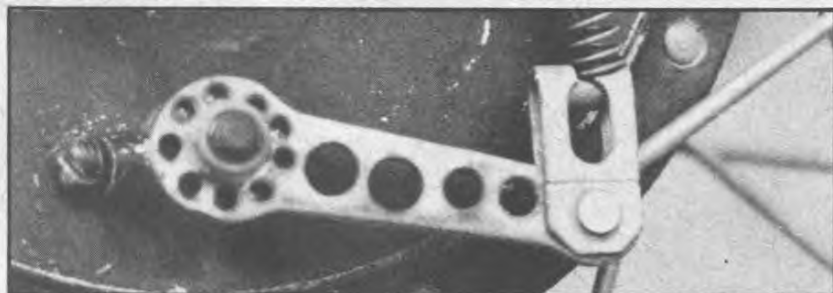
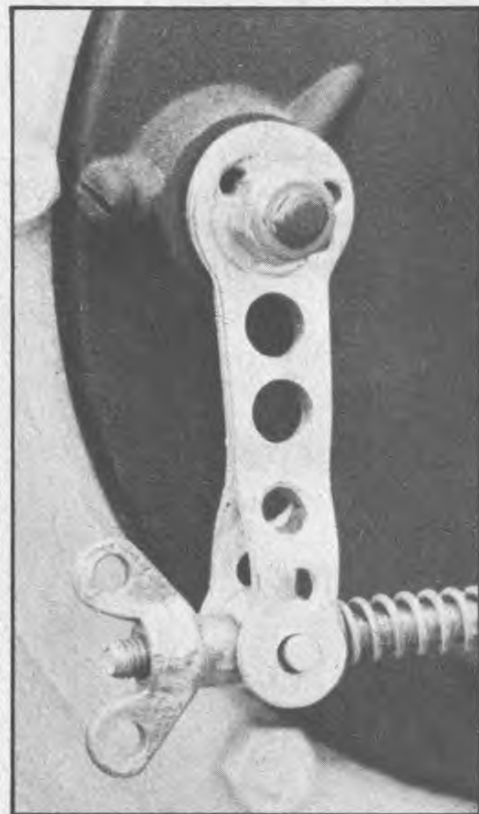
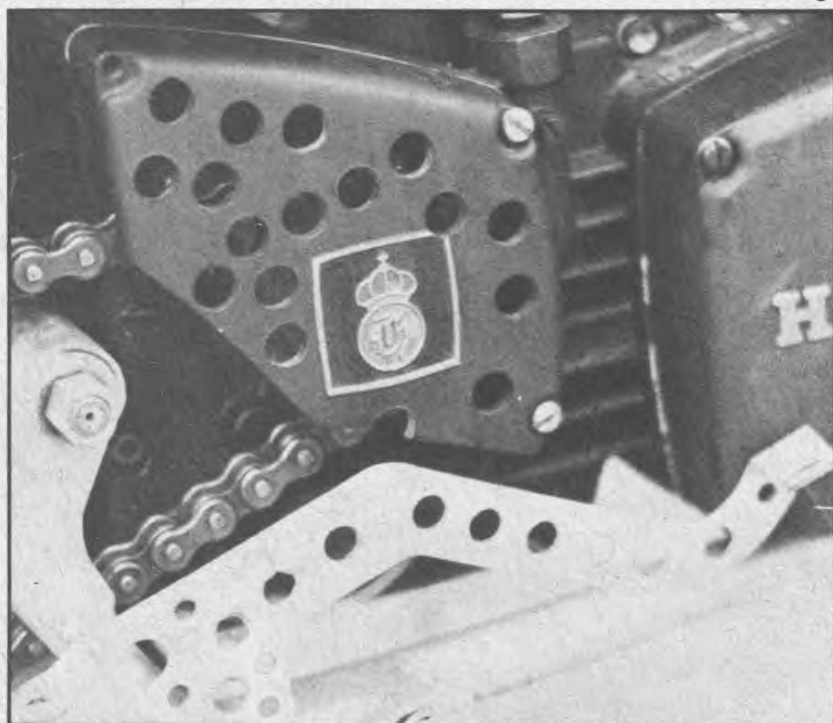


WAKE IT UP!

Overcoming the various tugs of earthbound travel. Go higher, farther, faster with less.

Drilling.



Today, most production racing motorcycles are relatively light. Thanks to modern lightweight metals and advancing technology, current racing bikes average about one hundred pounds less than the behemoths of old. It's hard to believe, but Rene Baeten (Belgium) won the 500cc World Championship in 1958 on a Belgian four-stroke F.N. motorcycle weighing more than four hundred pounds. As the years passed, bikes became lighter. Rolf Tibblin (Swe-

den) won the 500cc World Championship aboard a four-stroke Husqvarna in 1962 and 1963 that weighed over three hundred pounds. Jeff Smith and B.S.A. took the 500cc Championship in 1964 and 1965 with their factory bikes tipping the scale at right around three hundred pounds wet. Two-strokes entered the scene in 1966, and CZ dominated 500cc competition for the next three years with Paul Fredrichs (East Germany) riding the lightweight (two

GHT

By Russ Darnell, the Swiss Cheese king

hundred sixty-five pounds) Czech bike.

Since 1966, two-stroke motorcycles have dominated motocross primarily because of their inherent lightness. The only factory capable of competing in World Class competition in the intervening years with a four-stroke, was B.S.A. To stay with the two-strokes, B.S.A. invested a huge amount of money in exotic metallurgy to lighten their racers. In 1969 and 1970, John Banks (England) finished second in the World Championship behind Bengt Aberg (Sweden) on a Husky. John's bikes were just as fast as Aberg's, and just as light, but not as reliable.

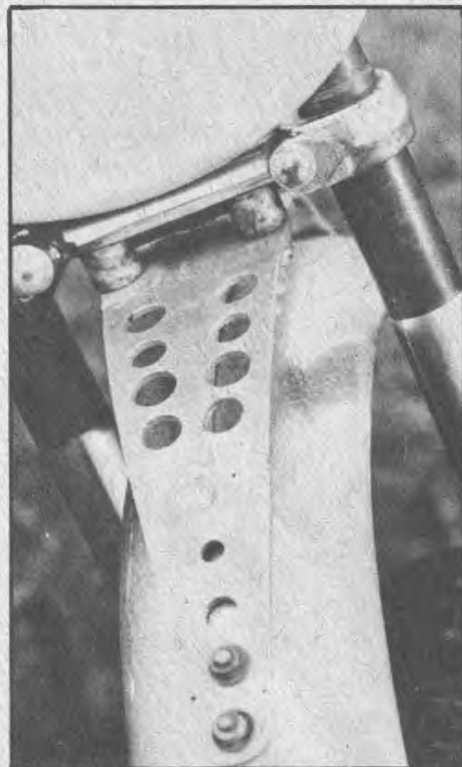
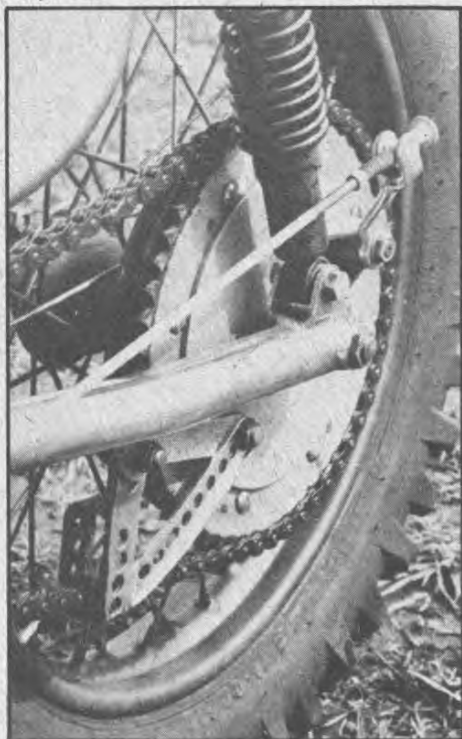
In the 250cc Class, things were much the same. There was an increasing trend toward lightness. In 1969 Suzuki entered the motocross scene with Ollie Petersson. The bike was super light, and ungodly fast. Joel Robert signed with Suzuki for the 1970 season and ran away with the Championship on a factory machine weighing about one hundred ninety pounds. His machine was twenty-five pounds lighter than anything else, and Joel won almost without contest.

To protect the private racer from the mega-buck approach of the factories following Joel's stunning victory, the F.I.M. imposed weight minimums for Championship events. The F.I.M. weight for 250s is now one hundred ninety-three pounds dry, and 500cc machines must be no lighter than two hundred nine pounds. You may have weighed your own bike, and found it much heavier than these minimums. You may even think it impossible to lighten your machine thirty, or even twenty pounds. My 1972 Husky (400cc MX) weighed two hundred twenty-six pounds the

185-pound Husky 250 moves from here to there and back again quicker by slipping from the grips of Ma Nature's inertia.



Factory parts you'll be hard pressed to afford on the Beezer: brake lever, chain guide, bolts and axle. 2-ply Dunlops help too.



More titanium except for the spacers which are magnesium. Black portions of fork tubes are where they've been turned down.



Alloy tank.

day I got it. I had it weighed on a certified public scale (dry). After tremendous effort and long hours, the same bike weighed in at two hundred eight pounds (dry) on the same scale. By removing the fork springs and modifying the forks to operate on gas, I could have further trimmed the weight to one hundred ninety-nine pounds! My friend Tom Volin has a four-speed Husky that weighs one hundred eighty-six pounds (dry).

The new generation of motocross bikes are very light. Ossa, Bultaco, CZ, Yamaha, Husky, and Maico' all make 250cc machines that weigh near two hundred pounds. Ossa's new Phantom is the first production motocrosser in the sub two hundred-pound range at one ninety-seven (dry). Most modern 500cc class bikes are around two hundred twenty-five pounds or more in stock form.

No matter what size or shape your bike is, you can trim weight. Keep in mind that one horsepower is equal to about seven pounds. In other words, for each seven pounds you remove from the overall weight of the machine, you gain the equivalent of one horsepower. This is essentially "free" horsepower, because you don't have to spend money to modify the engine.

Here's a run-down on steps to lighten your machine. You can perform each operation as it pertains to your mount. I'll start at the front of the bike, and work back, leaving the engine for last.

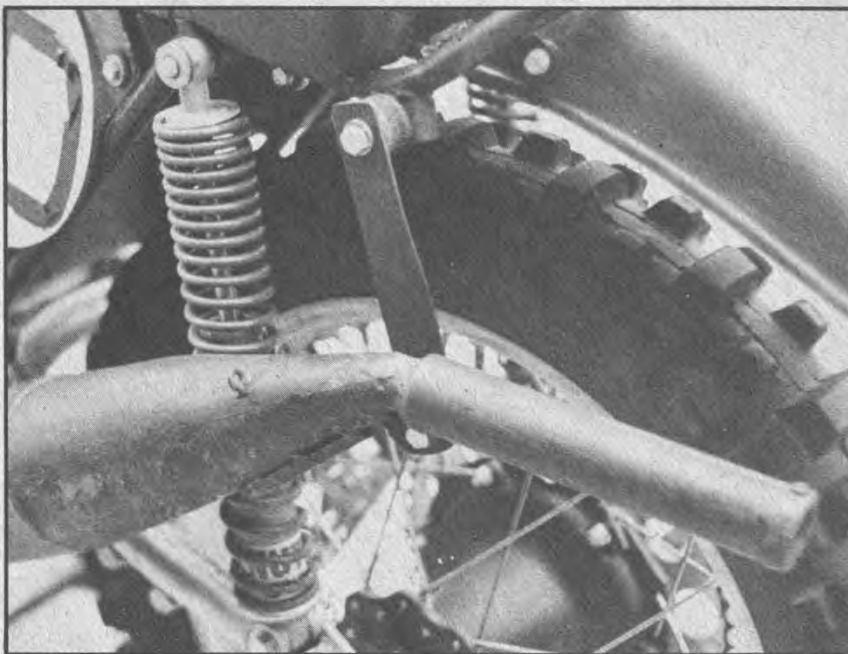
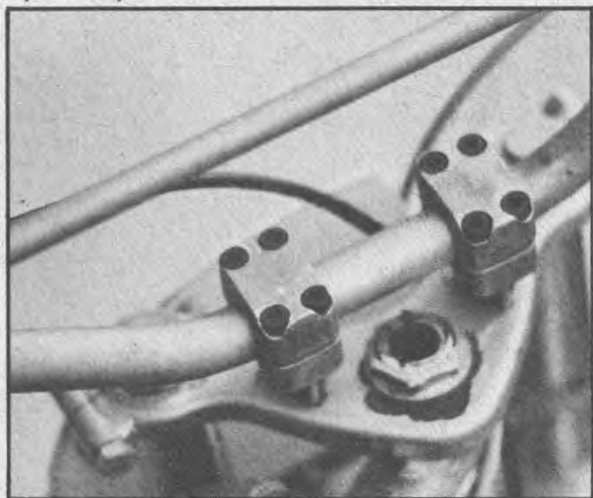
FRONT WHEEL—Remove rim lock(s), and secure the tire to the rim

with sheet metal screws through the bead. Measure the screws carefully so they don't penetrate clear through the tire bead. Six screws will work fine. Place them at 120-degree intervals (three on each side of the rim), and locate the screws directly opposite each other. Remove the rubber rim strip and replace with duct tape. Two times around is plenty. Fabricate aluminum wheel spacers to replace the steel ones. Don't forget the spacer inside the hub between the bearings (where applicable). Use a hardened aluminum stock or the spacers will mushroom when tightened down. Replace steel rims with alloy jobs. Shoulderless Akronts and D.I.D.s are good. Drill brake shoes, brake cam, and brake actuating lever (if steel).

FORKS—Turn down the o.d. of the sliders where possible. To find out exact specs, call the factory reps for info. Some forks have steel damper units. Check the accessory houses for alloy dampers. This will save you two or three pounds alone. If you are willing to go the expense, you can have alloy dampers made at a machine shop. Don't use fork protectors unless your sliders are ultra thin. Fork guards are just a fad for the most part. If your sliders are thin, a strip of duct tape works fine. Build an aluminum fender bracket (where applicable) and use a plastic fender. Some plastic fenders will be lighter than others. Mount your fenders with aluminum nuts and bolts. Aircraft suppliers carry alloy bolts, and they will weigh about two-thirds less than steel. Exchange your steel fork caps

Weld on silencer, drilled alloy sprocket and alloy bolts in airbox.

Heat treated chrome moly bars with countersunk Allen and alloy bolts in triple clamps.



(where applicable) with aluminum items. To cut unsprung weight, mount your fork springs with the tight winds at the top of the forks. Some bikes can use aluminum bolts in the triple clamps (Husky for instance).

HANDLEBARS—Replace stock steel bars with light accessory items. Either steel or aluminum will work. Replace bar clamp bolts with Allen head bolts (where applicable). Drill and counter-sink Allen bolts if the clamps are made of aluminum. Cut off any excess bolt length. Mount number plate with aluminum bolts, or discard bracket completely and mount with inner tube rubber band.

GAS TANK—Replace stock item if steel with aluminum or plastic counterpart. I prefer aluminum because it's lighter.

AIRBOX/AIRFILTER—Replace steel airbox cover with plastic (like on Husky), or build new airbox and side panels from aluminum sheet. Fiberglass works well too, but will be slightly heavier. Most Japanese bikes come with an airfilter which is bonded in some way to a steel plate. These are heavy and should be replaced with a light, foam type filter.

SEAT—Many bikes are now coming with light plastic seat bottoms. If your machine has a steel pan, it is an easy, and inexpensive job to fashion one from plastic. Most surplus stores have thin, sheet plastic. Buy some which is fairly flexible. You don't want it to break. Use your steel pan as a mold, and work the plastic into

shape with a propane torch. Use the seat bottom as part of the fender, any time you can. There is no reason to have both surfaces, when one will do the job of stopping mud and dirt. Use a plastic rear fender, and make a splash pan (for the back of the airbox) from aluminum or plastic. Many of these items are on the market already, and you can just pick them up from a local shop.

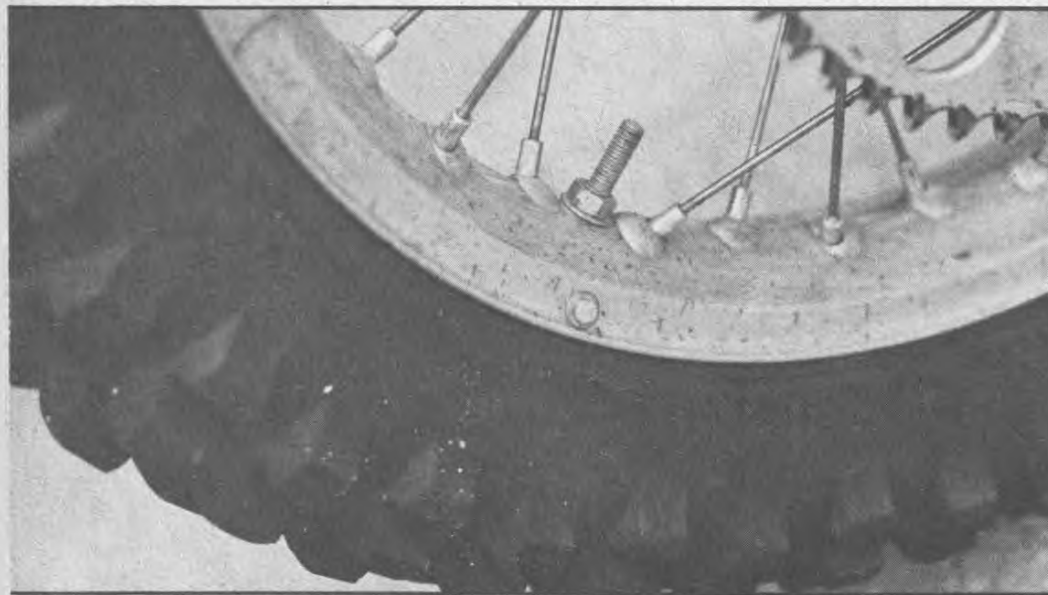
SWINGARM—Fabricate an alloy brake stanchion, if it will be lighter than the stock steel part. Replace your steel chain guide with an alloy guide or alloy chain tensioner. Drill out extra gussets on swingarm if you have moved your shocks up. Drill holes which are about thirty percent (maximum) of the gusset width. In other words, if you have a one inch gusset welded on the swingarm, half-inch lightening holes would be risky. 5/16" or 3/8" drill size would be safer. Keep in mind, anything you want to drill to lighten, should remain reliable as well as light.

REAR WHEEL—Replace steel wheels. Replace steel sprocket with alloy part. If you get an alloy sprocket without holes, drill it carefully. If you just indiscriminately ventilate it, you will unbalance the sprocket. Drill brake shoes, brake pivot, and brake actuating arm (if steel). Make alloy wheel spacers, including inside spacer. Use heat treated aluminum stock. If your bike has snail type wheel adjusters, drill them out like swiss cheese. Remove one security bolt from rim, and use sheet

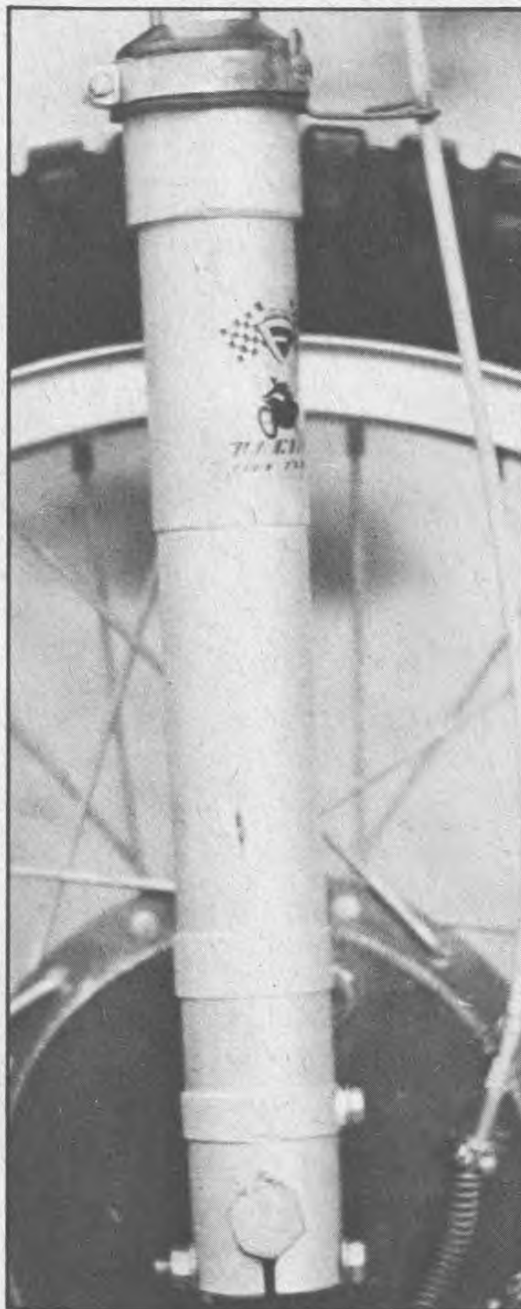
metal screws to secure tire as described for front wheel. Mount one pair of screws in line with shank of remaining rim lock. Replace rim strip with duct tape. To cut unsprung weight, mount the shock springs with the tight winds at the top. Some shocks can be mounted upside down also, and for the same reason. If in doubt, ask the dealer. I suggest talking to a dealership that has some racing experience instead of just sales experience.

FRAME—Remove the kickstand, bolts, and mounting springs. Cut off the mounting tab and sand smooth. It is not advisable (and not necessary) to otherwise lighten the frame. Some bikes, however, can have the rear fender loop removed without consequence. In fact, it's a good idea, if you need more clearance for your long travel set-up, to cut the loop off. This will vary from bike to bike.

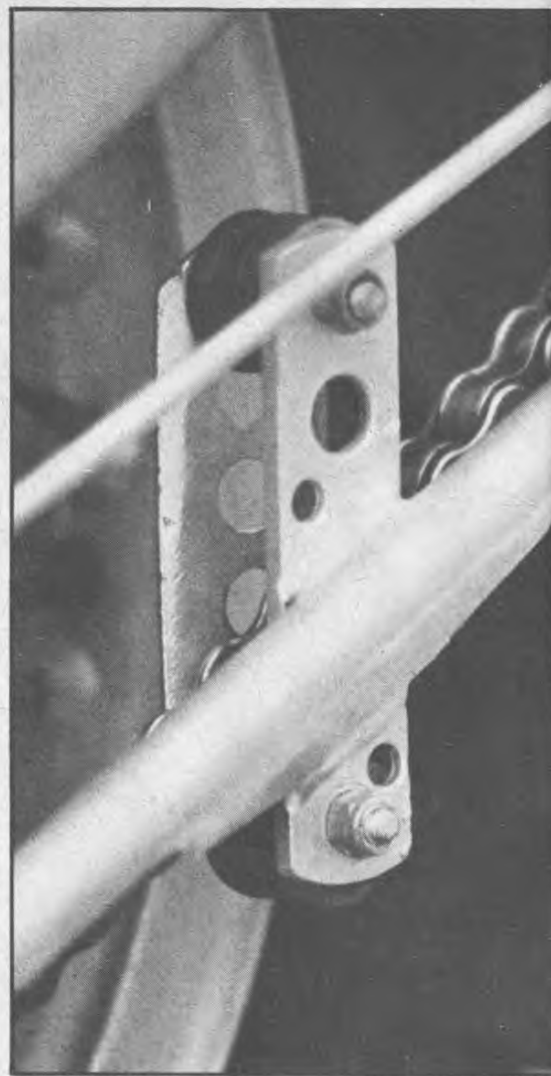
ENGINE and PIPE—Get a small silencer that is repackable. This will keep weight down, and you can just re-stuff it when it gets noisy. Weld the silencer on to eliminate any clamps. Many accessory houses build entire pipe systems which are lighter than stock. You have to decide if the weight loss is worth the dollar loss. If your engine has oil injection, get rid of it. No matter what the dealer tells you, *all* oil injection systems can be discarded. You may have to drill some new oil holes or something, but it will be worth the effort. Call the factory direct for full details on pump removal. Some bikes use a com-



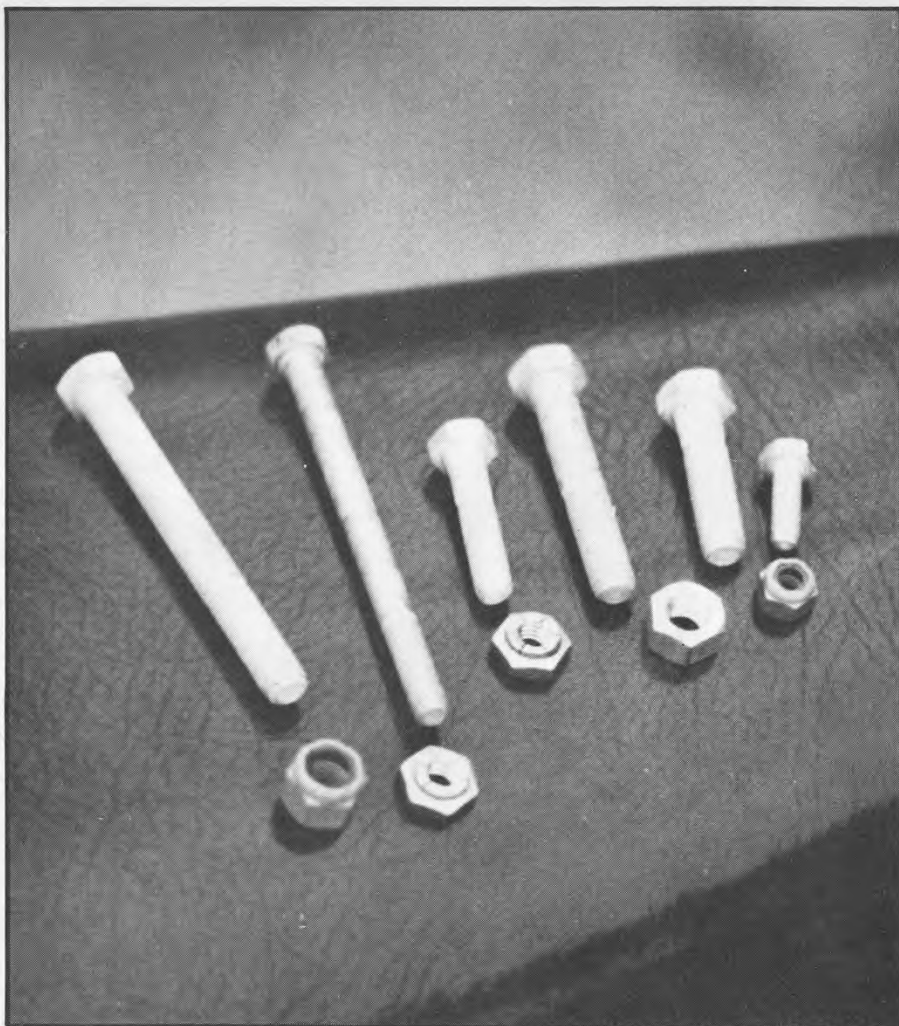
Rim screws opposite one rim lock.



Milled down Husky forks.



mon case between the mag and the countershaft sprocket cover. Separate these wherever possible by cutting to form two cases. Many times you can discard the sprocket cover altogether. Not only will this lighten the bike slightly, it will make the mag cover easier to waterproof and service. Drill the clutch actuating arm (if steel). Older Husky heads can be drilled. At the back of the head is a large square casting lump. You can remove it entirely with a mill, or drill into the square horizontally. If you plan to drill the fins on the head and/or cylinder of any bike, use a $\frac{1}{4}$ " drill at the largest. It is better to make many small holes than fewer large ones. By the time you get to this stage of lightening, you may not have to touch the cylinder and head at all. You can also drill out the alloy backing plate on the magneto (where applicable), or the point plate holder which is also alloy, and usually pretty thick. Alloy shift levers and brake levers are available for most bikes on the market. When you need a new clutch, think about using an alloy set of plates. This will save



Titanium bolts with nylon lock nuts.

from one to three pounds of spinning weight (mass). Aluminum slides are available for some carbs, such as Mikuni.

ULTRA ENGINE MODS—If you want to lighten the engine, and expense is no object, you can machine the gears and shift drum in the gear box. This requires softening the gears and drum, machining the pieces, then re-heat treating everything. I had it done just once. It saved slightly more than three pounds of spinning weight, but it was costly.

MISC.—Most bikes have too many washers. You don't need a flat washer, plus a lock washer, plus an aircraft locknut to keep parts on the bike. On the head side of the bolt I usually discard the flat washer if the head rests against steel. I retain both flat washers when the bolt goes through aluminum. I always discard the lock washer if an aircraft lock nut is present. When I have all the washers that are excess weight removed, I cut off the excess length of bolt sticking out past the nut. Leave about three threads beyond the nut. Use

aluminum nuts and bolts wherever you can. These are available from aircraft parts suppliers and some surplus stores. Don't use aluminum bolts to mount the engine. Vibration will wear them out too quickly.

When lightening your own machine you are striving to trim the most weight for the least dollars. Do as much of the minute detail work as possible yourself. When you get the bike as light as your tools and talents allow, then look to the supply houses for accessory parts, and finally to custom work. To make a motocrosser lighter is simple; all it takes is ingenuity, a little money and five thousand dollars worth of your own twenty-five-cent-an-hour labor!

One last point. If you are a lardo, "pleasingly obese," as Rick Sieman puts it, I mean if your vented racing jersey clings to your body like a frightened monkey, go on a diet! If you trim twenty-five pounds off your scooter, it's still gotta carry *you*. Remember, seven pounds equals one horsepower.

Russ Darnell



Plastic filter cover.



John Bank's 1970 factory BSA weighed 209 pounds and sported alloy seat pan, tank, airbox, number plates and fenders. Rims and engine cases: magnesium of course.