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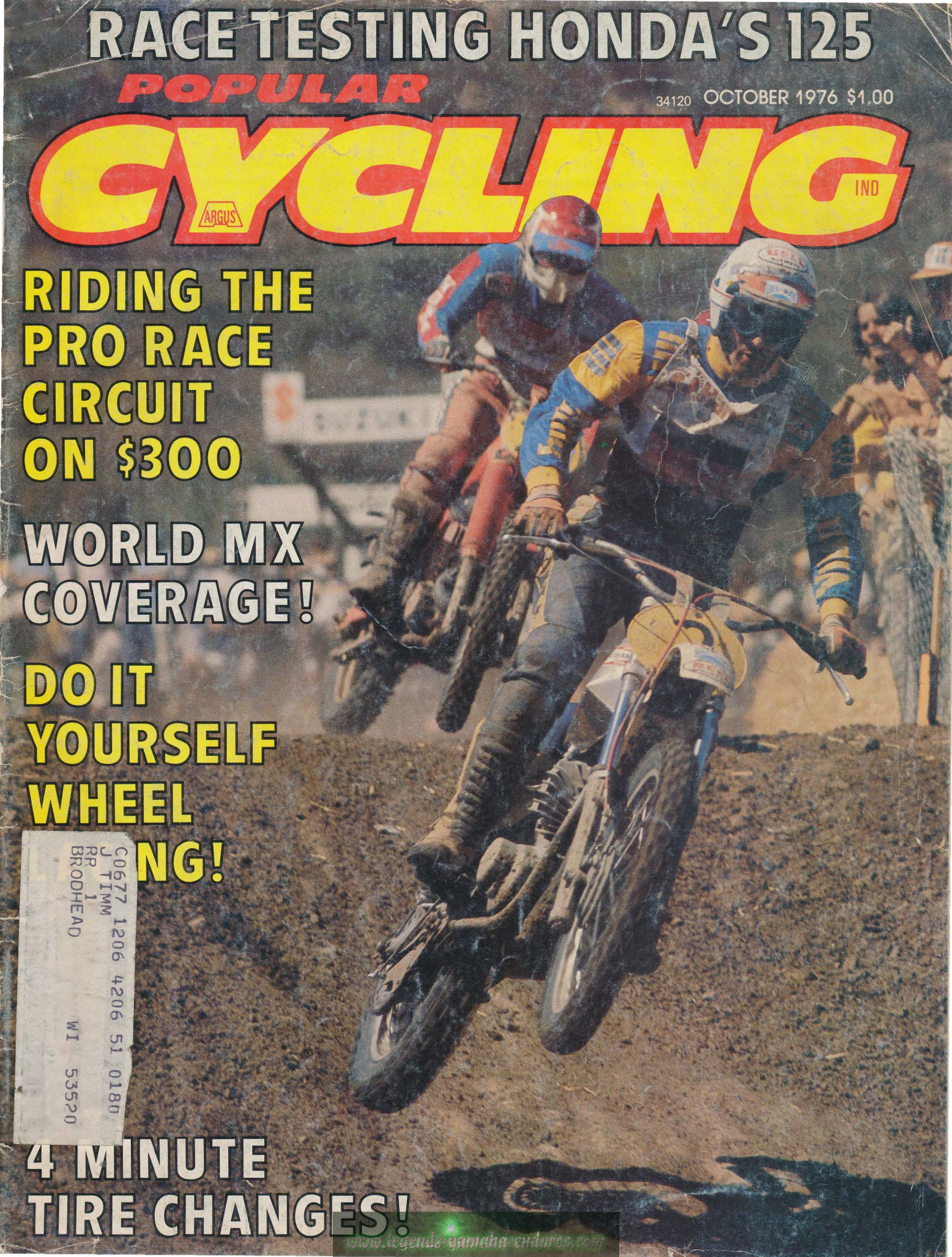

4 MINUTE TIRE CHANGES!

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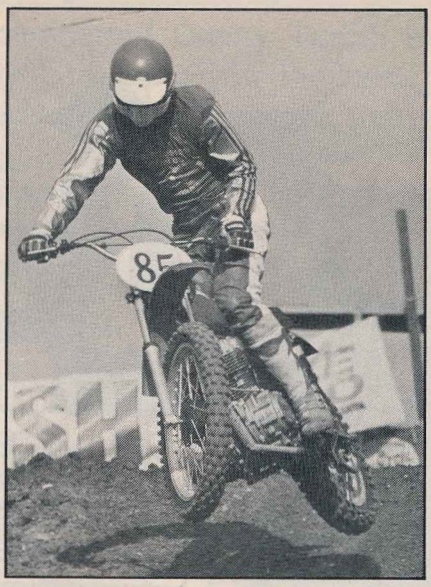

Cover:
Action from the U.S. Grand Prix at Carlsbad, with Adolf Weil and Tommy Croft. Shot by Steve Reyes and Ektachrome, loaded in a 6x7 Pentax.

Centerspread:
More race action from Carlsbad—this time at the start of the second moto. Steve Reyes again doing the honors.

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From a distance, the trickery doesn't stand out. Towards the middle of a moto, you'll visibly notice the difference in engine performance.

Presently an experiment, possibly a stock item in the future.

YAMAHA'S WATER-COOLED OW FACTORY MOTO-CROSSERS

Will Prestone soon be a major MX sponsor?

By Brad Zimmerman

Since the Hopetown race at the beginning of this year's season, there have been as many different versions of how the water-cooled Yamahas work as there are magazines. Everybody has gone and written down what he or she thinks goes on inside the cases and cylinder. Unfortunately, most of the versions have been wrong.

Realizing that it's the biggest change for 125cc motocross machines this year, we decided to sit down with Bill Buchka. Bob Hannah's mechanic, and find out what really goes on inside the motorcycle, while also taking an overall look at the total bike.

First of all, the reason for the water cooling is obvious. As we mentioned in our Shinobi head article, water cooling is the best way to fight the problem of horsepower loss due to heat build-up in a two stroke. When the engine gets hot, it begins to slow down. Liquid cooling seems to be the answer.

The idea of water cooling the OW-27 (Yamaha's designated part number for the factory machines) has been used before by the factory on their TZ-type road racing machines. The methods and functions have simply been adapted to motocross usage.

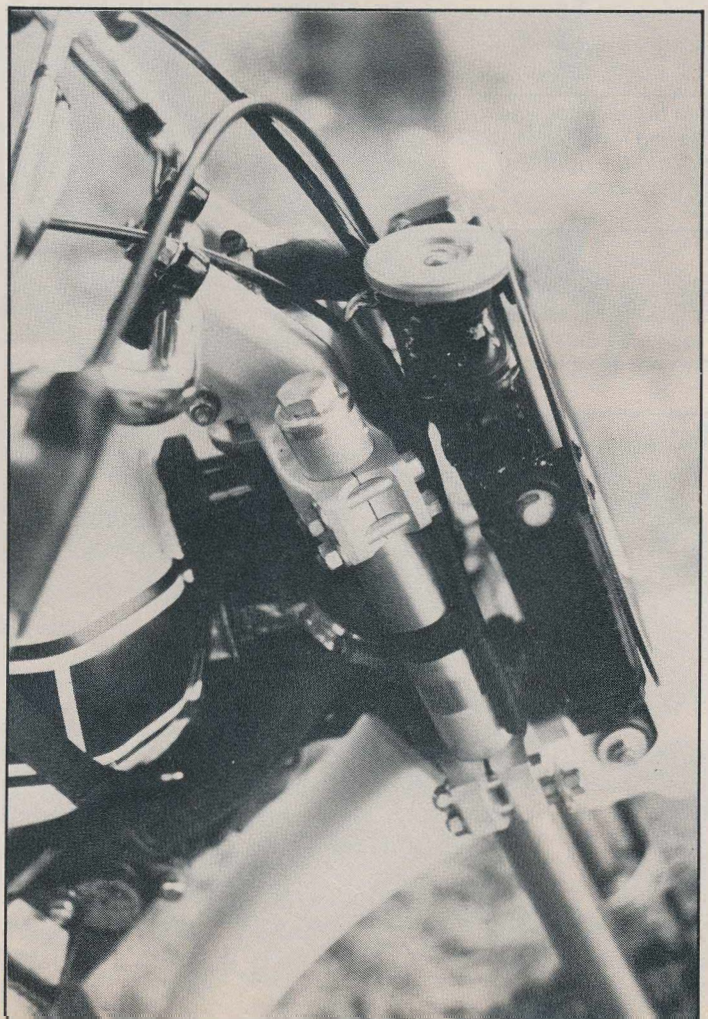
In the OW model there is a mechanical pump, driven by a series of reduction gears, that is actuated off of the crank. When the engine turns over, the water pump does its thing.

To follow the water pattern, we'll begin at the radiator. When the bike is first started, the water is sitting in the radiator, cylinder, head and hoses. As the engine turns over, the water is circulated through the radiator. This is due to the pull of gravity, the fact that hot water rises and cold water sinks, and the mechanical workings of the pump. In the radiator it flows over a series of zig-zag channels where the air flowing over the fins as the bike goes forward, cools the water. From the top of the radiator on down, the water is fed through these tiny, little channels. The air blows over the outside of the channels, cooling the water. Just like in your family station wagon.

From the bottom of the radiator, the cooled water enters a hose that goes briefly into the steering head area. This is to avoid problems encountered while turning the machine. If the tubes only went from the radiator to the cylinder, when you turned the forks to the click stops, you might run the possibility of crimping a hose, thereby defeating your purpose. With the hoses routed briefly through the steering head, that problem disappears. The forks can't get to the hose and stop the liquid flow.

Once it clears the forks, the water exits out of the steering head via a hose that runs down the right side of the machine and into the right side case. Inside this case area is a water pump,

Looking a little closer, you can see the radiator and accompanying hoses. Bill Buchka shows off his muscles lifting Bob Hannah's machine.



The radiator is less than 2 inches deep and about 8 inches long. You can also see the Pro Fab handlebar clamps and knurled fork legs.

driven by a series of reduction gears that are excited by the crank turning over. The water is then forced out of the case by the pump and makes its first entry into the cylinder by way of a spigot at the rear of the cylinder head.

Inside the cylinder head, the water first swirls around the top of the top end, cooling the rear of the engine block. Then, through a series of channels, it drops into the cylinder itself, working its way around the sleeve which houses the piston. Inside the cylinder area, the water eventually works its way towards the front, routes itself back into the cylinder head and exits the engine by way of a water jacket found at the front of the cylinder head.

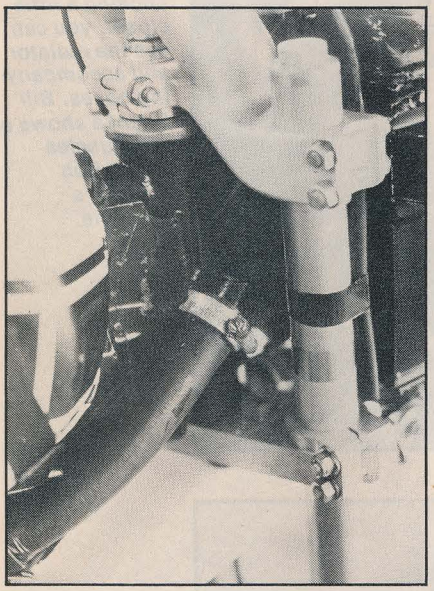
From there, it's back up the left side of the frame structure, through the steering head area again and back to the radiator again. The entire process doesn't take long. If you were to follow one small amount of water on its journey, you'd find that it's only about a 10 to 15 second trip at the very most. As the engine gets hotter, the rpms are turning faster. The water temperature rises, and its traveling speed is gradually increased.

The advantages of the water cooling system are obvious. First of all, the bike will run stronger and longer with this system. Although its performance is almost identical to an air-cooled engine in the first stages of warm-up, the real difference begins to show up when the machine is warmed to normal operating temperatures.

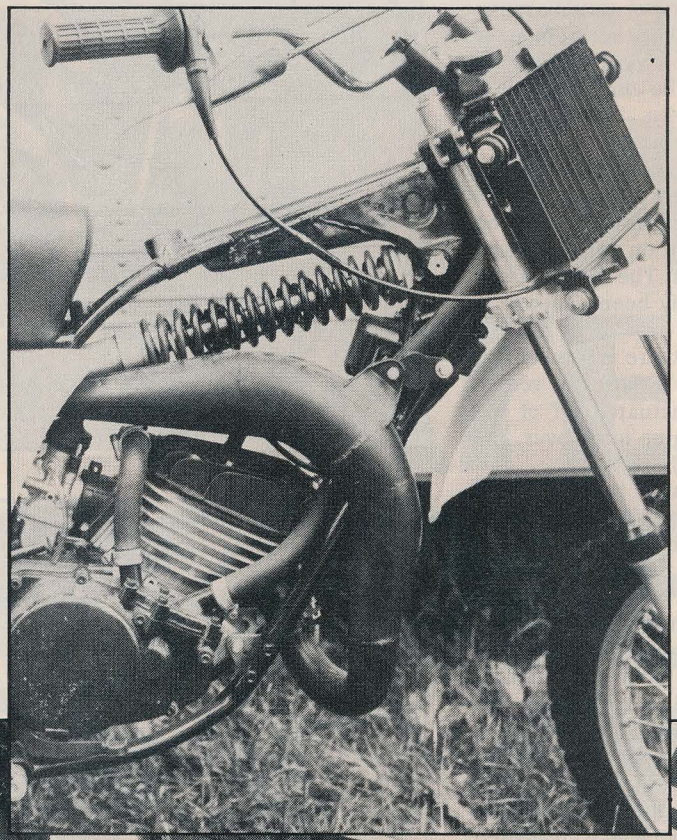
An air-cooled engine loses about 20 percent of its potential horsepower due to the heat build-up. The water-cooled engine, although it does suffer slightly from the heat, only loses about 3 percent of its horsepower abilities. When you're looking at a machine that puts out somewhere between 25 and 30 hp on a motocross track, a 3 percent loss is almost insignificant.

There are other little goodies you can

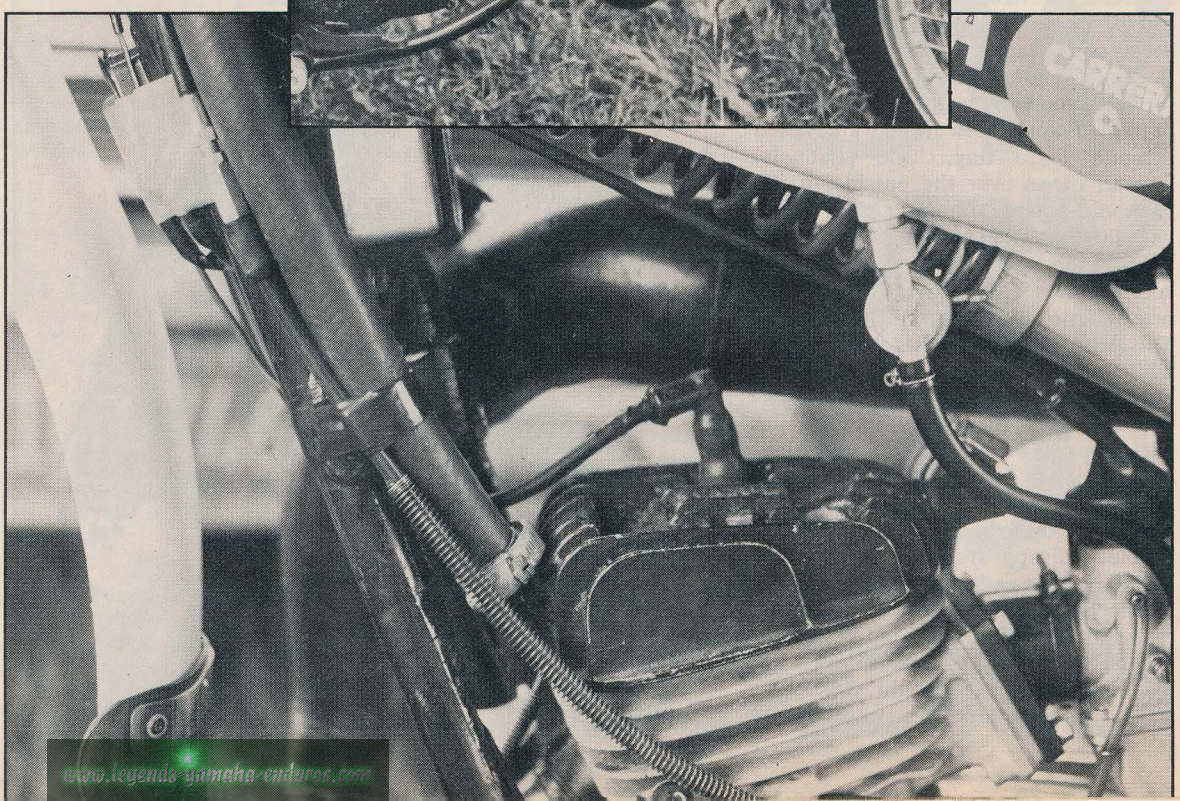
Continued on page 72



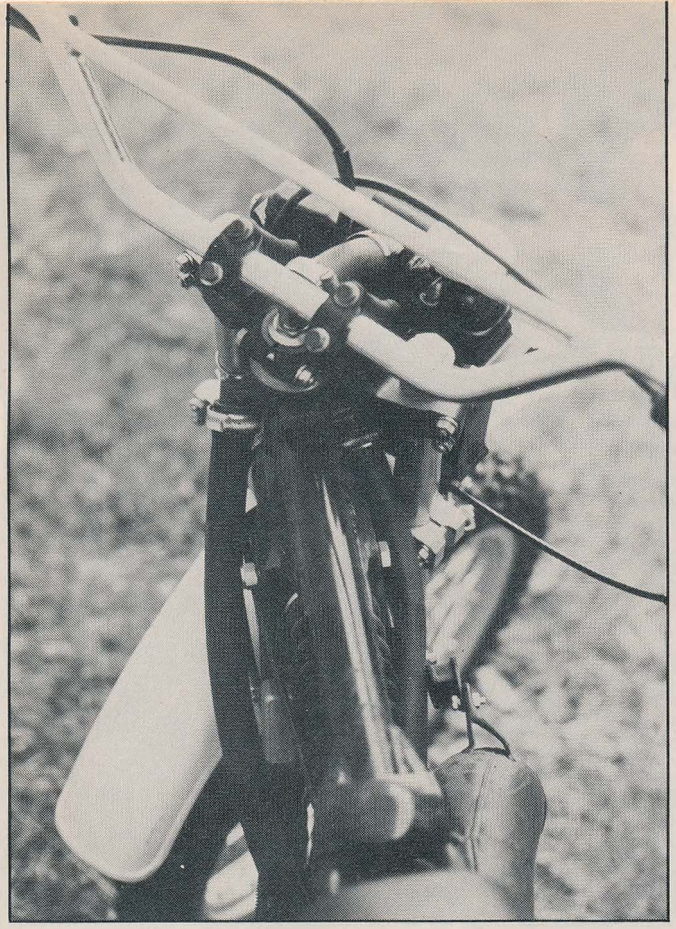
After being cooled in the radiator, the water enters the steering head for fork clearance, then exits out the right and heads down toward the pump.



Run by a set of gears connected to the crank, the pump, located behind the right side case, forces the water up and into the rear of the cylinder head.

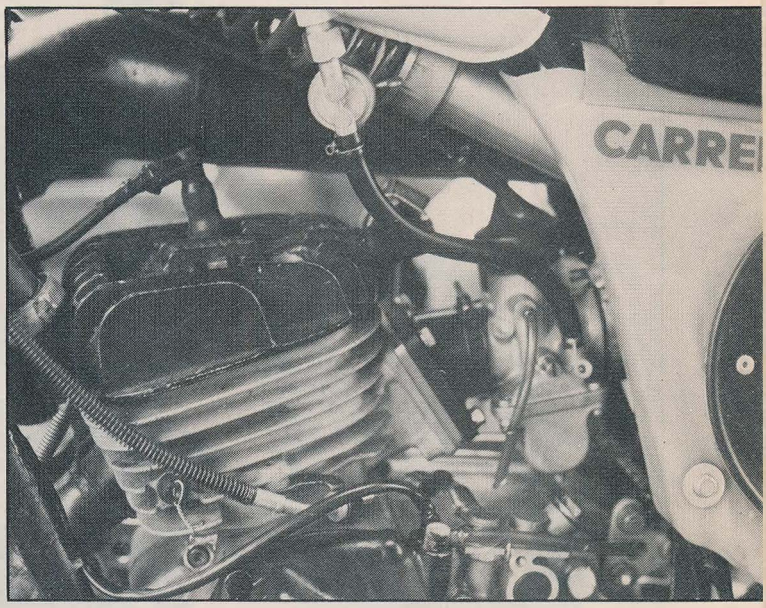


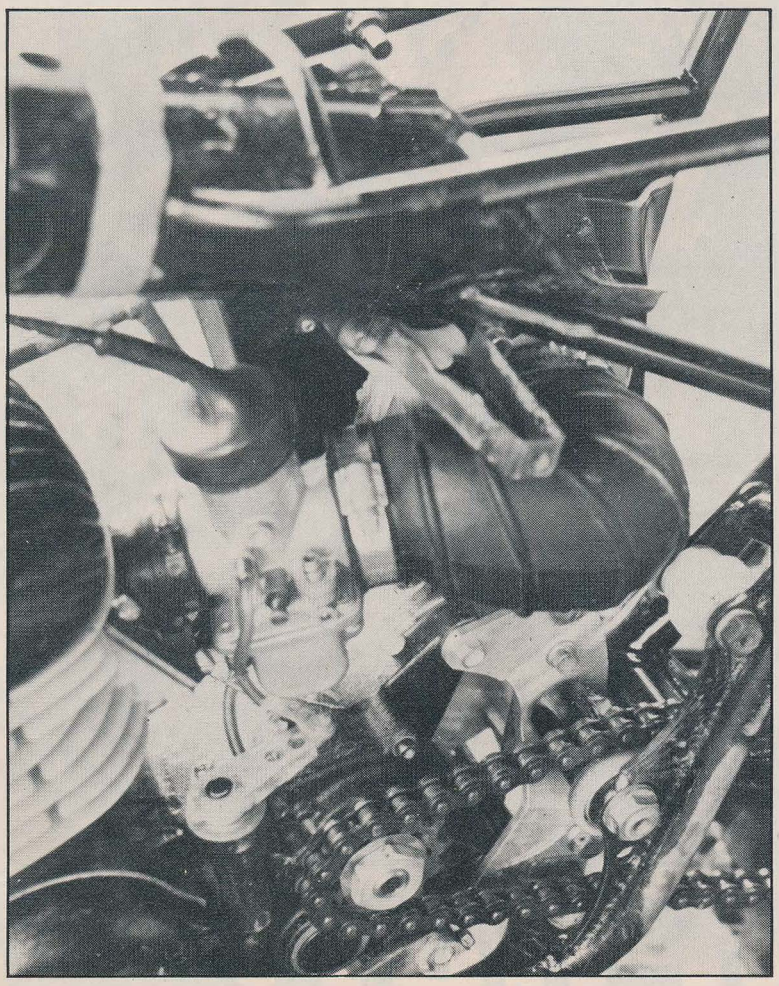
After going through both the head and the cylinder, the water exits out the front of the head toward the left and gets routed back to the steering head and into the radiator to be re-cooled.



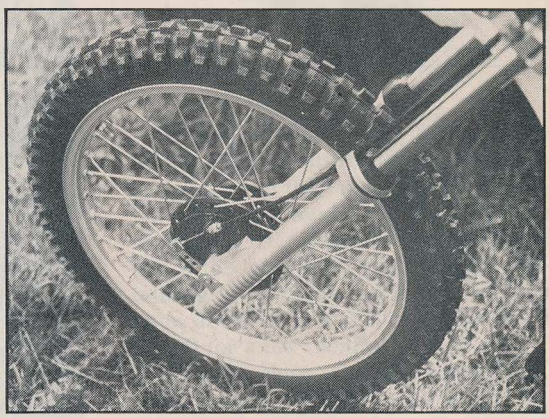
Looking down from above, you can see the water's pathways and how the steering head comes into play. The hose going from the radiator to the top of the steering head is outgoing; the hose on the left is returning water.

Even though there is a lot going on inside, the cylinder doesn't look any larger than stock. Unfortunately, the stud pattern is different, so you can't plonk one of these down on your stocker.

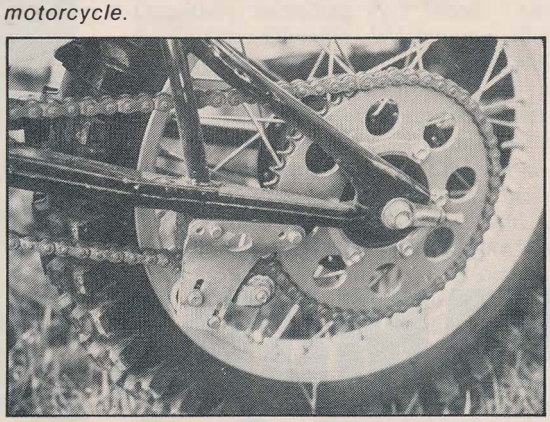




The new airbox design, now being tested on the 250 and open class machines, is slated to appear on the 125 in the near future.



These forks, manufactured one at a time out of solid stock, probably cost more than your total motorcycle.



Another little goody is this combination chain guide and chain tensioner. So far it hasn't failed all season and would be a welcomed addition to production machinery. Note, also, the thinner than normal tubing that comprises the frame.

WATER-COOLED

get away with in a water-cooled situation. The carburetion is the first to be fiddled with. The OW Yamaha machines have had their main jets lowered at least four sizes, and the slide, needle and needle jet are all changed. The nice thing about the water-cooled engine is that carburetion is basically stabilized into a controlled situation.

Also, the compression ratio of the machine can be pumped up much higher than usual. You're also running less of a risk of engine seizure, rings sticking and bearing failures. Basically, the powerplant, although it isn't bulletproof, will last longer than an air-cooled unit with the same horsepower ratings.

You'd think that the water-cooled system would weigh a lot more than a similar machine that is air-cooled. It does, but at the same time you've got to remember that Yamaha has the resources to compensate for this additional weight by lightening other components on the machine. When put through weigh-in, their bikes have been right down there at the minimum weight in the past. With the water-cooled system added, it's simply a matter of taking off weight in other areas to compensate for the additional taxation.

There are a few disadvantages of the water cooling system. If, for example, the water pump itself were to give up the ghost, the bike could get to the point of overheating. But due to the fact that the water itself (because it's being constantly cooled and heated) is traveling normally up and down both sides of the radiator, the bike could continue its cooling cycle without the aid of the mechanical pump.

Also, the engine still has the cooling fins in existence. Even though the carburetion is very lean compared to an air-cooled system, the bike could still probably get by through the combination of water and air finned cooling and continue to run.

The only mishap so far happened to Bill Buchka during a tuning run on a Friday before the race when one hose came loose from a spigot and poured very warm water on him. Other than that, the water-cooled system has worked satisfactorily.

Looking at the rest of the machine, you'll find that it still has those exotic parts that normal competitors can't afford or can't find. For instance, the offset forks on the Yamaha machines are made out of solid block aluminum and would run about $1,500 to make yourself. Then, you'd have to go to the expense of finding the internal parts to match. Not really what you'd call a feasible proposition.

The framework has been modified to accept the water cooling system, especially in the steering head area, where the problem of running warm and hot water around greased bearings without getting the bearings wet had to be conquered. Besides that, it's still the same OW frame we've all come to know and love.

The tubing is stronger than what you've got and lighter than you can find. The structure design is different, and the monoshock in the rear works better. Suspension travel out back works out to about 10½ inches, and the front forks are probably giving something in the same neighborhood of available travel.

A new airbox design is being tried out in the 250cc machines and will probably show up on the 125 racers in the near future. Instead of the usual split airbox, which snakes around the monoshock system and is prone to varying degrees of dust penetration, the 250 works machines are using an airbox system similar to that found on the Husky machines. The hose comes out of the carburetor and goes toward the right side of the machine where a single airbox unit houses a single dual element filter.

Supposedly, the monoshock system in the rear end is also very trick. There is some type of thermostatically controlled valving that controls the dampening characteristics of the machine. When the monoshock unit gets hot (thus, in theory, thinning down the oil viscosity), the valving apparatus narrows down or almost shrinks. This compensates for the oil's thinning out tendencies and keeps the dampening characteristics at a constantly identical rate.

Up front, the triple clamps are similar to those available to the public through Pro-Fab. They move the handlebars back closer toward the rider, compensating for each individual's style and the physical demands. You'll also find magnesium hubs and a different set of gears inside the box (still six-speed, but varying ratios according to each track). A better shifting mechanism allows the rider to shift the machine up a gear while leaving the throttle in the wide open position.

The most important thing about these OW models is the fact that Yamaha is experimenting with their motocross team on a new concept for motocross racing. For all of you asphalt racers, you already know that the Yamaha factory experimented with a water-cooled engine on their TZ road racers and then made the machines available to the public soon afterwards. It's commendable to see a factory experimenting with a new idea for the motocross field. It wouldn't be very surprising if we were offered the same thing soon in the new line of motocross machines. You don't do this much experimentation just for the fun of it.