





...Ford's tough 4-wheelers.

(It's our middle name!)

Ford Ranger

Ford introduces
Ranger SuperCab. It gives
you over 22 cu. ft. of
space behind the front
seat. Or, add optional
center-facing jump seats
for seating up to five.



Sporty Ranger STX.

The 4x4 with everything on it... to go! The exuberant Ranger STX has over a dozen extra features, from unique paint to bucket seats, at a special package price. STX won the West, now it's offered nationwide.

New 2.9L V-6 Power.

The STX boasts
Ranger's new bigger,
more powerful 2.9L V-6.
Electronically fuel
injected, it hands
you the reins to 140
horses.* (Ranger
standard trim models also offer 2.3L
EFI Four.)

New "Touch-Drive" System.

Presto! Just touch a button in the overhead console to shift from 2WD to 4WD high at any speed. Shift back to 2WD the same way. Ford's new "Touch-Drive" is that simple! (Manual locking hubs are still standard for you traditional off-roaders.)

Ford Bronco II

This tough number shares most of Ranger's good news. Like slick "Touch-Drive." Ford's remarkable new option brings push-button ease to 4-wheeling. You never have to wrestle a reluc-

tant ZWD/4WD shift lever. You always have the assurance of 4-wheel drive high instantly.

New Powerhouse V-6.

Bronco II has the dash and drive of Ford's new fuel-injected 2.9L V-6. It's the one for power. For bashing through the brush with tighter turns than S-10 Blazer or Jeep CJ's. And for turning heads in town, too.

Eddie Bauer Broncos.

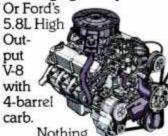
Both Bronco II and Bronco are offered in luxurious Eddie Bauer

editions. They
feature unique
paint and special trim. Highstyled interiors
with Captain's
Chairs. Plus Eddie
Bauer tote and
garment bags. And
Ford's Extended
Maintenance and Limited Warranty coverage.
Ask to see this warranty
when you visit your
dealer.

Ford Bronco

Bronco's a winner... the strapping 4-wheeler that outsells every other full-size sport utility.**

Bronco starts with Ford's husky 4.9L Six, standard. And you go up from there, with the 5.0L V-8 with multiport electronic fuel injection – and 185 surging horsepower*



Nothing in its class can match Bronco for power!

Unique Suspension.

Of all the big
4-wheelers, only Bronco
has independent front
suspension. To smooth
your on-road ride. And to
help keep wheels glued
to the ground for maximum traction off the road.
Your choice: manual front
hubs or optional automatic front locking hubs.

Tow almost 4 tons!

The strong, powerful Ford Bronco can be equipped to tow 7,900 lbs. That's nearly a ton more than competitors giving Bronco extra value and versatility nobody else offers!

Ford F-Series

They're too tough to top: America's best sellers 8 years straight.†

This year, Ford 4x4's pour on the power. With the biggest standard Six, plus the most powerful lineup of V-8's—big as 7.5L and 245 horsepower.*

They're the only big 4x4's with independent front suspension (Mono-Beam on F-350). The only ones with your pick of three cab sizes.

With Ford's rugged 4-wheelers, even the choice is tough!

Best-Built American Trucks.

At Ford, Quality is Job 1. A 1985 survey established that Ford makes the best-built American trucks. This is based on an average of problems reported by owners in the prior six months on 1981-1984 models designed and built in the U.S.

Lifetime Service Guarantee.

Participating Ford
Dealers stand behind
their work, in writing,
with a <u>free</u> Lifetime Service Guarantee for as long
as you own your Ford car
or light truck. Ask to see
this guarantee when you
visit your participating
Ford Dealer.

Buckle up-together we can save lives.

*Horsepower based on SAE Standard J1349 7.5L engine horsepower lower in California.

**Based on 1985 model year manufacturers' reported retail deliveries through July, 1985. †Based on 1978 through July 1985 model year manufacturers' reported retail deliveries.

BEST-BUILT

AMERICAN TRUCKS





Popular. Mechanics

MARCH 1986

VOLUME 163 NO. 3



ON THE COVER

Competition is heating up as the 1986 motorsports season gets under way. On the International Motor Sports Assn. [IMSA] circuit, Chevy has a turbocharged, 775-hp, midengine V6 in its Corvette GTP. It's running against Ford's plastic-chassis Mustang Probe with its computer-controlled, 2.1-liter, 650-hp Turbo Four. Read about the latest in speed technology in our story on page 91.

—Photos by

—Photos by Chevrolet Motor Division and Ford Motor Co.



109 Remote control



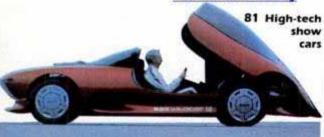
102 Boating's best



99 Rock 'n' roll tech



106 Barrels of money



DEPARTMENTS

- 4 Letters
- 6 Editor's Notes
- 8 Imports
- 10 Photography
- 14 Freewheeling
- 23 Motorsports
- 24 Audio
- 27 Appliance
- 28 Inside Detroit
- 33 Homeowners' 34 Science
- 37 Minicourse

- 38 Tool Tests
- 43 Home Video
- 46 Electronics
- 48,69 Hints
- 50 Computers
- 56 Aviation
- 58 Outdoors
- 64 Cycles
- 72 Car Clinic
- 79 Tech Update
- 168 Worth Writing For
- 178 Time Machine

AUTOMOBILES AND BIKES

- 60 Is This The Next Corvette?
- 91 Technology Of Speed

There's more to going fast than standing on the gas.

94 Six Mechanics, No Waiting

Racing mechanics can rebuild an engine in an hour.

147 Saturday Mechanic

Here's how to diagnose Ford's EEC-IV system.

BOATING

102 All Decked Out

These '86 sport boats are fun and affordable.

104 What's New On The Transom

New systems feature safety, durability, performance.

HOME AND YARD

112 Striking Pay Dirt

Stock your toolshed with these 30 gardening tools.

123 The Better Home

We show how you can carpet a stairway.

SHOP AND TOOLS

115 8 Great Shop Projects

Our woodworking section has projects for everyone.

OUTDOORS

106 Barrels Of Money

You'll find beauty, quality, tradition in these shotguns.

ELECTRONICS

99 The Heart Of Rock 'n' Roll

Behind the scenes, it's electronics, mechanics and fire.

109 Let Your Fingers Do The Walking

Infrared lets you control electronics from your chair.

110 There's Music In The Air

It's a first: wireless sound for passenger planes.

AVIATION

86 Foreign Air Raid

Is foreign competition downing U.S. plane sales?

145 Why The F-20 Isn't Selling

It's the plane nobody wants.

TELEVISION

96 TV At Speed

In-car video takes you around the racetrack.

TECHNOLOGY

79 PM Tech Update

Here's the latest from the worlds of military technology, lasers, aviation, marine biology, electronics, astronomy, space, aeronautics, maritime technology and more.



Letters



A project of patience



BD-200 autocycle, a motorcycle-based vehicle, is a 2-place tandem.

efore starting construction, it took me a year to gather all the parts needed for my autocycle (see BD-200: It Almost Flies, page 148, Feb. '82). And then it took two years to build it in my garage at home. The hardest job was getting the aluminum pipe for the main frame. I found it at a boat-building yard in Vancouver. In Edmonton, Alberta, I found a place that used my forms to pull the Plexiglas windshield and canopy. The motorcycle parts are from a Suzuki 400. My autocycle may be displayed at Expo '86 in Vancouver. I've enjoyed PM for a long time and have built many of your projects, including the heavyduty workbench that I do all my work on.

GERRY E. MARICLE KAMLOOPS, B.C. CANADA

The BD-200 that reader Maricle built was the brainchild of aircraft designer Jim Bede, founder of Bede Design (1215 Crawford Rd., Lakewood, OH 44107), and was made using Bede's plans. Since it was not a kit with all parts included, construction was a challenge—and the result is beautiful!

A bad rap

In your article Fear Of Flying on page 104 (Dec. '85) there is a photo of a Pacific Southwest Airlines 727 going down in flames "after being



Airliner ran into small plane before '78 crash over San Diego.

hit by a small plane," according to the caption. A small plane did not hit the airliner. The airliner overtook and crashed into the small plane.

EDWARD ROSSIT OLYMPIA, WA

The National Transportation Safety Board concluded that the airliner ran into the small plane, which was flying where it was supposed to, following proper procedures and air traffic control instructions. NTSB determined that the probable cause of the accident was failure of the flight crew of flight 182 to follow proper procedures.

Too often, we in general aviation find small aircraft blamed for accidents not of their doing. In fact, general aviation safety has been improving steadily for the last 10 years.

EDMUND PINTO

SR. VICE PRESIDENT, COMMUNICATIONS AIRCRAFT OWNERS & PILOTS ASSN. FREDERICK, MD

We appreciate the response of the many readers who called and wrote PM regarding the actual sequence of events in the sky over San Diego on Sept. 25, 1978.

Wills, the man

I enjoyed Accessories: A Century Of Progress in your Dec. '85 issue (page 46). However, I would like to correct one small error I noticed. You mentioned that the first automotive backup light was invented by a man named Wills Sainte Claire. Actually, this was the name of the remarkable car that C.H. Wills designed and named after himself and the Saint Clair River where his factory was located in Marysville, Michigan. Besides the first backup light, the Wills Sainte Claire boasted such features as a 65-hp overhead-valve and overhead-cam V8, and an engine fan that automatically declutched at speeds over 40 mph (all this in 1921). Wills was an associate of Henry Ford and one of the chief designers of the Model T (primarily engine and transmission). He also designed the "Ford" script that's still used as the company's logotype. Wills left Ford in 1919. He wanted to make, in his words, a car that was "10 years ahead of its time." The Wills Sainte Claire was also one of the first cars (in 1924) to have 4-wheel hydraulic brakes and lowpressure balloon tires.

> RAY WODEHOUSE TAMARAC, FL

Tribal wrongs

Under the photo of the new



New Jeep pickup is Comanche, not to be mistaken as Cherokee.

AMC Jeep Comanche in your '86 Detroit section (page 92, Oct. '85) you mistakenly refer to it as a Cherokee pickup.

> RICHARD PASCHKE SOUTHFIELD, MI

We hope we didn't ruffle too many feathers with that slip, and that readers realized from the accompanying story that the photo was, indeed, of the new Jeep.

Skiing for credit

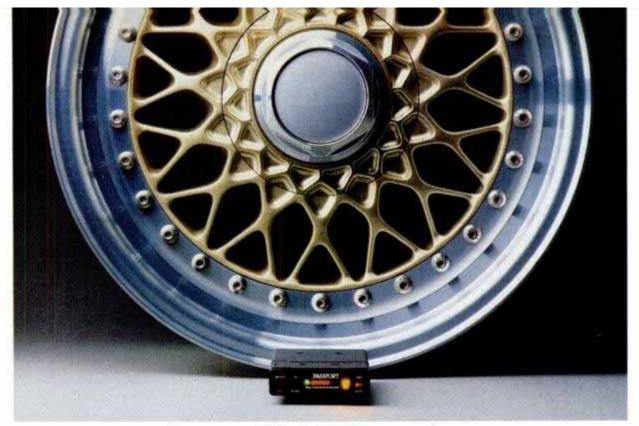
My son was looking for a project for his ninth-grade wood-working class. His grandfather suggested that he build a pair of trick water skis; the plans for which were in the August 1962 issue of PM that his grandfather had saved (How To Make Turn-Around Skis, page 124). Seems some things, like POPULAR MECHANICS, never go out of style.

ROBERT HARRIS ROCHESTER, NY

Old PM issues never die, they just get shopworn. PM



Water skis that Robert Harris's son made are from a '62 issue.



Small Wonder

It's here, pocket-size radar protection.

Imagine a superbly crafted electronic instrument, powerful enough to protect against traffic radar, miniaturized enough to slide into a shirt pocket, beautiful enough to win an international design award.

Small means nearly-invisible protection

That could only be PASSPORT. It has exactly what the discerning driver needs, superheterodyne performance in a package the size of a cassette tape.

This miniaturization is possible only with SMDs (Surface Mounted Devices), micro-electronics common in satellites but unprecedented in radar detectors. It's no surprise that such a superlative design should be greeted by superlatives from the experts.

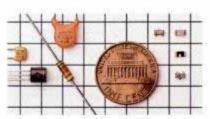
"In a word, the Passport is a winner," said Car and Driver.

The experts report excellent performance. Simply switch PASSPORT on and adjust the volume knob. Upon radar contact, the alert lamp glows and the variable-pulse audio

Small means the size of a cassette tape

begins a slow warning: "beep" for X band radar, "brap" for K band. Simultaneously a bar graph of Hewlett-Packard LEDs shows radar proximity.

As you get closer, the pulse quickens and the bar graph lengthens. Should you want to defeat the audible warning during a long radar encounter, a special switch provides silence, yet leaves PASSPORT fully armed for the next encounter. A photocell adjusts alert lamp brightness to the light level in your car PASSPORT was designed for your protection and your convenience.



In PASSPORT, 102 SMDs (right) do the work of ordinary transistors, resistors and capacitors.

PASSPORT comes with a leather case and travels like a pro, in your briefcase or in your pocket—to the job for trips in the company car, on airplanes for use in far-away rentals. Just install on dashtop or visor, then plug into the lighter PASSPORT keeps such a low profile. It can be on duty without anyone noticing.

Small means an easy fit in the briefcase

One more PASSPORT convenience—call us direct. It's toll free. We make PASSPORT in our own factory and we'll be happy to answer any questions you may have. If you decide to buy, we'll ship your PASSPORT within 24 hours by UPS, and we'll pay the shipping. For an extra \$6.00, Federal Express guarantees 48-hour delivery.

If you're not satisfied within 30 days, return PASSPORT. We'll refund your purchase and your return shipping costs. There are no hidden charges.

Isn't it time for a PASSPORT of your own?

\$295 (OH res. add \$16.23 tax) Slightly higher in Canada





© 1985 Cincinnati Microwave, Inc.



Call Toll Free 800-543-1608

Cincinnati Microwave Department 100-068-C15 One Microwave Plaza Cincinnati, Ohio 45296-0100

Editor's Notes



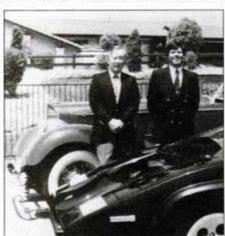
hat's Madonna, Bruce Springsteen and Dire Straits doing in POPULAR MECHANICS? Are we turning into Rolling Stone? Hardly. The fact is, you can't go to a rock concert today without being confronted with leading-edge electronics technology. And technology is one of the things this magazine is all about. With computers controlling laser lights, sound mixing, smoke effects, explosions and every other facet of the show, it's a wonder music is still part of it. Of course, the music is still the heart of rock and roll. But high-tech runs a close second these days. Read all about it in this issue starting on page 99. . Mike Kitain, also known as The Power Broker among Corvette cognoscenti, is

one guy I really envy. Imagine making your living by buying and selling the creme de la creme of the Corvette world. Nothing but the best tripower, big block and fuel-injected cars for Kitain. His Corvette Enterprises in Passaic Park, New Jersey, is probably the largest Corvette brokerage in the country. Kitain's reputation among Corvette people also gives him access where others are denied. If it weren't for Kitain and his contacts in the inner sanctum of the world of Corvettes, we'd never have had our story on the 1990 Corvette, which appears on page 60. We can't wait to drive one. . When Outdoors Editor Tim Cole came in and said he wanted to do an article on \$30,000 shotguns, I



Cole (left) with Jeremy Clowes, Holland & Holland marketing director.

reached for the phone to order a straitjacket. Once I calmed down, Cole convinced me that there was a fascinating story here. What makes one gun cost as much as some people pay for their home? Or as much as two cars? To get the answer (page 106), Cole traveled to England to visit the premier gunmakers of the world-Holland & Holland and James Purdey & Sons. Yes, there is such a thing as a \$30,000 shotgun, and people buy them. And while such a gun may be little more than a curiosity to you, Cole's words about \$300 shotguns may be more meaningful, if less fantasylike. . . . How many of you have asked, "What kind of car should I buy?" Probably all of you at one time or another. We try to help you make an intelligent buying decision with our road tests and other automotive articles in PM. But what if you need still more help? Now you can call The Car Consultants. The Car Consultants are a former Detroit Editor of



Batchelor (left) and Witzenburg are The Car Consultants.

this magazine, Gary Witzenburg, and a former editor of Road & Track, Dean Batchelor, Both Witzenburg and Batchelor are truly car enthusiasts and car experts. For a modest fee, they'll listen to your needs, desires and budget. Then they'll research the car market and make recommendations on what you should buy. For more information, contact The Car Consultants, PO Box 1003, Woodland Hills, CA 91365. "Til next time.



Editor-In-Chief Joe Oldham

Managing Editor Bill Hartford

Graphics Director Bryan Canniff

Science/Technology Dennis Eskow, editor

Automotive

Wade A. Hoyt, SAE, editor Norman S. Mayersohn, assistant editor Jim Dunne, Detroit editor Michael Lamm, Steve Potter, Mort Schultz, Rich Taylor, contributing editors

Home And Shop

Steven Willson, editor Joseph Truini, shop and tools editor Arthur Rooze, associate editor Roy Berendsohn, assistant editor Norman Becker, Rosario Capotosto, Steve Toth, contributing editors

Electronics

Stephen A. Booth, editor James B. Meigs, Ron Scibilia, Terry Shea, contributing editors

Boating/Outdoors Timothy H. Cole, editor

West Coast

Steve Parker, editor

Editorial Production Peter Francesconi, chief John Bostonian Jr., art Rebecca Harth, David Meyer, copy editors

Art Ira Herrick, design director John Johanek, art director Alan Andresen, Ann Bennett, associate art directors Diane DePasque, assistant art director

Editorial Administration

Josephine Caronia, administrative assistant Barbara A. Novak, executive assistant

Editorial Offices

224 West 57th St., New York, NY 10019 We cannot be responsible for loss of unsolicited queries, manuscripts, or photos. For return, they must be accompanied by adequate postage.

SUBSCRIPTION SERVICE: Popular Mechanics Magazine will, upon receipt from its reader of a complete new or renewal subscription order, undertake fulfillment of that order so as to provide the first-copy delivery either to the Postal Service or alternate curriers within six to twelve weeks. If for some reason this cannot be done, you will be promptly notified of the issue date that will begin your subscription, with a request for any further instructions you may have concerning your order. Please address all such orders to us at Popular Mechanics, P.O. Box 10064, Des Moines, IA 50050, e Should you have any problem with your subscription, please write Joan Harris, Castomer Service Department, Popular Mechanics, P.O. Box 10064, Des Moines, IA 50050 or call toll-free 1-800-247-5470; IA residents call 1-800-522-1272. Please enclose your mailing label when writing to us or renewing your subscription • Renewal orders must be received at least eight weeks prior to expiration to assure continued service.

Use this address for subscription orders & inquires. POPU-SUBSCRIPTION SERVICE: Popular Mechanics Magazine

Use this address for subscription orders & inquires. POPU-LAR MECHANICS, P.O. Box 10064 Des Moines, Iowa 50350.



Wise Buy

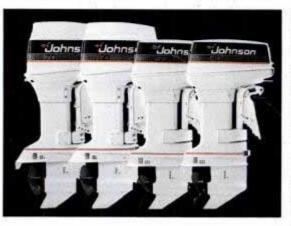
When you match an outboard to your new boat, go value shopping, not bargain hunting.

Your outboard is an important part of your boating investment, so be sure you get the best value.

That means getting an outboard that's technically advanced, like a Johnson®, to give you more important features now, better resale down the line.

And it means not settling for anything less than an outboard that performs like a Johnson. Fast. Strong, Smooth.

The outboard you choose should have a simple and precise oilinjection system, a rugged single-



piece crankshaft you can count on, and full corrosion protection. Like a Johnson.

And value means an outboard with a reputation for dependability, one that's backed by a nationwide network of servicing dealers with parts in stock when you need them. Like — you guessed it — Johnson.

Truth is, you're going to find that no other outboard comes close to measuring up to Johnson value. And that's why, throughout the world, more boaters run Johnson outboards than any other brand.



Ask about the optional OMC 1+2™ Extended Protection Plan available from your Johnson dealer. For the name of your nearest Johnson dealer call 1-800-255-2550.



©1986 Outboard Marine Corporation. All rights reserved.

Imports

BY BILL HARTFORD

Ultimate driving with BMW



Student in 535i dodges pylons at BMW/Skip Barber Driving School.

f a big Mack ever hits me from behind, I hope I've adjusted my head restraint properly. And if I have to dodge a drunk, I hope my car's responsive enough to get me out of harm's way. BMW is one car company that prides itself on building active and passive safety into its models. But that doesn't mean we're off the hook. Even with built-in safety features, the responsibility to buckle up and adjust head restraints is the driver's (in some BMWs, displaying the height of luxury, head restraints are power operated). And only the driver can utilize a car's active safety potential-using a steering wheel and a couple



Switch on new automatic selects sport, economy or manual.

of pedals. The best way to sharpen your use of these controls is with some g-whiz training—feeling g-forces while skidding, swerving and braking somewhere safe with an instructor at your



Chris Hartford gets tips from instructor Terry Earwood before practicing skid control in 325e.

side. The safe place for us was at the Lime Rock track, which is one of the locations where BMW is conducting an advanced driving school with former racer Skip Barber and his first-class cadre of instructors. In the 1-day session, we unlearned bad habits and practiced controlling skids, while quantum

susp dyna Ir

The L7 is the super-luxury version of BMW's 735i 4-dr. sedan.

leaps in skill level were made by young drivers never versed in emergency handling in driver education. The best investment you can make in your future safety on the road is this 1-day course (\$400). Even better is the 2-day program (\$700). Enrollment is through local BMW dealers. There's also no harm, figures BMW, if you develop a keen appreciation for its cars.

BMW's cars are easy to appreciate. All models now mount 6-cylinder engines and feature antilock braking. Best value are the 3-series cars-under \$23,000. The entry-level 325 (2-door or 4door) uses the 2.7-liter Six (121 hp) and includes as standard just about anything you'd want: air; sunroof; sound system; power steering, locks, windows, mirrors. The 325e is a luxury 4door that gets leather seats, electric sunroof and cruise control. The 325es, a sporty 2-door, has special seats,

suspension, lights and aerodynamic body parts.

In the 5-series, the 528e is the mild sedan and the 535i is the wild, 182-hp 4-door. In between is BMW's first diesel,

the 524td turbodiesel. Introduced the middle of last year, it has an 11-second 0 to 60 and 106 mph top speed.

BMW's big luxury sedan is the 735i with its leather seats, wood trim, full power assists and 3.5-liter Six. The



Sporty 325es, set up for the enthusiast, has firm suspension.

L7 takes luxury to the nth power, including full leather interior. Airbag in the steering wheel hub is standard, as is a new electronically controlled automatic transmission (optional in 735i, 535i and the 635CSi coupe). It has a 3-position switch on the console for choice of S, E and 1-2-3 modes. In E, shifts occur at relatively low speeds for fuel economy. In S, or sport position, upshifts are at higher speed. In 1-2-3, you get full manual control.

Look out for the Legend

Next month at Acura dealerships, Honda rolls out its most expensive car to date, the Legend. Honda Motor Co. makes it in Japan, but lest it be confused with those other "cheap" Hondas, the \$18,000 Legend is being marketed through a separate division.

To set it apart farther, Honda insists that Acura dealerships be at least a dozen miles distant from dealers who sell Civics, Preludes and Accords. Honda is the first of the Japanese carmakers—the rest are right behind—to take aim at the luxury market. The first victims may be the Europeans with cars that have eased over the \$20,000 mark in recent years: BMW, Audi, Volvo, Saab. And since "Japanese Mercedes" is a tag hung on Honda, even M-B cars are a target.



Legend Xi, 3000 pounds of luxury, has 160-hp, 2.5-liter V6.

Publisher

Daniel J. Coleman

Advertising Director

Floyd Sembler

National Sales Manager Bud Gilbert

Advertising Offices

New York

224 West 57th St New York, NY 10019 (212) 262-8824

Chicago

1 South Wacker Dr. Chicago, IL 60606 (312) 984-5190

Detroit

377 Fisher Rd. Grosse Pointe, MI 48230 (313) 881-3520

Los Angeles 3000 Ocean Park Blvd. Santa Monica, CA 90405 (213) 450-8881

Business Manager

Agnes P. Maillaro

Marketing Director Edward Vaquero

Production Manager

Lori Ellwood

Advertising Production Patricia Woods

(212) 262-4800

Classified Sales Manager

Sophie Gronowicz (212) 262-4825

Reader Service Department

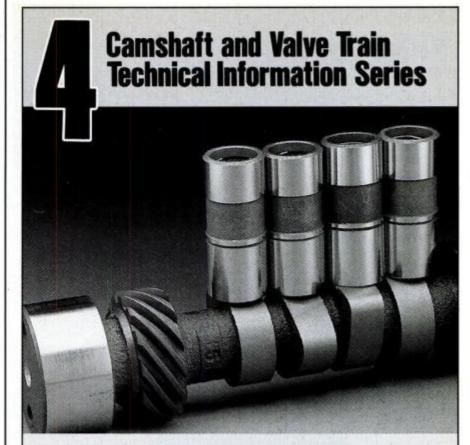
Gary Frederick, supervisor 224 West 57th St., New York, NY 10019 (212) 262-4292

Published by The Hearst Corporation:
Frank A. Bennack Jr., President
Randolph A. Hearst, Chairman
Gilbert C. Maurer, President, Magazines Division
Richard E. Deems, Publishing Consultant

POPULAR MECHANICS is published monthly by the Hearst Corporation, 959 Eighth Avenue, New York, NY 10019, U.S.A. Frank A. Bennack Jr., President; Randolph A. Hearst, Chairman; Harvey L. Lipton, Vice-President and Secretary, Edwin A. Lewis, Vice-President and Treasurer. Hearst Magazines Division: Gilbert C. Maurer, President; K. Robert Brink, Executive Vice-President; George J. Green, Executive Vice-President; Mark F. Miller, Executive Vice-President; Thomas J. Hughes, Vice-President & Resident Controller; Kenneth A. Chester, Vice-President, Director of Circulation; Daniel J. Coleman, Vice-President for Popular Mechanics.

INTERNATIONAL EDITIONS: CARIBBEAN, MEXICO, SOUTHERN HEMISPHERE

AS A SERVICE TO READERS, Popular Mechanics AS A SERVICE TO READERS, Popular Mechanics publishes newsworthy products, techniques and scientific and technological developments. Due to possible variance in the quality and condition of materials and workmanship, Popular Mechanics cannot assume responsibility for proper application of techniques or proper and safe functioning of manufactured products or reader-built projects resulting from plans published in this magazine.



Cirst Performance Cam and Lifters warranted for the life of your car or truck

You read it right-lifetime* warranty! Crane Cams is proud to be the first major cam company to put its warranty where its mouth is. If you buy any new Crane hydraulic camshaft and matching hydraulic lifters, and if they ever prove defective, we'll replace them-FREE-for as long as you own your car.

New kit includes Lifters, Lube Hardware and instructions

Chances are you'll NEVER need such a comprehensive warranty. Obviously, we didn't get to be the world's largest performance cam company by giving away free cams. But if you saw the quality control steps that go into every Crane cam and valve train component, you'd realize

why we're so confident about our quality and dependability.

Crane Cams is an absolute powerhouse of technology. You can see it in the winner's circle of virtually every form of motor sports. You can see it in the ultra high-tech computercontrolled manufacturing equip-ment we use. And you'll see it for yourself when you experience the power, throttle response and outstanding reliability that comes with genuine Crane engine components. Fact is, a performance cam and lifters is the single most powerful modification you can make in an engine, and frankly, we make the best. If you're looking for performance-without problems—we invite you to take the final step up to Crane. It's high performance that lasts a lifetime.

* See our written limited lifetime warranty for full details.

If we build it, you know it's right

Crane products are available consumer direct. Camshaft part number 113901 (shown)—\$102.24. Lifters shown part number 99277-16—\$90.88. Add \$10.00 shipping and handling. Send to Crane Cams, Inc., 530 Fentress Blvd., Daytona Beach, FL32014.

Photography





f Santa recently left camera equipment, binoculars or a telescope by your hearth—take heart. There's still time to snatch a last glimpse of Halley's Comet before this oncein-a-lifetime (for most of us) phenomenon zooms beyond the sight of earthbound mor-

Last seen in May 1911, the peripatetic space-ham began its current theatrical run in November, then dipped behind the Sun for a winter tan. The comet is expected to look marvelous when it makes its return engagement this month—brighter than before, and wearing a longer train.

You'll have 'til mid-April to catch the act before it goes on another 75-year road tour to other parts of the universe. The farther south you are, the better—the South-

ern Hemisphere being best of all. But even as far north as 42° above the Equator (the latitude of New York) you'll be able to spot Halley in the predawn sky, slightly above the southern horizon. In fact, you'll see it juxtaposed near the Milky Way this month.

To help you observe and photograph the comet better, we've collected these tips from knowledgeable makers of camera and optical equipment. First, though, we'd like to make a suggestion of our own.

A great deal of hoopla attends major astronomical events such as the return of Halley. But many other beautiful sights routinely shine in the night sky, though they rarely grab the quantity of limelight that a Halley does. After this traveler becomes a memory,

make the most of your equipment to observe and document the space dwellers that entertain us all the time. The hints provided here are timed for Halley-watching, but they apply equally well to other astrophotography opportunities.

■ If your camera can take time exposures, it's fine for shooting stars. To capture Halley, keep the shutter open for 5 to 60 seconds, but be sure to use a cable release and sturdy tripod to minimize vibration.

■ The camera's standard 50mm lens will do fine. Focus at infinity, and open the aperture to its widest (fastest) setting. For special effects, experiment with wide-angle and telephoto lenses.

■ For dramatic closeups, attach your camera to a telescope. Adapters for this are available from photo specialty stores. Just remember—telescopes and telephoto lenses have high magnification but narrow angles of view. With a 50-mm lens (or lower) you'll grab more of the comet's tail.

■ Use films that give you the best combination of high speed and fine grain. ASA 1000 film (slide and print) is faster but grainier than ASA 400. Try both.

■ Pictures of the nighttime sky might appear as underor unexposed frames to your processing lab. Give instructions to print (or mount) all your exposures.

■ Light (and heat waves) can obscure or distort your view of the heavens. Shoot away from city lights (and moonlight). Cold weather is preferable and perhaps unavoidable, so take standard winter precautions. Keep the batteries warm, advance the film slowly to prevent static and tearing, don't let condensation form in the camera.

A final word on Halley: While you photograph the comet at long exposures, the Earth and stars continue on their courses. This means your picture will show other heavenly bodies besides Halley as streaking stars.

If you like this effect, fine. But if you want a still, starry background for Halley to show off against, you'll have to track the comet with your camera. Spiratone's Bracket/Scope enables you to do this. The attached telescope lets you see and follow the comet while you're making the exposure-since an SLR camera's own viewfinder is closed when its shutter is open. The Bracket/Scope costs \$100 with 3-way panhead, \$140 with geared movement. Call (718) 886-2000 to order.

PM PHOTO ALBUM

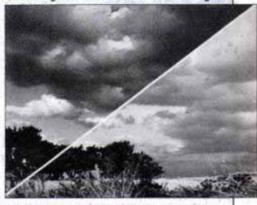
The lack of color in black and white images creates an opportunity to exercise one's imagination. Responding to new public interest, many labs, including Kodak, now process monochrome films.

Improving black and white pictures requires the understanding that these films do not perceive colors in the same way our eyes do. The film tends to be more sensitive to certain colors, such as blue.

To create black and white images with the same "relative bright-

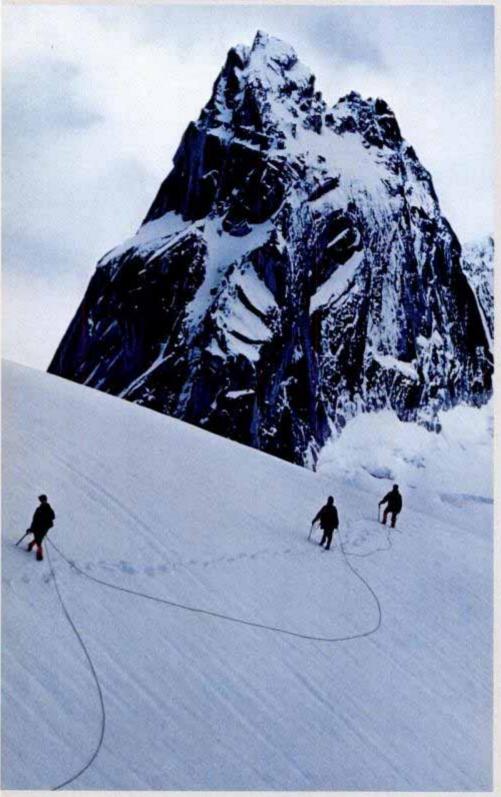
ness" that we are used to seeing among colors, use a No. 8 (yellow) filter on the lens. For dramatic skies use a No. 25A red filter to absorb haze-producing ultraviolet rays.

Filters can also be used to increase contrast between colors. To lighten a color, use the same colored filter. To darken a color, use the complemen-



tary colored filter. Red and green are complementary colors, as are blue and yellow. The left half of this cloudy beach scene was shot through a 25A red filter. It's more dramatic than the right half, for which no filter was used.—Armand Ensanian

Purcell Mountains. A rugged place for a smooth whisky to start.



WESTERN CANADA—The hardest part of the climbing is just getting enough air. I gulped it in. Icy. Thin.

And then we stopped, and looking around took my breath away all over again.

Later, thawing out by the fire, we knew we'd been someplace we could never forget.

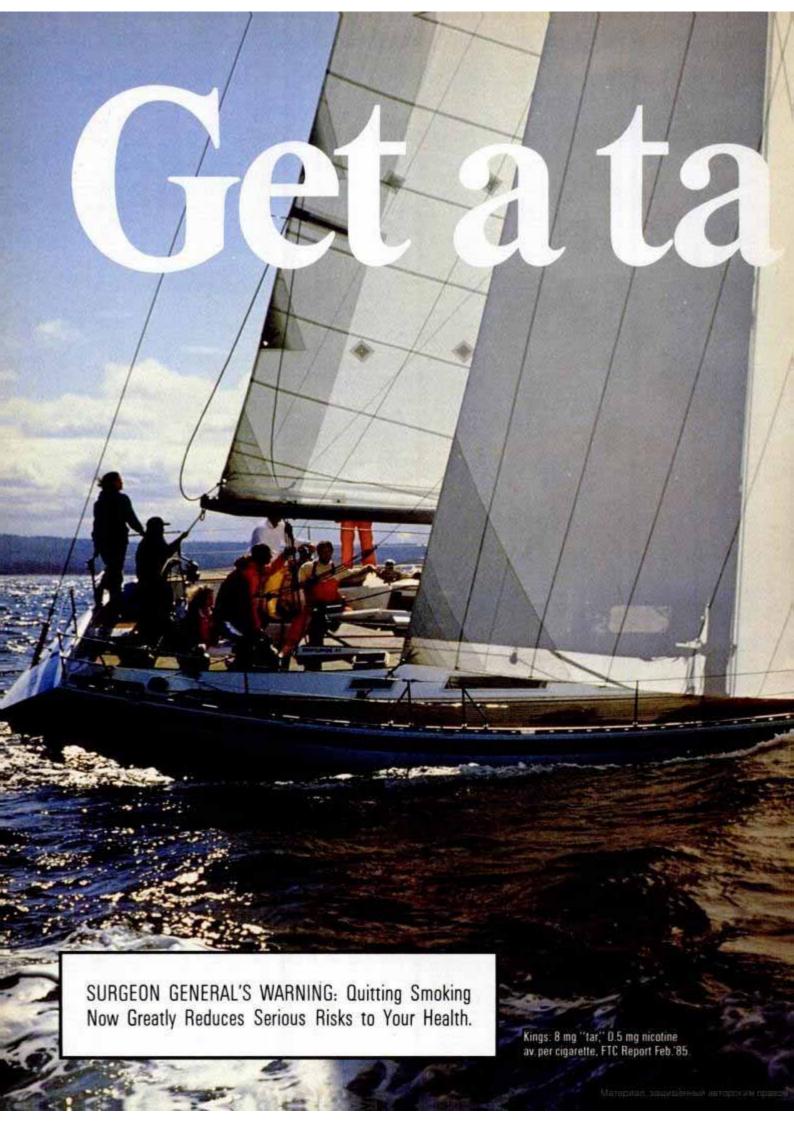
Over Windsor Canadian, we talked about it all night long. That's some smooth whisky.

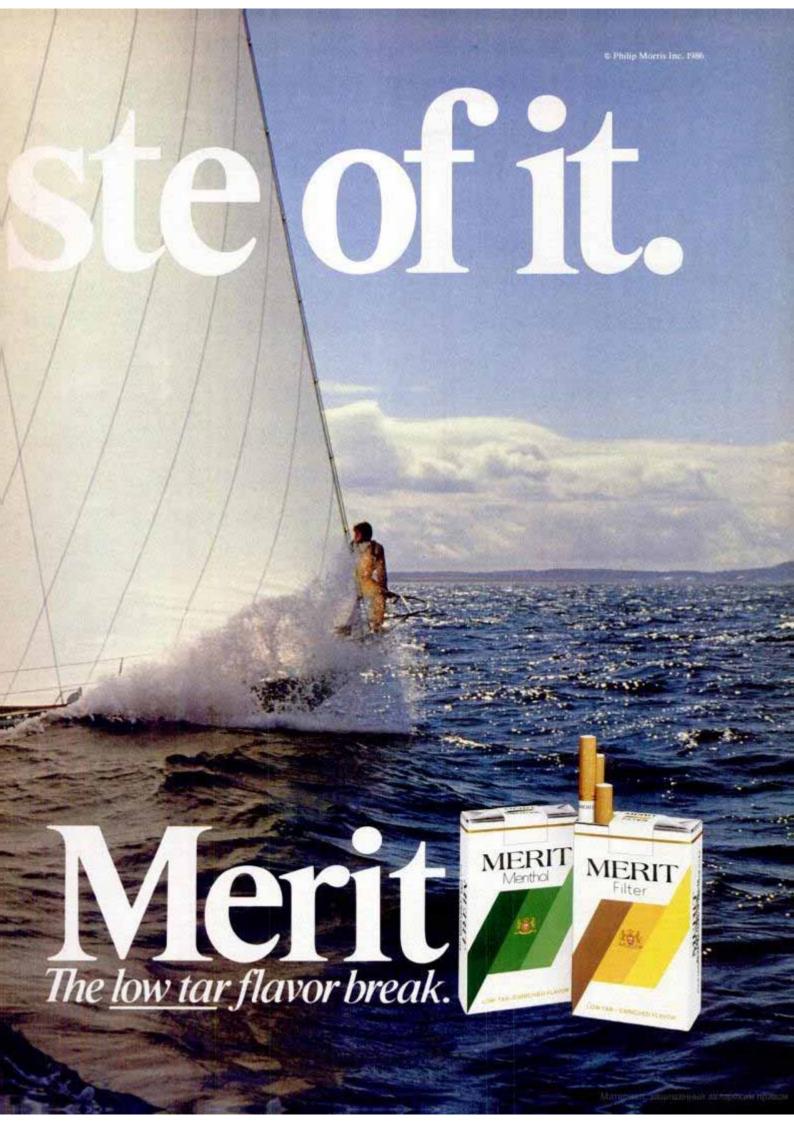
It's made from water that runs down from the glaciers. They use the local rye. And that high, clean air must have something to do with the way Windsor Canadian ages.

Rugged country. Smooth whisky. Both unforgettable.



WINDSOR CANADA'S SMOOTHEST WHISKY.





Freewheeling



BY WADE HOYT

Life in the fast lane



Smooth roads, light traffic on autobahn make high speed possible.

ne of the joys of driving in Germany is being able to take a car out on the *autobahn* and see what it'll do. That's because many sections of *autobahn* have no speed limit, and you can belt along at well over 100 mph. Most Americans view this as sheer madness, but Germans seem to consider it a God-given right. At least until recently, when environmentalists tried to impose a 62-mph speed limit to reduce auto emissions suspected of killing trees.

German carmakers opposed this vigorously, arguing that unlimited speeds have made German cars the best in the world. They have a point. When the *autobahns* were first opened in the '30s, many drivers went out to do what came naturally, and the roadsides were littered with blown engines. German carmakers soon learned to build engines that could run at top speed for hours on end, instead of just minutes. Brakes and suspensions were improved, as well.

A 10-month test proved that speed limits made little difference in roadside pollution, preserving one of the best rides in the world: no looking over your shoulder for police, just stand on it! Alert, law-abiding drivers who keep right and watch their mirrors help to make it all possible.



At 130mph in a Mercedes, your worry is 150-mph Porsches, not cops!



Pontiac's fwd 6000 SE provides sports performance in a wagon.

No tail waggin'

The last time we drove a GM A-body station wagon (see Long-Term Test Reports, page 68, July '84), we were not impressed. Sloppy handling and poor quality were high on our list of complaints. The new Pontiac 6000 SE shows what can be done with this platform. Equipped with P195/70R14 Eagle GT tires on 14-in, castaluminum wheels, 28-mm front and 22-mm rear stabilizer bars and Electronic Ride Control, it is one of the best handling station wagons in America. There's no tail wagging at highway speeds and no washing out in turns. The 140-hp 2.8-liter V6 properforvides satisfying mance. Leather steering wheel and bucket seats make it a real sports wagon.

The real Taurus

Although the Ford Taurus and Mercury Sable officially went on sale Dec. 26, we'd been driving prototypes since early 1985. We finally got to drive a real production-line Taurus for a few weeks and were very impressed. The car had a few startup glitches: fit and finish were not up to Ford's recent high standard, the ride was very jiggly on rough roads, and the automatic transmission occasionally threw a hard shift. But otherwise, this car has the potential to be one of the best U.S. sedans ever. Handling and performance are outstanding for a family car. We can hardly wait for a performance model, which Edsel Ford says "will be like the Pontiac 6000 STE.'



Peugeot's already good 505 Turbo is improved and smoother.

Peugeot puffer is a real smoothie

Probably one of the most performance under-rated cars in the world is the Peugeot 505 Turbo Sedan. This car is so smooth that it doesn't seem to be going as fast as it is. When we last tested one (see *The Sports Sedans*, page 92, March '85), we said, "For such an attractive and comfortable car, the performance is uncanny." That performance included 16.7-sec. 1/4-mile times at 82 mph and handling that rivaled the best Europe had to offer in the big-buck (\$18,000 to \$24,000) sports sedan class. For 1986, an intercooler has been added, upping power modestly from 142 hp to 150. More important, the power peak has been lowered from 5600 rpm to 5000 and the new, smaller turbo has much less throttle lag.

The interior features a major improvement in the dash and controls. Gone is the forest of control stalks with their effete script labels, replaced by a modern "Euro-tech" design that's much easier to live with. This year the turbo motor is available on the big Peugeot wagon and with automatic transmission.

NISSANINTRODUCES THE MOST IMPORTANT TRUCK ADVANCE IN 25 YEARS.





BODY NISSAN

BIGGER INSIDE Totally re-designed. Nissan created this new truck around its most important payload—you. With the biggest, broadest, roomiest cab in any Nissan.

BIGGER OUTSIDE Totally re-shaped. With hot-rolled steel wrapped around the longest, widest, most aerodynamic truck Nissan's ever built. And the biggest cargo box of all leading standard compact trucks. The Hardbodies. Bold. Taut. Muscular.

The Nissan SE King Cab® 4X4 Optional light bar, grille and brush guard shown here not available until April '86.



EVERY TRUCK FUEL-INJECTED

Regular Bed. Long Bed. King Cab.® 4X2. 4X4. The whole line fuel-injected for more power and performance. With a new 5-speed manual transmission standard throughout the line.

BIGGEST V-6 IN THE CLASS Workout the biggest engine in any compact truck ever—Nissan's new 3.0 litre overhead cam V-6. With 140 horse-power, no other compact pumps out more power. Or, choose Nissan's twinspark, hemi-head 2.4 litre NAPS-Z engine. It's got the most power—106 horsepower—and torque of all the leading standard model compact trucks.

NEW FUNCTIONAL AERODYNAMICS

Nissan knows that power alone doesn't make a truck great. It takes a truck designed with agility and finesse, too. Witness the new Nissan—the airfoil roofline, raked windshield, sloped hood and flared fenders. They weren't designed to make this Hardbody the sleekest, hottest-looking truck on the street—they're a function of aerodynamics designed to improve performance, reduce noise, and deliver a smoother ride.



Nissan SE King Cab 4X4 in Thunder Black

Standard Regular Bed 4X2 in bright red— Nissan's lowest sticker-priced Hardbody



LINE OF COMPACT TRUCKS EVER

BUILT TOUGHER FROM THE
GROUND UP Every Hardbody truck is
built around a new, reinforced box-ladder
chassis as tough as the steel from
which it's cast—a chassis that handles
a 1400 lb. payload on all the
new E, XE, and SE models.
A clean new underbody design—

featuring a beefed-up independent front suspension—creates Nissan's best-ever ground clearance. And more galvanized steel is used in its underbody and sheet metal for even more rust resistance.

ONE-TON PAYLOAD For extra-big loads, Nissan's got an extra-big, extra-tough Hardbody—the new Heavy Duty Long Bed. V-6 powered, it's got an 88" bed and a 2000 lb. payload.



NISSAN-OUR BIGGEST, WIDEST,

BIGGEST CARGO BOX Double walls of steel shape a cargo box so wide and deep, this new Nissan has the biggest cargo volume of any leading standard compact truck. It's wider, too, between the wheel wells, accommodating a wider track and bigger tires. Incredible attention was paid to even the smallest details. Case in point—the tie-down hooks. They're hidden—set into the

cargo-side walls until you pop them out. These patented pop-up hooks are a Nissan exclusive.



Nissan exclusive, standard on all SE models.

BIGGEST, FATTEST TIRES The biggest. widest (P235/75R15) factory-available tires of any compact truck are standard on the SE 4X4. If the biggest aren't big enough, trick-out the SE with Nissan's optional 31 X 10.5 R15's mounted on new alloy wheels. It's the hot set-up. BIGGER KING CAB® America's best-selling extended-cab compact truck is now even better—and bigger. With more lockable space behind the buckets-for people or cargo. This new King Cab® introduces hideaway jump seats that fold flush into the side walls-another Nissan exclusive. And, new side windows wrap into the roof for extra visibility.

BIGGEST, ROOMIEST CAB—
DESIGNED AROUND YOU Move into
Nissan's biggest cab ever. Discover
roominess head and shoulders above
anything you ever expected in a compact
truck. Look through the big side
windows and huge windshield—the
visibility is Nissan's best ever. New
insulation and aerodynamics combine
to dramatically reduce interior noise.
Ventilation is improved, too. Nissan
calls it ergonomics. You'll just call it
intelligent. With full instrumentation
laid out the way it should be. Easy to
read. Easy to reach.



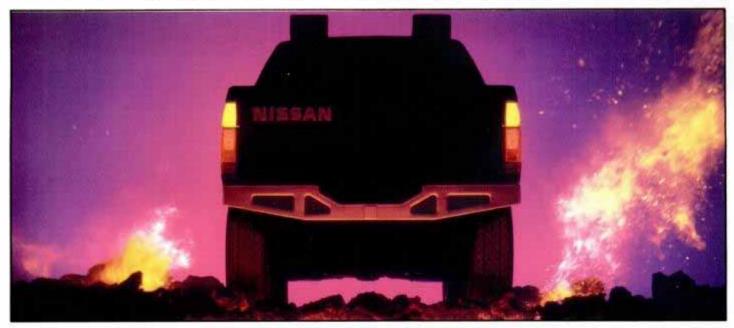
ROOMIEST TRUCKS EVER



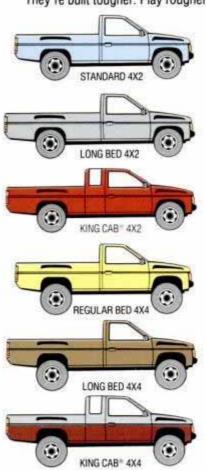
WIDE CHOICE OF OPTIONS There's a Hardbody truck for everybody. Regular Bed. Long Bed. King Cab. 4X2. 4X4. The long list of options includes the only 4-speed overdrive automatic transmission in any compact truck. A big, new air conditioner. A Power Package (available with Sport Package) with power windows and doorlocks, cruise control, variable intermittent wipers, dual electric outside mirrors, and a superb AM/FM stereo cassette 4-speaker system. And the list goes on. Outfit a Hardbody truck any way you want-there will never be an ounce of fat on it.



SPEC THE NISSAN HARDBODIES



They're built tougher. Play rougher. Look hotter. They're Hardbodies. There's never been a line of trucks in better condition.



NISSAN TRUCKS DIMENSIONS AND WEIGHTS	REGULAR BED	LONG BED	KING CAB*	REGULAR BED	LONG BED	KING CAB®
		4X2			4X4	
Wheelbase (in.)	104.3	116.1	116.1	104.3	116.1	116.1
Length Overall (in.)	174.6	190.0	190.0	174.6	190.0	190.0
Width (in.)	65.0	65.0	65.0	66.5	66.5	66.5
Height (in.)	62.0	62.0	62.0	66.7	66.7	66.7
Track—Front (in.)	54.9	54.9	54.9	56.1	56.1	56.1
Track—Rear (in.)	54.5	54.5	54.5	54.5	54.5	54.5
Headroom—(in.)	39.3	39.3	39.3	39.3	39.3	39.3
Legroom—(in.)	42.2	42.2	42.6	42.2	42.2	42.6
Shoulder Room (in.)	55.3	55.3	55.3	55.3	55.3	55.3
Payload (lb.)	1400	1400	1400	1400	1400	1400
Bed Length (in.)	72.6	0.88	73.4	72.6	88.0	73.4
Bed Width (in.)	59.8	59.8	59.8	59.8	59.8	59.8
(Between Wheel Wells)	41.7	41.7	41.7	41.7	41.7	41.7
Bed Depth (in.)	17.1	17.1	17.1	17.1	17.1	17.1
Transmission (std.)	M50D1	M50D	M50D	M50D	M50D	M50D
Transmission (opt.)	A40D*	A40D	A40D	N/A	N/A	N/A
NISSAN TRUCK ENGINES	2.4L I-4			3.0L V-6		
Displacement (cc)	2389			2960		
Horsepower @ rpm	106 @ 4800			140 @ 4800		
Torque (ft. lbs.) @ rpm	137 @ 2400			166 @ 2800		
Induction System	Single Point Fuel-Injection			Single Point Fuel-Injection		

YOURSELF

**Heavy-Duty Payload Available 2000 lbs **Regular Bed Standard Payload 1000 lbs. **Manual 5-Speed Overdrive **Automatic 4-Speed Overdrive Nissan trucks are available with a wide choice of trim levels (STD, E,

Nissan trucks are available with a wide choice of trim levels (STD, E, XE, and SE), exterior colors (11—including 3 great new two-tones), and interior colors (4—including a new dark red).





Motorsports



BY STEVE POTTER

Closed-circuit records



Ford racer Lyn St. James poses with the 204-mph Mustang Probe.

ast November, Lyn St.

James flat-footed the
Ford Mustang Probe GTP
coupe around the highbanked 2.66-mile Talladega
International Speedway at a
lap average of 204 mph. That
established a new women's
closed-course speed record.

Closed-course speed record attempts don't seem to generate the kind of excitement that accompanies assaults on straightaway records. That's because probably straight-line land-speed-record machines like Richard Noble's massive jet-powered Thrust 1 are so exotic in appearance-and the numbers associated with their velocities are of such magnitudethat they dwarf the highspeed marks set on traditional racetracks. In '84, Noble set a land-speed record of 633.468 mph, while the official closedcourse record is by Mark Donohue at over 221 mph.

Donohue set his mark on the NASCAR stock-car track at Talladega, Alabama, in August 1975. Earlier that year, the former Indy 500 winner had come out of a year-long retirement to drive Roger Penske's new Formula One car on the European Grand Prix circuit. But for the record attempt, he retrieved the Porsche 917-30 he'd used to win the 1973 Can-Am championship.

The Porsche was a remarkable car. It was developed from the 12-cylinder 917 endurance racing coupes that had signaled the German firm's transformation from a producer of quick, small cars to a supercar builder.

In its normally aspirated 5liter form, the 12-cylinder engine produced perhaps 500 hp

and could propel the sleek, low-drag 917 long-tail coupe a reported 240 mph! Turbocharged, the engine produced as much as 1000 hp on the dynamometer. In race trim, fitted in the Cam-Am roadster, it generated about 800 hp. But the terminal velocity for the Can-Am car wasn't as high as the less-powerful endurance racer. Since the Porsche enjoyed a huge horsepower advantage over the other Can-Am contenders, what Porsche engineers had done was to trade off some of that extra horsepower for increased downforce. The higher cornering speeds

St. James' run at Talladega last November was made in one of the most potent roadracing cars ever conceived. With its advanced, modular chassis/body construction, it weighs 1980 pounds. Its 2.1liter 4-cylinder turbo-motor kicks out about 710 hp.

permitted by the added

downforce more than made

up for the loss of theoretical

top speed.

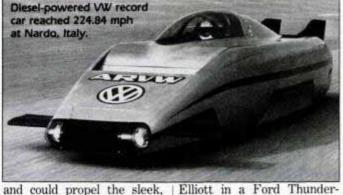
But the 204.223 Lyn recorded on her last of four laps—absolutely flat out all the way around the track—fell short of Donohue's mark by a wide margin, and failed even to match the 209-plus mph NASCAR stock car qualifying record set by Bill

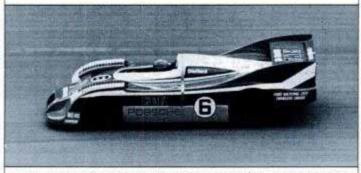
Elliott in a Ford Thunderbird. That car has the frontal area of a barn door and, at most, 650 hp. Why wasn't the more powerful Probe, with less frontal area, faster?

It's not that St. James isn't a good driver. Ironically, the fault lies in the basic design of the road-racing car, which compromises top speed for cornering power. The T-Bird has no ground effects, and because NASCAR rules force a basically stock body contour, despite a larger frontal area, the T-Bird has less drag than the Probe.

Actually, Donohue's record was unofficially broken five years ago. Volkswagen built a special record car, which featured a very narrow width, and ultrastreamlined, low-drag bodywork. The $C_{\rm d}$ was low enough that all it required was 175 hp from a turbocharged diesel engine. Grand Prix champion Keke Rosberg circled the 5-mile high-speed banked test circle at Nardo, Italy, for an hour at a best speed of 224.84 mph. Because VW never applied for an official sanction for its attempt, the record is unofficial. Rosberg, who has a reputation for fearlessness, later described the drive as the most frightening of his life.

If anyone is a candidate to break Donohue's record, it's the man who held the record before him, A.J. Foyt. The 4time Indy 500 champ has a special car being built in England at March Engineering. It features a March 85C Indy car chassis, covered in a lowdrag envelope body. There are rumors that the engine will be an experimental Oldsmobile capable of over 1000 hp. That should be able to kick the record up to 235 mph, even at Talladega!





Mark Donohue's Porsche still holds the official 221-mph record.

Audio



BY TERRY SHEA

Car CD—for a song



The CDA50 adapter by Sparkomatic sends digital audio to radio.

If you want the clear, dynamic sound of the digital Compact Disc in your car, you can spend \$500 to \$600 on an automotive CD player. Or, you can opt for a more versatile portable CD player, and for \$20 pick up an adapter that will let you play it through your car stereo system.

Most personal-size portable CD players are priced at about \$300, and discounts aren't hard to find. So for about half the cost of a car CD player, you've got a unit that can go practically anywhere you can—and do double duty as a home player.

For automotive use

adapters are now available that let you play a portable CD player through car stereo radio/tape players that are not equipped with extra CD inputs. I recently had the opportunity to try two of these adapters, each of which uses a different method for sending the signal from the player to the car stereo unit.

Sparkomatic's CDA50 works by converting the CD player's signal into an FM signal and sending it to your radio through the antenna input. (Sony sells a similar unit in Japan. We'll take a look at it when it arrives here.) You mount the CDA50, which is about 3½ inches square and an inch tall, anywhere that's convenient. For power, a wire is

run from the CDA50 to a fused terminal in the car's fuse box. You then disconnect your car's antenna cable from the back of your radio and plug it into the CDA50. A cable from the adapter then plugs into your car radio's antenna jack.

player requires the connection of a single cable (supplied) between the adapter and the CD player. The player needs power too, and if it is designed to operate on 9 volts, the CDA50 can provide the juice by plugging a supplied power cord between the adapter and the 9volt input on the player. Be certain to check the voltage requirements of your CD player. If it requires something other than 9 volts, you can still use the CDA50, but don't use the power cord. Use the player's battery pack or a cigaret lighter adapter cord. With the player connect-

With the adapter installed, using a portable CD

With the player connected, you turn on the CDA50. The power switch automatically disconnects the car's external antenna so that only the signal from the CD player is sent to the car's radio. You tune the radio to 90.1 MHz on the FM band, and you're in business. To make it even more convenient, you can preset one of your radio's pushbuttons to 90.1 for CD player use.

The other adapter I tried was a prototype device from Recoton that sends the CD player's signal through the magnetic playback head inside your car cassette deck. The device, designed by FM whiz-kid Larry Schotz, looks like a cassette with a wire growing out of it. At one end of the wire is a plug that goes into the CD player's headphone jack. At the other end is a cassette shell, inside of which is a magnetic head similar to the one in your tape deck.

The signal from the CD player is sent to the Recoton device's head, which hands it off to your deck's head. To use it, all you have to do is insert the "cassette" into your tape deck. The player is powered by its battery pack or a cigaret lighter adapter cord.

At \$19.95 each, both the Sparkomatic CDA50 and the Recoton CD Adapter are inexpensive alternatives to buying an automotive CD player. How well do they



Sound from CD goes to tape deck with Recoton adapter.

perform? Both worked just fine for me, and I can't say I detected any difference in signal quality between the two. How good they sound in your car will depend on the quality of your existing car stereo rig.

Because the CD's signal is fed to your speakers through this gear, the clearness of your unit's amplifier (and in Recoton's case, your tape section) will determine how clean a CD signal you hear.

Of the two adapters, Recoton's is the most convenient since there's nothing to install. However, it does require that you have a tape deck, and it doesn't offer a built-in power supply for the CD player as Sparkomatic's adapter does.

Sparkomatic's CDA50 is as easy to use as the Recoton unit, but installing it isn't as easy as the company would have you believe. The instruction manual says that it's not necessary to remove the radio from the dash, but you've got to unplug the antenna cable from the rear of the radio, and in many cars that will require pulling out the radio. In most cases, it at least requires disassembling some parts of the car's dash or console to reach the rear of the radio. Also, wiring the unit to the fuse box will be easier on some cars. If your fuse box is under the hood, you've got to get the wire from the CDA50 through the firewall. Still, if you installed your radio yourself, hooking up the CDA50 will be kid's play. And once installed, it's unobtrusive and a cinch to use.

Sony adapter sold in Japan uses FM too, might arrive here soon.



ce you hear a Delco

Turn it on, start to listen and discover love at first sound. You'll never want to leave your truck again.

That's the way we planned it.
Right on the drawing board, while GM was designing your truck, Delco Electronics was designing the right music system to match that truck's acoustics.

Delco's tuned in to all the latest features, too. From

five-band equalizers* that let you adjust the sound to your own ear to locked-in electronic tuning engineered not to drift,

even if you do.
Stop by your GM Dealer and discover how

a Delco Music System can make the great outdoors sound better indoors.

Delco Electronics

You'll love it too much to leave it.



Interstate, the battery that starts This beautiful rare 1909 Lozier coma cranky seventy year of

peted in the most grueling event possible for classic cars: The Great American Race.

It not only completed the 10 day, 3500 mile coast-to-coast endurance rally, but finished third, within seven minutes and three seconds of a perfect time.

What does it take to get a cranky 76 year old across the country? A quality machine, a strong willed team, and a dependable Interstate battery. This year almost five million Americans will replace their old worn out batteries with new Interstate batteries at over 122,000 authorized Interstate dealers all across America. And for good reasons. Today's vehicles are loaded with more electronics and need deep reserve capacity, as well as dependable starting

power. Interstate Starts Great for you too. batteries have the best combination of both.

Even a toll free 800 number you can call if you ever have a problem.

It's nice to know you are a part of the Interstate Battery system.



Appliance Clinic

BY STEVE TOTH

Dryer drum seal

have a Maytag electric dryer, Model DE406. Lately, I'm finding hardened brown strips of material in the drum. They appear to be burnt strips of a gasket.

W.C. STEWART MISSION VIEJO, CA

You probably need to replace the felt seal on the front lip of your dryer drum. This seal is cemented to the drum lip and provides a tight fit between the turning drum and the front drum cover. Without this seal, you risk having keys, coins or other objects left in pockets fall through the space and short out the heating elements.

To repair the dryer, you'll need a new drum-lip seal, part No. 3-11534, and a tube of high-temperature adhesive, part No. 55980. The seal costs approximately \$6, and the adhesive about \$9. Both are available at a local Maytag parts dealer.

Disconnect the power to the dryer and remove the dryer vent duct. Take off the rear access panel and disconnect the wires from the thermostat on the blower housing, and from the drive motor. The wires are color coded to correspond to the terminals on the thermostat

THERMOSTAT

THERMOSTAT

TO replace a dryer's felt drum-lip seal, disconnect wires to thermostat and drive motor (above). Then, remove cabinet from dryer base. Apply new seal with high-temperature cement.

and the motor switch. If the colors have faded, identify each wire and its terminal with masking tape tabs.

The wires feed into a harness attached to the dryer cabinet. Since your next step is to remove the cabinet, it's easier to disconnect the individual wires than to remove the entire harness.

To detach the cabinet, remove the three large Phillips-head screws at the bottom of each side of the cabinet. Move to the front of the dryer and pull the cabinet toward you to flip it off the base. Move the cabinet forward and set it to one side, out of your way.

You will now be able to see the front lip of the drum with the felt seal—or what remains of it. Scrape off the old seal and adhesive with a chisel or razor blade knife.

Put a bead of the hightemperature cement on the lip of the drum and let the cement set for about one minute. Apply a light coating of cement to the inner surface of the new seal. Slip the seal over the lip of the drum and hold it in place until it bonds. Reassemble the dryer.

Refrigerator makes icicle

I have a Whirlpool no-frost refrigerator, model No. EHT171HKNR3. Water drips out the bottom of the ice maker at the end farthest from the fill tube, and forms a small icicle. The unit works okay, but the icicle is getting bigger. WILLIAM FOX SAN DIEGO, CA

I suspect that either your ice maker is not level, or a mineral deposit has built up on the ice cube mold.

Place a level on the top of the refrigerator cabinet, and check both front to back and side to side to be sure the cabinet is level. If not, reset the two adjustable wheels under the front of the refrigerator until it sits level and makes solid floor contact.

If leveling doesn't correct the problem, check the ice cube mold for mineral deposits around the high water line. These deposits act like a sponge, drawing water over the sides of the mold, where it freezes.

Remove the ice maker by taking out the three screws holding it to the freezer's side wall. Lift up the ice maker, then unplug the power cord from its connector. Empty the water and let the mold air-dry, then look for the telltale white buildup.

These deposits are usually quite hard and may need to be scraped off using a piece of wood, but take care not to gouge the mold. Once the mold is clean, apply a thin coat of nontoxic silicone grease—Whirlpool part No. 542638—to the top edge of the mold. This should retard any mineral buildup in the future. For sanitary reasons, throw away the first two batches of ice cubes after cleaning the mold.

Broken liner

I have a 1961 Frigidaire, model No. FDA-13T-61, serial No. 56A38086. Our local appliance repairman says my fine working unit is too old to get parts for. I need a large door liner and the breaker strip for the bottom of the door opening—both plastic. Can you tell me where to find these parts or how to repair them? JOSEPH B. MILLIGAN VASHON, WA

Frigidaire tells me the interior plastic door liner for your refrigerator is still available in limited quantity. The part number is 6587654. It costs about \$40.

The breaker strip is no longer available. But Frigidaire has a liner repair kit, part No. 8950026, that costs about \$12. It contains white vinyl tape 3 in. wide × 28 in. long, with instructions for repairing the cracked panel. Order door panel and repair kit from your local Frigidaire parts distributor.

If you have a problem with any appliance, send your question, along with the model and serial numbers, to Appliance Clinic, Popular Mechanics, 224 West 57th St., New York, NY 10019. Sorry, but letters cannot be answered individually. Problems of wide interest will be discussed in this column.

Inside Detroit



BY JIM DUNNE

Double-duty prototype

The prototype shown below is being developed for both the Monte Carlo and Grand Prix. The sheetmetal and grille look like a Pontiac, but the hubcaps bear the telltale bow-tie insignia of Chevrolet.

The front-drive chassis marks a departure from the popular rear-drive of GM's G-cars (Regal, Monte Carlo/Malibu, Cutlass and Grand Prix/Bonneville). Styling cues from the current cars are missing from the prototype. Taillights could be used by either division. Note

the door handle in the window frame (B-pillar). Pontiac is scheduled to replace its rear-drive Grand Prix with this type of car sometime in the fall of 1987, while Chevy has a new Monte Carlo set for a year later.

Sooner to appear in Pontiac showrooms is a fast-backed update of the Fiero. With a rounded rear-end treatment and sail panels extending the roofline all the way back along the rear deck, the car assumes a totally fresh and somewhat Italian look from the back.

World class in five colors

Cadillac promises a worldclass car in its Allante, a luxury sportster that will compete with the best from Mercedes, Porsche, BMW and Jaguar. The 2-seat convertible, set to go into production this fall, will have a body built by Pininfarina in Turin, Italy, and an all-Cadillac suspension and drivetrain. "We'll give Mercedes performance," reports one Cadillac official, conceding the wide power edge M-B will have with its 341-cu.-in. V8 vs. the 251-cu.-in. V8 Cadillac will use in Allante. "But we'll have the edge in ride, quietness, elegance, maybe even handling."

Cadillac also talks about the "longest assembly line in the world" for Allante. The bodies will be assembled, painted and outfitted with interior trim in Turin, then shipped by Alitalia and Lufthansa in 747s to Detroit, a distance of 3300 miles. There, the drivetrain and other mechanical parts will be installed. Each 747 will carry 56 bodies, stacked like candies in a gift box. Clearances between the car bodies



GM's Chevy-Pontiac "small car" group shares this '87 prototype.

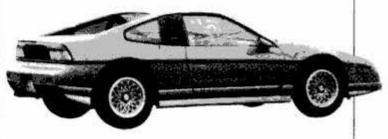
and the plane's bulkheads are as tight as 2 inches, though the cars were not, officials insist, originally designed to air-shipment size.

On the return trip, the planes will carry U.S.-made parts to GM's plants in Europe. Some of these parts—things like air-conditioning systems and instrument panels—will be installed by Pininfarina in the Allante bodies. Other parts will be made in Germany, Norway, Japan (!) and France.

Sergio Pininfarina, whose firm specializes in custom body fabrication and design, claims that the final Allante styling came, en toto, from claimed. "But on at least one color, silver, there will be subtle red piping in the bumper face and along the lower body sides." Look for the price to be in the \$45,000 to \$50,000 range. For that price, you get 4-wheel antilock braking, an air bag in the steering wheel and even 4-wheel drive, if you wish.

Why Kentucky?

Thirty states wooed Toyota in an attempt to get the big Japanese automaker to locate its new assembly plant in their tax region. Kentucky won out, but not for the obvious reasons, like closeness to markets and



Due at dealers now is a new fastback roofline on Pontiac Fiero.

his studios in Turin. There was virtually no interference from GM stylists, though a few minor decisions like the type of door handle—pull type in place of squeeze type—were dictated by GM. "What we wanted," explains Pininfarina, "was a front end that looked like a Cadillac. For the rest of the body, we wanted a wedge shape, both for aerodynamics and for a larger trunk."

Contrary to earlier reports, the Allante will not have a plastic removable roof. Instead, Cadillac chose an aluminum roof to go over the steel body. "I can take it off by myself," we were told by a Cadillac official who drives a prototype home on occasion. "But my wife needs help, mostly because of the size of the roof, not because it's heavy."

PM also learned that the Allante, which was designed against bogeys like 560 SL and Porsche 928, will use five paint colors—white, gold, silver, blue and a subdued red. "We won't have rally striping, or anything gaudy," the Cadillac official

suppliers. "Yes, we like the idea of being on I-75, just south of the Detroit-Chicago axis where we will get many of our U.S.-built compo-nents," a Toyota official admits. "But in the end, it was just a feeling. Kentucky's land and temperatures are very close to what we have in Japan. That's the best way I can explain it." Toyota will build Camry replacements, 2-liter family sedans, in a plant to be built in the rolling hills of bluegrass country at Georgetown, Kentucky, starting in 1989. For Kentucky's ecstatic state offi-cials, the Toyota "Oh, what a feeling" slogan is more than a simple advertising statement.

Bigger tires

Not just in tread width. But the diameter of tires is on a trend to bigger sizes, too. Fuel economy is one reason, road clearance and handling are others. GM is looking at tires and wheels of 17-in. diameter for cars of the late 1980s. Insiders expect that Corvette will be one of the

(Please turn to page 30)



INSIDE DETROIT

(Continued from page 28)

first, and other sporty cars will follow.

It's not easy

Building a new pickup truck sounds like a cinch, compared with bringing out a new car. But that's evidently not the case. At least, GM expects a slow startup of production of its new GMC and Chevy pickups next fall. So, instead of dropping the old pickup immediately, GM will continue to produce it, assembling both old and new models until the new model gets into high production. GM insiders expect the dual assembly plan will continue for six months.

What's so different about the new trucks? Biggest improvement is the antilock rear brake system. It solves one of the pickup's weakest features—rear-wheel lockup when running unloaded. Also, Chevy and GMC pickups will have new cabs and interiors, with the emphasis on aero design for the exteriors. Part of the phase-in period will be used to make certain that a full line of trucks is always available.

Pontiac's balancing act

Its 2.5-liter (151-cu,-in.) 4-cylinder en-

gine will have counter-rotating balancing shafts similar to those used by Mitsubishi, Porsche and Chrysler before the end of 1986. The Pontiac Four, once known as the Iron Duke, is widely used in GM's compact and intermediate-size cars, so the change, which will produce operating smoothness, will stretch across a great number of models. The idea of the shafts is to set up movement in the engine case that will offset the natural movements that cause vibration. At the same time that the engine wants to move upward with the force of the piston, the balancing shaft will impart a downward force. Side-to-side motions can be canceled by the shafts as well. While the principle of balancing shafts is an old one and dates back to the early 1900s, its use in a modern automobile engine was begun five years ago by Mitsubishi in the 2.6liter Four it supplies to Chrysler.

Ford double header

Two sports cars are in the works at Ford, one to sell in the \$25,000 to \$30,000 class, the other in the \$15,000 market. Scheduled to be on the road by the end of the 1980s, the cars will both come in from overseas. The higher priced model is the GN34, a 2-seat, midship-engine type that will be built by Chausson, in France. It will reportedly have a dohc V6 engine, and compete against cars like Corvette, Renault Alpine, Porsche 944 Turbo and even Ferrari. Design and engineering are under the direction of Ford's Special Vehicles Office in Dearborn.

The second car is code-named the SA30. It will be built in Australia, and combine Ford designs with Mazda components. This model will be styled by ItalDesign of Turin and, though it is a 2+2 layout, it will not replace the Mustang or any other car in Ford's current lineup. Look for this car to compete with Pontiac Fiero, Mazda RX-7 and Toyota MR2. With the two new models, Ford will catch up with GM in offering true sports car models in both the midand high-price ranges.

'Tokyo by night'

That sardonic description of electronic instrument panels on some of the newer cars is not one to which customers subscribe. Subaru, in a study of what customers want, found that the public likes the bright panel lights. But auto writers do not. So in the future, Subaru will continue to offer the electronic instruments, though not on every model. Look for other manufacturers to take a similar approach. One suggested solution: use electronic lights on the instrument panel, but present them in the shape of analog gauges, like the traditional round speedometer, tachometer and others.

POPULAR MECHANICS • MARCH 1986



"The Army Reserve trained me in electronics, but the surprise is what I've learned about people." PFC Norman Harjus, Crypto Repair

"The company I work for sells and services color TVs, VCRs, and stereo systems. I'm in the servicing end of it, the electronics repair shop. They hired me because of the training I received in the Army Reserve. It was a school where I learned a lot of things nobody else would have taught me. To me, electronics is interesting, fun, hands-on kind of work. I even took my car stereo apart and fixed it. True!

"What I didn't expect, though, was learning a whole lot about people. About myself, to start with. And about the different kinds of people I mix with, my one Reserve weekend a month, and my two weeks annual training.

I also deal with the public every day, customers with problems. To me,

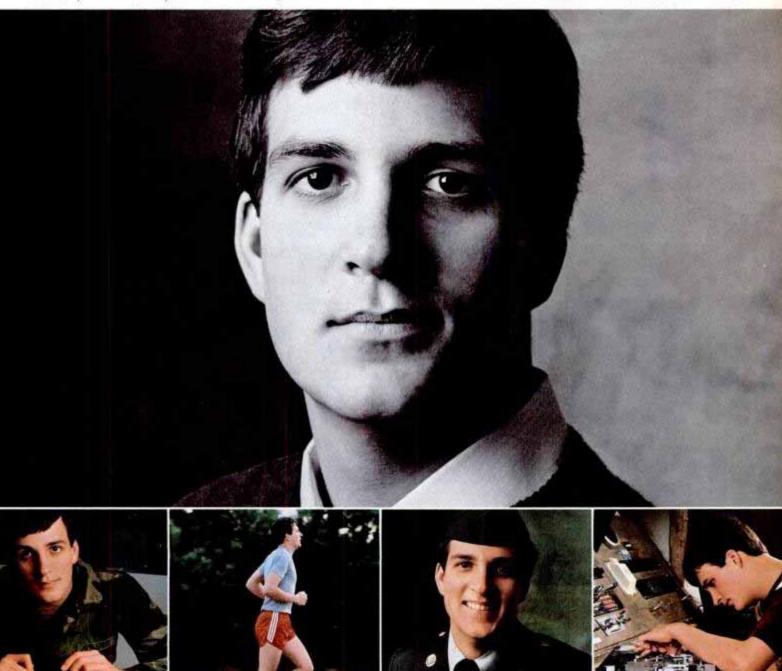
my situation feels great. And I see good things in my future, too."

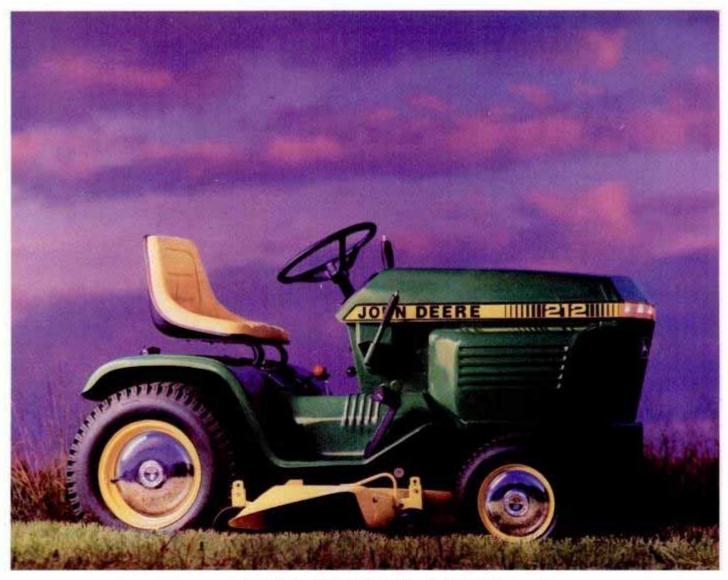
Could the Army Reserve add to your skills and your future?

Talk to your local Army Recruiter about it, or call I-800-USA-ARMY.

ARMY RESERVE.

BEALLYOU CAN BE.





Ahead of every John Deere lawn and garden tractor lies a great future. Because one of the things our tractors

are famous for is how long they last. Which is why more people rely on John Deere than any other tractor.

Our 200 Series 10-16 horsepower tractors, for instance, let you change speed within any gear—without clutching or shifting, or changing the speed of a PTOdriven attachment.

Our 300 Series 16 and 18 horsepower hydrostatic tractors feature easy control of direction and speed with just one lever.

And at the top of the line are our 400 Series 20-horsepower gas and diesel tractors with hydrostatic drive and power steering.

But whatever the horsepower, you get a real

workhorse with a John Deere lawn and garden tractor. All year through. Because you can add dozens of optional John Deere attachments for mowing, tilling, landscaping and moving snow.

So, while your tractor's keeping busy, you'll be

sitting pretty. Perhaps right into the next century. For the name of the nearest dealer, or a free folder on the John Deere Lawn & Garden Tractor line, call 800-447-9126 toll free (800-322-6796 in Illinois) or write John Deere, Dept. 50, Moline, IL 61265.



Nothing Runs Like a Deere

Homeowners

BY NORMAN BECKER, P.E.

1-story central air

e live in a 1200-sq.-ft. 1-story house, and plan to add a family room next to the kitchen. We have an oil-fired hot-water heating system with baseboard radiators. Would it be practical to centrally air condition our house? Can the ducts be run through the attic? And how would it be powered? IRENE LEFFEW HERNDON, VA

It is possible-in fact, relatively easy-to install central air conditioning in a 1-

story house. The basic components of an air-conditioning system are the compressor/condenser, ducts. and a blower coil, or air handler.

The compressor/condenser is usually located outside the house. Refrigerant lines run from the compressor/ condenser to the blower coil-up the outside wall and along the attic floor.

Unless the attic is extremely low and inaccessible, the blower coil is usually located there. The ducts run

DEHUMIDIFIED EVAPORATOR COILS COOL AIR REFRIGERANT LINES E RETURN DUCT CONDENSATE BLOW/FR CEILING RETURN AUXILIARY PAN WITH FILTER RETURN DUCT SUPPLY DUCTS ELECTRICAL POWER REFRIGERANT **OUTSIDE AIR** OUTSIDE CONDENSING CONDENSER COIL COMPRESSOR

Central air conditioning installed in a 1-story home consists of three basic elements: an outside compressor/condenser, an attic-mounted blower coll and ducting to ceiling registers in rooms below. Refrigerant lines run from the compressor to the blower coil.

along the ceiling beams to ceiling registers located in the various rooms.

When a blower coil is located in the attic, mount it on an insulating material to minimize vibration noise. It should have an auxiliary condensate drain pan located below the unit to collect overflow if the primary condensate drain becomes clogged. If your electrical service to the house is not at least 100 amps at 220 volts, it will have to be upgraded.

Worn shingles

The asphalt shingles on my 14-year-old house are turning up at the corners and have lost most of their white mineral surface. My roof is still serviceable, but I prefer unweathered, white, white roof. Can the corners be made to lay flat, and can the old shingles be treated so they look white again?

JOHN SODERBERG DOYLESTOWN, PA

When the corners curl and turn up, the roof deck and underside of the shingles become vulnerable to water penetration by wind-driven rain. If you don't have too many curling shingles, resecure them with quick-setting asphalt roofing cement. Apply a dab about the size of a 25-cent piece under each corner, and press the shingles down so they lay flat. You may have to lay a weighted board over badly curled shingles. This repair should be done on a warm day when the shingles are pliable. Quick-setting roofing cement is available at hardware or roofing supply stores.

Widespread curling, however, indicates that the shingles have dried out and are losing their ability to keep the roof weathertight. In this case, it's hardly worth your time trying to salvage them. The same holds true for your disappearing mineral granules. They are pressed into the asphalt coating of the shingles to provide a fireresistant surface, color and protection from the sun's ultraviolet rays. Granules of different colors are available to patch and match small areas, but since most of your shingles have lost their granules, you'll have to reshingle to get your white, white roof.

Whistling line

Our water line has developed a loud whistle whenever a faucet is turned on. This occurs with both hot and cold faucets, indoors or out. Can you help? FLOYD GALWAY SALT LAKE CITY, UT

A whistling sound in the plumbing system is often caused by water flowing at high velocity past a constriction. Since you hear a whistle when any tap is opened, the problem probably lies in the section of pipe common to all taps—the inlet water service pipe, which contains the water meter and, in many communities, a pressure-reducing valve. I suspect the problem is in either of these two components.

To check this out, get permission from the water company to bypass the water meter. The meter and reducing valve usually have union fittings for easy installation and removal.

If the water meter is the culprit, ask the water company to repair or replace it. If the pressure-reducing valve is the problem, check for sediment in the strainer that could be constricting the flow. Some older reducing valves have brass strainers that disintegrate. If a replacement strainer is not available, replace the reducing valve. Newer valves have stainless-steel strainers that can be cleaned.

You can also try momentarily adjusting the pressure reducer to a higher or lower pressure. This might dislodge sediment buildup. FM

Do you have a home-maintenance or repair problem? Send it to Homeowners' Clinic, Popular Mechanics, 224 West 57th St., New York, NY 10019. Letters cannot be answered individually, but problems of wide interest will be discussed in the column. For more home-repair and maintenance help, get PM's Home Care Guide. \$2.45 postpaid. Send your order(s) to Popular Mechanics, Box 1014, Radio City Station, New York, NY 10101.

Science



BY DENNIS ESKOW

Astro heads for orbit

ne Space Shuttle launch this summer and two planned for next year will carry a unique telescope rig into orbit. It will be called Astro, a bank of telescopes and sensors that is expected to open a new range of astronomy.

Astro was designed to sit in the open cargo bay of the Shuttle. The rig, designed and operated by NASA's Marshall Spaceflight Center in Huntsville, Alabama, is to be used for a range of experiments, the earliest of which will be to get a wide-field image of comet Halley while it is still in our vicinity. While this will undoubtedly be the most publicized part of the Astro missions, it won't be the most important. The Astro rig includes spectrographic and camera equipment that works in the ultraviolet range.

Among the major components in the odd-looking Astro rig is the Hopkins Ultraviolet Telescope. It will be able to find 17th magnitude objects. In space, a 17th magnitude object is so faint that no earthbound telescope could pick it up. Other major components include the Ultraviolet Imaging Telescope and the Wisconsin Ultraviolet Photopolarimetry experiment, affectionately known to astronomers as WUPPE.

The UIT will capture faint objects with magnitudes similar to those captured by earthbound optical telescopes. But since it will be working in the UV range, it will be able to pick up some objects not seen from Earth.

These may include hot masses of stardust in forming galaxies. WUPPE uses fiber-optics and charged-couple devices to aim a bank of detectors that will give us the most accurate readings yet of the temperatures of many nearby stars and galaxies.

The Astro missions are among a shrinking number of scientific Space Shuttle launches coming up this year and next. A growing number of Shuttle launches that are set for later this year and early next will be strictly military. The manifest lists them only as "DOD" for Department of Defense. Thus, the little bit of science that we are seeing is something to cherish.

Send cards

I need your help in my quest to get the first journalist seat on the Space Shuttle. Readers of this column often write to ask for more information about the things we cover in this space. If you'll write to me (postcards only, please) with a note supporting my application for the seat, I'll acknowledge your support pace the heart for 30 minutes. In the future, a permanent capsule-pacemaker is expected to be available. But for the moment, it's a device used at the University of Michigan only in extreme cases.

Steamed dice

Many Americans fear that nuclear reactors can build up steam so quickly and under so much pressure that a cataplaced disc during surgery. The surgeon attaches electrodes to the patient's ankles, where nerves leading to the lower back are located. Then, each disc is touched with a wire leading from the electrodes. A normal disc puts out an electronic signal that is regular and distinctive. An abnormal disc gives off a different signal. The technique may be adopted across the nation later this year.

personally with a letter and send your card to NASA along with the others.

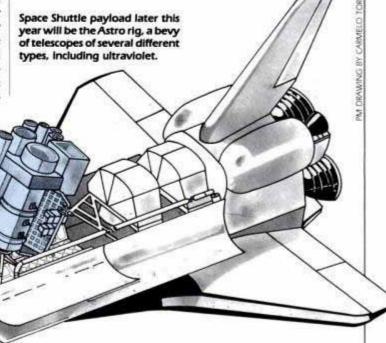
As you read this column, I am putting the finishing touches on my application file and I need cards and letters indicating that I can cover a Shuttle launch. Send yours to me at PM, 224 W. 57th St., New York, NY 10019.

Pacemaker pill

Patients who once had to go through the discomfort of having a heart pacemaker installed may soon find pacemakers easier to swallow. University of Michigan researchers have developed an electrode installed in a gelatin capsule. The patient swallows the capsule, which is attached to an ultrafine thread. After a prescribed time, the physician slowly pulls up the pill until an electronic signal indicates the capsule is at the left atrium. The physician can strophic explosion could occur. But University of California chemist Theofanis G. Theofanous says his studies of existing nuclear reactors give odds of less than one in 10,000 that a catastrophic explosion will happen. Catastrophic is when the reactor core melts, causing an explosion that would spread nuclear material for miles. Theofanous's computer studies indicate the reactor bottom would blow out first, venting the explosion and reducing its power. The results have been submitted to the Nuclear Regulatory Commission.

Spinal tap

Surgeons at New York's Columbia-Presbyterian Medical Center are "sounding" the spinal column of disc patients. The technique prevents the surgeon from moving the wrong disc or missing a mis-



Is this the key to your car?



The Civic DX Hatchback is packed with space to keep you from feeling packed in.

The key is its innovative long-roof design. It makes this car remarkably big for its size.

In the rear, there's generous headroom so comfort doesn't take a back seat to economy. The rear seats slide back as well as recline so you can kick back. They also fold down one at a time to accommodate even odd-sized cargo.

Outside, the roof design makes the most of aerodynamics. So the exterior is

as efficient as the interior.

And all around, there is a panoramic expanse of window area covering 319 degrees out of 360. Tinted glass and a rear wiper/washer help make sure the view stays clear.

This Civic is big on value, too. A 1.5 liter, 12-valve engine, 5-speed manual transmission, front-wheel drive, as well as an adjustable steering column are standard.

This year, there is 4-speed automatic transmission available.

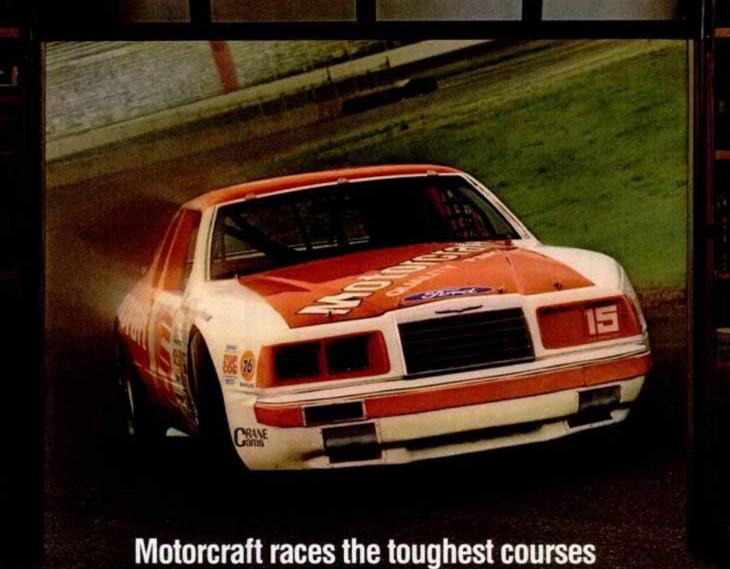
If your small car leaves you open for

suggestion, then we've got a suggestion. The 1986 Honda Civic DX Hatchback.

It's so big, it's uncanny.







to get into your garage.

High-performance racing cars that generate about 600 horsepower demand tough, quality parts. So does your car. And Motorcraft spark plugs, filters, batteries and motor oil deliver top performance, out on the race course or on the highway. Because the technology used to develop Motorcraft racing parts is the same technology used to develop Motorcraft quality parts for your car or truck.

Motorcraft quality parts have been installed as original equipment in more than 35 million Ford, Mercury and Lincoln cars and Ford trucks and are engineered to meet the needs of all vehicle manufacturers. So no matter what kind of car or truck you own, there's only one logical choice. Motorcraft, of course—so you know you're getting reliable original equipment quality replacement parts. Race-proven parts. Trustworthy parts. Motorcraft from Ford. Quality parts for all makes of cars and trucks.

Motorcraft from Ford

EXCEEDS THE NEED



Buckle up-together we can save lives.

Minicourse



BY ROSARIO CAPOTOSTO

To make twists in flat metal stock, grip the workpiece so that the vise jaws align with the first mark. Then hold locking pilers at marks in between and twist 180°. Repeat for each successive twist.

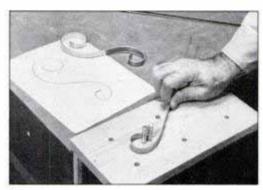
Bending metal

orkshop projects sometimes call for forming metal into a variety of shapes. The techniques for doing these jobs are quite simple and can be accomplished with common tools or easy-to-make jigs.

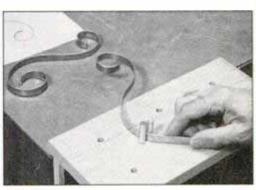
To form scrolls you need a jig that consists of two %-in.-dia. steel pins inserted into holes bored into hardwood. Spacing between the pins should be equal to the thickness of the strip being bent. Draw a pattern of the desired shape to use as a guide.

Twisting is done with a vise and locking pliers. Mark the workpiece with beginning and end marks for the twists, and equally spaced marks in between for the number of twists required. Wrap tape around the plier jaws to avoid marring the metal. Then clamp the work in the vise with the first mark aligned with the jaw ends and start twisting.

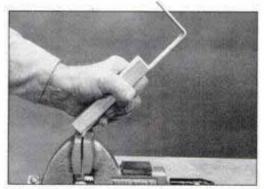
To bend thin-wall aluminum or copper tubing, you need the special jig shown. It consists of a wood disc and two holding strips that have V-cuts on their inside edges. The disc and one strip are tacknailed to a plywood base so the tubing fits snugly between them. The second holding strip is placed against the other tubing side and both strips are clamped together. Follow these minimum bending radii: for 3/4in.-dia. tubing the minimum radius is 5 in., for 1/8-in., 1-in. and 11/4-in.-dia. tubing the minimums are 7 in., 9 in. and 11 in., respectively.



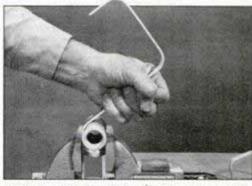
To start a scroll bend, insert the end of the strip between the steel pins and swing the strip around slowly until desired curve is obtained.



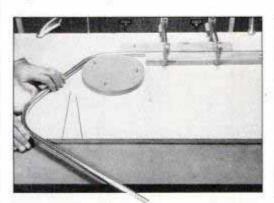
To make a larger sweeping curve, advance the strip between the pins in ¼-in. increments. Bore other jig holes for bending different shapes.



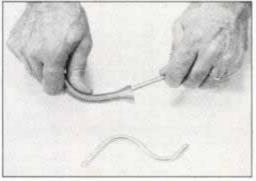
To make a tight bend in flat stock, hold a wood block against one side and press. Heavy stock requires hammering to form bend.



A tee pipe fitting with its rim filed flat on both sides makes a good radius-forming jig. Tees are commonly available for \(^3\)_6- to 4-in.-dia. pipe.



Draw index lines on the tubing Jig to match the desired bend (left) and actual bending limit (right) that compensates for stock spring-back.



Bending springs are used to shape small diameter metal tubing. They are generally available in several sizes at well-stocked hardware stores.

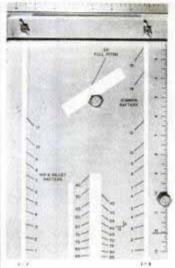
Tool Tests

Carpenter's friend

major part of a carpenter's day is spent measuring, marking and cutting. To help increase the speed and accuracy of these three common carpentry functions, the Speed Block Cutting Guide was developed.

This multipurpose layout tool is especially useful for cutting the various short wood blocks that are needed in new construction and remodeling jobs such as solid bridging and short cripple studs and nailers. The guide has a sliding bar that can be adjusted for cutting blocks from 2 in. to 141/2 in. long. Simply hold the guide against the board's end and make the cut-no marking or measuring is necessary. But block-cutting is only part of what this time-saving tool can handle.

Use the guide to lay out and cut hip, valley and common rafters, ridge cuts, seat cuts and plumb cuts. A handy chart, printed on the guide, provides information on the allowable spans for ceiling and floor joists. The tool accepts two removable angle gauges that bolt to the edges of the guide. Align the gauges on the appropriate scales to mark the desired angle-cut. Then, hold the guide with the two gauges against the board's edge and mark the angled line of cut. (Angle gauges are available at hardware stores and lumberyards.) The guide is an effective tool for laying out and cutting stair stringers, too. Simply position the angle gauges for marking the desired size tread and riser.



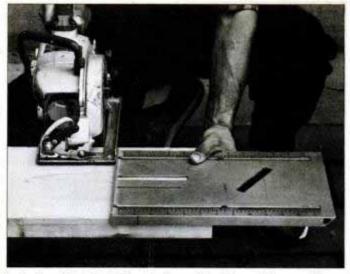
Aluminum cutting guide eliminates much time-consuming measuring and marking.

The guide can also be used to mark rip cuts. Position the adjustable bar to the desired width cut and then slide the guide along the board's edge while marking the line of cut with a pencil.

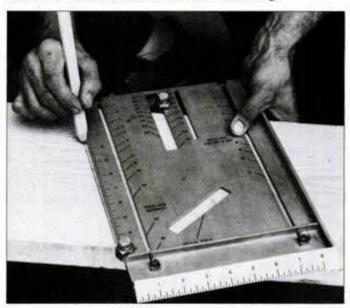
Other time-saving features of the cutting guide include a scale for speed-cutting any angle from 1° to 180° and a convenient ¼-in. equals 1-ft. scale used to estimate blueprint dimensions. The ¼-in. scale will measure up to 38 ft. The edge of the guide serves as a 13-in. straightedge ruler.

The guide is made entirely of aluminum, weighs about 32 ounces and comes with a well-illustrated instruction booklet. The guide is available for \$27.50 postpaid from the Building Machine General Contractors, 903 44th St., Oakland, CA 94608.

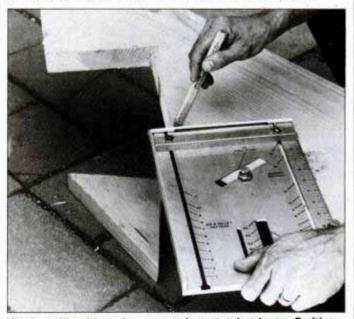
-Rosario Capotosto



Lock the adjustable sliding bar in position for making repetitive cuts. Guide will cut blocks from 2 in. to 14½ in. long.



Mark rafter cuts quickly with the aid of two angle gauges. Attach the hexagon-shaped gauges to hold guide at proper angle.



Use the guide with angle gauges to lay out stair stringers. Position the gauges for marking the tread and riser dimensions.

Sure you want a Snapper. And now's the time to get one. Your local dealer is making it a snap to own the best with unbeatable deals and easy credit.

SMAPER

SPRING SAVINGS EVENT





You can depend on SNAPPER to meet your needs. Our machines are built for durability, simple operation and hard-working efficiency. We stand behind them with integrity and service. So, put your mind at ease and let SNAPPER do the work for you.

Attachments limited on certain models. All prices shown are manufacturer's suggested list price and may vary by dealers.

PUSH MOWERS

FREE ATTACHMENT or 50% OFF Choose from a 19" or 21" push mower with SNAPPER's Hi-Vac* cutting system. Vacuum action stands grass up for an even cut and removes clippings, leaves, and pine straw. So buy one** now and get your choice of:

- A. Mulcherizer,[®] retail value \$44.95 B. Grass Catcher, retail value \$49.95 C. Snapperizer,[®] retail value \$59.95
- OR 50% OFF: H. Pac-N-Sac, retail value \$109.95

SELF-PROPELLED MOWERS

FREE ATTACHMENT or 50% OFF SNAPPER's self-propelled mowers have all the power for lawn care. 6 forward speeds, a 4 HP engine, and our patented Hi-Vac* deck take the effort out of your work. Buy one** now and receive your choice of:

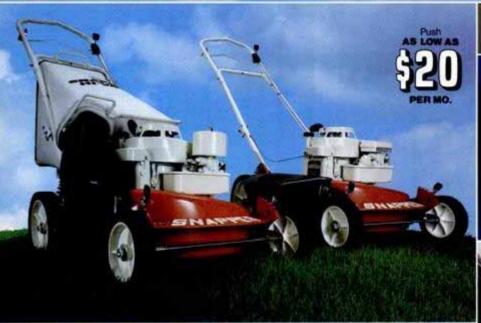
- A. Mulcherizer, retail value \$44.95
 B. Grass Catcher, retail value \$49.95
 C. Snapperizer, retail value \$59.95
 D. Thatcherizer, retail value \$69.95

OR 50% OFF:

H. Pac-N-Sac, retail value \$109.95

SNAPPER SP

D

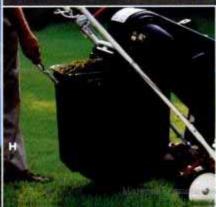














RIDING MOWERS

FREE ATTACHMENT or 50% OFF Get riding mowers with the quality SNAPPER features. Like famous disc drive, and a patented cutting height adjustment. And our riders have an automatic blade stop and a smooth start clutch. So buy a rider** now and choose from:

E. Dump Cart, retail value \$189.95 F. 6 Bu Catcher, retail value \$139.95

OR 50% OFF:

I. Bag-N-Wagon, retail value \$369.95 J. Twin Bag catcher, retail value \$259.95

LAWN TRACTORS

FREE MOWER DECK SNAPPER's lawn tractors give you muscle. Choose the 11 HP engine or the 12.5 or 16 HP twin cylinder engine and get our famous disc drive that lets you shift through 12 forward and 2 reverse speeds. Buy a lawn tractor**
now and receive your choice of:

FREE:

G. 33" Hi-Vac* mower deck, retail value \$250. 41" side discharge mower deck, retail value \$330. 48" side discharge mower deck, retail value \$500.

SNAP-CREDIT

No down payment and no monthly payment for 90 days:

*Finance charges will accrue from date of delivery. "At regular retail price.



880 1234 123456 JOHN O CUSTORER

NGS EVENT









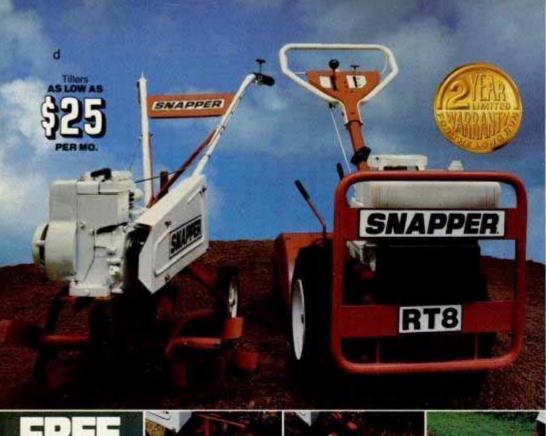
10% OFF



















TILLERS

FREE ATTACHMENT
You can feel the quality difference in a SNAPPER tiller. Get a front tine tiller** with garden tractor wheels or a rear tine tiller** and receive your choice of:
FREE: (front tine tiller attachments)
K. Hiller-Furrower, retail value \$79.95
L., M. Plow Kit, Cultivator and 2 gauge wheel kits, retail value \$139.95
N. Dozer Blade, retail value \$129.95
FREE: (rear tine tiller attachments)
K. Hiller-Furrower, retail value \$79.95
M. Cultivator, retail value \$109.95
"At regular retail price

"At regular retail price

No down payment and no monthly payment for 90 days.* *Finance charges will accrue from date of delivery



880 1234 123456 7 JOHN O CUSTONER

AT PARTICIPATING DEALERS.

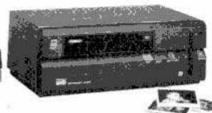
Visit the SNAPPER dealer nearest you. Or look in the Yellow Pages under lawn mowers.

Home Video



BY JAMES B. MEIGS





"Someday, my prints will come": Kodak's video floppy-disk player/ recorder (left) stores images for color video printer (right).

The video revolution is causing many Americans to abandon something our society has treasured for over 100 years: the family photograph. With the boom in video camcorders, many people are retiring their film cameras for the excitement of moving pictures on tape.

While home video movies are great, they're a little tough to paste in an album or put in your wallet. And, since the pictures on a video-cassette exist only as an electronic signal, they require a VCR and TV set to become visible.

Fortunately, long before we're tangled in tape albums with no prints to show for it, new electronic photography technologies should begin to bridge the gap between video and film.

In fact it's already possible to make acceptable paper prints from home video images. Mitsubishi makes a video printer that can take a video signal from any source—videocamera, VCR or TV monitor—and convert it to a black and white print on special paper.

The picture quality isn't great (it offers detail of only 70 dots per inch), but it's enough to catch a good likeness. The printer carries a \$390 price tag, but the prints themselves only cost about 2 cents each.

While Mitsubishi's video printer is new to most video fans today, products like it might someday become common accessories in the home. Pressing a button to produce a paper print of an image in a video movie will seem as natural as taking a snapshot today. This trend away from chemical film toward electronic imaging hasn't been lost on photo giant Kodak. But instead of trying to fight this evolution, Kodak is leading the way. The company recently introduced two products that may point the way to the electronic imaging systems of the future.

The first is a still-video player/recorder, a device one observer aptly described as a "video slide projector." Essentially, the system lets users play back still pictures on a TV set or monitor. The system stores pictures on a small (1.87-inch) magnetic disk, known as a video floppy disk. Though the system can record still TV pictures from

any video source, Kodak thinks the primary use for the system will be to play back snapshots originally taken on film. The company will offer a service to convert people's existing photos to magnetic disk.

Though Kodak is the first company to introduce the video floppy in the U.S., it didn't invent the system. The video floppy is the product of a worldwide standardization agreement signed by many leading electronics and photography companies. In theory, this means video floppy systems introduced after Kodak's should be compatible with it.

Kodak's still video player/ recorder seems quite well thought out. In fact, it has features that leave the aver-

age home slide projector in the dark ages. These include wireless remote control, the ability to cycle through the pictures at a variety of speeds, and quick access to any picture on the disk.

The video-floppy standard allows for one disk to hold either 25 full-frame pictures, or 50 one-field images. Since each video frame is made of two fields displayed sequentially, that means the one-field pictures should have only half the detail of the full-frame type.

Kodak decided to build its system to handle 50 pictures per disk. But when I had a chance to experiment with the product at a recent demonstration, I was surprised to see that the one-field images looked almost as good as a standard TV picture. The secret is in Kodak's playback deck: Even though its one-field pictures should have only half of the 525 lines in a full frame, it manages to interpolate, or fill in, the missing lines. For anyone used to watching movies on a VCR, the picture quality would seem quite adequate.

If this sounds like just the thing to replace that cumbersome old slide projector, you'll have to hold on for a little while longer. Right now, Kodak is just conducting market tests of the product—they haven't even put a price tag on it. Kodak's other new product does have a price—about \$700. It's a color printer for making still photos from video or computer images. For now, Kodak is aiming the device at business users. Eventually the company will sell it to home users as well.

Kodak's new printer works on a totally different principle than the Mitsubishi model. It uses a cathode ray tube (CRT) to expose a sheet of color instant-print film. The printer spits out the film, which then develops before your eyes within a couple of minutes. In the demonstration I saw, the print quality was surprisingly good, certainly on a par with prints I've seen from Japanese companies.

Despite its good quality, I think Kodak is right to wait before trying to sell this technology to households. Right now, it's just too expensive—and that instant print film isn't cheap, either. But I can easily imagine the day when a printer like this will be tied in with a video floppy player/recorder, VCR or camcorder, computer and TV monitor in many home systems. Think of the versa-

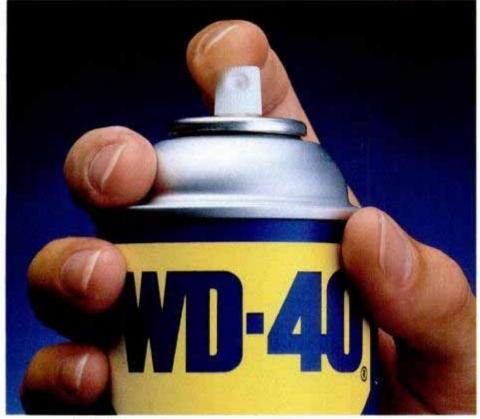


Black-and-white photo, from TV, made on Mitsubishi printer.

tility this would allow: You could record still photos from home movies onto video floppies, make prints of these to mail to relatives, even edit still pictures from video floppy into your home movies.

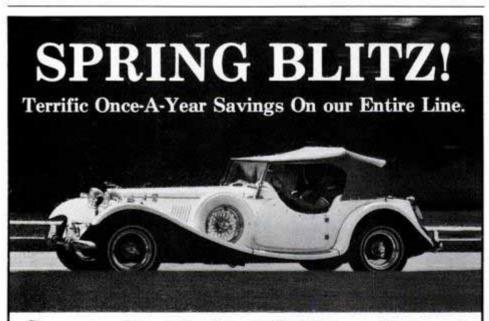
There's just one thing missing from the electronic still photography picture: something to take the picture. So far, neither Kodak

(Please turn to page 44)



If it moves, shoot it.

Take a shot at tools with moving parts, lawnmowers, sticky locks and squeaky hinges. Anything that moves. WD-40. America's troubleshooter.



Save now on Classic Roadsters' MG-TD, Jaguar, Healey and Mercedes Kits and completed cars - as seen on major TV game shows. Limited quantities. Call today for best selection.

For details, call toll-free

1-800-245-3864



Classic Roadsters, Ltd.

1617 Main Ave., Fargo, ND 58103

DKA11BW13

HOME VIDEO

(Continued from page 43)

nor anyone else has managed to build an electronic still camera good enough to compete with film. However, there has been some heartening progress recently in building charged-couple device (CCD) image sensors with drastically improved picture detail. This is the first step to building a good electronic still camera. A remaining obstacle is price. It would probably cost more than \$1000 to produce just a passable model. Yet it's possible to buy remarkably good 35-mm film cameras for \$100. It may be years before anyone manages to eliminate that gap.

Preservation tips

While we wait for video printers and floppy disks, anyone storing precious images on videocassette should give some thought to how long those moving pictures will last.

Lab tests indicate that, under perfect archival conditions, videotape could last over 100 years. But in actual home environments, videotape images can begin deteriorating in as little as 10 years. How long your tapes last depend much more on how you store and use them than on what type or brand you buy. Here are a few basics on helping your tapes survive, courtesy of Dr. Yasuo Imaoka, executive director of TDK Electronics.

- Keep your VCR and tape storage area dust-free. Dust on the tape can scrape off the precious particles. Consider using plastic cassette boxes.
- Avoid high humidity. If necessary, keep your cassettes in plastic bags with silica-gel packs to keep them dry.
- Don't let your cassettes get too warm—keep them out of the sun and never leave them in a closed car. Extreme changes in temperature can also harm tape.
- Store cassettes vertically—on their narrow edges—and never flat.
- Keep cassettes away from magnetic fields—never leave them on speakers or TV sets.
- Exercise or "air" your tapes by fast forwarding and rewinding them at least once a year.

Legislation alert

Under pressure from the record industry, Congress is considering a bill to place a one-penny-per-minute royalty tax on blank audio tape and a stiff tax on audio recording equipment.

The distinction between audio and video is disappearing. Many hi-fi VCR owners use their decks as audio-only recorders. The 8-mm cassette can hold 24 hours of digital audio. At a penny per minute, the tax adds up to a whopping \$14.40 per cassette.



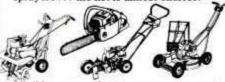
In just a short time, you can be ready to join one of the fastest growing industries in America... an industry where qualified men are making from \$25.00 to \$30.00 per hour... and that's just for labor. Parts, engines and accessories add even more to the profits.



Because the small engine industry has grown so quickly, an acute shortage of qualified Small Engine Professionals exists throughout the country. In fact, it's not unusual for a good small engine man to be three to four weeks behind in the summer and at least a week behind in the winter. When you see how many small engines are in use today, it's easy to understand why qualified men command such high prices—as much as \$49.95 for a simple tune-up that takes less than an hour!

65-million small engines are in service today!

That's right - there are over sixty-five million 2-cycle and 4-cycle small engines in service across the U.S.A. That's the official count from the Engine Service Assn., and new engines are being built at a rate of one-million per month! With and accredited approved Foley-Belsaw training, you can soon have the skill and knowledge to make top money servicing these engines. Homeowners and businessmen will seek you out and pay you well to service and repair their lawnmowers, tillers, edgers, power rakes, garden tractors, chain saws, mini-bikes, go-carts, snowmobiles, generators, snowblowers, paint sprayers . . . the list is almost endless.



No experience necessary.

You don't need to be a 'born mechanic' or have prior experience. If you can read, you can master this profitable trade right at home, in your sparetime, without missing a single paycheck. Lessons are fully illustrated—so clear you can't go wrong.

BEAT INFLATION!

Cash in on the huge demand for small engine repair.

Work part time, full time right at home - we help you every step of the way.

<u>making business!</u>

You receive trade secrets and business plans.

We guide you every step of the way, including tested and proven instructions on how to get business, what to charge, how to get free advertising, where to get supplies wholesale...all the "tricks of the trade"...all the inside facts you need to assure success right from the start.

Increased Income

"I've had about 8 years experience repairing small engines ... but repairs were only minor ... until I started the Foley-Belsaw Course."



Walter H. Strick Campbell, California

With our famous 'learn-by-doing' training method, you get practical 'hands-on' experience with specialized tools and equipment that you'll receive with your training plus a brand-new 4 HP engine all yours to keep!

SEND FOR FREE FACTS!

You risk nothing by accepting this offer to find out how Foley-Belsaw training can give you the skills you need to increase your income in a high-profit, recession-proof business of your own.

Just fill in and mail coupon below (or send postcard) to receive full information and details by return mail. DO IT TODAY!

FOLEY-BELSAW INSTITUTE of SMALL ENGINE REPAIR 50864 Field Bldg., Kansas City, MO. 64111

There is NO OBLIGATION and NO SALESMAN Will Call—ever!

FOLEY-BELSAW INSTITUTE 50864 FIELD BUILDING KANSAS CITY, MISSOURI 64111 YES, please send me the FREE booklet that gives full details about starting my own business in

☐ YES, please send me the FREE booklet that gives full details about starting my own business in Small Engine Repair. I understand there is no obligation and that no salesman will call.

Name	
23.2	
City	
State	Zip

You get all this Professional equipment with your course, PLUS 4 H.P. Engine ALL YOURS TO KEEP. . . . All at NO EXTRA COST.



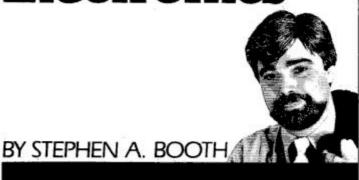
for this fact-filled FREE

Send TODAY



Tells how you quickly train to be your own boss in a profitable Sparetime or Fulltime business of your own PLUS complete details on our 30-Day NO RISK Trial Offer!

Electronics



Letter-perfect

It's hard to believe that 15 years have passed since I first punched copy on a "word processor." I didn't like the term then and I like it less today. But I did appreciate how even that primitive machine let you revise your story all you liked and still have neat copy, without retyping.

Because your keystrokes were deposited in a magnetic memory before going to paper, you could go back to correct mistakes, rewrite sentences and move paragraphs before pressing a button that printed pristine prose.

That early word processor I trained on would today be considered a dinosaur. It used %-in. magnetic tape and was the size of a small refrigerator. That was just

the processor part: You still needed an electric typewriter to make the words. Its cost, in today's dollars, would be about the price of a domestic econocar.

Over the years, word processors came down in size and price to about the dimensions and cost (\$2000) of personal computers. In fact, a word processor is a computer-but one that's dedicated to writing. This makes the computer a better buy, because it will do so much more. Trouble is, you have to study a manual and learn a legion of keyboard commands in order to address an envelope. This is why so many professional writers shell out two grand for a word processor, which lets you write without previous experience running the control board at NASA.

Now, I'm happy to report on two machines you can use right out of the box as you would a typewriter—and which don't cost a heck of a lot more. One isn't even called a word processor!

I've had the chance literally to put my hands on the new Videowriter by Magnavox, and on Smith-Corona's Personal Word Processor. They have much in common, but enough different features to offer a choice based

sole, and keypad. S-C typewriters range from \$300 upward; a 50,000-word spelling checker is available in the more expensive models.

Another difference between machines is the way they print. Videowriter uses thermal-transfer for quiet and fast printing—25 to 50 characters per second. The S-C typewriters use daisywheels, so printing can be as slow as 12 characters per second. But because daisywheel is a contact system, print quality is somewhat

Three-piece Personal Word Processor uses Smith-Corona typewriters as keyboard and printer.



hetter and you can make

on what's most useful to you.

First of all, each machine is easy to use. The monitor screens literally coach you through the steps necessary to create a document. The screen, by the way, is where your words will appear after you've punched them on the keyboard. Videowriter's amber screen shows 18 lines of 80 characters; the PWP's green tube shows 24 lines of the same length. Your words are stored magnetically, for printing after the document's done. The PWP stores about 32 doublespaced pages on a micro-wafer cassette. Videowriter holds about twice that on a 31/2-in. diskette-which also contains a 50,000-word spelling checker.

With Videowriter, the monitor, printer and memory are housed in a single unit, attached by cable to a keyboard. PWP's printer and keyboard are actually one of 20 Smith-Corona typewriters, purchased separately and plugged into the PWP. The PWP itself costs \$500 and consists of a separate monitor, memory con-

better, and you can make carbon copies. You can't do this with Videowriter's non-contact system—which produces remarkably good type for a thermal system, though. By the way, you don't need special paper for either machine, but top-quality bond looks best.

Because of its smaller size and fewer components, the \$800 Videowriter is easier to transport than the multiple unit PWP. On the other hand, the PWP can be used as a typewriter only. This is a convenience when you have to dash off something short that requires neither permanent storage nor massive rewriting. With Videowriter, you must use the monitor and store the item on disk before printing.

Despite their differences and shortcomings, the PWP and Videowriter bring some much-needed convenience to what's often a tedious chore—and do so at reasonable prices. These and others yet to come might not make writing any easier, but they'll make typing less tiresome.



Videowriter memory console (top) houses printer and TV display.

Smoking in public: A radical proposal.

These days the level of social discourse between smokers and non-smokers is approaching that of a tag-team wrestling match.

While some people try to solve this problem through segregation or confrontation, we at R.J. Reynolds have been proposing a more

daring solution: greater courtesy.

For these outlandish views we might be called dreamers and cockeyed optimists. But we continue to believe in the power of politeness to change the world.

We can almost imagine how it might begin.

A smoker is about to light a cigarette in public. He pauses in midmatch, suddenly conscious of the non-smoker next to him. Bracing himself for a hostile response, he asks, "Excuse me, do you mind if I smoke?"

The non-smoker is momentarily stunned by this unexpected act of courtesy. She stifles several witty replies that leap to mind; she cannot let his politeness go unchallenged. "I don't mind," she answers, "as long as you don't let your smoke blow in my face."

Her flagrant tolerance puts the smoker on the defensive. But he tries to regain the upper hand. "I'll do my best," he responds. "Let me

know if the smoke bothers you."

A deft comeback. But the non-smoker presses her attack: "I will—and thanks for asking." Not to be outdone, the smoker brazenly replies, "Thanks for being so understanding."

An unlikely dialogue? Perhaps. But, who knows? If this sort of thing ever caught on, it might lead to a sudden outbreak of civil

decency. Or even escalate into full-scale friendliness.

Common courtesy. It's just crazy enough, it might work.

Brought to you in the interest of common courtesy by R.J. Reynolds Tobacco Company



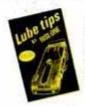
SMALL ENGINES WORK HARDER THAN LARGER ONES

Yes, 4 cylinder engines work harder than 8 cylinder engines to travel the same distance. When the 4 and 8 cylinder engines have both traveled 10,000 miles, the 4 cylinder engine has worked the equivalent of nearly 20,000 miles. They also run hotter — tending to shorten the life of your oil by creating varnish, gum and sludge.

All this means more wear and tear on your smaller 4 cylinder engine. It needs more care and attention. A quart of RISLONE with each oil and filter change will help get rid of those deposits that rob your engine's efficiency and smoothness. Clean engines run better, longer and more economically than dirty ones.

Use RISLONE at oil change time or when you're down a quart.

Get the big, yellow, red and black QUART can of RISLONE at discount stores, retail auto chains, and parts stores everywhere.



FREE: 32 page LUBE TIPS booklet. Information, ideas and discussion about problems, performance and lubrication. Send self-addressed, stamped envelope 4½ x 6½ or larger.

THE SHALER CO.

Waupun, WI 53963

In Canada: Warren Packaging Co., Ltd. Scarborough, Ontario, M1R 4G2

REAL Estate Catalog

of America

544 pages, 1000s of pictures, real estate in 43 states. Forests, streams, homes, small businesses, secluded areas. CALL STROUT

1-800-555-1212 any area or town or 1-800-641-4266; (or write Strout #6190, Box 4528, Springfield, MO 65808. Please include \$2 shipping).





HINTS FROM READERS

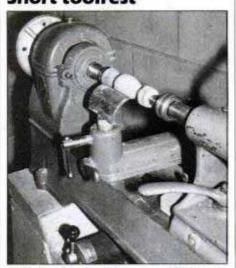
Bobby-pin holder



Mount a bobby pin in the end of a 6-in. length of 5/16-in.-dia. hardwood dowel, and you have a handy tool for manipulating screws, bolts, nails and other things in restricted spaces. To mount the bobby pin, you should bore a ¼-in.-deep hole into which the loop end of the pin can be forced. Then you can add wedges cut from toothpicks and glue them to anchor the pin firmly in place.

—Walter E. Burton

Short toolrest



This short toolrest for a wood lathe was made of two short pieces of pipe. The toolpost is a 1-in.-dia. pipe. The rest is a quarter section cut from a 4-in.-dia. pipe. The toolpost was slotted to take the edge of the rest. Then the two pipe sections were arc-welded together. The total cost was less than \$1 because both of the pieces were salvaged from a plumber's scrap pile.

-Alice and Robert Tupper



Discover the world's oldest hobby!

Build this beautiful wooden ship model.

> Special offer for those who have never built a ship before!

Wouldn't you love to build this historic ship model? It's a true-to-scale, 21" replica of the 2-masted schooner Swift, a Virginia pilot boat of 1805. Well, now you can! And you don't have to be a skilled craftsman to do so.

It really isn't hard

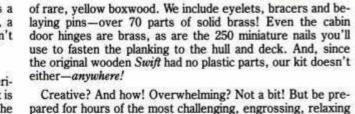
Even if you've never built a model before, you can experience the relaxing pleasure and pride of accomplishment that is offered by this fascinating hobby. You can build the Swift. The

secret's in our kit, designed especially for the first time modeler, with pre-cut parts that make assembly easy. Clear, large scale plans and instructions that virtually take you by the hand and guide you every step of the way through hours of the most relaxing fun you'll ever have. And when completed-a museum quality model you'll display with pride. with gleaming brass fittings, walnut planked hull, delicate rigging-lifelike in every detail.

Quality you can see and feel

The materials in our kit may be better than those used in the original Swift. The keel section and frames are pre-cut plywood, ready for quick assembly. The Swift's hull is planked twice; once with thick, flexible limewood for strength, then overlaid with planks of African walnut for lasting beauty.

You won't have to make the fittings-we've done that for you. Our kit contains ready-to-use blocks and deadeyes



pared for hours of the most challenging, engrossing, relaxing

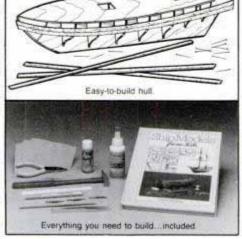
fun you've ever had.

An "everything you'll need" special offer, with free tools and handbook.

We want to introduce you to this great hobby, now! So we've made it easy for you to get started. Our special offer includes the Swift kit plus all the tools you'll need to build her: pliers, hammer, knife, file, tweezers, sandpaper, glue, wood oil, and more. You'll also receive a free copy of "Ship Models from Kits," a 110 page beginner's guide. You don't have to buy anything else. The tools normally cost \$17; the book retails for \$7.95. But they're yours, FREE when you buy the Swift kit at its regular price of \$39.95 (plus \$4.00 for delivery).

Credit card holders order toll-free

Call 800-228-2028, ext. 68, 24 hours a day. In Nebraska, call 800-642-8300. Use Visa, Mastercard, American Express, or use coupon below to send check or money order.



Miniature Cannon Kit Bonus!

Set of two solid brass cannon on walnut carriages to be mounted amidship. \$4.00 value, sent FREE with your order.



model expo, inc. 23 Just Road, Fairfield, N.J. 07007

MODEL EXPO, INC. 23 Just Road, Fairfield, NJ 07007 Dept. PM-36

kits of the Swift (No. AL150) at \$39.95 plus FREE tools, book and cannons. Check or money order enclosed. (Add \$4.00 for delivery. NJ residents must add 6%

Name			
Address			

If less than delighted, you may return your purchase within 30 days for a full refund. 6 Model Expo. Inc. 1985

Computers



BY RON SCIBILIA

Sitting pretty



Tandy's Model 600 laptop has plenty of memory, improved display.

Tandy Corp. is the clear leader in the portable field thanks to its popular Radio Shack TRS-80 Model 100 and Tandy 200 laptop computers. The Fort Worth, Texas, company plans to keep ahead of the portable pack by adding a top-of-the-line model.

The new Tandy 600 builds on the strengths of its predecessors, both of which remain in the line, and suggests that the Texas giant has been perusing "wish lists" sent in by Model 100 and Tandy 200 users.

For starters, the Tandy 600 makes the long-awaited jump into the 16-bit microprocessor world, using a low-power-draw version of the same Intel 8088 found on the IBM Personal Computer. The result is both faster processing speed and, more significantly, greater memory-addressing capability.

Although the 600 comes with only 32 kilobytes of random-access memory (RAM) standard, the 11-pound portable can handle up to 224-KB RAM by means of optional 96-kilobyte upgrades. All 224-KB RAM is "contiguous," meaning that unlike the Model 100, which outside suppliers have expanded beyond its original 32 kilobytes by means of extra RAM "banks," the Tandy 600 can handle single files larger than 32 kilobytes in size.

The new portable also packs a built-in disk drive with 360 KB of storage on single-sided 3½-in. microfloppy disks. But users who don't require immediate disk storage (or who don't have a disk on hand) can, as with the 100 and 200, keep data alive in the 600's nonvolatile RAM.

The 600 also retains the

Tandy philosophy of providing a selection of built-in, instantly ready-to-use software (or more accurately, firmware) etched into ROM. The new machine improves upon the earlier versions' firmware-though at some cost in ease of use-with a considerably more powerful integrated Microsoft package. This package includes six programs: System Manager, a housekeeping program that serves as a traffic cop among the other applications; Word, a version of Microsoft's well-known word processor; Multiplan, a version of the publisher's spreadsheet; Telecom, a communications with auto-dial capability and XMODEM protocol for error-free file downloading; Calendar, an appointment scheduler; and File, a data base.

The 600 has a new 16-line by 80-column liquid-crystal display, twice the 16-by-40 capacity of the Model 200. Other features of the Model 600 include a built-in 300-bps (bits per second) modem with auto-dial, auto-answer and direct connections; a built-in clock with auto wake-up; and automatic shutdown. Its built-in rechargeable NiCad batteries power the laptop for about 11 hours.

Base price on the 600 is \$1599, with each 96-KB RAM memory upgrade kit tagged at \$399.95.

Going beyond laptops, Tandy's other new computer, the Tandy 3000, takes aim at IBM's top-of-the-line PC/AT.

There's no questioning that Tandy has priced the 3000 very aggressively indeed. A 1-drive model that has a 1.2-megabyte floppy disk drive and 512-KB RAM is tagged at \$2599. The same model with the addition of an internal 20-MB hard-disk drive goes for \$3599. Both prices reflect substantial discounts—up to 40 percent—from IBM prices for similarly-spec'd equipment.

Wild blue yonder

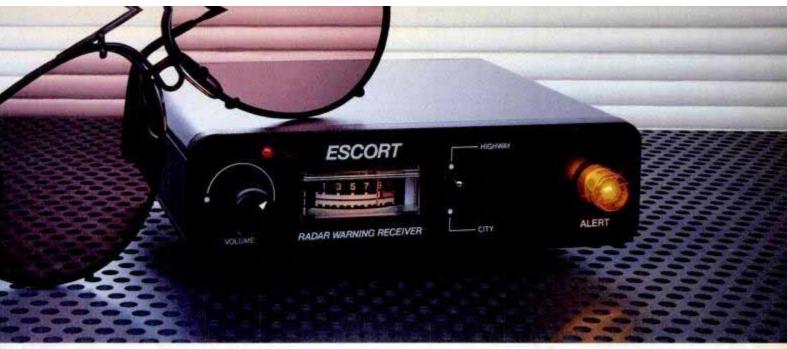
Armchair jet jockeys get a chance to show just how much of the "right stuff" they have with "Jet"—Sub-LOGIC Corp.'s \$50 software program. "Jet" lets owners of IBM-PC compatible computers experience all the thrills of high Mach numbers, redouts, blackouts, strafing, dogfighting and carrier landings without leaving the safety of their homes.

While your colleagues may believe you're assembling a bulletproof spreadsheet analysis, you can escape your deskbound reality to soar after MiG 21s or 23s in your choice of an F-16 Fighting Falcon or F-18 Hornet. And SubLOGIC offers optional scenery disks that can simulate terrain anywhere in the continental U.S. The program also can load scenery from Microsoft's Flight Simulator disk.

(Please turn to page 52)



Pilot an F-16 or F-18 fighter with SubLOGIC's "Jet" simulator.



It's Unanimous

(Even the competition says ESCORT's the one to beat)

It's easy to see who sets the pace in radar warning. Just read all the detector ads. Most of them claim to be as good as ESCORT. A few say they're better.

At least they agree on one thing, ESCORT is the one they have to measure up to.

A modern classic

ESCORT was a radical piece of electronic engineering in 1978 when it was introduced, the first practical use of superheterodyne technology to warn of police radar. Car and Driver magazine said, "...the radar detector concept has finally lived up to its promise."

Since then, our engineers have never stopped refining that technology. ESCORT may look the same on the outside, but it never stops getting better on the inside.

Standard of comparison

Now, when experts refer to the high-water mark in radar protection, they automatically turn to ESCORT. In March of this year, Car and Driver published its latest detector test, this one comparing remote-mounted models. ESCORT is designed for dashtop or visor mounting. But the magazine included ESCORT in the test anyway, as the reference against which the performance of the others would be measured. ESCORT scored 412 points in the final rating, compared to 274 for the highest-finishing remote. You might say the comparison showed that there is no comparison.

A gitt-edged reputation

Seven years is a long time in the radar warning business, but there is no shortcut to a good reputation. Car and Driver said, "The ESCORT radar detector is clearly the leader in the field in value, customer service, and performance..."



These excerpts were taken entirely from advertisements for other radar detectors.

So it's easy to understand why other detectors would try to stand in our limelight. ESCORT has seven years worth of credibility, the one quality that money can't buy in this business.

Check our references

Credibility doesn't come from extravagant claims. It comes from satisfying customers. You probably know someone who owns an ESCORT (nearly a million have been sold). So ask about us.

ESCORT pioneered superheterodyne receiving circuitry. Ask if our radar warnings always come in time.

ESCORT's reporting system combines an alert lamp, a variable-rate beeper that distinguishes between X and K band, and an analog meter, all to give an instant indication of radar strength. Ask if our warning takes the panic out of radar.

ESCORT is sold in one place only, the factory that makes it. This lets you deal directly with experts. Any of our staff of over 60 sales people will be glad to answer any questions you may have, about ESCORT or about radar in general.

We've been solving people's radar problems since 1978. How can we help you?

Try ESCORT at no risk

Take the first 30 days with ESCORT as a test. If you're not completely satisfied return it for a full refund. You can't lose.

ESCORT is also backed with a one year warranty on both parts and labor.

ESCORT \$245 (OH res. add \$13.48 tax) Slightly higher in Canada

TOLL FREE 800-543-1608





By mail send to address below. Credit cards, money orders, bank checks, certified checks, wire transfers processed immediately. Personal or company checks require 18 days.



Cincinnati Microwave Department 100-068-A15 One Microwave Plaza Cincinnati, Ohio 45296-0100

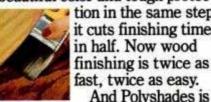
From bare to beautiful in less than a day...



Stain & polyurethane in one!

Polyshades:

Because Polyshades combines beautiful color and tough protec-



tion in the same step, it cuts finishing time in half. Now wood finishing is twice as fast, twice as easy.

HINWAX

highly transparent. It highlights rather than hides wood grain. In

six rich colors, satin or gloss, Polyshades is a stroke of genius. See POLYSHADES how easy it is. Send for our free booklet.

Minwax Co P.O. Box 42	mpany, Inc., D 6, Little Falls,	ept. PM-030 NJ 07424	9
Please send free 'Tips' booklet.			
Name			
Address			-
City	State	Zip	-
		10.00	

Minwax makes wood beautiful

@Minwax is a registered trademark © 1986 Minwax Company

COMPUTERS

(Continued from page 50)

Hard news

Data storage is not only getting cheaper, it's getting smaller. For some time, owners of IBM PCs and close compatibles have been able to upgrade their data storage dramatically by adding an internal hard-disk drive to their systems.

What's changed now is that instead of taking the place of a floppy-disk drive, the "new wave" hard-disk drives are plug-in boards small enough to fit into the PC's option slots.

The first of these products to hit the market was Plus Development Corp.'s Hardcard. For \$1095, the Hardcard puts a preformatted 10-megabyte 31/2in. hard-disk drive with controller on a plug-in card 4 in. high by 13 in. deep by only 1 in. wide. The card weighs just 2 pounds, has an average access time of 65 milliseconds, and consumes only 10.9 watts when operating. The drive comes with a file management software program, which was codeveloped with Software Publishing Corp. and is called Hardcard Directory. It allows for easy loading and locating of application programs and data files on the hard disk. The product's 1-year warranty includes immediate exchange at authorized service locations.

Other manufacturers are losing no time in bringing out hard-disk cards of

The DriveCard supplied by Mountain Computer of Scotts Valley, California, is compatible with the IBM PC family, the AT&T PC 6300, and Compaq models. Mountain has two versions of its card, one with 10 megabytes of storage, the other boasting 20 megabytes. The unit occupies 11/2 card slots and draws 14 watts of power. Average access time is 85 milliseconds. Mean time between failures, Mountain claims, should be as much as 20,000 hours. Prices are \$1195 for the 20-megabyte drive, \$1095 for the 10-megabyte version. Both carry 1vear warranties.

Irvine, California-based Western Digital has introduced its hard-disk-ona-card, dubbed FileCard. The 11/4-in.thick, 10-megabyte unit uses a single slot on an IBM PC and 11/2 slots on the IBM PC/XT or compatibles. Western Digital's product gives the memoryhungry computer user an extra bonus: You can add from 128 kilobytes to 512 kilobytes of RAM on the same card via an optional expansion board. Western Digital says it's planning other interesting add-ons for its FileCard in the coming months. Suggested retail price

Chatsworth, California-based disk drive supplier Tandon Corp. is yet another contender. Tandon's Diskard 21

for the IBM PC, XT and compatibles installs in a single slot on most systems, and is able to cram a hefty 21.3 megabytes of formatted capacity into its drive. Power consumption is 11 watts, price is \$995.

In other news from the data storage front, Japan's JVC will offer a 1.47pound one-third-height 31/2-in. harddisk drive with up to 10 megabytes capacity. Because of its small size and low power consumption, the JD-38 should find its way into a wide variety of portable applications.

On-line crimestoppers

You've seen pictures of bad guys on the Post Office walls. Now, get ready to see them on your computer display. PC owners who subscribe to CompuServe Information Service can take part in an electronic dragnet designed to ferret out some of this country's nastiest criminals. The FBI's 10 Most Wanted Fugitives program, which began in newspapers back in 1950, has now arrived in the electronics age, and computer buffs are being enlisted to help with leads.

Users of Columbus, Ohio-based CompuServe get a brief history of the 10 Most Wanted Fugitives program, then a list of names. Subscribers can get a "Story and Description" or "Portrait of a Fugitive" rundown on whichever fugitive they pick. The Story and Description option describes the fugitive's crime, personal habits and history, the last place he or she was spotted and other relevant data. The Portrait option provides a monochrome rendering of the fugitive and includes such vital statistics as age, height, weight and habits. CompuServe says the graphics can be received by 40 to 60 percent of its 230,000 subscribers, those possessing an IBM PC or IBMcompatible unit and using Compu-Serve's Professional Connection or VIDTEX software. Subscribers who don't have this combo can download the pictures to disk and view them later, the service says.

What's disk?

Fuji Photo Film, recognizing that the floppy disk is fast becoming a kid's best friend, has put out a free 32-page booklet which introduces any age computer users to the basics of diskette care and handling-and furnishes a lot of basic information about the floppy format along the way.

The Floppy Disk Story even includes a glossary of computer terms-from access time to word processing. You can get a copy by writing to Fuji Film Promotion Dept.; P.O. Box 9870, Wethersfield, CT 06109.

BE YOUR OWN BOSS EARN UP TO \$20 AN HOUR IN A MONEY-MAKING BUSINESS OF YOUR OWN!



NOW! Use your SPARE TIME to BEAT inflation and the high cost of living!

No Experience Needed

With Belsaw Sharp-All it's easy to start your own business. No selling is involved, no inventory. People bring in their work...
you take in year round CASH PROFITS and keep 90¢ out of every dollar you earn. Work spare time or full time right at home in your garage, basement or tool shed. Work the hours you want — FREE Book tells how to start your own business even while working at your regular job.

BIG PROFITS — Plenty of business waiting.

Every home and business has saws and tools that need periodic sharpening. There's plenty of business waiting for the man who can sharpen saws, planer knives, jointer blades, wood chisels. scissors, pinking shears, snips, lawn mowers, axes and other garden, shop and home tools. Belsaw Sharp-All does ALL these jobs and more... quickly, and at a big profit. You will be sharpening headquarters for carpenters, builders, lumberyards, factories, home workshops and hobbyists... hundreds of jobs right in your own neighborhood.

SEND FOR FREE FACTS TODAY!

You risk nothing by accepting this offer to see how easily you can turn your spare time into BIG CASH PROFITS with your own Complete Sharpening Shop. Send coupon or nail postcard for full details on our exclusive 30-Day FREE Trial Offer.

30-Day FREE Trial Offer!

Our FREE Book tells how to start a profitable, lifetime home sharpening business, how we help you grow, how we'll finance you.



BELSAW MACHINERY, DEPT. 60599 P.O. BOX 34620, N. KANSAS CITY, MO. 64116

With the BELSAW SHARP-ALL It's Easy To Get Started!

You don't need to invest thousands of dollars to get started in business for yourself. Low cost Belsaw Sharp-All and our 50 years business for yourself. Low cost Belsaw Sharp-All and our 50 years of experience in helping sincere men to earn extra income, plus the desire to get ahead is all you need. Complete Operator's Manual gives clear, step-by-step instructions, shows exactly how to sharpen each tool, where to get the tricks of the trade to sharpen each tool, where to get the tricks of the trade to Belsaw Sharp-All does the kind of precision job that brings customers back time after time.

There are NO franchise tees of any kind, With the Belsaw Sharp-All YOU are the boss... YOU set the hours YOU want to work... YOU put the PROFITS in YOUR pocket! customers back time after time.

ACT NOW! Coupon

Brinas

Full

Details!

BELSAW SHARP-ALL lets you sharpen saws . . . shop and garden tools for home and industry.

There is NO OBLIGATION!



BELSAW MACHINERY DEPT. 60599 P. O. BOX 34620

N. KANSAS CITY, MO. 64116 Please send my FREE copy of your book "LIFETIME SECURITY" and full details on your 30-Day Free Trial Offer!

Address





Call 1-800-533-5545 today and ...

On These Name Brand Parts, Tools & Equipment!



Heavy Duty Log Splitters

8 Ton Electric, 110 volt, #1110..\$459.00

16 Ton Model, #1134 * \$789.00

24 Ton, Low Profile, #1142 + ... \$1329.00

* Comes with 2-stage pumps, heavy duty slides

& beams and large oil tanks.

Gas Engines Always the Lowest Prices And the Largest Selection!

One Year Warranty!



5 Hp. Tecumseh 4" shaft, #6051 \$139.95 5 Hp. Briggs, 4" shaft. #6052......\$141.95 8 Hp. Tecumseh, cast iron sleeve. 6081.\$192.95

8 Hp. Briggs, 1" shaft. #6080.....\$222.95 10 Hp. Tecumseh, cast iron sleeve, 6010 \$232.95 10 Hp. Tecumseh, elec. start, #80101...\$289.95 3-20 Hp. Horizontal & Vertical engines available at SUPER LOW DISCOUNT PRICES!

Vertical

8 Hp. Briggs, 1" shaft. #7080......\$217.95 8 Hp. Tecumseh, cast iron sleeve, 7082 \$198.95 10 Hp. Tecumseh, cast iron sleeve. 7010 \$221.95 3-23 hp. horizontal & vertical engines available at SUPER LOW DISCOUNT PRICES!

Log Splitter Parts

11 Gpm 2 Stage Pump, #1012...... \$83.95 22 Gpm 2 Stage Pump, #1017......\$248.00 Standard 4-Way Control Valve, #2010 \$46.50 Auto Detent Valve, #2020......\$49.95 4x24x2" Welded Cyl., #902424.....\$109.95 5x24x2" Tie Rod Cyl., #909524....\$195.00

Much More in Stock at Low Discount Prices!

Honda Generators

Other Honda Products Available! HONDA

Honda EX1000, 1000 watts of power. List \$479. Ship Wt. 58 lbs.

Item# 1672.....\$393.00 Honda EG1400, 1400 watts of power, List \$509. Ship Wt. 79 lbs.

Honda EG2200, 2200 watts of power. List \$749. Ship Wt. 89 lbs.

Item# 1668.....\$519.00



High speed hub & spindle set, 2000 lb, capacity, 4" bolt circle, 4 hole, 2 hubs & 2 spindles, dust caps, tapered bearings, lug bolts & cotter pins \$37.50/set

High speed trailer wheels & tires. Fits all 4 hole boat & snowmobile trailers.

item# Size Sale tire only Cap. 1211 480x8 590 lbs. \$23.95 \$15.95 715 lbs. \$33.95 \$24.95 570x8 1212 1216 480x12 780 lbs. \$39.95 \$24.95

Trailer springs, 1%" wide w/eye center of 25%" Item# Sale Capacity Springs Leafs 1250 \$22.00/pr.

1000 lbs. 2 2 1251 24.00/pr. 2000 lbs. 2 1252 3000 lbs. 27.00/pr. 2 Single Spring Set Shackle, Item# 1255, \$10.00/pr.

Don't Be Without Power

Ideal for homeowners, farmers contractors & vacationers.

1 Year Warranty

Generators

4000 Watt, 8 Hp. Briggs, 33 amps @ 120 V. 16.6 amps @ 240 volts. List \$1009.00, Item# 16402

\$422.00

4000 Watt, w/elec. start, List \$1143. Item# 16403 \$485.00

5000 Watt, 11 Hp. Briggs, 42 amps @ 120 V. 21 amps @ 240 volts, List \$1174.00, Item# 16404

\$599.00 5000 Watt, w/elec. start, List \$1299., Item# 16405

\$699.00 (1 Year Warranty on Above Generators)

Air Compressors SANBORN Single Stage

5 Hp., 60 gallon vertical, 2 cylinder

single stage. 2.7 Cfm @ 40 Psi, 10.6 Cfm @ 90 Psi. List \$1160.00

ttem# 159545...\$497.00

IMC Two Stage 5 Hp., 2-stage, 60 gallon vertical, 17.3 Cfm @ 100 Psi, 13.39 Cfm @ 175

Psi. A Real Bargain, List \$1202.00

tem# 15975.....\$879.00 (Compressors shipped truck freight collect) We carry a wide selection of compressors & air tools at Super Low Discount Prices! Act Today!



Homelite 2" Pump

This pump is equipped with abrasive and chemical resistant seals. Ideal for clear water, chemical fertilizers or chemical transfer. Uses 2" suction. Pumps 8400 Gph, with a 28' lift. EDPM seals, 3 hp. Briggs engine. Comes with universal mounting base for permanent installation. List \$329.95, Sh Wt. 37 lbs.

\$175.95

801 East Cliff Road, Box 1219, Burnsville, Mn 55337 Call our order dept. at 1-800-533-5545 in Mn call 612-894-8310

in Mpls. Metro Area Call 894-0326

Sale Expires March 31

Phone Orders Monday-Thursday 8am-8:30pm Fridays 8am-6pm, Saturdays 8am-5pm

1986 We Ship UPS, Bus or Truck



Order Toll Free 1-800-533-5545

Send for a Free catalog or include \$6.00 and receive your

catalog and a Splitter Design Booklet.

Northern **Hydraulics** 801 East Cliff Rd. Box 1219 Burnsville, Mn 55337 Dept.# 9036

Name . Address ___

City _ State.

Please Rush Me My FREE Discount Catalog!

Aviation



BY DENNIS ESKOW

Vintage year aviation



Stearman trainer and others brought back fond memories.

ommercial aviation has marked 1985 as a landmark year for air crashes. But it was also a year of positive aviation anniversaries. We celebrated the 50th anniversary of the Flying Fortress. The DC-3 also marked its 50th, as did Pan American China Clipper service. It was in this spirit that McDonnell Douglas and the Douglas Historical Foundation put on a "Wings Of Glory" display as last year came to a close. It wasn't all McDonnell Douglas. True, they displayed their historic aircraft, but they also displayed products of Boeing, Hughes, Piper and others. The Stearman (Boeing) bi-plane seen above was designed for the Navy training program in the 1930s. Other aircraft on display included vintage B-25s, Cord Convertables, Grumman Amphibians and British Spitfires.

There were a few contem-

porary twists as well. The Air Wolf Helicopter from the TV show was displayed, along with the real-life Hughes 500 helicopters. A good portion of the show's aircraft is on display permanently in Long Beach, California, home of the Spruce Goose.

Insurance downs planes

In America today, lawsuits have become practically reflex. And that's the main reason why aircraft manufacturers have to pay very high product liability insurance premiums. Officials of the General Aviation Manufacturers Assn. (GAMA) say the rising cost of product liability insurance is choking the makers of small aircraft.

Other insiders in the aerospace world say product liability insurance costs have actually killed a half dozen ultralight companies and are threatening big names in the general aviation business.

In 1985, general aviation airframe builders alone spent over \$100 million for insurance. But the costs of insuring engines and avionics raises the price to \$200 million, according to GAMA.

Congress is considering several proposals to create a model product liability law. But these are stale, and no one believes anything will be done about them soon. Maybe there's a good reason for delaying action. After all, most of us have become leary about over-regulation. Let me suggest, however, that pilots reading this column write today to their congressman asking what is being done and why. Send me a copy at PM, 224 W. 57th St., New York, NY 10019. We'll make the lawmakers go public with their positions on this hot is-

Cliff flies off

Cliff Robertson, whose brilliant acting career has included roles as pilots, is working these days on the twin-engine Beechcraft Baron he takes cross-country. PM correspondent Shirley Lee caught Robertson recently at the Santa Paula airport north of Los Angeles. He was inside his private hangar recharging the Baron's batteries.

"I designed this double hangar myself," he said. Inside, he keeps some of his collectible aircraft, which include a couple of biplanes, a Messerschmitt 108 and a British Spitfire Supermarine.

"When I was 14 years old, I'd pedal my bicycle out to a little dirt airport near my hometown of La Jolla during the summertime," Robertson told Lee. "I'd work all day long—for no pay—cleaning dirty engine parts. My reward was to go up in a Taylor Cub and be given flying instructions a couple of times during the week."

A busy schedule of film production and direction has forced Robertson to hire a full-time mechanic. But he still likes to work around his planes. Robertson has flown in the Reno air races, but flying isn't all fun and games for him. He organized mercy flights to Biafra during the Nigerian drought of the 1960s. And he actively supports the Civil Air Patrol.

Civil Air Patrol

Speaking of the search-andrescue group, a Pentagon official tells me CAP will get \$20 million in new aircraft distributed to local units around the country this year and next. Divide \$20 million by 50 states and it's not many aircraft. But the Defense Department aid to CAP indicates the volunteer group is getting the recognition it deserves. Local media may play down the rescue work done by CAP members since it isn't always glamorous. But weekend fliers appreciate their presence at airports everywhere. If you have a CAP story to share with us, send it to me.



Cliff Robertson works on one of the many planes in his collection.

POPULAR MECHANICS • MARCH 1986

56

PERFORMANCE COUNTS. THE THRILL OF REAL CIGARETTE TASTE IN A LOW TAR.

XIDGARTES

VANTAGE



© 1986 R.J. REYNOLDS TORACCO CO

9 mg. "tar", 0.7 mg. nicotine av. per cigarette by FTC method.

SURGEON GENERAL'S WARNING: Smoking Causes Lung Cancer, Heart Disease, Emphysema, And May Complicate Pregnancy.

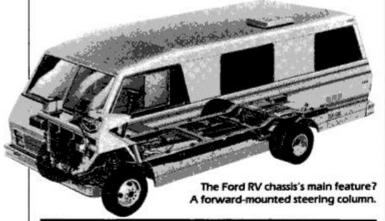
Outdoors



BY TIM COLE

Ford's new RV chassis

n a field long dominated by Chevrolet, the Ford Motor Co. has decided to unveil a Class A motorhome chassis to the recreational vehicle industry. The Ford unit is actually a reengineered Class C chassis with lower, wider frame rails that permit wide variations in RV interior design. The powerplant is the proven and highly regarded Econoline 7.9-liter V8, coupled to the simplicity and economy of a single exhaust system. Ford hopes to aim its new Class A at coach builders in the 20- to 27-foot range. A steering column located farther forward than aboard conventional units permits a smaller, more aerodynamic shape outside-and more space inside. Also up front, you'll find twin I-beam suspension and a 3speed automatic transmission. Beefy dual rear wheels, a 158in. wheelbase and a GVW rating of 11,500 pounds provides the basis for a stable, sturdy RV platform. For more information, contact the Ford Motor Co., 300 Renaissance Center, P.O. Box 43306, Detroit, MI 48243.



3-wheeler ATV conversions

Off-road fun has changed dramatically in the past six months with the growing emergence of 4-wheel ATVs. These back-road bombers are generally more stable than their 3-wheel antecedents, but they're hardly tame. Roll on the power and you can still scale the berms with the greatest of ease. And, as PM's August report on 4-wheel ATVs confirms (Wringing Out The New

Four-Footed ATVs, page 80), 4-wheelers have a distinct utilitarian side. Racks and trailers make them the beasts of burden for the '80s.

But what if you've just purchased a 3-wheeler and want to convert? Enter 3X4 Products. This California company will sell you a slipon front end, tires, brakes, shocks and a plastic nosepiece for under \$1000. The assembly weighs 86 pounds for most applications (Honda ATVs require a 3X4 unit be-



tween 45 and 70 pounds).

As the photos indicate, you install the 4-wheel conversion system by disassembling your 3-wheeler's fork, wheel, handlebar, headlight, cables and levers. Knock the steering races out of the steering head and insert the stem of the 3X4 frame's front end. The bottom frame rails

bolt to the chassis foot-peg mounting holes. Then, all you have to do is refit the handlebars, headlights, cables and other front-end gear. A mechanically minded ATVer can perform the work in an hour.

Contact 3X4 products, 1452 N. Johnson Ave., El Cajon, CA 92020.

Hobie goes high-tech

Hobie Cats have been making waves around the world ever since Hobie Alter, the iconoclastic surfboard maker, scratched his first design on a sandy California beach. That 14-foot cat-rigged catamaran altered (so to speak) the face of sailing forever, and the Oceanside, California, firm has made variations on the theme ever since.

The latest permutation in the Hobie lineup, which in-



Hoble 17's lone operator tests waters from a trapeze harness.

cludes 16-foot and 18-foot sloop-rigged cats, is a 17-foot singlehander intended for 1man racing or cruising by the pair. But this Hobie is ingrained with several leading-edge twists that make it possibly the highest performing Hobie ever. It took Hobie designers three years to develop this machine, which boasts a Mylar una-rig with composite aluminum/fiberglass spar. Hobie designers also invested time and energy in the 17's springloaded center-board system. Special racks port and starboard help the singlehanded operator extend weight outboard and provide bench seating for two on more relaxed occasions. For more about this \$3685 speedster, contact Hobie at P.O. Box 1008, Oceanside, CA 92054.



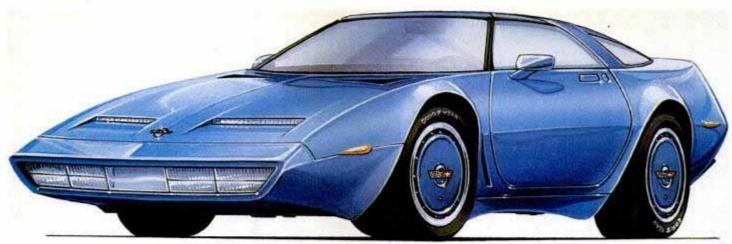
A classic truck? Well, sure.

The pickup is a classic of sorts, with over five decades of service to mankind to its credit. But the GMC S-15 4X4 Pickup is a classic departure from trucks as they are commonly perceived.

Its rakish looks and sophisticated comforts allow this GMC truck to do virtually anything a car can do. And its Insta-Trac four-wheel drive, double-wall cargo box and optional V-6 engine allow our pickup to do a lot of things a car could never do.

The GMC S-15 4X4 Pickup. If you're into fine cars, it's time you discovered fine trucks. Buckle yourself into one soon at your nearby GMC Truck dealer. And please help preserve America's natural beauty whenever you're out four-wheeling.





IS THIS THE NEXT CORVETTE?



There are big changes in store for America's favorite sports car, all aimed at holding off foreign competition.

BY CLIFF GROMER Illustrations by Jeff Mangiat

he idea was brilliant. Take
the country's leading performance nameplate and tack it
onto a totally new-design
sports car, one that would outpower,
outhandle and out-tech everything else
in the world. That car was the 1984
Corvette, undeniably world-class machinery. The basic model series continues through '86, but then things get
interesting.

Why? Because other manufacturers are casting covetous glances at Corvette's prestigious ultraperformance market segment. Nissan, for one, plans to unleash in 1987 a 230-hp, mid-engine 2-seater featuring 4-wheel drive and 4-wheel steering. Sticker price is expected to be about \$25,000. So what does Chevrolet do for an encore?

Current plans are to continue the existing body/chassis through '87. In 1988 we'll see a new body, the one shown here, grafted onto a basically carryover chassis. The Vette gets a new V8 in mid-1988, and this package will continue until '91, when we'll see an all-new chassis. Chevrolet is kicking around mid-engine and 4-wheel-drive designs for '91—especially in light of the threat from Nissan. The '91 model will be built using techniques borrowed from the Pontiac Fiero—attaching plastic body panels to a rolling chassis.

The 1988-'90 Corvette series will be called Grand Sport, a name last used for the five hand-built 1963 Corvette race cars. Grand Sport will be lower, sleeker, roomier and 200 to 300 pounds lighter than current models.

The current tilt hood will revert to a conventional design and will feature vents similar to those now used on the Trans Am. The rear end will have three taillights per side. They'll be smaller in size and perhaps sequentially operated.

Rolling stock will be 17-in. wheels, available in four to six body colors. The flat-disc wheels will not use the current "gatorback" unidirectional tires.

The real excitement for performance fans will be the mid-1988 intro engine—a 350-cu.-in. aluminum block V8 with steel sleeves. The engine will use four valves per cylinder, driven by four overhead cams. Sparkplugs will be centrally located in the hemispherical combustion chambers. We may see a form of direct ignition, each cylinder having its own ignition coil.

The hot V8 will rev to 7000 to 7500 rpm and crank out 300 hp and 400 lb.-ft. of torque. Acceleration should be strong enough to give you a nosebleed.

The real surprise about the new Corvette is that it's being developed not in Detroit, but in England. Lotus is handling powertrain development while Hawtel Whitting is working on the body/chassis package. This means there will be even more "world" in Chevy's new world-class sports car.

Body design for the 1988-'90 Vette, now under development in England, will carry familiar styling clues up front, and take on Grand Sport moniker.



Now you can have Lifetime Security in a **CASH** business where you can easily make up to \$200.00 per day and more

Find out how ...

... send NOW for your

FREE Lifetime Security Fact Kit

Your FREE Lifetime Security Fact Kit tells you how to make \$18.00 to \$30.00 an hour in your own Foley-Belsaw Full-Service Saw and Tool Sharpening Business. Your FREE Fact Kit explains how you can:

- be your own BOSS!
- work full time or part time, right at home.
- do work you enjoy and take pride in.
- operate a CASH business where 90¢ of every dollar you take in is clear cash profit.

And it is so easy to learn. Foley-Belsaw gives you all the facts and instructions. No previous experience or special training is necessary. All you need is the desire and ambition to be your own boss. Foley-Belsaw tells you everything you need to know to be successful.

There's plenty of business where you live to keep you busy. It doesn't matter whether you live in a big city, small town or a small farm community.

You'll quickly be able to develop the skills necessary to earn a steady income. You'll be able to sharpen all types of saws, garden and shop tools for home, farm and industry.

Profits from your Foley-Belsaw Full-Service Sharpening Business can provide...

- ... CASH for future security or supplemental
- ... CASH for travel, vacations, fishing trips
- ... CASH for the things you've always wanted!

And you'll be able to set your own hours and not

have to worry about layoffs and strikes. There are no franchise fees. Best of all-age or physical condition is no barrier-any age person can succeed.

You can be like Steve Taylor of Brookville, Ohio, who told us:

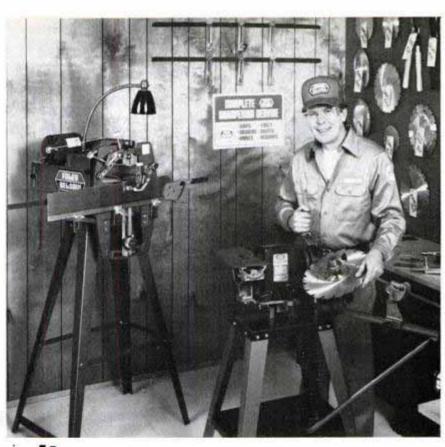
"... the first year I grossed \$21,000.00."

Or James B. Jones, of Albuquerque, NM who reported:

"This past summer my sales and service amounted to almost \$6,000.00 a month."

But you've got to get the FACTS before you can get started. So WRITE NOW for your FREE Lifetime





COMMODORE 64 COMPUTER

(Order Now)

\$139⁹⁵

- C128 Disks 79° ea.*
- Paperback Writer 64 \$34.95
- 10" Comstar 10X Printer \$148.00
- 13" Zenith Color Monitor \$139.95

CALL BEFORE YOU ORDER

COMMODORE 64 COMPUTER \$139.95

You pay only \$139.95 when you order the powerful 84K COMMODORE 64 COMPUTER! LESS the value of the SPECIAL SOFTWARE DISCOUNT COUPON we pock with your computer that allows you to SAVE OVER \$250 off software sale prices!! With only \$100 of savings applied, your net computer cost is \$39.95!!

* C128 DOUBLE SIDED DISKS 79' EA.

Get these 5%" Double Sided Floppy Disks specially designed for the Commodore 128 Computer (1571 Disk Drive). 100% Certified. Lifetime Warranty. Automatic Lint Cleaning Liner included. 1 Box of 10 - \$9.90 (99" ea.). 5 Boxes of 10 - \$44.50 (89" ea.). 10 Boxes of 10 - \$79.00 (79" ea.).

13" ZENITH COLOR MONITOR \$139.95

You pay only \$139.95 when you order this 13" ZENITH COLOR MONITOR. LESS the value of the SPECIAL SOFTWARE DISCOUNT COUPON we pack with your monitor that allows you to save over \$250 off software sale prices!! With only \$100 of savings applied, your net color monitor cost is only \$39.95. (16 Colors).

Premium Quality 120-140 CPS Comstar 10X Printer \$148.00

The COMSTAR 10X gives you a 10" carriage, 120-140 CPS, 9×9 dot matrix with double strike capability for 18×18 dot matrix (near letter quality), high resolution bit image (120 \times 144 dot matrix), underlining, back spacing, left and right margin setting, true lower decenders with super and subscripts, prints standard, italic, block graphics and special characters. It gives you print quality and features found on printers costing twice as much!! (Centronics Parallel Interface) List \$399.00 Sale \$148.00.

4 SLOT EXPANDER & 80 COLUMN BOARD \$59.95

Now you program 80 COLUMNS on the screen at one time! Converts your Commodore 64 to 80 COLUMNS when you plug in the 80 COLUMN EXPANSION BOARD!! PLUS 4 slot expander! Limited Quantities

80 COLUMNS IN COLOR PAPERBACK WRITER 64 WORD PROCESSOR \$39.95

This PAPERBACK WRITER 64 WORD PROCESSOR is the finest available for the COMMODORE 64 computer! The ULTIMATE FOR PROFESSIONAL Word Processing, DISPLAYS 40 or 80 COLUMNS IN COLOR or black and white! Simple to operate, powerful text editing, complete cursor and insert/delete key controls line and paragraph insertion, automatic deletion, centering, margin settings and output to all printers! List \$99,00. SALE 139.95. Coupon \$29.95.

COMMODORE 64 SYSTEM SALE

Commodore 64

Plus \$30.00 S&H

Com. 1541 Disk Drive

13" Color Monitor \$457

PLUS FREE \$49.95 Oil Barons Adventure Program

SPECIAL SOFTWARE COUPON

We pack a SPECIAL SOFTWARE DISCOUNT COUPON with every COMMODORE 64 COMPUTER, DISK DRIVE, PRINTER, or MONITOR we sell! This coupon allows you to SAVE OVER \$250 OFF SALE PRICES!!

(Examples)

PROFESSIONAL SOFTWARE COMMODORE 64

Name	List	Sale	Coupon
Paperback Writer 64	599.00	\$39.95	529.95
Paperback Database 64	\$69.00	\$34.95	\$24.95
Paperback Dictionary	574.95	\$14.95	\$10.00
The Print Shop	\$44.95	\$27.95	526.95
Halley's Project	\$39.95	525.95	\$24.95
Practicals (spread sheet)	\$59.95	\$19.95	\$14.95
Programmers Reference Guide	524.95	\$16.95	\$12.50
Nine Princes in Amber	532.95	\$24.95	521.95
Super Bowl Sunday	\$30.00	\$19.95	\$17.95
Flip & File Disk Filer	524.95	514.95	\$12.95
Deluxe Tape Cossete (plus FREE game)	\$89.00	\$44.95	\$34.95
Pro Joystick	\$19.95	\$12.95	\$10.00
Computer Care Kit	\$44.95	529.95	\$24.95
Dust Cover	\$ 8.95	\$ 6.95	5 4.60
Injured Engine	\$39.95	\$27.95	\$24.95
Pitstop II (Epvx)	\$39.95	522.95	\$19.95
Music Calc	\$59.95	\$14.95	\$12.95
File Writer (by Codewriter)	539,95	529.95	\$24.95

(See over 100 coupon items in our catalog)

Write or call for Sample SPECIAL SOFTWARE COUPON!

ATTENTION

Computer Clubs

We Offer Big Volume Discounts
CALL TODAY!

PROTECTO WARRANTY

All Protecto's products carry a minimum 90 day warranty. If anything fails within 90 days from the date of purchase, simply send your product to us via United Parcel Service prepaid. We will IMMEDIATELY send you a replacement at no charge via United Parcel Service prepaid. This warranty proves once again that **We Love Our Customers**.

C128 COMMODORE



Plus FREE \$69.95 Timeworks Wordprocessor.

- 340K 1571 Disk Drive \$259.00
- Voice Synthesizer \$39.95
- 12" Amber Monitor \$79.95

PRICES MAY BE LOWER

C128 COMMODORE COMPUTER \$289.00

We expect a limited supply for Christmas. We will ship on a first order basis. This all-new revolutionary 128K computer uses all Commodore 64 software and accessories plus all CPM programs formatted for the disk drive. Plus FREE \$60.95 Timeworks Wordprocessor.
List \$349.00. SALE \$280.00.

340K 1571 COMMODORE DISK DRIVE \$259.00

Double Sided, Single Disk Drive for C-128 allows you to use C-128 mode plus CPM mode. 17 times faster than 1541, plus runs all 1541 formats.
List \$349.00. Sale \$259.00.

SUPER AUTO DIAL MODEM \$29.95

Easy to use. Just plug into your Commodore 64 computer and you're ready to transmit and receive messages. Easier to use than dialing your telephone, just push one key on your computer! Includes exclusive easy to use program for up and down loading to printer and disk drives. **Best in U.S.A.** List \$99.00. **SALE \$29.95**, Coupon \$24.95.

VOICE SYNTHESIZER \$39.95

For Commodore-64 computers. Just plug it in and you can program words and sentences, adjust volume and pitch, make talking adventure games, sound action games and customized talkies!! PLUS (\$19,95 value) TEXT TO SPEECH program included FREE, just type a word and hear your computer talk — ADD SOUND TO "ZORK", SCOTT ADAMS AND OTHER ADVENTURE GAMES!!! (Disk or tape.) List \$89.00. \$ALE \$39.05

12" MAGNAVOX (NAP) 80 COLUMN MONITOR WITH SOUND \$79.95

Super High Resolution green screen monitor. 80 columns x 24 lines, easy to read, plus speaker for audio sound included. Fantastic value List \$129.00 **Sale \$79.95.** (C128 cable \$19.95. C64, Atari cable \$9.95)

PRINTER/TYPEWRITER COMBINATION \$229.95

"JUKI" Superb letter quality, daisy wheel printer/typewriter combination. Two machines in one — just a flick of the switch. 12" extra large carriage, typewriter keyboard, automatic margin centrol and relocate key, drop in cassette ribbon! (90 day warranty) centronics parallel or RS232 serial port built in (Specity). List \$349.00. SALE \$229.55. (Ltd. Qty.)

13" RGB & COMPOSITE COLOR MONITOR \$259.95

Must be used to get 80 columns in color with 80 column computers (C128 - IBM - Apple). (Add \$14.50 shipping)
List \$399.00. SALE \$259.95.

- LOWEST PRICES 15 DAY FREE TRIAL
- BEST SERVICE IN U.S.A.
 ONE DAY EXPRESS MAIL

PHONE ORDERS

- 8 a.m. 8 p.m. Weekdays 9 a.m. - 12 noon Saturdays
- 90 DAY FREE REPLACEMENT WARRANTY
- OVER 500 PROGRAMS FREE CATALOGS

Add \$10.00 for shipping, handling and insurance, Illinois residents please add 6% tax. Add \$20.00 for CANADA, PUERTO RICO, HAWAII, ALASKA, APO-FPO orders. Canadian orders must be in U.S. dollars. WE DO NOT EXPORT TO OTHER COUNTRIES EXCEPT CANADA, Enclose Cashiers Check, Money Order or Personal Check. Allow 14 days for delivery, 2 to 7 days for phone orders, 1 day express mail! VISA — MASTER CARD — C.O.D. No C.O.D. to Canada, APO-FPO

PROTECTO

We Love Our Customers
Box 550, Barrington, Illinois 60010

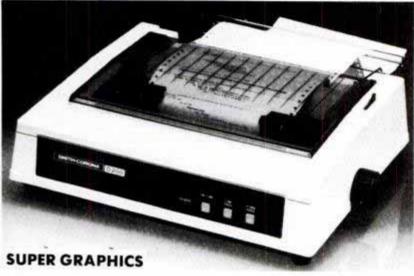
312/382-5244 to order

Famous Smith Corona National Brand

RINTERS

Below Wholesale Cost Prices!!!

- ONE YEAR IMMEDIATE REPLACEMENT WARRANTY
- Speed: 120 or 160 characters per second Friction Feed/Tractor Feed Standard
- 80 character print line at 10 CPI 1 Line Buffer, 2K Buffer on 120/160 CPS Plus LQM
- Six pitches Graphics capability Centronics compatible parallel interface
 - Features Bidirectional Print, Shortline Seek, Vertical And Horizontal Tabs



This is a sample of our near-letter-quality print.

emphasized

There is standard data italic print. processing quality print

Check these features & prices

120 CPS 10" Printer

\$429.00 SALE

120 CPS + Letter Quality Mode 10" Printer

\$449.00

SALE

160 CPS + Letter Quality Mode 10" Printer

\$499.00

SALE

(Apple — Atari — Etc.)

(IBM — Commodore)

Size/Weight Height 5.04" Width 16.7" Depth 13.4" Weight 18.7 lbs. Internal Char. Coding **ASCII Plus ISO Print Buffer Size**

120 CPS: 132 Bytes (1 line) 120/160 CPS Plus LQM: 2K No. of Char. In Char. Set 96 ASCII Plus International **Graphics Capability** Standard 60, 72, 120 DPI Horizontal 72 DPI Vertical Pitch 10, 12, 16.7, 5, 6, 8.3, Proportional Spacing

Printing Method Impact Dot Matrix

SPECIFICATIONS

Char. Matrix Size

9H x 9V (Standard) to 10H x 9V (Emphasized & Elongate)

Printing Features

Bi-directional, Short line seeking, Vertical Tabs, Horizontal Tabs

Forms Type Fanfold, Cut Sheet, Roll (optional)

Max Paper Width

Feeding Method

Friction Feed Std.; Tractor Feed Std. Ribbon

Cassette — Fabric inked ribbon

Ribbon Life

4 million characters

Interfaces

Parallel 8 bit Centronics compatible 120/160 CPS Plus NLQ: RS232 Serial inc.

Character Mode

10 x 8 Emphasized; 9 x 8 Standard; 10 x 8 Elongated: 9 x 8 Super/Sub Script (1 pass)

Character Set

96 ASCII 11 x 7 International Char.

Line Spacing

6/8/12/72/144 LPI

Character Spacing

10 cpi normal; 5 cpi elongated normal; 12 cpi compressed; 6 cpi elongated compressed; 16.7 cpi condensed; 8.3 cpi elongated condensed; 5.12.5 cpi elongated proportional

Cartridge Ribbon — List \$19.95. Sale \$12.95.

- Interfaces

IBM \$89.00

Apple \$59.00

Atari \$59.00

Commodore \$39.00

Add \$14.50 for shipping, handling and insurance. Illinois residents please add 6% tax. Add \$29.00 for CANADA, PUERTO RICO, HAWAII, ALASKA. APO-FPO orders. Canadian orders must be in U.S. dollars.

WE DO NOT EXPORT TO OTHER COUNTRIES, EXCEPT CANADA.

Enclose Cashiers Check, Money Order or Personal Check. Allow 14 days delivery. 2 to 7 days far phone orders. 1 day express mail!

VISA - MASTERCARD - C.O.D. No C.O.D. to Canada or APO-FPO PROTECTO

We Love Our Customers 22292 N. Pepper Rd., Barrington, Illinois 60010

312/382-5244 to order

Cycles



BY NORMAN MAYERSOHN

Radical chic



At Laguna Seca, Fazer proves it's much more than a style cruiser.

ver in Japan, where cheap-to-run scooters with catchy names like Honda's Spacy rule the streets, styles run a few years ahead of what's acceptable here in the West, Out-of-this-world show machines appear in production quickly there, but often fail miserably in the fickle U.S. marketplace. Yamaha isn't letting that hold back design creativity, though. They're about to unload the Fazer on these shores, and the look is as futuristic as the nameplate.

This model isn't easy to tuck into a convenient marketing pigeonhole. It's certainly not a road-race clone, clearly not a "standard" model, but then again, we can't call it a cruiser, either.

What we do know is that it uses the 5-valve-per-cylinder Genesis engine, this time in a tariff-skirting destroked 700-cc version. That makes it fast, and rubber engine mounts make it oh-sosmooth, but long-distance touring is not the point here.

Call the Fazer a junior musclebike, Son of V-Max, if you will. The functional air scoop snouts run up to the sides of the fuel tank about as subtly as a polished supercharger poking through the hood of your Camaro. At 87 hp, the Fazer falls slightly short of the 100-hp FZ750 on which it's based, but the delivery is more tractable and less demanding about being kept up in the top of the rpm range.

The liquid-cooled Four cants its cylinders over at a 45° angle to improve the downdraft carburetors' shot at delivering fuel into the cylinders and allow the header pipes a straighter exit path. And it all works as intended: Top speed is over 135 mph at the 11,000-rpm redline, despite the lack of a wind-cheating fairing.



Radical bodywork makes this Yamaha model unmistakable.

Our ride at the model's introduction on California's Laguna Seca Raceway showed that the Fazer gives up very little in the curves. besides. The box-section steel-tube frame seems out of place with old-tech dual rear shock suspension, but you sure couldn't tell that by the high-speed manners displayed on the track. It's stable, agile and, despite the futuristic styling, ground clearance enough for serious backroad scratching.

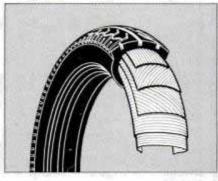
Love it or loathe it, the Fazer makes a bold statement. Yamaha has brought us an undiluted aggressive motorcycle that can't be confused with any other. Determined styling of the tank and side panels, rear tailpiece and seat kickup, plus dressup details of the engine,

mark this as an all-American hot rod. And instead of being one of the unobtainably expensive and frighteningly heavy models, they've given the treatment to a mainstream machine that, at \$3499, is accessible to the majority of riders.

Retiring soon?

Just when you've mastered all the fine points of intelligent tire selection for your family sedan, here come a few new choices for the 2-wheelers in your garage: treadless slicks for street bicycles and radial tires for motorcycles. In both cases, the technology has come from the racetrack to the street, with considerable advantages for performance-minded riders. If you can't

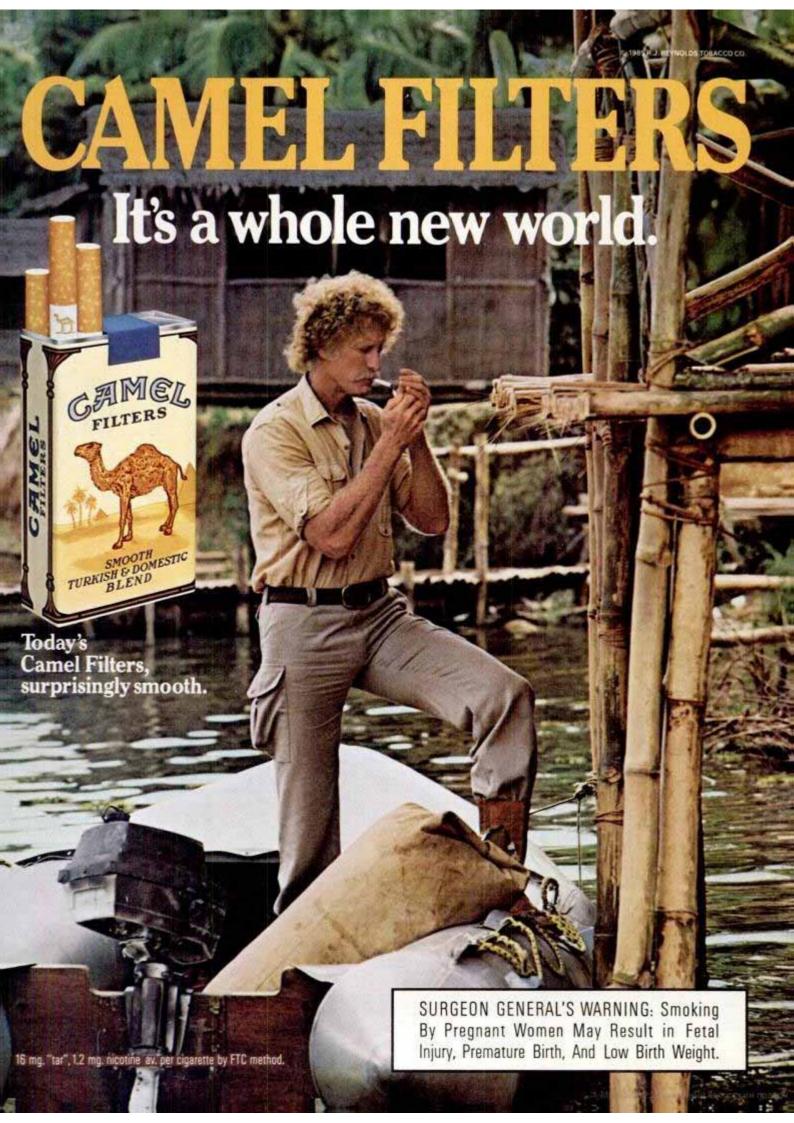
(Please turn to page 66)



Dunlop's radial K700 for motorcycles promises longer life and less heat buildup, but requires that riders adapt to the unfamiliar feel of flexy sidewalls.

Bicycle slicks use a smooth tread surface to put maximum rubber on the pavement. Lower rolling resistance comes with special construction and 115-psi inflation pressures.





(Continued from page 64)

quite warm up to replacing your bald old bicycle tires with bald new tires, think about the long-revered racing maxim: The more rubber on the road, the better the traction. Tread patterns molded into the tire have to reduce rubber contact patch area, though the grooves are vital to allow water to escape from under the tire in wet riding conditions. Even better, the new smooth facings, along with recently developed tire casing designs, go a long way to reduce rolling resistance. That

means longer riding distances with less pedaling energy required.

Propulsion power is in no shortage over on the motorcycle side of the world, but all of those superslick suspension setups have been crying out for more advanced rubber on the road surface. Michelin made up radial racing slicks for Honda's Freddie Spencer; now Pirelli and Dunlop offer radials for your street motorcycle. They offer the same advantages over bias-ply conventional tires as they do for your car: reduced rolling resistance, lower operating temperatures and less contactpatch distortion under cornering forces. Because the tire carcass cords of a true radial run perpendicular to the rim and don't intersect each other, they have less internal friction. This keeps running temperatures low, but cuts sidewall rigidity.

In order to make the rim transmit cornering forces to the tire directly and improve straight-line stability, the engineers found it necessary to beef up sidewall stiffness.

Even so, the radials take getting used to. The sidewall flex gives them a vague feeling when cornering hard, as if the bike is going to slide. In truth, the slide almost never happens, and when the radial lets loose it does so with a generous amount of warning. Cornering speeds are nearly on par with the best sport tires, and tread wear will probably be a lot lower.

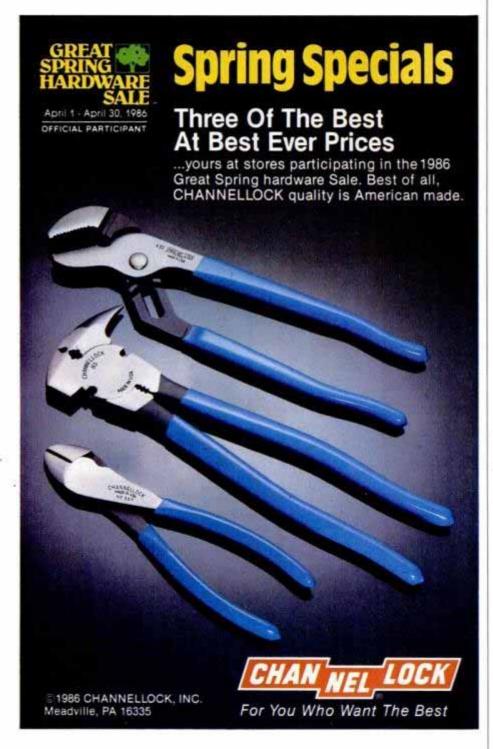


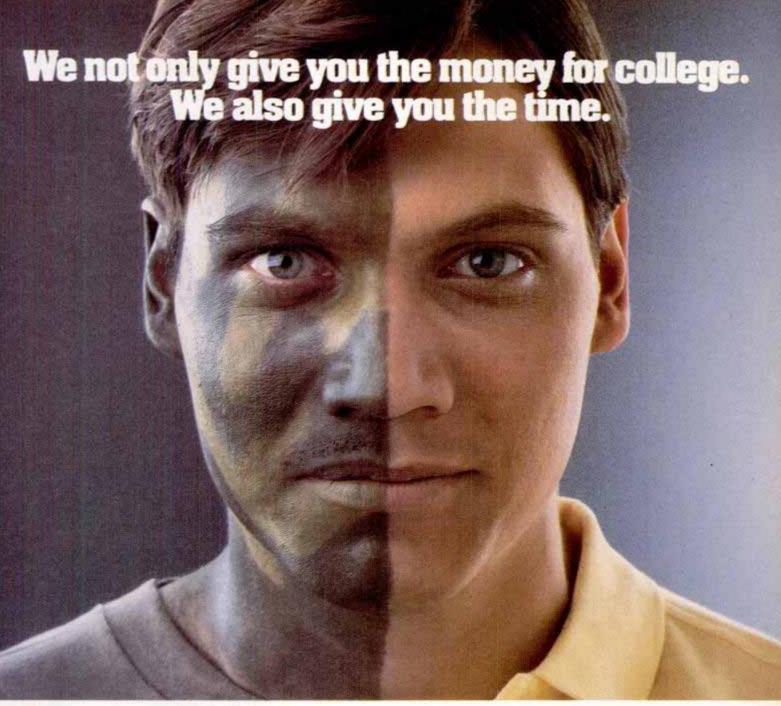
At the touch of a button, Cyclometer tells speed, distance and time 'til dinner.

Electronic handlebars

It's not much bigger in diameter than a 50-cent piece, but the Cyclometer 20 is an honest-to-goodness computer. Like any good computer, it can deliver information in a hurry. Mounted on the handlebars for easy reading, its digital display instantly indicates speed, trip distance, total distance and time.

All of this is vital for racers, of course, but bike tourers also find the Cyclometer helpful for monitoring their progress. On unfamiliar roads the trip odometer aids navigation. Installing the Cyclometer is easy-the transmitter snaps on the front-wheel hub. The receiver mounts on the right fork. To attain the 99.9-percent accuracy claimed by the manufacturer, you have to calibrate the Cyclometer for your bike; detailed instructions make it a cinch even for nonmathematicians. Specialty bike shops sell the Cyclometer for about \$25. For information, write Avocet Inc., P.O. Box 7615, Menlo Park, CA 94025.





If you think the best way to pay for college is to put it off for a few years and join the military, you're half right.

Because with the New GI Bill, you can join the Army National Guard and earn \$18,000 for college.

But best of all, you serve two days a month and two weeks a year. Which means you can go to school full-time. Right now. On us.

So the question you have to ask yourself is not, can you afford college.

The question is, can you afford to wait.

For more information about the Army Guard and the New GI Bill, fill out the attached coupon and mail it in. Or call 800-638-7600*

*In Hawaii: 737-5255; Puerto Rico: 721-4550; Guam: 477-9957; Virgin Islands (St. Croix): 773-6438; New Jersey: 800-452-5794. In Alaska consult your local phone directory.

NAME		OM OI
ADDRESS	S.	
CITY/STATE/ZIP		
AREA CODE PHONE		⊥ US CITIZEN □ YES □ NO
SOCIAL SECURITY NUMBE	IR .	BIRTH DATE
OCCUPATION		ARMY
STUDENT HIGH SCHOOL PRIOR MILITARY SERVICE	L □ COLLEGE □ YES □ NO	
BRANCH RANK	AFM/MOS	

Americans At Their Best.



America to the Highest Standards of Quality and

Excellence.

BROCHURE containing application tips and money-saving ideas for home fix-it fastening uses of heavy-



Available at All Leading Hardware, Home Center and Discount Department Stores Everywhere.

duty staple gun.

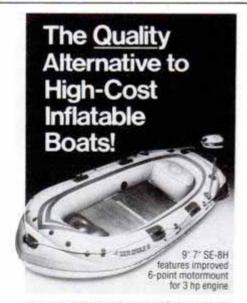




SONErai two seats, 170 mph, 4 gph on VW power: all for less than \$8,000 with a complete kit and simplified construction manual.

For information on all INAV products send \$8.00 to

P.O. Box 2984-J Oshkosh, WI 54903 (414) 426-1212



Why pay \$600, \$1000 or more for an inflatable boat? Sea Eagle inflatable boats last for years, go almost anywhere and cost as little as \$60. Fishing platform, motor runabout, river raft, camp boat, yacht tender and now a true speedboat! Lakes, rivers, ponds, bays and oceans. Sea Eagles give you real value for your money!

FREE COLOR CATALOG!

Write: Sea Eagle, Dept. PM63B PO. Box 944, Smithtown, NY 11787

Or telephone: 516-724-8900 8:30 AM-4:30 PM, Monday-Friday, EST



A division of Harmon-Hoge Industries, inc

HINTS FROM READERS

Reusing rubber stamps

I have found that obsolete rubber stamps have a multitude of uses. By simply twisting the handle, you can separate the parts and reuse them in the ways shown below. They also work well for cleaning clogged abrasive. Just remove the sheet of rubber lettering and hold the foam-backed pad against a moving belt or a rotating disc.

-Walter E. Burton



File handles are made from old stamp handles with holes bored in the ends to accept the file. Slip a ferrule cut from brass tubing over the end to prevent splitting the wood.



To use as a lamp pull, counterbore a hole in the top of the handle large enough to recess the chain end. Then, from the center of this hole, bore a 1/2-in.-dia. hole through the handle for chain clearance.



With the rubber lettering peeled off and abrasive paper glued in its place, the stamp block makes a handy sander for small jobs.

How to Offer Your Got a great invention you diske to self-bell on FREE copy of our fact filled booklet tells how to off your invention for sale. No cost. No obligation Send your, name and address to Kessler Sales Corp. Dept. D-51, Fremont, OH 43420. TOLL FREE 1-800/537-1133, Ext. D-53 In OH 1-419/332-6496.

SUPER CARBURETOR

BIG V8 GETS 72 MPG Computer Verified: Learn How To Build Your Own High Mileage Carburetor, Too. Send 22¢ Stamp For Free Brochure! H & A INDUSTRIES - DEPT. PM-3 #2 BOX 35E

BOWLING GREEN, MO 63334





THE WORLD'S FIRST SYNTHETIC WIPER.

Tripledge blades are made from DuPont Nordel-the same material used in 50,000 mile radial tires. Tripledge wipers will never tear, crack, split, rot, dry out or stick. Not affected by ice, snow, blazing sun, smog or road chemicals.

EASY, DO-IT-YOURSELF INSTALLATION.

Universal adapter snaps on; accepts bayonet, hook, pin type applications.

CUSTOM FIT for virtually every U.S. and import car, van or truck.

AIR-FLO DESIGN. Blades won't lift in high winds, high speeds. 6 claws grip firmly, distribute pressure evenly.

PATENTED DESIGN.

Protected by U.S. Patent 4473919.

PRICE PER PAIR ONLY

Delivered. Specify

make, model, year of car.

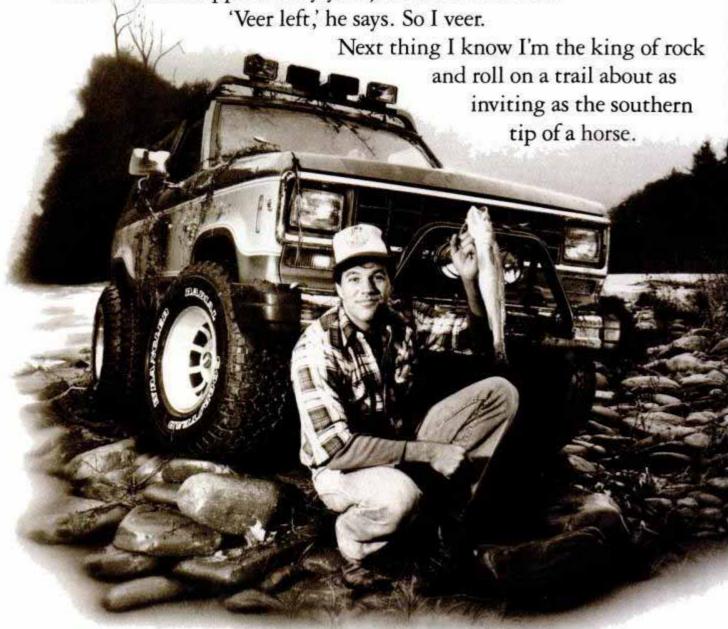
CALL TOLL-FREE 1-800-847-0653

or send check, money-order or card number and expiration date of your Visa or MasterCard. Pennsylvania residents add 6% sales tax.



CROSSING THAT CLOSEST I EVER CAME RAINBOW TROUT. We're about

25 miles into the rally. Gertrude, my 4x4, and her Wranglers are chewing up the trail like a fat man cheating on a diet, when I make the mistake of looking over at Chuck. Mr. Charles "Short Cut" Baldwin, that is, whose face is all twisted up like the last prune in the box, which means he's got an idea. Which happens every year just about this time.



RIVER WAS ABOUT THE TO WALTZING WITH A

So I let my Wranglers do all the talking, while I kiss my double loop single kicker fully welded roll bar.

That's when Chuck says, 'Oh, no.' As in, 'Oh, no.

I'll never see my sweet mama again.'

Up ahead there's a half-mile stretch of rolling thunder known as the Waxahachee River with a stampede of four-wheelers making tracks on the other side.

'We gotta get across,' says Einstein. I figure I have two options.

I can harness the jeep to the point on Chuck's head and let him swim us across, or I can load up Gertie with rocks, roll up

> her windows and dive. And that's just what we do, holding our breath, lungs aching, while the

Wranglers eat the river bed for breakfast. Just when Chuck's as red as a beet and half as tasty we break the water about ten miles downstream. I race Gertie up in front

of the pack, and the Wranglers stroll across the finish

line doing eighty with time to spare.

Now some people will tell you that the mighty Waxahachee is just a little old wisp of a stream, but you can save that story. Save it, and tell it to the thirty-pound trout camping out on the spare Wrangler.



You either have Goodyear Wranglers. Or you need them.

Car Clinic



BY MORT SCHULTZ

Advisory: '85 GM models

eneral Motors has informed Car Clinic that some 1985 models were sprayed with contaminated black and dark red paint. Affected are Buick LeSabres and Oldsmobile Delta 88s manufactured at the Fairfax plant from April 11 to July 30, 1985; also Chevrolet Impalas, Caprice Classics and Chevettes, and Pontiac Parisiennes and 1000s manufactured at the Lakewood plant from May 22 to July 30, 1985. Though there hasn't been a notification of owners of these models, dealerships have been instructed to correct the problem for customers dissatisfied with their car's finish.

A white or milky haze may form over the finish. Polishing will make it disappear for a few days, but the condition, called blushing, is chronic. It will return. Therefore, if your car is affected, your dealer has been authorized by the factory to repaint it at no cost to you.

GM has urged dealers to do "a top-quality" job by removing rather than masking moldings, headlamp bezels, taillamps, grilles and emblems. "A top-quality" job requires treatment with lacquer and enamel cleaner, wet-sanding and the application of a minimum of three coats and a maximum of five coats of DuPont acrylic lacquer (Code 19-99S for black cars and Code 79-B8509 for dark red). If the job is not done to your satisfaction, contact the zone office listed in the owner's manual. If you let your dealer know you're aware of the proper procedure before he starts the job, this shouldn't be necessary.

Mid-life crisis

My 1970 Ford Country Squire station wagon (215,000 miles) is in excellent condition. You can understand, therefore, why I'm desperate for information about where I can buy weatherstripping to replace the deteriorated strips around doors and windows.

I've been to numerous Ford dealers, body shops and auto supply houses and have gotten only sympathy. Everyone says it's a lost cause. You're my last hope.

> ANGELO YAKIS GLENDALE, AZ

You've been going to the wrong places. Cut off swatches of old weatherstripping and take them to an auto glass shop. They will order the weatherstripping from a firm like C.R. Laurence Co. of Los Angeles, which specializes in weatherstripping and other products relating to automobile glass for new and not-so-new cars, but does not sell directly to the public.

Fuming

My 1979 Chrysler LeBaron station wagon builds up tremendous pressure in the gasoline tank, especially on hot days. When I remove the gas cap, fumes shoot up into my face. Has Chrysler issued an advisory about this?

JAMES E. WEBSTER CHATTANOOGA, TN No, but maybe I can help. If the original gas cap was ever replaced, a wrong one may now be on the car. When a new cap is needed, one of original design must be used. On the other hand, if the original cap is on the car, it may be damaged. The cap should vent when 1.5 to 1.9 pounds per square inch of pressure builds up in the fuel tank.

In any case, I suggest you buy a new gas cap from a Chrysler dealer. If your wagon needs a wood-grain cap, order a new one using part No. 4185062. If it's not a wood-grain cap, use part 4002305.

Filter follies

Is my dealer giving me the runaround about the oil filter for my 1985 Toyota van? He tells me I should use only a Toyota filter, because it has a check valve that prevents oil from draining back into the crankcase when the engine is turned off. He claims if I use another brand it would take several seconds

(Please turn to page 74)



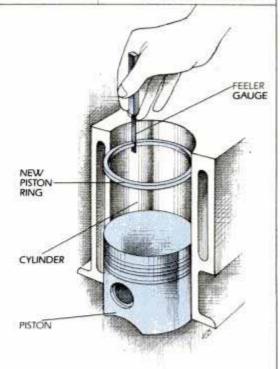
Piston ring end gaps

Every home mechanic has read about the pitfalls of failing to check piston ring end gaps when doing an engine rebuild. If the gap is too small and the rings bind up, they'll scuff the cylinder walls the first time the engine heats up. If that happens, the engine will have to be rebuilt again!

To check the end gaps, place a piston in the bore down far enough to be below the wear area at the top of the piston's travel. Insert each compression ring in the bore, one at a time, and square it against the piston top. You could also do this by placing the piston in the bore upside down from the cylinder head end.

With the ring squared, check the gap by using feeler gauges and compare your reading with the specifications in the shop manual.

From Perfect Circle division of the Dana Corp. comes a reminder that while too-tight gaps must be corrected by filing the ends of the ring, a too-



wide gap won't make much difference. Even a considerably oversized gap, according to their tests, will not increase blowby or oil consumption. Tight end gaps are critical in racing engines, but the difference would never show up in the performance of a street-driven car.



(Continued from page 72)

for pressure to build up and oil to circulate, and that this would eventually lead to engine damage. I can't believe Fram, Purolator and other reputable companies that make replacement oil filters would allow this to happen.

LARRY D'ANGELO WATERBURY, CT

Good for you, Larry—don't believe it. Name-brand filters have the same check valve as filters bearing the Toyota name. Satisfy yourself by reading package data, which will say that the filter contains an antiflow-back check valve.

Lust for power

My 1982 Nissan Sentra engine loses power as if it were starving for gas and eventually dies unless I pull off the road and shift into NEUTRAL. If I try driving off again without first shutting off the ignition for several minutes, the engine stalls. That shutdown period seems to

DO YOU HAVE A CAR PROBLEM?

Just ask Mort about it. Send your question to the Car Clinic. Popular Mechanics, 224 West 57th St., New York, NY 10019. While letters cannot be answered individually, problems that are of general interest will be discussed in the column.

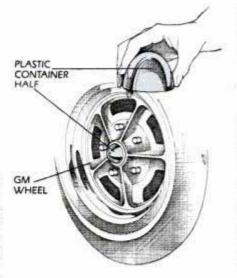


High-stepping tip

Ed Krzysik of New Castle, Pennsylvania, had a hole in the middle of a styled steel wheel where the Buick insignia should have been. Those ornamental rings in the other wheels had loosened and were about to pop off, too. So Ed thought he had two choices-keep the wheels "bullseyed" or buy four new wheels, an expensive deal.

Before he could make up his mind, fate took a hand-or should I say, a leg. As he was emptying a waste paper basket in the bedroom, something that looked like half an eggshell dropped to the floor. It was the top part from a container that had held L'eggs panty hose used by his wife.

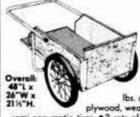
He took it to the garage, took off the logoless wheel and pressed the "L'egg egg" into the hole from the backside. It fit like a glove. When Ed's wife opened the drawer in her dresser later that day, she found three



topless panty hose containers.

"I replaced all those Buick ornaments," Ed says. "The cases fit those rims real snug, they don't make noise, they don't rust and they don't cost me a penny. Besides, I like the way they look," he states. Kind of like the chrome bullets hotrodders used to be so fond of. L'egg eggs come in colors, too, if you really want to get fancy.

Top Quality, Name Brand Merchandise at LOW, LOW Prices!



Garden Cart

Accomplish more in less time, less effort with this handy Garden Cart. Heavy-duty steel front support system. • 250 lbs. cop. • 1/2" exterior grade plywood, weather proofed. • 16" x 1.75

stic tires. •2 sets of double steel bearings in each wheel. • Rust-proofed, metal parts. • Axle placement & eel design assure perfect balance. Assembly required.

60 HZ

Compare at \$95.00

Order No. 264-1768 ng: \$12.00 Shipping & H

5000 Watt **Power Generator**

Now have electrical power anywhere anytime! This power generator features: • 8 HP Briggs & Stratton engine. • 1-120

V duplex & 1-240 V duplex receptocles, 36.7/18.3 amps. • 5000 watts surge, 4400 watts continuous power. • Magnetron® solid-state ignition. • NEW rotary field design means no brushes to replace, ever! • Service centers nationwide. • Assembled in U.S. • Dimensions: 25"L x 17"4"W x 17"4"H. • Wt. 116 lbs. • Full 1 Year Parts Replacement Warranty!

Compare at over \$1000.00

Order No. 240-1018

Send \$1.00 for the latest Money-Saving Catalog from Wholesale Americal
Includes unbelievably LOW, LOW prices
on power tools, hardware & housewares!



Take it anywhere - it's lightweight & cordless! Powerful, magnetic motor, 3200 RPM. • Max. cutting depth - 2-1/8". • Safety switch lock. • Automatic blade brake. • Rip fence guide. • 1-6%" carbide tipped saw blade. • 2 blade-change wrenches. • Charger. • Battery pack - B-12.

Charger: Input - single phase, 120V AC, 60 Hz.
 Charging time - 100 min.
 Output - 12V DC.
 Wt: 3.7 lbs.

\$189.88

Order No. 241-5033 Ship./Hand.: \$9.00

TO PLACE AN ORDER please type or print clearly (on sheet of clean paper) the name & order number of the item along with your name & address. Enclose a check or money order payable to Wholesale Ameri-ca, Inc. (be sure to add ship./hand.charges). You can also charge to MasterCard or VISA. Print the acct. no. & expiration date and sign your name. Allow 1-2 wks. for delivery. Add 2-3 wks. for clearing of personal

Send your orders to:



4777 Menard Drive, Eau Claire, WI 54703 For credit card orders or more info



1-715-874-5000

1-800-826-3403





gines that run out of gast You'll love this lightweight (only 35 lbs.), easy-to-maneuver, super efficient, elec-tric TORO mower/trimmer. It cuts a 20" swath. No bag-ging! Safety shutoff handle. Handle folds easily for storing.

HURRY! Quantities are Limited!! Mfg. List: \$229.95

Order No. 270-9008

START 6000 Watt **Power Generator**

Full TORO

Never be without electrical power again! Features: •8 HP Briggs & Stratton en-gine. •2-120V & 2-240V out-lets, 35/17.5 omps. •6000 watts surge, 4250 watts continuous power. Service centers n tionwide. • Made in U.S. • Measures 27"L x 19"W x 19"H. • Wt. 158 lbs. • Full 1 Yr.

Parts Replacement Warrantyl

e at over \$1200.00 Order No. 240-1034 Shipped Frt. Collect

60 HZ

8000 Watt Generator with 16 HP Briggs & 5000



If you're not completely satisfied with your purchase, return it (prepaid) within 10 days for a FULL CASH REFUND (less shipping & handling). Returned product must be in original box and original condition.



system. Check for possible primary circuit shorts, loose connections and broken wires. If all else fails, you might have to try replacing the pickup coil, ignition coil and ignition control module—one at a time—until you solve the problem. While ignition diagnostic procedures outlined in the manual might reveal the cause of the problem, it's quite unlikely since the condition occurs intermittently.

SERVICE TIPS

■ When changing the oil filter on the 2.3-liter turbocharged engine of a 1985 Merkur XR4Ti, see that the filter adapter plate points toward the crankshaft pulley at an angle equivalent to 4 o'clock. If it doesn't, the filter will be out of position and could be punctured.

 Windshields in some 1986 models have a layer of plastic on the inside to catch flying glass in an accident. If your car is one of them (check your owner's manual), don't let someone at a state inspection station remove an inspection sticker with a metal scraper. He should use a plastic scraper. To clean the inside of the windshield, use a soft cloth, paper towels or sponge moistened with a household glass cleaner or water. Remove stubborn stains with mineral spirits or rubbing alcohol. Let the surface air dry-don't rub.

 Chrysler now recommends using SAE 5W-30 motor oil in all engines when the prevailing temperature is below 100°F, except in turbocharged, 1.6-liter and pickup truck engines which include Voyager, Caravan and Mini Ram Van. Chrysler says SAE 5W-30 provides better engine starting, faster lubrication of engine components and better fuel economy than SAE 10W-30, 10W-

40 and 15W-40.

■ The rear glass of a 1986 Civic Hatchback may discolor because of a faulty seal on the high-mount brake light assembly. Have your dealer apply the fix described in TSB 85-043. It calls for discarding the brake light, cleaning the glass and installing a new brake light (Honda control No. 2274397).

do it a lot of good, because the engine performs normally until the next occurrence, which may be an hour later or months later. Since November 1982, this has happened on 17 different occasions, in cold weather and hot. The dealer and Nissan district representative say the condition is unique to my car, but I know several people who had the same trouble and sold their cars because of it. Any suggestions? JOHN VAN STEENBURGH POUGHKEEPSIE, NY

If this is actually a fuel starvation problem, it should occur when load is high-such as when going uphill or when accelerating at wide-open throttle. If the problem does occur under these circumstances, check for incorrect carb float adjustment, insufficient fuel pump output or a partially clogged fuel tank pickup or fuel filter.

You can test the fuel pump. It should produce 3.1 to 3.8 psi and deliver 44 ounces of fuel per minute with the engine

running at 600 rpm.

Nissan has issued a service bulletin (TS84-083) that outlines a fix for excessive fuel vaporization. The repair calls for installation of a new pump (part No. 17010-34A25). While this problem is generally restricted to warm weather, it might become evident in cold weather if underhood temperature is high.

A buildup of vacuum in the fuel tank is another possible cause of fuel starvation problems. Next time the engine falters, get out of the car and remove the gas cap. If you hear air rushing into the tank and the engine picks up, look for a condition that might be preventing proper ventilation of the tank. Possibilities include a misconnected or kinked evaporative emission line, and, of course, a faulty gas cap.

If the engine die-out occurs sporadically and doesn't seem to be related to load, the cause might be in the ignition



Leave it to Sony to bring a home security system down to size

With the Sony WatchCam™ Home Security System, the most convenient way to protect your home

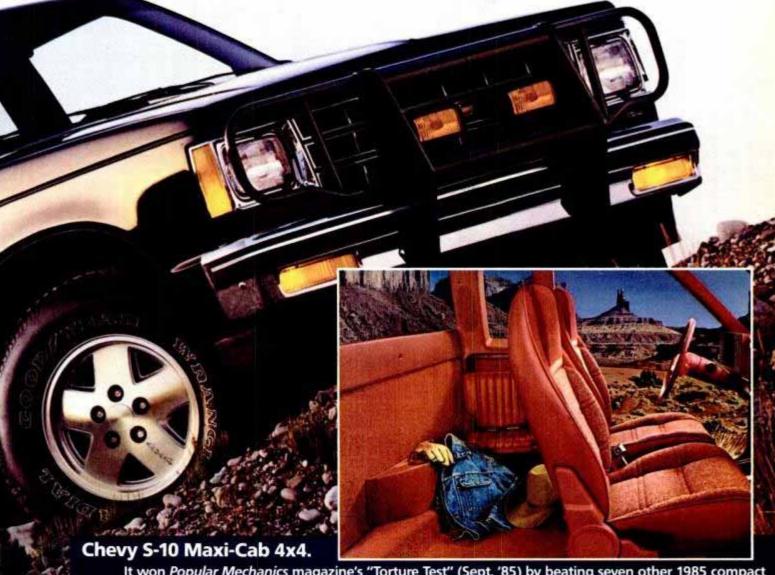
Mount the 2" camera anywherefront door, back door (even the baby's room). It transmits a b/w image and sound to a portable 4" TV monitor. It's sensitive in low light, easy to install, and comes with a through-the-door peephole adapter.

So why not look into one at your local Sony dealer today?

THE ONE AND ONLY-



REOUR



It won *Popular Mechanics* magazine's "Torture Test" (Sept. '85) by beating seven other 1985 compact 4x4s and a lot of rough terrain. Maxi-Cab 4x4 has shift-on-the-fly Insta-Trac and a wheelbase longer than any of the competitors tested. Available features like the 2.8 Liter V6—now with EFI in '86 models—and off-road suspension with high-pressure Delco/Bilstein gas shocks make Maxi-Cab one remarkable truck. And loads of extra room behind the front seat lets you fit in loads of cargo. You can even opt for front buckets with rear jump seats and have room for four passengers.

Chevy S-10 Maxi-Cab 4x4. The 4x4 for four...and more!

Light bar shown can be purchased through outside suppliers. This is not a safety device. Tires supplied by various manufacturers.

LET'S GET IT TOGETHER ... BUCKLE UP

DRKS LIKE A

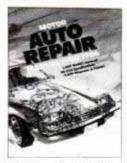
TRUCK

The same of the sa

Popular Mechanics **BOOKSTORE OF HOW-TO** INFORMATION

Auto Repair Manual '80-'86 Covers more than 1.900 domestic car models, with over 55,000 essential service specs and

repair facts and



2,500 diagrams, cutaways and quick-check spec charts. Updated section on fuel and ignition systems for the do-ityourselfer. Considered the "Bible" of auto repair and maintenance. (B-1906-\$21.50)

TO ORDER Send your name and address with check or money order to: Popular Mechanics, Box 1014, Radio City Station, New York, NY 10101. Please specify the proper "B" number.

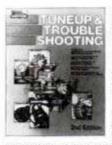
Popular Mechanics is a publication of Hearst Magazines, a Divion of the Hearst Corporation. © 1985 The Hearst Corporation. All rights reserved.

Basic Car Care

Step-by-step instructions and troubleshooting charts, tuneup specs for U.S. and import cars, and a glossary of car care terms. Includes sections on preventive maintenance, fuel, starting and cooling systems, brakes,



tires, and air conditioning. (B-1901-\$16.95)



Tuneup & Troubleshooting Newly revised with over 700 illustrations. Valuable information on tuning your engine, including spark plugs, breakerpoint ignitions, compression and vacuum service and lubrication. Specs on most U.S.

models and popular imports made between '80-'84. (B-1902-\$14.95)

Bodywork & Painting Color photos, diagrams and instructions tell you how to eliminate rust, fix dents, spray paint, repair grills and bumpers, keep interiors clean and bring out your car's lustrous shinewithout expensive



equipment. (B-1903- \$19.95; B-1903A (paper) - \$12.95)



Imported Car Repair Manual '79-'85 Comprehensive information on cars by 28 foreign manufacturers. Over 1,300 pages. Covers all areas including cooling, electrical and exhaust systems. brakes, steering, sus-

pension, ignition and transmission. (B-1904-\$25.00)

Light Truck & Van Repair '79-'85 1,200 pages of information on AMC, Chrysler, General Motors and Ford trucks and vans. 2,000 illustrations plus step-by-step instructions for the tuneup and care of engines, brakes, suspension, and more.

(B-1905-\$27.50)



ual '74-'79 A handy reference of facts gathered from over 300 factory manuals for domestic cars. More than 1,000 illustrations and data on such areas as electrical, fuel and cooling systems, suspension, brakes, steer-

Auto Repair Man-

ing and transmission. (B-1907-\$22.00)



Boatkeeper Keep your boat ship shape. This book covers all areas of

maintenance, repair and improvement for both power and sailboats. Includes electrical systems, anchoring gear, tools, cabin comfort and sealants and adhesives. From the boating columns in Motor Boating and Sailing. (B-1909-\$17.95)

Beatman's Handbook A complete guide to such important boating topics as safety, seamanship, emergencies, weather and piloting. Plus you get listings of boating organizations, schools, regulations by state, sources for publications and

> documents and more. (B-1908-\$10.95)



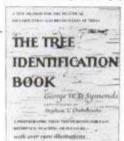
The Guide to Self-Sufficiency

Guide to Self-Sufficiency Learn to be totally self-sufficient, Find

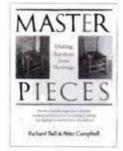
and prepare your own food, raise farm animals, brew beer, thatch a roof, create your own electricity, tan a hide and much more. Over 600 two-color illustrations and step-by-step instructions show you how. (B-1912-\$10.00)

The Tree Identification Book Ever wonder about that tree in your front yard? Or what your oak table looked like before the wood was cut for lumber? This book, with over 1,500 illustrations, takes you on a nature walk to identify the shape,

leaves, bark, and branches of more than 100 trees. (B-1913-\$10.95)



Master Pieces Bring masterpieces of art to life by building the furniture they depict. This book has designs and complete



instructions for recreating furniture that appears in 20 classic paintings-among them, Van Gogh's "Chair and Pipe" and Picasso's cubist "Still Life on a Sideboard." Beautiful color reproductions. (B-1919 -\$22.95)

Old-Fashioned Wooden Toys Enter the enchanted world of wooden seesaws, doll cradles, fire engines, rocking horses, spinning tops and

biplanes. Build these and other charming toys from detailed plans, easy instructions and color photographs. Over 31 projects shown. (B-1911-\$17.50)



TECHNOLOGY UPDATE 3/86



France's Maginot line finds nuclear-age use

Built in the 1930s to fend off a German attack, the Maginot line's bunkers and tunnels have been transformed into Europe's most sophisticated anti-aerial observation complex, called Aerial Base 900.

Located 125 meters below ground in eastern France, its complex system of IBM computers, linked to another facility in northern France, can locate enemy planes and within 10 minutes scramble a Mirage II, F1 or Mirage 2000 to intercept the intruding aircraft.

The underground labyrinth of tunnels and bunkers stretches for 5 miles. The entrance to Aerial Base 900 is protected by a network of dogs, guards and armored

doors. Part of the Maginot line, however, is open to tourists wishing to see the bunker system.

The defense system was named after André Maginot, a French minister of war from 1929 to 1932. It failed to prevent the Nazi invasion of World War II.

The updated version of the Maginot line protects its radar installation and is, for all practical purposes, invincible. Even if outdoor radar systems are destroyed in an attack, the main installation, tucked deep under the ground, is safe.

Editor Derinis Eskow Assistant Editor Ted Francis Contribution: Wade A. Hoyt, Frank Lisk Fran Golden, Steve Eskow, Ken Sanders, Douglas Williams, John Dornberg, Chris Mitchell, Jack Hammond



L SPORTS P





More than 500 people monitor sophisticated computer-radar systems around the clock (top). Workers must pass through armored doors in the underground complex (above). Today, tourists can visit part of the Maginot line and see drawings made during WWII (left). The tunnel system stretches for miles (right).

TECHNOLOGY

UPDATE

SUBMERSIBLES

Sub rescue

The worst aspect of submarine warfare is the rescue operation. In the case of a sinking, there is little chance of rescuing a crew. But the picture is changing thanks to several developments. At Massachusetts Institute of Technology. researchers have developed a rig that can weld a rupture in a vessel at 6000 feet. A British partnership, meanwhile, is conducting sea trials of the Dragonfly, which can assist remote-control operations by video camera observation. The American rescue sub Mystic and the research sub Alvin have just been certified seaworthy for submarine rescues.



MARINE

Gold fishing

Treasure hunters will find the Aquascan X3 proton magnetometer a boon to their searches. The Aquascan probe, or "fish," is towed behind a boat with a 16-foot cable. When the fish passes over a large ferrous object, an audible beat increases through its control box.



TOTALLY LASING MEDIUM PARTIALLY POINT TRANSMITTING MIRROR

MEDICINE

Laser Gum

Common but troublesome gum disease (pyorrhea) is being treated by laser. Pioneered by Northwestern University, the technique avoids hemorrhage, surgical area sterilization and postoperative discomfort. A small, intense laser beam with the ability to vaporize, coagulate and cut is obtained when a lens is placed in front of the beam. The result is highly localized tissue removal through evaporation-vaporation. Neither tooth structure nor alveolar bone is damaged. Laser surgery successfully reduces surgical time and healing.

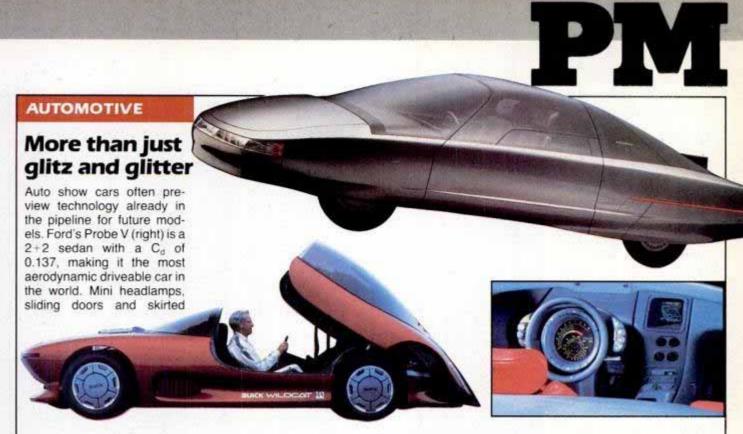
OPTICS

Vision study



The Eye Mark Recorder (EMR) electronic headgear is mounted with a TV camera (below). An infrared LED below each eye reflects a ray from the eyeball. The ray is detected by sensors and processed to determine exactly where the wearers' eyes are pointing. The results are videotaped and used to determine what instruments a pilot is looking at or what objects a driver is watching.





wheels help it achieve less drag than an F-15 fighter. Buick's 4-wheel-drive Wildcat (above) is powered by a 4-cam, 24-valve, 3.8-liter V6 that develops 230 hp without turbocharging. Electronic in- hub. Both cars project a digistruments are housed in its stationary steering wheel

tal speedometer reading onto their windshields.

EVA takes you home

Blaupunkt calls its new navigation system EVA, an acronym for road navigation system in German. Toothed sensors on each rear wheel register distance traveled and the angles of any turns. This information is compared to the street grid map in EVA's route search, navigation and orientation comput-



DISC-MAP COMPUTER VOICE ROUTE SEARCH, COMPUTER KEYBOARD NAVIGATION, **ORIENTATION**

er, a compact-disc device. The driver punches in a 6digit code for starting and ending points of the trip. A

dashboard display tells which way to go.

ELECTRONIC CONTROL UNIT **ACTUATOR** POSITION SENSOR

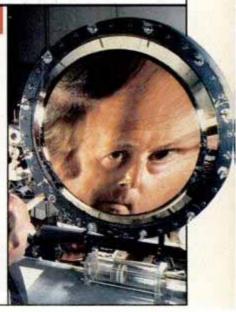
Drive by wire

The German firm Robert Bosch has developed a drive-by-wire system. It removes the mechanical connections between the accelerator and engine, replacing them with sensors that tell an actuator when to turn up the throttle. It may be on German-made buses next year.

ASTRONOMY

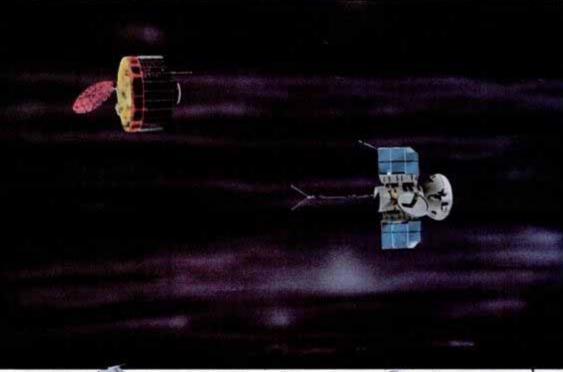
New approach to reflections

A low-cost, infinitely variable mirror has been developed at Strathclyde University Glasgow. Silvered plastic film is stretched over a kettle drum and evacuated. The film flexes, closing the mirror's curvature and giving it the capacity to focus on an object 24,000 miles away. The Mount Palomar mirror took years to grind. This method could produce a comparable mirror in weeks.



Chasing the great comet

During the second and third weeks of March, five separate spacecraft are scheduled to have close encounters with Halley's Comet. Giotto, the European satellite, will actually come within 300 miles of the comet's nucleus. Two identical Soviet craft (shown with their solar arrays open) will come within 6000 miles and 2000 miles of the comet's icy head. And two cylindrical Japanese satellites, dubbed Planet A and Planet B will photograph the comet from inside its tail. These images will be the closest ever taken of Halley's Comet.



Space station ferry design

TAAS Engineering is proposing a new vehicle for economical shuttling to and from the proposed space station. The Earth Orbiting Aircraft (right) would take off and land conventionally, and use on-board ram-jet and scramjet engines and glider profile to reach orbit. Its design would also permit low-heat re-entry.



AVIATION

'Flying carpet'

The Air Force's Air Cushion Equipment Transportation System (ACETS) is employed at airfields damaged by bombing. ACETS moves aircraft on air cushions located beneath it (right). Air ducted by ASP-10 engines into open rubber cushion-skirts beneath the platform allow the platform to float over uneven terrain. The Air Force intends to use the system in its new "floating" fire truck.





mation Distribution System, providing air, land and sea forces with instantaneous access and input to tactical data. The F-15 is equipped with color display instruments, enabling the pilot to determine friendly, enemy and unknown aircraft.





MILITARY

'Siren' lures sea missiles

Siren, an intelligent naval decoy, can attract sea-skimming rockets away from a ship when it is deployed by parachute following detection of enemy aircraft or missiles. Siren is said to be effective against known air-launched and shiplaunched missiles. The siren decoy selects rounds for either radar-guided or heatseeking missiles.



FUSION

Gyrotron tests

Hughes' gyrotron is a microwave tube that uses a spiraling stream of electrons to produce extremely high power microwave frequencies. Gyrotron heats electrons through Electron Cyclotron Resonant Heating, resulting in the production of plasma (hydrogen energy) held by a magnetic field. The Japanese use gyrotron to convert seawater into electricity. Tu



Marines seek more punch

In the late '60s, the Marines dumped the 3.5 bazooka. Now, they're adopting the Is-

Launched, Multipurpose Assault Weapon). SMAW is effective against both hard and soft targets. Its shell embeds in soft targets and flattens against hard targets.

raeli

SMAW

(Shoulder-



DRAWING BY ED VALIGI.



he insulator that

or presenting Transparent

nce upon a time, choosing window glass to let the sunshine in gave you a terrible two-sided problem: Heat Loss in cool, northern climates and Solar Heat Gain in warm, southern climates.

In other words, your windows were always either too cold or too hot.



"These windows are too cold!"

That meant condensation
—drops of water—rotting
away sills, walls, sometimes
even carpeting and
draperies.



"These windows are too hot!"

Worst of all, you'd be so uncomfortable, you'd end up wasting more energy than necessary trying to warm up or cool off.



"Then Ford Glass introduced a window glass that works like transparent insulation."

Then Ford Glass, the second largest glass manufacturer in North America, put their technological expertise to work in the home.

We introduced a dynamic, new solar management product: Sunglas* Heat Reflective® glass.

Sunglas Heat Reflective glass is high-tech window glass that looks like clear glass but works like transparent insulation.

Here's how: Sunglas HR glass lets the winter sun's heat inside and keeps it in—so you stay nice and cozy.

And when properly shaded, or when combined with Ford tinted glass products in sunny climates, Sunglas HR glass keeps the summer sun's heat out—so your air conditioner doesn't have to work as hard to keep you cool.

Sunglas HR glass saves your energy dollars. It actually cuts heat loss, helps manage heat gain, and reduces condensation by keeping the window glass surface warmer. It could even add to the resale value of your home, all without changing its appearance.



"So easy to handle, it's ideal for both new home and replacement windows as well."

really was a window

Insulation from Ford Glass.

No matter what the season or time of day or night, double-paned Sunglas HR is 66% more efficient than single glazing.



"These windows are just right!"

Sunglas HR is 20% more efficient as an insulator than old fashioned, ordinary double-paned glass* and when used in triple-glazed windows, it works even better.

That means you can turn your thermostat down lower in the winter, and use your air conditioner less in the summer—and still stay more comfortable year round.

What's more, Sunglas HR glass lets in visible light, but reduces the sun's harmful ultra-violet rays that can cause premature fading of your valuable draperies, carpeting and furniture.

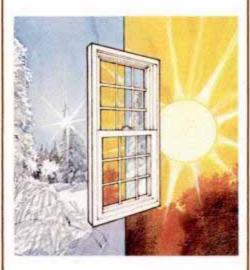
Best of all, Sunglas Heat Reflective glass is backed by the Ford Glass 5-year limited warranty.



"Thanks to Sunglas" Heat Reflective" glass, you can live comfortably ever after."

The happy ending?
Sunglas HR glass is ideal for both new home and replacement windows.
Even for simple add-on storm windows in your present home. Ask for Sunglas Heat Reflective glass by name.

And remember, the moral of our story: When it comes to glass that works 24 hours a day, 365 days a year, every year—Nobody outglasses Ford.



See your local window supplier or for more information and a free brochure call <u>1-800-GLASS-HR</u> or write to:

Sunglas HR Manager Ford Glass Division P.O. Box 43343 Detroit, Michigan 48243



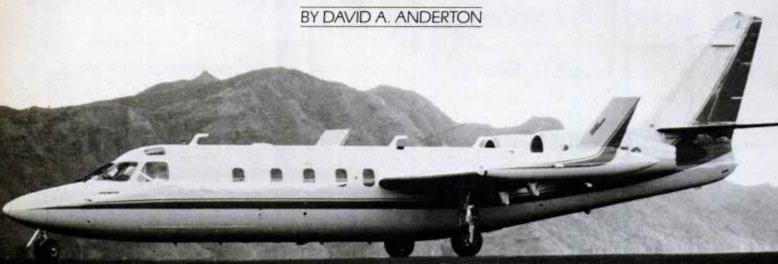
Founded 1919. A division of the Ford Motor Company.

*Based upon ½" air space. Performance will change with the width of the air space.



FOREIGN AIR RAID

America once dominated the world aviation market. Now foreign competitors are beginning to sell planes to us. Why?



The Astra, Israel's most popular corporate jet, has suddenly become popular on the American market. The 15-seat model is one of 300 small jets Israel has sold in the previously all-domestic American market.

or decades, the nameplates on the world's best-selling aircraft have read Boeing, General Dynamics, Grumman, McDonnell Douglas, Lockheed. Those giant U.S. companies have produced planes from supersonic fighterbombers to efficient, economical airliners and

Fokker F.100s from Holland. Other American carriers fly transports made in Brazil, Canada, England, Holland and Northern Ireland.

Future U.S. Navy pilots will learn to fly in the T-45A Hawk, a jet trainer designed and developed in England. The Marines now operate a largely British Japanese aircraft, in addition to American types. What in the world is going on? Aren't American aerospace com-

Canadian, French, Israeli and

Aren't American aerospace companies predominant in the technologies of design, production and operation of advanced aircraft? The answer is yes and no. Yes, we still maintain a strong technological lead in highly sophisticated military aircraft such as the Northrop Advanced Technology ("Stealth") Bomber, and the Rockwell B-1B low-level penetration bomber. But, no, we have not developed the broad spectrum of designs that meet the widening needs of both civil and military operators of aircraft here and abroad.



Airbus Industrie's A310 takes off with Pan Am. Eastern also is using a growing number of A310s in its jet fleet.

mammoth cargo carriers—all unequalled in their performance. But within the last few years, American dominance of the world aircraft market has been threatened. Foreign firms are selling in regions once the almost-exclusive territories of the U.S. giants of aerospace. And more recently, they have begun selling large numbers of planes to the civil and military sectors in America.

Pan American Airways and Eastern Airlines count 62 Europeanbuilt Airbus transports among their fleets. US Air recently ordered 20 V/STOL fighter, the AV-8A and AV-8B Harrier. And the Navy is flying Lavi jets made in Israel.

In the world of business transportation, American corporate executives fly between their tightly scheduled appointments in British, There are reasons for the foreign capture of (Please turn to 88)



USAir was the earliest to fly Fokker's new F.100 passenger planes. Delivery of 30 models to various airlines starts later this year. Fokker is a Dutch firm.

New Players Lights 25's

5 GREAT TASTIN OTRICKS.



Mfr's, suggested pricing based on full-price brands.

> SURGEON GENERAL'S WARNING: Quitting Smoking Now Greatly Reduces Serious Risks to Your Health.

Kings: 10 mg "tar," 0.8 mg nicotine -

100's: 12 mg "tar," 0.9 mg nicotine av. per cigarette by FTC method.

(Continued from page 86)

significant portions of the domestic market. In some cases, international politics have dictated the purchases of foreign military aircraft and other equipment by the U.S. The NATO countries particularly want to sell some weapons to us, to balance some of the billions they pay for our weaponry. In some particularly troublesome cases, American government financial assistance has determined the buy in favor of a foreign manufacturer (see Why The F-20 Isn't Selling, on page 145).

In most cases, the successful foreign manufacturers have studied the world aircraft market, detected and defined a technological gap in that market, and proceeded successfully to fill it. Some years ago, that would have been an extremely difficult task for any foreign company. They were not then equipped with the technology needed to match their U.S. counterparts.

But today, foreign manufacturers are as advanced in the arts and sciences of aeronautics, and the skills of management and marketing, as the best of the Americans. Backing them are strong and capable government and academic research facilities, with modern, high-performance wind tunnels, simulators, computer systems and test equipment.

With technology equal to that of their U.S. counterparts, and with marketing expertise equal to the best available, it is no wonder that discerning foreign manufacturers develop and penetrate major U.S. markets for aircraft.

For example, in spite of decades of research and development, America has yet to produce its own effective and efficient fixed-wing aircraft that can take off and land vertically or in a very short distance. The Navy, wedded to carriers with catapults, has never seen a need for the type. The Air Force, equally tied to thousands of feet of concrete runways, has not taken the idea seriously. Its recent purchase of French Durandal munitions for destroying runways heralds the Air Force's long-delayed discovery of the vulnerability of fixed bases and concrete runways.

But the Marines, assigned to mount amphibious assaults on foreign shores and then move inland, needed a V/STOL fighter for support of their troops on the ground. They would not be able to depend on the availability of either runways or carriers. Only the British had ready the advanced V/STOL technology of an airframe with a vectoring-thrust engine, and that's why the Marines today operate the AV-8A Harrier and its improved successor,



America is buying 300 British Aerospace Hawks. They are the Navy's newest training jets.

the AV-8B, built under license by Mc-Donnell Douglas.

Politics, financing and lack of direct competition may result in orders over the short term, but for the long term, technology is the answer. America entered World War II with aircraft reflecting the technology of the 1930s. We came out of it with new technology that is still with us. But in recent years, advanced military aircraft programs have sharply decreased in the U.S. Our first-line fighters like the Grumman F-14 and the McDonnell Douglas F-15 now are more than 10 years old, and they show the technology of 15 and 20 years ago, respectively. There is little new in prospect for fighter design; the Advanced Tactical Fighter is in its very early stages and growing concern about military cost overruns could conceivably kill it.

Meanwhile, the European aerospace industry has been forced into cooperative efforts, with entities like Airbus Industrie formed to handle single major projects.

Airbus Industrie, a multinational European effort to develop and market advanced-technology transports, has firm orders to date for 62 of its widebodied transports from Eastern and Pan Am. That's 62 transports Boeing or McDonnell Douglas did not sell. But it's a small percentage of the Airbus total sales of 469 worldwide.

Airbus officials point out that their planes use American components. In fact, since 1979, Airbus Industrie has bought almost \$3 billion worth of original U.S. equipment for its aircraft. Still, the European presence in the American market is growing.

Much of the pioneering in the U.S. market was done by British and French producers of business aircraft. More than 400 British and more than 500 French business jets from two manufacturers have been sold to U.S. customers since 1964. No other foreign manufacturers have achieved anything like those numbers of sales in business aviation in the U.S.

The total list of recent foreign acquisitions by U.S. customers is a long one, with some surprises. We've leased Israeli-built fighters, for example, and bought transports from Northern Ireland for the U.S.A.F. in Europe. Here are some significant examples:

 Aerospatiale Helicopter Corp., an American subsidiary of Aerospatiale, French member of the Airbus Industrie

(Please turn to page 145)

Why the first name in outboards should be your first outboard.

If you're buying your family's first boat, you're wise to start here at the business end of the rig.

The technology you buy here will have the most impact on your rig's performance. And isn't performance what family boating's all about?

Merc's 50 and 60. 3-cylinders smooth.

The legendary Mercury 60 and new 50 get the fun started fast. They're engineered to fire up quickly, run wide open all day, and further prove the theory that getting there is half the fun.

Both models feature a 3-cylinder design that runs smoother and accelerates better than twin cylinder engines. The three cylinders also get better performance out of pulse-tuning, a technique that works like racing exhaust systems to boost power and fuel efficiency.

Constantly proved. And improved.

Each year, each Mercury gets better. They're evaluated in the laboratory. In punishing tests. In real world applications. And in customer satisfaction.

And in every possible way, a change is made for the better. Because to us, the only kind

Standing behind the Legend.

Your Mercury comes with one of the industry's most comprehensive limited warranties. Backed by 2,500 dealers nationwide. And now you can further protect your investment with the new Mercury 2-year Product Protection Plan. It's even transferable, so it adds to your Merc's already high resale value.

high resale value.
Sure, there are cheaper outboards. But if you're serious, you'll make the investment that means years of fun for your family.

years of fun for your family.

After all, quality time deserves a quality outboard.



THESE TWO PENNZOIL MOTOR OILS HAVE THE ONLY MULTI-GRADE VISCOSITIES RECOMMENDED FOR ALL NEW GM, FORD & CHRYSLER 4 CYLINDER & SMALL 6 CYLINDER



ENGINES.

It's simple.

Use Pennzoil 5W-30 for winter.

Pennzoil 10W-30 for summer.

They have the factory-recommended viscosities to protect high-revving small engines.

Now you know all you need to know about small engine protection.

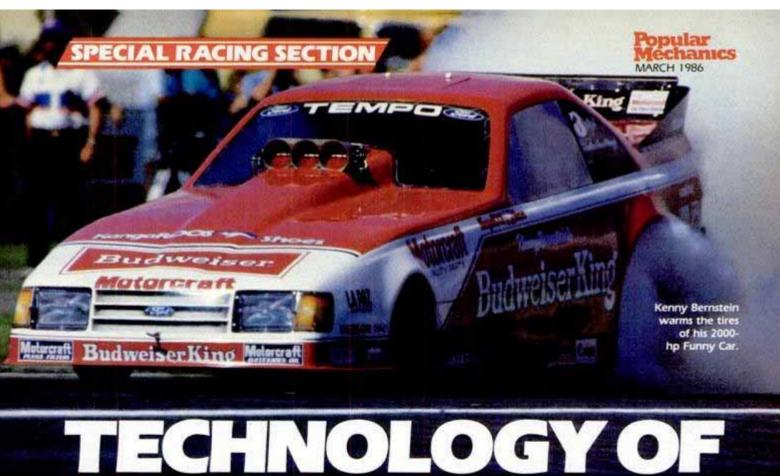


SAE 5W-30



SAE 10W-30

The Standard of Protection Since 1889.



TECHNOLOGY OF
STATEMENT OF THE STATEMENT

he speed secrets of the '80s are computers, composites, aerodynamics-and cubic cash. It's no longer enough for a successful racing team to have a fearless driver, a flawless engine and a peerless chassis. Winning today's highstakes races can require the services of a full-time aerodynamicist, a consulting computer engineer and an on-staff telemetry technician. Selecting the right silicon chip can be as crucial to victory as choosing the correct tire compound. Crew chiefs fret over drag coefficients and wing cross-sections. Mechanics are becoming as adept with carbon fibers as they are with ratchets and wrenches. In short, the race for the checkered flag has become a race to apply the latest in advanced technology.

It's a maxim of motorsports that speed costs money. Million-dollar racing budgets have become commonplace in this age of Fortune 500 sponsorships and same-day television coverage. And while team managers have more to spend than ever before, the cost of some surplus high-tech hardware has never been lower. Aerospace equipment, materials and know-how is find-

There's more to going fast than just standing on the gas, and most of it takes place behind the scenes.

BY RICK VOEGELIN Formula One text by John Rettie

ing its way from launching pads to pit lanes across America. Technology developed for Space Shuttles and Stealth bombers is making race cars lighter, stronger, safer and, most of all, faster. In this special section on high-tech and high-performance, PM surveys this new science of speed.

Funny car, serious business

Hell hath no fury like a Funny Car. The Budweiser King is 2000 hp of sound and fury. It rides like a jackhammer and makes noise like a Saturn IV. Driving a Funny Car requires superhuman skill. And remembering everything that happens on a 5-second Funny

Car run isn't humanly possible.

Enter the Racepak computer. NHRA Funny Car World Champion Kenny Bernstein has brought drag racing into the electronic age with an onboard microprocessor that records and displays thousands of bits of information. Back in the relative quiet of the team's transporter, crew chief Dale Armstrong can coolly analyze the run and make his decisions on fuel mixtures and clutch adjustments before preparing Kenny's Tempo for its next 260-mph run down the quarter-mile.

The 3-pound computer has become the team's secret weapon. While other racers are scrambling to adjust to track conditions, Dale is consulting his reference library of computer printouts. "We record engine speed and driveshaft rpm," Dale reports, "and we've learned what produces a low elapsed time. If the car performs poorly, we compare the graphs with good runs to see where it's lacking."

The onboard computer can also have two "event channels" that record when Bernstein shifts his Funny Car into high gear and leans out the fuel mixture. Dale has noted the improvement

SPECIAL RACING SECTION

in Kenny's driving since this computerized report card was added to the team. Despite the hellish environment it must endure, the computer has proven totally reliable. "The blower exploded and caught the car on fire on one run," Armstrong recalls. "The heat melted the computer case. When we got the car back to the trailer, the computer printed out its data as if nothing had happened!"

Armstrong foresees the computer eventually taking over some of the driver's chores. Computer controls for the fuel system and transmission would leave Bernstein free to concentrate on more important tasks. For now, though, Dale is still getting to know his racer-friendly computer. "I can't imagine anyone racing seriously without one," says the premier Funny Car crew chief.

Oven-fresh race car

Ford Motor Company's recipe for a high-tech road racer is easy to follow: "Place sandwich of Kevlar, carbon fibers and aluminum honeycomb in oven, heat to 200° C., let cool, and go racing." Actually, Ford's third-generation Mustang GTP (Grand Touring Prototype) is a 200-mph showcase for the company's expertise with space-age composite materials. Composites are hybrid mixtures of test-tube materials—fiberglass, for example, is a mix of glass strands and epoxy resins.

The materials used in the Probe's construction are not so mundane, however. Ford's race car cookbook calls for exotic ingredients such as Kevlar aramid fibers, honeycomb Nomex and Nextrel (a heat-resistant fiber that will stand up to a red-hot turbocharger).

Ford fabricators can literally bake a race car using these modern composites. Dry fibers impregnated with resin are placed in molds, then cured by heating them in a vacuum. Chassis designers tailor the composite's characteristics by loosen, one of these "plastic" chassis will retain its stiffness much longer than a metallic frame—as long as the driver steers clear of immovable objects.

"Working with these types of plastics is *real* engineering," says designer Chris Murphy of Zakspeed USA, the team responsible for developing and preparing Ford's premier road-racing machines. "It requires a high degree of skill and diligence. People tend to think of plastic as the race car's skin. But in this type of construction, the plastic is the race car."

Ford plans to sell Mustang Probes to private racing teams. The car's modular construction appeals to potential buyers because it simplifies maintenance and repairs. Nine bolt-together modules make up the entire chassis. A damaged or outdated module can be replaced by unbolting the old section and bolting on a new piece. The fuel system, instrumentation and electrical systems are also modular to speed up trackside repairs. Like a space-age Model T, Ford's building-block Probe GTP is out to win racer's hearts with its simplicity and durability.

Six equals eight

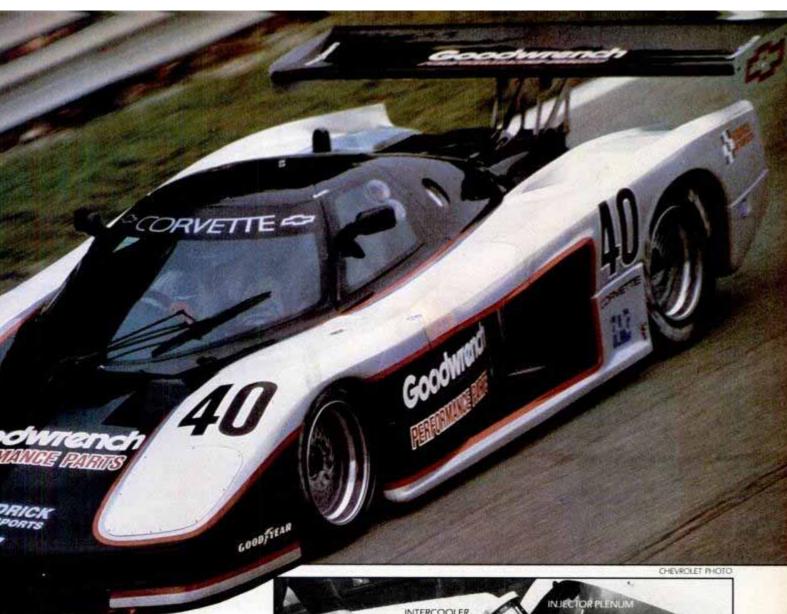
For three decades, the Chevrolet small-block V8 has been the first choice of racers and engine builders. But even the Chevy V8 can't withstand the winds of change sweeping through Detroit. The future belongs to downsized powerplants. Chevrolet is already at work on the small-block's successor: a 209-cu.-in. 775-hp turbocharged V6 that propels the stunning mid-engined Corvette GTP road-racing prototype campaigned by Hendrick Motorsports.



adjusting baking time, temperature and cooling.

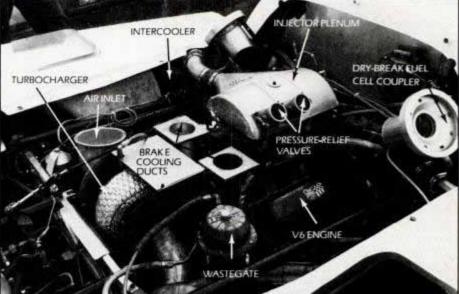
Composite materials are revolutionizing race car construction. Aircraft-type aluminum monocoque chassis designs made tube frames obsolete in the '60s. Now molded composite structures, originally developed for spacecraft and communications satellites, are replacing riveted aluminum tubs as the state-of-the-art in racing. Engineers are taking advantage of the superior strength-to-weight ratio of composite materials to build cars that are lighter, stronger and stiffer than conventional chassis. Composites can be molded into complex shapes that can't be duplicated by cutting and welding metal. With no rivets and joints to





Corvette GTP car run in IMSA road races (above) is actually a March racing chassis powered by a 775-hp turbocharged Chevy V6 (right). While Indy engines are limited by the rules to 48 in. of manifold boost, there are no such restrictions in IMSA, and the 3.4-liter V6 uses 68 in. of boost.

Ford's Mustang Probe (left) is the other U.S. entry challenging the Porsche 962s on the IMSA circuit. Its turbocharged 2.1-liter 4-cylinder engine makes "only" 650 hp, so it depends on a sophisticated modular chassis of space-age materials to be competitive. The whole car weighs 1980 pounds.



unknown on America's racetracks.

Initial EFI development for the turbo V6 is based on a Racetronic system that determines fuel delivery according to engine speed and throttle position. A computer "map" of the engine's fuel requirements signals banks of Bosch fuelinjection solenoids. Two injectors per cylinder satisfy the turbo motor's appetite for high-octane racing gas. Adjustments to the air/fuel ratio can be programmed instantly—even while the engine is running.

This system offers quicker response, more mid-range torque and better fuel economy than mechanical fuelinjection systems. There's still room for refinement,

This vest-pocket powerhouse is a heavy-duty version of the 4.3-liter production Chevy V6 installed in pickups and Malibu station wagons. What distinguishes the GTP engine from its commuter cousins is a truckload of high-tech components from Chevrolet's Special Products group and 68 in, of turbo boost.

The little Chevy's cast-iron block, pushrods and two valves per cylinder are hardly innovative hardware. For new technology, you have to look inside the black box controlling its fuel system. While electronic fuel injection is standard equipment on even the cheapest econobox these days, computer-controlled fuel management is virtually

SPECIAL RACING SECTION

though. Chevrolet is at work on a second-generation system that will add inputs for barometric pressure, air temperature and humidity—in short, a "smart" injector that will automatically compensate for the changing weather conditions. Ironically, Chevrolet's production-line ECMs (electronic control modules) already have many of these capabilities. By reversing the normal flow of technology, Chevy engineers hope to improve their racer's on-track performance with assembly-line parts.

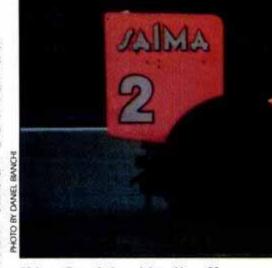
Flying on the ground

The wing's the thing in Indy car

racing. Aerodynamics is the black art that separates winners from also-rans in today's Championship Auto Racing. No crew in the CART flying circus has mastered the science of Indy car airflow as thoroughly as Roger Penske's Pennzoil March team. Al Unser Sr. drove Penske's screaming yellow machine to the 1985 CART national championship.

Today's Indy cars are flying wings designed to take maximum advantage of the air moving under and around their sleek bodies. "Ground effects" virtually glue the cars to the pavement at speed. Air entering the front of the sidepods is ducted through carefully contoured venturis. This rapidly ex-

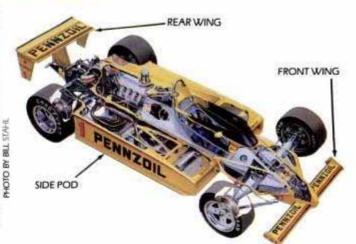
(Please turn to page 130)



McLaren Formula 1 cars (above) have 90-cu.-In. V6 engines that pump out 1000 hp.



Penske-Pennzoil March carried Al Unser Sr. to the 1985 CART championship. Like other Indy cars, it depends on components (right) to provide 2000 pounds of aerodynamic downforce.



Six Mechanics, No Waiting

Thile your neighborhood auto repair shop may take three days to rebuild the engine of a family car, professional drag racing mechanics complete the same job in less than an hour, and they do it three or four times in a single day. Impact wrenches speed the work, as do a number of special tools and techniques. The reason for this frantic "thrashing" is that a 496-cu.-in. Keith Black aluminum racing engine is a highly stressed piece of equipment. Running on a volatile mixture of alcohol and nitromethane, the supercharged motor produces over 2000 hp and runs through the guarter-mile at 260 mph in 51/2 seconds. A winning run often results in holed pistons, broken valves or complete meltdowns of critical internal parts. The typical time between elimination runs is under an hour, so all work has to be completed in 45 minutes.

Depending on a team's finances, anywhere from two to six mechanics will lay into a Funny Car when it gets back to the pits. The spectator usually can't see much of what's going on, so we asked Chris Christensen's Odyssey Engineering team of Valencia, California, to go through the motions for us.

After the body's been popped (photo 1), one or two mechanics remove the plugs and cylinder heads (2 to 5) while another drains and discards the 10 to 12 quarts of 70W racing oil. Because of nitromethane contamination, the oil can only be used for one run.

Next, the man under the car removes the clutch inspection plate to check for wear and to make adjustments. He also pushes out the pistons with a rubberhandled hammer while crew members up top play "catcher" (6).

Any worn or damaged parts are replaced and the engine reassembled (7 and 8), using new oil and sparkplugs. During this rebuild, the crew chief must be thinking about final turning for the next run: how much nitromethane and spark advance to use, supercharger and fuel pump drive ratios and clutch adjustments. Teams keep extensive log books to determine which combinations work best at what tracks. But the perfect combination is a moving target, affected by weather and traction conditions that can vary from one lane to another on the same track.—Jon Asher



1 Odyssey Engineering crew pops 1-plece fiberglass body off Chris Christensen's Corvette Funny Car for access to engine.



5 Finally, the head stud nuts are removed and the cylinder heads are taken off with the exhaust headers still attached.







Digital display (above) tells World Champ Alain Prost how much boost he can use. McLaren's space-age carbon fiber and aluminum chassis (right) is made by Hercules Aerospace in Utah.

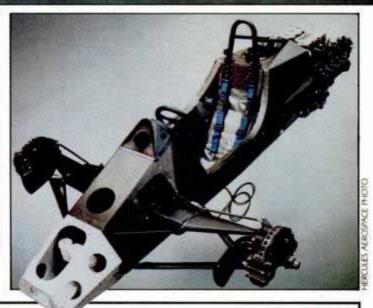
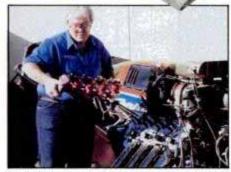




PHOTO BY JOHN RETTIE

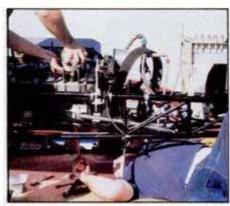
2 One crew member removes and inspects sparkplugs for signs of internal problems, while another removes valve covers.



3 Next, the complete rocker arm assembly and pushrods are removed so that the cylinder heads can be taken off.



4 The magneto, fuel lines, supercharger and intake manifold also have to come off before the cylinder heads can be removed.



6 After the oil pan, crankshaft and connecting rod caps are removed, pistons and rods are pushed out from below.



7 Before reassembly, oil is applied to all bearing surfaces to prevent scuffing before the oil pump can pressurize the system.



8 Pistons and rods are installed with one shove of rubber-handled hammer, thanks to tapered 1-piece piston ring compressor.





he scene is Tennessee's Bristol International Petty's front bumper taps Earnhardt's rear. If you Raceway. You are watching from inside the look closely you can see the tach needle swing higher car as Kyle Petty steers the Woods Brothers' as the short Bristol back straight looms into view and 7-Eleven Ford Thunderbird into the tight first turn. the second-generation stock car driver pushes the You can see the set to Petty's jaw as he cranks the throttle to the floor. The sound is overwhelming as steering wheel to the left and the banking picks up the Ford overhauls the Chevy. Looking out the side window, you can see Earnhardt, the former Winston the car. Out just in front of the Ford's hood is the rear end of Dale Earnhardt's Wrangler Chevrolet Cup Champion, glaring intently. Monte Carlo. Both machines are doing a A couple of laps later, as Petty brakes hard down little dance, slithering on the edge into the turn, a competitor bangs the Ford's rear of traction, and you can bumper so hard that your vision jars-and then the almost feel the world begins to rotate. From your seat inside the car, it's almost as if it is all happening in slow motion. The thump as horizon changes abruptly as the spinning Ford slides down off the banking, and the shapes of several cars briefly fill the windshield as they flash by. Almost before the car has come to rest at the bottom of the racetrack. Petty has selected first gear and is accelerating back along the apron.

SPECIAL RACING SECTION

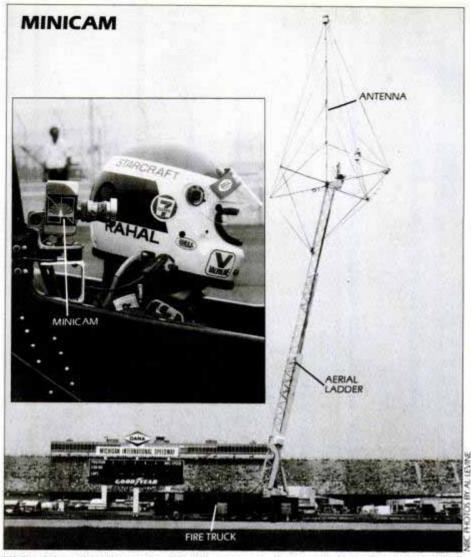
Congratulations! You've just sat through one of the most exciting moments in auto racing—and you did it without leaving your living room chair. Through the magic of live, in-car video, ESPN has taken you along for the ride.

For years, the rap on televised motorsports was that it was boring. One car following another, with the cameras so far away from the action that all sense of speed and intimacy was lost. A driver might be interviewed in the pits before the race started, or perhaps during the race if his car broke down. And, of course, viewers of some types of racing got to see the victor spraying journalists with champagne in the winner's circle.

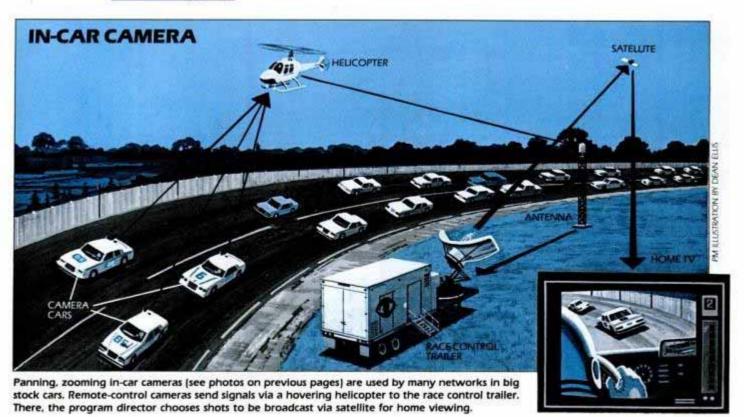
But in football the television technology has taken the viewer right up to the line of scrimmage during the game itself, letting him see into the quarterback's eyes and hear him barking signals (see Television Touchdowns, page 73, Nov. '85). The fan at home could hear the banging of pads, and the grunts of linemen crashing into one another. The producer of an NFL football game was able to provide exactly the sort of up-close feeling that the auto racing fan never enjoyed. Telephoto lenses, because they shrink distance but not time, make race cars seem to be going slower than they are.

The producers of racing TV shows did their best. For one thing, they came up with the "speed shot," where a fixed, remote-control camera located next to the track at the exit of a fast

(Please turn to page 143)



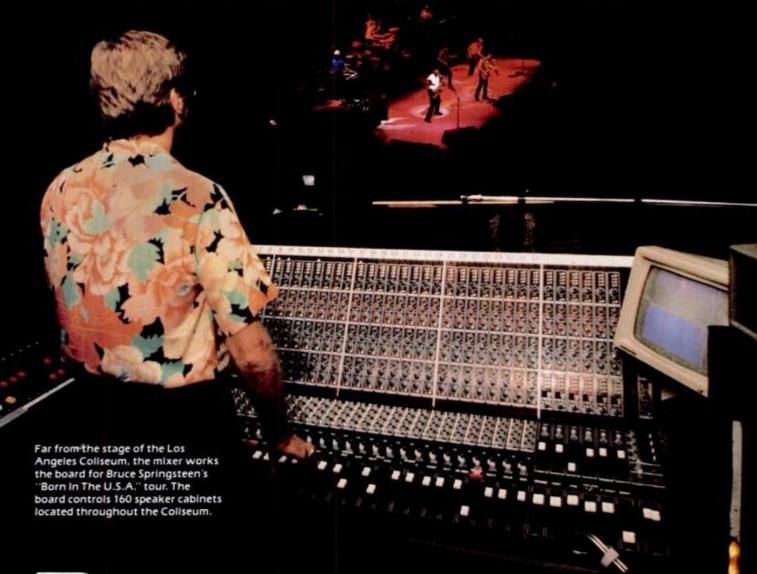
NBC's minicam (inset) uses a tiny Hitachi camera mounted to an Indy car chassis just behind the driver's head. The signal from this fixed camera is sent to a huge antenna mounted on an aerial ladder in the infield and then on to the director's trailer.



The Heart Of Rock'n' Roll

To the audience it's magic. But to the engineers behind the biggest rock concerts, it's electronics, mechanics and fire.

BY DENNIS ESKOW, Science/Technology Editor, AND RALPH HODGES



orninthe U.S.A.," the pleasant timbre of Bruce Springsteen's honkytonk voice thundered across the packed stadium. The sound literally pushed against the lucky ones in the front row, "Born in the U.S.A." The Boss, as Springsteen's fans

know him, bellowed it deliberately again. This time they cheered as the music echoed across the New Jersey Meadowlands. The audience didn't know, but as their hero rose to the climactic moment of one of rock music's most memorable tours, a half-dozen "roadies" were scrambling about

lugging cable, flipping switches and watching meters to keep the tens of thousand of fans as spellbound in the open-air stadium as they would have been in the more manageable confines of a music hall. If rock 'n' roll is truly here to stay, credit the growing ranks of engineers and

technologists who are making the seemingly impossible become the everyday fact of life. We followed the Springsteen tour from New York to Los Angeles and delved into the backstage technologies of Madonna, Kiss, Heart and Michael Jackson, among others, to translate magic into sci-

PM PHOTO BY RANDY LEFFINGWELL



ence and mechanics.

For Springsteen, the trick is to get the sound beyond accepted levels, to the point where your skin gets as much involved in audio perception as your ears. If you're in front of one of Springsteen's sound systems, you can open your mouth and let the sound coming out of the speakers push your lungs like a bellows.

The Springsteen tour began in a series of indoor auditoriums, but by the end of last summer it moved to outdoor venues and Clair Brothers, the biggest sound production company in the music business, had to be called in to add equipment to Springsteen's usual arsenal of electronics.

We were on hand at midnight before the first Meadowlands concert, arriving just in time to see a quartermile-long line of trucks waiting to pull inside to disgorge loudspeakers, amplifiers, equipment racks, control consoles, lighting ensembles, stage segments, scaffolding, cable, mikes and musical instruments.

"The loudspeaker cabinets are really a single standard module repeated 200 times," explained Bruce Jackson, Springsteen's senior engineer and production chief. "So erecting the loudspeaker towers is like merely filling in the squares of a checker-

board." Once the size of the stadium and the number of seats is taken into account, Jackson explained, the show sets itself up. Consoles and processor electronics are installed and preharnessed in standard road racks, rolled into position and left standing until the next day's "sound check" when sound levels are set shortly before the concert. While the sound crew is getting itself organized, lighting—provided



Boating's Best '86 ALL DECKED OUT

Compact continental styling and package-boat refinements make it a year to remember.

BY JOHN WOOLDRIDGE

Range, comfort and economy are the objectives in this year's crop of compact cruisers. But let's not forget styling. A distinctly European influence is discernible in the high-freeboard, wedge-shaped hull forms. Raked panels, swept-back windshields and radar arches are likely to be visible features on the marine scene for some time to come. The Larson DC-230 Aft-Cabin Cruiser (above) leads the parade. Her accommodation belowdeck includes comfortable galley/dinette/berth area (right). Following along these same lines is the Chris-Craft 232 AC Scorpion, Chaparral 238 XLC and Sea Ray Seville II 6.3 Mid-Cabin.

mun

LARSON DC-230 INTERIOR



ake one glance at the lineup of new marine products for 1986 and there's only one conclusion you can reach. Boating is booming, with hull designs, motors and accessories that reflect a new sense for quality, durability and intelligence. Stylish wedge-shaped lines inspired by European designers accent sleek muscle boats and comfortable raised-deck compact cruisers. Last year's sensibly priced entry-level "package" boat concepts-which include hull, motor and trailer-are more numerous than ever, and they're value-packed with new features. Powerplants continue to flow to the trailerboat marketplace with advanced corrosion protection, simplified 2-stroke operation and added performance.

The big news is part cosmetic, part design innovation, part muscle. Performance and solid quality look better than ever in the growing stable of sleek compact family cruisers. The common denominator? You might find them quayside in Monte Carlo with some of Europe's most rakish sport cruisers. But looks aren't everything. Builders are packing some pretty remarkable features in relatively short lengths over all (LOAs) by raising freeboard and deck. Aboard these compact cruisers, you'll find expansive cockpits and commodious belowdeck space, even an after sleeping compartment on some models.

A few examples: Larson's DC-230 and DC-250 Delta Aft-Cabin Cruisers combine quick-planing, stable Delta-Conic hull forms and a choice of seven Mercury and four OMC power options to get you there and back with efficiency and speed. From the convenient anchoring platform to the integral radar arch, swept-back lines and hull graphics create good-looking boats that house completely equipped galleys, enclosed head compartments and aft cabins tucked away under raised bridgedecks.

The popular and affordable Seville series from Sea Ray was expanded this year to include a 6.3-meter (that's about 21 feet on the centerline) Seville II Mid-Cabin, another feature-packed weekend getaway boat just right for couples or families of four. Take the same idea, lengthen it by about 4 feet and you'll get their Sundancer SRV 250—with an opening



Comfort and snappy lines mark Hunter's \$10,500 package.

transom door, a more spacious cockpit for fishing or optional fold-down seating, and a more stylish cabin that even has room for a hanging locker.

Chaparral's 238 XLC takes a more conservative approach to raised-deck styling, with a giant cockpit along with an elevated helm and bridgedeck that provide excellent sight lines. Top, side and aft canvas is standard. Welded stainless steel safety rails and teak accents, including a teak swim platform, give the 238 XLC subtle though distinctive touches.

Chris-Craft's 232 Aft Cabin Scorpion blends rakish good looks and a livable cabin with lots of light and ventilation. On deck, helm instrumentation is up high and clearly visible, and an aft-facing sun lounger seat to port gives the navigator a place to relax.

Package boats, the most interesting piece of boating news in 1985, have several interesting twists in 1986. Most models still include boat, motor, trailer and drive-it-away accessories at low prices, but inboard/outboard power in various displacements has become an option with several builders.

Bayliner Marine is still the unquestioned leader among package-boat manufacturers; most of the boats in their line are intended for entry-level mariners. Their Capri series of boats includes six models complete with boat, motor and trailer for under \$10,000—but they don't stop there. The 1950 Capri bowrider, equipped with a Volvo-Penta sterndrive and a custom trailer, a deluxe interior, a convertible top, a swimstep and an AM/FM cassette stereo is Bayliner's newest, most affordable package. The price for the 1950 comes to \$9995, and that includes an all-galvanized Escort trailer. With low, aerodynamic profile of a high-performance sports car, that's not just a great value—it's a great-looking value.

Chris-Craft is also making a concerted effort to

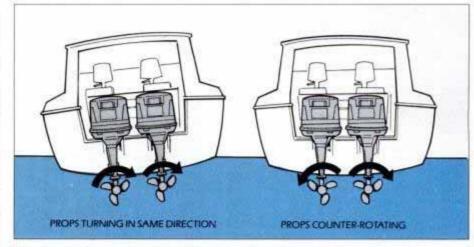
More Power To You—What's New On The Transom

S afety, durability and higher performance lay at the heart of several innovative outboard propulsion systems for '86—all the result of savvy, but subtle, engineering.

For example, Yamaha's counter-rotating V6 outboards take the effort out of steering boats with twin 150-hp or 200-hp installations. Props rotating in opposite directions dampen torque, creating a balanced boat that doesn't heel or turn in one direction excessively. That means you won't have to fight the wheel anymore on long runs.

Yamaha has also created a system that includes a special key panel with single safety lanyard that'll stop both engines in an emergency. A custom binnacle allows trim/tilt functions either separately with two switches or simultaneously with one. The Yamaha Counter-Rotating system also offers 50 percent more alternator power for large-boat accessories. This pair of Yamahas even has brains: overheating or low oil activate a buzzer and rpm is automatically reduced.

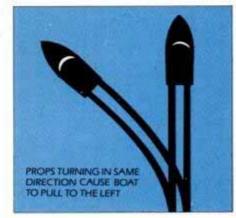
Also new from Yamaha for 1986 is the ProV 150-hp outboard (not shown). This 2.6-liter V6 designed for the tournament angler boasts a special cowling design and air intakes.



Counter-rotating props on Yamaha's new twin-engine installation limit motor torque, which can cause a boat to heel excessively (above) or steer off course (right).

Underneath the hood, Yamaha has added redesigned carburetion, modified reed-valve induction and fine-tuned exhaust.

From Evinrude comes two new loopcharged V6 outboards developing 200 and 225 hp. They share many of the same parts and much of the technology developed in the loop-charged V4 and V8 engines introduced last year. Follow-





Chris-Craft's 17-foot Cavaller is a package boat with I/O option.



Bayliner continues its successful Capri series in I/O bowrider.

capture the new boater with its Cavalier line of affordable boats. With the exception of one 17-foot bowrider that will take an outboard rated up to 140 hp, all the Cavaliers come standard with Mercury or OMC stern drives. Their best value is a 17-foot closed-deck model powered by a 120 OMC, priced around \$9700. But if you want performance, you can opt for the 200 Merc on a 19-foot Cavalier, priced from \$15,200 to \$17,200, depending on the model. Trailers are optional in this instance.

Hunter Marine has applied the same package concept to a new 23-foot sailboat, equipping it with a Nissan 5-hp outboard. Hunter also throws in either a Florence or Magic Tilt trailer, and the company's famous "Cruise-Pac" accessory kit, all for only \$10,500. Their objective is to attract the new sailor to the sport, the one who's already involved in other outdoor activities or who may already own a power-boat. Standardized parts and high sales volume make it possible for Hunter to hold down the price. Throwing a trailer into the package makes it easy to beat the high cost of maintaining a sailboat in a slip.

In the sportboat category, there's a stylish new breed of personal boat on the market this year, a boat meant for two people more often than four, following the lead established by Donzi powerboats back in the early '60s. Sea Ray Boat's Pachanga II, Tiara's Davanti and the Chris-Craft 222 Stinger are designed

(Please turn to page 134)

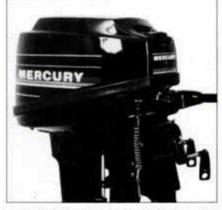


KEVLARREINFORCED
DRIVE
BELT

HYDRAULIC
ASSIST
PUMP
HYDRAULIC
FLUID
FILTER

POWER
ASSIST
CYLINDER

New Evinrude V6 (left) develops 225 hp. Big. high-performance engines from Johnson Outboards are easier to steer with addition of hydraulic power assist (above).



Lanyard-activated stop switch that cuts engine if operator leaves boat is new on small engines from Mercury.

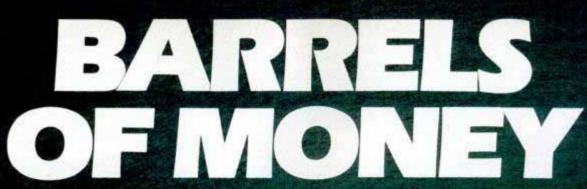
ing the current trend,
VRO oil metering does
away with the need to premix oil
and gas, and an all-new "no oil" warning
system sounds if the oil supply to the
engine is depleted.

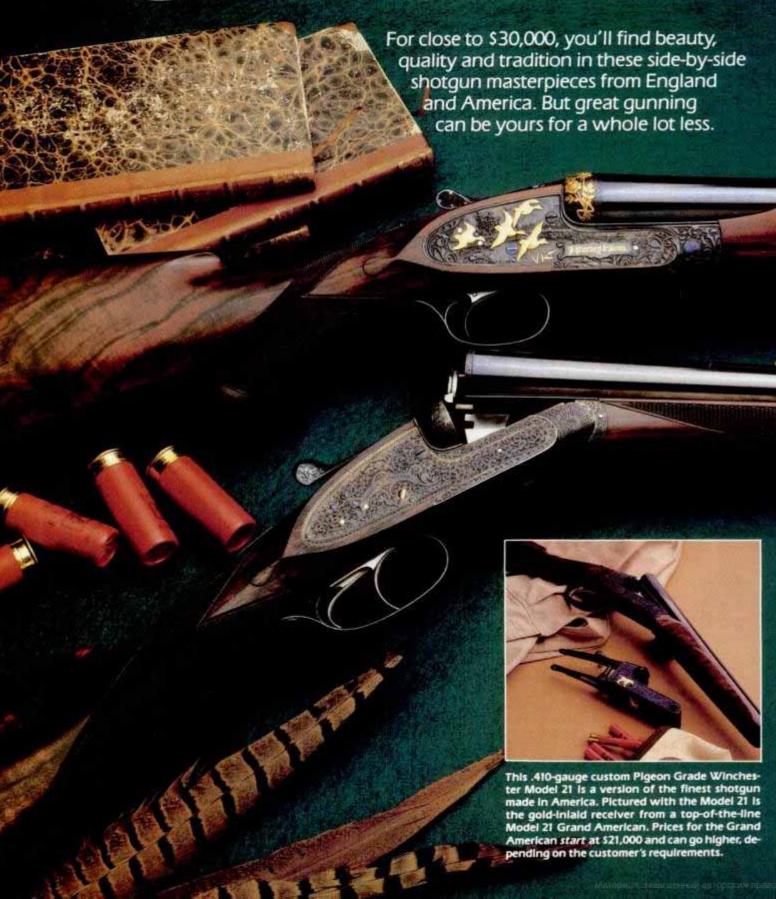
Johnson's most powerful outboards, the 3.6 GT and the 275 hp V8, come standard this year with power steering. A Kevlar belt transfers power from a flywheel pulley to a hydraulic-assist pump, just like the one found on most power-steering equipped automobiles. The pump provides the system pressure required to smoothly turn these

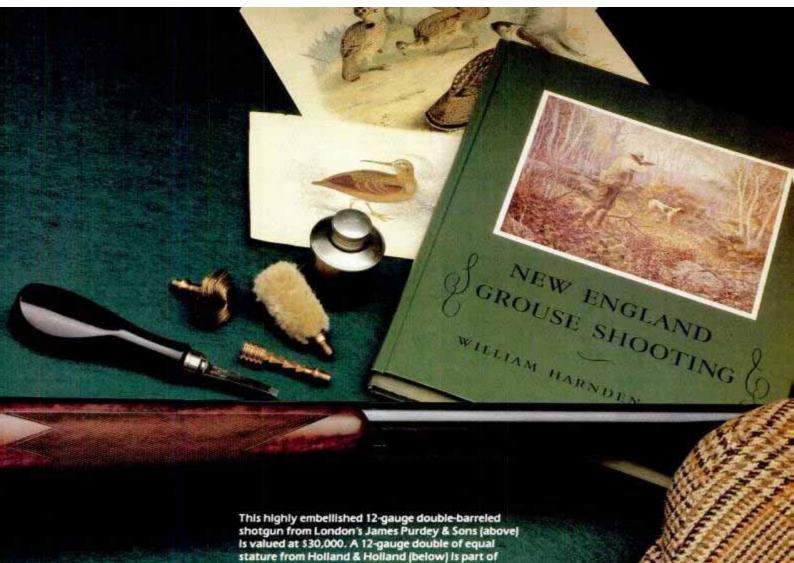
high-torque units via a power-assist cylinder positioned in front of and below the powerhead. PM had a chance to check this new power-steering system last fall. Twin Johnson V8s equipped with the new power-steering units were attached to Gil brackets on the transom of a Wellcraft Scarab. Despite extreme rough water out on Lake Michigan off Chicago, the giant V8s tracked superbly and offered precise maneuverability dockside. Additionally, these Johnsons feature VRO oiling, a top-charge 35-amp alternator to power large boat accessories, improved carburetion and

cooling and a newly geared starting motor.

Mercury's new family of 6-, 8- and 9.9-hp 2-cylinder outboards feature cross-flow induction for easy starting, and smooth and quiet running. Integral lanyard-activated stop switches bring a new margin of safety to the Mercury line, as do the locations of the stop button and shift mechanism in the tiller handle. Merc has also started using low-copper-alloy aluminum, a new epoxy painting process, and zinc sacrificial anodes to minimize corrosion problems.—J. W.







a 2-gun matched set that's valued at 557,000.

BY TIM COLE, Boating/Outdoors Editor; Photos by Bill Dolce

ount among the finer things in life this triplet of sporting arms. The 12-gauge double-barreled shotguns from James Purdey & Sons and Holland & Holland represent the finest examples of quality gunmaking. The Winchester Model 21 from U.S. Repeating Arms Co. is without question the best shotgun made in America today. These world-renowned firms have been producing fabulous firearms for decades, and the very names Purdey, Holland & Holland and Model 21 are synonymous with a kind of quality that transcends the guns themselves. Like a stately Rolls or an antique Chris-Craft, they are the epitome of art, of engineering, of handcrafted care—indeed, the epitome of excellence. And the price, if you have to ask, is hardly the point. Let's just say you'd pay as much for a Porsche 944 Turbo. But then, you can't shoot a Porsche, can you? Or let it rest on its baize within the burnished confines of a quality leather case? Or cradle it on the moor in the fiery azure of a day's first light?

No. These are objects that defy comparison—and elicit wonder. Start with the stock of carefully selected walnut. Move forward to the intricate checkering, meticulously wrought by hand in a stylish fleur-de-lis or majestic sweep—often with a pattern still in use after many decades. The stock is hand-tailored to owner specifications after a careful measurement of such critical factors as length of pull, drop at heel and drop at comb. Note the seamless wood-to-metal fit where the stock meets the action, the crisp movement in the top lever and

BARRELS OF MONEY

the authoritative, unequivocal snap as the breech closes. Run your fingers along the delicately carved hunting scenes on the side of the action—bird dogs, pheasant on the wing, grouse that got away.

What separates these rather majestic examples of human craftsmanship from the rest of gunning's greats? And what (we had to ask) makes a shotgun worth such enormous sums? PM began its inquiries at the U.S. Repeating Arms Co. in New Haven, Connecticut, where production continues on the Winchester Model 21. We then crossed the Atlantic to shoot at the Holland & Holland test grounds and visit the H&H factory outside London. We also visited with Sir Richard Beaumont, chairman of the board of James Purdey & Sons Ltd., at his office on South Audley Street in London's Mayfair district. Along the way, we discovered wood and metal work of subtle richness, and guns that possess an unmistakable mystique.

America first took the Winchester Model 21 to the field in the early '30s. Back then, L.C. Smith, Parker, Ithaca and A.H. Fox were introducing countless sportsmen to the gunning arts. Today, the Winchester Model 21 upholds the tradition with a talented 8-





Each piece of Holland & Holland's traditional sidelock action (above left) is forged and assembled by hand. The sideplate then undergoes hand engraving by one of Holland's inhouse craftsmen. The length of pull on one customer's gun is double checked (right).

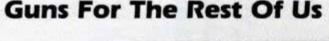
man staff. Entering the custom shop, you'll find John Durkin, a veteran of 37 years, checkering the half-pistol grip of a Model 21 stock using hand-made tools. Bob Schroeder painstakingly hand-rubs a 20-ga. barrel to the proper taper, analyzing the amount of steel he removes with an ancient micrometer. He rubs his fingers along the soldered barrels and the special high-strength dovetail joint, a Model 21 trademark

that will marry these barrels for life.

One hundred eighty man-hours are invested in the barrels alone; 600 hours on the gun as a whole.

Actually, there are three grades of the Model 21 by U.S. Repeating Arms, which uses the Winchester name under license from Olin Corp. The Standard Custom, with relatively little embellishment, can be purchased for around

(Continued from page 140)



Remington 1100 \$480

Mossberg Model 500 \$269.95

Ruger Red Label \$798

Savage-Stevens 311 \$255.89

Remington Model 1100, boasting good looks and handling, is a true perennial among American autoloaders.

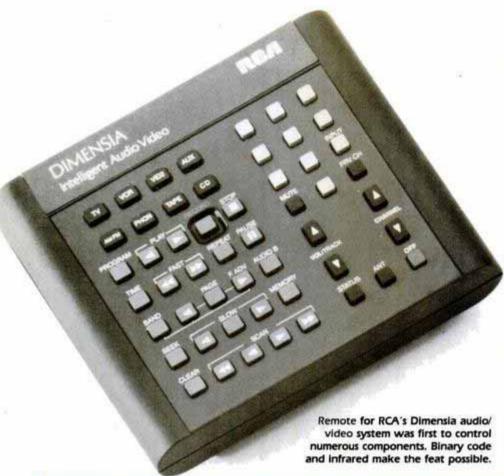
Mossberg Model 500 slide-action shotgun features a top tang safety, instead of a cross-bolt, and ventilated rib.

Ruger Red Label is a classic American superposed shotgun in a field populated by pricey imports; great for skeet.

Savage-Stevens 311, one of few American-made double guns, offers high utility and long life for a low price. hotguns from Purdey, Holland & Holland and U.S. Repeating Arms' Winchester remain the stuff of dreams for most of us mortals. But you needn't travel far to find superbly crafted, functional firearms that won't dislocate a sensitive budget. Take the Remington 1100 as an example. Interchangeable barrels mean this well-designed, all-around autoloader is compatible with nearly every type of shooting—from trap to upland bird to waterfowl. And a tough, simple action and gutsy good looks have firmly established this moderately priced shotgun in the American outdoors. The same kind of affordable utility found in the autoloading 1100 also appears in the

slide-action Mossberg Model 500, for those who prefer the safety and serviceability of a pump-action shotgun. More than 20 interchangeable barrels in 12 ga. mean you can tune the Model 500 to the type of shooting you prefer. Skeet-range connoisseurs seem to gravitate to the high-priced imports like the Beretta, or Browning's Citori and Superposed. But it's hard to beat the Ruger Red Label O/U for its handsome, American-built profile and terrific balance. For more basic, year-round shooting under \$300, Savage-Stevens produces the Model 311 Double. This no-nonsense 2-trigger side-by-side is designed to take every kind of abuse, and still shoot straight.-T.C.





tually any other electronics component one can imagine.

There are reasons why infrared succeeded where wired, ultrasonic and radio frequency systems flopped.

Manufacturers love infrared. Because it doesn't use precious radio frequencies, they don't have to bother with the Federal Communications Commission every time they introduce a new function. Consumers love it because there are no wires to trip over, and the light-beam system can perform more functions than the older technologies. Prices are coming down, and future possibilities seem limitless.

What makes infrared so hot? In short, binary codes.

The same sort of digital codes that make it possible to record music onto a Compact Disc make it possible to program that CD from across the room. The electrical signal generated when you push a command button is converted into a code consisting of ones and zeros. This code travels from the remote control unit to a receiver in the component being programmed. All of this takes about 67 milliseconds.

The highway this code travels is a

There's Music In The Air

If Hughes Aircraft gets its way, passenger planes will break the sound barrier—at least in the way entertainment travels.

The California company has developed the first wireless sound system for planes since the days when solo pilots whistled in an open cockpit. It's called AIRES, standing for Advanced Infrared Entertainment System, and it's already aloft on some passenger craft operated by California's Jet America.

As its name implies, the system uses beams of infrared light to dis-

tribute audio information—wirelessly—to headphone-wearing passengers.

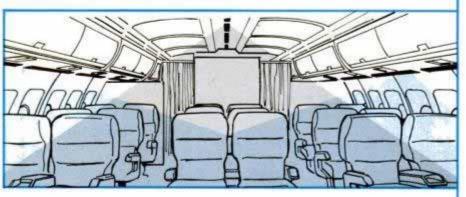
AIRES, in fact, will deliver up to 16 channels of audio, including music, movie soundtracks or announcements from the crew.

In conventional aircraft sound systems, each passenger's seat must be wired to receive sound from the central source—with anywhere from five to 32 wires! Moreover, the seat needs a control board to let the occupant choose channels and control volume. The passenger must be wired, too—connected to the control panel via the umbilical cord of the headset.

Hughes' AIRES system eliminates all this hard-wiring. Instead, infrared transmitting panels run the length of the cabin. The overlapping but invisible beams they emit virtually blanket the cabin, thereby ensuring that the receiving photocell on the headphones picks up a signal. Those 3ounce headphones house volume controls and channel selector, and an AA battery for power.

Besides passenger convenience and construction economies for airlines, AIRES has the added benefit of not interfering with aircraft wiring, antennas or avionics. Sound quality is acceptable, too—though not what you'd expect from your home hi-fi system. AIRES's one gremlin enters via the window. Since strong sun can foil infrared beams, you might have to give up your bird's-eye view.—J.C.





Jet America planes use infrared sound system developed by Hughes Aircraft. Infrared transmitters are installed down center and along sides of cabin. Beam pattern emitted overlaps to distribute sound everywhere. Wireless headset (left) is used by passengers.







STRIKING PAY DIRT

Don't let springtime catch you ill-equipped. Stock your toolshed now with these 30 pro-quality gardening tools.

ith spring just around the corner, it's time to prepare for the gardening season. And to help you get a head start with your gardening chores, we've collected 30 hand tools, each designed to make gardening easier and more enjoyable.

Selecting the right tool for the job is the first step toward relaxing, rewarding gardening. The hand tools shown were selected for use in small- to medium-sized gardens, but they could also be used to complement the work of power equipment on larger plots. Now, let's look at each of the tools to decide which ones belong in your toolshed.

- 1. Hand sprayer—Apply liquid pesticides to your plants safely and effectively with this easy-to-use hand sprayer. The tin-plated sprayer (\$10.69) has a 32-ounce capacity storage tank and the brass nozzle can be adjusted for a fine mist or coarse spray. To provide continuous spraying, pump the handle occasionally to pressurize the tank. Contact Gilmour Manufacturing, Box 838, Somerset, PA 15501.
- Dibbles—Use a dibble, also known as a dibber, to make neat, tapered holes for small transplants, bulbs and seedlings. Simply poke a planting hole with a quick twist of your wrist. Shown are

Text by Joseph Truini, Shop and Tools Edit in Photos by Brian Kosoff

STRIKING PAY DIRT

two versions of the dibble. The T-shape-handled tool has a round-nosed, 1¼-in.-dia. × 5½-in.-long steel poker. The pistol-grip dibble features a pointed, 1¼-in.-dia. × 5-in.-long steel poker. The T-shape-handled dibble is available for \$14.50 postpaid from Smith and Hawken, 25 Corte Madera, Mill Valley, CA 94941. The pistol-grip tool costs \$15.95 postpaid from Gardener's Eden, Box 7307, San Francisco, CA 94120.

3. Flower gatherer—Reach and snip flowers with one hand using this clever tool. The lightweight plastic shear cuts the stem and then grips it securely to prevent the flower from falling to the ground. It also features a built-in thorn stripper and stem crusher. The flower gatherer costs \$9.84 postpaid from Clapper's, Box A, 1121 Washington St., West Newton, MA 02165.

4. Stainless-steel hand tools—These handsome tools feature stainless-steel blades and rosewood handles. The fork has two 3¾-in.-long prongs for easy weeding and less root disturbance. The trowel has a 2¾-in.-wide × 5½-in.-long blade. The tool pair costs \$27.95 postpaid from Gardener's Eden, Box 7307, San Francisco, CA 94120.

5. Fine-work trowels—When potting and planting seedlings and other small plants, try the fine trowel (left) and the fine-point trowel. Both tools feature 1-piece stainless-steel construction with cushioned PVC handgrips. The fine trowel (\$10.45) has a 2½-in.-wide × 5-in.-long blade. The fine-point trowel (\$9.35) has a 1¼-in.-wide × 4-in.-long blade. Both tools are available from Clapper's, Box A, 1121 Washington St., West Newton, MA 02165.

6. Compact tool set-Designed for

use in small gardens and flower beds, these tools have 48-in.-long ash handles, but the heads are scaled down to work in tight spaces. The set includes a 5½-in.-wide leaf rake, 6-in.-wide shovel, 1-in.-wide single-prong cultivator and a 4½-in.-wide hoe. The set costs \$37.45 postpaid from Gardener's Eden, Box 7307, San Francisco, CA 94120.

7. Rotary disc hoe—This unusual-looking hoe has four 4%-in.-dia. steel discs that work the soil on the pull and on the push stroke. Use the rotary hoe for weeding, mulching and aerating. It can even be turned upside-down and used as a rake to level tilled soil. It's available for \$24.95 postpaid from Gardener's Eden, Box 7307, San Francisco, CA 94120.

8. Expandable rake—Although it may look like an ordinary leaf rake, this tool has a slide mechanism that allows you to adjust the rake from 13 to 20 in. wide. The 22 12-in.-long tines are made of resilient spring steel to resist bending and twisting. The expandable rake with 60-in.-long ash handle costs \$22 postpaid from Green River Tools, 5 Cotton Mill Hill, Box 1919, Brattleboro, VT 0530l.

9. Children's tools—Get your children interested in gardening with their own set of tools. This 3-piece, scaled-down tool set includes a 32-in.-long, 4-prong fork (\$28), 32-in.-long spade (\$26) and a 37½-in.-long, 8-tine rake (\$17). Each tool has a T-shaped ash handle. These high-quality tools are also great for adults who tend small balcony and roof-top gardens. For details, contact Smith and Hawken, 25 Corte Madera, Mill Valley, CA 94941.

10. Handplanter-Unlike a conven-

tional trowel, this tool's handle is attached at an obtuse angle (about 102°) to the blade. This arrangement makes it easy on your wrist when digging holes, according to the supplier. The 2½-in.-wide × 5½-in.-long stainless-steel blade is bolted to a 4½-in.-long tubular steel handle. It's available for \$13.75 postpaid from Green River Tools, Box 1919, 5 Cotton Mill Hill, Brattleboro, VT 05301.

11. Hand pruner-Continuous pruning often results in fatigued, sore hands. Reduce these discomforts with the Felco No. 7 pruner. The lower handle of the pruner rotates with the natural movement of your fingers to help reduce friction and work effort. The 81/4-in.-long pruner features a hollow-ground blade. It's available for \$43 postpaid from Smith and Hawken, 25 Corte Madera, Mill Valley, CA 94941. 12. Cultivator/weeder-Work close to and in between plants easily with this narrow cultivator/weeder. The tool has a 2-in.-wide × 4-in. steel head that is attached to a 48-in.-long ash handle. Use the tool for light cultivating, to aerate the soil and to uproot weeds. It's sold for about \$10. Contact Ames, Box 1774, Parkersburg, WV 26101.

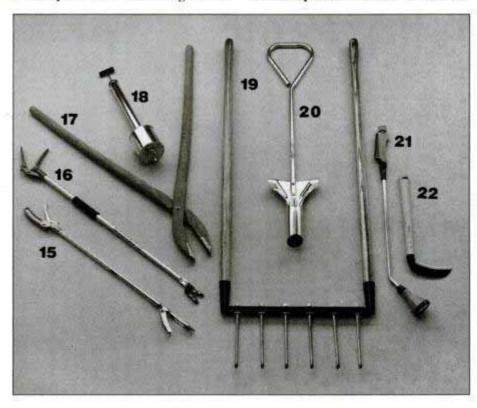
13. Dandelion weeder—Dig out pesky dandelions and weeds—roots and all—easily with this 42-in.-long weeder. The tool has a double-pointed, forked steel head that is mounted to a 36-in.-long ash handle. Push the 1½-in.-wide head under the weed and pull back on the handle to uproot the plant. It's sold for about \$8. Contact Ames, Box 1774, Parkersburg, WV 26101.

14. Goatskin gloves—A pair of highquality leather work gloves is the one tool that every gardener should own. These heavy-duty gloves are made of supple goatskin sewn with double-reinforced, rot-proof nylon thread. And, the seams run on top of the fingers not in between them—to provide greater dexterity and sensitivity. The gloves are available in sizes 6 through 12 and cost \$27 postpaid from Green River Tools, Box 1919, 5 Cotton Mill Hill, Brattleboro, VT 05301.

15. Long-handled weeder—Pull out stubborn weeds from a comfortable standing position with this lightweight aluminum weeder. To use, simply uproot the weed with the tool's pointed tip and then squeeze the handle to close the jaws on the plant. The 33½-in.-long tool costs \$43.45 from Gardener's Eden, Box 7307, San Francisco, CA 94120.

16. Long-reach flower picker—Pick out-of-reach flowers with this 39-in.-long aluminum flower picker. The tool has a snip-and-hold feature that allows you to cut and retrieve a flower easily. The tubular shaft rotates 360° to position the steel cutters at the most desir-

(Please turn to page 142)



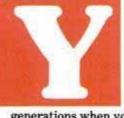
Bonus Woodworking Section

Shop Projects

This special woodworking section contains a variety of doit-yourself projects to match nearly anyone's skill level. Novice woodworkers might first try building the lamp, puzzle or board game, while more advanced enthusiasts might well be lured to the child's Victorian rocking chair or clever lathe-turned wood vase.

This section was also designed to accommodate different types of personal taste. Those more interested in traditional styling will find the colonial washstand and miniature chest of particular interest, while those with a more contemporary bent will lean toward the folding table or cube puzzle. No matter what your choice, we wish you happy and productive building.

Child's Victorian Rocker



ou can please children of several

generations when you build this Victorian rocker. It features a seat and back of machine-woven cane. The chair is made of maple. Begin by planing the pieces to thickness. Then, sand the stock before cutting out the parts. Start with 120-grit and then progress to 180- and finally 220-grit abrasive paper.

Transfer the full-size patterns for the uprights, arms, seat frame members and rockers (parts A-F, see Materials List), from the drawing to the stock.

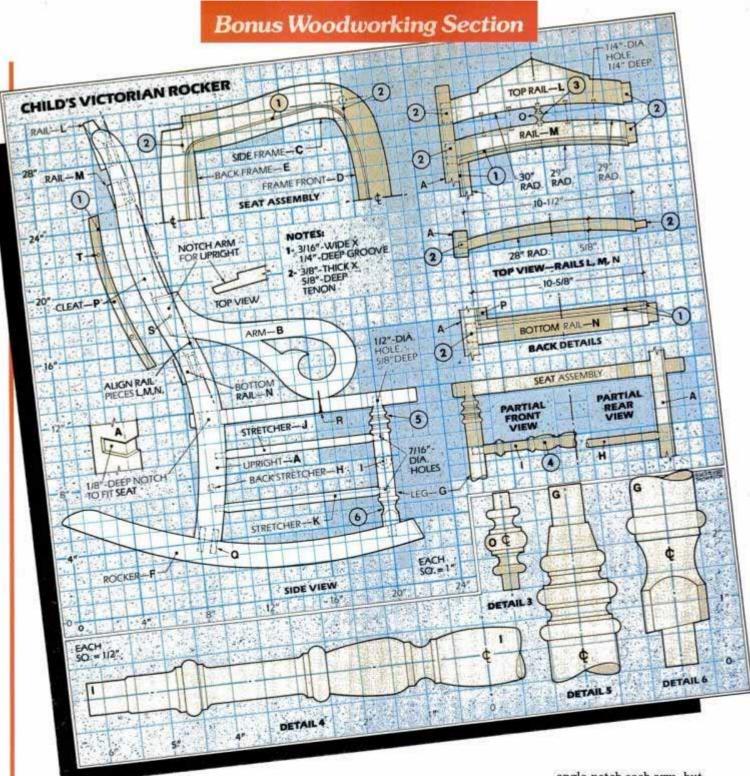
Use a ¼-in.-rad. beadand-quarter-round bit to shape the top and back of the arms where they join the uprights. Then, use the quarter-round portion of the bit to ease the remaining edges of the arms.

Next, use a %-in.-dia. straight bit in a router or shaper to cut mortises in the front and back seat frame parts (D, E). Then, glue and clamp together the seat frame. Rout the spline groove in the seat frame using a 3/16-in.-dia. veining bit. Attach a guide bushing to the router base and use a 4/8-in. hardboard template to

control the cut. Make the template opening slightly larger than the finished groove outline to allow for the guide bushing.

Lay out the full-size profile of the chair on paper. Place the finished parts on the drawing to determine cutting angles.

Locate and cut mortises in the uprights to accept the rails (L, M, N). Cut the rail tenons at a slight angle so



that the front of the uprights tilts outward about $\frac{1}{16}$ in. Then, bore holes in the two uppermost rails (L, M) for installing the five rail spindles (O). Rout a groove in the middle rail (M) and lower rail (N) for the seatback cane spline. Turn the rail spindles on a lathe. Install the spindles between rails.

Mark and bore holes in the uprights and rockers for %-in.-dia. dowel pins (Q). Also, bore holes for installing the back stretcher (H) between the uprights. Then notch the uprights to hold the seat frame. Glue and clamp the rails and back stretcher to the uprights.

Rout the two cleats (P) to form a spline channel. Use a $^3/_{16}$ -in.-dia. straight bit set $^{1}/_{16}$ in. deep. Angle the cleats' ends to fit between rails. Attach the cleats with glue and wood screws.

Trim the back corners of the seat frame to make it fit in the uprights' notches. Then, turn the front stretcher (I) and the front legs (G) on the lathe. Now turn the upper and lower stretchers (J, K). Glue and clamp together the front legs, side and front stretchers, uprights and rockers. Use two 3-way edging clamps to assemble the rocker/upright joints.

Clamp the seat frame in place and bore pilot holes through the uprights and into the back seat frame. Drive in 6d finishing nails. Set and fill all nailheads.

Bore screw-pilot holes in the uprights for attaching the arms. Use a backsaw to angle-notch each arm, but don't attach them yet.

Finish the rocker with stain, and two coats of satin polyurethane varnish.

To install the cane, cut two pieces 1 in. oversized on all edges. Soak the cane and spline for about 30 minutes in warm water. Then, drive the cane into the groove with small softwood wedges. Begin at the center on opposite sides. Keep the center of the cane taut. Squeeze glue into the groove and then use a mallet and wedge to tap the spline in place. Finally, attach the arms.—Ralph S. Wilkes

Bonus Woodworking Section

MATERIALS LIST-

CHII	D'S	ROCKER
Key	No	Size & description (use
A	2	√s × 4 × 27° maple
		(upright)
В	2	$\frac{7}{8} \times 5 \times 14^{\circ}$ maple (arm)
C	2	% × 4 × 1056* maple
		(side seat frame)
D	1	% × 3½ × 15" maple

C	2	% × 4 × 10% maple
D	1	(side seat frame) % × 3½ × 15" maple
E	1	(front seat frame) % × 3 × 13" maple (back seat frame)

F	2	$\% \times 4 \times 23^{\circ}$ maple
		(rocker)

2	1½ × 1½ × 9½ maple
- 33	(front leg)
1	½"-dia. × 12" hardwoo

dowel (back stretcher)

1 1¼ × 1¼ × 13¼" maple
(front stretcher)

2 1½" dia × 11½" hardwor

J 2 ½"-dia. × 11½" hardwood dowel (upper stretcher) K 2 ½"-dia. × 11½" hardwood dowel (lower stretcher)
L 1 $1\frac{1}{2} \times 3\frac{1}{2} \times 12$ " maple

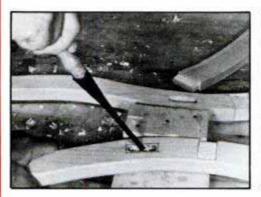
(top rail) M 1 $1\frac{1}{2} \times 2 \times 12$ " maple (middle rail) N 1 $1\frac{1}{2} \times 1\frac{1}{2} \times 12$ " map

1 1½ × 1½ × 12" maple (lower rail) 5 ¾ × ¾ × 2½" maple (rail spindles)

2 ½ × 1½ × 10" maple (cane cleat) 4 %'-dia. × 1½' hardwood dowel pin (attach rocker to upright)

R 2 1½" No. 10 fh screw S 2 1¼" No. 10 rh screw

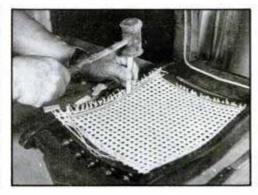
4 11/4" No. 8 fh screw Misc.: 12 × 28" sheet of medium cane from Constantine's, 2050 Eastchester Rd., Bronx, NY 10461, 3/32" × 8' cane spline, 6d finishing nails, white glue. Minwax walnut stain, varnish.



Mark mortise locations on the uprights with a straightedge. Centerpunch and bore %-in.-dia. x %-in. holes. Clear the waste with a chisel.



Use a finished leg as a guide in turning a mate. Support the completed leg on a bent wire coat hanger.



Attach the back caning first. Align it with the seatback edges, then drive wedges around the perimeter to sink the caning into the groove.

Wooden Vase

his unusual turned wooden vase is made of 12 pine segments that are glued together.

that are glued together and fastened to a 5-in.-dia, pine base.

Make the first cut with the table saw blade set at 16°. Then, rip a 24-in.-long board to 5 in. wide. Be sure that the cut edges angle in the same direction.

For the second cut, remove the saw fence, set the blade at 15° and adjust the miter gauge to 84°. Be sure to position the miter gauge so that its right side angles downward, away from the leading edge of the saw blade. Then, place the board against the miter gauge fence with the leading angled edge face down so that it meets the blade first.

Trim the board's end. Then, turn over the board, measure back 2 in. and make another cut to pro-



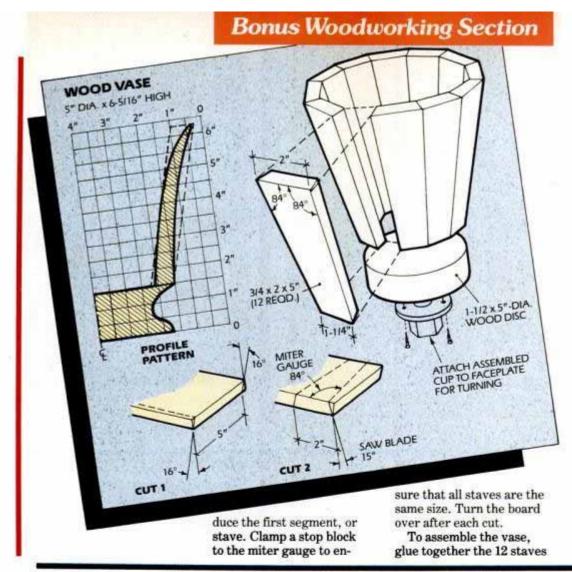
Use a stop block clamped onto the miter gauge fence to ensure that the staves are cut to a uniform size.



After gluing together the staves, clamp top and bottom.



To shape the vase exterior, start with a deep-fluted gouge. Then, finish-shape the wood vase with a round-nose scraper.



and place the assembly upright on wax paper. Wax paper will shield the workbench from glue squeezeout. Clamp the top and bottom of the vase with web clamps or hose clamps. Allow the glue to dry overnight. Sand or plane the bottom of the vase smooth. Glue on a 1½ × 5-in.-dia. wood base.

Next, mount the vase on a lathe faceplate. Use a deep-fluted gouge to turn the exterior. Finish-shape the exterior with a round-

nosed scraper.

The nearly vertical interior surface was turned with a $\frac{1}{2} \times \frac{1}{2} \times 16$ -in. iron bar tipped with a wedge of tungsten carbide steel sharpened at a 15° angle. A machine shop can custom-make this tool, or a 1in.-wide, long and strong skew chisel can be used. Caution: When using the scraper, take shallow cuts to prevent the tool from digging in. Sand the vase while it's on the lathe; apply polyurethane varnish.-Russell Bay

Folding Table

or occasional use or for use in small rooms, this fold-down table is ideal. When not in use, a decorative wall hanging hides the folded table's

use, a decorative wall hanging hides the folded table's underside. When the table is down, the hanging is removed and stored. Another fabric hanging is permanently mounted to the wall over the table.

Begin by edge-gluing pine boards together to make the tabletop (part A; see Materials List). The top could also be made of ¾-in. plywood with veneer-banded edges. Cut the apron parts (C, D, E) to size. Then, cut a ¼-in.-deep × ½-in. rabbet in the front apron (D) to hold the removable hanging



(M). See detail 1 on the drawing. Glue and nail the apron parts together with 6d finishing nails. Set and fill the nailheads.

Next, secure the assembled apron to the underside of the tabletop with wood screws (Q). Be sure that the apron frame is square. Then, attach the $1\frac{1}{2} \times 1\frac{1}{2}$ in. legs (B) to the top with back flap hinges (J). Now install the leg braces (K).

Cut the hinge cleat (F) and the frame parts (G, H) to size. Paint or stain the frame to match the existing

woodwork. Bore holes in vertical frame parts (G) for the 1/4-in.-dia. × 51/2-in. dowel holding pins (O). The pins are used to hold the table securely when it's folded against the wall. Secure the wall frame and hinge cleat to the wall studs with 10d finishing nails. Be sure that the frame is plumb and that the cleat is level. Set and fill all nailheads with wood putty. Install a continuous hinge to the tabletop's back edge. Then, butt the table to the cleat and screw the hinge to the cleat.

Cut the fabric for the removable wall hanging (P). Sew a pocket for the steel rod (L) along the bottom edge of the hanging. Cut the hanging rod (M) and the pine strip (N). Then, glue and nail the pine strip to the rod with 1-in. brads as shown in detail 1 on the

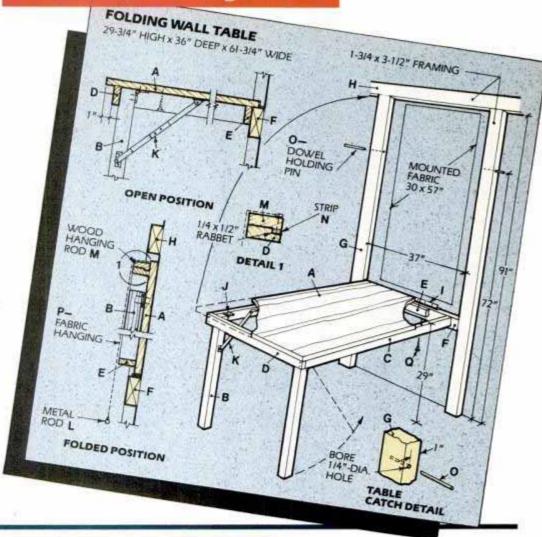
Bonus Woodworking Section

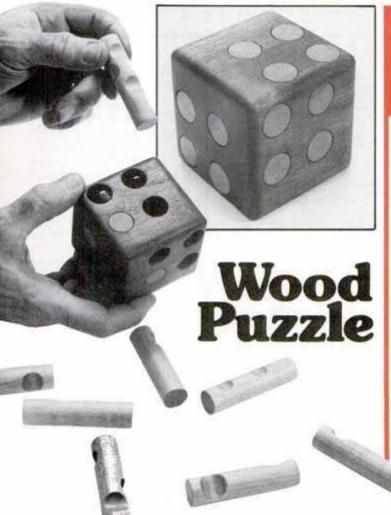
drawing. Now glue or staple the top of the fabric to the rod.

Finish the table with stain and satin polyurethane varnish.—Annette Sukov

FOLDING WALL TABLE No. Size & description (use) 1 ¾ × 36 × 60° pine (table Key top) $1\frac{1}{2} \times 1\frac{1}{2} \times 29^{\circ}$ pine (leg) $\frac{1}{4} \times 2 \times 57\frac{1}{2}$ pine (side apron) 34 × 2 × 34" pine (front D apron) ¾ × 2 × 32½" pine (back apron) 1 1% × 3½ × 37" pine (hinge cleat) 1% × 3½ × 91" pine (wall frame) 11/4 × 31/2" pine (top frame*) 11/2 × 36" continuous 1½ × 36° continuous hinge, Stanley No. 314 1½ × 3°/₁₆° back flap hinge, Stanley No. 814 1¼ × 16%° leg brace, Stanley No. 446 ¼-dia. × 37° steel rod ¾ × 2 × 37° pine (hanging rod) ½ × ½ × 37" pine (strip) ¼"-dia. × 5½" hardwood dowel (secures closed table) 1 37 × 72" fabric hanging 10 2½" No. 8 ft screws Misc.: Carpenter's glue, 6d finish nails, 1" brads, paint or stain and polyurethane varnish.
*Cut top frame's length to fit across the room from wall to wall

or cut it flush with the outside edges of the vertical frame parts.





his game tests your logic, your memory

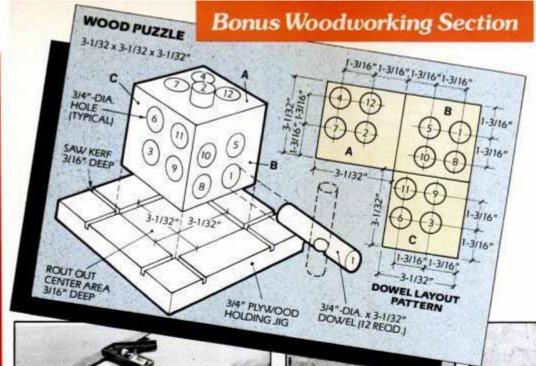
and, once you've become familiar with it, your coordination. Play consists of removing and then replacing the 12 notched pegs. An hour to solve the puzzle can be cut to several minutes with a little practice. The unofficial record is about 38 seconds.

First, make the cube by gluing together two $1\%_{16} \times 3\% \times 3\%$ in. pieces of walnut or other hardwood. Sand each side reducing the cube to about $3\%_{32} \times 3\%_{32} \times 3\%_{32}$ in. Be sure that all sides remain square.

Next, draw the dowel layout pattern on paper as shown in the drawing. Be sure to locate the dowels accurately. Adhere the pattern to the cube with rubber cement. Make side A the top of the cube; position sides B and C as shown. Then, use an awl to centerpunch each of the numbered holes.

Now make a plywood jig for holding the cube on the drill press table. First, make four $^3/_{16}$ -in.-deep cuts to form a $3^1/_{32} \times 3^1/_{32}$ -in. square at the center of the plywood. Rout away the center with a $^5/_{16}$ -in.-dia. straight bit to form a $^3/_{16}$ -in.-deep recess.

Next, cut 12 ¾-in.-dia. × 3½-in. dowels. Number the dowels one through 12. Now clamp the holding jig to the drill press table, insert the cube and bore hole No. 1. Place a dowel in the hole and clamp it to prevent the dowel from shifting. Bore and install a dowel in the second hole in the same way. Proceed in this manner until all 12 dowels are installed. Sand dowels that protrude



from the cube's surface. Remove the dowel layout pattern and clean off the rubber cement with a rubber pickup eraser, available at art supply stores.

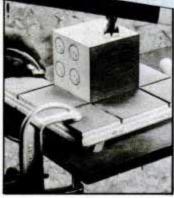
With the dowels in the cube, sand lightly with 120grit abrasive paper. Then, remove the dowels—keeping them in order—and round their edges. Also, round edges and corners of the cube.

Finally, you should apply two coats of Watco Danish oil to all parts.

-James Schooley



Cut out the pattern and adhere it to the cube with rubber cement. Be sure to position the pattern as shown in the drawing. Centerpunch each hole.



Bore holes with brad-point bit so only point breaks through. Then, rebore from the opposite side.



After boring a hole in the cube, insert the mating dowel. Be sure to brush-clean the hold-ing Jig recess so that the cube seats properly.

Table Lamp

uild a custom lamp of the shape

and finish you want easily and inexpensively-usually for under \$25-by using readily available turned hardwood parts and packaged lamp hardware. Lamp components are sold at hardware stores and at electrical and lighting supply dealers. Turned wood parts are sold in lumberyards as spindles and balusters. Use part of a turning or combine turnings to produce a variety of lamp sizes and styles. A wooden plaque will serve

as a lamp base.

The wood parts are held together by a continuously threaded lamp pipe designated 1/8-IP (3/8-in. outside diameter). The electrical cord runs through the center of the pipe. Fasteners must be threaded 1/8-IP.

First, bore a ½-in.-dia. hole through the center of the wood components. Use a drill press or a portable drill fitted with a guide to ensure perpendicular holes. Next, you should bore a hole horizontally from the outer edge of the base to the center hole to provide an exit for the lamp cord. Then, paint or stain the wood parts as desired.

Assemble the lamp on the uncut pipe as follows: two



locknuts on the bottom, wood parts, steel washer, harp base, locknut and socket base. Mark the pipe even with the top of the threaded part of the socket base and then disassemble the lamp.

Run a locknut onto the pipe about 1 in. beyond the cut mark. Now cut the pipe with a hacksaw. Lightly file off burrs and run the nut off the cut end to restore the threads. Then, reassemble the lamp. Make sure that the cardboard insulator is in the bottom of the socket base before it's installed. To protect the cord insulation from damage, make sure that the pipe doesn't extend into the socket base or below the bottom nut.

Next, you must wire the

Bonus Woodworking Section

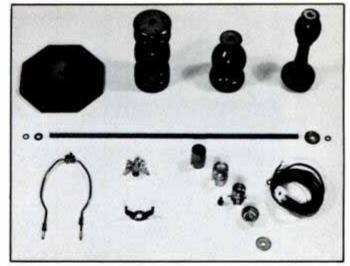
lamp. Use coded electrical wire that has a ribbed edge indicating the side to be attached to the narrower "hot" prong. Feed the lamp cord from the bottom of the lamp until 4 in. of cord extends from the top. Pull the halves of the cord apart 2 in. and strip off ½ in. of insulation. Now, you should twist the wire strands and attach one lead to each binding post of the socket in a clockwise direction.

Tighten the screws so that all of the wire is secured. Then, gently pull the wire from the bottom until the socket is resting on its base. Snap on the socket cover with its cardboard insulator in place and attach a plug. Finally, add the harp, bulb, shade and the finial to the lamp.

Wood bases and turned parts are available by mail from: Constantine's, 2050 Eastchester Rd., Bronx, NY 10461. Turned parts only are available from Woodworkers' Store, 21801 Industrial Blvd., Rogers, MN 55374.

If you have trouble locating lamp hardware, write to the following company for the name of a lamp parts distributor in your area: Angelo Bros. Co., 10981 Decatur Rd., Philadelphia, PA 19154.

-Edward Morrissey



You can build your own lamp with readily available wood parts and hardware. Lamp components consist of (top row): wood pieces; (middle row) bottom locknuts, threaded pipe, washer, top locknut; (bottom row) harp, finial, harp base, socket, electric switch cord.

Colonial Washstand



popular piece of American country

furniture today, the washstand was once considered to be an essential home furnishing. Most were made of pine, as is the washstand here, or poplar. This piece is also known as a drysink.

The legs of this washstand were cut from a 2-in.thick clear pine plank. Other parts were cut from ¾-in.thick No. 2 pine, which is a less expensive grade. Note that some parts were planed to ½ in. thick (parts I through N, see Materials List) to more closely duplicate an authentic washstand.

Begin by making the four legs. Cut the blanks oversize, to about 30 in. long to include waste. Make sure that the blanks are square and centered on the lathe.

Mark the areas that are to be shaped and begin turning with the foot end of the leg at the tailstock. Use the first completed leg as a guide for turning the others. Keep it in view next to the

lathe as you work. Check measurements frequently with calipers.

After all legs have been turned, sand them with 120- and 150-grit abrasive paper. Use a sanding block on flat surfaces. Match the legs with the best grain for the front of the washstand and place blemishes toward the

back. Carefully locate and mark mortises on the legs for the sides (B), back (C), stretchers (D) and shelf supports (E). The mortises for the upper stretcher are larger than those for the lower stretcher (see detail No. 1). Cut mortises with a mortising attachment in a drill press or use a wood bit and chisel.

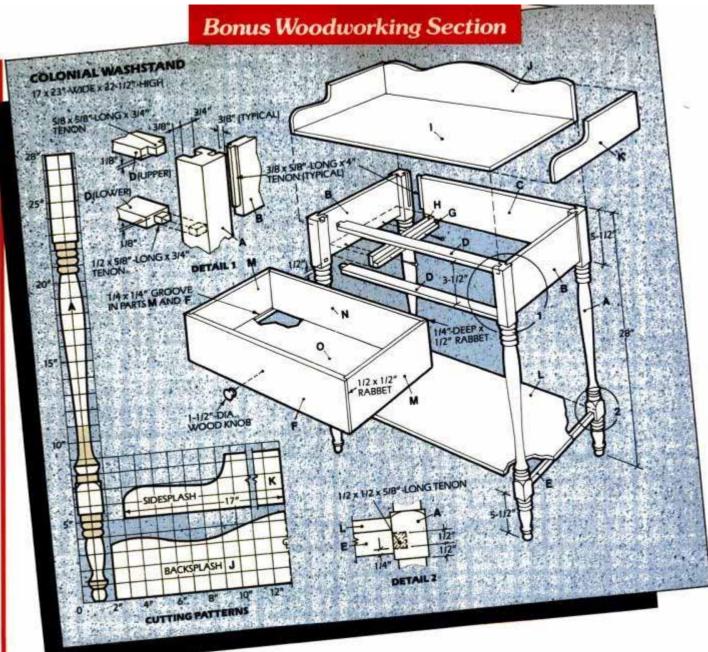
Next, cut the sides, back, stretchers and shelf supports to size. Sand the parts smooth. Then, use a table saw, shaper or back saw to cut the tenons. After testing for a snug, but not too tight fit, glue and assemble the legs, sides and shelf supports.

Be careful not to get any glue on surfaces to be stained. Clamp the ends while checking diagonal measurements for square. Let the glue dry.

Next, glue and clamp the stretchers and back to the ends. Check both horizontal and vertical angles with a square. Also, be sure to check diagonal measurements from leg to leg. Clamp a temporary stretcher to the shelf supports to maintain proper spacing for the shelf.

Cut the two drawer runners (G,H) of maple. Attach the runners with No. 10 flathead screws so they are about $\frac{1}{32}$ in. above the lower parts (F,M,N,O) to

Rabbet the ends of the drawer front and the back edges of the drawer sides. Cut 1/4 × 1/4-in. grooves 1/4 in. from the bottom edge of the



drawer front and sides for installing the bottom (O). Sand the parts smooth and then glue and clamp the drawer together. Nail the drawer bottom to the back with 1-in. brads. Don't use glue when installing the back. Purchase a 1½-in.-dia. drawer knob or turn one on the lathe.

Cut the top (I), backsplash (J) and sidesplash (K)
pieces of ½-in.-thick pine.
Sand the parts smooth and
assemble them with glue
and 1-in. wire brads. Then,
attach this assembly to the
washstand with 4d finishing
nails. Set the bradheads and
nailheads and fill the holes
with wood putty.

Finish-sand the wash-



Legs in three stages are, from the top: initial blank has been squared and cut extra long with markings where turnings are needed. Middle leg is roughed out and the bottom leg is completed.

stand as needed with 220grit sandpaper. Remove the sanding dust with a tack cloth before applying the finish.

Stain the washstand as desired. The stand shown here was stained with Minwax Puritan Pine stain (No. 218). Let the stain dry thoroughly. Then you should apply two coats of satin poly-

(Please turn to page 158)



Test-fit sides and legs before final assembly. Mortise and tenon Joints should fit snug.

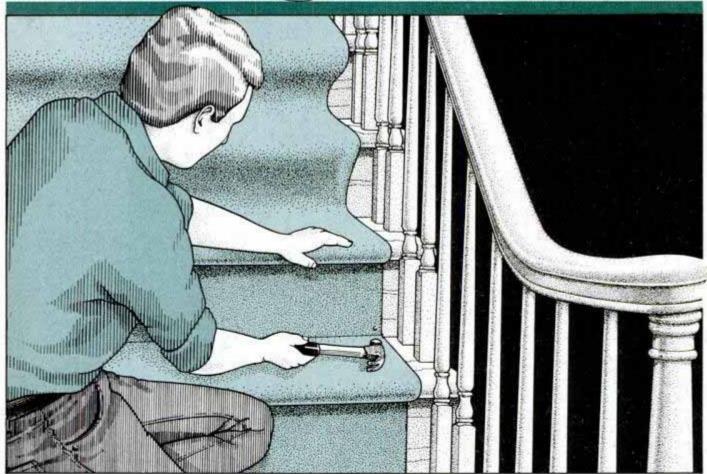
MATERIALS LIST— COLONIAL WASHSTAND

Key		Size and description
		(use)
A	4	15% × 15% × 28" pine (leg)
AB	2	% × 5 × 141/2" pine (side)
C	1	% × 5 × 14½" pine (side) 44 × 5 × 20" pine (back)
C	2	% × 1% × 20" pine
		(stretcher)
E	2	% × 1 × 141/2" pine (shelf
		support)
F	1	% × 3% × 18%" pine
STORES.	775-97	(drawer front)
G	2	% × % × 1314" maple
	1000	(drawer track)
H	2	1/4 × 11/2 × 131/4" maple
		(drawer track)
J	1	1/2 × 161/2 × 22" pine (top)
J	1	1/2 × 41/2 × 22" pine
		(backsplash)
K	2	1/2 × 31/2 × 17" pine
104011	-	(sidesplash)
L	1	1/2 × 131/4 × 22" pine
		(shelf)
M	2	1/2 × 31/4 × 141/1" pine
		(drawer side)
N	1	1/2 × 21/8 × 181/6" pine
		(drawer back)
0	1	1/4 × 141/4 × 181/4" ply-
		wood (drawer bottom)

Misc.: Carpenter's glue, 1½-dia. wood knob, 1-in. brads, 4d finishing nails, four 2-in. No. 10 fh screws, stain, varnish.

Материал, эжцимненый авторожим прис





How To Carpet A STAIRWAY

here are lots of good reasons for carpeting a stairway. Stairs leading directly from a living room or central hallway can look more attractive and inviting when carpeted. And a carpeted stairway will quiet your home, not only by softening footsteps, but by partially absorbing sound waves passing from one floor to the other. Carpeted stairs are safer, too, lessening your chances of slipping.

It's easier to carpet a stairway than a large room. There's no need to stretch a cumbersome expanse of carpeting into place, and it's easier to measure and make adjustments in position. Also, there are no tricky seams to join.

Avoid using utility-grade carpeting.

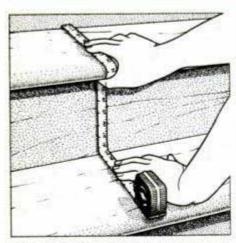
BY ARTHUR ROOZE Associate Home And Shop Editor

Stairways get heavy wear, especially along the tread nosing. Choose an easy-to-clean variety with a dense pile. Carpet with attached cushion backing is cheaper and easier to put down, but isn't recommended for stairways. For this reason, we are describing the installation of a conventional carpeting—with a jute backing—placed over separate sponge or felt padding.

Since you'll require a long, narrow runner, you may be able to buy remnants of high-quality carpeting for considerably less than the going rate for a room-size piece. It isn't necessary for the runner to be in one continuous length. Two or more sections can be used, placing the seam under the tread nosing where it will be unnoticeable.

Whether you use a continuous runner or several pieces, keep in mind when purchasing the carpet that the pile on each piece should always lay facing toward the bottom of the stairs. Both ascending and descending, the pressure of your foot is mostly toward the tread nosing, so unless the pile faces the same way, wear will be excessive—perhaps as much as doubled. You can determine the direction of the pile simply by running the palm of your hand lightly across the carpet surface.

HE BETTER



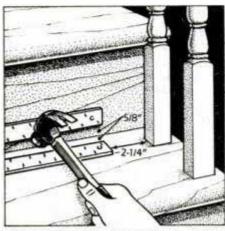
1 Measure step around the nosing to bottom of riser. Multiply by number of steps to find runner length. Allow extra if runner pieces will be joined under nosing.

Which installation method?

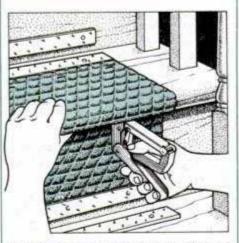
The most common method for carpeting stairs—and the one we describe—applies to a stairway that has one closed side wall and open balusters at the other side. Both edges of the carpeting are rolled under and tacked in place, with the rolled edges either set back 1 to 3 in. from the wall and balusters, or butted directly against them. Our illustrations show the carpeting set 1 in. from the wall and balusters, with a 1½-in. roll-under at the edges.

However, if your carpeting is a type that will not unravel, you can butt the uncut edge directly against the side wall without roll-under. In fact, with this type of carpeting, you can butt both cut edges in a stairway that's enclosed within two walls.

Our method calls for wrapping the

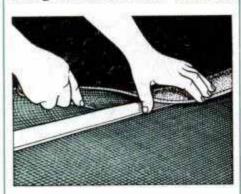


2 Nail tackless strips % in. from crotch for carpet of average thickness. Setback of 2 ¼ in. allows 1 ¼-in. roll-under and 1-in. space between carpet and baluster.



\$ Cut padding the same width as tackless strip. Staple first to back of tread against strip; pull padding tight and staple under nosing, then at bottom of riser.

carpeting tightly around the tread nosing. Another method—called a waterfall installation—allows the carpet to fall directly from the leading edge of the nosing to the crotch below where the



4 Cut carpet 2½ in. wider than finished width. Score the length of the runner 1¼ in. from each edge using a straightedge and awl. Fold carpet over and press flat.

tread and riser join. While this method is simpler, we consider it less desirable from a safety standpoint and less attractive, especially if one side of the stairway is open to view. Still another method, known as cap and band installation, is illustrated on page 126.

Measuring the stairway

Determine the total length of the runner by measuring one tread and one riser, wrapping the tape measure around the nosing as shown. Add 1 in. to allow for the thickness of the padding that will wrap around the nosing. Multiply this amount by the number of steps. Remember to allow for additional carpeting if your runner will consist of two

or more sections, since each section must adjoin under a tread nosing.

To calculate the required carpet width, measure the distance from the wall to the base of the balusters, or whatever portion of the step you will be covering. Add 2½ in. for rolling the edges under—1¼ in. for each side. Since you will probably need to trim at least one edge along the runner's length, allow an additional inch for this. If the carpeting you purchase has irregularly cut edges, be sure you will have enough carpeting to trim a straight line for the entire length of the piece.

A stairway that includes a landing is measured as though the landing were a deep step. Ideally, you will want to cover the landing and the first riser above it in one piece. However, if this won't work with the carpet dimensions, include this first riser in the runner with the steps above.

Winder steps—wedge-shaped steps that turn a corner—will require carpeting approximately 50 percent wider than your runner, and will produce considerable waste. This is because each step and the riser above it must be covered with a separate piece. For the sake of appearance, carpet life and safety under foot, the pile on each step should be at right angles to the nosing,

and facing downstairs.

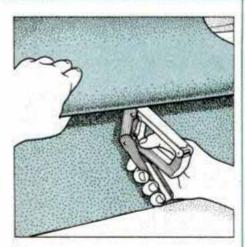


Secure bottom edge of runner to tackless strip on first riser, butted flush against the floor. Place three carpet tacks through each doubled-over edge, into riser.

Preparing the stairs

If your stairs have been previously carpeted, remove old nails or tacks that may remain. Check treads and risers and secure any that are loose, using glue and 8d finishing nails. If you don't plan to carpet the entire width of the

HE BETTER



6 Press carpet snugly into the corner against underside of the nosing, and staple into bottom of the tread. Start from center of stair and work toward each side.

stairway, you may want to refinish those portions of treads and risers that will be exposed. Remove any quarterround or other molding nailed against the wall, in the crotch or under the nosing.

Mounting tackless strip

Our installation shows the use of tackless strip to secure the carpeting in place. These are \(\frac{1}{4}\)-in.-thick x 1-in.-wide lengths of plywood with pins protruding from the face of the strip at a 60° angle. The strips are installed with the pins pointing against the pull of the taut carpeting.

If you plan to roll under both edges of the carpet 1¼ in., cut the tackless strip 2½ in. shorter than the finished width of the runner. Nail one strip to the riser, % in. above the tread with the pins pointing down. Nail another strip to the tread, % in. from the riser with the pins pointing back.

The %-in. dimension will produce a tight, secure angle at the crotch with carpeting of average thickness. But before nailing all the strips in place, test-fit a piece of carpeting at the crotch as shown in illustrations 7 and 8. If your carpet is either thicker or thinner than average, you may have to increase or decrease the %-in. dimension slightly. When you're satisfied with the crotch fit, nail all the strips in place, including one at the bottom of the first riser.

Installing padding

Cut the padding to the same width as the tackless strips. Then, measure the distance from the strip on the tread, around the nosing, to the strip on the



7 Work carpet tight around nosing, then into space between strips using a blunt cold chisel. Keep equal space between carpet edges and the wall and balusters.

riser. Cut each piece of padding about ½ in. undersize, since it will stretch as you pull it tight.

If you are using felt padding, the waffled side should face outward. With sponge-rubber padding, the fabric webbing faces outward. Staple the padding to the tread, then under the nosing, then to the riser. A bit of space remaining between the bottom edge of the padding and the tackless strip on the riser is nothing to worry about.



8 Drive the carpet into the crotch with the cold chisel to tighten carpet and secure it to tackless strips. Start from the center of the crotch and work toward each side.

Cutting and rolling edges

Lay the runner out flat to cut it to width. Carpet with a looped pile, that is, with adjacent strands joined at the tops, should be cut from the face side. Cut-pile carpeting, where all the strands are unjoined at the tops, is cut

from the backing side. Make pencil marks or small cuts at the width required, allowing for roll-under. Then, place a straightedge—a long, straight board will do—on the marks and cut the carpet with a sharp utility knife. If you are cutting from the face side, separate the pile and cut between the rows of loops.

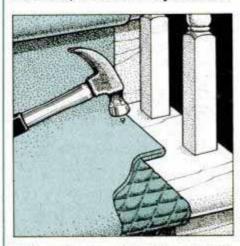
With the carpet face down, pencilmark 1¼ in. back from both edges for the roll-under. Place the straightedge on the marks and score the jute backing with a sharp awl. Your scored lines should form a substantial depression in the backing, but be careful not to cut all the way through. Fold the edges back on the scored lines, and walk them flat.

installing the carpet

Spread the runner up the stairway, keeping the edges rolled under. Secure the bottom edge to the tackless strip on the first riser and pull it onto the pins. Press the carpeting against the riser and be sure to work it snugly into the joint under the nosing. Staple the carpet to the underside of the nosing, starting from the center of the runner and working outward.

To attach the carpeting securely through the padding and into the tread, which is probably hardwood, you'll need a heavy-duty stapler. Most electric staplers won't do the job. You can rent an industrial-grade stapler, electric or hand operated, either from your carpet supplier or a tool rental outlet. The stapler should be capable of driving a %16-in. staple all the way home into hardwood.

After the carpet is stapled under the first tread, drive 1/2-in. carpet tacks at



Place a long carpet tack through both doubled-over edges into the crotch, and drive them home with a nailset. Drive two tacks into treads at each edge.



the lower left-hand and lower righthand corners, through the roll-under, into the riser bottom, as shown in the illustration on page 125. Place two additional tacks into the riser along both rolled-under edges.

Work the carpeting tightly around the nosing and against the tread surface with your left hand. With your right hand, press the carpet into the crotch using a wide, blunt cold chisel. Work from the center of the crotch toward each side, making sure the rolled-under edge remains equidistant from the balusters and the wall. Then, force the carpeting into the crotch with the chisel and a hammer. This will pull the carpet tight across the tread and secure it to both tackless strips.

Drive 1-in. carpet tacks into the

crotch through the roll-under at each side, and set these tacks with a nailset. Drive two ½-in. tacks through the rolled-under edges into the tread surface

Continue up each stair following the same method. When you reach the top of the stairway, extend the carpeting up the last riser and staple it at the top of this riser.

Cap and band stair carpeting

You may wish to wrap carpeting completely around your stair treads, either for the full length of the stairway, or on just the first two or three exposed steps of an otherwise enclosed stairway. This method is called cap and band installation—the cap being the tread covering, and the band a separate



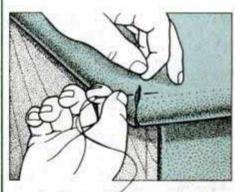
Cut carpet for riser to full riser height. Score carpet at end of riser, and fold against edge of padding. Staple at top and bottom of riser, and tack rolled-under edge.



After riser is covered, secure tackless strip and padding to the tread below. Cut carpeting to size and attach it to the tackless strip. Make diagonal cuts at corners.

piece applied to the riser. You can, if you wish, cut the tread carpeting to fit around balusters. Start the installation procedure from the top riser. Use tackless strips on the treads, but not on the risers. Cut padding to the full height of the risers and staple it in place, 1¼ in. back from the risers' open side. Cut carpeting to full riser height and 1¼ in. wider for roll-under at the open side. Score the carpeting with an awl and straightedge, 1¼ in. back from the edge, and fold flat. Staple the carpet to

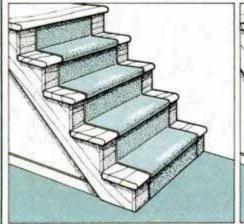
the riser along the top and bottom edges, and secure the rolled-under edge with three ½-in. carpet tacks. Secure tackless strip to the treads, ¾ in. from the crotch. Measure and cut padding to fit against the tackless strip and around all the exposed nosing. Then, staple the padding at the back and under the nosing, cutting miters at the corners. Measure and cut the tread carpet pieces and secure them to the tackless strip. Miter the corners, then staple the carpeting under the nosing. Sew the corners.

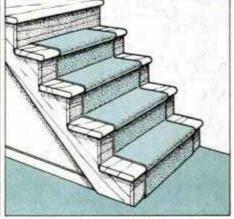


Staple carpet to bottom of tread under all exposed nosing. Sew miters at front and back corners with large needle and heavy thread that matches carpet color.

Reviving a worn runner

Stairway carpeting usually shows its first signs of wear along the leading edges of the treads. Carpet people call it "grinning." If your stairway is beginning to grin at you, and if the runner is of one piece, you may be able to revive it. Remove the runner, then shift it toward the bottom of the stairway approximately 2 in., enough to reposition the worn areas so they are out of sight under the nosing of the treads and at the very top of the risers. Reinstall the carpeting as described on the previous pages. Since it will now be too short to reach the nosing of the floor above, leave the top riser uncarpeted, or install a matching piece.





Make the wear disappear from tread edges of a 1-piece stair runner. Shift the entire length of carpeting toward the bottom of the stairway so worn areas are under nosing.

Learn robotics and industrial control as you build this

New NRI home training prepares you for a rewarding career in Americas newest high-technology field.

The wave of the future is here. Already, advanced robotic systems are producing everything from precision electronic circuits to automobiles and giant locomotives. By 1990, over 100,000 "smart" robots will be in use.

Over 25,000 New Jobs

Keeping this robot army running calls for well-trained technicians . . . people who understand advanced systems and controls. By the end of the decade, conservative estimates call for more than 25,000 new technical jobs. These are the kind of careers that pay \$25,000 to \$35,000 a year right now. And as demand continues to grow, salaries have no place to go but up!

Build Your Own Robot As You Train at Home

Now, you can train for an exciting, rewarding career in robotics and industrial control right at home in your spare time. NRI, with 70 years of experience in technology training, offers a new world of opportunity in one of the most fascinating growth fields since the computer.

You need no experience, no special education. NRI starts you at the beginning, takes you in easy-to-follow, bite-size lessons from basic electronics right on through key subjects like instrumentation, digital and computer controls, servomotors and feedback systems, fluidics, lasers, and optoelectronics. And it's all reinforced with practical, hands-on experience to give you a priceless confidence as you build a programmable, mobile robot.

Program Arm and Body Movement, Even Speech

Designed expecially for training, your robot duplicates all the key elements of industrial robotics. You learn to operate, program, service, and troubleshoot using the same techniques you'll use in the field. It's on-thejob training at home!

Building this exciting robot will take you beyond the state of the art into the next generation of industrial robotics.

You'll learn how your completely self-powered robot interacts



with its environment to sense light, sound, and motion. You program it to travel over a set course, avoid obstacles using its sonar ranging capability. Program in complex arm and body movements using its special teaching pendant. Build a wireless remote control device demonstrating independent robot control in hazardous environments. You'll even learn to synthesize speech using the top-mounted hexadecimal keyboard.

Training to Build a Career On

NRI training uniquely incorporates hands-on building experience to reinforce your learning on a real-world basis. You get professional instruments, including a digital multimeter you'll use in experiments and demonstrations, use later in your work. And you get the exclusive NRI Discovery Lab*, where you examine and prove out theory from basic electrical concepts to the most advanced solid-state digital electronics and microprocessor technology. Devised by an experienced team of engineers and educators, your experiments, demonstrations, and equipment are carefully integrated with 51 clear and concise lessons to give you complete

confidence as you progress. Step-by-step, NRI takes you from the beginning, through today, and into an amazing tomorrow.

Send for Free Catalog Now

Send for NRI's big free catalog describing Robotics and Industrial Control plus over a dozen other high-technology courses. You'll see all the equipment you get in detail, get complete descriptions of every lesson, find out more about career opportunities for trained technicians. There's no cost or obligation, so send today. Your action today could mean your future tomorrow.

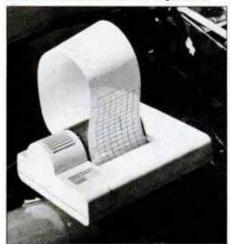
NRI SCHOOLS

McGraw-Hill Continuing **Education Center** 3939 Wisconsin Ave. Washington, DC 20016

E'LL GIVE YOU TOMORROW.

(Continued fr m page 94)

panding air creates a low-pressure area under the bodywork that presses the tires to the asphalt. Just as the shape of an airplane wing creates lift, the underbody contours of an Indy car produce downforce. On a high-speed oval, this downforce can exceed 2000 pounds!



Engine and driveshaft rpm are recorded by Budweiser King Funny Car's Racepak computer, stored for between-rounds printout.

Drag is the price Indy cars pay for downforce. Its aerodynamic penalty saps a race car's power. For example, doubling a car's speed quadrupl s its drag—and overcoming this drag requires eight times more horsepower. Until Penske introduced the new Chevy-Ilmor V8 this year, most competitive CART cars used the same Ford Cosworth DFX V8 engines, and no team had a horsepower edge. Finding the right balance between drag and downforce is the "unfair advantage" that still preoccupies the Penske Indy car team.

"It's an evolutionary process," notes team manager Derrick Walker. "A slight change in sidepod shape can move the car's center of pressure. Then you may have to adjust the suspension geometry, the tires, the front and rear wings. That's why testing is so important to our team."

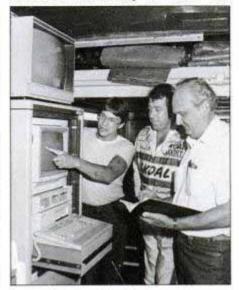
Like all topflight Indy car efforts, the Penske crew uses different cars for different circuits. They roll out a low-drag version for high-speed ovals like Indianapolis, and maintain a road-race chassis for tight courses such as Laguna Seca and Long Beach. Front and rear wings are critical on road courses because the cars need maximum traction for cornering. Airfoils have less importance on the banked ovals. Some teams have even removed the rear wing during qualifying to wring out the last possible mph, although the handling then becomes very tricky.

The science of ground effects is still in its infancy. There are volumes on the aerodynamics of aircraft, but little is known about flying at 200 mph just inches above the ground. Wind tunnels provide some answers, but no team has a tunnel that will accept a full-size car with a moving ground plane to simulate the interaction between the chassis and the pavement. And there's no way to re-create the turbulence produced when two cars are running nose to tail. That's why the driving skill and courage of earthbound pilots still count in Indy car racing.

Formula horsepower

These single-seat racers, which compete in Grand Prix races around the world, are directly related to Indy cars, are similar in appearance and use the now-common carbon-fiber chassis. For several years, many Indy and Formula One cars used the same Ford-Cosworth V8 engines and virtually identical bodies with ground effects. Nowadays, the two have become quite different, thanks to high-tech advancements in F1 engines and the banning of ground effects on F1 cars.

When the GP organizers last changed engine regulations in 1966, they allowed normally aspirated engines a maximum capacity of 3 liters, while supercharged or turbocharged engines were restricted to 1.5 liters. Nobody felt a turbocharged 1.5-liter engine could be competitive until Renault built the first turbocharged F1 engine in 1977. It was two years before it won against the bigger engines. But the writing was on the wall, and by the middle of 1985 every GP team was



Onboard telemetry system in Harry Gant's NASCAR Monte Carlo reports in to a transporter-based Hewlett-Packard computer.

using a turbocharged engine.

Each GP team has to build its own chassis, but is allowed to use engines built by other companies. Throughout the history of F1 there have been periods when either the chassis or the engine proved most important. At present, it's the engine, and auto manufacturers like Renault, BMW, Ferrari, Alfa Romeo, Porsche, Honda and Ford have developed F1 engines.

The last two seasons have seen the Marlboro McLaren team all but dominate GP racing, winning both drivers' and constructors' championships. The McLaren is powered by a TAG engine, which was designed and built by Porsche. Techniques d'Avant Garde (TAG) is a high-tech French company



Aluminum plates replace side engine mounts, use block to bolster chassis stiffness.

that helped cover the vast development costs after McLaren commissioned Porsche to design the engine from scratch in 1981. The basic parameters were laid down by McLaren's designer, John Barnard, since the engine's size and shape are important in modern race cars where airflow under and over the car is critical. After studying 4-cylinder, V6 and V8 configurations, Porsche decided on an 80° V6 engine with twin turbochargers.

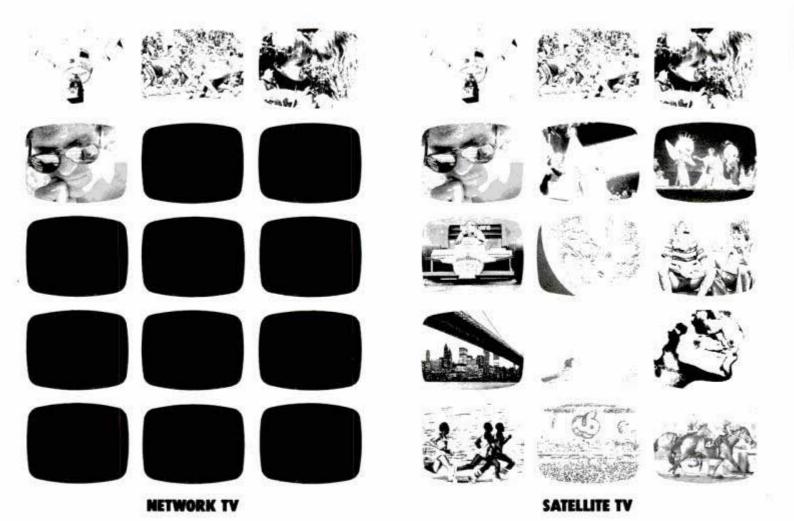
Fuel economy has become an important part of GP racing because the cars are no longer allowed to refuel and are restricted to using only 220 liters (58 gallons) during a race. On some of the faster tracks, drivers have to cool it in order to conserve fuel. The average fuel consumption is 3.4 mpg, not bad from a 1.5-liter engine that produces over 700 hp in race trim and over 1000 hp for qualifying!

The TAG engine has an extremely sophisticated electronic engine management system developed by Bosch that integrates functions such as ignition, fuel injection and turbo boost. The driver has a high-tech dashboard with a digital display that tells him how much fuel is left in the tank and how many laps of the racetrack he can cover with-

(Please turn to page 132)

Материал задишенных авторокам правом

THE REASONS FOR OWNING A SATELLITE TV SYSTEM SEEM CLEAR TO US.



There's only one problem with network TV. You just don't get enough choices.

Fortunately, now there is a choice. With a M/A-COM home satellite TV system, you can get 45, 55, 65 or more channels to choose from. And you don't have to be a math whiz to know what that means.

You'll get hundreds of movies, from the best black and white classics to first-run feature films. Sports of all sorts, from drag racing to steeple chasing. And a ton of ball games to boot. You'll get shows that teach, preach, even make you blush.

And to keep the kids from getting their G's confused with their X's, every M/A-COM satellite TV system can lock out adult entertainment.

We also have an optional VideoCipher*II descrambler unit that allows you to receive premium subscription TV

M/A-COM has an entire line of satellite systems to

choose from. Each built with the pride and precision that have made us a leader in satellite TV. So whether you're after the best deal on a system, or the best system money can buy, we've got what you're looking for.

So sit back and take a look at the programming choices you now have. Then, visit your local authorized M/A-COM dealer to clear up the situation.

For a free brochure, write: M/A-COM Home Satellite Systems, P.O. Box 1729, Dept. 2D, Hickory,

North Carolina 28603.

A step ahead in satellite TV.



@1985 M/A-COM Inc.



ross-country skiing is often cited by physiologists

as the most perfect form of cardiovascular exercise

for both men and women. Its smooth, fluid, total

body motion uniformly exercises more muscles so

higher heart rates seem easier to attain than when

jogging or cycling. NordicTrack closely simulates the pleasant X-C skiing motion and provides the same cardiovascular endurance-building benefits-right

in the convenience of your home, year 'round.

Eliminates the usual barriers of time, weather,

Jogging, Swimming, or Cycling

Vordic rack

Jarless Total Body

Cardiovascular Exerciser

Duplicates X-C Skiing for the Best way to Fitness

> formly exercises the large leg muscles and also adds important upper body exercise. Higher pulse rates, necessary for building fitness, seem easier to attain because the work is shared by more muscle mass.

Even Better Than Swimming

NordicTrack more effectively exercises the largest muscles in the body, those located in the legs and buttocks. When swimming, the body is supported by the water, thus preventing these muscles from being effectively exercised. The stand up exercising position on the NordicTrack much more effectively exercises these muscles.

A Proven, High Quality Durable Product

NordicTracks have been in production since 1976. NordicTrack is quiet, motorless and has separately adjustable arm and leg resistances. We manufacture and sell direct. Two year warrantee, 30 day trial period with return privilege.

> Folds and stands on end to require only 15" x 17" storage space.

Toll Free 1-800-328-5888

Minnesota 612-448-6987

chance of injury, etc. Also highly effective for weight More Complete Than Running NordicTrack gives you a more complete work out-conditions both upper body and lower body muscles at the same time. Fluid, jarless motion does Call or write for not cause joint or back problems. FREE BROCHURE More Effective Than Exercise Bikes

NordicTrack's stand-up skiing motion more uni-PSI, 141PM Jonathan Blvd., Chaska, MN 55318

Homeowners

Rid Your Property of Unsightly Brush Piles!

Turn a mess like this ...



into beautiful FREE mulch in less than one hour!



...with the Amazing New SUPER TOMAHAWK Chipper/ Shredder...exclusively from Garden Way!

- *It's a powerful Chipper...handles big branches up to 3" in diameter with ease!
- *It's an efficient Shredder...turns almost any organic matter into perfect mulch and compost instantly!
- Revolutionary New Compact Design...
- 7 ways better than bulky "old-style" chipper/
- *Professional Quality...designed, sized and priced for the homeowner!

Send for FREE details today!

Exclusively from the makers of the Troy-Bilt®Tiller!

Garden Way Mlg. Co. Dept. A243 102nd St. & 9th Ave., Troy, N.Y. 12180

YES! I want to know more about the amazing SUPER TOMAHAWK Chipper/Shredder! Please send me complete details including prices, models. and SPECIAL SAVINGS OFFER right away!

Name	
Address	
Mudress	

State. Zip_

TECHNOLOGY OF SPEED

(Continued from page 130)

out running out of fuel. He then knows how much boost he can afford to use in order to beat the other drivers. The system is so accurate that Alain Prost, the McLaren driver who won the 1985 championship, ran out of fuel soon after crossing the finish line in several races last year.

In tire technology, Goodyear leads the way with specially compounded radial tires that are altered for every track. In order to gain maximum grip at the start of a race, electric blankets are placed over each tire so they can be warmed up-no burnouts allowed in

In 1984, McLaren totally dominated the results. Other competitors decided it was mainly due to the great powerto-economy ratio of the TAG engine. Then, at the end of the season, a secret was let out-McLaren had been using the American-developed Gleason Torsen differential instead of a conventional limited-slip differential. It is no coincidence that the second and third best cars during 1985 also used Gleason Torsen differentials. Audi will put them into some of its road cars next year.

Telemetry at Talladega

The question on every NASCAR crew chief's mind is: What's it like out there? Drivers generally reply that the car doesn't handle right, complain that it's down on power, and report that it "just doesn't feel right." Now, sophisticated telemetry systems can precisely measure the effects that drivers can only feel with the seats of their fire

Thank the U.S. space program for this latest application of high-tech to the high banks. NASA engineers developed the hardware to monitor conditions on missiles, then transmit the data to ground stations. It's just a small step to adapt this telemetry to race cars. In this instance, mission control is the trailer of the Hal Needham/Burt Reynolds Racing Team, and the rocket they're tracking is Harry Gant's Skoal Bandit NASCAR stock car.

Joe Sargent developed the team's telemetry technology. He outfitted Harry's Monte Carlo SS with 23 onboard sensors that relay information by FM telemetry to the team's transporter parked in the infield. There, a Hewlett-Packard computer stores and processes the data. Jim Mastro's software interprets the readings and displays 26 vital statistics about the car and its perfor-

When Skoal Bandit crew chief Travis Carter asks, "What's it like out there?" the computer has a ready answer. It checks the engine's health by monitoring rpm, exhaust-gas temperatures, fuel flow and underhood and carburetor entry air pressure.

Other sensors record the air pressure under the car, the loads on the suspension and wheel speeds. An accelerometer tracks lateral g-forces to evaluate the car's handling and cornering. There's even a channel that records throttle opening. This "chicken channel" checks whether Harry Gant is driving flat out or feather-footing.

For all its sophistication, the Skoal Bandit's telemetry system was assembled on a shoestring. According to designer Joe Sargent, most of the equipment already existed for aerospace applications. "It's outrageously expensive," Sargent reports, "because the government was the only buyer. But we bought surplus parts for a fraction of the original price."

NASCAR officials were so impressed with the system that they outlawed it for competition. The team still uses their telemetry for private test sessions, though, including a 400-lap tire test at Rockingham. The crew is still learning to use all the information the system can provide. "We could add sensors to monitor Harry's heartbeat and respiration," notes Joe, "but they'd probably go off the scale in the last turn at the Daytona 500."

Space-age speed

The link between high technology and high performance is being forged in countless shops across America. Engine builders in California can now compare notes with race teams in North Carolina thanks to the widespread use of computerized dynamometers. The self-contained SuperFlow "dyno with a brain" records thousands of bits of information during an engine test, displays the results on a video screen, and prints out a graph of the power curve. For less than the cost of a new Cadillac, a racing team can install its own test facility that rivals anything in Detroit's engineering centers.

Even familiar components are receiving a high-tech touch. Ram Racing Clutches' carbon-graphite clutch assemblies can withstand temperatures that will melt aluminum, while retaining their original coefficient of friction. The resins in a conventional asbestos disc begin to break down at 600° F., but a carbon-fiber clutch shrugs off 3000°! And when you consider the 9-pound weight savings offered by these high-tech clutches, it's easy to see why racers are lining up to buy them, even at \$2500 apiece.

Not even a lowly motor mount is safe from racing's technological revolution. Many chassis builders have adopted motor plate mounting systems, using thin machined-aluminum sheets at the front and rear of the engine block to carry the weight. Generally, the motor plate sandwiches between the block and water pump up front and between the engine and clutch housing at the rear. The mounting plate then bolts to tabs fabricated on the chassis tubes, allowing the engine block to help stiffen the framework. That also leaves wide open spaces for exhaust header plumbing. Best of all, it makes for a self-contained engine package that can be swapped as a unit in 10 minutes.

Intake manifolds fabricated from sheets of aluminum are the rage in Pro Stock drag racing. Changing the size or length of the runners is as simple as switching on the heliarc welder with these made-to-order manifolds.

America's dirt tracks, the last bastion of low-budget competition, are also feeling the impact of advanced technology. A new breed of "wedge cars" can be found circling the clay tracks like a flock of flying doorstops. Billboard-sized Lexan spoilers channel air across their low-slung bodies to press the tires against the slippery track surface. From the glistening super speedways to ramshackle "bullrings" on the edges of small towns, technology is changing the way America goes racing.

WATER WELLS FOR EVERYONE!



"World's leading manufacturer of low-cost drills since 1962."



Lake Geneva, WI 53147 1-800-KLOCKIT

LEARN TV/VCR REPAIR



taking career as a TV/VCR Repair Specialist. No need to quit your job or school. We show you how to troubleshoot and repair videocassette recorders and TV sets, how to handle house calls and shop repairs for almost any make of television or VCR. You learn about TV receivers, tuners and antennas, x-ray emission, the characteristics of sound, how electrical impulses are converted into a TV picture, and much, much more. Tools are included with your course so you can get "hands-on" practice as you follow the lessons step by step. Send for free facts about opportunities in TV/VCR Repair and find out how you can start making money in this great career.

Experts show you what to do, how to do it...guide you every step of the way!

Everything is explained in easy-to-understand language with plenty of drawings, photos and diagrams. But if there is ever anything in your lessons you don't under-stand, you can write or phone your instructor and you can count on getting an authoritative answer. Send for free facts and color brochure. No cost. No obligation. an will visit you. MAIL COUPON TODAY!

SCHOOL OF TV/VCR REPAIR	R, Dept. PB026				
Please send me free facts on how I can learn TV/V Repair at home in my spare time. No salesman will v					
Name	Age				
Address					
City/State/Zip					
Phone ()					

Build a Custom House at Savings up to 40%



New factory-made "kits" offer you top-notch houses of every size and type, including log and dome houses. Or have one custom-made from your plans! Get the Com-plete Guide to Factory-Made Houses by A.M. Watkins. Here is all about factory-made houses and how to build a custom model fast with no hassles. It also cites 250 top U.S. makers. 184 pages; many photos, plans. Moneyback guarantee. Only \$9.95. FREE with every order! New Report: "Building Your Own House." The Building Institute, M-3 855 River Road, Piermont, N.Y. 10968

MEN'S WIDE SHOES

EE-EEEEEE, SIZES 5-13 Extra width for men who need it Excellent variety, styling and quality. Send for FREE CATALOG.

THE WIDEST SELECTION OF THE WIDEST SHOES



HITCHCOCK SHOES, INC. Dept. 28C, Hingham, MA 02043

JOB FINDING

Send for FREE brochure to find and land your next job the ST JAMES way. Land a ob using step-by-step method proven to help you develop your personal profile, resource inventory. Send request to ST JAMES CAREER SERVICES, PO. Box 407, Broomall, PA 19008.

ALL DECKED OUT

(Continued from page 105)

to fill the need for power and performance in an upscale pleasure boat with trim, flowing lines. Wellcraft's 185 Elite shows the same distinctive profile and sculpted transom with built-in swim platforms, and room for more than a couple of friends. Recently, Donzi introduced three new Z-series cruisers that up the stakes considerably in the offshore luxury performance boat arena, an indication that Continental styling trends may play a larger role in our choice of boats in the next few vears.

On the more utilitarian side, state-of-



Boats with a distinct European flair, like the Tiara 1800 Davanti, dot sport boat class.

the-art fishing machines between 27 and 30 feet, some of them trailerable and capable of handling two large outboards, are now able to reach the fishing grounds and canyons once reserved for much larger boats. The Boston Whaler 27 and Mako 28 are fast becoming established in this category, attracting those of us who love sportfishing but can't handle the budget of a semicustom, wide-beamed war wagon.

Bass fishing in general, and tournament bass fishing in particular, is growing so rapidly that fast-running bass boats seem to be the hot tickets on dealers' floors these days. Beginning with simple, though speedy, designs in the 18-foot range-like the boats featured in PM's January bass boats test (Battle Of The Bass Boats, page 79)these fishing platforms now sport dual consoles for extra comfort, or steering amidships as a fishing/skiing compromise. Several inexpensive, quite functional bass boats made of aluminum are gaining in popularity, notably from Bass Tracker.

Small boats, by design, have a lot going for them. They are usually much more affordable than larger boats, they are often ruggedly simple in construction and in purpose, and they pack a "fun quotient" you won't experience in larger boats. Lately, small-craft builders have recognized the need some of us have for basic boats that do many

things well.

The Hobie Power Skiff, introduced last year, is a high-quality, 15foot runabout powered by an outboard of up to 60 hp that will run like the wind all day, then easily tow home. In 1986, bright gelcoat colors, foam-core composite construction and enough reserve buoyancy to float four occupants if swamped are part of the Hobie formula for safe, wet fun. And the Hobie Power Skiff now converts to a serviceable though diminutive fishing platform with the addition of a Bimini canvas top and a large-size Coleman bench seat/ cooler.

Multimode boat

While boardsailing has been the rage for the last few years, a company called Fusion Boats has introduced a multimode craft that is part sailboard/daysailer/rowboat/canoe—all in Weighing in at 80 pounds, the Fusion's foam and fiberglass 11-foot hull comes complete with all the accessories for about \$1400.

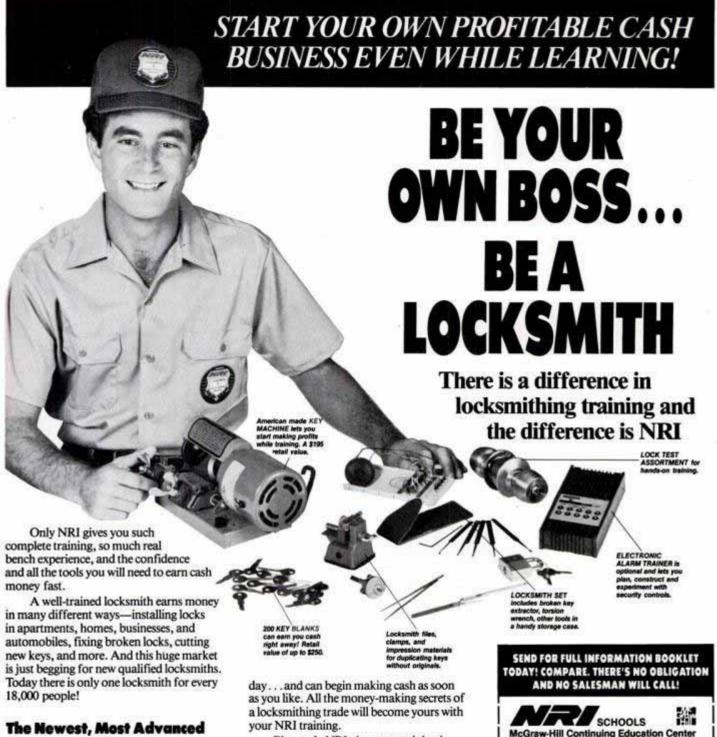
And just when you thought sailboards would forever replace monohulls like the Sunfish and Lasers on the

(Please turn to page 136)





Row It. Boardsail It. Paddle It. Or sail it with a conventional tiller and rudder. For \$1400, do it all with the multimode Fusion boat. A single 80-pound hull makes it happen.



Course of Its Kind

Thorough step-by-step lessons and professional locksmithing equipment such as the Taylor KD5 Key Machine give you hands-on experience in this exciting growth field. You'll start earning huge cash profits of 800% to 900% duplicating keys. And only NRI offers you an Electronic Security Alarm training system.

Compare! NRI offers the only course that is nationally approved by the accrediting commission of the National Home Study Council.

Compare! NRI's course training has been broken down into 10 learning modules, each with the right number of lessons to keep your training at an easy-to-follow pace. All the lessons, hands-on training, and experiments have been developed to ensure that you begin practicing from the very first

Plus, only NRI gives you training in both locksmithing and electronics security systems in one complete course.

Start Your Own Business, **Full or Part-Time, Even From Your Home**

Add to your income with part-time work with established locksmiths. Start your own part-time or retirement business in your own home. Make locksmithing and security a full-time career as a skilled technician in your own growing business. There is opportunity everywhere!

NRI's free 4-color booklet will show you how quickly you can train to be your own boss in a profitable locksmithing business and gain the respect you deserve as a trained technician like other professionals in your community.

AND NO SALESMAN	MILL CALL
SCHOOL SC	
3939 Wisconsin Avenue Washington, DC 20016 We'll give you tomorrow.	For Career courses approved under GI b
Locksmithing & Bestranic Base Security Tell Data Communications Sm. Robotics & Industrial Controls Color TV, Audio, and Video Aut	ALOG ONLY ic Electronics sphone Servicing all Engine Servicing stance Servicing omotive Servicing

Name (Please Print)	Age
Street	
Street	

1701-036



with cheaply built, small-wheeled mowers that just can't handle tough jobs.

Garden Way Mfg. Co., Dept. A208 102nd St. & Ninth Ave., Troy, N.Y. 12180

YES! Please send all the exciting facts about the TUFF-CUT Mower, including details on your 5 models and Special Savings Offer now in effect.

Address

Send for FREE Details Today

State

¢1986 Garden Way Inc.

#6 in a series

Zin

CEN PERFORMANCE

The K&N Filtercharger® More Than An Air Filter - Much, Much More

The K&N Filtercharger is the most powerful filter in the world.

Powerful? You bet. Our unique oiled gauze and-screen design smooths and straightens the air as it super cleans it,

allowing your engine to take a larger "gulp" of air

on each intake stroke. The result enhanced power and economy. In addition, the K&N Filtercharger is completely reusable. When dirty, just clean, re-oil and reinstall. It's the filter designed to last the life of your engine.

We're serious, K&N Filters are

used by professional racers from the desert of Baja to the straights of LeMans, for just one reason they really perform! And we've got

a filter to fit just about anything you drive -Chevy, Honda, Porsche, even motorcycles, RVs and Peterbilts. Get yours now, K&N performance

awaits! K&N products are available by direct mail Panel Filter shown fits Porsche 914-924, p/n 33-2003

Send \$29.90 plus \$5.00 shipping and handling to K&N Engineering Inc., PO. Box 1329, Riverside, CA 925O2. Complete catalog \$3.00

ALL DECKED OUT

(Continued from page 134)

roof racks of every other car you see, along comes Zuma from Alcort. Zuma is the monohulled sailboat designed to put the sport of sailing within the reach of virtually everyone, budget and ability notwithstanding. But the Zuma possesses the kind of multiple personality that will satisfy a variety of interestsracing, daysailing or knocking around the harbor.

Also on the small side, the American Power Boat Assn. recently sanctioned miniature race boats. The Mercub is a downsized Cougar design powered by a 25-hp Mercury outboard. The Mini Grand Prix is normally powered by either Johnson or Evinrude. These realistic versions of legitimate offshore racers offer an exhilarating though still tame top end of roughly 35 mph for the safety of youngsters 14 and over.

This small-scale racing is also another example of the incredible variety in boating this year. But there's a down side. So many choices make it tougher to choose the boat that's right for you. Assess your needs well. Whether you plan to run the inlet to your favorite fishing ground, tow your children water skiing or explore the nation's rivers, somewhere there's a boat for you. FM

BOAT

MANUFACTURERS/SOURCES

■ AMF Alcort Sailboats, South Leonard St., Waterbury, CT 06708; (203) 756-7091

■ American Assn., 17640 E. Nine Mile Rd., East Detroit, MI 48021; (313) 773-9700

■ Bass Pro Shops, Bass Tracker Dept., 1935 S. Campbell, Springfield, MO 65807; (417) 882-4000

■ Bayliner Marine, P.O. Box 24467, Seattle, WA 98124; (206) 435-5571

■ Boston Whaler 1149 Hingham St. Bockland

■ Boston Whaler, 1149 Hingham St., Rockland,
■ Boston Whaler, 1149 Hingham St., Rockland,
■ Chaparral Boats, Industrial Park Blvd., P.O.
Drawer 928, Nashville, GA 31639; (912) 686-7484
■ Chris-Craft, Box 9450, Bradenton, FL 33506;

Donzi Marine, 7000 Bradenton Rd., P.O. Box 987, Tallevest, FL 34270-0987; (813) 355-9355
 Fusion Boats, 660 LaSalle Place, Suite H, High-

land Park, IL 60035; (312) 433-8770
■ Hobie Power Skiff, Box 1008, Oceanside, CA 92054; (619) 758-9100

■ Hunter Marine, Rt. 441, Alachua, FL 32615; (904) 462-3077

Larson Boats, 702 W. Mississippi Dr., Little Falls, MN 56345; (612) 632-5481

Mako Marine, 4355 N.W. 128th St., Miami, FL 33054; (305) 685-6591

MerCub, Att. Mike Butler, Mercury Marine, 2521 Bowen St., Oshkosh, WI 54901; (414) 236-

Mini Grand Prix, c/o Evinrude Motors, 4143 N.
27th St., Milwaukee, WI 53216; (414) 447-5715
Sea Ray Boats, 2600 Sea Ray Blvd., Knoxville,

TN 37914; (615) 522-4181

■ Tiara, 725 E. 40th St., Holland, MI 49423; (616) 392-7163

Wellcraft Marine, 8151 Bradenton Rd., Sarasota, FL 33580; (813) 753-7811

OUTBOARD ENGINE

MANUFACTURERS

Evinrude Motors, Box 663, Milwaukee, WI 53201; (414) 447-5812

■ Johnson Outboards, 200 Sea-Horse Dr., Waukegan, IL 60085; (312) 689-5371
■ Mercury Outboards, 1939 Pioneer Rd., Fond du Lac, WI 54935; (414) 929-5000
■ Yamaha Motors, Dept. CR, Box 30595, Phoenix, AR 85046; (602) 992-5799



Market How-To Book Club

Discover the Troubleshooting and Repair Secrets of Skilled Auto Mechanics and Home Craftsmen!

- Repairing
- Restoring
- Customizing

- Refinishing
- Remodeling
- Renovating
- with the Book Club that Makes it Easy

Select 5 Books for Only 19 5



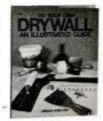








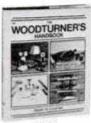




1244P List \$14.95 (paper)







1769 List \$21.95













1984 List \$14.95









1587P List \$13.95 (paper)









1982 List \$19.95



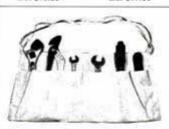






1530P List \$15.95 (paper)





FREE Shop Apron!

7 very good reasons to join the How-To Book Club

. Big Savings. Save 20% to 75% on books sure to increase your how-to know-how

No-Risk Guarantee. All books returnable within 10 days

without obligation · Club News Bulletins. All about current selections-

mains, alternates, extras-plus bonus offers. Comes 13 times a year with hundreds of up-to-the-minute titles to pick from Automatic Order. Do nothing, and the Main selection will be shipped automatically! But . . . if you want an Alternate selection—or no books at all—we'll follow the instructions you give on the reply form provided with every News

Bulletin Bonus Books. Immediately get Dividend Certificates with every book purchased and qualify for big discounts of 60% to 80%

 Extra Bonuses. Take advantage of added-value promotions, plus special discounts

 Exceptional Quality. All books are first-rate publisher's editions selected by our Editorial Board and filled with useful up-to-the-minute information

HOW-TO BOOK CLUB

P.O. Box 8, Blue Ridge Summit, PA 17214

Please accept my membership in the How-To Book Club and send the 5 volumes circled below, plus my FREE shop apron billing me only \$2.95 plus shipping and handling charges. If not satisfied, I may return the books within ten days without obligation and have my membership canceled. I agree to purchase 4 or more books at regular Club prices (plus shipping/handling) during the next 12 months, and may resign any time thereafter.

1046P 1122 1128 1244P 1321 1354 1415 1530P 1553 1569 1574P 1587P 1638 1654 1680 1687 1744 1769 1784 1792 1818 1838 1909 1971 1982 1984 1998 2073

Name			
Address			
City			
State	Zip	Phone	



Geodesic Home Kits.

Beautiful, Efficient, Affordable.

Monterey Domes sells home kits for less than many new home down payments. Completely affordable...remarkably beautiful...our homes are designed for a lifetime of savings.

The most energy efficient homes on earth...up to 50% more than everyday homes. In addition, construction costs are cut dramatically using our patented building system...(our 1813 sq. ft. house parkage is just \$15.660°).

house package is just \$15.660?)

Discover Monterey Domes living with our 100 page Color Catalog and Plans Book. ORDER TODAY for just \$6.00. Unconditionally Guaranteed or your Money Back!

- Please rush my 100 page copy of Monterey Domes Catalog and Plans Book. Enclosed is \$6.00.
- Also please send me the Monterey Domes Basic Dome Assembly Manual for an additional \$5.00.
 Order by Credit Card. Call 800-634-2255
 (In Calif. 800-847-4663)

Address _____ City/State/Zip



MONTEREY DOMES Dept. AQ-3 1760 Chicago Ave. Riverside, Calif. 92517

BIG PROFITS in Steel Frame Homes

OWN YOUR OWN SUCCESSFUL TRI-STEEL DISTRIBUTORSHIP!

We make it easy with:

- Low capital investment
- No inventory requirement
- Distributor training & support
- Substantial discounts
- Single & multi-family designs
- Low maintenance
- Tremendous energy efficiency (R-30)
- Unique patented designs



Select territories now available with a refundable \$4,950 investment.

For more information call [800] 433-5555 or in Texas [800] 772-5909.



1400 Crescent • Denton, TX

© 1986 All Rights Reserved

ROCK 'N' ROLL

(Continued from page 101)

speakers to a single crowd. Each of the 160 speaker cabinets contains two 18-inch, low-frequency drivers; four 10-inch, lower/midrange assemblies, and two each of upper/midrange and high-frequency compression drivers. An additional 40 similar cabinets are hung above the stage facing rearward to accommodate the audience sitting around the stage. There was a similar setup at the East Coast version of last summer's rock fundraiser, Live Aid.

The loudspeaker colossi are driven by 96 channels of high-power amplification totaling about 380,000 watts. That's more than double the traditional outdoor rock concert rating. But last summer's Springsteen tour drew unusual critical acclaim for crispness and distortion-free performances.

Pure stereo sound

Last summer's tour produced a second pioneering effort in sound reproduction. Jackson realized that the usual attempts at stereo sound in an open setting fail for the people sitting at the concert. They only work faithfully for the recording studio. For the Springsteen tour, Jackson adopted a scheme whereby mixes created for nominal left and right would alternately drive the 10 speaker stacks in each tower. Thus, there would be a slight delay in the sound coming from speaker to speaker. The result was the creation of 10 individual stereo "zones" splayed out across the entire audience. No matter where you sat, Springsteen and his E-Street Band came to you in pure stereo.

Jackson, the sound man, played the role of mixer for the Springsteen tour, sitting far from the stage behind a console and mixing sounds and automated lighting cues. Of course, lighting is not The Boss's trademark.

But the rest of the rock world regards lighting and special effects as a major part of the show. The Michael Jackson Victory Tour of 1984 carried about the same amount of sound equipment as Springsteen, but almost twice as many lights and lighting controls. Michael Jackson's spectacular finishes. which often included fireworks and purposely overpowered and blown-out lights on stage, were handled by his own traveling crew. But the Jackson family became especially concerned about the safety of the group's stage antics following a mishap on the sound stage during the filming of a Pepsi commercial. Jackson's hair caught fire and he was out of commission for several weeks. Thus, when he returned to the road, the Jackson family had added a consulting firm to the regular tourgroup lighting brigade.

There are more than a score of lighting and effects companies devoted to the rock business, most of them local businesses set up to handle touring groups smaller than Jackson and Springsteen. But the biggest concert technology contractor goes on the road with the big stars. Showco handles sound, lighting and special effects for Genesis, Prince, Kiss and others. The company has staged the stunts of the Rolling Stones and The Who.

"We're in the sound business primarily, but we also act as general contractors," says John Maxson, Showco's chairman. His partner, Dave Alley, runs Varilite, which specializes in hightech lighting for hard-rock concerts. Varilite uses a bank of computers—the number varying with the musical group on stage-to run a dazzling lighting display. Its trademark is a "small-beam signal" light system which uses highintensity, narrow-beam lights to create visual explosions literally going in time with the music. The Varilite system will change the color mix of the lights pinpoint by pinpoint with each beat coming from the sound system.

"They did some work for us in Dallas and the light mix gave some of the band members a chill," said Billy Montgommery who traveled last summer with Dire Straits. "The Varilite people also gave Genesis a big dramatic stage presence, completely different from Dire Straits."

Dire Straits relied more on traditional lighting values, including the now classical use of strobes. Genesis went to a more visually risky display using over 12,000 pencil-thin light sources to produce a shower of color.

Fantasy effects

Another major lighting and effects contractor is Source Point Design, which has worked on Genesis, Madonna and other groups whose trademark is lighting.

"For Madonna we used 380 Parkans (Parabolic Aluminized Reflectors of the type used around an auto's sealed beam)," says Robert Roth of Source Point. The company also used aircraft landing lights and projection lamps in Madonna concerts last year. Source Point's operation is also highly computerized. A rock show can easily have over 1200 lighting cues that have to be programmed. A recent Police concert used six personal computers to run the sound and lighting systems and join the systems together.

When rock was young the bands traveled with groupies, adoring female fans who fulfilled about every fantasy. Today's rock band travels with roadies who deal with the hard realities in hard rock. The fantasy all goes to the audience, thanks to rock technology.

If you've got the drive to start your own business, NRI's got the training to get you there

Two Top-Paying Opportunity Fields Wide Open for Trained Specialists

Everybody wants to get ahead, but most people don't know where to start. Now, NRI not only shows you the opportunities for good money, advancement, even a business of your own, but gives you the skills you need to get there. No night school, no need to quit your job until you're ready to make your move. NRI trains you right at home in your spare time.

No Experience Needed

NRI starts you with the basics, then builds your knowledge and skill a step at a time, all the while adding practical know-how through hands-on training. You even get tools you'll need in the business. Over a million and a half students have trained the NRI way since 1914.

Learn Building Construction and Remodeling

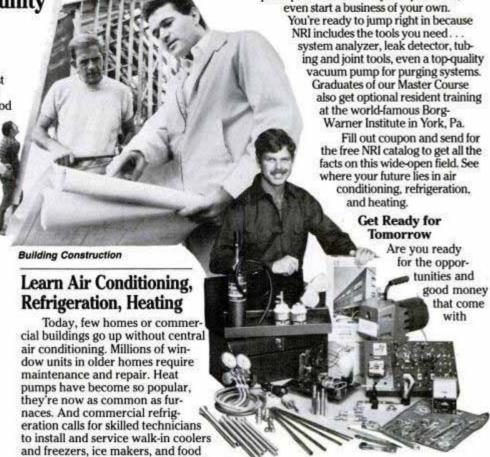
Get the know-how you need to become a foreman, supervisor, or contractor yourself with NRI's Building Construction course. Housing starts are up, and that means big profits waiting for successful builders. Over 18 million families will be buying new homes in the next 10 years alone.

Includes Plans for an Energy-Efficient Home

Using actual plans for a highly marketable, energy-efficient home, you learn how to plan and supervise its entire construction. You actually frame the house in miniature and construct a framing section in full scale. You're even given the opportunity to attend an industry-acclaimed owner/builder seminar led by expert builders.

Over 100 Hands-On Training Projects

NRI's easy-to-digest lessons and projects teach you the skills and professional secrets of carpentry, masonry, roofing, even wiring and plumbing. You'll end up with the know-how to deal with all the building trades, the skill to handle part or all of the job yourself. You'll be ready to move up in the lucrative building industry or simply move up to the home of your dreams—and save 10% to 50% by building it yourself. Check into building construction as your opportunity field. Fill out and mail the coupon today.



Training Includes Professional Tools

cases. It all adds up to tremendous oppor-

tunity for the trained air conditioning,

refrigeration, and heating technician.

NRI trains you for this lucrative field, gets you ready to land a good-paying job, the hands-on projects you do, the professional tools you train with, and the future that awaits you. Act today.

Air Conditioning, Heating, & Refrigeration

catalog. See the quality training you get,

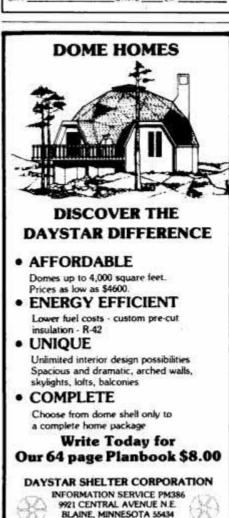
expert skills? Then send for NRI's free

pick up extra income in your spare time,

SEND COUPON TODAY FOR FREE NRI CATALOG!

CHECK ONE FREE CATALOG ONLY Building Construction Air Conditioning, Heating, Refrigeration, & Solar Technology Telephone Servicing Locksmithing & Electronic Security Small Engine Servicing	Industrial Electronics Data Communications Computer Electronics with Microcomputers Robotics & Industrial Controls Color TV, Audio, and Video System Servicing	Electronic Design Technology Digital Electronics Communications Electronics Basic Electronics Appliance Servicing Automotive Servicing
Name (Please print)		Age





612/780-2276

BARRELS OF MONEY

(Continued from page 108)

\$7500. The Model 21 Custom Grade can be ordered with greater engraving—at greater cost. And a full-blown Grand American costs \$21,000 in 12 and 20 ga. and can reach as high as \$37,000 for 28 and .410 ga. Even though its history can be measured in terms of a mere half century, quality born of manufacturing consistency is an important feature of this exquisite sporting arm.

The same philosophy holds true on the opposite side of the Atlantic, where Sir Richard Beaumont oversees the operation of James Purdey & Sons. Except in this case, the Purdey tradition stretches back to the year 1814.

Purdey sells only one grade of its hammerless double-barrel shotguns, which can cost as much as \$34,000 with optional extras. The gun hasn't changed since it was originally designed in 1884, and some Purdey guns over a hundred years old are still in use. Nor has the company felt compelled to alter its standard but nonetheless distinctive sidelock engraving pattern, called "Fine Rose and Scroll," although custom engraving to owner specifications is available. The highly polished demonstration action and fore-end components in the Purdey showroomused to convey the contemporary workings of the Purdey gun-was pieced together just after World War I using hand-crafted pins, springs, bolts and interceptor sears.

Memorabilia

Beaumont takes a special delight in showing off Purdey memorabilia in The Long Room, where Purdey directors meet. This room was commandeered by Gen. Dwight Eisenhower and his chief of staff, Walter Bedell-Smith, for planning the defeat of Nazi Germany. The Purdey Long Room is unchanged from the Victorian era and contains portraits of Purdey fathers and sons, shotguns and double rifles. In addition, photos of Purdey customers dot the oak-paneled walls. Beaumont boasts several royal customers, including King Alfonso XIII of Spain ("a keen shot"), Kaiser Wilhelm and Czar Nicholas II. More recent members of the Russian elite, namely Nikita Khrushchev and Leonid Brezhnev, were faithful Purdey customers. So were Charles Darwin, Bing Crosby and General Franco.

Illustrious customers also occupy the ledger books at Holland & Holland company, 33 Bruton Street. Members of the British Royal family past and present are Holland & Holland devotees, as were such colorful 19th century personalities as the Maharajah of Cooch Behar and the Nizam of Hyderabad.

Holland's jovial marketing director,

Jeremy Clowes, estimates that 750 man-hours are invested in an H&H double gun; 1100 in an H&H double rifle. A tour of the Holland & Holland factory outside London, managed by Sir Geoffrey Brooke and Roger Wilkin, tells why. The chrome-moly barrels are hand-forged. precisely tapered. weighed and meticulously balanced. The action is cut from hand-forged steel and pieced together with incredible care. The walnut stock and forearm is carved from a blank imported either from the Dordogne region of France or from Turkey.

"The blank itself costs about 300 pounds," says Wilkins. "It's selected to exacting standards and each piece must meet specific grain criteria." Longitudinal grain, he explains, is best for the high-stress grip area; a more gnarly pattern, or "figure," is more suitable near the butt. The best figure is located in the root of the walnut tree, so a Holland & Holland shotgun actually begins its long life beneath the surface of the earth.

True perfection

The intricate components in a Holland & Holland sidelock action are fitted neatly into the head of the stock through a process of soot-marking and hand carving. Perfection in the woodto-metal fit, the hallmark of quality gunmaking, is achieved through a laborious process of eliminating wood—bit by bit.

When barrels, action and wood fit perfectly, the unfinished firearm is sent to the London Proof House, where high-powered proof rounds are fired through the barrels. If the gun passes this test, it receives a special proof mark and is taken back to the factory for checkering, finishing and polishing. The side plates and action are disassembled for engraving and the Holland & Holland shotgun begins to take its ultimate and altogether pleasing shape.

But enough of all this fancy stuff. What are these guns like to take into the field? The Holland & Holland shooting grounds are located between Ruislip and Northwood on London's western perimeter. The company maintains a splended hilltop shooting facility, where you can learn to shoot—and shoot well—in the true English style.

Shooting clay pigeons in America is more an object unto itself. In England, the exercise of shooting clay birds is purely a tune-up for shooting birds on the wing or as they're driven across the moor by beaters. Consequently, the Holland & Holland shooting school strives to simulate hunting conditions as closely as possible. Attendants launch clay birds from high towers toward the shooter—as opposed to away from or across the shooter in

American trap and skeet. The closer you are to the tower, and the higher the tower is, the faster the birds fly and the more you have to lead the target.

Right on target

English shooters also stand more squarely than their American cousins, as observed by Holland's expert and congenial instructor, Bob Kerr (ask for him when you go). That way, an English shooter can more easily twist his upper body to follow through on a bird flushing right or left. With a more square-on stance, it's also possible to shoot over your shoulder high and to the left at a rapidly retreating birdand nail it! Variable birds test one's capacity for bagging doubles.

All of this activity focuses on the Holland & Holland try gun. One is instructed to stand square, grasp the extreme leading edge of the forearm in the palm of the hand (a rounded beavertail forearm makes this feel more natural) and mount the gun to the shoulder. An adjustable butt fine-tunes the distance from trigger to shoulder (or "length of pull," in the vernacular); an elevating cheek piece further establishes the 3-dimensional shape the stock will ultimately assume. The angle of the stock from side-to-side, is referred to as either "cast off" or "cast in," and it is a function of which eye is dominant. The angle is adjusted by set screws in the grip area.

A few experimental shots with this fitting gun and you're suddenly cracking away at the birds with gleeful abandon. Watch those high fast ones, though. Crank in more lead in this subtle psychological game and you're ready for the grouse moor.

Indeed, as any aficionado will tell you, firearms from Purdey, Holland & Holland and Winchester are pretty to look at. But their real value-as high as it certainly is-only becomes evident when you take one in your hands and actually shoot it. Suddenly, the care, attention-and yes, all that moneydistills to a split-second of unsurpassed delight.

SHOTGUN MANUFACTURERS

■ Holland & Holland, 33 Bruton St., London, W1X 8JS, England
■ James Purdey & Sons Ltd., 57-58 S. Audley St., London, W1Y 6ED, England
■ Winchester Model 21, U.S. Repeating Arms Co., 275 Winchester Ave., P.O. Box 30-300, New Hares. CT. 06511. Haven, CT 06511

Haven, CT 06511

Remington 1100, Remington Arms Co., 1007
Market St., Wilmington, DE 19898

Mossberg Model 500, O.F. Mossberg & Sons Inc., 7 Grasso Ave., North Haven, CT 06473

Ruger Red Label, Sturm, Ruger & Co., South-

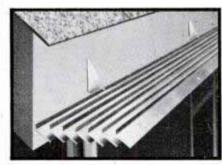
port, CT 06490 Savage-Stevens Model 311, Savage Industries Inc., Springdale Rd., Westfield, MA 01085

Special thanks to Griffin & Howe, 589 Broadway, New York, NY 10012, which provided Purdey and Holland & Holland shotguns for lead photography; Hansen & Co., Southport, CT, 06490, which pro-vided 4-gun set shown on page 108; John Jovino Co., 5 Center Market Place, New York, NY 10013.

NOW-END GUTTER PROBLEMS FOREVER WITH NEW

RMAR WEATHER-

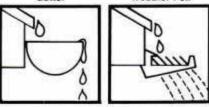
THE AMAZING GUTTER ALTERNATIVE



- Can't clog
- Stays clean automatically
- Eliminates downspouts and dry wells
- Works to prevent ice damage
- Helps stop water leaks
- Installs easily in 3 hours (average home).

Ordinary Gutter

THERMAR Weather-Foil



STOPS TRENCHING. EROSION.

Air Foil designed THERMAR WEATHER-FOIL breaks up water sheet which usually runs from roof edge. Weather-Foil DISPERSES WATER—produces mil-lions of tiny droplets which fall harmlessly to earth—pleasantly as a light spring rain. NO DOWN-SPOUTS NEEDED! Eliminates TRENCHING, ERO-SION. Helps prevent basement water leakage too.



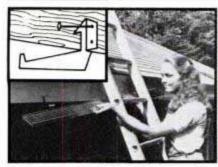
AVOIDS SNOW & WATER DAMAGE.

In winter snow can freeze on roof edge making gutters ineffective. Heat "leaking" from inside home and through roof causes some melting where ice and roof meet. Water trapped inside this ice blanket can then flow under shingles causing costly damage. WEATHER-FOIL'S "WEB" design helps prevent ice



NO CLOGGING, NO CLEANING.

Gutter maintenance can be a constant problem. Gutters tend to fill with leaves, twigs, and debris. WEATHER-FOIL design avoids these problems. If cleaning should ever be necessary just use ordinary garden hose—right from ground level . . . Amazing-because it's so very simple!



INSTALLS IN JUST THREE HOURS.

First Really New Advance In Gutter Design In 100 Years. Units snap in place using simple mounting brackets. Installation for an "average" home can be made in three hours or less-with just a hammer and screwdriver. No experience necessary. WEATHER-FOIL is rustproof, corrosion proofshould last the life of your home. AND THE COST IS MODEST TOO-usually less than the cost of a traditional gutter system with its downspouts and leaders. WEATHER-FOIL IS VIRTUALLY INVISIBLE ONCE INSTALLED.

If your gutter system is more than ten years old, you should investigate THE THERMAR WEATHER-FOIL NOW!

Protected by US patents - Made in USA

SEND COUPON TODAY FOR SIMPLIFIED LAYOUT AND ORDERING INFORMATION. DETAILS FREE

ı	-		-				-
ı		м	E	ж	м	Λ	ĸ
ı		•		ш.	v	n	
			~		•	~	~
i		-		-		-	_

JOHNSON POWER TECH THERMAR CENTER

Canadian Residents send to 56 Bramsteele Ad., Suite 8, Brampton, Ontano L6W3N4

TRUMBULL, CT 06611-0398

Call Toll Free 1-800-854-8679

Connecticut Residents Call 452-0055

YES, please rush-FREE-all details of the new THERMAR WEATHER-FOIL system. designed to end old fashioned gutter problems forever! I understand that I am under

The designation inflatorer.			
NAME			
100	please print		
ADDRESS	=3_201		
NAMES OF THE PARTY	3.577M66	245	



"Success is endurance for one moment more."

How you can achieve personal success with a remarkable new opportunity

Your personal success depends upon how you use four factors.

- An opportunity which offers you a high goal
- 2. Your insistent desire to achieve that goal
- 3. Your confident expectation of success
- 4. Your persistent will to reach the goal

We will send you **free** details of a remarkable new opportunity for success, if you phone 1-800-824-5092.

Catalytic Converters Reduce Exhaust Emissions

More than 80 million vehicles in the USA have catalytic converters in the exhaust system. Each year over 10 million new vehicles with converters are sold. Catalytic converters contain small amounts of precious metals. Texasgulf Minerals & Metals operates a plant in Alabama to recover precious metals from converters.

Catalytic Converters Are Being Thrown Away

Every year over 7 million vehicles are dismantied and scrapped. Thousands of faulty converters are replaced in muffler shops and auto repair shops. Only 1.5 million converters are collected for recycling. There are millions of converters thrown away or shredded with junked vehicles. Collecting these converters is your opportunity.

You Can Make Money Collecting Converters

Set your goal now. You can earn \$1,000 per week. You can start collecting converters today by visiting all the muffler shops, auto

repair shops, dealer workshops and auto wrecker yards in your area. You should buy scrap converters for \$3 - \$5 each. When you have collected 100 to 500 converters, call a Major Collector and sell them for cash with pickup at your door. You should make a profit of \$1.50-\$2.00 for each converter when you sell to a Major Collector.

We send you a list of Major Collectors

Phone 1-800-824-5092 and we will send you more details about converters and a list of names and phone numbers of Major Collectors who buy and pick up converters nationwide. The Major Collectors remove the catalyst from the converters and sell it to us in 15 ton lots. Major Collectors don't have time to pick up 10 to 20 converters at individual muffler shops and wrecker yards. This is your opportunity.

What do I need to Get Started?

Set your goal at 500 converters a week — \$1,000 per week profit. Use Yellow Pages to locate possible suppliers. It will take three or four visits to possible suppliers before they believe you will collect converters regularly. Start visiting in your spare time, after work, at weekends or on days off. Your persistence will pay off and you will develop a strong collection route. You will find the Major Collectors want to help you grow because it helps them to grow too.

You will need some capital, but it will grow as you grow. And you will need a vehicle, preferably a pickup. Then it comes back to the four factors of personal success mentioned above...and you.

Texasgulf Minerals & Metals Inc.

1610 Frank Akers Road • Anniston, Alabama 36201 (205) 831-8300 1-800-824-5092

STRIKING PAY DIRT

(Continued from page 114)

able cutting angle. It costs \$36.45 from Gardener's Eden, Box 7307, San Francisco, CA 94120.

- 17. Thistle puller—Here's an easy way to clear your yard and garden of thistles, brambles and other thorny plants. Use this 39-in.-long hardwood tool like a pair of giant pliers to yank out problem plants. Sharp brass teeth ensure a nonslip grip. The thistle puller costs \$39.50 postpaid from Green River Tools, Box 1919, 5 Cotton Mill Hill, Brattleboro, VT V05301.
- 18. Hand duster—Dispense powdered pesticides to your garden plants neatly and easily with this hand duster. Fill the canister with up to I pound of pesticide and then pump the handle to apply uniform clouds of dust. It comes with a 24-in.-long extension tube for dusting small plants without stooping down. It's available for about \$11.69. Contact Gilmour Manufacturing, Box 838, Somerset, PA 15501.
- 19. Double-digger—This unique tool loosens the hardest soil easily—without stooping over. Use a double-digger (\$71.50) to prepare fall bulb beds, harvest root crops and to cultivate in the spring. Push the tool's six copper-plated tines into the soil with your foot. Then, pull back on the 47-in,-long ash handles to loosen the earth. The tines enrich the soil by leaving traces of copper, its retailer claims. Specify 8½-or 10-in,-long tines. Contact Green River Tools, Box 1919, 5 Cotton Mill Hill, Brattleboro, VT 05301.
- 20. Bulb planter—Use this chromeplated, no-stoop planter (\$13.50) when planting bulbs, seedlings and small shrubs. Force the 2¼-in.-dia, cylindrical cutter into the soil by stepping on the cutter's upper rim. Then, twist the handle and lift out a core of earth. The planter will remove an 11½-in.-deep core, according to the maker. For details, contact Ames, Box 1774, Parkersburg, WV 26101.
- 21. Shower arm—Use this garden hose attachment to water your plants with a soft spray that won't harm delicate plants or disturb the soil. The 33-in.-long shower arm makes it easy to water hanging baskets and out-of-the-way plants. It costs about \$17. For details, contact True Temper, Box 3500, Shiremanstown, PA 17011.
- 22. Japanese hand sickle—Called a kama, this supersharp, heavyweight sickle is ideal for chopping stalks and cutting tall grass. The tool features a 7-in.-long, curved blade that is handforged laminated steel. The 13-ounce blade is attached to a 14-in.-long hardwood handle. It's \$15.50 postpaid from Smith and Hawken, 25 Corte Madera, Mill Valley, CA 94941.

TV AT SPEED

(Continued from page 98)

turn helped capture the missing sense of speed. But because the cars are merely unidentifiable blurs as they come by, the director could only use the speed shot for a second or two at a time, to make transitions from one long-lens shot to another.

Producers also tried packing bulky camera and videotape machines into race cars that were large enough to hold them, or mounting small movie cameras to the roll bars of open cockpit racers during practice in order to capture some sense of the perspective the driver has of the road. The problem was that this viewpoint was suitable only for prerace use, to demonstrate what a lap around the circuit looked like. It helped, but it didn't address what CBS auto racing commentator Ken Squier identified as the key problem in televising motorsports.

"Getting live pictures was the issue," Squier noted. "How to get across to the people at home the human issue of races, so they could really understand what was going on with the racer.'

Squier was on assignment for CBS in Australia, covering the 1980 Mr. Universe contest. Coinciding with his visit Down Under was the running of Australia's answer to the Indy 500, the James Hardie 1000 Touring Car Race. The event was televised live on Australia's TV 7, and what Squier saw knocked his socks off.

There were live shots from one of the competing cars being integrated into the coverage of the event. And even more remarkable, the camera inside the car moved! It panned from side to side, zoomed in and out, and changed its focus. Viewers might have been forgiven for assuming that there was a cameraman riding shotgun in the car, but the camera was being run by remote control.

"You could immediately sense that this was exactly what was needed," Squier recalled. He ordered tapes of the Hardie Race shipped back to New York, and began campaigning within CBS for the use of the remarkable camera system he had seen.

Ride to victory

Three years passed. Then, in 1983. the CBS audience for the Daytona 500 rode to victory with Cale Yarborough, listening to him talk with Squier on a radio link during caution periods and watching from inside the cockpit as Yarborough acknowledged the checkered flag with his arm thrust heavenward. The face of auto racing coverage in America had changed.

"It finally moved motorsport into a live fantasy game," Squier said. "Be-

fore, it used to look easy. A guy sitting at home would say, 'I could do that. The in-car camera put racing on a level where you could see all the vibration in the car and all the other things that the driver has to deal with. Now the guy in his living room realizes he'd rather let the driver do the driving, and partake of an exciting, impossible fantasy.'

The camera system used to make those pictures cost CBS a small fortune. Since that day, in-car cameras have become more common, and a number of groups have setups available for a producer to use. But it still costs more than \$20,000 each to add in-car coverage to the broadcast of a race.

Technical wizardry

The technical aspects of the telemetry-controlled system used by ESPN and Turner Broadcasting's WTBS are fascinating. Developed by the Vision Group's late founder, Steve Fried, and called Inpacar, the system starts with a normal production JVC home video camera. The camera is taken apart and "blueprinted," adding some special shielding and beefing up critical components to make certain there are no problems that might interfere with the camera's reliable operation in a hostile environment, namely the hot, noisy, vibrating interior of a race car.

A pair of the cameras is mounted in a framework on the passenger's side of a NASCAR stock car. One is mounted on the floor, where it looks up at the driver's face, while the other is located in a motorized mount capable of swinging up and down as well as left and right. The zoom and focusing motors, along with the video and audio output, are wired into an external harness that leads to a transmitter in the back seat area of the vehicle. The whole package weighs less than 20 pounds.

A small cylindrical antenna on the car trunk transmits the signal to a repeater mounted on a helicopter hovering over the racetrack. The repeater, a small, lightweight microwave relay that consists of a receiver, amplifier and transmitter hooked together, sends a strengthened signal back to a receiver on the ground. The signal goes from there into the race control TV truck. where it provides the picture and audio elements that the director can call up to use in the live broadcast.

Controlling the camera

The camera is controlled from a console in the Vision Group's trailer. Next to the transmitter in the car is a receiver, which picks up the commands from the remote-control operator. The camera operator works at a small console equipped with a pair of computer-game joy sticks. The stick on the left controls

(Please turn to page 152)

Choose from 29 Career Opportunities

Get your Specialized Associate Degree in Business or Technology or a Career Diploma at Home in Spare Time

Now without attending school or college, without any previous experience, you can train for a money-making career...even get a Degree or Career Diploma. Send for free facts about the exciting career program that interests you most. You will receive color brochure and program that interests you most. You will re-ceive color brochure and



information on employment opportunities in the field you choose. Mail coupon today and see how easy it is to train at home for a great new career or advancement on and see now easy it is to dain at home on a great new career or advancement on your present job.Send For Free Facts! 1082F

Total Table 1

Please send me free facts, colo on how I can study at home for t stand I am under no obligation a CHECK ONE	he career I have chosen. I under and no salesman will visit.
ASSOCIATE IN SPECIALIZED BUSINESS DEGREE PROGRAMS TO Business Management with option in Finance Business Management with option in Marketing	ASSOCIATE IN SPECIALIZED ICHMOLOGY DEGREE PROGRAMS Crivil Engineering Tech Mechanical Engineering Technology Electrical Engineering Technology Electroics Technology
High School Auto Mechanics Surveying & Mapping Dirating Air Conditioning & Retrigeration Wildfide-Forestry Conservation General Law Enforcement Diesel Mechanics Bectinoan Small Business Mgmt.	MA PROGRAMS Gun Repair Small Engine Repair Electronics Microcomputer Repair Bookkeeping Art Motorcycle Repair Catering Gourmet Cooking Computer Programming Fitness & Nutrition TV/VCR Repair

New State-Of-The-Art Vapor Carb

So Efficient You May Do Much Better! We Guerante

"If You Don't Double Mileage, We'll Send You A Double Refund!"

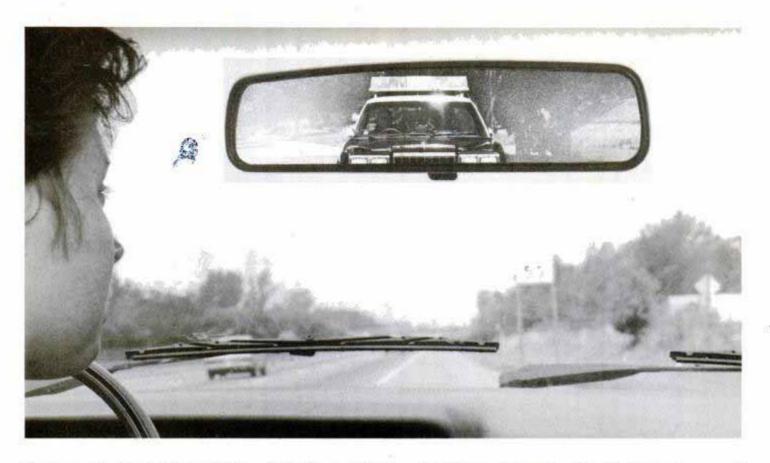
Model shown in for 4 cyl engines. V6s, V8s, need slightly-larger unit.

Share in the adventurel Learn how to greatly increase MPG of your car, truck, RM CRC's brand new "Super Carb" is compact, fits under hood. Simple proven-design boosts Impro 70 Applied For milieage sky-high! Dual system, retains emmission controls. Run on main carb or vapor, at filip of switch! VAPOR VOLUME LET'S SMALL CARB DO BIG CARB JOB Fuel, under low pressure enters small metering carb. VAPOR VOLUME LETS SMALL CARE DO BIG CARE JOB Fuel, under low pressure, enters small metering carb, mixes with pre-warmed air, passes through exhaustheated tube/baffle maze. Vapor expands, is drawn into engine under main carb. Optional steam injection further increases mileage, powerf Build your own from detailed drawings, specs; or have if built, any metal shop. New easy-to-understand Manual guides you every step. Lists parts, sources. Most are stock, low-cost.

JOIN CRC'S ROAD TEST TEAM! WE NEED YOUR HELP To gain pre-production data Send for FREE Road Test
Application, more IMPRO 70 and double-refund, details.

Carb Research Center Dept PM-3
PO Box 1 Foyli, OK 74031
21986, CRC





TOMER HOURDINGENVIE

A Glance in the Mirror and Your Heart Rate Jumps .

Your fears have become a reality: a traffic ticket, an expensive fine and points on your license. If you think it won't happen to you, think again. At least 20% of the radar generated tickets are issued in error.

Upping the Odds

Your risk of being ticketed is increasing. There are more radars in use today than ever before! To make matters worse, many states that are in fear of losing federal highway funding have begun to crack down on motorists—even those driving one mile over the speed limit.

Line of Defense

The first radar detector on the market, Fuzzbuster®, has added a new weapon to the driver's defense arsenal; the FUZZBUSTER® 4000. Being first means years of unmatched experience resulting in a radar detector of

unmatched performance. The 4000 provides you with everything that you expect from a leader; performance, styling, features and innovation. In addition to a seven LED warning panel volume control and on/off switch, the 4000 features a dark mode for inconspicuous nighttime driving.

False alarms are virtually eliminated by two advanced filtering systems. The city mode screens out microwave signals such as garage door openers and security systems prevalent in urban areas. The I.R.I.S. (Interfering Radar Impedance System) filters out frequencies emitted from poor-quality radar detectors and other radar sources on the road today.

The 4000, the smallest Fuzzbuster® ever, is equipped with a detachable power cord for easy removal and comes complete with a bracket for visor or dash mounting.

Remember, a radar detector is a safety device . . . awareness equates to good driving behavior.



FUZZBUSTER® 4000 Superheterodyne Radar Detector \$19995

Call toll free 1-800-222-7165

or

Please enclose check, money order or the card number and the expiration date for your Visa or MasterCard.

FUZZBUSTER® 4000

P.O. Box 596 Vandalia, OH 45377





FOREIGN AIR RAID

(Continued from page 88)

cooperative effort, has sold 96 HH-65A helicopters to the Coast Guard.

- British Aerospace (BAe) holds a firm contract for 300 T-45A Hawk trainers for the Navy, and for 328 AV-8B Harriers for the Marines. Several U.S. shorthaul or commuter airlines have a total of 39 BAe 146 airliners in this country, and corporate customers in North America—predominantly in the United States—own and operate about 400 BAe 800 business jets.
- Brazil's Embraer, powerful competitor for the commuter airline business, has sold more than 100 of its 19-passenger EMB-110 Bandeirante turboprop transports to U.S. commuter lines. Its EMB-120 Brasilia, a 30-seat pressurized turboprop transport, was certificated by the U.S. Federal Aviation

Administration in mid-1985. Currently, Embraer holds firm orders for 35 Brasilias from U.S. carriers.

- France's Avions Marcel Dassault, developers of the Falcon series of business jets, has sold more than 500 units, in four basically different models, to U.S. customers.
- Israel Aircraft Industries has leased a dozen of its operational Kfir C2 fighters, refurbished and redesigned as F-21A, to the Navy for use as aggressor aircraft. It has delivered more than 300 of its Westwind business jets to U.S. operators.
- Short Brothers of Belfast sold 18 C-23 Sherpa light transports to the U.S. Air Force for European support.
- Fokker of Holland sold more than 50 F.28 transports to U.S. carriers. By the end of 1986, it is expected to deliver the fuel-efficient new F.100s. Commuter airlines will use them the most.

 Rolls-Royce of England is a major supplier of engines for U.S.-built Gulfstream jets and Boeing transports.

Beyond that, all Boeing 757 and 767 advanced-technology transports use French TRT radio altimeters. All General Dynamics F-16C and D models will use British Marconi head-up displays. The Navy is buying 200 Norwegian Penguin antishipping missiles for use aboard Seahawk antisubmarine-warfare helicopters. The French Ariane space launcher is lofting U.S. commercial satellite payloads into orbit.

What it boils down to is a continuing series of market changes as the industry becomes more and more international in character. Customers recognize that exceptional equipment, aircraft or engines can come from many countries and sources, and buying the best equipment yields the best results, economically.

Why The F-20 Isn't Selling

wight Eisenhower once observed that the Pentagon shouldn't buy weapons or sell weapons, but it should know what to do with them. Unfortunately, the Pentagon has never heeded the former Commander-in-Chief's wisdom. Typical was the call made in the mid-1970s for American aircraft manufacturers to dig into their own pockets and develop a jet fighter that allied nations could buy, and at a price any nation could afford. With brand new jet fighters costing upwards of \$70 million each, the Delense Department asked American aerospace companies to come up with a cost-outter.

It sounded like a good idea to the Northrop Corp., makers of the B-1 bomber. And so they went to the proverbial shelf, took design features from this plane and that, and eventually came up with the F-20 Tigershark, a jet called "magnificent" by test pilot Chuck Yaeger. The Tigershark could fly as fast as Mach 2, as high as 55,000 feet and under a force nine times Earth's gravity. The price tag: \$20 million, fully loaded with avionics and weapons systems. When the first F-20s went up for sale in 1981, military analysts were predicting widespread sales to our allies everywhere.

To date, Northrop hasn't been able to sell a single Tigershark. Not that allied countries wouldn't be willing to buy the jets. But it seems the Pentagon, not satisfied with breaking the Eisenhower rule about buying weapons, has gone the next step and broken the rule about selling them.

While Northrop was developing the Tigershark, Congress approved a plan whereby the more advanced and more expensive F-16 from General Dynamics could be sold to allies at cut-rate prices. The United States would pick up the cost for most of the purchase of the F-16, a plane flown by the U.S. Air Force. The Tigershark was not designed for U.S. Air Force use. Thus, the foreign governments reasoned, it would be



Northrop's F-20 Tigershark was built with no U.S. government funding. The government then gave foreign customers discounts on other jets, making the F-20 hard to sell.

foolish to spend \$20 million on a plane the Americans won't fly when you can pay less than that for one they will fly.

The Department of Defense is slated to run a computer-simulated flyoff between the F-16 and the F-20 later this year. It is expected to prove to allied countries that the Tigershark can hold its own against the more expensive plane. And the cut-rate program is now dropped, so the Tigershark may have a fighting chance.

Thomas Jones, Northrop's chairman, acknowledges that the F-16 is superior to the F-20 in some ways. But he points out that the Tigershark "is less expensive to buy . . . to own and operate. Its cost of ownership is less than half the cost of an F-16."

As an interceptor, the Tigershark has no peers, not even among the world's most expensive jets.

It has the fastest "scramble time" of any fighter in the world, going from standstill to 32,000 feet and locked on target within 2½ minutes. The F-16, however, can climb to 62,000 feet, 7000 feet higher than the F-20's combat ceiling and possibly important in the chasing of reconnaissance planes.

Perhaps the future of the Tigershark will be brighter as military cost containment becomes more important. The F-20 requires about half the crew of its American, French and British rivals. The jet is said to require less than half the spare parts needed by the world's most popular fighters.

At last year's Paris Air Show, Northrop introduced its Multiplex Data Bus System (MUX), a computer linkup that dumped information from sensors to the plane's instruments in fractions of the time it takes in any other jet. The new system apparently won't raise the price tag on the F-20 by more than a few thousand dollars.

With that and the growing concern about cost overruns in mind, Northrop is building the next generation Tigershark with more fiberglass composite parts and new mechanical parts, including speed brakes, control stick and ailerons.

It remains to be seen whether the improved and still low-cost Tigershark will attract the business it was supposed to get in the first place. But no one will be able to say that Northrop failed to give the Tigershark everything it could.—D.E.

Be a Better Gardener

Recycle all your Brush, Weeds, Leaves, Old Crops, Cut Grass, Dead Flowers, etc. into:

- DECORATIVE WOOD CHIPS
- SPREADABLE MULCH
- RICH COMPOST

With a Kemp Shredder/Chipper, the "3-in-1 **Garden Machinel**

1. Wood Chip Maker

If you've always loved the look of perennials and shrubs mulched with wood chips but thought they were too expensive . . . here's wonderful news! Make your own with Kemp! The Kemp Chipper reduces branches (up to 3" thick!) into beautiful wood chips . . . in seconds!

2. Mulch Maker

Simply toss anything organic - wet or dry -into the rugged Kemp Shredder/ Chipper. It instantly chops, cuts, and pulverizes everything into valuable mulch. Use it to eliminate up to 90% of your weeding chores and hold needed moisture during dry spells.

3. Compost Maker

The Kemp Shredder/Chipper will devour piles of brush, old plants and weeds (including soggy materials that clog most shredders). This nutrient-rich compost can be mixed in your gardens to create super-rich soil for extra-productive vegetable crops and beautiful flowers.





Built "Kemp Tough" To Last A Lifetime

Kemp works better, because it's built better. As a matter of fact, it's 18 ways better than any other shredder money can buy! Here are just 6 ways (you'll find all the others in our colorful FREE brochure):

- · Heavy-Duty Built-In Chipper
- Reversible Hardened-Steel Knives
- Exclusive Anti-Clog Features
- Full 240° Arc Grinding Screen
- 4-Wheel Mobility
- Built To Last A Lifetime

Prove It To Yourself At Our Expensel

Use any Kemp for a full 30 days in your garden and around your yard. If you don't think it's the best, most useful machine you've ever owned . . . return it to us for a full refund! Could anything be more fair?

The Standard of the Home Gardener Since 1890.

NOW! SAVE UP TO \$225 OFF-SEASON BONUS 30-DAY FREE TRIAL



160 Koser Rd., Dept. 27036 Lititz (Lancaster Co.), PA 17543

☐ Please rush details on the Kemp Shredder/Chipper and FREE 30-Day Trial.

Name	
Address	
City	

State Zip

DRAINS CLOGGED? **BLOW THEM OUT WITH THE** PANGO PLUNGER*

Don't risk damaging your plumbing with strong corrosives, and stop using messy snakes. Just pump air into the "Pango Plunger"™ place adaptor fitting over drain (3 adaptors furnished) pull trigger and a blast of air will clear most blockages. Made of tough non corroding plastic. We guarantee your satisfaction.



PANGO PLUNGER" **BOX 308**

\$19.95 + \$3.00

CANFIELD. OH 44406 MONEY ORDER OR CHECK HANDLING

CALL TOLL FREE 1-800-772-1234

24 HRS. - 7 DAYS A WEEK

BUY ONE AND WE'LL MAKE YOU AN EXCLUSIVE DEALER'

6-wheel drive AT



Amphibious 2 and 4 passenger models Call toll-free 1-800-255-2511

NY and Alaska 716-855-2226 Collect Canada toll-free 1-800-338-0012

Recreatives Industries, Inc. 60 Depot Street Buffalo, NY 14206 *if the territory still is open



AT HOME! SPARE OR FULL TIME

free book on learning to reupholster chairs, divans, footstoots, all furniture for BIG MONEY in spare or full time. No experience needed, no age or educational limits. We show you how and provide EVERTHING needed to start: (1) Self-study program covering all phases. (2) All tools and 3 big furniture kits for practice. (3)... all supplies, frames and materials to build \$300 worth of furniture, yours to keep or sell. Write for big, free opportunity book. No obligation, no salesman will call. MEN & WOMEN ALL AGES! send for

all. MODERN UPHOLSTERY INSTITUTE, 80426 Field Building, Kansas City, Missouri 64111



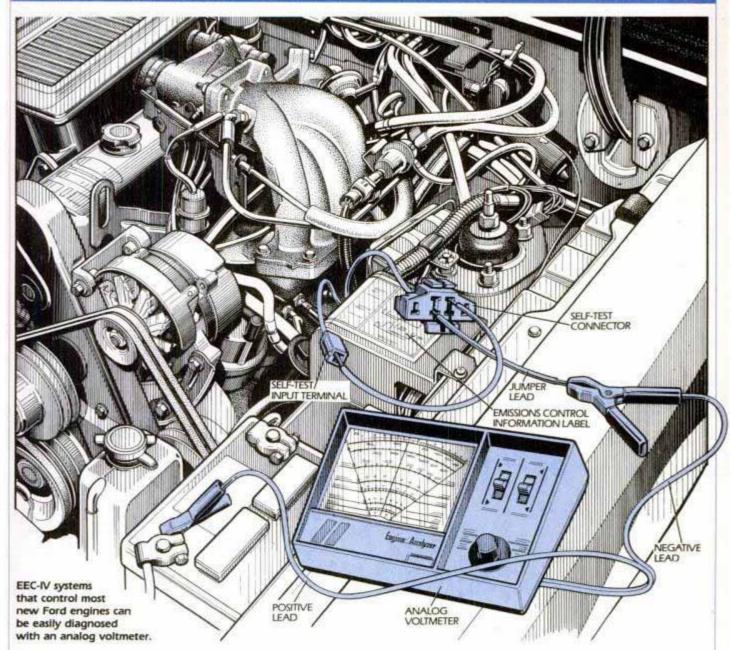
P 1986

Portable Steam Cleaner Steam in 60 seconds

CLEAN: Air Filters, Lawn I 3-yr. guarantee on fire box, coils. Uses liquid soap, propane fired. Wt. 120 lbs. Auxil pump required on low water pressure.

WEDCO MFG. INC., Dept. M-16
P.O. Box D, 940 West Broadway,
Jackson, Wyoming 83001

SATURDAY MECHANIC



TROUBLESHOOTING FORD'S COMPUTER

With nothing more than a voltmeter, you'll be able to diagnose most of the EEC-IV ailments.

BY PAUL STENQUIST

ord's EEC-IV electronic engine control system, which was introduced on the Escort 1.6-liter and turbocharged 2.3-liter engines for 1983, is now used on all Ford, Mercury and Lincoln engines with fuel injection—both throttle body and direct-port types—and on the 2.3-liter carbureted engine used in Mustang, Capri, LTD and Marquis. Other carbureted engines

are not equipped with the EEC-IV.

EEC-IV replaces a variety of computer control systems found on earlier Ford products. Using a high-speed microprocessor called the Electronic Control Assembly (ECA), it monitors engine operating conditions and adjusts fuel mixture, spark advance and other functions accordingly. The sensors that tell the microprocessor what the engine

is up to include inlet air volume, inlet charge temperature, engine coolant temperature, throttle position, exhaust oxygen content, crankshaft position and engine speed.

Like most other engine control systems, EEC-IV is designed to diagnose itself. If a part of the system malfunctions, the computer recognizes the problem and stores it in memory. By activating a self-test routine, the mechanic or car owner can determine what area of the control system is malfunctioning. Further tests can then pinpoint the defective part.

When do you check EEC-IV?

Because the EEC-IV computer system controls engine operation, it is a possible cause of almost any driveability problem. Potential symptoms include no-starts where the engine cranks okay, hard starting, stalling, hesitation, rough idle or cruise, misfire under load, backfire, surge, spark knock, lack of power, poor fuel economy and even overheating.

In every case, however, the EEC-IV system is the last thing that should be checked. Before looking for a computer system problem, all normal causes of the above problems should be considered. This is important because a conventional engine fault, like worn sparkplugs or a dirty air cleaner, can cause the computer system to behave as though there's something wrong.

EEC-IV diagnosis

The EEC-IV troubleshooting procedure is divided into two main parts: the Quick Test and the Pinpoint Tests. The Quick Test consists of four subtests: Key On/Engine Off Self-Test, Timing Check, Engine Running Self-Test and Continuous Self-Test. The first three parts reveal system problems that are present at the time of testing. The Continuous Self-Test portion of the procedure reveals intermittent problems that were stored in memory and may or may not be revealed in the other tests. The Continuous Self-Test includes a Continuous Monitor Mode that allows you to watch for intermittent failures that might occur while wiggling wires or tapping on sensors.

If the engine passes all four of these tests, the driveability problem is not due to EEC-IV failure. If it fails one of the Quick Test checks, you'll be directed to a Pinpoint Test that troubleshoots one or more particular components of the EEC-IV system. Once a Pinpoint

Test has been completed and the problem component has been serviced, the Quick Test must be repeated to make sure that the system has been fixed.

To perform the Quick Test, you'll need a conventional analog voltmeter (one with a needle and dial rather than a digital readout), a timing light and a short jumper lead. The voltmeter is used to read the failure codes that the computer has stored (see lead illustration). The jumper lead is needed to activate the self-test function, and the timing light is used to verify that the electronic spark control is operating.

In the following sections, we'll explain how to perform the Quick Test and how to locate the correct Pinpoint Test if the vehicle fails a part of the Quick Test. Instructions for performing the Pinpoint Tests are found in the Ford Emission Diagnosis, Engine/ Electronics manual. Without this manual, you won't be able to locate the specific cause of a problem or repair a defective system. However, you can confirm that the EEC-IV controls are operating properly just by performing the Quick Test described below.

The manual is available from Helm Publication Division, P.O. Box 07150, Detroit, MI 48207.

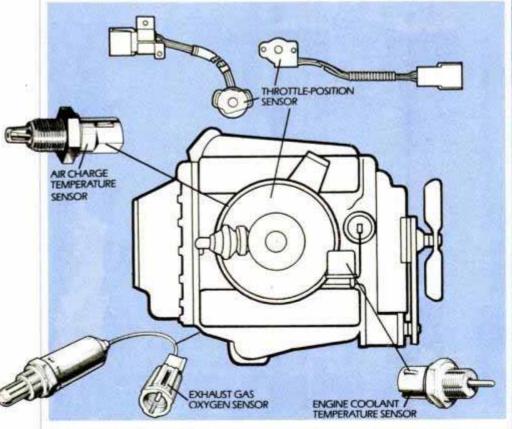
Quick Test preparation

Before beginning the diagnostic procedure, check all vacuum hoses for leaks or pinching. Then find the Vehicle Emission Control Information label that's located under the hood and make sure all of the vacuum hoses are routed properly. Check the EEC system wiring harness for proper connections, loose or detached connectors, wires and terminals, corrosion and proper routing. Once you're sure the harness is okay, check the Electronic Control assembly and other system components for physical damage (Fig. 1).

Once you're sure that the wiring and components appear to be in good condition, apply the emergency brake and place the shift lever in PARK (or NEUTRAL for manuals). Make sure all electrical accessories are turned off. When testing, the doors must remain closed, so roll down the driver's window to provide access to the ignition switch.

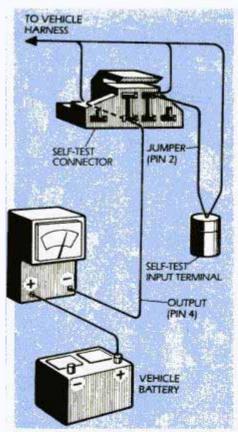
Check and correct the engine coolant level. Then start the engine and let it idle until the upper radiator hose is hot and pressurized and the throttle is off fast idle. Make sure the exhaust manifold and the exhaust gas oxygen sensor located in the manifold are not leaking.

Next, connect a jumper wire from



1 A variety of sensors located on the engine and under the hood feed information to the Electronic Control Assembly microprocessor, located under the dashboard.

SATURDAY MECHANIC



2 Read test codes by wiring voltmeter to self-test connector and input as shown.

the self-test input to pin 2 on the selftest connector (Fig. 2). Set the dial on your voltmeter to read from 0 to 15 volts DC, and connect it from the battery's positive terminal to pin 4 of the self-test connector. Connect your timing light following the manufacturer's directions.

Key On/Engine Off Self-Test

To trigger the computer self-test mode, turn the ignition key to the run position without starting the engine. The computer will respond with 2-digit codes, which can be read by watching the voltmeter (Fig. 3). Each sweep or pulse of the voltmeter needle is a code readout. If, for example, the voltmeter needle pulses two times, pauses for two seconds, and then pulses three times, the code indicated is 23. If more than one code is stored, there will be a 4-second pause between codes.

Following the initial reporting of codes, the computer will pause for six to nine seconds, provide a single voltmeter pulse or sweep, then pause for six to nine seconds again. This means it's preparing to deliver continuous memory codes. Continuous memory codes were stored at a previous time and will be needed for a subsequent test.

In both cases, code 11 is the pass code. So if your system is performing as it should, triggering the Key On/Engine Off Self-Test mode should produce a single pulse of the voltmeter, followed by a 2-second pause, then another pulse of the meter. The meter should then remain at rest for six to nine seconds. produce a single pulse, rest for another six to nine seconds, produce a single pulse, rest for two seconds, and, finally, produce another single pulse. These results indicate a code 11 for both intermittent and existing faults. If this is the case, proceed to the section below headlined "Timing Check."

Instead of two code 11s, let's say the computer reveals a code other than 11, followed by that 6- to 9-second pause, the single pulse, the second 6- to 9-second pause, and, finally, a code 11. This means that there's an existing problem that the computer has diagnosed, but there are no intermittent problems in memory. In this case, the Pinpoint Test that pertains to that code for your vehicle must be performed.

Page 19-5 of the Emission Diagnosis, Engine/Electronics manual provides a chart that directs you to the correct Pinpoint Test.

As a third possibility, let's assume that the computer reveals trouble codes both before and after the two long pauses, indicating that there are both intermittent and existing problems. If this is the case, the existing problems those identified by the first code or codes—should be repaired now, using the pinpoint tests indicated on page 19-5 of the manual.

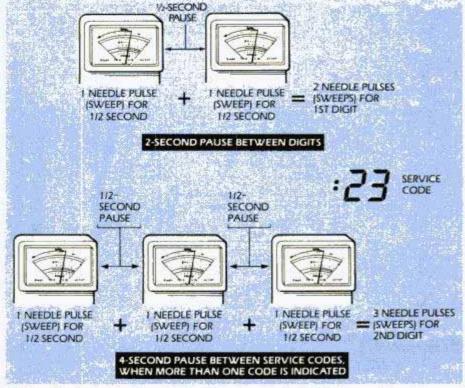
Continuous memory (intermittent problem) codes should only be serviced after existing problem codes and any codes revealed in the following "Engine Running" test have been identified and the problems have been fixed. Write these codes down for later reference.

There are two exceptions to the above procedures. If the computer provides a code 11, followed by the two long pauses and a code 15, pinpoint test Q10 is performed. If no codes are outputted, the diagnostic system is probably not working and a special test must be performed. First, make sure, however, that your voltmeter and self-test lead are hooked up correctly and that the voltmeter is set to the low voltage range (usually 15 volts).

If you're sure that no trouble codes are being displayed, proceed to Pinpoint Test Q1. You'll find Q1 on page 22-207 of the manual. To perform the test, use a digital volt/ohmmeter.

Timing Check

With the jumper lead and voltmeter still attached as described above, start the engine and check timing. You must



3 To read codes, count each meter needle sweep as a single digit. There will be a ½-second pause between pulses to indicate the digit and 2 seconds between each digit.

SATURDAY MECHANIC

check timing within two minutes from the time you read the last code. Your timing check should show that spark is occurring 20° before top dead center (BTDC) plus the base timing figure on the Vehicle Emission Control Information sticker located in the engine compartment. Ford allows a tolerance of plus or minus 3° for the self-test timing figure.

If timing is within specs, move on to the Engine Running Self-Test described below. If timing is not correct, pinpoint test P1, as outlined in the manual, must be performed. The first step of this pinpoint test, as you probably expect, is to verify that base timing is okay.

Engine Running Self-Test

Turn the ignition key to the OFF position and deactivate the self-test mode by removing the jumper wire. Start the engine and allow it to run at more than 2000 rpm for two minutes. Then turn off the engine, wait 10 seconds and reattach the jumper that activates the self-test mode as before.

Start the engine. The analog voltmeter will again provide pulses that allow you to read codes. The first code you see is the engine ID code. This will either be a 2, 3 or 4. This indicates how many cylinders the engine has, divided by 2. In other words, a 4-cylinder engine will produce a 2 code. If the code doesn't properly indicate the number of cylinders your engine has, the vehicle is probably equipped with the wrong computer.

Six to 20 seconds after the engine ID code is transmitted, the computer will send a single pulse code. When your

voltmeter responds to this code with a single sweep of the needle, open the throttle all the way momentarily and then release it. Four to 15 seconds after this single pulse appears, the computer will transmit the test codes. A code 11 again indicates a pass. If the problem that led you to test the system was intermittent, proceed to the Continuous Self-Test described below. If the problem is currently present and pass codes were transmitted during both this test and the Key On/Engine Off Self-Test, the fault is not in the EEC-IV system and normal diagnostic procedures should be repeated.

If codes other than 11 are displayed during the Engine Running Self-Test, they indicate problems in the EEC-IV system. Again, specific Pinpoint Tests are prescribed by the manual for the various codes.

Continuous Self-Test

The Continuous Self-Test can only be performed after the three previously described tests—the Key On/Engine Off Self-Test, the Timing Check and the Engine Running Self-Test—have been completed. And if the previous tests have not yielded pass grades, the problems must be resolved before performing the Continuous Self-Test.

Begin the Continuous Self-Test by repeating the Key On/Engine Off Self-Test as described above. When the codes begin, remove the self-test jumper wire (Fig. 4). This will clear all codes stored in the computer's continuous memory. Confirm that codes are cleared by performing the Key On/Engine Off Self-Test. You should get a code 11, followed by a single pulse,

followed by a code 11 (a pass result). If not, check the Self-Test Input lead for a short to ground, repair it and repeat the above procedure. If you again get a code other than 11, there is an existing problem that has not been fixed. Go back and check the appropriate code on page 19-5 of the shop manual.

Find the piece of paper on which you recorded continuous memory codes. If any of the codes were repaired because they were duplicated in other parts of the test, disregard them. If they were not, check the manual for the Pinpoint Tests that service these codes.

Continuous Monitor Mode

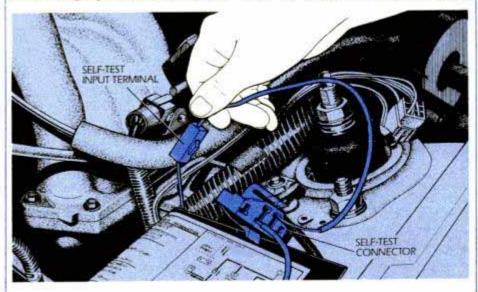
The Continuous Monitor Mode can locate intermittent problems that might be revealed by tapping on sensors or wiggling wires. These show up in the continuous memory portion of the Key On/Engine Off Self-Test after the vehicle has been operated for some time, but disappear when you clear memory during the Continuous Self-Test. The Continuous Monitor Mode testing is not a substitute for the designated Pinpoint Test, but should be performed in conjunction with the Pinpoint Test.

To enter this mode, disconnect the self-test lead but leave the voltmeter connected to pin 4 of the self-test connector. Then turn the key to on. Check the heading on the page in your manual where the Pinpoint Test for the intermittent code is presented and locate that part on the engine.

Lightly tap on the component and watch the voltmeter. If it responds with a pulse of 10.5 volts or more, the part has an intermittent failure problem.

If you get no response, wiggle the wires and connectors that link that component to the computer, watching the voltmeter for a pulse. If the voltmeter needle moves past the 10.5-volt position, you've found the cause of an intermittent problem.

A few words of caution are in order. Do not attempt to attach the voltmeter or self-test jumper without turning the key to the OFF position. The only exception to this is the step in the Continuous Self-Test where you remove the jumper while the codes are being displayed. When you service a problem, make sure the key is in the OFF position before any electrical connectors are unplugged. Finally, don't try to shortcut the manual's Pinpoint Tests when you're looking for the specific cause of a failure code.



4 To clear continuous memory, unhook test lead while computer is sending test codes.

Your Own Boss

Hundreds we've trained have succeeded in this fascinating and highly profitable professionYOU Can Do It, Too!



"No more hard, nasty work for me. Now I have my own business and with hardly any effort I average around \$50 a day. Thanks for my new start in life." Sam Walker Prichard, Alabama



"I opened my own business, spare time, seven months after I enrolled and made a profit of \$329 for the first week." B. A. Deberry Littleton, Colorado

"Before enrolling I checked other courses and also asked for advice from several of the professional locksmiths in my area. They all said Foley-Belsaw was tops and h the most versatile Key Machine. "I always



and now I do, thanks to Foley-Belsaw. David Fairbrother—Dave's Locksmith Service Milwaukee, Wisconsin 53209

Work Part Time, Full Time - Right at Home,

Get into this booming high-profit business that's Easy to learn - Easy to do - Easy on You!

Never before have money-making opportunities been so great for qualified Locksmiths, Now lucrative regular lock and key business has multiplied a thousandfold as millions seek more protection against zooming crime. Yet there's only one Locksmith for every 17,000 people!

Make Up to \$26.00 an Hour — even while learning! Train FAST at Home!

You're "in business" ready to earn \$10 to \$26.00 an hour a few days after you begin Foley-Belsaw's shortcut training. Take advantage of today's unprecedented opportunities in locksmithing for year-round EXTRA IN-COME in spare time — or fulltime in a high-profit business of your own. Hundreds we've trained have done it. So can YOU! All tools plus professional Key Machine given you with course. These plus practice materials and equipment, plus simple, illustrated lessons, plus expert supervision, plus business-building guidance will enable you the KEEP THE MONE COMING IN! Ideal for retirement — good jobs, too.

SEND FOR EXCITING FACTS-No Obligation

Discover what's in Locksmithing for you — how Foley-Belsaw's master-locksmith-approved training can give you the skill you can depend on to EARN MORE — ENJOY LIFE MORE.

PRO KEY MACHINE YOURS TO KEEP!

This Pro Key Machine can YOURS FREE alone add up to \$200 a month to your income . . and it won't cost you a penny extra with your training.

Find out all about it!

Just fill in and mail coupon below (or send post-card) to receive full information and details by return mail. DO IT TODAY!

No Extra

Included With Your Locksmith Training



BURGLAR ALARM and SECURITY SYSTEMS training Covers

all phases of Burglar, Hold-Up and Fire Alarm servicing and installation. This valuable and

timely instruction includes all special tools and supplies. ONLY Foley-Belsaw offers such extensive training in this rapidly expanding field as a part of your Locksmith training.

ADVANCED Locksmithing!

How to change combinations, in-stall and service Safe, Vault and Bank Safe-Deposit Box locks. You'll find it fascinating and high-

ALL SPECIAL TOOLS AND **EQUIPMENT INCLUDED!**



FOLEY-BELSAW INSTITUTE 10877 Field Bldg., Kansas City, Mo. 64111

inere is No OBLIGATION NO SALESMAN Will Call—ever! and

30-DAY

NO RISK

TRIAL!

SEND FOR FACTS TODAY!

RUSH

COUPON

RUSH COUPON TODA FOR THIS FACT-FILLED

BOOKLET!

Tells how you quickly train to be your own boss in a profitable Sparetime or Fulltime business of your own PLUS complete details on our 30-Day NO RISK Trial Offer!



Send for you copy today!

FOLEYBELSAW INSTITUTE, 10877 FIELD BUILDING KANSAS CITY, MISSOURI 64111

YES, please send me the FREE booklet that gives full details about starting my own business in Locksmithing. I understand there is no obligation and that no salesman will call

Name	 	 	_
. dd.			

City



Try this all-new PORTABLE POWER SPRAYER at your home for 3 full weeks ... FREE!

You'll find 1,001 uses for the versatile Mantis Spray Mate:

- Fertilize vour lawn
- Eliminate backyard mosquitoes
- Spray fruit trees
- Kill wasps and hornets
- Disinfect swimming areas
- Safely spray vegetables
- Control Japanese beetles
- Clean out gutters
- And, lots more!

The Mantis Spray Mate pulls along easily on its two big rubber-tired wheels. A pistol-grip wand shoots a jet up 30 feet! The big 12-gallon tank means fewer trips back and forth. The long-life battery and compact electric motor run silently for hours between charges.

This remarkable sprayer is available to Popular Science readers on a FREE 3- Week Home Trial (for a limited time only!). Get details now for your FREE TRIAL this spring.

BONUS EXTRA: FREE BAT

	CHANGEN	
Mands S	PRAY MATE	986
Mantis Manufact 1458 County Line Huntingdon Valley	uring Co. Rd., Dept. P171	MMC 1
	the Mantis SPRAY MATE, FREE nd FREE Bonus.	*
Name	CHEST SET SET SET SET SET SET SET SET SET	3
Address		
City		Ž.
State	Zip	- 1

AMAZING SCIENTIFIC AND ELECTRONIC DEVICES

LASERS. PHASERS for shock wave, weapons, burning, cutting, holography, cloud writing and visible light beam application. PLASMA TORNADO, FORCE FIELD, ION WIND, ION MOTORS, LIGHTNING GENERATION, TELSA COILS, ANTI-GRAVITY, MAGNETIC IMPULSE GUNS, INFRASONICS and ULTRASONIC DEVICES SHOCK and STUN GUN PROJECTORS for personal protection SEE IN TOTAL DARKNESS, LONG RANGE VOICE TRANSMITTERS, DIRECTIONAL MICROPHONES, INTRUSION DETECTORS for security. SATELLITE TV, ENERGY and INSECT/RODENT KILLERS, REPELLORS for the home. SEND \$1.00 FOR CATALOG OF PLANS, KITS AND COMPELTED ITEMS TO

INFORMATION UNLIMITED BOX 716, DEPT M8 AMHERST, NH 03031

Troubled With Getting Up Nights Pains In Back, Hips, Legs Nervousness, Tiredness

If you are disturbed by these symptoms, your troubles may be caused by glandular inflammation of your prostate. Methods that merely give temporary relief for this condition cannot be expected to

remove the cause of your trouble.

The Excelsior Institute Clinic, devoted to the NON-SURGICAL methods of treatment for dis-NON-SURGICAL methods of treatment for dis-eases peculiar to older men, has a new FREE BOOK that tells how these troubles may be cor-rected. The NON-SURGICAL treatments de-scribed in this book require no surgery, hospitaliza-tion or long period of convalescence. Treatments take but a short time and the cost is reasonable. Write today. This book may prove of utmost im-portance to you. No obligation. Excelsior Institute Clinic, Dept. 1288 110 E. Broadway, Excelsior Springs, Mo. 64024

TV AT SPEED

(Continued from page 143)

focus and zoom, while its twin on the right rotates the camera's view. A switch in the center of the console selects which camera is being controlled, while a nearby video monitor shows the operator what the camera is

Before his death, Fried predicted that within a few years television viewers would see live action shots from the top of a hockey player's helmet, and he had already developed a 6-pound system suitable for use in an open-cockpit racer such as an Indy car.

At the Meadowlands Indy car race last summer, NBC used an even more sophisticated unit, the minicam, which was developed by Optical Resources. The entire camera and transmitter system weighs 21/2 pounds-half a pound less than the battery that powers it.

Technical challenge

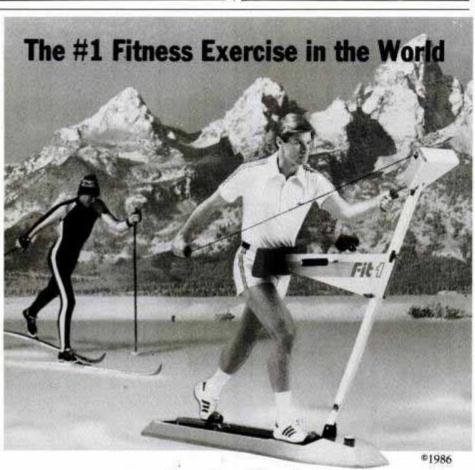
Arnie Reif, the president of Optical Resources, points out that there's a big technical challenge in getting pictures at an Indy car race. "You can go to the moon easier than you can get a picture out of an Indy car," Reif says, with only slight exaggeration.

Reif points out that in the tight confines of an Indy car's cockpit, there are problems with grounding, insulation from vibration, electrical shielding and the force of the wind beating directly on the camera's lens-problems that don't exist with a system developed for the relatively roomy interior of a stock car. To lick those problems, Optical Resources starts with a tiny Hitachi camera that is just 21/4 in. wide by 31/2 in. tall by 11/2 in. deep.

The basic unit costs \$6000 and replaces the bulky TV tube with a solidstate chip. The use of the chip has the additional advantage of eliminating lag, the phenomenon that creates the swirling, ghost-like images that plague some other in-car systems. The camera is mounted over the driver's right shoulder on a specially fabricated bracket, just inches away from the engine. Copper foil and plates are used to shield the camera from the electromagnetic radiation created by the Indy car's high-rev ignition system.

The transmitter, which measures 11/4 by 2 by 21/2 in., is mounted behind the driver's seat, while the antenna is clamped on the left side of the roll bar.

At the Meadowlands, at last year's Indy car race, this system provided television viewers with a perspective that none of the patrons at the track ever enjoyed, including the closeup results of a spin. Unless you can make the field at Indy on your own, you'll never have a closer view of the action.



...can now be duplicated at home!

You deserve the best. Now you can have it.

Cross country skiing is rated the number one cardiovascular and muscle toning exercise in the world. It's better than running. Better than exercise cycles, or rowing machines. Even better than swimming!

The unique design of Fit 1 duplicates cross country skiing. It firms and tones every major muscle group in your body. And it gives you the best cardiovascular workout available

Fit 1 features variable resistance settings for arm and leg movements. It can challenge you no matter what your level of fitness. Duplicate the resistance of a casual glide across a flat field . . . or a tough trek through the Rockies.

The electronic console provides immediate feedback on your heart rate, speed, distance traveled and elapsed time. Data that guarantees you're getting the maximum cardiovascular workout in the minimum amount of time.

Fit 1 can get you in the best shape of your life. All on one simple machine.

To learn more on how you can enjoy the number one fitness exercise in your home, call anytime for our free brochure.

1-800-453-1212

Ask for operator 48



REMOTE CONTROL

(Continued from page 111)

ure theirs so you can add to the system a component at a time.

So long as you continue buying the same series from the same brand, you'll be able to operate the newest components through the remote obtained with your original purchase. In the case of RCA's Dimensia system, the remote comes with the television. Sony's Access system packages the unit with an audio receiver. The ADS remote control comes with the company's Compact Disc player as an option.

Though these multicomponent remote controls will only operate components of the same brand, that's still quite a feat, and one too complex for the older wired and radio-frequency units to handle. But infrared is capable of even further sophistication.

Universal remotes

General Electric, for example, is battling coffee-table clutter with its Control Central, a programmable remote that is able to "learn" commands from other companies' remotes. You simply place the remote from your Brand-X VCR head-to-head with Control Central, press the right buttons in the right sequence (carefully coached by Control Central) and the Command Central will do everything the original remote could. And it will do this for four components of any brand.

Looking to go a step further is Steve Wozniak, of Apple Computer fame.

Wozniak's company, CL-9, plans to offer an infrared remote control system that will learn commands from an unlimited number of other remotes. The system, dubbed IRS, will also act as a timer for the components it controls, so your audio receiver and tape deck can come on to record a radio program while you're away, or your satellite dish can be turned toward exactly the source you want to record on your VCR while you are in Bermuda for the week.

Besides doing its bit to tidy up the coffee table, CL-9 is working on another problem of remote controls, namely, infrared blockage.

Commands, remember, are sent on a beam of invisible light. Other light frequencies can interfere with infrared: In very brightly sunlit rooms, getting a message from transmitter to receiver might take repeated tries.

Additionally, because the infrared beam widens as it travels, its strength dissipates over distance. The average range of most remotes is 35 feet. Finally, because infrared is a light, commands won't reach the receiver if a solid object—even glass doors—blocks the beam's path. That's why infrared works best in a light-colored room, where the beam can carom off walls and ceilings to reach the receiver.

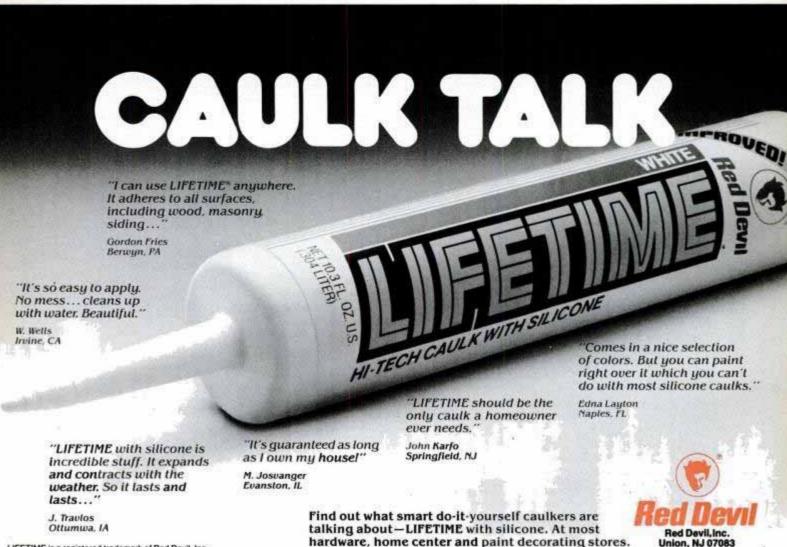
Wozniak's company believes it has a solution to these problems. CL-9 plans to sell a device called Tyrone, which boosts the power of an infrared remote unit. Tyrone thereby extends the reach of an infrared beam and blasts the signal through or around any potential interference. CL-9's IRS unit also has Tyrone's added power.

Infrared has won the battle of the remote control systems, but commands to turn on the VCR or repeat a song on a CD are not all that can be transmitted through the air on invisible light beams. Infrared is now being used to send stereo sound across the room.

Infrared systems already exist in some theaters and auditoriums, to send sound from the screen (or actors with hidden microphones) to audience members who've rented special headphones in the lobby. Now, though, the technology is available for the home—and not just to aid the hearing-impaired or those in need of bilingual translation.

Wireless headphones for stereo TV (and to a lesser extent, for hi-fi systems) are sold by companies including

(Please turn to page 156)





HOME REBUILDER

A.W. PRICES LOWER? WE BUY DIRECT, WE SELL DIRECT & THAT SAVES YOU MONEY.

STOCK & HIGH PERFORMANCE PARTS FOR THE SHOP & HOME REBUILDER

SB CHEVY DELUXE MASTER REBUILD KIT



Cast \$244.00 Forgard \$299.00



MANUAL



CARTER PERFORMANCE FUEL PUMPS San Carl

ENGINE IS WARMED UP USES WATER ONLY AS

THE HOLLEY SYSTEM COMES COMPLETE WITH STEP-BY-STEP INSTRUCTIONS AND ALL MOUNTING HARDWARE

GENUINE BENDIX BRAKE SHOES

\$19.95

GENUINE BENDIX PREMIUM QUALITY DISC BRAKE PADS

\$10.95

GENUINE BENDIX SEMI-METALLIC FRICTION KING II DISC BRAKE PADS

№ \$24.95

MANIFOLD SPECIAL SPECI

\$74.95

SAVE OVER 50%

ON SALE SAVE OVER 50%

HOLLEY WATER

INJECTION KITS

LOW PRICE \$19.95

HIGH QUALITY CHROME VALVE COVERS

	Price	per Pair
MC 290-401 VE	19549	\$26.95
turck 231 VB	19449	\$24.95
hevy V6	19201	\$24.95
hevy SB Short	19196	\$18.95
hevy SB Tall	19195	\$19.95
hevy SB Short	19333	\$26.95
hevy SB Tall	19238	\$29.95
Appar SB	19330	\$24.95
fopar BB	19547	\$29.95
nes CD	40004	***

CARTER AFB CARBS

CARTER THERMO-QUAD CARBURETORS

ON SALE HOLLEY PERFORMANCE CARBURETORS

4 BARREL UNIVERSAL VACUUM SECONDARY

Firetric Choks 390 CFM + 8007 900 CFM + 9834 2 BARREL UNIVERSAL

DOUBLE PUMPERS

CHEVY SPREAD BORE QUADRAJET REPLACEMENTS

RAPID COOL **ELECTRIC FANS**



\$59.95

\$69.95

ACCEL Adjustable Vaccuum QM Only C Advance \$11.95

ACCEL ON SALE ACCEL® MALLORY DUAL-POINT DISTRIBUTORS (YOUR CHOICE)

RECHANICAL ADVANCE 090 289-302 390 351 W* 380 351 W* 380 350-400 480 429-460 3PAR MOPAR 318-340-360 \$54.95 MOPAR 383-440" \$54.95 VACUUM ADVANCE

ICIDUM ADVANCE HEVY VE S09.95 1810 289-307 \$99.95 1810 351 W* \$99.95 1810 351C-400 \$79.95 318-340-360 \$79.95 MOPAR 383-440 \$79.96

* MALLORY ONL

MALLORY UNILITE

evy VIII of 289-302

EDELBROCK PERFORMER MANIFOLDS



Sect. 16: 221 (75: in	4586 \$126.00
Chevy V6 60* 2.8	37857 \$172.95
SB Chery	2101 \$99.95
89 Chevy (D.Pt.)	2167 \$148.95
88 Chey L. Pt.	2645 \$144.65
S8 Mapar	
Mosie 441	7191 \$133.95
SB Ford	2121 \$134.95
Ford 35 tW	2181 \$133.95
Ford 351m-400	2171 \$147.85
Ford 351C (2V)	2665 \$132.95
Ford 351C (4V)	2750 \$136.95
Fort 352 thru 428	2105 \$187.95
Fore 429-460	2166 2165.95
Das 300 thru 403	3711 \$152.95
Pontac 151 4 Cyl	5407 \$106.95
Shortest US	TIES BUTTON

EDEL BROCK PERFORMER-PLUS CAMSHAFT KITS
INCLUDES CAMS & LIFTERS
THE LIFTERS

from milet a filling	the wat	e-compa-
AMC VE (TO se)	7132	21435
Book in 179 will	5487	\$104.95
Devy 15 60°	258	
SB Dwy	2102	\$136.95
BB Chivis		\$108.95
58 Mopar	267	1148.95
Mirpor 441	2192	1162.95
SB Ford	2102	\$145.95
Not 2016 Fort 202 SNL 390	2182	\$157.95
Fort 202 thru 300	2106	\$145.95
First 460	2967	\$146.55
DON 200 On 400	3717	E158-95
Secretary with	41.00	*100.00

ADD-A-LEAF

FOR FRONT OR REAR SPRINGS FITS MOST DOMESTIC TRUCKS ETC. YOURLOW \$44.95 PAIR

BREAKERLESS ELECTRONIC IGNITION

DISTRIBUTORS schanical Advance bey V8 89 56 rd 289-302 99 36 rd 351C-800 99 36 rd 429-480 99 96 roar 318-360-360 99 96 roar 318-360-360 99 96 ecuum Advence hevy V8 urd 269-302 urd 3610-400

PERFORMANCE WIRES

SUPER COILS

制的

\$14.9 Mailory Pro-Master 36.9

MANLEY O.E.M. REPLACE-MENT . VALVES

-SMALL BLOCK CHEVY SMALL BLOCK CHEVY
Imake 2078 \$1.85
Imake 1676 \$2.85
Imake 1650 \$4.75
Echaust 1649 \$3.95
BLOCK CHEVY
Imake 1652 \$3.95
Echaust 1649 \$3.95
BLOCK CHEVY
Imake 1652 \$3.95
Exhaust 1651 \$4.95
SMALL BLOCK MOPAR
Imake 1652 \$4.95
Exhaust 1651 \$4.95

B MOPAR (WEDGE)

Intake 1316 \$3.65
Exhaust 1265 \$3.65
Exhaust 1717 \$4.96
FORD 289 (NON RAIL)
Intake 1628 \$3.65
Exhaust 1517 \$4.25
B FORD 192 (RAIL)

8. POntake I miske 1567 34. S.B. FORD 302 (RAIL) Intake 1732 \$2.95 1771 \$4.95 8 Intake 1732 6 Exhaust 1771 351C 4 BL HEAD FOR 9 Intake 1762 \$4.45 1 Exhaust 1763 \$4.95 351C 2 BL HEAD FORD 4 Intake 1764 mtake 1764 \$3.65 Exhaust 1765 \$4.65 351W FORD 69-74 Intake 1780 Exhaust 1760 \$3.85 Exhaust 1761 \$4.45 351W FORD 75-77 Intake 1811 Intake 1830 Exhaust 1831 352-390-428 FORD Intake 1418 \$2.65 Exhaust 1355 \$3.95 429-460 FORD

BOOKS

HOW TO REBUILD BOOKS

RAPID COOL TRANSMISSION OIL COOLERS

COUNTOWFRICE \$19.95 1922 CARS, TRUCKS & TOWING (MEDIUM DUTY) OUR LOW PRICE \$29.95

1528 MOTORHOMES, TRUCKS & ALL HEAVY TOWNED KOLIFICOWPRICE \$34.95

RAPID COOL **ENGINE OIL** COOLERS

8080 FORD-MOPAR-8081 A.M.C.-GM FOURLIWING \$39.95 STAINLESS STEEL **FLEX-A-LITE FANS**

UNIVERSA FIT BOOD RPM RATING

#1070 17 DIAMETER #1080 18 DIAMETER YOUR LOW PRICE \$10.95

MONROE SHOCK SPECIALS

MONROE VIP S BORE HEAVY DUTY CON UCTION EXCEEDS MAN TURERS SPECIFICATIONS ABLE FOR ALL US L CARS

MONROE-MATIC

T SHOCK 55% INCREASE CONTROL OVER REGULAR SHOCKS AVAILABLE FOR

MONROE GAS-MATIC

MAGNUM 60

LOAD LEVELLERS

AIR SHOCKS

ELECTRIC RIDE CONTROL (DASHBOARD MOUNT) ADD \$84.95

OEM REPLACEMENT **IGNITION PARTS** TOP QUALITY



\$6.95 VOLTAGE

REGULATORS

ELECTRONIC TUNE-UP KITS IGNITION KITS



\$4.95 STARTER

SOLENOIDS

ANC 67-N # U800 54-95 FORD 16-St # U800 54-95 GM 57-64 # D991 38-95

IGNITION COILS



ENGINE WITHOUT DON'T REBUILD YOUR CHECKING OUR PRICES.

California residents: Items in this ad are. Not legal for sale or use on pollution controlled motor vehicles in California. Legal in California only for racing vehicles which may not be used on highways

WE CARRY A COMPLETE LINE OF MECHANICAL ENGINE PARTS FOR ALL APPLICATIONS, STOCK REPLACEMENT, HI-PERFORMANCE & RACING.





Four Kit Stages to Choose from

filmerSur	£	nt Pe	shim A		For	ged P	iston	KHS
AMC			C	0			c	0
199-232-258 267-399-304-20 343-360-401 380	74.00 174.00 174.00 174.00 174.00	THE RES	116.00 106.00 106.00	74.5 74.5 74.5 74.5	178.00 179.00 174.00	14.8 18.8 14.8	194.00 276.00 274.00	294.0
		51.00 136.00 146.00	100.00	163.80 296.60 216.60	194.00	274.00	244.00	354.0
CADILLAC 380-429-472-500	183.00	213.00	141.00	-	-	-	-	
CHEVROLET 145-164 Consu 194-230-240-250 216-235 256-263-327 306-307-350 386-400 402-427-454	*** *** *** *** ***	HAR HAR HAR HAR HAR HAR	114.00 114.00 134.00 134.00	154.00 154.00 154.00 154.00	716.56 716.50 136.50 213.50 213.50		164.00 164.00 166.00 16	204.0 204.0 216.0 216.0 256.0
FORE) 164-170-200-200 260-360-302-2019 2010-360-302-3019 2010-360-360 2772-362-312 429 428-400	10.00 10.00 10.00 10.00 10.00 10.00 10.00	54.90 114.90 114.90 114.90 104.90 104.90 104.90	114.80 124.80 138.80 148.80 154.80 154.80	54.00 101.00 101.00 101.00 101.00	116.00 106.00 106.00 106.00 276.00 176.00	194.00 194.00 194.00 194.00 294.00	196.00 276.00 196.00 196.00	
MOPAR 170-196-225 275-316-360-360 361-363-413 440	110	M.M M.M 134.M	114.00 (34.00 104.00 104.00	200.00	111.00 141.00 141.00 141.00 141.00	134.80 161.80 268.80 268.80	184.00 184.00 179.00 179.00	275.00 275.00
OLDSMOBILE 330-350 394-400-425-455	III.N IN.N			201.00 245.00				277.00
PONTIAC 230-250 350-389-400-456	**	\$4.00 CR.00	114.00	200.00	110.00	134.66	194.00	796.00

Pediate Avenage in all Projecto States and Stock Compression Ratios. Rold & Main Bearing states if not standard. Carmshafts are available. Performance Carmshaft saction or stock carmshaft will be outstand.

ENGINE OVERHAUL SPECIAL



Buy All Three & Save

\$69.95 \$79.95

CHROME MOLLY **PUSH RODS**

\$36.95 \$39.95

TRW FORGED FLAT TOP PISTON

& RING SPECIAL 1000 (040-060 Call)

GASKET SETS

0000 QUQ.

Your Low

\$14.95 \$19.95 Bathtub Intake Manifold Gasket not included on

ON SALE

SB CHEVY DELUX ENGINE REBUILD KIT

\$99.95

S.B. CHEVY UNIT.

T INCLUDES:
PISTON RINGS
CL77 ROO BEARINGS
CL77 MAIN BEARINGS
ENGINE GASKET SET

NOTE: BATH TUB INTAKE GASKET NOT INCLUDED WHERE APPLICABLE

OPTIONS AVAILABLE Molly Rings ADD \$15.00* H V ADD \$6.00*Double Roller Chain Set ADD \$3.00 NOTE Available Std .010 .020 .030 Rings Available .030 .040

SUPER STOCK CRANK KIT



0.425-472-500 \$423.00 EVROLET 1.230-250-292 \$294.00 1-235 \$294.00 1-263-327 \$294.00

504-00 5485.00 FORD 144-170-200-250 8299.00 8338.00 201-260-280 302-351W 8299.00 8354.00

\$349.00 \$412.00 \$369.00 \$428.00 \$348.00 \$438.00

DOUBLE ROLLER

Others Your Le

BB Chevy SB Mopar BB Mopar SB Ford 351C 400 Ford 429 460 390 428 29.95 29.95 29.95 39.95 39.95 49.95 49.95

SUPER STOCK MASTER KIT



PISTONS & PINS PISTON RINGS

ONNECTING

440 S509.00 \$579.00 0.055MOBILE 330-350 \$8609.00 \$579.00 564-00-435 \$549.00 \$588.00 700-730-700 \$458.00 \$344.00 250-250-360 \$458.00 \$344.00 250-300-300 \$400-400 \$458.00 \$344.00 400-455 \$509.00 \$668.00

HIGH VOLUME PUMPS " \$24.95 20% More vol

Genuine Clevite Bearing Special

Rod Bearings Main Bearings



Both for the \$39.95

HI-PERFORMANCE TIMING CHAIN SETS



\$18.95 \$24.95

HI PERFORMAL LONG SLOT OF THE ROCKER ARMS 29 35 set 16 HI PERFORMANCE

ROCKER ARMS

OF 16

0.427-429

RHOADS CAM & LIFTERS KIT

\$159.95 \$169.95

NEW STOCK REPLACEMENT CAMSHAFT— LIFTERS KIT WELL

\$119.95 PERFORMANCE LIFTERS SOME MINISTERS

\$36.95 \$39.95

California residents: Items in this ad are: Not legal for sale or use on pollution controlled motor vehicles in California; Legal in California only for racing vehicles which may not be used on highways

SUPER STOCK **ENGINE KIT**

HORT BLOCK KIT Includes

TRW

WATER

PUMPS ?

CHEVROLET Small Block Big Block



LONG BLOCK KIT

WITH RINGS *# \$99.00



Tachs



\$29.95 Gauges

ENGINE STANDS

\$59.95 \$99.95

on Drip Tray on Tool Tray 519 95 519 95

ISKENDARIAN SUPER CAMS Designation of

Camshafts-Lifters-Spring

\$139.95 ADJUSTABLE PERFORMANCE SHOCKS

\$49.95

PAW T-SHIRTS & HATS Get Our Giant The Fabulous PAW Blown Motor New 1986 Logo in 3 Colors on both Front & Back of a Quality Hanes Beefy T' Shirt. Available SM. M. L & XL. State Your Size ONLY \$6.50 Catalog

PAW Hat with Logo ONLY \$4.50



FREE with an order from this

advertisement or

P.A.W. MONEY BACK GUARANTEE
BUY WITH CONFIDENCE FROM P.A.W.: IF FOR ANY REASON YOU ARE NOT
SATISFIED WITH OUR PRODUCTS, JUST RETURN THEM WITHIN 90 DAYS
FROM DATE OF RECEIPT AND WE WILL REFUND YOUR MONEY.

NOTE: NO REFUND ON SHIPPING CHARGES. PRODUCTS MUST BE IN NEW AND UNUSED CONDITION IN ORIGINAL PACKAGE. INSTALLED ITEMS CAN-NOT BE REFUNDED. CALL 818-996-3641 FOR RETURN AUTHORIZATION.

WE SHIP COD. NO DEPOSIT REQUIRED ON MOST ITEMS IN STOCK

WE ACCEPT MASTERCARD & VISA VISA

818-998-6000 8:30 AM to 5:30 PM Pacific Time

Monday thru Friday CUSTOMER SERVICE: For Return Information and Inquiries Regarding Previ-

MAIL ORDER

PERFORMANCE AUTOMOTIVE WHOLESALE, INC. 21122 Lassen Street, Chatsworth, CA 91311

HOW TO ORDER

State Make, Model, Year & Engine Size. Send at least 50% deposit by Cashiers Check or Money Order, no personal checks accepted or use your Mastercard or VISA, All Overseas & Canadian orders must be paid in full. No C.O.D. on UPS only. All Engines & Master Kits must truck freight shipments. C.O.D. on UPS only. All Engines & Master Kits must

Print Name				Phone # ()
Address				
City		State _		Zip
Make	Model		Year	Engine Size

IF YOU DON'T SEE IT, PHONE FOR YOUR LOW PRICE







REMOTE CONTROL

(Continued from page 153)

Nady, Sony, Sennheiser, Sears and North American Philips. Besides these, an infrared headphone system that distributes entertainment-channel sound throughout an aircraft is already being used by Jet America, an airline operating in California. And in Japan, Sharp offers a hi-fi system whose rearchannel surround-sound speakers are fed via infrared.

The process of sending audio is similar to that of sending commands via remote control. The signal, which starts out as sound, is digitized as electrical impulses (combinations of ones and zeros) then sent into a diode—basically a semiconductor chip inside a glass bead. The diode converts the electrical impulses into infrared bursts, which are received by a photocell in the headphones. The cell converts the impulses back into electrical signals and sends them to an amplifier in the headphones, which converts the energy back into sound.

In the Nady system, for example, the TV or audio system is connected to an infrared transmitter by a cable plugged into the source unit's headphone or audio output jack. The transmitter, when activated, sends a signal to the headphones, which have an infrared receiver at the peak of their headset. The headphones have a separate power source (in this case, a C-battery) and their own volume controls.

Pros and cons

Prices for infrared headphone systems vary widely—from \$100 for the Nady and North American Philips models to \$350 for Sennheiser's. So does the fidelity of the audio you'll hear.

Sending simple data via lightwaves is one thing. Remote controls do it routinely. Even the keyboard of IBM's abortive PCjr computer transmitted to the main unit via infrared. But music waveforms are more complex, as is the conversion process between light and sound.

Sennheiser, which offers the most expensive system available, claims specifications that maintain full-fidelity reception from a good stereo music system. Other more modestly priced brands make more modest claims—generally suggesting the user confine wireless listening to TV sound, which is not as demanding as music.

For the time being, the decision to use wireless infrared headphones entails a compromise between convenience and quality—and expense. But given the rapid developments in infrared technology, it probably won't be long before the need for compromise is eliminated.

Why Are We Giving Away
Famous Nationally Advertised™
MALIN M-15™
SURVIVAL KNIVES
for only \$4?

Hard to believe, but true!

As part of a nationwide advertising campaign, a New York firm will give a way one million (1,000,000) of its most expensive hunting knives—the best-selling MALIN-15TM SURVIVAL KNIFE—for the astonishing publicity price of only \$4 each to the first one million persons who write to the company address (below) before Midnight, May 31, 1986.

This original publicity ad must accompany your request. Copies or photostats are not acceptable.

These knives are not copies. These are genuine MALIN M-15TM SURVIVAL KNIVES—the same famous survival knives nationally advertised in leading media throughout America. They are the most popular (and most expensive) hunting/fishing/camping knives of their kind ever sold by this multi-million-dollar firm.

A foot long and r-r-r-r-r-razor sharp!

If you had to describe the MALIN M-15 in just one word, that word would have to be...big! Each MALIN M-15 is a whopping 12 inches long—a foot in length!—yet so perfectly balanced it cuts and thrusts like an extension of your own hand. Heft this beauty just once; you'll never want to put it down!

Each MALIN M-15 blade is crafted entirely of 420 molecular stainless! Thick as a silver dollar at the spine, it's tough enough to split wood or shatter bone. Yet the edge is so wickedly sharp it slices thin as a whisper!

Survival Kit hidden in the hollow handle

But that's not all! In the pommel of each MALIN M-15 is a precision ZF-360 Liquid Damped Compass. And when you unscrew the compass—there is an astonishing Survival Kit complete with packet of waterproof wrapped matches, half-a-dozen fishing hooks, sinkers, nylon test fishing line, sewing needle kit—even an 18-inch cable saw actually capable of cutting down a a small tree. No wonder this is the best-selling

Compass Unscrews To Reveal Survival Kit

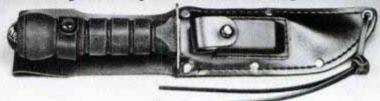


survival knife of its kind ever sold by this multi-million dollar New York firm.

These Famous Nationally Advertised MALIN M-15 SURVIVAL KNIVES will not be sold at this price by the company in any store. There is a limit of two (2) per address at this price, but if your request is made early enough (before May 25) you may order up to five. Each knife is covered by the company's unconditional one-year money-back guarantee.

To get your MALIN M-15 SURVIVAL KNIFE, mail this original publicity ad (no copies or photostats) together with your name and address and \$4 for each knife. Add only \$2 shipping and handling per knife. (New York residents add sales tax.) Allow up to 6-8 weeks for shipment. Make check payable to CVP Co. Mail to: CVP MALIN M-15, Dept. 114-108, Box 1201, Westbury, New York 11595. (V22830)

FREE Sheath & Sharpening Stone if you respond before May 25



Heavy duty sheath for your belt is 1-foot long with lanyard, 6-rivet construction, haft retainer, and built-in snap-pouch for sharpening stone (stone included).

© 1986 PDM, Inc. 1200 Shames Dr., Westbury, N.Y. 11590

Bonus Woodworking Section

(Continued from page 122)

urethane varnish.

After each coat, be sure to sand the washstand with 400-grit sandpaper, and wipe the surface with a tach cloth after each sanding.

-Ralph S. Wilkes

Glue and clamp the ends to the back and stretchers (near right). Note the temporary stretcher nailed to shelf supports. Drawer is test-fitted to washstand before top is installed (far right).







Rip the scoring bed to size and cut kerfs for the scoring bed lines. Then, sand the board and glue on edge band strips.

as shown and paint the lines that border the scoring squares. Mark peg holes with an awl, then bore. Glue on edge banding, head board and edge stop. Finishsand, varnish and wax the playing surface. Turn pegs on the lathe or fashion them from dowel rods.

Each player shoves five pennies per turn, using the heel of the hand. The first player to get three pennies in each bed wins. A penny is scoreless if it lands on another penny or stops half in a scoring bed (it can, however, be hit into the bed). A penny is dead, and removed, if it lands in a scoring square, but if it stops short of the first line it can be replayed. Remove each penny as it scores and peg a hole. If a player has more scoring pennies than needed, per bed, the opponent gets the extra scores .- Willard and Elma Waltner

(Please turn to page 160)

POPULAR MECHANICS • MARCH 1986

SCORING PEG

REOD!



FREE!

24 Page Satellite TV Buver's Guide

800-4-SATMAN

The new SATMAN Buyer's Guide is a necessity for any homeowner who wants to learn more about affordable, legal, and value packed 100 channel satellite TV. It's a better value than Cable TV, a VCR, or going to the movies. Buy direct, Do-It-Yourself and save with SATMAN, GUARANTEED LOWEST PRICES ON ALL MAJOR BRANDS, CALL NOW FOR YOUR FREE 24 PAGE BUYER'S GUIDE

1-800-4-SATMAN



- Call Now! ----

HOW TO FIND GOLD NUGGETS



Finding gold nuggets or coins is now made easy with a new patented gold finding detector. Before with other detectors it was virtually impossible because of interference from black sand. This new detector is unaffected by black sand and can detect pinhead size gold nuggets at great range. Its maximum range is 17 feet. Free catalog

GARDINER ELECTRONICS

Dept. 35 • 4729 N. 7th Ave. • Phoenix, AZ 85013



MAKE THIS SHADE FOR LESS THAN \$75.00

Send \$1.00 for our big catalog

WHITTEMORE Box 2065EM, HANOVER, MASS, 02339

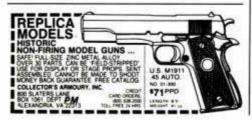
HERNIA

FOR COMFORT!

You can enjoy heavenly comfort night and day at work or at play! Send for FREE illustrated booklet.

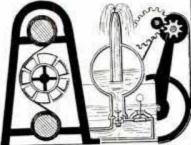


BROOKS APPLIANCE COMPANY 300 Michigan Ave., Marshall, Mich. 49068



Rare Technical Books

Picture book



507 MECHANICAL MOVEMENTS You'll really enjoy this remarkable picture book from the late 1800's revealing the secrets of over 500 different mechanisms. secrets of over 500 different mechanisms, from very simple to ingeniously complex! You'll find presses, steam engines; gears, clocks, mill machinery, and much, much more! You get drawings and descriptive text! Great ideas for your next invention! Valuable reference! Fun reading on a rainy afternoon! Order a copy today! 128 page paperback Cat. no. 4252 97.95 **Melt Metal!**



CHARCOAL FOUNDRY by Dave Gingery
Learn how you can turn an old pail and a blower into a powerful furnace that can melt aluminum cans and scrap, pot metal and even brass. We built one for less than \$25! Uses grocery store charcoal! Build a complete foundry. Pour the castings that you need to build a lathe, shaper, milling machine, drill press, indexing head and more. Small book jam packed with valuable how-to! 72 page paperback.

Hundreds of unusual books!

Here are just a few of the hundreds of high quality, unusual books you'll find in Lindsay's catalog. Write for a copy!

esla Coil Secrets . Windmills and Windmotors \$4.95 Toolmaking 1905 \$9.95 Blacksmith Shop & Iron Forging \$6.50 Lathe Design Steam Engine Design Crystal Radio Construction \$5.00 History of Perpetual Motion \$5.
How to make mirrors \$3.
and hundreds more! Write for a catalog!



Rare Information!



RUN THREE PHASE MOTORS ON SINGLE PHASE POWER!

Learn three proven methods in use since turn-of-the-century! Two are easily installed! No motor rewinding! Booklet Cat no. 81

ALTERNATOR SECRETS
Get thousands of watts from common auto alternator! Run tools, lights, AC-DC appliances, charge batteries, light are welding, and more. Tips for building custom regulator! Great info! Low price.

POWER INVERTER TECHNOLOGY

Convert low voltage DC into 110 ACI Learn how they work, why some won't, why some will Covers smallest up to large industrial models. Sources of plans supplied. Rare info. . Large

Jam-packed catalog!

Discover rare, top-rate books on woodstove, sundial, and windmill construction, perpetual motion machines. Tesla coils, making of mirrors, satellite TV, lathe accessories! Make glass, paper, kilns, soap, cheese, explosives, heat treat furnace! Learn calculus, steam engine design, electronics, crystal set construction, more!

Homestead! Build a fish farm! Build a complete rounderstead build a fish farm! Build a complete foundry for aluminum, brass, cast iron, more! Repair small engines, and diesels! Learn to electroplate! Study the history of technology. Rediscover all this and more in Lindsay's Technical Books catalog.

Yours is waiting!

Send \$1.00 US & CAN (\$3.00 foreign airmail). If you order books from this ad, request a free copy. You'll see in a minute why everyone is talking about this incredible mailorder bookstorel You've already missed some incredi-ble books that are no longer printed. Don't wait! Write for your copy today!

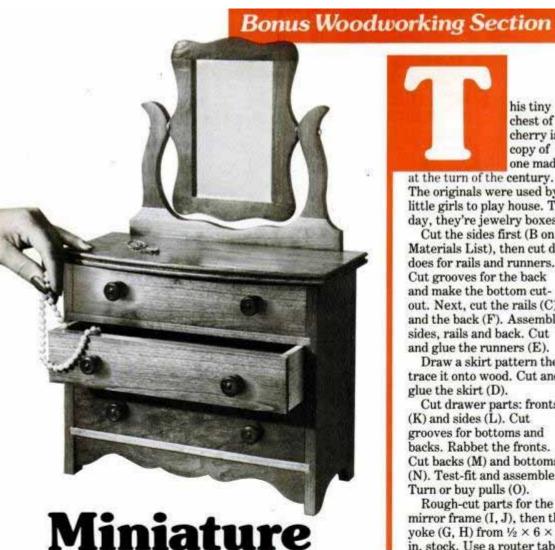
How to order

Send your name and address; the name, number and price of the books you want along with check or money order. Or send your VISA or MASTERCARD numbers and your signature. Include 75 cents for the first book and 25 cents for each additional book. Illinois residents add 6% sales tax. Satisfaction guaranteed. You may return any book within 7 days for refund.

Lindsay	Publications,	Inc
	Bradley IL 60915-0012	5

			· mondie			
	Send	a catalog!	I've enclosed	\$1.00 (\$3.00	foreign airmail),	
					. I've enclosed 7	5¢ shipping
	for the	a direct han	b and DEC for	s anch additions	The second second second second	

Name		
Address		
City	State	Zip



his tiny chest of cherry is a copy of one made

at the turn of the century. The originals were used by little girls to play house. Today, they're jewelry boxes.

Cut the sides first (B on Materials List), then cut dadoes for rails and runners. Cut grooves for the back and make the bottom cutout. Next, cut the rails (C) and the back (F). Assemble sides, rails and back. Cut and glue the runners (E).

Draw a skirt pattern then trace it onto wood. Cut and glue the skirt (D).

Cut drawer parts: fronts (K) and sides (L). Cut grooves for bottoms and backs. Rabbet the fronts. Cut backs (M) and bottoms (N). Test-fit and assemble. Turn or buy pulls (O).

Rough-cut parts for the mirror frame (I, J), then the yoke (G, H) from 1/2 × 6 × 8in. stock. Use a router table

and 1/s-in. bit to cut mirror grooves. Groove the ends of J for splines (detail 4). Cut lap joints in yoke parts (detail 3). Assemble frame and yoke separately. Cut scroll design. Cut the top (A) and groove. Assemble yolk to mirror frame, yolk to top, and top to chest.

-Tom A. Gardner

MATERIALS LIST

G

- Size & description (use)
 ½ × 5½ × 11½" cherry (top)
 ½ × 5½ × 11½" cherry (side)
 ¾ × 16 × 9½" cherry (fail)
 ½ × 1¼ × 9½" cherry (skirt)
 ¼ × ¾ × 3¼" cherry (runner)
 ½ × 8½ × 9½" plywood
 (heak)
 - (back) 2 1/2 × 11/4 × 5/4" cherry (yoke
- side) ½ × 1¼ × 9" cherry (yoke H 1 base)
- 1/2 × 3/4 × 51%" cherry (mirror 1 2
- 72 × 74 × 5% cherry (mirror frame top/bottom) ½ × 1 × 5% cherry (mirror frame side) ½ × 1% × 9% cherry (draw-J
- K er front)
- 1/8 × 1/8 × 4" pine (drawer L side) 1/8 × 1/8 × 81/8" plywood M
- (drawer back) 1/8 × 3/8 × 8/8" plywood
- (drawer bottom)

 O 6 % % %"-dia. wood pulls

 Misc: Carpenter's glue, % × 3% ×
 5% mirror, % and 1 brads, 1%" No. 6 rh screws and washers, 1' No. 6 fh screws, 120-, 220- and 600-

grit abrasive paper, 4/0 steel wool.

Chest 1-1/2" NO.6 RH SCREW AND NOTE: ATTACH YOKE WITH WASHER MINIATURE CHEST 5-112" DEEP x 11-114" HIGH x 17-114" WIDE I" NO. 6 FH SCREWS 118 x 112 x 112" 1/B" x 1/4"-DEEP GROOVE FOR MIRROR SPLINE (4 REOD.) UNDERSIDE 118 x 3/16" GROOVE DETAIL 2 3116 x 318* 118 DADO (TYPICAL) DETAIL 1 1" BRAD NOTE: ASSEMBLE YOKE AND MIRROR FRAME BEFORE CUTTING DETAIL 3 1-9/16 SHAPES 3/4" 1/8 x 1/8" GROOVE 15/16 118 x 1/8 1/4 x 3/8" RABBET DETAIL 4 3/4" BRADS CUTTING PATTERNS

FAMILY OF SEVEN CUTS HOT WATER BILLS IN HALF!

Tankless Heater Provides Endless Hot Water



Sound, Simple, Money-Saving Idea

Did you know that much of the energy used to heat your basement tank of water is dissipated right through the walls of the tank itself and into your storage or crawl space area?

The Perfect Answer-New Thermar™ Tankless Instant Hot Water Heaters

If heat losses are created by the need to keep large volumes of water standing in a tank, why not eliminate the tank? And, that's just what Thermar* has done. In its place we have developed a tiny, super powerful instantaneous heating unit which ACTUALLY CREATES HOT WATER AS YOU USE IT. A microswitch on the unit automatically turns on the moment hot water is needed. Then a continuous stream of delightful, sparkling hot water flows from the tap for shower or wash basin. IMAGINE—as much hot water as you want—produced in a never-ending stream as long as you need it.

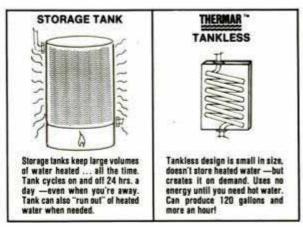
The ordinary Tank-Type Hot Water Heater is the most "Energy Costly" appliance in your home. In this day of rising costs and energy consciousness, a new THERMAR" TANKLESS INSTANT HEATER should be considered by everyone interested in saving money and saving energy.

U.L. Listed Electric and AGA Certified Gas Models Thousands in Use Around the World

You'll recover the initial costs many times over in fuel savings as the years pass. And, you'll enjoy a lifetime of hot water — shower after shower after shower!

*Savings will depend upon local cost of fuel, type of fuel used, condition, age and type of present heater equipment. Your actual savings may differ from those shown. Estimates and assumptions used for these calculations available on request.

The Hughson family just took 7 showers in a row — the 7th was as hot as the first —and they're saving hundreds on their hot water bills too.





- America's Leader in Tankless Heaters
- Featured in Popular Science Magazine
- Seen on Television!
- Member Gas Appliance Manufacturer's Assoc. Inc.

FOR RUSH DELIVERY OF FREE ENERGY CATALOG AND FULL DETAILS USE COUPON BELOW OR CALL

1-800-854-8679

CT Residents 452-0500

THERM	
	TRUMBULL, CT 06611-0398
Please RUSH your	cut my hot water heating bills in ha FREE catalog of THERMAR'* INSTAN ERS. Include details of the absolute
	arantee and replacement plan. I unde nder no obligation to buy anything.
stand that I am un	
stand that I am un Name	arantee and replacement plan. I unde ider no obligation to buy anything.

AMAZING MULTI **USE TILLER:**



3-Week in Your **Garden Trial!**



Use engine for other attachments!

Women love Sunbird's easy handling!

Send for Introductory Sale Prices!

Please send

Please send complete Sunbird information plus Cornwall Road, Dept. 3036

information plus details on your 30 day garden trial! Cornwall Road, Dept. 3 PO. Box 906 Middlebury, VT 05753

Zip





Includes: Shipping & Handling

- Adjustable fits all sedans, hatchbacks, wagons
- (U.S. or Foreign made)

 Easily installed inside rear window

 Hardware and extra bulb included

 Conforms to FMVSS No. 108, DOT, and SAE

Send check, money order, C.O.D. cash only to:

TECH AUTO

PO. Box 303 + Clawson, Mt 48073-0303 + Allow 30 days for de

KOHLER 8-HP GAS ENGINE ITEM 28-1048-A \$339.99

F.O.B. Lincoln



. Extra rugged Kohler 181 8-HP engine. Cast iron block, flywheel, crankshaft, camshaft; heavy duty ball bearings. Easy starting and maintenance. Recoil start. 1,25 gallon fuel tank. Shpg. 75 lbs.

Air Pressure Sand Blast Gun \$18.95 add \$3 shpg. • ITEM 415 - - 70-PSI (min.); V4-NPT inlet; trigger control; 1-quart grit bottle; 12-CFM. SEND FOR FREE CATALOG.

BURDEN'S SURPLUS CENTER - 800-228-3407 1000 West"O" . Box 82209-PM . Lincoln, NE 68501

Exciting Breakthrough For Suburban Gardeners!



A tiller/cultivator exclusively designed for small, backyard gardens.

No longer do you have to choose between a yank-you-along front-tine tiller and an expensive, hard-to-guide, rear-tine tiller. Now there's Mantis . . the 20-pound wonder that makes every gardening job a breeze! Mantis starts with a flick of the wrist . . . turns on a dime . . . weeds an average garden in 20 minutes . . . and runs all day on a gallon of gas.

Mantis tills a full 8" deep, or delicately cultivates the surface for precision weeding. And, because it's so easy to maneuver, women and older people (many of whom had almost given up gardening) find Mantis an absolute joy.

Mantis is so easy to guide that you can cultivate right around plants, along crop rows and up tight to fences . without worrying about running into your growing flowers and vegetables.

And, with its easy-on/easy-off precision attachments, Mantis quickly becomes a Planter/Furrower...a Border Edger . . . a Lawn De-Thatcher and Aerator . . . or a superb Trimmer for pruning shrubs and hedges.

Best of all, Mantis costs a fraction of what you'd pay for a big tiller!

Get the whole wonderful story on the remarkable Mantis . . . the little machine that has made gardening such a joy.

LIMITED TIME BONUS FREE \$41.00 Border Edger!

Mantis Manufacturing Co. 1458 County Line Rd., Dept. 875 Huntingdon Valley, PA 19006

☐ Please send more information on the Mantis Tiller/Cultivator...and your special FREE limited time offer!

Name Address City State Zip .

PLEASURE FROM WOODWORKING!



The world famous Constantine Catalog offers over 2,000 items to help you BUILD, RESTORE. REPAIR, REFINISH anything made of wood!

Every item is top quality, reasonably priced and backed by CONSTANTINE'S MONEY BACK GUARANTEE! Choose from 150 kinds of veneer, 118 carving tools and chisels, 32 upholstery tools and essentials, 39 clamps, pages of brass furniture and cabinet hardware, 72 lamp parts, 96 how-to books, 73 wood picture kits, 33 styles of pre finished picture molding, 200 sizes and kinds of cabinet lumber, professional wood finishes, hundreds of plans for furniture, cabinets, shelves, toys...over 2,000 ITEMS IN ALL!

116 page catalog-Only \$1.00 \$2.00 refunded on 1st order.

CONSTANTINE Est. 1812 2051R Eastchester Road, Bronx, NY 10461



es as a portable flash ght. Money-back guaran-ee. Only \$13.95 & \$2.00 shipping and handling. B.L. MORRIS 164A Main

Plan Book - \$6.00





	$\overline{}$			
INSTALL	HOME	LIGH	TNING PR	OTECTION
FREE	/	Worth \$1,	200 For C	Inly \$194
INFO	4	WE SUPPLY	Hardware	& Instruction
	1	YOU SUPPLY: 1	Day Labor	
P	MC0	Excellent Pa	rt-Time M	loney Maker
421	MKT ST	ELMWOOD		

How Can Anyone Make \$2,000 An Hour? Claim a share of your \$25,000,000,000 the Gov't. holds!

Would you like \$2,000 for just making a few phone calls and looking in some phone books? That is all you have to do to enjoy this kind of money. If you can read English and can talk on the phone, you can make thousands of dollars in a few hours-and you don't have to do any selling at all.

I am going to show you how you can make \$2,000 an hour. This ad will also explain every detail of an exciting new business that has never been advertised or attempted before-what's more, you can enter with no money.

Life was not always rosy for me. I got involved in a bad business investment two years ago and I lost more than \$11,000. I lost every cent I had, even money I didn't have. I worked as a clerk by day and a waiter by night. I never really liked cleaning tables, but what else could I do? I had to stop disappointing my loved ones. I remember coming home on Mother's Day really anxious to call my mother, only to find the phone disconnected. I went through my mail and prayed for some good news, only to find an envelope with no return address-it contained an eviction notice. We were fortunate to have relatives that were kind enough to let us stay with them. I didn't know that being in debt could hurt so much. I prayed for a way out.

In the depth of my despair, I received a funny-looking letter. When I first saw it, I thought it was another creditor making a claim on me. The letter told me about money that was rightfully mine-it said that if I signed the enclosed form, I would receive \$2,592.59. Things were so bad that I had nothing to lose, so I signed the form neatly and returned it to the company.

Ten days later I received a check for \$2,592.59. With an explanation. A distant aunt had died and left \$4,320.98 in her savings account. The company that found me collected \$1,728.39. The firm had no trouble finding out that I was related to her. Just for matching up people with the same last names, that company was making millions

every year.

I was so excited that I was compelled to find out more about this great opportunity. One out of ten of all Americans have forgotten or lost money in bank accounts, stocks, insurance premiums, etc., worth as much as the amount of \$10 bills you could lay end-to-end around the world: \$25 billion. I will disclose a plan to you that will show you how to get your hands on this money.

\$20,000 In 30 Minutes

Twenty-five billion is just sitting there waiting for someone to recover it. I picked up three phone directories and made some calls. I contacted an 81-year-old Virginia widow. Her husband had left \$61,251 in a bank account 20 years earlier. She had an unlisted phone number but her address

was in an earlier phone book. She had lived at the same address for 50 years. A certified letter informed her of her money. The finder's fee for that job was \$20,416-not bad for 30 minutes work, don't you agree? Never in my life have I ever been paid so much for looking up a name in the phone book.

I got a C-minus average in high schoolone year, I got an F in English. By no means was I ever considered to have the smarts. All you have to do to make \$2,000 an hour is thumb through phone books and make a few calls.

My family and I have always loved the beach, so last summer we moved into a \$250,000 home by the sea. The amount of money I was making was incredible. Last month I deposited more than \$30,000. Just as a hedge against taxes, I bought two 3bedroom houses valued at \$200,000. I asked everyone in my family what they wanted the most and they said they wanted to see all of us together going places. In the past month we have visited three countries. In fact, we take a vacation every month. It's great seeing the joy in everyone's eyes as I spend more time with them. All of this for thumbing through the phone book.

Only 10% of the rightful owners claim their share of the \$25,000,000,000. The states, not surprisingly, make no real effort to contact the rightful owners. Why should they, when unclaimed property is their biggest source of revenue, second only to taxes? The states are required by law to make a list of unclaimed owners. These lists are hard to find but I will show you how to get every one that the states publish. And in most cases, they're free.

Let me give you a random sample list from the state of Wisconsin. (Addresses are included in the lists.)

Owner's Name	Property	Amount
Drinka, Teresa, A	Savings	\$10,891.47
Lavelle, Samuel	Stock Proceeds	\$21,529.61
McDonnell, Martha	Savings	\$12,843.78
Meyer, Thusneida		\$18,489.18
Patterson, Arthur		\$14,629.24
Stien, George	Savings	\$57,525.83

This listing is only a minor portion of the \$25 billion in unclaimed property that is waiting for you.

California still hasn't found the owner of one account worth \$186,000. Someone in Massachusetts left behind \$400,000. North Carolina owes one person \$500,000.

Sample Proof

Bonnie Goldstien, a well-known syndicated newspaper writer who doesn't know very much about finding people, located the owners of \$4,100 in two and a half hours with two telephone directories—she said so in the "San Francisco Sunday Examiner & Chronicle." All you need is a phone and a phone book to get your share of \$25,000,000,000.

Sworn Testimonial

Thanks to the methods outlined in your book I was able to raise \$41,935 in three weeks. I have read all the other "get rich" books but none has shown me how I am able to make so much money with so little effort. Your book certainly does... At first I was skeptical, but now I am a strong believer.

Gary S., Portland, Oregon

As soon as you receive my book, you can make up to \$2,000 an hour. All you need are telephone books and a telephone. The proven system in this book can be learned in a half hour. After that, you are all set. If you can read English and can talk on the phone, you're in business. It's as easy as that.

My Guarantee

Send for my complete guide to recovering unclaimed money. Read the simple formula that has been tailored for each individual state. Sit down and make the required few phone calls and directory searches. After following the simple formula, you must be able to recover \$10,000 in one day or your complete payment will be returned to you.

Everything in this ad is true, but I don't expect you to believe me. I want you to hear it from a very credible source. Contact your local state controller's or treasurer's office and ask them about the \$1 billion they receive every year. In fact, contact any politician and he or she will verify everything I tell you in this ad.

This opportunity can give you a new home, car and all of the luxuries money has to offer. Think of what \$10,000 today could do for you. Could you use this kind of money? There is a definite flaw in our revenue system, and you can profit from it. I pride myself on making your decision simple. You can either enjoy a guaranteed \$2,000 or be one hour older-the choice is yours.

David Bendah (619) 265-8777 6602B El Cajon Blvd., Dept. 513C San Diego, CA 92115

Dear Dave.

© 1986 David Bendah

You can show me how to make \$2,000 an hour, so \$10 is a small price to pay. Send me your complete guide to recovering \$25,000,000,000 in unclaimed money on the condition that I must be able to recover \$10,000 easily in one day with your book or you will return my entire

Name	ere is my \$10.	
Address		
City	State	Zip





QUALITY TOOLS AND REPLACEMENT PARTS

- . Save up to 35% Off Retail
- Complete line of Chainsaws and Brushcutters
- Hard to find parts for Chainsaws, Lawnmowers and Small Engines
- Table Saws and Band Saws
- . Hand and Shop Tools
- Repair Manuals and Safety Equipment
- Over 23 Years Experience
- · Full Money Back Guarantee

SEND FOR YOUR **FREE CATALOG**

Address	
City	
State	Zip _

Size Plans

SACRAMENTO, CA 95851



The New England Rocker is 26" x 44". The parts kit contains foam, vinyl, rings, eyes, buttons & tacks. Wood, fabric & fringe not included in kit. Easy to build. Tots love it. Plan-338—\$9.00 Plan & Parts Kit—\$15.00

ARMOR PRODUCTS (516) 462-6228 Dept. C., Box 445, E. Northport, NY 11731

.000'S WEEKI

Home Business Directory Exciting Free Details. Write: Box 2019-PM New York, NY 10163

YOURSELF KITS

BUILD YOUR OWN GRANDFATHER CLOCK



Under LC (including movement and dial)

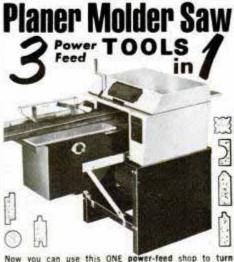
- · Do-it-yourself case
 - kit, parts pre-cut Finished clocks · Solid 3/4" hard-
 - woods: black walnut, cherry, oak • Heirloom quality
 - Factory direct prices
 Solid brass West
 - German chiming movements
 - Money back
 - guarantee
 Prompt shipment
 No woodworking experience necessary

WRITE FOR FREE COLOR CATALOG



WORLD'S LARGEST MANUFACTURER OF GRANDFATHER CLOCKS Dept. 1822 Emperor Industrial Park Fairhope, Alabama 36532 * Phone 1-205-928-2316 I am interested in Do-It-Yourself Kits Finished Clocks

Zip
00



Now you can use this ONE power-feed shop to turn rough lumber into moldings, trim, flooring, furniture—ALL popular patterns. RIP-PLANE-MOLD . . separately or all at once with a single motor. Low Cost . . . You can own this power tool for only \$50 down.

30-Day FREE Trial! EXCITING FACTS NO OBLIGATION-NO SALESMAN WILL CALL FOLEY-BELSAW CO. 90791 FIELD BLDG RUSH COUPON TODAY!

KANSAS CITY, MO. 64111 Foley-Belsaw Co. 90791 Field Bldg. Kansas City, Mo. 64111

☐ YES Please send me complete facts about PLANER-MOLDER-SAW and details about 30-day trial offer.

Name	- 12
Address	
City	

State Zip



WOMEN START MAIL ORDER

I'll send you a free sample import to prove you can make big money in your own spare/full time business. No investment in stock. World's most famous importer will guide you. Clip this ad, good for free sample and big Free Report — tells all! Offer limited to adults. big Free Report – tells all! Offer limited to adults. Mail this ad today. THE MELLINGER CO., 6100 Variel Ave., Dept. S2253, Woodland Hills, CA 91364.

At Last a New Amezingly Simple JET ENGINE

Build from easy to follow plans.
Length 18", Dia, 81/2", Wt. 18 lbs.
Fuel: Gasoline or Kero.
"Screaming Demon" develops 20 H.P.
serious-minded hobbyists, students: sale al arts classes. Make on 5" metal cutting attachment. For use on small racing betc. Full size assembly drawings with a bill of materials and photos. Price \$10. n 9" metal cutting lathe win on small racing beats, min of drawings with critical di shotos. Price \$10.00 No. 1510 28th St. P.O. Box SANTA MONICA, CALIF. SAVOY SCIENTIFIC



BE AN EXPERT IN CARPET LAYING

CARPET LAYERS EARN \$150 PER DAY AND UP. Big dem of firms are looking for corpet craftures. We had ra money doing corpet service work in the You get valuable corpet tools and equip

WRITE TODAY FOR FREE INFORMATIONS

Carpet Crafts Inst. 1115-J Ave. Acaso Camarillo, Ca. 93010

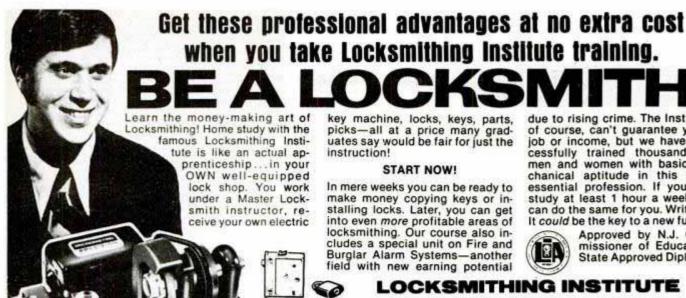
Be a Legal INVESTIGATOR

Nationwide shortage of trained legal investigators. Many earn \$20,000 to \$50,000 a year. Men and women. Full or part-time. Earn while you learn at home. Send name, address for free opportunities booklet.

Commercial Technical Institute, Dept. 110-036 1500 Cardinal Drive, Little Falls, N.J. 07424

BASEMENT TOILET FLUSHES UP To Sewer or S No Digging Up Floors Install It Yourself - Anywhere Write McPherson, Inc., Dept. 16 Box 15133 Tampa, Florida 33684

20	Record office casset priorie priorie	VE LISTENING I telephone conversations or home. Connects be- te or tage recorder and line. Starts automatics is answered Records but satisful Stops recorder whe set	weet any your tele- ily when n sides of
19°	OT TO	Oty discounts ava	
up to 14 mile to 15V battery inc 119.85 - 11 sh Rex PM-2052, sceapted. For o	any FM rac to sect 1 Ca toping per Melbour atalog of tr	an other mice. Transmits the Easy to assemble kill (305) 725-1000 er send then to USI Corp., P. O. ne., FL \$2001. COD's rensmitters, voice scramlems, encites \$2 to USI	



key machine, locks, keys, parts, picks-all at a price many graduates say would be fair for just the

In mere weeks you can be ready to make money copying keys or installing locks. Later, you can get into even more profitable areas of locksmithing. Our course also includes a special unit on Fire and Burglar Alarm Systems-another field with new earning potential due to rising crime. The Institute, of course, can't guarantee you a job or income, but we have successfully trained thousands of men and women with basic me-chanical aptitude in this most essential profession. If you can study at least 1 hour a week, we can do the same for you. Write us. It could be the key to a new future!



Approved by N.J. Com-missioner of Education. State Approved Diploma.

LOCKSMITHING INSTITUTE

Established 1948 • Division of Commercial Technical Institute Little Falls, New Jersey 07424

COMO UTO

SEND TODAY FOR FREE BOOKLET

"I have already master keyed my Elks Lodge and 38 apart-

and 38 apartments...so you
see my locksmith course is
practically paid for! I was
never so enthused with lessons in my entire life!"
Adelindo Orsi, Ir.,
Azusa, Calif,

"The lessons, materials and instructors were EXCELLENT

I really enjoyed the Locksmithing course. Am telling my friends about the course, as it is well worth the tuition."

Frank R. Bishop, Holt, Mich

TO: Locksmithing Institute, Dept. 110-036

Please send FREE Opportunity Booklet and sample lesson materials. No obligation. No salesman will call.

NAME ADDRESS CITY ZIP STATE

> Check here if Veteran -------------



Gas and Kerosene REFRIGERATORS

Needs no electricity! Large size plus mizerly fuel consumption in a two-door, freestanding design. Send for free report!

Lehman Hardware Box 411A, Kidron, OH 44636



* For virtually all outboard motors (foreign & domestic) Full instructions for easy

installation Easy hand control from the drivers seat

Also Available DOLE TRIM N TILT KITS

INTRODUCTORY

\$149.95

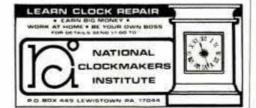
Little Falls, New Jersey 07424

TO ORDER OR FOR FREE INFORMATION 1 800 245-0357 7 a.m. to 5:30 p.m. CST In KS call collect 1-316-663-8361

Kits @ \$149.95 Check enclosed (We pay shipping) Please Send Kits @ \$149.95 C.O.D. (You pay shipping) Please send Please send literature about Dole Tilt and Dole Trim-N-Tilt Kits

DOLE KITS MFG. & DIST. BY ARROW MACHINE INC. P. O. BOX 1987 PM

HUTCHINSON, KS 67504-1987



WHAT'S HE DOING!

Making a Concrete Flower Pot! ... and SO CAN YOU!

Make and sell your own Ornamental Concrete items. Rush \$5.00 for Book

about Aluminum Molds with prices and production trade secrets direct from world's largest mold manufacturer. Over 350 designs to select from.

Today To >

Send \$5.00 CONCRETE MACHINERY COMPANY

P. O. BOX A99 - HICKORY, N. C. 28601



it plans - jrame kits · full size patterns ·

HUNDREDS of designs, 7' to 55" Save 50% OR MORE!

Build in WOOD, STEEL, ALUMINUM, FIBERGLASS, GLEN-L kits, plans, & full-size patients are especially for amateurs. Easy, proven methods assure professional re-sults. Order \$3 catalog now & also receive FREE "BOAT-BUILDING SUPPLIES" catalog.

GLEN-L catalog (i) \$3.00 (sent \$LOWER 4th CLASS), OR GLEN-L catalog (ii) \$4.00 (sent FASTER AIR MAIL) "FIBERGLASS BOATBUILDING—AMATEURS" \$24.00 \$24.00 BOATBUILDING WITH PLYWOOD \$17.00 "INBOARD MOTOR INSTALLATIONS" "HOW TO FIBERGLASS BOATS" \$16.00 \$10.00 TRIGGING SMALL SAILBOATS HOW TO BUILD BOAT TRAILERS \$ 7.50





WORTH WRITING FOR LOOKING FOR IDEAS ON TOOLS, HOME IMPROVEMENTS, HOBBIES & MORE? CHECK THESE LISTINGS, THEN USE THE COUPON BELOW.

168 THINGS YOU NEVER KNEW EXISTED

Fun-filled catalog where the unusual is the usual. 1,800 hard-to-find novelties, hobby and sports equipment, jokes, tricks, science and electronic items. Free

169 MAYBE THE CAR OF YOUR DREAMS IS A TRUCK

The 1986 Mazda B2000 is an all-new truck experience. Mazda offers 6 different models to choose from—including one of the lowest priced extended cab trucks in America. Send for a 26-page, full-collor Mazda Truck Catalog and see why—now more than ever—the more you look, the more you like. Free

170 MANUFACTURERS' FACTORY HOUSES

12-page brochure from The Building Institute lists the names and addresses of manufacturers of factory-made houses you can build yourself. Houses include log, dome, A-frame, classic and contemporary models. \$1.00

171 FLY LIKE AN EAGLE

Cessna answers the most commonly asked questions about learning to fly. Explains the Cessna Pilot Center training program, including learning procedures and financing programs. Free

172 BEAUTIFY YOUR BACKYARD

Sakrete's instructional booklet will assist you in backyard do-it-yourself projects. Learn to build a bar-b-que pit, a fieldstone wall or construct a patio, 50¢

173 WOODWORKER'S REFERENCE GUIDE

Constantine's 116-page Woodworker's Catalog for 1986 is full of prod-ucts for the woodworker, hobbyist and homeowner. It includes 150 veneers, 65 new tools, a complete line of professional finishing materials, plans and hundreds of how-to-craft books. \$1.00 (\$2.00 Credited towards your first order.)

174 PROTECT YOUR INVESTMENT

Read how TUFOIL® lubricant may help prevent damage to exhaust valves on older cars running on lead free gas. This fact sheet explains the other cold weather/hot weather benefits of Tufoil. Free

175 MACHINERY MAGIC

Delta International offers a 48-page machinery catalog for building trades and home shops for the do-it-yourselfer and professional craftsman. A complete line of saws, drill presses, grinders, jointers, lathes, shapers and accessories. Free

176 WINDOW SHOPPING

Velux-America's 24-page brochure gives their complete line of roof windows and skylights including screens, blinds and remote controls. Velux answers questions on passive solar, triple glazing and energy control. Free

177 UNCOMMON FINDS

Lehman Hardware's 88-page catalog contains a diverse selection of "how-to" books, hard-to-find tools, unusual hardware and old-fash-ioned housewares. Includes special sections on woodworking, wood heaters and gas refrigeration. \$2.00

178 GET THE CONNECTION!

Find out about QuickPower Battery Connectors-a new way to attach battery connectors to the existing cables. Made of plastic and copper alloy, QuickPower can be used on cars, boats and equipment. Free

179 DREAMING OF THE PERFECT HOME?

If you plan to decorate, build or remodel—custom built or from stock plans—Design Works offers five new kits to help you. This 4-page brochure describes their interior design kit, house building kit, architect's drawing kit and others. 50¢

180 MASTER KEYS TO CAR CARE

38 areas of car care are detailed in 13 folders. Step-by-step instructions with easy-to-follow illustrations and diagrams take the mystery out of fixing and maintaining your car. Conveniently fits in your glove compartment. From POPULAR MECHANICS. \$5.95

181 TENDING YOUR GARDEN

John Deere's 12-page booklet gives tips and information on how to plan a garden, start seeds indoors, reduce weeding, troubleshoot garden problems and more. Free

182 GETTING TO KNOW YOUR COMPUTER

28-page brochure from CompuServe tells you how to get the most of your computer and how to put a world of information, communications and entertainment at your fingertips. Free

183 DOOR AND WINDOW DRESSING

Blaine's 64-page catalog of over 800 hard to find parts for the home includes storm door and drawer guides for quick identification. Also includes decorative hardwood door and window grilles of diamond and rectangle patterns. \$2.00 (Credited towards your first order.)

184 THE CUTTING EDGE

Forrest Manufacturing Co. gives the complete story of their carbide-tipped saw blades. Includes testing procedures and explains the difference between table and radial saws. Free

185 CAR COSMETICS

The Eastwood Company offers their 84-page catalog of auto restoration tools: welding, body tools, sheet metal, pinstriping, sandblasters, upholstery and more. Includes a technical article on welding quarter panels with a new stitch welder. Free

186 MASTER SHOP GUIDE

An A to Z guide on nails, screws, moldings, sandpaper, wallpaper, lumber, floor tiling, wood finishings, electrical and plumbing supplies and more. Printed on large laminated cards that can hang in your workshop for easy reference. From POPULAR MECHANICS. \$5.95

187 TIPS FOR THE GOLDEN YEARS
National Home Life Assurance's 24-page booklet offers tips on living an active life in retirement. It's full of money-saving information and helpful tips-from tax breaks and money management to exercise and real

188 WOODWORKING STOP 'N' SHOP

The new 1985/86 112-page catalog from The Woodworkers' Store features specialty hardware, tools, plans, veneers, kits and finishing materials. \$1.00

189 KNIFE KNOW HOW

All new 16-page informative booklet from Buck Knives shows how to sharpen a knife, field-dress a deer, skin/fillet fish. Also includes safety techniques and much more. Free

190 BUILDING YOUR OWN HOUSE

The Building Institute explains what is involved when building a house from a factory-made kit, how to shop for a kit house and how much money you can save. 4-page brochure also provides a checklist for finding a reputable manufacturer. \$1.00

191 GO FOR THE GOLD

Alabama Metals Company's flyer explains how their manual can teach you to recycle and reclaim precious metals from "scrap." \$1.00 (Refundable upon order.)

192 TREMENDOUS TOOL VALUES

Harbor Freight Salvage's newest brochure offers values in brand name tools for home, automotive and shop use. Includes quality hand tools, wood and metal working machinery, socket sets, pneumatic and power tools, hydraulic equipment. Free

		r Mec 18, Sa			3/86 , Ohio	448	370									This Coupon E	xpires	May 31, 1986
Pleas	e see	that I rece	ive th	o items	checked b	elow												
	168 169			173	\$1.00			50€	182	\$2.00	H	186			\$1.00	Total money for priced items	\$	
		\$1.00				H		\$5.95	184		H	0.00	\$1.00			Service Charge	\$.50
	171	50€		176			181		185			189				Total money enclosed	\$	
ш	1/2	506	П	1//	\$2.00											Total items requested	1 \$	
Nam	e (Pie	ase Pri	nt)											_				
Add	ess_			110	W	_				-						The state of the s		-
Tow	·												_ State _			Zip Co	de	

(Please send cash, check or money order made out to POPULAR MECHANICS, NO stamps, please)

Note: Popular Mechanics processes your requests for the above information and forwards these inquiries to the organization making the offer. Each company mails the material directly. Your order will be on its way to you within 90 days.

CLASSIFIED ADVERTISEMENTS

Sophie Gronowicz, Classified Sales Manager Dorothy Nolan, Classified Service Manager Rate: \$6.70 per word payable in advance each insertion. Minimum insertion ten words. Bold face capitalized words—\$1.00 per word additional (First word set in Bold Face at no extra charge, Zip Code Free.) Centered Headlines in All Bold-Face Letters—\$45.00.

The next available issue to place an advertisement in America's No. 1 Classified Section is MAY. The closing is MARCH 5th.

Send remittance payable and order to Popular Mechanics, Classified Department, 224 West 57th Street, New York, New York 10019.
Please indicate Heading under which ad is to appear. As a consumer service and in cooperation with our mail-order advertisers who use post office box addresses for their convenience in handling your order, Popular Mechanics maintains a register of such mail-order advertisers containing their complete names and street addresses.
Advertisers using P.O. Box number must furnish complete name and street address for our records.
To avoid delay in the publication of your ad, please send samples and descriptive materials with your request.

PUBLISHER'S MART BOOKS & PUBLICATIONS

PUBLISH your book! Join our successful authors. All subjects invited. Publicity, advertising, beautiful books. Send for fact-filled booklet and free manuscript report. Carlton Press, Dept. PM,11 West 32 Street, New York 10001

PUBLISHERS' OVERSTOCKS, BARGAIN BOOKS 2,000 titles, all subjects! Free catalog: Hamilton, Box 15-A, Falls Village, CT 06031

60 LBS, honey in your own backyard, It's easy and profitable. Start now. Manual tells how. \$4.95 plus \$1.50 P&H. Penguin Publishers, 15415 N. 95th St., Longmont, CO 80501

FREE ILLUSTRATED BOOK LISTS, HUNDREDS HOW-TO, SELF-HELP. BARGAINS. Cricket Hills Guild, 110 Rinkus, Route 6, Indiana, Pennsylvania 15701

CHEAP EFFECTIVE WAY TO BE RID OF COCK-ROACHES! Don't be tricked into spending more than needed. For secret send \$2.00 to: Chartsie, P.O. Box 117, Gardena, CA 90248

MONEY Problems? Surprising new system. Satisfy creditors honestly. Full year control. Send \$9.95. IFS, Box 4P, Webster City, IA 50595

100'S OF SELF-IMPROVEMENT BOOKS. Free catalogue. Balta Books, PO Box 4463, East Providence, RI 02915

THE 100 MOST IMPORTANT MEDICAL QUESTIONS ABOUT SEX. Booklet by MD explains libido, hormones, sexual development, impotence, orgasm, malerfemale sexual dysfunction, sexual infections. Guaranteed. \$5.00. Metabolism Education Services, PO Box 35293, Tulsa, OK 74153

TECHNICAL BOOKS. Electronics, metalworking, workshop, and more! Catalog \$2.00. Keats & Company, Box 796, Station A, Scarborough, Ontario, Canada, M1K 5C8.

ATTENTION TREASURE HUNTERS GUARANTEED INFORMATION

INTRODUCING a little-known government report documenting in fascinating detail sources of shipwreck information and location. Information Guaranteed Valid. Rush \$5.00 today to: Essential Products, Box 4276, Santa Barbara, California 93140

T-SHIRT BUSINESS. Step-by-step plan for starting profitable business in spare time by people who've done it! Comprehensive, honest, guaranteed. \$4 to: Harvard Ventures, P.O. Box 2224, Cambridge, MA 02238.

FALL ASLEEP easily and deeply. Guaranteed program developed by former insomniac. Honest help. \$2.50 to: Val Harper, P.O. Box 2224, Cambridge, MA 02238.

MAKE \$50,000 from a household hobby! Report shows you how. \$3.00. Dubell PM3, 145 East 44th #218, San Bernardino, CA 92404

MLM SUCCESS SECRETS REVEALED! Moneyback guarantee on book, "A Guide to Multilevel Marketing," Send \$4.95 plus \$1.00 postage and handling to: The Data Mart, Dept. A4, P.O. Box 66834, Seattle, WA 98166.

BOOKS ON CASSETTE TAPE

RENT/ Buy Books for Listeners, EZ return, Catalog \$2.00, refundable. Box 6235, Leawood, KS 66206

SIMPLIFY Preparation of your Individual INCOME TAX RETURN. By CPA. Heritage Publications, Box 718C3, Southbury, CT 06488

MAGAZINES

THE HOME SHOP MACHINIST MAGAZINE is devoted entirely to metalworking, with articles on latties, drilling, miling, grinding, toundry, micro-machines, plus projects you can build at home. 6 issues per year. \$18.50. Check, charge card. Money-back guarantee. Call 800-824-7888, Operator 660 (anytime) or write: HSM, Box 181082, Traverse City, MI 49685.

BUILD scale model locomotives, stationary steam engines, other machine shop projects from plans in monthly magazine. \$25 per year. Check, charge card. Money-back guarantee. Call 800-824-7888, Operator 660 (anytime) or write: LIVE STEAM, Box 62982, Traverse City, MI 49685.

CATALOGS

FREE CATALOG - BEST IN THE INDUSTRY A COMPLETE CAMERA STORE IN A CATALOG

ONE of the World's Great Catalogs, and it is photographic. Send to Porter's Camera Store, Inc., Box 628, Dept. PM, Cedar Falls, Iowa 50613 for your Free Copy (U.S. Only). 112 tabloid size pages filled with 4,000 items many of them exclusive and very unusual. Plus popular brand cameras, lenses, flash, etc., at discount prices. Huge inventory, fast service, great packaging. You must see it to believe it. Order your Free copy today.

KITES! Free Color Catalog. Choose from over 100 unusual and innovative kites. Into The Wind, 2047M Broadway, Boulder, CO 80302

FREE tool catalog. Toolline, 817 New York Ave., Martinsburg, WV 25401

LEATHERCRAFT CATALOG. 100 pages. Largest selection available of genuine leathers, tools, kits, supplies. Includes Tandy's new professional head knife and basic instructional Leathercraft Video Tapes. Upholstery and utility leathers to fine garment suedes and Cabretta. Kits for purses, wallets, clocks, even bowling bags. Send \$1.00 for postage and handling to: Tandy Leather Company, P.O. Box 2934, Dept PM386C, Ft. Worth, TX 76113.

SIXTH LARGEST CATALOGUE SALES Major brand items, financing available. Catalogue \$5.00 refundable first order. J&S Associates, 1050 Dorothy Lane, Harker Heights, TX 76543

POPULAR MECHANICS "PLANS AND IDEAS" CATA-LOG #1700 — Hundreds of ideas on workshop projects, plans for shop tools, storage houses, boats, furniture, toys just about everything! Send \$1.50 to: POPULAR MECHANICS P.O. BOX 1014, RADIO CITY STA., NEW YORK, N.Y. 10101

AUTOMOBILES

CARLISLE Pennsylvania Collector Car Flea Market. Buy, sell cars, parts. 7300 vendor spaces full. April 17-20. The Flea Marketeers, 1000 Bryn Mawr Rd., Carlisle, PA 17013-1588. Phone (717) 243-7855.

EASY Made Inexpensive 75% More Miles. Box 247, Lebanon, Ind 46052

FREE AUTOMOTIVE SECURITY CATALOG: Largest selection available. Do-It-Yourself, Pagers, alarms, hood/locks, glass detectors. Allow 4 weeks, Immediate Delivery, Send \$1.00. Automotive Security Equipment, Dept. 2, P.O. Box 382, Plainniew, New York 11803

OLD CAR FANS - subscribe to HEMMINGS MOTOR NEWS, world's largest old car marketplace. Herminings has over 600 pages of ads each month, crammed with thousands of old cars & parts for sale. Only \$16.75 for 12 giant issues. Subscribe to the "bible" of old car collectors today. Send to: Hemmings Motor News, Dept. 6318, Box 100, Bennington, Vermont 05201. Order Toll Free 1-800-228-2028 ext. 137 within Nebraska dial: 1-800-642-8300 Visar/Mastercard Only

EZEE STARTER jumpstarts your car thru the cigarette lighter safe and easy. Send \$24.95 + \$1.50 p&h to: Ezee Starter, Box 765, Solana Beach, CA 92075

GREAT AMERICAN RIP OFF Automotive service manager confesses shocking hidden truth. 26 page report. Lower repair costs as much as 50% Free repairs are possible. Order now \$8.95 plus \$3.00 handling. Michael Hillard, G.4296 W. Court, Flint, Mich. 48504

PERSONALIZED NAME PLATES Attractive, Eye-Catching. Information: WHITE ENTERPRISES, Box 14576, Orlando, Fl. 32857

REVOLUTIONARY Proven Product INCREASES gas MILEAGE. One time application. Send \$1.00 for info. AR Industries, 8016 Harris Ave., Baltimore, MD 21234

RENT YOUR CAR TO THE STUDIOS

YOU can earn up to \$300 per day by renting your classic or special interest auto to major motion picture studios filming on location or at the studio. Find out how. Send \$2.00 and self addressed enveloped: CAR Dept. PM3, 14755 Ventura Bl. Suite 1469, Sherman Oaks, Ca. 91403

EXTEND Engine Life, used Nationally, \$2.00. Midwest Enterprises, 11691 Long Street, Bowling Green, Ohio

200 MPG CARBURETORS: FACT or FRAUD? You decide! Twenty-six page SPECIAL REPORT. Fascinating! Informative! Order your copy Today. Send \$6.00 to: Special Report, Dept. 386A, 304 San Miguel, St. Charles, MO 63303. FULL MONEYBACK GUARANTEE.

MIDGET CARS

SIDEWALK CLASSIC: Looks and drives like a real car, but travels at a safe 5mph. A black fabric top, leather dashboard straps and gas headlights give the look of an open roadster. Six volt auto generator serves as a motor and 12-volt electrical system with built in battery charger runs the accessories. Makes an excellent gift for child or grandchild. PL-1227-\$6.95. Send order to: Popular Mechanics, P.O. Box 1014, Radio City Station, New York, NY 10101

AUTO SUPPLIES & EQUIPMENT

BRITISH SPORTSCAR PARTS - AH, JAGUAR, MG, TRI-UMPH. COMPLETE SELECTION OF RESTORATION PARTS AND ACCESSORIES. INTERIOR, BODY, ENGINE, AND ELECTRICAL PARTS. 400 PAGE CATALOG \$7.00, (203) 655-8731. SPORTS & CLASSICS, INC., 512 BOSTON POST ROAD, DEPT. PM. DARIEN, CT 06820.

ALTERNATOR Generator Rebuilding Book. Price: Hedelund Engineering, Box 26024, Las Vegas, NV 89126.

PARTS: Army Jeep and truck parts. Spare Parts & Equipment Co., P.O. Box 751, Lexington, Kentucky 40587-0751

CARPETS, top, shocks, suspension parts for all cars 1935-1980. Free catalogue. Kanter Auto Products, 76P Monroe, Boonton, NJ 07005. 800-526-1096.

AUTO SUPPLIES & EQUIPMENT

(Continued from preceding page)

MOTALOY ring valve job while driving, Guaranteed. \$10.00 two \$18.00. Postpaid. Andris, Box 34061, San Francisco, CA 94134. Dept. A

HUBCAPS; WHEELCOVERS for U.S. cars: 1949 thru 1990; Nice original wheelcovers; reasonable prices; write your needs: Agape Automotive, 2825 Selzer, Evansville, IN 47712

PREPARE FOR EMERGENCIES! Deluxe "Road Saver" signal light has three settings: lights, blinks, both, Multi-purpose necessity for vehicles, boats, outdoorsmen. Battery powered, 7½". \$13.88. SATISFACTION GUARANTEED. ORDER NOW. Ashbriar Place, 5670 Ashbriar, Dept. PMM, Memphis, TN 38119.

BICYCLES, SUPPLIES

SAVE-a-Life with Bike-Boogie. Cotorful Spinning lateral reflector for Bicycle Hubs. \$2.98 plus \$1.00. P.O. Box 45431, Pallae, Teyes 75245.

MOTORCYCLES, MOTORSCOOTERS &

GO Karts, Minibikes, Atv's. Kits, Parts, Engines. Lowest Prices. Largest Selection. 72 Page Catalog \$3.00. Refundable. Kart World, Dept. C., 1488 Mentor Ave., Painesville, Ohio 44077

PLANS Build Your Own!! Go-Kart \$5.00, Mini-Bike \$4.00, Three Wheeler ATV \$7.50, Hydro-Plane \$4.00, Pedal-Boat \$6.00, UWP-Plans, 389 Ward, Burlington, Ontario L7R 3H8

MINIBIKE Kits-\$49.00. Go-Karts, Frames, Engines, Wheels, Ciutches, Tires, including AMF and Universal Moped Parts. More Parts-Reduced Prices, 1986 Wholesale Catalog-\$2.00. Go-Karts & Kits, P.O. Box 548, Closter, NJ 07624-0548

MOPED & Mini-Bike parts and accessories - send \$1.00: Mayfield Mopeds, 5651 Mayfield Road, Lyndhurst, Ohio 44124

AVIATION, HANG GLIDING

DESIGN-Build Airplanes, Hang Gliders. Simplified publications brochure 25¢. McCoy Aircraft, Suite 243, Box J. Manhattan Beach, CA 90266

BOOMERANGS—WORLD'S BEST! Incredible returns, exciting sport. FREE illustrated catalog . . . 70 boomerangs, books, plans. Write today! BoomerangMan, 1806-1 N. 3rd., Monroe, Louisiana 71201-4222

PLANS 7/8th Nieuport biplane. Ultralight or experimental. Brochure \$5.00. Graham Lee, 8027 Argyll; Edmonton. Canada T6C-4A9

"LESS Expensive Flying For A Recreational Pilot" Send \$8.95 to: Fisher Aviation, Rt. 3, Box 552, Marthasville, Mo. 63357.

HOBBY HELICOPTER. "Choppy" Ultralight Single-Seat Helicopter. Simplified Construction—Motorcycle Engine. Brochure \$3.00. Polynova, Box 670M, St. Remi, Quebec, Canada JOL 21.0

GET OFF YOUR DUFF!

NOW'S the time to become a Commercial Pilot, Job Market busting wide open. Great \$I Book tells how: \$9.95; TPC, Box 260, Watertown, WI 53094-0260

SPACE & ASTRONAUTS

FASCINATING, FLYING, SOLAR POWERED 10 FOOT BLIMPS. Capable of 30,000 FEET! Expose to sun, airship ascends towards the sky IN SECONDS. Includes cable to keep in sight. Great science experiment. Reusable. No assembly. GUARANTEED. \$5.50 each plus \$1.50 postage. JWD Solar, 2929 N. Westmoreland Street, Arlington, Virginia 22213.

NASA emblems, toys, gifts, collectibles. Catalog \$1.25. Refundable. Collector Trends, Box 361, Dayton, Ohio 45409

HOVERCRAFT

HOVERCRAFT Plans All Sizes. Catalog \$1.00. Universal Hovercraft, Box 281, Cordova, Illinois 61242

HOVERCRAFT PLANS & PUBLICATIONS Catalog, \$1,00. Lansing Aero-Marine, P.O. Box 27655, Lansing, Michigan 48909 AERO-CAR Amazing Hovercraft built easily with ordinary tools, Lawnmower engine power. Carries one man plus. Hovers, files forward, backward. Sideways over land/snow/water. Complete constructions plans and brochure. \$10.95. Aero-Projects, Box 5118PM, Clinton, New Jersey 08809.

CB'S, RADIO & HAM EQUIPMENT

LINEAR PARTS — Tubes, Transistors, Modifications. MRF455 \$12, MRF454 \$16, MRF477 \$11. Catalog. RFPC, Box 700, San Marcos, CA 92069, (619) 744-0728

POLICE Scanners, Bearcat, Regency. HPR, Box 19224, Denver, CO. 80219.

CB MODIFICATIONS1 Frequencies, sliders, FM, amplifiers, books, kits, repairs, high-performance accessories. Catalog \$2. CBCI, Box 31500M, Phoenix, AZ 85046

CB MODIFICATIONS, Linear Planbook, Kits \$1.00 refundable. APS, POB 263, Newport, RI 02840, 401-846-5627

ELECTRONICS

BUGGED? WIRETAPPED? Find out fast. Countermeasures equipment catalog \$1. Capri Electronics. Route 1P, Canon, GA 30520.

NIGHT VISION SCOPES. Reconditioned Military units. Both Starlight (Passive) and Infrared (Active). Catalogs \$4.00. STANO Components, P.O. Box 6274, San Bernardino, CA 92412, (714) 883-2728.

ELECTRONIC DEVICES for SECURITY, COUNTERSUR-VEILLANCE, and PERSONAL PROTECTION. Giant sixtyfour page catalogue \$1.00. HUNTEREX, Box 12922, Winston-Salem, NC 27117-2922.

COMPUTERS & SOFTWARE

TI-99/4A Software Hardware bargains. Hard to find items. Huge selection. Fast Service. Free Catalog. Dynamic, Box 690. Hicksville, N.Y. 11801

C64/APPLE programs cheap! Write: Softwaire Shack, Box 133PM, Fresno, CA 93707

IBM-PC programs; everything you need on 5 da/dd disks; word processing, spread sheet, communications, data base, arcade games, and utilities. Send \$25.00 to: ALT/CTRL Software, 686 Longbrook Ave., Stratford, CT 06497

STEREO, CASSETTE TAPES, ETC.

THOUSANDS OF OLDIES! Hard-to-find 45rpm hit records from the last 40 years including pop, country, rock and soul. Send \$2.00 for catalog to: American Pie, P.O. Box 66455, Dept. PM, Los Angeles, CA 90066

TV & VIDEO EQUIPMENT NOTICE: USE OF CERTAIN ITEMS IN THIS CLASSIFICATION REQUIRES STATION AUTHORIZATION.

CABLE TV CONVERTERS & EQUIPMENT. Plans and parts. Build or buy. Send SASE. C&D Electronics, P.O. Box 1402, Dept. PM, Hope, Arkansas 71801

VIDEO MOVIES. Bargains! VHS. Beta. Catalog \$1.00. Tower, Dunkirk, MD 20754-0213

CABLE TV CONVERTERS. Guaranteed lowest prices in U.S. Jerrold, Hamlin, Zenith—Many others! Lowest Dealer Prices! Orders shipped within 24 hours! Complete illustrated catalog, \$2.00. Pacific Cable Co., Inc., 73251/2 Reseda Blvd., #110, Reseda, CA 91335. (818) 716-5914.

SATELLITE Television Systems, Wholesale to public. For free catalog call 1-800-624-2964. In Pennsylvania collect 717-586-1733. Mon - Fri 9 to 5 EST.

BUILD Your Own Satellite TV Receiving System And Save! Instruction manuals, circuit boards, kits! Send stamped envelope for information: XANDI. Box 25647, Dept. 28S, Tempe, AZ 85282.

VIDEO Classics-Sales-Rent by mail. Free Catalog. Video, Box 7122, Burbank, California 91510

CAMPERS & TRAILERS —KITS, PLANS

BUILD YOUR OWN - Travel Trailer - Fifth Wheeler - Motorhome - Camper - Pickup Cover - Plans - Patterns - Kits -Catalog \$1 - Glen-L R-V's, 9152PM Rosecrans, Box 756, Bellthower, CA 90706.

TRAILER PARTS

TRAILEX ALUMINUM TRAILERS can now be purchased direct and delivered or shipped to your door. We have twenty three years of successful field experience, over 65,000 traiters in use. Call 216-533-681e4 or Write: Box 553, Canfield, Ohio 44406. TRAILEX builds Lightweight Non Rusting Trailers to carry anything towable.

BOATS, OUTBOARDS, TRAILERS, &

BOAT KITS - PLANS - PATTERNS - World's Largest Catalog - 200 Designs - 40th year - 8'/80' - Plywood - Fiberglass - Steel - POWERBOATS - Cruisers - Houseboats - Hydroplanes - Runabouts - Duckboats, Canoes, Kayaks - SAIL-BOATS - Daysailers - Trailersailers Multihulls - SUPPLIES - Epoxies - Polyesters - Cloth - Foam - Fastenings - CATALOG - \$3.00 (Airmail \$5.00) - Includes free International Design Catalog, (Amateur Boatbuilding Book \$6.00), CLARKCRAFT, 16-P Aqualane, Tonawanda, NY 14150.

BOAT Plans - Patterns - Kits - Hundreds of designs - 7',55' - Sailboats - Powerboats - Sportfishers - Houseboats - Row-boats - Duckboats - Bassboats - Cances - Kayaks - Hydroplanes - Dories - Boatrailers - Simple construction - Proven instructions - Tremendous savings! Gigantic 160-page catalog \$3.00 (\$4.00 Airmail) - Includes Free "Boatbuilding Supplies" catalog - Fiberglass - Fastenings - Glues - Books, Revolutionary "Poxygrip!Poxyshield" manual \$2.00. Glen-L, 9152 Rosecrans, Box 756MP, Bellflower, CA 90706

EVINRUDE - ALL BRANDS - 1984 Bargains ... all sizes ... \$2.00 handling ... Scott McCulloch parts ... Electra Marine, 610 Merrick Road, Lynbrook, New York 11563

BOAT KITS — SAIL — 16'-30'. FIBERGLASS. Save half. Anyone can assemble. FREE 48 page catalog. LUGER, Dept. BC-26, P.O. Box 1398, St. Joseph, MO 64502. 816-233-5116.

CAMPING EQUIPMENT & TENTS

FREE BROCHURE. Equipment for campers and triathletes. Write: JFB, Box 24U, Montoubville, PA 17754

CUBELESS COOLER No Batteries no cords 25 qt, durable hinged lid, cold for hours send \$11.95 to: Smalling Bros., Box 88, Blue Point, N.Y. 11715

OUTDOOR EQUIPMENT

PICNIC TABLE: Stowaway Picnic Table is a clever onepiece design that folds like a scissor for convenient storage. Easy to build. (PL-1716-\$5.95). Send order to: Popular Mechanics, P.O. Box 1014, Radio City Station, New York, NY 10101

ATHLETIC EQUIPMENT AND BODY BUILDING COURSES

BIGGER, More Powerful Muscles - faster!! Free Booklet! Universal, Box 6694A, Detroit, Michigan 48240

KUNG-FU Free Lessons, Send \$1.00 for Postage, McLisa, Box 1755, Dept. PM86C, Honolulu, Hawaii 96806

SKI RACK - Wall mounted. For storing skis & poles year round. Finished pine. Replacement Guaranteed. \$9.95 plus \$2.00 shipping. Grandma's PM1, 18704 U.S. 20, Bristol, In. 46507.

STRONGER, Leaner Waistline!! Proven Plan! Cecere, 277 Whitehall Rd., Garden City S., N.Y. 11530

BODYBUILDING At Home. Free booklet gives insiders secret, fast NEW ways to build BIGGER, more powerful muscles. American Titan, Box 6892, Leawood, Kansas 66206

SPORTING GOODS AND EQUIPMENT

SPORTSMANS UTILITY KNIFE — 12 tools in one. Stainiess steel, compact, perfect for fighermen, campers, hunters and handyman. \$6.95. Stewart's Premium Products, 2231 Scott, PM1, Des Plaines, IL 60018

GENUINE goatskin wine sack. Great for hikers, cyclists, campers. Holds one quart. Satisfaction Guaranteed. \$6.95 to: Practical Products, 150M W. 87 Street #2B, New York, NY 10024

FISHING, TACKLE, LURES

FREE Sinker Mold Catalog over 100 molds 25 shapes. Carmen's, Box 220PM, West Newton, PA 15069

FISHING, TACKLE, LURES

(Continued from preceding page)

FISHERMEN! Plastic Worms. Samples \$10.00. DMS, Dept. PM. Box 27, Judson, Texas 75660.

SPORTSMEN'S Video Tapes. Catalog \$2.00. DMS, Dept. VPM, Box 27, Judson, Texas 75660.

FISHERMAN'S dry fly assortment. 12 famous flys complete with case. Satisfaction Guaranteed. \$5.95 to: Practical Products, 150M W. 87 Street #2B, New York, NY 10024

GUNS, DECOYS, HUNTING

BEEMAN HIGH POWER ADULT AIRGUNS, Fine Firearms, Magnum Stingshot. Guaranteed best prices for the very tinest. Unexcelled power yes, but more importantly: unequalled accuracy, trigger action, durability, ownership pride. \$1 Lifetime Repair Policy. Mention code PMC for FREE Airgun Catalog-Firearm Information. Add \$1 for fast mail. Beeman, 47-PMC Paul, San Raleel, Calif. 94903. (415) 472-7121, 24 hours.

BATTERY REBUILDING SCHOOL

REBUILDING and reconditioning information/prices. \$3.00 postage/handling. Sun Battery/Moore Tool, 10415 US 98, Sebring, Florida 33870.

ENGINES, MOTORS

BANKRUPT SALE! 386cc two cycle engines. Complete with electric start, carburetor, manuals. Brand new - \$250. Save Hundred\$. Hydrotech, Box 14444, Long Beach, Ca. 90803, 213-424-6094.

TOOLS FOR SALE

BOLTS, SCREWS, TOOLS, WHOLESALE, DIRECT. Guaranteed. Catalog \$1.00 (Retundable). Camelot, Dept. 44, Box 65, Bristol, Wisconsin 53104

UPHOLSTERY SEWING MACHINES

UPHOLSTERY Sewing Machines with Walking Feet, Complete ready to use—only \$488.00. Thompson Model PW200-AVAILABLE FROM YOUR LOCAL DEALER, or order direct. (Master Charge-Visa). Datho Mig., Inc., P.O. Box 12110. Lubbock, Texas 79452—Phone: (806) 744-6774

MACHINERY, TOOLS & SUPPLIES

4" METAL Cutting Lathe \$104.50. Taig, 15048 Proctor, Industry, CA 91746

BEST Prices, Woodworkers Machinery Catalog, Free. McKilligan, PMC86, Johnson City, N.Y. 13790

LATHES, Mills, Tools. Many manufacturers. Blue Ridge, Box 536V, Hurricane, WV 25626. 1-800-872-6500. WV: 1-562-3538. Catalog \$1.00.

SMALL FOUNDRY Furnaces, Supplies. Free literature, Pyramid Products, 3736 South 7th Avenue, Phoenix, Arizona 85041

"SHARPENERS REPORT" Monthly Newsletter, Sharpening Guidebook, Angle Wall Chart, Free details. Skog Company, Dept. PM3, P.O. 22559, Minneapolis, MN 55422

BANDSAW BLADES, Any Size, Free literature. King Saw, 6541 Tidewater Drive, Norlolk, Virginia 23509

STEEL, Aluminum, Brass—Sheet, Bar, Shop Supplies, Plans. Write: CEI, RR1, Box 163, Cameron, IL 61423.

CARBIDE - TIPPED, Circular Saw Blades, Free Iterature. Blades, 801 Dept. 2 East Harrison, Seattle, WA 98102

GERSTNER Tool Chests, buy factory direct and save. Send for free brochure. H. Gerstner & Sons, P.O. 517, Dayton, Ohio 45402.

WELDING, SOLDERING, PLATING

"WELD LIKE A PRO" (booklet) Whips, Weaves, Positions, Illustrated \$2.95. Construction Specialty Services, 3290 E. Simmons Rd., Edmond, OK 73034

ENERGY SAVING

SAVE ENERGY! SAVE MONEY! Lightbulb saver converts alternating to direct current, extends lightbulb life approximately ten years. Set of 6 for \$9.95 plus \$2.40 postage. Guaranteed. Catalog \$2.00. K. G. Gaines, Dept. A, 1566 Mariwood Circle, Charlotte, NC 28212

FIREPLACES and WOODSTOVES cleaned AUTOMATI-CALLY, Easy, Quick and Safe with the ASH GENIE. Send for illustrated brochure. Please enclose \$1.00 postage and handling to: Air Tech., P.O. Box 521P, Sutton, Nebraska 68979

SOLAR & ALTERNATE ENERGY

FREE HYDROGEN FUEL and Oxygen Generator uses Water and Solar Cells. Plans and Kit \$12.00. Prairie Power, Box 8291, Edmonton, Alberta, T6H 0L0, Canada

HOME CRAFTSMAN

WOODEN TOYS, plans, parts, wheels. Catalog \$1,00-WOOD CLASSICS, Box 389M, Everson, WA 98247

OVER 400 WOODWORKING DESIGNS! Create profitable toys, gifts, whiringigs, folk art, household accessories and more! Brochure PLUS Sample Pattern only \$2.00. Accents (BP-36), Box 262, Danvers, MA 01923.

WOODCRAFT PATTERNS, Windmills, Wishing Wells, Bird Houses, Feeders, Flying Duck, Pheasant, Outdoor Planters, Catalog \$1.00. Crafters, 11840 US. 27 North, DeWitt, Michigan 48820.

MAKE WOODEN TOYS - PROJECTS - 100's Plans, Kits. Hardwood Parts (toy, craft, furniture), Tools, Wood, Supplies. Color Catalog \$1.00. (614) 484-4363 - Cherry Tree Toys, Belmont, Ohio 43718 - 0369

HARDWARE CATALOG \$1.00 Refundable with first order. The Bever's, P.O. Box 12, Wills Point, Texas 75169

WORLD'S LARGEST CATALOG? Three pounds 704 pages. Every Tool, Supply, Machine Imaginable \$5.00. Refundable. McKilligan, PM-3-86, Johnson City, New York 13790.

BATTERY CLOCK MOVEMENTS. Below wholesale prices. Best Quality Catalog \$1.00 (refundable). Yankee, Box 26, Thompson, Connecticut 06277

FAVORITE WOOD TOYS, Patterns, Parts, Wheels, Catalog \$1. Toys and Joya, Box 626M, Lynden, Wash. 98264

CATALOG FULL-SIZE FURNITURE PLANS - \$2.00. Refunded with first order. Traditional, Early American, over 180! Furniture Designs, 1425 Sherman, Dept. CP-86, Evanston, IL 60201.

PICTURE FRAMING SUPPLIES — Moulding, Matting, Tools, More - Catalog \$2.00 (refundable) — Japs, 126-PC Seventh North, Hopkins, Minnesotis 55343.

THREE WHEEL SLOT MACHINE

MADE from wood, fun for all without payoff, plans \$4.00, R. Mikels, 1142 Lee Rd., Troy, Ohio 45373

STAINLESS Steel And Brass, Screws And Bolts. Small Quantities, Free Catalog. Elwick, Dept. 576, 230 Woods Lane, Somerdale, N.J. 08083

MAKE PVC PIPE FURNITURE. Many proven plans. Profitable home business. FREE details. J&L Casual Furniture, Box 208, Tewksbury, MA 01876

MINI STORAGE BARN PLANS. 10 detailed sheets, \$5.00. Quality Plans, Box 302, Eau Claire, MI 49111

FREE TOY PLAN Catalog \$1. Peanut Butter Toys, Box 296PM, Ossipee, N.H. 03864

BEST Country Furniture Plans. Catalog \$1.00 (refundable). Hammermark Associates, Box 201PM3, Floral Park, New York 11002.

WOOD, WOODWORKING

FREE WOODEN TOY PLAN \$4.00 Value. Send \$1.00 for postage. Toycraft, 601-PM3 East Main, Waynesboro, PA 17268

MAKE your own work bench from a laminated table top. Southern Pine, Box 1056, Bay Minette, AL 36507

CHERRY, OAK, WALNUT, MAPLE Boards. Small Orders Our Specialty. Send \$1.00 for Listing (Refundable). Park Timber, P.O. Box 558P, Orchard Park, N.Y. 14127

WOODWORKER'S supplies catalog!! . . . Hundreds veneers, toymaking, turning squares, carving blocks, hardwoods, patterns, books, cane, dowels, pags, spindles, morel Bargain offers included. Send \$1.00. Morgan, P01M31, 1123 Bardstown, Louisville, Kentucky 40204.

PLANS, BLUEPRINTS, PROJECTS

PLANS FOR 100+ TOOLS, Catalog \$1.00 Refundable. Wood-Met, 3314 Schoff, Peoria, II. 51604

77 INNOVATIVE BARNS, WORKSHOPS, GARAGES.
Catalog 34. (REFUNDABLE). ASHLANDBARNS, 990PM
Buttercreek, Ashland, OR 97520.

MULTIPURPOSE UTILITY SHED: This 12 × 16 structure is ideal for storing all lawn and garden equipment, including a tractor and compact car. Special features include "a 7-ft-wide overhead garage door. "Fold-down stairway and exterior doors, for convenient access to the storage loft, both are extra wide for easy handling of building of materials. "Built in work-bench with roll-out storage bins below and cabinets above provide plenty of work room. (PL-4/85 - \$17.50) Write: Popular Mechanics, P.O. Box 1014, Radio City Station, New York, N. Y. 1019.

HOME BUILDING & REMODELING

BUILD/REMODEL YOUR HOME. New Kit Erases Doubts, Estimates All Costs, Gets Loans. \$5.95. William Sturley, 20705 Smallwood, Birmingham, MI 48010.

800 parts for WINDOWS - PATIO DOORS - STORM DOORS - DRAWERS - CLOSETS. FREE PART IDENTIFI-CATION SERVICE. Repair instructions for double hung windows. Wood Snap-in window grilles. Catalog \$2.00 refunded with first order. VIsa. Blaine Window Service, 1921 Blaine Dr. PM-16, Hagerstown, MD 21740 (301) 797-2510

PLASTICS

CASTOLITE Liquid Plastics. Crystal clear, colors. For casting, embedding, coating, fiberglassing; in industry, laboratories, craft work. Reproduce your designs with our mold materials. Cstatog \$2.00. CASTOLITE, Dept. 86C/PM, Box 391, Woodstock, II. 6008.

BUY guaranteed replacement plastic furniture \$4.00 information. Plastic Man, 6223 Maple, Box 4237, Omaha, NE 68104

DO IT YOURSELF

ELECTROPLATING kits, complete, \$17.95. Free Details. Judsonco, 321PM Charles, Cherokee, IA 51012.

ELECTROPLATING. Complete amateur's textbook. All metals Electroplate metallic/nonmetallic items \$11.95. Details free. Tropic, Box 95-P3, Palm Bay, Florida 32905.

BELT BUCKLES for coins or stones, specialty buckles, jewelly mountings, cut stones, clock works. Wholesale catalog 25c. Eloxite Corp., 8061/2 10th Street, Wheatland, Wyoming 82201

INSTALL YOUR OWN IN GROUND SWIMMING POOL for as low as \$1,895.00. Cheswick Pools, Rt. #28, Cheswick, Pa 15024, 412-274-6400

APPLIANCE REPAIR - Book written by Retired Service Technician shows SECRETS, FREE DETAILS. DLR Publications, 713 Silverstone, Richardson, Texas 75080PM

"PROFESSIONAL" GIANT SCREEN PROJECTION TV—
"Don't be fooled by cheap imitations!" . . . "Build the best for home or high profit with lenses and screens utilized by SONY, ZENITH, SYLVANIA, and MAGNAVOX!" . . Simple construction! . . . Illustrated information and complete parts catalog \$2.00 . . . Money back guarantee! . . . POLI-VISION, 187K Cypress St., Throop, PA 18512

NOW! . . . REPAIR TV'S . . . EASY. Servicemen reveals SECRETS. Write, Research, Rt. 3 Box 601BN, Colville, WA 99114

COMPLETE In-Ground Swimming Pool Kits from \$1595.00.
Free Brochure and Price Lists. Burnett, 4801 Bunkerhill, North
Little Rock, Arkansas 72116. 1-800-251-4663 Ext. D10.

TERMITE repair book, free information. P.O. Box 7654, San Jose, Ca. 95150

REPAIR MOST ANY TV . . . EASILY! Write: Caltronics, 902 Maine, Windsor, IL 61957

TIRED of buying razor blades? Blade hone with instructions. This tool really works. \$7.50. Patent pending. John H. Henry, Rt. 2, Box 56-B, Beaver Dam, Wisc 53916

GOPHERS Leave Your Yard Fast! Guaranteed Method -\$2.00. Pacific, Box 1015, National City, CA 92050

HEATING & AIR CONDITIONING Brand Name Boilers, Furnaces, and Air Conditioners. All Makes and Models - Lowest Prices. Boilers - \$595.00. Furnaces - \$249.00, Central Air Conditioners - \$395.00. Do it Yourself & Save. Write: Heatmasters, 5540 W. Lawrence Ave., Chicago, II 80630

PROJECTION TV ... Convert your TV to project 7 Foot picture ... Results comparable to \$2,500 projectors ... Total Cost less than \$30.00 ... PLANS AND 8* LENS \$19.95 ... Illustrated information. FREE. Macrocoma-BG, Washington Crossing, Pennsylvania 18977. Creditcard Orders 24HRS. (215) 736-3979.

DO IT YOURSELF

(Continued from preceding page)

NEW T.V. PROJECTOR LENS, TURNS ANY T.V. INTO PROJECTING 7-FOOT PICTURE. Lens And Plans \$16.95 (MONEY BACK GUARANTEE). FREE Information. Angel Gifts - BP1, 6481 Attartic - N108, Long Beach, California 90805

TROUBLE with your "HoneyDo" projects? Send \$5.95 + SASE and the details, we send you the specifics on how to remodel or build. Jack - Box 1348, Wellace, Idaho 83873.

PROFITABLE EASY FUN Beautiful Furniture From 2×4's. Photos Plans Only \$4.95 Or Details 25¢. Doit-Ur-Self, Box 87P, Syracuse 13205

UPHOLSTERING SUPPLIES. \$1.00 for catalog. Variety Products, Box 566P, Lathrup Village, Michigan 48076-0566

4,321 Catalogs listed. Sources for Anything! \$5.00. Directory, Box 92452N, Atlanta, Georgia 30314

DUTCH TREAT Do-it-yourself plans and instructions for building your own Dutch Mini Barn. Attractive and practical. Offers large storage area — 10" × 131/2" with 8 feet of headroom. Detailed drawings and materials list. (B-1279—\$5.95) Write: Popular Mechanics, P.O. Box 1014, Radio City Station, New York, NY 10101

ARTS, CRAFTS, SUPPLIES

LEATHERCRAFT Supplies catalog, tools. \$1.00 (Refundable.) Crafter, Tom Bean, TX 75489-0778.

STAINED GLASS SUPPLIES Complete Catalog \$2.00 (refundable). Sunshine Glassworks, 3690 Harlem, Dept CT, Buffalo, NY 14215

CLOCK WORKS. Wood clock blanks, rockhound supplies, belt buckles, cut stones, etc. Wholesale catalog 25c. Eloxifie Corp., 8061/2 10th Street, Wheatland, Wyoming 82201

JEWEL-like crystal stone clocks. No two ever alike! Kits/finished. Steebar, P.O. Box 463P, Andover, N.J. 07821

STAINED GLASS SUPPLIES: EXCITING SUPER CATA-LOG-PM \$3.00. CORAN-SHOLES INDUSTRIES, 509 E. SECOND, BOSTON, MA 02127.

"GETTING Started in Stained Glass" \$1.00. Whittemore, Box 2065T, Hanover, Mass. 02339.

WOODCRAFTS: Catalog \$3,00 (refundable). Larson Wood Manufacturing, Box 672P, Park Rapids, Minnesota 56470

CARTOONING, COMMERCIAL ARTS, SIGN PAINTING

CARTOON for Fun and Money!!! Free booklet!!! Cartoons, Box 40614A, Detroit, Michigan 48240

LEARN SIGN PAINTING, Cartooning, Pinstriping, Free Catalog, Kaufmann Company, Centertown, Missouri 65023

MODELS, MODELS SUPPLIES

FIRING CIVIL WAR 2" - NAPOLEAN Model CANNON PLANS, \$8.00: CATALOG \$1.00. Green-PM36, Box 892, Shalimar, FL 32579-0892

RADIO CONTROL Airplanes, Boats, Helicopters, Supplies. Big Discount Catalog \$5.00 (Refundable), Modelers Supply, Box 310P, Eclectic, AL 36024.

SAILBOAT in bottle secret revealed, plans \$6.00. Laurdon, Box 864, Hamburg, New York 14075

"WORKING STEAM MODELS!" KITS or ASSEMBLED. Tractors, Locomotives, Limousine, Roadster, Truck, Engines. Two Steam Books total 59 Color pages \$4.95 (Refundable). Colored Circular \$1.00 Winter Discounts 20%. Diamond Enterprises, Dept. PMF, Box 537, Alexandria Bay, NY 13607. (613) 475-1771

SAVE MONEY on STEAM ENGINE KITS Fast delivery on quality American made power models. Free illustrated facts. P. M. Research Inc., Dept. 7, RD#2 Box 29, Wellsville, NY 14864.

MAGIC TRICKS, JOKES, VENTRILOQUISM

FREE Catalog! Things you never knew existed! 1600 Novelties, Jokes, Tricks, Science, Hobbies, Sports. Johnson-Smith, C-1013, Mt. Clemens, Mich. 48043

LEARN VENTRILOQUISM! Guaranteed Instruction, Supplies, DUMMIES, Information Free! Maher, Box 420-PM, Littleton, Colorado 80160.

HOBBIES & COLLECTIONS

MILITARY Medals Catalogue \$1.00. Subscription Yearly \$6.00. Vernon, Box 1387PM, N. Baldwin, NY 11510.

NAZI - Collectors, Our Super 256 Page Fully Illustrated Catalog. \$3.00: W.W.#2 Ltd., Box 2063PM, St. Louis, Mo. 63158

BASEBALL CARD SETS FOR SALE. 1986 Topps (792 cards) \$19.95, 1986 Fleer (660 cards) \$18.75, 1986 Donruss (660 cards) \$21.95, 1985 Topps (792 cards) \$19.95. All sets in mint condition - Add \$2.00 postage per set. Catalogs FREE with orders or send \$5.00. We accept Visa - Mastercard & C.O.D. FAST SERVICE. Send orders to: Howard's Coin Shop, 119 East Main St., Dept. PM, Leipsic, Ohio 45856. For C.O.D. or VISA - Mastercard orders call Day or Night 1-419-943-2612.

NAZI & Historical Military Collectibles. FREE catalog. HMA, Box 1806PS, Lafayette, CA 94549.

DECALS, EMBLEMS, PATCHES

CUSTOM EMBROIDERED EMBLEMS, PINS, DECALS. Free Catalog Quotes. Rush Sketch. Stadri, 61P Jane, N.Y.C. 10014. (212) 929-2293.

WHOLESALE Prices - Factory Direct- Embroidered Emblems, Caps And Pins - Free Catalog. . Wiltex, Box 977-PM, Paterson, N.J. 07503

SELL FLAG DECALS - 500% Profit. Send 25¢ and SASE for sample and sales information. Advertising Ideas, Dept. P. P.O. Box 2176, Springfield, IL 62705

ANTIQUES, RELICS, INDIAN GOODS & CURIOS

FREE List to Serious Collectors. 30,000 Indian Artifacts, Pots, Spears, Axes, Slate, Beadwork, Caddo Trading, Box 669, Murfreesboro, AR 71958

INDIAN retics List 35c. Identification Book \$10.00pp. Arrowheads, etc. samples \$16.50pp. Secrist's, Deerfield, Mo. 64741

BUYING ARROWHEAD COLLECTION, write describing quality, types artifacts, outstanding pieces, where found, price. Collins, Suite 806, 2001 Bryan Tower, Dallas, Texas 75201

STAMP COLLECTING

WOW! 50 All Different Germany 25cl Super collection of genuine Germany Commemoratives, Definitives, Airmails, High Values. Free Big Catalog. Also fine stamps from our approval service. Buy what you like. Peturn balance promptly! Send 25c today! Thank you. Jamestown Stamp Co., Dept. A36PM, Jamestown, NY 14701

50 YEARS Old fifteen different United States, over tiffty years old—25c with approvals. Jaxon, Box C11-P, New Rochelle, New York 10804

FREE!!! Beautiful Stamps. Gold, Silver, Other Approvals. Delor, 21127 Fleetwood, Harper Woods, MI 48225

UNITED Nations 3 Complete Mint Sets 25c, Approvals, Cometta, POB 1509-M, Lake Placid, Florida 33852

BREATHTAKING Beautiful. 50 Different mint Monaco pictorials commemoratives only \$1.50 with mint complete set approvals. Pagoda, Box 132P, Sidney, Ohio 45365.

WORLD Wide Stamps mounted in books on approval 2¢ and up. TRUST STAMP COMPANY, P.O. Box 100-P, Jamaica, N.Y. 11435

FREE Surprise Collection with approvals. Gould, Box 2130, Petaluma, CA 94953

ONE! Two! Three! Cent Stamp Approvals! Regardless Catalog. Kloster, 4164 52nd, San Diego, CA. 92105

"WHOLESALE" U.S.—Foreign Pricelist and catalog Free! Everything Guaranteed. No Approvals. Schneider, Box 1240, Grand Rapids, Michigan 49501

"INVERTED ERROR" + 100 Different United States, 50c with approvals. Luray, P.O. Box 7088, Silver Spring, MD 20907

FREE U.S. Mint Set. Approvals. Hildebrand, Box 4867, Santa Clara, California 95054

35 DIFFERENT Old U.S. Revenue Stamps \$1.00. Winchester Stamps, Box 3592, Mansfield, Ohio 44907

U.S. 6 commemorative plate blocks or 30 mint commemoratives \$1.00! Approvals. Gordon Davison, Nokomis, FL 33555 100 Different U.S. 25c, Approvais. Bradley, Box 425P, Midlothian, VA 23113

CANADA. 50 different 25c. Approvals. Oroszky, Box 1-C, Samia, Ontario, Canada N7T 7H8

BARGAIN 100 World-wide Stamps 25c. Quality Approvals. R. Parker, Box 143, West Brookfield, MA 01585

50 DIFFERENT Old U.S. between 1861 and 1939 - \$1.00. Ed Roush, 423 Shepard, Mansfield, Ohio 44907.

CANADA starter packet including commemoratives 10c, approvals. Harley Boardman, Little Valley, New York 14755

FREE Gift With First Purchase. U.S. Approvals And Want List Service. 20c for Handling. The Stamp Boutique, P.O. Box 456, Madison, N.J. 07940

101 Large Pictorials 50c when requesting worldwide approvals. Benet, P.O. Box 210244, Dallas, TX 75211.

50 RUSSIA 25c Worldwide Approvals. Birnell, 2304 Hancock #9P, Austin, Texas 78756

200 DIFFERENT Canada \$1.00. Approvals. Quebephil, Box 68M, St-Jerome, Canada J7Z 5T7

FREE price list for Canadian stamps, Damell/Lighthouse albums, supplements and accessories. Ken's, Box 3318, Revelstoke, B.C., Canada VOE - 250

APPROVALS Denmark, Finland, Iceland, Norway, Sweden. Nordic, 5144 I-Ah-Maytah, Oshkosh, WI 54901

50 U.S. Mostly Commemoratives Plus Mint Souvenir Sheet 25c. No Approvals. Gibson, Box T, Williamstown, N.J. 08094-0469

FREE! Big Bargain Catalog - New Edition listing thousands of bargains including U.S. & B.N.A. stamps, packets, albums, accessories and supplies. Also line stamps from our approval service. Buy only what you like. Return balance promptly! Thank you. Jamestown Stamp Co.. Dept. E36PM, Jamestown, NY 14701

100 LATIN AMERICAN \$1.00 with attractive approvals. Jaydee, 3995 Sandy Hill, Buford, GA 30518.

\$15.00 COLLECTION: \$1.00. Approvels, third catalog. Gains, 716-S Sixteenth, Mattoon, IL 61938

SPECTACULAR! 300 Breathtaking Stamps from 35 Countries. Only \$1.00 with latest bargains and sensational approvals. StampsPlus+, Dept. MC6, Box 982F, Toronto, Canada M4Y 2N9

FREE 100 Canada with request of World Wide approvals. Briner's, P.O. Box 5607, San Mateo, Calif. 94402

ISRAEL 15 Different 10c Approvals. Sam Chazen, Box 666, Delray Beach, Florida 33444

107 Different Triangles, Space, Animals, Etc. \$4.00 Value Only 10c. Approvals. Fayette Stamps, Dept. 418M, Fayetteville, NY 13066

100 Different United States And British Commonwealth Commemoratives One Dollar With Approvals. SSS, Box 208, Wales, WI 53183

GRENADA, "Space", Olympic, USA "Bi-Centennial" Collections - Free! "Approvals." William Deems, 226C Race, Ravenswood, West Virginia 26164

FIFTY U.S. 25¢, Approvals. Zanetich, P.O. Box 264P, Oaklyn, New Jersey 06107

FREE 25 World Wide Stamps Plus Free Catalogue With Over 2,000,000 Stamps. No Approvals. Jefferies, 28311 Franklin, C334, Southfield, Michigan 48034.

WORLDWIDE 100 Different Beauties, 25c. Approvals. J.D. Michaei, P.O. Box 2273, Martinez, CA 94553

COINS, TOKENS, CURRENCY

PROFIT from coins, Information for new and experienced collectors, \$3.00 to: Red Jacket, 104 Kokomo Street, Box 7, Depow, NY 14043

SILVER half-dollar, \$2.00. Catalog. Chesscoin-65, Box 153, Wyoming, PA 18644

CLUBS & SOCIETIES

NEW FRATERNAL ORDER For Men, Women \$10.00 Annually. FREE Details. Gator, 781W Oakland Park, Fort Lauderdale, Florida 33311

PLAYS, SONGS, MANUSCRIPTS

POEMS, Songs Wanted. Free Recording/Publishing. Broadway Music Productions, Box 7438PM, Sarasota, FL 33578

MUSIC INSTRUCTIONS & INSTRUMENTS

ACCORDIONS, NEW, USED. Electric, electronic, Cordovoxs, concertinas, Button Boxes, Hohners We Buy, Self. Trade, Exchange, Repair, Tune, 50 Years Experience. If Deal ers unavailable, Call or Write for Brochures, Mastercard And Visa Accepted. CASTIGLIONE ACCORDIAN, 12644 E. 7 Mile, Detroit, MI 48205. 313-527-1595

INSTRUMENT Kits! Build Appalachian and hammered dulclimers, banjos, mandolins; even harps, harpsichords. Free Catalog. PM Hughes, 4419 West Colfax, Denver, CO 80204

PIANOS, PLAYERS, PUMP ORGANS. Rebuild and repair. log of "How-To" books, \$2.00 (refundable). Vestal Press. Vestal 11, New York 13850.

VIOLIN, GUITAR, etc., making materials, accessories. books. Catalog, \$1.00. International Luthiers Supply, Box 580397, Tulsa, OK 74158

ACCORDION Top Brands, Cordovox, Buy Direct. Treme dous Discounts. Trades accepted. Free brochure. PM, Accordion-O-Rama, 16 West 19th Street, New York, NY

INTERNATIONAL VIOLIN COMPANY, Catalog for instrument makers, repairers. Imported tonewood, tools, vamishes, perts, accessories, strings, cases. European instruments, bows. Assemble yourself violin and guitar kits. Catalog \$1.00 includes 10% discount certificate. Dept. HC, 4026 W. Belvedere Ave., Baltimore, Md. 21215.

POEMS Wanted. Cash Awards. Nashville Music, Box 40001PM, Nashville, TN 37204

SELF IMPROVEMENT

LEARN 10 languages each year while striding, driving, 200 Language Club, Box 1727, Beverly Hills, Calif. 90213

STOP smoking in 5 days. Free details. Self Addressed, stamped envelope. Box 6443A, Las Cruces, NM 88001

DISCOURAGED? You can have a new life! Send \$1.00 with name, address, AND age for Bible lessons. The Mailbox Club, 404 Eager Rd., Valdosta, Ga. 31602

CHOOSE from over 300 self-improvement books. Write to: Leo's Gifts and Specialties, 3517 Wappato Court, Bozeman,

STOP SMOKING! With this helpful booklet you can! Send \$2.95. Collins Publishing, Box 259PM, Murdock, FL 33938

EDUCATION & INSTRUCTIONS

BE A PARALEGAL-Handle your own legal affairs. Accredited Attorney Instruction. Home Study, FREE CATALOG. Southern Career Institute, Drawer 36PM-2158, Boca Raton. FL 33427, (305) 368-2522

SUPER-INTELLIGENCE Amazing method sent Free! EDEMP, Box 1462, Glendora, CA 91740

TERMPAPER ASSISTANCE. 15,278 papers available! 306-page catalog—rush \$2.00. Research, 11322 Idaho, #206PS, Los Angeles 90025. OR, CALL 213-477-8226.

LEARN Sewing Machine repairing. A profitable Trade. Easy to learn. Free details. Sewing Center, 187 FR, Rochelle, GA

HIGH SCHOOL DIPLOMA AT HOME, NO CLASSES, Low cost. Information FREE. Call toll free 1-800-228-5600 or write: American School, Dept. #345, 850 E. 58th St., Chicago, IL

FREE Catalog. Learn Auctioneering. Nashville Auction School, Box 190, Lawrenceburg, Tennessee 38464

PIANO TUNING PAYS - Plano tuning - Electronic organ servicing. Learned easily at home. Free booklet. Niles Bryant School, P.O. Box 20153, Sacramento, CA 95820

AUTOSUGGESTION. Sleep-learning headquarters(Tapes, records, books, Gigantic catalog free. Research Association, Box 24PM Olympia, Washington 98501.

LEARN Asleep or awake. Records, tapes, equipment! Free catalog! Drawer PM-400, Ruidoso, New Mexico 88345

EXTENSION And Post-Graduate Awards in Philosophy, Art, Science, Botanic, Medicine, Homeopathy, Radionics, and others. 30 subjects Curricular free (airmail \$1.00 refundable). Registrar, Sussex College of Technology, Highfield, Danhill, Sussex, England.

RADIESTHESIA, Radionics, Dowsing E.S.P. Courses and Equipment Illustrated Catalog \$1.00 (refundable) Established 27 years. Dept. PM/R, Bruce Copen, Highfield, Danehill, Sussex, England RH17 7EX.

A UNIVERSITY DEGREE CAN UNLOCK YOUR EARN-ING POWER. Complete your B.A., M.A., P. hD., or J.D.* Credit for work/learning experience. No classroom attendance required. 'Registered with California Committee of Bar Examiners. KENSINGTON UNIVERSITY, 330 N. Glendale Ave., Glendale, CA 91206. In Calif. (800) 421-9115, ext.84. Other States, (800) 423-2495.ext 84.

L-EARN Clock Repair, State Approved. Free Catalog. School of Clock Repair, Rm M, Squire Village, 7 Cambridge Ct., Toms River, NJ 08753.

STOP NOW! DON'T MAKE ANOTHER MORTGAGE PAY-MENT . . . until you have read this booklet. Possible savings of \$10,000 to \$30,000 of interest. Send \$3.00 today for incredit simple method. Gremann, P.O. Box 5433, Roanoke, VA

TYPEWRITER Repair at home. Moneymaking career. Typewriter Inst., 147A Crooks, Paterson, NJ 07503

LOCKSMITHING. Free book. Locksmithing Institute, Dept. 310-036, Little Falls, NJ 07424

HOMEOWNERS - Save thousands in mortgage interest payments. Send \$2.00: RK Information Enterprise, P.O. Box 190, Dept. AC1, Plano, Texas 75086

DETECTIVE training home-study program. Free informa-tion. Global, Box 191 PM, Hanover, Mass 02339

DEUT. 18; Joel; Malachi; Acts; James Evangelize. 1127 NE Fifth St., Ocala, FL 32670

LOCKSMITHING, Universal School of Master., Correspondence and Shop Training, Box 214652PM, Sacramento, CA 95821

UNIVERSITY DEGREES By Mail. Accredited Bachelors, Masters, PhD's. Free Facts Revealed. Careers-PM3, Box 470886, Tulsa, OK 74147

SUPERLEARNING! Triple learning speed through music! Develop Supermemory; control stress; access potentials. Free - book excerpt & catalog. Superlearning, 450-P3 Seventh Avenue, N.Y.C. 10123

SCHOOLS

WHY NOT INVESTIGATE COMMERCIAL DEEP SEA DIV-ING AS YOUR CAREER? Our Graduates are working worldwide making excellent money. Send \$5.00 (fully refundable upon enrollment) for catalog containing disclosures, credentials, course outline, employment statistics, instructor qualifications, progress standards, financial assistance to: Divers Institute of Technology, Inc., P.O. Box 70312, Dept. PM, Seattle, WA 98107

WORLD WIDE COLLEGE of Auctioneering, Inc. The original—50-yrs.—Worlds largest! Term soon. Approved for V.A. Free catalog. COL. GORDON E. TAYLOR, Box 949, Dept. 19, Mason City, IA 50401. 1-800-255-2255, Ext. 5242.

EMPLOYMENT INFORMATION

ROCKY MOUNTAIN EMPLOYMENT NEWSLETTER!! Colorado, Idaho, Montana, Wyoming! Current openings - All occupations! FREE INFORMATION!! Intermountain-I Colorado Springs, Colorado 80907. Hancock. 1-303-630-7478 X112.

SHIPS, Tugs, Cruiseships, Riverboats. Women, Men. \$15,000-\$60,000 Work month, Home month. Experience unnecessary. U.S. 112 Countries. Free report. SASE. Marine Employment, Box 207, Central, IN 47110

FIREFIGHTING Earn \$20,000+. Learn How SASE. P.O. Box 402, Alpine, CA 92001

EAGER TO MAKE MONEY? Write for free details! No obligation. Career & Opportunity Inc., 12555 Biscayne Blvd. Suite 920, Miami, Florida 33181

FEDERAL Employment (nationwide) Newsletter, 137-56th 232nd Street, Laurelton, New York 11413. (Free Information).

JOBS-ORLANDO, FLORIDA. Great demand in every field! Free report. Tortora, Dept. 40, 6422 Undine Way, Orlando, FL 32808.

EMPLOYMENT WANTED

ARE YOU LOOKING FOR EMPLOYMENT? Try our Classified Section! It costs only \$6.70 per word. And, if you wish to run all or part of your ad in bold capital letters-you can do so for as little as \$1.00 per word additional. Act now! Send your ad to: POPULAR MECHANICS, CLASSIFIED DEPT., 224 WEST 57TH STREET, NEW YORK, NY 10019

HELP WANTED

AUSTRALIA — Openings Now! Top pay! Transportation. Plus Worldwide listings: \$2.00. Jobworld, Box 681E, Cypress,

OVERSEAS U.S. Jobs Available. Unlimited opportunities. Write for application. Employers, Box 3239-G, Gulf Shores, AL 36542 or call 205-968-2500.

AUSTRALIA WANTS YOU! Big Pay! Transportation! New-est Employment Handbook—\$2.00. INTERNATIONAL, Box 19107-AO, WASHINGTON, DC 20036.

OVERSEAS . . . \$25,000 - \$65,000+. Free Reporti Employment, Box 19760-AO, indianapolis, IN 46219.

FOR INVENTORS

PATENT AND DEVELOP Your Invention. Registered Patent Agent and Licensed Professional Engineer. Send for FREE PATENT INFORMATION Every Inventor Should Have. Richard L. Miller, 12 Parkside Drive, Suite M. Dix Hills, NY

INVENTORS! Can you profit from your idea? Call today regarding the marketing of your invention, or write for your free information package. Over a decade of service. AMERICAN INVENTORS CORPORATION, 82 Broad Street, Dept. PM. ld, Massachusetts 01066. 1-800-338-5656 Massachusetts call (413) 568-3753

NONPROFIT Foundation helps inventors. Free recording forms. Free evaluation. Affiliated Inventors Foundation, 501-B Colorado Springs, CO 80909, Or

REGISTERED PATENT ATTORNEY Washington, D.C. urburb. Donald A. Kettlestrings, 414 Hungerford Drive, Surburb. Rockville, Maryland 20850

FREE: Patent Search Information: Agostino's, 101-A Spring Street, St. Augustine, Florida 32084

PATENT/Trademark Researching Specialists, 25 years service to Patent Attorneys and industry - now availab individual inventors. ESD Associates, 2001 Jefferson Davis Highway, Arlington, Virginia, Suite 304A, 22202

PATENT IT ECONOMICALLY! Free Details, Licensed since 1958. N. Raner, 2008 Fondulac, Richmond, VA 23229

INVENTORSI Save money. Get your own patent. Step-by-step, layman's language. Send \$6.45. Do-It-Yourself Patent Guide-PM, Box 2774, Pittsburgh, PA 15230.

INVENTORS: Learn how to submit your ideas to industry. Call free 1-800-528-6050, Canada 1-800-528-6060, X831.

INVENTORS: Free information on offering your invention sale. Kessler Sales Corporation, C-5-F1, Fremont, Ohio 43420

HOW you can get rich from your idea - Invention. Free information. Discovery, Box 43772, Austin, TX 78745.

FREE INFORMATION. Patent search under \$100. Macro Search, 25061 Castlewood, El Toro, CA 92630

INVENTIONS WANTED

NEW Idea? American Patent in Washington, D.C. Gets Results! Best References - Free Kit - 1-800-257-7880

EARN ROYALTIES. NUPRODUX INTERNATIONAL, 1377 K STREET, #203, WASHINGTON, DC 20005

INVENTION MARKETING, FREE INFORMATION, REP-RESENTING MANUFACTURERS. Patmart, 77 Fulton, 26D, Financial District, New York, NY 10038

INVENTORS! Have an idea? Don't know what to do? Call AIM for free information kit. Toll Free 1-800-225-5800

PERPETUAL MOTION INVENTIONS wanted. Call Douglas Stewart, collect, at 617-465-9408.

INVENTORS: If you have an invention for sale or license, write for free booklet explaining how we can help you. Kessi Sales Corp., C-5-1W, Fremont, Ohio 43420

REAL ESTATE & FARMS

NEW ... FREE ... CATALOG! Top real estate values coast to coast! Please specify type property and location desired. UNITED FARM AGENCY, 612-PM West 47th, Kansas City. Mo. 64112.

REAL ESTATE & FARMS

(Continued from preceding page

CANADIAN Country Properties. Our 70th year. Terms vailable. Catalogue airmailed \$1.00. Dignam Corporation, Suite 498, 85 Bloor East, Toronto, Ontario M4W 1B5.

MONTANA LAND NEW OFFERING. 20 Acres (or more) starting at \$6950, with \$150, down, \$96,58 mo, Near Br Yellowstone Park and National Forests. In the heart of trophy elk, deer, moose, antelope and turkey hunting. Blue ribbon trout streams. Guaranteed Access. Insured Title and Warranty Deed. Your Inspection Welcomed. Free Brochure, Maps, Color Photos. LARGER WHOLESALE BLOCKS AVAILABLE. CALL TODAY TOLL FREE: 1-800-252-5263.
YELLOWSTONE BASIN PROPERTIES, 1119 N. 7th Ave. Dept. PM, P.O. Box 3027, Bozeman, MT 59772-3027 • (406)

FREE REAL ESTATE CATALOGS. Midwest and Southeast Sun Belt States. Specify Property and Area Desired. Call or Write: COUNTRY NETWORK, Box 368PM, Gainesville, MO 65655, 417-679-4632,

PLASTIC BAGS

HUNDREDS of Sizes, Plain and Ziplock, Lowest prices! Immediate delivery! Free Catalog. Action Plastic Sales, 16900 94th Lane NE, Minneapolis, Minn. 55434. Tollfree: 1-800-328-8484

BUY IT WHOLESALE

EARN MONEY selling rings, jewelry, buckles, watches— buy direct. 130% below retail. Catalog \$1.00 (refundable). Anks-PM 90 Greenwich Ave. Warwick, RI 02886

BELTS, Buckles, Key Tags, Hat Tacs, Jewelry, More. Complete line tast sellers. Big Profits. Complete dealer set up. Color catalog \$1.00 (refundable). Anchor, Box 3958-PMR, North Providence, RI 02911

CLOSEOUT Jewelry 55c dozen. (Catalog 25c), Roussels. 107-1631 Dow, Arlington, MA 02174

WORLDWIDE BARGAINS . . . Imports — Dropship -Closecut — Surplus — Freebies — (stamped Envelope). Marnees, Box 1717PM, Highland, Ind. 46322

EARN 300% Profits. Quality rings, fine jewelry. Buy direct. Catalog \$1.00 (refundable). Creations, 639 Clay, San Francisco, CA 94111

2000 QUALITY IMPORTS: Wholesale Catalog \$3.00 (Refundable), A&S, Box 90l30l(PM), Dallas, Texas 75390

items. Tools! Toys! Radios! Housewares! More! NO MINI-MUMS. Giant Catalog \$2.00. OWT, 302 East Main, Independence, lowa 50644 FLEAMARKETEERS - 1200+ BELOW WHOLESALE

400,000 BARGAINS Below Wholesale: Many Free! Liquidations . . . Closeouts . . . Job Lots . . . Single Samples. Free Details. Bargainhunters Opportunities, Box 730-A, Holland,

CLOSEOUTS! Discounts! Below Wholesale! Freebies! Information/stamp: DDN, Box 20152K, Ferndale, Michigan 48220

NEW merchandise arriving each month, send for free bro-chure. Brass Shoppe, 1803 N. Garey Ave., Pomona, Calif.,

ADVERTISING AGENCIES, ADV. SER. MAILING LISTS

BEHOLD NEW GREEN THUMB CLUB MAILING ADDRESS. DISTRIBUTORS, P.O. BOX 574, BALDWIN, MICHIGAN 49304

MAILING LISTS-FANTASTIC RESULTS! Categorized. computerized, customized, competitive prices. Details - selfaddressed, stamped envelope: Galaxy Communications, 5687 Phoebe Dr., Arlington, TN 38002.

FREE Mailing List Consultation. Details. GOC-25P. Box 1107, Stuart, FL 33494. (305) 334-5205. 1-800-554-5478

MAILING LISTS GUARANTEED DELIVERABLE. COM-PUTERIZED IN ZIP CODE ORDER. PEEL AND STICK LABELS. RUSH SASE: J.D. BREWER CO., BOX 467395, ATLANTA, GA 30346

MAILORDER LISTS, Fresh hot names computerized on peel and stick labels in zip code order. Guaranteed deliver-able. Rush SASE: Listings Unlimited, RD#3 Box 18-C PM. Millville, N.J. 08332

MAILING LISTS - Fresh, Hot Responsive Name Lists of actual mailorder Buyers. Most categories. Computerized in Zip Code Order On Peel and Stick labels. Guaranteed Deliverable! For Brochure Rush SASE to: John Logan, P.O. Box 859, Rt. 605, Warrenton, VA 22186

OPPORTUNITY SEEKERS/MLM NAMES. FREE SAM-PLE, Venture-PM, Box 336, Riviera, AZ 86442

GUARANTEED Quality Mailing Lists! SASE: Qualitist, Box 3628PM1, Saratoga, CA 95070

BUSINESS SERVICES

INCORPORATE without legal fees! Free booklet tells how includes forms. Call Harvard Business Services, now

PRINTING PRESSES, RUBBER STAMP OUTFITS

BARCO Type Founders. Type and Rubber Stamps catalogue. Mail \$2.00 refundable on first order. 237 S. Evergreen, Bensenville, 60106

TYPE Fonts, Hand Printing Presses, Hot Stampers, Supplies. 120 Pages. \$2.00 Deductible first order. Acme Type. 1720 N. Marshfield, Chicago, 60622

MAKE rubber stamps - big profits. Complete supply and equipment catalog with instructions. \$1 deductible with order. Star Stamp Supply, 1720 N. Marshfield, Chicago 60622

TYPE for printing. Catalog \$1.00/deductible 1st order. Quaker City Type, R.D. 3, Box 134, Honeybrook, PA 19344

PRINTING SUPPLIES

PRINT YOUR OWN - Printing presses, type, supplies, direct from factory. Famous since 1872. Send \$1.00 for catalog and samples to: Kelsey Company, DM, Meriden, CT

QUICK Copy Printing. Low Prices. Write: Nationwide, 614 North Main, Bloomington, Illinois 61701

BUSINESS CARDS (thermographed) free samples. BG, 808 Taylor, Pittsburgh, PA 15202

SAVE over 50%—Printing, Office Supplies, JMZ, 731 Leroy, Ferndale, Michigan 48220.

GIFT SHOPPING

FIVE POWER LIGHTED MAGNIFIER complete with batter ies, Slips easily into pocket or purse, Ideal for theater, maps, directories, Price reduced, \$4.75 plus \$1.25 handling, Olympic Gifts, 843 Olympic Drive, Box 2372, Waterloo, IA 50704

UNIVERSAL OPENER - Kitchen Helper - Opens all size covers, jars and caps. Chromeplated with vinyl handle \$3.95 plus \$1.60 p/h. Guaranteed, or Gift Catalog \$1.00 retundable with order. Griffin's Gift Box - P.O. Box 1357, Dept. 863. Beckley, WV 25802-1357

AUTOMATIC night light goes ON automatically when darkness occurs, goes OFF when sufficient light re-occurs. Simply plug into a socket. (Bulb included). \$6.99 + \$1.50 shipping. Surlite Co., 39 Bowery Dept. 976, New York, N.Y. 10002.

SIMPLE WHISTLE to locate misplaced keys. Electronic KEYTRACER keychain responds by a pleasant melody from 30 ft. (Batteries included). If cannot whistle we will supply one FREE. \$12.95 + \$1.50 shipping. Sunlite Co., 39 Bowery Dept. 976, New York, N.Y. 10002

CLOCKS, WATCHES, OLD GOLD,

HIGHEST CASH for Gold, Jewelry, Gold Teeth, Rings, Diamonds, Welches, Silver, Platinum. Mail Articles Today. Free gift with Information. Chicago Gold & Precious Metals, 10 South Wabash, Dept. 758, Chicago, 60603.

CLOCKWORKS, wood clock blanks, rockhound supplies, belt buckles, cut stones, etc. Wholesale catalog 25c. Eloxite Corp., 8061/2 10th Street, Wheatland, Wyoming 82201

TAKE NO CHANCES. Deal with oldest, most reliable firm in old gold business. Established in 1934, We buy Gold, Silver, Platinum, Diamonds, Highest Cash. Free Information: Rose Industries, 29-A East Madison, Chicago 60602

TREASURE FINDERS

TREASURE - Locate quarter mile away with ultra sensitive locator - brochure free. Research Products, Box 270270 -AMC, Tampa, Florida 33688

FIND old coins, jewelry, gold nuggets. New patented revolutionary device. Free catalog. Gardiner, 4729M N. 7th. Ave., Phoenix, AZ 85013

PROFITABLE OCCUPATIONS

FREE Brochures. Repair air conditioning, Refrigeration. Tools, Supplies, full instructions. Doolco, Inc., 11252 Goodnight, Dallas, TX 75229.

FT. SMITH Auction School, Ft. Smith, Ark, 72903. Resident & Home study. Veteran Approved.

REPAIR lawnmowers thousands of parts and tools whole-sale list 40c. Eliwanger's, PM, P.O. Box V, Port Jervis, NY

PLASTERCRAFT . . . Profitable Home Business 3000 Molds Available. Details. Lynnette, 6251C Mentpark, Mentor, Ohio 44060.

SALESMEN-DIST.

MAKE EXTRA MONEY DURING YOUR SPARE TIME! Earn weekly commissions showing our exciting line of Calendars, Pens and other popular Advertising Gifts, Prompt, personal service from AAA-1 firm. Our 77th year. No experience necessary. No investment or collections. Set your own hours. Full Time Potential! Write to: Kevin Peska, NEWTON MANUFACTURING COMPANY, Dept. DPMC3, Newton,

AGENTS WANTED

WITH Mason Shoes, pay day is when you want it! Take orders from friends and neighbors. Watch your business build, without risk or investment. Write: Mason Shoes, K-991, Chippewa Falls, WI 54774.

BUSINESS OPPORTUNITIES

IMPORT - Export opportunity, profitable world-wide, mail order business from home, without capital. We ship plan for no risk examination. Experience unnecessary. Free Report. Mellinger, Dept. C2703, Woodland Hills, California 91367

ARAB BUSINESSMEN have money to buy & invest. Top finders fees paid. IMEA, 386PM1, Box 3574, Newport Beach, CA 92663.

NEW MACHINE makes low calorie donuts that sell like cra-No gimmick. Hundreds doing it. Some make \$50,000 yr with us. Send \$2.00 for complete how-to booklet. Lif' Orbits Mfg., 8851-53 Research Center, Minneapolis, MN 55428

MAKE BIG MONEY REPAIRING WINDSHILDS & Plate Glass! Up to \$60,000 yearly! Call TOLL-FREE for Valuable FREE report. 1-800-321-2597. Glas-Weid Systems, Box 5755D3, Bend, OR 97708.

RECYCLE METALS, EASY \$458 WEEKLY! Includes conper, platinum, others. Free information. Recycler, Box 1214, Franklin, TN 37065-1214

HIDDEN LAW!! Eliminates debts, brings Wealth, Cash, Credit. FREE report. Superior, 215 Davis, Detroit Lakes, MN

EASY 1,000's1! Clipping newspapers. FREE report. Superior, 215 Davis, Detroit Lakes, MN 56501

HOW to raise money for starting your business, Free Report. Way Distributors, Route 1, Box 316A, Bogalusa, Louisiana 70427.

HUGE PROFITS FROM HOME!! Free Details. Srivali, 806 S. Orange Dr., Los Angeles, CA 90036

MAJOR LEAGUE PROFITS, Learn Secrets, Free Details. Reliable Ventures, Box 23A, New Port Richey, Florida 34291-0023

SELL GIFTS FROM HOME! Profitable. Shelton, Box 9016PM, Newark, N.J. 07104

\$1,000.00 MONTHLY PART TIME. If you like working with your hands, and have a garage or basement, Write: C. Distributing, Dept. C. P.O. Box 86, Jasper, Indiana 47546

MAILORDER Opportunity! Start profitable home business ut experience or capital. Write for free book, plus details Mail Order Associates, Inc., Dept. 425, Montvale, NJ 07845.

WOULD YOU LIKE TO DOUBLE YOUR INCOME? Write: Raymond McCann, 32 Maine Avenue, Carteret, New Je 07008

авторским правом

BUSINESS OPPORTUNITIES

(Continued from preceding page)

MAKE Money Selling Zip Codes. Send \$1.00 to: Zip-Mail Service Co., Box 6467, Beaumont, Texas 77705.

HOW YOU CAN MAKE \$220-\$745/WEEKEND. National network Television advertising will proclaim sensational new product. You supervise weekend demonstration sales in local stores. Write: J & R Limited, Suite 229, 1471 S. Main, N. Canton, OH 47720

MONEYMAKING MACHINE SECRETS! New Publication.

Machines Can Make You Rich! Free Report. Write: InfoMail,
Box 1518 (M3), Pinellas Park, FL 34290

START a SUPER PROFITABLE BUSINESS from scratch. Free Subscription to Opportunity Magazine tells how. Write: Opportunity, Dept. G58, 6 N. Michigan, Chicago, IL 60602.

14,947 HONG KONG-TAIWAN Products Cheap. Small lots. Some samples free. Harbor, Box 1719PM3, Yuba City. CA 95992.

HOMEMADE BOOKLET BUSINESS. Free Information. Rayner, Box 77070 Stn-S, Vancouver, Canada. V5R 5T4

HOME COMPUTER INCOME!! Free information: Abundant Life, Box 278-2G, Sugarland, TX 77487

ENTER Billion Dollar Industry, Immediately. Start-up Mariual, \$7. CLP, 7641 Clarewood, Suite 1330, Houston, TX 77036.

PVC PIPE FURNITURE pays big. Start now! Turn your spare hours into easy cash profits. Free details: Owen, 771PF, Battle Ground, Washington 96604.

STAGGERING Profits in Sparetime HOME PRINTING. Easy. Free Information. Printing, Box 25297. Colorado Springs, CO 80938

RECONDITION "JUNK" BATTERIES. \$40,000 year possible, spare time. Easy! Free details: Owen, 771PM, Battle Ground, Washington 98604

ASSEMBLE PRODUCTS AT HOME. Many opportunities paying High Weekly Profits presently available without investment. Write: Businesses, 92B Brighton 11th, Brooklyn, New York 11235.

HIGH PROFITS WITH CUSTOM T-SHIRTS AND CAPS. Inexpensive, professional heat transfer machines. All supplies. PRESS MAGIC, P. O. Box 22809 (GC), Tampa, FL 33823

SCREEN PRINT T-SHIRTS. Inexpensive kits. Free Details. "T-Printer," POB 23991 (GC), Tampa, FL 33623.

LUCKY TEEN PAPERWEIGHTS Bring Money - Success -Happiness! Free Brochure, Write: Half's, USSAH, Box 23X, Washington, D.C. 20317

GOLD STAMPING MACHINES. Inexpensive. Quality. Large imprint Area. Free details. Magic Systems, POB 24986 (GC), Tampa, FL 33623.

BUMPER STICKER PRINTING DEVICE, Cheap, Simple, Portable, Free details, Bumper, POB 22791 (GC), Tampa, FL 33622.

MAKE Rubber Stamps. Highly Profitable Business. Free Details, Stamper, POB 22809 (GC), Tampa, FL 33622.

TAKE Catalog Orders. We drop-ship 2500 best-selling specialty products. Lowest below wholesale prices. Immediate delivery. Spectacular home business apportunity. Free Book. SMC, 9401 De Soto Ave., Dept. 20-63, Chatsworth, CA 91311-4991.

ALUMINUM SCRAP - Recycle Yourself - MAKE \$25.00/ POUND! Free Information: Industrial-PM63, Box 127, Alexandria Bay, New York 13607

VINYL'S Where the money is! Professionally repair, refinish, recolor furniture, luggage, car tops. Quick, easy. Two small \$20 jobs a day earn you \$1,000 a month. Homes, cars, offices, restaurants, unlimited customers. Start earning after a few days practice. Sensational details free. VIP, 2007 Montrose, Chicago, 60618

PIANO Tuning quickly learned with home study courses. Diploma granted. American Tuning School, 17050 Telfer Drive, Morgan Hill, Calif. 95037.

CONCRETE Block Machines: Catalog \$1.00. Route One, Box 3740, Rapid City, South Dakota 57702-3740

REPAIR HYDRAULIC JACKS — DETAILS FREE. WRITE: HYDRAULIC PARTS SUPPLY, BOX 4157, BROWNSVILLE, TEXAS 78520.

VENDING MACHINES. No selling. Routes earn amazing profits. "Big Catalogue FREE." Parkway Corporation, 1930 PMB Greenspring Drive, Timonium, Maryland 21093

LEARN Sewing Machine Repairing, Men. Women. Lucrative Profits. Gresslin Correspondence School, Box 5104, Spencer, lows 51301.

MAKE MILLIONS MANUFACTURING BATTERIES!!! Supplies available, Everlast, Box 365, Bogota, NJ 07603.

\$25,000 LOANS INTEREST FREE!! Secret Federal law WIPES OUT DEBTS!! Details FREE!! Moneywise B, Box 26744, Tamarac, FL 33320

GET RICH using OTHER PEOPLE'S MONEY!! Unique amazing business!! Details FREE!! Finance'B, Box 4605, Margate, FL 33063

CLIP newspaper items—\$2 - \$25 EACH!! FREE Report! Clippings/B, Box 6109, Pompano, FL 33063

GET RICH!! Secret law smashes debts—brings Cash, Credit! FREE report!! WealthKit/B, Box 4036, Pompano, FL

HUGE prolits! Reconditioning used car batteries. Secrets others don't tell. Stamp please. Battery Outlet, Box 3300, Hickory, N.C. 28603.

\$1,000.00 WEEKLY Possible Bronzing Baby Shoes FREE BROCHURE SHOWS HOW. NBPM, 398 Airport, Sebring, FL 33870

NEW discovery in battery reconditioning. Eighteen months guarantee means "Big Profits Fast"! Electone, 7415 Gable Dr., Little Rock, AR 72205

PREPARE Tax Returns. Earn high fees, dignified work. Train at home. Accredited Program. National Tax Training School, Monsey, 2CT, New York 10952.

SURE TO SUCCEED! Seven home businesses, guaranteed, free details! Business Dynamics, Suite 32,PM, 1220 3rd Ave., Chula Vista, Calif. 92011

LEARN MIRROR RESILVERING free information. Silvercraft, Box 127, Lansdowne, PA 19050.

SELL Books by Mail. Dealership-25c. Midwest, Box 44R2-PM. Shawano, Wis. 54166

\$1000's WEEKLY clipping articles. Self-addressed, stamped envelope: National, Box 85518, Los Angeles, CA 90072.

EARN \$800 Weekend With Profitable Mini Donut Business. Financing Available. Donut Man, 9853 13th, Minneapolis, MN 55441

MAKE HOMEMADE BOOKLETS. I've earned \$187,000 with mine. Free information: Falcon, Box 37169, Ft. Worth, TX 76117

GET RICH! Selling Books By Mail . . . 400% Profit! Dealers Wanted. Free Catalog. Premium, Box 1621PM, Spring, Texas 77383

TAKE PICTURES for profit. Photomoney, 14589K West 32nd, Golden, CO 80401.

LEARN DENTAL DRILL REPAIR in your own home. Tools furnished. Southwest Dental, 1501 E. Chapman Ave., Suite 252PM, Fullerton, CA 92631

HIGHLY PROFITABLE home-based, WHOLESALE/RE-TAIL/MAIL-ORDER opportunity. Free information: Cloud, 231-32P Menick Blvd., Lauretton, NY 11413.

NEW Luxury Car Without Cost! Write: AMCO 9, 1601 E. Main, Plainfield, IN 46168

GOOD partitime-Full time iNCOME CLIPPING newspaper articles. FREE REPORT: MCPI-PM, 231-32 Merrick Blvd., Laurelton, NY 11413.

LIFETIME Security. Multi-Level Mailorder Two Opportunities. Oneil-M. 10 Oak Lane, Suisun, CA 94585

LIFETIME OF HOMEWORK! Successful 48 years! Retiring. Secret can now be yours! Publico-265, Carlsbad, Calif. 92008

\$40,000 ON 1/2 ACRE! New Hydroponics - inexpensive, pleasant, practical! Free information. Robin's, Box 1214, Franklin, TN 37085-1214

101 EASY BUSINESSES TO START NOW. Free Details, Wells, 2 Sundrop Court, Woodridge, IL 60517

FREE business success catalog. Lant, 50 Follen, Cambridge, MA 02138

WEALTH of "How-To" home business opportunities. Free Report! Stewart, Box 2772P3, Erving, MA 01344

\$2,000 WEEKLY at home. Write or mail this advertisement for free literature today. Kellero, Suite 281, 448 Ignacio Blvd., Novato, CA 94947

SELL Books by Mail. 400% Profit. Free Literature. Trousdale's, Box 8671C, Albuquerque, New Mexico 87198. FREE information on business opportunities. GDC, Box 6796, Deot.P2, Metairie, La. 70009.

\$500.00 WEEKLY From Junked Tires. (Stamp Appreciated). LeValleys, Fountain, FL 32438

DEALERS & Servicemen needed, Deodorize Products. Unlimited potential. Astra Air, P.O. Box 5038, Orlando, Florida 32855

EARN BIG BUX AT HOME! Send for free valuable report. Selfstart, 2405 E. 9110 S., Sandy, UT 84092.

BATHTUB REGLAZING, product sales, service and training. Call Unique Coatings Corp. (313) 538-8600

\$200,000 yearly with EASY TRIM passive exerciser. HPK, BOX 9133, Silver Spring, MD 20906.

FREE!... TREASURY OF HOME BUSINESS OPPORTUNITIES"... MAILCO, BOX 34370, BARTLETT, TENNESSEE 36134-0370

UN-REPAIRABLE, UNTIL NOW! I earn \$40 hour repairing the unrepairable. Huge demand. Today, Box 19636, Portland, OR 97219

EARN up to \$300,000!! Monthly! Details Free! Write: JLF-PM, 1048 Ash, Waterloo, IA 50703

SELL BOOKS!! Huge Profits. Easy! Simple! Free Details. Elite, Box 29548P, Parma, OH 44129

GET YOUR FREE INFO-KIT — Making MONEY with Balloon Magic . . . Kit tells how . . . Write Today . . . Winner's -PM63, Box 250, Alexandria Bay, New York 13607

START MONEYMAKING WOODCRAFT BUSINESS making "Easy-Quick" toys, gifts, novelties. Free details. Williams, 3600L San Sebastian, Tucson, AZ 85715

GET RICH QUICK SCHEMES. Proven, Legal! Write: The HOG, 8048 Midcrown, #321PM, San Antonio, TX 78218

NEWEST BUSINESS VENTURE: Transportation Brokering. Unlimited income potential!! GET your permanent Interstate Commerce Commission nationwide brokers license for low filing fee. NO TEST OR EXPERIENCE REQUIRED. Operate at home. COMPLETE instructional booklet with sample forms, \$9.95. SAVES all legal costs. Transmart Company, 47 Main Street, Plymouth, Massachusetts 02360.

SELL HOMEMADE BOOKLETS. Earn \$2,000 Monthly! Hartwick House, Box 534, Decorah, Iowa 52101.

SELL books by mail. 400-900% profit. Free sales kit. Speedibooks, 23860-4P Miles, Cleveland, Ohio 44128

GOLDMINE in "PVC" FURNITURE . . . "Free Details" . . . West & West Publications, Box 12175-PM, Bothell, WA

PROFITABLE HOMEMADE BOOKLET BUSINESS! Earn \$25,000 - \$75,000 yearly! Manual, \$4.95: Moneymark, 1308 Hilton, Reynoldsburg, OH 43068.

HOW TO MAKE MONEY PHOTOGRAPHING AIR-PLANES Free information for SASE, K. W. Brown, 3015-312 E. Bayshore Rd., Redwood City, CA 94063.

MONEYMAKING HOME BUSINESS OPPORTUNITIES. Instructions FREE! Dorsey's, Dept. PM-385, Box 5352, Lakeworth, FL 33467

IDEAL Home Business (Woodworking) - Exciting, Enjoyable, Very Profitable, Details - Pine Shop, 897-3 Mammoth, Manchester, NH 03104

SELL "800" NUMBERS. Major name brands, travel, up to 50% off. Dalman, 9016 Decatur Rd., Fort Wayne, IN 46816.

BUILD CLOSET ORGANIZERS ... Huge Profits ... Details 25c. 1372 Alexander, Simi Valley, Ca. 93065

PROJECTION TV ... Make \$\$\$'s assembling Projectors ... Easy ... Results comparable to \$2,500 projectors ... Your total cost less than \$20.00 ... PLANS, 8' LENS & Dealers information \$17.50 ... Illustrated information FREE ... Macrocoma-BGX, Washington Crossing, Pennsylvania 18977, Creditcard orders 24HRS. (215) 736-2880.

MAILORDER Books 1,000% Profit. Free Report. Selective, Box 1140. Clearwater, FL. 33517

PIANO Tuning learned quickly at home. Free information. Empire School, Box 1014, Jupiter, FL 33468.

MAKING it rich in the 1980's. Write for free information. The Foster-Riggs Company, 1832 Delmar Drive, Colorado Springs, Colo. 80910.

BUSINESS OPPORTUNITIES

(Continued from preceding page)

RAGS TO ROLLS! Incredibly simple method look welfarelevel teacher to WASHINGTON POST interview and cash purchase Rolls Royce. Have helped thousands. I'll help you. Free heavily documented proof! Focus, 4 Tabb House, P.O. Box 916, Gloucester, VA 23061

FREE Information, "HOW TO SUCCEED IN ANY BUSI-NESS" SASE: JDS, Box 1204, Poway, CA 92064

SELL PHOTOS - Make money with your camera. Where to sell directory. \$3.00. Sunshine Services, 192 Hubbard, Mt. Clemens, Michigan 48043

SAVE! Two stamps sends your name to Thousands of Opportunity Advertisers. B(Assoc.; Box 4222, Rockford, Illingis 61110

FREE information. Profitable Home Business Made Easy! Emperor Publishers, 1638 Brookcrest Dr., Suite #301, Hamilton, Ohio 45013

"SELL Books . . . By Mail!" Immediately!! Murrey, Box 547, Hagerstown, Maryland 21741

START YOUR OWN BUSINESS Fast Profits All Ages. Valuable Report. 50c. Sunrise, P.O. Box 527, Northfield, Ohio 44067

SEIZED IN GOVERNMENT NARCOTICS RAID!! Automobiles . . Vans . . Boats . . Furniture . . Thousands other items. Buy Dirt Cheap — Resell for Big Profits! Free information: Marcel, Box 7557-M. Monroe, LA 71211

GET Rich! 90 Days. Low Investment! Free Details. Fortune, 6520 Selma, #32P15, Los Angeles, CA 90028.

\$1,000 weekly mailorder. Immediate opportunity. No obligation. Enterprise, 210 Welch-PM, Ames, IA 50010.

\$20,000 MONTHLY! Details Free. Security, 323 North Magnolia, Sumter, SC 29150

AUTO INTERIOR CUSTOMIZING AND UPHOLSTERY are today's high demand skills - yet easily learned at home! Fabulous profit potential. Send for FREE Opportunity Kit, s. Auto Upholstery Institute, 2118 S. Grand, Dept. SA609, Santa Ana, Ca. 92705.

EASY BUSINESS! Earn \$1,000's Weekly. Free Details. Write or send stamped addressed envelope. Toddco, Dept. PM, 4219 West Olive Ave., Burbank, CA 91505

\$1,000 Weekly. Home Business Directory, Box 2019-PM. New York, New York 10163.

EARNINGS unlimited! Mail our burglar alarm advertisements from home! RBM Merchandising, Box 59314, Chicago,

999 SUCCESSFUL LITTLE KNOWN BUSINESSES. Little or no investment. Full-part time. FREE details. Lucas, Box 36333M36, Houston, Texas 77236-6333.

WHOLESALE Thousands of Specialty Items, Big Profits Catalog/Selling Methods \$2.00 Refundable. TMD, 278 C. Watchung, Orange, NJ 07050

I MADE \$40,000 Year by Mailorder! Helped others make money! Details 25c. Torrey, Box 318YY, Ypsilanti, Michigan

PERSONAL COMPUTER OWNERS earn \$1000.00 to \$5000.00 monthly selling simple services performed by their computer. Work at home - in spare time. Get free list of 100 best services to offer. Write: CILDY, P.O. Box 60369, San Diego, CA 92106-8369.

\$3,000 MONTHLY. Information Business Brings. Initiative-P. Box 10179, Alexandria, VA 22310

HUGE Profits! Patented Electronic Energy Saver! Free is. EBI-1, 2565-D Cloverdale, Concord, CA 94518.

BE YOUR OWN BOSS. Start America's most successful home business. No Capital Nor Experience Needed. Free details. Thomas, P.O. Box 38901, Houston, Texas 77238

\$1,000 Month by third month. Emtron, Box 494, Avon, MA 02322

\$192.00 From Square Foot Plywood. (Huge Demand) Revealing Proof 50c. (Refundable). Woodwin, Bridgewater, Mass 02324

THE SUPERSTAR OF MULTI-LEVEL MAILORDER. Automatic Shopping! Electronic Shopping! Much Morel Mailorder Research, 726P1 South Jefferson, Abilene, TX 79605.

MONEYMAKING OPPORTUNITIES

BIG BUCKS Government Surplus Special Report \$3.75 NATHAN'S, 3175 Longmendow, Cincinnati, Ohio 45236

STARTING YOUR OWN SUCCESSFUL BUSINESS. FREE Subscription to Opportunity Magazine tells how. Write: Opportunity, Dept. G64, 6 N. Michigan, Chicago, IL 60602.

GOLD STAMPING MACHINES. Inexpensive. Quality. Large imprint Area. Free details. Magic Systems. POB 24986 (GG), Tampa, FL 33623.

MAKE Rubber Stamps. Highly Profitable Business. Free Details. Stamper, POB 22809 (GG), Tampa, FL 33622.

BUMPER STICKER PRINTING DEVICE. Cheap, Simple Portable, Free Details, Bumper, POB 22791 (GG), Tampa, FL

FANTASTIC earnings mailing from home!! Offer: Rush Stamped Addressed Envelope. Imperial, P-8 X17410. Fort Lauderdale, FL 33318

GET RICH!! Secret law smashes debts-brings Cash. Credit! FREE report!! WealthKit/B, Box 4036, Pompano, FL 33063

NEW Luxury Car Without Cost! Write: AMCO 9E, 1601 E. Main, Plainfield, IN 46168

HOME DEALERS WANTED! Sell Books By Mail . . . 400% Prolit! Free Report. Premiums, Box 1621, Spring. Texas 77383

REALTY Riches without investment for everybody: Homes, Apartments, Land. Continuous Individual Assistancel Simplified Instructions Free. Intermediaries, Box 241867, Los Angeles, CA 90024

DISCOVER YOUR HIDDEN POTENTIAL! Learn How! Free Details. Write: Alpha, 4015 San Jacinto, Houston, Texas

CUCKOO Clocks hand carved from Black Forest. Grand Fathers clocks. Children Clocks. Beautiful gifts. Free Catalog. Hugh Aulisio Imports, P.O. Box 5062, Newark, New Jersey 07105

EXTRA Cash in your spare time; Details \$2.95. Joron Enterprises, Dept. M56, 454 Beeland Dr., Vacaville, Ca. 95688

MONEY, Power, Respect are yours with our proven Business and Personal Development plans. Thirteen to choose from. Free Details. Popular Products, Inc., 8120 Westbury Drive, Suite 2C, Magna, Utah 84044

MONEY from Discarded Bottles \$6.00 SASE, Christians, Route 1 Box 33, Stockholm, SD 57264

NEW - FASCINATING HOMEWORK PLAN. Incredible ney maker. Simple operation. Guaranteed. Free details CMI, 6689 Orchard Lake, Suite 253-3, West Bloomfield, Michigan 48033

EARN money with your camera. For full report send \$3.00 to: ERIKANE, 1030 East Ortega Street, Santa Barbara, California 93103.

FREE Catalog. Home Business Mail Order Programs. Youngers, Princeton, Iowa 52768

EARN \$100's week, Exciting mailorder business. All ages. GUARANTEED. DACO, 2941 Driftwood A3, San Jose, CA 95128

MAKE money giving away samples, \$4.00 P&H. Consumers, Box 2856, Paducah, KY 42002-2856.

GET RICH! Zero Investment. No Borrowing. Free Details! Money, 6520 Selma, #32P15, Los Angeles, CA 90028.

BIG money in Gov't Surplus! Details, directory \$4.00. Tri-L. Company, Dept. PM3, P.O. Box 143, Texarkana, AR 75504

GET Rich, Quickly, Easily!! Low Investment! Free Details. Riches, 6520 Selma, #32P15, Los Angeles, CA 90028.

ONLY MLM THAT GUARANTEES INCOME! Practically No Dropouts! Information \$1.00, Hawaii White 92-916-71 Palailai Street, Makakilo, Hawaii 96707.

MAKE Thousands Weekly. Free information. Sobol, 1706 Avenue W. Brooklyn, New York 11229

STOP Struggling! Learn money making secrets. Experts reveal PROVEN systems. No gimmics. Free proof. Crossroads, Box 5097J, Babylon, NY 11704

PROFITABLE Home Craft, SASE: Jeffords, 2153 BevBeach Dr. NW, Olympia, WA 98502

ADVERTISE Free in 507 Magazines. \$5.00. Directory, Box 11N, Atlanta, Georgia 30301

BUY DIRECT FROM TAIWAN EARN TREMENDOUS PROFIT Jewelry, giftware, toys, electronics, novelties, and more. Start home import business at once without experience or hidden charges. Satisfaction guaranteed. Send \$3.00 cash for catalogues. Chou Industries Co., Ltd., Dept. P1 Box 3692, Taipei, Taiwan.

MAKE MONEY IN SPARE TIME. Earn generous commis-sions as a subscription representative for leading magazines. For free details, send this ad with your name and address to: POPULAR MECHANICS, Dept. AB-S. 250 W. 55th St., New

MAILORDER OPPORTUNITIES

WANT to earn more? Free catalogue describes 200 sucdence Diplo correspon Institute, 263A Adelaide Street West, Toronto, Canada, M5H

EASY TURNKEY MAILORDER. FAST START. Big Profit Seminar Series, Booklet \$1.00, Amerguild, 1038 No. Tustin, 227, Orange, Calif. 92667

GIFTS by mail. Free catalog! MOSLEY'S UNIQUE GIFTS, 1033 S. Tajauta Ave., Compton, Calif. 90220

EARTHWORMS, LIVE BAIT

FREE Literature, Raise Fishworms, Crickets, Redworms 1000-\$8.95, 5000-\$42.50. Book on How and Where to Sell with Order, Carter Fishworms, Plains, GA. 31780.

GREY NIGHTCRAWLERS - "Action Worm" - Free Literature-Telephone - 912-835-2542 - Fain's Farm - Edison, GA 31746

OF INTEREST TO ALL

VACUUM Cleaners "Discount Prices" New Rainbow \$449.95, Kirby, Filter Queen, Compact, Details: ABC Vacuum Warehouse, 6720 Burnet-PM, Austin, Texas 78757.

SAVE Up To 84% On Books. Write Today For Catalog. Earmonite, Box 1649, Bridgeview, IL 60455.

FREE Promotional Albums, Concert Tickets, Stereos, etc. Information: Barry Publications, 477 82nd Street, Brooklyn, NY 11209

MAYAN PENDULUMS, TALISMANS. Mystical powers. Made of jadeite, as the Mayans used since BC. Request information and very interesting legend. Noel Merriam, Importer, P.O. Box 6491, Torrance, CA 90504.

FOREHEAD THERMOMETER, Place plastic strip on fore-head. Temperature lights up like magic. Accurate, Inexpensive. (415) 763-6099

TELEPHONES sales-service (American made) write: Telephones, Box 6, Simpson, PA 18407

STRESS DETECTOR. Helps you relax anytime. Monitors ensions. Learn relaxation techniques. Inexpensive. Great gift. (415) 763-9396

ARE You A Closet Psychic? New booklet reveals Rigi Brain secrets. Develop Creativity, Intuition. \$3.95 ppd. CCW Publications, 3401 NE 11th St., Renton WA 98056

GREYHOUND RACING: For more details send \$3.00 to: Trifecta Solution, Box 20235, Montgomery, Alabama 36120

SAVE 5% to 35% on long distance telephone service. Free details application: J&S Associates, 1050 Dorothy Lane. Harker Heights, TX 76543

THE TRUTH ABOUT HALLEY'S COMET. \$2.00 PPD. Clydemant Co., Box 85, Mantua, Ohio 44255

"COBRA TELEPHONES" Performance, Reliability, Quality. DISCOUNT PRICES. Free Brochure-Martindale's, 1127 E. Schumacher, Burton, MI 48529

FREE PRIVACY CATALOG. Cash income opportunities Hiding assets. Secret loans. New identity. Eden, Box 8410-PC, Fountain Valley, CA 92728.

THE ULTIMATE TAX SHELTER. Immediate savings . . . 1559 Eighty Second Street, St. Louis, MO 63132

POPULAR MECHANICS FILE BOXES — keep magazines + bookshelves orderly. Holds a year's magazines. FREE self-adhesive tabels (yrs.: 1975 - 1986) with every order. 1 box \$2.95 — 3 or more \$2.50 ea. Popular Mechanics, (PL-1744) Box 1014, Radio City Sta., New York, NY 10101

GOVERNMENT SURPLUS

IS IT True You Can Buy Jeeps For \$44 Through The U.S. nment? Get The Facts Today! Call (312) 742-1142 Ext. 7133

MILLIONS OF SURPLUS BARGAINS! Jeeps included! Many 1% original cost. "Nationwide Government Directory" — \$2.00 (Guaranteed). DISPOSAL, Box 19107-AO, WASHINGTON, DC 20036.

GOVERNMENT SURPLUS

(Continued from preceding page)

"GOVERNMENT SURPLUS" JEEPS \$30.00! 5,000,000 Items! Complete Information Your Area. 1986 OFFICIAL DIRECTORY. \$3.00 (Guaranteed). Surplus, (B60), 4620 Wisconsin Northwest, WASHINGTON, D.C. 20016

ORIGINAL Civil Defense Rations. 2 Sealed Tins, 30 Lbs. Crackers Or Biscults, \$15.00 Emergency Rations Or Conversation Pieces. Check to: Craven Corp., 60 Pine St., Elizabeth, N.J. 07206

G.I. SURPLUS, Hunting and Camping Equipment, 56 Page Catalog \$2.00. Red Bank Army Navy, 12-M Monmouth Street, Red Bank. NJ 07701

LOANS BY MAIL

MONEY Problems? Free Book describes Loans, Cash, Government Grants, Other benefits, available to individuals. Write: Associates, Box 96-A4, Brooklyn, New York 11235

BORROW \$25,000 "overnight." Any purpose. Keep indefinitely! Free Report! Success Research, Box 19739-AO, Indianapolis, IN 46219.

NO CREDIT? Get major bank credit cards such as VISA and MASTER CARD. Free details. MCPI-CP, 231-32 Merrick Blvd., Laurelton, NY 11413.

BORROW \$1,000 - \$100,000 OVERNIGHT. Rush stamped envelope: Finance, 2409 17th Street Terrace, Leavenworth, Kansas 66048

NEED Money? Free Book details Cash, Loans, Government Grants. 99% eligible-regardless of past credit history. Write: KPA, Box 373-ENM, Woodmere, New York 11598.

ATTENTION N.Y., CT., Mass., N.H., R.I. Homeowners. Equity Loans. Low Low Bank Rates. Consolidate Your Bills Or Any Other Worthwhile Purpose. Save Thousands In Interest Charges. Fast Easy Conflicential Application. Preapproval In 48 Hours. \$10,000-Unlimited. Heritage Funding Corp. Inside Mass. 1-800-453-4011; Outside Mass. 1-800-633-0160

BORROW \$500-\$25,000 By Mail. Write; Elite, Box 3195-PM, Jamaica, New York 11432.

BORROW \$100-\$100,000! Instant Reply! No Co-signers! Rush Stamped Envelope! Financial, P.O. Box 1697(P), Richardson, TX 75080

QUICK Cash LOANS! Write: FICPA, P.O. Box 748, Pinconning, MI 48650.

LOANS-GRANTS \$10,000/UP. No credit investigation, collateral, cosigners. Information, \$1.00 (refundable): McReynolds, 323P South Franklin, Suite 804/R-96, Chicago, 60606-7096.

DIVORCE

WINNING Information \$2.00 MEN'S RIGHTS ASSOCIATION, 17854 (Lyons), Forest Lake, MN 55025

PERSONAL

BIBLE Questions answered. Stamped envelope. Bylon, k7167 Bentler, Detroit, Michigan 48219

REMAILING SERVICE

FREE Remailers List. Agents Needed, PS, Box 29656, San Antonio, Texas 78229

TRUSTWORTHY forwarding, Stamped remails \$1.00. Diamond-H, Box 129A, Caddo, Texas 76029

CONFIDENTIAL Mail Receiving Forwarding, Mail Drop, Box 18039PM, Orlando, FL 32860

FREE Details! Postal Shoppe, 396 East 900 South, Salt Lake City, UT 84111

MOTOR CITY REMAILING SERVICE (SINCE 1965) DRAWER 890, DEARBORN, MI 48121

SECURITY, Confidentiality. Details: Consumer Warehouse, 6333 Pacific #508, Stockton, CA 95207

NYC-NJ Remails, Postcards, \$1.00. Forwarding/Holding Service, Free Details! MAILARAMA, Box 3219, Weehawken, NJ 07087

FREE PACKET/remails. Flying Fingers, 4806F Steams Rd., Valrico, FL 33594.

UNLISTED ADDRESS Discreet and confidential. Remail \$1.00 Single. Mail Forwarding Service, 8050 S. Main, Houston, Texas 77025

SOUTHERN Ontario remailing, gifts, postcards. Incorporated firm assures fast, professional service. Box 356, St. Catharines, Canada, L2R 6T7.

WANTED MISCELLANEOUS

BUYING Tungsten Carbide, Tungsten, Molybdenum, Silver Solder, Silver Contacts, Gold, Platinum, 800-321-6914 Ohio 216-531-8333 collect.

GOLD, Silver, Platinum, Mercury, Tantalum. Samples Evaluated Free. Ore Assaying Service. Call Wholesale Terminal Toll Free: 1-800-932-1010.

1947 CANADIAN PONTIAC Full-line Sales Color Brochure Wanted: I'm looking for 1947 Canadian Pontiac full-line color catalog. No. D6667, dated 5-47. Altred Sherman, 247 Parkview Ave., Bronsville, New York 10708

HEARING AIDS

HUGE SAVINGS Eliminate Dealer Markups. Free Trial. Batteries Wholesale. Terms Arranged. Call Toll Free 1-800-323-1212. Or Write: Lloyds-PMC, Rockford, IL 61110

FREE HEARING AID CATALOG - Save 1/2 by mail! Write: "Money\$avers", 9530PM-3, Langdon, Sepulveda, California 91343.

FREE HEARING AID BATTERIES. SIGMOTEK, 327 Clarkin Ct., Walnut Creek, CA 94596

SAVE \$200+. Modern name-brand aids improve understanding. No Salesmen. Free Trial. Free Catalog. J&M, Dept. 132-P. 329 Third, DeKalb, IL 60115.

TOBACCO

DO YOU Chew - Smoke? Free Samples. Write: Stoker's, Dresden, Tennessee 38225

CIGARS BY MAIL — SINCE 1934 Domestic and Imported, Free brochures. The House of Delmage, Inc., P.O. Box 22706, Tampa, FI 33622-2706

SCIENCE & CHEMISTRY

COMPLETE Catalog \$1.00. Bargain Lists. Laboratory Sales, Box 161A, Brighton, MA 02135

HALLEY'S ESCAPING! Optical Maintenance Kit helps you view clearly. Cleans lenses, telescopes, cameras. Repairs glasses. \$4.50 (Ca. residents 6% tax). Consumer Warehouse, 6333 Pacific, Suite 508, Stockton, Ca. 95207

LABORATORY CHEMICALS, GLASSWARE—APPARA-TUS. Catalog \$1.00. HAGENOW LABORATORIES, 1302 Washington, MANITOWOC, WISCONSIN 54220

FORMULAS, PLANS, ETC.

ANY Formula \$10.00. Catalog \$2.00. J. Belfort, Box 568. Chicago, 60690

MONEYMAKING CHEMICAL FORMULAS-THOU-SANDS! CATALOG \$5.00 (REFUNDABLE): GWA3, Box 193, Brookfield, Wisconsin 53005-0193

SPECIAL SERVICES

HATS CLEANED BLOCKED Satisfaction guaranteed. For history of Virginia's last hatter including price list and order form send \$2.00 to: Hats. Box 29885, Richmond, Virginia 23229

INFORMATION On anything. Ferguson Research Specialists, 60-15 Woodside, Woodside, New York 11377.

HEALTH, VITAMINS

RESPIRATORY ILLNESSES, sinus, bronchial, etc. RE-SPIRIZER helping thousands breathe easier. Trial available. RESPIRIZERS, 474 BOYDS SCHOOL ROAD, GETTYSBURG, PA 17325. TELEPHONE (717) 334-1478

CHILDHOOD DISEASES, PARENT'S GUIDE TO CHILD-HOOD SYMPTOMS, GUARANTEED, \$14.95, Bovall, Box 371168, Decatur, Georgia 30037

GARDENING & LAWN CARE

LEARN Gardening and Landscaping at home. Free booklet. Lifetime Career Schools, Dept. A-202, 2251 Barry Avenue, Los Angeles, California 90064.

FLOWERS, PLANTS & NURSERY SUPPLIES

EXOTIC CELOSIA FLOWERS will Highlite your garden with SPLASHES of IRIDESCENT HUES!! Seeds, Instructions \$2.00. T. D'Innocenzi, 955 Hermann Rd., North Brunswick, NJ

RECIPES, COOKING, ETC.

55 CHICKEN Recipes Or 49 Shrimp Recipes. \$4.00 Each. Sausville Marketing, Dept B, Box 561, Stone Mountain, GA 30086

GOURMET COFFEE Blending Recipes \$2.00. Perez, Box 8595, San Diego, CA 92102

10 CHINESE RECIPES, \$4.00, also condiment and auxiliary available. M. Fu, Box 810391, Houston, Tx. 77281

COUNTRY COOKING — Southern Recipes. Meats, Breads, Desserts. 30 recipes \$5.00. RECIPES PM, P.O. Box 64, Waycross, Ga. 31502-0064

GOURMET VEGETARIAN 65 International recipes for good health, end cancer risk. \$4.00. Box 1380, Paso Robles, CA 93447.

PRANK RECIPE for birthday cakes. HILARIOUS \$1.00 Sase. Tweten, P.O. Box 957, Virginia, Minn. 55792

FIBER - Up - 3 Grain Bread, Send \$2.00 SASE: Jem, Box 192, Pompton Lakes, NJ 07442

Mmmm! Delicious CHERRICHOCAROO dessert! \$2.00 to: Cookmart-P36, 313 Clarksley Road, Manitou Springs, Colorado 80829

OLDFASHION APPALACHIAN COOKERY!! 300+ Down Home Recipes. \$4.95. Hillside Publishing, 3891 Orchard Drive Rd., Huntington WV 25701

HUNTERS Recipe for comed Venison, Bear, Antelope, Moose, Beef, Send \$3.95 MO and SASE to: Rose, Box 1667, Chetwynd, B.C., Canada VOC 1J0

DESSERT BOOK: Cakes, Bars, Cookies. Send \$3.00 SASE to: V.J.M., 32523 Jaclynn, Union City, Ca. 94587.

\$\$\$\$ CAN Be Yours!! Reagle Reports Reveal Moneymaking Details. SHIRLEY'S, Box 544, Mattoon, IL 61938.

WINEMAKING, BEERMAKING, ETC.

WINEMAKING-BEERMAKING-GASOHOL. Free Supply Catalog. Yeast Equipment. Continental, Box 188PM, Casselberry, FL 32707

WINEMAKERS-BEERMAKERS— Free Catalog—Fast Service—Large Selection: Kraus, Box 7850-L, Independence, Missouri 64053.

WINEMAKERS-Beermakers: Free Illustrated catalog of supplies. Semplex, Box 12276R, Minneapolis, Minnesota 55412-0276

MAKE QUALITY BEER, Wine. Free catalog. Village Store, Box C-51PM, Westport, MA 02790.

WINE/BEER MAKING Catalog: B&J Enterprises, 1845 South 19th, Springfield, Illinois 62703

WINE 28 Days Guaranteed. Instructions. SASE. Box 965, Morrisville, PA 19067

WINEMAKERS — Beermakers Free Catalog, Low Prices. Free Recipes. Cellar-M, Box 33525, Seattle, WA 98133.

ENJOY keg beer at home. Convert your old refrigerator into a beer dispenser. Tastes better than cans and costs less. Free information. Keg Beer Warehouse, 3529 East Grant, Tucson, Arizona 85716

BEER LOVERS — Brew your own. Delicious! Inexpensive! Free Catalog. Beer Gear, Box 25093M, Lansing, Michigan 48909

BEERMAKERS ONLY! Free Catalog/Newsletter. Williams', Box 461MX, Oakland, California 94604

BEERMAKERS Winemakers Catalog. Fast Personalized Service. Bacchus & Barleycorn, 6110-H Johnson Dr., Mission, KS 66202.

FREE Beermaking Catalog, German, English Malts, Moneyback guarantee, HOMEBREW, Box 158M, Haslett, Michigan 48840

BURGLAR ALARMS & HOME PROTECTION

NEW! Inexpensive burglar Alarms, Foolproof Protection. FREE Information. Homeguard, Box 51, Gosport, In. 47433.

HOME or AUTO Burglar Warning (Inside Of Glass) Decals. 5 Postpaid \$5.00. Thomas, 6969 Neshoba, Memphis, TN 38138

LET BURGLARS BEWARE. Looks like expensive security system. Highly visible; electronic; wireless; battery operated. Covers door, 5 windows in Home, Apartment, Business. For complete system rush \$24.95 to: Intra-Scan, 101 S. Federal, Deriver, CO 80219

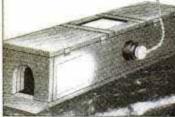
TIME

75 YEARS AGO: March 1911



Air year

Our cover depicted Archibald Hoxsey's fall from a crashing plane at a field near Los Angeles. He was killed when part of a wing came loose. The cover painting was somewhat exaggerated, but aviation was the story of the year, as the Navy launched its first air service and the Army demonstrated the ability of planes to drop bombs. This year marks the 75th anniversary of naval aviation in an era when flying has become commonplace, and military aviation has become safest



Trapped in shock

Bowing to the adage about a better mousetrap, an inventor devised this electric one consisting of a box and two electrified copper electrodes. A rodent's attack on the bait ended in electrocution. But an alert cat is still the best device.

Spare parts

The French manufacturers of the Bleriot monoplanes supplied spare parts for their machines, which they put into a wooden chest. The chest contained two extra propellers, a pair of landing wheels and two pieces of bent bamboo used to support the tail. It also carried numerous small metal parts for different sections of the framework. This was prepared just as the motorist carried spare parts for his automobile. Some modern ultralights have spare kits. Better safe than sorry.

50 YEARS AGO: March 1936

Rules of thumb

Industrial designer Kuhler's ideas for streamlining steam and diesel locomotives seemed futuristic, but proved practical. Kuhler listed five requirements for good streamlining: 1) easy identification for vision at crossings, 2) a visibility radius of 270° for the engineer, 3) sturdy construction, 4) good aerodynamics, and 5) pleasing appearance. Some of Kuhler's streamlining suggestions have been incorporated in the latest versions of Japan's Bullet Train and England's Maglev.

How much line?

A built-in meter showed at a glance the amount of line used in a single cast. Before reeling on a new line of certain weight, either cork ar-bor or "filler" line was used to build up the spool diameter of the empty reel to the weight's required size. This enabled the meter to register accurately when the line was cast or rewound as it worked both ways. With the aid of this measure, you were able to determine how much line you would have to use and at what level the fish were biting.

Robot wrestler

A dummy with springs developed the necessary muscles in wrestlers. The wooden robot had strong springs attached to where the wrestler placed his feet, giving power to the leg muscles. Constant training with the robot gave wrestlers strength to build muscles for their favorite holds.



Streamlined trains are born.

25 YEARS AGO: March 1961

Boat by all means

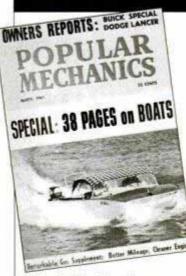
PM's Special Boating Section reviewed utility and sporting craft from tripleengined speedsters to houseboats. Boating along the Mississippi was a burgeoning industry. The river became a thriving deposit for waterborne policemen, paperboys, grocery clerks and restaurants as well as barges, tugs and freighters. In Winona, Minnesota, there were 1500 boats for every 7000 families. "Anybody who can afford a second car can afford a houseboat," advised one river resident.



Disaster leads to aviation regulations

"Are We Flying Junk?" was prompted by the deaths of 16 members of a California university football team during the takeoff of a World War II C-46. An FAA investigation concluded that the craft, as

well as hundreds of World War II planes, was poorly maintained. It said failing doors, props and engines were not unusual. Such occurrences led to stringent FAA regulations.



Mississippi boating reborn.

POPULAR MECHANICS (ISSN 0632-4558) is published monthly by The Hearst Corporation, 224 West 57th Street, New York, NY 10019, U.S.A. Subscription prices: United States and possessions, \$13.97 for one year; \$23.97 for two years. Canada and all other countries, add \$16.00 for each year. Second-class postage paid at New York, NY, and additional mailing offices. Authorized second-class mailing-in-Canada privileges by Canada Post, Windsor, Ont. Registered as second-matter at the Post Office at Mexico D.F., Mexico, June 29, 1950, v. 1984 by The Hearst Corporation. All rights reserved. Printed in U.S.A. POSTMASTER: Please send address changes to Popular Mechanics, P.O. Box 10054, Des Moines, IA 50350.



The most honest set of wheels you could ever own.

Go ahead. Compare this one[†] with any other truck you can think of. Part by part. Dollar for dollar. We're sure you'll agree. This Dodge is a tough, lay-it-on-the-line piece of machinery.

It's a truck with a nononsense approach to any job it's asked to do. With the kind of go-for-it capability that, over the past seven years, has helped Dodge earn more off-road

championships than any other pickup in the business. Another thing. It's a truck that never lets you down on value. And proves its faithfulness by offering you America's best truck warranty. Only Dodge Backs Every Truck It Builds With 5/50 Protection, Standard. We have so much confidence in the quality of the trucks we build, we back them with the same warranty we give the cars we build. With our standard 5 year or 50,000 mile Protection Plan* Nobody else...not Ford, not Chevy, not the imports... does that. When we say we build tough trucks, we prove it.

There's something about the way it sits on the road that tells you this one isn't going to leave

you hoping for more. A look that's straight, direct, unshakable. The name is Dodge.

'Shown with dealer installed options.

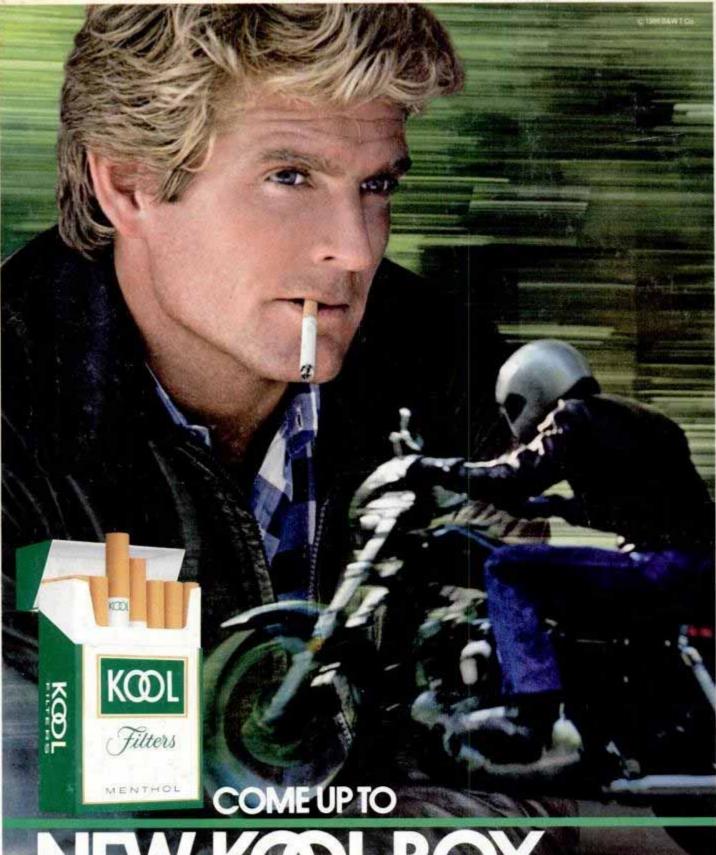
*Limited warranty on the engine, powertrain and against outer body rust-through. Excludes leases. Restrictions apply. See copy at dealer.

AMERICA'S BEST BACKED TRUCKS



DIVISION OF CHRYSLER CORPORATION

BUCKLE UP FOR SAFETY.



NEW KODLBOX

SURGEON GENERAL'S WARNING: Quitting Smoking Now Greatly Reduces Serious Risks to Your Health.

16 mg, "ter", 1.1 mg, nicotine av. per cigarette, FTC Report Feb. 85.