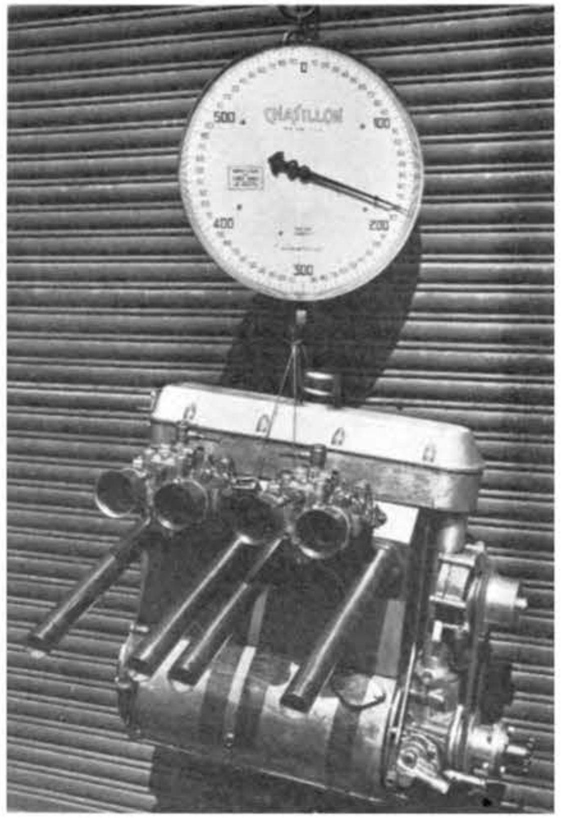


ONE HORSE PER POUND

Supersports Two-Liter, 180 pounds, 180 horses!

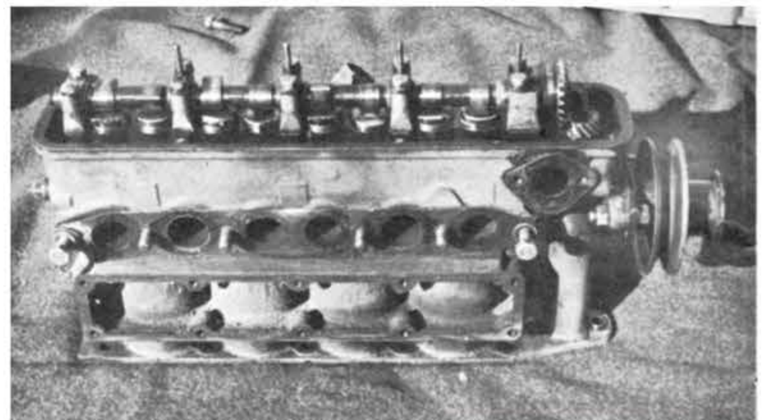
by Ocee Ritch

ONE of the biggest thrills that comes to the amateur mechanic is undoubtedly when he fires up an engine which he has completely disassembled and put back together. He knows, of course, that he has put all the parts in properly and done everything he can to reconstruct the manufacturer's specification and that there is no reason for the mill not to run; however, when the engine comes to life there is a feeling of satisfaction (and relief). It is completely unjustified, but it is also almost beyond description.

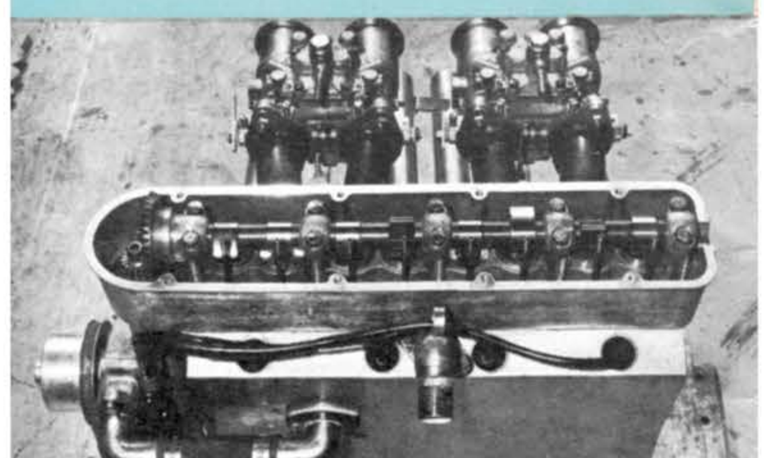
Imagine, if you will, how this feeling would be magnified if the engine were of your own design . . . one on which you had labored for the best part of two years and which represented an investment of thousands of dollars. Suppose, in addition, that the powerplant were one of rather radical construction and, in effect, culminated a 20 year struggle to prove the soundness of a theory. What would you do after the engine fired up with a throaty roar, spit a couple of times and then settled down to a healthy snarl that indicated a power reserve beyond your expectations?

Lloyd Taylor, who had just this experience on a crisp cool evening in Los Angeles late last Fall, wiped his hands on a shop rag and said, "That ought to do for now boys. Let's go home and get some sleep." Lloyd, to whom the Super Sports two-litre is the culmination of nearly a quarter-century of hard work and unheralded pioneering, wasn't being blasé. It was merely that he had worked 14 hours on that particular Monday and there had never been a doubt in his mind that the unusual mill would do anything but perform admirably.

The big difference between this ocassion and similar ones that had preceeded it in many other shops at many other times was that this particular engine appears on the stage when the scene is set for big things. This may be the happy culmination of a sequence of events that places it at the right place at the right time. In brief, the SS is the first *American* post-war powerplant to be built specifically for a sports car. And if its specs aren't a bombshell in the sports car field, then Ferraris aren't red!



The original Crosley engine was fabricated from sheet metal, however production difficulties and that demon called money dictated a switch to a cast block. But its descendent, the Supersports, is made by a bug-proof process that works.



Many of the things anent the SS are of keen interest to the enthusiast, but the fact that there is now a native two-litre engine probably heads the list. Until this time we have been able to storm rather well in the big-bore division with modified Detroit iron; but in the smaller stuff, only the Crosley has held up against foreign invaders. Even the otherwise highly successful Offy has not been able to gain much of a foothold in the swelling ranks of specials because of its limited rev range.

That this two-litre should weigh only 180 pounds and crank out nearly 1 bhp/lb and more than 1 bhp/cu. in. is almost incredible. That its builders have competition uppermost in mind for the breed and that the engine can be stuffed, as is, right into an MG, Healey, TR or other small car is perhaps the most encouraging aspect of the picture. But, word that the selling price should be around $800 as a replacement engine certainly vies with the other facets for top billing.

The technical aspects of the SS, quickly delineated, show it to be a water-cooled, head-en-block, overhead-cam 4. Bore and stroke are: 3.50 x 3.125 inches. The block is welded steel, incredibly light and rugged. It runs 12/1 compression on *pump gasoline* without pinging under load. On the first model, two dual-throat Solex side-draft 40mm carburetors provided fuel, and sparkplugs were Champion J-6. The first time the engine was fired up on the Dyno it logged 145 hp (uncorrected for temperature, etc.) at 6000 rpm. With carburetion, cam and ignition brought into the best focus, 170 @ 7600 is practically certain. In which case, our very own two litre will be on even terms with the hottest continental go-toys in its class . . . Maserati and Ferrari . . . and will underweigh them by nearly 50%!

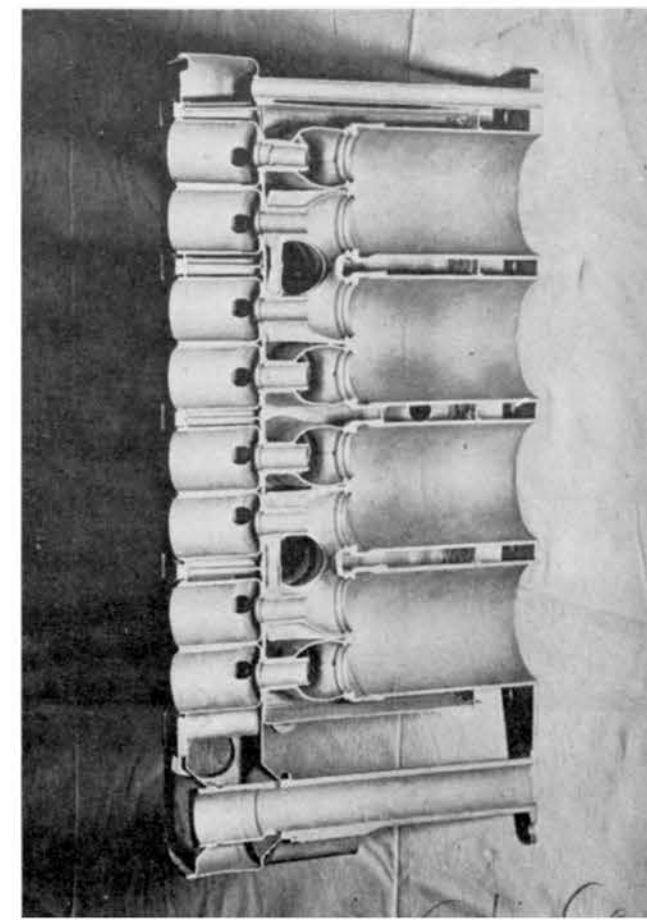
With a welded steel block as the most unusual part of the engine, we should probably start there in describing it. Such construction is not brand new, it was used on the Liberty aircraft engine of WW 1 (a design stolen from the Benz racing cars interned in France at the outbreak of hostilities), the Mercedes M196 (considered by many to be the ultimate) and the giant diesels which power railway engines. But, where these units are torch-welded, the SS is fused together in a controlled-atmosphere oven untouched by human hands.

Actually, to get the full flavor of the story, we should go back to the 750cc Crosley, a welded block, and even farther . . . to Oakland, California in the middle thirties and pick up an airline mechanic who built racing equipment in his spare time.

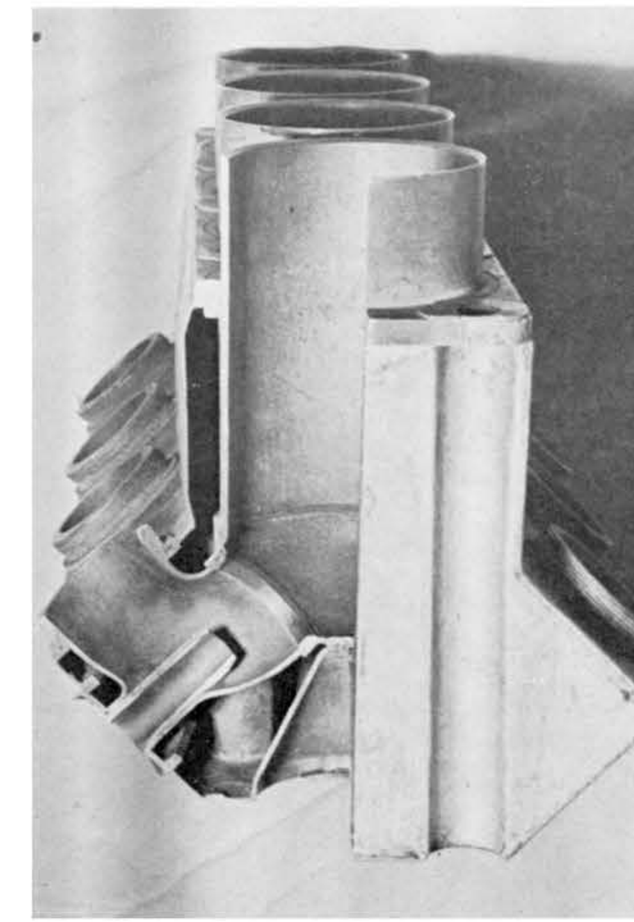
Lloyd Taylor's reputation as a cam grinder and speed-equipment designer spread around the Bay area and soon power-boat owners, as well as the racing fraternity, were consulting him for hop-up items. Business got so good that Lloyd retired from the airline and set up his own shop where he worked over a lot of engines, including the powerful Hisso that powered *Miss Golden Gate* to a second place in the International Boat Races at Detroit.

The heavy weight of these engines and their fragility, in spite of that weight, haunted Lloyd and he began to cast about for some new way of overcoming the deficiencies inherent to the iron block . . . poor thermal conductivity, inferior wearing qualities and, of course, gross poundage. But, what to use in place of cast iron? Aluminum? Lloyd considered it, but at that time Henry Ford had just come a-cropper with his light-alloy block and it didn't look like too promising an avenue for a poor man. "How about steel? Steel would only have to be about 1/3 as thick to do the same job . . . and, maybe it could be fabricated and welded . . . sort of like exhaust collector rings on radial engines. . . . I wonder?"

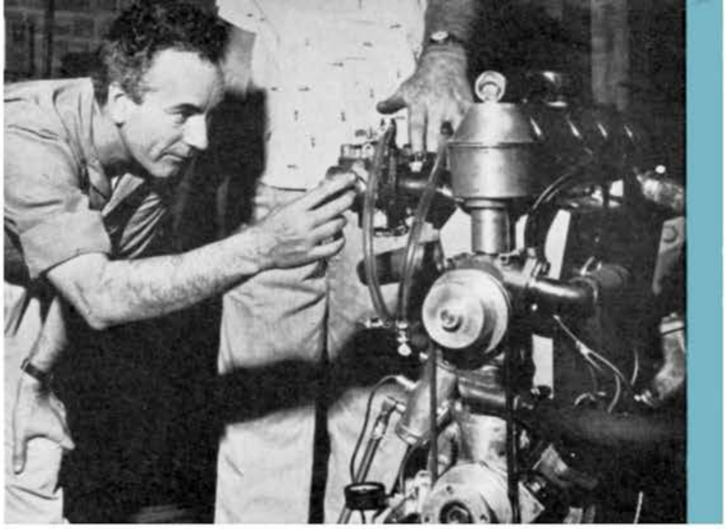
Brother Taylor continued to wonder long enough to plan such a block, stamp out the pieces, clamp them together and have them heat-fused in an electric furnace. He then assembled the remainder of the components, built many pieces in his own shop, hooked them all together and turned the crank. The engine not only ran, it ran well and didn't



Cutaway Crosley block, also designed by Lloyd Taylor, shows design features that tie its lineage to the improved version.



Cross section of the 96-in. 2-stick oh 4 shows thin wall sections that keep temps low, allowing high compression ratios.



Maybe Bill Devin has something in mind, as he tunes a carb on the SS engine that logged 145 hp on dyno before tuning.

come unglued under full pressure. The first specimen weighed 40 lbs and developed 21 bhp. Lloyd, feeling that such a lightweight might have commercial applications, tucked it into a sort of briefcase and set out to find someone interested in developing it further.

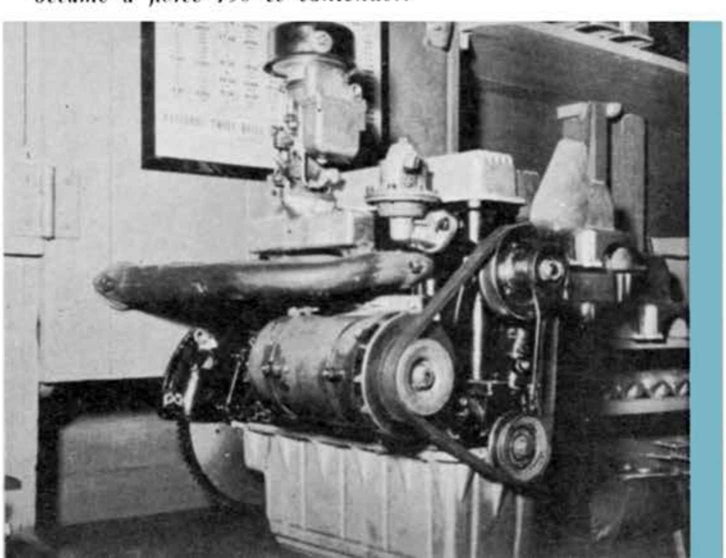
Among those who had a look at the remarkable achievement were the U.S. Navy, Henry Ford and Powell Crosley. As Ford's guest, Taylor spent five weeks with the auto tycoon, and a fabricated block might today be standard in FoMoCo products if the company's founder hadn't been advised against it by his engineers. They were exceedingly proud of their accomplishment in casting the V8 as a single pour and bringing the cost down to $12.00 a unit, or some such ridiculous figure.

The wealthy Cincinatti appliance manufacturer, on the other hand, was regarded by those who knew him as a man who told his engineers which way to point their slide rules and Crosley went for the Taylor design lock, stock and overhead cam.

Lloyd recalls today that he advised Crosley that the engine was strictly experimental . . . a model which he thought could be de-bugged and put into production in a reasonable time; but Crosley was eager to give this newest bit to the country as a wartime contribution. He plunged into tooling immediately. According to Lloyd, the experimental stage was dismissed with the statement that all engineers are inclined to prove things out until the market has passed them by.

(Continued on page 63)

This Crosley engine, after being given the Braje treatment, became a fierce 750 cc contender.



COMPARISON OF CURRENT TWO LITRE ENGINES

AC

Bore (in/mm)	2.56 (65)
Stroke	3.94 (100)
Cyls.	6
Comp. Ratio	8/1
BHP @ rpm	90@4500

BRISTOL

Bore (in/mm)	2.60 (66)
Stroke	3.78 (96)
Cyls.	6
Comp. Ratio	8.5/1
BHP @ rpm	125@5750

FERRARI

Bore (in/mm)	3.54 (88)
Stroke	3.07 (78)
Cyls.	4
Comp. Ratio	9.5/1
BHP @ rpm	170@7000

FRAZER-NASH (Sebring)

Bore (in/mm)	2.60 (66)
Stroke	3.78 (96)
Cyls.	6
Comp. Ratio	8.8/1
BHP @ rpm	140@5750

MASERATI (GT)

Bore (in/mm)	3.01 (76)
Stroke	2.83 (72)
Cyls.	6
Comp. Ratio	8/1
BHP @ rpm	125@6000

MASERATI (Sport)

Bore (in/mm)	3.01 (76)
Stroke	2.83 (72)
Cyls.	6
Comp. Ratio	8.5/1
BHP @ rpm	170@7300

MERCEDES (190SL)

Bore (in/mm)	3.35 (85)
Stroke	3.29 (84)
Cyls.	4
Comp. Ratio	8.5/1
BHP @ rpm	120@5700

OSCA

Bore (in/mm)	2.99 (75)
Stroke	2.87 (72)
Cyls.	6
Comp. Ratio	9/1
BHP @ rpm	165@6500

STANDARD (Triumph)

Bore (in/mm)	3.27 (83)
Stroke	3.62 (92)
Cyls.	4
Comp. Ratio	8.5/1
BHP @ rpm	100@5000

SUPER SPORTS

Bore (in/mm)	3.50 (88)
Stroke	3.12 (79)
Cyls.	4
Comp. Ratio	12/1
BHP @ rpm	145@6000 170@7300

(Estimated)

PLYMOUTH FURY

(Continued from page 63)

ratios now has dropped to two. They are 3.73 for the stick job and 3.36 for the TorqueFlite torque converter transmission.

Our '58 test Fury was not equipped with optional Constant-Control recirculating-ball power steering, but none of its several robust drivers missed this. Caster action in the test car was extremely strong, perhaps even excessive. This might be due to incorrect caster adjustment although the effect might be due entirely to fixed king pin inclination. The steering is smooth and positive but somewhat heavy and slow.

When you buy merely a Fury you do not get our test car. The basic Plymouth has the 318 inch engine that powered last year's Fury, but with one two-throat carb. The regular '58 Fury comes with the same engine, a camshaft change, a pair of dual four-throats, and heavy duty springs and shocks. The Golden Commando Fury has the H.D. suspension, plus the new 350 inch engine with dual four-barrels.

It is more than an exciting car. It's a kind of car that Detroit has produced few of in the last 20 years. It's a car with a really strong personality. It's a taut feeling vehicle that does not see-saw on rubber-bushed suspension. Yet its ride cannot conceivably be called harsh. It is extremely fast and responsive to the driver's touch. It moves with authority and grace. It is sleek but it has its bestial side. Like the old *kompressor* Mercedes, the engine emits an animal moan when you floor the throttle. But its built-in fury is entirely on the driver's side; it has no sneaky little vices that appear when the chips are down, aside from its brakes.

As for sheer *go,* it far outstrips the already hot '57 Fury.

Griff Borgeson

SUPERSPORTS

(Continued from page 18)

Taylor's advice could have been well heeded, as it turned out. The difference in one-off and production is considerable, and is compounded by the fact that problems involved in powerplant manufacture are not the same as other consumer items of a less durable nature.

Controlled-atmosphere brazing (the proper term for the process) of steel parts to replace castings, die castings and manually welded parts dates from about 1929, when General Electric went into hydrogen-electric oven research. Since that time, fabrications weighing from fractions of an ounce to 400 pounds have been fused at the 2000°F temperature. A variety of useful gadgets is included in this list . . . from freon-filled bug bombs to end plates of Oerlikon cannon and jet turbine parts. And the brazing technique, when applied to engine blocks, is advantageous in respects other than weight-saving, as we shall see.

(Continued on page 64)

SUPERSPORTS

(Continued from page 62)

When steel stampings to be bonded together are placed in the oven (which is not necessarily electrically heated, any method can be used as long as the air is excluded and hydrogen is introduced), copper, in paste or wire worm, is placed in and near the joints. The clean, hot steel is reduced by the hydrogen and an attraction for the copper is set up which results in a copper-steel compound bridging the seams. Capillary action causes the copper to flow into the most minute crevices and, in some instances, vertically as high as 2 feet . . . in defiance of gravity. Photomicrographs of such welds shows that there is a true amalgamation and the seams are stronger than plain copper itself. In using this method any ferrous materials can be joined together. This means that valve seats of the hardest tool steel can be bonded into the block . . . an advantage denied the ordinary cast block. Steel tubing of the proper hardness for long wearing cylinders can be joined to the less expensive sheet stock suitable for water jacketing, while still another grade can be formed into heads and valve guides.

These considerations, and the desire to produce a perfected engine of great strength, impelled Lloyd Taylor to continue experimentation after Crosley had put his initial design into production. As the Crosley plans for a small car materialized, it became apparent to Lloyd that when mass-production techniques were applied to the 44 cubic inch mill, and cost cutting principles were favored over sheer quality, that something was bound to go wrong. He harbors no grudges at this date, but Taylor feels that the big business approach, successful as it has made our country, still has its blind spots, and that one of them is the frantic endeavor to be first with the latest for the least money.

In the unique set up of the Crosley stampings, as they were originally plotted, several pieces were laid out to be stretch-formed in three operations. The first die roughed out the blank, and succeeding presses completed a precision part. This was particularly vital around the valve guides where a radiused corner called for uniform thickness to provide uniform heat dissipation. The economy axe fell on this and other idealistic tooling specifications, and the engine design went to bed considerably altered from the original conception. Compound dies replaced multi-stage parts production.

Those who were actively interested in the Crosley at the time it appeared on the market well remember the "tin engine" and its problems of maintenance. There were many flaws in the stout little OHC 4 . . . not the least of which was maintaining gear clearances in the cam drive — a bevel gear and shaft arrangement working off the front of the crank.

In Taylor's opinion the thrust should have been taken by a bearing at the front main. But this posed assembly problems and a switch was made to a rear-thrust arrangement. As the engine heated up to normal operating temperature and cooled again it expanded lengthwise and caused the gear clearances to grow and diminish alternately.

(Continued on page 66)

INDEX OF ADVERTISERS

Sports Cars Illustrated
March, 1958

SUPERSPORTS

(Continued from page 64)

Much of the rattle-and-roll noise attributed to the tin block was in reality an improperly meshing gear train.

Refrigerator assembly experience apparently wasn't too sound a background for quality control in engine manufacture, and many Crosley blocks emerged with tiny unwelded spaces in the seams. While this may not be of great importance to the performance of household appliance, it proved to be deadly where the continuous vibrations and stresses of power output were encountered. According to those in the Crosley organization at the time, the leakage was not recognized as primarily a tooling boner. When it was finally admitted, so much money had been sunk into the project that a final mistake was added in an effort to salvage all the former ones.

This almost incomprehensible move was to *galvanize* the block to seal the leaks!

As any first-year chemistry student could have told the project engineers, plating zinc onto a copper-steel unit and filling it with water containing even the slightest mineral traces would result in an inefficient but nonetheless active *battery*.

The denouncement was as might have been expected. The "tin block" began to devour itself through electrolysis and literally ate itself up before it got underway. When this manifested itself, the switch was made to a cast block, and considerable disparagement was heaped upon the fabricated unit.

We all know the cast-block Crosley as one of the most spectacular engines of our time. And, Lloyd Taylor's radical design, (five mains, OHC, over-square) even though much aborted, is sound and respected by anyone who has worked on the little devils. Nick Braje, and others, have coaxed fantastic amounts of hp from Crosleys in spite of the inferior breathing (changed from Taylor's original 4-port arrangement) and difficult valve timing.

At a certain point in the Crosley revisions, Lloyd threw in the towel and went home a most unhappy man. Although his connection with Crosley was ended, he continued to work further with the engines at O'Keefe & Merrit in Los Angeles to develop a portable generating unit, that is still being bought by the Government . . . the same generators which power our Radar defense line from the Arctic south. During this period Lloyd began to think about the fabricated block again and planned ahead, convinced that this method offered the only economical approach

In his analysis these improvements were needed: lighter weight, higher compression ratio (for more power), more efficient heat transfer (for lower internal temperatures and longer life), overhead cam arrangement (for better breathing) and a barrel crankcase for the ultimate in bottom-end sturdiness.

He was so convinced that his fabrication principle was the answer to these requirements that he spent the next ten years—plus a man-sized fortune—to prove it. The SS two-litre is the result.

Ocee Ritch

PRINTED IN U.S.A.