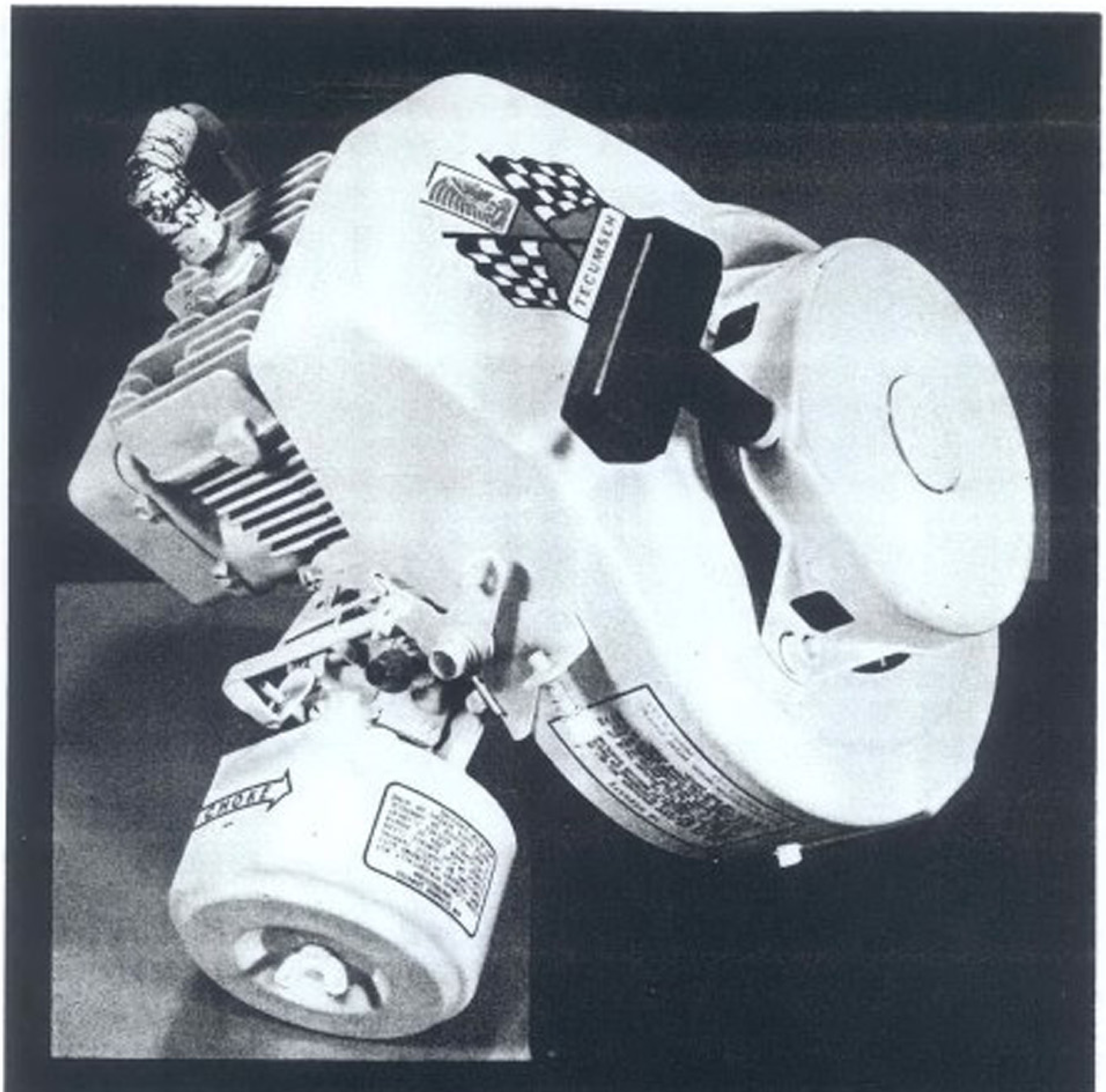
A PEEK INSIDE THE NEW TEKE TWO BANGER



ORMEL DUKE
LOOKS AT THE
TECUMSEH'S 817
TWO-STROKE FOR MINI-BIKES

By O. F. DUKE

Hey, have you heard about the new AH-817 by Tecumseh? That new two-stroker for mini cycles that grinds up to—

Wait—wait—wait! Hold up, man! What's a Tecumseh? What's this AH-817 thing? What excitement are you off on now? Tell me, quick.

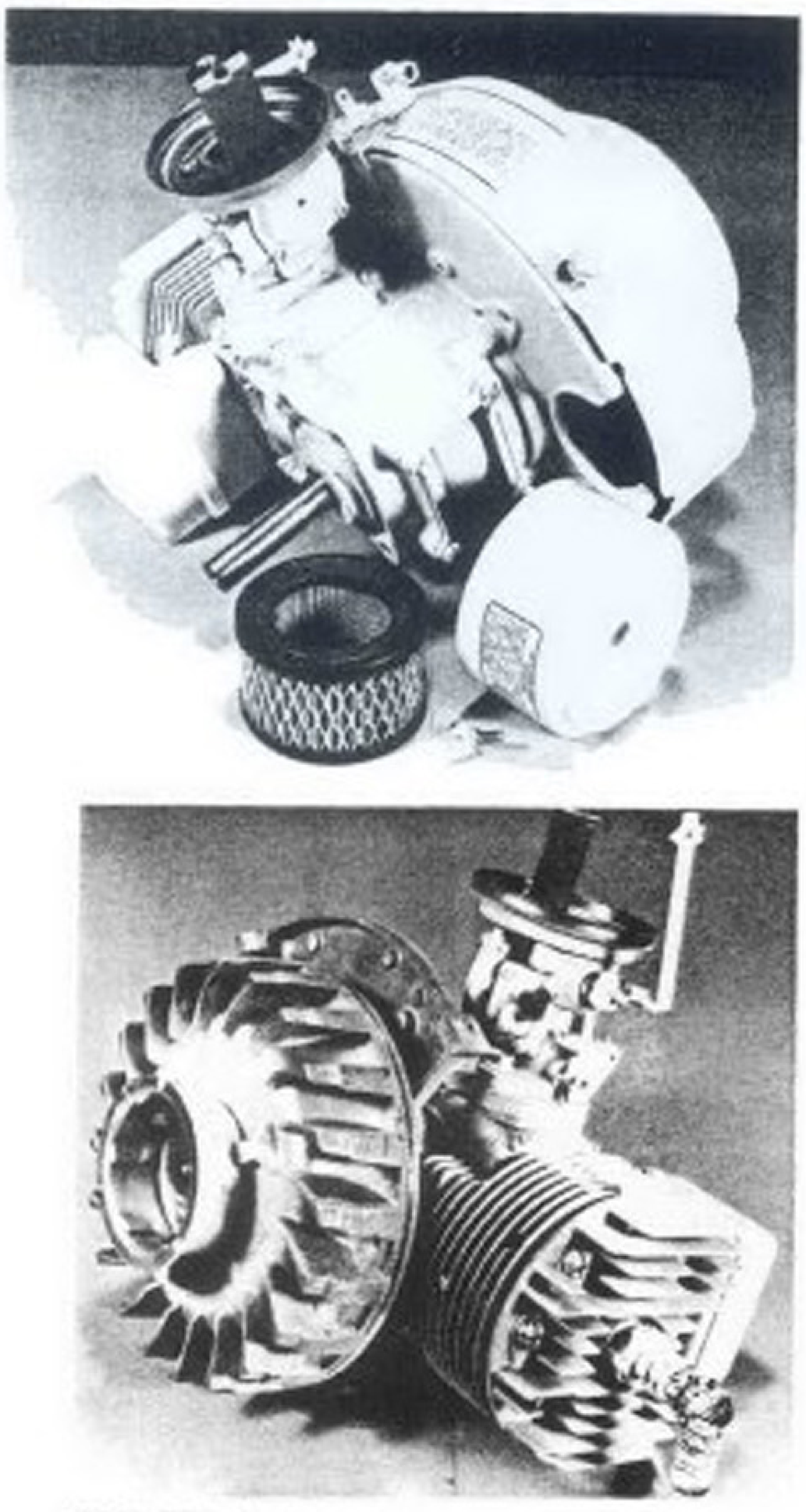
I was telling you quick until you shut me off at the corner. Now, if you will kindly put your kick stand down and settle back, I'll give you the whole bag from aardvark to zymurgy.

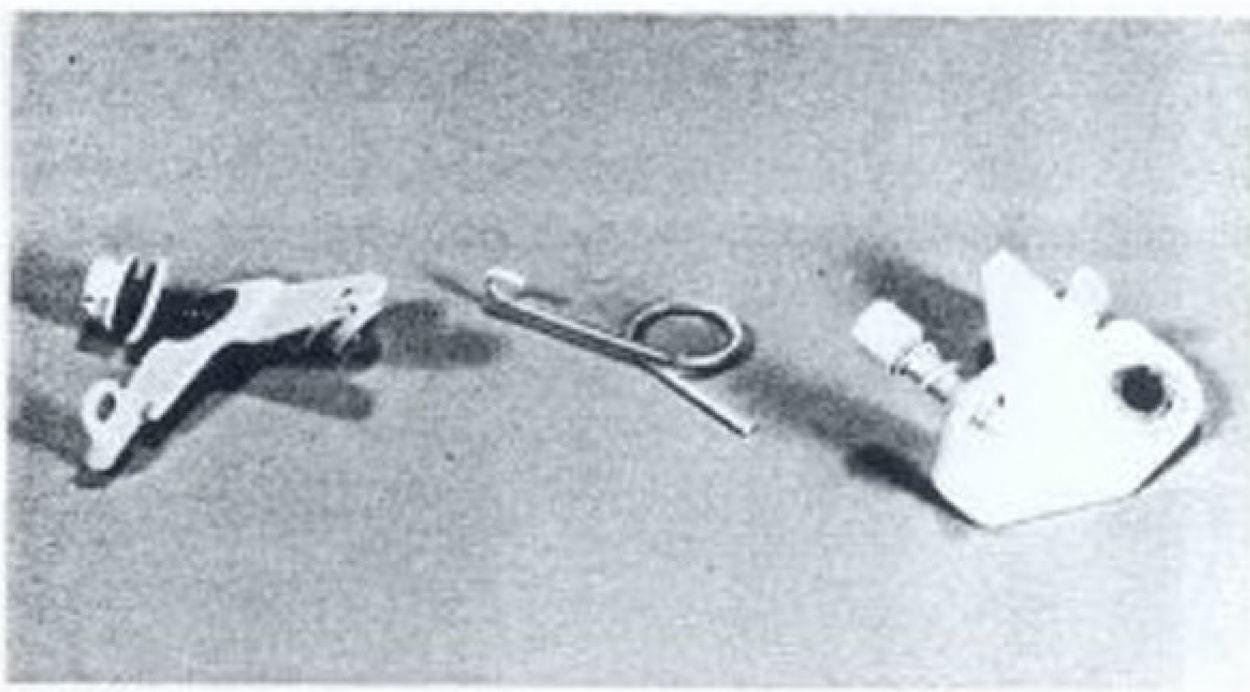
Aardvark? Zymurgy? I thought you were going to tell me about that, uh, uh, that, uh, that 817 thing? Now what are you off on?

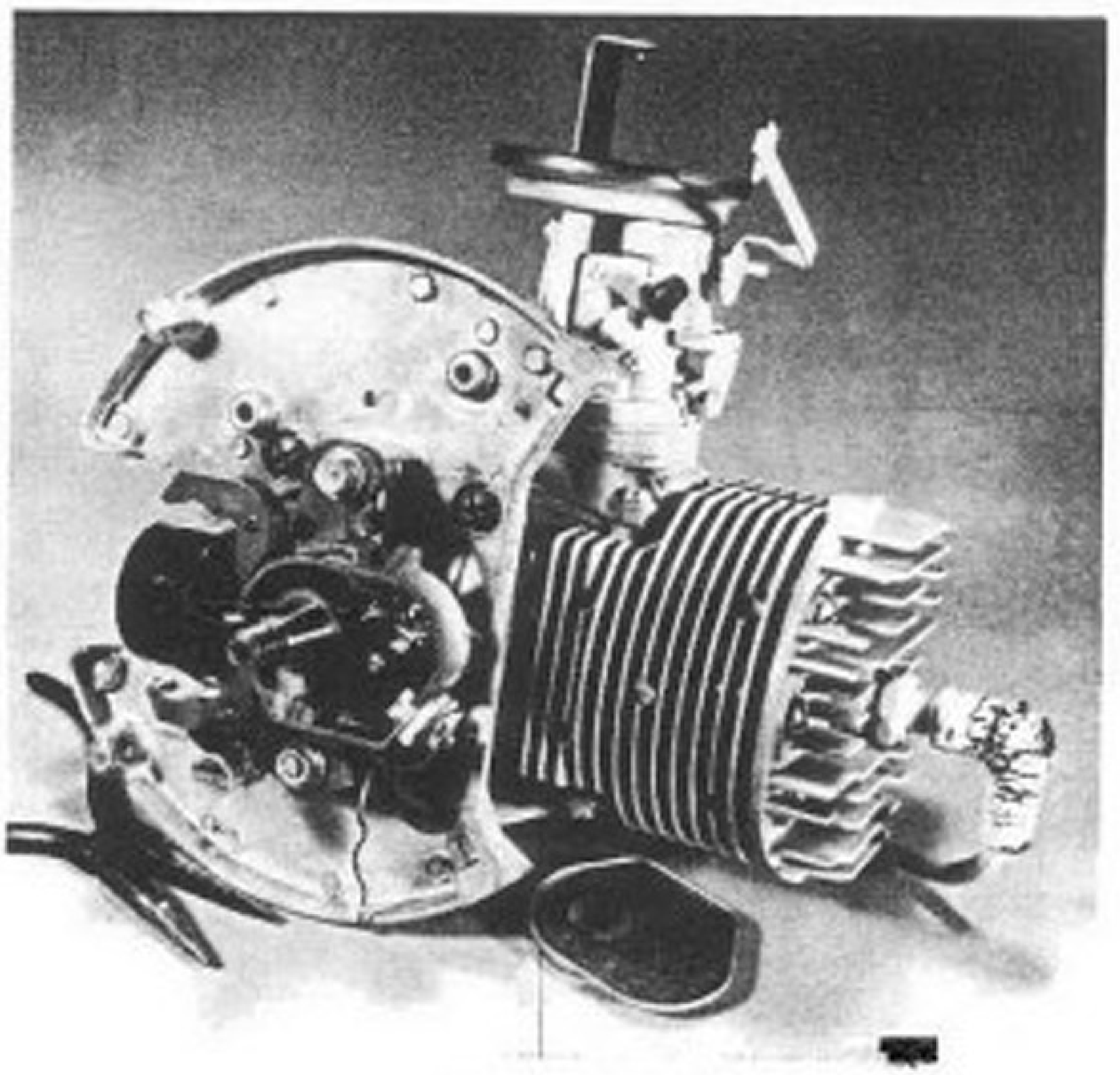
Fellah, I'm going to tell you if you will just listen. OK? Here we go—

A long, long time ago, long before mini cycles and when karting was still using just about any kind of a popper that could be found, there was this outfit called Power Products. Now, they put together a real respectable engine which karters knew as the AH-58, and that little two-stroker sure took home its share of the trophies in those days. Somehow, though, that little engine dropped from the scene at just about the same time the first mini bikes started putt-putting around the back lots. Now, a big brother to that little 5.8 cubic inch screamer, the Tecumseh AH-817, is among us to put some real zip into mini cycling.

First of all, to show you what I mean, that 817 figure represents a displacement of 8.17 cubic inches, or 133cc's, whichever you prefer. On the corrected horsepower curve, this adds up to five solid horses at 5,700 revs per minute! Along with this, the 817 twists out slightly over five foot-pounds of torque at about 4,500 revs, and the torque curve is fairly flat from 3,500 to 5,500 revolutions per minute. When all of this







TOP LEFT - Pleated paper filter is big-time approach for mini-cycle engines. No more choked off air supply by oil-soaked sponges.

TOP RIGHT - Throttle return mechanism is positive, designed to provide smooth, not-too-rapid throttle control to prevent jerky starts.

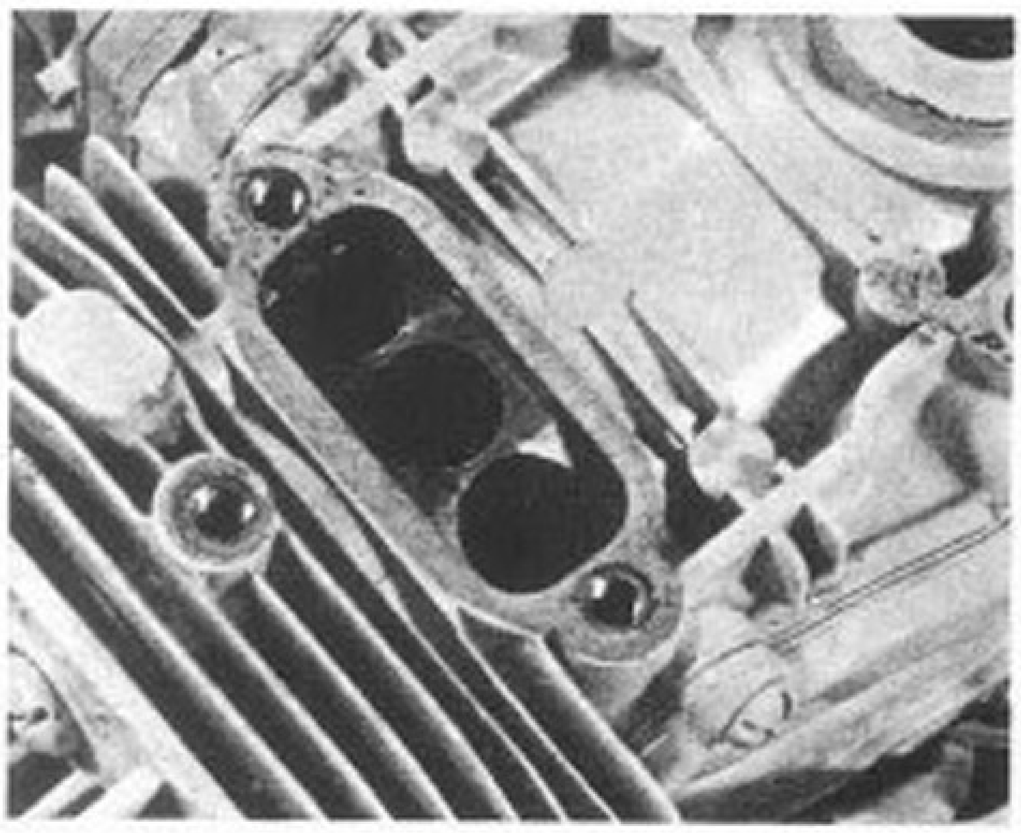
BOTTOM LEFT - With shroud removed, the air moving capabilities of the flywheel fan are readily seen.

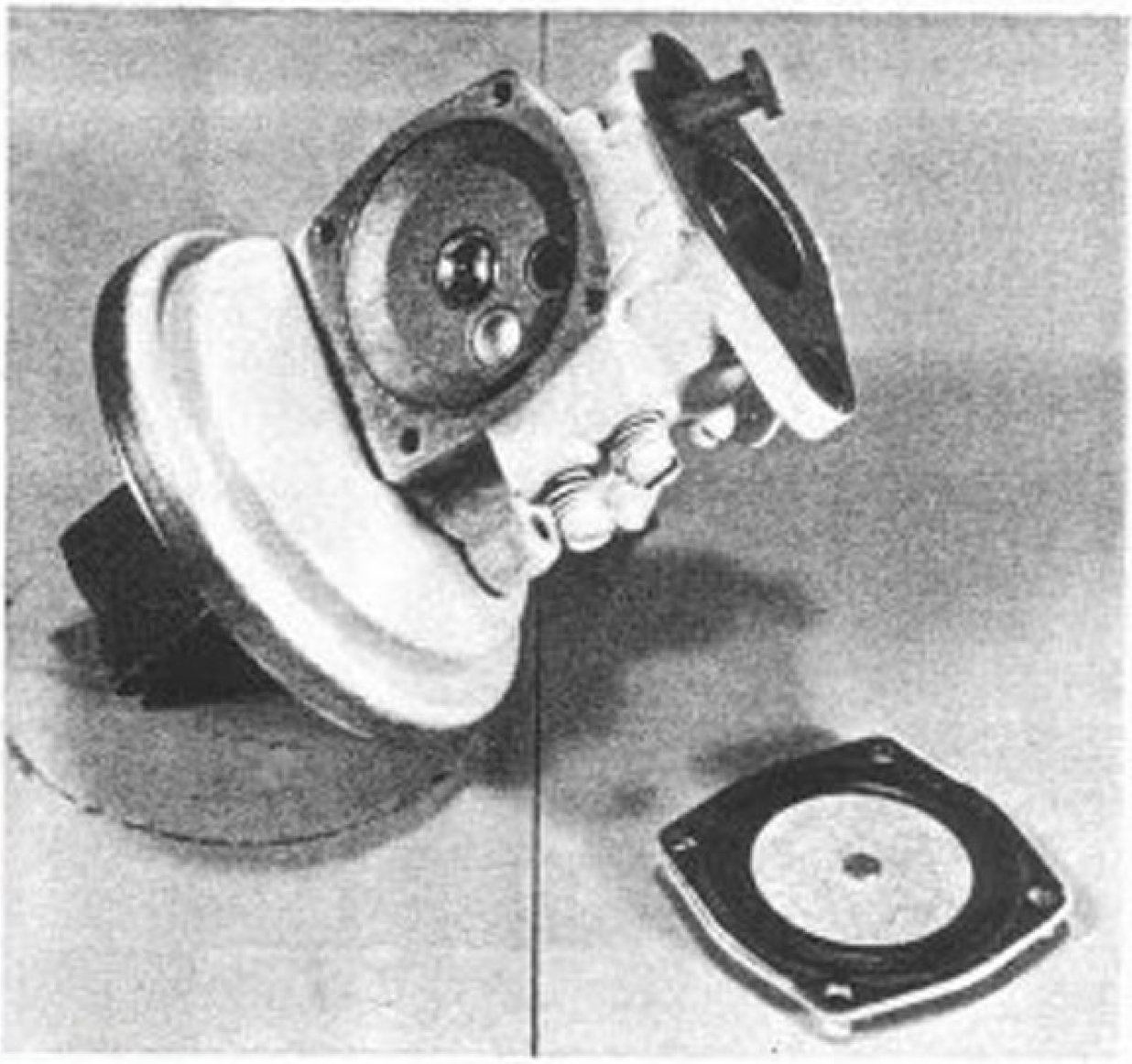
BOTTOM RIGHT - The conventional ignition are readily available for adjustment following removal of the flywheel.

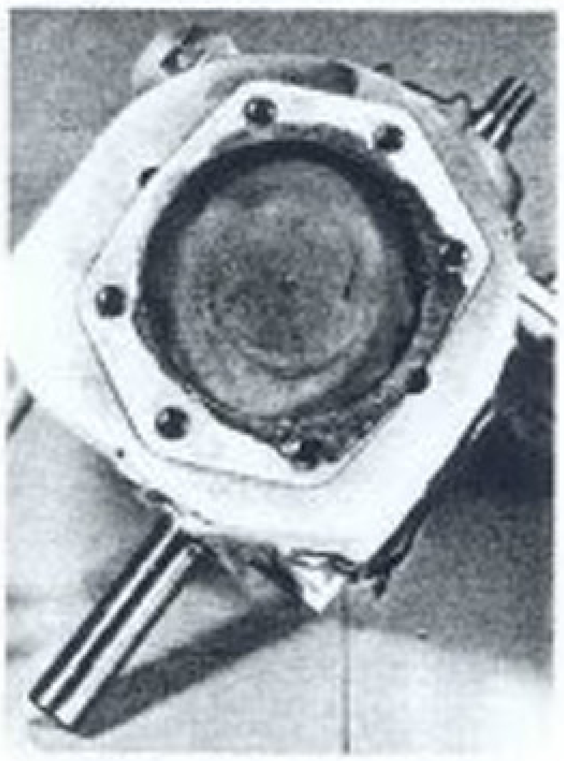
is added together, it means that you can cruise all day long without working the engine too hard; that you can crank it on up to six grand if you want to go real quick; or you can climb hills almost to the point where all the blood is in the back of your head.

To do this, Tecumseh Products has put together an over-square (Bore: 2-7/16-inch x Stroke: 1.3/4-inch) two-stroke cycle engine that weighs in at just about 12 pounds. To make sure that it will fit into the popper department of your bike, the people have kept it small and compact. To show you, check these: From the bottom of the case to the top of the plug, the engine is just 11-3/4-inches. From the tip of the air cleaner wing screw to the far side of the case, it stretches only 11-5/32-inches. Then, from the outside of the recoil starter assembly to the far end of the PTO shaft, it's a mere 9-27/32-inches. And now that you know what the outside looks like, let's take a look into the innards at the things that go around and up and down—

Before starting to unbutton the engine, though, there was a guideline that was established. Simply, just what tools are required? It's one thing to have a garage full of special equipment that makes it possible to cope with any situation that might arise; it is still another to head out for a week-end of fun riding—and know that you can meet just about any problem without carrying along a van of tools. Thus, disassembly of the AH-817 got under way with only the following tools on hand: (i) A standard 3/8-inch drive socket set; (ii) a standard 1/4-inch drive socket set; and (iii) two screwdrivers, a ball-peen hammer, a small plastic head hammer, waterpump pliers, and a 14mm spark-







TOP LEFT - Three sizeable exhaust ports permit rapid removal of exhaust gases during scavenging portion of power cycle.

TOP RIGHT - The small but well-designed carb incorporates both diaphragm fuel regulation and an integral fuel pump (shown pulled from cavity).

ABOVE - The back transfer ports are accessible by simply removing the back cover plate.

LEFT - Although there appears to be an eight screw head hold-down pattern, only six screws are actually used. This is discussed in the text.

ABOVE - To form the correct squish clearance, the cylinder head fits down into the cylinder bore. This is not a metal-to-metal fit common to many large bike engines.

plug wrench. And the first thing used? Fingers—to remove the wing screw securing the air cleaner assembly.

Once off, inside the can was found a pleated paper air cleaner of the type commonly used for automotive engines. Although miniature by comparison, the area of the cleaner is more than adequate to properly breathe the engine. A plus here is that there is but minimum air restriction such as is found in the commonly-used oil-soaked "sponge." The filter is rubber-sealed on both ends and is sized to assure that there is seating without leaks which would permit dirt and grit to enter the engine induction tract.

Next off was the flywheel shroud assembly, which included the throttle bellcrank and return spring. The arm lengths of the bellcrank, plus associated linkage to the carburetor were such to provide fine control of the carburetor without either under- or over-twisting of the handlebar throttle control. Although this may not sound important, a carburetor that opens too fast is just as dangerous as one that requires so much twisting of the throttle grip that the rider is left with a hand in an awkward control position. Equally important is the sturdy, plated throttle return (dead man control) spring which forms part of the assembly. The spring on the unit under check was adequate to pull back all but the extremely corroded grips or badly damaged cables.

With the shroud off, details of the pull rope starter assembly were apparent. Here, as the starter rope is tugged, a single pawl moves outward to engage the starter cup secured to the end of the crankshaft. The flywheel proper, which also provides the base for the magnetic

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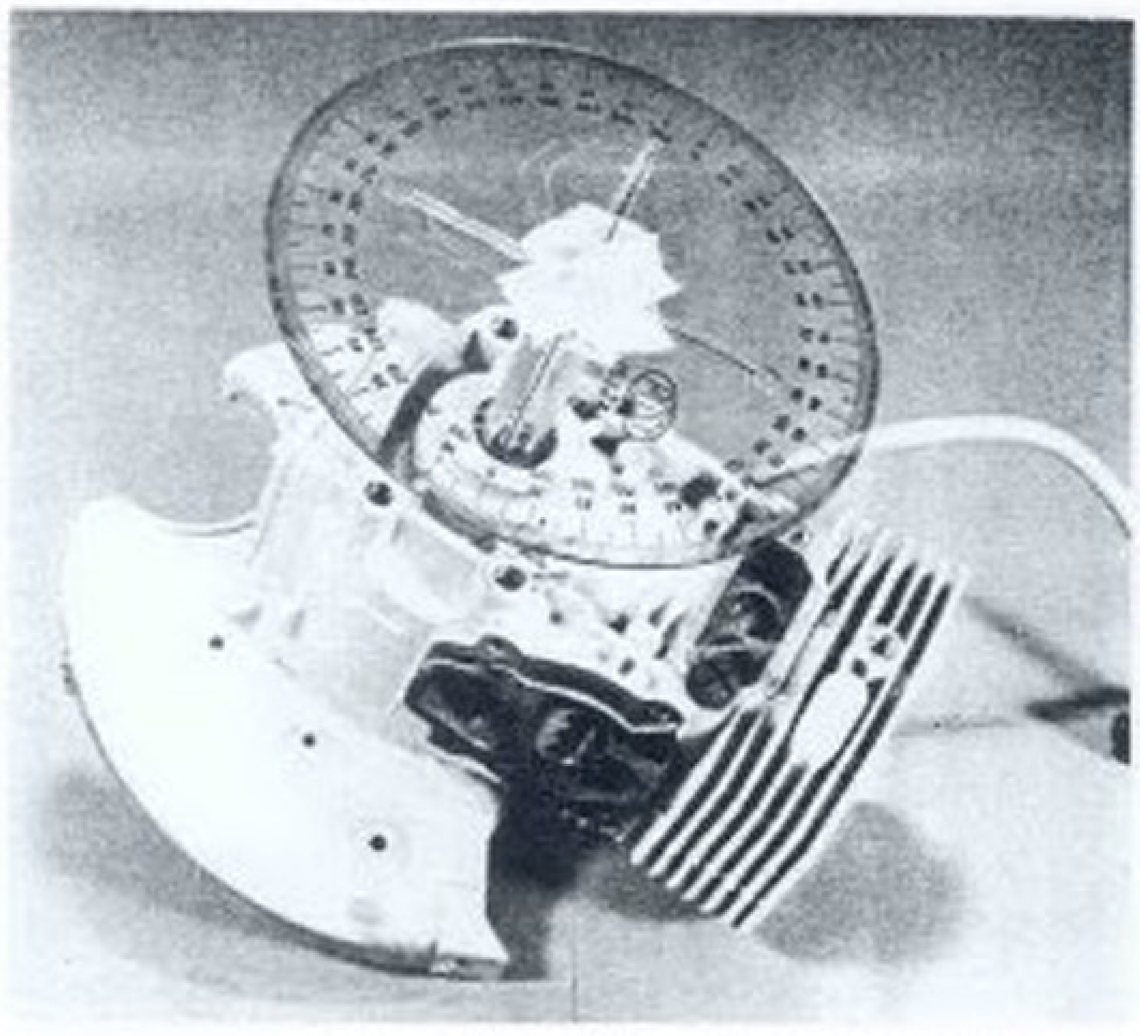
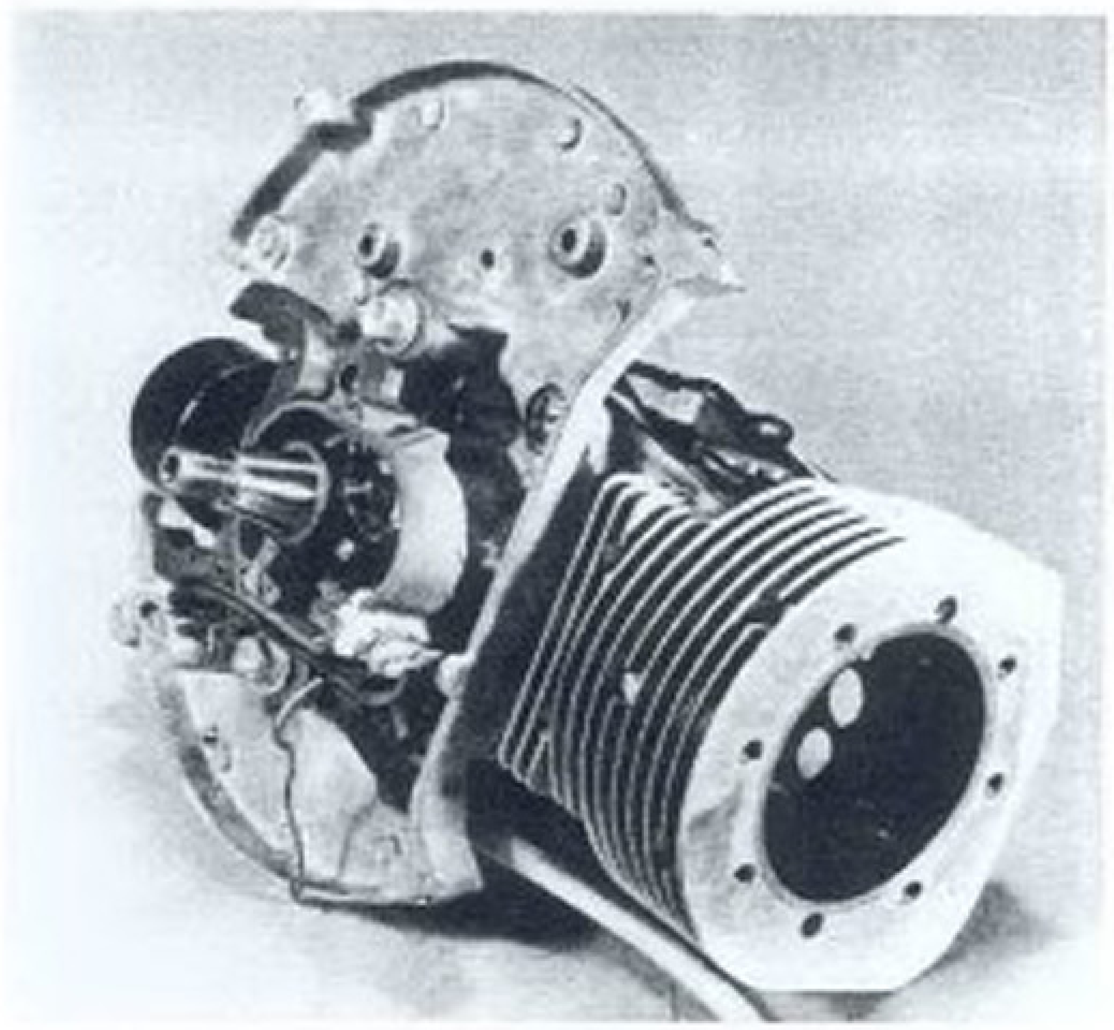
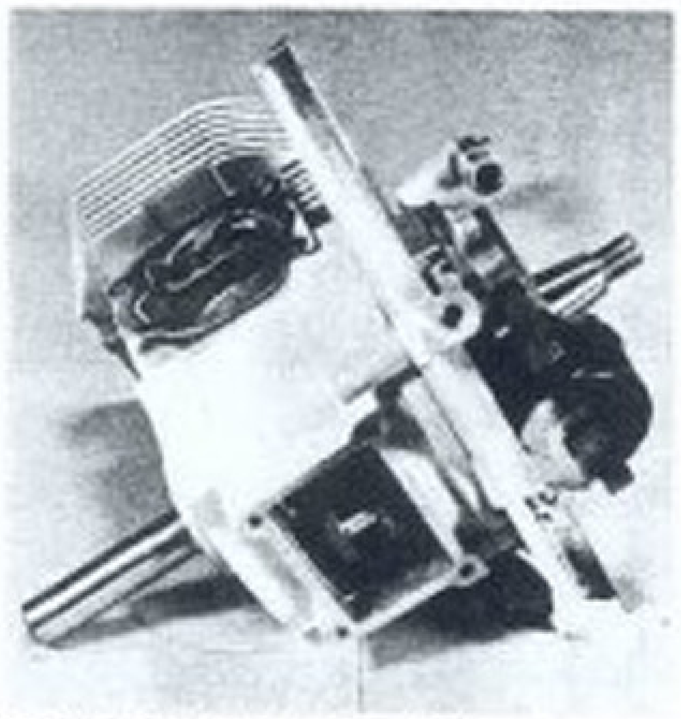
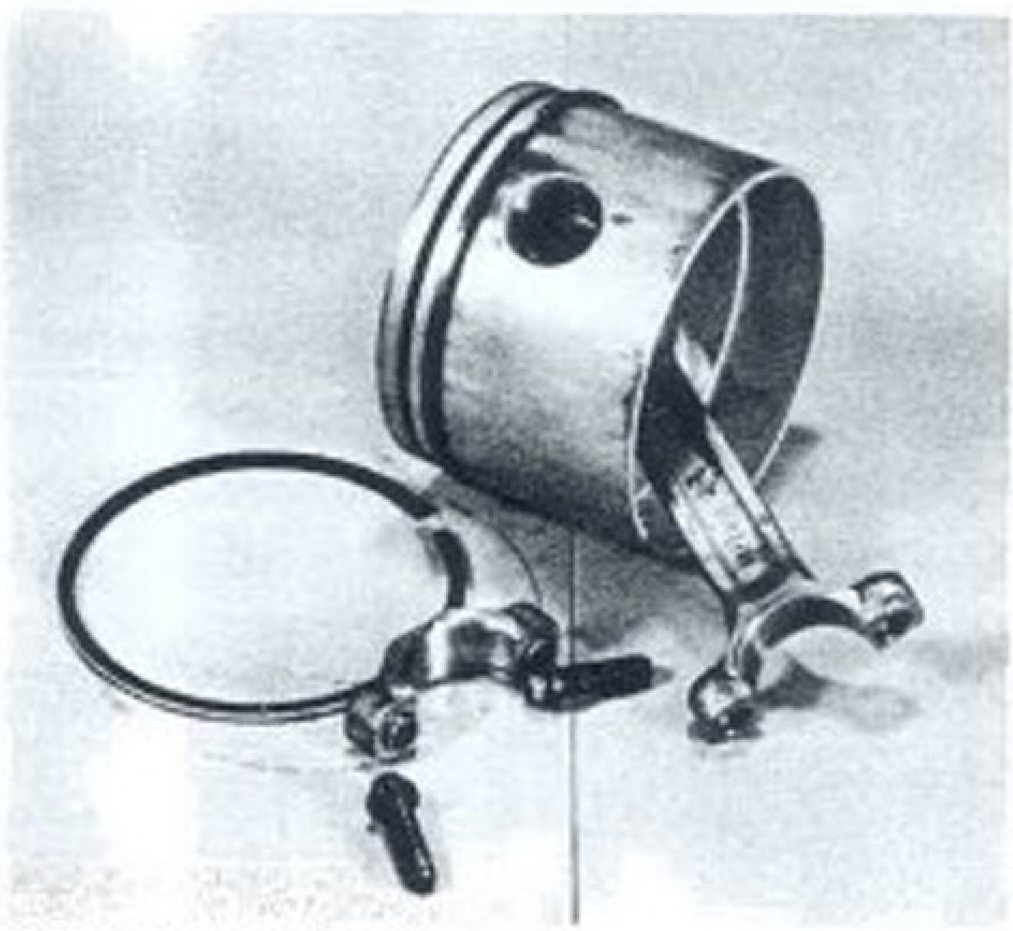






TOP LEFT - A jerry-rigged degree wheel was made up to check port timing, using a bent paper clip for a pointer.

TOP RIGHT - With the flywheel removed, the ignition breaker-points and condensor set-up can be seen.



BOTTOM LEFT - The well-finished crankshaft throw is visible in this end view of the AH-817.

BOTTOM RIGHT - Piston rod and piston assembly - minus 66 tiny needle rollers. Rings are not pinned.

TECUMSEH TWO-STROKER

Continued from page 39

components of the ignition system, is both sizable (diameter: 6-5/8-inches) and of good heft. Again, the point may not appear important, but the flywheel weight certainly helps to smooth out the power pulses on a single cylinder engine—and particularly so when the engine is lightly loaded. Less BLAM! BLAM! shaking, in other words. Equally important is the well-finned design of the wheel as even at idle engine RPM's it will certainly move plenty of air over the cylinder fins for good cooling.

And it was here, when the flywheel was to be pulled, that the minimum service tool approach was put to test. With the flywheel securely held—a folded shop towel protecting the holder's upholstery from nicks or cuts—two sharp raps on the end of the socket handle were sufficient to break loose the flywheel retaining nut. Next, with the nut backed off to the end of the crankshaft (to protect the shaft threads), three raps with the plastic head hammer directly on the shaft end and nut popped the flywheel right off the taper. But it was also at this point that the first disagreement with the service procedures issued by Tecumseh came about.

To check the breaker point setting (point of opening as related to the crank throw position before top dead center), the book calls for 0.115-inch BTDC, which is fine. Fine, that is, provided that your tool box is stocked with a fairly expensive dial indicator timing device. For the average Joe with the average thin pocketbook, a measurement in degrees before top dead center is really preferable. If you haven't tried it, there is a considerable difference between a one buck plastic protractor and a 25 buck dial indicator! Anyway, when checked, the points were found to be set at 0.116-inch, which is not too bad for a production engine.

The 817 as produced is best identified as a vertical shaft engine, and it is very likely that it started in life as the power unit for a small outboard motor. This is no mark against the little engine, as a two-stroker—having no crankcase full of oil—has no awareness of operating attitude. Thus, a twist of the wrist—plus a side mounting bracket—immediately converts the engine for horizontal shaft operation. An excellent feature of the all-attitude capability of the engine is in the carburetor that Tecumseh elected to use for mini cycle application. Specifically, the carb is a floatless, diaphragm-regulated, with integral fuel pump assembly. Now, what does all of that mean?

Simply, the carburetor has no float bowl. A regulating diaphragm, with one side exposed to atmospheric pressure and the opposite side to fuel (termed the wet side), replaces the float and chamber. Like the engine, the carburetor can be operated in any attitude and there is never a problem of fuel surging or of the jets going dry. An outstanding feature of the carburetor is the integral fuel pump—and it is novel!

The pump is nothing more than a small nipple-like tube inserted into the carburetor body from the mounting flange. Open on one end, sealed on the opposite, this tube is inflated and then sucked flat by the crankcase pulsations common to a two-stroker. (As the piston moves up the barrel, the tube is sucked flat as crankcase pressure is reduced. As the piston descends, crankcase pressure increases and the tube is caused to expand like a balloon.) As the tube is caused to contract, fuel enters the chamber in which the tube is loosely fitted. Then, as the tube is expanded by crankcase pressure, the fuel in the chamber is forced into the chamber under the wet side of the regulating diaphragm. To prevent fuel from just moving back and

forth in the fuel line, a series of valves open and close with the change in pressure and fuel is permitted to move in one direction only—straight to the regulating diaphragm. Thus, even with a gravity flow fuel system, a constant and even supply of fuel is furnished the carburetor which infinitely improves fuel metering and regulation.

The unhappy part of the carburetor is in the 0.810-inch diameter throttle bore, which is quite small for an eight-inch engine. On the other hand, the small bore will certainly limit wild engine operation (through lack of breathing capability) and there can be no doubt that this factor will improve the service life of the engine. But more on this later.

The fuel intake system of the 817 is of the third port design, which means that there are neither reed valves nor a rotary valve. Instead, the skirt of the piston opens and closes three ports which are drilled through the cylinder block (directly under the carburetor) and into the crankcase. These ports are approximately 0.350-inch in diameter which, like the carb throttle bore, is certainly minimum size for an eight-inch engine.

As one thing seems to balance out another, however, there has been considerable thought in the mounting of the carburetor. With recognition that heat soak from the engine could cause fuel boiling in the carburetor, the carburetor is mounted with thermal spacers to reduce the transfer of heat. Thus, much improved engine performance on hot summer days—plus much less trouble in the starting of a hot engine. (To explain, fuel has a boiling point. When this temperature is reached, vapor is released from the fuel much like steam from boiling water. As the jets will pass vapor much more readily than a liquid, the engine starves for fuel and either dies or is extremely hard to start when hot. OK?)

A feature of the 817 design is in the use of a loop scavenging system. Both the front and back transfer ports are angled upward and away from the exhaust port, directing the incoming fuel mixture in a loop through the chamber over the top of the piston. This design improves the charging efficiency and ultimate power production. There are four transfer ports, two each front and back, and these ports are 0.50-inch in diameter. In order to plot the relationship (port timing)—an important factor in the performance of a two-stroker—a hastily contrived degree wheel was made up from a plastic protractor. And this uncovered the next rub of why-did-they-do-it-that-way?

You see, the only logical place for mounting the degree wheel was on the end of the crankshaft (PTO end). Great, but why was a fine thread screw (5/16-24) used here when all other screws are of the coarse thread variety? Not that it is a big problem, but fine threads can be very hard to find in the middle of the desert on a Sunday afternoon.

With the degree wheel installed and a bent paper clip for a pointer, it was found that the exhaust ports open at 82 degrees BBDC and the transfers at 63 degrees. This results in a 19 degree blow-down timing, which is very respectable for a two stroke engine. In parlance of the trade, it means that the exhaust gasses are given a longer period to escape before the fresh fuel charge is pumped from the crankcase and into the chamber over the piston. In turn, the third ports (fuel mixture inlets) are opened by the piston skirt at a point 73 degrees BTDC, which gives 146 degrees of inlet duration.

In the logical sequence of disassembly, next off was the head—and the next question on design. An eight screw hold-down pattern was available in the cylinder block, but the head had provision for only six screws. This resulted in two

groups of three hold-down screws, with a sizable gap between the two groups. Perhaps the problem is minor, but the review engine had very noticeable witness marks of liquid leakage in the two large gaps (between groups) and it appears that there could be some problem of adequate sealing due to the warping of the head when pulled down against a soft gasket. And this brings forth another question: Why an asbestos type gasket for sealing between the cylinder head and block? It will be interesting to see if such a practice survives the rigors of engine use on mini cycles. (This, too, is not a serious problem. A few minutes with a piece of dead soft copper of suitable thickness will produce an excellent gasket—so fret not.)

And then the piston and rod assembly was removed—sheer Panicsville! If you have ever seen 66 tiny black rollers—each 0.065 in diameter by 0.210 in length—falling out of the bottom of an engine, you know the despair that was felt when the con rod cap was pulled free of the rod body. Everything stopped until a large piece of clean white paper could be found and placed under the engine. Even then, with these little things fairly well contained, every nook and cranny of the piston and engine was checked with a strong light and a magnifying glass just to make certain that no engine destroying culprits were left up in the innards. (And the problem of putting them all back in has yet to be faced—and solved. It is not something that is recommended to be tried while huddling under a cactus plant in the middle of the Mojave on an average summer day!)

A quick fanning of the service manual revealed that a double row of these little monsters is used in the 817. For service purposes, strips of rollers in wax are wrapped around the crankshaft throw and the rod and cap are then assembled —provided the heat of your hands hasn't melted the wax and released the needles. But again, a minor technical point of assembly.

With everything removed, the construction of the engine is impressive. The cylinder liner is husky and, being of cast iron, will provide a virtually endless service life unless destroyed by something breaking. The crankshaft is carried by two anti-friction (ball) bearings and the alignment is excellent. When rotated, there is absolutely no sign of binding or other deformation of the bearings through misalignment. The crank journal miked out to 0.630-inch, and the finish looked as if it had been polished. The same held true for the connecting rod. Of good cross-section through the web, there were no discernible points noted that could ultimately cause trouble through early failure.

The piston is fitted with two rings, each 0.062-inch in thickness. The rings, iron, are not pinned but this should not present a problem due to the diameters of the exhaust and transfer ports in a stock engine. Based upon the experience of Tecumseh in the two-stroke engine field, if there were any serious problems of either port pound-out or ring end hooking, there would have been ring keeper pins in the piston ring grooves.

In summation, production quality and finish of the engine is very good. The castings are clean and the machine work above average. All dimensions checked against the furnished prints, specifications sheets, and service manual were well within specification. The piston skirt was slightly egg-shaped, but what is 0.0005-inch among friends? But these are just the bits and pieces. The next step is to prove the engine through use, and this is planned to be done through the simple fact of mounting it on a bike—and then getting out and letting it all out to do its thing.

Stick around. We'll tell you all about it next month. □