AJS

A history rich in competition and design progress . . .

BY GEOFFREY WOOD

IN THE colorful annals of motorcycling, there are a few manufacturers which have been pioneers of design progress as well as creators of legend in competition. One such company is AJS—a British marque that possesses a great legacy of success in trials, motocross and road racing, and which has exerted a driving force for better motorcycle design during the first half of the 20th Century.

The story of this progressive concern began in 1897 when an engineering blacksmith named Joseph Stevens gathered his five sons about him to design and produce an internal combustion engine. The new gasoline burning device was soon put into production, and within a short time it was powering such early day motorbikes as the Werner and the Wolf.

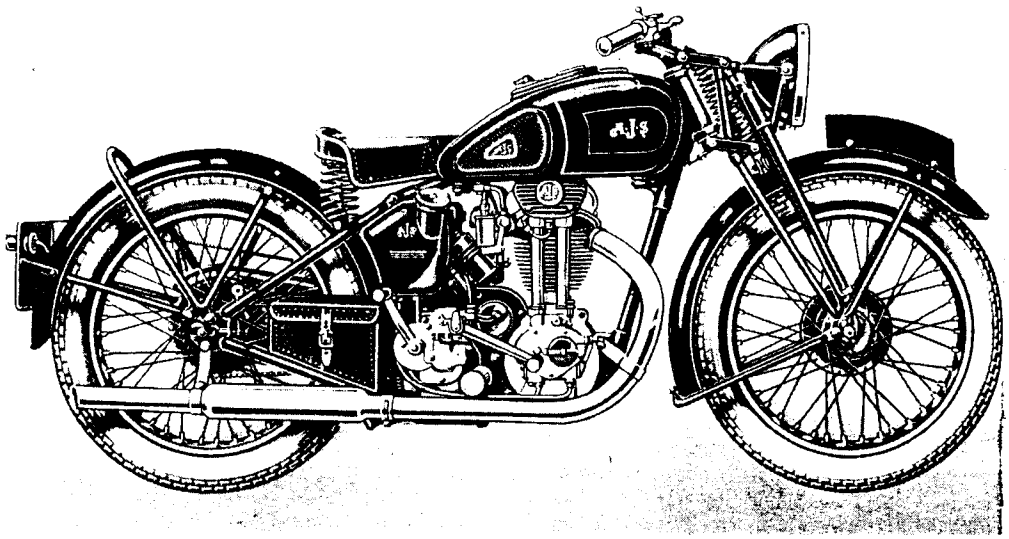
This engine proved to be a reliable little chugger, and the reputation of the Stevens family was established. Thus encouraged, the business expanded and production of motorcycle frames and other proprietary parts was initiated. By 1900, the 2.25- and 3.25-bhp single-cylinder engines were available in both air and water cooled versions, and the little company was on a firm financial base.

By 1909, the Stevens family was eager to try its own hand at producing a complete motorcycle, so the plans were drawn up and production was started. Named the AJS after the A.J. Stevens name, the new motorbike featured a 2.75-bhp single-cylinder engine mounted in a bicycle frame; belt drive was used. The model proved to be as reliable as any during those early days.

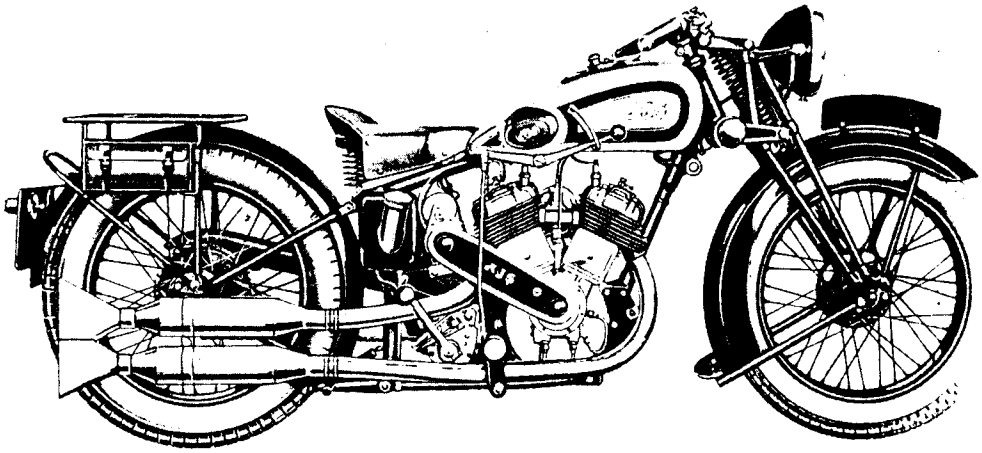
By 1911, the infant company was producing a genuine motorcycle with a heavier frame, a 298-cc (70 by 77.5 mm) side-valve engine, belt drive, and a three-speed gearbox. This use of a separate gearbox was a most unusual feature, as the majority of manufacturers still were using either a single-speed belt drive, a two-speed rear hub gear, or an expanding-pulley belt drive arrangement. Two of these AJS machines were entered in the 1911 Isle of Man TT, but 15th and 16th places were the best obtained.

In 1913, the factory made a really noteworthy design advance when it produced the 350-cc model with bore and stroke measurements of 74 by 81 mm. The engine was a side-valve unit that produced 2.75 snarling bhp, and this power was transmitted by an all-chain drive. The earlier three-speed gearbox was dropped in favor of a two-speed unit. Another progressive idea was the use of an internal expanding brake on the rear wheel. A caliper type brake still was used on the front wheel. One of these thumpers was entered by the factory in the famous Isle of Man TT, and it garnered a creditable 9th place.

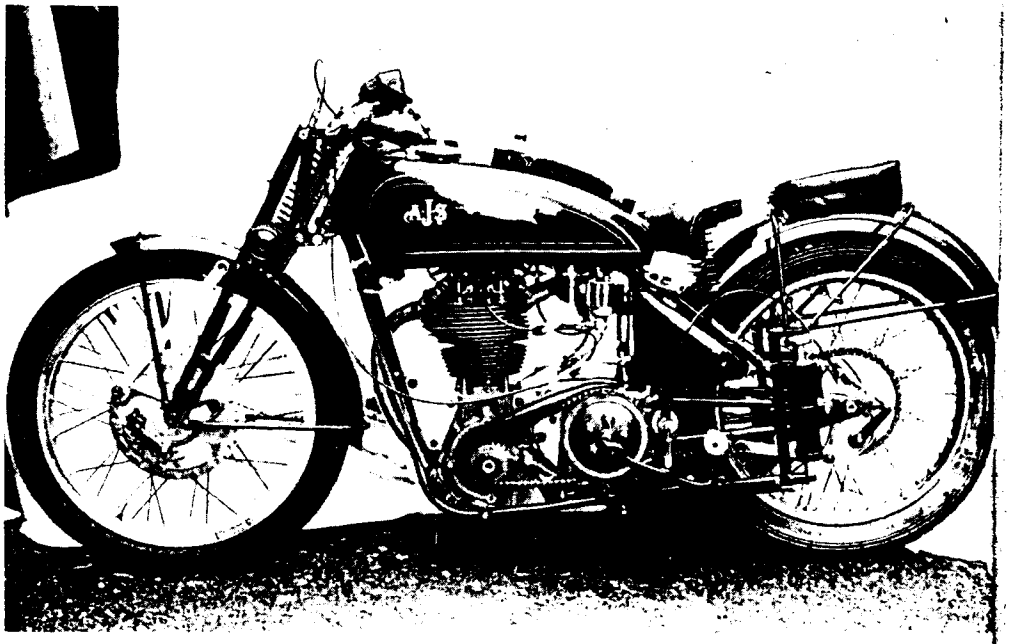
The following year, the 350 was improved by the fitting of a double chain and sprocket



The 1937 AJS Single was available in both 350- and 500-cc sizes. A peppy ohv engine, four-speed footshift gearbox, rigid frame, and girder front fork were standard practice.



The 1932 AJS model T-2 was a smooth-running side-valve V-Twin in either 800- or 1000-cc sizes. A hand shift three-speed gearbox was used. Reliability was legend.



The 1938 model R7 featured a chain-driven ohc alloy engine and unusual pivoted-fork rear suspension with plunger spring boxes. The R7 was not as fast or reliable as the Velocettes.

arrangement from the engine to the clutch, with a lever and cable sliding one or the other set into engagement. The two chains ran on engine sprockets with an odd number of teeth, and this provided four speeds when used with the hand-shifted two-speed gearbox.

The side-valve engine also was developing greater power, with the remarkable engine speed of 5000 rpm possible on the road. The engine, incidentally, had a cast iron cylinder, and a steel piston with a slim clearance of only 0.001 in. between them. The lubrication system was still rather archaic. A hand pump and the total loss method were used.

The 1914 Junior TT saw five new AJS machines entered, and they all finished—1st, 2nd, 4th, 6th and 29th. Eric Williams was the victor, and he won at the record speed of 45.72 mph with a record lap at 47.57 mph. This magnificent showing greatly enhanced the company's reputation and boosted sales. A move soon was made to larger quarters at Wolverhampton. Then came the Kaiser's war, and the AJS folk were plunged into war contract work.

The war itself taught the Stevens brothers a great deal about metalurgy in general, and the value of aluminum and other light alloys in particular. When peace returned, much of this knowledge was put into practice in motorcycle production. This provided a great leap forward in design progress.

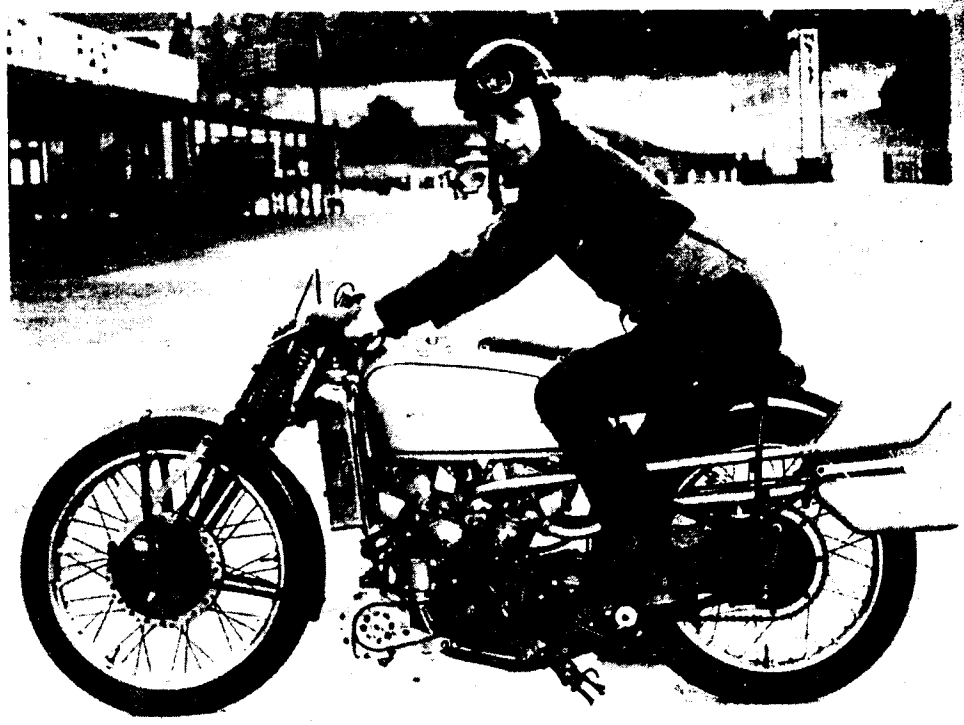
The first post-war TT race, in 1920, provided the marque with another victory in the Junior class. AJS was rather lucky, however, because six of the eight works entries broke down, and winner Cyril Williams pushed his bike in from Keppel Gate after it had ceased to run. Eric Williams did increase the lap record to 51.36 mph, though, which well demonstrated the speed of his Single.

The new AJS actually was a very advanced design for its day, and it can be said to have been the true father of the high performance single-cylinder design. The 350-cc engine had a bore and stroke of 74 by 81 mm, and it featured an overhead valve design. The valves were set at a 90-degree angle to each other, thus providing the now common hemispherical combustion chamber design. The advantages of the hemispherical combustion chamber were better fuel flow characteristics and greater head space for larger valves. Today this is a standard practice for most high performance ohv engines. The head and cylinder were cast iron; a steel piston was used.

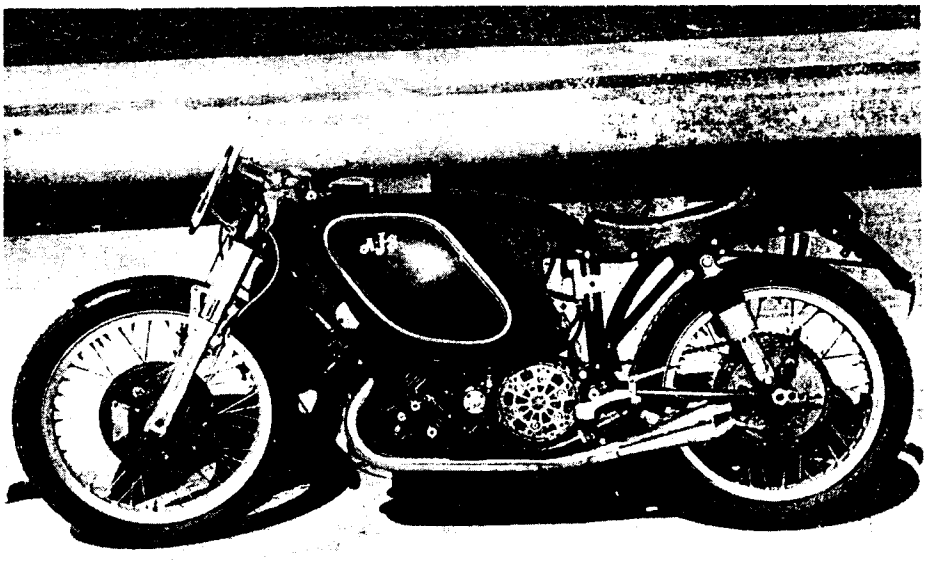
The belt drive, by then, was just about dead, and AJS was progressive with its all-chain drive. An interesting feature was the six-speed gear setup (and present-day riders think six-speeds are something new!) which had a three-speed gearbox with the two-speed engine-clutch arrangement. An internal expanding brake was used on the rear, but a caliper brake was still featured at the front.

During 1921, the factory worked the bugs out of their new ohv design, and reliability took a big jump. The number of gear ratios was reduced to only three by doing away with the dual engine-clutch chain setup, and the gear ratios were 4.9:1, 6.0:1, and 9.3:1. A new frame was used in conjunction with 2.25-26 tires. Dry weight was only 190 lb. Maximum speed was 70-75 mph, which was teriffically fast for those days.

In the Junior TT, the marque scored a smashing 1st, 2nd, 3rd, 4th and 5th, with Eric Williams the winner at 52.11 mph. Howard Davies upped the record lap to 55.15 mph, then went on to win the Senior TT at the record speed of 54.49 mph—the only time a 350 ever has won the 500 event!



The 1939 V-4 was a fierce looking beast with its supercharger and water cooling. Bob Foster sits ahead of Brooklands mufflers. Top speed was 150 mph.



The last of the Porcupines—the 1954 model—this Twin produced 54 bhp at 7500 rpm, good enough for 145 mph. The engine was mounted at 45 degrees. The bike weighed 335 lb.

By then, the reputation and sales of the AJS were at a very high level. Profits from production were turned back into research and additional race results. The 1922 models were again improved, with the famous 350-cc Big Port Single heading the range of machines. This thumper ran on a compression ratio of 5.75:1 and had a huge 2.625-in. diameter exhaust pipe. Internal expanding brakes were used front and rear. The model again took a 1st and 2nd in the Junior TT with Tom Sheard winning at 54.75 mph.

The following year, the racers were modified by use of aluminum alloy pistons. In 1924, a large inlet valve was fitted to better charge the cylinder. The racing fortunes of the marque declined after 1922, as a result of some peculiarly rotten luck, rather than through deficiencies in design and engineering. A few places were gained in the TT races, plus a win or two in Continental grands prix, but for the time the coveted No. 1 was to elude AJS.

In the meantime, the production range was

(Continued on following page)

going strong with sales climbing to previously unheard of heights. By 1925, the range of machines offered was comprehensive and included models for just about every type of riding. For the budget minded there were 250-, 350- and 500-cc side-valve Singles that offered reliable day-to-day transportation at rock bottom prices. For the more sporting minded there were 350- and 500-cc ohv models that provided spirited performance. For the connoisseur of motorcycles there were the powerful, smooth-running 800- and 1000-cc side-valve V-twin models.

Another 1925 success was the 500-cc Single, built for a bash at the Senior TT. Ridden by Frank Longman into 2nd place, the ohv engine had a bore and stroke of 84 by 90 mm, and weighed only 270 lb. After winning the French Grand Prix, the factory decided to put the model into production for the 1926 season. By then, AJS had won renown throughout Europe for their well designed Singles.

Motorcycle racing in Europe became extremely competitive during the late 1920s. Greater horsepower was required to stay in contention. In response to this, the Wolverhampton firm developed new ohc works racers for the 1927 season. The Single camshaft was driven by chain, and the primitive foot-operated oil pump (total loss) was at last replaced with a double-gear pump and a dry sump system. A new four-speed gearbox also was used, with gear ratios of 4.6:1, 5.58:1, 7.5:1, and 10.29:1 on the 350-cc model, and 4.12:1, 4.99:1, 6.7:1, and 9.19:1 on the 500-cc model. An unusual feature was the foot operation of both brakes. The idea was to leave the right hand free to operate the throttle and gearshift lever.

The new camshaft engines proved reliable, but slow. In the TT, the best the AJS machines could do was a 3rd in the Junior. Jim Guthrie, however, went on to win the 350-cc class in the grands prix of Belgium, Switzerland, Austria, and Germany. Nevertheless, the company decided that the cammer needed more development, so AJS reverted to its pushrod design for the 1928 season—with a fair turn of success in Continental events.

In 1929, the factory reintroduced the ohc engine with small internal improvements, plus a stronger girder fork at the front. Large brakes also were used, with an 8-in. unit on the front and a 9-in. size on the rear. The 350 proved much faster that year with a 2nd place in the Junior TT, plus victories in the Ulster, Austrian, German, and European grands prix.

The 500-cc model generally proved unreliable, but it did set up a new one-hour record at 104.51 mph, plus a 500-cc one-kilometer record of 118.98 mph. The 350-cc model also set a kilometer record at 107.37 mph. Altogether, this marque set over 100 speed/endurance records that year.

During 1930, the standard production range was enhanced by the introduction of a new side-valve V-twin that was aimed at the rider who wished something smooth, powerful, and a bit different. The unusual thing about his new Twin was that the engine was mounted transversely in the frame. The model stayed in production only a few years and was then discarded as being too expensive to produce.

Another model that was introduced in 1930 was the R7 racer. This 350-cc model featured a chain-driven ohc 350-cc engine patterned after the works racer, and it had a rigid frame and girder front fork. The R7 proved to be popular with the private owners, but it never did achieve speeds to match the KTT Velocette or Manx Norton.

The AJS factory also had a bash at the world speed record with a 1000-cc V-twin in 1930, but 130 mph was the best obtained. The engine was a 50-degree V-twin with bore and stroke of 79 by 101 mm. It had chain-driven overhead camshafts. There were two carburetors, with both inlet ports facing rearward and exhaust ports facing forward. Cylinders were of steel and heads of light alloy. The V-twin appeared again in 1933, fitted with a supercharger, but 136 mph was the best speed achieved. The last attempt was made at Tat, Hungary, with 145 mph recorded, but this was 6 mph below world record.

During the early 1930s, the marque scored a few grand prix wins, plus Jim Guthrie's 1930 Lightweight TT victory. As time passed, AJS faded away from serious contention. The main cause was financial, because the economic depression severly damaged the financial standing of the company. By 1931, the concern was on the rocks, and the doors were closed, but, happily, the name and tradition were kept alive when the Matchless Co. purchased AJS and moved it to Woolwich, London.

This move to London, plus the depression, naturally caused a curtailment of AJS racing efforts, and increased emphasis was put on the standard production models. The side-valve and ohv Singles continued to be the most popular models in the range, and their reliability and performance endeared them to owners throughout Europe. The big side-valve V-twin also was continued, and this long wheelbase model offered about as much rider comfort as could be expected in those days of rigid frames and girder front forks.

There was an AJS reentry into international racing in 1934. From then, until 1939, the 350-cc machines followed the general trend of design. The engines remained basically the same chain-driven ohc units, but they gradually included more light alloy in their construction. Aluminum bronze heads were used in 1934, a bi-metal head with a bronze skull in 1935, and aluminum alloy with screwed-in valve seats in 1937.

Aluminum alloys also were used extensively for the cycle parts. Magnesium alloys were employed for gearbox and engine castings. This all helped keep the weight down to a light 270 lb. on the 1935 model, but the weight climbed to over 300 lb. in 1938 when rear suspension was added. The suspension was by an unusual pivoted-fork that attached to plunger spring boxes at the rear of the frame. Another improvement was the huge alloy front hub-brake unit, and nearly all of these modifications were adopted on the R7 model which was produced in limited number for the private owner.

By the middle 1930s, the world was on its way to economic recovery, and the AJS higher echelon decided that the expanding sales justified a more intensive racing campaign. Those also were the days when everyone else had the same idea, and international road racing became terribly competitive. Matt Wright, who was AJS' chief design engineer, thought really big. When his pet project was laid out on the drawing boards it caused even the strongest to gasp.

The basic plot was a 50-degree V-4 with bore and stroke of 50 by 63 mm. The light alloy cylinders and heads were very similar to the R7 design. Overhead cams were driven by a chain in the center of the engine. The valves were controlled by exposed hairpin valve springs, and two carburetors fed the cylinders. Eccentrically mounted rocker arms were used to set valve clearances. The compression ratio was 8:1. The hollow, two-throw crankshaft was supported by five roller and ball bearings. A vertical shaft and bevel gear setup drove the oil pumps and two magnetos.

Two of these Fours were ridden in the 1936 Senior TT by Harold Daniell and George Rowley, but they both retired halfway through the race. The machines were not terribly speedy, and they obviously needed a great deal of development work to make them raceworthy. This Four was put on display at the 1935 Olympia Show. It was to be sold either with or without supercharger; the price was very high, of course. History books make little mention of how many of these super/sport road models were sold.

During 1937, the Four was under development and was not raced. In 1938, it reappeared with a supercharger mounted in front of the crankcase. The new spring frame also was used, as was a huge 8-in. by 1.75-in. front brake that was housed in a magnesium alloy hub with deep fins. The blown Four proved to be very fast, but overheating and poor steering plagued the model. Little success was obtained.

Meanwhile, the production models were faring exceptionally well. The trend away from side-valve engines to ohv models had been wholeheartedly accepted by the factory, and the 350- and 500-cc Singles were very popular. With Burman four-speed footshift gearboxes the performance was good, even if the rigid frames and girder front forks provided a far from smooth ride. These fine handling Singles were particularly successful in trials competition, and their fame continued to spread the world over.

The final year of international motorsport before the war was 1939; AJS contributed greatly to that classical year of speed. The V-4 model had been converted to water cooling during the winter, and it was ready to do battle with the best. In the Senior TT, the 405-lb. Four was handicapped by the twisty nature of the circuit, plus a need to take on more water, and 11th and 13th places were the best obtained.

Late in the season, in the fast Ulster GP, the great Walter Rusk finally was able to show the speed of the Four, as the 7-mile Clady Straight allowed him lots of room to unleash the blown engine's fury. Walter and Dario Serefini, on a blown Gilera Four, were locked in a terrific battle, and on Lap 3 Rusk pulled clear by 19 sec. and recorded the first ever 100 mph lap. Then came disaster when a front fork link broke, thus ending a colorful era for both motorcycle sport and the AJS V-4.

After the war, supercharging was abolished by the FIM for international racing, and, at any rate, the factories could not have afforded such an expensive luxury. In war-torn England, the most pressing need was to rebuild factories and start production again. To this goal AJS dedicated itself, and a whole new range of machines was introduced.

The basis of the new range was 350- and 500-cc ohv Singles with bore and stroke measurements of 69 by 93 mm, and 82.5 by 93 mm. Both models featured the new Teledraulic front fork, which provided a much

(Continued on page 88)

AJS continued

smoother ride. Frames still were rigid. These Singles were of an exceptionally sound and rugged design, and riders the world over came to know and love them for their ease of operation and dependability.

These Singles were used by the factory in both trials and the newly founded motocross sport, in which they achieved tremendous success. Hugh Viney, for example, won the coveted trophy in the Scottish Six Days Trial, and other riders kept the marque well to the fore in all types of dirt competition.

The factory also made a return to road racing with a new 500-cc Twin. The Twin was rather unusual, with its engine mounted horizontally in the frame, and spike fins on the head that led to the nickname of "Porcupine." The bore and stroke were 68 by 68.25 mm. The one-piece crankshaft featured two roller bearings, plus a third plain bearing in the middle. Rods of RR-56 alloy were used with plain big-end bearings, and the engine ran "backward."

The drive to the double overhead camshafts was by spur gears. Exhaust valves were sodium filled to facilitate cooling. Oil was circulated at the amazing rate of 45 gph at 7000 rpm. The engine was mounted in a wide duplex cradle frame that featured air-oil shock absorbers on a swinging arm suspension. Front suspension was by the Teledraulic fork with 3 in. of travel. Huge brakes with air scoops were used.

In the 1947 Senior TT, the Porcupine showed a fair turn of speed in the hands of Jock West and Les Graham, but minor teething troubles kept them well down on the finishing list. A few other places were obtained in grand prix events, but additional development obviously was needed to make the Twin a winner.

The following year, the marque intensified its racing campaign with the introduction of the 350-cc 7R model. Produced both as a works and production racer, the 74 by 81-mm Single had the traditional chain drive to a single overhead cam. The "Boy Racer," as it was affectionately called, had a duplex cradle frame, Teledraulic front fork, and huge conical hubs cast from magnesium alloy.

The alloy engine was fitted with a 1.156-in. TT carburetor. A Lucas magneto provided spark. An 8.45:1 compression ratio was used. The engine produced about 30 bhp at 7000 rpm. The four-speed Burman gearbox had ratios of 5.24:1, 5.95:1, 7.07:1, and 10.14:1, which produced a speed of 110 mph in top cog. Other specifications of this sleek new racer were a 56-in. wheelbase, 298-lb. dry weight, 4.75-gal. fuel tank, large megaphone exhaust, a 3.00-21 front tire, and a 3.25-20 rear tire.

In classical racing that year, the team fared well with both the 350- and 500-cc models, but they still lacked the speed of the all-conquering 350 Velocette and 500-cc Norton. Many good places were obtained, and private owners did exceptionally well on the 7R model. In dirt competition, the AJS figured prominently. The great Hugh Viney again won the Scottish Six Days Trial.

The year 1949 generally is regarded as the greatest in the AJS history. The production range was expanded to include a new 500-cc (66 by 72.8 mm) Twin. All the models could be had with the swinging-arm frame that made the AJS one of the most comfortable bikes in the world. The marque also produced special 350- and 500-cc models in trials and motocross trim, and these alloy-engined bikes achieved tremendous eminence in their fields.

In grand prix racing, the works team experienced a fabulous year, although Les Graham did lose the Senior TT when his magneto drive shaft broke, just a few miles from victory while he led by a wide margin. The Porcupine was a very speedy model that year, and on the Continent AJS engaged in some epic struggles with the equally speedy Gilera Fours. Les won the Ulster and Swiss Grands Prix, plus taking a 2nd in the Dutch event, and this gave him enough points to win the coveted 500-cc World Championship. Teammate Bill Doran won the Belgian GP and took a 4th in the Ulster and a 3rd in the Monza classic. This enabled the marque to also win the 500-cc manufacturers' championship. In the Junior class the 350 failed to score any wins, but it did provide honest opposition to the terrifically fast dohc Velocette.

In trials competition, Hugh Viney etched his name indelibly in the history books with his third straight victory in the Scottish Six Days Trial. This remains the lone "hat trick" victory string in the famous trial, and it is perhaps one of the all-time greats in motorcycle competition. In motocross, the AJS recorded another great year, and in America the Singles won many of the most important dirt competitions that were held.

In 1950, the AJS did not fare so well in the Senior class, as the new Norton Featherbed was a little too fast. The team placed well in many races, and Les Graham did win the Swiss GP. In the Junior class the Velo was again too fast for the 7R, but Les did score a popular win in the Swiss meeting on wet roads.

During 1951 and 1952, grand prix racing became more competitive, and AJS responded with many technical improvements to its race ware. The works 7R model had the valve angle reduced from 79 to 70 degrees, and the intake port was steepened 12 degrees. The engine also was mounted farther forward in the frame, the wheelbase was shortened to 55 in., a narrower crankcase fitted, and clip-on handlebars were used. Then the height was lowered by using 3.00-19 front and 3.25-19 rear tires, and the front fork was shortened 1 in. These fork and wheel modifications also were made on the Porcupine. Then in 1952, the engine was raised to 45 degrees, orthodox engine finning was used, and the weight was lowered by mounting the oil sump beneath the engine.

For 1952, the factory also designed a unique new works 350 model with three cams and three valves. Two exhaust valves were used in conjunction with two ports and two exhaust pipes. The bore and stroke also were changed to 75.5 by 78 mm, and these measurements were later used on the production 7R in the late 1950s. The three-cam model fared well on the racetracks, and it also set a one-hour record of 115.66 mph for the 350-cc class late in the year at Montlehery, France.

During the next few years, the line of models continued the same with road, trials, scrambles, and the racing 7R models being offered. Improvements were mainly of small technical nature to the existing sound design,

(Continued on page 90)

AJS continued

and the sales and reputation of the AJS continued to expand around the world. By 1954, the 7R model was producing 37 bhp at 7200 rpm, and it was by then the most popular mount in the world for 350-cc class road racing.

The year of 1954 also was a memorable one for the marque, as AJS won the Junior TT with a three-cam Single in the hands of Rod Coleman of New Zealand. Both the 350- and 500-cc racers were weird in appearance with their huge low-slung 6.5-gal. alloy fuel tanks that required a fuel pump to get the fuel up to the carburetor. The idea was a bit of streamlining, with a non-stop ride for fuel and a lower center of gravity. The 500 Twin by then weighed 335 lb., was breathing through a pair of 1.125-in. GP carburetors, and developed 54 bhp at 7500 rpm—good enough for 145 mph.

After 1954, the marque lost interest in grand prix racing, and AJS discontinued active participation to spend time on production model development. In 1956, a new 600-cc Twin was produced, along with the traditional 350- and 500-cc Singles in road, trials, and motocross trim. In 1958, a clean looking 250-cc ohv model was added to the range, and, in 1959, the 600 Twin became a powerful 650-cc model.

Meanwhile, the 7R model had been under constant development, and by 1961 it was developing 41.5 bhp at 7800 rpm. With a wide torque range that produced 33 bhp as low as 6000 rpm, the 285-lb. Single delivered terrific acceleration. The compression ratio, by then, had been upped to 12:1, and the Amal GP carburetor had a bore of 1.375-in. The four-speed gearbox had ratios of 4.87:1, 5.36:1, 6.48:1, and 8.67:1, which provided a top speed of 120 mph.

During the early 1960s, the company underwent a great change. The dynamic leadership that had characterized AJS history was lacking. Design progress and sales began to sag. The company continued to make a modest effort in trials and scrambles competition, and Gordon Jackson's magnificent one-point victory in the 1961 Scottish Trial (his only point was for one dab of his foot) helped keep the name alive.

Things were not well, though, and, in 1963, the last of the illustrious 7R models rolled off the production lines. Next came the amalgamation with Norton, and the AJS Twin became a Norton with AJS on the fuel tank. Today the Singles still are produced, but lack of design improvement has hurt their image and competitiveness. Just at the darkest hour, when it appeared as though the doors were going to close again, a company, Manganese Bronze Holdings, came forward, and out of this has arisen a new company called Norton-Villiers that holds promise of great things to come. Already, the name AJS has been restored to racing by a 250-cc two-stroke of Villiers ancestry, and the company has given a hint that more racing activity is to follow.

So this is the story of the AJS—a tale of a make that has a great legacy in both motorcycle sport and production. From the early trend-setting with gearboxes and overhead valve engines to the wonderful trials, motocross, and road racing models, it is a legend that is rich in tradition and engineering achievement. ■