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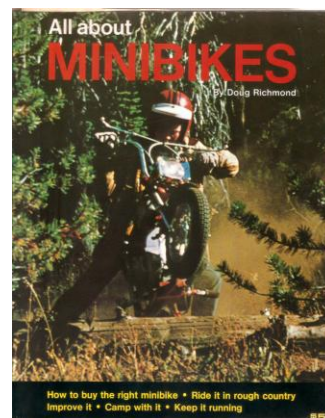
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The first book I ever read on mini bikes back in 1973. I got it at the Library. I bought the kids a mini bike for Christmas several years ago, [Sarah loved riding](#) and I got back into mini bikes. Hence, the name of our FaceBook page and Website... "All About Mini Bikes" thought you might get the connection. Thanks for your patronage in our hobby and feel free to write us anytime at Przyojski@Yahoo.Com

Your Mini Bike Friends,

Dan & Sarah

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REPORT: THE TRAILS & THEIR MACHINES

MINI BIKE

GUIDE

Incorporating Modern Karting

MAY 1970 — 60c

TESTS:

CHALLENGER
HILLCAT
MARK I

OVERHAULING
THE TECUMSEH





THEIR BEAUTY IS A BONUS . . .

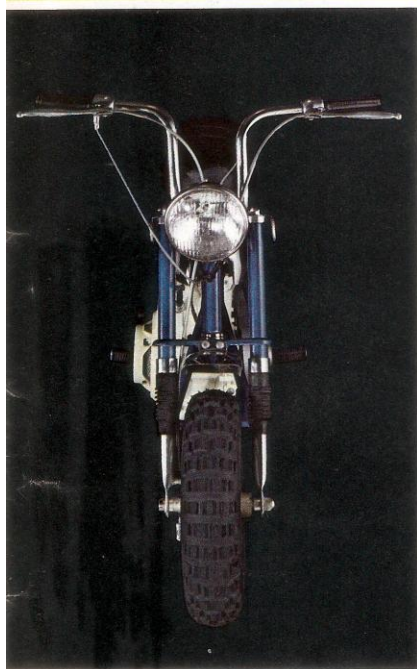
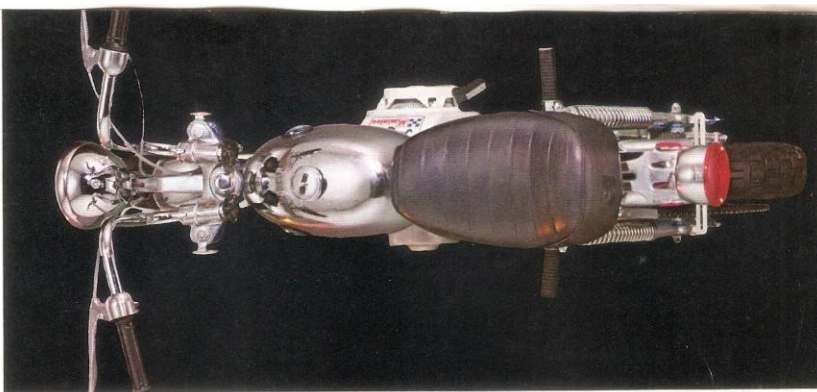
Because their performance is paragon . . . Clock-wise from noon; Metalflake and Channeled Naugahyde Seats, ducktail styling—from \$5.95; 5" and 6" Aluminum Wheels with precision Ball Bearings, $\frac{5}{8}$ " bore . . . \$8.50 and \$9.95 respectively; New! Extra Wide Steel Fenders for wide boots—Chrome Plated . . . \$3.50; Mini-Bike Shocks—these Chrome and Black Beauties measure 11 $\frac{1}{2}$ " eye to eye, in two models—Softie . . . \$7.95 a pair—Toughy . . . \$8.95 a pair; New! Super Clutch with Steel Shoes, positive engagement—no fade—Styles to fit $\frac{5}{8}$ " or $\frac{3}{4}$ " Shafts—any size . . . \$16.95; Jack Shaft Kits—Complete with Hangers, Bearings, Sprockets, Collars, Keys, and Jackshaft—10" Kit . . . \$9.95 . . . 12" Kit . . . \$10.95; Standard Size Chrome Fenders, available in three lengths—9" . . . \$1.95, 15" . . . \$2.50, and 18" . . . \$2.65; The Chromed Cycle Tank holds 4 $\frac{1}{2}$ Quarts . . . \$18.95; Finally our newest addition, U. S. Forest Service Approved, Spark Arrestor—three pipe thread sizes— $\frac{1}{2}$ ", $\frac{3}{4}$ ", and 1" . . . \$14.95

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Kick starter.

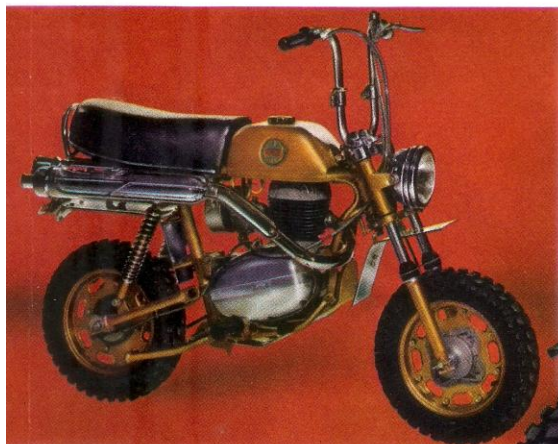
1970 BUZZER JR. Same as above without lights, speedometer or horn.



1970 HORNET. The hot little mini that goes anywhere. 65CC engine; Automatic clutch & transmission. Street legal in most states. Kick starter. 9" wheels for better ground clearance. Retractable luggage rack.



Benelli



1970 DYNAMO TRAIL. Made for the "trail blazer". A powerful "on-or-off" the road mini-cycle that's street legal in most states. 65CC 4-speed, foot shift engine. 10" knobby tires and skid plate.

(Above, Left) **1970 VOLCANO.** The world's most powerful mini-cycle! 180CC 4-speed, foot shift engine. Long travel, motocross fork. Luggage rack. This one is street legal in most states.

(Left) **1970 DYNAMO COMPACT.** A powerful miniaturized motorcycle. 65CC, 4-speed, foot-shift engine. Street legal in most states. Folding handlebars. Carries 2 adults with ease.

1970 WOODS BIKE. Same as above without lights, speedometer or horn.

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MINI BIKE

Incorporating Modern Karting



MBG SPECIAL REPORT — The Trails and Their Machines

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COVER: Flying high with the Larkin Hillcat, MBG's test rider shows how it is nearly impossible to break the rear end free with the revolutionary tandem driving wheels. This was a deliberate high-speed "near-jump", not recommended for normal trail riding.

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editorial

INTER-OFFICE CONTROVERSY

We have another minor war going, here at MBG. Things are never really peaceful around here. But that's probably a good thing. Everybody is pretty involved in mini-biking and, naturally, everybody has their idea of what's good and bad. In general, we have been questioning the practicality of lights on mini-bikes for some time. However, Chris Mossman, our art director, thinks that they are a good idea even on the trail.

Chris formed this opinion last time we were out testing - way out on the desert. We'd done all the work and there was just enough light to do a little fun riding, just to relax. However, the test rider had to put a master link on his machine and told Chris to go ahead - he'd catch him up. Off Chris went, up the trail - while the master link proved a big problem in the fading light. It never did get fixed.

In the meantime, Chris had wandered off two or three miles up the trail when it suddenly got dark - as it does on the desert. Chris was riding the Powell, complete with lights, and feels he might never have got out of there but for those lights. Also, he points out, if he had an accident, he could have used the lights to signal rescuers. He's got a point.

On the other hand, he should never have been on his own in those circumstances. And most people do their riding in the daylight. The question is, are the lights worth what they cost for the odd occasion, perhaps one ride in a 100, when they

will be needed? Cost, remember, can range from about twelve bucks to \$30 (although the extra cost may be buried in the total cost of the machine). And, of course, the lights are usually the first casualty of the inevitable spills that are to be taken on the trail. It boils down, we suppose, to how much money you've got to buy a little extra insurance.

Anyway, the controversy around MBG is unresolved and we would like to hear from other mini-bikers - pro and con - about their experiences and opinions.

MINI-BIKERS' ASSOCIATION

In this issue we have a story by Len Hool on the use of mini-bikes in the snow. Len is the guy behind the new International Mini-Bike Association. He is currently the City Manager of New Baltimore, Mich., and formerly held the same position with Richmond, Mich. Prior to this he was Richmond's police chief. A good background in civic affairs.

Len is aged 44 with three children and he has a parent's viewpoint about mini-biking but we expect he will get a lot of help from people involved in racing, organized trail riding and fun events. MBG is not directly involved in I.M.B.A. but we hope that it will be successful in providing a much-needed service to mini-bikers - and we will be watching developments.

ON FEELING UNWANTED

Remember that readers' poll we ran in the February issue. Well, the response has been excellent. However, this column is not coming out of it too well. Readers were asked what they liked least about MBG. You've guessed it, poor ol' Pat Mackie's ramblings get it right in the neck from a goodly number of replies. Well, I'm the editor, guys, and I'm going to get at least one little corner to sound off in - no matter what.

NEW! Rupp TC-1*Cycles

Looks and rides like big bikes. Compact fun cycles with wire wheels. Groovy around town. Gutsy in the boonies. New TC-1 Torque Converter takes you anywhere without a hitch. Five fun models. One street legal. A new breed... from Rupp. See your Rupp dealer or send 25¢ for catalog. Rupp Manufacturing, Inc., Dept. MBG20, P.O. Box 1095, Mansfield, Ohio 44903.

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EXCLUSIVE FLOATING TANDEM DRIVE

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OTHER RUBBED TRAIL FEATURES

The HILLCAT'S power plant is Tecumseh's 4 hp four stroker, specially designed for mini-bike use, Transmission is through the Salsbury Mini-Verter torque converter which provides a constantly changing gear ratio keyed to trail conditions. Trail climbing abilities of the rear end are matched by the 14-inch diameter front knobby and fully telescopic front forks. Frame, fastenings and other components are of high grade aircraft quality derived from the aircraft engineering background of Larkin Aircraft's designers.

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letters

THE HEALD VIEWPOINT

We would like to thank you for your excellent review of our Trail Bronc in your March issue. We would also like to commend you for the wholesome and informative manner in which you conduct your magazine. Your articles always provide useful and interesting knowledge that's not obtainable in other publications in our industry.

However, we would like to take issue with some of the points made in your

review of the Trail Bronc. I am sure you realize that there are two points of view on every subject. Your criticism of solid foot pegs may have merit but we feel that the position of the solid foot pegs provides a more comfortable ride. Perhaps more important, solid footpegs also provide some protection of the rider's legs and the engine starter housing that could not be afforded with folding pegs. The ride provided by the large size tires when properly inflated, in our opinion, is the proper balance for trail riding.

We also find it somewhat difficult to understand your cost efficiency rating when you compare our 5 H.P. motor, 2 speed transmission, large tires and etc. to other bikes reviewed in the same

issue. Hope you don't think we are complaining but thought you would like to hear our view point. Keep up the good work.

Carl F. Heald, President
Heald Inc.
P.O. Box 638
Benton Harbor, Michigan 69022

Always glad to hear from you, Carl, even when we disagree. Got to stand by the test. Our criticisms of fixed footpegs are well known but your defense of them (because we're the ones who get to spout off all the time) are not so well known. It's true that a fixed object extending beyond the leg-line and engine area will provide protection in a fall - our objections concern the number of falls that those same fixed objects cause. Then, too, we have taken quite a few spills ourselves, as you can imagine and we have the scars to prove it. But we have never ended up underneath the machine - always thrown clear. As to the engine - that's the last thing we worry about as we're sailing through the air.

As to the Cost/Efficiency Index - there is just too much confusion about what we are attempting, so, with this issue we are making a change. This change will give the reader more information regarding our opinions on specific aspects of the test machine. With the Cost/Efficiency Index we were trying to make things really simple and sum everything up with one numerical rating. Seems it can't be done - and, like many manufacturers who have changed their machines under our prodding, we are changing our rating system under prodding from both readers and the industry. In defense of our C/E Index and as an explanation of the rating given the Trail Bronc, the final rating stemmed from our opinion, and this cannot be overstressed, from our opinion of the machine's performance in relation to the cost. This means it was a value judgement. How good it was for the money. In the case of the Trail Bronc, we added \$30 - \$40 as the average labor cost of assembling the kit and came up with a final, true, cost of about \$230 - \$240. Then we evaluated performance in the light of the machine's intended use - on the trail. The lack of suspension (although the big Terra Tires help in this department) worked against its overall rating although everything else seemed fine. So we came up with a rating of eight.

We suspect, Carl, that you compared your test with that of the Boonie Bike from Heathkit, done in the May issue, our second attempt at a mini-bike magazine. Like you, we have learned a lot since then and we don't expect that they would achieve a rating of nine today, even though, at that time, the price tag was \$10 lower than today.

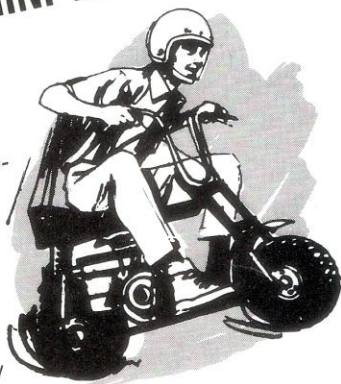
Continued on page 12

NEW 'CBI' CLUTCH



HAS A 'BETTER IDEA' IN MINI-BIKE CLUTCHES

We call it the 'CBI' clutch... you'll call it the best mini-bike clutch ever designed. 'CBI' has been tested on all types of mini-bikes and has consistently improved their performance... CBI is stress-designed; is better able to take high torque punishment and rough rider abuse. Features like a heavy duty drum, and an easy to reach Oilite bearing make 'CBI' the finest engineered clutch mechanism you can buy - anywhere. Available in two crankshaft diameters: $\frac{5}{8}$ " or $\frac{3}{4}$ ". Ask your dealer, or write

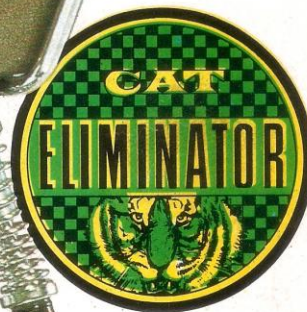


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This one's the "RAKER", with style features two years ahead of its time. From its glistening chrome plated front end to the flowing contoured seat, backed by a fitted "Sissy Bar", the Eliminator simply overwhelms any model on the trail.

- 4 hp, 4 cycle Tecumseh engine
- 14" diameter rear, 12½" diameter front, heavy duty trail tires.
- Hand operated automotive type disc brake.
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- Pineapple flam finish.
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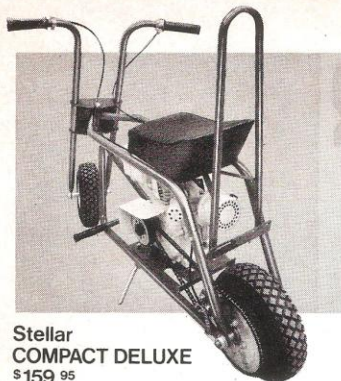
Stellar
COMPACT
\$139⁹⁵

Stellar

Stellar CHOPPER

\$249⁹⁵

This black and chrome beauty with polished chrome gas tank, rakish front fork with reinforcing fork struts; six-inch cast aluminum wheels and thick 12.5/350 by 6 two ply knobby tires front and rear, is a versatile eye-catching performer. Powered by a smooth-running 3½ h.p. 9.06 cubic inch Tecumseh engine with torque-rated centrifugal clutch-to-wheel and 6:1 gear ratio. Dependable internal expanding brakes insure swift stopping. Motorcycle-type power grips; foam cushion saddle seat. Submerged arc welded tubular frame. Overall length: 68". Overall height: 41". Overall width: 22". Wheelbase: 48". Curb weight 79 lbs.



**Stellar
COMPACT DELUXE**
\$159⁹⁵



**Stellar
TRAIL DELUXE**
\$189⁹⁵

delivers the excitement!

SEVEN WAYS!



**Stellar
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Stellar offers seven different ways to satisfy your particular brand of fun and excitement!
Seven different models ranging in price from \$139.95 to \$299.95,
yet each one is precision-engineered to provide extra strength, extra safety.

Stellar COMPACT DELUXE \$159⁹⁵

This rugged, smart looking, 66 pound performer sports a submerged arc welded tubular steel frame, solid steel wheels, tubular steel 'sisy bar', sure-footed 410/350 x 4 two ply knobby tire in front and big 12.5/450 x 6 two ply knobby rear tire. Performance-rated 2½ h.p. 7.75 cu. in. Tecumseh engine, torque-rated centrifugal clutch-to-brake with 5:1 gear ratio; super-safe DISC brakes; motorcycle type 'power-grips' and foam cushion saddle seat. Overall length: 51". Overall height: 36". Overall width: 24". Wheelbase: 39½".

Stellar TRAIL DELUXE \$189⁹⁵

A 'natural' for camping, fishing trips, or backwood exploring, this model is designed to tame the toughest terrain. 3 h.p. 7.75 cu. in. Tecumseh engine, torque-rated centrifugal clutch-to-wheel with 6:1 gear ratio. Solid six-inch, cast aluminum wheels with thick 12.5/450 x 6 two-ply knobby tires; internal

expanding type brakes. Submerged arc welded tubular steel frame, painted contoured steel fenders. Motorcycle type power grips, foam cushion seat. Overall length: 54". Overall height: 33". Overall width: 27". Wheelbase 39½". Curb weight: 72 lbs.

Stellar MAXI DELUXE \$299⁹⁵

This lustrous black 'top-of-the-line' mini-bike with polished chrome, contoured steel fenders, chrome headlight and tail-light is a precision powered super-performer. The big 5 h.p. 12.2 cu. in. Tecumseh engine has a 'kill-switch' and incorporated alternator. Torque-rated centrifugal clutch-to-jackshaft, 6:1 gear ratio; solid six inch cast aluminum wheels with big ground-grabbing 12.530/450 x 6 two ply knobby tires. Swing-arm rear suspension and telescopic front end. Motorcycle type power grips; internal expanding type brakes. Submerged arc welded tubular steel frame.

Overall length: 56". Overall height: 37½". Overall width: 28". Wheelbase: 43½". Curb Weight: 93 lbs.

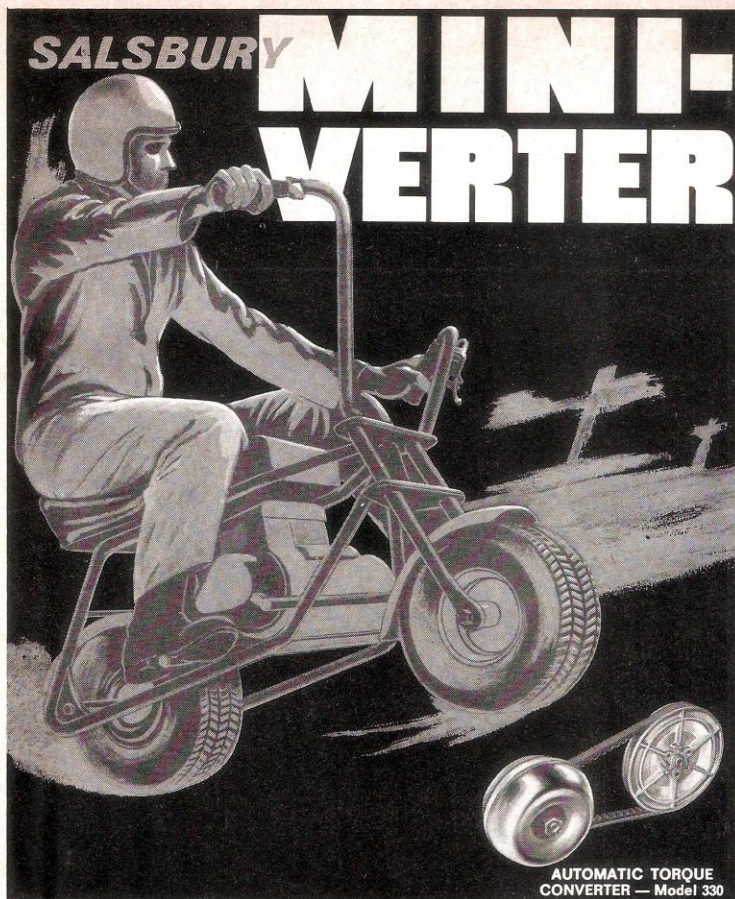
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How do you maintain your position when you're No. 1 in Torque Converters? Count the reasons...

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CUSTOMER SERVICE — Close alliance with customer during both engineering and application phases for highest performance at most practical cost.

(Need more reasons? We have them... give us a call!)



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LETTERS

Continued from page 8

Finally, in case all this discussion has got people worried - both the Trail Bronc and the Boonie Bike are excellent machines - and we have had many, many, letters from proud owners of these machines, confirming this.

YOU CAN'T HAVE IT BOTH WAYS

I wish you wouldn't start an article on a page then continue it somewhere else in the book. Maybe you could do something about it.

I have a Cat mini-bike and I would like to put a transmission on it. Can you put it on without too much adjusting? If so how?

James Davey
Dedham, Massachusetts

One of two ways, James. Short stories that don't go into much depth - or meaningful stories that "jump". What's it to be. We think we can guess - so you'll just have to follow the "continued" lines. But don't feel bad - you're not the only one who's complained about this. As to a transmission on your Cat - you don't say which model so we can't help very much except to suggest that you write HPE Inc., 225 Acacia Street, Colton, California 92324, makers the the Cat.

HERTERS'S? RIGHT ON, INSIDE

I have a problem. I have been saving for a mini-bike since around August. My father will contribute about half of its cost.

When I got my December issue of MBG, I almost immediately chose the Herters Mark I with the automatic 2-speed transmission. The entire price of it should be around \$230.00 including shipping.

But my father won't let me have it until he sees good comments or a good test report on it. So please, I'm begging you, print this letter to show my father you are concerned about mini-bikers problems, and do a test on the Herters Mark I.

Steve Shurman
Vineland, New Jersey

How come you guys out there are always reading our minds? Or perhaps we think alike. Look on Page 32 of this issue. Only thing is, it doesn't have the two-speed any more - it's got the more expensive Mini-Verter variable ratio transmission - making it an even better buy.

OUR READERS ARE THE BEST

I have just sold my fifth subscription as your Subscription Agent No. 42 and should be receiving my free subscription. Since I already have a subscription I would like my free one donated to a

Continued on page 14



MINI-MOTOCROSS

Saddleback National Championship. Tense day. Hairy track. And hundreds of minibikes ready for the guts-up run for first. Enter BONANZA's new hot one . . . the MINI-MOTOCROSS . . . straight off the assembly line. The finish. The big showdown. MINI-MOTOCROSS takes 1st and 2nd in the main event. And other BONANZA's finish 3rd, 4th, 5th, and 6th.

The all new MINI-MOTOCROSS from BONANZA's stable of Fun Products. It's got a tougher frame, built to take the pounding that competition demands. It's got a new hot 11 HP engine that pushes it from 0 to 50 in only a few seconds, making it the fastest mini around. It's got a new Ceriani-type fork with deep travel, to keep you moving on the toughest track or roughest trail. And it's got new larger knobby tires that bite, corner, and cross ruts and rocks that would stop other minis. It's got one more thing. Guts.

It's the all new BONANZA MINI-MOTOCROSS. See it at your authorized Bonanza Fun Products Center. Or send 25¢ for a brochure—or \$1 (refundable) for the full scam.



BONANZA®

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LETTERS

Continued from page 12

local children's hospital in your area. Thank you.

Ken Ragozzine
Commack, New York

Dear Miss McClung:

Thank you for your letter telling us of the subscription to Mini Bike Guide which we understand will be sent to Childrens Hospital as a gift through the generosity of one of your young agents, Ken Ragozzine. We do agree that this was indeed a fine, thoughtful gesture on Ken's part, and we are sending him a

note of thanks, too.

As you know, publications of special interest to teenagers and pre-teens (boys in particular) are somewhat limited - with the current popularity of mini-bikes in Orange County, we know how pleased many of our older patients will be to see the Mini Bike Guide.

We have also just received the back issues you mailed - these will be given to Mrs. Stawicki to place on our book cart and in the recreation lounge. Again, our thanks and best wishes!

Sister Mary Alma, C.S.J.
Administrator
Childrens Hospital of Orange County

Ken Ragozzine was the winner of the Fox Street Scamp in the January contest for MBG Subscription Agents - but before he knew he was the winner, he asked that his free subscription (for selling five subscriptions) be given to a children's hospital. That doesn't really surprise us because we know that our readers are the best people in the world. What did surprise us was the reaction of Sister Mary Alma, administrator of the Children's Hospital of Orange County - in her busy, busy, schedule as head of a large hospital, she took time to acknowledge the gift. Who said the world is going to the dogs?

HORSTMAN MFG.

is on top of the clutch problems
OF MINI-BIKES • KARTS



Shown are the two faces of the finest coin in the realm of mini-bike clutches — the new Horstman Super Cycle Clutch! Smooth, Chatter-free, positive engagement... drums flanged to maintain roundness and prevent bell mouth... cooling holes to eliminate heat from friction area... hardened sintered steel shoes provide uniformity in weight and size, greater strength and longer life — and THEY WON'T FADE... simplicity of design (no pins, rivets, hooks or clips to shake loose or break) means easier maintenance, maximum durability!

HSC-100	5/8" shaft	11T	#35 chain
HSC-200	5/8" shaft	10T	#41 chain
HSC-300	3/4" shaft	12T	#35 chain
HSC-400	3/4" shaft	11T	#41 chain
HSC-500	3/4" shaft	12T	#35 chain

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NEW MATH CONFUSING

After reading your February issue of Mini Bike Guide I noticed an error in "Exploding a Myth" on page 38. In estimating the maximum theoretical speed in my mini-bike, I filled in the missing figures in the formula. In finding the circumference the formula is correct. When I multiplied by 5280 this did not equal the amount of tire revolutions per mile. The tire revs per mile is the circumference divided by 5280, then the formula should work out.

Marc Perler
New Rochelle, New York

It's all this "new math" stuff that gets us confused. Give us a mini-bike and we know what to do with it. Give us a slide rule and we're liable to cut our throats with it. You're right, of course, Marc, the formula should have divided instead of multiplied. Another reader accused us of perpetrating a myth - something about a 2,300 mph mini-bike. Sorry.

WHAT PRICE BENELLI?

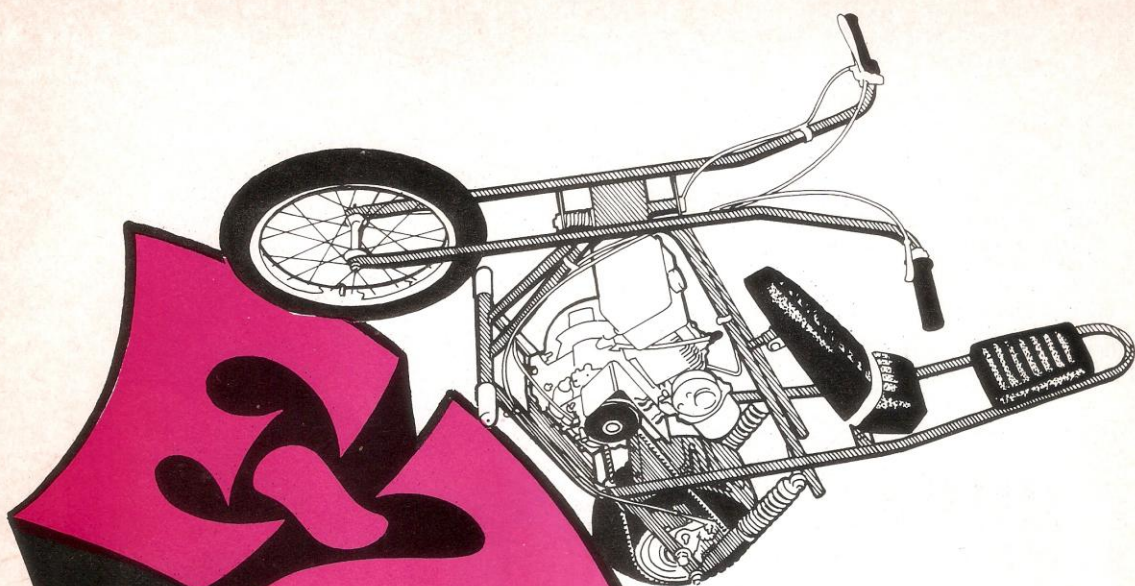
In the December issue of MBG on the Benelli test you said the price was "a modest \$269.00" and in the next paragraph you said \$300.00 and to top it off in the back on page 89 you said it cost \$319.00. I'm usually not so picky, but I'm interested in getting one. Thanks alot (please answer this because I am really confused!).

By the way, what is the difference between the Dynamo Scrambler and Compact?

Les Bluestone
Woodbury, New York

You're quoting us out of context, Lee. We said, first off, that it was selling at J.C. Penney stores for "a modest \$269." But we are not sure what equipment that includes. Then we listed the equipment that comes on the Scrambler for "around \$300." In the spec. box we get more specific and quote the importer's exact suggested retail - \$319. Does all that sound like a cop out? Well, it is. We're a little confused ourselves - but sneak on down to Penney's and see what you can get.

Continued on Page 17



What a chopper! The new E-Z Rider from ARCO. Built for the lean back, rear-wheel, dare-devil driver. Rugged enough to take any and all the acrobatics that can be dished out. Dependable too, and economical. With a styling that will make you spin your wheels. What else is in it for you? Well, a 3½ HP engine; a double flared extended fork and handle-bars; a motorcycle twist grip throttle; a fully automatic clutch; a 5.45=1 power ratio; a top speed of 28 MPH; pre-lubed and sealed ball-bearings; a rear tire of knobby stud tread design in 13" diameter; a chrome plated heavy duty front wheel, 17½" diameter; a **dual** brake system of aircraft caliper disc brakes with a secondary system of a band brake; a front and rear coil spring suspension system; chrome plated steel clutch and chain guard; fold-up kick stand; sparkle vinyl upholstery; sparkle vinyl head rest; red reflector mounted on head rest. How's that for openers? There's more: 10 other squarer models from 2½ HP to 5 HP.



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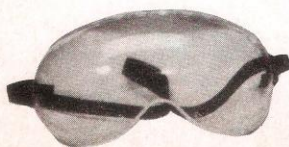
That's right, if you had been a member of Cycle Club of America (\$5.00 annual membership dues) you could have taken advantage of our "Steal of the month" . . . a 4 H.P. Briggs and Stratton "Mighty Mite" mini cycle weighing 75 lbs. with full front and rear suspension, disc brakes, centrifugal torque rated clutch . . . The bike sells nationally for \$219.00. CCA has priced it at only \$159.95. That's what you call savings!

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goggles.
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a great gift.*

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Cycle Club of America

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O.K., sign me up! Enclosed is my \$5.00 entitling me to membership card, CCA decal, Super Deal discount bulletins, special member benefits and free bubble goggles.

Name

Address

City State Zip

LETTERS

Continued from page 14

ONLY TWO SUGGESTIONS?

I have two suggestions: One is, when someone subscribes to Mini Bike Guide you should give them a gift such as a decal and a patch for a shirt or jacket. Secondly, you should give every salesman that sells seven or more subscriptions a T-shirt that has a mini-bike on it with big letters over it saying "Mini Bike Guide Salesman".

John Adami
Denton, Texas
Anything else?

ABOUT THAT GUY, THURGOOD...

Thanks for a great magazine. I'm hooked on mini-bikes and I plan to get one around March or April.

Now, about this wild toughie, Thurgood Crumppacker - he's the greatest. I saw the cartoon in the February issue about him and the high speed wheelie. I thought it was wicked. You should have a cartoon in every issue.

By the way, why don't you do a test on the Charger II by Central Cycle Supply, because it's the mini-bike I plan to get. Keep up the good work.

Rick Rybarsyk
Saline, Michigan

What has happened to the Le Mans Company? I have sent them two letters but haven't heard a word.

Can you buy a speedometer for a mini-bike? Where could you buy one, and what would it cost? What diameter tires could you use with it?

You have a fine magazine and I have told lots of guys about it. My "hog" is a Trail Horse SS300 with a souped-up engine.

Please have good ol' Thurgood C. write some articles.

Bob Bartz
Georgetown, Texas

We'd reservations about Thurgood - how he was being received by our readers - but the odds seem in his favor. As to Le Mans - they are still in there - pitching. If you've got a Fox, you can get a speedometer to fit - if not, you're out of luck. Seems to us that there is a great need for a universal mounting speedometer.

WE'VE DONE IT

Will you do a progress report on the new motorcycle-type starters from Hegar 4 Products (at \$24.95) and also the way it works so I maybe can build one.

Joe B. Land
Shreveport, Louisiana

We did a product review of the Hegar 4 kick-starter in the April, 1970, issue and plan a review of the California Products unit in the June issue.

BOLD NEW



BANDIT II

(shown) 6" wheels,
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\$184.95

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6" wheels, 5 hp,
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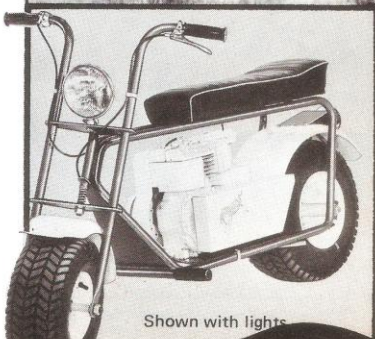
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TECH TIPS

TWO ABOUT HODAKA & RUPP

I have a Rupp Roadster and a problem! I am doing a engine transplant for a winter project. I am changing the standard 5 h.p. Tecumseh and dropping in a Hodaka 100cc 5-speed. The Hodaka uses No. 41 chain. The small sprockets for the jackshaft are not a problem because I can buy them from Steen's. It is the sprocket for the rear wheel that is

causing my problem. The Roadster has a 72-tooth sprocket for No. 35 chain. I would like to reduce the size to 60-tooth and fit it for No. 41 chain and still keep the six-bolt pattern. Can you help?

Allan S. Machulda,
1655 South Grand View Ave.,
Dubuque, Iowa 52001

About the best we can do, here, is sic you onto Tabloc Sprockets, 15004 East Arrow Highway, Baldwin Park, Calif. 91706. These guys know as much about sprockets as anybody. There are two ways to tackle your problem - send \$1 for the Tabloc catalog and find what

you need there - or at least find out they haven't got it (which is unlikely). Or you can send your old Rupp sprocket, showing the bore size and hole pattern, and ask them to match it up with a 60 tooth, 41 chain, sprocket. Undoubtedly they will be able to match it up from stock if you allow them a few teeth leeway but if the Rupp layout is really peculiar, Tabloc will make you a special sprocket for six extra bucks to take care of the machining. We suggest that you leave the type of material up to the Tabloc people and be prepared for a bill somewhere in the \$20 range for a special sprocket. Your order will be shipped to you COD so leave the money with somebody at home so that they can pay for it when the package arrives. When you get the job done, write and tell us how it went - with a photograph or two.

I have a Rupp Roadster and I like to ride it alot. One day a friend and I took our mini-bikes to Memorial Park and rode on the dirt-track. We were having fun on the track but when I was going up a slightly steep hill my clutch started skipping and it was getting muddy. After that my mini wasn't running too good so my brother let me ride his Triumph.

I've been wondering if I should get a Hodaka 100cc engine for my mini-bike. I think it would be better because it would have five gears, wouldn't be hard to clean, and be better for the trails. The question is, should I get the Hodaka 100cc or is there a better motorcycle engine to get? Thank you.

Edmond McGuyer
Houston, Texas

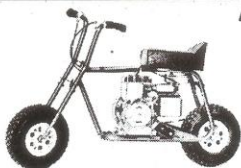
Impossible to tell, from your letter, what engine is best. Factors to consider are: weight of rider and machine; type of terrain the machine is to be used on; major objectives of the rider (i.e. racing, trail riding, boonie-bashing) and the amount of money to be spent. You might write to Alan Machulda, who wrote the previous letter, and ask for his experience in installing a Hodaka in a Rupp Roadster. It certainly sounds like an interesting transplant if a top performing mini-bike is what you're after.

We've never tried the bolts-through-the-pipe routine to provide back pressure and we don't hold out much hope of it being successful - besides, the possibility of corrosion around the bolt holes is pretty good. If your engine is a Briggs or the Tecumseh with the round muffler, you could try fitting a dress-up pipe around the existing muffler. Get a piece of pipe with an inside diameter to fit snugly over the muffler (a tight fit can be had by heating the pipe pretty good and slipping it over the muffler

Continued on page 20

MINIBIKE HEADQUARTERS

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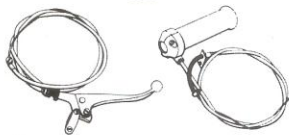
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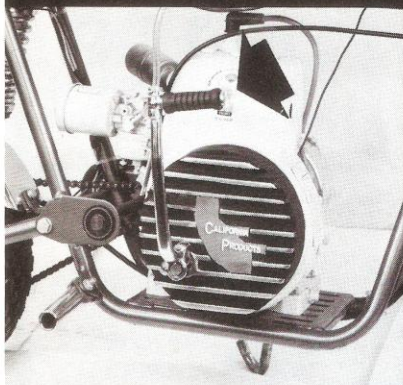
For even more expert opinion and complete specifications, see test elsewhere in this issue.

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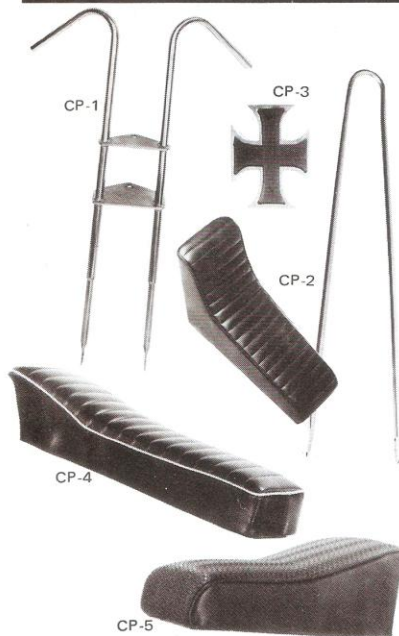
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TECH TIPS

Continued from page 18

while the muffler is cold), cut it to size, arrange fittings, and have the whole thing chromed. We suggest you write the Rupp Manufacturing, P.O. Box 1095, Mansfield, Ohio 44903, regarding the Dell Orto carb. As far as we know, if you can get a carb of this type to fit, there are no drawbacks and quite a bit of power to be gained.

IF IT DOESN'T FIT - MAKE IT FIT

I now own a 3 h.p. Tecumseh engine but I want to get a 5 h.p. Briggs & Stratton. The problem is I don't know if the 5 h.p. engine will fit on the frame (where it bolts down) in place of the 3 h.p. Would you please tell me if it would? Also, my mini-bike lacks power and I've checked everything, the clutch, air filter, etc. Would you please give me your opinion on what I should do? Thank you very much.

Roger Yadow
Clark Mills, New York

It is quite possible that your 3 horse Tecumseh is tired, Roger, and needs a pep-up such as the procedure described in the previous two issues (Shape up for Spring) and the conclusion of the series in this issue. If you don't have the March and April issues, write to our Circulation Department, enclosing 60 cents for each. The engine mount hole pattern for the five horse Briggs will not match that for the 3 horse Tecumseh (unless the mounting plate has a peculiar arrangement). However, that's no big thing - just mark the new positions with a center punch through the engine base plate and drill, or get somebody else to drill, four new holes.

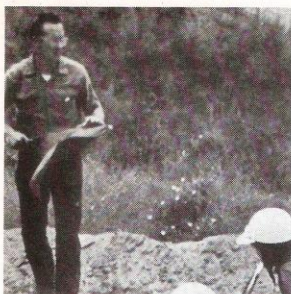
WHAT IS A SPARK ARRESTOR?

I am writing this letter in regard to your article about the Horstman Spark Arrestor (December 1969 issue). There is only one thing I do not understand. You say this is a spark arrestor, so, it arrests sparks. All I want to know is if this is a muffler also, or just a spark arrestor. Does this device muffle the noise that comes out of the engine?

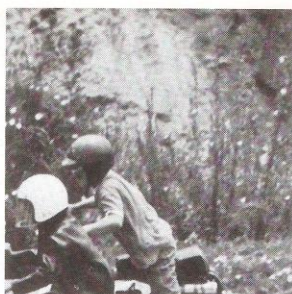
I plan on getting a Taco 100 this time. I always change my mind - last time I wanted a Bandit TT, the time before that, a Ruttman 250, before that, a Rupp Roadster, and so on, back to May when I bought my first issue of MBG. (Notice that they get more expensive each time.) I read every word in your test on the Taco 100 in the November 1969 issue. It doesn't say anything about the muffler. It looks different from the other kind of mufflers. Is this a spark arrestor or is this a fake?

I thought your article on putting a 3-speed box in a Taco 100 was great. I

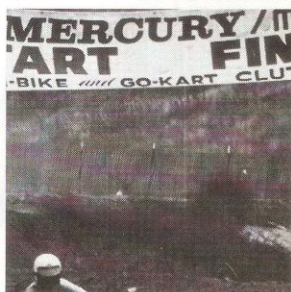
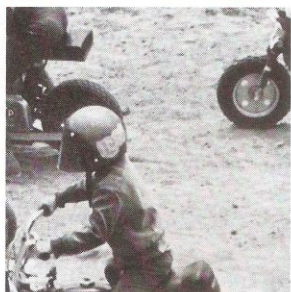
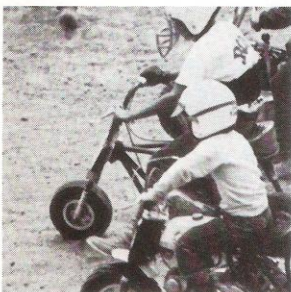
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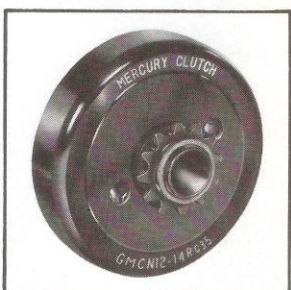
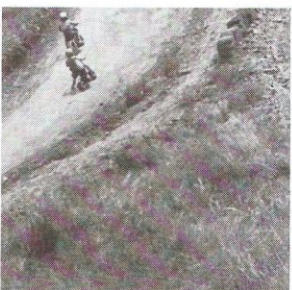
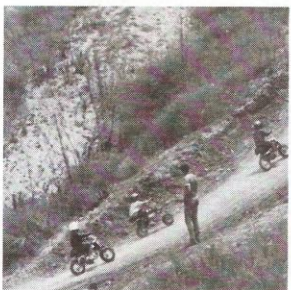
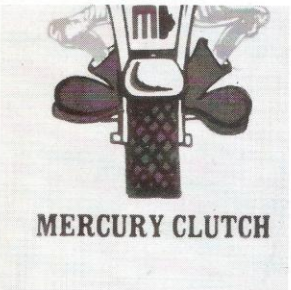
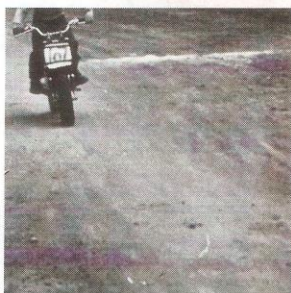
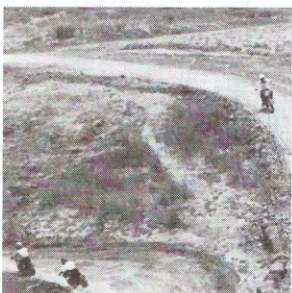
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MINI-BIKE GUIDE / 21

TECH TIPS

Continued from page 20

plan to put one in mine. Could you tell me where I can get mini-bike speedometers and who makes them? Thank you for such an informative magazine.

John Plowy
Buffalo, New York

What is a spark arrestor?

Tony Capps
Indianapolis, Indiana

To Tony goes the award for the shortest technical inquiry we have ever received. As John indicates, a spark arrestor arrests sparks emitted from the

exhaust (hot carbon particles). Its function is to prevent fires - and every mini-biker worthy of the name would sooner die than start a forest fire - right? Anyway, the spark arrestor prevents hot carbon from escaping by trapping the particles inside the tube long enough for them to cool down. The secret is to do this without reducing the flow of exhaust gases - or, at least, without reducing the flow enough to effect the running of the engine. This is done by a baffle, series of bends and baffles, or by a revolving vane. Naturally, this is going to have a dampening effect on the sound - although that is not the prime function of a spark arrestor. The Taco

100 (at least, the one we tested) did not have a spark arrestor. Sorry, Fox is the only mini-bike manufacturer that we know of, making a speedometer - and it only fits their machines. If we had a dollar for every inquiry about speedometers - we'd be rich.

QUESTIONS ABOUT JACKSHAFTS

I am going to make a three wheeled mini-bike and I would like to get a little speed and power. What would you suggest for the transmission - direct or jackshaft?

Mike Prechs
Michigan City, Indiana

I have owned several mini-bikes and have always had trouble with the jackshaft in one way or another. I am planning to buy a new mini-bike without a jackshaft. The bike I am planning on is a direct drive with a gear ratio of 6:1. I would like to do some hill riding with this bike but mostly ride in civilized areas and also plan to do a fair amount of double-riding. Would changing the back sprocket and adding a different chain effect the gear ratio? Would you suggest the purchase of the bike?

Brian Blaka
Oak Park, Illinois

A few of my friends are getting in an argument about the jackshaft. Most of the new mini-bikes coming out have them, but what do they really do? Also, what gear ratio would you recommend for speed. I have a Flexo Super Scrambler and I want mostly speed.

Dennis Koehler
Oswego, Illinois

A jackshaft will allow you to pick the gear ratio to meet your needs, easily and simply. But a jackshaft, on its own, does not effect power - it is merely an intermediate shaft allowing you to easily change sprockets. We say "merely" but it is the first step to improving the performance and versatility of a mini-bike. We don't know why you have had trouble with your jackshafts, Brian, but they are usually trouble-free - provided the sprockets are properly fixed. From the number of things you expect your mini-bike to do, a jackshaft seems almost essential so that you can change gear ratios - certainly changing the rear sprocket will change gear ratios, but it is a lot more bother (and more expensive).

STICK TO REGULAR

In my neighborhood everybody has a mini-bike (including seven Mini Trails) and there is a controversy on which gas is better for our four-cycle machines.

Regular gas, I hear, has lead in it and this results in carbon build-up. White gas

Continued on page 24

**PUT FAST, SMOOTH
'TIGER
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Big daddy will go for the Pak Mule cause it's a bigger machine. Big 24" seat means room for two. Super wide track with a strong 4 HP engine for the toughest trails. Includes folding handlebar for transit, two pairs of folding foot pegs and a rugged jack shaft. Also 6" steel wheels, kick stand, GT grips, chrome chain guard, automatic clutch and positive hand lever brake. For even tougher hill climbing, add the extra optional 5 HP engine and new Variable speed drive. Hauls a 300 pound load up a 45 degree incline. Standard color is high gloss Orange.



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MINI-BIKE GUIDE / 23



GOOSE

You don't know what wild is 'til you've got your gander off with the Goose. Super equipped with big 5" Mag style wheels, chrome fenders and a super 19" seat. The boonies just won't be the same with this 4 HP honker. Includes chain guard, GT grips, automatic clutch, positive hand lever brake, and kick stand. Finished in Gucky Orange.



VULTURE

This bird is just waiting to pounce on its competition. A touch of the throttle and it sprouts wings, ready to eat up anything in sight. Big 3½ HP for low flying just about anywhere. Has chrome fenders, 4" steel wheels, the nasty 19" seat and GT grips. Plus . . . a chain guard, automatic clutch, positive hand lever brake and a kick stand. Finished in Potent Purple.



TOAD

Hang on . . . the Toad is ready to horn in on the toughest trail. Those knobby's mean business when it comes to digging out! Rap the throttle and you'll know what 3½ horses really feel like. Includes a 14" scramble seat, tough 4" steel wheels, kick stand, chain guard and, of course, automatic clutch and positive hand lever brake. Finished in Wart Green.

TECH TIPS

Continued from page 22

has no lead (so no carbon) but I read it makes your engine get hotter faster. I (and about 10 to 15 other kids) would like to know which is best.

Gregg Gammon
Richmond, Virginia

Stick to the regular gas - it's what the manufacturers recommend and they should know. However, we don't think it hurts to run a tank of premium through, now and then, just in case the regular leads to carbon build up, or put a few drops of the many excellent carburetor cleaners on the market, into the gas tank on occasion.

WHAT ABOUT MULTI-GRADE OIL?

I own a Bonanza BC1200 with a 3.5 h.p. Tecumseh engine. The manual for the engine states to use S.A.E. 30 motor oil for running above 32 degrees (F) and 10 W oil below. With this changeable weather, it is impossible to change the oil every time it gets cold. Would it be possible to run 10 W - 30 oil like used in many cars? If it is, why doesn't the manual specify this?

Bob Huddleston
Bel Air, Maryland

The reason manufacturers recommend

one grade or another is to save you money - multi-grade oils are much more expensive but equally as good (if not better). And another tip, try putting in some STP, or similar product - about 10 per cent of the total oil volume (but no more than 20 per cent). The greater viscosity of the additive helps to seal the valve guides. Worn valve guides allow the oil to get up past the valves, into the combustion chamber, thus reducing the efficiency of the fuel mix and promoting internal deposits.

TRANSMISSION FOR FOX

I would like to know what kind of transmission I should put on my Fox Street Scamp. I know you must think I am crazy because it already has one, but it is no good on the trails I ride. So you see, I am in a bad spot.

I thought about the Salsbury Mini-Verter but I want your suggestions first.
Hobart Harris
Flint, Michigan

Brother, you sure know how to put us on the spot. We cannot recommend, directly, one product over another. We can only tell you all about each product and then expect you to make up your own mind. We have described various two-speed transmissions and the Salsbury Mini-Verter. Now what do you think? And don't forget, new products

are coming on the market every day. Just read MBG - we'll try to keep you up-to-date on the worthwhile happenings.

INSTALLATION OF ALTERNATOR

I have a problem that I think you could help me out on. Recently I acquired a Tecumseh 7 h.p. motor. Is there any way I can build in an alternator into the motor? Also, this motor has a one-inch crankshaft. Is there any company that makes a clutch to fit a one-inch shaft?

Brian Koenig
Staten Island, New York

So far as we know, there is no way to build an alternator into a Tecumseh 7 hp engine that is not already equipped with the unit. However, nothing is impossible with time, effort and money. Did you know they come equipped with alternators, directly from the factory?

Interesting question that we cannot answer too satisfactorily. Undoubtedly there must be centrifugal clutches made to fit that shaft but we cannot recall, immediately, seeing anything about them. The standard PTO shaft size for mini-bike engines is, of course, 3/4-inch. We suggest you contact your local Tecumseh dealer (look in the Yellow Pages) - he should be able to tell you.

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4 H.P. TECUMSEH ENGINE/ALTERNATOR
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Wide Track

WILDCAT

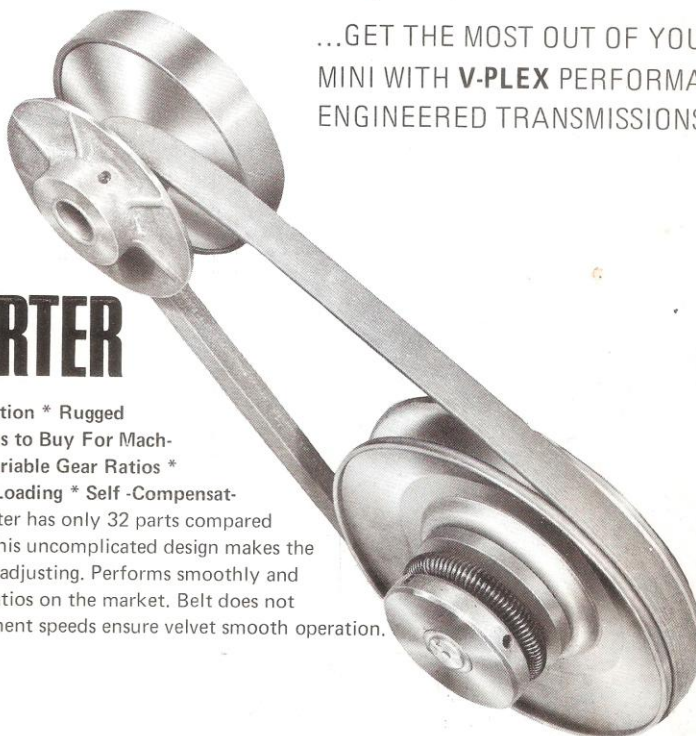


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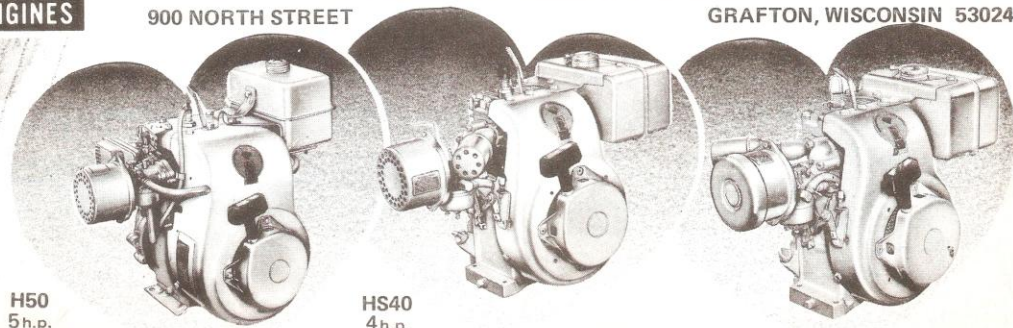
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H25 H30 H35
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THE TRAILS & THEIR MACHINES



PERHAPS THE FASTEST growing use of mini-bikes is on the trail. Manufacturers are putting their best brains to work on developing machines for this purpose. Mini-bikers are responding by digging ever deeper into their pockets for the more sophisticated machines. More reliability and versatility is leading to an easily detectable trend - greater use of mini-bikes by whole families - particularly families interested in camping and the outdoors.

Today's trail mini-bikes are able to tackle the worst of conditions - and do it with a degree of reliability undreamed of a few years (or even months) ago. Mini-bikers are finding that they can stray far from base camp without worry. And this has led to the search for greater utilization. Trail mini-bikes are no longer toys. They can be put to work.

In this Special Report, MBG's second on trail machines, we have several stories by readers who have put their machines to work - from gold panning through over-night camping on old logging trails - and including mini-biking in the snow. We have covered three trail mini-bikes that seem, to us, to represent the entire field. One utilizing a new, far-out, type of power train (Larkin's Hillcat). One representing the recent tremendous improvements in more-or-less traditional design (Herter's Mark I). And one that does it's own thing, regardless of the rest, improving with familiarity (Powell Bros.' Challenger).

For those with boonie-bashing in their future, we have prepared an article (calling on outside advice) on how to prepare themselves and prepare their machines.

THE MACHINES

Now and then, a design comes along, in nearly every field, to set the established practices on their ear. What has been accepted as the natural course of events suddenly becomes questionable. Not that the new thing may be so much better than the old - just that it's radically different. Something that nobody has done before. And it shakes your comfortable conceptions. Like - mini-bikes, except for special tri-cycle types, have two wheels, right? Not quite right. The introduction of the Hillcat from Larkin Aircraft now makes respectable the idea of three wheels, all in-line.

Larkin's new design is not based on a concept as simple as "three are better than two". That would not be the result of inventor Bruce Larkin's worrying about mini-bike design. Sophisticated engineering - that's the Larkin bag - and he has a number of inventions to his credit that have moved vast areas of the communications and aircraft industry forward in giant steps. So, what's a fertile brain of this magnitude doing, worrying about mini-bike design. Well, like most things that Larkin does, it's all part of a scheme.

He believes that recreation is where it's at for the enterprising businessman. After a period of inactivity (enjoying the fruits from the sale of an invention), Larkin wants back into business. His idea is to develop a line of recreational vehicles with fresh approaches (one of our spies reports getting a glimpse of a little sport plane that he said looked like it would fit into a small bedroom and still leave room for the bed). And a mini-bike is the first order of business in that plan.

Which brings us back to the Hillcat. And the obvious question - why two in-line rear wheels?

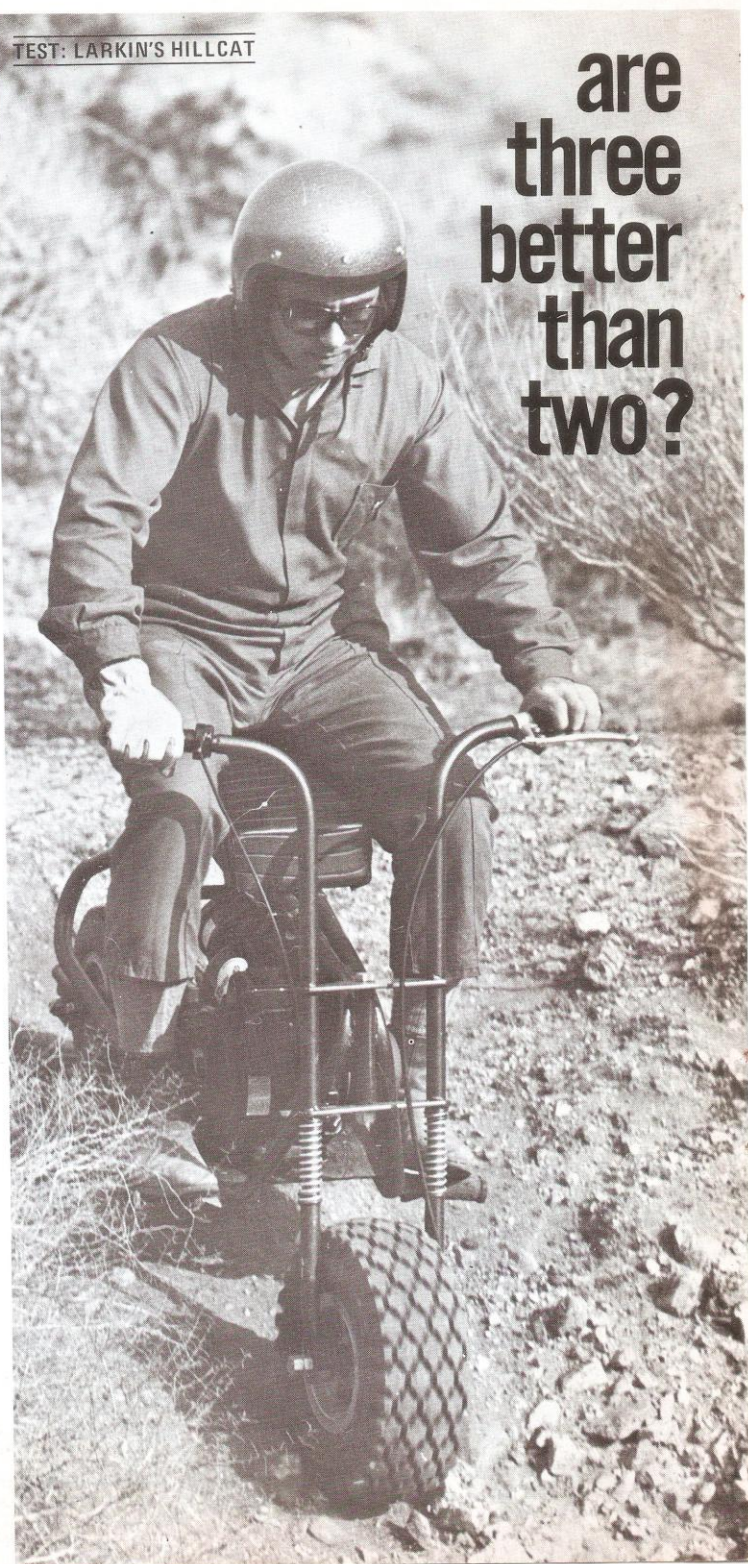
It's all rather simple, really. Like most good ideas. All Larkin has done is apply the principles of tracked vehicles, like Army tanks, to wheeled vehicles. As you know, tracked vehicles lay their own trail (the inside of the track) and then roll over it with multiple wheels so that the weight of the vehicle is spread out over the track. In this way, individual obstacles do not effect performance or, rather, the effect is spread out over a wide area.

This same effect can be observed in the two-wheeled mini-bikes now on the market - those with little tires get bogged down by even small obstacles, because the effect of the obstacle is in a small area. Those with larger tires (the ultimate being the 8-inch wide tread and 18-inch diameter of the Goodyear Terra Tire) spread the effect out over a wider area. In fact, the Terra Tire, because of its low pressure, acts as a tread, folding over the obstacles, rather than churning at them.

The two rear wheels of the Hillcat, both of them driven, are intended to use

TEST: LARKIN'S HILLCAT

are
three
better
than
two?



the trail like the track of a tank. Let's suppose the machine is being ridden up a trail - the leading wheel on the rear meets a 6-inch boulder sticking up above the surface. Normally we could expect the 11½-inch diameter of the tire to bog down, however, the trailing rear tire has not yet reached the boulder and, as the engine is gunned, tends to push the leading tire up and over the boulder. This is possible because the tandem axle arm floats about a central pivot point which automatically gives the wheel with the most "bite" the most work to do.

Now, the leading rear wheel has been pushed up and over the boulder, and the trailing rear wheel is up against it. The work load now goes to the leading wheel, with the trailing wheel still giving an assist, and the leading wheel *p-u-l-l-s* the trailing wheel over the boulder. It is this push/pull, ever-equalizing, pivoting action of the tandem wheels that, theoretically, gives the Hillcat its superior trail-bashing capabilities.

Despite the peculiarity of the drive system, the Hillcat's basic frame is - basic! It utilizes the usual double loop frame, just a little elongated at the rear to accommodate the tandem wheel drive. It has the standard steering crown with upper and lower crown plates holding a Taco-like front end. The proportions are well within the normal mini-bike practice and despite the protruding trailing rear wheel it comes in with an overall length of only 56-inches.

Only those in love with engineering ingenuity will think that the Hillcat is good looking but there is about it a purposeful simplicity that is appealing - if trail-bashing is your thing. Yet, that frame simplicity is deceiving because a good deal of thought has gone into the design. For instance, the ground clearance is a generous 9½-inches and extra strength is given by the primary drive jackshaft bracket and the seat supporting rear vertical loop.

Experience is the greatest teacher and we expect that the footpegs will be moved more to the rear (or an additional set added) and more rake will be given to the front forks.

Power for the Hillcat comes from a 4 horse Tecumseh driving through a Salisbury Mini-Verter to a primary jackshaft located high on the frame, in a bracket welded across the frame under the seat. This location was chosen because the arc of the leading rear wheel would not permit the standard jackshaft location. Getting the primary jackshaft high allows the maximum arcing of the wheel (although we found, in one or two really extreme situations, that the leading rear wheel could still come into contact with the rear sheave of the Mini-Verter).

The rear sheave on the transmission is located, naturally, in line with the PTO mounted sheave, on the left hand side

of the machine. On the other side of the primary jackshaft is mounted a No. 41 chain sprocket which drives a matching sprocket on the final drive jackshaft. This heavy chain is used to handle the fairly long stretch from the primary to final jackshafts.

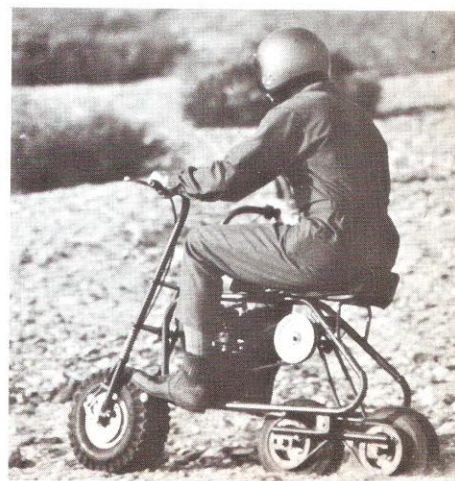
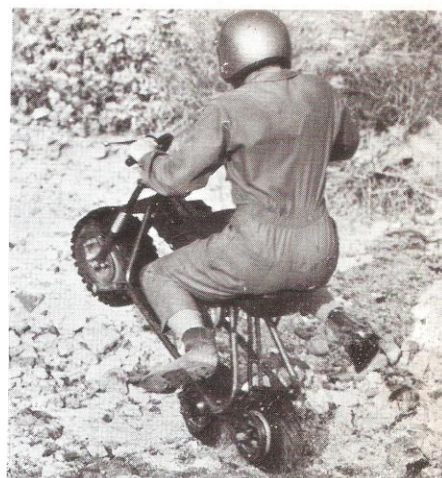
On the left hand side of the final jackshaft are two No. 35 chain sprockets, driving chains to the front and to the rear sprockets on the drive wheels. As the final jackshaft is also the pivot point for the tandem axle arm, the gyrations of the drive wheels as they negotiate trail conditions in no way alters the chain tension. The bearing hangers for the final drive jackshaft, incidentally, are welded under the frame for several reasons - to get the jackshaft sprockets as close as possible to the wheel sprockets for minimum chain strain; to provide greater frame ground clearance; and to lessen the strain at the weld by having the thrust directly against the frame.

The tandem axle arm is swung below the final drive jackshaft and the brackets are fitted with ball bearings for friction-free movement. Space inside the axle arms is at a premium because the arms have to swing, free of obstruction, inside the rear frame. For this reason, both the diameter and tread width of the tires are somewhat restricted. However, Larkin feels that the dual, equalized, traction of both rear wheels more than makes up for the 11½-inch diameter and 3½-inch tread.

However, judging from the front end, he realizes the advantages of large wheels. The front wheel is a 14-inch diameter, 5-inch tread, knobby that dwarfs the rear tires - sitting, as they do, in the same frame. The front tire is mounted in telescopic forks that have enough travel in them to be useful. For transportation, the Larkin people simply remove the steering crown pin and stow the machine in two sections.

The folding footpegs (angled, correctly, to the rear) are way up forward and, for our money, would be better positioned behind the engine, close to the weight center. Weight distribution appears to be just about right although our experience with tandem rear axles is limited, to say the least, and we are not sure what would be the best distribution pattern for the rear end. We assume the Hillcat has it, because Larkin told us so.

Other detailing, controls, throttle linkage, seat comfort and size, is of good quality - however, we found the front mounted internal expansion brake needed to be treated with respect. The location of the brake, we believe, is a compromise created by the difficulty of arranging rear braking on wheels that are constantly gyrating. Although we are basically nervous about braking that acts through the drive chains, we feel that a solution could have been found to this problem by having the brake



THE MACHINES

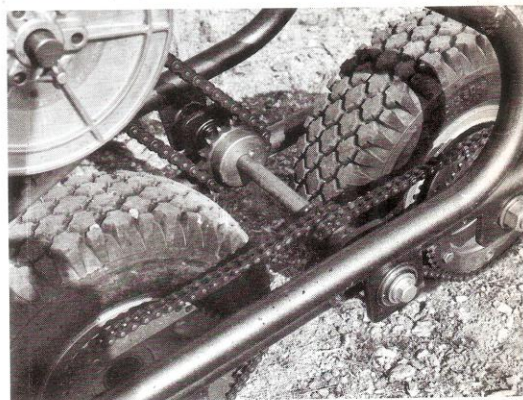
mounted on the final drive jackshaft, which is about the only constant point on the rear. With two chains providing the drive (and, therefore, the braking) there is double the assurance that the rider will not be left sans brakes at a particularly awkward moment.

This front wheel braking was responsible for our major criticism of the power train as a result of the testing. We found that when the brake was applied quickly before, perhaps, all the power was off - the trailing rear wheel would tend to force itself forward. With the front end locked up, there was nowhere else for the leading rear wheel to go but up. This gave us a situation, more than once, when we found ourselves with the leading rear wheel trying to do a flip-flop and with only the rear sheave of the torque converter preventing it from doing so. It seemed to us that a rear brake would solve this problem and Larkin Aircraft indicated that they were working on the project.

We were prepared to be unimpressed by the handling of the Hillcat, probably because it was like no other machine we have ever tested. However, we were pleasantly surprised. In "washboard" conditions (very few of us ever see a washboard these days and what we mean by that term is rapidly undulating terrain with fairly even bumps) the Hillcat handles as well, if not better, than anything else on the market. When the surface becomes like a washboard there is only one thing to do, normally, and that is to slow down to a walk - or risk losing your back teeth - if you don't shake the machine to pieces beforehand. With the Hillcat, however, we were able to go full bore over this type of terrain with only minor reverberations from the rear end.

Considering the fact that the rear end is innocent of shock absorbers, this surprised us no end. It appears that the floating tandem axle arm creates its own shock absorbing qualities. The weight of the rider and machine prevents the two rear wheels from over-reacting to the bumps. If the leading rear wheel wants to leave the ground after hitting a particularly nasty obstacle (as sometimes happens with even the best suspended standard rear end), the rear wheel sternly controls the impulse. The weight of the rider and machine, acting on the rear wheel, levers the leading wheel back down. And, of course, the same is true, front to back. This action is constant and, in actuality, results in both wheels being firmly in contact with the trail at all times.

The cushioning effect of the two driven wheels results from the fact that the trail conditions are not directly telegraphed to the frame. That is to say, the driven wheels are free, within the limits imposed by the pivoting point, to rise and fall over the bumps without



effecting the frame. This can be explained by taking the action in "slow motion". The machine is tooling along the trail (imagine it perfectly flat - as no trail can be) when the leading driven wheel hits the first bump of the day. If we hit it hard enough, and the bump is sharp enough, the leading wheel will try to leap off the top - but the rear wheel, now carrying most of the weight, says "down boy" and uses its leverage through the pivot point to enforce the order. Now it's the turn of the trailing wheel to hit the bump and the tables are turned.

In addition, while the leading wheel is climbing the bump, the axle arm is pivoting upwards at the front. By the time the pivot point reaches the bump, the leading wheel is already on the way down. The action is the same at the trailing wheel. As the pivot point is the place where the axle arm is connected to the frame, it is the action at this point that determines the movement of the frame. It is fairly obvious that the amount of movement at the pivot point will be half of the see-saw action of the driven wheels - thus, if we are riding over six-inch bumps (which would be pretty extreme) the frame is moving only 3-inches. In practice, the trail bumps occur with such frequency that the oscillation of the frame is pretty nearly constant - giving a fairly level ride even in the worst conditions. In fact, the kind of conditions that are hardest on the conventional mini-bike, show the Hillcat up in its best light.

Still, in all, things in the garden are not all rosey, George. The contention that two 11½-inch tires have the equal traction of, say, a 14-inch tire, just doesn't hold up in testing. In loose (we have to point out, *very* loose) desert conditions, these relatively small tires will dig in just like two relatively small tires. One would assume, as we are splitting the drive train from a 4 horse engine, that we would have about two horses per driven wheel - but once they break loose, they dig in like each had an engine of their own. Maybe it's that torque converter - it really does some amazing things to those little engines.

We would like to see larger tires on the rear of the Hillcat but, frankly, we don't see how they are going to fit in. However, we wouldn't be at all surprised to see Bruce Larkin come up with a solution - after all, it only requires an engineering miracle. As is customary with MBG tests, this was carried out in the worst of conditions and, where the surface doesn't exactly crumble away from looking at it, the Hillcat's drive system works really well. However, there are times. . .

On the other hand, the front end handled the loosest stuff very well. The large tire was a real rock gripper and the shock absorbing abilities of the tele-

scopic forks were good. We felt, nevertheless, that if the rake on the front forks was a little more extended the handling would have improved a shade and the direction of the shocks would have been more in line with the telescoping direction. We noticed little difference in steering characteristics from the usual type of mini-bike although really sharp maneuvers should, from logical observations, have produced some scrubbing action of the rear wheels.

In traversing tests on fairly firm terrain, the Hillcat had a rare degree of stability - tracking across the slopes in a straight line. We mentioned our problems with the front-mounted brake but in conditions not critical, that is to say, the normal type of trail, the brake was very effective in stopping ability. We were not able to test for fading when using the brake on a long down-hill run because of the tendency for the machine to swop ends.

Seating position, and the seat itself, was very comfortable and the ride was surprisingly smooth. We have already

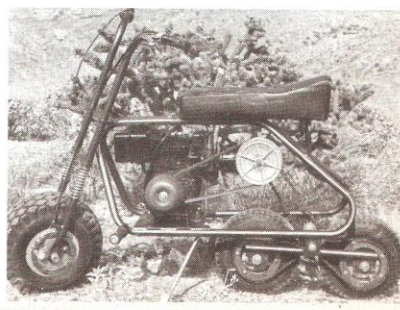
suggested relocation of the footpegs to make it possible to stand when riding over the rougher spots. One thing we feel is absolutely essential, and one that Larkin Aircraft has said they will provide on the production models, is a guard for the Mini-Verter - at least for the PTO sheeve which is located right next to the rider's ankle.

Top marks for ingenuity must go to Larkin Aircraft for producing and developing a new type of trail mini-bike. For those looking for a really rugged machine and with a love for the unusual, the Hillcat will require consideration. Within the limits suggested by the test, the new drive system works amazingly well - certainly on fairly hard-packed surfaces with consistent irregularities, the Hillcat will perform with the best and out-perform most. Final retail price has not yet been worked out but something in the order of \$250 to \$275 has been suggested - which, considering the number of components and the amount of design work, is not a bad range. At the lower end of the range, interest should be quite intense.

SPECIFICATIONS

Manufacturer:	Larkin Aircraft Co., 230 Airport Blvd., Freedom, Calif. 95019
Model:	Hillcat
Price:	Not Available
Engine:	Tecumseh 4 hp, four-stroke
Transmission:	Salsbury auto, variable speed torque converter; primary and final jackshafts; primary drive, No. 40 chain, final No. 35; both rear wheels driven
Gear Ratios:	Constantly variable between 6 to 1, and 12 to 1
Tires:	Front, 14-inch diam., 5-inch tread; rear, 11½-inch diam., 3½-inch tread (two)
Wheels:	Split rim, cast aluminum; front, 6-inch; rear 5-inch (two); sealed ball bearings
Suspension:	Front, telescopic forks; rear, rigid frame, swinging tandem axle arm
Brake:	Internal expansion, front mounted
Weight:	98 lbs.
Overall Length:	56-inches
Wheelbase:	28½-inches (leading rear wheel); 42¼-inches (trailing rear wheel); 36-inches, front axle to tandem axle arm pivot
Heights:	Handlebars, 37-inches; seat, 28½-inches
Ground Clearance:	9½-inches
Miscellaneous:	Rearward angled folding footpegs; large motorcycle type knobbed brake lever

	Excellent	Good	Fair	Poor
Transmission	★			
Clutch operation	★			
Ratio range	★			
Controls		★		
Brake(s)				★
Suspension, front		★		
Suspension, rear		★		
Finish			★	
Handling		★		
Traction		★		



THE MACHINES

Ever hear of Waseca, Minnesota? We thought you hadn't. Well it's about 60 miles south of Minneapolis - halfway between there and nowhere. We want you to know where it is because a lot of mini-bikers are going to be writing to Herter's Inc., which is located in Waseca.

What's a Herter's - did we hear somebody say? Well, a Herter's is a sporting goods house that sells its products through the mail. One of the biggest. And, certainly, one of the oldest - since 1893, man, that's 77 years.

Their letterhead, which must be one of the horseiest letterheads around, claims that they are the largest direct importer of diamonds, star sapphires and cultured pearls in the world (besides making a bunch of other outdoorsy stuff). What all this has to do with mini-biking, we don't know, except that now they will have to add another line to an already overloaded list. It'll read - "makers of one of the finest mini-bikes in the world".

And they won't have to say it themselves - we'll say it for them. Herter's Mark 1 mini-bike is one of the finest mini-bikes in the world.

"Can it be that MBG has flipped? They just never made such sweeping statements. Always careful, those guys."

In a way we have flipped over this machine. Which is not to say that we didn't approach it with a critical eye - and found some things that could have been done better. Not surprising - the perfect mini-bike, or the perfect anything, for that matter, is just too much to hope for. And, besides, what the heck does a retailer of sporting goods know about mini-bikes? And who ever heard of Herter's?

But we supposed we better take a look at it - just so that we could lay its faults on the line for our readers. They even shipped it funny - great big wooden crate instead of those cardboard boxes. It was dusty and dirty as all get out - of course, there weren't any dings in it, either.

Then, as we pried off the creaking boards, something strange happened. It really doesn't look too bad - in fact, it looks pretty good. Rugged little devil. Man, look at the size of that tubing. And that classy looking gas tank. And five, not four, horses. With the Salsbury torque converter, yet. Hey, these front forks really telescope - and those rear shocks aren't too bad, either. Nice, fat, tires!

By the time we had got the machine totally out of the crate, we had a bunch of people ohhing and ahing, just standing around waiting for a ride. And we were getting ready to change our minds about funny "sporting goods shops" in the middle of nowhere knowing anything about building mini-bikes.

After everybody got to ride it around the parking lot (which is no test), we

TEST: HERTER'S MARK I

improvement on a tradition



got down to a closer look. And it looked pretty good. In fact, it looked well "over-engineered", with a safety factor that must be about double any normal load. Remember how Porsche made a big thing about their cars being "over-engineered", how that made them the best thing in sports cars? The only trouble was, you had to pay for the engineered part you might never have to use.

So, we thought, might be the case with the Herter's machine. Remembering that last year the Mark 1 came with a two-speed, and knowing that the Salsbury unit is a little more than twice as expensive, we called Herter's and innocently asked for their increase in price. This would explain away all the goodies, we were sure. It was a good job we were sitting down when we made the call, otherwise we might have fallen down when they told us there was no increase - even with the Salsbury. The Mark 1 sold for \$199 (without lights) then and sells for the same price now.

How the heck Herter's does it, is beyond us. No doubt they'll be out of business in 1970 - except that the record (77 years) doesn't bear this assumption out. What can we say? It's a mystery. Of course, their marketing technique has something to do with it - selling directly through the mail means that they have no local dealers for service - and that's something the Mark 1 buyer will have to live with. Herter's does back up their products with a guarantee but to make use of it means working through the mail - and that can be pretty frustrating. On the other hand, their machine is so built that there doesn't look as though the guarantee will ever be needed - except, maybe, for a broken chain or a flat tire. Of course, as long as the governor is not disconnected or other alterations made, Tecumseh will honor the warranty on their engine.

What's the catch? Well, there are a couple. First, unless you go to Waseca to pick up your machine its going to cost you twelve bucks for them to put it into its wooden cage for shipping. And the light kit (which runs off an engine alternator) is going to set you back additional \$12.95.

Which makes for a total, undelivered price, as tested of \$223.95. Herter's also make a Trail version of the test machine which is basically the same except that it is equipped with an 18-inch diameter, 8-inch tread, Goodyear low-pressure, Terra Tire. With this big, soft, doughnut of an "irresistable force" tire, the machine sells for \$211 plus crating, plus lights, if needed. Total, \$235.95.

This arithmetic adds up to an inescapable conclusion. The Herter's mini-bikes, with all their features, are first class value.

Enough of this waffling - let's find out just what the features are.

For a starter, the Mark 1 has a 5 hp Tecumseh engine driving through a Salsbury automatic, variable gear ratio, torque converter. Many of today's top-line mini-bikes are being equipped with the Tecumseh four horse job and, especially when they use a torque converter such as the Salsbury (there are others, you know), this engine provides more than enough poop. That additional equine (horse, to you) between the shafts does, however, provide a measurable increase in torque, which is, after all, what you are after in a trail machine. And, although the 4 hp engine might be, and usually is, perfectly adequate - five has just got to be more powerful than four - right? Right!

The test machine was fully suspended with a suspension that really works. The front forks actually telescope enough to iron out all but the cliff droppers and have about a 1½-inch easy travel. On the rear swinging arms are two external spring shock absorbers that seem a little stiffer than the front end. Which is the opposite way to most mini-bikes - not that the rear shocks are any stiffer - just that the front end is more forgiving.

There is a large, chromed, saddle-type gas tank and this, of course, means a single backbone type frame. Except that it isn't quite a single backbone - its really a great big, fat, strong-as-a-house, triangulated backbone. The 1½-inch steering head tube forms one side of the triangle with 2-inch tubing (the fattest tubing we have seen on a mini-bike) cut, formed and welded to compose the other two sides of the triangle. What we have here is the strongest center section on a mini-bike frame we have seen in a long time. Beyond this triangulated backbone, to the rear, is a seat-carrying loop with two hefty brackets welded to it for the upper shock absorber mounting points. The double loop engine cradle is welded at the back to the upper loop and at the front to the

junction of the steering head and the lower backbone member. All the welds appear very well executed and the frame design is exceedingly strong - the only quarrel we have with the construction is the fact that the engine cradle/shock absorber mounts are located about halfway along the seat loop distance which might tend towards a lightly loaded front end if the rider sat well back. However, despite the apparent cantilever of the seat, the pivot point is still the rear axle and, in fact, we stood a full-grown man on the carrying handle, back of the seat (the point of maximum leverage) without lifting the front end. The front wheel wasn't carrying much weight, true, but it didn't lift.

Below the seat, inside the engine cradle, is welded a large box bracket to carry the jackshaft for the rear sheave of the Salsbury unit (this unit which is belt driven, was fully described in the February issue of MBG). The rear sheave on the Herter's Mark 1 had to be mounted high because of the relatively restricted space between the engine and the frame. A jackshaft was placed in the normal position to carry the conventional final drive chain. The power chain goes this way: the centrifugally controlled power take off shaft sheave with its bell housing drives a belt to the rear sheave mounted high in the frame on a secondary drive shaft. In turn, this rear sheave drives the secondary drive shaft which is mounted with a sprocket. This sprocket drives a chain going to the final drive jackshaft, mounted lower in the bracket, which, in turn, drives the final drive jackshaft-mounted sprocket to the rear wheel-mounted sprocket. Sounds a little complicated but it isn't and a few minutes with the photographs should reveal the drive chain's method of operation.

One final point before we leave this jackshaft assembly. The lower jackshaft passes through the box bracket and on the end protruding into the engine cradle, is mounted a drum for the contracting band brake. This idea is infinitely better than mounting the band on the outside of the clutch (as is sometimes done) but it still relies on the chain to transmit the braking force and, as we all know, we can rely on the chain for breaking - at some time or other. When it happens - no brakes. Chains seem to have a habit of breaking at points of maximum stress - like just about making it to the top of the worst local hill climb. Just when you need brakes the most.

Talking to Herter's about this, we learned that most of the 1970 models, those coming off the production lines now, will sport an internal expansion brake working on the rear wheel. Great! Our criticism of the band brake on the Herter's machine extends to performance - it just wasn't satisfactory in the stopping department - although that



THE MACHINES

may be due to poor adjustment.

We might as well get all the criticisms out of our system, while we're at it. The rear swinging arm is mounted back of the engine cradle, while the final drive jackshaft is mounted well inside. There is about three inches separating the two center lines, with corresponding differences in swinging arcs - the wheel is on a swinging arc three inches shorter than the arc of the chain. We feel there is a possibility of losing the chain unless careful attention is given to chain tension but although we were aware of the possibility and watching for it, we beat the living daylight out of this machine (much more than normal) without any chain problem. So, having warned you of the possibility, and then told you not to worry - let's see what happens.

Most of the components made by Herters seem to be excellent in design and execution - but nobody makes *all* their own parts - every manufacturer has to buy some stuff to put on their machines. And, as there are not too many switches, lights, shocks and so on that fit mini-bikes, the manufacturer is often in the position of having to take what's available. That must be true, we feel, about the kill button/light switch mounted on the Mark 1's handlebars. A pretty useless piece of equipment. First of all it has the goofiest mounting system we've seen - and after we had tried to tighten it - we found that the kill button was permanently grounded-out. After janking on the rope starter for about 20 minutes, and checking just about everything out, trying to get a little fire started in the Tecumseh's belly as a last resort we disconnected the control cluster. It fired up so easily that we felt silly. Just one of those annoying little things.

Final bitch - then we're all through. The footpegs are too far forward, for our personal preferences. Standing for the rough stuff or to adjust weight distribution while climbing steeper hills, is next to impossible. We think we detect the reason for the footpegs being in their present position - with the Mini-Verter transmission, the engine unit is 15½-inches wide, from clutch guard to starter housing. Although the engine is correctly positioned, this still gives quite a bit of overhang on either side and with the footpegs located for best weight distribution, behind the engine, there may be a possibility of somebody getting their leg jammed between the footpeg and the engine during a spill. However, the footpegs, even way up front, have to be wide enough to clear the engine so, we believe, this is a remote possibility.

We here at MBG, are going to fit a set of pegs back of the engine, anyway, for use as long as they let us keep the machine (which, we hope, will be a long time).



A set of "shark's fins" have been welded to the rear swinging arm as protection against breaking chains (in case, after looking at the photographs you are wondering what the heck they are). They appear on both sides of the machine although, of course, the chain is on only one side - it's probably easier to set up a welding jig to do the same job on both sides than to figure out which are the right and left arms. The arms are welded to a bearing tube running the width of the frame and bolt through the brackets and the tube provides the pivot point. This method helps to keep the arms swinging ur



formly so that the wheel does not twist as it might with indepently swinging arms. Cam action chain tensioners are provided on the rear axle but do not have finger tabs, so we assume a hammer and punch or screwdriver are used for adjustments.

The wheels on the test machine are 6-inch cast aluminum, split rim, units with three spokes. Mounted on these wheels are 14-inch diameter Carlisle knobbies with 4-inch treads. When we first got the machine we were not sure whether it was the Trail or the Mark 1 or, for that matter, what Herter's merchandizing plans were for 1970. However, these tires are obviously trail breakers so we assumed that they had sent us the Trail model. Later, we found out that our test machine was, in fact, the Mark 1 - not, basically, in Herter's thinking, their prime trail machine. Nevertheless, it was tested for trail use - the results of which you'll read later - but now we would like to give the Trail model the same working over - just to see what the differences are.

If the Trail model handles the boonies any better than the Mark 1, it must be quite a machine. And it is possible that it just might - because it is fitted with Goodyear's famous low pressure Terra Tire with an 18-inch diameter and an 8-inch tread. But that's another story.

Our test machine came equipped with the lighting kit - and a very effective lighting setup it was. However, part of our test crew thinks that lights on a mini-bike are pretty nearly irrelevant (at least, in view of the cost) while some others think they are a sometimes handy, if not totally necessary, feature. This interoffice controversy is expounded in this month's editorial and we'll leave the reader to make up his own mind. Anyway, the Herter's lighting was well anchored and all the wiring and brake switches and everything neatly tucked out of the way inside the engine loop area.

Even the rear/stop light is well protected by the lifting handle loop behind the seat and the headlight is mounted on an adjustable bracket running across the front forks. This bracket, incidently, like everything else on the Mark 1, is held by top quality lock nuts - so it is unlikely that anything will shake loose (the only loose fastening we found after about eight hours of hard pounding was one of the fender screws).

Finish on the Mark 1 ranges from excellent to mediocre. The chrome-work, gas tank, handlebars, headlight, fenders, and suspension springs, is top-notch. However, the red paint on the frame looks like a good undercoat - of course, that doesn't count for anything on a trail machine because its going to get pretty scratched up in short order, anyway. And the decal on the side of the gas tank is a joke - the first time we

spilled a little gasoline on it, it started to peel - besides, it's confusing - it says "Husky", the catalog mentions "Hudson's Bay Mini-Bikes" and then we have "Trail" and "Mark I".

Are we carping about nothing? Well, we have to admit that all the little faults of the Mark 1 don't amount to very much - especially in view of its performance in the field - but we're just trying to do a job and prove that we haven't lost our objectivity. Because, when all is said and done, we think the Mark 1 is just great.

Naturally, we formed this opinion only after trying to destroy it out in a particularly rugged section of California's desert. Just for the record and our readers who have never seen a Californian desert, we should explain that it is not, necessarily, simply a lot of sand (although we have that kind of desert, as well). Our test area, like a great deal of the "desert", is simply a lot of pretty barren countryside without much in the way of roads, houses or people. It has good, long, hills to test the durability of mini-bikes laying claim to the title of "trail machine" and

surface conditions that are as tough as any. In fact, it is the surface conditions that provide, perhaps, the greatest difference with terrain found elsewhere in the country. After all, many (most?) areas around the country can come up with hills - and, as the lady said, a hill is a hill, is a hill.

However, in the desert, the surface covering is very thin and, in places, disappears altogether - leaving a bunch of loose, bumpy, tire-cutting, rocks for the rider to contend with. This is in addition to the never-really-level terrain and sometimes-nearly-mountainous inclines, cactus bushes, chuckholes, and deep, steep, ditches carved out by the spring runoffs. In short, man-and-machine killing conditions. The only redeeming feature, as far as we are concerned, are the never-ending "trails" (for want of a more descriptive term) cut through the brush for fire-breaks or to get to some long-forgotten mine or hermit's cabin way out in the wilds.

Now, many of our readers will never subject themselves or their machines to this kind of terrain - and some of the

Continued on page 60

SPECIFICATIONS

Manufacturer:	Herter's Inc., Highway 13 South, Waseca, Minnesota 56093
Model:	Mark 1
Price:	\$211.95 f.o.b. Waseca
Engine:	Tecumseh 5 hp, four-stroke
Transmission:	Salsbury auto. variable speed torque converter; primary and final jackshafts; No. 35 chain
Gear Ratios:	Constantly variable between 5 to 1 and 10 to 1
Tires:	14½-inch diameter, 4½-inch tread, universal tread
Wheels:	Cast aluminum, 6-inch, split rim, sealed ball bearings
Suspension:	Front, telescopic; rear, swinging arm shock absorber dampened
Brake:	External contraction (band), jackshaft mounted
Weight:	102 lbs.
Overall Length:	53½-inch
Wheelbase:	39-inches
Heights:	Handlebars, 37-inches; seat, 25½-inches (approx.)
Ground Clearance:	4½-inches
Miscellaneous:	Complete lighting kit, alternator powered, with handlebar mounted control; handlebar mounted kill button; 22-inch long, 10-inch wide, naugahyde covered seat; one gallon, tear-drop, chromed gas tank with reserve; folding foot pegs; full-coverage chromed fenders; full-coverage transmission guard; spark arrestor.

	Excellent	Good	Fair	Poor
Transmission	★			
Clutch operation	★			
Ratio range	★			
Controls		★		
Brake(s)			★	
Suspension, front		★		
Suspension, rear		★		
Finish			★	
Handling	★			
Traction		★		



THE MACHINES

Many years ago, when the Powell Brothers first finalized the design of their Challenger, they thought they had it licked. This had to be, they thought, the ultimate in trail bike design. It was strong, well suspended, had go-anywhere tires and wheels, a powerful engine and a transmission that was, at that time, unique in the mini-bike field (although they didn't, then, and to some extent don't now, think of their machine as a mini-bike). And to top it all off - the price was right.

Looking at their pride and joy, in those innocent days, they thought that their days of experimentation were over. Now they could just go ahead, for as long as they wanted, producing Challengers for people who wanted a lightweight machine to get off into the boonies - and beyond. After all, what else was there on the market?

Powell Bros. were, of course, one of the first in the mini-bike field (although that was before the current popularity of the little machines) and, perhaps, the first to produce a rugged trail machine of the type gaining more and more interest. Consequently, they have a vast amount of experience behind them. They were, in fact, the leaders in the field of trail mini-bikes.

Today, of course, there are many manufacturers in the trail mini-bike field. In fact, nearly every manufacturer has in his line at least one machine aimed at trail useage - however effective it might be in those conditions. Some of the trail mini-bikes now on the market are very good - others, not so good. Still, there are few that can match up to the Powell Challenger in effectiveness, despite the length of time that the basic design has been around. And that is because it was done right the first time.

Nevertheless, competition being the life-blood of American business, the Powell Brothers haven't been able to lay around on their laurels. Like those little cars from across the Atlantic, the changes haven't been simply skin deep - at first glance the Challenger looks like it did in the beginning. But below the skin, the engineering changes have been considerable.

Since the beginning, the Challenger has used a primary belt drive of the kind coming into play in the 1970 models from other manufacturers. This provides a constantly variable gear ratio keyed to varying trail conditions and shifting automatically to meet those conditions. Originally, the Challenger's transmission was not fully automatic. There was no manually operated clutch (it was automatic from that point of view) but there was a gear lever that the driver had to shift to find the gear ratio he wanted.

Instead of the normal engine mount plate, the engine was mounted on a pivot point that allowed the engine to swing fore and aft. The engine was then hooked up to a "gear lever" and by

TEST: POWELL CHALLENGER

the unusual gets more unusual



pushing it forwards or hauling back on it, the rider controlled the depth that the belt ran in a sheeve. It worked - but it was awkward to operate when the rider was more concerned about what was happening at the wheels.

In the new Challenger, the transmission has gone *almost* totally automatic. The belt now rides up and down the sheeves in accordance with trail conditions - thus providing varying diameters, front and rear, for the belt to ride around. This, of course, means varying ratios - like having a great number of varying sized sprockets on the PTO and the jackshaft and an intelligent chain that can jump from one to another depending on the ratio required. Only, instead of a chain it uses a drive belt and instead of lots of sprockets there are just two sheeves (one on the PTO shaft and the other on the jackshaft) that change the radius that the belt has to travel around.

The changes in radius are caused by engine speed - when the engine starts to slow down because the machine starts to climb a hill or there is a tricky section to negotiate, the radius of the belt in the front gets smaller and the jackshaft radius gets larger - resulting in a lower gear ratio. This allows the engine to keep winding tightly, in the maximum torque range. When the going is easy and the engine starts to wind up to its higher rpm, the belt starts riding higher on the front sheeve and lower on the jackshaft sheeve - resulting in a higher gear ratio and the possibility of higher speeds.

We said the Challenger's transmission was *almost* automatic. The "almost" part is a lever on the left hand side, just behind the transmission, which can be used to keep the belt in low gear. This is a neat little touch because in terrain that is essentially tough, but with little sections that are easy, a fully automatic transmission could be riding in and out of low gear. This is no big problem as this is precisely what the fully automatic transmission is designed to do. However, the low gear lever on the Challenger gives the rider that little bit of control over gear ratios that the boonie-basher, sometimes feels he needs (at least, until he gets used to doing without). Anyway, for better or worse, the Challenger has this low gear lever.

What it does is applies pressure, via an idler arm, to the belt so that it helps to keep the belt in low ratio. The arm is spring-loaded and uses the spring for the tension so that the belt is still able to change ratios when the demand for a change overcomes the tension of the spring. Which means - the transmission is not held rigidly in low gear - some flexibility of ratio remains.

While we are talking about the transmission, we should mention that the final drive, from the jackshaft, uses beautiful, strong, No. 40 roller bearing

chain. Powell Bros. say that this chain has oilless bearings that never need lubrication - which is some assurance but we would make sure by giving it a drop of oil now and then. It just sounds too good to be entirely believable.

The rear sprocket is cast in with the wheel (and the brake, on the other side). The rear sprocket has 60 teeth and the jackshaft sprocket has 10 teeth. With the 1:1 high ratio of the transmission, the Challenger has a 6 to 1 high gear and the low gear is 16 to 1. The 8-inch aluminum wheel is mounted by a 16-inch knobby tire, giving a top theoretical speed of about 32 mph with the governor attached - more than enough for trail conditions.

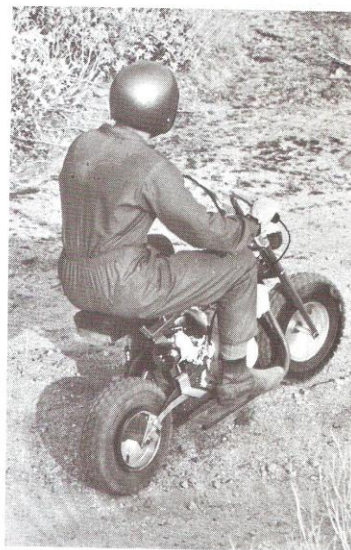
Away from the power transmission, but still part of the overall consideration, is the brake. Powell Bros. have cast the brake into the rear aluminum wheel to give a swept area of approximately 27 square inches. That's a lot of swept area. But don't think that means actual contact area. The swept area is the friction material bonded to the inside of the wheel hub - the contact area, nearer 10 - 12 square inches, depending on how hard the brake is applied - is the shoe that is levered, via a foot lever, against the friction material.

Boosting the brake as "27 inches of braking surface" is rather like gilding the lily. Whatever the effective area is, the brake works really well. However, our tastes run to something else, besides a foot brake - if you're using the brake to control forward momentum coming down a hill, say, that is likely to be the time when you require your feet for stability. Something has to suffer. As far as we can see, there shouldn't be any big deal in rigging up hand controls for the brake so that the rider could have the benefit of both methods - hand and foot control.

We have called the Challenger "ugly" in previous issues - to the anger of Challenger devotees. How they can argue about it, we don't know - it seems obvious to us but, of course, everybody to their own tastes. We still maintain that it wouldn't win any mini-bike beauty contests but that doesn't mean a thing when you're talking about trail mini-bikes. What does mean a thing is, will it win an Indian wrestling match with a mountain.

And the Challenger is strong enough to give the mountain a backhand to the table. Some attempts have been made to make the test machine handsome, in a rugged sort of way. Like, the whole front end has been chromed, the paint job is a glossy red, and a 6-inch headlight plus a brake/tail light have been added. But it still is not very long on looks. We'll concede a certain rakish purposefulness about it's appearance - but that's all.

But, in the muscle department - now, that's another matter. The basic design



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is single backbone, double-loop engine cradle - but from then on, it departs the norm. For instance, the backbone (with a nice hip-movement for the seat location) is square tubing. And the double loop engine cradle isn't, really - it's double loop in the front, coming back to engine mount angle iron, to a rear upright support bracket. The rear upright member is constructed from two two-inch by 3/16 steel plates that provide an anchoring point for the very unusual rear suspension.

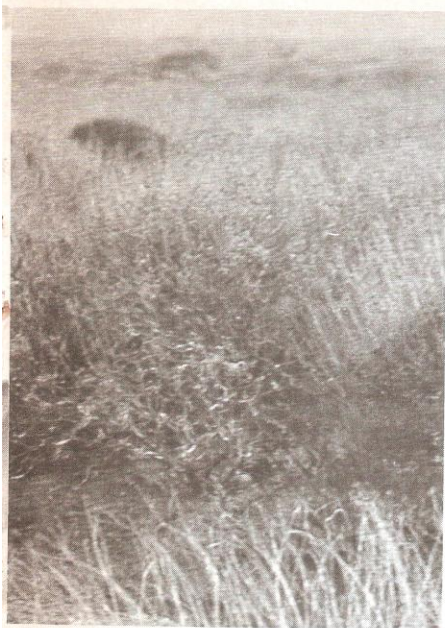
The rear swinging arm is cantilevered at the rear upright members with a large spring providing the shock absorbing qualities. The spring, mounted ahead of the uprights, is compressed as the swinging arm pivots at the upright. It sounds kind of odd but this system provides one of the most responsive rear suspensions to be found on mini-bikes or, for that matter, any two-wheeler. The front suspension, on the other hand, more or less follows tried and true practices - telescopic with the lower unit entering the top for about 1½-inches of travel - except that it is heftier than most. The top tubes are 1¼-inch while the lower are 7/8-inch - with a bushing between the two for smooth action.

The front end, incidentally, can be released from the rest of the machine by simply undoing a hand-operated butterfly nut on the upper steering crown plate. This allows the handle bar unit, which is mounted in the steering crown plates independently of the front forks, to be lifted up, releasing the steering crown pin (which is ball-bearing mounted). It all takes about 15 seconds - and there is a quick release junction for the headlight electrical leads and for the accelerator cable at the twist grip so that the machine quickly becomes two separate units. This is a finely engineered system, unique to Powell Bros., that should be appealing for those hauling their machines by car.

The seat, too, releases by a butterfly bolt but, in the course of testing, we managed to strip the threads of this bolt (giving you some idea of the pounding the machine took). However, it is unlikely that the seat, fixed to the frame, is likely to get in the way and we made repairs by permanently fixing it with another nut and bolt.

Just before we get into the actual test, we should pin a medal on the chests of the Powell Bros. for designing a very fine Forestry Services approved spark arrestor and putting it on all their machines. It is a very workmanlike unit that bolts directly to Tecumseh's "mini-bike muffler" (part of the mini-bike oriented design of the Tecumseh four horse HS-40 mill). The resulting sound is very distinctive - something between a two-stroke's bark and a four-stroke's rumble. While we are talking about the engine, we should mention that the Challenger's lights are driven by an





alternator on the flywheel. Now, with the preliminaries out of the way - on to the test.

The Challenger performed just about as we expected it would. Great! We were familiar with last year's model and did not expect any unusual surprises for the new machine. The main point of our investigation was the transmission. We are happy to say, it is an improvement on the old unit. Not having to change the ratios by pushing a balky lever back and forth - and seldom hitting the right slot - was a boon. Doing without the wobbles greatly increased our enjoyment of the machine and allowed us to concentrate on trail conditions.

The low gear lever works, holding the machine to lower speeds (but don't try pushing the Challenger with the lever engaged, unless you want to build Charles Atlas-type muscles). However, we question whether it is really necessary. The Powell Bros. have to have their little bit of fun, making their bits and pieces different, but, for all practical purposes, the Challenger can be left in high all the time and things work out just fine. We had some other machines, equipped with another type of torque converter, out for testing at the same time and in some inpromptu drags we found that the Powell unit did not "dig out" as fast but this is probably a good thing on the trail.

As we have found with all four horse machines equipped with a torque converter, power is ample. This transmission does things for the mini-bike engine you wouldn't believe unless you've tried it. And they appear as reliable as the sun setting and rising.

The rear suspension of the Challenger was a joy, easy riding without being squishy, but the front could be made to bottom if the bumps were bad enough. The seat is not the most comfortable in the world but made up for its lack of padding by being long enough for the rider to chose his riding position. The degree of variance of riding position was further enhanced by the "running board" foot rest - there are no foot pegs in the accepted sense - just a foot-long, three-inch wide, metal platform running down each side of the engine. This also helps to protect the engine when the machine is dumped - as we managed to do once or twice.

The foot brake was exactly what we expected - awkward. It worked fine - as long as we could keep our feet on it - but it proved to be an on-again, off-again, proposition as we balanced ourselves through the rough stuff.

Apart from the brake, our only major criticism is of the tires. The are plenty big enough in diameter, 16-inches, but the 3/4-inch tread left something to be desired in the traction department. Of course, we were running in the worst of

conditions and on the normal trail there probably would not be much of a problem but we felt that the traction provided by the Challenger's tires did not match up to the excellence of the rest of the machine.

Handling was very good with the steering precise and light (without being squirrely). We needed quick steering and a narrow turning circle when we were out dodging catcous bushes and the Challenger provided it. Power on turning circle could be held to about ten feet and, at the slow speeds needed in desert conditions, there was no lack of control.

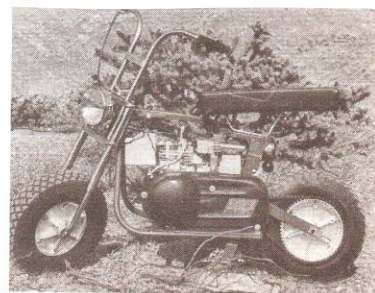
The test machine got a particularly rugged pounding and, aside from the seat anchoring bolt stripping its threads, we detected no other signs of damage.

Despite its size, mass of features (some of them unique to the Challenger), excellence of construction and design, the Powell Challenger sells for \$215, f.o.b. South Gate, California. This makes it one of the best bargains of its type - that is, once you get past its homely looks and peculiarity of engineering.

SPECIFICATIONS

Manufacturer:	Powell Bros. Inc., 5903 Firestone Blvd., South Gate, Calif. 90280
Model:	Challenger
Price:	\$215.00 f.o.b. South Gate
Engine:	Tecumseh 4 hp, four-stroke
Transmission:	Auto, variable speed torque converter; single jackshaft; final drive No. 40 oilless bearing chain; low ratio range lever
Gear Ratios:	Constantly variable between 6 to 1 and 16 to 1
Tires:	16-inch diameter, 3/4-inch tread, knobbies
Wheels:	Aluminum cast 8-inch, split rim, sealed ball bearings
Suspension:	Front, telescopic forks; rear cantilever swinging arm
Brake:	Foot operated internal expansion
Weight:	110 lbs.
Overall Length:	54-inches
Wheelbase:	37 1/2-inches
Heights:	Handlebars, 38-inches; seat, 27 1/2-inches
Ground Clearance:	7 1/2-inches
Miscellaneous:	Complete alternator powered lighting kit; positive lock, quick-release, front end; spark arrestor; "running board" foot rest; ball bearing steering crown and jackshaft; 19-inch quick-release seat; electrical leads and accelerator cable equipped with quick-release fasteners for easy dis-assembly.

	Excellent	Good	Fair	Poor
Transmission	★			
Clutch operation	★			
Ratio range	★			
Controls	★			
Brake(s)			★	
Suspension, front		★		
Suspension, rear	★			
Finish		★		
Handling	★			
Traction		★		



Part-bike, part-goat, part-wondermachine, that's the Rokon Trailbreaker. It really is no mini-bike, it's bigger, even, than a motorcycle. But it isn't a motorcycle, either. So, like all well-done but homeless two-wheelers, we decided to take it in, out of the cold.

The Trail Breaker is more appropriate in this issue because it is the trail machine par excellence, we doubt a mountain goat could accomplish all the tricks displayed by this amazing bike.

At first glance the Trail-Breaker looks like a do-it-yourselfer's motor-scooter with tractor tires. Its design, however, has one purpose...to take you where no other vehicle, two or four or six wheeled, could ever get to. And it does.

Manufactured by Rokon, Inc. of Keene, New Hampshire, the rugged bike is amply described in its company brochure as "the bike that will go places that even pack animals can't negotiate."

As a trail machine, the Trail-Breaker surpassed our wildest dreams. The adjective-laden brochure practically had us believing this bike if dressed in blue underwear with a red S on its tank, could leap tall buildings in a single bound! It did everything except the tall building trick. Maybe next time - if we can rustle up the blue underwear.

Gordon Morton, Rokon's Western Sales Manager, introduced us to the Trail-Breaker while making a sweep of the Pacific Coast states on a dealer promotion trip.

With Gordon as an accessory to the crime, we decided to shake the rig down on the steep slopes of Saddleback Park, one of our favorite bike test areas on Irvine Ranch in Orange County, California.

Reluctant to try the "go-anywhere" test at first, we gained confidence as Gordon demonstrated the bike's ability by driving over a large trash barrel (the barrel was laying on its side). We then proceeded to power up a 50-degree grade that was heavily covered with brush, timber and deep grass. The Trail-Breaker didn't miss a beat and never lost its footing.

The secret of all this "pulling and pushing" power is in the bike's unique two-wheel drive; each wheel operating independently of the other with gearing running through a three-speed Albion transmission.

Thrashing through the rough terrain is simple with the drive system...no clutching is needed with an automatic clutch set-up. You just make your gear changes by moving the shift lever, which engages quickly so you lose no traction on an uphill climb.

Gear ratios run from 84 to 1 in low up to 30 to 1 in third.

Surprisingly, the Trail-Breaker depends on the lightweight, 8.2 cu.in. Chrysler 2-cycle (formerly West Bend) which generates a maximum of 8 hp at 7000 rpm. It has proved to be the most

MBG IMPRESSION: ROKON TRAIL BREAKER

talking of trail bikes...



dependable powerplant for their use.

High speed is not the idea behind this off-road animal but it tops out at approximately 25 miles an hour on the open trail.

The machine is incredibly light, much lighter than it looks with the huge tires and weighs in at 180 pounds. But it is not fragile by any means.

The frame and fork are chrome moly tubing, the axles are solid, and the "suspension system" is based "around" the low pressure tires which absorb most of the shocks.

With a ground clearance of 15-inches, the Trail-Breaker has no trouble passing over obstacles that would hang up most two and four wheelers. When encountering some extremely lumpy terrain, the front wheel simply pulled its way over while the back wheel was pushing. The most difficulty was gravity. We found ourselves trying to oversteer, but discovered it wasn't necessary as the bike tracked its way through the brush. The steering characteristics, however, have to be gotten used to, as the power driving through the front wheel make it like no other two wheeler we have tried.

One of the obstacles we didn't encounter during our test was water. And, one of the highly touted tricks for the Trail-Breaker is its ability to ford streams up to 24-inches deep. (That's what the brochure said.) Gordon had plenty of photos to substantiate the watery claims and had demonstrated the bike's "swimming ability" the previous day. He drove off a 10-foot waterfall into a pond...floated the bike to shore, cleaned off the spark plug, cranked it over and it started immediately. He drove off, much to the amazement of the attending photographer.

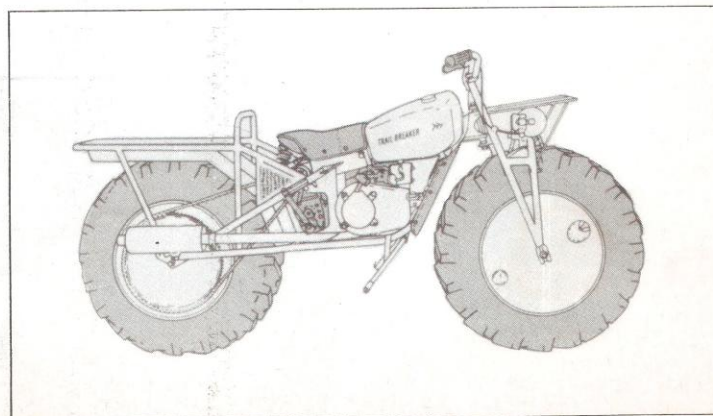
The bike's floating ability is due to the twin wheel drums, which act as floatation chambers. They can also be used to carry drinking water or extra fuel, as they are sealed tight and independent of the axle.

We had most of the motorcycle advocates stopped along the trail gaping in amazement as the Trail-Breaker trampled up a slope that only the bravest hill climber would challenge.

But the Trail-Breaker is not a motorcycle or a trail bike...It does everything but fly...And we think Rokon is working on that, too.

While comparing our thoughts and notes with the Trail-Breaker brochure, we really couldn't find an area of over-statement. The Trail-Breaker lives up to its press clipping all the way. Forest Rangers and Forest Fire Fighters have apparently found this versatile go-anywhere machine quite useful in their appointed rounds.

One of the bike's optional equipment features, a fire-fighting system, consists of a pumping unit specially adapted for use on the Trail-Breaker and pours up to 92 gallons per minute.



Trail riding is the whole thing for many mini-bikers - an end unto itself. And there are few of us who would try to put down the joys of bumping along some far-from-civilization pathway, looking for the next new vista to open up around the bend. The putting-down of some nasty stretch with loose boulders or ruts big enough to swallow man-and-machine requires a good deal of derring-do, skill and preparation. And the mini-biker can be justly satisfied when he gets to the top and pauses for a breath of air and a swig from the canteen.

However, it is probably true to say that most of us are failing to get the most out of our trips through the boon-docks. The bucking mini-bike is fun and thrills enough, for sure, but we probably pass through, over and under much that is fascinating in the woods, deserts and hills - without knowing it. There was a time when practically the whole of America was nothing but trail country - yet few of our ancestors would have gone out in it without some reason. They were there for a purpose - not just to see if they could get up the next hill.

What we are talking about is "utilization". The mini-bike as a tool. A tool to expand our awareness of what's around us. A means of helping us understand the living root of America. And believe you us, that root is to be found in the countryside - not on the pavement of the school yard or the race-track.

This article is about only one of the many activities anybody can participate in - if they have a mini-bike - and panning for gold, for that's what we are talking about, has particular appeal with its overtones of pioneer America.

If you're mini-biking in the mountains or anywhere there are fresh running streams, take along a gold pan. You may find yourself as enthusiastic for prospecting for the yellow stuff as for mini-biking. Gold is still where you find it, and though you probably will not become rich, the finding of even small amounts exerts a strange thrill.

The brilliant yellow metal is there for the taking in most parts of the country, but especially in the Mother Lode country of Northern California. Here, the clank of the miner's pick and the rattle of gravel in steel pans are familiar sounds in the spring and summer mining season.

Most prospecting today is done by hobbyists, people in it for fun, not money. There are men who drag dredges and sluiceboxes into the back country in a serious search for the big strike, but they are relatively few. If you've got a mini-bike, you're way ahead of the next guy, for your little machine will get you back where the gold is, and the rest is easy.

Few "strike it rich," these days, but

READER TRAIL REPORT

panning for gold

by LOU ROSE



nearly everyone finds at least a little, and those bright flakes in the bottom of your pan can change an average ride or camping trip into a big occasion.

Placer (panning) mining equipment, if you keep it simple, is inexpensive and easy to obtain. Hardware stores in the gold country are bulging with the stuff. Things you need are a pan, a small miner's pick, a shovel or G.I. surplus trenching tool, tweezers (to pick up the gold) and a pack to carry your gear in.

While researching this article, we met a long-time gold hobbyist who uses Bonanza's Hodaka- powered mini-cycle for his explorations, usually four or five weekend trips each spring and summer. It has the same engine that has won the U.S. Trail Bike Championship for the last four years, so it's a natural for the back country.

"Mini-bikes can be stowed in the car trunk", he said, "and a good trail mini-bike has all the power needed for trail riding." If you do get stuck, they're light enough to lift over obstacles.

"It's amazing, where the things will go," the part-time prospector smiled. "There are lots of fire roads and smooth trails in the area I go to, and my machine will really haul on the smooth stuff, it has all the beans I'll ever need."

This spring and summer are good prospecting seasons because of the snows, which buried most of the country during the winter, are melting then. Gold in the streams is placer gold, washed from the soil by erosion. Big snows mean high water and a fresh supply of the precious metal.

"Gold is where you find it", the old timers say. It sounds confusing, but what it means is the best place to find gold is where it has been found before. "You can work one part of a stream clean out, get all the crevices and everything, and if you come back the next year, you'll likely find gold there again", said the mini-bike-riding prospector.

He has several bottles of gold flakes and nuggets found over several years of panning. "I never sell any, I just keep it," he said. "But I did have a tie tack made out of one nugget. It's worth \$75.00 easy," he said.

Our prospecting friend usually travels California's Highway 49 to get to his gold country. Mini-bikers in other parts of the country will have to find their own areas but the State officials who control mining in your State, may be able to help. Highway 49 runs from the Sonora area on the south to around Downieville on the north, following the line of the foothills and crossing dozens of gold-bearing rivers and streams.

When you've found the area you want, your mini-bike will take you back in the boonies to find the right spot. Then the search is on in earnest. Gold often collects on the inside of a bend in the river or stream, where the water is

going slower and the heavy metal drops to the bottom.

Getting it out is simple but rather slow. Put a shovelful of mud and gravel from the stream bed into your pan, crouch down by the water and begin.

The idea is to wash out the lighter mud and gravel and leave the gold. You dip into the water and swish the water around, letting the rocks swirl over the lip of the pan and back into the river. It will take several dips to get the mixture down to where the gold is, but if you're lucky, soon you'll see the bright flakes of yellow in the bottom of the pan.

As you revolve the pan you'll notice that the gold moves much more slowly than the rocks and dirt. With practice you'll learn to take advantage of this to get the gold separated more quickly. When you get down to the flakes, pick them up with the tweezers and put them in a small bottle.

If you pick a spot and the first few pan fills reveal no gold, move a little on either side and try again. If there is still no results, pack up and move somewhere else. It's easy with your mini-bike.

Much gold lodges in rock crevices. To get it out, many miners use what they call a "snifter." It's a suction device sold in auto parts stores. Mechanics use it to suck oil out of car transmissions. Get the kind with a flexible nozzle—it's much easier to use. Put the nozzle in the crevice, pull the handle, and a mixture of mud, gravel and (you hope) gold will be sucked up into the tube. Then you just pan it as before.

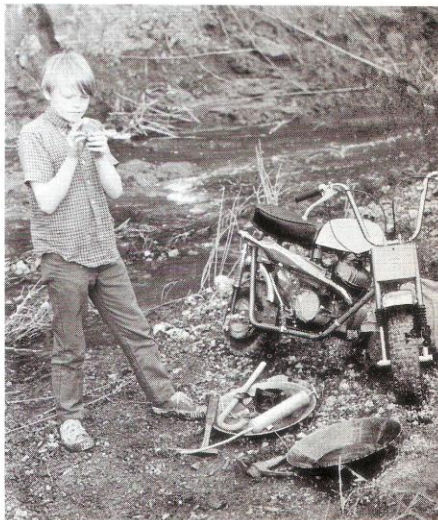
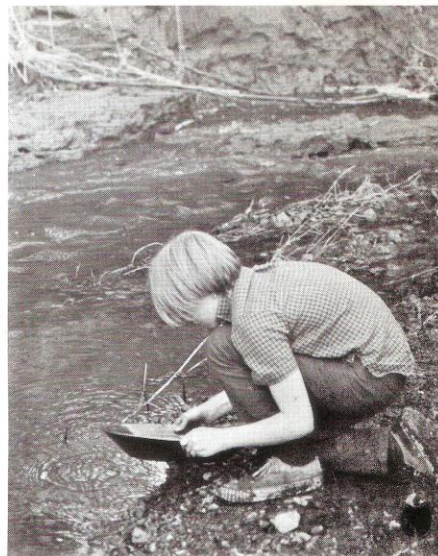
Another good spot for gold is below a rapids or waterfall, where the water becomes quiet and gold can drop. It was in areas such as these that Indians used to plant gold traps. A log would be split in half, scooped out and carved with riffles, then weighted with rocks on the bottom of the stream. The Indian would leave his trap in the fall, then return in the spring and pan out the fresh gravel which had fallen into the trap—usually rich in gold.

Gold comes in many forms: hardrock, nuggets, flakes and "flour"—particles so tiny that even a tweezers can't pick them up. If you find yourself with flour gold in your pan, you can use a drop of mercury to recover it.

As it rolls around, the mercury will pick up the gold dust and form an amalgam. You get part of your mercury back by squeezing it in a twisted piece of chamois—the mercury oozes through leaving the gold. But the gold will still be combined with mercury.

To recover all the mercury, cut a potato in half and scoop out a little hole big enough for the ball of gold. Put the gold on a tin can lid and cover it with the potato, then put it in a fire to

Continued on page 61



THE TRAILS

LEN HOOL is the founder of the International Mini-Bike Association and City Manager of New Baltimore, Michigan. The farm he mentions in this story is to be developed as a pilot mini-bike park.

It was readily apparent that time was beginning to hang heavy on the hands of our two boys Pat and Brad, as the winter dragged on. This could easily be measured by observing the state of nervous prostration being reached by the mother of my children and her counterparts in the neighborhood.

We'd had a good snow fall and the first part of the week had seen a barrage of snowballs flying through the air from one yard to the next. Not infrequently, one would rattle off someones picture window, thus adding to the frantic apprehensions of the poor mothers witnessing the action. I noted mother's tranquilizer bottle getting perilously close to the bottom and realized it was time for father to step in and take charge of the troops.

I called in my 14 and 15 year old sons and asked them if they and a couple of their buddies would be interested in a winter camp out, at our farm, for the weekend. Within five minutes they had their friends Denny and Mike present for a conference.

Pat and Brad had received new jack shafts for Christmas, and they were anxious to see what they would do. Denny had gotten a ski to replace the front wheel of his bike for snow use, and Mike had a new helmet, so there was sufficient cause to justify a field trip. We were all curious to see if mini-bikes could be used through the winter months.

We spent the rest of the day making our plans-an essential and enjoyable part of any field trip. The next day, while I was at work, the boys began assembling a gigantic pile of food, clothing, equipment, and tools. The temperature forecast was for zero weather for the weekend, so we supplemented our sleeping bags with good warm blankets.

Our plan called for us to spend the night sleeping in the old eight room farm house on the property and it was not equipped with modern conveniences. We did have an old coal/wood burning stove, salvaged from one of the assorted junk piles around the farm yard. All the boys' mothers were nervous, but we had gone off many times before and always returned safe and sound. Thus, we got final clearance after assurances that the boys would look after the Old City Manager, and see that he didn't suffer too many cuts, burns and bruises.

Bright and early Saturday morning, which for us is about 9:00 a.m., we packed all the assembled gear in the family sedan, along with one of the mini-bikes. The remaining three ma-

READER TRAIL REPORT

it's a (snow) ball

by LEN HOOL



chines we loaded into our converted 14-foot boat trailer.

After loading our extra gas cans in the trailer and lashing them down, we all piled into the car and took off like big birds in eager anticipation. Within thirty minutes we pulled into the farm yard. I had hardly turned the ignition switch off, before the mini-bikes were filling the frosty air with special music.

The boys were off down the driveway in a flurry of snow with feet cautiously dragging at the sides to get the feel of these strange new conditions. Within a few minutes the stability and easy handling capability of their mini-bikes gave them all the confidence they needed and away they went blasting over the snow, playing their throttles like experts, and delighted to find the machines were performing beautifully.

Our farm is comprised of 64 acres, located two miles off the I-94 Expressway, and one mile outside St. Clair, Michigan. It is bordered on either side by wooded ravines with running creeks that empty into the Pine River at the rear boundary. The entire rear boundary fronts on Pine River. We had acquired the property about six months previously primarily because of the obvious need for a safe place to ride the mini-bikes.

Shortly after we purchased the land, we spent many weekends bulldozing and grading better than two miles of winding trails and straight aways.

I unloaded the car and started a roaring fire in the old stove. Mother had thoughtfully made a huge pot of chili, which was set on top of the stove to simmer till needed. With everything properly stored, I started the old dump truck and drove it around and around on the trails. The dual wheels on the rear quickly packed the snow down and the boys found this provided a very good surface to run on, much faster than packing the snow with their machines. Denny's machine with the ski on front travelled a little faster and maneuvered better, particularly in areas where there was loose snow. Surprisingly, though the others could go just about any place they wanted to in 12-inch deep snow with a little effort.

The boys wore high-top rubber-insulated boots and these proved to be a good choice. These boots provided maximum protection for the feet and legs from obstacles and also kept the feet dry and warm. Without the benefit of warm footwear and clothing our outing would have not been much fun.

The weather was getting progressively colder and the half helmets Brad and Pat were wearing did not provide sufficient protection from the cold for their ears. This was the only equipment we had any problems with and it appears we will have to acquire suitable helmet liners or new helmets for winter.

Everyone was having such a good time that they stopped only long enough for a quick sandwich at lunch and, after refueling, were off for more adventure. I had cautioned them not to go on to the river ice until I'd had a chance to check it. Having learned the need for safety rules none of them had gone near the river. They found the ravines to be challenging and spent the balance of the day zipping through them with an occasional charge at Chicken Hill to see if they could top it.

By the time evening came the machines were pretty well coated with ice and snow on the running gear and the boys had all worked up a real appetite. We dispatched the pot of chili with great gusto and congratulated ourselves on the success of our experiment so far.

Pat and Mike found the remains of an old coal pile and soon had several large boxes hauled in to stoke the fire. As a result we had one room that was as warm and toasty as could be. The boys then began to string their cots and sleeping bags around the kitchen ready to bed down for the night. Between the heat of the room and the hum of conversation, I knew that sleeping in the kitchen was not for me. I gathered up my sleeping bag, several blankets and moved into the front bedroom. The talk in the kitchen centered around the merits of skis, jackshafts, carbide tipped snow tires, and various gear ratios. As I drifted off to sleep the thought crossed my mind that there were many other topics much less desirable.

Bright and early the next morning around 9:00 a.m. we all hit the cold deck. A roaring fire and a breakfast of bacon and eggs soon had everyone wide awake and raring to go mini-biking. At this point we discovered that two of the machines had frozen up over night and had to be brought in by the fire. The drive shaft on Denny's machine would not turn over but with heat and a little penetrating oil, we soon loosened it up. Pat's throttle cable had frozen but the same treatment worked for it and before long everyone was blasting off.

Trying to get those guys together for pictures was like chasing herds of frisky colts and before long they were scattered in all directions. Boys on mini-bikes do not sit still long enough for amateur photographers to practice their art and I spent a busy half hour dashing up hill and down trying to capture the action on film.

Finally, I abandoned the idea and decided now would be a good time to check the river ice. Loading a spud bar and a hot thermos of coffee into the old truck, I drove back to the river bank, and began edging out cautiously. There was about 3 inches of well settled snow on the surface and I soon found the ice beneath it was better than 8 inches

thick. When I returned to the bank, the four boys were sitting there waiting. "Come on down, I believe it's safe", I called.

Down they came and down they went. It was funny to witness their first experience on the glassy smooth surface, camouflaged by the heavy snow on top. Fortunately, nothing was hurt but their dignity. They soon learned that fast acceleration caused a change of direction that invariably separated boy from bike.

Before long they adapted to the new conditions and asked if they could safari down the river for a mile or so. I told them to go ahead, not realizing till they had rounded the bend that they had only a limited selection of tools with them. Fortunately, they had their tow ropes. About an hour later they returned with Brad in tow as the result of the set screw vibrating loose on one of his sprockets. Which points up the good sense in never riding alone. We loaded his machine on the truck and returned to the farm house and our well-stocked tool box. When we originally purchased the machines I thought most anything on these machines could be repaired with a screw driver, crescent wrench and a pair of pliers. I still believe this is basically true, but found that a wider range of more refined tools save a lot of time and make the job much easier.

Every mini-bike owner does not have to own a complete set of tools initially, but they provide a benefit for other uses, too. Youngsters can begin building a set with spare earnings that they might otherwise spend on nonessential things, thus teaching them the value of budgeting money to meet their needs. Also, a good tool received as a gift on a birthday or at Christmas time will have a lasting meaning to a youngster everytime he uses it.

The combination of our tools and Mike's mechanical knowledge serves us well. The set screw had vibrated all the way out and became lost. At this point we didn't think much of the engineering and manufacturing abilities of the people who proved running gear for mini-bikes. This was not the first time, by any means, that we had this kind of problem. Trying to look at it from the manufacturers side, in the relatively short time mini-bikes have been produced most of the firms have demonstrated steady improvements. True to form they scrounged around, coming up with a nut and bolt of they same type thread. After turning it in and tightening the nut down against the shaft the protruding length was cut off with a hacksaw blade and Brad was back in business.

They promptly headed for the river and spent the rest of the afternoon

Continued on Page 61

THE TRAILS

One of the most satisfying and challenging applications for a mini-bike is an overnight, back-country, camping trip. Even today, when city pavement seems to be eating up all the available space, there are still areas around most big cities that offer the opportunity for a family to get off by themselves - if they have the right equipment. That is where the mini-bike comes in.

If you can get there by car - forget it. When you arrive you'll find your neighbors and everybody else already squatting on their equivalent of home-sweet-home. If you want to know something about the countryside, if you want that sense of adventure that only exploring can give, if you want a little breathing space - you've got to go where automobiles fear to tread. That means walking (pretty strenuous); horseback riding (pretty expensive); motor cycling (pretty scary); or mini-biking (just great). Everybody in the family, even mom, can mini-bike into places that very few people get to see. But a little careful preparation and planning is necessary.

First of all, your machines should be in really sharp condition. If you've noticed some little thing wrong when you're buzzing around the parking lot, but managed to live with it, fix it before you head off into the hills. As sure as your name's what your name is, when you get up there it's going to become a major problem. Don't be content with "nearly right" or "close enough". Make your machine work like it should.

Go over the mini-bike with a fine tooth comb, from the rear of the rear tire, to the front of the front tire; and from the kickstand to the accelerator twist grip. Tighten every screw, nut and bolt in sight; set up the tension on all the chains, replacing them if there is the slightest doubt in your mind; make sure that the control cables are okay, paying particular attention to the end couplings and all the friction points for possible fraying; check out the condition of your tires and add a few extra pounds of air pressure unless your machine is equipped with low-pressure tires; grease any points provided with nipples; change the oil in the crankcase; and finally give the chain a good coating of oil. A few hours of preventive maintenance might well save the trip from later disaster.

EQUIPPING YOUR MACHINE

Very few mini-bikes, as they are usually purchased, are really suitable for prolonged hauls into the back country - for the simple fact that they seldom provide any place to hang things. However, it is a little known fact that many manufacturers have in their line, as accessories, racks and carriers of many kinds. For some reason, these important items receive little attention from the manufacturers and, consequently, mini-bikers who need them usually end up by

MINI-BIKE CAMPING

what it takes...



making them or adapting similar items from other fields. Usually this make-do approach proves unsatisfactory.

General Appliance Mfg. Co., for instance, provides a very complete line of accessories, including front and rear carrying racks and, bless their hearts, side saddle bags that fit over the rear wheel. Engine Specialties also has a large rear rack (they call it a luggage carrier), a safety bar to protect the engine from damage, a bumper carrier kit so that the machines can be carried outside as well as inside the station wagon, and a rear-view mirror in case the trail blazer wants to make sure the others are staying up with him. Rupp has a deep wire "convenience carrier" that looks as though it is made for carrying plastic water or gasoline containers (but don't carry them together). Fox Corp., like the others, has a very strong-looking rack with three cross bars that should make it easy to strap on camping gear and a loud "bugle horn" which would be handy for getting the attention of the other riders when you discover something interesting to look at.

If it happens that your machine does not have fenders, they should be fitted before going trail riding. Sooner or later you are bound to find a wet patch and an unfendered mini-bike is sure to splatter you with mud or water. Azusa Engineering, Horstman Mfg., Steens, General Appliance, and other manufacturers offer good fenders. Rear footpegs are also a good idea on at least one or two of the bigger mini-bikes on the trip - you never know when somebody is going to have to climb up behind another rider. Most mini-bike dealers carry at least one line of folding footpegs - and if any of the machines have fixed footpegs - saw them off and install the folding type before you head into the boonies.

No matter what State you live in, it is almost mandatory, from a conservation point of view, that you have a spark arrestor on any mini-bike you take into the back-country. In the West, it is a legal requirement in many States and, although the fire hazard is less in other areas of the country, nobody, especially a mini-biker, should be so careless as to run the risk of starting a forest fire. Sad as it seems, not many mini-bikes come equipped with a spark arrestor but more-and-more manufacturers are giving their attention to this important (shall we say "vital") accessory. For the moment you could contact K & P Manufacturing, 330 South Irwindale Ave., Azusa, Calif. 91702, or Horstman Manufacturing Co., 730 East Huntington Drive, Monrovia, Calif. 91016, or your local dealer, if your machine lacks a spark arrestor.

Some essential tools and spare parts should be taken on any trip into the boonies. These include spare chain master links (attach them to a convenient

spot on a cable); a little more gasoline than will be needed to complete the trip (in a plastic container and carried separately from food or water); spare control cable and connecting linkage (try to make the spare do for both brake and throttle); and a spare clutch (or two). Essential tools include: pliers; screwdriver; 8-inch crescent wrench; needle-nose pliers; hacksaw blade; friction tape; small hammer; Allen wrenches (check machine for sizes needed); 1/2" x 9/16", 3/8" x 7/16", 3/4" x 7/8" open end wrenches (and any other special sizes to suit the machine's fastenings); G-clamp; Phillips and slot screwdrivers; tire repair kit; and a small air pump. The object is to try and anticipate trouble on the trail and to be prepared for it. If the group taking the trip sticks together pretty well, only one tool kit need be carried.

Before starting out, examine your gear ratio(s). Generally speaking, a trail mini-bike will have, at least, a jackshaft and this should be set up to produce a gear ratio not higher than 7 to 1. If you have the common 6 to 1 ratio, change it - otherwise you'll have problems on the trail (you'll never need the 30 mph the higher ratio produces). An 8 to 1 ratio would probably be more suitable and it would be a good idea to take along a spare jackshaft sprocket in case you need an even lower gear ratio. If you plan on doing much trail riding (and after one camp-out, we're betting you do), serious consideration should be given to a multiple ratio transmission - either a two-speed; variable ratio torque converter; an add-on gearbox, or a motorcycle engine with an integral gear box. A multiple ratio transmission greatly eases the strain on the engine in terrain that might vary from straight up to straight down. The extra bucks these units cost pay handsome dividends in peace of mind and performance.

EQUIPPING YOURSELF

Now your mini-bike is going to make it (presuming you follow the previous suggestions) - but, are you? Your comfort on your weekend camping trip is of prime importance - don't think you have to rough it, otherwise you will not

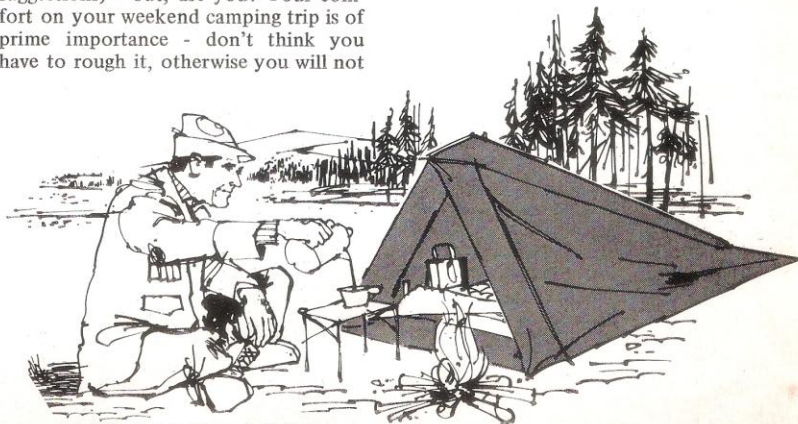
really enjoy yourself. Of course, you can't take along your king-sized bed or the kitchen sink - but there is plenty of lightweight camping equipment to make life as easy as possible when you're far away from civilization.

First of all, let's consider your comfort while riding. You'll be gripping those handlebars a long time so a stout pair of riding gloves are almost essential. Any motor cycle dealer carries riding gloves but if you don't want to go that route, buy a good pair of work gloves and cut off the tip of the fingers and two holes in the backs for ventilation.

A good pair of boots, not tennis shoes, and long pants for the guys, capris for the girls, are other essentials. If possible, the boots should be hiking or work boots that are, at least, partially waterproof. The pants should be good and strong, not new, and of a thickness determined by the weather. Don't forget that the temperature is going to drop considerably at night - and there's not going to be any heating thermostat to turn up. Likewise about shirts and jackets. A long-sleeved shirt or blouse is best to protect from wind, sun and the occasional swinging branch, while some kind of jacket will probably be needed for the evening. Of course, a change of socks and underwear will be needed, plus the necessary toilet articles.

So much for the personal gear - now for the camping equipment. A good place to start looking at lightweight camping gear is at your local Boy Scouts' Shop. Although the equipment at these shops is not as inexpensive as you'll find at the local surplus store, it is all good stuff and specifically designed for lightweight. It should be remembered that mini-bikes have a limited carrying capacity, both from a space and power point of view.

George Svenson, who handles Bonanza's publicity, is an avid camper who loves to go out, believe or not, in the dead of winter and camp atop some mountain in the High Sierras. We asked him for some tips on equipment for



Ute Mountain Corp.'s Inflatable



General Appliance's rear carrier rack

camping and here is what he wrote, "A pack, whether it's on one's back or on a mini-bike, should be small and light. A big and heavy pack can be no better for keeping you warm, dry and comfortable. Of course, everybody's idea of 'small' and 'big' varies but the object should be to keep it as small as possible.

"To give you an idea of what I consider the best - I snowshoe into the High Sierras in winter with only seven to eight pounds on my back. With the new ultra-light freeze-dried foods I can forget I'm carrying a pack at all. Yet, I've seen motorcyclists going on a trip with huge awkward bundles that they apparently feel are necessary - in the middle of the summer.

"On my camping trips I carry a two-pound sleeping bag, goose-down filled and baffled (no through seams). At night I wear a pair of down booties because that's where the cold effects me most. In the really cold weather, below zero, I use a 4½ pound sleeping bag from Gerry Mountain Sports, Boulder, Colorado.

"For weather protection I use a 1½ pound reflector tent that is large enough to sleep me and my two sons or, on one occasion, me and a 6ft. 8in. friend (a former fur trader at Fort Yukon). One time, a few years ago, I slept *on top* of my sleeping bag in the dead of winter while at 7,200 feet altitude - all night long, and was perfectly comfortable. That was possible because of a very small fire we kept going at the entrance of the tent - a reflector tent, like a reflector oven, bounces radiant heat all around.

"Of course, this kind of equipment is for the serious camper and costs a bit more than the stuff you see in surplus stores - \$70 for a baffled goose-down sleeping bag. Perhaps more practical for the occasional camper (although that is questionable) is a good dacon "mummy" (after the Egyptian embalming practices - nothing to do with female parents) bag for about \$18. The mummy shape is best because of weight and bulk savings. The one sold by Recreational Equipment in Seattle weighs about 4½ pounds.

"In summer an air mattress is fine but buy a 'shortie' - you don't need padding under your feet and legs. The short air mattresses are lighter - about two

pounds. Plastic air mattresses are untrustworthy - and too easy to puncture - rubberized cloth is best. In winter the air mattress should be left home - they are no good in really cold weather. Use, instead, a foam pad (again, a short one). The reason air mattresses are better for the mild weather is that they can be rolled up more compactly than a foam pad.

"For a tent I suggest an inexpensive, very light, Visqueen tarp - with a 1/8" nylon cord for pitching. These tarps are sold in sporting goods stores, at least, the more sophisticated ones. They have a fabulous ball-and-socket arrangement that allows you to attach the tarp anywhere, without danger of tearing it. It is simple to use nearby trees, or upright stakes, to pitch the lean-to to make a primitive reflector tent. Weight of the tarp is around two pounds.

"Of course, a tent is not absolutely necessary unless the weather is liable to be bad and, to save weight, it should be left home, if possible. However, if cold-weather camping is contemplated the tarp can be used in conjunction with a carefully placed, dinner-plate-sized, fire laid about 30-inches to 36-inches in front of the lean-to. By carefully placed, I mean so that the smoke does not blow into the sleeping area. In the mountains, you can be sure that during the day, the wind will go up-hill and the lean-to should be set parallel to the wind direction.

"The fire should be kept small for both cooking and heating purposes - and for safety. To set the fire up for cooking, take along a small chain, not much heavier than a watch chain, about 30-inches long. This chain can be used to hold the top of three stout sticks, set up like a tripod, over the fire. The other end of the chain is allowed to dangle over the fire to hold the cooking pot, which should, of course, have an over-the-pot handle. Small hooks will fix the chain around the sticks and enable the cooking pot to be placed at any distance from the fire. Like everything should be on a camping trip, this arrangement is simple and can be set up for fast or slow cooking.

"Personal clothing is topped off, on a trip that includes cold weather, with a down or dacon filled jacket. Norwegian net underwear is the best kind as it retains heat in the winter and insulates in the summer. The air pockets created by the net provides the insulation and also helps to keep sweaty clothing away from the skin. This underwear can be bought at most sporting goods houses.

"I have given a few tips here that even some experienced outdoorsmen don't know. The important thing is - keep it light and simple - and your camping trip can blow your mind."

So sayeth George Svenson. However, we would add a line or two ourselves. MBG recently received the 650-

some-odd page catalog, plus supplement, from Herter's Inc., Waseca, Minnesota - and all we have to say is, anybody remotely interested in the outdoors better send in a buck and get this volume. It is the most amazing list of products, claims, guarantees, and short educational courses on just about every subject, that we have ever seen.

For instance, they have thirteen sleeping bags listed, from a goose down bag for \$55 to a bag made of the same material used in astronaut's clothing for \$14.67 - claimed to be suitable for just about every kind of weather and weighing only *two pounds* total. Herter's also has the Astro Cloth tarp that can be used as a reflector tent, and a survival kit, and . . . well, just gobs of stuff.

We don't have the full addresses of some of the good sporting goods houses but catalogs can be obtained from; Trailwise, The Ski Hut, University Ave., Berkeley Calif.; Gerry Mountain Sports and Holubar, both in Boulder, Colorado.

Food is largely a matter for the individual to decide - how much and what kind. However, the range of freeze-dried foods now available are varied enough to meet the needs of nearly everybody. Without doubt they are the easiest to carry and the most convenient to prepare. But, like most good things, they cost a little more. However, the savings in weight more than compensate for this. Most good sporting houses will carry a good supply. When you go shopping for food to be eaten on your camping trip, make sure you have a carefully compiled shopping list. It has been our experience that the estimates of servings given on the freeze-dried food packages are a little on the skimpy side - not much, but when you're out there, in the open, all day. . . We'd recommend allowing about 25 per cent more than the label states. But, on the other hand, do not take along a lot of stuff you will not use - it's expensive and who wants to lug it in and out?

There is nothing very complicated about mini-bike camping - it just needs a little common sense in the preparation. Because the mini-bike can penetrate deeper into country that it would be difficult to walk, it is wise to prepare for as many eventualities, including mechanical breakdown, as possible. However, there is one cardinal rule - *never try it alone* - and, if possible, try to make up parties of three or more - and stay close together. We have tried to cover some of the needed preparations, some of them obvious, others not so obvious, but only experience produces a good trail rider.

Don't be too ambitious with your first trip - then, as you get more confident, you'll want to get further into the areas seldom visited by others. Try it - it's a great way to get the most from your mini-bike.

"Tie sleeping bags on our bikes, pack some food in pack sacks, and camp out in one of the old logging shacks back in the woods for a couple of nights." We must have talked about this topic for a whole two minutes before both my cousins (Yamaha riders) and I were completely hooked on the idea.

Being the oldest, I decided what each of us would bring and more or less organized the operation. We brought food for seven meals for the four people

who planned on going. These were my two cousins, Pete and Doug McCorison, Brian Djerf (a good friend of mine from Minneapolis), and myself, (ages 15, 11, 17 and 16 respectively). For our food requirements we decided to allow three 12-ounce cans for each main course between the four of us. For our trip, this worked out perfectly. Of course we had sandwiches, kool-aid and other snacks along with this.

Brian and I carried most of the food and none of us ended up with more than we could handle. The best way, of course, is to buy the popular dried foods that the canoeists buy, but we had none of these available to us at the time.

On Thursday, the day picked for our departure, Brian and I had been waiting around for about half an hour when my uncle drove Pete and Doug up to the house in their truck with the two Yamahas in the back. We were surprised to see Doug's dog, Gus, jump out of the back. It was nice to see them but I was kind of leary about the dog. However, I soon found out that there was no need to worry.

After unloading their cycles, we divided up the loads, double-checked all our gear and our bikes, fired up and started on our way.

The old railroad grade we followed was quite rough and had some muddy parts but even my youngest cousin, Doug, had no great difficulty piloting his machine under these conditions. During our trip up this grade that crazy dog, Gus, was running around in circles - darting into the woods and back out again.

It seemed to be only a short ride before we arrived at our campsite. We parked our cycles and started to clean out the shack as it was pretty messy. We were all quite hungry when we finished so we cooked up our spaghetti and had some sandwiches and water. We washed up our dishes in a nearby stream. The availability of running water should be considered when you pick your campsite. Life can get rough when you don't have access to fresh water for cooking and washing. After cleaning up, we went out for a cool evening ride before we hit the hay. During this and other rides there were many chances to compare the performance and handling of the two Yamaha trail-bikes against our two mini's. The conclusion I came to was, any power advantage they had over us was eliminated by a 2-foot thick pine lying across the trail. We could pick the mini-bikes up and carry them over. This isn't so easy with a motorcycle. All in all, I'd say, back in the woods, a low-geared mini is just as good as a motorcycle and sometimes better since you can't go very fast back there anyway.

We rat-raced around the trails until

dusk and then headed back to camp. As soon as the last engine was turned off we heard something coming up the trail. Pretty soon we spotted a light flying toward us. When it got closer I noticed that the cycle was touching ground about once every 25-feet and I had a pretty good idea who it was. Sure enough, it was my good friend, Al Lien, on his 175cc Detroit-engined mini-bike.

The next morning we all woke up to the sounds and smells of fresh bacon and eggs frying. Al was already up and making breakfast for us. After a good hot breakfast we spent the rest of the morning mowing, trimming, sweeping and getting everything in shape around the cabin. By the time noon rolled around we had that place looking pretty good and we were starved. So we put a fire in the stove and cooked up a big pot of chili and made a bunch of salami sandwiches.

Brian and I had just started to wash up the silverware when we heard Pete's cycle winding up somewhere in back of the cabin. "bwaaaaaaaaaaaaaaaaaaah! bwaaaaaaaaaaaaaaaaaaah! I couldn't figure out what he was doing in fourth gear, out there in the woods, so I walked over to the door to have a look-see. Just as I got to the door he went flying past the cabin and hit a stump that was about 6-inches high. For a second or two I wasn't sure we would be going back with as many as we started with. When Pete hit that stump he and his cycle parted company. He flew about 10 feet - landing on his back-side in a brush-pile. No damage was done but this just goes to show that speed has no place in the woods.

Now it was about 80 degrees and we were all hot and sweating. Pete suggested we go swimming. The nearest river was the Gooseberry so we got our swimming suits and started the two mile ride to the river.

This ride was really a lot of fun as we were traveling on an old path and all five of us were scrambling around in the woods. There were a lot of clearings where old sawmills used to stand. We went through all the old cabins and buildings and found many old bottles, horse-shoes, axes, knives, saws, and just about anything else you can imagine.

We found a good swimming hole and swam for about two hours. How that dog kept up with us, I'll never know but he was right on our tails all the time we were riding, exploring and swimming.

The next morning we woke up to Alan again making us all breakfast. This time pancakes and bacon. We ate heartily, swept out the shack, packed all our gear and said good-bye to one heck of a good time camping out in an old logging shack on our own. I'm sure if other mini-bike enthusiasts were to go on a trip like ours, they'd never regret it. I know we won't.

READER TRAIL REPORT

a night in the woods

by SCOTT ROEN



SCOTT ROEN (far right, shown with fellow campers, Allan Lien and Roger Alson) is an MBG subscriber who has the good fortune to live in Gooseberry Falls State Park, Minnesota. He first came to the attention of MBG through a letter he wrote to Jayco Transmissions about their three-speed. We would be happy to hear from other readers telling about their mini-bike experiences - especially if they can write as well as Scott.

TECHNICAL REPORT

PART III - AND THE CONCLUSION OF THIS SERIES - DEALS WITH CHECKING OUT AND SETTING UP THE VALVE TRAIN, CAM, AND THE INTERNAL COMPONENTS OF THE CRANKCASE. IF THIS AND THE WORK DESCRIBED IN THE PREVIOUS ISSUE, IS CARRIED OUT, THE MINI-BIKER SHOULD HAVE A GOING MACHINE FOR THE COMING SEASON.

SHAPE UP FOR SPRING

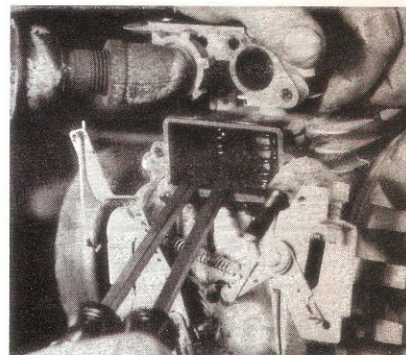


FIG. 1

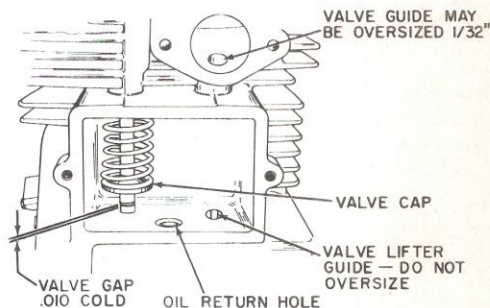
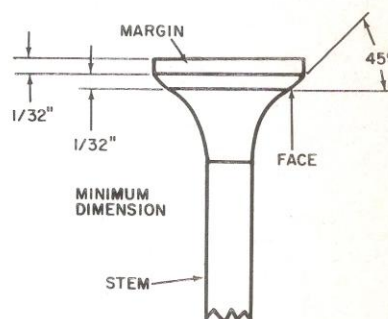


Fig. 1 - The valve springs are lifted free of the caps by levering with two screwdrivers.

Fig. 2 - Showing valve, spring, and cap with locking groove.

Fig. 3 - Valves must be identified for correct re-assembly - this intake valve has "I" impressed.

Fig. 4 - Lapping valve by the "two-finger" method - the least efficient.

Fig 5 - Valve grinding tool, with suction end being used for lapping valves.

FIG. 2

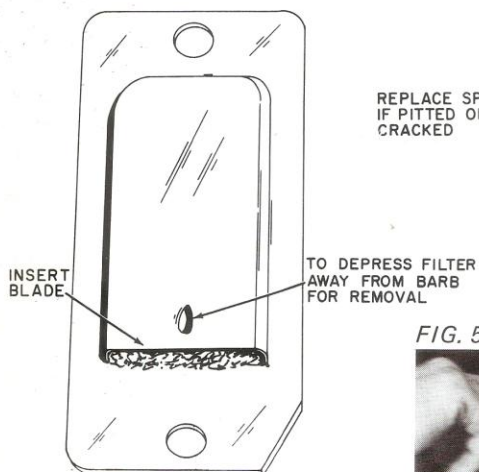


FIG. 4

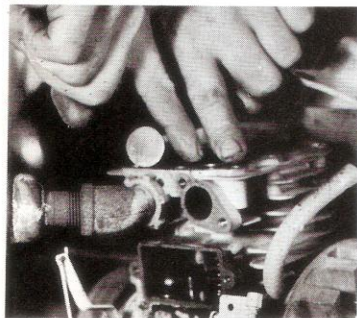
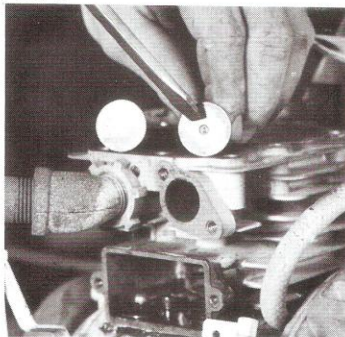


FIG. 3



SPRING MUST BE SQUARE

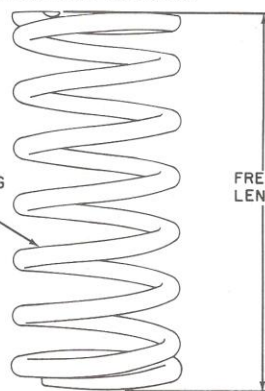
REPLACE SPRING
IF PITTED OR
CRACKEDFREE
LENGTH

FIG. 5



Part I of this series on tuning up a mini-bike engine for the spring riding season, which appeared in the March issue, dealt with the ignition system. Part II, in the April issue, covered the fuel system including the carburetor. In this section, Part III and the conclusion, we are going into the innards of the engine - the valve train, piston, cylinder head, crank, connecting rod, and oil seals. Unless the reader carries out the work specified in Parts I and II, it is pretty pointless starting at Part III - all engines have a logical train and this story covers the last section. Also, this section requires the greatest mechanical aptitude. It is not our intention to scare anybody off - it is still very simple - but the practice in using tools afforded by Parts I and II will pay off in Part III. So, with this warning out of the way, and with the cooperation of Tecumseh and Ron Stewart of Ron's Mini-Cycle City, Huntington Beach, California, let's take a deep breath, clear and clean a goodly section of the work bench, and plunge in.

Having completed the work on the ignition and fuel system, you may want to take the final step for a complete tune-up - and that is to check, clean and correct the internal working parts - valve train, piston, crank, and connecting rod. While doing this work on the moving parts, the static parts - valve seats, cylinder head and oil seal - should also be serviced.

This work, while still not difficult, involves a greater degree of mechanical skill and prior to starting, the mini-biker should ask himself - is it really necessary. It's a funny thing about engines - sometimes, in an attempt to make a good-running engine run even better, the whole thing can get fouled up. Some simple tests of the internal condition of the engine should be made before tearing the whole thing down.

If you can get hold of a compression gauge, the first thing to do, naturally, is test the compression. Remove the spark-plug and insert the gauge couple into the hole. Crank the engine noting the highest position of the needle in the gauge. Do this several times to make sure you are getting an accurate reading. This should be done while the engine is cold and if the reading is anywhere between 55 and 75 pounds per square foot, you can rest assured that the piston rings are making good contact with the cylinder walls (this contact is further sealed during normal operation by the lubricating oil). This will also

TECHNICAL REPORT

indicate that the valves are seating properly. If this is the case, there is little point in going into the engine to clean up - unless you've got the time and just want to make sure.

In case you do not have a compression gauge - you can make a fairly accurate guess using the following procedure. Disconnect the spark plug lead but leave the spark plug in the head. Then pull on the starter rope slowly, or turn the flywheel by hand. There should be an area where the engine will turn freely and then a distinct build-up of pressure that will require some effort to overcome. The pull on the starter rope should be maintained steadily and the pressure should remain for several seconds. This is not a very scientific method but if you try it with engines you know are running well, you'll soon get the feel and will be able to detect an engine that is out of wack.

If you have doubts about how good the compression is, if the engine turns easily without any distinct pressure areas, then you'll know you've got some problems that need correcting. A few more tests may help you identify the problems. Crank the engine slowly while listening for noises inside the engine. Any scraping, knocks, clicks or rattles could indicate damaged bearings, piston rings, connecting rod, valves or a bent crankshaft. Take a firm hold on the PTO end of the crankshaft and push it in and out - excessive movement (a slight movement, up to .022-inch, is built into the engine) will indicate worn rod bearings or piston pin.

Before assuming that low compression is due to piston ring or cylinder wall wear, check the valve stem clearance. Remove the crankcase breather assembly (see illustrations for location) and this will expose the valve springs and valve stems. Slowly turn the engine while watching the valves - making sure that the tappets are in their lowest position (at this point the gap will be widest) check the clearance. It should be .010-inch for both valves but if there is any clearance at all, and you have low compression, you can assume that it is due to one of these problems - worn or broken piston rings; piston ring gaps not correctly aligned; worn cylinder walls; burnt exhaust valve; warped cylinder head; carbon accumulation on valves; weak or broken valve springs; defective head gasket. Or any combination.

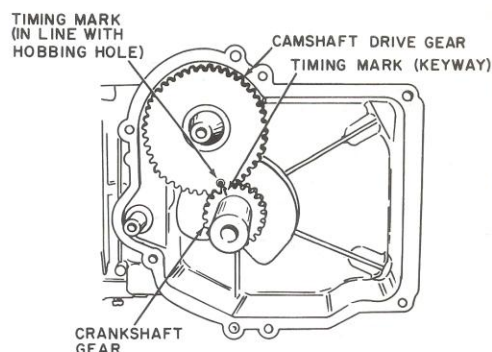
And the only way to find out is to get inside. So let's go.

Once again, get yourself a clear, rea-

Fig. 6 - After lapping the valves, and with the spring removed, gauge the clearance to .010.

Fig. 7 - If clearance is too tight, remove metal from valve stem with file, as shown, for squreiness.

Fig. 8 - Removal of cover reveals interior of crankcase. Attached to cover is the governor mechanism.



IF GEAR IS PRESS FIT ON CRANKSHAFT LOOK FOR A BEVELED GEAR

FIG. 6

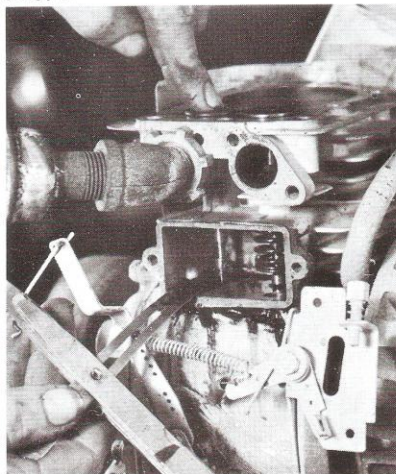


FIG. 8

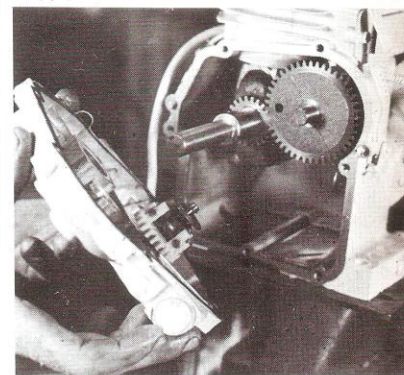


FIG. 7

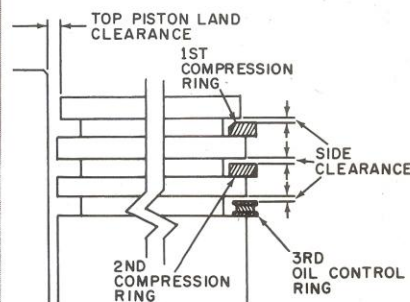
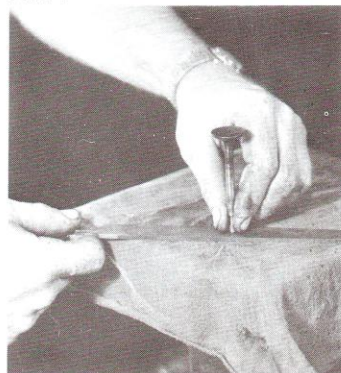


FIG. 10

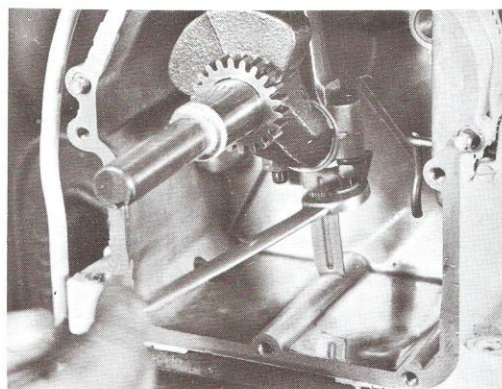


FIG. 9

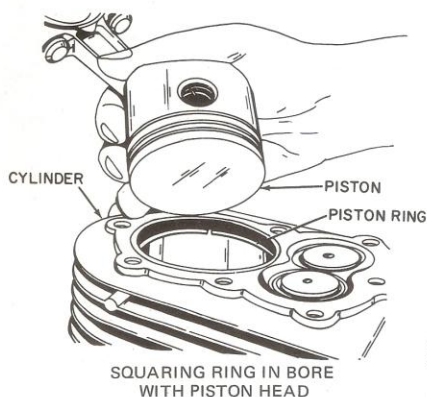
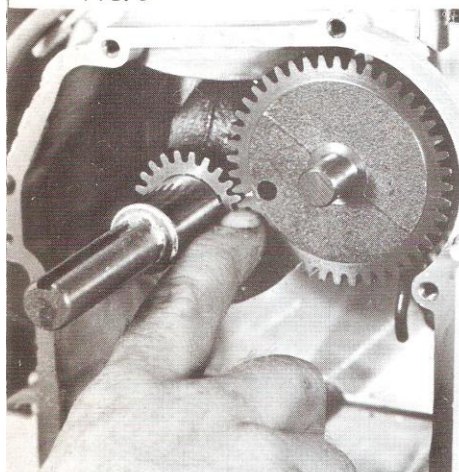


Fig. 9 - Timing mark on cam gear (touched up for identification) opposite crank key.

Fig. 10 - "Big end" on bottom of stroke for removal of the con rod cap.

Fig. 11 - Cap loosely assembled to con rod to ensure correct re-assembly.



FIG. 11

sonably clean, area to work on - preferably a solid work bench or stout table. Remove the engine from the frame. Strip the engine of all shrouds and shields - remove the fuel system at the intake manifold on the engine - disconnect the governor - remove the exhaust at the manifold - thoroughly clean the outside of the engine with solvent.

Now you are ready to begin opening up the engine - after carefully draining out all the oil.

Remove the cylinder head bolts (some will have already been removed in taking off the shroud from the starter side) and carefully place the bolts to one side. Carefully remove the head. Do not use a screwdriver to pry the head off the block but tap gently around it with the wooden handle of a hammer, until it comes free. The head gasket should be replaced every time the head is removed so there is no need to be careful with it.

You will already have removed the crankcase breather (under the exhaust and intake manifolds) to check the valve clearance. The breather should be completely disassembled (the filtering element is retained in the breather housing by a small barb in the cover and to remove it a thin blade should be inserted between the element and the barb). Remove the mounting gasket before placing all the breather parts in solvent for a thorough cleaning.

The valve springs are exposed by removing the breather and the valves are now ready for removal from the block. Before doing so, however, mark the valves so that they can be distinguished as the exhaust valve is made from different metal than the intake valve. Turn the engine so that the valves are completely closed, putting the springs in their most relaxed position.

Now, you'll probably need a "third hand" or a longish "G" clamp to remove the valves. You'll notice that the bottom of the springs are held on the stem of the valves by caps with a locking arrangement and a hole large enough to pass over the stem diameter. The trick is to get caps moved forward enough so that the stems are in the larger hole. To do this, make sure that the larger hole is on the inside, furthest away from the worker, and insert two screwdrivers, one on either side of the stem, under the cap. Using the bottom edge of the valve case as a fulcrum point, lever upwards with the screwdrivers to ease the tension on the valve. Meanwhile, have somebody hold the valve against the valve seat (or clamp it

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there) while wriggling the cap outwards. This should put the valve stem inside the larger hole in the cap. The screwdrivers can then be released, allowing the spring to ride down, over the stem. The valves are simply lifted, straight up, out of the block.

To keep things in order, so that the work area is not littered with bits and pieces, the work on the valve train should be completed at this point. First of all, examine the springs (after cleaning them thoroughly) for pits or cracks. Make sure that both ends of the springs are square and that they are both *exactly* the same length. The length of the springs is critical because if one or both are not long enough, the valves will start to "float" (fail to seat) at high speeds. On the smaller Tecumseh engines (up to 3.5 hp) the spring length should be 1-inch - on the larger engines (up to 6 hp) the spring length should be 1 9/16-inch. If the work has gone this far, perhaps it would be advisable to replace the springs.

Examine the valve seats (in the engine) and the valve faces (points of contact on the valves), with special attention to the exhaust valve (once again, this should be preceded by a thorough cleaning which should include wire brushing to remove carbon deposits). If badly pitted areas are in evidence, the valves may have to be re-ground and it is best to take the engine to a service center for this work (make sure, after re-grinding the valves, that the clearance between valve stem and lifter is correct and have the valve stems ground by the service center, if necessary). Valve seat angle on Tecumseh engines is 45 degrees.

If valves and seats have not been severely pitted, the valves should be "lapped" to remove any slight irregularities and to provide an air-tight seal. To lap valves, buy some fine grinding compound (from any automobile supply store), wipe a little of the compound on the face of the valve, and return it to the valve seat (making sure the exhaust valve is in the exhaust seat and vice versa). The best of the economical ways to lap valves - buy a vacuum cup valve grinder at the automobile supply store (making sure the suction cup is small enough to fit on the valve without going beyond the edges). This grinder has a rotary handle which turns the valve back and forth. Second best way is to buy a vacuum cup valve holder, resembling a toy target arrow, which is rotated between the palms of the hand. Most difficult way, but still useable, is to place the tips of the fingers of both hands on the head of the valve and twist it back and forth.

Whichever lapping procedure you follow, keep working at it until both the seat and the valve face are clean and shiny, with the pits removed. However, care should be taken not to go too far as the face angle could be altered. Also, do not use a compound coarser than "fine". Lift the valve from the seat every eight or ten strokes and redistribute the compound evenly. When the lapping is finished for both valves, wipe and wash off with solvent thoroughly - any grinding compound left in the engine can play havoc with the bearing surfaces.

Check the valve stems for straightness (it is unlikely that there will be problems here unless the engine has been severely abused) and make sure that there is not too much slop in the valve guides - the stems should ride without friction but not flop around. If there is too much clearance between the stems and the guides, it is possible for oil to mix with the fuel charge - no big thing but there could be a quicker build-up in carbon deposits and a drop in firing efficiency. If there appears to be too much play, Tecumseh had valves with a 1/32-inch oversized stem and the guides can be re-bored at a service center to accommodate the larger size. If this is done, the valve spring caps will also have to be re-bored to accommodate the larger size.

This completes the work on the valve train (except for that part of it inside the crankcase) and the springs, caps and valves should be loosely laid into position while the rest of the work proceeds.

To gain access to the crankcase, the six bolts holding the crankcase cover (on the opposite side to the flywheel) must be removed. The flange may be held by the gasket and if so, it should be loosened by tapping around it with the wooden handle of a hammer - not by prying off with a screwdriver. Be careful when removing the cover as some oil may remain in the crankcase.

The secret, inner, workings of your engine are now stripped bare. Before you go any further, trace the working of the engine by turning the flywheel - try to get a mental picture of it firing, breathing out, then taking another breath just to fire again. See how the governor works and the cam that drives the valve train. It all has a beautiful simplicity - but if you don't impress on your mind how it goes - you may have trouble putting it together again.

As you remove the cover, you will see the governor mechanism pegged into the

Continued on page 70

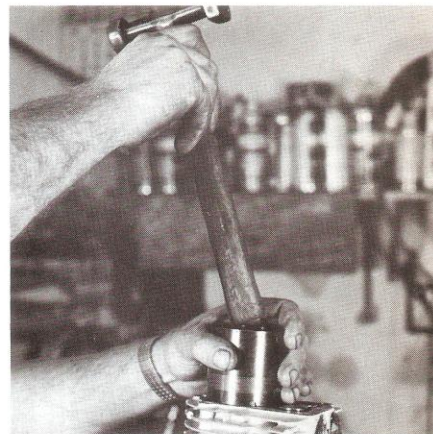


FIG. 12



GAUGING END GAP ON RINGS

Fig. 12 - Installing piston with new rings using a ring compression tool.

Fig. 13 - Thick oil (STP) retains valve lifter while cam is being re-assembled



FIG. 13

Fig. 14 - Ron Stewart pries out oil seal from crankcase cover.

Fig. 15 - Work to head is confined to clean-up with fine emery cloth.

FIG. 14

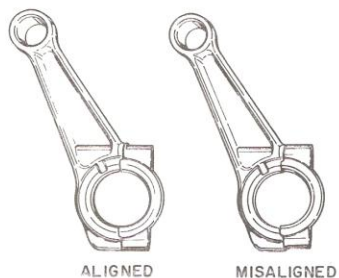
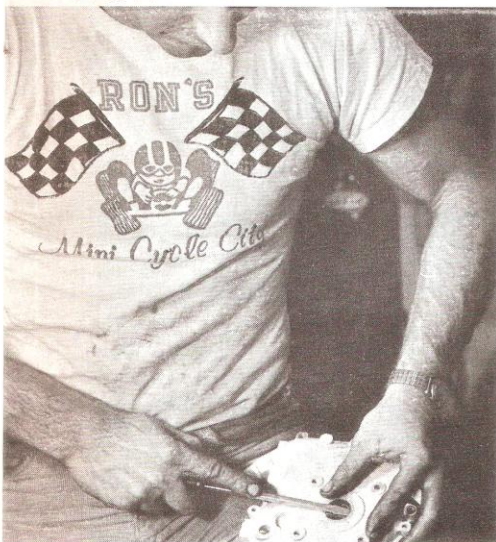


FIG. 15

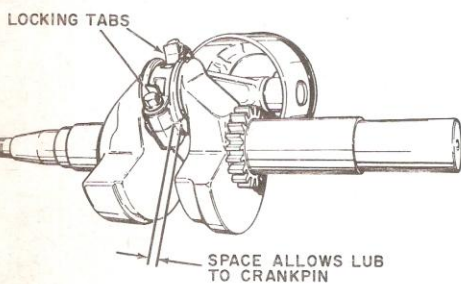
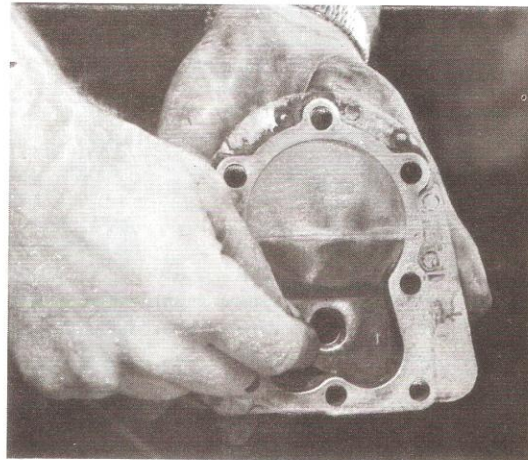


FIG. 16

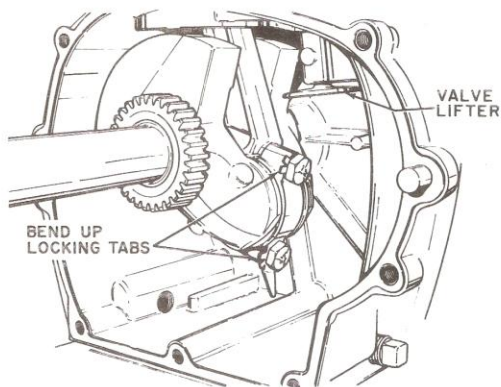
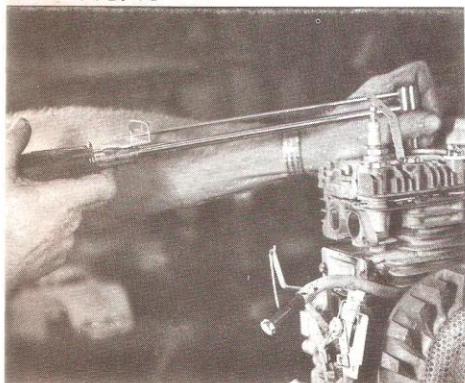


Fig. 16 - Torque wrench is almost essential for tightening down the head.

MBG MISCELLANY



HAP JONES FRAME FOR SPARE ENGINES

Hap Jones realizes that there are a lot of bike enthusiasts and dealers with good new or used engines kicking around. So he developed a high quality, moderately priced, mini-bike frame to put them in. The HJM Master frame which carries a suggested retail price of \$125.00 plus freight.

The HJM Master frame is loaded with great features including a unique cantilever sprung seat which can be adjusted to the weight of the rider. The Master frame also

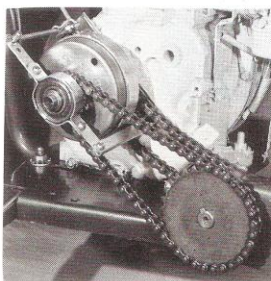
has telescopic front forks, independently operated drum brakes, fold-down chrome handle bars, twin chrome mirrors, leak-proof gas tank, 8-inch wheels, chain guard, light brackets, wiring harness, horn, safety reflectors, battery brackets, a kick stand and a really rugged, tubular steel frame. It carries a 90 day warranty. Write: Dept. MBG, Hap Jones, P.O. Box 3068, San Francisco, Calif. 94119; or P.O. Drawer "A", Prattville, Alabama 36067; or P.O. Box 41144, Cincinnati, Ohio 45241.

V-PLEX'S MANUAL TWO-SPEED

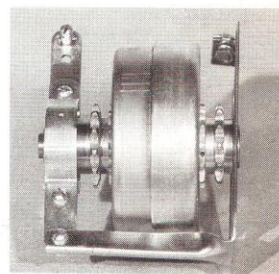
The demand for a manually controlled two-speed has led to the development of the V-Plex Two-Speed Sprocket Clutch for up to 5 h.p. engines. An uncomplicated design affording additional take-off and climbing power for mini-bikes, trail bikes and other vehicles for as long as the driver or terrain demands it.

The double clutch arrangement fits easily on the engine shaft ready to be connected with chain to the sprockets on the jackshaft.

Manual control mechanism contains a sealed ball bearing so it can be shifted in and out smoothly. When the low range is manually released,



the high range clutch engages automatically. It is not necessary to reduce the RPM of the engine to shift into low gear from high gear.



Available in 12-tooth sprockets for No. 35 chain in two bore sizes: TS35125-5/8" bore and TS35126-3/4" bore. For No. 41 chain it is available in 10-tooth sprockets in two bore sizes: TS41105-5/8" bore and TS41106-3/4" bore.

Available with mounting and manual control brackets for converting existing mini-bikes and trail bikes to added power performance. Price, \$29.25. Write: V-Plex, Dept. MBG, 550 West Main Street, Hagerstown, Indiana 47346.

NEW IDEA — PENNSYLVANIA SUMMER CAMP BASES ACTIVITIES AROUND MINI-BIKES

John Kuntz operates a summer camp near Blairsville, Pennsylvania, that has mini-biking as its main activity. It is called, appropriately enough, Camp Trailbreaker. John, who used to be an Eagle Scout and holds an MA in education from the University of Pittsburgh finds running Camp Trailbreaker with his wife and three children, satisfies his interest in working on youth projects. His eight years in teaching and 12 in business has convinced him of the need for a character-building camp, rather than one purely for recreation, and that mini-biking is the way to go.

Camp Trailbreaker is located

about 50 miles east of Pittsburgh, near Penn View Mountain, and makes use of miles of trails and open country. Says John Kuntz, "Many boys lead a life of ease that creates a lack of involvement. We believe that mini-biking through open country is a way towards self-discovery. The little problems and challenges of supervised mini-biking activities give him a 'stretching' experience - and confidence in their own abilities."

The program includes initial instruction of how to handle a mini-bike (last year the camp used, mainly, Honda Mini-Trails but campers can bring their own machines if

they are capable of handling the trails). Badges are awarded up the Expert rating. Map and compass reading; plotting a trail to reach a distant objective; a solo overnight camp; a week-long trail ride for older campers; formation riding; and fun timed events involving riding skill, are among the mini-biking activities. Other activities include volley ball; handicrafts; swimming; riflery; archery; nature study; and hiking. Sounds like a ball.

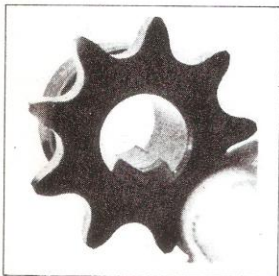
Mini-bikers interested in Camp Trailbreaker should get their parents to write to John Kuntz soon, as space is limited. The address is: Dept. MBG, R.D. 2, Box 219-B,

Blairsville, Pennsylvania 15717 (phone, area code 412, 459-8549).



NO. 40 SPROCKETS

Tabloc Sprockets has put in an inventory of No. 40-41 chain sprockets in steel and aluminum from 8 teeth to 82 teeth in one tooth increases.

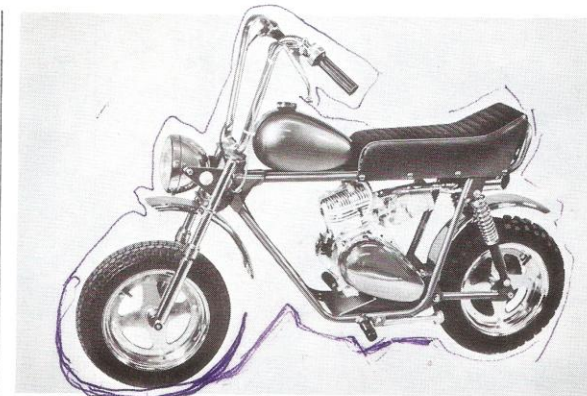


The trend for rougher usage and higher torque engines on mini-bikes is making heavier chain and sprockets necessary.

Tabloc's new heavier sprocket features the "Key-fast" design, a built in key, as an integral part of the sprocket. This sprocket's key can't wiggle out, an original design by Tabloc. See your dealer for these sprockets, or send 25 cents to cover cost of mailing for a 36 page catalog, chock full of sprockets and accessories. Write: Dept. MBG, Tabloc Sprockets, Box 220, Baldwin Park, California 91706

RUPP'S '70 T.C. LINE

Rupp's Scrambler is in the middle of the 1970 line and features a 150cc engine on the new, strong, inverted "A" frame. A better ride in rough country is said to be given a Scrambler's design. And, Rupp's new TC-1 Torque



NEW SPEEDWAY MINI-BIKE LINE

There's a new line of mini-bikes coming out of Mansfield this year with the introduction of six new models by Speedway Products, Inc., of Mansfield, Ohio. John Morrow, S.P.I. president, says a fresh new ap-

proach to styling, engineering, and actual handling with 10" mag style chrome wheels, motorcycle style saddle, high-rise handlebars, and power plants that range from 2.5 h.p. to 12.5 h.p., depending on how much action the rider can handle.

The new line of bikes, such as the Scorpion (illustrated) are racing oriented with the accent on performance. Prices start at \$149.00, with the top of the line selling for \$299.00. Inquiries from dealers and distributors are invited. Write: Speedway Products, Inc., Dept. MBG, 160 East Longview Avenue, Mansfield, Ohio 44905.

Converter automatically adjusts to needed speeds, on hills, curves, or flatout with infinite variable gear ratios for all situations. Riders say it's smooth, solid. The engine is never overloaded because the TC-1 transmission adjusts automatically.

Rupp's new raked fork and suspension front and rear, give a big bike ride on a mini.



The 10-inch wire wheels, trail tires, and drum brakes in back, add to the big bike like performance. Other Rupp goodies include: A standard spark arrester muffler. Kick stand. Heavy-duty No. 41 roller chain. New big fuel tank. Kill bottom. Scrambler's available in Rally Red, Lightning Blue, or Grabber Orange. Write: Dept. MBG, Rupp Mfg. Inc., 1776 Airport Rd., Mansfield, Ohio, 44903.

TOWARDS STATE OPERATED TRAIL AREAS

Wisconsin trail motorcyclists and mini-bikers won a victory in Wisconsin recently when the Motorcycle Outdoor Recreational Program was signed into law by Governor Warren Knowles. The Wisconsin Department of Natural Resources has been charged with the job of developing and operating off-road recreational areas - with an advisory council comprised of five to seven people knowing something about trail riding.

As MBG reads the new law, it provides that motorcycles and mini-bikes will be charged a fee of \$7 - \$2 of which will go towards provision of the trail-riding areas. Although the legal language

seems to indicate that this fee may be waived in favor of charging admission fees to special events. Seems that they are trying to feel their way.

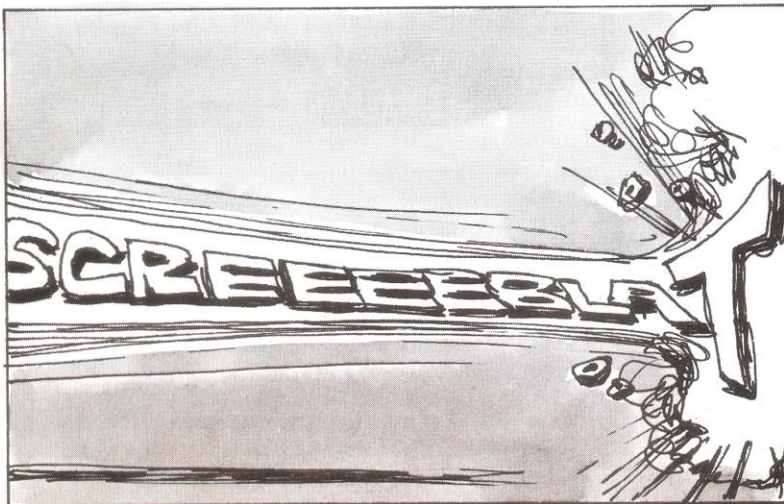
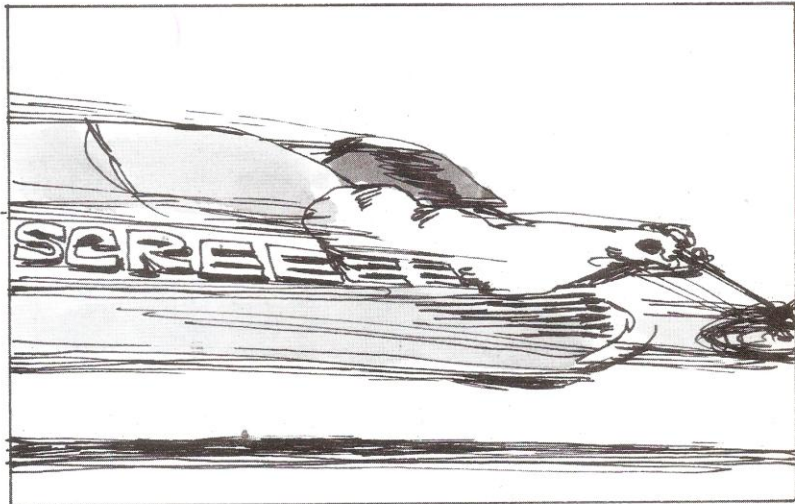
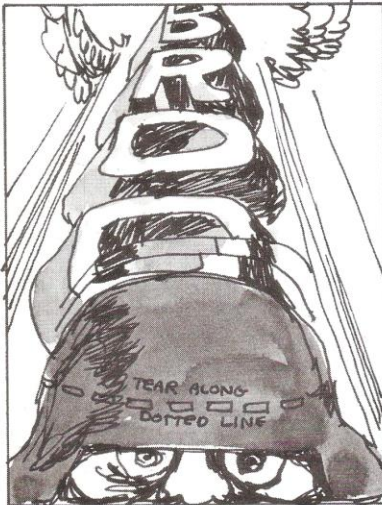
This development is important as it might lead other States in the same direction. What it means is that Wisconsin must make provision for people to ride their trail machines if the State is going to charge a fee for that purpose. The benefits of this far outweigh the few dollars involved. A similar situation existed a few years back in California when surfers looked like being legislated off the beaches - they were begging the State to charge them a fee so that they could have some official recognition.

Mini-bikers in Wisconsin, or organizers in other States, who want more information should write: Jeff Bumby, 815 Newberry St., Ripon, Wisc. 54971; or Jim Baxter, R.R. 1, Dane, Wisc. 53529 or A.E. Ehly, Director, Bureau of Parks & Recreation, P.O. Box 450, Dept. of Natural Resources, Madison, Wisc. 53701.

RACKS FOR HONDA M-B's

Triple A, long makers of the best selling luggage racks for motorcycles, now offers racks for Honda Mini-Trails and Honda Trail 70's. They are designed to become a part of the machine. Racks list for \$14.85 and safety bars for \$10.95. Send \$1 for catalog to: Dept. MBG, Triple A Accessories, 340 Alondra Blvd., Gardena, Calif. 90247.

THURGOOD CRUMBRACKER



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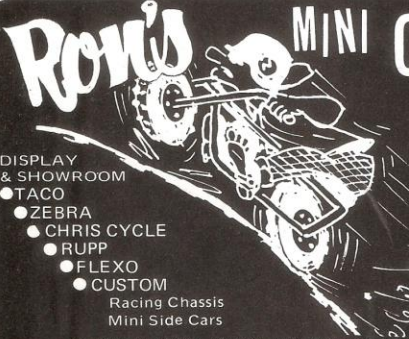
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HERTER'S MARK I

Continued from page 35

manufacturers of mini-bikes have been quick to point this out when their machine comes up for a test. These manufacturers have painted pictures of trails in their areas being gentle, winding, pathways through thickly carpeted woods with the sunlight softly filtering down through the trees. Just great! And we would like to spend a week riding through countryside such as that. But that is not our job. Our job is to try to break these test machines. To put them through enough punishment in a few hours to equal, say, a year's normal riding. Or at least enough to reveal some of the more obvious weak points.

Of course, our test procedures are modified in accordance with the intended use of the test machine. A simple fun machine is not expected to do what a full-blown trail mini-bike is expected to do. Nevertheless, we will give it more than a pavement-only test. On the other hand, a trail machine is expected, during the test, to tackle the worst possible conditions that it is ever likely to be thrown at. Say we're riding along the bed of a stream and we decide to climb the bank - there's a little trail up the bank and then there is the bank itself - loose, rough as a cob, and steep. Which one will we shoot at? Right! The bank. We understand that the average mini-biker will take the trail - but we are not after the average and one day that same mini-biker may be faced by a bank without a trail - and we have to tell him whether or not the test machine is going to make it.

Where were we? Oh, yes, out in the desert with the Mark I. From riding around the office parking lot and bumping over the curbs, we had an idea that the test machine was going to perform pretty well - but we were not prepared for its excellence. Yes, that's what we said, George, "excellence".

In action, this really is a great machine. The 5 hp Tecumseh/Mini-Verter combination proved to be a mountain-moving brute that would let nothing, and we mean nothing, stop it. In the worst of conditions, up the steepest hills with the loosest piles of rocks, hauling a 160 pound rider, the engine would wind away manfully until the tires, despite their sticking abilities, would start to slip and dig in. And, if we wanted, it would keep turning until the rear wheel had dug a hole for itself up to the axle - and beyond.

This ability of the Mini-Verter to make things easy for the engine by selecting the lowest gear ratio, automatically, to meet the demands of the trail conditions has a reverse side to the coin - albeit, a minor one. Say you're going up a steepish hill and you started up without much speed - the Mini-

Continued on page 64

GOLD-PANNING

Continued from page 43

cook. As the potato cooks, the mercury will vaporize and leave the gold on the can lid. Then, put the potato in a bucket of cold water and the mercury will condense back out of it and flow to the bottom of the bucket.

Once you have your gold you can keep it or sell it. Most California gold is 850-900 parts fine. British Columbia gold is the finest natural gold in the world, over 900 parts fine. Pure gold is 1000 parts fine. If you sell your gold to the government it is refined and they pay you \$35.00 per ounce of pure gold. Gold nuggets are prized for use in jewelry, and good nuggets bring up to \$100.00 per ounce.

The luckiest miners are those that find a "glory hole". This is a loose term which can be applied to any place gold is found in large quantities. Often a glory hole is a pothole in a creek, where the water swirls around slowly before moving downstream and lots of gold drops to the bottom. But your strike can be anywhere. One lucky soul was idly pulling up handfuls of grass when he noticed something funny in the roots—thousands of flakes of gold.

He found his glory hole in a cow pasture, so while you're mini-biking, watch your tire tracks! You just never know!

IT'S A (SNOW) BALL

Continued from page 45

spinning the river ice.

Our campout of fun and experimentation finally came to a close. As I watched the boys loading their machines and equipment, I formed several conclusions regarding the sport. I believe the experience the youngsters under-go teaches them aptitude, patience, team work and self reliance much more effectively than many other sports. The risks of personal injury, when the machines are properly used, are no greater than with contact sports such as football, baseball or basketball.

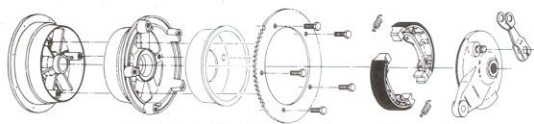
Each time these youngsters get on the seat of their mini-bikes and become aware that here is a mechanical device of good stability over which they can be the master, is to see true happiness in a grin.

If mini-biking is going to become truly popular in any season, responsible people are going to have to take an active interest in the acquisition and development of riding areas. Perhaps, by getting public officials and their children to take their first ride on one of these safe, sturdy little machines in the proper surroundings, more support can be gained for development of public facilities.

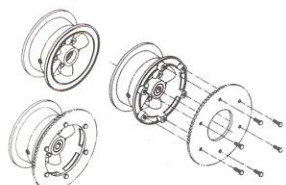
Mini-biking in the snow, or mini-biking anytime, is a great sport.



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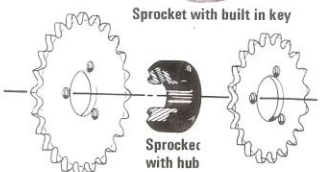
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CLAY WHITE, 7-YEAR-OLD HOT SHOE, POINTS WINNER

Clay White, seven-year-old member of the Southern California Mini-Bike and Kart Association, was the Club's high point man for 1969. Young Clay, who was six-years-old when he started racing earlier last year, was feted at the Association's annual banquet recently. As a mark of his efforts, Clay was awarded a Maverick III mini-bike which he will race in 1970.

To race the Maverick, Clay will move up one class, from the 6 to 8 year olds, 1 - 3 hp, to the 6 to 8 year olds, 4 - 6 hp. In this class he will run head-on to his closest points challenger (and, incidentally, one of his closest friends) Jeff Ward.

Clay got his start in mini-bike racing through the interest his father, Quentin, has in hare and hounds motorcycle racing. To keep young Clay occupied at the motorcycle races, his father bought him a mini-bike. One day they were visiting Saddleback Park when the mini-bike races were in progress and Clay badgered his dad to let him enter. On his very first time out, Clay won a trophy - and he was hooked on racing.

Asked about whether she worries about her son's racing, Clay's mother Mayris confessed to some anxious moments. However, she said that the efforts (and expense) has been worthwhile in that the family all participates. She also pointed out that Clay's teachers have noticed a marked improvement in his grades and his ability to get along with other children at school.

She said the low point of the year came when Clay lost his first race after a string of wins. The shock to his ego, she said, took a bit of getting over - but now he has lost several times and it is all just part of the scene.

Clay's 52 pounds have been propelled to ownership of 19 trophies, a naugahyde jacket from Endura of California, a Taco 100 mini-bike for winning high points at Saddleback Park (a separate award from the SCMBKA award) and the Maverick III - all in less than a year.

Clay's faithful, fully stock, 3 hp Taco will now go to his younger brother who will be racing (he hopes) as soon as he gets out of kindergarten - and plans on assaulting Clay's record.



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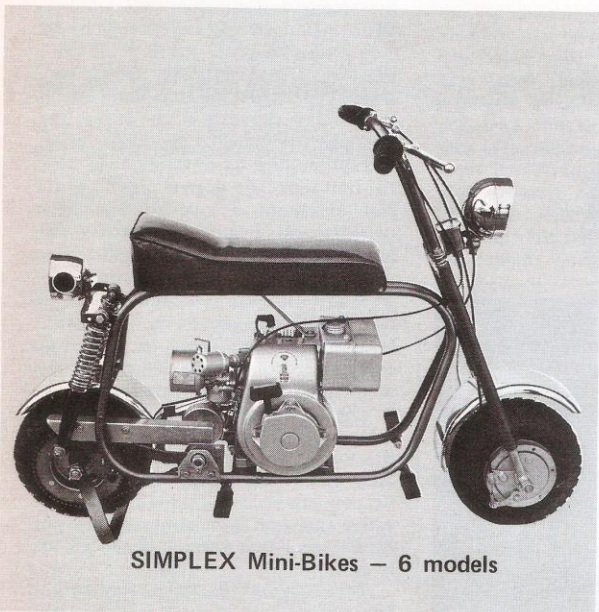
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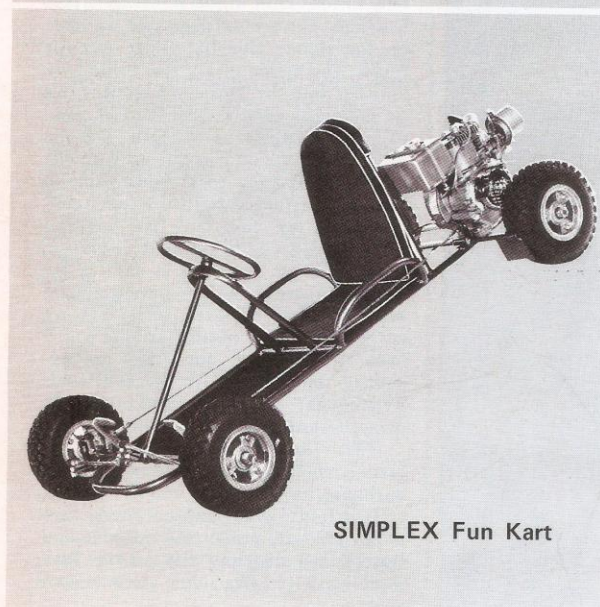
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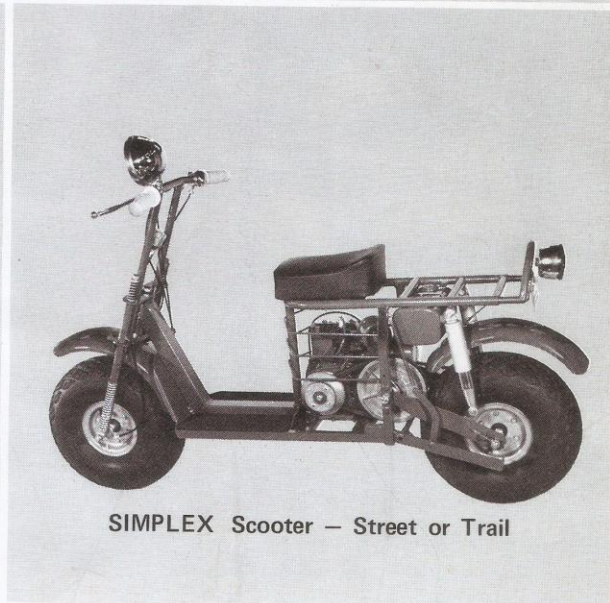
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MINI-BIKE GUIDE / 63

HERTER'S MARK I

Continued from page 61

Verter automatically drops back into low so that engine revs can remain high although the machine is not moving very fast. Now you hit a loose patch - and the rear wheel starts to spin. In these conditions, it would be better if you could get the machine into a higher gear and hold it there so that it would slowly work its way out of the loose stuff. Rather like handling a car in the snow. But, as with any automatic, you have to take what the transmission hands out - which, 99 per cent of the time, is right for the conditions.

Herter's are using a high gear ratio of 5 to 1 and, as the Mini-Verter goes from 1 to 1 up to 2 to 1, the low gear ratio is 10 to 1 - and the transmission will select any ratio in between to meet the trail conditions. The governor remains connected on the Mark 1 and it is unlikely that such a sensible group as Herter's with tinker with it and, thus, void Tecumseh's warranty. So we assume a maximum rpm of 3,600 and a 14½-inch diameter tire hooked up to a 5 to 1 gear ratio will produce a maximum theoretical speed of a little over 30 mph. Which is more than enough. Anybody going faster than that on the trails has more love of speed than respect for

their own person - no matter how smooth the conditions.

Where we took the Mark 1 up reasonable hills (by "reasonable" we mean hills with trails that the tires could grip) the engine/transmission just wouldn't let us down. Revs were kept high by the torque-sensing device keeping the transmission in low, although speeds were slow. This made the maximum use of the twisting capacity of the engine and, although the engine got good and warm, it kept pulling us upwards even when the trail took a 45 degree upswing at the end of about a mile of 30 degree twisting and turning. Fantastic! This particular hill was one we had always wanted to climb - not having any idea of what lay over the top - but we'd never had the confidence to try it until the Herter's machine came along. We did get over the top on this test (there was just more trail on the other side) but we had to get down immediately because that cob of a trail had put a hole in the front tire - and we had to get to the base camp before we lost all the air. One day we're going back up that hill to find out where that trail goes. And we'll use the Mark 1 or, better yet, the Herter's Trail, to do it.

Talking about the rocks brings up the only serious fault in the Mark 1 as a trail machine. The ground clearance is a little on the skinny side for riding over big rocks. The frame clears the ground by 5-inches but the kickstand reduces this to 4½-inches - and we lost the kickstand to some boulder as a result. On the other hand, if you can put up with the jolts - hitting a few rocks is not going to damage this rugged brute - as we found out when we got our flat tire and further reduced the ground clearance. Coming down that hill as fast as we could in a race with the outgoing air, we bounced from rock to rock. Yet we never once lost control, a tribute to the Mark 1's stability, and when we examined the machine for cracked welds we thought sure we'd find, the only damage was the loss of the kickstand.

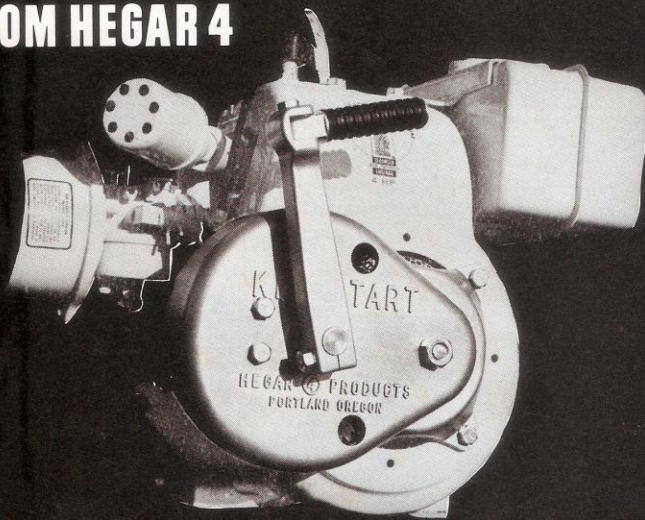
That's how we know Herter's mini-bike is built like the proverbial brick outhouse.

It is fair to point out that the Mark 1 is not Herter's prime trail machine and the 18-inch diameter tire on the Trail machine should give ample ground clearance.

As we've indicated, there were times when the tires lost their grip - despite their 14½-inch diameter, 4-inch knobby treads - so that will give some idea of the trail conditions. But for most of the test, they were just fine. Although they are pretty hefty tires, steering was light (without being sloppy) and positive. The rake on the front forks seemed about right, a nice compromise between agility and comfort. Agility was necessary, testing out there in the desert,

Continued on page 66

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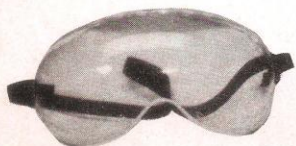
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HERTER'S MARK I

Continued from page 64

because once off the trail (you didn't think we'd stick to the trail, did you?) there were plenty of cactus bushes to be avoided. This also put a premium on predictability, a squirrely machine could have proved a "thorny" problem, and the Mark I did precisely what it was told to do - no more and no less.

Out of the undergrowth, back on the trail, the test machine showed that it was particularly surefooted when it came to traversing the side of a hill. Even when we'd bump off a rock, giving an excellent excuse for the machine to start sliding, recovery was immediate and the wheels would continue to track straight and true until the next big bump.

The great, big, well-padded, broad-based, 21-inch long seat; high-rise, widely-spaced, handlebars; and forward mounted folding footpegs, gave an extremely comfortable riding position - for those kind of trails we are told you can find in other parts of the country. For our test we would have preferred the pegs where we could have stood on them. (After the test, we fitted auxiliary pegs back of the engine - and found them much better for control.)

Comfort is a prime purpose (in addition to handling characteristics) of suspension. The Mark I's suspension is one of the best that we have found on mini-bikes and perfectly suited to hard boonie bashing. The front suspension, which seems the end most often neglected in other mini-bikes, has sufficient travel (about 1½ - 2-inches), and sufficient softness to use that travel, to iron out all but the impossible bumps. We never once heard the front end bottom out throughout one of the most demanding tests we have ever done. The rear end? Well, we have an idea that the rear shocks might be a shade too stiff for a lightweight mini-biker - say, around 100 pounds - although they worked fine for our 160 pound test rider. On the other hand, the soft seat is more appropriate for a lightweight rider than our test rider - who tended to crush it right down. All of which is nit-picking because the rear suspension is as good as any we have tested.

The one gallon gas tank came in handy for our long test (let's face it, at least half the test was devoted to pleasure riding) and pointed out one peculiarity. The tunnel that fits over the backbone practically cuts the tank into two sections and the petcock (with on/off valve) is on one side only - meaning that there is nearly a quart in reserve. Only thing is, to get the reserve gas into the petcock side you have to lay the machine on its side. But it works - and that's the important thing.

Another very nice little touch - the exhaust is fitted with a spark arrestor.

And everything is just bitchen.

Reading through this test, the mini-biker might think we are being a little picky with some of our criticisms. And, reading through this test, we agree. It's just that we are a cautious bunch and feel the need to curb our natural enthusiasms. Because we are really enthusiastic about the Mark I. Riding this machine is like having most of your mini-biking dreams come true. Out on the trail, the Mark I encourages a feeling that there is nothing it, or the rider, could not tackle. And we believe that feeling is very nearly fully justified - just don't try climbing the face of a sheer cliff - like we did.

The construction of the Mark I must make it one of the strongest, if not the strongest, mini-bike around. And it is the equal of anything in the power and handling departments. It is not the best looking mini-bike we've seen but it certainly isn't ugly and has the grace of executed purpose. Altogether, a very fine machine.

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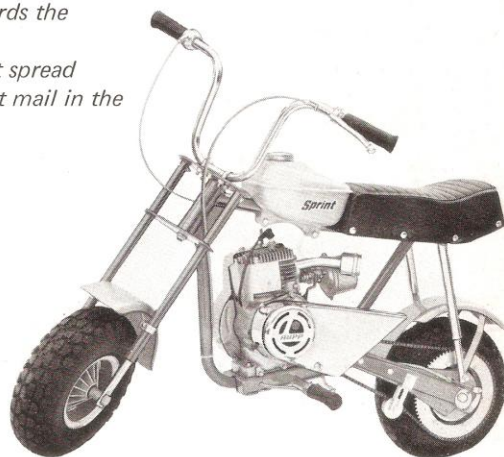
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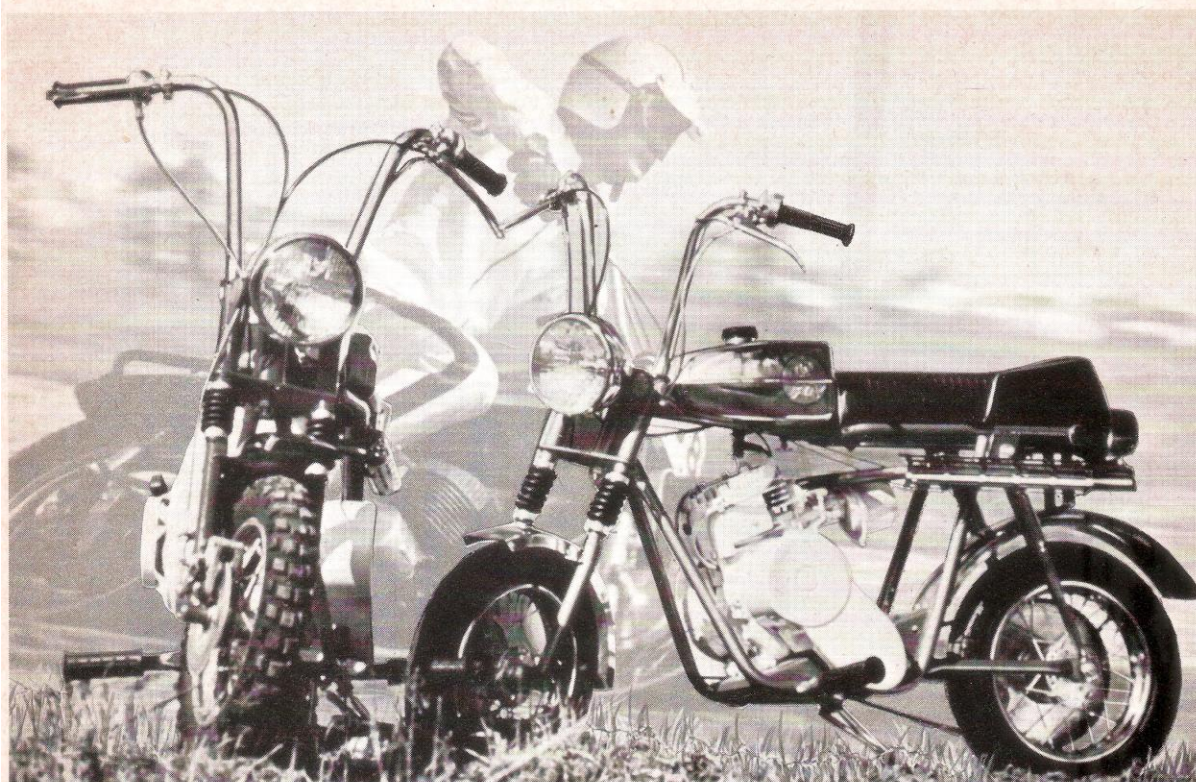
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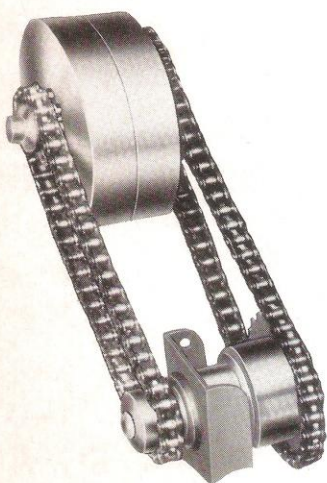
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SHAPE UP FOR SPRING

Continued from Page 54

inside of the cover. There will be no need to remove this mechanism - simply clean it up well as you clean the inside of the cover.

It is vitally important that the gear driving the cam shaft, that is, the large gear on the top right hand side of the crankcase, be re-placed in the engine the same way it was removed. Otherwise, the timing will be off. So, before removing the cam, locate the timing mark on the cam gear. This timing mark is a stamped indentation at the bottom of one of the cogs, looking like a file mark and sometimes further indicated by a drilled hole in the gear. Now, turn the crank until the mark is closest to the drive gear on the crankshaft - the drive gear will be marked at this point by either a bevelled cog or a keyway in the shaft and the gears *must* be replaced in this position. If you have any doubts about being able to find this position later, make your own marks with a sharp point.

The cam can now be removed by simply pulling it out of the bushing in the opposite side of the crankcase. The valve lifters, which are still in place, could hang up the cam so it is best to reach in, behind the cam, and ease them up as the cam is being pulled out. When

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the cam is out, the lifters will drop down and the whole assembly should be thoroughly cleaned in solvent, wire-brushed, all passageways blown clear or cleaned with pipe cleaners, and wiped clean. Inspect the cam gear and cam lobes (the concentric parts that push the valve lifters up) for wear and damage - replace the cam with a new unit, if necessary. The valve lifters should have square ends, free of burrs, and a file can be used to do this work, if necessary, but care should be taken to remove as little metal as possible because the valve train is not adjustable and too large a gap could result. Make sure the assembly is free of all metal filings and so on, wrap in a clean rag and lay to one side.

Turn the crank so that it is possible to work on the "big end". On the Tecumseh engines up to 3½ hp, the journal will be at right angles to the connecting rod line but on the larger engines they will be at an angle. Note the position of the oil dipper as this must be assembled in the same way. The same is true, especially true, about the connecting rod caps and to assist in this a deep matching scratch should be made in both the cap and the con rod end of the journal. With this done, dis-assembly can proceed.

Remove the two nuts holding the cap to the con rod and place the nuts and oil dipper to one side. In all probability, the cap will remain in place but it can be loosened by turning the crankshaft so that the piston is halfway up the cylinder and then giving the piston head a sharp (not too hard) rap downwards with the wooden handle of a hammer. Do not try to pry off the cap with a screwdriver. Place the cap and oil dipper aside. Turn the crankshaft until the piston is in the topmost position then push it up from the bottom, via the con rod, with your fingers until you can get a grip on the piston head - gently pull straight up until it is free. To avoid losing the parts and later confusion, loosely replace the cap and oil dipper in their correct position back on the con rod journal after thoroughly cleaning the whole unit in solvent.

Using clean solvent and a long bristled brush, wash out the inside of the crankcase and crankshaft. Examine the crank for wear or damage. If the journal bearing is badly worn or scratched, or if the crank is bent, the crankshaft should be replaced - some lawnmower repair shops advertise a crankshaft straightening service but this is seldom (if ever) a satisfactory answer to a bent crankshaft. If a new crankshaft is indicated, it is better to let a service center do the work.

Examine the con rod cap and the bearing area on the con rod. Minor scratches can be tolerated (may even help lubrication) but major damage or wear will require a new con rod and cap.

Continued on page 73

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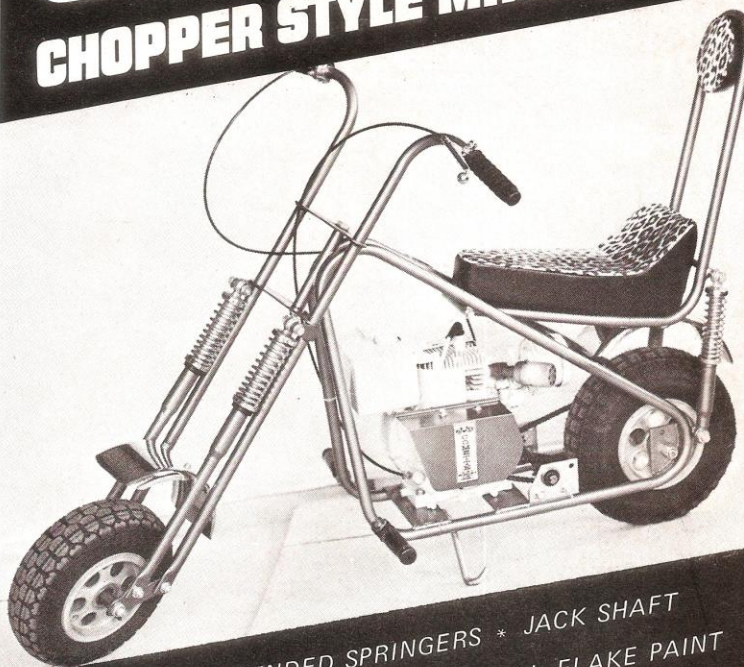


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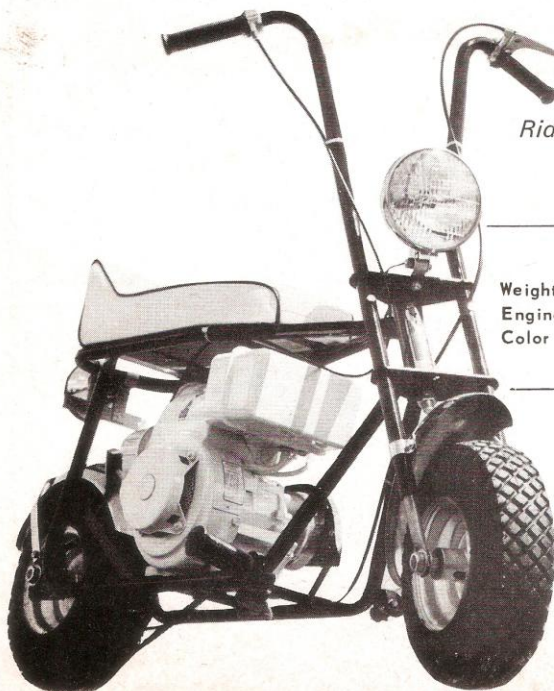
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SHAPE UP FOR SPRING

Continued from page 71

Wear on the piston pin (the pin holding the piston head to the con rod) is not very usual, unless the engine has been used a great deal, but it should not have too much slop (although it should act without friction).

Remove the rings by carefully inserting a point, such as a center punch, under the ring at the gap and lifting up. It is wise to replace the rings with new ones if the work has gone this far so there is no need to be concerned about the rings - but great care should be taken not to damage the ring grooves or lands (the section of piston between the ring grooves). All carbon should be removed from the piston head and a piece of broken piston ring used to thoroughly clean out the grooves (a very fine piece of emery paper, very gently used, will remove the carbon). In removing the piston rings, carefully note the shape and type of ring in each groove. The bottom ring is the oil control ring and is characterized by holes through the ring. The middle ring is the second compression ring and has square shoulders whereas the first compression ring, at the top, has a chamfered corner on the inside top edge. The new rings must go back in the same order.

To check the wear on the cylinder and/or piston rings, insert one of the rings into the bore of the cylinder and get it square by inserting the piston head, upside down, into the bore until it makes contact with the ring all the way around. The ring should be about 3/8-inch below the top of the bore as the diameter may alter considerably further down. Now take a feeler gauge and measure the gap - it should be between .007 and .017 - any bigger than this and too much wear is indicated. The only question remaining - is the wear in the cylinder or ring? Using a new ring can answer this - if the gap with a new ring is greater than .017, it means the wear is in the cylinder.

If you are uncertain about the amount of wear in the crankshaft journal bearing, the con rod cap and journal, the piston pin, the cam shaft lobes, the cylinder, piston rings and ring grooves - take the engine, stripped down, to your service center for checking. In any case, you've got to buy new rings so you may be able to talk your service center representative into taking a look at the rest of it just in case other parts have to be replaced. If too much wear in the cylinder is indicated, the cylinder should be re-bored and fitted with an oversized piston, they come .010, .020 and .030 oversized.

Before re-assembling, after checking everything out, give all the parts a final wash in clean solvent and go over the

Continued on page 74

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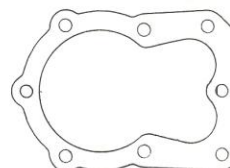
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SHAPE UP FOR SPRING

Continued from page 73

engine, once more, with a clean, long bristled, brush and get everything "operating room" clean - in particular, make sure that no grinding compound from the valve lapping job remains in the engine.

Install the new rings in the proper order, making sure that you do not damage the ring lands or grooves. Stagger the gaps in the rings at equal positions around the piston. If any of the gaps get in-line, there will be a drop in compression. Remove the cap and oil dipper and carefully place to one side. To get the piston into the bore of the cylinder the rings will have to be compressed and there is available a ring compression tool. However, as this will not be needed too often, you might try to make do with a large hose or pipe clamp of the type available at plumbing supply houses. Whichever tool is used, it is tightened around the piston sufficiently to compress the rings to less than the bore of the cylinder but not so tight as to prevent the piston from slipping through when it is tapped. Place the con rod into the bore so that it is not binding up on the crankshaft and slip the piston skirt (lower portion of piston head) into the bore. The ring compression tool will slide down until it contacts the block and then the wooden

handle of a hammer is used to gently tap the piston head so that it slides down, through the compression tool. As the rings leave the bottom of the compression tool they will be caught by the cylinder bore and guided into place.

If it is not necessary to re-bore the cylinder, and new rings are being installed, the glaze on the face of the cylinder must be removed. This will allow the new rings to seat properly and permit the engine oil to soak, once again, into the walls of the cylinder. The glaze is removed by a gentle application of very fine emery paper, making sure that the application is even throughout the wall area - do not rub more in one area than in others.

With the piston well down in the cylinder, guide the crankshaft bearing into the con rod journal, put the cap into place, making *absolutely* sure that it is on the right way, follow with the oil dipper and the nuts. If the cap is fitted with locking tabs (the larger engines) new tabs should be used each time the cap is removed. If the cap is not fitted with locking tabs, self-locking nuts (obtainable from the service center) should be used.

If possible, use a torque wrench to tighten the cap nuts - turning them down to 65 - 75 inch pounds (up to 3.5 hp) and 86 - 110 inch pounds (4 hp and above). Without a torque wrench it is difficult to judge tension but the nuts

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should be tightened firmly (imagine the piston banging up and down against them) but not so tight as to distort the caps (there has to be clearance to allow for oil circulation).

Unwrap the cam and valve lifters and apply a little thick oil, such as STP, to the ends of the lifters so that they will stay in the guides while you are fitting the cam. Insert the lifters. Turn the crankshaft so that it is approximately in line with the mark on the gear of the cam - insert the cam in the bushing at the back of the crankcase and make the final adjustments to match the crank and cam timing marks.

Before bolting the crankcase cover back on, it would be wise to replace the oil seal. Lever the old seal out by holding the case firmly, insert the blade of screwdriver under the seal and twist, repeating around the diameter. The new seal can be installed by driving it into place with a socket a little undersized from the oil seal bearing. Some care should be taken with this operation as the seal must go home squarely. Make sure that the inside of the cover is thoroughly clean and re-install with a new gasket. As the cover is guided in place, engage the governor mechanism as it was prior to dis-assembling.

Keep the crankshaft in the same position as it was during the re-installation of the cam (timing marks lined up) to check the valve gaps. Remove the springs and spring caps that were laid into position prior to work on the crankcase. Now the valve stems and valve lifters are unobstructed and a .010 feeler gauge can be freely used to check the clearance. The valves should be held down, firmly, in their seats while gauging. If there is insufficient clearance (caused by lapping in the valves), the valves should be removed from their seats and the ends carefully filed to the specified clearance, making sure that the valve stems remain square at the ends.

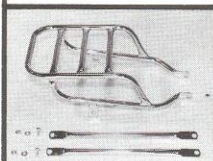
Re-install the valve springs and caps - reversing the procedure followed for removing them. This involves two screwdrivers being used to lever the caps up and over the locking groove at the end of the stems - while having the valve held down in the seat. When installing the springs, the larger hole in the caps that slides over the stems should be closest to the worker so that the natural direction of the levering screwdrivers is into the locking groove. Replace the breather cover, using a new gasket.

Work on the head should be confined to complete removal of all carbon deposits and a light clean-up with fine emery paper. A new head gasket should be used everytime the head is removed. Beg, borrow or steal a torque wrench to install the head bolts which should be gradually tightened down to 140 - 200 inch pounds (12 - 16 foot pounds).

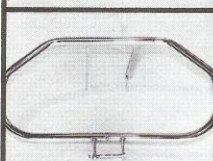
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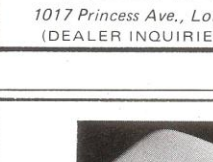
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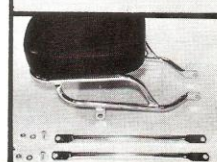
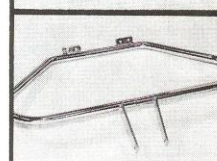
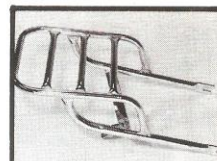
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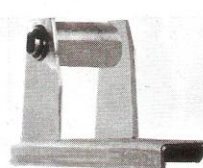


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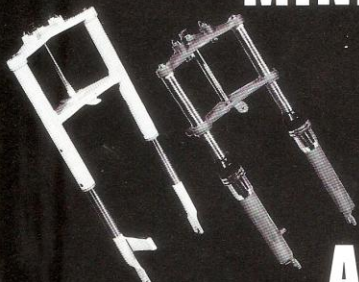
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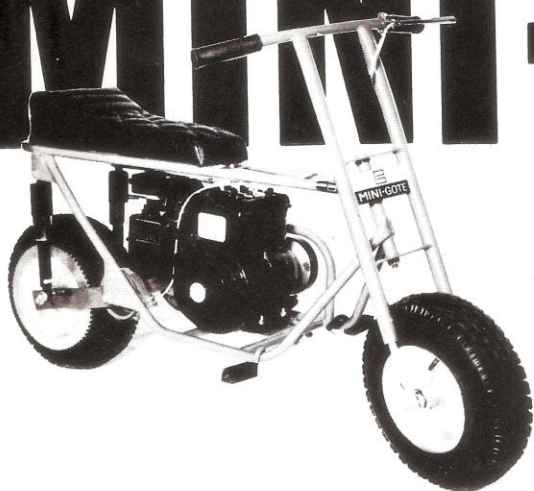
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The head bolts should be tightened a little at a time, working across the head, i.e. 12 o'clock to six o'clock; three o'clock to nine o'clock; and so on.

After re-installing the starter shroud, intake manifold with fuel system, and exhaust system - filling the crankcase with 20 weight oil and connecting the spark plug lead - you are ready to fire her up. Do this while you still have the engine out of the mini-bike frame so that you can get to it easily. If the engine is hard to start (as they often are after all this work has been carried out), try a squirt or two of the "sure-start" preparations they sell for starting cold automobile engines. Once it has fired up, it will start much easier the next time. After the engine is warm (do not race the engine for the first five hours of operation) set up the carburetor as outlined in Part II of this series. To seat the engine in nicely after this overhaul, run the engine on the bench (making sure you have enough ventilation) for about half-an-hour, at a fast idle - varying the speeds every five minutes for about a minute. Then install the engine on the mini-bike and run it nice and easy for the next four hours.

Change the oil after the first five hours of running (very important) - and you should be all set for a good-running machine throughout the mini-bike season. Normal maintenance (changing the oil every 25 hours of operation, greasing the clutch bearing, oiling the chain every time you go out) is still necessary, of course. But, if anything *does* go wrong again - you won't be standing around like a ninny, wondering what goes on inside and around that fire-breathing monster.

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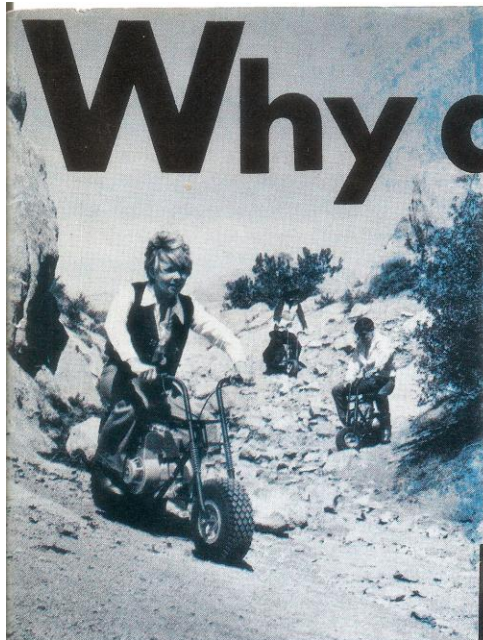
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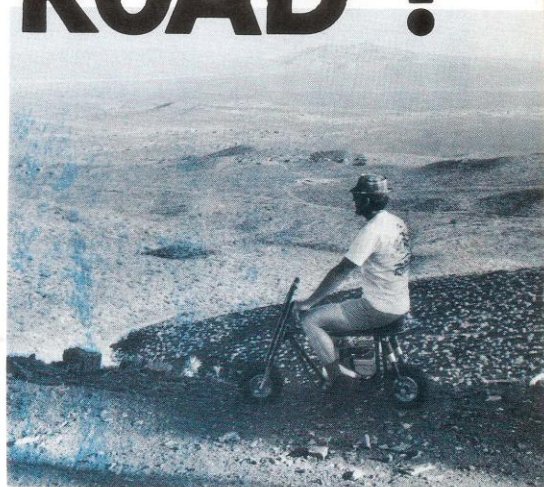
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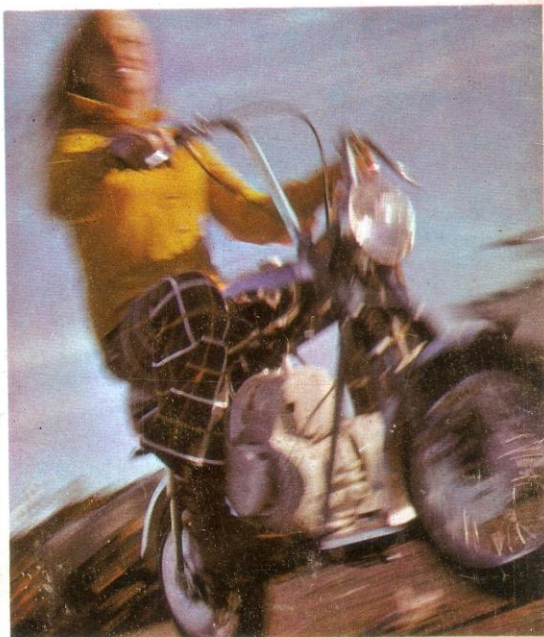
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