray
Number built: 5,896
Price: $295

Harley-Davidson had a roster of five models in 1914, three singles and two twins. For 1915 the selection had grown to nine machines with the introduction of battery-ignition versions of the 1914 models and a racing [illegible]

Milwaukee had shown in 1914 that it was ready and able to build modern motorcycles. In 1915 Harley-Davidson not only quickened the pace of improvement, but also displayed its new commitment to professional racing.

The most significant advance for road and track was the introduction of a 3-speed transmission. The sliding-gear mechanism provided attachment of the step starter to the gearbox. With transmission and clutch fitted amidships, the 11J certified Harley's position in the mainstream of American motorcycle manufacturing. It was also the first model equipped with an electric headlight.

At $310, the J model carried a hefty price tag. The 60-inch twin (989cc) with magneto was offered at $240 for the single-speed version (11E) and $275 for the three-speed (11F). Two singles remained in the catalog, the one-speed B and two-speed C models at $200 and $230 respectively. The racing K model ("stripped stock") was priced at $250.

Racing would provide Milwaukee with substantial bragging rights in 1915. Following the factory team's marginal success the preceding season, Bill Harley and William Ottaway brought new determination, and equipment, to the line for the following year. Of the 17 models now offered in the catalog, eight were racing bikes.

The sidecar also took on new stature in 1915. A new chassis and longer body replaced the original model, and advertising emphasized the economic benefits of sidecar travel. The chairs or sidebacks as they came to be called, also found wide application in the postal and military services. The early sidecar bodies were built by the Seaman Company in Milwaukee. Right-side chairs were designed for the U.S. and Europe, while left-side rigs were fitted for the British market.

Most of the military motorcycles Harley-Davidson built for use in World War I were equipped with sidecars. Though employed mostly for reconnaissance and courier duty, the sidecars could be fitted with armor and machine-gun mounts. The same chassis was utilized for commercial civilian use to mount a sidevan.

One requirement shared by racers and sidecarists was the need for more power. Harley-Davidson advertised a guaranteed 11 horsepower from the 61-inch (1000cc) V-twin, noting that dynamometer readings had been as high as 16 horsepower. The racing engines were said to be making nearly 20.

These increases were largely the result of better intake and exhaust design, with larger ports, valves and carburetors. Beefier rod bearings, flywheels and crankpins were designed to handle the higher horsepower. And as we have noted, the engineering efforts were certified on the race track.

But despite the improvements and convincing victories in racing, the sales figures failed to rise accordingly. The impact of Henry Ford's manufacturing and marketing techniques had seriously constricted the U.S. motorcycle market. And even though the number of prospective buyers remained more or less static, the competition for market share was ever more rigorous.

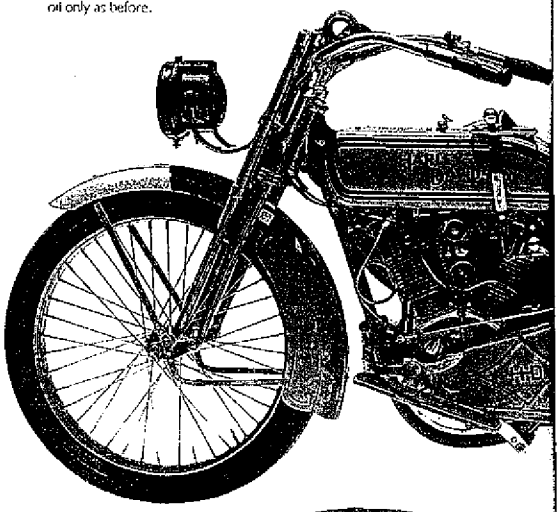
In 1916 Harley-Davidson introduced its step-starter and dispensed with the last major bicycle component. The pedals were gone, at least on the twins with gearboxes. The model numbering system was also changed, brought up to date by using the current year as the prefix. And this would be the last year for gray paint.

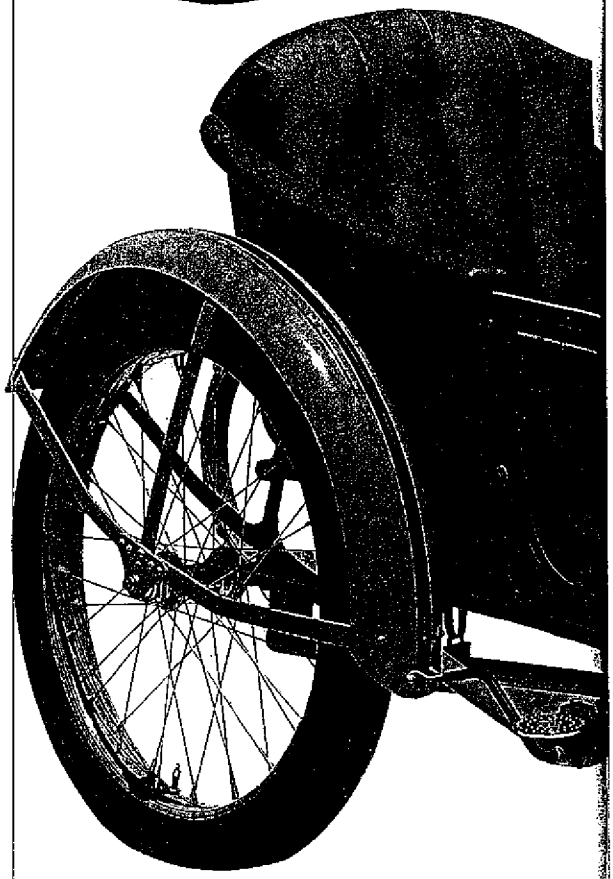
Engineering changes included stronger frames that were common to singles and twins. Both were available with either direct drive or the 3-speed transmission. The basic twin with magneto sold for $240, while the gear-selecting version with battery and lights went for $295. The single-speed single was $200 and another $30 was added for the 3-speed.

Functional development resulted in styling shifts as well. The larger fuel tank and fenders featured more rounded shapes, as the first hints of streamlining appeared from Milwaukee.

As it turned out, Harley-Davidson's characteristic prudence in product development was to serve the company well in this circumscribed marketplace.

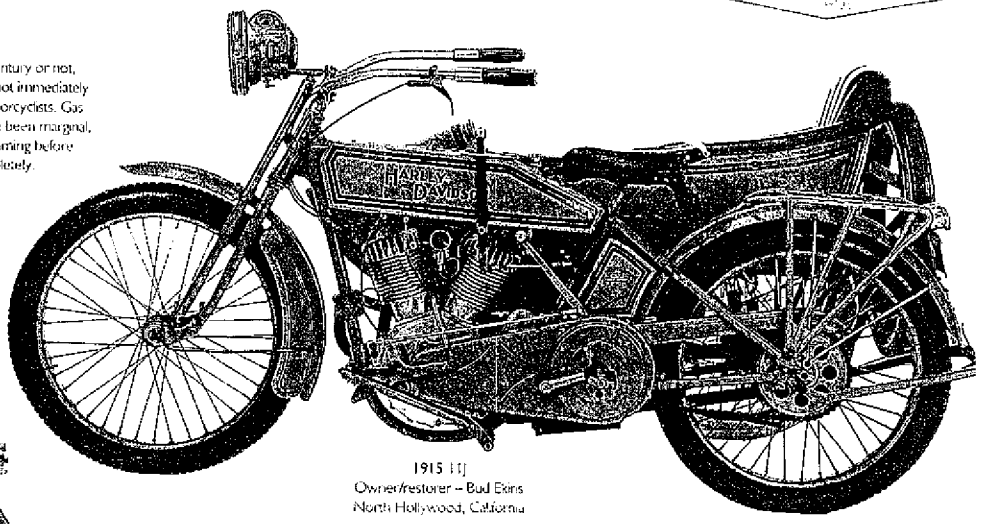
Below: The fuel tank on the '16 was more rounded than its counterpart of a year earlier (upper right). The left side now held compartments for oil and fuel, rather than oil only as before.



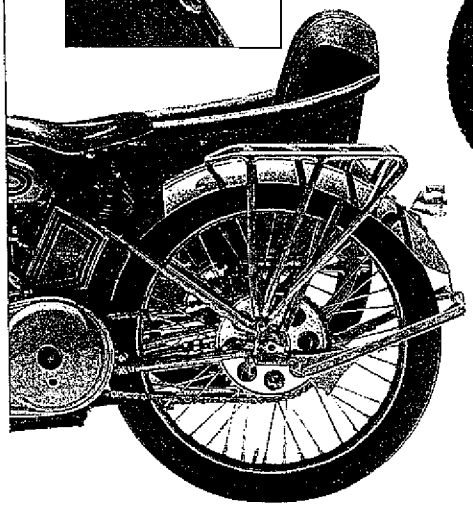


1916 16F
Owner/restorer – Mike Parti
North Hollywood, California

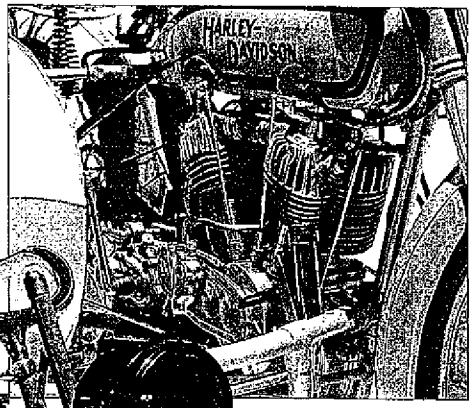
Left: Twentieth century or not, electric lighting was not immediately popular among motorcyclists. Gas illumination may have been marginal, but gave some warning before failing completely.



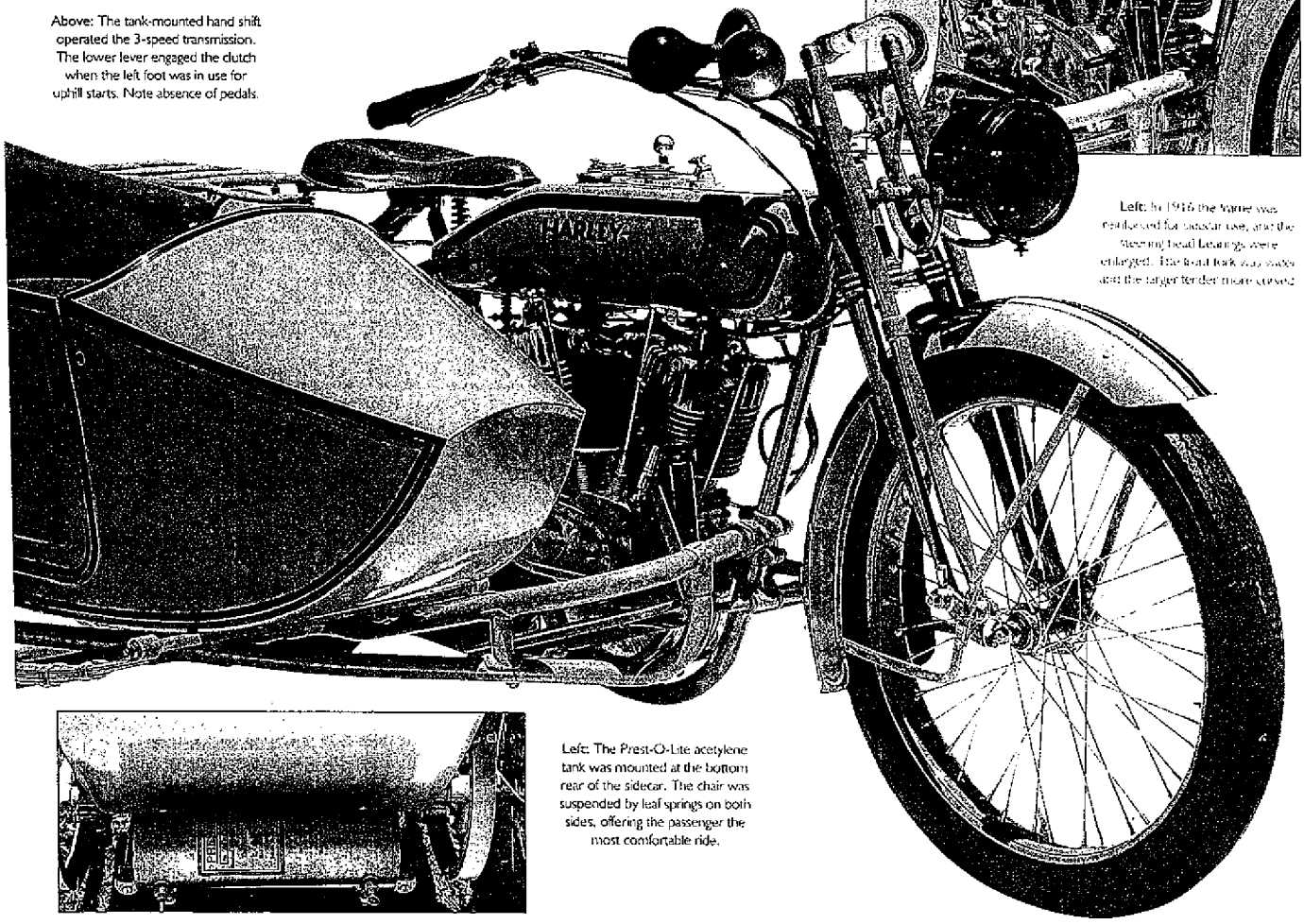
1915 IJ
Owner/restorer – Bud Ekins
North Hollywood, California



Above: The tank-mounted hand shift operated the 3-speed transmission. The lower lever engaged the clutch when the left foot was in use for uphill starts. Note absence of pedals.



Right: The kick-starter was new for 1916. The bulge at the timing cover housed the oil pump; the brass collar held a sight glass for checking oil flow. Note ratchet mechanism on brake pedal, used for parking brake on sidecar models.



Left: In 1916 the frame was reinforced for sidecar use, and the steering head bearings were enlarged. The front fork was swept and the larger fender more curved.

Left: The Prest-O-Lite acetylene tank was mounted at the bottom rear of the sidecar. The chair was suspended by leaf springs on both sides, offering the passenger the most comfortable ride.

8 VALVE RACER

SPECIFICATIONS

ENGINE/DRIVETRAIN
Engine: OHV 45° V-twin
Displacement: 60.33ci (987.67cc)
Bore & stroke: 3.31 x 3.5in (84 x 89mm)
Compression ratio: Approx 6:1
Horsepower: Approx 14-16
Carburetion: Schebler
Transmission: Direct drive
Primary drive: Chain
Final drive: Chain
Brake: None
Battery: None
Ignition: Magneto

CHASSIS/SUSPENSION
Frame: Steel, single downtube
Suspension: F: Leading link spring fork
Wheelbase: 51.5in (130.8cm)
Weight: 275lb (124.7kg)
Fuel capacity: 1.43gal (5.4lit)
Oil capacity: 5pts (2.4lit)
Tires: 28 x 3in (71 x 7.62cm)
Top speed: 105-115mph (170-185km/h)
Color: Olive green
Number built: Approx 30-50
Price: $1,500

Right: The 8-valve racer was the result of another collaboration between Bill Harley and racing manger William Ottaway. The $1,500 price, more than four times its Indian counterpart, intentionally discouraged privateers.

8-VALVE RACER (1916-1928)

The Indian Motocycle Company of Springfield, Massachusetts dominated the first two decades of American motorcycling. Owner George Hendee and engineer Oscar Hedstrom were innovators in early technology, and also committed the company to a strong program of factory-supported racing.

Indian had presented its first factory racers in 1908, and quickly established a reputation as tough competitors. With their resounding 1-2-3 placing at the Isle of Man in 1911, the Springfield bunch initiated a string of racing victories that produced growing publicity and sales. Milwaukee soon realized that Something Had To Be Done.

William Harley was convinced early on that factory support for racing had tangible promotional value. It took him several years to convince Walter and Arthur Davidson that winning races would mean selling more machines to the general public. And Indian was busy proving his point.

By this time it was generally accepted that more horsepower required the movement of more air fuel mixture in and out of the engine. The vague concepts of motorcycle handling had barely reached the drawing board. Top speed was the issue at hand, and overhead valves were one way to get it.

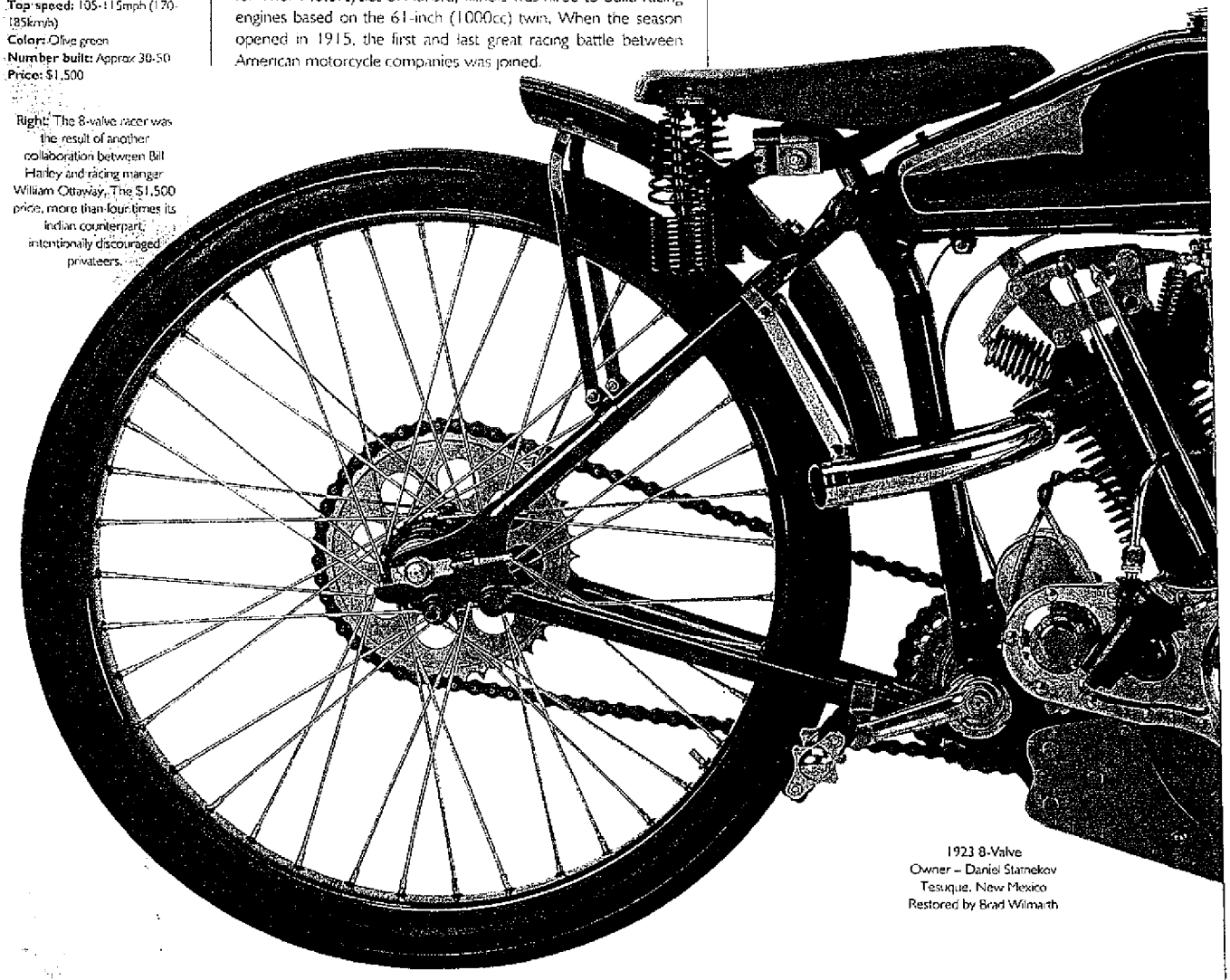
So Milwaukee reached corporate consensus, more or less, on a factory team in 1913. William Ottaway, a development engineer for Thor Motorcycles of Aurora, Illinois was hired to build racing engines based on the 61-inch (1000cc) twin. When the season opened in 1915, the first and last great racing battle between American motorcycle companies was joined.

Indian had introduced its 8-valve racing machine in 1912, and offered it for public sale at little more than the conventional road model. The Federation of American Motorcyclists (F.A.M.), in the interest of ensuring a level playing field, stipulated that manufacturers must offer their racers for public sale. But they said nothing about price. So Milwaukee priced the new 8-valve at $1,500 to discourage privateers, and it worked. No record has been turned up showing civilian ownership of a Harley 8-valve until after the factory team was dissolved.

Just how many of the 8-valves were built is unknown. Even among expert historians and restorers there is wide disagreement; some say as few as ten were built, others say it was more like 50. A number of engines were sent to England, Europe and Australia, and some machines were converted to singles. Since the 8-valve was still available as late as 1928, an educated guess puts the total somewhere between 30 and 50 bikes.

According to the company history, the first three OHV racers were built in 1916. One had a manual oil pump, one a mechanical pump and the third was fitted with one each. The machines

Below: The racer featured the least of everything but motor. Pedals were strapped to the frame, serving only as footrests. Starting was by tow rope.

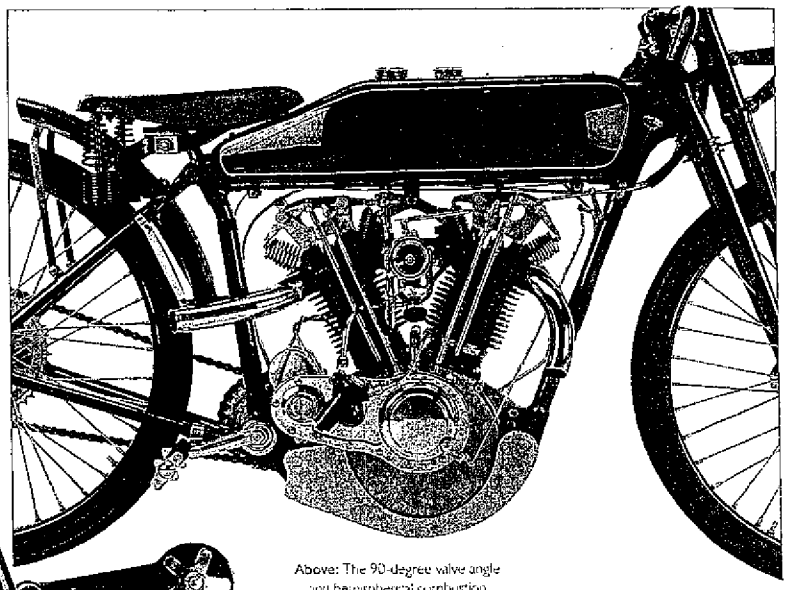


1923 8-Valve
Owner – Daniel Stamekov
Tesuque, New Mexico
Restored by Brad Wilmarth

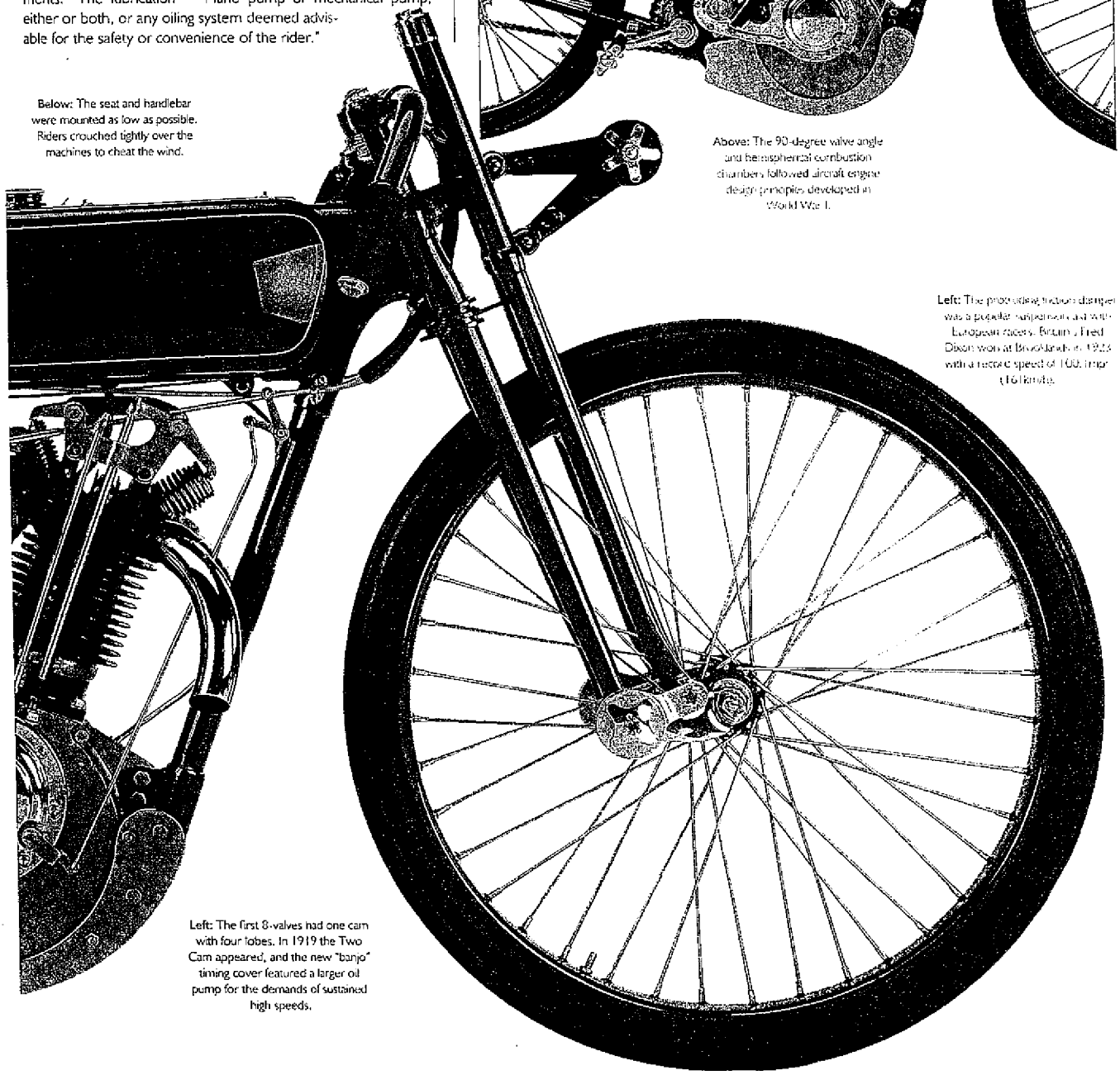
were relatively short-coupled, with wheelbase at about 50 inches (127cm). The bikes had a keystone frame, with front and rear downtubes bolted to plates attached to the engine, making it a stressed member.

These engines made good power, probably close to 20 when the weather was right. Compression ratios were elevated considerably, and starting procedures usually required a tow rope and a car. It wasn't long before these machines were averaging over 100mph (161km/h) on the board tracks. By then the pocket-valve engines were only a few ticks slower, and often carried the day when the 8-valves expired from fried valves, seizures or fractured engine components.

Harley-Davidson advertised the 8-valve ($1,500) and the 4-valve single ($1,400) as a gesture of compliance with the F.A.M. edict. The motor was "air-cooled, piston displacement not exceeding 61cu.in. Mechanical construction to meet any requirements." The lubrication – "Hand pump or mechanical pump, either or both, or any oiling system deemed advisable for the safety or convenience of the rider."



Above: The 90-degree valve angle and hemispherical combustion chambers followed aircraft engine design principles developed in World War I.



Below: The seat and handlebar were mounted as low as possible. Riders crouched tightly over the machines to cheat the wind.

Left: The protruding friction damper was a popular suspension aid with European racers. Britain's Fred Dixon won at Brooklands in 1923 with a record speed of 100.1mph (161km/h).

Left: The first 8-valves had one cam with four lobes. In 1919 the Two Cam appeared, and the new "banjo" timing cover featured a larger oil pump for the demands of sustained high speeds.

1917 MODEL J

Specifications
Engine/Drivetrain
Engine: F-head 45° V-twin
Displacement: 60.33ci (987.67cc)
Bore & stroke: 3.31 x 3.5 (84 x 89mm)
Horsepower: 16 @ 3,000 rpm
Carburetion: Schebler
Transmission: 3-speed
Primary drive: Chain
Final drive: Chain
Brake: Rear expanding band
Battery: 6-volt
Ignition: Coil/points

Chassis/Suspension
Frame: Steel, single downtube
Suspension: F. Leading link spring fork
Wheelbase: 59.5in (151cm)
Weight: 325lb (147.4kg)
Fuel capacity: 2.75gal (10.4lit)
Oil capacity: 5pts (2.36lit)
Tires: 28 x 3in (71.1 x 7.62cm)
Top speed: 65mph (105km/h)
Color: Olive green
Number built: 9,180
Price: $310

MODEL 17J (1917)

The early '17 models were the last of the Silent Gray Fellows as World War I brought the advent of the Silent Green Soldiers, or the Olive Drab Doughboys.

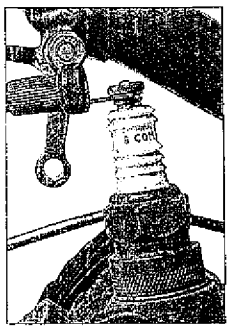
From the Harley-Davidson brochure: "It is a really strange coincidence that within recent years various governments of the world have selected this color as the most serviceable for government equipment such as motorcycles, automobiles and motor trucks. The new military drab color furnishes a most delightful contrast with the handsome satin nickel finish used on many of the motor parts."

Serviceable indeed. Olive green would become Milwaukee's standard color for years beyond the military conflict. But for a brief interlude of darker brewster green in the early 1920s, Harley-Davidson stretched its supply of olive green paint until the 1932 model year.

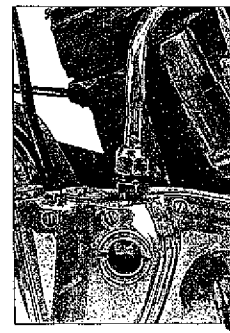
In 1917 the V-twin inherited the four-lobe cam designed for the 8-valve racer. Valve lift and timing were revised for the demands of increased performance. The gear-driven oil pump, introduced in 1915, ensured that lubrication was delivered in proper amounts to the critical moving parts. The earlier hand pump and drip-feed oiling systems often created either a shortage or surplus of oil in the engine, both of which meant problems.

For sidecar use, Milwaukee recommended the 14-tooth countershaft sprocket for a higher gear ratio. The order blank noted: "This motor develops slightly less speed but gives maximum efficiency where power is needed. This motor can also be used satisfactorily for solo riding."

The sidecar enjoyed its highest popularity in this heady era that created rural mail delivery and mechanized warfare. Although Indian was the primary supplier of military motorcycles during World War I, Milwaukee provided its share of motorcycles with



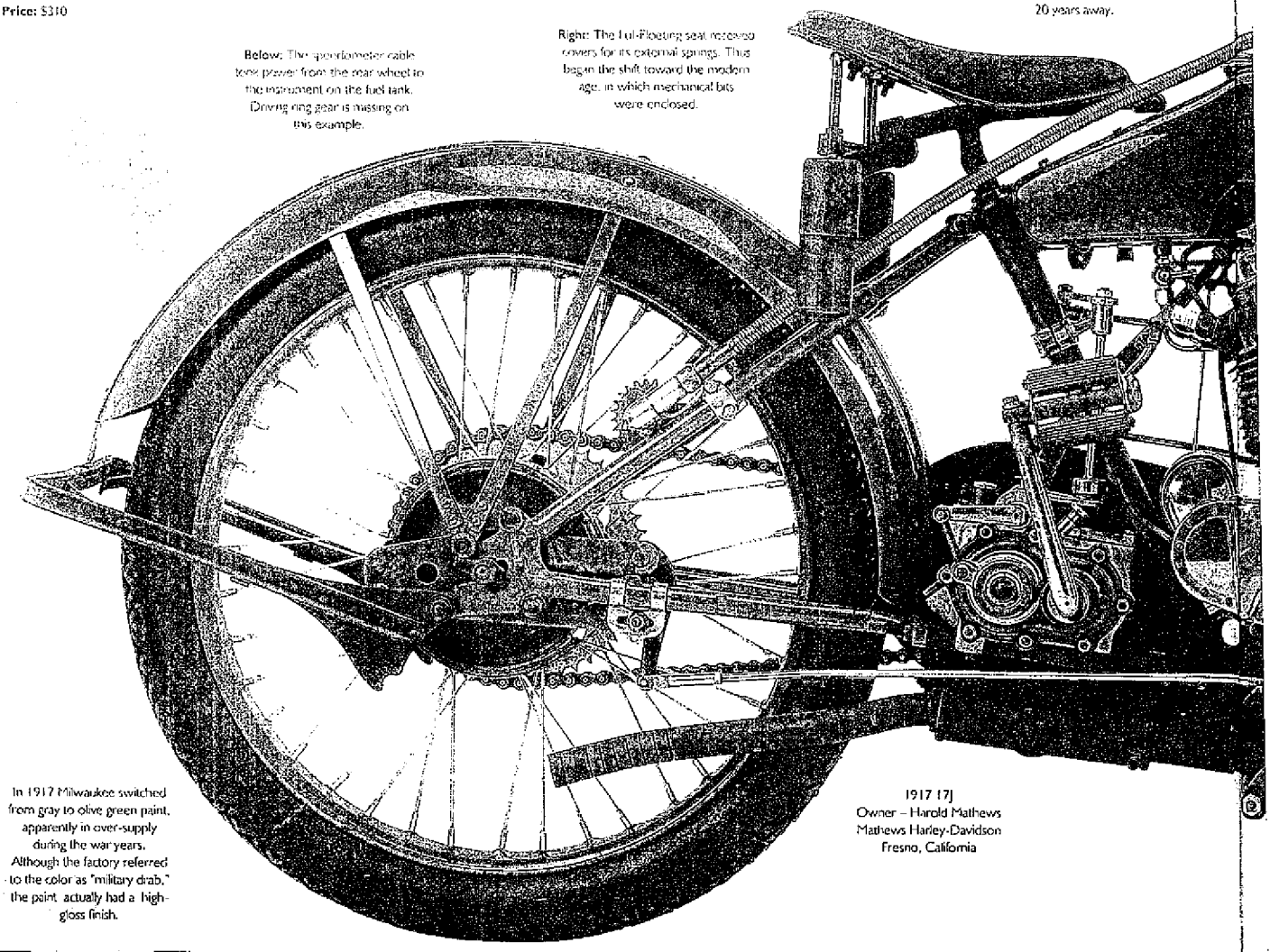
Above: Two-piece spark plugs could be disassembled for cleaning.



Above: The sight-glass on the oil pump remained for many years. Recirculation of oil was 20 years away.

Below: The speedometer cable took power from the rear wheel to the instrument on the fuel tank. Driving ring gear is missing on this example.

Right: The Lul-Floating seat received covers for its external springs. Thus began the shift toward the modern age, in which mechanical bits were enclosed.



In 1917 Milwaukee switched from gray to olive green paint, apparently in over-supply during the war years. Although the factory referred to the color as "military drab," the paint actually had a high-gloss finish.

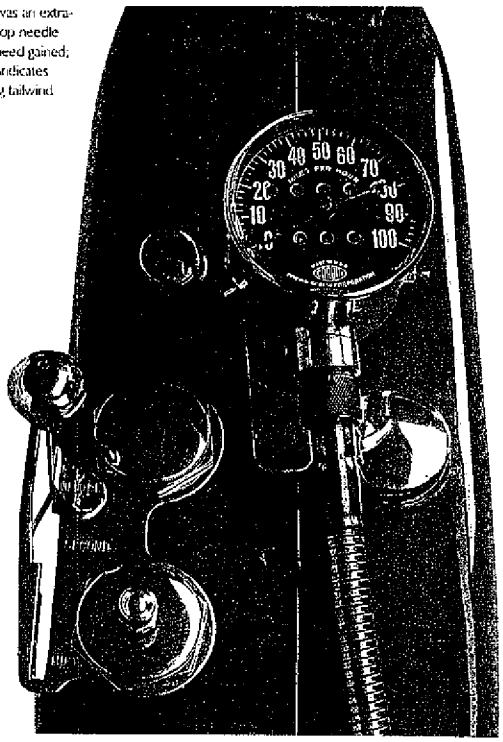
1917 17J
Owner – Harold Mathews
Mathews Harley-Davidson
Fresno, California

sidecars rigged for combat. The "standard pleasure sidecar" for civilian use sold for $80.

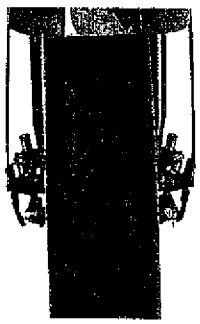
According to the advertising copy, "the sidecar in the new color is a real beauty. Finished as it is in the new military drab, the strikingly handsome lines of the body are set off better than ever by near brewster green striping." Genuine brewster green was probably unavailable during the war. That was the case with German Bosch magnetos, which were replaced by American-made units.

By this point the V-twin's popularity had limited the single to mostly commercial and racing applications. Of the 18,522 motorcycles built by Harley-Davidson for 1917, only about 730 were singles. But Milwaukee had taken note of the demand for a lightweight sporting machine, and concluded that a smaller twin would be the logical choice. So work began on the Sport Model W, a 36 cubic-inch (584cc) opposed twin that would appear in 1919.

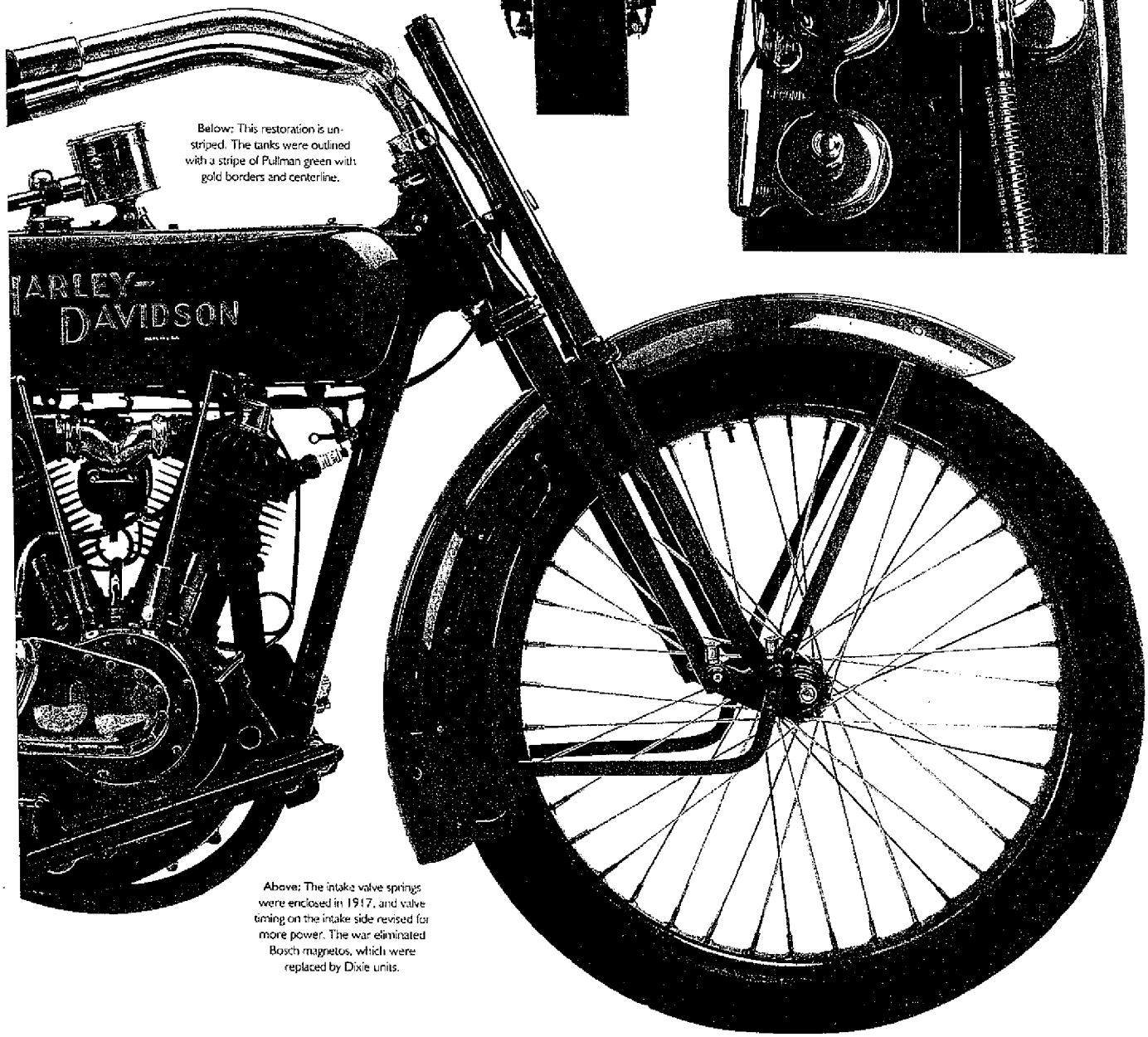
Right: A speedometer was an extra-cost accessory. The top needle remained on highest speed gained; 79mph (127km/h) indicates long downhill, strong tailwind or both.



Below: Firestone Tires put their advertising where the rubber meets the road. To motorcyclists, few words are more reassuring than Non-Skid.



Below: This restoration is unstriped. The tanks were outlined with a stripe of Pullman green with gold borders and centerline.



Above: The intake valve springs were enclosed in 1917, and valve timing on the intake side revised for more power. The war eliminated Bosch magnetos, which were replaced by Dixie units.

MODEL W SPORT TWIN (1919)

As American motorcycling shifted focus after the war from transportation to recreation mode, the interest in lightweight sport bikes rose accordingly. Harley-Davidson responded with the Model W Sport Twin, a 36ci (584cc) horizontally opposed twin featuring an integral 3-speed transmission.

Set lengthwise and low in the frame, the flathead boxer engine had a large external flywheel and an enclosed drive chain. Given the nearly perfect primary balance factor of this engine design, the Sport Twin was by far the smoothest running Harley-Davidson ever built, past or present. The motor, rated at a meager 6 horsepower, was comfortably understressed and the motorcycle weighed only 265 pounds (120kg).

Patterned after the British Douglas, the W model was a radical departure for Harley-Davidson in terms of design and engineering. The chassis incorporated a keystone frame, utilizing the engine as a stressed member. While that feature was familiar on the 8-valve racer, everything else about the Sport Model was different from the V-twins.

The intake and exhaust manifolds were long, siamesed tubes along the right side of the engine. The prevailing notion held that preheating the intake charge enhanced the combustion process. A single camshaft operated all four valves. The screw-in valve guides were easily accessible for replacement, and the valves could be removed without pulling the engine. The cylinders and heads were still a single casting, but they could also be detached without removing the engine. Ease of maintenance and the accessibility of components had played a role in the motorcycle's design.

Roller bearings supported both the crankshaft and connecting rods, and the geared primary drove the wet clutch and magneto mounted atop the engine. The early models came with magnetos and with or without acetylene lights. From 1921 through its final year in 1923, the Sport Twin was offered with either magneto ignition (WF) or battery (WJ).

The sporty twin also incorporated a fork unlike other Harley models. The trailing lower links connected by rods to upper links acting on a central spring. The fender, attached to the Merkel-style truss fork, was stationary as the front wheel moved up and down. Rear suspension was absent save the enclosed springs beneath the solo saddle. The fuel tank, which carried 2.75 gallons (10.4lit) of gas and two quarts (1.9lit) of oil, was situated between the upper frame tubes. The rear luggage rack was standard equipment.

Despite its shortage of both horsepower and ground clearance, the Sport Twin was a record-setting machine. Rider Hap Scherer set a winning time in the 3-Flags run from Canada to Mexico, and the WJ was the first motorcycle to ascend California's Mt. Baldy.

Unfortunately these victories had little effect on the Sport's popularity. The V-twin had been firmly established as the American motorcycle engine of choice, whether in medium, large or extra large. Utilitarian twins of non-V configuration were met with general disinterest in the United States. It was Milwaukee's good fortune that such was not the case in Europe.

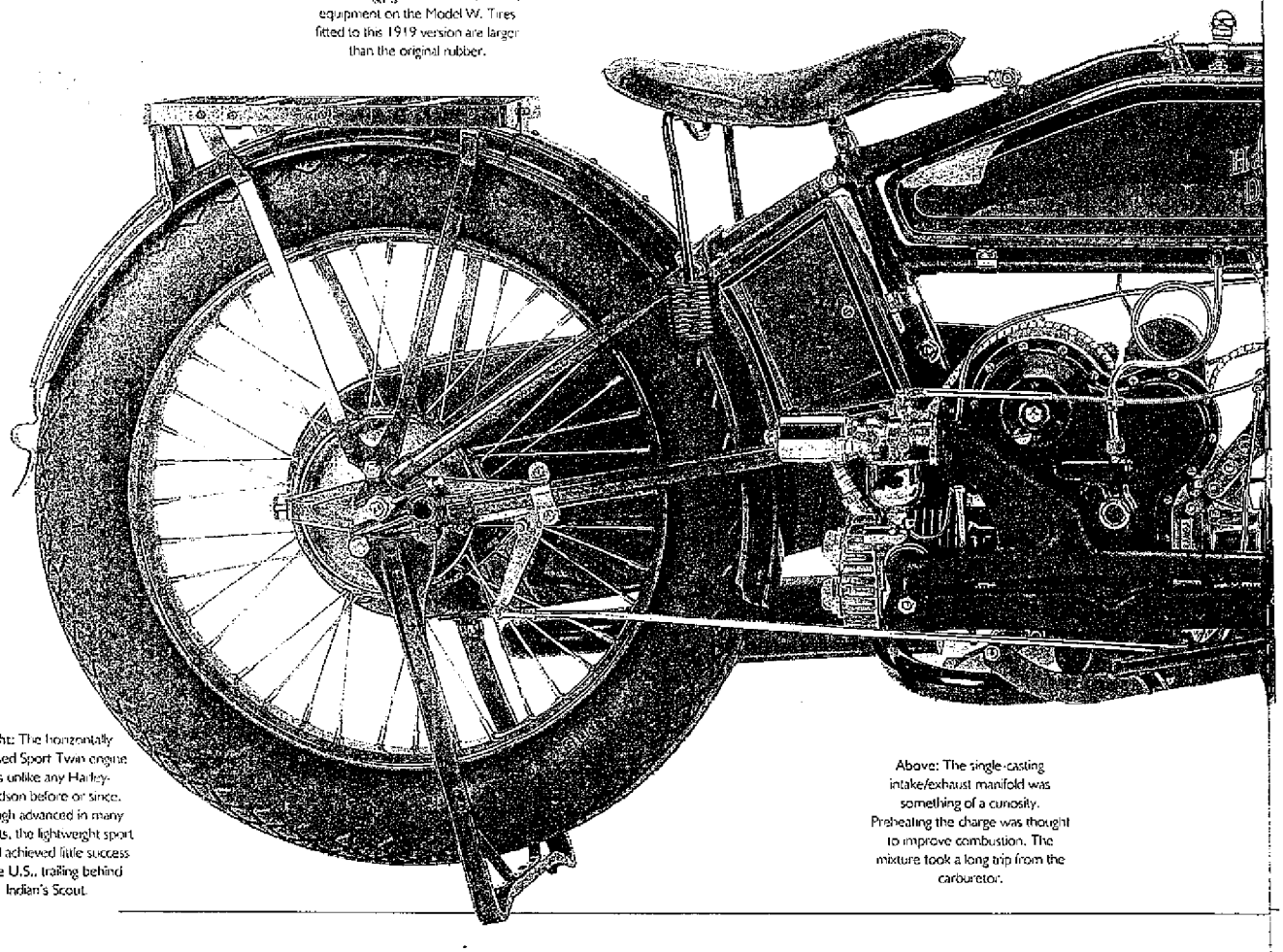
The Douglas brothers of Bristol, England had developed a popular opposed twin, with the aid of Freddy Dixon. With the British motorcycle industry hobbled by the war, the market was ripe for overseas manufacturers. Thus Milwaukee's lightweights sold well in Great Britain and Europe.

1919 MODEL W SPORT TWIN

Specifications
Engine/Drivetrain
Engine: Flathead opposed twin
Displacement: 35.64ci (584.03cc)
Bore & stroke: 2.75 x 3in (70 x 76.2mm)
Compression ratio: 3.75:1
Horsepower: 6
Carburetion: Schebler
Transmission: Unit 3-speed
Primary drive: Helical gears
Final drive: Enclosed chain
Brake: Rear contracting band
Ignition: Magneto

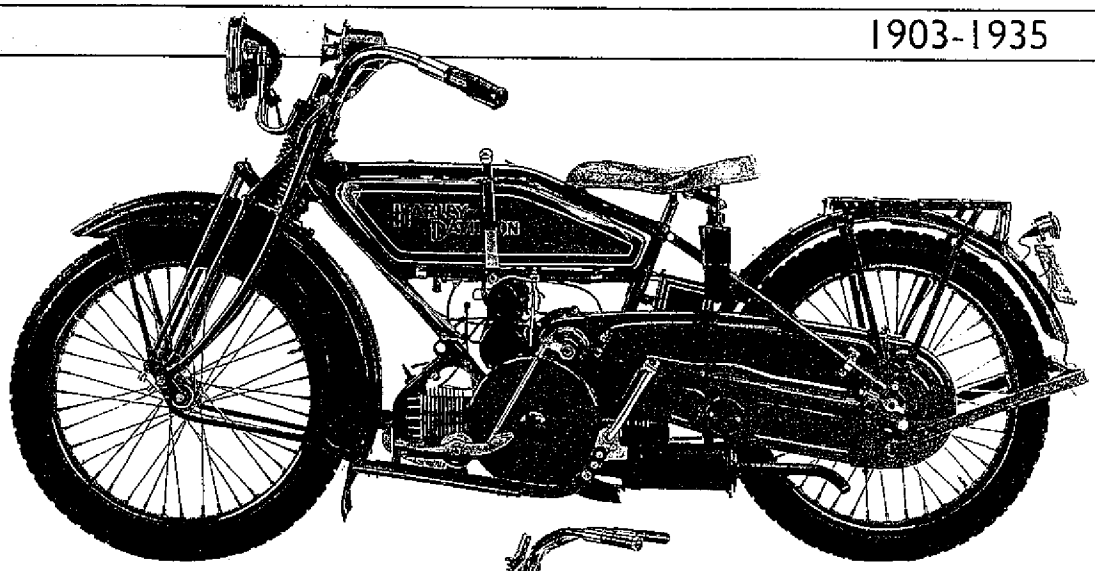
Chassis/Suspension
Frame: Steel, single downtube
Suspension: Trailing link single spring fork
Wheelbase: 57in (144.8cm)
Weight: 265lb (120kg)
Fuel capacity: 2.75gal (10.4lit)
Oil capacity: 2qts (1.9lit)
Tires: 26 x 3in (66 x 7.62cm)
Top speed: 50mph (80.5km/h)
Color: Olive green
Number built: 753 in 1919 (Total production: 9,883)
Price: $335

Below: Luggage carrier was standard equipment on the Model W. Tires fitted to this 1919 version are larger than the original rubber.



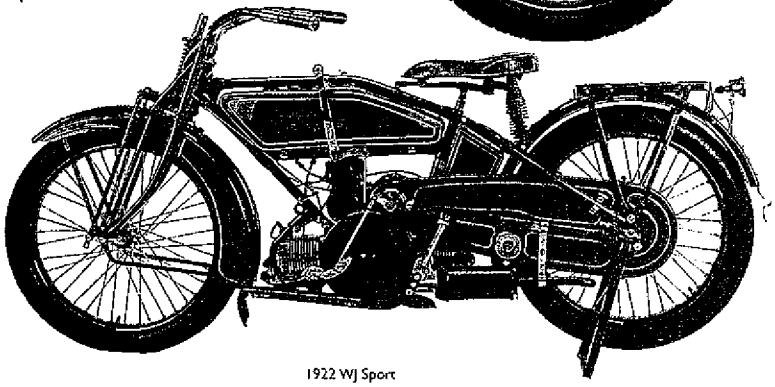
Right: The horizontally opposed Sport Twin engine was unlike any Harley-Davidson before or since. Though advanced in many respects, the lightweight sport model achieved little success in the U.S., trailing behind Indian's Scout.

Above: The single-casting intake/exhaust manifold was something of a curiosity. Preheating the charge was thought to improve combustion. The mixture took a long trip from the carburetor.



1921 WJ Sport
Owner/restorer – Armando Magri
H-D of Sacramento, California

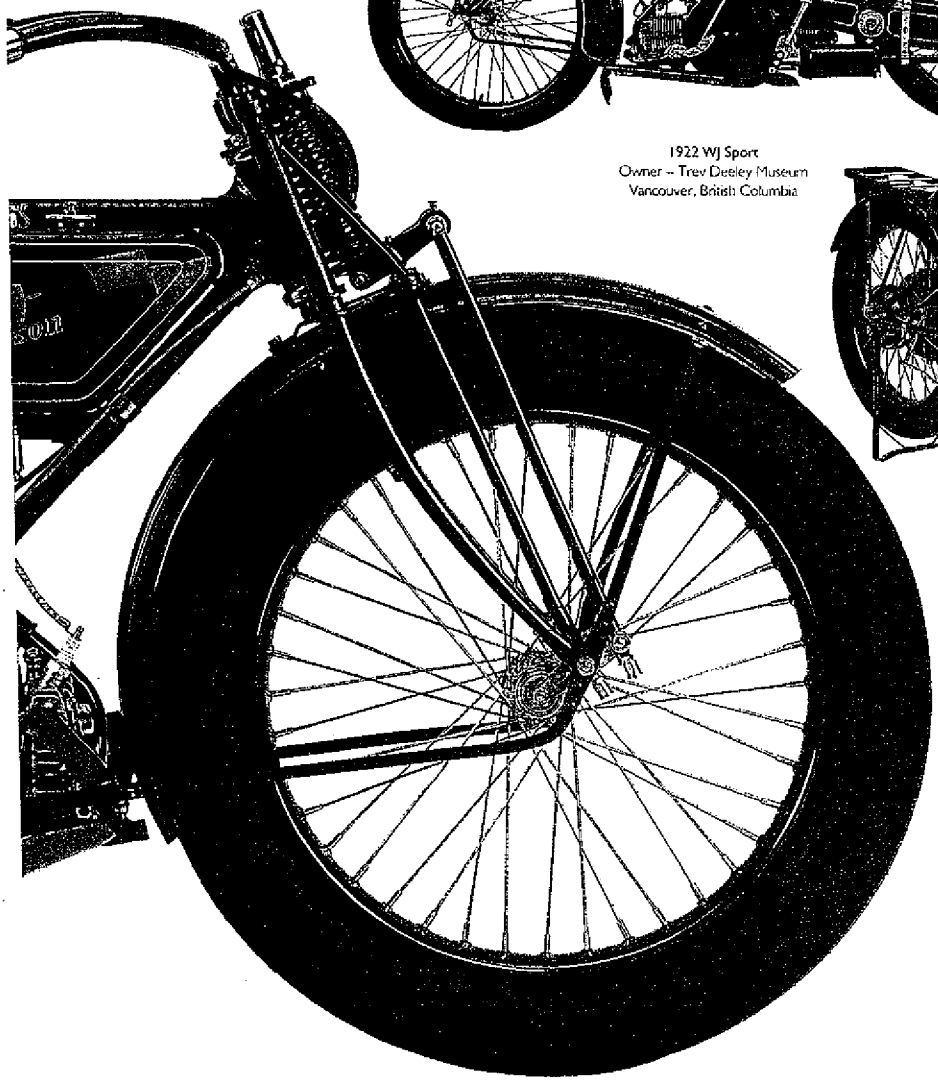
Left: Electric lighting came to the Sport in 1920, thus the battery box under the seat. In 1921 the tank lettering was changed to the standard logo used on the other models.

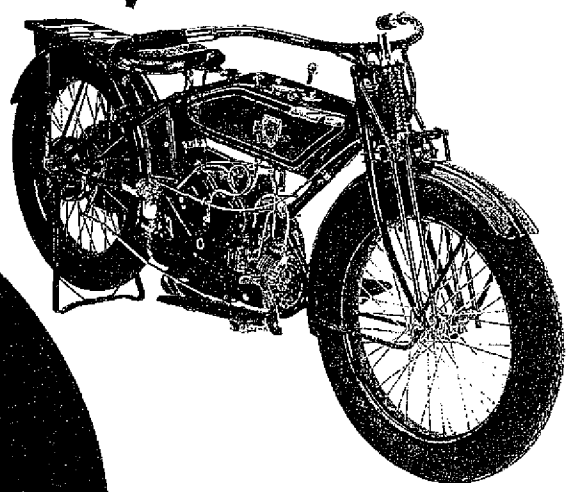


Left: In 1922 Milwaukee switched from olive to brewster green and gold striping was extended to the fenders and other bodywork. The front fork and handlebar were slightly modified.

1922 WJ Sport
Owner – Trev Deeley Museum
Vancouver, British Columbia

Left: The Sport model was easily distinguished from the left by its large external flywheel. The bike was available without enclosed chain.





Above: Endurance rider Hap Scherer established two distance records on the 1919 Sport. One from British Columbia to Tijuana, Mexico and another from New York to Chicago.

1919 W Sport Twin
Owner – Otis Chandler
Ojai, California
Restored by Glenn Batta

MODEL J (1921) AND MODEL CA (1920)

1921 MODEL J

SPECIFICATIONS
ENGINE/DRIVETRAIN
Engine: F-head 45° V-twin
Displacement: 74.66ci (1207.11cc)
Bore & stroke: 3.12 x 4in (79.3 x 101.6mm)
Horsepower: 18.69 @ 3,000 rpm
Carburetion: 1.25in (32mm) Schebler
Transmission: 3-speed
Primary drive: Chain
Final drive: Chain
Brake: Rear drum
Battery: 6-volt
Ignition: Coil/points

CHASSIS/SUSPENSION
Frame: Steel, single downtube
Suspension: F: Leading link spring fork
Wheelbase: 59.5in (151cm)
Weight: 365lb (165.6kg)
Fuel capacity: 2.75gal (10.4lt)
Oil capacity: 4pts (1.9lt)
Tires: 28 x 3in (71.1 x 7.62cm)
Top speed: 70mph (113km/h)
Color: Olive green
Numbers built: 4,526 (V-twin total: 9,472)
Price: $485

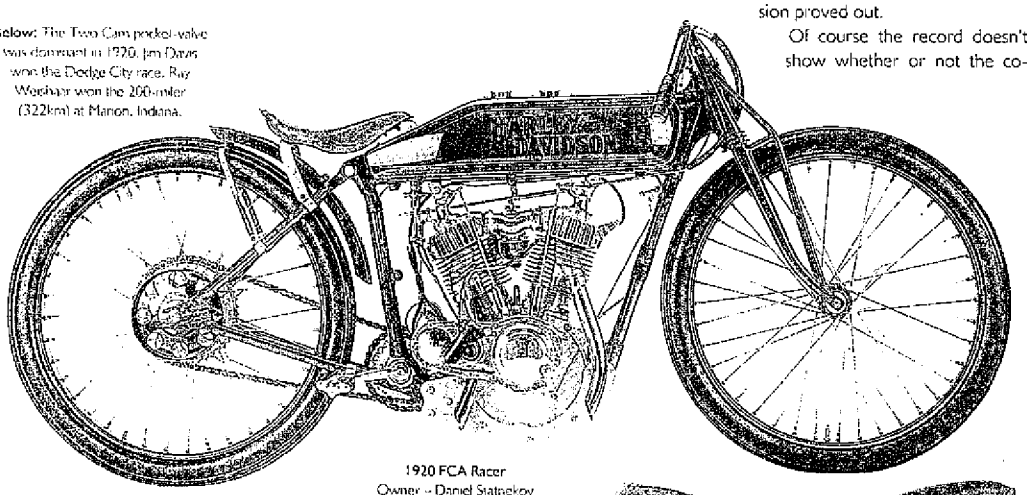
The first Harley-Davidson J model was sold in 1915. The letter designation was applied to both the first 3-speed twin and the premier model with "complete electrical equipment." Proven on road and track, in peace and war, the J model became Milwaukee's top-of-the-line motorcycle.

In 1921 the 61-inch twin (1000cc) was joined by a bigger brother, the 74-inch (1200cc) JD (battery) and FD (magneto). Rated by the factory at 18 horsepower, the big twin was touted as the ideal mate to the new 2-passenger sidecar. The sidecar motor (JDS) was fitted with compression shims for the lower rpm chores imposed by the chair. It also had a 16-tooth countershaft sprocket, two teeth fewer than the solo motor.

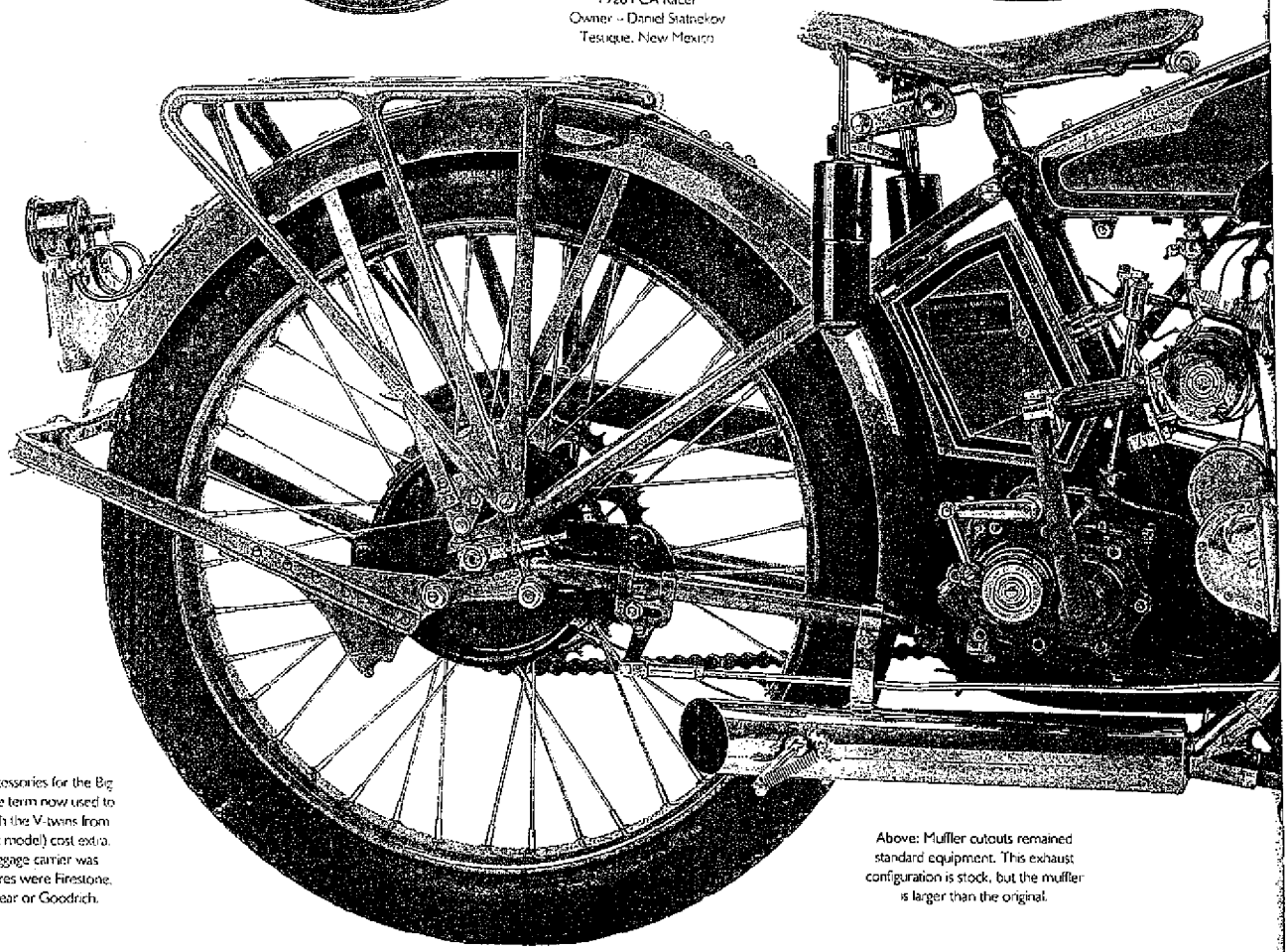
Development of the JD was prompted by the growing popularity of four-cylinder engines from Indian, Henderson and Cleveland. Smoother, more powerful fours threatened to dilute the dominance of V-twins in the sporting, commercial and police markets. Milwaukee had considered building a four, but eventually rejected the idea in favor of upgrading the V-twin. And the decision proved out.

Of course the record doesn't show whether or not the co-

Below: The Two Cam pocket-valve was dominant in 1920. Jim Davis won the Dodge City race. Ray Weishair won the 200-miler (322km) at Marion, Indiana.



1920 FCA Racer
Owner – Daniel Statnekov
Tesuque, New Mexico



Some accessories for the Big Twins (the term now used to distinguish the V-twins from the Sport model) cost extra. The luggage carrier was $6.00. Tires were Firestone, Goodyear or Goodrich.

Above: Muffler cutouts remained standard equipment. This exhaust configuration is stock, but the muffler is larger than the original.

Below left: Harley-Davidson extended its racing supremacy in 1921 by winning every national championship event on the calendar. D. H. Davidson (no relation) became the first rider to break the 100mph (161km/h) mark in England. On the Harley pocket-valve racer, he set the 100.76mph (162.2km/h) record at Brooklands.

founders could predict the future. But 1921, as it turned out, was a disastrous year for motorcycle sales. Government contracts during the war had accelerated production, and Harley-Davidson registered a record year of more than 27,000 machines in 1920. With surplus inventory on hand, production for 1921 dropped to 11,460. Not until 1926 would the figures again top 20,000.

But the war had stimulated engineering and production improvements, due largely to research and development on aircraft engines. As these advances filtered down to automobile and motorcycle production lines, the engines showed gains in efficiency, power and durability. So even as engine technology made significant strides, the overall market was in decline. And not only was the flat economy to blame; two other factors put motorcycles at a disadvantage. Henry Ford had again lowered the prices on his cars, and motorcycling was once more facing a public image problem.

They became known as the Roaring Twenties only in retrospect, but two-wheeled hooligans contributed their share of noise at the time. Walter Davidson urged dealers to become more aware of public relations in their communities. Advertising campaigns were drawn up to distinguish between responsible motorcyclists and hell-raising hot rodders. In the meantime, professional motorcycle racing was withering away.

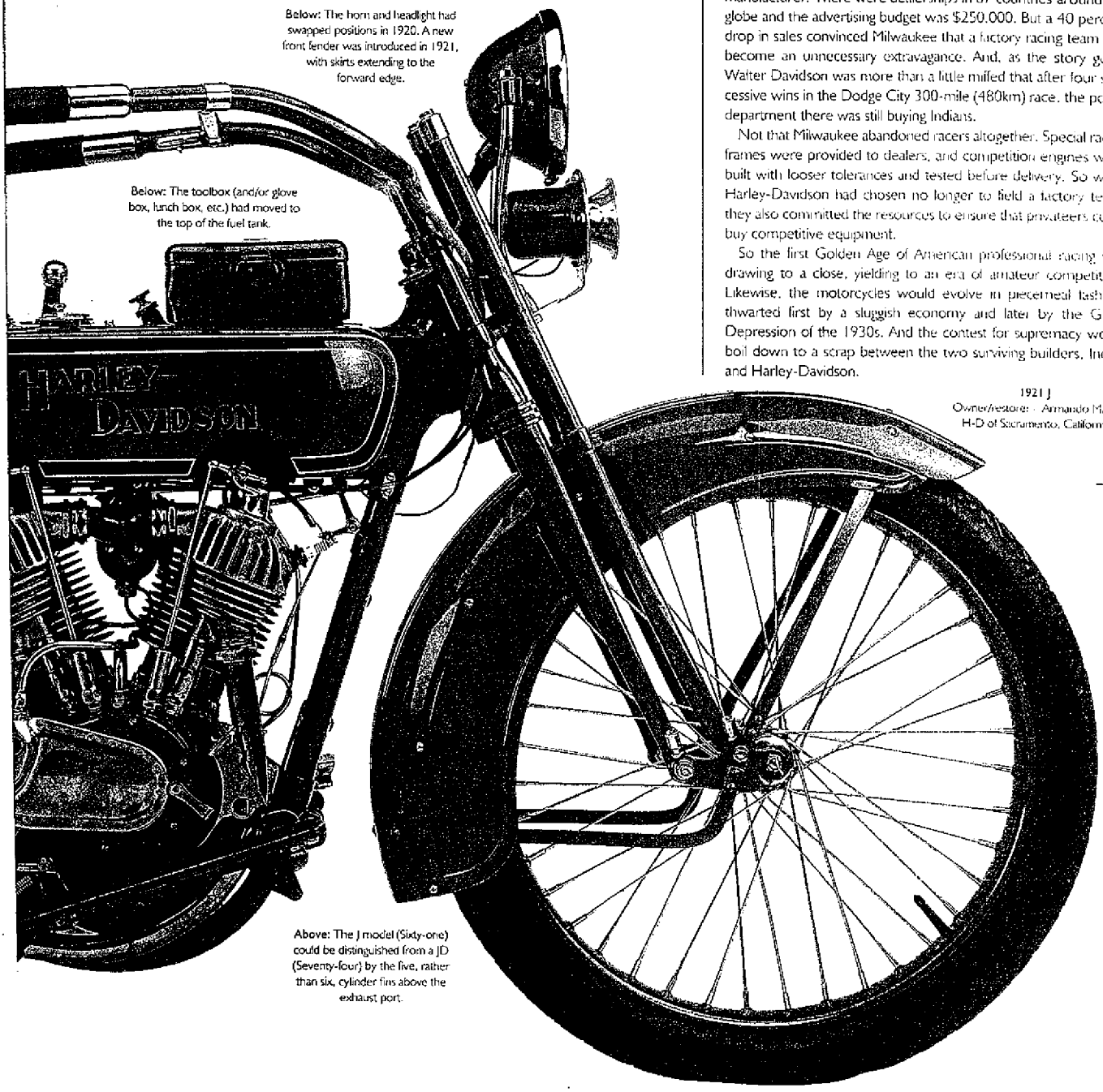
Harley-Davidson was now the world's largest motorcycle manufacturer. There were dealerships in 67 countries around the globe and the advertising budget was $250,000. But a 40 percent drop in sales convinced Milwaukee that a factory racing team had become an unnecessary extravagance. And, as the story goes, Walter Davidson was more than a little miffed that after four successive wins in the Dodge City 300-mile (480km) race, the police department there was still buying Indians.

Not that Milwaukee abandoned racers altogether. Special racing frames were provided to dealers, and competition engines were built with looser tolerances and tested before delivery. So while Harley-Davidson had chosen no longer to field a factory team, they also committed the resources to ensure that privateers could buy competitive equipment.

So the first Golden Age of American professional racing was drawing to a close, yielding to an era of amateur competition. Likewise, the motorcycles would evolve in piecemeal fashion, thwarted first by a sluggish economy and later by the Great Depression of the 1930s. And the contest for supremacy would boil down to a scrap between the two surviving builders, Indian and Harley-Davidson.

Below: The horn and headlight had swapped positions in 1920. A new front fender was introduced in 1921, with skirts extending to the forward edge.

Below: The toolbox (and/or glove box, lunch box, etc.) had moved to the top of the fuel tank.



1921 J
Owner/restorer: Armando Magi, H-D of Sacramento, California

Above: The J model (Sixty-one) could be distinguished from a JD (Seventy-four) by the five, rather than six, cylinder fins above the exhaust port.

MODEL JD TWIN, MODELS A AND B SINGLES (1926)

For the first 20 years in Harley-Davidson's existence, engineering had the dominant role in motorcycle design. With the mid-1920s came a new emphasis on styling. The Silent Gray Fellow was yielding to the stylish Speedy Green Hornet.

For 1922 and '23, the traditional olive green paint was replaced by darker brewster green with gold striping. Olive remained available as an optional color, and returned as the standard hue in 1924. In 1926 Milwaukee offered white and cream as color options.

The flagging motorcycle market had stimulated action on several fronts in Milwaukee. Advertising and public relations efforts were stepped up, the designers and engineers made advances in engine efficiency, suspension and ease of maintenance for the rider. For 1924 the twins featured grease fittings on the running gear, stronger front forks, iron-alloy pistons, new exhaust pipes, larger batteries and generators. Late in the year the two-cam got a new valve train design that brought increased power.

While streamlined styling and direct mail campaigns were employed to attract new buyers, the design and construction of these new models were intended to impress riders by offering higher standards of performance and reliability. In 1925 the cradle frame was replaced by a lower unit using an engine plate between the front and rear downtubes. Seat height was reduced by three inches (7.62cm), which provided a lower center of gravity and easier handling.

Smaller diameter wheel rims also contributed to the lower overall stance, and wider tires provided better grip on the roadway. With softer front suspension, and shorter handlebars with a slight downward bend, the new twins handled significantly better than their predecessors. The more forward seat position put the rider in better control of the machine, and the seat-post spring had been lengthened from 9 to 14 inches (22.9 to 35.6cm). The ads boasted:

"Never a mount like this before – so powerful, so speedy, so perfectly balanced, so roadworthy. From every standpoint of performance, good looks and economy, the 'Stream-Line' sets a new standard. And yet the price is reduced!"

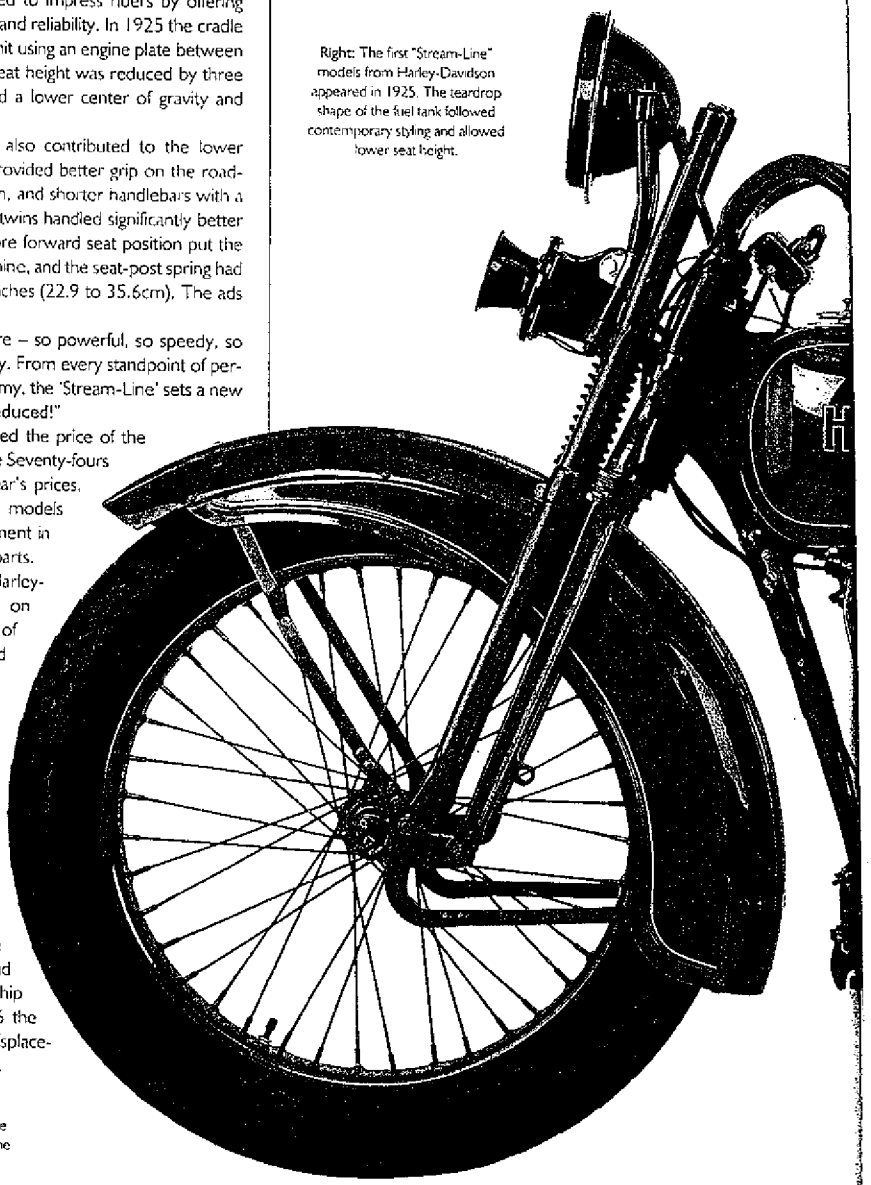
Indeed, Milwaukee had dropped the price of the Sixty-ones by five dollars. And the Seventy-fours were offered at the previous year's prices, despite the fact that the new models represented considerable investment in design, engineering, tooling and parts.

So despite the slow market, Harley-Davidson was obviously intent on maintaining its hard-won position of leadership in the industry. And each time Indian tried a new machine, Milwaukee responded in short order. The challenges were usually first met on the racetrack.

Board-track racing was on its way to history in 1925. The dangers invoked by the increasingly fast V-twins led to the creation of classes for slower machines -- which naturally meant singles. The Thirty-fifty (500cc) engines had been used for national championship events since 1922, and by 1926 the schedule was a mixed bag of displacement classes for twins and singles.

Milwaukee had gone without a road model single for three years, but with the advent of Indian's 21-inch (350cc) Prince in 1925, Harley-Davidson reacted quickly with two singles the following year. The 350s marked Harley's first side-valve engine since the Sport Twin, and the first overhead-valve powerplant offered to the public (in the form of the AA and BA models). The ohv version actually debuted in 1925 at a Milwaukee race, and was soon dubbed the Peashooter for its staccato exhaust note.The overhead valve engine was built in limited numbers and primarily for racing.

The A (magneto) and B (battery) side-valve models accounted for more than 7,000 machines, most of which were exported to Great Britain, Europe and Australia. The single had a three-speed transmission, "ful-floating" seat and external contracting rear brake. And it sold for $210, $50 less than its pocket-valve predecessor of 1918.



Right: The first "Stream-Line" models from Harley-Davidson appeared in 1925. The teardrop shape of the fuel tank followed contemporary styling and allowed lower seat height.

Right: The original paint scheme featured a maroon stripe with the fine gold stripe in the center.

1926 MODEL JD

Specifications

Engine/Drivetrain
Engine: F-head 45° V-twin
Displacement: 74.66ci (1207.11cc)
Bore & stroke: 3.44 x 4in (87 x 102mm)
Horsepower: 24
Carburetion: 1.25in (32mm) Schebler
Transmission: 3-speed
Primary drive: Chain
Final drive: Chain
Brake: Rear drum
Battery: 6-volt
Ignition: Coil/points

Chassis/Suspension
Frame: Steel, single downtube
Suspension: F. Leading link spring fork
Wheelbase: 59.5in (151.1cm)
Weight: 405lb (184kg)
Fuel capacity: 11.5pts (5.44lit)
Oil capacity: 5pts (2.36lit)
Tires: 27 x 3.85in (68.6 x 9.78cm)
Top speed: 60mph (97km/h)
Colors: Olive green (options: white, cream)
Number built: 9,543
Price: $

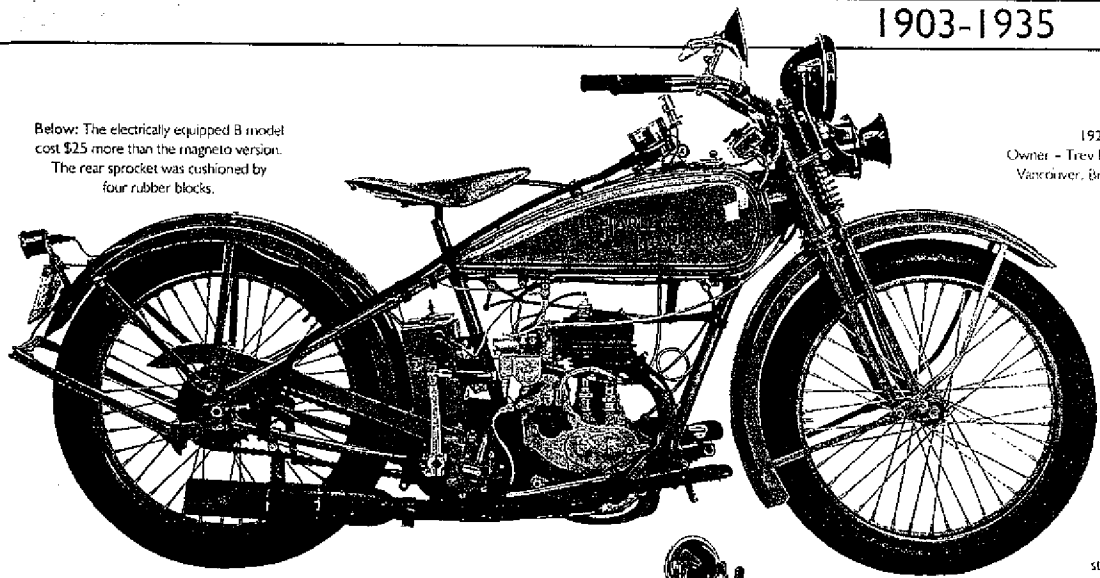
1926 MODEL A

Specifications

Engine/Drivetrain
Engine: F-head 45° V-twin
Displacement: [illegible] (345.23cc)
Bore & stroke: 2.875 x 3.5in (73 x 82mm)
Horsepower: 8 @ 4,000 rpm
Carburetion: Schebler
Transmission: 3-speed
Primary drive: Chain
Final drive: Chain
Brake: Rear contracting band
Ignition: Magneto

Chassis/Suspension
Frame: Steel, single downtube
Suspension: Leading link spring fork
Wheelbase: 56.5in (143.6cm)
Weight: 251lb (113.9kg)
Fuel capacity: 3gal (11.36lit)
Oil capacity: 3qts (2.84lit)
Tires: 26 x 3.30in (66 x 8.38cm)
Top speed: 55mph (88.5km/h)
Color: Olive green
Number built: 1,128
Price: $210

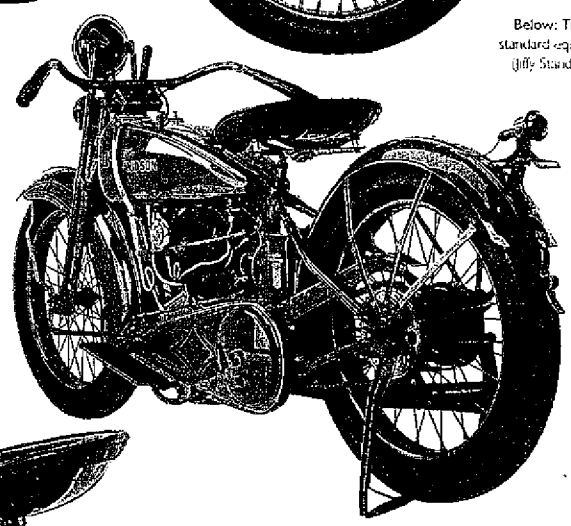
Below: The electrically equipped B model cost $25 more than the magneto version. The rear sprocket was cushioned by four rubber blocks.



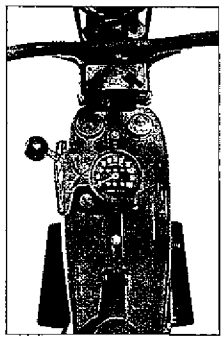
1926 B
Owner – Trev Deeley Museum
Vancouver, British Columbia

Left: The singles shared a number of common features with the twins. Chassis designs were similar, as were electrical systems and switchgear. The front fender was mounted to the rigid rather than the spring fork.

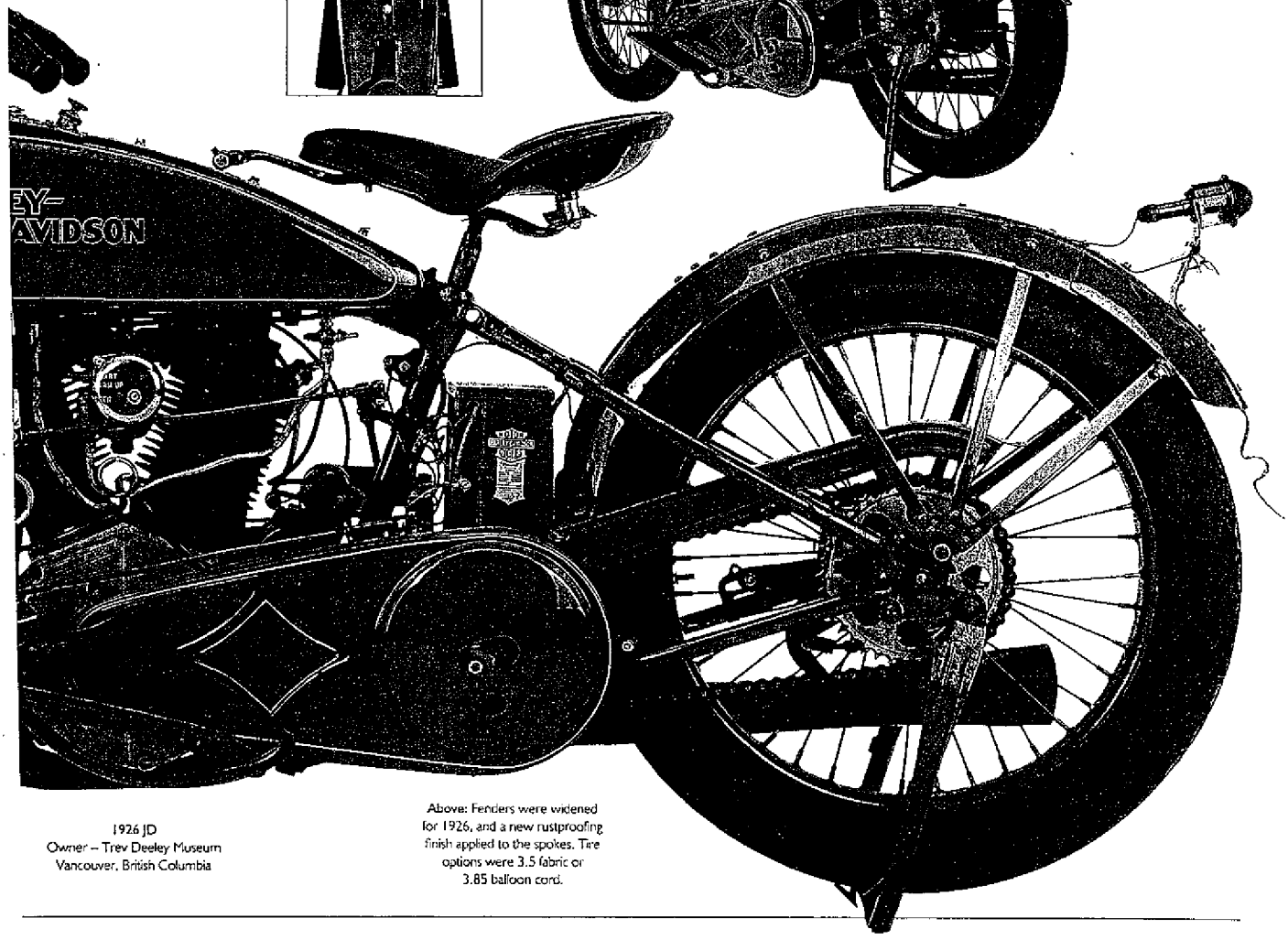
Below: The rear stand was still standard equipment. The side stand (Jiffy Stand) was a $2.50 option.



Right: Two optional speedometers were available from either Corbin Brown or Johns-Manville companies.



Below: The clutch mechanism was changed on the big twins in 1926. The previous cam-actuating mechanism was replaced with a fork system.



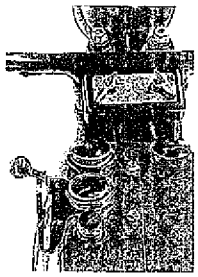
1926 JD
Owner – Trev Deeley Museum
Vancouver, British Columbia

Above: Fenders were widened for 1926, and a new rustproofing finish applied to the spokes. Tire options were 3.5 fabric or 3.85 balloon cord.

1926 MODEL BA

Specifications
Engine/Drivetrain
Engine: Overhead valve single
Displacement: 21.10ci (345.73cc)
Bore & stroke: 2.875 x 3.25in (73 x 82.5mm)
Horsepower: 12 [illegible] 4,000 rpm
Carburetion: Schebler
Transmission: 3-speed
Primary drive: Chain
Final drive: Chain
Brake: Rear contracting band
Ignition: Battery/coil

Chassis/Suspension
Frame: Steel, single downtube
Suspension: Leading link spring fork
Wheelbase: 56.5in (146.3cm)
Weight: 263lb (119.3kg)
Fuel capacity: 3gal (11.36lit)
Oil capacity: 3qts (2.84lit)
Tires: 26 x 3.30in (66 x 8.38cm)
Top speed: 60mph (97km/h)
Color: Olive green
Number built: 524
Price: $275



Above: The simple control panel featured an ignition switch on the left and light switch on the right. The three speed gearbox was operated by a shift lever on the left side of the tank.

MODELS AA, BA AND BC (1926)

Harley-Davidson's first experience with side-valve engines, more commonly known as flatheads, was not hugely successful. The Sport Twin did not sell well in the U.S.A., losing out to the popular Indian Sport Scout, a 45-inch (750cc) V-twin. But Milwaukee hadn't lost interest in the design.

In 1924 Harley executives visited Europe and Australia, conducting their own research on the international market. The Sport Twin had sold well overseas, where light weight and fuel economy figured more strongly in buying decisions. But the opposed twin was relatively expensive to build, and the Europeans had embraced single-cylinder motorcycles as the sensible combination of sport and economy. So Milwaukee returned to singles.

Not that the one-lungers had ever been completely abandoned. Economic realities, in both commercial and sporting contexts, had perpetuated the market for less expensive mounts. Harley and Indian both built and maintained a brace of racing thumpers in the 1920s, as the big-inch twins slowly dissolved into racing history. Highly-paid factory racers had been demoted to semi-pro status, and the prospects for the growth of amateur competition began to look appealing. As did that growing population of riders who couldn't afford the twins. Yet.

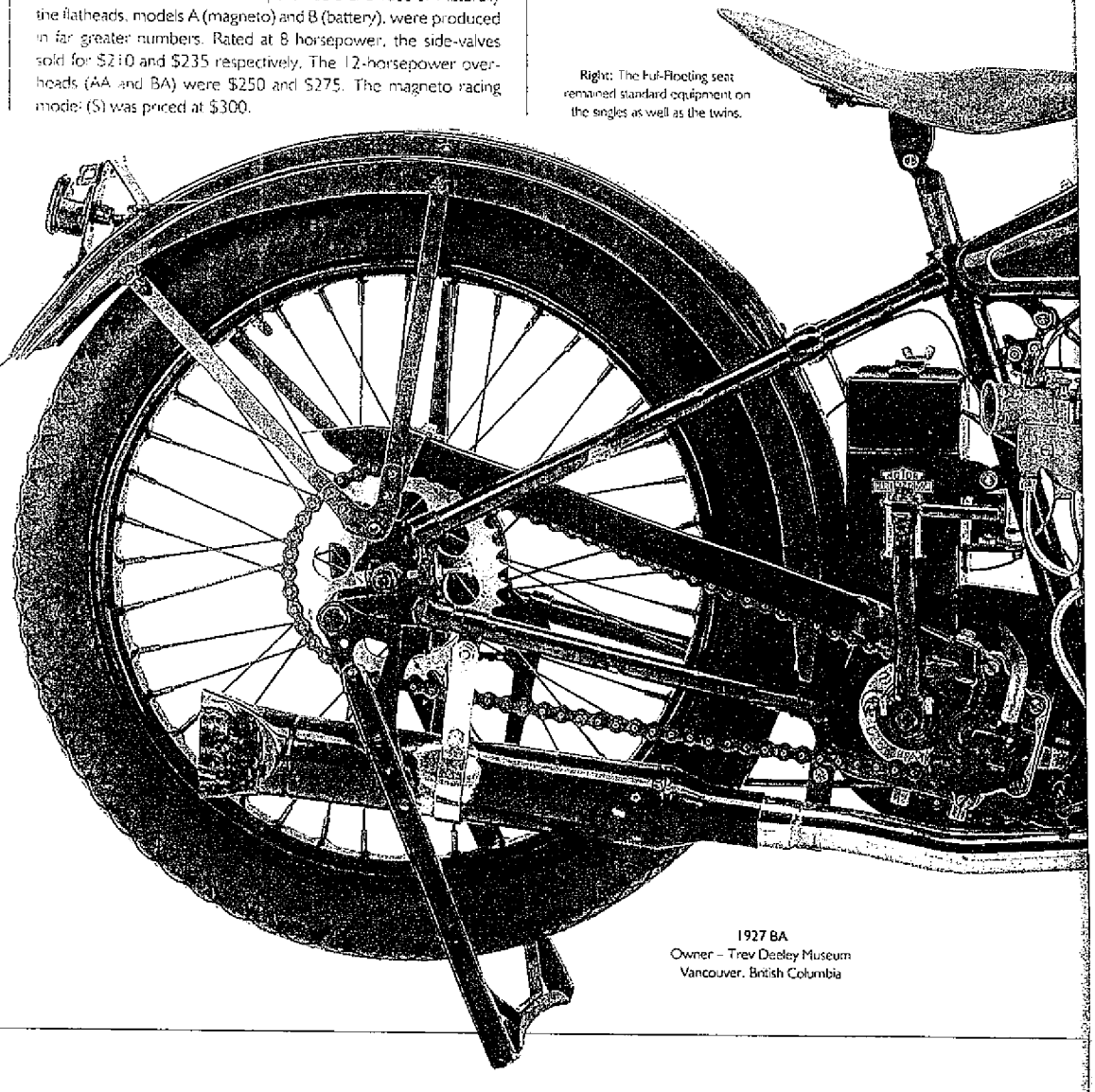
Thus it was decided that two singles would be developed simultaneously: a side-valve model for economical transportation and an overhead-valve version for sport riders and racers. Naturally the flatheads, models A (magneto) and B (battery), were produced in far greater numbers. Rated at 8 horsepower, the side-valves sold for $210 and $235 respectively. The 12-horsepower overheads (AA and BA) were $250 and $275. The magneto racing model (S) was priced at $300.

Unlike the twins, the new singles featured detachable cylinder heads. The combustion chambers, pioneered and patented by British engineer Harry Ricardo, incorporated what came to be called a "squish band." The design created turbulence in the fuel charge, which translated as more complete combustion and higher horsepower. In racing trim, the Peashooter weighed about 235 pounds (106.6kg) and could reach upwards of 70mph (113km/h). Harley-Davidson won six of the 14 national championship 350cc races in 1926, with Indian victorious in the remaining eight.

So the singles appealed to that steadfast, but more or less static segment of the motorcycling fraternity that prized lightweight sport bikes, and their budget-minded counterparts who simply couldn't afford a twin. And while their numbers, at least in the U.S., were relatively small, the complementary considerations of sport riding and economic utility ensured them some choice of equipment.

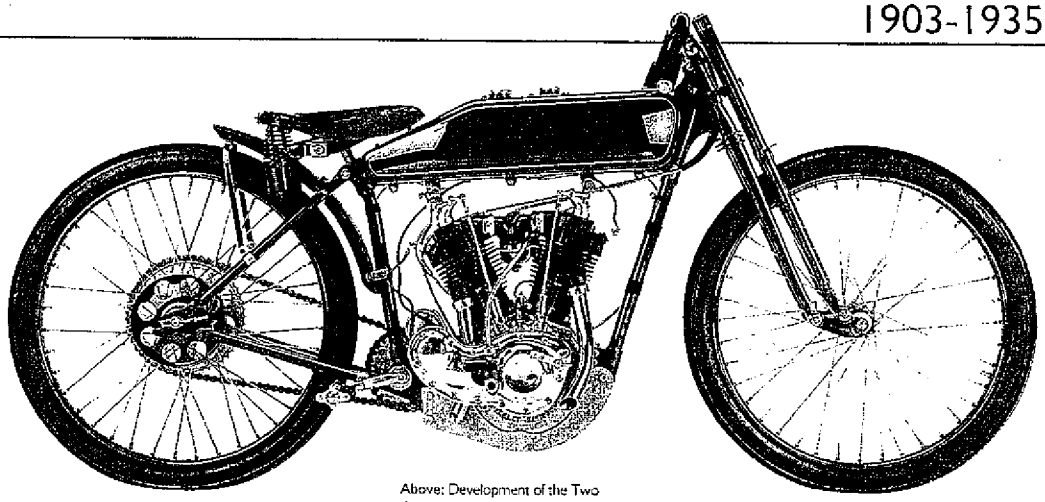
And the commercial sense of producing side-valve engines would soon extend to the V-twins, as Milwaukee noted the proliferation of Excelsior and Indian 45ci (750cc) V-twin sport bikes on the road. The pocket-valve twins had served Milwaukee well for more than 20 years, but the future obviously lay in more efficient and powerful engines. Indian had demonstrated, with the aid of Irish tuning wizard Charley Franklin, that four-valve flatheads could beat eight-valve overheads on the race track, and so pointed the way to the next generation of engine design.

Right: The Fuf-Floeting seat remained standard equipment on the singles as well as the twins.



Right: The overhead-valve singles were produced in far fewer numbers than the flatheads. More than 4,000 side-valves were built for 1927, but only 722 of the ohv models. Included in that number were export models and racing bikes.

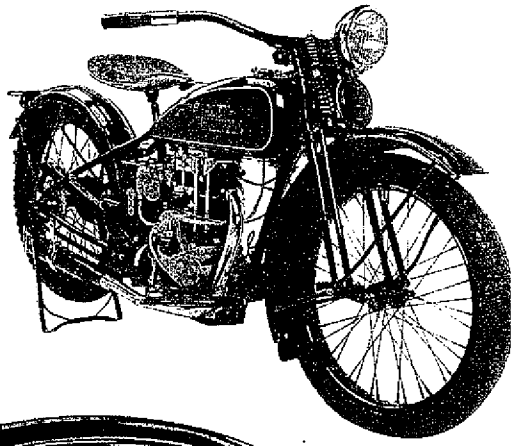
1927 BA
Owner – Trev Deeley Museum
Vancouver, British Columbia



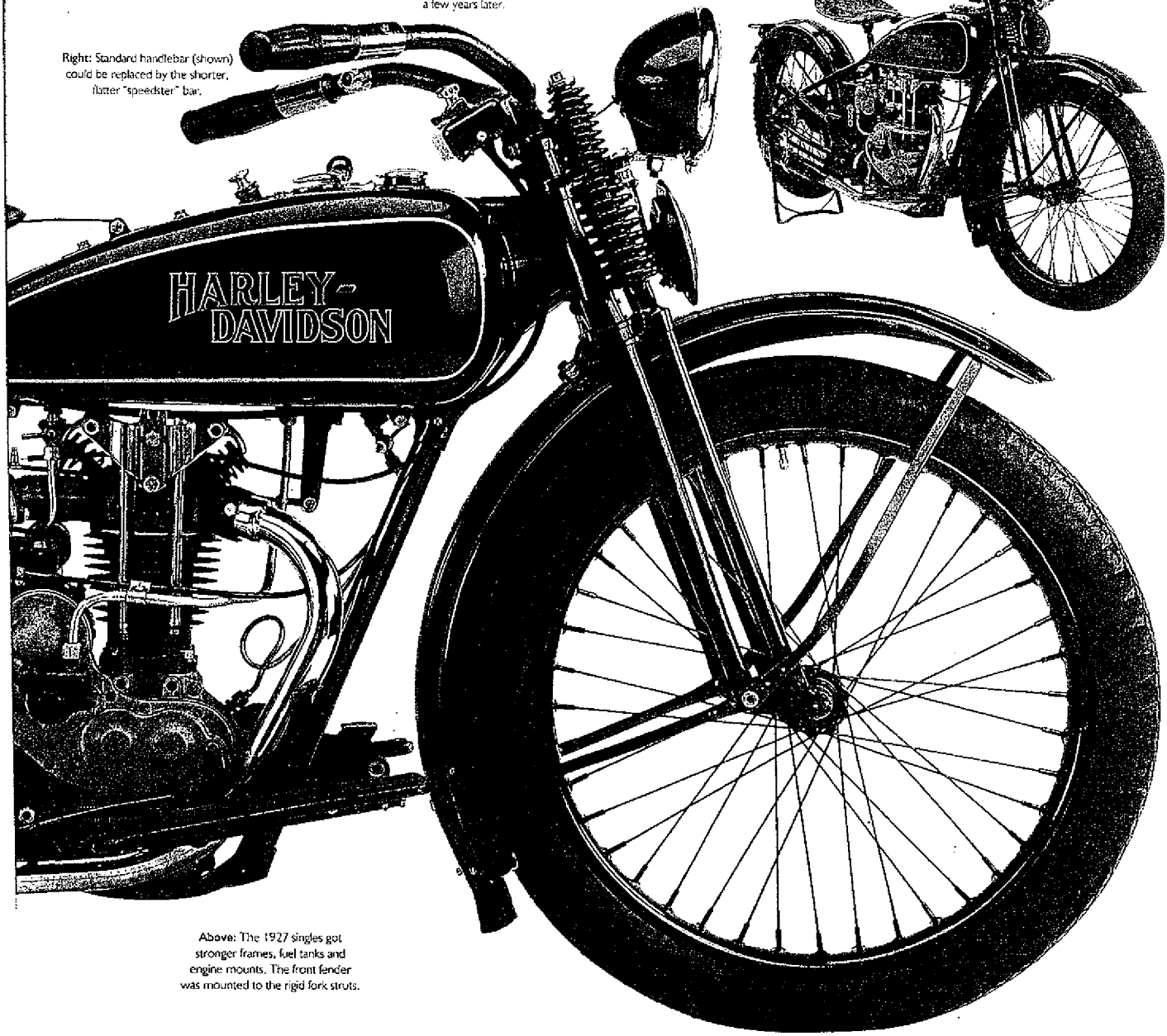
1926 FHAC
Owner -- Daniel Stittleton
Tesuque, New Mexico
Restored by Brad Wilmarth

Above: Development of the Two Cam pocket-valve racer led to the production of the Sixty-one and Seventy-four twin cam road models a few years later.

Below: Although it was well received by the motoring press, the ohv single proved more popular overseas than it did in the United States.



Right: Standard handlebar (shown) could be replaced by the shorter, flatter "speedster" bar.



Above: The 1927 singles got stronger frames, fuel tanks and engine mounts. The front fender was mounted to the rigid fork struts.

1929 JDH

Specifications
Engine/Drivetrain
Engine: IOE 45° V-twin
Displacement: 74ci (1200cc)
Bore & stroke: 3.4 x 4.0in (87 x 101.6mm)
Compression ratio: 6.5:1
Horsepower: 29 @ 4,000rpm
Carburetion: Schebler
Transmission: 3-speed
Primary drive: Chain
Final drive: Chain
Brakes: F. & R. Drum
Battery: 6-volt
Ignition: Coil/points

Chassis/Suspension
Frame: Steel, single downtube
Suspension: F. Double spring fork
Wheelbase: 59.5in (151.1cm)
Weight: 408lb (185kg)
Fuel capacity: 4.75gal (18lit)
Oil capacity: 4qts (3.79lit)
Tires: 18 x 3.85in (45.7 x 9.78cm)
Top speed: 85mph (137km/h)
Colors: Olive green (options: azure blue; police blue; fawn gray; cream; maroon; orange)
Number built: 10,182 (JD); JDH, unknown
Price: $370

MODEL JDH (1929)

The JDH made its first appearance in 1928, and was known as the Two-Cam. Offered in both JH and JDH models, respectively 61 and 74-inch (1000cc and 1200cc) versions, this engine was derived from Milwaukee's racing experience gleaned throughout the 1920s.

Prompted by the improving performance figures of the Indian Powerplus and the four-cylinder Excelsior, Harley needed a faster machine. The factory had built many twin-cam competition bikes, and simply decided to apply that knowledge to the production of a road model. So the JDH got the racer's direct valve gear, with tappets replacing the standard roller arms. Adding dual intake valve springs, the Two-Cam was capable of higher rpm. Larger cooling fins on the head helped dissipate the heat inevitably created by more power, and a new throttle-controlled oil pump improved engine lubrication.

The Two-Cam was equipped with domed Dow metal pistons, optional on the J and JD, manufactured with magnesium alloy. This meant higher compression.

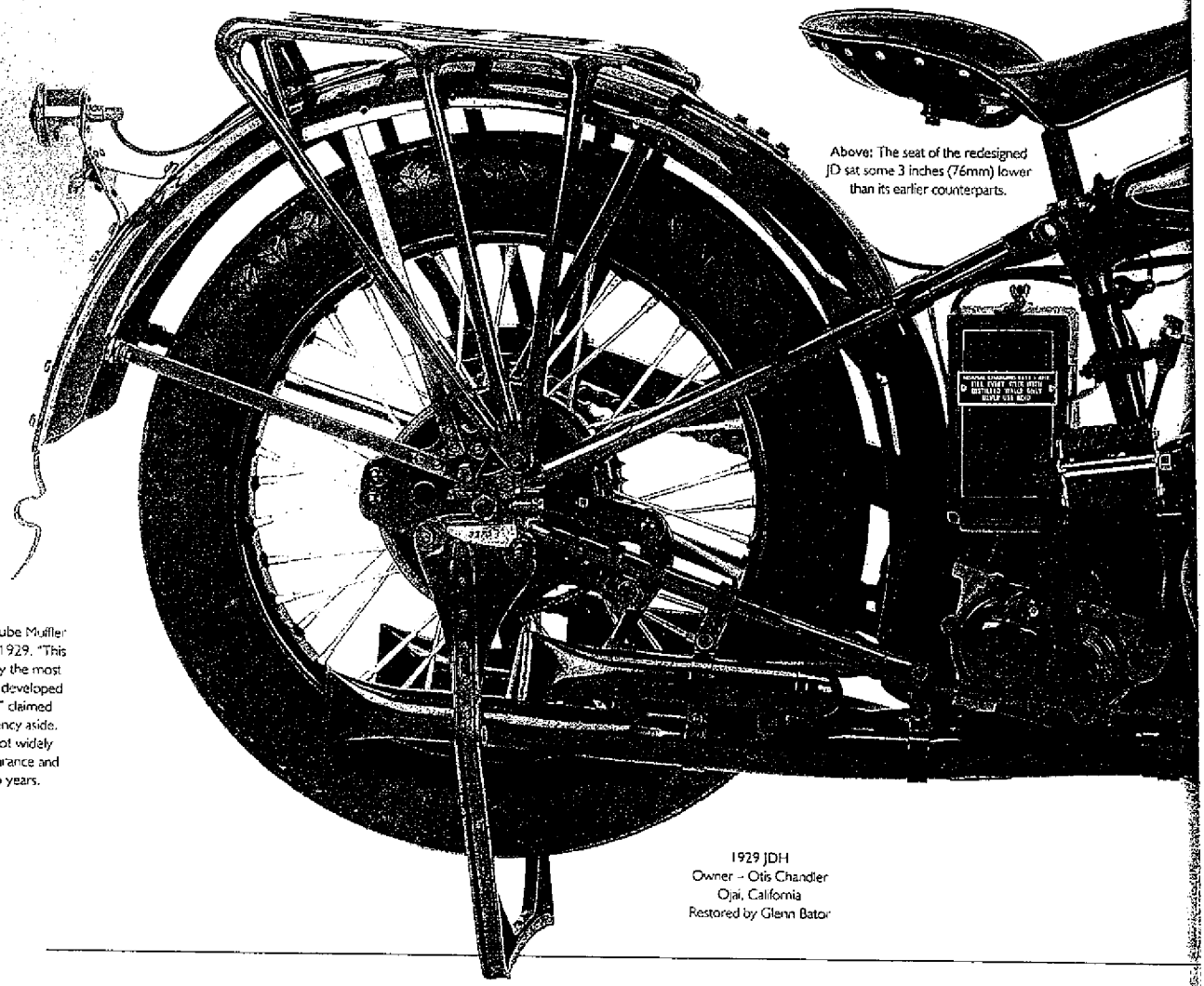
The JDH had a smaller and lighter fuel tank than the standard road machines, with capacity reduced from 5.3 to 4.75 gallons (20 to 18lit). Smaller diameter wheels lowered the center of gravity, and heavy duty spokes in the rear wheel helped handle the additional power. With the capability of more speed, the addition of a front brake was welcomed by sport riders.

More color options were also available, as more riders complained about the unrelieved flow of green from Milwaukee. Though not touted in the general sales literature, the new colors were listed in dealer bulletins. Many two-tone combinations were available to customers willing to ask questions.

The first Golden Age of American motorcycle racing (1915-25, give or take, with time out for World War 1) had now passed to history. Expensive racing budgets were no longer deemed necessary. Harley had been drawn to the track wars by Indian and Excelsior; the gauntlet thrown, challenge accepted and the battles engaged. On July 4, 1925, young Joe Petrali achieved the first 100mph (161km/h) average, riding a two-cam Harley at the Altoona, Pennsylvania board track.

That period of testing, tuning and racing accelerated Harley-Davidson's development as a builder of sporting machines, specifically in the big twin idiom. The smaller, lighter (and less powerful) 37ci (600cc) Sport Twin had achieved little success, and it lasted only five years. That failure effectively consigned American motorcycles to the heavyweight V-twin configuration they have maintained ever since. Big, powerful and, by God, American.

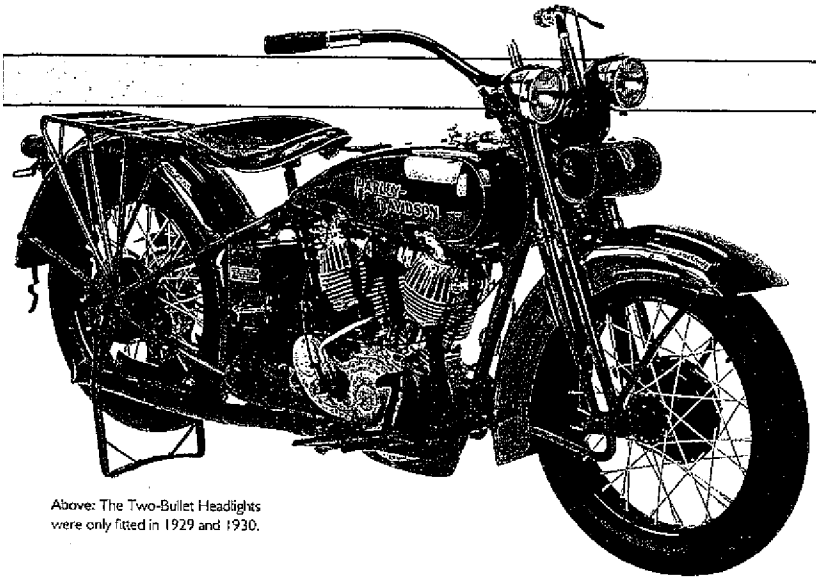
But 1929, at the edge of the Great Depression, would be the final year for the J series. Some 75,000 of the bikes had been built in its nine-year run, and it had evolved as the ultimate logical extension of its progenitor, the 1911 V-twin. In that time the horsepower had risen, the electrics acquired dependability, the styling had achieved acceptance and the motorcycle ranked well for overall performance and reliability. But other forces were at play in the market, and the pocket-valve engine would soon be consigned to the back pages. Which, of course, are now the front pages.



Above: The seat of the redesigned JD sat some 3 inches (76mm) lower than its earlier counterparts.

Right: The Four-Tube Muffler was introduced in 1929. "This muffler is positively the most quiet muffler ever developed for motorcycles," claimed Milwaukee. Efficiency aside, the design was not widely admired for appearance and lasted only two years.

1929 JDH
Owner - Otis Chandler
Ojai, California
Restored by Glenn Bator



Above: The Two-Bullet Headlights were only fitted in 1929 and 1930.

Still, the pocket-valve twins, in 1000 and 1200cc forms, were the motorcycles most responsible for securing Harley-Davidson's place in motorcycling. They were employed in every conceivable enterprise from basic transportation to sporting adventure, professional racing to sidecar duty, commercial delivery service to law enforcement, from hillclimbing to hell raising. The J model was the All-Purpose American machine.

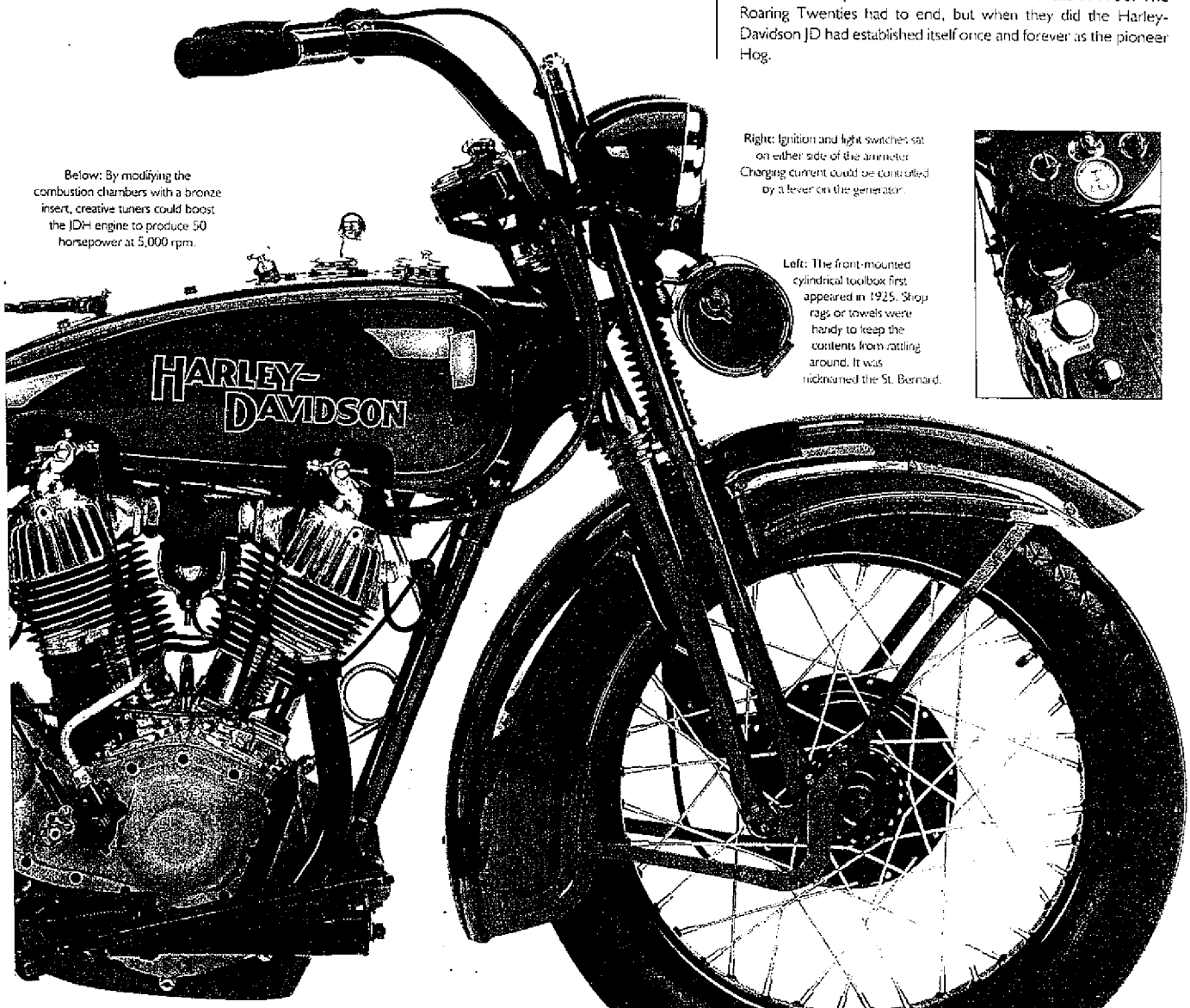
At the same time, the JDH moved Milwaukee a large step closer to the international mainstream in motorcycle design. The engine oiling system was still total-loss, but 1928 saw the introduction of an oil pump regulated by the throttle. And the front brake shows the recognition of deceleration as an important matter in sporting performance on the open road.

But reality intervened, in the form of the Great Depression, and with it the fact that flatheads could be produced more cheaply. Nonetheless, the JDH had set the pattern for the next high-performance Harley, the overhead-valve Knucklehead in 1936. The Roaring Twenties had to end, but when they did the Harley-Davidson JD had established itself once and forever as the pioneer Hog.

Below: By modifying the combustion chambers with a bronze insert, creative tuners could boost the JDH engine to produce 50 horsepower at 5,000 rpm.

Right: Ignition and light switches sat on either side of the ammeter. Charging current could be controlled by a lever on the generator.

Left: The front-mounted cylindrical toolbox first appeared in 1925. Shop rags or towels were handy to keep the contents from rattling around. It was nicknamed the St. Bernard.



Right: With the addition of a stronger fork and a front brake, both introduced in 1928, the handling of the big twins improved considerably.

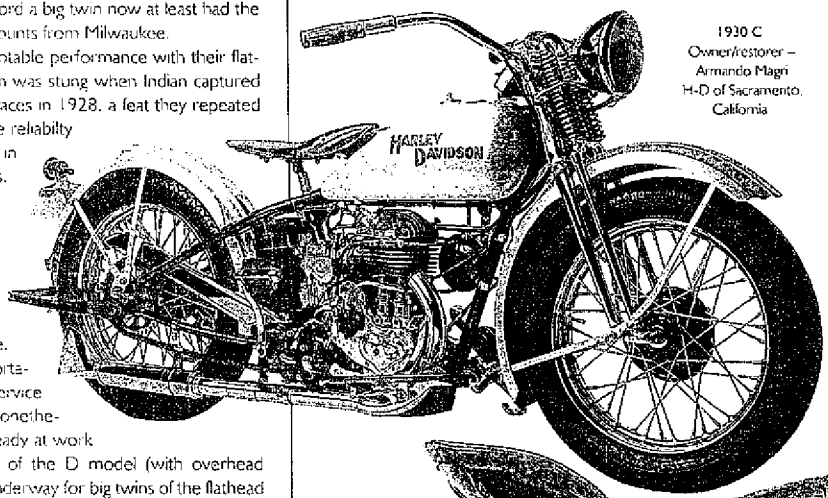
As years go, 1929 is rarely recalled as one of America's best. But although the collapse of the stock market has become the signal event in history, the first nine months of the year looked encouraging in Milwaukee.

Two new models appeared in 1929: the 45 cubic-inch (750cc) V-twin D (standard) and DL (high compression) model and the 30.50 inch (500cc) model C single. Neither of them looked too appealing to riders accustomed to 1000 and 1200cc twins, but those models were still available. At $255, the new single was $115 cheaper than the DH, and the 45-inch (750cc) twin only cost $290. Riders unable to afford a big twin now at least had the benefit of more economical mounts from Milwaukee.

Indian had been achieving notable performance with their flathead V-twins. Harley-Davidson was stung when Indian captured all the national championship races in 1928, a feat they repeated in 1929. Indian had proven the reliabilty and performance of flatheads in 750, 1000 and 1200cc engines. So it was obvious in Milwaukee than something more than just a mildly-tuned flathead for the road was in order.

But the smaller V-twin had never been intended as a high performance motorcycle. Practical, economical transportation was its role, and reliable service in commercial applications. Nonetheless, William Ottaway was already at work on a more powerful version of the D model (with overhead valves), and plans were well underway for big twins of the flathead persuasion. Milwaukee had faced the facts: the side-valve made sufficient power for the open road, it was a quieter engine by design, and it was less expensive to build than its ohv counterpart. In 1930 the "small twin" got a new frame and front fork, and a sport model (DLD) was introduced that featured higher compression and a larger carburetor, producing 20 horsepower.

The singles followed a similar line of development. Even though sales of the Twenty-one had declined for several years, Milwaukee thought a bigger single was in order. Thus the C model, a 30.50 cubic inch (500cc) single which shared the same frame with the 350 single and 750 twin.



1930 C
Owner/restorer – Armando Magri H-D of Sacramento, California

1929 MODEL DL

Specifications
Engine/Drivetrain
Engine: Flathead 45° V-twin
Displacement: 45.82ci (746.33cc)
Bore & stroke: 2.75 x 3.81in (70 x 97mm)
Compression ratio: 5:1
Horsepower: 18.5 @ 4,000 rpm
Carburetion: Schebler Deluxe
Transmission: 3-speed
Primary drive: Duplex chain
Final drive: Chain
Brakes: F. Expanding shoe. R. Contracting band
Battery: 6-volt
Ignition: Coil/points

Chassis/Suspension
Frame: Steel, single downtube
Suspension: F. Leading link spring fork
Wheelbase: 57.5in (146cm)
Weight: 390lb (177kg)
Fuel capacity: 3.75gal (14.2lt)
Oil capacity: 7.5pts (3.55lt)
Tires: 4.00 x 18in (10.16 x 45.72cm)
Top speed: 70mph (113km/h)
Colors: Olive green (options, black; maroon; gray; blue; cream)
Number built: 6,856 (D,DL) in 1929; (total production: 15,015)
Price: $290

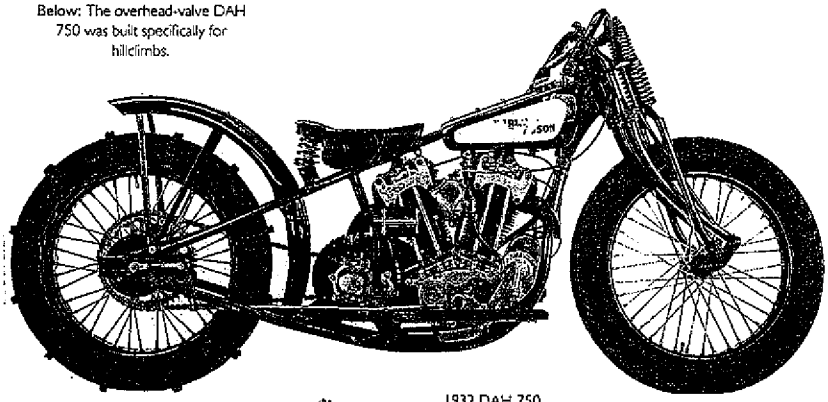
1930 MODEL C

Specifications:
Engine/Drivetrain
Engine: Flathead single
Displacement: 30.1ci (493.28cc)
Bore & stroke: 3.09 x 4in (78.6 x 101.6mm)
Horsepower: 10.4 @ 3,600rpm
Carburetion: Schebler Deluxe
Transmission: 3-speed
Primary drive: Duplex chain
Final drive: Chain
Brakes: F. Expanding shoe. R. Contracting band
Battery: 6-volt
Ignition: Coil/points

Chassis/Suspension
Frame: Steel, single downtube
Suspension: F. Leading link spring fork
Wheelbase: 57.5in (146cm)
Weight: 340lb (154.2kg)
Fuel capacity: 3.75gal (14.2lt)
Oil capacity: 7.5pts (3.55lt)
Tires: 4.00 x 18in (10.16 x 45.72cm)
Top speed: 60mph (97km/h)
Colors: Olive green (options: maroon; black; blue; gray; cream)
Number built: 1,629 (C, CH, CR)
Price: $260

Right: The quadruple mufflers lasted several years more on the Forty-fives and singles.

Below: The overhead-valve DAH 750 was built specifically for hillclimbs.



1932 DAH 750
Owner – Daniel Statnekov
Tesuque, New Mexico

The 500cc single, known in the U.S. as the Thirty-fifty, became the only single in Milwaukee's lineup for 1931. Even though Joe Petrali was blitzing the race tracks on the 21-inch (350cc) Peashooter, the overwhelming effects of the depression were felt throughout the country. Most people simply couldn't afford a motorcycle. In 1932 Harley-Davidson again offered the 350 single, dropping the price to $195, the lowest tag ever on a Milwaukee machine. The 30.50in (500cc) single was reduced to $235, the price of a 350 only three years earlier.

As Europe likewise fell into economic doldrums, and protective import tariffs rose, Milwaukee's export markets shriveled up. The days of the economic and/or sporty singles were numbered, and 1934 would be their last year of production. The national championship racing class for 350s (Class A) carried on for several years, and in 1935 Harley rider Joe Petrali won every meet on the calendar. A few years later the Class C formula, for 750cc flatheads, became the standardized format for American racing.

That both Harley-Davidson and Indian built such machines figured strongly in the formation of the competition category. The Indian Sport Scout had set the standard for the small twins, and Harley's Forty-five, following some early teething problems, became the foremost competitor on road and track. Some devotees of the big twins would deride the smaller bike for its utilitarian aspect and lack of power, but the flathead 45 would carry the longest-running production life on the Milwaukee roster.

As Harley's workhorse, the 45-inch (750cc) flathead served as police bike, commercial transporter, tow vehicle, mail carrier, combat mount and racing machine. And it was, as fate would have it, 45 years later when the last one rolled off the assembly line.

1929 D
Owner/restorer – Harold Mathews
Mathews Harley-Davidson
Fresno, California

Left: The Forty-five struggled at first in the market dominated by the Indian 101 Scout. In 1930 the series was upgraded with a stronger frame, fork and clutch.

Above: The standard D model was easily changed to the high-compression DL with an optional cylinder head and a 28-tooth rear sprocket.

MODEL V AND SIDECAR (1930) AND MODEL VL (1932)

1930 MODEL VL

SPECIFICATIONS
ENGINE/DRIVETRAIN
Engine: Flathead 45° V-twin
Displacement: 73.73ci (1208.19cc)
Bore & stroke: 3.44 x 4.0in (87.3 x 101.6mm)
Compression ratio: 4.5:1
Horsepower: 30 @ 4,000 rpm
Carburetion: 1.25in (32mm) Schebler
Transmission: 3-speed
Primary drive: Duplex chain
Final drive: Chain
Brakes: F. and R. Drum
Battery: 6-volt/22 amp
Ignition: Coil/points

CHASSIS/SUSPENSION
Frame: Steel, single downtube
Suspension: F. Leading link spring fork
Wheelbase: 60in (152.4cm)
Weight: 529lb (240kg)
Fuel capacity: 4gal (15.14lit)
Oil capacity: 1gal (3.79lit)
Tires: 4.00 x 18in (10.16 x 45.72cm)
Top speed: 85mph (137km/h)
Colors: Olive green (options: black; gray; blue; maroon; coach green; cream)
Number built: 3,246
Price: $340

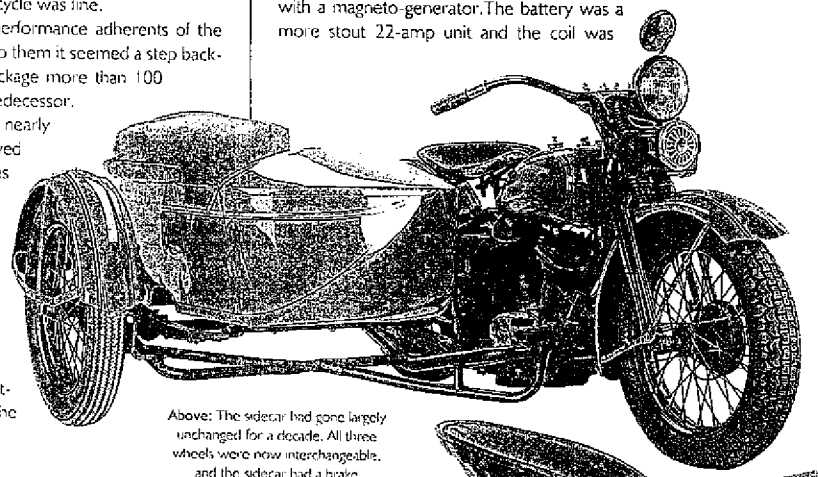
Though they were still called Seventy-fours, the 1930 V (standard) and VL (high compression) models were entirely different motorcycles from the earlier FD and JD models. And at first it was not the machine Milwaukee had hoped it would be. The VL did produce a tad more horsepower than the JD, and featured a new frame and fork. But it was less than reliable.

The new 74 had appeared in mid-1929, little more than two months before the stock market disintegrated. At $340, twenty bucks more than the JD, the VL had a weak clutch, frail flywheel, poor lubrication, bad valve springs, inefficient mufflers and marginal pistons. Otherwise the motorcycle was fine.

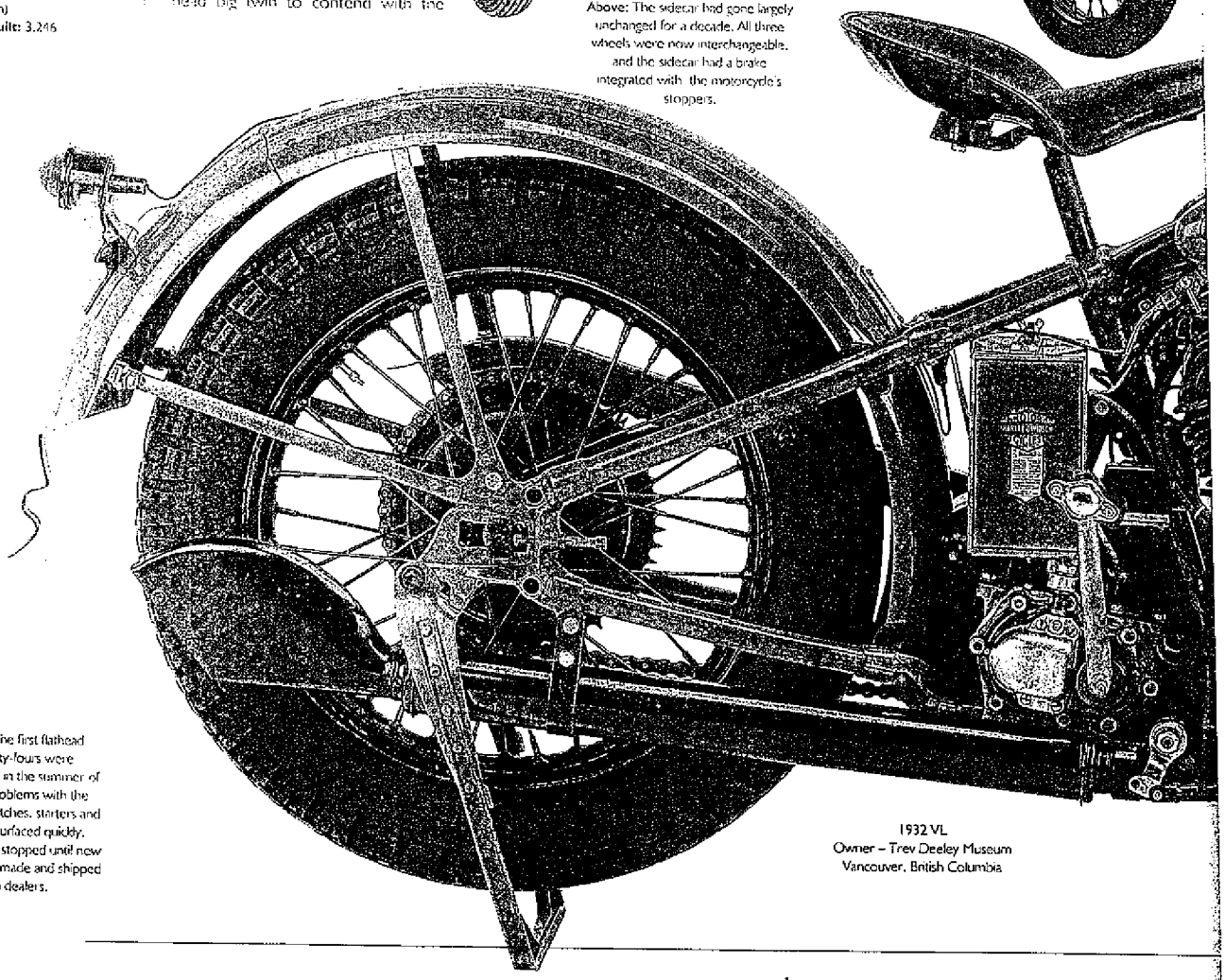
Fans of the JD, especially high-performance adherents of the JDH, scoffed at the new flathead. To them it seemed a step backwards, a pedestrian design in a package more than 100 pounds (45kg) heavier than its predecessor. But the performance figures were nearly identical, and Milwaukee moved quickly to correct the deficiencies revealed in the early models. Moreover, the VL added features such as detachable cylinder heads, interchangeable wheels, bigger brakes and tires, lower seat height and more ground clearance. And a wider torque spread than the J motor offered.

Harley-Davidson had built the flathead big twin to contend with the Indian Chief, which had a similar configuration. So the future, at least that foreseeable portion, was a side-valve vision. The standard V model made 28 horsepower, while the higher compression VL cranked out 30. Like the Forty-five, each valve had its own cam and the lubrication system remained total-loss. A forged I-beam front fork replaced the tube-style of the J model. New 19-inch (48.26cm) wheels came standard with 4.00-inch (10.16cm) tires and 4.40-inch (11.18cm) rubber was an extra cost option.

Four versions of the new Seventy-four were available in 1930: the V and VL with batteries and the VM and VLM each equipped with a magneto-generator. The battery was a more stout 22-amp unit and the coil was

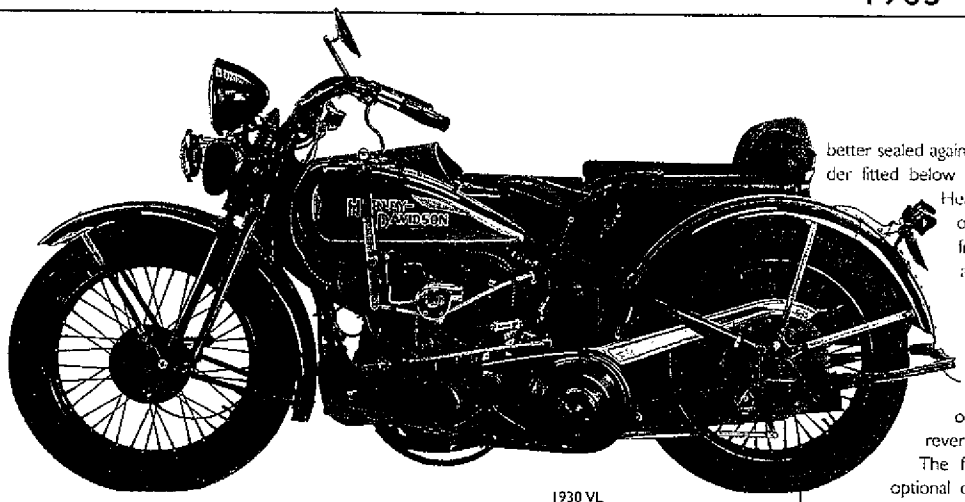


Above: The sidecar had gone largely unchanged for a decade. All three wheels were now interchangeable, and the sidecar had a brake integrated with the motorcycle's stoppers.



Right: The first flathead Seventy-fours were introduced in the summer of 1929. Problems with the wheels, clutches, starters and pistons surfaced quickly. Production stopped until new parts were made and shipped to dealers.

1932 VL
Owner – Trev Deeley Museum
Vancouver, British Columbia



1930 VL
Owner/restorer – Dave Royal
Nipomo, California

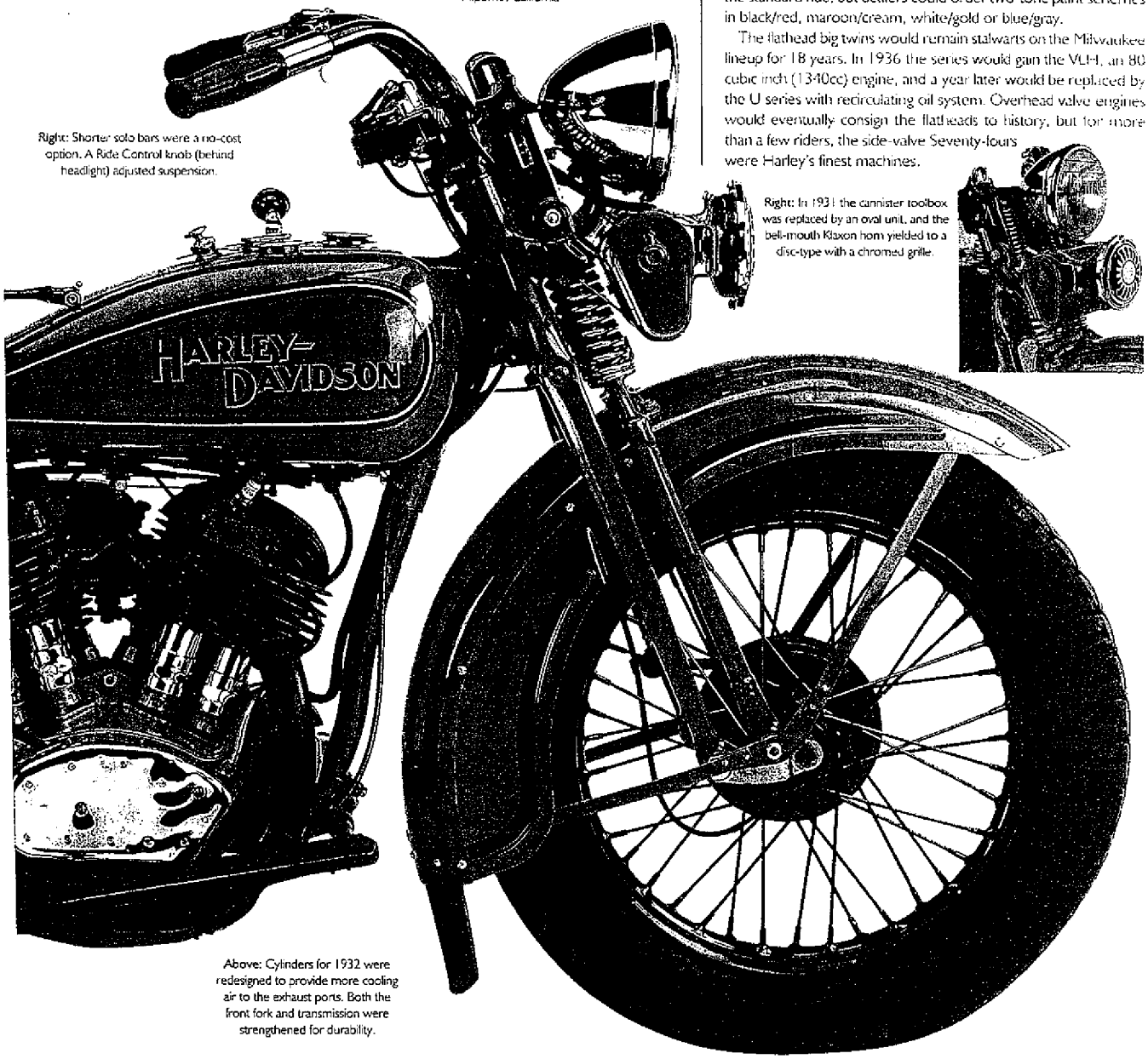
better sealed against the elements. The tool box was still a cylinder fitted below the "Clear-the-way Horn" and "Two Bullet Headlights". In 1931 the tool container became an oval shape with a new disk-type horn on its front, and the dual headlights were replaced by a single unit.

The double-muffler exhaust was replaced by a single-tube pipe in 1931. A timing plug was fitted to the left crankcase to facilitate ignition adjustment, and the new Schebler carburetor was a die-cast unit. Milwaukee also offered an optional 3-speed transmission with reverse gear for sidecar and Servi-Car applications.

The factory became slightly less secretive about optional color combinations, although the information was still not included in sales brochures. Olive green remained the standard hue, but dealers could order two-tone paint schemes in black/red, maroon/cream, white/gold or blue/gray.

The flathead big twins would remain stalwarts on the Milwaukee lineup for 18 years. In 1936 the series would gain the VLH, an 80 cubic inch (1340cc) engine, and a year later would be replaced by the U series with recirculating oil system. Overhead valve engines would eventually consign the flatheads to history, but for more than a few riders, the side-valve Seventy-fours were Harley's finest machines.

Right: Shorter solo bars were a no-cost option. A Ride Control knob (behind headlight) adjusted suspension.



Above: Cylinders for 1932 were redesigned to provide more cooling air to the exhaust ports. Both the front fork and transmission were strengthened for durability.

Right: In 1931 the cannister toolbox was replaced by an oval unit, and the bell-mouth Klaxon horn yielded to a disc-type with a chromed grille.

MODELS VLD (1934), RL (1935) AND CB SINGLE (1934)

The VLD Special Sport Solo was introduced in 1933. The full force of the Great Depression had reached Milwaukee in 1931, and production had dropped to the lowest figure in 20 years. In the two years that followed, the picture grew even worse.

At Harley-Davidson, with management and labor working for reduced pay, technological advancement was not on the agenda. So color and graphics took on new importance. Following the lead of the automobile industry, Milwaukee introduced Art Deco styling to the motorcycles. The 1933 fuel tanks featured a stylized eagle in flight, accented by gold stripes and contrasting colors. The design, a variation on optional scrollwork on 1932 tanks, was used for only one year.

Not that the new models were simply old machines in colorful garb. Numerous improvements developed before the economic crisis had been incorporated a year earlier.

The V series had new cylinders, designed for better heat dissipation, plus an improved oil pump, new generator and stronger fork. The same upgrades appeared on the Forty-fives, now called the R series, and the Thirty-fifty singles. The small twin also carried a stronger frame, larger flywheels, better valve springs and a new 4-plate clutch.

The VLD was to the big twin flatheads what the JDH had been to the earlier 74, the factory hot rod. A new Y-shaped intake manifold gave the fuel charge a more direct shot into the cylinders, and a new Linkert die-cast brass carburetor was fitted. With aluminum alloy pistons replacing magnesium alloy, new cylinder heads and a compression ratio of 5:1, the engine made 36 horsepower at 4,500rpm. Acceleration, given the machine's weight, was robust.

In 1934 the V and R series were fitted with skirted rear fenders and upswept exhaust tips, and the 74 had a longer muffler. The decorative trend included an optional $15 chrome package that included handlebars, exhaust pipes, chain guard and generator cover. Another popular option was the Buddy Seat, an oversized saddle that would accommodate two in close proximity. The seat was also appreciated by solo riders, since it afforded space to change positions on long rides, thereby reducing the incidence of numb-butt.

For 1934 the fishtail muffler returned on the twins, and the 74 toolbox was changed to a box fitted to the frame behind the transmission. The new 80-inch (1340cc) twin appeared late the following year, and was designated VLDD. In 1936 the biggest twin was labeled the VLH. A competition version of the 74 was also listed in the 1935 catalog, with the designation VLDJ.

With the transition from professional to amateur racing, Milwaukee offered a competition-bred 45 in the RLDR. The small twin had received most of the upgrades applied to its big brother, including a constant-mesh transmission. The R series also received internal expanding rear brakes, with both drums and shoes hardened for better braking and durability. The racing bikes were set up with slightly looser piston clearances.

Five color combination were offered on the 1935 twins: teak red/black; venetian blue/silver; verdant green/black; egyptian ivory/regent brown and olive green/black.

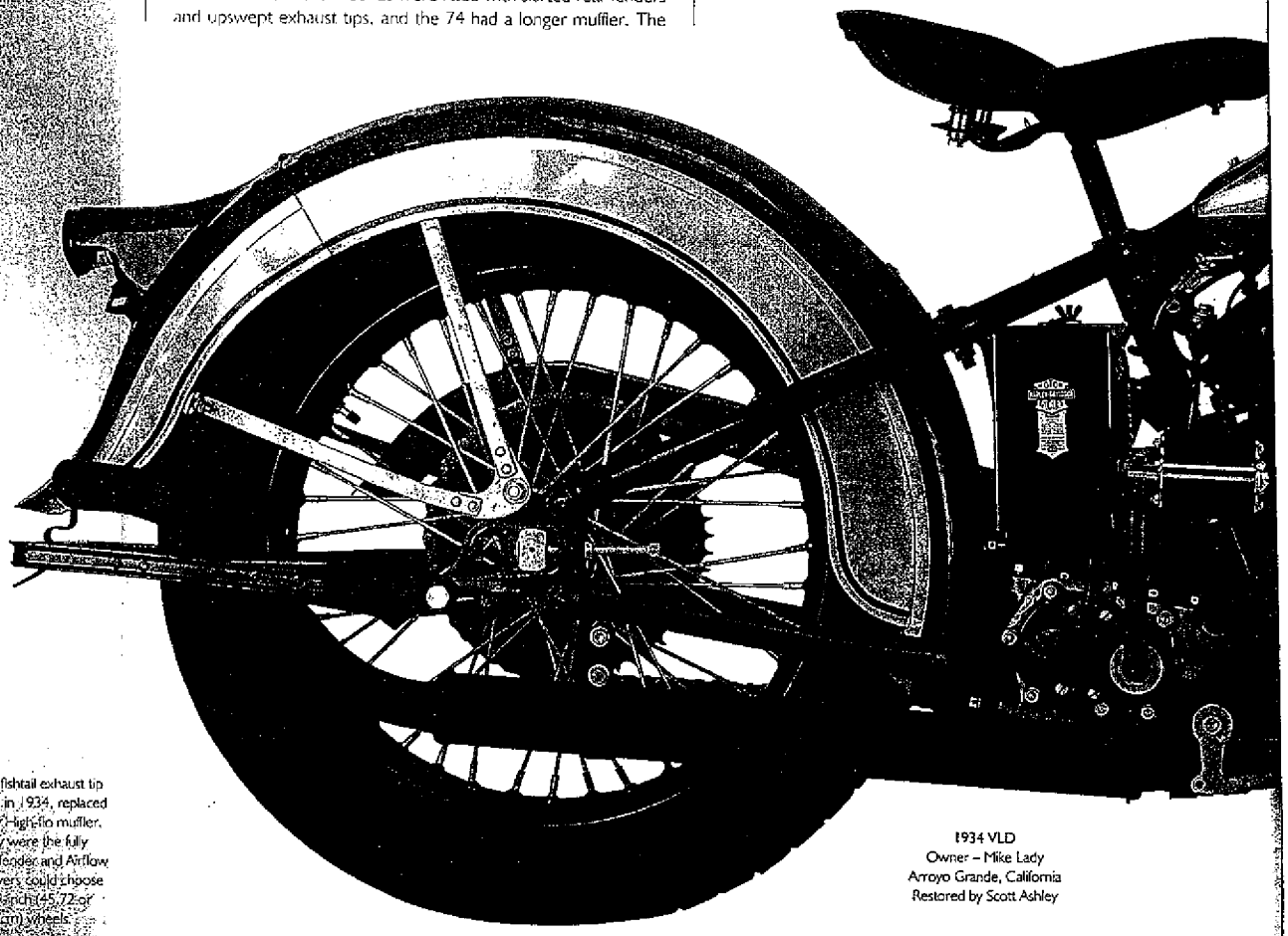
1935 MODEL RL

Specifications

Engine/Drivetrain
Engine: Flathead 45° V-twin
Displacement: 45.32ci (746.33cc)
Bore & stroke: 2.75 x 3.81in (70 x 97mm)
Horsepower: 18.5 @ 4,000rpm
Carburetion: Schebler Deluxe
Transmission: 3-speed
Primary drive: Duplex chain
Final drive: Chain
Brake: F. Expanding shoe, R. Contracting band
Battery: 6-volt
Ignition: Coil/points

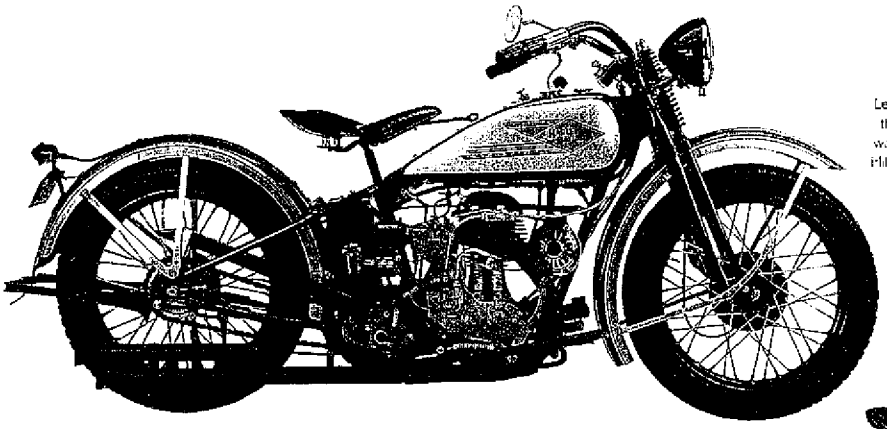
Chassis/Suspension
Frame: Steel, single downtube
Suspension: F. Leading link spring fork
Wheelbase: 57.5in (146cm)
Weight: 390lb (177kg)
Fuel capacity: 3.75gal (14.2lit)
Oil capacity: 7.5pts (3.55lit)
Tires: 4.00 x 18in (10.16 x 45.72cm)
Top speed: 70mph (113km/h)
Color: Teak red/black; venetian blue/silver; verdant green/black; egyptian ivory/regent brown; olive green/black
Number built: 8.9
Price: $295

Below: The more deeply contoured saddle featured polished studs and a black enamel bar. The larger Buddy seat was a $6.75 option.



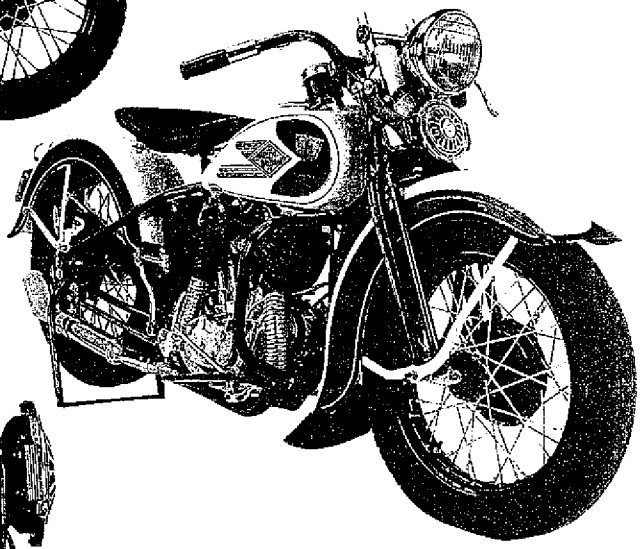
1934 VLD
Owner – Mike Lady
Arroyo Grande, California
Restored by Scott Ashley

Right: The fishtail exhaust tip disappeared in 1934, replaced by the new High-flo muffler. Also new were the fully skirted rear fender and Airflow taillight. Buyers could choose 18- or 19-inch (45.72 or 48.26cm) wheels.

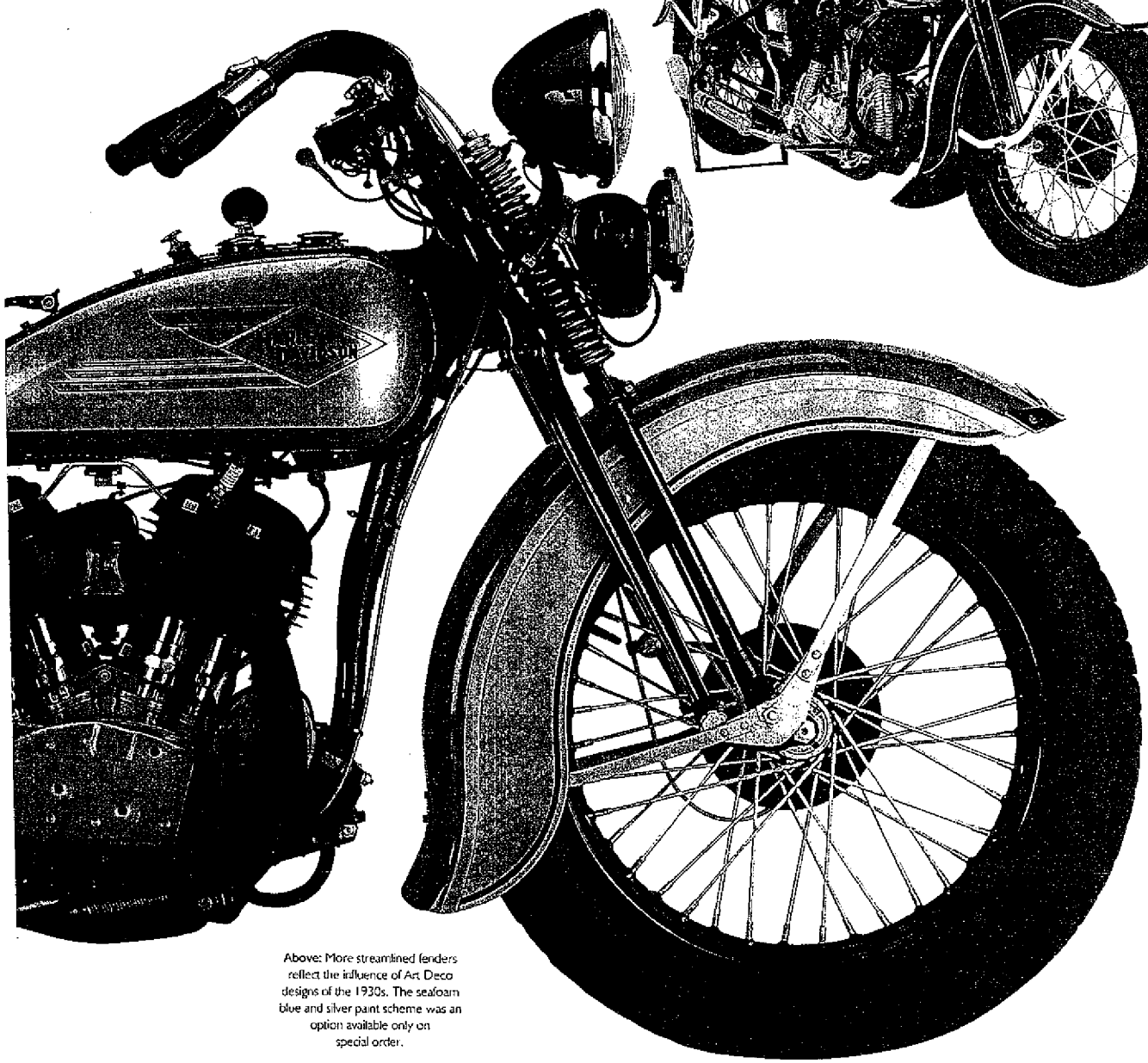


Left: Thus ends Chapter One, with the last of the singles. The V-twin was to prevail henceforth. The next Milwaukee single, in 1948, would be a two-stroke from Germany.

1935 RL
Owner – Troy Deeley Museum
Vancouver, British Columbia



1934 CB
Owner/restorer – Harold Mathews
Mathews Harley-Davidson
Fresno, California



Above: More streamlined fenders reflect the influence of Art Deco designs of the 1930s. The seafoam blue and silver paint scheme was an option available only on special order.

EL 61 OHV (1936)

1936 EL

SPECIFICATIONS
ENGINE/DRIVETRAIN
Engine: OHV 45° V-twin
Displacement: 60.33ci (988.56cc)
Bore & stroke: 3.31 x 3.5in (84 x 89mm)
Horsepower: E 37, EL 40 @ 4,800 rpm
Compression ratio: E 6.5:1, EL 7:1
Carburetion: 1.25in (32mm) Linkert
Transmission: 4-speed
Primary drive: Duplex chain
Final drive: Chain
Brakes: F & R, Drum
Battery: 6-volt
Ignition: Coil/points

CHASSIS/SUSPENSION
Frame: Steel, double downtube
Suspension: F, Spring fork
Wheelbase: 59.5in (151.1cm)
Weight: 565lb (256kg)
Fuel capacity: 3.75gal (14.2lit)
Oil capacity: 4qts (3.79lit)
Tires: 4.50 x 18in (11.4 x 45.7cm)
Top speed: 95mph (153km/h)
Colors: Shelwood green/silver; teak red/black; dusk gray/buff; venetian blue/ croydon cream; maroon/nile green
Number built: 1,526
Price: $380

In 1931 the founders had discussed plans for a new V-twin. The motorcycle would be the logical successor to the JDH, featuring more contemporary engineering, styling and performance. Meaning faster.

That summer a mock-up was built around a proposed 65-cubic inch (1065cc) flathead. The design incorporated a twin-downtube cradle frame, reinforced fork and an integrated instrument panel on the fuel tank, featuring Milwaukee's first standard-equipment speedometer. The frame and overall styling won approval, but the flathead engine was rejected. A few months later the decision was made to design and build a 61-inch (1000cc) overhead-valve engine.

Scheduled to appear as a 1935 model, progress on the 61 OHV was slowed by the effects of the depression. Problems with oil leakage on the prototypes delayed the project further. So the debut of Milwaukee's first ohv big twin, with recirculating oil system, was postponed to 1936. Despite the delays, the stylish new machine was an instant success.

Nicknamed the Knucklehead for its bulbous rocker boxes, the 61 OHV was a new motorcycle from the bottom up. The double downtube frame was necessary to handle the added power, and the early versions were not quite up to the task. The frames were strengthed for 1937. The front fork employed oval tube struts, more streamlined and stylish than the forged I-beam style used earlier. The 18-inch (45.7cm) wheels wore 4.50-inch (11.4cm) tires and the seat height dropped to 26 inches (66cm), lower than the Thirty-fifty singles of a few years before.

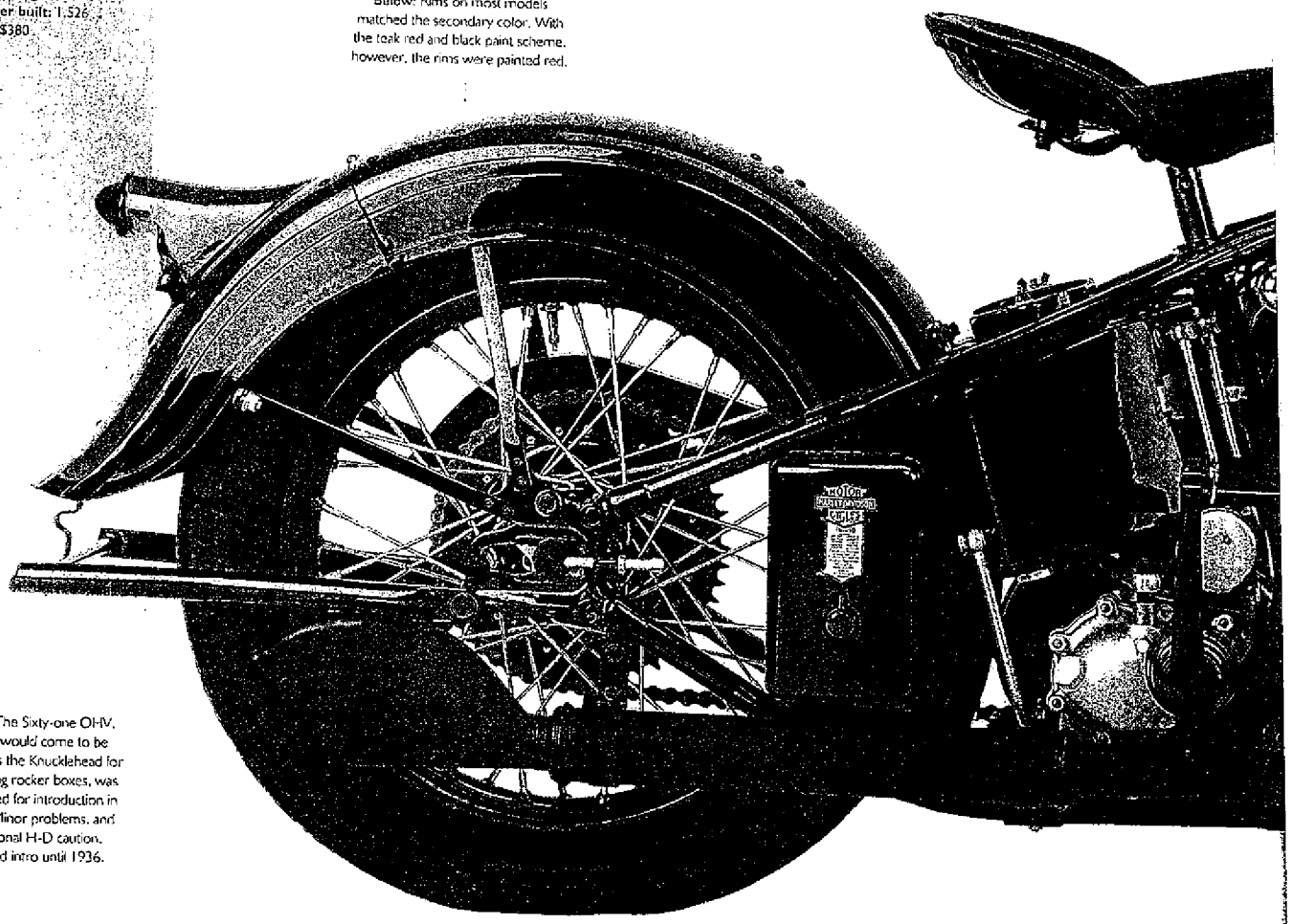
The new engine accentuated the Sixty-one's stylishly muscular profile. The polished rocker boxes and pushrod tubes added a decorative touch to the V-twin, and drew the eye to the heart of the machine. The Knucklehead engine *looked* like horsepower. And the chassis' clean, unbroken line from the rear axle to the steering head was stately and strong. The consensus among most riders in 1936: the best-looking damn motorcycle they had ever seen.

And it worked. The single camshaft was more efficent and quieter than its two- and four-shaft flathead forebears. The hemispherical combustion chambers provided by valves set at 90 degrees meant horsepower; 37 at 4,800 rpm in the standard E model, 40 from the high-compression EL. And despite the fact that a fully-fueled Knucklehead weighed in at close to 600 pounds (272kg), that was sufficient urge to propel the daring rider close to 100mph (161km/h).

Milwaukee wasn't at all shy about capitalizing on the new engine's capabilities. In March of 1937, racer Joe Petrali set a new top speed record of 136 mph (219km/h) at Daytona Beach and eclipsed the mark set earlier by Indian. Later, at California's Muroc Dry Lake, Fred Ham set a new 24-hour record on the

Below: One school of thought holds the '36 Knucklehead as the most handsome Harley ever built. Not a bad school.

Below: Rims on most models matched the secondary color. With the teak red and black paint scheme, however, the rims were painted red.

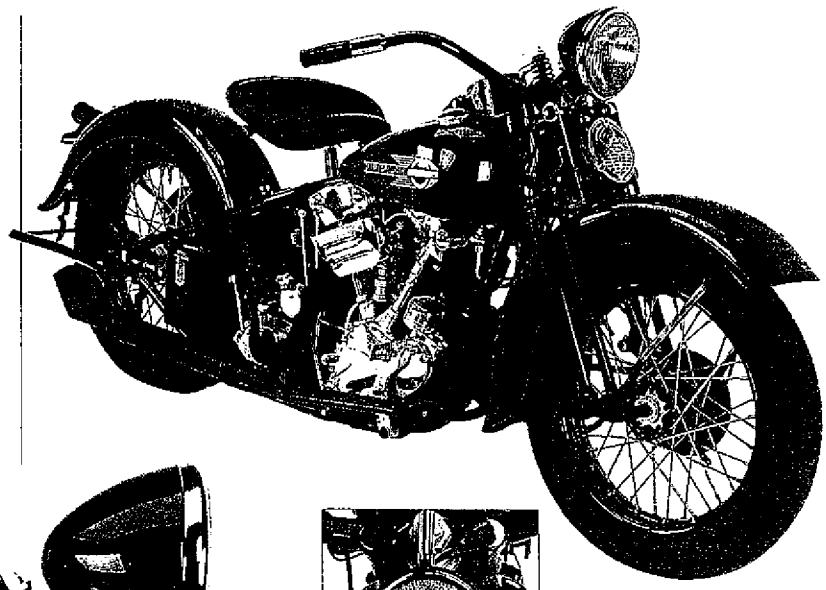


Right: The Sixty-one OHV, which would come to be known as the Knucklehead for its bulging rocker boxes, was scheduled for introduction in 1935. Minor problems, and traditional H-D caution, delayed intro until 1936.

Knucklehead, over 1,825 miles (2,937km) at an average of 76 mph (122km/h). The 61 OHV had established its credentials.

Just as the economic woes of the depression began to lift, Milwaukee had come through with a modern motorcycle. They had leapfrogged Indian, their primary competitor, and captured the attention of American motorcyclists. Of course the 61 OHV was not without problems; oil leakage still plagued the early examples, and oil consumption was higher than necessary. The kick-start gearing ratio and ignition timing could make starting difficult, and the transmission required more secure mounting. But all these problems were rectified before 1937.

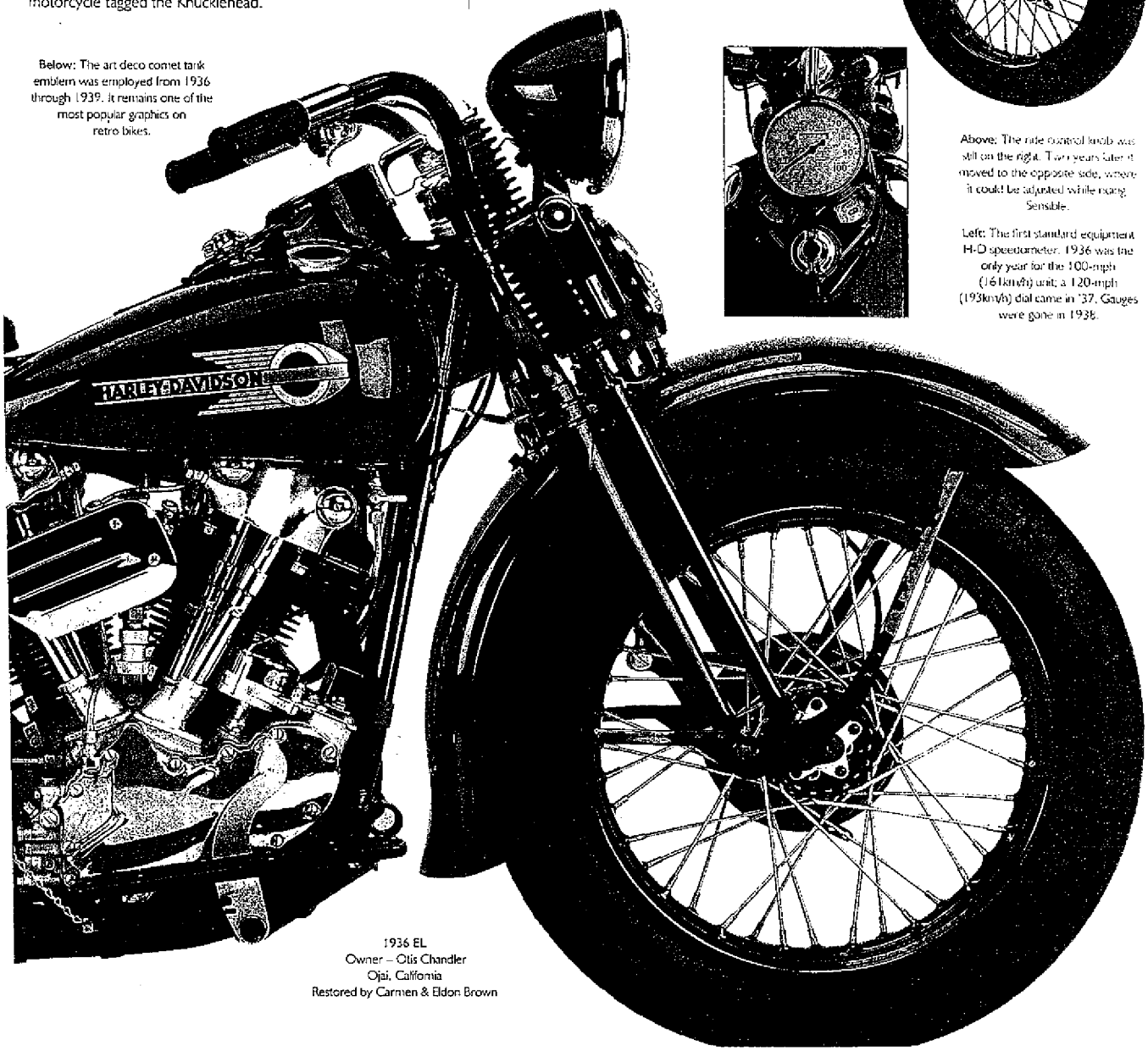
What the Knucklehead did was look good and run strong. It had a stout dry clutch and constant-mesh 4-speed transmission. The tank-mounted instrument panel and streamlined profile made it just about the most dashing looking machine on the road. Harley-Davidson had barely managed to stay afloat in the depression years, but they emerged with the right machine at the right time. And began a new chapter in the everlasting adventure, with a motorcycle tagged the Knucklehead.



Above: The ride control knob was still on the right. Two years later it moved to the opposite side, where it could be adjusted while riding. Sensible.

Left: The first standard equipment H-D speedometer. 1936 was the only year for the 100-mph (161km/h) unit; a 120-mph (193km/h) dial came in '37. Gauges were gone in 1938.

Below: The art deco comet tank emblem was employed from 1936 through 1939. It remains one of the most popular graphics on retro bikes.



1936 EL
Owner – Otis Chandler
Ojai, California
Restored by Carmen & Eldon Brown

1936 VLH

Specifications
Engine/Drivetrain
Engine: Flathead 45° V-twin
Displacement: 80ci (1340cc)
Bore & stroke: 3.42 x 4.25in (87 x 109mm)
Horsepower: 34 @ 4,000 rpm
Compression ratio: 5.5:1
Carburetion: Linkert
Transmission: 3 or 4-speed
Primary drive: Chain
Final drive: Chain
Brakes: F. & R. Drum
Battery: 6-volt
Ignition: Coil/points

Chassis/Suspension
Frame: Steel, double downtube
Suspension: F. Leading link spring fork
Wheelbase: 60in (152.4cm)
Weight: 545lb (247kg)
Fuel capacity: 3gal (11.36lt)
Oil capacity: 8.5pts (4.02lt)
Tires: 18 or 19 x 4.00in (45.7 or 48.3 x 10.16cm)
Top speed: 90mph (145km/h)
Colors: Sherwood green/silver; teak red/ black; dusk gray/buff; venetian blue/cream; maroon/nile green
Number built: 2,046
Price: $340

VH (1936) & U Series (1937)

The 80-inch (1340cc) flathead was introduced late in 1935 and made its official debut the following year. The big-inch twin shared with its smaller brothers new cylinder heads with larger fins and re-shaped combustion chambers. Cylinder fins were extended over the intake ports.

The Eighty shared its bore with the Seventy-four, adding displacement with a quarter-inch (6.3mm) longer stroke. The machines were otherwise identical, including the total-loss lubrication system, which would be gone the next year. Milwaukee figured the bigger twin was required for several reasons: Indian offered one, the added power would appeal to sidecarists, and the design had been proven out. Plus, it sold for $40 less than the 61 OHV, which had yet to establish its reliability.

The list of factory options had really begun growing in 1934, and a number of special equipment packages were added the next year. For 1936 the premium package included the Safety Guard (crash bars), lighted speedometer, Jiffy Stand, Ride Control, steering damper, chrome plate group, fender lamp, stop light, dice shift knob and switch keys, saddlebags and hangers. All for $49.50. And for an extra $15, the 74 or 80 could be fitted with a 4-speed transmission.

The optional speedometers were equipped with a Maximum Speed Hand, a separate indicator that remained fixed at the highest speed attained on a ride. This was to certify one's bragging rights when comparing the motorcycle's performance with other riders' machines.

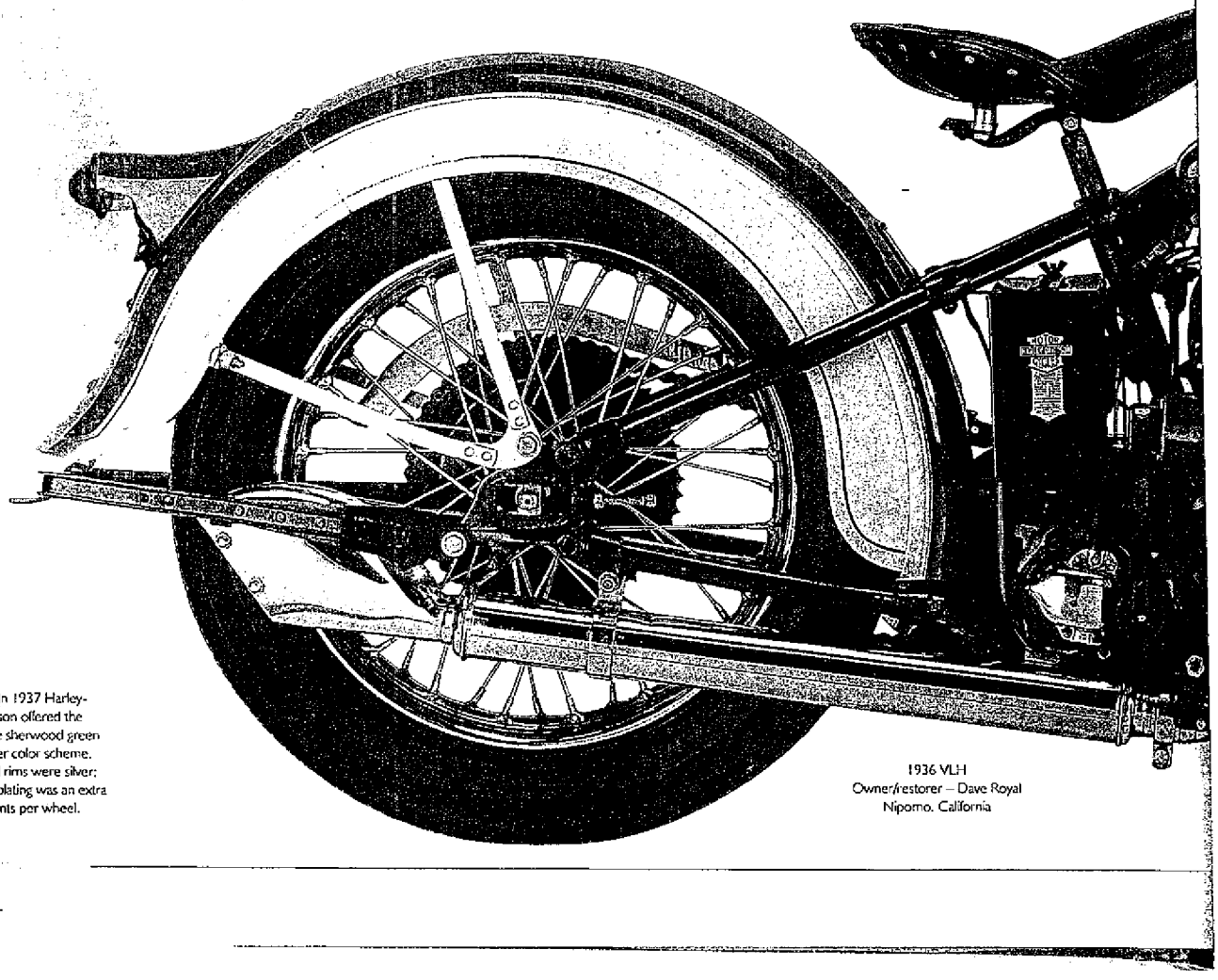
In 1937 the V series were modified and became known as the U models, with the twin downtube frame, recirculating oil system and 4-speed transmission standard. The R series Forty-five was likewise revised as the W model, which also got dry-sump lubrication. Most of the improvements first seen on the 61 OHV were now incorporated throughout the Harley-Davidson lineup, and all the big twins shared a strengthened frame for 1937.

The Seventy-four now had the same stroke as the Eighty, with the bore reduced to match the 61 OHV. This was done as a cost-saving move, so the two machines could use the same pistons. The big twin flatheads also had new cylinders with added finning, and improved bearings and oil seals in the transmission. For 1937 only, the oil tanks on all models were painted the same color as the tank and fenders. In succeeding years the oil tank would be painted black.

"A new high in beauty has been attained in the appearance of the 1938 models," proclaimed the brochure. Red and green lights replaced the ammeter and oil gauge on the instrument panel. Gone was the bronze brown hue, which hadn't proven popular. Teak red with black and gold striping was still available; the new color options included venetian blue with white striping, hollywood green with gold, and silver tan with sunshine blue striping. The new striping was centered on the sides of the tank and fenders. Higher handlebars were fitted to aid low-speed handling.

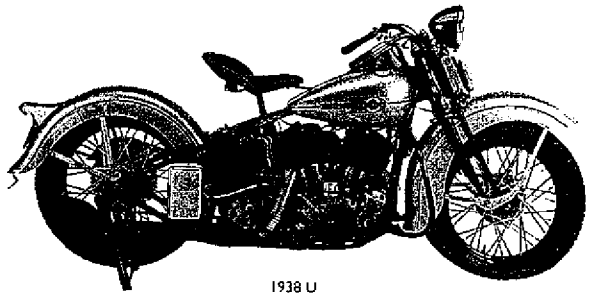
Once again the big twin frames were reinforced and given a larger backbone. The lower steering head cone was designed with a self-aligning feature to distribute force evenly on the bearings. Clutch assemblies were improved and the oil outlet fitting moved from the bottom to the rear of the oil tank.

The accessory groups became standard equipment in 1938. Customers could choose either the standard or deluxe group, which were $16.70 and $49.75 respectively. The latter added four-ply tires, Ride Control, colored shift knob, air cleaner, saddlebags and chrome trim package. The night rider could select either the pair of Little King spotlights ($11.50) or the Little Beauty pair at $13.25.

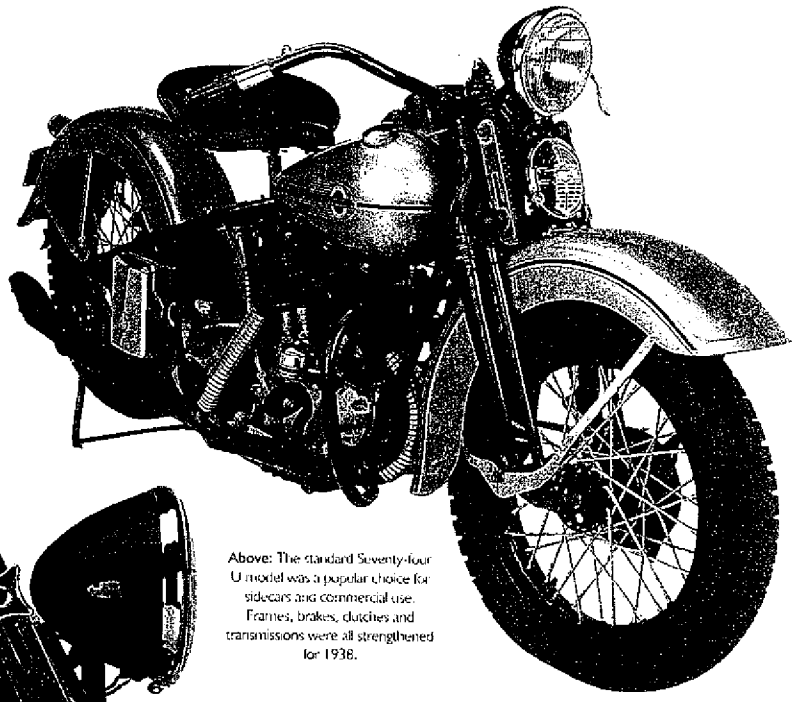


Right: In 1937 Harley-Davidson offered the distinctive sherwood green and silver color scheme. Standard rims were silver; cadmium plating was an extra 50 cents per wheel.

1936 VLH
Owner/restorer – Dave Royal
Nipomo, California



1938 U
Owner – Trev Deeley Museum
Vancouver, British Columbia



Above: The standard Seventy-four U model was a popular choice for sidecars and commercial use. Frames, brakes, clutches and transmissions were all strengthened for 1938.

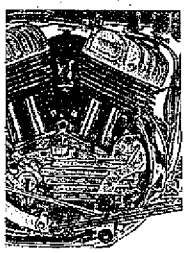
Left: The fork spring cover was a one-year feature on the big twins, but stayed on the Forty-five for four years.

Above: The Eighty (VLH) and Seventy-four (VLD) could be ordered with the optional 4-speed transmission for $15. New cylinders had larger cooling fins.

1938 WLDR

Specifications
Engine/Drivetrain
Engine: Flathead 45° V-twin
Displacement: 45.32ci (746.33cc)
Bore & stroke: 2.75 x 3.81in (69 x 97mm)
Horsepower: 27
Carburetion: Linkert
Transmission: 3-speed
Primary drive: Duplex chain
Final drive: Chain
Brakes: F, Expanding shoe; R, Contracting band
Battery: 6-volt
Ignition: Coil/points

Chassis/Suspension
Frame: Steel, single downtube
Suspension: F, Leading link spring fork
Wheelbase: 56.5in (143.5cm)
Weight: 390lb (176.9kg)
Fuel capacity: 3.5gal (13.25lt)
Oil capacity: 7.5pts (3.55lt)
Tires: 4.00 x 18in (10.16 x 45.7cm)
Top speed: 85mph (137km/h)
Colors: Teak red/black; venetian blue/white; hollywood green/gold; silver tan/blue
Number built: 139
Price: $380



Above: The flathead Forty-five had become the foundation of American Class C racing. Milwaukee moved to challenge Indian's dominance.

By 1938 Milwaukee had applied to the Forty-five most of the improvements made on the big twins. The baby flathead had roller bearings in the lower end and one-piece cam gears. The transmission got the new shift mechanism and stronger gears. The oil pump was upgraded and cooling fins were added to the timing case cover and the left side of the crankcase. And like the big twins, standard automotive-style grease fittings were adopted.

With the 61 OHV and flathead big twins fairly well sorted out, more attention was devoted to the small twin. The primary reason was the broad popularity of the Indian Sport Scout, which had captured numerous fans on the road and race track. Bill Harley campaigned for an overhead-valve 750, using the existing flathead bottom end. Production cost projections shelved the idea, but the decision was made to build a limited number of sportier 750 flatheads to compete with the Indian.

Class C racing became the prominent competition category in 1938. Harley-Davidson's WLDR, rated at 27 horsepower, was the closest thing Milwaukee had to a factory racer. Since Class C was formulated as amateur racing, riders were expected to ride their machines to the track, remove the lights and unnecessary equipment, and have at it. So the WLDR was configured as a standard road model, but featured higher compression and larger valves. With the addition of aluminum heads and larger intake ports in 1939, horsepower was up into the mid-thirties.

A great measure of credit for tweaking the Forty-five's performance goes to San Jose Harley dealer Tom Sifton. As a tuner, Sifton managed to solve the breathing, lubrication and overheating difficulties magnified by racing conditions. Racer Sam Arena was soon beating the Indians, and Milwaukee incorporated most of Sifton's improvements on subsequent models. The first factory version built solely for racing, the WR, would appear in 1941.

61 OHV

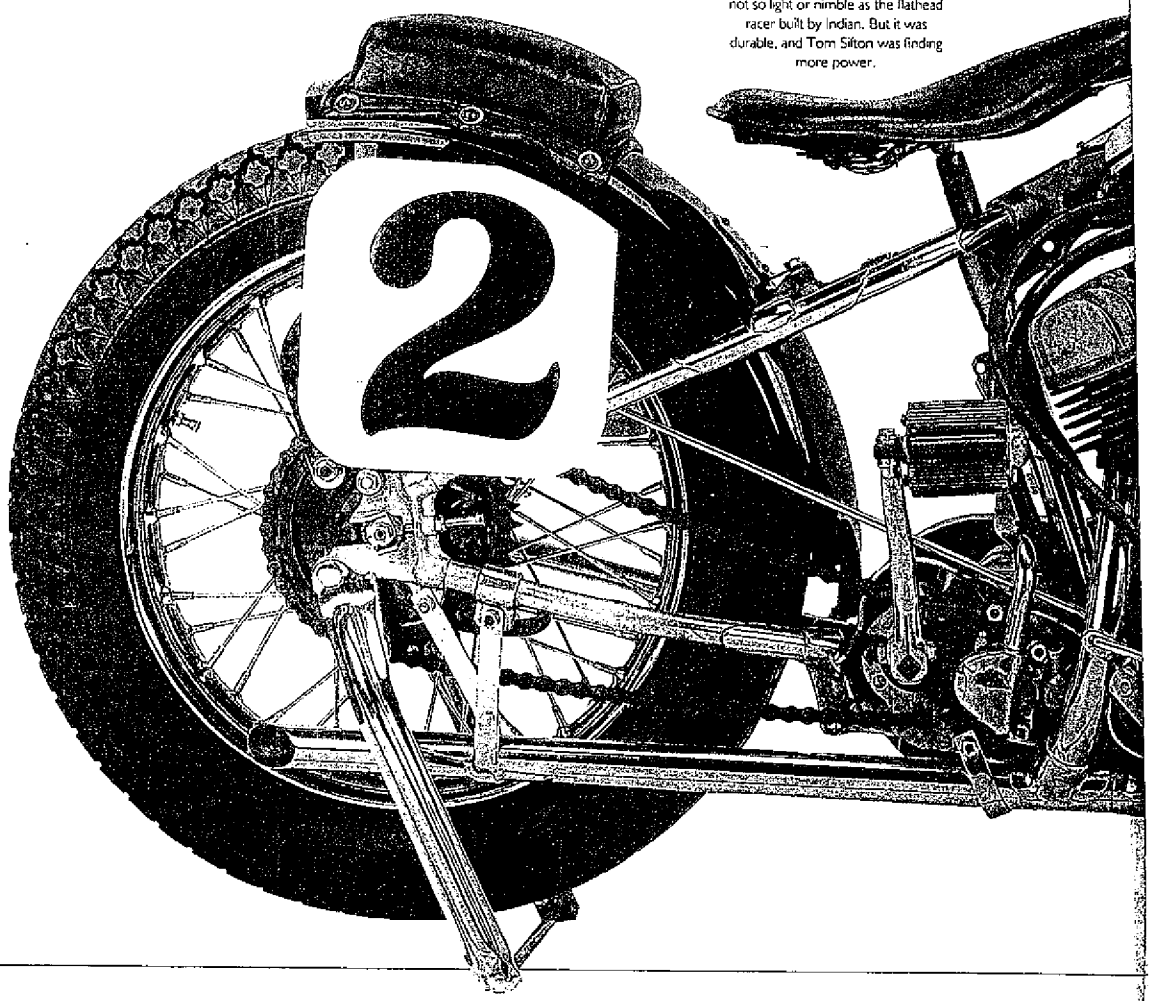
The mighty Knucklehead was strengthened in 1939 with splined pinion and oil pump drive gears, and a one-piece pinion gearshaft. Stronger valve springs were also fitted, and the valve train assemblies had been completely covered the year before. All big twins in the Harley roster now had upper and lower self-aligning steering head bearings.

The instrument panel was streamlined and color matched with the motorcycle, and the design came to be called the "cat's eye" panel. Painted fender stripes gave way to stainless steel strips. The available colors were airway blue/white panels, black/ivory panels and teak red/black panels. The price, for the third year running, was $435.

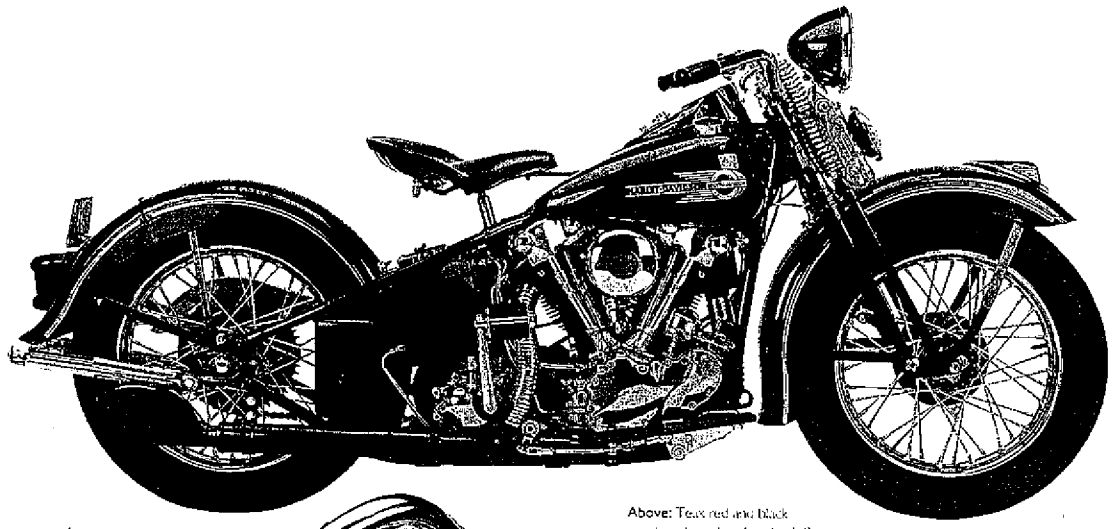
Development of a military motorcycle had been underway in Milwaukee for more than a year, with prototypes of both the 61 OHV and Forty-five tested. Just before the German invasion of Poland, two Forty-fives with the model designation WLA were shipped to Fort Knox, Kentucky for Army testing.

Below: There was still no evidence of rear suspension in 1938. Chromed frame was not original livery.

Below: Milwaukee's Forty-five was not so light or nimble as the flathead racer built by Indian. But it was durable, and Tom Sifton was finding more power.



Right: The WLDR first appeared in 1937, and cost $25 more than the standard Forty-five. The engine used roller bearings throughout, and cooling fins were added to the timing case.

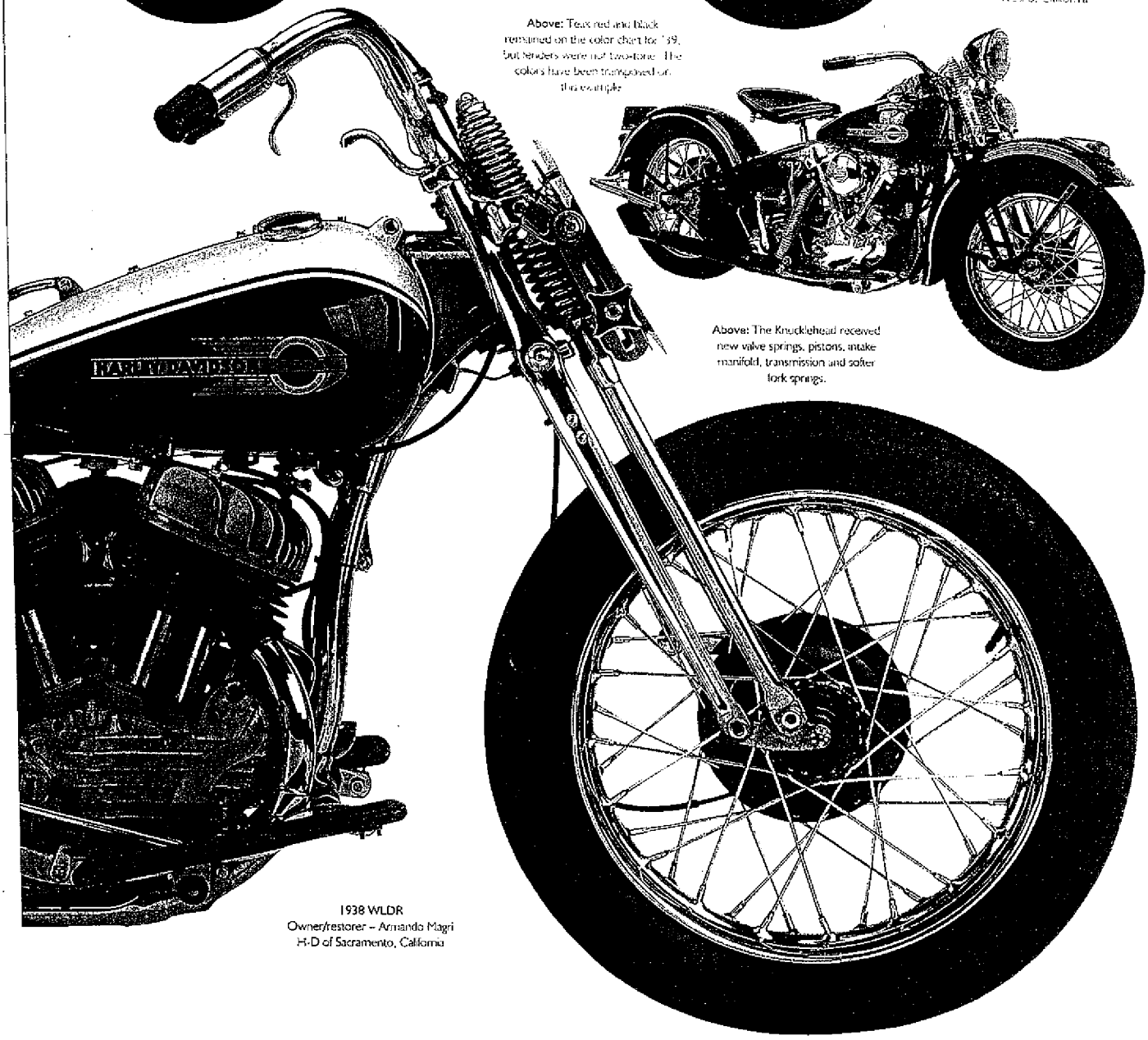


Left: Painted fender stripes were replaced by stainless steel stripes in 1939. The fender light was included in the standard accessory package. A rear taillight was replaced by a larger lamp with a license plate bracket above it.

1939 EL
Owner/restorer – Harold Mathews
Mathews Harley-Davidson
Fresno, California

Above: Texas red and black remained on the color chart for '39, but fenders were not two-tone. The colors have been transposed on this example.

Above: The Knucklehead received new valve springs, pistons, intake manifold, transmission and softer fork springs.



1938 WLDR
Owner/restorer – Armando Magri
H-D of Sacramento, California

1941 GA SERVI-CAR

Specifications

Engine/Drivetrain

Engine: Flathead 45° V-twin
Displacement: 45.32ci (742.65cc)
Bore & stroke: 2.75 x 3.81in (70 x 97mm)
Compression ratio: 4.75:1
Horsepower: 22 @ 4,500rpm
Carburetion: Linkert
Transmission: 3-speed w/reverse
Primary drive: Duplex chain
Final drive: Gear differential
Brakes: F & R, Drum
Battery: 6-volt
Ignition: Coil/points

Chassis/Suspension

Frame: Steel, single downtube
Suspension: F, Leading link springs/shock fork, R, Coil springs
Wheelbase: 61in (155cm)
Track: 42in (106.7cm)
Weight: 1,360lb (619kg)
Fuel capacity: 3.4gal (12.9lit)
Oil capacity: 3.5qts (3.3lit)
Tires: 5.00 x 16in (12.7 x 40.6cm)
Top speed: 50mph (80kmph)
Colors: Skyway blue; cruiser green; flight red; brilliant black
Number built: 1,159 (all models)
Price: $510

SERVI-CAR (1932-1973)

Harley-Davidson recognized early on the commercial applications for motorcycles. Until 1930, most of Milwaukee's service vehicles employed the sidecar chassis. Rigs were modified to use open and closed sidevans, parcel cars and mail trucks.

The Servi-Car was spawned by the Cycle-Tow, which utilized an outrigger wheel on each side of the motorcycle's rear wheel. The device was sold to auto service shops as a tow vehicle to bring disabled cars in for service. It didn't work so well.

In 1932 the Servi-Car appeared as a genuine 3-wheeler. The following year small or large bodies were available, and the 3-speed transmission included reverse. Powered by the 45-inch (750cc) flathead, the machine was soon equipped with a towbar, bumper and spare tire mount. Final drive was by chain to a sprocket on the rear axle, which drove an automotive-type differential. The axle also carried a drum brake from the 74 VL.

The Servi-Car was widely used by car dealers and repair shops, since one man could collect and return a customer's vehicle with the 3-wheeler in tow. Small businesses used the trike as a delivery vehicle, but its most common application became the police transporter for emptying parking meters and writing traffic tickets.

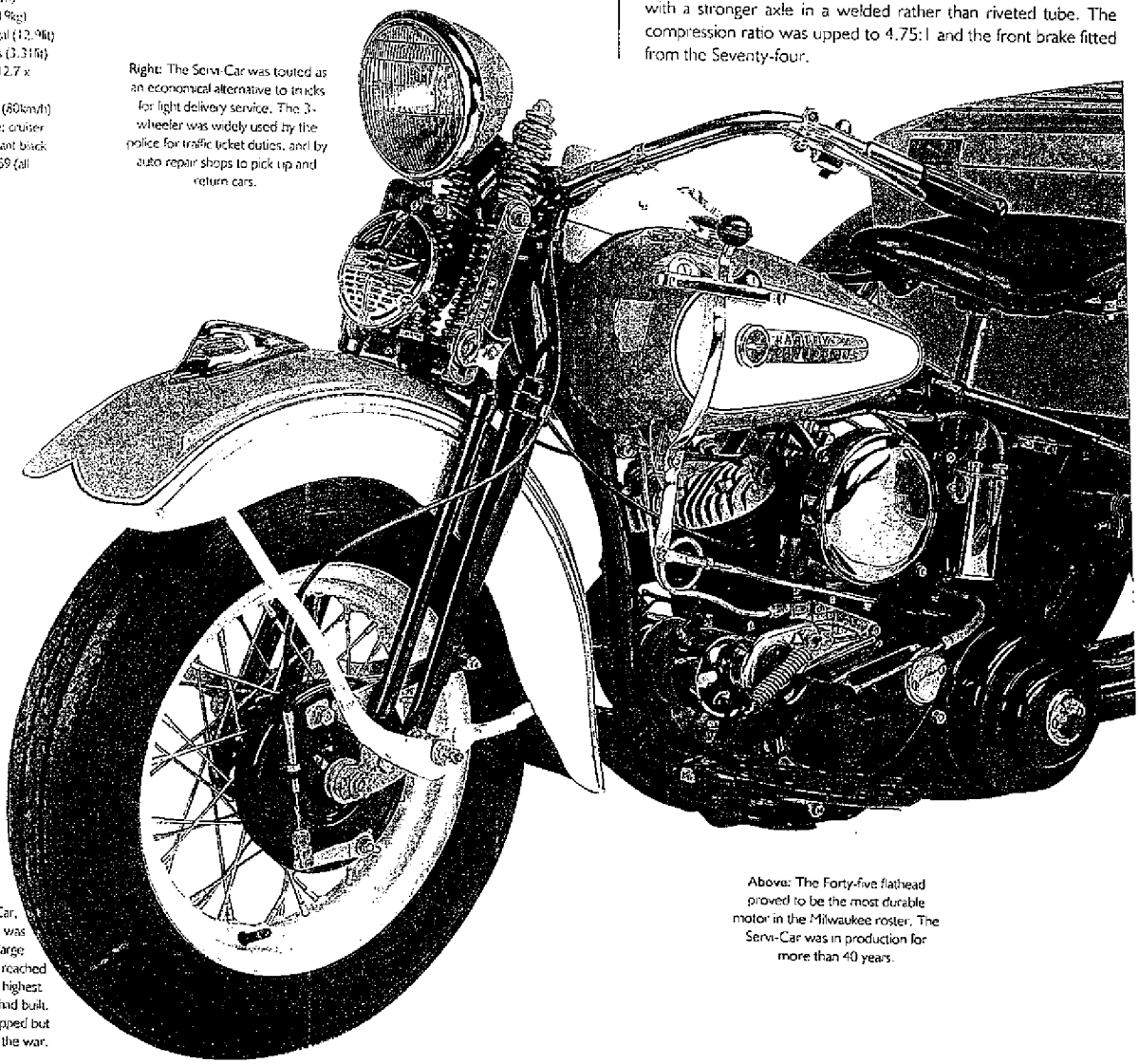
Solo motorcyclists generally scoffed at the 3-wheeler, which, lik the sidecar, they viewed as a bastardized union of car and moto cycle. Something to be driven, not ridden. But the practical aspec of the Servi-Car were difficult to deny. Riders who, by virtue c disability or inclination, were unable to operate a two-wheele could still travel in the wind. As motorcycle clubs gained increasin popularity, trike owners were welcomed as haulers of food an refreshments.

Commercial entrepreneurs on tight budgets utilized the Servi Car as both delivery trucks and traveling billboards. The rear of the cargo box offered advertising space to display the company name and phone number. And to add billboards to each side, Harley-Davidson offered fender "Ad" skirts at $3.50 the pair.

The Servi-Car was continuously upgraded in the 1930s and 1940s, sharing many of the improvements made to the motorcycles. It gained two rear brakes in 1937 and an enclosed chain the following year. In 1939 the towbar was strengthened and given a permanent attachment, eliminating the need to remove it and carry it in the trunk. Larger bodies were offered and the rear suspension modified to reduce body roll.

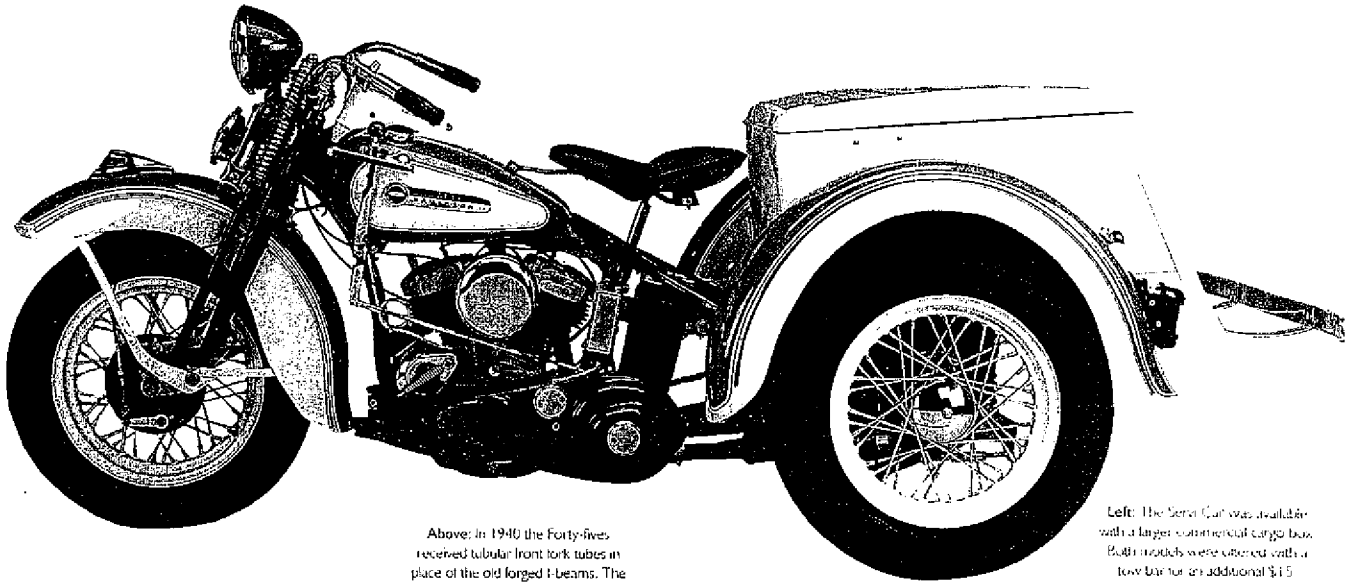
In 1940 the axle housing was beefed up and the transmission's shifting mechanism was simplified. Cast iron brake drums replaced the stamped steel housings. A new frame was introduced in 1941, with a stronger axle in a welded rather than riveted tube. The compression ratio was upped to 4.75:1 and the front brake fitted from the Seventy-four.

Right: The Servi-Car was touted as an economical alternative to trucks for light delivery service. The 3-wheeler was widely used by the police for traffic ticket duties, and by auto repair shops to pick up and return cars.



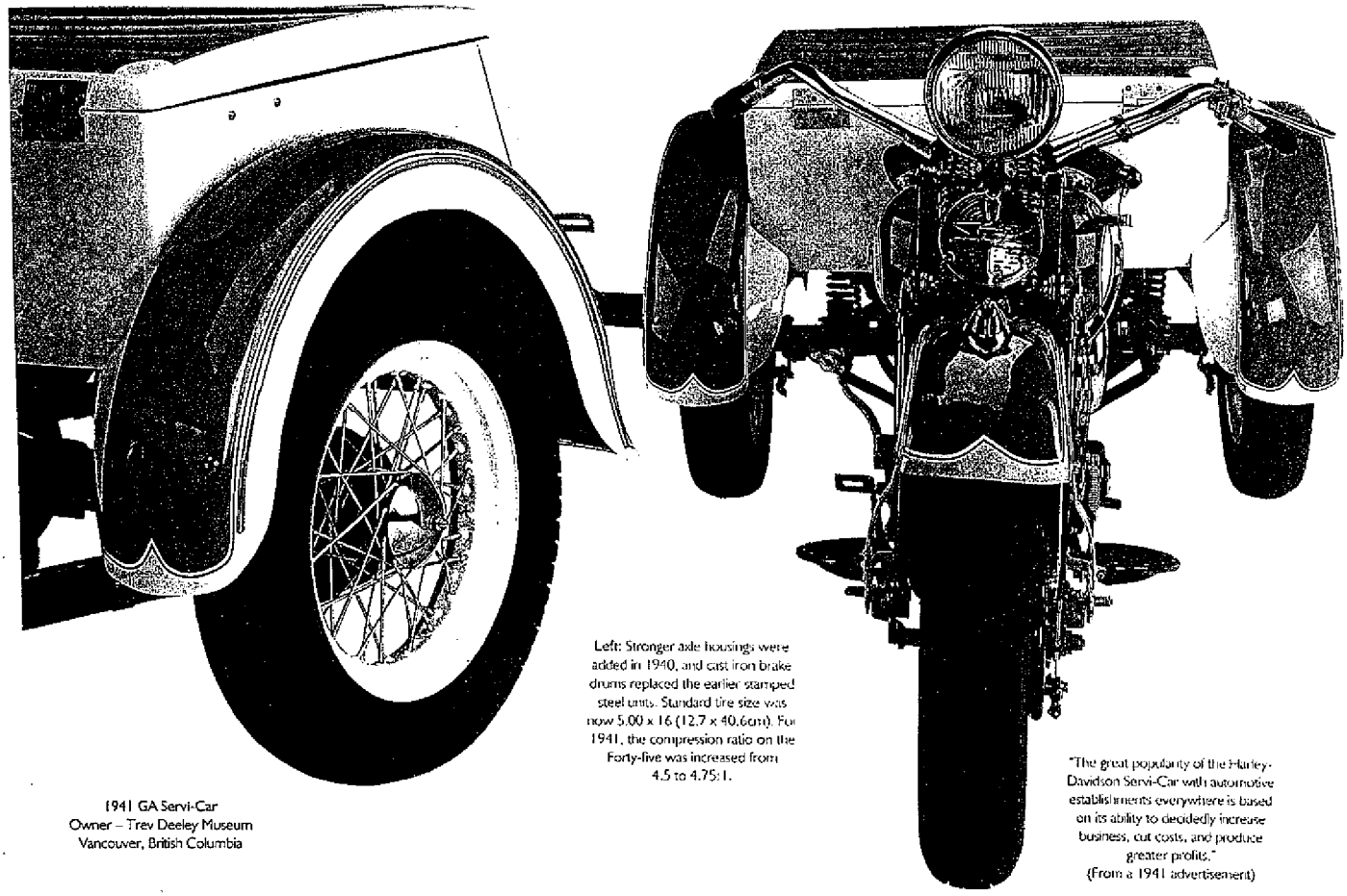
Above: The Forty-five flathead proved to be the most durable motor in the Milwaukee roster. The Servi-Car was in production for more than 40 years.

Right: The Servi-Car, introduced in 1932, was never produced in large quantities. Production reached 1,159 in 1941, the highest number Milwaukee had built. The figures then dropped but increased again after the war.



Above: In 1940 the Forty-fives received tubular front fork tubes in place of the old forged I-beams. The clutch and gearbox were improved.

Left: The Servi-Car was available with a larger commercial cargo box. Both models were offered with a tow bar for an additional $15.



1941 GA Servi-Car
Owner – Trev Deeley Museum
Vancouver, British Columbia

Left: Stronger axle housings were added in 1940, and cast iron brake drums replaced the earlier stamped steel units. Standard tire size was now 5.00 x 16 (12.7 x 40.6cm). For 1941, the compression ratio on the Forty-five was increased from 4.5 to 4.75:1.

"The great popularity of the Harley-Davidson Servi-Car with automotive establishments everywhere is based on its ability to decidedly increase business, cut costs, and produce greater profits."
(From a 1941 advertisement)

1941 WLA

Specifications
Engine/Drivetrain
Engine: Flathead 45° V-twin
Displacement: 45.12ci (739.38cc)
Bore & stroke: 2.75 x 3.81in (70 x 97mm)
Compression ratio: 5:1
Horsepower: 23.5 @ 4,600rpm
Carburetion: Linkert
Transmission: 3-speed
Primary drive: Duplex chain
Final drive: Chain
Brakes: F. & R. Drum
Battery: 6-volt
Ignition: Coil/points

Chassis/Suspension
Frame: Steel, single downtube
Suspension: F. Leading link spring fork
Wheelbase: 57.5in (146cm)
Weight: 540lb (250kg)
Fuel capacity: 3.375gal (12.8lit)
Oil capacity: 7.5pts (3.55lit)
Tires: 4.00 x 18in (10.16 x 45.7cm)
Top speed: 65mph (105km/h)
Color: Olive drab
Number built: 2,282
Price: $380

1942 XA

Specifications
Engine/Drivetrain
Engine: Flathead opposed twin
Displacement: 45.04ci (738cc)
Bore & stroke: 3.125 x 3.125in (78 x 78mm)
Compression ratio: 5.7:1
Horsepower: 23 @ 4,600rpm
Carburetion: 2 Linkert
Transmission: 4-speed
Primary drive: Gear
Final drive: Shaft
Brakes: F. & R. Drum
Battery: 6-volt
Ignition: Coil/points

Chassis/Suspension
Frame: Steel, double downtube
Suspension: F. Leading link spring fork, R. Plunger
Wheelbase: 58.75in (149.2cm)
Weight: 528lb (244kg)
Fuel capacity: 4.1gal (15.5lit)
Oil capacity: 2qts (1.89lit)
Tires: 4.00 x 18in (10.16 x 45.7cm)
Top speed: 65mph (105km/h)
Color: Olive drab
Number built: 1,000
Price: $870.35

Rumors of war were gaining momentum in 1938, and Harley-Davidson considered the prospect of preparing motorcycles for the military. The Army had been using Seventy-fours with sidecars, but was unhappy with them. Milwaukee prepared several Sixty-one ohv and Forty-five models for military tests.

At the time, development was underway on overhead-valve civilian versions of both the the big and small flathead twins, but the program was slowed by the military situation. In 1939 the Army conducted rigorous testing on motorcycles built by Indian, Harley-Davidson and the Delco Corporation. The latter, a BMW clone, featured shaft drive and telescopic fork. Both the Indian and Harley-Davidson were versions of each company's 750 flathead. The Army stipulated that the motorcycle must be capable of 65mph (105km/h) and not overheat at low speeds.

Despite the popularity of their Chief and Scout, Indian was not in a strong position near the end of the decade. Their four-cylinder machine had been an expensive failure, and problems with quality control created difficulties in the marketplace. Both Indian and Harley were selling motorcycles to allied military forces overseas, and the competition for the U.S. government contracts had both companies intent on becoming the major supplier.

In March of 1940 the Army ordered 745 WLAs from Milwaukee. Harley-Davidson fitted the new style tubular front fork, which was lengthened 2.375 inches (6.03cm) to provide additional ground clearance. The olive drab machines were equipped with the new aluminum heads and D-shaped footboards, crash bars, skidplates, cargo racks and saddlebags. Orders were soon forthcoming from South Africa for 2,000 machines, 5,000 for Great Britain and another 659 for the U.S. Army. Milwaukee would later furnish military motorcycles to both the Chinese and Russian armed forces.

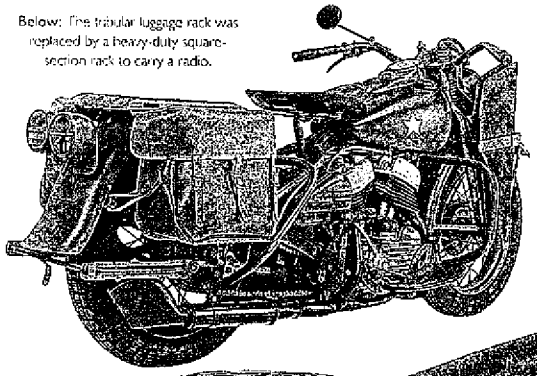
In its final configuration the WLA had a compression ratio of 5:1, and was rated at 23.5 horsepower at 4,600rpm. An oil-bath air filter was fitted, the clutch and transmission were improved, and engine lubrication was upgraded with the use of a bypass valve calibrated to engine speed. By the end of the war, Milwaukee had built some 88,000 motorcycles for military use.

XA

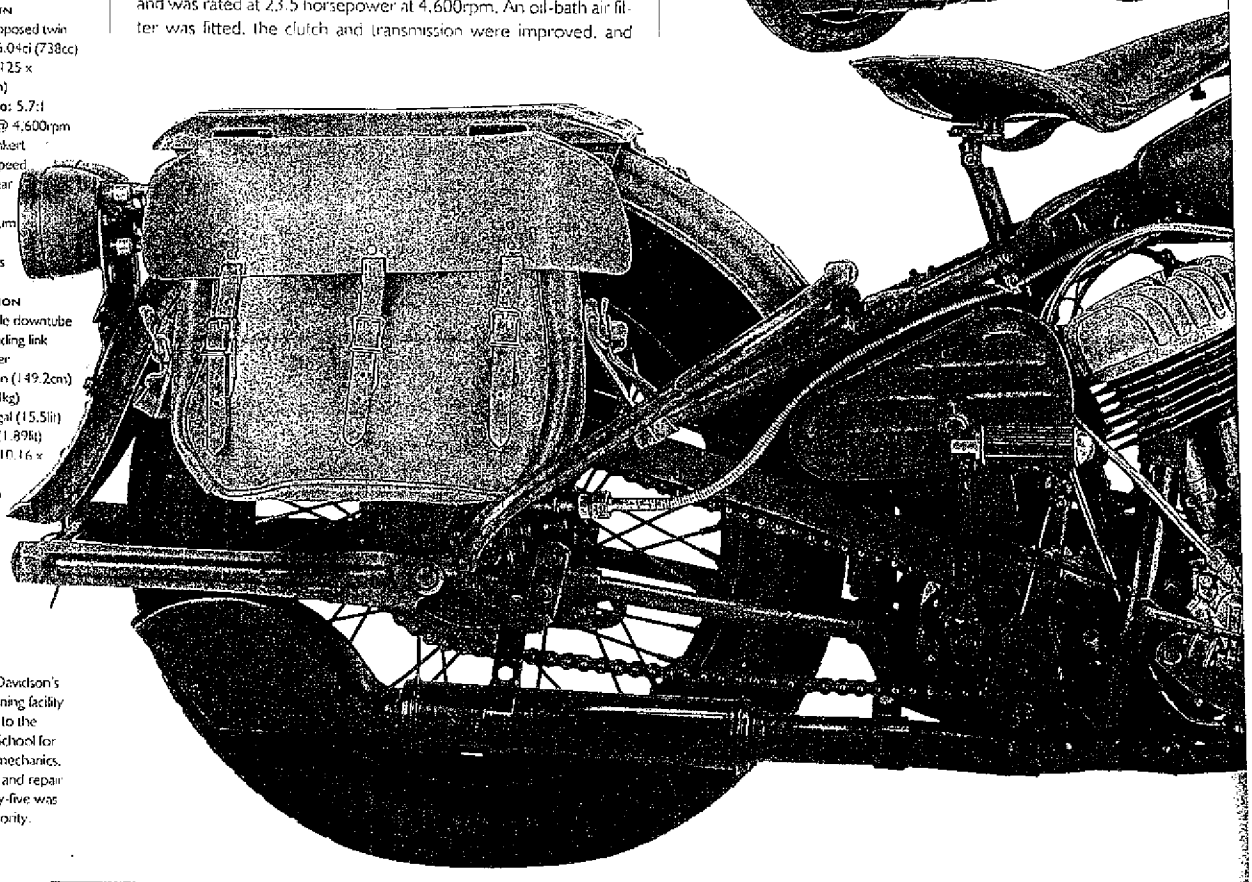
By 1941 most of Harley-Davidson's production was devoted to military machines. The new 74-inch (1200cc) overhead-valve FL was introduced, but fewer than 2,500 were built. The Army had long insisted on a prototype BMW-style, shaft-drive motorcycle. Milwaukee, though hardly convinced of the necessity for such a machine, responded with the XA.

The 45 cubic inch (750cc) flathead opposed twin was a frank copy of the BMW. It featured a foot-shift 4-speed transmission, shaft-drive, hand clutch, plunger rear suspension and a lengthened WLA fork. The Army ordered 1,000 machines at a cost of $870 each. Production ended when the military decided that the WLA would do the job at considerably less expense.

A prototype sidecar version of the boxer twin was also constructed, with a shaft driving the sidecar wheel. Development work was also underway on a shaft-drive 3-wheeler, but the creation of the Jeep canceled both projects.



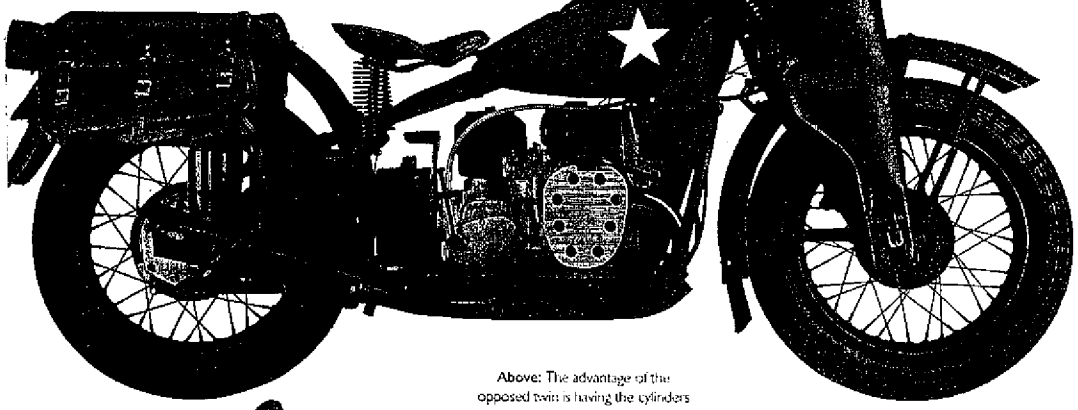
Below: The tubular luggage rack was replaced by a heavy-duty square-section rack to carry a radio.



In 1942 Harley-Davidson's civilian service training facility was changed to the Quartermaster School for teaching military mechanics. The maintenance and repair of the WLA Forty-five was given top priority.

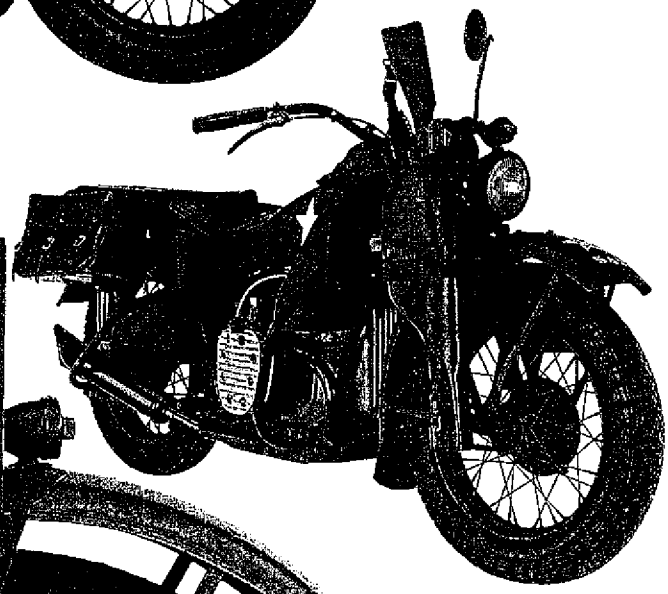
Below: Harley-Davidson was at first reluctant to build the shaft-drive XA. Only 1,000 of the BMW copy were built.

1942 XA
Owner/restorer – Fred Lange
Santa Maria, California

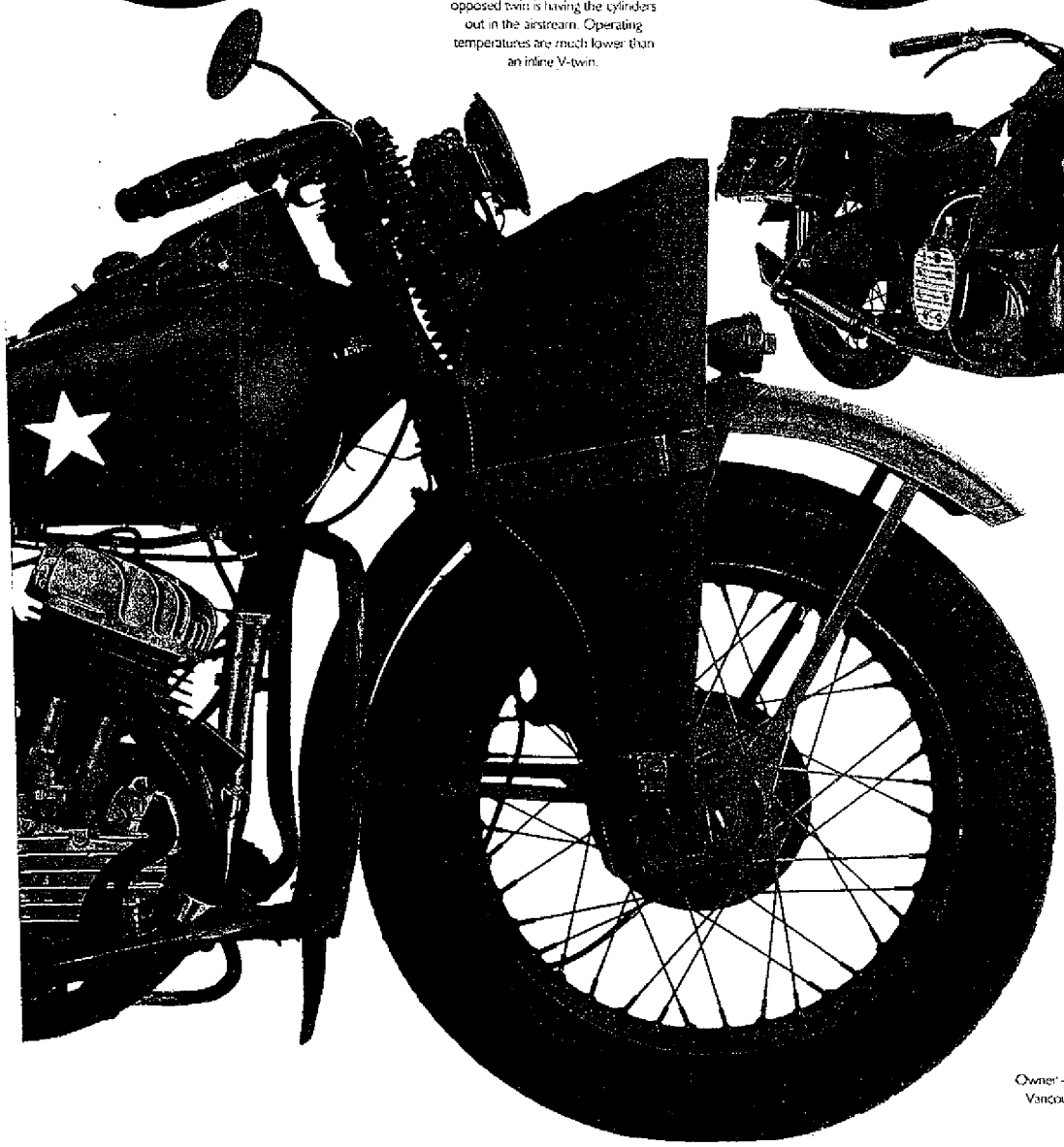


Left: The XA was fitted with an extended version of the WLA fork. The high-clearance flat fender was designed to prohibit mud from building up around the front wheel. The fork scabbard carried a Thompson submachine gun.

Above: The advantage of the opposed twin is having the cylinders out in the airstream. Operating temperatures are much lower than an inline V-twin.



Above: In 1943 the U.S. Army notified Milwaukee that the XA was eliminated as a military bike. Plans for a post-war ohv sport version were later dropped.



1942 WLA
Owner – Trev Deeley Museum
Vancouver, British Columbia

61 OHV KNUCKLEHEAD AND WLDR (1941)

1941 FL

Specifications
Engine/Drivetrain
Engine: OHV 45° V-twin
Displacement: 73.73ci (1,208.19cc)
Bore & stroke: 3.43 x 3.5in (87 x 101.6mm)
Horsepower: 48 @ 5,000rpm
Compression ratio: F, 6.6:1, FL, 7:1
Carburetion: 1.31in (33.3mm) Linkert
Transmission: 4-speed
Primary drive: Chain
Final drive: Chain
Brakes: F & R, Drum
Battery: 6-volt
Ignition: Coil/points

Chassis/Suspension
Frame: Steel, double downtube
Suspension: F, Spring fork
Wheelbase: 59.5in (151.1cm)
Weight: 575lb (261kg)
Fuel capacity: 3.75gal (14.2lt)
Oil capacity: 4qts (3.79lt)
Tires: 5.00 x 16in (12.7 x 40.6cm)
Top speed: 95 mph (153km/h)
Colors: Clipper blue; flight red; cruiser green; black; olive green (export)
Number built: 2,452
Price: $465

The 61 OHV Knucklehead was certainly a powerful motorcycle for its day, but the American notion that bigger is better would prevail. Police forces were especially keen on top speed. The J series had established in the market an affinity for the Seventy-four, so a bigger overhead-valve twin was part of the natural progression.

The big twins had been given stronger, smoother operating clutch assemblies two years earlier. The 1939 models featured a transmission combining elements of sliding-gear and constant-mesh components, with neutral between second and third gears. The design lasted only one year. Long-distance testing on the 74 ohv prototype revealed the need for stronger crankcases, and the rocker arm assemblies were also redesigned to improve top end lubrication.

Crankpins increased in diameter, and the new crankcases for the 61 and 74 ohv lacked the baffles previously employed to equalize lubrication in the cylinders. The change helped solve the persistent problem of excessive crankcase pressure, and produced an increase in power. At the top end, larger intake ports, carburetor and redesigned manifold contributed to the horsepower gain. A new vane-type oil pump assisted in ensuring the engine's overall comfort, and a change to 5.00 x 16-inch (12.7 x 40.6cm) tires provided a smoother ride. These 74-inch (1200cc) twins were designated the F and FL (higher compression) models.

Styling changed only slightly for 1941. The speedometer face changed from black numbers on white to a black background with larger silver numbers. The fuel tank featured a chrome band bisecting the sides. Four color options were still available, with cruiser green replacing squadron gray on the menu. But it wasn't long before the paint selection was subordinated by the war effort, and buyers had to take what they could get.

From the 1941 brochure: "The deluxe solo group has just about everything in it but a chrome-plated shower-bath and will decorate your new Harley-Davidson like a Christmas tree."

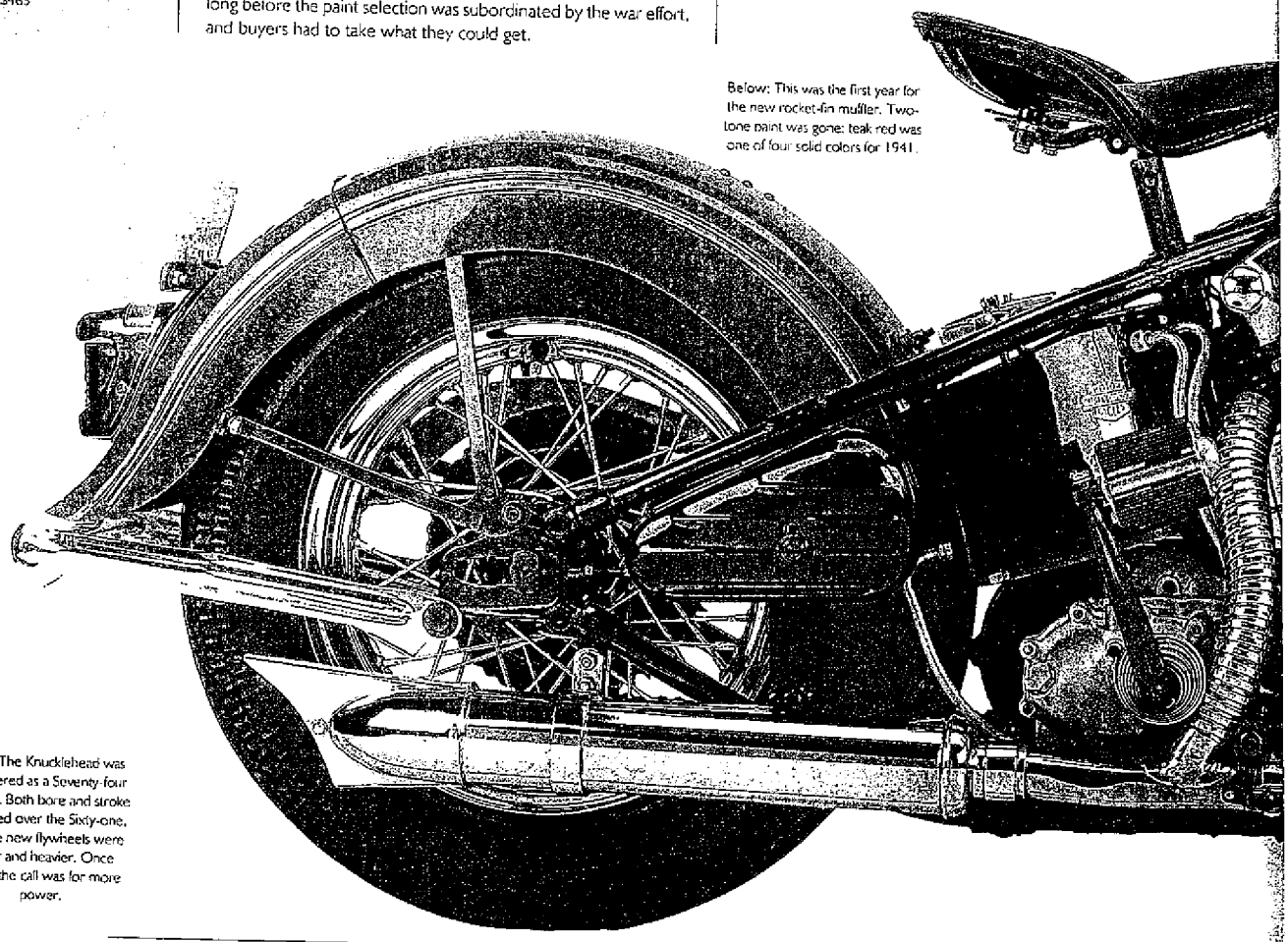
WLDR

Military testing had produced improvements that transferred to the civilian Forty-fives. Many big twin upgrades were applied to the little guy; the clutch assembly grew stronger and smoother in operation, and the gearbox was beefed up and given larger gears and an improved shifting mechanism.

The iron-head WL became the economy model, with compression ratio reduced to 4.75:1. The aluminum-head WLDR, on the other hand, grew even sportier with larger crankpin, stronger valve springs, hotter cams and bigger carburetor. These engines reportedly produced about 35 horsepower. It was also 1941 when the factory racing versions appeared. The WR (flat track) and WRTT (roadracing and scrambles) had flat valve lifters instead of rollers, for higher rpm.

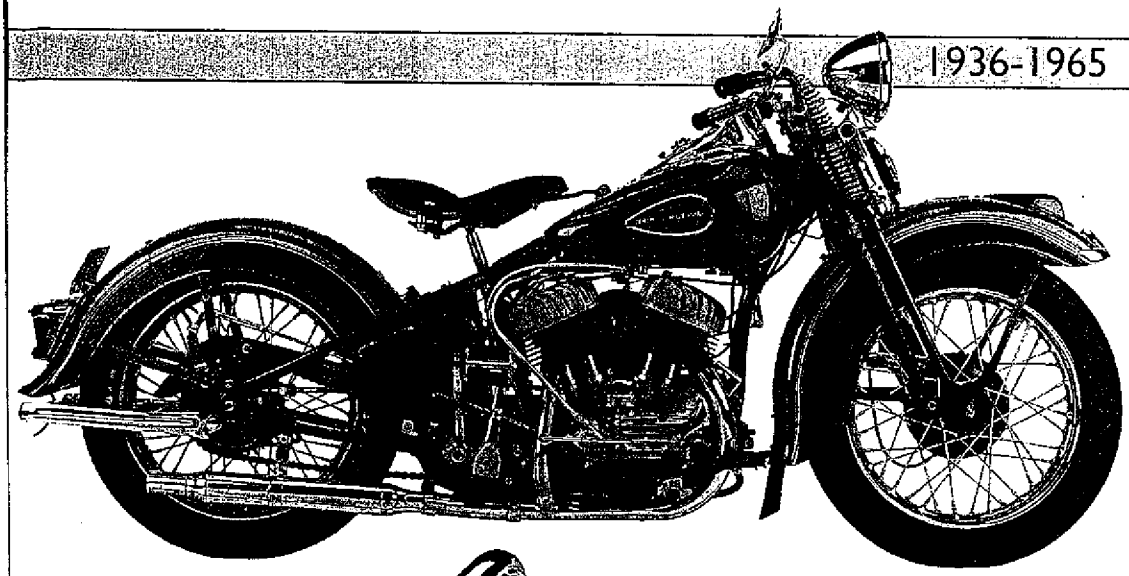
Class C racing was achieving more popularity just as the advent of World War II put such frivolous activities on the shelf. The WLDR was discontinued during the summer, and the production of racing models was suspended with the United States' entry into the war.

But the workhorse Forty-five would continue as the motive power for Army bikes, the Servi-Car and be resuscitated once again for sport riding and racing after the war. Eventually it would develop into the K model of the 1950s, which later evolved into the Sportster. The little twin was to achieve a lasting legacy in the Milwaukee hierarchy.



Below: This was the first year for the new rocket-fin muffler. Two-tone paint was gone; teak red was one of four solid colors for 1941.

Right: The Knucklehead was first offered as a Seventy-four in 1941. Both bore and stroke increased over the Sixty-one, and the new flywheels were larger and heavier. Once again, the call was for more power.

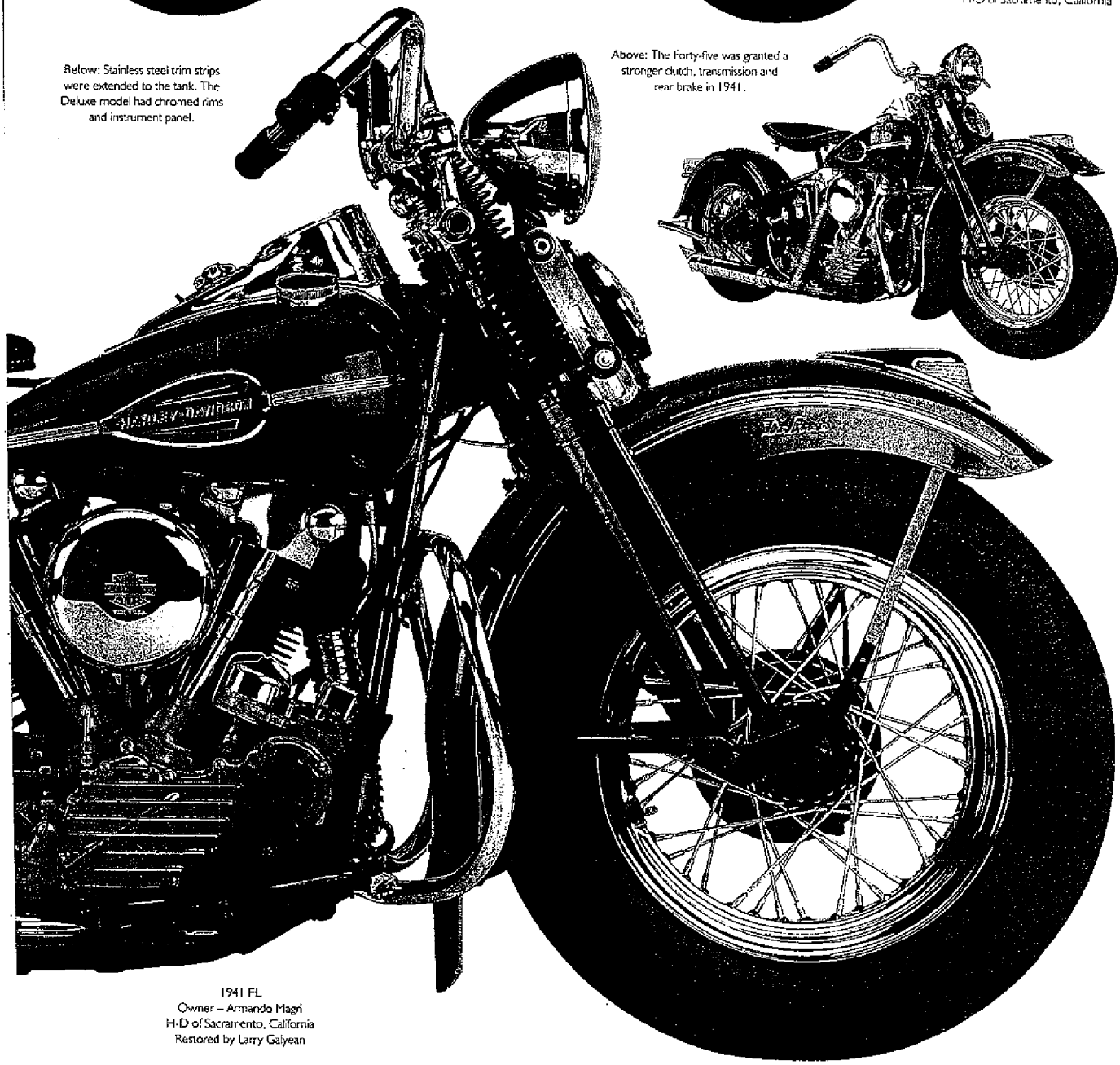


Left: With the arrival of the racing WR, 1941 was the last year for the WLDR. The hot-rod Forty-five was rated at seven more horsepower than the WLD; the R model would pull to 5,500 rpm.

1941 WLDR
Owner/restorer – Armando Magri
H-D of Sacramento, California

Below: Stainless steel trim strips were extended to the tank. The Deluxe model had chromed rims and instrument panel.

Above: The Forty-five was granted a stronger clutch, transmission and rear brake in 1941.



1941 FL
Owner – Armando Magri
H-D of Sacramento, California
Restored by Larry Galyean

UEL (1941) EL (1941) AND WLD (1945)

Because of the war, Milwaukee made virtually no changes to the motorcycles between 1941 and 1946. Color choices dwindled to gray or silver, and in 1944 to gray only. The option of red paint returned in 1946.

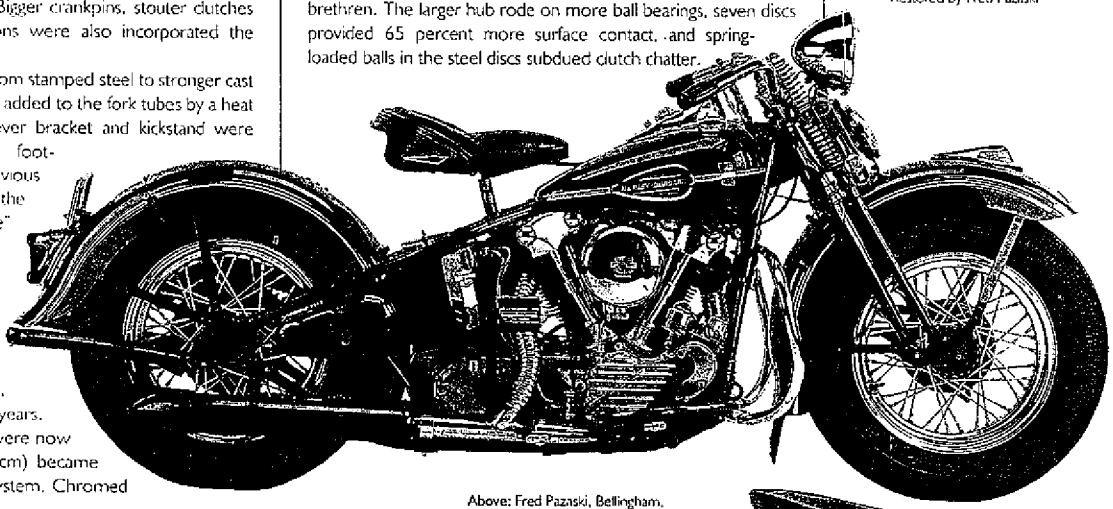
As noted earlier, the big twins received numerous improvements in the years just before the war. Aluminum heads were standard on the Eighty in 1940 and optional on the Seventy-four. The alloy cylinder head weighed over five pounds (2.27kg) less than its cast iron counterpart. Bigger crankpins, stouter clutches and constant-mesh transmissions were also incorporated the same year.

Front brake drums changed from stamped steel to stronger cast iron units, and strength was also added to the fork tubes by a heat treating process. The clutch lever bracket and kickstand were redesigned, and streamlined footboards replaced the previous rectangular style. This was also the first year of the "instant reserve" fuel valve at the top left of the tank, and the larger 7-inch (17.8cm) circular air cleaner.

Buckhorn handlebars were still standard in 1941, but flat-bar Speedster bars remained available as a no-charge option, as they had for the previous ten years. Sixteen-inch (40.6cm) wheels were now standard and 18-inchers (45.7cm) became optional, opposite the earlier system. Chromed rims were $2.50 apiece extra. The fishtail muffler was replaced by a longer "rocket-fin" silencer, and tail light housings were now painted black rather than the bodywork color.

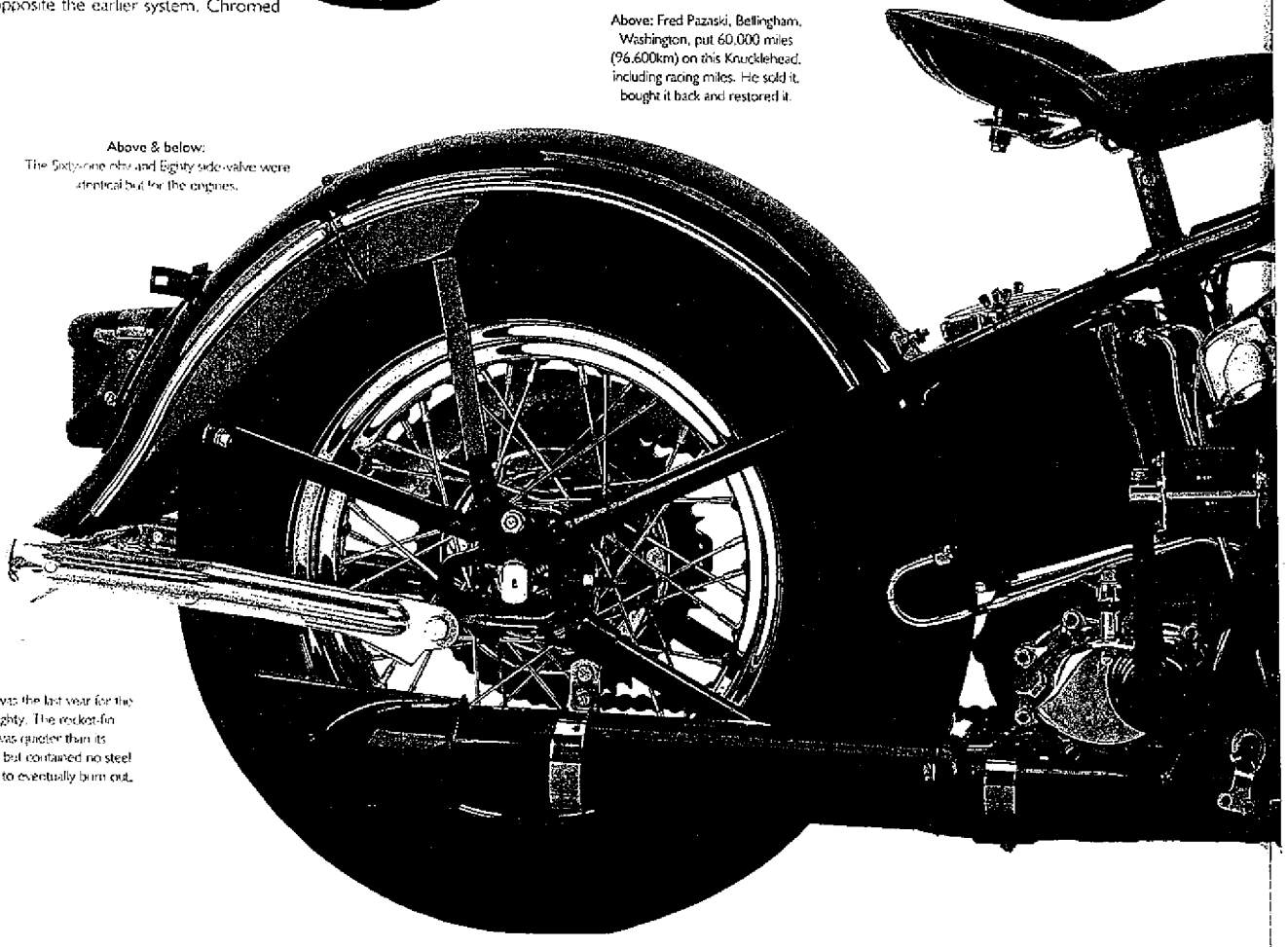
The 61 ohv E series Knucklehead now shared the heavier flywheels of the Seventy-four. The change to a half-inch (1.27cm) longer intake manifold and reduction in carburetor venturi to 1.125 inches (28.6mm) aided low-speed operation. The Sixty-one also featured the clutch upgrades applied to its bigger brethren. The larger hub rode on more ball bearings, seven discs provided 65 percent more surface contact, and spring-loaded balls in the steel discs subdued clutch chatter.

1941 EL
Owner – Trev Deeley Museum
Vancouver, British Columbia
Restored by Fred Pazaski



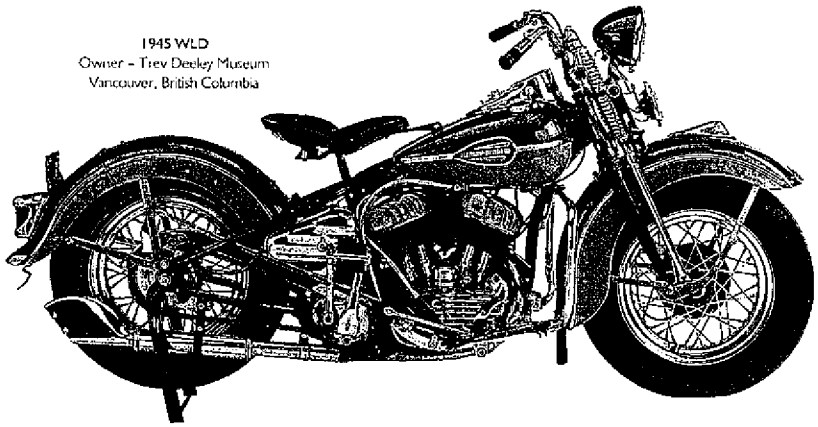
Above: Fred Pazaski, Bellingham, Washington, put 60,000 miles (96,600km) on this Knucklehead, including racing miles. He sold it, bought it back and restored it.

Above & below:
The Sixty-one ohv and Eighty side-valve were identical but for the engines.



Right: 1941 was the last year for the Flathead Eighty. The rocket-fin muffler was quieter than its predecessor, but contained no steel wool packing to eventually burn out.

1945 WLD
Owner – Trev Deeley Museum
Vancouver, British Columbia



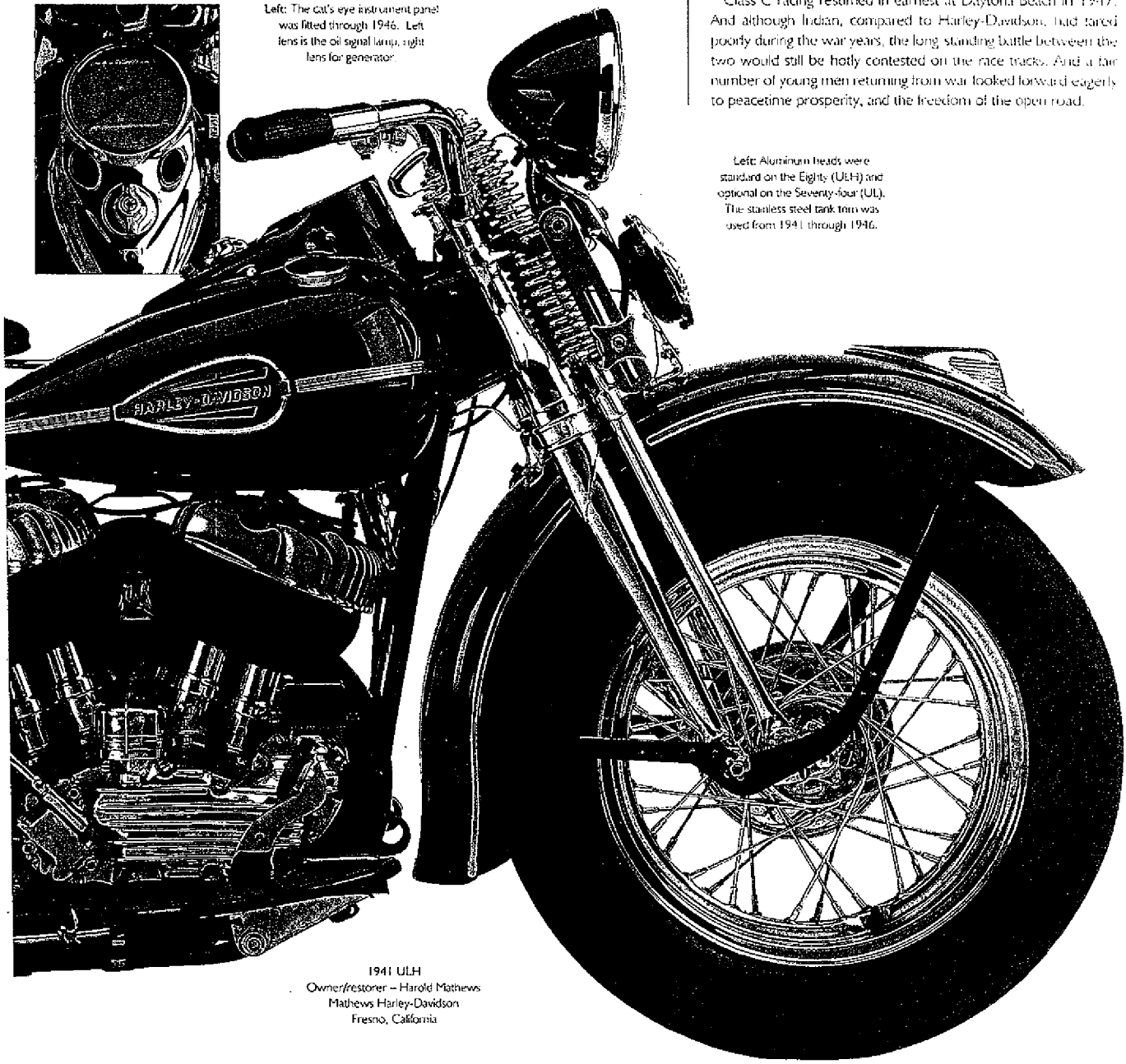
With reductions in government orders for military bikes, Harley-Davidson began the process of converting to civilian production. Most of the 88,000 motorcycles built for the war effort were WL Forty-fives. In addition to the thousands of machines in Great Britain, Europe and the Soviet Union, a sizeable inventory remained in Milwaukee. The surplus war models were sold in large lots, at substantial discounts, to Harley-Davidson dealers and automobile dealers throughout the country.

The post-war demand for motorcycles was high, and Milwaukee resumed its emphasis on the big twins. The first model year for full-scale civilian production was 1946, and the following year Harley-Davidson manufactured more than 20,000 machines, the highest output they had reached since 1929 (excluding the years of military production).

Class C racing resumed in earnest at Daytona Beach in 1947. And although Indian, compared to Harley-Davidson, had fared poorly during the war years, the long standing battle between the two would still be hotly contested on the race tracks. And a fair number of young men returning from war looked forward eagerly to peacetime prosperity, and the freedom of the open road.

Left: The cat's eye instrument panel was fitted through 1946. Left lens is the oil signal lamp, right lens for generator.

Left: Aluminum heads were standard on the Eighty (UEH) and optional on the Seventy-four (UL). The stainless steel tank trim was used from 1941 through 1946.



1941 ULH
Owner/restorer – Harold Mathews
Mathews Harley-Davidson
Fresno, California

F AND FL (1946)

Production of the F-series Knuckleheads jumped from fewer than 1,000 for 1945 to more than 4,000 for 1946, and rose to over 7,000 the succeeding year. The Seventy-four was outselling the Sixty one by a significant margin.

The stylish cat's-eye instrument panel made its last appearance in 1946. The speedometer face was two-tone rather than silver, with the numerals matching the color of the inner circle. The three color combinations offered were black/silver, green/cream and gray/white in a design known as the "airplane-style" speedometer. This would also be the last installment of the streamlined tail light, more evidence that the Art Deco influence was fading in favor of more squarish designs.

Wartime material shortages were still apparent early in the year. Gray and red were the only color options available until about mid-year, when skyway blue and black were offered once again. Chrome tank badges and stainless steel trim were also absent from the earlier models, and likewise for chromed shift levers and gates, headlight rims and gas caps.

Few more than 2,000 ohv models had been produced in Milwaukee during the war, and most were for military use. But testing and development continued during this period, as Harley-Davidson looked ahead to the prospects in the post-war market. Work on the first hydraulic telescope front fork was underway, and a prototype was fitted to a Knucklehead in 1945. The Hydra-Glide fork would appear on production models in 1949.

The first indication of hydraulic damping for the front wheel appeared on the big twins in 1946. A Monroe shock absorber adjoined the fork springs, replacing the rudimentary Ride-Control friction device. No corresponding cushioning occured at the rear wheel, which remained solidly bolted to the frame. Suspension advancements in Milwaukee evidently would be addressed strictly one end at a time.

The Knucklehead itself was on the road to history by 1946. Notwithstanding their reputation for caution in developing new models, Milwaukee recognized that motorcycling would soon be changing. That more riders would be demanding smoother, oil-tight engines, motors that started easily and were reliable (even for the mechanically disindined), and transmissions that shifted without the removal of a hand from the handlebar.

These and other items were most certainly on Harley-Davidson's agenda as the United States shifted to a peacetime economy. The tussle between Springfield and Milwaukee was renewed, in the growing motorcycle marketplace and on the race track. The Daytona 200, the traditional season opener, wasn't resumed until 1947, and it went to Indian rider Johnny Spiegelhoff. And in 1948 former Harley racer Floyd Emde switched to Indian and won the prestigious beachfront competition.

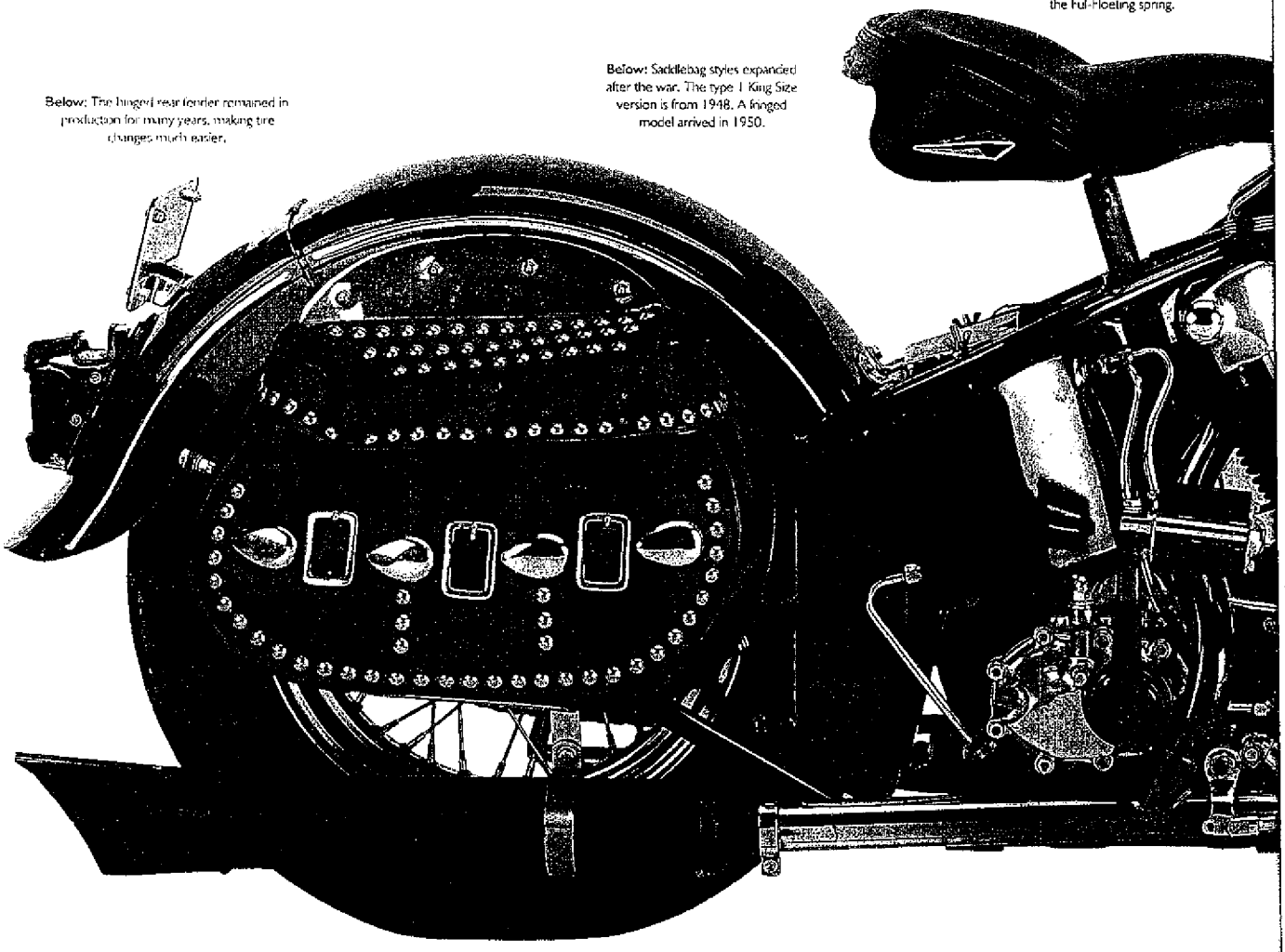
In the meantime, shrewd Tom Sifton was extracting more horsepower from the venerable WR engine. And Harley-Davidson was at work on the tasks of bringing rear suspension, foot-shift and effective brakes to the racing arena. All of which would soon make their way to road machines for the public.

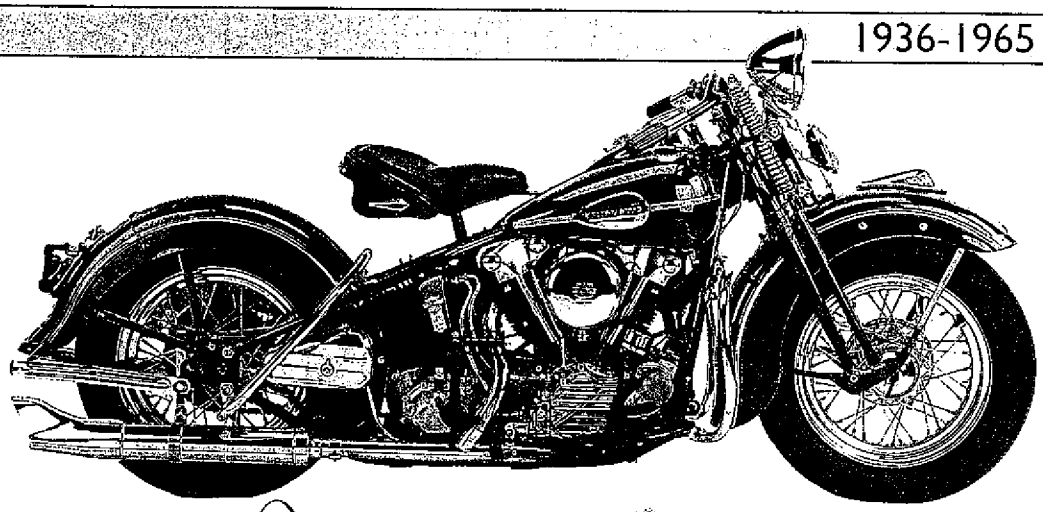
Above: The airplane-style speedometer was fitted from 1941 through 1946. The two-tone face was either black/silver, green/cream or gray/white.

Below: Seat options were in limited availability just after the war. The deluxe solo saddle still rode the atop the Ful-Floating spring.

Below: Saddlebag styles expanded after the war. The type 1 King Size version is from 1948. A finged model arrived in 1950.

Below: The hinged rear fender remained in production for many years, making tire changes much easier.

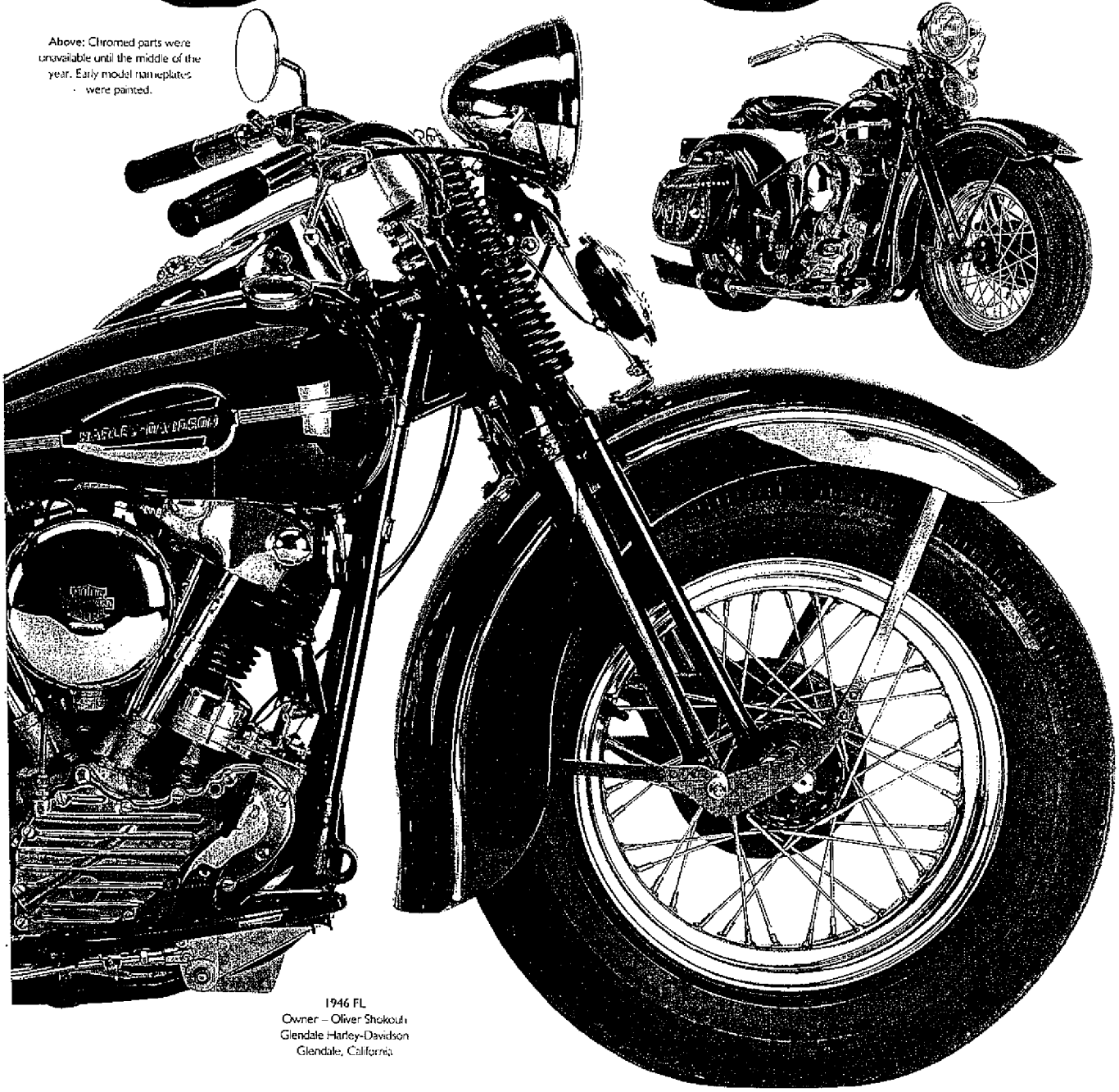




1946F
Owner/restorer – Ken Lang
Oakville, Ontario, Canada

Below: The spring fork shock absorber first appeared in 1946. The rear view mirror was included in the special solo group, which included safety guards, trip odometer and sheepskin seat cover.

Above: Chromed parts were unavailable until the middle of the year. Early model nameplates were painted.



1946 FL
Owner – Oliver Shokouh
Glendale Harley-Davidson
Glendale, California

FL (1941) AND 125 MODEL S (1948)

The biggest change in Harley-Davidson's 1947 models was the price. The cost of the top-of-the-line 74 OHV had held steady at $465 for six years, although very few were produced from 1941-45. The price on the last of the Seventy-four Knuckleheads was $605, a 33 percent jump from the year before. Inflation was soaring, and peacetime recreation was going to be expensive.

A number of revisions were made for 1947 that distinguish the final Knucklehead from its predecessors. Streamlining was back in the form of new fuel tank nameplates, which came to be called "speed ball" badges. Stainless steel fender trim returned to production, as did the front fender lamp. A larger tail light, nicknamed the "tombstone" design, incorporated the license plate bracket.

The fuel tank was redesigned to accommodate a new instrument panel, and the speedometer face featured a two-tone black and white background with italicized silver numerals and a red pointer. The separate generator and oil lights were consolidated in a small rectangular housing with a single lens situated in the center of the tank.

The Deluxe Buddy Seat had been deleted during the war years and returned to civilian duty in 1946. The 1947 version was offered in black cowhide only, featuring a plastic skirt with a chromed star on each side.

Four color options were again offered in 1947: skyway blue, cruiser green, flight red and brilliant black. Nearly 12,000 Knuckleheads were made for the model year, over half Milwaukee's total production. In its twelve-year run the Knuckle had won a loyal following, and remains an icon in the Harley lineage as the original American superbike.

125 S

Harley-Davidson was the only U.S. motorcycle manufacturer in a strong position before, during and after the war. Among the most tangible spoils of victory was the appropriation of Germany's DKW manufacturing rights, which Milwaukee shared with BSA of Great Britain. Thus the instant lightweight.

Small two-stroke motorcycles had never achieved wide popularity in the United States, and the S model would prove no exception. But it did provide benefits for Harley-Davidson in the long term. The tiddler offered a low-cost entry into motorcycling ($5.50 per week), and surely stimulated the appetites of young novice riders for bigger and better machines. Preferably, from the Milwaukee viewpoint, bigger and better motorcycles with valves.

DKW (Dampf Kraft Wagen) had built some fast racing motorcycles, but the proletarian 125 was simply an economical utility machine. They served well as mass transportation on the congested byways of Europe, but seemed little more than a motorized bicycle to Americans weaned on big twins. Harley-Davidson dealers, by and large, didn't want to be bothered with the machine and did little to promote it.

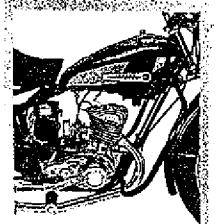
Thousands of youngsters, on the other hand, learned to ride on the 3-horsepower machine. And racers prized the small, lightweight fuel tank, which would appear some years later on the Sportster. So while the S model never became a sales leader, it did evolve into a multi-purpose machine later tagged the Hummer, and expand to 165 and 175cc off-road variants.

The S model turned out to be a good (and inexpensive) investment in Harley-Davidson's future. It enticed a good number of young folks into the exhilarating sport of motorcycling. And, with almost perfect timing, it taught them how to clutch with the hand and shift with the foot. That process would soon accelerate with the arrival of other more substantial motorcycles from overseas.

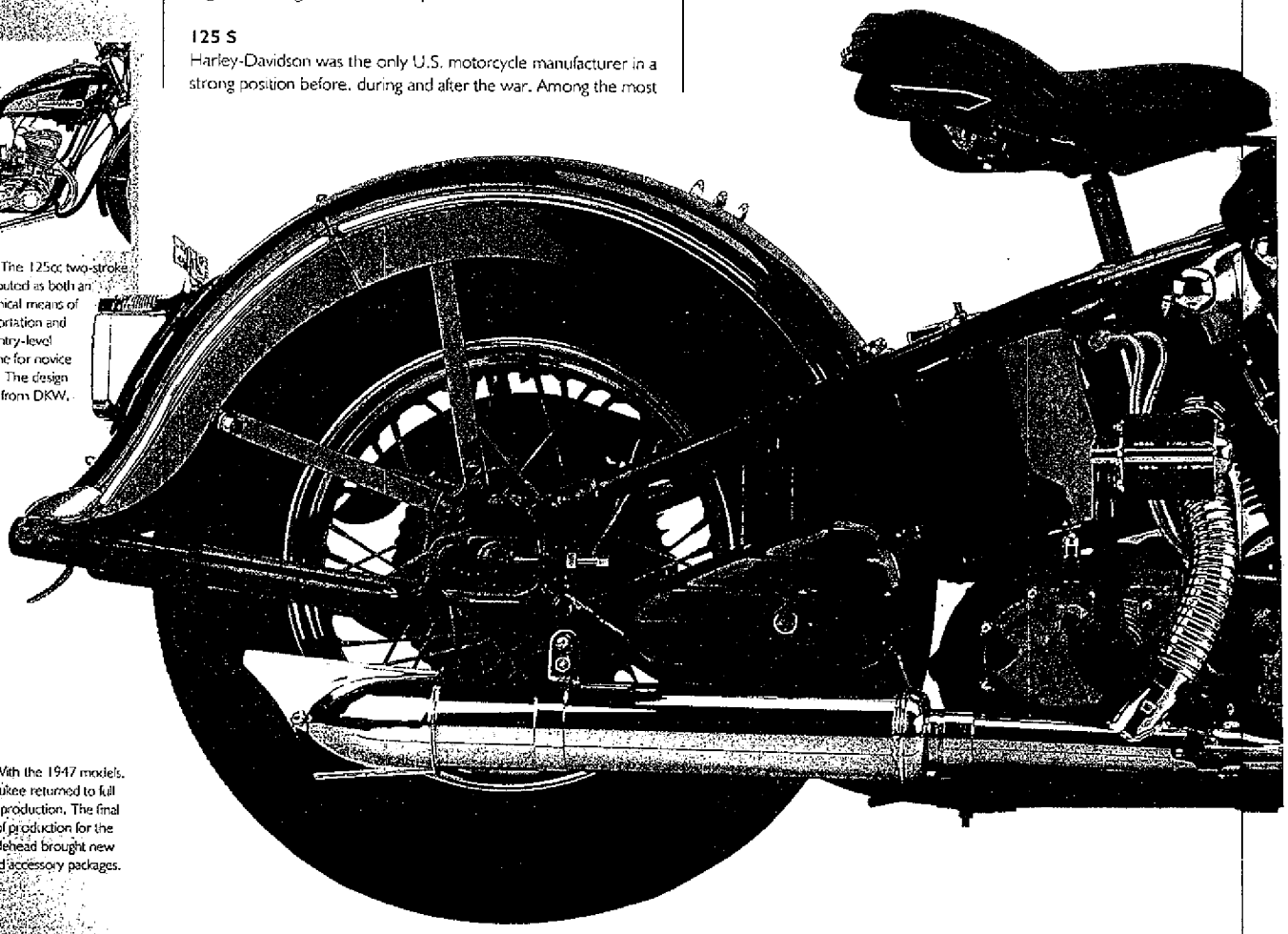
125 MODEL S

Specifications
Engine/Drivetrain
Engine: Two-stroke single
Displacement: 7.6ci (124.87cc)
Bore & stroke: 2.06 x 2.28in (52 x 58mm)
Horsepower: 3
Compression ratio: 6.6:1
Carburetion: L & L
Transmission: 3-speed
Primary drive: Chain
Final drive: Chain
Brakes: F & R, Drum
Battery: 6-volt
Ignition: Coil/points

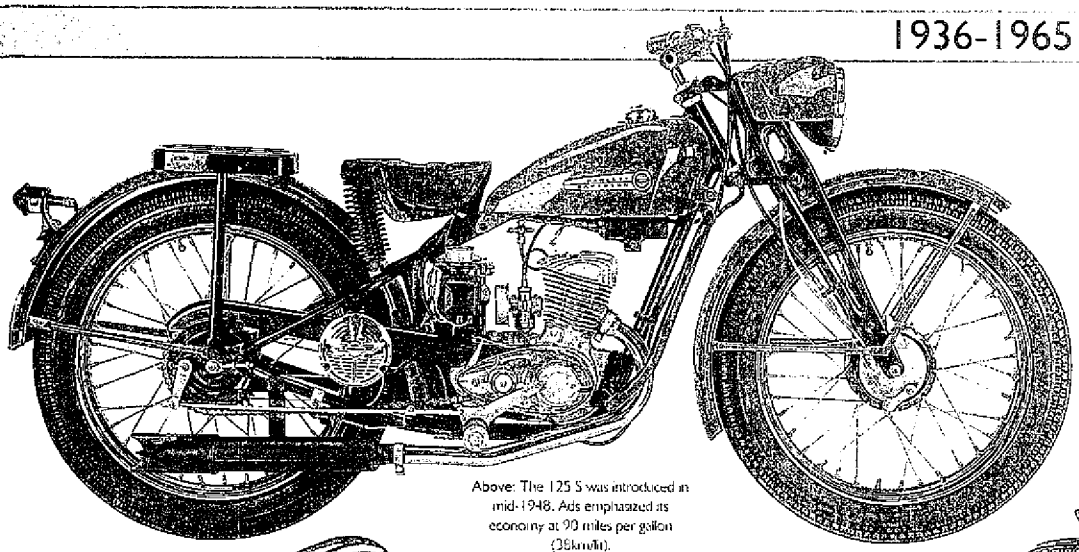
Chassis/Suspension
Frame: Steel, single downtube
Suspension: F, Girder fork, rubber band
Wheelbase: 50in (127cm)
Weight: 185lb (84kg)
Fuel capacity: 1.75gal (6.6lt)
Tires: 3.25 x 19in (8.26 x 48.26cm)
Top speed: 50mph (80km/h)
Color: Black
Number built: 10,117
Price: $325



Above: The 125cc two-stroke was touted as both an economical means of transportation and an entry-level machine for novice riders. The design came from DKW.

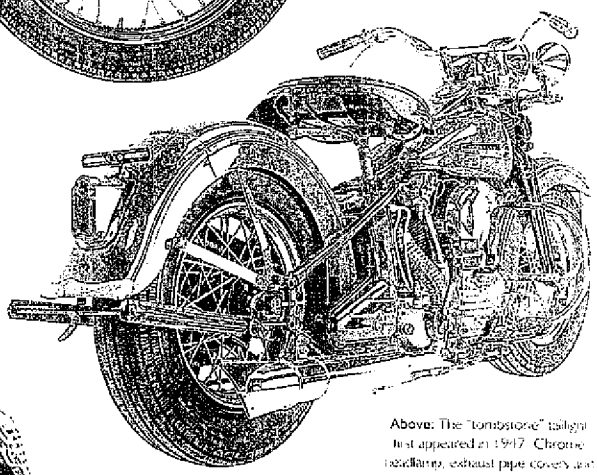


Right: With the 1947 models, Milwaukee returned to full civilian production. The final year of production for the Knucklehead brought new trim and accessory packages.



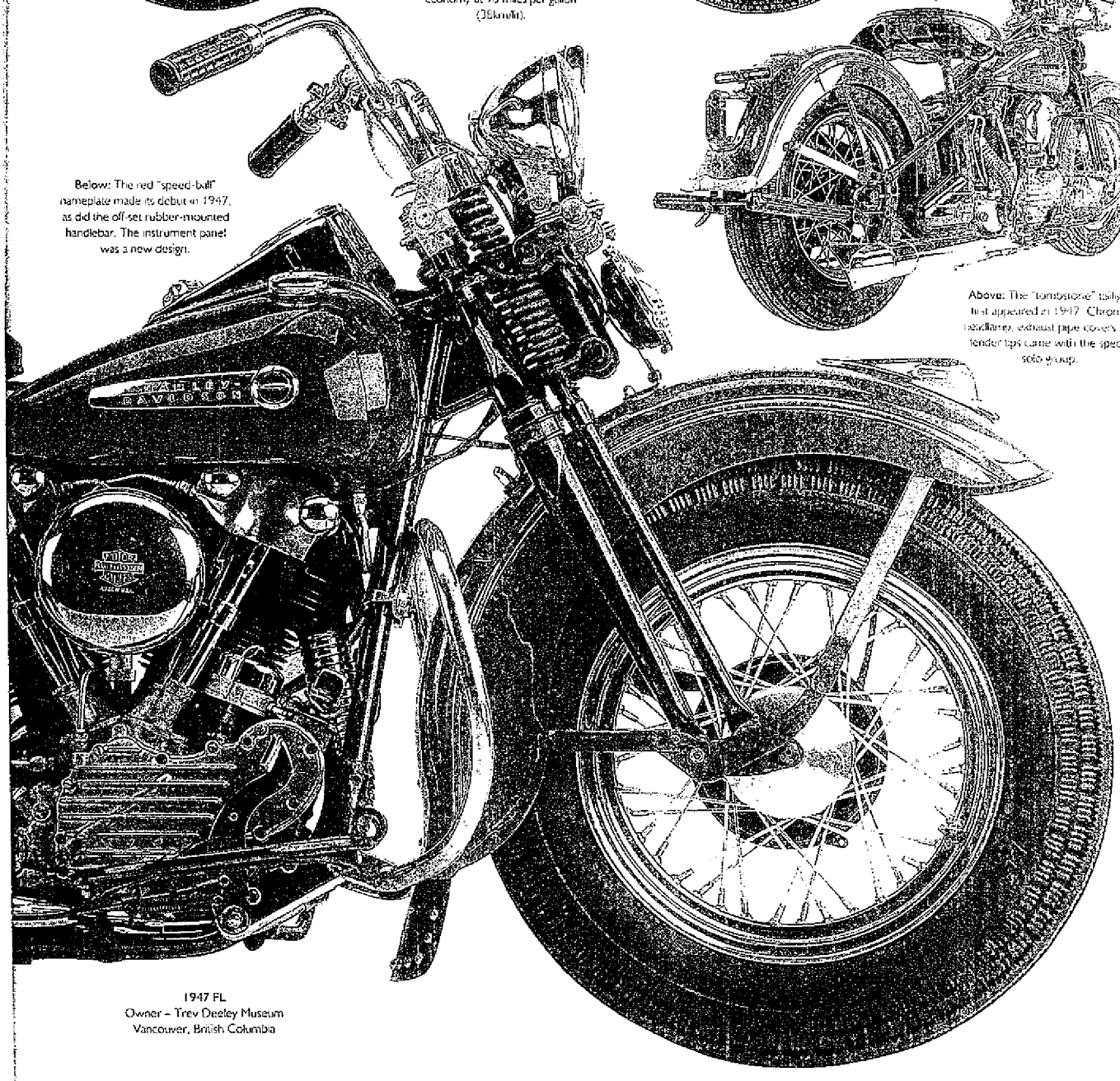
1948 125 S
Owner – Fred Lange
Santa Maria, California

Above: The 125 S was introduced in mid-1948. Ads emphasized its economy at 90 miles per gallon (38km/lit).



Above: The "tombstone" taillight first appeared in 1947. Chrome headlamp, exhaust pipe covers and fender tips came with the special solo group.

Below: The red "speed-ball" nameplate made its debut in 1947, as did the off-set rubber-mounted handlebar. The instrument panel was a new design.



1947 FL
Owner – Trev Deeley Museum
Vancouver, British Columbia

1948 FL

Specifications
Engine/Drivetrain
Engine: OHV 45° V-twin
Displacement: 73.7ci (1208.19cc)
Bore & stroke: 3.44 x 4in (87 x 102mm)
Compression ratio: 7:1
Horsepower: 50 @ 4,800 rpm
Carburetion: 1 3/4in (37.3mm) Schebler
Transmission: 4-speed
Primary drive: Chain
Final drive: Chain
Brakes: F & R, 5"
Battery: 6-volt
Ignition: Coil/points

Chassis/Suspension
Frame: Steel, double downtube
Suspension: Leading link spring/shock fork
Wheelbase: 59.5in (151.1cm)
Weight: 565lb (256kg)
Fuel capacity: 3.75gal (14.2lit)
Oil capacity: 1gal (3.78lit)
Tires: 5.00 x 16in (12.7 x 40.6cm)
Top speed: 100mph (161km/h)
Colors: Azure blue; light cast black
Number built: 8,071
Price: $650

NEW! IMPROVED! No other two words figured more strongly in American advertising after World War II. As applied to motorcycle engines they usually meant overhead valves, hydraulic lifters, aluminum heads, improved lubrication and better combustion. Enter the Panhead.

If, as H-D chronicler Allan Girdler says, "technical progress is war's only useful product," the Panhead owed much of its usefulness to military combat. The development of high-performance aircraft created a sourcebook of engineering and design lessons for builders of earthbound air-cooled engines. One result was less attention to form and more on function.

Not that the new FL was an entirely new engine, as the Knucklehead had been 12 years before. Harley-Davidson product development has always been evolutionary. The frame was stretched to accommodate the taller engine, which was lighter and carried its oil lines inside. A new oil pump did a more thorough job of sending lubricant to the required parts. But the most distinctive departure from the past was the Panhead's hydraulic valve lifters, which solved two problems. Maintaining exact valve adjustment became less critical and the engine ran cooler.

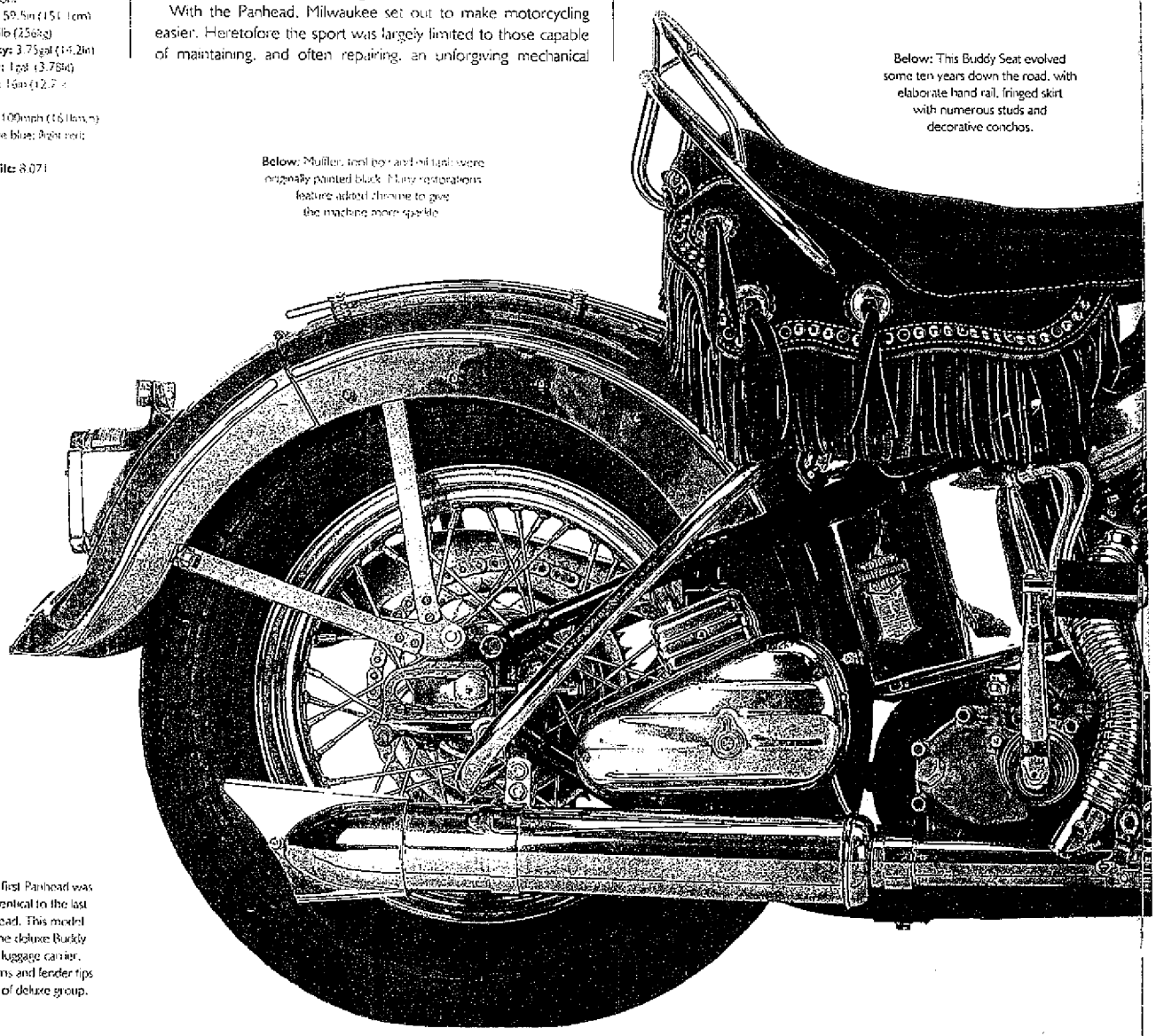
With the Panhead, Milwaukee set out to make motorcycling easier. Heretofore the sport was largely limited to those capable of maintaining, and often repairing, an unforgiving mechanical assemblage. Motorcycles that ran better and longer without expert attention were likely to attract new riders, which was the Panhead's primary mission.

The engine's bottom end was largely unchanged. A new camshaft was designed for the new valve system, and the cases modified for the new cylinders. The frame was tagged the "wishbone" for its bowed downtubes, and incorporated a steering head lock and mounting plate for crash bars. With the advent of the Hydra-Glide front fork the following year, the '48 grew to become a prized model since it was the first Panhead and the last Springer. Like the Knuckle, the Pan's designations were E for the Sixty-one and F for the Seventy-four.

Horsepower was only marginally higher for the new engine, but it was generally more reliable power. The pan-shaped valve covers kept more oil inside the motor, and the aluminum heads reduced operating temperatures on long rides and in hot weather. Steel inserts held the new 14mm spark plugs. The new system

Below: This Buddy Seat evolved some ten years down the road, with elaborate hand rail, fringed skirt with numerous studs and decorative conchos.

Below: Muffler, tool box and oil tank were originally painted black. Many refrigerators feature added chrome to give the machine more sparkle.



Right: The first Panhead was virtually identical to the last Knucklehead. This model includes the deluxe Buddy Seat and luggage carrier. Chrome rims and fender tips were part of deluxe group.

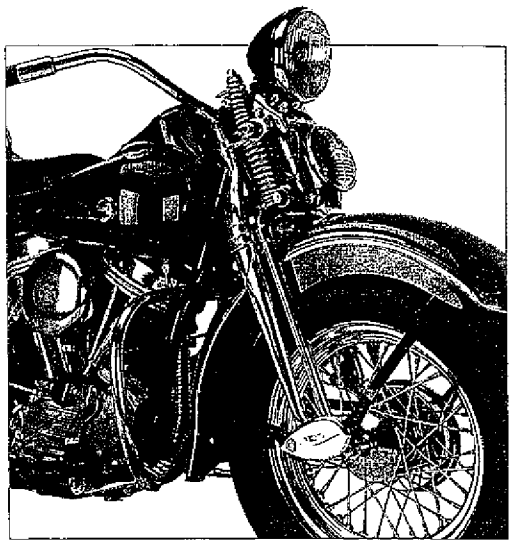
was not trouble-free, of course. From 1948 through 1952 the hydraulic lifters rode atop the pushrods, and a low oil supply could cause them to malfunction. In 1953 the lifters were relocated to housings above the timing case.

Other changes in 1948 included the gear shift mechanism, which was reversed to put first gear at the rear and fourth in front. Speedometer faces were color matched to the motorcyle, and the debut of the relatively bright azure blue captured a measure of attention. Detractors naturally refered to it as baby blue.

The Panhead enjoyed considerable success for a first-year model. Nearly 13,000 rolled out of Milwaukee in E and F form and total Harley-Davidson production was 29,612, a new peacetime record. National advertising programs were underway once again, easy-payment plans revived, motorcycle racing had resumed and the peaceful highways of the good old U.S.A. beckoned.

And Harley-Davidson was ready with new motorcycles. Improved, too.

Right: Aluminum heads, hydraulic lifters and cake pan valve covers distinguished the Panhead from the Knucklehead. In most other respects, the engines were identical.



Right: The first Panhead was also the first big twin with the wishbone frame, featuring bowed front downtubes.

Left: The front fork assembly and springs were originally painted black. The springer front end would be gone the following year, but would magically reappear 40 years later.

1948 FL
Owner – Mike Lady
Arroyo Grande, California
Restored by Scott Ashley

1951 FL

Specifications
Engine/Drivetrain
Engine: OHV 45° V-twin
Displacement: 73.77ci (1208.19cc)
Bore & stroke: 3.44 x 4in (87 x 102mm)
Compression ratio: 7:1
Horsepower: 55 hp @ 4,800rpm
Carburation: 1 Linkert 33 2mm S/cheleine
Transmission: 4-speed
Primary drive: Chain
Final drive: Chain
Brakes: F & R, Drum
Battery: 6-volt
Ignition: Coil/points

Chassis/Suspension
Frame: Steel, double downtube
Suspension: Telescopic fork
Wheelbase: 59.5in (151.1cm)
Weight: 590lb (267.6kg)
Fuel capacity: 3.75gal (14.2lt)
Oil capacity: 1gal (3.78lt)
Tires: 5.00 x 16in (12.7 x 40.6cm)
Top speed: 100mph (161kph)
Colors: Brilliant black; persian red; mid-blue
Number built: 6,560
Price: $900

NEWER! MORE IMPROVED! HARLEY-DAVIDSON LEAPED INTO THE HYDRA-GLIDE

NEWER! MORE IMPROVED! Harley-Davidson leaped into the present in 1949 with the introduction of the Hydra-Glide front fork. Not long after the war, Milwaukee realized that more British and European motorcycles were headed for the U.S.A. And that the imported machines had hydraulic suspension systems. And that these motorcycles were fast.

How the foreign makes would be received by American riders, that remained uncertain in 1950. But Harley-Davidson was not so hidebound by tradition that they could wait and see. Even though Indian was in serious decline, that meant only that new competitors would arise. So development and refinement of the big twins continued, albeit with the measured pragmatism for which Milwaukee was known.

The Hydra-Glide fork served two functions. With two hydraulic/spring tubes, more compliant suspension brought a smoother ride. Secondly, it looked more contemporary. For both cars and motorcycles, the trend in the 1950s was to cover up more of the mechanical bits. Designers moved to more rounded, seamless shapes that reflected the New Modern Age.

The styling shift was also apparent in the fenders, more deeply skirted, one-piece units with contours unbroken by seams or stripes. Parking lamps adorned the upper fork cover and the horn was moved down between the frame tubes. The fuel tanks still carried the subdued nameplate, created by automotive designer Brooks Stevens, that first appeared in 1947. In 1951 the nameplates changed to a script-style logo on a bar background.

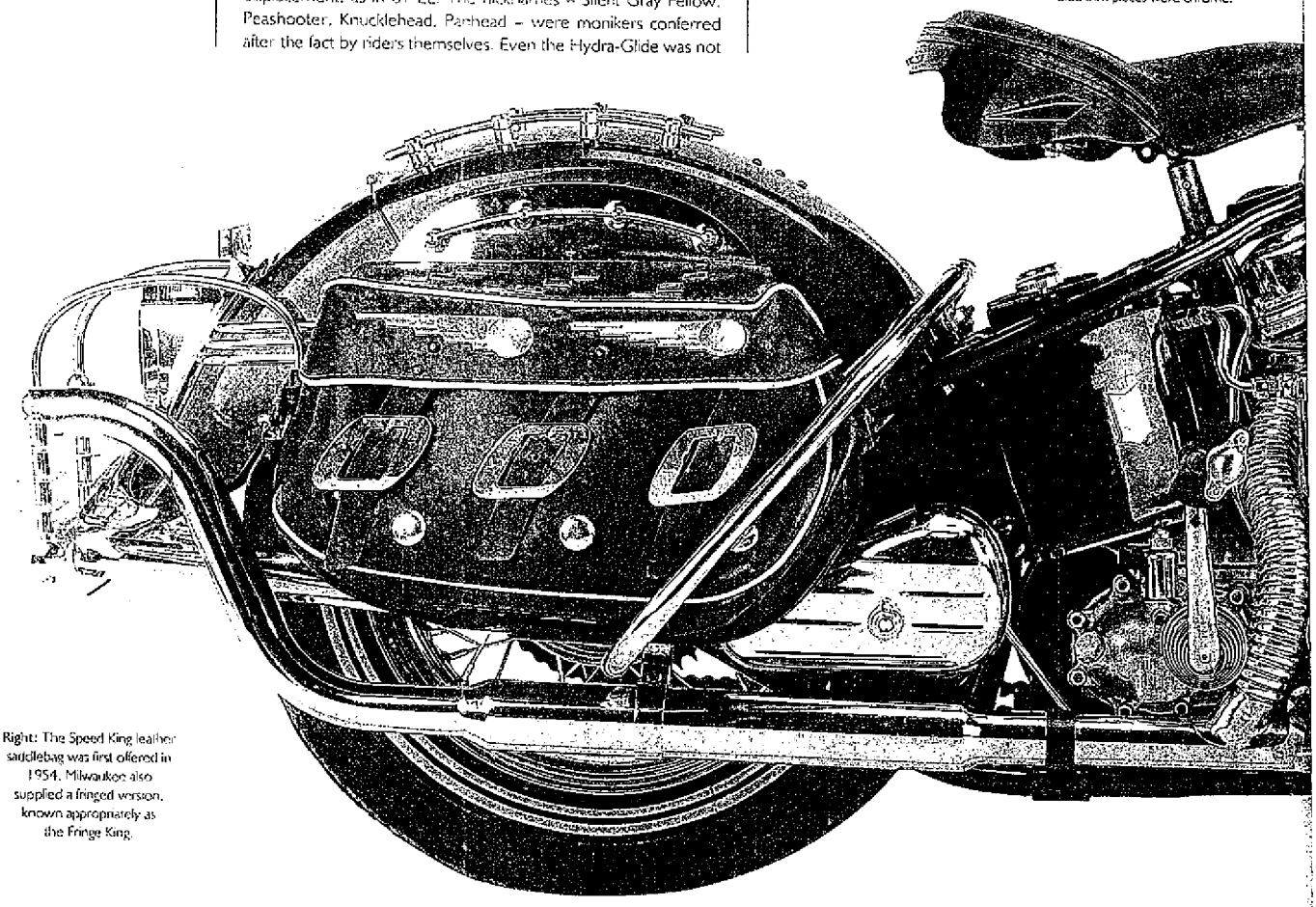
It was during this period that Milwaukee discovered what's in a name. Harley-Davidson motorcycles had always been designated only with model letters preceded by a number indicating engine displacement, as in 61 EL. The nicknames – Silent Gray Fellow, Peashooter, Knucklehead, Panhead – were monikers conferred after the fact by riders themselves. Even the Hydra-Glide was not actually a model name, but rather a label for the new front fork.

In 1952 The Motor Company (a contraction by early employees) used Hydra-Glide as a distinct model name on the order blanks. Three years later the two-stroke S model became the Hummer, and in 1957 the new XL would be christened with one of motorcycling's most winning appellations, the Sportster. And a year later, when the first big twin with shock absorbers at both ends rolled off the line, its title was prominently displayed on the front fender: Duo-Glide. Since then, but for racing models, no Harley-Davidson has gone nameless down the road.

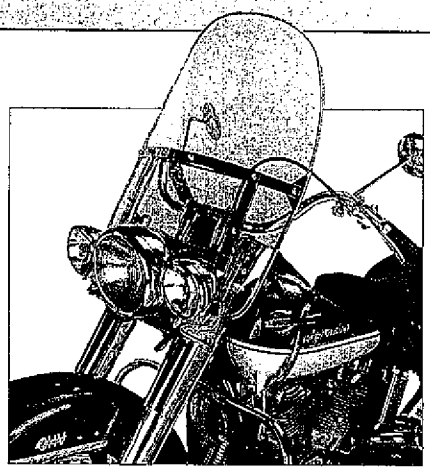
Rewind to 1950: concurrent with the drift to less ornate motorcycles came increasing options in accessories. Milwaukee had noted the pride most riders took in outfitting the machines according to their individual tastes. The term Full Dress entered the lexicon, later distilled to Dresser, meaning a motorcycle bedecked in full touring regalia. Harley-Davidson expanded both its line of add-on hardware and the selection of functional yet fashionable motorcycling apparel.

The Panhead was effectively Milwaukee's first easy rider. A big motorcycle, topping 600 pounds (272kg) fully dressed, built for comfort not for speed. Yes, it could be pushed to 100mph (161km/h) and the rubber-mounted handlebar ignored some of the vibration, but the engine was not happy. The adult portion of the 55 horsepower lived between 3,500 and 4,500rpm, plenty enough to motor smartly along. A larger front brake offered a bit more assistance in getting the big twin slowed down.

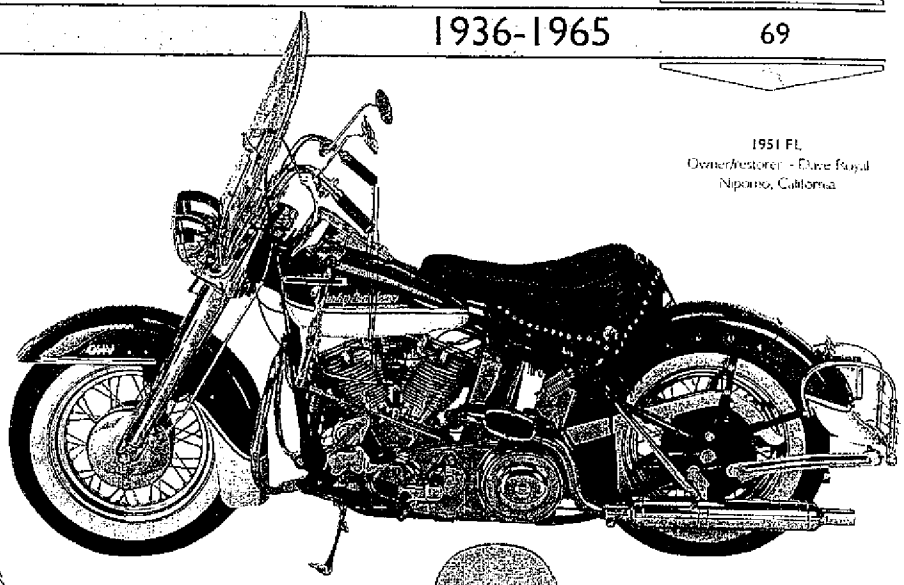
Below: This rendition of the Deluxe Solo Seat first appeared in 1955. Side trim pieces were chrome.



Right: The Speed King leather saddlebag was first offered in 1954. Milwaukee also supplied a fringed version, known appropriately as the Fringe King.



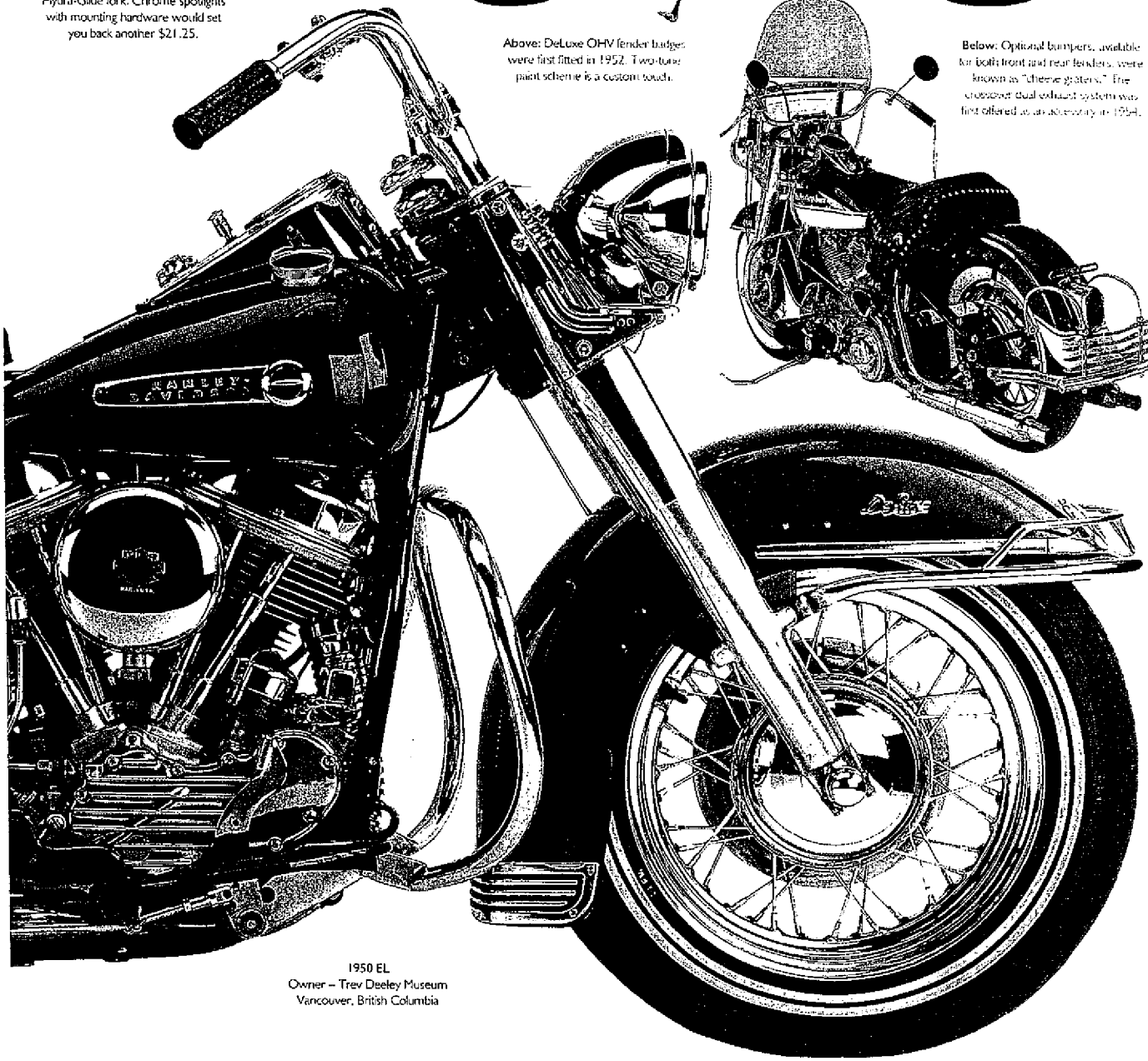
Above: The solo windshield was a $21.00 option for the 1951 FL with Hydra-Glide fork. Chrome spotlights with mounting hardware would set you back another $21.25.



1951 FL
Owner/restorer – Bruce Royal
Nipomo, California

Above: DeLuxe OHV fender badges were first fitted in 1952. Two-tone paint scheme is a custom touch.

Below: Optional bumpers, available for both front and rear fenders, were known as "cheese graters." The crossover dual exhaust system was first offered as an accessory in 1954.



1950 EL
Owner – Trev Deeley Museum
Vancouver, British Columbia

FLF (1952)

Some of the veteran Harley-Davidson fraternity, now accompanied by a growing sorority, were stunned with the 1952 option of foot-shift (the designation for this version being FLF). Many riders never considered the foot-clutch/hand-shift system a major inconvenience. That's how cars operated, so what the hell. But most, after riding one and swapping the functions of hand and foot, noted the new ease of riding in traffic. In retrospect, the old method was monkey motion.

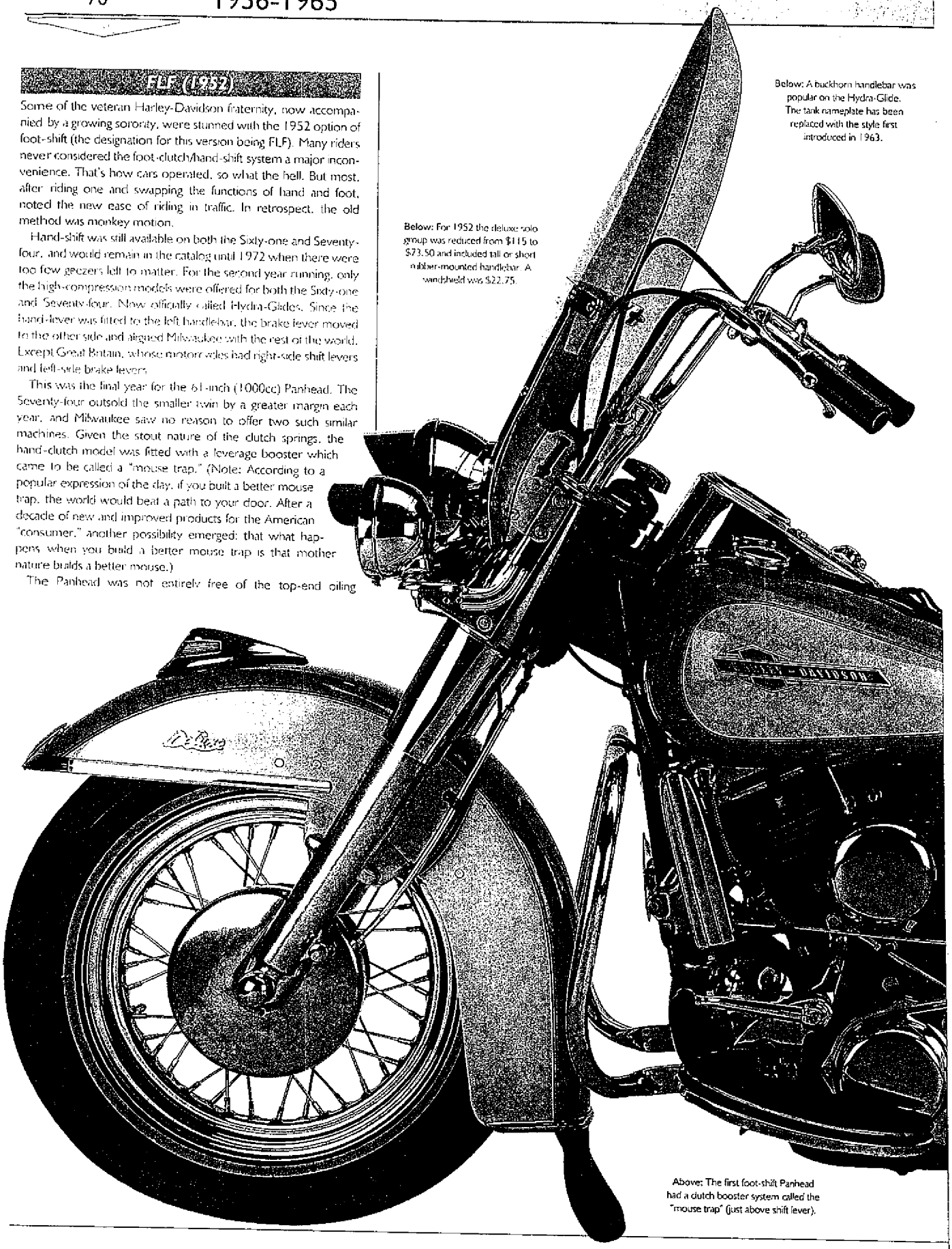
Hand-shift was still available on both the Sixty-one and Seventy-four, and would remain in the catalog until 1972 when there were too few geezers left to matter. For the second year running, only the high-compression models were offered for both the Sixty-one and Seventy-four. Now officially called Hydra-Glides. Since the hand-lever was fitted to the left handlebar, the brake lever moved to the other side and aligned Milwaukee with the rest of the world. Except Great Britain, whose motorcycles had right-side shift levers and left-side brake levers.

This was the final year for the 61-inch (1000cc) Panhead. The Seventy-four outsold the smaller twin by a greater margin each year, and Milwaukee saw no reason to offer two such similar machines. Given the stout nature of the clutch springs, the hand-clutch model was fitted with a leverage booster which came to be called a "mouse trap." (Note: According to a popular expression of the day, if you built a better mouse trap, the world would beat a path to your door. After a decade of new and improved products for the American "consumer," another possibility emerged: that what happens when you build a better mouse trap is that mother nature builds a better mouse.)

The Panhead was not entirely free of the top-end oiling

Below: A buckhorn handlebar was popular on the Hydra-Glide. The tank nameplate has been replaced with the style first introduced in 1963.

Below: For 1952 the deluxe solo group was reduced from $115 to $73.50 and included tall or short rubber-mounted handlebar. A windshield was $22.75.

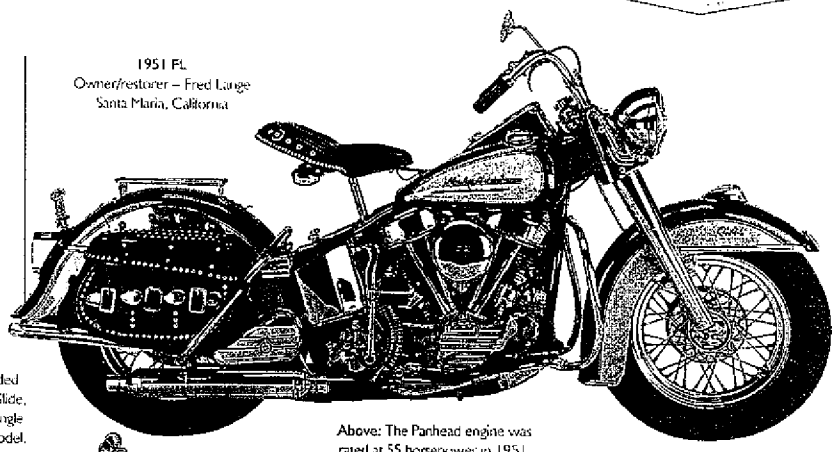


Above: The first foot-shift Panhead had a clutch booster system called the "mouse trap" (just above shift lever).

problems that had nagged the Knucklehead. Difficulties with dirty oil clogging the lifters was addressed with a check valve and filter screen. This worked until the screen itself clogged up and choked the oil supply. The problem was eliminated in 1953 when the lifters moved from the tops to the bottoms of the pushrods.

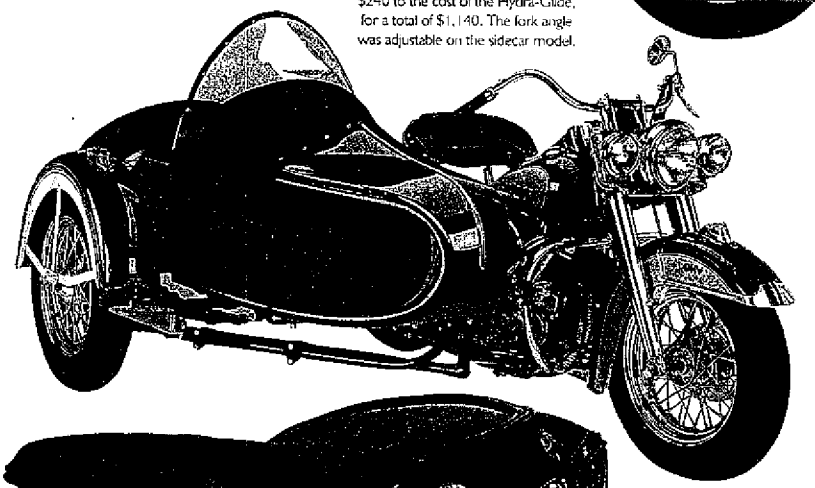
Another top end modification for 1952 was the rotating exhaust valve. In an effort to reduce the likelihood of burned valves, a cap between the valve stem and rocker allowed the valve to rotate when open. This worked to equalize the wear pattern and maintain good compression. The big twin muffler looked identical to the 1951 version, but new internals made it quieter. Thus the name change from the Mellow-Tone to the Low-Tone muffler.

1951 FL
Owner/restorer – Fred Lange
Santa Maria, California



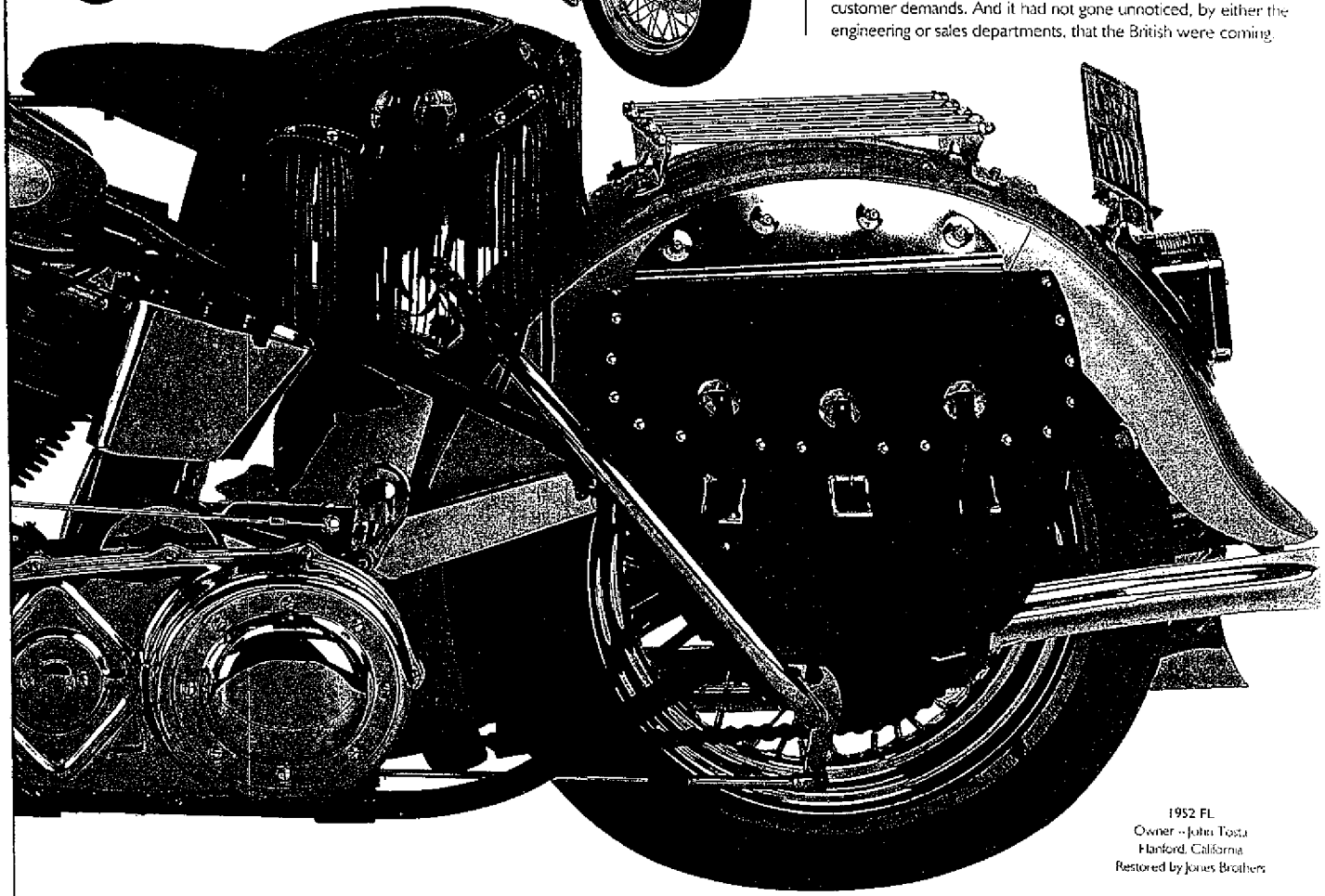
Above: The Panhead engine was rated at 55 horsepower in 1951.

Below: In 1951 the sidecar added $240 to the cost of the Hydra-Glide, for a total of $1,140. The fork angle was adjustable on the sidecar model.



Production numbers had remained about the same for three years. Motorcycling was competing with more types of recreation each year, and Milwaukee campaigned with dealers to promote the products locally. A large portion of the push for new riders focused on the new 45ci (750cc) K model, which replaced the old Forty-five. Hopes were high that a sportier middleweight would attract those riders being courted by the growing number of European motorcycle dealers in the U.S.

But despite a slipping market, the big twin still sold well. Milwaukee stuck to the development path of modifying or replacing one or two components at a time, as engineering and tooling costs were balanced with the vagaries of national economics and customer demands. And it had not gone unnoticed, by either the engineering or sales departments, that the British were coming.



1952 FL
Owner – John Tosta
Hanford, California
Restored by Jones Brothers

WR (1950) AND K (1952)

Now it was time for something almost completely different. Almost, because it was still a 45-inch (750cc) flathead, but otherwise a workhorse of an entirely different order. As the first D model of 1929 had begat the R of '32, which sired the W in 1937, the K model became the sole surviving son in the flathead family tree.

While the engine was entirely new, improved was another matter. The K engine was a thoroughly contemporary design, incorporating the transmission in the crankcases, foot-shifter on the right side and a hand clutch. And, compared to the Panhead, it looked downright sporty. But the style went unreflected by the machine's performance, which was widely described as moderate to mediocre. Some said it was just slow.

On the other hand, the K was the first Harley-Davidson with forks in the plural. One at the front and one at the rear, commonly called a swingarm. With hydraulic suspension at both ends, the motorcycle demonstrated better handling than its springer/rigid predecessor, but with 30 horsepower hauling 400 pounds (181kg) the envelope was lightly pushed. To Milwaukee's added misfortune, the K bike arrived just as the Korean War was heating up and overall motorcycle sales were in decline.

On yet another hand, the new flathead served well in racing trim. Since racing had resumed after the war, Harley-Davidson hadn't won at Daytona Beach. Six times in a row the competition had prevailed, and for the last four years running the victor had ridden a British Norton. This caused some moodiness in Milwaukee, which had won three of the five pre-war events. Corrective measures would be taken.

The racing version, designated the KR, wasn't ready until the 1953 season. Paul Goldsmith was equipped with a 37-horsepower version and won convincingly at Daytona, upping the average speed by nearly seven mph (11.2km/h). A BSA victory interrupted Milwaukee's comeback the following year, but after that the Harley-Davidson would take first place in the next seven events in a row. Obviously there was still fight in the old flathead.

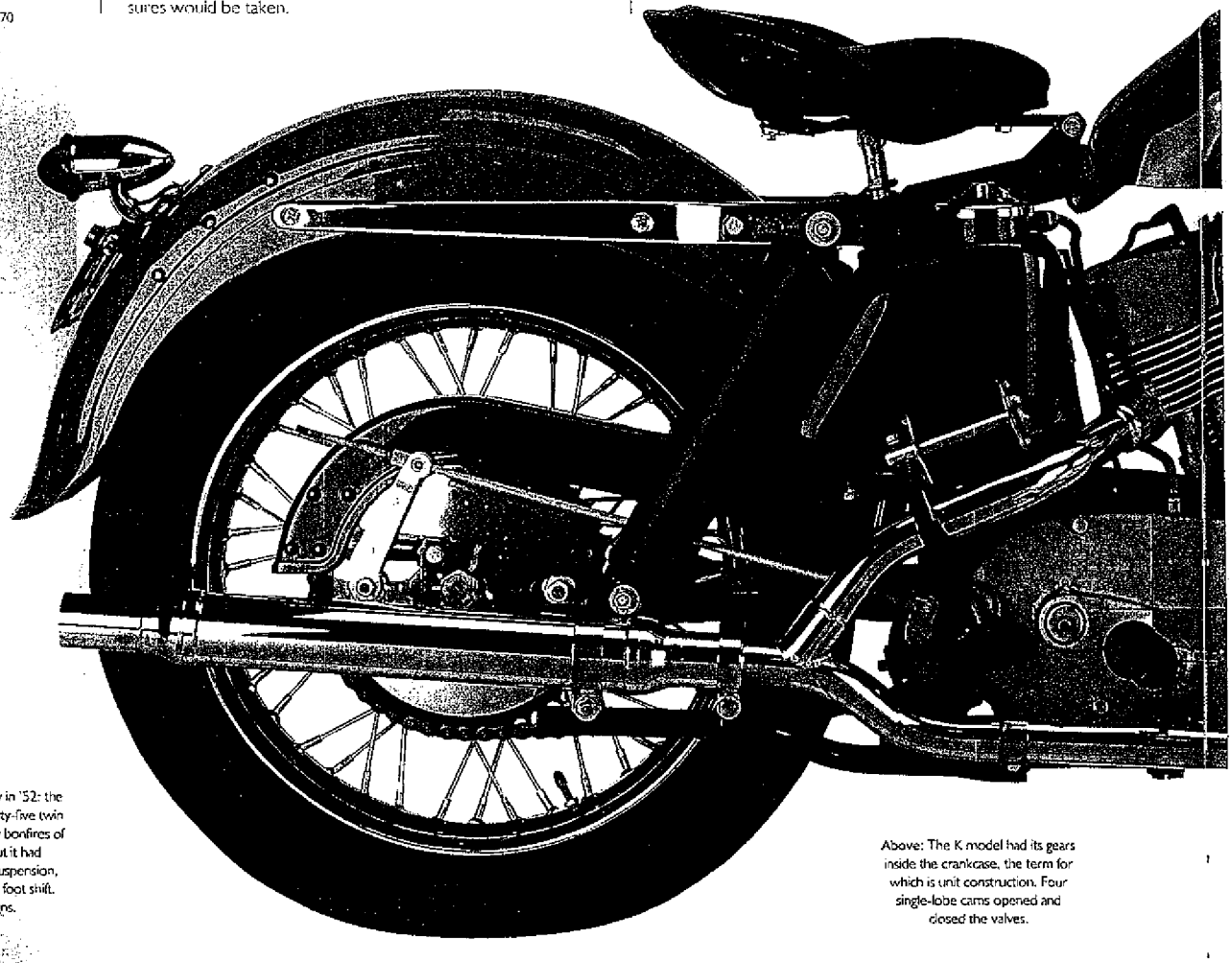
Out on the American highways it was another matter. Young hot-rodders hoping for a hopped-up Harley were getting smoked by overhead-valve 500cc Triumph and BSA twins. Milwaukee recognized the need for a sporting ohv motorcycle, and in fact had one in development, but cautionary advance was still the rule. Racing had shown that more power could be had from the flathead, and the simple route was an increase in displacement. Development work on a single-cam, overhead-valve engine designated the KL, was shelved. Work would proceed on an ohv engine called the XL, based on the K model's four-cam configuration.

So the K model, as a 750, lasted only two years. For 1953, pepper red replaced persian red as a standard color, rio blue was supplanted by glacier blue and forest green was added to the list. Cavalier brown, glamour green and white were the optional colors available at extra charge. Buyers had the option of 18- or 19-inch (45.7 or 48.26cm) tires as standard equipment, and for $2.00 extra could specify a 3.25 x 19 (8.26 x 48.26cm) or 3.50 x 18 (8.9 x 48.26cm) front and 4.00 x 18 (10.16 x 45.7cm) rear. Total production on the K model for two years was 3,693.

1952 K

Specifications
Engine/Drivetrain
Engine: Flathead 45° V-twin
Displacement: 45.32ci (742.66cc)
Bore & stroke: 2.75 x 3.81in (70 x 97mm)
Compression ratio: 6:1
Horsepower: 30
Carburetion: Linkert
Transmission: Unit 4-speed
Primary drive: Duplex chain
Final drive: Chain
Brakes: F. & R. Drum
Battery: 6-volt
Ignition: Coil/points

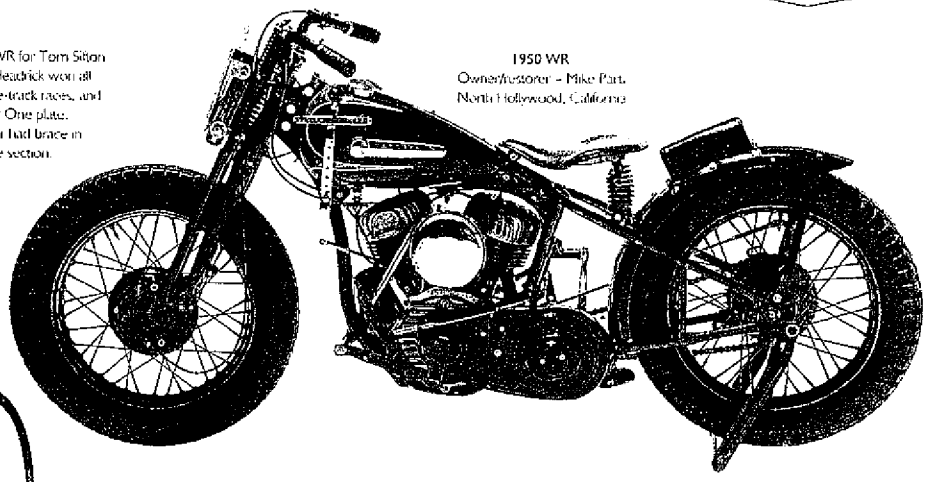
Chassis/Suspension
Frame: Steel, single downtube
Suspension: F. Hydraulic spring fork, R. Hydraulic spring shocks
Wheelbase: 56.5in (143.5cm)
Weight: 400lb (181kg)
Fuel capacity: 4.5gal (17.03lt)
Oil capacity: 3qts (2.84lt)
Tires: 3.25 x 19in (8.26 x 48.26cm)
Top speed: 80mph (129km/h)
Colors: Black; persian red; rio blue (option; bronco bronze metallic)
Number built: 1,970
Price: $865



Right: Brand new in '52: the Sports Model Forty-five twin didn't ignite many bonfires of popularity. But it had swingarm rear suspension, hand clutch and foot shift. Good signs.

Above: The K model had its gears inside the crankcase, the term for which is unit construction. Four single-lobe cams opened and closed the valves.

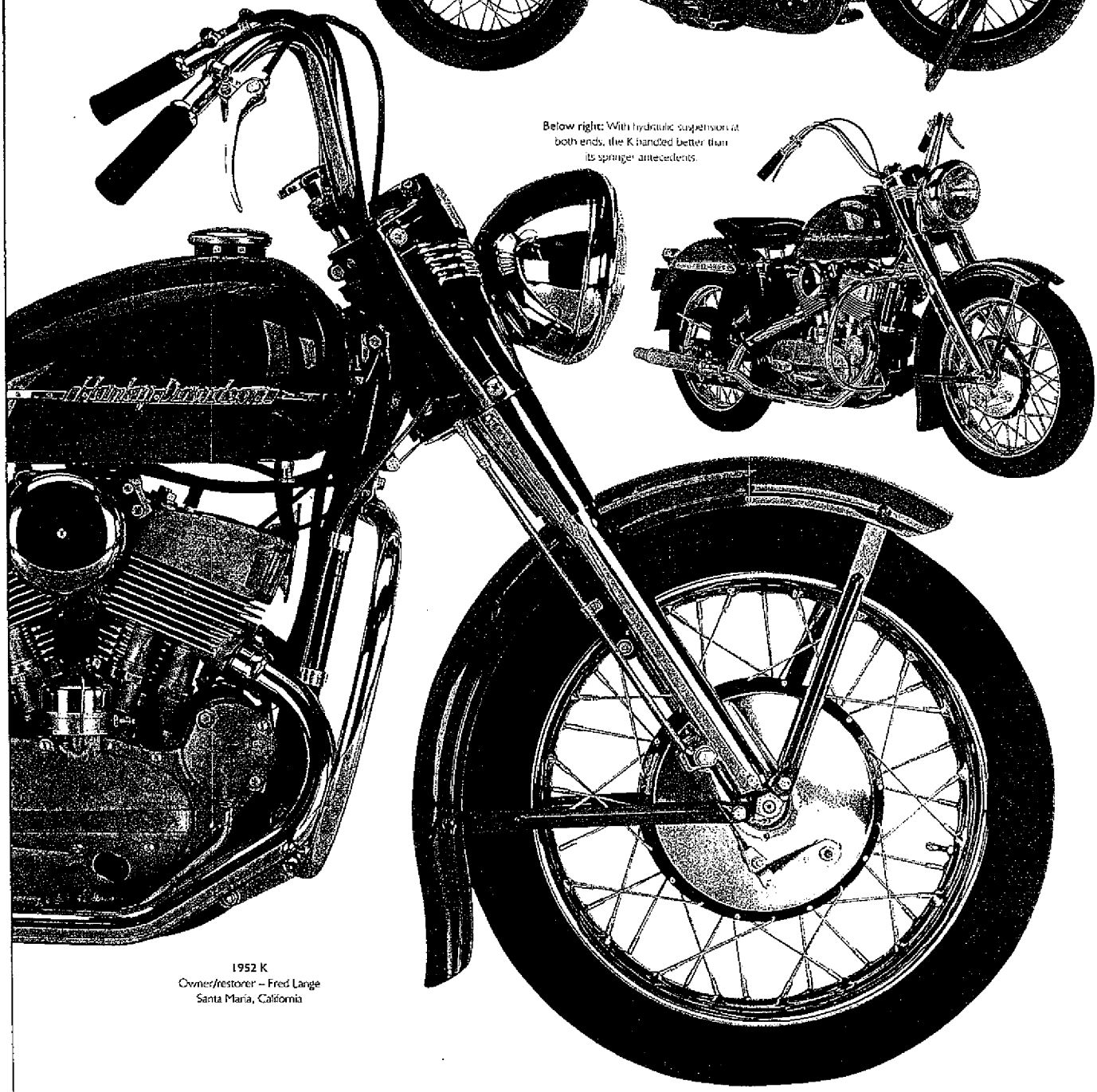
Right: Riding the WR for Tom Sifton in 1950, Larry Headrick won all three national mile-track races, and the Number One plate. The dirt tracker had brace in rear frame section.



1950 WR
Owner/restorer – Mike Part,
North Hollywood, California

Below: Riders could choose either buckhorn handlebar (shown) or the lower speedster bar.

Below right: With hydraulic suspension at both ends, the K handled better than its springer antecedents.



1952 K
Owner/restorer – Fred Lange
Santa Maria, California

FLH (1955) AND SERVI-CAR (1955)

Harley-Davidson was now the only remaining manufacturer of motorcycles in the USA. A welcome but sobering thought in Milwaukee, since the tide of British and European competitors continued rising.

Milwaukee had jacked up the performance curve on the K model in 1954, and decided that the FL was also eligible for more muscle. The first of several new components was an improved intake manifold, employing O-rings to improve sealing and accommodate a measure of vibration. Intake tracts were cast into the new heads, eliminating the threaded nipples used before.

The new hot-rod heavyweight appeared in mid-1955 and was naturally designated the FLH. (H representing, as it always had, Hopper!-up, a term originally coined to describe the behavior of some Milwaukee beer drinkers.) Compression ratio was up to 8.0:1 and the H was rated at 60 horsepower. The bottom end was given stoutness in the form of stronger cases and bigger bearings. The primary cases were redesigned, and for $15 could include the new optional compensating sprocket to diminish driveline lash. New aluminum rocker covers featured thick O-ring reinforcement. This hearty brew of high-performance was slightly quicker and several miles per hour faster than the standard FL.

The FL series also premiered a number of styling changes in 1955. The V-twin configuration was extended to the tank emblem, which incorporated a large V behind the Harley-Davidson script logo. A V-shaped medallion was also fitted to the front fender of the FL, FLH and KH models, a 1955-only feature. The new fork top panel was decorated with three diagonal stripes on each side, and the Hydra-Glide insignia was discontinued. The tombstone tail light was replaced by an oval unit with separate and adjustable license plate bracket.

Prices held steady in 1955 with the FL listed at $1,015. The FLH was priced $68 higher. All the big twins remained available with either hand or foot shift.

SERVI-CAR

As the post-war trends of motorcycle and automobile customizing and hot-rodding grew apace, the Servi-Car became a favored platform for all manner of outrageousness. The bodywork might be replaced by a throne, phone booth, outhouse or modified car body. The flathead V-twin was often removed in favor of a Detroit V-8, bristling with chrome and exhaust headers.

The Servi-Car evolved as Milwaukee's all-purpose, multiple-choice machine for work or play. In 1959 the factory replaced the Springer front end with the Hydra-Glide fork, and in 1964 the trike became the first Harley-Davidson ever fitted with an electric starter. The 3-wheeler extended the service life of the workhorse Forty-five all the way to 1973. When it was finally retired at the advanced age of 42 years, the Servi-Car was and remains the longest-running model ever made in Milwaukee.

The record will most likely be broken by the Sportster, which turns 43 in the year 2000. The Forty-five was, in effect, the Sportster's grandfather.

1955 FLH

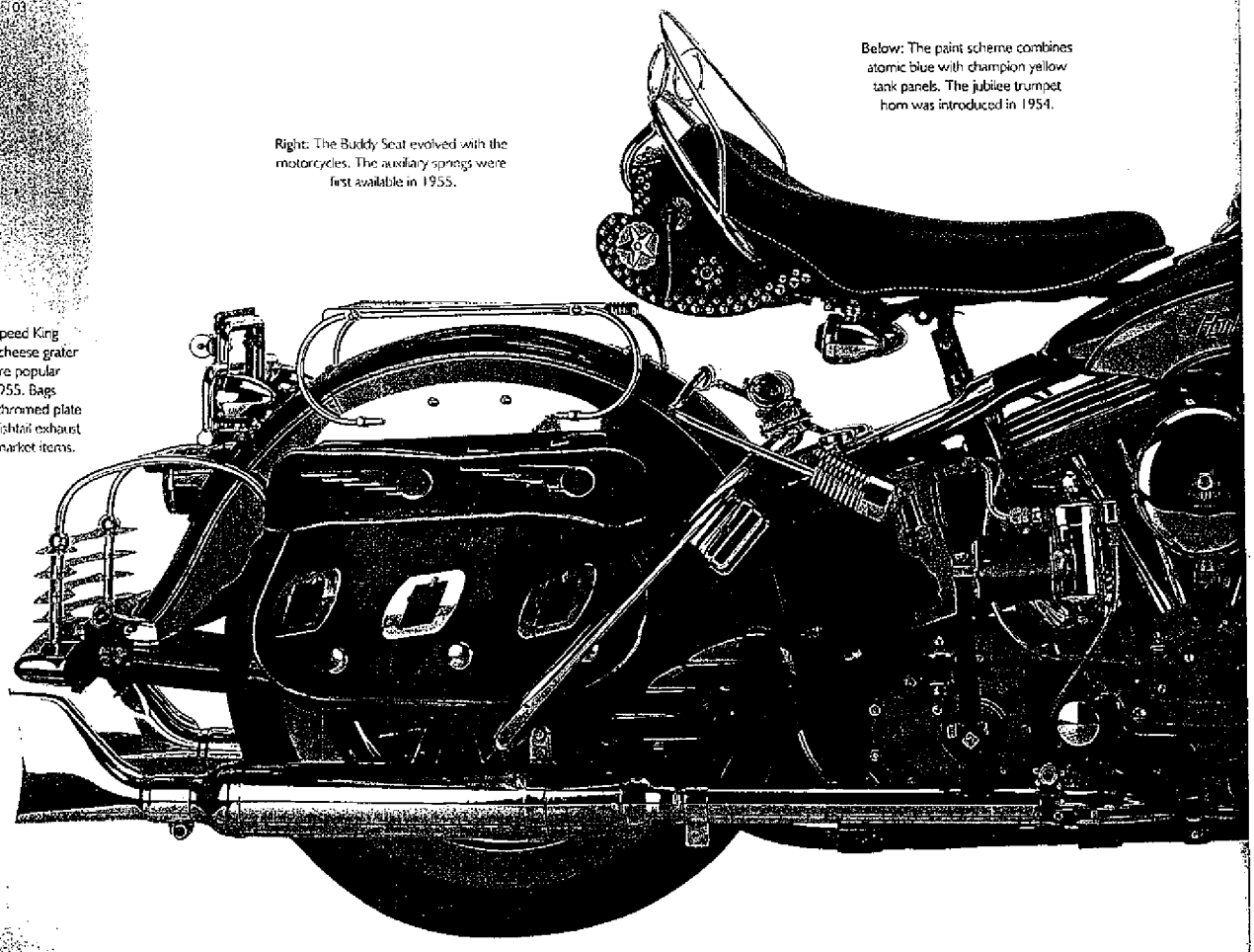
SPECIFICATIONS
ENGINE/DRIVETRAIN
Engine: OHV 45° V-twin
Displacement: 73.73ci (1208.19cc)
Bore & stroke: 3.44 x 4in (87 x 102mm)
Compression ratio: 8:1
Horsepower: 60 @ 4,800rpm
Carburetion: 1.31in (33.3mm) Schebler
Transmission: 4-speed
Primary drive: Chain
Final drive: Chain
Brakes: F & R, Drum
Battery: 6-volt
Ignition: Coil/points

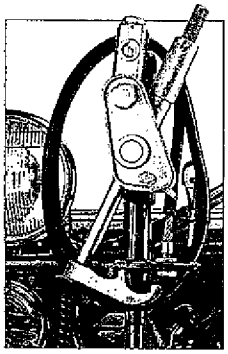
CHASSIS/SUSPENSION
Frame: Steel, double downtube
Suspension: Telescopic fork
Wheelbase: 59.5in (151.1cm)
Weight: 598lb (271.3kg)
Fuel capacity: 3.75gal (14.2lit)
Oil capacity: 1gal (3.78lit)
Tires: 5.00 x 16in (12.7 x 10.6cm)
Top speed: 105mph (169km)
Colors: Pepper red; atomic blue/anniversary yellow; aztec brown/black (option: hollywood green)
Number built: n/a
Price: $1,083

Right: The Speed King saddlebags and cheese grater bumpers were popular options in 1955. Bags attached to the chromed plate on the fender. Fishtail exhaust tips were aftermarket items.

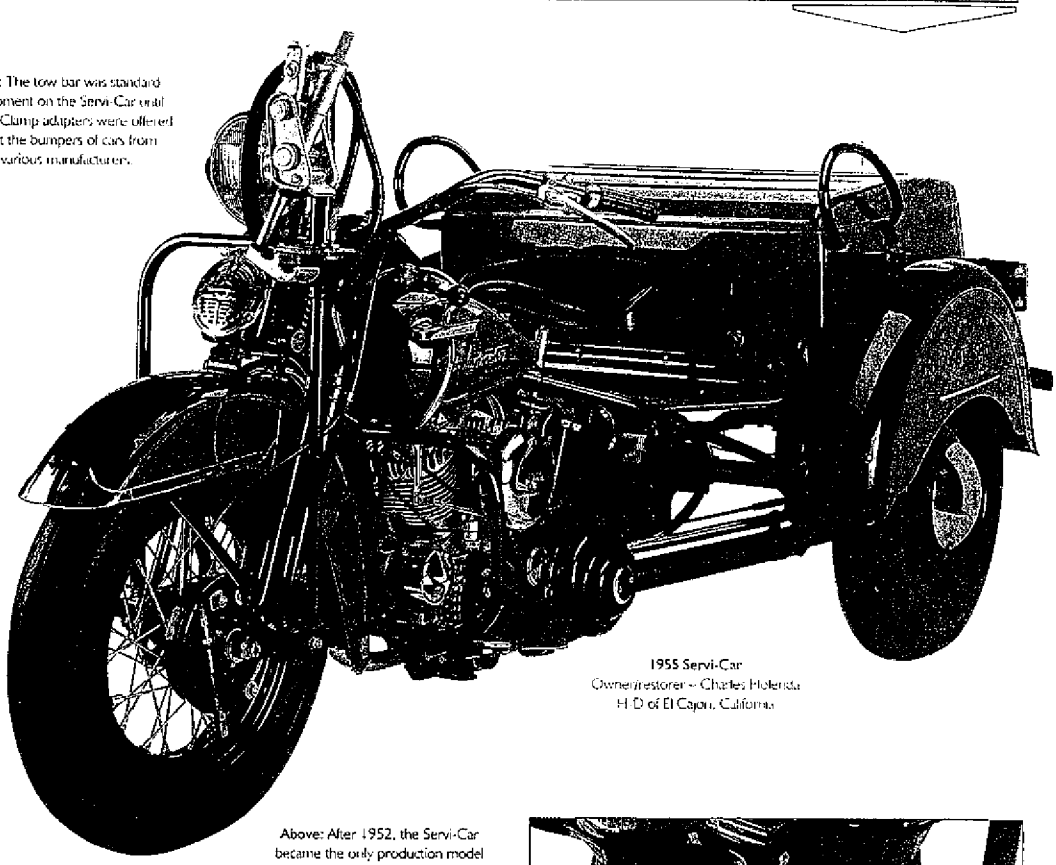
Right: The Buddy Seat evolved with the motorcycles. The auxiliary springs were first available in 1955.

Below: The paint scheme combines atomic blue with champion yellow tank panels. The jubilee trumpet horn was introduced in 1954.



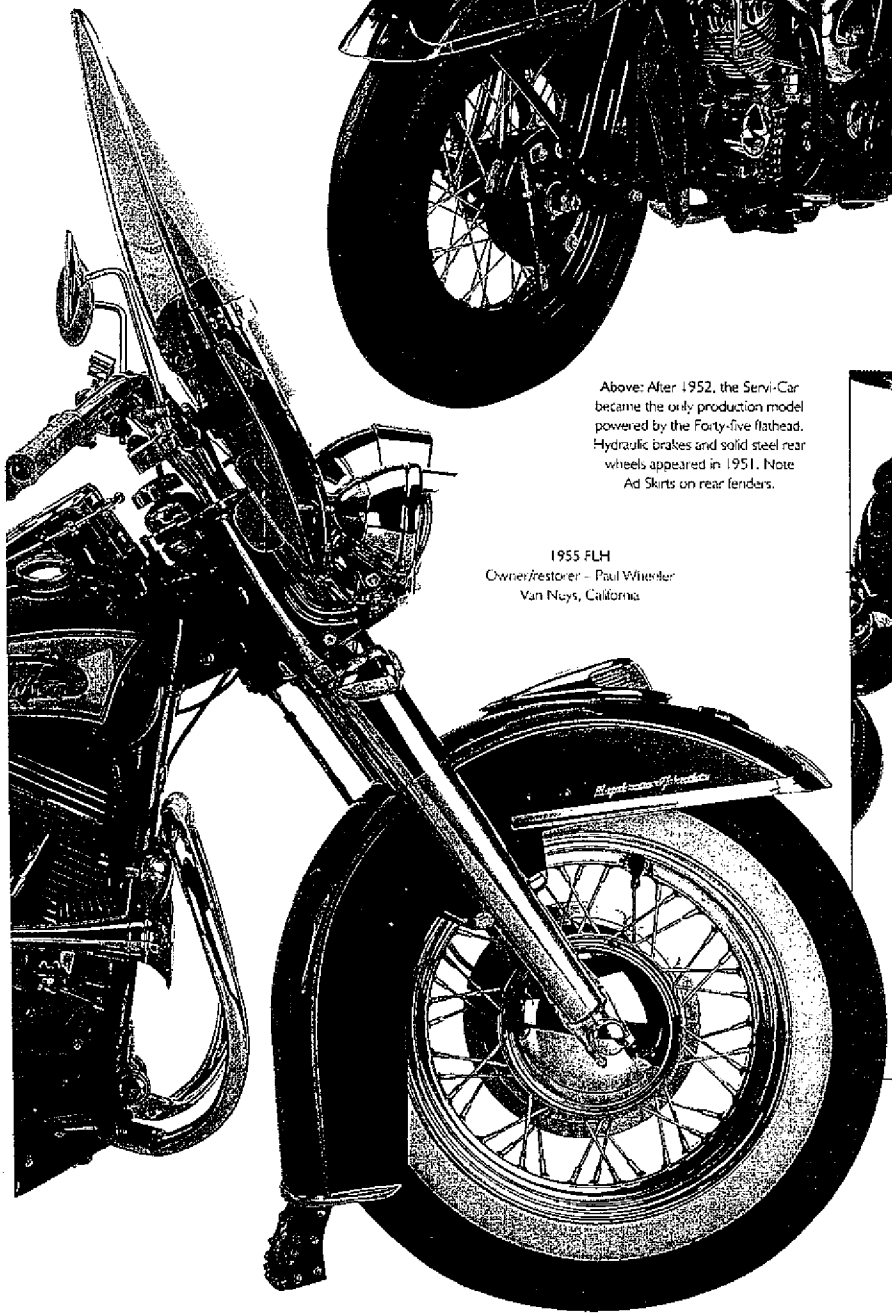


Left: The tow bar was standard equipment on the Servi-Car until 1963. Clamp adapters were offered to fit the bumpers of cars from various manufacturers.

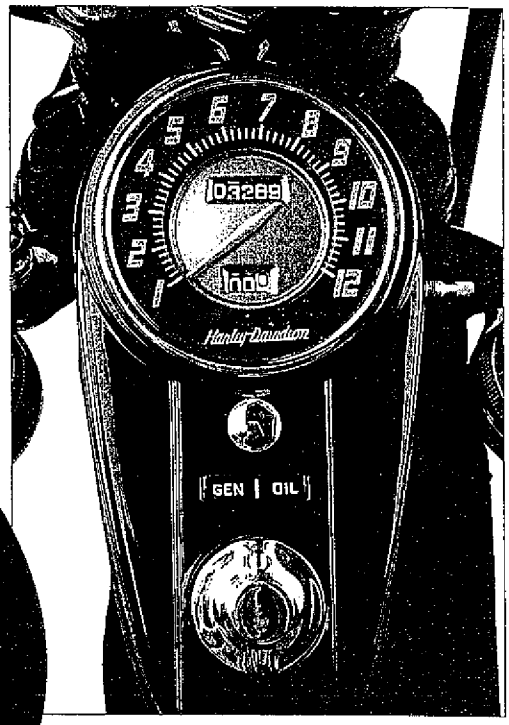


1955 Servi-Car
Owner/restorer – Charles Holeroft
H-D of El Capon, California

Above: After 1952, the Servi-Car became the only production model powered by the Forty-five flathead. Hydraulic brakes and solid steel rear wheels appeared in 1951. Note Ad Skirts on rear fenders.



1955 FLH
Owner/restorer – Paul Wheeler
Van Nuys, California



Above: The speedometer introduced in 1956 featured clock-style italic numerals painted in day-glo green. A gold center replaced the silver background used for two years prior.

KH (1955), KHK and KR (1956)

Following its customary letter designations, Milwaukee added an H to the K model in 1954. Fans seeking to apply some retrospective rationale to the Harley-Davidson lettering system have offered Hot, Heavy Duty and High Compression as possibilities. Hmm.

As an added letter, the H first appeared in 1915 as identification of a Fast Motor, Roadster Racer and a Track Racer. Then the letter disappeared from the roster until 1929, when the JD got an H to designate the twin-cam engine. So the mysterious H may simply be the traditional letter for the High performance version of an existing engine. Or Hero, or Hell-on-wheels.

In 1954 the H meant an additional three-quarter inch (19mm) of stroke, which upped the displacement to 54 cubic inches (883cc). This translated into a jumbo increase in torque and a tendency for the transmission gears to shred teeth. The gears were made stronger, and with its larger valves the KH cranked out a claimed 38 horsepower. Top speed was up to 95mph (153km/h), and according to a *Cycle Magazine* test, the new model was two seconds quicker in the quarter-mile. The elapsed time was 14.75 seconds.

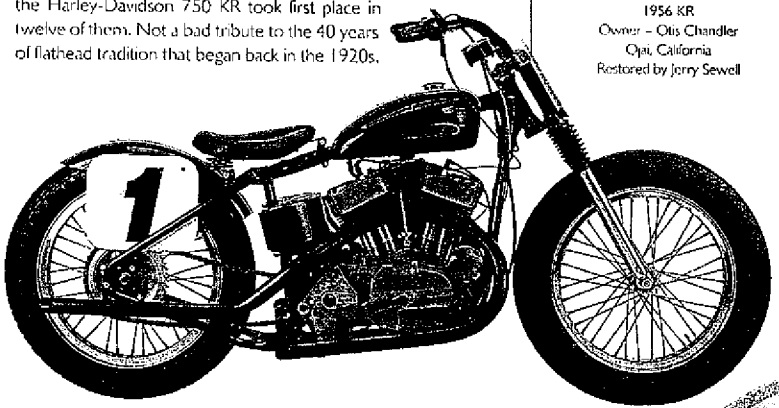
Next came the model KHK in 1955. (Alphabet historians will note that the K also first appeared in 1915, to designate a "stripped stock" racing model.) The extra K meant that for $68 a Speed Kit was installed at the factory, which included a roller-bearing bottom end, hot rod cams and polished ports. Unlike the earlier models, the transmission in the 1954-'56 K models could be accessed without splitting the cases. The bike weighed about 440 pounds (200kg).

In 1956 the KH was fitted with slightly shorter shock absorbers, although wheel travel remained the same. The oil pump was strengthened and the rear wheel got roller bearings in place of the former double-row ball bearings. The big twin tail light replaced the old bullet-style lamp, and a bold stroke of color appeared on the fuel tank. The model shown here features the new color, champion yellow.

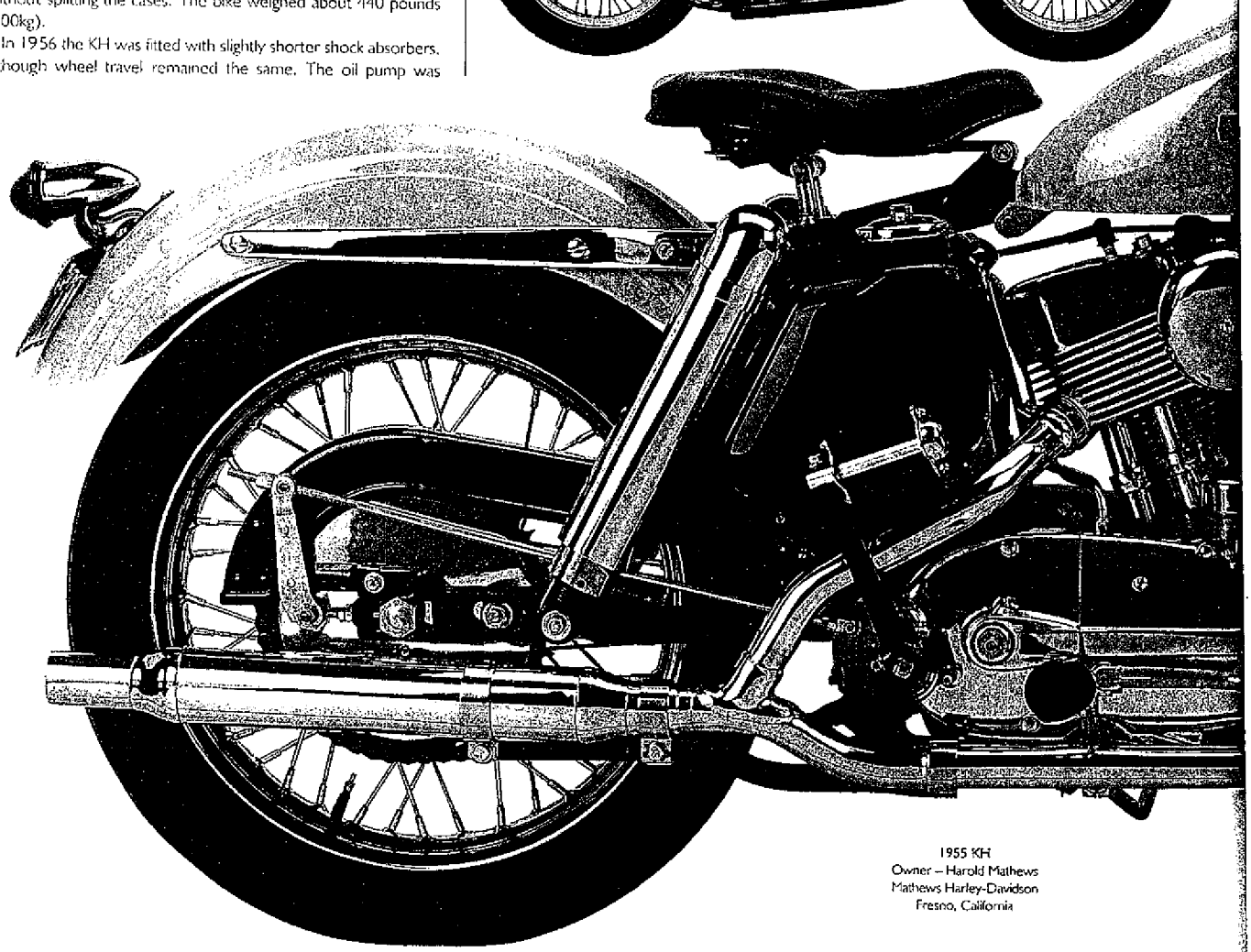
The K and KH models occupy a sort of curious niche in Harley-Davidson history, given their brief production runs. In its four-year span the total KH output was 2,824. Total production for the KHK was 1,163. The factory records are sketchy on the KR racing versions, but probably fewer than 500 were built over 15 years.

Although 1956 was the final year of the KH, its racing cousin the KR would carry on for more than a decade longer. Of the 15 Daytona national championship races from 1955 through 1969, the Harley-Davidson 750 KR took first place in twelve of them. Not a bad tribute to the 40 years of flathead tradition that began back in the 1920s.

Below: The KR won every Class C national race in 1956.



1956 KR
Owner – Otis Chandler
Ojai, California
Restored by Jerry Sewell



1955 KH
Owner – Harold Mathews
Mathews Harley-Davidson
Fresno, California

Below: Externally the KH and KHK were identical but for the decal on the oil tank and an extra K on the cases. KHK was the hot rod.

Left: The bold stroke of color on the '56 fuel tanks grabbed plenty of attention. The $68 speed kit brought the price of the KHK to $1,063. Standard tires were 4.50 x 18 at both ends.

Below: The Harley-Davidson logo with the V graphic was the new nameplate on the 1955 fuel tank. The new color was anniversary yellow. A new hue, hollywood green, was a $10 option.

1956 KHK
Owner - Otis Chandler
Ojai, California
Restored by Glenn Baker

Left: In 1954 the front brake carried a medallion commemorating Harley-Davidson's 50th anniversary. In 1955 the FLH, FL and KH sported a V medallion with the year, model and H-D script logo.

Above: The KH was a stroked K model. The 4.56-inch (116mm) stroke increased the displacement from 750 to 883cc.

XL (1957) THE SPORTSTER

1957 XL

Specifications
Engine/Drivetrain
Engine: OHV 45° V-twin
Displacement: 53.9ci (883cc)
Bore & stroke: 3.0 x 3.81in (76 x 97mm)
Compression ratio: 7.5:1
Horsepower: 40 @ 5,500rpm
Carburetion: Linkert
Transmission: Unit 4-speed
Primary drive: Duplex chain
Final drive: Chain
Brakes: F & R, Drum
Battery: 6-volt
Ignition: Coil/points

Chassis/Suspension
Frame: Steel, single downtube
Suspension: F, Telescopic fork; R, Hydraulic shocks
Wheelbase: 57in (144.8cm)
Weight: 495lb (225kg)
Fuel capacity: 4.4gal (16.7lt)
Oil capacity: 3qts (2.84lt)
Tires: 3.50 x 18in (8.9 x 45.72cm)
Colors: Pepper red/black; skyline blue/White; birch white/black; black/red. (Extra charge option: metallic midnight blue/white)
Number built: 1,983
Price: $1,103

Much like the Spanish Inquisition, few people were expecting the Sportster. Insiders knew that another overhead-valve twin was in the works, and that the new cylinders would be bolted to the K model bottom end. Hopes were not exceptionally high.

But the doubters were all but dumbstruck when the XL showed up lean and mean and ready for the green. Hot rodding had become a booming national sport in 1955. When the signal came from Detroit, in the form of the square-shouldered Chevrolet coupé with a 265ci (4.3lit) V-8, the flags went up. Horsepower in the streets. By 1957 "three-quarter race" engines were rumbling at stoplights all over this land. And ka-thumping right there alongside them were Harley-Davidson Sportsters.

The Sportster perpetuated its flathead forebears' tradition of a camshaft for each valve. In addition to allowing shorter and stronger camshafts, the 4-cam design provides the pushrods more direct paths to the rocker arms and simplifies adjustments to cam timing. In stock trim the XL motor made 40 horsepower at 5,500 rpm, and the compression ratio increased to 9:1. Exhaust valves were hardened with stellite facing, and the valves were much bigger than the flathead's. The engine retained the same stroke as the K model (3.81in, 97mm), but the cylinder bore grew a quarter inch to 3.0 (76mm). In comparative terms, the Sportster held a shorter-stroke engine that revved more quickly.

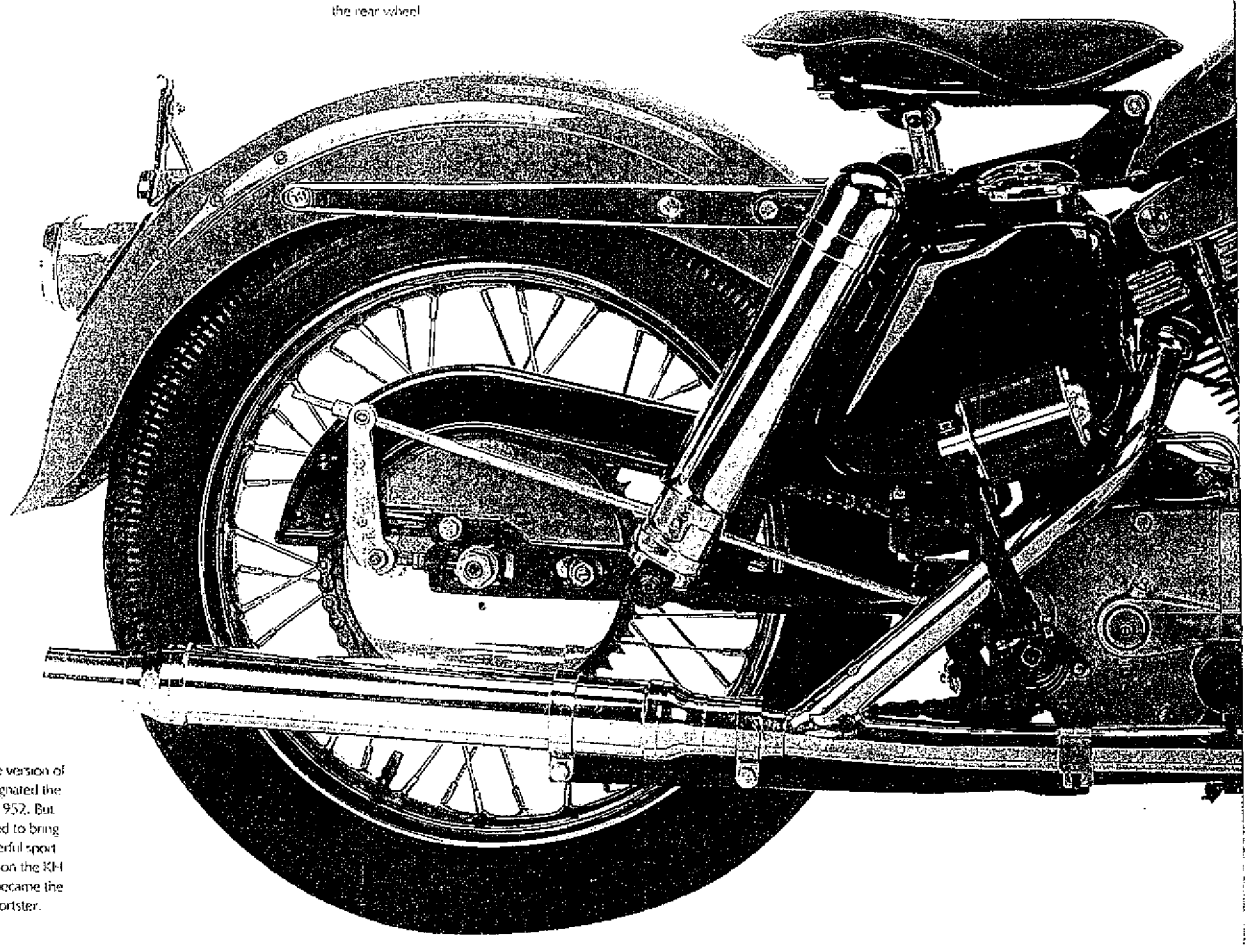
Some riders were surprised, given the Sportster's high-performance profile, that it appeared with cast iron rather than aluminum heads. Even though aluminum's superior heat dissipation was a proven factor, Milwaukee's experience with the early Panhead had been troublesome. Rather than risk similar problems with the Sportster, which had to confront the British twins from the get-go, Harley-Davidson went with the known quantity of cast iron. Heavier, yes, but durable and eminently do-able.

The first Sportster was obviously not an all-out roadburner, as indicated by the moderate state of tune. With its buckhorn bars and complement of accessories, the XL was designed as the middleweight sport-touring mount in the lineup. Only slightly more powerful, and barely faster than the KH, the 495-pound (225kg) machine reflected more of the style of high performance than the substance. The large fuel tank and full rear fender made the motorcycle look more like a shrunken Panhead than a serious backroad blaster.

And sure enough, the Sportster had barely hit the streets when sport riders and racers took up the call for a lighter and faster example. The potential was obviously there: overhead valves, unit construction transmission, hemispherical combustion chamber

Below: Standard Sportster tires were 3.50 x 18 front and rear. For off-road use, a Goodyear Grasshopper was optional for the rear wheel.

Below: The Sportster saddle was the same as the standard KH seat. The Buddy Seat was an available option.

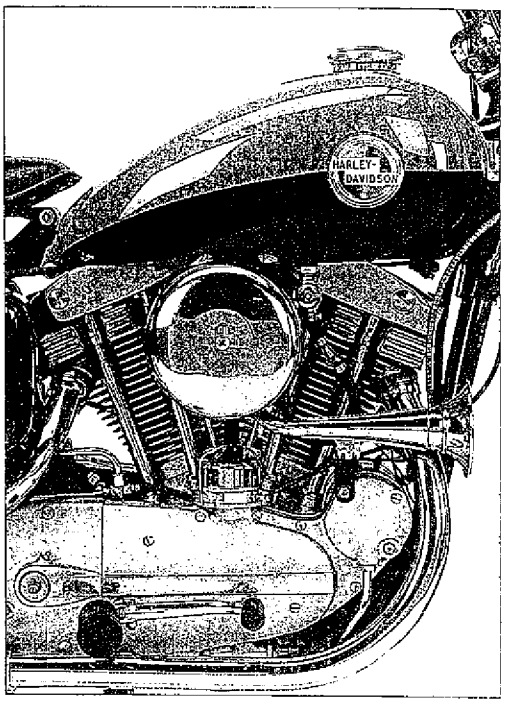


An overhead-valve version of the K model, designated the KL, was built in 1952. But Milwaukee, rushed to bring out a more powerful sport machine, decided on the KH flathead. The KL became the basis of the Sportster.

and room for bigger valves. The throttle jockeys became so persistent that Milwaukee set to work on a high-compression rendition for 1958. More about that later.

Even though the new model didn't stun the motorcycling world with its initial appearance or performance, the Sportster was obviously Milwaukee's boldest move in a long time. And although some compromises had been made to keep production costs in line, the XL made it apparent that Harley-Davidson wasn't about to forfeit a growing portion of the market to the British and European competition.

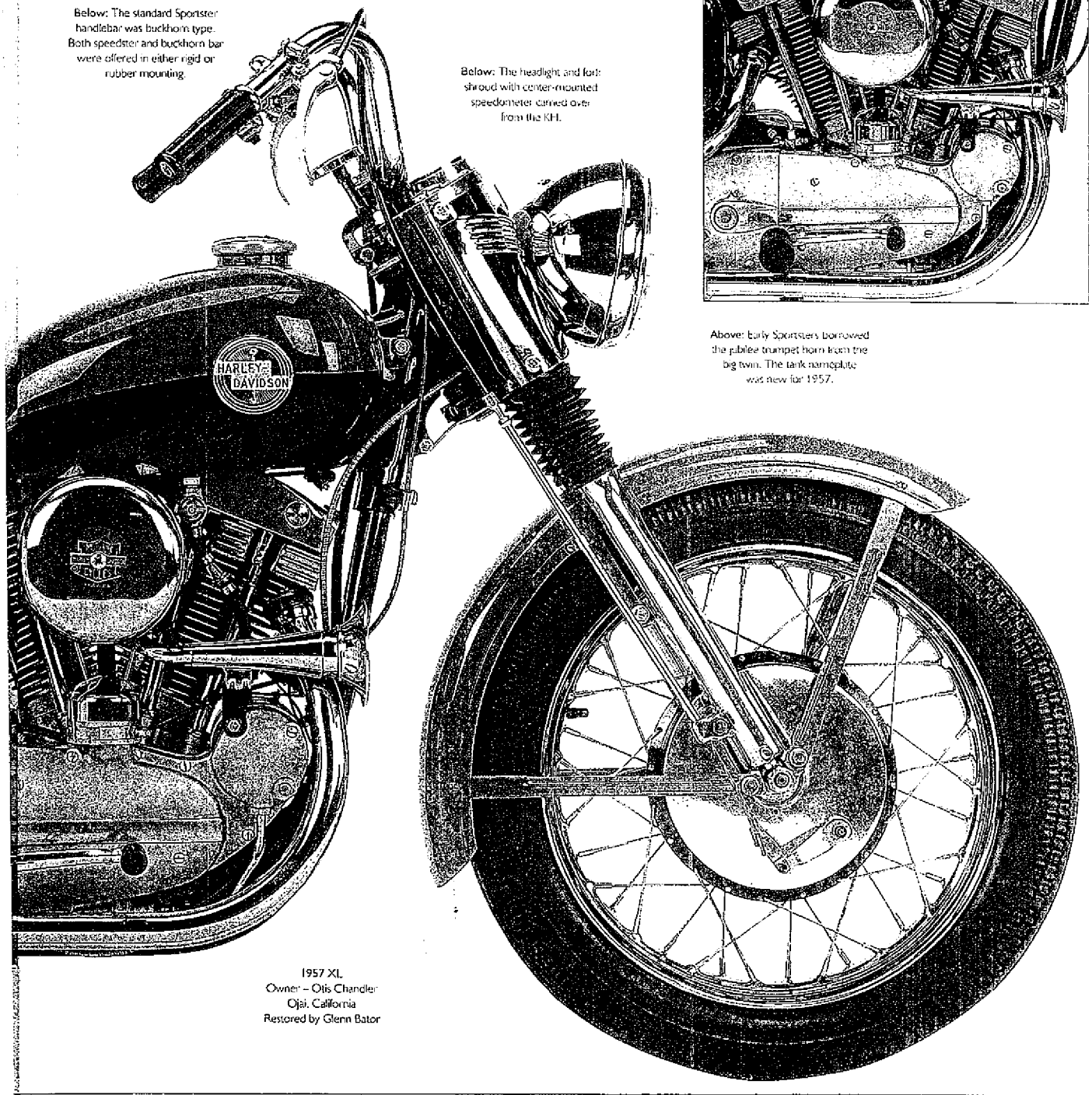
Right: Two versions of red/black paint scheme were offered in '57 pepper red with black tank panel and red fenders (shown), or black with red tank panel and black fenders.



Above: Early Sportsters borrowed the jubilee trumpet horn from the big twin. The tank nameplate was new for 1957.

Below: The standard Sportster handlebar was buckhorn type. Both speedster and buckhorn bar were offered in either rigid or rubber mounting.

Below: The headlight and fork shroud with center-mounted speedometer carried over from the KH.



1957 XL
Owner – Otis Chandler
Ojai, California
Restored by Glenn Bator

1958 FLH

Specifications
Engine/Drivetrain
Engine: OHV 45° V-twin
Displacement: 73.73ci (1208.19cc)
Bore & stroke: 3.44 x 3.97in (87 x 101mm)
Compression ratio: 7:1
Horsepower: 52
Carburetion: Schebler
Transmission: 4-speed
Brakes: F & R, Drum
Battery: 6-volt
Ignition: Coil-points

Chassis/Suspension
Frame: Steel, double downtube
Suspension: F, Telescopic forks. R, Hydraulic shocks
Wheelbase: 60in (152cm)
Weight: 648lb (294kg)
Fuel capacity: 3.75gal (14.2lt)
Oil capacity: 4qts (3.79 lt)
Tires: 5.00 x 16in (12.7 x 40.64cm)
Top speed: 100mph (161km/h)
Colors: Skyline blue/white, calypso red/white, sabre gray metallic/white, black/white (options: any standard solid color)
Number built: 3,178 (FL, 2,890)
Price: $1,320

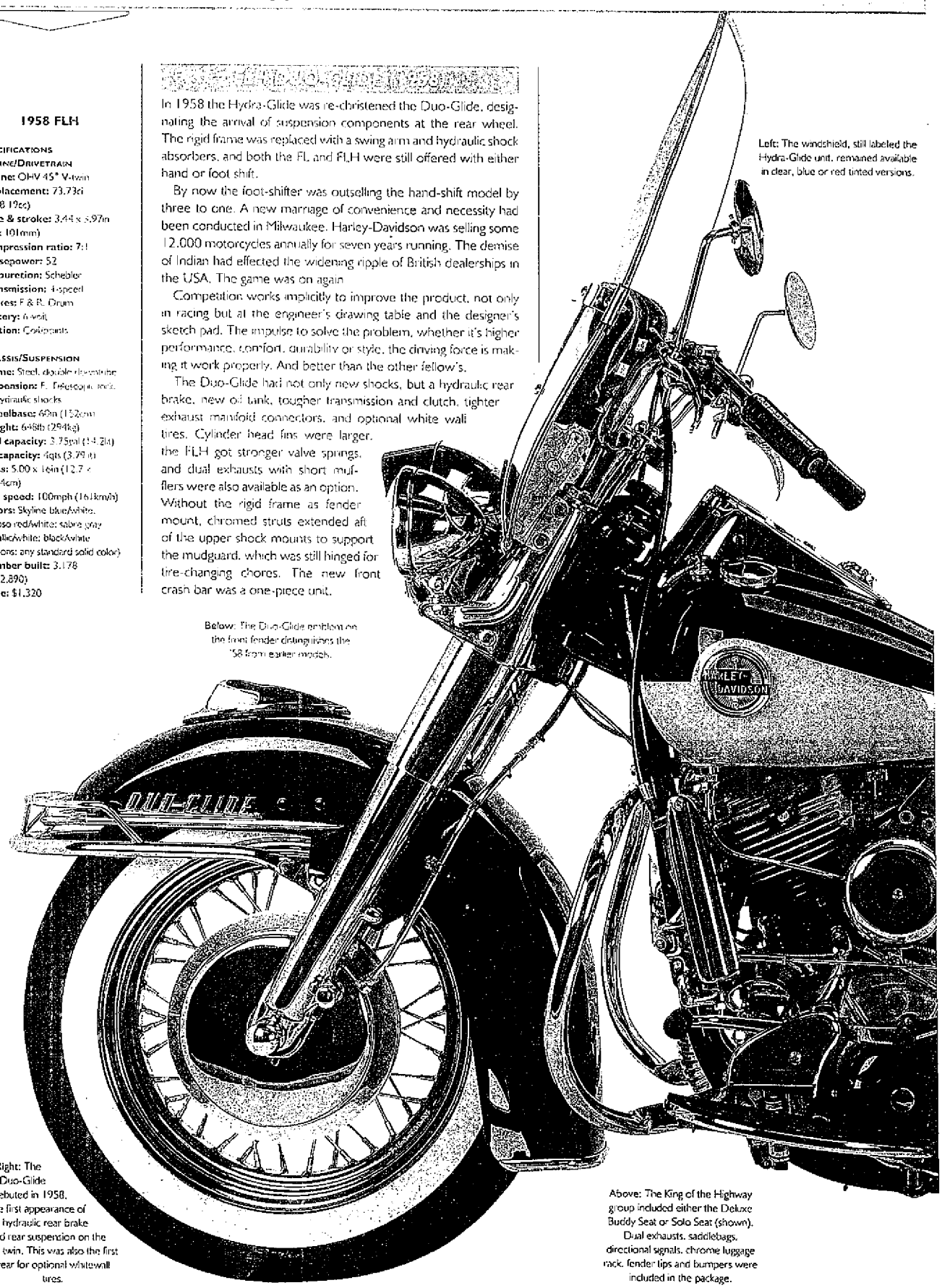
In 1958 the Hydra-Glide was re-christened the Duo-Glide, designating the arrival of suspension components at the rear wheel. The rigid frame was replaced with a swing arm and hydraulic shock absorbers, and both the FL and FLH were still offered with either hand or foot shift.

By now the foot-shifter was outselling the hand-shift model by three to one. A new marriage of convenience and necessity had been conducted in Milwaukee. Harley-Davidson was selling some 12,000 motorcycles annually for seven years running. The demise of Indian had effected the widening ripple of British dealerships in the USA. The game was on again.

Competition works implicitly to improve the product, not only in racing but at the engineer's drawing table and the designer's sketch pad. The impulse to solve the problem, whether it's higher performance, comfort, durability or style, the driving force is making it work properly. And better than the other fellow's.

The Duo-Glide had not only new shocks, but a hydraulic rear brake, new oil tank, tougher transmission and clutch, tighter exhaust manifold connectors, and optional white wall tires. Cylinder head fins were larger, the FLH got stronger valve springs, and dual exhausts with short mufflers were also available as an option. Without the rigid frame as fender mount, chromed struts extended aft of the upper shock mounts to support the mudguard, which was still hinged for tire-changing chores. The new front crash bar was a one-piece unit.

Below: The Duo-Glide emblem on the front fender distinguishes the '58 from earlier models.



Left: The windshield, still labeled the Hydra-Glide unit, remained available in clear, blue or red tinted versions.

Right: The Duo-Glide debuted in 1958, the first appearance of a hydraulic rear brake and rear suspension on the big twin. This was also the first year for optional whitewall tires.

Above: The King of the Highway group included either the Deluxe Buddy Seat or Solo Seat (shown). Dual exhausts, saddlebags, directional signals, chrome luggage rack, fender tips and bumpers were included in the package.

New bumpers for the front and rear fenders were introduced in '58. The tank nameplates were plastic, replaced a year later by metal. The color options included skyline blue/white, calypso red/white, sabre gray metallic/white and black/white.

In 1959 the circular nameplate was replaced by an oval background for a chrome arrow with Harley-Davidson inscribed. Like the previous badge, the new design was used for only two years. The foot-shift model had a neutral indicator light on the instrument panel. New metal front and rear fender tips replaced the plastic versions, and the toolbox featured an optional chrome cover.

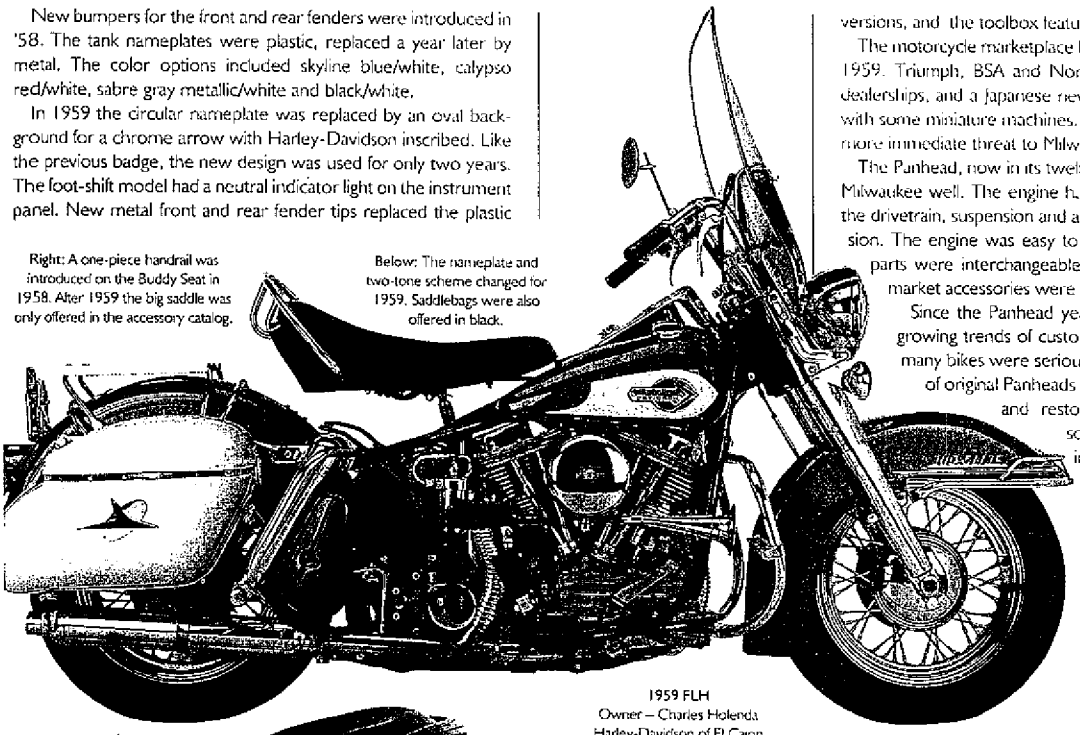
The motorcycle marketplace become a more crowded space in 1959. Triumph, BSA and Norton expanded their networks of dealerships, and a Japanese newcomer named Honda appeared with some miniature machines. The British challengers posed the more immediate threat to Milwaukee.

The Panhead, now in its twelfth year of production, had served Milwaukee well. The engine had remained largely unchanged as the drivetrain, suspension and accessories underwent steady revision. The engine was easy to work on, most of the important parts were interchangeable throughout the years and aftermarket accessories were multiplying.

Since the Panhead years (1948-65) coincided with the growing trends of customizing, drag racing and choppers, many bikes were seriously modified. As a result the prices of original Panheads have been leaping in recent years, and restoring these models has become something of a national cottage industry.

Right: A one-piece handrail was introduced on the Buddy Seat in 1958. After 1959 the big saddle was only offered in the accessory catalog.

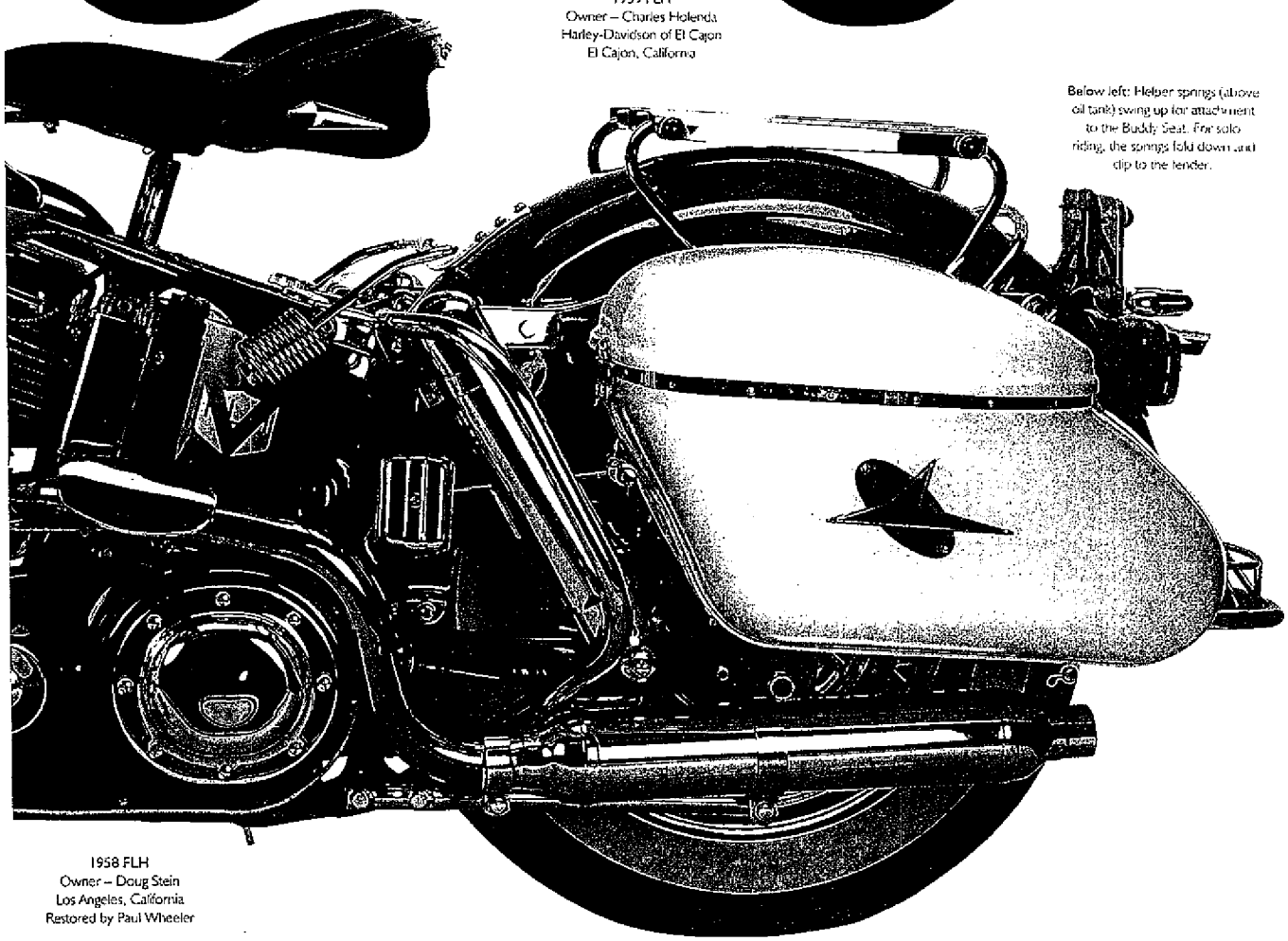
Below: The nameplate and two-tone scheme changed for 1959. Saddlebags were also offered in black.



Left: Standard exhaust was twice intrusive. Production for 1959: FLH - 3,344, FL - 2,423

1959 FLH
Owner – Charles Holenda
Harley-Davidson of El Cajon
El Cajon, California

Below left: Helper springs (above oil tank) swing up for attachment to the Buddy Seat. For solo riding, the springs fold down and clip to the fender.



1958 FLH
Owner – Doug Stein
Los Angeles, California
Restored by Paul Wheeler

1958 XLCH SPORTSTER

Specifications

Engine/Drivetrain
Engine: OHV 45° V-twin
Displacement: 53.9ci (883cc)
Bore & stroke: 3.0 x 3.81in (76 x 97mm)
Compression ratio: 9:1
Horsepower: 45
Carburetion: Linkert
Transmission: 4-speed
Primary drive: Triplex chain
Final drive: Chain
Brakes: F & R Drum
Battery: 6-volt
Ignition: Coil/points

Chassis/Suspension
Frame: Steel, single downtube
Suspension: F. Telescopic fork, R. Hydraulic shocks
Wheelbase: 57in (144.8cm)
Weight: 480lb (217.7kg)
Fuel capacity: 1.9gal (7.19lit)
Oil capacity: 3qts (2.84lit)
Tires: F. 3.50 x 19in (8.9 x 48.26cm), R. 4.00 x 18in (10.16 x 45.42cm)
Top speed: 115mph (185km/h)
Colors: Skyline blue/white; calypso red/white; sabre gray metallic/white; black/white
Number built: 239
Price: $1,155

XLCH (1958) and XLH (1960)

Entering its second year of production, the Sportster got two burly brothers. The XL remained the standard-issue model, while the XLH featured higher compression and the XLCH was offered as a scrambler.

Horsepower was up in 1958, with bigger ports and valves, stronger gears and better oil sealing. The CH was created in response to pressure from California racers, who wanted to challenge the more nimble British twins. The original edition had twin straight exhaust pipes, painted not chromed, a bobbed rear fender, no lights and wide-ratio gearing. The fuel tank, which would come to be known as the peanut tank, was pirated from the 125cc Hummer.

The Sportster was thus destined to have two distinct identities, and generate several more hybrid versions, during the next 15 years. The XL and XLH versions were developed in Milwaukee's traditional fashion of incremental improvements from year to year. As sporting middleweights in the American idiom, the road model Sportsters were logical derivatives of the KH model. The XLH was more powerful, and became a reasonable option for riders who didn't care for the bulk and weight of the FL.

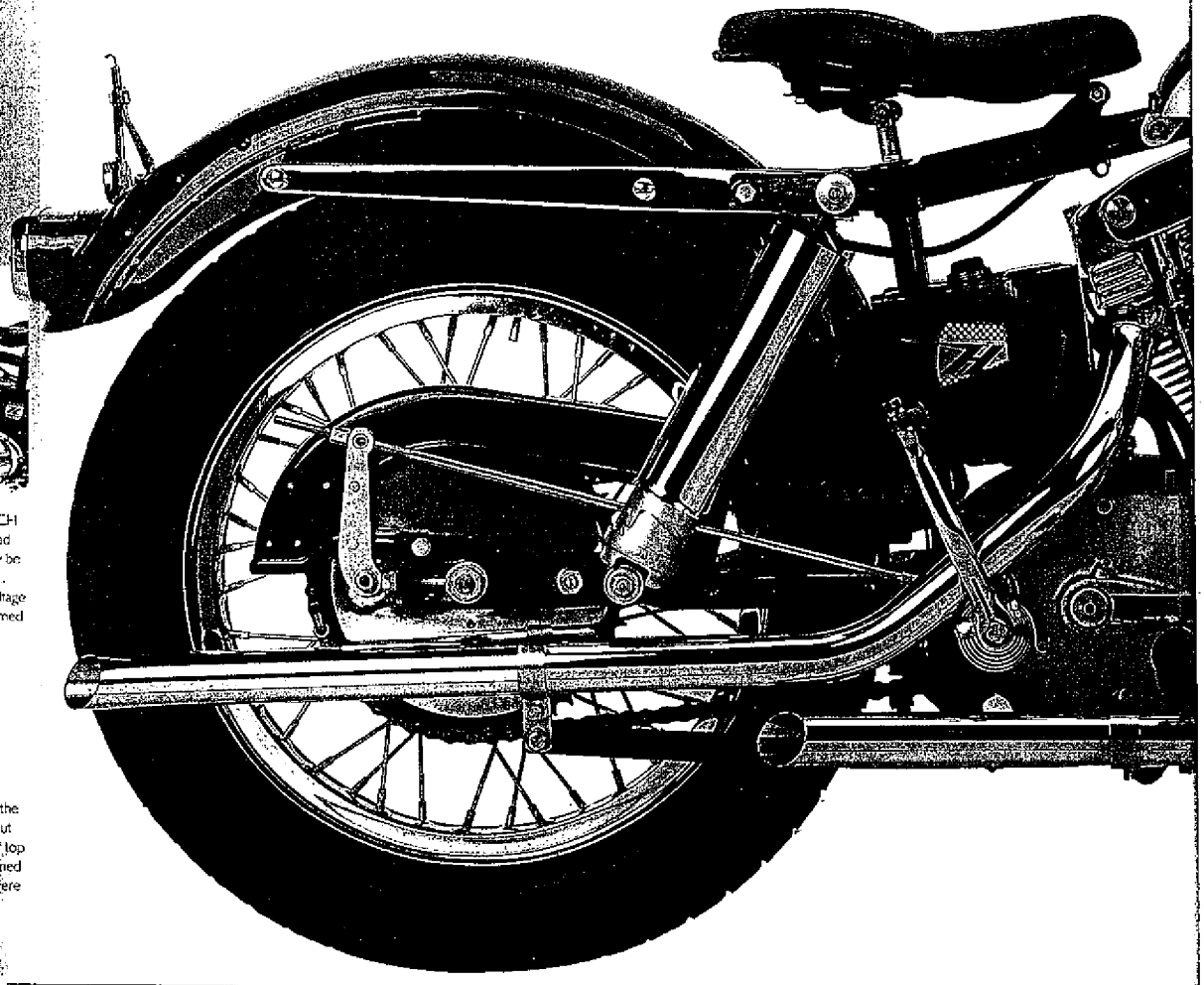
The XLCH, on the other hand, became the production prototype for all manner of snorting tire-smokers for the road and track. First, it was available with a 19-inch (48.26cm) front wheel which meant more ground clearance and stability in off-road conditions. Without the baggage of battery, lights, mufflers and chrome appointments, it weighed about 40 pounds (18kg) less than the road model. And with the proper application of throttle and clutch, the XLCH emitted an enormous roar followed by a cloud of rubber-burning smoke, until it caught traction and shot down the road in some haste.

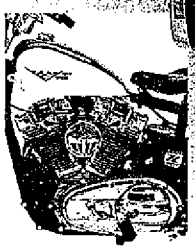
However, for the rider positioned too far aft, or subject to attacks of panic, the CH would promptly elevate the front wheel and head quickly for vertical. Blaring through town on the back wheel tended to attract more attention than one might have wished for. But once accustomed to the Sportster's power and handling characteristics, the average rider found himself motoring smartly down the road and having a thumping good time in the bargain.

The XLCH was an instant hit with many riders who had no off-road ambitions. So in 1959 the sportier Sportster arrived in legal highway trim: muffler, lights, bigger fenders and chromium-plated accessories. Which was exactly what the hot-rod riders wanted, a street/dirt bike.

The trend in on/off-road, dual-purpose, street/trail, dual-sport motorcycles would show steady growth in the following decade, and lead to increasingly specialized motorcycles. But the Sportster remained in the street configuration from here on, while retaining the profile of the scrambler. But ten years later it would beget the XR 750, a genuine racing bike.

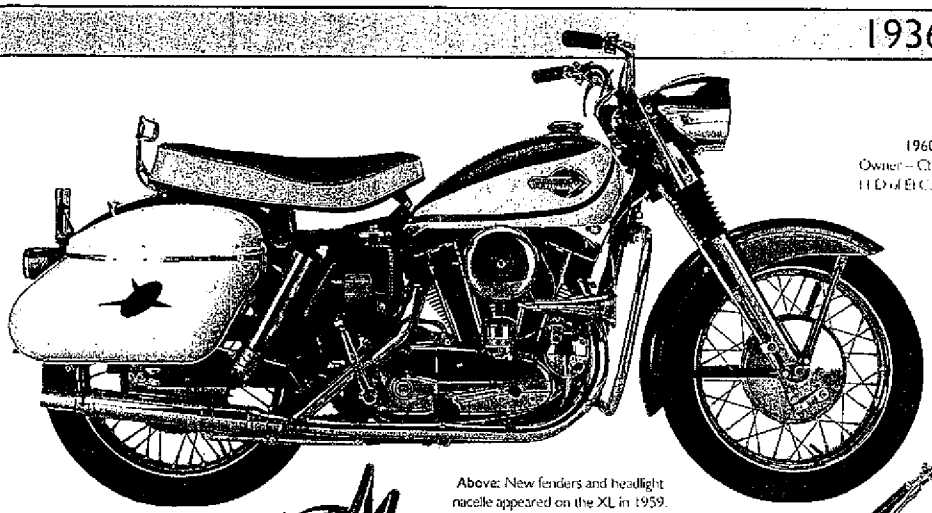
Below: The competition version had the fender bobbed just aft of the strut. The Sportster taillight also appeared on big twins





Above: The original XLCH was set up as an off-road machine, but could easily be modified for the street. Additions here include voltage regulator, horn and chromed primary cover.

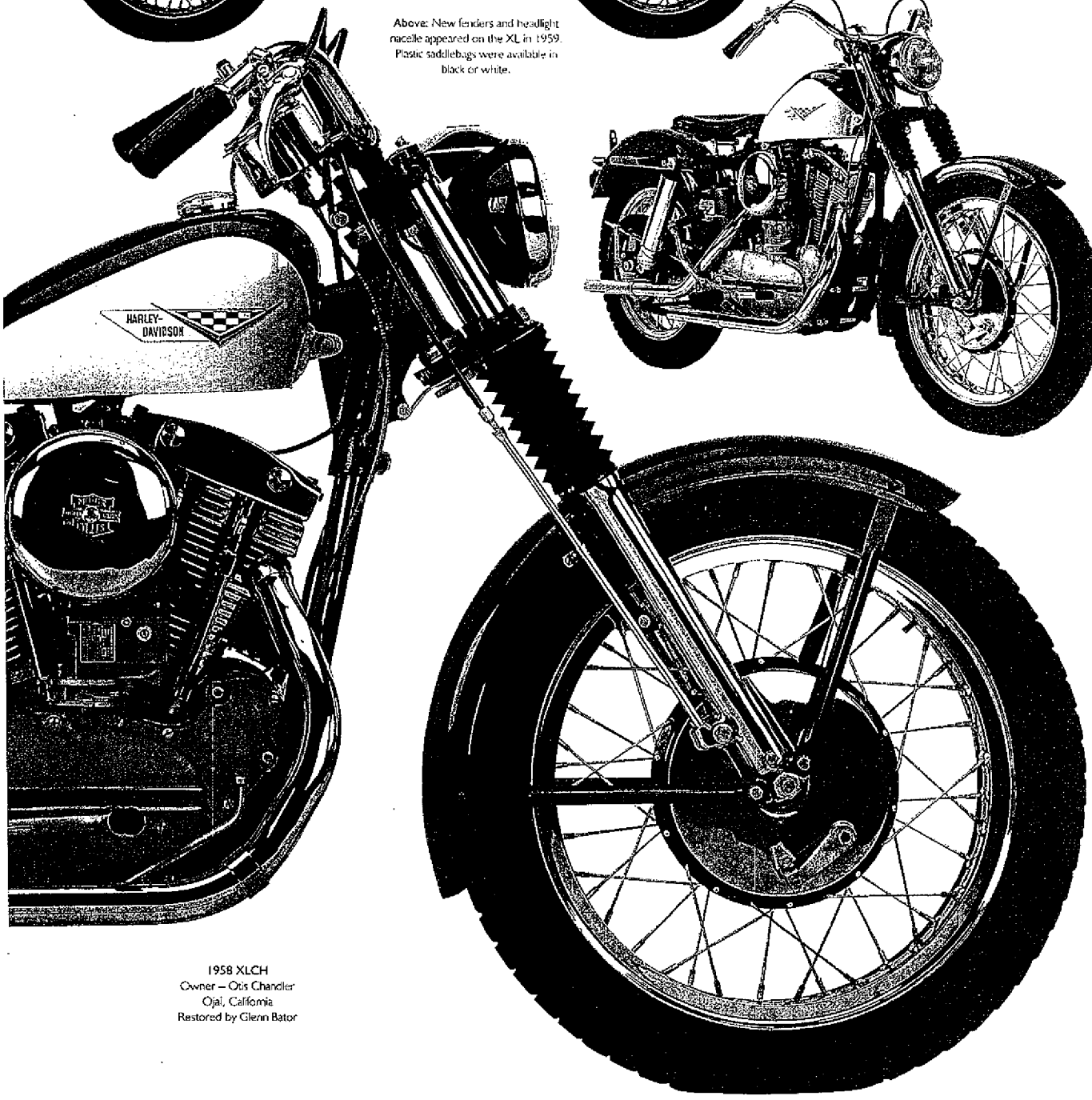
Right: Straight pipes are the original configuration, but have been lengthened for top end performance. Chromed shock absorber covers were available as optional equipment.



1960 XLH
Owner – Charles Holenda
H-D of El Cajon, California

Below: Even in road trim, the XLCH Sportster is a powerful, aggressive looking motorcycle. The minimalist eyebrow covered headlight would become a Sporty trademark.

Above: New fenders and headlight nacelle appeared on the XL in 1959. Plastic saddlebags were available in black or white.



1958 XLCH
Owner – Otis Chandler
Ojai, California
Restored by Glenn Bator

SPRINT (1961), KR (1960), SCAT (1963) AND TOPPER (1962)

1961 SPRINT

SPECIFICATIONS
ENGINE/DRIVETRAIN
Engine: OHV horizontal single
Displacement: 15ci (246.2cc)
Bore & stroke: 2.59 x 2.83in (66 x 72mm)
Compression ratio: 8.5:1
Horsepower: 18 @ 6,750rpm
Carburetion: Dell'Orto
Transmission: 4-speed
Primary drive: Helical gear
Final drive: Chain
Brakes: F & R, Drum
Battery: 6 volt
Ignition: Coil/points

CHASSIS/SUSPENSION
Frame: Steel tube, single strut
Suspension: F, Telescopic fork. R, Hydraulic shocks
Wheelbase: 52in (132cm)
Weight: 275lb (124.7kg)
Fuel capacity: 4gal (15.14lt)
Oil capacity: 2qts (1.89lt)
Tires: 3.00 x 17in (7.62 x 43.18cm)
Top speed: 75mph (121km/h)
Colors: Red/white, red/silver, gray/blue
Number built: n/a
Price: n/a

In 1960 Harley-Davidson bought half-interest in the Italian firm of Aeronautica Macchi, which built single-cylinder, two-and four-stroke machines. Milwaukee knew the lightweight market was on the way up, and that the Hummer-derived two-strokes would not be competitive.

The 250cc Sprint was introduced in 1961. The ohv single hung horizontally in a single-strut frame, which made it distinctive on American roads. The base engine had compression of 8.5:1 and produced 18 horsepower at 6,750 rpm. The styling was not an instant hit with U.S. riders.

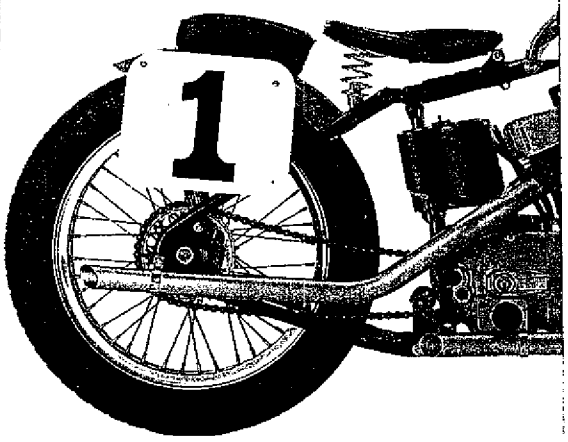
But the Sprint had a capable engine for its displacement, and had already shown its gumption in European roadracing. Renzo Pasolini would put the 350cc version in third place for the world championship in 1966, behind Agostini and Hailwood. In 1969 Kel Carruthers was second 350 at the Isle of Man TT, with an engine making 42 horsepower at 9,000 rpm.

Once again a gaggle of Americans were keen to find out what it would do in the dirt, so the Sprint soon evolved into dual-purpose trail-bike/racer formats. The initial C model was joined in 1962 by the H rendition, a street-scrambler with smaller tank, seat, high front fender and exhaust pipe. The Sprint H later became the Scrambler and then the Sprint SS. The racing model was designated CRS.

KR

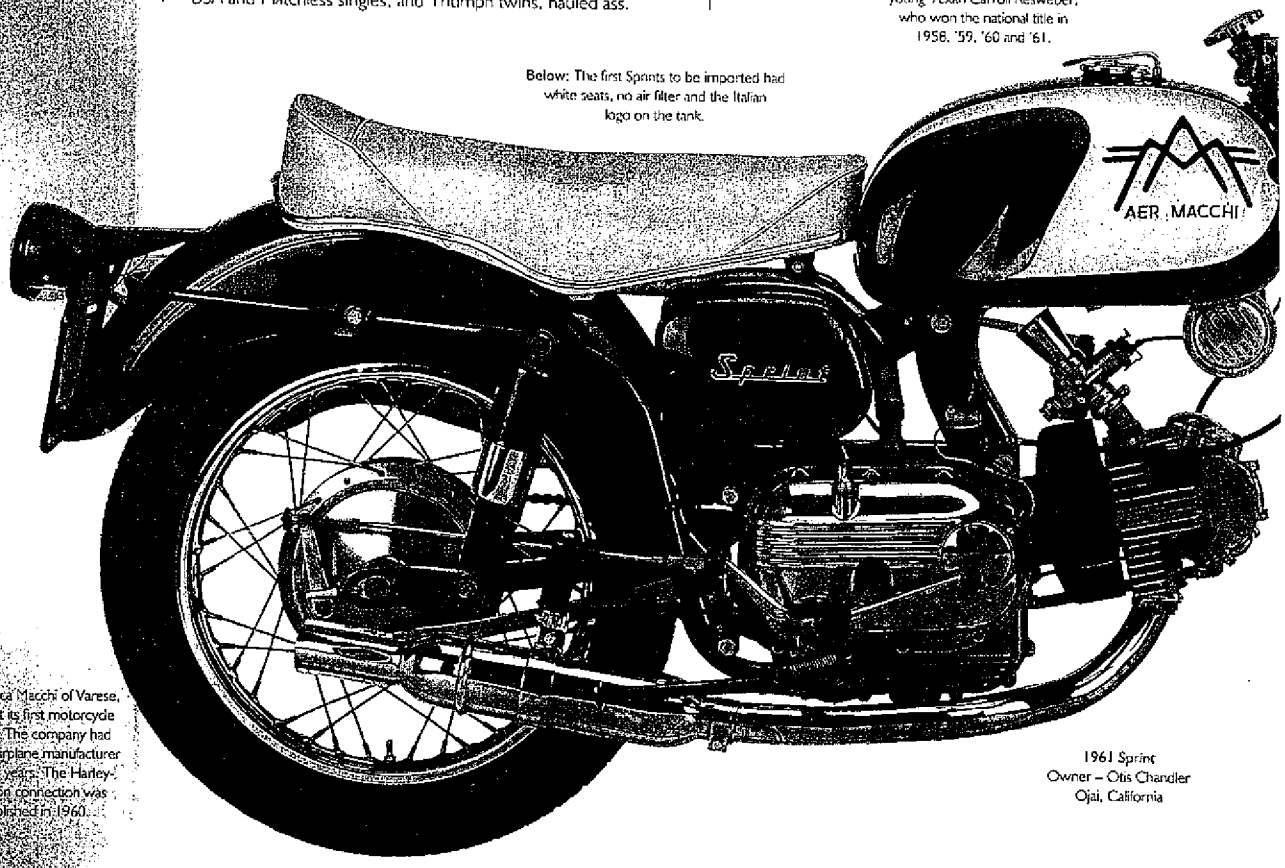
The Sprint made a fine short-track racer, but the KR 750 still ruled the mile and half-mile ovals. This reign had come at some expense in terms of good will, since the national championship rules specified 750cc flatheads (Milwaukee) ran against 500cc ohv engines (Great Britain). The deck looked stacked, but in fact there was rough parity. The results owed more to the abilities of tuners and riders than to the displacement difference. In other words, the BSA and Matchless singles, and Triumph twins, hauled ass.

Factory rider Carroll Resweber gave Milwaukee the national title four years running, from 1958 to 1961. The gifted Texan was impressive, riding a rigid-frame tracker that weighed little less than 400 pounds (181kg) and made about 60 horsepower. Resweber defined the craft. California's Brad Andres dominated the road-races on the factory KR TT, winning three of Milwaukee's six straight Daytona victories. In 1961 the beach race moved to the speedway, and Roger Reiman won it on the KR. The old flathead just kept keeping on.



Above: This is a replica of the 750 KR ridden by the remarkable young Texan Carroll Resweber, who won the national title in 1958, '59, '60 and '61.

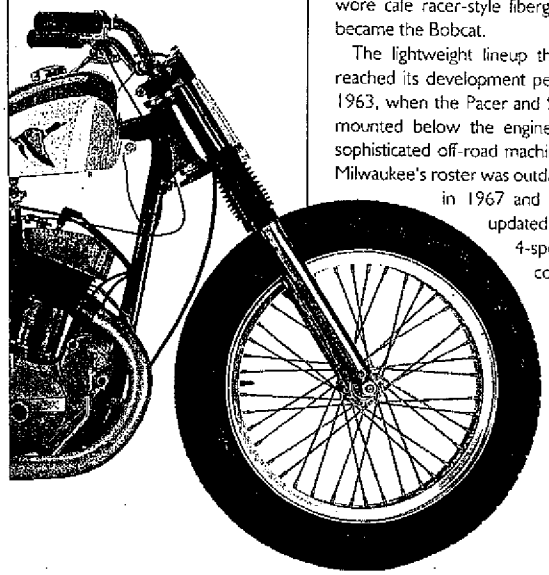
Below: The first Sprints to be imported had white seats, no air filter and the Italian logo on the tank.



Aeronautica Macchi of Varese, Italy, built its first motorcycle in 1946. The company had been an airplane manufacturer for many years. The Harley-Davidson connection was established in 1960.

1961 Sprint
Owner – Otis Chandler
Ojai, California

1960 KR
Owner – Ron Stratman
Sturgis, South Dakota
Restored by Bartels' H-D



Scat

The Hummer family had also grown, from the 125cc Super 10 of 1951 to the later 165 and 175cc renditions. In street trim it was the Pacer, the stripped racer was called the Ranger and the dual-purpose model labeled the Scat. A few years later the machine wore cafe racer-style fiberglass tank/seat/fender bodywork and became the Bobcat.

The lightweight lineup that had begun in 1948 had nearly reached its development peak. The 175s had rigid frames until 1963, when the Pacer and Scat got a swingarm with the shocks mounted below the engine. By this time a number of more sophisticated off-road machines were arriving from Europe, and Milwaukee's roster was outdated. These models were phased out in 1967 and supplanted by the Rapido 125, an updated Aermacchi two-stroke single with a 4-speed transmission. And its competition cousin, the Baja 100.

Even though the early two-strokes were widely ignored in the U.S., and usually not considered real Harleys, they were part of the company history. The name on the tank, prefaced or not by the letters AMF, has granted the little bikes some collectibilty status. It could happen.

Topper

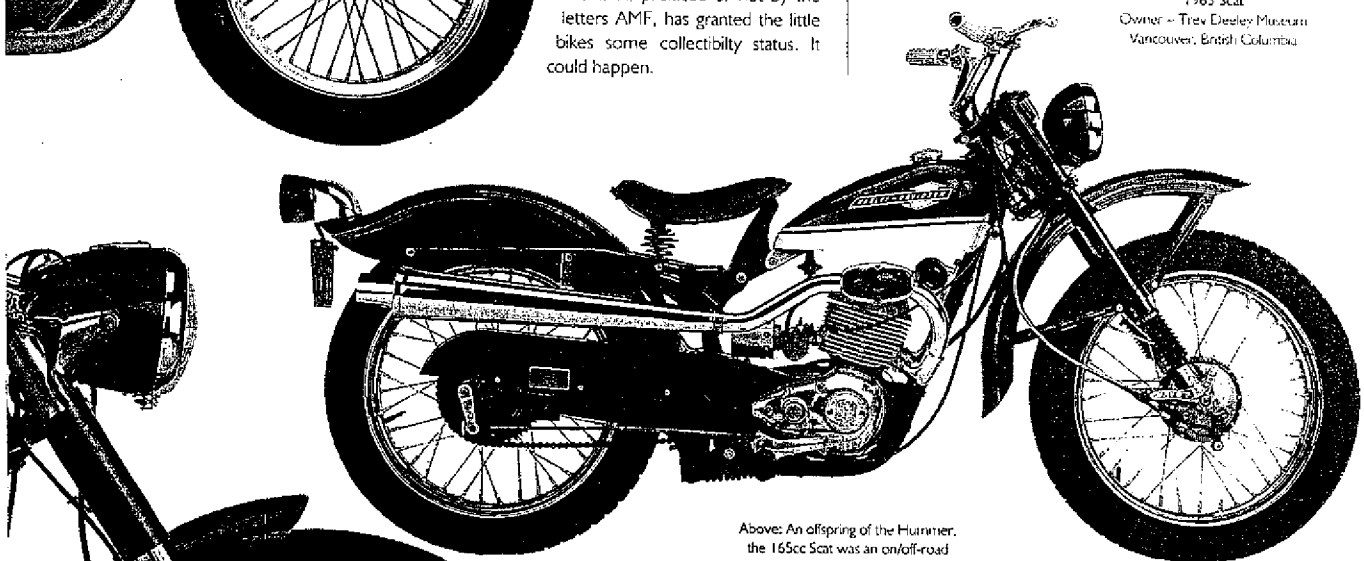
Introduced in 1960, the Topper was a cute motor scooter. Cushman, Vespa and Lambretta had been selling plenty of scooters, so Milwaukee sought a share of the market. But, coincidental with the arrival of the Honda 50, it seemed the demand pinnacle had passed.

The Topper took its power from a 165cc two-stroke single. The engine was rated at 9 horsepower, which sprang to life with a pull on the starter rope. An optional sidecar transformed the scooter into a utility vehicle, perfect for ferrying the baseball relief pitcher out to the mound or going for groceries. Large men in fraternal organizations rode them in parades.

With its variable pulleys, belt and final chain drive, the Topper's power delivery could be erratic. Milwaukee touted the economy appeal (100 miles per gallon) and safety aspects of the scooter, but even with Scootaway Drive automatic transmission the Topper never captured the fancy of students or commuters. The 1960 price was $430.

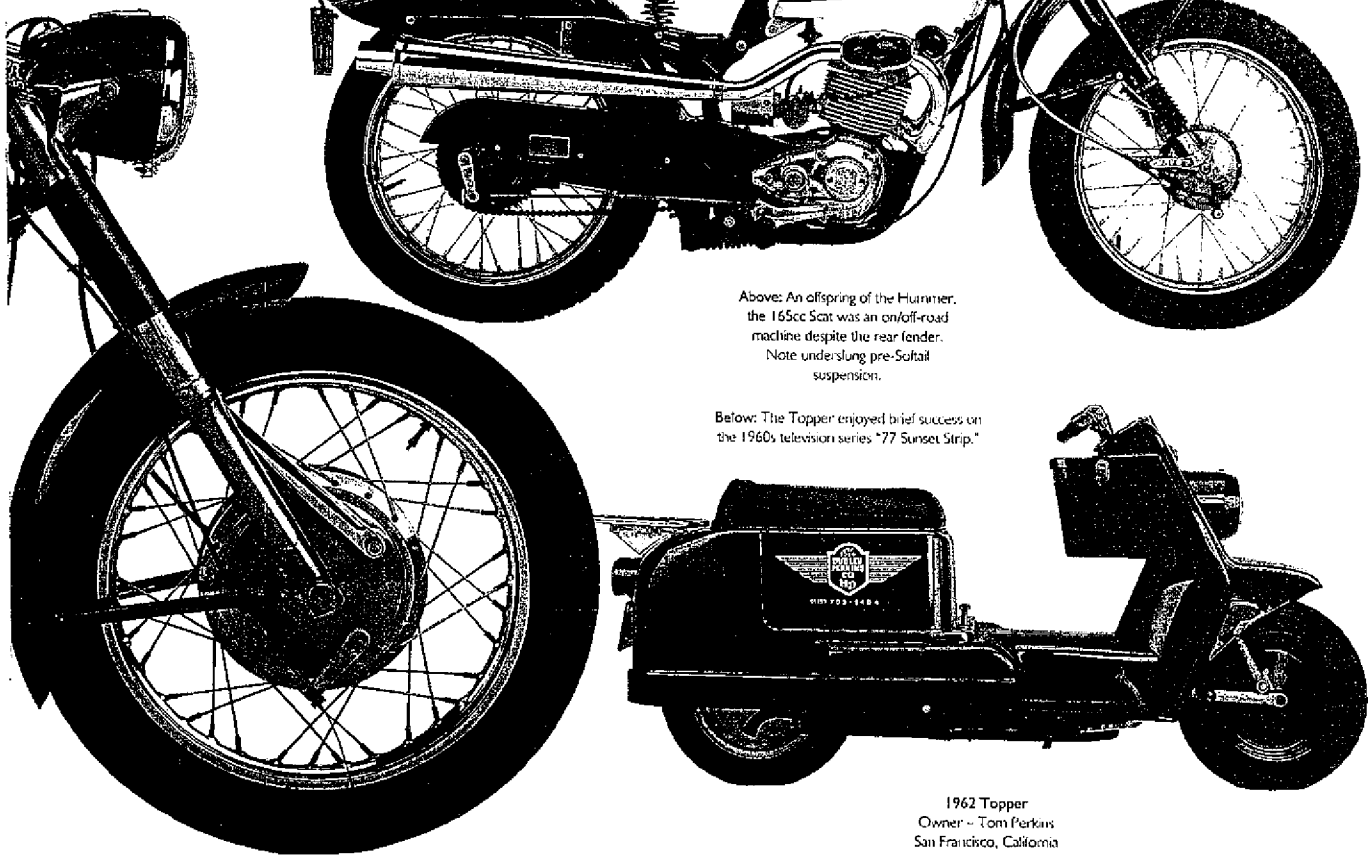
Production records are sparse, but probably fewer than 3,000 scooters were made from 1960 to 1965.

1963 Scat
Owner – Trev Deeley Museum
Vancouver, British Columbia



Above: An offspring of the Hummer, the 165cc Scat was an on/off-road machine despite the rear fender. Note underslung pre-Softail suspension.

Below: The Topper enjoyed brief success on the 1960s television series "77 Sunset Strip."



1962 Topper
Owner – Tom Perkins
San Francisco, California

XLR (1962), XLH AND XLCH (1964)

The Sportster continued its evolution with the XLR, which was built for TT scrambles racing. At a glance the R appeared to be simply an XLCH stripped for competition, but the engine had a number of differences. The only obvious hint was the magneto mounted ahead of the front cylinder, rather than on the right side.

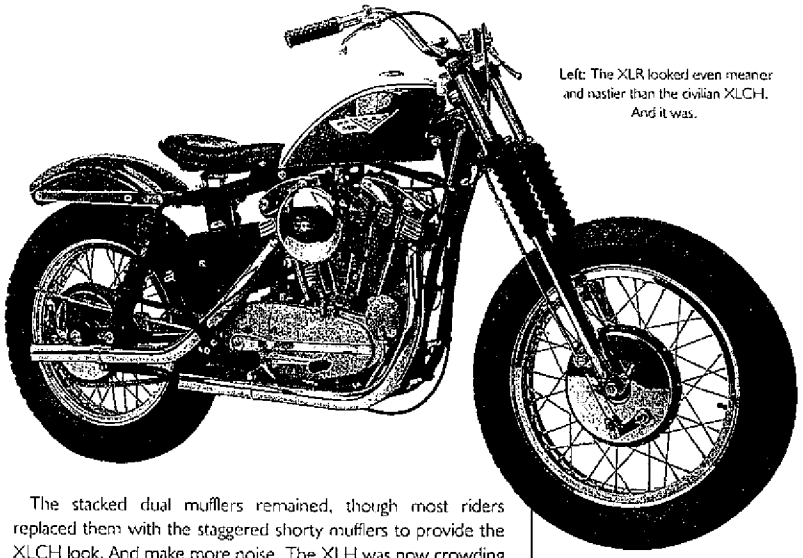
The XLR ran ball bearings at the crankshaft ends and different heads, flywheels, cams, pistons and valves. In the hands of factory riders Mert Lawwill and Mark Brelsford, the machines were wicked fast on the track. With the aid of tuner Jim Belland, the motors were good for about 80 horsepower and the bike weighed little over 300 pounds (136kg). Brelsford, whose motorcycle was nicknamed Goliath, was one of the few riders to explore its limits.

The XLR engine was produced in limited numbers, probably fewer than 500 in a ten-year period. But until the rules changed and it was supplanted by the XR 750, the XLR was the horsepower king. The engine was used in many drag racing machines, and powered the Manning/Riley/Rivera streamliner that Cal Rayborn aimed to a new Bonneville record of 265mph (426.5km/h) in 1970. Strong motor.

Note: William G. Davidson joined the company in 1963 as director of styling. As the son of former president William H. and grandson of founder and works manager William A. Davidson, Willie G. had some sense of the family business. He has held the position for 34 years.

XLH

Stylistic changes were few in 1964. The Sportster received a full-width front brake hub fashioned of aluminum by the Aermacchi branch, and the company logo was redesigned to fit the fashion of the times. A center stand, officially named the Jiffy Stand, was now standard equipment on both models. In 1965 the Sportster was granted a 12-volt electrical system, and the gas tank was slightly smaller. Spark advance on the XLH became automatic, while the XLCH retained it manual advance on the left handgrip.

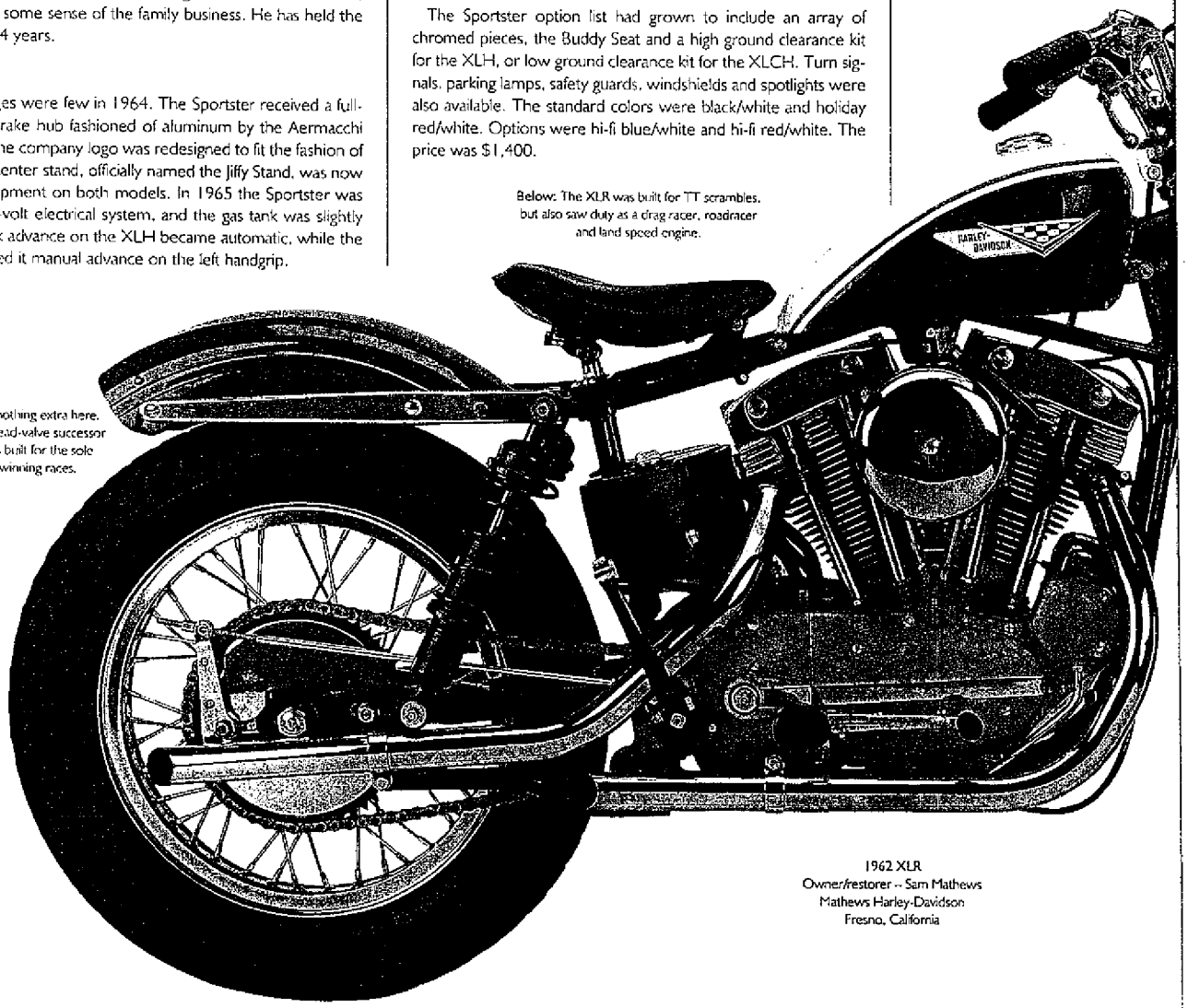


Left: The XLR looked even meaner and nastier than the civilian XLCH. And it was.

The stacked dual mufflers remained, though most riders replaced them with the staggered shorty mufflers to provide the XLCH look. And make more noise. The XLH was now crowding 500 pounds (227kg), but with a rated 55 horsepower it was still good for quarter-mile times close to 14 seconds. And in top-gear roll-on contests, it could walk away from most everything on the road.

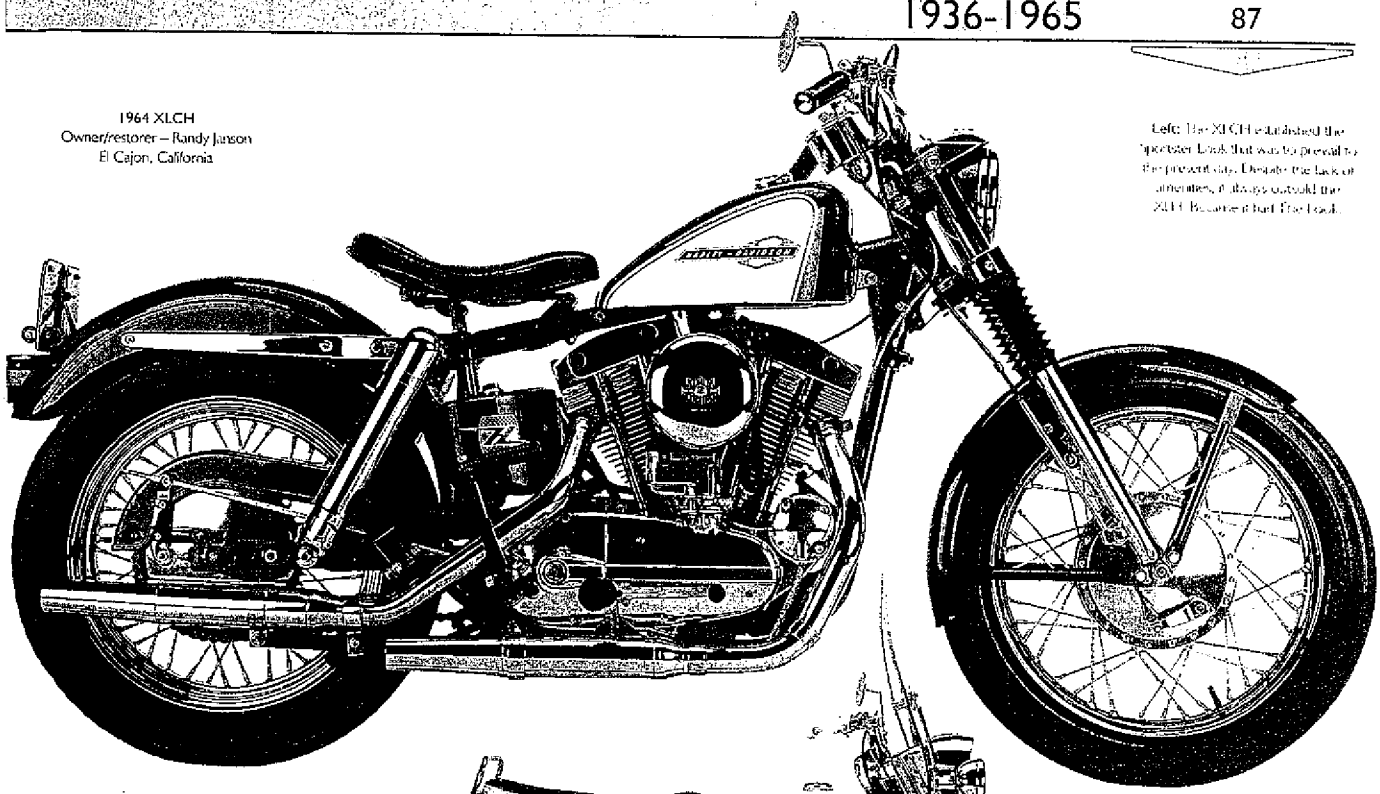
The Sportster option list had grown to include an array of chromed pieces, the Buddy Seat and a high ground clearance kit for the XLH, or low ground clearance kit for the XLCH. Turn signals, parking lamps, safety guards, windshields and spotlights were also available. The standard colors were black/white and holiday red/white. Options were hi-fi blue/white and hi-fi red/white. The price was $1,400.

Below: The XLR was built for TT scrambles, but also saw duty as a drag racer, roadracer and land speed engine.



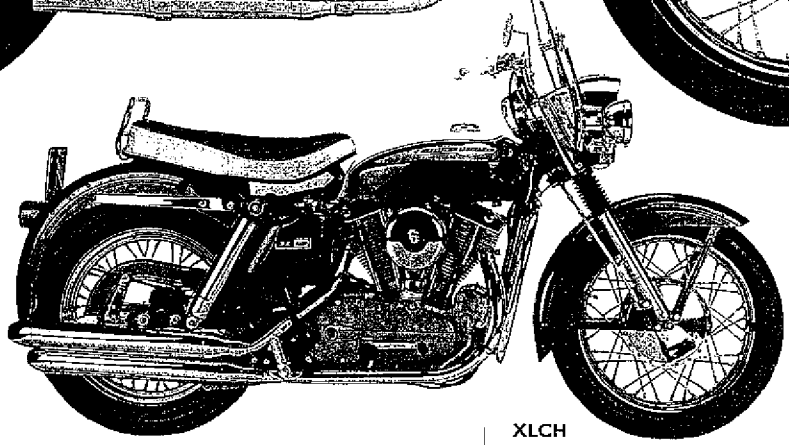
Right: There's nothing extra here. The XLR, overhead-valve successor to the KR, was built for the sole purpose of winning races.

1962 XLR
Owner/restorer -- Sam Mathews
Mathews Harley-Davidson
Fresno, California



1964 XLCH
Owner/restorer – Randy Janson
El Cajon, California

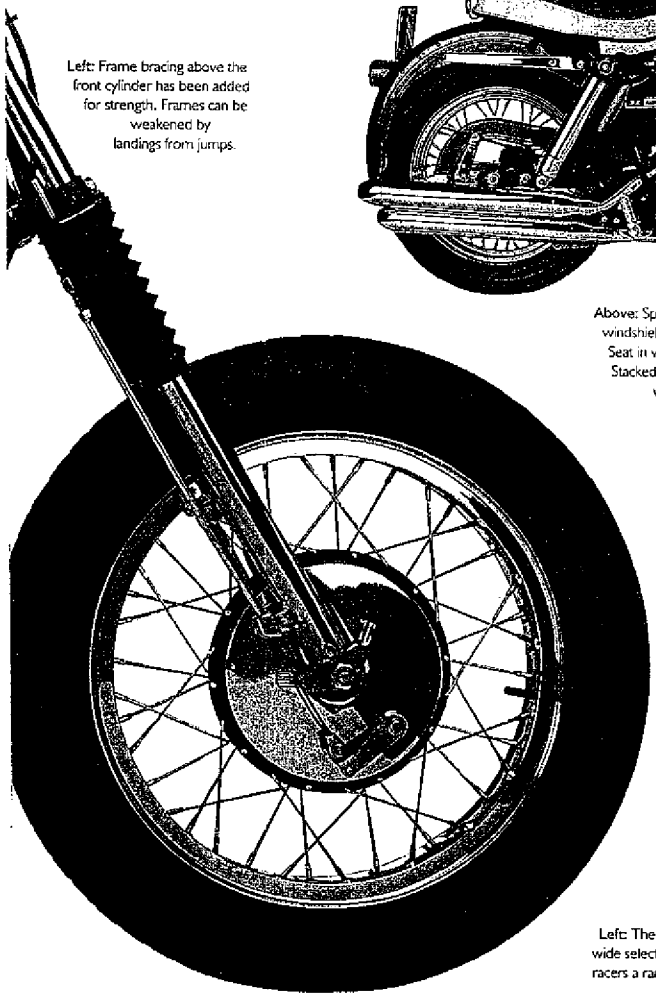
Left: The XLCH established the "sportster look" that was to prevail for the next decade. Despite the lack of amenities, it always outsold the XLH. Because it had the look.



1965 XLH
Owner/restorer – Randy Janson
El Cajon, California

Left: Frame bracing above the front cylinder has been added for strength. Frames can be weakened by landings from jumps.

Above: Sportsters options included windshield, spotlights and Buddy Seat in white or black & white. Stacked dual mufflers weren't widely popular.



Left: The XLR was offered with a wide selection of sprockets to afford racers a range of gearing choices for various tracks.

XLCH

The lean machine saw only minor modifications until 1966 when a new carburetor and high-performance cams bumped the horsepower to about 60. This year also marked the advent of the "ham can" air cleaner cover, the result of federal emissions controls.

The larger Tillotson carburetor featured a diaphragm and accelerator pump. The new cams, designated the P profile, bumped the power in the middle and upper segments of the rev range. The CH was a certified road warrior, but for the novice it could be a bitch to kick start. Knowing the precise priming drill helped but didn't always light the engine before the operator was slumped sweating at the curb.

The problem was solved on the XLH in 1967 when an electric starter was fitted. The hard-core macho boys took this as heresy, and derided the "electric leg" crowd as sissies. But so long as the battery was charged, the sissies didn't much care. The 12-volt battery and oil tank fitted to a rubber-mounted platform, and the smaller headlight resided in a compact nacelle topped by a new indicator lamp panel.

The XLCH shared the new cases, with provision for the electric starter, but remained a kicker. In 1969 the magneto was replaced by an ignition timer/coil system which made starting easier. Two years later the ignition moved inside the timing case where it was better protected from the elements.

Approaching the 1970s, the H and CH Sportsters were losing their individual identities. Development of the racing version had shifted to the XR 750, a short-stroke version of the XLR. Honda and Kawasaki were intent on raising the stakes in the superbike game, and Milwaukee set about upgrading the Sportster in traditional fashion – more cubic inches.

1965 FLH ELECTRA-GLIDE

Specifications
Engine/Suspension
Engine: OHV 45° V-twin
Displacement: 73.73ci (1208.19cc)
Bore & stroke: 3.44 x 3.97in (87 x 101mm)
Compression ratio: 8:1
Horsepower: 60 @ 5,400rpm
Carburetion: Linkert
Transmission: 4-speed
Primary drive: Chain
Final drive: Chain
Brakes: F & R, Drum
Battery: 12 volt
Ignition: Coil/points

Chassis/Suspension
Frame: Steel, double downtube
Suspension: F, Telescope; R, Hydraulic shocks
Wheelbase: 60in (152.4cm)
Weight: 783lb (355kg)
Fuel capacity: 5gal (18.9lit)
Oil capacity: 4qts (3.79lit)
Tires: 5.00 x 16in (12.7 x 40.6cm)
Top speed: 100mph (161km/h)
Colors: Black/white; holiday red/white (options: hi-fi blue/white; hi-fi red/white)
Number built: 4,800 (FL: 2,130)
Price: $1,595 (FL: $1,530)

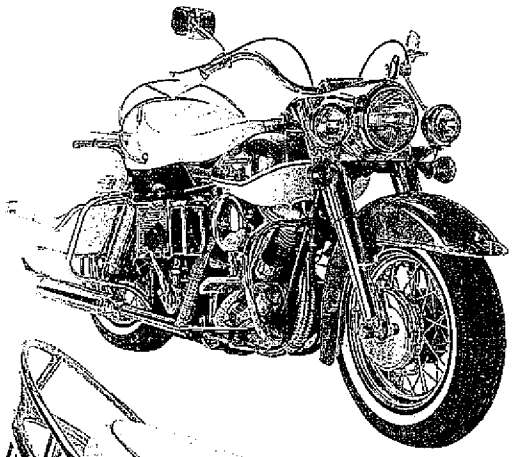
The Duo becomes Electra-, and the perennial Panhead makes its final appearance. With the addition of an electric starter, and the name Electra-Glide, the 74-inch (1200cc) Panhead meets its 18th and final year of production. Retired after mostly meritorious service.

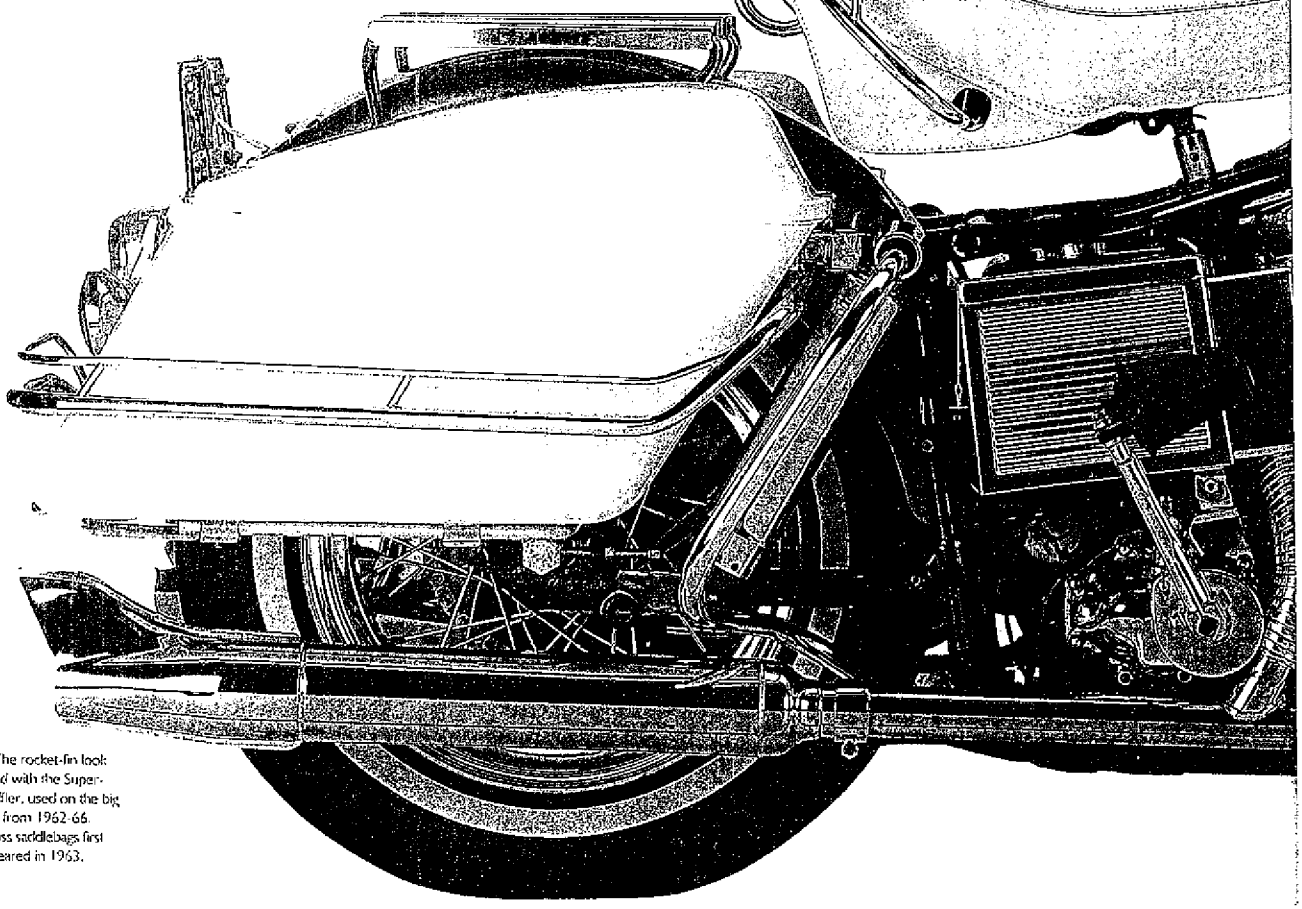
The mantle of first thumb start/last Panhead has ensured collector status for the '65 Electra-Glide, combining as it does an end and a beginning. Premier and finale, opening act and encore, and so forth. The first electric-start big twin carries the freight of Historical Significance.

And properly so. Milwaukee was witnessing the greatest leap in motorcycle sales in U.S. history, and was determined to be more than just a spectator. Harley-Davidson's sales figures had been more or less static for ten years, and Panheads accounted for roughly half the total each year. But with the stunning ascent of Honda, soaring motorcycle sales made the old graph obsolete. And for 1965, H-D built more Panheads (6,930) than any year since its debut in 1949.

So '65 was a seminal year that came to represent Milwaukee's transition to the Modern Age of American motorcycling. With 12-volt electrics came a new frame to accommodate the large battery, the new oil tank moved to the left side and the foot-shift model got a 5-gallon (18.9lit) fuel tank. A new cast aluminum primary cover was fashioned to support the electric leg.

Once again the motive was to make motorcyling easier, since it was now established that the market for user-friendly machines was larger than anyone had previously imagined. Spark advance was now handled automatically, eliminating the cable-operated mechanism. And although the Electra-Glide's engine internals were unchanged, stronger cases and clutch were also dictated by the starter. The new primary covers held the transmission in fixed position, so primary chain adjustment was done through an access hole in the cover.

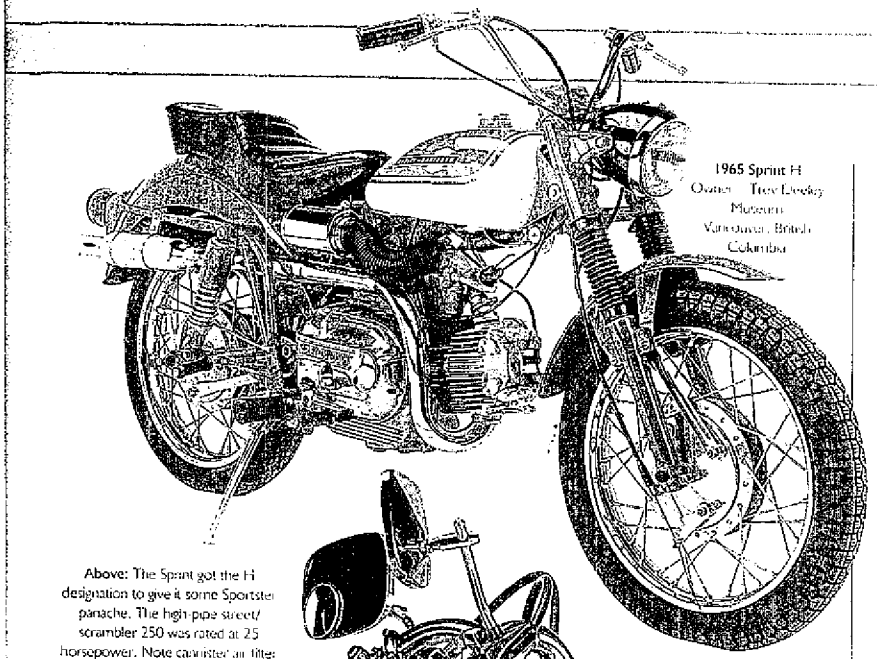




Below: The luggage rack with three U-section rails was first used in 1958. The fiberglass saddlebags were available in black or white. Whitewall tires were optional. Wheels were 16in (40.6cm) only

Above right: The Super Deluxe Buddy Seat was offered in white, black and white or red and white. The chrome finish group included rims, muffler, instrument panel, safety guard and timer cover.

Right: The rocket-fin look returned with the Super-Quiet muffler, used on the big twins from 1962-66. Fiberglass saddlebags first appeared in 1963.



1965 Sprint H
Owner – Trev Deeley Museum
Vancouver, British Columbia

Above: The Sprint got the H designation to give it some Sportster panache. The high-pipe street/scrambler 250 was rated at 25 horsepower. Note cannister air filter mounted above exhaust pipe

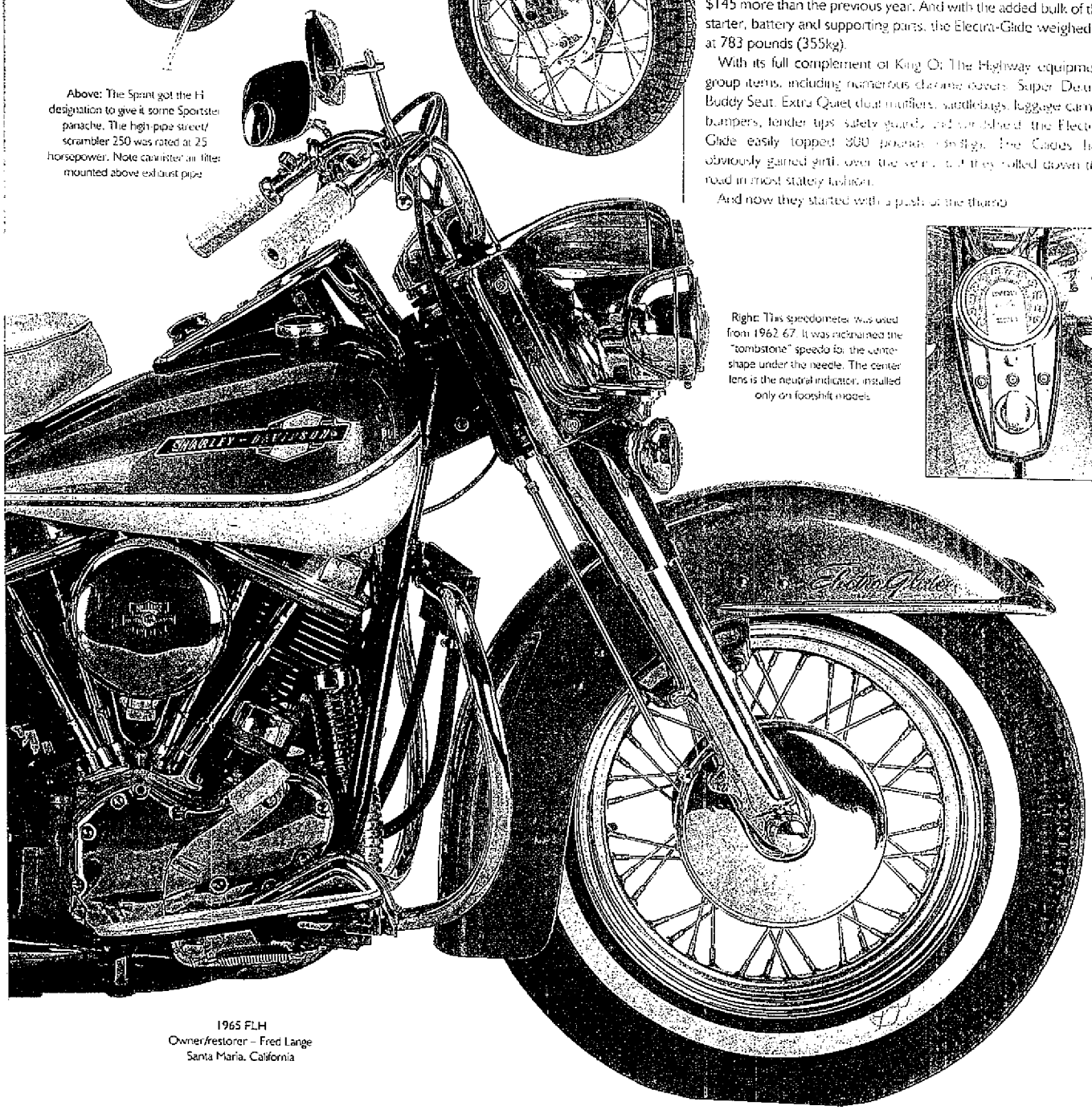
The Electra-Glide differed from prior Paris in several other ways. The domed caps were gone from the shock absorbers, since the upper shock mount also served to attach the rear crash bar. The trumpet horn was replaced by a disc and fitted below the headlight, and the ribbed timing cover was supplanted by a smooth aluminum casting. Ball-end aluminum clutch and brake levers made their first appearance, and the toolbox was eliminated by the large 12-volt battery.

The only color change for 1965 was the slightly darker holiday red, which replaced the earlier fiesta red. The Electra-Glide did post two of Milwaukee's largest increases of the era; price and weight. At $1,595 and $1,530, both the FLH and FL models cost $145 more than the previous year. And with the added bulk of the starter, battery and supporting parts, the Electra-Glide weighed in at 783 pounds (355kg).

With its full complement of King Of The Highway equipment group items, including numerous chrome covers, Super Deluxe Buddy Seat, Extra Quiet dual mufflers, saddlebags, luggage carrier bumpers, fender tips, safety guards and windshield, the Electra-Glide easily topped 800 pounds (363kg). The Glides had obviously gained girth over the years, but they rolled down the road in most stately fashion.

And now they started with a push of the thumb.

Right: This speedometer was used from 1962-67. It was nicknamed the "tombstone" speedo for the center shape under the needle. The center lens is the neutral indicator, installed only on footshift models.



1965 FLH
Owner/restorer – Fred Lange
Santa Maria, California

1966 FLH

SPECIFICATIONS
ENGINE/SUSPENSION
Engine: OHV 45° V-twin
Displacement: 73.73ci (1208.19cc)
Bore & stroke: 3.44 x 3.97in (87 x 101mm)
Compression ratio: 8:1
Horsepower: 54 hp @ 5,400rpm
Carburetion: Linkert
Transmission: 4-speed
Primary drive: Chain
Final drive: Chain
Brakes: F & R, Drum
Battery: 12-volt
Ignition: Coil/points

CHASSIS/SUSPENSION
Frame: Steel, double downtube
Suspension: F, Telescopic forks; R, Hydraulic shocks
Wheelbase: 60in (152.4cm)
Weight: 783lb (355.2kg)
Fuel capacity: 5gal (18.93lt)
Oil capacity: 4qts (3.79lt)
Tires: 5.00 x 16in (12.7 x 40.64cm)
Top speed: 100mph (161km/h)
Colors: Black/white; indigo metallic/white (options: hi-fi blue/white; sparkling burgundy/white)
Number built: 5,625 (FL: 2,175)
Price: $1,610

Milwaukee wasn't entirely prepared for the motorcycle sales boom of the mid-1960s. In some quarters that might qualify as an understatement, but few prophets predicted the social or economic upheavals of the times that were "a changin'". Harley-Davidson, as ever, charted its own course.

As the Electra Glide had grown in size and weight, the demands on the engine increased in proportion. Economic realities would not permit a completely new engine, so Milwaukee settled for a new top end. And although conceived in terms of functional improvement, the Shovelhead (as it came to be known) displayed a return to the forms of yesteryear. With its rocker boxes in lieu of covers, the Shovel recalled the styling cues of the mighty Knucklehead of the 1930s.

The new cylinder head was a larger aluminum version of the Sportster lid, with the same combustion chamber and valve angle. The more efficient respiration was good for an increase of five horsepower. With the power gain came a corresponding rise in vibration, but most fans of the full dressers counted it an acceptable trade-off. Properly maintained and serviced, the Shovelhead was slightly better at keeping its oil supply inside the engine.

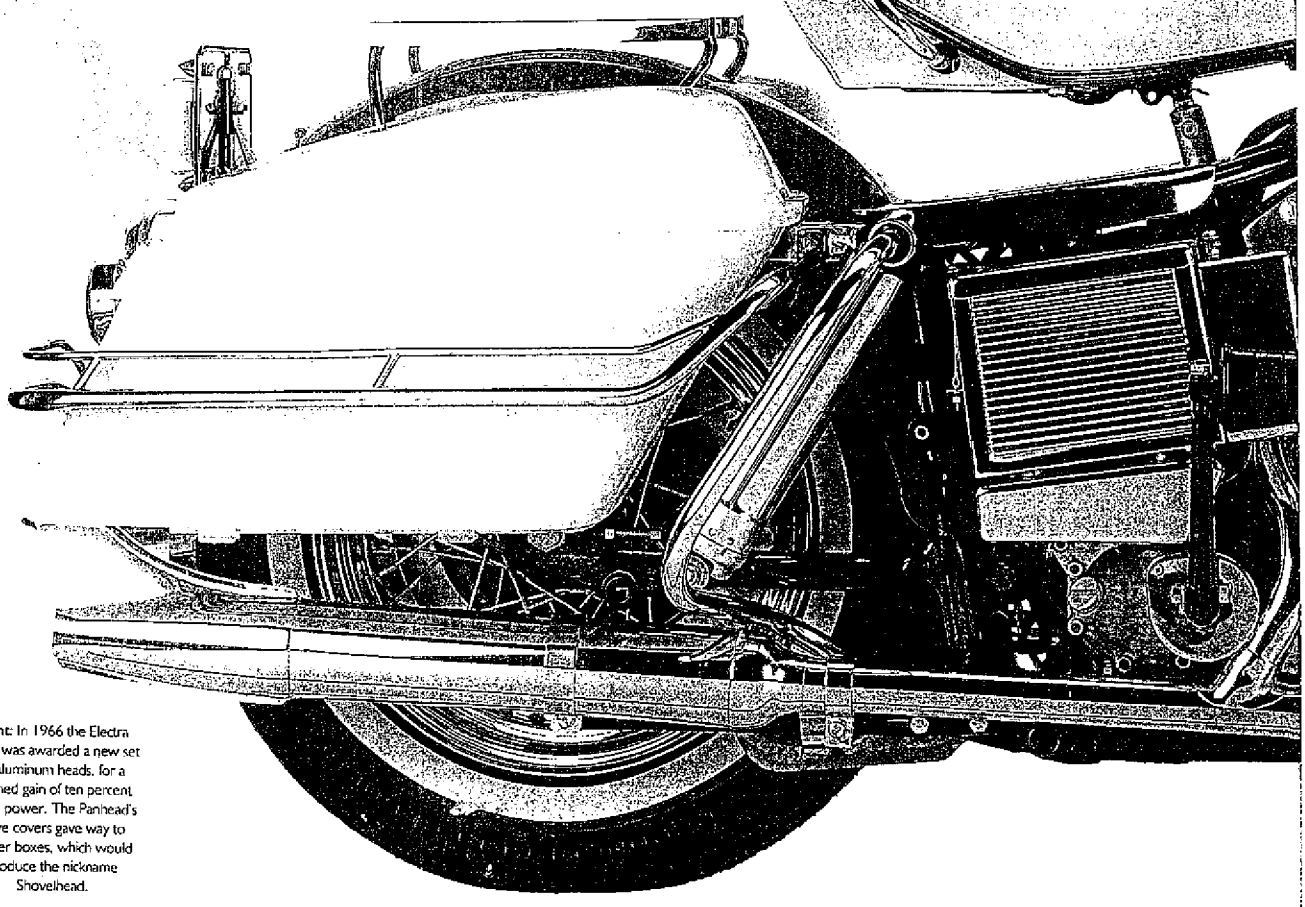
But exploding motorcycle sales (not sales of exploding motorcycles, though there are rumors) put other forces to work. The Shovelhead would come to be widely maligned by some of the Harley faithful, for reasons often not connected to its design or engineering. The engine came to symbolize the acquisition of Harley-Davidson by American Machine and Foundry (AMF) in 1969. The Motor Company found itself in need of a substantial financial injection to produce more and better motorcycles for a growing market. Unfortunately the "better" component suffered diminishing focus in the rush to regain a bigger piece of the pie.

As friction between the corporate officers and Milwaukee's family management grew more heated, the residue of the executive chafing settled on the production force. Some of the people who built the motorcycles grew somewhat moody about breathing this boardroom grinding compound, and as a result a number of motorcycles were not properly screwed together. So the burden shifted to the dealears, who often had to shoulder extensive repairs before the motorcycles could be sold. Thus the dealers came to recognize that it was them, and the customers, who were getting screwed together.

But back in 1966, production numbers had reached a peacetime high of 36,320. Though it should be noted that 16,200 50cc "no-peds" from Aermacchi are part of the figure. Nearly 8,000 Electra Glides rolled out of Milwaukee, and Sportster production reached a new high at 4,800. For the 1967 model year, more than 9,000 Sprints were on the market.

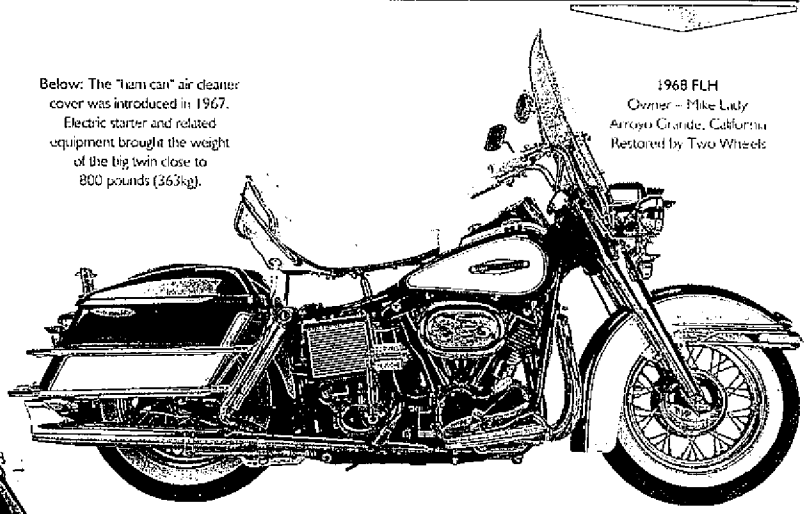
Below: The Buddy Seat came in white or black and white. The passenger backrest was optional.

Below: The fiberglass saddlebags were fundamentally the same from 1963 through 1980.



Right: In 1966 the Electra Glide was awarded a new set of aluminum heads, for a claimed gain of ten percent more power. The Panhead's valve covers gave way to rocker boxes, which would produce the nickname Shovelhead.

Below: The "ham can" air cleaner cover was introduced in 1967. Electric starter and related equipment brought the weight of the big twin close to 800 pounds (363kg).



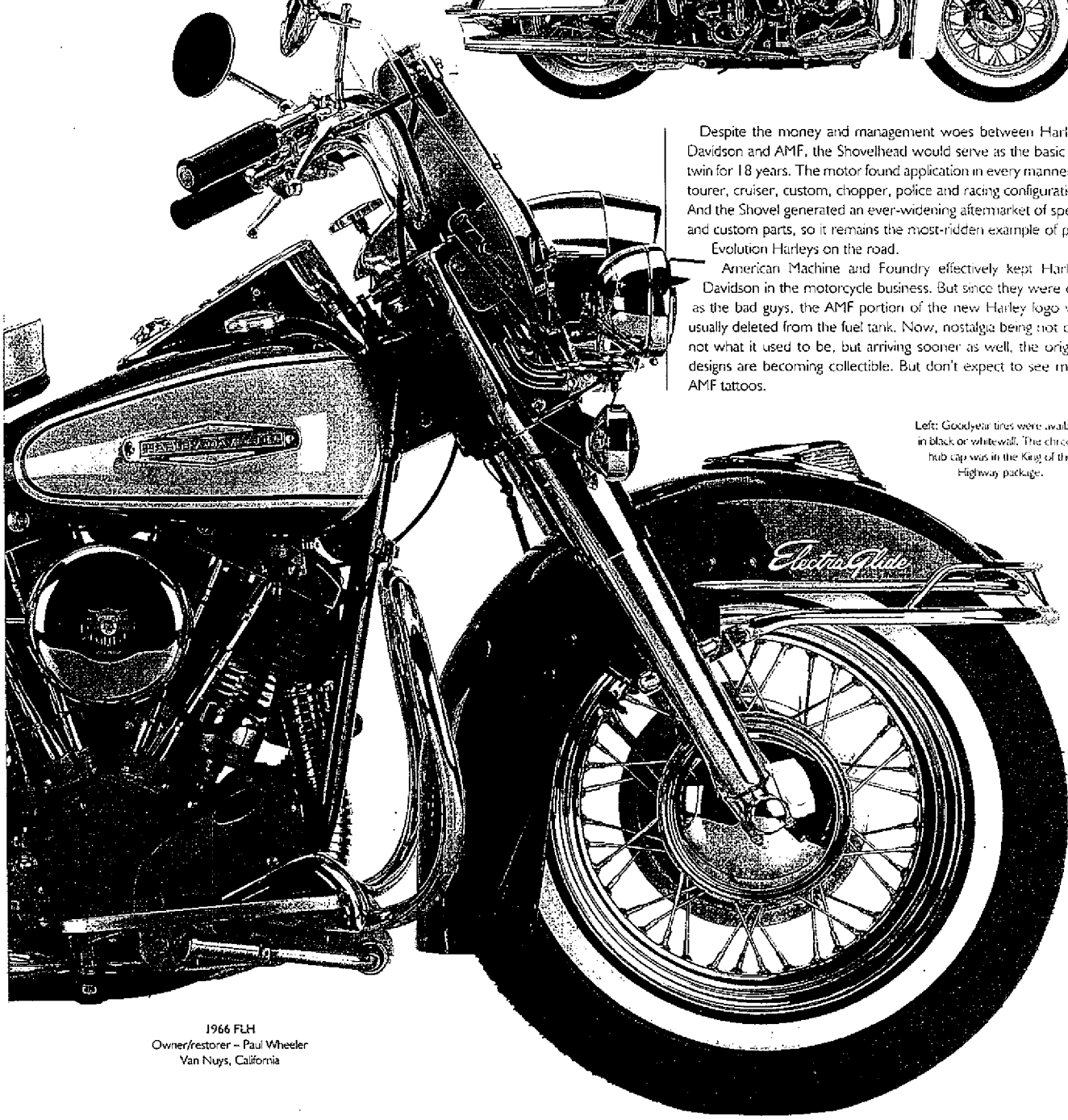
1968 FLH
Owner – Mike Lady
Arroyo Grande, California
Restored by Two Wheels

Below: Beyond the mechanical improvements, the Electra Glide was little changed from the Duo-Glide. The windshield was part of the King of the Highway equipment group, clear or with red or blue tint.

Despite the money and management woes between Harley-Davidson and AMF, the Shovelhead would serve as the basic big twin for 18 years. The motor found application in every manner of tourer, cruiser, custom, chopper, police and racing configuration. And the Shovel generated an ever-widening aftermarket of speed and custom parts, so it remains the most-ridden example of pre-Evolution Harleys on the road.

American Machine and Foundry effectively kept Harley-Davidson in the motorcycle business. But since they were cast as the bad guys, the AMF portion of the new Harley logo was usually deleted from the fuel tank. Now, nostalgia being not only not what it used to be, but arriving sooner as well, the original designs are becoming collectible. But don't expect to see many AMF tattoos.

Left: Goodyear tires were available in black or whitewall. The chrome hub cap was in the King of the Highway package.



1966 FLH
Owner/restorer – Paul Wheeler
Van Nuys, California

XLH (1966), CRS (1966), M-50 (1965), AND KRTT (1968)

The overall configuration of the Sportster hadn't changed in seven years. In 1966, which would be the last chapter for kick-start only, the price of an XLH was $1,415. And although it was only $200 less than the Electra Glide, the Sporty was in great demand as a smokin' street machine.

The XLH was still chunkier than the British challengers from Triumph, BSA and Norton. But with 60 horsepower and an adult portion of torque, the V-twin held its own, especially when the engine was tweaked for a bit more urge. The factory bump in the horsepower came from new cams, pumper carburetor and better exhaust plumbing. The "ham can" air cleaner cover, fitted to meet federal emission regulations, was not generally considered an attractive addition.

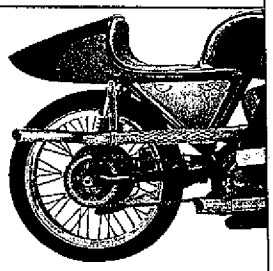
In 1967 the XLH got a new battery/oil tank platform to accommodate the electric starter. As with the Electra Glide, the battery pushed the oil tank to the right side, and everything was rubber-mounted. Even with the addition of 30-some pounds (14+kg), the Sportster was still faster than it had been the previous year. The shock absorber spring adjusters were changed for a wider range of settings. The only significant styling change was the compact form of the new headlight nacelle, which included an indicator lamp panel for the oil pressure and ammeter lights. The shroud also helped enclose the cables for the new "twin tach-speedo" instrumentation.

Also, as proclaimed in the magazine ads, "The Neat-Pleat All-Model Buddy Seat has California styling that says 'class' from the word go!"

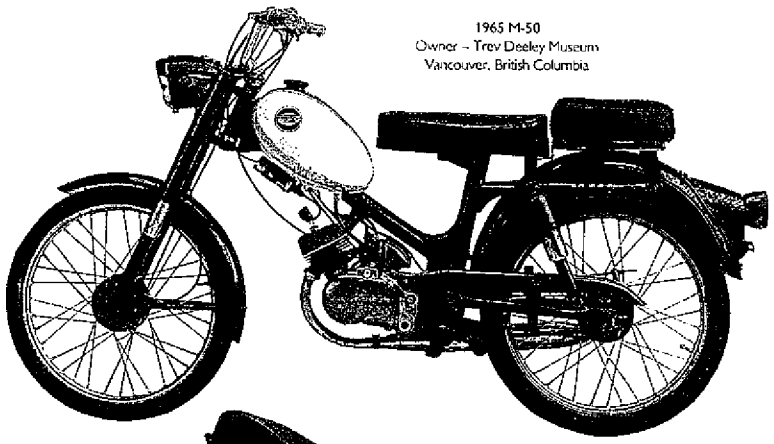
CRS

The Italian Sprint from Aermacchi continued its Americanization in the mid-1960s. The generic road model had spawned a family of scramblers, flat-trackers and roadracers. The competition-only scrambler was designated CRS. The 250cc four-stroke single was now straining its legs to keep pace with the two-strokes in road-racing. But on the dirt oval short tracks the Sprint could still carry the day, as Bart Markel and Fred Nix continued to show.

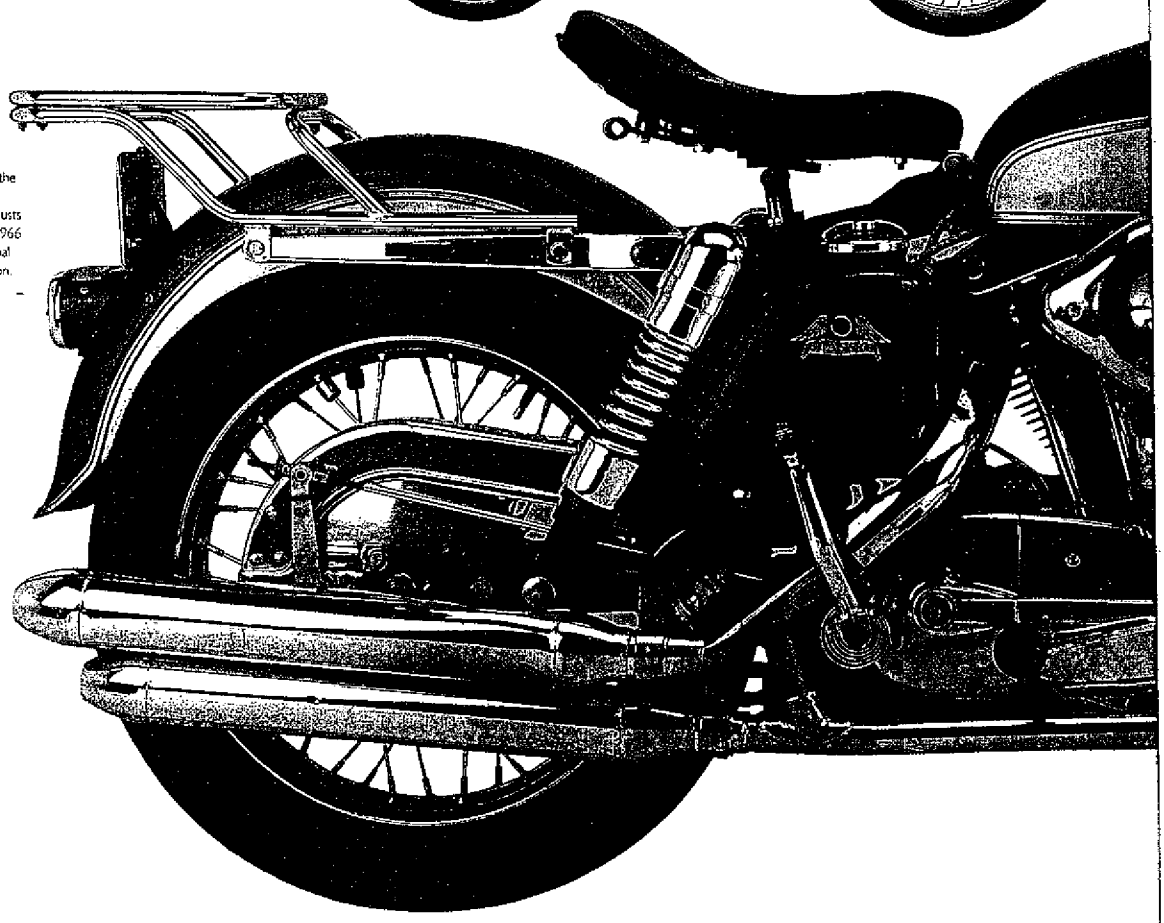
In 1967 the Sprints received new aluminum barrels and heads, with shorter stroke and larger bore. The H model retained the large tank while the S5 became the sportier street version with



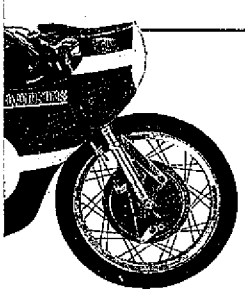
Above: The last hurrahs of the KR roadracer were Cal Rayborn's Daytona wins in '68 and '69.



1965 M-50
Owner – Trev Deeley Museum
Vancouver, British Columbia



Right: Most riders chose the rigid-mount seat and staggered shorty dual exhausts for the XLCH look. This 1966 XLH retains the traditional sport-touring configuration.



1968 KRTT
Owner – Hayashi collection
Rick Cole Auctions

smaller fuel tank, rear fender and detachable headlight. The CRS remained the scrambler model and the road-racing rendition, with fairing, became the CRTT. For 1969 the stroke was increased to make the Sprint a 350cc engine, with the SS serving as the street version and the scrambler re-labeled the ERS.

The total number of Aermacchi Sprints imported from 1961 to 1974 is somewhere in the neighborhood of 40,000 machines, including racing models. They received better welcome than the smaller two-strokes, but were prohibited from wide popularity by virtue of stiff competition and Italian electrics, rarely noted for their dependability. And the Sprints required more mechanical nurturing than most of their Japanese and European counterparts, not to mention the stolid V-twin.

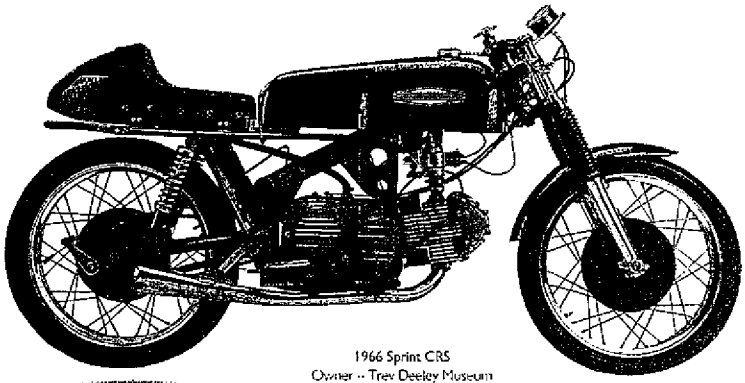
M50

The M-50, a 50cc two-stroke motorbike from Aermacchi, and the M-50 Sport were brought in to compete with the popular Honda 50. Milwaukee's market projections turned out to be optimistic, when nearly half the 9,000 machines imported sat unordered in the warehouse. The Sport version, more motorcycle in appearance than the step-through M-50, was introduced in 1966.

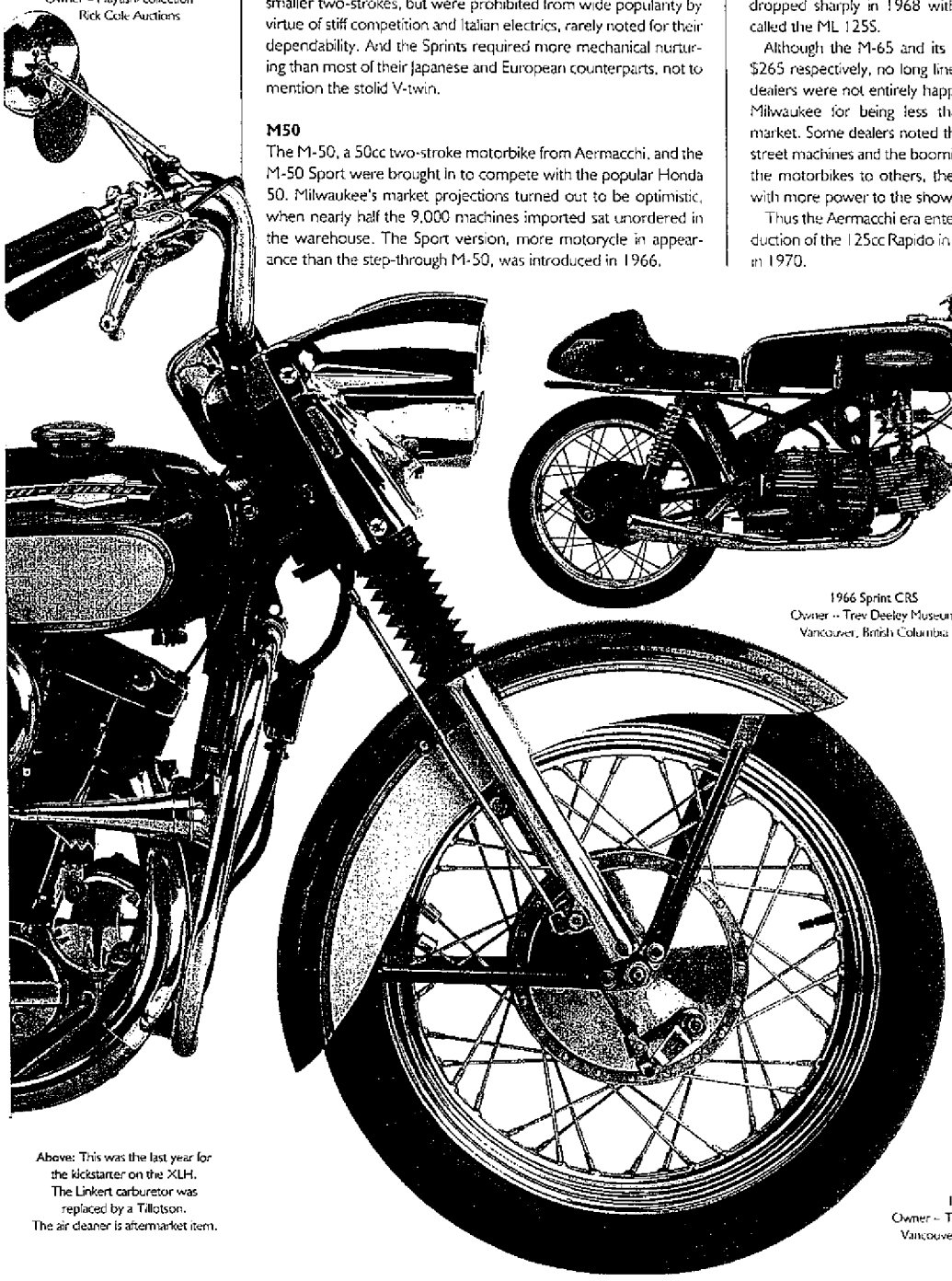
The attempt to corner a share of the lightweight market came too late to provide Milwaukee any significant increase in market share. Honda had virtually secured the motorbike segment and accompanied by the other Japanese builders, had moved strongly into the middleweight sportbike sphere. And they were joined by several Italian and Spanish contenders, as motorcycle sales in the U.S. mushroomed. In 1967 the M series went to 4 cubic inches (65cc) engines ("with 62% more horsepower"), but the numbers dropped sharply in 1968 with the arrival of a 125cc rendition called the ML 125S.

Although the M-65 and its sporty brother sold for $230 and $265 respectively, no long lines formed at the dealerships. Most dealers were not entirely happy with the small bikes, and chided Milwaukee for being less than serious about the lightweight market. Some dealers noted the obvious popularity of small-bore street machines and the booming interest in off-road riding. Leave the motorbikes to others, they suggested, and bring something with more power to the showroom.

Thus the Aermacchi era entered another chapter with the introduction of the 125cc Rapido in 1968 and the 100cc Baja scrambler in 1970.



1966 Sprint CRS
Owner – Trev Deeley Museum
Vancouver, British Columbia



Above: This was the last year for the kickstarter on the XLH. The Linkert carburetor was replaced by a Tillotson. The air cleaner is aftermarket item.

1966 XLH
Owner – Trev Deeley Museum
Vancouver, British Columbia

SS 350 (1969), CRTT (1969), RAPIDO 125 (1970) AND M-65S (1968)

The Italian connection reached full-bloom in the late 1960s, when nearly half of Milwaukee's inventory was coming from Varese. The sportbike market was crowded with British, Japanese and European contenders, and the Harley-Davidson imports faced an increasingly sophisticated market that was discriminating about performance, technology and style.

As we noted earlier, Aermacchi's horizontal four-stroke single became a genuine giant-killer in Europe. In the hands of Kel Carruthers and Renzo Pasolini the new happy little singles bumbled many of the traditional victors in continental roadracing. A small, powerful engine, hung low in a lightweight chassis, would outperform larger and more powerful machines on a demanding road circuit. In the meantime, the Japanese were applying this knowledge to two-stroke racers.

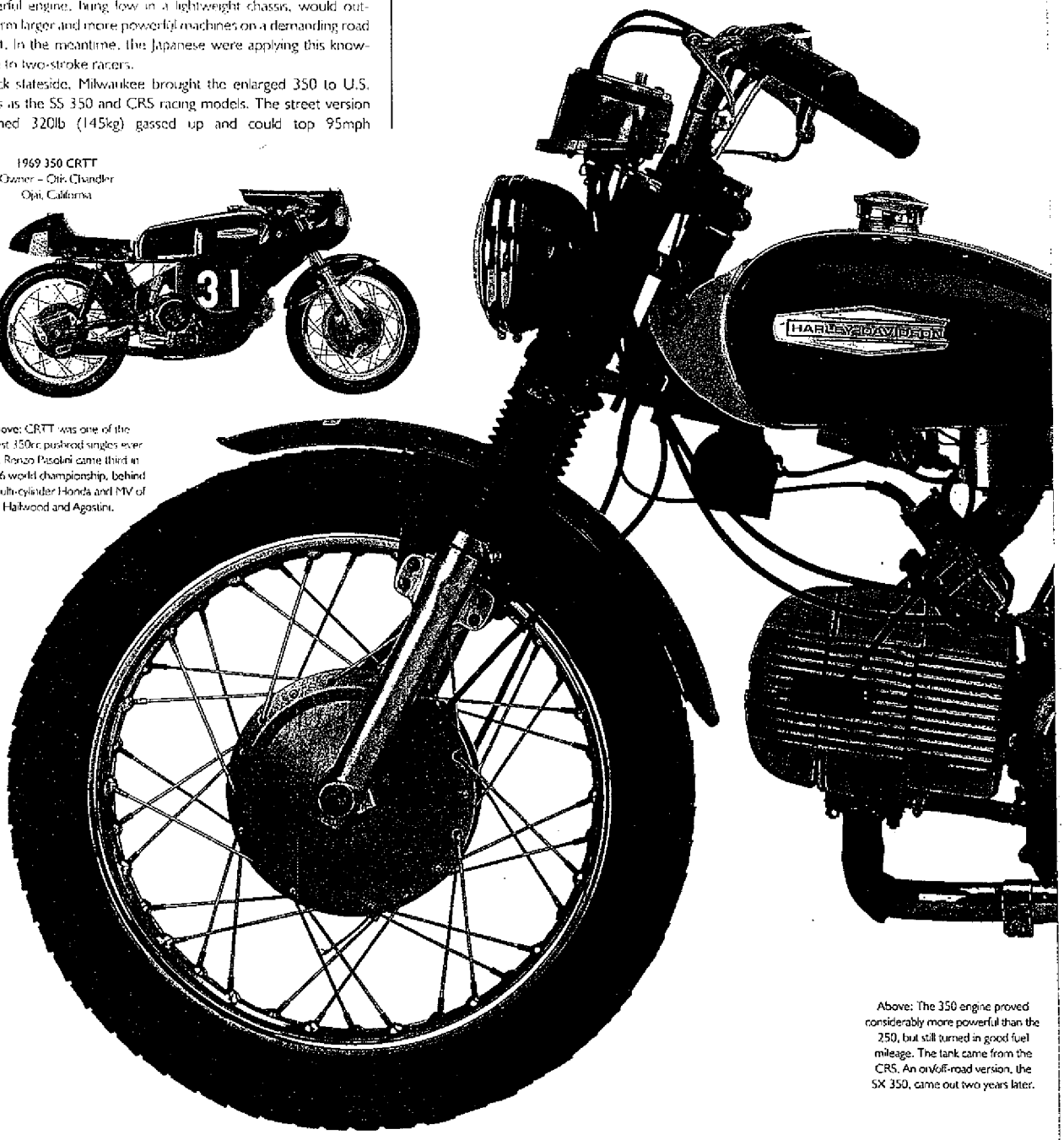
Back stateside, Milwaukee brought the enlarged 350 to U.S. riders as the SS 350 and CRS racing models. The street version weighed 320lb (145kg) gassed up and could top 95mph (153km/h). This Sprint reached a new statistical mark in 1969, with 4,575 machines imported. Only the Electra Glide and Sportster XLCH topped 5,000 units for the year.

The CRTT 350 remained a short-stroke racing engine, for which there was no national class in the U.S. The CRS dirt-track models remained competitive in short track against the BSA and Triumph singles, but here too the two-stroke invasion was well underway. The SS 350 remained on the Harley-Davidson roster through 1974, when the factory transferred its lightweight chores to the two-stroke Aermacchis.

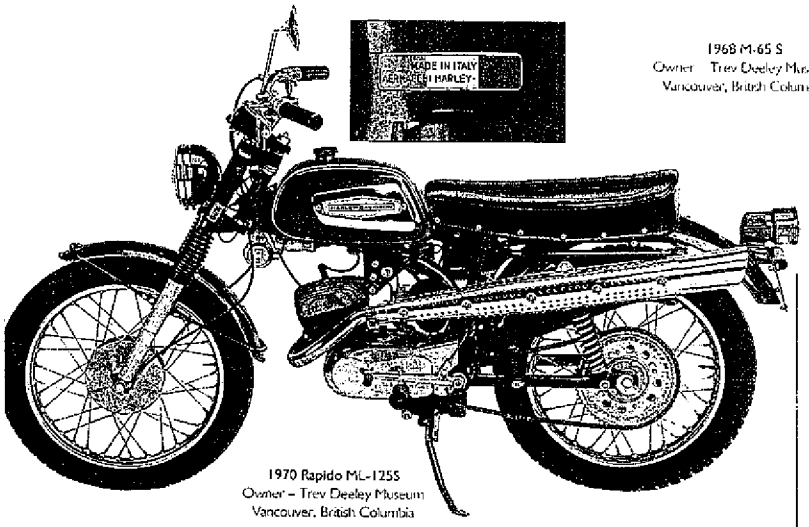
Below: By 1969 the Sprint showed the effects of American styling on Italian design. The attempt to cast the import as a baby Sportster was not entirely successful. The Sprint would get an electric starter in 1973.

1969 350 CRTT
Owner – Otis Chandler
Ojai, California

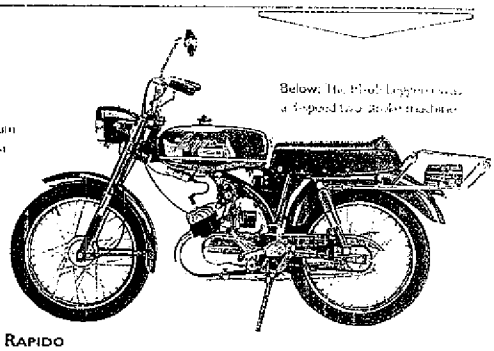
Above: CRTT was one of the swiftest 350cc pushrod singles ever built. Renzo Pasolini came third in the '66 world championship, behind the multi-cylinder Honda and MV of Hailwood and Agostini.



Above: The 350 engine proved considerably more powerful than the 250, but still turned in good fuel mileage. The tank came from the CRS. An on/off-road version, the SX 350, came out two years later.



1968 M-65 S
Owner – Trev Deeley Museum
Vancouver, British Columbia



Below: The M-65 Leggero was a 3-speed two-stroke machine

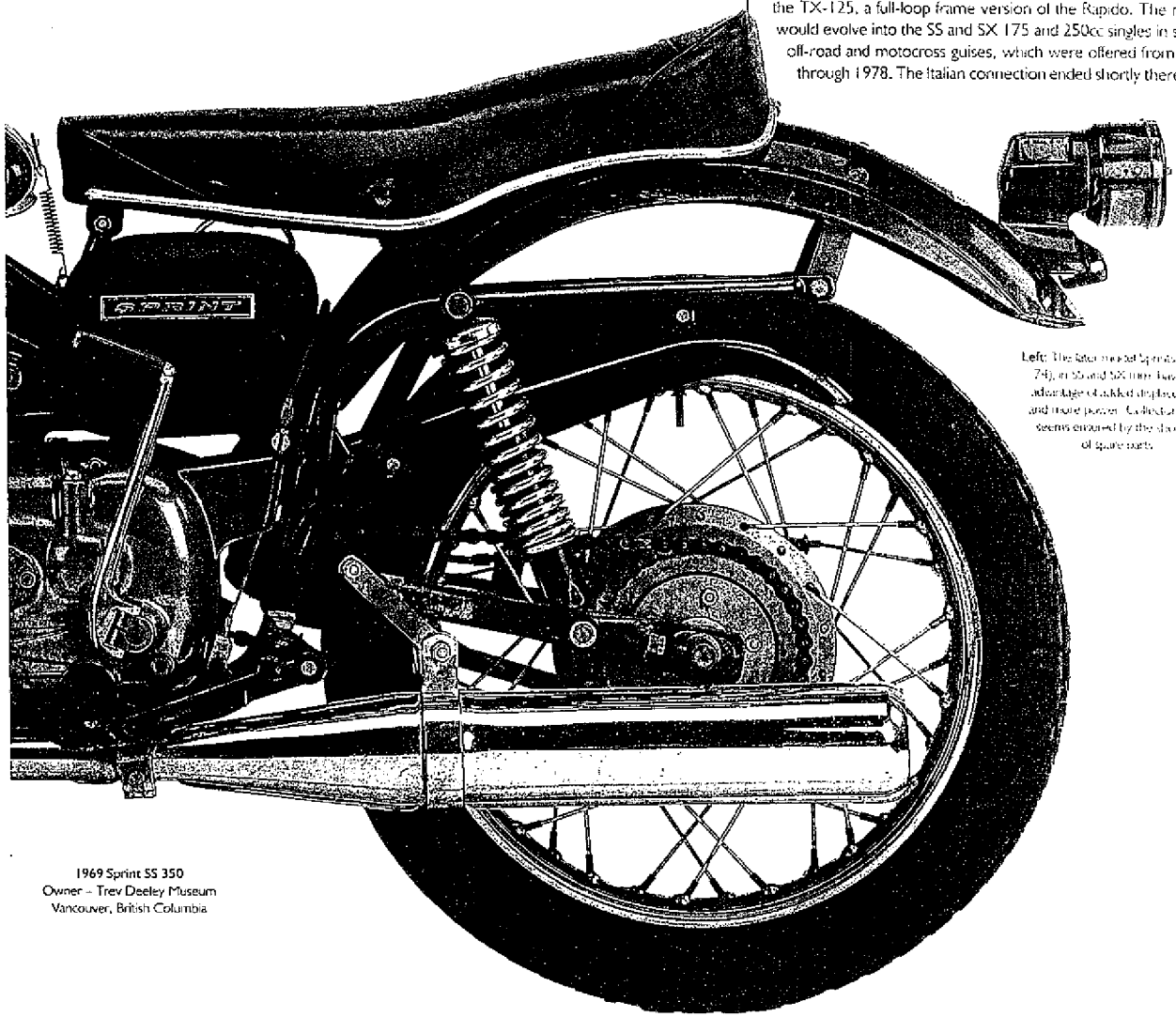
1970 Rapido ML-125S
Owner – Trev Deeley Museum
Vancouver, British Columbia

Rapido

A larger version of the M-65 Sport, the 125cc Rapido was introduced in 1968. The following year it featured a reinforced frame, longer seat and smaller fuel tank, and was offered in standard and street/trail versions. The road model was discontinued in 1970 and the dual-purpose type was available through 1972.

Once again it was a matter of too little too late to make much of a dent in the growing dirt-bike market. The Aermacchi two-strokes were far outstripped by both the new on/off-road entries from Japan and the purpose-built scramblers and motocrossers from Europe.

The second upgrade of the imported single came in 1973 with the TX-125, a full-loop frame version of the Rapido. The model would evolve into the SS and SX 175 and 250cc singles in street, off-road and motocross guises, which were offered from 1972 through 1978. The Italian connection ended shortly thereafter.



Left: The later model Sprints (1969-74), in SS and SX mini, have the advantage of added displacement and more power. Collector status seems entered by the shortage of spare parts.

1969 Sprint SS 350
Owner – Trev Deeley Museum
Vancouver, British Columbia

1970-80 XR 750

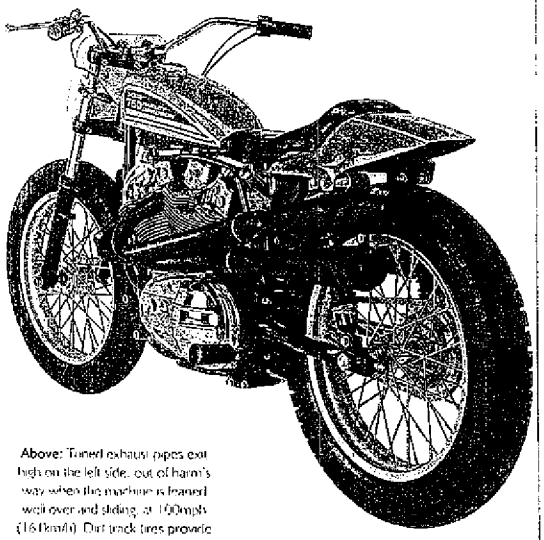
Specifications
Engine/Drivetrain
Engine: [illegible]
Displacement: [illegible]
Bore & stroke: [illegible]
Compression ratio: [illegible]
Horsepower: 95
Carburetion: Two 36mm Mikuni
Transmission: 4 speed
Primary drive: Triplex chain
Final drive: Chain
Brakes: Rear disc
Ignition: Magneto

Chassis/Suspension
Frame: Steel, double [illegible]
Suspension: [illegible]
Wheelbase: [illegible]
Weight: 320lb [illegible]
Fuel capacity: [illegible]
Oil capacity: [illegible]
Tires: 4.00 x 19in (10.16 x 48.26cm)
Top speed: 130mph (209km/h)
Colors: jet fire orange/black
Number built: 160 (1980)
total production: approx 530
Price: $4,000

The XR 750 began as a de-stroked Sportster, replacing the KR 750 flathead racer. Even though Cal Rayborn displayed in convincing fashion the side valve's gumption at Daytona in '68 and '69, the need for more power had arrived.

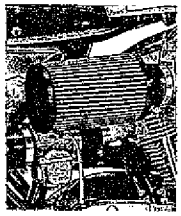
Milwaukee was assailed in dirt-track racing by BSA, Triumph and Norton, who were joined by Honda, Yamaha and Kawasaki to make the roadracing more engaging. Under the direction of racing chief Dick O'Brien, the lighter and faster Sportster drew on the KRTT and XLR for inspiration. The first XRs had iron cylinders and heads, with the exhaust pipes exiting low on the right. With the arrival of the alloy engine in 1972, the pipes curled around high on the left side and two carburetors poked out on the right.

The iron XR was about 100lb (45.4kg) lighter than a kick-start Sportster and made roughly 10 more horsepower in stock form. The ports, valves and cams got the racing treatment and the magneto went up front in place of a generator. Fuel was mixed by a Tillotson carburetor, and compression was only 8.5:1 in the interest of reliability. The motorcycle was fast but suffered serious overheating in long events, a deficiency most apparent in road races. The Harley team got spanked by Dick Mann on a Honda at Daytona in 1970, and the same Mann did it the following year on a BSA. Harley-Davidson rider and former Daytona winner Roger Reiman was fourth, a lap down on the Triumph of Gene Romero and Don Emde's BSA.

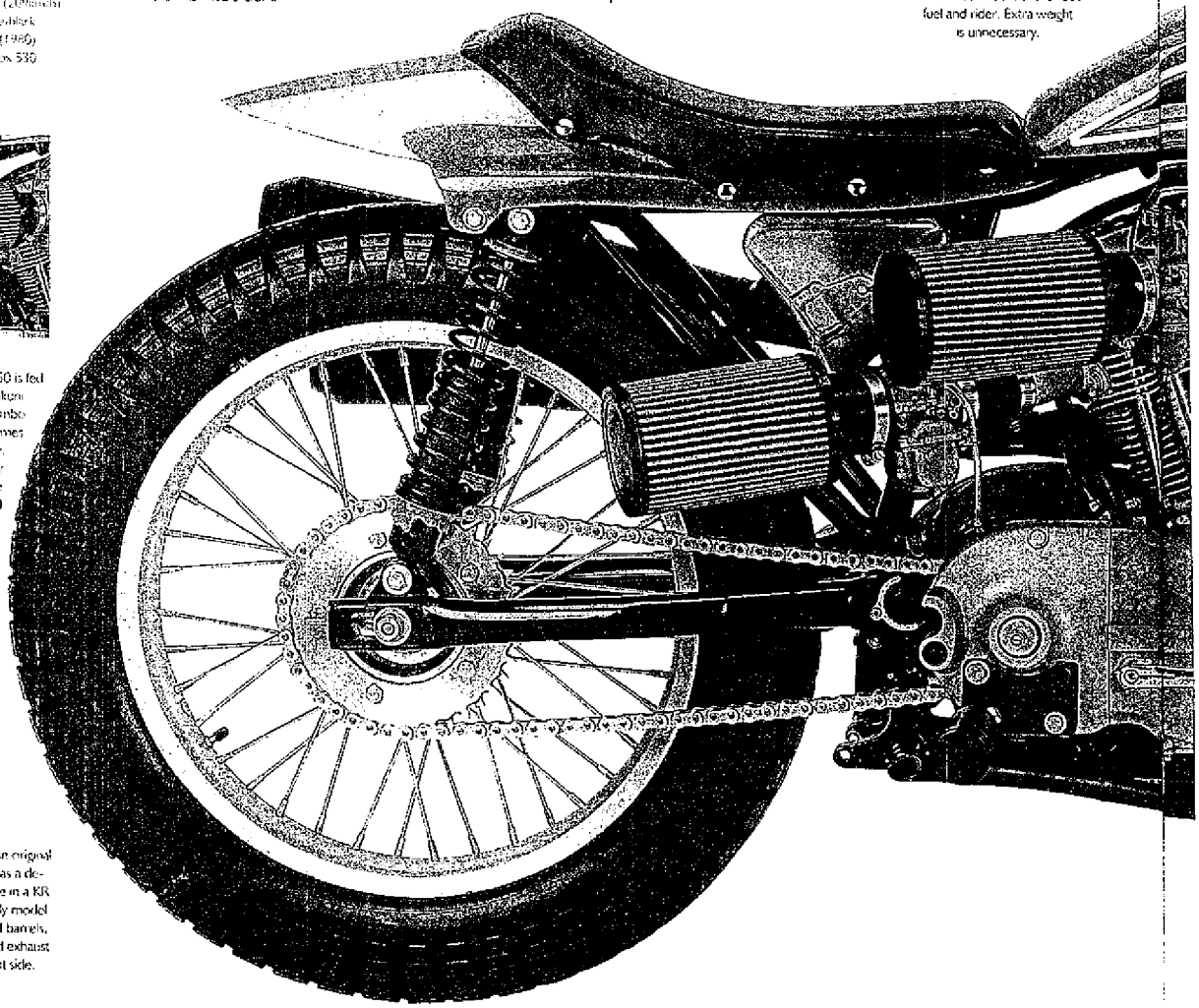


Above: Tuned exhaust pipes exit high on the left side, out of harm's way when the machine is leaned well over and sliding, at 100mph (161km/h). Dirt track tires provide the best balance between slip and grip.

Below: The XR provides only minimal accomodations for both fuel and rider. Extra weight is unnecessary.



Above: The XR-750 is fed by two 36mm Mikuni carburetors with jumbo air filters. Large volumes of air pass this way, and when properly mixed with fuel, the result is close to 100 horsepower.



Right: This is not the original XR-750, which was a de-stroked XLR engine in a KR chassis. So the early model had iron heads and barrels, one carburetor and exhaust pipes on the right side.

Below: Flat track racing machines have never carried front brakes. From the beginning they were considered an unnecessary hazard on machines that spent most of their time traveling sideways.

The alloy XR wasn't ready for Daytona in 1972, but its American road-racing career was effectively ended before it began. The impeccable Cal Rayborn took his old iron-head to England, without Milwaukee's blessing, and blistered the best of the British on tracks they knew and he didn't. The cool weather and short circuits matched perfectly the skills of Rayborn and the iron XR . He returned to the U.S. and won the Grand National road-racing events at Indianapolis and Monterey on the alloy version. But thereafter, the two-strokes consigned the XR 750 to dirt-track racing exclusively.

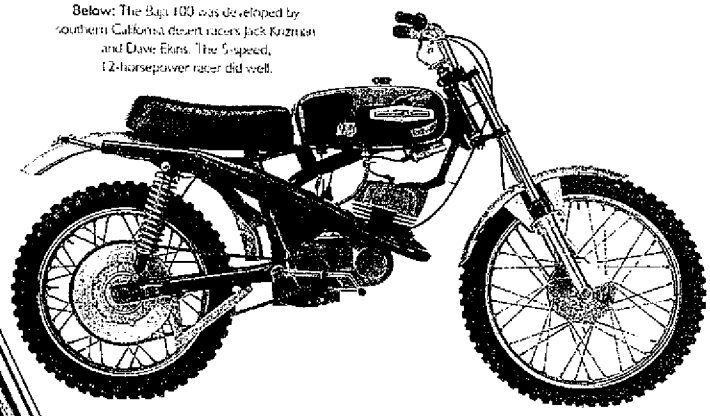
There it has reigned, almost uninterruped, ever since then. Now in its 27th consecutive season, the XR 750 has become the all-time durability champion among production racing machines. Well, engines at least. The factory got out of the chassis business in the 1980s because racers were choosing their own frames, wheels and suspension components.

The aluminum cylinders and heads contributed greatly to the new XR's ability to run stronger longer. The combustion chamber was improved and each was fed by a 36mm carburetor. Compression was up to 10.5:1. The rods, pistons and valves were all developed for the new engine, which had slightly less stroke and larger bore. Even though the cylinders were shorter than the iron ones, more and wider fins surrounded them.

With the technical asssistance of independent tuners C.R. Axtell and Jerry Branch, the new XR became a formidable racing engine that made about 90 horsepower. The bike was well suited to young charger Mark Brelsford, who returned the Grand National Championship title to Milwaukee in 1972. Kenny Roberts put Yamaha on top for the next two years, then Gary Scott gave Harley-Davidson another Number One ranking in 1975.

The XR 750 continues its winning ways today, several times removed from the original Class C concept of production racing, but still a traditional 45° pushrod V-twin built to go fast.

Below: The Baja 100 was developed by southern California desert racers Jack Kruzman and Dave Ekins. The 5-speed, 12-horsepower racer did well.



1970 Baja 100
Owner – Tres Davis Museum
Vancouver, British Columbia

1980 XR-750
Owner – Otis Chandler
Ojai, California

1971 FX SUPER GLIDE

Specifications

Engine/Drivetrain
Engine: OHV 45° V-twin
Displacement: 73.7ci (1208.19cc)
Bore & stroke: 3.44 x 3.97in (87 x 101mm)
Compression ratio: 8.1
Horsepower: 65
Carburetion: Bendix
Transmission: 4-speed
Primary drive: Chain
Final drive: Chain
Brakes: F & R: Drum
Battery: 12-volt
Ignition: Coil/points

Chassis/Suspension
Frame: Steel, double downtube
Suspension: F: Telescopic fork R: Hydraulic shocks
Wheelbase: 62in (157.5cm)
Weight: 560lb (254kg)
Fuel capacity: 3.5gal (13.25lt)
Oil capacity: 4pts (3.79lt)
Tires: F: 3.50 x 19in (8.9 x 48.26cm), R: 5.00 x 16in (12.7 x 40.64cm)
Top speed: 110mph (177km/h)
Colors: Black; birch white (options: sparkling green; burgundy; blue; turquoise; red; copper; "sparkling America" [red, white and blue])
Number built: 4,700
Price: $2,500

FX IS TO THE SUPER GLIDE

When Harley-Davidson was acquired by AMF in 1969, several new models were already on the drafting table. One of them, penned by design director William G. Davidson, was the first attempt at a factory customized production roadster. And it was special enough to have a name like Super Glide.

The FX 1200 represented the response of Milwaukee, Willie G. in particular, to the spreading popularity of customs, cruisers and choppers on the motorcycle scene. Numbers of aftermarket performance and accessory makers had been established around the Shovelhead's platform, which didn't harm sales of the Electra Glide. But Harley-Davidson reckoned there was a market for a moderately-styled production cruiser with a sporting flair. And they were right.

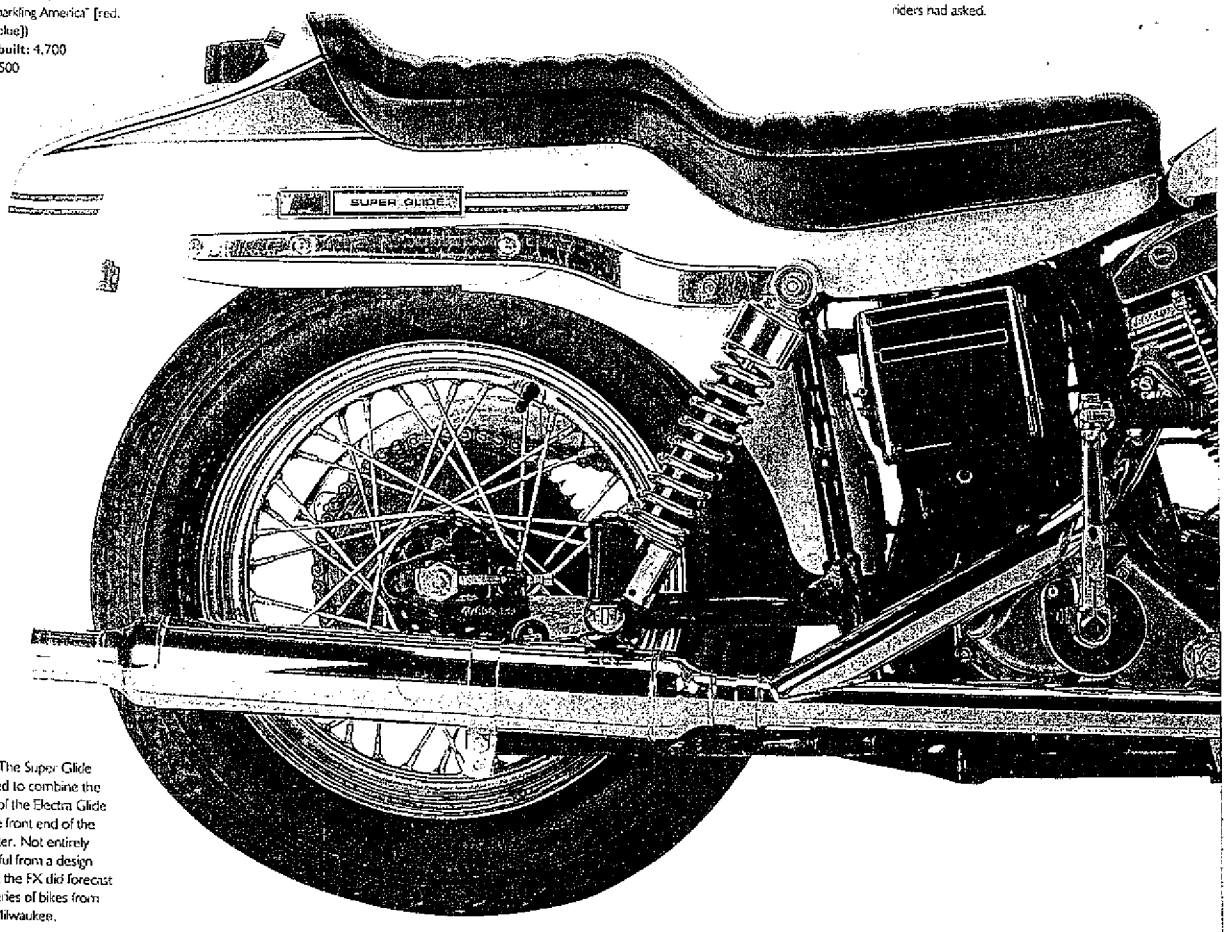
The Super Glide, as the FX designation suggests, was part Electra Glide and part Sportster. The FL series had grown larger and heavier through the years, as the Sportster was becoming lighter and leaner. Somewhere in the middle, between porky and piglet, there was ground for a big-bore sport/cruiser. Some riders would revise and reshape the Super Glide to suit their own preferences, while others would be well served by the factory styling. Something for most everybody.

The FX combined the 74ci (1200cc) Shovelhead engine and frame with the Sportster front end. The electric starter was omitted, so a smaller battery was mounted on the right side. A European-style fiberglass seat/tail section was fitted, and a Sportster-type two-into-one exhaust system. The red, white and blue paint scheme reflected the current swell of patriotism in reaction to the Vietnam war. The new racing logo, a block numeral 1 in stars and stripes, decorated the top of the fuel tank. Ads touted the FX as the "All-American Freedom Machine." The Super Glide weighed 560lb (254kg), only about 60 (27kg) more than a Sportster and some 150lb (68kg) less than the Electra Glide.

The concept was sound, although the boat-tail seat/fender was destined for early retirement. The prospect of European-style cafe racers achieving wide acceptance in the U.S. seemed at least a possibility in the early 1970s. But the Super Glide was hardly a backroads scratcher, and the tailpiece was over-sized to include space for a passenger. Set against the spare front end of the Sportster, the FX looked just like what it was – two different motorcycles. For 1972 the Super Glide had a standard rear fender, and sales began rising.

In 1973 the FX slimmed down even further when the wide 3.5-gallon (13.25lt) fuel tank was replaced with the slimmer tank from the Sprint. The suspension got stiffer springs and a disc brake appeared at each wheel, as the Super Glide became more performance-oriented. Not that it was becoming a Sportster. In 1974 electric start was offered as an option (FXE), and the thumb-starter sold in twice the numbers of the kick-start FX.

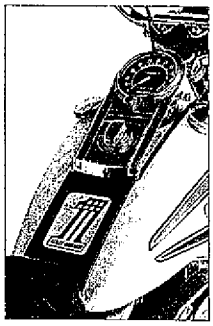
Below: The Euro-style seat and tail section answered a question few American riders had asked.



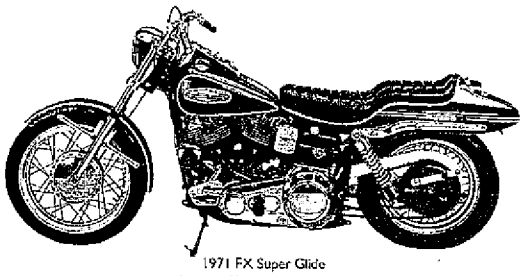
Right: The Super Glide attempted to combine the rear end of the Electra Glide with the front end of the Sportster. Not entirely successful from a design standpoint, the FX did forecast a new series of bikes from Milwaukee.

The Super Glide is properly considered a seminal machine in the evolution of the Harley-Davidson Motor Company. It was the catalyst for a continuing variation of FX series machines, starting in 1977 with the Low Rider. Then followed the more retro Fat Bob and the custom Wide Glide, which begat the Sturgis, the Softail, the FXR sport model and the nostalgic Springer.

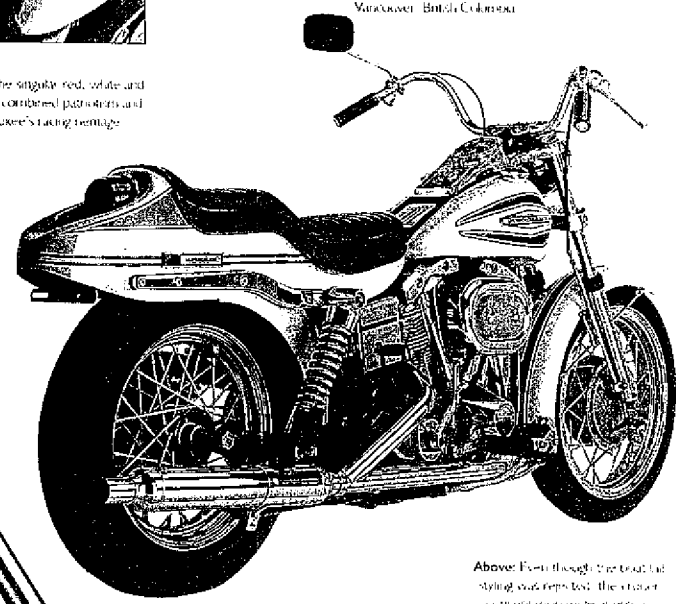
The FX series became more popular with each succeeding rendition, and provided a substantial boost to Milwaukee's balance sheet as the Electra Glide slipped against the wave of Japanese touring bikes. Most of the firm's styling and engineering emphasis focused on the FX models throughout the 1970s, and introduced the belt drive system that would later be adopted across the line.



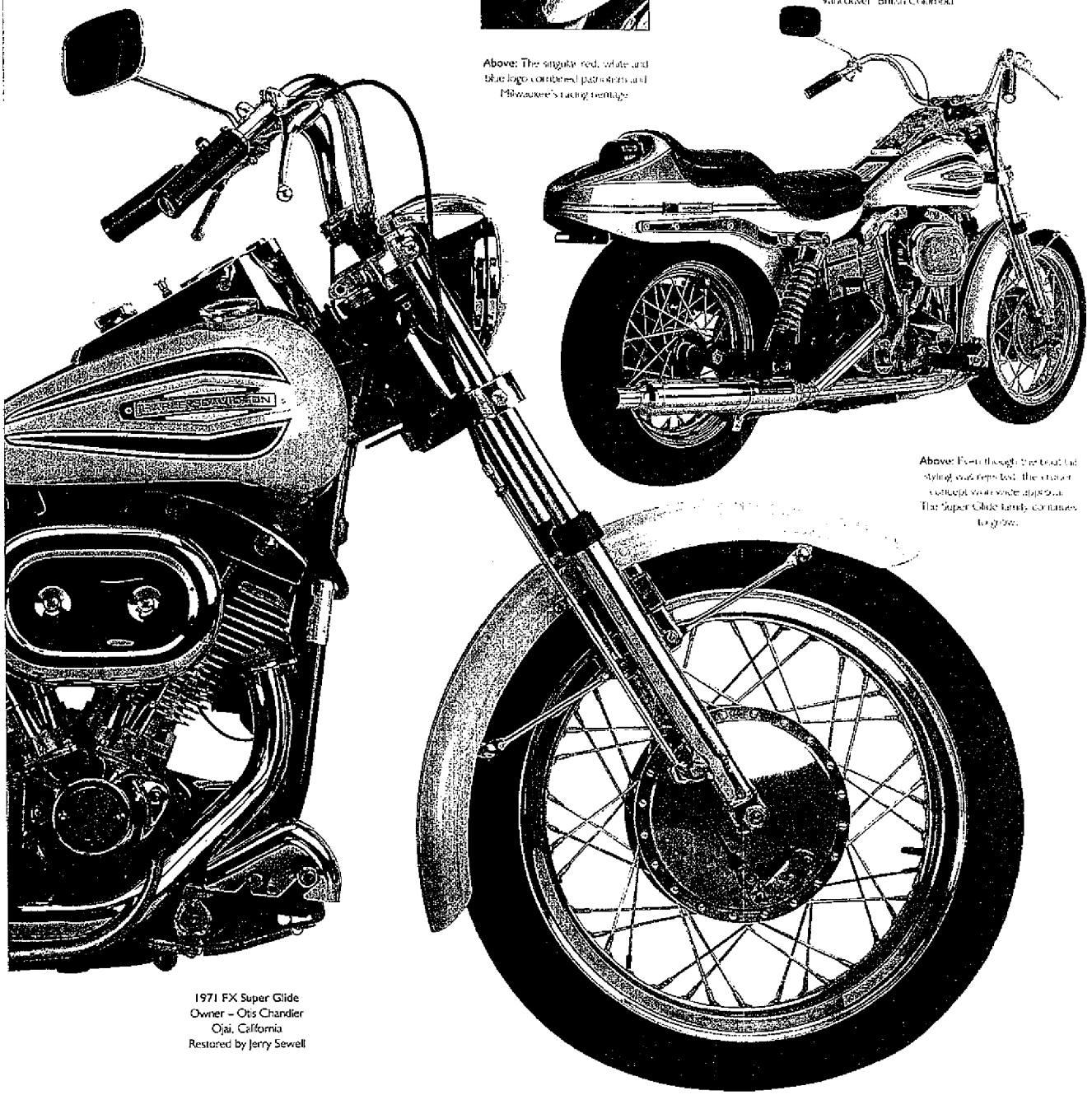
Above: The singular red, white and blue logo combined patriotism and Milwaukee's racing heritage



1971 FX Super Glide
Owner – Trey Dooley Museum
Vancouver, British Columbia



Above: Even though the boat tail styling was rejected, the cruiser concept won wide approval. The Super Glide family continues to grow.



1971 FX Super Glide
Owner – Otis Chandler
Ojai, California
Restored by Jerry Sewell

XLH (1971), RR250 AND X-90 (1974)

By 1968 the XLCH Sportster was outselling the XLH by two to one. High performance motorcycles were in demand as more new riders moved up from lightweight machines. The race was on for top honors in the power and speed categories, and new contenders from Japan challenged the current champs from the U.S. and Britain.

But while the XLH was in the process of looking more like the CH, and producing the same power, it was still outfitted in sport/touring trim. Windshield, saddlebags, and Buddy Seat were all available options, and one could still choose the Low or High Ground Clearance style, which meant either 18- or 19-inch (45.72 or 48.26cm) front wheel. The fork received an improved damping mechanism and increased travel. In 1968 the XLH sold for $1,650.

The heads were slightly redesigned for 1969 and got bigger valves, which with more efficient exhaust plumbing produced a five horsepower increase. In 1971 the Sportster was changed from a dry to wet clutch, which solved the problem of gear lube causing slippage. The ignition points now moved inside the timing case, and featured an automatic advance mechanism. An optional boat-tail seat, a reduced version of the Super Glide tail, was offered in 1970 and 71 but roundly rejected. Of course it's now a collector's item.

The Sportster's standard colors were black or birch white. The options were sparkling burgundy, turquoise, green, blue, red or copper. The buyer could also order the bike in gray primer and have it painted to taste.

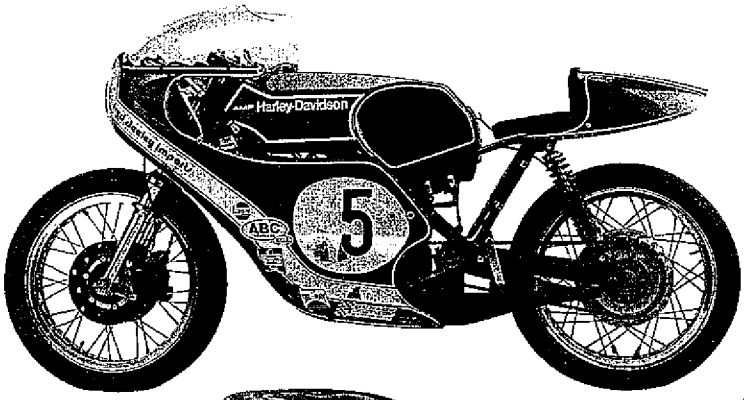
RR250

The RR250, a road-racing two-stroke twin from Aermacchi, appeared in 1971. Yamaha had begun demonstrating the speed and reliability of their two-strokes in world roadracing, but Walter Villa dominated the class from 1974-76. And in the third year he also collected the world 350cc championship.

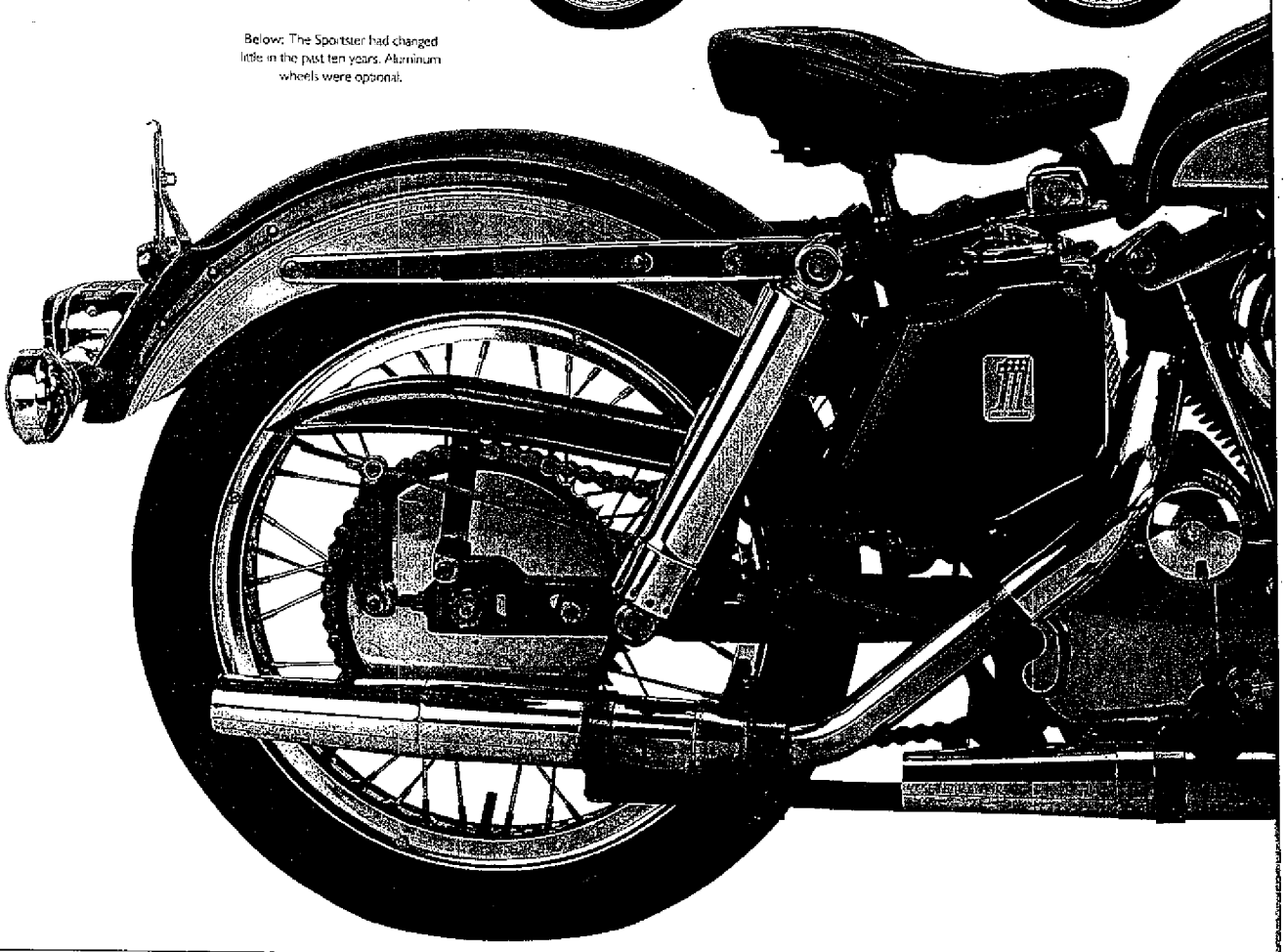
The RR was built solely for roadracing, and neither Aermacchi nor Harley-Davidson offered a comparable road model. The engine was a short-stoke vertical twin (bore/stoke: 2.21 x 1.96in, 56 x 50mm), with a 5-speed transmission in a tidy package weighing 230lb (104kg). The early air-cooled engines made about 50 horsepower at 10,000 rpm, but as development continued and

Below: The Aermacchi RR 250 roadracers were popular mounts until Yamaha came to dominate the class. Dual disc brakes replaced original drum. AMF logos appeared on all Harley bikes by 1972.

1972 RR 250
Owner – Trev Deeley Museum
Vancouver, British Columbia



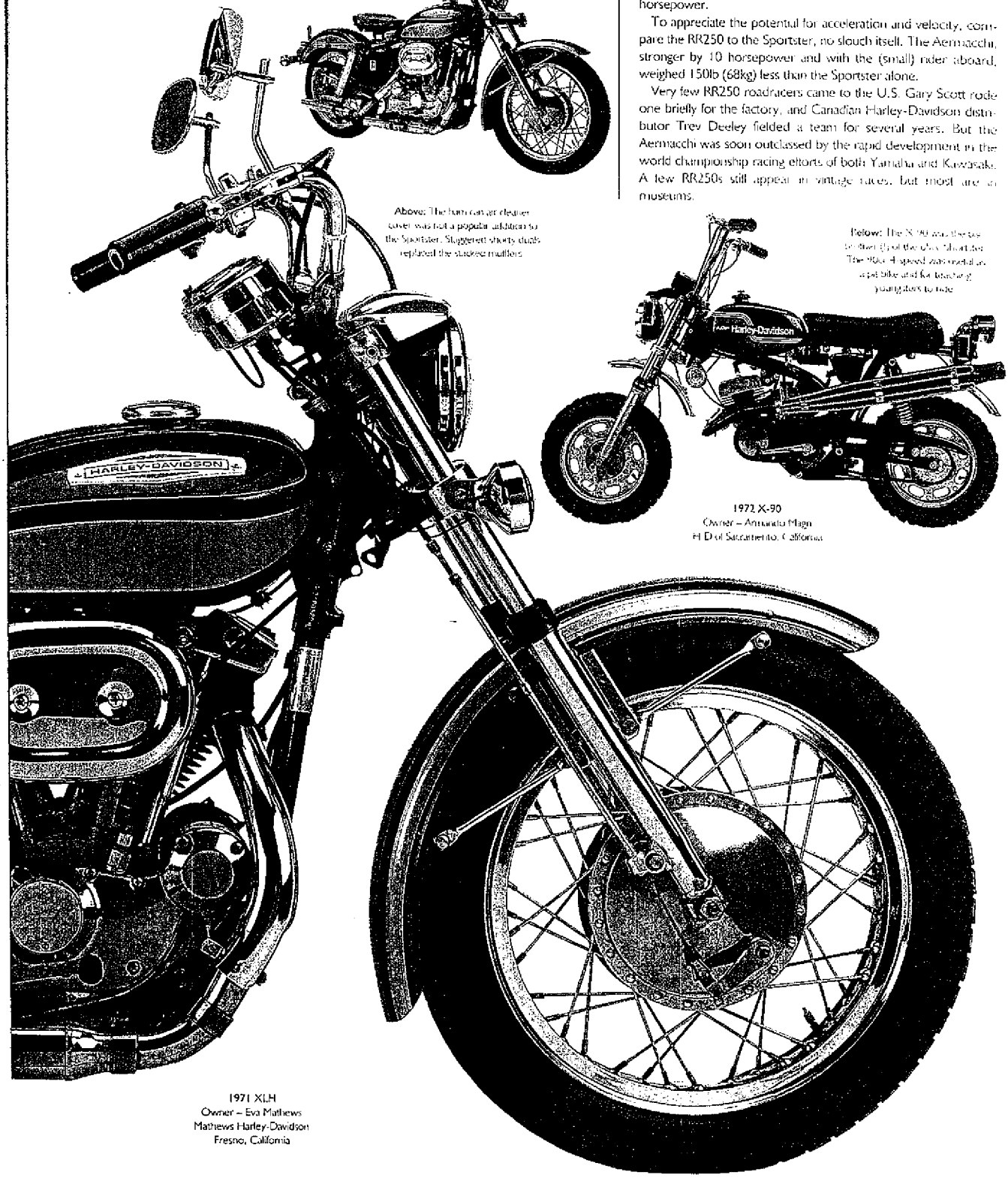
Below: The Sportster had changed little in the past ten years. Aluminum wheels were optional.



water-cooling was added, the figure rose to 58 at 12,000. The otherwise identical 350cc version was said to produce nearly 70 horsepower.

To appreciate the potential for acceleration and velocity, compare the RR250 to the Sportster, no slouch itself. The Aermacchi, stronger by 10 horsepower and with the (small) rider aboard, weighed 150lb (68kg) less than the Sportster alone.

Very few RR250 roadracers came to the U.S. Gary Scott rode one briefly for the factory, and Canadian Harley-Davidson distributor Trev Deeley fielded a team for several years. But the Aermacchi was soon outclassed by the rapid development in the world championship racing efforts of both Yamaha and Kawasaki. A few RR250s still appear in vintage races, but most are in museums.



Above: The ham can air cleaner cover was not a popular addition to the Sportster. Staggered shorty duals replaced the stacked mufflers

Below: The X-90 was the top brother (!) of the ohv Shortster. The 90cc 4-speed was useful as a pit bike and for teaching youngsters to ride

1972 X-90
Owner – Armando Magn
H D of Sacramento, California

1971 XLH
Owner – Eva Mathews
Mathews Harley-Davidson
Fresno, California

XLH (1972), XLH (1974) AND SX 350 (1973)

1972 XLH

SPECIFICATIONS
ENGINE/DRIVETRAIN
Engine: OHV 45° V-twin
Displacement: 61ci (1000cc)
Bore & stroke: 3.19 x 3.81in (81 x 97mm)
Compression ratio: 9:1
Horsepower: 61
Carburetion: Bendix/Zenith
Transmission: 4-speed
Primary drive: Triplex chain
Final drive: Chain
Brakes: F&R Drum
Battery: 12-volt
Ignition: Coil/points

CHASSIS/SUSPENSION
Frame: Steel, double downtube.
Suspension: F: Telescopic fork R: Hydraulic shocks
Wheelbase: 58.5in (148.6cm)
Weight: 530lb (240kg)
Fuel capacity: 3.7gal (14lit)
Oil capacity: 3qts (2.84lit)
Tires: F: 3.00 x 19in (7.62 x 48.26cm) R: 4.00 x 18in (10.16 x 45.72cm)
Top speed: 116mph (187km/h)
Colors: Black, white, sparkling burgundy, green, red, blue
Number built: 7,500
Price: $1,795

The Sportster's development route had taken few turns in its first 15 years. The H and CH models became more similar than different, and the Superbike market was crowded with high-performance motorcycles from Italy, Britain and Japan. Time for more horsepower.

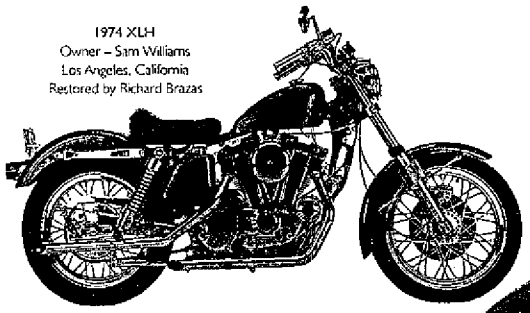
In 1972 the Sportster engine was bored to 3.18in (81mm) while the stroke remained at 3.81in (97mm). This brought displacement into the original Knucklehead realm, 61 cubic inches or 1000 cubic centimeters. In keeping with the European and Japanese emphasis on metric designations, the new Sporty was christened the XL 1000. The factory rating was 61 horsepower, meeting the popular standard of one pony per cubic inch. In the test by *Cycle World* magazine the new Sportster ran a 13.38 quarter-mile at just under 98mph (157.7km/h). The top speed was posted at 116mph (186.7km/h).

The wet clutch got mixed reviews; engagement was good and only severe abuse would induce slippage, but lever effort was higher than before. An improved shifter drum in the transmission made gear changes more predictable, and the 530-pound (240kg) machine was easy to ride. The new seat, while stylishly thin and swoopy, had too little padding for long-ride comfort. But the Sportster wasn't in the cozy corner anymore. The new look was naked aggression, or partially clothed at best.

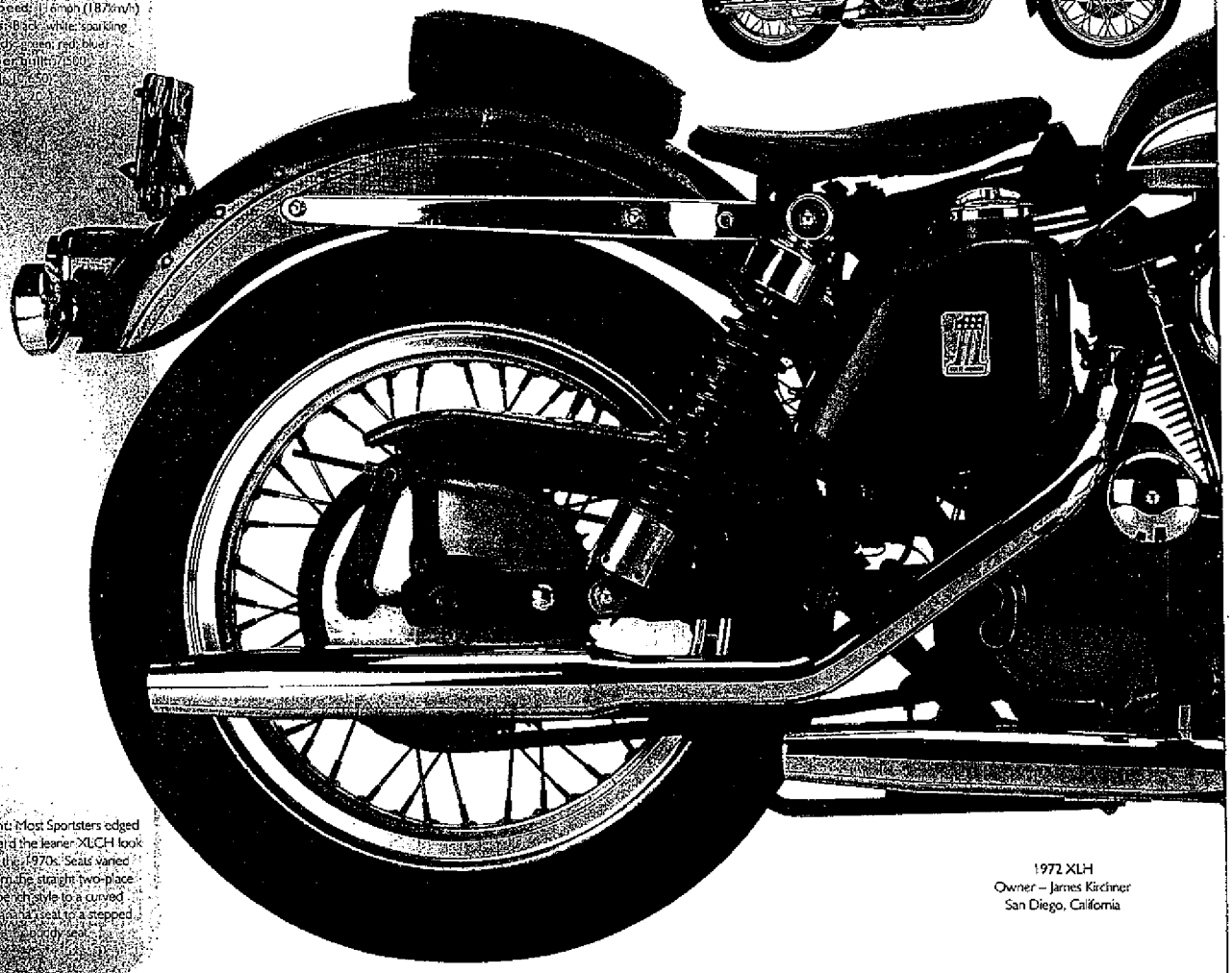
For 1973 both Sportsters were awarded a front disc brake, which improved stopping but required a stout squeeze. (Meaning lever pressure, not a passenger.) The new fork, from Showa of Japan, improved suspension compliance at the front, but better rear shocks remained several years distant. The federal government's safety program brought throttle return springs to the Sportster in 1974. Throttle controls had previously been simple push/pull cables. The horsepower rating remained at 61, but the XL 1000 was slightly quicker and faster than the 883.

SPRINT SX 350

The Sprint closed out its Milwaukee period with an on/off-road package called the SX 350. Although the four-stroke single had proven its merit in European roadracing and American dirt track,

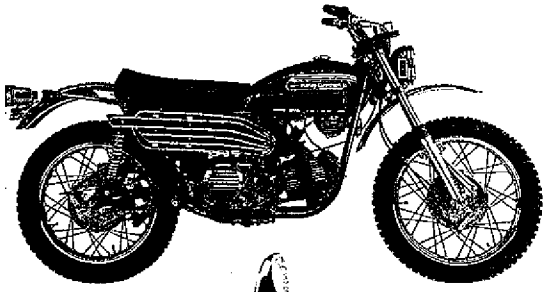


1974 XLH
Owner – Sam Williams
Los Angeles, California
Restored by Richard Brazas



1972 XLH
Owner – James Kirchner
San Diego, California

Right: Most Sportsters edged toward the leaner XLCH look in the 1970s. Seats varied from the straight two-place bobber style to a curved passenger seat to a stepped solo seat.



Above: The SX 350 was a popular mount with on/off-road riders who preferred the power delivery of a four-stroke engine. A heat shield prevented toasted legs.

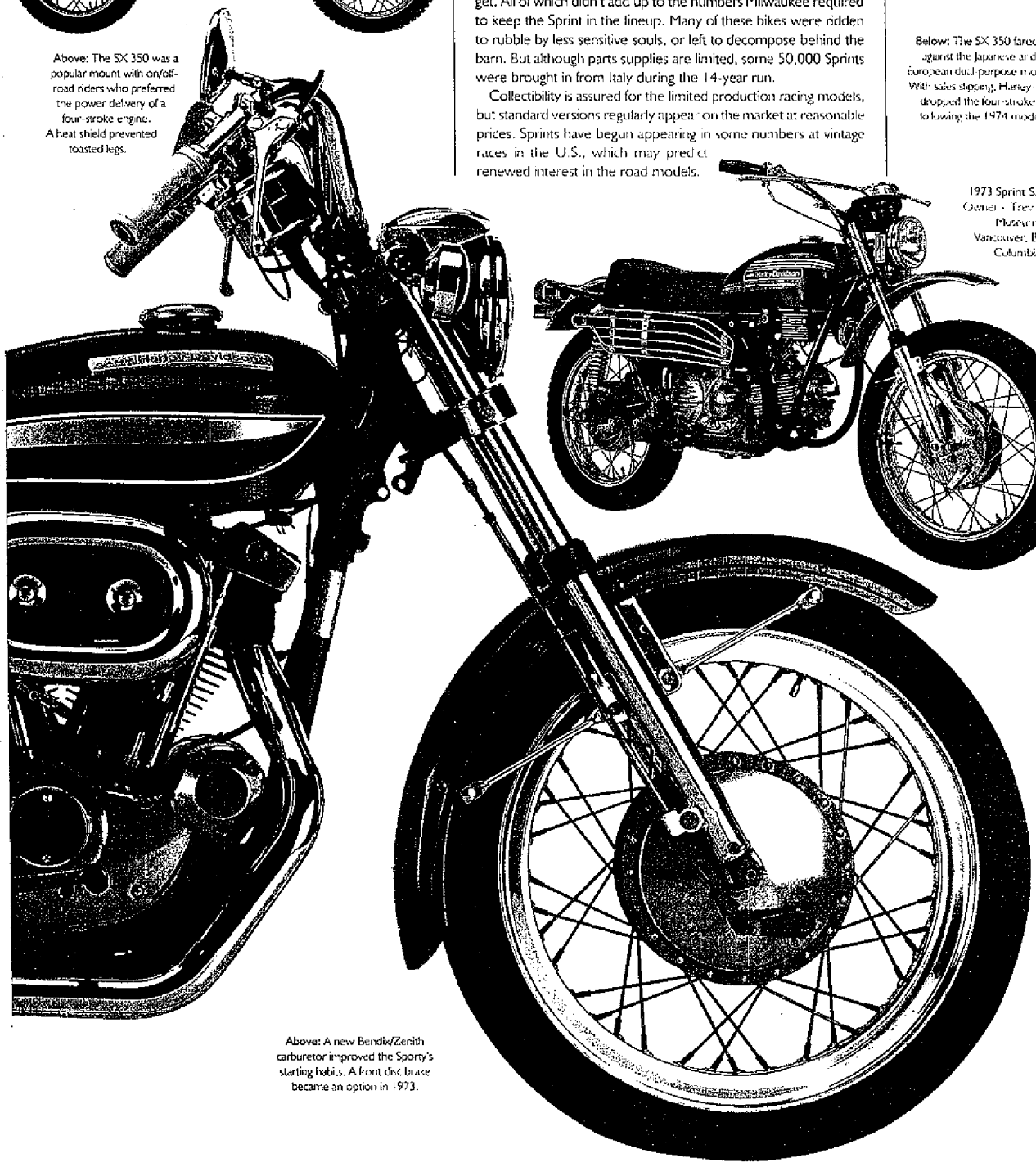
the civilian versions never captured the public fancy. As a trail bike it was greatly outclassed by purpose-built European and Japanese machines.

But it was cute, and different, and had a nice motor. Plus it was fast for a 350cc four-stroke single, and enjoyed a fair market among students, wanna-be racers and sport riders on a tight budget. All of which didn't add up to the numbers Milwaukee required to keep the Sprint in the lineup. Many of these bikes were ridden to rubble by less sensitive souls, or left to decompose behind the barn. But although parts supplies are limited, some 50,000 Sprints were brought in from Italy during the 14-year run.

Collectibility is assured for the limited production racing models, but standard versions regularly appear on the market at reasonable prices. Sprints have begun appearing in some numbers at vintage races in the U.S., which may predict renewed interest in the road models.

Below: The SX 350 fared poorly against the Japanese and other European dual-purpose motorcycles. With sales slipping, Harley-Davidson dropped the four-stroke singles following the 1974 model year.

1973 Sprint SX 350
Owner - Trev Deeley Museum
Vancouver, British Columbia



Above: A new Bendix/Zenith carburetor improved the Sporty's starting habits. A front disc brake became an option in 1973.

1973 FLH

Specifications

Engine/Drivetrain
Engine: OHV 45° V-twin
Displacement: 73.73ci (1208.19cc)
Bore & stroke: 3.44 x 3.97in (87 x 101mm)
Compression ratio: 8:1
Horsepower: 66
Carburetion: Bendix
Transmission: 4-speed
Primary drive: Chain
Final drive: Chain
Brakes: F. Disc. R. Drum
Battery: 12-volt
Ignition: Coil/points

Chassis/Suspension
Frame: Steel, single downtube
Suspension: F. Telescopic fork. R. Hydraulic shocks
Wheelbase: 61.5in (156.2cm)
Weight: 738lb (355.2kg)
Fuel capacity: 5gal (18.93lit)
Oil capacity: 4qts (3.79lit)
Tires: 5.00 x 16in (12.7 x 40.64cm)
Top speed: 100mph (161km/h)
Colors: Black, sparkling purple; [illegible] burgundy, sparkling blue; sparkling red, sparkling [illegible]; sparkling America [illegible]
Number built: 8,100 [illegible]
Price: [illegible]

FLH (1972 and 1973)

Harley-Davidson faced a sea of troubles in the 1970s. Added to the intense competition from overseas, a growing roster of management, economic and political concerns required attention.

As more manufacturers joined the movement to consumer-friendly motorcycling, and two-wheeled traffic increased accordingly, the federal government noted that the machines might well be made safer. Or at least have uniform operating controls, and run cleaner. And be quieter.

Milwaukee's big twins had always been left-side shifters, so no expensive modifications were required. But the Sportster had to be converted from right- to left-side operation. Noise and emission regulations affected all models, and turn signals beacame mandatory equpment.

The Electra Glide was fitted with a front disc brake in 1972, adding needed stopping power to the heavyweight. The disc brought the FL a step closer to the mechanical mainstream, into which new and better technology was flowing faster each year. Even though the sales boom of the late 1960s had peaked, the market remained relatively strong and brand competition reflected equally dedicated competition. To the extent that the British were driven from the field.

Harley-Davidson was challenged not only to build better motorcycles, but a lot more of them as well. The AMF partnership was expected to accomplish that, and production did increase dramatically in three years. But the parent company decided that the Milwaukee facility lacked the capacity for greater output. So in 1974 the original factory was responsible for building engines and transmissions, while chassis construction and final assembly shifted to AMF's plant in York, Pennsylvania. This led to problems.

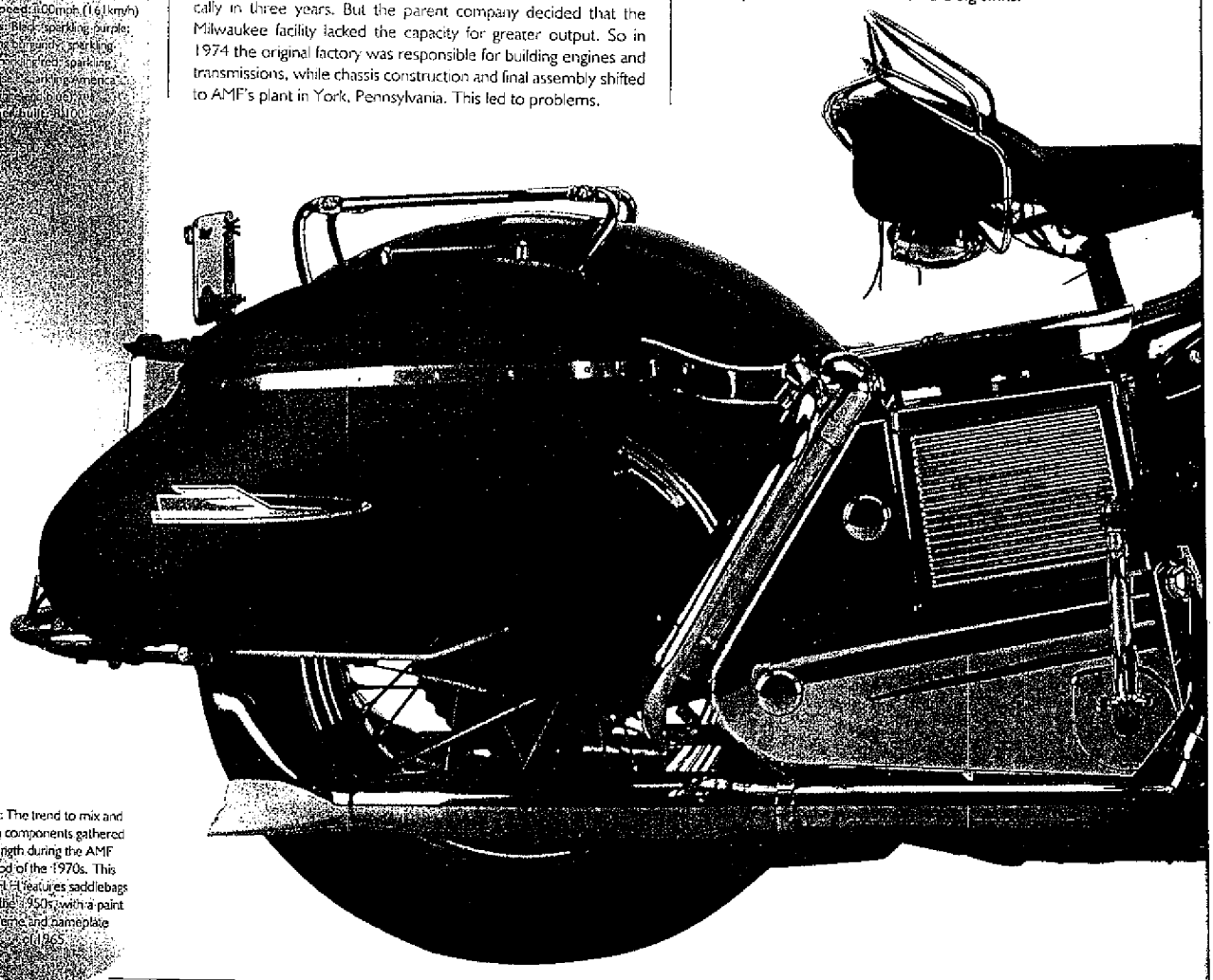
Motorcycle production had risen about 30 percent in the first two years under AMF, with total output for 1971 at 37,620 machines. The biggest jump came the following year, when Milwaukee recorded output of nearly 60,000 motorcycles. In 1973 the number climbed to 70,903.

But the transfer of final assembly to York was hardly a seamless matter. A three-month strike in 1974 put a serious crimp in the production schedule, and other difficulties were at hand. Harley-Davidson was now confronted with a discontented work force, increasingly expensive modifications required by the government, the so-called Oil Crisis, conflicts between the old and new management, the arrival of the Honda Gold Wing, and quality control problems in the manufacturing and assembly processes.

Then, when it seemed things could hardly get worse, national motorcycle sales went into decline. But there was some good news.

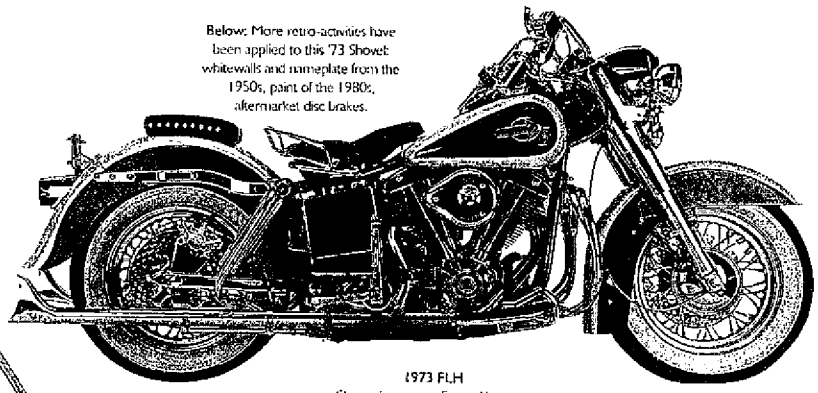
Milwaukee management, abetted by increasingly hard-nosed road tests in the enthusiast press, convinced AMF that better motorcycles were required. And machines that looked a bit more contemporary. Approvals were issued, and the first of the next generation would arrive with the XLCR sport bike and FXS Low Rider in 1977.

Meanwhile the Electra Glide was subjected to incremental modification. The horsepower rating for the FLH was 66 in 1973, and the front disc brake extended to the Super Glide. For 1974 the smaller Glide got an electric starter (FXE), and Keihin carburetors replaced the Bendix units on the big twins.



Right: The trend to mix and match components gathered strength during the AMF period of the 1970s. This 1972 FLH features saddlebags from the 1950s, with a paint scheme and nameplate of 1965.

Below: More retro-activities have been applied to this '73 Shovel: whitewalls and nameplate from the 1950s, paint of the 1980s, aftermarket disc brakes.

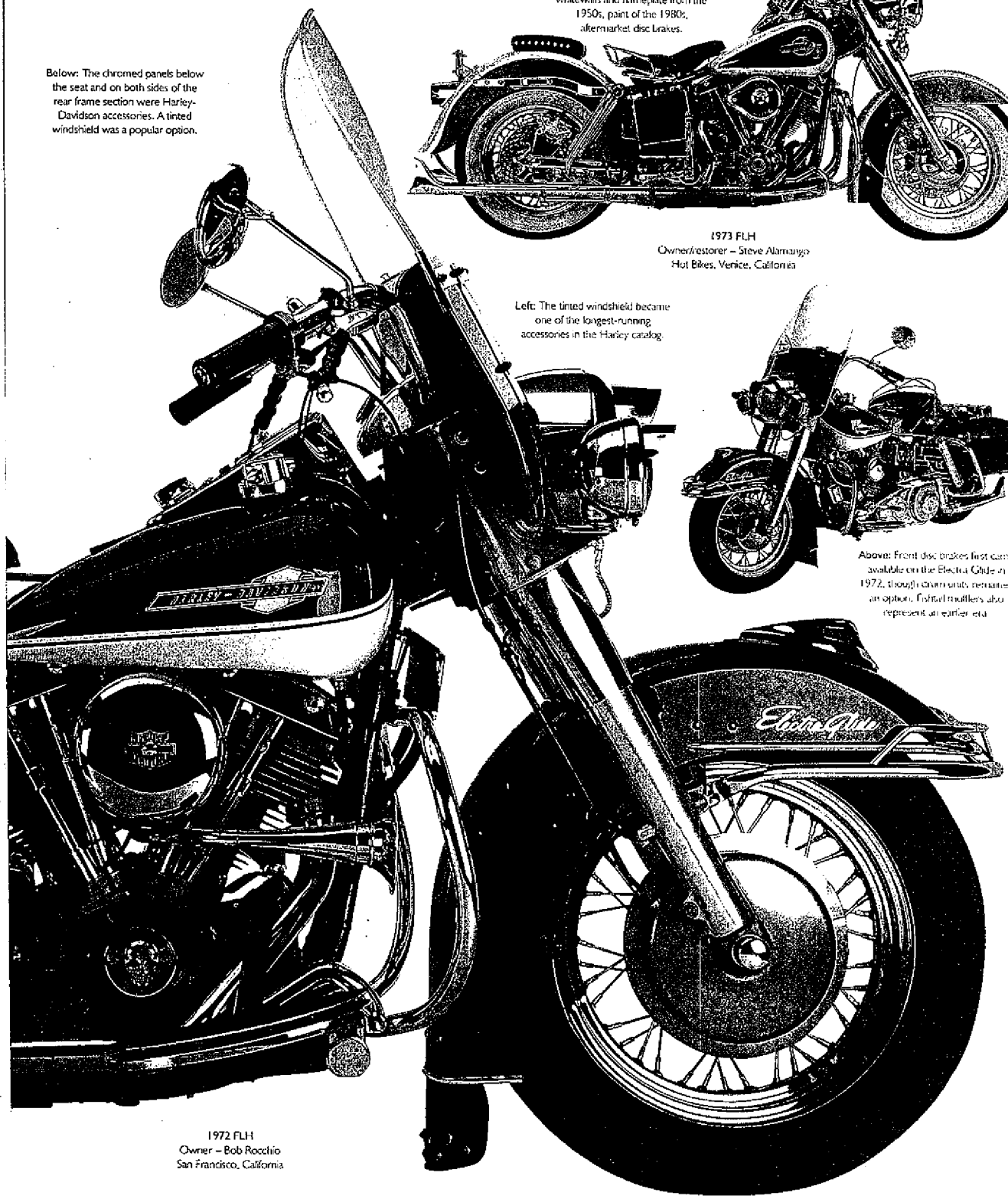


1973 FLH
Owner/restorer – Steve Alamango
Hot Bikes, Venice, California

Below: The chromed panels below the seat and on both sides of the rear frame section were Harley-Davidson accessories. A tinted windshield was a popular option.

Left: The tinted windshield became one of the longest-running accessories in the Harley catalog.

Above: Front disc brakes first came available on the Electra Glide in 1972, though drum units remained an option. Fishtail mufflers also represent an earlier era.



1972 FLH
Owner – Bob Rocchio
San Francisco, California

ELH (1975), SX 250 (1975), MX 250 (1975) AND Z 90 (1975)

1975 SX & MX 250

Specifications
Engine/Drivetrain
Engine: Two-stroke single
Displacement: 14.81ci (242.6cc)
Bore & stroke: 2.83 x 2.34in (72 x 59mm)
Compression ratio: SX, 10.3:1. MX, 11.8:1
Horsepower: SX, 18. MX, 32
Carburetion: Dell'Orto
Transmission: 5-speed
Primary drive: Chain
Final drive: Chain
Brakes: F &R, Drum
Ignition: CDI

Chassis/Suspension
Frame: Steel, double downtube
Suspension: F, Telescopic fork. R, Hydraulic shocks
Wheelbase: SX, 56in (142.2cm). MX, 57in (144.8cm)
Weight: SX, 270lb (122.5kg). MX, 233lb (105.7kg)
Fuel capacity: SX, 2.8gal (10.6lit). MX, 2.2gal (8.3lit)
Oil capacity: SX, 3.3pts (1.56lit)
Tires: F, 3.00 x 21in (7.62 x 53.3cm). R, SX, 4.00 x 18in (10.16 x 45.72cm). MX, 4.50 x 18in (11.43 x 45.72cm)
Top speed: 90 mph (145kmh)
Colors: SX, Blue: black. MX, Orange
Number built: SX, 14,162 (75-78). MX, 87
Price: SX, $1,142

Not much happened in 1975. Just one of those years, distinguished by its lack of distinction. Harley Davidson was in the process of sorting out its corporate and production concerns, and struggling to bring new products to the showroom.

The racing department did provide good news when Gary Scott returned the Grand National championship to Harley-Davidson, following two successive titles by Yamaha's Kenny Roberts. Fewer road-racing events appeared on the national schedule, and Milwaukee still held the edge in dirt track. The situation was to prevail, as Jay Springsteen brought Harley three successive titles from 1976 through 1978.

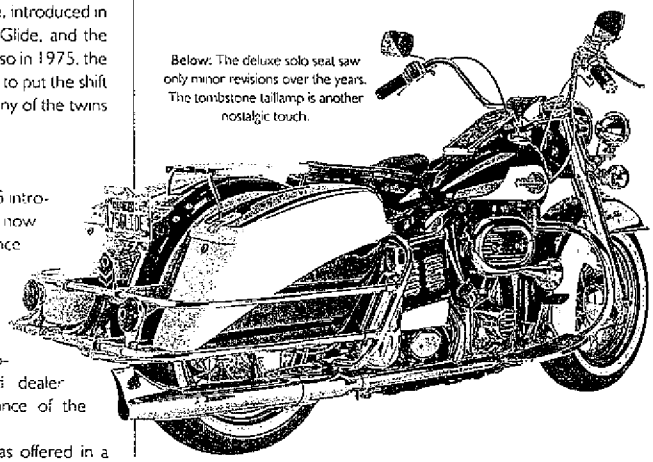
The King of the Road touring accessories package, introduced in 1973, remained a popular option for the Electra Glide, and the electric-start Super Glide was winning more fans. Also in 1975, the Sportster was fitted with a circuitous shifting linkage to put the shift lever on the left side. There were few changes to any of the twins for 1975 or the following year.

SX 250 and MX 250

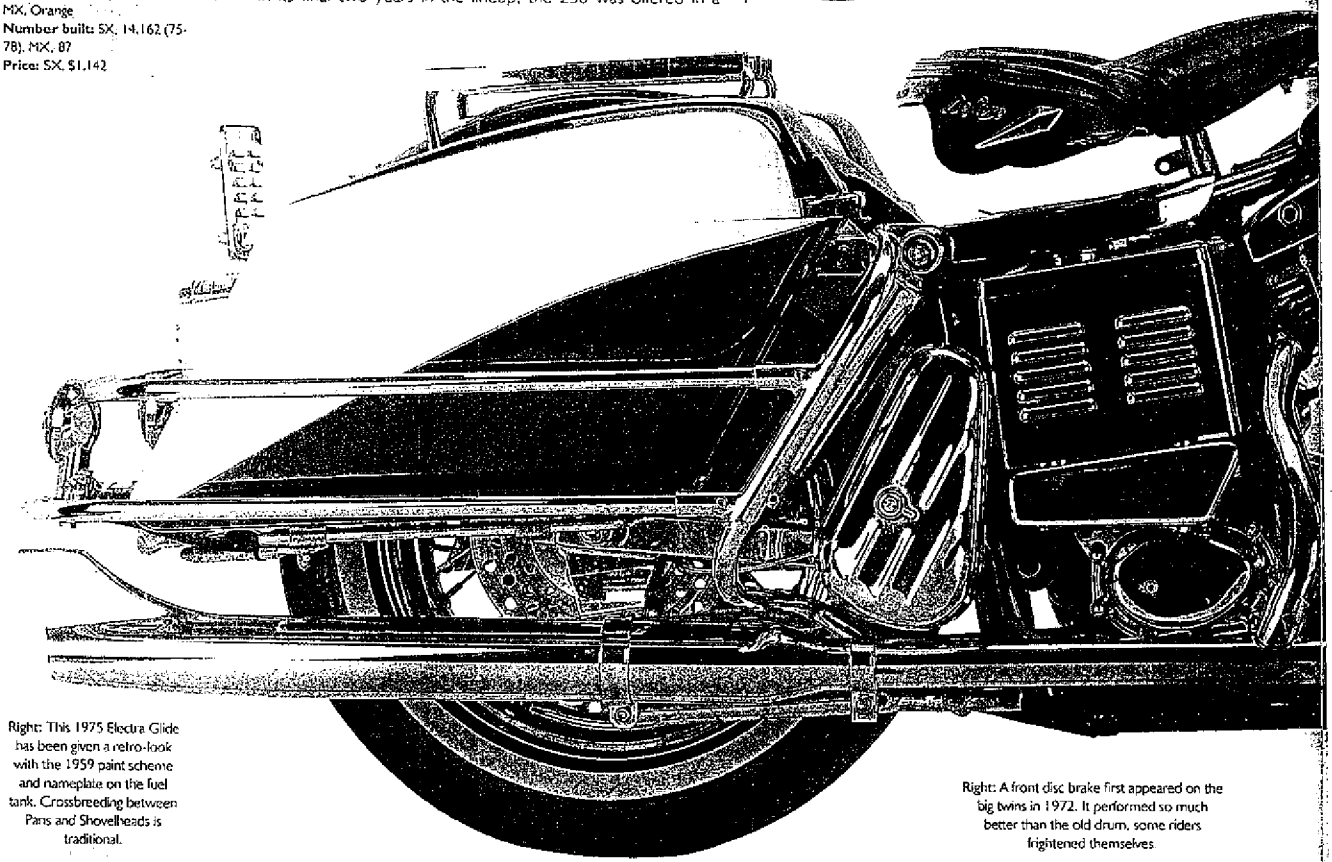
The SX 250 was a large-bore version of the SX 175 introduced the year before. The Aermacchi two-strokes now represented Milwaukee's on/off-road offerings, since the four-stroke Sprints had been dropped from the roster. The 250 was created to combat the success of Yamaha's similar DT-1, but despite making reasonable horsepower, the handling and reliability were not widely praised. The two-strokes still had to battle against widespread dealer indifference, and the price/performance dominance of the Japanese machines.

In its final two years in the lineup, the 250 was offered in a motocross version. Unfortunately the MX bike came in just as the sport had become an engineering study on long-travel suspension, and once again the dominant contenders were the Japanese manufacturers. Milwaukee did field a motocross team featuring the talented Rocket Rex Staten, but the effort was short-lived.

In 1978 Harley-Davidson made the decision to concentrate on its traditional strengths and leave the lighweight market to others. The Aermacchi interest was sold to the Cagiva group in Italy, which went on to build a broad-based motorcycle company that would later include Ducati and Husqvarna.

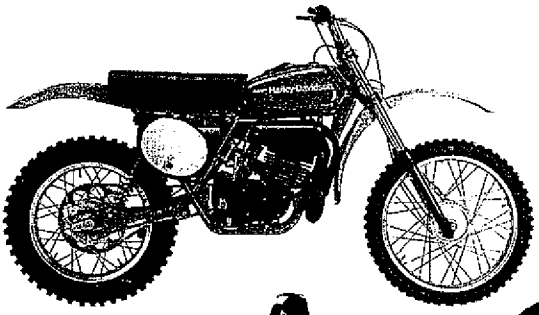


Below: The deluxe solo seat saw only minor revisions over the years. The tombstone taillamp is another nostalgic touch.



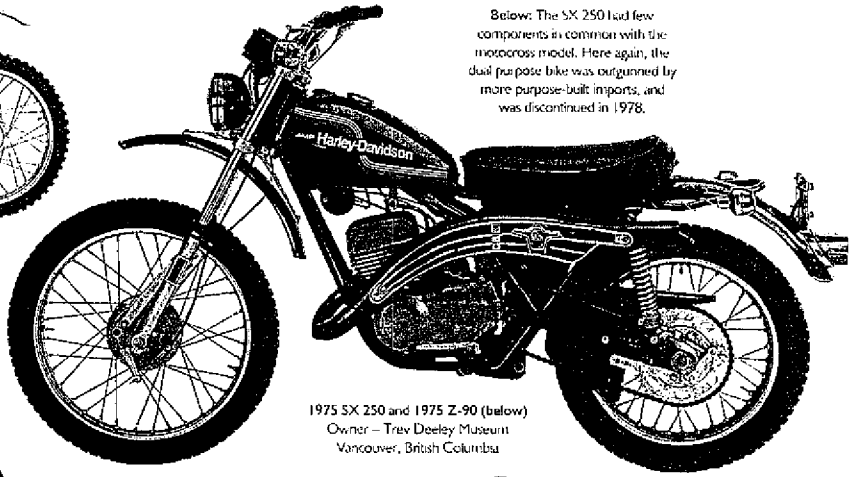
Right: This 1975 Electra Glide has been given a retro-look with the 1959 paint scheme and nameplate on the fuel tank. Crossbreeding between Pans and Shovelheads is traditional.

Right: A front disc brake first appeared on the big twins in 1972. It performed so much better than the old drum, some riders frightened themselves.

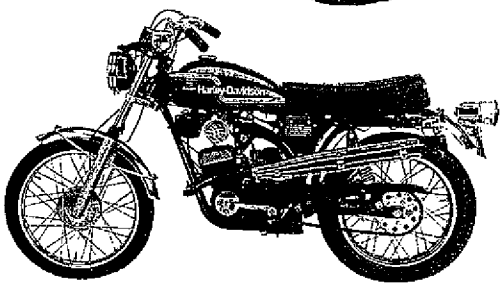


1976 MX 250
Owner – Oliver Shokouh
Harley-Davidson of Glendale
Glendale, California

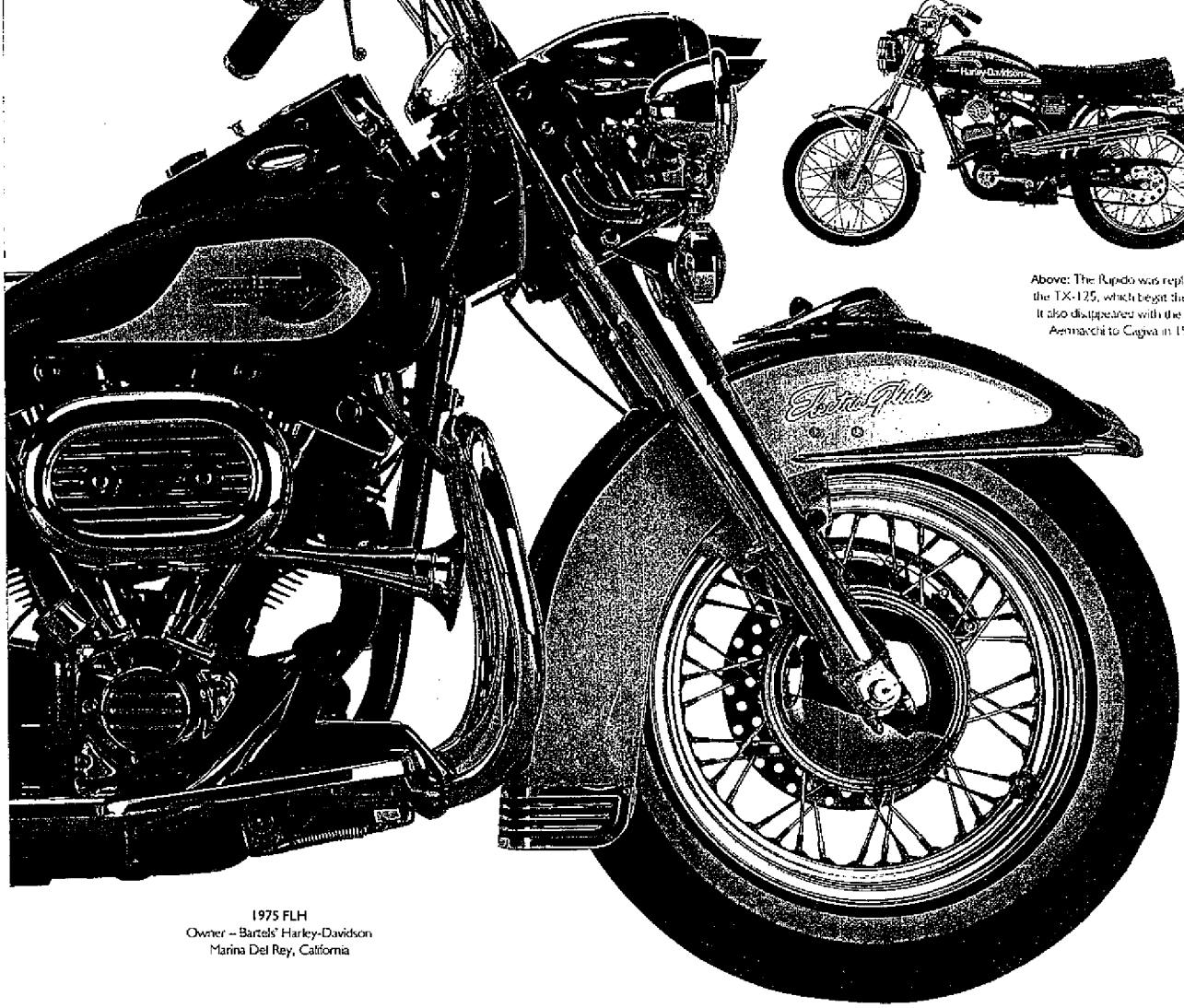
Below: The SX 250 had few components in common with the motocross model. Here again, the dual purpose bike was outgunned by more purpose-built imports, and was discontinued in 1978.



1975 SX 250 and 1975 Z-90 (below)
Owner – Trev Deeley Museum
Vancouver, British Columbia



Above: The Rapido was replaced by the TX-125, which begat the Z-90. It also disappeared with the sale of Aermacchi to Cagiva in 1978.



1975 FLH
Owner – Bartels' Harley-Davidson
Marina Del Rey, California

XLCR 1977 THE CAFE RACER

William G. Davidson had not been disheartened by the lukewarm reception accorded the styling of the first FX Super Glide when it appeared in 1971. He recognized that one design could hardly serve the requirements of two distinctly different sorts of motorcycle buyers. So, since the Super Glide was short on sportiness, he elected to base the next sport bike on the Sportster, and the next cruiser on the FX.

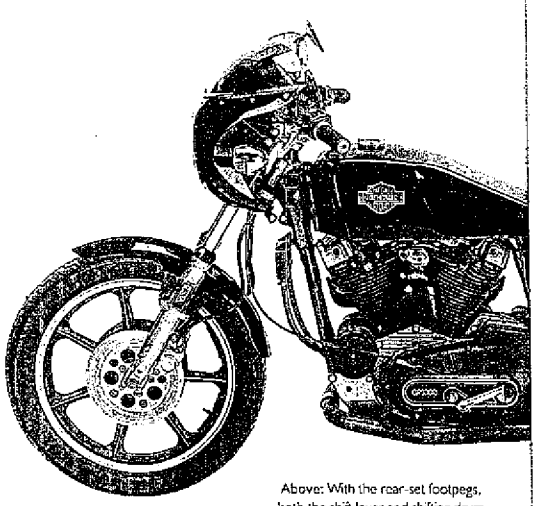
The former took form in the XLCR of 1977, a stark, Euro-style cafe racer (borrowing the British tag for a street racer) with a Sportster engine and modified chassis. The new frame took some design elements of the XR 750, with a box-section swingarm. Both upper and lower shock mounts were farther aft on the CR chassis, and allowed more room amidships for the battery and oil tank. Cast alloy wheels were fitted at both ends, with dual disc brakes in front and a single disc at the rear. The engine's black cylinders and sidecovers presented an imposing effect, and the siamesed exhaust system was, well... different. The design was said to produce an extra five horsepower.

The XLCR had the looks of a real sprinter for the twisties. The bikini fairing, low handlebars, racing-style seat, cast aluminum wheels and rear-set footpegs were all standard equipment for the civilian roadracers of the day. But in the 1970s, the real bad boys of the back roads had a sumptuous menu of street rods from which to choose. In addition to genuine cafe racers from Britain

1977 XLCR

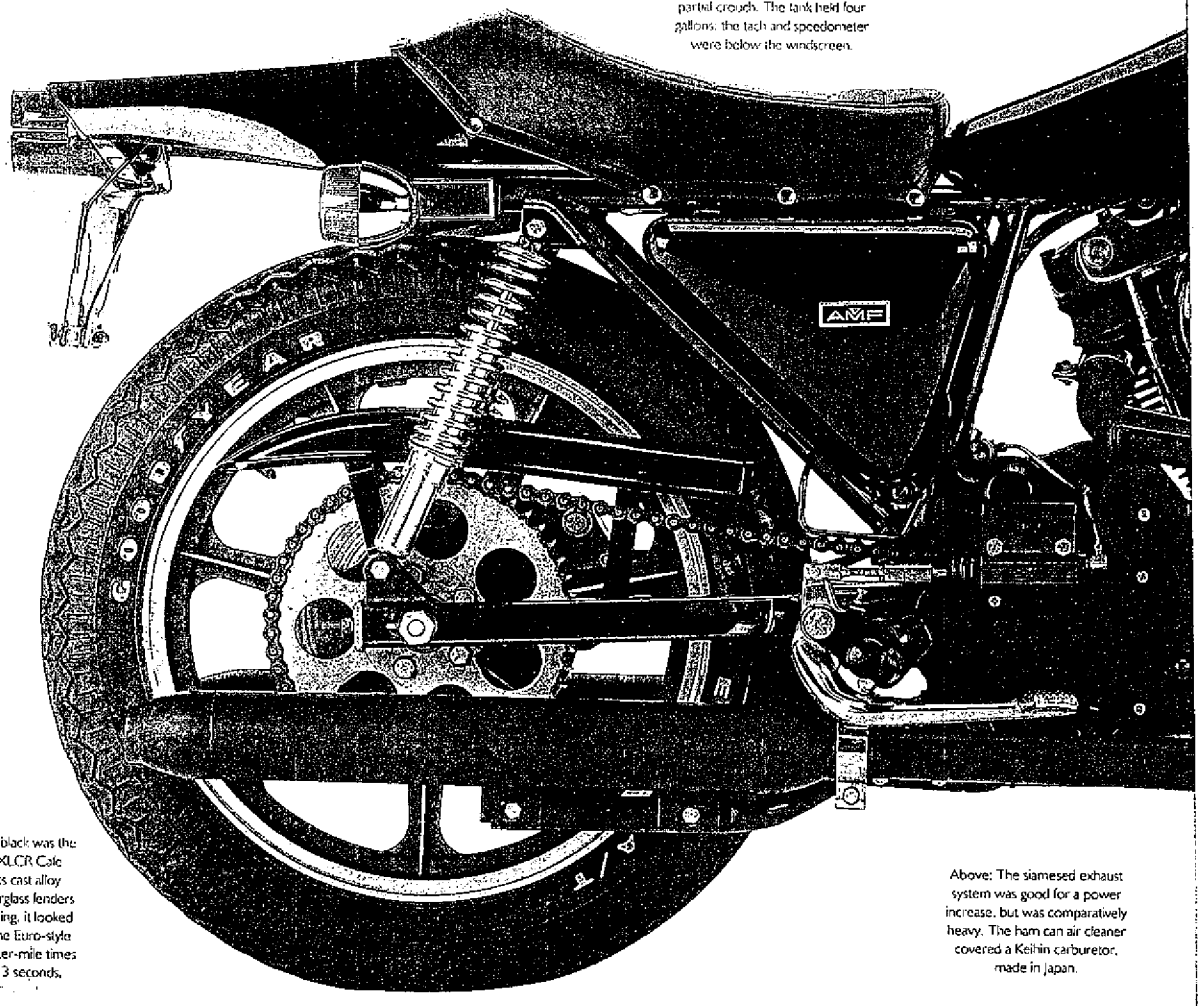
Specifications
Engine/Drivetrain
Engine: OHV 45° V-twin
Displacement: 61ci (1000cc)
Bore & stroke: 3.19 x 3.81in (81 x 97mm)
Compression ratio: 9:1
Horsepower: 68
Carburetion: Keihin
Transmission: 4-speed
Brakes: Triple disc
Battery: 12-volt
Ignition: Coil/points

Chassis/Suspension
Frame: Steel, double downtube
Suspension: F. Telescopic fork; R. Hydraulic shocks
Wheelbase: 58.5in (148.6cm)
Weight: 515lb (234kg)
Fuel capacity: 4gal (15.14lt)
Oil capacity: 3qts (2.84lt)
Tires: F. 3.00 x 19in (7.62 x 48.26cm); R. 4.00 x 18in (10.16 x 45.72cm)
Top speed: 110mph (177km/h)
Color: Black
Number built: 1,923
Price: $3,623



Above: With the rear-set footpegs, both the shift lever and shifting drum were reversed, retaining the one-down, three-up pattern. Triple disc brakes appeared on Sportsters in 1978.

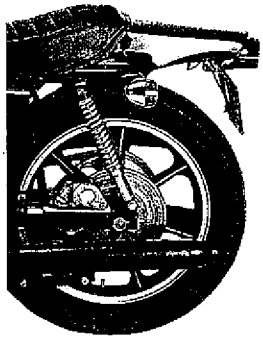
Below: The upswept solo saddle and low handlebar put the rider in a partial crouch. The tank held four gallons; the tach and speedometer were below the windscreen.



Right: Black-on-black was the motif for the XLCR Cafe Racer. With its cast alloy wheels and fiberglass fenders and minimal fairing, it looked the part. And the Euro-style Sportster's quarter-mile times were below 13 seconds.

Above: The siamesed exhaust system was good for a power increase, but was comparatively heavy. The ham can air cleaner covered a Keihin carburetor, made in Japan.

1977 XLCR Cafe Racer
Owner – Oliver Shokouh
Harley-Davidson of Glendale
Glendale, California



and Italy, the Japanese offered platforms with great heapings of horsepower in both four- and two-stroke engines. The XLCR was designed to appeal to this segment of the market, but once again the effort was too little too late. The CR had little performance advantage to boast over a stock Sportster, and neither the chassis nor suspension were in line with prevailing sport bike performance standards.

Most dealers showed little interest in the XLCR, and some showrooms still contain the same machine that first rolled in 20 years ago. Now, of course, they are worth considerably more than they were then, despite the failure to generate much response among riders. The XLCR became a collector's item at the beginning.

Some have characterized the Cafe Racer as a design masterpiece that was a commercial failure, that it was unappreciated because it was ahead of its time. Fact is, although the XLCR featured new and improved engineering for the Sportster, it was primarily a design exercise. Its time had already come and gone before it reached the market, and sport bike design and performance were about to take another giant step in the 1980s.

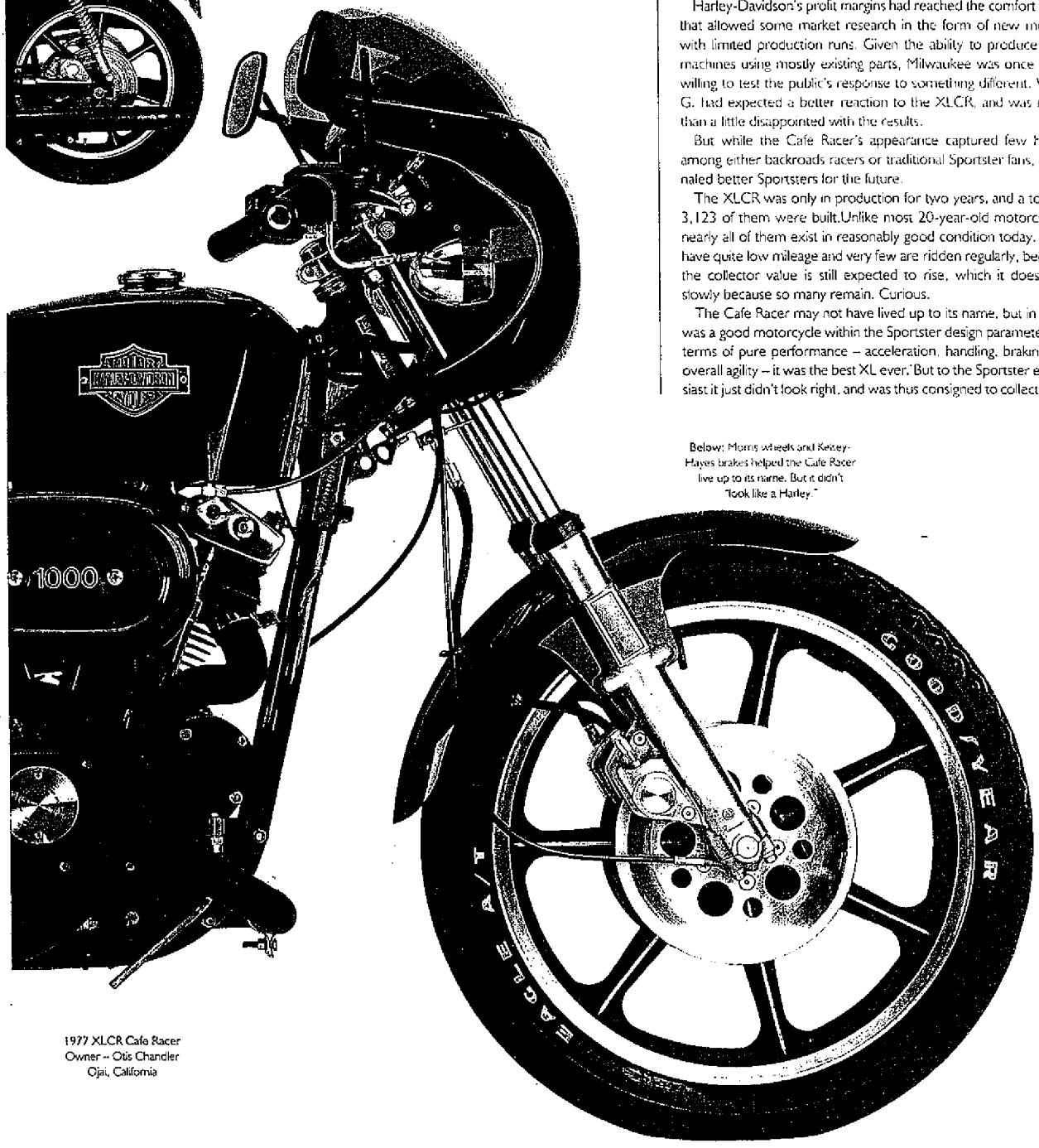
Harley-Davidson's profit margins had reached the comfort zone that allowed some market research in the form of new models with limited production runs. Given the ability to produce new machines using mostly existing parts, Milwaukee was once again willing to test the public's response to something different. Willie G. had expected a better reaction to the XLCR, and was more than a little disappointed with the results.

But while the Cafe Racer's appearance captured few hearts among either backroads racers or traditional Sportster fans, it signaled better Sportsters for the future.

The XLCR was only in production for two years, and a total of 3,123 of them were built. Unlike most 20-year-old motorcycles, nearly all of them exist in reasonably good condition today. Most have quite low mileage and very few are ridden regularly, because the collector value is still expected to rise, which it does only slowly because so many remain. Curious.

The Cafe Racer may not have lived up to its name, but in fact it was a good motorcycle within the Sportster design parameters. In terms of pure performance – acceleration, handling, braking and overall agility – it was the best XL ever. But to the Sportster enthusiast it just didn't look right, and was thus consigned to collectibility.

Below: Morris wheels and Kelsey-Hayes brakes helped the Cafe Racer live up to its name. But it didn't "look like a Harley."



1977 XLCR Cafe Racer
Owner – Otis Chandler
Ojai, California

1977
FXS LOW RIDER

SPECIFICATIONS
ENGINE/DRIVETRAIN
Engine: OHV 45° V-twin
Displacement: 73.73ci (1208.19cc)
Bore & stroke: 3.44 x 3.97in (87 x 101mm)
Compression ratio: 8:1
Horsepower: 65
Carburetion: Bendix
Transmission: 4-speed
Primary drive: Chain
Final drive: Chain
Brakes: F & R, Drum
Battery: 12-volt
Ignition: Coil/points

CHASSIS/SUSPENSION
Frame: Steel, double downtube
Suspension: F, Telescopic forks. R, Hydraulic shocks
Wheelbase: 63.5in (161.3cm)
Weight: 623lb (282.6kg)
Fuel capacity: 3.5gal (13.25lit)
Oil capacity: 4qts (3.79lit)
Tires: F, 3.50 x 19in (8.9 x 48.26cm). R, 5.00 x 16in (12.7 x 40.64cm)
Top speed: 100mph (161km/h)
Colors: Gunmetal gray
Number built: 3,742
Price: $3,475

FXS LOW RIDER

Fortunately the limited success of the XLCR was compensated for by the next member of the Super Glide family tree – the FXS Low Rider.

After a thorough survey of the custom/cruiser marketplace, Willie G. adopted the "less is more" credo of the times. The original FX had made the same gesture, but lacked the components for genuine sport-bike minimalism. The larger market for economy of design (and purpose) lived closer to the other side of the demographic chart, toward the chopper profile.

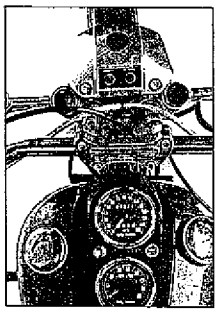
Thus the FXS. The junior Glide had produced steady 30 to 40 percent sales gains each year since 1973. The image of the back-roads rambler had been supplanted by the outline of a boulevard brawler. The low-slung riding position, kicked back and looking cool, and the low seat offered chopper-style posture within easy reach of the tarmac.

By now the cruiser-bike styling had reached popularity levels that attracted other manufacturers. In a few years the Japanese offered a series of semi-custom bikes but achieved little success. The notion of a machine with form as its primary function was difficult to grasp in cultures outside the U.S.A. The second generation of imported cruisers, provoked by the continuing popularity of Harley's FX series, has arrived only recently. Time will tell.

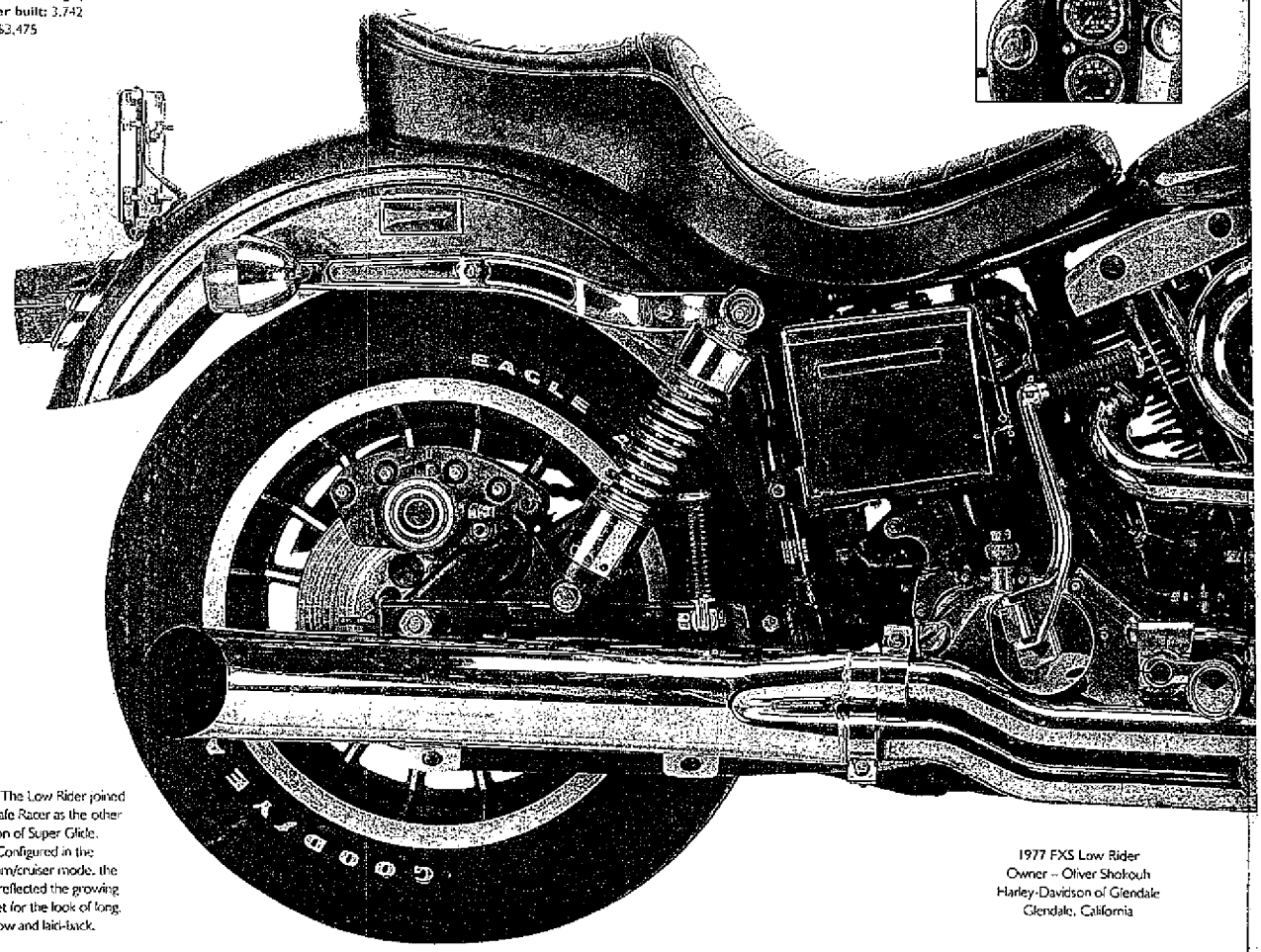
The AMF/Harley-Davidson team had managed to double the production of motorcycles in four years. But the rush to put machines on the market had created difficulties in form and structure, in the motorcycles, the company, its dealers and their customers. Production and assembly quality control had been poorly observed, and many machines were shipped in less than roadworthy condition. Which caused widespread moodiness.

Most of these difficulties had been solved by 1977, but the damage to reputation took some years to repair. The FXS, distilled as the Low Rider, accomplished for Milwaukee a tighter focus on the custom/cruiser style, and expanded the consumer base in substantial numbers. And the pattern was set for the next 20 years of variations on the theme.

Despite its parts-bin parenthood, the Low Rider emerged as the most coherently integrated motorcycle in the FX series to date. With its kicked-out Sportster front fork, deeply stepped dual seat and cast alloy wheels, the Low Rider looked both lean and muscular. It shared the front dual disc brakes with the XLCR, but had its own graceful two-into-one exhaust pipe, low-rise handlebars and the 3.5-gallon (13.25lit) fuel tank of the original FX. The lowered rear suspension brought seat height down to 27 inches (68.6cm). The Low Rider set the cruiser-look standard still in evidence today.

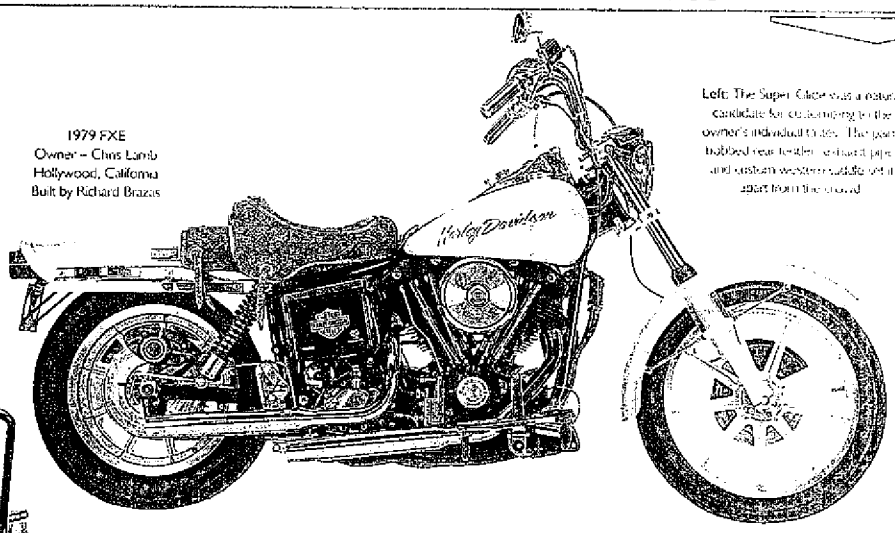


Right: The traditional fat bob dual fuel tanks were adorned with contemporary instruments, with speedometer above the tachometer. Neutral indicator and oil pressure lights are on the headlight nacelle.



Right: The Low Rider joined the Cafe Racer as the other son of Super Glide. Configured in the custom/cruiser mode, the FXS reflected the growing market for the look of long, low and laid-back.

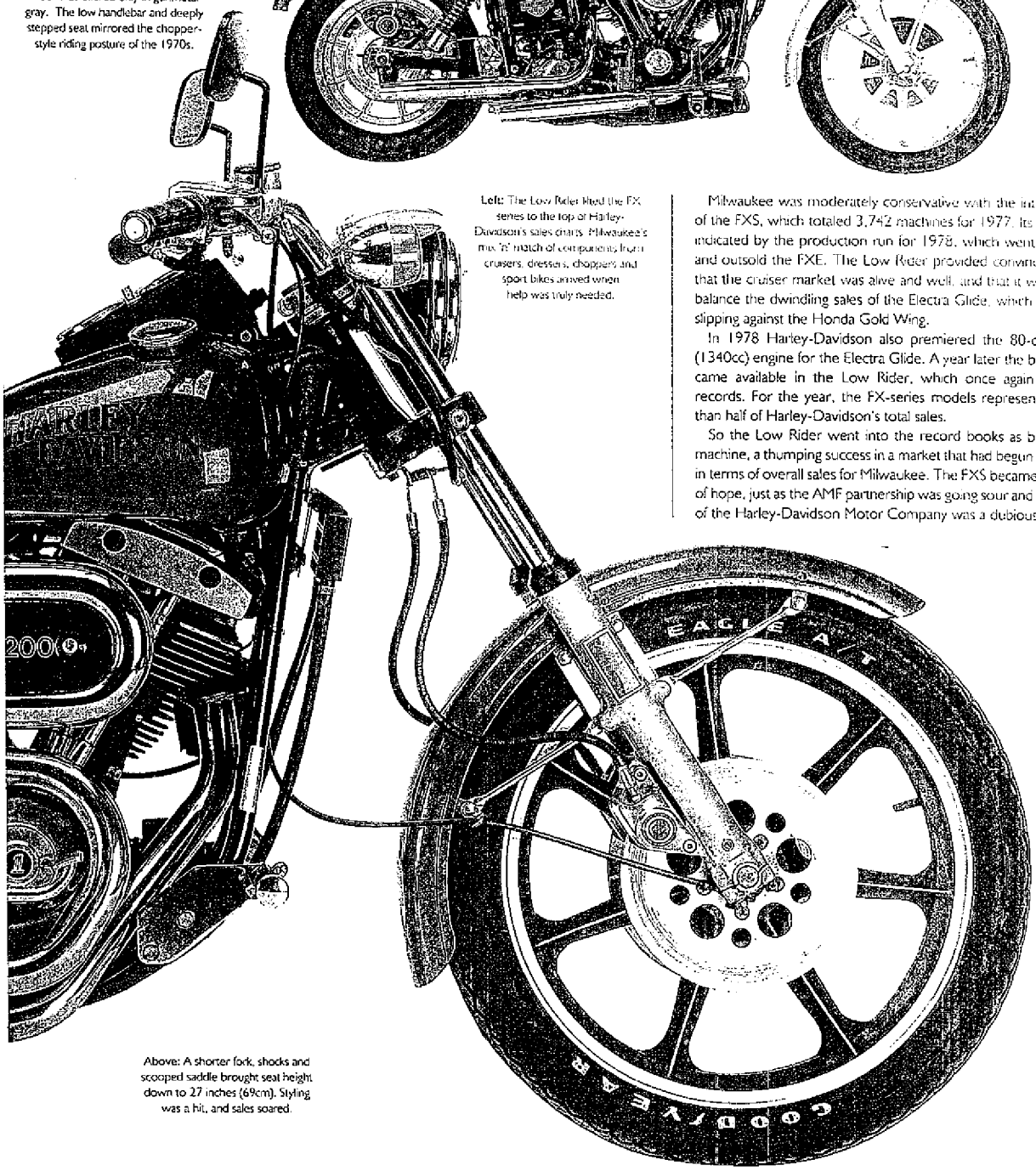
1977 FXS Low Rider
Owner – Oliver Shokouh
Harley-Davidson of Glendale
Glendale, California



1979 FXE
Owner – Chris Lamb
Hollywood, California
Built by Richard Brazas

Left: The Super Glide was a natural candidate for customizing to the owner's individual tastes. The paint, bobbed rear fender, exhaust pipes and custom western saddle set it apart from the crowd.

Below: In its debut year, the Low Rider was offered only in gunmetal gray. The low handlebar and deeply stepped seat mirrored the chopper-style riding posture of the 1970s.



Left: The Low Rider lifted the FX series to the top of Harley-Davidson's sales charts. Milwaukee's mix 'n' match of components from cruisers, dressers, choppers and sport bikes arrived when help was truly needed.

Milwaukee was moderately conservative with the introduction of the FXS, which totaled 3,742 machines for 1977. Its success is indicated by the production run for 1978, which went to 9,787 and outsold the FXE. The Low Rider provided convincing proof that the cruiser market was alive and well, and that it would help balance the dwindling sales of the Electra Glide, which had been slipping against the Honda Gold Wing.

In 1978 Harley-Davidson also premiered the 80-cubic inch (1340cc) engine for the Electra Glide. A year later the bigger twin came available in the Low Rider, which once again set sales records. For the year, the FX-series models represented more than half of Harley-Davidson's total sales.

So the Low Rider went into the record books as benchmark machine, a thumping success in a market that had begun to decline in terms of overall sales for Milwaukee. The FXS became a beacon of hope, just as the AMF partnership was going sour and the future of the Harley-Davidson Motor Company was a dubious prospect

Above: A shorter fork, shocks and scooped saddle brought seat height down to 27 inches (69cm). Styling was a hit, and sales soared.

1979 FXEF

Specifications
Engine/Drivetrain
Engine: OHV 45° V-twin
Displacement: 81.65ci (1338cc)
Bore & stroke: 3.5 x 4.25in (89 x 108mm)
Compression ratio: 8:1
Horsepower: 66
Carburetion: Bendix
Transmission: 4-speed
Primary drive: Chain
Final drive: Chain
Brakes: F. Dual discs. R. Drum
Battery: 12 volt
Ignition: Coil/points

Chassis/Suspension
Frame: Steel, single downtube
Suspension: F. Telescopic fork R. Hydraulic shocks
Wheelbase: 63.5in (161.3cm)
Weight: 642lb (291kg)
Fuel capacity: 5gal (18.9lit)
Oil capacity: 4qts (3.79lit)
Tires: F. 3.5 x 19in (8.9 x 48.26cm). R. 5.00 x 16in (12.7 x 40.64cm)
Top speed: 105mph (169km/h)
Colors: Vivid black; brilliant red; concord blue; chestnut brown
Number built: 5,264 (1200: 4,678)
Price: $4,260

FLH (1977) AND FXEF (1979)

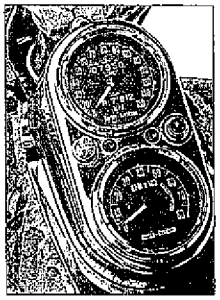
Harley-Davidson celebrated its 75th anniversary in 1978. The occasion was marked by the arrival of the 80-cubic inch (1340cc) Electra Glide, and anniverary editions of the the FL 1200 and the Sportster in black with gold striping. The Eighty featured the rocket-disc tank emblem of the late 1930s. Nostalgia returns.

Even though Milwaukee's overall sales had slipped nearly 30 percent, and the guys upstairs in suits were at odds over the company's future, work had proceeded on both new cruisers and tourers. The FLH 80 would head the effort to recoup some of the riders who had defected to Asian touring bikes. The baby Glides were expanding into more varied cruiser motifs, mixing styles of past and present. Despite the encroachment of economic recession, the game had grown more interesting.

With a slight increase in bore and larger one in stroke, the new Eighty recalled its flathead ancestor as big inch king. At a glance the engine was identical to the Seventy-four, but had one less fin on the cylinders and a huge ham-can air cleaner cover with 80 on the face. With cast alloy wheels, fairing, saddlebags and trunk the FLH-80 registered 750lb (340kg) on the scale.

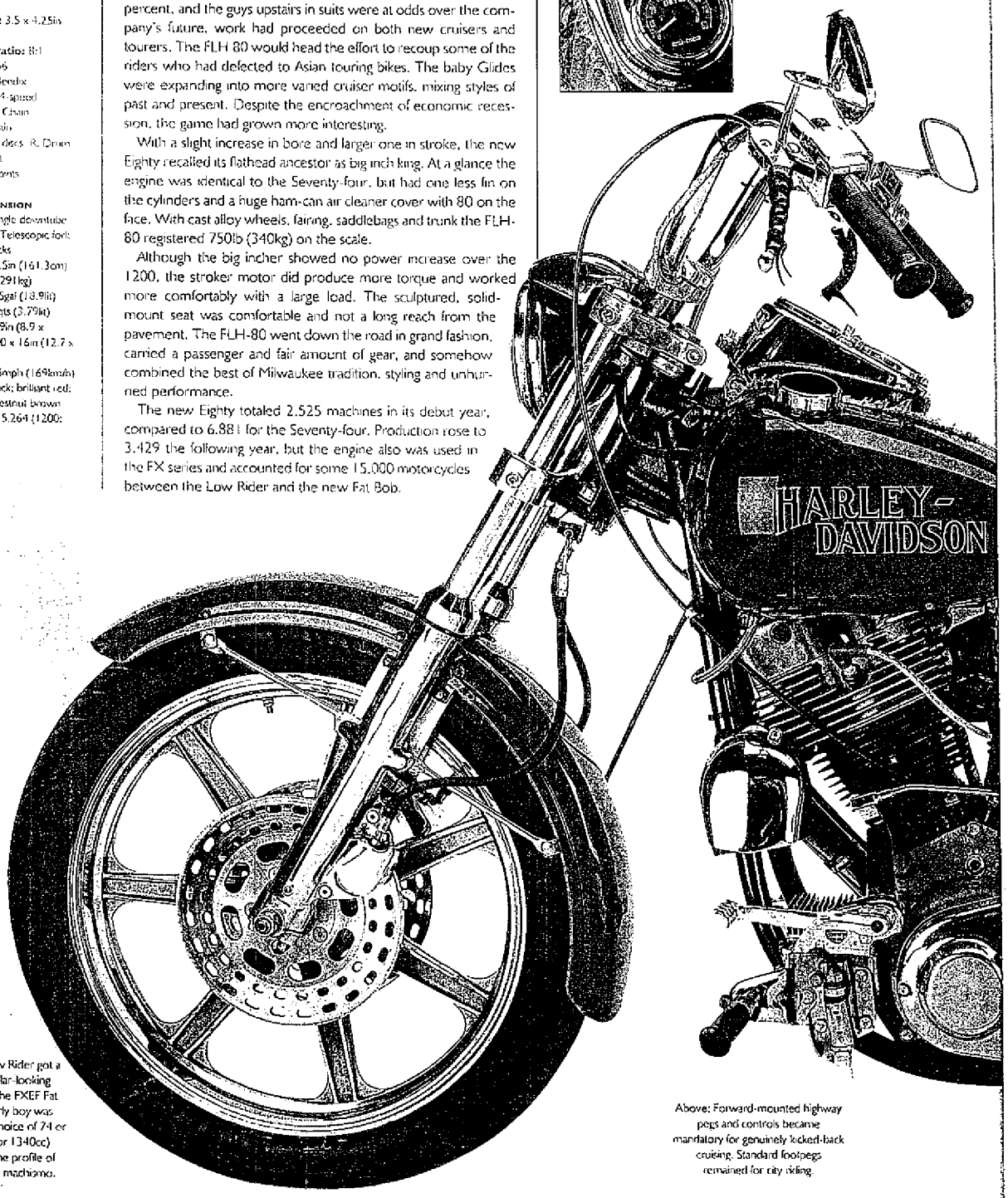
Although the big incher showed no power increase over the 1200, the stroker motor did produce more torque and worked more comfortably with a large load. The sculptured, solid-mount seat was comfortable and not a long reach from the pavement. The FLH-80 went down the road in grand fashion, carried a passenger and fair amount of gear, and somehow combined the best of Milwaukee tradition, styling and unhurried performance.

The new Eighty totaled 2,525 machines in its debut year, compared to 6,881 for the Seventy-four. Production rose to 3,429 the following year, but the engine also was used in the FX series and accounted for some 15,000 motorcycles between the Low Rider and the new Fat Bob.



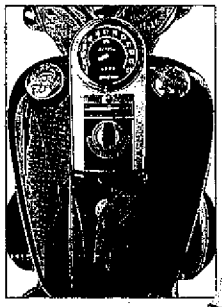
Left: FXEF had both tach and speedo on the console. The 150mph (241km/h) limit indicated Milwaukee's sense of humor.

Right: The view from astride the '77 FLH. This speedometer is an aftermarket accessory.



Right: The Low Rider got a more muscular-looking brother with the FXEF Fat Bob. The burly boy was offered with a choice of 74 or 80in (1200 or 1340cc) engine, and the profile of Muscle Beach machismo.

Above: Forward-mounted highway pegs and controls became mandatory for genuinely kicked-back cruising. Standard footpegs remained for city riding.



FXEF

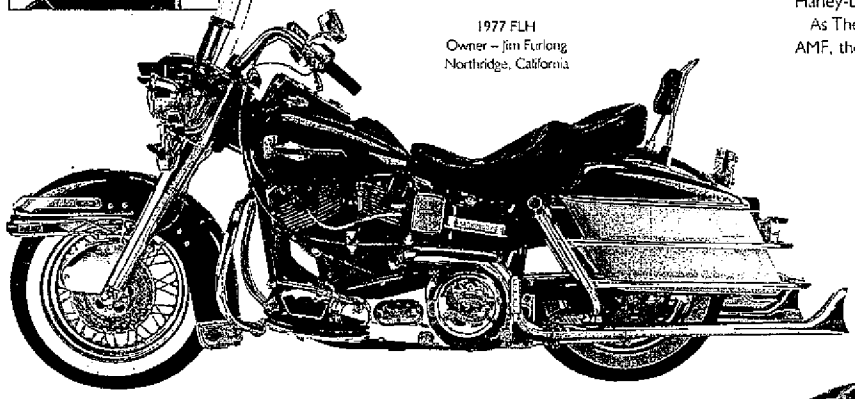
The next model to slide into the custom/cruiser/chopper parade was the FXEF Fat Bob. The nickname came from the customizer's coinage for the first home-built cruisers with separate fuel tanks. Bobbed bikes with single tanks never got a distinctive moniker, other than choppers, and were never called Skinny Bobs.

The FXEF was a Low Rider with the choice of either 74- or 80-inch (1200 or 1340cc) engine, buckhorn handlebars, cast or spoked wheels, dual exhausts and a profile both long and lean. Once again Milwaukee had provided a motorcycle cast roughly in the styling fashion adopted by its customers years earlier, offering a taste of specialized fashion to a wider audience. And in naming the factory fat bob the Fat Bob, adjoined by a symbol of trademark registration, Harley-Davidson staked legal claim to the name. The same was true for the labels Electra Glide, Sportster, Super Glide and Harley-Davidson.

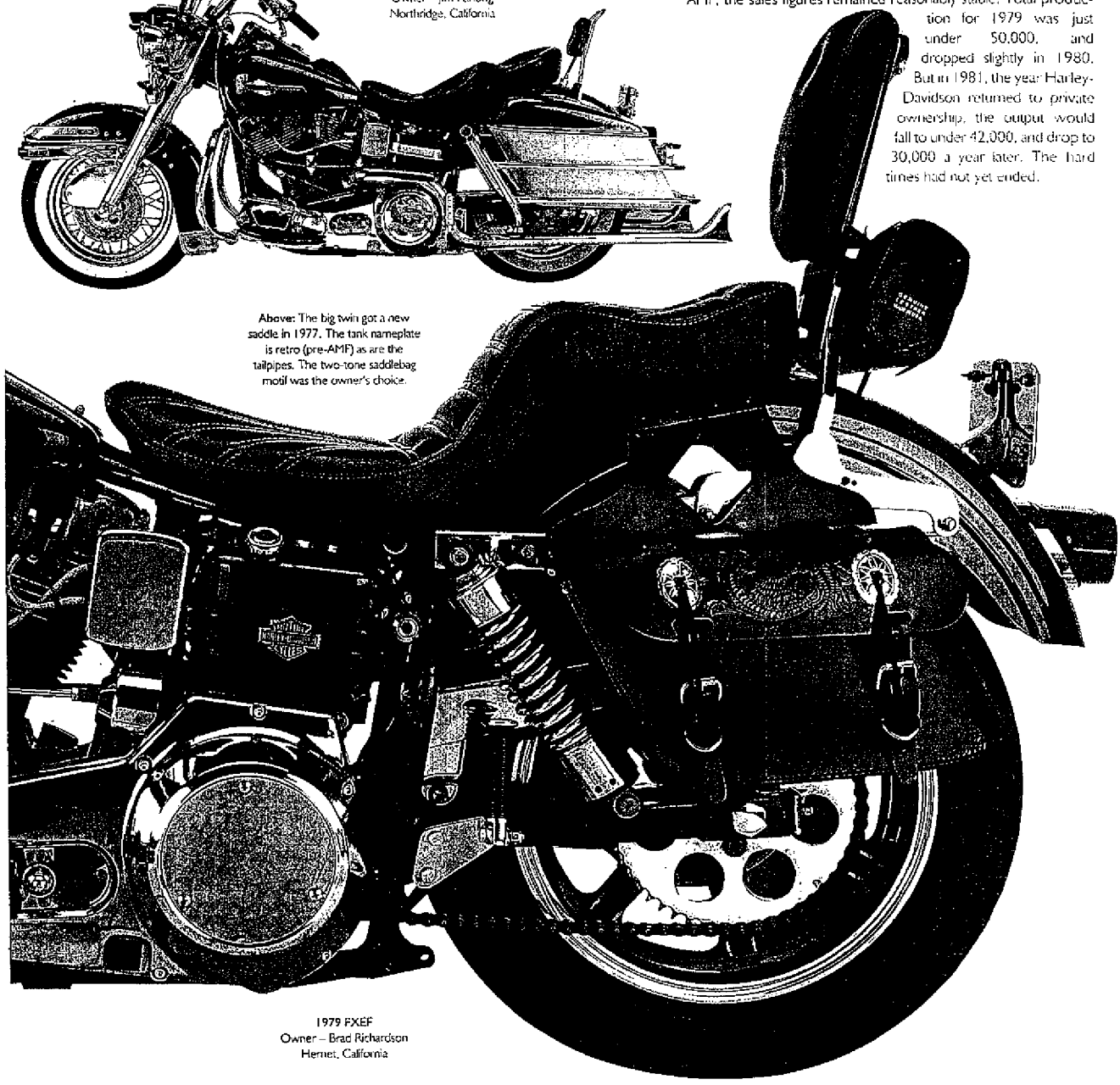
Concurrent with the arrival of retro-styling and factory folk art came the age of trademark protection. That story, which yet unfolds, has been, is and will be told elsewhere.

With Bob the FX series had grown to five models, which represented more than half of the Harley-Davidson production run. The Super Glide serial had come at just the proper time to write more chapters in the Milwaukee journal. Internal corporate strife and an ailing economy had combined to revise the plans for Harley-Davidson's return to glory.

As The Motor Company reached the end of its relationship with AMF, the sales figures remained reasonably stable. Total production for 1979 was just under 50,000, and dropped slightly in 1980. But in 1981, the year Harley-Davidson returned to private ownership, the output would fall to under 42,000, and drop to 30,000 a year later. The hard times had not yet ended.



1977 FLH
Owner – Jim Furlong
Northridge, California



Above: The big twin got a new saddle in 1977. The tank nameplate is retro (pre-AMF) as are the tailpipes. The two-tone saddlebag motif was the owner's choice.

1979 FXEF
Owner – Brad Richardson
Hemet, California

1980 FXB STURGIS

SPECIFICATIONS
ENGINE/DRIVETRAIN
Engine: OHV 45° V-twin
Displacement: 81.65ci (1338cc)
Bore & stroke: 3.50 x 4.25in (89 x 108mm)
Compression ratio: 8:1
Horsepower: 65
Carburetion: Bendix
Transmission: 4-speed
Primary drive: Belt
Final drive: Belt
Brakes: F. & R. Drum
Battery: 12-volt
Ignition: Electronic

CHASSIS/SUSPENSION
Frame: Steel, double downtube
Suspension: F. Telescopic forks R. Hydraulic shocks
Wheelbase: 64.7in (164.3cm)
Weight: 610lb (277kg)
Fuel capacity: 3.5gal (13.25lit)
Oil capacity: 4qts (3.8lit)
Tires: F. 3.50 x 19in (8.9 x 48.26cm). R. 5.00 x 16in (12.7 x 40.64cm)
Top speed: 106mph (171km/h)
Colors: Black
Number built: 1,470
Price: $5,687

FXB Sturgis

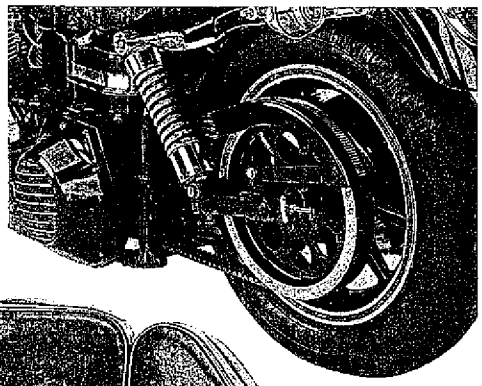
Hard times or not, Harley-Davidson had introduced new models each year during the AMF decade. Not entirely new from the ground up perhaps, but the company had demonstrated its commitment to remain a force in the motorcycle market. And from the Milwaukee perspective, that meant machines which retained the traditional Harley appeal and also met higher standards of performance and reliability.

So in 1980, classic style met contemporary technology in the form of belt drive. The newest rendition of the Super Glide was called the FXB Sturgis. B for belt and Sturgis for the South Dakota town hosting the annual summer gathering of the clans. The latest cruiser was another Willie G. creation in basic black with orange and chrome trim. The styling was immediately popular, but the rubber primary and final drive belts aroused suspicion. How durable would they be? What if they broke in the middle of nowhere? Valid questions.

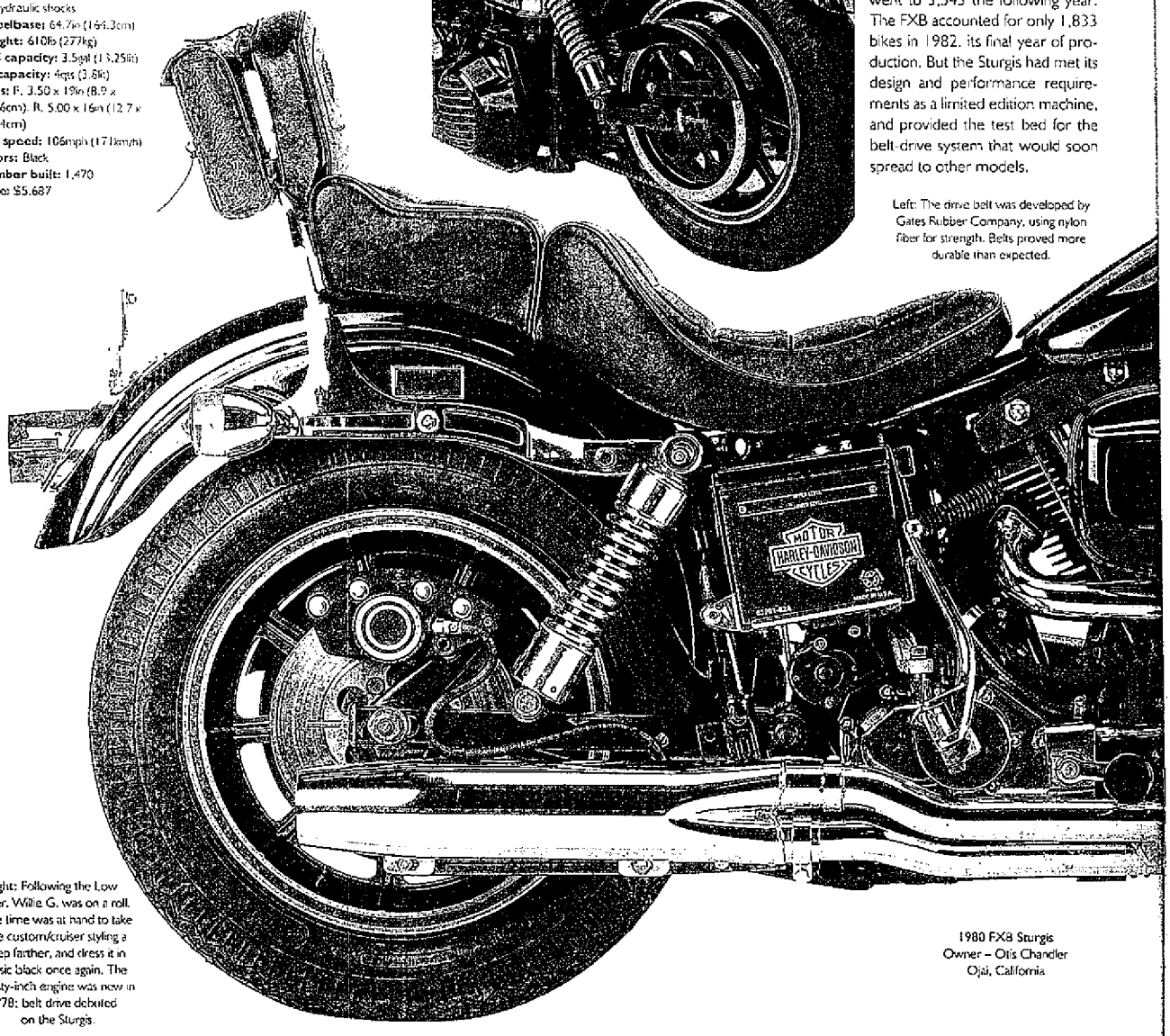
But the return to belt drive proved out, because 70 years of development had produced belts that could withstand considerable abuse. Manufactured by the Gates Rubber Company using Aramid nylon fiber, the belts provided quieter operation, required no adjustment or lubrication and outlasted steel chains. But replacement, when it was necessary, of the final drive belt was no simple matter, since it required removal of the primary drive and inner cover. As it turned out, the belts exhibited longer working life than the factory expected, lasting from 30,000 to 40,000 miles (48,000-64,000km).

The new driveline also originated a new transmission with revised gear ratios. The new 4-speed gearbox offered the tallest overall ratio (3.27:1) in the Milwaukee lineup, which meant 60-mph (97km/h) highway speeds at little more than 2,500rpm. Acceleration was naturally less than brisk, but the Sturgis engine was pleasantly relaxed in the element for which the bike was designed, easy cruising.

Once again Harley-Davidson had proceeded with caution in untested waters. Only 1,470 examples of the Sturgis were made in its debut year, and production went to 3,543 the following year. The FXB accounted for only 1,833 bikes in 1982, its final year of production. But the Sturgis had met its design and performance requirements as a limited edition machine, and provided the test bed for the belt-drive system that would soon spread to other models.



Left: The drive belt was developed by Gates Rubber Company, using nylon fiber for strength. Belts proved more durable than expected.



Right: Following the Low Rider, Willie G. was on a roll. The time was at hand to take the custom/cruiser styling a step farther, and dress it in basic black once again. The eighty-inch engine was new in '78; belt drive debuted on the Sturgis.

1980 FXB Sturgis
Owner – Otis Chandler
Ojai, California

Sportster

Sales of the Sportster had been relatively strong throughout the decade, but declined in 1978. The touring version (XLT) introduced in 1977 was not successful and the XLCR Cafe Racers were mostly collecting dust as they became collectibles sitting in dealerships hither and yon. Given the success of the Low Rider, Milwaukee decided to apply the same styling to the Sportster to see what happened.

Not much. The 1979 XLS had the updated XLCR frame, 16-inch (40.64cm) rear wheel, extended fork, cast wheels and siamesed two-into-one-into-two exhaust system with a muffler on each side. And no kick starter. The bike had flat handlebars and a stepped dual seat with sissy bar. Decidedly un-Sportster-like. The disparate styling cues from cafe racer, cruiser and sport bike were met with nearly universal derision. Many dealers swapped the exhaust systems and cruiser seats for standard Sportster items immediately.

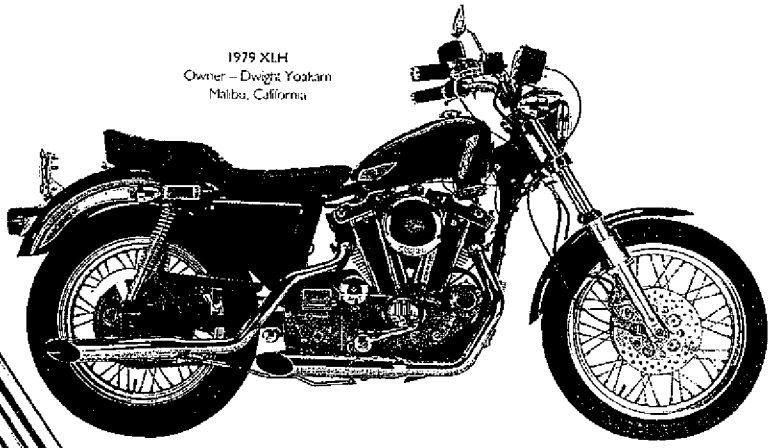
The XLS got its own name, the Roadster, despite the fact that it was more cruiser in appearance. The cafe racer pipes were later discontinued and the production numbers for the Roadster dropped considerably. But it stayed in the lineup for several years and gained even more resemblance to the Super Glide, with two-tone paint and the old Sprint gas tank.

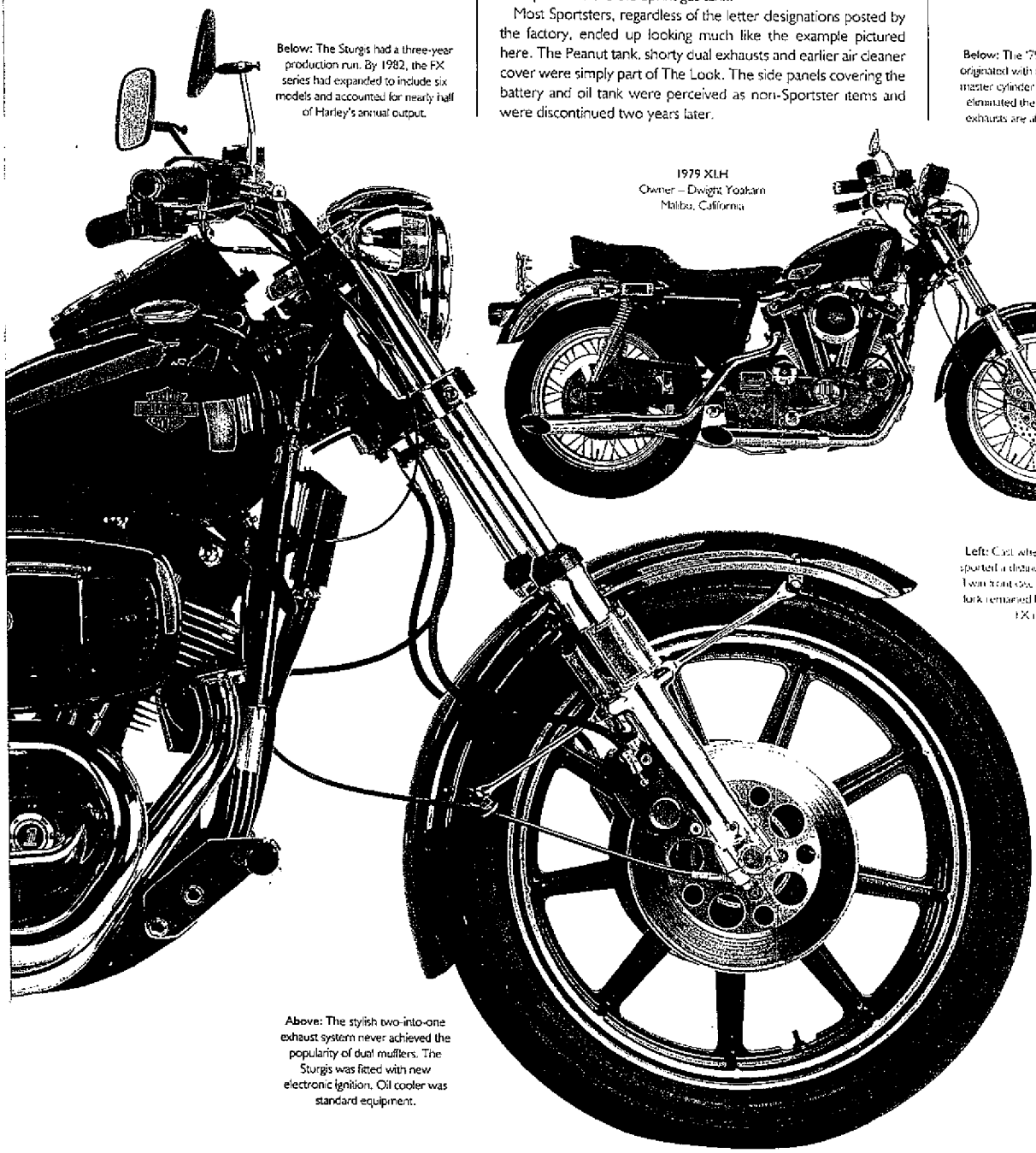
Most Sportsters, regardless of the letter designations posted by the factory, ended up looking much like the example pictured here. The Peanut tank, shorty dual exhausts and earlier air cleaner cover were simply part of The Look. The side panels covering the battery and oil tank were perceived as non-Sportster items and were discontinued two years later.

Below: The Sturgis had a three-year production run. By 1982, the FX series had expanded to include six models and accounted for nearly half of Harley's annual output.

Below: The '79 Sportster frame originated with the XLCR. A new master cylinder for the rear brake eliminated the kickstarter. Dual exhausts are aftermarket item.

1979 XLH
Owner – Dwight Yoakam
Malibu, California





Left: Cast wheels on the Sturgis sported a distinctive orange stripe. Twin front disc brakes and Showa fork remained features on several FX models.

Above: The stylish two-into-one exhaust system never achieved the popularity of dual mufflers. The Sturgis was fitted with new electronic ignition. Oil cooler was standard equipment.

FLT (1980) AND FXWG (1980)

Although the Sturgis drew attention with its brawny appearance and belt drive, the most important news of 1980 was the arrival of the FLT Tour Glide. Milwaukee had given its competitors something to strive for in the cruiser/custom format, and turned its attention to the the touring machine. But unlike the primarily cosmetic touches applied to the FX editions, the FLT was virtually a new motorcycle.

Only the Tour Glide's engine identified it with the FLH-80. With the next generation big twin still in the design stage, the interim fix was to bring the enlarged Shovelhead to a new standard of performance. Not in terms of more power, but by reducing chassis vibration and improving the handling. The engine featured transistorized ignition and a spin-on oil filter, and was buttoned to a new 5-speed transmission.

The vibration and handling goals required a new frame and engine-mounting system. Harley engineers designed a three-point attachment system with rubber-shimmed mounts between frame and engine, which worked to absorb vibration. The swingarm bolted directly to the transmission case, so the entire engine/drivetrain assembly was effectively isolated from the rest of the machine. The nickname Rubber Glide remained unofficial and untrademarked.

The free-floating energy was directed to the rear wheel first by the new 5-speed transmission. The more compact gearbox reduced the distance to the crankshaft, which allowed a shorter primary chain. And the final drive chain was fully enclosed and sealed. With full-time lubrication it performed much longer without adjustment, and was also much cleaner.

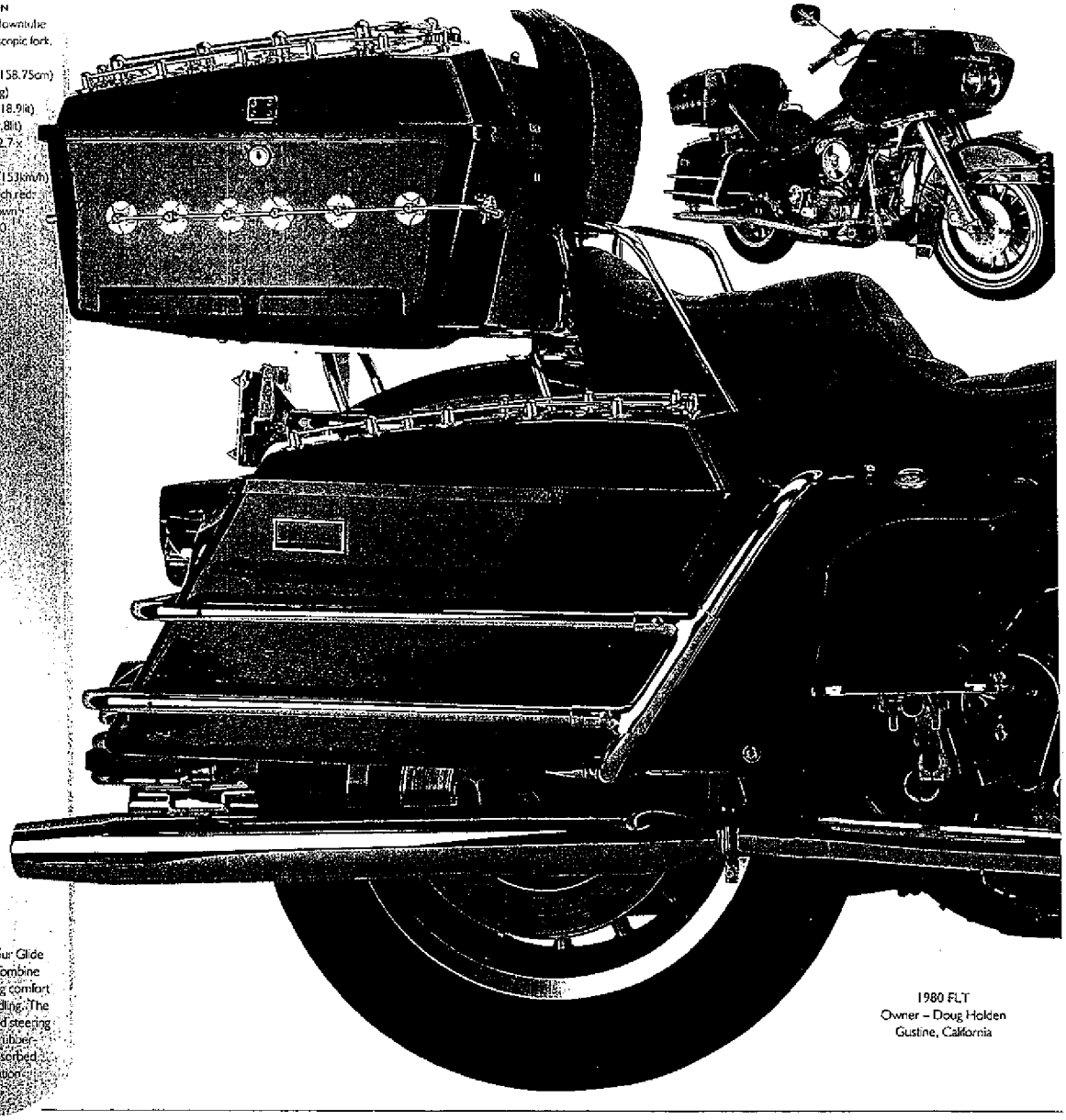
Supporting all this jiggery-pokery was a new frame, distinguished by a protruding steering head and trailing fork. With the object of improving the heavyweight's low-speed handling, the engineers

1980 FLT TOUR GLIDE

Specifications

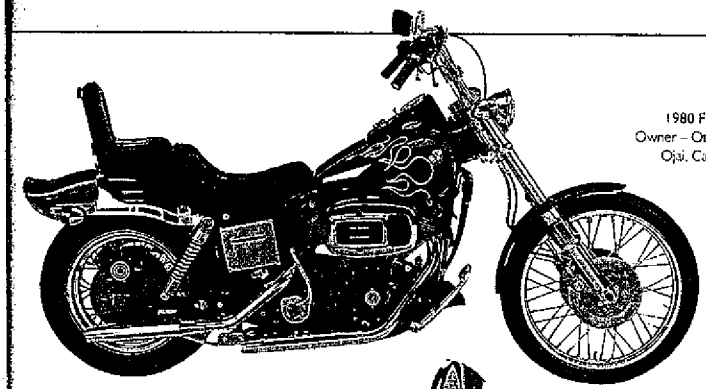
Engine/Drivetrain
Engine: OHV 45° V-twin
Displacement: 81.65ci (1338cc)
Bore & stroke: 3.5 x 4.25in (89 x 108mm)
Compression ratio: 7.4:1
Horsepower: 65
Carburetion: Bendix
Transmission: 5-speed
Primary drive: Chain
Final drive: Chain
Brakes: F. Disc, R. Drum
Battery: 12-volt
Ignition: CDI

Chassis/Suspension
Frame: Steel, single downtube
Suspension: F. Telescopic fork, R. Hydraulic shocks
Wheelbase: 62.5in (158.75cm)
Weight: 781lb (354kg)
Fuel capacity: 5gal (18.9lit)
Oil capacity: 4qts (3.8lit)
Tires: 5.00 x 16in (12.7 x 40.64cm)
Top speed: 95mph (153km/h)
Colors: Vivid black, rich red, [illegible] blue, saddle brown
Number built: 4,480
Price: $6,96



1980 FLT
Owner – Doug Holden
Gustine, California

Right: The FLT Tour Glide was designed to combine long-distance touring comfort with sport bike handling. The new frame improved steering [illegible] rubber-[illegible] system absorbed [illegible] vibration.



1980 FXWG
Owner – Otis Chandler
Ojai, California

Above: Milwaukee grew even bolder with the introduction of the Wide Glide in 1980. The factory chopper had a 21-inch (53.3cm) wheel, flame paint job and the lowest seat in the lineup.

Left: The Tour Glide was distinguished by its frame-mount fairing and dual headlights. The cargo capacity, enclosed final drive chain and five-gallon (18.9lt) fuel tank were appreciated by touring riders.

crafted an extended frameset with a steep, head-first steering stem set at 25 degrees. The set-back fork was canted at 28 degrees to offer enough trail for stability at highway speeds. The frame-mount stepped saddle fit lower in the chassis, putting the seat height at 29 inches (73.6cm).

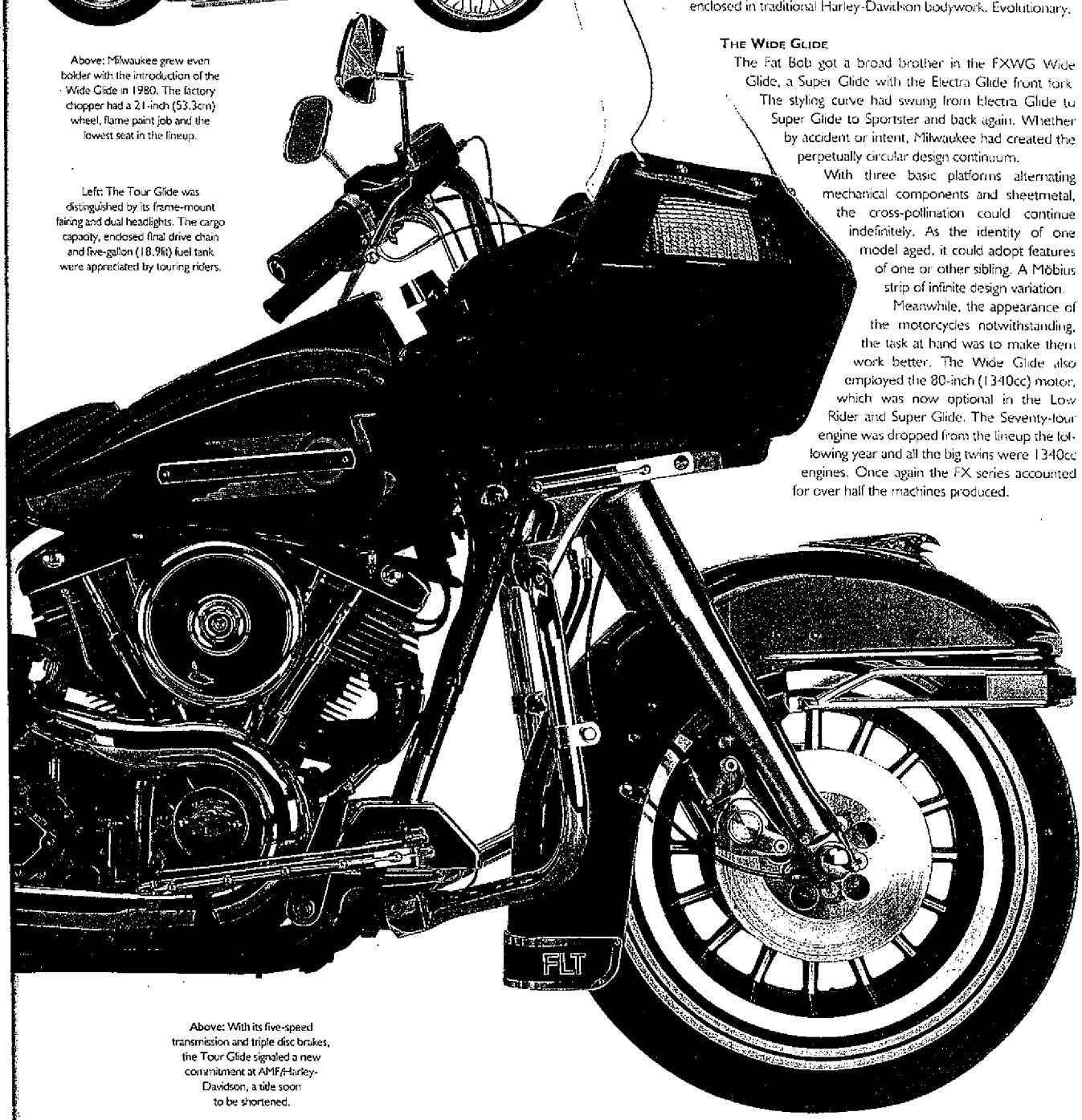
The Tour Glide signaled that the design and engineering folks in Milwaukee had been busy. This was the first step toward building an entirely new motorcycle, engine included. The forecast for future Glides was in place; the 45-degree air-cooled V-twin would remain, in quieter and gentler form, in a contemporary chassis. All enclosed in traditional Harley-Davidson bodywork. Evolutionary.

The Wide Glide

The Fat Bob got a broad brother in the FXWG Wide Glide, a Super Glide with the Electra Glide front fork. The styling curve had swung from Electra Glide to Super Glide to Sportster and back again. Whether by accident or intent, Milwaukee had created the perpetually circular design continuum.

With three basic platforms alternating mechanical components and sheetmetal, the cross-pollination could continue indefinitely. As the identity of one model aged, it could adopt features of one or other sibling. A Möbius strip of infinite design variation.

Meanwhile, the appearance of the motorcycles notwithstanding, the task at hand was to make them work better. The Wide Glide also employed the 80-inch (1340cc) motor, which was now optional in the Low Rider and Super Glide. The Seventy-four engine was dropped from the lineup the following year and all the big twins were 1340cc engines. Once again the FX series accounted for over half the machines produced.



Above: With its five-speed transmission and triple disc brakes, the Tour Glide signaled a new commitment at AMF/Harley-Davidson, a tide soon to be shortened.

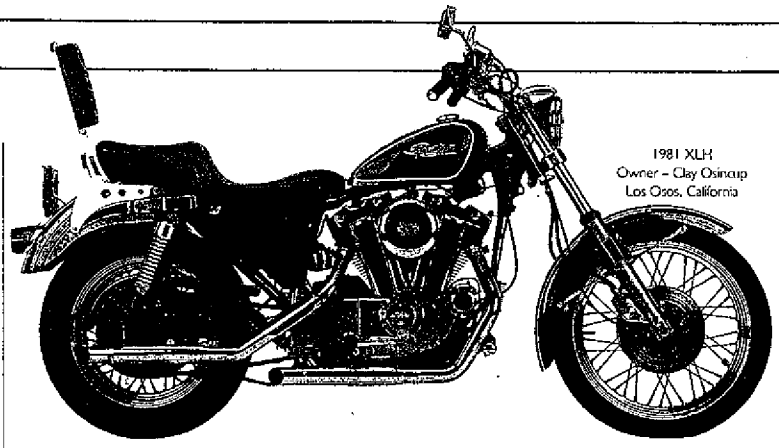
FLH (1981) AND XLH (1981)

The 1981 FLH became the final Electra Glide of the the AMF chapter in Harley-Davidson's biography. That may or may not confer upon it collectible status, but stranger things have happened. Much like the '65 Panhead, the final AMF/FLH represented an end and a beginning.

The signed copy in limited numbers for 1981 was titled the Heritage Edition, an appropriate term. The relationship with American Machine and Foundry had enabled Milwaukee to increase production and develop new models. But it had also created some scarred confidence among both dealers and customers, an issue the new owners were determined to address. A heritage restoration program.

New and better motorcycles were then half-way between the sketch pads and the assembly line. The new management team, thirteen former officials who had pooled their resources and borrowed lots of money, had to balance caution with daring. The sales of motorcycles had fallen in an economic recession, but new models were still arriving from Japan, meaning a smaller and tougher market.

The new Harley-Davidson Motor Company had to be a thoroughly modern example of efficient management, marketing, design, engineering and manufacturing. In order to meet those objectives, the new owners undertook a three-channel plan to control production costs and simultaneously ensure higher standards of quality control. Part of the new system gave factory workers more responsibility in the manufacturing and assembly processes.



1981 XLH
Owner – Clay Osincup
Los Osos, California

Above: The last AMF Sportster in the traditional orange-and-black racing team colors. Front dual discs were deleted two years later.

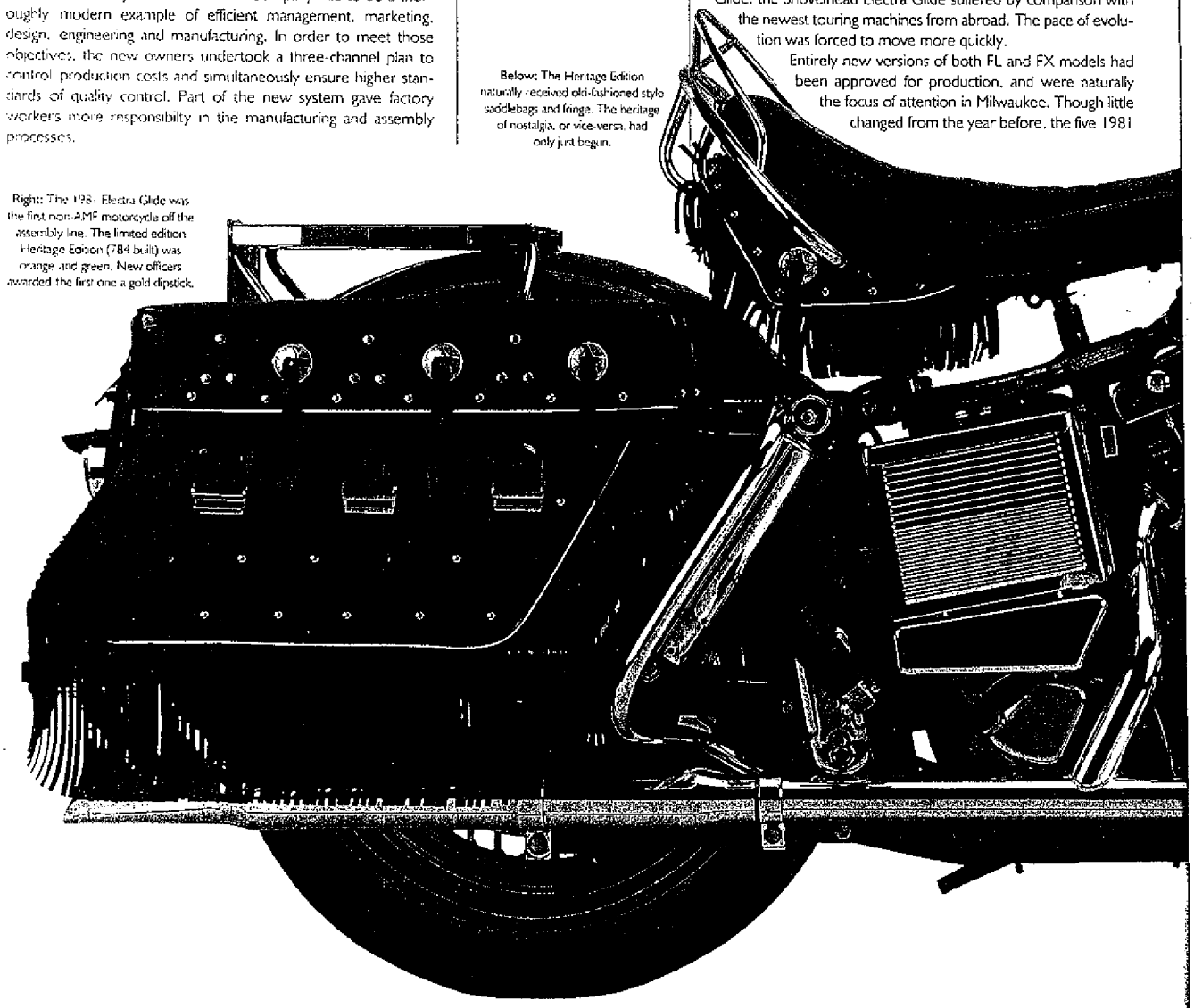
Against long odds, and after a four-year struggle, it worked. Harley-Davidson was back, same as it ever was but much better.

Sales of the Electra Glide had averaged better than 10,000 annually for several years. But the flagging economy combined with efficient Japanese touring bikes cut the total to under 6,000 in 1982. The FX models remained Milwaukee's top sellers, followed by the Sportster. Despite the improvements exhibited by the Tour Glide, the Shovelhead Electra Glide suffered by comparison with the newest touring machines from abroad. The pace of evolution was forced to move more quickly.

Entirely new versions of both FL and FX models had been approved for production, and were naturally the focus of attention in Milwaukee. Though little changed from the year before, the five 1981

Below: The Heritage Edition naturally received old-fashioned style saddlebags and fringe. The heritage of nostalgia, or vice-versa, had only just begun.

Right: The 1981 Electra Glide was the first non-AMF motorcycle off the assembly line. The limited edition Heritage Edition (784 built) was orange and green. New officers awarded the first one a gold dipstick.



FX models accounted for some 23,000 machines. Sportster figures topped at just over 10,000. Not record-setting numbers, but enough to maintain Harley-Davidson's production force and proceed with work on the new machines. Many of the chores ran overtime.

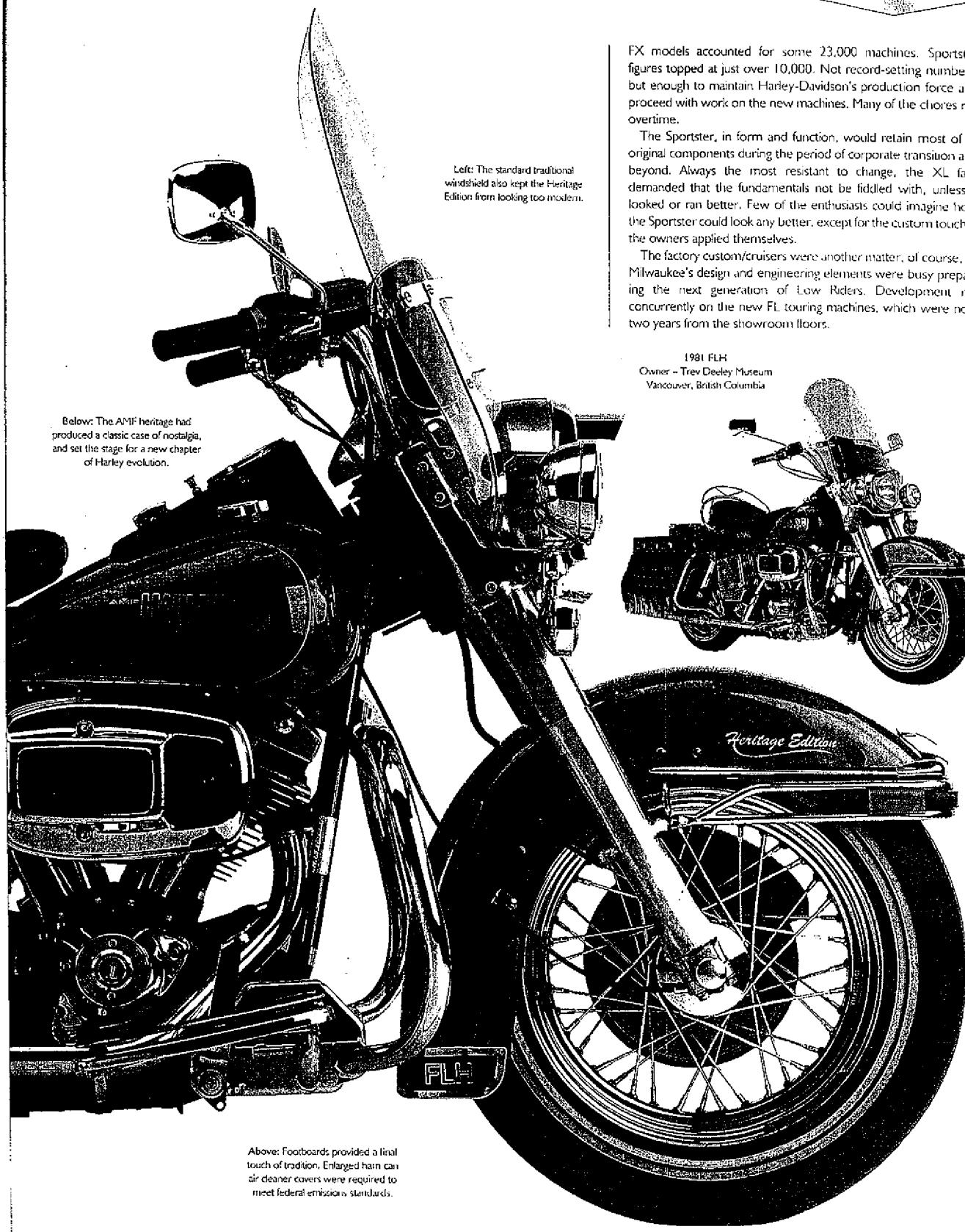
The Sportster, in form and function, would retain most of its original components during the period of corporate transition and beyond. Always the most resistant to change, the XL fans demanded that the fundamentals not be fiddled with, unless it looked or ran better. Few of the enthusiasts could imagine how the Sportster could look any better, except for the custom touches the owners applied themselves.

The factory custom/cruisers were another matter, of course, so Milwaukee's design and engineering elements were busy preparing the next generation of Low Riders. Development ran concurrently on the new FL touring machines, which were now two years from the showroom floors.

Left: The standard traditional windshield also kept the Heritage Edition from looking too modern.

1981 FLH
Owner – Trev Deeley Museum
Vancouver, British Columbia

Below: The AMF heritage had produced a classic case of nostalgia, and set the stage for a new chapter of Harley evolution.



Above: Footboards provided a final touch of tradition. Enlarged horn can air cleaner covers were required to meet federal emissions standards.

1982 FXRS SUPER GLIDE II

SPECIFICATIONS
ENGINE/DRIVETRAIN
Engine: OHV 45° V-twin
Displacement: 81.65ci (1338cc)
Bore & stroke: 3.50 x 4.25in (89 x 108mm)
Compression ratio: 8.1
Horsepower: 65
Carburetion: Bendix
Transmission: 4-speed
Primary drive: Duplex chain
Final drive: Chain
Brakes: Dual discs F, Disc R
Battery: 12-volt
Ignition: Electronic

CHASSIS/SUSPENSION
Frame: Steel, double downtube
Suspension: F, Telescopic fork; R, Hydraulic shocks
Wheelbase: 64.7in (164.3cm)
Weight: 610lb (277kg)
Fuel capacity: 3.5gal (13.25lt)
Oil capacity: 4qts (3.8lt)
Tires: F, 3.50 x 19in (8.9 x 48.26cm); R, 5.00 x 16in (12.7 x 40.64cm)
Top speed: 115mph (185km/h)
Colors: Vivid black; candy red; metallic blue; metallic green; cream and black
Number built: 3,490 (FXR: 3,065)
Price: $6,690

FXR (1982) and FXRS (1982)

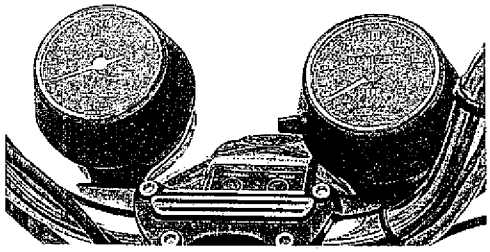
The first of the next generation middle-Glides was the FXR, which debuted in 1982 as the Super Glide II. The new chassis featured another version of the FLT frame, with a strong box-section backbone and rubber-mount system. The letter R distinguished the new model from the standard FX models, which retained solid-mount 4-speed engines.

The 5-speed 80-inch (1340cc) Shovelhead retained the lower compression first used in the FLT. The transmission was improved by revising the linkage and shift mechanism, which produced shorter lever throws and more positive gear changes and made neutral easier to select. Heim-jointed turnbuckles prevented the engine from rocking or twisting in the frame. The massive backbone and larger-diameter frame tubes provided a stiffer chassis.

The FXR was another product of established Milwaukee development paths. The engine had been upgraded first in the time-honored tradition of more displacement and more tractable power. Reliabilty was enhanced with improved lubrication delivery, better valve guides and electronic ignition. Then the new chassis came along to improve handling, comfort and overall performance. And, keeping with the circular development system, a new engine was soon forthcoming.

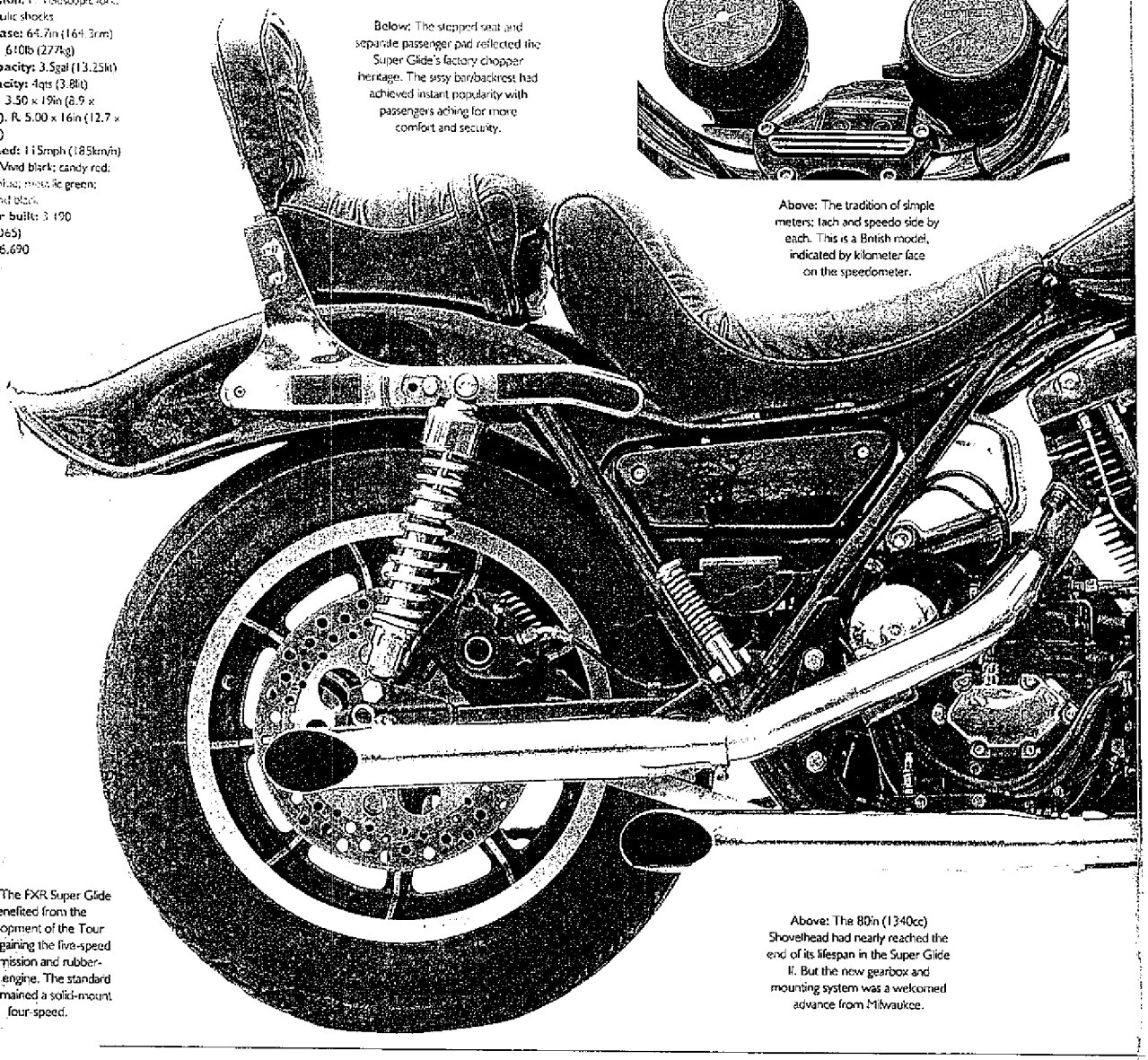
The FXR matched the FLT for seat height (29 inches, 73.6cm), but its 31-degree steering head extended the wheebase to 64.7 inches (164.3cm). A long motorcycle normally suffers some clumsiness at low speeds, and the Super Glide II was no exception. But at highway speeds it was impressively stable, and the new quotient of chassis rigidity allowed the FXR to handle twisty roads with considerable composure. Most testers agreed that this was the best-handling big twin ever to come out of Milwaukee. Ground clearance didn't match the pure sport bikes, but within its limits the new model could straighten turns with new levels of speed and security. A cruiser that could scoot.

Fortunately the new handling standards were accompanied by better brakes. Two discs at the front and a dual-piston caliper disc



Above: The tradition of simple meters: tach and speedo side by each. This is a British model, indicated by kilometer face on the speedometer.

Below: The stepped seat and separate passenger pad reflected the Super Glide's factory chopper heritage. The sissy bar/backrest had achieved instant popularity with passengers aching for more comfort and security.



Right: The FXR Super Glide benefited from the development of the Tour Glide, gaining the five-speed transmission and rubber-mount engine. The standard FXE remained a solid-mount four-speed.

Above: The 80in (1340cc) Shovelhead had nearly reached the end of its lifespan in the Super Glide II. But the new gearbox and mounting system was a welcomed advance from Milwaukee.

at the rear elevated braking performance. Redesigned brake and clutch levers offered better leverage than previous controls. With form dialed in to Milwaukee's satisfaction, the function was coming up to speed. The FXR made a number of riders take another look at Harley-Davidson.

Below: The FXR signaled Harley's intent to bring higher performance standards to the custom/cruiser category; more function for the form.

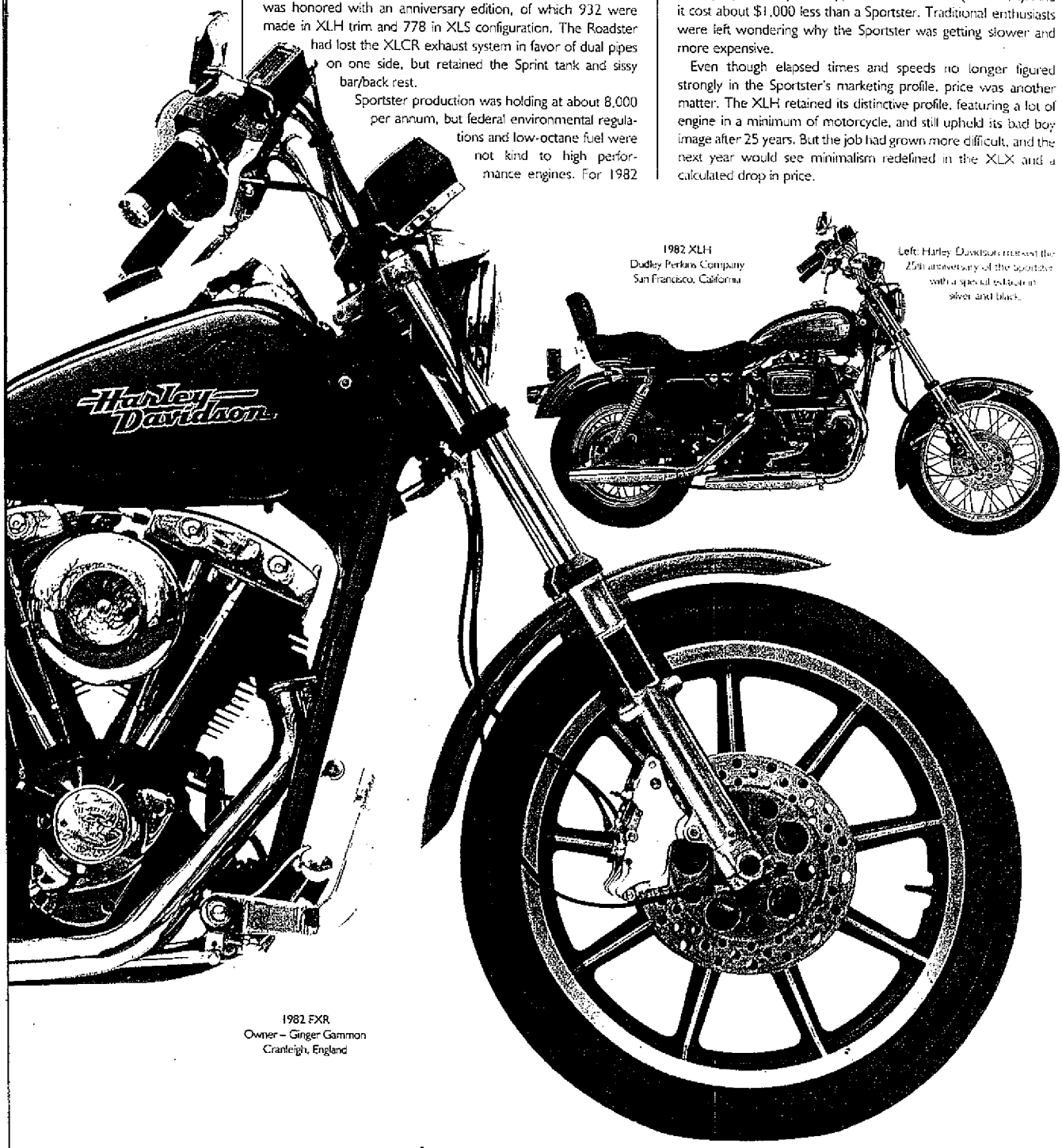
XLH

The Sportster was 25 years old in 1982. Naturally the occasion was honored with an anniversary edition, of which 932 were made in XLH trim and 778 in XLS configuration. The Roadster had lost the XLCR exhaust system in favor of dual pipes on one side, but retained the Sprint tank and sissy bar/back rest.

Sportster production was holding at about 8,000 per annum, but federal environmental regulations and low-octane fuel were not kind to high performance engines. For 1982 the Sportster's compression ratio was dropped to 8:1, with a consequent reduction in horsepower and speed. But it still weighed under 500lb (227kg) and could dip the quarter-mile under 14 seconds at 100mph (161km/h), which was about the top speed.

In terms of pure performance the Sporster had one real problem, which was designated the Honda CB900F. The four-cylinder sport bike sprinted the quarter at well under 13 seconds at 110mph (177km/h), and topped out around 130 (209km/h). And it cost about $1,000 less than a Sportster. Traditional enthusiasts were left wondering why the Sportster was getting slower and more expensive.

Even though elapsed times and speeds no longer figured strongly in the Sportster's marketing profile, price was another matter. The XLH retained its distinctive profile, featuring a lot of engine in a minimum of motorcycle, and still upheld its bad boy image after 25 years. But the job had grown more difficult, and the next year would see minimalism redefined in the XLX and a calculated drop in price.



1982 XLH
Dudley Perkins Company
San Francisco, California

Left: Harley-Davidson marked the 25th anniversary of the Sportster with a special edition in silver and black.

1982 FXR
Owner – Ginger Gammon
Cranleigh, England

XR-1000 (1983) AND XLX-61 (1983)

No matter the national economic conditions, or the shifting fortunes of the motorcycle market, there always remained in Milwaukee a core group of hot rodders. In this instance it was marketing director Clyde Fessler, racing manager Dick O'Brien and design chief Willie G. Davidson. The result was the XR-1000.

Harley-Davidson had lost sizeable chunks of several market segments to the Japanese motorcycle manufacturers. Giving up the street rod market was rather like adding salt to the wounds. The high-performance fans had lobbied Milwaukee for years to build a street version of the racing XR-750, but to no avail. The XLCR had been considered little more than a cosmetic gesture. Real horsepower was the demand, in traditional Sportster trim.

The factory did consider the possibilities, but the costs involved in outfitting the racer for the street were much higher than projected sales would warrant. So the focus shifted to the existing Sportster, since the new chassis could handle more power and most of the necessary components were in house. Since the Evolution engine project had top priority at the time, the XR-1000 had to be a back room project.

Dick O'Brien enlisted the aid of California flowmeister Jerry Branch, who made sure the new alloy heads breathed properly. Since the heads were larger, the new cast iron cylinders had to be shortened a half-inch (12.7mm) to fit the engine into the Sportster frame. The motor was rated at 70 horsepower, ten more than the standard powerplant. The XR-1000 was quicker (sub-13 second quarter-mile) and faster (125mph, 201km/h) than the XLH, but was less than comfortable on the street. The potent engine made more mechanical clatter and stumbled at low speeds. And at nearly $7,000 the XR was much costlier than the crotch rockets from across the water.

Though no great success on the highway, the XR-1000 proved itself on the race track. O'Brien had the engine bolted into an old road-racing chassis, with competition suspension, brakes and full fairing, which was aptly dubbed "Lucifer's Hammer." Three-time national champ Jay Springsteen dusted the competition with it at

1983 XR-1000

Specifications
Engine/Drivetrain
Engine: OHV 45° V-twin
Displacement: 61ci (1000cc)
Bore & stroke: 3.19 x 3.81in (81 x 97mm)
Compression ratio: 9:1
Horsepower: 71 @ 5,600rpm
Carburetion: Two 36mm Dell'Orto
Transmission: 4-speed
Brakes: Triple disc
Battery: 12-volt
Ignition: V-Fire CDI

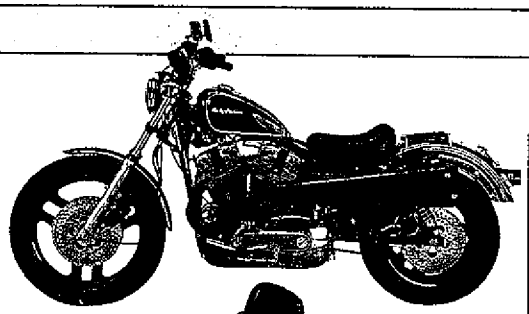
Chassis/Suspension
Frame: Steel, double downtube
Suspension: F, Telescopic fork R, Hydraulic shocks
Wheelbase: 60in (152.4cm)
Weight: 490lb (222kg)
Fuel capacity: 2.5gal (9.5lt)
Oil capacity: 2.5qts (2.36lt)
Tires: F, 110/90-19, R, 130/90-16 (18in, 45.72cm rear wheel optional)
Top speed: 125mph (201km/h)
Color: Slate gray (option: orange/black in 1984)
Number built: 1,108
Price: $6,995

1983 FLH
Owner – Dennis Huggins
Lompoc, California

Right: Belt drive arrived just in time for the last of the Shovelhead dressers. Production ran half way through 1984, when the Evolution engine superseded the Shovel. Another collectible, shown here in vivid blue.

Right: The XR-1000 resulted from requests for a street version of the XR-750 racer. Thus the expression, "Be careful what you wish for, because you may get it."

1983 XR-1000
Owner – Oliver Shokouh
Harley-Davidson of Glendale
Glendale, California



1984 XR-1000
Owner – Duane Anderson
Arroyo Grande, California

Daytona. Later, under tuner Don Tilley and rider Gene Church, the machine went on to win three successive titles in the Battle of the Twins competition.

XLX-61

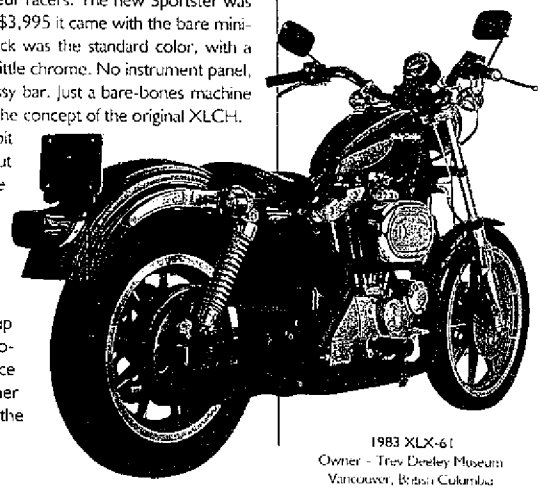
The XR-1000 did serve Milwaukee well as an image builder, and drew more than a few prospective customers into the showrooms. Usually, after the oohs and ahhs had subsided, the viewers looked at the price tag and bought an XLX-61.

By contrast, the baby brother from the bargain basement was an instant winner with the public. The XLX-61, with its traditional cubic-inch designation, was the Spartan warrior of the Sportster clan. And with a price below $4,000, it attracted attention.

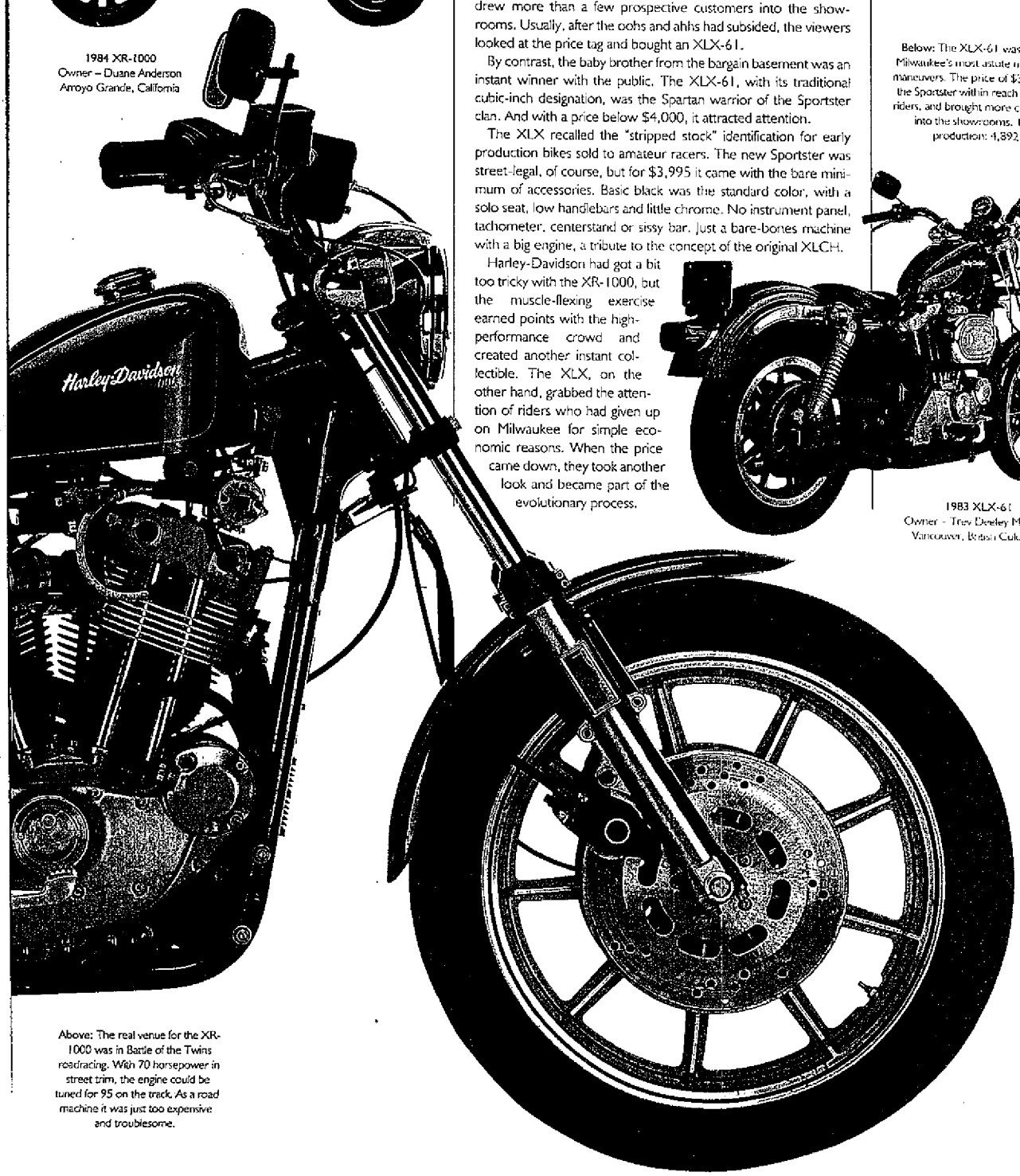
The XLX recalled the "stripped stock" identification for early production bikes sold to amateur racers. The new Sportster was street-legal, of course, but for $3,995 it came with the bare minimum of accessories. Basic black was the standard color, with a solo seat, low handlebars and little chrome. No instrument panel, tachometer, centerstand or sissy bar. Just a bare-bones machine with a big engine, a tribute to the concept of the original XLCH.

Harley-Davidson had got a bit too tricky with the XR-1000, but the muscle-flexing exercise earned points with the high-performance crowd and created another instant collectible. The XLX, on the other hand, grabbed the attention of riders who had given up on Milwaukee for simple economic reasons. When the price came down, they took another look and became part of the evolutionary process.

Below: The XLX-61 was one of Milwaukee's most astute marketing maneuvers. The price of $3,995 put the Sportster within reach of more riders, and brought more customers into the showrooms. 1983 production: 4,892.



1983 XLX-61
Owner – Trev Deeley Museum
Vancouver, British Columbia



Above: The real venue for the XR-1000 was in Battle of the Twins roadracing. With 70 horsepower in street trim, the engine could be tuned for 95 on the track. As a road machine it was just too expensive and troublesome.

FLEX (1984), FXST (1984) AND FXEF (1984)

1984 FXST

Specifications
Engine/Drivetrain
Engine: OHV 45° V-twin
Displacement: 81.65ci (1338cc)
Bore & stroke: 3.5 x 4.25in (87 x 108mm)
Compression ratio: 8.5:1
Horsepower: 55
Carburetion: 38mm Keihin
Transmission: 4-speed
Primary drive: Duplex chain
Final drive: Chain
Brakes: F. Disc R. Drum
Battery: 12-volt
Ignition: CDI

Chassis/Suspension
Frame: Steel, double downtube
Suspension: F. Telescopic fork, R. Shocks
Wheelbase: 66.3in (168.4cm)
Weight: 628lb (285kg)
Fuel capacity: 5gal (18.9lt)
Oil capacity: 3.5qts (3.3lt)
Tires: F. 3.00 x 19in (7.62 x 48.26cm). R. 5.00 x 16in (12.7 x 40.64cm)
Top speed: 110mph (177km/h)
Colors: Vivid black with pinstripes; candy red with pinstripes
Number built: 5,413
Price: $7,999

Evolution takes time. In the motorcycle business, money is also helpful. In the late 1960s, at the height of the motorcycle sales boom, Harley-Davidson had run out of time and money.

The Motor Company had survived Henry Ford, the Indian Motorcycle Company, the Great Depression, Hollywood and the Hell's Angels. But they were not prepared for Soichiro Honda. (Who knew?). American Machine and Foundry bought the time Milwaukee needed, and even helped finance the evolution. It took 15 years (a millisecond on the Darwinian scale), but by 1984 the newest member of the species *Milwokus motobikus* had evolved.

Even veteran insiders had given Harley-Davidson little chance of success. A dinosaur, they concluded, that had reached the end of its natural lifespan. AMF, an apparent expert in the "recreation" business, had bailed out. The Japanese, who could design, tool-up and build entirely new motorcycles in a period of 18 months, ruled the marketplace. Milwaukee was granted the proverbial snowball's chance in hell.

Then hell froze over.

To evolve is "to develop gradually by a process of growth and change." The Milwaukee process was nothing if not gradual. The company had, over the years, produced a few mechanical mutations that were rejected by the market organism. But given the span of time and weight of numbers – eight decades, millions of motorcycles – Harley had the one element essential for survival. Experience.

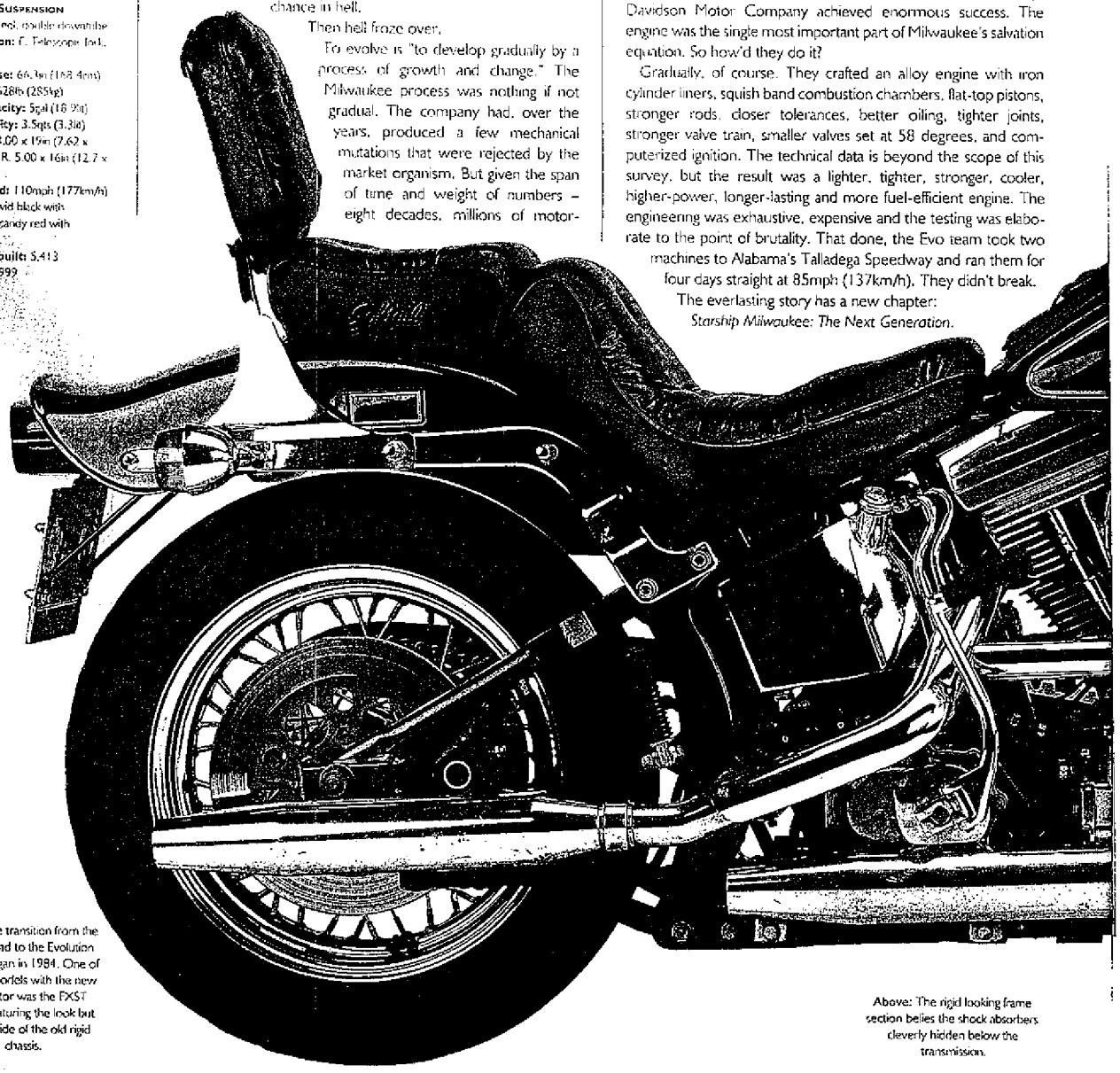
The brick walls on Juneau Avenue housed four generations of genetic information. Threatened with extinction, Harley-Davidson was forced to adapt or expire. Once the decision was made, the experience could be put to work. The result of that effort was called appropriately, the Evolution engine.

Experience, that great teacher, showed that the new Harley-Davidson had to have a V-twin engine. And that the motorcycle must look, sound and feel much the same as Milwaukee iron always had. And further, that it perform to contemporary standards in terms of comfort, safety, maintenance and reliability. And maintain its resale value.

The story of how Harley-Davidson accomplished this feat has been recounted elsewhere. This book is merely a hardware history, the existence of which testifies that the New Harley-Davidson Motor Company achieved enormous success. The engine was the single most important part of Milwaukee's salvation equation. So how'd they do it?

Gradually, of course. They crafted an alloy engine with iron cylinder liners, squish band combustion chambers, flat-top pistons, stronger rods, closer tolerances, better oiling, tighter joints, stronger valve train, smaller valves set at 58 degrees, and computerized ignition. The technical data is beyond the scope of this survey, but the result was a lighter, tighter, stronger, cooler, higher-power, longer-lasting and more fuel-efficient engine. The engineering was exhaustive, expensive and the testing was elaborate to the point of brutality. That done, the Evo team took two machines to Alabama's Talladega Speedway and ran them for four days straight at 85mph (137km/h). They didn't break.

The everlasting story has a new chapter:
Starship Milwaukee: The Next Generation.



Right: The transition from the Shovelhead to the Evolution engine began in 1984. One of the five models with the new Evo motor was the FXST Softail, featuring the look but not the ride of the old rigid chassis.

Above: The rigid looking frame section belies the shock absorbers cleverly hidden below the transmission.

Below: The Softail was traditional in more than just appearance: the engine may have been all new inside, but it was still mounted solidly to the frame and had a four-speed transmission. And a kickstarter.

1984 FLHX
Owner – Trev Deeley Museum
Vancouver, British Columbia

Above: The FLHX Electra Glide was built as a limited edition model for 1984. This marks the final chapter for the solid-mount four-speed Shovelhead. The production total was 1,258.

Left: The 1984 Fat Bob was the last Shovel in the Super Glide series. It was also the custom cult for chain drive.

1984 FXEF
Mathews Harley-Davidson
Fresno, California

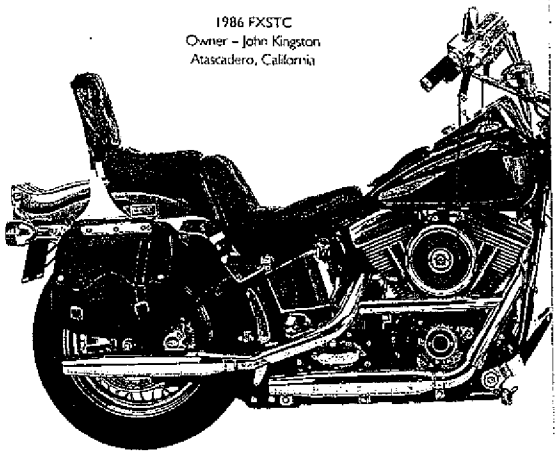
1984 FXST Softail
Dudley Perkins Company
San Francisco, California

FLHT (1985) AND FXST (1986)

When the Evo engine became the only big twin in 1985, design variations arrived to identify them by type and function. The FXRS Low Glide had the rubber-mount system, 5-speeds, belt drive and triple disc brakes. The Heritage Softail joined the FL series in 1986, expanding the retro-look of the 1950s and retaining the solid-mount chassis.

Testing its abilities (characteristic of newly evolved species), Harley-Davidson sought to learn how many levels of the custom/cruiser/touring/sport market were out there. Things had changed. The niche segments of the riding spectrum had been redefined by the motorcycle boomers of the 1960s and 1970s, so Milwaukee developed a new interest in demographics. The engineers and engine builders had done their jobs, now it was time for the boys in marketing.

Even though the Evolution engine received favorable coverage in the enthusiast press, the new models didn't claim overnight success. Not until 1988 did production approach the levels it had reached in the 1970s. Styling, market research and advertising employees took responsibility for the next phase of the natural selection process.

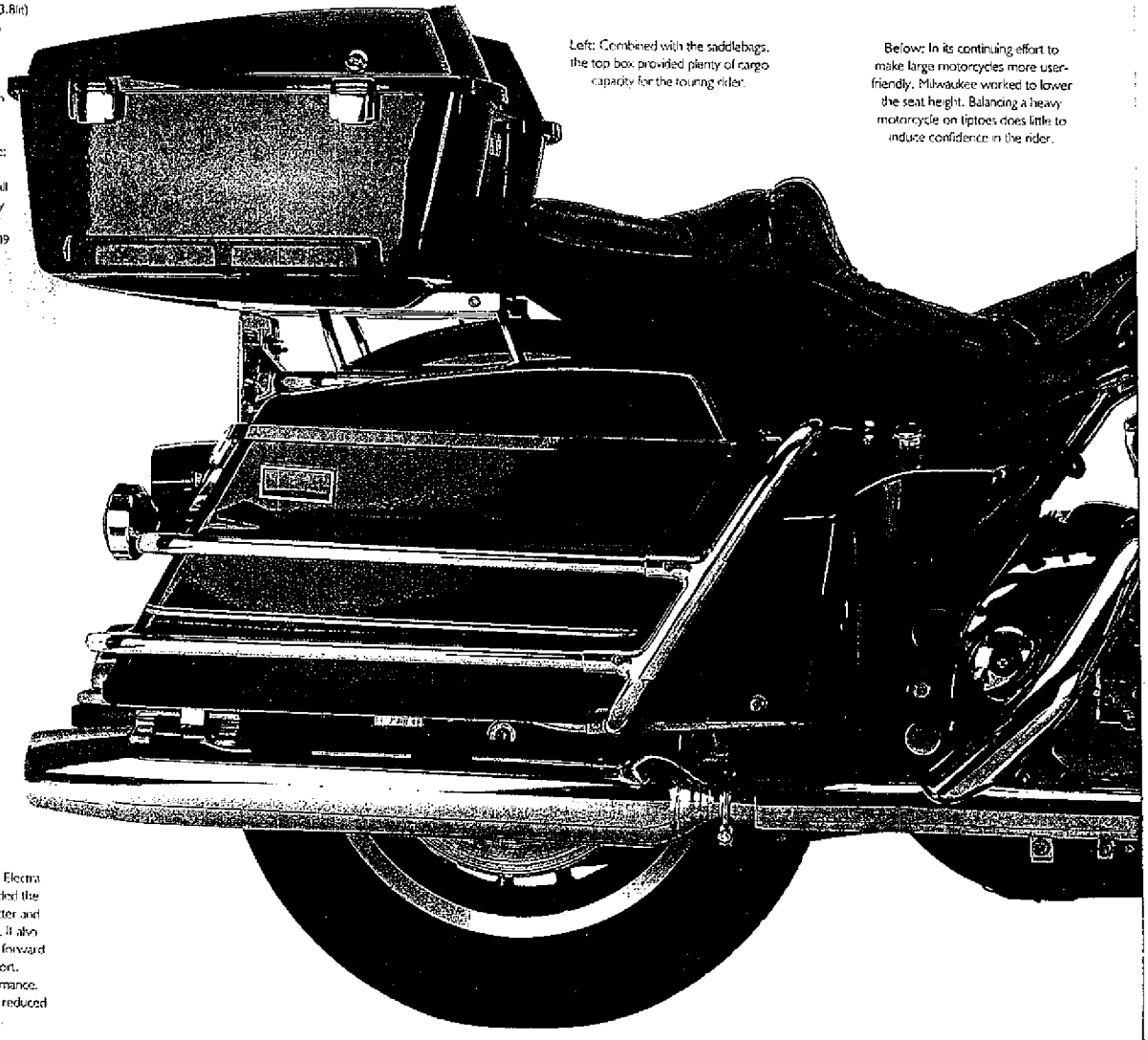


1986 FXSTC
Owner – John Kingston
Atascadero, California

1985 FLHTC

Specifications
Engine/Drivetrain
Engine: OHV 45° V-twin
Displacement: 81.65ci (1338cc)
Bore & stroke: 3.5 x 4.25in (89 x 108mm)
Compression ratio: 8.5:1
Horsepower: 55
Carburetion: Bing Keihin
Transmission: 5-speed
Primary drive: Duplex chain
Final drive: Belt
Brakes: F. Dual discs, R. Disc
Battery: 12-volt
Ignition: CDI

Chassis/Suspension
Frame: Steel, double downtube
Suspension: F. Telescopic forks, R. Shocks
Wheelbase: 62.9in (159.8cm)
Weight: 760lb (345kg)
Fuel capacity: 5gal (18.9lt)
Oil capacity: 4qts (3.8lit)
Tires: F. 3.00 x 19in (7.62 x 48.26cm), R. 5.00 x 16in (12.7 x 40.64cm)
Top speed: 110mph (177km/h)
Colors: Vivid black; candy red; candy blue; tan/cream; candy burgundy/slate gray (all with pinstripes); candy burgundy/candy pearl
Number built: 3,409
Price: $9,199



Left: Combined with the saddlebags, the top box provided plenty of cargo capacity for the touring rider.

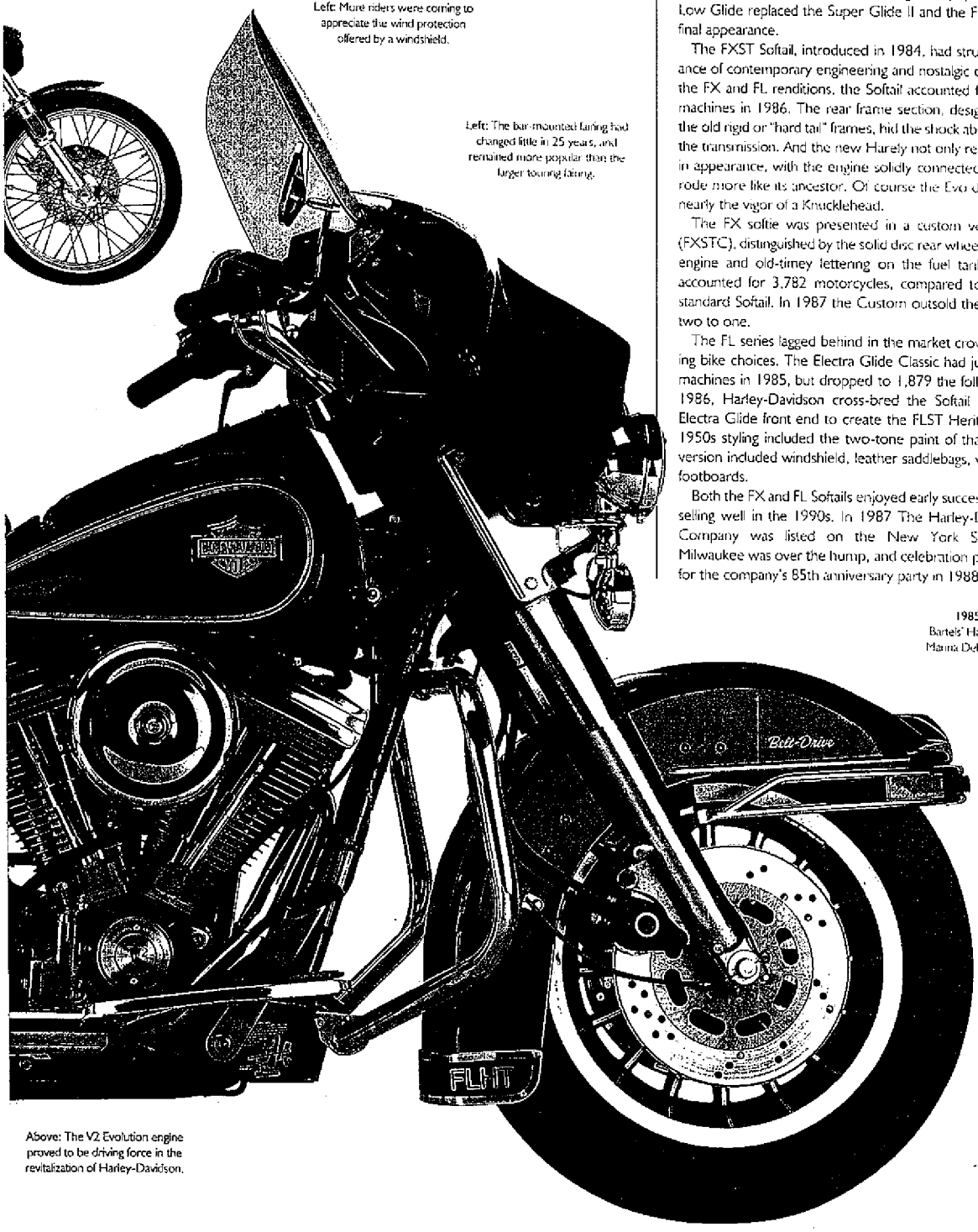
Below: In its continuing effort to make large motorcycles more user-friendly, Milwaukee worked to lower the seat height. Balancing a heavy motorcycle on tiptoes does little to induce confidence in the rider.

Right: The FLHTC Electra Glide Classic heralded the advent of longer letter and name designations. It also marked a great step forward in touring comfort, roadworthy performance, engine reliability and reduced maintenance.

Left: The Softail was joined by a Custom model in 1986, featuring a disc rear wheel. Both models had the new five-speed transmission and belt drive.

Left: More riders were coming to appreciate the wind protection offered by a windshield.

Left: The bar-mounted fairing had changed little in 25 years, and remained more popular than the larger touring fairing.



Above: The V2 Evolution engine proved to be driving force in the revitalization of Harley-Davidson.

The FLHT Electra Glide Classic wore the traditional bar-mount fairing in 1985, and the styling was unchanged but for the old-time bar-and-shield tank emblem. An improved diaphragm clutch had been introduced the year before, designed for cooler running, less slippage and easier operation. With the 5-speed and belt drive, the big twins required less effort of the rider. The FLTC Tour Glide Classic with frame-mount fairing had gained popularity, the FXRS Low Glide replaced the Super Glide II and the Fat Bob made its final appearance.

The FXST Softail, introduced in 1984, had struck the right balance of contemporary engineering and nostalgic design. Between the FX and FL renditions, the Softail accounted for nearly 9,000 machines in 1986. The rear frame section, designed to emulate the old rigid or "hard tail" frames, hid the shock absorbers beneath the transmission. And the new Harely not only resembled the old in appearance, with the engine solidly connected to the frame it rode more like its ancestor. Of course the Evo didn't shake with nearly the vigor of a Knucklehead.

The FX softie was presented in a custom version for 1986 (FXSTC), distinguished by the solid disc rear wheel, sissy bar, black engine and old-timey lettering on the fuel tank. The Custom accounted for 3,782 motorcycles, compared to 2,402 for the standard Softail. In 1987 the Custom outsold the ST better than two to one.

The FL series lagged behind in the market crowded with touring bike choices. The Electra Glide Classic had jumped to 3,409 machines in 1985, but dropped to 1,879 the following year. For 1986, Harley-Davidson cross-bred the Softail chassis and the Electra Glide front end to create the FLST Heritage Softail. The 1950s styling included the two-tone paint of that era. A Special version included windshield, leather saddlebags, wire wheels and footboards.

Both the FX and FL Softails enjoyed early success and continued selling well in the 1990s. In 1987 The Harley-Davidson Motor Company was listed on the New York Stock Exchange. Milwaukee was over the hump, and celebration plans were made for the company's 85th anniversary party in 1988.

1985 FLHTC
Bartels' Harley-Davidson
Marina Del Rey, California

FLST (1986) and XLH-1100 (1987)

The Electra Glide had added considerable bulk over the years, and the FX Softails had subtracted a few pounds in the cruiser category. Which meant there was room in between for an updated version of the Hydra-Glide. Enter the FLST Heritage Softail.

With the Evolution engine solidly in place (not rubber-mounted as it was in the FX series), the Heritage Softail mixed Milwaukee tradition with contemporary technology and design. The rigid-look rear frame section complements the Hydra-Glide front end, with its deeply skirted fender, large headlight and sergeant-stripe cowling. The deeply stepped saddle reflects more modern tastes, and puts the seat height at only 26.5 inches (67.3cm).

1986 FLST

Specifications
Engine/Drivetrain
Engine: OHV 45° V-twin
Displacement: 81.6ci (1338cc)
Bore & stroke: 3.5 x 4.25in (89 x 108mm)
Compression ratio: 8.5:1
Horsepower: 55
Carburetion: 38mm Keihin
Transmission: 5-speed
Primary drive: Duplex chain
Final drive: Belt
Brakes: F. & R. Disc
Battery: 12-volt
Ignition: CDI

Chassis/Suspension
Frame: Steel, double downtube
Suspension: F. Telescopic fork R. Shocks
Wheelbase: 62.5in (158.75cm)
Weight: 650lb (295kg)
Fuel capacity: 5gal (18.9l)
Oil capacity: 3qts (2.84l)
Tires: MT-90S-16
Top speed: 112mph (180km/h)
Colors: Signal red/creme; bronze/creme
Number built: 2,510
Price: $9,099

1987 XLH-1100

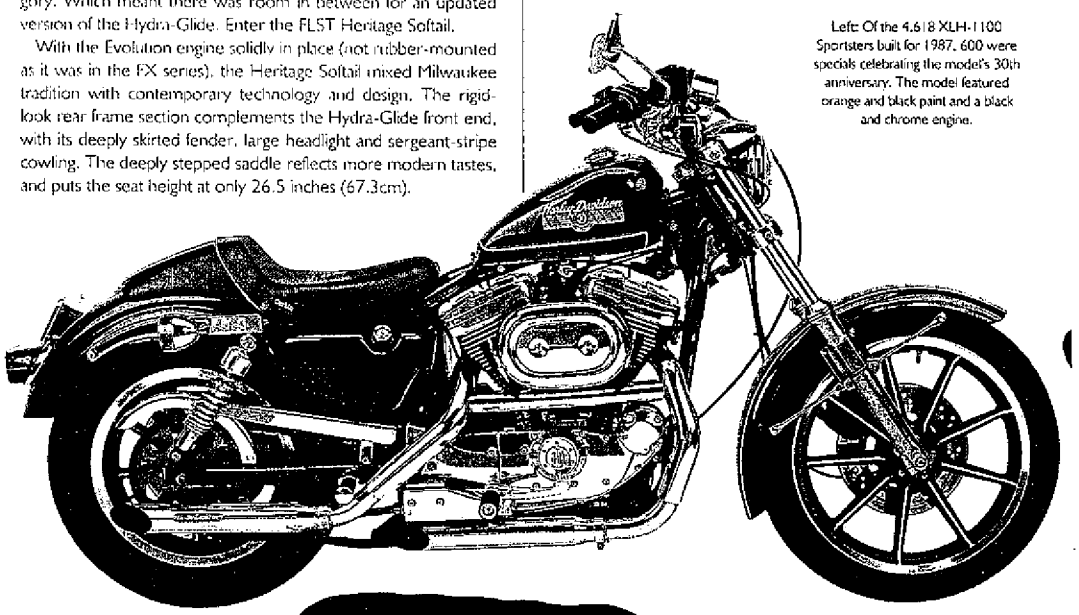
Specifications
Engine/Drivetrain
Engine: OHV 45° V-twin
Displacement: 67.2ci (1100cc)
Bore & stroke: 3.35 x 3.81in (85 x 97mm)
Compression ratio: 8.5:1
Horsepower: 63
Carburetion: Keihin
Transmission: 4-speed
Primary drive: Chain
Final drive: Chain
Brakes: F & R. Disc
Battery: 12-volt
Ignition: CDI

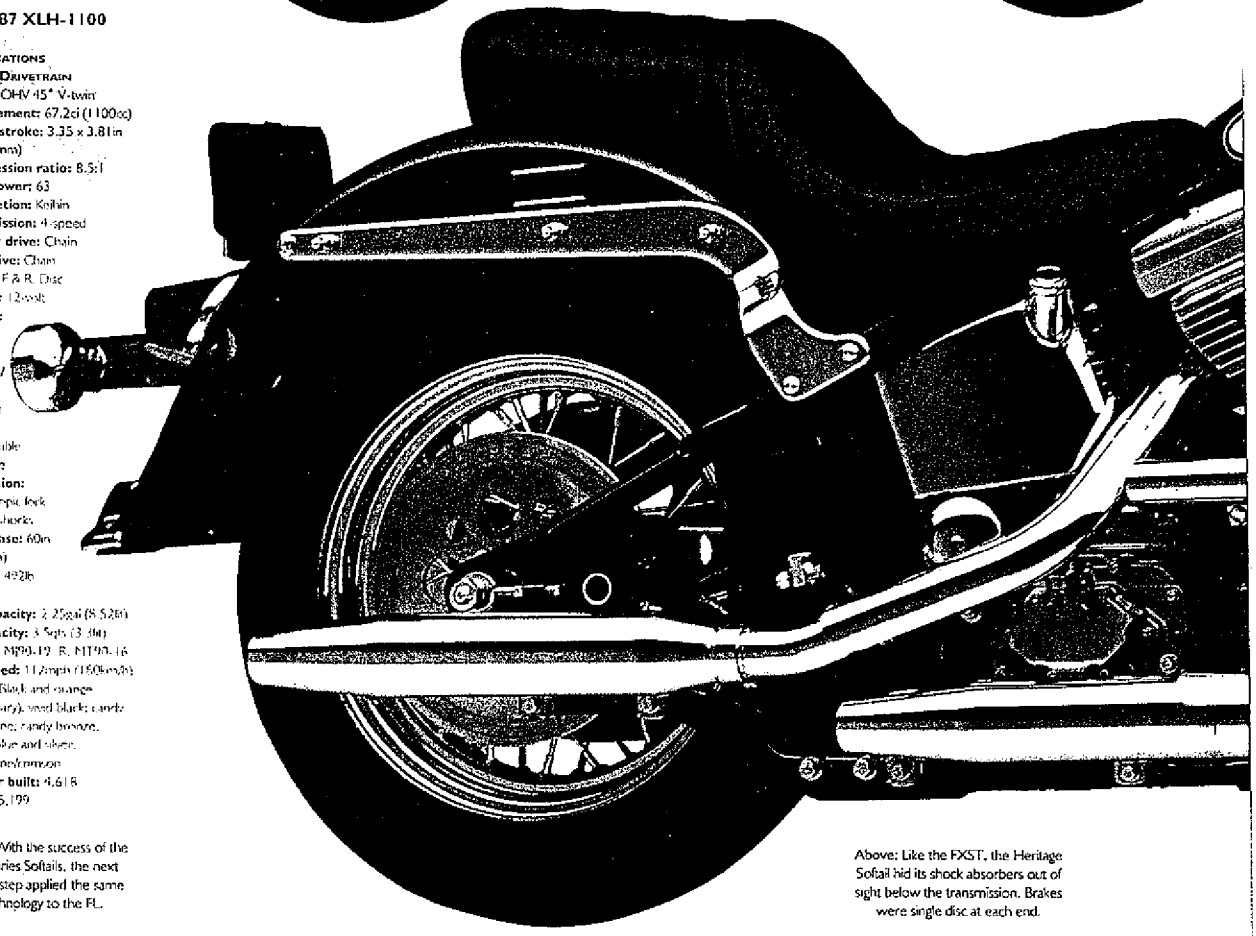
Chassis/Suspension
Frame: Steel, double downtube
Suspension: F. Telescopic fork R. Dual shocks
Wheelbase: 60in (152.4cm)
Weight: 492lb (223kg)
Fuel capacity: 2.25gal (8.52l)
Oil capacity: 3.5qts (3.3l)
Tires: F. MT90-19 R. MT90-16
Top speed: 112mph (180km/h)
Colors: Black and orange (Anniversary), vivid black; candy brandywine; candy bronze, metallic blue and silver, brandywine/cream
Number built: 4,618
Price: $5,199

Right: With the success of the FX-series Softails, the next logical step applied the same technology to the FL.

1987 XLH-1100
Dudley Perkins Company
San Francisco, California

Left: Of the 4,618 XLH-1100 Sportsters built for 1987, 600 were specials celebrating the model's 30th anniversary. The model featured orange and black paint and a black and chrome engine.





Above: Like the FXST, the Heritage Softail hid its shock absorbers out of sight below the transmission. Brakes were single disc at each end.

Below: The Heritage handlebar had plenty of pullback to put controls within easy reach of the rider, who was positioned relatively far aft on the machine.

The seat put the rider farther aft than the FXR perch, so the handlebar was pulled back for comfort. The riding position was designed to accommodate the traditional footboards, locating the feet between the standard touring posture and the recliner mode of highway pegs.

Although it shared many components with the FXR Low Rider, the Heritage Softail was a quite different machine. With some two inches (5cm) less wheelbase, 16-inch (40.64cm) front wheel, more trail, reduced ground clearance and 50-pound (22.7kg) weight surplus, the FLST was hardly a nimble sport bike. The Heritage Softail was designed for stately motoring, which was reflected by the 1950s styling.

In the FLST Milwaukee had brought forth a modern classic, a retro-look with clean, uncluttered lines and modern, low-maintenance engine and running gear. Naturally it was followed a year later by the Heritage Softail Classic, with paint schemes from the past, rocket-fin mufflers, studded seats and saddlebags.

The Sportster was awarded an Evolution engine in 1986. The 883cc version was soon joined by an 1100 with larger valves and 63 horsepower, a ten-horse jump. The Sporties got new clutches and trannies, and a slightly revised frame.

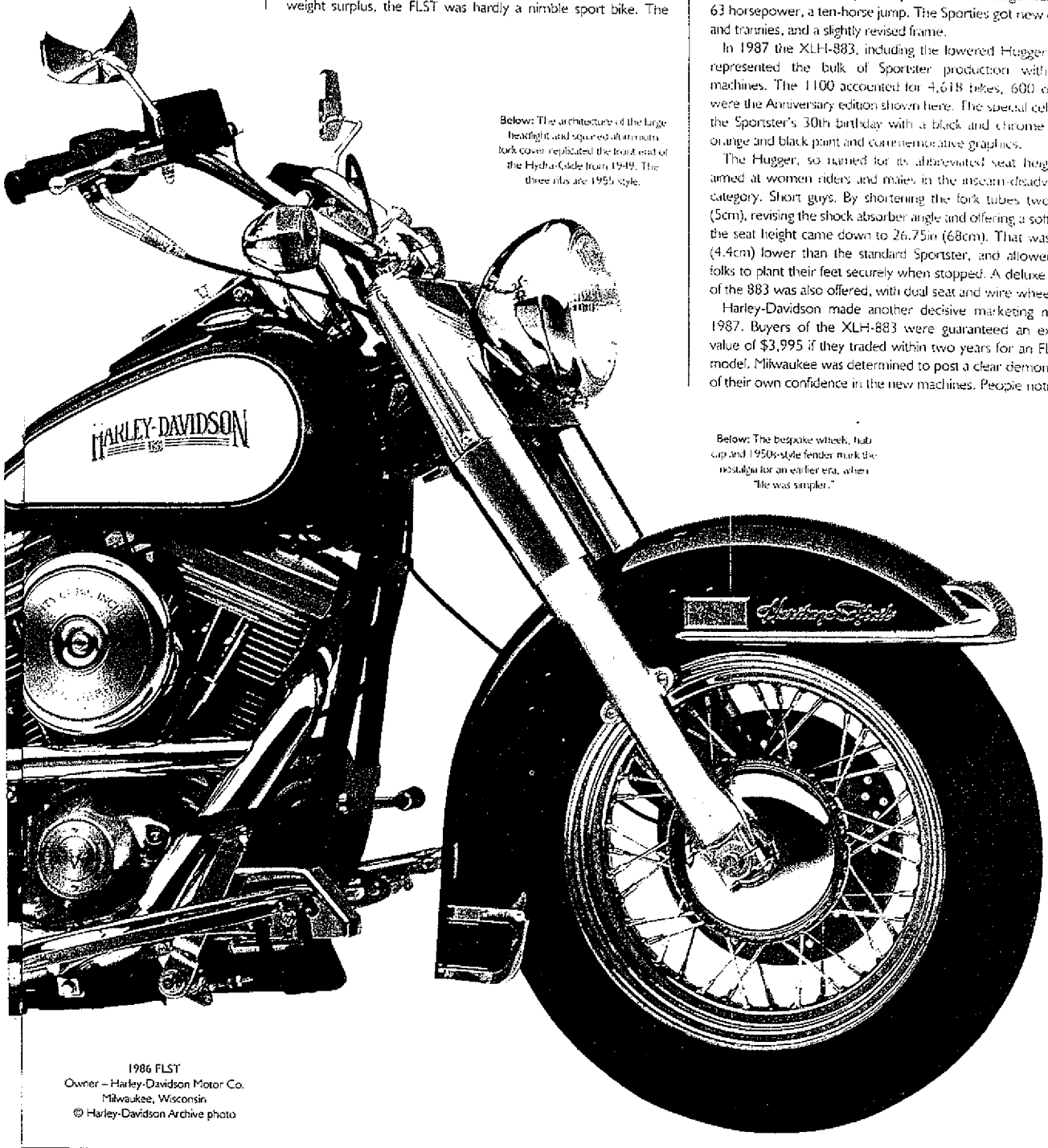
In 1987 the XLH-883, including the lowered Hugger model, represented the bulk of Sportster production with 9,356 machines. The 1100 accounted for 4,618 bikes, 600 of which were the Anniversary edition shown here. The special celebrated the Sportster's 30th birthday with a black and chrome engine, orange and black paint and commemorative graphics.

The Hugger, so named for its abbreviated seat height, was aimed at women riders and males in the inseam-disadvantaged category. Short guys. By shortening the fork tubes two inches (5cm), revising the shock absorber angle and offering a softer seat, the seat height came down to 26.75in (68cm). That was 1.75in (4.4cm) lower than the standard Sportster, and allowed more folks to plant their feet securely when stopped. A deluxe version of the 883 was also offered, with dual seat and wire wheels.

Harley-Davidson made another decisive marketing move in 1987. Buyers of the XLH-883 were guaranteed an exchange value of $3,995 if they traded within two years for an FL or FX model. Milwaukee was determined to post a clear demonstration of their own confidence in the new machines. People noticed.

Below: The architecture of the large headlight and squared aluminum fork cover replicated the front end of the Hydra-Glide from 1949. The three ribs are 1955 style.

Below: The bespoke wheels, hub cap and 1950s-style fender mark the nostalgia for an earlier era, when "life was simpler."



1986 FLST
Owner – Harley-Davidson Motor Co.
Milwaukee, Wisconsin
© Harley-Davidson Archive photo

FXRS (1988), XLH 1200 (1988) AND XLH 883 (1989)

1988 FXRS

Specifications
Engine/Drivetrain
Engine: OHV 45° V-twin
Displacement: 81.65ci (1338cc)
Bore & stroke: 3.5 x 4.25in (89 x 108mm)
Compression ratio: 8.5:1
Horsepower: 55
Carburetion: 38mm Keihin
Transmission: 5 speed
Primary drive: Duplex chain
Final drive: Belt
Brakes: F. Dual discs R. Disc
Battery: 12-volt
Ignition: CDI

Chassis/Suspension
Frame: Steel, double downtube
Suspension: F. Telescopic fork R. Shocks
Wheelbase: 63.1in (160.3cm)
Weight: 580lb (263kg)
Fuel capacity: 4.5gal (17lt)
Oil capacity: 3qts (2.8lt)
Tires: F. MT90-19, R. MT90-16
Top speed: 110mph (177km/h)
Colors: Vivid black; candy brandywine; bright candy plum; candy brandywine/candy crimson; bright cobalt/candy blue/silver; champagne gold/black (Anniversary)
Number built: 2,637 (Sport: 818; Anniversary Edition: 519)
Price: $9,295

With the Evolution (Darwinhead?) engine powering the entire Harley-Davidson lineup, attention in Milwaukee turned to variations on the theme. A frenzy of new names and letters arrived to identify the assortment of Super Glide/Low Rider derivations that multiplied each year.

With the addition of hybrids like the FXSTC (Softail Custom) and FLSTC (Heritage Softail Classic), the model chart grew increasingly complex. There was the standard FXR Super Glide, FXRS Low Rider, FXRS-SP Low Rider Sport, FXLR Low Rider Custom and FXRT Sport Glide. Then the FXRS Convertible, followed by the FXDB Dyna Glide Sturgis. One had to pay attention.

In 1985 the FXRS had returned with the longer suspension and dual-disc front brakes it had worn three years earlier. Now it was enhanced with the Evo engine and belt drive. The new version was slightly lighter despite the larger 4.5-gallon (17lit) fuel tank, and was rated at 55 horsepower. The price was $8,149.

By 1988 the Low Rider's popularity had been eclipsed by the Softail models, but performance-minded riders prefered the FXRS for its rubber-mount engine and sporting road manners. And they had the choice of more traditional styling in the standard model, which put the instruments on a tank panel rather than the handlebar. The Low Rider had a single disc brake on the front wheel and came standard with forward-mounted highway pegs. The turn signals were now attached to the mirror mounts rather than the handlebar. Fork tube diameter increased from 1.38in to 1.54in (3.5 to 3.9cm).

The Sport Edition still wore its instruments on the handlebar and the gas cap in the center of the tank. The sporty version featured a new version of the air-assisted fork first seen in 1983 on the Sport Glide. Using the handlebar as an air resevoir, the system incorporated an anti-dive feature to reduce nosedive under braking. Air volume was adjusted using a Schrader valve at the left end of the handlebar.

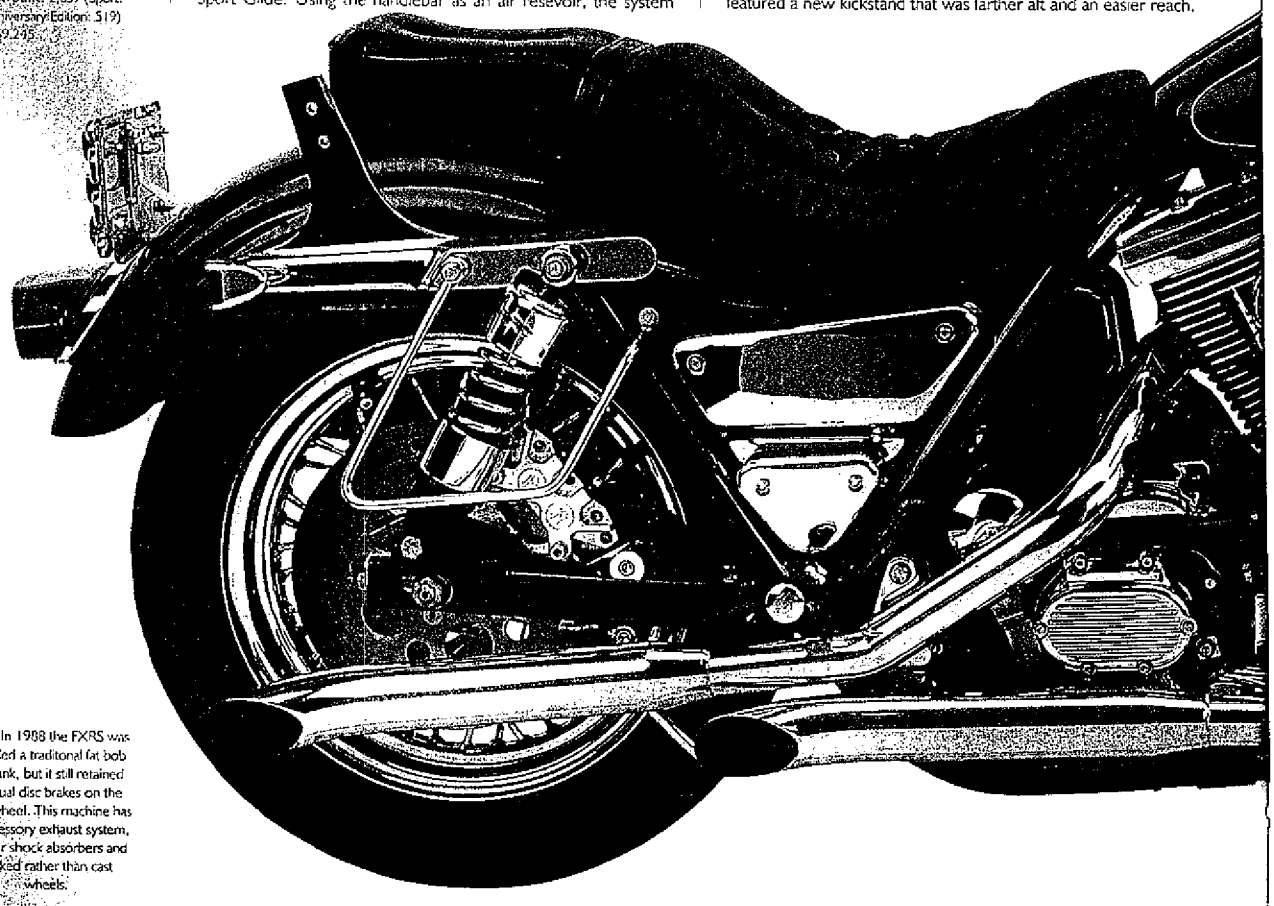
Dual disc front brakes were standard on the Sport Edition, which had 1.4in (3.56cm) more wheelbase than the standard model. Steering geometry was different as well, the sport fork set at 31 degrees rather than 29, and the handlebar was lower and flatter. Despite its handling advantages, the Sport Edition enjoyed far less popularity than the Super Glide and Low Rider versions. Only 818 of the sporties were made in 1988.

XLH 1200

The Sportster climbed another rung on the muscle ladder in 1988 with the introduction of a 1200cc model. The 1100 cylinder bore was taken out to 3.50 inches (89mm), which combined with new combustion chambers, smaller valves and a 40mm carburetor produced 12 percent more power.

Naturally the 1200 was quicker and faster than its predecessor. The ratios betwen the first three gears had been tightened up the year before, which helped with acceleration. The new carburetor also featured an enrichening circuit that allowed smoother running in city riding and improved throttle response. The Sportsters also got the larger fork tubes awarded to the FX series, and for the first time came fitted with two rear view mirrors.

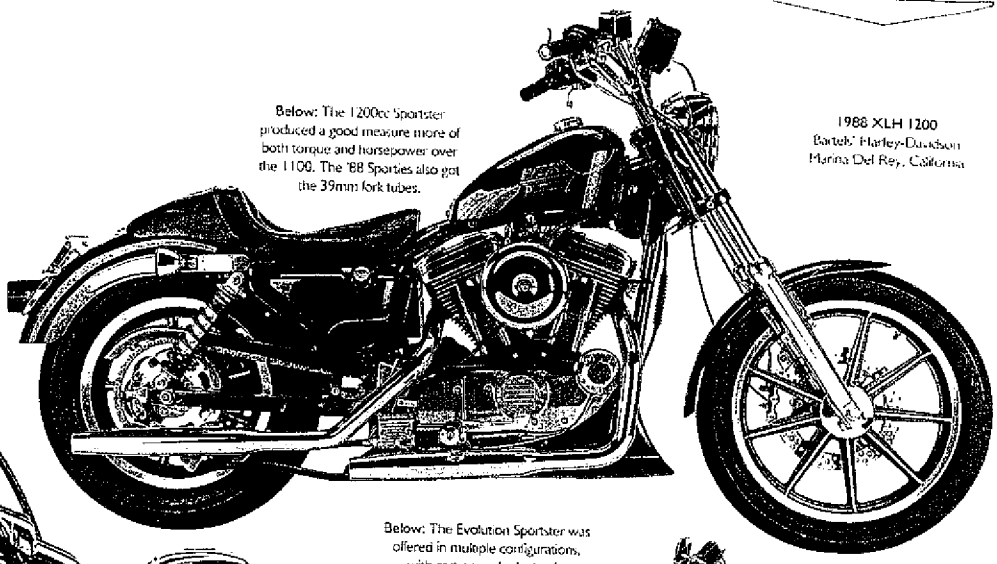
For 1989 the Sporster roster remained at four models: the XLH 883 with solo seat and speedo only, with the price up to $3,999; the similarly equipped Hugger with buckhorn bars; the 883 Deluxe with wire wheels, dual seat and passenger pegs, and the 1200 with Deluxe accoutrements and more ponies. All models featured a new kickstand that was farther aft and an easier reach.



Right: In 1988 the FXRS was awarded a traditonal fat bob fuel tank, but it still retained the dual disc brakes on the front wheel. This machine has an accessory exhaust system, shorter shock absorbers and spoked rather than cast wheels.

Below: The standard FXR was now labeled the Super Glide, the FXRS the Low Rider and the FXRS-SP was the Low Rider Sport Edition, with longer travel suspension. The FXR was produced as one of four special anniversary editions in 1988, commemorating the 85th anniversary of Harley-Davidson. Only 519 of the specials were built.

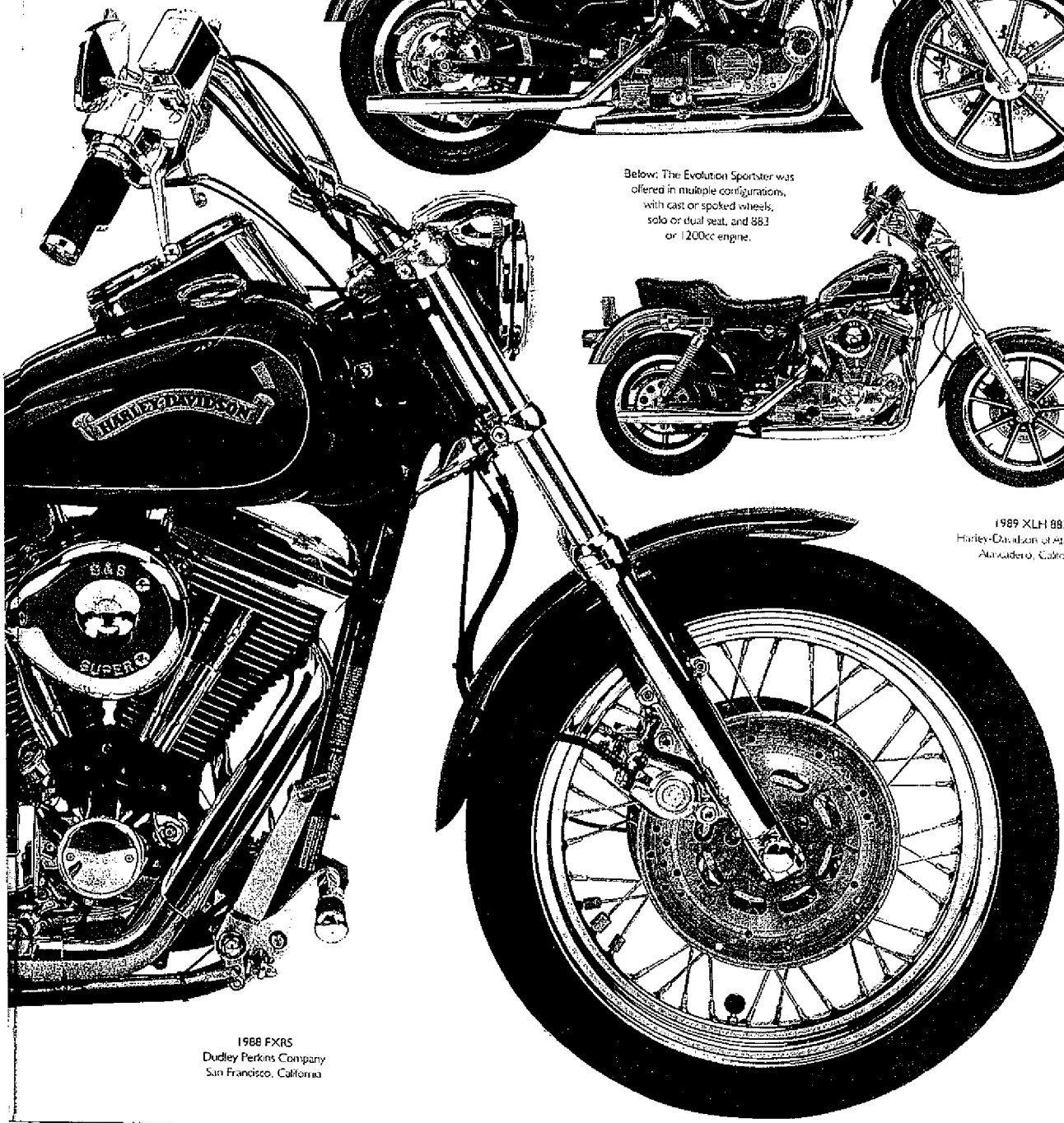
Below: The 1200cc Sportster produced a good measure more of both torque and horsepower over the 1100. The '88 Sporties also got the 39mm fork tubes.



1988 XLH 1200
Bartels' Harley-Davidson
Marina Del Rey, California

Below: The Evolution Sportster was offered in multiple configurations, with cast or spoked wheels, solo or dual seat, and 883 or 1200cc engine.

1989 XLH 883
Harley-Davidson of Atascadero
Atascadero, California



1988 FXRS
Dudley Perkins Company
San Francisco, California

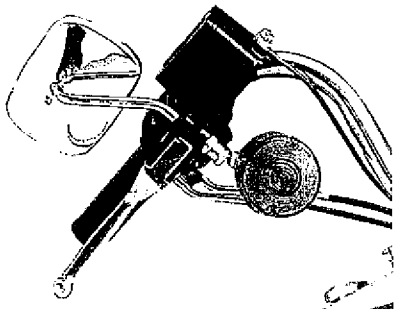
FXSTS (1988) AND FLHTC (1989)

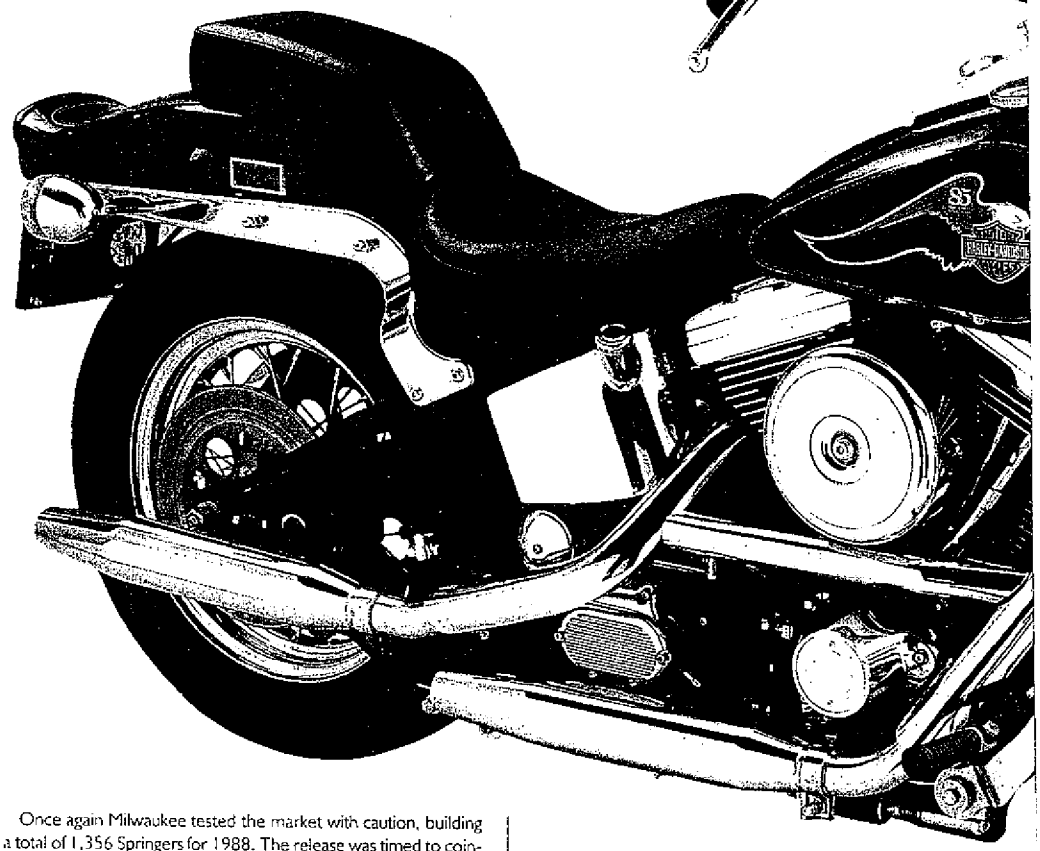
Harley-Davidson took nostalgia another step into the past with the Softail Springer in 1988. Having made the rear suspension look just like the no-suspension frames of earlier years, Milwaukee decided to retro-style the front end as well. So the fork appeared to be right out of the 1940s, with the leading link/spring assembly characteristic of the Knucklehead era.

But while the look was 1948, the performance proved to be surprisingly contemporary. Harley engineers worked diligently to give the Springer fork modern manners on the road. And while they couldn't provide the same travel or damping provided by a telescopic fork, the result was a decent compromise between comfort and style.

With the help of computers, Teflon bearings and extensive testing, Milwaukee created a modern version of a design first used nearly 60 years earlier. Critics of retro-style motorcycles were skeptical, but most were forced to admit that the new/old fork worked better than expected. Braking performance was acceptable, limited by the narrow front tire, not by the fork's design.

Below: The Springer successfully combined styling cues from the 1940s to the 1970s, adding '90s reliability.





Once again Milwaukee tested the market with caution, building a total of 1,356 Springers for 1988. The release was timed to coincide with Harley-Davidson's 85th anniversary celebration, and the FXSTS featured commemorative graphics on the tank and front fender. The styling was an immediate hit, and Milwaukee was encouraged to crank up the production line for 1989. Which they did, fashioning 5,387 Springers for the next season.

Harley-Davidson was obviously on a retrospective roll, creating one piece of motorized memorabilia after another. The Springer didn't overtake the cruiser champion, the Softail Custom, but the numbers were close and the balance sheets properly weighted. The only recurring complaint from the field concerned the front fender; its height above the tire reminded people of a dirt bike. So the mounting brackets were changed and the gap closed.

Above: Like its FX brethren, the Springer runs the 80in (1340cc) Evolution engine with belt drive and hidden rear shocks. A triangular swing arm provides 3.4 inches (8.6cm) of rear wheel travel.

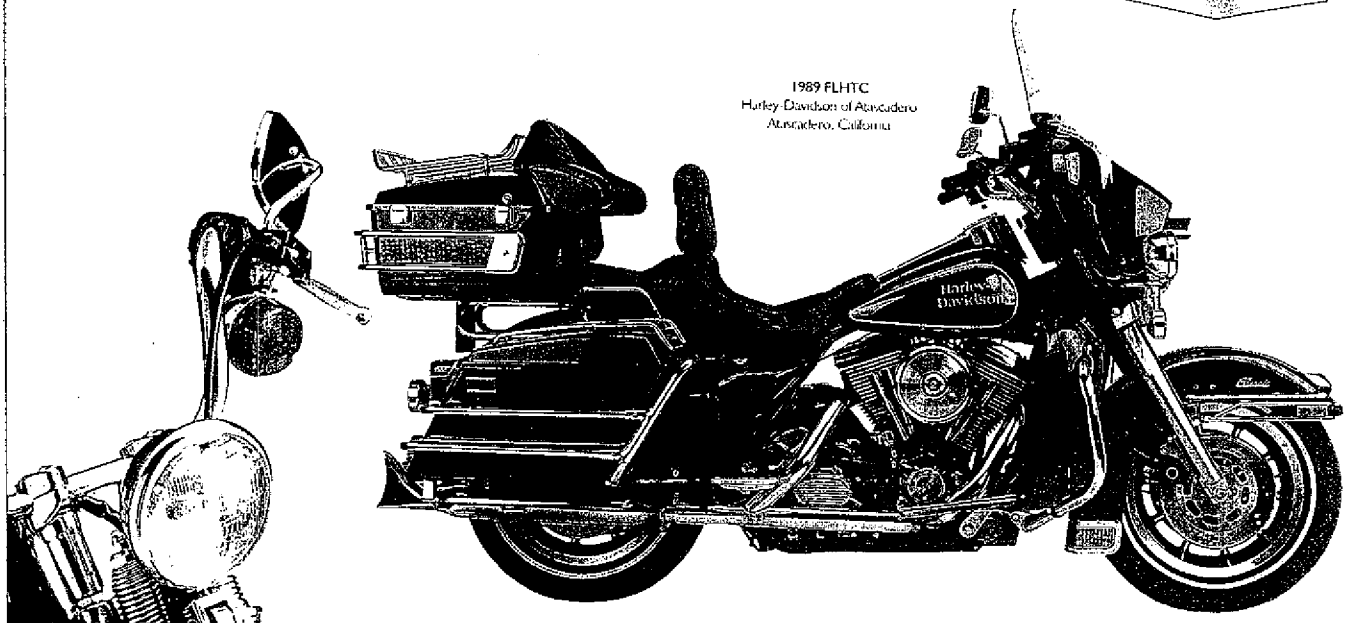
1988 FXSTS

Specifications

Engine/Drivetrain
Engine: OHV 45° V-twin
Displacement: 81.6cid (1338cc)
Bore & stroke: 3.5 x 4.25in (89 x 108mm)
Compression ratio: 8.5:1
Horsepower: 55
Carburetion: 38mm Keihin
Transmission: 5-speed
Primary drive: Duplex chain
Final drive: Belt
Brakes: F and R, Disc
Battery: 12-volt
Ignition: CDI

Chassis/Suspension
Frame: Steel, double downtube
Suspension: F, Springer fork; R, Shocks
Wheelbase: 64.5in (163.8cm)
Weight: 635lb (288kg)
Fuel capacity: 6.4gal (24.2lit)
Oil capacity: 3qts (2.8lit)
Tires: F, MT90-21; R, MH90-16
Top speed: 114mph (183km/h)
Colors: Black with red pinstripes
Number built: 1,356
Price: $10,279

Right: The FXSTS Softail Springer first appeared in 1988. In blending vintage styling with contemporary engineering and materials, Milwaukee created yet another popular piece of functional nostalgia.



1989 FLHTC
Harley-Davidson of Atascadero
Atascadero, California

Above: The Classic Electra Glide was number five in Milwaukee production for 1989, with 3,969 built. The FL touring models all got self-canceling turn signals, a stronger alternator and a redesigned fuel tank. The Ultra models were fitted with cruise control.

Left: The 21-inch (53.3cm) wheel enhances the long and lean look. The front fender was later lowered in response to customer demand.

1988 FXSTS
Owner – Harley-Davidson Motor Co.
Milwaukee, Wisconsin
© Harley-Davidson Archive photo

The first Softail was an immediate hit with the craftsfolk in the customizing realm. The uncluttered back end provided a clean backdrop for stylish seat and fender formulations, and put more of the rear wheel on display. The low seating position offered by the frame was perfectly suited to the easy-chair riding position favored by most of the cruiser crowd, and no cutting or welding was required.

Grafting on the Springer front end added another dimension to the Softail's multi-faceted personality. In addition to giving it some of the Knucklehead panache of the 1940s, the configuration offered yet another direction for custom treatments. The Knuckle had attracted many fans in the modified motorcycle trend that grew up following World War II, and the later generation was attracted to the Softail Springer for the same reasons. The straight line from rear axle to steering head provided an open framework for the engine and drivetrain; and the traditional leading link fork and exposed springs put the suspension's working hardware in plain view. And it worked pretty well.

Spring Back to the Future

The spring fork worked much newer than it looked. The design, though a couple of generations old, had been good in the first place. And with the advantages of computer-aided engineering and better materials, this incarnation was superior on the road.

Although the Springer carried a 20 percent disadvantage in terms of wheel travel compared to the telescopic fork, it offered a more rigid attachment between the frame and axle. And despite its added weight penalty, the girder-and-yoke assembly didn't suffer the stiction problems of hydraulic tubes. Plus, the 21-inch (53.3cm) front wheel traversed potholes with less drama than the smaller hoops.

Pivoting-link forks, with the axle either ahead or behind the pivot, were used on the earliest motorcycles. The Harley system hinged the suspension arm at the rigid fork, with the axle in front and the sprung yoke fitted at the fulcrum. Spring action is damped by a small hydraulic shock, and the wheel is braced by four fork legs rather than the telescopic's two.

The new fork had to meet higher performance standards than the old lower-case springer, including more than double the wheel travel. This dictated the need for strong bushings and close tolerances at the pivot points. Harley engineers solved the problem with adjustable Teflon bushings that proved efficient and durable. Then they cleverly incorporated a compact disc brake carrier above the axle. A dandy piece of work, all told.

FLTC ULTRA (1990) AND XLH (1992)

Following the design and development efforts devoted to the FX series, Harley-Davidson refocused attention on the Electra Glide. The FLHS Sport model was produced in limited numbers for 1987 and 1988, but didn't light large fires of enthusiasm with the sport-touring crowd. The FL Softail was far more popular.

For 1989 Milwaukee introduced the Tour Glide and Electra Glide Ultra Classics, the Ultra indicating full-dress and then some. The Tour Glide featured the frame-mount fairing and the Electra Glide retained the bar-mount fairing. Both models got cruise control, 80-watt four-speaker stereo system with tuning controls for the passenger, CB radio/voice-activated intercom and fairing lowers.

The Ultras were distinguished by silver and black paint schemes, circular graphics on the tank and Ultra Classic nameplates on the front fender and saddlebags. All the touring models got new fuel tank designs, high-output alternator and self-canceling turn signals.

The luxury touring market, much like its automobile counterpart, had been steadily redefined by the Japanese manufacturers. Electra Glide sales were back on the rise and Milwaukee wanted to see that direction maintained. The popularity of long-distance touring, in considerable style and comfort, was showing signs of strength once again. Customer's requirements had expanded in hand with the manufacturers' abilities to produce deluxe machines. Amenities that Harley-Davidson had previously consigned to the aftermarket suppliers were now expected as original equipment.

And passengers were now getting more attention than ever before. (If the saddlepal is unhappy, the rider is soon informed). More creature comforts were being built into the pillion perch every year. Seat shapes and heights, backrests, armrests, footboards and grab rails all were reexamined and redesigned. Touring, after all, is largely a family activity.

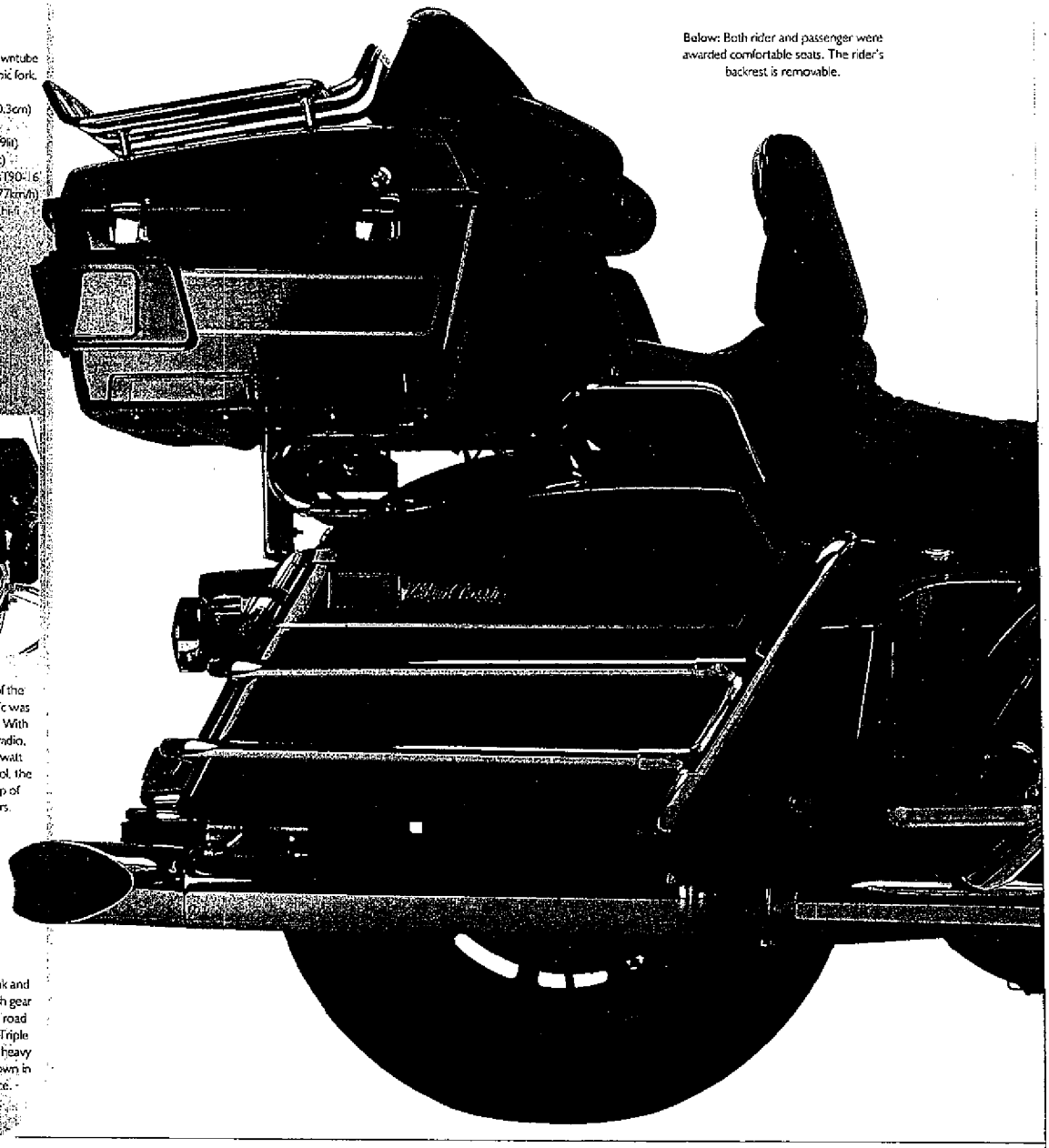
1990 FLTC

Specifications

Engine/Drivetrain
Engine: OHV 45° V-twin
Displacement: 81.65ci (1338cc)
Bore & stroke: 3.5 x 4.25in (89 x 108mm)
Compression ratio: 8.5:1
Horsepower: 55
Carburetion: 38mm Keihin
Transmission: 5-speed
Primary drive: Duplex chain
Final drive: Belt
Brakes: F. Dual discs, R. Disc
Battery: 12-volt
Ignition: CDI

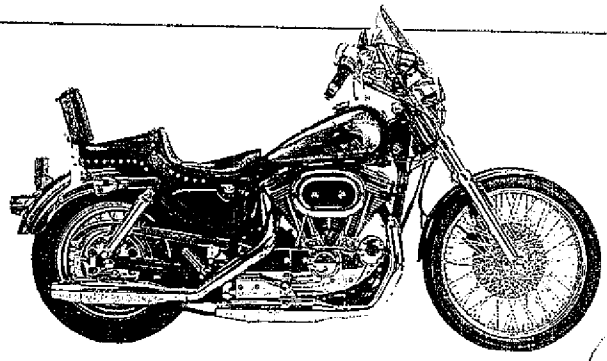
Chassis/Suspension
Frame: Steel, double downtube
Suspension: F. Telescopic fork, R. Dual shocks
Wheelbase: 63.1in (160.3cm)
Weight: 780lb (354kg)
Fuel capacity: 5gal (18.9lit)
Oil capacity: 3qts (2.8lit)
Tires: F. MT90-19, R. MT90-16
Top speed: 110mph (177km/h)
Colors: Vivid black, dark hi-fi blue, candy hi-fi blue, dark ruby/candy ruby
Number built: 3,082
Price: [illegible]

Above: The cockpit of the Tour Glide Ultra Classic was loaded with amenities. With built-in citizen's band radio, intercom system, 80-watt stereo and cruise control, the FLTC was the flagship of long-distance tourers.



Below: Both rider and passenger were awarded comfortable seats. The rider's backrest is removable.

Right: Large travel trunk and saddlebags carry enough gear for two people on the road for extended periods. Triple disc brakes ensure that heavy loads can be slowed down in a reasonable distance.



1992 XLH
Owner – Val Barsetti
Bradley, California

Above: This Sportster has been modified with a number of custom touches to suit the owner's style: a larger tank, studded seat, aftermarket exhaust system and fancy laced wheels give the Sporty a whole new look.

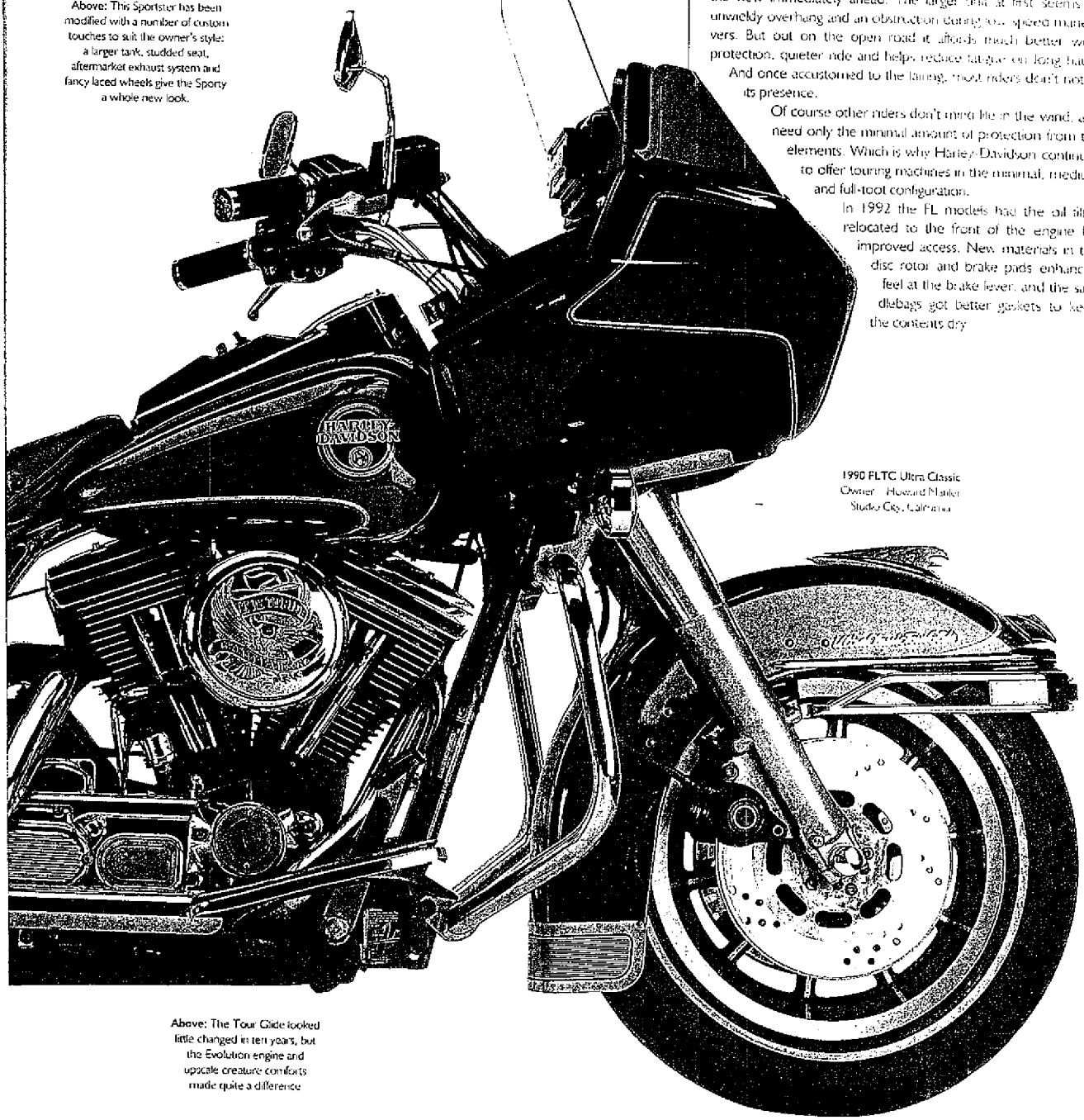
The Electra Glide family came in for incremental revisions and improvements in 1990. The clutch was beefed, or maybe in this case porked, up and the cruise control was awarded some fine adjustment. The Electra Glide, with its traditional bar-mounted fairing and small windscreen, had continued outselling the Tour Glide better than five to one. But in 1991, partly owing to Milwaukee's demonstration ride program at major rallies, the Tour Glide and its frame-mounted fairing picked up the pace.

For riders unaccustomed to full fairings (a sizeable segment of Harley enthusiasts), the first experience with one is awkward. The bar-mount fairing sits much closer to the rider and blocks little of the view immediately ahead. The larger unit at first seems an unwieldy overhang and an obstruction during low-speed maneuvers. But out on the open road it affords much better wind protection, quieter ride and helps reduce fatigue on long hauls.

And once accustomed to the fairing, most riders don't notice its presence.

Of course other riders don't mind the wind, and need only the minimal amount of protection from the elements. Which is why Harley-Davidson continues to offer touring machines in the minimal, medium and full-boot configuration.

In 1992 the FL models had the oil filter relocated to the front of the engine for improved access. New materials in the disc rotor and brake pads enhanced feel at the brake lever, and the saddlebags got better gaskets to keep the contents dry.



1990 FLTC Ultra Classic
Owner – Howard Mailer
Studio City, California

Above: The Tour Glide looked little changed in ten years, but the Evolution engine and upscale creature comforts made quite a difference.

FLSTF (1990) AND BUELL RR1200 (1990)

1990 FLSTF

Specifications
Engine/Drivetrain
Engine: OHV 45° V-twin
Displacement: 91.65ci (1345cc)
Bore & stroke: 3.5 x 4.25in (89 x 108mm)
Compression ratio: 8.5:1
Horsepower: 55
Carburetion: 38mm Keihin
Transmission: 5-speed
Primary drive: Duplex chain
Final drive: Belt
Brakes: F. and R. Disc
Battery: 12-volt
Ignition: CDI

Chassis/Suspension
Frame: Steel, double downtube
Suspension: F. Telescopic fork, R. Shocks
Wheelbase: 62.5in (158.7cm)
Weight: 665lb (302kg)
Fuel capacity: 4.7gal (17.8lt)
Oil capacity: 3qts (2.8lt)
Tires: F. and R. MT90-16
Top speed: 114mph (183km/h)
Color: Metallic silver
Number built: 4,440
Price: $10,995

The evolutionary retro-revolution produced a chubby new member of the species in 1990, the Fat Boy. Genetically engineered with components from the Softail Custom and Heritage Softail Classic, the portly FLSTF was an instant crowd pleaser.

The Fat Boy took the Softail series into still another quasi-historical realm, the Flash Gordon era of science fiction space travel in the late 1940s. The silver custom dresser personified the ideal craft for solo interplanetary travel, or a funky little shuttle for delivering recruits to outposts on frontiers of the galaxy, or, in real life, to the diner across town.

Harley-Davidson had invented fantasy bikes from the factory, but the Fat Boy was still something of a first. The Super Glide, Low Rider, Fat Bob and Springer were all contemporary takes on historical or existing themes that were established, motorcycles modified to achieve a look. Derivative, in other words. The genius of the Fat Boy was not only that the look came before the machine, but that it emerged from a retouched Heritage Softail. New and old were combined not to replicate a motorcycle, but to create something new.

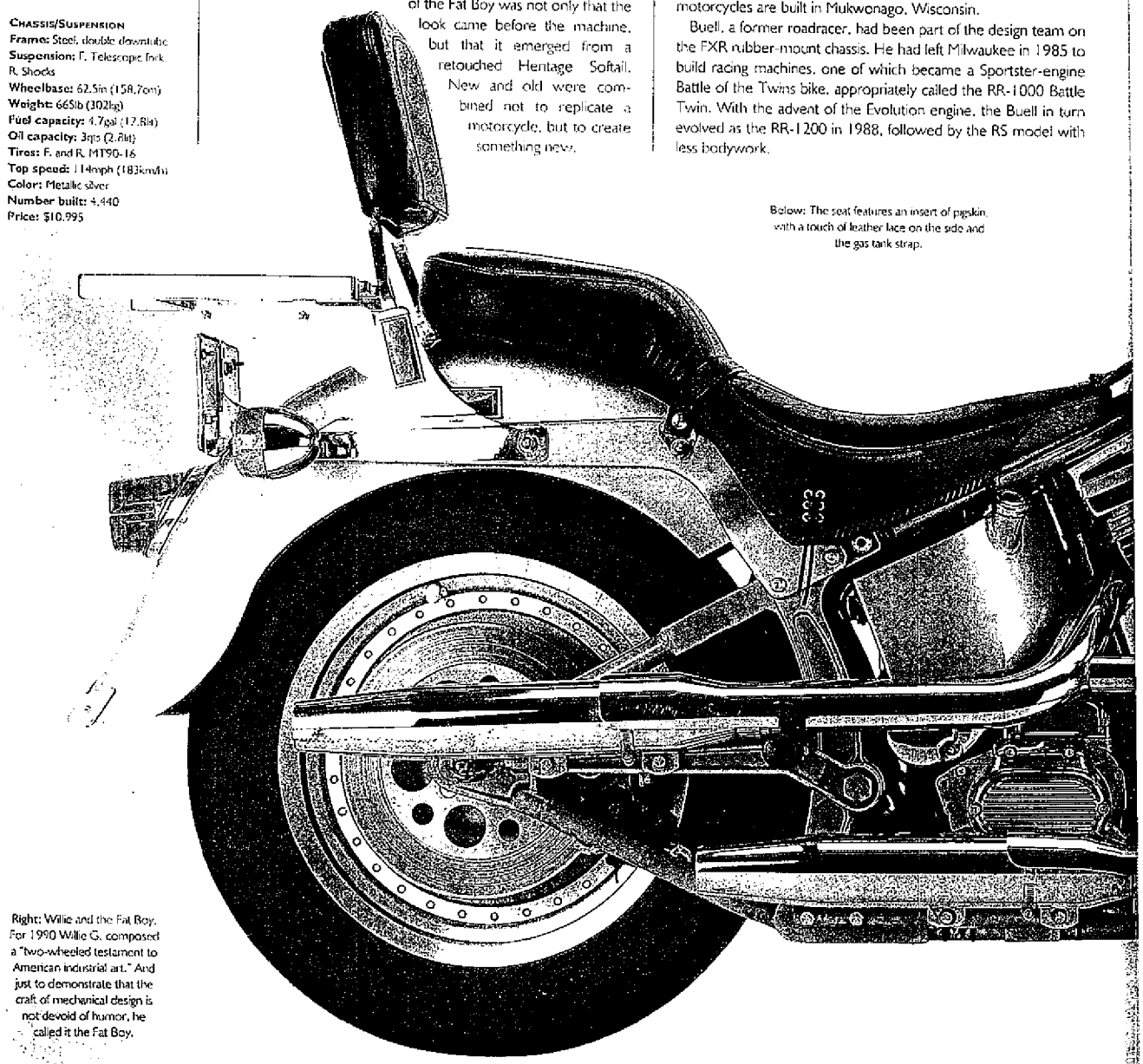
The Fat Boy was Milwaukee's first novelty bike, but it didn't fit the category of cautionary market experimentation. Harley-Davidson built 4,440 examples in the first year of production, not numbers associated with testing the waters. The Softail had already proven itself for four years running, so only the industrial-cosmic styling qualified as a risk factor.

Of course had it failed, the bike could readily be retrofitted with Heritage Softail components and probably not oversupply the market. But the production numbers indicate otherwise; that someone knew the brash Fat Boy would succeed on its own. That someone would be Willie G. Davidson, who designed this one for himself.

Buell RR1200

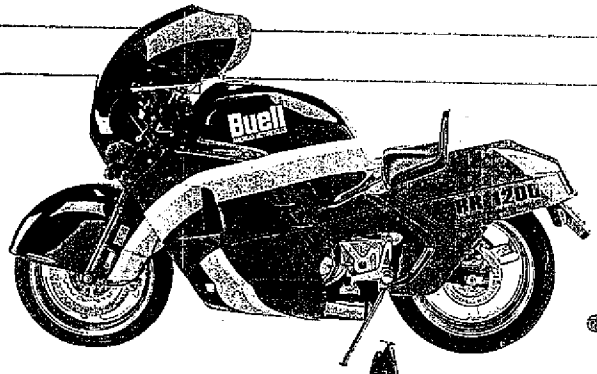
This is a Harley from an entirely different hogpen. Actually only the engine is from Harley-Davidson; the rest originated in the imagination of ex-Milwaukee engineer Erik Buell. The handcrafted motorcycles are built in Mukwonago, Wisconsin.

Buell, a former roadracer, had been part of the design team on the FXR rubber-mount chassis. He had left Milwaukee in 1985 to build racing machines, one of which became a Sportster-engine Battle of the Twins bike, appropriately called the RR-1000 Battle Twin. With the advent of the Evolution engine, the Buell in turn evolved as the RR-1200 in 1988, followed by the RS model with less bodywork.

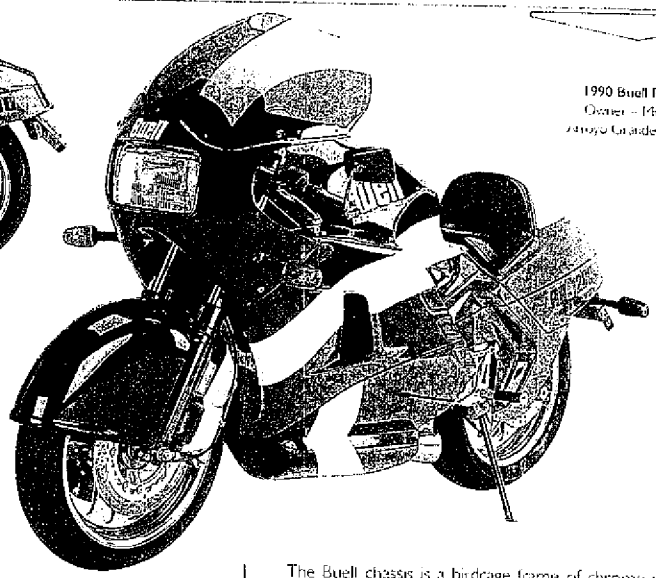


Below: The seat features an insert of pigskin, with a touch of leather lace on the side and the gas tank strap.

Right: Willie and the Fat Boy. For 1990 Willie G. composed a "two-wheeled testament to American industrial art." And just to demonstrate that the craft of mechanical design is not devoid of humor, he called it the Fat Boy.



Above: Echoes of the Vincent Black Prince are evident in Erik Buell's Harley-powered RR 1200. Later models lost most of the bodywork.

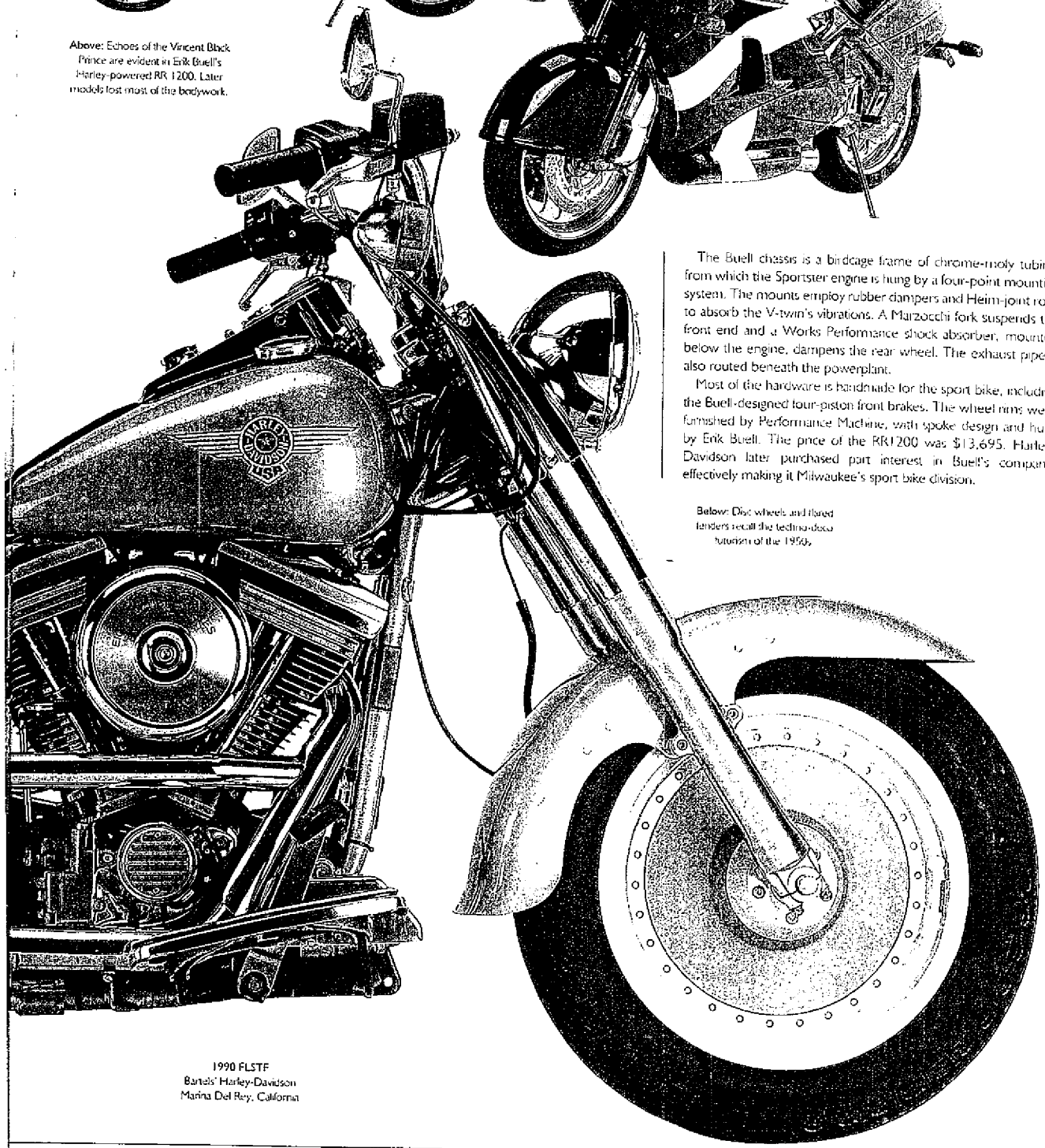


1990 Buell RR 1200
Owner – Mike Ladd
Arroyo Grande, California

The Buell chassis is a birdcage frame of chrome-moly tubing, from which the Sportster engine is hung by a four-point mounting system. The mounts employ rubber dampers and Heim-joint rods to absorb the V-twin's vibrations. A Marzocchi fork suspends the front end and a Works Performance shock absorber, mounted below the engine, dampens the rear wheel. The exhaust pipe is also routed beneath the powerplant.

Most of the hardware is handmade for the sport bike, including the Buell-designed four-piston front brakes. The wheel rims were furnished by Performance Machine, with spoke design and hubs by Erik Buell. The price of the RR1200 was $13,695. Harley-Davidson later purchased part interest in Buell's company, effectively making it Milwaukee's sport bike division.

Below: Disc wheels and flared fenders recall the techno-deco futurism of the 1950s.



1990 FLSTF
Bartels' Harley-Davidson
Marina Del Rey, California

FXDB STURGIS (1991) AND FXDB DYNA DAYTONA (1992)

1992 FXDB DYNA DAYTONA

SPECIFICATIONS
ENGINE/DRIVETRAIN
Engine: OHV 45° V-twin
Displacement: 81.65ci (1338cc)
Bore & stroke: 3.5 x 4.25in (89 x 108mm)
Compression ratio: 8.5:1
Horsepower: 72 @ 4,000rpm
Carburetion: 40mm Keihin
Transmission: 5-speed
Primary drive: Duplex chain
Final drive: Belt
Brakes: F. Dual disc R. Disc
Battery: 12-volt
Ignition: CDI

CHASSIS/SUSPENSION
Frame: Steel, double downtube
Suspension: F. Telescopic fork. R. Shocks
Wheelbase: 65.5in (166.4cm)
Weight: 630lb (286kg)
Fuel capacity: 4.9gal (18.5lt)
Oil capacity: 3qts (2.8lt)
Tires: F. 100/90-19. R. 130/90-16
Top speed: 103mph (166km/h)
Color: Gold pearlglo/indigo blue metallic
Number built: 1,700
Price: $12,120

Following the whimsical styling of the Fat Boy, what might be the next costume drama in the Willie G. bag of tricks? And what could the next name be – Chub Hog? Glide Rider? Super Low Glider? None of that, thank you, and in fact the bike was a revival of the Sturgis. Would the G-man repeat himself?

Yes and no. The Sturgis styling had been enormously popular ten years earlier, and now Milwaukee had the technology to present it in new and improved form. Thus the Dyna Glide chassis, the result of computer-aided design work. The square-section frame backbone runs from the steering head to the swingarm pivot, and the engine-mount system uses two rather than four rubber mounts. All major frame junctions are forged rather than stamped, and the oil tank has been relocated below the transmission.

As a third-generation Low Rider, this version of the Sturgis was another limited edition model, built only a single year with a production run of 1,546. The reborn Sturgis served as a handsome platform to introduce the Dyna Glide chassis, and to satisfy the many requests to offer the model once again. The belt drive system had been simplified and improved since its inception, and now included an improved drive sprocket retainer that had better retention.

The new Sturgis resembled the original in most respects, but numerous differences appeared in the details. The Dyna version got only one disc brake in the front, and both the new seat and handlebar were higher than the old. Both machines weighed in at 610 pounds (277kg), but the new model has nearly an inch (2.5cm) more wheelbase. Of course the new one was smoother, more comfortable and ran longer between tune-ups. And cost more. (1981: $5,687 – 1991: $11,520).

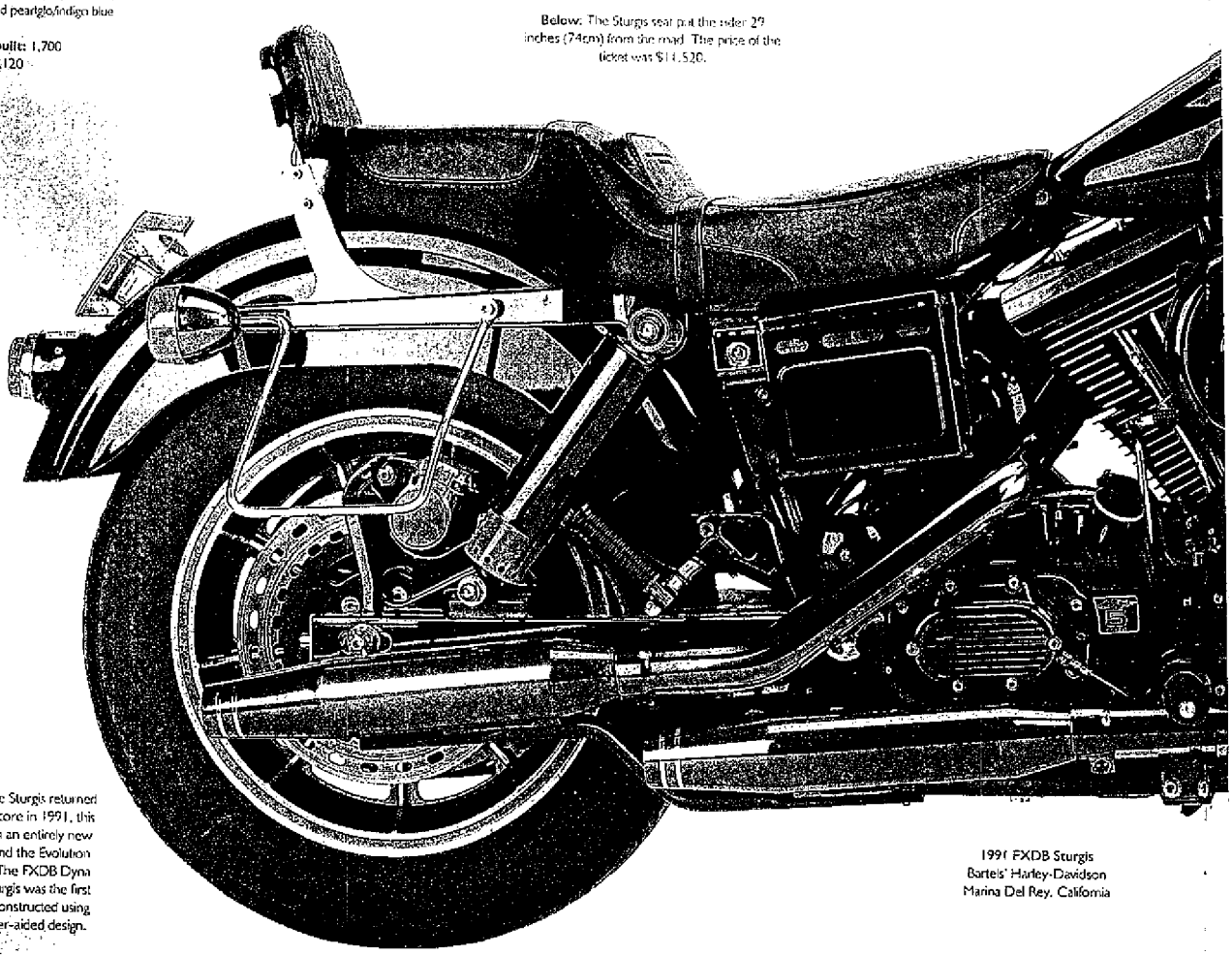
DAYTONA

The next model to carry the Dyna Glide chassis was still another limited edition, named the Daytona in honor of the 50th anniversary in 1991 of the Daytona 200. Released in 1992, the Daytona shared its running gear with the Sturgis but carried dual disc brakes in front.

The Daytona was heralded as the first Harley-Davidson to feature a true pearl paint. The two-tone scheme was gold pearlglo with indigo blue metallic. The cast wheels and rear drive pulley were painted a complementary gold, and the tank featured a special 50th anniversary graphic. An inscription on the air cleaner cover also noted the exclusivity.

The electrical components hid in a chrome-capped boxed under the seat's left side, where the oil tank formerly fit. The battery, also encased in chrome, sat in its original position on the right. The Daytona received Milwaukee's new self-canceling turn signals and a horn loud enough to wake up car drivers. The

Below: The Sturgis seat put the rider 29 inches (74cm) from the road. The price of the ticket was $11,520.

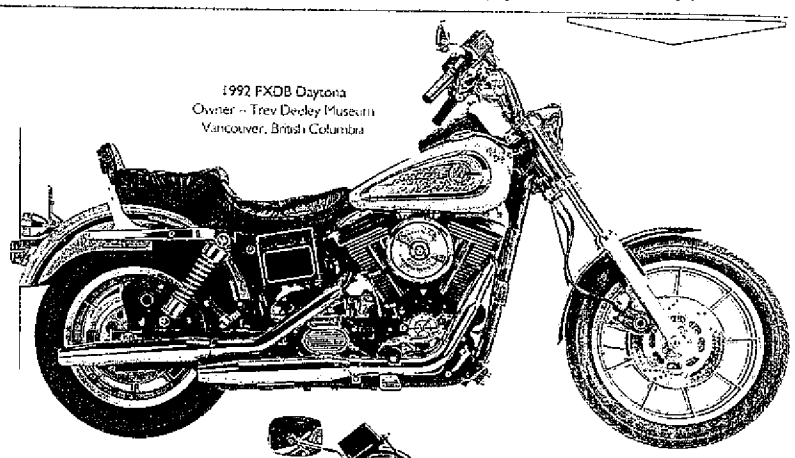


Right: The Sturgis returned for an encore in 1991, this time with an entirely new chassis and the Evolution engine. The FXDB Dyna Glide Sturgis was the first Harley constructed using computer-aided design.

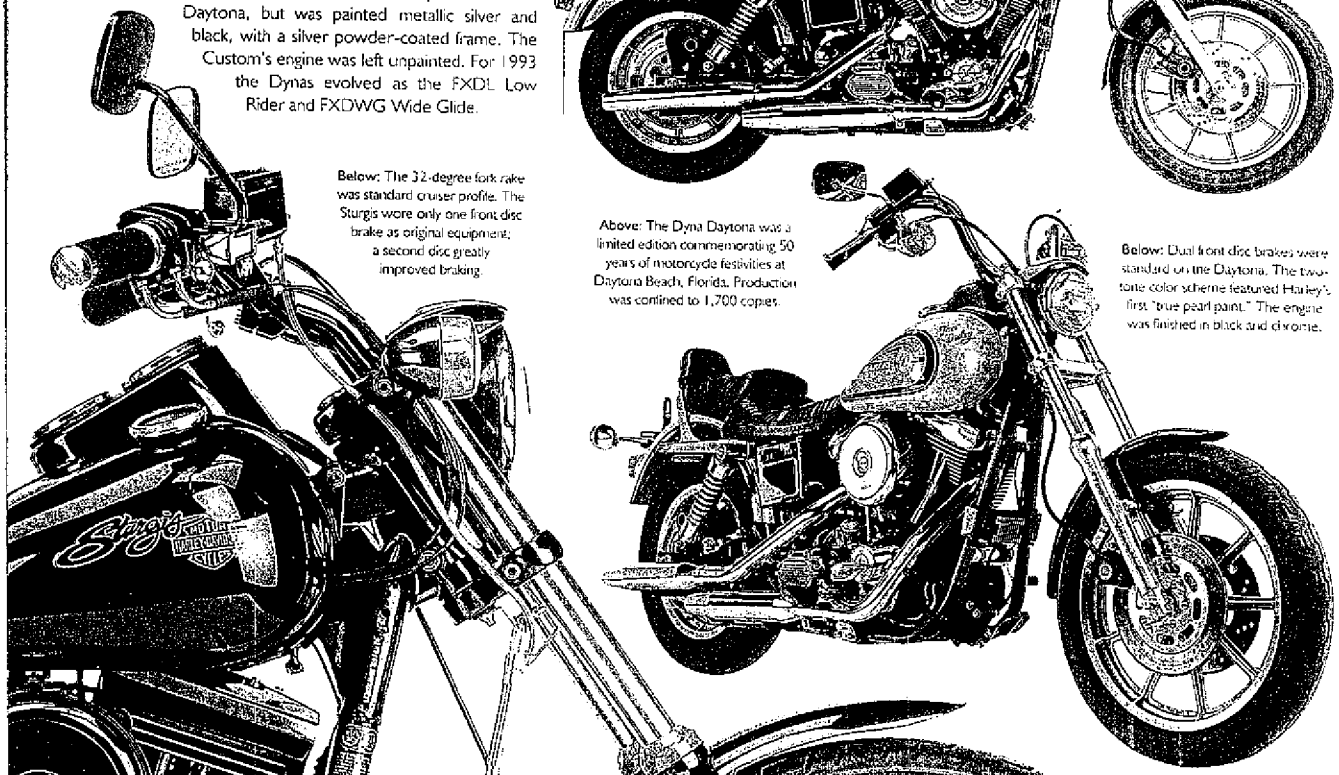
1991 FXDB Sturgis
Bartels' Harley-Davidson
Marina Del Rey, California

exhaust crossover pipe was nicely hidden away below the transmission. Other modifications included continuous venting for the fuel tanks to ensure constant fuel supply to the 40mm carburetor, which was recalibrated to make starting easier in cold weather.

The next version of the Dyna Glide would be designated the FXDC Custom. This model shared all the components of the Daytona, but was painted metallic silver and black, with a silver powder-coated frame. The Custom's engine was left unpainted. For 1993 the Dynas evolved as the FXDL Low Rider and FXDWG Wide Glide.



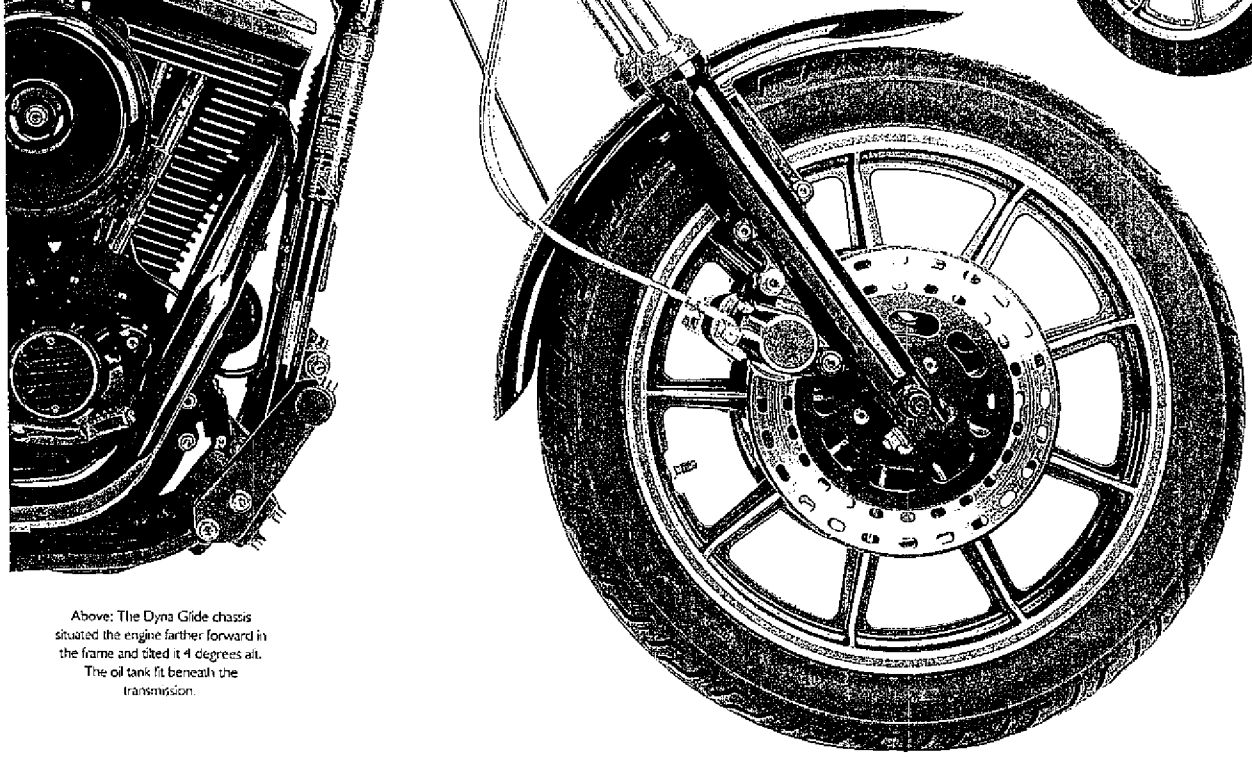
1992 FXDB Daytona
Owner – Trev Deeley Museum
Vancouver, British Columbia



Below: The 32-degree fork rake was standard cruiser profile. The Sturgis wore only one front disc brake as original equipment; a second disc greatly improved braking.

Above: The Dyna Daytona was a limited edition commemorating 50 years of motorcycle festivities at Daytona Beach, Florida. Production was confined to 1,700 copies.

Below: Dual front disc brakes were standard on the Daytona. The two-tone color scheme featured Harley's first "true pearl paint." The engine was finished in black and chrome.



Above: The Dyna Glide chassis situated the engine farther forward in the frame and tilted it 4 degrees aft. The oil tank fit beneath the transmission.

FXDWG (1993) • FXRS (1990) • FXRS (1992)

1993 FXDWG

Specifications
Engine/Drivetrain
Engine: OHV-45° V-twin
Displacement: 81.65ci (1338cc)
Bore & stroke: 3.5 x 4.25in (89 x 108mm)
Compression ratio: 8.5:1
Horsepower: 72 @ 4,000rpm
Carburetion: 38mm Keihin
Transmission: 5-speed
Primary drive: Duplex chain
Final drive: Belt
Brakes: F, Dual discs R, Disc
Battery: 12-volt
Ignition: CDI

Chassis/Suspension
Frame: Steel, double downtube
Suspension: F, Telescopic fork R, Shocks
Wheelbase: 66.1in (167.9cm)
Weight: 615lb (279kg)
Fuel capacity: 5.2gal (19.7lt)
Oil capacity: 3qts (2.8lt)
Tires: F, MH90-21 R, 130/90-16
Top speed: 110mph (177km/h)
Colors: Vivid black; victory red/sun-glo; aqua sun-glo/silver
Number built: 5,602 (including 1,993 Anniversary)
Price: $12,550

With the arrival of 1993 it was obviously time to celebrate Harley-Davidson's 90th anniversary in the motorcycle business. A large party was planned for Milwaukee, with group rides arriving from across the continent, parades, motorcycle races, rock 'n roll shows and assorted revelries. And six Anniversary Edition motorcycles.

Foremost among the commemorative models was the FXWDG Dyna Wide Glide. With its 32-degree fork rake, 21-inch (53.3cm) front wheel and officially trademarked Ape Hanger handlebars, it was fat bob's fashion revisited. Once again Milwaukee had blurred the distinction between civilian and factory choppers. For more conservative cruisers, Harley-Davidson offered the FXDL Dyna Low Rider.

The Wide Glide represented a salute to the chopper revival of two decades prior, the kicked-out, laid-back Easy Rider posture of bike and rider. The minimalist's recliner for the open road, headed for adventure feet first. Maybe not the most comfortable posture for long hours in the saddle, but just right for cruising the back roads or boulevards. New motor mounts and support plates brought reduced vibration.

The bobtail rear fender housed a tucked-in tail light ("Frenched" was the 1950s term). The slim front fender sat in the 8-inch (20.3cm) gap between the fork tubes, accounting for the Glide's wideness. From the custom "pillow-roll" seat to the forward-mounted shifter and brake levers was a long span for the short of leg.

The Anniversary Editions were all fitted with serialized nameplates, "jeweled" clorsonné fuel tank emblems and two-tone silver/charcoal satin-brite paint schemes. The FXDWG special was limited to production of 1,993 machines.

FXRS

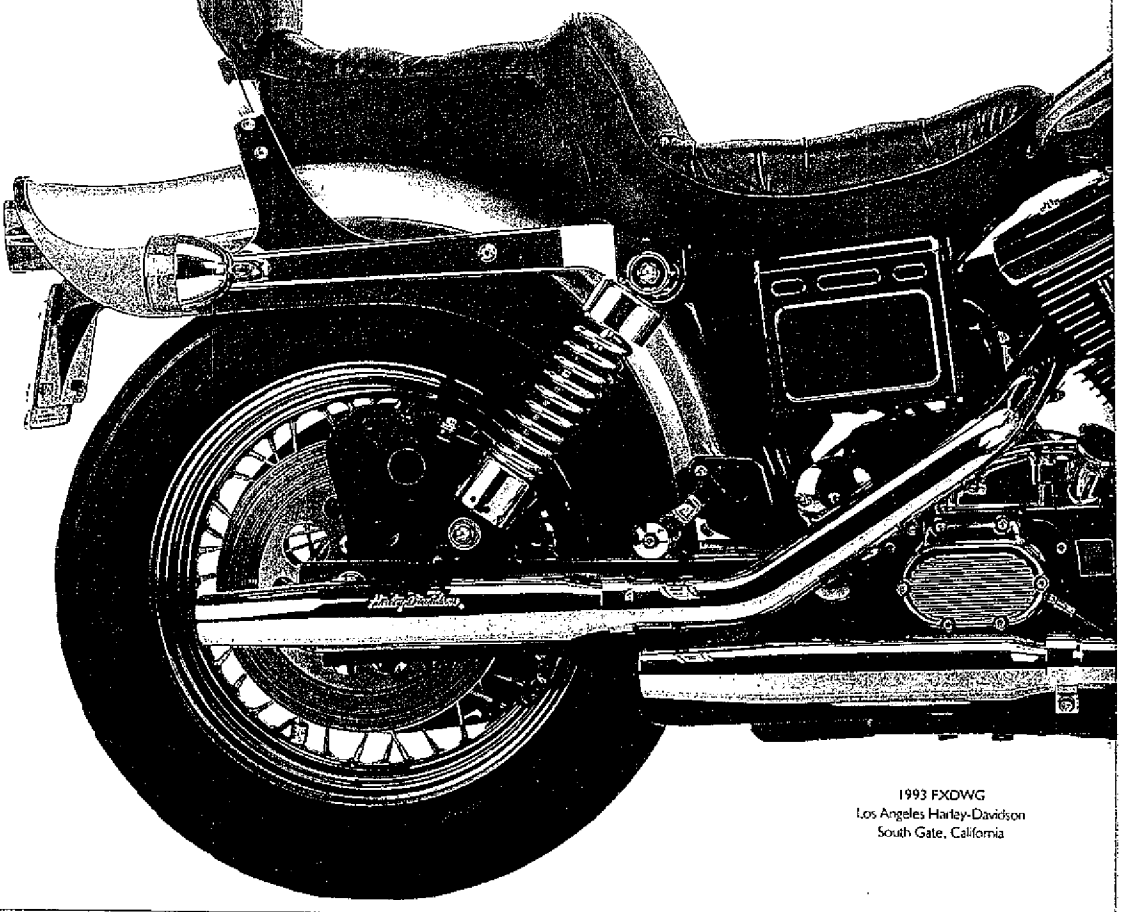
With the addition of the Convertible in 1989, the Super Glide/Low Rider family had grown to six models. The Low Rider remained the most popular member of the family, followed by the Custom and Super Glide. The Sport model, with its longer suspension travel, ran a distant third, but the Convertible was matching numbers with the standard FXR.

The Convertible was simply a Sport model with adjustable/detachable windshield and quick-release saddlebags. The dual-function option would later be used in similar fashion for the FLHR Road King. The Convertible was Milwaukee's rendition of a sport-touring machine, which was easily rigged to suit (or disrobe) for either end of the functional scale. A motorcycle with fewer long-haul comforts than the Electra Glide, and more capacity and amenities than the Sportster.

The motorcycle press held general consensus that the FXR Sport was the best handling and most versatile of all the big Harleys. Though a broad accord among the H-D faithful held that the motorcycle press was comprised largely of wheelie-mad dilberts, street-racing rabble and draft dodgers.

The Springer was not elected to carry anniversary edition status in 1993. But it did receive, in response to continued urging, a front fender that more closely conformed with the tire. The new fender attached via chromed dog-bone links to the sprung yoke, so the fender moved with the wheel. A new more tapered headlamp was added to complement the Springer's suspension hardware.

Above: Harley-Davidson marked its 90th birthday with a major celebration in Milwaukee. Limited edition anniversary models were customized with special silver/charcoal paint, serialized nameplates and clorsonné tank emblems.



1993 FXDWG
Los Angeles Harley-Davidson
South Gate, California

Right: Just as the Sturgis was reborn in updated form, the Wide Glide also returned with the Dyna chassis and Evolution engine. The fat bob format was apparent in the wide fuel tank (fat) and trimmed (bobbed) rear fender.

Below: The latest Wide Glide was déjà vu all over again, with a 21-inch (53.3cm) wheel bolted to a kicked-out fork topped by ape hanger handlebars. The social stigma of earlier apes having passed to history, the high-rise tillers became Ape Hangers®, a Milwaukee trademark.

Below: The FXRS Low Rider had established itself as the most popular model on the Super Glide roster. After 15 years, and numerous upgrades, still king of the cruisers.

1991 FXRS
Harley-Davidson of Sacramento
Sacramento, California

1992 FXSTS
Dudley Perkins Company
San Francisco, California

Left: The Softail Springer looks even more traditional with the studded seat and saddlebags.

Above: Forward-mount foot controls allow the laid-back riding position essential to easy chair cruising.

FLHTC (1990), FLSTC (1994) and FLHTC (1993)

1993 FLHTC ULTRA CLASSIC

SPECIFICATIONS
ENGINE/DRIVETRAIN
Engine: OHV 45° V-twin
Displacement: 81.65in (1338cc)
Bore & stroke: 3.5 x 4.25in (89 x 108mm)
Compression ratio: 8:1
Horsepower: 72 @ 4,000rpm
Carburetion: 38mm Keihin
Transmission: 5-speed
Primary drive: Duplex chain
Final drive: Belt
Brakes: F, Dual discs; R, Disc
Battery: 12-volt
Ignition: CDI

CHASSIS/SUSPENSION
Frame: Steel, double downtube
Suspension: F, Telescopic forks; R, Shocks
Wheelbase: 62.9in (159.9cm)
Weight: 774lb (351kg)
Fuel capacity: 5gal (18.9lt)
Oil capacity: 4qts (3.8lt)
Tires: F, and R, MT90-16
Top speed: 110mph (177km/h)
Colors: Vivid black; victory red sun-glo; two-tone aqua sun-glo/silver; two-tone victory red sun-glo/silver (option: 90th anniversary livery)
Number built: 3,702
Price: $15,349

Another of the six 90th Anniversary limited editions was the FLHTC Electra Glide Ultra Classic, of which 1,340 were made. A new automotive-style cruise control, with a tap-feature for raising and lowering speeds was introduced, and a new American-made CB radio was installed. The silver/gray/black paint, cloisonné tank emblems and serialized nameplate put the Anniversary model price at $16,099.

All the touring machines had the new oil pan below the engine, which afforded better oil cooling and a lower center of gravity. Maintenance was also simplified, and the oil was checked with a dipstick. The battery, formerly housed in the saddlebag, had a new position below the seat. The tourers also got the ergonomically contoured (dog-leg) brake and clutch levers, for easier reach and better feel.

The saddlebag lids, now permanently attached, received new hinges and a nylon tether. The guard rails surrounding the bags were redesigned for both strength and appearance. The new latch mechanism was fashioned for both secure sealing and ease of operation.

The Ultras (Electra and Tour Glide) shared with the rest of the FL series an air-suspension system at both front and rear. Air pressure settings at both ends could be balanced to accommodate varying loads and road conditons.

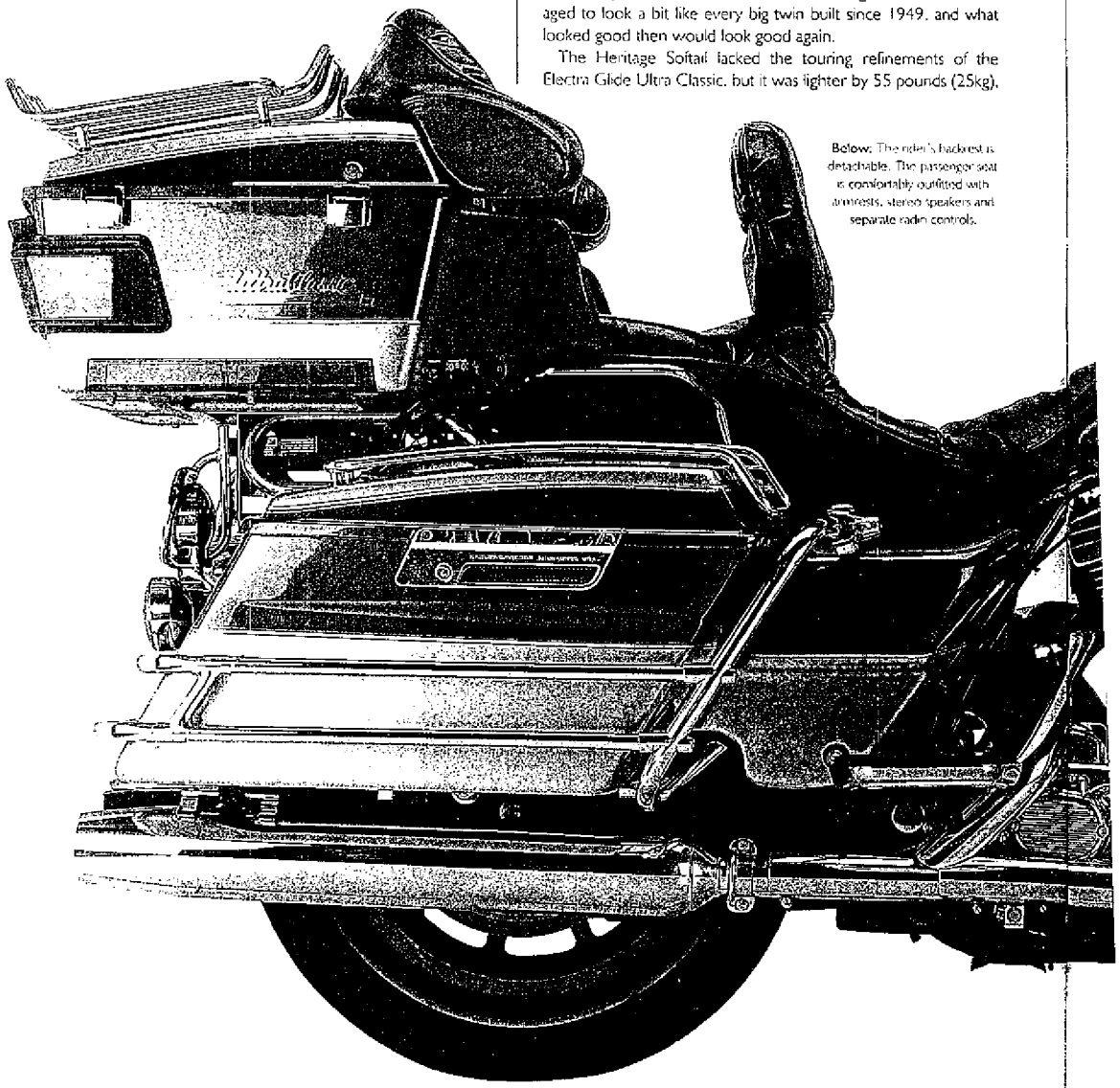
FLSTC

The Heritage Softail Nostalgia was first shown to the public during Bike Week in Daytona Beach. It was quickly dubbed the Cow Glide for its natural cowhide inserts on the seat and saddlebags. The bovine motif was complemented by wide Dunlop whitewall tires on wire wheels and a black and white paint scheme.

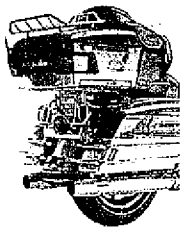
The Nostalgia was the only non-Anniversary model to wear the chrome and fired-enamel cloisonné tank emblems. The FLSTN shared the Fat Boy's "shotgun" dual exhausts. Also a limited edition, the production line rolled out 2,200 Nostalgias.

The Softails shared many of the engineering improvements to the controls and drivelines of the other models. The Heritage Softail Classic retained the vintage character of the 1950s with two-tone paint and studded seat and saddlebags. The Classic managed to look a bit like every big twin built since 1949, and what looked good then would look good again.

The Heritage Softail lacked the touring refinements of the Electra Glide Ultra Classic, but it was lighter by 55 pounds (25kg),

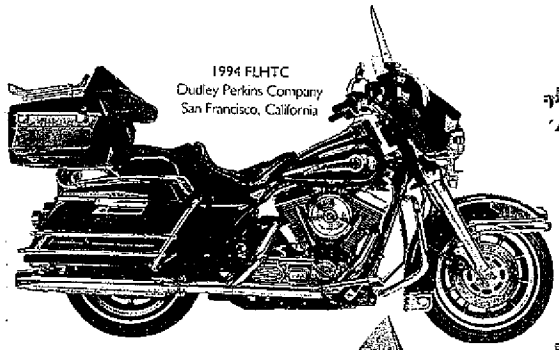


Below: The rider's backrest is detachable. The passenger seat is comfortably outfitted with armrests, stereo speakers and separate radio controls.

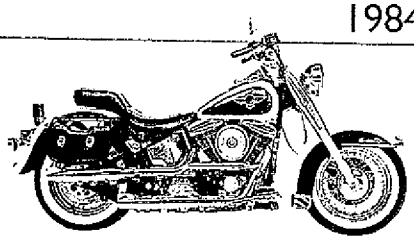


Above: The Electra Glide's generous travel trunk is hinged on the left, opening sideways. The luggage carrier was optional. Flexible antennas for radio and CB radio attach at the trunk's corners. The saddlebags gained 15 percent more capacity for 1993.

Right: With the battery relocated under the seat, it no longer intruded on space in the right saddlebag. New lockable latches operate with the same key used for the ignition and fork lock.

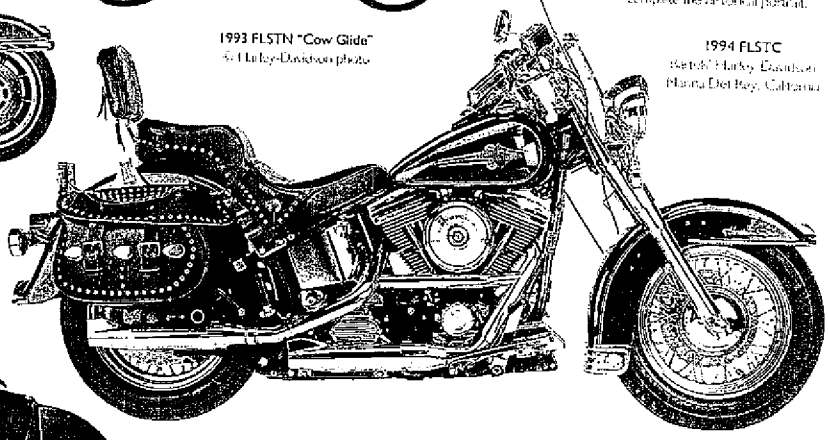


1994 FLHTC
Dudley Perkins Company
San Francisco, California



Below: The Heritage Softail Classic echoes an earlier era, with its fishtail mufflers, spoked wheels and studded seat and saddlebags. Full windshield, passing lamps and floorboards complete the traditional picture.

1993 FLSTN "Cow Glide"
© Harley-Davidson photo



1994 FLSTC
Bartels' Harley-Davidson
Marina Del Rey, California

Above: The Electra Glide Classic shares most components with the Ultra Classic except the CB radio and cruise control. The Classic is likewise some 25 pounds (11kg) lighter and several dollars less expensive.

Below: Instruments and radio are shielded from the elements by the fairing. Sound system controls are fitted to the handlebar.

a tad faster and didn't cost as much. And it was easier to handle around town. The stylish full-dresser marked its eighth year of production, and remained popular for several fundamental reasons. Between touring luxury and sport-touring compromise stretches the broad landscape of all-purpose big bikes.

The 4.2-gallon (15.9lit) fuel tank is sufficient for all-around travel, the seat is less than 28 inches (71cm) off the pavement and the motor feels good. The massive V-Twin does not float in the middle of the chassis, but is bolted directly to the frame. For many more than a few Harley enthusiasts, feeling the motor is a large portion of the appeal. The Heritage Softail delivered a balanced package of past and present, and put more than several Shovelheads in the classified columns.

The Classic arrived fitted with high-rise handlebars that sweep back to the rider and a king-size Lexan windshield. The Hydra-Glide fork cover and leather saddlebags are directly from the 1950s, and the fishtail mufflers date back further. The Classic was offered in black, red, blue, or two-tone victory red sun-glo, aqua sun-glo/silver, wineberry sun glo or black/scarlet red.

Left: The air suspension system allows air pressure settings to be altered to suit loads and road conditions.

1993 FLHTC Ultra
Bartels' Harley-Davidson
Marina Del Rey, California

VR 1000 (1994) AND 883 RACERS (1996)

The 1994 VR 1000 was the first pure racing motorcycle Harley-Davidson ever built. Every other Harley racer, from 1915 through 1993, had been a modified production machine. The VR was purpose-built from the ground up.

Milwaukee has never been comfortable with the concept of pure bred competition machines. Eighty years earlier the founders had been dragged mumbling into the racing game, convinced of its necessity only after Indian had captivated the sporting enthusiasts of the 1910s and 1920s. But once installed in the Milwaukee hierarchy, the racing department proved itself a continuing resource of team spirit and public good will. People rode their motorcycles to the races, and supported their favorite riders and manufacturers.

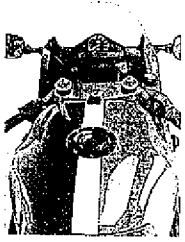
Harley-Davidson had maintained its support of dirt tack, the traditional American fairgrounds racing, and built a few XR 1000 production-based roadracers. But nothing on Milwaukee's menu

1994 VR 1000

Specifications

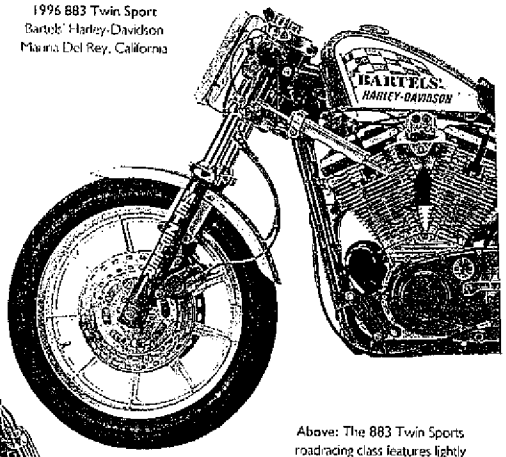
Engine/Drivetrain
Engine: DOHC 60 V-twin
Displacement: 61 (1000cc)
Bore & stroke: [illegible] (98 x 66mm)
Compression ratio: 11.6
Horsepower: 135 @ 10,000rpm
Fuel injection: [illegible]
Transmission: 5-speed
Clutch: Multi-disc, dry
Primary drive: Gear
Final drive: Chain
Brakes: F. Dual discs, R. Disc
Ignition: Electronic

Chassis/Suspension
Frame: Aluminum 2-spar perimeter
Suspension: F. Inverted fork, R. Single shock
Wheelbase: 55.5in (141cm)
Weight: 390lb (176.9kg)
Fuel capacity: 4.5gal (17lit)
Oil capacity: 3qts (2.84lit)
Tires: F. Dunlop 120/70ZR17, R. 150/70ZR17
Top speed: 170mph (274km/h)
Color: Orange/black
Number built: 50
Price: $49,490



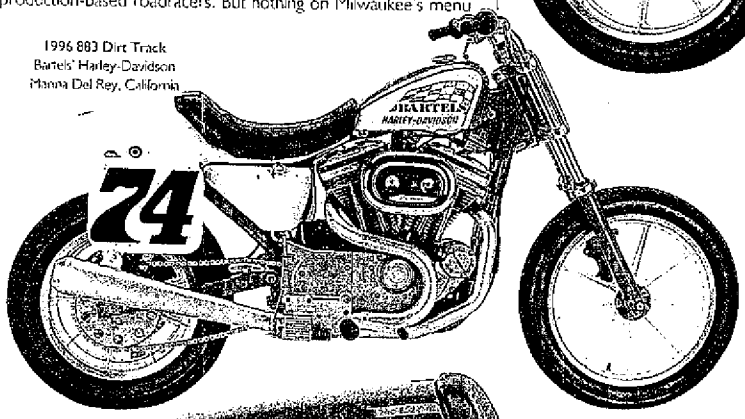
Above: View from the VR 1000 cockpit shows the centered analog tachometer. The LED panel below the tach displays speed, mileage, oil pressure, engine temperature and battery condition.

1996 883 Twin Sport
Bartels' Harley-Davidson
Marina Del Rey, California

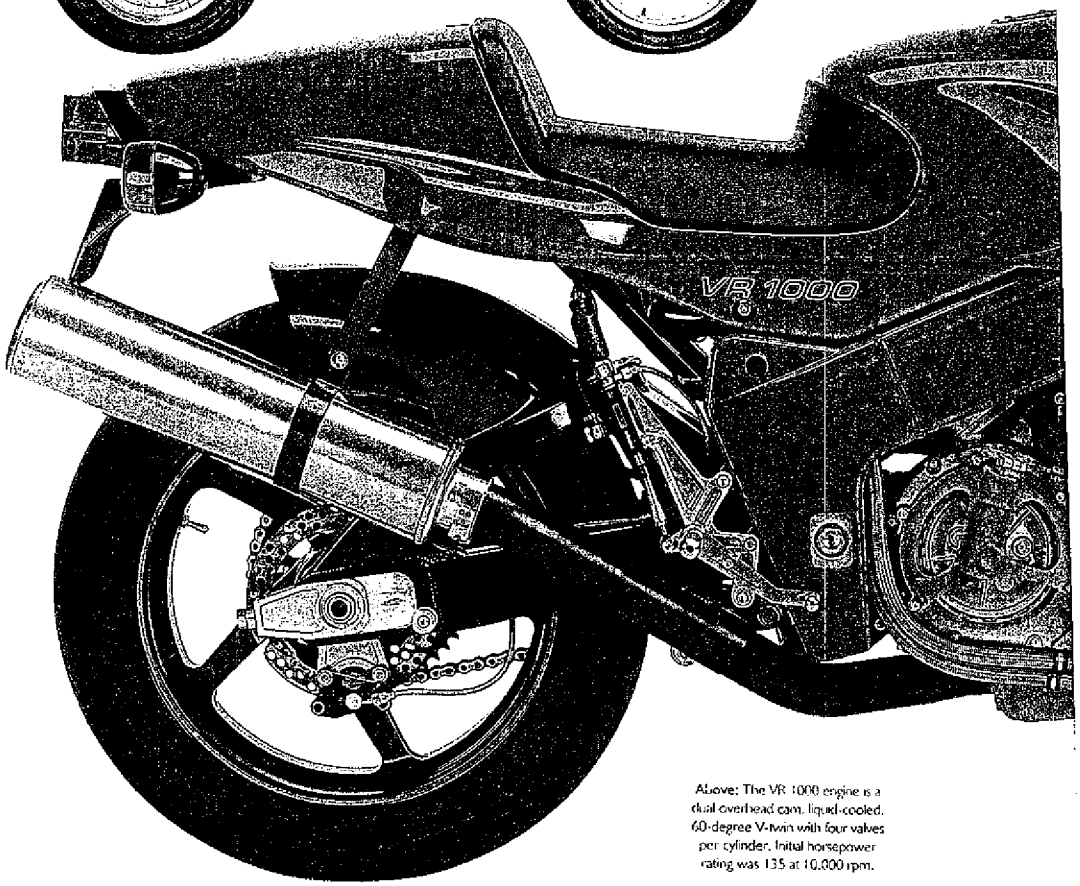


Above: The 883 Twin Sports roadracing class features lightly modified Sportsters in close competition. Footpegs are raised and moved aft, shift lever reversed and unnecessary hardware removed.

1996 883 Dirt Track
Bartels' Harley-Davidson
Marina Del Rey, California

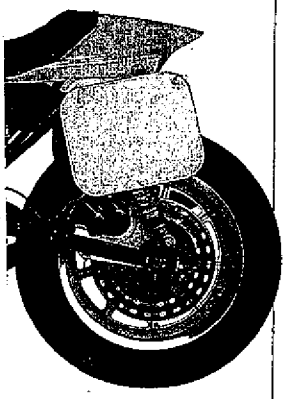


Left: The 883 Dirt Track series runs in conjunction with the AMA Grand National Championship races. These are also moderately modified Sportsters set up for the demands of half-mile and mile dirt ovals.



Right: The street-legal version of the Superbike racer includes a few concessions to civility. A single muffler replaces the racer's duals, and lights, turn signals, mirrors and horn are fitted.

Above: The VR 1000 engine is a dual overhead cam, liquid-cooled, 60-degree V-twin with four valves per cylinder. Initial horsepower rating was 135 at 10,000 rpm.



suited the demands of Superbike racing in the 1990s. At the upper outposts of "street bike" competition, the track-wise roadsters weigh 375 pounds (170kg) and produce 150 horsepower. Handling and braking factors are tuned to millisecond response margins. All of which is enormously expensive to achieve.

With some money in the bank, Harley decided to build its second eight-valve racer, with an American engine, chassis and brakes. Engineer Steve Schelbe headed the team, and called in experienced help from NASCAR and Indy Car racing. The project took five years and produced a double-overhead-cam, 60-degree V-twin, with 4-valve heads, Weber-USA electronic fuel injection and liquid cooling. Power went by gear to a multi-disc dry clutch and through a 5-speed transmission.

The first bikes used a Penske inverted fork and Wilwood six-piston brake calipers. The road model carries an Ohlins fork with titanium-coated stanchions. The body work is constructed of carbon fiber, and the factory listed the dry weight at 390lb (176.9kg). The production schedule was set for 50 copies of the VR 1000, the price of each listed at $49,490.

The VR first appeared on the racetrack for the Daytona Superbike race in 1994. There were few illusions about the early chances, and teething problems were anticipated, but the motorcycle handled remarkably well. Top speed was not at the level of frontrunners, though rider Miguel Duhamel turned in good results on some of the tighter circuits. Results for the 1995 season were disappointing, and rider Doug Chandler had difficulty coming to terms with the machine. National dirt track champion Chris Carr was also on the team and showed a quick learning curve.

Rumors circulated during the off-season that management disputes in Milwaukee cast doubts on the future of the VR 1000. The factions split as they had a half-century before; the economic rationale perceives big-league factory racing as large expense versus small return. The sporting enthusiast segment says racing pays huge dividends in public relations, and puts the company logo on television. And wins hearts and minds.

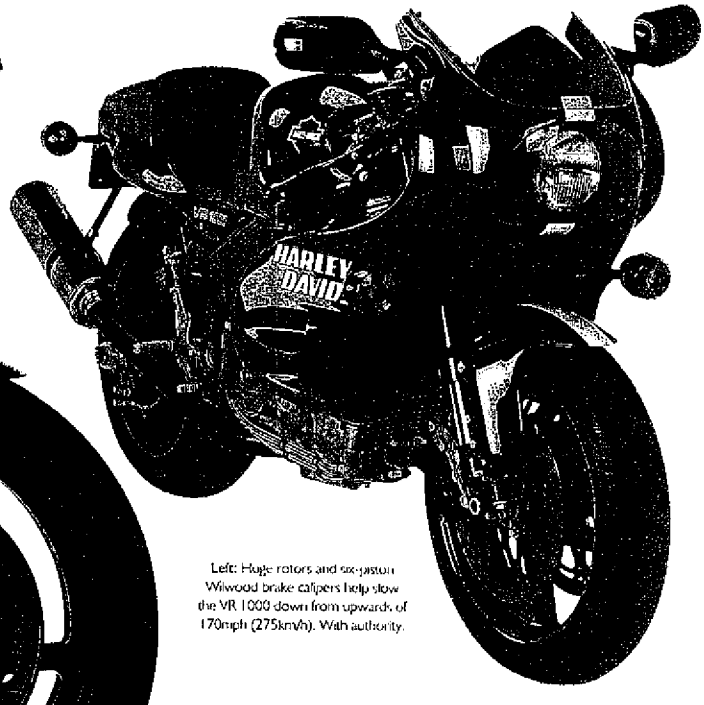
Harley-Davidson continued the support of two Sportster-based production racing divisions: Twin Sports Roadracing and 883 Dirt Track. These all-Harley contests serve racers as a semi-pro league, attract the faithful to the race tracks, and offer more tangible coporate benefits than Superbike racing. Without a street-legal counterpart to the VR 1000, where's the profit?

The Superbike project was still operational for the 1996 season. No expensively talented racer/development rider had been hired to bring the bike up to speed, but Chris Carr did manage a tenth place at Daytona. New cylinder heads upped horsepower as the '96 season began, which suggests more investment from either Milwaukee or outside sponsors, or both. Time and money will tell. Keep the faith.

Below: Even though the Superbike racer is outfitted for civilian use, the riding position necessarily enforces the racer's crouch. Road riders would likely opt for higher handlebars, or limit the distances of their rides.

Left: Most of the bodywork is constructed of light, and expensive, carbon fiber. The frame design came from Oregon mountain-bike builder Mike Etough.

1994 VR 1000
Petersen Automotive Museum
Los Angeles, California



Left: Huge rotors and six-piston Wilwood brake calipers help slow the VR 1000 down from upwards of 170mph (275km/h). With authority.

Above: The front fork is built by suspension specialist Ohlins. Stanchions are coated with titanium. Wheel travel is 4.7 inches (11.94cm).

FLHR ROAD KING (1995), FXDL (1995) AND BUELL S2 (1995)

1995 FLHR

Specifications
Engine/Drivetrain
Engine: OHV 45° V-twin
Displacement: 80ci (1340cc)
Bore & stroke: 3.5 x 4.25in (89 x 108mm)
Compression ratio: 8.5:1
Torque: 77lb-ft @ 4,000rpm
Carburetion: 40mm Keihin
Transmission: 5-speed
Primary drive: Duplex chain
Final drive: Belt
Brakes: F. Dual disc, R. Disc
Battery: 12-volt
Ignition: Electronic

Chassis/suspension
Frame: Steel, double downtube
Suspension: F. Air-adjustable fork, R. Dual air-adjustable shocks
Wheelbase: 62.9in (159.8cm)
Weight: 719lb (326kg)
Fuel capacity: 5gal (18.9lit)
Oil capacity: 4qts (3.8lit)
Tires: F. and R. MT90B-16
Top speed: 112mph (180km/h)
Colors: Vivid black; two-tone aqua pearl/silver; two-tone vivid black/silver; two-tone burgundy pearl/silver
Number built: 7,910
Price: $13,475

The F series has gone through more permutations over the years than any other Harley-Davidson. The Kings of the Road are in continuous process, with subtle changes in accessory groups, paint schemes and comfort amenities. The '95 FLHR Road King boasts what Milwaukee calls "the ultimate in traditional styling."

The FLHR replaced the Electra Glide Sport in 1994. The new 5-gallon (18.9lit) tank had an electronic speedometer and digital odometer mounted at the top. The passenger seat detached easily, for kingly solo rides. Also detachable were the saddle bags and new Lexan windshield, easily turning the highway monarch into a boulevard emperor.

The Road King also received the appointments of its subordinates in the big twin royal family. The new wiring harness featured waterproof connectors, the accessory plug activated with an illuminated switch, and the petcock was vacuum-operated. Also in common with its big brethren was a taller overall gear ratio.

To trace its royal lineage more specifically, the Road King is descended from the Electra Glide Sport, for ten years the econo-tourer in the FL roster. At 692lb (314kg) dry, it was also the lightweight among the heavyweights, and the Road King, despite the higher luxury quotient, weighs in at exactly the same. Better doesn't necessarily have to mean bigger.

The Road King has an air-adjustable front fork and stout 11.5in (29.2cm) brake discs at the bottom of each leg. But despite the modern techno-trickery, with those wide whitewalls, from a distance you'd swear it was an Electra Glide from the 1960s. It just works a whole lot better.

Given the longevity of the Electra Glide Sport, the Road King is likely to have a similar lifeline. The convenience factor of a motorcycle that can be quickly switched from cruising to touring mode has broad appeal. For 1996 the FLHR came available with the fuel-injection system first offered on the '95 Ultra Classic Electra Glide. ESPFI (electronic sequential port fuel injection) was also fitted to the Classic and Ultra Classic Glides for 1996.

FXDL

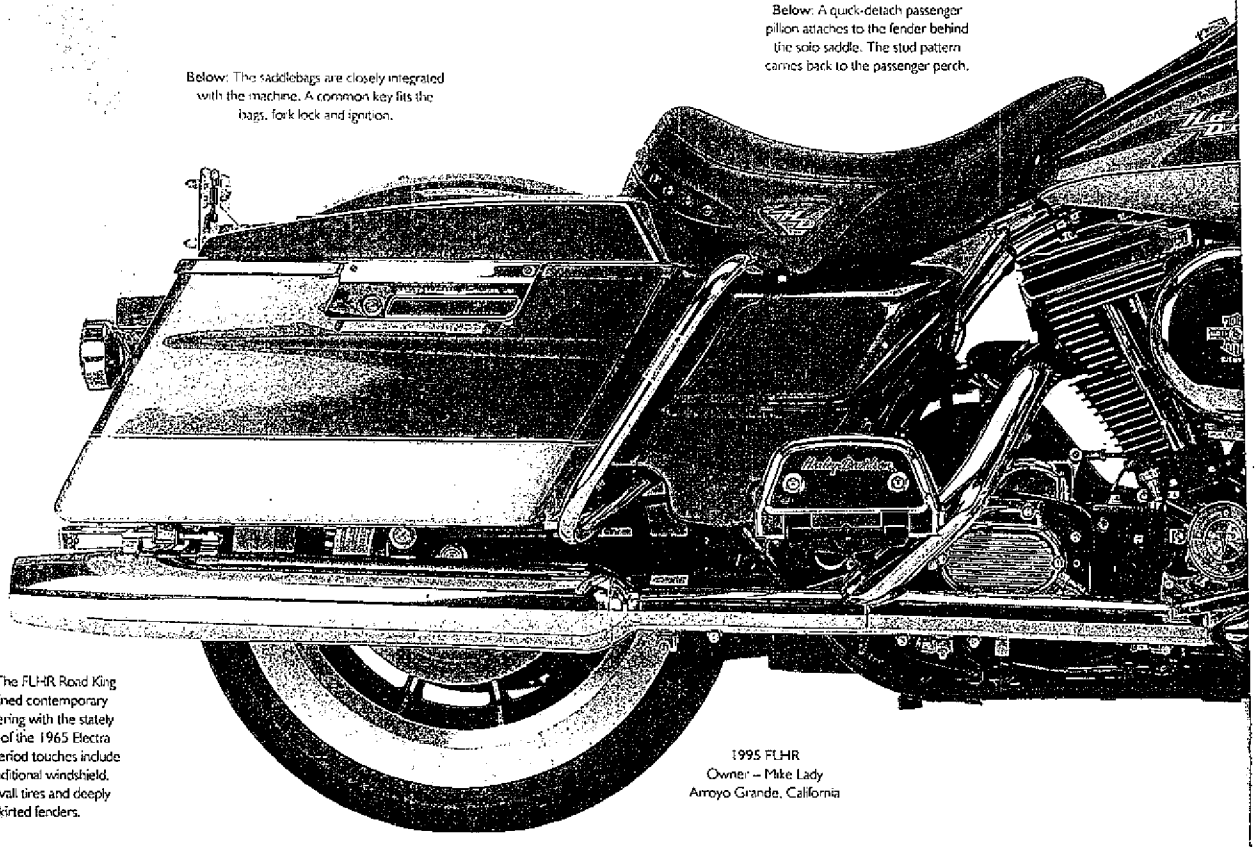
The Dyna Low Rider continued its role as the standard cruiser of the FX series. The machine appealed to both the creative customizers and the cruising comfort segments of a broad market. The easier riders now accounted for 35 percent of the street-legal motorcycles sold nationwide. And Harley-Davidson, which had effectively re-engineered the cruiser division, held the lion's share of the category.

The imports were coming closer in terms of style, and even a greater portion of the substance than they had previously managed. But, whether imititation is the highest form of either praise or incompetence, the derivatives lacked that intangible element of the Harley identity. "Things Are Different on a Harley" asserted the ad slogan. And the price for those differences was about 30 percent more than the competition charged.

The Dyna Low Rider received an electronic speedometer in 1995, and seat height was down a half-inch to 26.5 inches (67.3cm). The 32-degree front fork maintained the long and low look, and the dual disc front brakes help decelerate the Dyna's 615-pound (279kg) mass. The FXDL was priced at $12,475 for solid colors, with a $75 premium for metallic paint and another $150 for the choice of two-tone victory red/sun-glo or aqua pearl/silver.

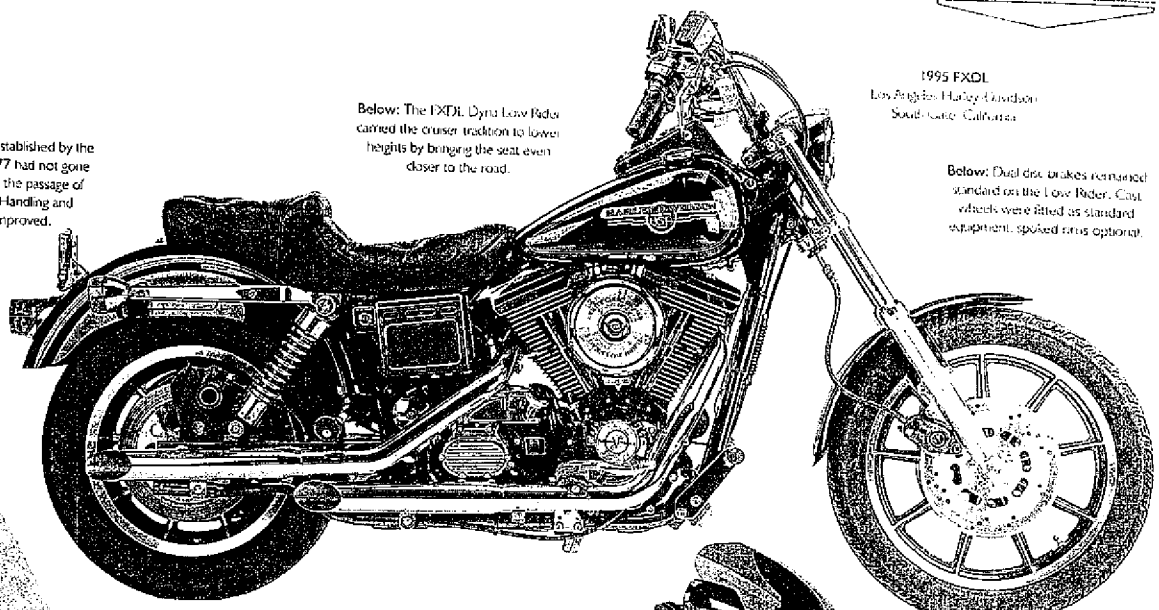
Below: A quick-detach passenger pillion attaches to the fender behind the solo saddle. The stud pattern carries back to the passenger perch.

Below: The saddlebags are closely integrated with the machine. A common key fits the bags, fork lock and ignition.



Right: The FLHR Road King combined contemporary engineering with the stately styling of the 1965 Electra Glide. Period touches include the traditional windshield, whitewall tires and deeply skirted fenders.

1995 FLHR
Owner – Mike Lady
Arroyo Grande, California

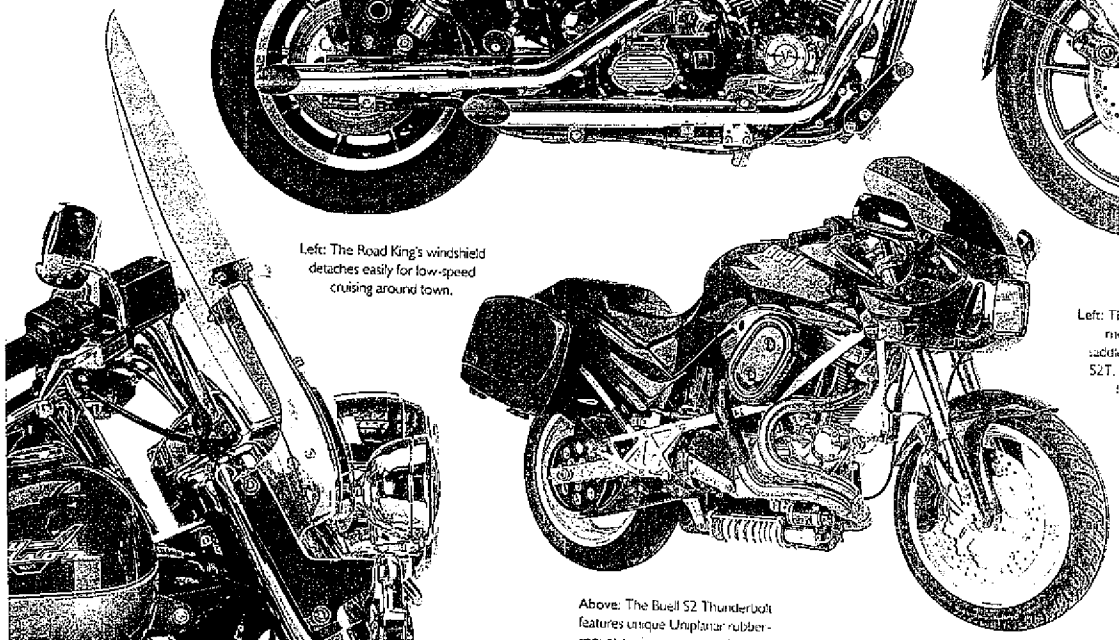


1995 FXDL
Los Angeles Harley-Davidson
South Gate, California

Below: The FXDL Dyna Low Rider carried the cruiser tradition to lower heights by bringing the seat even closer to the road.

Right: The look established by the Low Rider in 1977 had not gone out of style with the passage of two decades. Handling and reliability improved.

Below: Dual disc brakes remained standard on the Low Rider. Cast wheels were fitted as standard equipment, spoked rims optional.

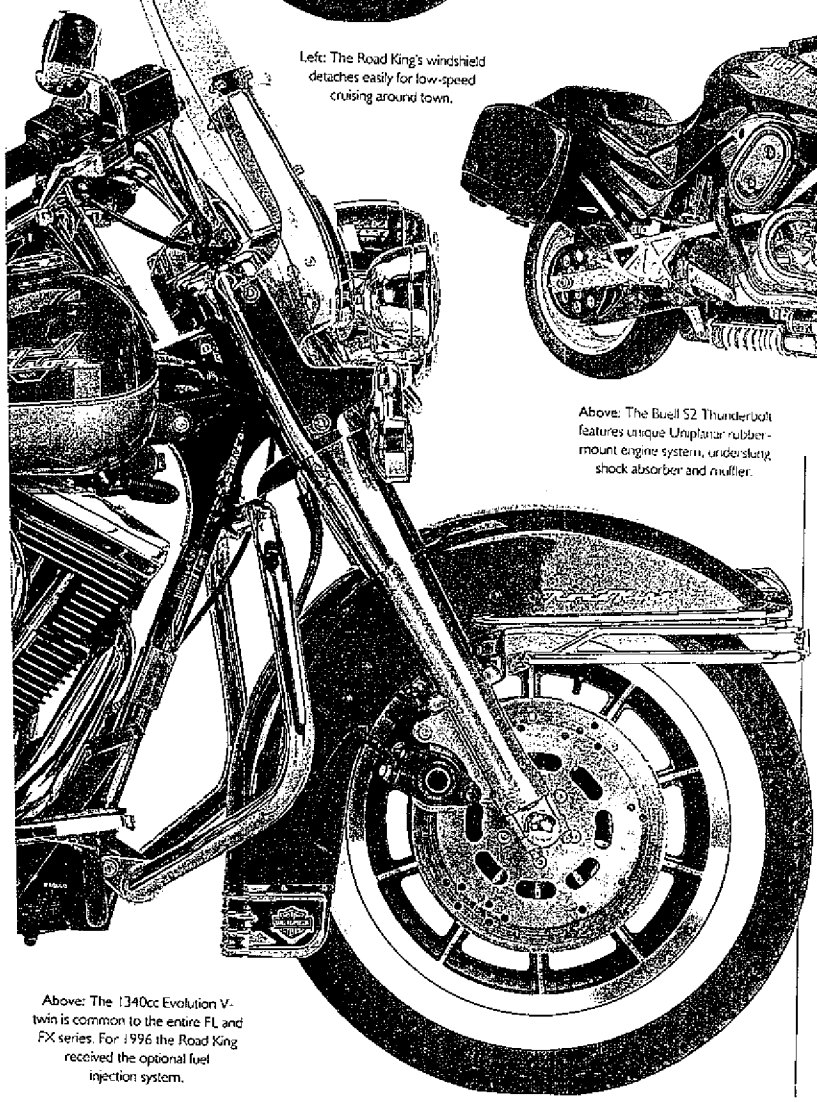


Left: The Road King's windshield detaches easily for low-speed cruising around town.

Left: The S2 adapts to sport-touring mode with the addition of saddlebags. The factory version, S2T, comes with fairing lowers, higher handlebars and lower footpegs.

1995 Buell S2
Owner Ray Earls,
Foster City, California

Above: The Buell S2 Thunderbolt features unique Uniplanar rubber-mount engine system, underslung shock absorber and muffler.



Above: The 1340cc Evolution V-twin is common to the entire FL and FX series. For 1996 the Road King received the optional fuel injection system.

BUELL S2 THUNDERBOLT

In 1993 Harley-Davidson became almost-half owner of the Buell Motorcycle Company, Milwaukee, in a refreshing bit of candor, admitted its specialized factory sport bikes had achieved little success. Better to assist someone well-suited to the design, chassis and assembly requirements of those machines, with Harley-Davidson acting only as the engine supplier.

The timing was right. Buell was under-capitalized, Harley needed a sport bike and an investment opportunity. In 1994 the Thunderbolt was the first product of the new partnership between Milwaukee and Mukwonago. The chassis' wheelbase and steering geometry were unchanged, but the new design left more of both the engine and frame visible. The riding position became something of a compromise between the racer's crouch and the cruiser's slouch.

The Thunderbolt bristles with tasty techno-pieces, from the frame and engine mounts, huge disc brake with 6-piston caliper, inverted fork, to the subverted shock absorber and carbon-fiber air cleaner cover. The oversize muffler permits some tweaking of the 1200 Sportster's performance profile, and the horsepower rating bumps up to 76 at 5,200 rpm, with exactly matching figures for torque. The curb weight is 481 pounds (218kg). The production schedule was set for 300 Thunderbolts in its debut year.

In 1996 the S2T was introduced with color coordinated saddlebags and fairing lowers, with touring handlebars and footpegs. Another example of Harley-Davidson's support showed in the prices: the S2 listed for $11,995 and the touring model for $12,795, well in line with the competition.

FXDS (1996), FLSTN (1996) and FXSTC (1996)

1996 FXDS

Specifications
Engine/Drivetrain
Engine: Oil-V 45° V-twin
Displacement: 81.65ci (1338cc)
Bore & stroke: 3.5 x 4.25in (89 x 108mm)
Compression ratio: 8.5:1
Horsepower: 72 @ 4,000rpm
Carburetion: 38mm Keihin
Transmission: 5-speed
Primary drive: Duplex chain
Final drive: Belt
Brakes: F. Dual discs. R. Disc
Battery: 12-volt
Ignition: CDI

Chassis/Suspension
Frame: Steel, double downtube
Suspension: F. Telescope fork. R. Shocks
Wheelbase: 63.9in (162.3cm)
Weight: 638lb (289kg)
Fuel capacity: 4.9gal (18.5lt)
Oil capacity: 3qts (2.8lt)
Tires: F. 100/90-19. R. 130/90H-16
Top speed: 112mph (180km/h)
Colors: Vivid black; patriot red pearl; states blue pearl; violet pearl; two-tone victory sunglo/platinum; two-tone violet/red pearl; two-tone platinum silver/black
Number built: n/a
Price: $13,330

The FXRS Convertible Low Rider had proven more popular than its stablemate the Sport Edition. With the switch to the Dyna Glide chassis, the Sport was deleted in favor of the FXDS Convertible. The motorcycles had been too similar to warrant separate models, and without its windscreen and saddlebags the Convertible was a Sport.

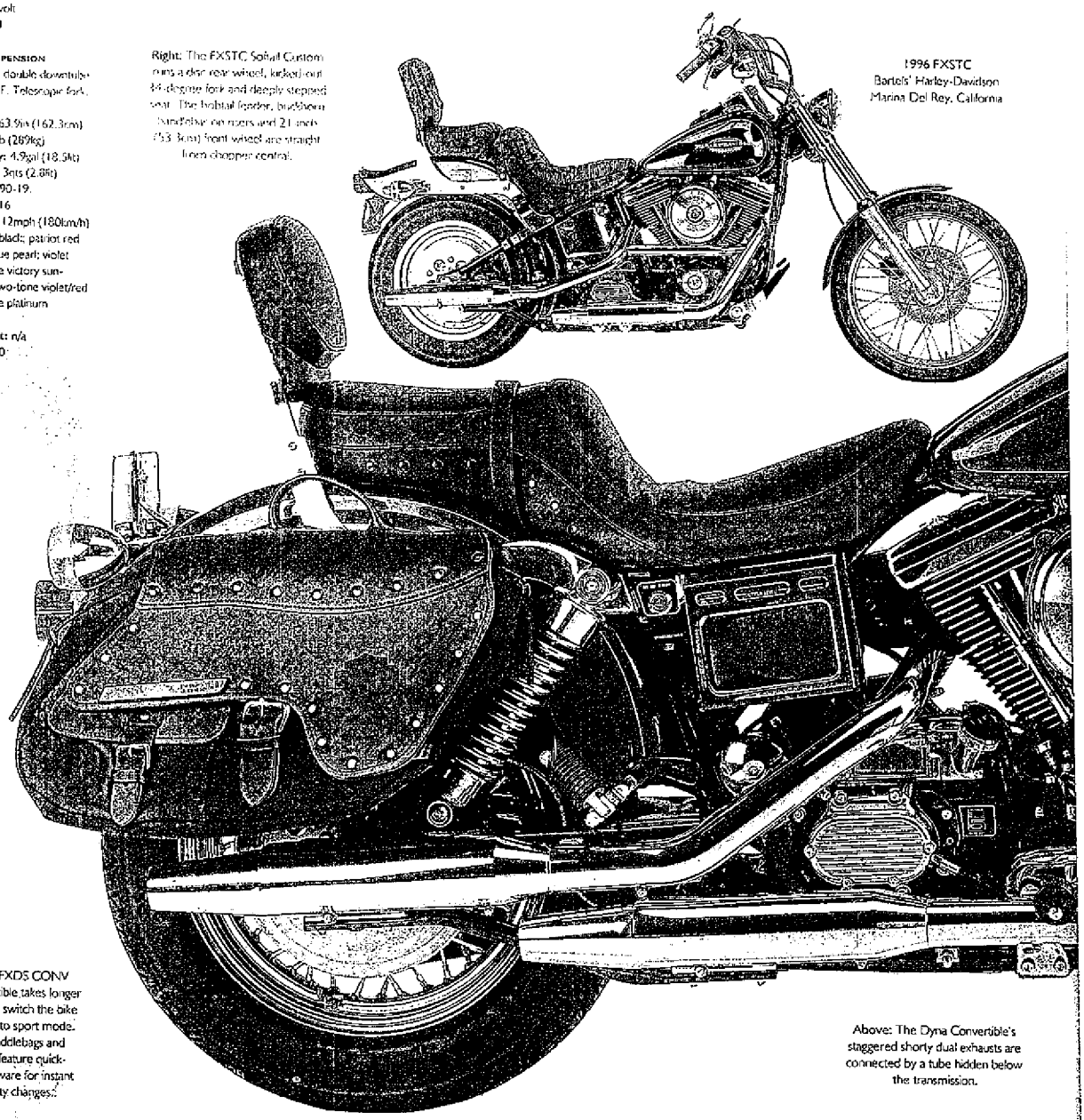
The Dyna transition did effect some modifications to the sport-touring member of the Milwaukee roster. The steering head angle diminished from 31 to 28 degrees, and wheelbase shrank about an inch to 63.9 inches (162cm), giving the newer generation quicker handling in the tighter turns. And the Dyna had a quarter-inch (0.63cm) more ground clearance. But the FXDS also managed to gain 35 pounds (15.9kg) in the process.

The obvious appeal of the Dyna Glide Convertible, just as its predecessor, was the quick-change capability. The windshield and saddlebags detach readily in a few minutes, swapping the Convertible's character from tourer to boulevardier in short order. Most commuters and weekend recreation riders tend to leave the windshield in place, since it offers a significant reduction in wind buffeting. The leather-topped saddlebags feature a nylon liner and hard plastic frame to retain their shape.

With the Low Rider Sport gone, the series dropped to four models. The FXD Dyna Super Glide shared the Convertible's steering geometry, but had slightly less wheelbase, only one front disc brake and an engine in milder tune. The Dyna Wide Glide and Low Rider retained the 32-degree fork and longer wheelbase.

Right: The FXSTC Softail Custom runs a disc rear wheel, kicked-out 38-degree fork and deeply stepped seat. The bobtail fender, buckhorn handlebar on risers and 21-inch (53.3cm) front wheel are straight from chopper central.

1996 FXSTC
Bartels' Harley-Davidson
Marina Del Rey, California



Right: The FXDS CONV Dyna Convertible takes longer to say than to switch the bike from touring to sport mode. Both the saddlebags and windshield feature quick-release hardware for instant personality changes.

Above: The Dyna Convertible's staggered shorty dual exhausts are connected by a tube hidden below the transmission.

Below: The Convertible traces its lineage from the original FXRS Sport Model. The tachometer and speedometer are mounted to the handlebar. Windshield detachment is quick and easy.

FXSTC

The Softail Custom also saw few revisions in five years but for color options and graphic trim. The spiritual cousin of the Springer was the kicked-out king of the crowd, with a fork raked at 34 degrees and 66.5 inches (169cm) of wheelbase. The seat height had dropped to 26.6 inches (67.6cm).

The Custom bore more resemblance to the original hard-tail choppers of the 1950s. The laced 21-inch (53.3cm) front wheel sits well out in front of the rest of the machine, and the buck-horn bars and highway pegs invite the laid-back posture characteristic of the traditional feet-first style. The disc rear wheel is shared with the Fat Boy.

Unlike some of its siblings, the Softail Custom had become no more of a porker over the years, and in fact even lost a few pounds. Dry weight was 613lb (278kg).The Custom and the Wide Glide still employed 5.2-gallon (19.7lit) fuel tanks while the other FX models had the trim 4.9-gallon (18.5lit) units. For 1996 the Custom was offered in vivid black, patriot red pearl, states blue pearl, violet pearl, and two-tone victory sun-glo/platinum, violet/red pearl, and platinum silver/black.

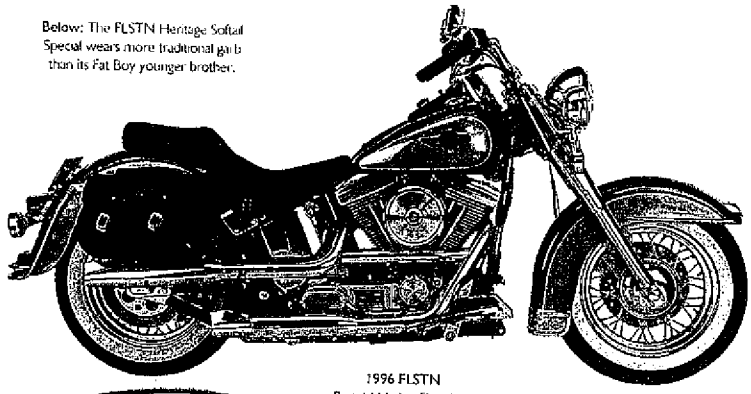
FLSTN

The Heritage Softail Special also carried over to 1996 relatively unrevised. Despite the new Fat Boy-style fired-enamel nameplate on the tank, the Special was some 70 pounds (31.7kg) lighter than the Softail Nostalgia of 1993. And the seat height, according to the factory specs, was two inches (5cm) lower.

Like the Springer, the Heritage Softail built a loyal following among riders faithful to traditional Milwaukee style. With 16-inch (40.6cm) spoked chrome wheels, whitewall tires and elegantly subdued two-tone paint scheme in traditional fashion, the Special spoke fondly of the pleasant days of yesteryear. Now made more pleasing by the presence of an easy-starting, oil-tight V-twin rum-bling through its hardtail-style chassis. Altogether a satisfying blend of sight, sound and roadworthy sensations, the Softail prevails where engineering logic gets lost in the shadows.

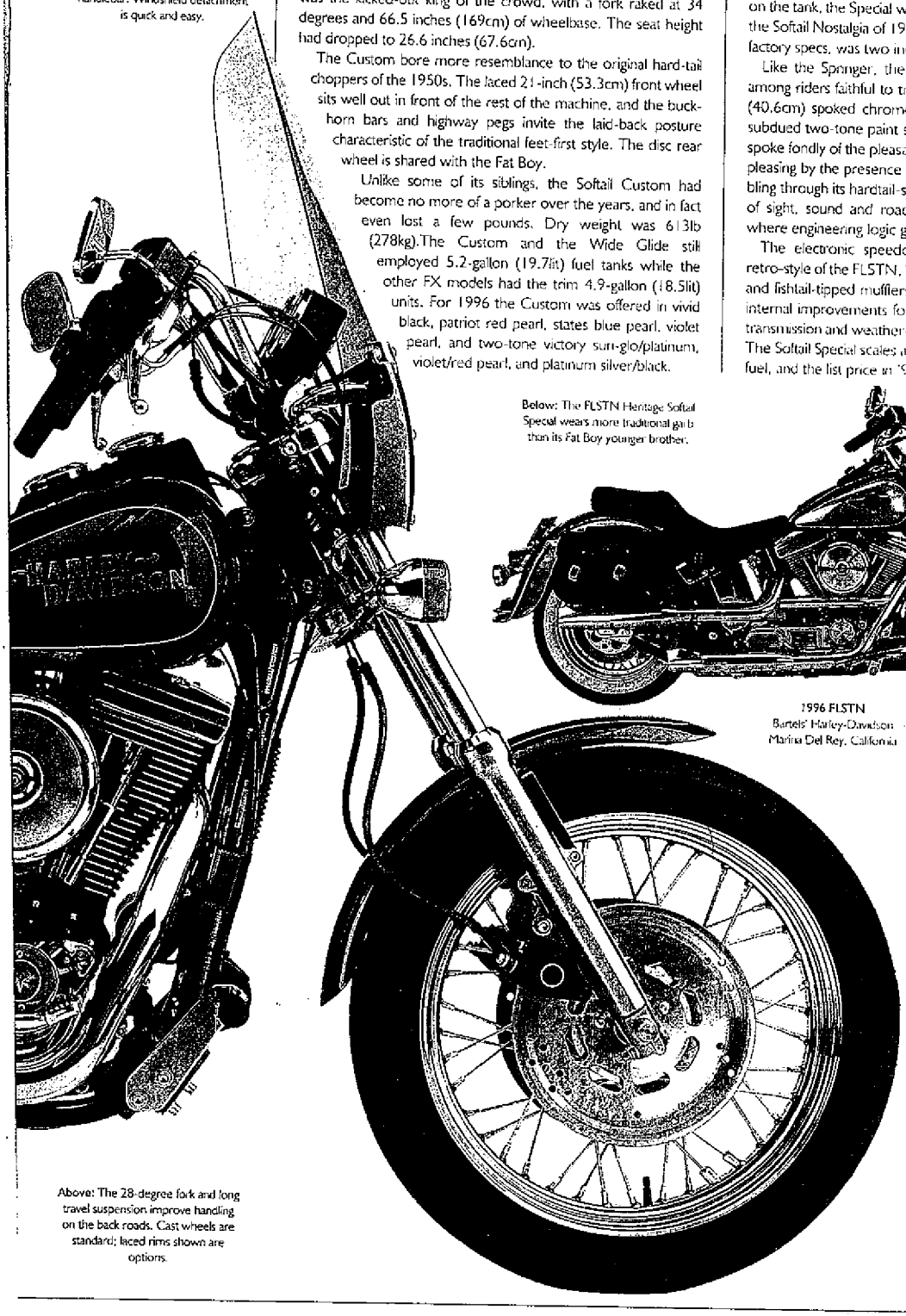
The electronic speedometer may be inconsistent with the retro-style of the FLSTN, but the laced leather seat and saddlebags and fishtail-tipped mufflers provide a balanced anachronism. The internal improvements for 1996 included a stronger and quieter transmission and weather-sealed connectors in the wiring system. The Softail Special scales at 655 pounds (297kg) with a half-tank of fuel, and the list price in '96 was $14,655.

Below: The FLSTN Heritage Softail Special wears more traditional garb than its Fat Boy younger brother.



1996 FLSTN
Bartels' Harley-Davidson
Marina Del Rey, California

Above: The fishtail mufflers, wide whitewall tires, chromed spoked wheels and jumbo headlight conjure up 1950. But the Evo engine, solid-state ignition, 5-speed transmission and disc brakes are contemporary components.



Above: The 28-degree fork and long travel suspension improve handling on the back roads. Cast wheels are standard; laced rims shown are options.

1996 FXDS
Bartels' Harley-Davidson
Marina Del Rey, California

XL 1200S (1996), FLHTC UI (1996) AND XL 1200C (1996)

Since joining the Evolutionary family in 1986, the Sportster had been awarded doses of the technology advanced by the heavyweights. Belt drives and 5-speed transmission were standard on both the 883 and 1200cc models, and in 1996 the Sporties had five models in the lineup.

The standard XLH 883 with solo seat, laced wheels and low handlebar was the price leader at $5,095, and the buckhorn-barred Hugger followed in line at $5,760. The two new members of the group were the 1200cc Sport and Custom. The latter featured a 21-inch (53.3cm) wire wheel in front, 16-inch (40.6cm) slotted disc wheel at the rear and an embroidered dual seat. The Custom got handlebar risers, chromed highlights and a fired-enamel tank emblem. This top shelf Sportster listed for $8,360.

The XL1200S offered to put more of the sport back in Sportster, thus its full moniker, XL 1200S Sportster 1200 Sport. All the 1200s shared common upgrades for '96; the more efficient high-contact transmission gears, better switchgear and 13-spoke cast wheels. Laced wheels became an option. The S model added several bonuses for the corner-strafers on the back country roads. Adjustable suspension made its Sportster debut, with gas reservoir shocks and cartridge-type front fork from Showa. Both were adjustable for spring pre-load and compression and rebound damping.

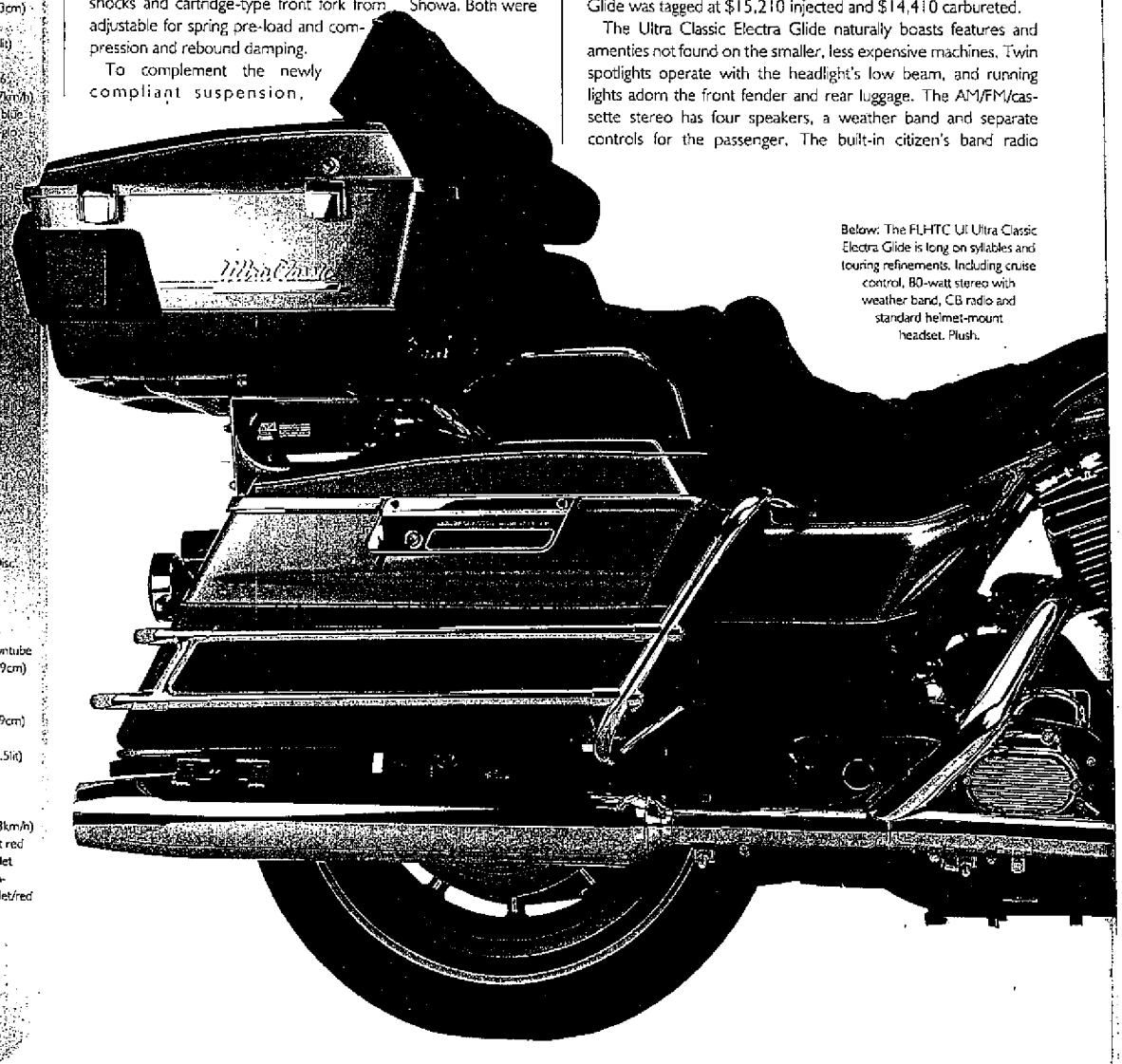
To complement the newly compliant suspension, Milwaukee fitted the Sportster front wheel with two 11.5-inch (29.2cm) floating discs and a redesigned master cylinder. The new braking system, in concert with Dunlop Sport Elite tires, gives new zeal and energy to the deceleration process. The slowing distance is compressed by better equipment and the feedback it offers the rider through the chassis. The suspension, brakes and tires render the sporting Sportster a more stable and comfortable platform at brisk rates on the twisty roads.

FLHTC UI

Milwaukee unveiled its first fuel-injected tourer with the 30th Anniversary Ultra Classic Electra Glide in 1995. The next year the Weber Marelli spritzer system was standard on the Ultra Classic Tour Glide and optional for the Classic and Ultra Classic Electras.

In addition to performance gains at all speeds, the injecta-Glides ran clean enough to meet the California emission standards without a catalytic converter. And fuel mileage went up by two miles per gallon (0.85km/lit) in city and country riding. The two-tone Tour Glide commanded a price of $18,160. With the optional injection, the Electra Ultra was priced the same, while the Classic Glide was tagged at $15,210 injected and $14,410 carbureted.

The Ultra Classic Electra Glide naturally boasts features and amenities not found on the smaller, less expensive machines. Twin spotlights operate with the headlight's low beam, and running lights adorn the front fender and rear luggage. The AM/FM/cassette stereo has four speakers, a weather band and separate controls for the passenger. The built-in citizen's band radio



Below: The FLHTC UI Ultra Classic Electra Glide is long on syllables and touring refinements. Including cruise control, 80-watt stereo with weather band, CB radio and standard helmet-mount headset. Plush.

1996 FLHTC UI

SPECIFICATIONS
ENGINE/DRIVETRAIN
Engine: OHV 45° V-twin
Displacement: 81.65ci (1338cc)
Bore & stroke: 3.5 x 4.25in (89 x 108mm)
Compression ratio: 8.5:1
Torque: 77lb-ft @ 4,000rpm
Carburetion: Electronic fuel injection
Transmission: 5-speed
Primary drive: Duplex chain
Final drive: Belt
Brakes: F. Dual discs, R. Disc
Battery: 12-volt
Ignition: CDI

CHASSIS/SUSPENSION
Frame: Steel, double downtube
Suspension: F. Telescopic fork, R. Shock
Wheelbase: 62.7in (159.3cm)
Weight: 781lb (354kg)
Fuel capacity: 5gal (18.9lit)
Oil capacity: 4qts (3.8lit)
Tires: F. 130/90-16, R. 150/80-16
Top speed: 110mph (177km/h)
Colors: vivid black; patriot red pearl/states blue pearl/violet pearl; two-tone vintage sunglo/platinum; two-tone violet/red pearl; two-tone platinum silver/black
Number built: n/a
Price: $17,910

1996 XL 1200S

SPECIFICATIONS
ENGINE/DRIVETRAIN
Engine: OHV 45° V-twin
Displacement: 74.6ci (1222cc)
Bore & stroke: 3.5 x 3.875in (89 x 98.4mm)
Compression ratio: 9.5:1
Horsepower: 63
Carburetion: 40mm Keihin CV
Transmission: 5-speed
Primary drive: Triple-row chain
Final drive: Chain
Brakes: F. Dual disc, R. Disc
Battery: 12-volt
Ignition: CDI

CHASSIS/SUSPENSION
Frame: Steel, double downtube
Suspension: F. 1.53in (3.9cm) cartridge fork, R. Dual gas-reservoir shocks
Wheelbase: 60.2in (152.9cm)
Weight: 512lb (232kg)
Fuel capacity: 3.3gal (12.5lit)
Oil capacity: 3qts (2.8lit)
Tires: F. 100/90-19, R. 130/90-16
Top speed: 120mph (193km/h)
Colors: vivid black; patriot red pearl/states blue pearl; violet pearl; two-tone victory sunglo/platinum; two-tone violet/red pearl; two-tone platinum silver/black
Number built: n/a
Price: $7,910

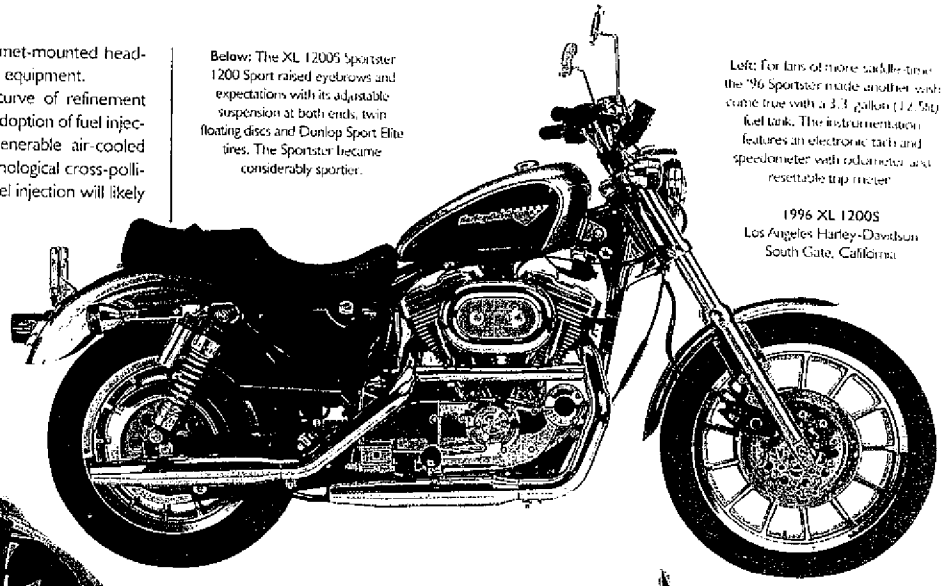
features a voice-activated intercom with helmet-mounted headsets. Electronic cruise control is also standard equipment.

The Electra Glide has shown a steady curve of refinement during its 31 years in service. The successful adoption of fuel injection heralds an even longer life for the venerable air-cooled V-twin. And given the Harley history of technological cross-pollination within the extended family of twins, fuel injection will likely appear on other models in the near future.

Below: The XL 1200S Sportster 1200 Sport raised eyebrows and expectations with its adjustable suspension at both ends, twin floating discs and Dunlop Sport Elite tires. The Sportster became considerably sportier.

Left: For fans of more saddle-time, the '96 Sportster made another welcome change with a 3.3 gallon (12.5L) fuel tank. The instrumentation features an electronic tach and speedometer with odometer and resettable trip meter.

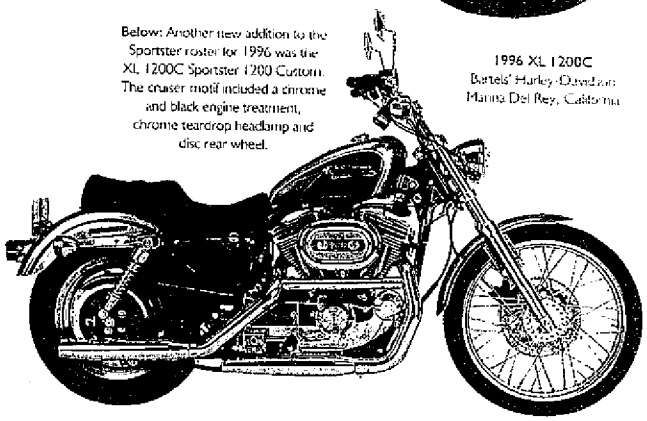
1996 XL 1200S
Los Angeles Harley-Davidson
South Gate, California



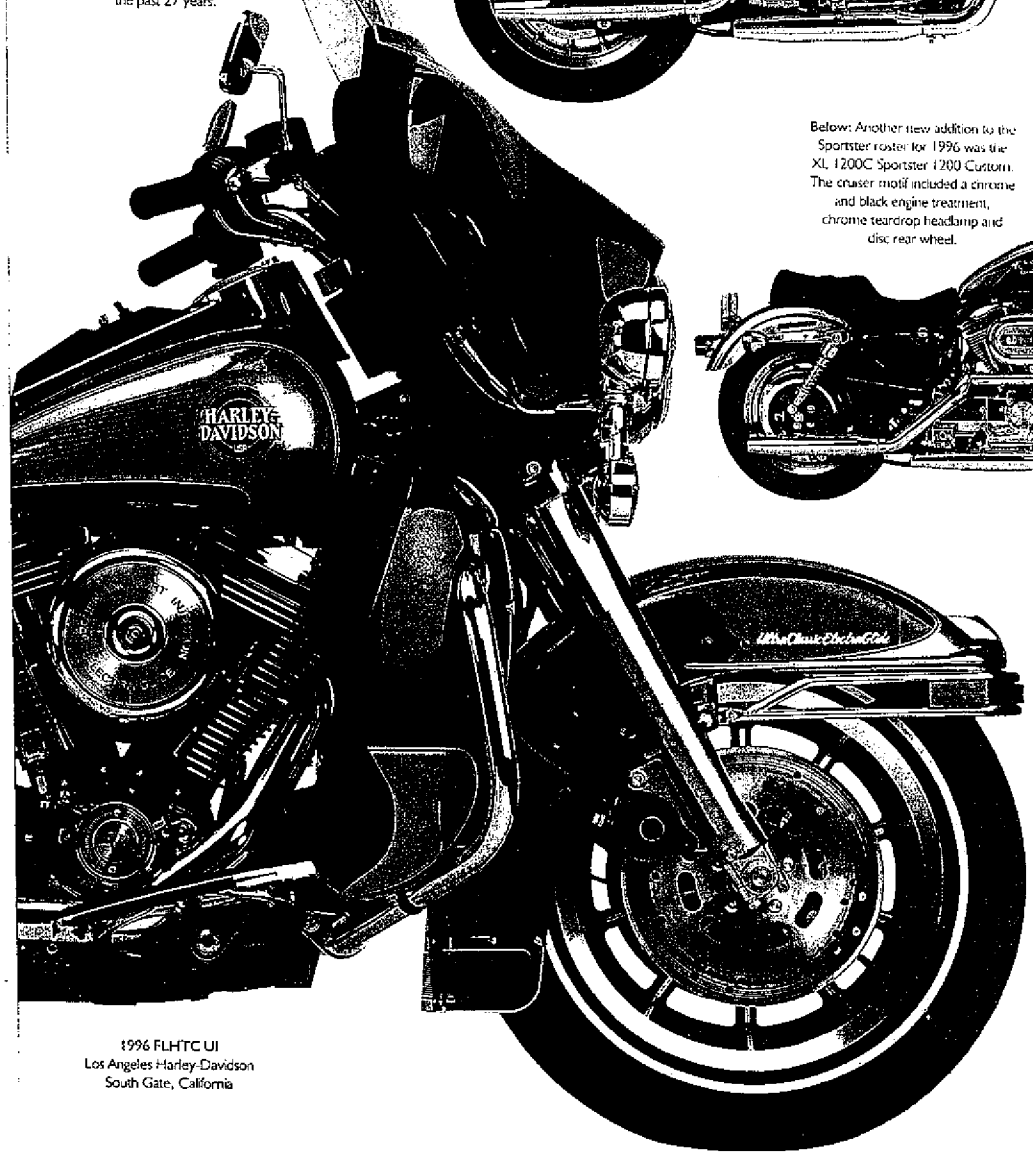
Below: The bar-mounted fairing has been a favorite of Harley touring riders since 1969. Styling of the fairing and luggage has changed only slightly in the past 27 years.

Below: Another new addition to the Sportster roster for 1996 was the XL 1200C Sportster 1200 Custom. The cruiser motif included a chrome and black engine treatment, chrome teardrop headlamp and disc rear wheel.

1996 XL 1200C
Bartels' Harley-Davidson
Marina Del Rey, California



Above: The Sporty Custom has a spoked 21 inch (53.3cm) front wheel and shorter suspension at both ends, so seat height is nearly two inches less than the Sport. The three-dimensional elongated tank emblem is unique to the Custom.



1996 FLHTC UI
Los Angeles Harley-Davidson
South Gate, California

Left: The Ultra Classic is designed to accommodate varying loads on the open road. Front and rear suspension are air adjustable, with an anti-dive system at the front. Rider and passenger footboards are also adjustable.

FXSTSB (1996), BUELL S1 (1996) AND FLSTF (1996)

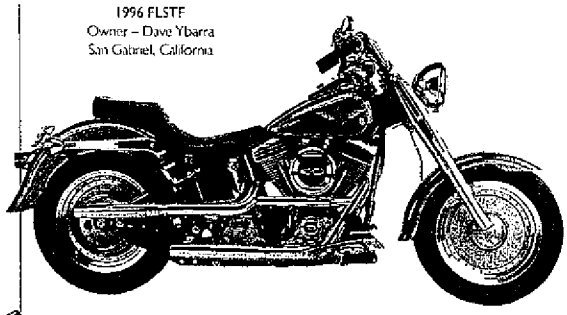
If the name Softail Bad Boy seems a contradiction in terms, just call it the FXSTSB for short. Whatever the designation, the latest Springer is a stylistic nod to the Knucklehead and the black-and-white movies of the 1940s. Jimmy Cagney would have ridden a Bad Boy.

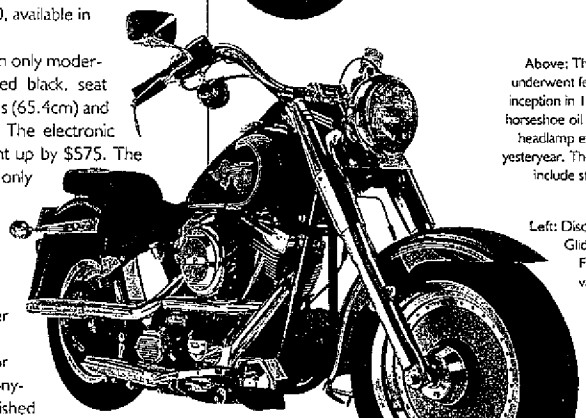
Introduced in 1995, the Softail Springer with-an-attitude traded chrome for the black outfit of the boulevard bandito. The Bad Boy wore the slotted disc rear wheel of the Custom and the smaller 4.2-gallon (15.9lit) fuel tank of the Springer. The studded, deeply-stepped saddle and forward-mount foot controls put the rider in the classic sit-up-and-beg posture. With seat height an inch (2.54cm) less than the Sportster Hugger, the rider sits more in than on the bike. The price was $13,850, available in any color so long as it was black.

The Bad Boy carried over to 1996 with only moderate revisions. More chrome had turned black, seat height dropped still lower to 25.75 inches (65.4cm) and the machine lost five pounds (2.27kg). The electronic speedometer arrived and the price went up by $575. The Black Bart color scheme remained the only option, but the tank and fender graphics were offered in choices of either yellow, purple or turquoise.

Designer Willie G. Davidson has shown an affinity for black motorcycles, as evidenced by the XLCR Cafe Racer and the Sturgis. The classic British machines such as the Brough Superior and Vincent Black Shadow were ebony-coated constructs with chrome and polished

1996 FLSTF
Owner – Dave Ybarra
San Gabriel, California

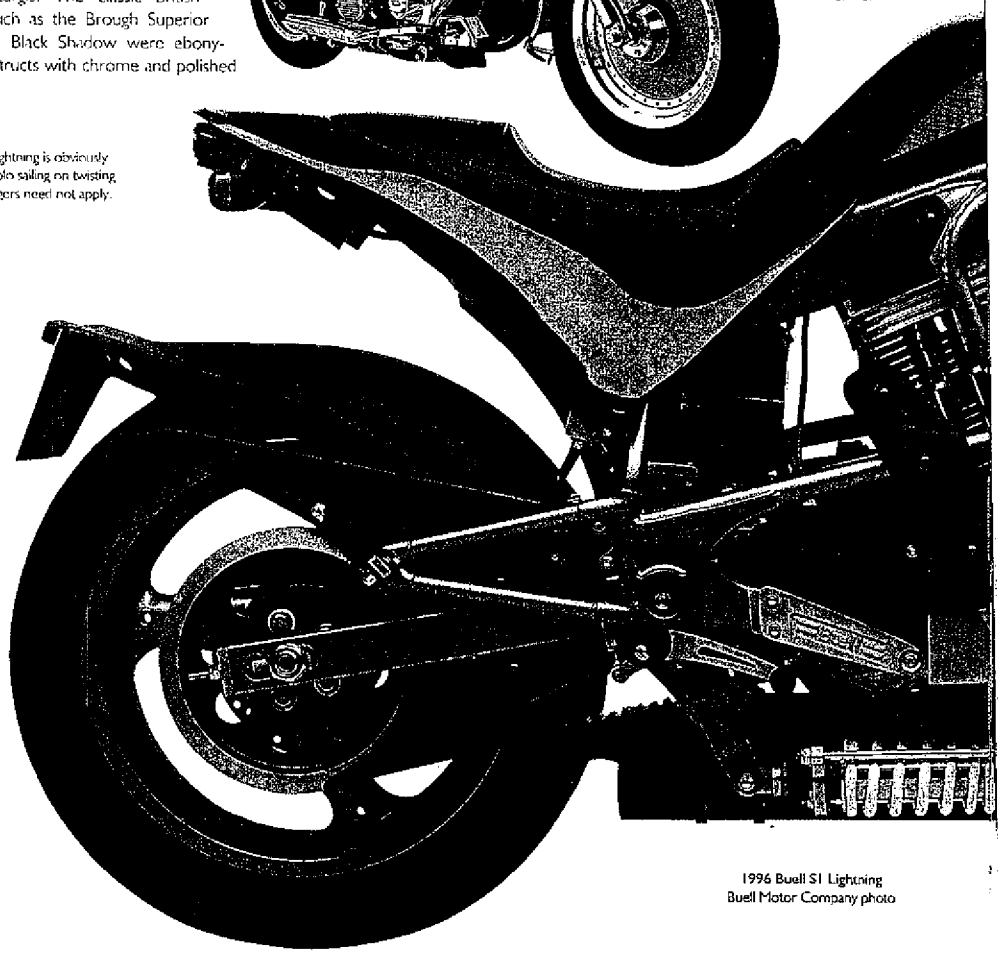




Above: The FLSTF Fat Boy underwent few changes since its inception in 1990. The traditional horseshoe oil tank and big chrome headlamp evoke memories of yesteryear. The color chart grew to include states blue pearl.

Left: Disc wheels and a Hydra-Glide fork distinguish the Fat Boy from garden variety nostalgia bikes. The enlarged tank emblem was new for '96.

Right: The Lightning is obviously designed for solo sailing on twisting roads. Passengers need not apply.



1996 Buell S1 Lightning
Buell Motor Company photo

1996 FXSTSB

Specifications
Engine/Drivetrain
Engine: OHV 45° V-twin
Displacement: 81.65ci (1338cc)
Bore & stroke: 3.5 x 4.25in. (89 x 108mm)
Compression ratio: 8.5:1
Torque: 76lb-ft @ 3,500
Carburetion: 38mm Keihin
Transmission: 5-speed
Primary drive: Duplex chain
Final drive: Belt
Brakes: F. and R. Disc
Battery: 12-volt
Ignition: CDI

Chassis/Suspension
Frame: Steel, double downtube
Suspension: F. Telescopic fork. R. Shocks
Wheelbase: 64.4in (163.6cm)
Weight: 635lb (288kg)
Fuel capacity: 4.2gal (15.9lit)
Oil capacity: 6qts (2.8lit)
Tires: F. MT90-21
R. MT90-16
Top speed: 110mph (177km/h)
Colors: Vivid black with yellow, purple or turquoise graphics
Number built: [illegible]
Price: [illegible]

1996 BUELL S1

Specifications
Engine/Drivetrain
Engine: [illegible]
Displacement: [illegible]
Bore & stroke: [illegible]
Compression ratio: [illegible]
Horsepower: [illegible]
Carburetion: [illegible]
Transmission: [illegible]
Primary drive: [illegible]
Final drive: Belt
Battery: 12-volt
Ignition: CDI

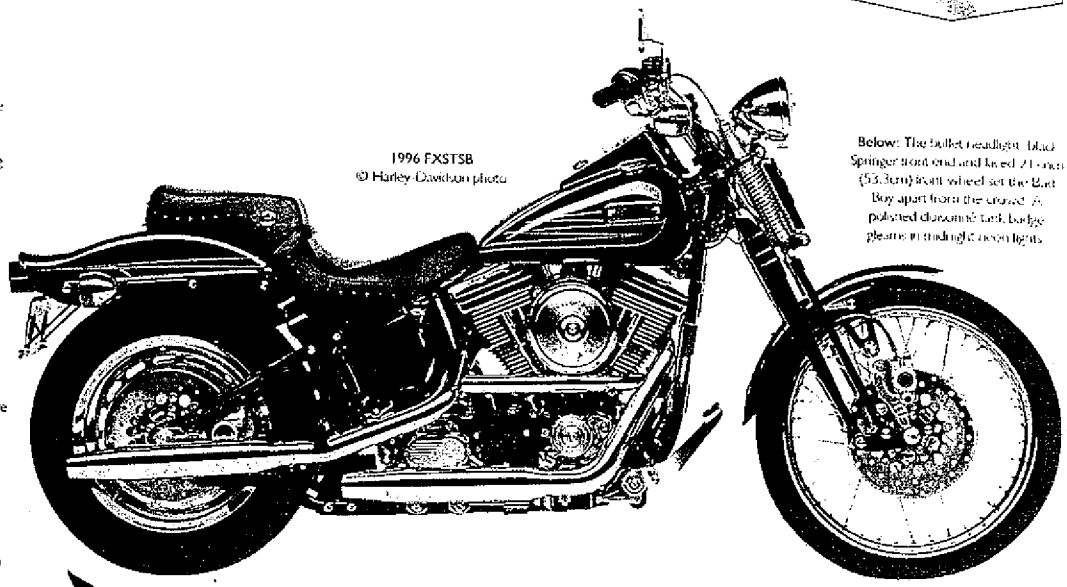
Chassis/Suspension
Frame: Chrome-moly perimeter
Suspension: F. WP inverted fork, adjustable. R. WP extension shock, adjustable
Wheelbase: 55in (140cm)
Weight: 440lb (200kg)
Fuel capacity: 4.0gal (15.1lit)
Oil capacity: 2.6qts (2.5lit)
Tires: F. 120/70-17.
R. 170/60-17
Top speed: 130mph (209km/h)
Colors: Red snap; carbon black; high voltage yellow
Number built: 1,407
Price: $9,995

Right: The Buell S1 Lightning is strong evidence that Erik Buell's heart remains on Racer Row. Aluminum subframe and rear suspension are new. Wheels are 17-inch cast aluminum jobs made [illegible]

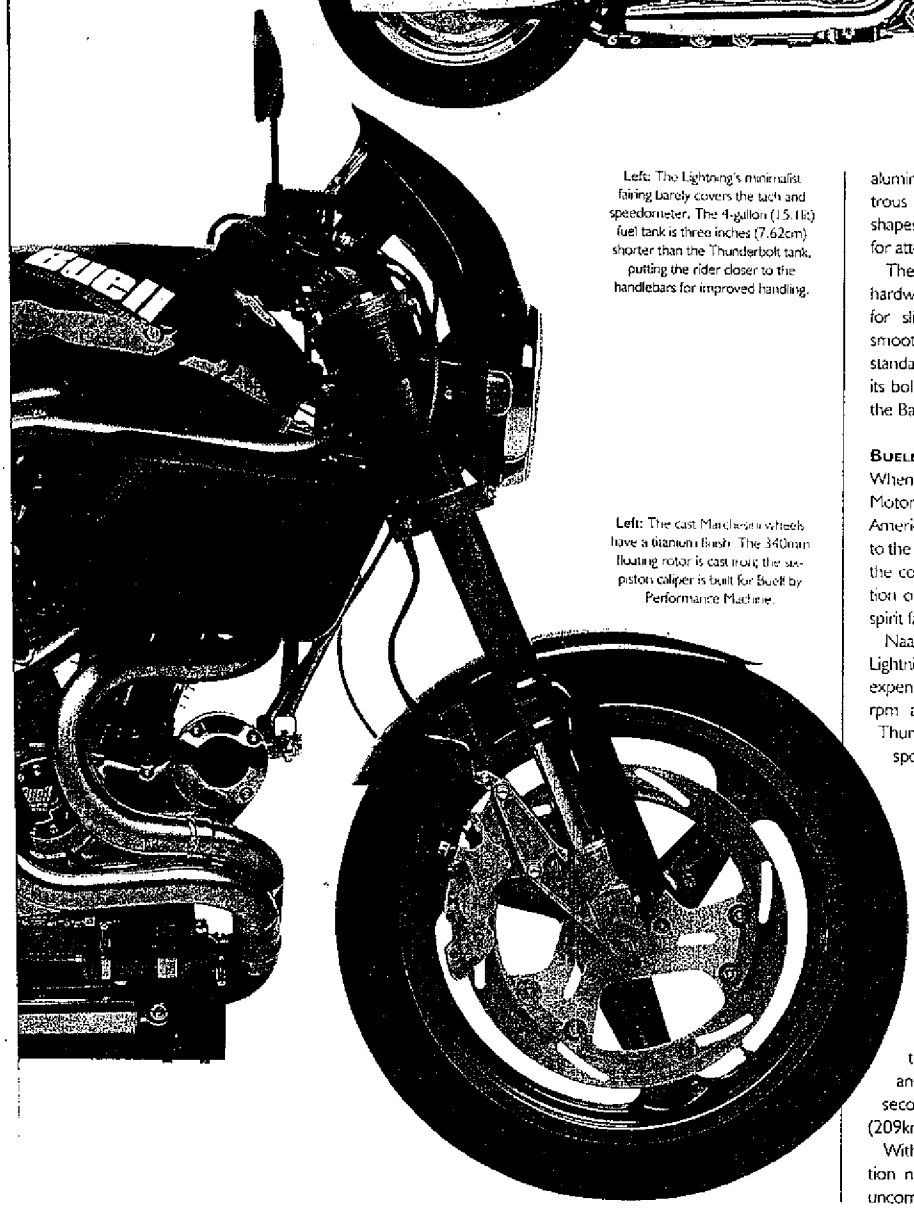
Right: The FXSTSB Bad Boy is the leaner, and marginally meaner, cousin to the Fat Boy. Their vital specs are nearly identical, including the lowest seat of all the Harleys.

1996 FXSTSB
© Harley-Davidson photo

Below: The bullet headlight, black Springer front end and laced 21-inch (53.3cm) front wheel set the Bad Boy apart from the crowd. A polished chromium tank badge gleams in midnight neon lights.



Right: The Bad Boy owes a measure of its machismo to the massive slotted disc rear wheel.



Left: The Lightning's minimalist fairing barely covers the tach and speedometer. The 4-gallon (15.1lit) fuel tank is three inches (7.62cm) shorter than the Thunderbolt tank, putting the rider closer to the handlebars for improved handling.

Left: The cast Marchesini wheels have a titanium finish. The 340mm floating rotor is cast iron; the six-piston caliper is built for Buell by Performance Machine.

aluminum highlights. Something about big motorcycles and lustrous black finish complements both the mechanical bits and the shapes and lines of the overall design, without colors competing for attention.

The Bad Boy rekindles the imagery of the past framed in the hardware of the present. The Softail chassis geometry was revised for slightly more rear wheel travel, and the new quieter, smoother-shifting gearbox and slotted floating disc brakes bring standards of contemporary performance. But the Bad Boy sells on its bold profile and patent leather sheen; Milwaukee's version of the Batmobile.

Buell S1 Lightning

When Harley-Davidson acquired 49 percent interest in the Buell Motorcycle Company, the prospects for a genuine made-in-America sport bike dimmed somewhat. And the subsequent shift to the sport-touring configuration of the Thunderbolt underscored the concern. Would Harley-Davidson dictate the style and function of Buell motorcycles? Would the independent skunk works spirit fade with the pressure of Big Money from Milwaukee?

Naah. If anyone thought that Buell had gone soft, the S1 Lightning answered their concerns. The sportier, and $2,000 less expensive, model got 10:1 compression, 91 horsepower at 5,800 rpm and a curb weight of 440 pounds (200kg). That the Thunderbolt is designated S2 and the Lightning S1 indicates that sport performance had not been demoted as a priority.

Though the chassis are the same, the Lightning differs from the Thunderbolt in most other respects. The small windscreen, 4-gallon (15.1lit) tank, seat/tail section and rear fender are unique to the Lightning, which is 25 pounds (11.3kg) lighter than the Thunderbolt. Add the 15-horsepower increase and the S1 takes a large stride in acceleration and speed. With the footpegs two inches (5cm) farther aft, the Thunderbolt rider adopts a posture closer to the racing crouch.

Another obvious distinction is the Thunderbolt airbox, designed to flow more air to the high-performance engine and simultaneously subdue intake noise. The curiously low-tech muffler was also enlarged to exhaust spent gases quickly and quietly. The S1 turns in quarter-mile times under 12 seconds at 114 mph (183km/h), with a top speed of 130 (209km/h).

With Harley-Davidson as partner, engine supplier and distribution network, the future of Buell's American sport bike looks uncommonly bright.

1903 1905 1906 1907 1908 1909 1910 1911 1912 1913 1919 1921 1922 1923 1926 1929 1930 1932 1935 1936 1937

First single — 27in single — Model 4 — 45in Servi-Car

First V-twin

5-35 single (to 1920)

CD single

50in D

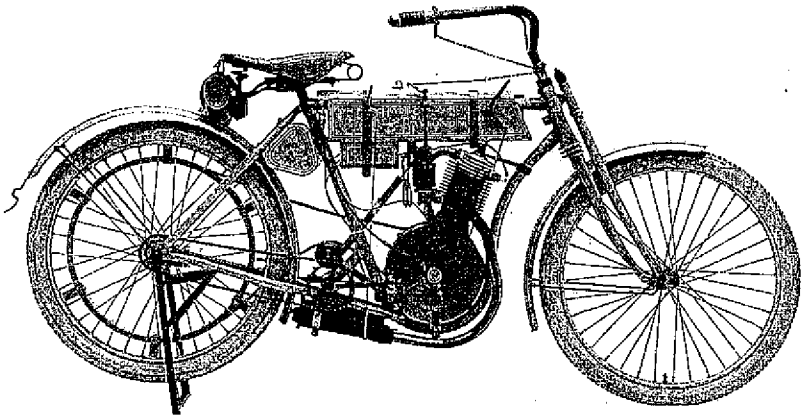
61in E,F,J — 74in JD — 74in VL side valve — UL

80in VL — UL

37in W Sport Twin — 61in OHV EL

21in A & B OHV AA & BA

45in D — R — WL



30.50 Model C

1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990

(Servi-Car)

(FL) — FLH1200 — FLHS — FLH80 — FLH80 Classic — FLHS — FLHF Heritage — FLHTC/ FLHT — FLHTC/ Liberty & Special Ann. — FLHTC Special Ann. — FLHTC Ultra Classic

FLT Tour Glide — FLT Classic — FLTC Sp. Ann — FLST Special — FLTC Tour Glide Ultra Classic

FLST Heritage — FLHS Sport

FLSTF Fat Boy

(XL) — XLH / XLCH1000 — XLT / XLCR — XLS — XLS Roadster / Custom Sport — XLH/XLSA Anniver. — XLH Evo — XLH Ann. — XLH Hugger / XLH1200

XLX61 — XR1000

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FXSTC Custom

FXEF1200 - FXEF80 Fat Bob — FXR 5-speed — FXR/FXRS Super Glide II — FXRT Tour Glide — FXRS Sport Glide — FXRS Liberty and Special Anniv. Edn — FXRC Special — FXDS Convertible

FXSB Belt FXRDG — FXRS Low Rider — FXRS Low Glide — FXRD Touring — FXLR Custom

FXRS Sport

XR750 — XR750 aluminium engine — Engines only

(SS350) — SX350

(Rapido) — TX125 — SS125 — SXT125 — SX175 — SS175

100cc Baja — SR100

(M65) — Shortster — Z90 / X90 — SS250 — SX250

1941 1942 1945 1947 1948 1949 1951 1952 1954 1957 1958 1959 1960 1961 1962 1963 1965 1966 1967 1968 19

74in FL — 74in FL Panhead — FL Hydra-Glide — FL Duo-Glide — FL Electra-Glide

45in K — 55in KH

WLA Army Special

XL Sportster

XA 750 Army

125 Model S — 125cc Telaglide — 165cc engine — Ranger trail bike

125cc Hummer

175cc Pacer — 175cc Bobcat

175cc Scat

125cc Topper

250cc Sprint C — 250cc Sprint SS

250cc Sprint H (trail) — 250cc Sprint H

SS350 S

125cc Rapido

M50 — M50S — M65

1991 1992 1993 1994 1995 1996 1997

FLTCU injection

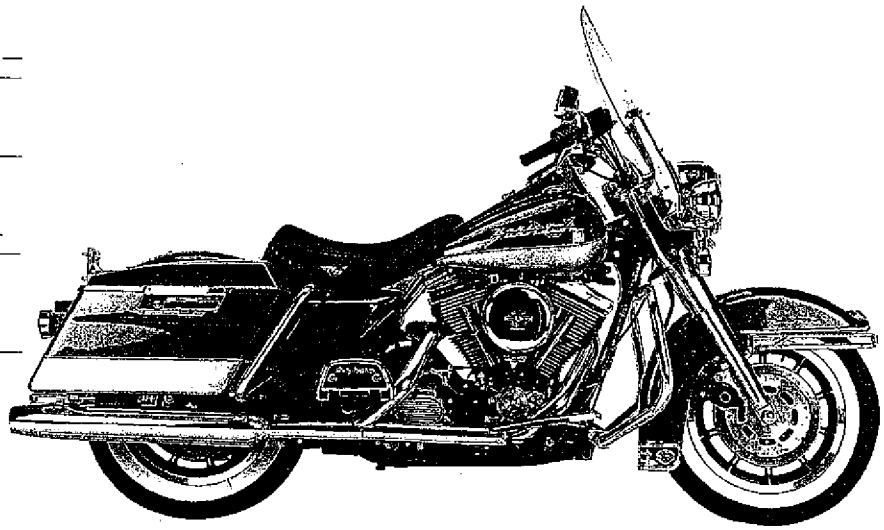
FLH Road King — FLHTC (fuel injection) — FLHR injection

FLSTN Heritage Softail Nostalgia

XLH 5-speed belt-drive — XL1200 Sport — XL1200 Custom

VR1000

FXDB Sturgis — FXDB Dyna Daytona — FXDC Dyna Custom — FXD Wide Glide — FXD Low Rider — FXSTSB Bad Boy — FXD series (new frame)



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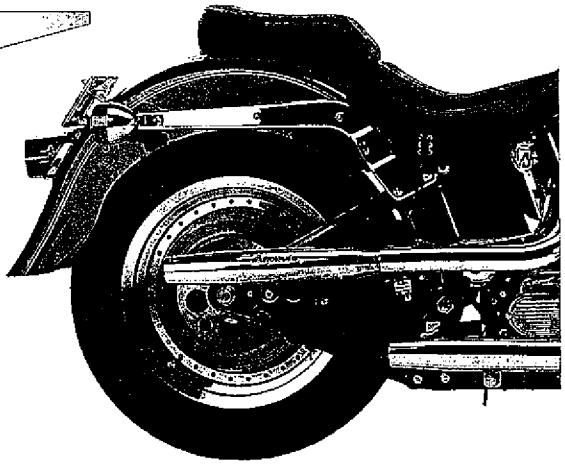

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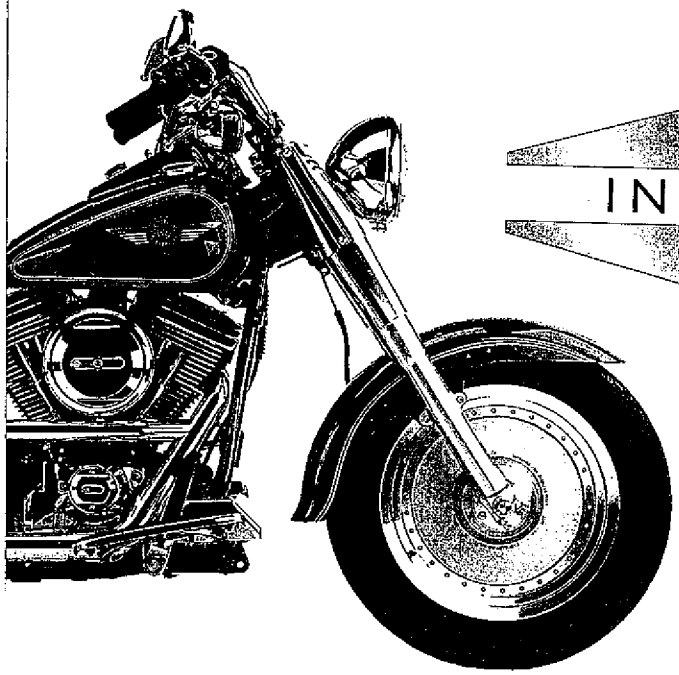

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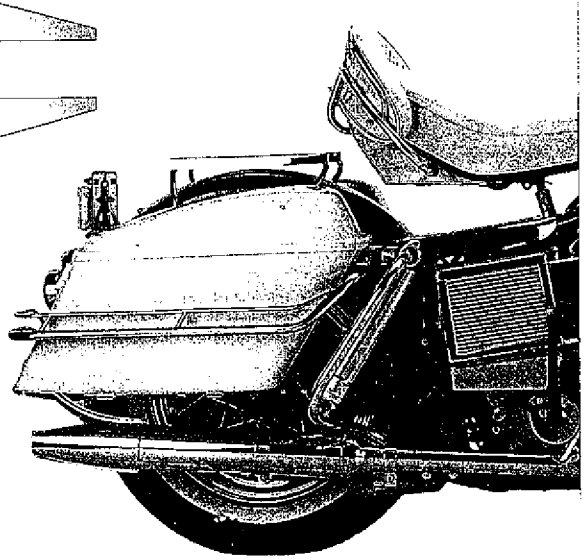

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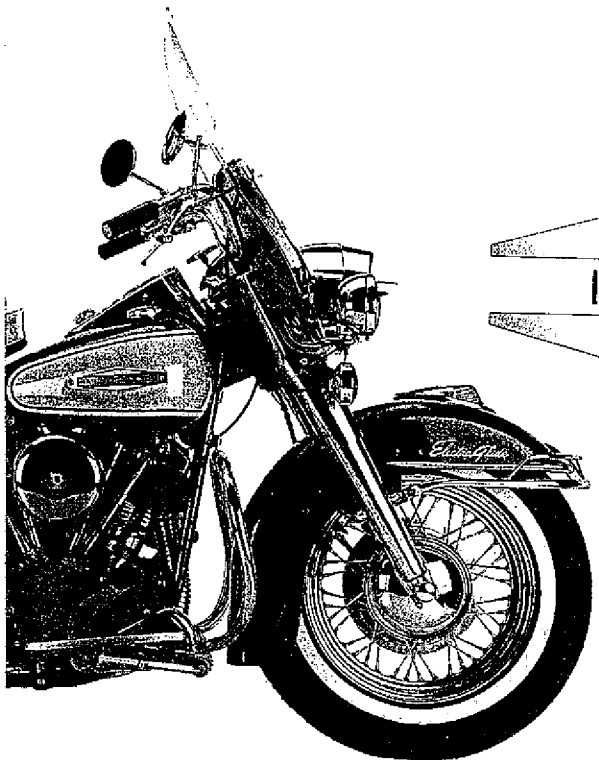

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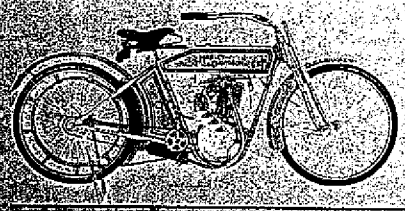

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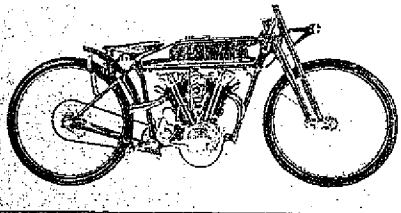

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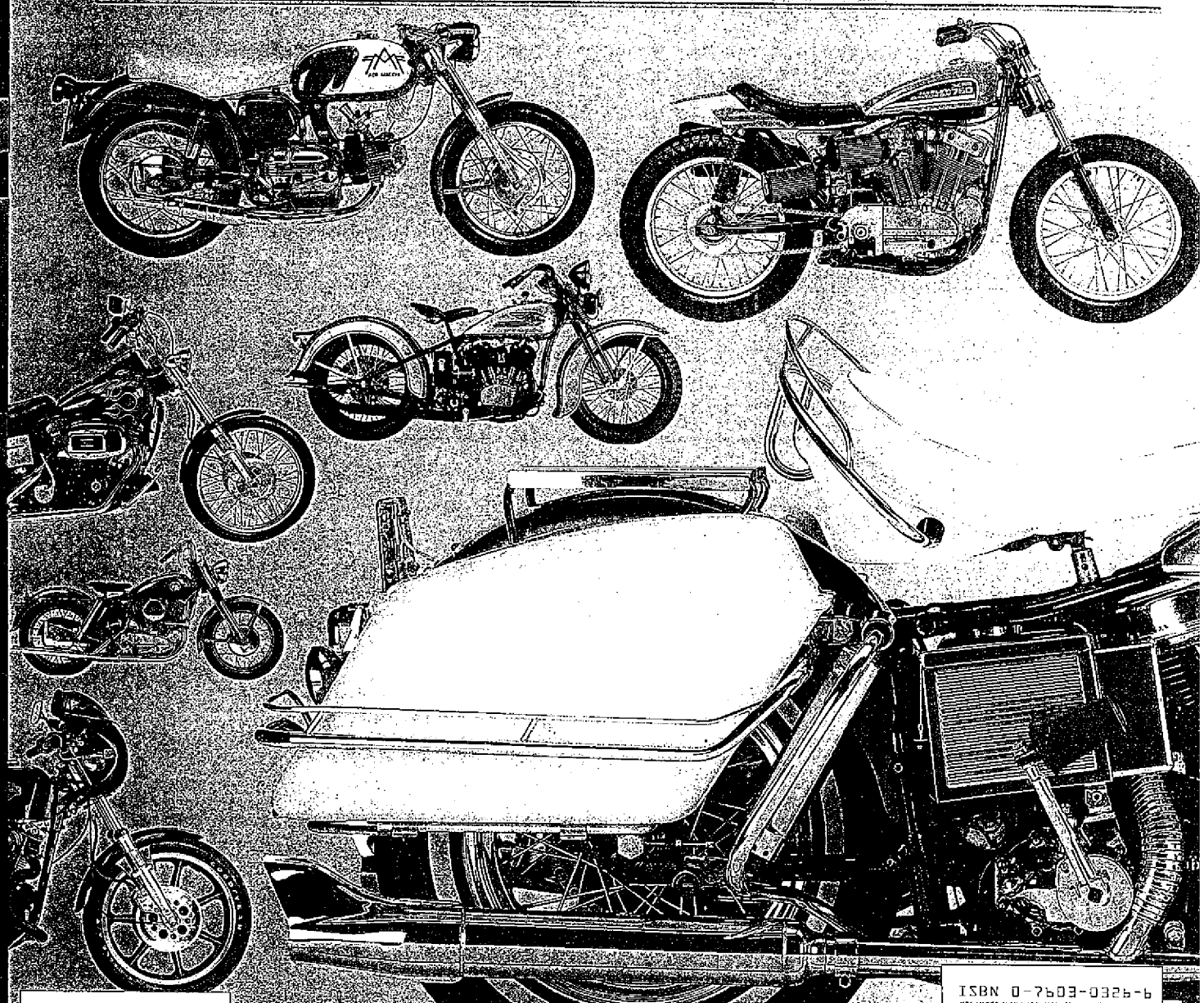

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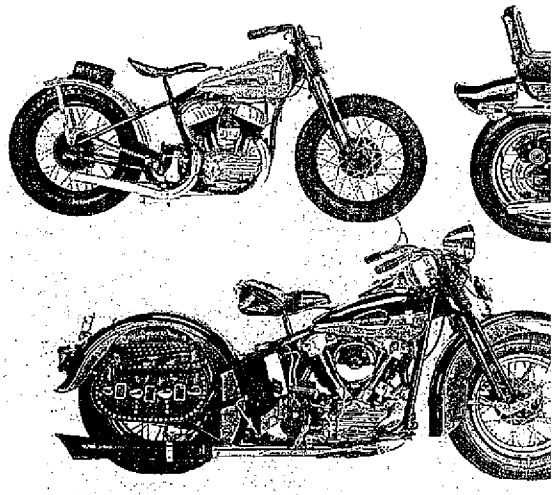

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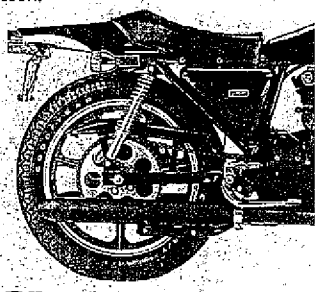

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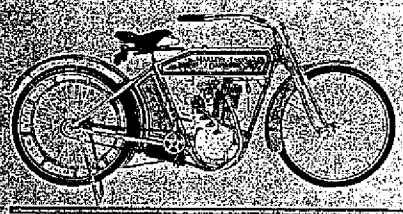

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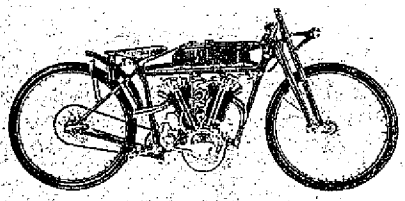

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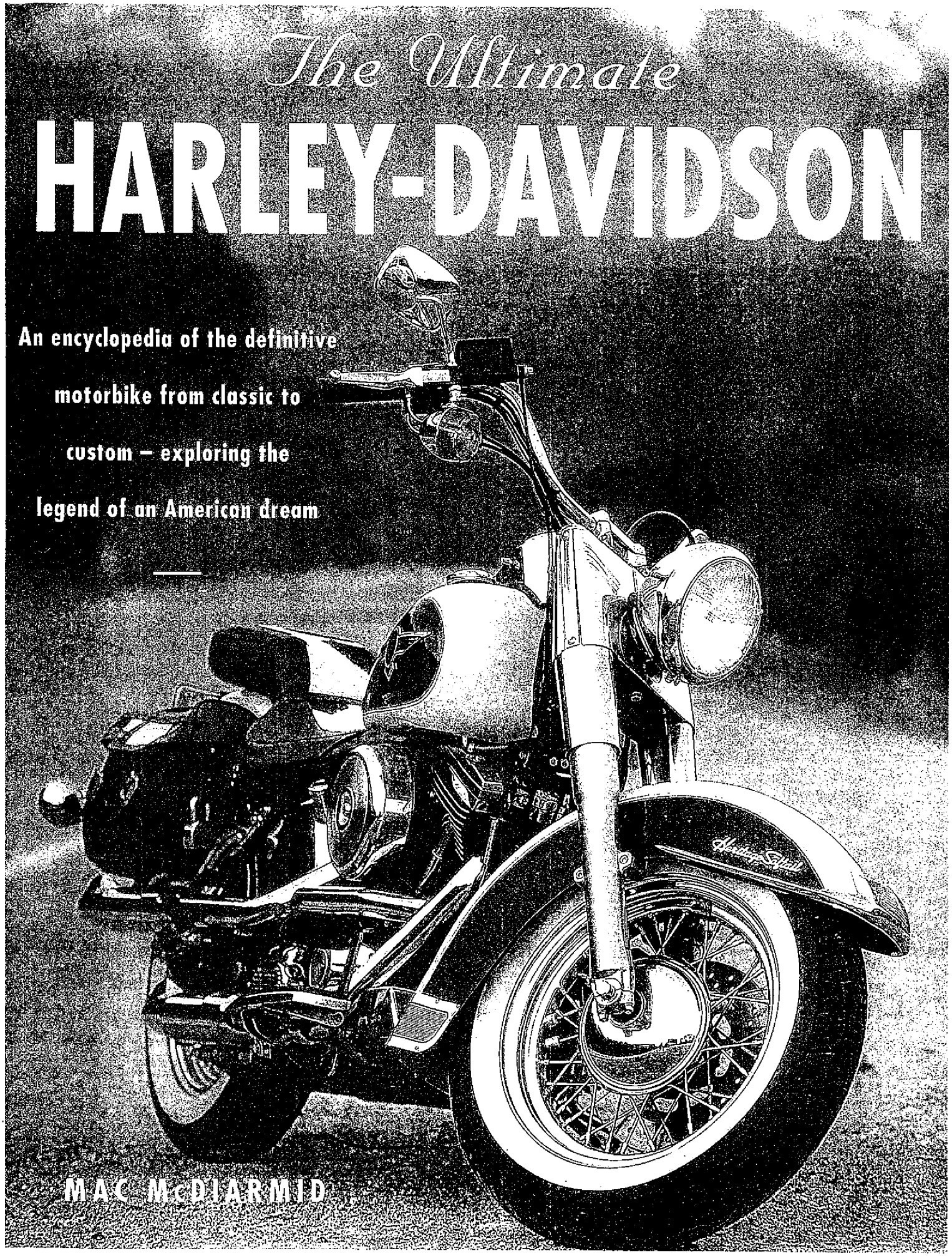

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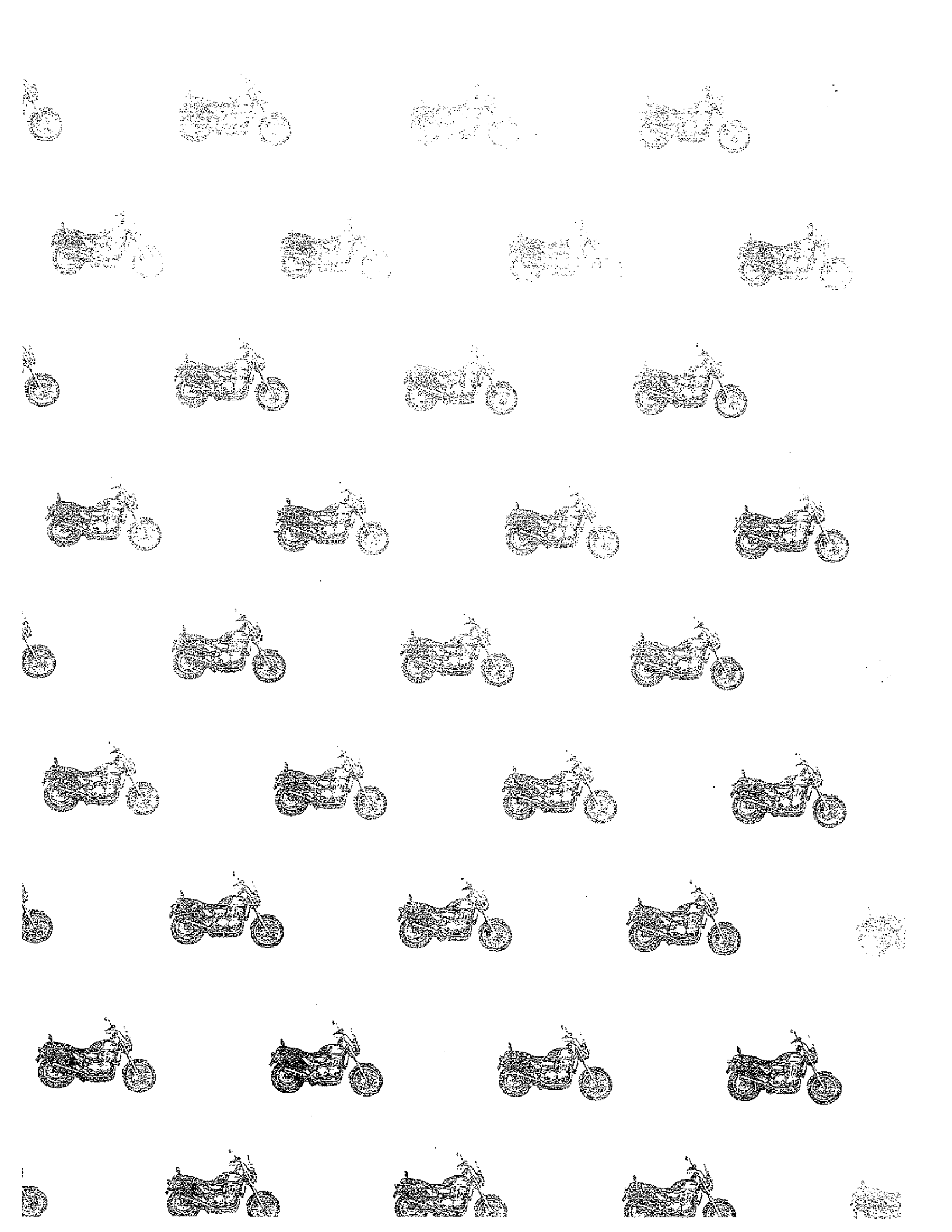

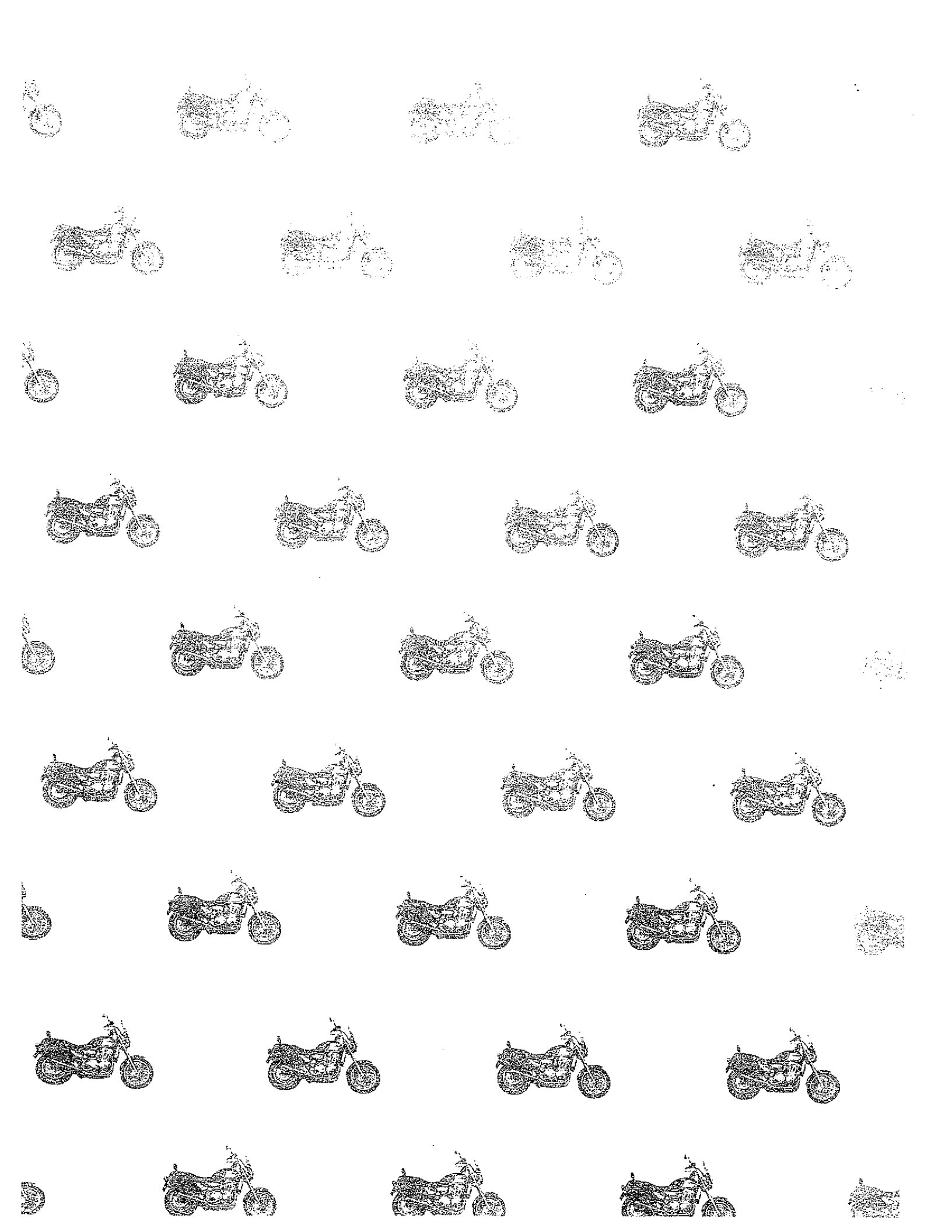

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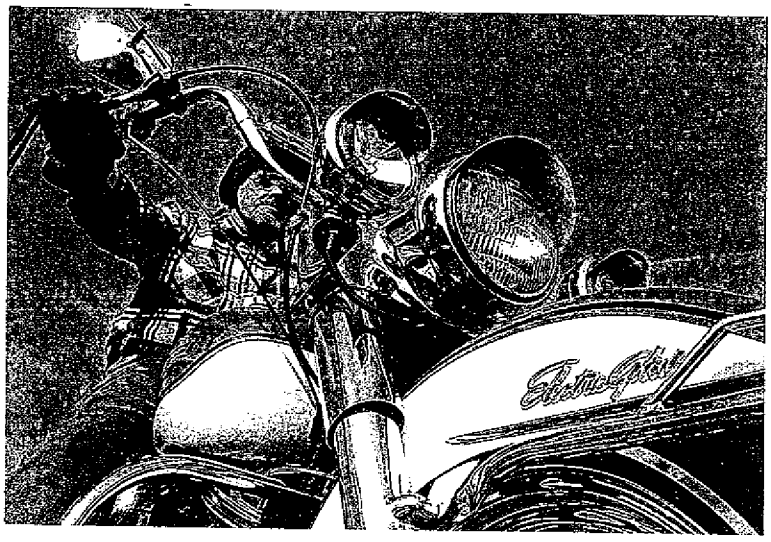

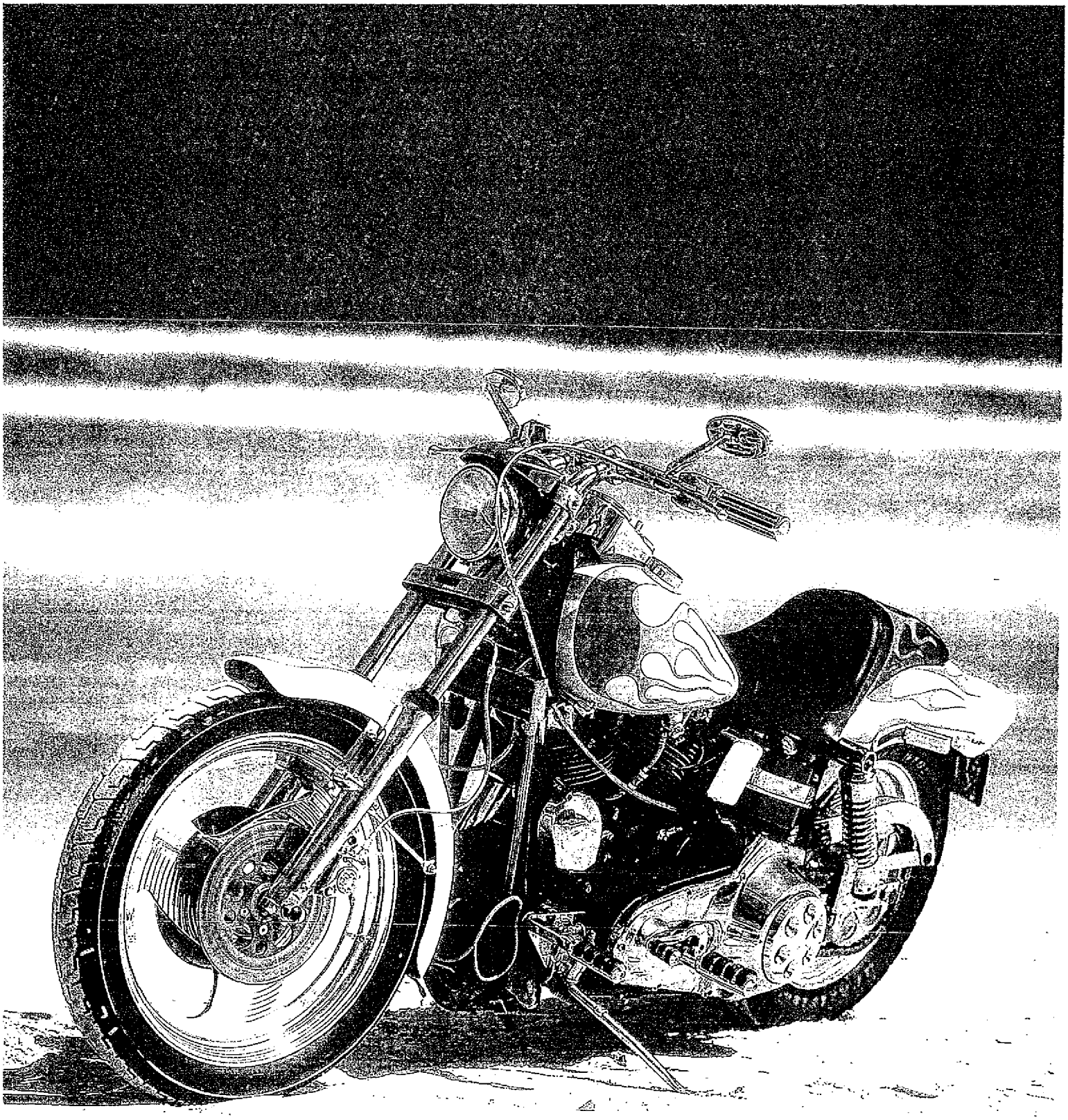

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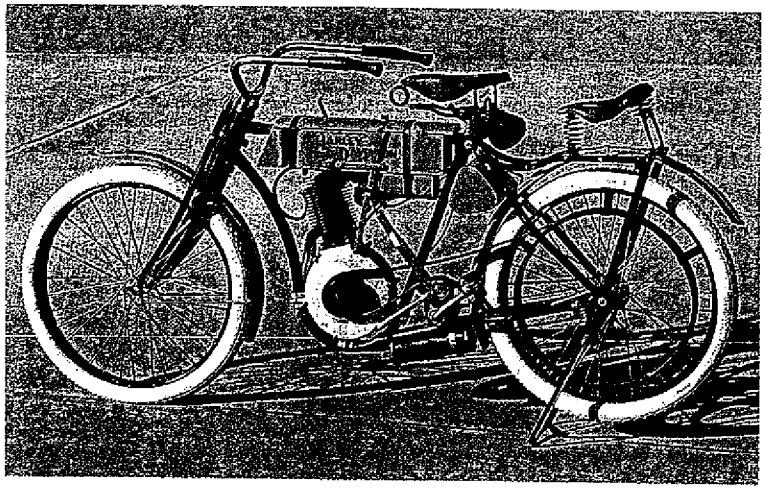

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Publisher's note

In recognition of the uniquely American pedigree of the motorcycles featured on the following pages, engine capacity is generally expressed in imperial units (cubic inches) with the metric equivalent (cc) in brackets. However, even Harley-Davidson employ units somewhat arbitrarily, favouring cu in for heavyweight twins, but ccs for Sportster models, a practice we have also adopted.

The capacity of Harley engines should also be treated with some care. Even from the early days, the inch sizes quoted and used by Harley fans were a sort of numeric shorthand, relating only approximately to measured reality. More recently, even the "80-inch" Evo engine actually measured 81.8cu in – a difference of no less than 29cc. In general, where an engine is referred to as something-inch, this refers to popular usage. Dimensions expressed in cu in and/or cc are as accurate as records permit.

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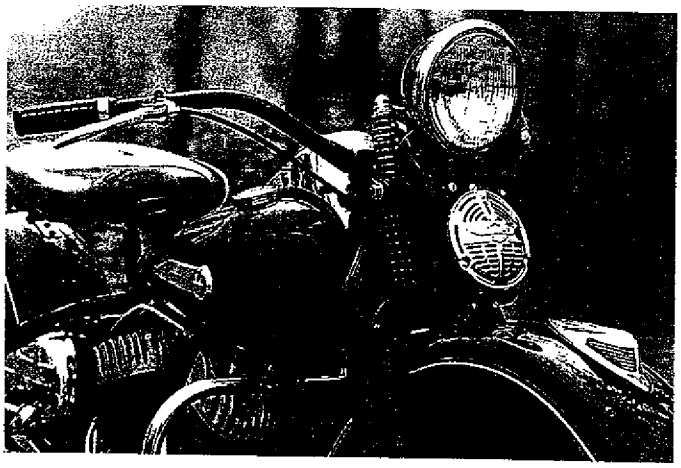

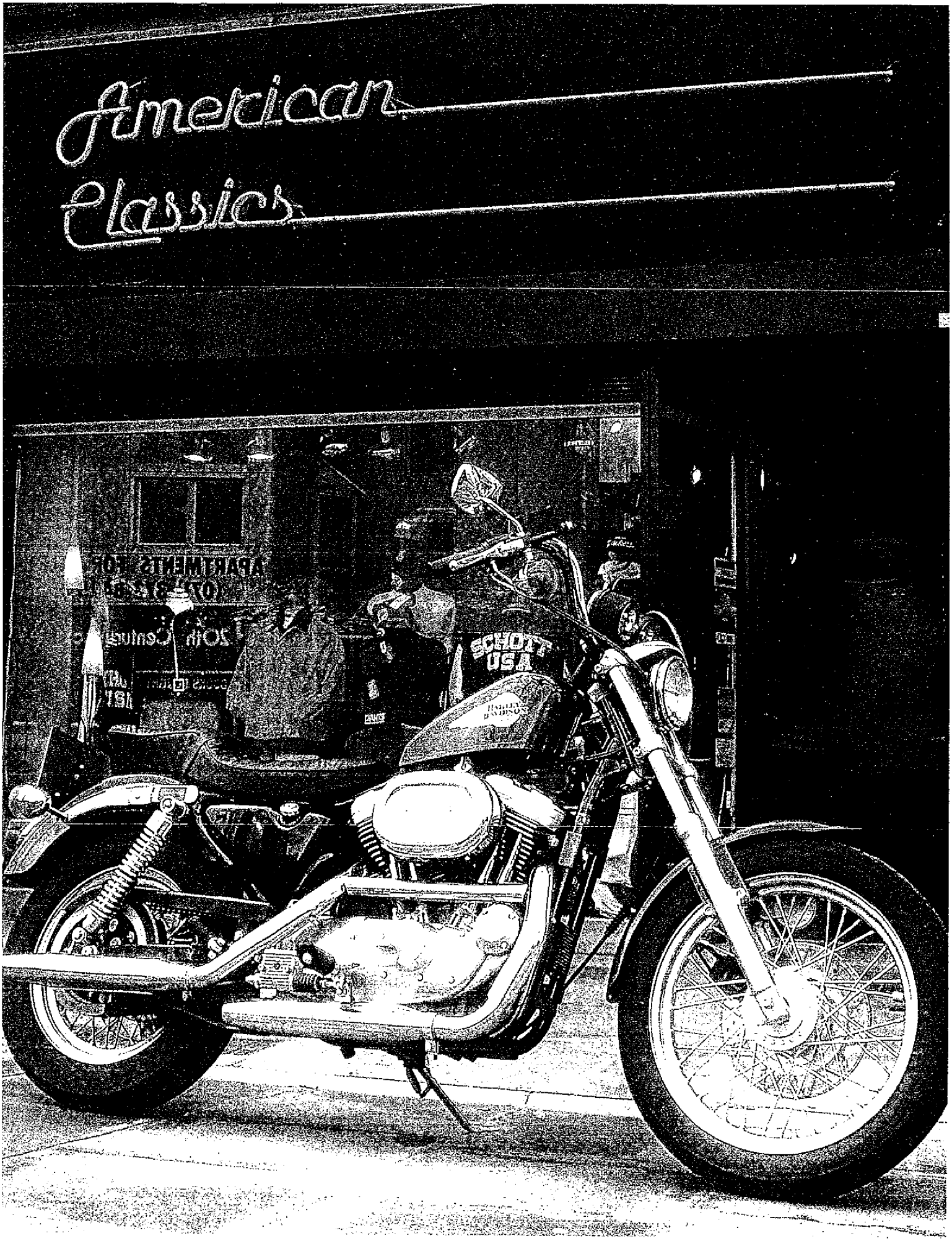
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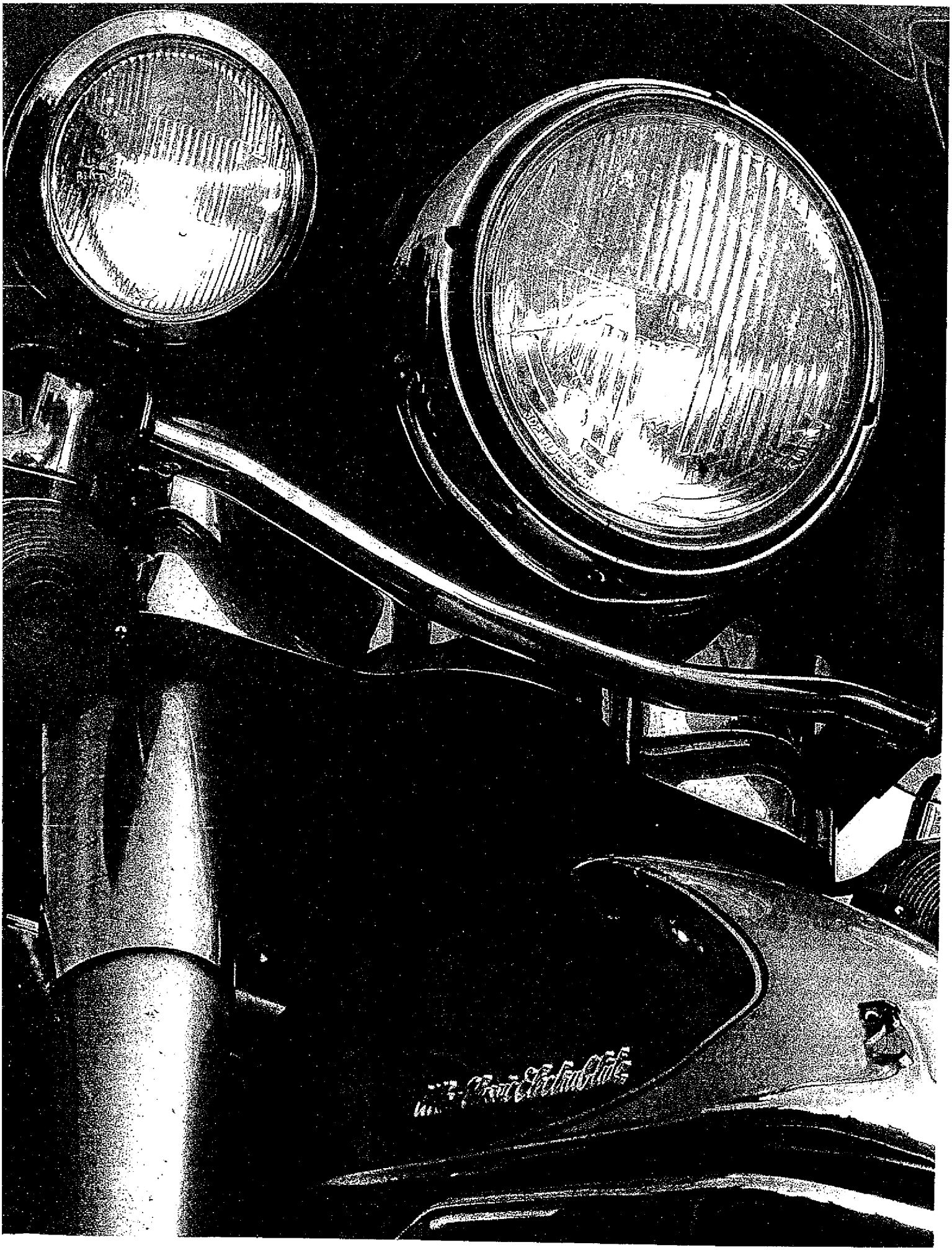
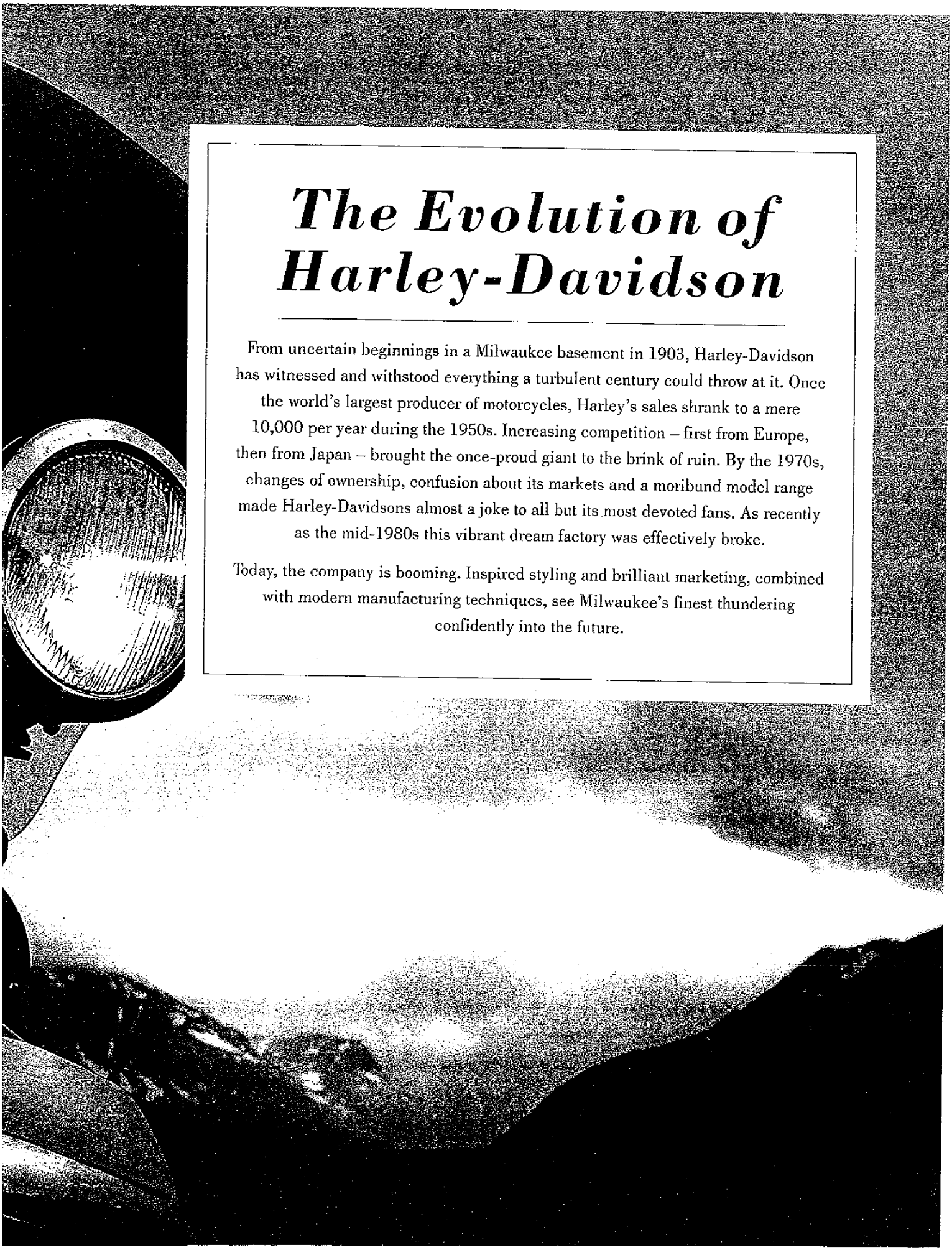
THE WORLD OF HARLEY-DAVIDSON

"If you have to ask..." said the Harley-Davidson slogan, "...you wouldn't understand." Just what is it that makes Harley-Davidson so special? The company makes motorcycles, true, but it is much more than a mere motorcycle manufacturer -- Milwaukee makes legends. The company that has become an American icon crafts heavy metal into love affairs, forges lifestyles and fulfils dreams. As much myth as motorcycle – often imitated, never copied – there is simply nothing quite like a Harley-Davidson.

Today, Harleys are as recognizable around the world as the Stars and Stripes, as ubiquitous as McDonald's and as prized for their rugged honesty as Zippo lighters and Levi's. They appear in movies and advertising; they're the wheels of choice for celebrities and stars. Elvis owned one and, according to the T-shirt at least, God rides one too. Men have raced them almost as soon as the first one came out of the shop. They have been a unique facet of American life through two world wars and a crippling Depression.

Harley-Davidson's is the longest history in motorcycling, almost the story of motorcycling itself, and *The World of Harley-Davidson* is the epic tale of the making of an American legend.





The Evolution of Harley-Davidson

From uncertain beginnings in a Milwaukee basement in 1903, Harley-Davidson has witnessed and withstood everything a turbulent century could throw at it. Once the world's largest producer of motorcycles, Harley's sales shrank to a mere 10,000 per year during the 1950s. Increasing competition – first from Europe, then from Japan – brought the once-proud giant to the brink of ruin. By the 1970s, changes of ownership, confusion about its markets and a moribund model range made Harley-Davidsons almost a joke to all but its most devoted fans. As recently as the mid-1980s this vibrant dream factory was effectively broke.

Today, the company is booming. Inspired styling and brilliant marketing, combined with modern manufacturing techniques, see Milwaukee's finest thundering confidently into the future.

EARLY YEARS

In the early days of the 20th century, young men in dingy workshops across the industrialized world tinkered with an endless array of new-fangled mechanical contraptions. There may have been hundreds of such enthusiastic amateurs in Wisconsin alone, but it was the relatively untutored tinkering of two young Milwaukee men in particular that would give rise to an American legend.

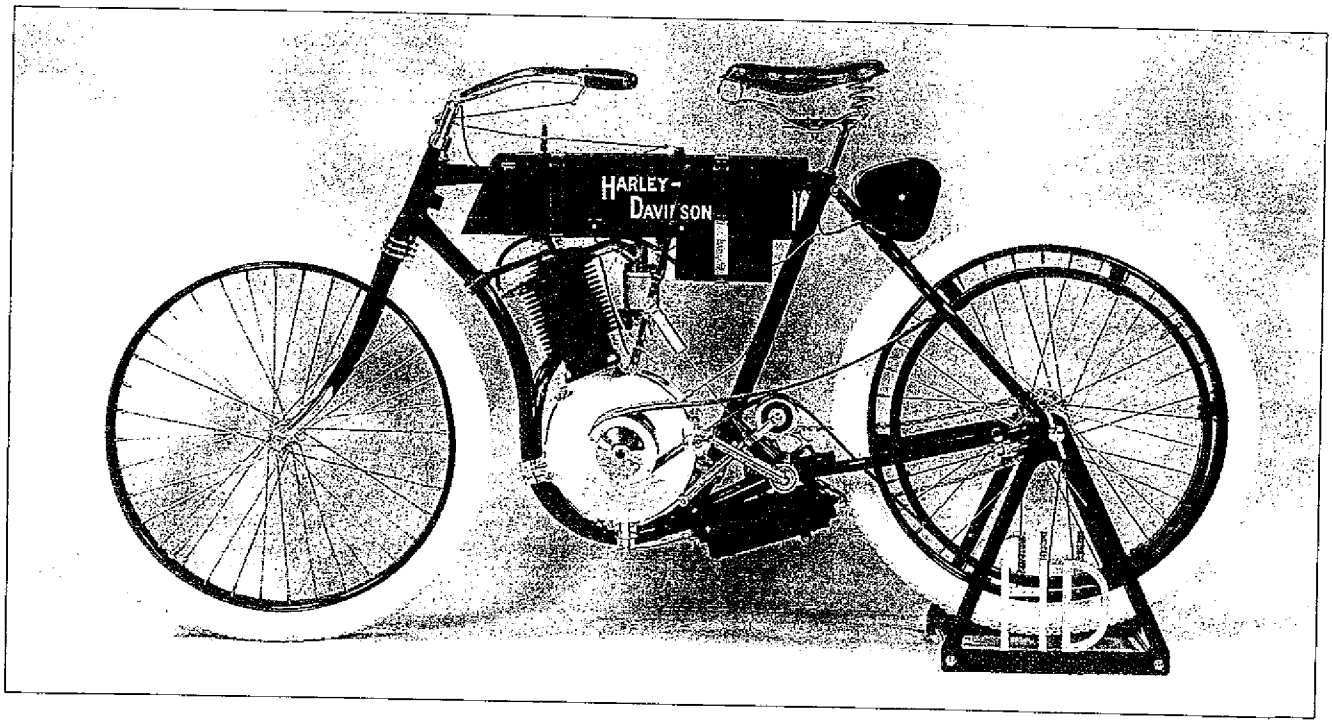
The story begins in 1900 – 15 years after Gottlieb Daimler created the world's first powered two-wheeler and only six years after the first production machine – when William Sylvester Harley and Arthur Davidson got together in a Milwaukee basement with motorcycling in mind.

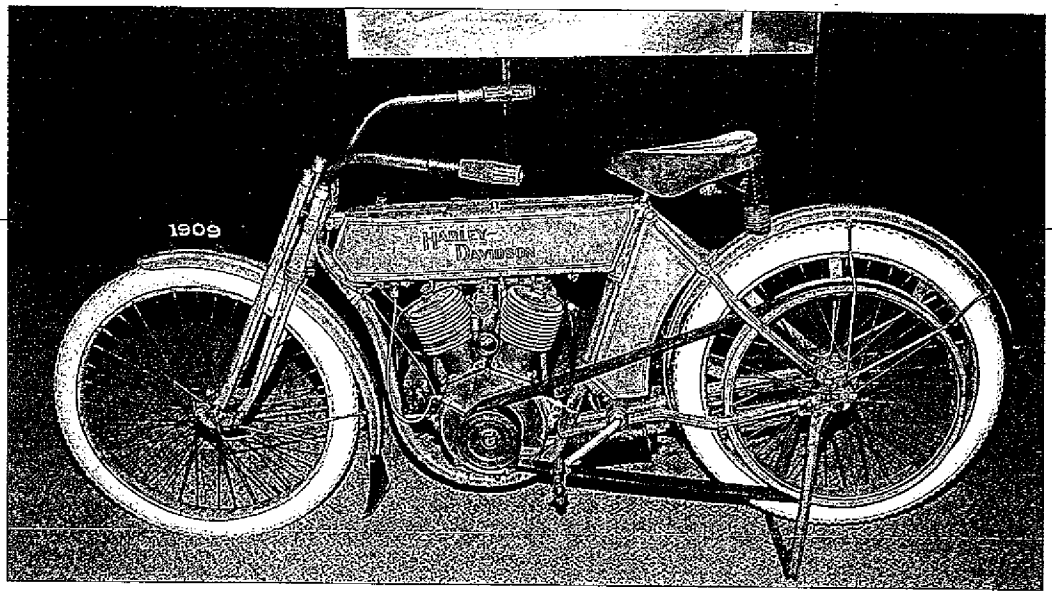
Information from these early years is sketchy, so the inspiration for their enthusiasm is unclear. A primitive motorcycle was demonstrated by its creator, Edward Joel Pennington, on nearby Wisconsin Avenue as early as 1895, though it's not clear whether the duo actually witnessed the event. They are known to have been impressed by a variety act five years later, however, in which comedienne Anna Held rode a French-built motorcycle across the stage of Milwaukee's Bijou theatre.

Harley was just 20 at the time, Davidson a year younger. The pair had been friends since their school days and, by accident or fate, had already accumulated some of the skills their

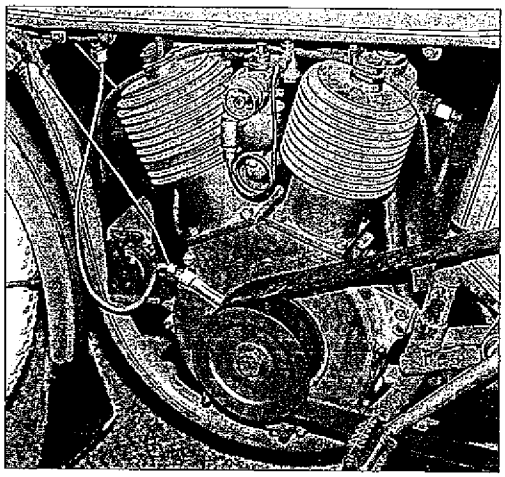
■ ABOVE *The founders, from left: Arthur Davidson, Walter Davidson, William Harley and William Davidson.*

■ BELOW *What is believed to be the very first production Harley-Davidson, now fully restored, enjoys pride of place in the Juneau Avenue lobby.*





■ RIGHT AND BELOW *The Model 5D twin from 1909 was essentially two singles on a common crankcase. Valve gear problems meant that only 27 were built. Production of an improved version began for 1911 with the Model 7D.*

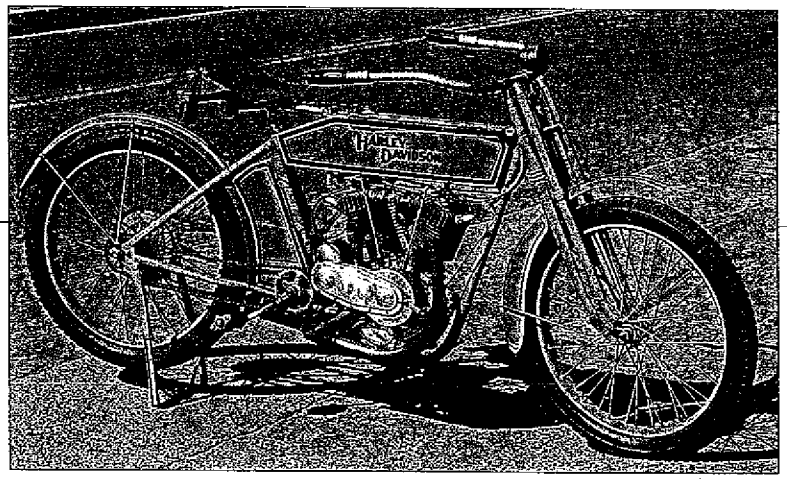


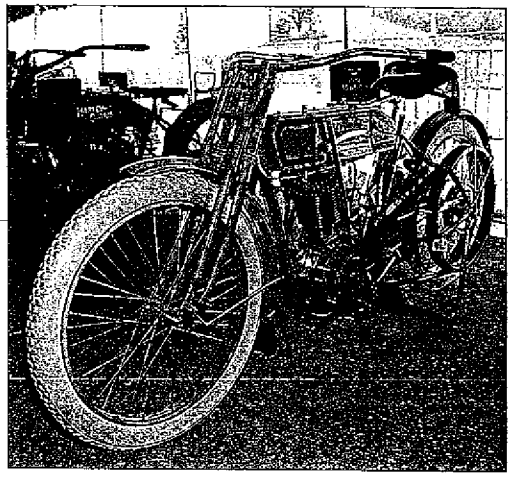
■ RIGHT *America's early road network was primitive, but motorcycles proved easier to manhandle than cars.*

dreams required by the time they began working together in that Milwaukee basement. Harley worked as a draughtsman and had six years of experience in bicycle manufacturing; Davidson was a pattern maker with the same company as Harley, working on small petrol (gas) engines. They were also fortunate enough to have working alongside them a German colleague familiar with pioneering European motorcycles. Work on the first Harley-Davidson engine began in 1900 or 1901 and was probably based on one of the do-it-yourself kits then available, itself roughly based on the French De Dion-Bouton design. A drawing dated 20 July 1901 shows a 7.07cu in (115.8cc) engine with a bore and stroke of 2 x 2.25in (50 x 55mm). When installed in a bicycle, power proved deeply disappointing.

At least one more prototype followed, including a machine capable of "thrilling speeds up to 25mph" and measuring 10.2cu in (167cc). It soon became clear that their venture required more expertise if it was ever going to get up to speed – beginning with the need for a skilled mechanic. Fortunately, Arthur's brother, Walter Davidson, was just such a man.

Walter was working as a railroad machinist in Parsons, Kansas, at the time, but was due in Milwaukee for the wedding of a third Davidson





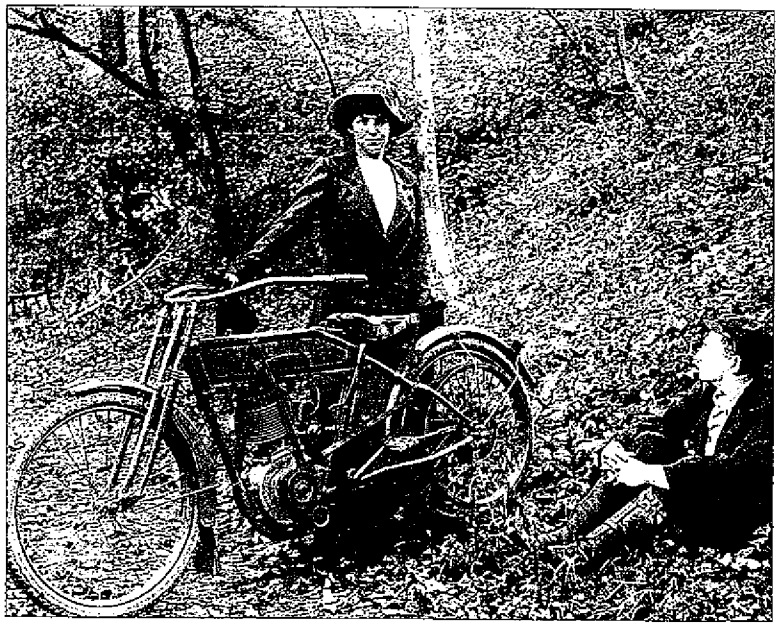
brother, William A. (Bill). Arthur wrote to Walter, offering him a ride on their new motorcycle. It was only later that he discovered ("imagine my chagrin") that he would have to help build it first. He must have liked the idea though –, enough to find work in Milwaukee and join the team. The founders became four when William, the eldest Davidson brother and a foreman railway toolmaker, jumped on board – and the four began the ride of their lives.

The machine recognized as the first true Harley-Davidson engine was built during 1902-3, by which time locally built Merkel and Mitchell motorcycles were already a familiar feature of Milwaukee life. Bore and stroke were 3 x 3.5in (76.2 x 88.9mm) for a displacement of 24.74cu in (405cc) but the Harley-Davidson engine incorporated many technical refinements. The new engine was of F-head layout, with much larger cooling fins than before, as well as much larger flywheels – almost 10in (250mm) across. Some of the machining was done on a lathe belonging to a friend, Henry Melk, while other parts were crafted illicitly as parts for foreign sales in the toolrooms of William A. Davidson's employers, the Chicago, Milwaukee and St Paul Railroad. Legend has it that the first carburettor was made from a discarded tomato can (although this could as easily refer to the 1901 engine), and Bill Harley later described its spark plug, which had cost the princely sum of $3.00, as being "as big as a doorknob".

■ ABOVE *By 1913 all Harley twins enjoyed all-chain drive, although the basic Model 9A single (right) continued with leather belt drive.*

■ BELOW *A well-to-do couple with a Model 9A, pictured in 1913.*

Assistance with the design came from Arthur's childhood friend, Ole Evinrude, who was already making liquid-cooled engines of his own and would later find fame with his outboard motors. Evinrude is credited with setting up the carburettor, but other components – notably the roller tappets still used on Harleys today – may have been his idea as well. Scaling 49lbs (22kg), this engine was installed in a loop frame similar to the existing Merkel design, in the Davidson family's back yard at 315 37th Street. The site, known as 38th Street today, is now owned by the giant Miller Brewery and is little more than a stone's throw from Juneau Avenue.



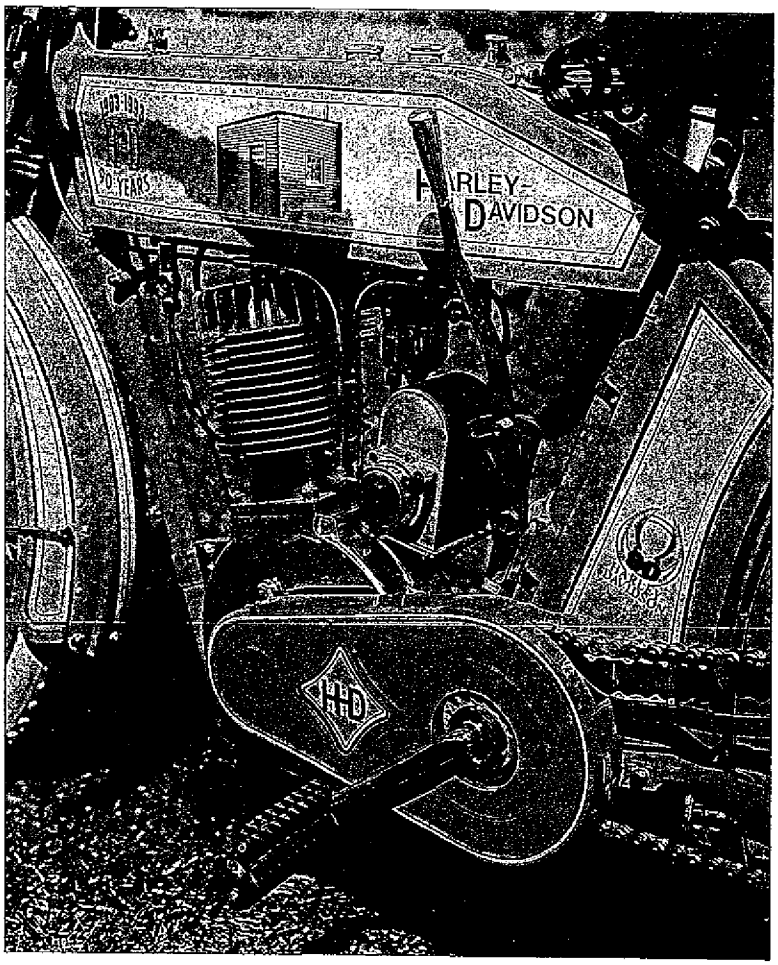
■ LEFT *Team Harley in 1915, from left: Otto Walker, Harry Crandall, Joe Walter, Red Parkhurst, Alva Stratton and Ralph Cooper.*

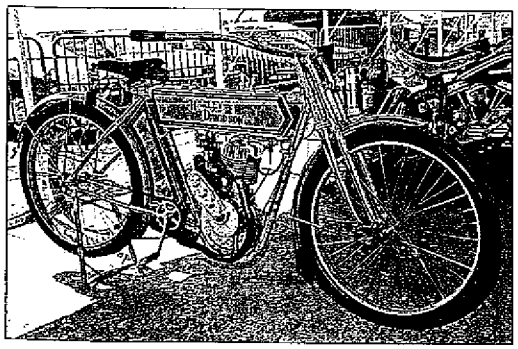
■ THE HARLEY-DAVIDSON MOTOR CO.

So it was that in 1903 – the same year the Wright brothers took to the air – the Harley-Davidson team created its first motorcycle and readied itself to produce similar machines for public consumption. This handsome machine was gloss black with gold pinstriping, a single-loop tubular steel frame, unsprung forks and leather belt final drive directly from the crankshaft. Additional power was offered by pedals, which also provided the only braking force. It is unclear how many machines were built during 1904 – sources suggest figures anywhere from one to eight, although anything over three seems unlikely. However many there were, each was assembled in a 15 x 10ft shed erected in the Davidson back yard by the boys' father, a cabinet-maker. Modest though it was, the shed bore the legend "Harley-Davidson Motor Co." on its front (and only) door with typical understated pride.

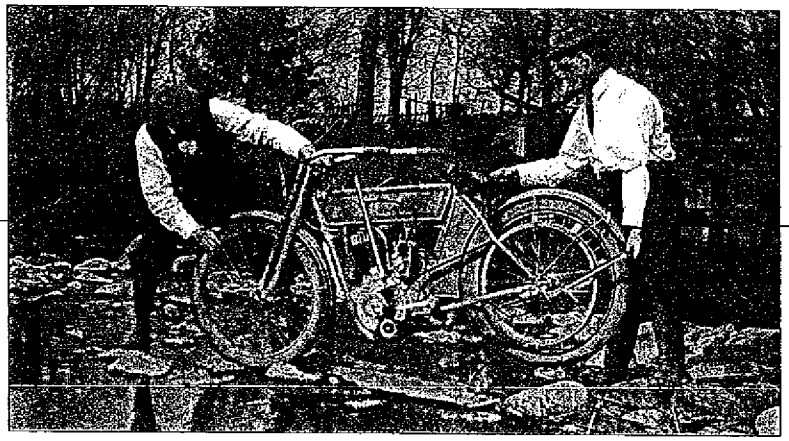
The first production Harley has a tale to tell all its own. It carried its first owner, a Mr Mayer, for almost 6,000 miles before passing to George Lyon, who covered another 15,000 miles. It was sold in turn to a Dr Webster, followed by Louis Fluke and Stephen Sparrow, who between them clocked up almost another 62,000 relatively untroubled miles (a total of 134,000 km). By 1913, the company decided to advertise the bike's exploits, promoting an image of dependable travel:

■ BELOW *The inlet-over-exhaust valve layout is clearly seen on this early "Renault Gray" single.*





■ ABOVE *This celebratory restoration of a 1913 single shows an image of the first factory (which was located on Juneau Avenue, Milwaukee) on the tank.*



■ LEFT *William S. Harley on the left and Walter Davidson on the right getting a motorcycle over the rocks of a creek, 1912.*

"100,000 miles on its original bearings and no major components replaced". Harley-Davidson engines were also produced for use in "buckboards" (four-wheel wagons) and the company's earliest advertisements also proposed their use in boats.

Motorcycle production soared to seven in 1905 as the company took on its first outside employee and attracted its first dealer. C.H. Lang of Chicago, who would become the largest motorcycle dealer in the country within a dozen years. A year later, in 1906, "Renault gray with red pinstriping" joined black as a colour option, and the model became known as "the Silent Gray Fellow", a name that reflected its quietness and dependability.

Engine capacity had by now increased to 26.84cu in (440cc) and the list price for the latest models was $200.

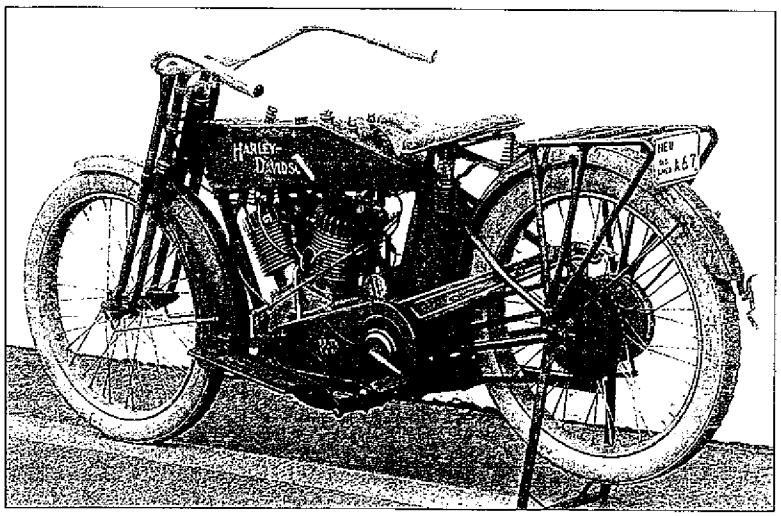
Production had soared to 50 units by 1906, prompting a move from the company's original hut on 37th Street and Highway Boulevard into its first proper building on the present Juneau Avenue site. The new factory turned out to be sitting partially on land belonging to the railroad. Fortunately, the "factory" was a wooden structure, and at 28 x 80ft (9 x 25 metres) eight or ten people were able to carry it the few feet to its proper location.

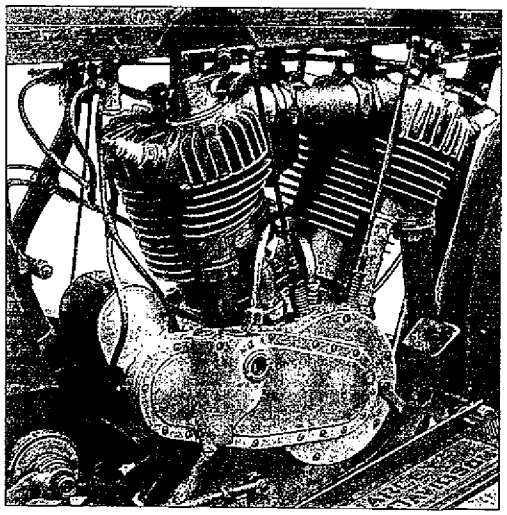
Finance for expansion came from a relative, James McLay, known as "the honey uncle" due to his generosity and hobby of beekeeping. This affectionate tribute was more appropriate than anyone could imagine, for Juneau Avenue was to become a veritable hive of activity, seven days a week, 365 days a year.

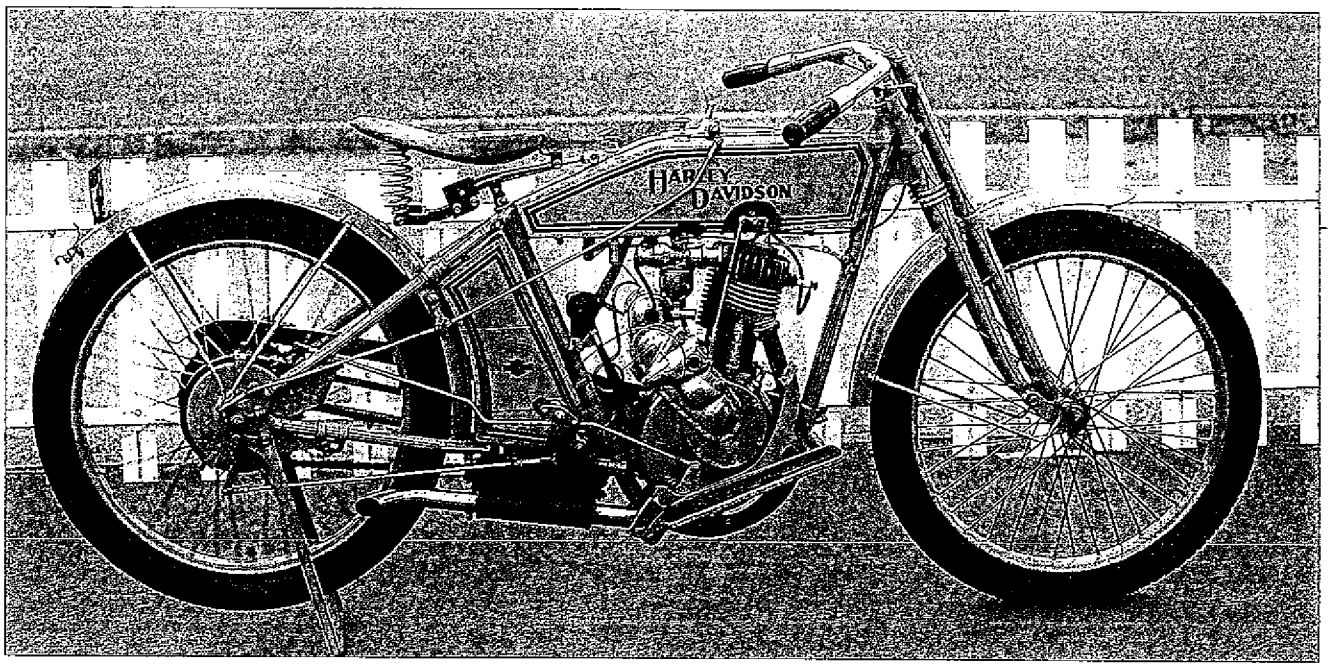
■ FORGING AHEAD

By 1907, the company was getting serious: it became Harley-Davidson Inc. Walter was the largest stockholder, followed by Arthur, with the two Williams a joint third. A Davidson sister, Elizabeth, also had the good sense to buy Harley-Davidson shares early in the firm's

■ BELOW RIGHT AND LEFT *An unrestored and original 1915 61-inch F-head twin. Note that pedal assistance is still retained.*



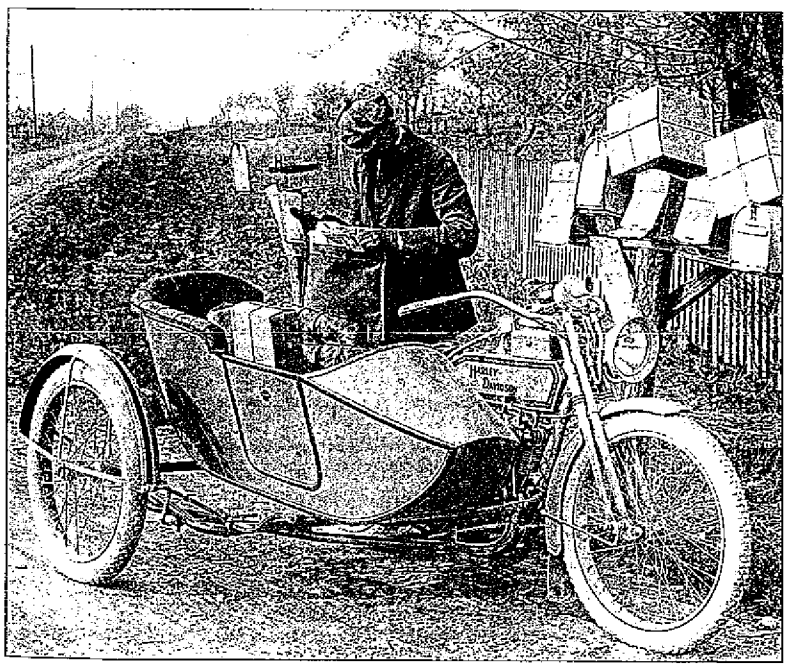




■ ABOVE *A rare 1914 Model 10C single with hugely complex two-speed rear hub.*

■ BELOW *Harley-Davidson motorcycles and sidecars were used by the rural postal service.*

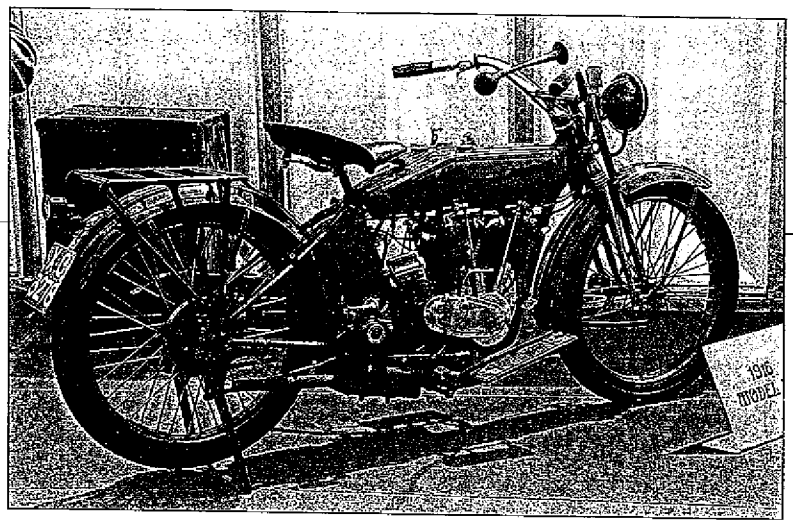
life. (By 1916, Davidson family stockholders would outnumber Harleys seventeen to three.) It was a heady time. The company had already taken on extra staff; William Harley had begun an engineering degree at the University of Wisconsin in Madison; Walter was exploring the mysteries of heat treatment on metals; and the enterprise, and Arthur, as company secretary and sales manager, was taking a more professional approach to production and training. The company may have begun as four young men with more enthusiasm than talent, but they had ambitions for the company they had created. That year, they produced no fewer than 150 machines and within 12 months had sold the first of many thousands for police duty.



Even so, it was clear that further progress demanded a more ambitious new motorcycle than the existing single, which in 1909 expanded to 30.17cu in (495cc). By 1908, William Harley had graduated and continued work on a more potent engine. This bore fruit a year later with the launch of the company's first production V-twin, the Model D, essentially a doubled-up single with strengthened bottom-end.

The first such model became officially available on 15 February 1909, although the first working prototype appears to have been built as early as 1906. A press report from the time clearly mentions a 53in (869cc) Harley twin in April 1908, while a privately-owned Harley-Davidson twin won a hill climb event at Algonquin, Illinois, in July that same year.

Whatever its exact development history, the Model D twin was an inlet-over-exhaust valve design with a capacity of 53.7cu in (880cc), developing around six horsepower and capable



■ LEFT *By 1917 Olive Green had replaced Renault Gray as the factory colour, here on a Model J twin three-speed.*

of a top speed close to 62mph (100 kph). The cylinders were splayed apart at the trademark 45 degree angle.

The strength of the Model D twin was amply proven in June 1908 when Walter drove one of his bikes to its first "official" competition success, a two-day endurance run in New York's Catskill Mountains. The sole Harley scored a "perfect" 1,000 points, outstripping all the more fancied runners in a field of 61 machines. Surprisingly – and embarrassingly – the first production twins were beset by valve-gear problems, with production being suspended during 1910.

The factory resisted official racing for several years despite widespread success in competitions. The factory's reluctance continued even when a private owner took the new 61in (989cc) X8E twin (the first Harley with a clutch) to victory in the 1912 San José road race by no less than 17 miles (27km): Bill Harley established a works race department two years later.

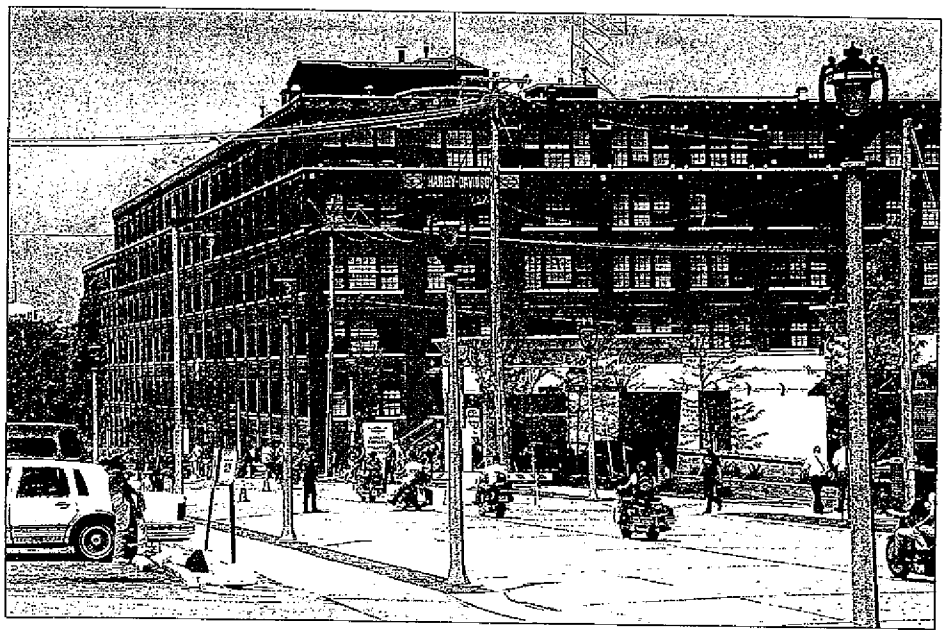
■ A DEPENDABLE TWIN

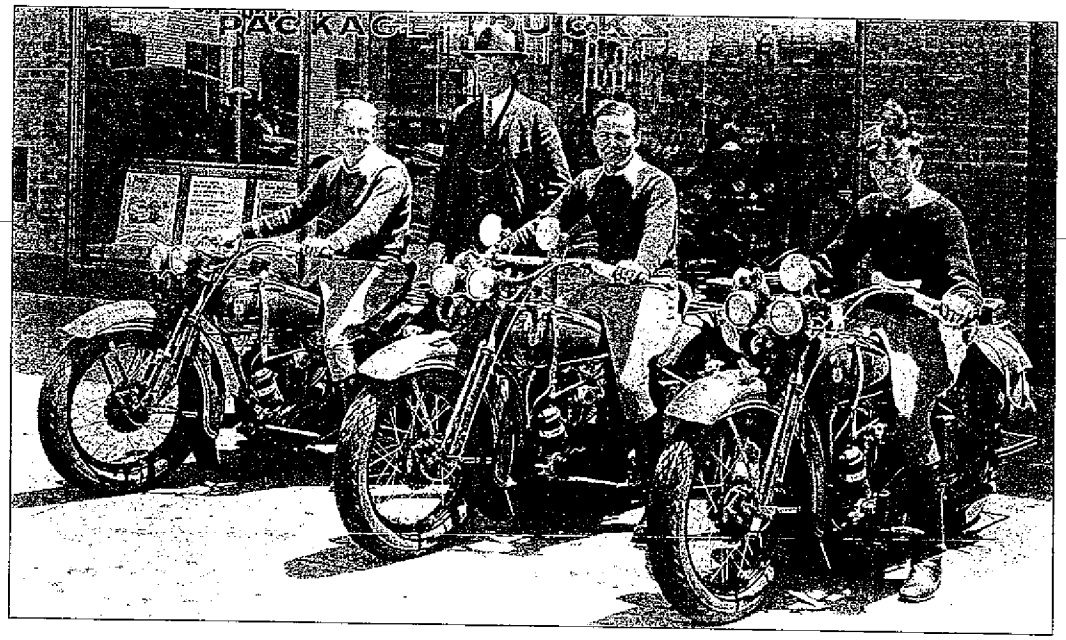
When the V-engine reappeared as the "50-inch" (810cc) Model 7D of 1911, no expense had been spared and every effort made to produce a machine worthy of Harley-Davidson's reputation. Not only had proper mechanical valves replaced the hit-and-miss automatic inlets, an adjustable tensioner had been added to the slippage-prone belt final drive.

Another notable improvement to this model saw the revised powerplant housed in a new, much sturdier frame.

■ BELOW LEFT *Since opening in 1919, this Juneau Avenue factory has been the home of Harley-Davidson.*

■ BELOW RIGHT *William Ottaway, who was Harley's first race boss, sits astride a 1924 Model JDCA.*

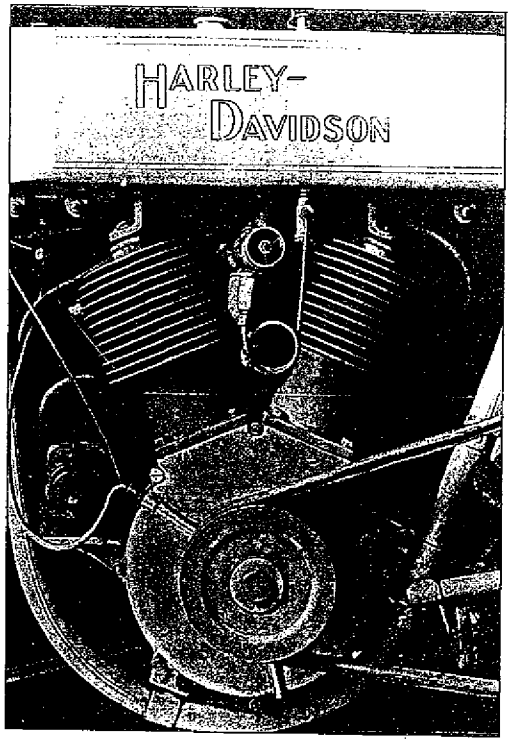




■ RIGHT *Gordon, Walter Jnr. and Allan Davidson (sitting on bikes) in San Francisco after a cross-country ride in 1929.*

A year later, a 61cu in (989cc) version, the chain-drive Model X8E, reinforced these developments. With its second attempt, Harley hit the nail on the head, and the V-twin took its rightful place in Milwaukee history.

Production in the rapidly expanding company soared to 450 machines in 1908, housed in a new, brick-built factory of 2,380sq ft (221sq metres) and employing 18 people. New machinery arrived almost weekly and was set to work, according to legend, "as soon as the cement was dry", and in what must have seemed like an instant, became obsolete. Two years later, 149 staff were engaged in another new factory – a reinforced concrete structure of 9,520sq ft (885sq metres).



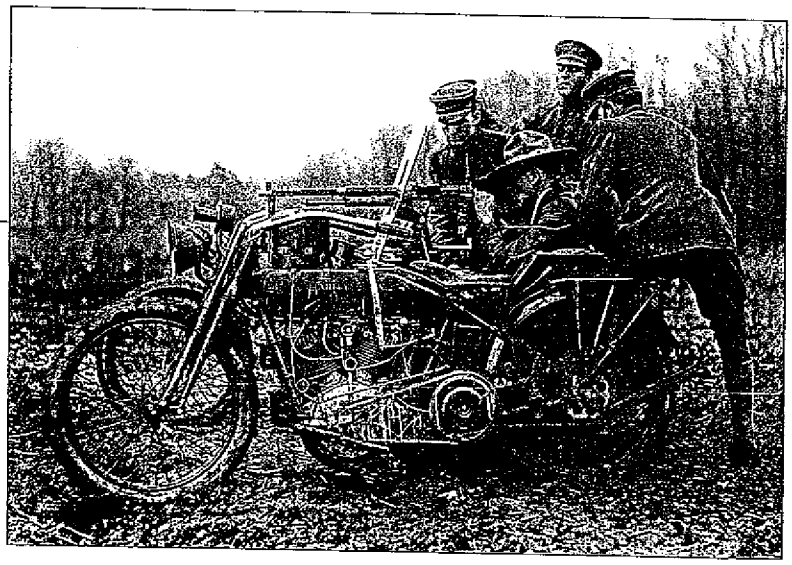
■ RIGHT *Harley-Davidson's first V-Twin engine, introduced in 1909. It displaced 49.5cu in (811cc).*

By the time the new 5hp, 35cu in single model (565cc 5–35) appeared in 1913, the company had established a reputation for producing machines that were dependable in both domestic and competitive use. The factory was hurtling ahead as well in this changing age and included a separate Parts and Accessories Department. More than 1,500 employees worked for a company whose manufacturing floor area had grown from nothing to almost 300,000sq ft (28,000sq metres) within a decade. Production rocketed from eight machines in 1905 to 1,149 in 1911 and 17,439 in 1916, the year prior to the United States' entry into the First World War.

Though not yet dominant in the industry, in 1913 Harley produced around 18 per cent of the 70,000 American-built motorcycles.

Very soon, however, all this would change, and much of this energy would be called to the service of Uncle Sam.

WAR AND PEACE

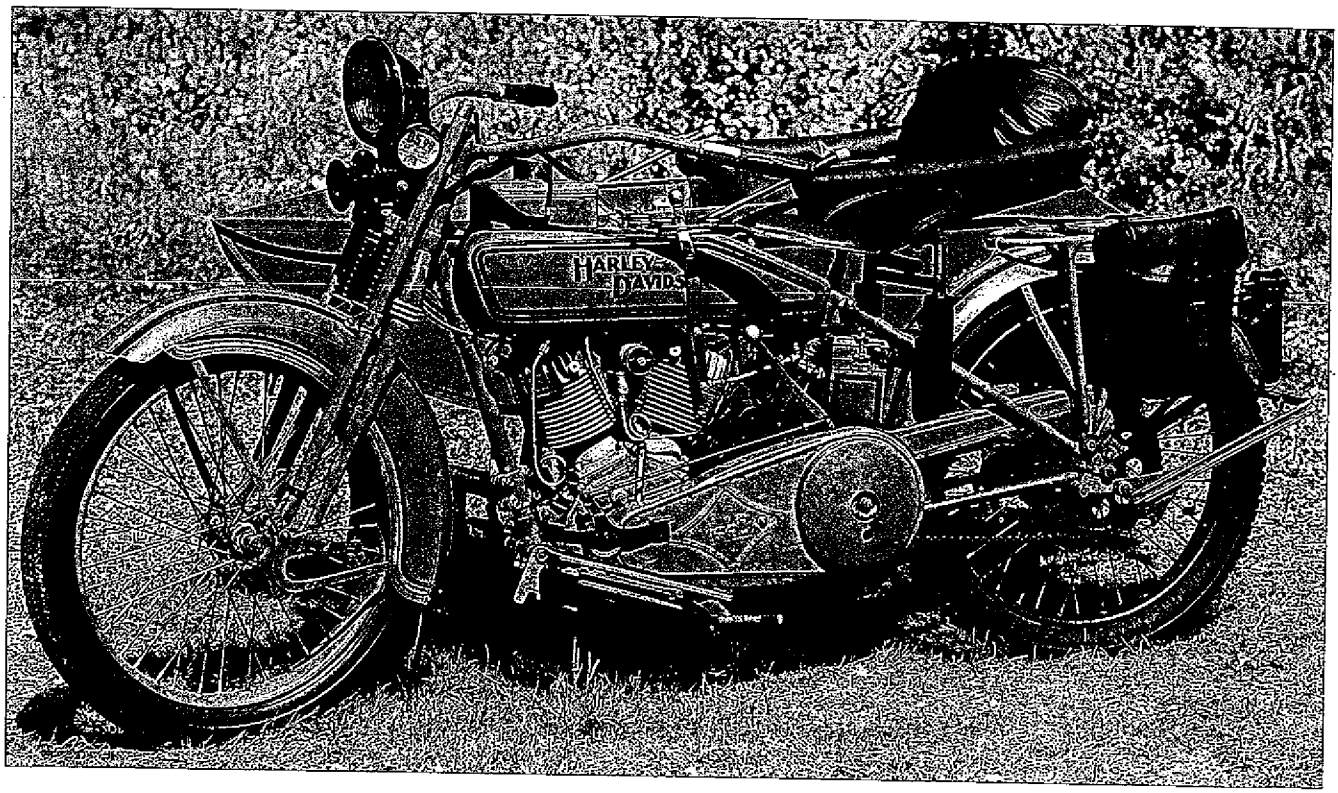


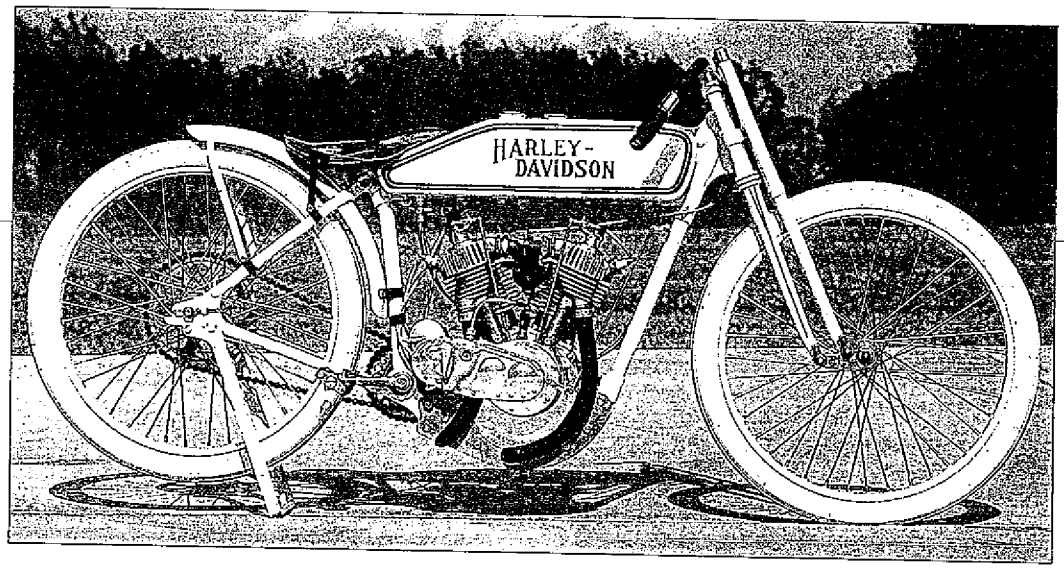
On 6 April 1917, the United States declared war on Germany. Harley's successful peacetime formula suddenly faced an entirely new set of demands for which, five years earlier, the company may have been ill-prepared. By 1917, however, this bullish, expanding company was ready to go to war for real.

Harley-Davidson supplied the best part of 20,000 motorcycles to the American military in total, the majority being 61-inch twins. Indeed, the war did little but good for the company's prospects. Rival European motorcycle manufacturers were preoccupied by hostilities for a much longer period (1914–18) than those in the United States. Consequently, Milwaukee was able to extend its markets and reputation overseas. By 1918, aided by a $3 million loan from the M&I bank, Harley-Davidson had become the world's largest manufacturer of motorcycles. Within a year, "Hap" Scherer had been appointed Harley-Davidson's first publicity manager. By 1921, machines were being sold through 2,000 dealers in 67 countries with product catalogues printed in seven languages. As the dust settled on the carnage of the war, one-sixth of Milwaukee's production was destined for export.

■ ABOVE *Harley was quick to develop its bikes for war, including mounting them with machine guns.*

■ BELOW *Milwaukee-built sidecars proved to be extremely popular for both military and civilian use.*





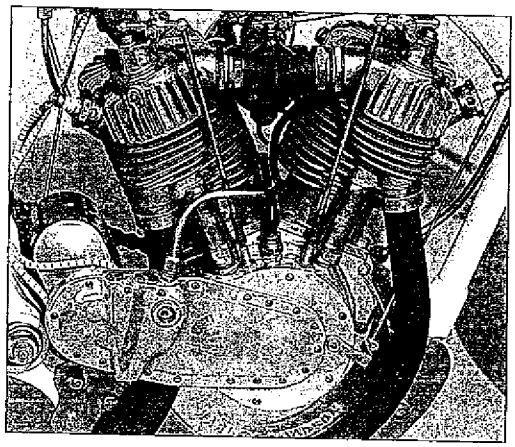
■ RIGHT *Board racers were Harleys in their leanest form, stripped of even any semblance of brakes...*

The aftermath of war had other, less predictable side-effects. One of these was the retention of army green as the company colour in place of the pre-war pale grey. Another more enduring effect concerned training. To help military personnel keep Milwaukee's wares reliable, the Harley-Davidson Service School was established in 1917. Initially intended as a military measure and as concerned with riding instruction as mechanics, the Service School soon developed into a crucial arm of the factory's civilian service.

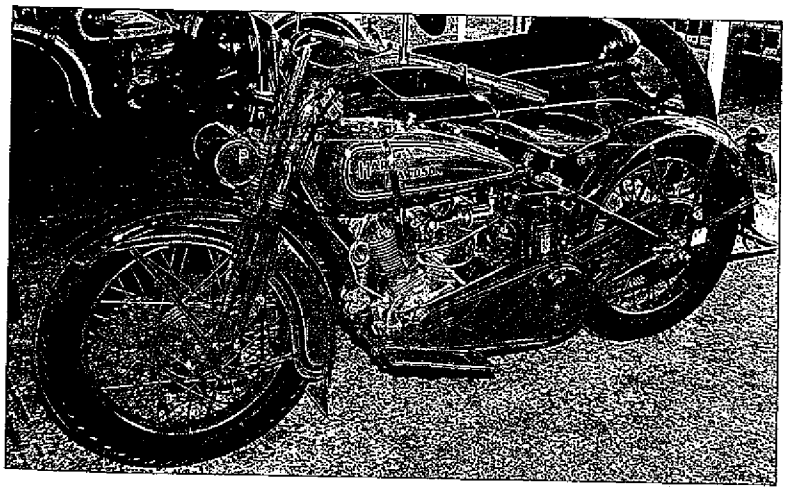
By the eve of the "Roaring Twenties", the Juneau Avenue factory had become a colossus. In 1919, close to 1,800 employees toiled on a floor area exceeding 400,000sq ft (37,000sq metres) to produce 22,685 motorcycles and over 16,000 sidecars. The Model J Sport Twin, unveiled that same year, was unique among Harleys, if not American motorcycles in general. Instead of the "V" layout, the 35.6cu in (584cc) twin adopted a horizontally opposed design, akin to today's BMWs. Instead of lying across the frame, the cylinders were orientated fore-and-aft. Although long and unwieldy, the layout offered a very low centre of gravity and a compact width, ideally suited to America's then-primitive road network.

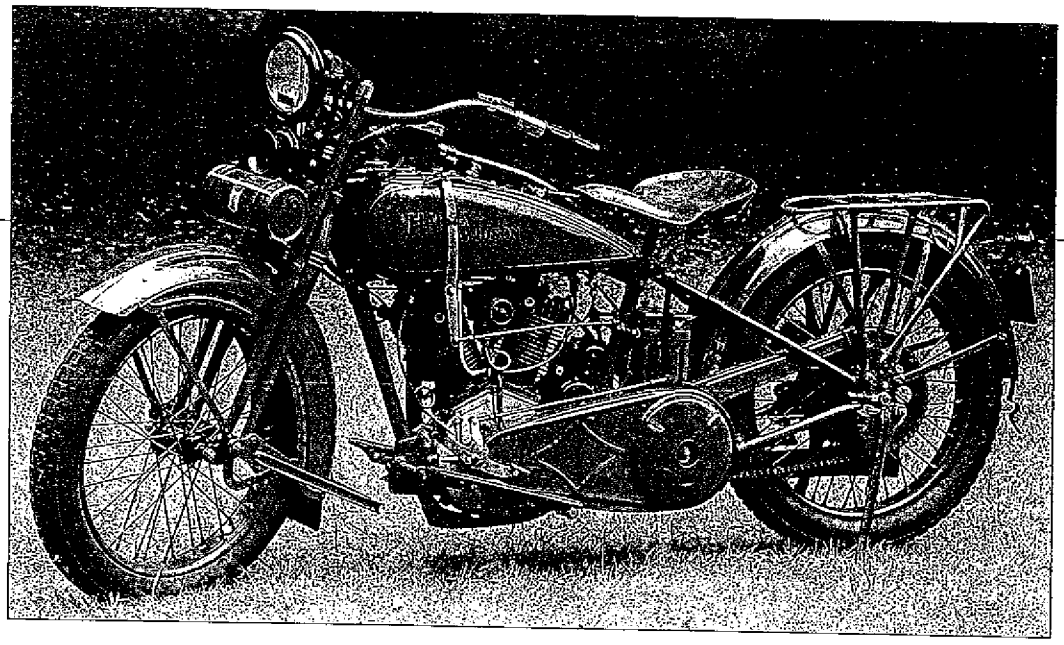
There were other innovations, most of which would stand the test of time better than the model itself. The final drive was sensibly protected from dust in a metal enclosure, not unlike more recent MZ machines, lubricated by oil mist from the engine breather. It was also the first model to feature a full electrical

■ RIGHT *...or silencing, as can clearly be seen on this handsome 1916 F-head twin.*



■ BELOW *Front brakes finally arrived in the late 1920s, as on this Model J Big Twin.*



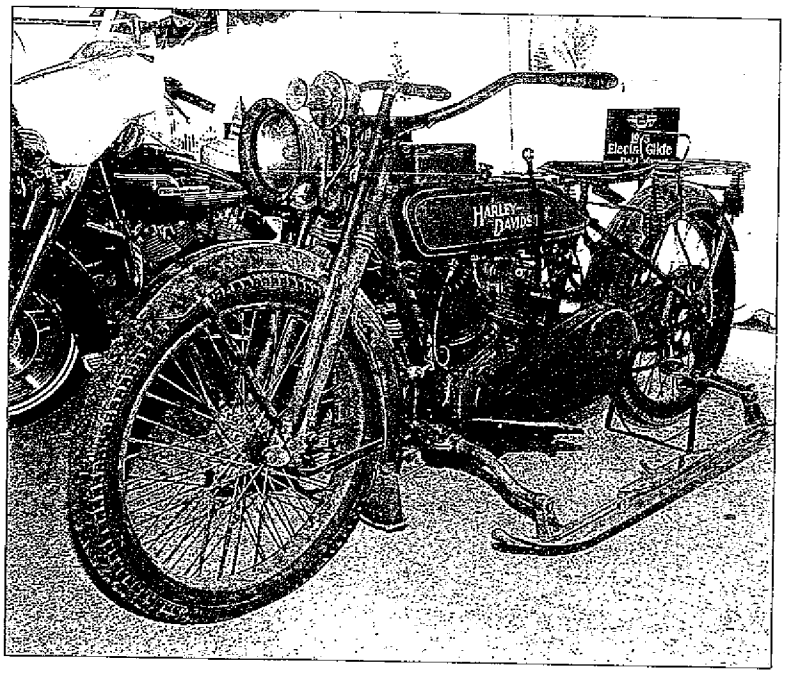


■ LEFT *Before 1927, only a rear brake was fitted onto bikes.*

system produced by the Harley factory. Although the Sport set many records – Canada to Mexico in less than 75 hours, no easy task even today – its six horsepower engine lacked the bottomless big-inch power America demanded, and was discontinued after 1922.

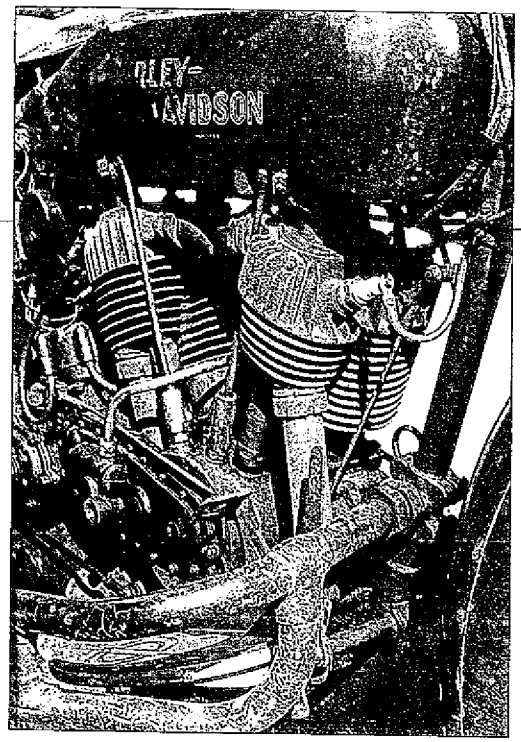
The 1920s didn't so much roar as whimper where motorcycles were concerned. Much of the blame for the Sport Twin's relative failure lay far beyond Milwaukee's control – 1920 witnessed a major trade recession with a massive over-supply of manufactured goods as global economies struggled to adjust to peace-time trade. One of the consequences was Henry Ford's slashing the price of his Model T car to $395, the same as the biggest Harley twin. The effects on motorcycle sales were inevitable. The trade slump was brief, but America's love affair with the car was not, and neither Harley nor any other bike manufacturer fully recovered their previous momentum.

■ BELOW *Inventiveness is apparent in this 1919 twin, fitted with stabilising skis for use in icy conditions.*



Milwaukee's sales collapsed from over 28,000 in 1920 to 10,202 in 1921, with sales so poor during that spring that the factory, which had expanded 12 months before, shut down for a month. Sales would not return to 1920s levels for a further 21 years. Most of the machines that were sold during that time were 61-inch V-twins.

Although the Sport failed to make the impact Harley hoped, one of the next models quickly became a Milwaukee legend. In 1921, the V-twin was replaced by the JD and FD, the first 74-inch (actually 74.2cu in/1,216cc) models, with F-head, inlet-over-exhaust (ioe) valve layout. Each example was dubbed a "Superpowered Twin" in tribute to its 18-hp engine and both underwent rigorous pre-delivery testing: yet another Harley innovation.



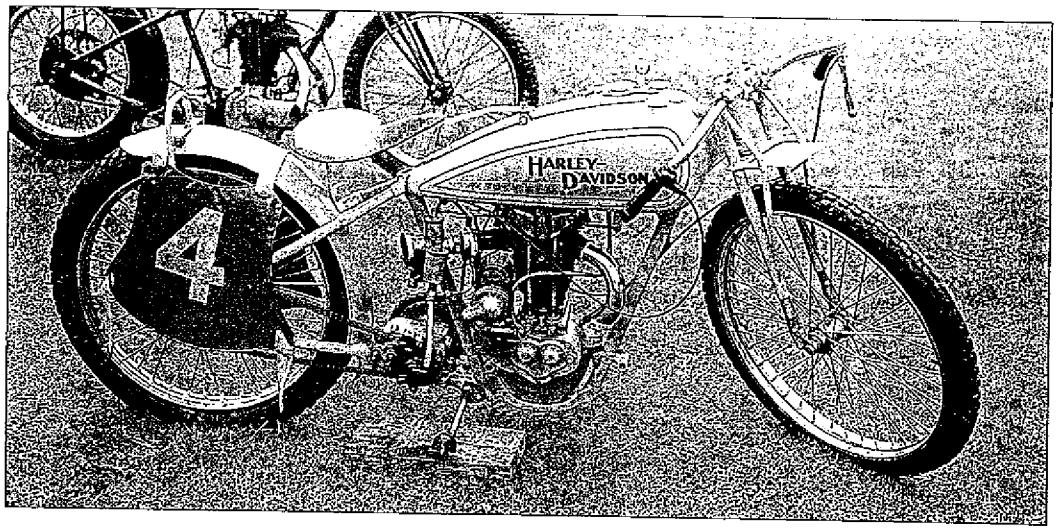
■ RIGHT *The 1920s was marked mostly by F-head machines like this 1922 61-inch twin. Flatheads began to appear from 1926, the same year as the first overhead valve engines.*

As for the rest of the range, the 30-inch single had been dropped after 1918. In 1926, a new single – the 21in (344cc) Model A – was introduced, joined four years later by a 30.5in (492cc) sister. In a radical move, Harley-Davidson pioneered the front brake in 1928, just as the company had pioneered kick-starts and three-speed transmissions more than a decade earlier. All models were sold in varied specifications of transmission, valve-gear and power, so that in 1928, for instance, three basic engine types accounted for no less than a dozen models. By this time, Harley's only surviving domestic competitors were Indian, Henderson, Cleveland and Super-X.

The last year of the decade introduced the machine that would become Milwaukee's bread and butter. The new WL was a 45in (742cc) side-valve V-twin which supposedly combined the single's agility with the power of the bigger twins. Capped by rakish twin "bullet" headlights, the new model was an instant success and constituted the lowest rung on a V-twin ladder made up of 45-, 61- and 74-inchers). Star billing in the 1929 Harley-Davidson catalogue went to the JDH Two-Cam, which housed a specially-prepared variant of the 74-inch engine that had been developed for the factory's all-conquering board racers.

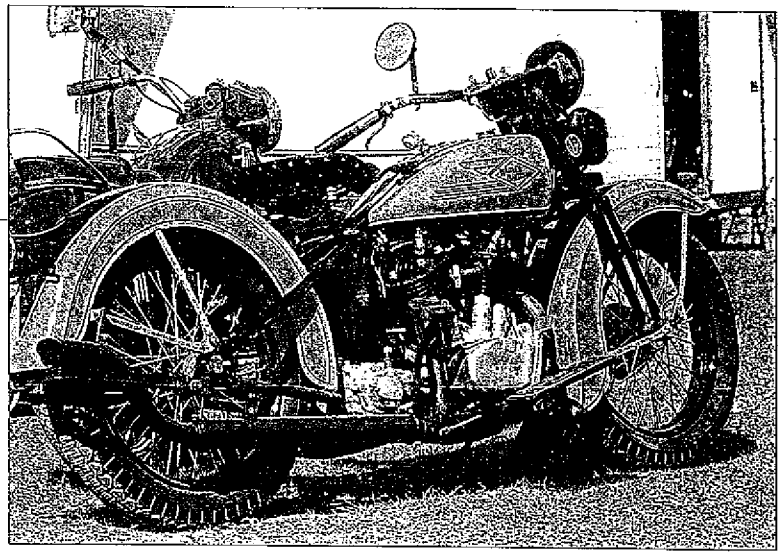
Billed as "the fastest road model that Harley-Davidson has ever offered to the public", it could probably out-run any other two-wheeler on the American highway.

The WL may have been humbler but it proved its worth by keeping Milwaukee's head above water in the years ahead.



■ RIGHT *This stylish ohv "Peashooter" speedway machine dates from 1927.*

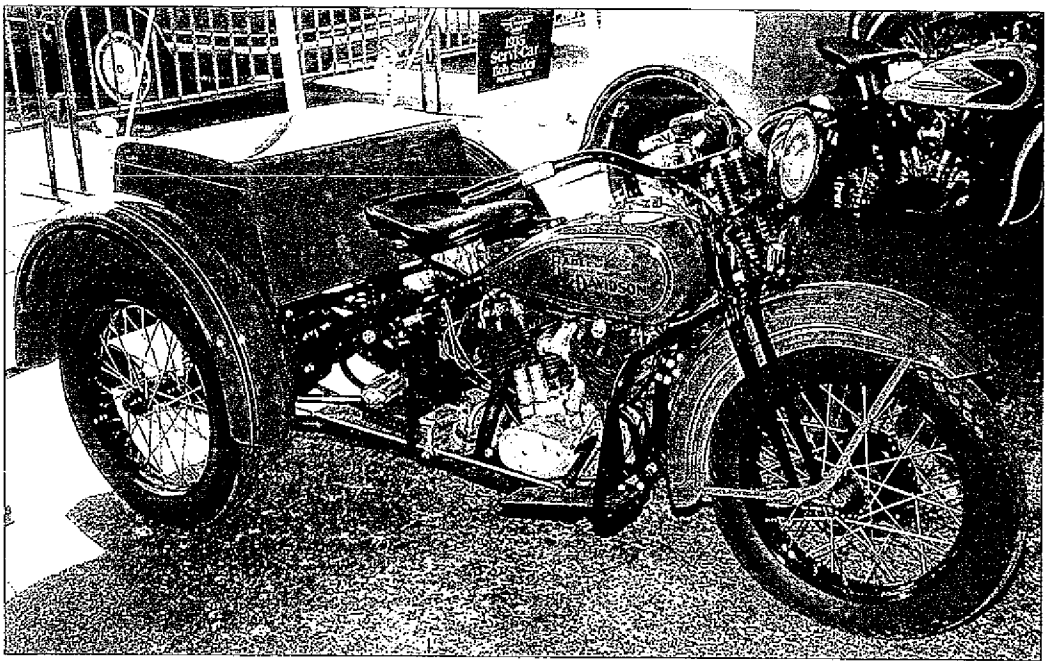
THE 1930s



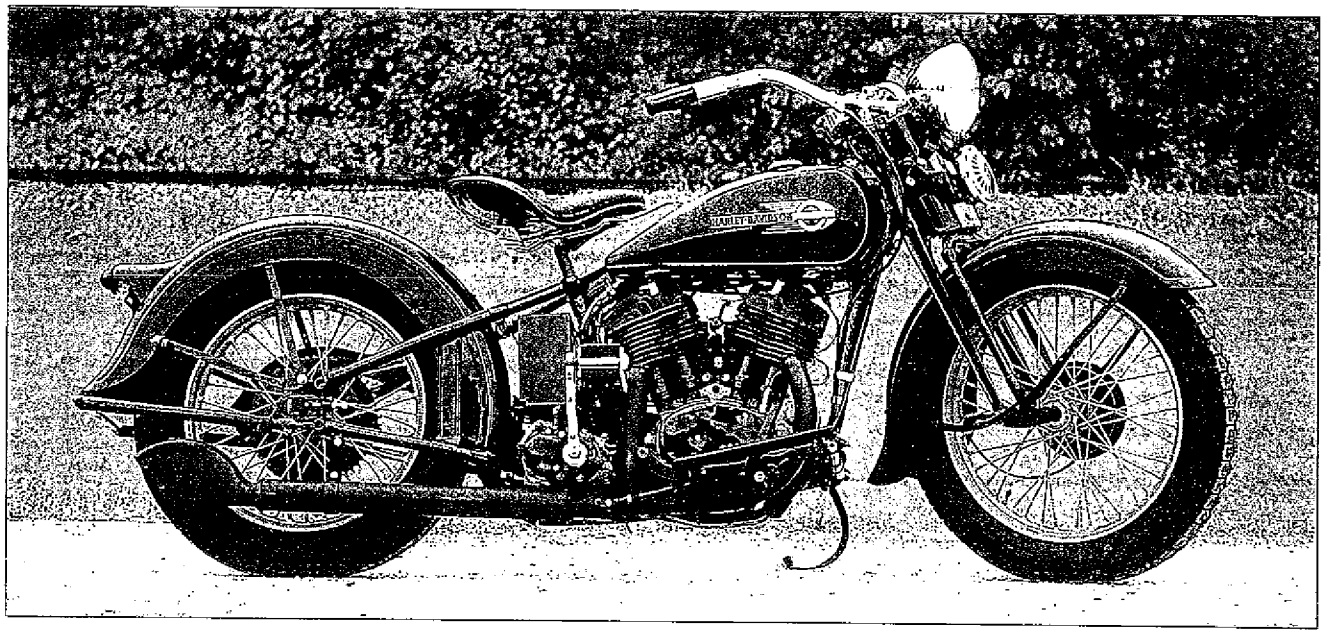
The 1930s began in high spirits with arguably the most mouth-watering range to come out of Milwaukee for years. All models now had bigger brakes and tyres, improved ground clearance, lower saddles and – best of all – removable cylinder heads. These "Ricardo" heads were far more practical and efficient than the one-piece iron cylinders previously employed. Although plagued by early problems, the new high-compression 74.2cu in (1,216cc) VL offered fully 15 per cent more power than any previous Harley roadster. A nation-wide "open house" attracted customers by the thousands and, with sales quickly up 30 per cent on the previous year, the new decade appeared rich in promise.

There was one cloud on the horizon, however. In October 1929, a few weeks after the 1930 range was unveiled, the Wall Street stock market crashed, sending tremors throughout the American economy and the rest of the world. President Herbert Hoover's initial rapid intervention seemed to stem the tide but economic confidence continued to wilt. In 1930, 1,300 banks went to the wall. Manufacturers in every industry offered incentives to stimulate business, but to no avail. Within 12 months, the mighty Juneau Avenue factory was running at a mere 10 per cent of production capacity and would report a loss of more than $320,000 the following year. By 1933, one quarter of the United States workforce was unemployed. Few people had

■ ABOVE *By the 1930s all Harleys were flatheads, such as this imposing 74-inch VL from 1933.*



■ LEFT *1932 saw the introduction of the enduring Servi-Car, which would continue in production for 40 years.*



■ ABOVE *The troubles of the Depression encouraged novel art-deco styling, such as the tank badge on this mammoth 80-inch VLH from 1936. The same motifs can be seen even on modern Harleys.*

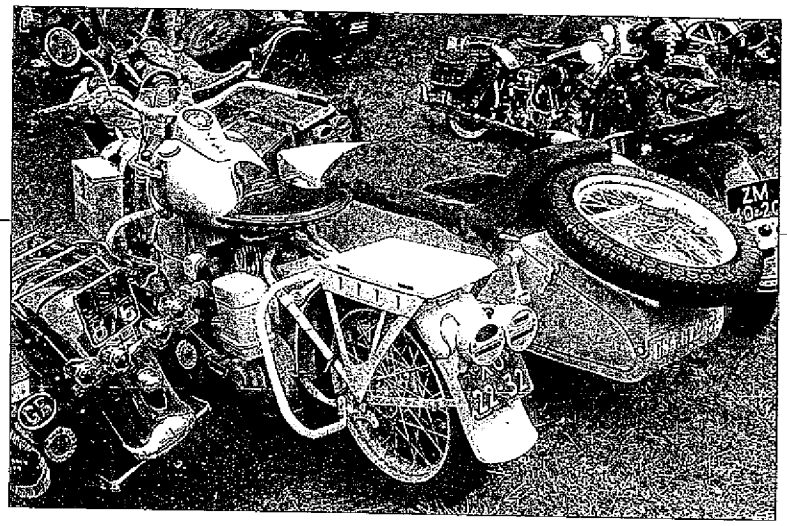
money to spend on motorcycles. Of hundreds of American bike manufacturers, only Harley and Indian had the financial strength and acumen to survive. Industry-wide production fell from 32,000 to 6,000 units per year by 1933, by which time fewer than 100,000 motorcycles were registered in the whole of the United States. Of these new sales, Milwaukee's share was just 3,703 – its lowest in 23 years.

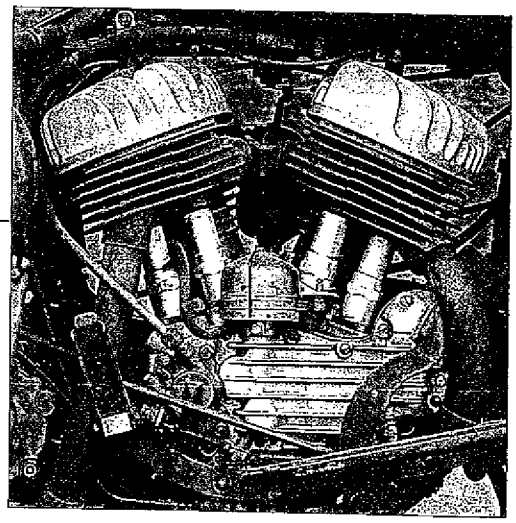
Desperately, Juneau Avenue wracked its brains for innovative sales ideas, ranging from savings plans to a medal scheme intended to turn every Harley owner into a salesman. One enduring response was the sale of branded clothing and accessories – a sideline now worth millions of dollars per year. A superficial but significant measure was the abandonment of dull green paint in 1933, in favour of more vivid colours and art-deco graphics which continue to brighten Harley-Davidsons today.

An altogether grittier response was the three-wheeled Servi-Car, a cheap delivery and police vehicle powered by the 45-inch (742cc) Model D engine. Surprisingly, given the fraught circumstances of the time, this three-wheeler was both a sound design and a solid piece of engineering – so tough and enduring, indeed, that it survived in production from late 1931 until 1974. The true hero of the Depression years was the side-valve twin: cheap to produce, economic to run and maintain, and easily repairable.

Almost on their own, the D and V models saw Harley through the Depression, along with the 30.5in (492cc) single-cylinder machine of 1929. As the financial vice tightened, no other significant new models were developed during those six years.

In many ways, the worst of the Depression also brought out the best in the company. By reducing the length of the working week, as many staff were kept on as possible, although this was less generous than it might appear, since it was partially mandated by the





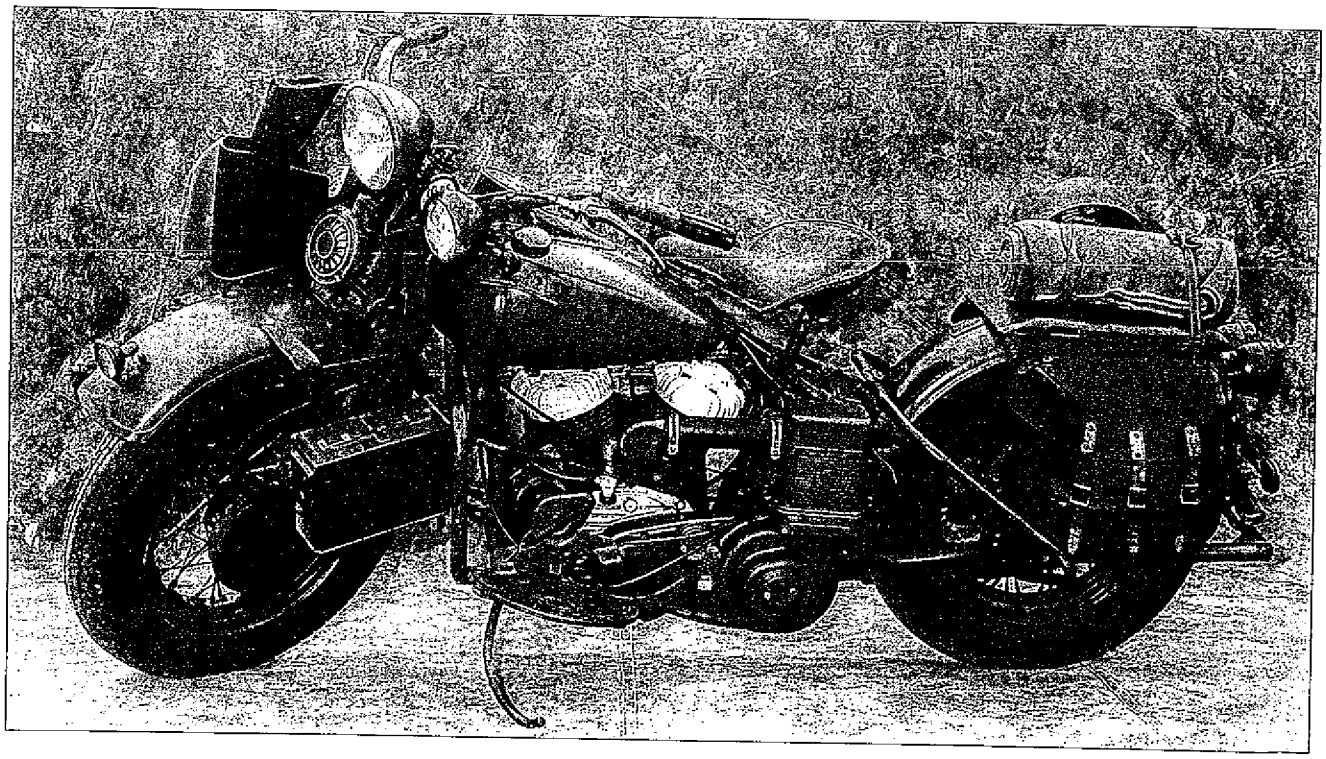
government's National Recovery Administration, and every skilled hand would be needed when the slump finally abated. Prudent financial controls, police and military contracts, novel sales strategies and energetic pursuit of exports kept the company afloat, and by 1934, the books were back in the black.

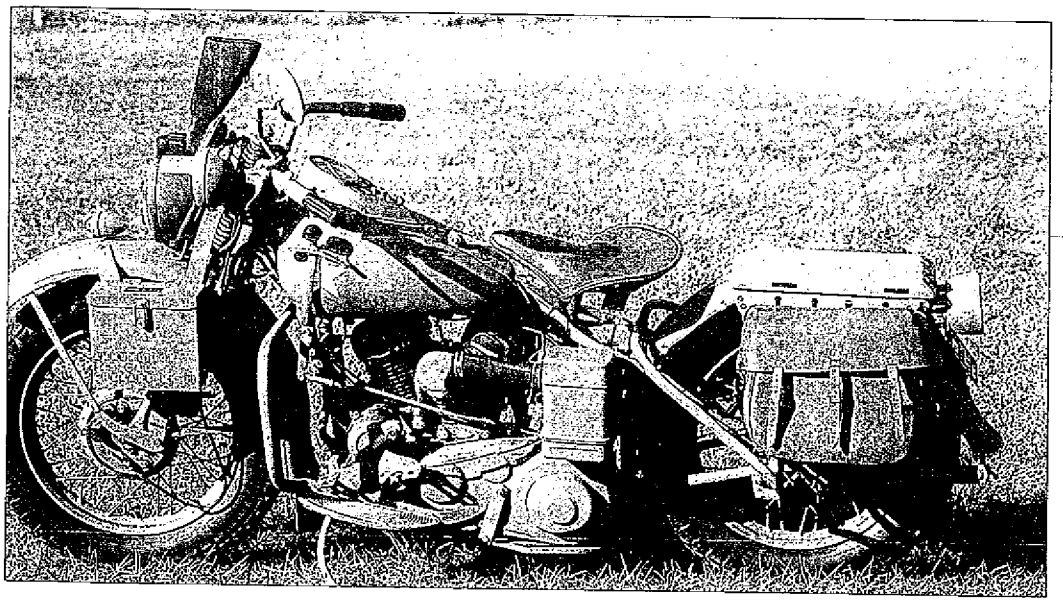
KNUCKLING DOWN

Painfully slowly, President Roosevelt's "New Deal" began to take effect and, by 1936, the crippling Depression came to a close. New machines began to emerge from Milwaukee, whose 1935 model range had comprised a mere two basic models. These were the 45-inch (742cc) Model R (essentially the D model with light alloy pistons, soon to become the heroic W) and the 74-inch (1,216cc) Model V and its derivatives, now cured of its original and varied ills. Both were side-valve designs, slow and steady, whereas the American public increasingly craved more advanced machines.

ABOVE LEFT *A WLA in desert camouflage stands out against civilian chrome.*

ABOVE RIGHT AND BELOW *Drab green was more common. Almost 90,000 of these 45-inch (742cc) flathead twins were built for the military during the Second World War, and thousands served with the Soviet forces.*



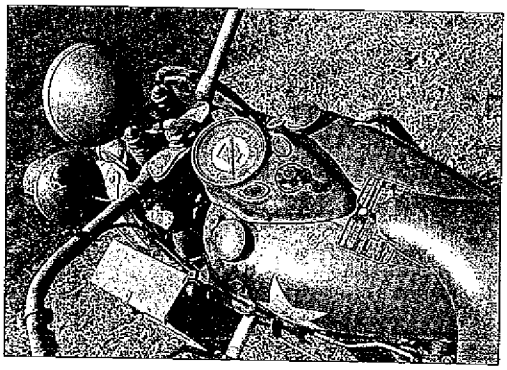


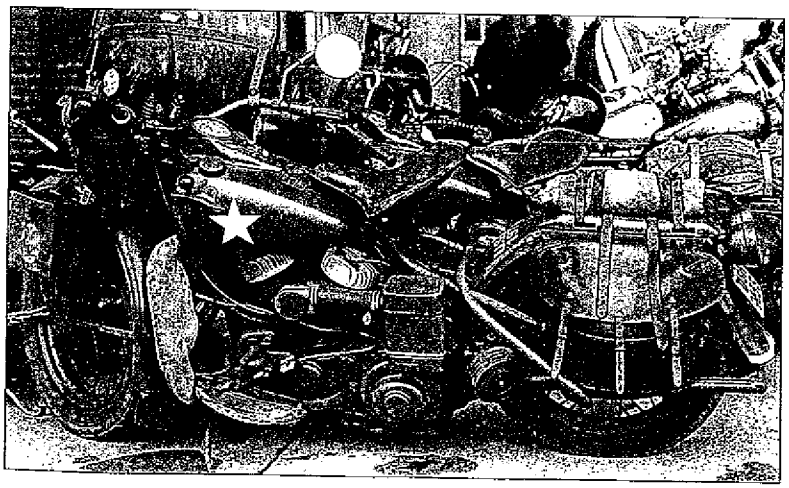
The biggest newcomer was the V-twin Model UL. Although still side-valve and visually similar to the proven DL-45, it displaced a stupendous 78.9cu in (1,293cc), making it ideal for heavy sidecar use. It was to continue in production until 1945. Most important of all was a new generation of 61-inch (898cc) twin with overhead valves and twice the power of its predecessor. The legendary Model E – the Knucklehead – had arrived.

The 1936 Knuckle could have appeared in 1934 but for government restrictions aimed at reducing employment. For company and public alike, this was frustrating but certainly worth the wait. The Knuckle was a Juneau Avenue first in many respects – the first four (forward) speeder; the first overhead valve roadster twin; the first hemispherical heads. The engine was heavily influenced by the competition experience of the legendary Joe Petrali, Harley development rider and near-unbeatable racer. It announced its arrival by 136.183mph (219.16kph) on the sands of Daytona Beach, Florida. The rider, naturally, was Joe. His waterside speed record stands to this day.

■ ABOVE LEFT AND RIGHT *The "A" in WLA stood for army, so naturally military rules came with the machines. Soldiers were warned not to exceed 65mph.*

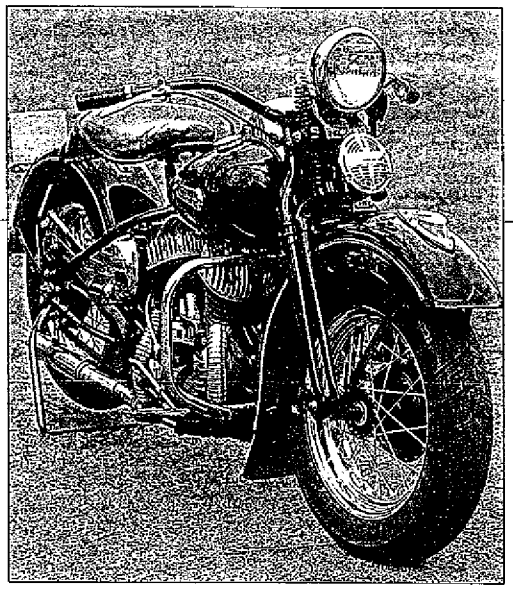
■ RIGHT AND BELOW *Even soldiers could be customizers: note the "Uncle Sam" on the fuel tank (right) and grenade-box lettering (below).*





With the new model as its flagship, Harley's fortunes rapidly improved. In 1937, sales exceeded 11,000 for the first time since 1930. The same year brought significant improvements elsewhere in the range: full roller bearing engines, chromolly fork tubes and interchangeable wheels.

As well as these technical advances, the lessons of the Depression had instilled in the company a faith in styling and cosmetics which



■ LEFT *Civilian versions of the humble WL45 could be surprisingly handsome.*

stands them in good stead even today. The aftermarket and art-deco innovations of 1932 were continued. Balloon tyres appeared in 1940 (more striking, if less functional, than new aluminium alloy heads for the flathead side-valve models). In 1941, four-speed transmissions became standard across the big twin range. Eleven models were now on the books in four basic engine configurations: side-valves of 45-, 74- and 80-inch (742, 1,216 and 1,293cc), and Knuckleheads of 61-inch Model E (989) and 74-inch Model F (1,207cc).

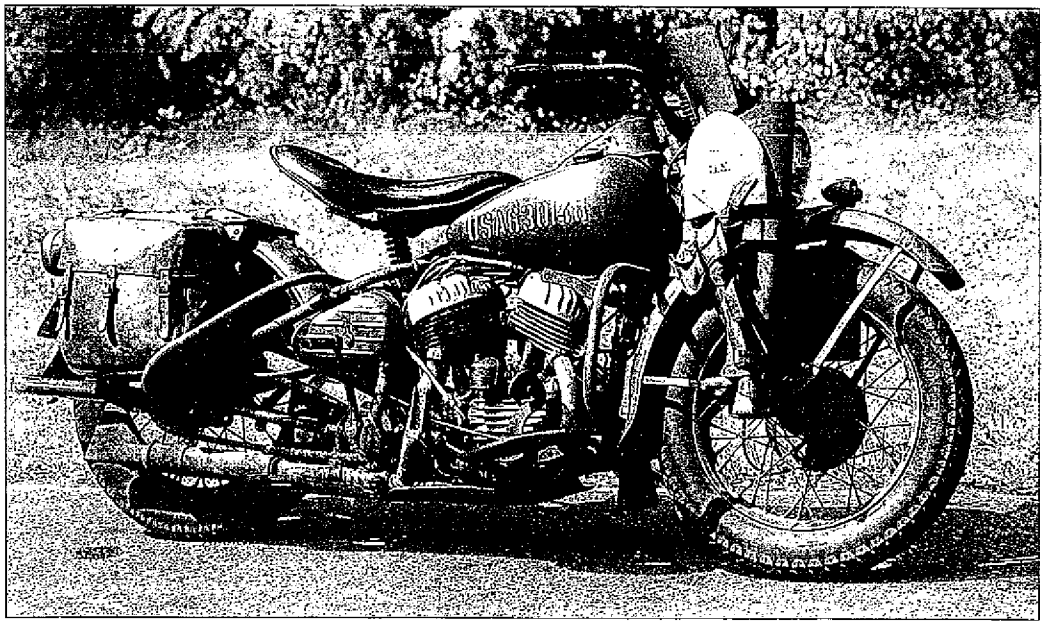
■ BACK TO WAR

Motorcycle production in Milwaukee rose from a low of 3,703 in 1933 to more than 18,000 in 1941. Harley made it through the Depression by the narrowest of squeaks, emerging stronger than ever before. However, not long after this rocky period in Harley-Davidson's history, a catastrophe of an altogether more terrible kind occurred: the world once again went to war.

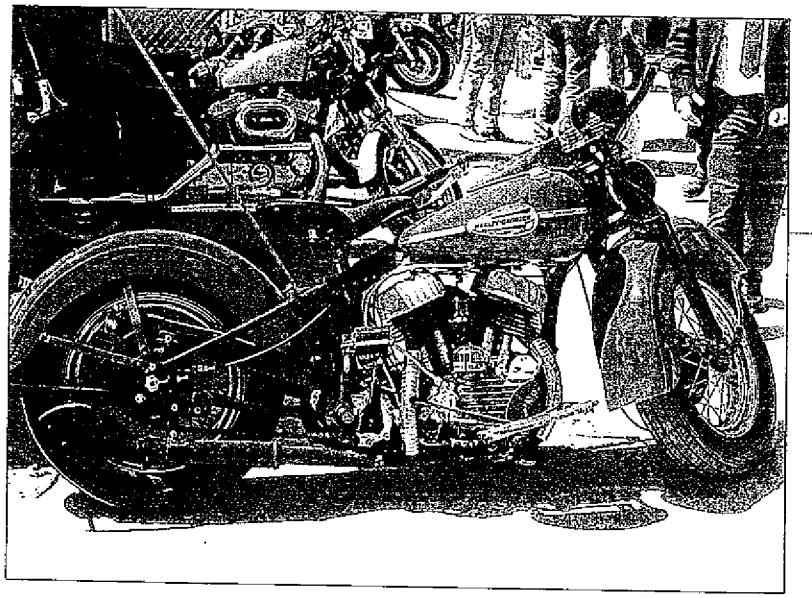
The United States entered the conflict after the bombing of Pearl Harbor on 7 December 1941.

As the country's largest motorcycle producer, it fell to Harley-Davidson to underpin the bulk of the country's two-wheeled war effort. Throughout the years of America's involvement in the war (1942–45), practically the entire output of the Milwaukee factory was turned over to military production – some 90,000 machines in total.

As with the First World War, the Second was fairly good to Milwaukee. In 1940, sales

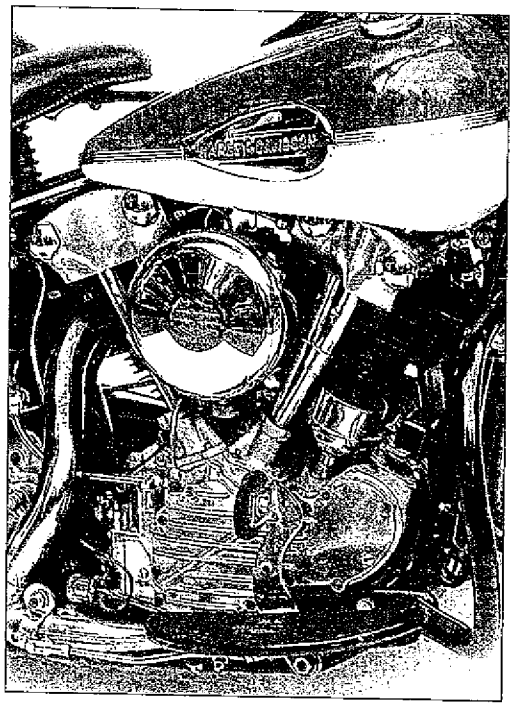


■ LEFT *Astonishingly, the WL45 engine survived until the 1970s in the Servi-Car.*



■ LEFT *During the Second World War almost no machines were made for civilian use. This is one of the first post-war WL45 twins, in vibrant red.*

totalled less than 11,000. These soared to 18,000 as the military build-up began in 1941, reaching more than 29,000 in each of the two years that followed before tailing off again as peace approached. However, since the military favoured Harley Davidson's robust side-valve plodders over the new Model E and Model F, this meant that Knucklehead production was practically zero during the same period.



■ RIGHT *The noble Knucklehead, Milwaukee's first overhead valve roadster twin.*

HARLEY JAPAN

One little-known, highly ironic consequence of Milwaukee's quest for export markets in the 1920s and the economic slump of the 1930s was the creation of a Japanese big twin. During the 1920s, Arthur Davidson had pursued new sales openings with vigour, including the establishment of the Harley-Davidson Sales Company of Japan with a comprehensive network of dealers, agencies and spares distributors. Milwaukee's stock stood so high that Harleys soon became Japan's official police motorcycle.

Less worthily, in 1924 the Murata Iron Works began building copies of the 1922 Model J, but the quality was appalling. Murata would later build the Meguro, a distant precursor of modern Kawasakis. Harley exports to Japan all but ceased in the wake of the 1929 Wall Street crash, as the global economic slump crippled the yen. The story might have stopped there but for Alfred Childs, head of Harley's Japanese operation, who asked: "Why not build Harleys there?"

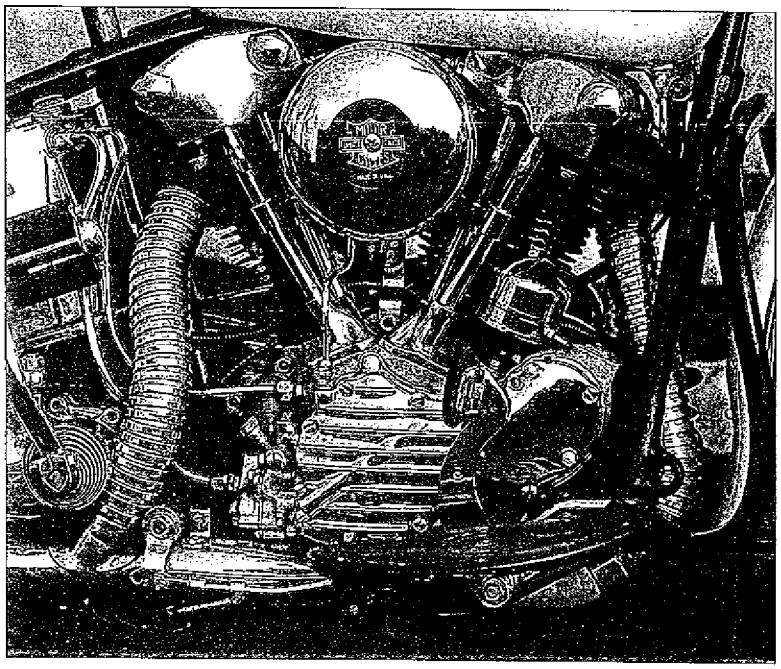
Juneau Avenue was sceptical at first, but such was Childs' persistence that Harley's first overseas factory soon began production at Shinagawa, near Tokyo. Built with tooling, plans, blueprints and expertise borrowed from Milwaukee, the factory was considered the most modern in the world. By 1935 Shinagawa was manufacturing complete motorcycles, mainly 74-inch V-series flathead twins. In 1930, these had become the official motorcycle of the Japanese Imperial Army. Later, when the army became the effective civil power, it declined the chance to convert production to the new ohv Knucklehead, preferring the proven durability of the side-valve twin. It was at this point that the Sankyo corporation took over control of the factory and began selling Japanese Harleys under the Rikuo name. The "74" twin became the Rikuo Model 97.

As an increasingly truculent Japan readied for war, Harley cut its losses and sold out. As military demand increased (especially after the invasion of China in 1937), Rikuo sub-licensed the product to Nihon Jidosha ("Japan Combustion Equipment Co."). Its "Harleys" were variants of the model 97s, entitled Kuro Hagane ("Black Iron").

Ominously, the factory had only a few more years to run. Nihon Jidosha was located in Hiroshima.

BACK TO PEACE

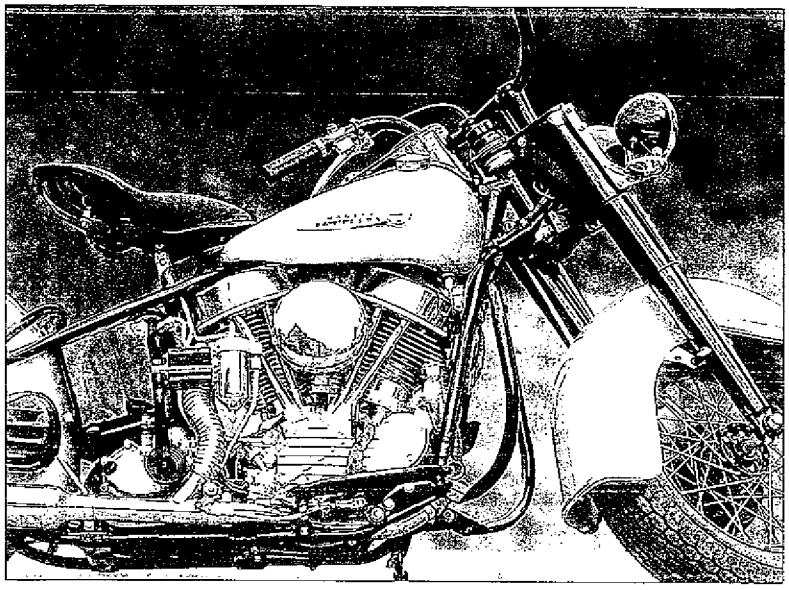
■ BELOW *A 1946 FL Knucklehead, as handsome a motor as Milwaukee has built.*



Although the Second World War ended on 15 August 1945 following the Japanese surrender, it would be more than a year before the unveiling of any new revisions from Milwaukee. Even these – theoretically 1947 models – were no more than cosmetic updates of Harley's pre-war machines. Of all the changes, perhaps the best remembered is Brook Steven's design for new "streamlined" H-D tank badges. A revamped clothing and accessories catalogue appeared in the same model year, a harbinger of the direction the company would take three decades later.

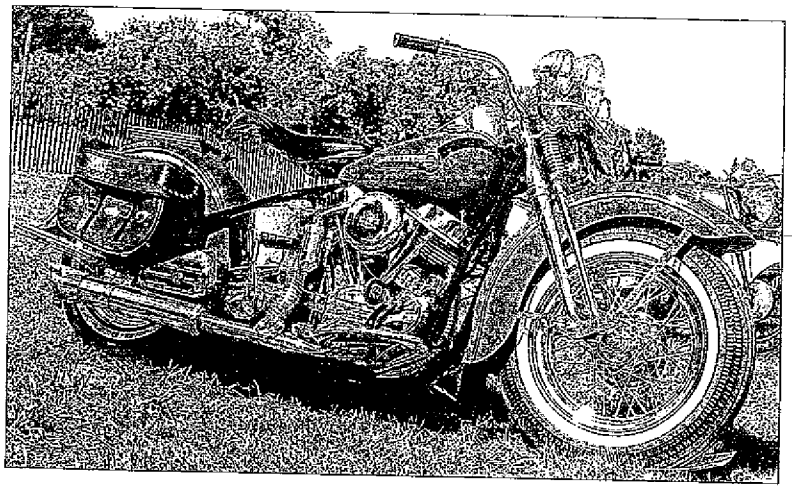
For the time being, however, motorcycles were scarce as the industry readjusted to civilian production and the loss of military demand. In the aftermath of the War Department's cancellation of orders for over 11,000 machines in 1944, more than 500 Harley-Davidson workers were let go. The rest, limited to a shortened working week, went on strike in late 1945. Paradoxically, limits on civilian production remained in force, and things went from bad to worse when 15,000 war surplus WLs were offered for public sale. It would be two more years before motorcycle production regained its pre-war level.

■ BELOW *But by 1948 the Knucklehead was history as the era of the Panhead had begun, as with this HydraGlide.*



There was only one thing that had not changed in the forced interlude of war – Harley-Davidson's winning ways. In 1947, among other successes, seven of the first ten Daytona finishers rode Harleys. Over the next two years, 36 of 47 AMA championship events went to the Milwaukee marque.

Harley-Davidson took up residence in a second factory on Capitol Drive, Wauwatosa, in 1947. By 1948, production was at an all-time high and, more important to America's highways, the replacement for the noble Knucklehead made its first public appearance that same year. The Panhead as it became known, was a development of the Knuckle rather than an all-new concept. As well as a revised (and much more oil-tight) lubrication



■ LEFT *Before the appearance of the HydraGlide's telescopic forks, the first Panheads ran with the old girder-fork chassis, as with this magnificently restored 1948 example.*

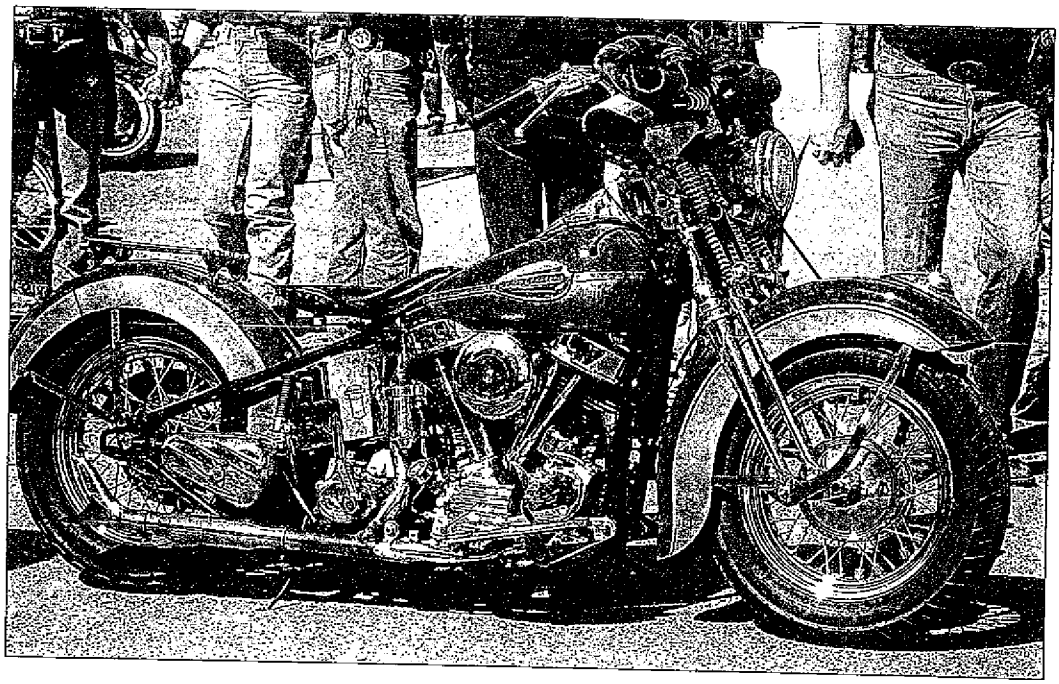
system, the Pan featured aluminium alloy cylinder heads in place of the Knuckle's iron and hydraulic "lifters" rather than solid push-rods. The Pan, so named because its chrome-plated rocker covers resembled inverted baking pans, was built in both 74cu in (1,200cc) and 61cu in (1,000cc) sizes; the latter was discontinued in 1953. The larger version retained the "traditional" bore and stroke dimensions of 3¾ x 4in (87 x 101mm).

The first all-new model powered by the Panhead engine was the HydraGlide of 1949, so-called because it was the first Harley to incorporate hydraulically-damped, telescopic front forks. It was also, of course, the first model granted one of the most evocative titles in motorcycling: "Glide". The Panhead engine would do much to get the species on its famous way, propelling not only the DuoGlide of 1958 but the first of the ElectraGlides as well.

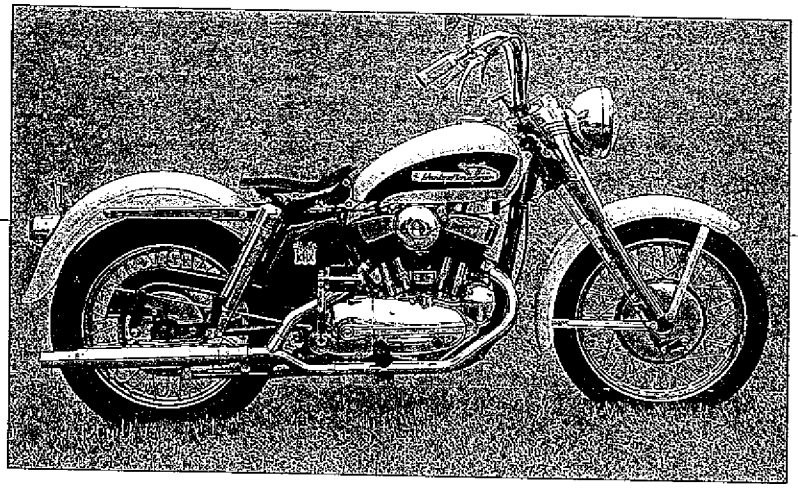
Though no-one knew it at the time, this first Glide was to set the visual cues for the "Retro-Tech" Harleys which would appear four decades later. From its deeply-valanced mudguards and its chromed fork shrouds to its stylized rear end, the style of modern Softails owes much to the HydraGlide.

■ INTO THE 1950S

Harley-Davidson styles of the 1950s were in many ways a contradiction of those with which the company is now synonymous. True, 1950s imagery rates high in current Harley design but the decade began under the cloud of the Hollister "riots" of 1947, which tarnished the



■ RIGHT *Another perfectly restored example of a 1948 Panhead.*

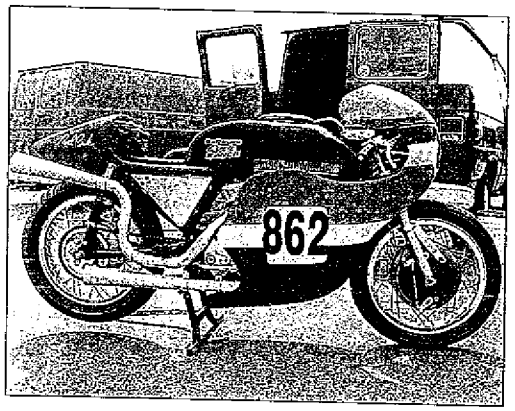


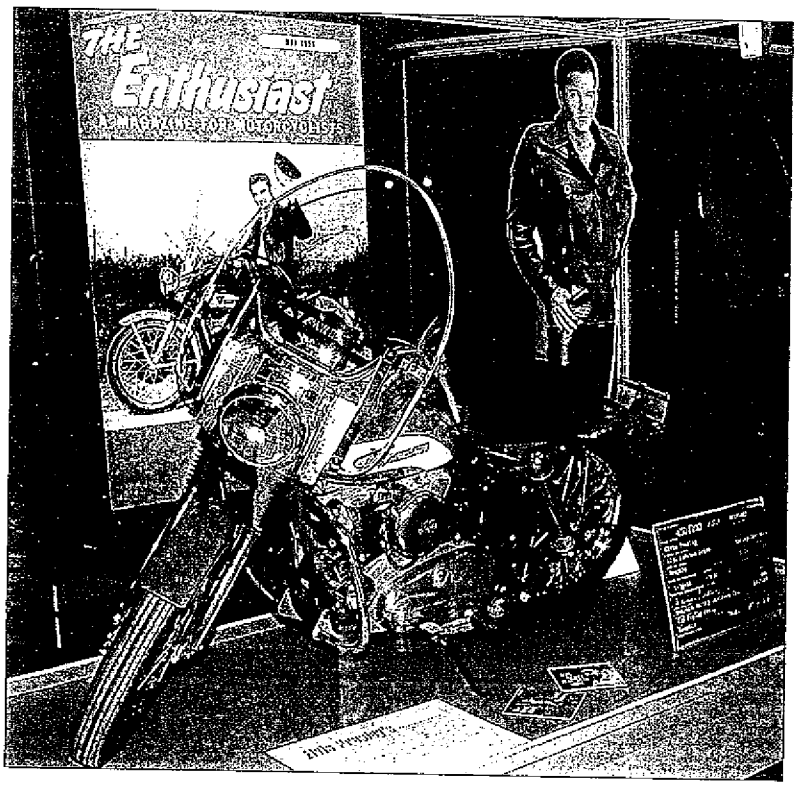
■ LEFT *Even the hottest side-valve Model K, the KHK, was unable to run with European overhead valve (ohv) sports machines which stole Harley's thunder during the 1950s.*

image of motorcycling and alarmed motorcycle manufacturers. The true creator of the riots, however, was the media (including *Life* magazine) which represented the gathering in Hollister as a major assault on small-town America. The world was just getting over the shock when the Hollister-inspired film *The Wild One* was released in 1953, reopening old wounds. Although the film's star, Marlon Brando, rode a Triumph Thunderbird on screen, many people still swear it was a Harley.

■ RIGHT AND BELOW *The Model K-derived KRTT fared better on the track, whilst on the street, their slowness made them popular with the insurers of Hollywood stars.*

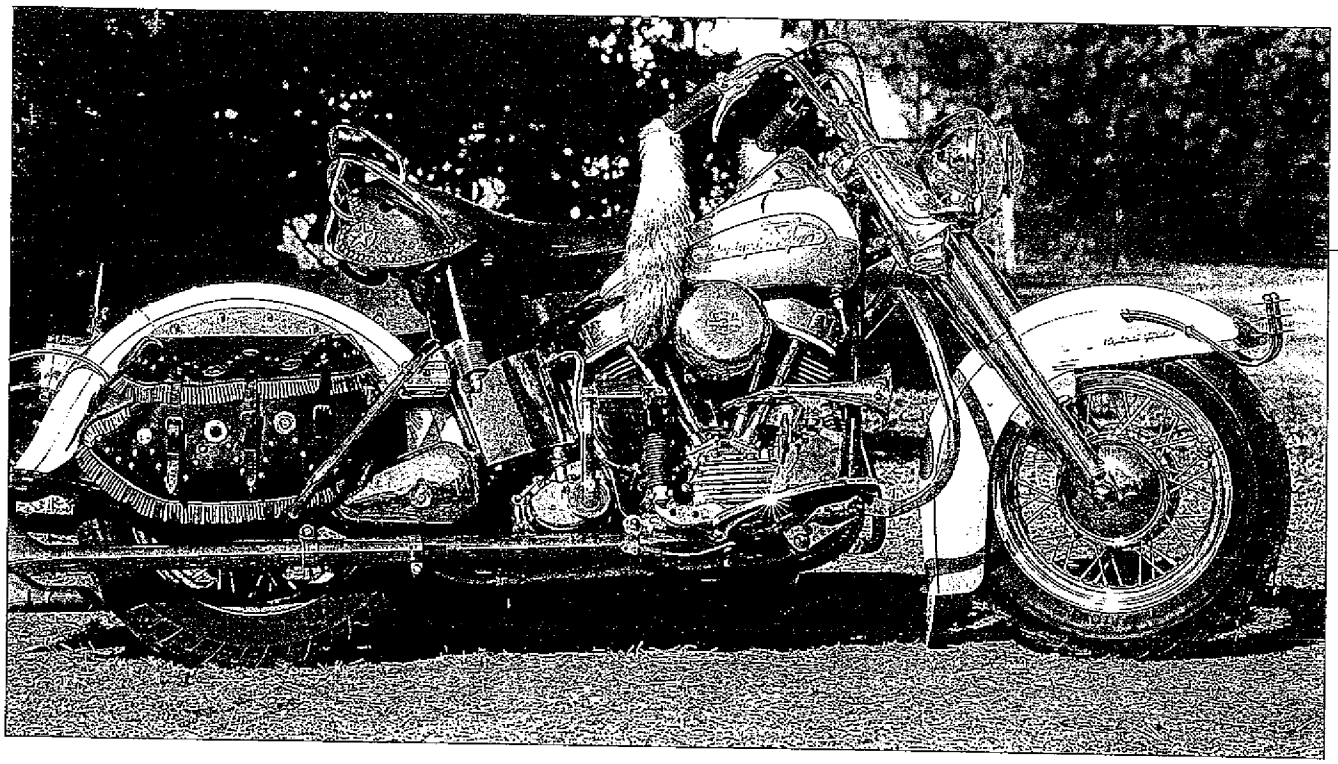
Even if the typical Harley owner of the day could handle the tarnished image of the motorcycle he loved, he may have been less sanguine about another development: in 1947, the world's foremost manufacturer of big V-twins began the manufacture of two strokes.





This seemingly radical departure was an attempt to bring Milwaukee's appeal to a wider market, a move that was applauded at the time by many observers.

The line began with the 125cc Model S, a 1.7 horsepower machine based on the same German DKW RT125 design as the BSA Bantam, the rights to which both companies acquired as part of Germany's war reparations. More than 10,000 were built in the model's debut year, based on the expensive misconception that war veterans would buy almost anything with wheels, before production slipped to a more realistic 4,000 or so per annum. The engine grew to 165cc in 1954, powering the Models ST and Super Ten before increasing to 175cc for the Ranger/Pacer/Scat series in 1962. Perhaps Harley's best-known lightweights were the 125cc Model B Hummer, produced from 1955–59, and the 165cc Topper Scooter of the early 1960s.

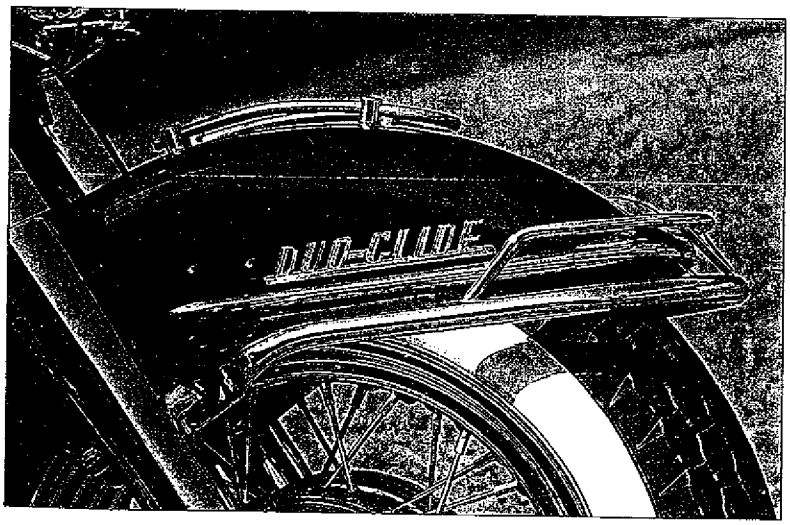


■ ABOVE *The HydraGlide was special, but something was missing...*

■ BELOW *...this came with the DuoGlide, the first Harley big twin to feature real suspension at both ends.*

Unfortunately, other manufacturers were also intent on broadening their markets. Harley-Davidson had by now introduced dealer demonstrator models and was to lose one competitor with the demise of Indian in 1953, but Triumph's creation of a vibrant new American import network in 1951 was a major alarm.

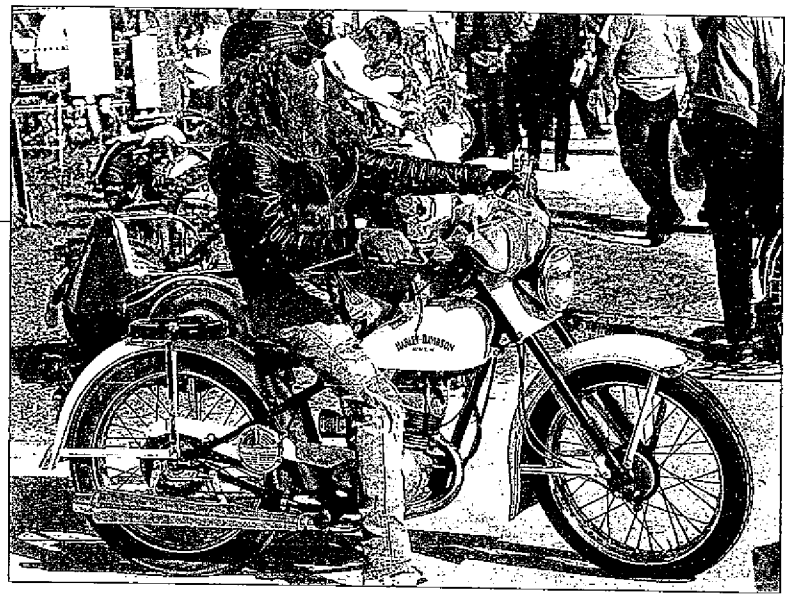
Isolated by war and supported by military production, Harley had enjoyed easy pickings for too long. Triumph – along with other British marques such as BSA, Norton and Royal Enfield – had a range of cheaper yet much more exciting and technically sophisticated models than Harley-Davidson (whose flagship model persisted with hand-gear-change until 1952).



Harley's response was heavy-handed and ultimately counter-productive as they attempted to bully dealers into having no business with the British pretenders.

Milwaukee also went so far as to apply for federal trade protection in 1952, alleging that the British machines were being subsidized and "dumped" on the American market. They asked for a 40 per cent import tax and quotas on the number of machines that Triumph (and parent company BSA) could import.

Thirty years later, Harley would get the protection that it had wanted, this time against the Japanese. The first time around, however, the Government's Tariff Commission found that Triumph had no case to answer. Worse still, they told Harley to quit its restrictive trading practices – a ruling that was to have devastating echoes for the company in the decades ahead.



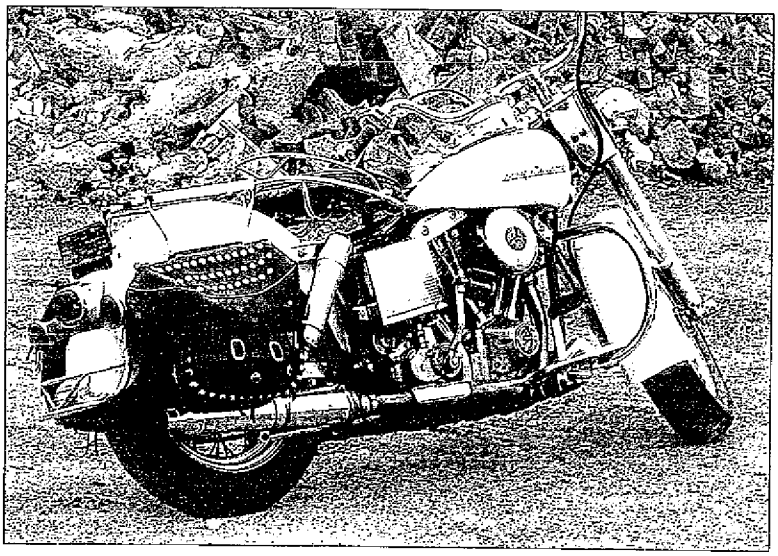
■ ABOVE *Not quite King of the Road: a Milwaukee two-stroke.*

■ OLD, SLOW AND OBSOLETE

No model summed up Harley's problem more than the Model K, introduced in 1952 to replace the WL. The K was a heavy 45.3cu in (742cc) side-valve design compared to the overhead valves, lightweight construction and good suspension offered by British twins (and, in the case of Norton, arguably the finest handling motorcycle in the world). Granted, the K included proper suspension at both ends – a first for Milwaukee – but in virtually every other respect it was woefully outclassed by the British-made bikes.

Harley claimed 30 horsepower for the Model K, which was only a little less than the contemporary Triumph Thunderbird. Whether or not this was true, the 85mph (137kph) V-twin was no match for the 103mph (166 kph) British model, although the KK version, which had hotter cams, was better. Early Model Ks also had serious mechanical problems, although quality and power was improved by a capacity increase to 883cc for the 55-inch KH model in 1954.

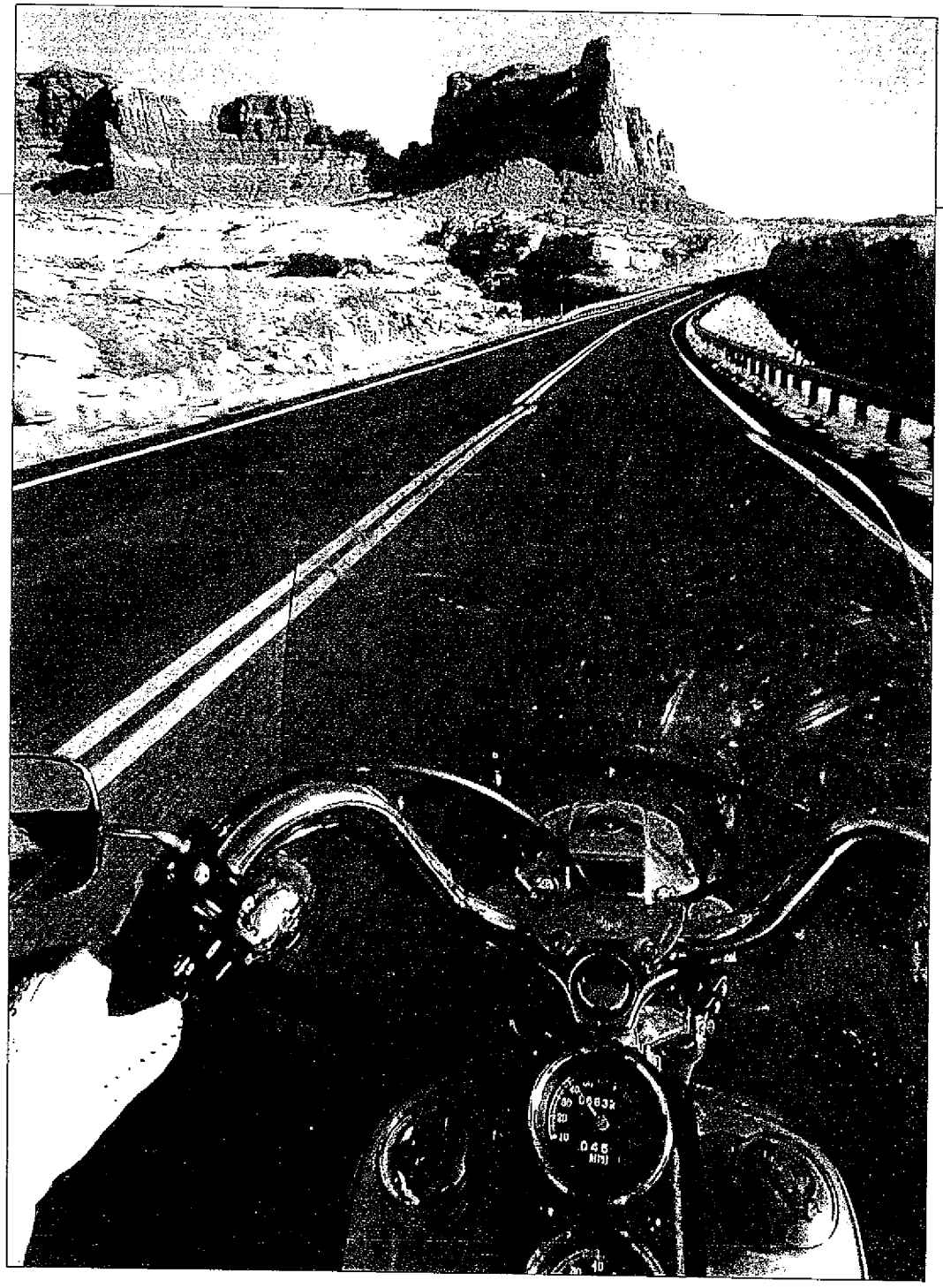
■ BELOW *The Shovelhead would replace the Panhead for the 1966 model year, as with this ElectraGlide.*



Remarkably, Paul Goldsmith took a K-based KR racer to victory by more than two miles (3km) in the Daytona 200 road race of 1953, a victory Harley-Davidsons were to repeat for the remainder of the decade. In 1954, the legendary Joe Leonard became first American national champion on KR and KR-TT racers. Although superficially impressive, these exploits owed much to the now familiar ploy of persuading the authorities to handicap the opposition. In this case, foreign ohv engines competing against 750cc Harley flatheads were limited to 500cc.

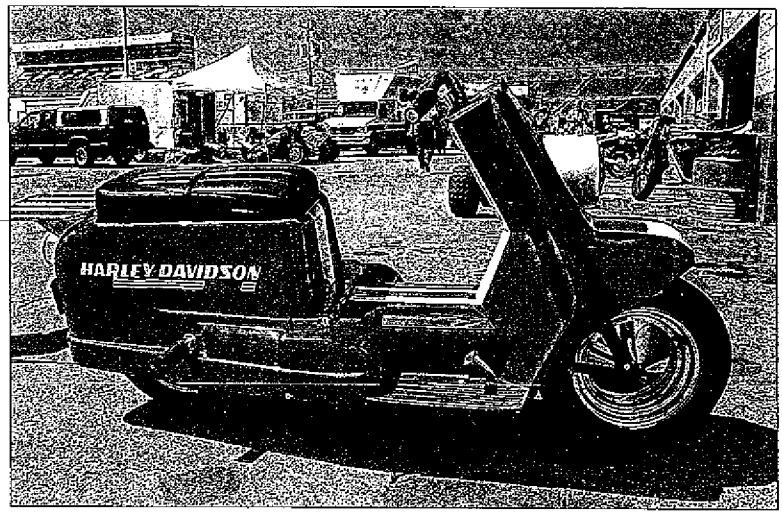
The K sold moderately well but overall sales figures show the full extent of Milwaukee's problem. In wheel-hungry 1948, Harley-Davidson produced more than 31,000 machines, the largest figure in its history. Yet by 1955, sales had plummeted to a low of less than 12,000. The problem could not be blamed on public disaffection with motorcycling, either – during the same period sales of imported machines went from strength to strength.

The machine which superseded the Model K in 1957 – the XL Sportster – was better in every way, eventually. The original Sportster's performance was lacklustre but by 1958 it benefited to the tune of 12 horsepower, due to lighter valve-gear, higher compression, larger ports and valves, and a legend was born.



■ RIGHT *What Harleys are best at: cruising the vastness of the good ol' US of A.*

Displacing 53.9cu in (883cc), as today, the XL boasted unit construction for the engine and gearbox. Swing-arm rear suspension with car-type dampers allowed early Sportsters to be sold for either on- or off-road use. The XL was an instant hit, accounting for almost 20 per cent of Harley's 1957 production of more than 13,000 machines. In 1958, the stock XL was joined by one of the most legendary Harleys ever produced, the XLCH – "Competition Hot". Other variations have included the low-riding Hugger (1979) and the limited-edition XR1000 (1983). The Sportster is also father to the remarkable XR750 dirt oval racer.



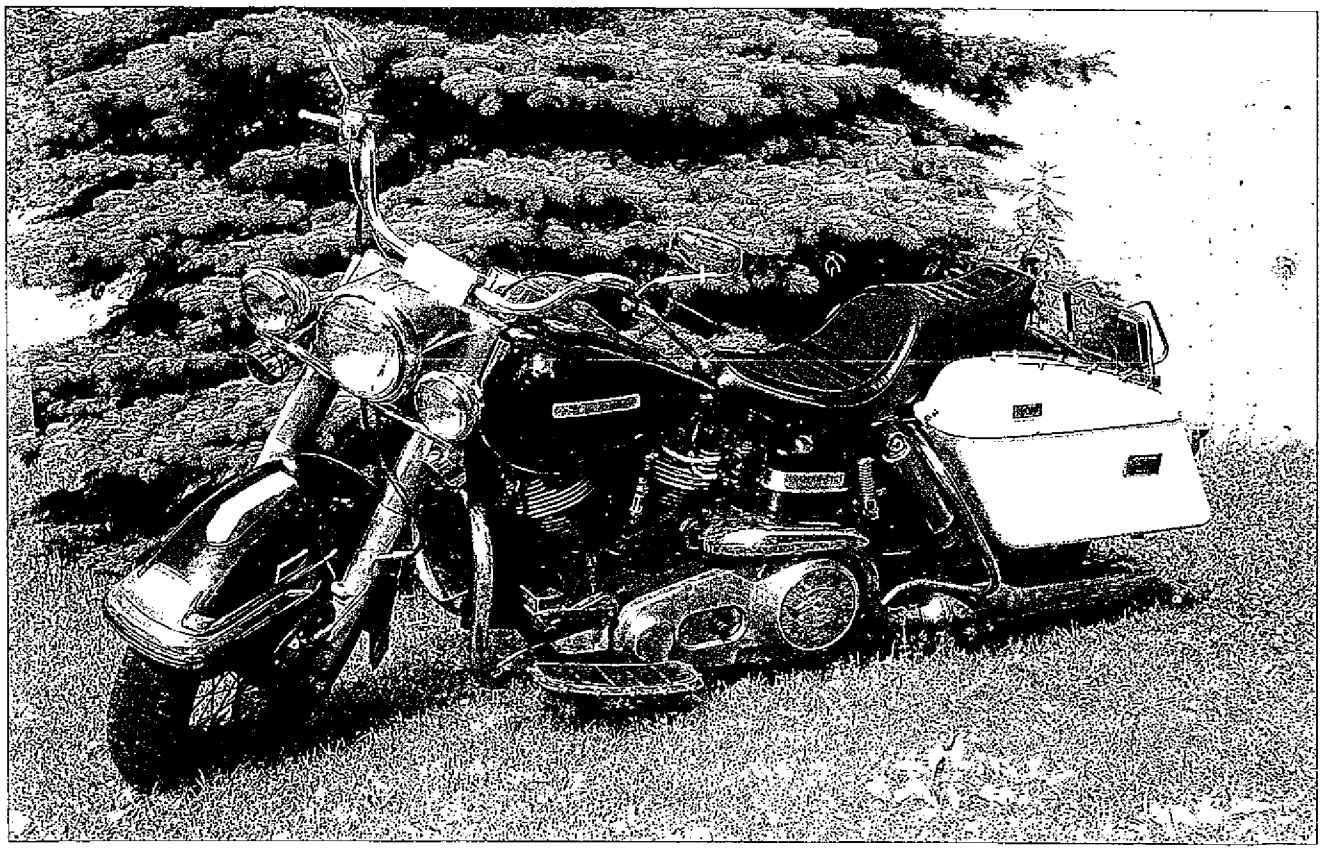
■ RIGHT *The Topper scooter was another of Milwaukee's attempts to diversify. At best, these achieved very limited success.*

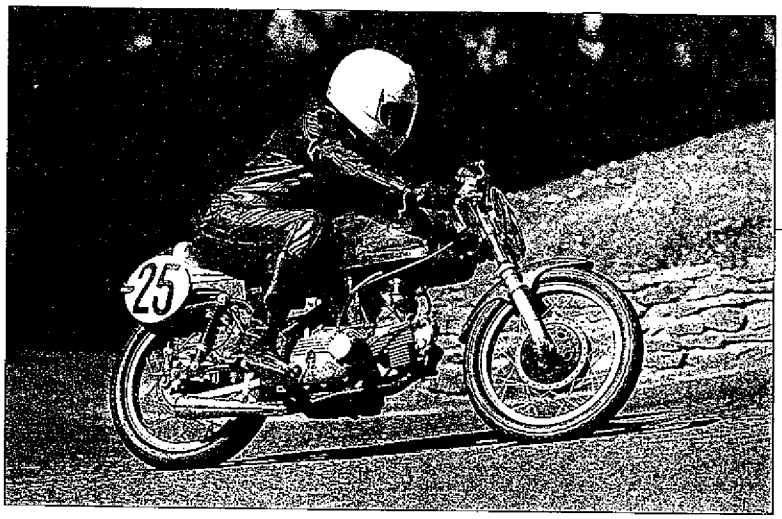
■ GLIDING INTO THE 1960S

As the 1950s drew to a close, the HydraGlide finally got the rear suspension it deserved and the Model F DuoGlide was born in 1958. The Duo featured a hydraulic rear brake as well as handsome two-tone styling and a swinging-fork rear end. However, this was something of an indulgence as both wheels contained puny six-inch drum brakes which struggled to slow down the Glide's substantial bulk, whatever their means of operation. The Duo is perhaps better remembered for film stardom – Dennis Hopper rode one in the cult movie *Easy Rider*.

With a new heavyweight on the block and the Sportster seglling moderately well, Harley-Davidson renewed its attention to expanding its market base. One of the more successful measures was a move into glass-fibre moulding – initially boats, but later golf carts and motorcycle accessories. The main goal was still a foothold in the global boom in motorcycle sales. At the time, this meant lightweight machines, a demand to which the existing two-strokes were proving unequal. Sales of the ST

■ BELOW *Harley would surely have done better to concentrate on its core business, big V-twins, than on other models.*





■ LEFT *Harley's purchase of Aermacchi broadened its range and even brought grand prix success.*

were roughly similar to those of the Sportster, yet profit margins were much lower. Juneau Avenue's Development Committee, responsible for future-planning, decided that collaboration with an overseas company might be the most effective way forward.

Consequently, Harley became half-owner of the motorcycle division of Aermacchi, or Aeronautica Macchi SpA, for just under $250,000. Harley anticipated the partnership would generate sales of 6,000 lightweight bikes per year, to be produced in Varese, Italy.

The first Harley-Aermacchi appeared in September 1960, quickly announcing its pedigree with a 1-2-3 result at the Santa Fe AMA short track championship races. The 250 Sprint was based on a spine-framed, horizontal, single-cylinder, four-stroke design similar to that of the famous Aermacchi racers, although most subsequent "joint venture" models would be small two-strokes. The 250 was light, powerful (the company claimed 21 horsepower, growing to 25 by 1964), handled well and spawned a line of superb racing machines.

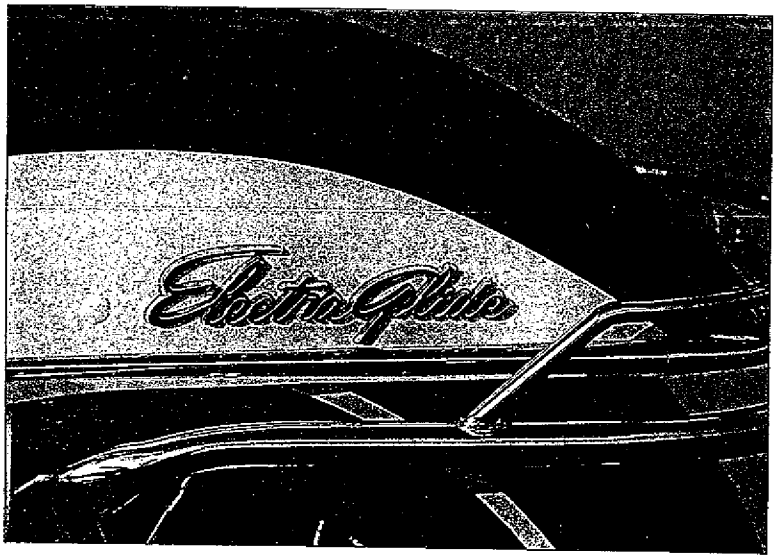
Yet the Sprint and its fellow Macchis – and indeed Milwaukee's home-grown lightweights – all failed to live up to Harley's commercial expectations, for a variety of reasons. Communications between the company's headquarters in the United States and Varese were often poor, causing continuous supply problems with bought-in components and incompatibility with American parts. Later, after the AMF take-over of Harley-Davidson in 1969, specifications were often changed erratically, without appropriate consultation or repricing. Most of all, the products were not wanted by a public being offered Japanese machines of ever-more sophisticated specification at lower prices (Honda had entered the American market in 1959). Nor were they wanted by dealers who had to carry new parts stock, retrain staff and relearn their business – all for a much smaller profit margin.

There were high-points, though – not least Walter Villa's consecutive world 250cc road-race titles in 1974 and 1975. The four-strokes got into the act: Roger Reiman took a Sprint-powered streamliner to a new world 250cc speed record of 156mph (251.05kph) in 1964, improved to 177mph (284.85kph) in 1965.

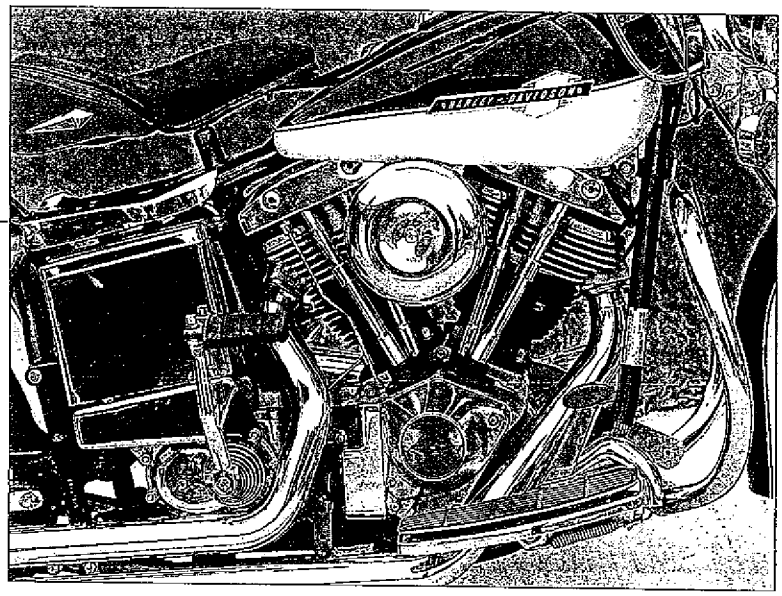
It was an unrewarding marriage and divorce came too late.

In June 1978, Harley closed its Italian factory. Juneau Avenue would never again aspire to a true mass market.

■ BELOW *ElectraGlide, possibly the most evocative badge in motorcycling.*



THE AMF YEARS

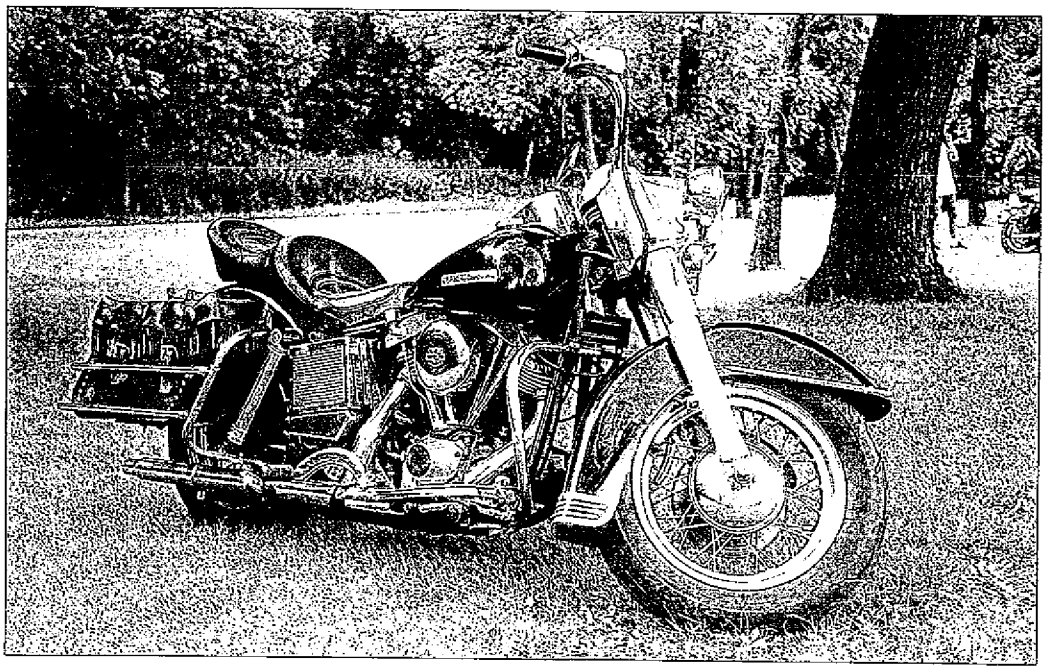


In 1964, Harley-Davidson not only unveiled its first new corporate logo in almost 60 years but also the model bearing possibly the most evocative name in the company's long history: ElectraGlide. Yet it was the following year that would be remembered as the more momentous. According to Harley lore, 1965 represented two climactic events. The first was the unveiling of a new generation of Shovelhead engines, replacing the venerable Panheads. Second, and ultimately more far-reaching, was the decision to list the company on the New York Stock Exchange – after more than 60 years as a family firm, its founding families were now to lose complete control.

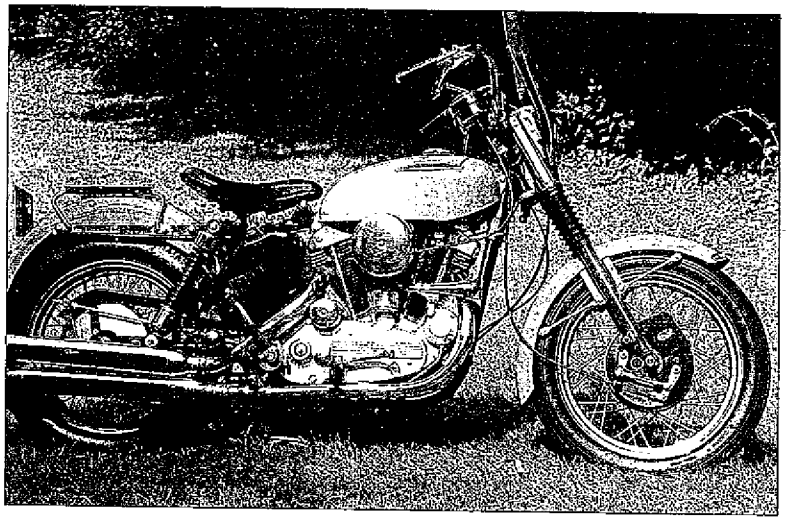
More than 1.3 million Harley shares were sold in the four years that followed the original listing. They performed well and investors – and straightforward enthusiasts – felt good. Optimism was short-lived once again, however, as imported Japanese motorcycles made ever-increasing inroads in the American market. Initially, these machines were middleweights – light, fast, affordable and refined – but soon Honda would begin a full-frontal assault with the seminal four-cylinder CB750. The age of the high-performance "superbike" had arrived.

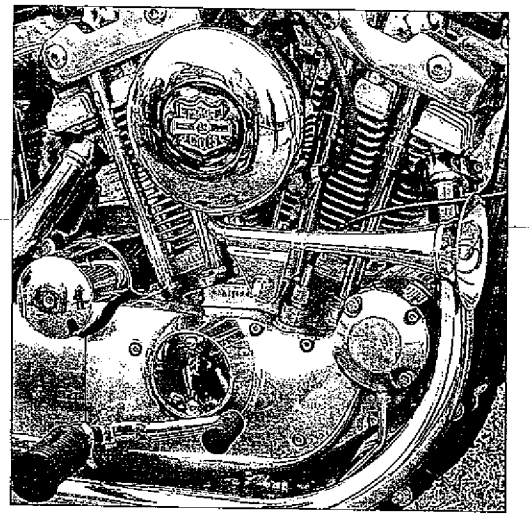
As Harley's fortunes ebbed and its shares dipped, it came under threat of takeover from an industrial conglomerate, Bangor Punta, which was busily accumulating Harley-Davidson stock. In 1968, fearful of the

■ ABOVE *Under AMF's ownership, sales improved but quality reputedly suffered, yet the Shovelhead soldiered on.*



■ LEFT *80-inch (1,340cc) versions of the Shovelhead first appeared in 1978, as with this FLH.*





■ ABOVE LEFT *The ohv Sportster was a vast improvement on the sidevalve Model K.*

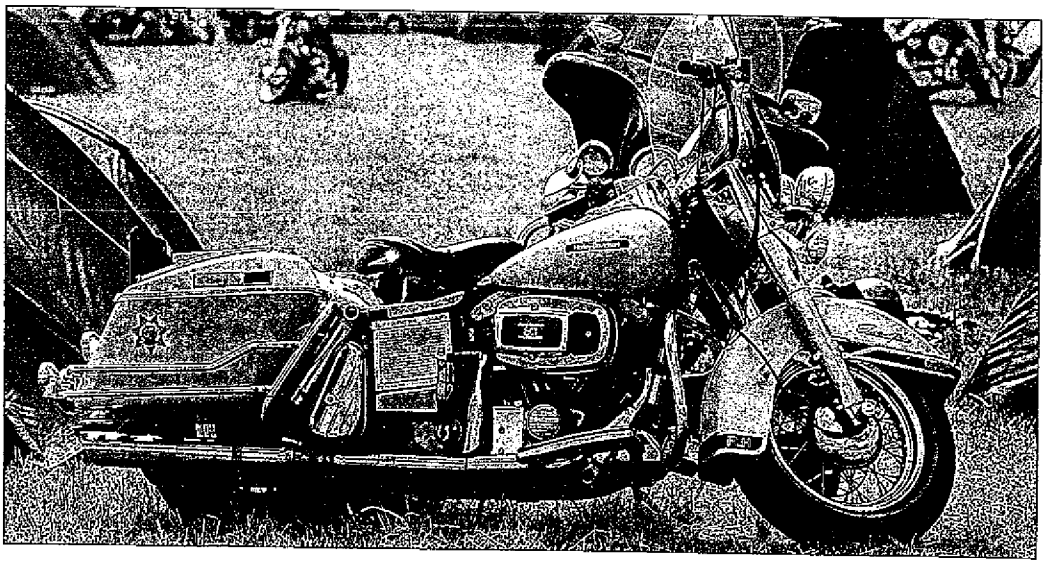
■ ABOVE RIGHT *More prized still was the tuned XLH Sportster, such as this example from 1972.*

sweeping changes proposed, company president William H. Davidson resumed talks with American Machine and Foundry (AMF).

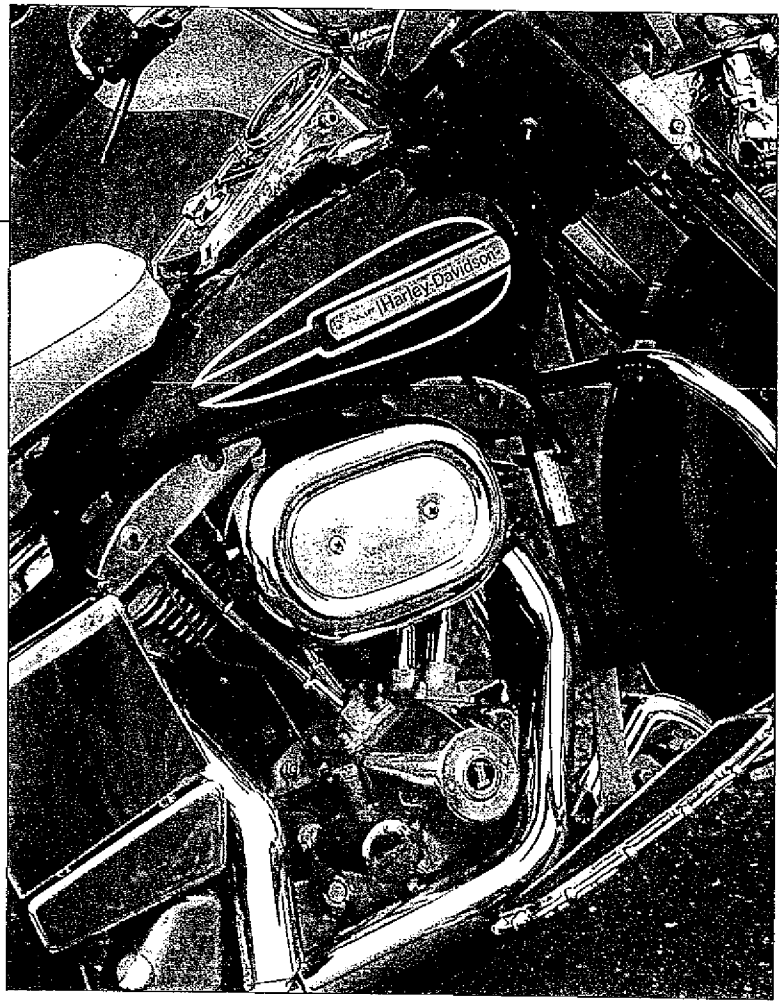
AMF was another industrial giant with designs on Harley but with less of a predatory reputation (chairman Rodney C. Gott was a keen motorcyclist). Harley recommended AMF's offer to shareholders, most of whom did well out of the subsequent $21 million deal. So it was that on 18 December 1968, Harley-Davidson voted to merge with AMF, a move ratified by shareholders on 7 January 1969. Thus the American icon became AMF property, with Gott as chairman, although it wasn't until 1971 that the new owner's logo would be seen on Harley-Davidson machines.

Today, it is fashionable to believe that AMF starved and milked Milwaukee's finest, that it didn't understand motorcycles or motorcyclists, that quality went to the dogs and that Harley/AMF never built a decent bike. Some of this is probably true, but AMF did sink millions of dollars into its new project. During its first three years in control, total sales more than doubled and, during its 12 years at the helm, sales of American-made machines more than tripled. In addition, the company diversified into such unlikely fields as snowmobiles and desert racers. Sales were reasonably strong but profits, unfortunately, were not.

Difficult labour relations at Capitol Drive were another concern. As a consequence of the



■ RIGHT *The look was still there, as with this flathead, but quality was declining as Harley struggled to keep pace with a changing market.*

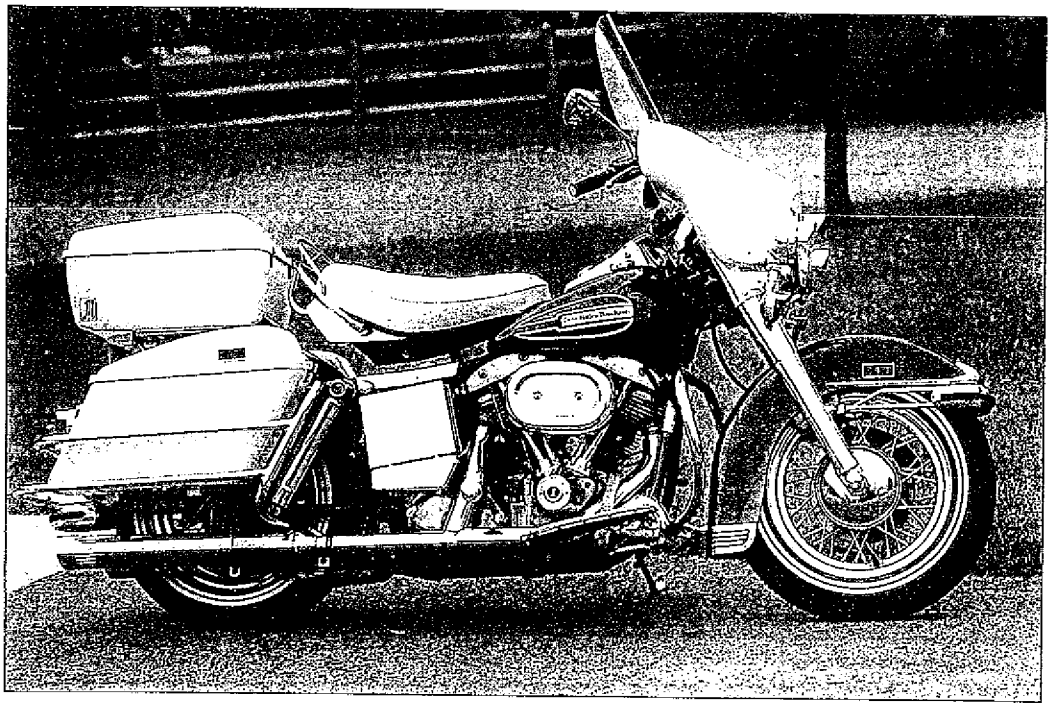


tension, the bulk of production was moved to a vacant AMF plant in York, Pennsylvania (where it remains to this day, although Milwaukee has always made engines).

More exciting developments were afoot. 1970 brought a whole new kind of iron, the FX1200 SuperGlide. This was the first of a string of startling cosmetic innovations from the fertile mind of William G. Davidson. Just as crucial was AMF's marketing and promotion expertise, which certainly rubbed off on the future, independent Harley-Davidson company.

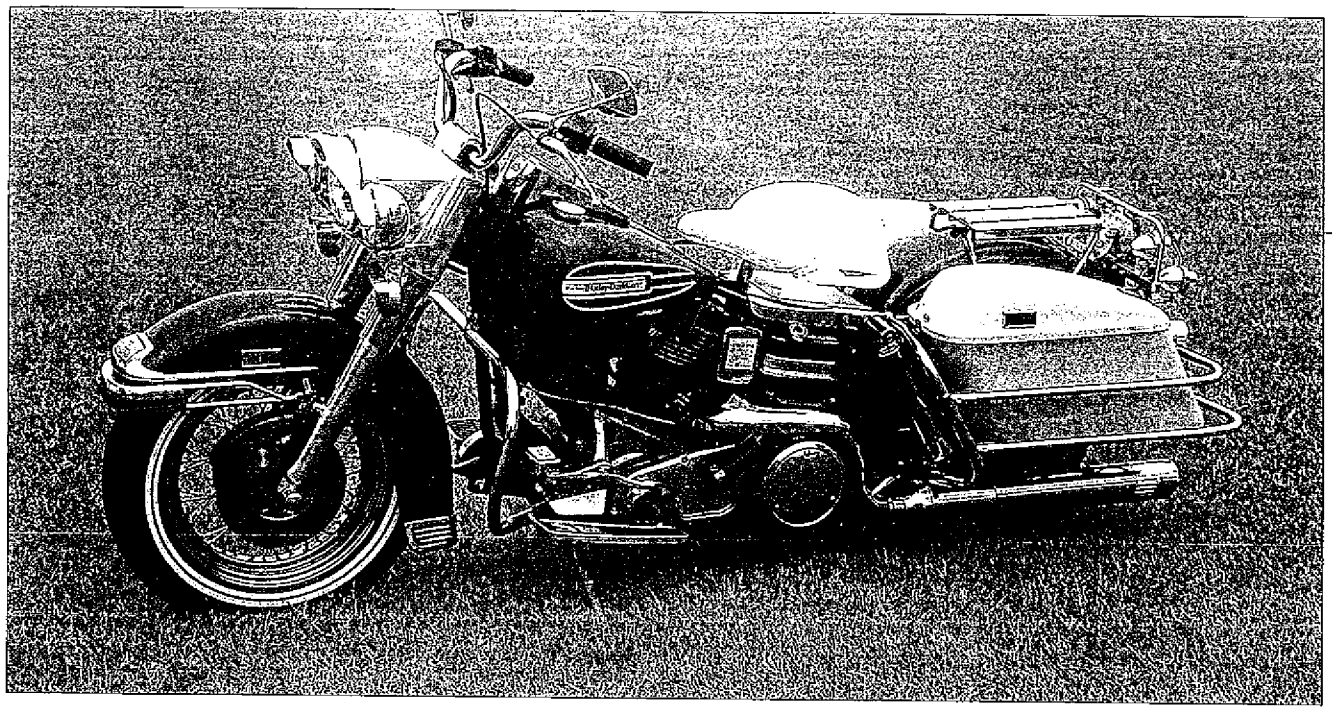
EXCITING IRON

If the 1970s was a commercially disastrous decade for Harley-Davidson, the hardware it produced at least paved the way for better times to come. Nowhere was this more evident than with the – the SuperGlide, the first major new twin launched by Harley after the takeover



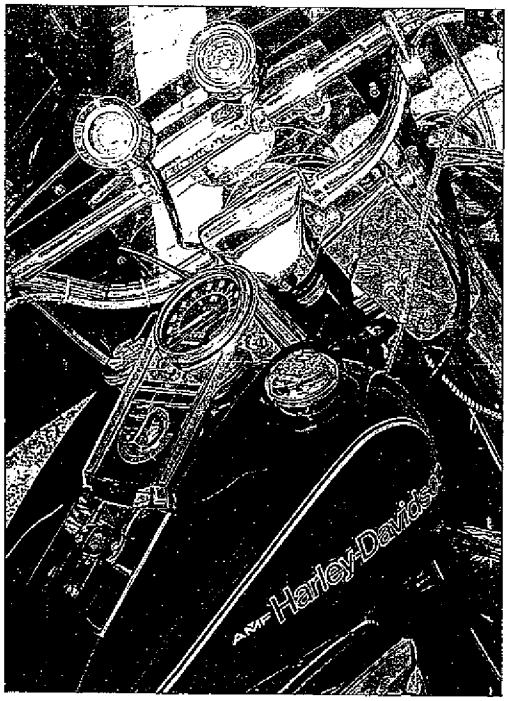
ABOVE *"AMF" on the tank was not well received by many, but others still considered the ElectraGlide the king of the road.*

LEFT *The King of the Road title actually referred to optional touring accessories. Bolt-on parts and other "goodies" would become huge business in later years.*



■ ABOVE *A 1972 ElectraGlide: no other motorcycle could get away with a white leather seat.*

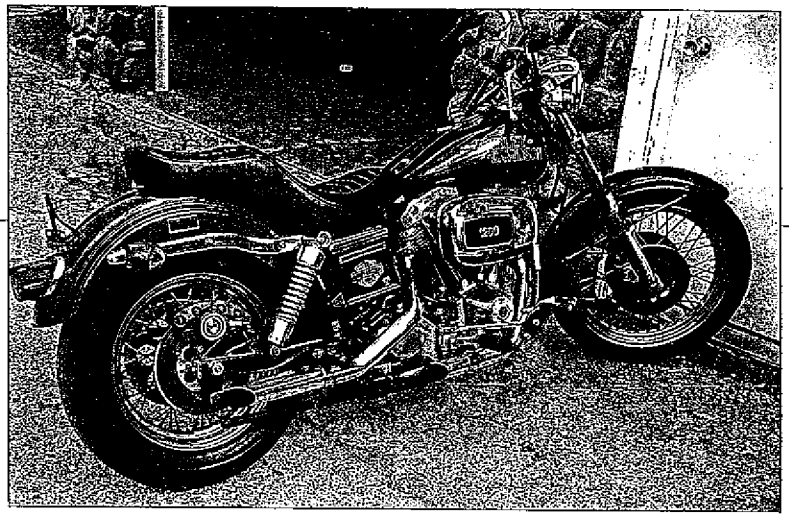
by AMF. The SuperGlide's hybrid philosophy – a little bit from one model, some from another and more parts from a third – became the essence of all the most memorable Harleys produced since. Despite the splash it made at the time – most road tests praised the SuperGlide expansively – early examples were distinctly under-specified for the new "superbike" age. Disc brakes arrived in 1973 and an electric start option, the FXE, in 1974.



■ RIGHT *Twin filler caps, tank-top speedometer and lashings of chrome: all Harley hallmarks.*

By 1977, Willie G. launched another classic derivative: the FXS Low Rider, complete with standard highway pegs, Fat Bob two-piece petrol tank and a seat just 27in (685mm) above the ground. Later the same year, the XLCR Café Racer was launched. This sinister all-black device was too radical a statement to enjoy much sales success at the time, but is a highly-prized collector's piece today.

The range of options increased further with the introduction of the 80-inch (1,340cc) Shovelhead engine, initially on the Electra-Glide in 1978. This led to the FLH one year later, offered as standard with a complete set of touring extras, later to become the long-haul norm: saddlebags, luggage rack, fairing, running boards and additional lights. This in turn led to the FLT TourGlide of 1980, similar to the full-dress Glide but with better brakes and a larger, twin headlamp touring fairing. More significantly, the FLT featured Harley-Davidsons' first five-speed transmission and, not least, its first use of rubber-mounting to protect the rider from engine vibration.



■ OPPOSITE *Willie G. Davidson (second left) pictured at Daytona with the Japanese-built Sundance racer.*

In fact, 1980 can be viewed as a vintage year all round. The Super Glide cruiser became the FXB Sturgis, named after the famous rally held annually in North Dakota. The "B" represented the first toothed-rubber belt drive – a clean, smooth and trouble-free system now standard across the range. For good measure, there was the FXWG Wide Glide and FXEF Fat Bob.

■ ABOVE *Willie G. Davidson's immortal "factory custom": the trend-setting SuperGlide.*

■ CHALLENGE FROM JAPAN

Nostalgia tells us that the 1970s produced a stream of classic Harley-Davidson models but, hardware aside, it was all an illusion. Even after shedding its Italian operation, the unpalatable truth was that, at the start of the 1980s, few people gave AMF Harley-Davidson very much chance of survival.

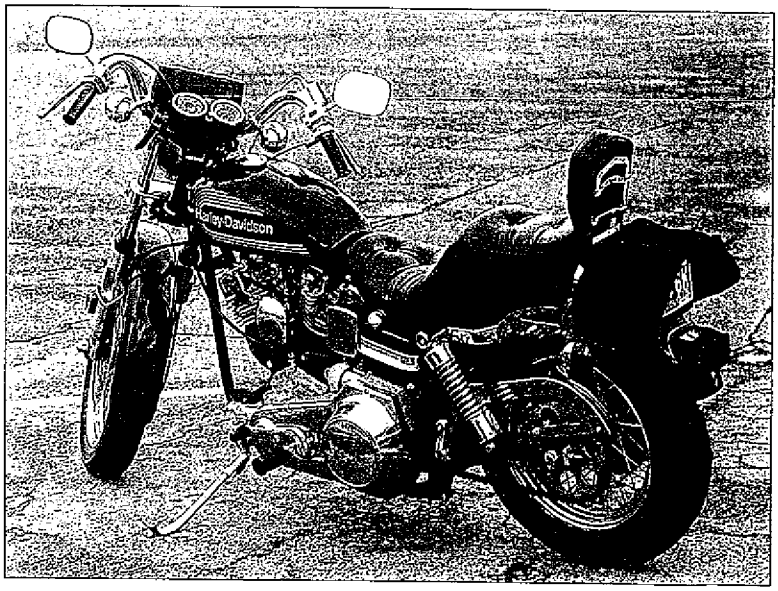
Who was to blame? It is tempting to point the finger at AMF, but whatever the company's shortcomings as custodians of the Milwaukee legend, Harley's biggest problem lay in a quite different direction. After all, it was scarcely AMF's fault that this period coincided so precisely with the rise to global domination of the Japanese motorcycle industry.

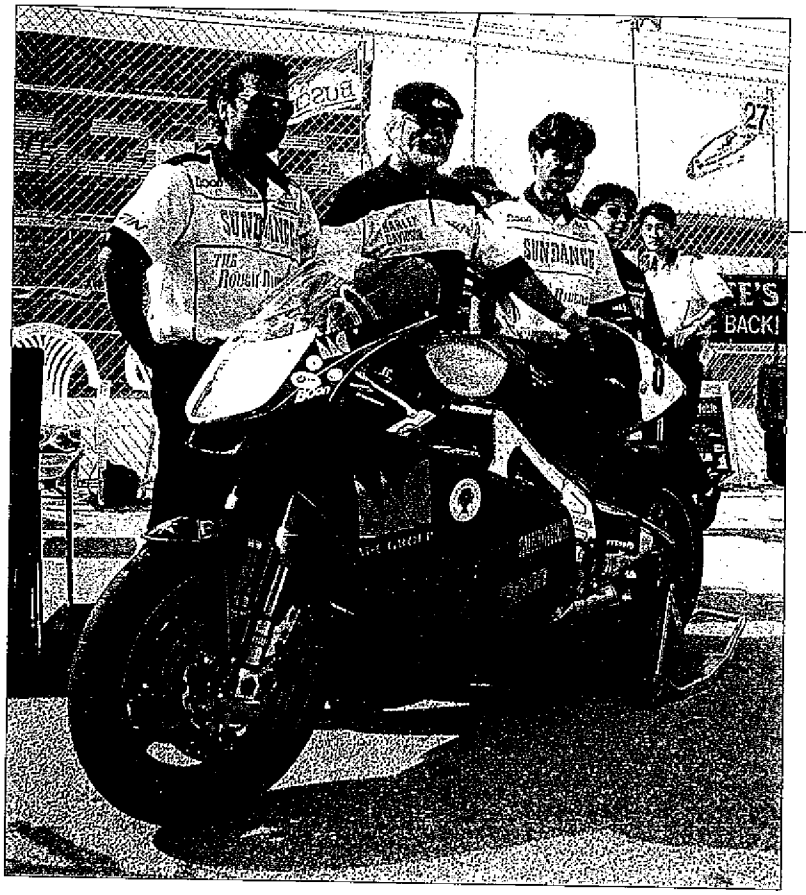
It is also a myth that Japan hijacked the American motorcycle market, either from Harley-Davidson or from the Europeans. Even after the British invasion of the mid-1950s, sales of new motorcycles in the United States stood at a paltry 60,000 units per year. By 1973, annual sales had soared to more than two million. This staggering increase was almost solely due to the inventiveness and enterprise of the Japanese, who produced reliable, fast and exciting machines far more advanced than any Harley, at a far lower price. Whatever "image" Harleys possessed was undersold, with few buyers prepared to pay the premium. The AMF years had seen turnover grow from $49 million to over $300 million but profits were going into reverse.

Milwaukee's response was to allege cut-price "dumping" of Japanese models, as with Triumph 20 years earlier. The American International Trade Commission agreed that dumping had taken place but that the effective subsidy was almost negligible. It concluded that the practice had not significantly harmed Milwaukee's sales and that the principal cause of Harley's difficulties was self-imposed: its model range was obsolete.

More than a decade earlier, William H. Davidson had remarked that AMF "thought Harley-Davidson could become another

■ BELOW *Another SuperGlide, this time fitted with optional pillion backrest.*





■ BELOW *The American – or is it Harley? – Eagle, proudly displayed in the Visitor Center lobby at Wauwatosa.*

Honda. That's ridiculous... we were never meant to be a high production company."

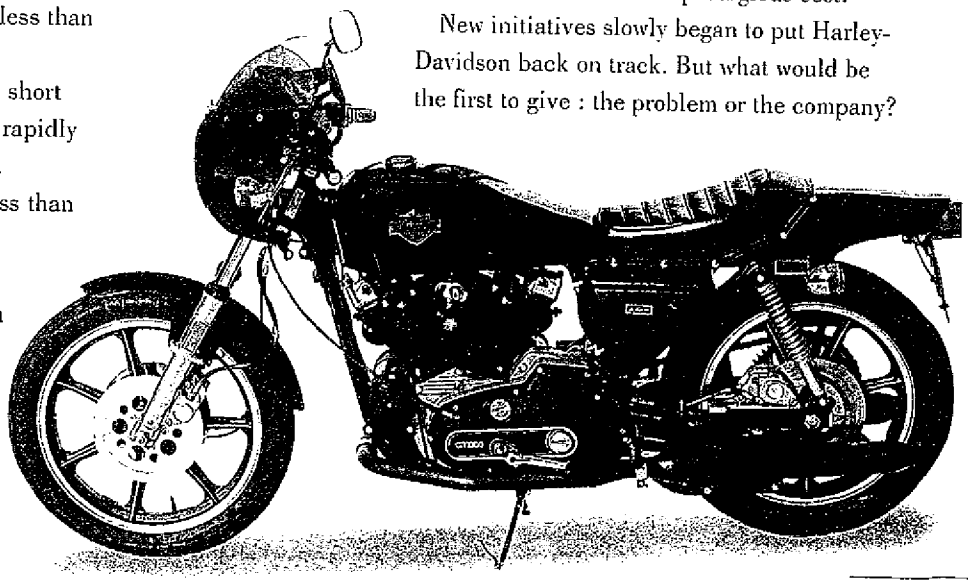
AMF had to some extent attempted to compete head-on with Japan rather than concentrating on the more specialized market that Harley suited best. Production figures for 1982 offer some measure of the hopelessness of such a strategy: Honda built more than 3.5 million bikes in the year; Harley built less than 50 thousand.

The situation was desperate. Just six short years after 1973, Harley's share of the rapidly growing American big-bike market had plunged from almost 100 per cent to less than 40 per cent.

Production in the United States plummeted from 75,000 motorcycles in 1975 to 41,000 in 1981. Dire labour relations had brought a 101-day strike in 1974 over cost-of-living wage increases. Some in the company saw this coming, despite an artificial boost in 1978 due to the company's 75th birthday celebrations. Vaughn Beals, company president since 1977, and chief engineer Jeff Bleustein alerted top managers to the unpalatable realities. Beals set up a quality control and inspection programme that began to eliminate the worst of the problems, but all these measures were at a prodigious cost.

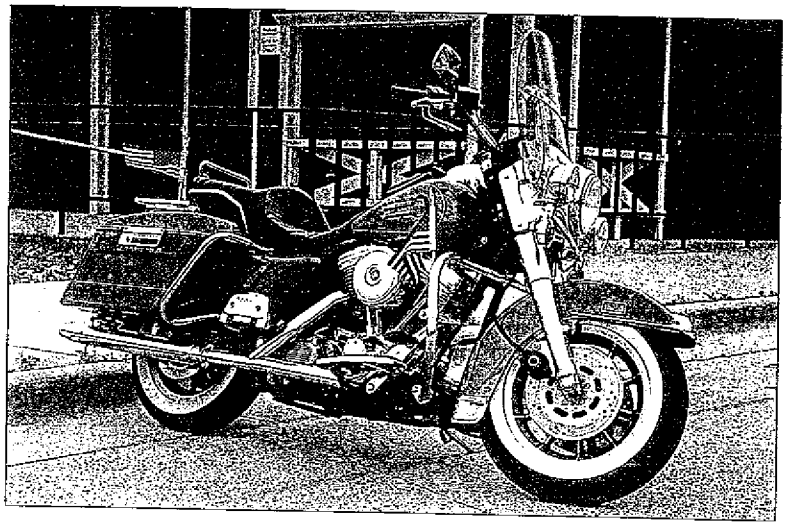
New initiatives slowly began to put Harley-Davidson back on track. But what would be the first to give : the problem or the company?

■ BELOW *Another symphony in metal from Willie G., the XLCR Café Racer.*

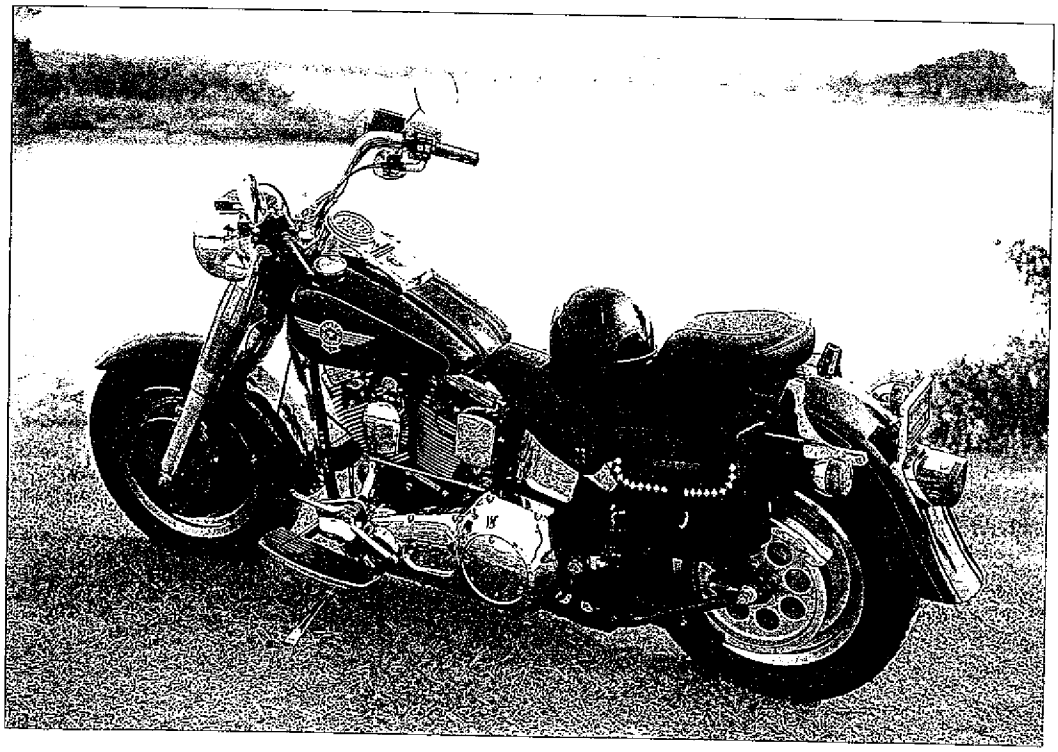


"THE EAGLE FLIES ALONE"

The year 1981 brought what was probably the most momentous – and certainly the most audacious – episode in the long history of Harley-Davidson. With AMF losing interest and patience, chairman Vaughn Beals persuaded 12 other Harley executives to join him in an $81.5 million leveraged buyout from AMF control. The group included Charlie Thompson, appointed president the previous year, and Willie G. Davidson. A letter of intent was signed on 26 February and the bid went public five days later at Daytona Beach. The group found a willing lead lender in Citicorp Bank and after several months of tough bargaining with AMF the newly-independent Harley-Davidson Motor Co. began business on 16 June 1981. The event, not surprisingly, was accompanied by widespread rejoicing and fanfares, under the slogan "The Eagle Flies Alone" – including a symbolic ride-out by the new owners, from Milwaukee to York, as well as a solid gold dipstick for the first bike built under the new regime. Harley-Davidson was



■ ABOVE *There's no mistaking the American roots of this early Evo FLH model.*



■ LEFT *One of the very first Evo engines in one of the very first Softail models, pictured here.*

finally owned and run by real motorcyclists, men who loved the big V-twins, men who really cared. They were heady days, but the euphoria counted for nothing on its own. The American market, and Harley-Davidson's part in particular, was about to cave in even further. The buy-out did not enhance the buyers' fortunes as much as had been hoped – the newly-independent company's share of the shrinking American big-bike cake had dropped to a mere 23 per cent by 1983.

Ownership may have changed but one fundamental truth had not: Harley-Davidson's competitors were still producing better bikes at lower cost.

Over-staffing was part of the problem, and almost 200 clerical jobs went almost at once, but there was much more to it. Put bluntly, Harley's – indeed, much of America's – manufacturing culture was antique. Beals and other managers had toured Japanese plants in 1980 but it wasn't until after the buyout, when they were given the opportunity to inspect the Honda assembly plant in Marysville, Ohio, that they began to understand fully.

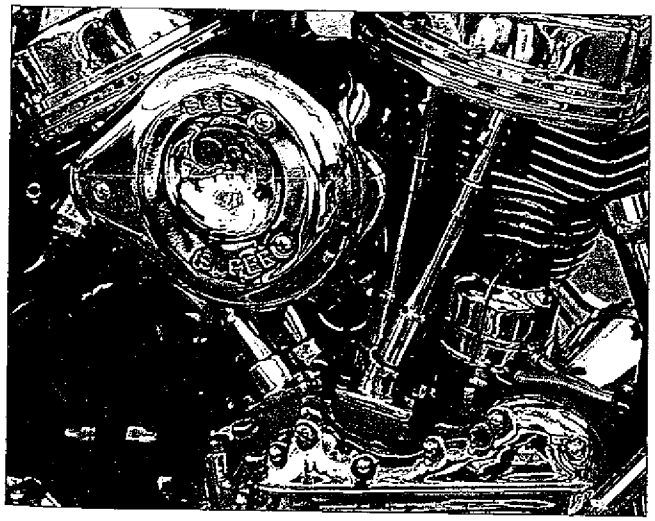
■ ABOVE *As quality suffered, many US police forces spurned Milwaukee machines.*

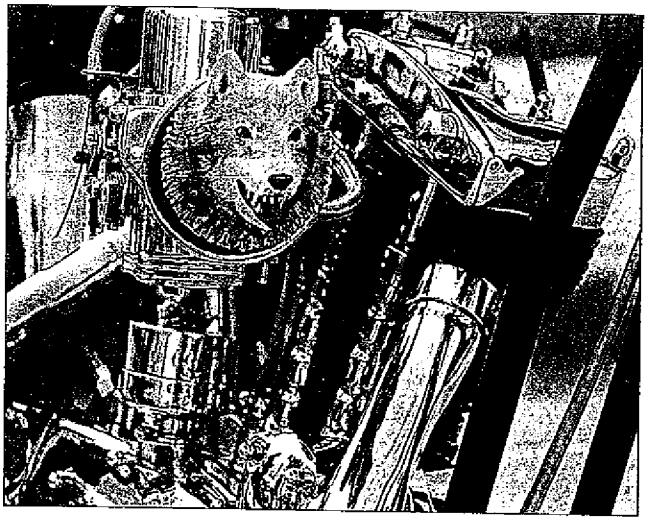
■ BELOW LEFT *To confirmed Harley aficionados, nothing beat customizing, whether of an old Panhead...*

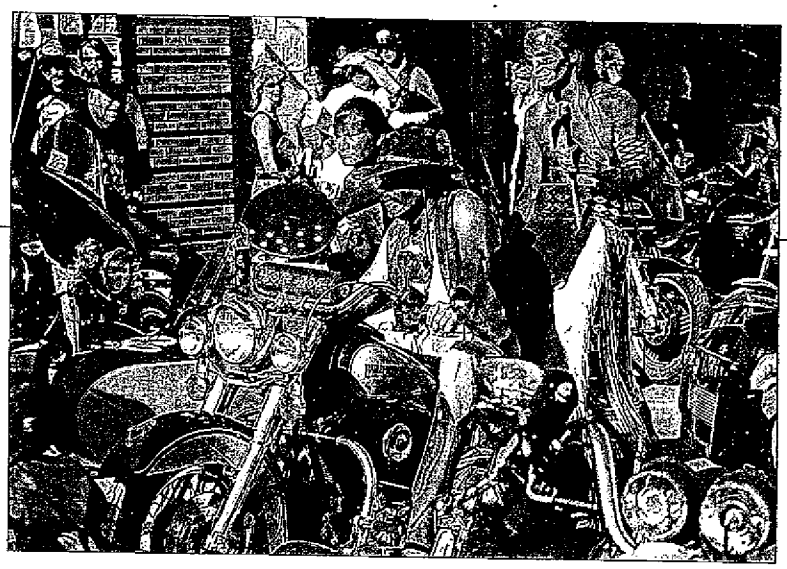
■ BELOW RIGHT *...or perhaps something more recent... a Shovelhead.*

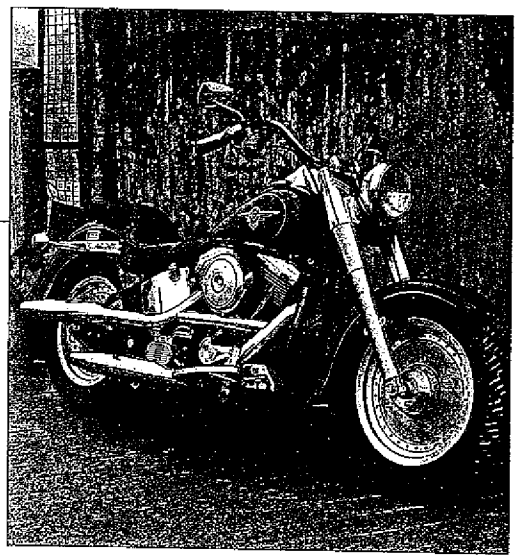
As chairman Vaughn Beals remarked: "We found it hard to believe we could be that bad – but we were. We were being wiped out by the Japanese because they were better managers. It wasn't robotics, or culture, or morning callisthenics and company songs – it was professional managers who understood their business and paid attention to detail."

Beal's message wasn't lost on the new team. With help from industrial fixers Andersen Consulting, within four months pilot programmes for "just-in-time" statistical process control (Harley called this "MAN" – Materials As Needed) and other up-to-date production systems were initiated and staff levels were slashed from 3,800 to 2,200. Tom









Gelb, in charge of production, explained the situation to Harley-Davidson staff as directly as possible: "We have to play the game the way the Japanese play it or we're dead."

Quality and efficiency was one thing, getting the message across to potential customers quite another. The company shifted its marketing focus, stopped trying to compete against Japanese mainstream motorcycles and threw all of its resources into developing what we now take for granted as its uniquely American big-bike niche. (Along the way, a little-known project inherited from AMF for an overhead camshaft V-four was quietly dropped after several working prototypes were produced.) Was it too little, too late? Despite new models such as the five-speed FXR SuperGlide II and a new Sportster, the lone-flying eagle reported a loss of $25 million in 1982. It was going to be a close-run thing.

■ ABOVE LEFT *AMF did not realise how lucrative Harley lifestyle and hardware were to be in the future.*

■ ABOVE RIGHT *The Evolution engine, as in this 95th Anniversary 'Glide transformed Harley's fortunes.*

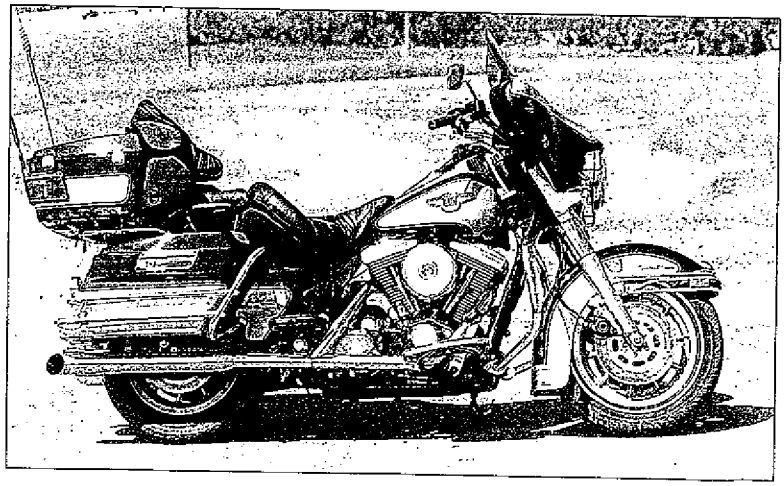
■ BELOW *Meanwhile the Softail range – like this Fat Boy – opened up a whole new field of Harley machines.*

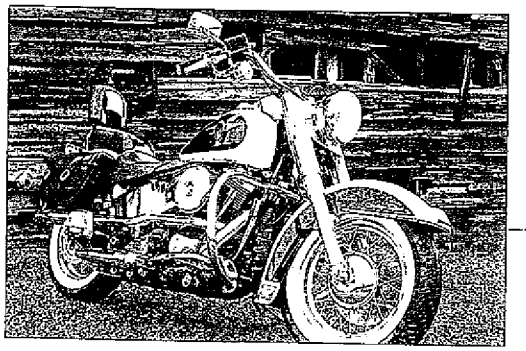
■ THE PRESIDENT STEPS IN

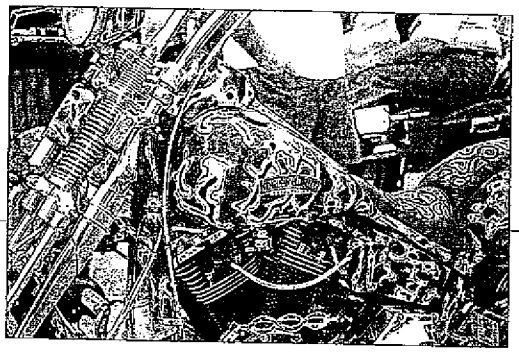
In August 1982, another Harley delegation made the trip to Washington, again alleging illegal trading practices by Japanese motorcycle companies. Yet again, the ITC was told that cheap motorcycles were being illegally dumped on the market and that the Japanese were "virtually copying" Harley models, all of which was seriously undermining their sales. This time Harley had a case, as massive over-supply in declining markets meant that many machines were sold at a loss. As Vaughn Beals put it, "We simply want the US government to restore order to a motorcycle market under siege by Japanese manufacturers who increased production in the face of sharp market decline."

As if to highlight the problem, the local Wisconsin police force bought Kawasaki motorcycles rather than Harleys, prompting a mass ride-out in protest from Capitol Drive.

The Commission duly found in Milwaukee's favour and recommended as much to President Ronald Reagan. On All Fools Day 1983, the White House confirmed that import tariffs were to be imposed on Japanese machines. The tariffs would apply to all imported models of







■ LEFT *The "CowGlide", Heritage Softail Nostalgia, coolest of all the Softails...*

■ ABOVE RIGHT *...although even this wasn't radical enough for some owners, as shown by this Springer Softail.*

more than 700cc, at the hefty rate of 45 per cent (in addition to the existing 4.4 per cent duty), decreasing year-by-year to 35, 20, 15 and 10 per cent until April 1988.

Although Japanese machines built in the United States, such as Honda Gold Wings, were exempt, the levy was inevitably a major asset to Harley-Davidson's regeneration. In the meantime, they had to continue to improve quality and efficiency. Perhaps most crucial of all, a credible replacement for the aged Shovelhead was long overdue. Short-term fixes such as the digital ignition introduced on the new FXRT in 1983 were no longer enough.

Harley threw $3 million into a "Super Ride" demonstration programme in 1984, to show that the company had solved its notorious quality-control problems. TV commercials invited bikers to visit any of its 600-plus dealers to road test a new Harley. Over three weekends, the company gave 90,000 rides to 40,000 people, half of whom owned other brands. At first, the venture didn't sell enough bikes to cover its cost, but itmade the point.

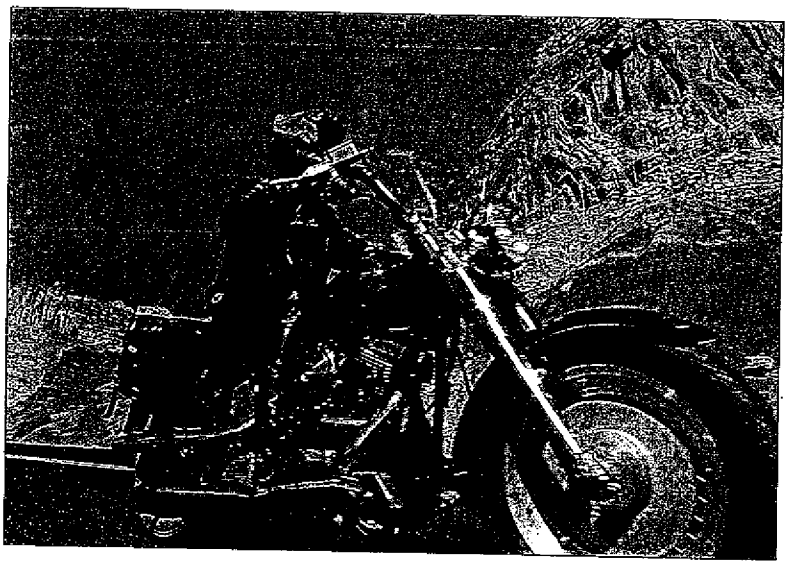
Then there was HOG – the Harley Owners' Group. This was a major corporate effort to bring customers together in the Harley-Davidson lifestyle. Nothing so ambitious had ever been attempted by any motorcycle manufacturer, yet HOG proved uniquely suited to the Harley image. A runaway success, HOG now boasts almost half a million committed members worldwide and is a model for similar schemes by other motorcycle manufacturers.

The company also began to defend its name, copyrights and trademarks for the first time, and vigorously. In future, if anyone wanted a Harley-Davidson logo, Milwaukee would demand its rightful royalties. Over half a century after pioneering the sale of branded accessories, Harley was at last determined to cash in on the image it had taken eight decades to create. Slowly, Vaughn Beals and his team began to turn the near-disaster around. Thanks to improvements in quality and efficiency, and more aggressive marketing, Harley began steadily to catch up with mighty Honda in the heavyweight division.

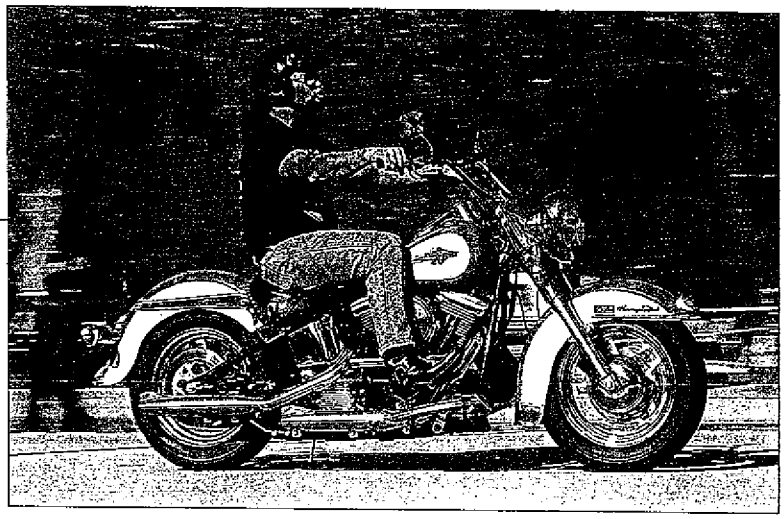
At last, this very American company was beginning to make the most of its uniquely American image. 1982's loss became a small surplus in 1983.

A year later, in 1984, Harley reported a profit of $2.9 million on sales of $294 million. Even though there was still a very long way to go, the eagle was on its way.

■ BELOW *Meanwhile, out on the open highway, Milwaukee's long-legged punch counts for more than mere paint.*



EVOLUTION



The anxiously-awaited replacement for the Shovelhead finally arrived in 1984 – and Harley-Davidson's future balanced precariously on a knife's edge. The V2 Evolution engine certainly looked like the answer to everyone's prayers. Despite a bottom-end with origins dating back to the 61E of 1936, it was an altogether better powerplant than the Shovelhead it replaced.

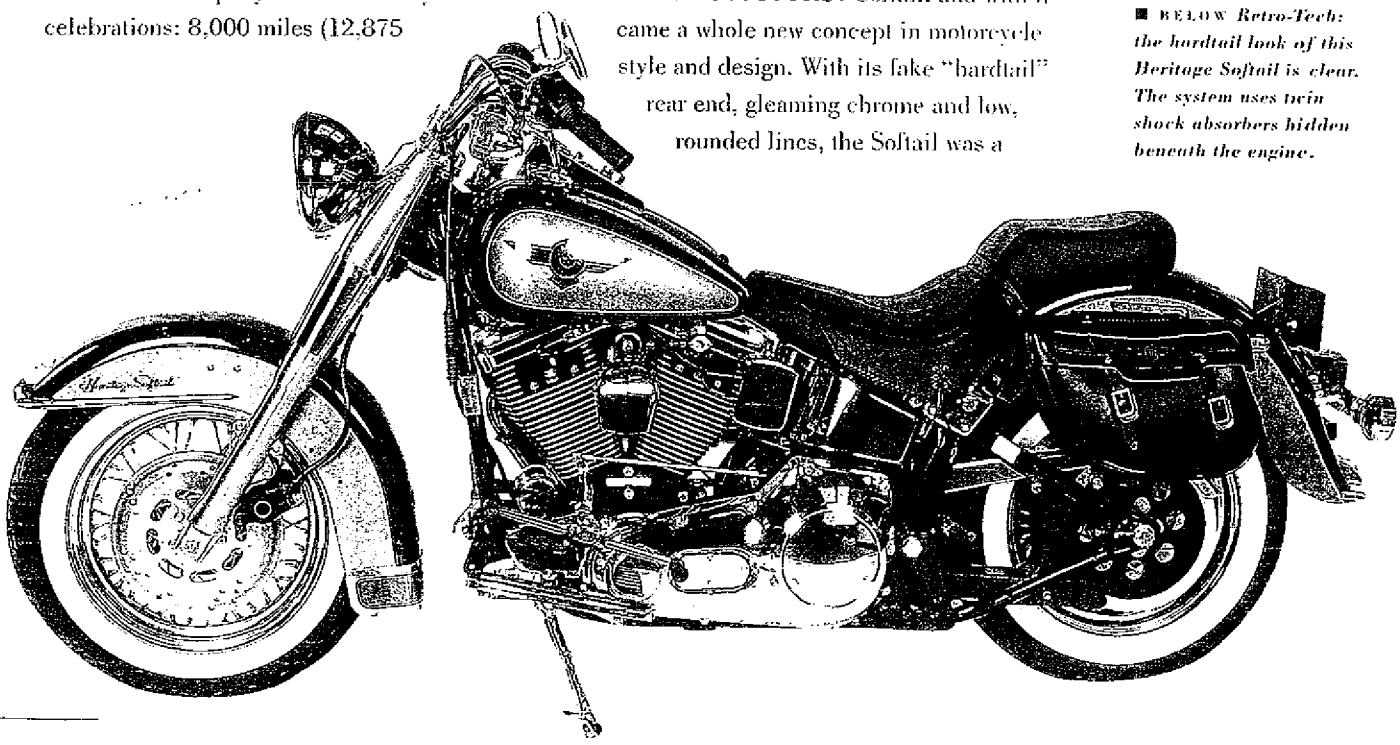
As the name suggests, the "Evo" is a development of the Shovel rather than a totally new design, yet almost every component was different and improved. Its cylinders, splayed at the "classic" 45 degrees, displace 81.8cu in or 1,340cc (although badges round this down to 80in). Scaling 20lbs (9kgs) less but producing 15 per cent more torque than its predecessor, the Evo would prove to be all it was cracked up to be.

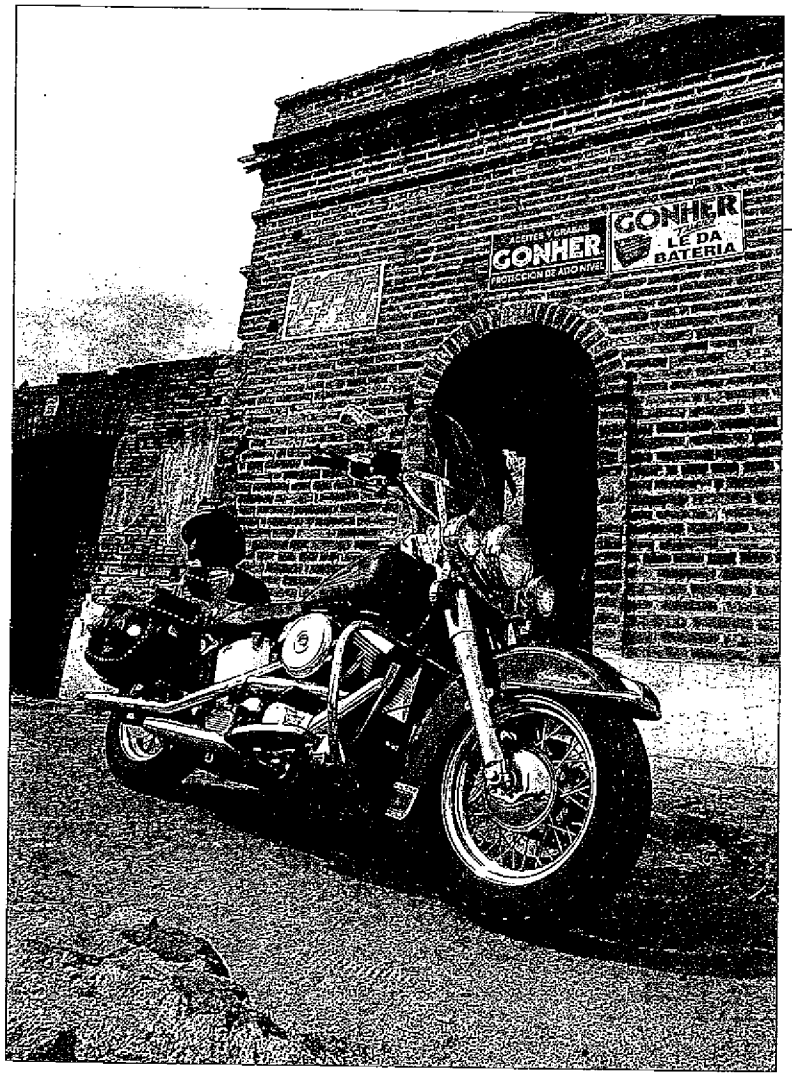
In 1983, Harley-Davidson made sure its new baby created an impact with a publicity stunt to mark the company's 80th birthday celebrations: 8,000 miles (12,875 km) at an average of 80mph (128.7kph) with none of the routine servicing a customer's machine would receive on standard FLT Tour Glides. At Talladega Speedway in July 1983, the Evolution-engined TourGlides thundered through the designated 8,000 miles, but slightly off the scheduled pace: allowing for mishaps that never occurred, they averaged 85mph (136.8kph).

A brand-new engine was cause enough for celebration (helped perhaps by the new H-D brand beer), but the first model powered by the Evo engine was a landmark in its own right. This was the 1984 FXST Softail, and with it came a whole new concept in motorcycle style and design. With its fake "hardtail" rear end, gleaming chrome and low, rounded lines, the Softail was a

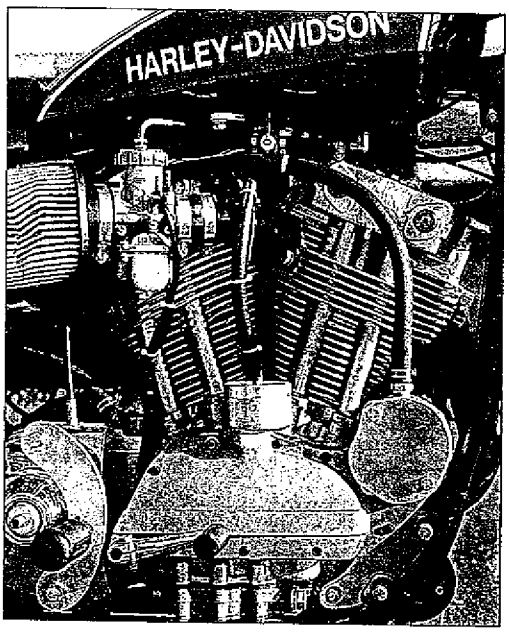
■ ABOVE *Cruisin' through town can just look so cool.*

■ BELOW *Retro-Tech: the hardtail look of this Heritage Softail is clear. The system uses twin shock absorbers hidden beneath the engine.*



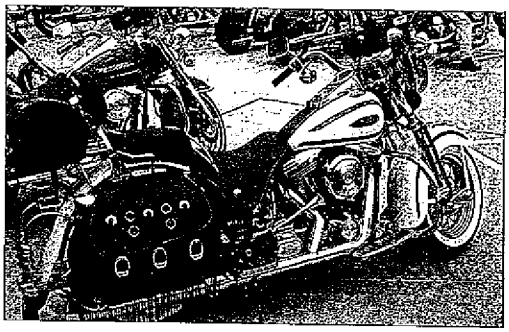


■ ABOVE *"Basic" Softails retain telescopic front forks.*



■ RIGHT *At the opposite extreme is this road-registered XR750 racer, as used in US dirt-track competition.*

■ BELOW *The Springer Softail adopts a girder-style front end.*

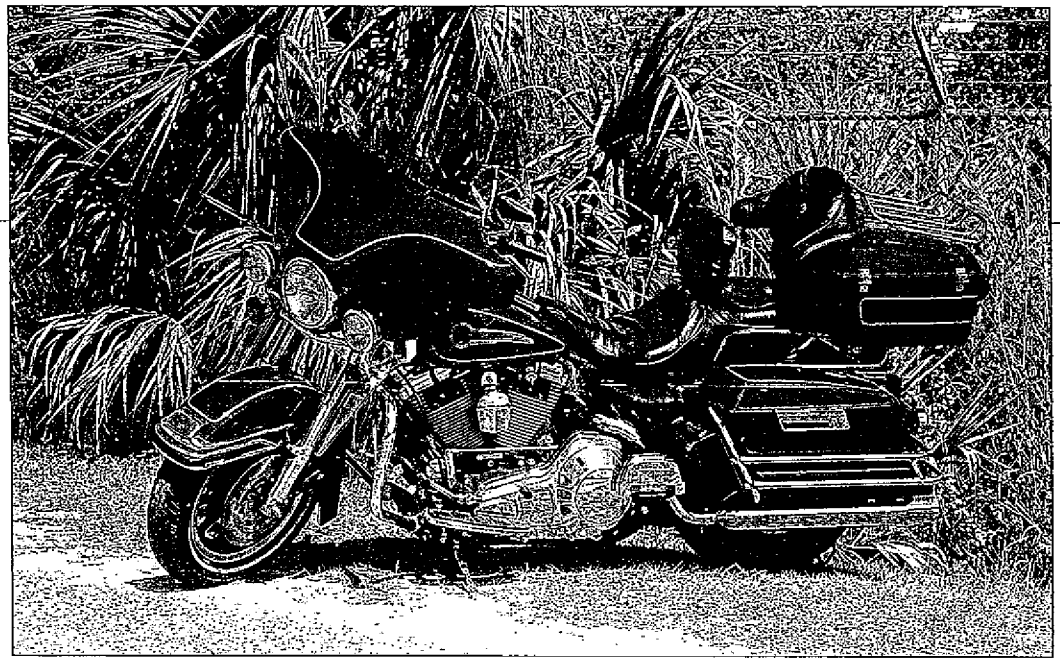


strident echo of motorcycles of the 1950s: the age of Retro-Tech had dawned. Sportsters still cut a dash, especially with the launching of the new XR750-inspired XR1000. A year later, the Heritage Softail followed the basic FXST.

Almost overnight – or so it seemed – Harley-Davidson had a credible range and, after the gremlins of the Shovelhead years, a reputation for the dependability that had once been its hallmark. Again it had a product capable of meeting the demands of the California Highway Patrol (CHiPs) who, after a decade mounted on Kawasakis and Moto Guzzis, in 1984 ordered 155 FXRP Police Specials.

To Harley insiders, however, the "Evo year" was probably far more memorable for the financial strife which continued to undermine them. In 1984, Citicorp Bank, underwriter of the original buy-out, was becoming concerned that Harley's future might not be so rosy once the tariff on foreign competitors ended in 1988. Reasoning that the best time to get a good price for the company was when sales were still on the rise, they moved quickly, hitting Harley's directors with the bombshell: all credit facilities would be severely restricted from the following year.

This was a major blow to Harley's ambitious plans and the survival of the entire buy-out. Harley-Davidson was broke.

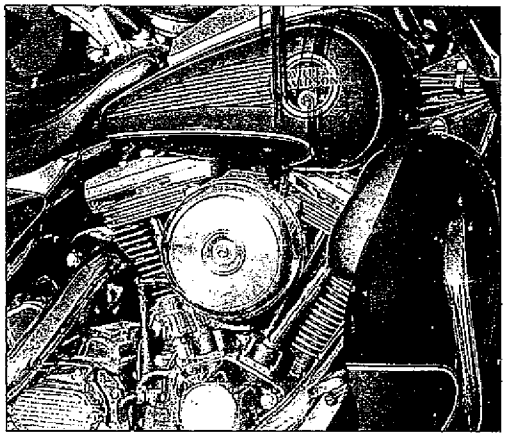


■ LEFT *ElectraGlides and TourGlides evolved ever-more luxury features such as cruise control, CB radio and intercoms.*

■ TURNING BACK THE TIDE

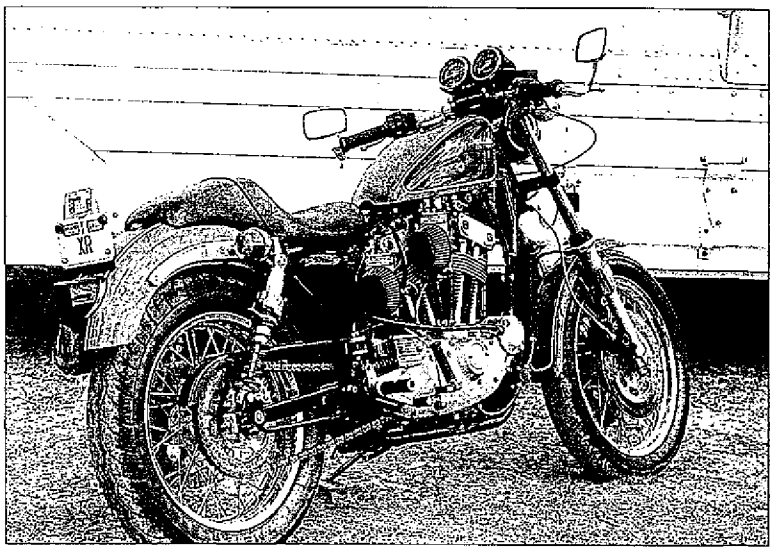
"Hawking begging bowls around Wall Street" was how Vaughn Beals described his desperate response. Over the summer of 1985, Beals and chief financial officer Richard Teerlink (later to succeed Beals as H-D's head), chased in vain after new lenders. Then, with the situation looking hopeless and lawyers drafting bankruptcy plans, Dean Witter Reynolds put Beals and Teerlink in touch with the Heller Financial Corporation. Luckily for Beals, Heller's second-in-command, Bob Koe, was a long-time Harley buff and willing to listen. He was impressed by what he heard, and on 23 December 1985 a financial package was agreed – the best Christmas present for which Harley could have wished.

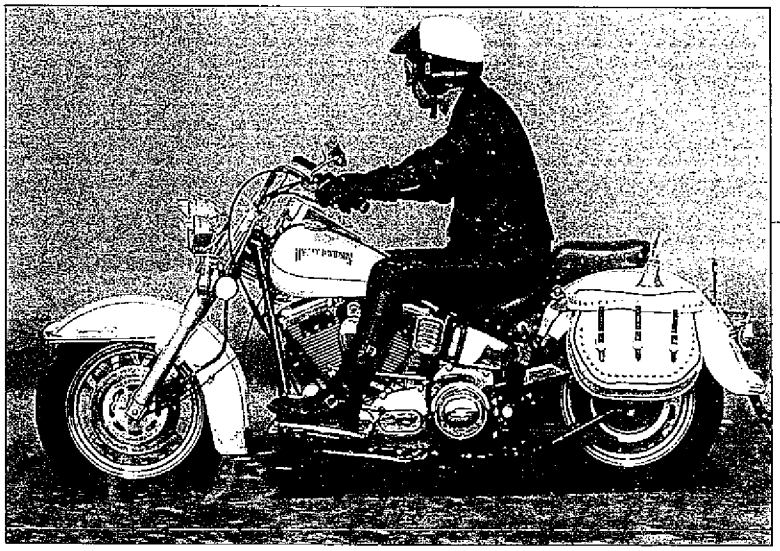
The rescue package turned out to be a good deal for everyone but Citicorp, who had badly underestimated the outlook for this vibrant new Harley-D. Including credits, the bank received $49 million for the deal, $2 million less than it had poured in. Harley received $49.5 million of working capital. In a supreme irony, Harley recovered the Number One spot from Honda a year after being abandoned by Citicorp, with 33 per cent of the over-850cc American market. The long struggle to improve production



■ LEFT *Detail of the striking Ultra Classic ElectraGlide.*

■ BELOW *In stark contrast was the Sportster series, of which this 1984 XR-1000 is surely the best looking and most prized.*





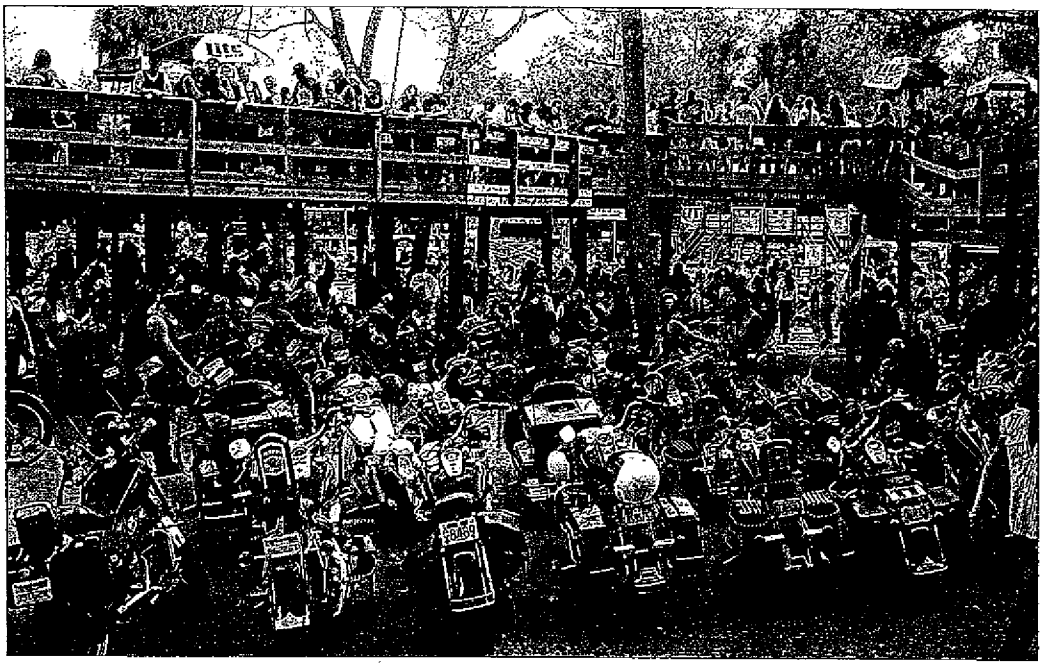
■ ABOVE *In Europe, as well as the United States, Evo Harley sales began to boom. This Heritage Softail Classic thunders across the Belgian Ardennes.*

and marketing, and regenerate the model range was beginning to pay dividends. 1986 profits were $4.3 million on sales of $295 million.

Harley's financial base was secured in June 1987 by floating the company on the New York Stock Exchange. The offer raised more than £30 million, allowing the company to reschedule its debts and buy the Holiday Rambler Corporation, a leading manufacturer of recreational vehicles. In October, the manufacturing rights to the military MT500 motorcycle were acquired from the British Armstrong company. Less comforting was the closure of the competition department, though it made sound financial sense. Production of XR750 dirt-track engines was unaffected, and racing continued in the famous livery through independent dealer teams.

The most impressive news of all came on 17 March. In what turned out to be a public-relations triumph, Harley had taken the unprecedented step of asking that trade protection be removed a year ahead of schedule. As Vaughn Beals explained at the time, Harley-Davidson "no longer need tariff relief to compete with the Japanese". The chairman highlighted "the strong message... to the international community: US workers... can become competitive in world markets." Harley was again "the pride of America".

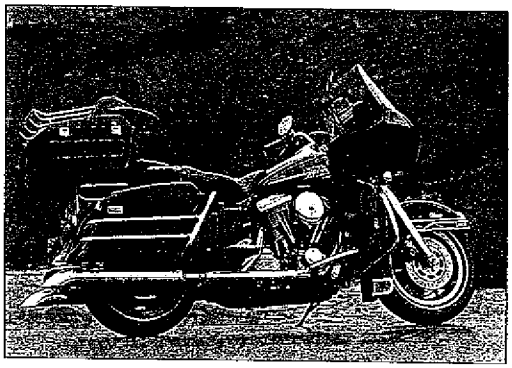
This was brought home best of all by President Ronald Reagan. After touring the York factory in Pennsylvania in May 1987, he



■ RIGHT *In places such as Florida's Daytona Beach, Harleys inspire crowds of fans of American iron. Fittingly, this is the famous Iron Horse Saloon.*

■ BELOW *International Harley: an ElectraGlide Classic in the damp Welsh mountains.*

■ RIGHT *Flying the Stars and Stripes with pride: a 1200 Sportster about to be revealed.*



hailed the turnaround in Harley-Davidson's fortunes as "an American success story". And how right he was.

A major contribution to future success was tied up with the XLH 883 Sportster. With a price tag of just under $4,000 when introduced, the 883 was the type of entry-level machine so conspicuously absent from the Milwaukee stable in the past. In 1987, 883 owners got an even better deal with the announcement of Harley's innovative buy-back scheme: "Trade in your XLH against an FX or FL within two years and we'll guarantee $3,995 on your old machine."

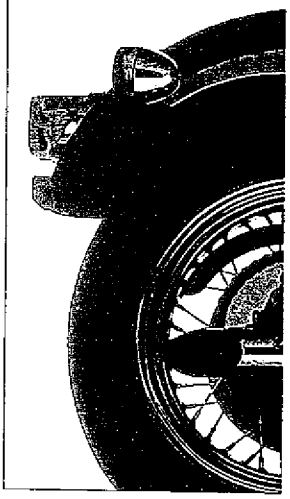
Major new models included the stunning Heritage Softail Classic, ElectraGlide Sport and Low Rider Custom. By the end of 1987, Harley had 47 per cent of the American "super-heavyweight" market, a figure which would rise to 54 per cent just one year later. At last, Harley-Davidson was on its way.

■ SPRINGING AHEAD

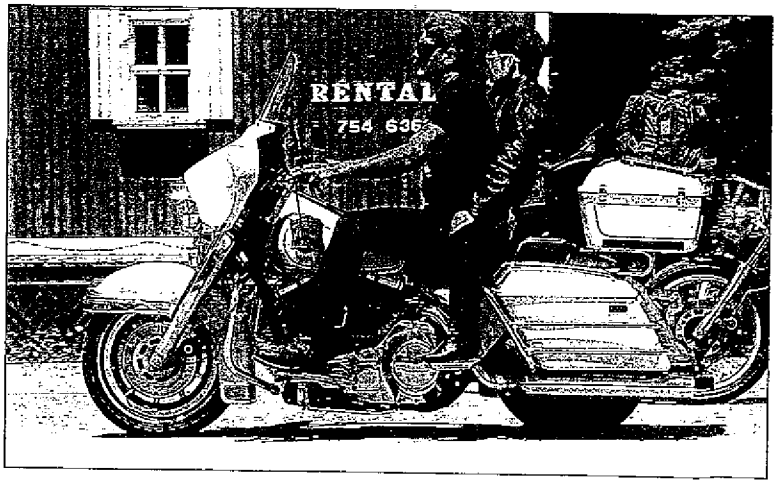
1988 saw the debut of the largest-capacity Sportster ever – the 1100 grew to the full 1200cc of the XLH 1200. 1988 also brought a revamped FXRS Low Rider with improved forks and twin-cap Fat Bob fuel tank. Most striking of all was the model chosen to mark H-D's 85th birthday, the FXTS Springer Softail. The Springer was a radical step both forward and back. Looking like a 1950 classic, it dispensed with the telescopic front end in favour of gleaming, chromed, lookalike girders. For the first time, a Harley had Retro-Tech at both ends and, almost overnight, became the style king of the Milwaukee range.

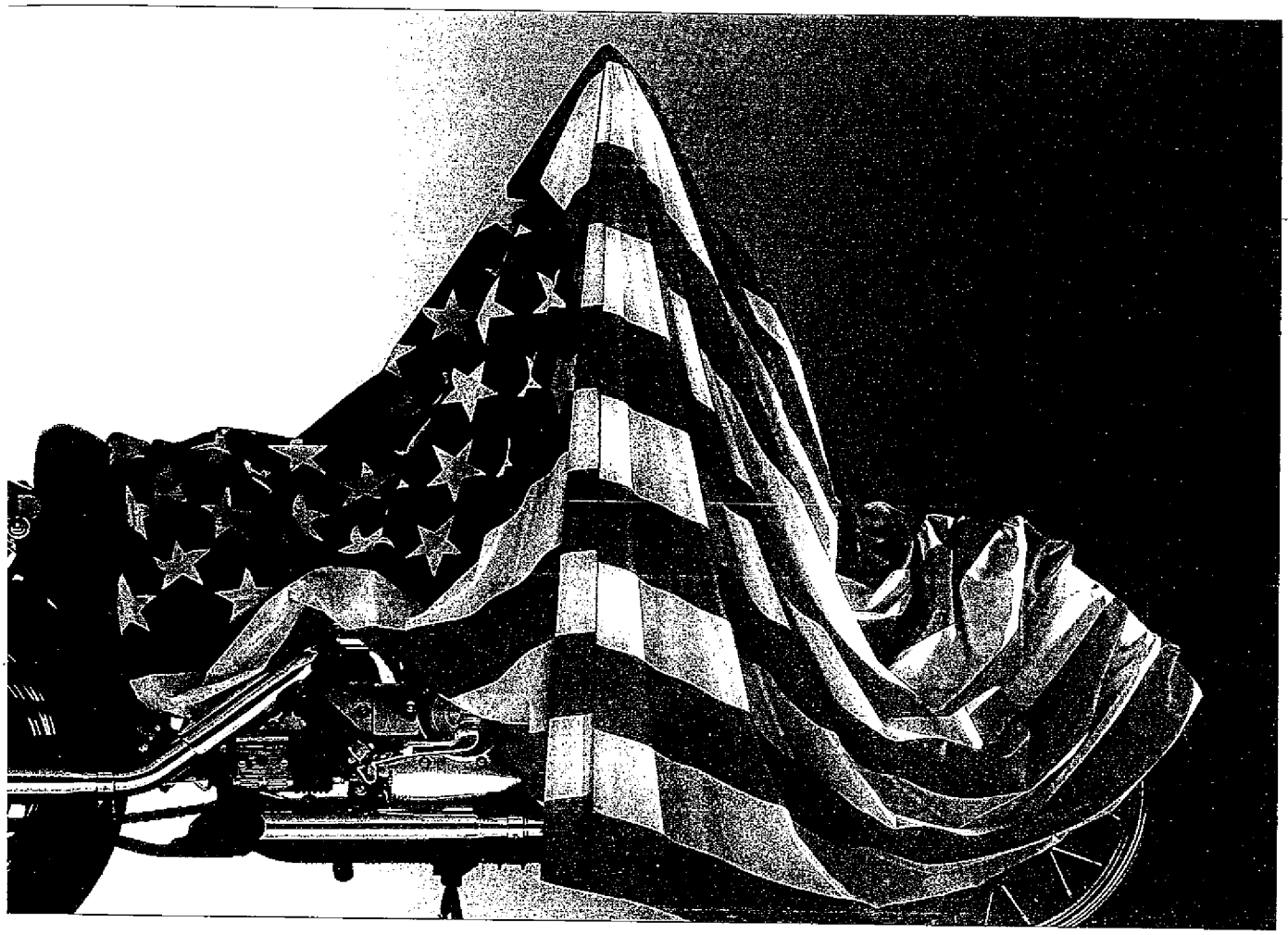
Within a year, the Springer and new Low Rider were joined by "Ultra Classic" versions of the all-conquering TourGlide and ElectraGlide models. These luxurious machines came equipped with a host of extras as standard, including cruise control, cigar lighter, intercom, CB radio and a sophisticated stereo hi-fi system. These were, and remain, the best-equipped and most expensive models in the Harley-Davidson range.

Ironically, as standard equipment became even more comprehensive, there was counter demand for a model more like the stripped-down Glides of the 1970s, such as the handsome FLHS ElectraGlide Sport introduced two years earlier. The FLHR Road King of today is in much the same mould as its handsome predecessor.



■ BELOW *A big twin in the heat of New Mexico, south-west USA.*

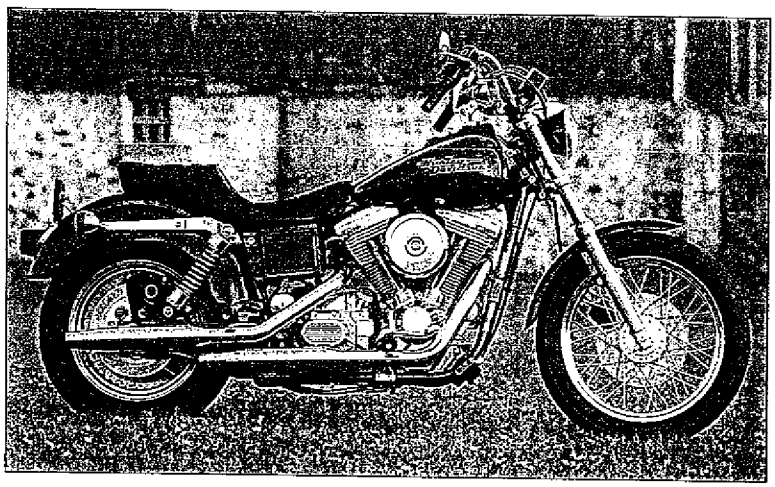


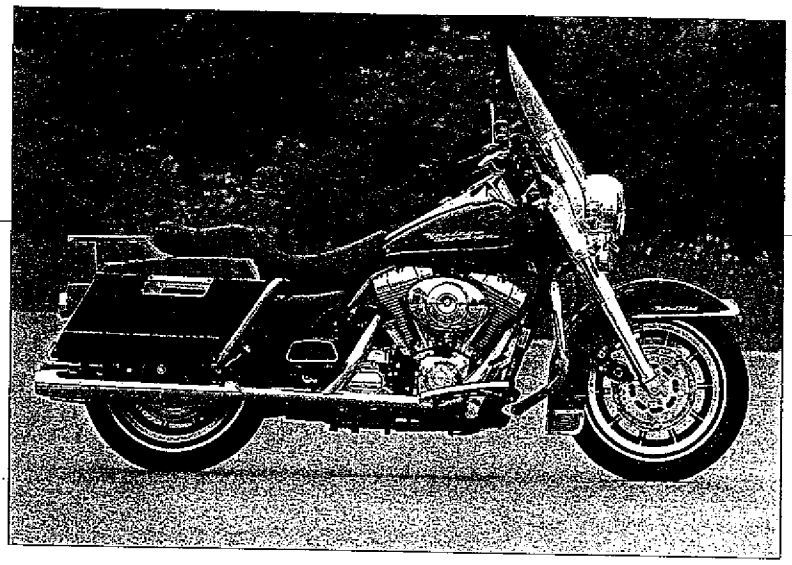


In 1989, a revamped clothing division – "MotorClothes" – was launched. MotorClothes, allied with Harley-Davidson's flourishing aftermarket hardware accessories, accounts for a substantial portion of overall annual profits. It is now possible to buy anything from bowie knives to toiletries bearing the celebrated H-D motif. Since the early 1990s there have been "Harley" shops that sell no motorcycles at all. The company's image had been transformed from a sick joke to the height of fashion.

With this priceless image came a turnaround in overall fortunes, from near-broke leviathan to glorious sales success. The foundations were varied: much-improved manufacturing of a broader, better model range allied to shrewd financial management, as well as inspired marketing. Production methods had witnessed a revolution, with each worker both a vital part of the quality-control process and a partner in Harley-Davidson's affairs. The Evolution engine earned a deserved reputation for rugged durability, oil-tightness and general user-friendliness.

■ BELOW *During the 1990s' DynaGlides evolved from Low Riders to become one of the core elements of the Milwaukee line-up.*





Not least was Harley-Davidson's good fortune in being located in the world's largest market for big-inch touring machines.

■ ABOVE *The moody Road King was a stylish attempt to return to the leaner, cleaner lines of the earliest ElectraGlides.*

■ INTO THE 1990S

By the early 1990s, the tide had well and truly turned – indeed the boot was on the other foot. Annual production had reached more than 62,000 units, with 20 models accounting for 61 per cent of the American heavyweight market and more than 30 per cent of output exported to Milwaukee fans worldwide, double the figure of four years earlier. At the same time, sales of Japanese motorcycles were in steep decline, their dealers cutting margins or going out of business altogether.

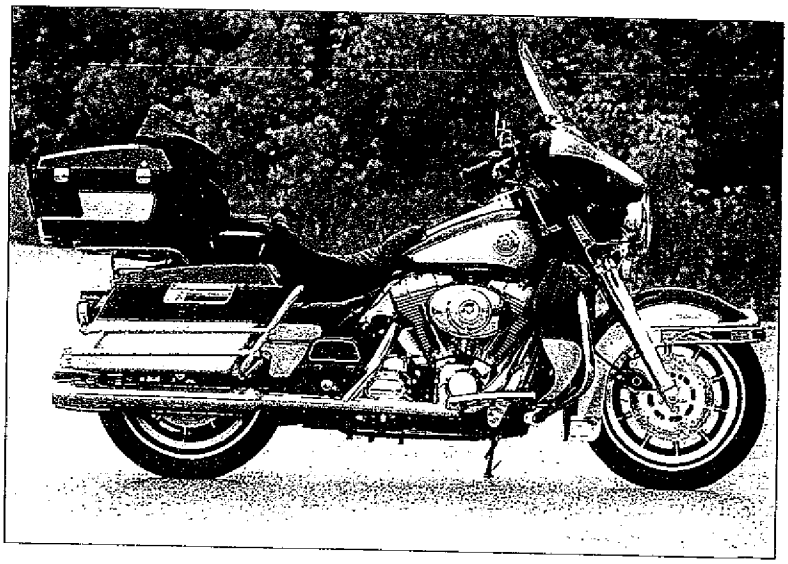
New hardware continued to stream out of York. Many Harley fans rate the star of the 1990 catalogue as one of the most beautiful Harley-Davidsons ever created. "Fat Boy" was its unprepossessing title, yet the original FLSTF was an understated symphony in silver-grey. Later versions, in less restrained colours, never quite had the same class. The FXDB DynaGlide Sturgis, a mean and moody all-black cruiser unveiled for 1991, was the first of a new generation, and classy to boot.

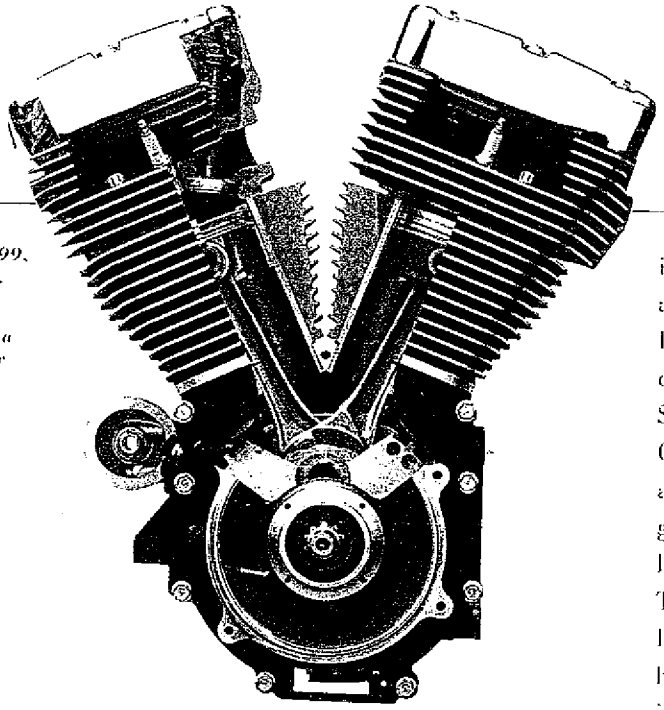
If Milwaukee had any problems during the 1990s, one was encroaching noise and emissions regulations; the other the sheer difficulty of meeting soaring demand as customers waited up to a year for their new dream machines. A major victory for environmental concerns was the first fuel-injected Harley roadster, the FLHTC-1 Ultra Classic ElectraGlide, in 1985. Injection made the twin smoother, cleaner and more powerful than any previous Harley-Davidson.

Then came the Twin Cam 88 powerplant for 1999, which promised to take the same qualities even further. After four years and more than 2.5 million test miles (4 million km) under development, Harley-Davidson's new Twin Cam offers new levels of performance, reliability and durability.

Solving the supply problem involved a whirlwind programme of capital investment, culminating in the opening in 1998 of an $85 million Sportster plant at Kansas City. The spending began with the opening of a huge new automated paint plant at York in 1992. This $23 million facility finally broke York's crippling production bottleneck, taking manufacturing capacity beyond 110,000 machines per year.

■ BELOW *By the mid-1990s, top of the range Glides had added fuel injection to their extensive repertoire of "goodies".*





■ RIGHT *For 1999, 15 years after the arrival of the redoubtable Evo, a new generation of Twin Cam 88 big twins hit the Harley scene.*

Accompanying this has been a hard-nosed commercial edge which began with the defence of trademarks – even including attempts to copyright the "Harley sound". To many die-hard fans, Harley's corporate clout sits uneasily alongside the image of easy-going, down-home virtues the company is at pains to present. Some might even prefer the mom-and-pop-corner-shop image of decades before – the one that almost went bust.

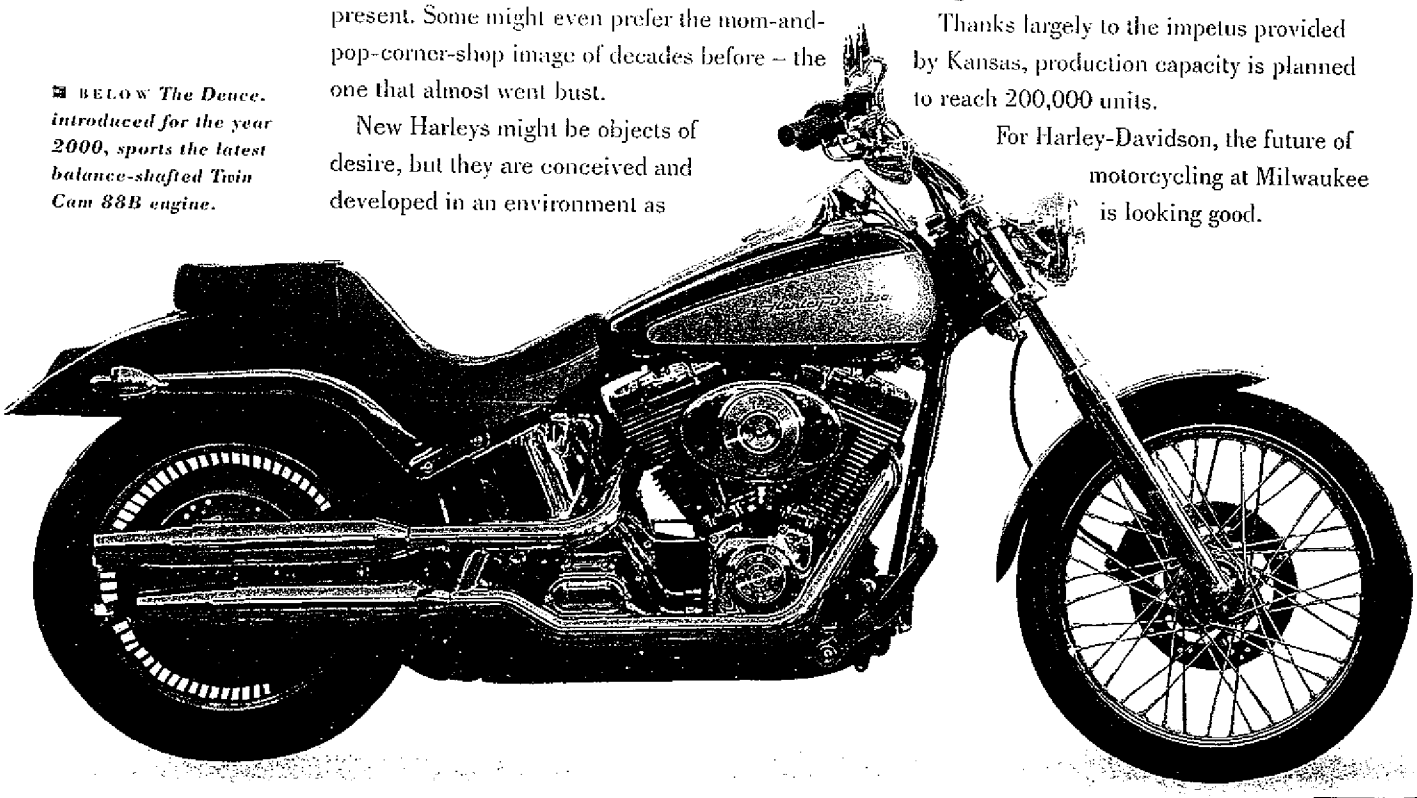
New Harleys might be objects of desire, but they are conceived and developed in an environment as implacably space-age as the bikes themselves are defiantly old-fashioned. The Willie G. Davidson Product Development Center was completed in 1997, at a cost of $40 million. Standing just a stone's throw from the existing Capitol Drive engine factory, it boasts a floor area of 213,000sq ft (20,000sq metres) under a graceful arc of concrete and glass, a structure befitting 21st-century ambitions. A new Big Twin powerline plant was also opened in 1997, located at nearby Menomonee Falls. Buell, now half-owned by Harley, assembles motorcycles in nearby East Troy, Wisconsin.

Harley-Davidson hasn't witnessed expansion like this since the years either side of the First World War. In fact, 1998 marked the thirteenth consecutive year in which Harley-Davidson had achieved record earnings. Sales topped $2,000 million for the first time, with output totalling 150,818 machines.

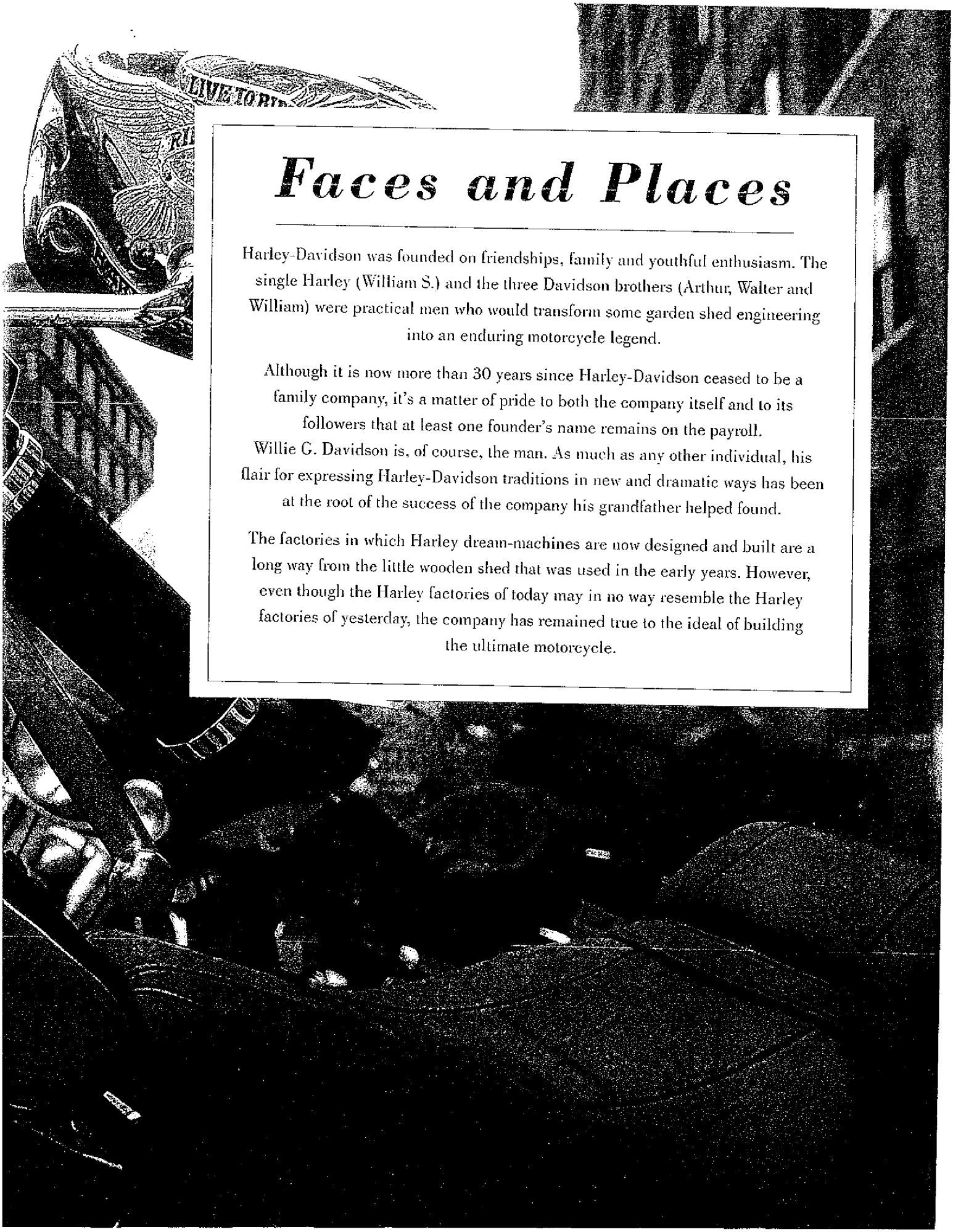
Thanks largely to the impetus provided by Kansas, production capacity is planned to reach 200,000 units.

For Harley-Davidson, the future of motorcycling at Milwaukee is looking good.

■ BELOW *The Dance, introduced for the year 2000, sports the latest balance-shafted Twin Cam 88B engine.*



HARLEY-DAVIDSON
USA



Faces and Places

Harley-Davidson was founded on friendships, family and youthful enthusiasm. The single Harley (William S.) and the three Davidson brothers (Arthur, Walter and William) were practical men who would transform some garden shed engineering into an enduring motorcycle legend.

Although it is now more than 30 years since Harley-Davidson ceased to be a family company, it's a matter of pride to both the company itself and to its followers that at least one founder's name remains on the payroll. Willie G. Davidson is, of course, the man. As much as any other individual, his flair for expressing Harley-Davidson traditions in new and dramatic ways has been at the root of the success of the company his grandfather helped found.

The factories in which Harley dream-machines are now designed and built are a long way from the little wooden shed that was used in the early years. However, even though the Harley factories of today may in no way resemble the Harley factories of yesterday, the company has remained true to the ideal of building the ultimate motorcycle.

THE FOUNDERS

WILLIAM S. HARLEY

"Young Bill" began work at the age of 15 in a Milwaukee bicycle factory, and even as an enthusiastic dabbler soon showed engineering skills. As able in the saddle as he was in the workshop, he later became Harley-Davidson's chief engineer and treasurer, positions he held until his death from heart failure on 18 September 1943.

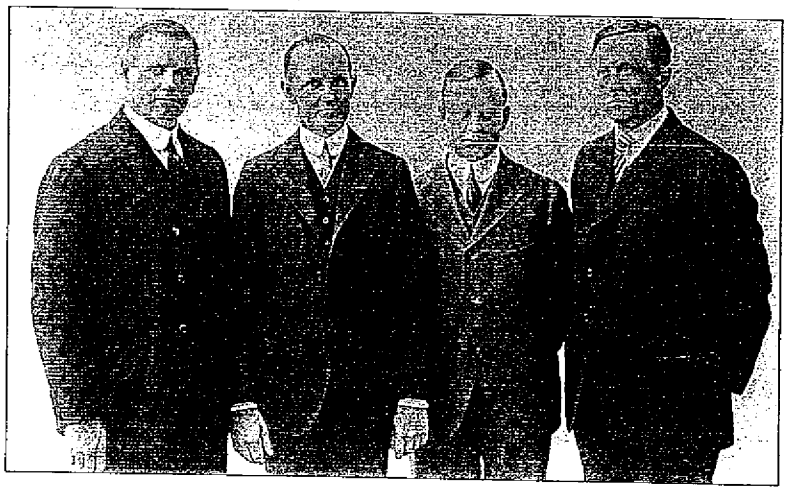
On graduating from university in 1908, he had set about designing Harley's first successful V-twin, which appeared the following year, although it was 1911 before the design became as dependable as earlier singles.

Bill was later responsible for a host of classic Harleys, not to mention the first clutch, kick start and many other developments. In 1914, he established the factory's race shop, which scored 26 major wins in its first season. During both world wars, his contacts with the military were vital to the company's (and the nation's) success. Active in the governing body of American bike racing, the American Motorcycle Association (AMA), he was also a keen wildlife photographer in private life.

ARTHUR DAVIDSON

A pattern-maker by trade, Arthur had the reputation of being the most outgoing of the founders, his energetic temperament making him particularly suited to sales. Arthur became the company's secretary and general sales manager, roles he discharged with distinction until his death in a car accident on 30 December 1950, at the age of 69. His own son, James, and James' wife, were also to die in a road accident 16 years later.

Perhaps Arthur's most lasting legacy was the establishment of Harley-Davidson's nationwide and international dealer networks. Beginning in 1910, he had no fewer than 200 American outlets by 1912, later expanding to include official Harley-Davidson dealerships as far away as Australia and New Zealand. In the early years he practically ran the AMA "because there was no-one else around". After the Second World War, he spent an increasing amount of time at his farm in Waukesha County where he raised prize-winning Guernsey cattle.

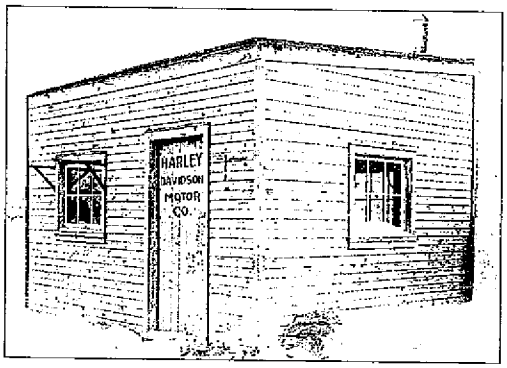


ABOVE *The founders, left to right: William A. Davidson, Walter Davidson, Arthur Davidson and William S. Harley.*

WALTER S. DAVIDSON

Trained as a mechanic and machinist, Walter was a naturally gifted rider who brought the emergent Harley-Davidson company its first competition success. In June 1908, he entered a Harley-Davidson single in a two-day endurance run in New York's Catskill Mountains. The sole Harley in a field of 61, he scored a "perfect" 1,000 points, outstripping all of the preferred bikes. One month later, Walter was at it again, winning a Long Island economy run at no less than 188mpg (66km/litre) over 50 miles (80.5 kilometres).

Walter is best remembered, however, as Harley-Davidson's first president. Generous and scrupulously honest, he also became a



■ RIGHT *Harley-Davidson's first "factory", a 15 x 10ft wooden shed.*

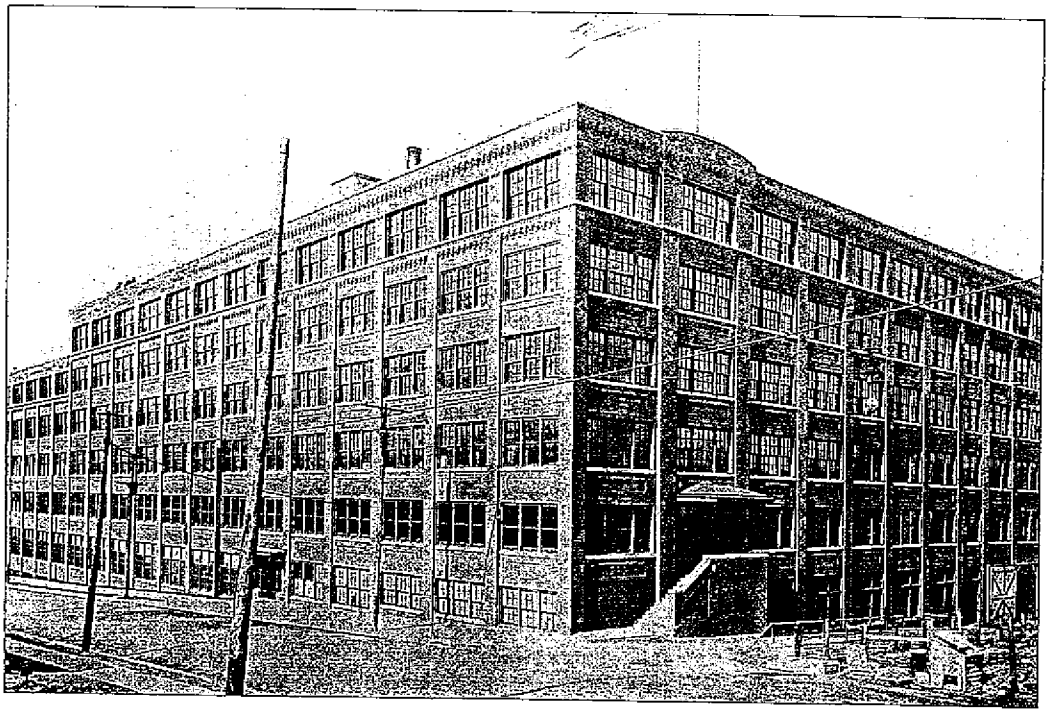
director of First Wisconsin, the state's biggest bank. Walter died on 7 February 1942, still in charge at Juneau Avenue.

■ WILLIAM A. DAVIDSON

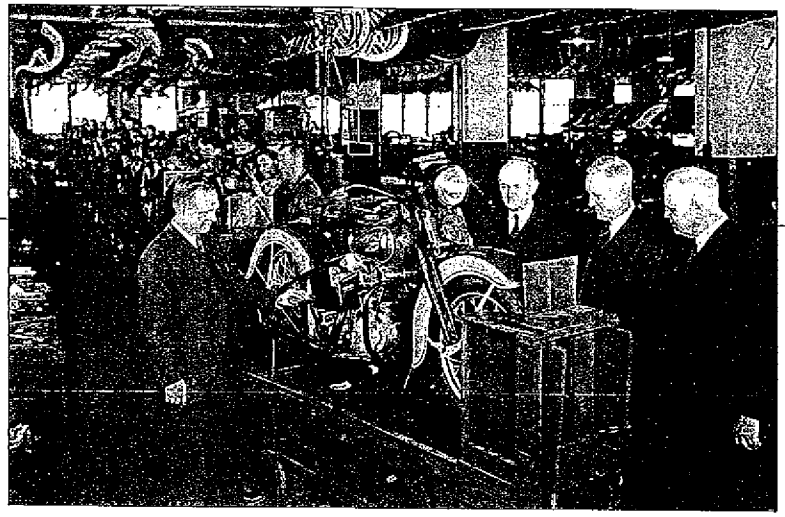
If Walter was the head of the company, "Old Bill" Davidson was regarded as its heart and driving force. Perhaps the least able rider of the foursome, Bill quickly found his niche as works manager, a vital position in a company expanding as quickly as Harley-Davidson. A big, burly character equally at home hunting and fishing as on the factory floor, he had a generous but paternalistic attitude to Harley's employees. Despite his bitter opposition, the factory first became unionized in April 1937. Within two years, Old Bill was gone, the victim of diabetic complications and the first of the founders to die. His son, William H., believed the stress of losing the battle to the unions hastened his father's death.

■ SECOND GENERATION

In the late 1920s, the founders' sons began to join the company. William H. Davidson joined in 1928, although he had worked on the shop floor while a student at the University of Wisconsin. A year later, he was joined by Gordon and Walter C. (both sons of Walter S.)



■ RIGHT *The famous Juneau Road factory, which was a large step up from the wooden shed.*



■ ABOVE *The Founders inspect the first Knucklehead to roll off the Juneau Avenue production line for the 1936 model year.*

Davidson, William J. Harley and, later, John E. Harley. Of the other sons, Allan Davidson, son of William A., worked only briefly for the company and died young; Arthur Davidson Jr. made a successful business career in his own right. Four of these "first generation founders" were to make major contributions to the American icon the company would become.

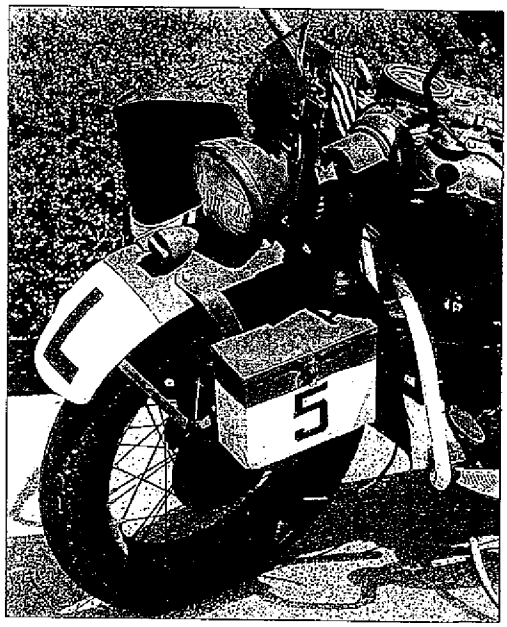
William J. Harley succeeded his father as the company's chief engineer. He became vice president in charge of engineering in 1957, a position he held until his death in 1971. A connoisseur of fine wines and cheeses, he evidently needed little encouragement to visit the Harley-Davidson factory in Varese, Italy, after the take-over of Aermacchi.

John E. Harley, younger brother to William J., was elected to the board in 1949 and ran the Harley parts and accessories business, today one of Milwaukee's major profit centres. He rose to the rank of major during the Second World War, including a spell instructing army motorcyclists.

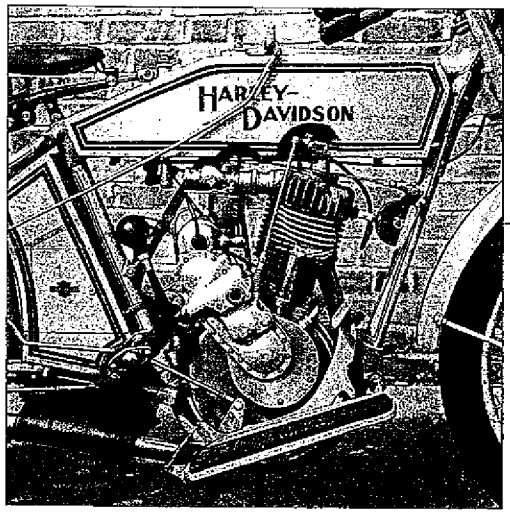
Walter C. Davidson ultimately followed his uncle Arthur as vice president of sales, earning a reputation during the Second World War as the man who could somehow get materials other companies could not. After the war, he fought Harley's increasingly rebellious dealer network, as Triumph and BSA in particular began offering cheaper and faster products in the American market. Harley's efforts to hold the fort not only backfired at the time but were to lead to legislation which would later open the door for the Japanese. When AMF took over the company in 1968, Walter saw the writing on the wall and took early retirement.

William H. Davidson, the son of William A., made the most lasting mark of all. A skilled rider (he won the prestigious Jack Pine Enduro in 1930 riding a Model 30DLD), he was later described as "the mortar that cemented the company". He joined Harley-Davidson full-time in 1928, was elected to the board in 1931 and became vice president six years later. For the next five years, he was the driving force behind Harley-Davidson's vital government contract work. When Walter S. died, William H. was the obvious candidate to lead the company, becoming president "by common consent" 16 days later, on 23 February 1942.

William H. had no doubts about where the company's future lay: "We tried for a long time to convince people that motorcycles had some

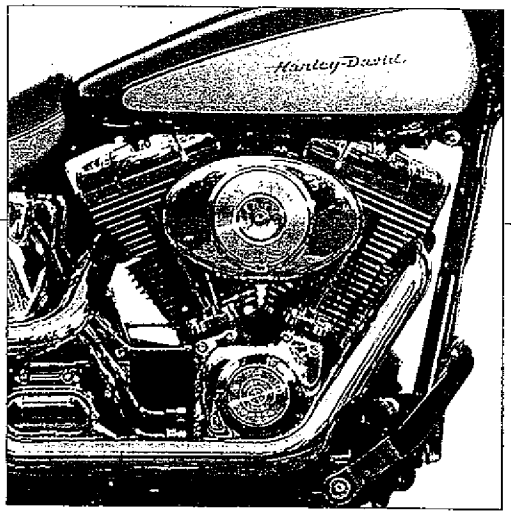


■ RIGHT *During the Second World War John E. Harley, younger brother of William J., was responsible for training army motorcyclists on bikes such as the one pictured.*



■ LEFT *The famous "Silent Gray Fellow" of 1914.*

■ RIGHT *The 2000 Harley model: the Deuce.*



utility value," he once presciently observed, "[but they] have never been anything but pleasure." In 1971, three years after the AMF takeover, he was appointed chairman of Harley-Davidson, but felt that the new company had "pulled my teeth" and soon resigned. Nor did he fully share AMF's ambitions, observing with typical foresight that AMF "thought Harley-Davidson could become another Honda. That's ridiculous... we were never meant to be a high production company."

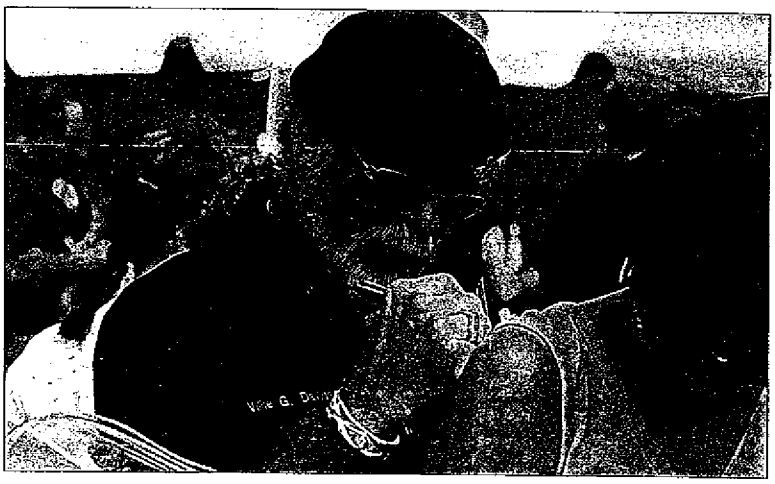
■ WILLIE G. DAVIDSON

Willie G. is a remarkable man from a family of remarkable men. Yet it's perhaps surprising that he began his working life not with Harley-Davidson, but cutting his teeth with Ford and Excalibur cars. By the time he joined his grandpa's company in 1963, he had a broad schooling in industrial design – although he had also found time to design a new Harley-Davidson tank logo in 1957. He has spent most of the intervening years as vice president of styling – arguably the single most important role in such an image-conscious company. In another of quirk of fate in which Harley seems to specialize, the model that made Willie C.'s name, the FX Super Glide of 1971, was the first major new model produced by the much-maligned AMF. A decade later, he was one of the prime movers of the buy-out from AMF orchestrated by chairman Vaughn Beals.

AMF's hold on Harley-Davidson may not have lasted but Willie C.'s has. During the week, his domain is the Willie G. Davidson Product Development Center, a space-age structure of steel and glass tucked behind the Sportster Engine Plant on Wauwatosa's Capitol Drive. Yet to the biking world he's the man in the trade-mark black beret at gatherings such as Sturgis and Daytona Bike Week, ogling hardware just like any other Harley fan.

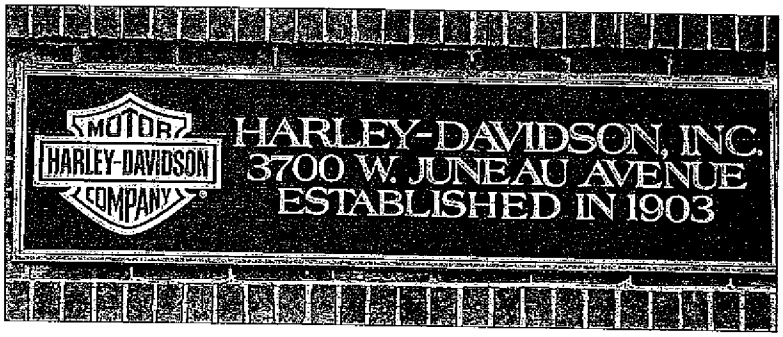
Willie G. has an uncommonly successful stylist's touch, yet he also has the common touch. To many he *is* Harley Davidson, and when he finally hangs up his leathers, there are two Davidsons waiting in the wings. Son Bill, who joined the firm in 1984, runs HOG, while daughter Karen runs the MotorClothes division. Harley-Davidson is truly a family affair.

■ BELOW *Willie G. Davidson, grandson of the founder, and a great guiding spirit of Harley.*



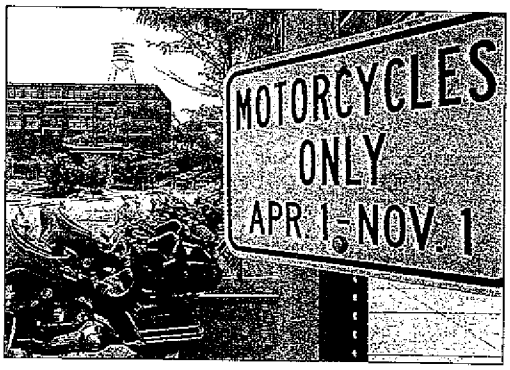
HARLEY-DAVIDSON FACTORIES

William S. Harley and the Davidson brothers first went into production in 1904 in a shed hastily thrown up in the Davidson backyard, bearing the grand legend "Harley Davidson Motor Co." on its humble wooden door. These days, the location of the famous shed, 38th and Highland Boulevard, is owned by a company producing something else for which Milwaukee is famous – the huge Miller Brewing Company.



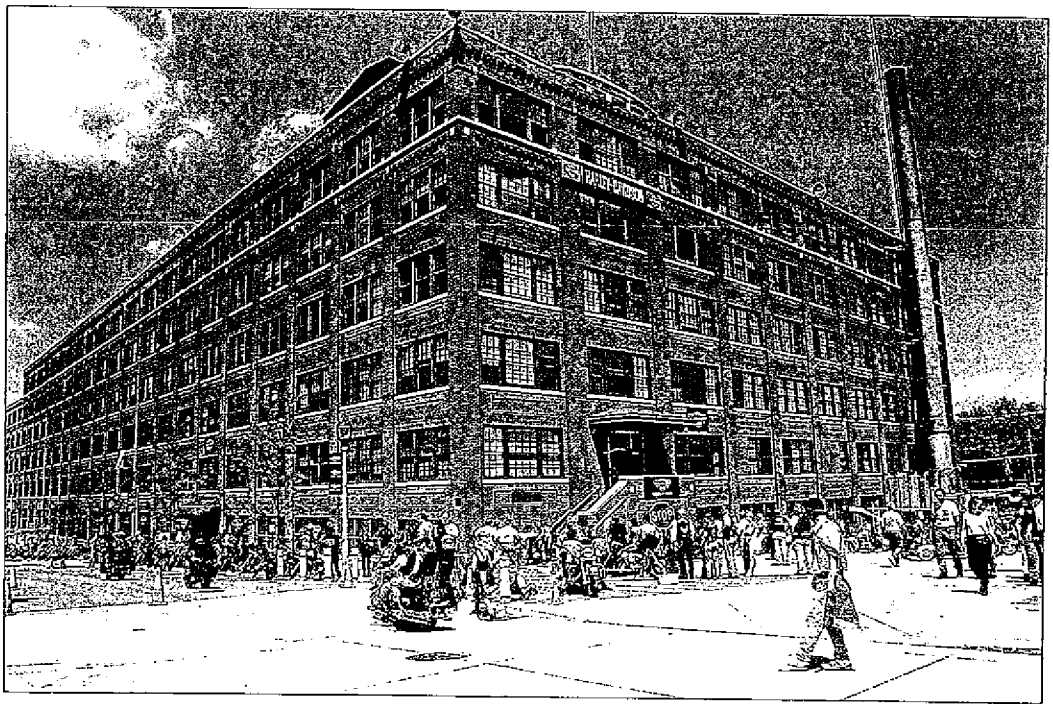
JUNEAU AVENUE

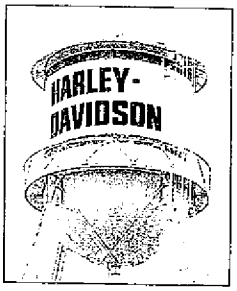
The founders took on their first employee in 1905, and moved into their first building on the present Juneau Avenue site twelve months later (although the road was then called Chestnut Street). In that year another five workers joined the Harley bandwagon as production soared to 50 motorcycles. Progress was relentless – and punishing. Walter Davidson later described how "we worked



■ ABOVE *3700 Juneau Avenue, possibly the most famous address in motorcycling.*

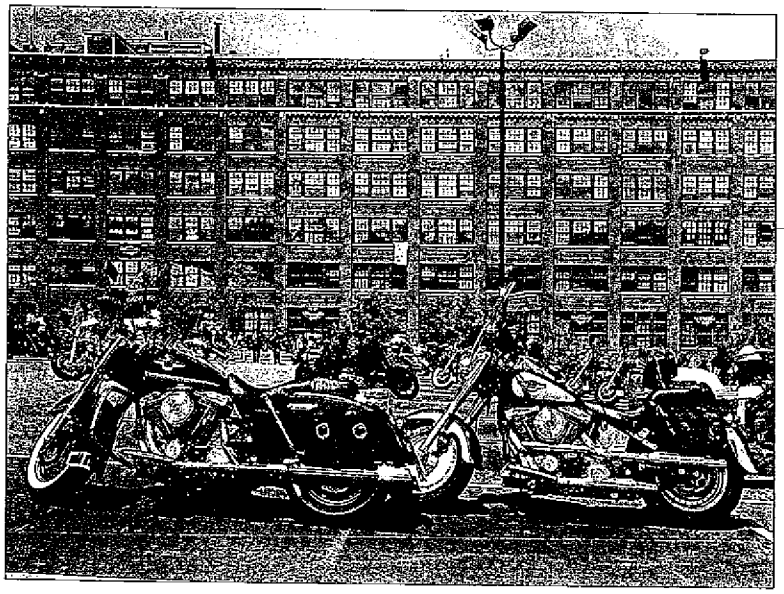
■ LEFT *Like it says, "motorcycles only".*

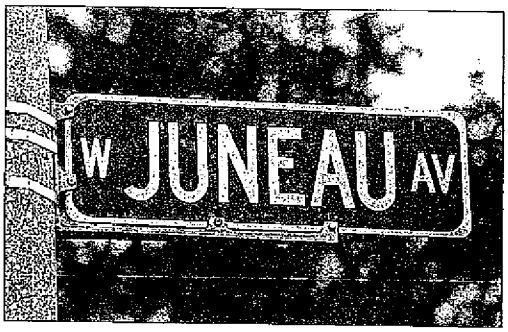




■ ABOVE *On Juneau Avenue, even the water is branded Harley-Davidson.*

■ LEFT *Now more than 80 years old, the former main factory is a protected historical site.*





■ LEFT AND BELOW *The Juneau Avenue factory now houses only management and administrative personnel, but echoes to almost a century of Harley's history.*

every day Sunday included, until at least 10:00. I remember it was an event when we quit work on Christmas night at 8:00 to attend a family reunion."

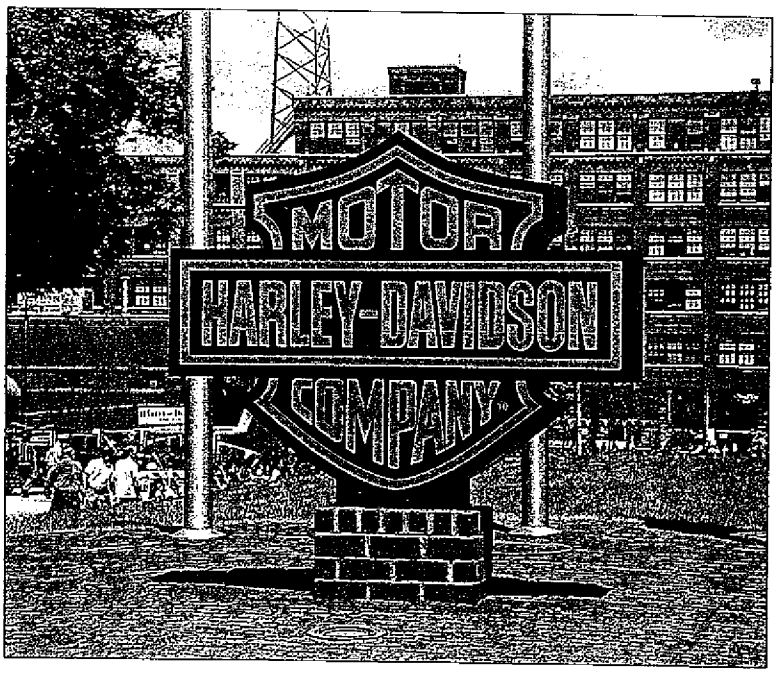
So it continued: 1907 – around 150 machines built, including the first police Harleys; 1908 – 18 employees and production tripled again to 450 units. By this time, manufacturing was in Harley-Davidson's first brick building, with a floor area of 2,380sq ft (220sq metres).

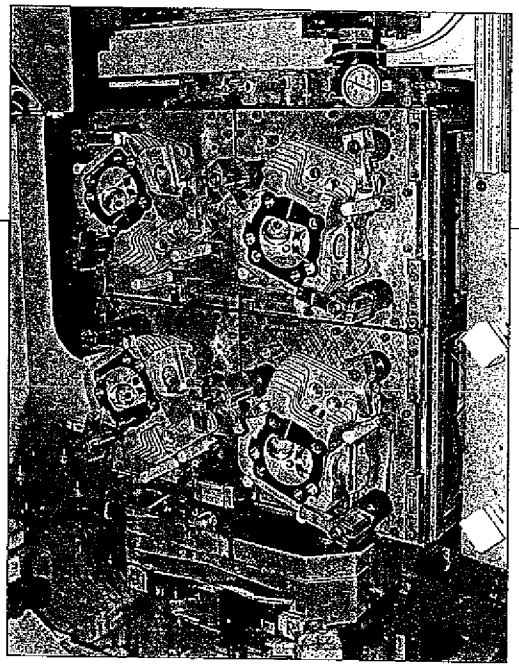
Such was the pressure to grow and get new bikes through the door that workers recall "putting machinery in place and starting production before the cement was dry". From 1907 to 1914, the Harley facility at least doubled in size every single year. At the outbreak of war in Europe, 1,574 employees built more than 16,000 machines in a factory of almost 300,000sq ft (28,000sq metres). With no exaggeration, the Milwaukee Journal described the company's breakneck progress as a "modern miracle".

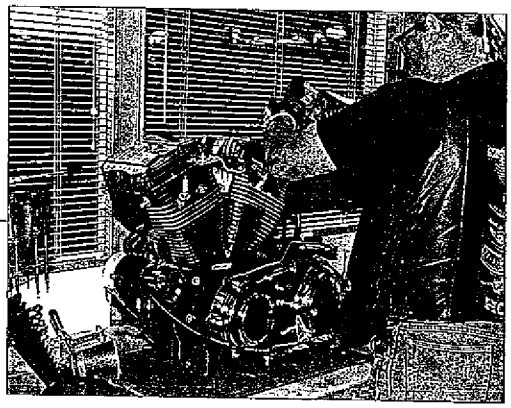
Wartime pressure for space became so intense that the company once threw up a 2,400sq ft (220sq metre) brick building, only to tear it down and build something even bigger six months later. Buildings were leased on a temporary basis all over Milwaukee. Even Prohibition came to the company's aid, in a manner far more benign than Al Capone's. When breweries became idle, Harley-Davidson stepped in to rent the Pabst Brewing Company as storage space for Harley parts.

The post-war boom helped Harley-Davidson become, briefly at least, the largest motorcycle manufacturer in the world, pumping machines out of its huge, six-storey plant on Juneau Avenue, offering more than half a million square feet (500,000sq metres) of floor space on its completion in April 1919. The

■ BELOW *The Harley "bar and shield" is as recognizable in Morocco as here in Milwaukee.*







■ LEFT AND RIGHT
High-tech computerized machining is now part of the Harley way (left), but testing (right) is still hands-on. And could this man work for anyone else?

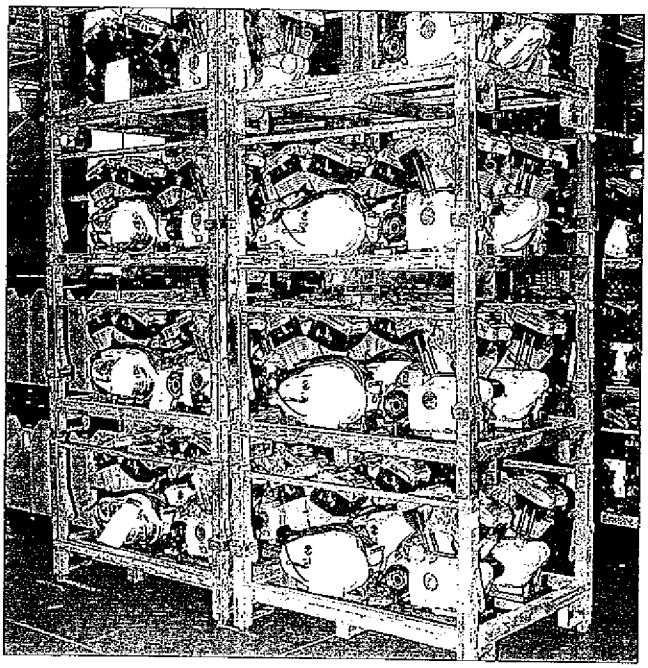
distinction lasted only until the Depression of 1920, when annual sales collapsed from more than 28,000 to just 10,202. America's economy recovered from this slump but motorcycle sales somehow did not. It was 1942 before Harley sales again exceeded 1920 levels. Under these circumstances, the last thing Milwaukee needed was more plant. Since its conversion to offices and warehousing in 1973, there has been no manufacturing at Harley's most evocative address: 3700 West Juneau Avenue, Milwaukee. Instead, the old site – and the grand old building – houses H-D's corporate headquarters and training departments.

■ BELOW LEFT
Sportster engines awaiting shipment from Capitol Drive to Kansas.

■ BELOW RIGHT
Heavyweight engines are now made at Pilgrim Road before shipment to York for their final assembly.

■ CAPITOL DRIVE

No sooner had Harley sales begun to recover from the Depression of the 1930s (sales slid to a pitiful 3,703 bikes in 1933) than Pearl Harbor was bombed and the United States entered the war. Towards the end of the 1940s, the company was looking to expand again as markets recovered. At the end of 1948, Harley moved into its first new address for 42 years, in the Milwaukee suburb of Wauwatosa.

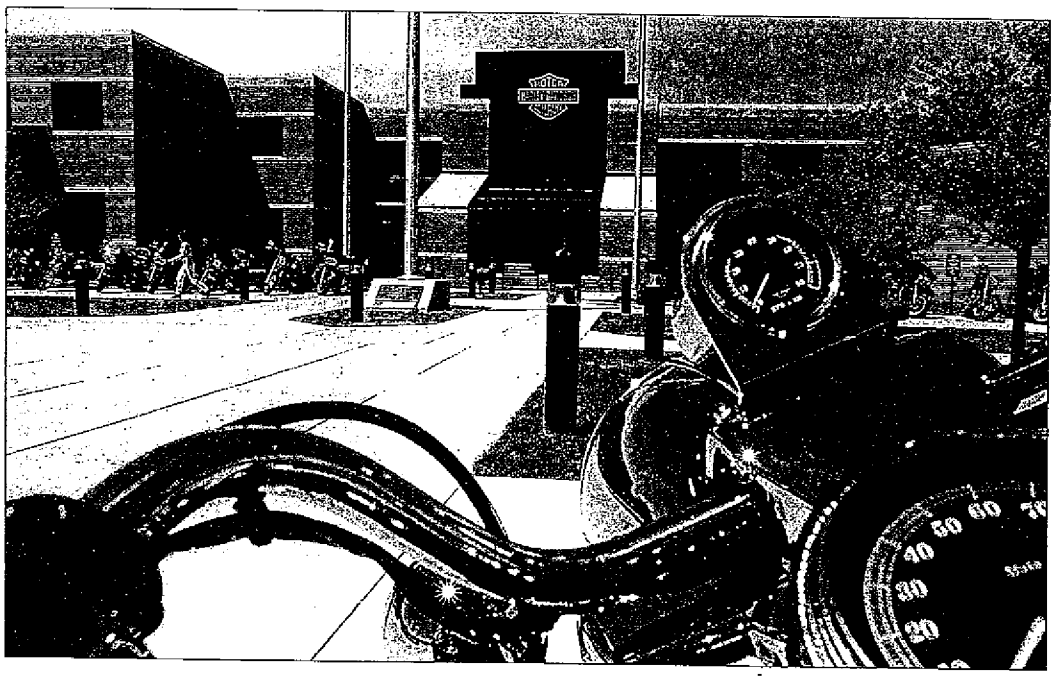


■ RIGHT *For finishing items such as mudguards, no machine can match a craftsman, as here at the factory in York, Pennsylvania.*

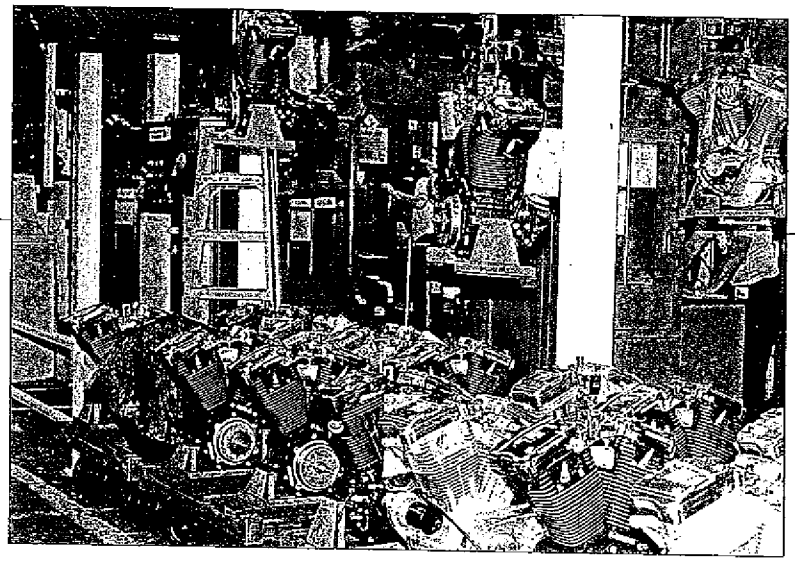
Thus, Capitol Drive, a single-story building of more than 260,000sq ft (24,000sq metres) which had previously housed the A. O. Smith propeller plant, became Harley-Davidson's second manufacturing centre. In anticipation of a boom in post-war demand for motorcycles (and the opposite for aircraft propellers), the factory had been bought for $1.5 million two years earlier. Harley dealers – introduced to the new facility in a night-time "mystery tour" – weren't the only ones impressed.

Within a year, production was at an all-time high, although tougher times lay ahead. Also, less auspiciously (for V-twin die-hards, at least), November 1947 marked the debut of the 1.7 horsepower Model S 125cc single – a two-stroke Harley, heaven forbid. This was based on the same German DKW RT125 design as the BSA Bantam (and later Yamaha's very first model, the YA1 "Red Dragonfly") – and not least on the expectation that demobbed GI's would buy almost anything with wheels.

It was to be decades before the potential of Capitol Drive was fully realized, however. From today's viewpoint, it's difficult to envisage the trials cash-starved Harley-Davidson faced after that first burst of post-war optimism. During the 1950s, Harley sales were totally outstripped by British imports. From 31,000 units in 1948, sales never exceeded 17,250



■ RIGHT *Capitol Drive, home of Sportster engines and the official Harley Visitor Center.*

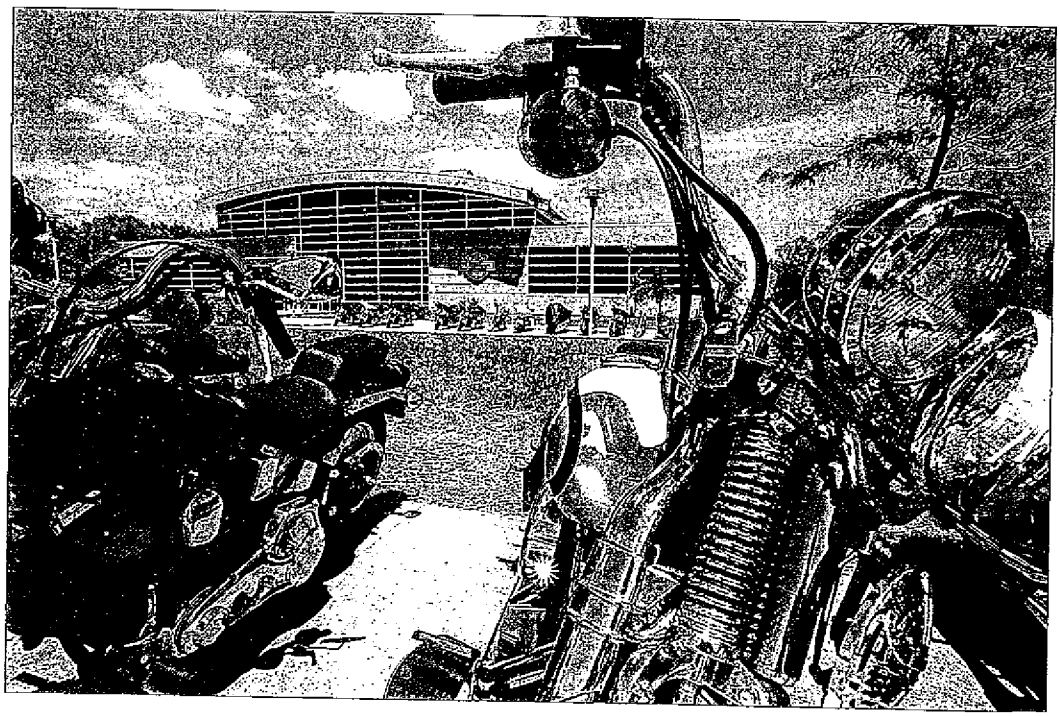


■ ABOVE *"Heavy powertrains" – Evo engines – awaiting shipment to York.*

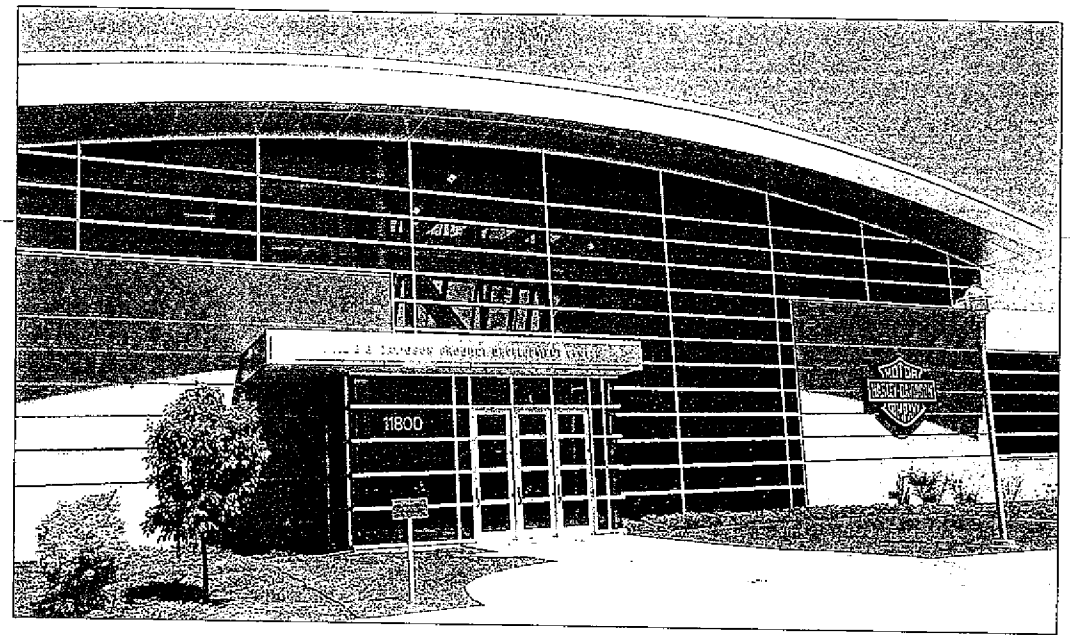
again until 1965 – and for most of that time they were nearer 12,000. Paradoxically, matters only began to improve when the mass arrival of Japanese motorcycles stimulated wider interest in two-wheelers. Sales averaged around 30,000 for the remainder of the 1960s, rising to 70,000 by the mid-1970s.

This latter upturn in sales was due largely to AMF's heavy investment in manufacturing space, much of which is still in use today. The biggest single purchase was a $4.5 million monster for machining five-speed cases. Prior to this, Juneau Avenue had been a model of inefficiency, with part-assembled machines wheeled about and moved from shop to shop in lifts. Engine assembly moved from Juneau Avenue to Capitol Drive in 1971, although Harley-Davidson headquarters continued to undertake engine painting and the assembly of XR race engines for some years, the last actual manufacturing at the original site.

The addition of a modern facade means the Capitol Drive site no longer looks like a wartime propeller plant, but behind the facade the old factory now makes "small powertrains" for final assembly at Buell and the new Sportster plant in Kansas City. The facility also houses Harley's official Visitor Center, as well as a new customer engine reconditioning plant which is quite unique among volume motorcycle manufacturers.



■ RIGHT *Chrome and glass: a Springer guards The Willie G. Davidson Product Development Center (PDC), where the dreams of the future are generated.*



■ RIGHT *The PDC is located to the rear of the "small powertrains" plant on Capitol Drive.*

■ VARESE

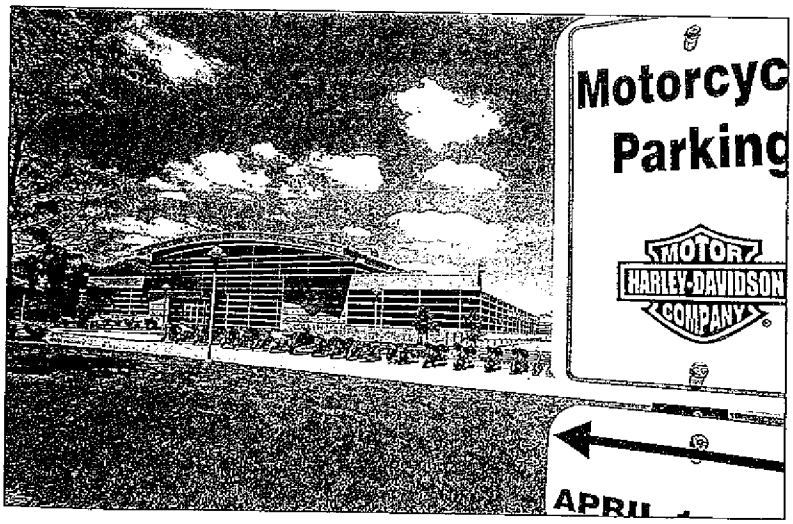
With the exception of the original wooden sheds, Harley-Davidson has never abandoned one of its permanent sites on American soil. Overseas, however, it is a different story.

Milwaukee's Italian connection arose out of a desire to diversify into smaller, cheaper models, in order to hoist itself out of the financial mire of the 1950s. In 1960, Harley bought half of Aermacchi's two-wheeler division, based in Varese, Italy. The purchase was seen as a more sensible means of expanding the Harley-Davidson range than actually trying to develop new, cheaper models from scratch. In September 1960, the first Italian Harley emerged. This was the 250cc four-stroke Sprint, although two-strokes later predominated. (Although a stinkwheel Harley may sound like an offence against nature, lightweight two-strokes were produced in Milwaukee from 1947 until 1965.)

The joint venture didn't quite work out as hoped, but it did give Milwaukee its first and only world road race titles, with Walter Villa taking three 250cc and one 350cc crowns between 1974 and 1976, all on two-stroke twins. Roadster production was dogged by such absurdities as fitting American-made cables and controls to bikes built in Italy (where they made such things quite well).

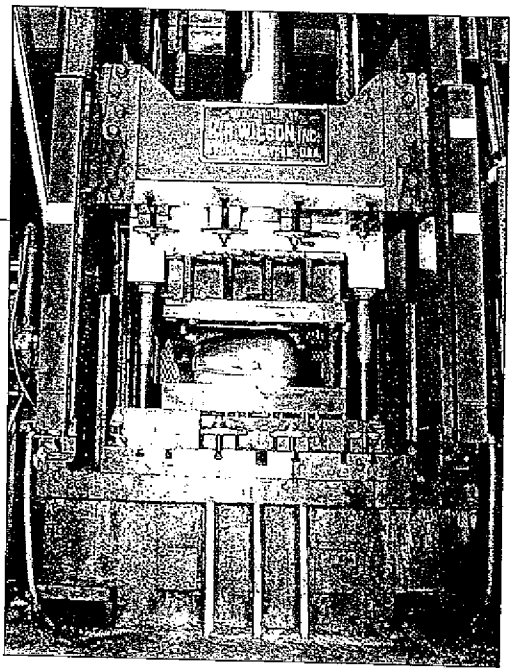
Fundamentally, however, Varese couldn't compete with Japan. In June 1978, John A Davidson announced the closure of the project. The factory was bought by Cagiva which was producing 40,000 machines per year within less than three years.

■ BELOW *Many Harley employees favour motorcycles, but winter in Milwaukee is no place to be riding them.*



■ YORK

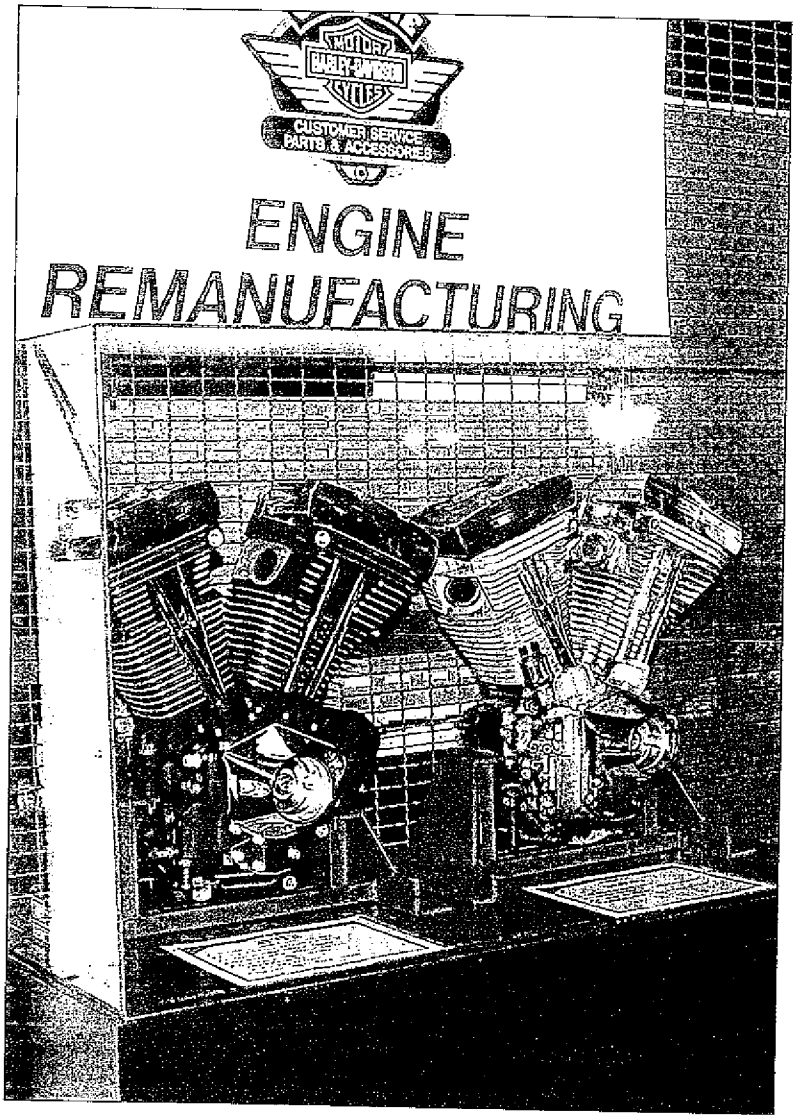
In 1972, AMF's massive plant in York, Pennsylvania, lay almost idle. This coincided, after two decades in the doldrums, with Harley-Davidson's dire need for more manufacturing capacity and, not least, with one of



■ RIGHT *"The Tool", a 70 year-old monster which presses fuel tanks at York.*

Milwaukee's periodic upsurges in union militancy. York was refurbished and motorcycle final assembly took over. The first "York" Harley rolled off the lines in February 1973. Capitol Drive would now build only engines and transmissions. York remains Harley's largest production facility, although production is less diverse than it once was. After buy-out, York continued to manufacture military hardware – the casings on some of the bombs dropped over Iraq during the Gulf War were made at York – as well as IBM circuit boards. These peripheral activities have now ceased.

■ BELOW *Capitol Drive now reconditions customer engines.*



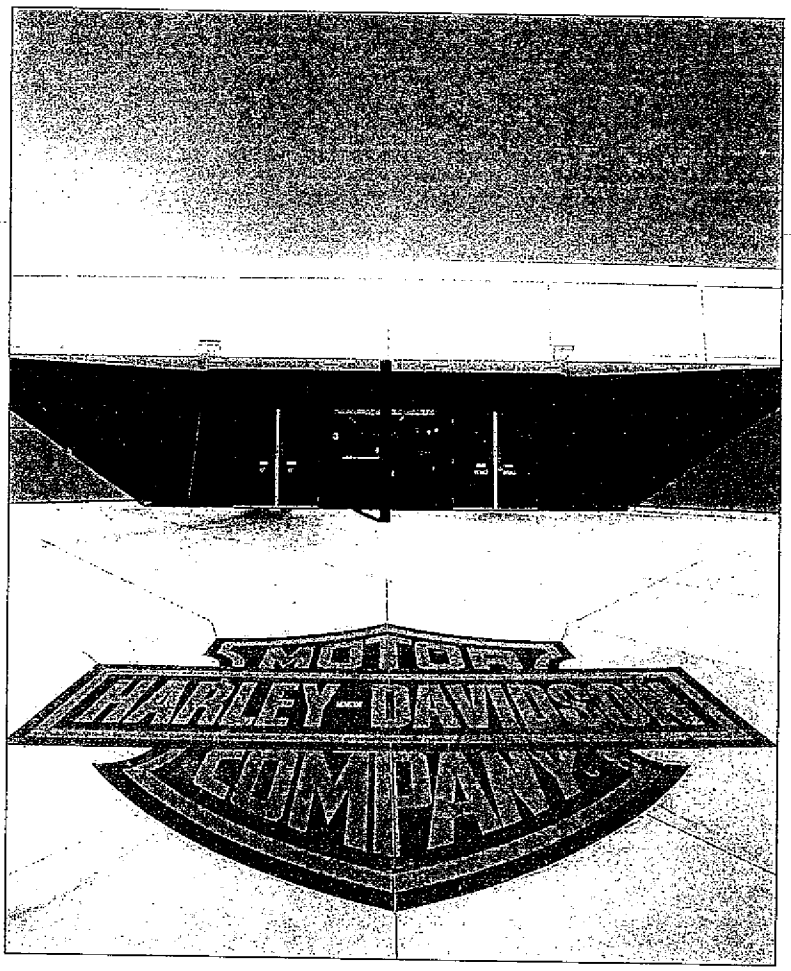
In common with the rest of the company, the plant at York has received massive investment in recent years – not the least of which was a new paint shop to unplug what was once the biggest production bottleneck.

With the transfer of Sportster production to Kansas, York now concentrates on building Big Twins on four lines – three for customs and one for heavyweight tourers.

■ TOMAHAWK, WISCONSIN

About 250 miles (402 km) north-west of Milwaukee lies the old Tomahawk boat company plant, of which Harley-Davidson bought a 60 per cent share in 1962. The 35,000sq ft (3,250sq metre) plant was purchased principally to make Servi-Car three-wheeler and golf-cart bodies (for which Harley-Davidson once controlled a third of the American market). It has since specialized in the manufacture of fairings, saddlebags, windshields and sidecars.

Like pretty much everywhere else in the Harley-Davidson empire, Tomahawk was



■ RIGHT *This plant on Pilgrim Road, Menomonee Falls was once the home of Briggs and Stratton engines, but has produced Harley "heavy powertrains" since 1997.*

recently expanded after an extension of 14,250sq ft (1,300sq metres) was completed in 1997.

■ KANSAS CITY, MISSOURI

The brand-new $85 million plant in Kansas City is the jewel in Harley's manufacturing crown. The first machines rolled off the line at the 330,000sq ft (30,000sq metre) factory in 1998. Kansas builds all Sportster models.

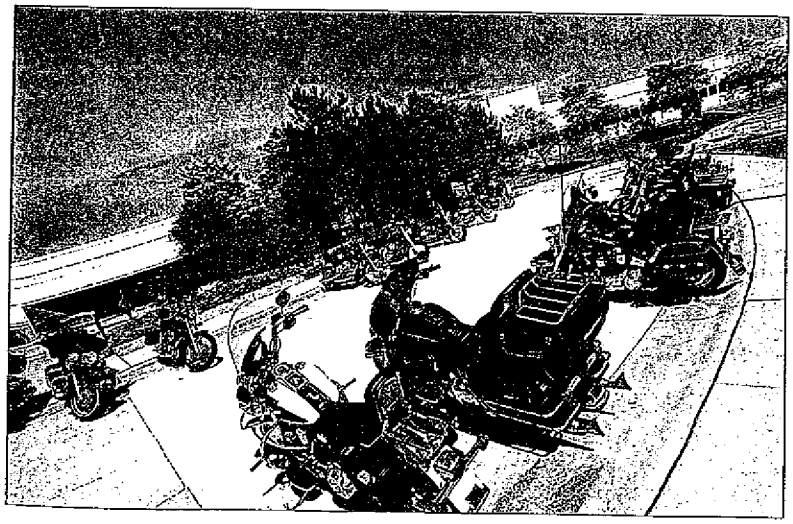
Kansas is the nearest Hog-building comes to state-of-the art. Expressions like "evolutionary turning point" and "ergonomically-friendly production lines" roll off corporate tongues as easily as "unique labour-management joint leadership philosophy".

■ MILWAUKEE

There was a time when "Milwaukee" meant just one thing – Juneau Avenue. Capitol Drive then opened to confuse the issue. Now there are six facilities in the Milwaukee area.

The Product Development Center (PDC) is where future H-D models are created. It is immediately behind the Capitol Drive engine measuring 213,000sq ft (20,000sq metres), was completed in 1997 at a cost of $40 million.

■ BELOW *Pilgrim Road is where the latest Twin Cam 88 and 88B engines are built.*

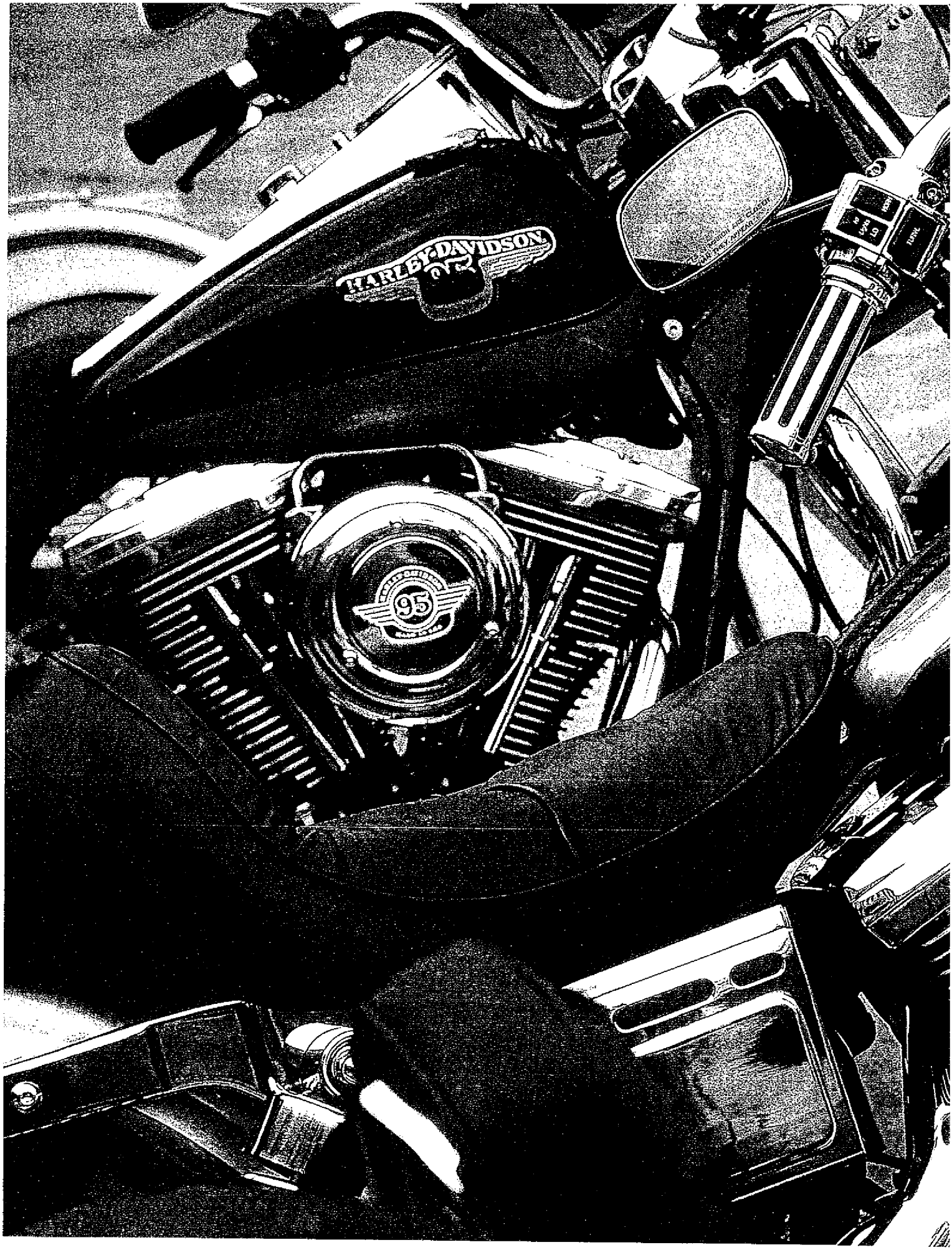


In 1997, a new Big Twin powerline plant was opened in nearby Menomonee Falls, and a new P&A Distribution Centre at Franklin, outside Milwaukee.

Pilgrim Road now produces all Evo and Twin Cam engines, before final assembly at York. Buells are built a half-hour's drive to the south-west, in East Troy, Wisconsin.

Harley-Davidson hasn't witnessed such expansion since the First World War. Production for 1998 totalled 148,000 machines compared to just 62,000 at the start of the 1990s. Thanks to the impetus provided by Kansas, production is planned to increase even further in the near future.

All of this development is a very long way away from that little wooden shed where it all began.


HARLEY-DAVIDSON
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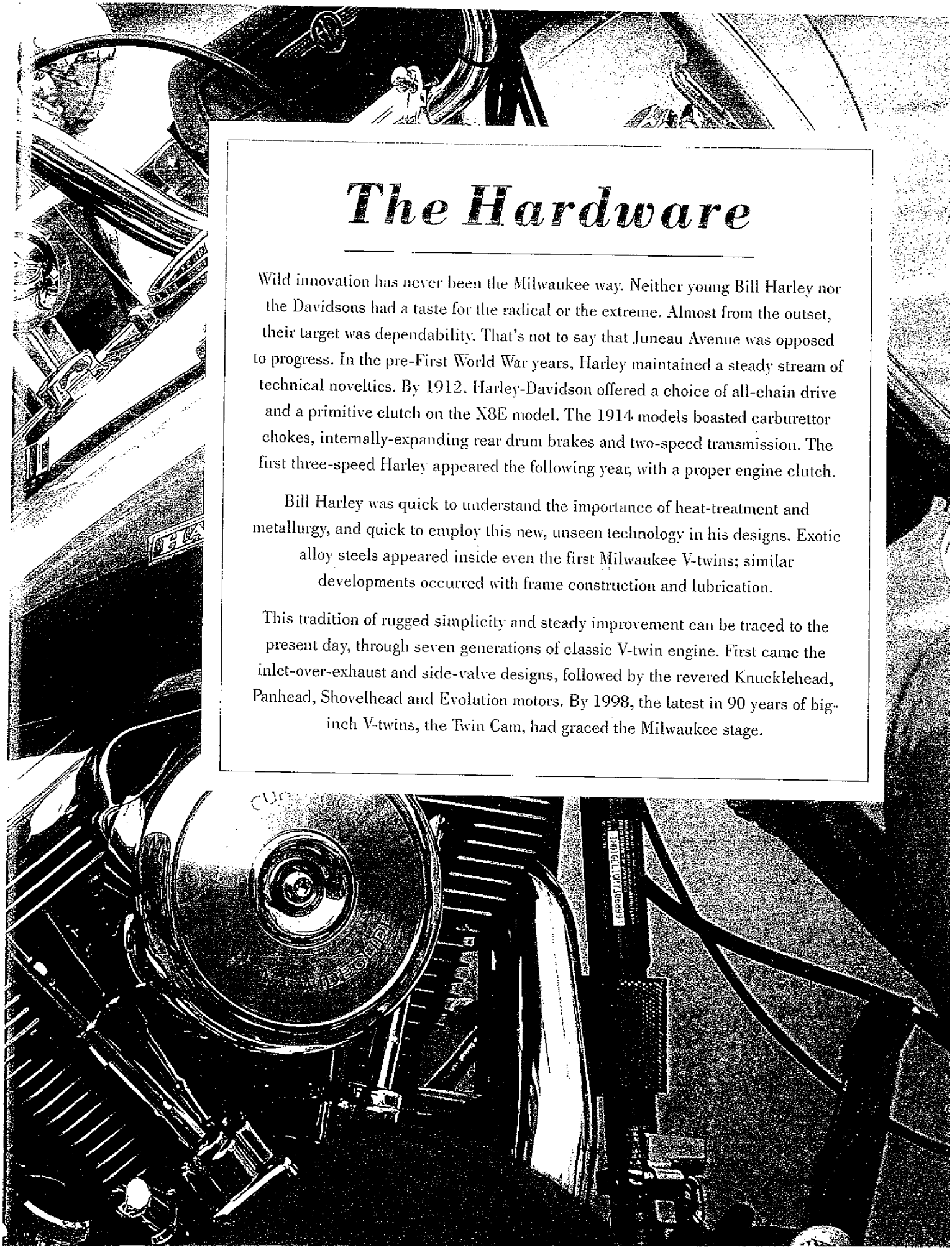


The Hardware

Wild innovation has never been the Milwaukee way. Neither young Bill Harley nor the Davidsons had a taste for the radical or the extreme. Almost from the outset, their target was dependability. That's not to say that Juneau Avenue was opposed to progress. In the pre-First World War years, Harley maintained a steady stream of technical novelties. By 1912, Harley-Davidson offered a choice of all-chain drive and a primitive clutch on the X8E model. The 1914 models boasted carburettor chokes, internally-expanding rear drum brakes and two-speed transmission. The first three-speed Harley appeared the following year, with a proper engine clutch.

Bill Harley was quick to understand the importance of heat-treatment and metallurgy, and quick to employ this new, unseen technology in his designs. Exotic alloy steels appeared inside even the first Milwaukee V-twins; similar developments occurred with frame construction and lubrication.

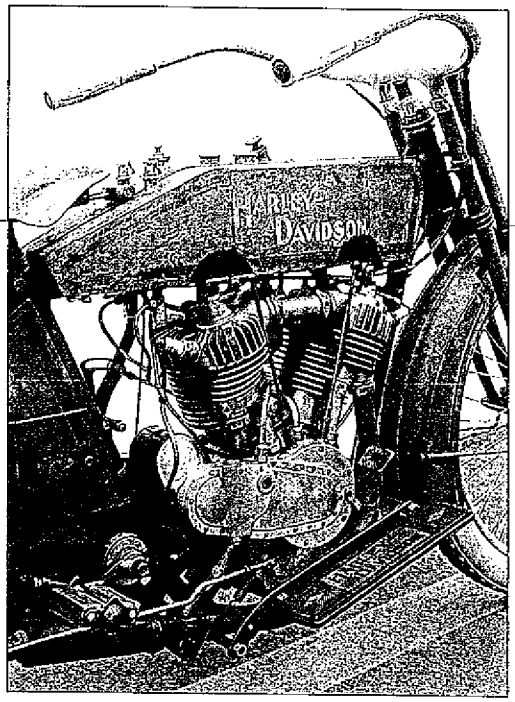
This tradition of rugged simplicity and steady improvement can be traced to the present day, through seven generations of classic V-twin engine. First came the inlet-over-exhaust and side-valve designs, followed by the revered Knucklehead, Panhead, Shovelhead and Evolution motors. By 1998, the latest in 90 years of big-inch V-twins, the Twin Cam, had graced the Milwaukee stage.

F-HEADS & FLATHEADS

F-HEADS

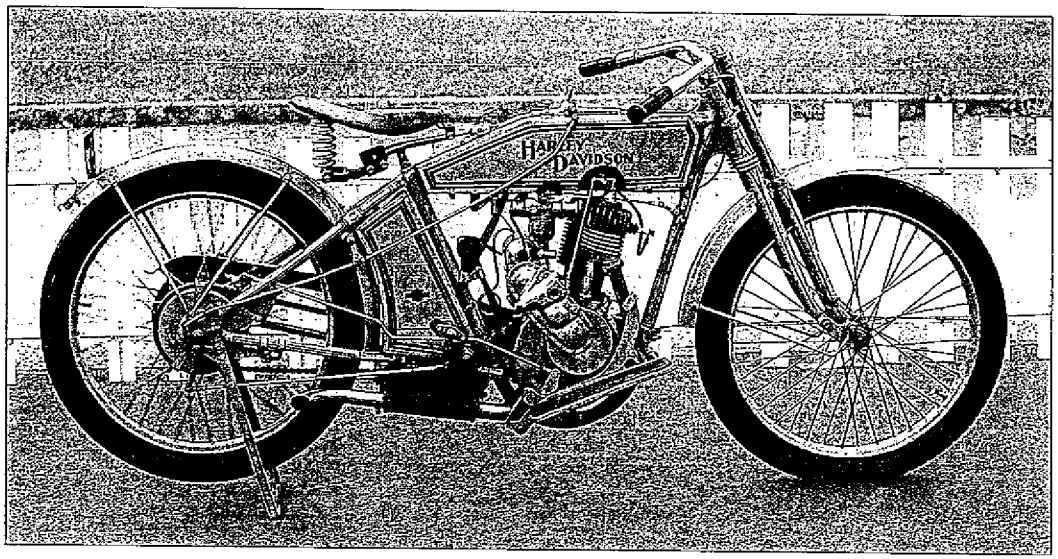
A halfway house between flathead and overhead valve design was the inlet-over-exhaust (ioe) layout. Also called the "F-head", as the name suggests, this configuration combined an overhead inlet valve with a side exhaust valve.

All early Harleys followed this design, with one important additional characteristic. For reasons of simplicity, the inlet valve was of the "automatic" or induction type, in which the descending piston simply "sucks" the valve open only for it to be returned to its seat by a conventional spring. This spring was of necessity light, which precluded high engine revs. One major advantage of the system was that by removing the inlet valve housing, both valves could be removed easily for servicing – a considerable advantage on these relatively primitive engines. It was also found that since the valves directly faced each other, the incoming fuel charge helped cool the exhaust valve, extending its life. As well as the early singles, the first V-engines adopted the same layout – to their cost, for it proved an untimely failure with the twin cylinder design.

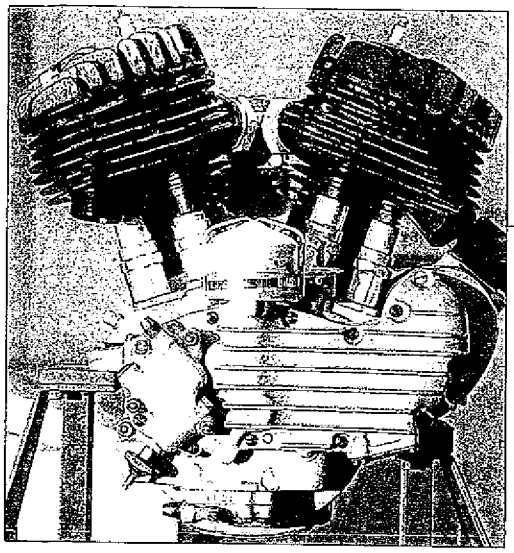


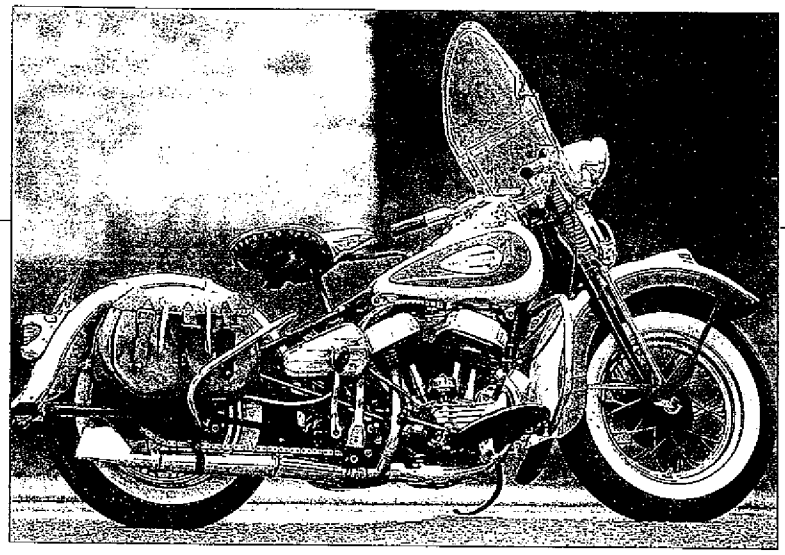
■ LEFT *The F-head. The long push-rods to the overhead inlet valves and the "under head" exhaust valves are clear on the 1915 twin shown here.*

Both the revised twin and the 5–35 series singles of 1913–18 moved to a far more positive ioe arrangement with a conventional, mechanically-operated overhead inlet valve. The same design was grafted on to the 74-inch Model J of 1922, also known as the "Super-powered Twin". This 18 horsepower engine was also the first Milwaukee twin to feature lightweight aluminium pistons. When Model J



■ LEFT *Inlet-over-exhaust layout was the norm on singles, such as this 1914 example.*





production ended in 1929, Harley twins remained exclusively side-valvers for the next six years.

■ ABOVE LEFT *By the late 1920s, side-valve engines were the norm.*

■ ABOVE RIGHT *Sidevalve engines formed the backbone of the Harley range into the 1950s, as with this WL45.*

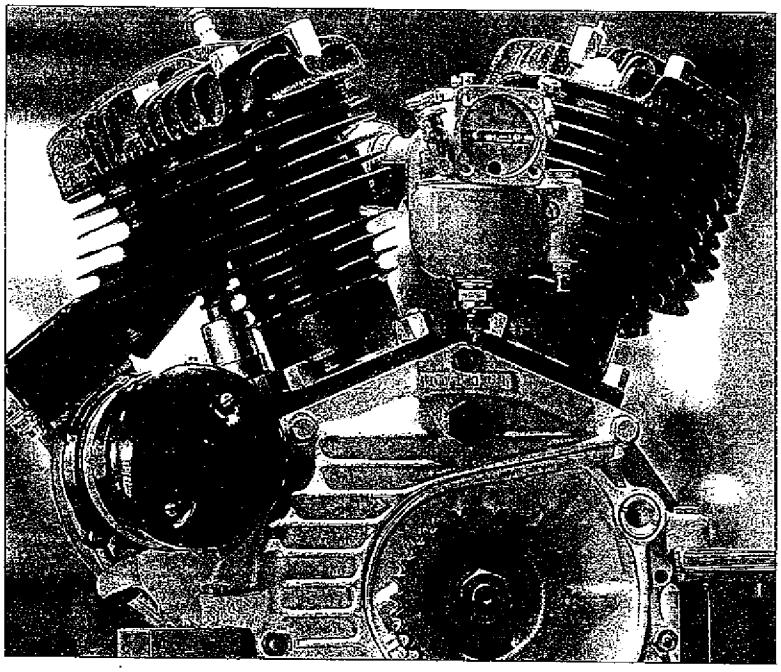
■ BELOW *This angle clearly shows the utter simplicity of the basic side-valve V-twin.*

■ FLATHEADS

"Flathead" was the unflattering generic title given to any side-valve engine, whether made by Harley-Davidson or not. The reason for the nickname is obvious: with all the valve gear, including the valves themselves, located below the level of the piston at the top of its stroke, the heads were flat. The first side-valve Harleys were the Series A and B singles of 1926. All roadster twins from the end of the 1920s until the arrival of the Knucklehead in 1936 were flatheads as well. Milwaukee's catalogues continued to feature side-valve models until 1951 and even into the 1970s.

Side-valve engines were popular because they were relatively cheap to make and maintain, as well as much more compact than F-head and overhead valve designs. Although valve control was usually quite good – the camshaft and valves were in close proximity – the side-valve layout inevitably produced an elongated combustion chamber with tortuous gas-flow characteristics and poor valve cooling. This placed a severe limitation on the power such designs could produce. Side-valvers were renowned as dependable plodders, such as the seemingly unstoppable WL45.

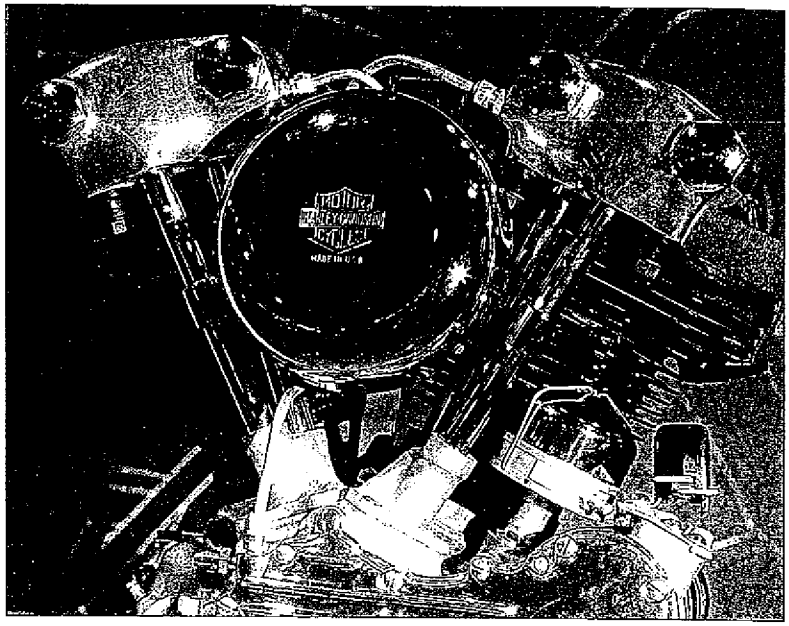
Harley's side-valve years threw up one notable exception, however – the overhead valve 21-inch (346cc) single, produced from 1926 until the eve of the Knuckle in 1935. Designed with the help of Harry Ricardo, this single was not only successful in its own right but gave rise to the celebrated "Peashooter" racer. Five years earlier, Ricardo created the Model R, Triumph's first four-valve engine. His company contributed to the development of the latest Triumph triples and Aprilia's new V-twin, the RSV Mille.



KNUCKLEHEAD, 1936–47

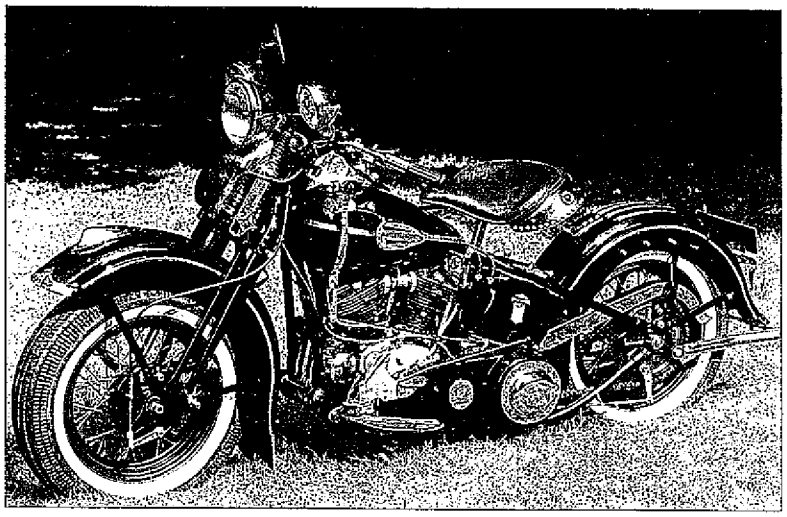
The Knucklehead's chunky looks make it the quintessential Harley-Davidson. To many motorcyclists its debut in 1936 announced the end of years of crippling economic depression survived by only two American motorcycle manufacturers – Harley and Indian. Sales were so poor that, only one year earlier, Harley's entire range comprised just two models. With the new model – formally designated the Model E – as its flagship, Harley's fortunes rapidly improved. Sales in 1937 exceeded 11,000 for the first time in the decade.

Development of what would become the Knuckle effectively began in the late 1920s, first with specials comprising single-cylinder Peashooter top-ends grafted on to existing V-twin JDH crankcases, then with the factory DAH racers. Although substantially new, the DAH utilized heads derived from the Peashooter's. Board approval for the "official" Knuckle project was granted in 1931 – a bold move at a time when the factory was running at just ten per cent capacity. The engine would probably have been in production by 1934 but for government restrictions intended to reduce unemployment which effectively barred overtime in the engine development shop. It was a long haul but certainly worth the wait.



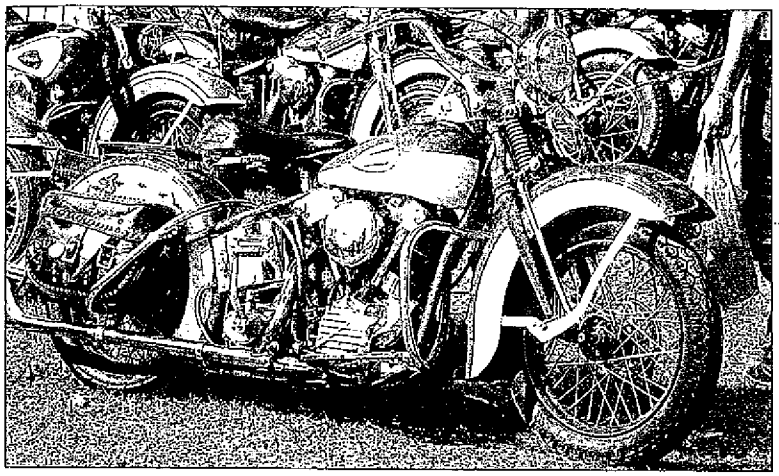
■ ABOVE *The Knucklehead, Harley's first production overhead valve twin.*

■ BELOW *Developed from the ohv Peashooter single, the Knuckle was a direct ancestor to the Evo engine of 1984.*



The Knuckle was a Juneau Avenue "first" in many respects – the first four (forward) speeder, the first engine with hemispherical (hemi) heads and the first overhead valve roadster twin. The engine was heavily influenced by the competition experience of the legendary Joe Petrali, Harley-Davidson development rider and near-unbeatable racer. The Knuckle announced its arrival with a resounding flourish by posting 136.183mph on the sands of Daytona Beach, Florida. This speed record still stands.

The 61-inch – actually 60.32cu in (989cc) – Knuckle was initially available in three specifications: E (standard), ES (sidecar) and EL (high compression sport, with 6.5:1 pistons). Petrali's influence was clear. With more than 40 horsepower at 4,800rpm, the EL



in particular offered a huge increase in performance over the sluggish side-valvers. Despite its leisurely route to production – and not for the first time – there were initial reliability problems.

The worst of these concerned its new dry-sump lubrication. Some parts got too little oil while others – including the road underneath – got too much. A partial fix came in 1937 but the problem was not solved fully until the arrival of the 73.7cu in (1,207cc) Model F Knuckle in 1941, with its centrifugally-controlled oil pump by-pass. Although notorious for oil leaks through its many external seals and separate primary drive oiling, in very hot conditions many riders would prefer the big Knuckle's oil system to that of the later, "improved" Panhead.

■ ABOVE *But for the Depression, the Knucklehead would almost certainly have reached production before 1937.*

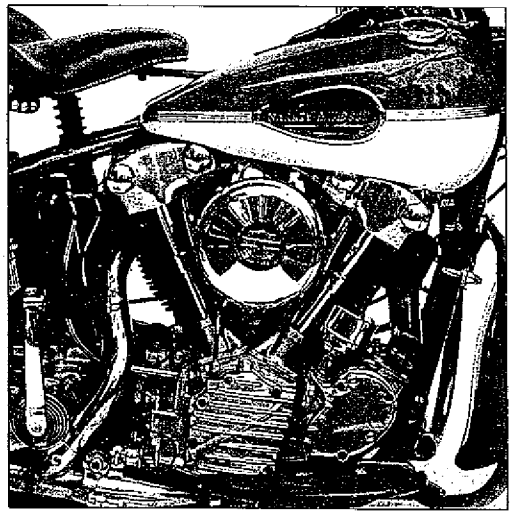
■ BELOW LEFT AND RIGHT *The numbers of Knuckelehead models built were severely curtailed by the Second World War, three years after which it was succeeded by the Panhead.*

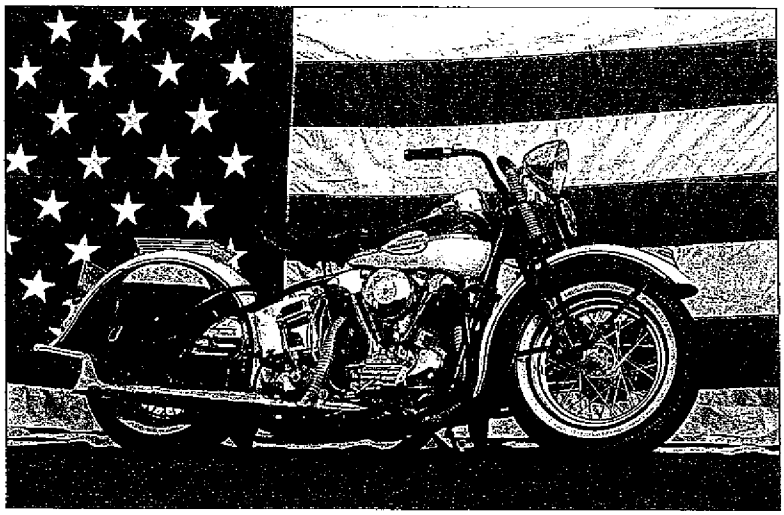
The bigger Knucklehead had come about largely in response to competition from large-capacity Indian V-twins. The larger engine's extra torque demanded a new seven-plate clutch in place of the old five-plate device, giving 65 per cent greater friction area. In addition, there was a bigger rear brake, an "airplane-style" speedometer and a larger, more efficient air-cleaner.

For a variety of reasons, the Knuckle never quite made the impact it deserved. It would certainly have reached production earlier, but for the Depression. No sooner had the Model F reached the street than the Japanese attacked Pearl Harbor in December 1941. The outbreak of war obliged the factory to divert most of its attention to military production.

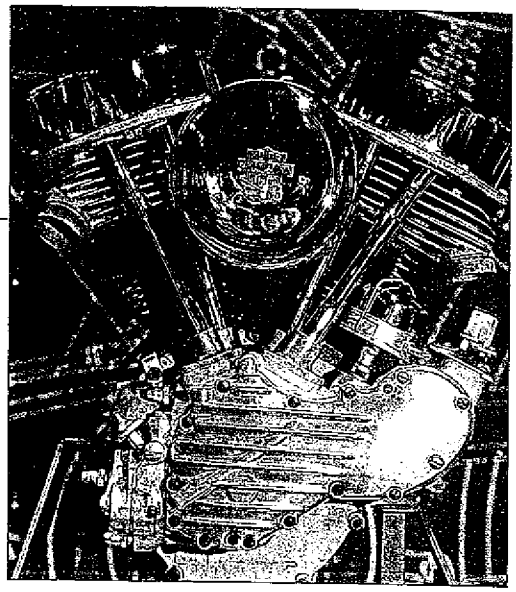
Milwaukee lore has it that the best of the big Knuckles were those built in that final pre-war year, but hostilities meant that relatively few 74-inch (1,207cc) Knuckles reached the road until 1947.

By 1948, a new boss at Harley meant that the Knuckle was consigned to the annals of company history.





PANHEAD, 1948–65



■ RIGHT *The Panhead powered Harley-Davidson's big twins from 1948 until 1965.*

In 1945, Harley resumed civilian motorcycle production, although sales would not return to pre-war levels (partly due to industrial action) until 1947. In 1948, the replacement for the noble Knucklehead made its first public appearance.

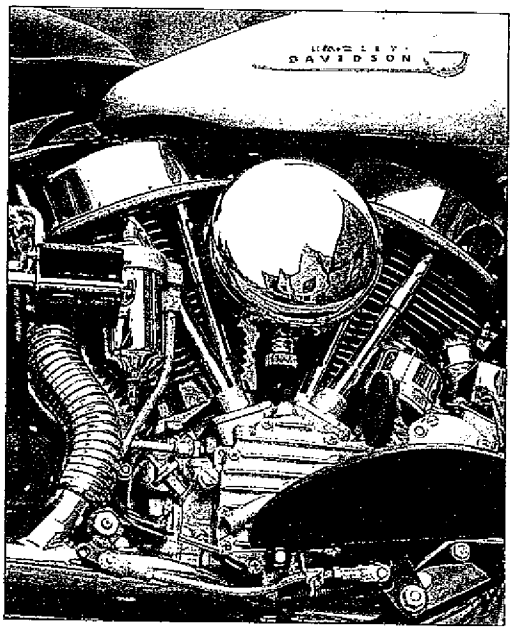
In the Milwaukee tradition of steady evolution, the "Panhead", as it was dubbed, was a development of the Knuckle rather than an all-new concept. So-named because its chromed steel rocker covers (stainless steel from 1949) resembled inverted baking pans, the Pan was built in both 74-inch – actually 73.66cu in or 1,207cc – and 61-inch (989cc) sizes, although the latter was discontinued in 1953. The larger version retained the "traditional" bore and stroke dimensions of 3⅜ x 3½in (or 87.3 x 100.8mm).

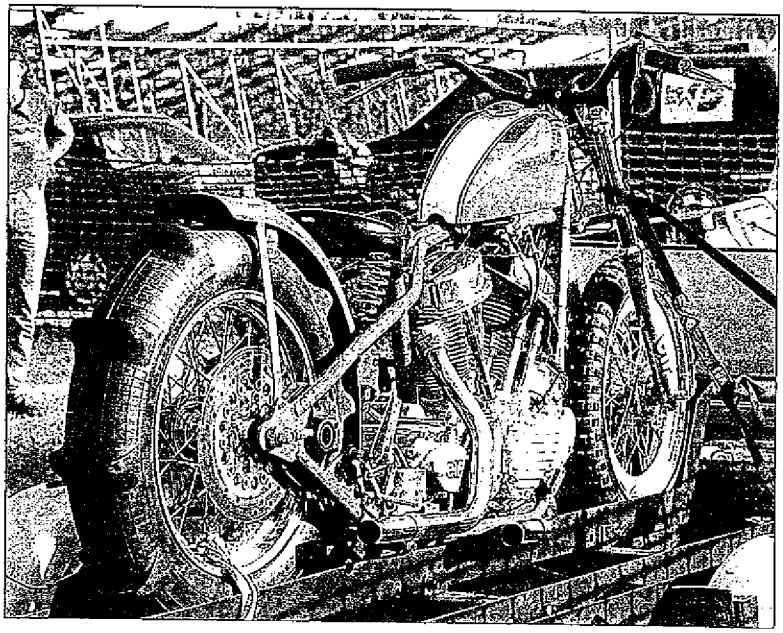
The Pan featured aluminium alloy cylinder heads in place of the Knuckle's cast iron ones, new rocker gear and hydraulic tappets (or "lifters" as they're known in the United States) rather than noisier solid push-rods, as well as a revised and less leaky lubrication system. The camshaft was also new. Although the bottom-end was substantially like the Knuckle's, the oil system benefited from a larger capacity oil pump and the main oil feeds were now internal rather than untidy external lines.

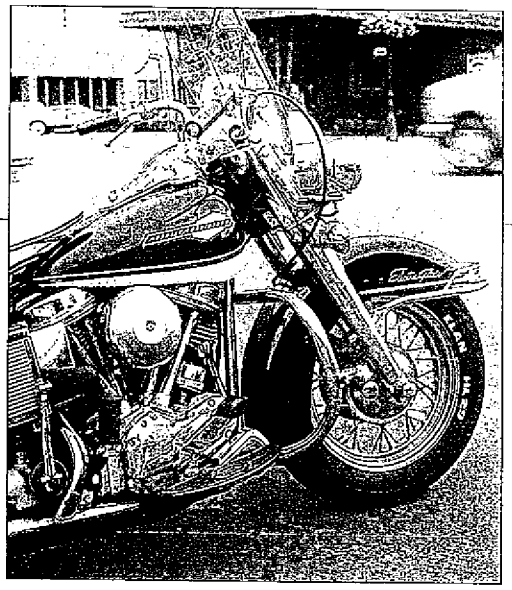
The new aluminium heads not only improved engine cooling but contributed to an engine weight 8lbs (3.6kg) lighter than before. To ensure durability, the spark plugs and cylinder bolts threaded into steel inserts rather than the

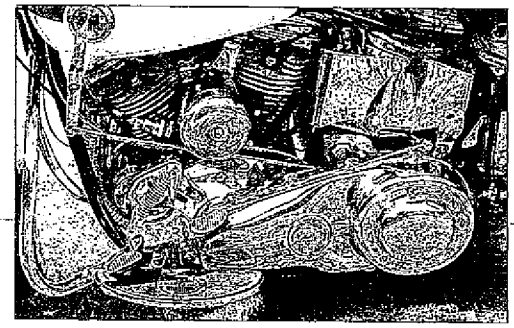
■ BELOW LEFT *Since 1948 Pans have powered everything from the first Glide, the HydraGlide...*

■ BELOW RIGHT *...to crazy dirt racers, as pictured here.*









■ RIGHT *The very first ElectraGlide was Panhead-powered.*

■ ABOVE FAR RIGHT *The DuoGlide had also been Panhead-powered.*

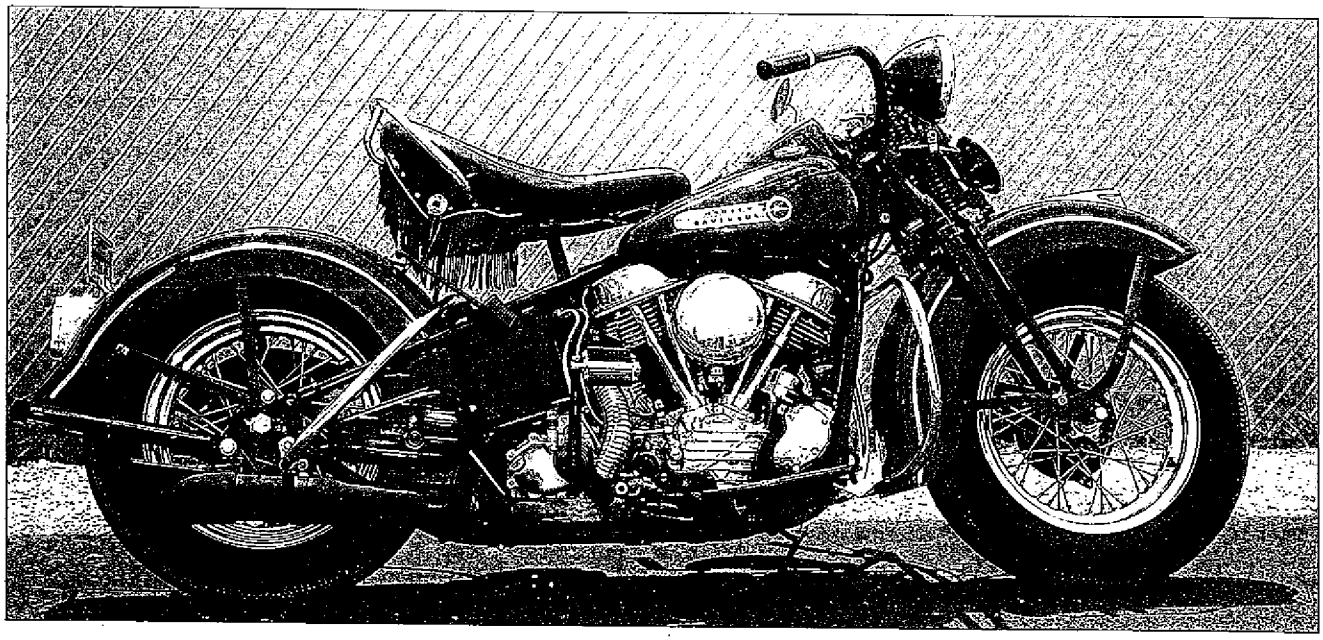
relatively soft aluminium of the head itself. Despite these improvements, the power output of early Pans was about the same as the Knuckle's – around 50bhp at 4,800rpm for the 74-inch motor. The valve lifters were relocated from the top of the push-rods in 1953, to lie between cam lobe and push-rod in the timing case. At the same time, both crankcase halves were heavily modified, with particular emphasis on oil control. In 1956, Harley-Davidson introduced even more of the same. By now, a freer-breathing air cleaner and high-lift "Victory" camshaft had brought a gain of around 5bhp on the Pan's original power output. Near the end of its life in 1963, the Panhead reverted to the Knucklehead's external top-end oil feeds to prevent overheating, a particular problem in the scorching deserts of the American south-west.

At least as enduring as the Panhead itself was the name given to the first new model to bear such an engine.

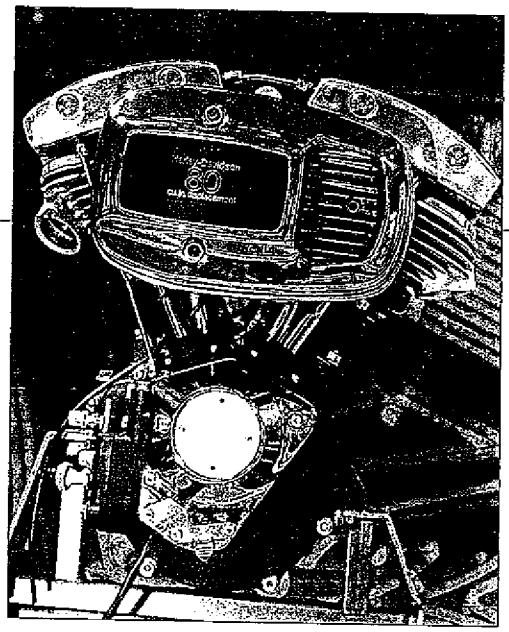
The HydraGlide of 1949 was the first Harley-Davidson to employ hydraulically-damped telescopic front forks.
It was also the first model granted one of the enduring names in motorcycling: "Glide".

The Panhead engine would do much to get the famous species on its way, propelling not only the DuoGlide of 1958 but the very first of the ElectraGlides as well.

■ BELOW *One of the first Panhead Harleys, a 1948 girder-forked Model F.*



SHOVELHEAD, 1966–84

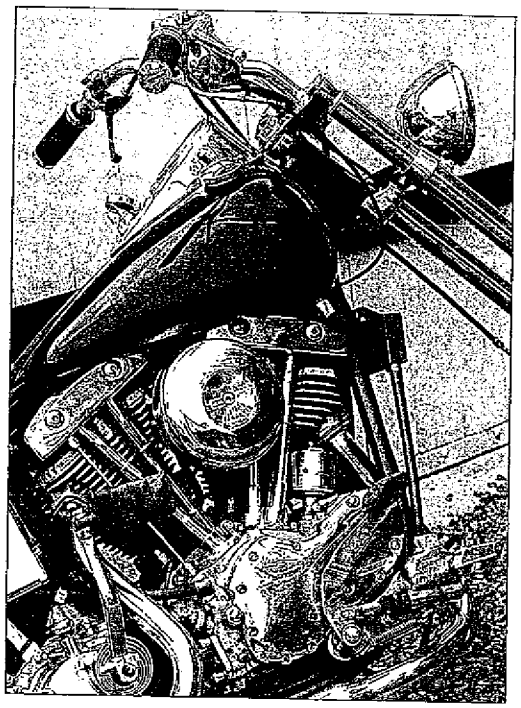


■ LEFT *Early Shovelheads used an all-new light alloy top end on what were essentially Panhead crankcases.*

According to Harley lore, 1965 is notable for two things. The first was the unveiling of a new generation of Shovelhead engines, replacing the venerable Pans. Second and ultimately far more momentous was the decision to list the company on the stock market. What no doubt seemed a good idea at the time would ultimately lead to takeover by American Machine and Foundry (AMF).

Popular opinion now says that AMF neglected the company, that it didn't understand motorcycles and that quality went rapidly downhill. Much of this criticism has an element of truth to it but AMF actually sank millions of dollars into its new project and actually tripled annual sales.

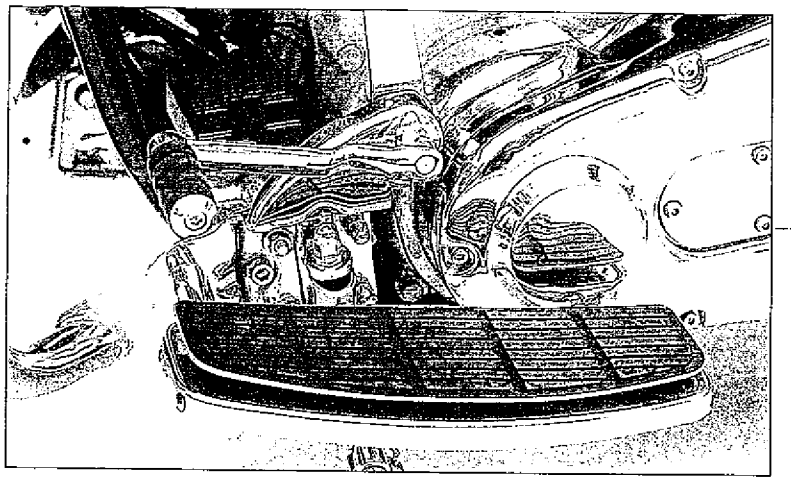
If Harley had a problem it was probably as much to do with being part of America as being part of AMF for, like many other sectors of American industry, it was overwhelmed by the tidal wave of sophisticated new products pouring in from Japan. As the British motorcycle industry learned to even greater cost, the 1960s and 1970s were no place for leisurely updates of a 1930s design. Put simply, the Shovelhead never had a chance.



First seen on the 1966 ElectraGlide, the Shovelhead followed the usual Harley practice of bolting a new top-end on to the tried-and-tested crankcases developed during the course of the previous generation of engines. There were minor revisions to the right crankcase half and a fin-less timing cover, but the bottom-end was essentially that of a 1965 Panhead, including the external oil feeds reintroduced in 1964.

An all-new top-end included aluminium alloy cylinder heads and iron cylinder barrels. Light alloy was also used for the rocker boxes in place of the Panhead's pressed steel. These were derived from the XL Sportster engine and enclosed redesigned rockers and exhaust valves. Although this rendered the Shovel top-end slightly reminiscent of the Sportster range, the latter was a quite separate family of unit-construction engines. Equally striking was the Shovel's "Ham-can" air cleaner cover, mated to a constant velocity Tillotson diaphragm carb from late 1966 onwards. The "Power Pac" head

■ FAR LEFT *This is a "generator" Shovelhead, produced up to 1970.*



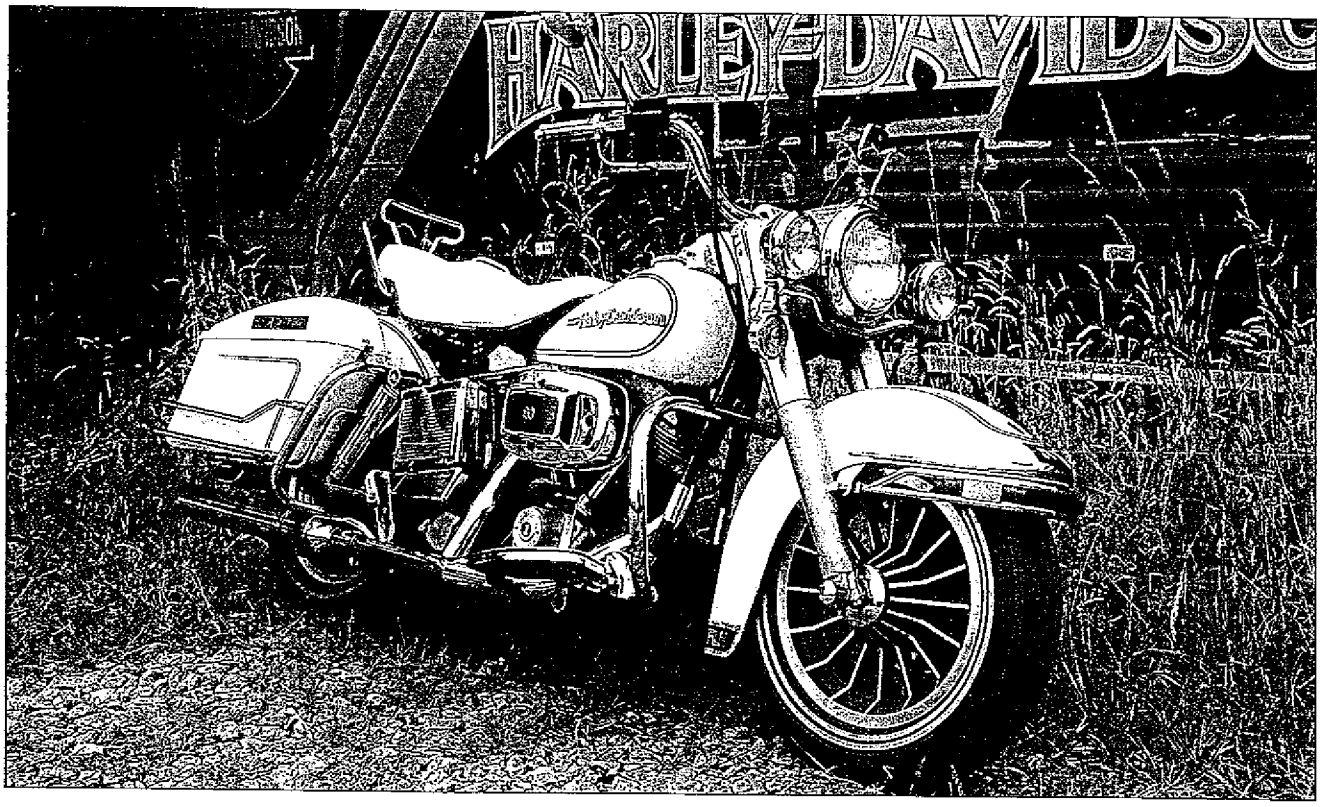
■ LEFT *Harleys managed to be both practical and stylish.*

design gave around 60bhp in FLH specification, 5bhp more than an equivalent Panhead. The standard FL developed 54bhp. Observers described the new heads as resembling the backs of coal shovels, hence the nickname.

Like all Harley Vs, the ohv engine runs forked con-rods with both cylinders in the same plane to eliminate rocking couple. Primary drive is via chain to a four-speed box (with a sidecar option up to 1980, of three forward and one reverse). The Shovel received its new bottom-end in 1970, in which a crankshaft-mounted alternator replaced the previous generator (and made the engine even wider) – hence "generator" and "alternator" Shovels. The later type, also called "cone motors", are recognized by their cone-shaped, right-side engine cover. The ignition points assembly was moved from its original external position inside the timing case and the timing gears simplified.

Originally produced in 74cu in (1,207cc) form, Shovels grew to 80cu in (1,340cc) with the FLH-80 of 1978, when electronic ignition was added. Two years later, the first five-speed gearbox appeared, firstly on the FLT Tour-Glide, and was also the first of Harley's rubber-mounted engines.

■ BELOW *"Alternator" Shovelheads are recognizable by the conical housing on the end of the crankshaft, here marked with AMF's Number One logo.*

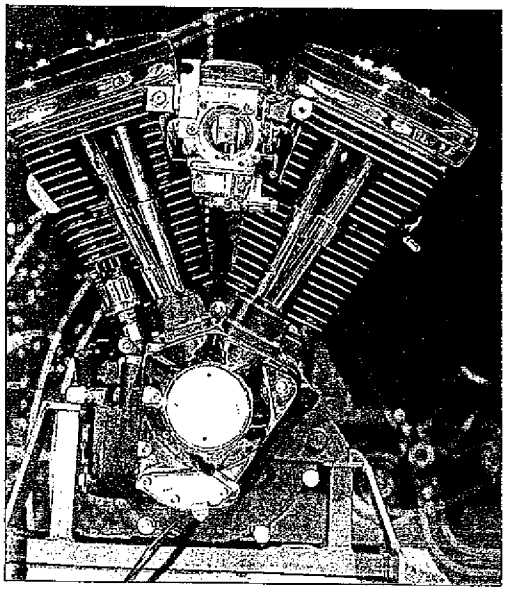


V2 EVOLUTION, 1984–PRESENT

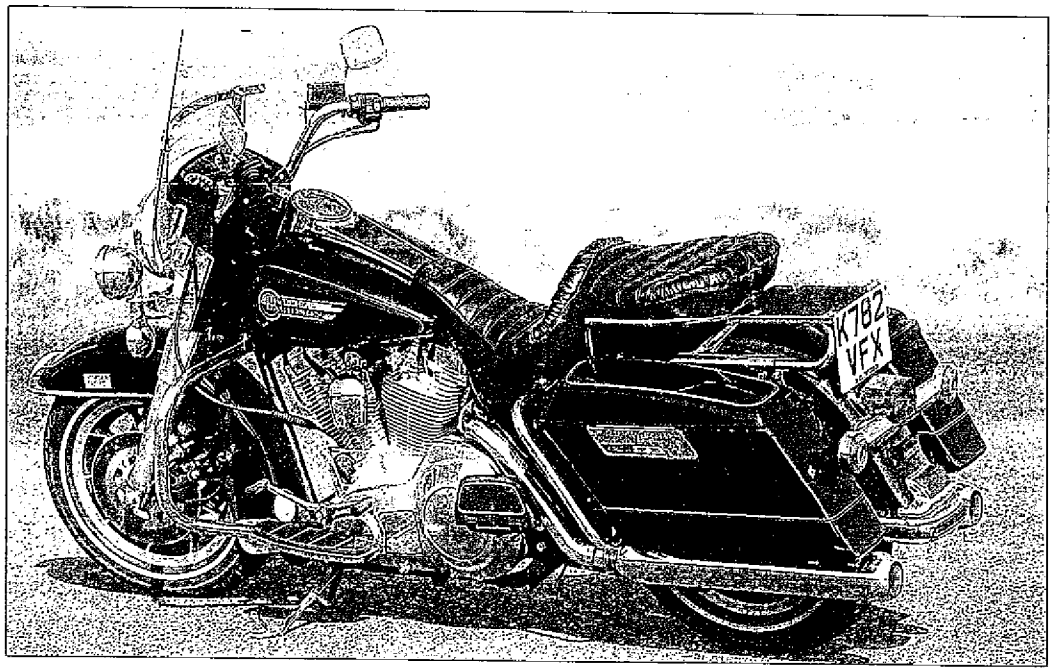
Perhaps the biggest fault of the next in Milwaukee's noble line of big twins is the lack of an attractive nickname. Its official title is "V2 Evolution" which, in common with most Milwaukee monikers, is a registered trademark. It is also profoundly fitting, since like the Shovel and Panhead before, it evolved from its predecessor rather than representing an all-new design.

Appropriate as the name might be, it is not evocative at all. After decades of Flatheads, Knuckles, Pans and Shovels, it has to be said that "Evo" lacks the same gritty authentic ring. Happily for its creators, an unkind early suggestion of "Blockhead" failed to stick.

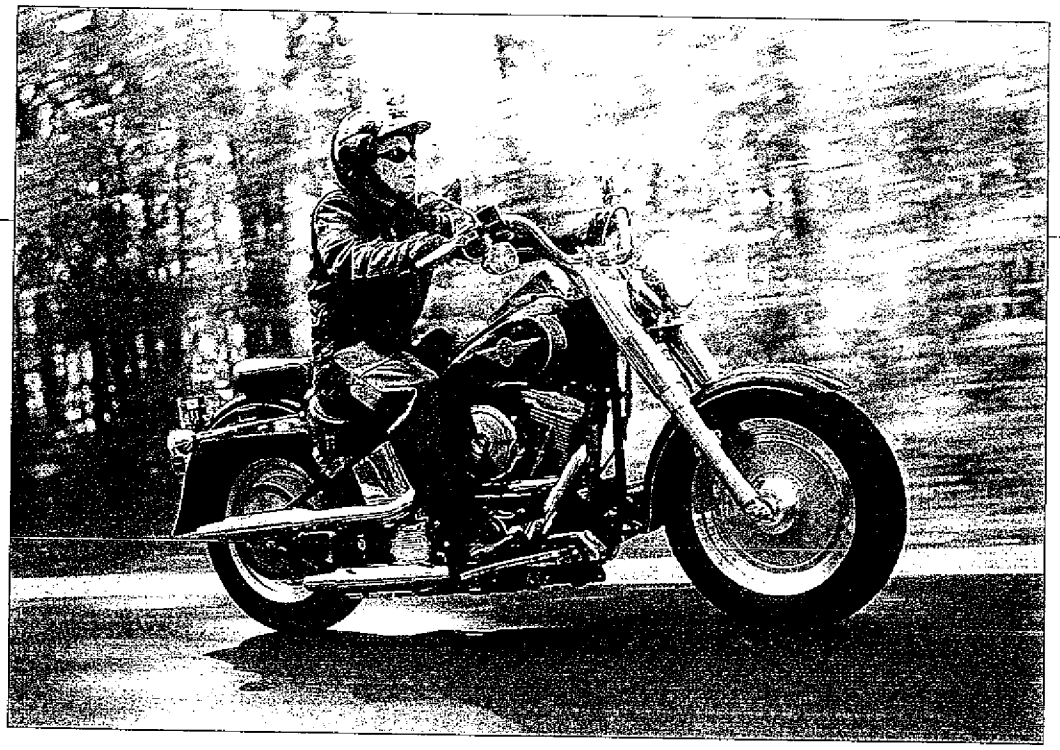
It's a curious Milwaukee fact that all major Harley-Davidson ohv engines have been born in the midst of strife. The Knuckle was a child of the Depression, the Pan arrived surrounded by strikes and post-war rebuilding, and the Shovel heralded years of decline. As the long-awaited replacement for the Shovel arrived in 1984, Harley-Davidson was effectively broke. The story of how the company got out of perhaps the biggest crisis in its history is



■ LEFT *The Evolution engine was developed from the Shovelhead twin, but soon proved itself stronger, cleaner and more dependable. It saved Harley's fortunes just in time.*



■ LEFT *By 1985, Evolution engines powered the entire big twin range, with Sportsters getting similar treatment one year later. It eventually gave way to the Twin Cam.*



■ RIGHT *The Fat Boy is one of the most stylish examples of the Softail family.*

related elsewhere, but never was Milwaukee in greater need of an engine that would deliver the goods for them.

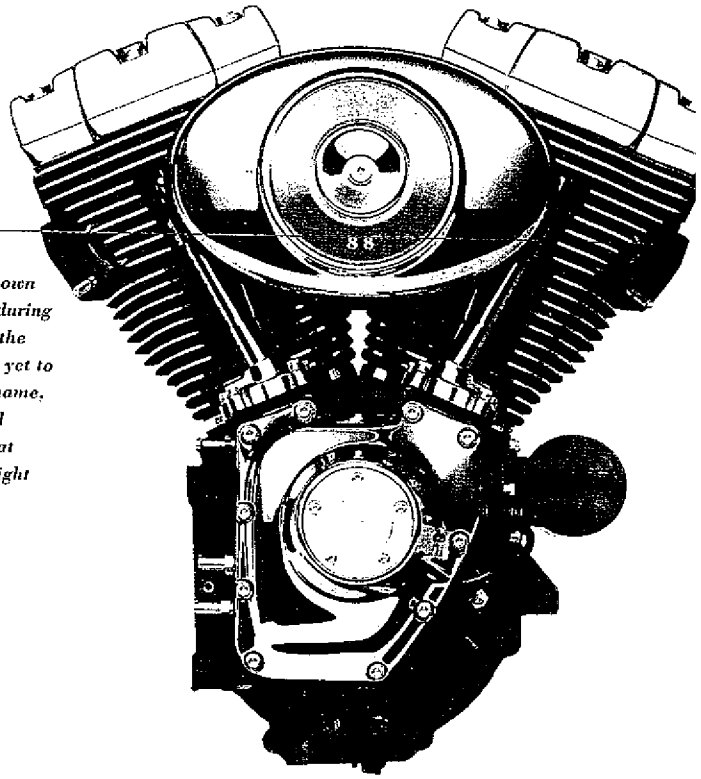
Fortunately for Harley-Davidson fans everywhere, the Evo was – and remains – everything they and Milwaukee had hoped for. Compared to the venerable Shovel which began life 18 years before, the Evo is 20lbs (9kgs) lighter and generates 10 per cent more horsepower and 15 per cent more torque. Its cylinders retain the "classic" dimensions of 3⅞ x 4½in (88.8 x 108mm), giving an actual displacement of 81.8cu in or 1,340cc (not 80in as it is nominally called). As with the evolution of Pan to Shovel, the Evo uses a bottom-end derived from its (alternator-type) predecessor but with improved con-rods and a new all-alloy top end. Efforts were made to improve oil-tightness and reliability, and decrease maintenance chores, with great success.

The extra power (around 70bhp at 5,000rpm) comes mainly from steeper, straighter ports feeding into redesigned combustion chambers, a new ignition, revised valve timing and higher compression ratios. During the seven years of the new engine's development, much effort also went into redesigning the lubrication system to prevent the Shovel's notoriously leaky nature. All but a handful of Evos sport five-speed transmission and, from later 1984, a much-improved diaphragm clutch. By 1986, the 1340 Evo had been joined by V2 Sportster cousins offering 883cc and 1100cc, the latter growing to become the first 1200cc Sportster two years later. Unlike the 1340s, Sportster Evos are of unit construction in which the crankcases and gearbox form a single unit.

So much for metal. As far as the vibrant, imaginative management team running the newly-independent company was concerned, the Evo had one other priceless asset the much-derided Shovelhead lacked. Milwaukee now seemed to have its finger on the pulse of motorcycle culture, and most importantly, seemed to understand its market.

Those at the helm now reached out to their customers in a way that the remote, faceless AMF never could, in stark contrast to the Shovelhead era. They sold their new product as if Harley's life depended on it – which, make no mistake, it did.

TWIN CAM 88

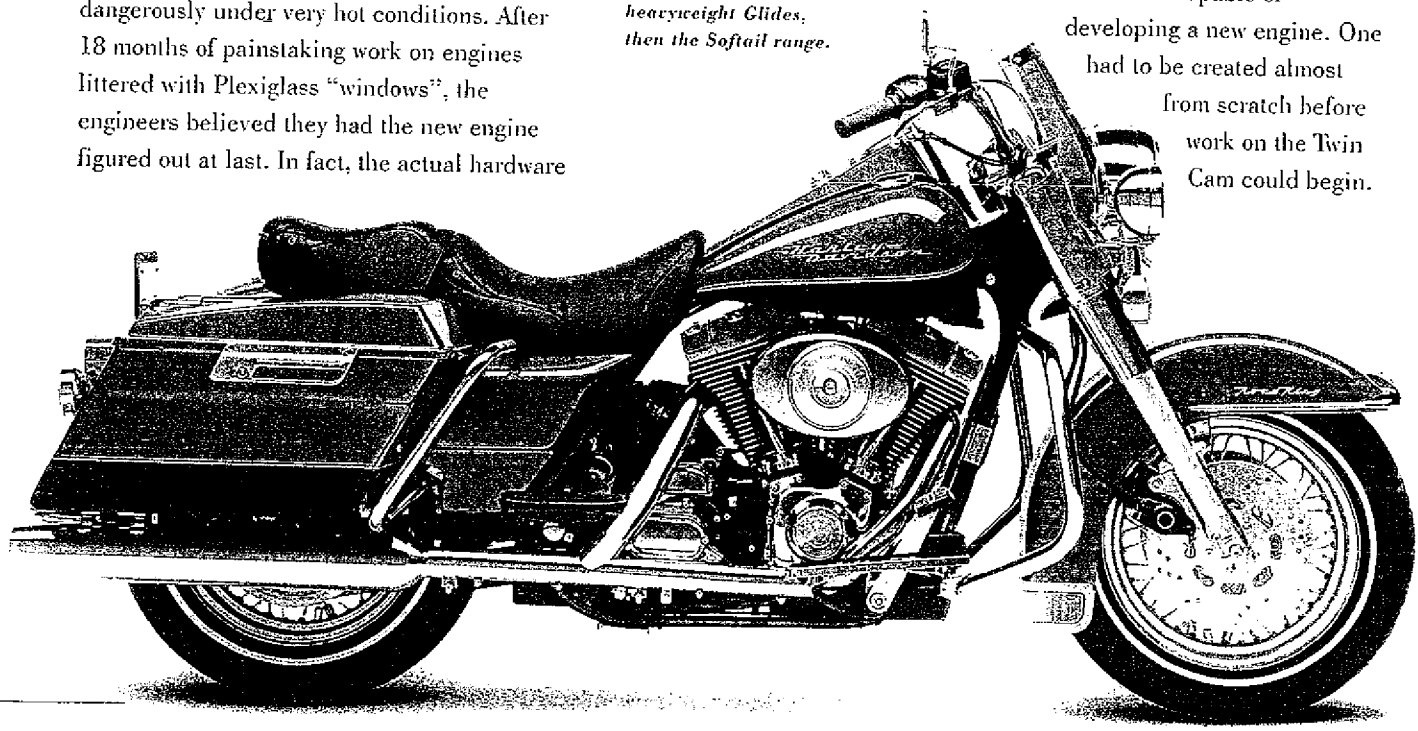


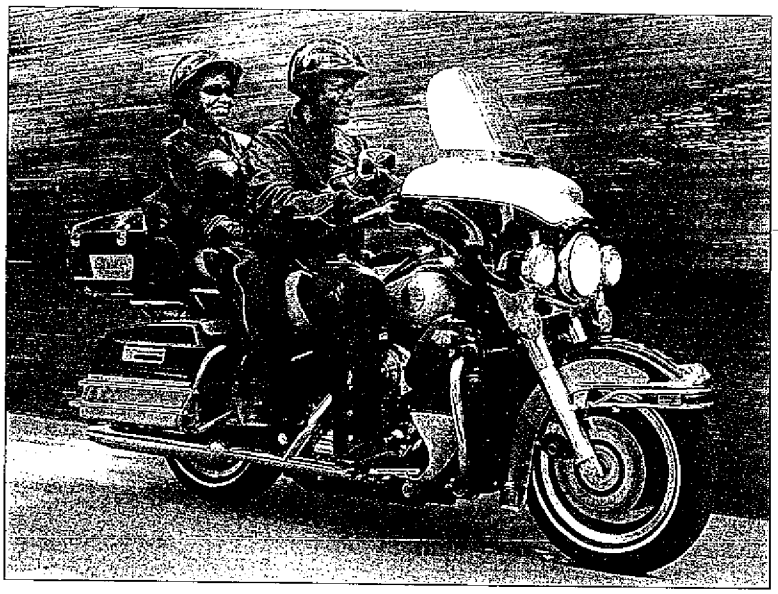
■ RIGHT *Known as plain P22 during development, the Twin Cam has yet to attract a pet name, despite unkind suggestions that "Fat head" might fit the bill.*

The Twin Cam was unveiled in 1998 and billed as "the biggest change in engine design since the Knuckle". First seen on the 1999 SuperGlides, DynaGlides, Road Kings, RoadGlide and ElectraGlide, the Twin Cam offers more power and torque in a smoother, more refined package. Yet despite the name, this is still an overhead valve engine – the cams in question are downstairs. Unlike the gear-driven camshafts of previous big twins, these are chain-driven and far less costly to produce. Considerable savings are also made in crankcase machining, which required 37 distinct operations on the Evo but only three on the Twin Cam.

One area which received particular attention was the oil circulation. Surprising though it may seem, as they set out to create the Twin Cam, Milwaukee's engineers had very little idea what the lubricating oil in the Evo engine actually did – except that it didn't always go where it ought and that pressure could fall dangerously under very hot conditions. After 18 months of painstaking work on engines littered with Plexiglass "windows", the engineers believed they had the new engine figured out at last. In fact, the actual hardware – a high-capacity "gerotor" pump and two distinct scavenge systems – is less crucial than the engine's internal detailing. This was simple compared to the project's biggest problem, which had nothing to do with hardware, but with people. After the lay-offs of the 1980s, Harley simply didn't have a team capable of developing a new engine. One had to be created almost from scratch before work on the Twin Cam could begin.

■ BELOW *The Twin Cam brought a new dimension of power and refinement, first to heavyweight Glides, then the Softail range.*





■ ABOVE *Faster, cleaner, easier to service—any Harley rider's delight.*

Depending on the state of tune, Harley claims a 14–22 per cent power increase (to 87bhp on the DynaGlides) compared to the previous Evolution design. This is achieved partly through higher compression ratios, improved combustion-chamber shape and induction plumbing, as well as a new ignition pack.

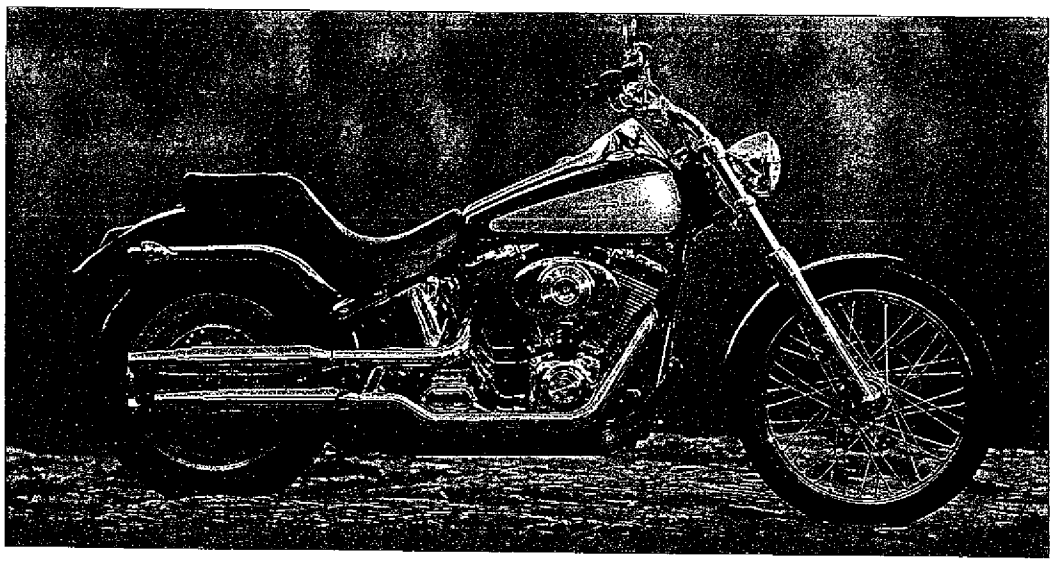
Last but not least is a ten per cent increase in capacity to 88.4cu in (1,449cc), making this the largest stock engine Milwaukee has ever built. To achieve the extra volume, the stroke has decreased from 4¼ to 4in (108 to 101.6mm) while the bore has risen substantially from 3⅜ to 3¾ (88.8 to 95.3mm). Traditionalists may bemoan the departure from the hallowed 88.8 x 108mm (3⅜ x 4¼in) dimensions which have endured since the Shovel.

They will certainly not bemoan, however, the Twin Cam's prodigious peak torque: 86lb/ft (116Nm) at a mere 3,500rpm. Riders needing more can take heart: the Twin Cam was designed to allow an increase in displacement as high as 1550cc, adding another six to eight horsepower.

Compared to the bolted-up crankshafts of previous ohv twins, the Twin Cam has a pressed-up crankshaft. With its shorter stroke, it is capable of higher revs. Although the 5,500rpm redline is only 300rpm higher than before, development engines have been safely tested at up to 7,000rpm.

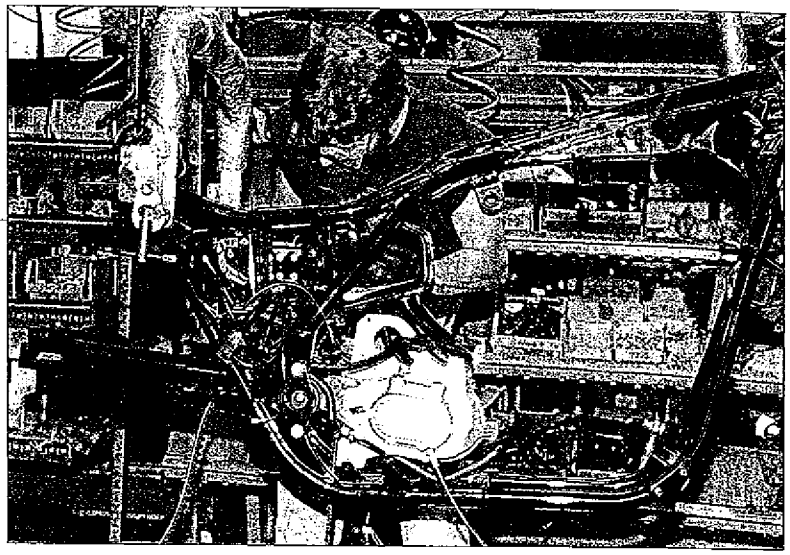
Harley surprised everyone by dropping the Evo and unveiling the Twin Cam 88B for the year 2000, a unit-construction engine specifically tailored for the Softail range.

It represents another Harley first – twin balance-shafts to smooth out engine vibrations. Softails will no longer be able to lay claim to being the "judderers" of the range.



■ RIGHT *Twin Cam power reached the Softail range with the balance-shafted Twin Cam 88B for year-2000 models.*

RETRO-TECH

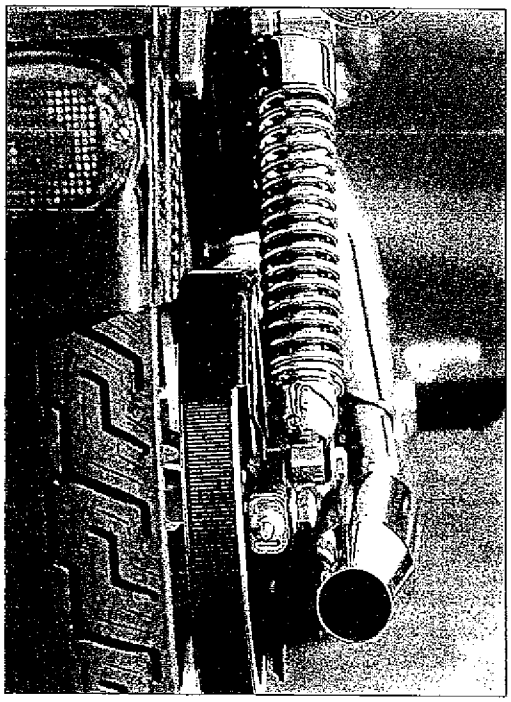


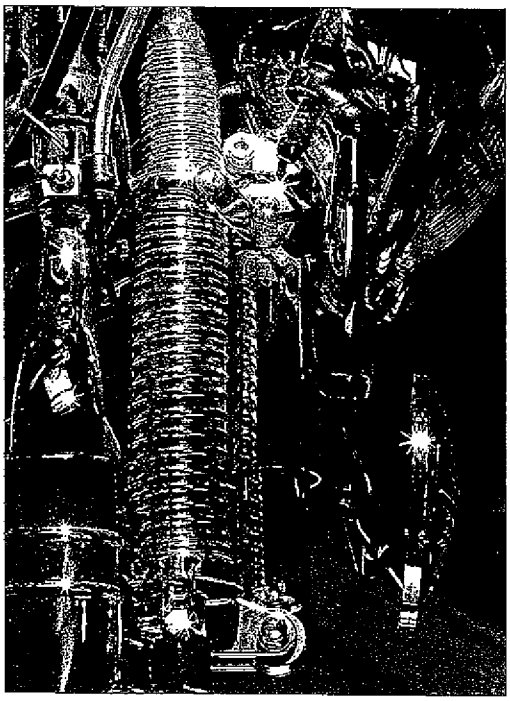
Harley-Davidson, like any ambitious pioneer motorcycle company in its early years, introduced scores of new ideas and technologies as its motorized bicycles evolved into true motorcycles. With running gear, as with engines, change was based on a trial-and-error philosophy, in which good practice prospered and bad quickly failed and fell into disuse. It was soon clear to Harley-Davidson's founders, however, that their interests lay foremost in making things that worked – and dependably. Unfamiliar ground was broached only in response to some specific need or shortcoming, and then with a thoroughness that often escaped their rivals. To this extent, the company has changed little.

It's perhaps surprising, then, that Juneau Avenue occasionally lapsed into dubious claims of motorcycling "firsts". The "step-start" and front brake, introduced in 1914 and 1927 respectively, are cases in point. British Scotts had kick-starts much earlier and front brakes were already commonplace on European machines by the 1920s. In 1923, for instance, Douglas racers were sporting quite modern-looking front-disc brakes. When Harley-Davidson claimed a "first", what it really meant was an American first.

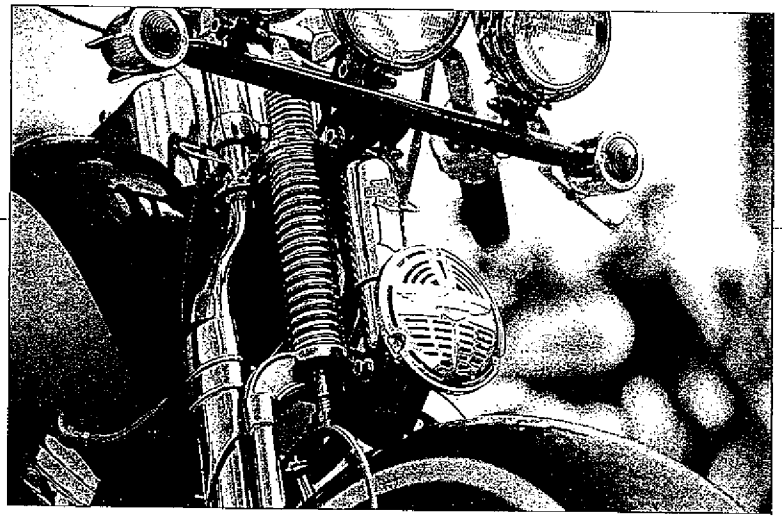
Milwaukee makes little pretence at space-aged technological innovation these days, although it might claim its machines are state-

■ ABOVE *Even today, all Harleys use variations of twin-loop steel frames, as on this one on the York assembly line.*





■ FAR LEFT AND LEFT *Two of Milwaukee's major innovations: belt final drive, as on this five-speed 883 Sportster (far left) and the "Retro-Tech" Springer front end (left).*



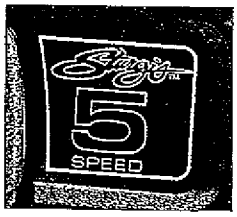
■ ABOVE *Another view of the Springer front forks, inspired by the girder forks of Harleys of the 1940s.*

of-the-art – with the emphasis very much on "art". In sheer performance terms, novel engineering is usually introduced slowly: its first five-speed gearbox in 1980; fuel injection in 1995 (to clean up emissions more than to enhance power); and the long-awaited and still anticipated overhead cams (other than on the high-tech VR1000 Superbike racer). The two fields in which Harley-Davidson has taken a lead are in toothed-belt final drive – a relatively simple but truly wonderful development first seen on the 1980 FXB Sturgis – and, most strikingly, the concept of "Retro-Tech".

Retro-Tech grew out of the imaginations of Willie G. Davidson and his colleagues at the Product Development Center as well as the ingenuity of Harley's engineers. It is the means by which modern engineering receives a post-modern styling twist which is uniquely Harley-Davidson, which can contrive to make a 1999 model look for all the world like a 1949 HydraGlide but function far better. Willie G. coined the phrase, the "New Nostalgia".

Its chief elements are the Springer and Softail front and rear ends, respectively. The Softail system, designed by consulting engineer Bill Davis and much imitated by competitors, comprises a cantilever suspension system using two underslung shock absorbers cunningly persuaded to look like the rigid rear end of bygone days. Hence the name – Softail, a play on the "hard tail" nickname of custom machines whose rear suspension has been removed in favour of lines that are cleaner, if distinctly less comfortable.

■ BELOW *Detail of the revolutionary Sturgis of 1991.*

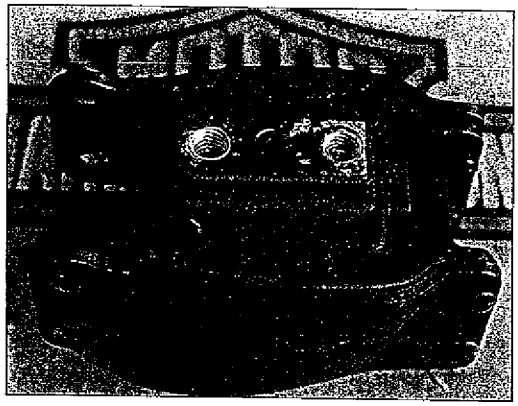


Springer front forks are highly-stylized facsimiles of the girder forks used on Harleys prior to the HydraGlide. Despite the 1940s looks created by their exposed springs and brilliant chrome blades, Springer forks benefited from more computer-aided design than any previous piece of Harley-Davidson hardware had done.

Almost any other make of motorcycle you can mention boasts "more" than any Harley-Davidson – more cylinders, valves and camshafts, more gears, more revs, more power – but with Milwaukee's finest, as the cognoscenti well understand, less is more.

If a Harley is about anything, it's about getting back to motorcycling's roots. As styling vice president Willie G. himself observed a few years ago, owners "rank the Harley look right up there with motherhood and God and they don't want us to screw around with it." Like that other American icon, the Zippo cigarette lighter, "It Works".

And, as the saying goes, "if it ain't broke, don't try to fix it."



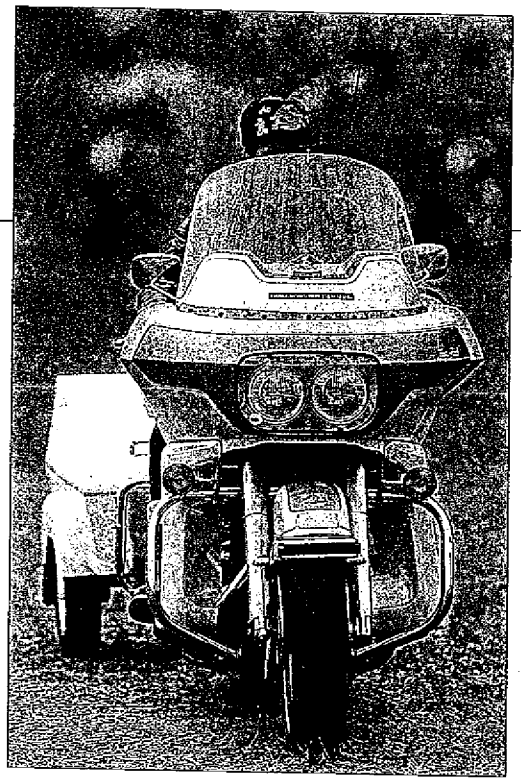
■ LEFT *This deceptively simple-looking rubberized mounting transformed the ride of the 1993 WideGlide and subsequent Dyna-Glide models.*

ODDBALLS

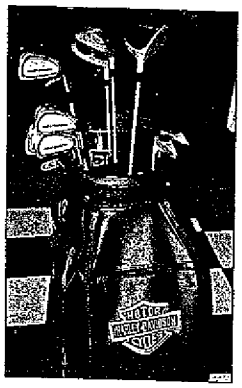
Harley-Davidson began as a company with lofty aspirations, but some developments must have surprised even the founders. In 1924, a Harley-engined (18hp) plane built by Harvey Mummert won the speed and efficiency contest at an air race at Dayton, Ohio.

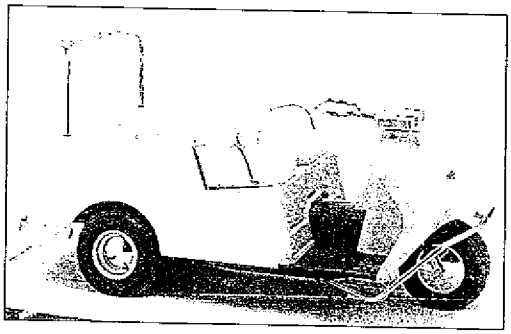
Four years later, Flying and Glider Manual published plans for crafting a propeller for a 74-inch Harley twin. By the mid-1930s, several hundred light planes were powered by Harlequin engines, using Harley-Davidson cylinders on special, horizontally-opposed crankcases. The resulting boxer twin produced 30 horsepower and could be built for less than $100. At the opposite end of the spectrum was the bicycle built for Harley by the Davis Sewing Machine Co. from 1918–24 – a "Hog" with no engine at all.

Milwaukee twins have also been used in boats and as all manner of stationary engines. Contrary to popular belief, it has not been a single, seamless tide of thundering big twins from almost the dawn of the 20th century into the 21st. Other than the early singles, perhaps



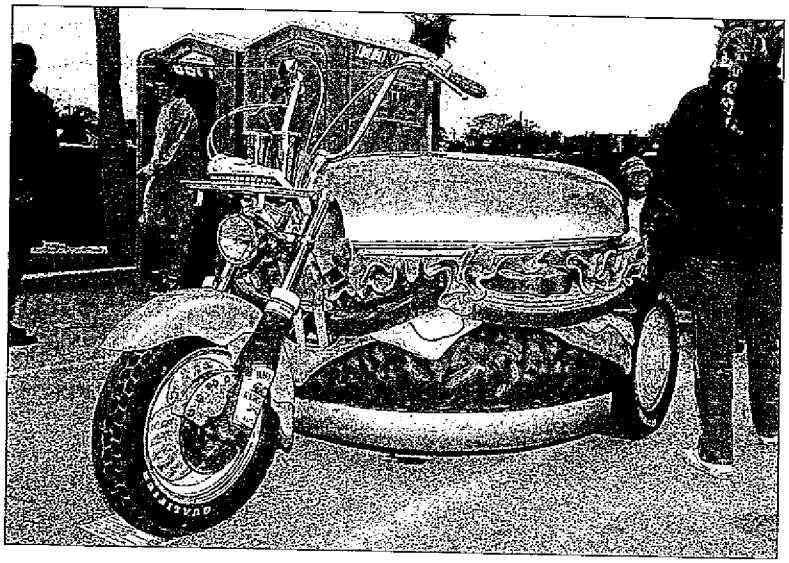
■ LEFT *The TourGlide certainly wasn't strange, but for a while motorcycles towing trailers were. Now they are commonplace.*

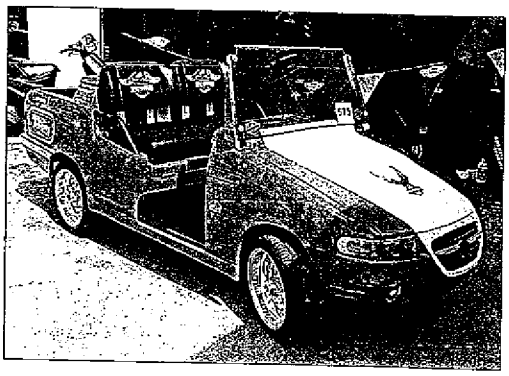




■ ABOVE *Harley-Davidson golf clubs?*

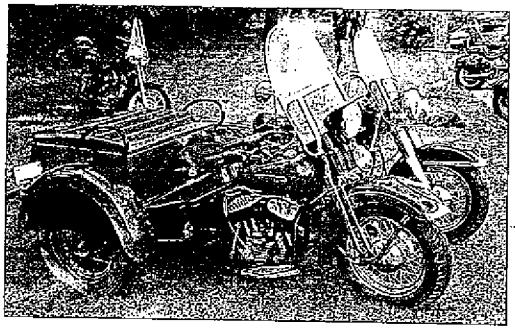
■ LEFT *Well, Milwaukee did make golf carts for a while.*

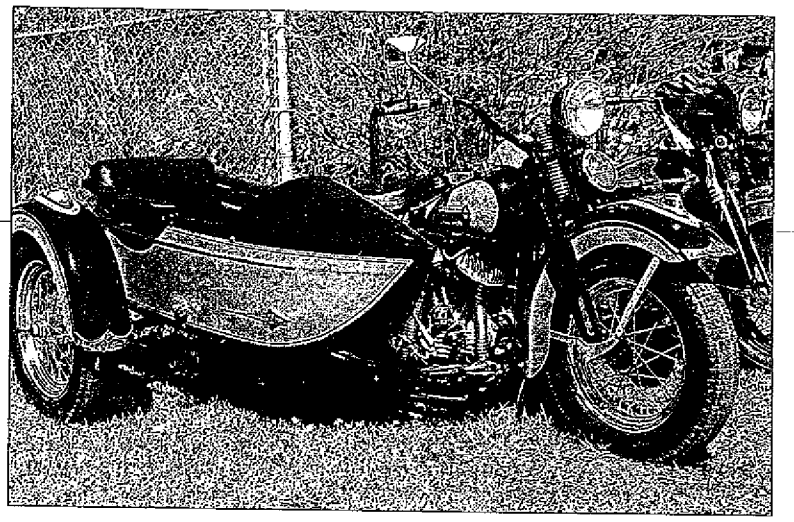




■ ABOVE *Another variation on Harley wheels, this time used as paddock transport by the factory race squad.*

■ LEFT *One American icon mutates into another: the Harley hamburger.*





the best-known variation from the V-twin theme was the Sport Twin of 1919–22, using a 37in (584cc) horizontally-opposed engine, similar to contemporary Douglas motorcycles. A generation later, the military XA appeared during the Second World War, powered by a transverse, horizontally-opposed, flathead twin.

Even the oddball XA might not have made it had other military prototypes reached production. These included a three-wheeler for use over rough ground, an armoured machine-gun carrier and a small tank powerplant consisting of a linked pair of Shovelheads. By then, one Milwaukee three-wheeler was an everyday part of American civilian life.

They called it "Servi-Car" when introduced in 1932. Although the front end – "borrowed" from the Model D side-valve V-twin – was fairly conventional, what lay behind caused surprise. Above a two-wheel rear axle sat a metal-framed "boot" (trunk): this ungainly-looking device was a cheap delivery vehicle which found a ready market in Depression-torn America. For many Harley fans worse was to come, beginning with the 1947 Model S and ending with the Topper Scooter.

■ LEFT *Odd, but the Servi-Car worked, from 1932 until the 1970s.*

■ ABOVE RIGHT *Harley was one of the world's biggest sidecar manufacturers, as with this WL45 outfit.*

■ BELOW LEFT *This Evo-engined prototype of a Servi-Car successor failed to reach production.*

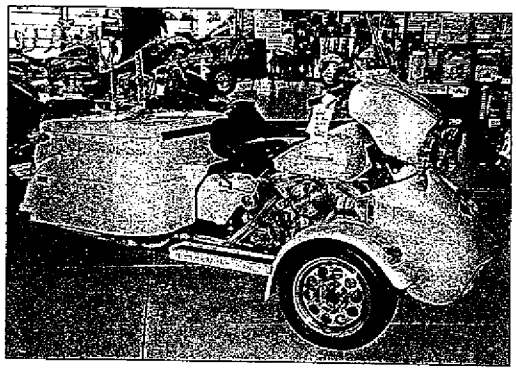
■ BELOW *The little-known XA was a boxer twin.*

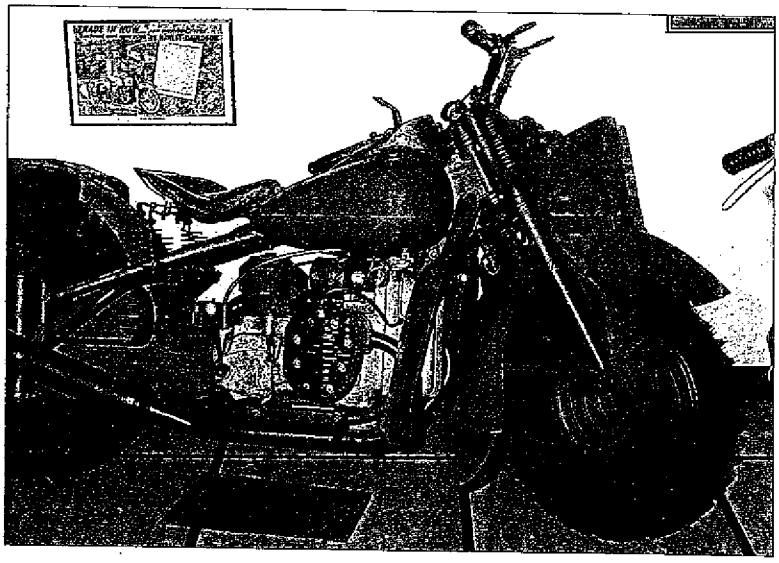
One of the strangest ventures was a Harley two-stroke actually manufactured in the United States – without wheels. The Harley Snowmobile, powered by either 400 or 430cc engines, was built for four years until 1975.

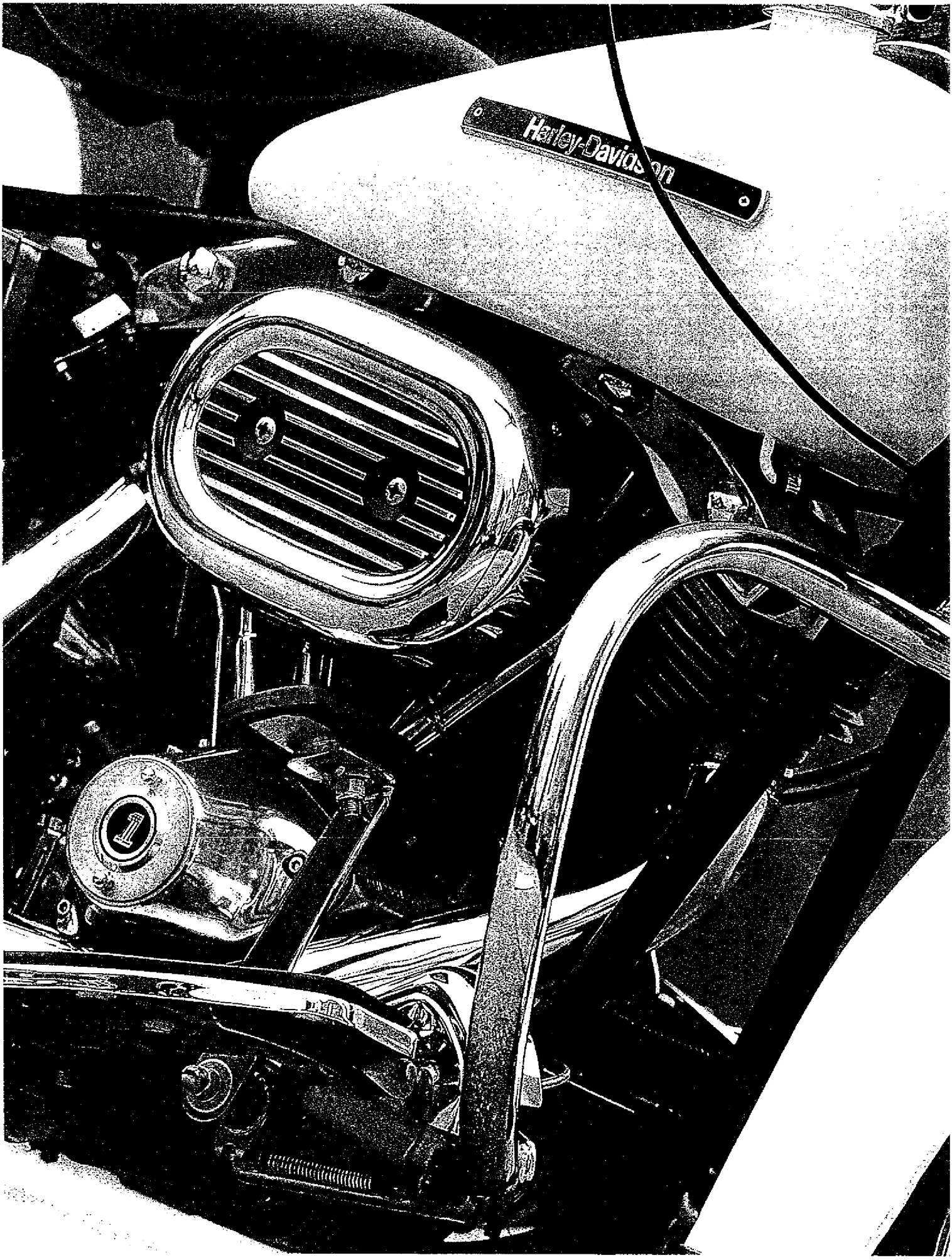
Another quest for diversity saw the company branching out to build military bomb casings, computer circuit boards and "Holiday Rambler" recreational vehicles.

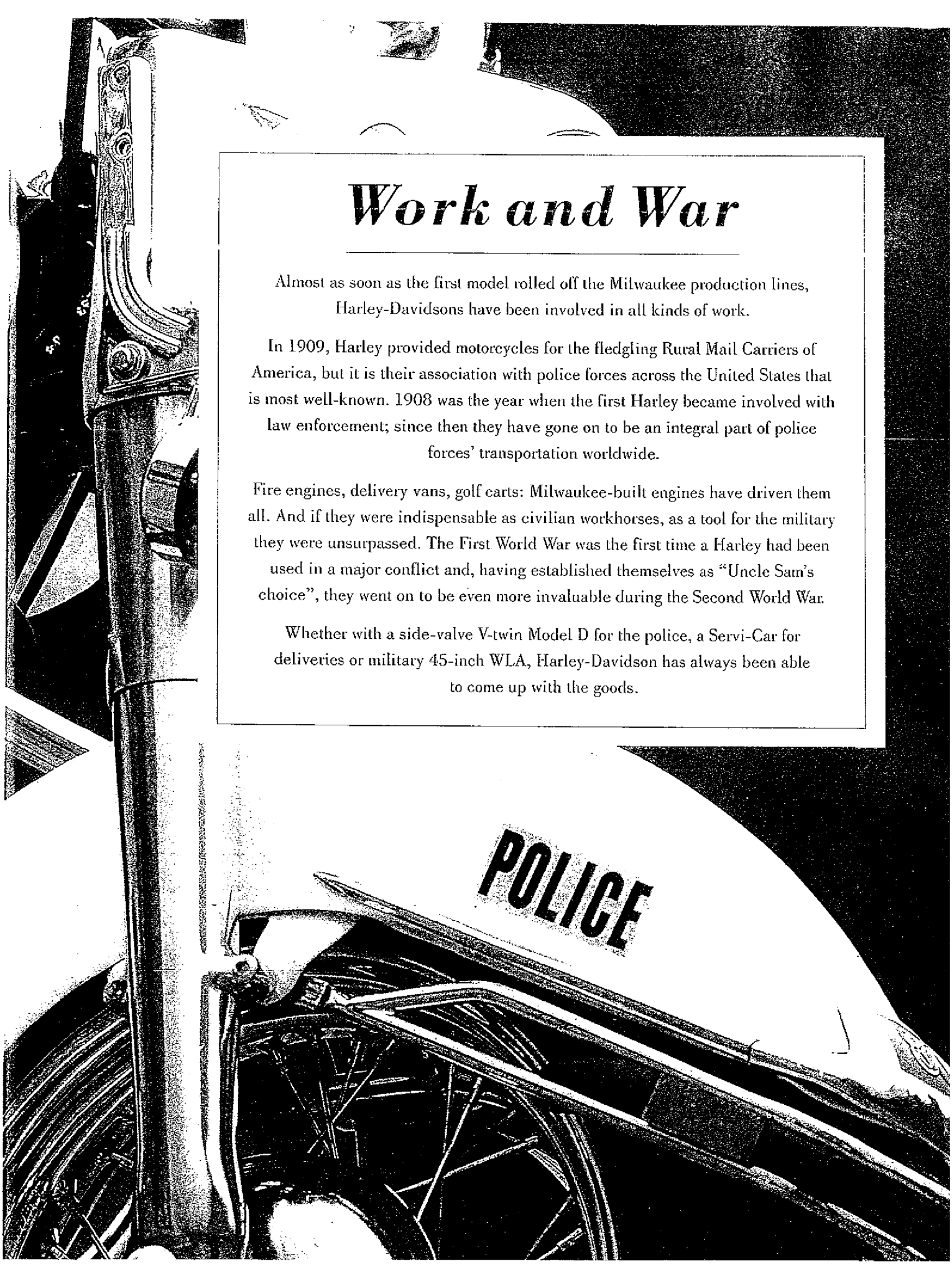
If nothing else, this demonstrates just how far the company had strayed from what it now regards as its essential roots.

Legislation permitting, in the future, all Harley-Davidsons will be air-cooled, 45-degree V-twins with both cylinders precisely in line. You can bet your house on it.






Harley-Davidson



Work and War

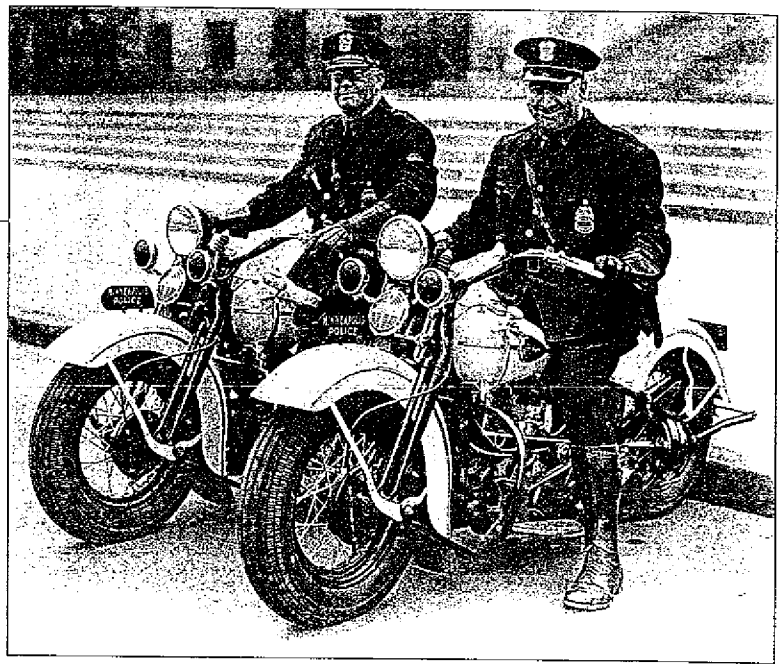
Almost as soon as the first model rolled off the Milwaukee production lines, Harley-Davidsons have been involved in all kinds of work.

In 1909, Harley provided motorcycles for the fledgling Rural Mail Carriers of America, but it is their association with police forces across the United States that is most well-known. 1908 was the year when the first Harley became involved with law enforcement; since then they have gone on to be an integral part of police forces' transportation worldwide.

Fire engines, delivery vans, golf carts: Milwaukee-built engines have driven them all. And if they were indispensable as civilian workhorses, as a tool for the military they were unsurpassed. The First World War was the first time a Harley had been used in a major conflict and, having established themselves as "Uncle Sam's choice", they went on to be even more invaluable during the Second World War.

Whether with a side-valve V-twin Model D for the police, a Servi-Car for deliveries or military 45-inch WLA, Harley-Davidson has always been able to come up with the goods.

WORK AND WAR



■ WORK

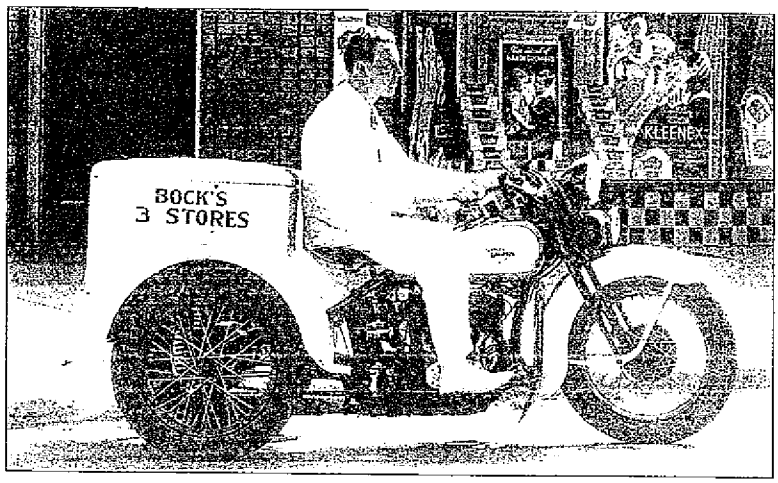
Throughout the 1920s and 1930s, the words "Harley-Davidson" and "workhorse" were almost synonymous. Surprising though it may seem now, much of America's road network scarcely existed until President Roosevelt's job-creation programmes of the Depression years. Even the celebrated Route 66 dates from only 1926 (and was almost obliterated by Interstate 40 after 1985). Any affordable, rugged machine able to cope with rough terrain had something going for it, and Milwaukee's finest certainly met that bill. Harleys have offered mobility in every walk of American life, from painters to policemen. The company saw this potential early – Arthur Davidson attended the annual meeting of the Rural Mail Carriers of America as early as 1909, coming away with a pocketful of sales. It is with the police, however, especially the Highway Patrol, that Milwaukee twins are best associated.

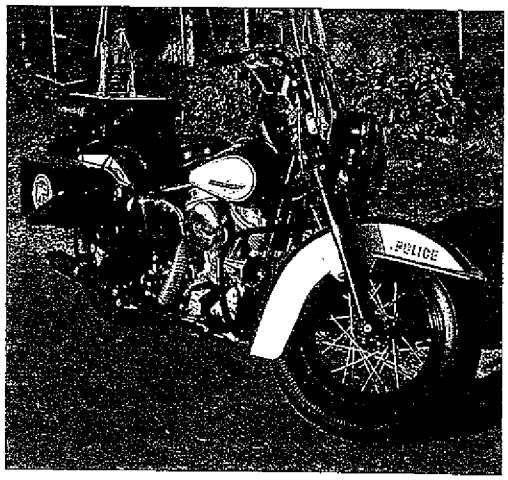
Literally thousands of Harleys have joined America's police forces since they first went into uniform in 1908. Until recently, it was believed that the first police Harley went to Pittsburgh in 1909, although the distinction actually goes to Detroit one year earlier. Indeed, Harley-Davidsons have been popular across the globe, and Milwaukee twins have often been prominent in newsreel footage of presidential cavalcades in countries as far-flung as Burma and Guatemala. By 1915, Juneau Avenue was also producing "rapid response" sidecar outfits equipped with fire extinguishers and first-aid kits. A decade later, Harley motorcycles were in use by more than 2,500 American police forces, some of which quickly saw the public-relations benefits of organizing their riders into display teams. By the 1930s, police-model special equipment

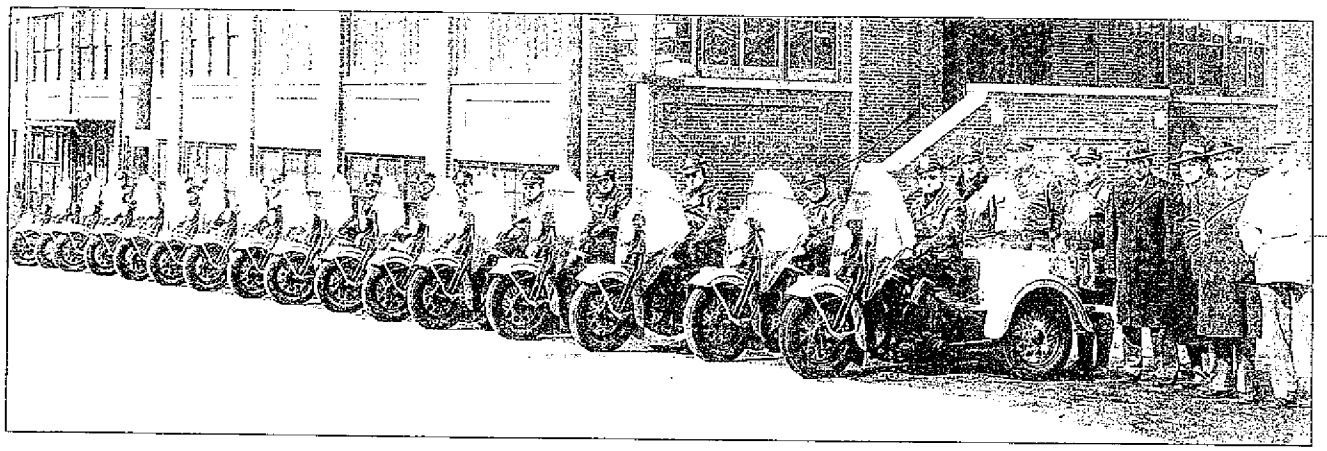
■ ABOVE *Police officers on 1944 UL models patrol Minneapolis, Minnesota. Harleys have been involved in law enforcement since 1908.*

■ BELOW LEFT *The Servi-Car three-wheeler did much to allow Harley to endure the Depression.*

■ BELOW RIGHT *A police Panhead, one of thousands of machines to have served US law-enforcement.*



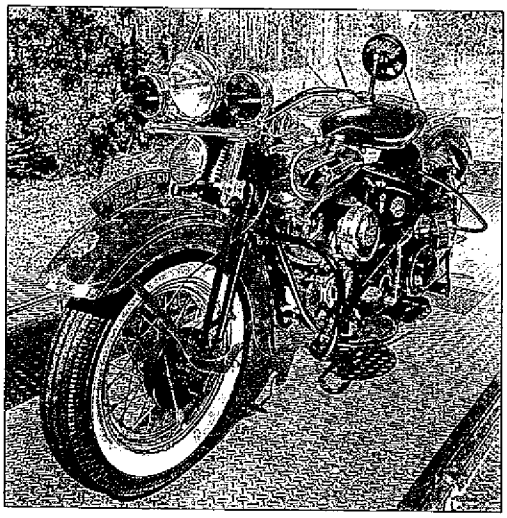




■ ABOVE *An impressive line-up of police Harleys outside the Juneau Avenue factory.*

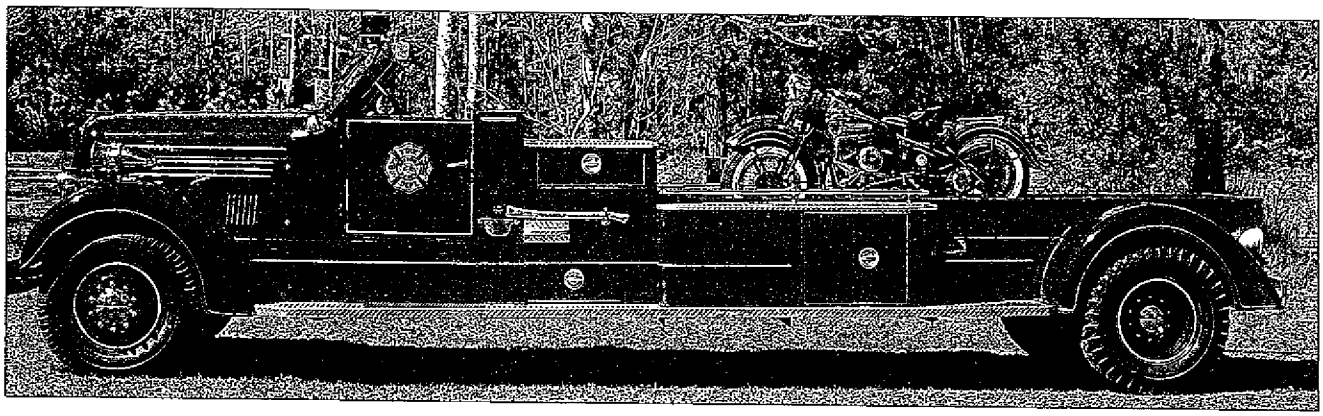
included radios (initially only one-way; two-way arrived 1948), although some squads made riders buy their own police lights and sirens.

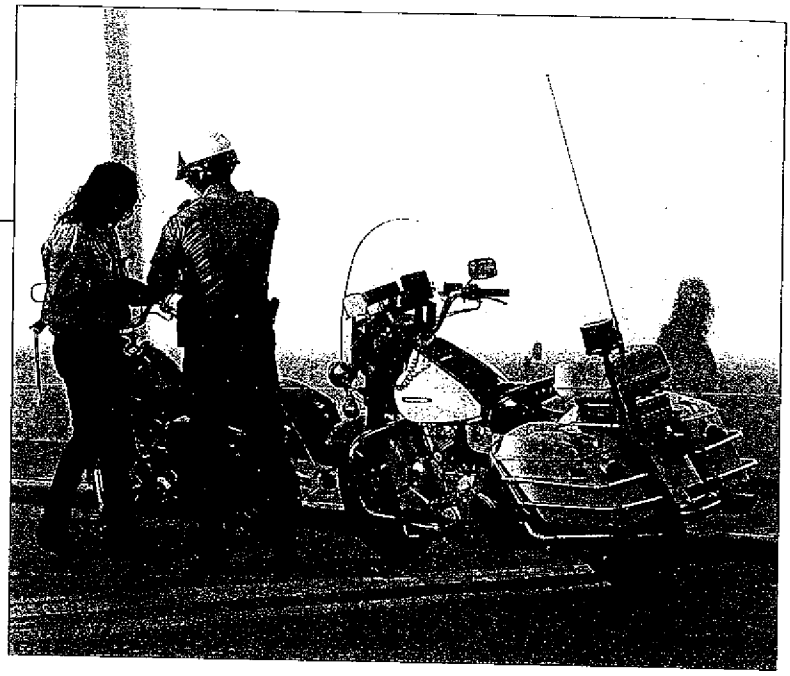
The same period also welcomed two definitive Harley-Davidson workhorses. The archetypal side-valve V-twin Model D, introduced in 1929, became the Model W in 1937 and continued in production until 1951. Although crude and slow – its 22-or-so-bhp, 45-inch engine generated around 65mph (105kph) – it was rugged, dependable and easy to fix – ideal for cash-strapped Depression America. The American military version, known as the WLA – the "A" stood for "Army" – represented the bulk of Milwaukee's contribution to the Second World War. Though the majority of WL production during the war years was earmarked for military use, some also went to police forces and other strategic or security operations.



■ RIGHT AND BELOW *This immaculately restored Flathead served with the Daytona Beach Fire Department.*

The Servi-Car, introduced for 1932, was the Model D's three-wheeled sister ship, and enjoyed an even longer production run – until 1974. The model's capacious boot (trunk) made it as popular with trade and delivery men as it was with local police forces. This unique three-wheeler remained in service, even in metropolitan San Francisco, into the 1990s. One clever and user-friendly Servi-Car touch





was the adoption of the same 42in (1,070mm) wheelbase as the typical car – so inexperienced riders would not need to forge their own ruts in mud and snow.

So enduring was the Servi-Car's appeal that for a period during the late 1970s and early 1980s it was the only Milwaukee machine serving many American police forces.

The later Shovelhead years were not happy ones for Harley-Davidson's law-enforcing pretensions. Quality-control problems and general performance issues caused many forces to look elsewhere. For around a decade, even the California Highway Patrol (CHiPs) found itself powered by Italian Moto Guzzi V-twin and Japanese Kawasaki four-cylinder machines. It was not until the arrival of the Evolution engine in 1984 that Harley could again supply machinery that met CHiPs' requirements. Since then, Harley's principal police models have been the FLHT-P Electra-Glide and FXRP PursuitGlide.

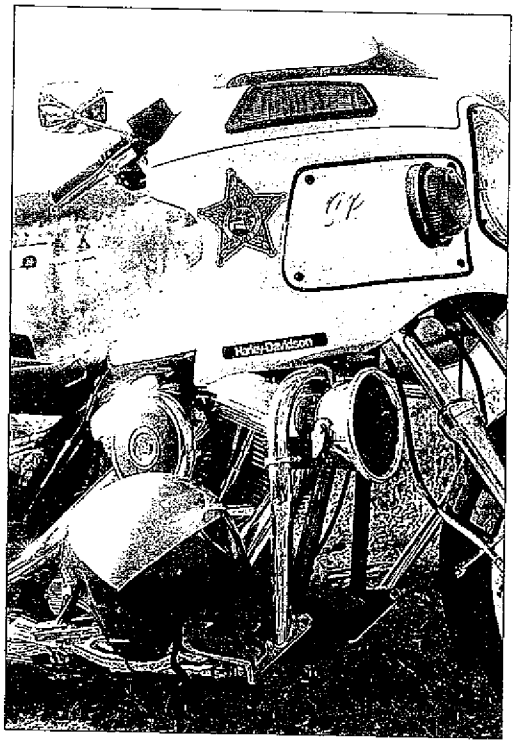
THE FIRST WORLD WAR

By the time the United States entered the First World War in 1917, H-D machines had already seen action in skirmishes against the forces of Pancho Villa, the Mexican revolutionary. Under General "Black Jack" Pershing, machine-gun-toting Harley-Davidsons proved themselves ideal for border patrols in rough terrain.

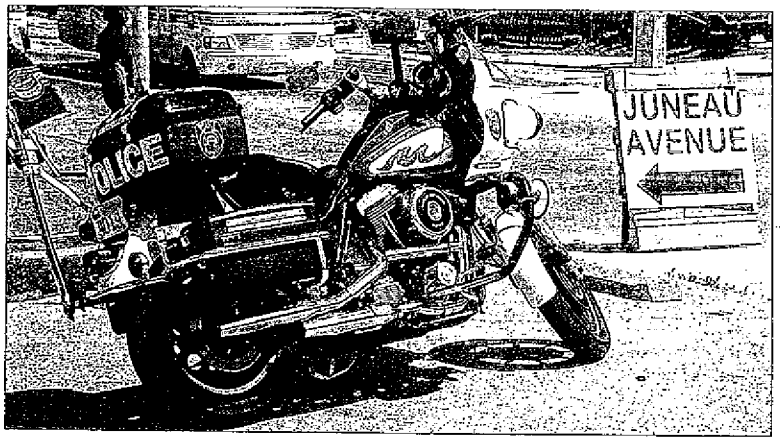
In the process, Juneau Avenue proved itself adept at meeting military demands. An order for additional machines was placed by a War Department telegraph on 16 March 1916. A

■ ABOVE LEFT *Fancy being paid to ride a Harley at Sturgis: a local cop.*

■ ABOVE RIGHT *Busted for good taste? Harley catches Harley.*



■ LEFT *An Era serving with Volusia County Police, one of several forces in the Daytona Beach area.*



■ LEFT *Since the first police Harley of 1908 there have been literally thousands, most of which have travelled further than this.*

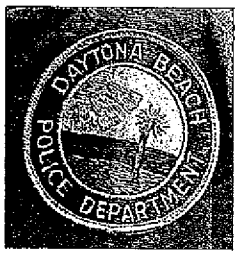
dozen motorcycles equipped with William Harley's design for a sidecar gun carriage duly arrived at the border – more than 1,000 miles (1,610km) distant – two days later. Nine days later still, a second order for six machines reached Milwaukee. This one was filled in just 33 hours. Needless to say, the factory was not slow to advertise its efficiency in meeting "Uncle Sam's Choice".

Harley was just as quick to recognize the contribution it might make to the war in Europe. Within four months of the United States' entry into the war, Arthur Davidson was telling a sales meeting where the country's – and perhaps the company's – destiny lay:

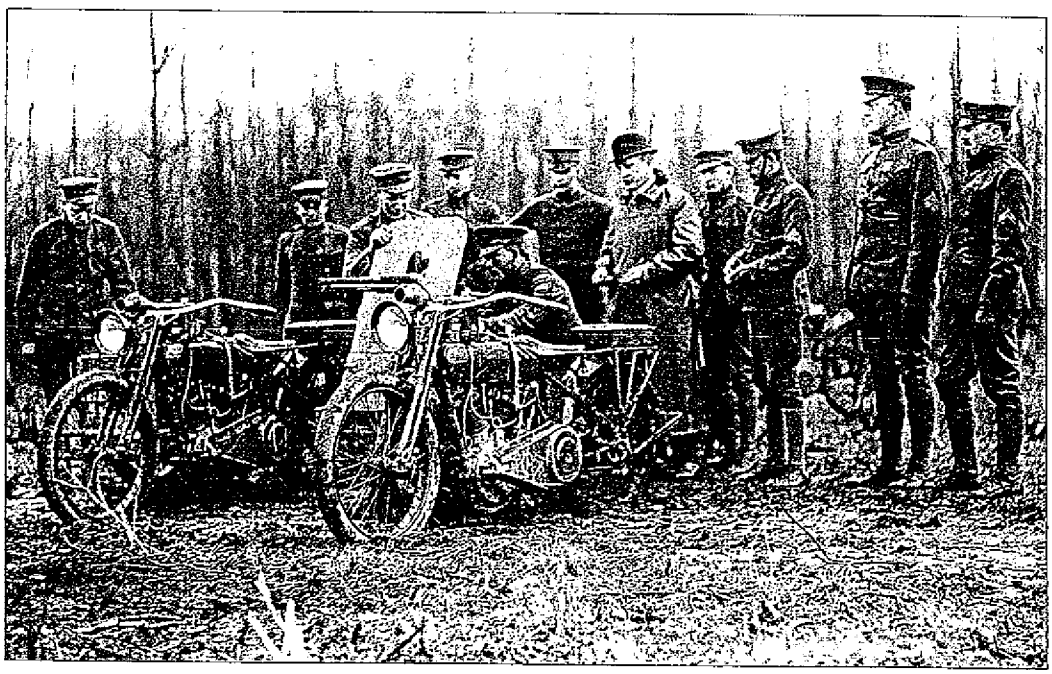
"The time is coming when no man can be in the middle of the road. He must be either for America or against America, and the sooner we get together on this question, the better able we will be to win the war."

During the first year of America's war, roughly half of all motorcycle production went to military service. By the end of the conflict, every motorcycle Milwaukee made was built for Uncle Sam. Along the way, William Harley, a member of the Motorcycle War Service Board, was instrumental in giving motorcycles a "B-4" classification, which gave them essential production status with priority for raw materials. Some 312 Harley-Davidson employees also enlisted, of whom all but three survived the experience.

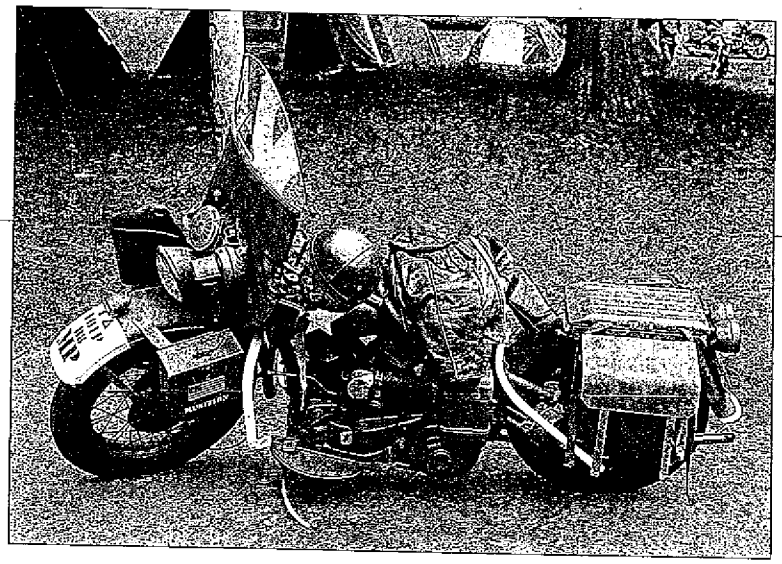
As to hardware, in all some 20,000 motorcycles became American "conscripts" in the First World War, the vast majority of which were Harley-Davidsons. This success finally



■ ABOVE *Daytona: Sun, sea and Harleys.*



■ RIGHT *William Harley oversees the testing of specially equipped Harley twins during the early years of the First World War.*



leap-frogged Harley ahead of its main rival, Indian, a position it was never to relinquish. Military Harleys were mainly 61-inch (989cc) twins of conventional F-head design, producing almost nine horsepower. They were employed mainly for dispatch and scout duty. One became a cause célèbre.

Its rider was Corporal Roy Holtz of Chippewa Falls, Wisconsin, little more than 200 miles (320 km) from downtown Milwaukee. On 8 November 1918, with the German army in chaotic retreat, Holtz was assigned to take his company captain on a reconnaissance mission. At night and in foul weather, the captain became disorientated and, over Holtz's objections, directed him across enemy lines where the duo eventually stumbled across a German field headquarters at which Holtz was instructed to ask directions. They were taken prisoner but released with the Armistice three days later. Holtz – and his Harley V-twin – thus became the first American serviceman on German soil.

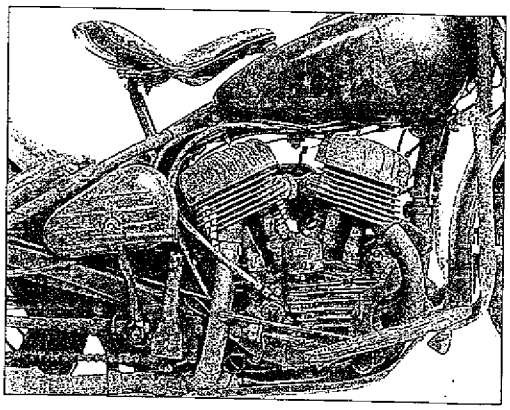
■ ABOVE *A Second World War WLA45 assigned to the US military police.*

■ THE SECOND WORLD WAR

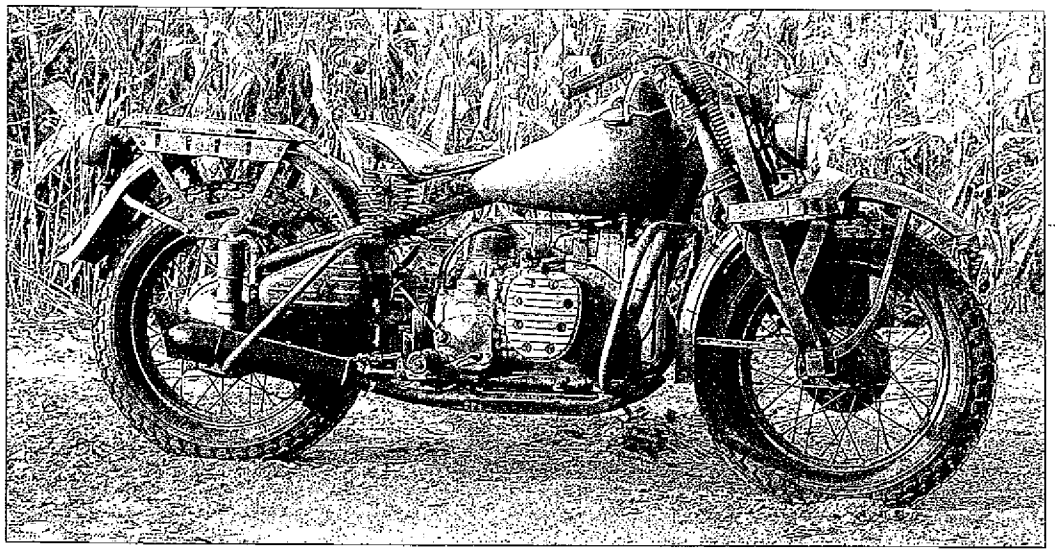
No sooner had Harley sales begun to recover from the Depression of the 1930s than Pearl Harbor was bombed and the United States entered the Second World War. Milwaukee had begun planning in anticipation of military needs as early as the autumn of 1939, shortly after the outbreak of war in Europe. Early work, in competition with Indian and Delco, focused on a flat twin Servi-Car to meet army proposals for a three-wheeler for rough terrain. Other unfinished projects were even stranger, including an armoured machine-gun carrier and a prototype powerplant for a small tank comprising paired overhead valve engines.

With civilian motorcycle production suspended, by far the bulk of Harley-Davidson's war effort was the production of military versions of the WL side-valve V-twins, the WLA. The equivalent 74-inch (1,207cc) military UA and USA (sidecar) models were built in much smaller numbers. Of almost 90,000 military Harley-Davidsons, around 88,000 were 45-inch WLAs, of which one third served with Soviet forces. The same attributes of rugged simplicity that had brought the side-valve twin such a dependable peacetime reputation made it ideally suited to the harsher demands of war.

With very few Knuckleheads "enlisting" (although a special ELC model was built for the Canadian army), Milwaukee's other major contribution was the oddball Model XA, powered by a horizontally-opposed flathead twin displacing 45cu in (739cc). The XA was



■ RIGHT *A particularly war-torn WLA, but they were remarkably sturdy machines.*



■ RIGHT *The horizontally-opposed XA twin looked more like a German BMW or Zundapp, but served in small numbers during the Second World War.*

expressly designed for use in the North African desert, with its shaft final drive and plunger rear suspension. There was also an XS variant, with sidecar. Less well known was a mission for American intelligence, the stripping and assessment of a Russian motorcycle.

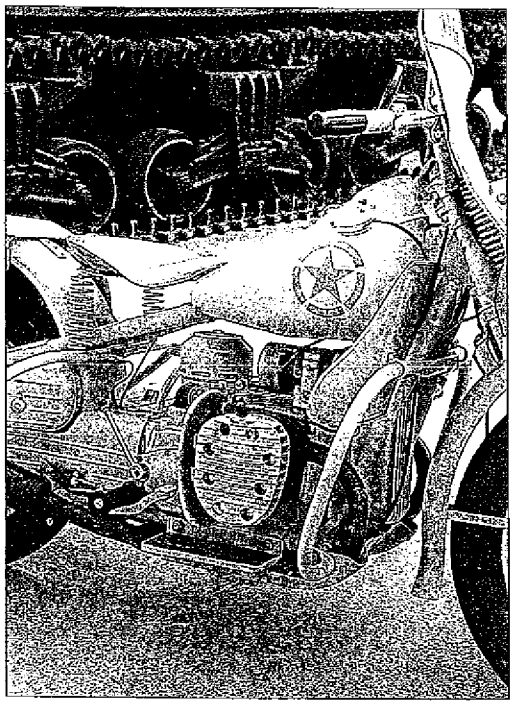
Harley-Davidson's contribution was not confined to hardware. John E. Harley, later in charge of the parts and accessories division, rose to the rank of major in the Second World War. Among his various tasks, and one to which he was eminently suited, was the training of army motorcyclists at Fort Knox, Kentucky. WLAs in the hands of raw recruits must have tested Harley's talents to the limit. Even setting off on such a machine was a knack, thanks to its hand gear-change and foot-operated "suicide" clutch.

From late 1941 until the armistice in 1945, Juneau Avenue burned the midnight oil to meet the escalating demands of the forces as almost the whole of American industry was turned over to the war effort. Fittingly, Harley-Davidson's special contribution was recognized by the award of three coveted Army-Navy "E" awards for excellence in wartime production. Milwaukee's factory workers couldn't necessarily go to war with the enemy but they could certainly help those who did.

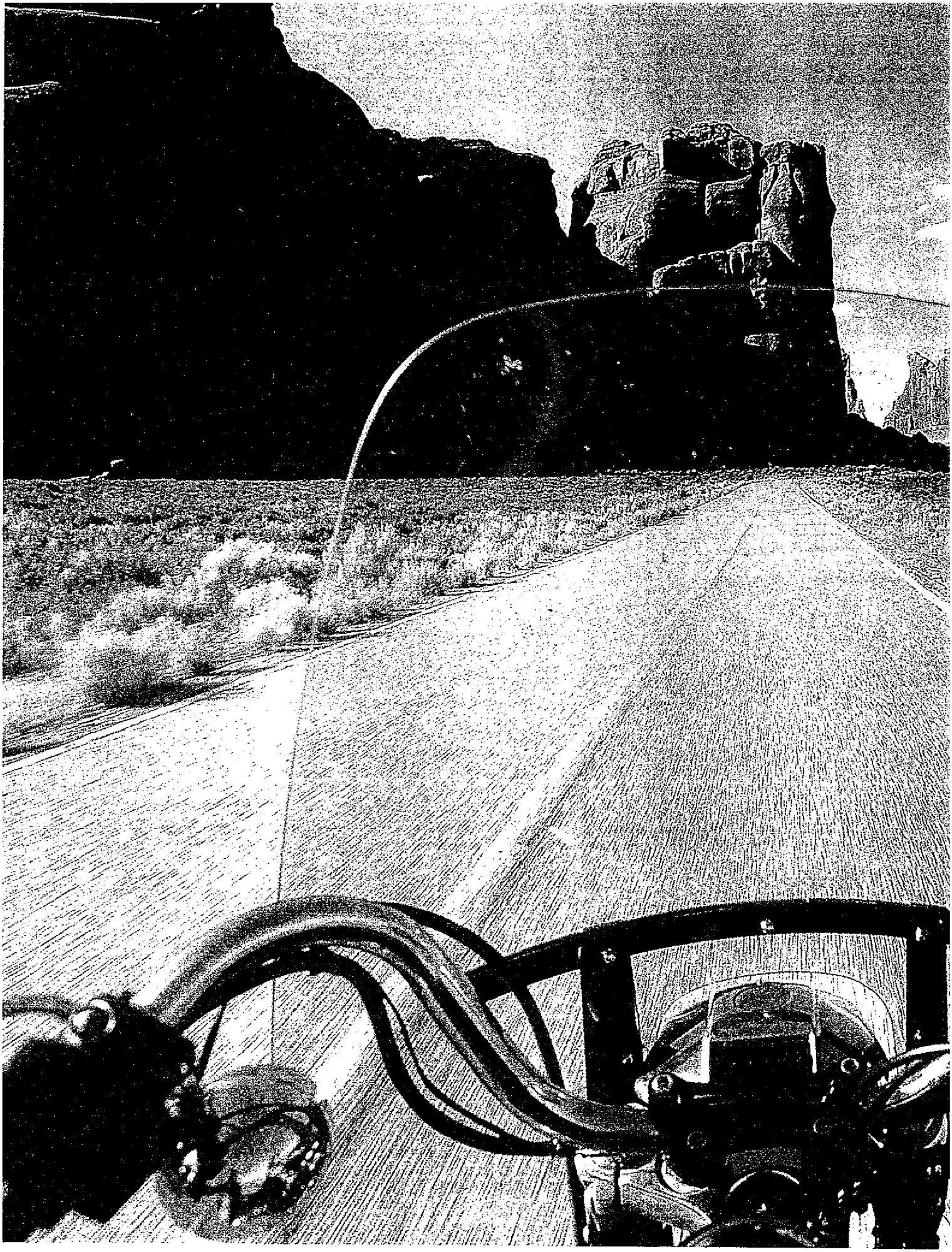
Some might believe Harley's military career ended with the Second World War but there are two surprising post-scripts.

The first was the 1987 purchase of the rights to the military-MT500 motorcycle from the British Armstrong company.

The second was a legacy of the AMF takeover: one "sideline" at the former AMF plant in York, Pennsylvania – where Harleys are still assembled – was the manufacture of bomb casings, a practice which continued well into the 1990s. It is likely that some of these found their way into the Gulf War.

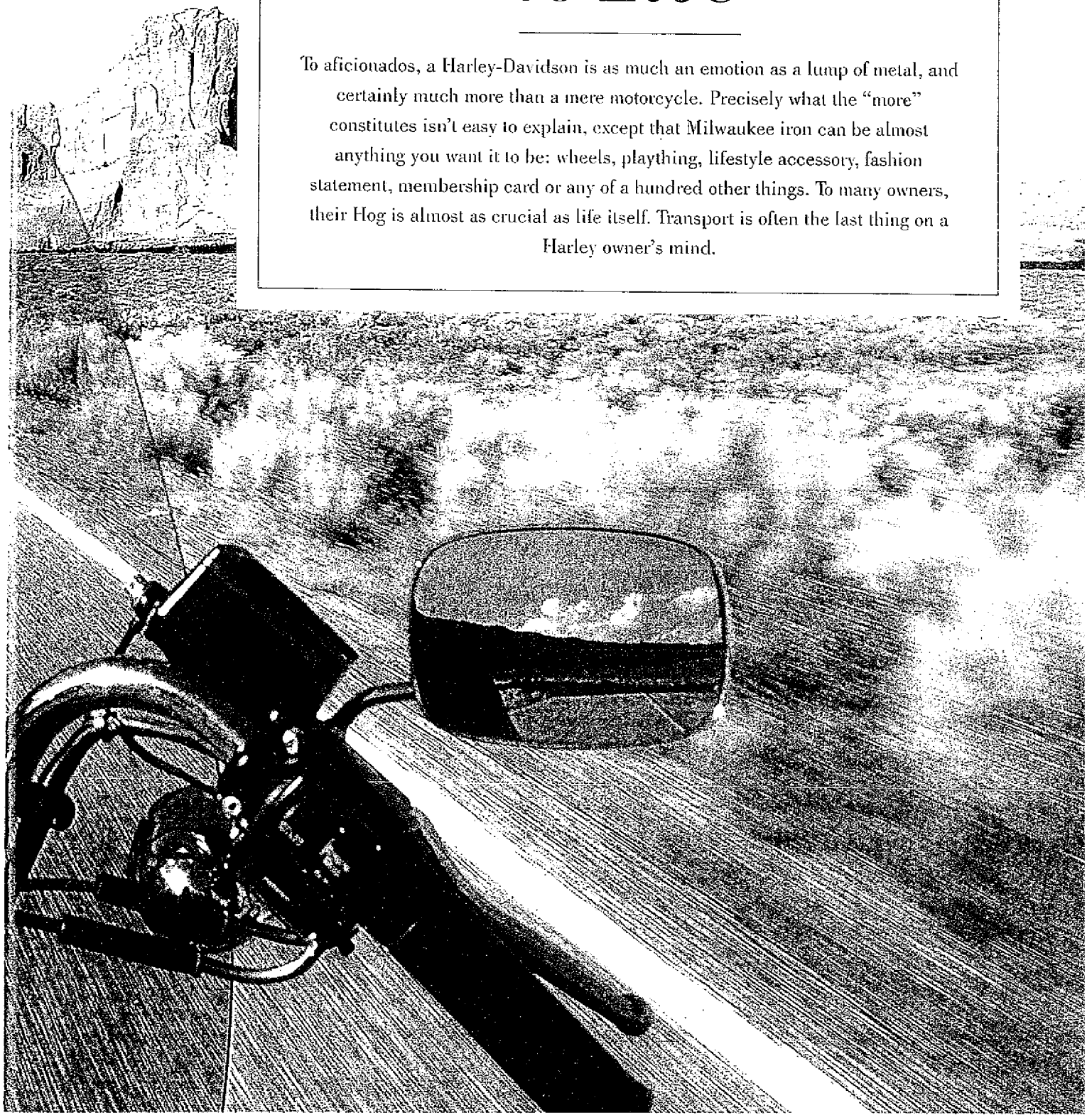


■ RIGHT *Although intended primarily for service in the North African desert – hence this colour scheme – the XA suffered badly from all the sand which would collect in its wheel bearings.*

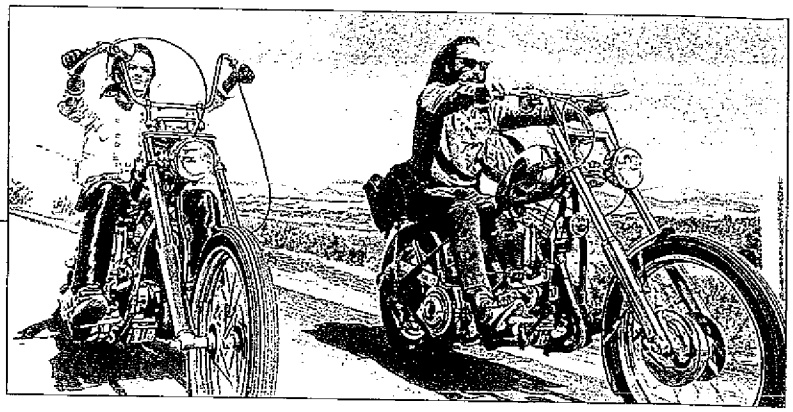


Live to Ride... Ride to Live

To aficionados, a Harley-Davidson is as much an emotion as a lump of metal, and certainly much more than a mere motorcycle. Precisely what the "more" constitutes isn't easy to explain, except that Milwaukee iron can be almost anything you want it to be: wheels, plaything, lifestyle accessory, fashion statement, membership card or any of a hundred other things. To many owners, their Hog is almost as crucial as life itself. Transport is often the last thing on a Harley owner's mind.



STYLE



The image forged from steel in the American Midwest travels across frontiers and media. It's as instantly recognizable in Bangkok as it is in Brooklyn, as rich with associations in Clackmannanshire as it is in Cincinnati. Advertisers know this and use it as shorthand for youth, freedom, rebellion and freewheeling affluence. It is almost impossible to watch a commercial for anything from cars and pensions to jeans and toiletries without a Harley-Davidson cropping up sooner or later in a mood-setting role. In other words, Harleys may be motorcycles – but they're also stars.

Some of this rubs off on the people who ride them. Owning a Harley isn't about speed or performance, or about imitating your favourite racer or impressing friends. It's about individuality but also brotherhood, retro-cool and happening places, latter-day cowboys or folk who just want to get away from it all.

When they move, Harley-Davidsons cruise. To the ear, they also thunder rather than rev.

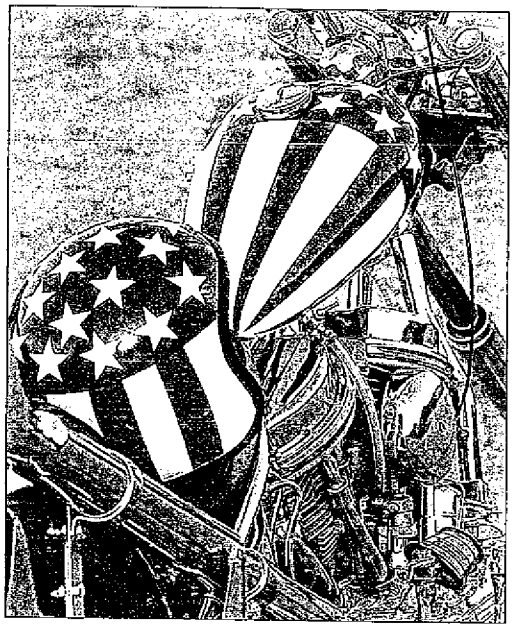
■ ABOVE *Poster of Peter Fonda and Dennis Hopper cruising to New Orleans in* Easy Rider.

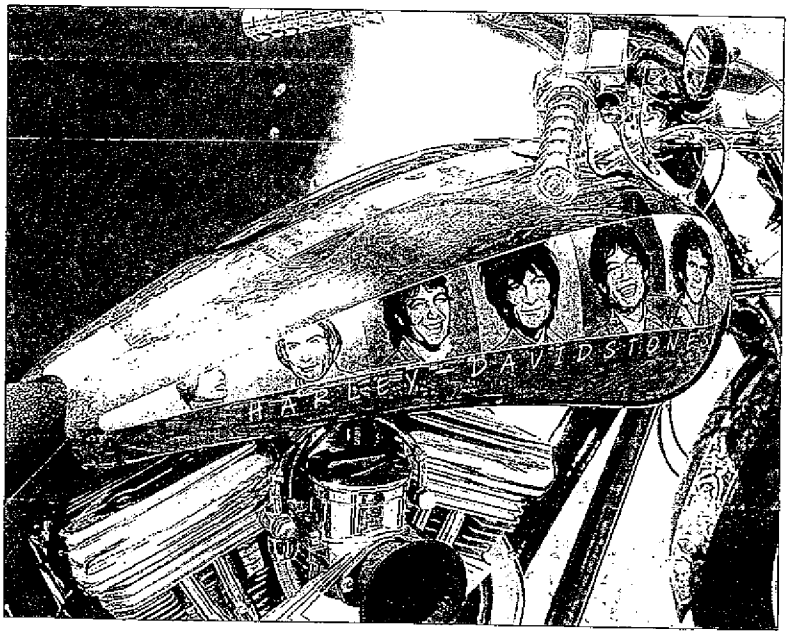
■ LEFT *Christian Slater and Harley in* Heathers.

You can cruise around the block, along the beach or down to the bar: equally you can cruise from New York to San Francisco if that's your thing. They work equally well on the long-haul because of where they evolved – in a land of empty spaces and almost no corners at all.

■ BELOW LEFT *"Captain America" and helmet, as ridden by Peter Fonda.*

■ BELOW *"Harley-Davidstones" – one Stones fan wears his heart on his Harley.*





■ LEFT *Mickey Rourke cuts loose on a Harley in* The Marlboro Man.

■ ABOVE *You will find Hogs everywhere!*

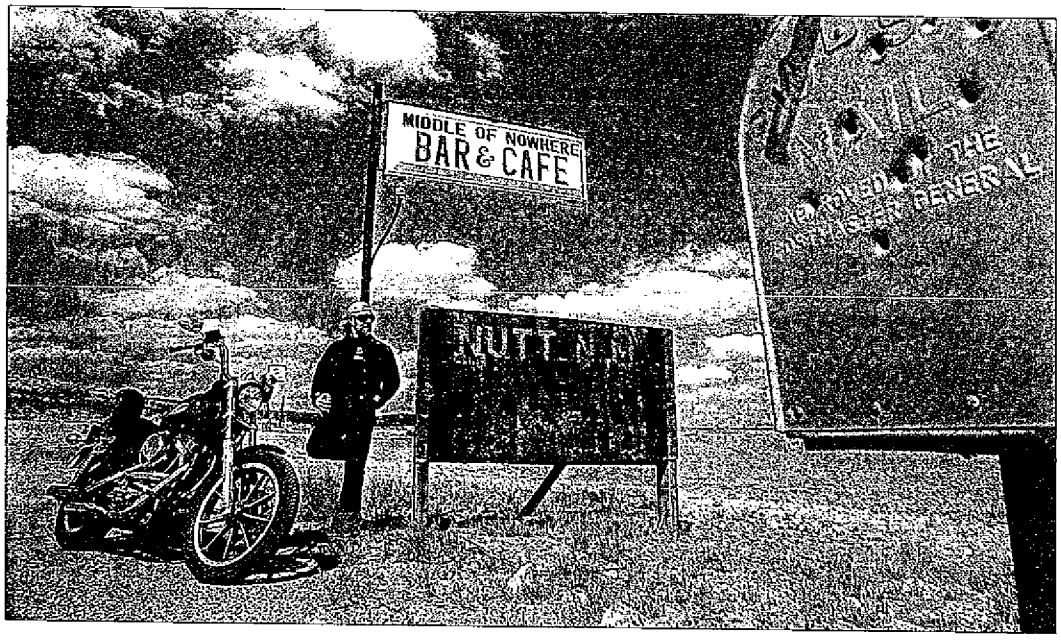
■ BEAUTIFUL PEOPLE

"God rides a Harley", according to some. The King certainly rode one. As well as Elvis Presley, celebrity hoggers have included Muhammad Ali, Bob Dylan, Clint Eastwood, Sly Stallone, Mickey Rourke, Dan Ackroyd, Malcolm Forbes, Cher, Whoopie Goldberg and dozens more. You're as likely to see a film star in Hollywood riding a Harley-Davidson today as lounging in a stretch limousine. Often, the stars want something out of the ordinary. Custom builders can easily charge $40,000 for bespoke machines and, in the process, become minor celebrities themselves.

The phenomenon is far from new, especially in Tinseltown. Photographs from Hollywood's golden years show everyone from *Gone with the Wind*'s Clark Gable to Marlene Dietrich astride Milwaukee machines. In some cases, the pictures were pure publicity stunts, but even Roy Rogers rode a Harley when he wasn't riding Trigger. Hollywood even had its own Harley group once – the Three Point Motorcycle Club.

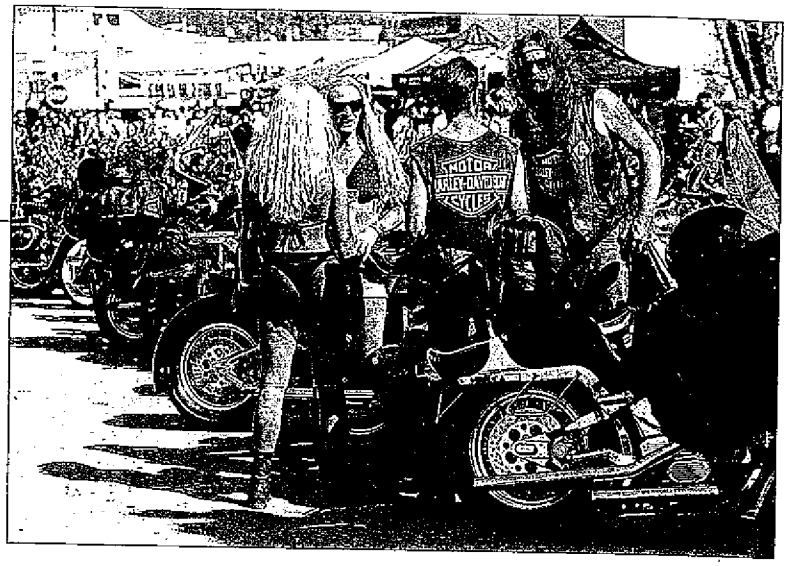
Harleys themselves have become film stars, notably Robert Blake's mount in *Electra Glide in Blue* and, of course, in the hugely successful *Easy Rider* starring Dennis Hopper. Hopper's co-star in the film, Peter Fonda, remains a committed Harley-Davidson fan to this day.

■ ABOVE *"Made in the USA" – and long before Springsteen sang it.*



■ RIGHT *Nothing else out there: just you, your Harley and the open road.*

RALLIES: STURGIS



Sturgis is an unremarkable little farming community in South Dakota. For most of the year very little happens until, in mid-August, this sleepy little hamlet goes motorcycle crazy as the famous Sturgis Rally lets rip.

The monster that Sturgis has become was born way back in 1938 when the Jackpine Gypsies Motorcycle Club organized the first Black Hills Rally and Races, with a $300 purse to the winner. Almost every year since, bikers by the thousand have cruised in along Interstates 85 and 90 to renew old friendships or make new ones. Being conveniently located in middle America – if 900 miles (1,450 km) from Chicago and 1,500 miles (2,410 km) from San Francisco can be considered convenient – attendance tends to be huge. Any old Sturgis Rally attracts 50,000 of the faithful. For the 50th anniversary in 1990, somewhere between 250,000 and 300,000 turned up.

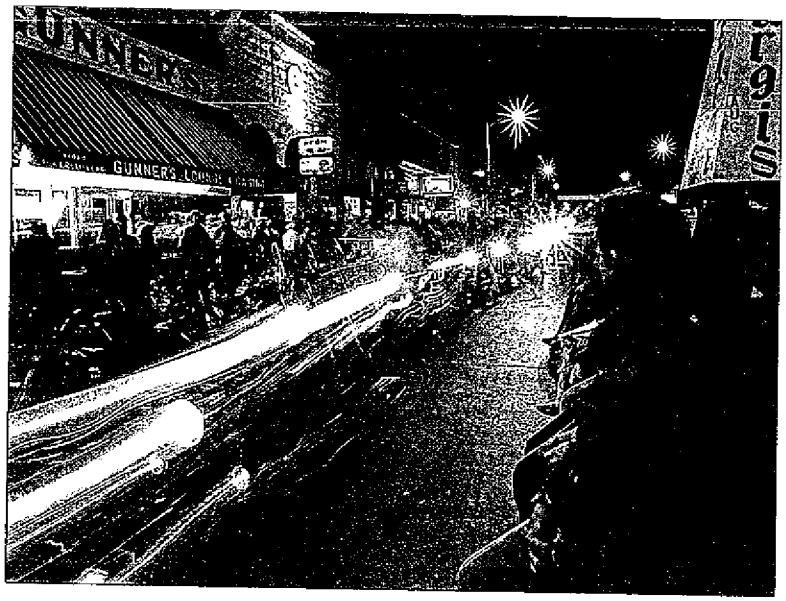
Sturgis is not specifically a Harley rally – not that you'd notice if you were there for all the Harley bikes on site. It lasts for a week – a week of swap meets, hog roasts (pigs, not bikes), drag-bike racing at the Sturgis Dragway, tours, gawking at fancy Harley hardware and generally having a good time. Bikers hang out at joints like the Bear Butte Café. Main Street is air-cleaner to wheel-spindle full of Hogs. If you need a break, there are tours to the nearby Dakota Badlands, Devil's Tower (featured in the movie *Close Encounters of the Third Kind*) or Mount Rushmore.

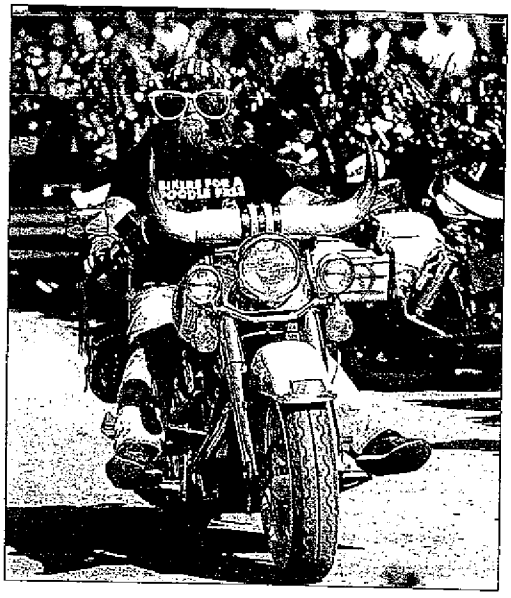
There's strangeness, as well. One year, a guy rode a buffalo into town, moseyed down Main Street and hung a left on to Junction Avenue. Another year, the nearby US Air Force base

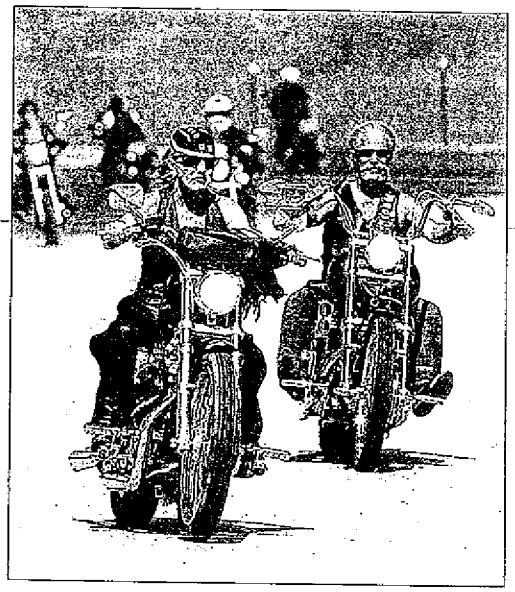
■ ABOVE *At Sturgis, you don't necessarily need a lot of clothes, but they have to be the right ones.*

■ BELOW LEFT *Usually the action lasts right through the night.*

■ BELOW RIGHT *And some people say all Harley owners are alike.*







■ RIGHT *Ladies are welcome, too.*

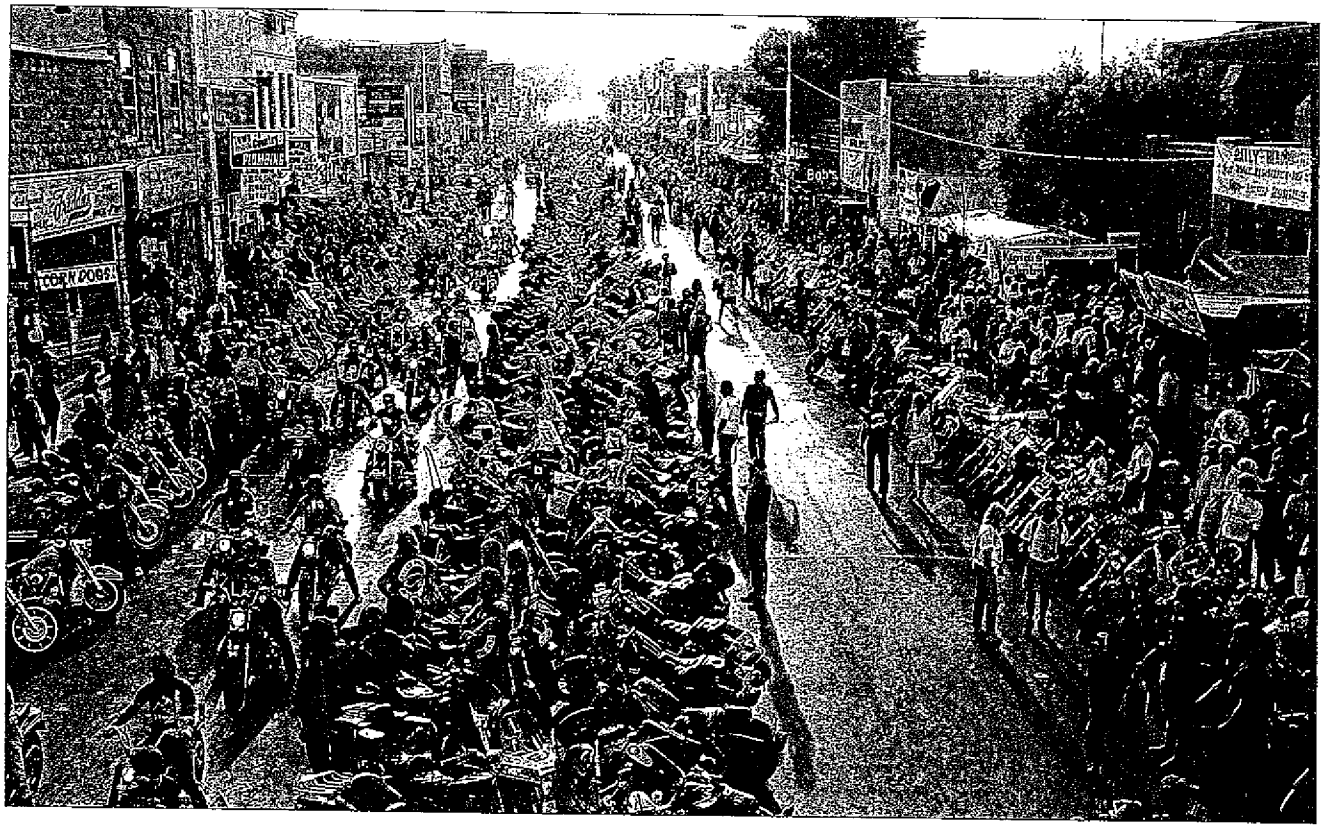
reputedly laid on a rather special kind of fireworks display when a couple of their jets dipped low over town, hit their afterburners and drowned out even the noise of a thousand V-twins.

The whole town joins in (Sturgis is usually quite lucrative, although the town is so outnumbered by bikers it has little choice) from the women of the United Presbyterian to the Grace Lutherans. There have been occasional troubles with biker gangs, notably in 1982, but on the whole Sturgis is comparatively peaceful (if far from tranquil). These gangs are actively encouraged by the Sturgis city fathers, who clearly know a good deal when they see one.

According to Jackpine founder, former Indian dealer J.C. "Pappy" Hoel, there's never been a serious problem with outlaw biker groups: "We have their co-operation as long as we don't hassle them."

Mainly, it's a week-long party. Behaviour has been known to be on the excessive side, but it's usually harmless and only takes place once a year. Besides, it's legendary.

■ BELOW *Main Street in Sturgis, as can be seen, is a car-free zone.*

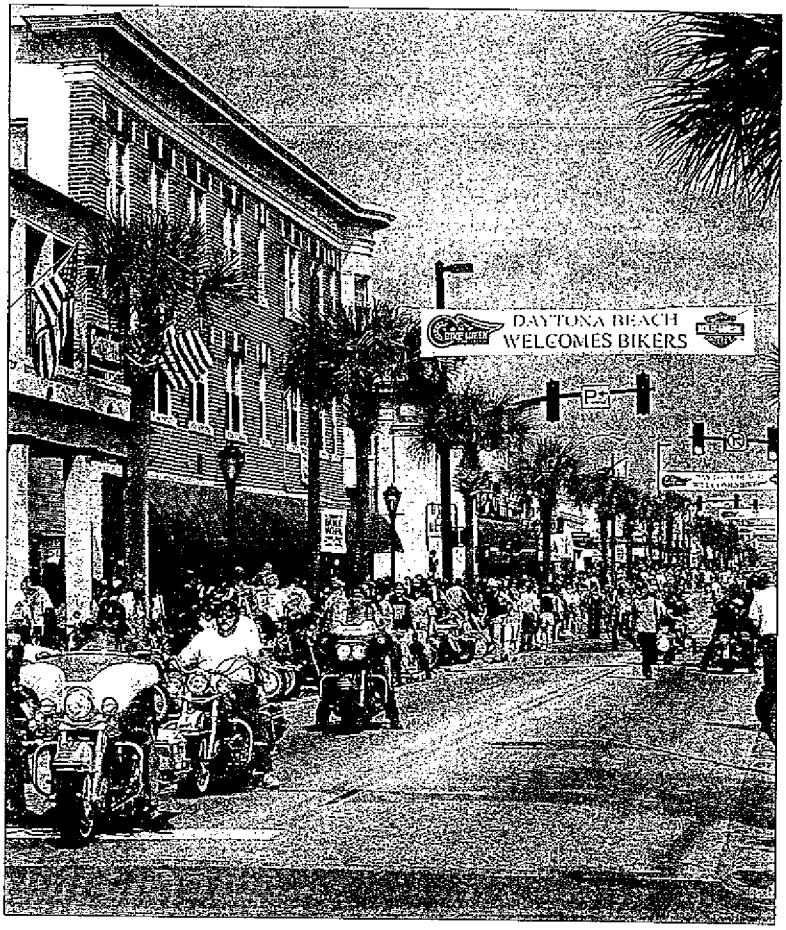


RALLIES: DAYTONA CYCLE WEEK

■ BELOW *Like it says: "Daytona Beach Welcomes Bikers".*

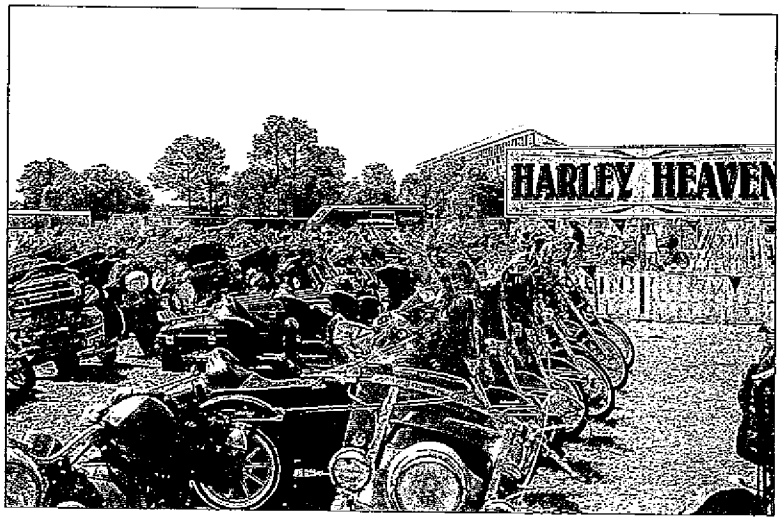
Outside the Rat's Hole custom shop, Main Street reverberates to the rumble of big-bore Vs on open pipes. Heavy-looking bikers in wraparound shades stand beergut-to-beergut, shoulder-to-tattooed-shoulder on every inch of sidewalk. It's March and almost 200,000 bikers have Daytona Beach under siege.

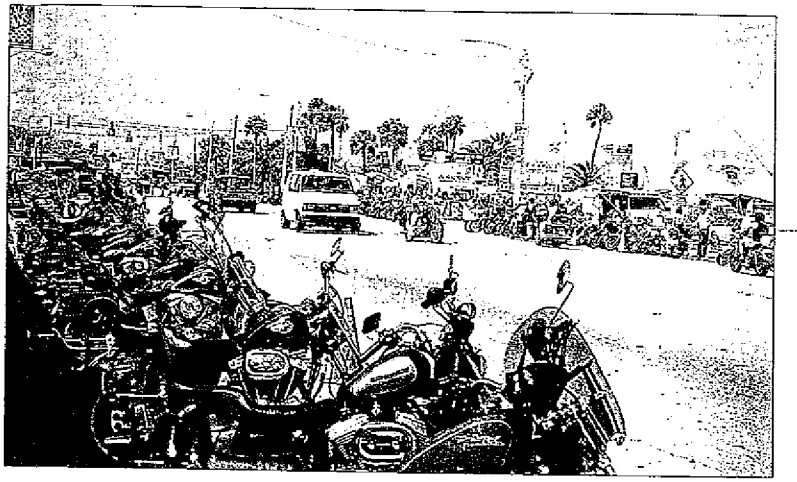
Like Sturgis, this is a week-long party. For the most part, the siege is friendly. As the barmaid at La Playa Hotel put it, "Bike Week's the best because they're all really nice. You don't see manners like this any other time. Wannanother beer?"

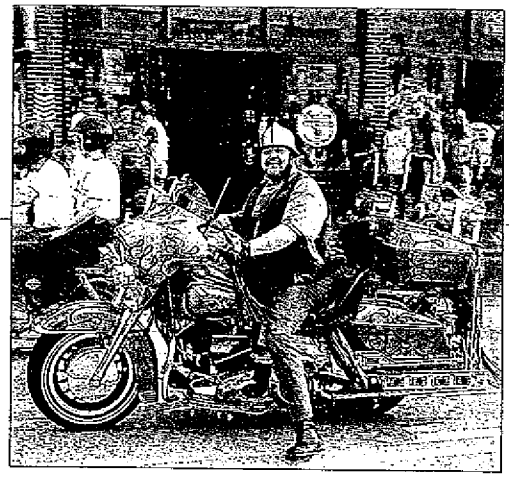


■ BADASS BIKERS?

Like Sturgis, Daytona's Cycle Week is one of those mammoth events that didn't begin as a celebration of all that is Harley-Davidson but somehow became one. Cycle Week takes place each year during March's Spring Break in the Florida coastal city of Daytona Beach. Its focal point is ostensibly the races at nearby Daytona International Speedway, a spectacular banked oval which also hosts the famous Daytona Nascar races.







■ ABOVE LEFT *At Daytona you can cruise or watch others cruising...*

■ ABOVE RIGHT *...or you can just chill and chew the fat.*

It's yet another of those Harley enigmas that, as the factory's twins' interest in the races has declined, its profile in Cycle Week as a whole has risen dramatically. Milwaukee's official XR750 road racer last competed there in 1973 (although the VR1000 has competed in recent years) and hasn't had a win since Cal Rayborn's in 1969, but this hasn't spoiled the party one bit. Quite the reverse – not having to ride the few miles out to the Speedway seems to leave more time for downtown fun. Daytona has become pure festival.

Sturgis, a small town, is understandably overwhelmed by bikes. Daytona Beach is big, yet the effect is much the same. The scene centres on the junction of Atlantic and Main Street, where bikes and bodies are crammed sidewalk to sidewalk. Harley-Davidson – wise to the public relations coup Daytona has handed them – takes over the city's Hilton Hotel to strut its corporate stuff and show the latest models. However most Daytona life goes on in the street, in the bars, on the beach and in nearby campgrounds.

Cycle Week has custom shows and impromptu drag races. During the day, bikes cruise along Daytona's beaches. There's official racing at the local quarter-mile dirt track and the main event at the International Speedway. There are swap meets in which enthusiasts sell or search for bike parts, notably at the Volusia County Fairgrounds.

Mainly it's lots of partyin', posin' and cruisin', and if you can't wait 12 months for your next Daytona fix, you can show up at the HOG "Biketoberfest" in October.

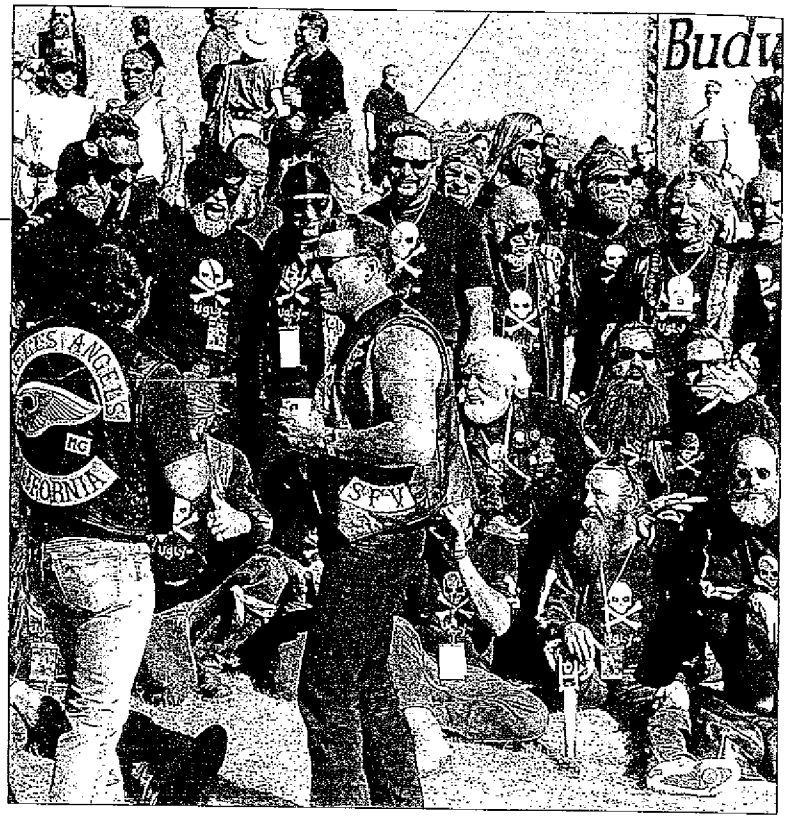
■ OPPOSITE BELOW LEFT *Spot the Honda.*

■ OPPOSITE BELOW RIGHT *If you can find a standard bike, you can keep it.*

■ RIGHT *If you can't paint your Hog, paint your clothes...*

■ FAR RIGHT *...if there's anything left to paint, that is.*

BAD BOYS



Mention Harley-Davidson to anyone in the street and they'll probably mutter back something about "Hell's Angels". The original Angels were a California bike gang of Second World War veterans sensationalized by magazines such as Life and author Hunter S. Thompson in his book *The Hell's Angels: A Strange and Terrible Saga of the Outlaw Motor Cycle Gangs*. Almost overnight, the Angels became a role model for "outlaw" groups across the globe.

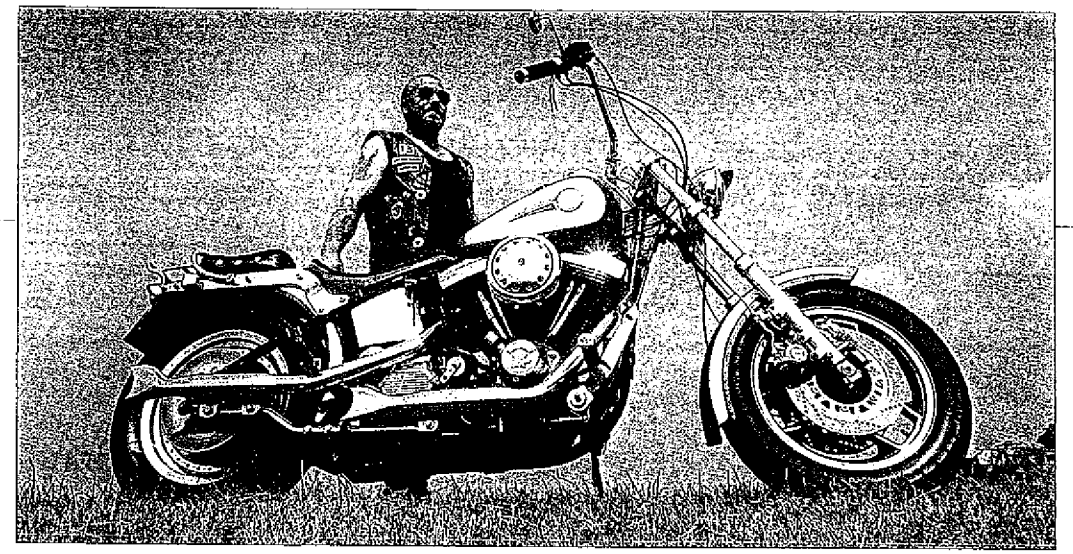
According to many observers, such groups revelled in their new-found celebrity status and, in living up to their reputation, became even more shocking and antisocial than before. Inevitably, bikers in general and Harley-Davidson riders in particular were tarred with the same unsavoury brush. Some stereotypes persist, but the bad old days of negative biker images have largely passed. In the United States, Harley owners have been growing older, wealthier and better educated. In 1984, the average age of a Harley buyer was 34; today it is almost 40, around one third of whom enjoyed a college education. Indeed, the modern stereotype is more of the well-off professional cruising any city's more fashionable streets rather than the grime-ridden outlaw of the past.

■ ABOVE *The original Hell's Angels were a group of Californian war veterans. Note Willie G., standing, facing the camera, third from the left.*

These days Harleys are the weekend wheels of lawyers, mayors and bankers: respectability, with an edge. This is all in motorcycle manufacturers' interests, for minority groups,

■ FAR LEFT *Imitators of the original Angels have since evolved as far apart as New Zealand...*

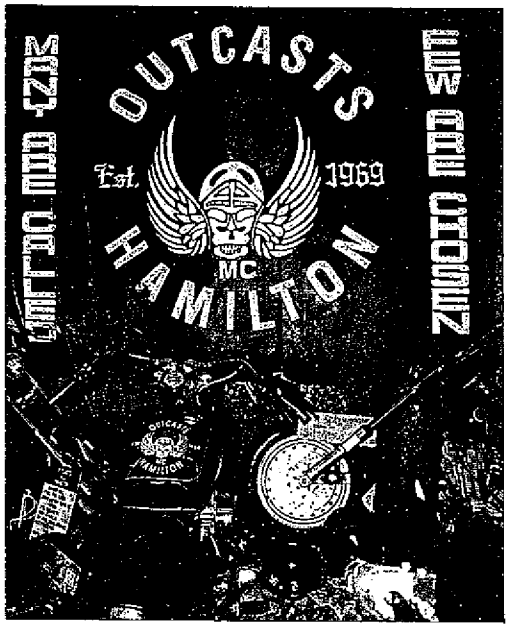
■ LEFT *...and Germany.*



■ RIGHT *Although "Hell's Angels" has become a cliche, Satan's Slaves is another well-known group of affiliated biker gangs.*

apart from tarring the rest, inevitably buy in minority numbers. One of the secondary purposes of HOG – the factory-sponsored Harley Owners' Group – was to broaden both the marque's appeal and its respectability, a service from which all bike producers benefit.

Hell's Angels and other so-called "outlaw" groups survive, and occasionally their activities hit the headlines. Perhaps the most notorious was a wave of knifings, bombings and shootings between rival Canadian gangs in the early 1990s, which left around 40 dead yet only attracted serious police attention when an innocent bystander became a victim. In the late 1970s, Australia was the scene of a shoot-out in a supermarket parking lot between rival gangs. More recently, Denmark witnessed a spate of murders and even anti-tank missile attacks arising from a long-standing feud between the Angels and Bandidos for control of drugs interests. Crime – particularly the sale of stolen goods – and later the manufacture and dealing of hard drugs has long been a source of income for some outlaw bands which, in Europe in particular, are also associated with neo-Nazi activities. Even the FBI has shown an



■ RIGHT *"Many are called... few are chosen" and even fewer care.*

■ FAR RIGHT *Sometimes known as "One Per Centers", although this veteran Angel begs to differ.*

A DAY OF INFAMY

One of the most notorious episodes in American motorcycling history concerned the so-called Hollister riots of 1947. Events unfolded around the first Hollister Memorial Day races to be held since the Second World War, a focal point for recently demobbed biking GIs. As with the Isle of Man Tourist Trophy ("TT") today, the races were welcomed by residents of the little Californian town for the business and prosperity they brought.

Thousands arrived for the races, including bike clubs such as the "Booze Fighters" from Los Angeles and San Francisco. Main Street was crowded "like sardines" and undoubtedly rowdy. The press loved it: "Riots... Cyclists Take Over Town" and "Havoc in Hollister" cried the *San Francisco Chronicle*. Other papers and magazines quickly jumped on to exploit the bandwagon. Six years later, the "riots" would be commemorated on celluloid in the film *The Wild One*, starring Marlon Brando and Lee Marvin. In the film, Johnny – angrily and effectively played by Brando – is asked what it is he's rebelling against. "Whaddya got?" he replies, one of Hollywood's most memorable lines. Although Harley-Davidsons feature heavily in the film, Brando is actually portrayed riding a Triumph. Nonetheless, the American Motorcycle Association saw fit to picket the movie on its release.

It was one thing for the movie to portray fiction, quite another for the contemporary press to do the same. For the truth was that the Hollister riots were largely fabricated. Some people were arrested for drunkenness but this was certainly nothing resembling a riot. As local hotelier Catherine Dabo later recalled to journalist Mark Gardiner, "I didn't even know anything had happened until I read the San Francisco papers."

Other Hollister residents were equally baffled: "It was a mess but there was no real evidence of physical damage," said Harry Hill, of the American Air Force.

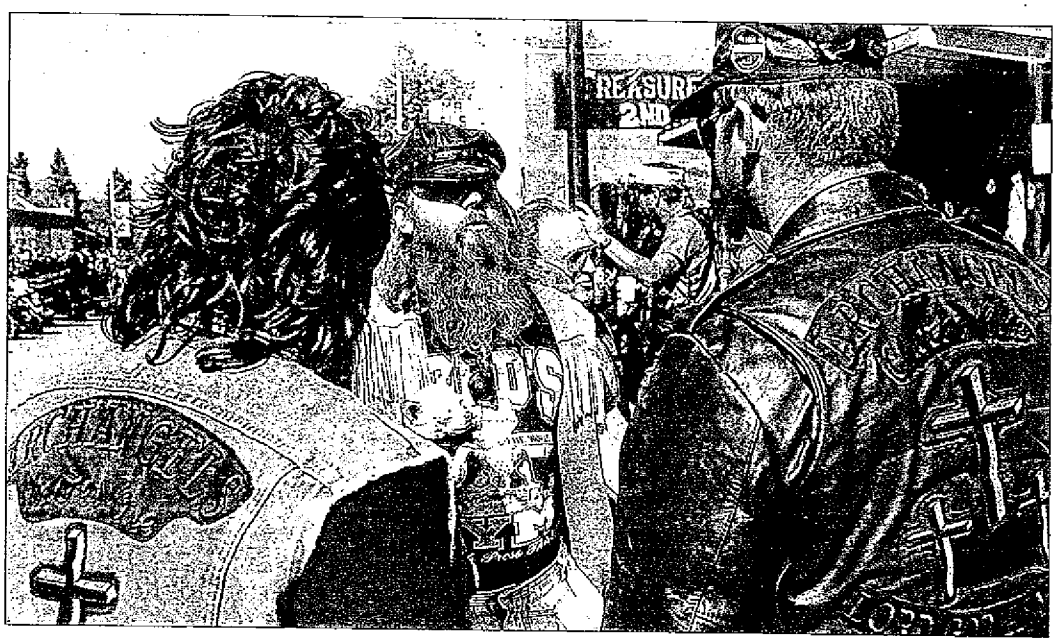
"I brought my two daughters along... it never occurred to me to be worried about their safety," remembered local pharmacist Marylou Williams.

Finally and perhaps more to the point was the observation made by car mechanic Bert Lanning: "Some people don't like motorcycles, I guess."

According to one witness, cinema projectionist Gus Deserpa, a famous *Life* magazine photograph of a drunken biker sitting on his Harley surrounded by bottles, was faked. The drunk was real but it wasn't even his bike and the bottles had been gathered expressly to "improve" the picture.

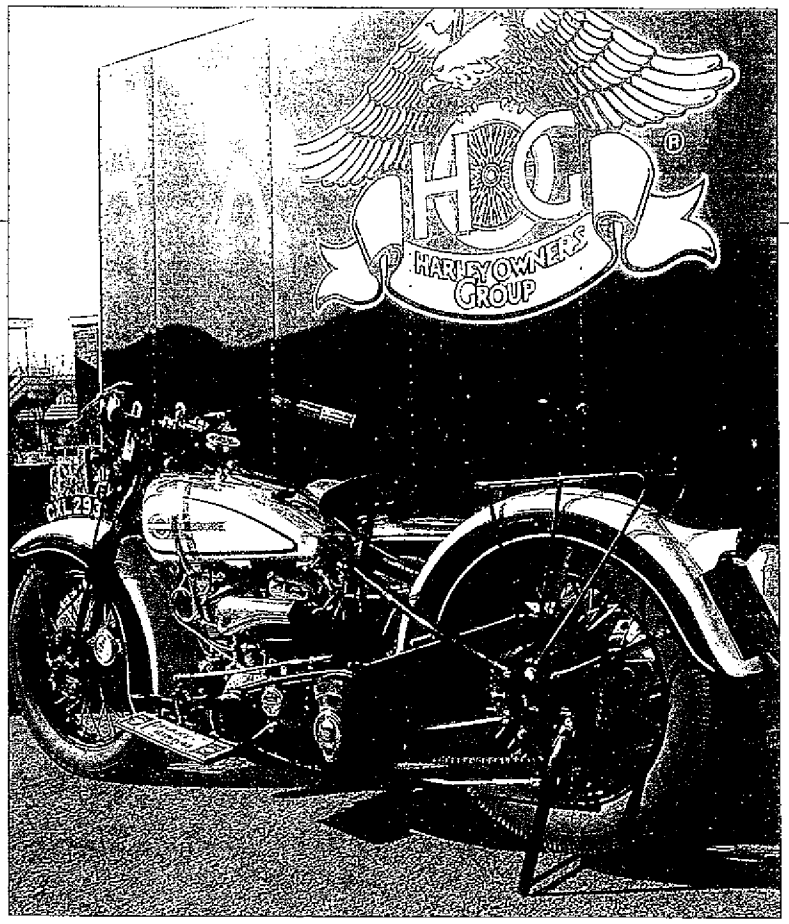
Yes, Hollister was a weekend of infamy: for the media.

avid interest in them and certainly not because the G-men have an innate love of motorcycling. These self-styled "One Percenters" mostly exist on the fringes of Harley-Davidson culture and of motorcycling in general. Ironically, much of HOG's paraphernalia – its insignia, colours and organisation into "chapters" – echoes the ways of the outlaw gangs. Beards, badges and leather are part of many everyday Harley riders' uniforms but the trappings don't always say much about the person underneath. Sometimes the individual in the street must be hard-pressed to tell the difference. Perhaps Milwaukee likes it that way.



■ LEFT *These guys are probably discussing needlework.*

HARLEY AND ITS PUBLIC



■ ABOVE *Years of effort and imagination have made HOG the envy of other manufacturers.*

■ BELOW *You need long sleeves to be a lifetime HOG devotee.*

Harley-Davidson has a long and imaginative tradition of embracing the interests of its customers. As early as 1916, Juneau Avenue was producing its own magazine, *The Enthusiast*, to encourage pride of ownership and fellowship among Harley owners – and to do no harm to sales. Within three years, sales of the nickel magazine had reached 50,000. A trade equivalent, *Dealer News*, began in 1912 and a Spanish-language manual and catalogue, *Los Entusiastas Latinos*, appeared briefly the following year. *The Enthusiast* carried tales of racing, travels and other daring Harley deeds.

In the dark days of the 1930s Depression, the Harley "medal system" was born in which bonuses were offered to owners generating a motorcycle sale. January 1951 brought the Harley-Davidson Mileage Club which offered recognition for riding achievements. Harley riders could earn a pin badge and membership card for clocking up 25,000, 50,000 and 100,000 miles. By the end of 1954, no fewer than 73 Mileage Club members had logged 100,000 miles (160,930 kilometres).

The same concept of customer involvement – and a certain degree of desperation – lay behind the creation of the Harley Owners' Group (HOG). It was founded in 1983 (a year after Carl Wick's less phonetic HDOA – the Harley-Davidson Owners' Association).

Today, HOG is run by its own vice president (Bill, son of Willie G. Davidson). Under the factory's guidance and auspices, many Harley dealerships worldwide now run HOG groups, arranging everything from hog roasts to ride-aways, dances and charity events.

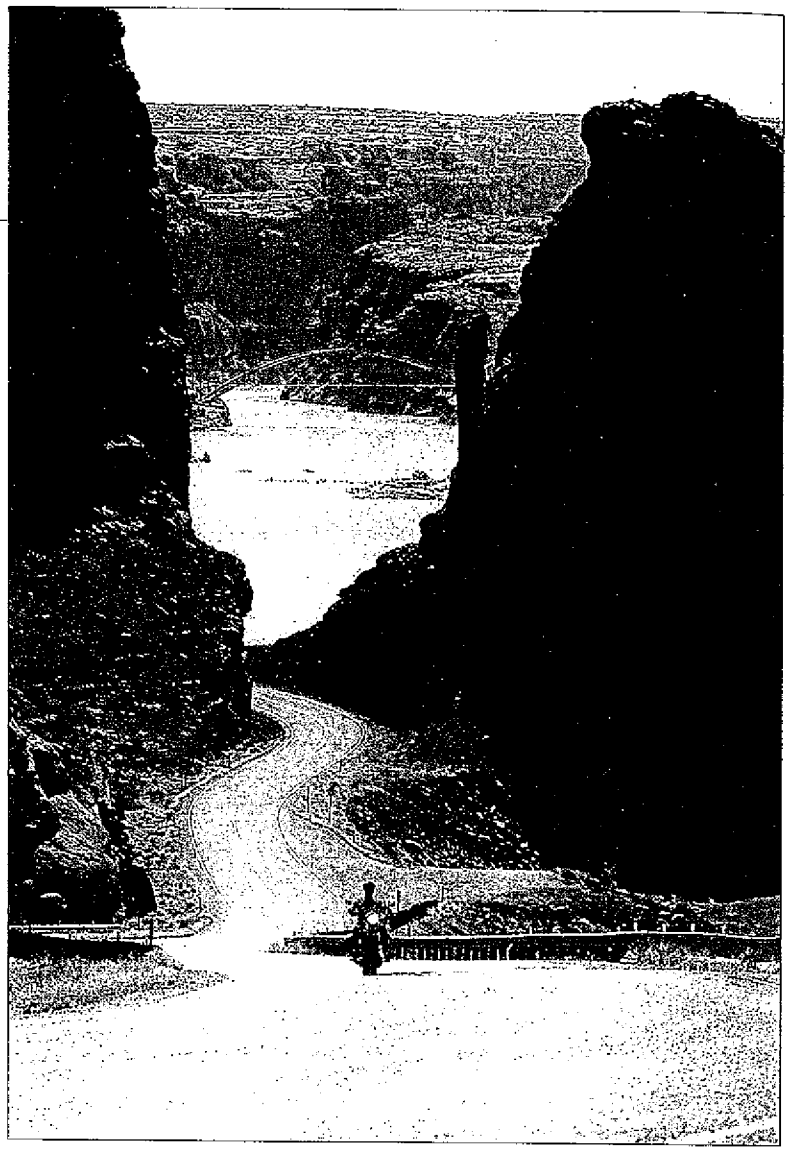
With the creation of HOG it was no longer enough to sell a customer a motorcycle – dealers had to be able to offer the lifestyle to go with it. A shrewd and prescient move, it anticipated the way motorcycling was going before any other manufacturer really took note. HOG now boasts more than 450,000 members in over 1,000 local chapters world-wide and has its own website, www.hog.com. On almost any summer weekend, it offers a choice of half a dozen rallies in the United States – plus others as far flung as Tunis, Darwin or Argentina. Like the motorcycles themselves, it is often imitated but never equalled.

If this portrays the company as only interested in the bottom line, it is also true that many of Harley's employees – at every level – are also committed motorcyclists. Harley-Davidson is fiercely protective of its interests, but also seeks to understand its customers. As the official company policy statement suggests: "It's one thing to have people buy your products. It's another for them to tattoo your name on their bodies." Sentiments such as that have brought Harley-Davidson a very long way.

CRUISING

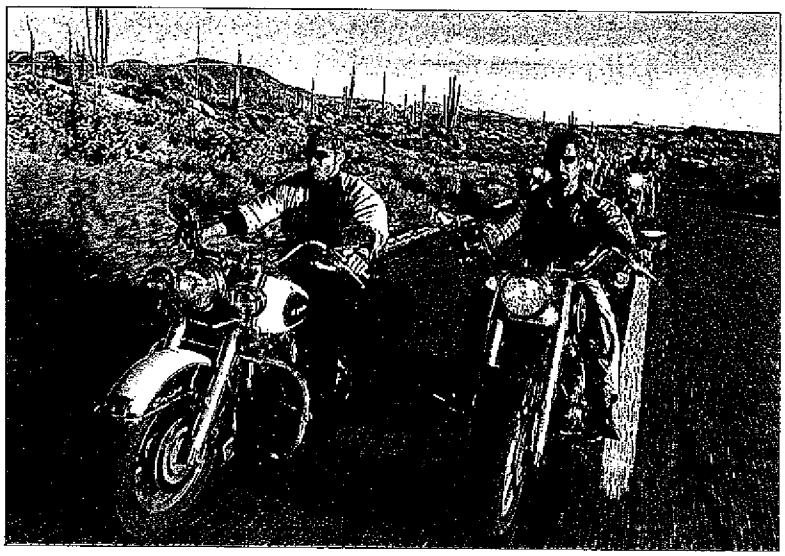
Harley-Davidsons may be sold, cherished and owned in every corner of the globe but there isn't a hogger alive who doesn't fantasize about cruising a Hog across the good ol' US of A. Epic American journeys are the stuff of Milwaukee dreams: thundering across the wide-open Midwest prairies or the baking deserts of Utah and the south-west; soaring over the Rocky Mountains or gliding down California's coast-hugging Highway 1. There is simply nowhere else where Harleys feel so resolutely, resoundingly right.

Harleys suit the United States perfectly because they're part of the cultural landscape you find yourself riding through. In the United States, Harleys open doors, start conversations and bring smiles to passing faces, but best of all is the way they glide over the staggering panoply of scenery that is the American West.



CRUISING

From the saddle of an ElectraGlide or Low Rider, America passes by at a pace your senses can get a hook on; horizons rise in waves, roll

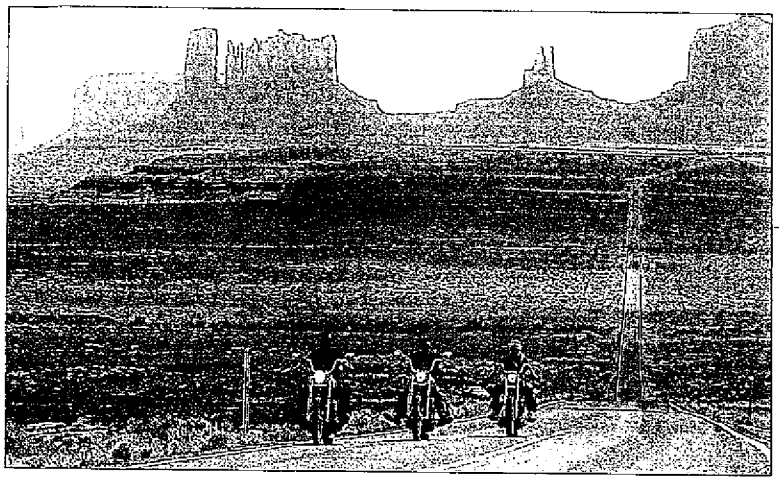


■ ABOVE *The author heading north on Route 95 in Utah, with the Colorado River in the background.*

■ LEFT *Dream come true: a group on a Harley package tour cruises through Baja, Mexico.*

■ OPPOSITE LEFT *What Hogs do best: thundering towards distant horizons in the American south-west.*

■ OPPOSITE RIGHT *A Fat Boy swings through the bends under the towering cliffs of Zion National Park, Utah, USA.*

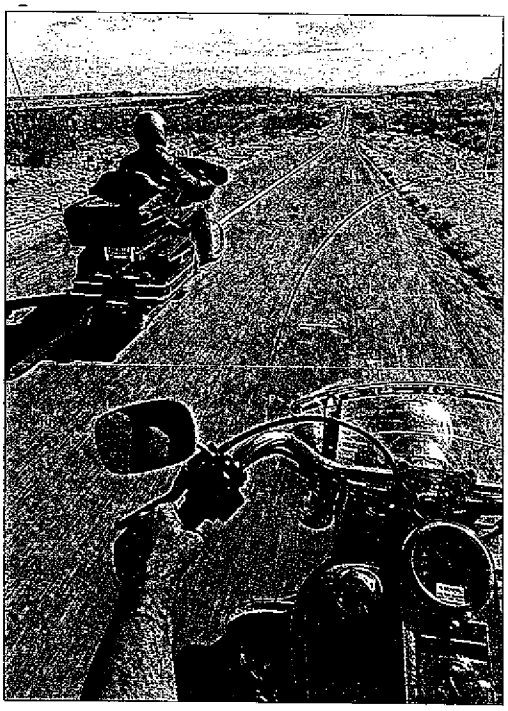


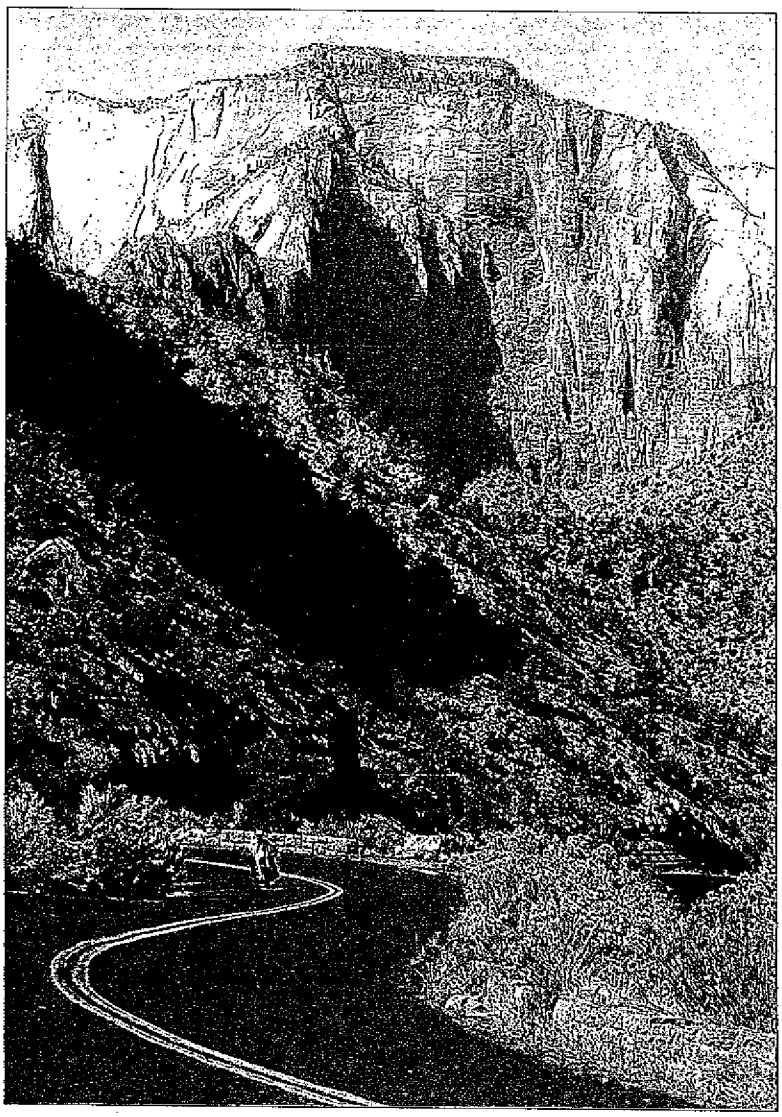
■ LEFT *A group of German riders on hired Harleys near Monument Valley on the Arizona/Utah border.*

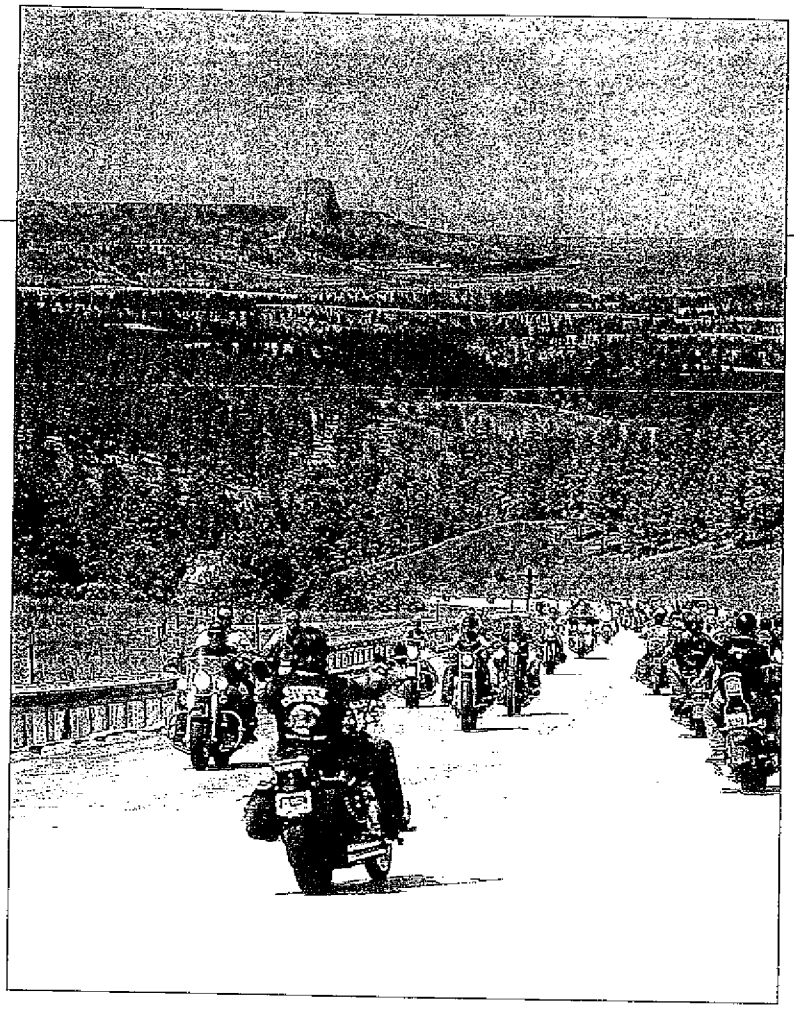
in like a gentle swell and gently recede under your wheels. It demands a different sort of tempo – more relaxed, less preoccupied with destinations – than riding in Europe. As it thumps over hills and plains, the big, lazy V-twin engine seems attuned to the environment in a way that other machines never could be. Then, with a jolt, you encounter somewhere like Utah – scenic America at its most extraordinary.

Utah is Mother Nature under hallucinogenic influence. Utah has National Parks in profusion, all with something spectacular and different: Arches, Canyonlands, Bryce, Capitol Reef and glorious Zion, to name but a few. Next door to Utah are Arizona and the Grand Canyon, Colorado and the Rockies, Nevada's sweeping high desert basins and the red rocks and white sands of New Mexico.

From magical, mystical Moab, it's just a short ride up Highway 191 to Canyonlands. Hang a left and let the Harley thunder up the

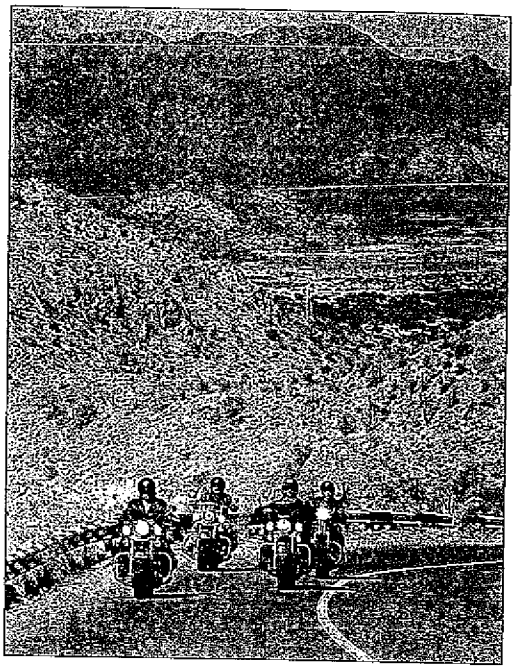






■ LEFT *Hoggers on a traditional ride-out from the Sturgis Rally to Dakota's Devil's Tower.*

■ BELOW *Baja California, the sea of Cortez beyond, and what better way to enjoy them?*

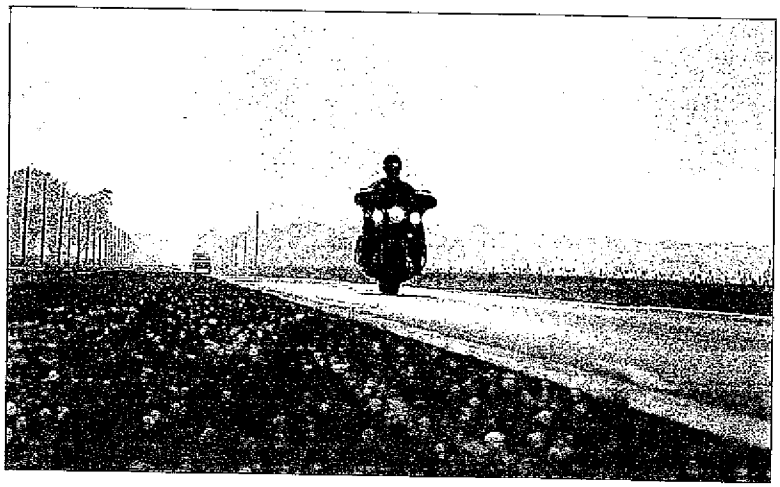


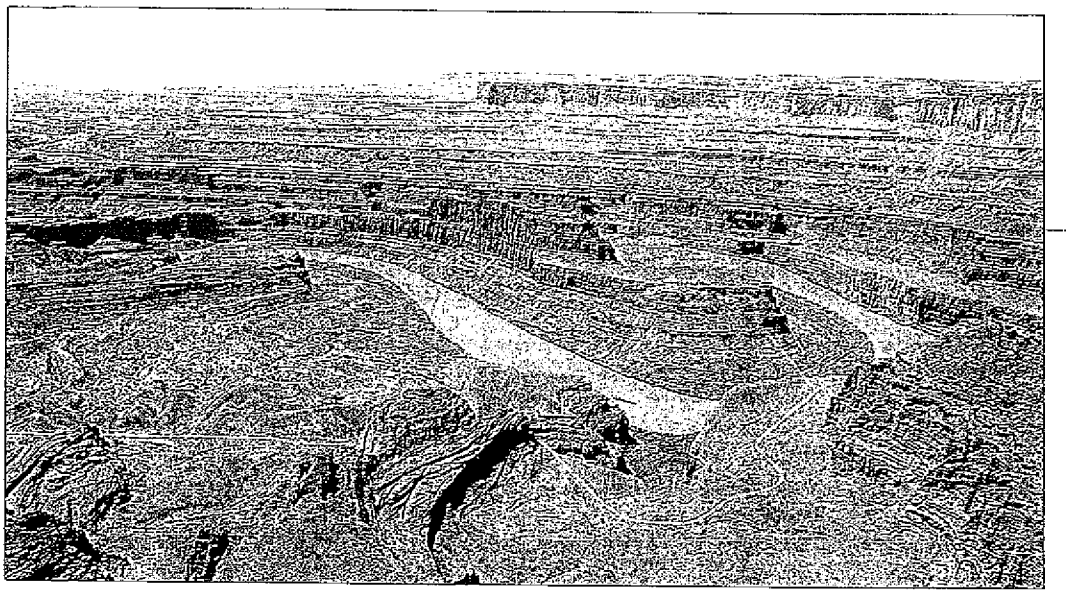
endless grades until suddenly the road stops and the world simply disappears. Gone. In its place, space – a void as big as the Alps. Half a mile (800 metres) below, the Colorado River surges noiselessly, framed by a rocky never-never-land that might be awe-inspiring if it were real. It takes a while to get your head around the fact that it is.

There's more. There always is in Utah. Shafer Canyon, Grand View Point, and then the daddy of them all, the Green River Overlook on the "Island in the Sky". From here, the western horizon is 100 miles (160km) away, about the distance from London to Bristol. Around where Berkshire ought to be is the baking wilderness of the Soda Springs Basin, through which Stillwater Canyon carves a distant trench which looks tiny but is fully 1,000ft (300 metres) deep. But for the shadows of passing clouds, creeping as though in awe of the landscape, it could be the dark side of the Moon.

■ BELOW *108°F (42°C) in the shade, and there is no shade. Must be time for a cold beer.*

If the landscape is dramatic, the sheer scale is extraordinary. Take Route 41 – cresting a rise north of Montezuma Creek,

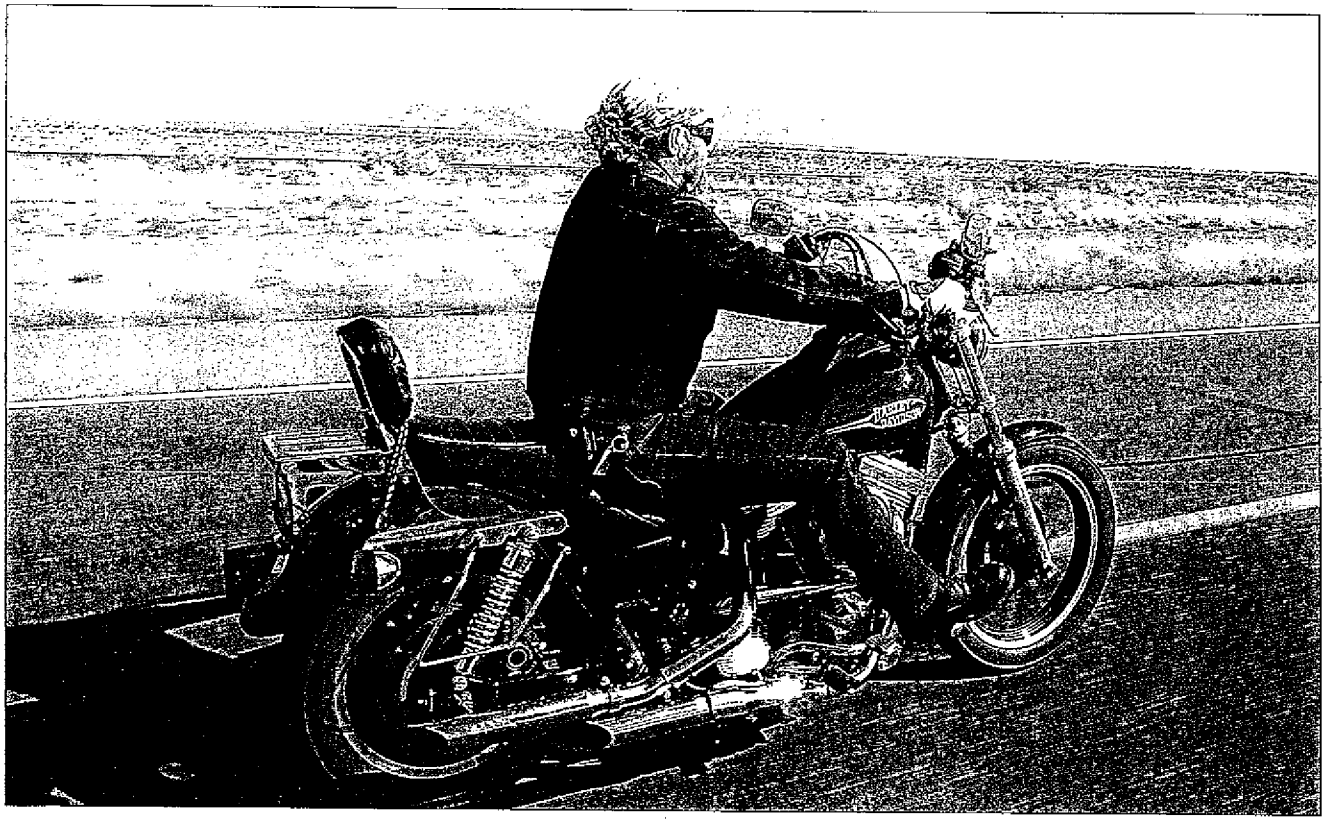


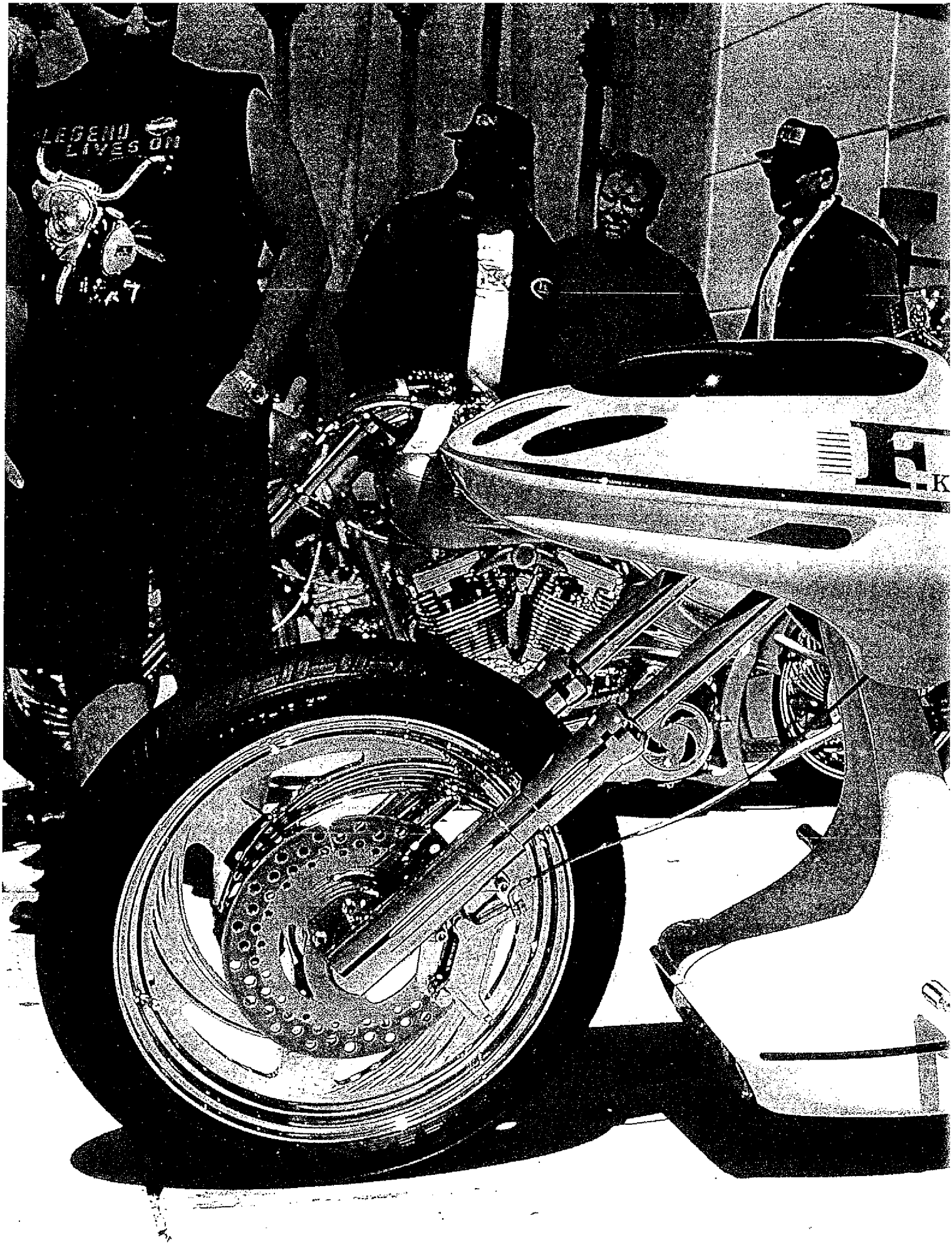


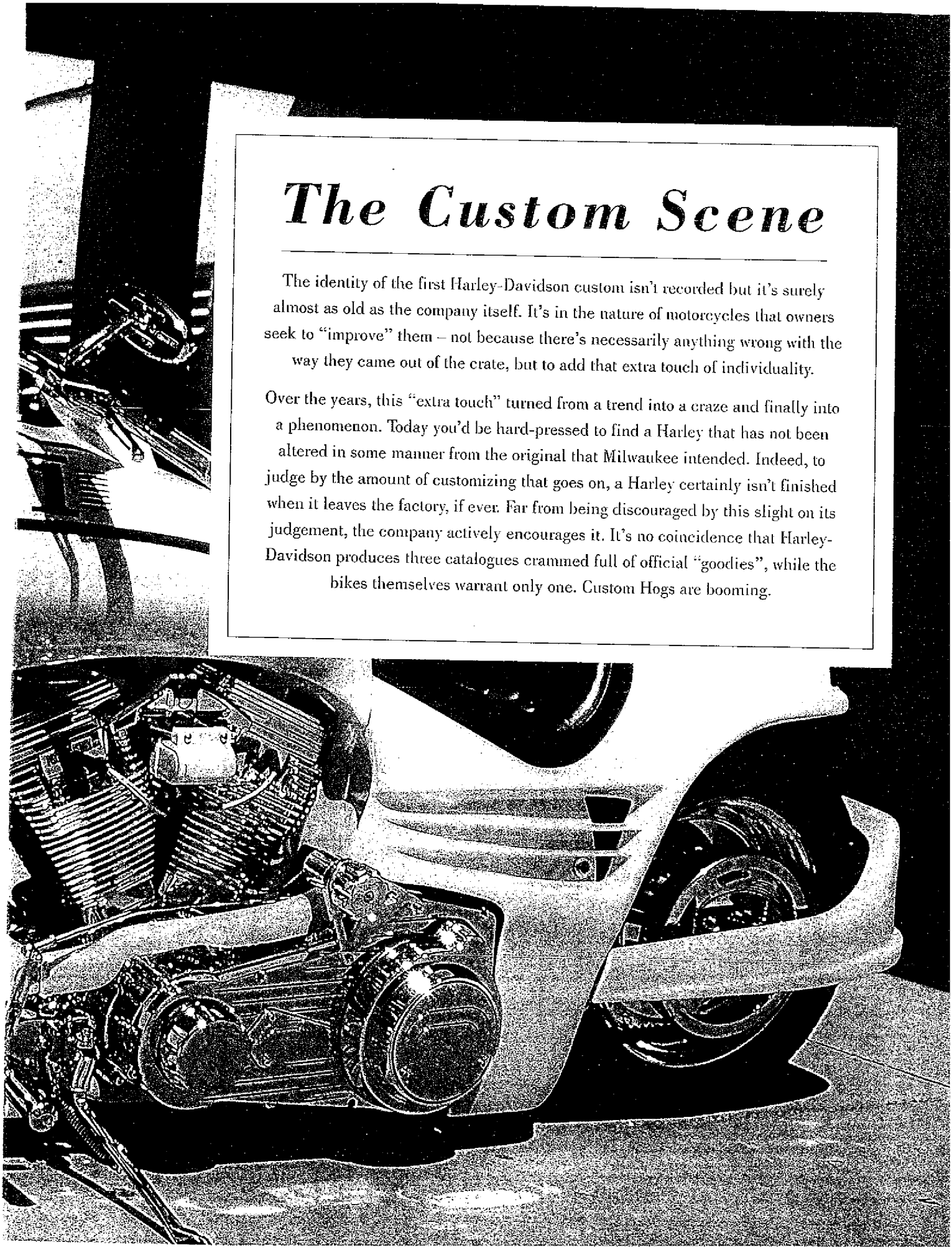
■ LEFT *Dead Horse Point, near Moab, just one of the scenic jewels of dazzling Utah.*

a view 200 miles (320 km) leaps into sight. Seventy-five miles (120km) away in Arizona, the orange spires of Monument Valley guard the western horizon; to the east, the snow-capped Colorado Rockies are fully 125 miles (200 km) distant. This a scene that is far larger than many countries in Europe, and yet it's a single, sweeping view – or a panoramic day's ride on a Harley-Davidson. For the great, mythic emptiness of the United States, nothing else comes close to experiencing it all – and more – as from the seat of a Harley-Davidson V-twin that has been made in Milwaukee.

■ BELOW *This man emigrated to the United States just to be able to do this.*




LEGEND
LIVES ON



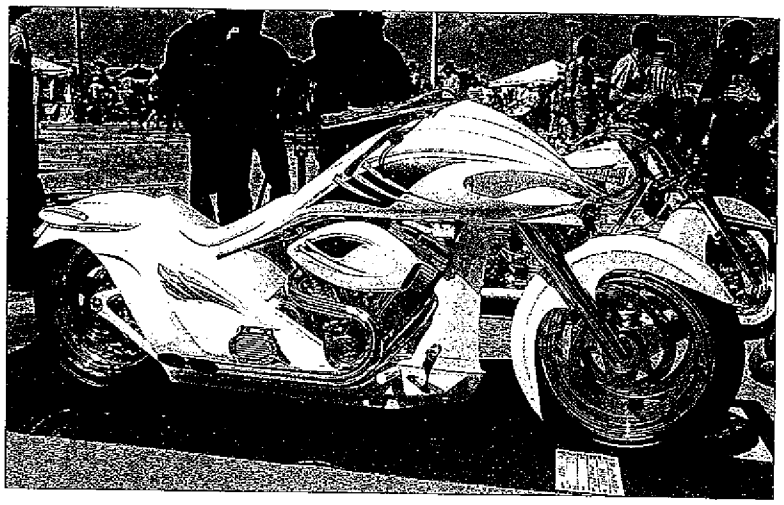
The Custom Scene

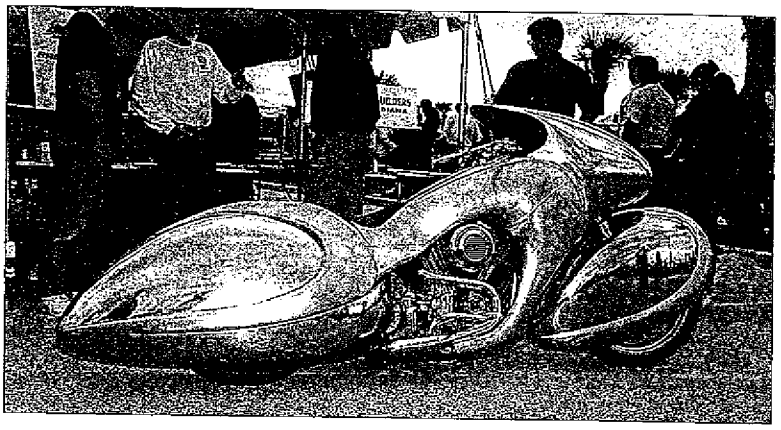
The identity of the first Harley-Davidson custom isn't recorded but it's surely almost as old as the company itself. It's in the nature of motorcycles that owners seek to "improve" them – not because there's necessarily anything wrong with the way they came out of the crate, but to add that extra touch of individuality.

Over the years, this "extra touch" turned from a trend into a craze and finally into a phenomenon. Today you'd be hard-pressed to find a Harley that has not been altered in some manner from the original that Milwaukee intended. Indeed, to judge by the amount of customizing that goes on, a Harley certainly isn't finished when it leaves the factory, if ever. Far from being discouraged by this slight on its judgement, the company actively encourages it. It's no coincidence that Harley-Davidson produces three catalogues crammed full of official "goodies", while the bikes themselves warrant only one. Custom Hogs are booming.

CUSTOM HARLEYS

■ BELOW *Bob Lowe's custom creation "Evil Twin".*

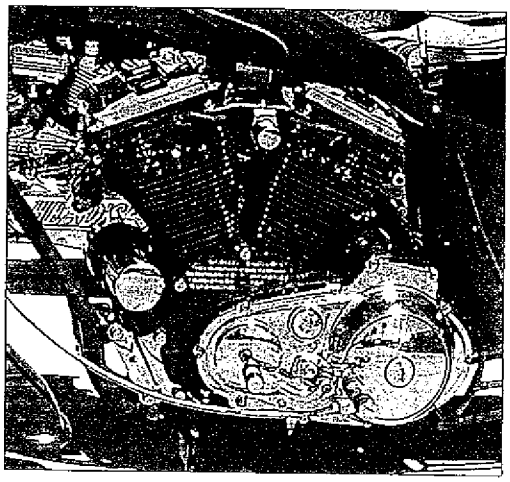




A customized Harley today can be anything from a Sportster pared down to the barest essentials to a Glide decked out with almost anything you'd expect to find in a deluxe motorhome. Perhaps in the very early days, changes were functional: one carburettor worked better than another, this mudguard kept you cleaner than that. And, since America fell in love with horsepower almost as soon as there was such a thing, engine tuning quickly became a growth industry: in almost every state of the union, someone was willing to sell you high-lift camshafts, high-compression pistons or any of the other goodies that make an engine even stronger. In the racing field in particular, many tuners became legends for their prowess at extracting more power.

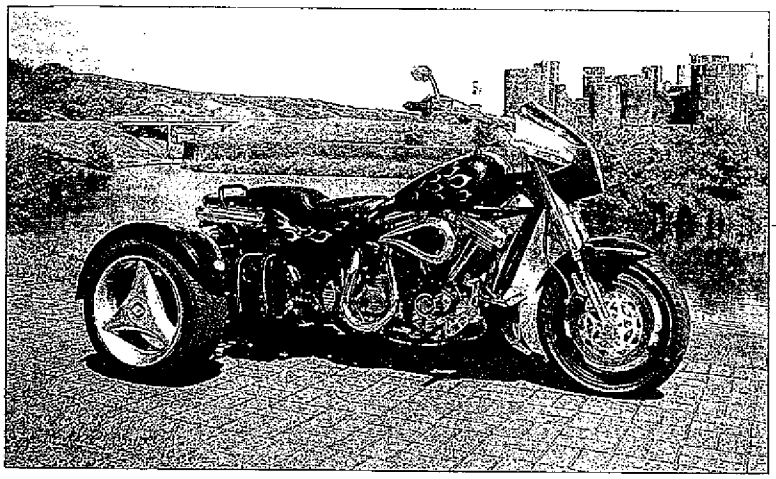
Extravagant cosmetic "tuning" came later. More than with any other make of motorcycle, Harley-Davidson customizing is an oddly circular process. First came Harley-Davidsons, which owners either lived with as they stood or adjusted to their tastes. Many of these creations were attractive in the extreme, a fact that was not lost on the people back at base in Milwaukee. Styling ideas which had first appeared as owners' one-offs fed back into the melting pot of Juneau Avenue design. Eventually, the wheel came full circle as the echoes reverberated through standard "factory custom" machines, beginning in 1970 with the FX1200 SuperGlide – although, at the time, the FX was resented by many in the custom scene for doing their job for them. Let's not forget that Buells – now an integral part of the Milwaukee range – began life as specials.

As far as graphics and paint are concerned, the inspiration reaches back farther still, to the art-deco designs with which the company



■ ABOVE *Not surprisingly, this one goes by the name of "Full Metal Jacket".*

■ LEFT *This level of detail can take months to achieve.*

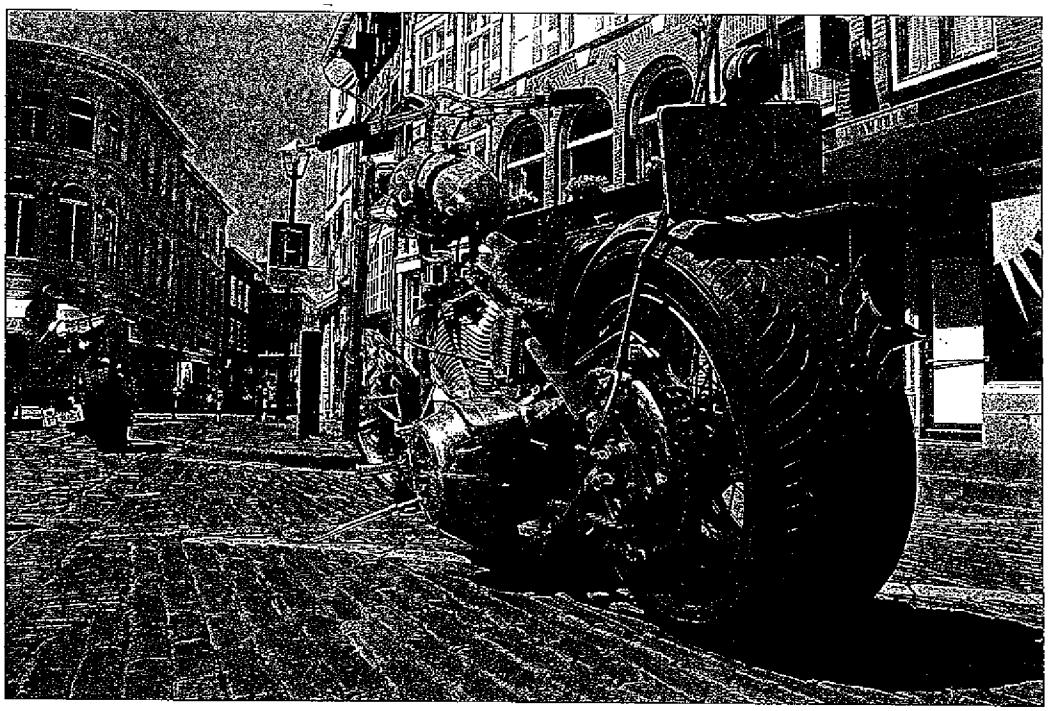


■ ABOVE *Custom can be three wheels...*

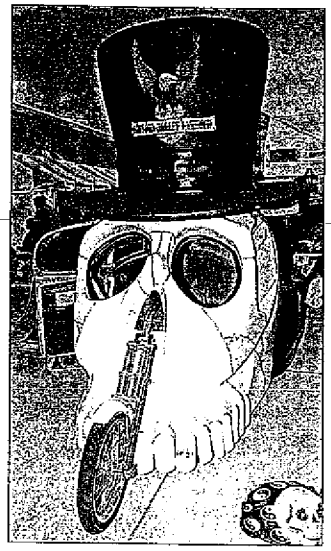
■ ABOVE RIGHT *...or designer grunge!*

attempted to sell bikes during the hardships of the 1930s. At the time, Harley was already marketing aftermarket parts such as mirrors and racks, but most were more functional than decorative. The true custom scene arrived in the California of the 1950s, with men such as Von Dutch and Ed Roth prominent. Often, 1930s art-deco was their inspiration in creating "blend" bikes – machines built from parts of several different models, as well as one-off components. Today, stylistic cues sometimes come from the Harley-Davidsons of the past, as demonstrated by the whole concept of "Retro-Tech". Harley brochures today speak about machines of the 1950s inspiring several of their Softail models, although the Springer looks more like a child of the 1940s.

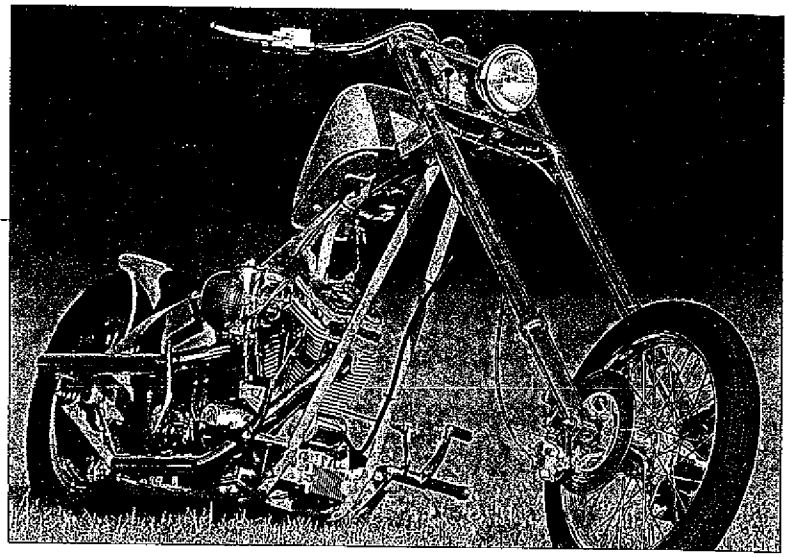
The 1960s and 1970s, of course, were the heyday of the chopper, with its radically extended forks, limited lock and lousy handling. These days, customizers and riders alike look for either something more functional or something that is very much more art than motorcycle – such as the creations of the doyen of customizers, Arlen Ness. Other celebrated custom artists include Dave Perewitz, Ricki



■ RIGHT *Presence, yes, but if you want ground clearance and rear suspension, look elsewhere.*



■ RIGHT *Sometimes practicality comes a very poor second to effect.*



Battistini and Donnie Smith, but almost anyone with a Hog can join the scene in their own small way.

Mechanically as well as cosmetically, Harley-Davidson gladly promotes change, chiefly through its range of "Screaming Eagle" accessories, and they tacitly acknowledge that, even at 1450cc, the new Twin Cam engine can be further enhanced with a factory kit, increasing displacement to a mammoth 1550cc. Other suppliers, such as California's Custom Chrome, feed the fertile ground of Harley customs.

■ ARLEN NESS

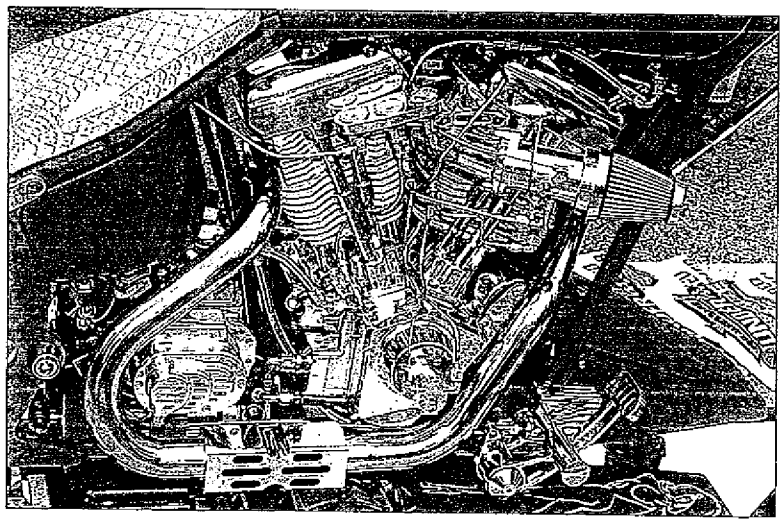
The most revered of all Harley special builders is Arlen Ness, a slight, grey-haired Californian who doesn't so much customize Harleys as transform them into works of rolling art. Like so many others in the custom field, Arlen Ness' interest started as a hobby, growing and growing as people took note of his creations and begged him to craft something equally extraordinary for them.

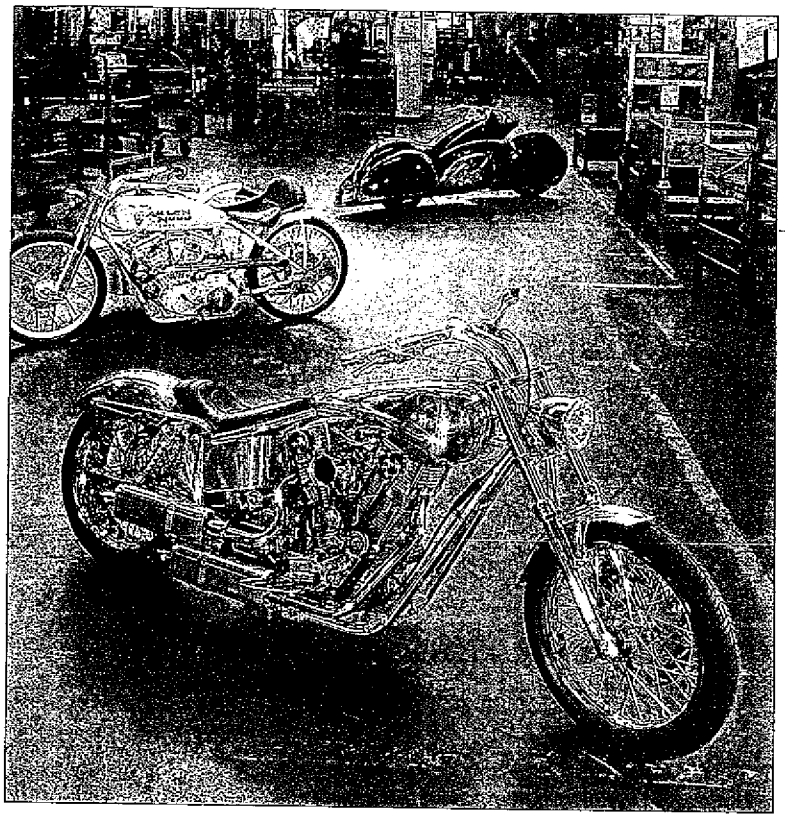
Beginning with a 1937 Knucklehead bought for $300 in 1967, he now designs and manufactures everything from the tiniest, most exquisite chrome-plated detail to his own overhead-cam "Harley" twin, the engine that powers the gleaming Light-Ness machine. "I started out painting motorcycles in my garage," he explains, "but it got so busy with people coming and going that I couldn't get any work done, so I ended up renting a little store. This meant people would go there instead so I could work at home in the daytime and kept the shop open at night."

From paint jobs and custom handlebars, he now runs a huge mail-order business from a 70,000sq ft (6,500sq metre) building in San Francisco's Bay area. He actually builds just a handful of specials each year, at prices ranging from $25,000 to $50,000, but turns away far more customers than that. Sometimes the problem is sheer pressure of work (would "Busy-Ness" make a good project?), sometimes it's aesthetic.

■ ABOVE *"Choppers" like this are now passé in the US, but live on in parts of Europe.*

■ BELOW *Sometimes, Milwaukee must wonder why it bothers at all.*





■ LEFT *Light-Ness (closest), Antique-Ness and Smooth-Ness, three of Arlen Ness' most famous creations.*

■ BELOW *Arlen Ness (left) with Hank, president of the Chopper Club.*

"We turn away quite a few people if we don't like a style they want or if we don't think they would be real happy... and others can't seem to make up their mind," he explains.

"There isn't a lot of money in building bikes. I just do it for fun." Or maybe Arlen just hates the one he hasn't built yet: Idle-Ness.

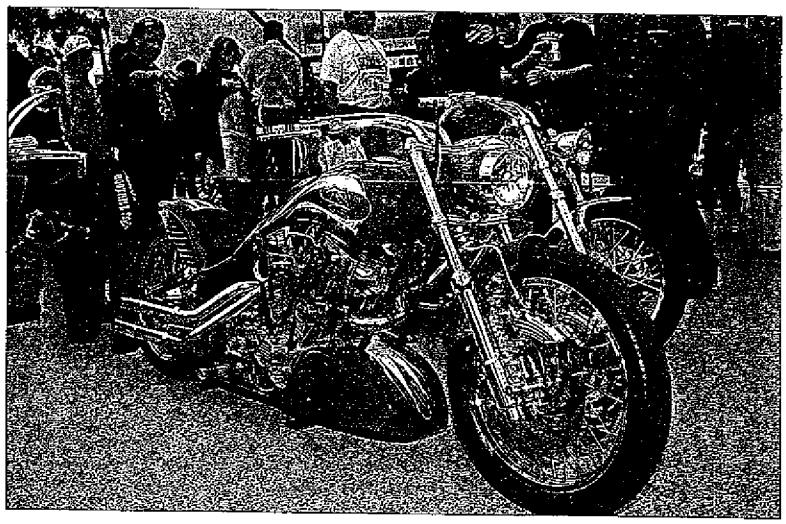
■ THE BIKES

The silver machine – "Light-Ness" – is powered by Ness' 100-inch (1,639cc) ohc "lightweight" motor housed in a special aluminium frame. Following the same theme, tank, fenders, mufflers and most other components are also highly-polished aluminium. Arlen values the bike at some $40,000.

The yellow bike is "Antique-Ness", Ness' first sidecar outfit. Based around a 1200cc Harley Sportster engine, it was created over a period of nine months by Arlen and fellow American customizers, Mun and Jimmy Rose. Built for Ness' wife, Bev, it was styled along the lines (if not the colour) of Harleys of the 1920s. Similar machines can be bought in kit form for around $27,000.

Although to some eyes it resembles half of a 1959 Cadillac, "Smooth-Ness" was inspired by the sleek, flowing lines of a classic Bugatti motor car. The all-aluminium body houses a rubber-mounted Harley "Evo" V-twin in a prototype Softail-type chassis. It took a year to build and is valued at $100,000.

■ BELOW *An earlier and slightly less radical Ness special.*



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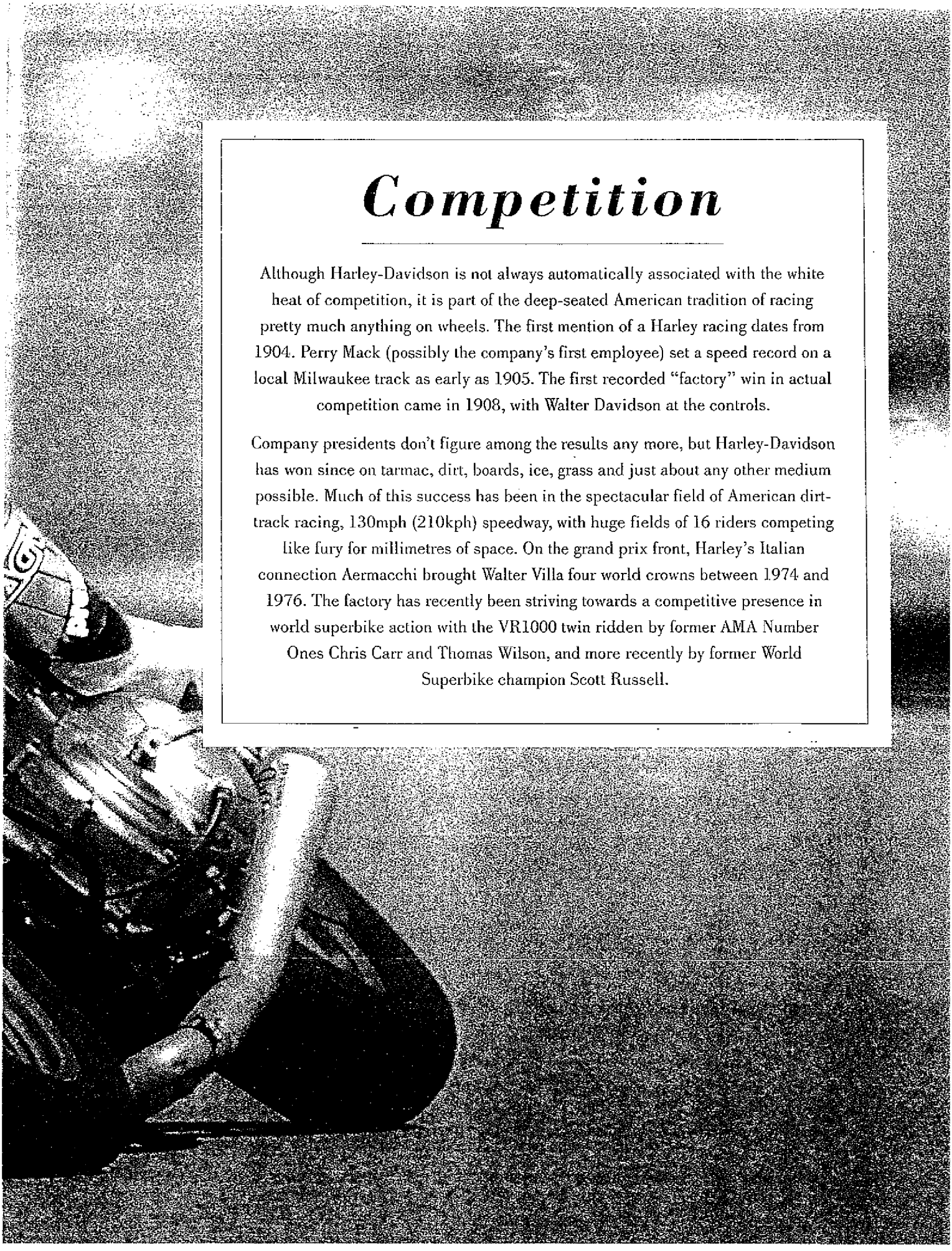
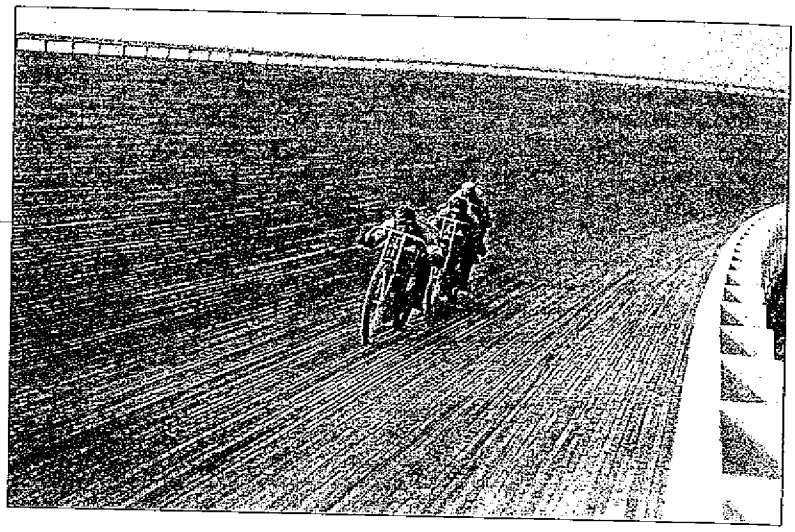
Competition

Although Harley-Davidson is not always automatically associated with the white heat of competition, it is part of the deep-seated American tradition of racing pretty much anything on wheels. The first mention of a Harley racing dates from 1904. Perry Mack (possibly the company's first employee) set a speed record on a local Milwaukee track as early as 1905. The first recorded "factory" win in actual competition came in 1908, with Walter Davidson at the controls.

Company presidents don't figure among the results any more, but Harley-Davidson has won since on tarmac, dirt, boards, ice, grass and just about any other medium possible. Much of this success has been in the spectacular field of American dirt-track racing, 130mph (210kph) speedway, with huge fields of 16 riders competing like fury for millimetres of space. On the grand prix front, Harley's Italian connection Aermacchi brought Walter Villa four world crowns between 1974 and 1976. The factory has recently been striving towards a competitive presence in world superbike action with the VR1000 twin ridden by former AMA Number Ones Chris Carr and Thomas Wilson, and more recently by former World Superbike champion Scott Russell.



RACING



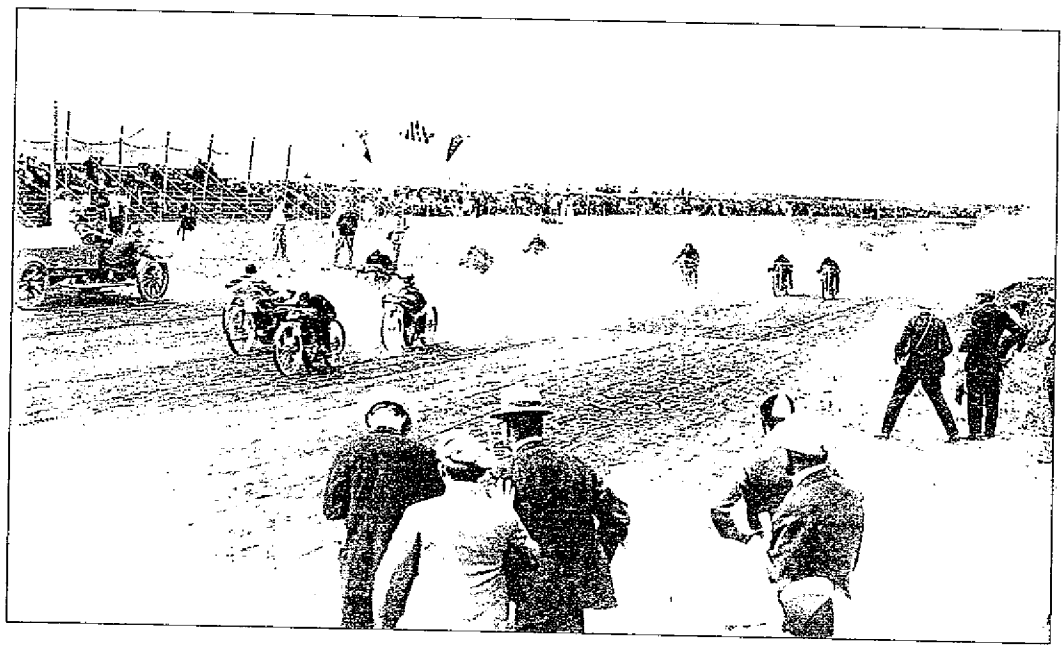
■ ABOVE *Harley-Davidsons board racing in Los Angeles, 1912.*

Harley-Davidson's early years were marked by racing successes too numerous to mention. The earliest of note came in 1908 when one of the first V-twins, ridden by company president Walter Davidson claimed victory in the FAM (Federation of American Motorcyclists) seventh annual endurance event in New York's Catskill Mountains. The 365-mile (587km) course was dauntingly rugged, yet "so strong was my confidence," Davidson later said, "that I carried with me no additional parts." This was in marked contrast to several other manufacturers, whose machines were followed by car-loads of spares.

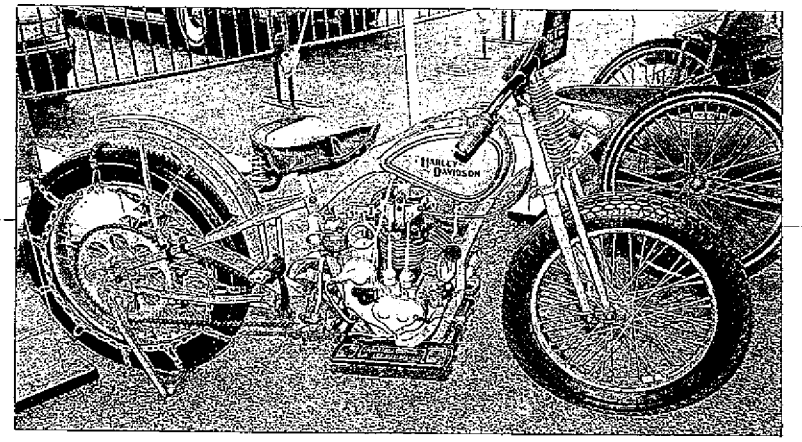
In July of the same year, the Chicago Motorcycle Club sponsored a hill climb in nearby Algonquin, Illinois. Fastest time of the day went to Harvey Bernard riding a Harley-Davidson. Mysteriously, contemporary photographs clearly show Bernard aboard a V-twin machine, yet the model did not officially appear until early the following year.

The succeeding years were distinguished by numerous, similar Harley-Davidson successes, yet they almost exclusively involved machines which were privately owned and run. A company advertisement from September 1911 bragged, "We don't believe in racing and we don't make a practice of it, but when Harley-Davidson owners with their own stock machines win hundreds of miles from the factory, we can't help crowing about it."

This boast was nowhere more graphically demonstrated than in the San José road race of 1912, in which a 61-inch Model X8E triumphed by the small matter of 17 miles



■ LEFT *Harley had major success in racing from the outset.*



■ ABOVE *One of the legendary "Peashooter" racers of the 1920s, in this case prepared for hill-climbing.*

(27 kilometres). That same year, Harley-Davidson twins won at Bakersfield and the following year took first, second and third place in a 225-mile (362km) dash from Harrisburg to Pennsylvania and back, but these were private machines contesting relatively obscure races.

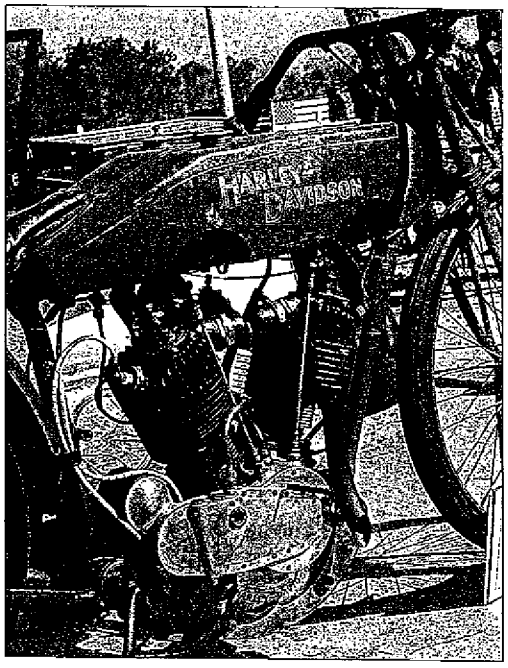
In 1914 – four years after Indian had won the prestigious Isle of Man TT – Milwaukee bowed to the inevitable when Bill Harley established a works race department which was to continue its winning ways into the 1970s. Some reports refer to instant success in taking that year's Dodge City 300-mile (480km) race, when in fact only two Harleys finished, well off the pace, in a race dominated by Indian. Clearly, the battle-hardened Springfield eight-valve twin was a formidable foe, but under the direction of the Bills Harley and Ottaway, Harley's progress was rapid. By 1915, Milwaukee twins were the bikes to beat.

The step from factory racers to racer production was a short and logical one. By 1916, $250 would buy any aspiring racer a special stripped-down competition version of the Harley twin, producing 11 horsepower and capable of around 75mph (120kph).

As well as speed, Harley iron chased many endurance records during the same period. In 1917, a Harley-Davidson ridden by Alan Bedell covered 1,000 miles (1,610km) non-stop at Ascot Park, taking almost 21 hours and averaging a remarkable 48.3mph (77.7kph).

In the same year, another Harley set a similar mark fitted with a sidecar.

■ BELOW RIGHT *From 1920, a board-track racer.*



RACE BOSSES

It's a remarkable fact that, once it finally got around to racing officially, Harley-Davidson needed a mere three race-team managers in all its many decades of competition – Bill Ottaway, Hank Syvertson and Dick O'Brien. They, too, became legends.

The factory crew's early successes were overseen by the cool gaze of Bill Ottaway. Described as "a wizard" by William Davidson, Ottaway began his career at Thor, manufacturer of proprietary motorcycle engines, leaving for Juneau Avenue in 1913. A talented engineer and a shrewd manager, he saw the factory squad through its formative years and into the glory days of the 1920s before Hank Syvertson took over as director of racing.

Dick O'Brien began a lifetime of working on Harley engines at Puckett's in Orlando, Florida. Apart from a period of military service as a senior aircraft mechanic during the Second World War, he continued as a Harley service-shop manager, with a special talent for tuning racing machines – Daytona Speedway was, after all, only a couple of hours distant. In June 1957, he joined the factory race squad as Syvertson's assistant. Three months later Syvertson retired and O'Brien took the helm, a position he held until his retirement in 1983.

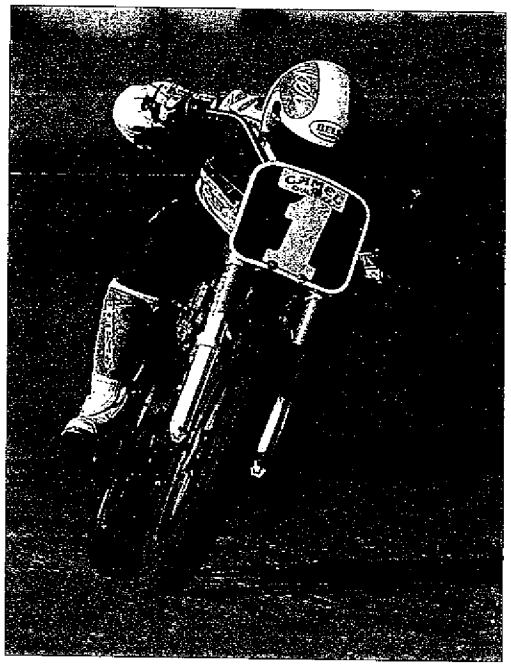
■ LEFT *Wrecking Crew at Dodge City in 1920. From left: race boss Bill Ottaway, Maldwyn Jones, Ralph Hepburn, Fred Ludlow, Otto Walker, Ray Weishaar, Jim Davis and mechanic Hank Syvertsen.*

■ THE WRECKING CREW

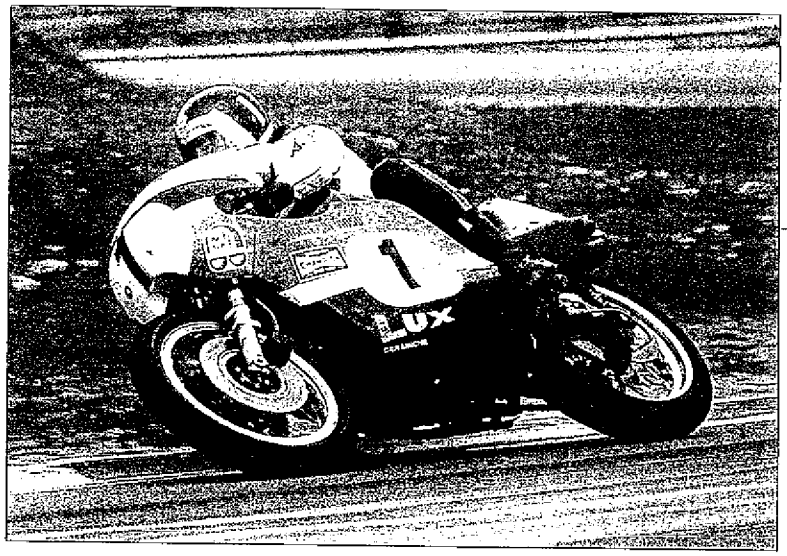
During the buoyant 1920s, Harley-Davidson's competitive exploits were even more remarkable than the salvos of new models roaring out of Milwaukee. In 1920, a Harley became the first powered vehicle to top California's 10,000ft (3,050 metre) "Old Baldy" hill-climb. In February 1921, at Fresno, a Harley became the first bike to win a race at an average of more than 100mph (160kph).

Many of the factory's innumerable successes came courtesy of the legendary Harley-Davidson "Wrecking Crew". The Crew was almost unbeatable on the dirt and boards of America from the days before the First World War until the factory briefly pulled out of racing following the 1920 slump. Board racing, on banked ovals of raw wood, was uniquely – and spectacularly – American.

The Crew included barnstorming individuals: Eddie Brinck, Otto Walker, Jim Davis, Leslie "Red" Parkhurst and many more. Walker marked the factory's withdrawal by taking a 61cu in. eight-valve machine to victory in a 50-mile (80km) race at San Joaquin, California, at the sensational average speed of 101.43mph (163.23kph). The crew began 1920 by taking the first four places in the Ascot 100-miler (160.93km) race on America's fastest track. In February, Harleys set 23 records, including four by Parker at the kilometre, mile – both at more than 103mph (165kph) – two mile and five mile marks.



■ LEFT *Scott Parker, the most successful dirt-track rider in AMA history.*



These men, riding in little more than cloth caps, sweatshirts and jodhpurs, were tough little heroes in the same mould that was later to produce stars such as Cal Rayborn, Jay Springsteen and Scott Parker. The racing life was hard and cruel. Eddie Brinck himself was killed when a tyre blew out in a race at Springfield, Massachusetts.

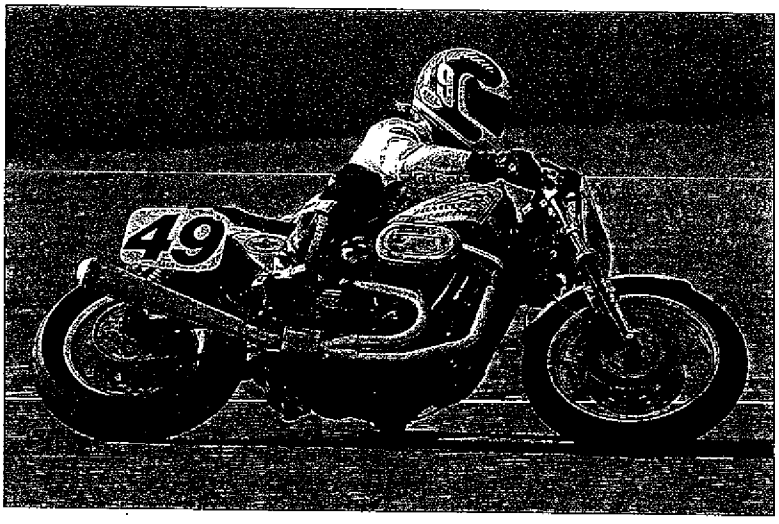
As America's road system developed, it was only natural that men would create some form of contest on it. As early as 1920, Hap Sherer took a Sport Twin (584cc boxer) from Denver to Chicago in 48 hours – no easy feat even today. Meanwhile, Walter Hadfield made a habit of lowering the "Three Flags Run" record from Vancouver (Canada) to Tijuana (Mexico), a route on which Fred Deeley later averaged more than 104mpg (36km/litre). Perhaps most impressive of all was the remarkable Earl Hadfield, who covered more than 3,000-plus miles (4,800-plus km) between New York and Los Angeles in less than 78 hours. At around the same time, the immortal Windy Lindstrom was king of America's booming hill-climb scene, on specially-modified Milwaukee iron.

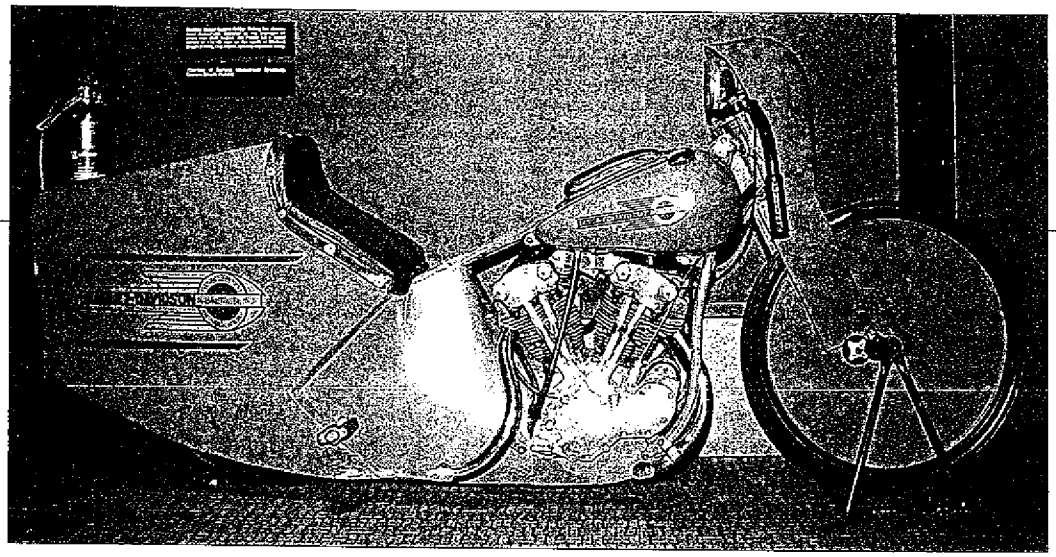
Harley victories were by no means confined to the United States. Harley-Davidson found willing, winning pilots as far apart as Scandinavia and Australia, notching up successes in fields as diverse as ice speedway and grass track. At the legendary banked Brooklands track in Surrey, England, Doug Davidson (no relation) took a factory 1000cc ioe twin to a record-breaking average of 100.76mph (162.15kph) over a flying kilometre. Within a few months, a similar machine ridden by Claude Temple had taken records in the hour, five mile, flying mile and kilometre.

Yet even these efforts paled when compared to those of the mercurial Englishman, Freddy Dixon, riding a special twin with four pipes and eight overhead valves. Dixon was nearly unbeatable in all forms of competition from hill-climbs to long-distance events around the daunting Brooklands circuit. On 9 September 1923 at Arpajon, near Paris, Dixon set a new world speed mark of 106.8mph/171.8kph (a record Harley-Davidson would not hold again until 1970). Ten months later he was at it again, flying through the half-mile at the Clipstone Speed Trials at 103.44mph (166.47kph). In 1925 he averaged 100.1mph (161kph) winning the Brooklands 1000cc championship – possibly the noisiest victory ever, for the machine had no exhaust pipes.

■ ABOVE *The legendary Cal Rayborn on the XR750, Brands Hatch, 1972.*

■ BELOW *Jay Springsteen is one in a long line of champions that stem from the legacy of the Wrecking Crew of the early part of the 20th century.*





■ LEFT *The Knucklehead streamliner on which Joe Petrali set record speeds at Florida's Daytona Beach.*

■ JOE PETRALI

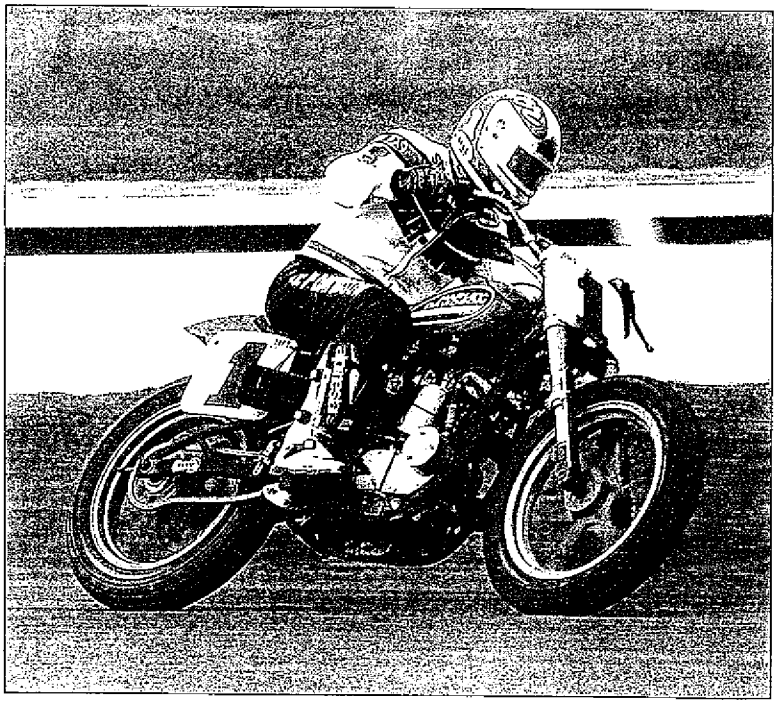
If Freddy Dixon had a counterpart on Harley's home turf, it was surely the legendary Joe Petrali. More than perhaps any other man, Petrali single-handedly made Harley-Davidson an unbeatable force during the late 1920s and throughout the 1930s. Born in Sacramento, California in 1904, he owned his first bike at 13 years of age and was racing – and winning – on boards by the time he was 16. Petrali first hit the big time when he showed up bike-less at Altoona, Pennsylvania, in 1925. Luckily for him, former Wrecking Crew man Ralph Hepburn had broken a hand. Petrali took over the factory Harley-Davidson instead. He was practically unknown at the time.

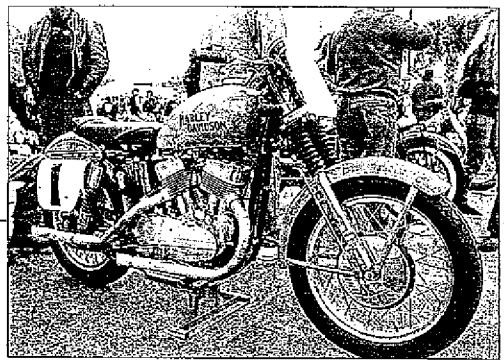
Less than an hour later (59 minutes and 47.2 seconds later to be exact), Petrali was a legend. He left the entire field of hardened pros in a cloud of dust, averaging 100.32mph (161.45kph) in the 100-mile (160.93-km) race over Altoona's lightning-fast boards. Earlier that same day, Jim Davis won the five-mile "sprint" at over 110mph (177kph) – at a time when the Indianapolis car race was being won at less than 101mph (163kph). From then on, there was no stopping Joe Petrali. He became so dominant that, for more than a decade, the rest were effectively riding for second place. In 1935, he won every single event of the National season, including five wins in a single day at Syracuse, New York. In 1937, he took a Knucklehead streamliner through the timing strip on the sands of Daytona Beach at 136.183mph (219.159kph), a record that still stands.

■ THE MICHIGAN MEN

Flint, Michigan, must be a remarkable place. Jay Springsteen is from Flint, where they build Chevrolets out of the same hard stuff. So is Scott Parker. So, too, is "Black" Bart Markel.

■ BELOW *Scott Parker rockets the XR750 around the Del Mar track.*





During a dirt-track career that began in 1957 and spanned 23 years, Markel was the original Michigan hard man. He won three national titles (in 1962, 1965 and 1966) but it was his style that caught the eye. Old boys still whistle in awe at the memory of Markel bouncing off guard rails, bales and other bikes – whatever it would take him to get to the finish line first.

Like the rest, he had to race on tarmac as well as dirt to take those titles. He crashed an awful lot, for the simple reason that "he refused to slow down for the turns," according to Harley-Davidson race boss Dick O'Brien. Instead, he just threw the bike sideways and slid round the turn – or slid off.

■ ABOVE LEFT *Scott Parker (left) and Jay Springsteen (right), both chips off the same Flint block.*

■ ABOVE RIGHT *During the 1950s, the flathead KRTT needed a capacity edge to compete with European ohc twins.*

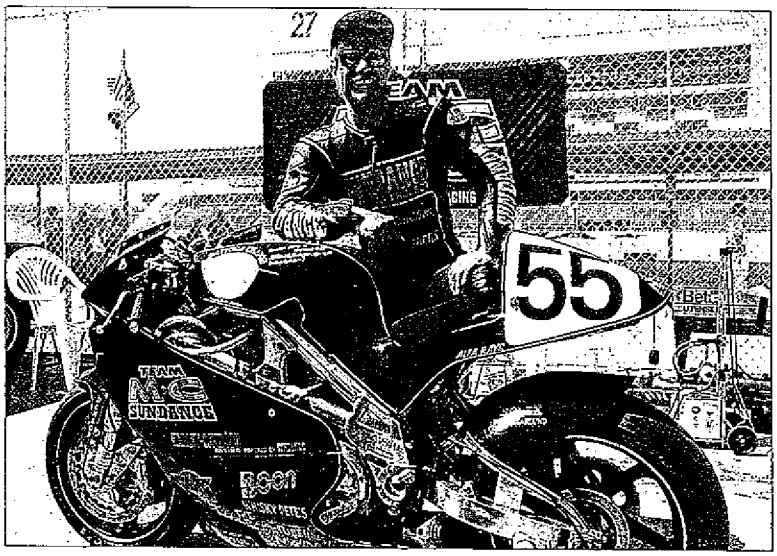
■ BELOW *As well as his prowess on dirt, Springsteen was an able road racer, as here with the Sundance twin.*

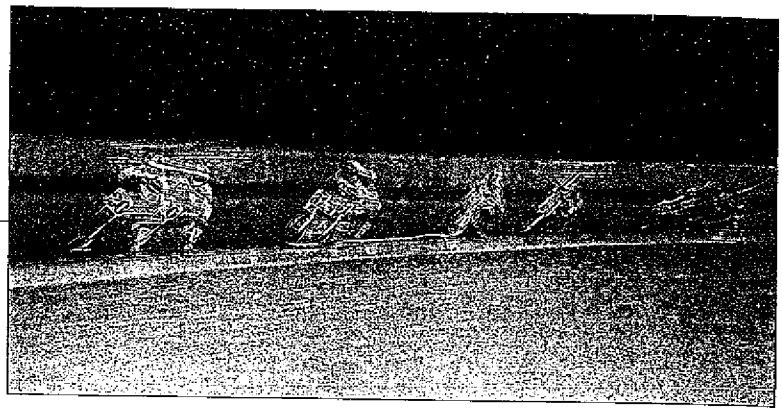
For the past decade and perhaps for all time, Parker has been "The Man" on the ovals, picking up titles most years and smashing every record in the books. Like his buddy Jay Springsteen (who was champion from 1976 to 1978), he's also from Flint, Michigan.

Born in 1962, Parker started riding at the age of six and racing at 13. He picked up his first Number One plate in 1988, posting four consecutive titles before Harley-Davidson team-mate Chris Carr took the crown in 1992. Ricky Graham won in 1993, but Parker struck back with five consecutive crowns since. His nine titles make him far and away the most successful rider in AMA dirt-track history.

THE HOLE IN THE WALL GANG

In the Depression years of the 1930s, people would try almost anything to turn a buck. If Evel Knievel enlivened the 1970s, the 1930s shone for an assorted bunch of desperadoes who might be called the "Hole in the Wall Gang". These weren't Butch and Sundance but a fellowship of maniacs who believed that if you hurtled a bike fast enough at a solid timber wall, you could punch clean through it. The first recorded case of a Harley-Davidson attempting the stunt came in Texas in 1932 when Daisy May Hendrich thudded repeatedly through inch-thick boards. (Daisy May, incidentally, was a man.) J.R. Bruce of Wooster, Ohio, went one better by setting the wall ablaze before the stunt. Wall stunts, burning or not, were a common feature of American county fairs in the 1930s.



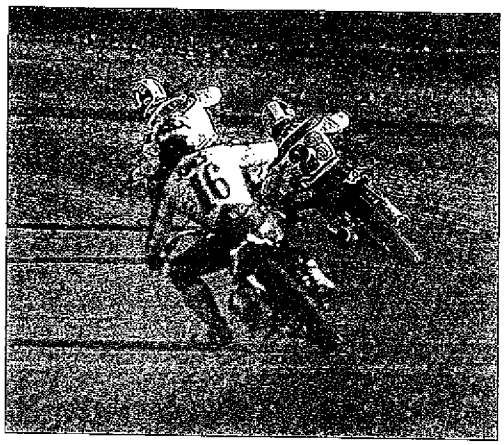


■ RIGHT *Quarter-mile action at Daytona. The bikes are Rotax-engined single-cylinder "Harleys".*

■ DIRT TRACK

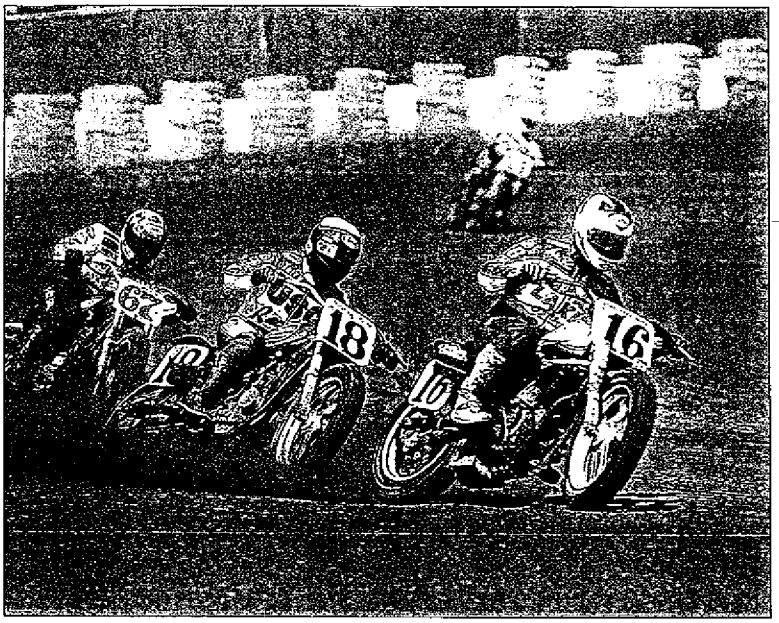
Dirt track "oval" racing spans the decades and is the essence of American motorcycle sport. This is the craziest and meanest of them all – chasing the prized "Number One" plate of the AMA champion. Although superficially similar to speedway, oval racing is held on tracks a mile or half-mile long where 750cc machines reach speeds in excess of 130mph(210kph).

Dirt track grew up on the county fairgrounds of middle America, a sort of rodeo on two wheels. In the early years, it was barely organized and, even during times when it was, it often wasn't: an "outlaw" series flourished in the 1940s. In 1946, the AMA founded the national championship which has been keenly contested ever since.



■ LEFT *Scott Parker leads the field into turn one during the Sacramento Mile.*

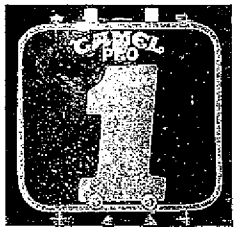
■ BELOW *The start of the "Dash for Cash" race at Daytona. Winner takes all.*



■ LEFT *Sideways at 100mph (160kph) – not for the faint-hearted.*

The pre-eminence of Americans in 500 road-racing grands prix has been ascribed to the special skills honed by dirt-track experience. Champion riders, including the likes of Kenny Roberts, Wayne Rainey, Eddie Lawson and most of the rest cut their teeth learning how to control bucking, sliding motorcycles on dirt.

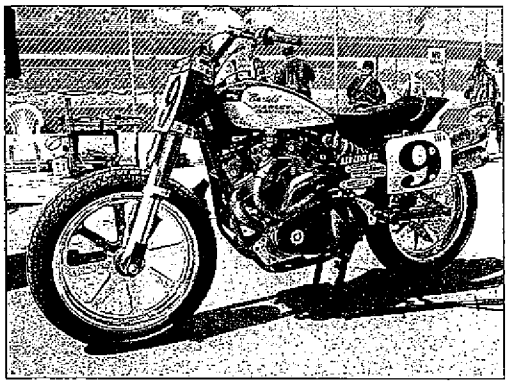
The early Harley-Davidson heroes were men like Jimmy Chann, Joe Leonard and Carroll Resweber, who took ten titles between them from 1947 to 1961. In those days and until 1986, the champion's cherished "Number One" was decided in a series which included quarter-, half- and mile flat-track racing, TT Steeplechase (a cross between dirt track and motocross) and European-style road-racing. These days, there's a separate road-race series, and the days of the great all-rounders are over – Bubba Shobert was the last, with three consecutive AMA titles. Shobert held the record for mile wins with 25, until eclipsed by current champ Scott Parker in 1991. The famed Harley-Davidson "Number One" logo, incidentally, was designed in 1970 to celebrate Mert Lawwill's AMA Grand National title.



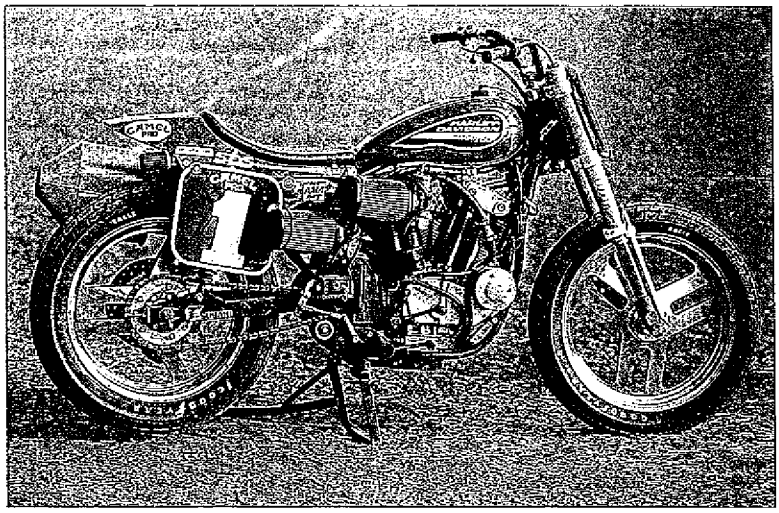
■ ABOVE *What it's all about: the coveted Number One plate.*

Done well – and the top exponents do it very well – dirt track is oddly balletic, almost poetry on wheels. But it can go wrong with sickening suddenness, ending in a maelstrom of muck, blood and machinery. Catch the motorcycle film *On Any Sunday* and you'll see men thrown through four-inch fence posts, clamber to their feet, dust off the dirt and the straw and climb right back on their bikes. You'll see men who can't walk drifting both wheels at three figure speeds. You'll see Dick Mann saw off a plaster cast – "I'm a fast healer" – just to chase that Number One plate.

■ BELOW *The all-conquering XR750, brutal and elegant at the same time.*

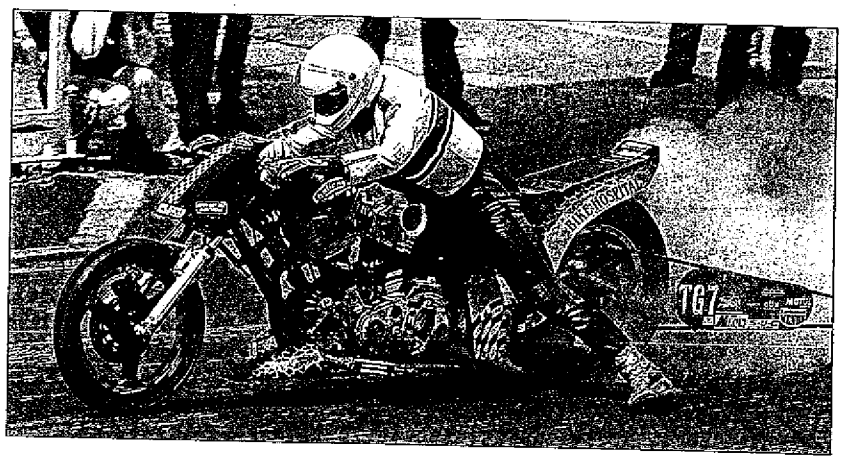


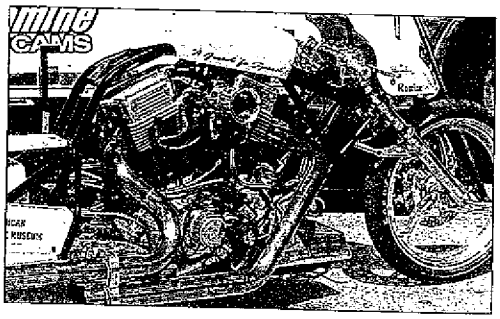
■ ABOVE *Springsteen's XR750, sponsored by Bartels of California.*



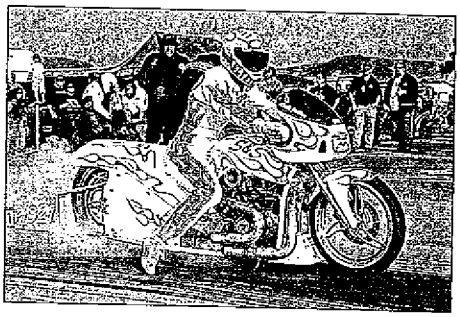
DRAG RACING

If all Harley-Davidsons thunder, none thunder with quite such a clap as fire-breathing drag machines. Like so much else in motorcycle sport, drag racing lies deep in the soul of America. Naturally, Harley-Davidsons have always been there when the lights go out at the start of the quarter mile. Men like Marion Owens, Leo Payne and Danny Johnson, with his celebrated double-engine Harley, continued to show that big-twin power was a force to be reckoned with long after multi-cylinder machines and two-strokes had dominated in other fields.





■ ABOVE, LEFT AND RIGHT *The idea is to expend as much money and effort in the shortest possible time. Strange, but thousands are addicted to this power-mad sport.*

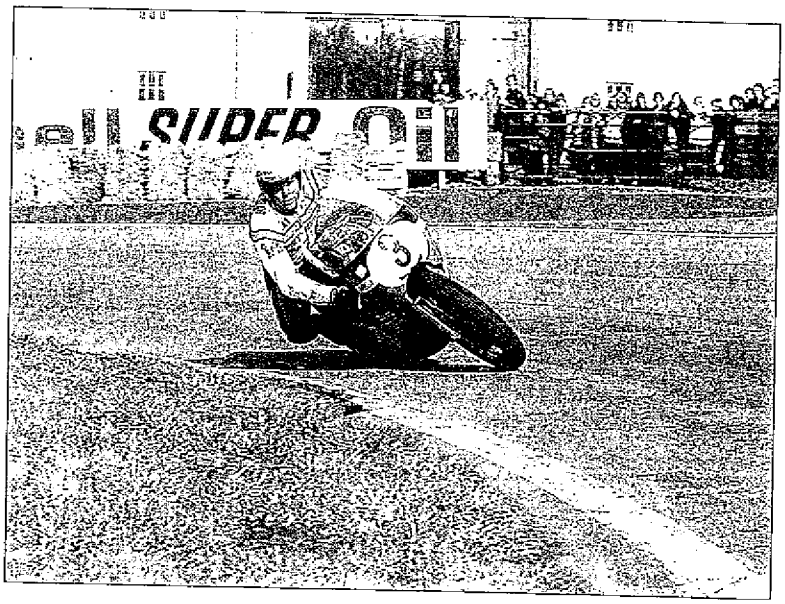


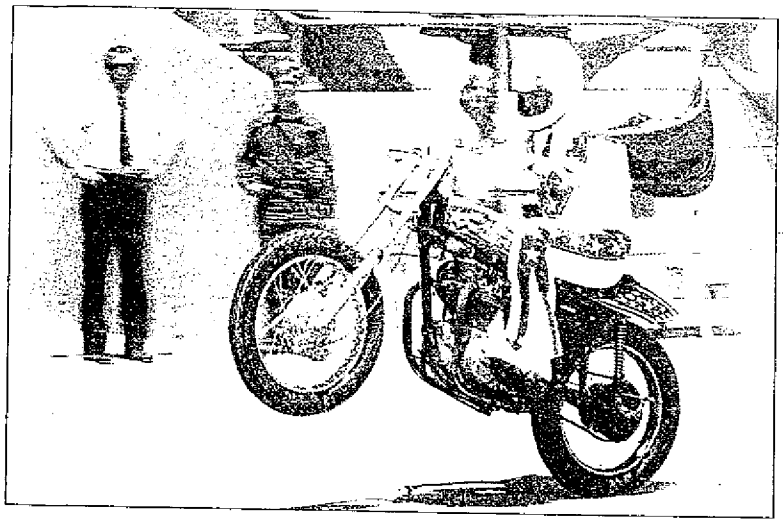
■ CAL RAYBORN

The great Cal Rayborn never won the coveted Number One plate but that didn't stop him being the best. Rayborn was the consummate road racer, a true natural and arguably the man who opened the door to Kenny Roberts, Wayne Rainey and other Americans who have since made their mark in grand prix competition. From Spring Valley, California, Rayborn won Daytona twice, as well as nine other major AMA road-race wins. Yet his career almost never began at all – in 1958, at only 18 years of age, he broke his back at California's Riverside circuit.

Never truly at home on dirt, Rayborn compensated with absolute mastery on tarmac. In 1968, he became the first man to average 100mph (160.93kph) winning the then world-renowned Daytona 200-miler (321.86km) – and comfortably: he recorded 101.29mph (163kph). In the process, his XR750 Harley-Davidson lapped the entire field. He won again in 1969, in what would prove to be the last Daytona triumph for Milwaukee. British fans will remember him for trouncing the field in the Easter Match Races in 1972, also on a factory XR750. The big V-twin had almost

■ BELOW *The late, great Cal Rayborn pictured at Oulton Park, England, at the Easter Match Races, 1972.*





■ ABOVE *Evel Knievel, the ultimate showman – especially for Milwaukee. The tank says "Harley-Davidson" but the engine's a Triumph twin.*

been dismissed in favour of factory Triumphs, Nortons and Japanese machines, but Rayborn made them eat their words.

Rayborn also found time for a succession of speed record attempts, in his case on Utah's Bonneville salt flats. In 1970, he took a pencil-thin, 19ft (6-metre), streamlined 1480cc Sportster to a staggering 254.84mph (410.11kph), a figure he later improved to 265.49mph (427.25kph).

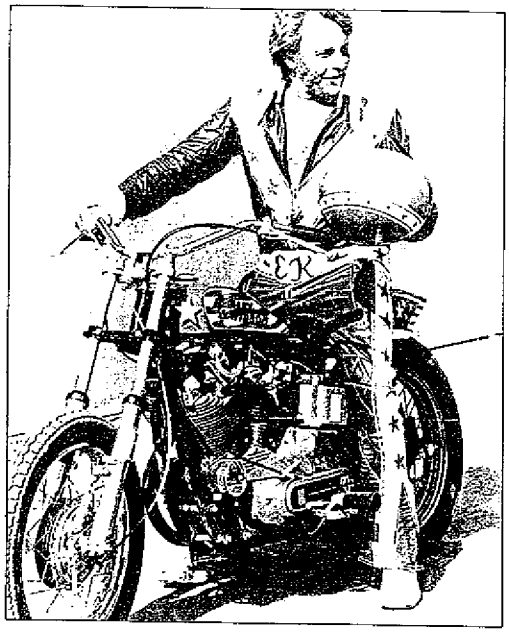
Rayborn was killed tragically in 1973 while riding in Australia, ironically on a two-stroke which seized and threw him into a trackside barrier.

■ EVEL KNIEVEL

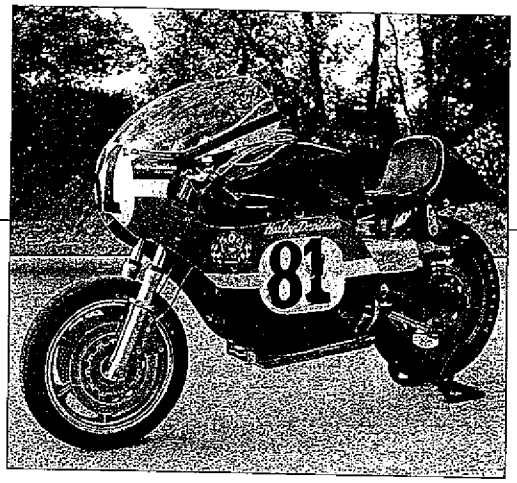
If Harley-Davidson's earlier successes had been in racing, Evel Knievel had a better idea: he'd make them fly. A pure showman, Knievel chased women and long-jump records in roughly equal measure. Beginning in 1970, his crazy schemes ran on Harley-Davidson power, mainly with a succession of XR750 machines.

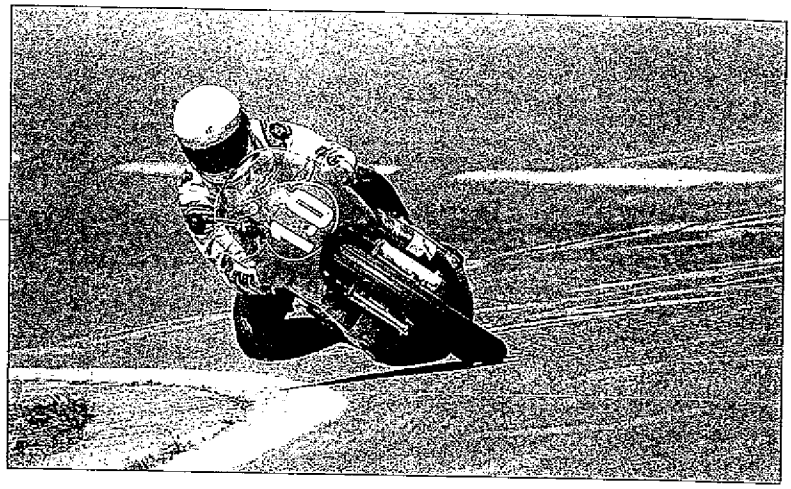
Knievel's bikes had to be tough – if not quite as tough as the man himself. He jumped cars (21 at Ontario Speedway on 28 February 1971), trucks, buses and even the fountain at Caesar's Palace in Las Vegas. Evel's problem was that he was effectively on piece-rate – his fees rose with the number of obstacles cleared. And he liked money: the jumps got bigger and the litany of crashes grew longer. In the process, he broke most of his important bones and a lot of smaller ones. When you went to watch Evel Knievel, you knew that you were in for a show. The Las Vegas leap resulted in one of his more spectacular crashes when he

■ RIGHT *The Sport-engined streamliner which took the 250cc land speed record in 1965, driven by George Roeder, pictured here.*



■ FAR RIGHT *Here the Knievel flying machine is pictured astride the genuine Harley article.*





bounced off cars, cartwheeling through the Caesar's Palace parking lot.

By 1978, Knievel had run out of conventional things to jump and crash into, and announced he would leap the Grand Canyon instead. The Canyon is over a mile wide and almost as deep, so the local Native American tribe probably did him a favour when they vetoed the plan. Undeterred, Knievel turned his sights to the Snake River Canyon, abandoning his beloved Harley-Davidson for a rocket-powered projectile. However the rocket only fizzed, and the attempt was a failure.

In 1999, Knievel's son put the record straight when he, finally and triumphantly, leapt over the Grand Canyon.

■ GRANDS PRIX

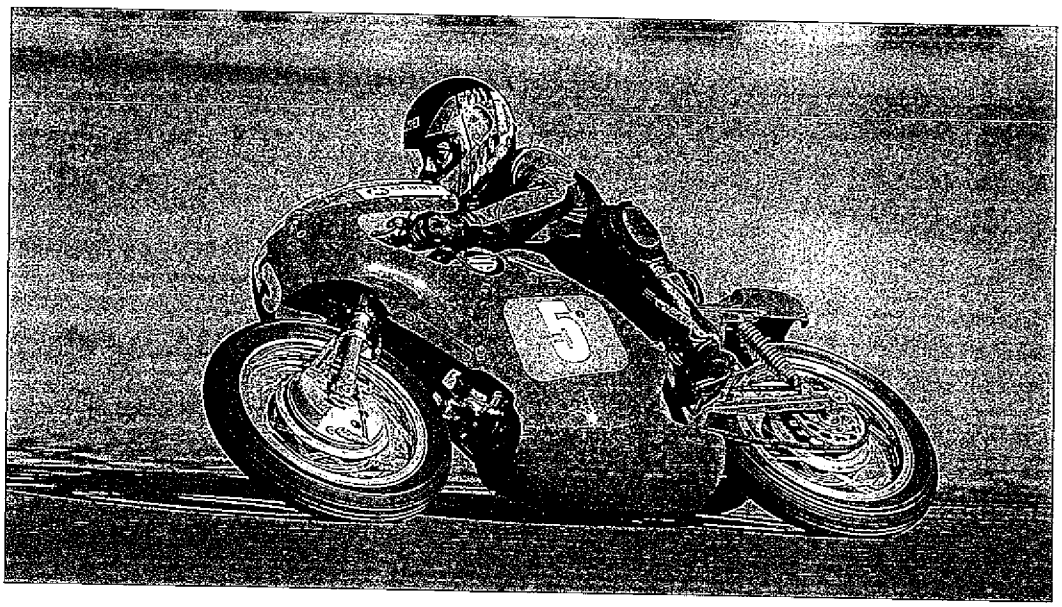
Whatever disappointments the arrangement brought in terms of sales, Harley's ties to Aermacchi produced resounding success on the world stage during the mid-1970s. Factory RR-250 and RR-350 twins ridden by Italy's Walter Villa won three consecutive 250cc world titles and one 350cc title between 1974 and 1976.

Producing 58bhp at 12,000rpm and 70bhp at 11,400pm respectively, these were unlike traditional Harley-Davidson twins.

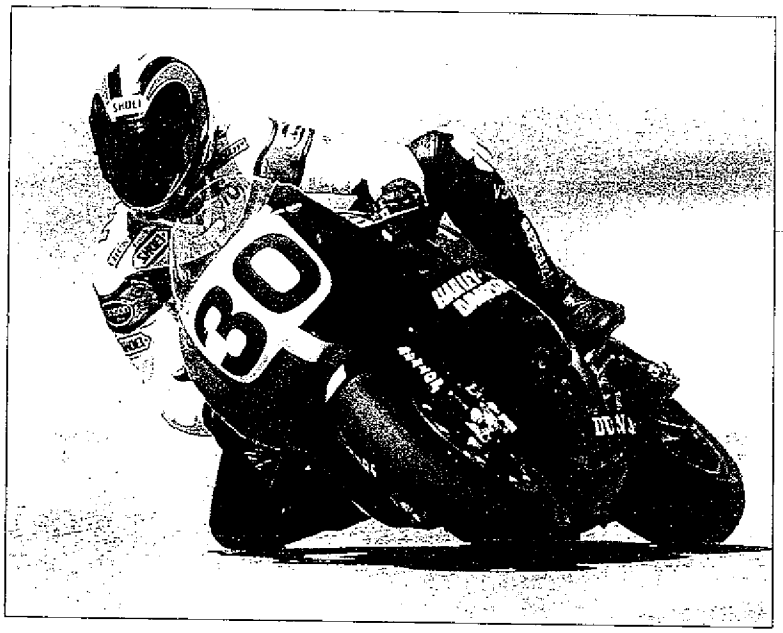
The engines were two-stroke, initially air-cooled but later with full liquid cooling. The gearboxes housed six ratios, due to the RR's narrow, peaky powerband. These two-stroke

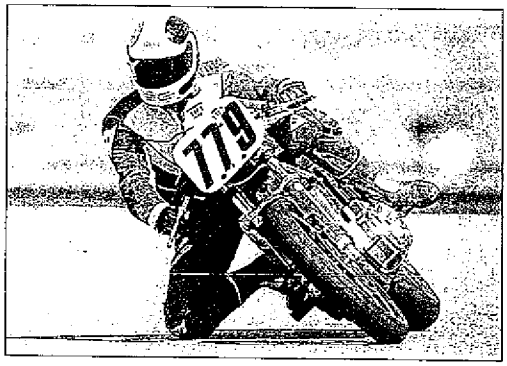
■ ABOVE LEFT *Based on the XR1000 roadster engine, Lucifer's Hammer surprised many onlookers by its speed in Battle of the Twins competition during the 1980s.*

■ ABOVE RIGHT *Walter Villa contesting the 250cc Belgian grand prix at Spa-Francorchamps in 1977 on an RR250. Despite carrying the number 10, he was world champion at the time.*



■ LEFT *An Aermacchi 350 charges round the Brands Hatch circuit.*





twins were also raced with some success in the United States by championship-winning riders such as Cal Rayborn and Gary Scott.

LUCIFER'S HAMMER

Perhaps the single most celebrated Harley racer of recent times, Lucifer's Hammer began its racing life with a win at Daytona in 1983 with the great Jay Springsteen on the saddle. The same bike went on to dominate American Battle of the Twins racing (under Harley Owners' Group sponsorship) during much of the 1980s, taking Gene Church to three consecutive American titles.

Powered by a highly-tuned XR1000 engine generating 104bhp at 7,000rpm, the Hammer was timed at no less than 158mph (254kph) at Daytona. The XR750 road race frame, albeit heavily reworked, had debuted at Daytona fully ten years before Springsteen's epic win, showing that at Milwaukee, they build 'em to last.

883 SPORT TWINS SERIES

The Sports Twins series, launched in the United States in 1989, quickly became a worldwide phenomenon. A "one-make" competition for modified 883cc Harley twins, the series' instant success saw it exported to race tracks all around the world, where spectators would flock to hear the thunder of a grid-full of Milwaukee twins. When Harley created the series, it probably expected it to be an all-American affair. If so, they were mistaken. That very first American Sports Twins series title was won by an Englishman, Nigel Gale.

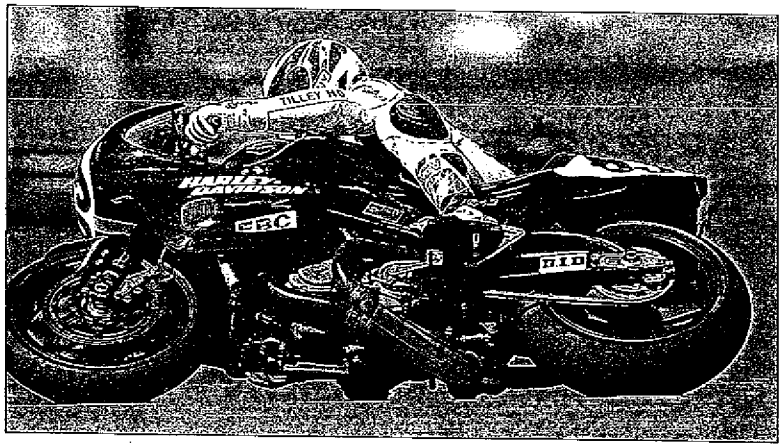
ABOVE *A Harley superbike – the factory VR1000.*

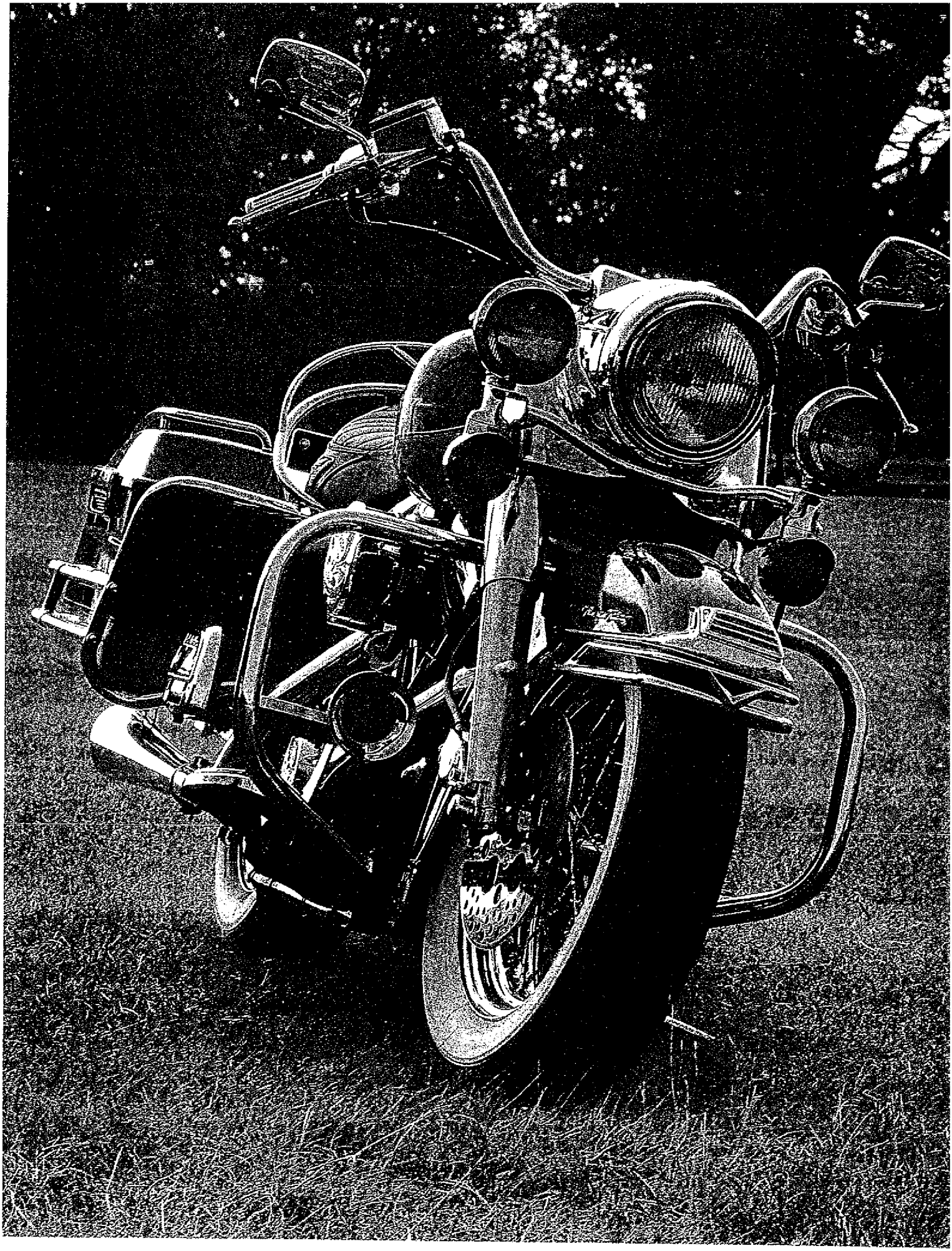
ABOVE RIGHT *Harley's inspired 883 Sportster series even attracted stars such as Jay Springsteen.*

VR1000

The factory has recently been striving towards a competitive presence in world superbike action. This has been achieved with the VR1000 twin ridden by former AMA Number Ones Chris Carr and Thomas Wilson and, latterly, by the former World Superbike champion, Scott Russell.

BELOW *Using double overhead cams in each head, four valves per cylinder and fuel injection, the VR1000 is unlike any Harley ever seen on the street.*



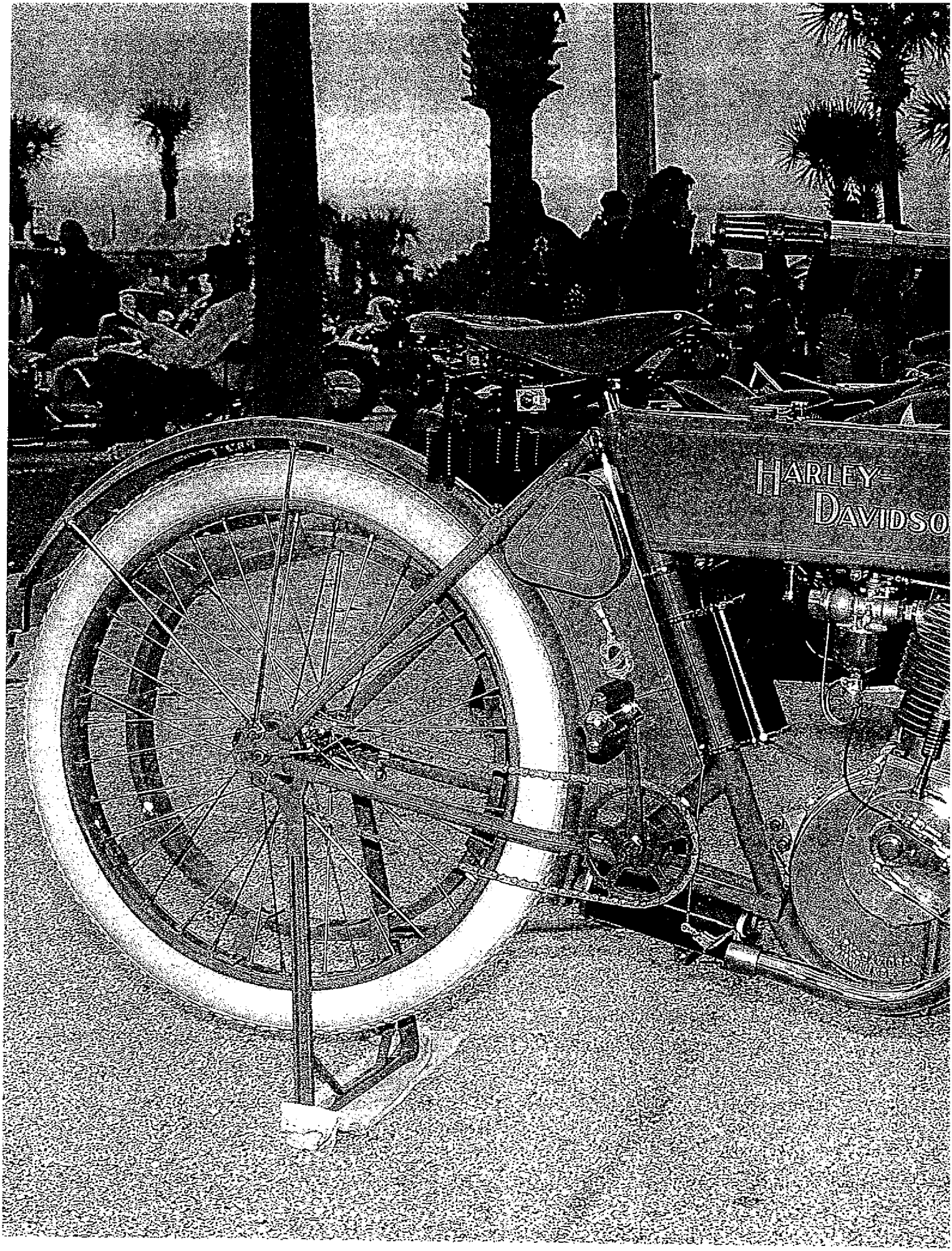


THE MODELS

The section that follows is a guide to the major models produced by Harley-Davidson, from the first primitive single of 1903 to the style kings and lavishly-equipped cruisers of today. It is not an attempt to cover every Harley-Davidson model, but all the most important and significant examples are included.

In reviewing machines spanning Harley-Davidson's history, the reader might become aware of one overriding enigma. The company is certainly the most enduring of all the world's motorcycle marques and is currently enjoying an almost unparalleled period of success. Yet, while other motorcycle manufacturers leap headlong into increased technical complexity, Harley-Davidson is as dedicated as ever to its original convictions of sound design and solid simplicity, remaining faithful to its dependable, thoroughbred V-twins.

What Harley-Davidson has in abundance is that indefinable quality called "character" – an attribute no specification panel can reveal. Harley-Davidsons are visceral. They have guts and charisma. Only by riding one can you really begin to understand.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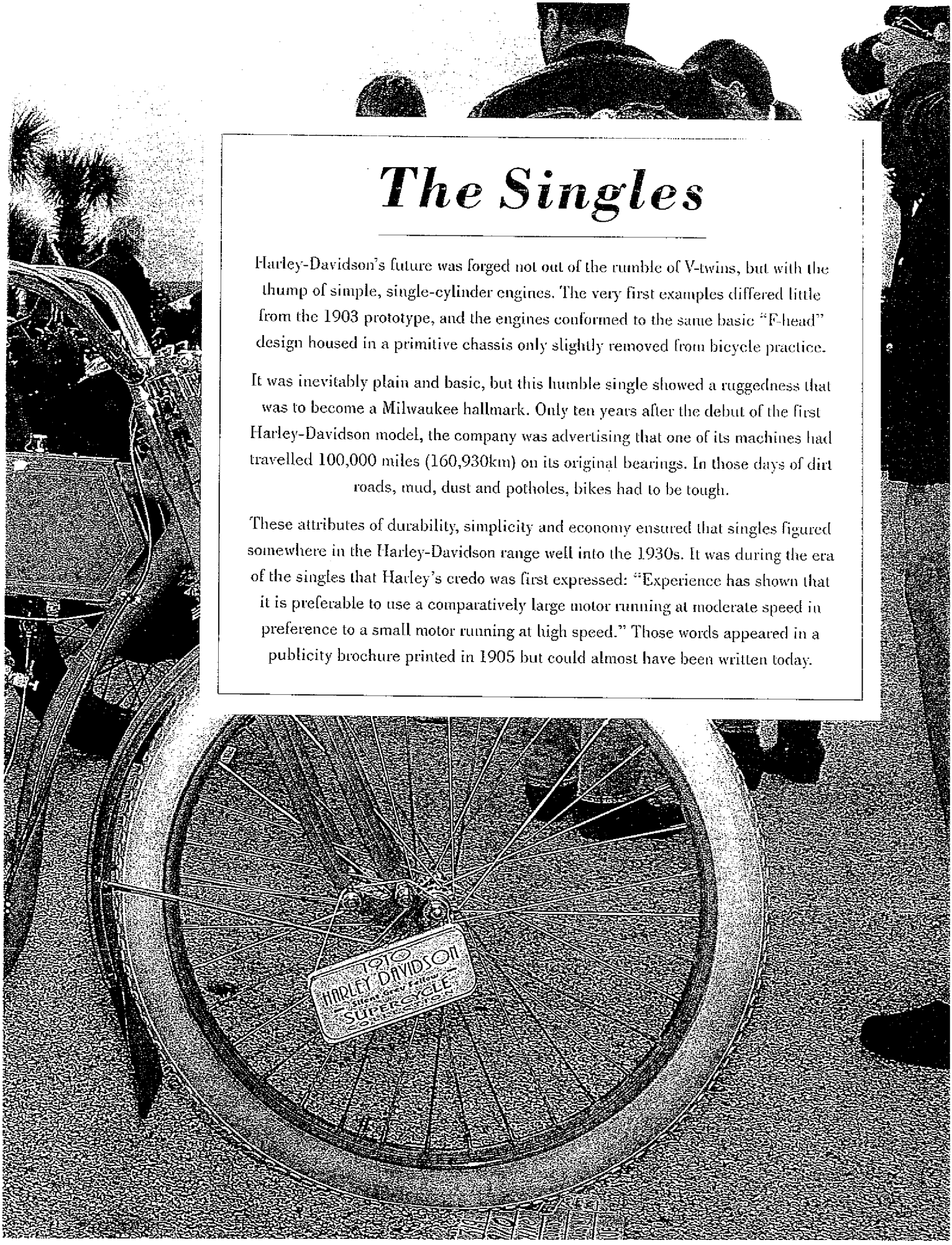


The Singles

Harley-Davidson's future was forged not out of the rumble of V-twins, but with the thump of simple, single-cylinder engines. The very first examples differed little from the 1903 prototype, and the engines conformed to the same basic "F-head" design housed in a primitive chassis only slightly removed from bicycle practice.

It was inevitably plain and basic, but this humble single showed a ruggedness that was to become a Milwaukee hallmark. Only ten years after the debut of the first Harley-Davidson model, the company was advertising that one of its machines had travelled 100,000 miles (160,930km) on its original bearings. In those days of dirt roads, mud, dust and potholes, bikes had to be tough.

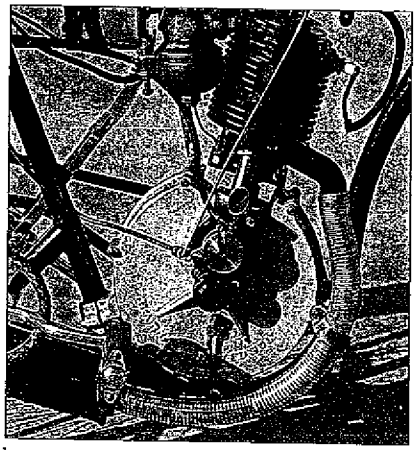
These attributes of durability, simplicity and economy ensured that singles figured somewhere in the Harley-Davidson range well into the 1930s. It was during the era of the singles that Harley's credo was first expressed: "Experience has shown that it is preferable to use a comparatively large motor running at moderate speed in preference to a small motor running at high speed." Those words appeared in a publicity brochure printed in 1905 but could almost have been written today.

FIRST SINGLE, 1903–11

■ BELOW AND BOTTOM *One of the first De Dion-Bouton-inspired singles. Pedal assistance was essential on hills. The belt final drive with its crude de-clutching mechanism is clearly seen in the lower photograph. The 1910 "Silent Gray Fellow" is altogether more sophisticated but retains pedals and belt final drive.*

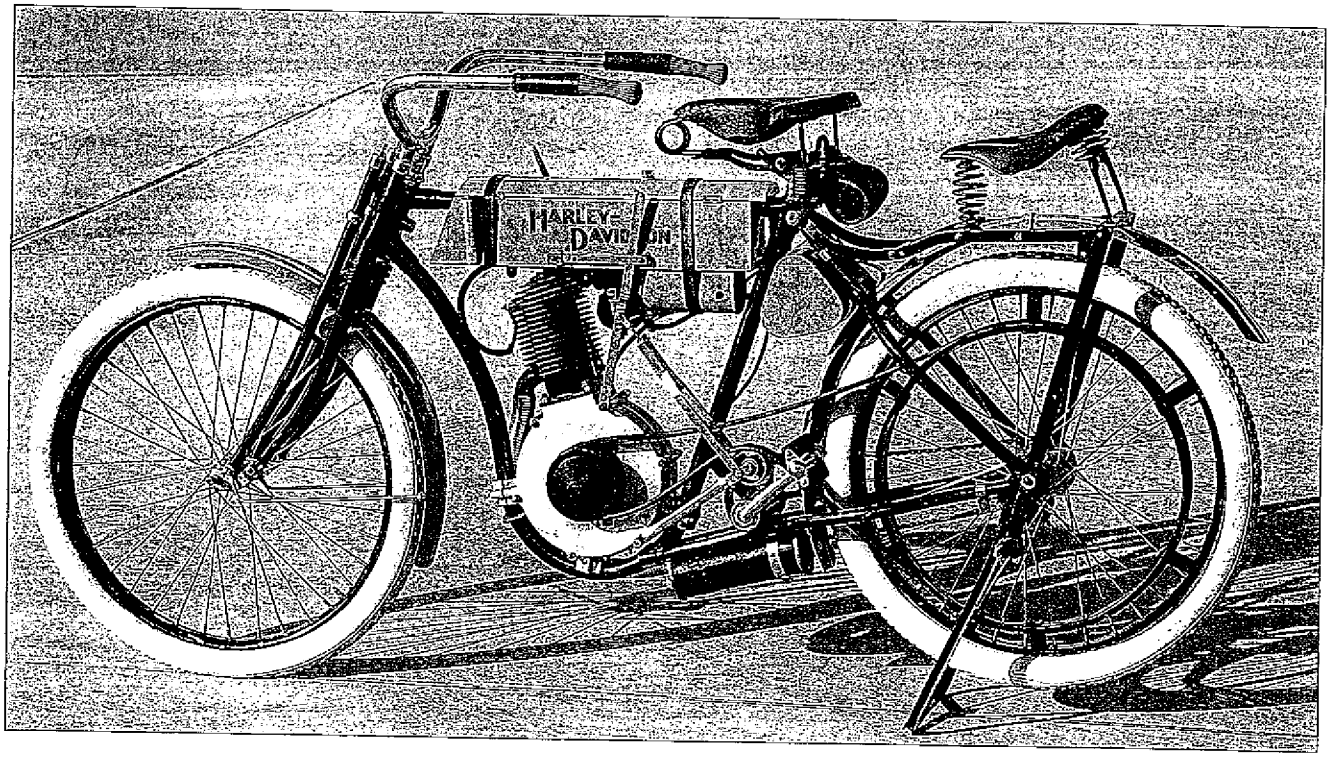
Harley-Davidson's first motorcycle, though nominally a single-cylinder model, evolved with the company over a production span of eight years. During that time, annual production figures soared from fewer than a handful to over 4,000 as demand – and know-how – grew in leaps and bounds. One thing that changed relatively little was the price: $200 in 1904, yet only $25 more by the time production ceased in 1911.

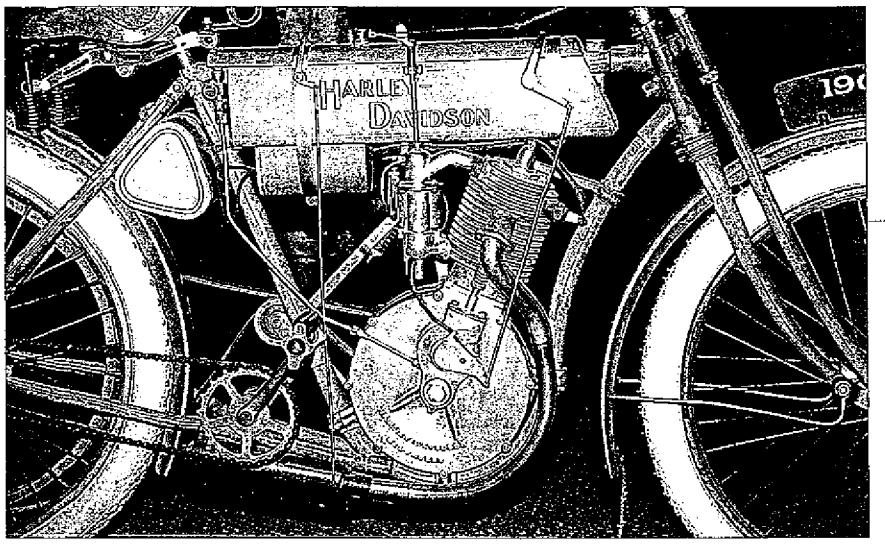
The heart of the engine was a bolted-up crankshaft running car-type, plain, big-end bearings in cast aluminium crankcases. Above this sat a one-piece iron cylinder head and cylinder barrel housing an iron piston. To allow for differential expansion – its top generated far more heat than its bottom – each piston was tapered, a considerable machining achievement for the time. Valve layout was inlet-over-exhaust, the "automatic" or "vacuum" inlet valve controlled – crudely – via pressure created by the rise and fall of the piston. Removable housing permitted the extrication of both valves for servicing: no method of valve-lash adjustment was available until 1908.

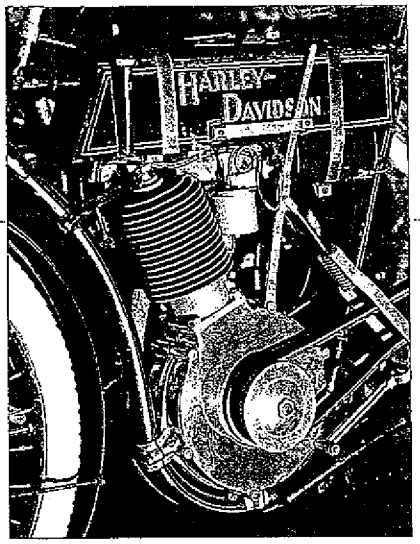


SPECIFICATIONS (1909)	
Engine	single cylinder ioe with automatic inlet valve
Capacity	30.16cu in (495cc)
Transmission	single speed, leather belt drive
Power	around 3.5bhp
Weight	185lb (84kg)
Wheelbase	51in
Top speed	around 45mph (72kph)

The initial cylinder dimensions of 3 x 3⅛in (76.2 x 88.9mm) gave a displacement of 24.74cu in (405cc). In 1905, the bore increased to 3⅛in (79.4mm), giving 26.84cu in (440cc). At the same time, the single loop frame was redesigned, as all previous examples







showed a tendency to crack at the headstock. Capacity was further increased to 30.16cu in (495cc) in 1909 by a 1/16in (1.6mm) increase in bore, by which time the exhaust port had also migrated from the side towards the front of the cylinder. Until 1910, all the motors had used horizontal "beehive" finning for both barrel and head; in 1911 this changed to distinctive vertical cylinder head finning.

Lubrication, like almost all engines of the time, was "total-loss" – a gravity feed dripping oil into the engine from a half-gallon (1.9 litre) tank, good for around 750 miles (1,200km). Transmission was of the simplest possible type with a 1¼in-wide (32mm), two-ply leather belt driving the rear wheel directly. There was no gearbox or clutch, although belt tension could be adjusted on the move by 1911.

The starting technique was straightforward, if energetic – run alongside then jump on board and pedal like mad until the motor fired.

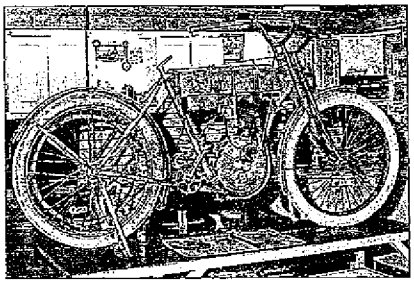
A hand-crank starter became available in 1906 for an additional cost, and was standardized the following year, although neither method of starting was notably elegant.

Like modern motorcycles, power was governed by a twist-grip on the right-hand handlebar and a simple "coaster" brake in the rear hub slowed things down. Lighting of any kind was only made available with the introduction of acetylene lights in the final year of production. Initially, suspension consisted entirely of springs under the leather saddle – and whatever the rider could suffer – but, in 1907, a crude but remarkably effective Sager front fork was added to ease the pain.

As well as standard, conservative "piano" black, by 1906 the single was also available – at an extra cost – in "Renault" pale grey with red pin-striping. This model thus became known from then on as "The Silent Gray Fellow", partly in tribute to its unusually effective silencing. Unpainted metal parts were nickel-plated and the aluminium engine covers were brightly polished to a high shine.

■ ABOVE LEFT *By 1907, the single had grown to 26.84cu in (440cc), was looking more sophisticated and had changed hue: "The Silent Gray Fellow".*

■ ABOVE RIGHT *A 1905 24.74cu in (405cc) single, which cost $200 when new.*



■ ABOVE *A very original 1907 single undergoing restoration work.*

HIDDEN TREASURE

The very first production Harley-Davidson may currently enjoy pride of place behind a bullet-proof glass screen in the Juneau Avenue lobby, but it hasn't always been quite so treasured.

The bike was originally retained by the company and sent to the Pan American Exposition in California in 1915 (since which time Harley has kept at least one example from each year of production). Upon its return, however, the company somehow "forgot" this bike was Number One. During the 1970s, it was damaged in transit to the Rodney C. Gott Museum in York, but its true identity remained unrealized, even while it was being repaired.

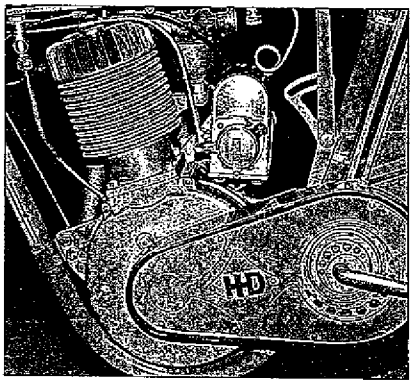
It was only when it underwent a recent comprehensive restoration at the hands of Harley Archives craftsman, Ray Schlee, that the machine's true pedigree was disclosed – by internal parts bearing the legend "Number 1." It is believed to have been raced in 1904 but is now housed in a 1905 frame, as all the earlier examples broke at the headstock.

This unique machine has now been insured for $2 million.

MODEL 5-35 SINGLES, 1913–18

The second-generation single-cylinder machine, produced from 1913 to 1918, housed a refinement of the earlier engine rather than an all-new design. Although the bore remained unchanged at 3⅜in (84.1mm), the stroke increased from 3½ to 4in (88.9 to 101.6mm), giving a capacity of 34.47cu in (565cc). The new engine was known generically as the 5-35, signifying 5 horsepower and 35 cu in.

Many lessons learned during the troubled development of the first twin were incorporated in the new single's design. Valve layout was still inlet-over-exhaust, although now the inlet valve followed the revised V-twin practice of mechanical operation via a long push rod on the motor's right-hand side. The camshafts – one exhaust, one inlet – were driven by a chain of gears, ending with the Bosch magneto (replaced by a Remy instrument from 1915) which provided the sparks.



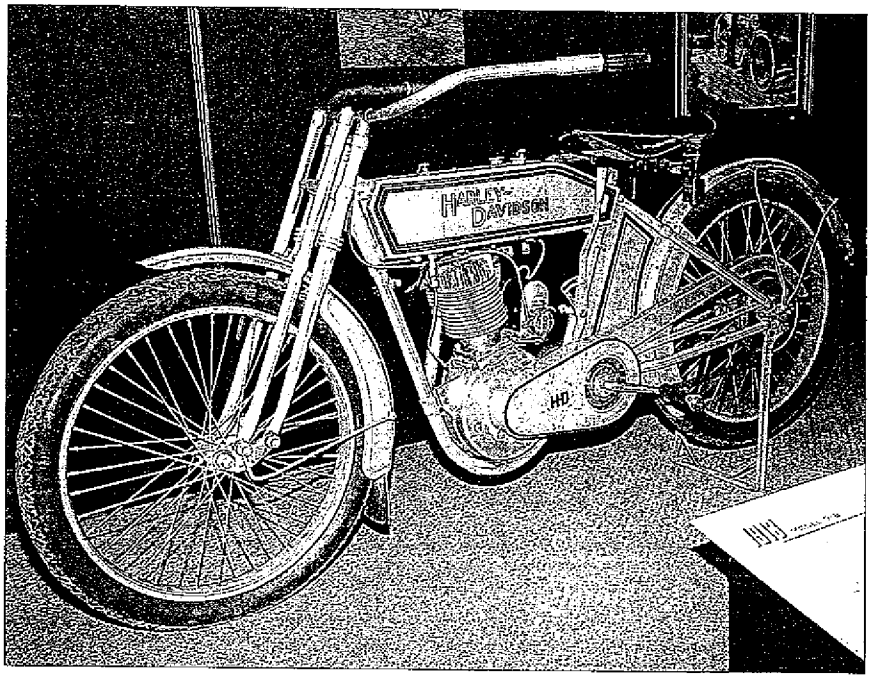
■ ABOVE AND BELOW *By the time this Model 9-B was built in 1913, chain drive was a factory option on single-cylinder machines and twins. Both the chain-drive and belt-drive singles cost the same: $290, $60 less than the twin.*

As before, the iron cylinder head and barrel were one-piece, accommodating a steel three-ring piston. The crankcases were of aluminium, in which a high-grade steel crankshaft ran on phosphor-bronze main bearings, with the whole crank assembly balanced. Lubrication was still total-loss, engine oil being metered by hand from its own compartment in the tank slung beneath the frame's top rail. A sight-glass below the tank gave the rider some idea how frequently to deliver drops of oil. As well as manipulating this, the rider was required to adjust the degree of ignition advance (in other words, the precise point at which the spark plug ignited the mixture), by means of yet another control lever. In those days, getting the best out of an engine was not a simple business. It demanded considerable awareness from the operator.

Perhaps the most obvious difference between these early singles was the replacement of belt with chain as the drive medium, eliminating the wet-weather slip that plagued all leather belt drives. On early examples, the drive was taken direct, via roller chain, from a sprocket on the left-hand end of the crankshaft to another on the rear hub. The same hub also contained a type of rudimentary clutch operated by a long lever on the left side of the machine. Starting involved placing the machine on its stand, which lifted the rear wheel off the ground, then vigorously rotating the bicycle-type pedals. These same

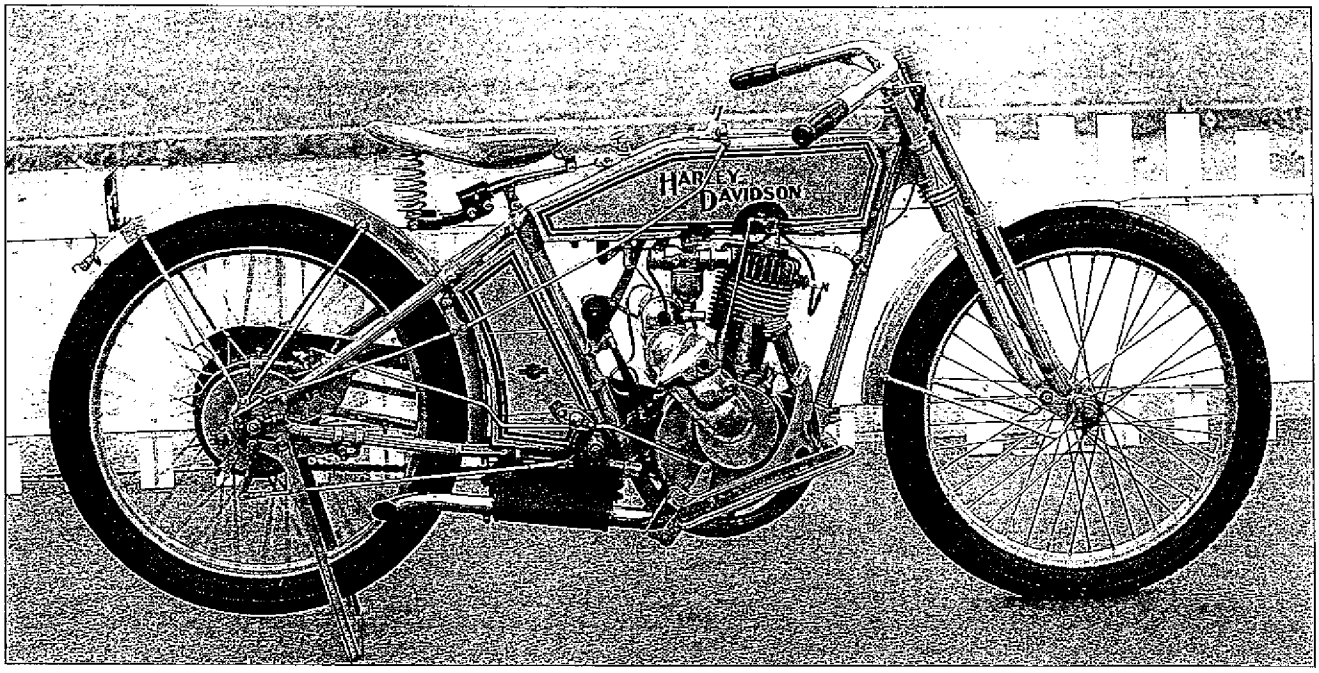
SPECIFICATIONS

Engine	ioe single
Capacity	34.47cu in (565cc)
Transmission	1-, 2- and 3-speed
Wheelbase	55in (1,400mm)
Top speed	around 54mph (87kph) (side-valve) or 65mph (105kph) (ohv)



■ BELOW *All three images show a two-speed Model 10-C from 1914. The single-speed Model 10-B proved far more popular.*

■ BOTTOM LEFT *Harley's astonishingly complex two-speed rear hub is clearly visible in this view. The hub employed a ring of interlocking bevel gears to vary the final drive ratio.*



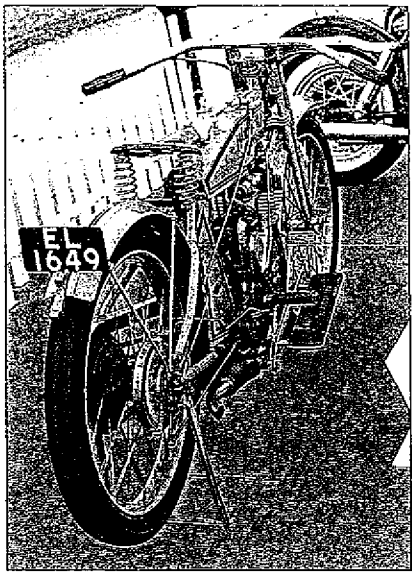
pedals, when rotated backwards, engaged the "coaster-type" rear brake via a chain on the right-hand side. Lever-operated brakes did not appear until 1918.

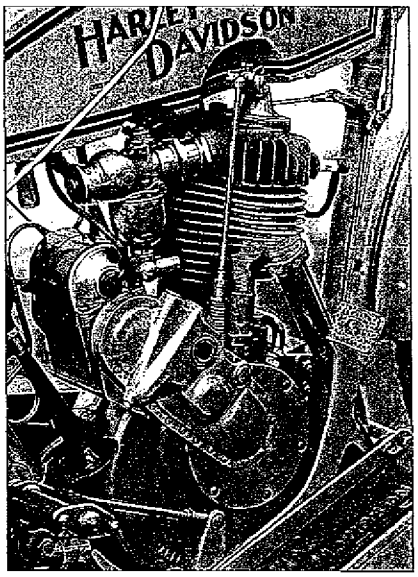
A "step-starter" and Harley's first two-speed rear hub arrived in 1914 (also in the V-twin), offering increased flexibility with maximum speeds of around 54 and 65mph (87 and 105kph) in the two ratios. Within a year, this deceptively intricate device had given way to three-speed transmission with a true sliding-pinion gearbox on better-specified models. Nonetheless, single-speed and even belt-drive models continued to be built for some years.

Chassis refinements included a more robust front suspension offering around 2in (50mm) of travel. The rear, of course, would remain rigid for many years. However, a degree of consolation was provided by Harley's patented "Full Floteing" seat.

As well as the paired springs common on other motorcycles, this seat featured a hinge at the front and a coil spring inside the seat post to cushion the rider from the worst of the bumps.

■ BELOW *Although it retained pedals, the two-speeder offered footboards for the first time. Note the ignition magneto which is below the carburettor.*

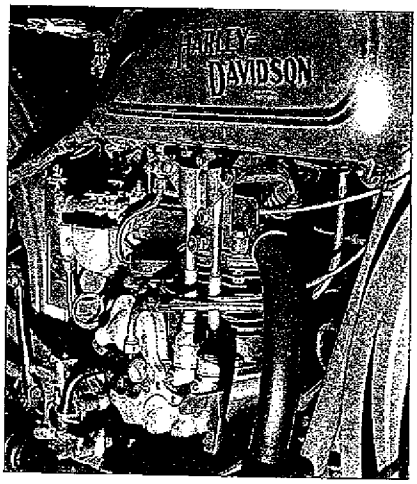




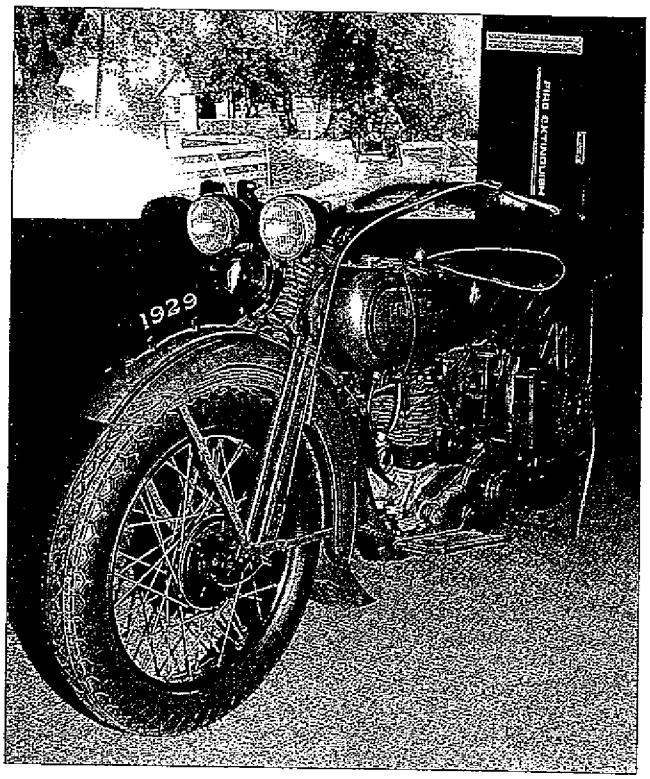
MODELS A & B SINGLE, 1926–34

Although single-cylinder machines were as much a hallmark of Harley-Davidson's formative years as the big V-twins with which they are now associated, Juneau Avenue produced almost no such models from 1919 until 1926. The sole exception was the Model CD, a 37.1cu in (608cc) machine created by the simple expedient of removing one pot from the 74-inch twin. It was built in very small numbers from 1921 to 1922 and was intended for commercial use only. When singles did reappear, they were considerably smaller than before, displacing just 21.1cu in (346cc) compared to the earlier 30-inchers.

Somewhat confusingly, the single was known simultaneously as both Model A and Model B. The former denoted a magneto version, the latter that the machine was fitted with a generator and coil ignition. This was further refined into Models AA and BA Sport Solos, where the second letter indicated that the engine had overhead valves. The more basic model, designated by a simple A or B was of straightforward "flathead" design, with valves side-by-side and operated by short push-rods.



SPECIFICATIONS	
Engine	side-valve or overhead valve single
Capacity	21.1cu in (346cc)
Transmission	3-speed
Power	8bhp (side-valve) or 12bhp (ohv)
Wheelbase	55in (1,400mm)
Top speed	around 50mph (80kph) (side-valve) or 60mph (96kph) (ohv)

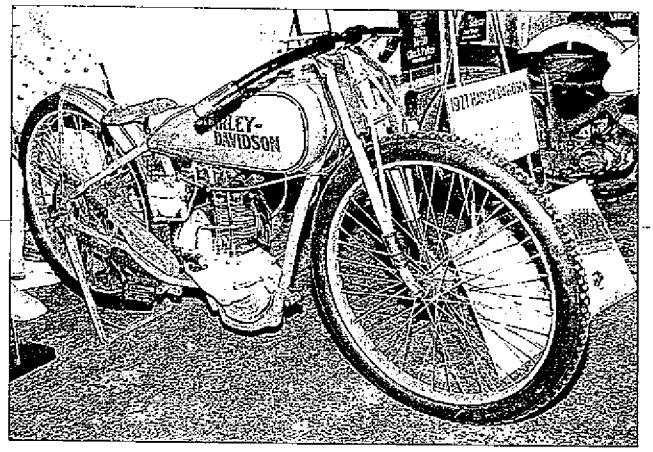


■ ABOVE *The ohv "Peashooter" engine. The push-rods, rocker arms and exposed valves are clearly visible.*

■ LEFT *Dual "bullet" headlights first appeared on this 1929 500cc single, derived from the Models A and B. Note the front brake – another novelty introduced the previous year.*

The overhead-valve model was an altogether more potent piece of machinery that would achieve considerable competition success as the legendary Peashooter racer. It was inevitably less aggressive in roadster trim, yet still capable of what was then a giddy 4,800rpm and close to 65mph (105kph). Its side-valve sibling, on the other hand, struggled to exceed 50mph (80kph). Despite this marked difference, both engines were rated at 3.31 horsepower. At the time, quoted power figures were not a measure of actual output, merely a function of piston displacement and thus quite meaningless as a reflection of performance. Modern power figures, of course, describe actual output. Strangely, Harley chose to promote the flathead at the expense of the more advanced engine, probably because side-valves would soon comprise the vast bulk of the Milwaukee range.

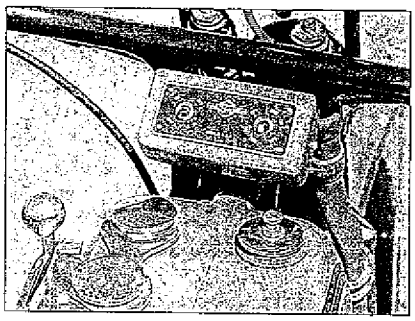
Mechanically, the engine featured a lightweight aluminium alloy piston



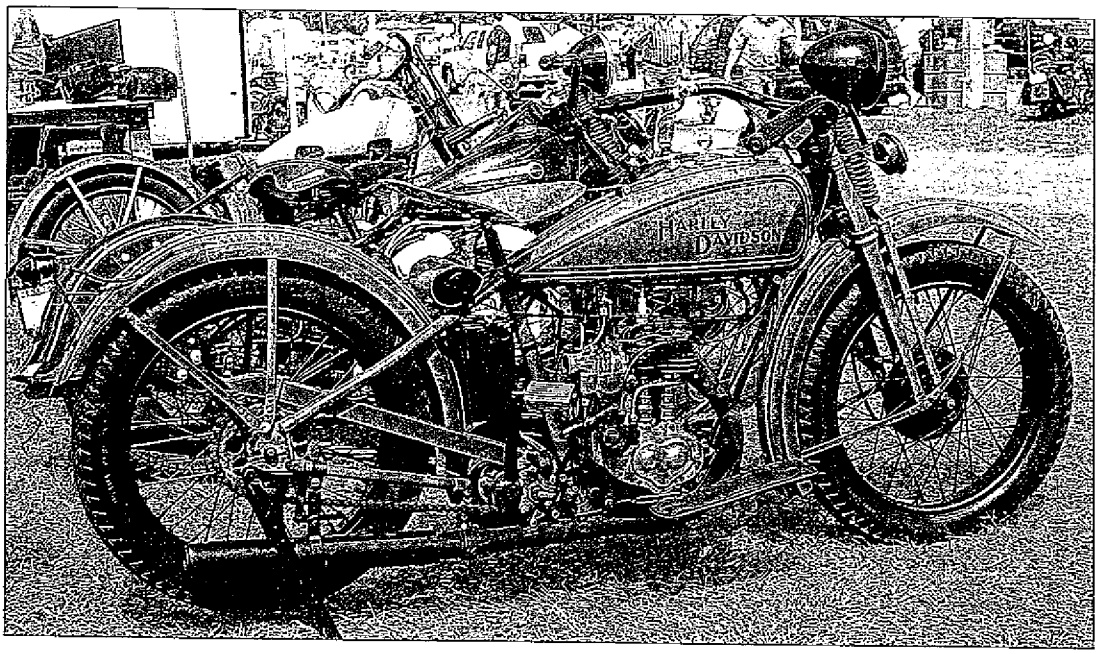
■ LEFT *Stripped-down racing version of the ohv "Peashooter". Note low, pulled-back handlebars and spartan saddle.*

(initially iron for the side-valve machines) running in a cast-iron cylinder. Typically for the time, the overhead's valve gear was exposed, although the 21.1 cu in (344cc) single was the first Milwaukee engine lubricated by a proper mechanical pump. Nonetheless, a hand pump was retained for supplementary oiling when the engine was under extreme loads. Transmission was by the now-familiar three-speed sliding gear, driven by a foot-operated single-plate dry clutch.

By the time of the new single's debut in 1926, electrical equipment had leaped forward in specification and dependability. Although full electrical equipment was optional (Models A and AA came as standard with just a magneto to generate sparks), it was also comprehensive. Generator models featured a coil and distributor (to power and time the ignition), battery, horn, two-bulb headlight and tail-light, all controlled from a switch on the steering head – everything you might expect to find on a modern motorcycle, except stop-light and indicators. Less can be said for the cycle parts. True, the single wore the new type of teardrop petrol (gas) tank, which wrapped over the top frame tube rather than hung from it, as before. At the front, Harley's familiar sprung forks gave some comfort and control, but the rear end was rigid and would remain so for more than 20 further years. The rear hub did contain a brake – a 5½in (146mm) drum – but the front wheel contributed nothing to retardation. It would be another two years before Milwaukee installed their first front brake. During the early 1930s, "21"'s sales were hit, partly by the relative success of the Series C single, but mainly by the Depression. Domestic supplies were halted during 1931 when just three examples were exported. The ohv model never reappeared, although flathead sales rallied slightly before the model was axed at the end of 1934.



■ ABOVE RIGHT *Note the gear lever (left) and fillers for oil and fuel. The switch console is a later addition.*



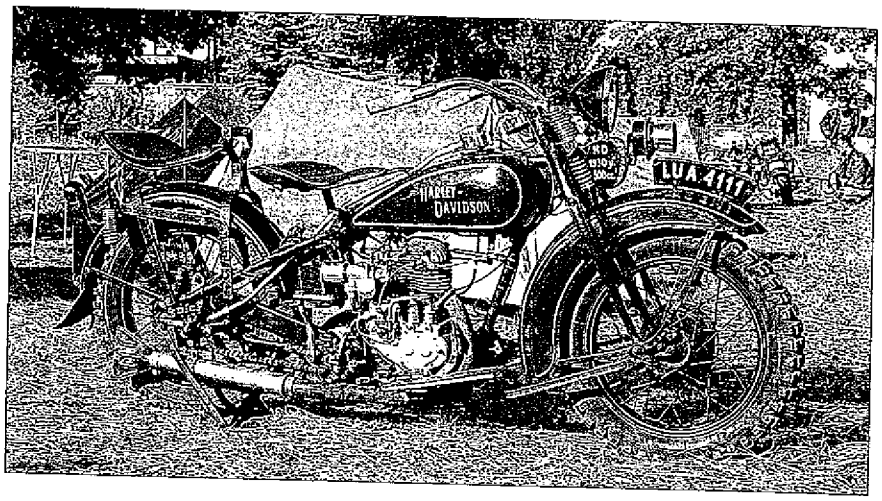
■ RIGHT *Although only $40 cheaper, flatheads such as this Model 26-B solo comfortably outsold the more exotic ohv singles.*

MODEL C SINGLE, 1929–34

In 1929, the Model A and B singles got a bigger brother with the introduction of the Model C. Displacing 30.1cu in (493cc), the newcomer's top end was essentially half of the old 61-inch Model F/J twin, mated to the 21-inch single's bottom end. This was clearly a more sound solution than the trick many American racers had been pulling for years – they had simply removed one top end and connecting rod from the J, blanked off the hole and let rip on the track. Road riders demanded something slightly more elegant.

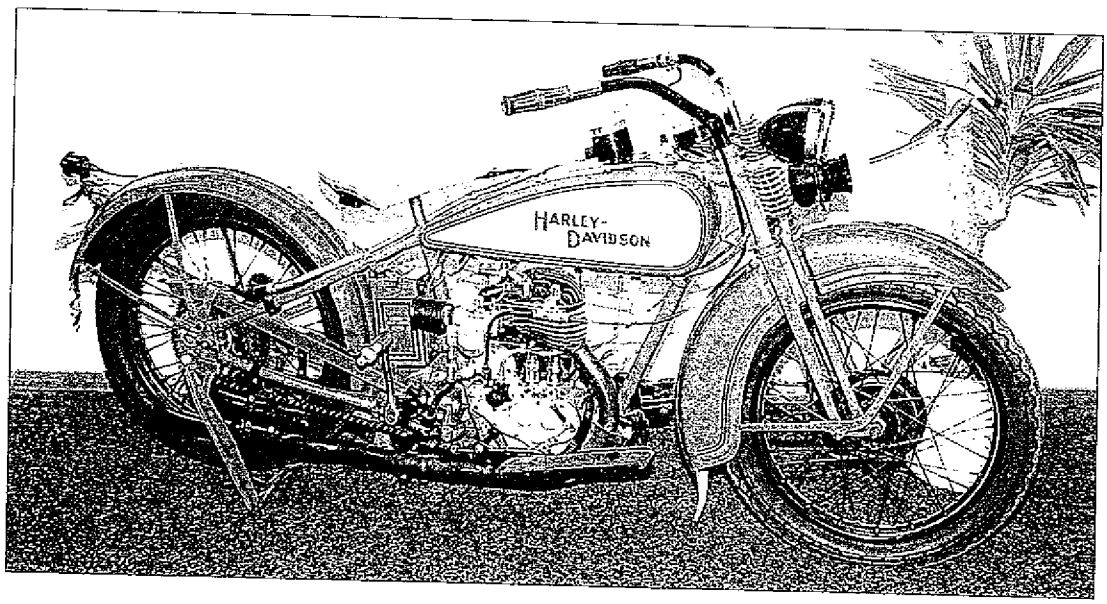
Unlike the "21" however, this time no overhead-valve variant was offered; the model was resolutely side-valve, although the greater pulling power of the 30-inch motor meant that, for the modest uses for which most singles were destined, no overhead valves were required. Power was sufficient for a top speed approaching 60mph (96kph).

Compared to the smaller single, the "30" was both bored and stroked with even more undersquare dimensions of 3⅜ x 4in (78.6 x 101.6mm). Since it was also slower revving than the "21", a 42 per cent increase in capacity realised only a 25 per cent increase in power, from eight to ten horsepower. Both machines shared a similar three-speed transmission. An overhead-valve competition derivative, the Model CA (later CAC) was produced in very limited numbers. By the time of the Model C's debut in 1929, Harleys had begun to develop front brakes (they also



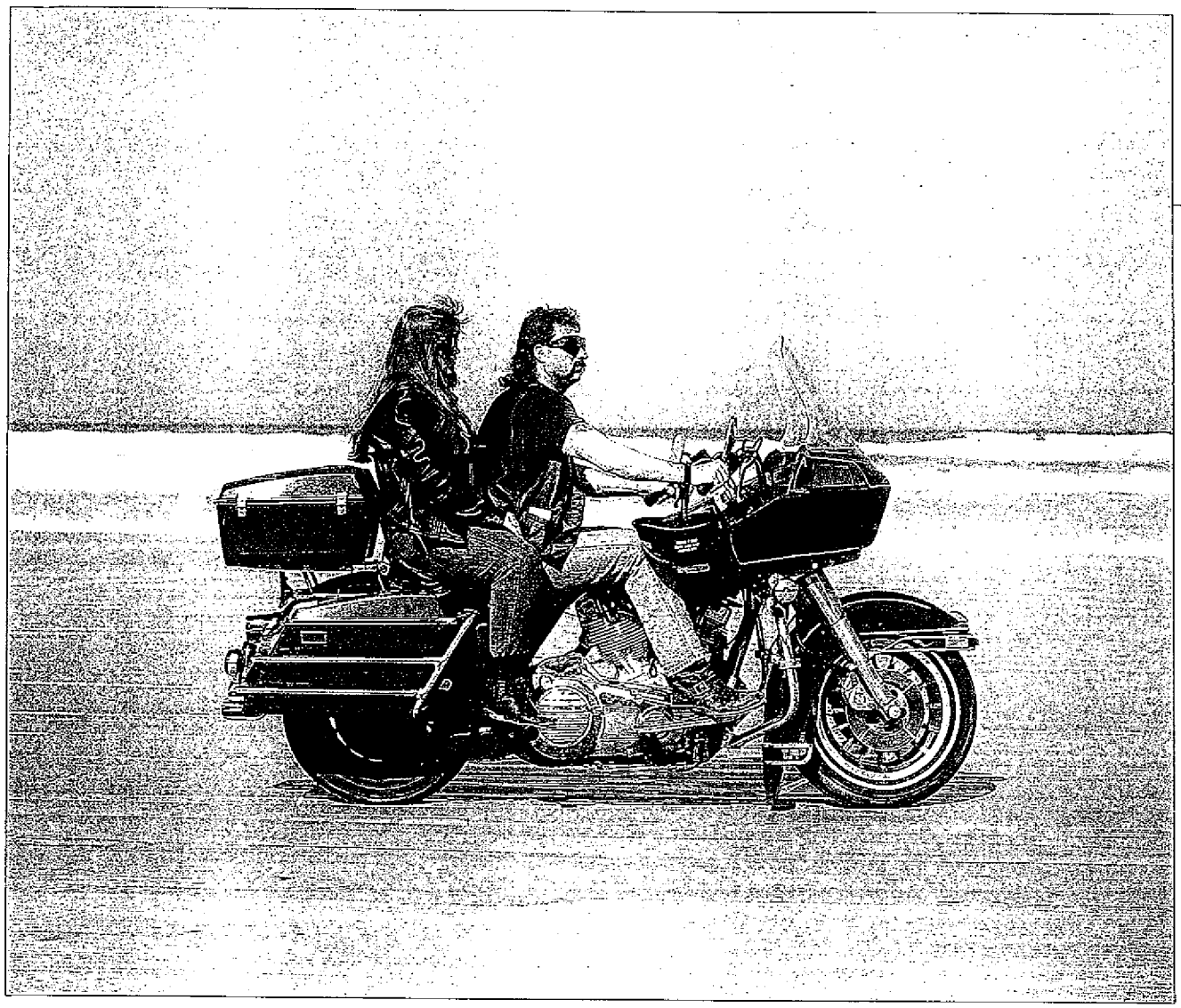
SPECIFICATIONS

Engine	side-valve single
Capacity	30.1cu in (493cc)
Transmission	3-speed
Power	10bhp
Wheelbase	57½in (1,460mm)
Top speed	around 56mph (90kph)



■ ABOVE *This Series C 500cc 3-speed single shows the low-line frame introduced in 1930.*

■ LEFT *A 1929 500cc single. At the time, the vibrant paint job was optional only on twins.*



■ ABOVE *This mammoth modern ElectraGlide might look a far cry from the early singles, but they are very much its ancestors.*

featured on the 45-inch twin that appeared in the same year). Like the rear brake, this was a simple, single-leading shoe drum, but activated by a lever on the right handlebar, as is the practice today.

Early examples shared the same frame and running gear as contemporary 21-inch singles, but during the second year of production the larger engine was installed in a chassis "borrowed" from the twin. This turned the robust little single into a "full-size" motorcycle – ironically with a lower seat height but increased ground clearance.

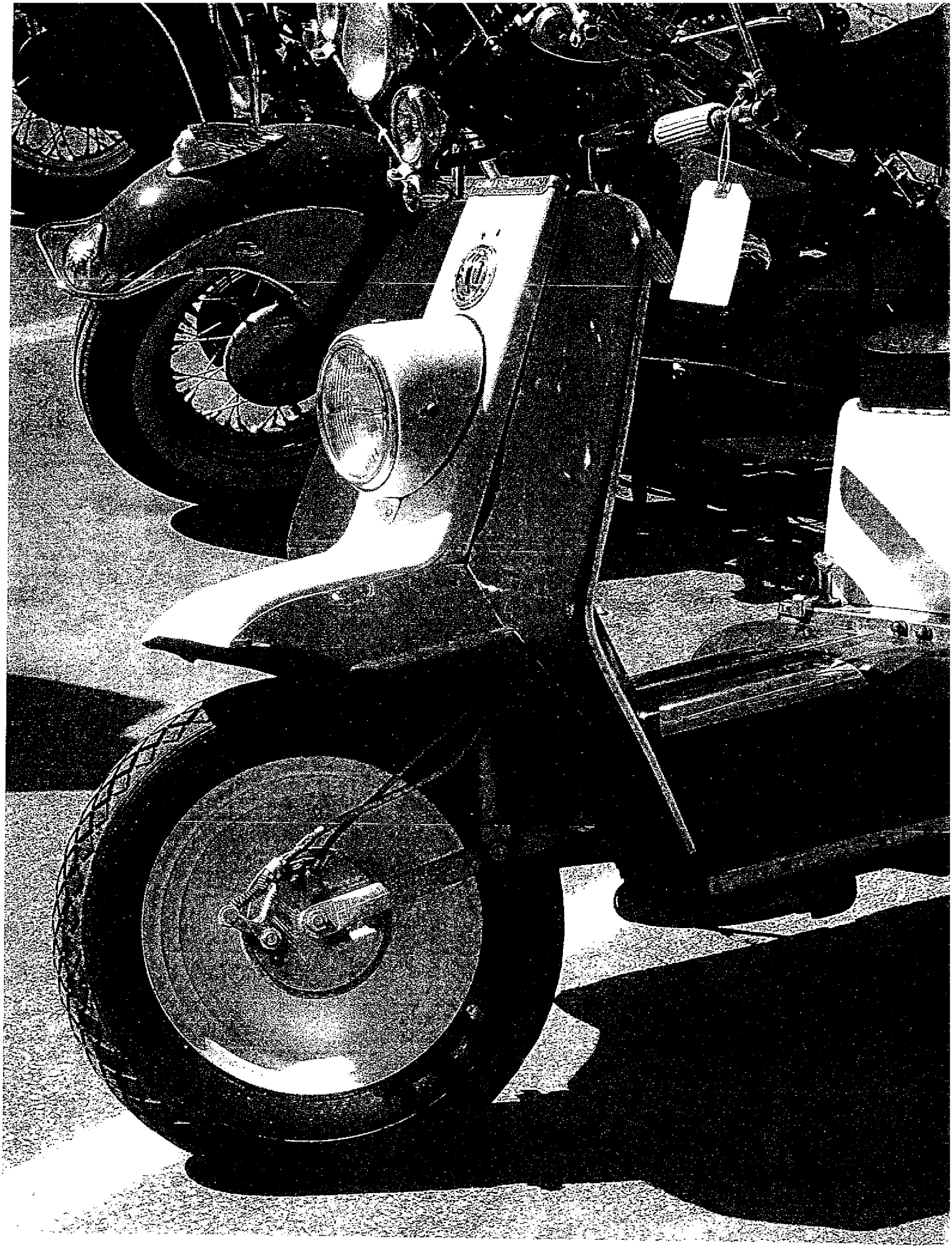
More ironically still, in 1933 it was joined by the Model CB, essentially a 30-inch engine in 21-inch running gear – a choice perhaps prompted by excess stock of the latter.

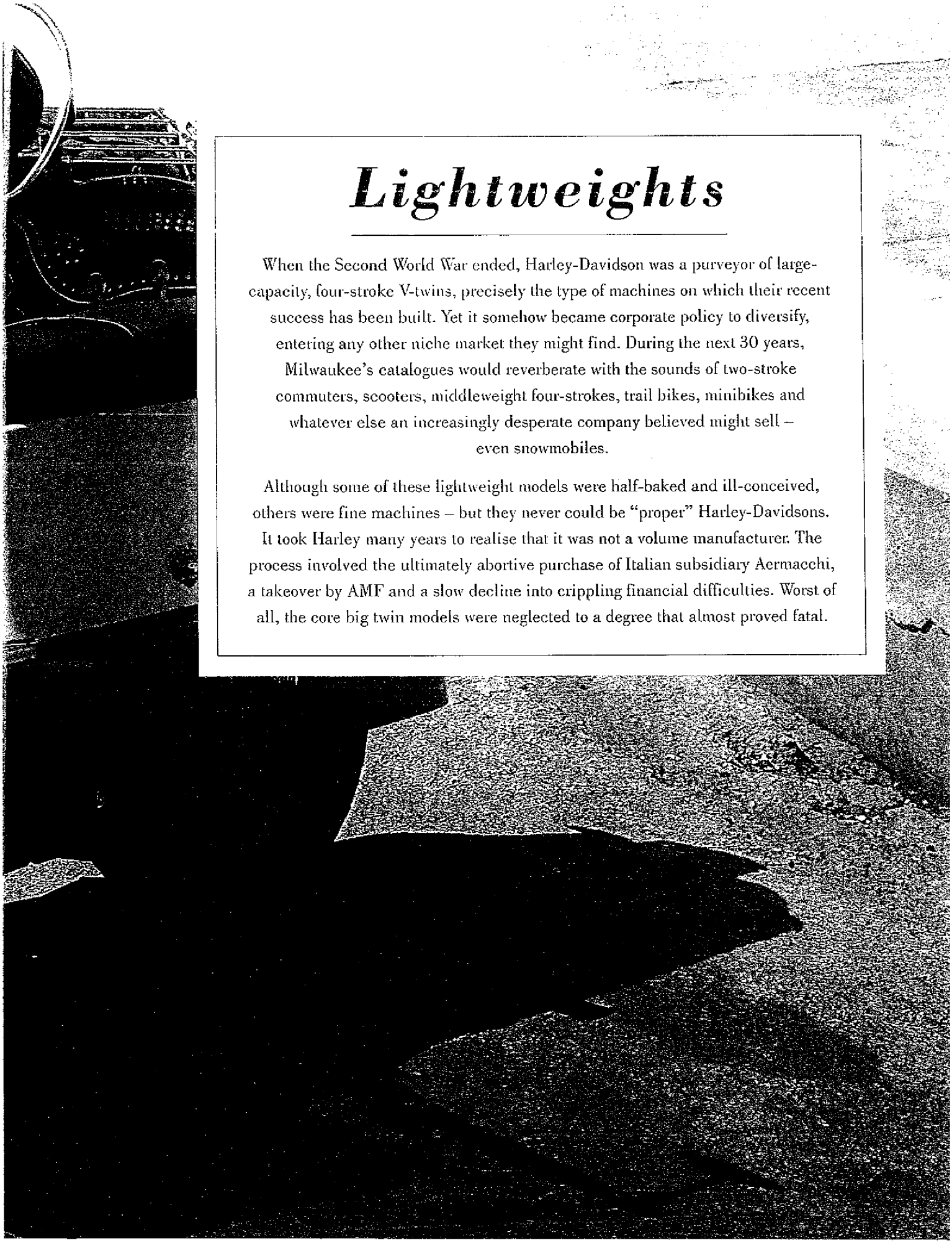
Worthy as the Model C was, the majority of American motorcycle buyers still hankered after twin-cylinder pulling power even during the depths of the Depression.

A measure of the singles' problem at home was that, during 1929, sales of the 21- and 30-inch singles combined were little more than half of those of the Series D twin – 3,789 units compared to 6,856.

Nonetheless, though comparatively unheralded in their own country, the sturdy little singles proved popular overseas as Harley-Davidson continued to develop its international markets, where the sheer weight and size of the big twins often posed problems to potential buyers. Not surprisingly, the larger single had soon became the dominant seller.

Initially priced at just $20 more than the $235 price-tag of the "21", the Model C comfortably outsold the smaller machine from 1930 onwards. More than 5,000 units of the popular Series C were produced in total over the life span of the model, which was to be six years in all.



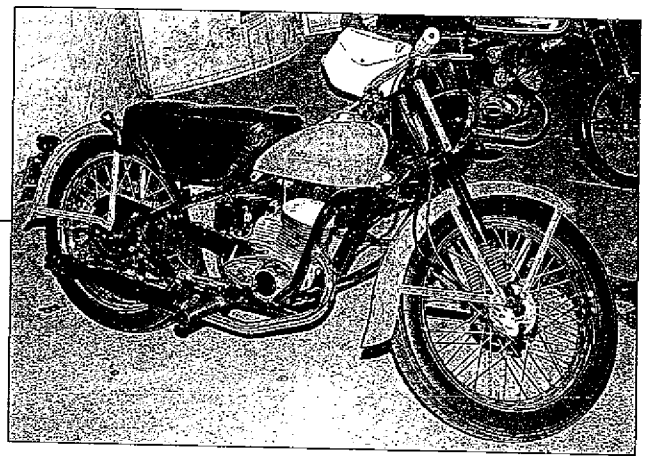


Lightweights

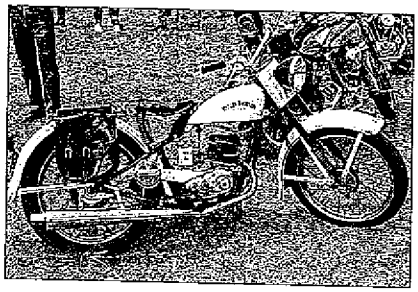
When the Second World War ended, Harley-Davidson was a purveyor of large-capacity, four-stroke V-twins, precisely the type of machines on which their recent success has been built. Yet it somehow became corporate policy to diversify, entering any other niche market they might find. During the next 30 years, Milwaukee's catalogues would reverberate with the sounds of two-stroke commuters, scooters, middleweight four-strokes, trail bikes, minibikes and whatever else an increasingly desperate company believed might sell – even snowmobiles.

Although some of these lightweight models were half-baked and ill-conceived, others were fine machines – but they never could be "proper" Harley-Davidsons. It took Harley many years to realise that it was not a volume manufacturer. The process involved the ultimately abortive purchase of Italian subsidiary Aermacchi, a takeover by AMF and a slow decline into crippling financial difficulties. Worst of all, the core big twin models were neglected to a degree that almost proved fatal.

STATESIDE STROKERS



■ LEFT AND BELOW LEFT *Two variants of the Milwaukee two-stroke derived from the German DKW. Note rigid rear end, "Tele-Glide" front forks and the fuel tank shape which would become the inspiration for the Sportsters.*



■ MODEL S-125, 1948–52
MODEL ST-165, 1953–9
MODEL B HUMMER, 1955–9

Harley-Davidson's first venture into the world of two-strokes owed much to the end of the Second World War. On the one hand, it was assumed that thousands of demobbed GIs would crave almost any motorcycle they could lay their hands on, and the 125cc single was considered the ideal low-cost candidate. Second, the design was basically that of the pre-war DKW RT125.

When partition placed the factory in the new East Germany, the design passed to the Allies as war reparations. British BSA's hugely successful Bantam was also a DKW copy, as was the very first Yamaha, the YA1 "Red Dragonfly".

Producing just three horsepower from its simple piston-ported, air-cooled engine, the S-125 must have been a profound disappointment to any American biker raised on big four-stroke power.

Juneau Avenue was evidently hopeful about selling these machines in huge numbers, producing more than 10,000 in the model's first year, but sales proved poor, settling to around 4,000 per annum even after the introduction of a "Tele-Glide" version with telescopic forks in 1951.

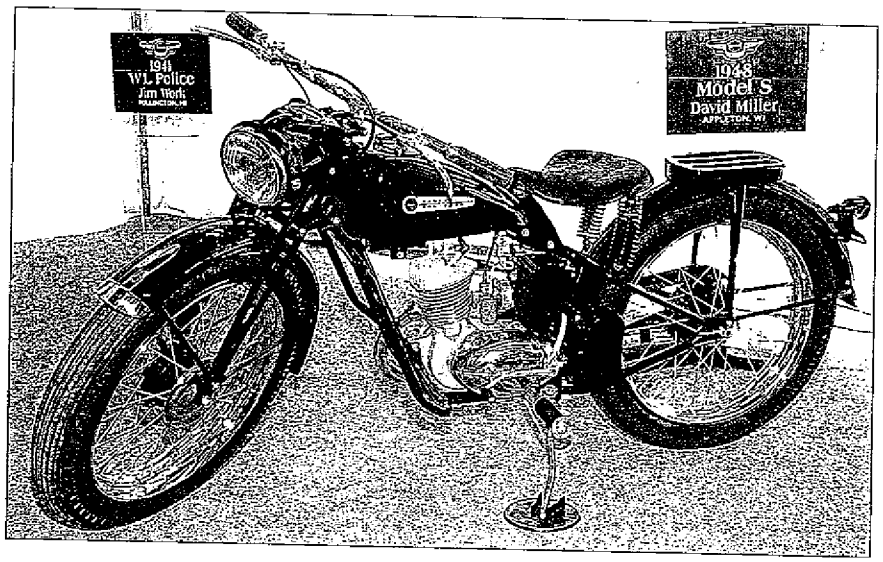
A bore increase in 1953, from 52 to 60mm, resulted in the slightly zippier 165cc Model ST. A restricted version, the STU, was also available.

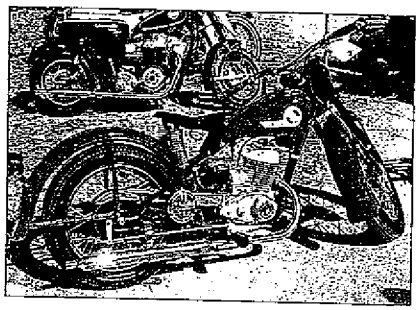
Two years later, the Model B Hummer – using essentially the same 125cc engine and transmission as the first Model S – appeared in the Harley-Davidson catalogue.

From 1960 to 1961, an updated 165cc range continued as the 6bhp BT and BTU (restricted to 5bhp) Super Ten. Harley-Davidson's slogan for this model went: "keen wheeling for teen wheeling".

SPECIFICATIONS: S-125

Engine	2-stroke single-cylinder
Capacity	125cc
Transmission	3-speed
Power	3bhp
Wheelbase	50in (1,270mm)
Top speed	around 40mph (64kph)





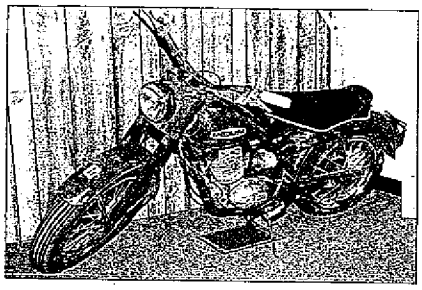
■ ABOVE *The ST-165: the striking quartered tank emblem dates from 1957.*

■ LEFT *The first two-stroke was this Model S of 1948. Note the girder front forks.*

■ BELOW *The Pacer was the pure street version of the Model BT range of 165 and 175cc two-strokes.*

■ BOTTOM *A Topper in conventional livery. Although quite advanced, the $450 machine failed to cash in on the scooter boom.*

■ BELOW *A Topper Scooter, now used as Harley's corporate paddock transport.*



■ RANGER, PACER, SCAT, BOBCAT, 1962–6

This quartet was another attempt to broaden the Harley range and allow Milwaukee to compete as a mass-market player. In hindsight, the strategy was clearly misguided, but Milwaukee believed there was a niche market of buyers not quite ready for the new 250cc Sprint (nor for the big twins). The Ranger and its siblings were the result.

All four machines, designated Model BT, shared a two-stroke engine derived from the Super 10, but with increased stroke from 60 to 61mm for a capacity of 175cc on all but the 1962 Pacer and Ranger. As with the Topper, "full power" and 5bhp versions were built.

Models that year were the street-only BT Pacer, the dual-purpose BTH Scat and the BTF Ranger, a stripped-down, off-road variant without lights. The first examples had rigid rear ends, but models that had swinging-fork suspension appeared for 1963.

The Ranger was dropped for 1963 while the Pacer and Scat gave way to the BTH Bobcat in 1966.

Available in road and optional off-guises, this lasted for one year, proving to be the last of the American-built Harley lightweights.

SPECIFICATIONS: BOBCAT

Engine	2-stroke single-cylinder
Capacity	175cc
Transmission	3-speed
Power	8bhp
Wheelbase	52in (1,320mm)
Top speed	around 60mph (96kph)

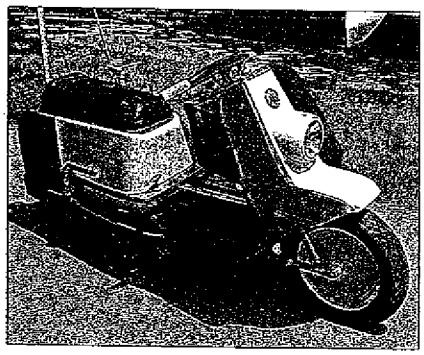
■ TOPPER SCOOTER, 1960–5

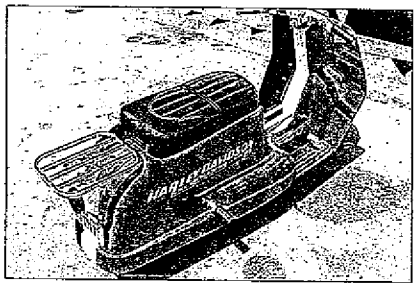
The Model A Topper – which was Milwaukee's obvious attempt to cash in on the scooter boom which swept the Western world during the late 1950s – employed a 165cc two-stroke with identical bore and stroke to the old ST but with the cylinder laid down horizontally to reduce engine height.

Power was claimed to be 9bhp from the 1961-on high-compression engine (Model AH), with a "restricted" five-horsepower version (Model AU) sold in those American states which permitted the use of low output two-wheelers without a driver's licence.

Unlike earlier three-speed Harley strokers, this time the "Scootaway" transmission was automatic, using belt drive and variable flanged wheels to change ratios.

The system was unusual but by no means new – the Rudge Multi and American-built NeraCar had featured similar drives decades before – yet it did anticipate today's fully automatic commuter machines.





SPECIFICATIONS: TOPPER

Engine	2-stroke single-cylinder
Capacity	165cc
Transmission	variable belt
Power	5bhp or 9bhp
Wheelbase	51.5in (1,310mm)
Top speed	around 50mph (80kph)

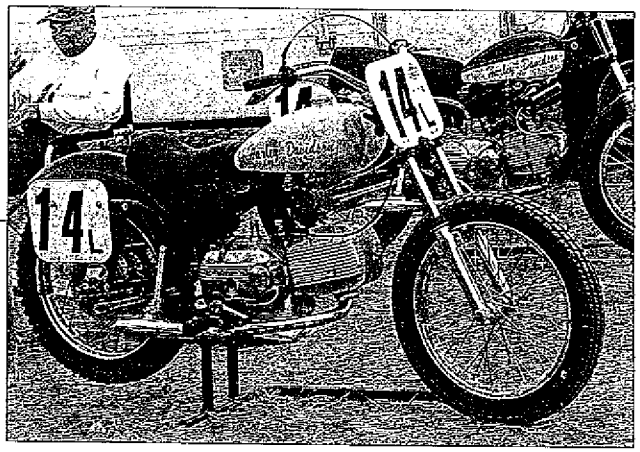
Other Topper novelties included a rubber-mounted engine with reed-valve induction, a parking brake, under-seat stowage space and lawnmower-style hand-starting.

By all accounts, the boxy Topper was a quirky but competent device which might have fared better had it not arrived just as the scooter market went into decline.

Sales of the $430 machine went from almost 4,000 to just 500 during its six years on the books.

Ironically – given that Harley-Davidson by then had an Italian factory – being "Made in Milwaukee" was no substitute for the true Latin style of other more genuinely Italian scooters, such as those that were made by Vespa or Lambretta.

FORZA HARLEY



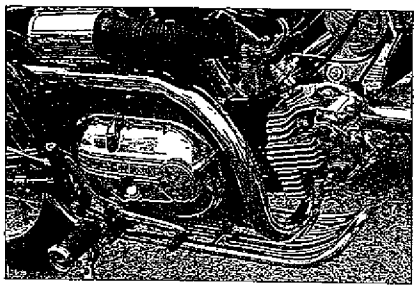
■ LEFT *Stripped-down Sprints proved surprisingly adept at dirt-track racing.*

■ SPRINT, 1961–74

The Sprint family of four-stroke singles, unveiled in September 1960, was the first tangible result of Harley-Davidson's purchase of the Aermacchi concern in Varese, Italy. Compared to much contemporary Milwaukee hardware, this was a technically advanced machine derived from the existing 250cc Ala Verde model, with an in-unit overhead-valve engine and superb handling from its spine frame, telescopic forks and swinging-fork rear end. With its unmistakable horizontal cylinder, variants of the same engine went on to innumerable race wins, including the famous Isle of Man TT, and remain hugely popular (and competitive) in classic racing today.

American buyers – despite the invitation to "thrill to the dynamic, virile note of its Hi-Flo tuned exhaust" – never quite warmed to the Sprint's lack of cubes and relatively revvy nature, yet the bike was as capable a standard production machine as its siblings were racers. The stock street version, the Model C, claimed a potent (if slightly ambitious) 18bhp at 7,500rpm from its eager, free-breathing engine. This was joined by the Model H, an off-road variant, one year later, with high-compression pistons and an additional 1.5bhp. The "H" quickly became the more popular model and was used in a wide range of American competitions, from flat track to motocross as well as for purely recreational use.

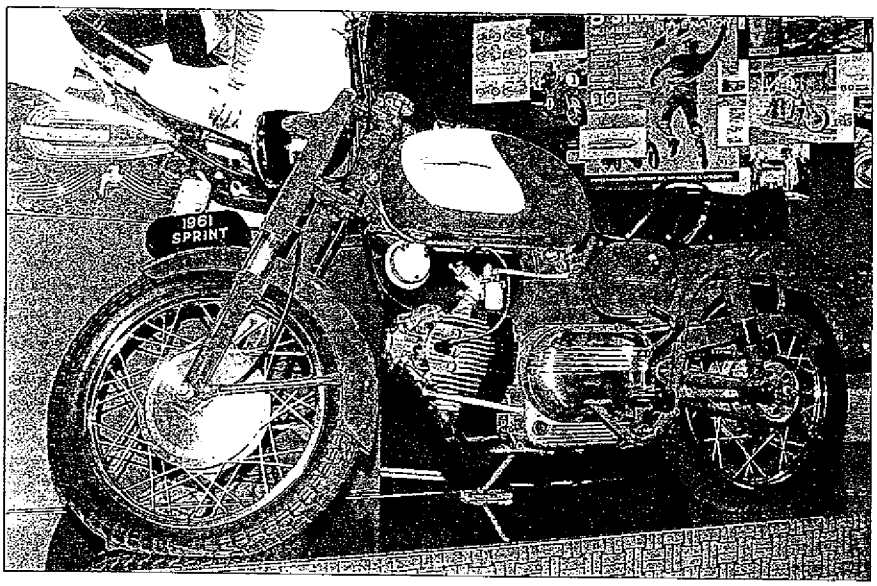
■ BELOW *Note the carburettor's steep downdraught angle, which is a hallmark of Aermacchi design.*



SPECIFICATIONS: SPRINT C (SS-350)

Engine	ohv horizontal single
Capacity	246cc (344cc)
Transmission	4-speed (5-speed)
Power	18bhp @ 7,500rpm (27bhp @ 7,000rpm)
Weight	unknown (355lb/161kg)
Wheelbase	52in/1,320mm (56in/1,420mm)
Top speed	around 75mph/120kph (85mph/136kph)

■ BELOW *This early Sprint enjoys pride of place in the Harley Museum.*

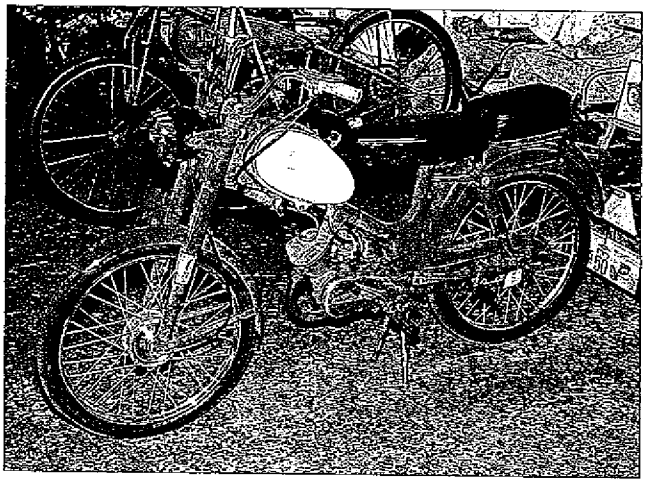


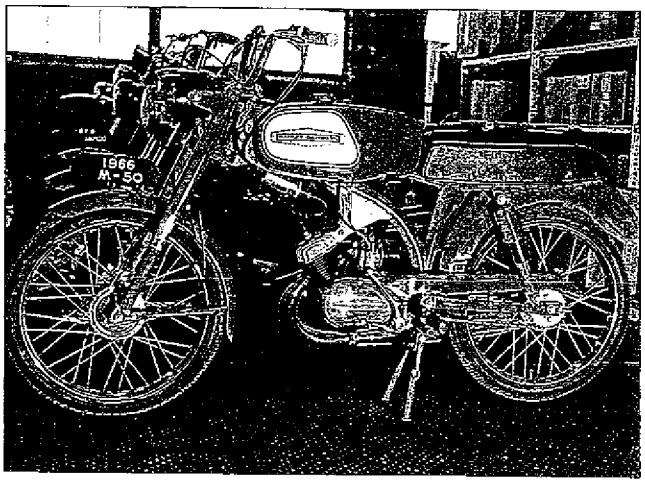
The Sprint Model H later became known as the Scrambler, producing as much as 25bhp at a relatively giddy 8,700rpm.

In 1967, the original long-stroke configuration changed to short stroke – "The Sprint holds two land speed world records, so we improved it", went the ad. Two years later, the first 350 Sprints appeared, the ERS dirt racer and road-going 350cc SS. The SS was joined by the dual-purpose SX-350 in 1971 and given an electric starter two years later as the "Sprint" title was dropped from the range.

Pure road racing examples of the same 344cc single produced as much as 38bhp, good for 130mph (210kph) with

■ BELOW RIGHT AND LEFT *The M-50, one of Milwaukee's strange two-stroke mini-bike range. Left is a 1965 example. By 1966 (right) it looked rather more like a motorcycle. Such lightweights never truly caught on in the USA.*





racing streamlining. Road riders, with maybe 25bhp, had to be content with top speeds in the low nineties. Although a simple spine frame was always good enough for the racers, the final SS-350 inexplicably included a heavy and wholly unnecessary twin-downtube chassis.

With a career spanning 14 years, the Sprint can rightly be regarded as one of Harley's more successful forays away from its core big twin-activities.

The Sprint's arrival coincided with the appearance of advanced, lightweight machines from Japan and, to some extent, it profited from their success.

For the first time since the 1920s, motorcycling in the United States was developing a broad appeal, and the market was soaring.

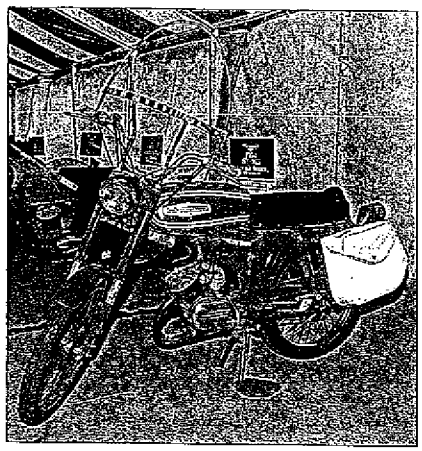
In 1971 it would peak at 2.1 million new machines sold – a 40-fold increase in less than 20 years.

The Sprint's weakness was not the way it went (when the typically feeble Italian electrical system was not playing up), but in the way its price kept rising when Japanese machines seemed, year after year, to be offering much more for much less.

SPECIFICATIONS: M-50

Engine	2-stroke single-cylinder
Capacity	50cc
Transmission	3-speed
Wheelbase	44in (1,120mm)
Top speed	around 40mph (64kph)

■ BELOW *Trying hard to look like a "real" bike, this 1967 M-50 sports saddlebags and screen, despite a top speed of only around 40mph (64kph).*



■ **M-50, M-65, 1965–71**

In the mid 1960s Harley-Davidson's quest for wider markets led it into the 50cc domain, a move which was ultimately no more successful than its other oddballs of the time. Ironically those other V-twin warlords, the British Vincent company, had dabbled unsuccessfully with lightweights a decade earlier.

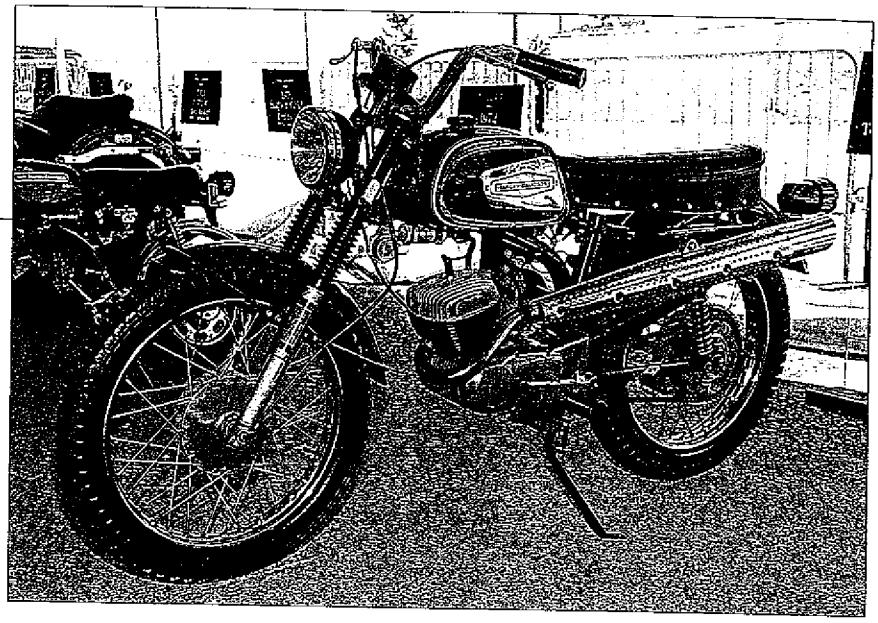
The range began with the M-50 in 1965 and a racier-looking Sport version 12 months later. Both were built in huge numbers – more than 25,000 in the first two years – causing massive oversupply and a sharp fall in price. 1967 brought an increase in capacity for the M-65 and Sport, and more realistic production figures.

For 1967, the original 50cc version developed much-needed extra power with the 65cc M-65, by which time some 4,000 unsold M-50s were flooding the market at knock-down prices.

Both models were available in standard and "Sport" guise, the latter with a racy fuel tank and seat.

A 65cc Leggero (which in Italian means "light") version was also built for the years 1970–1.

STRIVING FOR SALES



■ RAPIDO, TX, SX, STX, 1968–77

The Rapido family of machines was yet another attempt to find a profitable niche at the lightweight end of the market, this time with mainly off-road machines (although the first batch to be built were street bikes). Powered by a simple 123cc two-stroke single with four-speed transmission, the Rapido ultimately gave way to the five-speed, oil-injected TX, SS and SX models. Although often overlooked – not least by traditional big-twin dealers – the range established its pedigree in 1969 when three Rapidos completed an epic, 2,000-mile (3,2000km) ride across the Sahara, from Morocco to Nigeria. A smaller version of the TX, the 90cc Z-90, was produced.

SPECIFICATIONS: RAPIDO

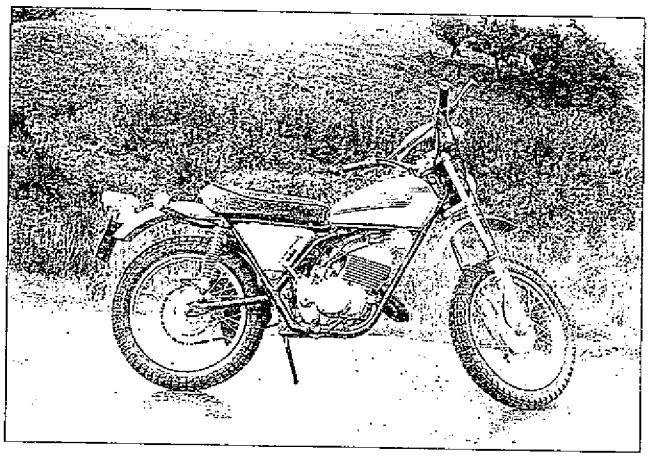
Engine	2-stroke single-cylinder
Capacity	123cc
Transmission	4-speed
Wheelbase	48.9in (1,240mm)
Top speed	around 60mph (96kph)

■ SS AND SX SERIES, 1974–8

By the start of the 1970s, off-road machines were huge business in the American motorcycle scene. Inevitably, this market was hugely competitive, with prices pared to the bone – so much so that even the super-efficient Japanese factories would soon find themselves with massive amounts of unsold stock.

At the same time, environmental concerns were targeting the high hydrocarbon emissions of the two-stroke engine. It was into this unpromising scene that the off-road SX range was launched for 1974. The SX was joined by the street-only SS-250 in 1975 plus its larger dirt sibling, the SX-250, with the road-going SS-175 introduced for 1976. It was the off-roaders, however, that dominated production and sales. More than 25,000 machines were built in 1975, of which all but 3,000 were SX models. In the face of declining demand and over-supply, production slumped to 12,000 for 1976, then 1,400 in 1977 before disappearing almost completely as Harley-Davidson disentangled itself from its Italian partner in 1978.

These were actually quite competent motorcycles despite being very much copies of Yamaha's DT-series engines. The SX-250 in particular achieved quite striking competition success. More successful still was the MX250, derived from what was substantially the same engine. Both failed to survive the closure of Harley-Davidson's Italian operation in 1978.

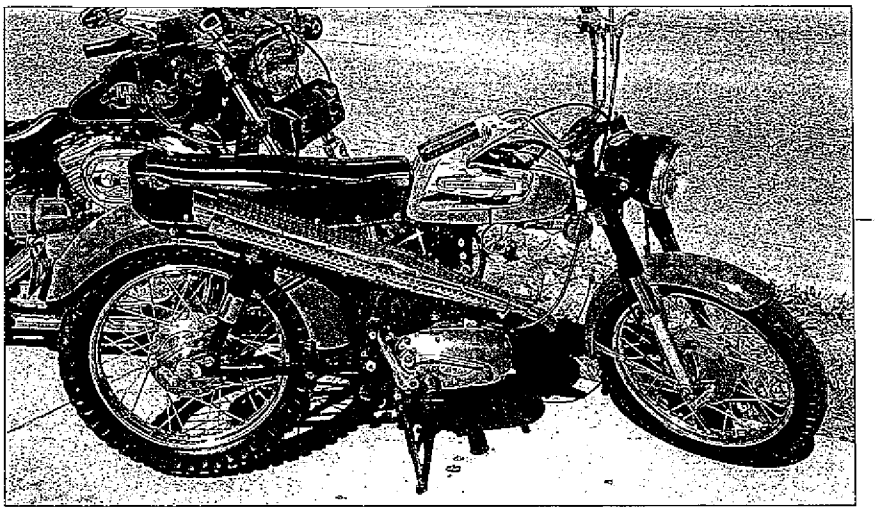


■ TOP *Models such as this 1970 Rapido attempted to cash in on the Stateside boom in lightweight off-road machines.*

■ LEFT *This SX-250 was used mainly for dirt-track racing.*

SPECIFICATIONS: SX-175 (SX-250)

Engine	2-stroke single-cylinder
Capacity	174cc (243cc)
Transmission	5-speed
Wheelbase	56in (1,420mm)
Top speed	around 70mph/112kph (80mph/128kph)



■ RIGHT *Outlandishly racy, maybe, but such dual-purpose lightweights were too far from Harley's heritage to succeed.*

SPECIFICATIONS: BAJA SR-100

Engine	2-stroke single-cylinder
Capacity	98cc
Transmission	5-speed
Wheelbase	52in (1,320mm)
Top speed	around 60mph (96kph)

■ BAJA, SR-100, 1970–4

Named after the notorious desert race down Mexico's Baja peninsula, this 98cc off-roader used a high-performance engine derived from the Rapido's (with the bore reduced from 56 to 50mm) but now with five-speed transmission. The little machine was surprisingly potent and almost 7,500 were built during its five year span. It was ultimately unable to overcome both environmental concerns and the increasingly sophisticated Japanese competition, despite the introduction of an improved, oil-injected SR-100 version for 1973.

■ MINIBIKES: SHORTSTER, X-90, Z-90, 1972–5

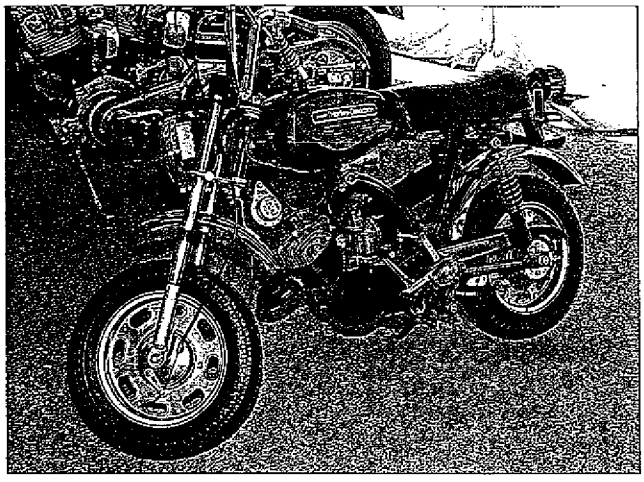
Anything further removed from big-inch cruisers would be hard to imagine, but that's exactly what Harley unveiled with the MC-65 Shortster of 1972. An obvious word play on "Sportster", the minibike used the M-65 engine and tiny 10in (254mm) wheels. Only 800 Shortsters were made before it grew to 90cc and became the X-90, which was built from 1973 to 1975. The Z-90 used the same engine, but in a quasi off-road chassis with larger wheels. "The Great American Freedom Machine" was how Harley billed the Italian-built two-strokes, intended mainly for hitching on the back of a camper van rather than as serious commuter machines. Almost 17,000 of these minibikes were made, plus a similar number of Z-90s.

SPECIFICATIONS: X-90

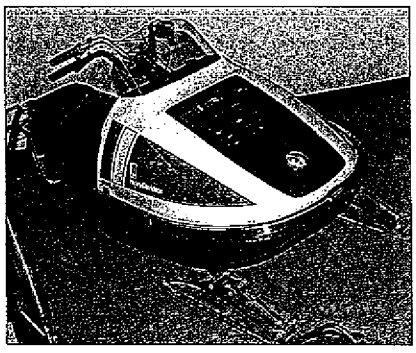
Engine	2-stroke single-cylinder
Capacity	90cc
Transmission	4-speed
Wheelbase	40.75in (1,035mm)
Top speed	around 55mph (88kph)

■ SNOWMOBILE, 1970–5

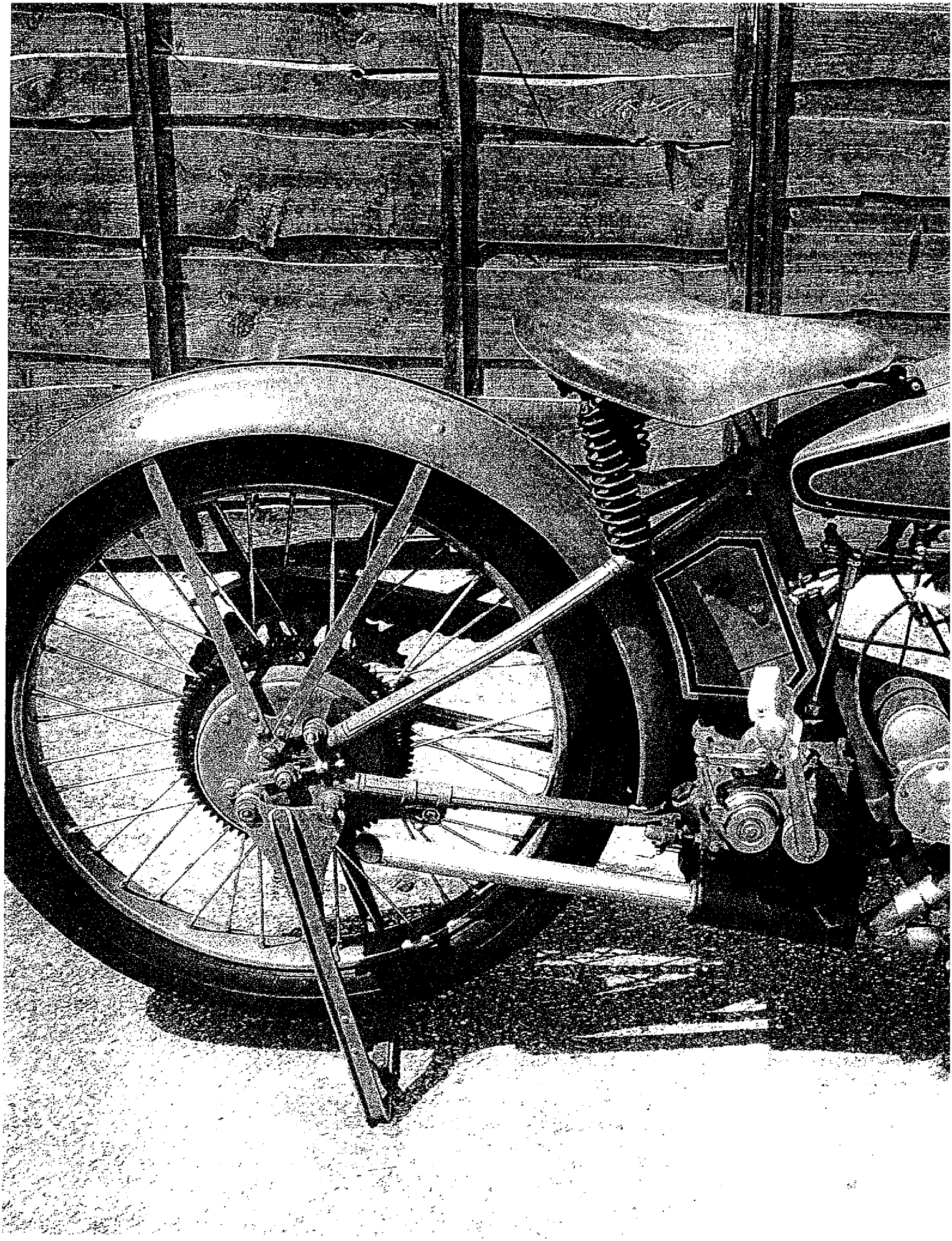
Like the Topper Scooter, Harley's Snowmobile was a tardy response to a passing craze. The fad initiated by the Canadian Bombardier company in the mid-1960s produced many similar machines, most with the same mechanical layout. Milwaukee's version, released in 1970, was steered by paired skis linked to motorcycle-type handlebars at the front and driven by a broad belt at the rear. It was powered by a twin-cylinder two-stroke engine and the all-chain drive featured automatic transmission. There were two capacities (398 or 433cc) and electric or manual start. The Snowmobile was dropped from 1975, the victim of three consecutive mild winters.

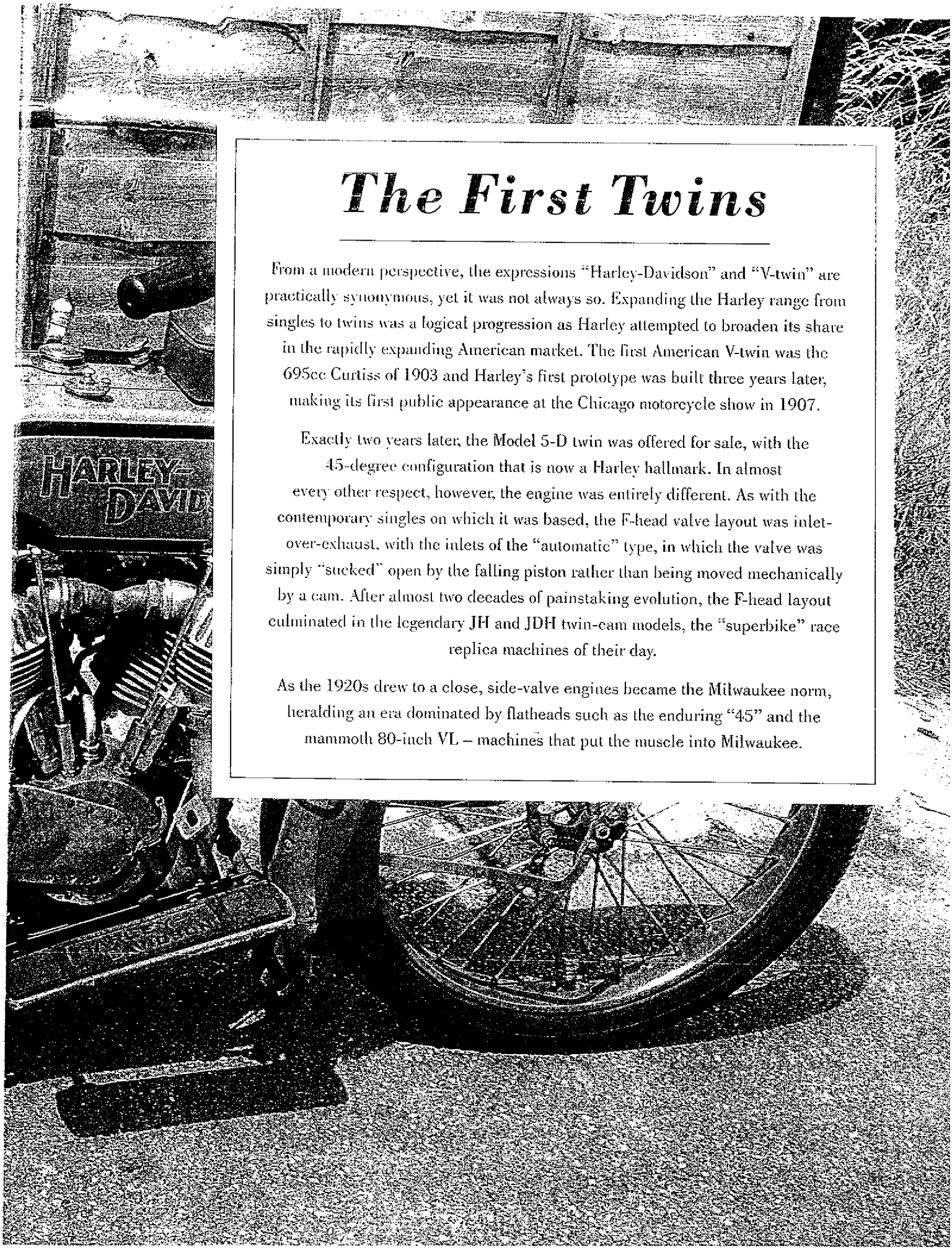


■ LEFT *The X-90. Dismissed as "a menace" at the time, the minibike range is now considered cute and even collectible.*



■ RIGHT *Harley's snowmobile sold poorly. Maybe if they'd called it a SnowGlide...*





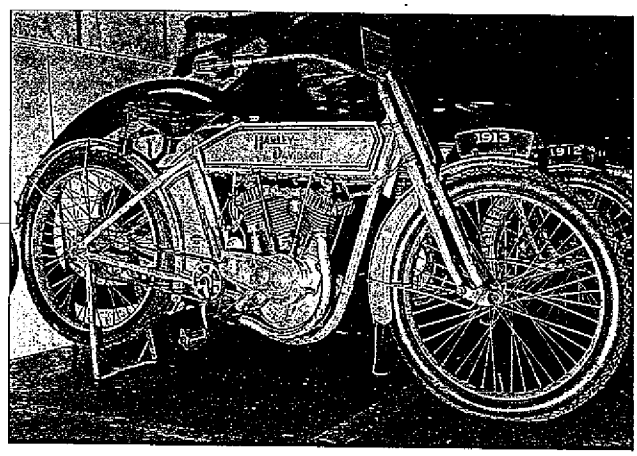
The First Twins

From a modern perspective, the expressions "Harley-Davidson" and "V-twin" are practically synonymous, yet it was not always so. Expanding the Harley range from singles to twins was a logical progression as Harley attempted to broaden its share in the rapidly expanding American market. The first American V-twin was the 695cc Curtiss of 1903 and Harley's first prototype was built three years later, making its first public appearance at the Chicago motorcycle show in 1907.

Exactly two years later, the Model 5-D twin was offered for sale, with the 45-degree configuration that is now a Harley hallmark. In almost every other respect, however, the engine was entirely different. As with the contemporary singles on which it was based, the F-head valve layout was inlet-over-exhaust, with the inlets of the "automatic" type, in which the valve was simply "sucked" open by the falling piston rather than being moved mechanically by a cam. After almost two decades of painstaking evolution, the F-head layout culminated in the legendary JH and JDH twin-cam models, the "superbike" race replica machines of their day.

As the 1920s drew to a close, side-valve engines became the Milwaukee norm, heralding an era dominated by flatheads such as the enduring "45" and the mammoth 80-inch VL – machines that put the muscle into Milwaukee.

EARLY TWINS



■ RIGHT *A 1913 61-inch single speed twin. Although this example has no lights, an acetylene kit was supplied as an optional extra.*

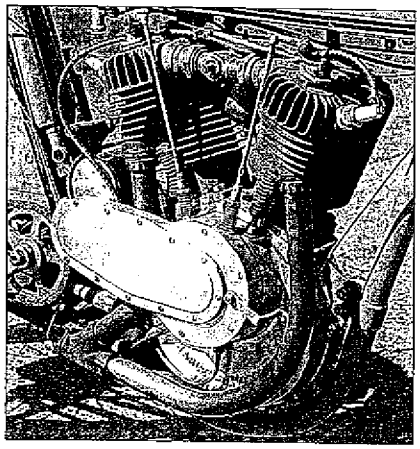
With the single having amply demonstrated its ruggedness, the twin that evolved from it ought to have been the same – only more so. Like the singles, the twin was single-speed with belt final drive, one-piece heads and barrels with horizontal "beehive" finning. Capacity was 53.7cu in (880cc), although several development engines of varying capacity had been built and even raced during the previous two years.

Yet the Model D proved remarkably troublesome, with a mere 29 built in 1909 and just one in 1910. Harley-Davidson appears to have blamed its shortcomings on its automatic inlet valves, although other sources suggest slippage of the belt drive was at fault. Either way, when the re-engineered twin returned in 1911, it had both mechanical inlet valves and a simple but sturdy belt tensioning device which could be operated on the move by the rider's left hand.

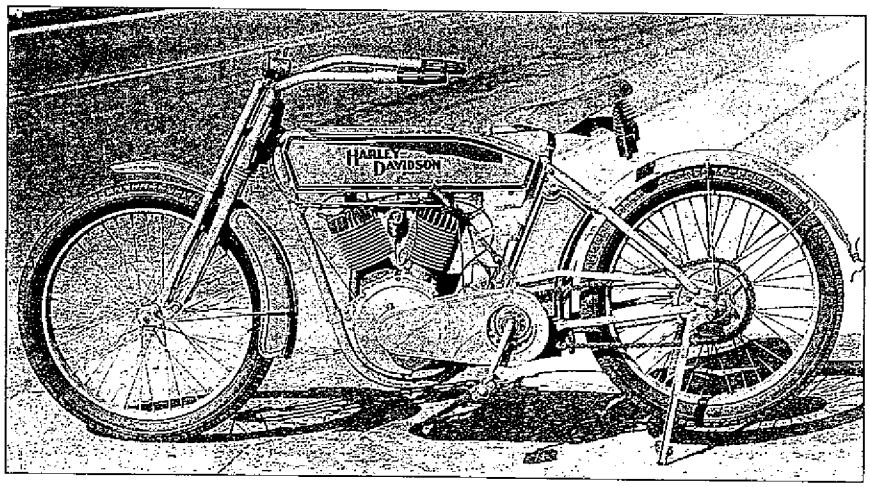
Although still designated the Model D, other changes included a slightly reduced capacity of 49.5cu in (811cc), from a bore and stroke of 76.2 and 88.9mm respectively, the same as the 1904 single. Beehive finning had also given way to vertical cylinder-head finning. At $250, the asking price was the same as the twin of 1908.

SPECIFICATIONS: 1911 MODEL D

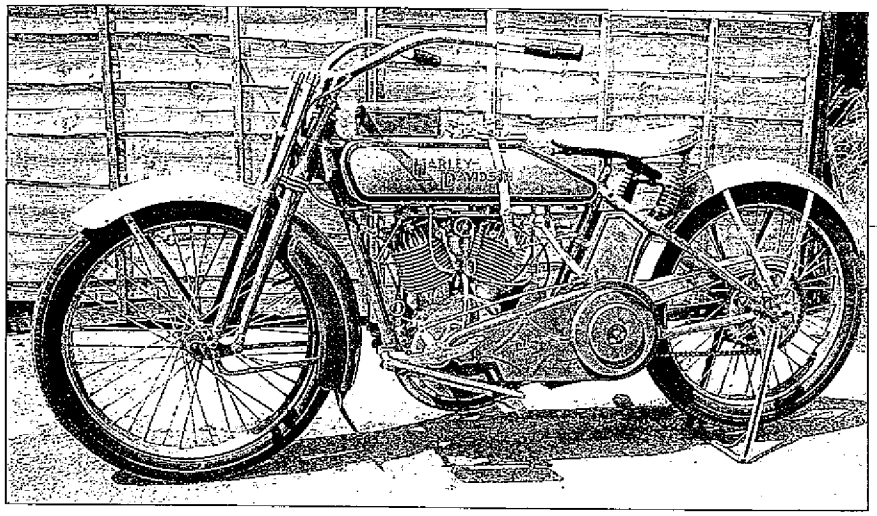
Engine	F-head V-twin
Capacity	49.48cu in (811cc)
Transmission	single speed, leather belt drive with freewheel "clutch"
Power	around 7bhp
Wheelbase	56½in (1,435mm)
Top speed	around 60mph (96kph)

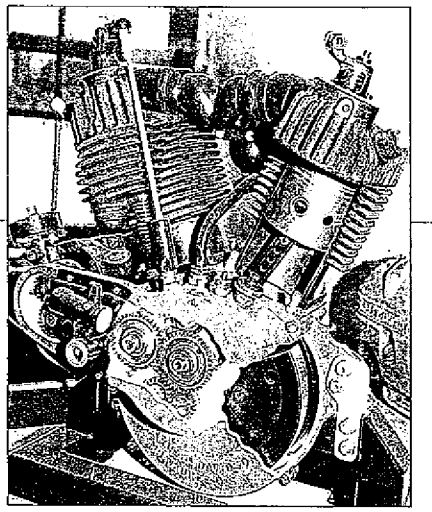


■ ABOVE RIGHT AND BELOW *Two views of another 1913 twin. Note the long push-rods to the inlet valves, far more dependable than the earlier "automatic" mechanism. The colour is "Renault Gray".*



By all accounts, the revised twin proved far more dependable than its troublesome predecessor. Although little faster on the flat than the 30-inch single, it climbed hills far better – not least because the belt tensioner allowed the rider to maintain drive. Even so, a welter of improvements followed year on year. 1912 brought a new frame and a free-wheel clutch assembly in the rear wheel that freed the rider from the need to kill (and re-start) the engine if wishing to halt the machine. The same year saw the introduction of the first "one-litre" Harley, the 61-inch X8E, which also featured chain final drive. Although the two capacities were briefly produced in tandem, production of the smaller twin was dropped for 1913. The same year marked the debut of the





Model G "Forecar", a 61-inch twin with front-mounted luggage box – a sort of back-to-front precursor of the Servi-Car.

By this time, the engine was almost unrecognizable in its internal details from the original twin. Relatively exotic alloy steels were employed in high-stress areas of the engine, such as chrome vanadium steel for the "I" beam connecting rods, while roller and ball crankshaft bearings were widely used. A separate three-quart (2.8 litre) tank held oil for the total-loss lubrication system (used oil was either burnt by the engine or drained by hand from the crankcases). Like most contemporary engines, there was no oil pump: good old gravity and flailing engine parts moved the oil around the engine's internals and all the major bearings were of "self-lubricating" phosphor bronze. An auxiliary hand-operated oil pump had become standard in 1912, crudely metering about 25 "drops" of oil per minute.

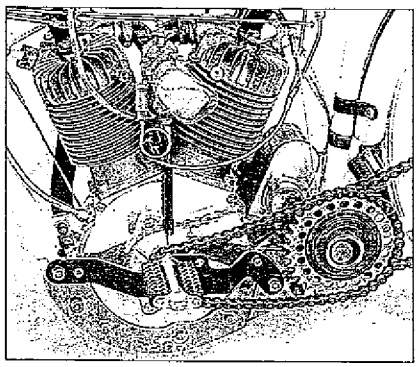
Until this time, all Harleys had been single-speed, but in 1914 the Model 10F and Forecar debuted the two-speed rear hub. This astonishingly intricate device comprised no fewer than five bevel gears, yet was replaced by a true three-speed gearbox after only one year.

A measure of the twins' success is that, by 1915 the Harley-Davidson range comprised just two single-cylinder roadsters but six twins, including the three-speed Model K "Stripped Stock" – a race replica for its time. Among six "Speciality" twins were the even hotter "Fast Motor" K12 and out-and-out racers such as the KRH. This elaboration continued throughout the 61-inch F-head's astonishingly long career.

So comprehensive was its evolution that, by the time it was discontinued in 1929, almost no part from the original twin would fit.

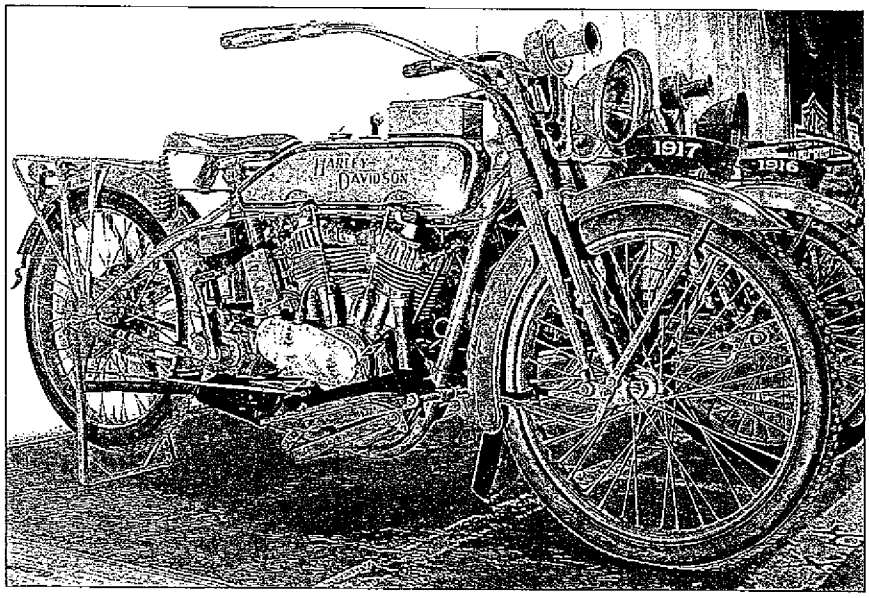
■ ABOVE *By the time this twin was built in 1917, three-speed transmission was available for an extra $25.*

■ ABOVE RIGHT *The cam drive is clear in this sectioned F-head twin.*

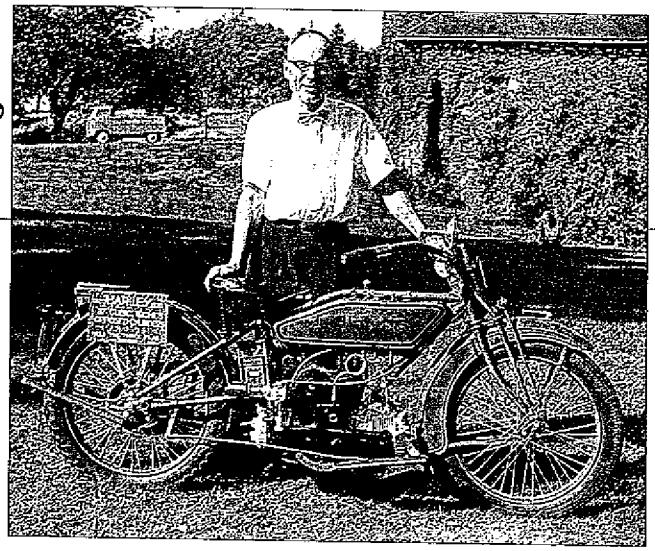


■ LEFT *An exquisite 1916 board-racing twin. Note the Bosch magneto and single carburettor.*

■ BELOW *The timing side of a 1917 twin. Note valve-gear cutaways in tank.*



MODEL W SPORT TWIN, 1919–22



■ LEFT *The very Model W machine that set the Three Flag record, riding from Canada to Mexico in less than 75 hours.*

One of Harley-Davidson's most radical machines appeared as early as 1919. Developed during the war years and first shown to the public in 1918, the Model W "Sport Twin" was quite unlike the general expectation of what a Milwaukee twin should be. Its cylinders, rather than being tucked close together in a 45 degree V, were set 180 degrees apart. This was Harley's Boxer twin – but unlike BMW's more modern Boxers, this carried its cylinders fore-and-aft like contemporary British Douglas machines.

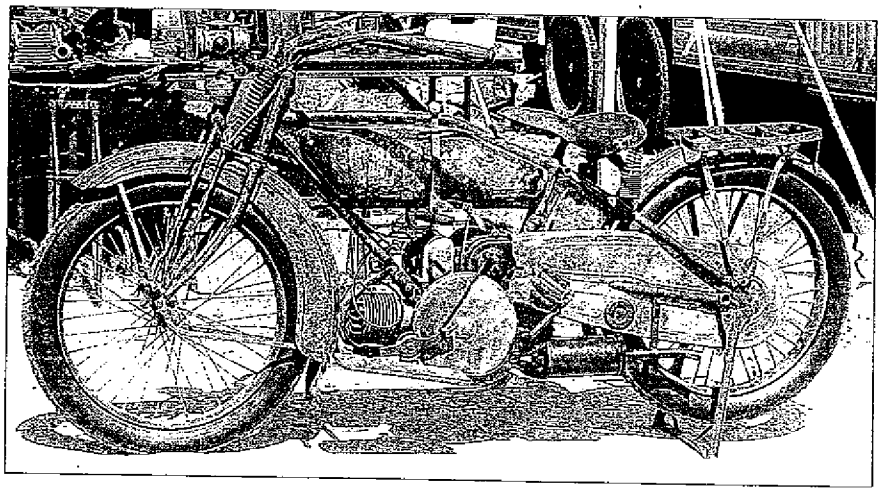
In theory, this somewhat unwieldy layout should have made the bike very long, but in practice the new model's wheelbase was actually three inches shorter than that of the existing V-twin – just 53½in (1,360mm). It was also low overall and carried its heaviest components in particular low to the ground – a considerable bonus on the rough roads of the time. It also weighed fully 100lbs (45kg) less than its sibling V-twins. Aesthetically, too, the "Brewster Green" Sport looked low and lean, with an elegance of line rarely achieved by previous V-twins. The engine's horizontally-opposed cylinders bestowed perfect primary balance, making it far smoother than the other big V's in the Harley range. In fact, this was a most civilized mount all round.

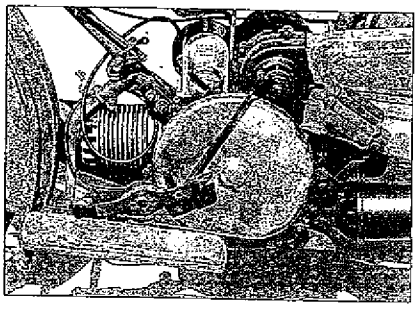
SPECIFICATIONS

Engine	horizontally-opposed side-valve twin
Capacity	35.6 cu in (584cc)
Transmission	3-speed
Wheelbase	53½in (1,360mm)
Top speed	around 50mph (80kph)

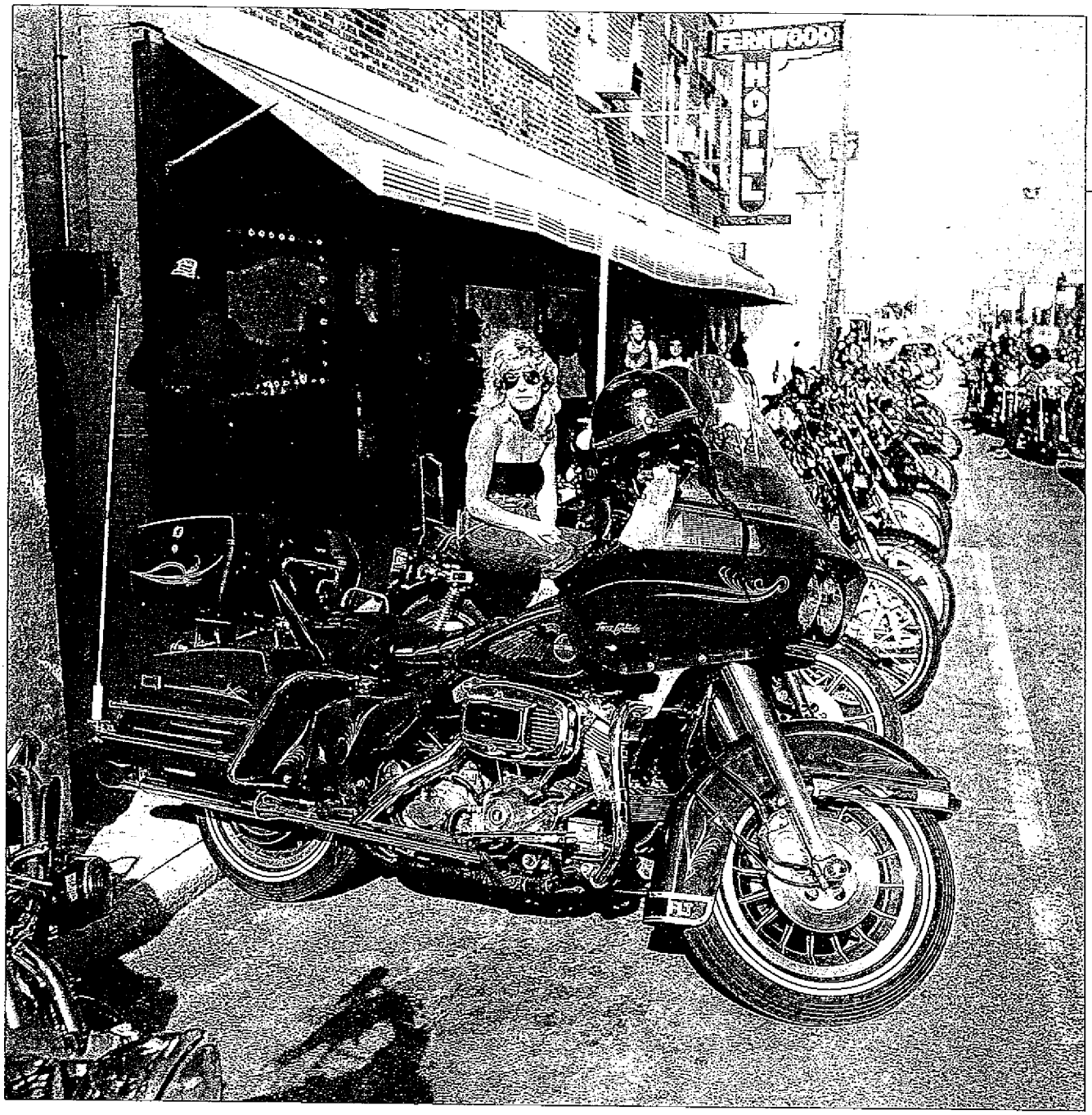
As well as the standard equipment of magneto ignition and gas lights (fed by acetylene gas produced "on the move" by dissolving calcium carbide in water), optional equipment included coil ignition and true electric lighting. Engine lubrication was taken care of by an automatic pump, freeing the rider from the obligation of injecting just the right amount of oil at just the right time. The three-speed transmission was driven by a multi-plate clutch (albeit hand-operated) running in engine oil, just like a modern motorcycle.

The Sport's drive chain, enclosed in a steel case and lubricated by oil mist from the crankcase breather, was as close to zero-maintenance as chain transmission could get at the time. All in all, the Model W was a neat, light, economical and innovative piece of kit which Milwaukee clearly hoped would find a ready market, as riders were less disposed to the rougher pleasures of previous big twins.





■ LEFT AND ABOVE *It may look ratty, but it still works. The horizontal cylinders and low overall lines of this original Sport Twin are clear.*



Unfortunately the Sport had one major shortcoming – cubic inches, or the lack of them. It was way down on power compared to the existing 61-inch Harley V-twin and similar offerings from Indian, with a displacement of just 35.6cu in (584cc). To compensate, at least in part, it had to be revved hard – indeed it was reputed (very dubiously) to be the highest-revving internal combustion of its time. Yet even when thrashed, power was poor, with a top speed of little more than 50mph (80kph). Then, as now, America's motorcyclists demanded less revs and far more guts. Although its agility made it modestly popular for a while on Europe's more tortuous roads (almost one third of exports to Britain in 1919 were Sport Twins), the Model W was never a success at home. Production ceased in 1922, after just four years on the Milwaukee line.

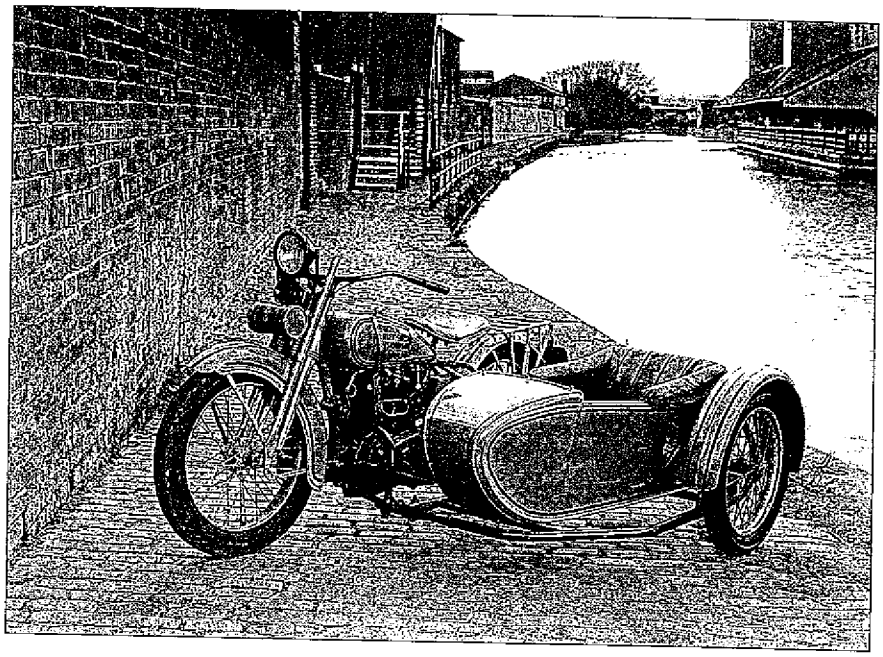
■ ABOVE *Little can the builders of machines like the Sport Twin have realized the cultural tide they were unleashing.*

MODEL JD & FD BIG TWINS, 1921–9

Milwaukee's first 74-inch model, the so-called "Superpowered Twin" hit America's streets for the 1921 model year. Producing some 18 horsepower, the big engine was intended to compete with Indian's big twins and four cylinder models from Henderson and others. The "74" followed the practice of the "61" from which it evolved, employing inlet-over-exhaust valves (the F-head layout) driven by a single camshaft in a timing cover on the right side of the engine.

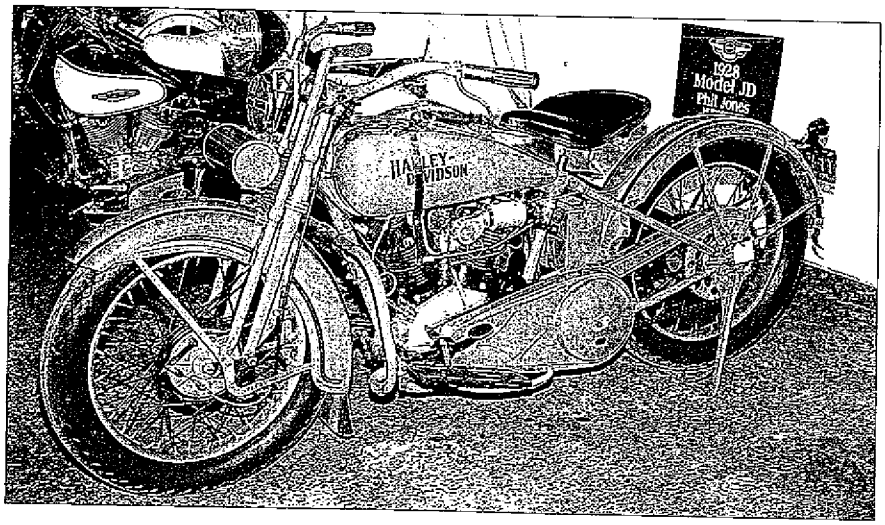
However, many major components – crankcases, cylinders and heads – were all new, and both bore and stroke were increased. The transmission was three-speed, the gears and shafts being located in a separate aluminium housing which was connected by enclosed chain to the left end of the crankshaft.

An "automatic" oil pump delivered lubrication for the engine's mixture of plain phosphor bronze, roller and ball bearings. As with almost every other motorcycle of the time, used oil was burned or dripped on to the ground. The multi-plate clutch, on the other hand, ran dry.



■ ABOVE *Sidecars, such as this mated to a Model J, were huge business.*

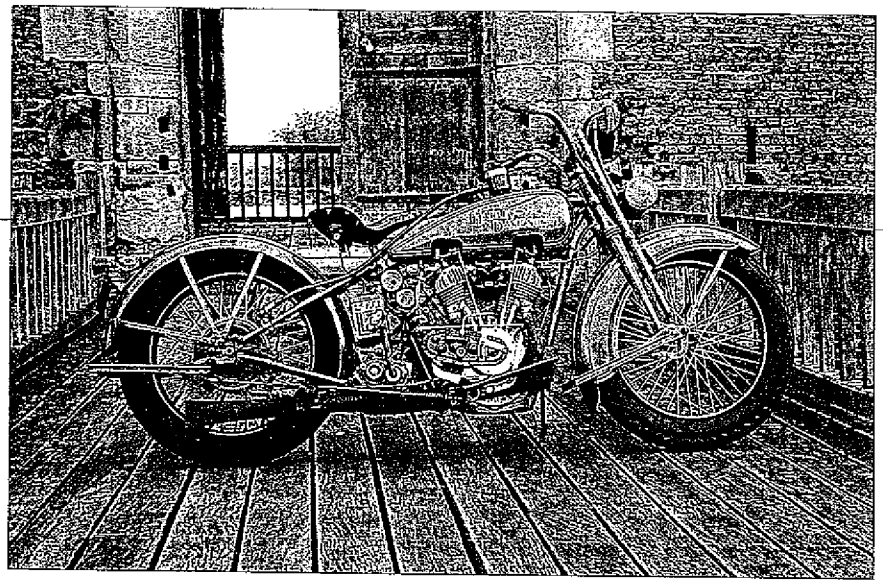
■ BELOW *An immaculately restored 1928 Model JD, one of the first to feature a front brake.*



Although often referred to generically as the JD, up to 1925 the 74-inch twin might more helpfully be called the Model D, with the addition of essentially the same prefixes as contemporary 61-inch twins. "JD" indicated a complete electrically equipped version, while the magneto model was designated "FD". Where fitted, electrical equipment comprised a six-volt generator, battery, contact breaker points and coil, headlight, tail light and oil

SPECIFICATIONS
74-INCH SUPERPOWERED TWIN

Engine	F-head V-twin
Capacity	74.2cu in (1,216cc)
Transmission	3-speed
Power	18bhp
Wheelbase	59½in (1,510mm)
Top speed	around 75mph (120kph)



■ RIGHT AND BELOW *This 1925 61-inch twin retains the original olive green colours with maroon and gold pin-striping, unlike the eye-catching example below.*

warning indicator light. An additional "S" in the model description indicated a sidecar model, with lower gearing and a 0.12in- (3mm-) thick steel spacer between cylinder and crankcase mouth to reduce the compression ratio. Other subsequent suffixes included such variables as piston material – A for aluminium, B for iron. The lighter weight and improved heat dissipation of the aluminium alloy pistons were particularly beneficial after their introduction in 1924.

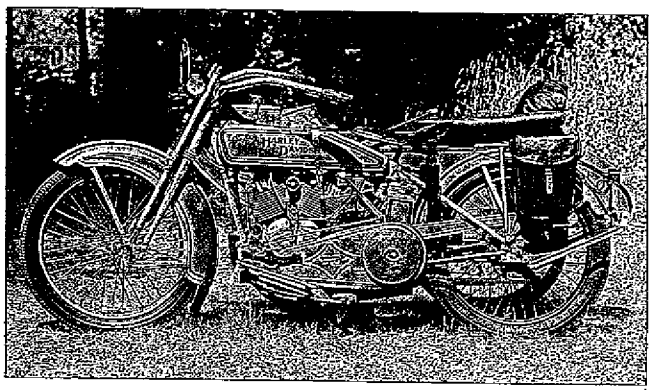
A tubular steel, single-loop frame tied the whole thing together, the rider cushioned from the worst road shocks by a "Full-Floteing" Mesinger saddle. Front suspension comprised similar double-sprung girder forks to the smaller twin. Only a rear brake – a 7⅛in (186mm) drum actuated by a long steel rod from a pedal on the right footboard – was fitted until 1928 when a front drum brake also became standard. For markets in which a second brake was mandated by law, an additional "stopper" – essentially a parking brake – could also be fitted. Other changes over the "74"'s life span included the use of "Alemite" surfaces for all chassis bearings in 1924. The rider would periodically inject these with grease from a purpose-made high-pressure grease gun, which did much to extend component life, especially in wet or dusty conditions. Less practical, but carrying echoes into the styling of Harleys today, 1926 found the big twin equipped with broad "balloon" tyres and a curvaceous "teardrop" fuel tank.

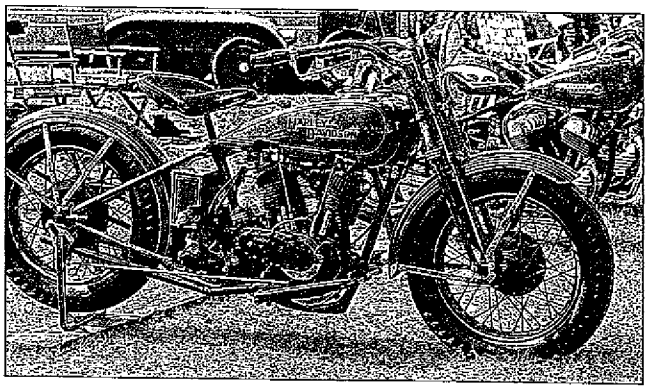
■ BELOW LEFT AND RIGHT *A lower frame carrying a teardrop-style tank first appeared in 1925, whilst front brakes finally arrived for the 1928 model year. The example below left clearly has neither.*

Over its eight-year career the "74" proved itself a brisk performer which enhanced Milwaukee's reputation for building dependable motorcycles.

Some indication of its virtues – and not least of Harley's tradition of sticking with what worked – was that, at 87 x 101.6mm, the "74"'s cylinder dimensions remained almost unchanged up to the Shovelhead models of relatively recent times.

Clearly, the machine that would take its place in the future would have to be at least as special as the present one. Yet to begin with, at least, it would be anything but.





JH, JDH Two-Cam, 1928–9

■ BELOW *The difference between the Two Cam's timing cover and that of the standard twin is clear.*

■ BOTTOM *The 1928 JDH Two-Cam was only available for two years.*

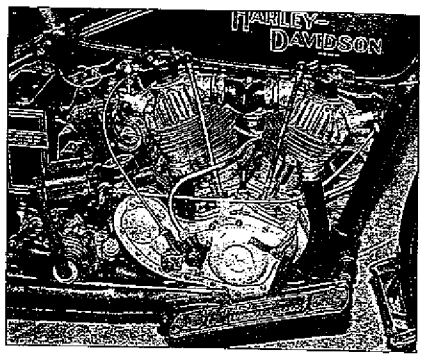
Twin-cam and even eight-valve machines had formed the cutting edge of Harley-Davidson's official racing efforts since the First World War, yet the ordinary road-going motorcyclist could only dream of such performance. All that changed in 1928 when Harley offered a two-cam motorcycle to the general public at an affordable price. These special J-series machines were available for two years only, as the 61-inch JH and the awesome 74-inch JDH, which were priced at $360 and $370 respectively.

"The magic words 'two-cam' mean exceptional speed and power," extolled contemporary advertisements, with some justification. Not for the last time, Milwaukee was treading the fine line between effective salesmanship and encouraging public disquiet over bad boys on antisocial machines.

Both twin-cam engines featured inlet-over-exhaust valve operation driven by paired, gear-driven cams in a timing case on the right side of the engine. Instead of operating via Harley-Davidson's customary roller arms, the cam lobes acted directly on tappets, offering more accurate valve control, higher revs and improved combustion. The height of each cylinder's inlet valve necessitated flamboyant clearance cutaways in the narrow fuel tank, which gave the "JH" its characteristically racy appearance.

The two engines differed in both bore and stroke, as well as in the use of Dow metal pistons, but were built on essentially the same crankcases. These were connected by roller primary chain to a multi-plate dry clutch and three-speed gearbox, which in turn drove the rear wheel by chain.

SPECIFICATIONS	
Engine	2-cam, F-head V-twin
Capacity	60.33cu in (988cc) or 74.2 cu in (1,216cc)
Transmission	3-speed
Wheelbase	60in (1,525mm)
Top speed	around 85mph (137kph)



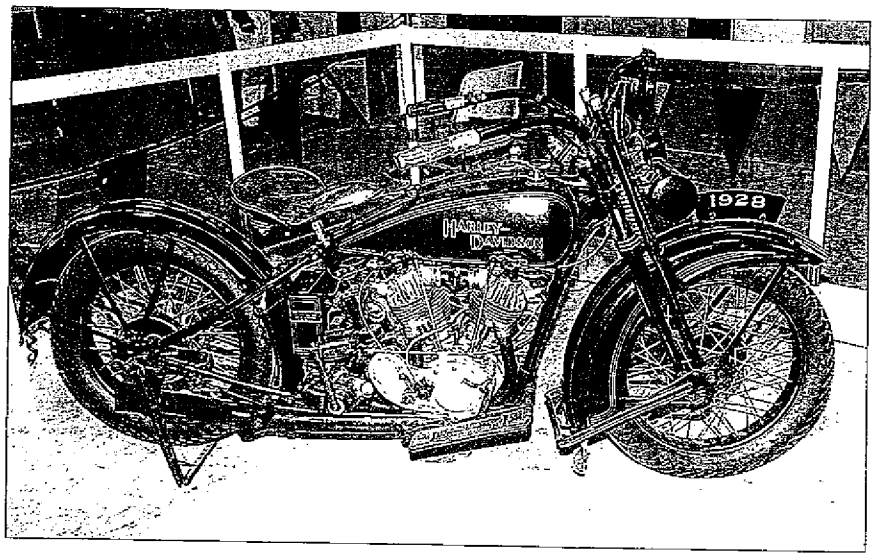
As well as the choice of capacities, two specifications of the Two-Cam were offered, although numerous racing specials would be created in private hands. As well as the competitive potential of stripped-down Model Js, Juneau Avenue anticipated a demand for an exclusive road version – or "superbike" as it might be known today. Thus the Two-Cam was available with full electrical equipment, carburettor air cleaner, fully valanced mudguards and front and rear brakes.

Echoes of the machine's racing pedigree were retained, however, in the slimline "sport" chassis, single seat and racer-style two-gallon (7.5 litre) fuel tank.

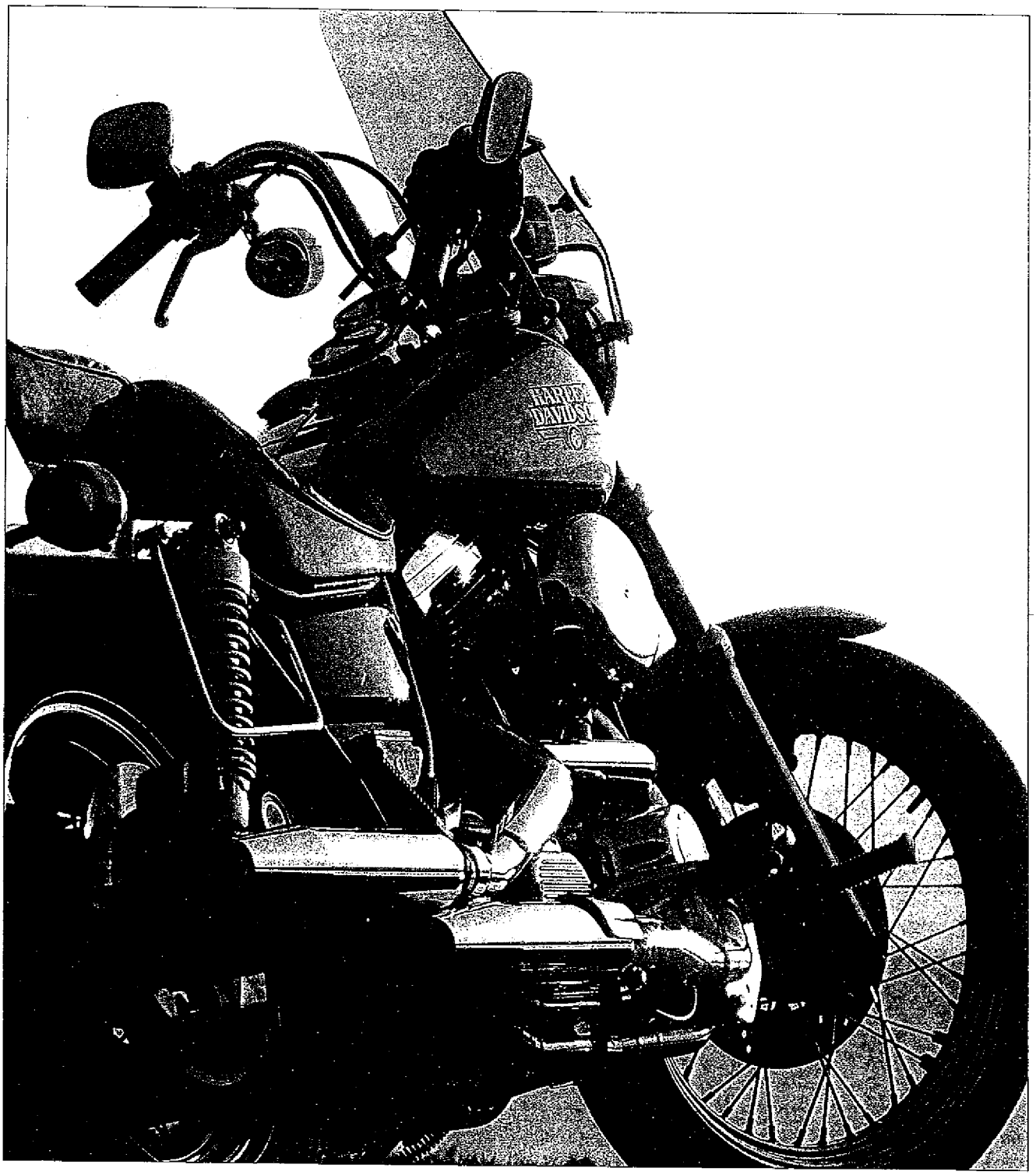
Even as a roadster, the Two-Cam was billed as "the fastest model ever offered by Harley-Davidson" with the JDH specially recommended "for greatest speed and maximum performance."

With an 80-inch version available on special order in 1929, this olive green projectile was no less than the American equivalent of Brough Superior's sensational SS100 in Europe.

Yet even this degree of exclusivity was priced too high for an American market more interested in cars, and the Two-Cams passed into legend after spending a very short two years in the Harley-Davidson range.



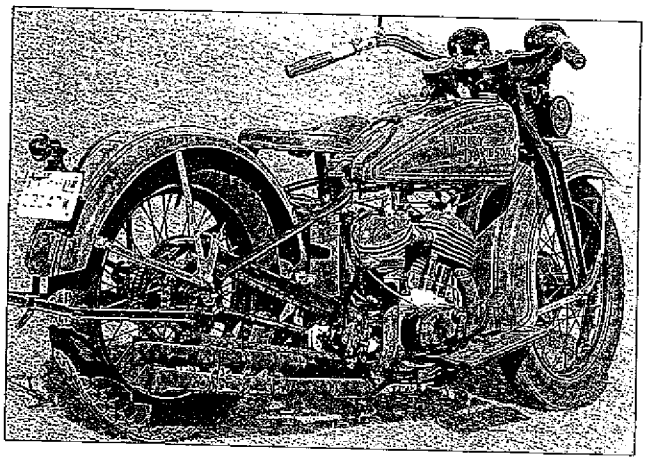
■ BELOW *Reflected glory: an Evo-engined Low Rider basks in the setting sun.*



45-INCH TWIN, 1929–51

One of the most enduring motorcycles in Harley-Davidson's history was announced in October 1927, hitting the road just over 12 months later. The Model D, as it was first styled, was the first of a new generation of side-valve "flathead" V-twins – far cheaper to create than the relatively complex F-head engines. Not much more than a pair of 21-inch "Ricardo" singles on a common bottom-end, it featured three-speed transmission and a spindly frame almost identical to the little single's.

If the beginnings were lacklustre, improvements came fast. Within a year, the "45" benefited from a sturdy new frame with lower saddle but increased ground clearance. It was now available in four guises: D (low compression solo), DS (sidecar), DL (high compression Sport Solo) and DLD Special Sport Solo. Two years later, it emerged from a comprehensive redesign as the Model R. This included aluminium pistons in place of Dow metal (with magnesium offered as a special option from 1933), new crankcases with improved oiling and a sturdier frame.

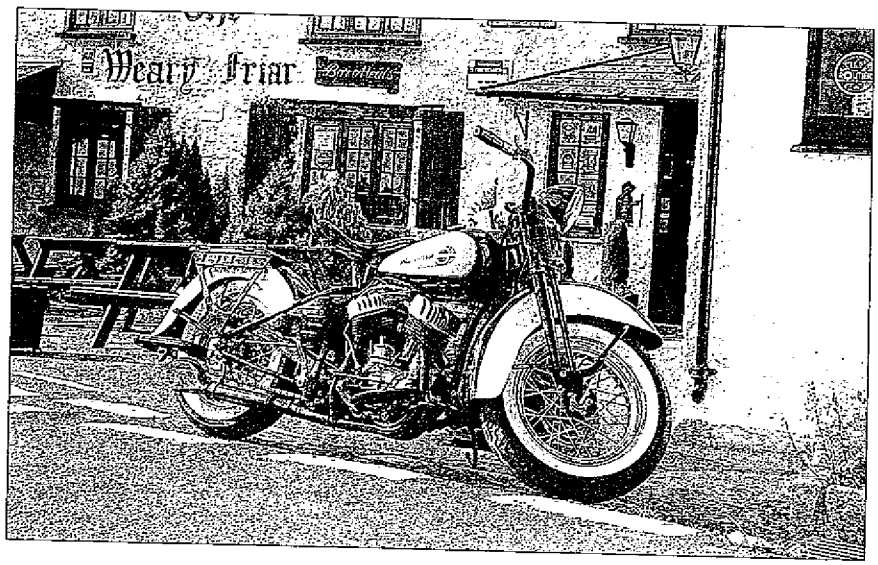


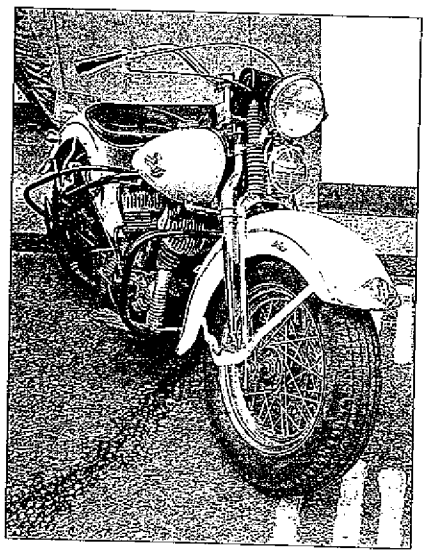
■ LEFT *An early Model D "45". The unfinned timing cover is one obvious difference from the later Model W.*

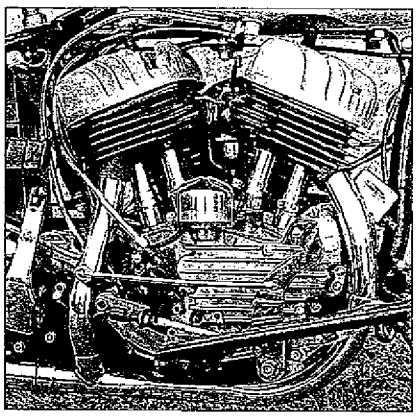
SPECIFICATIONS:
1929 MODEL DL

Engine	side-valve V-twin
Capacity	45.3cu in (742cc)
Transmission	3-speed
Power	around 22bhp
Weight	395lbs (179kg)
Wheelbase	56½in (1,435mm)
Top speed	around 65mph (105kph)

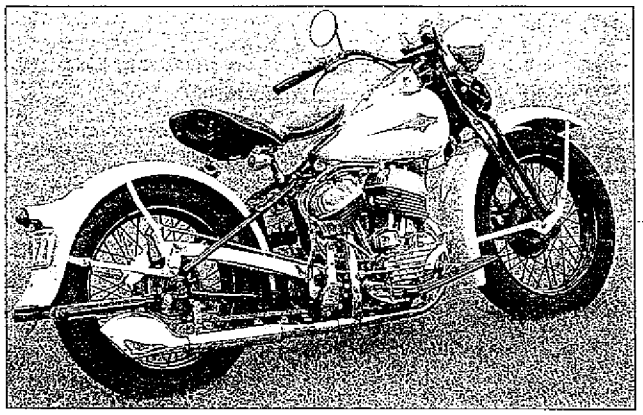
In 1933, of course, the Depression was at its deepest. A sign of these cash-strapped times was that this much-improved machine now cost just $280 – $10 less than the Model D had at its introduction. After a further steady regime of continuous improvement, the "45" was transformed once again to become the Model W in 1937. Although the most obvious difference was the adoption of styling from the Knucklehead released the previous year, there were numerous engine







■ LEFT AND RIGHT *The inspiration for the "flathead" nickname is obvious (left). Note the streamlined instrument console, which remains a Milwaukee hallmark.*



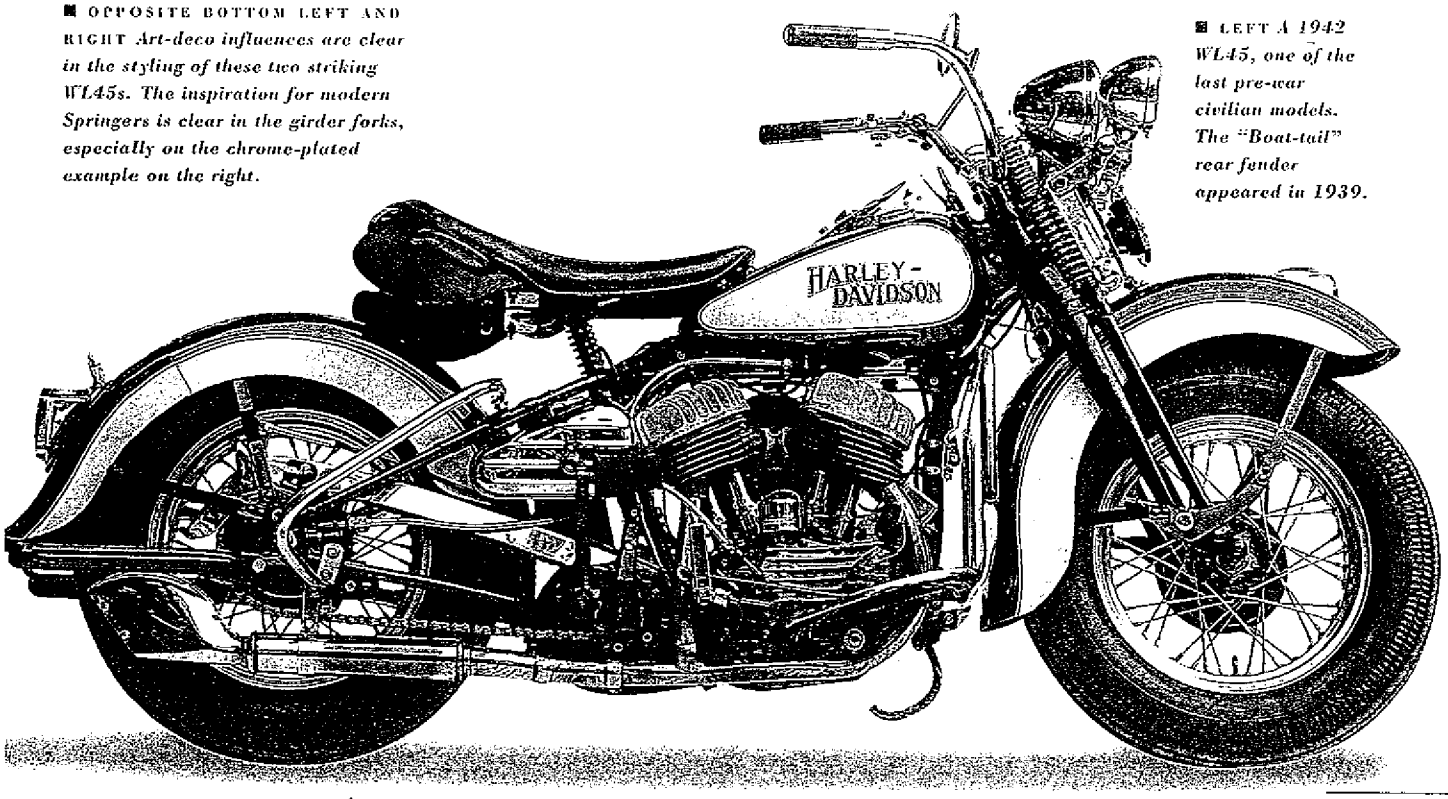
improvements as well, with its troublesome crankcase oiling and breathing system getting the lion's share of attention.

The range now comprised not only standard (W), sidecar (WS), Sport (WL) and Special Sport (WLD) models, but also the WLDR Competition Sport Special, a mean-looking stripped-down racer – though by 1941, the WLDR machine was a "Special Sport" roadster, the racer being known by a simple "WR". Four-speed transmission, adopted from the bigger twins, appeared in 1938 and by 1940 the WLA Army version was on the books. By now, the WLD and WLDR versions carried light alloy cylinder heads with more fin area and a larger carburettor, improvements that would not reach the base models for another five years.

Indeed, the engine would receive almost no more significant changes during the WL's final decade – a far cry from the 1930s when anything from 15 to 30 modifications were made each year. Instead, Harley-Davidson directed its efforts into its overhead-valve models, confining the "45" mainly to cosmetic revisions, partly inspired by the Hydra-Glide. Civilian production of "45"s ceased after 1951, although some military versions were produced later, and the same side-valve engine would continue to power the Servi-Car into the 1970s. The WL is – and was for most of its life – a crude, heavy machine better suited to the American Prairies or war-torn battlefields than any road with bends. By the time it went out of production, it was a motorcycling dinosaur. Though it was slow, outdated and cumbersome, it was also strong as an ox and almost indestructible: this model had proved itself to be a tough old Hog that for more than two decades had dependably delivered the bacon for Harley-Davidson.

■ OPPOSITE BOTTOM LEFT AND RIGHT *Art-deco influences are clear in the styling of these two striking WL45s. The inspiration for modern Springers is clear in the girder forks, especially on the chrome-plated example on the right.*

■ LEFT *A 1942 WL45, one of the last pre-war civilian models. The "Boat-tail" rear fender appeared in 1939.*



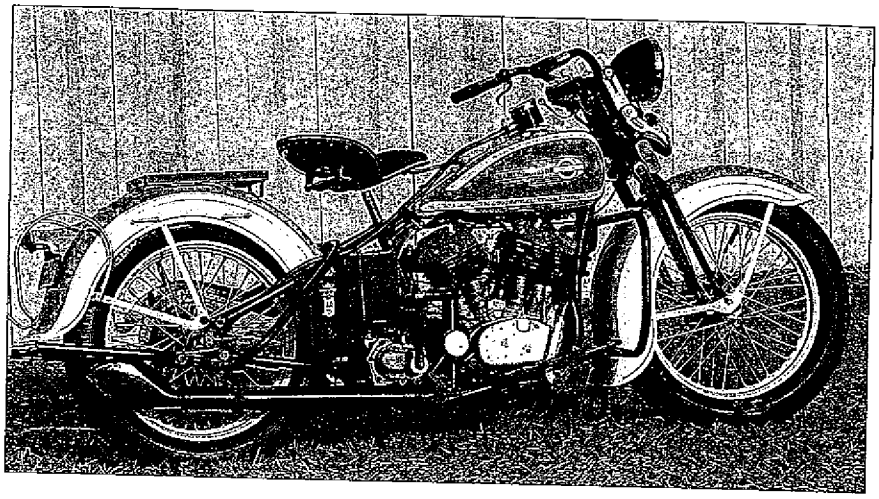
74-INCH SIDE-VALVE TWIN, 1930–48
80-INCH SIDE-VALVE TWIN, 1935–41

Far from being the dependable machine the market required, the model which propelled Harley's big-inch fortunes into the troubled 1930s was even more bothersome than that very first V-twin of 20 years earlier. Launched just in time to see the New York stock exchange collapse in 1929, the Model V "Big Twin" began life as a fiasco.

With the original twin, valvegear was the problem. With this new 74-inch model it was almost the entire machine. As William H. Davidson recalled: "bad engine... bad clutch... flywheels too small... frames broke... mufflers became so clogged the engine lost power."

It's a mystery now – and probably was for Harley at the time – why the first of this line were so very poor. The cylinder heads, though now of side-valve layout, retained the proven "Ricardo" pattern of the earlier single.

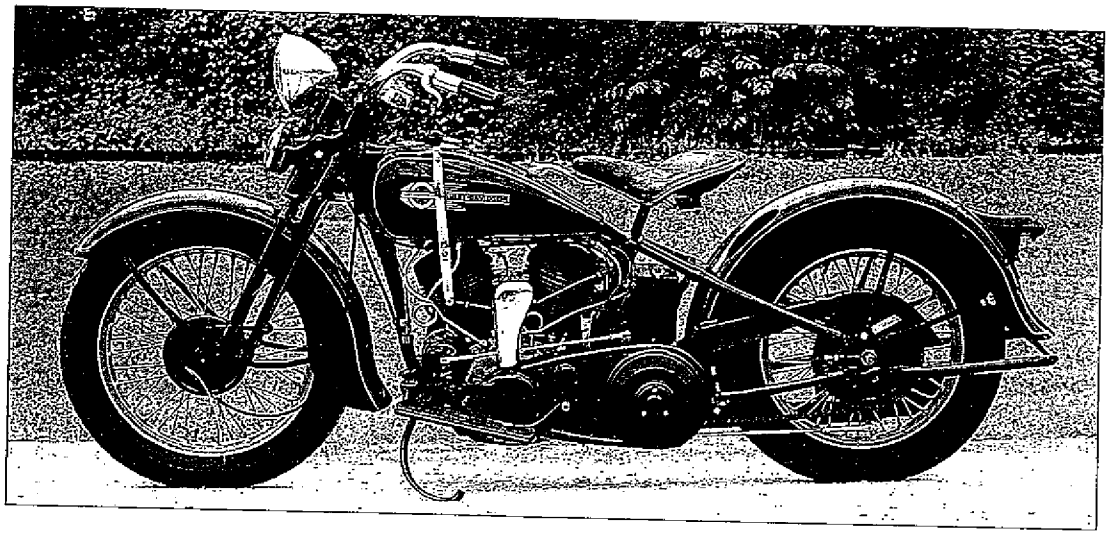
At 87.3 x 101.6mm, the bore and stroke dimensions were unchanged from the Model D. As before, a single dependable Schebler carburettor metered fuel via a forked manifold. Testing showed that power was up 15 per cent on the old "74".



SPECIFICATIONS:
74-INCH (80-INCH) TWIN

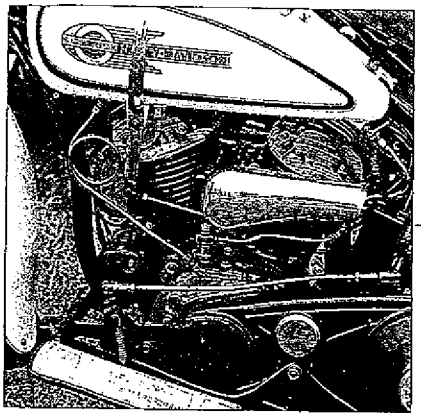
Engine	side-valve V-twin
Capacity	74.2cu in/1,216cc (78.9cu in/1,293cc)
Transmission	3-speed (4-speed from 1937)
Wheelbase	60in (1,525mm)
Top speed	up to 90mph (145kph)

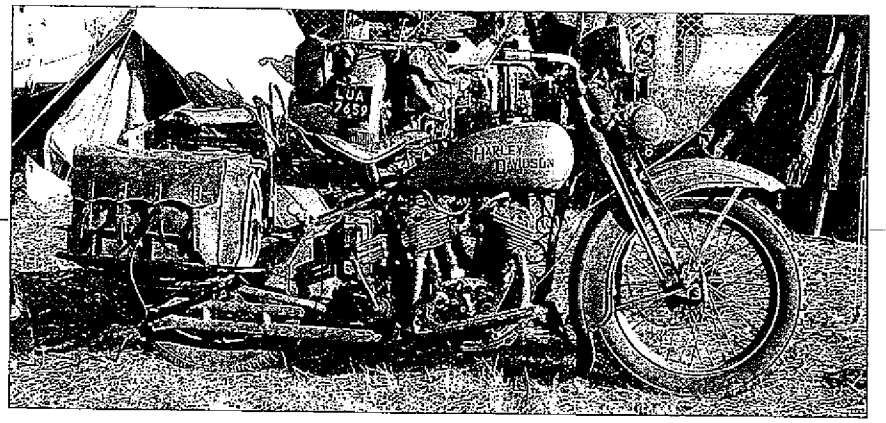
There were novelties, of course, but nothing suggesting the trouble to come. Primary drive was now based on duplex chain, far stronger than the single chain used previously. Revisions to the oil-circulation system promised the rider a less oil-soaked time, as did full enclosure of the valvegear which was impracticable on the old ioe twin. Other improvements that ought to have been welcomed by serious users included interchangeable quick-release wheels (at a time when punctures were a



■ ABOVE *The mighty VL, the top of the Milwaukee range before the arrival of the Knucklehead.*

■ LEFT *A 1936 VLH 80-inch twin. The spring shield on the girder forks was new for that particular year.*





■ ABOVE LEFT *Hand gear-change would remain a Milwaukee norm until the 1950s. The foot pedal operates this VL's "suicide" clutch.*

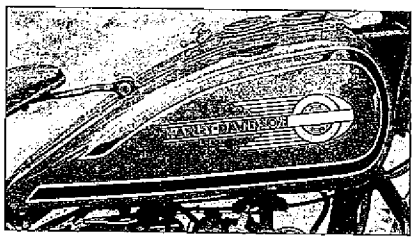
■ ABOVE RIGHT *An drab army 74-inch twin. Note the metric engine capacity in the "1200" on the tank.*

daily hazard) and an improved electrical system with better weather protection. The frame, too, was new: lower, heavier and reputedly sturdier than before.

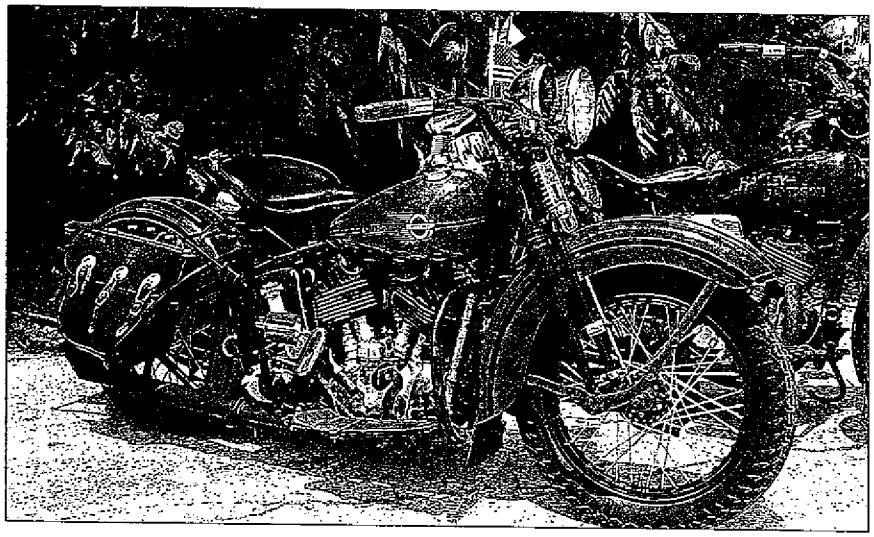
For a company trading on unsurpassable reliability, the "74"s problems were serious indeed. No matter how handsome the new machine was, dressed in olive green with red pin-striping, no-one would buy it if it didn't work. To its credit, Milwaukee dropped everything to fix all the faults and the Model V proved dependable for the rest of its days.

Having benefited from the fixes applied to the 74-inch model, the 80-inch model released for 1935 proved almost completely problem-free. The bigger engine was substantially similar to the contemporary "74", the extra capacity resulting from an increase in stroke from 101.6 to 108mm.

For 1937, the V-series gave way to the U-series big twins, with four-speed transmission, improved engine oiling and both the running gear and styling from Knucklehead twins. Both were capable of up to 90mph (145kph), had vestigial brakes and no rear suspension. Production of the "80" effectively ceased after 1941.



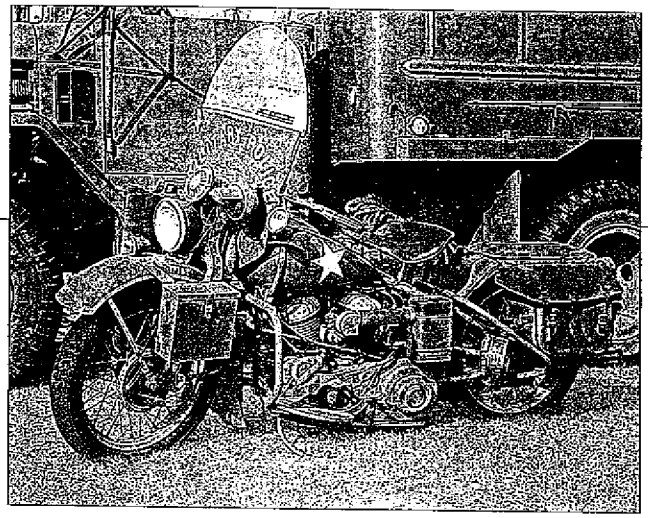
■ ABOVE AND BELOW *With the change to four-speed transmissions in 1937, the Model V became the Model U, one year before this handsome 80-incher was built. Note the revised timing cover.*



NAME GAMES

Not for the first time, Harley-Davidson's model nomenclature looks confusing viewed from decades distant. Sometimes called the "VL", the 74-incher was available from the outset as a straight Model V, with "VL" representing the high compression version, "VS" the sidecar puller and "VC" signifying the use of nickel iron rather than light alloy pistons. This continued until 1934, when options included the VLD ("Special Sport solo" with TNT motor), VD (low compression, solo), VDS (low compression, sidecar gears) and VFDS (heavy duty commercial, TNT motor). In 1935, the 80-inch model appeared and was dubbed VLDD (Sport solo) or VDDS (sidecar), alongside existing 74-inch models. This all changed for the 1937 model year, with "U" replacing "V" (alphabetically backwards). From then on, all the big side-valve twins' model designations began "U-" (80-inch models were indicated by a subsequent "H"). Thus a simple "U" indicated the basic 74-inch model and the plain "UH" was the equivalent 80-inch model.

WLA & XA

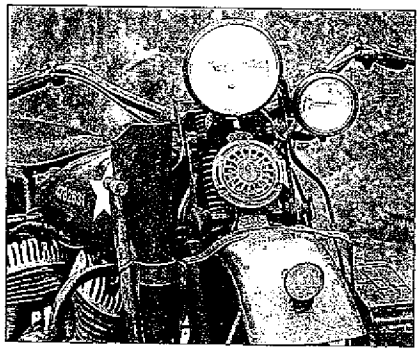


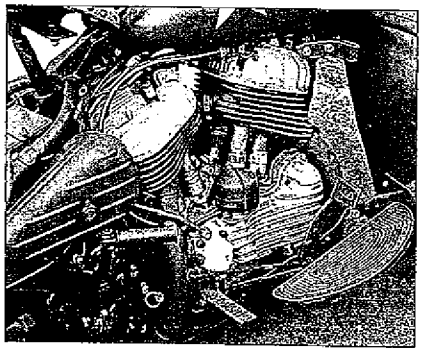
■ LEFT *The redoubtable WLA. Note the large auxiliary air-cleaner to prevent the motor choking in dusty conditions.*

■ WLA, 1940–5

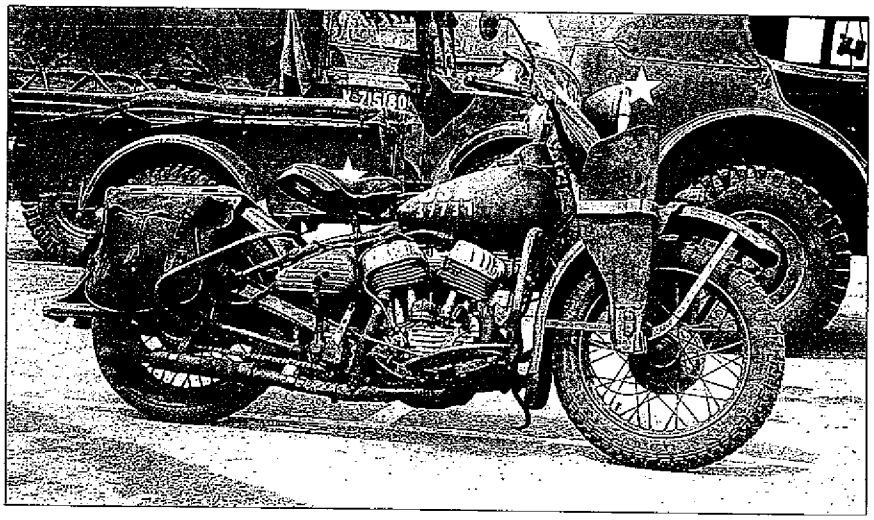
If the Willys Jeep was the archetypal American military four-wheeler during the Second World War then Harley-Davidson's rugged old 45-inch flathead twin was its two-wheeled equivalent. By the time the United States entered the war in December 1941, the "45" had proved itself during a dozen years of civilian development and was the obvious choice for an army workhorse. The first example, dubbed WLA (the A stood for "army") appeared in 1940 and was initially scarcely more than a drab green WL. By 1941, it had acquired blacked-out auxiliary lights, an oil-bath air-cleaner (intended for North African conditions) and a quieter fishtail exhaust. Depending on the precise military requirements, luggage racks were added, front and rear, plus a gun scabbard and under-sump bash plate.

That pivotal year also brought the first of around 18,000 WLC models built for the Canadian military, which differed principally in having a foot-operated gear change on the right, rather than hand-change on the left. Anti-hertz suppressors and more comprehensive blackout gear were added later, and by late 1943 – the year in which WLA/WLC production peaked, at over 27,000 – even the crankcases were painted olive drab. Each machine bore a plate warning the rider not to exceed 65mph (105kph), not that the WLA was capable of very much more. Of around





■ BELOW LEFT AND RIGHT *The key to the WLA's success was its low-tuned, dependable engine, which had already enjoyed over a dozen years of development since the original Model D of 1929. Later examples had slotted "black-out" lights.*

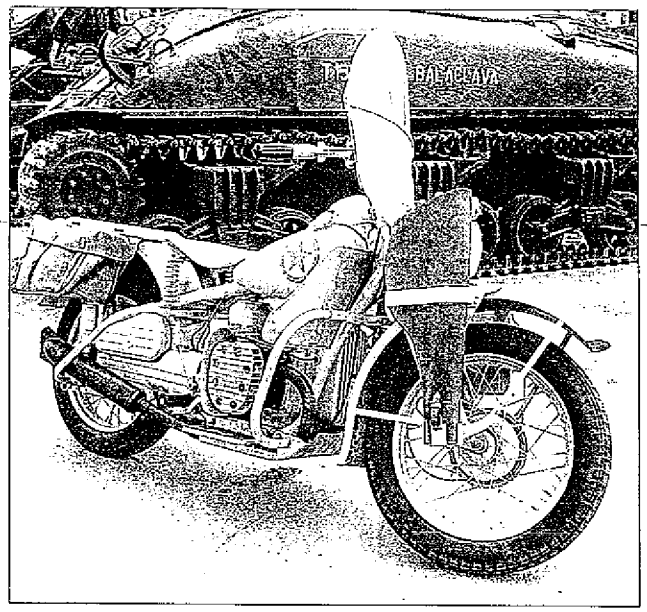


SPECIFICATIONS: WLA

Engine	side-valve V-twin
Capacity	45.3cu in (742cc)
Transmission	4-speed
Power	around 22bhp
Weight	varied with specification
Wheelbase	59½in (1,510mm)
Top speed	limited to 65mph (105kph)

■ LEFT *Although American-liveried models are best known, over half of military WL production went to other countries' armies.*

SPECIFICATIONS: XA	
Engine	side-valve horizontally-opposed twin
Capacity	45.1cu in (739cc)
Transmission	4-speed
Power	around 25bhp
Wheelbase	59½in (1,510mm)
Top speed	around 65 mph (105kph)



■ LEFT *Most observers would fail to recognize this as Milwaukee iron: the horizontally-opposed XA twin.*

88,000 WLs produced for war-time service, many went to Russia, of which later examples were specified WSR models. It is reputed that some 30,000 Red Army Harley-Davidsons entered Berlin as the war in Europe drew to a close. Milwaukee's contribution to the war effort was marked by no fewer than three Army/Navy "E" awards for excellence in military production – although this was to backfire commercially on the company when thousands of WLAs were sold as war surplus after 1945, damping-down the post-war recovery.

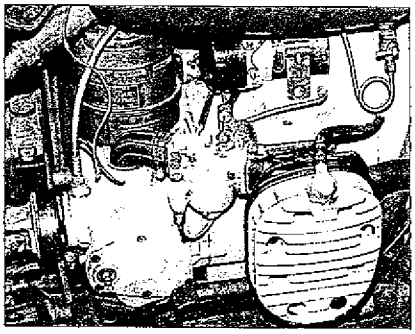
■ XA, 1942–3

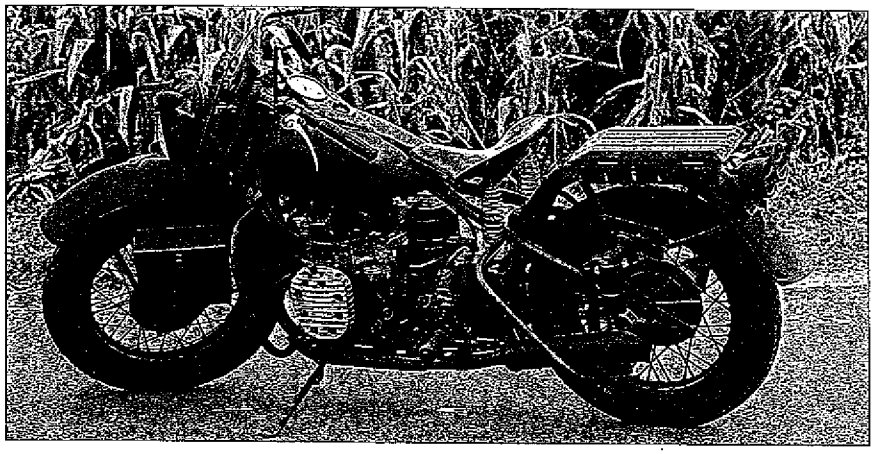
Although Milwaukee built some military versions of the 74-inch side-valve twin (UA) and even fewer ELC Knuckleheads for the Canadian forces, the factory's second-string army model was the curious XA. Powered by a horizontally-opposed 45.1cu in (739cc) twin with shaft final drive and plunger rear suspension, the XA was expressly designed for use in the North African desert. The transmission was four-speed, with foot change and twin carburettors feeding the two side-valve cylinder heads. This may seem reminiscent of contemporary BMWs: this was a direct copy of the German machine. Juneau Avenue did not copy the opposition's dependability, for it reputedly suffered serious bearing failures due to the Sahara's heat and sand. As a result, only around 1,000 XAs were built, all during the years 1942–3, though this may have been because the North African campaign was drawing to a close. There was also a rare XS variant with sidecar. A civilian prototype derivative of the XA was tested during 1946 but failed to reach production.

■ BELOW *Note the shaft drive coupling and large air-cleaner on this flathead XA.*

■ BOTTOM LEFT *Although most XAs were intended for North African use, this example is painted in non-desert livery.*

■ BOTTOM RIGHT *Note the instruction plate: the military ensured that as little as possible was left to chance.*



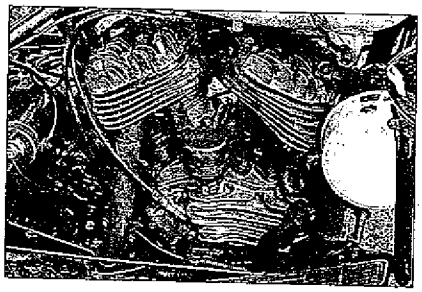


SERVI-CAR, 1932–74

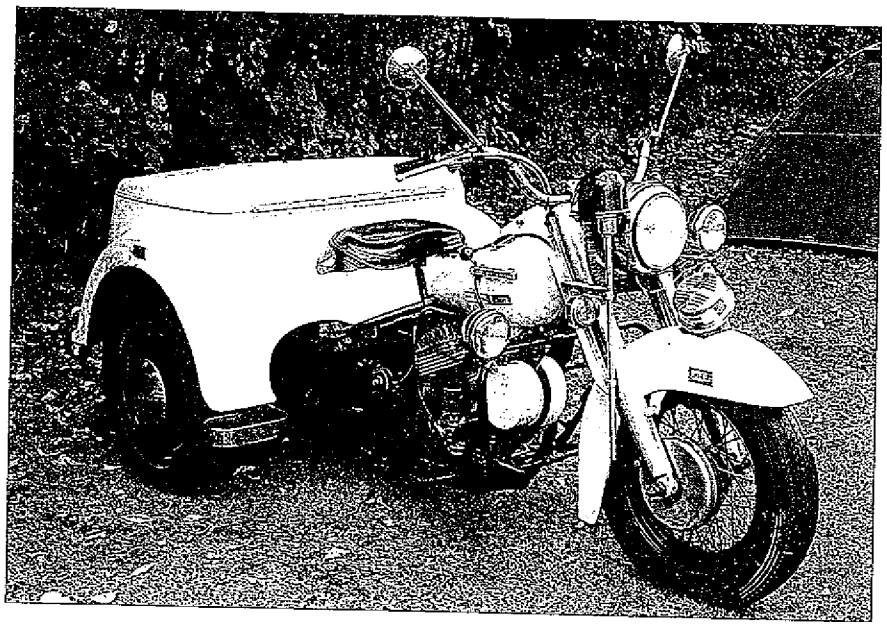
■ ABOVE *Servi-Cars proved adept at many tasks, although cooling ice cream in an inferno probably wasn't one.*

Although we think of them now as kings of style even when carrying the Highway Patrol along California's freeways, in their earlier years Harley-Davidsons were no strangers to humble workaday vehicles. As early as 1913, the range included a "Forecar" delivery van, the Model 9-G, essentially a 61-inch F-head twin with front-mounted luggage box. Sidecars and sidecar accessories had been an integral part of the Milwaukee range since 1916, with a huge sidecar production facility in operation at Juneau Avenue since 1926.

With the Wall Street Crash and its aftermath placing a particular premium on cheap, dependable commercial transport, it was perhaps no surprise that 1932 marked the debut of one of the strangest – and most enduring – Harleys ever produced. The Model G Servi-Car was a more-or-less conventional V-twin from the saddle forward, but the rear looked for all the world like an ice-cream van. Although it resembled a car rear axle crudely grafted on to a conventional bike (and topped off with a metal and fibreglass boot (trunk)), the Servi-Car was a practical and cheap working vehicle which found a steady market in Depression-torn America.



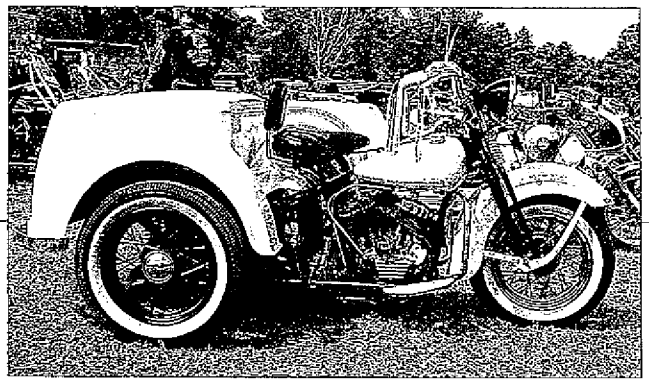
Some suggested that it was inspired by Far East rickshaw-style machines; however, the Servi-Car was initially



SPECIFICATIONS

Engine	side-valve V-twin
Capacity	45.3cu in (742cc)
Transmission	three forward speeds, one reverse
Power	around 22hp
Wheelbase	61in (1,550mm)
Width	48in (1,220mm)
Top speed	around 60mph (96kph)

■ ABOVE LEFT AND LEFT *A Servi-Car kitted out for police duty, as so many examples were. Note the additional lights and large siren on the front mudguard.*



■ RIGHT *Proving that any Harley can be customized, although tassels were never a Servi-Car factory option.*

intended for the recovery of broken-down cars – hence the tow-bar and huge 60 amp/hour battery fitted as standard. Perhaps surprisingly, given the fraught circumstances of the time, it combined both sound design and solid engineering – so tough and enduring in fact that it remained in production from 1932 until 1974. From the outset, it employed a purpose-built frame with chain drive from the gearbox turning a car-type rear axle complete with differential. It enjoyed conventional drum brakes in each wheel, plus a parking brake mounted inside the rear axle housing. Power came from the same 45.3cu in (742cc) flathead V-twin fitted to the Model R. It may have been sluggish but it was undeniably dependable.

The first examples had the same three-speed gearbox as the roadster solo but within two years a reverse gear (not to mention contemporary art-deco styling motifs) had been added. By this time, the three-wheeler range was popular with police, garages, motoring organizations and small businesses alike and comprised no fewer than five models. In fact it was almost everything such enterprises needed: practical, reliable and cheap.

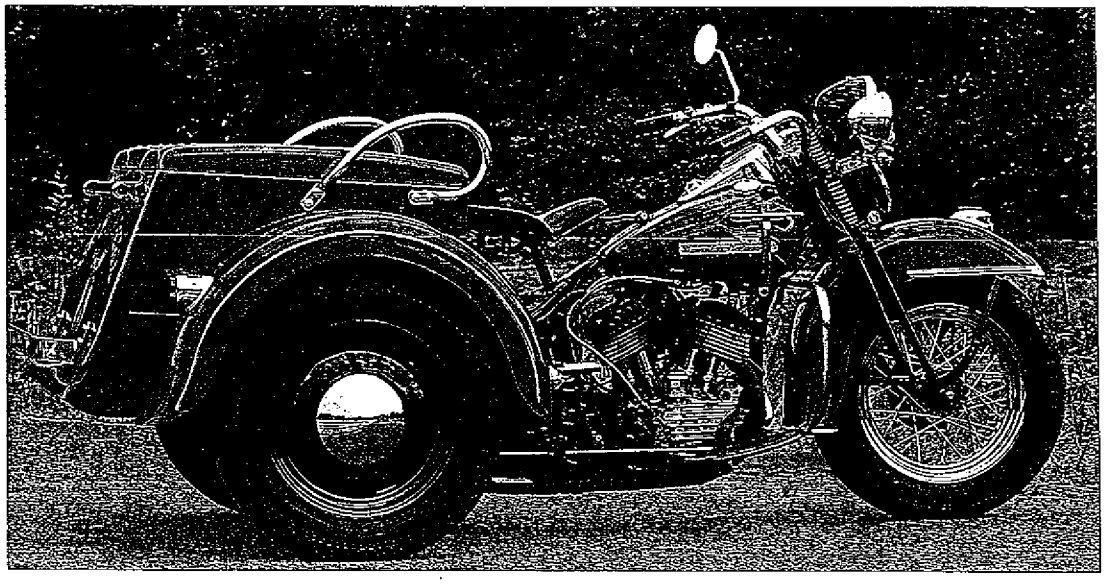
Above all, it was easy to drive, so there was usually need for only a minimum of operator training. One clever and user-friendly touch was the adoption of the same 42in (1,067mm) wheel track as the typical car – inexperienced Servi-Car drivers would not need to forge their own ruts in mud and snow. At its introduction, it was priced at just $450; by 1969 this had risen to $2,065.

With such a lengthy life-span, inevitably there were other changes too numerous to list. A radical styling change was introduced in 1937, echoing the new 61-inch Knucklehead (indeed the factory briefly dabbled with a prototype shaft-driven Knucklehead Servi-Car). This included a white-faced speedometer calibrated to 100mph (161kph), which would have been terrifying were it not at least 35mph (56kph) over the machine's capabilities.

At the same time, the revised flathead twin from the Model W provided the power – and would continue to do so for the rest of the Servi-Car's days.

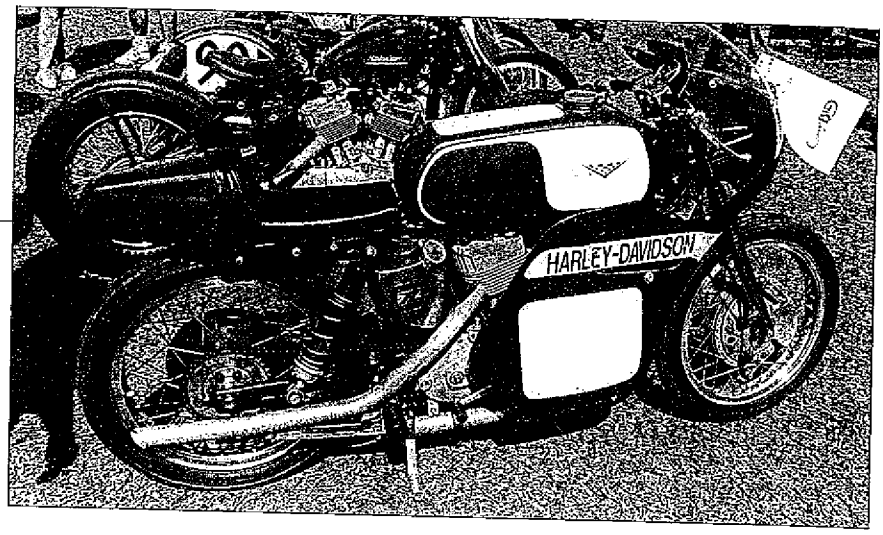
Electric start was finally added in 1964 and rear disc brakes toward the end of 1973, at which time annual sales still exceeded 400. Volume production of Servi-Cars ceased after 1973, although some were made to order the following year.

The Model C's most obvious drawback – the absence of heater and roof – had finally brought about its demise, although it could still be seen in service with United States' police forces well into the 1990s.



■ RIGHT *This is a more original example, and here it is painted in colours of the fire department.*

MODEL K, 1952–6

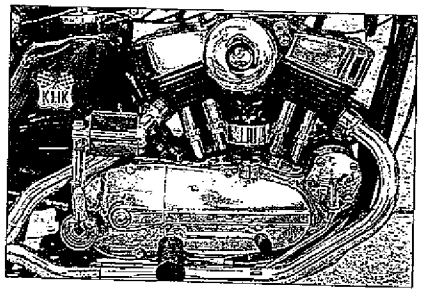


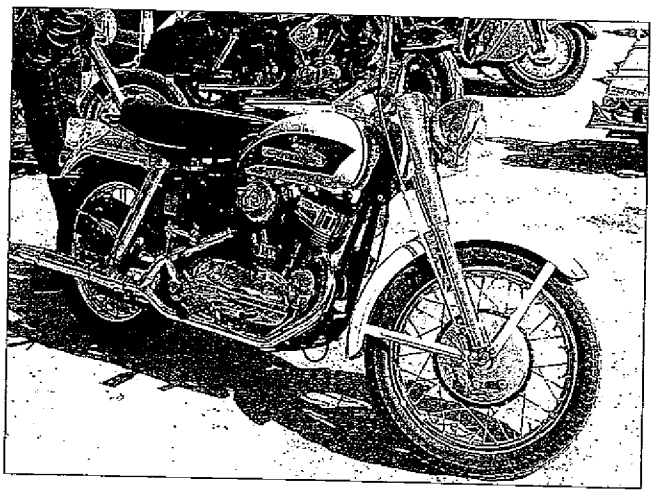
If a single model demonstrated Milwaukee's problems during the post-war years, it was surely the Model K, unveiled in November 1951. Virtually a technological throwback, the "K" was born into an age when competition from Europe was intensifying almost monthly. Opposition machines offered high-performance overhead-valve engines with 100mph- (161kph) plus performance and the finest chassis ever built. In response, Harley-Davidson offered as its premier model an antiquated, long-stroke, side-valve twin as its premier sports model, which struggled to reach 80mph (129kph).

Advertised as "America's Most Sensational Motorcycle", the "K" was "designed to outperform, outride, outlook, outvalue ... any motorcycle in its class." Of course, this was only true if a class existed for absurdly slow and out-dated machines – which it might if Milwaukee's plea for a 40 per cent tariff on imported motorcycles had succeeded in May 1951. Harley literature claimed 30 horsepower for the Model K, only a little less than the contemporary 650cc Triumph Thunderbird. Whether true or not, the V-twin was no match for the 103mph (166kph) Britisher. Yet remarkably, Joe Leonard became first American national champion in 1954, on a machine substantially derived from the K. Its other saving grace was that it was the only large-capacity motorcycle Hollywood stars could be insured to ride – in other words, the K was so slow, it was considered safe.

SPECIFICATIONS

Engine	side-valve V-twin
Capacity	45.3cu in (742cc)
Transmission	4-speed
Peak power	30bhp
Wheelbase	60in (1,525mm)
Top speed	around 80mph (130kph)



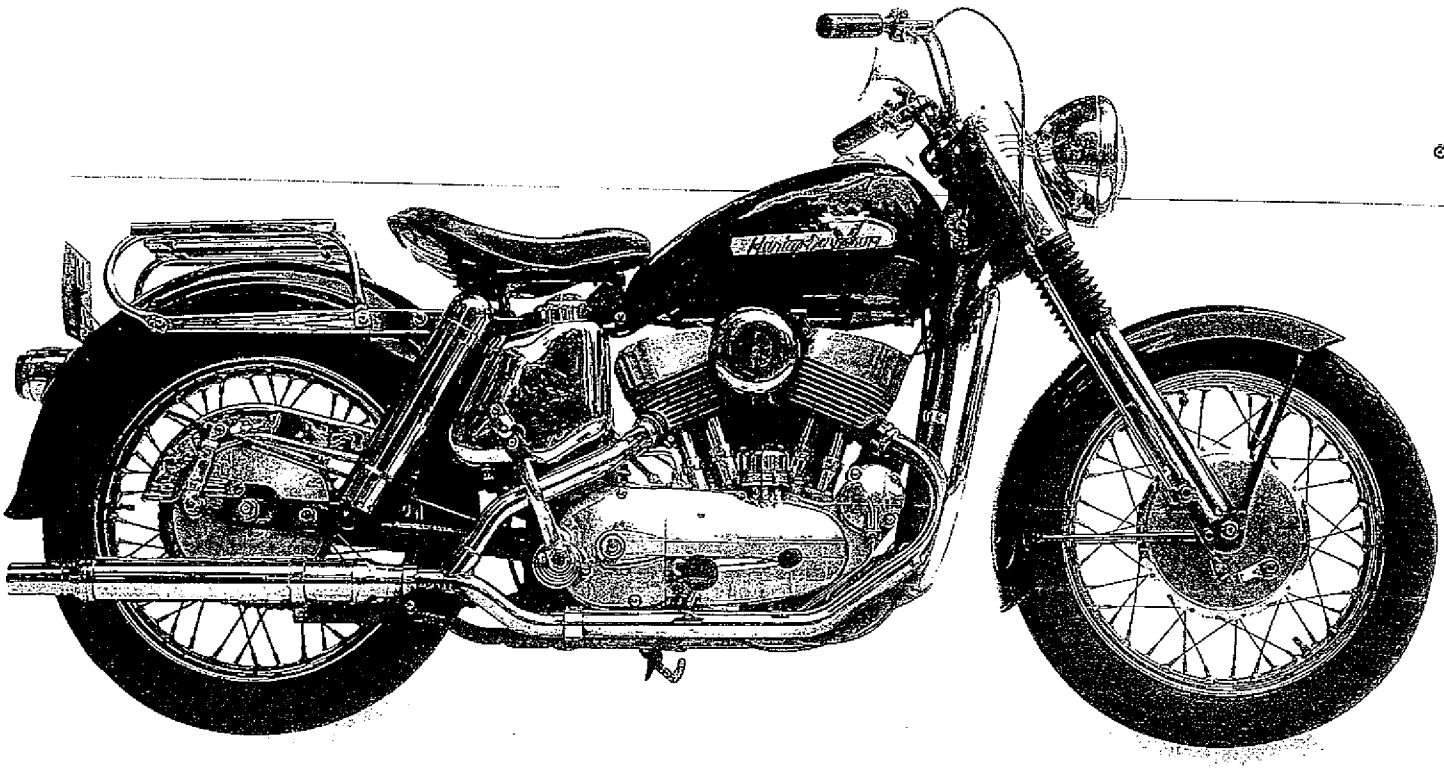


■ TOP *Aided by a 30.5cu in (500cc) limit for ohv engines, the side-valve 45.3cu in (742cc) Model K fared better on the track than on the street.*

■ ABOVE AND LEFT *The best of the breed: a KHK in strident yellow.*

True, the K was the first Harley-Davidson twin to feature suspension at both ends: "easy riding" double-action telescopic forks up front with a swinging-fork rear end (oddly, a sprung seat was retained.) By the standards of Triumph, BSA and Norton in particular, the handling was ponderous and mushy, although the eight-inch (200mm) brakes weren't bad for the time. It offered a hand-operated clutch and in a demonstration of supreme optimism, its speedometer was graduated to 120mph (193kph).

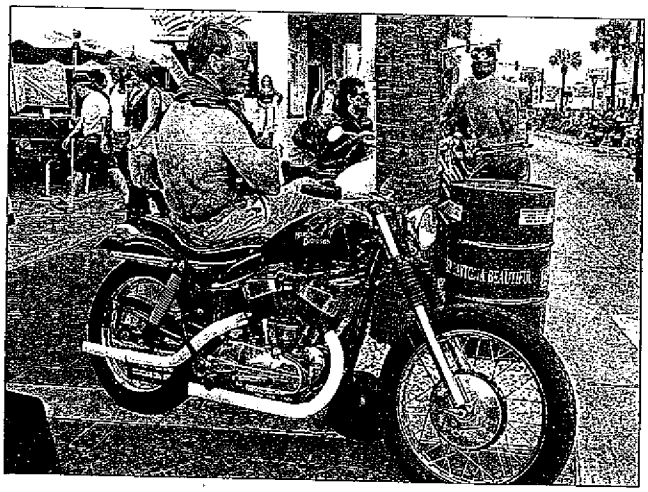
Nor was the K dependable, at least initially, as it was beset by a variety of performance and reliability problems. Perhaps the worst was its habit of breaking its "large, rugged" transmission gears, until a switch to forged parts after 1954. In many other respects, the bike was sturdy and sensibly conceived, such as in the use of taper-roller bearings for the swing-arm pivots. Bore and stroke were identical to the WLs: 70 x 97mm. The four-cam, air-cooled engine enjoyed generous finning to its aluminium heads and iron



barrels, and it featured in-unit construction of engine and gearbox, with triplex chain drive, long before this became widespread among competitors.

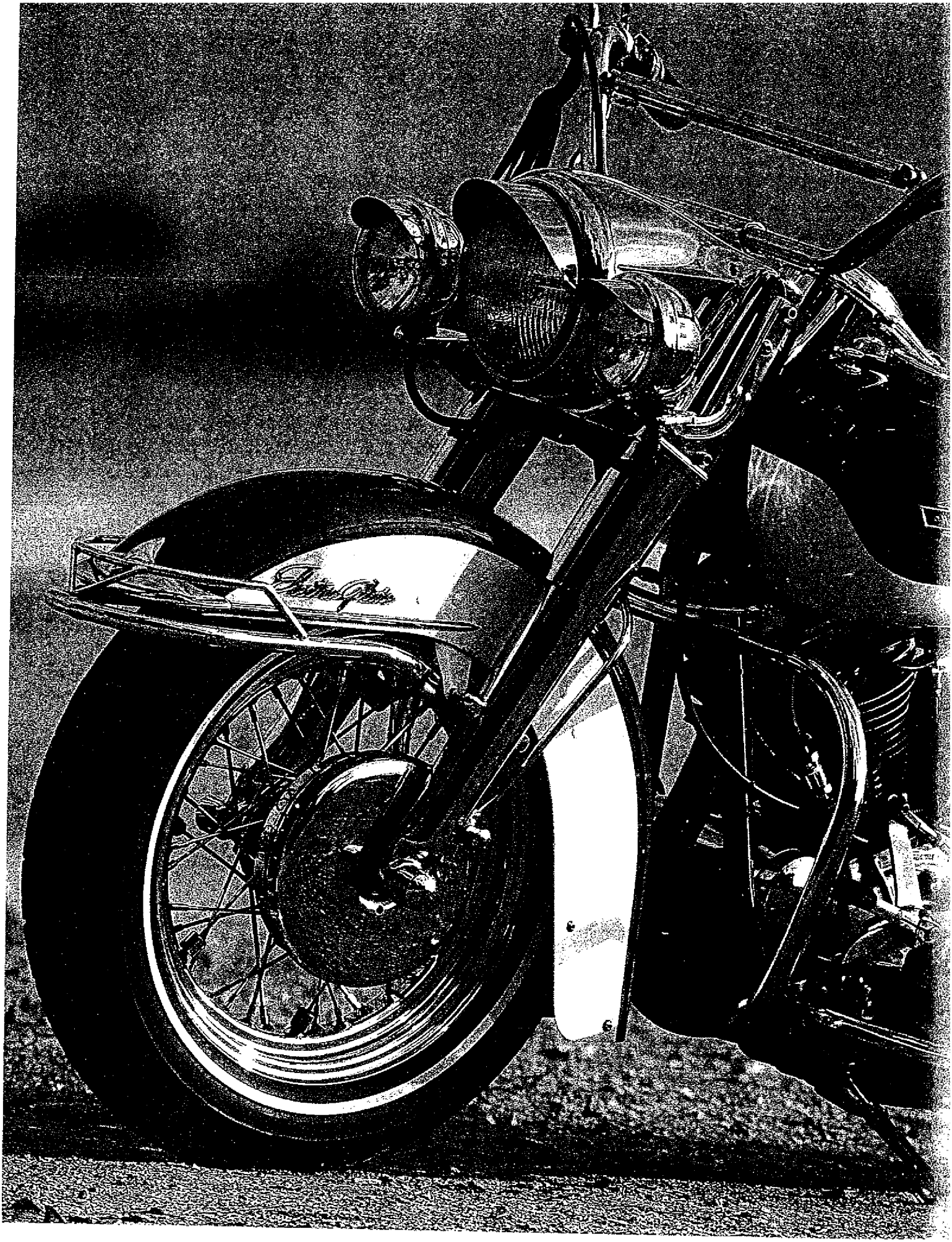
Some years after the age of the K, Harley revealed what many had suspected – that it was only a stop-gap model to see the company through until something better could be developed. Although history records that the Model K was superseded by the Sportster, something more radical was envisaged originally. The familiar 45-degree V layout was dropped in favour of a wider 60-degree engine to be known as the KL, with "high" cams, twin carburettors and side-by-side rather than forked connecting rods. This would have increased secondary vibration, although the wider V angle would have gone some way to reducing primary imbalance.

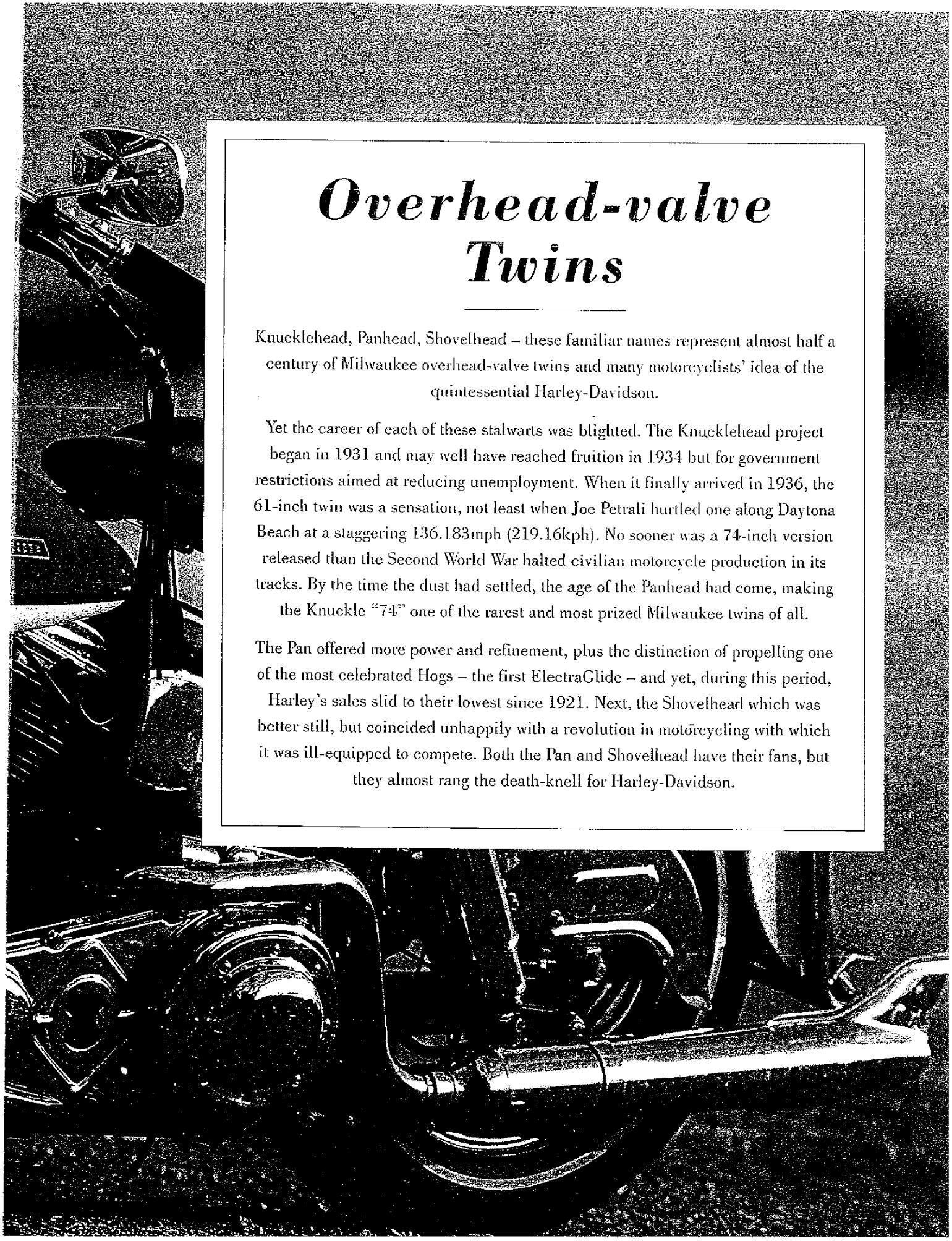
Evidently, the KL project ran into patent conflicts with Vincent and ran out of development time, although it is possible that the progress of European machines convinced Harley that something even more potent was required. By way of a stop-gap to the stop-gap, a drastic 19mm increase in stroke raised the Model K's capacity to 55cu in (883cc) for 1954, and power to a claimed 38bhp, in an attempt to stay at least within sight of the Brits. The cover of *The Enthusiast* showed one Elvis Aaron Presley on board just such a machine in 1956, by which time work on the model's successor was already well in hand. As well as the basic KH, a tuned Super Sport Solo KHK model with high-lift camshafts, polished ports, leaner styling and lower handlebars arrived in 1955. Though they were ostensibly intended for racing, most found their way on to America's streets where they proved far more acceptable to American sports riders – their top speed exceeded 90mph (145kph). After 1956, the old flathead expired and was replaced by the first of the overhead-valve Sportsters. As the KR and KRTT, it soldiered on for more than a decade as Milwaukee's principal racing iron.



■ TOP *Pictured here is a handsome example of a 1956 Model K.*

■ LEFT *The K probably looked cooler than it went, especially here at Daytona Beach, Florida.*





Overhead-valve Twins

Knucklehead, Panhead, Shovelhead – these familiar names represent almost half a century of Milwaukee overhead-valve twins and many motorcyclists' idea of the quintessential Harley-Davidson.

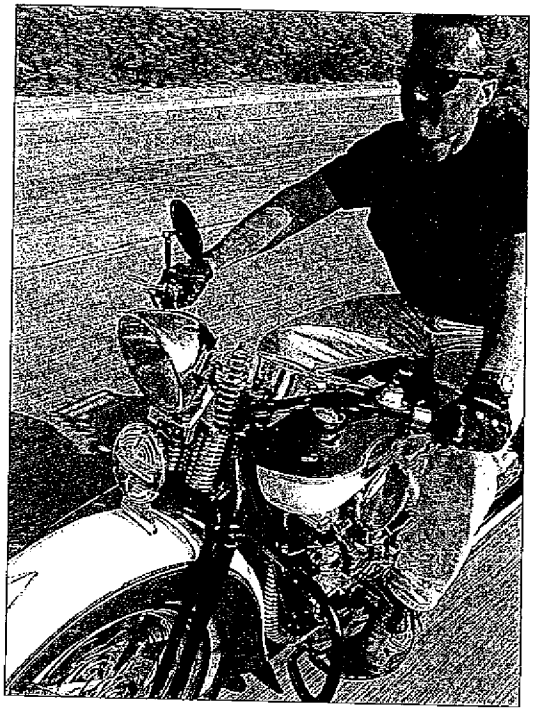
Yet the career of each of these stalwarts was blighted. The Knucklehead project began in 1931 and may well have reached fruition in 1934 but for government restrictions aimed at reducing unemployment. When it finally arrived in 1936, the 61-inch twin was a sensation, not least when Joe Petrali hurtled one along Daytona Beach at a staggering 136.183mph (219.16kph). No sooner was a 74-inch version released than the Second World War halted civilian motorcycle production in its tracks. By the time the dust had settled, the age of the Panhead had come, making the Knuckle "74" one of the rarest and most prized Milwaukee twins of all.

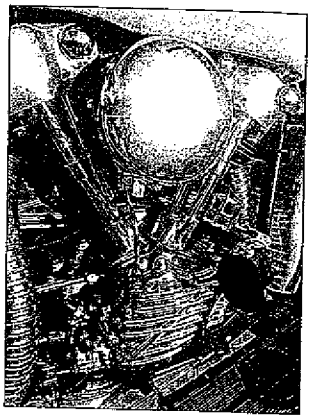
The Pan offered more power and refinement, plus the distinction of propelling one of the most celebrated Hogs – the first ElectraGlide – and yet, during this period, Harley's sales slid to their lowest since 1921. Next, the Shovelhead which was better still, but coincided unhappily with a revolution in motorcycling with which it was ill-equipped to compete. Both the Pan and Shovelhead have their fans, but they almost rang the death-knell for Harley-Davidson.

KNUCKLEHEAD, 1936–47

It's difficult to appreciate the impact Harley-Davidson's first overhead-valve roadster twin must have had on a motorcycling public that was emerging groggily from six long years of Depression. In fact, no Milwaukee model before or since was ever quite so comprehensively new. Even the latest Twin Cam, remember, is installed in largely familiar running gear.

Not so with the legendary Knuckle. Not only was the engine a major departure, but it sat in an equally new twin-cradle frame, with just the mudguards and generator remaining from the flathead VL. Its striking styling owed much to the art-deco innovations of the Depression years, capped by a teardrop-style tank, complete with an audacious white-faced Stewart-Warner speedometer calibrated to 120mph (193kph). Fanciful, perhaps, but factory

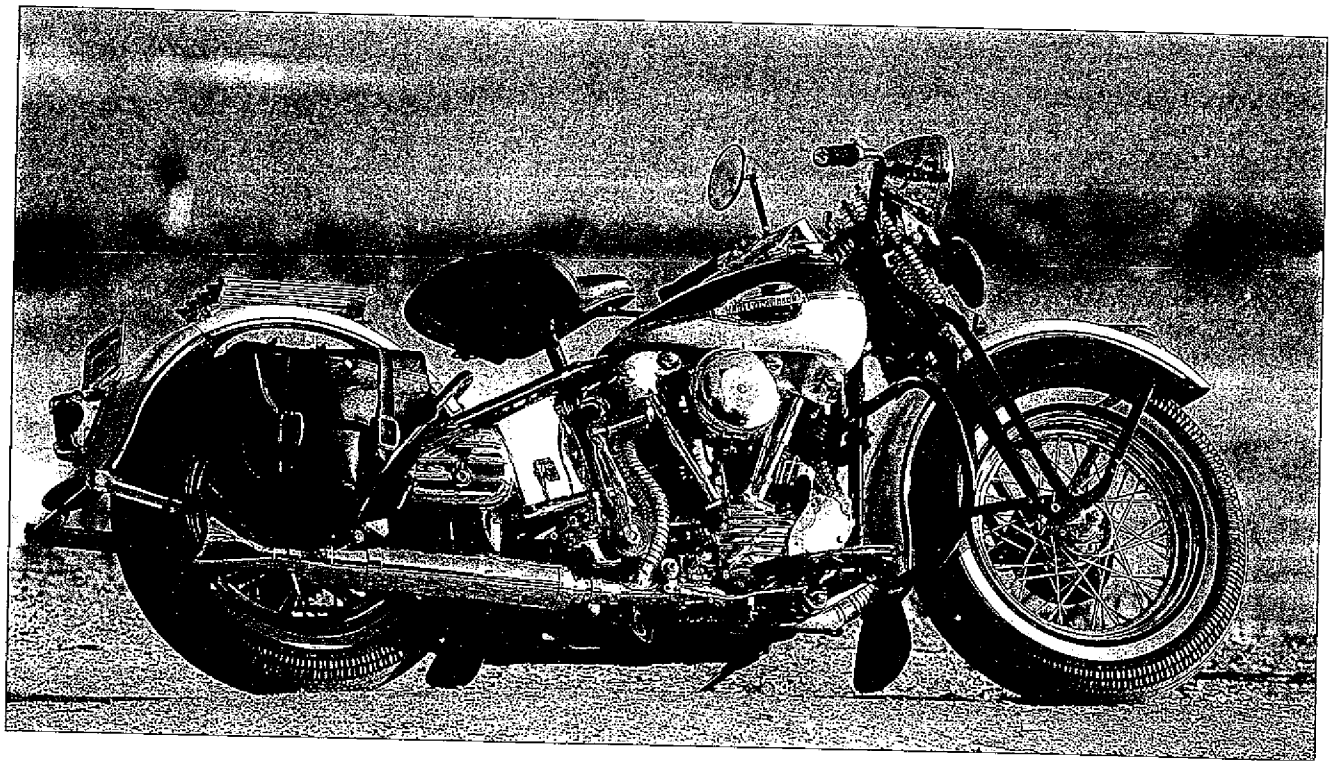




■ LEFT *The overhead-valve Knuckle was the biggest development in years*

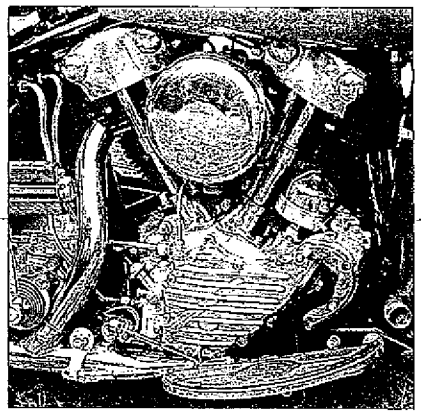
■ ABOVE *Milwaukee makes metal come alive.*

■ BELOW *This 1946 FL Knucklehead looks better now than it did when new.*



SPECIFICATIONS

Engine	ohv V-twin
Capacity	60.32 or 73.66cu in (989 or 1,207cc)
Transmission	4-speed, hand change
Power	40 or 45bhp
Weight	565lbs (256kg)
Wheelbase	59½in (1,510mm)
Top speed	up to 90mph (145kph)



■ LEFT AND BELOW *A finned timing cover (left) identifies this as a post-1941 Knucklehead. Compare this with the "smooth case" example below. A host of other changes also came in for 1942.*

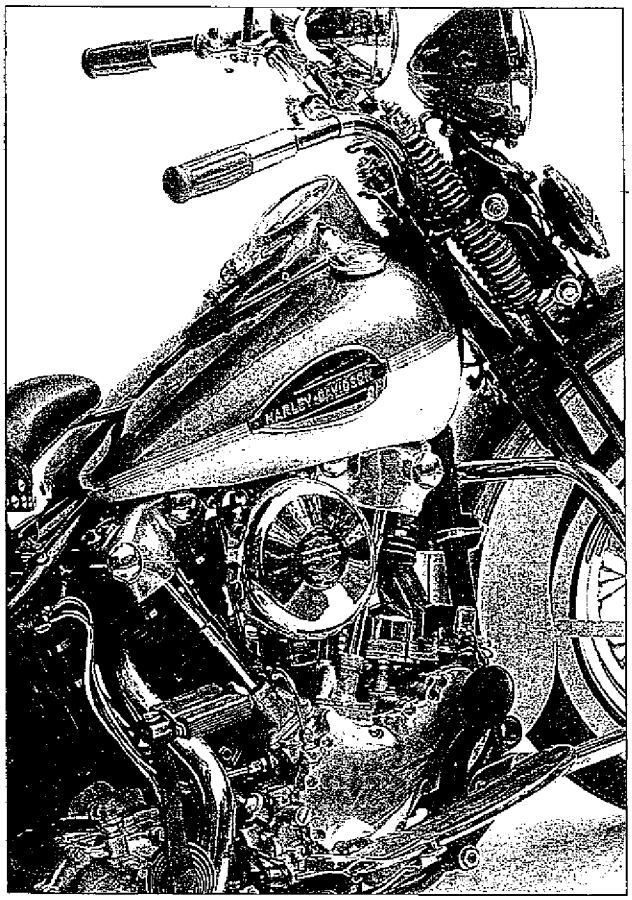
testers had reported 100mph (161kph) during development. Little wonder that would-be owners queued in droves when the first examples were shipped to dealers in January 1936, despite the $380 Knuckle costing $40 more than a contemporary 80-inch twin.

Designed by William S. Harley and Lothar A. Doerner (the latter tragically killed while testing a 1937 model), the 60.32cu in (989cc) twin underwent no fewer than 70,000 hours of testing, according to contemporary claims. As with previous mainstream models, the Knuckle was initially available in three guises: E (standard, discontinued after 1937 but restored during the Second World War), ES (sidecar) and EL (high-compression sport). All proved free-revving and eager, while the EL in particular – with 40 horsepower at 4,800rpm – offered a huge performance increase over the laggard side-valvers. Even the mighty 80-inch VL couldn't come close to an ohv twin.

Yet despite the time-consuming route to production – and not for the first time – there were initial problems.

Many changes were implemented during the first year of production, including frame reinforcing and revisions to the kick-start gears. The rocker assemblies became enclosed for 1938, by which time the patented tank-mounted instruments also included warning lights for low oil pressure and generator output.

But the 61's worst fault concerned its dry-sump lubrication. Some parts got too little oil while others – including the road underneath – got too much. A partial fix was introduced in 1937 but the glitch was not completely solved until the arrival of the centrifugally-controlled oil pump bypass of the 74-inch (Model F) Knuckle of 1941. The crankshaft main bearings had been up-rated in 1940, perhaps in anticipation of the extra loads on the bigger engine. The arrival of the more potent "74" also brought larger 8½in (216mm) diameter flywheels, revised crankcases, an up-rated seven-plate clutch and a carburettor choke increased to 1⅛in (28.6mm). By now, the two ohv models combined were comfortably out-selling Milwaukee's established range of side-valve twins. Given further development, the Knuckle could surely have become better still, but with the outbreak of war in December 1941, production concentrated almost exclusively on military side-valve twins and development of the ohv models all but ceased.



Milwaukee lore has it that the very best of the big Knuckles were those built in that final pre-war year, but hostilities meant that relatively few Model Fs reached the road until 1947, when the line's reign was almost over.

Not surprisingly, that first overhead-valve "74" remains one of the most prized Harley roadsters of all.

By 1948, however, a new pretender was on the scene: the age of the Panhead had arrived. At last it was goodbye, finally, to oil leaks from the rocker box, which was a problem that had never been completely solved on the Knucklehead.

HYDRAGLIDE, 1949–57

■ BELOW RIGHT *Although the Panhead shared its bottom-end with the Knuckle, the heads, valve-gear and oil feeds were new.*

■ BOTTOM *The HydraGlide name came from the bike's new telescopic front forks, then becoming widespread on motorcycles worldwide.*

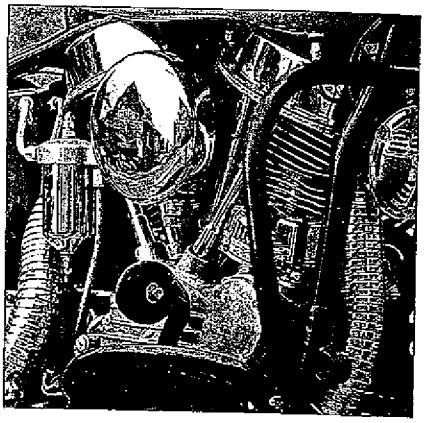
For the 1948 model year, Harley-Davidson had unveiled its new Panhead engine, mating it to a revised "Wishbone" frame with characteristic "dog-leg" front downtubes. Within a year, it had been eclipsed by the first of Milwaukee's "Glide" models.

Although retaining a rigid rear end, the HydraGlide broke with the company's usual reliance on leading-link sprung forks. Instead, here was a Hog with a modern oil-damped telescopic front-end. As if to compensate for this fit of novelty, the Hydra persevered with a uniquely American hand-change gearbox until 1952 and even later as an option for true die-hards.

For the present, however, it was as close to modern as heavyweight Harleys would get. Billed with characteristic restraint as "the nearest thing to flying and as modern as a spaceship," the first HydraGlide was, in truth, only a relatively slight departure from the model that went before.

SPECIFICATIONS

Engine	ohv V-twin
Capacity	60.32 or 73.66cu in (989 or 1,207cc)
Transmission	4-speed, hand change
Power	around 50/55bhp
Weight	560lbs (254kg)
Wheelbase	59½in (1,510mm)
Top speed	around 95mph (152kph)

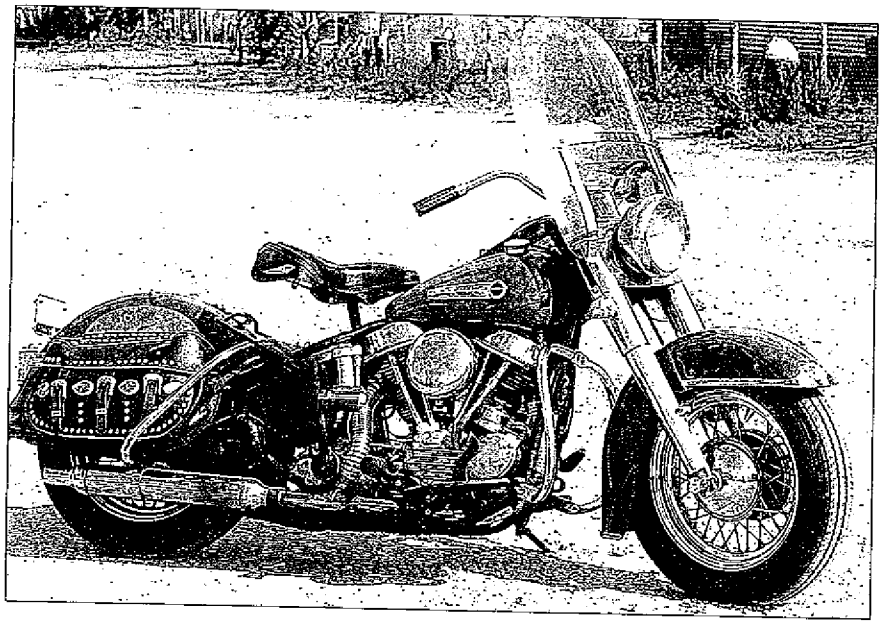


As was company tradition, a host of detail changes would follow year-on-year. Many of these would be cosmetic (the speedometer alone received an astonishing degree of attention), but most concerned the internal workings of the engine and chassis, making the final HydraGlide of 1957 very different from the first. It should be remembered, however, that in the American automotive industry in general, the 1950s and 1960s were characterized much more by developments in styling than in functional engineering.

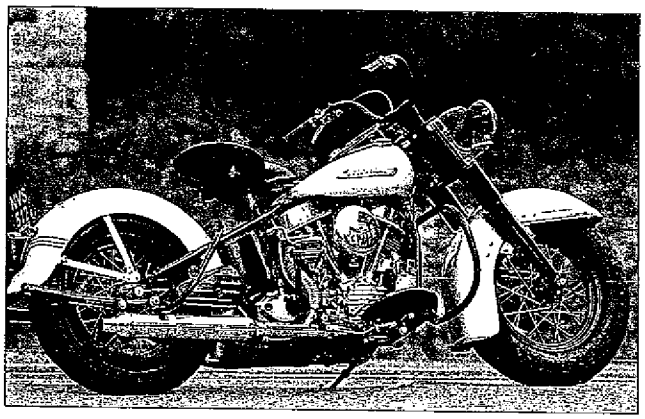
In essence, the Panhead engine comprised new cylinders and heads grafted on to the Knucklehead bottom end. The heads were now aluminium with hydraulic valve lifters (tappets), and internal oilways had replaced the Knuckle's external lines.

Like the Knucklehead it replaced, this new Panhead was produced in both 61- and 74-inch (989 and 1,207cc) versions, designated models E and F respectively. Six versions comprised the initial range: Model F Sport Solo, FL Special Sport Solo and FS Sidecar twin, with the designations repeated for the 61-inch motor. All featured four-speed transmission, while sidecar models had lower gearing and reduced compression ratios. At their launch, all sprung-fork Model Es cost $635, with the larger engine adding a mere $15 to the price. Within a year, the introduction of the HydraGlide had upped those figures by precisely $100. Just to be on the safe side, sprung-fork models – designated ELP and FLP – remained in the range for one transitional year.

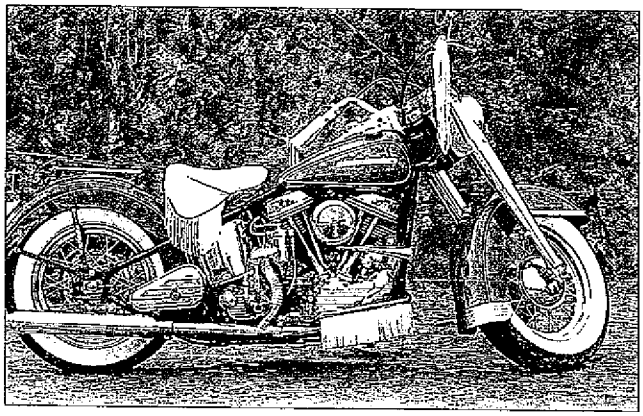
Of literally hundreds of detail changes, the first major improvement came in 1950 when revised cylinder



■ BELOW *Add electric start and rear shock absorbers and you'd have an ElectraGlide. The real thing was to take another 17 years.*



■ BELOW *White tassels probably weren't around when the HydraGlide was king of the road, but whitewall tyres certainly were.*



heads with larger ports added a claimed ten per cent more power. The 61-inch Model E was dropped for 1953, by which time annual sales of the smaller Panhead had slumped to below 1,000. The same year – the company's fiftieth anniversary – brought about Harley-Davidson's familiar "mid-series" bottom-end redesign. This included major changes to both crankcase halves as well as the relocation of the hydraulic lifters from top to bottom of the pushrods. A new "straight-leg" frame was brought in for 1954, followed by the FLH Super Sport model (the "H" stood for "hot") 12 months later, with gas-flowed heads and 8:1 compression ratios.

Even the FLH was no tyre-shredder, though, retaining the low-revving, high-torque virtues of every Milwaukee V-twin. These were very much machines in the American tradition, having ponderous steering, limited ground clearance, marginal brakes and hand gear change.

In terms of styling, the HydraGlide was pure 1950s – or perhaps pure 1990s, since so many modern Harley models echo its visual themes. Central to this was its low-slung profile with "Air-Flow" front and rear fenders (mudguards).

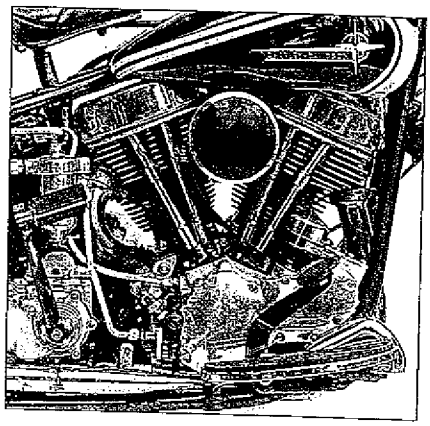
A chrome-plated tubular steel front "safety guard" was offered as an option from 1950, with "HydraGlide" emblems available one year later – both mimicking those gracing the very latest FLs.

It had some early "innovations" – like black silencers and fork sliders – that did not last, but overall the HydraGlide made an impact that is still very much with us today.

■ LEFT *Yes, this 1953 HydraGlide could almost be a year 2000 Softail. That's precisely the point of Retro-Tech.*

FL DUOGLIDE, 1958–64

■ BELOW *It was still a Panhead, but with the arrival of the DuoGlide the FL had springing at both ends.*



By 1958, Harley-Davidson was already in grave difficulties as annual sales hovered around a paltry 12,000 under intense competition from European machines. To make matters worse, the start of the Japanese invasion was just one year away – though no-one knew it at the time – with the arrival of Honda into the American market.

One way in which the company responded was through increased diversification of its range – first the Model K, and then the Sportsters took different directions from the heavyweight twins. But by the late 1950s, the latter – the FL models – were woefully outdated and badly in need of a major overhaul. Instead, they got little more than a facelift.

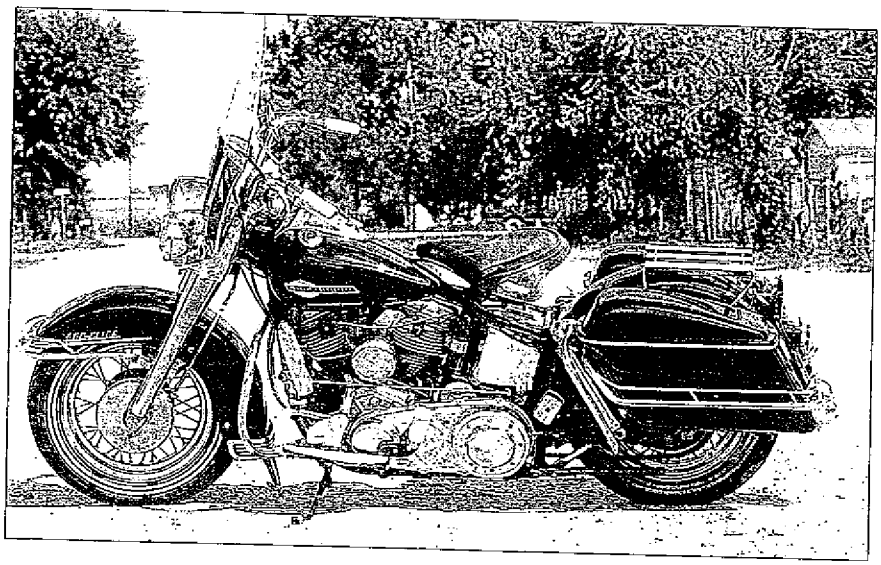
After the HydraGlide, the DuoGlide was the logical next step. As well as real, oil-damped telescopic front suspension, the Duo floated on a swinging-arm rear end, hence the name. This was a major improvement on the face of it, even though the Model K had beaten it comfortably for the distinction of being the first Harley-Davidson twin with rear suspension. By the time it appeared in 1958, however, pretty much everything it offered had already been done – and done better – by every other major motorcycle manufacturer, with the exception of the Duo's hydraulic rear brake. Unfortunately this was little more than a gimmicky novelty, since both hubs contain tiny, ineffective single-leading shoe drums.

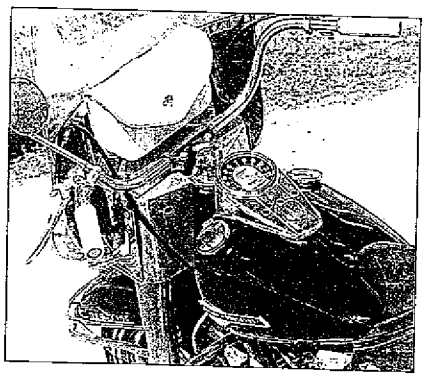
SPECIFICATIONS

Engine	ohv V-twin
Capacity	74cu in (1,207cc)
Transmission	4-speed
Power	55bhp
Weight	575lb (261kg)
Wheelbase	60in (1,525mm)
Top speed	around 95mph (152kph)

With major engine revisions having been implemented in 1953 and in 1956, the DuoGlide's engine might as well have been called the "Panhead Mark II". It also benefited from more generous finning than previous Pans for 1958, as well as an up-rated generator. With the 61-inch Pan long departed, all DuoGlides enjoyed 74-inch (1,207cc) power. The range offered a choice of hand or foot gear-change and Sport or Super Sport ("H") tune, making four models in all. In 1958, the hotter specification added $65 to the standard $1,255 purchase price.

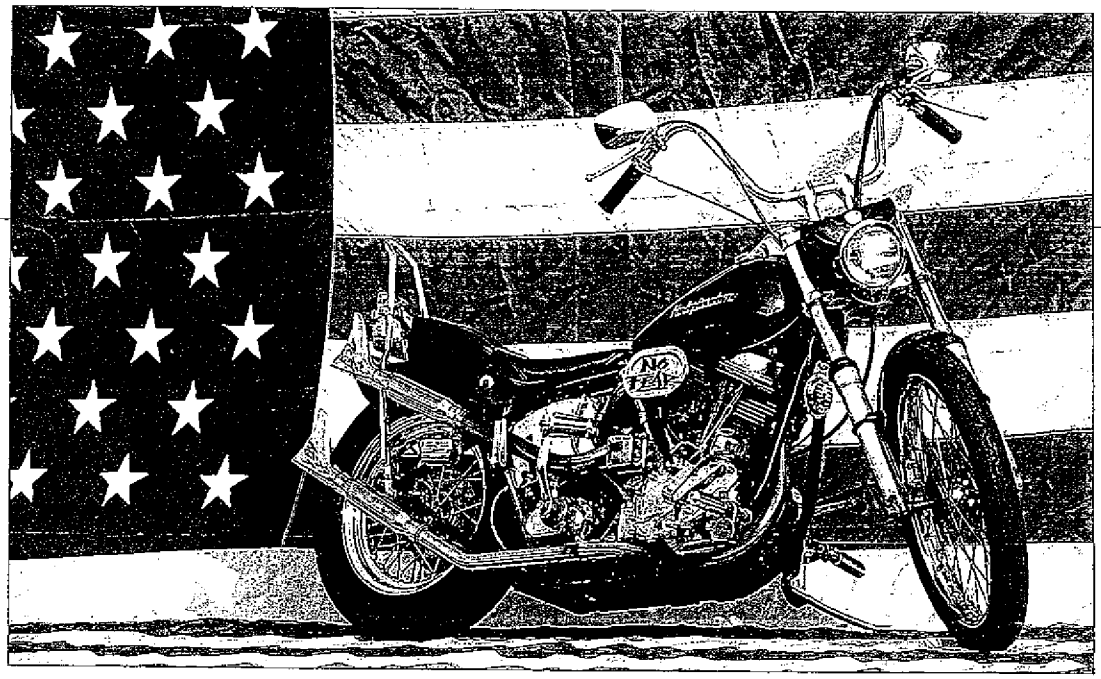
Central to the machine's layout was a new "Step-down" frame with larger diameter backbone and attachment





■ ABOVE *The distinctive speedometer is original; the handbag is not.*

■ LEFT *The chrome crash bars, fender rails and panniers were available as part of 16 Harley-Davidson option groups.*



■ RIGHT *As soon as Milwaukee installed rear suspension, some riders wanted to take it off. This hardtailed 1958 DuoGlide is similar to Hopper's* Easy Rider *mount.*

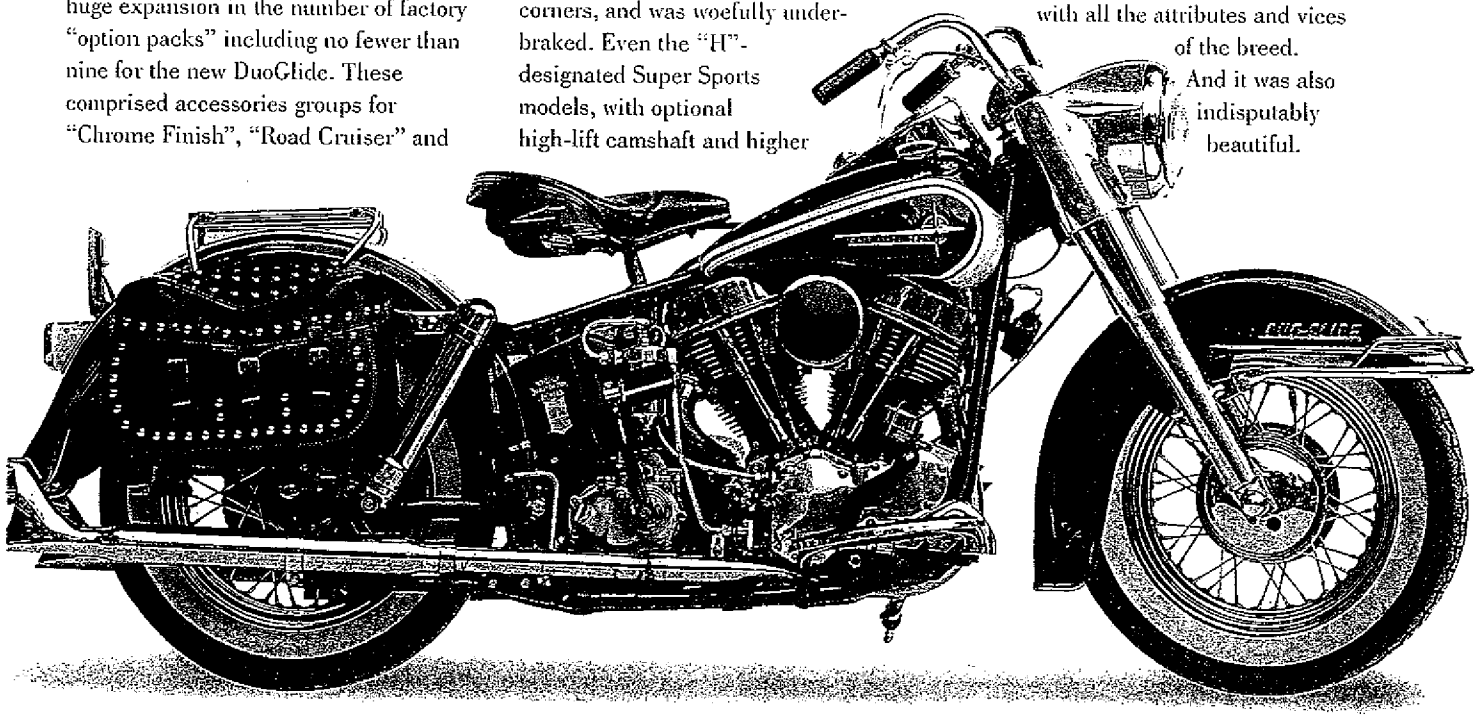
■ BELOW *An original 1961 example shows how Harley intended it to look.*

points for the twin rear shock absorbers. These incorporated oil-damping (typical of the time, for rebound only) and their springs were enclosed in gleaming chrome-plated shrouds. The new frame necessitated many other modifications – to the oil tank, toolbox and fork yokes – although the first Duos looked rather like soft-tailed HydraGlides.

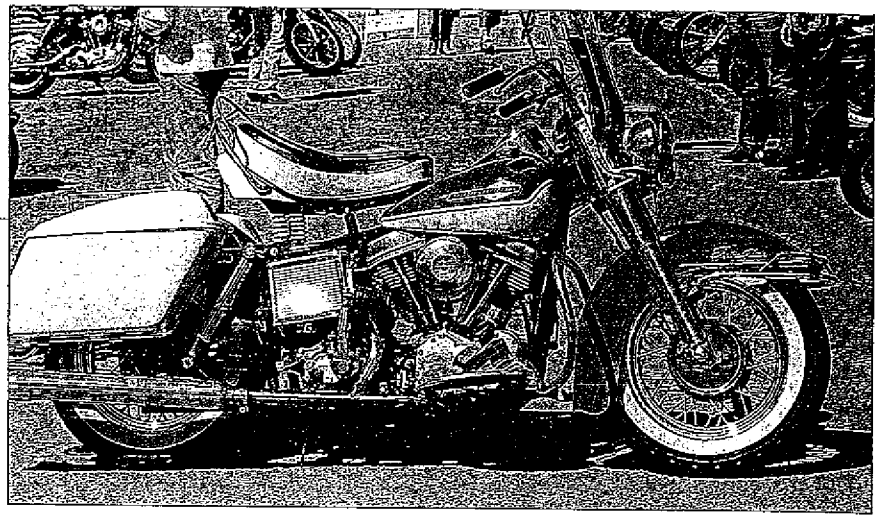
If the Duo's looks weren't enough for aspiring owners, 1958 also introduced a huge expansion in the number of factory "option packs" including no fewer than nine for the new DuoGlide. These comprised accessories groups for "Chrome Finish", "Road Cruiser" and "King of the Highway", with a bewildering array of lights, luggage items and other paraphernalia. The "King of the Highway" package included front and rear nudge bars, twin rear lights and a dual exhaust system.

Unfortunately it didn't sell very well, being particularly unsuited to most export markets, although it accounted for around 40 per cent of Milwaukee's sales at home. The Duo didn't much like corners, and was woefully under-braked. Even the "H"-designated Super Sports models, with optional high-lift camshaft and higher compression pistons, weren't rapid. Vibration was intense at high engine speeds, leaving much of their potential power unused most of the time, except by the most determined riders – who would probably seek the high-rev thrills of a Triumph Thunderbird anyway.

Then, as now, the DuoGlide was about a different sort of motorcycling, with its big, slow-revving engine and charismatic looks. It was indisputably a Harley, with all the attributes and vices of the breed. And it was also indisputably beautiful.



FL ELECTRA-GLIDE, 1965

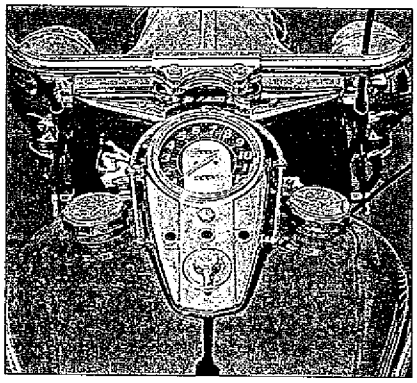


■ ABOVE *The first of the breed, the 1965 ElectraGlide. The large battery box distinguishes it from earlier DuoGlide.*

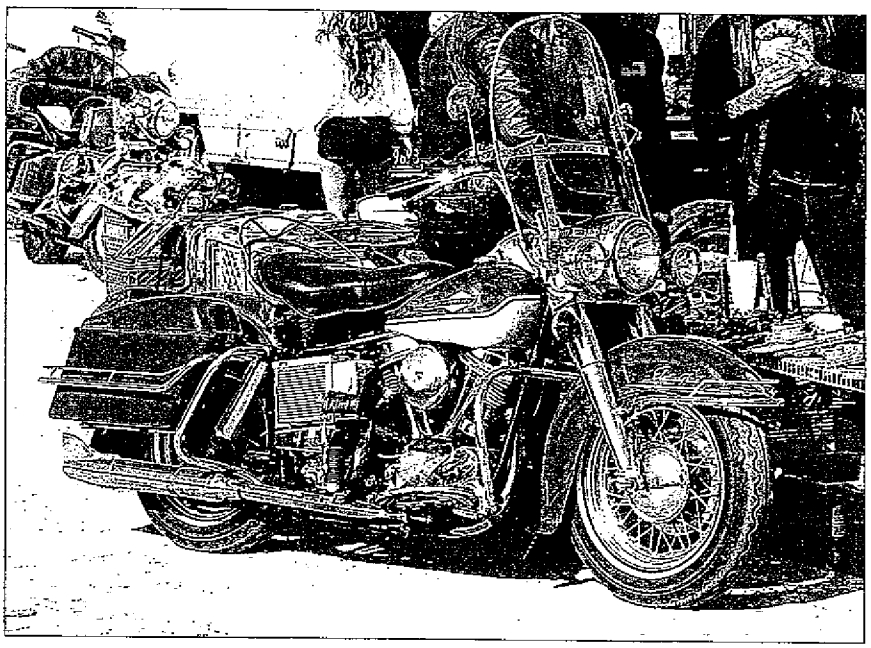
Of all Harley-Davidson models, surely the enduring FL ElectraGlide is the one that best epitomizes the breed. The "FL" designation actually arrived with the first 74-inch Knucklehead of 1942 and has since been ever-present in the Milwaukee range. The model that has carried those laurels with the greatest distinction has been the thundering ElectraGlide – the quintessential model since its 1965 debut.

Yet for all its lusty pedigree, that first ElectraGlide was little more than a DuoGlide with the addition of 12-volt electrics and an electric starter which – initially, at least – did not prove altogether very dependable.

Just as there was a 12-month hiatus between the introduction of the Panhead and the HydraGlide, Harley-Davidson waited until 1966 before giving the Glide something new. From its second year of production, it was powered by the new Shovelhead mill with its (relatively) more efficient "Power-Pac" heads. Initial examples used the alloy-headed Panhead engine which had first appeared in 1948 and gone on to propel the first Glide (the HydraGlide of 1949) and the DuoGlide of a decade later. The Hydra- had been the first big twin with telescopic forks while the Duo- added swinging arm rear suspension.



The starter motor itself lived behind the rear cylinder and engaged on the rear of the primary drive. The DuoGlide frame had to be opened up slightly to accommodate it, yet still there was no room for the earlier model's tool kit. Surprisingly for a unit "borrowed" from an outboard motor, the first starters were



SPECIFICATIONS: 1965–1970

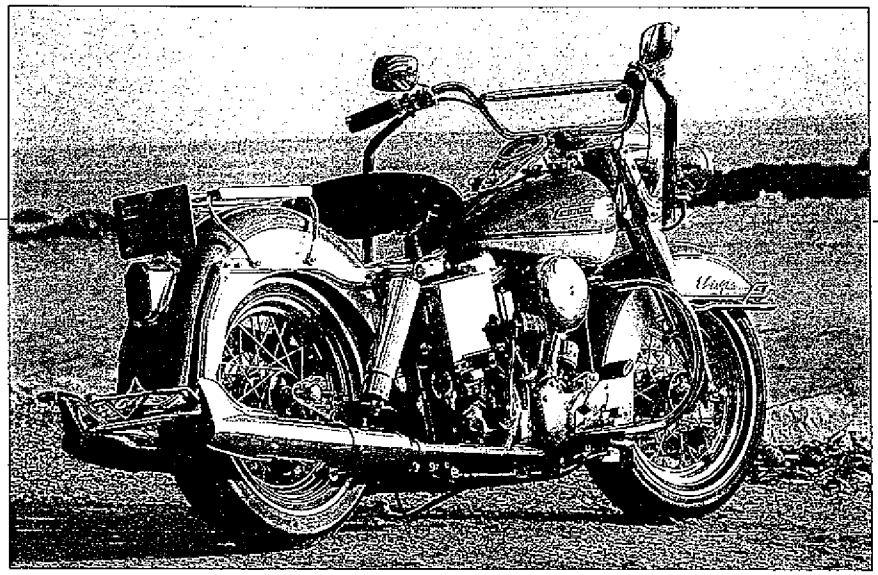
Engine	ohv V-twin
Capacity	73.66cu in (1,207cc)
Transmission	4-speed
Power	around 55bhp
Weight	595lbs (270kg)
Wheelbase	60in (1,525mm)
Top speed	95mph (152kph)

■ ABOVE LEFT *It would do considerably more than 12mph (20kph), but in Harley-land style counted as much as numeracy.*

■ LEFT *For little more than $1,500, this Milwaukee dream could be yours – in 1965.*

■ RIGHT *As leaps forward go, the ElectraGlide was conservative: both hand-change and foot-change versions were available until 1972.*

■ BELOW *The last of the Panheads: in 1970 the Shovelhead took its place.*



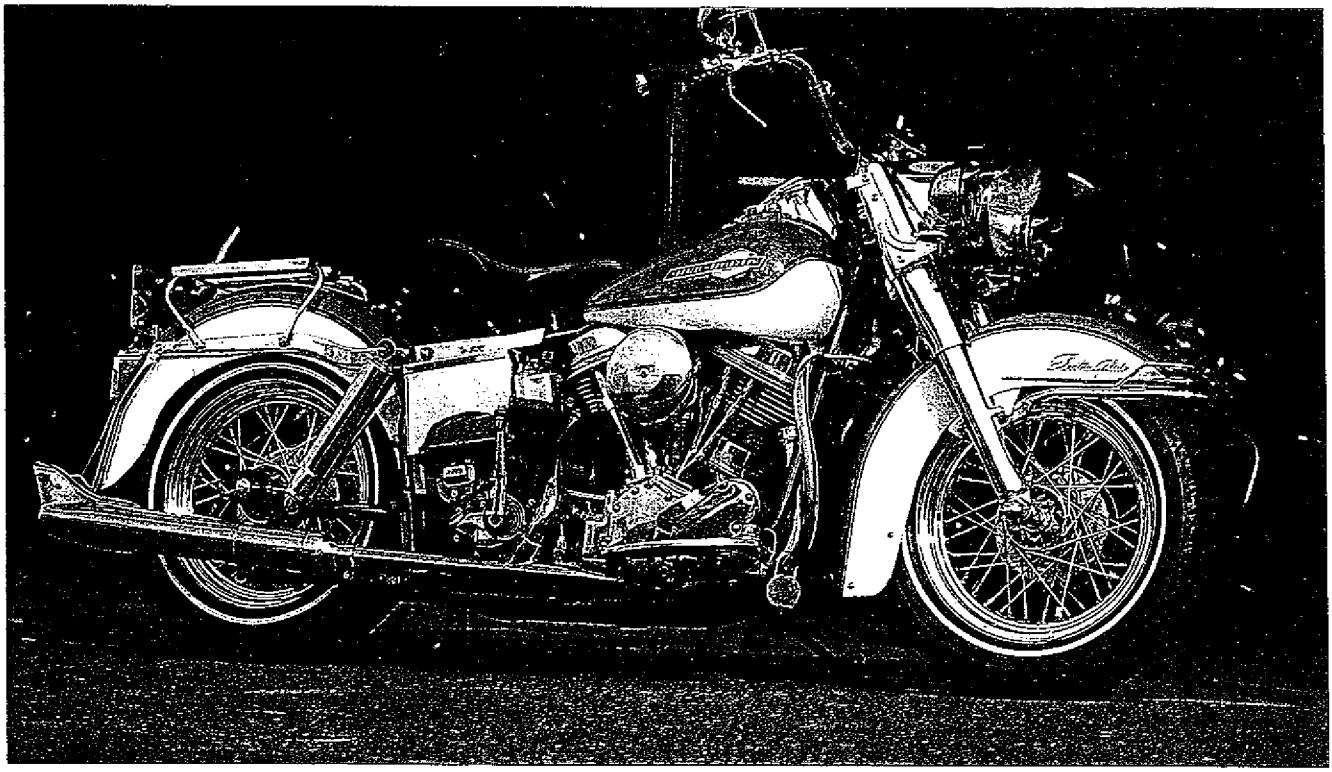
troublesome when damp and the kick start was prudently retained. Harley later adopted Homelite starters, which proved much more reliable.

Like all Harley big twins, the ohv engine ran forked con-rods to eliminate rocking couple (so the rear cylinder was precisely, rather than roughly, masked by the front). Primary drive was by chain to a four-speed box (with a sidecar option, up to 1980, of three forward and one reverse). Capacity was 74cu in (1,207cc): the current 81.7-cu in (1,340cc) dimensions didn't arrive until 1970 with the new generation of "alternator" Shovelheads. The rest was almost unchanged from the DuoGlide, complete with five-inch (127mm) whitewall tyres and running boards, although for the first time a five-gallon (19-litre) "turnpike" tank was fitted. Of the four-model range, two versions retained hand gear change, which would remain an option until 1972.

In short, this was never a state-of-the-art machine. Indeed the "King of the Road" touring pack offered in 1966 required the rear shock absorbers to be relocated forwards, to the detriment of the Glide's handling, which had already proved to be rather pedestrian.

For all that, it's a strikingly handsome machine – one which looks far better than it performs. Like most Harleys, the rear brake is good but, prior to the arrival of a front disc in 1971, no prudent rider would choose to stop a Glide in a hurry.

This is a device for getting into top gear and staying there as you cruise serenely to the next horizon.

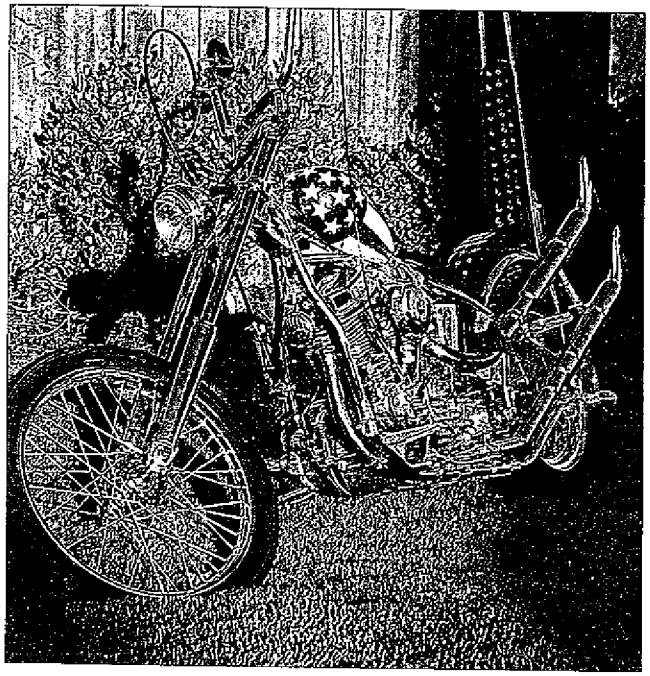


FX SUPERGLIDE, 1971–84

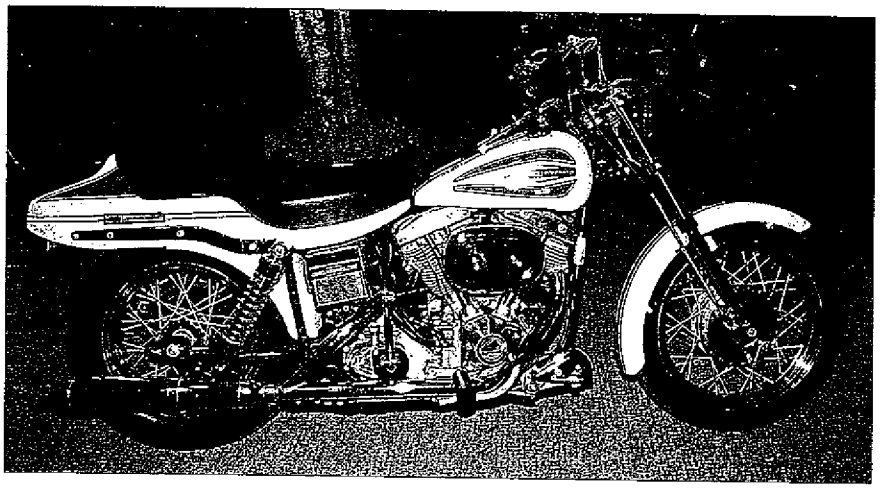
In the late 1960s, customizing was king. In California in particular, Harley-Davidson owners were tearing their machines to pieces, discarding one piece and adding another to produce unique examples of what were to become known as "blend" bikes. Nowhere was this more publicly demonstrated than in the film *Easy Rider*, with Peter Fonda cruising to New Orleans on the outrageous "Captain America" alongside Dennis Hopper's hardtailed DuoGlide.

Milwaukee's response was as startling as it was controversial. When the SuperGlide was unveiled for the 1971 model year, it was the first example of a genre quickly dubbed "factory custom". The influential *Cycle* magazine's misgivings were typical.

"Is the American motorcyclist ready to ride around on someone else's expression of personal, radical tastes?" it asked, before testing the newcomer and answering its own question enthusiastically in the affirmative. Such was the SuperGlide's impact that almost every major motorcycle manufacturer has since produced its own interpretation of the "factory" custom – invariably to less effect than Harley's original. From a modern perspective, taking into account models such as the Springer Softail, the FX wasn't actually all that radical. Styled and conceived by Willie G. Davidson, it was essentially a combination of heavyweight FLH frame, 74-inch Shovelhead engine (which still carried "FLH" on the timing cover) and running gear, with the front end from the existing XLH Sportster. The rear end's styling was dominated by a fibreglass boat-tail stepped seat and integral rear mudguard which had debuted as an option on the Sportsters the previous year. Although widely viewed as a defining element of the model, this lasted for only one year and was quickly replaced by a more conventional rear mudguard.



■ LEFT *By the 1970s, customs were all the rage. Willie G.'s official version was less flamboyant than this "Captain America", but its impact was more enduring.*



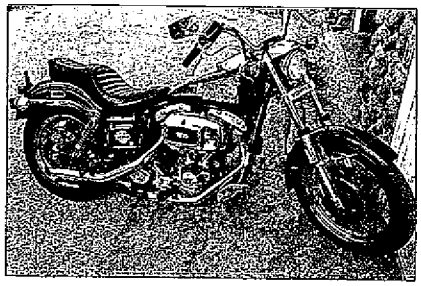
■ BELOW LEFT *Part Sportster, part FL, the SuperGlide was an instant hit, with 4,700 built in the first year.*

Compared to the FLH, the SuperGlide also had pegs in place of footboards, with foot controls revised to suit. Both exhausts were low-level feeding paired silencers on the right hand side. Wheels were 19in (483mm) front, 16in (406mm) rear, both equipped with fairly feeble drum brakes. The 3½ gallon (13 litre) fuel tank included a built-in speedometer. Functionally, it was a far from perfect machine, although it went and handled far better than the FLH

■ BELOW *In 1971 the SuperGlide gave rise to the FXE. Twin discs first appeared for 1979.*

■ BOTTOM *Although the SuperGlide's most eye-catching feature, the "boat-tail" rear end was an option rather than standard equipment.*

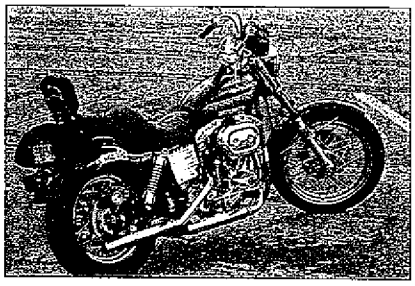
■ BELOW *A later, disc-braked FX. Note the "AMF" logo on its tank.*



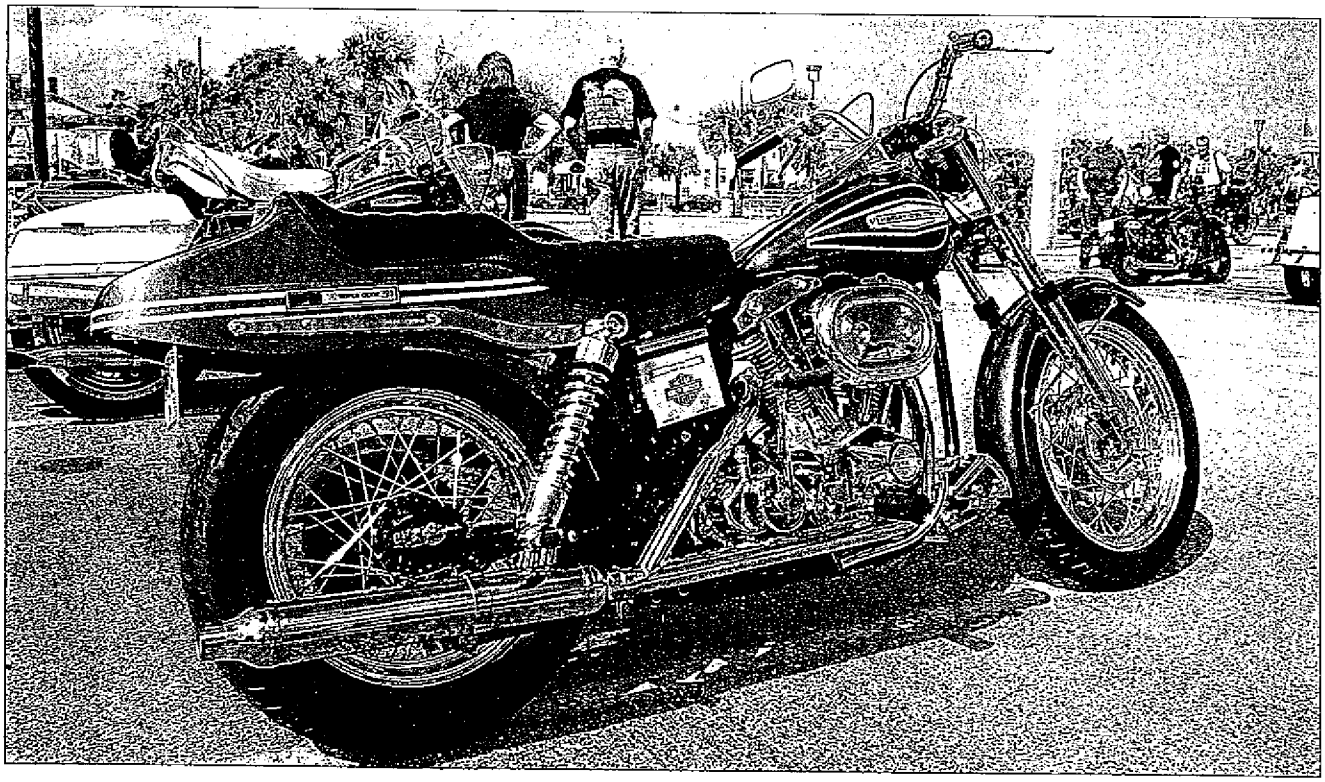
from which it was derived, not least because it was more than 66lbs (30kg) lighter. The hybrid instantly struck a chord and sold well – 4,700 units in its first year, almost as many as the established FLH ElectraGlide. After two years, it acquired hydraulic disc brakes at both ends and improved suspension with stiffer springs. A year later, an electric start option, the FXE, was added. Japanese Showa forks were added in 1977, electronic ignition in 1978 and twin front discs in 1979, before it developed 80-inch Shovelhead power for 1981. For the final year of production in 1984, five-speed transmission was added; the FXR and FXRS Super Glide II models were also

SPECIFICATIONS: 1971–80

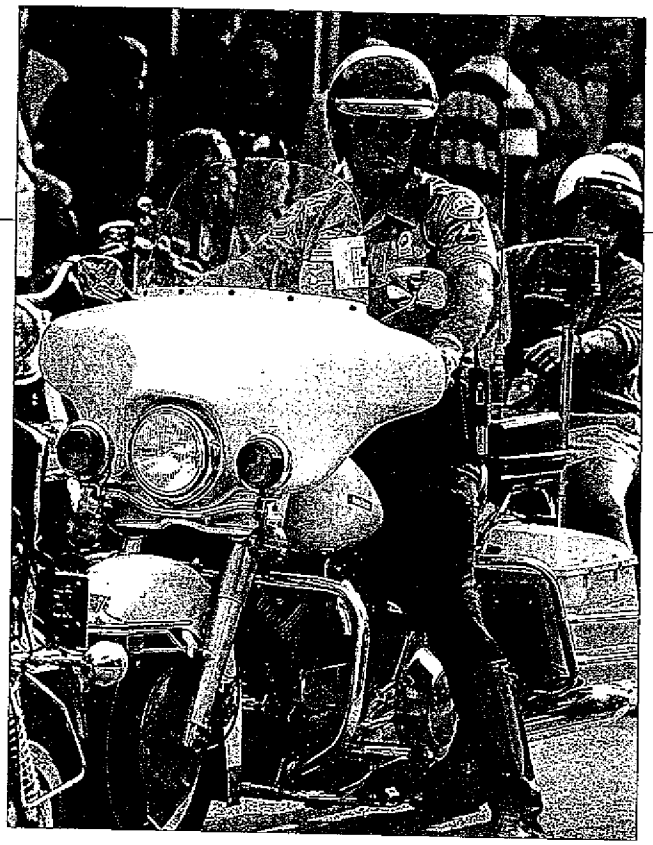
Engine	ohv V-twin
Capacity	73.66cu.in (1,207cc)
Transmission	4-speed
Power	around 60bhp @ 5400rpm
Weight	590lbs (267kg)
Wheelbase	61in (1,550mm)
Top speed	105mph (169kph)



on the Milwaukee stocks, comfortably out-selling the old stager. Although almost two decades would pass from the SuperGlide's launch to the turnaround in the company's economic fortunes, it's impossible to overstate the effect the model has had on Harley-Davidson's affairs. The FX invented the concept of the factory custom and led to landmark models such as the FXEF Fat Bob in 1979 and Sturgis 12 months later.



POLICE BIKES

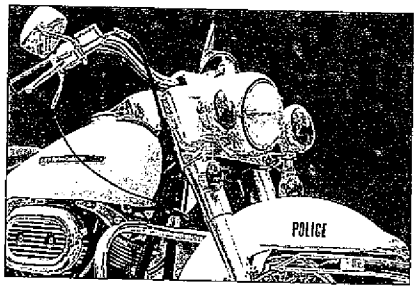


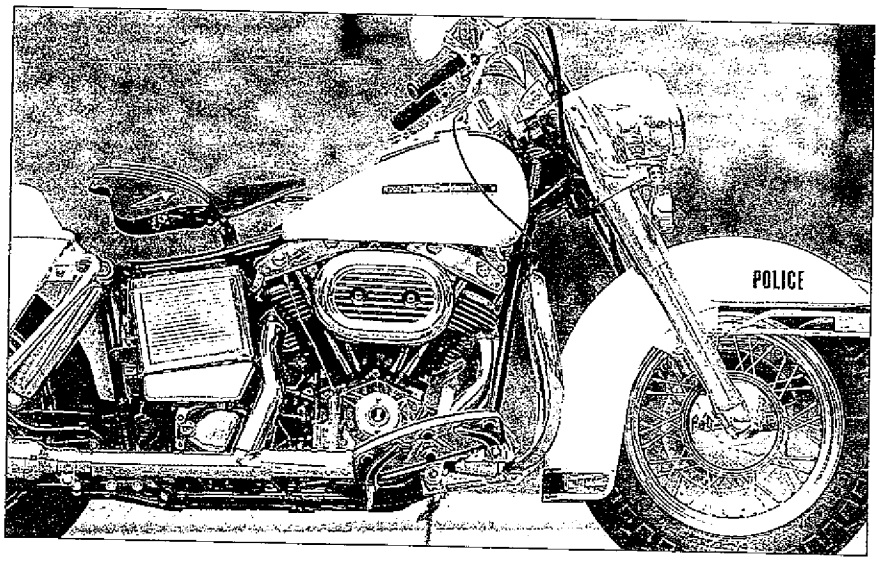
■ LEFT *"You mean they actually pay you to ride one of those?" A police hogger at Daytona.*

■ CENTRE AND BELOW RIGHT *Police bikes may be utilitarian, but that's no reason why they shouldn't look good, too. Rarely has so much chrome plate been put to law enforcement use as on these Shovelheads.*

The first police Harley was bought by the city of Detroit in 1908. Specially equipped machines took a little longer, but by 1924 more than 1,400 police forces across America had at least one Harley-Davidson in their ranks. Two years later, an office was established at Juneau Avenue to handle fleet sales to police forces, and it was from this that the first factory police option packs began to emerge. Previously, most modifications had been undertaken by the customers themselves. Incidentally, the first order from CHiPs – the California Highway Patrol – was for the 74-inch Model JD in 1929. Twelve months later, bikes could be equipped with that most vital piece of law-enforcement equipment: the Police Special speedometer. By 1935, two police option packs were available for inclusion on any of the big-twin models.

During the 1950s, the HydraGlide and then the DuoGlide – fitted with one of three option groups – became the "standard" police two-wheeler (for a time the Servi-Car had up to four distinct option packs). The arrival of the Shovelhead in 1966 continued the theme, until the first specific Police model hit the stocks for 1974. The FL-Police was essentially a 74-inch ElectraGlide with basic police equipment included as standard. Almost 800 were sold that year.



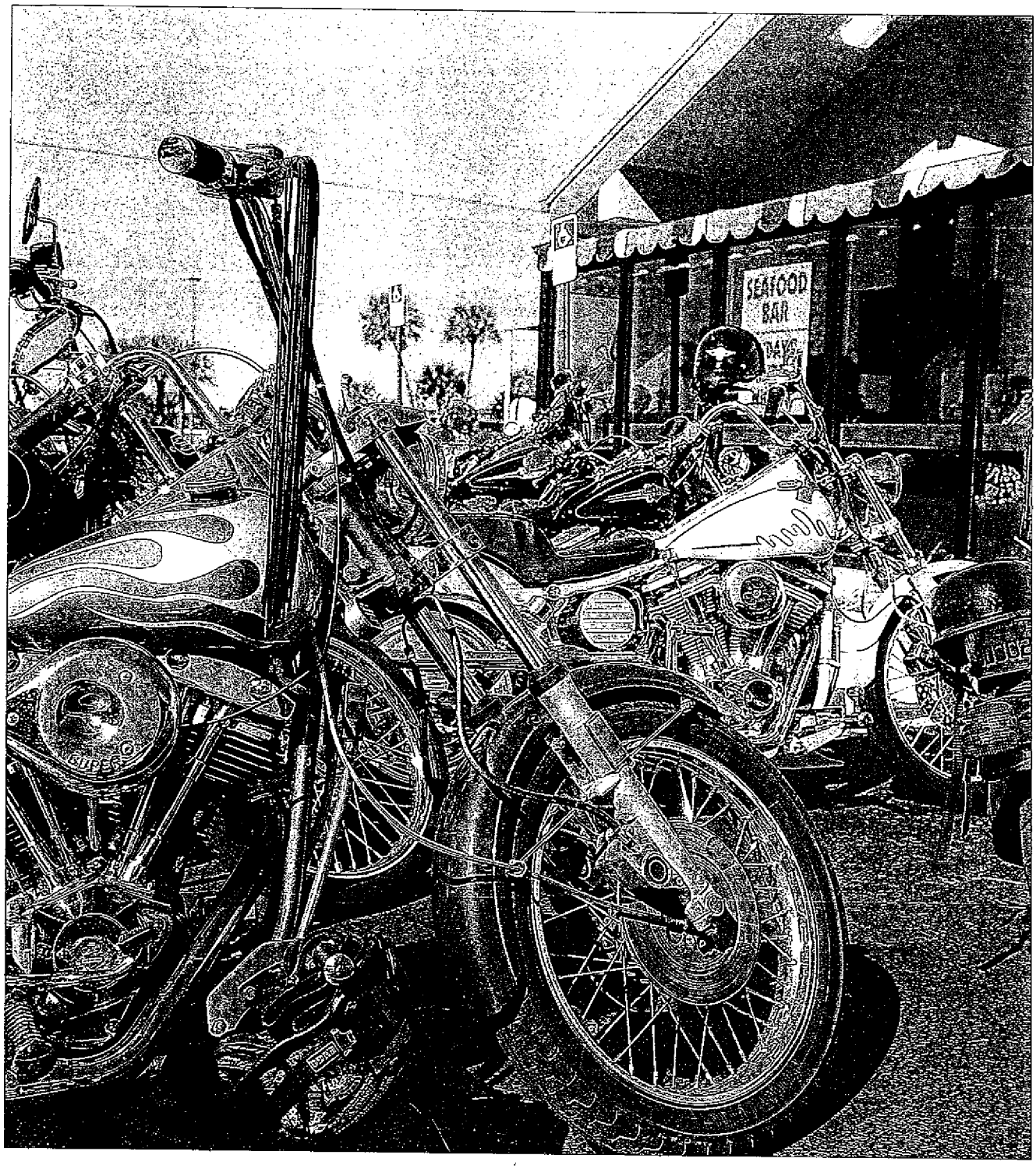


From 1979, the 80-inch Shovelhead FLH-80 began to displace the old FLH-1200 as the standard police model and, by 1982, Harley's law-keeper was known simply as the FLHP, available variously with chain, enclosed chain or belt final drive.

Today's police range comprises the FXRP CHiP and FLHT-Police, which are based on the Evo-engined Low Rider and ElectraGlide respectively, and each has special equipment, including an up-rated electronics system, coloured pursuit lights, radio carrier and siren switches (the siren is optional, though).

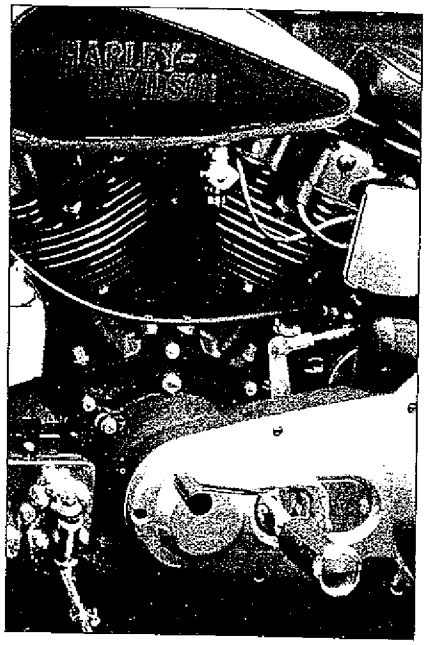
An indication of the importance of the police market can be gleaned from the sales figures for 1991, when more than 1,500 police machines were sold.

■ BELOW *There are limits. Unless their riders are off-duty, these Harleys are definitely not police machines.*



FXS LOW RIDER, 1977–85

■ BELOW *The Low Rider was built by Milwaukee, but born in the biker heaven of the United States.*



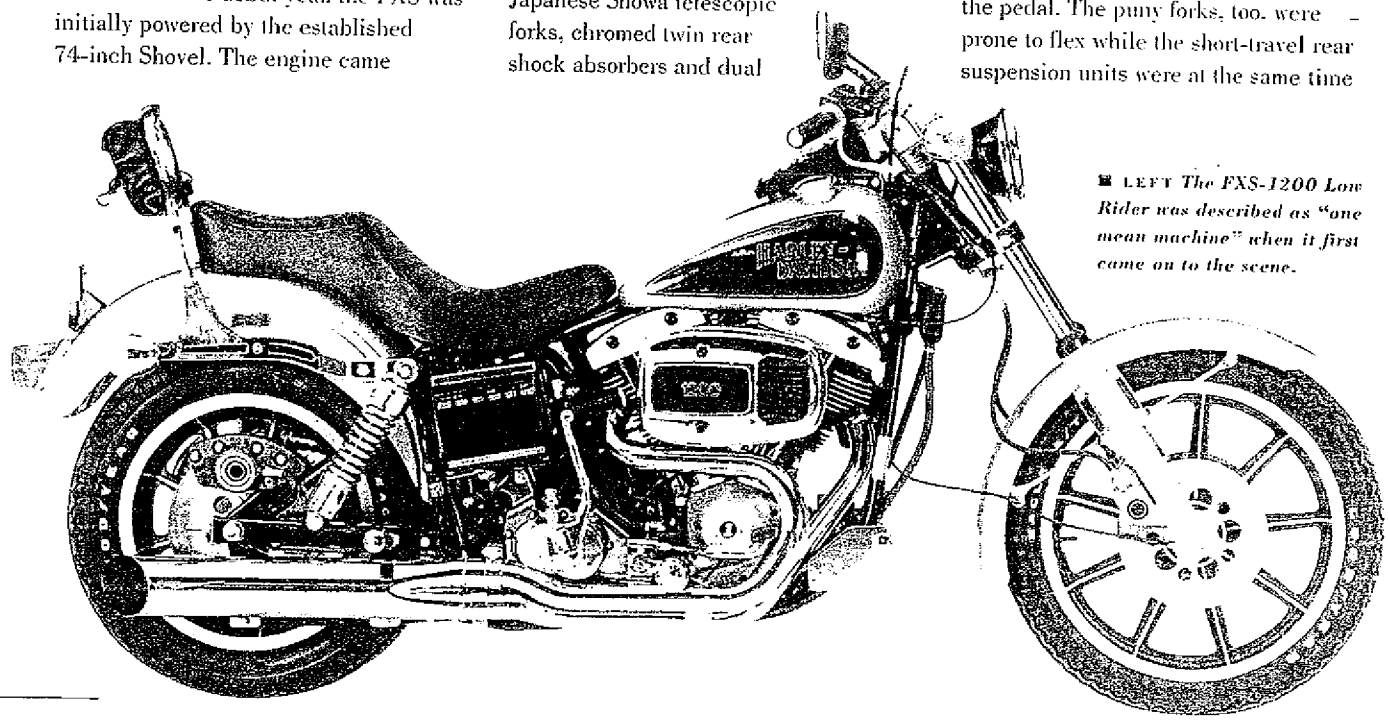
These days, the Low Rider range is as essentially Harley-Davidson as the Sportsters and heavyweight Glides, yet it wasn't until 1977 that Willie G. brought us the first Low Rider model. The FXS Low Rider was, in essence, another reworking of the seminal Super Glide theme, which in turn was to spawn yet another dynasty of Milwaukee hardware.

Described as "one mean machine" in Harley-Davidson's own publicity, the FXS was a new type of custom cruising model, intended to be as content cruising wide-open prairies as downtown avenues. It was finished in menacing gunmetal grey with flat, drag-style handlebars on pulled-back risers, resonating echoes of the choppers that countless enthusiasts had created in the past. The laid-back name came from a seat height of just 27in (686mm), a characteristic which would appear again in the Huggers of the future.

Although the 80-inch Shovelhead first appeared on the FLH ElectraGlide in the Low Rider's debut year, the FXS was initially powered by the established 74-inch Shovel. The engine came finished in crinkle black paint with highly polished outer covers. Both exhaust pipes curved back along the right side below a new "1200" air-cleaner cover, before thumping the atmosphere through a single chromed muffler. The revised frame was heavily raked and fitted with highway pegs, allowing the rider to stretch out, like the latter-day *Easy Rider* the styling sought to emulate.

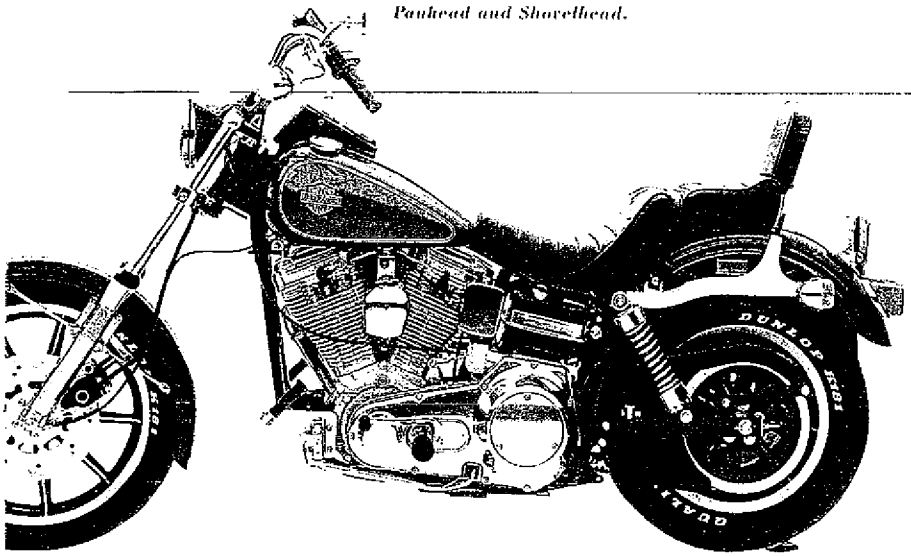
Chassis components included Japanese Showa telescopic forks, chromed twin rear shock absorbers and dual front disc brakes. Sadly, the stoppers were still disconcertingly feeble in their effect, although the rear was relatively fierce with massive leverage available at the pedal. The puny forks, too, were prone to flex while the short-travel rear suspension units were at the same time

SPECIFICATIONS	
Engine	ohv V-twin
Capacity	73.7cu in (1,207cc)
Transmission	4-speed
Power	60bhp
Weight	550lb (249kg)
Wheelbase	63in (1,600mm)
Top speed	98mph (158kph)



■ LEFT *The FXS-1200 Low Rider was described as "one mean machine" when it first came on to the scene.*

■ BELOW *This 1985 FXRS Custom picks up the tradition of V-Twin power that was started by the Knucklehead, Panhead and Shovelhead.*

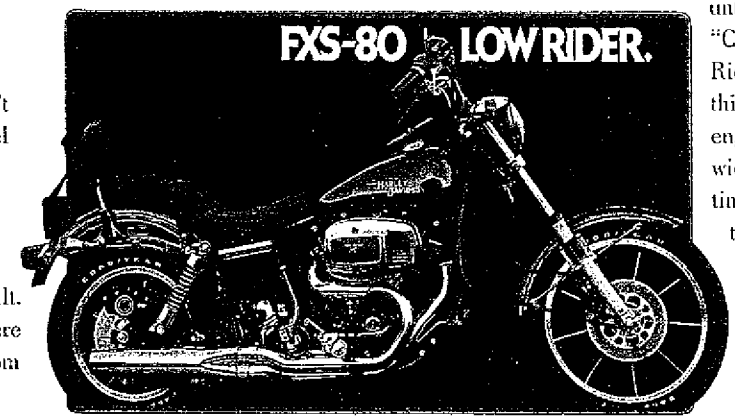


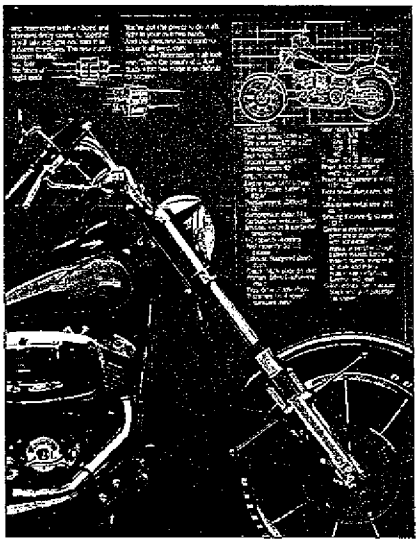
both harsh and under-damped. It would be a while before any heavyweight Harley aspired to even the sketchiest handling prowess.

Quicksilver handling, though, wasn't what the FXS was all about. The model was an instant success, hitting the public's wish-list almost as soon as it was unveiled. It was comfortably outselling the SuperGlide by its second year, with almost 10,000 examples built. Clearly, the Low Rider concept was here to stay and the breed has benefited from a steady stream of improvements in every succeeding year. Along the way, they've spawned eye-catching sister models, such as the 80-inch FXB Sturgis of 1980 – the year after the FXS itself was first offered with the larger Shovelhead mill.

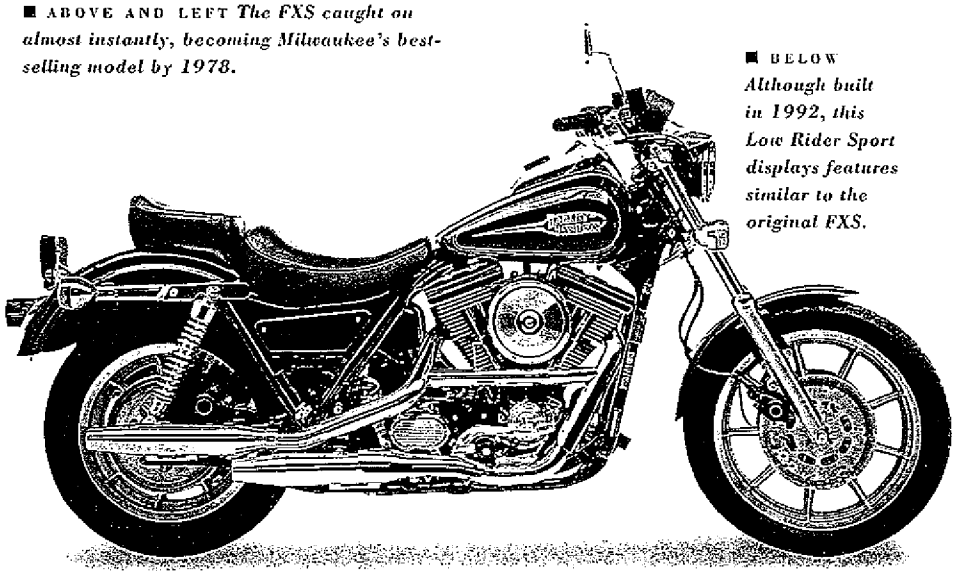
The biggest novelty came in 1983 with the much revised FXSB Low Rider. The "B" represented the adoption of the Aramid-fibre toothed belts first seen on the Sturgis for both primary and secondary drive.

A small number of late-1984 examples may have received the new 80-inch Evolution motor, but it wasn't until the FXRS "Custom Sport" Low Rider of 1985 that this much-improved engine became widespread. By the time five-speed transmission was grafted on to the same model 12 months later, the modern Low Rider series had arrived.





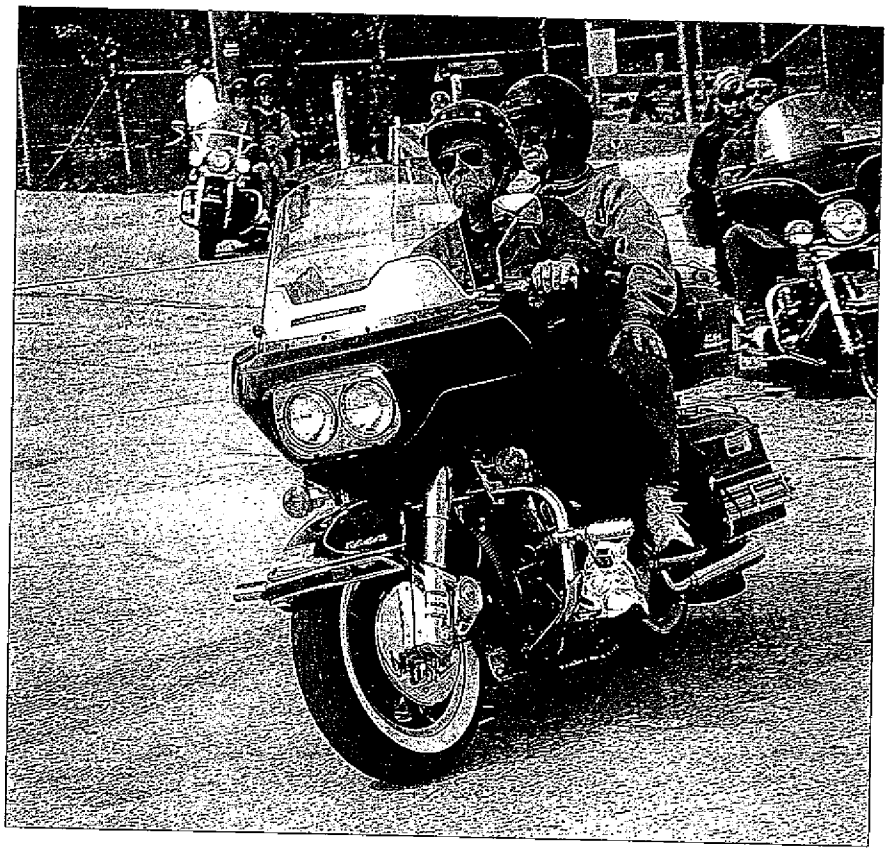
■ ABOVE AND LEFT *The FXS caught on almost instantly, becoming Milwaukee's best-selling model by 1978.*



■ BELOW *Although built in 1992, this Low Rider Sport displays features similar to the original FXS.*

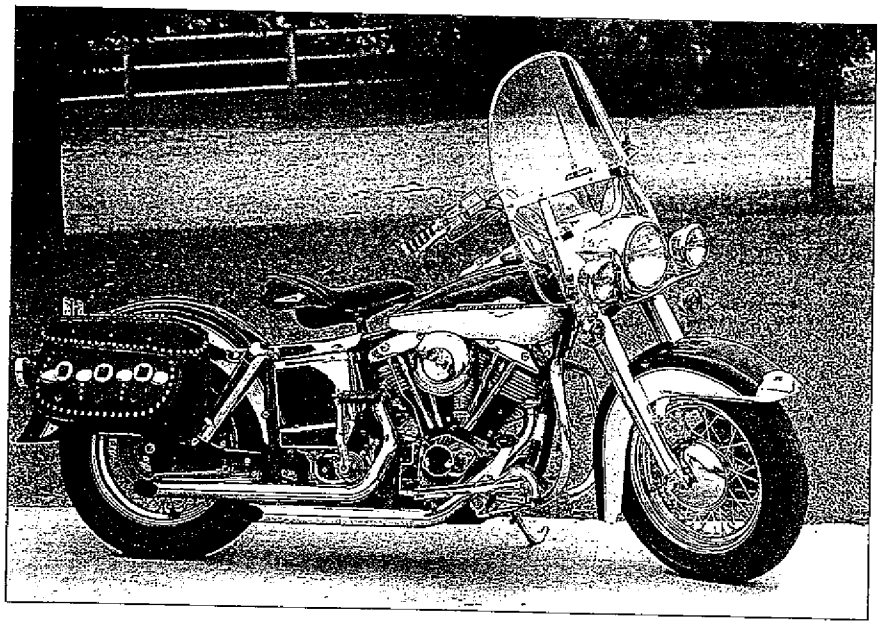
FLT TOURGLIDE, 1980

■ BELOW *Early TourGlides are easily distinguished by their huge twin headlamp fairing.*



Like most things Harley-Davidson, the TourGlide didn't suddenly appear out of the Milwaukee ether, it just sort of evolved. One fundamental element, the 80-inch Shovelhead engine – a long-stroke derivative of the old "74" – first appeared on the 1978 FLH ElectraGlide. Another arrived one year later with the FLH Classic, offered as standard with special paint and wheels as well as a complete set of "Tour Pak" touring extras. The Tour Pak was ultimately to become the heavyweight long-haul norm, comprising saddlebags, luggage rack, "batwing" fairing and chromed crash bars.

In 1980, Harley bundled the two together, adding a few other choice ingredients for good measure, and the FLT TourGlide was born. The most obvious change was the replacement of the ElectraGlide's handlebar-mounted fairing with a bigger, more protective frame-mounted fairing, now equipped with twin headlights. There was an improved new frame with "sport bike"



SPECIFICATIONS

Engine	ohv V-twin
Capacity	81.6cu in (1,338cc)
Transmission	5-speed
Power	65bhp
Weight	765lb (347kg)
Wheelbase	62½in (1,590mm)
Top speed	100mph (161kph)

■ LEFT *Additional long-distance kit allowed heavyweights such as this late-1970s ElectraGlide to evolve into the TourGlide series.*

■ RIGHT *In 1981 the FLTC Classic arrived, to be followed by further TourGlide variations.*

geometry and a box-section backbone. Fabricated from both tubes and forgings, the frame was further modified at the rear to increase suspension travel. At the front, it now extended forward of the head-stock for more secure fairing mounting.

Less obvious – unless you were riding one – were a host of engine improvements also bestowed on the FLT. Rather than existing separately, the engine and transmission were now bolted rigidly together, gaining the benefits of unit construction without the drawbacks. The transmission itself was now five-speed for the first time on any big twin Harley-Davidson roadster, permitting even more long-legged gearing than before. A new Motorola electronic ignition virtually guaranteed dependable running at all engine speeds (or perhaps not: within a year it gave way to the superior V-Fire II system).

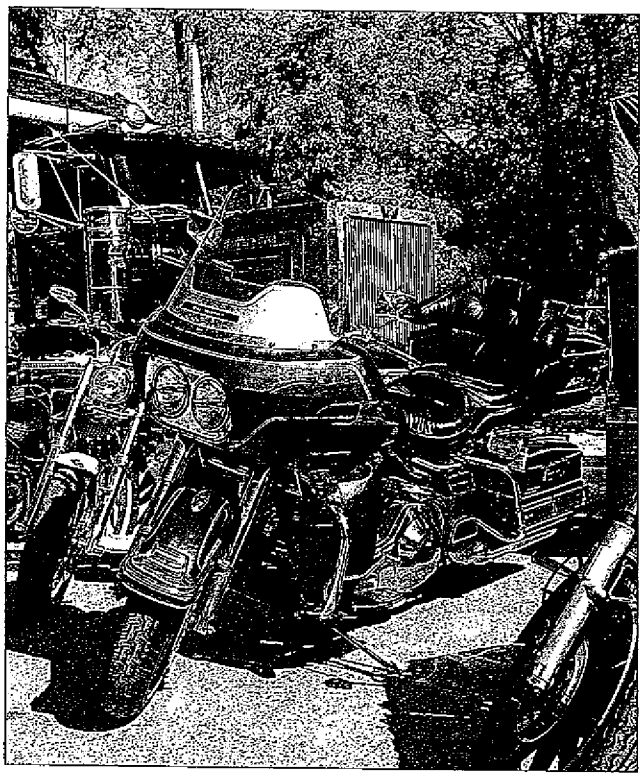
Final drive was still by roller chain but now fully-enclosed in its own oil-bath, a useful asset on any long-distance machines. Chain was superseded by a toothed belt drive on the FLTC Classic of 1984, which became standard across the FL range the following year.

Despite some initial scepticism, the Aramid fibre belts – made from a similar material to that used in bullet-proof vests – had worked well on the lighter V-twins, lasting four times as long as a chain, at similar cost but without the mess. By 1993, they would be a welcome feature on every Harley-Davidson model.

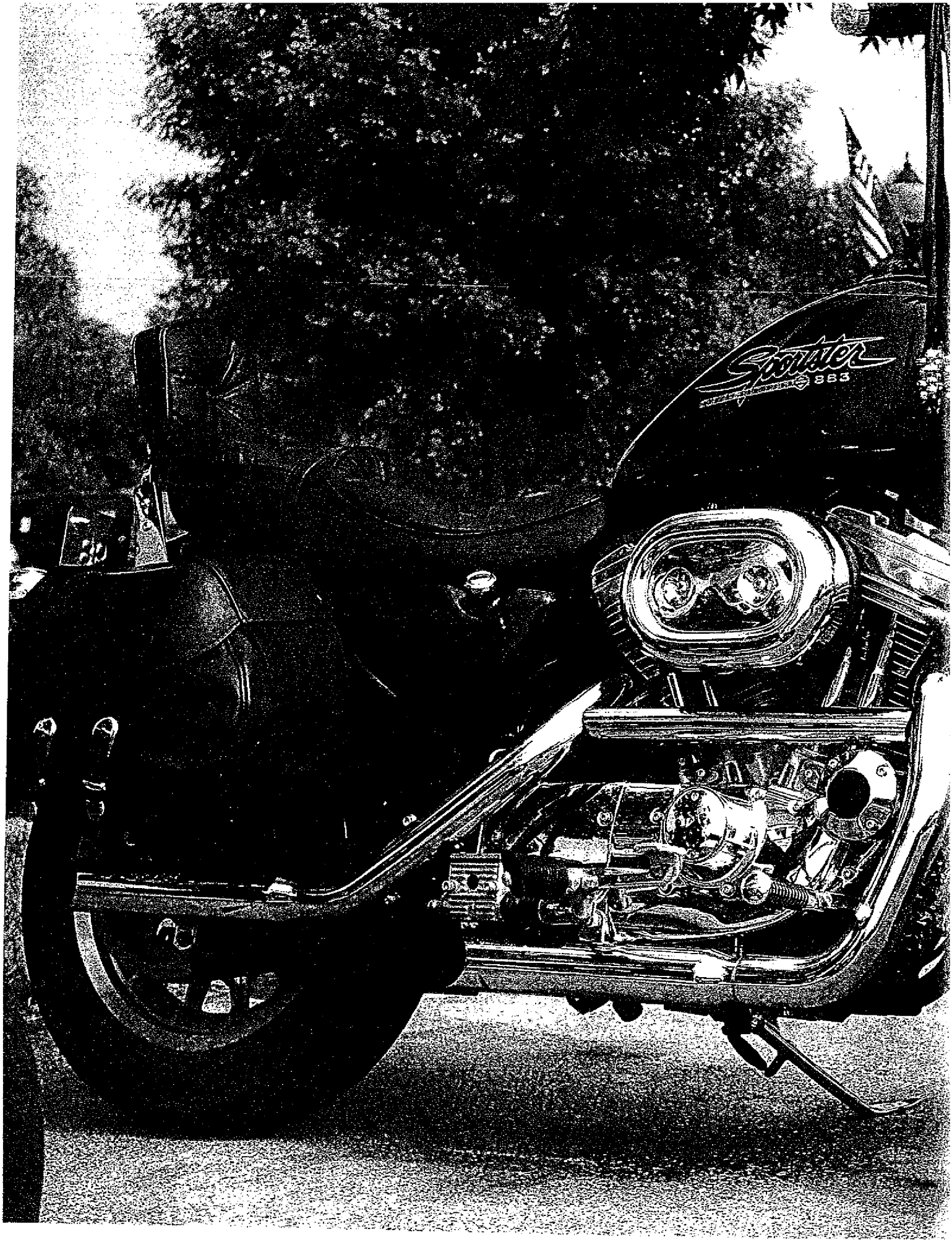
If that particular virtue was still in the future, an equally compelling one first appeared on the inaugural TourGlide. In contrast to previous rigidly-mounted engines, for the first time the FLT engine was installed using a clever three-point rubber-mounting system designed to isolate the rider from the worst of the big V-twin's vibration. In essence it couldn't be simpler, but the effect transformed the machine, making it smoother and more usable than any previous big twin.

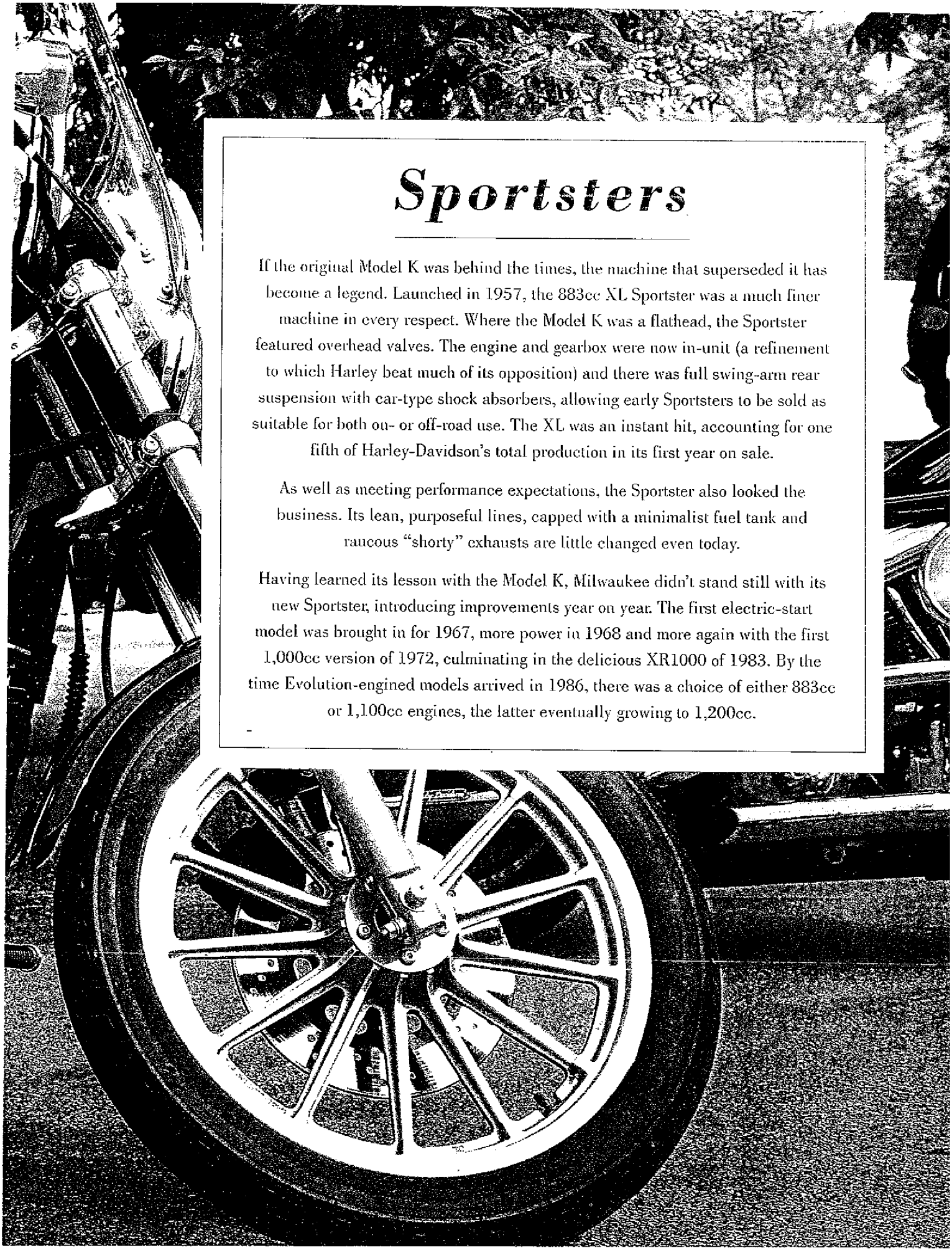
Anyone with $6,013 to spare in 1980 could buy what was undoubtedly the smoothest, most comfortable and lavishly-equipped motorcycle Milwaukee had ever produced, a machine tailor-made for demolishing large distances.

The TourGlide might not be everyone's idea of motorcycling but it launched a generation of Milwaukee luxury tourers to which rival manufacturers have yet again paid the ultimate compliment: most of them have since tried to copy it.



■ LEFT *All TourGlides enjoyed five-speed transmission and rubber engine mounts. The Evo powerplant brought further refinement from 1984.*


Sportster
883



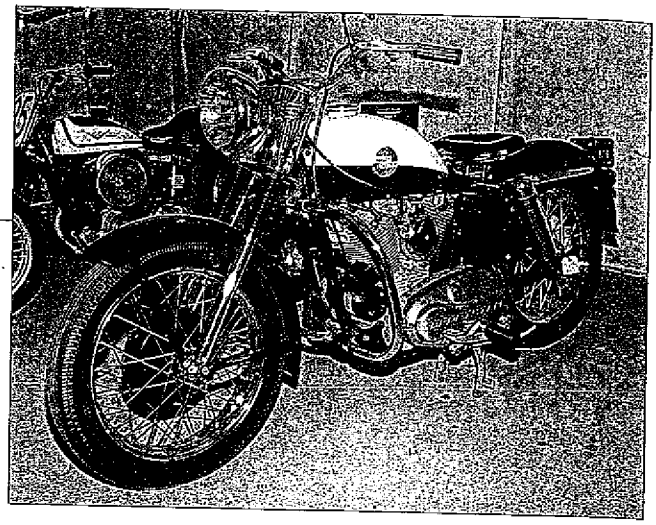
Sportsters

If the original Model K was behind the times, the machine that superseded it has become a legend. Launched in 1957, the 883cc XL Sportster was a much finer machine in every respect. Where the Model K was a flathead, the Sportster featured overhead valves. The engine and gearbox were now in-unit (a refinement to which Harley beat much of its opposition) and there was full swing-arm rear suspension with car-type shock absorbers, allowing early Sportsters to be sold as suitable for both on- or off-road use. The XL was an instant hit, accounting for one fifth of Harley-Davidson's total production in its first year on sale.

As well as meeting performance expectations, the Sportster also looked the business. Its lean, purposeful lines, capped with a minimalist fuel tank and raucous "shorty" exhausts are little changed even today.

Having learned its lesson with the Model K, Milwaukee didn't stand still with its new Sportster, introducing improvements year on year. The first electric-start model was brought in for 1967, more power in 1968 and more again with the first 1,000cc version of 1972, culminating in the delicious XR1000 of 1983. By the time Evolution-engined models arrived in 1986, there was a choice of either 883cc or 1,100cc engines, the latter eventually growing to 1,200cc.

THE FIRST OF THE BREED



■ RIGHT *In 1957 the first of the Sportsters proved to be a giant leap forward from the primitive side-valve Model K.*

After the debacle of the side-valve Model K, the Sportster series roared across America like a refreshing gale. At its heart was an overhead-valve engine displacing the same 883cc as the XLs of today. In those days, however, both the cylinder barrels and heads were of heavy cast iron, the latter with a hemispherical combustion chamber.

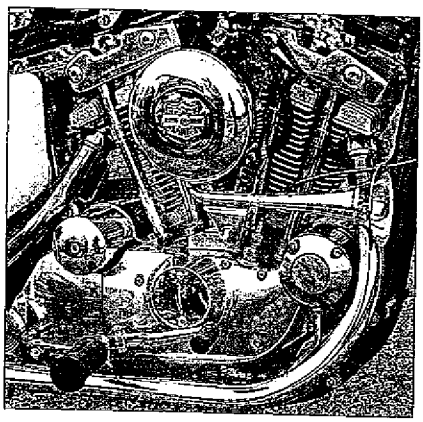
Each valve had its own gear-driven camshaft, operating the valve via "High Speed Racing" roller tappets and solid push-rods. A single Linkert carburettor fed mixture into the cylinder, where shallow domed pistons offered a compression ratio of 7.5:1. In 1957, peak power was around 40bhp but this rose considerably with the ported, high-compression "H" and "CH" versions, reputedly reaching 58bhp at 6,800rpm by the mid-1960s. By then, a good one could exceed 110mph (177kph).

Cosmetically, even fully-equipped versions of the XL were as lean as motorcycles can be – an attribute most retain to this day. Not so much as a pillion seat was permitted to mar their purposeful lines. The chassis was adequate if altogether less persuasive. A combination tubular steel and cast iron frame married "easy riding" telescopic forks and twin rear shock absorbers, with the swing arm pivoting on taper roller bearings. Each 18in (457mm) wheel held an underwhelming eight-inch (200mm) drum with shoes one inch (25mm) wide.

In truth, the handling wasn't great, although (for a Harley) the Sportster was light and low enough for a good rider to manhandle it into shape. An improved front fork helped matters from 1968 but the XL only really began to behave with the appearance of a lighter and stiffer frame, universally praised in press road tests, in 1982. By this time, the old one was very much feeling its age. Those first Sportsters were comparable with almost anything on the road and, at $1,103 apiece, sold like "Competition Hot-cakes". By the late 1960s, this was comfortably Harley's best-selling range.

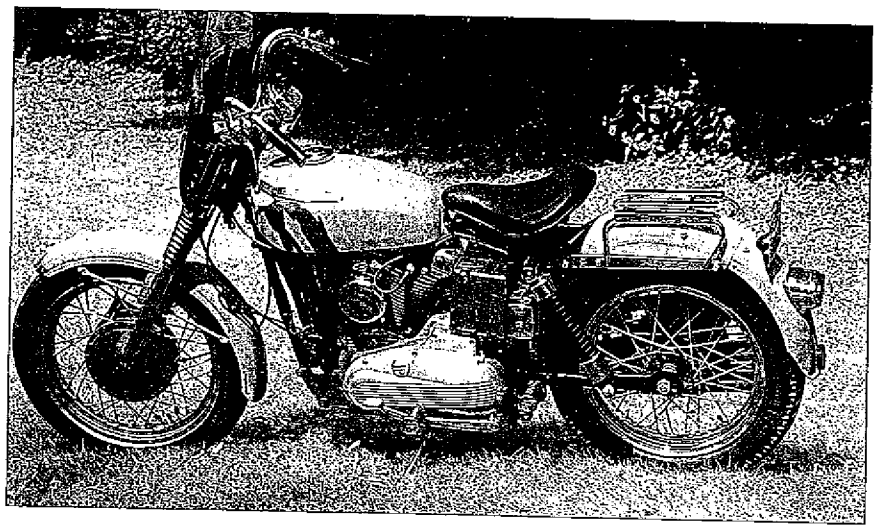
SPECIFICATIONS:
XL SPORTSTER 1957

Engine	ohv V-twin
Capacity	883cc
Transmission	4-speed
Power	40bhp
Weight	438lbs (199kg)
Wheelbase	58.5in (1,485mm)
Top speed	95mph (152kph)

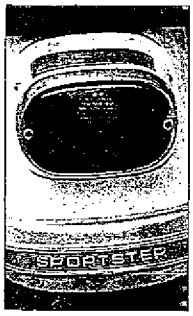


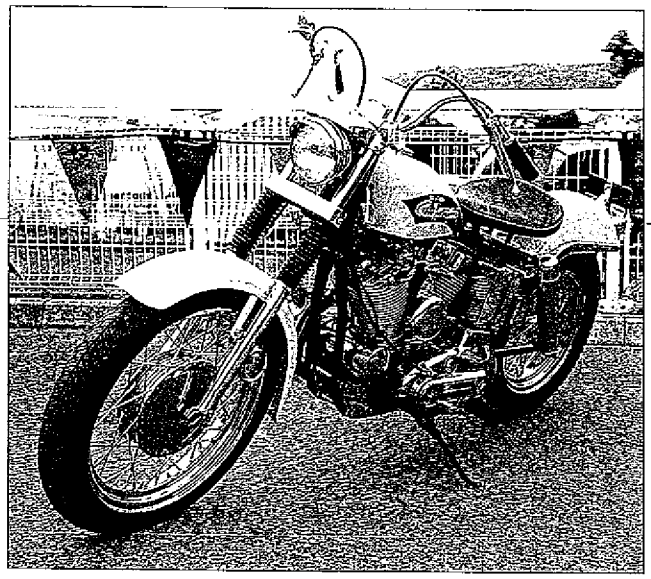
■ ABOVE RIGHT *The mercurial "H" stood for high-compression and was intended to signify that this machine was hot.*

■ BELOW *By 1970, the Honda CB750 had arrived, yet the XL had feeble brakes and relatively lacklustre performance.*



■ BELOW *Fiddly detailing is rare on the XL range, which favours fuss-free lines.*





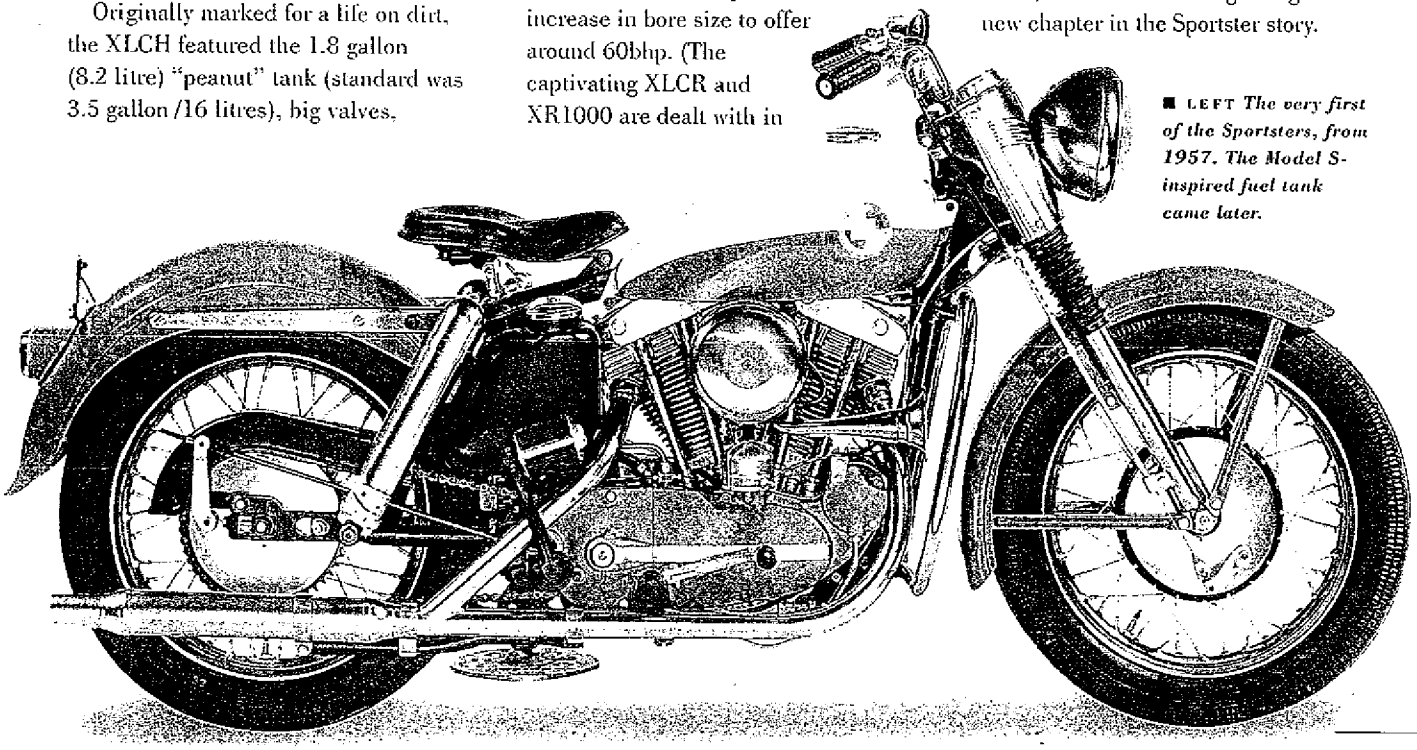
■ LEFT *The XLCH, which is commonly dubbed "Competition Hot". Sportsters remain the only Harleys to use unit construction engines.*

■ SPORTSTER EVOLUTION

Since its introduction in 1957, the XL Sportster has been the bread and butter of the Harley-Davidson range. Within a year, the stock Sporty had been joined by the high-compression XLH Sportster Sport, the legendary XLCH "Competition Hot" (as it is commonly called, although it actually meant "Competition High-compression") and the stripped-down XLC Sportster Racing. Perhaps surprisingly, the latter, intended for off-road use, lasted for only one year.

Originally marked for a life on dirt, the XLCH featured the 1.8 gallon (8.2 litre) "peanut" tank (standard was 3.5 gallon /16 litres), big valves, magneto ignition – and neither lights, speedometer nor battery. It was superseded by a fully road-equipped XLCH one year later. Detail changes included a switch to 12-volt electronics in 1965, two years before the first Sportster electric start – or "Push the button... ZAP.. and away you go" as Milwaukee promoted it.

For 1971, the previous dry clutch gave way to a wet one. The first 1,000cc examples were the XLH/XLCH Super H and Super CH of 1972, the extra displacement coming from a 4.5mm increase in bore size to offer around 60bhp. (The captivating XLCR and XR1000 are dealt with in detail later.) Another spin-off from the Sportster line was a series of hybrid models, hoping to hit any untapped market niche. The XLT Touring came out in 1977, equipped with saddlebags, high bars and a thicker seat. More than 1,000 were built in the first year, a mere six in the second, giving way two years later to the XLS Roadster, with extended forks, highway pegs and a 16in (406mm) rear wheel. That year might be remembered as the last year of the legendary XLCH. A lasting hybrid was the optional Hugger package of 1980, offering shorter shocks and a thinner seat – this was a precursor of the true Hugger models of today. The equally far-reaching XLX61 came out in 1983, a stripped-down, budget-priced version of the XLH1000 aimed at cash-strapped riders. It has been Milwaukee policy ever since to produce a cut-price "entry-level" model. When the 883 and 1,100cc Evolution models arrived for 1986, it was to be the beginning of a new chapter in the Sportster story.



■ LEFT *The very first of the Sportsters, from 1957. The Model S-inspired fuel tank came later.*

XLCR CAFE RACER, 1977–8

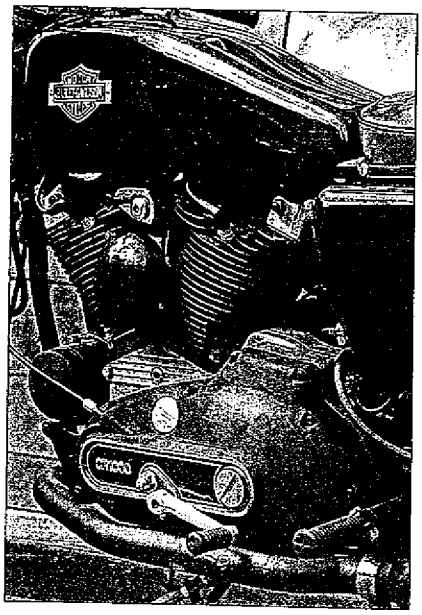
If black truly is beautiful, then the XLCR was sublime. So dark, it practically drank in the light, the Café Racer was another of Willie G. Davidson's variations on an old theme, in this case re-working the basic 1,000cc Sportster which had first appeared in 1972. When it arrived for the 1977 model year, the XLCR looked revolutionary – the most unashamedly different Harley-Davidson yet.

At its heart was the then biggest XL engine grafted into a redesigned frame, with extended rear frame rails allowing more vertical shock absorbers than before. Most striking of all was the "Black-on-Black" paint job. This included gloss black bodywork, crinkle-black engine finish and a black Siamesed exhaust which snaked together below the air-filter housing – which, naturally, was black.

The 3.8 gallon (14.5 litre) fuel tank – black, of course – was unique to the XLCR, as were a fibreglass "bikini" fairing and single seat. The latter ended with a racing-style "bum stop" – although a dual seat option was available for 1978, the model's second and final year of manufacture. Cast aluminium Morris wheels, as well as rear-set "race replica" footrests and controls, were also provided as standard.

The move to more vertical shock absorbers was a not particularly successful attempt to improve the Sportster's habitually sloppy handling.

At the same time, twin hydraulic front discs were fitted in much-needed pursuit of improved braking. They proved moderately powerful, if rather lacking in feel.

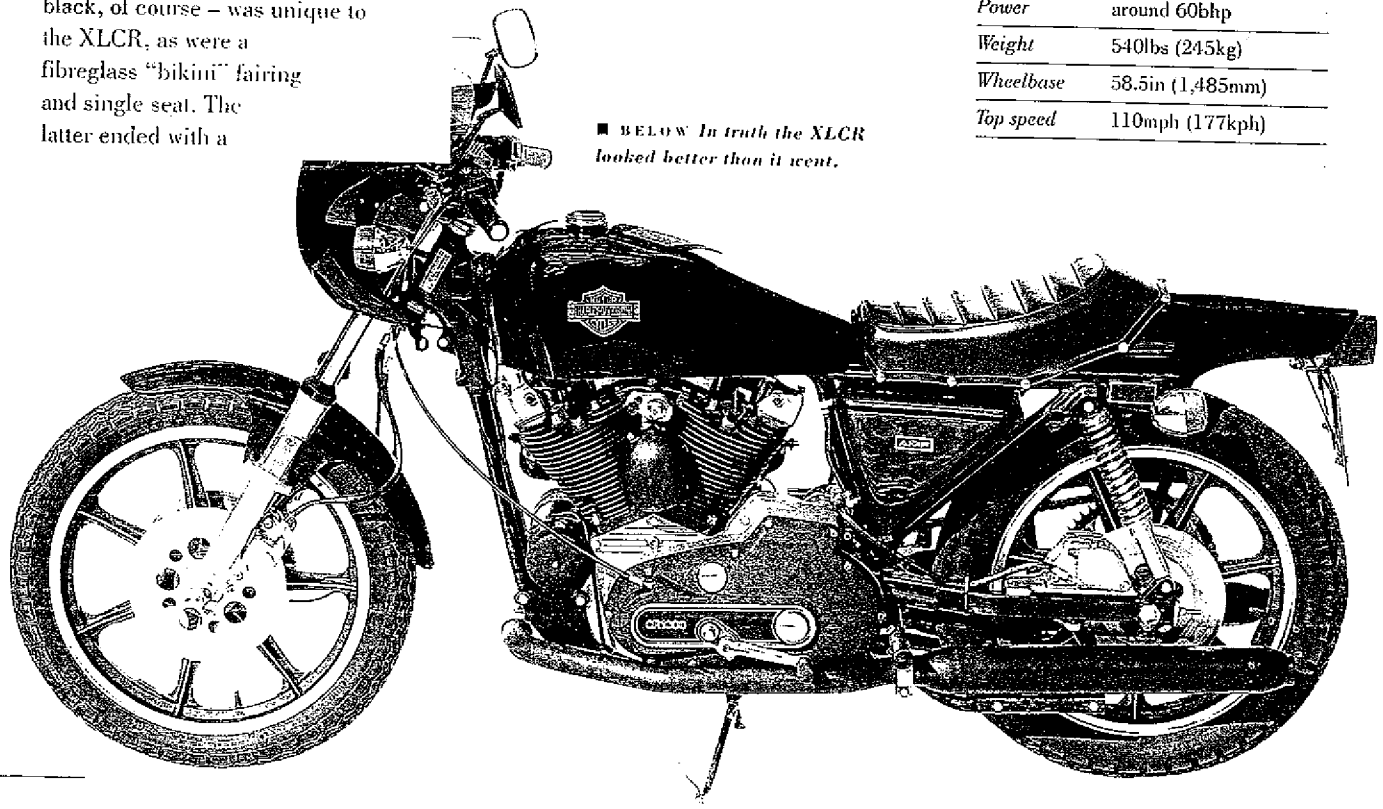


■ ABOVE *The stylish XLCR, with its "race replica" footrests, did not produce the kind of sales that Harley had hoped for.*

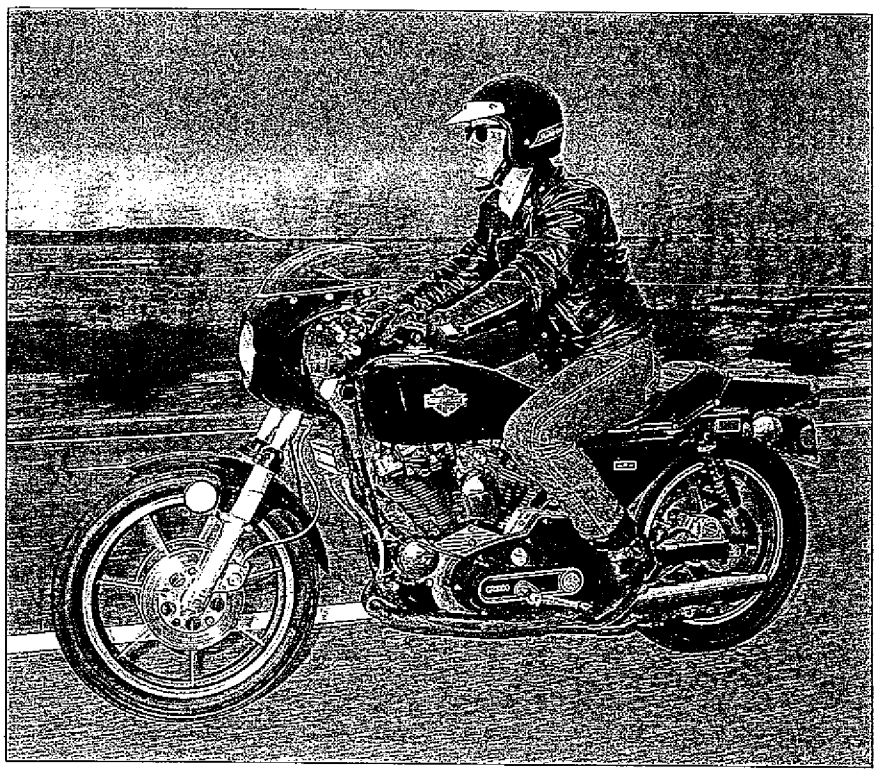
SPECIFICATIONS

Engine	ohv V-twin
Capacity	992cc
Transmission	4-speed
Power	around 60bhp
Weight	540lbs (245kg)
Wheelbase	58.5in (1,485mm)
Top speed	110mph (177kph)

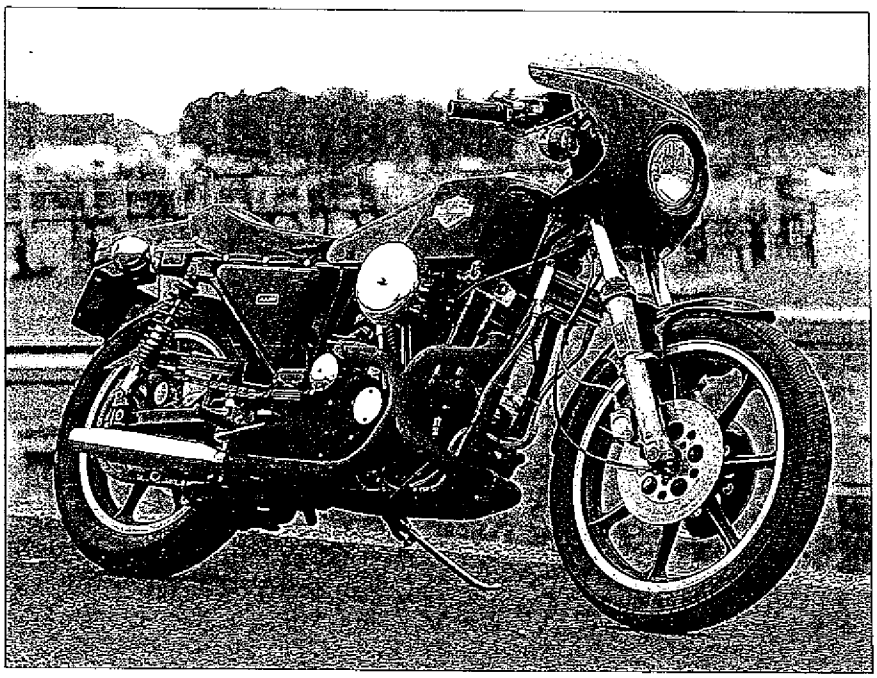
■ BELOW *In truth the XLCR looked better than it went.*



■ BELOW *In 1977, riders were required to enjoy the machine alone. A dual seat became an optional extra for 1978.*



■ BELOW *The problem wasn't so much the name on the tank as the AMF logo on the side panel. Just nine were made for the 1978–9 model year.*



Visually, this "top Sportster" was superb. True, it wasn't to everyone's taste, but most bikers would cast admiring glances at this stylish symphony in black. For all its eye-grabbing credentials, however, the XLCR was far from a runaway success.

On the one hand, most Harley die-hards found it visually too radical. On the other hand, more neutral buyers found sport-bike image and performance far more effectively packaged in Japanese and Italian machines. For all that, the XLCR is a desirable classic now, though at the time it was neither a vintage Harley-Davidson model nor a competent sports machine.

With around 60bhp and a top speed close to around 110mph (177kph), the XLCR was certainly no slug, but the bald truth was that it went at least 25mph (40kph) slower than rival sports machines, with equally inferior handling and braking. Worse still, the XLCR bore all the worst hallmarks of the AMF years. Contemporary road tests might praise the marque's "indefinable magic" but they would equally slate the Café Racer (and its siblings) for being "appallingly built and hideously unreliable," to which was usually added "prohibitively expensive".

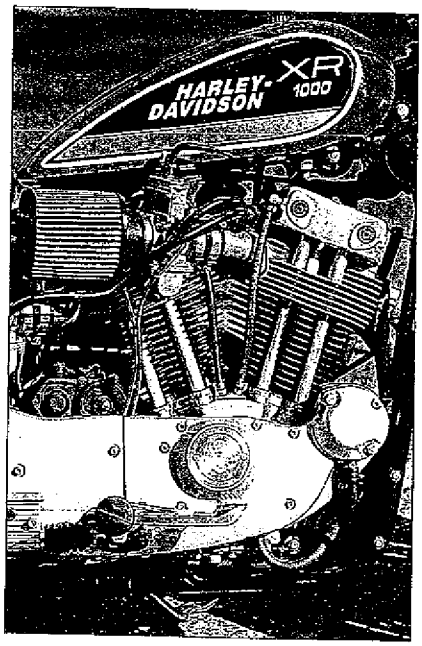
By the end of the model's brief reign, Harley-Davidson's share of the American motorcycle market had slumped to a paltry four per cent, yet it would be several years before the reborn company would seriously set about tackling its manufacturing shortcomings. This wasn't specifically the fault of the XLCR, of which just 3,124 examples were built, but this model did illustrate Harley-Davidson's problem – that beauty had to be much more than skin-deep.

XR1000 SPORTSTER, 1983–4

Unveiled at Daytona in March 1983, the XR1000 was the closest Harley-Davidson fans would ever get to a road-going XR racer. Even this far on, it's still many people's idea of the ultimate Harley Sportster. This should have come as no surprise because the big XR roadster was designed (and the prototype built) in the official factory race shop under the direction of Dick O'Brien. The 1000 could scarcely have enjoyed a better pedigree – O'Brien had managed Harley-Davidson's racing efforts since 1957 and overseen every moment of the XR750's career. Fittingly, O'Brien retired in the same year as the XR1000 roadster was released, making it an appropriately snarling swansong.

The $6,995 1000 wasn't quite a big-bore factory racer with lights but it was pretty special all the same. The engine employed a normal Sportster bottom end capped by special cylinder barrels, heads, fuel and exhaust systems. The aluminium heads were based on those of the racing XR, each reputedly shipped to Los Angeles to be ported and polished by legendary tuner, Jerry Branch (although it's likely that Branch simply oversaw the work, since a total of 1,777 XR1000s were built).

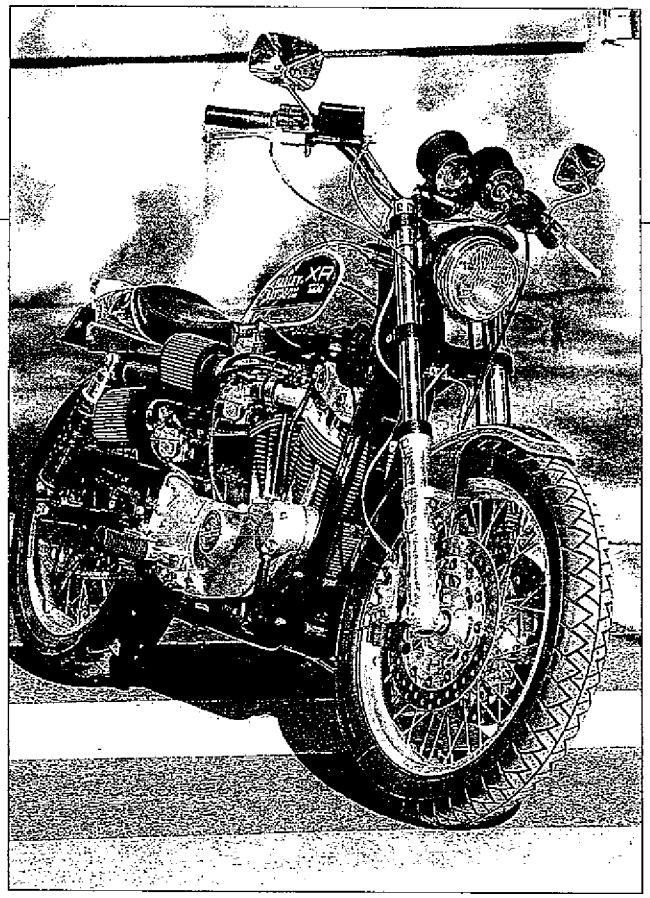
Induction was in the capable hands of twin 1⅛in 36mm Dell'Orto carburettors with accelerator pumps, each breathing through huge, free-flowing K&N air filters stacked, flat-track style, on the engine's right side. Although stock Sportster camshafts were employed, valve-lash was adjusted by racer-style



■ ABOVE *Not quite a racing XR750 for the road, but visually the XR1000 came pretty close.*

SPECIFICATIONS:	
Engine	ohv V-twin
Capacity	998cc
Transmission	4-speed
Power	70bhp
Weight	487lbs (221kg)
Wheelbase	59.3in (1,505mm)
Top speed	115mph (185kph)

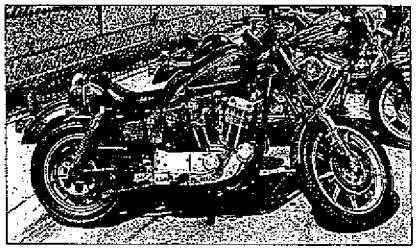
■ RIGHT *Possibly the most prized of all AMF-era models, the XR1000 was race boss Dick O'Brien's major contribution to Harley roadsters.*



■ RIGHT *This example has been customized to superb effect with a flat-track style rear mudguard and seat.*

■ BELOW RIGHT *That's better: the same colours flown by Jay Springsteen, Scott Parker and the rest of the champion racers.*

■ BELOW *Strangely, Milwaukee didn't offer the XR in their classic orange and black racing livery until 1984. In comparison this relatively standard machine looks mundane.*



eccentric rocker shafts. The push-rods, too, were special lightweight alloy components. Lumpy pistons gave a 9:1 compression ratio. Paired high-level black megaphone exhausts growled back along the machine's left side.

This bespoke engine was red-lined at 6,200rpm but there was no earthly need to spin it that high, since the spread of power was immense.

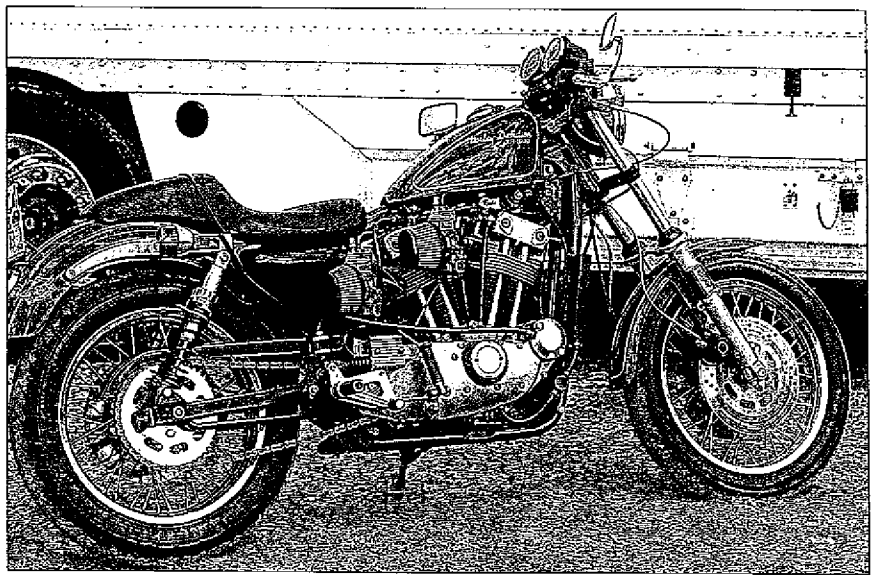
Peak power – a claimed 70bhp – arrived at 5,600rpm but the engine pulled strongly from as few as 2,000rpm. Maximum torque was 48lb/ft (65Nm) at just 4,400rpm. The speedometer was calibrated only to 110mph (177kph), a figure a good XR could reach comfortably.

With optional performance kits offering more than 90bhp, the sky was almost the limit.

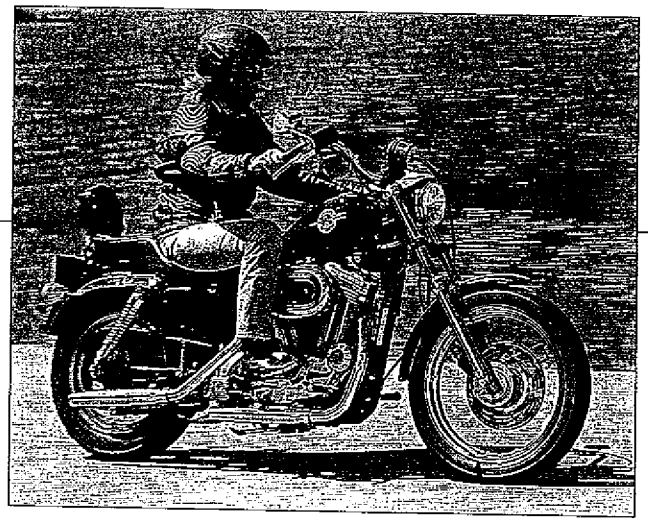
In truth, the XR's chassis was far less impressive than its engine. The frame and running gear were based on the XLX61, which was also new for 1983, with a nine-spoke, cast 19in (483mm) front wheel and 16in (406mm) rear. Rear suspension was in the hands of twin shock absorbers of no great quality, adjustable only for spring pre-load. Travel was quite short and the action harsh, making the XR nervous when ridden hard on bumpy surfaces. The brakes, however – twin 11½in (292mm) front discs – were surely the best Harley-Davidson had put on any roadster model up to that time and improved even further for 1984.

During the model's second year, it was offered with optional black and orange "factory" racing paintwork as well as the original steel grey. This seemed to be a suitably fitting livery for a such great machine.

The XR1000's reign as the ultimate sporting Harley-Davidson ever to have been produced by Milwaukee came to an end when production of this model ceased in 1984.



XLH883, 1986–PRESENT



■ LEFT *The 883 is just the coolest thing on the road.*

With a price tag of just under $4,000 when introduced as the XLX61 in 1983, the basic Sportster was precisely the type of entry-level machine so conspicuously absent from the Harley-Davidson stables in the past. This was a piece of genuine Milwaukee hardware at a price almost anyone could afford. In 1986, the deal was made even better with the appearance of Evolution engines across the Sportster range and the arrival of the XLH883. Then, just 12 months after that, would-be 883 owners got an even more irresistible package with the announcement of Harley's innovative buy-back scheme: "Trade in your XLH against an FX or FL within two years and we'll guarantee $3,995 on your old machine." How could anyone lose?

The smallest Sportster was the last model to benefit from the wave of refinements sweeping through the Milwaukee range. But in two short years from 1992, Harley-Davidson's bargain-basement superbike progressed from being the runt of the Harley-Davidson litter to become a thoroughly competent machine. There were dozens of detail changes over those two seasons, but two stand out. First came five-speed transmission for 1992, followed 12 months later by belt final drive.

The extra gear transformed the smallest Harley from a relatively buzzy, busy machine into a far more laid-back device, with the bonus of a better gear-shift. The tooth-belt drive made it smoother still, with the added benefits of low maintenance and cleanliness.

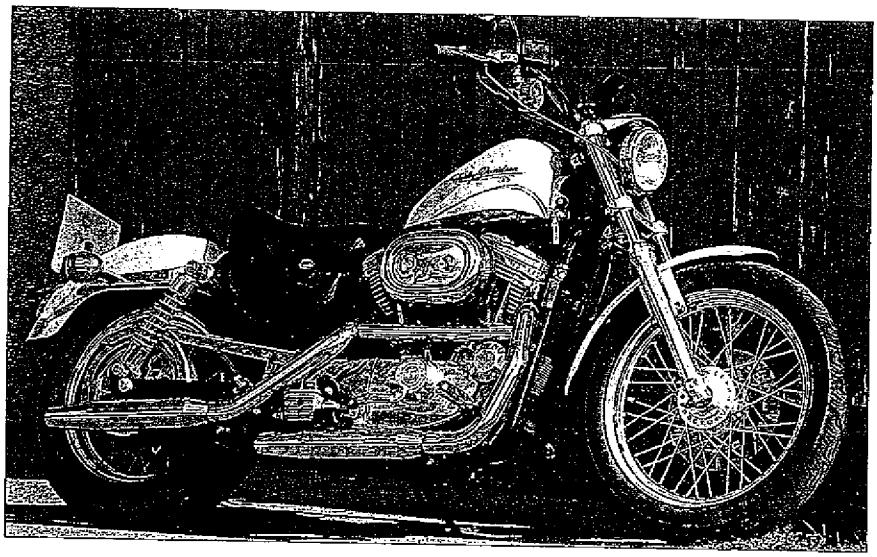
The first belts – pioneered by Harley-Davidson and the Gates company that manufactures them – aroused a degree of suspicion. However, thanks to space-age Aramid fibre reinforcement (similar to Kevlar – they last at least four times as long as a chain, cost about the same

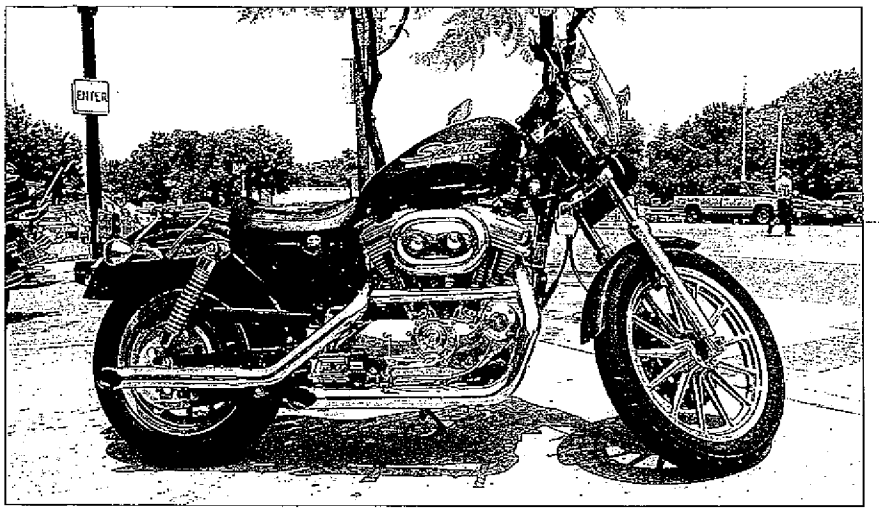
SPECIFICATIONS

Engine	ohv V-twin
Capacity	883cc
Transmission	5-speed
Power	52bhp
Weight	489lb (222kg)
Wheelbase	60.2in (1,530mm)
Top Speed	103mph (166kph)

■ BELOW LEFT *No frills, no tassels and bereft of baubles, the 883 is the most honest-to-goodness model in the Milwaukee range.*

■ BELOW RIGHT *The least expensive, lightest and easiest Harley to handle is popular with male and female riders alike.*





■ ABOVE LEFT AND ABOVE *Although this was the last model in the range to benefit from five-speed transmission and belt final drive, the Evolution-engined 883 has sold consistently well.*

and are practically unknown to fail. This was to make the XLH slightly more of what it was always good at – being a lean, spare and handsome means of filling practically all the space between headstock and rear spindle. There are no tassels, no gratuitously shiny but ultimately useless bits – just plain, single-seated function.

Of course, like all Harleys, the function in question has relatively little to do with sheer speed, handling or stopping. The 883 is essentially a cut-down cruiser, its low-profile Hugger stablemates all the more so. It looks cool while allowing its rider to appreciate, with as little intervening sanitation as possible, the most intimate doings of the internal-combustion engine.

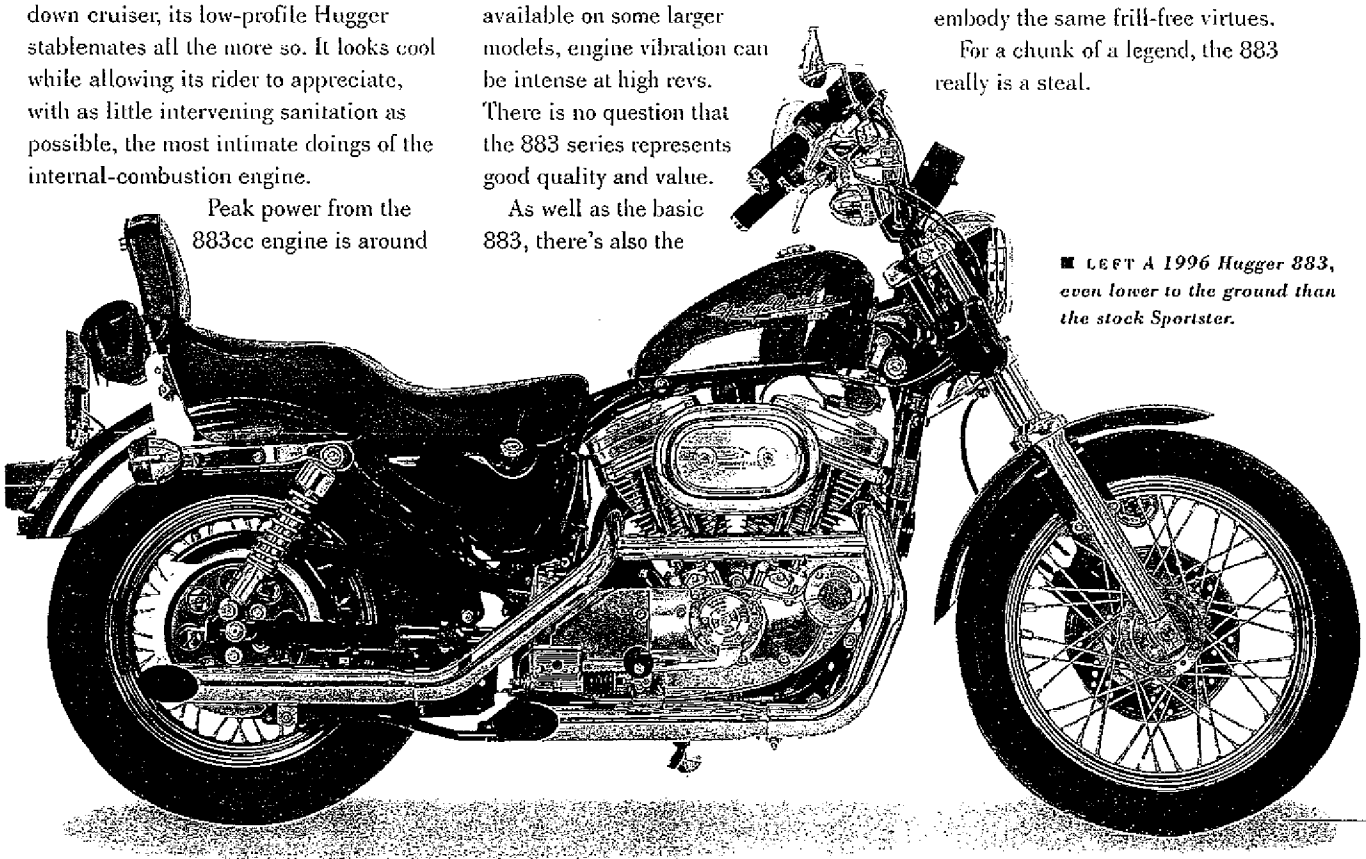
Peak power from the 883cc engine is around 52bhp at a distinctly unruffled 5,500rpm – 1,000rpm after the arrival of maximum torque of 52lb/ft (70.5Nm). Acceleration is brisk rather than vivid, although the ample torque means there's always power on hand.

This motorcycle might be smaller than any other that Harley has produced, but crank open the throttle at almost any revs and the Sportster lunges forward on the same irrepressible wave of power. Without the rubber-mounting available on some larger models, engine vibration can be intense at high revs. There is no question that the 883 series represents good quality and value.

As well as the basic 883, there's also the Hugger – a variant dating back to 1979 and so called because it squats even lower to the ground.

They hardly depreciate and, with a bit of care, they can all last practically forever. Best of all, however, more than 40 years after the introduction of the original XL, the 883s continue to embody the same frill-free virtues.

For a chunk of a legend, the 883 really is a steal.

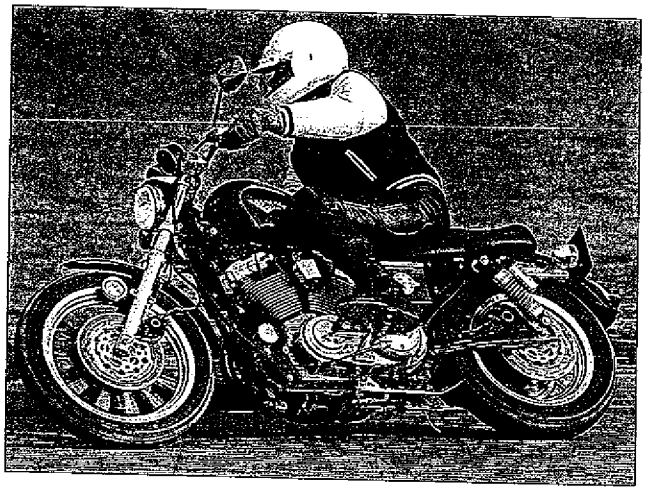


■ LEFT *A 1996 Hugger 883, even lower to the ground than the stock Sportster.*

XL1200S SPORTSTER SPORT, 1996–PRESENT

By the mid-1990s, the redoubtable Sportster family was approaching its fortieth birthday – and beginning to show it. True, Evolution V2 engine technology had reached the old XL steeds on the 883 and 1100 Sportsters for the 1987 model year. Twelve months later, Milwaukee unleashed the first of the family's 1,200cc models, the XLH. Essentially this was the old 1,100 engine with the bore increased from 85.1 to 88.8mm. The stroke remained unchanged at 96.8mm, the same as the 883. Other than a change to five-speed transmissions and belt drive across most of the Sportster family in 1991, the range remained largely unchanged until the appearance of the 1200S in 1996. Along the way, it had definitely lost some of the fire that had burned in the first of the breed all those years before.

Those first Sportster Sports were perhaps a case of "close, but no cigar." Initially, their chief distinction was the adoption of improved, fully-adjustable suspension components at both ends, mated to softer, grippier tyres – but the engine remained stubbornly unmoved.

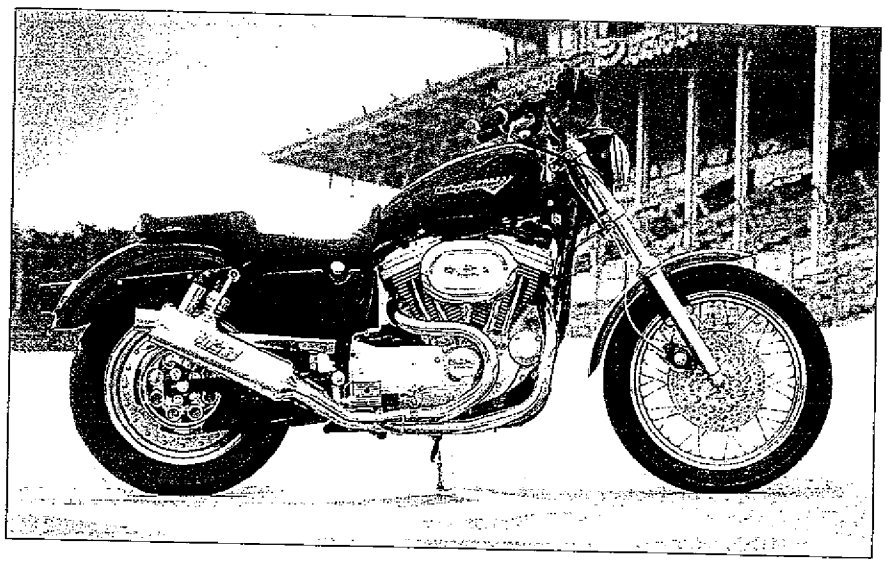


■ LEFT *Once sorted, the Sportster Sport represented a quantum leap in Harley-Davidson engine power, handling and stopping prowess.*

■ BELOW LEFT *The Sportster Sport was extremely popular, and the 1998 model pictured was long-awaited by its devotees.*

SPECIFICATIONS

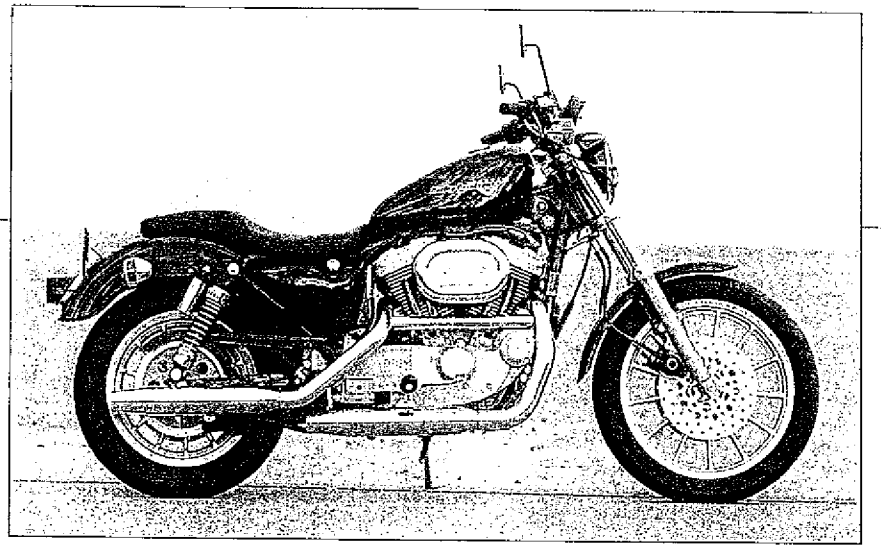
Engine	ohv V-twin
Capacity	1,203cc
Transmission	5-speed
Power	75bhp
Weight	518lbs (235kg)
Wheelbase	60.2in (1,530mm)
Top speed	110mph (177kph)



Sportster fans had to wait another two years before the model truly reached its peak, but the 1998 Sportster Sport was surely worth the delay. In broad terms, the engine was little changed from previous Sportsters, with its hydraulic tappets, dry sump and triple-row primary chain driving a wet multi-plate clutch and toothed-belt final drive. Naturally, the 1200S carries higher overall gearing: 2.103:1 compared to 2.259:1 on the 883.

However, a comprehensive engine revamp had raised torque figures by an average of 15 per cent throughout the twin's 2,000–5,500rpm operating range. The model now had both the chassis and the engine to justify its "Sport" aspirations at last.

Essential to these improvements was an all-new ignition pack igniting not one, but two spark plugs in each cylinder, promoting quicker, more efficient burning of the incoming fuel/air charge. Although a conventional carburettor was retained – a 1½in (40mm) constant velocity Keihin instrument equipped with an "accelerator" pump – combustion control was further improved by an

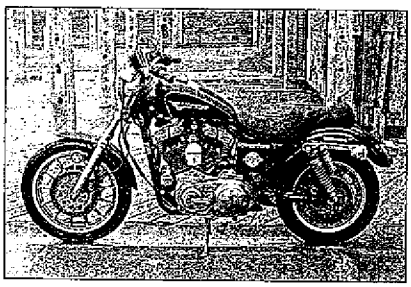


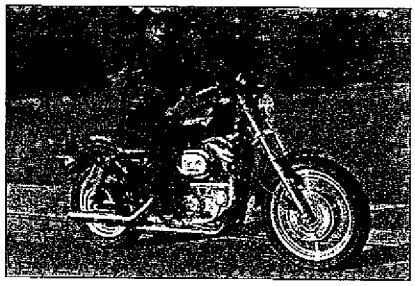
■ RIGHT *Clean lines are common, but note improved calipers between this early example and the 2000 Sportster that is pictured below.*

electronic management system even more sophisticated than the V Fire II set-up fitted to its sister models. The system, incidentally, also affords high-tech electronic diagnostic capabilities. These measures allowed Harley-Davidson's engineers to bump up compression from 9:1 to 10:1, offering a substantial increase in mid-range power.

As well as lumpier pistons, the revised powerplant benefited from a larger, less restrictive exhaust system and new camshaft design. The camshafts offer both higher lift and longer duration, again with the emphasis on enhancing mid-range torque. Harley can claim a peak torque figure of 78lb/ft (106Nm) at 4,000rpm, over 50 per cent higher than the 883. With not only much improved power characteristics but better throttle response as well, the Sport feels even stronger than the figures might show. The 1200S looks every inch as mean and muscular as a Sportster should, with its clean lines and understated black engine highlights. Nor is this a deception, for the twin-plug Sport package delivers genuine punch. Better still, it stops and handles in a most un-Milwaukee-like manner – a mantle several more recent models have since adopted, to welcome effect.

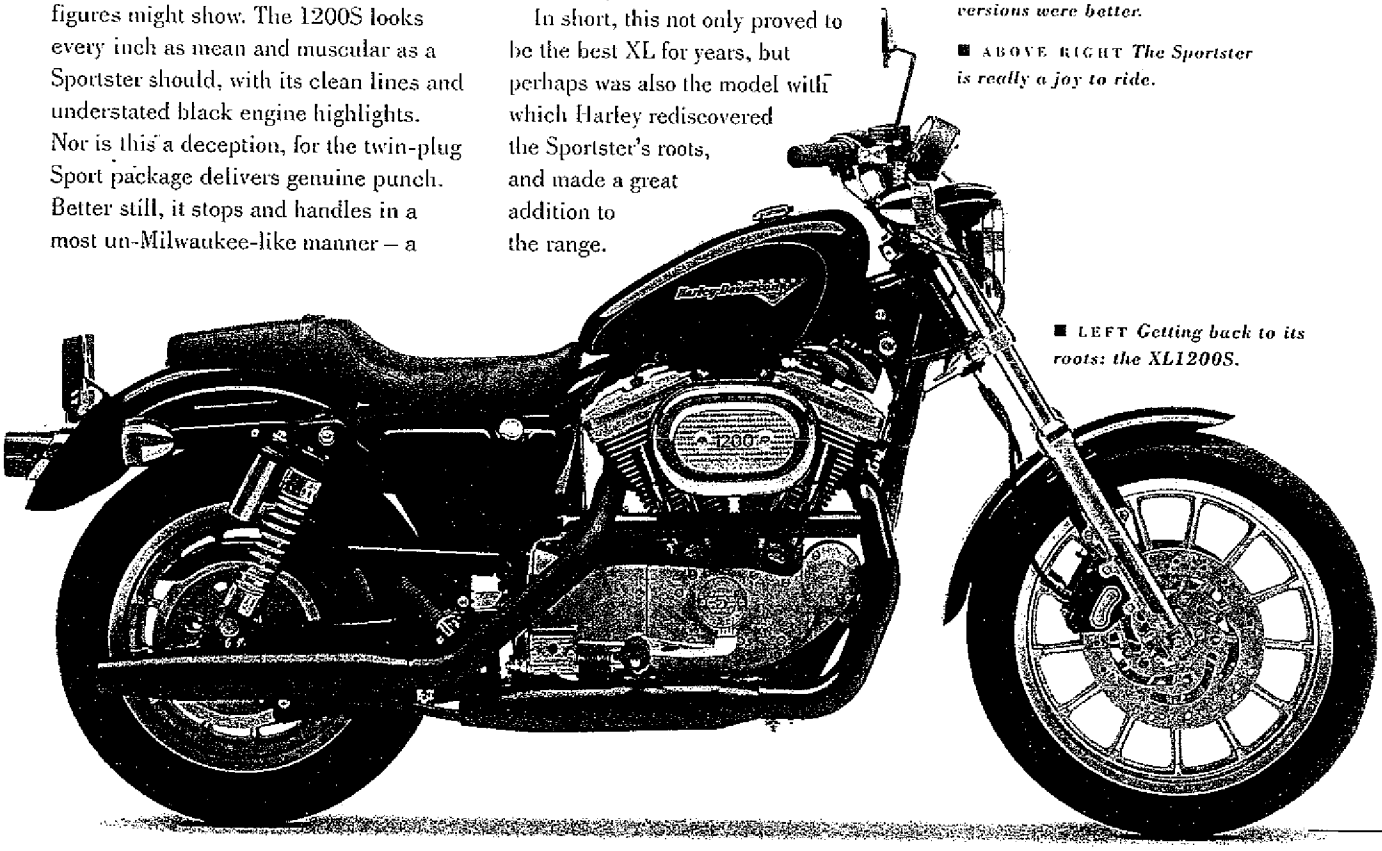
In short, this not only proved to be the best XL for years, but perhaps was also the model with which Harley rediscovered the Sportster's roots, and made a great addition to the range.



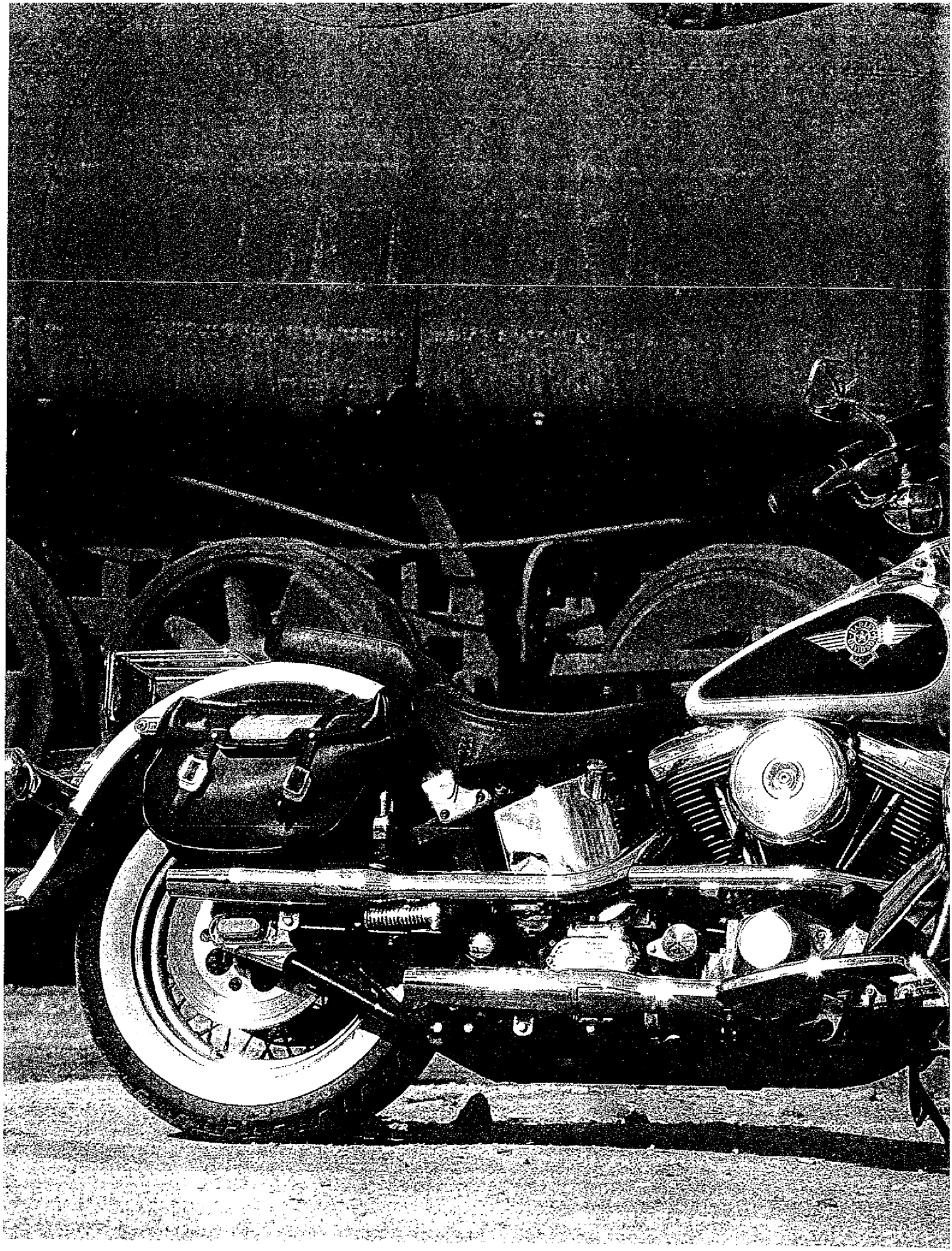


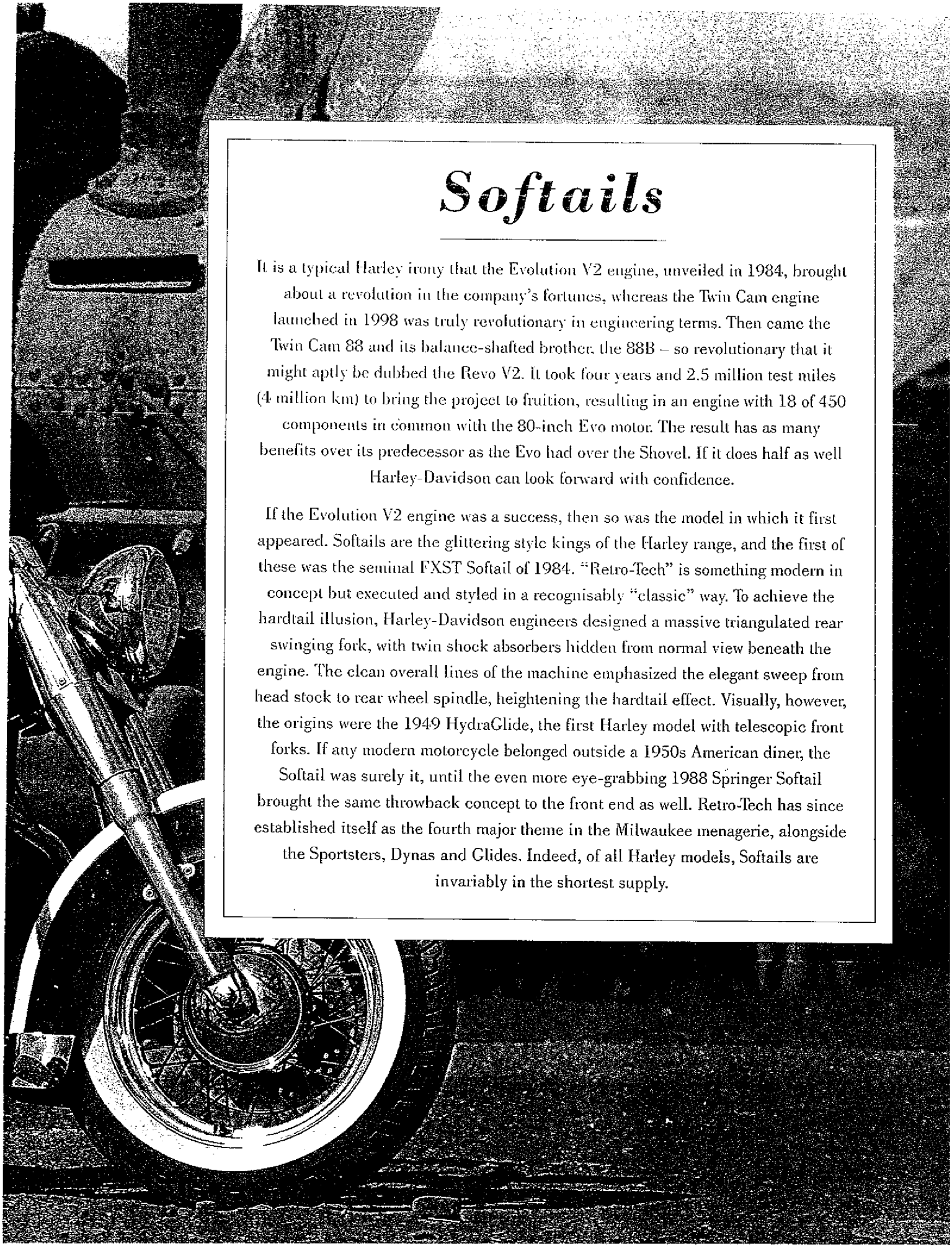
■ ABOVE LEFT *One of the first examples of the 1200S. Later versions were better.*

■ ABOVE RIGHT *The Sportster is really a joy to ride.*



■ LEFT *Getting back to its roots: the XL1200S.*





Softails

It is a typical Harley irony that the Evolution V2 engine, unveiled in 1984, brought about a revolution in the company's fortunes, whereas the Twin Cam engine launched in 1998 was truly revolutionary in engineering terms. Then came the Twin Cam 88 and its balance-shafted brother, the 88B – so revolutionary that it might aptly be dubbed the Revo V2. It took four years and 2.5 million test miles (4 million km) to bring the project to fruition, resulting in an engine with 18 of 450 components in common with the 80-inch Evo motor. The result has as many benefits over its predecessor as the Evo had over the Shovel. If it does half as well Harley-Davidson can look forward with confidence.

If the Evolution V2 engine was a success, then so was the model in which it first appeared. Softails are the glittering style kings of the Harley range, and the first of these was the seminal FXST Softail of 1984. "Retro-Tech" is something modern in concept but executed and styled in a recognisably "classic" way. To achieve the hardtail illusion, Harley-Davidson engineers designed a massive triangulated rear swinging fork, with twin shock absorbers hidden from normal view beneath the engine. The clean overall lines of the machine emphasized the elegant sweep from head stock to rear wheel spindle, heightening the hardtail effect. Visually, however, the origins were the 1949 HydraGlide, the first Harley model with telescopic front forks. If any modern motorcycle belonged outside a 1950s American diner, the Softail was surely it, until the even more eye-grabbing 1988 Springer Softail brought the same throwback concept to the front end as well. Retro-Tech has since established itself as the fourth major theme in the Milwaukee menagerie, alongside the Sportsters, Dynas and Glides. Indeed, of all Harley models, Softails are invariably in the shortest supply.

FXST SOFTAIL, 1984

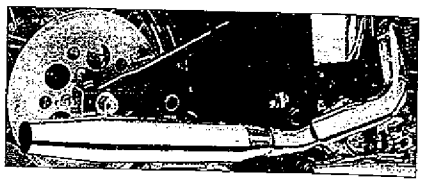
Certain motorcycles have stood out as memorably special over the years, mobbed for days on end at motorcycle shows. Honda's original CB750F was one, as was Ducati's sensuous 916. In recent years, the Milwaukee equivalent has surely been the first Softail, from 1984. True, all Harley-Davidsons are someone's idea of beauty but the FXST had a quality all its own.

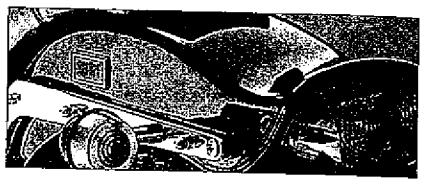
Based on the existing FXWG Wide-Glide – somewhat loosely, to judge by appearances – the Softail had bikers not knowing quite where to look. Did they focus on the all-new Evolution V2 engine or eyeball that strangely elegant rear end? Most probably they did both and Softails are still being eyed covetously to this day.

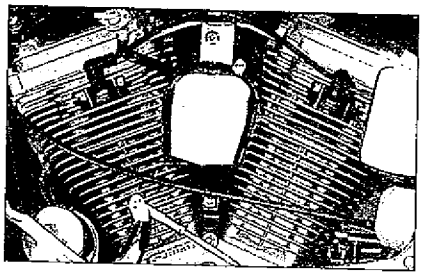
The Softail's rear suspension was a clever piece of lateral thinking based on an old theme, created for Harley by consulting engineer Bill Davis. The inspiration almost certainly came from custom craftsmen such as Arlen Ness – and even carries a distant echo of the Goudier-Genoud endurance racing Kawasakis. Essentially, it's an inverted cantilever rear end (as per Vincent and Yamaha) in which a triangulated assembly pivots at the top, near the seat, rather than at the usual place. Paired, gas-charged Showa shock absorbers lie unobtrusively under the engine. The layout has little to do with function but a lot to do with style, something it

SPECIFICATIONS

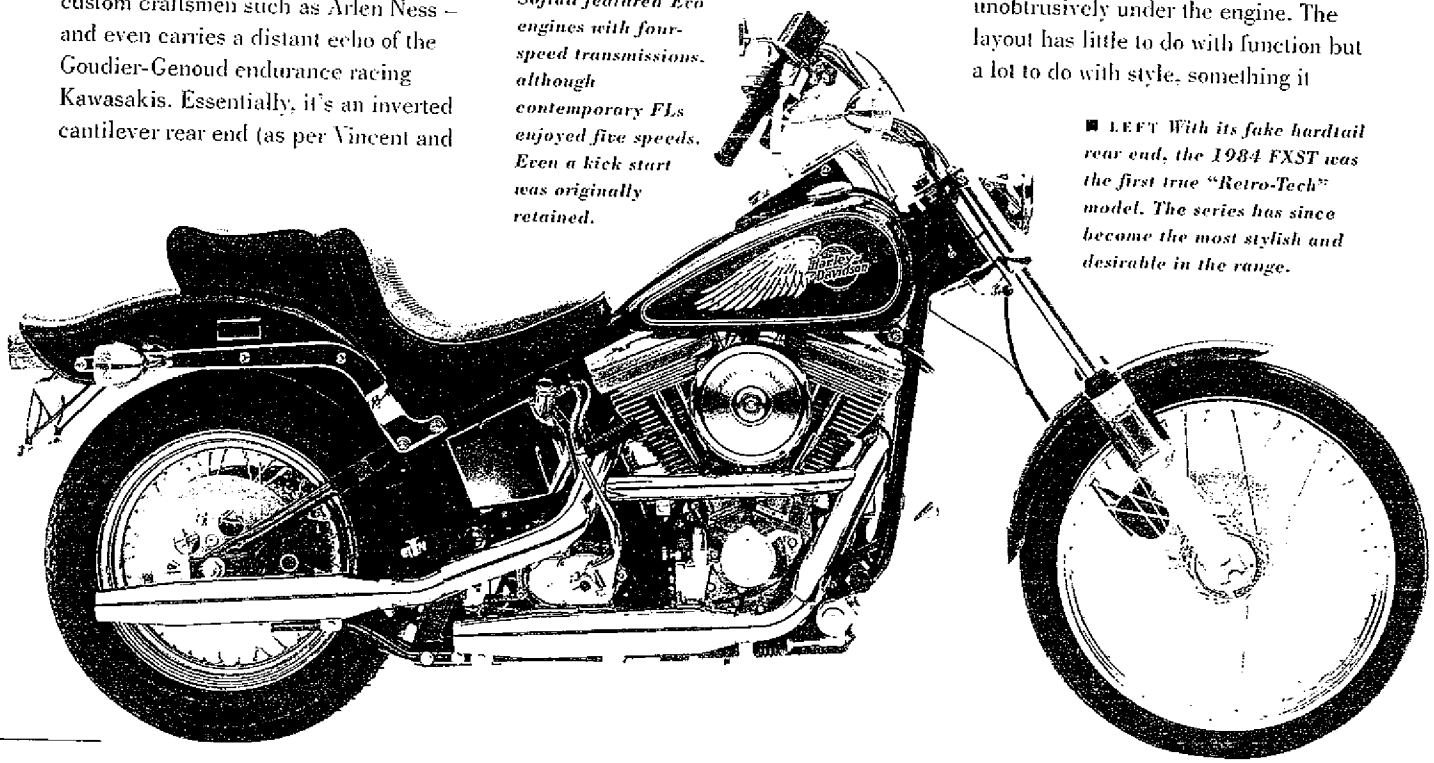
Engine	air-cooled ohv V-twin
Capacity	81.6cu in (1,338cc)
Transmission	4- (later 5-) speed
Power	69bhp
Weight	604lbs (274kg)
Wheelbase	66.3in (1,685mm)
Top speed	106mph (170kph)





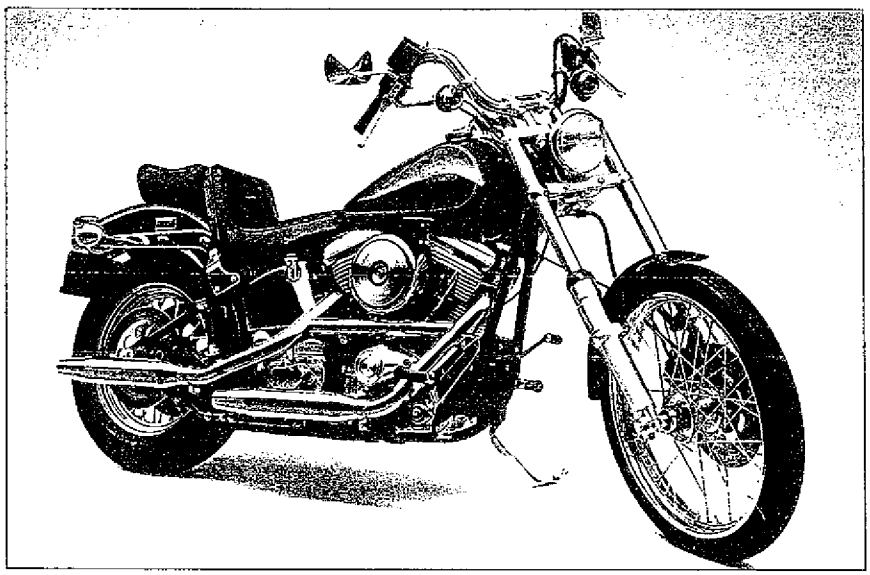


■ TOP RIGHT, CENTRE RIGHT, RIGHT AND ABOVE *The earliest versions of the Softail featured Evo engines with four-speed transmissions, although contemporary FLs enjoyed five speeds. Even a kick start was originally retained.*



■ LEFT *With its fake hardtail rear end, the 1984 FXST was the first true "Retro-Tech" model. The series has since become the most stylish and desirable in the range.*

■ BELOW *Based on the existing Wide-Glide model, the Softail was as visually startling as any Japanese "crotch rocket".*



demonstrated superbly. Despite the space constraints inherent in the twin-damper system, Softails in fact boasted more rear suspension travel – 4in (103mm) – than any other models in the Harley range.

Maybe the Softail look wasn't keenly anticipated, since most people didn't know it was coming, but the engine certainly was. Although a few very early 1984 Softails may have been built with Shovelhead engines, every one since has had belt-driven Evo power. With its all-new light alloy top end, the new big twin produced around 70bhp at 5,000rpm and a withering 84lb/ft (114Nm) of torque at just 3,600rpm. Indeed, the spread of power was so immense that almost no-one complained that 1984 examples had to make do with four-speed gearboxes. A five-speed cluster was installed for 1985, by which time a lighter diaphragm spring clutch had also appeared.

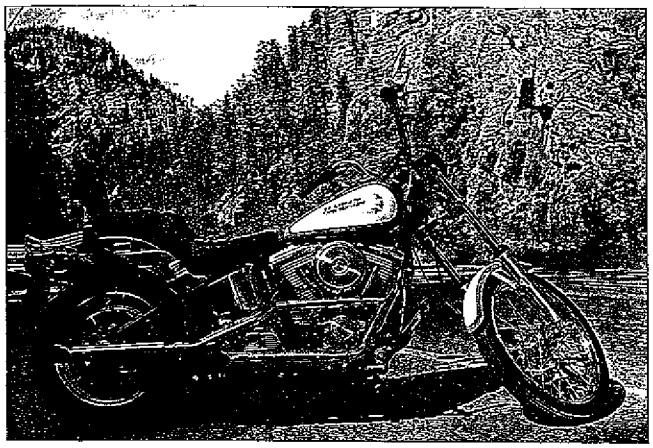
The chassis is characterized by an immense 66.3in (1,685mm) wheelbase and a seat height of 1in (25mm) lower than even a Low Rider's seat. Fuel is carried in the familiar, bulbous, two-piece Fat Bob tank, split across the mid-line, with a speedometer set in the centre. Wheels are wire-spoked, 21in (533mm) front and 16in (406mm) rear, carrying a single hydraulic disc apiece. Unlike contemporary Glides, the 80-inch engine is solidly mounted, although rubber-insulated handlebars and footrests compensate to some extent. Softails may be stylish, but smooth they are not.

The low saddle and forward-mounted "highway" pegs impose an appropriately laid-back riding position. As for handling: well, the Softail doesn't – it just sort of rumbles from A to B and all the better if that doesn't include too many fast corners. The suspension at both ends is woefully under-damped, the front forks are characteristically soft and woolly, and the rear is, frankly, harsh. Nonetheless, the expansive wheelbase and conservative steering geometry keep things more or less in line. Besides, this is a bike for cruising.

It's a measure of the overall rightness of the concept that, superficially at least, Softails appear little changed to this day. This disguises the vast improvements Harley-Davidson has made in build quality and detailing since the time of the FXST's launch.

Above all, there's the inescapable fact that this inspired piece of post-modern design was a huge and instant success.

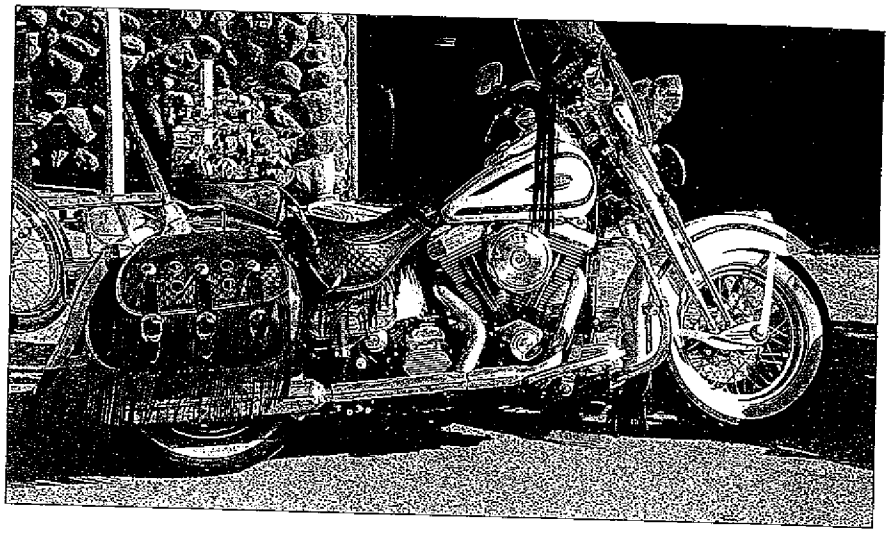
Although not the most practical model that Harley-Davidson has ever built, it certainly can be said that Softails are the most eye-catching and, the above all, the most prized.



■ LEFT *The Softail Custom introduced in 1987 was the first of many models inspired by the original FXST.*

FXSTS SPRINGER SOFTAIL, 1988-PRESENT

■ BELOW *Any Springer simply refuses to be ignored, especially one dripping with tassels and chrome plate as much as with this example.*

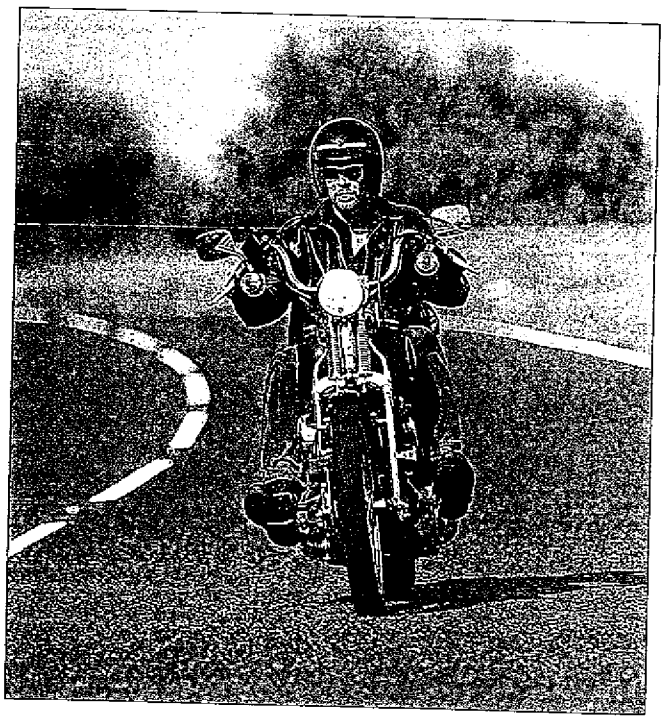


In late 1987, the motorcycle world took one look and pinched itself – twice. The Springer Softail unveiled for the 1988 model year looked like no new motorcycle of the previous 40 years. Gone were the telescopic front forks to which we had become accustomed. In their place was a trellis-work of bright-chromed steel members, linkages and springs. It was called "Springer", and was as audacious as it was surreal.

As Harley said at the time, the new front-end wasn't just reborn, it was re-invented. The Springer front end was styled along the lines of the girder forks seen on almost every make of motorcycle from before the 1920s until the late 1940s, but the technology and the detail were all-new. Using computer-aided design (CAD) and the latest materials, Milwaukee had created a system which not only afforded an acceptable level of wheel travel (around 4in/100mm) and suspension control, but which freed its designers to make the styling statement of the year.

We now had Retro-Tech at both ends: Springer at the front to accompany Softail lines at the rear. The engine, naturally, was the doughty 80-inch Evo, styled for its new role and fitted with staggered shorty dual exhausts.

Like all "conventional" Softail models, the new Springer offered defiantly lazy steering geometry. In this case, a shallow 32-degree steering head gave a generous 5¼in (133mm) of trail. The wheelbase was a lanky 64.6in (1,640mm). Unlike standard Softails, Springers roll on slow-steering 21in (533mm) front wheels, with a 16in (406mm) hoop at the rear. Inevitably, the result isn't quite at the cutting edge of modern suspension performance. Any Softail rear end can be harsh, especially



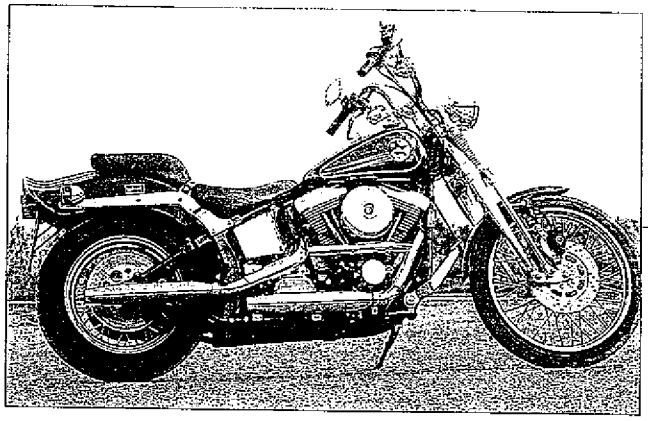
■ ABOVE *A modern damper unit (with Harley sticker) controls the movement of the Springer forks.*

■ LEFT *No-one pretends Springers give state-of-the-art handling, but who needs it on a cruise in the sun?*

SPECIFICATIONS

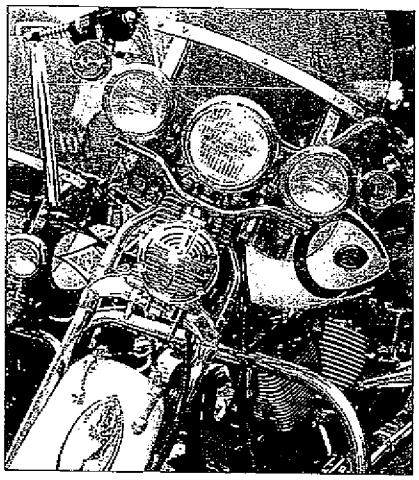
Engine	air-cooled ohv V-twin
Capacity	81.6cu in (1,340cc)
Transmission	5-speed
Power	69bhp
Weight	625lbs (284kg)
Wheelbase	64.6in (1,640mm)
Top speed	100mph (161kph)

■ RIGHT *The Springer has always been exclusive. Around 1,350 were produced in its first year, compared to more than 14,000 other Softail models.*



■ BOTTOM *Aftermarket fishtail silencers and two-tone paint contrive to make this Springer look for all the world like a 1946 FL.*

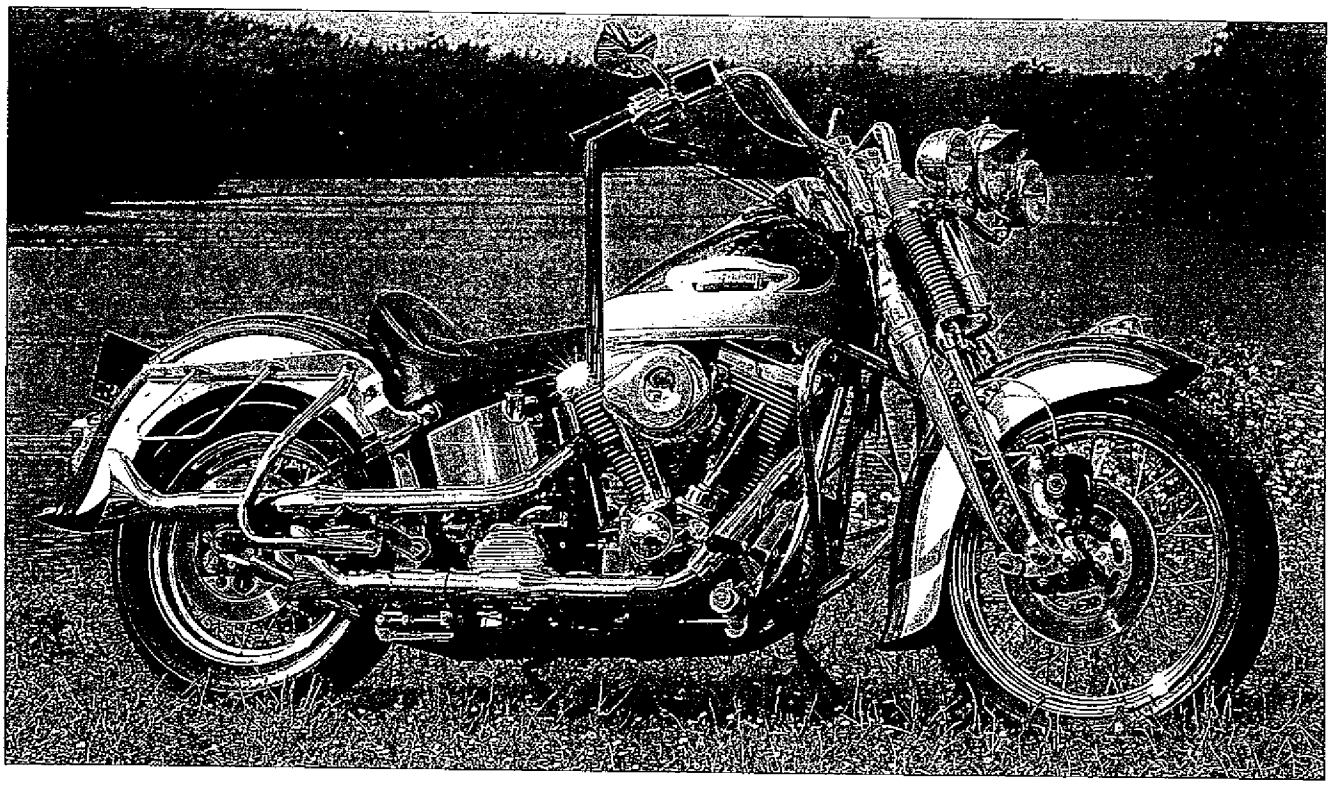
■ BELOW RIGHT *Optional screen, trim and running lights give the owner of this Springer even more to polish.*



over freeway seams, and the latter-day girders lack the control of even Fat Boy's massive telescopic forks. Such judgements miss the point, however. Of all the Milwaukee models, Springers are unashamedly machines for stately cruising – and are as far removed from a Japanese "crotch rocket" as a 1959 Cadillac.

If 1987 marked the Springer's debut, then 1997 marked what many regard as its finest hour. As well as offering practical accessories such as leather saddlebags as standard, the 1997 FLSTS Heritage Springer Softail went further down the classic road, combining even more vintage styling with today's retro-technology. "Loaded with chrome and leather," publicity material hailed at the time, "the Heritage Springer Softail screams nostalgia." And so it did, from its bright-chromed fishtail mufflers to its deeply-valanced mudguards and whitewall tyres. Even at first glance, the result is sublime, the level of detail extraordinary. Note the nostalgic front fender-tip light and the "retro-1940s tombstone tail-light once commonplace on Harley-Davidsons decades ago." Admire a seat with a leather fringed valance "embossed with a basket-weave pattern and accented with conchos".

The ultimate factory custom had come a long way from the original SuperGlide. As the man said: "Is it a motorcycle or is it art?"



FLSTN HERITAGE SOFTAIL NOSTALGIA, 1993

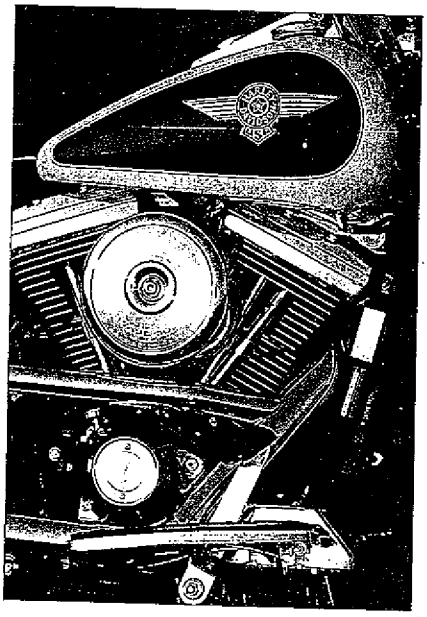
Dubbed the "CowGlide" on its release for the 1993 model year, the limited-edition Heritage Nostalgia was the fanciest incarnation of Milwaukee's fanciest line. The nickname came from its hairy, black-and-white natural cowhide seat and saddlebag inserts, but there were plenty more cosmetic tricks where they came from. Little wonder its creators described it as: "Without doubt, the most distinctive-looking motorcycle in Harley's 1993 line ... nostalgic-looking ... but thoroughly modern." It had already proved a winning formula.

Modern, of course, means something else in Harley-Davidson's wondrous time-warp world – like whitewall tyres and forks straight out of the 1940s. Ever since beginning life in 1986, the Heritage Softail package attempted to re-enact the look of the 1949 HydraGlide, with its "hardtail" rear and gleaming metal fork shrouds.

Fine detail isn't something you'd normally expect from a device scaling almost one third of a ton, but this is a Harley, so the tank badge is a specially fired enamel named "jewelled cloisonné." Yet at heart, it's essentially an even more customized variant on the Heritage Softail Classic, available only in Birch White and Black two-tone, with black and chrome engine trim. Power comes from an identical 80-inch Evo engine booming out the same 69bhp at a mere 5,000rpm and a mammoth 70-or-so pound-feet (95Nm) of torque at an even lowlier 3,500rpm. Like the rest of the 1993 range, the Nostalgia benefited from a taller final drive (61-tooth rear pulley) for lower revs at cruising speeds. Improved brake and clutch levers, master cylinder sight glasses and a new, neater engine-breather system also arrived for the same model year.

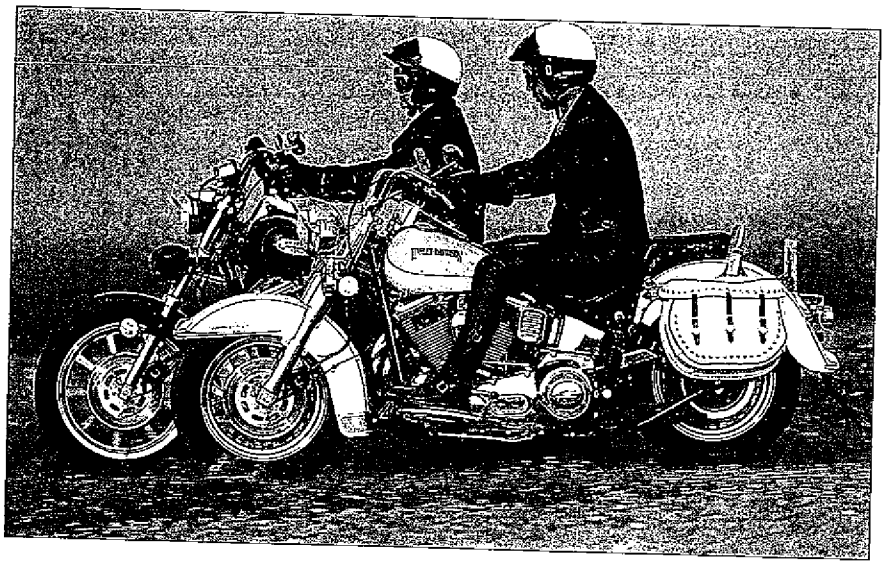
To ride, it's inevitably much like any other Softail, particularly the Classic or Fat Boy (with which it shares wheel sizes), steering geometry (32-degrees rake, 5.8in/147mm trail), forks, footboards, handlebars and almost every other relevant dimension. The only significant differences are a fuel tank almost ½gallon (1 litre) larger and the addition of a hefty 93lbs (42kg) of mass compared to the basic Softail model.

With suspension springing as soft as the CowGlide's considerable weight will allow, handling falls somewhere between sedate and ponderous. Over bumps, the steering is vague and

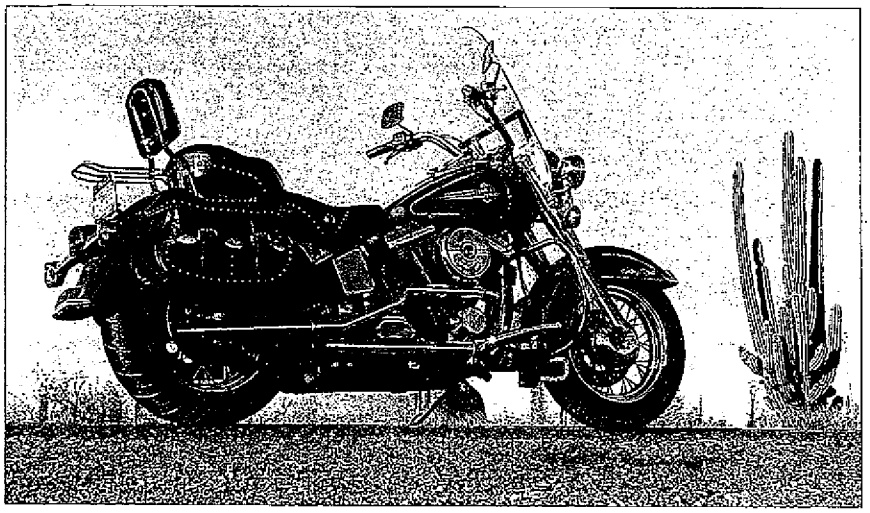


■ ABOVE *The engine was an 80-inch Evo like any other, but the Nostalgia package set it apart.*

■ BELOW *The "CowGlide" was derived from the stock Heritage Softail, here seen cruising in company with a LowRider.*



SPECIFICATIONS	
Engine	air-cooled ohv V-twin
Capacity	81.6cu in (1,340cc)
Transmission	5-speed
Power	69bhp
Weight	710lbs (322kg)
Wheelbase	64.2in (1,630mm)
Top speed	100mph (161kph)



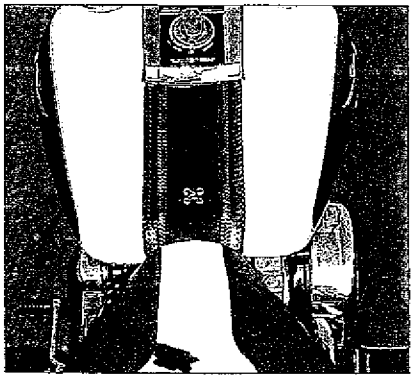
■ LEFT *No jewelled cloisonné, but plenty of leather and studs: a standard Heritage Softail.*

■ BELOW LEFT *"CowGlide" nickname comes from the Nostalgia's black and white hide details.*

accompanied by a slow weave whenever the road turns lumpy. As with the brakes, it's adequate if it is ridden with prudence.

Since Softail engines are not rubber-mounted, the vibrations intrude towards the top of the rev range even with its higher overall gearing – or as its makers prefer, the bike "rumbles with the echoes of Harleys past."

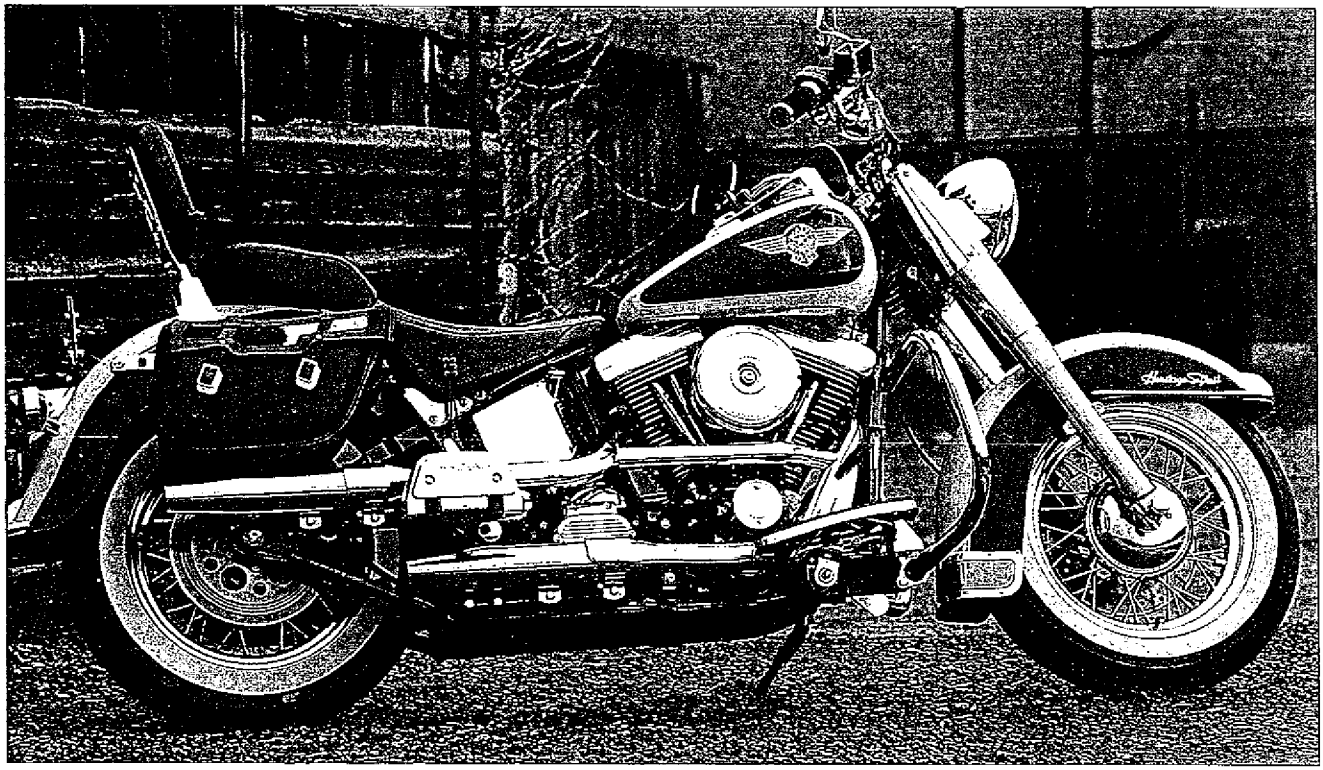
At a first glance, most onlookers took the Nostalgia – which was fresh from the factory floor – to be either the real 1949 McCoy or a bespoke special that had been put together at huge expense by one of Hollywood's celebrity custom farms. Harley-Davidson's retro illusion was that good, yet only 2,700 examples of the limited-edition Nostalgia were ever built.



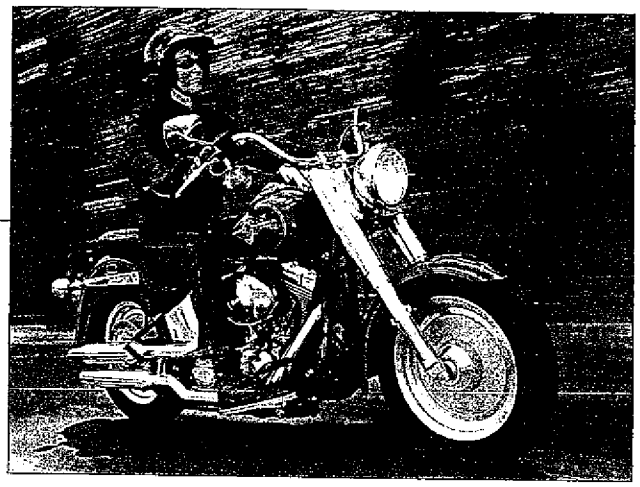
Even at $13,000 – just $3,100 less than the most lavish Glide – demand for these highly-desirable models far exceeded supply.

Second-hand "CowGlide" Nostalgias were soon changing hands at far more than list price. Mark up another masterpiece for Willie G. Davidson and his men.

■ BELOW *They say that nostalgia isn't what it used to be. No, in this case it's much better.*



FLSTF Fat Boy, 2000

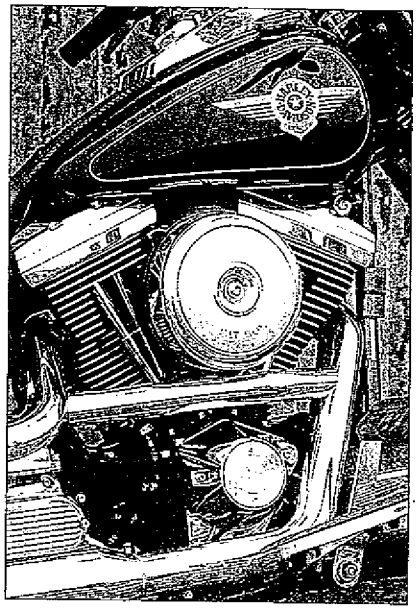


■ LEFT *Solid disc 16in wheels have distinguished the Fat Boy since its launch for 1990*

■ BELOW LEFT *Only Harley could get away with such a derogatory title – and make it sell.*

The irreverently-named Fat Boy has held pride of place in Milwaukee's custom line-up since its debut in 1990. The FLSTF could claim to be the coolest of all the Retro-Techs, with its 16in (406mm) solid-disc wheels, elegant lines and bold but understated paint. For the year 2000, Fatso and its fellow Softails got the biggest shake-up since the line began back in 1984, with only a handful of parts retained from the old model. The new millennium marks the end of the noble 80-inch Evo engine and the adoption of the Twin Cam 88 across the entire heavyweight range.

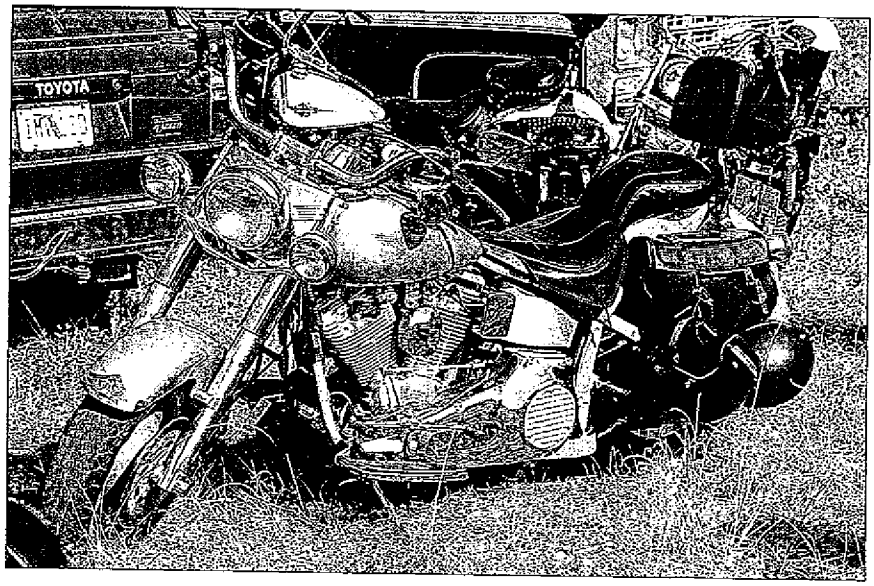
This is no ordinary Twin Cam, though. Designated the 88B, the engine was developed in parallel with the "stock" 88 and uses essentially the same top ends, including the same 88.42cu in (1,449cc) displacement from identical bore and stroke dimensions. The bottom-end, however, features hardware never seen on any previous Harley: twin counter-rotating balance shafts. The eccentrically weighted shafts, tightly-packed inside the crankcases, rotate in the opposite direction to the crankshaft to eliminate primary engine vibration.



This is necessary because the Softail rear suspension pretty much demands that the engine be mounted rigidly in the frame. As a consequence, the rubber mounting used to such good effect on other heavyweight models is not a practical option.

Since their inception, Softails have been marred by punishing vibration, especially at high revs, reducing their long-haul capability. Rideability has been dramatically improved with the 88B, offering true long-distance comfort. In keeping with this, fuel capacity was increased to 5 gallons (19 litres) and the tank is now one-piece, obviating the irritation of earlier twin fillers.

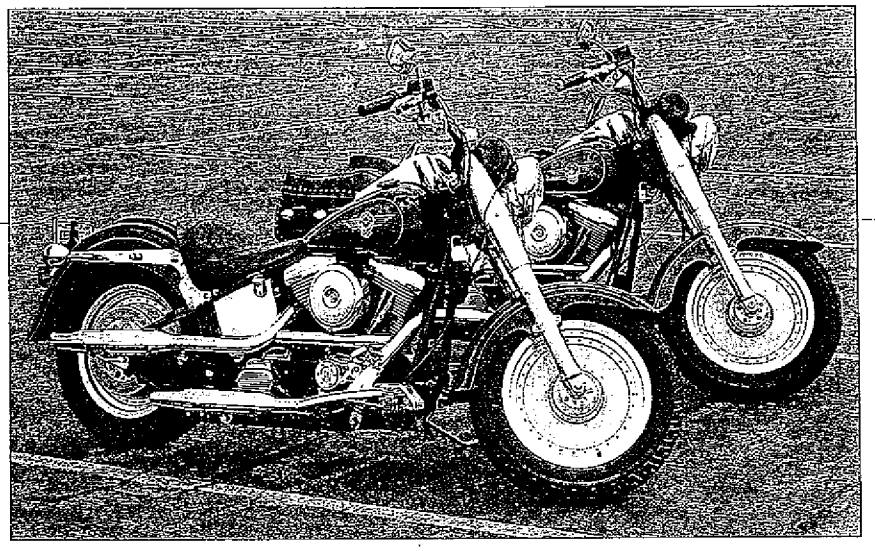
Although somewhat less powerful than Twin Cam Dynas and Glides, the 88B also offers more power and torque



SPECIFICATIONS

Engine	air-cooled ohv V-twin
Capacity	88.42cu in (1,449cc)
Transmission	5-speed
Power	63bhp
Weight	666lbs (302kg)
Wheelbase	64.5in (1,637mm)
Top speed	106mph (170kph)

■ LEFT *The first of the breed. Fender trim, backrest and saddlebags are non-standard.*

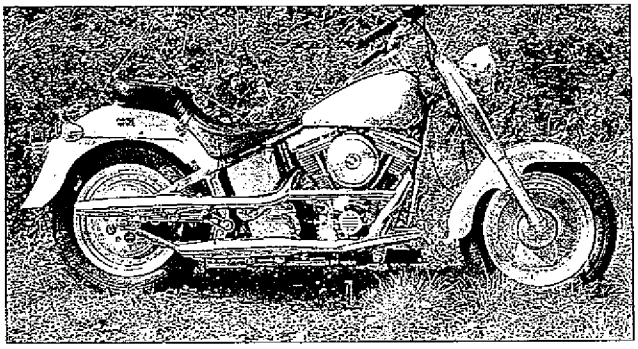


■ RIGHT *The Fat Boy is actually no more of a fatso than other Softails, and its lines are cleaner, as these late-Evo versions clearly show.*

with substantially improved tractability. Maximum power is some 63bhp at 5,300rpm, with torque peaking at 78lb/ft (106Nm) at 3,500rpm. Uprated gearbox internals offer slicker, lighter gearshifts, easier neutral-finding and less transmission noise.

At the rear, a new drive belt is stronger and longer-lasting than before yet, at 1⅛in (28mm), almost ½in (6mm) narrower in section. This permits a wider rear tyre, although – with less than 30 degrees of lean angle on offer – this is scarcely likely to promote scratching.

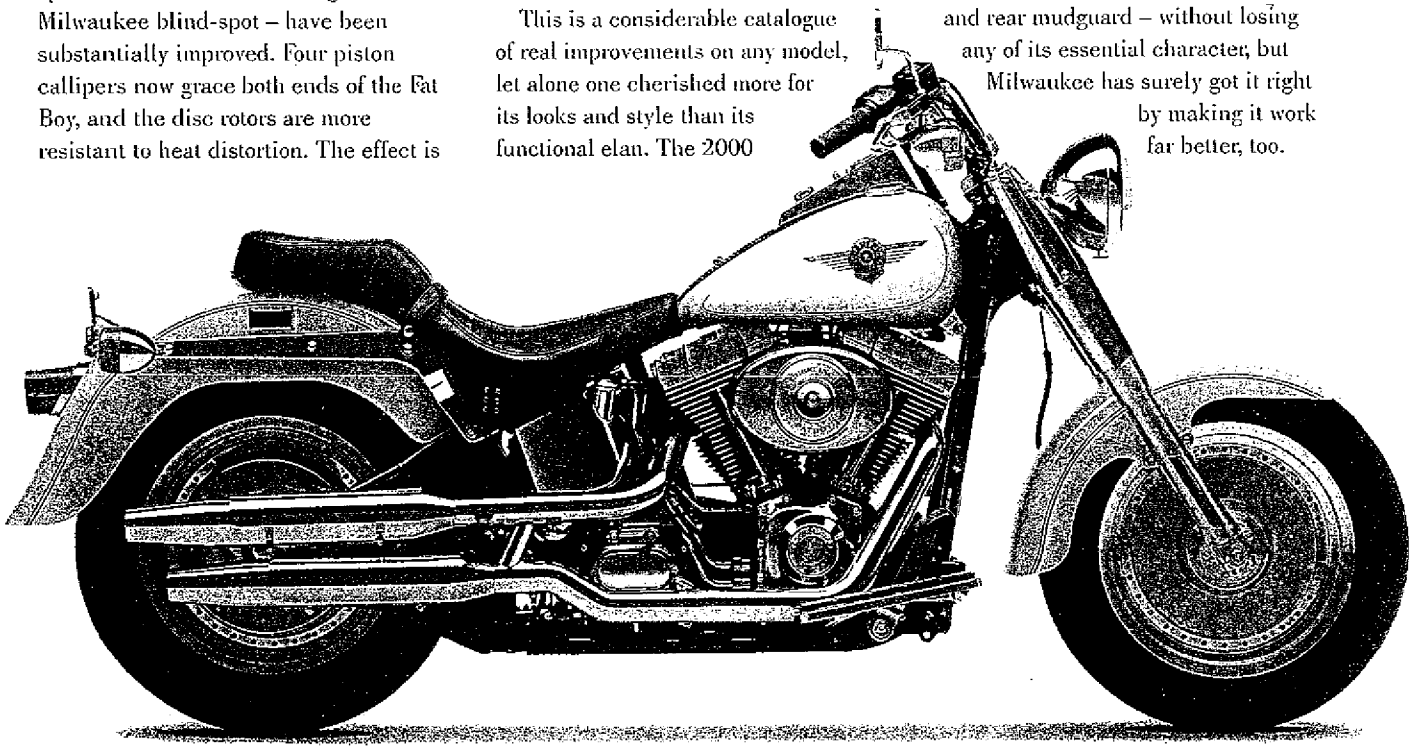
In addition, year 2000 Softails ride on an all-new frame, stiffer than before but fabricated from half as many parts – just 17 – as previous models. This is complemented by a redesigned swing arm which also contributes to a more stable ride. When it comes to hauling this 666lb (300kg) brute down from speed, even the brakes – long a Milwaukee blind-spot – have been substantially improved. Four piston callipers now grace both ends of the Fat Boy, and the disc rotors are more resistant to heat distortion. The effect is improving braking power and a 20 per cent reduction in brake-lever effort.

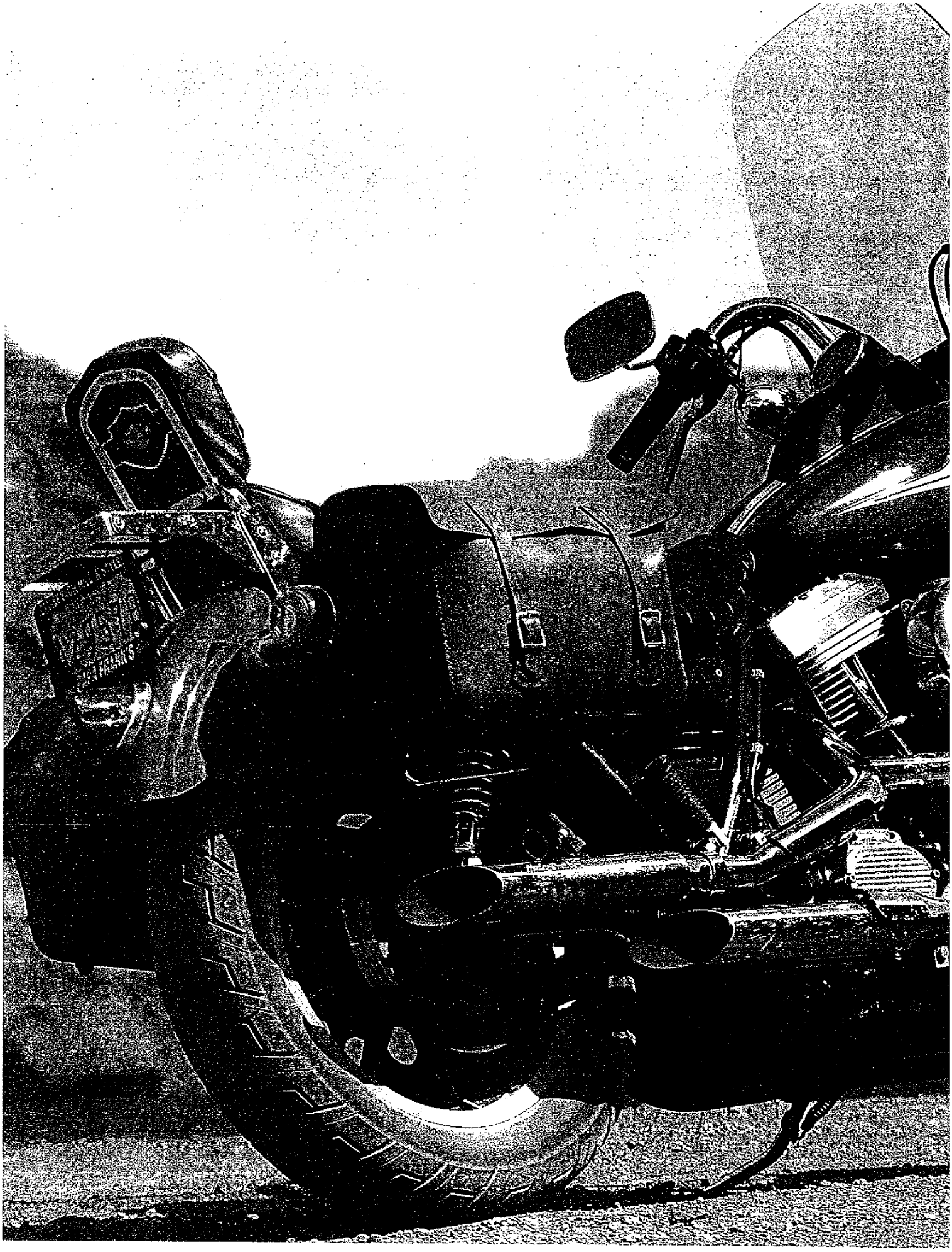


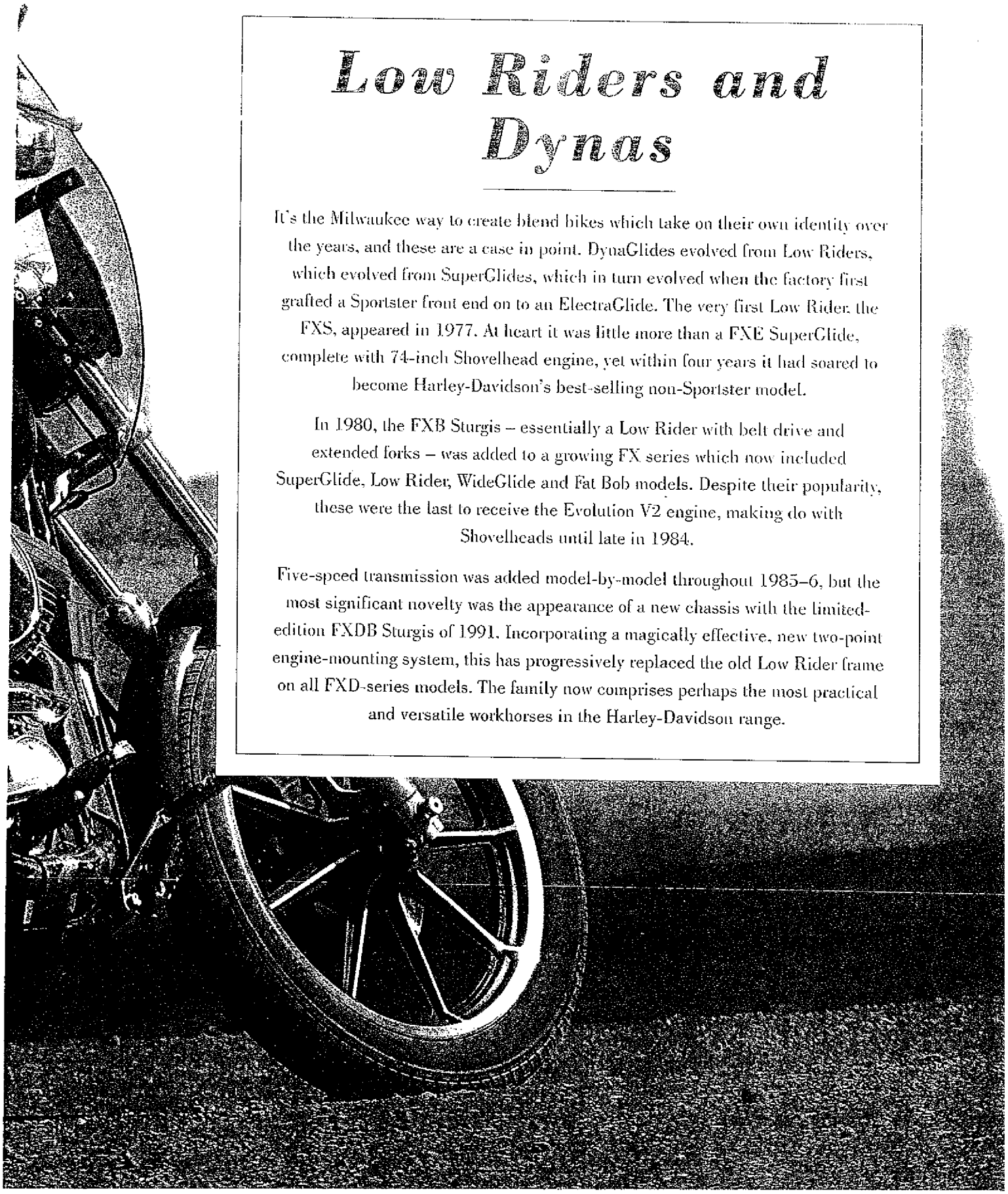
■ LEFT *The very first FLSTF in metallic grey was widely considered the most handsome.*

■ BELOW *For year 2000 the Fat Boy benefited from the new 88B balance-shafted Twin Cam engine.*

This is a considerable catalogue of real improvements on any model, let alone one cherished more for its looks and style than its functional elan. The 2000 Fat Boy has received a few cosmetic touches – notably, restyled exhausts and rear mudguard – without losing any of its essential character, but Milwaukee has surely got it right by making it work far better, too.







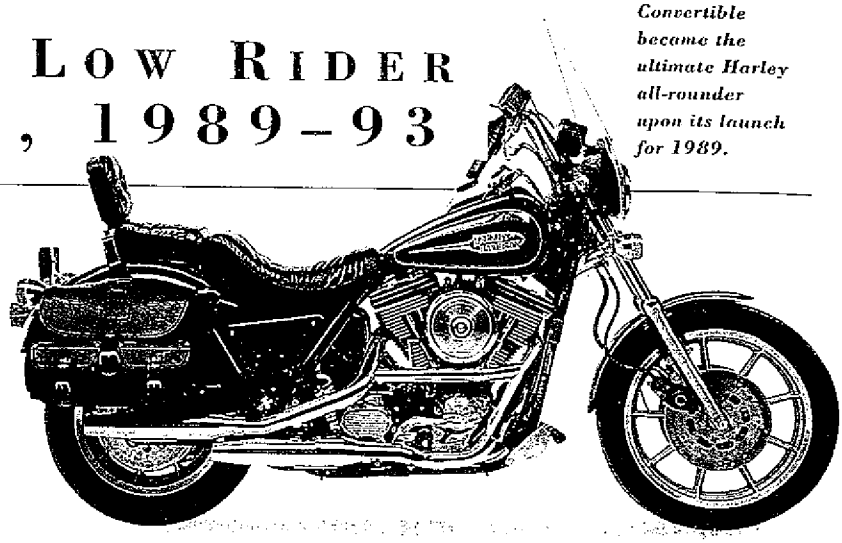
Low Riders and Dynas

It's the Milwaukee way to create blend bikes which take on their own identity over the years, and these are a case in point. DynaGlides evolved from Low Riders, which evolved from SuperGlides, which in turn evolved when the factory first grafted a Sportster front end on to an ElectraGlide. The very first Low Rider, the FXS, appeared in 1977. At heart it was little more than a FXE SuperGlide, complete with 74-inch Shovelhead engine, yet within four years it had soared to become Harley-Davidson's best-selling non-Sportster model.

In 1980, the FXB Sturgis – essentially a Low Rider with belt drive and extended forks – was added to a growing FX series which now included SuperGlide, Low Rider, WideGlide and Fat Bob models. Despite their popularity, these were the last to receive the Evolution V2 engine, making do with Shovelheads until late in 1984.

Five-speed transmission was added model-by-model throughout 1985–6, but the most significant novelty was the appearance of a new chassis with the limited-edition FXDB Sturgis of 1991. Incorporating a magically effective, new two-point engine-mounting system, this has progressively replaced the old Low Rider frame on all FXD-series models. The family now comprises perhaps the most practical and versatile workhorses in the Harley-Davidson range.

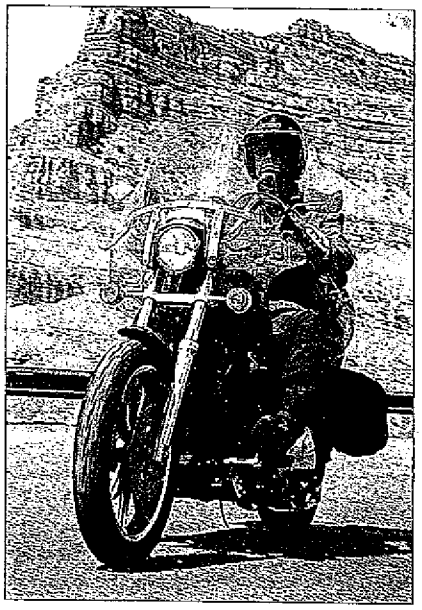
FXRS-CONV LOW RIDER CONVERTIBLE, 1989–93



■ BELOW *The Convertible became the ultimate Harley all-rounder upon its launch for 1989.*

Characterized by their brutal, low lines, fat rear wheels and skinny front ends, Low Riders represented one of the core "families" of Milwaukee models from 1977 until the mid-1990s. Beginning with the 74-inch Shovelhead FXS in 1977, the range grew to include seminal spin-offs such as the FXEF Fat Bob and FXB Sturgis. Along the way, Low Rider capacity grew to 80cu in (1,338cc) for 1980 and adopted toothed-belt final drive for the FXSB of 1983. The first Evolution-engine Low Rider, the FXRS Custom Sport, appeared for the 1985 model year, gaining five-speed transmission one year later. By 1987, Harley's "broadest and most versatile range" included Standard, Custom and Sport Edition models, as well as sister models such as the quintessential Super-Glide and SportGlide.

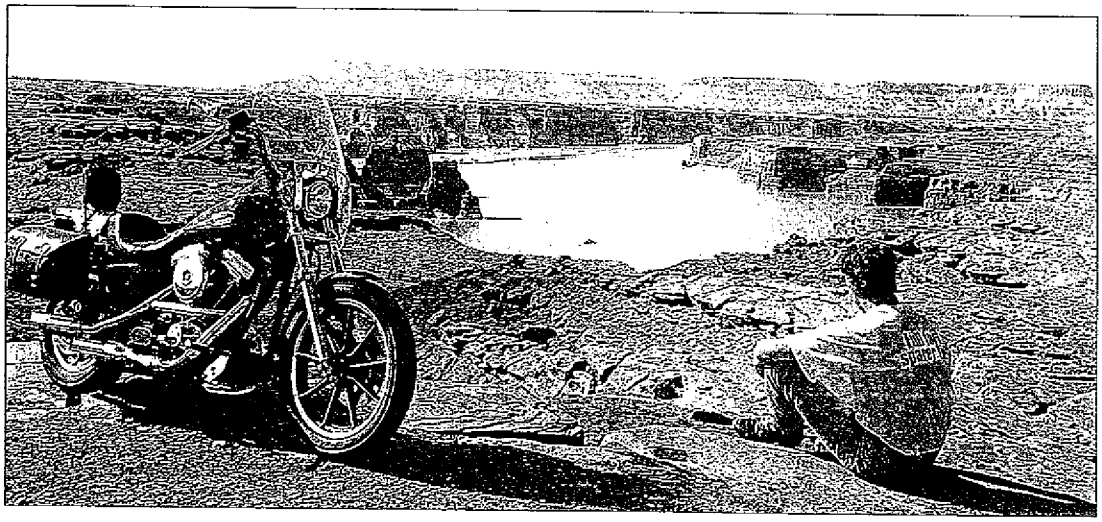
Harley-Davidson literature was always keen to stress Low Riders' unrivalled "combination of style and comfort", and it was certainly true that the range always veered towards the practical end of the style scale: cruisers that are as adept on the open road as on the city streets.



"They're in their element anywhere there's pavement" was how the brochures put it. It was no idle boast.

This was never more apparent than with the Low Rider Convertible released for the 1989 season.

Although not exactly a convertible in the Cadillac sense, this model was as close as any two-wheeler needed to be. No longer did owners need to lash luggage wherever they could – this Convertible came complete with leather saddlebags. There was a large, wind-cheating Lexan screen, too. The real beauty of both was that they were detachable, and quickly. Riders setting out for the long haul could leave them on – or, in just a few moments, whip them off for a cruise downtown.

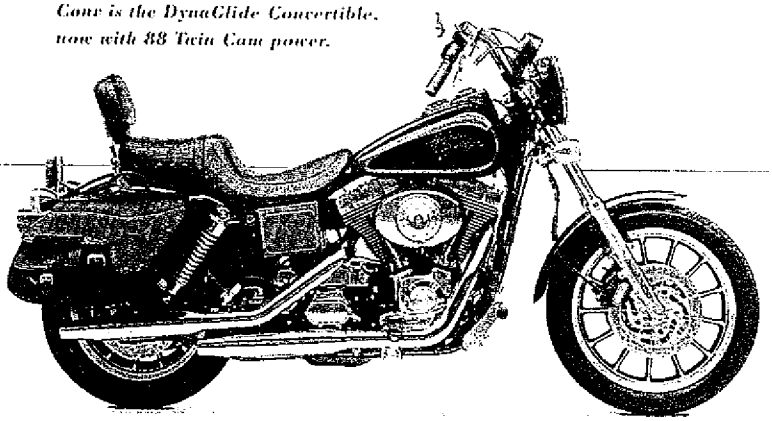


■ LEFT AND ABOVE LEFT *Easily detached screen and saddlebags made the FXRS equally at home in the western deserts as cruising city streets. The 1991 model (above) is en route from the Harley factory at York, Pennsylvania to San Francisco.*

SPECIFICATIONS

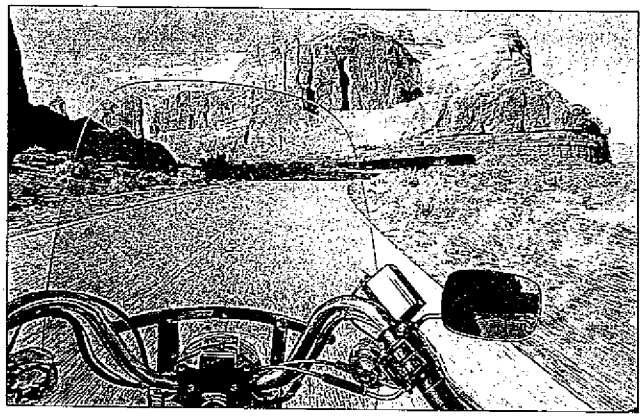
Engine	air-cooled ohv V-twin
Capacity	81.6cu in (1,340cc)
Transmission	5-speed
Power	69bhp
Weight	585lbs (265kg)
Wheelbase	64.7in (1,643mm)
Top speed	106mph (170kph)

■ BELOW *Successor to the FXRS-Conv is the DynaGlide Convertible, now with 88 Twin Cam power.*



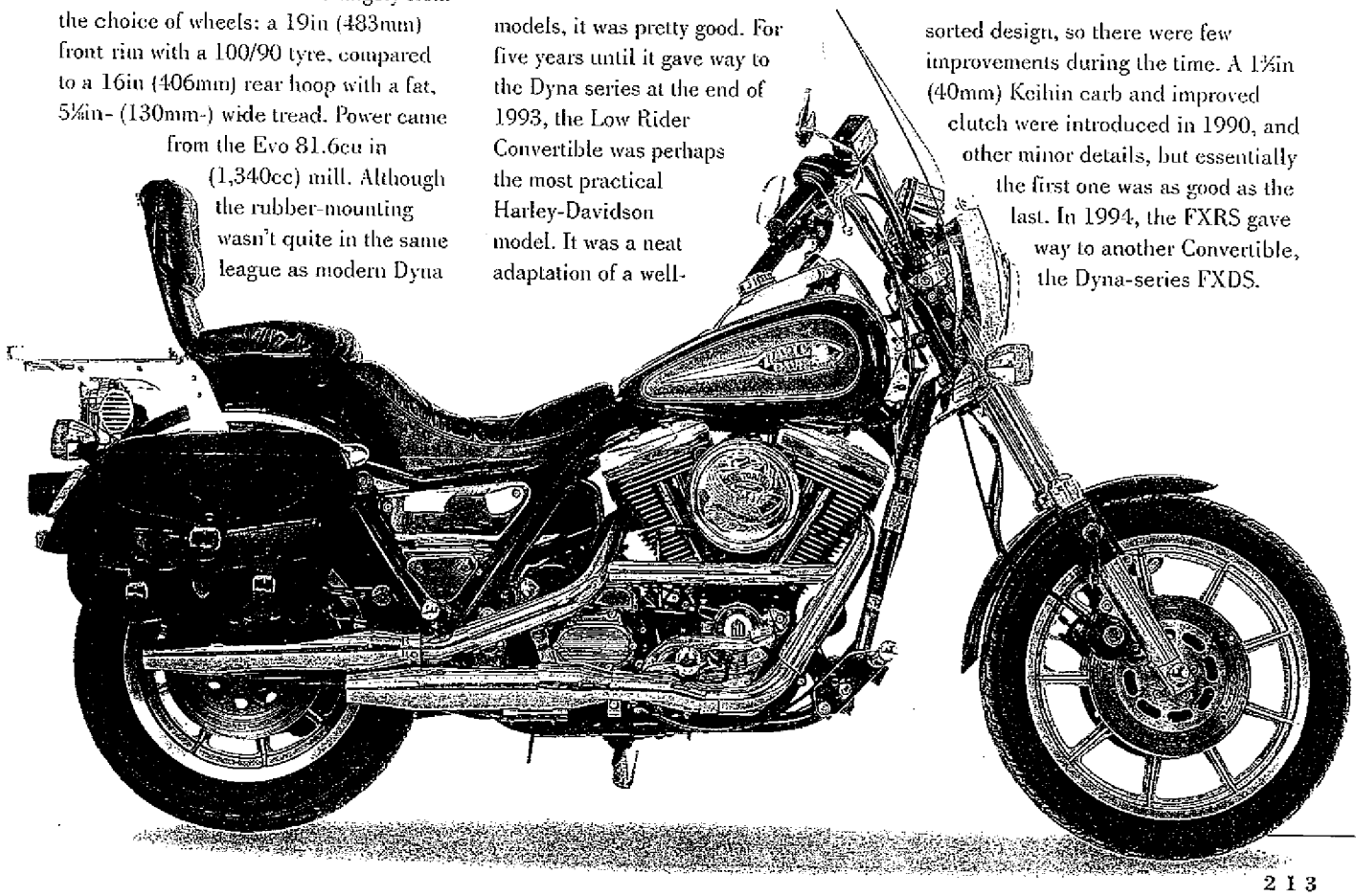
As a touring alternative to Electra-Glide overkill, the Convertible was supreme. Its plush seat, standard sissy bar and highway pegs offered reasonable comfort (although the pillion pad was always something of a style-dictated joke), while the screen kept off the worst of road grime and weather. It handled tolerably well, too. The 1½in (39mm) front forks featured air-adjustment and anti-dive. For a heavyweight Harley, ground clearance was also good. Stopping was better than the Milwaukee norm – courtesy of twin hydraulic discs at the front and one at the rear.

The Low Rider look came largely from the choice of wheels: a 19in (483mm) front rim with a 100/90 tyre, compared to a 16in (406mm) rear hoop with a fat, 5¾in- (130mm-) wide tread. Power came from the Evo 81.6cu in (1,340cc) mill. Although the rubber-mounting wasn't quite in the same league as modern Dyna models, it was pretty good. For five years until it gave way to the Dyna series at the end of 1993, the Low Rider Convertible was perhaps the most practical Harley-Davidson model. It was a neat adaptation of a well-sorted design, so there were few improvements during the time. A 1⅝in (40mm) Keihin carb and improved clutch were introduced in 1990, and other minor details, but essentially the first one was as good as the last. In 1994, the FXRS gave way to another Convertible, the Dyna-series FXDS.



■ LEFT *Hot dry air and stinging dust make the screen essential in desert conditions.*

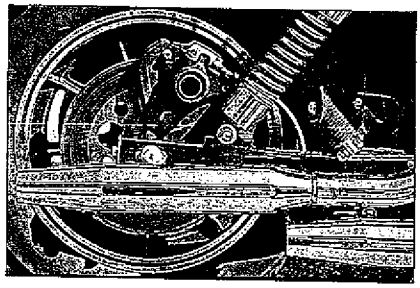
■ BELOW *Possibly not the most handsome chunk of Milwaukee iron, but very definitely one of the most practical. This is a 1992 example.*



FXDB STURGIS, 1991

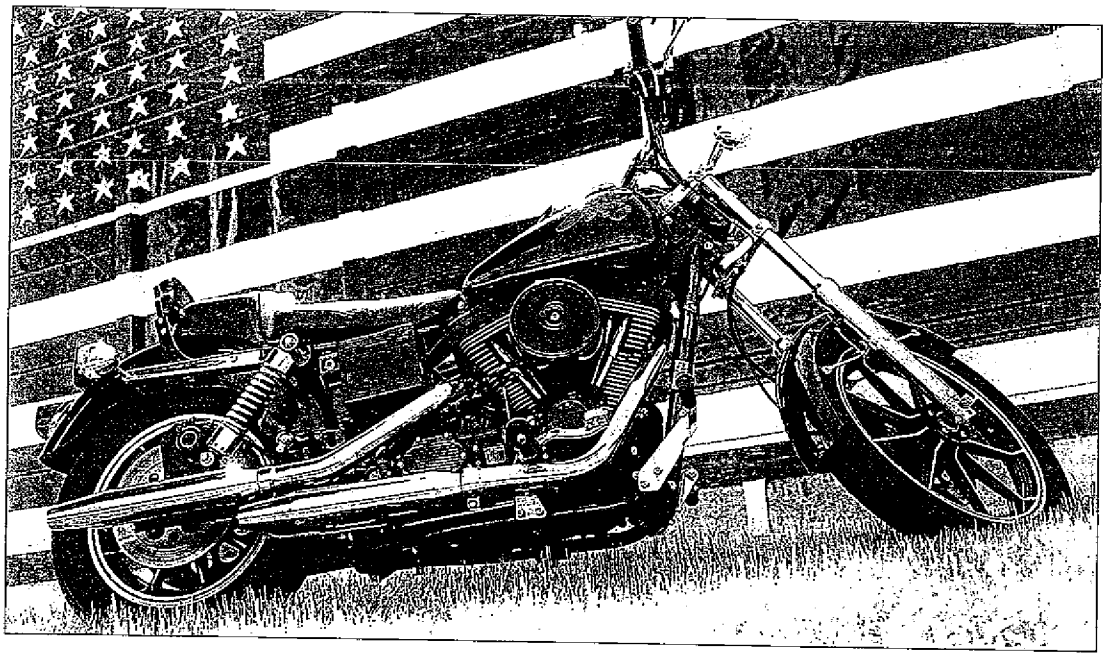
On the face of it, the "Mark II" Sturgis added little to the Low Rider family from which it sprang. Named after the annual North Dakota bike rally, the FXDB looked like little more than a midnight-black FXRS with modest changes to its rear shocks and oil tank. Indeed, the two models shared the same front end. The major attributes of the FXDB Sturgis were simplicity itself – just two hard-to-spot pieces of rubber – and with them, a motorcycle was transformed. The Sturgis was a limited-edition model – just over 1,500 were produced – but its impact lives on in every DynaGlide built since. The frame itself, an all-steel structure developed by advanced computer-aided design, is fabricated from a mixture of tubular and forged components with a large-diameter box-section backbone.

The engine isolation system differed from the existing Glide series and Low Rider mounts. These had used three location points with rubber-bonded bolts, rather than the two more sophisticated composite blocks of the Sturgis. The result was startling. The big twin's effective rev range had been limited by low-speed shudders at the bottom end and intrusive vibes at the top. With the Sturgis, that all changed. One could now happily ride at engine speeds where other Hogs would rattle. Softails have the highest overall gearing of any model to reduce revs to comfortable vibration levels at cruising speeds. Fittingly, another Sturgis, the FXB, had been associated with two other momentous bits of rubber a decade earlier – the toothed rubber belts of its revolutionary primary and final drive.



SPECIFICATIONS

Engine	air-cooled ohv V-twin
Capacity	81.6cu in (1,340cc)
Power	69bhp
Transmission	5-speed
Wheelbase	65.5in (1,665mm)
Weight	597lbs (271kg)
Top speed	106mph (170kph)



ABOVE TOP AND CENTRE *Named after a major motorcycle rally, the Sturgis was a major leap forward in Harley affairs. It was to give rise to the stunningly successful Dyna-Glide series.*

LEFT *Stars and stripes had less to do with the Sturgis legacy than did two deceptively simple rubberized blocks.*

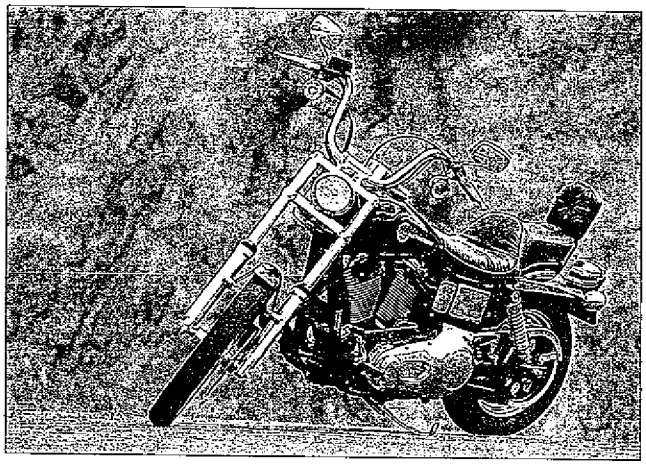
FXDWG DYNA WIDEGLIDE, 1993–PRESENT

By 1992, the Sturgis no longer existed, but it had spawned a growing DynaGlide family – first the Dyna Daytona, then the SuperGlide Dyna Custom. By 1993, the Dyna Low Rider was closer to the original but the WideGlide harked back to its namesake of the 1980s. Both, however, went one stage further than the Sturgis in the anti-vibration stakes, with revised "directionally-controlled" mounting blocks.

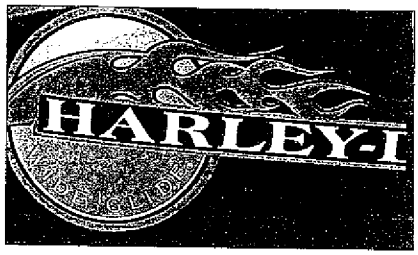
Harley's idea was "to combine the look of Low Riders of the late 1970s, with the handling and rubber-mounted ride of today", and it worked startlingly well. The 1993 DynaGlides were the smoothest Hogs yet, by a margin. Milwaukee's engineers had made a good bike better, even more than they had with the Sturgis. Without so much as laying a hand on the engine, the company had broadened the big V's effective powerband by a quantum amount – a bigger bonus than adding another ten horsepower.

Much of the rest, as is Harley's way, was in the hands of the blend-men and cosmetic engineers. There are "factory ape-hangers", a "tucked-in tail light", "air-foil directionals" and a wide front fork (hence the "WideGlide") with a 21in (533mm), wire-spoked front wheel, as well as a new, one-piece Fat Bob tank, which removed the need of having to fill up two separate fuel tanks each time you ran short on petrol (gas).

■ RIGHT *An original 1993 WideGlide, so named because of the obvious width between the fork legs.*



■ BELOW *The badge might be fiery, but the vibrations were not, thanks to a revolutionary system of engine mounting.*



To ride the WideGlide is to marvel at the unprecedented smoothness of the experience – especially after you've grown accustomed to having only forward-mounted footpegs and controls. The ape-hanger handlebars tower somewhere above you, but after a couple of miles it all feels fairly natural and comfortable.

In that uncanny Harley-Davidson way, the steering is light with excellent low-speed balance.

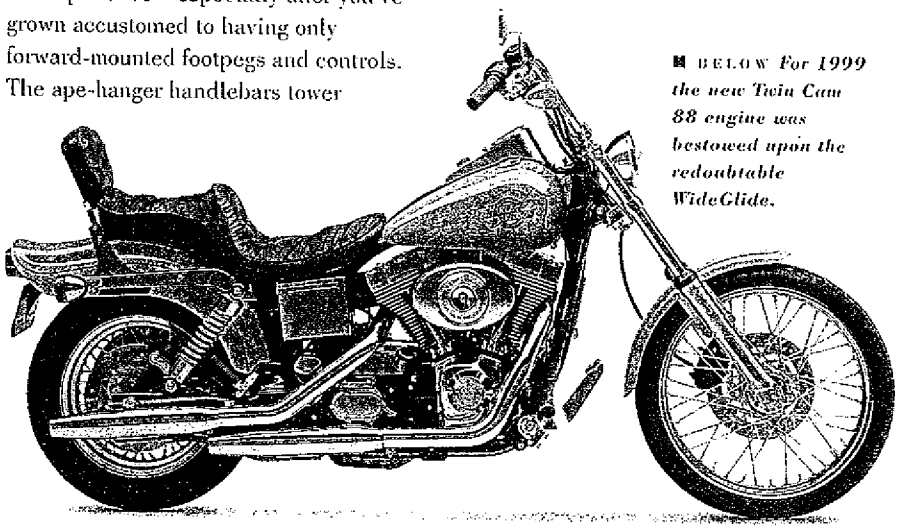
Turns, however, reveal a lot about the WideGlide. Even by Harley-Davidson standards, ground clearance is poor. The stand scrapes on the left, the muffler on the right, both with sufficient force to pitch you off line.

But on the straight, wide highway, it's great to ride.

SPECIFICATIONS

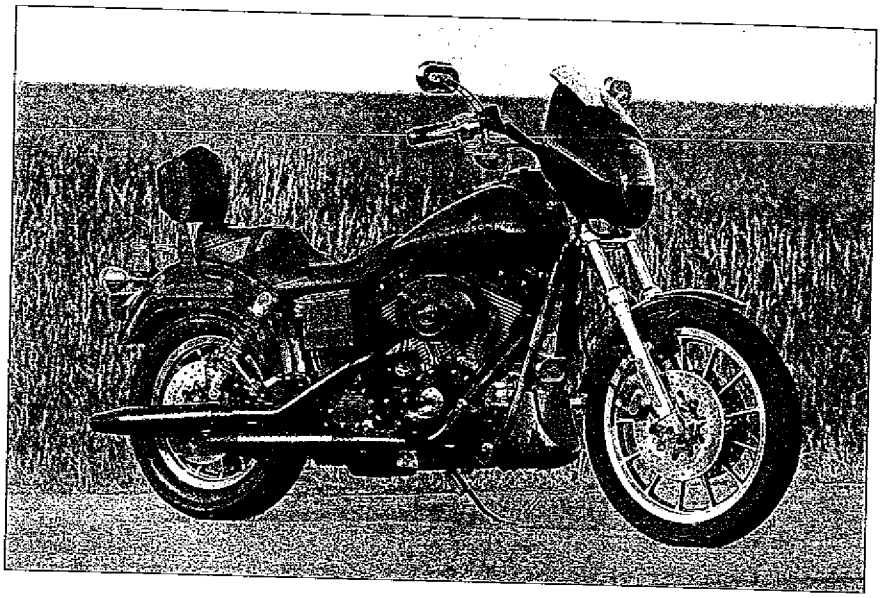
Engine	air-cooled ohv V-twin
Capacity	81.6cu in (1,340cc)
Transmission	5-speed
Power	69bhp
Weight	598lbs (271kg)
Wheelbase	66.1in (1,680mm)
Top speed	106mph (170kph)

■ BELOW *For 1999 the new Twin Cam 88 engine was bestowed upon the redoubtable WideGlide.*



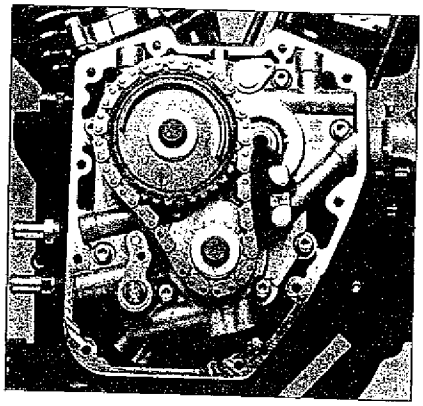
FXDX DYNA SUPERGLIDE SPORT, 1999–PRESENT

■ BELOW *With its understated lines, the FXDX is as stylish as previous Dynas.*



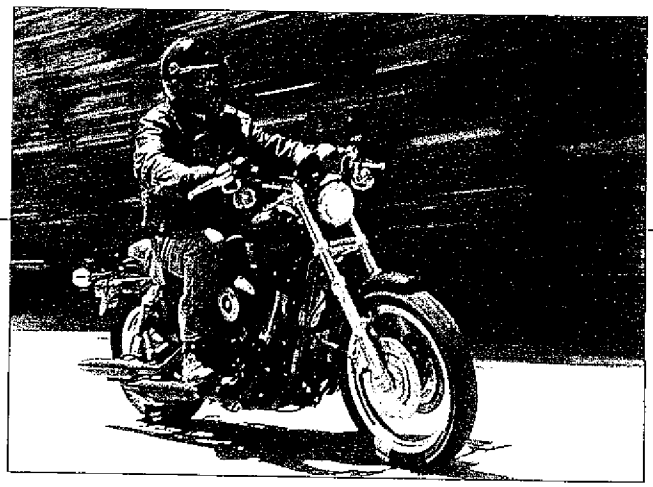
The FXDX Dyna SuperGlide Sport is much more than just the first model to be fitted with the new Twin Cam powerplant. True, the 88.42cu in (1,449cc) engine will attract the most fuss and gives the latest Dyna more get-up-and-go than any previous Milwaukee model, but the rest of the bike offers even more surprises – this is a Harley that stops and handles. For once, the "Sport" in the title means what it says.

Compared to the 80-inch Evo, the Dyna's blacked-out Twin Cam 88 engine runs a bigger 3¾in (95.25mm) bore with a shortened 4in (101.6mm) stroke. Despite a ten per cent increase in capacity, the result is a powerplant that spins up faster yet with less vibration and a higher rev ceiling of 5,500rpm. The high-pressure, die-cast aluminium crankcases possess a strengthened vertical rear face across which four high-tensile bolts connect the engine to the five-speed transmission. The resulting structure is more rigid than before, reducing stress on the inner primary drive and reducing overall vibration levels. The crankcases themselves are lighter and stronger due to design changes in high-stress areas, redesigned tappet guides and the relocation of the oil pump. Chain cam drive, in place of the previous straight-cut gears, is not only cheaper to produce but also one of several measures aimed at reducing mechanical noise in the face of increasing environmental concerns. Great effort has also been put into improving even the Evo's record of durability, with the all-new pressed-up



■ ABOVE *The FXDX was the first Harley to be fitted with the Twin Cam powerplant, the chain drive to which can be seen here.*

■ LEFT *The Dyna can be adjusted to suit any riding style.*



■ RIGHT *Gliding along on the open road.*

crankshaft featuring new forged flywheels, beefier connecting rods and an uprated crank pin – all of which should easily withstand the Twin Cam's prodigious torque – over 78lb/ft (106Nm) at a mere 2,900rpm. O-rings replace the Evo's cylinder base gaskets, allowing a sturdier and more oil-tight joint between the crankcase and cylinders, as well as enhancing temperature tolerance and reducing bore distortion. Of course, Harley's trademark air-cooling is retained, but a 50 per cent increase in fin area on the cylinders and cylinder heads improves its effect.

If the 88's eager power makes it a real joy to ride, the chassis is at least as rewarding. The frame is substantially similar to previous Evo-engined Dynas, with the same highly effective rubber mounting system insulating rider and passenger from vibration. By the standards of many Harley-Davidson heavyweights, the Dyna runs relatively little trail at just over 4in (104mm) and thus turns more eagerly, but it's the suspension that makes the difference – as big a departure as was the DuoGlide's more than four decades earlier. Both the forks and the Japanese Showa rear shock absorbers now feature full adjustment of preload, rebound and compression damping. Whatever type of riding you have in mind, the Dyna can be adjusted to suit.

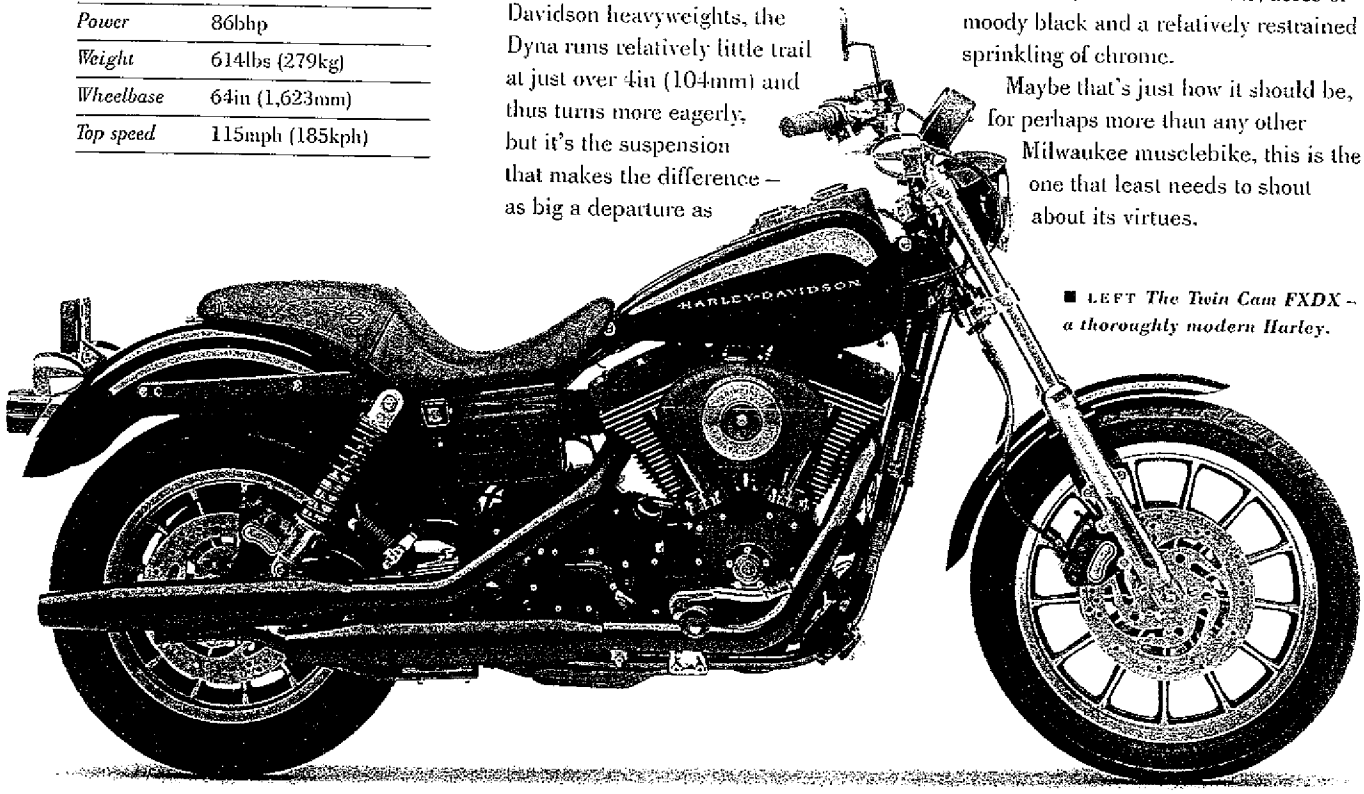
Winding up the damping at both ends won't turn the 614lb (279kg) FXDX into a sports bike, but it certainly allows it to corner like no previous big Hog. It still wallows to a degree through fast, bumpy turns, but handles with reassuring precision even at three-figure speeds. Ground clearance is also better. When the time comes to slow down, the latest Dyna is up to the challenge, thanks to a trio of four-piston Hayes calipers biting hard on 11½in (292mm) discs.

Cosmetically, the newcomer sports the same understated lines as previous Dynas, with flat, dirt track style handlebars, a low-line saddle, acres of moody black and a relatively restrained sprinkling of chrome.

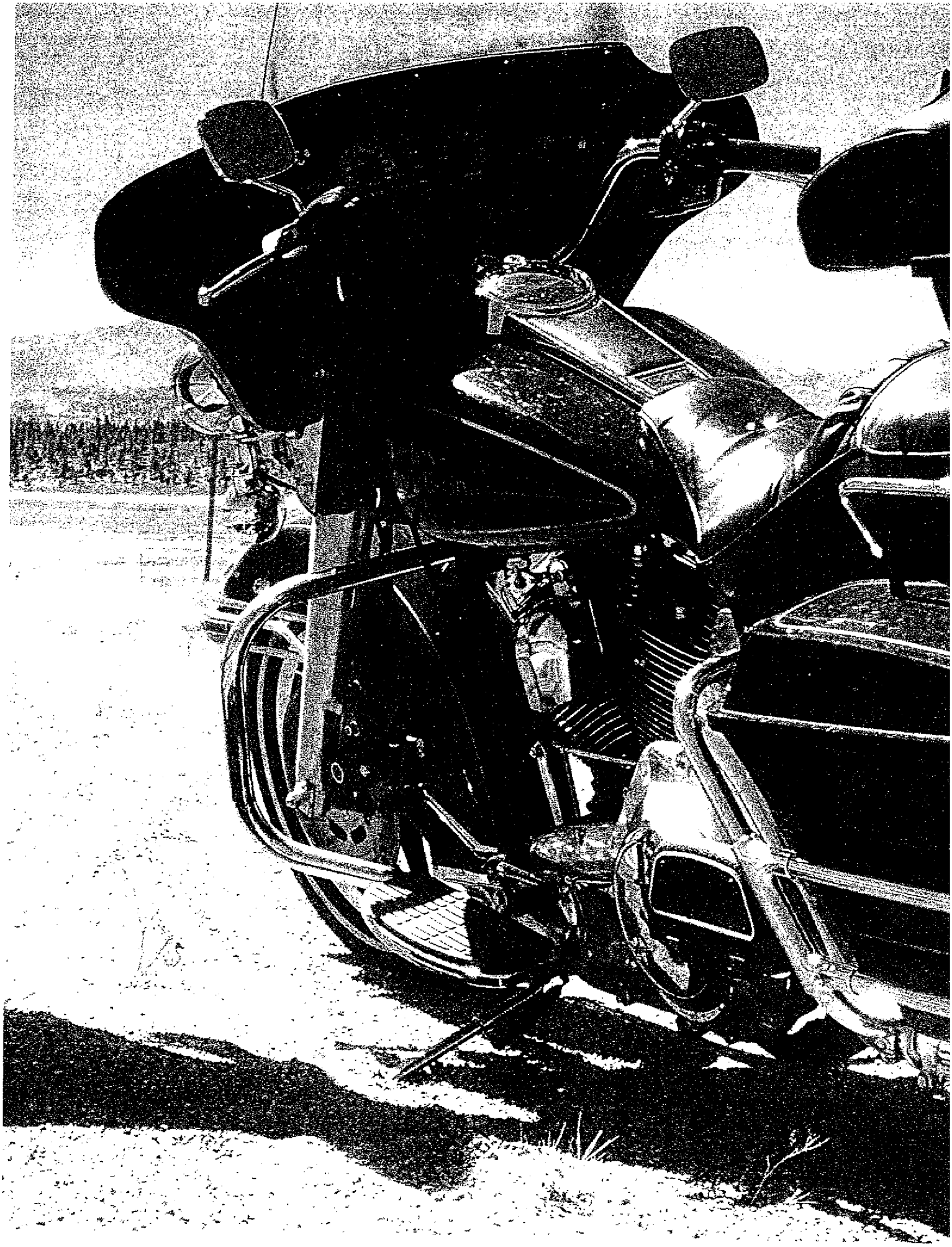
Maybe that's just how it should be, for perhaps more than any other Milwaukee musclebike, this is the one that least needs to shout about its virtues.

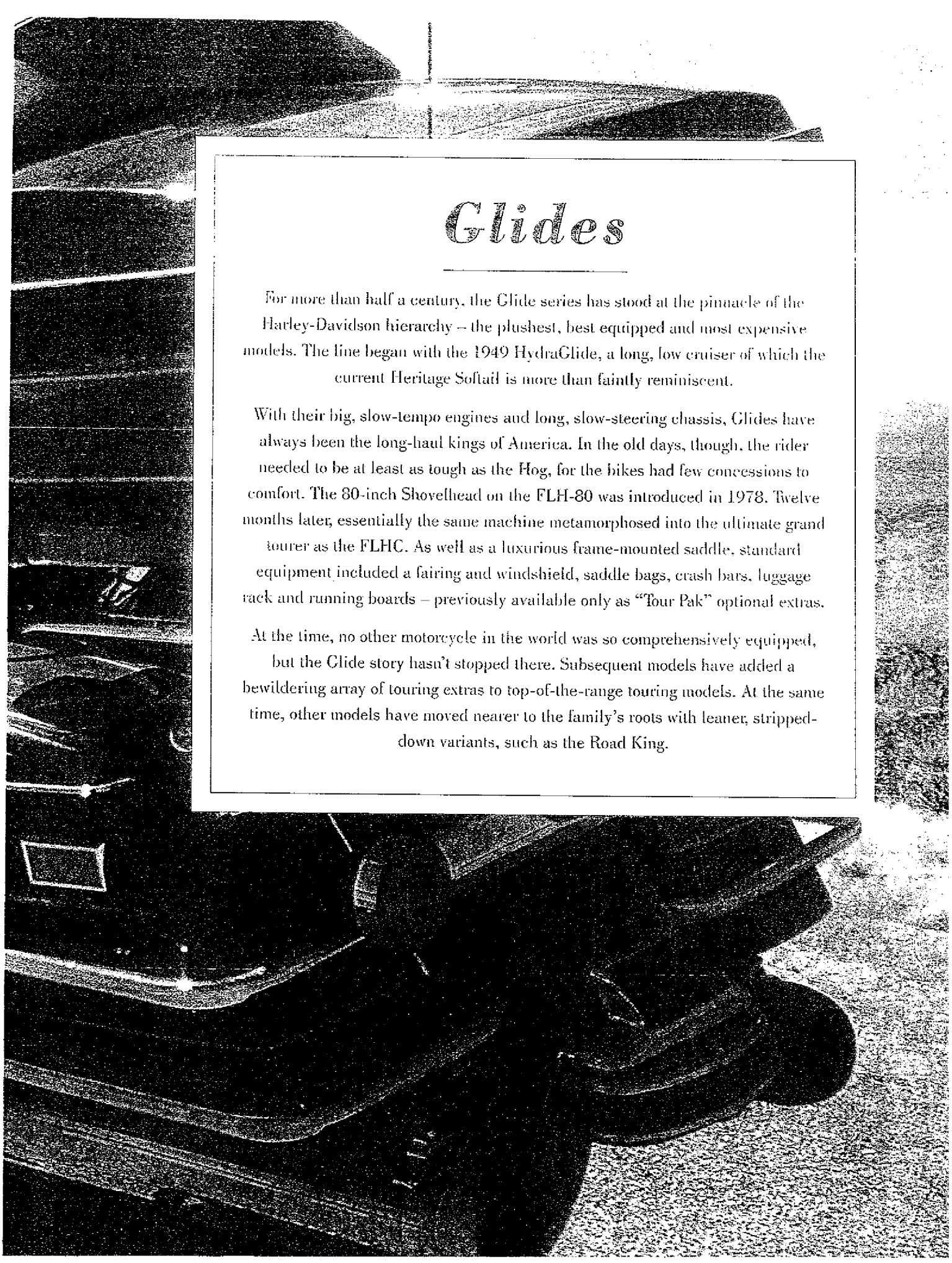
SPECIFICATIONS

Engine	air-cooled ohv V-twin
Capacity	88.42cu in (1,449cc)
Transmission	5-speed
Power	86bhp
Weight	614lbs (279kg)
Wheelbase	64in (1,623mm)
Top speed	115mph (185kph)



■ LEFT *The Twin Cam FXDX – a thoroughly modern Harley.*





Glides

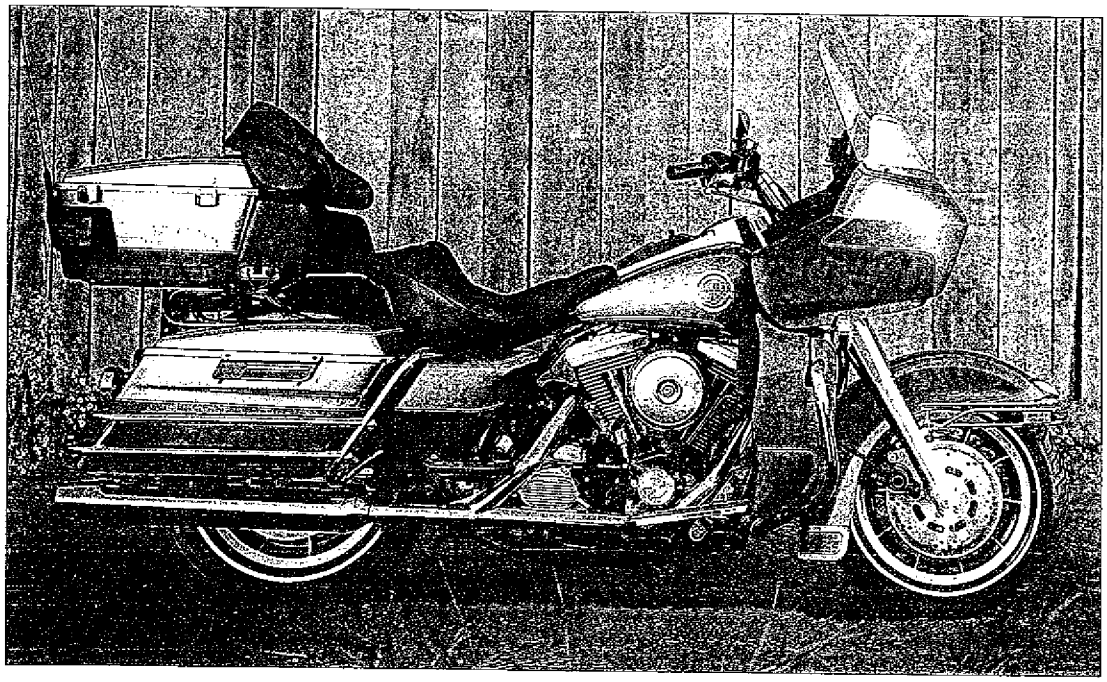
For more than half a century, the Glide series has stood at the pinnacle of the Harley-Davidson hierarchy – the plushest, best equipped and most expensive models. The line began with the 1949 HydraGlide, a long, low cruiser of which the current Heritage Softail is more than faintly reminiscent.

With their big, slow-tempo engines and long, slow-steering chassis, Glides have always been the long-haul kings of America. In the old days, though, the rider needed to be at least as tough as the Hog, for the bikes had few concessions to comfort. The 80-inch Shovelhead on the FLH-80 was introduced in 1978. Twelve months later, essentially the same machine metamorphosed into the ultimate grand tourer as the FLHC. As well as a luxurious frame-mounted saddle, standard equipment included a fairing and windshield, saddle bags, crash bars, luggage rack and running boards – previously available only as "Tour Pak" optional extras.

At the time, no other motorcycle in the world was so comprehensively equipped, but the Glide story hasn't stopped there. Subsequent models have added a bewildering array of touring extras to top-of-the-range touring models. At the same time, other models have moved nearer to the family's roots with leaner, stripped-down variants, such as the Road King.

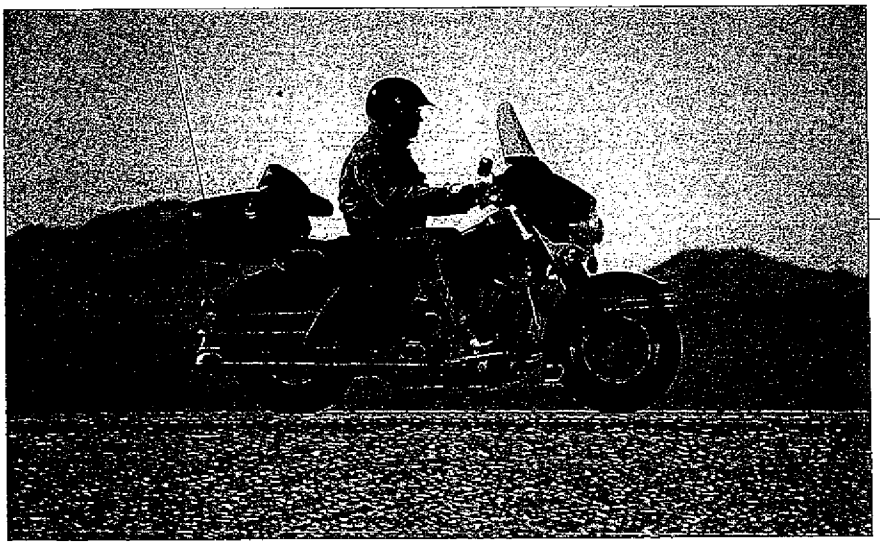
FLTCU TOURGLIDE ULTRA, 1989–96

After the ElectraGlide, Sportster and SuperGlide, the TourGlide was one of the most enduring packages in the entire Milwaukee line up. The concept – the most "loaded" machine Harley-Davidson engineers could imagine – began with the basic FLT TourGlide of 1980. At the time, the TourGlide offered the nearest thing you could buy to a two-wheeled limousine. Small refinements to the already profoundly refined machine followed year-on-year, not to mention the adoption of belt final drive and Evo V2 power in 1984. The basic concept was still fine, but as the decade was drawing to a close, an even more luxurious carriage was needed. It arrived in 1989 with the awesome TourGlide Ultra Classic, 81.6cu in (1,340cc) of imposing, luxurious brawn. As well as obvious features, such as new fairing "lowers" to protect the rider, a welter of electronics graced the big Glide. From the saddle, the rider now had control of a mouth-watering array of on-board refinement. At the rider's fingertips, there was now electronic cruise control, CB radio and a sophisticated stereo hi-fi system. Even the pillion was provided with separate speakers and a built-in intercom allowed rider and passenger to chew the fat. A cigarette lighter was



ABOVE *A 1991 TourGlide in its element, easing across the high desert plateau of Utah, in the south-western United States.*

LEFT *The last of a majestic line, a fuel-injected FLTCUI Ultra Classic TourGlide from the 1996 model year.*



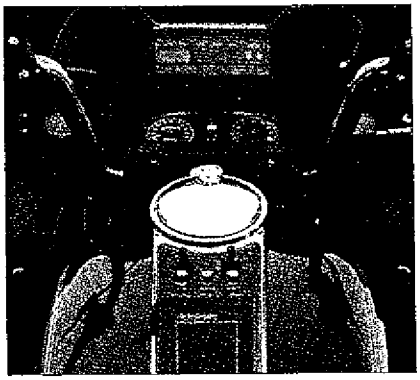
■ LEFT *Copious luggage capacity and excellent rider protection are clear from this image of a TourGlide crossing Nevada's wide-open spaces.*

In 1990, I rode a TourGlide from the Harley-Davidson factory in York, Pennsylvania, to San Francisco, California, on America's west coast. Along the way, the big Glide had thumped up endless gradients to more than 11,000ft (3,300m), rumbled across baking deserts for hour after hour, splashed through thunderstorms and scarcely missed a beat. It carried me and everything I needed for 4,000 miles (6,500km), and everyone I met smiled in appreciation. For this sort of experience – traversing the vast emptiness of the United States – no other motorcycle comes anywhere close to it. It was almost as though the TourGlide evolved there – which, come to think of it, it did.

The TourGlide story has ended – for the time being, at least. After 16 years as the long-haul king of America's open roads, the name was dropped from the Harley line-up after the fuel-injected FLTCUI model of 1996. However, its spirit still lives on in the extravagantly equipped Ultra Classic ElectraGlides.

SPECIFICATIONS

Engine	air-cooled ohv V-twin
Capacity	81.6cu in (1,340cc)
Transmission	5-speed
Power	69bhp
Weight	765lbs (347kg)
Wheelbase	63in (1,600mm)
Top speed	105mph (169kph)

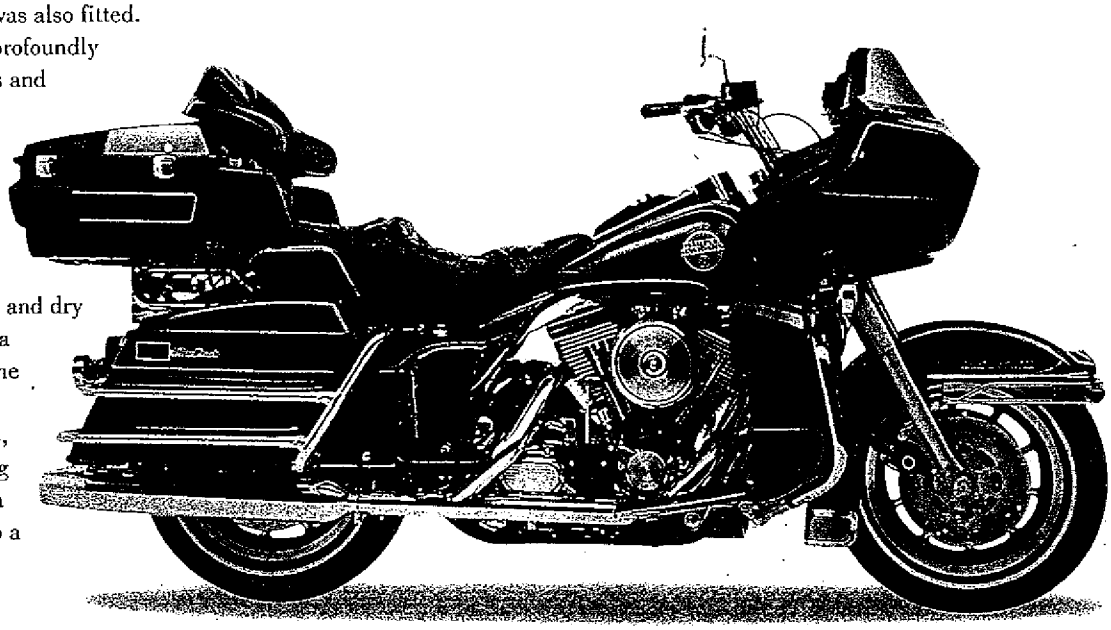


■ ABOVE *The rider's cockpit perspective of the Ultra Classic TourGlide.*

■ BELOW *The majestic spirit of the Glides lives on in this 1992 TourGlide.*

standard and even the self-cancelling indicators were microprocessor-controlled. To cope with this plethora of added electrical demands, a new high-output 32-amp alternator was also fitted.

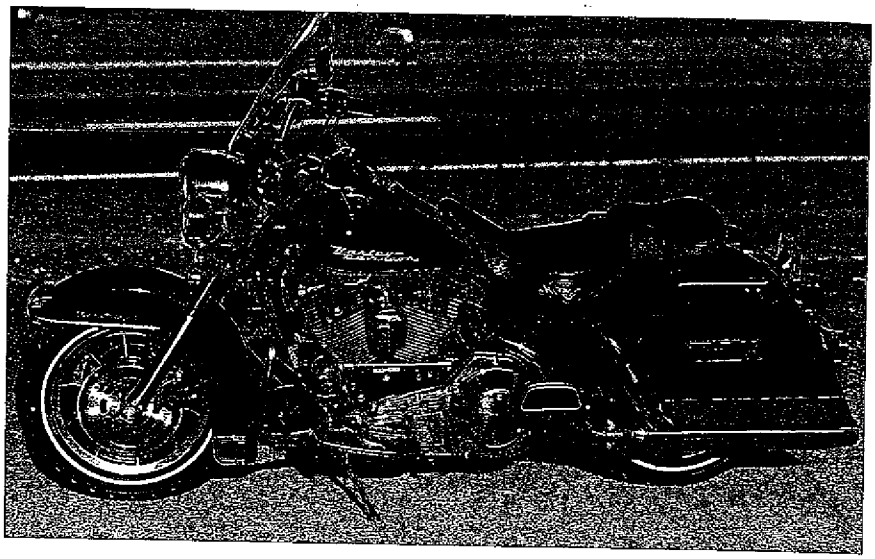
Overkill? Perhaps, but profoundly practical too. The panniers and capacious "Tour-Pak" top-box easily swallowed two weeks' luggage. The plush, upholstered saddle was good for long, long days on the road, while the screen kept dust and dry desert winds at bay. True, a sound system as good as the one at home isn't strictly necessary on a motorcycle, but who can resist cruising enchanted landscapes to a favourite blues tune, all to a backbeat of a thundering Milwaukee twin?



FLHR ELECTRAGLIDE ROAD KING, 1994–PRESENT

As standard equipment became even more comprehensive at the top of the ElectraGlide range, there came a demand for a model more like the stripped-down FLs of the 1960s. Harley-Davidson's response was the FLHS Sport of 1987 – a real lightweight at "only" 690lbs (313kg). Today's handsome FLHR Road King is in much the same mould.

Launched for the 1994 season, the Road King was an attempt to bridge the gap between Milwaukee's custom and touring models. Although in essence a full-on ElectraGlide minus the fairing, with a "retro" chromed headlight and tank-mounted speedometer, its long, low silhouette belied its super-heavyweight roots. Here was a machine that could hit the highway with the same authority as any other Glide – once the detachable windscreen was installed. As well as the QD windshield (an idea borrowed from the Low Rider Convertible), the panniers and pillion perch were also easily removed, changing the machine's profile and character in the wink of an eye. Thus stripped, the King had all the languid grace of a custom cruiser.

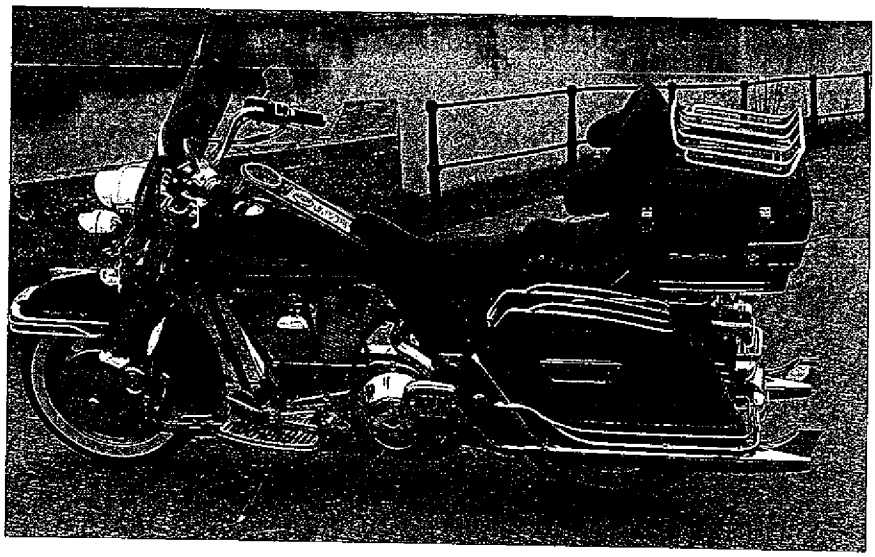


■ ABOVE *Cleaner, lower lines distinguish this king of the road from other heavyweight FLs.*

To most eyes this is the best looking of all the Glides, the normally ponderous lines replaced by a machine which, if not exactly svelte, has a certain grace. Where fully-loaded FLs tend to obesity, the Road King has style. It's a Harley-Davidson for those who want their heavyweight cake in custom clothes.

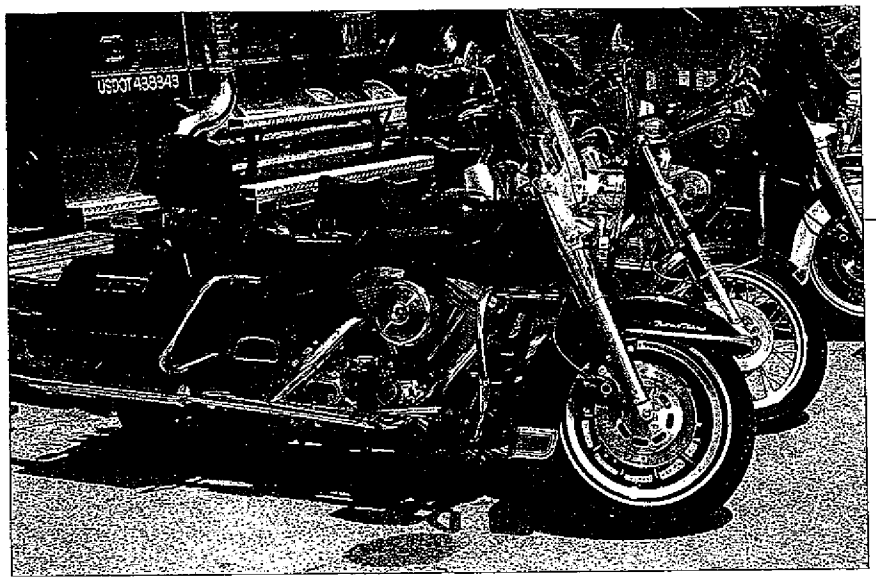
Equally, its touring roots make the King an eminently practical custom bike. Six hours in the saddle is hard work on any Softail but a Glide can comfortably knock that off – and more.

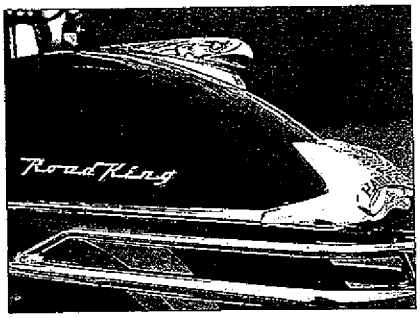
■ BELOW *Adding a few of Milwaukee's many accessories can undermine the effect.*



SPECIFICATIONS

Engine	air-cooled ohv V-twin
Capacity	81.6cu in (1,340cc)
Transmission	5-speed
Power	69bhp
Weight	692lbs (314kg)
Wheelbase	62.7in (1,590mm)
Top speed	100mph (161kph)





■ LEFT AND BELOW *The "Road King" badge and overall detailing is pure 1960s, although the other chromework (below) is aftermarket kit.*

The rubber-mounted Evo engine keeps vibration at bay but lets that evocative rumble pour through. Parked anywhere it looks good; on the open road, it works.

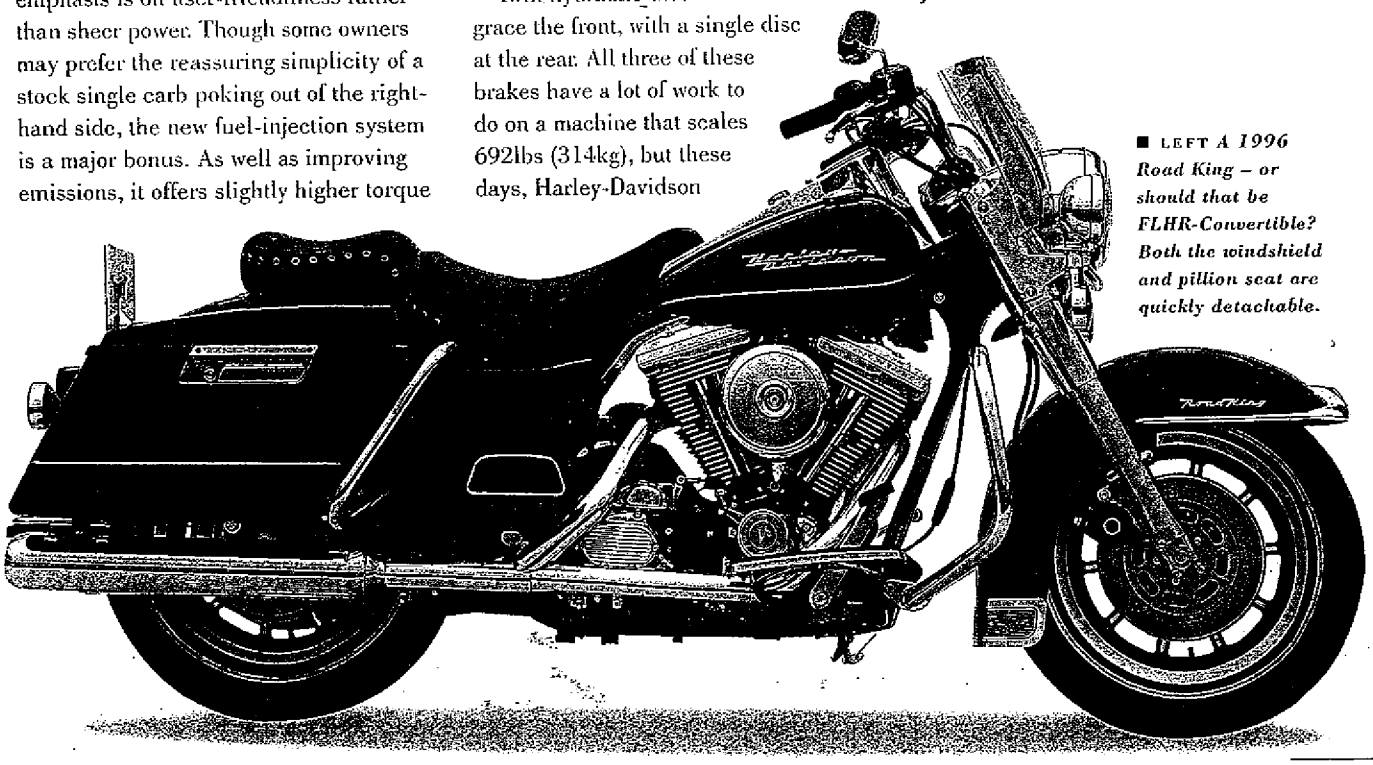
The first fuel-injected Road King, the FLHRI came in 1996, although carburetted versions continued to be produced in parallel. The ESPFI (Electronic Sequential Port Fuel Injection) system is based on a similar Italian Magneti Marelli design to that of Ducati V-twins, although in this case the emphasis is on user-friendliness rather than sheer power. Though some owners may prefer the reassuring simplicity of a stock single carb poking out of the right-hand side, the new fuel-injection system is a major bonus. As well as improving emissions, it offers slightly higher torque (83lb/ft rather than 79lb0/ft) and much better driveability, particularly at high altitude. The fuel system was improved across the injection range for 1997.

High-tech is largely absent elsewhere, except of course for Harley-Davidson's trademark belt final drive. Suspension is adjustable only for air pressure in the twin rear shock absorbers. Both wheels are cast light alloy, 16in (406mm) in diameter, wearing characteristically fat Glide rubber.

Twin hydraulic disc brakes grace the front, with a single disc at the rear. All three of these brakes have a lot of work to do on a machine that scales 692lbs (314kg), but these days, Harley-Davidson stoppers work fairly well. Like most of the Glide family, the Road King's top speed is maybe a shade over 100mph (161kph), although screaming the big twin that hard is a futile pursuit.

The Road King is happiest when it is ambling along at a disdainful 75mph (120kph); if you travel at much above 85mph (140kph), a disconcerting weave has sometimes been known to intrude.

To be king of the road the Milwaukee way, you don't need to be the fastest – just the coolest.

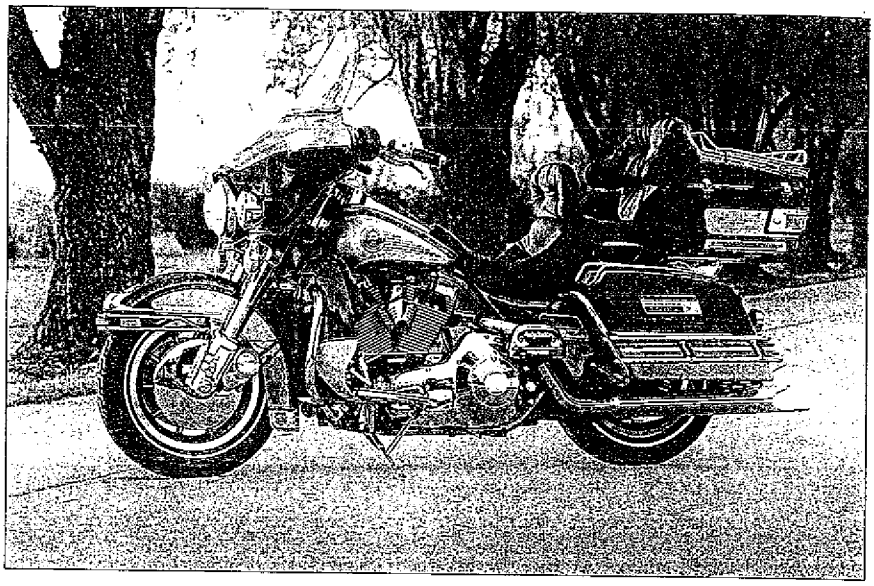


■ LEFT *A 1996 Road King – or should that be FLHR-Convertible? Both the windshield and pillion seat are quickly detachable.*

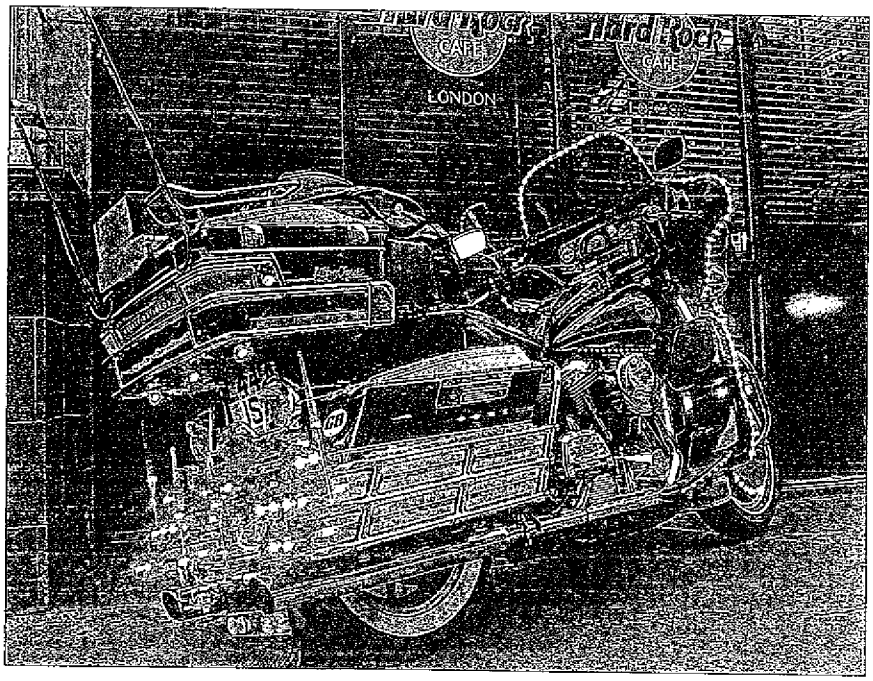
FLHTCU-I ULTRA CLASSIC ELECTRAGLIDE, 1997–PRESENT

For a supposedly conservative model from a fairly cautious company, the top ElectraGlide has undergone a relentless battery of changes during the past few years. Fuel injection (ESPFI) first hit the family on the FLHTC Thirtieth Anniversary in 1995, before becoming standard on Road King and top-of-the-range ElectraGlides for the following model year. Then, scarcely had 1997 brought a new frame with lower saddle height (27in/685mm) and many other detail changes, than Harley-Davidson's first new engine for 15 years graced the good old ElectraGlide.

The Twin Cam 88 is not only "glittering with chrome" but gives the massive ElectraGlide a welcome boost to more than 80bhp, with a prodigious peak torque of 86lb/ft (117Nm). With a wider spread of torque and the driveability that only fuel injection brings, the big Glide's legendary ability to gobble up countless miles is improved. Now it shrugs off gradients and altitude with even greater ease than before. Everything about the big Glide, from its fat tyres and sofa-like saddle to lazy, laid-back steering geometry, marks it out as the grandest of open-road tourers.



■ ABOVE *With its luxuriously cushioned seat, riding the Ultra Classic is a dream.*

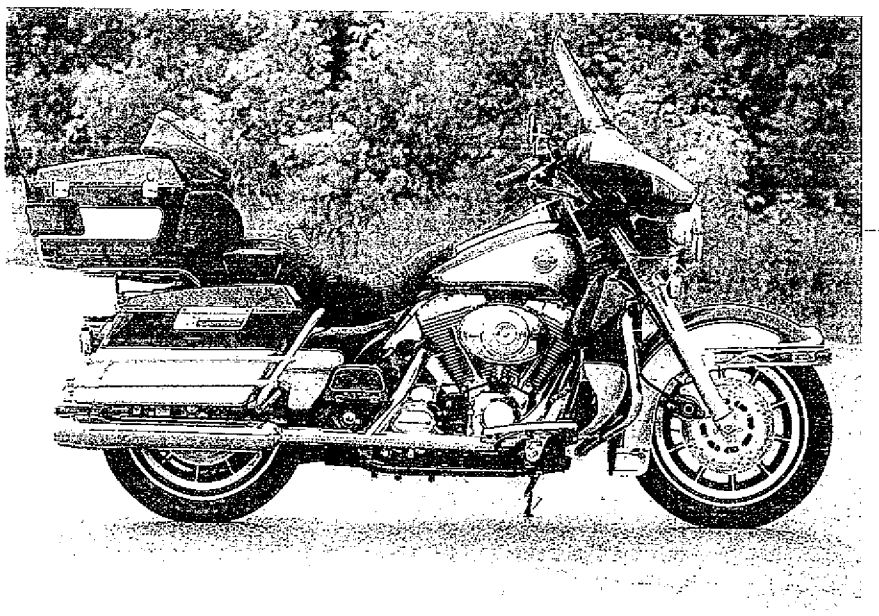


■ BELOW *An Evo-engined predecessor to the full-on Ultra Classic 88. But who'd want his electricity bill?*

Scaling a thundering 776lbs (352kg) without so much as a drop of fuel in the tank, this is the heaviest Hog of them all. Most of that weight is good, solid Milwaukee metal, but much of the rest aims to pamper the rider like no other bike known to humanity. The amply

SPECIFICATIONS

Engine	air-cooled ohv V-twin
Capacity	88.42cu in (1,449cc)
Transmission	5-speed
Power	80bhp
Weight	776lbs (352kg)
Wheelbase	63in (1,600mm)
Top speed	105mph (169kph)



■ RIGHT *With plenty of room to store luggage, this is the ultimate long-haul Hog.*

padded seat is huge and welcoming, while the adjustable footboards give room to move and relax. Harley's neat method of rubber mounting the engine in the steel square-backbone frame ensures that engine vibration is enough to say "Harley" but not so that it will intrude. Meanwhile the panniers, fairing pockets and copious, carpet-lined "King Tour-Pak" top box simply swallow up luggage.

Harley-Davidson describes its top model as "fully loaded" and you'd better believe it. Depending on the market, it comes with passing and running lamps, more instruments than a Boeing and even a cigarette lighter. There's a voice-activated intercom, CB radio and electronic cruise control complete with "Resume" and "Accelerate" modes. The 40-watts-per-channel AM/FM cassette radio contains weatherband, four speakers, separate passenger controls and dual antenna, all controlled from a myriad of switches on the left handlebar and able to respond automatically to ambient noise levels.

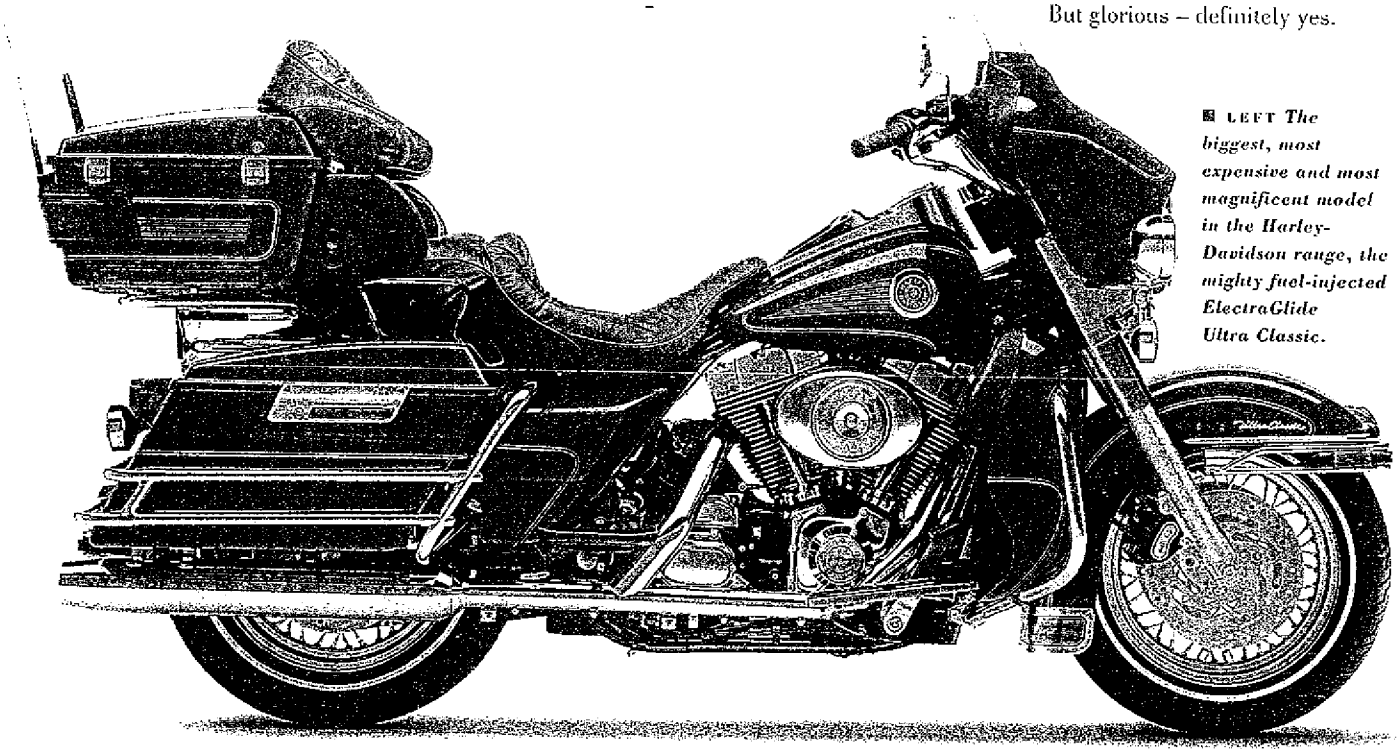
If any Harley-Davidson is as much fantasy as motorcycle, this top ElectraGlide takes the dream to the next level. Imagine cruising over Arizona's high plateaux, the warm desert wind tugging at your sleeves and caressing your designer sunglasses. Slip in your favourite blues cassette or tune in to a passing country music station, and the Glide will transport you to Hog heaven. Come service time, it can even talk to Harley-Davidson mechanics as well, since the engine management system contains full diagnostic capability – and that's only part of the story.

Some bikers mock the ElectraGlide as a two-wheeled Cadillac de Ville. Certainly, it's as far from a sports bike as it is possible for a motorcycle to get.

Absurd, to some.

Over-the-top, probably.

But glorious – definitely yes.



■ LEFT *The biggest, most expensive and most magnificent model in the Harley-Davidson range, the mighty fuel-injected ElectraGlide Ultra Classic.*

FLHRCI ROAD KING CLASSIC, 2000

■ BELOW *The aristocratic Road King Classic, a new breed of style machine.*

The Classic version of the Road King takes up where the standard model left off. In terms of straight specification, there is little to set the two models apart. Yet the Classic, as the name suggests, is a different sort of hybrid: a full-on tourer which is also a custom machine.

With laced (spoked) wheels and fat whitewall tyres, chrome-fringed saddlebags and swept-back lines, the King Classic is almost as svelte as the ElectraGlide is gross – or, as Harley puts it, "has enough traditional styling to drop jaws throughout the continent". Indeed, throughout any continent.

So, for a tourer, the Classic screams "style". As well as those wheels and tyres, it's in the custom metal emblems on the tank, fender tips and seat. It's in that bold trademark , chromed headlamp and twin 35-watt passing lights. It's in the chrome dual mufflers and stainless-steel "Buffalo" handlebars and – new for 2000 – in classic two-tone paint.

As with all year 2000 big-twin models, power comes from the Twin Cam 88 engine first unveiled the previous year. The 88.42cu in (1,449cc) ohv V-twin features electronic fuel injection via 1⅛in (38mm) inlet stacks – and, not least, an attention-grabbing chrome-and-black engine finish. Other than its long-legged lump, the King's touring credentials lie with its leather saddlebags (with rigid inserts to prevent their going out of shape), well-upholstered seat, Lexan windshield (quickly detachable for town riding) and 5-gallon (19-litre) fuel tank. In addition, both rider and pillion foot-boards can be adjusted to the right height.

SPECIFICATIONS

Engine	air-cooled ohv V-twin
Capacity	88.42cu in (1,449cc)
Transmission	5-speed
Power	80bhp
Weight	710lb (322kg)
Wheelbase	63½in (1,612mm)
Top speed	110mph (177kph)

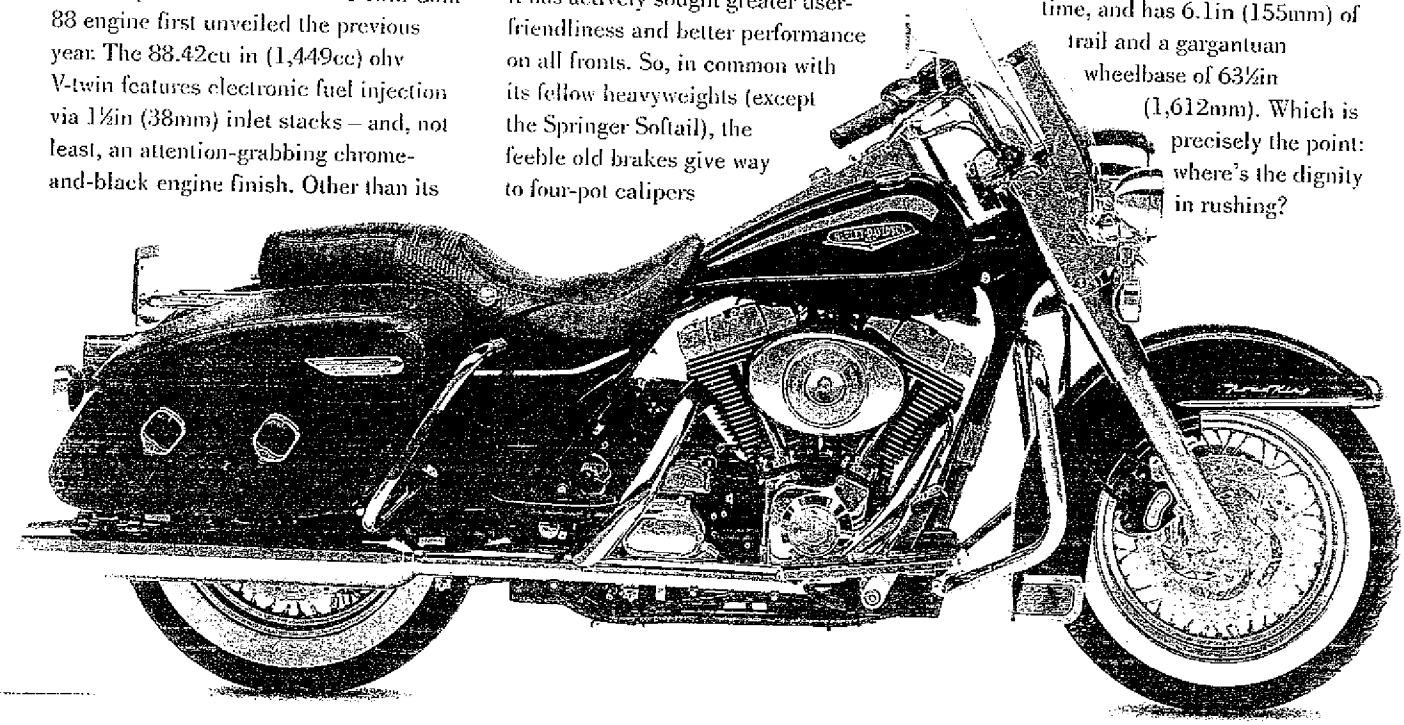
Once upon a time, Milwaukee might have been content with leaving it at that, but not any more. In recent times, it has actively sought greater user-friendliness and better performance on all fronts. So, in common with its fellow heavyweights (except the Springer Softail), the feeble old brakes give way to four-pot calipers (heavy-weights have two at the front), squeezing uprated friction pads on to much-improved 11½in (292mm) rotors. Both braking power and feel are improved as a result, while lever effort is reduced substantially.

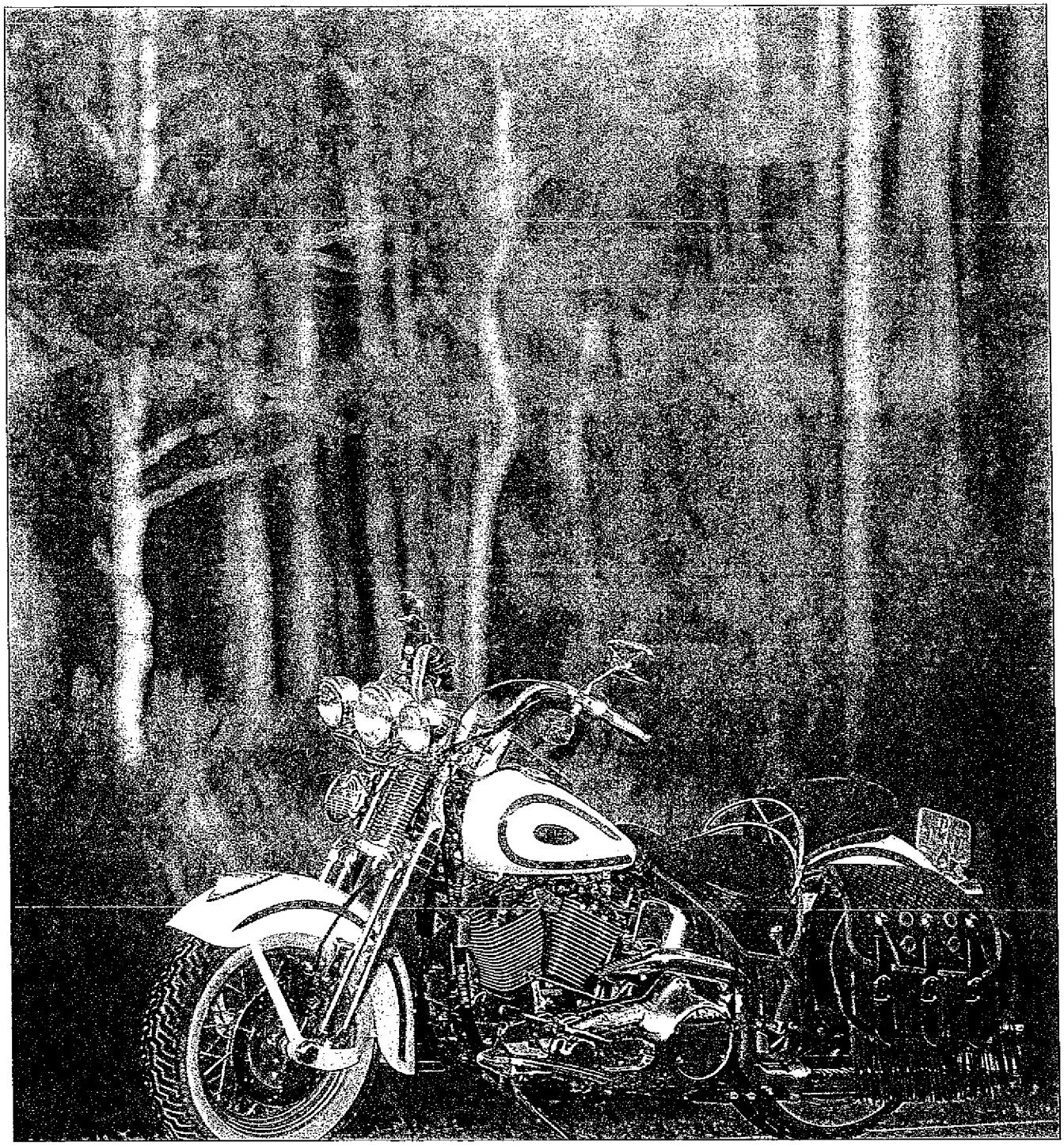
There are new wheel bearings, maintenance-free for 100,000 miles (160,000km). The same goes for the new sealed, long-life, 28Ah battery.

The King Classic is built as vast as only Harley-Davidson knows how, scaling over 700lbs (320kg) without so much as a drop of fuel in its Fat Bob tank. Tying the plot together is a massive mild-steel frame with heavyweight box-section spine and twin tubular cradles.

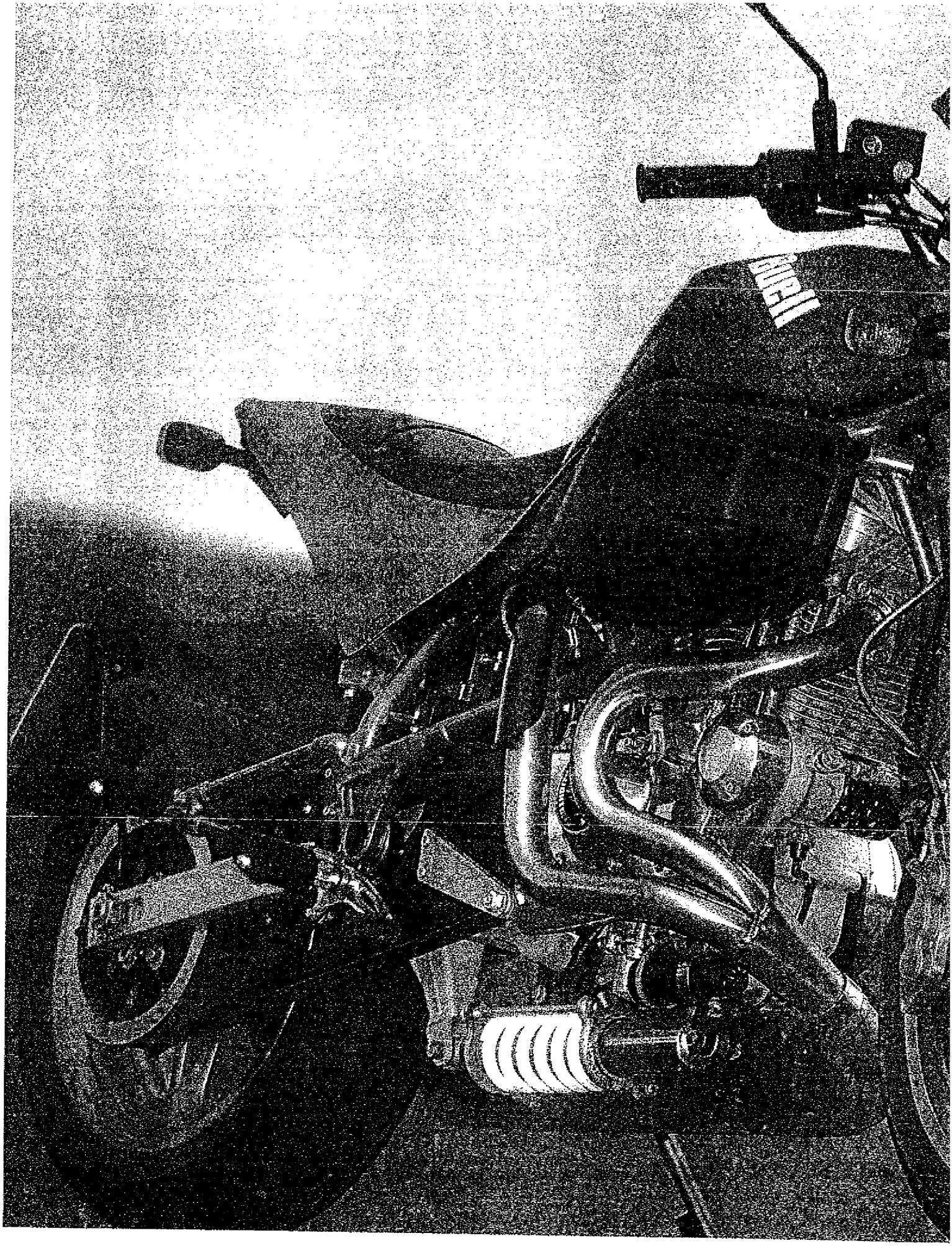
Suspension at both ends is air-adjustable, although wheel travel is less than generous.

The HydraGlide-style forks offer 4.6in (117mm) of movement while the twin rear shock absorbers afford (3in) 76mm. The King Classic will change direction in its own good time, and has 6.1in (155mm) of trail and a gargantuan wheelbase of 63½in (1,612mm). Which is precisely the point: where's the dignity in rushing?





■ ABOVE *An Evo-engined 1997 Heritage Springer Softail. The latest version benefits enormously from the smoothness of the Twin Cam 88B powerplant.*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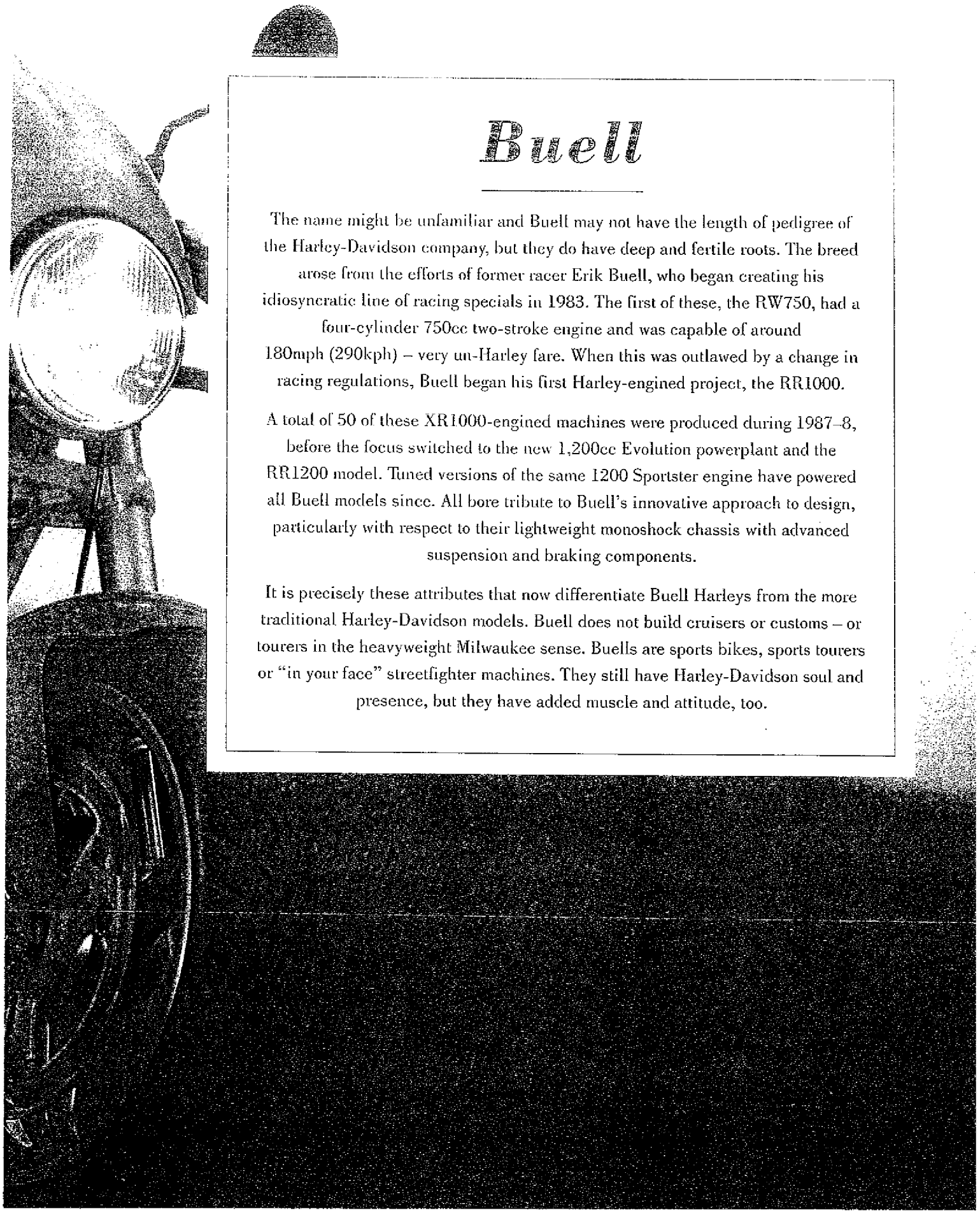


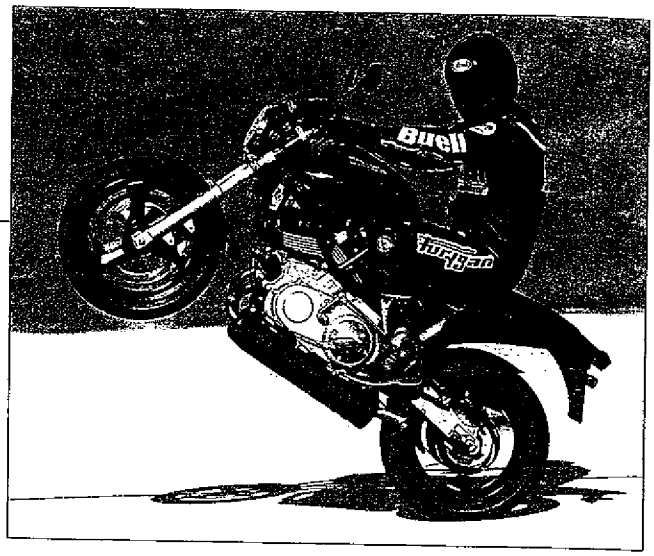
Buell

The name might be unfamiliar and Buell may not have the length of pedigree of the Harley-Davidson company, but they do have deep and fertile roots. The breed arose from the efforts of former racer Erik Buell, who began creating his idiosyncratic line of racing specials in 1983. The first of these, the RW750, had a four-cylinder 750cc two-stroke engine and was capable of around 180mph (290kph) – very un-Harley fare. When this was outlawed by a change in racing regulations, Buell began his first Harley-engined project, the RR1000.

A total of 50 of these XR1000-engined machines were produced during 1987–8, before the focus switched to the new 1,200cc Evolution powerplant and the RR1200 model. Tuned versions of the same 1200 Sportster engine have powered all Buell models since. All bore tribute to Buell's innovative approach to design, particularly with respect to their lightweight monoshock chassis with advanced suspension and braking components.

It is precisely these attributes that now differentiate Buell Harleys from the more traditional Harley-Davidson models. Buell does not build cruisers or customs – or tourers in the heavyweight Milwaukee sense. Buells are sports bikes, sports tourers or "in your face" streetfighter machines. They still have Harley-Davidson soul and presence, but they have added muscle and attitude, too.

M2 CYCLONE & S3 THUNDERBOLT



■ RIGHT *The Cyclone has style, speed and attitude. What more could you want?*

■ BELOW *Sleek yet brutal – the Buell Thunderbolt.*

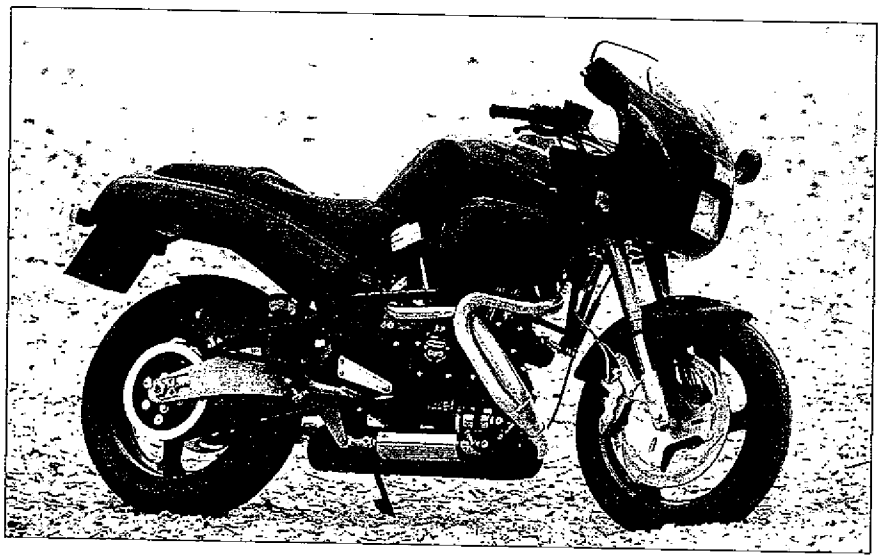
■ M2 CYCLONE

"It came from a motorcyclist's soul, not from a product planning committee," is the Buell promotional slogan, and it fits the streetfighting Cyclone to a "T". The base model of the East Troy range when launched in late 1996, the Cyclone is propelled by a tuned 1,200cc Sportster mill. Claimed peak power is a shuddering 86bhp – more than even the new Twin Cam 88. A wickedly broad torque band peaks at 79lb/ft (107Nm) at 5,400rpm.

The Cyclone runs on slightly less exotic chassis components than its siblings, notably conventional Showa teles rather than upside-down forks. All Buell models employ a single White Power rear unit located under the engine. Bodywork is kept to a minimum, showing the chrome-molybdenum steel perimeter frame off to maximum effect. The big twin engine is located using Buell's patented "Uniplanar" mountings, with tie-rods to reduce the effects of vibration. Final drive is via a reinforced toothed-belt similar to the mainstream Harley range. Although bestowed with only a single front disc, this offers an enormous friction area swept by a huge six-piston caliper. Both wheels are cast aluminium and of lightweight, three-spoke design. With a frame weighing a mere 26lbs (12kg), the Cyclone is fully 77lbs (35kg) lighter and more than 10bhp stronger than a 1200S Sportster. With these impressive numbers and this quality of chassis kit, the Cyclone and its kin handle and stop like no conventional Harley. Soul and speed are not mutually exclusive.

■ S3 THUNDERBOLT

The Thunderbolt, launched for 1997, was based around a chassis assembly similar to the then top-of-the-range S1 Lightning, mated to the Cyclone's 86bhp carburetted big twin engine. The race-bred chassis features fully-adjustable inverted White Power forks and under-slung rear suspension unit, with similar wheels and brakes to the Cyclone's. The Sportster-derived engine produces a claimed 86bhp at a giddy 6,000rpm and 79lb/ft (107Nm) of torque. The motor enjoys the same Uniplanar anti-vibration mountings as other Buell models, allowing plenty of gutsy rumble to reach the rider but damping out more destructive vibes. Visually, the T-bolt is distinguished by its swooping rear bodywork and aerodynamic fairing. Buell produces a sports-touring version, the S3T, with legshields and panniers.



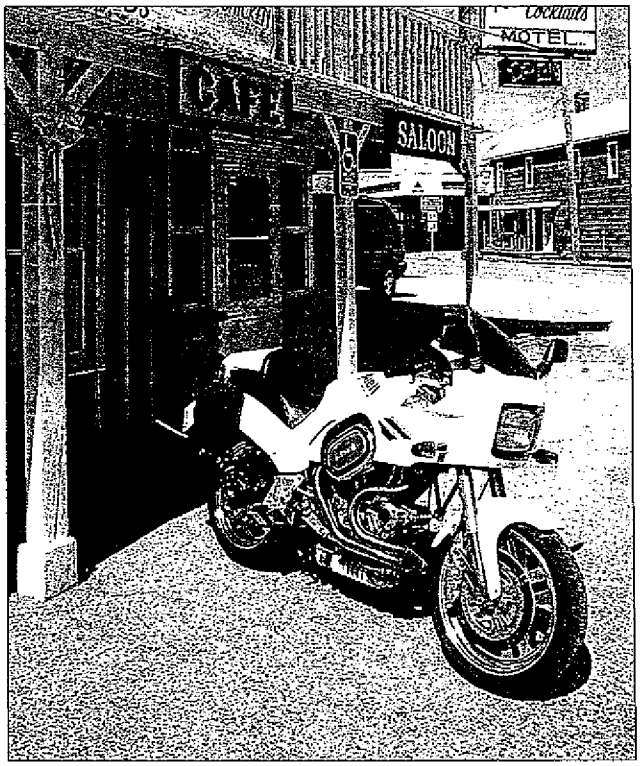
SPECIFICATIONS: CYCLONE (THUNDERBOLT)

Engine	ohv 45 degree V-twin
Capacity	1,203cc
Transmission	5-speed, toothed-belt final drive
Power	86bhp
Weight	434lbs/197kg (450lbs/204kg)
Wheelbase	55¼in/1,410mm
Top speed	126mph/203kph (133mph/214kph)

BUELL HISTORY

Following the modest success of the Sportster-powered RR1200 (of which 65 were built), 1989 marked the debut of the first two-seater Buell, the RS1200 from which the single-seat RSS1200 evolved two years later. By this time, inverted telescopic forks and six-piston disc-brake calipers had become the norm for a marque which was rapidly grabbing the attention of the motorcycle community. By the end of 1992, the company had built a total of 442 machines and brought its founder a solid reputation for engineering and design.

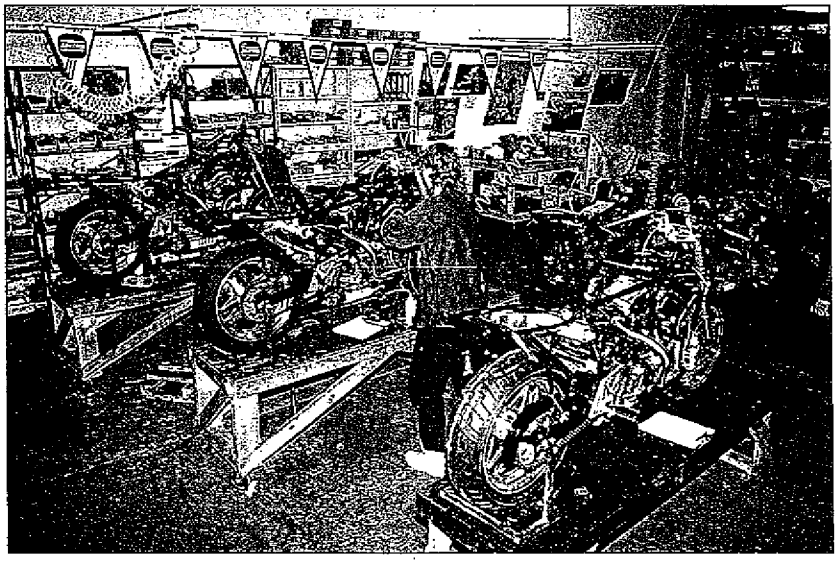
In February 1993, Buell became part of the Harley-Davidson empire when Milwaukee bought a 49 per cent stake in the company. The merger gave Buell access to development funds and Harley-Davidson expertise while offering Harley a direct avenue into Buell's creative engineering. Buell was in fact collaborating with Harley on design as early as the late 1970s when he contributed to the original belt-drive Sturgis project.

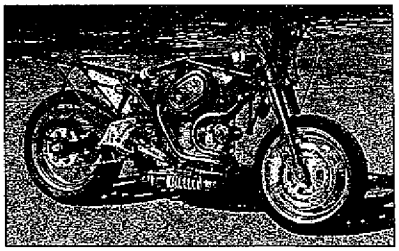


■ LEFT *A rare Buell RS1200 from around 1989. Its heritage is evident.*

■ BELOW LEFT *The Buell assembly line in East Troy, an hour from Milwaukee, shown before Harley bought in.*

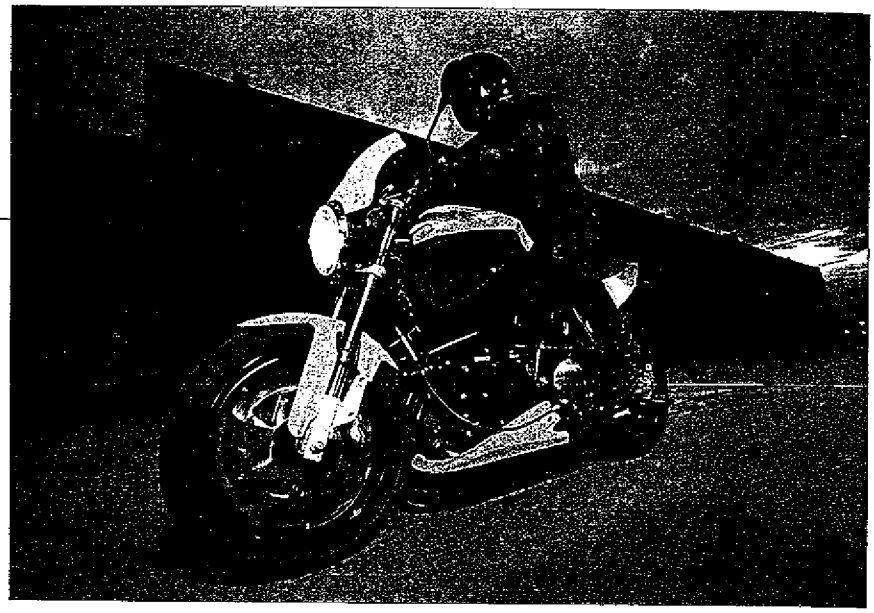
■ BELOW *The Buell's raw lines and radical engineering are abundantly clear with body-work removed.*





Buells are now built at East Troy, Wisconsin, using engines made at the "small powertrains" plant on Milwaukee's Capitol Drive. Now marketed in parallel with mainstream Harley-Davidson machines, the current generation of Cyclone, Thunderbolt and Lightning Buell models was first launched in the United States in 1994.

BUELL X1 LIGHTNING, 1999



Sharing a name with a 3,000mph (5000kph) jet plane, the X1 Lightning replaced the S-series Lightning when launched for 1999. This is a mean and purposeful "Streetfighter" from the makers of "Harleys with attitude".

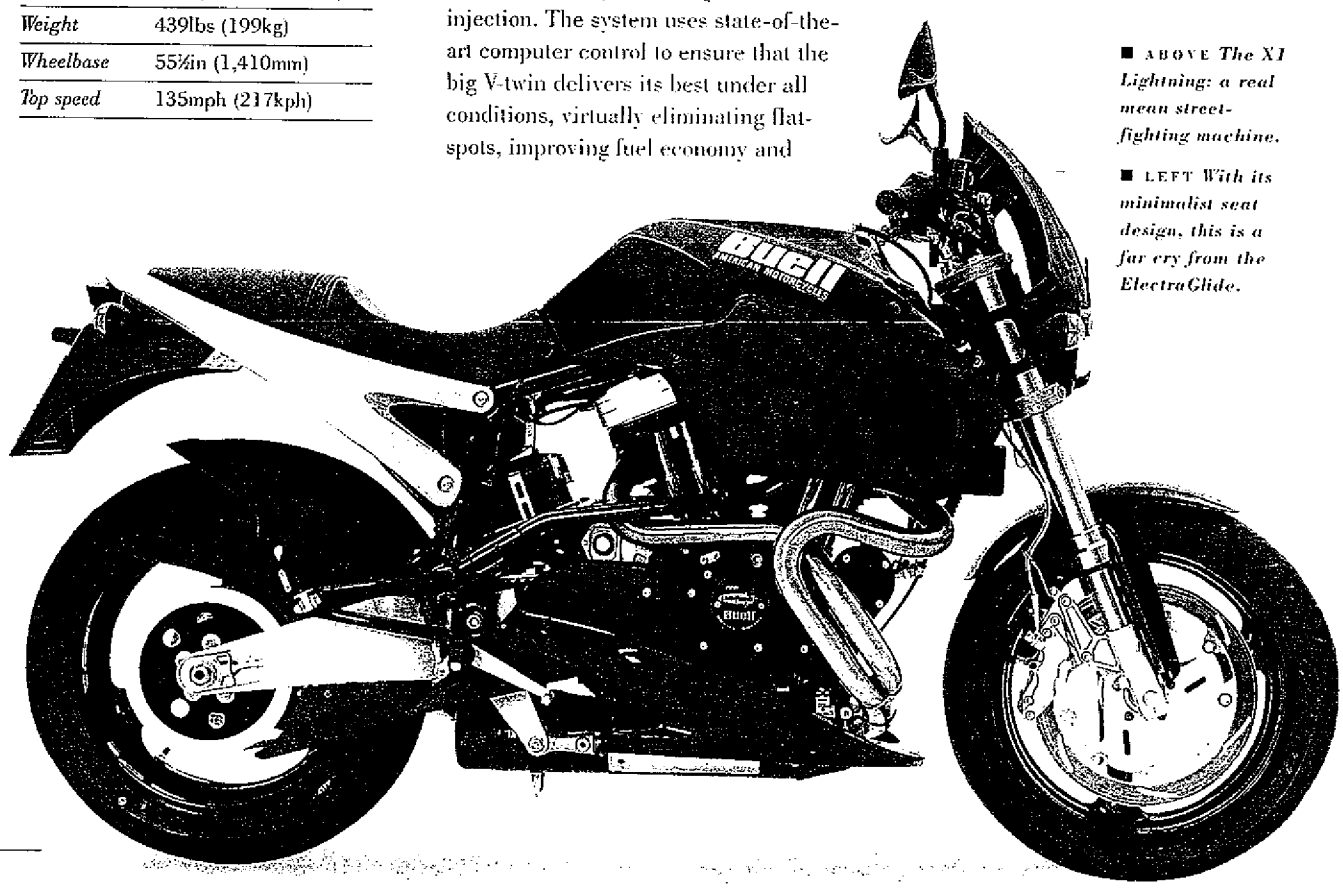
The X1 is a truly credible sports machine. It bristles with character, and its power and handling are vastly improved compared to more traditional Milwaukee fare. At the X1's heart is a reworked "Thunderstorm" version of the familiar 1,203cc Sportster engine with higher compression pistons, larger valves and ports re-profiled for improved gas flow. Lighter flywheels improve engine response and at the same time quicken the Sportster's normally leisurely gearchange.

Best of all is the X1's new and ultra-sophisticated Dynamic Digital fuel injection. The system uses state-of-the-art computer control to ensure that the big V-twin delivers its best under all conditions, virtually eliminating flat-spots, improving fuel economy and cleaning up exhaust emissions. The result is one of the sharpest Harley-Davidson's ever built – and perhaps the most powerful.

According to independent dyno tests, peak power is a 85bhp at 5,300rpm – more than any other stock Harley; the X1's torque is even more impressive:

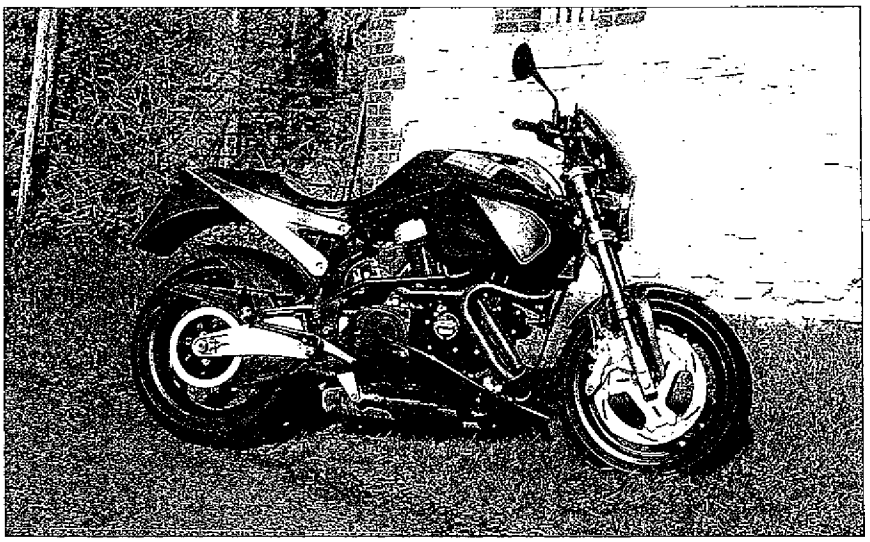
SPECIFICATIONS

Engine	ohv 45 degree V-twin with EFI
Capacity	1,203cc
Transmission	5-speed, toothed-belt final drive
Power	95bhp (see main text)
Weight	439lbs (199kg)
Wheelbase	55½in (1,410mm)
Top speed	135mph (217kph)



■ ABOVE *The X1 Lightning: a real mean street-fighting machine.*

■ LEFT *With its minimalist seat design, this is a far cry from the ElectraGlide.*



■ LEFT *Understated, fast and stylish, the Lightning lives up to its name.*

92lb/ft (125Nm) at just 3,300rpm, guaranteeing a broad range of solid, usable power (Buell actually claims 95bhp and 85lb/ft (115Nm).

With this engine there is almost no such thing as being in the wrong gear: simply wind open the throttle and the big twin will deliver the goods at almost any rpm. Top speed is around 136mph (220kph), although this can vary as some markets receive models with raised gearing to help meet local noise limits.

Pinning all of this to the road is a rugged tubular steel trellis chassis, with new Japanese Showa suspension components at both ends. At the front are sturdy inverted forks which are adjustable for pre-load, compression and rebound damping.

The monoshock rear end offers built-in rising rate, plus pre-load and two-way damping tuning. The stainless-steel exhaust is tucked tight in, providing maximum room and comfort for one- or two-up riding and giving the best cornering ground clearance of any Milwaukee roadster, allowing the X1 to exploit to the full its Dunlop rubber. Although the Lightning boasts only a single front disc, braking is excellent as well, with a brawny 13.4in (340mm) rotor grabbed by a huge, six-piston "Performance Machine" caliper. A simple single-piston caliper and 9in (230mm) disc adorn the rear.

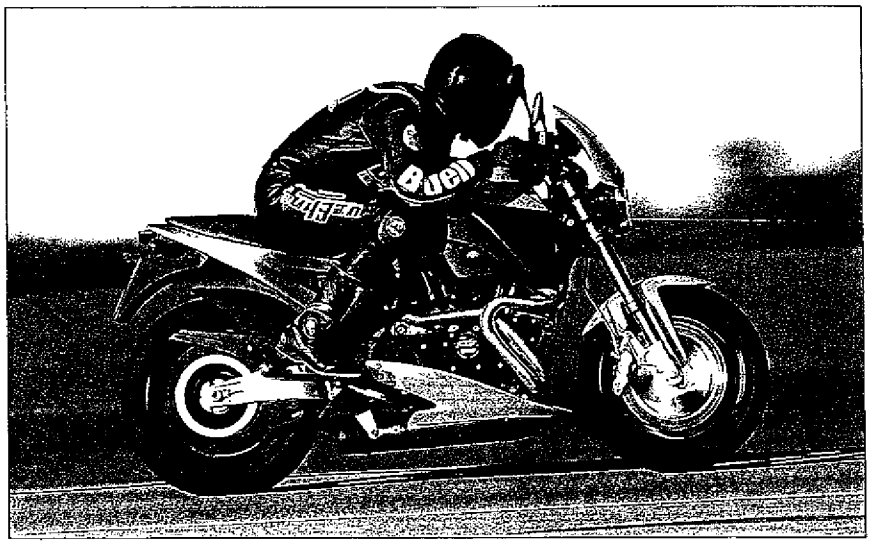
Handling, too, is top notch. With its short, nimble wheelbase and only 3½in (89mm) of trail, the X1 turns quickly by Harley standards, inviting riders to dive hard into turns. Stability, too, is surprisingly good, allowing the machine to be ridden with confidence under almost any circumstances. Its minimalist seat and overall ergonomics may fall a long way short of ElectraGlide territory, but the sort of owners the X1 is aimed at will not mind that.

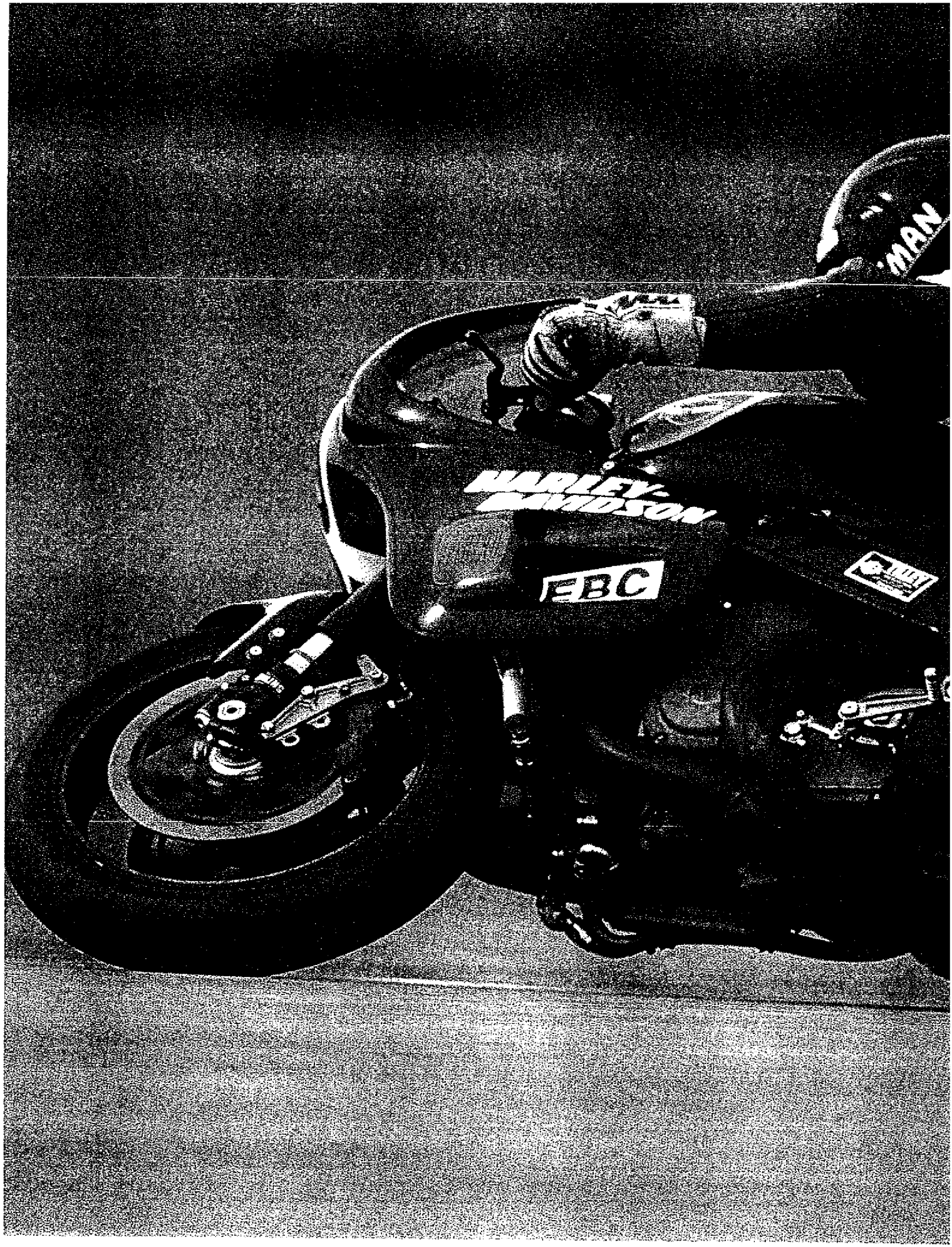
This impressive package is cloaked in the sort of eye-catching yet understated muscular styling for which the East Troy streetfighting machines have become renowned.

With a Buell, what you see is what you get – and you get the best Buell yet with the X1 Lightning.

■ LEFT *Burnouts are easy thanks to tuned 1,200cc Sportster power.*

■ BELOW *Truly awesome: the Buell X1 Lightning.*

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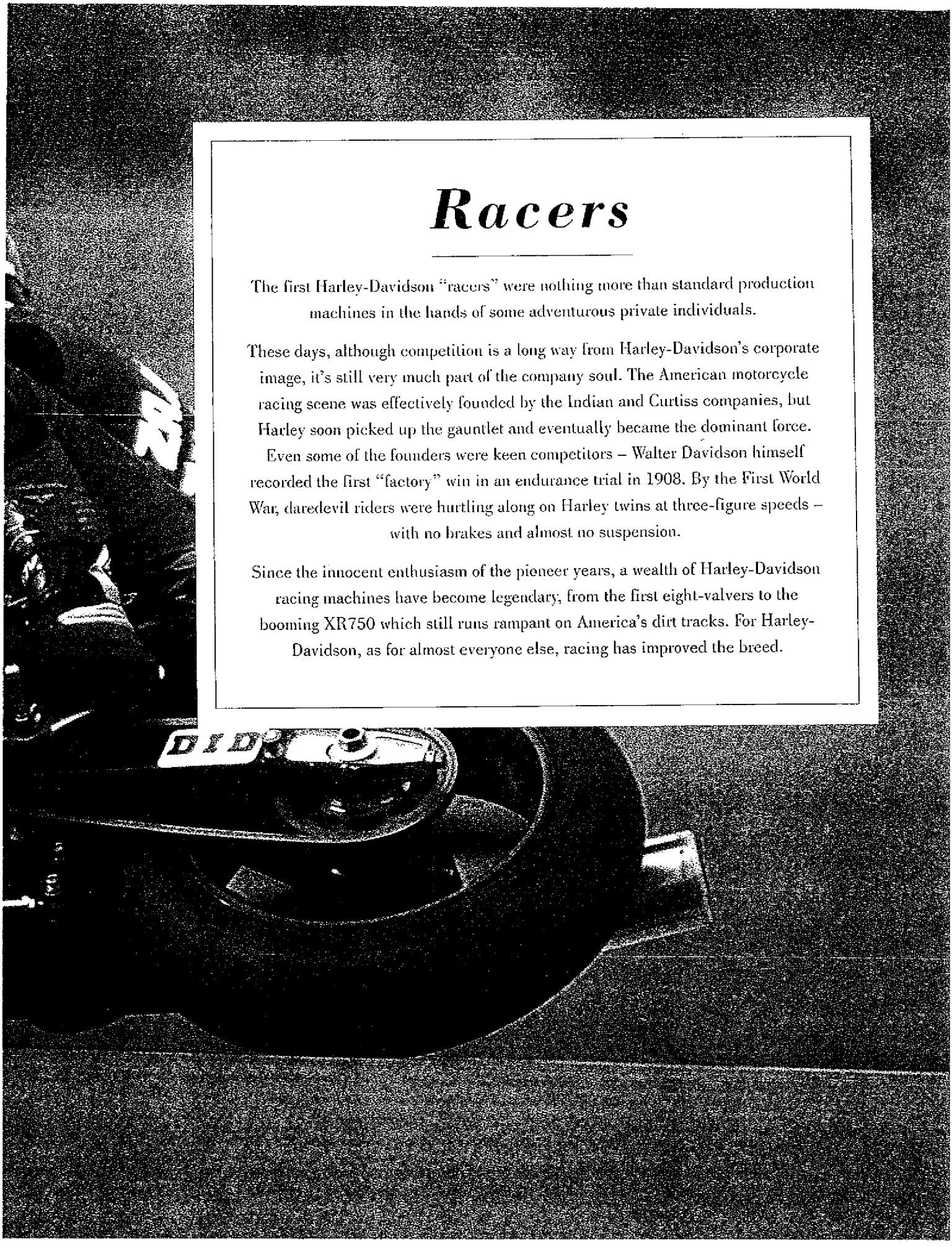


Racers

The first Harley-Davidson "racers" were nothing more than standard production machines in the hands of some adventurous private individuals.

These days, although competition is a long way from Harley-Davidson's corporate image, it's still very much part of the company soul. The American motorcycle racing scene was effectively founded by the Indian and Curtiss companies, but Harley soon picked up the gauntlet and eventually became the dominant force. Even some of the founders were keen competitors – Walter Davidson himself recorded the first "factory" win in an endurance trial in 1908. By the First World War, daredevil riders were hurtling along on Harley twins at three-figure speeds – with no brakes and almost no suspension.

Since the innocent enthusiasm of the pioneer years, a wealth of Harley-Davidson racing machines have become legendary, from the first eight-valvers to the booming XR750 which still runs rampant on America's dirt tracks. For Harley-Davidson, as for almost everyone else, racing has improved the breed.

EARLY RACERS

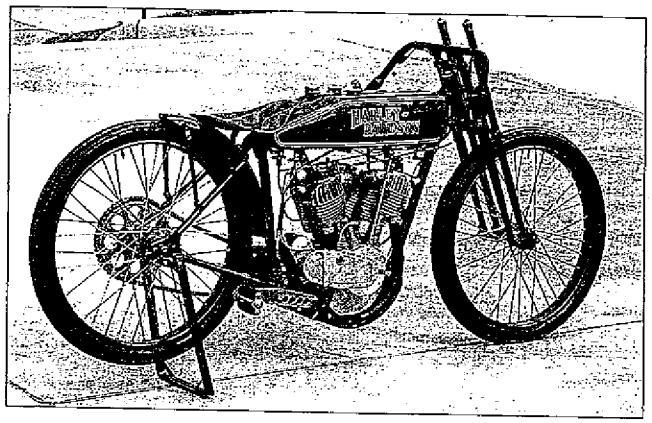
■ **EIGHT-VALVE, TWO-CAM**

Although a special "7-E" competition version of Harley-Davidson's first V-twin was built for selected customers as early as 1910, the first model created specifically for racing was the eight-valve twin which appeared in 1916. The multi-valve layout had already been amply proven by the exploits of Indian's similar engine, already the winner of the Isle of Man TT.

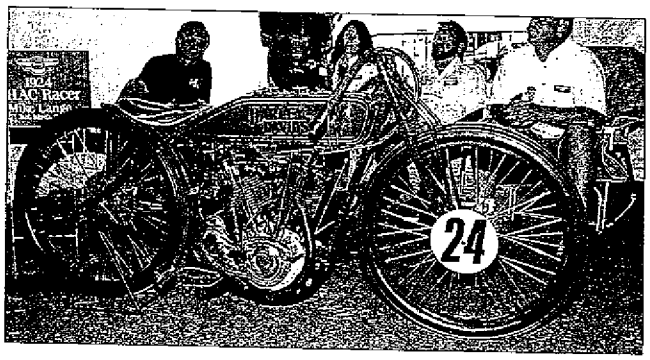
Displacing 61cu in (999cc), the Harley-Davidson eight-valve was the device on which the Harley Wrecking Crew began their domination of the American racing scene.

Private individuals were less fortunate, since the machine's price – $1,500 – was deliberately inflated to ensure that it could only fall into serious hands.

A 65cu in (1,065cc) twin-cam racer followed. Like the eight-valve model, the Two-Cam had inlet-over-exhaust valve layout, no brakes and direct drive by chain to the rear wheel (although some examples may have used three-speed transmissions). Once started – no easy task due to the use of very high compression ratios – these monsters were capable of well over 100mph (160kph). To promote its wares overseas, Harley-Davidson freighted its top racing machines all over the world. In Britain, both Freddie Dixon and D.H. Davidson took the Two-Cam to numerous records at the famed banked Brooklands circuit in Surrey. In September 1923, at Arpajon in France, Dixon took the same machine to a world-record speed of 106.5mph (171.4kph).

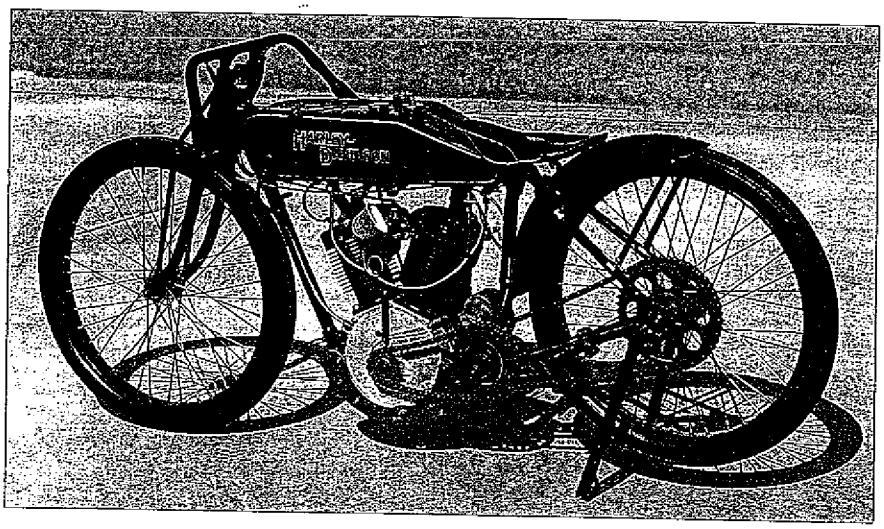


■ LEFT *A handsome 74-inch J-series racer dating from 1924. Note the total lack of any sort of brakes.*



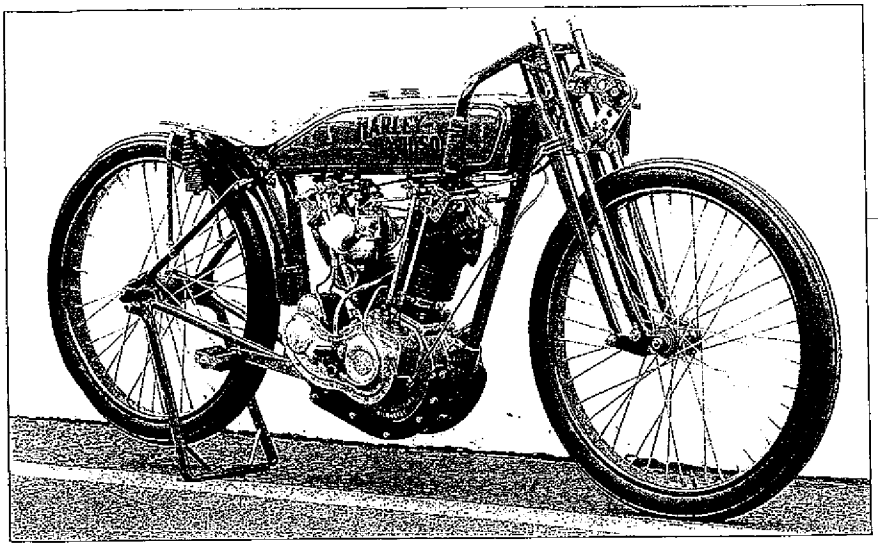
■ LEFT *A 1924 74-inch F-head racer. Exhaust silencing was not a prime concern.*

■ BELOW *Another F-head, a 1920 board racer ridden by Dewey Sims. The plunger on the left side of the tank feeds engine oil.*



■ **OHV TWINS**

During the mid-1920s, the F-head Two-Cam was the mainstay of Harley-Davidson's factory twin-cylinder racing efforts, but they were seriously hampered when the AMA introduced the new "Class C" racing formula. This was



■ LEFT *The legendary eight-valve racer, one of the most potent motorcycles in the world in its day.*

for production-based 45cu in (750cc) machines, of which at least 25 had to be built. Overnight, the old Class A and Class B factory specials were relegated to the sidelines in much of American racing – especially in the buoyant "slant-shooting" (hill-climbing) scene.

At the time, Milwaukee produced no eligible machine, but by 1926 it did have the remarkably fast 21-inch ohv Peashooter single, and any darn fool could see that two times 21 wasn't far from 45. It wasn't long before someone investigated the possibility of grafting Peashooter heads on to existing V-twin bottom ends.

The first such ohv Harley-Davidson twin was probably a machine dubbed "Home Brew", ridden with some success by Oscar Lenz in 1927. A similar device, also based on a 61-inch bottom end, was built by Ralph Moore of Indianapolis.

By 1928, Harley-Davidson had given in to popular demand and released "roadster" versions of its Two-Cam racing twins, the 61-inch JH and 74-inch JDH and it wasn't long before Juneau Avenue followed the example of creative privateers with a number of factory specials featuring ohv Peashooter top ends grafted on to JD Two-Cam crankcases.

These first hit the tracks in 1928 at Fond du Lac, just a few miles north of Milwaukee. However, there is some dispute as to whether they were actually created in Harley's competition shop or by a local dealer, Bill Knuth, with the factory's knowledge and support.

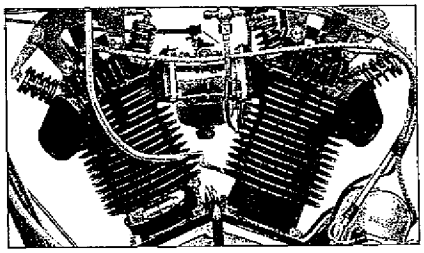
In either case, this was an interim measure, because twelve months later a 45-inch factory racer, the DAH, first appeared.

Unlike the Two-Cam-based machines, the DAH was substantially a new engine from the ground up, although it still depended on cylinder heads derived from the Peashooter's.

Displacing 45.44cu in (744cc), the DAH retained the 88.9mm stroke of the JD, but with a bore reduced to 70.6mm.

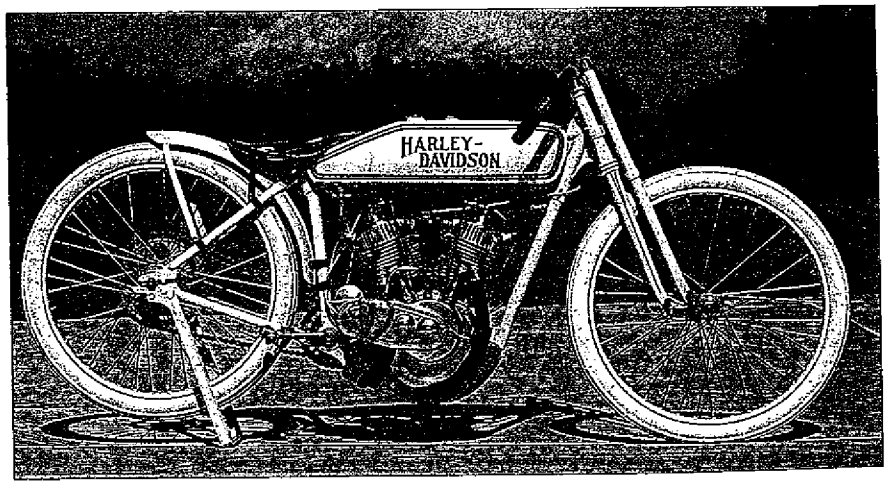
The DAH was dominant for a while, but Knuth came back with a four-cam hybrid reputed to produce fully 45 horsepower, which continued to give the official factory machines a run for their money. There are even records of a 61-inch ohv racing twin, designated FAR, being built for export.

It is highly likely that, in some measure or other, these exotic racing models were to inspire the later Knucklehead ohv twin. What is for certain is the profound influence that they had on the racing world at large.



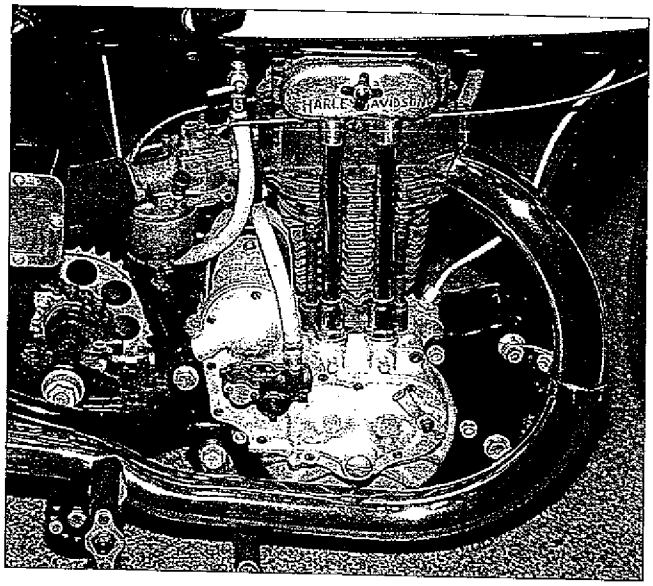
■ ABOVE *Four overhead valves per cylinder can clearly be seen in this view of the same 1923 eight-valver. Note the single carburettor between the cylinders.*

■ BELOW *Compared to the exotic factory eight-valvers, F-head board racers such as this were relatively low-tech, but still capable of frightening speeds.*



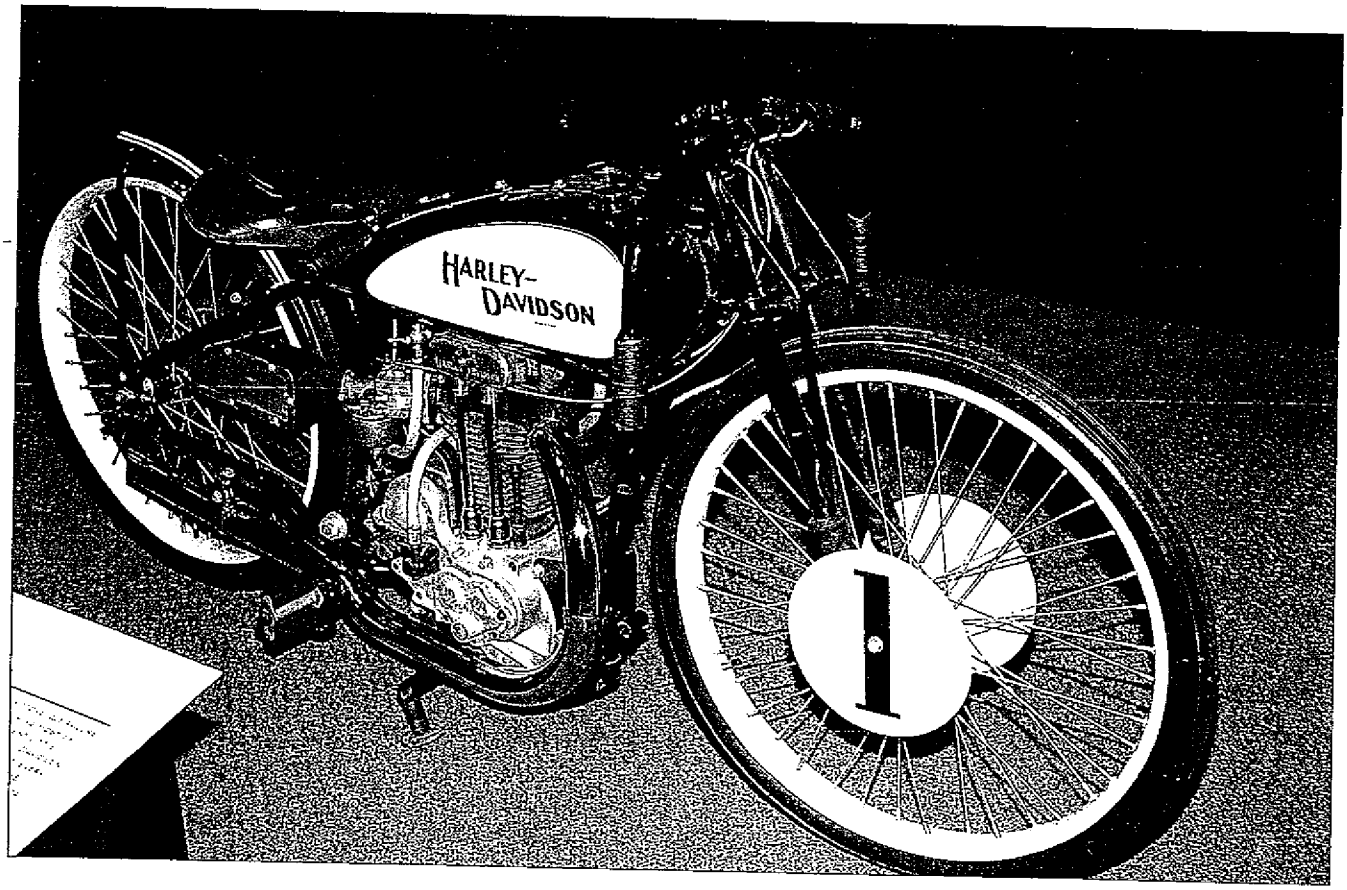
PEASHOOTER, 1929

As legendary in its way as was the exotic Two-Cam, the Peashooter began life as a standard roadster model. The Peashooter was based on the overhead-valve Model AA magneto version of the 21.1cu in (346cc) single produced from 1926 to 1935, which proved itself more than amenable to race tuning. Perhaps this was not altogether surprising, as the cylinder head – the most crucial performance element in any four-stroke engine – was designed by the great Harry Ricardo, the British engineering genius. Only a few years earlier, Ricardo had created Triumph's first four-valve motor, the Model R. Sir Harry, as he was later to become, practically invented the art of petrol- (gas-) flowing and, during



■ LEFT *The cylinder head of the Peashooter was designed by Harry Ricardo, a British engineer.*

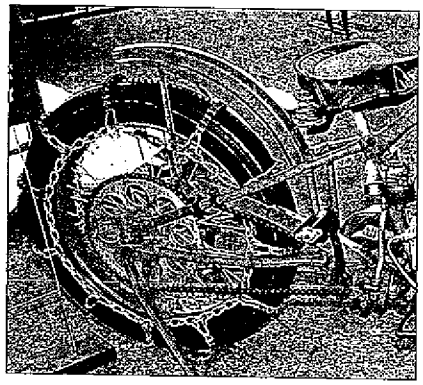
■ BELOW *This single became a legend on the race tracks of the United States.*



■ BELOW *The Peashooter was capable of speeds of over 80mph (128kph).*

SPECIFICATIONS

Engine	ohv single
Capacity	21.1cu in (346cc)
Transmission	1- or 3-speed
Weight	290lbs (132kg)
Wheelbase	55in (1,400mm)
Top Speed	over 80mph (128kph)



the course of developing the concept of octane ratings for fuel, gained an unparalleled understanding of the combustion process.

Central to the Peashooter's success were two things. One was the engine's hemispherical "squish" heads, in which the outer portion of the piston crown almost touches the cylinder head as it rises up the bore. This in turn creates a fierce turbulence, promoting fuel/air mixing and combustion. This made the 'Shooter's combustion more efficient than its rivals over a broader range of revs, also permitting the safe use of higher compression ratios. Even in roadster form, the "21" generated only 20 per cent less power than an F-head twin with almost three times the displacement.

The Peashooter's other "ace" was Joe Petrali who (along with Scott Parker) is surely the most successful racer ever to grace the race tracks of America. In 1935, towards the end of the model's racing career, he won every one of the 13 dirt track races in the national series. The diminutive Californian was equally adept whether board racing or tackling towering hill-climbs, proving virtually unbeatable until his retirement in 1938.

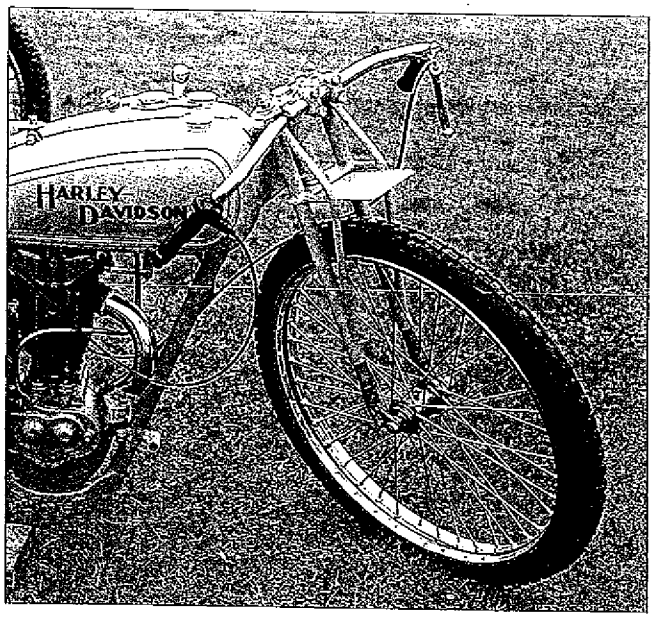
Petrali and the single first hit the headlines when the AMA adopted a new 21-inch racing class in 1925. In the first race under the new formula, fittingly held in Milwaukee before a crowd of over 20,000, Petrali, Jim Davis and Eddie Brock simply blasted the opposition into the Wisconsin weeds. Board-racing versions of the ohv roadster were stripped to the bare essentials, with tiny seats, "Speedster" drop handlebars and neither brakes nor mudguards. Such abbreviated devices were easily capable of speeds in excess of 80mph (128kph). Depending on the type of competition, they were built with single-speed (Model SM) or three-speed (SA) transmission.

Despite the ohv single's instant track success, Juneau Avenue was oddly disposed towards its side-valve sidekick since the flathead roadster was seen as the likeliest seller. However, others quickly saw the potential of high-revving overhead-valve engines, and the Peashooter became the single of choice on the American racing scene (although a speedway version, inspired by the all-conquering British JAP, was far less successful).

The final, flattering piece in the Peashooter jigsaw came with the introduction of the ohv Knucklehead in 1936.

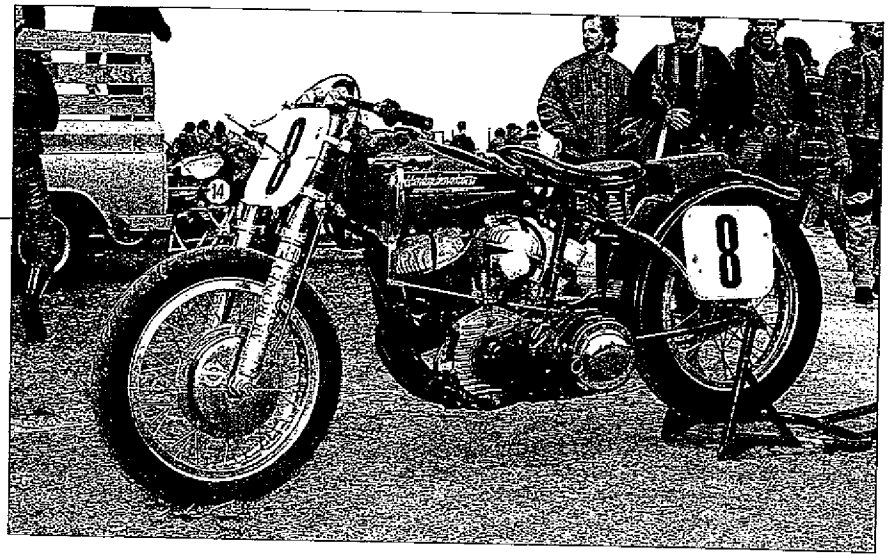
Although the factory was developing overhead-valve DAH competition twins during the late 1920s, the Knuckle bears many detail similarities with the Peashooter top end.

Whether this was by design or accident, no-one can now tell.



■ LEFT *"Speedster" drop handlebars were a feature of the Peashooter.*

WR/WRTT, 1940–51



■ ABOVE *This "45" wears telescopic forks manufactured long after the side-valve racer was history.*

Harley-Davidson's racing mainstay of the 1940s, the side-valve WR, had the humblest of beginnings, evolving by degrees from the unpretentious Model D of 1929. Essentially, this was powered by little more than a pair of Ricardo heads grafted from the 21.1cu in (346cc) single (which had almost the same bore diameter) onto a common crankcase. The machine developed rapidly year-on-year, becoming the Model R in 1932, at which time its hottest roadster derivative was the RLD Special Sport Solo.

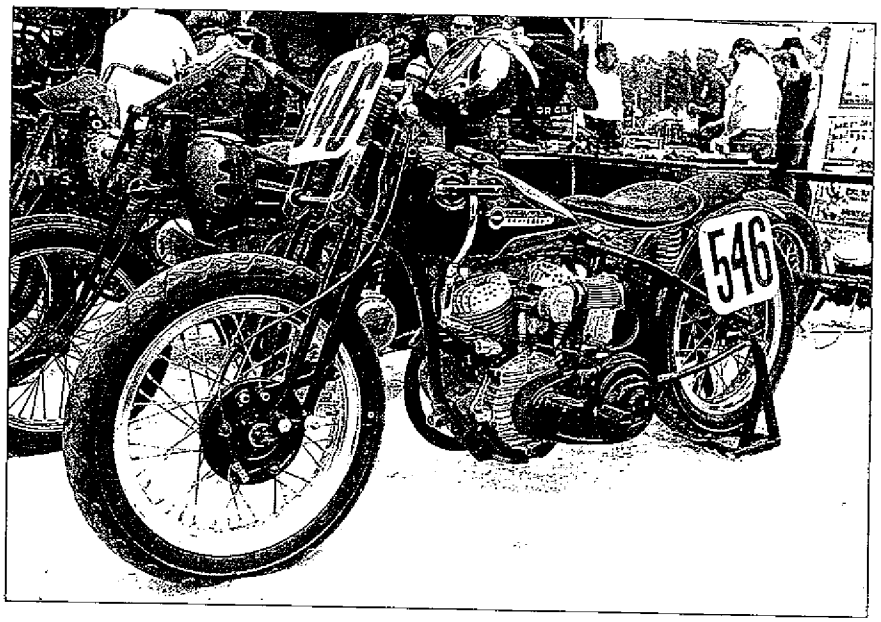
Racing efforts at the time, both official and private, were concentrated on overhead valve engines, both singles and 45-inch twins. However, by 1933 the RLDE twin with magnesium alloy pistons was available from the factory by special order.

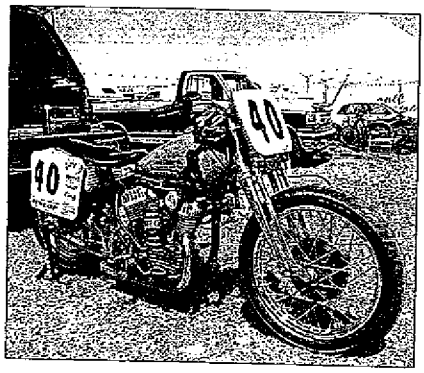
Two years later still, the Series R range included five models based on the familiar flathead "45", crowned by the lean and purposeful RLDR Competition Special – a snip at $322. For 1937, a Knucklehead-inspired restyle and a welter of engine improvements metamorphosed the R into the enduring Model W. Other than the change of prefix letter, the 45-inch range continued as before, now with the WLDR Competition Special at its head – a WR in all but name. Harley-Davidson put this right in 1941: the WLDR still existed, but now as a mere Special Sport Solo roadster.

Taking its place as the hottest 45 was the plain WR, a race machine available only to special order. Initially, availability was poor – just 36 WRs were produced in 1941 – but both

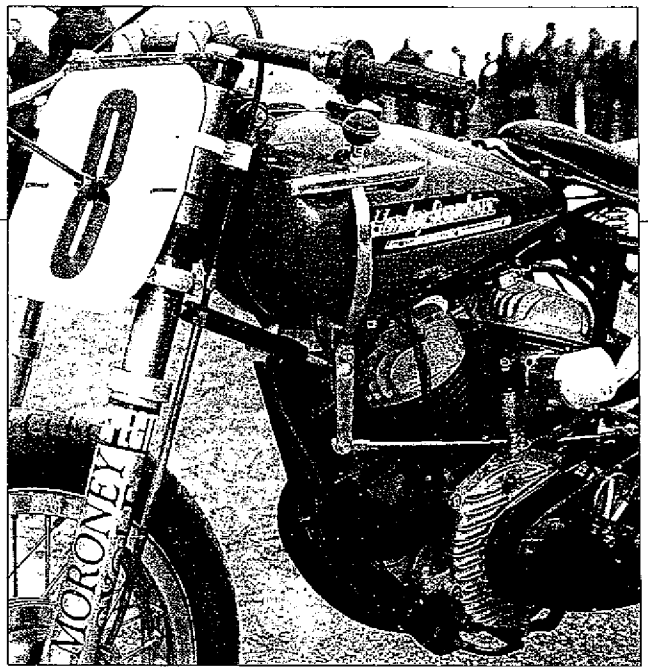
SPECIFICATIONS

Engine	side valve 4-stroke V-twin
Capacity	45.3cu in (742cc)
Transmission	3- or 4-speed
Power	40bhp
Wheelbase	60in (1,525mm)
Top speed	around 105mph (169kph)

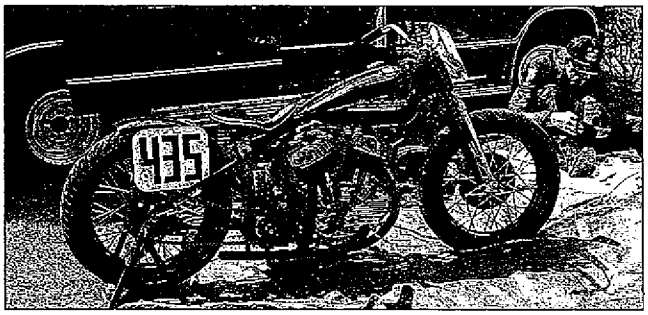




■ ABOVE AND LEFT *Although substantially similar engines propelled American postmen, the WR carried Harley's racing banner for a decade in both factory and private teams.*



■ RIGHT *The main advantage of the side-valve twin wasn't its potency, but its capacity, which kept it competitive in American racing.*



■ LEFT *A competitor fettles his "45" during a modern classic race meeting.*

■ BELOW *The "pillion" pad helped the rider stretch out to cheat the wind.*

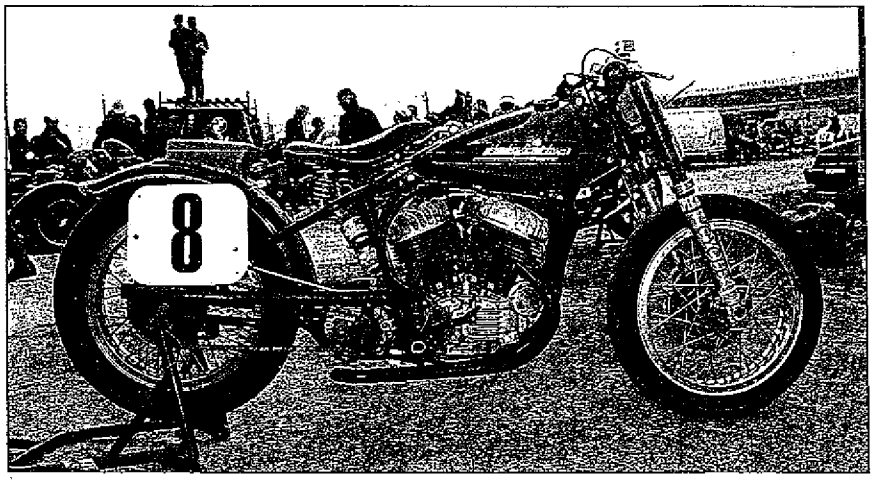
demand and supply picked up dramatically in the aftermath of war. A total of 292 were produced in 1948, 121 in 1949 and 23 in the last year of production.

These purpose-built racing machines were, of course, very much stripped down compared to their roadster cousins (the WR had not so much as a front mudguard, and later examples also benefited from a lightweight chrome-molybdenum steel chassis). The WRTT, produced as a specific model only late in the WR's career, retained the heavier roadster frame. Being a flat-track machine, the WR also had no brakes, while the road-racing TT machine was equipped with standard WL wheels and brakes – scarcely state-of-the-art stopping power. The WR's suspension was no more impressive, with old-fashioned girder front forks and a rigid rear end. For good measure, the gearbox, although available with close-ratio racing cogs, was hand-change. It may have been crude, and 40bhp from 45 inches was unimpressive. Yet this, and sheer weight of numbers, was enough to rival the much more sophisticated but sorely handicapped overhead-valve twins and overhead-camshaft singles from Europe. The brute toughness of the WRTT, in particular, made it a surprisingly capable "Class C" racer. This formula had first been introduced for roadster-based machines in the 1920s to reduce the spiralling cost of Class A and B factory specials.

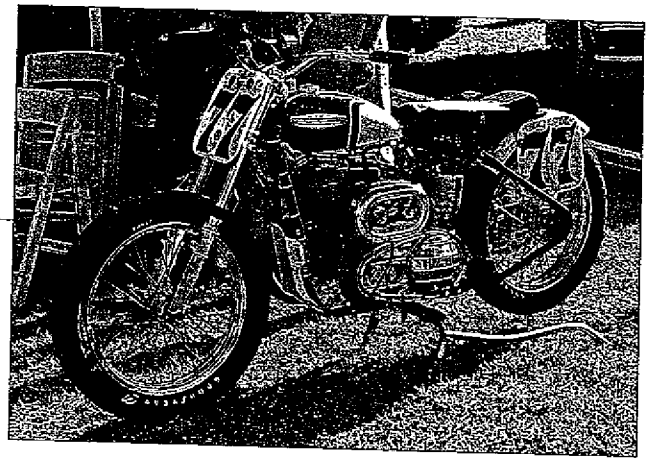
For more than a decade, these outwardly primitive machines gave a good account of themselves on the race tracks of America – taking 19 out of 23 championship victories in 1948 alone.

This was partly because they were rugged and dependable, and partly because the AMA was as eager then as it has been since to adjust the rules in favour of domestic hardware.

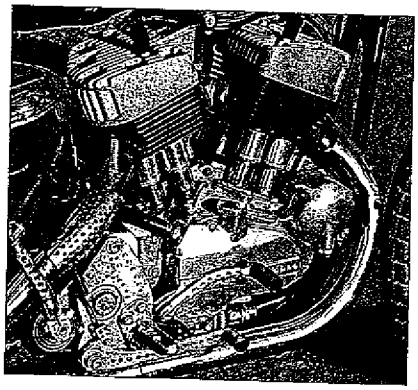
In this case the AMA, which is the governing body of American motorcycle sport, greeted the arrival of fast European overhead-valve machines with a decree that said they would be limited to 500cc, while side-valves of 750cc were permitted. And guess who made the only flathead racers in the frame?



KR/KRTT 1952–69



■ LEFT *Few racers have remained competitive for as long as the KR, although it needed help from the rules to survive.*



■ BELOW LEFT *The 45-inch (750cc) engine in close-up. The push-rod tubes to the side valves are clearly seen.*

What Harley-Davidson needed to replace the elderly WR was a machine reflecting the technology of its era. In the KR, the company most certainly didn't get it. What it got instead was yet another long-stroke flathead racer derived from a road bike, in this case the 45.3cu in (742cc) Model K which was about to be so comprehensively licked by British machines on America's streets. In racing, the KR had an edge: the AMA's 500cc limit on overhead-valve engines still applied.

As with the WR a decade earlier, production began slowly, with just 17 KRs built in the first year. Yet by 1955, the special equipment range encompassed no less than five specific models: the KHK Super Sport Solo, KHRM off-roader, KR dirt track racer, and KRTT and KHRTT "Tourist Trophy" machines.

All three KH models boasted the new 55cu in (883cc) long-stroke K-Series engine and were essentially "race replicas" intended as much for the private enthusiast as the racer. Serious racers remained limited to what the regulations allowed: 750cc.

In 1955, the factory built 90 45-inch competition models, declining to 33 by the decade's end. Unlike the WR/WRTT, all variants now enjoyed a lightweight racing frame, although only the road-racing TT model received the new swinging-arm rear end.

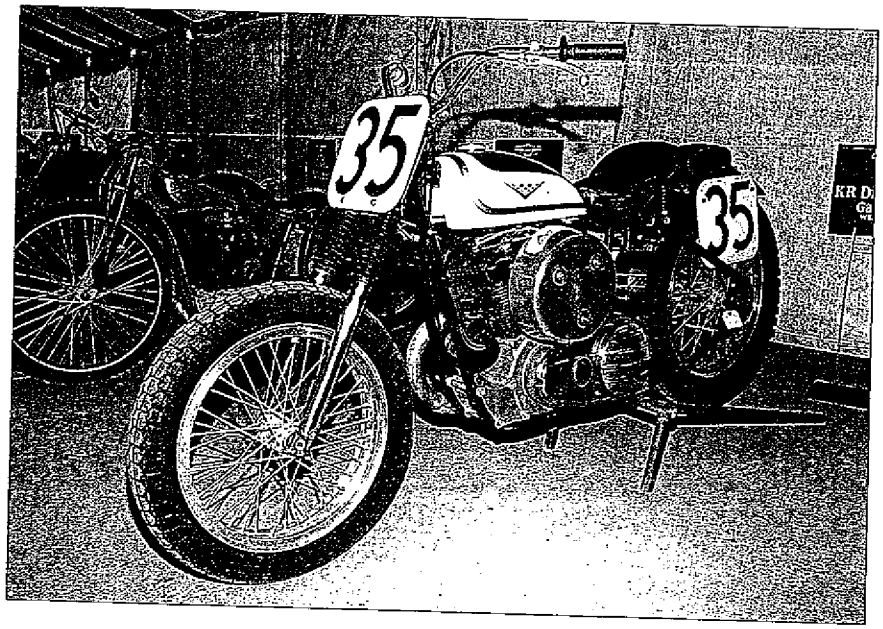
The flat-track KR had a smaller tank, fatter wheels and tyres and no need of brakes. Bore and stroke were identical to the WR's at 70 x 97mm (the slow-revving 55's stroke was even longer at 116mm).

However, the cylinders were commonly re-bored after bedding-in. By using the maximum permitted piston oversize – more than 0.04in (1.1mm) mechanics could raise the displacement legally to 46.8cu in (767cc).

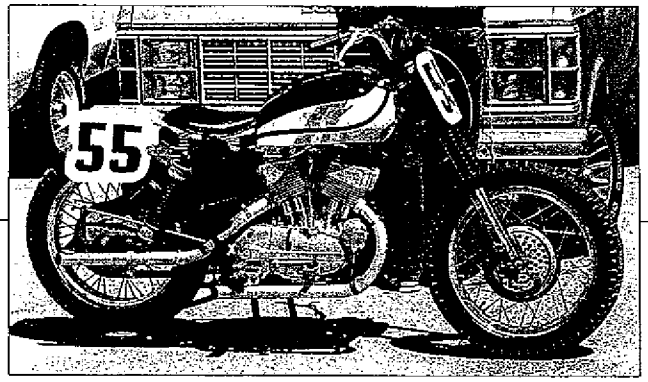
At 9:1, the compression ratio was high by side-valve standards and a single 33mm Linkert carburettor was

SPECIFICATIONS

Engine	side-valve 4-stroke V-twin
Capacity	45.3 cu in (742cc)
Transmission	4-speed
Power	48bhp
Weight	377–385lbs (171–175g)
Wheelbase	56in (1,420mm)
Top speed	150mph (240kph) (with road-race streamlining)



■ LEFT *A very original example of a 1962 KR dirt-tracker. Note the lack of rear suspension or brakes.*



■ RIGHT *Rear springing identifies this KR as the TT version.*

standard. Power was around 48bhp at 7,000rpm, with 50lb/ft (68Nm) of torque at 5,000rpm. British Norton, Matchless and Triumph machines, as well as putting out far more specific power than the KR, handled and stopped far better. Yet the old KRs just kept rolling on.

While they were heavy (around 380lbs/172kg) and ill-suited to any circuit with proper corners, they remained surprisingly competitive elsewhere – not least because every race grid in America seemed to be packed with them.

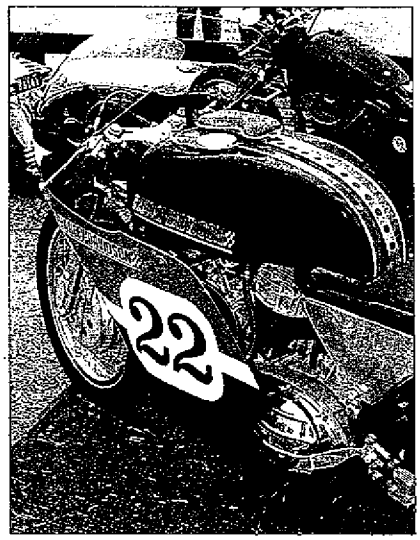
Since a dirt-track KR actually cost $95 less than a stock road-going Sportster during the mid-1960s, perhaps this wasn't too surprising.

The road racers, too, were capable of surprising feats. At the super-fast Daytona Speedway, streamlined KRs have been recorded in excess of 150mph (240kph), an astonishing achievement for a side-valve machine.

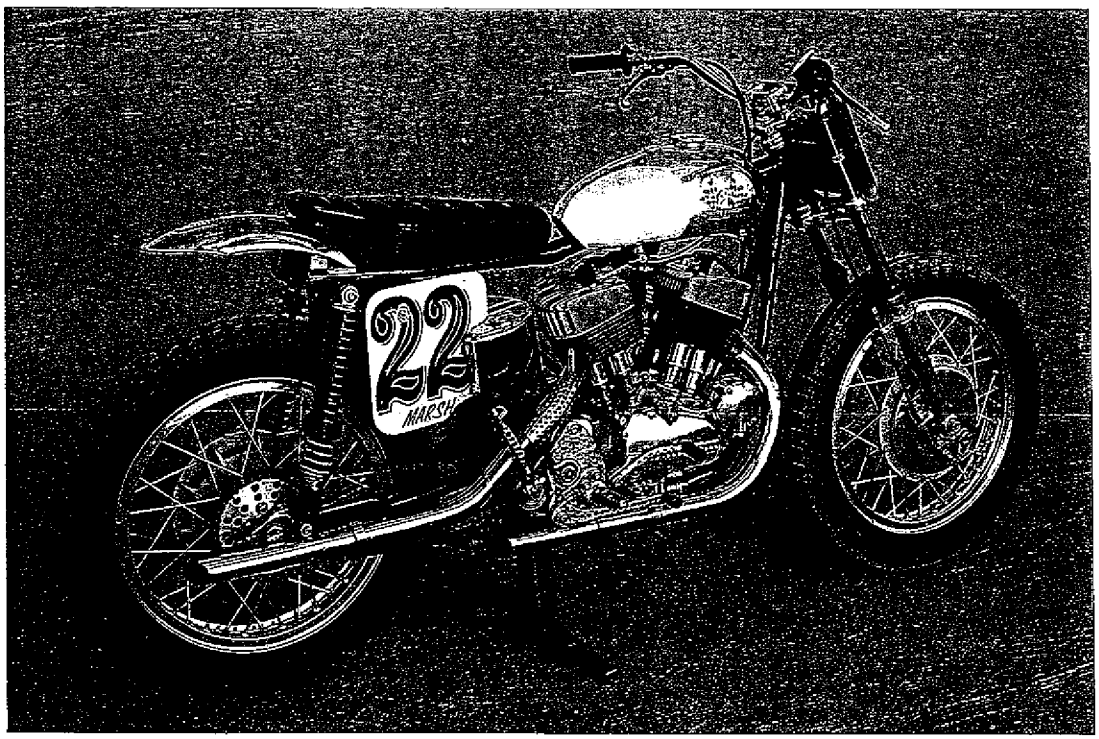
For all their shortcomings, in the hands of racing aces such as Markel and Resweber, they managed to win a round dozen American national titles during their 18 years on the grid.

The KR's astonishing span came to an end in 1969 when the AMA ended discriminatory limitations on overseas machines.

Faced with a level playing field, there was no way that the redoubtable old flathead "45" could compete with the machines that were coming in from abroad.



■ ABOVE RIGHT *A KRTT in Harley's famous orange and black factory racing colours.*

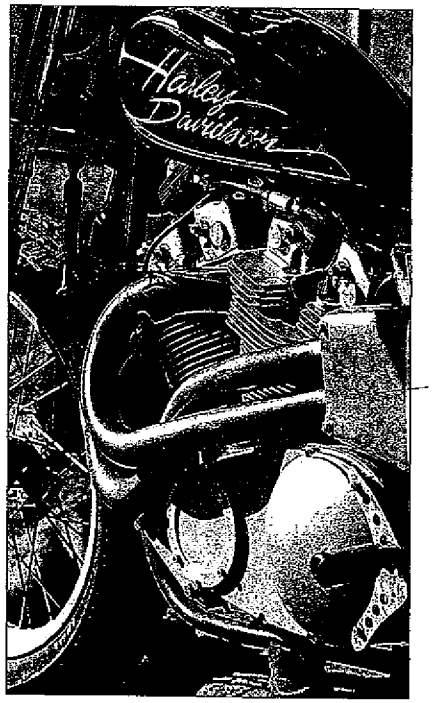


■ RIGHT *This dirt tracker wears TT-type rear suspension and brakes, although both the shock absorbers and front forks are non-period items.*

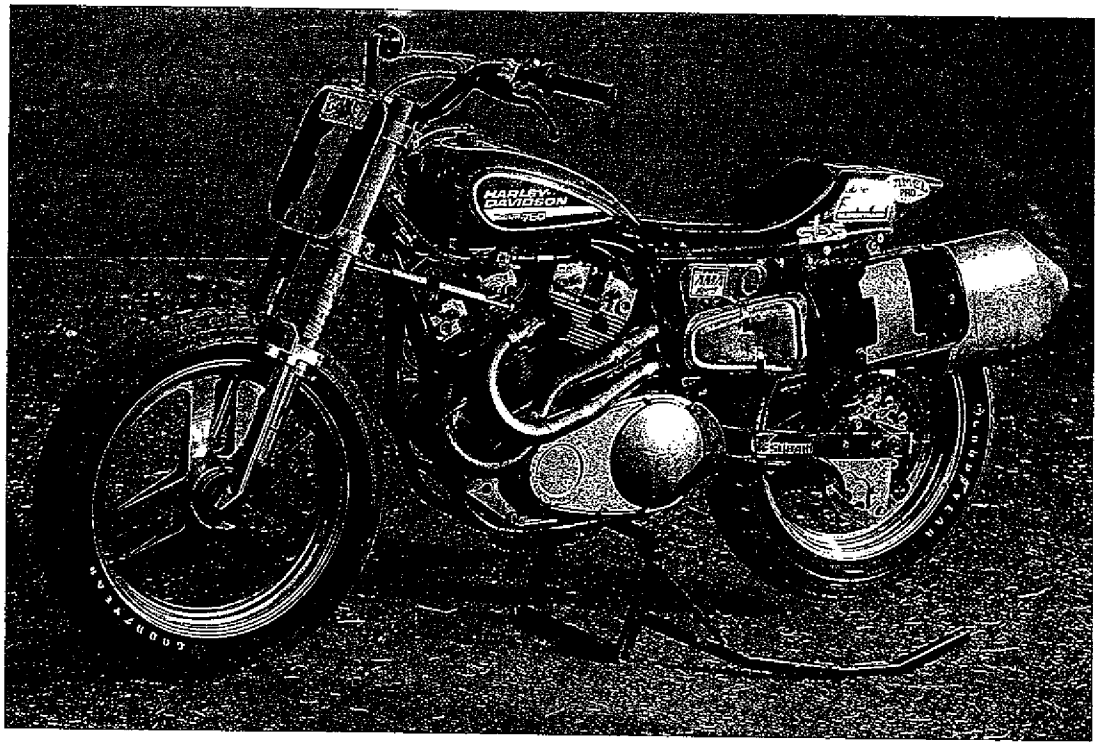
XR750 FLAT-TRACKER, 1970–PRESENT

To many people's eyes – and ears – the XR750 dirt-track machine is the most handsome, the raunchiest and the most purposeful piece of kit ever to rumble out of Milwaukee. Certainly no other Harley-Davidson has enjoyed so much competition success over so many years as the seminal XR. After almost two decades plugging along on the side-valve KR twin, the arrival of an overhead-valve replacement in 1970 must have been keenly anticipated. Yet its debut year was to prove a deep disappointment when Mert Lawwill and Mark Brelsford could manage only a disappointing sixth and seventh in the AMA championship. Just 12 months earlier, Lawwill had won the title on a side-valve KR.

The problem was the new engine's iron cylinders. They were heavy and conducted heat much less efficiently than aluminium components. This in turn meant that the motor's compression ratio had to be drastically reduced – to around 8:1 – if fatal breakdowns were to be avoided. With lumpier pistons, the iron XR had proven fast – but it just couldn't last the distance. In 1970, race boss Dick O'Brien admitted to a lowly 62bhp at 6,200rpm. In June 1971, light alloy replaced iron, and the XR750 hasn't looked back.

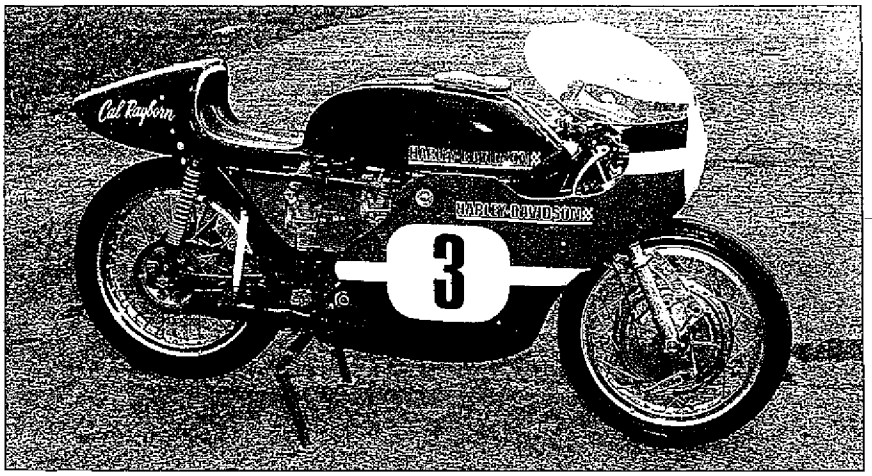


SPECIFICATIONS	
Engine	ohv V-twin
Capacity	45.8cu in (750cc)
Transmission	4-speed
Power	around 95 bhp
Weight	290lbs (132kg)
Top speed	130mph (210kph)



■ ABOVE LEFT *Despite troubled beginnings, the XR went on to sweep away all before it in American dirt-track racing – with only occasional help from the rules when Honda's RS750 got too close.*

■ LEFT *Only that ugly California-mandated silencer mars the XR750's brutal yet beautiful lines.*

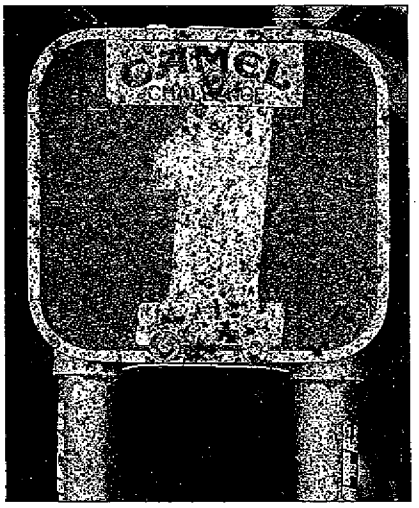


■ LEFT *The XR was also briefly successful in road racing, notably with Cal Rayborn in control. This is the iron-head machine on which he won the 1972 Transatlantic Series.*

On dirt, Mark Brelsford took the XR to the 1972 American Number One plate in its maiden season. At Easter the same year, the great Cal Rayborn whipped all comers in the annual USA v Great Britain road-race series.

At the heart of the XR is that rarest of beasts, a short-stroke Harley-Davidson. "Iron-head" XRs used what were essentially de-stroked 883cc Sportster engines, retaining the road machine's 72mm bore but with a shorter 82mm stroke. The 1972 engine's cylinders measured 79.4 x 75.8mm – by comparison, the side-valve KR measured an ultra-long-stroke 70 x 97mm. This, allied to a much stronger crankshaft, permitted more revs as well as a substantially higher 10.5:1 compression ratio made possible by the use of light alloy. The result was a dramatic rise in power and reliability. Shortly after Rayborn's Transatlantic road-race triumph (which was, ironically, on an iron-head engine), peak power was reputed to be around 80bhp at 8,000rpm. Even so, for many years even the light alloy XR ran dangerously hot – road-racers employed two oil coolers yet were worn out after only 200 miles (320km) – until the internal oil circulation was improved.

At the outset, carburation was by twin 1⅛in (36mm) Japanese Mikuni instruments (often larger on the road racers). Sparks were provided by a Fairbanks-Morse magneto, an unreliable system sometimes dubbed "Can't Get Worse" by unhappy riders. The lightweight, high-grade steel frame used Ceriani forks and paired Girling rear shock absorbers. Dry weight was a feather-light 291lb (132kg), although the road racers, with a fairing and brakes, were somewhat heavier.



■ ABOVE *They still fight for it: the coveted AMA Number One plate.*

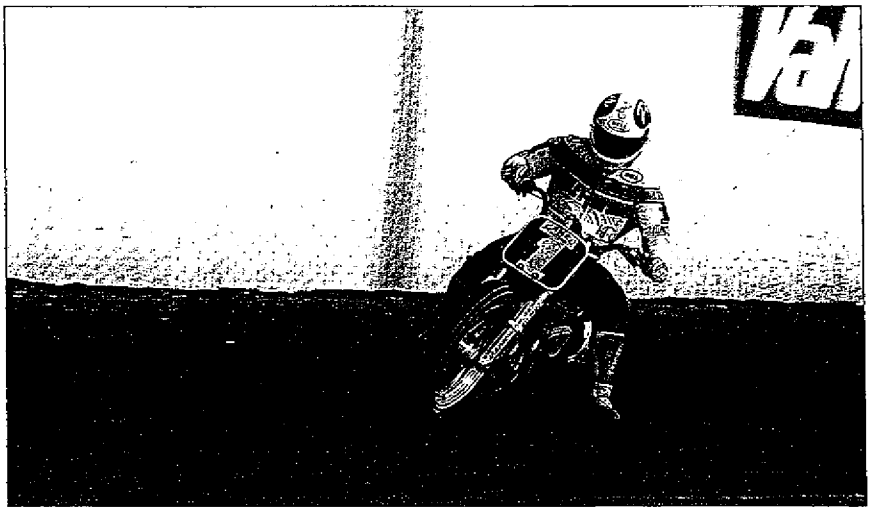
■ BELOW *Nine times AMA Number One Scott Parker, here in action at Sacramento. All his titles have been XR-powered.*

Almost 30 years of detailed development have left the XR engine little changed visually, but without equal for the demands of dirt-track competition.

These days, power is around 95bhp at 7,800rpm, with a strong spread from 4,500 to more than 8,000rpm. On one mile (1.61km) ovals, this is good for a top speed of around 130mph (210kph), although it's the way that the big twin finds grip that really sets it apart from the others on the field.

True, the XR soon became obsolete as a road racer, but has gone from strength to strength on the dirt tracks of the United States.

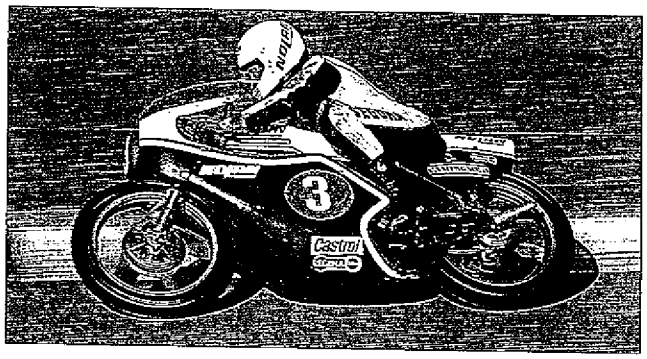
In the hands of men like Brelsford, Gary Scott, Jay Springsteen and Scott Parker, the XR has simply swept away all before it, taking three-quarters of all the subsequent AMA championships.



RR250, RR350 1971–6

The twin cylinder, two-stroke racers built at Varese during the 1970s brought Harley-Davidson its sole successes in post-war grand prix road racing. These were state-of-the-art machines, broadly similar to the stroker twins produced by Yamaha and Kawasaki, with fierce powerbands, strident exhaust notes and performance belying their relatively small engine displacement. To cope with the narrow band of usable revs, the gearbox held six speeds – and might well have held more if this were not prohibited by FIM regulations.

The 250's 56.2 x 50mm cylinders were fed via rotary disc valves by twin 34mm Mikuni carburettors. The earliest examples were air-cooled but the factory soon switched to liquid-cooling, bringing far greater temperature stability and reliability during long grand prix races. Primary drive was by gear, to a multi-plate dry clutch and thence to the six-speed "box". Power output was prodigious (particularly by Milwaukee's four-stroke standards), with the 250 producing 58bhp at 12,000rpm and the 350 a dozen horsepower more at 11,400rpm. The 250's figure equates to over 232bhp per litre, compared to a mere 65 for the KR750 which had been Harley-Davidson's racing mainstay at the time RR250 development began.



■ LEFT *The great Walter Villa at speed on the RR250 at the notorious Nurburgring circuit in 1978. He failed to finish. Note that the machine still relies on a drum front brake.*

SPECIFICATIONS: RR250

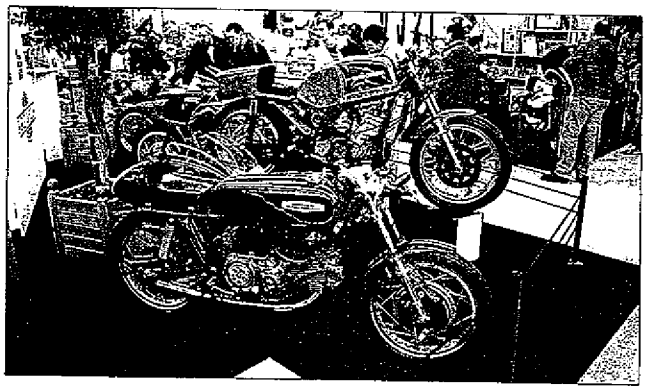
Engine	liquid-cooled twin cylinder 2-stroke
Capacity	15.1cu in (248cc)
Transmission	6-speed
Peak power	58bhp @12,000rpm
Weight	230lbs (104kg)
Top speed	140mph (225kph)

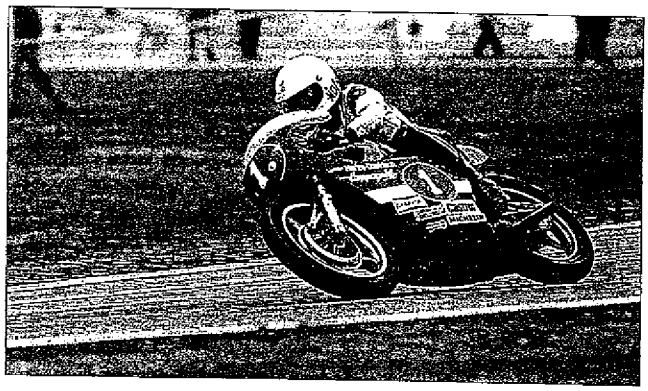
■ BELOW LEFT *Built at Varese, the RR250 (front model, as shown here) has brought Harley its only successes at grands prix since the Second World War.*

■ BELOW RIGHT *Villa on the RR350 at Hockenheim in 1977, carrying the world champion's Number One. He finished third in the 250cc world championship that year, but the 350 proved less competitive.*

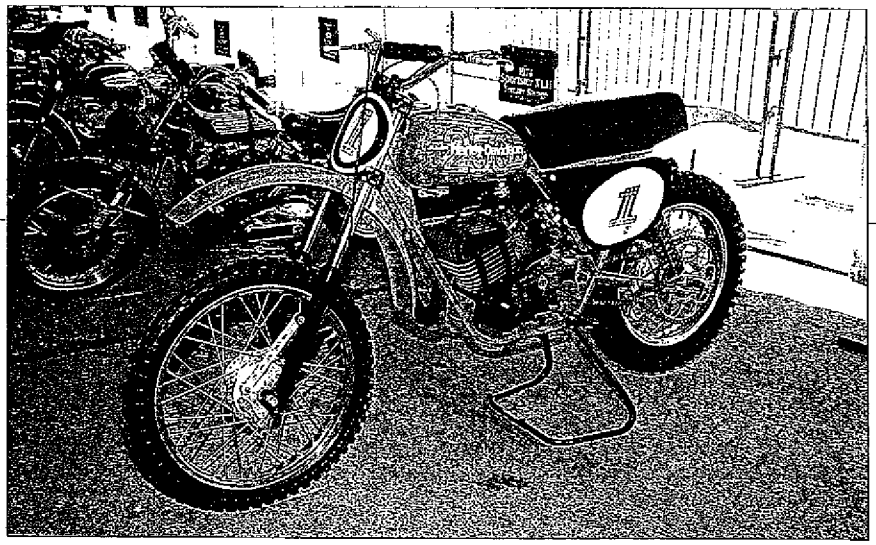
The chassis featured a conventional twin cradle of high-grade tubular steel. Italian Ceriani suspension graced the front end with a pair of English Girling shock absorbers at the rear. The whole package weighed just 230lbs (104kg). If the machine had a shortcoming, it was the use of drum brakes (albeit a double-sided twin-leading shoe affair at the front) when hydraulic discs were already in widespread use and far superior. Discs finally arrived in 1976, by which time the great Walter Villa had already taken two 250cc world titles.

With better brakes, he repeated the feat in 1976, adding the 350cc title for good measure. RRs also campaigned successfully in American road races, ridden by Gary Scott, Jay Springsteen, Cal Rayborn and others.





MX250 1977–8



Harley-Davidson's only venture into mainstream motocross produced a highly competitive machine which could have become better still had Milwaukee not severed its Italian links after just two years of MX production. By the time the MX250 came on stream in 1977, Varese had developed a formidable pool of two-stroke know-how, not least from its successful grand prix road-racing experience.

Four years after its official demise, the great Jay Springsteen mischievously used an MX-based machine to win the first AMA event of the 1982 season in Houston. We can only speculate about where this potential might have led.

The single-cylinder stroker used a short-stroke (72 x 59.6mm) engine which drove an integral five-speed transmission via gear primary drive and wet multi-plate clutch – such as you might find on any dirt-bike today.

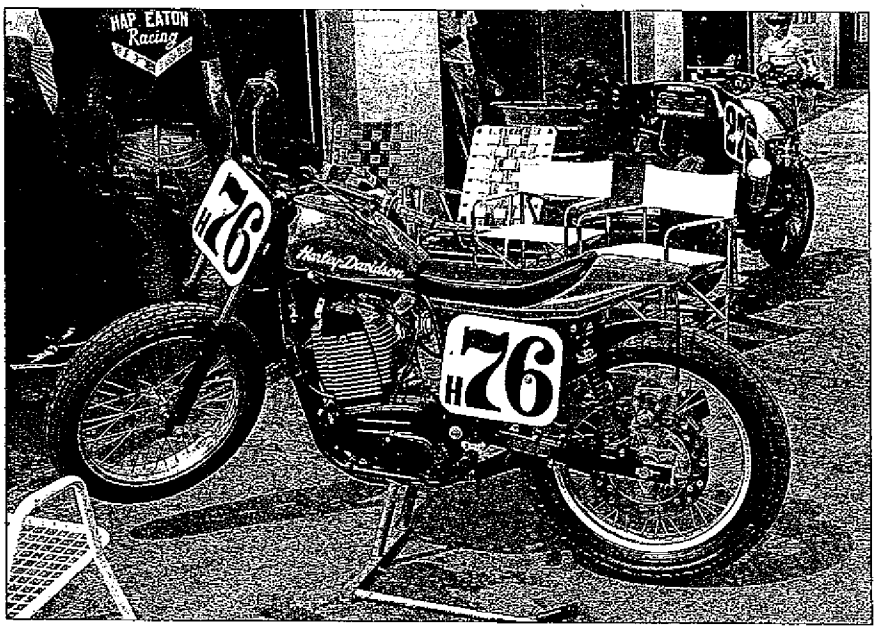
Initial examples were air-cooled, but a liquid-cooled version came later. A 38mm Italian dell'Orto carburettor provided the fuel (mixed 20:1 with oil for lubrication), while sparks came from a CDI generator on the left end of the crankshaft. During development, peak power rose to a ferocious 58bhp at a giddy 12,000rpm. Telescopic forks provided a generous 9in (228mm) of travel with a similar degree of movement that came from the twin rear shock absorbers.

Light alloy Akront rims were laced to simple 5½in (140mm) drum brakes (as discs were not yet used on dirt-bikes).

■ ABOVE AND LEFT *Harley's Italian-designed and built MX250 motocrosser benefited from lessons learned in grand prix road racing and might have gone on to great things had Varese not been sold.*

SPECIFICATIONS

Engine	single-cylinder 2-stroke
Capacity	14.8cu in (242cc)
Transmission	5-speed
Peak power	58bhp @12,000rpm
Weight	233lbs (106kg)
Wheelbase	57.3in (1,455mm)
Top speed	n/a

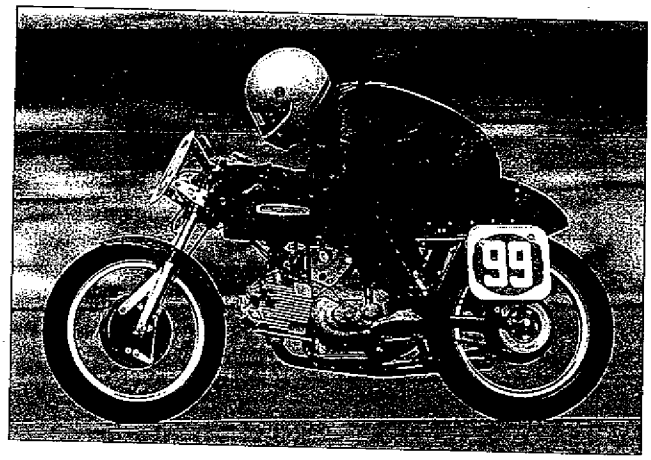


■ RIGHT *The MX250 was Harley's most serious venture into motocross.*

AERMACCHI OHV RACERS 1961–78

Originally an aircraft factory – hence the name – Aermacchi diversified into motorcycle production in 1948, in Varese, Italy. Its first models were 123cc (7.5cu in) singles – two-strokes but already possessing the horizontal cylinder which was to become so typical of the marque. Overhead valve four-stroke singles followed, both road bikes and the potent Ala D'Oro (Golden Wing) production racer. A generation of elegant racing models were developed from the late 1950s onwards, based on this Alfredo Bianchi-designed machine.

Although the racers were built in both 250cc (15cu in) and 350cc (21cu in) versions, it was the latter which achieved the greater success. Even during the 1960s, a single-cylinder push-rod machine was an anachronism among the exotica then crowding the grands prix grids, yet the "Macchi" exploited its fine handling, light weight and slim aerodynamic profile to the fullest. Its best world-championship performance came in 1966 when the late Renzo Pasolini – the "Paso" in the Ducati model of the same name – took third place in the 350cc grand prix championship.

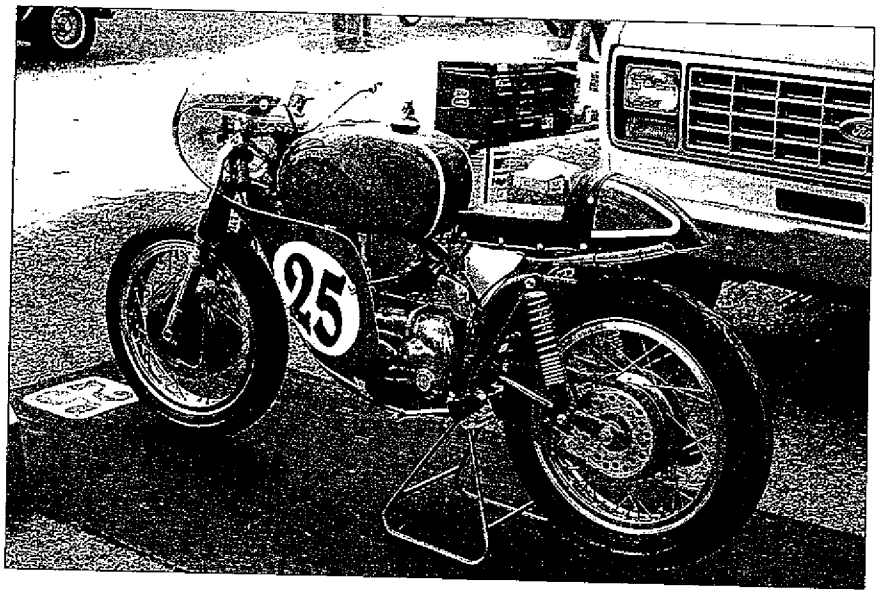


■ LEFT *An Aermacchi 250 at speed. Light weight and a slim profile made them astonishingly fast.*

■ BELOW LEFT *A CRTT 250 in factory racing livery.*

SPECIFICATIONS: 350

Engine	ohv horizontal single
Capacity	344cc (21cu in)
Transmission	5-speed
Power	38bhp
Weight	245lbs (111kg)
Wheelbase	not known
Top Speed	130mph (210kph)



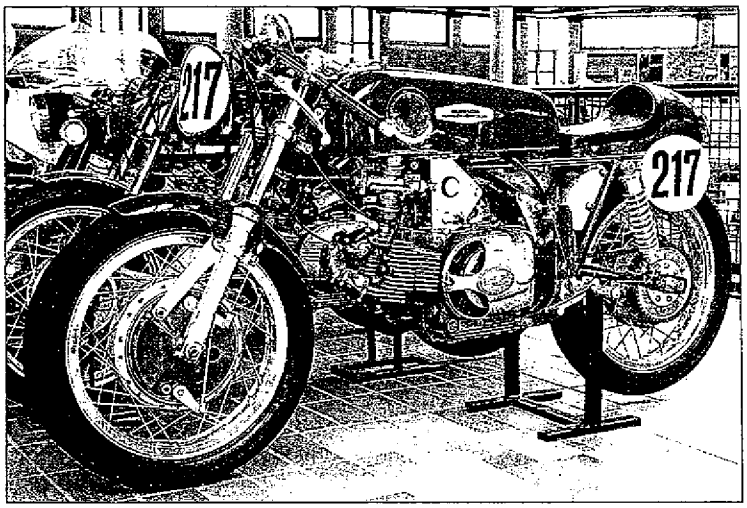
It was as a privateer mount that the little "Macchi" achieved its greatest popularity and success however, although it also had a reputation for being temperamental unless expertly set up. Perhaps its most remarkable performance came in the 1970 Isle of Man TT races when Alan Barnett lapped the daunting Mountain Course at a stunning 99.32mph (159.84kph) on a Syd Lawton 350, recording well over 40mpg (15km/litre) in the process.

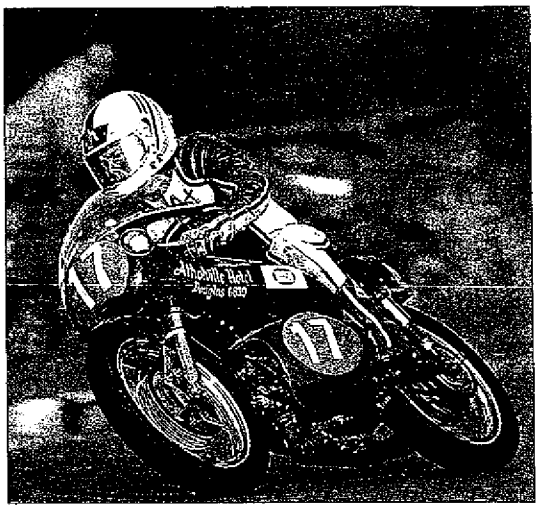
Nor were the ohv single's exploits confined to the track. On 21 October 1965, a 250cc Aermacchi established a world mile record of 176.817mph (284.55kph) and kilometre record of 285.21kph (177.225mph) at Utah's Bonneville salt flats. Although nominally a Sprint roadster, the machine in question used a 1966-specification CR racing engine on standard pump fuel. Officially, Milwaukee dubbed its Italian singles CR, CRS and CRTT, although in Europe these designations were largely ignored.

The single was produced with many variations over the years, but the 350's

■ BELOW *A brace of ex-factory racers. Note the racing dry clutch.*

■ BELOW *A 350 'Macchi contesting the 1984 Historic Isle of Man TT. Ironically this was the only TT ever won by an American – on a British Matchless machine.*





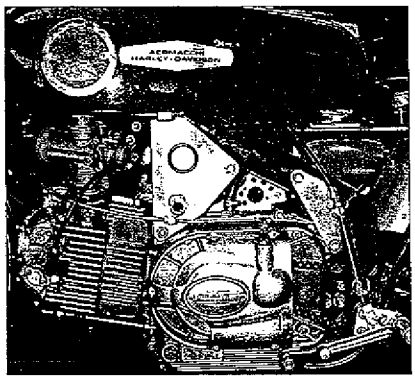
typical power output was around 38bhp at 8,400rpm. Bore and stroke were under-square at 74 x 80mm, although this incurred a dangerously high piston speed (almost 4,400ft/1,340m) at maximum revs. As a result, other configurations were also built, including short stroke and ultra-short stroke examples. Compression was high – around 11.4:1 – and the engine breathed through a 35mm dell'Orto carburettor tipped almost vertically to feed fuel into the horizontal cylinder. A short megaphone exhaust swept down the right side of the machine.

The racer was available with a choice of "A" or "B" gear clusters, the latter offering the closer ratios, although the engine delivered a reasonable spread of power considering its high state of tune.

The chassis was simple in the extreme, using a large-diameter tubular steel spine, which was reputedly to flex but in a controlled, user-friendly way which gave the rider ample feedback.

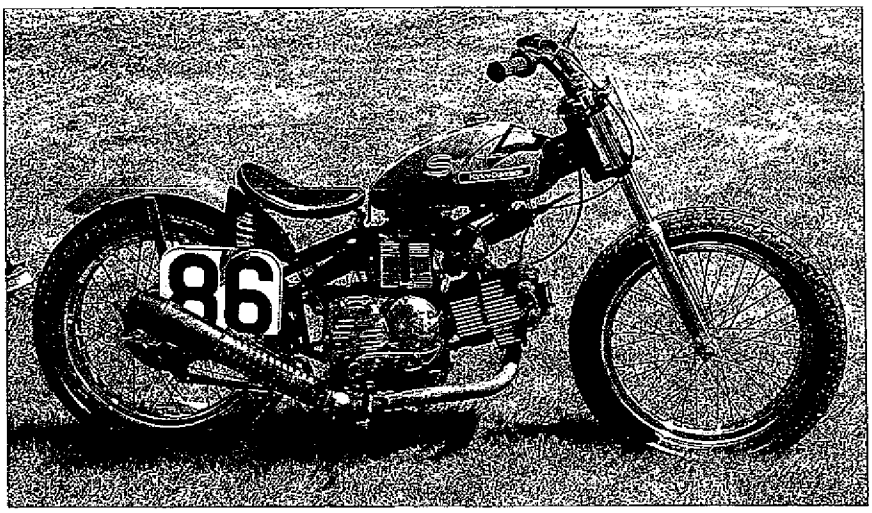
A variety of suspension and brake components were employed, invariably with telescopic forks (usually Ceriani), twin rear shock absorbers and drum brakes. On later versions, the front drum was often twin-sided.

A measure of the machine's excellence is the sheer joy – and speed – with which many contest classic races today.



■ LEFT *Pictured here, the engine of a 1969 350 Aermacchi.*

■ BELOW *In the USA, Aermacchis derived from the Sport roadster were also popular for dirt-track racing.*



LUCIFER'S HAMMER, 1983

■ BELOW *Lucifer's Hammer's engine was based on that of an XR750 competition model.*

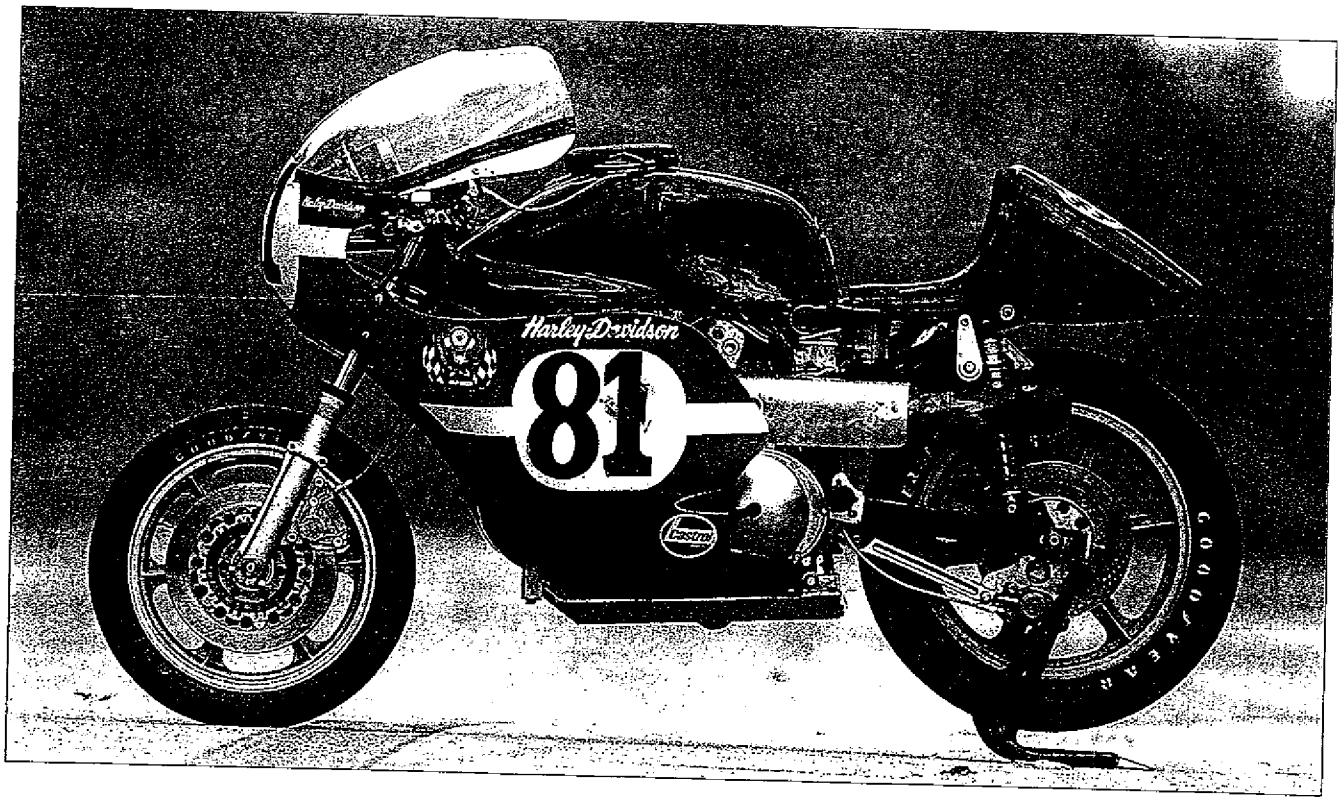
In the spring of 1983, Lucifer's Hammer was the first big twin for a decade to carry Harley-Davidson's famous black and orange racing livery on to the Daytona speed bowl. It certainly did so with distinction, taking the great Jay Springsteen – better known as a dirt-track rider but certainly no slouch on tarmac – to victory in the Battle of the Twins event. In October of the same year, Gene Church began a love affair with the same machine when he rode it triumphantly in the BoT finals, also held at Daytona.

The Hammer represented one of those bouts of enthusiasm and expertise with the big twin that were often typical of Harley-Davidson. The germ of the project began when Dave McClure rode a prototype XR1000 street bike at Daytona the previous autumn, which suggested that a full-on racer project might succeed. Once race-boss Dick O'Brien got the go-ahead to build what would become the Springsteen machine, he set his hand-picked team into action. Engine work was put in the hands of Don Habermehl, while racing legend Carroll Resweber (four times AMA champion for Harley, 1958 to 1961) put his considerable talents into the chassis, and Peter Zylstra oversaw the design. To some extent, the machine was also a test-bed and publicity statement for the XR1000 roadster unveiled at the same Daytona meeting, another project which very much carried the O'Brien imprint.

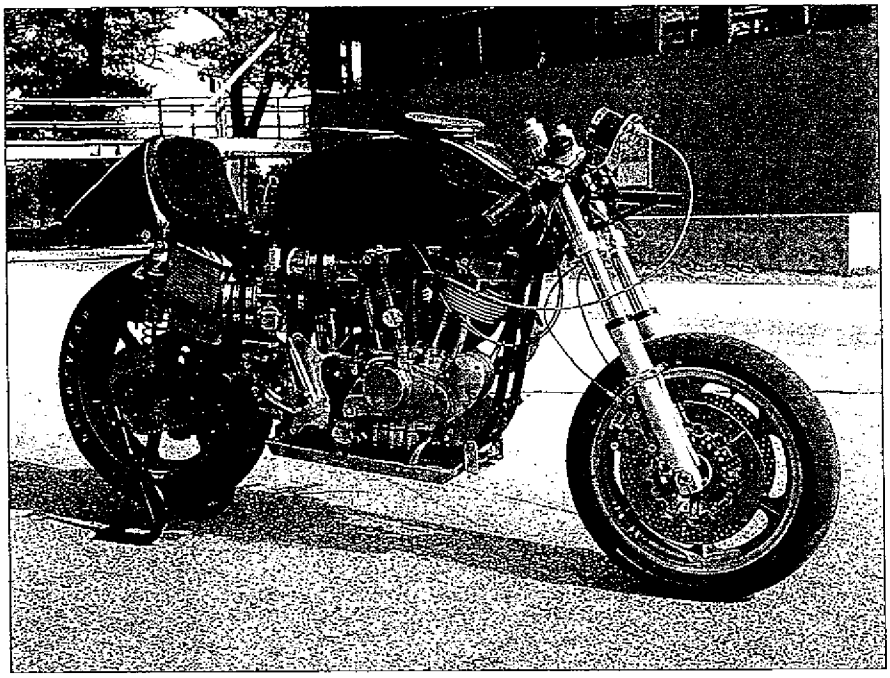
SPECIFICATIONS	
Engine	ohv V-twin
Capacity	60.9cu in (998cc)
Transmission	4-speed
Power	104bhp
Weight	286lbs (130kg)
Wheelbase	56in (1,420mm)
Top speed	158mph (254kph)

The engine consisted of a modified competition XR750 bottom end and light alloy heads mated to iron Sportster barrels. Twin 42mm smoothbore Mikuni carburettors took care of induction, feeding exotic 110 octane aviation fuel – for nothing less would handle the engine's giddy 10.5:1 compression ratio. To improve combustion, each cylinder boasted twin spark plugs, fired by a total-loss racing ignition system.

In dyno tests, this device had put out a brutal 106bhp at 7,500rpm, but fears



■ BELOW *The Hammer with fairing removed, at Daytona in 1983.*

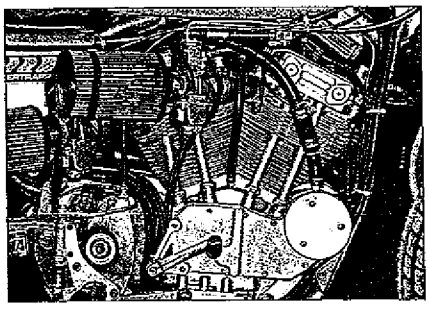


about reliability caused Habermehl to impose a rev ceiling of 7,000rpm, at which point the big twin was pumping out 104bhp. Since even this equated to a dizzying mean piston speed of 4,430 ft/min (1,350m/min), the precaution must have been wise. Not only was power prodigious but the spread was enormous, too, coming in strongly by 4,000rpm. A four-speed gearbox was more than adequate. Resweber's chassis employed the very XR750 frame comprehensively crashed by then-AMA champion Mark Brelsford at Daytona fully ten years before the Hammer's 1983 win. The basic single spine and twin tube cradle was heavily reworked with extra gussets and bracing, mated to an all-new box-section swing-arm.

The rest was essentially an Italian affair: front suspension was in the hands of a pair of 1.57in (40mm) Forcelli Italia forks, with twin Fox gas shock absorbers at the rear. Brembo supplied the brakes: twin 11.8in (300mm) floating-front disc brakes, with a 9.8in (250mm) disc at the rear. These ran on Campagnolo magnesium wheels, 16in (406mm) front wheel, 18in (457mm) rear, both shod with Goodyear racing slick tyres. Dry weight was a remarkably lean 285lbs (130kg) and top speed an even more impressive 158mph (254kph).

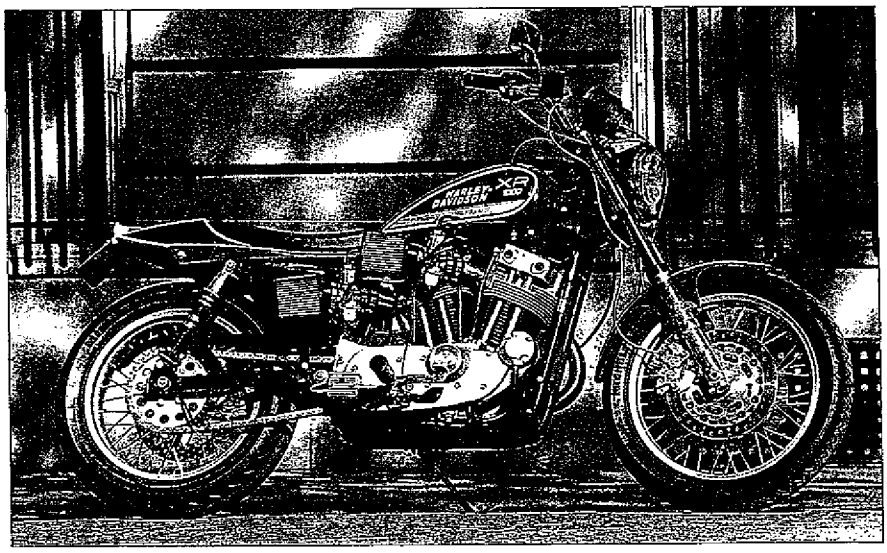
After its winning Daytona debut, Gene Church went on to take the HOG-sponsored Hammer to three AMA Battle of the Twins titles.

All of this success was not really too bad for a bike that began its life as a ten-year-old scrap!

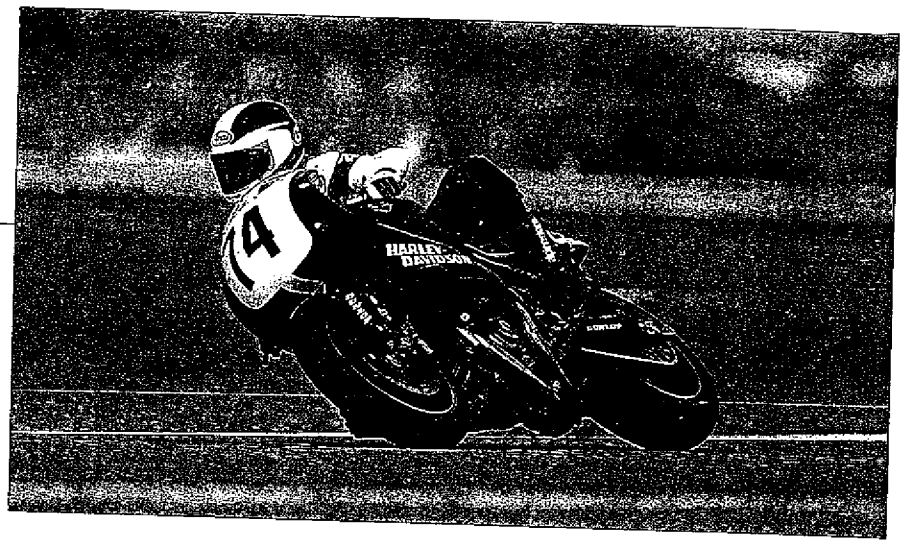


■ ABOVE *The Hammer owed many of its engine parts to the XR750 flat-tracker.*

■ RIGHT *The road-going XR1000 (shown here) is blood brother to the awesome Lucifer's Hammer.*



VR1000, 1997–PRESENT



■ ABOVE *Chris Carr in action on the VR1000 at Daytona Raceway. In 1999, Carr returned to dirt track and claimed the AMA title.*

The VR1000, which has been flying Milwaukee's road-racing flag through the latter half of the 1990s is a Harley even the faithful scarcely believe. It's a V-twin, true, but with twin overhead camshafts, and its cylinders are liquid-cooled and splayed at a sacrilegious 60 degrees. True, its four valves per cylinder have been done by Milwaukee before – but not for 70-odd years.

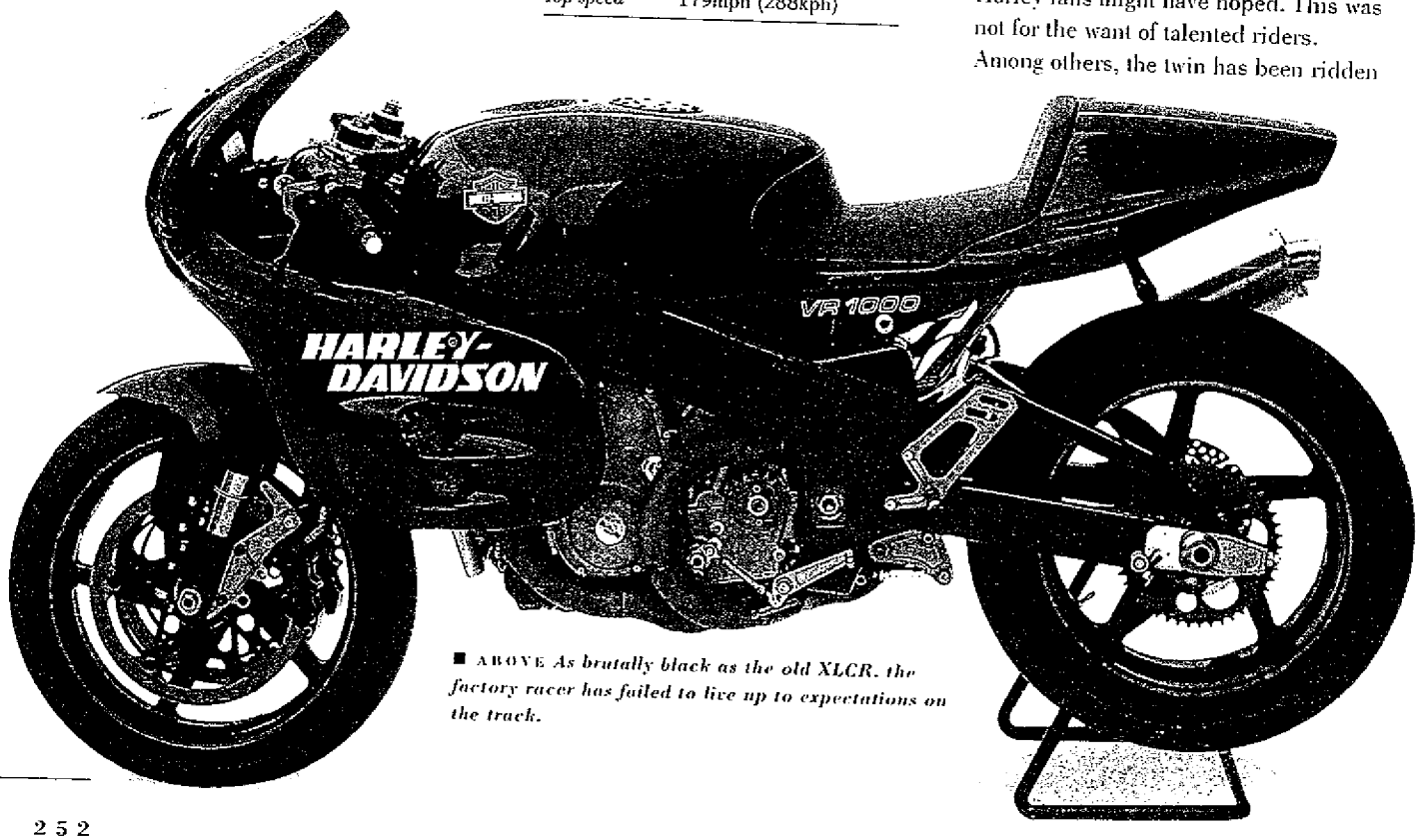
Clearly the VR is not your typical Hog. It's built in the United States, says "Harley-Davidson" on the side, and is decked out in classic black and orange racing livery. But it probably doesn't share a single part with any other Milwaukee model.

The machine uses Harley's own purpose-built powerplant, which looks for all the world like one quarter of a V8 car engine in its design and construction. Almost everything else is bought-in from quality suppliers, such as Swedish Ohlins suspension and Italian Marchesini magnesium-alloy cast wheels. The whole is tied together, not by American steel, but by a massively stiff twin-beam aluminium chassis. Erik Buell was one of the original development engineers on the project, while the race team is run by Steve Shybee.

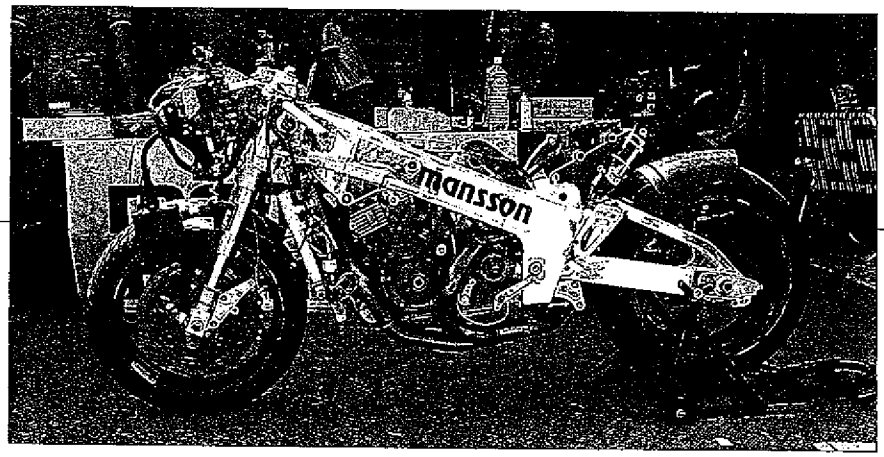
SPECIFICATIONS

Engine	dohc V-twin
Capacity	60.8cu in (996cc)
Transmission	6-speed
Power	171bhp
Weight	373lbs (169kg)
Wheelbase	55.1in (1,400mm)
Top speed	179mph (288kph)

In its early years, ridden by the mercurial Miguel du Hamel, the VR proved surprisingly potent, pumping out more than 120bhp at 10,800rpm. Yet it did not make the progress for which Harley fans might have hoped. This was not for the want of talented riders. Among others, the twin has been ridden



■ ABOVE *As brutally black as the old XLCR, the factory racer has failed to live up to expectations on the track.*



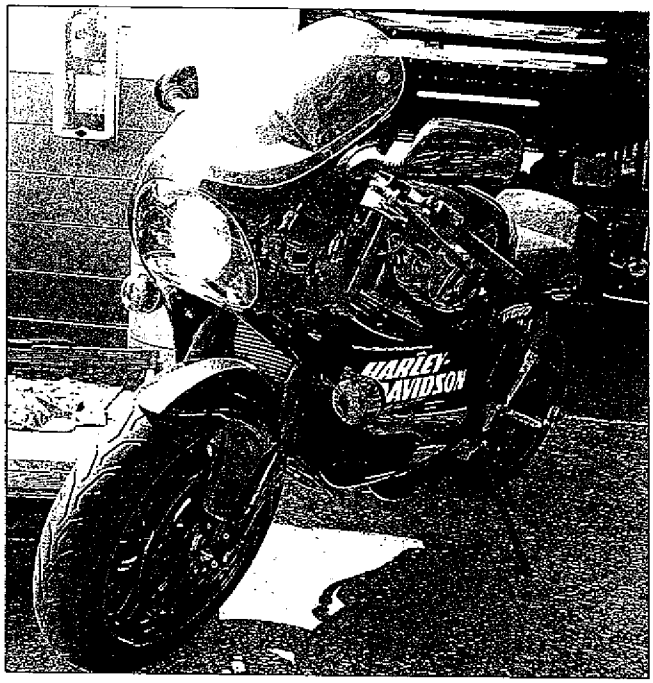
■ RIGHT *A private racing VR with special lightweight frame. The 60-degree engine layout is apparent with bodywork removed.*

by AMA Number 1 Chris Carr. Thomas Wilson, Doug Chandler and former World Superbike champion Scott Russell. The bike continued to improve, but not quickly enough. Observers were often surprised at the lack of all-out effort the factory appeared to put into the project. As a racer, it had one fatal and embarrassing flaw: it didn't win. No wonder onlookers – Harley devotees and not – struggled to comprehend quite what the VR1000 was for.

Even the VR's noted tractability could not overcome this sort of deficit. Although it could be competitive in wet conditions, it lacked at least 30bhp compared to similar Ducati twins. During 1998–9, however, an intensive programme of development work began to show startling results. Peak power soared to more than 170bhp, giving a measured top speed of 179mph (288kph) around the Daytona banking. Rider Pascal Picotte, in particular, posted some impressive results during 1999, although he could manage no better than twelfth place in the American MBNA Superbike championship. Team mate Scott Russell placed twentieth.

Some VRs have been sold to private teams, with an odd route to racing legality. To qualify for competition, these must be street-legal – not necessarily in the USA, but somewhere. The United States is a very expensive place to make any motorcycle legal, so a limited-edition run of 50 "roadster" VRs flew a flag of convenience. No, not Liberia, but the truth is almost as absurd. The VR1000 met the relevant standards for road-going motorcycles – in Poland.

Nonetheless, this high-tech device – the only racer in the world, for instance, to run a carbon multi-plate clutch – remains a puzzle. What is the purpose of the VR1000? Is it a rolling test-bed for hardware that might appear on future roadsters? Or is it the basis for a future roadster model? Racing people close to the factory team have suggested that a road-going liquid-cooled sports bike may be a genuine possibility. Some even believe that such a device could blow away even a Ducati V-twin; traditional Harley die-hards must throw up their hands in horror at the very thought. Wherever you stand, like the rest of us, you'll just have to wait and see.



■ FAR LEFT *Note the slim lines of the Superbike VR. The ventilated dry clutch would later be replaced by an exotic multi-plate carbon assembly.*

■ LEFT *What the future might hold: a sneak shot of a prototype roadster VR1000.*

GLOSSARY

Air cleaner: A filter for removing dust from the air entering the engine.
Air-cooled: An engine which is cooled directly by the air flowing over it, rather than via a liquid-filled radiator.
Alternator: An electrical generator producing alternating current which must then be converted to direct current by a rectifier.
AMA: American Motorcycle Association (governing body of American bike racing).
Bearing: Placed between two rubbing or turning components to reduce friction. Can be "plain" or with moving balls or rollers.
bhp (brake horsepower): Engine power as measured on a dynamometer, on which the engine is run against a resistance or "brake". Horsepower is essentially torque times revs.
Big end: The connection between con-rod and crankshaft.
Bore: Diameter of the cylinder in which the piston travels.
Bottom end: The engine below the cylinder, containing crankshaft, bearings, oil pump, etc.
CAD: Computer-aided design.
Camshaft: A lobed shaft turning at half engine speed which operates the valves.
Carburettor: Instrument that mixes fuel and air for combustion.
Choke: A device that enriches the fuel and air mixture to facilitate cold starts; also the carburettor venturi.
Clutch: A device which allows the rear wheel to be isolated from the turning of the engine.
Coil: An electrical device which turns low-voltage current into high-voltage for the spark plug.
Compression: The extent to which the piston "squeezes" the fuel and air mixture, expressed as a ratio of maximum to minimum volume.
Con-rod (connecting rod): A (usually steel) member connecting the crankshaft to the piston.
Crankcases: The (usually aluminium) housing containing bottom end components. These are commonly split into pairs.
Crankshaft: An eccentric (cranked) shaft on which the con-rods run, held in the crankcases by the main bearings; it turns the piston's reciprocating action into rotary motion.
Cylinder: A cylindrical "barrel" in which the piston moves up and down.
Disc: A type of brake in which "pads" of friction material are squeezed against rotating disc(s) attached to the wheel.
Displacement: An engine's capacity, i.e. total volume displaced by an engine's pistons.
Drum: A type of brake in which a mechanism forces "shoes" against the inside of a drum in the wheel hub.
Dry-sump: An engine in which lubricating oil is located in a separate tank rather than the sump.
Evo: The 1,340cc V2 Evolution engine produced from 1984.
F-head: An ioe cylinder head.
Flathead: Any side-valve engine.
Flywheel: A heavy disc spinning with the crankshaft which stores engine inertia and "smooths out" power pulses.
Gearbox: A housing in which lie the shafts on which the transmission gears run.
Gudgeon pin (wrist pin in the USA): A steel tube connecting the piston to the small end.
Hardtail: A rigid, i.e. unsprung, motorcycle rear end.
Hog: Nickname given to any Harley-Davidson model.
HOG: Harley Owners' Group.
Horsepower: Torque times revs, the actual power output of an engine. However, in the early years, an engine's rated horsepower was simply a function of engine displacement.
Hydraulic: Operated by pressure in a fluid, as with disc brakes or hydraulic "lifters".
ioe (inlet-over-exhaust): The earliest type of valve arrangement, with a side exhaust valve facing an overhead inlet valve. The latter could be "automatic" or mechanically operated.
Knucklehead: Harley's first ohv engine, 1936–47.
Lifter (USA): A push-rod. Also hydraulic lifters.
Magneto: An early, free-standing device which generates (and times) the ignition spark.
Mudguard: fender (USA).
ohv (overhead valve): Both valves contained in the cylinder head and actuated by rockers.
Panhead: An ohv Harley engine produced 1948–65.
Piston: An inverted cylindrical "tub" in the cylinder which transmits combustion forces to the crankshaft via the con-rod.
Piston ring: A flexible iron or steel ring located in a groove near the top of the piston which seals against the leakage of combustion gases or oil.
Power: See bhp.
Push-rod (also, solid lifter in the USA): A metal rod which transmits camshaft motion to the valve via the rocker.
Rake: The effective angle of the front forks, expressed in degrees from vertical.
Revs (rpm): Engine revolutions per minute.
Retro-Tech: Modern technology that mimicks old, such as Springer forks.
Rocker: A rocking arm which transmits motion from lifter to the valve.
Shovelhead: An ohv Harley engine produced 1966–84.
Side-valve: "Flathead" engines with both valves below the level of the cylinder head.
Small end (little end): The connection between the piston's gudgeon pin and the con-rod.
Softail: Rear suspension with swing arm and underslung shock absorbers, that is designed to look like a hardtail.
Springer: A modern "Retro-Tech" version of the sprung fork; any Harley-Davidson so fitted.
Sprung fork: Pre-1948 front suspension with solid legs, and (usually) coil spring(s) at the top.
Stroke: The distance travelled by a piston between its top-most and bottom-most points.
Swing-arm: Also known as swinging fork, a pivoting suspension member allowing the rear wheel to move up and down.
Sump: An extension at the bottom of the crankcase containing oil. "Dry sump" engines hold their oil in a separate tank.
Tachometer (rev-counter): An instrument that measures engine revs.
Telescopic fork: Front suspension in which one tube (containing a spring) slides within another, damped by oil.
Timing: Arranging that the spark is delivered (or the valves open and close) at the correct time.
Top end: The engine "above" the base of the cylinder, including the cylinder head.
Trail (castor): The extent to which the front tyre's contact patch trails the point at which the steering angle intersects the ground. Harley-Davidson favours high trail figures which tend to give slower steering and greater stability.
Torque: The turning force applied to the crankshaft (and ultimately the rear wheel) by the force of combustion on the piston.
Venturi: The part of the carburettor through which incoming air passes; also its diameter.
Wheelbase: Distance between the front and rear wheel centres.
Wrist Pin: see gudgeon pin.

HARLEY-DAVIDSON MODEL CODES

The Harley-Davidson company has always favoured a particularly cryptic method of model designation, although the system is in most cases quite simple once the "code" is understood. The first model made in any numbers was the 1908 Model 4 – indicating the fourth year of production. A suffix letter identified the precise model type, such as "A" for magneto ignition, with the most basic model simply known by its model year number. The first "suffix" was actually a prefix: in 1912, "X" before the model year indicated a rear wheel clutch.

Thus, the Model 5 followed in 1909, the Model 6 in 1910 and so on, until all models adopted the last two digits of their year of manufacture from 1916 (Models 16). Thus, Model 16B was a base-model 1916 single, a 16E was the most basic twin and a 16J was a three-speed twin with full electrical system. Unfortunately, Harley's long-standing habit of having lead times – by which you could buy most "year 2000" models in late 1999, for instance, often creates additional ambiguity.

Later, as the range became entirely composed of V-twins, the suffix letters became more elaborate and numerous but the basic year-prefix system continued publicly until 1969 (and technically still does). Initially, there was little attempt to marry a suffix letter logically with what it represented, although in recent times the connection has – usually – been more clear.

Not quite every letter of the alphabet has been used ("Y" is the exception) which would be daunting enough, but several have enjoyed different meanings at different times. Equally, the same "feature" has also commanded different code letters. Thus, electric start has been indicated variously by "B" and "E", while the latter has also represented the 61-inch Knucklehead and Panhead engines (as opposed to "F" for the 74-inch models) and even police spec. In recent times, "B" has variously represented Belt drive, Daytona and Bad Boy, to name but three.

All current Harley-Davidsons start with a pair of letters, denoting certain engine and chassis combinations. Therefore, XL is the Sportster range, with solidly-mounted 883cc or 1,200cc engines. The suffix dates back to the original 55-inch XL Sportster of 1957.

"FX" first appeared for the 1971 SuperGlide when the "X" indicated that the model had borrowed the lighter Sportster front end. The FX suffix now refers to a welter of models with Twin Cam or 81.6cu in (1,340cc) Evo engines. FXD now represents the Dyna series with two-point rubber-mounted engines dating from the FXDB Sturgis frame of 1991. FXST denotes Softails, with engines rigidly mounted in a chassis based on the previous FX range.

"Heavyweight" models (not that most others are light) have enjoyed the FL suffix since 1941, when "F" indicated the new 74-inch Knucklehead engine, of which the Special Sport version was designated "L". These days, it refers to rubber-mounted big twin engines: Electra and TourGlides. Exceptions to this are rigidly-mounted FLST Softail models, such as the Fat Boy and Heritage Softail.

The table on the right outlines a selection of the suffix letters that have been employed.

Suffix	Modern meaning	Historical meaning
A	–	Army (military spec)/without tow bar (on Servi-Car)
B	Bad, as in Bad Boy, Belt Drive and Daytona	Electric start/previously aluminium piston(s)
C	Custom, Classic, Café (as in Café Racer)	"Competition"/Commercial /Canadian spec
CH	–	"Competition Hot": super sports with magneto
D	Dyna, Daytona	At least four other uses
DG	Disc Glide	–
E	(Formerly) electric start. Previously 61-inch ohv engine and some police models	–
F	Fat Boy	As a prefix, 74-inch ohv engine; as suffix, foot change
H	Notionally extra power but largely redundant	Extra power/high compression/larger engine
I	Fuel injection	–
J	–	Battery electrical system (as opposed to magneto)
L	–	Sports specification; "LD" signified Special Sports models
LR	Low Rider	–
N	Nostalgia	Iron piston
P	–	Police model/sprung fork on 1949 ohv models
Q	–	Two passenger sidecar
R	Road King	Racing/pseudo racing (XR1000)
S	Springer, as in the last-letter of FXSTS (Springer Softail) or Sport, as in FLHS (ElectraGlide Sport)	Sidecar specifications/ sometimes Sport
SP	Sport Edition, as in FXRS-SP Low Rider Sport Edition	–
ST	Softail	–
T	Touring, with frame-mounting fairing	Reverse gear/Twin
U	Ultra	"Restricted" engines
WG	WideGlide	–
X	Some Sports models	Rear wheel clutch

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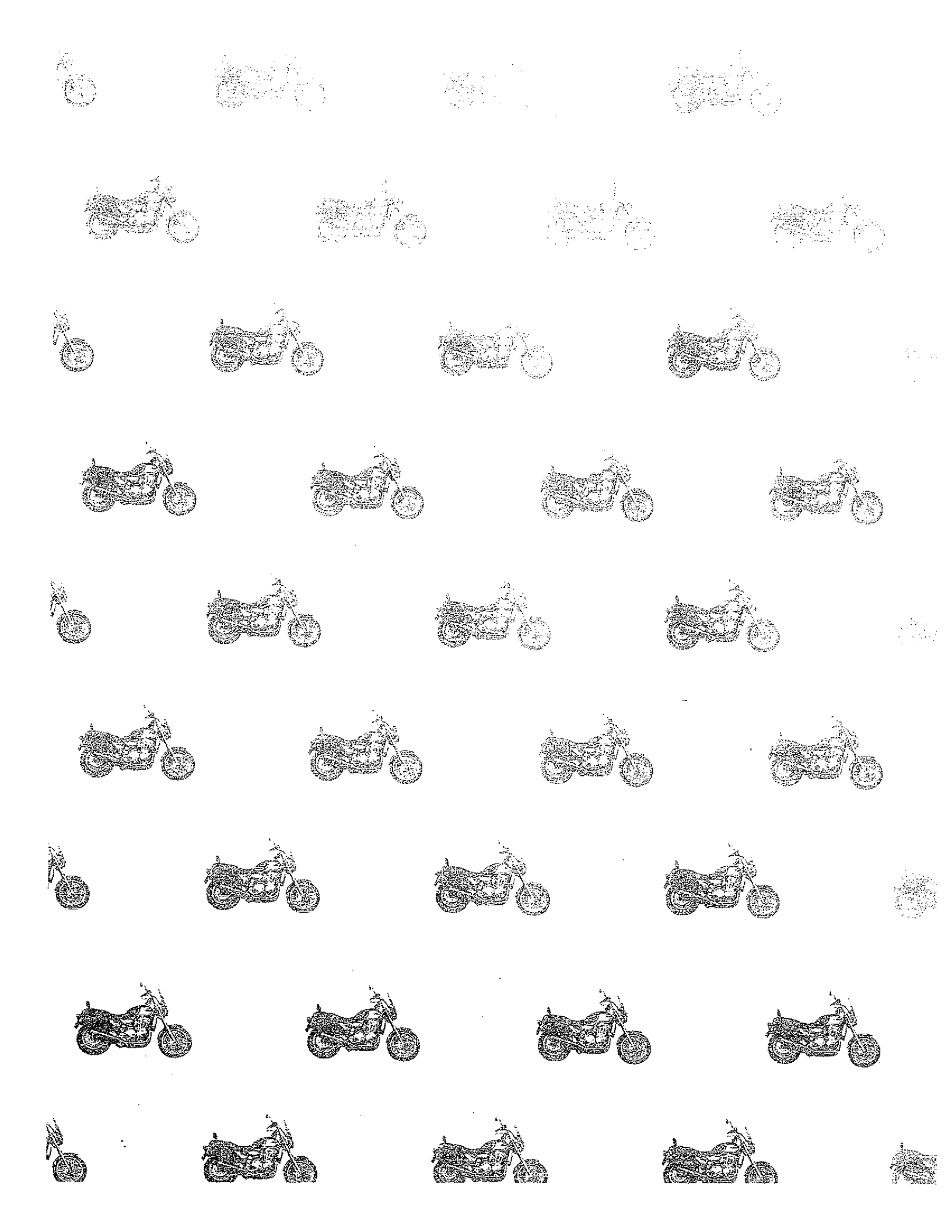

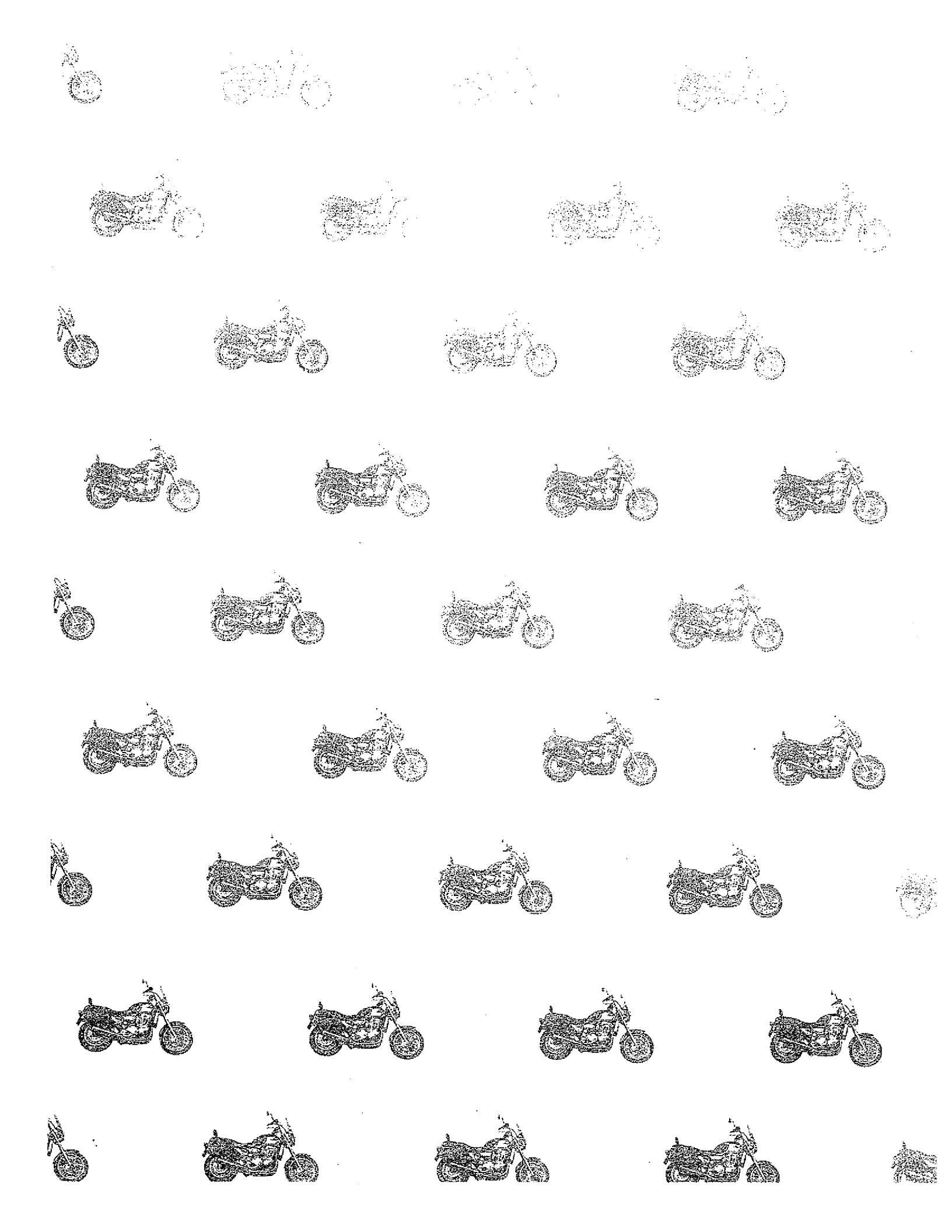

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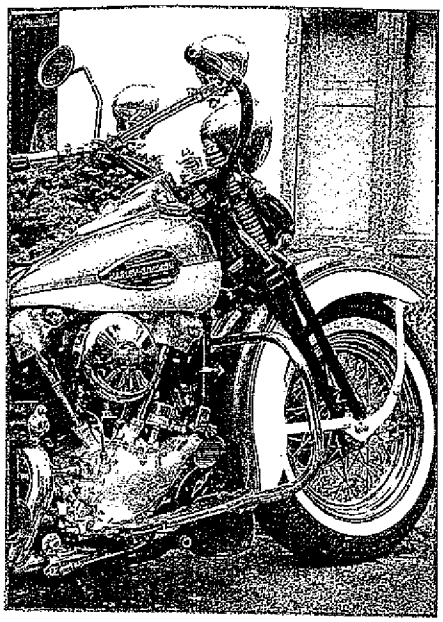

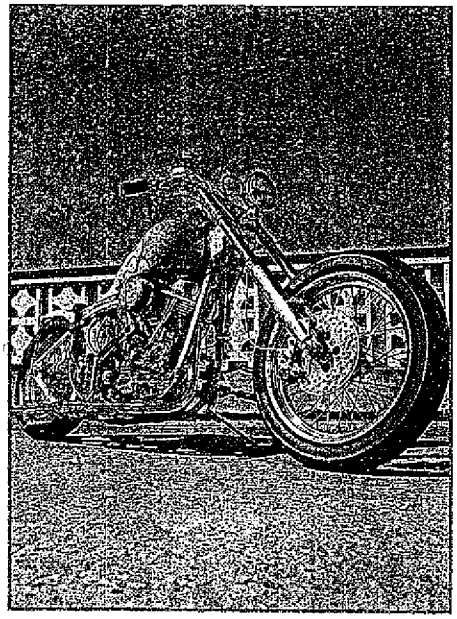

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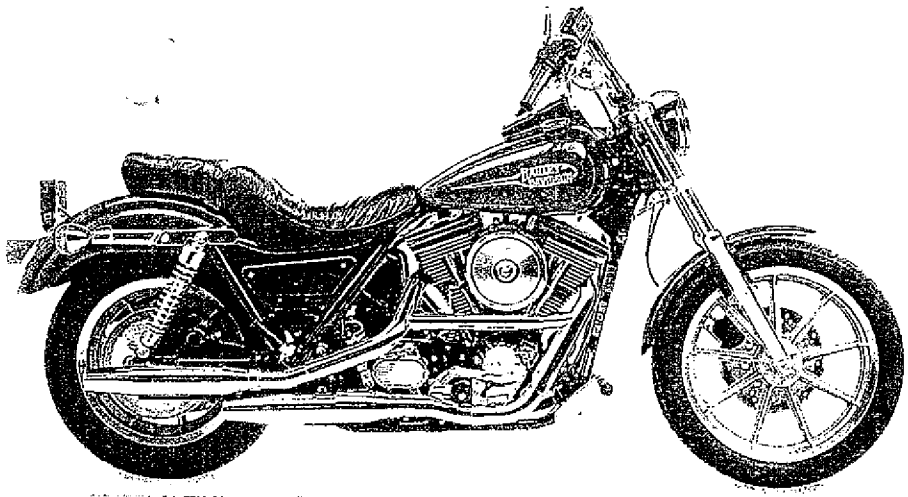

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