

JANUARY 1982 \$1.50

Popular Mechanics

**SPECIAL SECTION:
HOME SECURITY**

Practical ways
to protect your
home against
thieves

POPULAR MECHANICS MAGAZINE
EDITORIAL PROD. DEPT.
224 WEST 57th STREET
NEW YORK, N. Y. 10019



REGGIANE 2000
THREE-QUARTER-SCALE

P-51 MUSTANG
TWO-THIRDS-SCALE

**PM PICKS
6 BEST PERSONAL
COMPUTERS:**
Here's how they compare

**PM ROAD-TESTS 5
HOT SPORT COUPES:**
Surprising Chevy looks
great against imports

DOVETAIL JOINERY:
A master craftsman
shows you how

COMPLETE PLANS

**3 fireside log
holders to build**

**New portable
phones you can
install now**

**FLY A
HOMEBUILT P-51
MUSTANG FIGHTER**

Inside: 12 exciting new sports planes
you build from plans and kits





Marlboro



Warning: The Surgeon General Has Determined
That Cigarette Smoking Is Dangerous to Your Health.

16 mg "tar," 1.1 mg nicotine av. per cigarette. FTC Report Mar:81

Матеріал, наданий для опублікування

IF FUEL BILLS ARE PUTTING YOU IN THE RED, THINK PINK.

If you haven't added an extra layer of Owens-Corning's pink *Fiberglas*® Insulation up in your attic in the last five years, you probably should.*

Estimates are that fully half the houses in America are underinsulated for today's high fuel bills. Not to mention tomorrow's!

Check other spots around your house, too. Under floors in unheated garages and crawl spaces. Walls exposed to cold or heat.

Then put your house in the pink—with America's best-selling insulation.

*Savings vary. Find seller's fact sheet on Higher R-values mean greater insulation power.

out why in the R-values

© 1981 United Artists
All Rights Reserved



This One



RBKE-784-SNHT

OWENS-CORNING
FIBERGLAS
INSULATION

© O-C-F Corp. 1981

Multiple Listing Service, Inc. All Rights Reserved

THE 4x4 TRUCK

OH
WHAT
A
FEELING



TOYOTA

THE TOYOTA 4-WHEEL-DRIVE TRUCK. THE CLASS ACT IN RUGGED 4x4's.

The Toyota 4-Wheel-Drive Truck has "class" written all over it! Under it, too. In fact, this 4X4 is built right, everywhere you look.

Under the hood, a big 2.4 liter 4-cylinder engine is standard equipment. With enough power to get you to the front of the class—and keep you there.

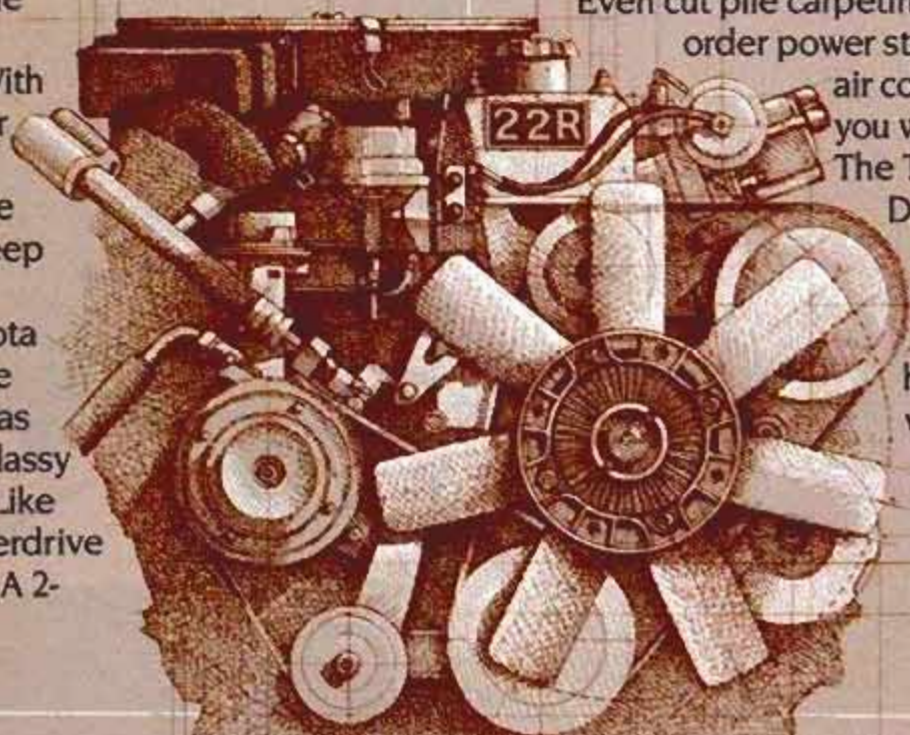
The Toyota 4-Wheel-Drive Sport Truck has lots of other classy features too. Like a 5-speed overdrive transmission. A 2-

speed transfer case, for the right gear in any terrain. Free-wheeling locking front hubs. And a fully transistorized ignition system, so "class" starts on time! Whether you choose a Standard Bed or the Long Bed, you get a truck that'll carry 1,100 pounds of payload.

Inside, the Toyota 4-Wheel-Drive Sport Truck is a class act from door to door. With bucket seats. AM/FM/MPX stereo radio. Oil pressure and voltmeter gauges.

Even cut pile carpeting. And you can order power steering and air conditioning if you want 'em.

The Toyota 4-Wheel-Drive Sport Truck. It has "class" written all over it. Because it has "Toyota" written across the tailgate!





On the cover

Showiest homebuilts in the air these days are often scaled-down versions of World War II fighters. Very popular Mustang and the unusual Reggiane were built from plans. Other sports planes you build at home from kits are detailed in this issue, beginning on page 79.
—PM photo by Howard Levy

Popular Mechanics

JANUARY 1982

CONTENTS

VOLUME 157 NUMBER 1

INTERNATIONAL EDITIONS: CARIBBEAN, ITALY, MEXICO, SOUTHERN HEMISPHERE

Special features:

PM road-tests 5 sport coupes

Chevy's Citation X11 stacks up surprisingly well against BMW 320i, Saab Turbo and other more expensive imports.

88

Special section: Home security

Latest equipment and methods for making your home safe from burglars and intruders.

110

PM picks the best personal computers

Feature-by-feature comparison of the six top entries in the personal computer field.

82

Dovetail joinery by a master craftsman

Follow these steps for professional-looking joinery in your projects.

98

Fireside log holders

Complete plans for three log holders you can build.

102

Portable telephones

How to install and use the newest models.

94

Automobiles and bikes

- 22 [Detroit Listening Post](#)
- 26 [Car Clinic](#)
- 35 [The PM Garage](#)
- 37 [Saturday Mechanic:](#)
[Troubleshooting GM's 5.7-liter diesel V8](#)
- 50 [Driving the 1982 Ford Ranger mini-pickup](#)
- 56 [Imports and Motorsports](#)
- 74 [The high-mileage files:](#)
[A super-slick oil additive that works!](#)
- 88 [PM road test: An American sport coupe takes on four imports](#)
- 96 [Firsthand report: Driving the Nissan Stanza](#)

Electronics, radio and TV

- 18 [PM Electronics Monitor](#)
- 68 [Build PM's Loudmouth sound-effects machine](#)
- 82 [Our pick of best buys: PM compares 6 top computers](#)
- 94 [New phones go where you go](#)
- 106 [Best tools for your electronics workbench](#)
- 110 [How to protect your home from thieves](#)

Science and engineering

- 8 [Science Worldwide](#)
- 147 [Conductive-plastics battery](#)
- 148 [Thing that ate upper Michigan](#)
- 149 [Pistons times two](#)
- 149 [Gun down pollution](#)
- 150 [City against the sea](#)

Boating and outdoors

- 48 [All Outdoors](#)
- 86 [Now BB guns join the big leagues](#)

Photography

- 44 [Kodak's Ektaflex makes color prints easy](#)
- 58 [Photo hints](#)

Shop and crafts

- 59, 166, 167 [Hints from readers](#)
- 60 [Workshop Minicourse:](#)
[Two more special tools](#)
- 66 [4 handy items to make for your home](#)
- 77 [PM Workbench](#)
- 98 [How to master fine wood joinery: Part 3](#)
- 102 [3 firewood holders you can build](#)
- 108 [10 clever ways to put magnets to work](#)
- 120 [New Now for home and shop](#)
- 164 [PM looks at a low-cost miterbox](#)
- 165 [PM looks at Dremel's chain-saw sharpener](#)

Home and yard

- 30 [Appliance Clinic](#)
- 32 [Homeowners' Clinic](#)
- 58 [Add moisture to reduce heat bills](#)
- 64 [5 energy-saving tips from PM readers](#)
- 65 [Wall-to-wall carpet you install yourself](#)
- 110 [How to protect your home from thieves](#)

Aviation

- 79 [12 hot, new sports planes you can build](#)
- 148 [Air Force "homebuilt"](#)
- 148 [SST in the works?](#)

Every month

- 6 [Letters](#)
- 16 [Notes from the Editor](#)
- 147 [Tech Lines](#)

Worth writing for
Looking for more ideas and information? See page 45.

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.

POPULAR MECHANICS (ISSN 0032-4556) is published monthly by The Hearst Corporation, 224 West 57th Street, New York, N.Y. 10019, U.S.A. Subscription prices: United States and Possessions, \$9.97 for one year; \$18.97 for two years; \$33.97 for three years. Canada and all other countries, add \$8.00 for each year. Second-class postage paid at New York, N.Y., and additional mailing offices. Authorized as second-class mail by the Post Office Department, Ottawa, and for payment of postage in cash. Registered as second-class matter at the Post Office at Mexico D.F., Mexico, June 26, 1950. © 1981 by The Hearst Corporation. All rights reserved. Printed in U.S.A.

POSTMASTER: Please send Forms 3579 to Popular Mechanics, P.O. Box 10064, Des Moines, Iowa 50336.

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 carrier 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, Iowa 50336. * Should you have any problem with your subscription, please write Joan Harris, Customer Service Department, Popular Mechanics, P.O. Box 10064, Des Moines, Iowa 50336. To assure quickest service, 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 & inquiries

POPULAR MECHANICS
P.O. Box 10064
Des Moines, Iowa 50336

POSTMASTER: Please send Forms 3579 to this address

When there's no room for an ordinary tool.



Do it easier and faster with Dremel. The Moto-Tool does projects that used to take many hours in a fraction of the time. Home repair projects become easier and more enjoyable. Variable speed control (5,000 to 28,000) RPM lets you dial the speed to fit the job. Comes with a useful assortment of accessories. The Dremel Moto-Tool—buy it wherever fine power tools are sold. Dremel, Div. of Emerson Electric Co., 4915-21st St., Racine, Wisconsin 53406-9989.

THE DREMEL[®] MOTO-TOOL[®]

Popular Mechanics

Editor-in-Chief: John A. Linkletter
Executive Editor: Joe Oldham
Managing Editor: Bill Hartford
Art Director: Ira Herrick

Special Editorial Features: Sheldon M. Gallager, editor
Automotive: Tony Assenza, editor; Michael Lamm (West Coast); Gary Witzenburg (Detroit)
Home and Shop: Harry Wicks, editor; Penelope Spangler, Conrad M. Stowers, Steven Wilson, assistants
Boating, Outdoors and Travel: Wm. T. McKeown, editor
Electronics: Neil L. Shapiro, editor
Editor at Large: Robin C. Nelson
Editorial Production: Peter Easton, chief; John Bostonian Jr., art; Shannon K. Kelley, Steven C. Fox, assistants
Art: Don Mannes, technical art director; Douglas Quinn, Alan Andersen, assistants

Special Publications: Clifford B. Hicks

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

Bureau of Information: Sophie Gronowicz, director; 224 West 57th St., New York, N.Y. 10019. (212) 262-4292

Advertising Manager
Frank P. Camastro

Advertising Offices:
New York: 224 West 57th St., New York, N.Y. 10019; (212) 262-7280
Chicago: 520 North Michigan Ave., Chicago, Ill. 60611; (312) 527-2400
Detroit: 377 Fisher Rd., Grosse Pointe, Mich. 48230; (313) 881-3520
Cleveland: PDC Building, 3659 Green Rd., Cleveland, Ohio 44122; (216) 292-7334
Los Angeles: 460 East Carson Plaza Dr., Carson, Calif. 90746; (213) 532-8101

Production Manager: Ronald Tuosto
Advertising Production: Patricia Woods
(212) 262-4900
Classified Advertising Manager: H. E. Kappel, (212) 262-4825

Published by The Hearst Corporation
President
Frank A. Bennack Jr.
Chairman
Randolph A. Hearst
Vice Chairman
John R. Miller
President, Magazines Division
Gilbert C. Maurer
Publisher, Popular Mechanics
Daniel J. Coleman
Publishing Consultant
Richard E. Deems

POPULAR MECHANICS IS PUBLISHED MONTHLY by the Hearst Corporation, 959 Eighth Avenue, New York, N.Y. 10019, U.S.A. Frank A. Bennack Jr., President; Randolph A. Hearst, Chairman; Harrison A. Mitnick, Treasurer; Harvey L. Lipton, Vice President and Secretary, Hearst Magazines Division; Gilbert C. Maurer, President; K. Robert Brink, Executive Vice President and General Manager; Raymond J. Petersen, Executive Vice President; Thomas J. Hughes, Resident Controller; William S. Campbell, Vice President, Director of Circulation.

For Maximum Mileage, Performance and Engine Life

Tufoil[®] the World's Best Engine Lubricant

A Revolution in Engine Lubrication

TUFOIL[®], the super lubricant concentrate, introduces a new and highly advanced standard in engine lubrication. A technological breakthrough, TUFOIL[®] (pronounced tough-oil) is the *only* patented* and proven successful combination of oil and microminiature particles of PTFE. Commonly known as Teflon[®] or Fluon[®], PTFE is the slipperiest substance known.

Tufoil Makes Oil Alone Obsolete

Coating all moving parts of your engine with a film of PTFE, TUFOIL[®] minimizes friction and metal-to-metal contact well beyond the capabilities of premium, synthetic, graphite or any type of motor oil.

Just a few *ounces* of TUFOIL[®] added to your favorite motor oil is better at reducing wear, increasing power, improving fuel economy and enhancing overall performance than *any* engine lubricant you can buy. Much better!

Satisfaction Guaranteed or Your Money Back

At a manufacturers suggested list price of \$12.95, a little TUFOIL[®] goes a long way and pays for itself many times over.

Used as directed, with TUFOIL[®] your car will *run better and last longer on less fuel!*

Next time you change your oil, really change it! Add TUFOIL[®].



Tufoil[®] One of a Complete Line of Revolutionary Lubricants For Every Consumer and Industrial Need

*U.S. Patent No. 3,933,656 4,127,491
other patents pending.
TUFOIL[®] is Reg. TM of Fluoramics Inc.
Teflon[®] is Reg. TM of DuPont
Fluon[®] is Reg. TM of ICI Americas

LOOK FOR TUFOIL[®] WHERE YOU BUY AUTOMOTIVE SUPPLIES.

SPECIAL OFFER TO PM READERS. To order, return this coupon with your check or money order for \$9.99 per 8 oz. bottle (includes shipping). Allow approximately 3 weeks for delivery. For further info return this coupon with a self-addressed stamped envelope or call us at (617) 877-3060. Dealer inquiries invited.



FLOTECH INC. 801 Water Street, Framingham, MA 01701

Name _____

Address _____

City _____

State _____

Zip _____

LETTERS TO THE EDITOR

Looks good in PM, too

I was intrigued by your article *Edwards Air Force Base: It Sure Looks Good From the Air* (page 83, Oct. '81). I thought it had remarkable photography and showed in-depth research. I congratulate you on your thoroughness. This is the kind of article that keeps me reading PM.

KEN HOUSER
MOUNT VERNON, IOWA

Be kind to bike riders

Your article *Oh, to Be a Traffic Cop for a Day!* (page 96, Sept. '81) was delightful. Author Wade Hoyt correctly identified many dangerous and inconsiderate driving habits. I especially appreciated his chastisement of motorists who overtake and pass bike riders when it is unsafe to do so.

However, some of Hoyt's advice may lead motorists to expect cyclists to endanger their own safety. He says: "A short, friendly toot of the horn will get most bikers to move over onto the shoulder." Usually, though, the shoulder is in poor condition, with broken glass, loose stones, oil slicks and other hazards. A cyclist could risk a spill by going off the road.

Even though it may be frustrating to wait a few seconds for a safe moment to pass a bicycle, motorists should welcome the cyclist's presence on the road. Studies show that five to six times more people can use the road when they're on bicycles than when they're in cars. This means less congestion, noise and pollution for all road users.

JOHN SCHUBERT
BICYCLING MAGAZINE
EMMAUS, PA.

The long and short of it

In your article *5 Shop 'Tools' You Can Make for Yourself* (page 51, May '81), you suggest lengthening a vise handle in order to get more leverage. Tools are designed to withstand certain maximum loads. Increasing the torque could strip the screw threads or damage the frame. If you need more squeeze, buy a larger vise.

MARK S. SIBILLE
LAFAYETTE, LA.

It's true that some tools, such as wrenches, should not be overtaxed by adding extension handles. But in the case of a vise, handle length is often

determined by such practical considerations as the size of the carton the tool comes in. Lengthening the handle—within reasonable limits—can increase torque without straining the jaws.

PM's versatile workbench

Enclosed is a picture (below) of my wife doing some stained-glass work on her new workbench that I built from your plans (*A Master Craftsman's Workbench*, page 112, Nov.



PM's master craftsman workbench, as built by reader Richard Shafer for Mrs. Shafer.

'80). The design is versatile and well thought out.

RICHARD H. SHAFER, M.D.
ALEXANDRIA, IND.

We're glad to hear it. For others who may be interested, photocopies of the article, which also includes plans for a junior-size version for young craftsmen, are available for \$1.50 from Popular Mechanics, Box 1014, Radio City Station, New York, N.Y. 10101.

Well, yes and no

In your article *Saturday Mechanic Looks at the '82 Chryslers* (page 130, Oct. '81), you say the plastic rack-and-pinion mechanism used in the rear-window lifter "does not need any lubrication."

It's true that the rack gear is made of flexible Delrin plastic, but I disagree with the statement that it doesn't need lubrication. A high-pressure grease is applied between the Delrin rack and the T-shaped

steel track it rides on. The grease is operational between -20° and 180° F., reduces friction and lowers the effects of moisture, particularly at cold temperatures.

DAVID H. PARKA
PRODUCT DEVELOPMENT ENGINEER
CHRYSLER CORP.
PONTIAC, MICH.

Good point. We were referring to the fact that the mechanism does not require owner servicing; lack of space prevented us from explaining that it does receive lubrication at the time of installation.

Do your own landscaping?

This is to voice strong objection to your article *You Can Be Your Own Landscape Architect* (page 92, Aug. '81).

To suggest to your readers that just by purchasing "a dollar's worth of paper," taking a few measurements and tracing a few drawings they would be competent and knowledgeable enough to perform the work of a trained, professional landscape architect is ludicrously misleading.

Landscape architects are professionals who have studied landscape design, drafting, architecture, surveying, planning, construction, engineering, horticulture, botany, geology, hydrology, agronomy, meteorology and the natural, behavioral and social sciences.

As you can see, there is more to know about the placement of trees, for example, than to "avoid planting a tree under a telephone wire or in front of a window." To infer that landscape architecture can be easily performed without formal education and training is a serious misrepresentation.

EDWARD H. ABLE JR.
EXECUTIVE DIRECTOR
AMERICAN SOCIETY
OF LANDSCAPE ARCHITECTS
WASHINGTON, D.C.

We appreciate the criticism and agree that no single magazine article can pretend to offer a full course in landscaping. What we showed was a simple method of making a yard plan to aid the homeowner in plotting existing and future features. Such a plan can be a valuable tool for determining problems and needs—regardless of who does the actual work.



Moonlight Your Way to \$50 Grand a Year

If you knew about a job you could do in your spare time — work about 9 hours a week — and pocket an extra \$400, would you be interested?

If your answer is "Yes" — here's the "moonlight" opportunity you've been waiting for!

It's a business you start yourself, part time, with an investment of under \$2,000. Work evenings and weekends till you've built up to the point where you're making more part time than your regular job pays.

Then you'll be ready to make your big move to an independent business — and an annual income that can rapidly reach \$50,000 or more!

If you have trouble believing that's possible, we'd like to send you a record made by people who are earning that much right now — as independent chimney sweeps using the August West System.

Hear for yourself from John Moszulski, who made \$2600 in 18 days in one month — Mo Simonson, who says "We're making '2 Grand' a Week" — Dave Richison saying "...the fourth quarter I think I did \$24,000" — and Fran Watts, whose husband Isaac cleans 8 to 10 chimneys a day at \$45 a chimney during the busy season.

More Sweeps Needed — Now!

With an income potential like that, you may be thinking, this field must be full already — too late for newcomers like me.

Wrong.

Woodstove sales are booming. More and more people are firing up their home fireplaces. 25 million chimneys all across the country need

cleaning, most of them every year. And there are only about 5,000 chimney sweeps out there to clean them!

A Dirty Chimney = Disaster!

Why should anyone pay \$45 to have a chimney swept?

In a word — *safety!*

You see, wood smoke contains two potentially dangerous substances, creosote and soot, which it deposits on the inside of the chimney. The more wood you burn, the more creosote and soot build up in your chimney. And creosote is a highly flammable substance. Without regular cleaning, it's just a matter of time before a stray spark ignites it, and that dull, flaky coating on the inside of the flue turns into a raging inferno that sounds for all the world like a rocket ship taking off inside your fireplace.

As a professional chimney sweep, you'll be offering a fire prevention service — peace-of-mind insurance for the homeowner who wants to know his chimney — and his home — isn't going to go up in flames.

A Real Bootstrap Business

Is it hard to become a chimney sweep? Not with The August West System.

We supply you with everything you need to make a success out of your new enterprise — from the finest in chimney sweeping equipment (our SootSweeper is the *only* power vac specifically designed for cleaning chimneys) to an instructional program that includes a complete self-teaching training program, telephone troubleshooting and free optional on-the-job training — to the kind of follow-up information that will make you not just a chimney sweep, but your community's resident expert on wood heat and chimney safety.

Want to know more?

I'd like to send you complete information on how you can become an independent chimney sweep using the August West System. Call me TOLL-FREE or mail the coupon below today... and start moonlighting *your* way to 50 GRAND A YEAR!



Tom Risch, President

CALL ME TOLL-FREE RIGHT NOW!

800-243-5166 ask for extension 210

and find out how to

Moonlight Your Way to Success!

\$50 Grand a Year sounds good to me! Send me complete information on how I can moonlight my way to success as a Professional Chimney Sweep!

Name _____

Address _____

City/State/Zip _____

Mail to:

August West Systems, Inc.
Box 603, Dept. 21PO, Westport, Ct. 06880



SCIENCE WORLDWIDE

Playing by ear

When the Dallas Bandits edged the Albuquerque True Sights in the last inning of the World Series, the losers might well have complained that the baseball was "loaded." And loaded it was—with electronic equipment that caused the standard-size softball to beep. But neither side complained, because the players on both teams were blind and all of them depended upon the "beep ball" to help them hit and field in the Sixth Annual Beep Ball World Series for blind players.

The modified softball game is played nationwide on teams sponsored by the Telephone Pioneers of America, a telecommunications industry fraternal organization. Each team has five players who field and hit for six innings. There's no second base in beep ball.

The ball, invented in 1964 by a Bell System engineer, is assembled at Western Electric's Merrimack Valley Works in North Andover, Mass., by retired phone company employees. They assemble 1,700 softballs a year by drilling holes about 3 inches deep and 2 inches in diameter, then inserting tiny printed wiring boards and other equipment, including a rechargeable battery.

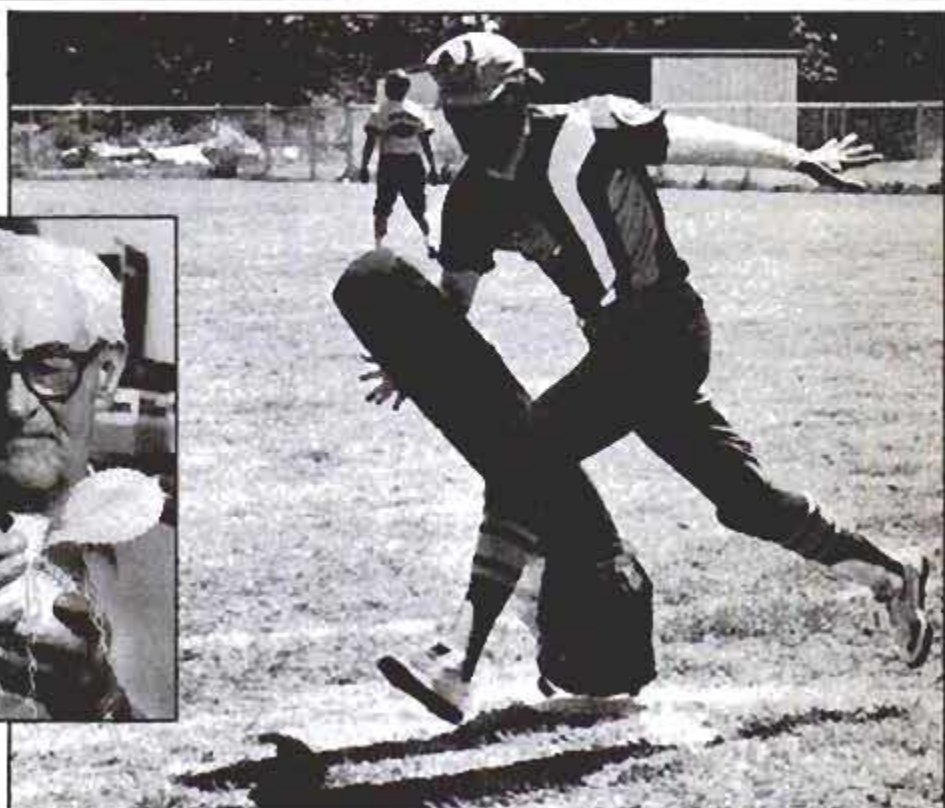
Then the ball cover is stitched back together and sent off to Pioneer chapters. Generally, the electronic guts outlive the softballs. The equipment can be removed and inserted into a new ball.

How durable are the electronics? Says Western Electric's Tippy O'Connell, "We've thrown the modules themselves against the wall and they kept right on beeping."

Milk it for all it's worth

Cornell University researchers are administering daily doses of synthetic growth hormone to dairy cows, following a series of successful experiments using natural growth hormone to stimulate milk production. The two-year project resulted in impressive increases in milk production.

The test animals—which normally produce 70 to 100 pounds of milk a day—yielded up to 15 percent more



Blind player tags beeping base as he heads toward home. In inset, George Burleon, retired Western Electric employee, inserts a beeper into a softball. Result: a beep ball.

milk in early stages of their lactation and up to 40 percent above normal in the late stages.

A Cornell spokesman said there was no adverse reaction noted in any of the experiments, and proclaimed the injections safe for animals. He also noted that someone must find a process to mass-produce the hormone if the research is to result in regular use of the hormone at dairy farms.

Atom eaters are coming

It sounds like something out of an old sci-fi thriller, but it's on the verge of becoming a reality: a metal-loving fungus that cleans up nuclear waste water.

Using a dried, pulverized form of the fungus *rhizopus arrhizus*, researchers of McGill University in Montreal have found that the biomass will absorb 20 percent of its own mass in heavy metals, such as uranium and thorium. This powder, placed in the discharge water of a nuclear powerplant, could filter out atomic waste, returning clean water to its source. The researchers can't say what to do with the waste-permeated fungus after the cleanup, but the nuclear discharge would be contained in a much smaller volume

than had ever been possible before.

And, says McGill biochemist R.J. Neufeld, the fungi may some day be used to leach uranium out of mineral deposits that couldn't otherwise be mined profitably.

Hot news from Stanford

Medieval alchemists couldn't do it. Industrial Revolutionist forgers were mystified. Even British physicist Michael Faraday failed to do it. But Oleg D. Sherby and Jeffrey Wadsworth—working at the Stanford University Dept. of Materials Science Engineering—have stumbled across the secret of making Damascus steel. The legendary metal, first encountered by Crusaders entering Damascus in the Middle Ages, was considered the best in the world for making swords.

Sherby and his co-worker were working on superplastic metal experiments when they came up with an odd-looking steel—it had a fine surface pattern they couldn't duplicate. Eventually, they uncovered the ancient secret: The surface pattern is formed by particles of iron carbide, produced when the metal is exposed to low temperatures. Previous workers applied too much heat in the forging process. **PM**

Everybody's making money selling microcomputers. Somebody's going to make money servicing them.

New NRI Home-Study Course Shows You How to Make Money Servicing, Repairing,
and Programming Personal and Small Business Computers

Seems like every time you turn around, somebody comes along with a new computer for home or business use. And what's made it all possible is the amazing microprocessor, the tiny little chip that's a computer in itself.

Using this new technology, the industry is offering compact, affordable computers that handle things like payrolls, billing, inventory, and other jobs for businesses of every size...perform household functions including budgeting, environmental systems control, indexing recipes. And thousands of hobbyists are already owners, experimenting and developing their own programs.

Growing Demand for Computer Technicians

This is only one of the growth factors influencing the increasing opportunities for qualified computer technicians. The U.S. Department of Labor projects over 100% increase in job openings for the decade through 1985. Most of them *new* jobs created by the expanding world of the computer.

Learn at Home in Your Spare Time

NRI can train you for this exciting, rewarding field. Train you at home to service not only microcomputers, but word processors and data terminals, too. Train you at your convenience, with clearly written "bite-size" lessons that you do evenings or weekends, without going to classes or quitting your present job.

Your training is built around the latest model of the world's most popular computer. It's the amazing TRS-80™ Model III, with capabilities and features to perform a host of personal and business functions. No other small computer has so much software available for it, no other is used and relied on by so many people. And it's yours to keep for personal or business use.

(TRS-80 is a trademark of the Radio Shack division of Tandy Corp.)



You get plenty of practical experience. Using the NRI Discovery Lab® that also comes as part of your course, you build and study circuits ranging from the simplest to the most advanced. You analyze and troubleshoot using the professional Beckman LCD digital multimeter you keep to use later in your work. Then you use the lab and meter to actually access the interior of your computer...build special circuits and write programs to control them. You "see" your computer at work and demonstrate its power.

Become the Complete Computer Person

You're also trained in writing and debugging both BASIC and advanced machine language programs...gain hands-on experience in the operation and application of computers to business and personal jobs. You're trained to become the fully rounded, new breed of technician

who can interface with the operational, programming, and service facets of today's computers. You're ready to take your place in the new electronic age.

Other Opportunities

NRI has been giving ambitious people new electronic skills since 1914. Today's offerings also include TV/Audio/Video Systems servicing with training on our exclusive computer-programmable 25" diagonal color TV...Communications Electronics for servicing and installing microwave, broadcast, CB, radar, etc...and other state-of-the-art courses.

Free Catalog...Mail Card No Salesman Will Call

Send the postage-paid card for our 100-page catalog showing all courses with equipment and complete lesson plans. There's no obligation other than to yourself. See how NRI can help you grow with the most exciting and important new field of the 80's. If card has been removed, please write to us.



NRI SCHOOLS
McGraw-Hill Continuing
Education Center
3939 Wisconsin Ave.
Washington, DC 20016

We'll give you tomorrow.





ONE SIZE FITS ALL. GMC INTRODUCES THE 6.2 LITER DIESEL.

It's not just a completely new diesel engine—but one designed exclusively for trucks. Built to deliver the power to haul or tow truck-size loads and do a truck-size job. With such features as five head bolts per cylinder and four-bolt main bearings.

This new 6.2 liter diesel is now available in GMC pickups, Suburbans and 4-wheel-



GMC is
a division of
General
Motors.



drive Jimmys to serve your work or pleasure needs. It not only brings you the benefit of the traditional diesel advantage in fuel cost, but, as you can see here, GMC's projections for the 6.2's estimated mileage are, in themselves, quite an economy story.

2-wheel-drive Pickup		4-wheel-drive Pickup		4-wheel-drive Jimmy		2-wheel-drive Suburban		4-wheel-drive Suburban	
EST. HWY.	EPA EST. MPG	EST. HWY.	EPA EST. MPG	EST. HWY.	EPA EST. MPG	EST. HWY.	EPA EST. MPG	EST. HWY.	EPA EST. MPG
31	23	29	22	28	20	30	20	26	18

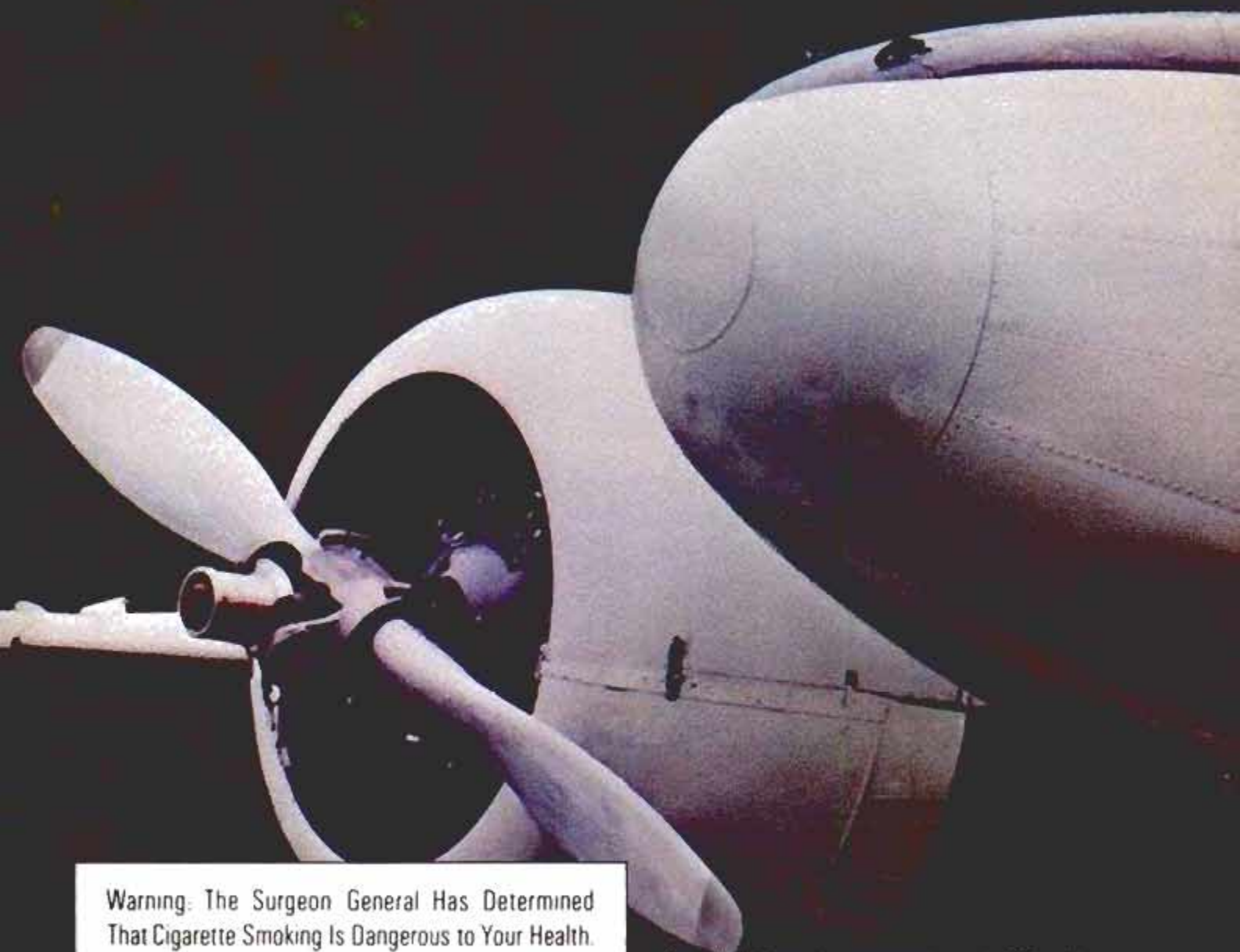
See the new diesel for full-size, light-duty GMC trucks at your GMC Truck dealer.

GMC projections of 1982 EPA Estimates. See your dealer for actual EPA estimates. Use estimated MPG for comparison. Your mileage may differ depending on speed, distance, weather. Actual highway mileage lower. Mileage will be lower towing or hauling a load. Estimates lower in California. Some GMC trucks are equipped with engines produced by other GM Divisions, subsidiaries, or affiliated companies worldwide. See your GMC Truck dealer for details.

GMC
TRUCKS ARE WHAT WE'RE ALL ABOUT.

CAMEL

Where a man belongs.



Warning: The Surgeon General Has Determined
That Cigarette Smoking Is Dangerous to Your Health.

8 mg. "tar", 0.8 mg. nicotine av. per cigarette by FTC method.



8^{mg}
tar.

Camel Lights.
Low tar. Camel taste.

OIL LEAKS?

DRIVEWAY AND GARAGE FLOOR OIL STAINS ARE MESSY AND DOWNRIGHT DANGEROUS!!!

Thousands of car owners have solved this problem by using Wynn's Engine Stop-Leak

Wynn's Engine Stop-Leak is a special blend of chemicals designed to help correct external engine oil leaks resulting from dry or shrunken rubber seals, gaskets, O rings, etc.

Time tested and used world-wide



Wynn's Engine Stop-Leak at leading discount, drug, and auto parts chains. Wynn Oil Company, Fullerton, CA 92631 with affiliates throughout the world.



NOTES FROM THE EDITOR

John A. Sillitto

The idea is still as fresh as it was on January 11, 1902, when a young Iowa newspaperman, Henry Haven Windsor, launched *Popular Mechanics* in Chicago. In the beginning, it was published every week and sold for a nickel.

In the ensuing 80 years, *Popular Mechanics* has become a household name, has gained an audience of 6,311,000 U.S. readers each month and has added Spanish and Italian language editions in Italy, Mexico, the Caribbean and South America.

Happy 80th birthday, PM!

POPULAR MECHANICS



PM's first cover was illustration of interior of the British Navy's first sub.



Genesio Silveira da Costa, Brazil's deputy consul, accepts rally prize check.

Speaking of rallies, we held another just the other day. It was in celebration of personal computers, which we've reported on now for some six or seven years—and are doing so again this month on page 82.

How would you like to get your hands on a lineup from Amdek, Apple, Atari, Commodore, Magnavox, Mattel, Radio Shack, Sinclair, Texas Instruments and Zenith/Heath?

It was really great! **PM**

It was a great day in New York when PM had the *Great American Kit Car Rallye* (page 98, Oct. '81). The day was made even greater for us when the rally winner announced he would donate the \$1,000 prize to aid Brazilian children in Memorial Sloan-Kettering Cancer Center here. William Schumer, president of Lafer Auto Sales, North Hollywood, Calif., won in a Lafer MP, imported from Brazil. As stand-ins for him, Publisher Dan Coleman and I recently had the pleasure of giving the prize to the Brazilian Consulate for final presentation to the hospital.



Are personal computers here to stay? Here's a hearty yes!

Get in on the PROFITS in SMALL ENGINE service and repair Start your own money



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.

making business!

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 \$10.00 to \$15.00 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 \$17.50 for a simple tune-up that takes less than an hour!

46-million small engines are in service today!

That's right—there are over forty-six 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 fully accredited and approved 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 have to be a 'born mechanic' or need 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.

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 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 4HP engine—all yours to keep!

SEND FOR FREE FACTS!

You risk nothing by accepting this offer to find out how 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!**

BELSAW INSTITUTE OF SMALL ENGINE REPAIR
512J Field Bldg., Kansas City, MO. 64111

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

BELSAW INSTITUTE, 512J FIELD BUILDING
KANSAS CITY, MISSOURI 64111

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 _____

Address _____

City _____

State _____ Zip _____

Accredited Member National Home Study Council

You get all this Professional equipment with your course—and it's Yours to KEEP!

PLUS...
4 HORSEPOWER
CLINTON ENGINE
YOURS TO KEEP!



Send TODAY for this fact-filled **FREE 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 10-Day NO RISK Trial Offer!

PM ELECTRONICS MONITOR

Caves and stars

You might expect an astronaut's son to be a computer programmer—but how about a knight in armor? Rich Garriott, son of Skylab 1's Owen Garriott, has managed to combine a love for the past with an understanding of what—to many of us—still seems to be the future. He's quite representative of today's computer-happy youth.

At 19, Rich is the author of one of the best and most popular programs available for personal computers. Called *Ultima*, it's a role-playing adventure game for the Apple II computer. And according to the label on the floppy disc's package, the program's author is named "Lord British."

The program is so popular that, just recently, a computer magazine ran a contest for people to guess the identity of Lord British. None of the entrants was able to unveil Rich's *nom de plume*.

Identity revealed

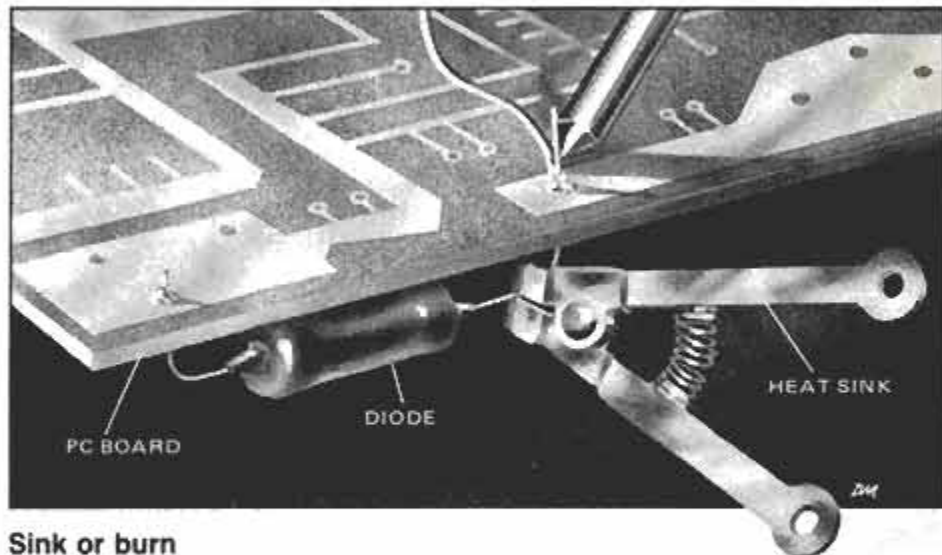
Lord British, or Rich Garriott, is also named Shamino within the Kingdom of Ansteorra in the Society for Creative Anachronisms (SCA). The SCA is a much-publicized, nationwide group of people who can only be described as fans of the past.

They dress up—the men in helmets, gauntlets, chain mail and bejeweled swords; their women in flowing *gytes* (gowns) and tall, steeple-shaped headdresses—and fight medieval-style tournaments and melees for the honor of the various realms.

In fact, they remain so true to the time period they simulate, that certain arts would be literally "dead" without them. In the manufacture of leather armor—for example—you might have a hard time finding a craftsman who can temper leather for just the right combination of flexibility and protection. But SCA armorers know the paraffin mixture required to boil the leather in—that and a hundred other hints that once helped fashion the beautiful—and functional—designs of the Middle Ages.

Tapping the ages

Bearing all this in mind, it should come as no surprise that Rich would create the first computer game to stretch from the Dark Ages to the Space Age. The game of *Ultima* begins, as many computer games do,



Sink or burn

When you're soldering delicate components, such as diodes and transistors, your main problem is to avoid cooking these heat-sensitive parts. Almost every project builder, at one time or another, has had a project fail because of heat damage. We suggest you use a heat sink to avoid this problem. These clothespin-

shaped devices clamp onto the lead of the component between the heat-sensitive body and the soldering iron. The heat from the iron goes into the heat sink, not the component. You can buy them, in various sizes, at any electronics store or from Radio Shack, where they are stock items.

in a sort of medieval world where magic works.

But unlike the other games, Rich's is a vast tapestry. The computer display screen is a window which opens onto a fantastically large and detailed world. You see a map of the land and, as you move, the map scrolls in all four directions. There are over 30,000 trees, mountains and grassy knolls that visually simulate a world.

From the main map, you can move into graphic castles and towns—and go exploring in three-dimensional dungeons. The dungeons are shown from the inside, and you walk through them by issuing keyboard commands.

As the game's historical time span progresses, technology begins to develop. Soon, the stores start to carry items such as air cars, blasters and phasors mixed in with the older swords and maces.

To end the game, you must amass enough treasure to afford a spacecraft—and that takes you into an entirely new world.

More than just a game, *Ultima*—and its young designer—illustrate what is happening in the real world of computers and technology.

Our own technology

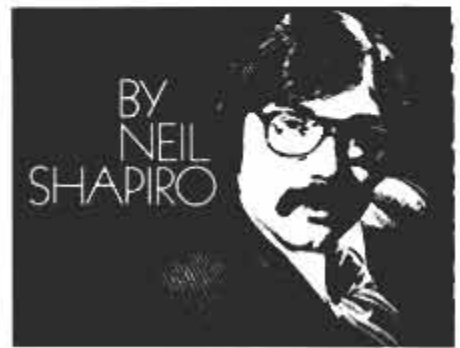
Computers are a new, viable and exciting field. An ever-increasing number of high schools, colleges—and, now, homes—are offering com-

puters to young people. And many of these young computerists are not only intelligent, but creative and romantic, as well.

We've read an awful lot about the dehumanizing influence of the computer—but that theory is being demolished. While the elder generation built the computer, it's the younger generation who will discover ways to use such machines for as well as science—and in ways we may not yet suspect.

If you have kids, make sure they get to know computers. And if you're young and seeking a life style, perhaps computers can help you, too, to invent your own career—one that will be both comfortable and satisfying creatively.

By the way, if you have access to an Apple II, you can get *Ultima* from any computer store for \$39.95. It's published by California Pacific Computer Co.



There's a spirit in the air.

It's a proud spirit.

It's the training, the skills, and the opportunities that go with being a member of the Air Force team. Get the spirit... it comes with Air Force experience.

Find out how you can be a part of it. See your Air Force recruiter or mail in the attached card.



Air Force

A great way of life.

DETROIT LISTENING POST

Big GM cars history by '85

General Motors, though constantly revising its new-product plans due to changing market conditions and cash-flow problems, continues to plan for the final curtain to fall on its family-car lineup, as we know it, by mid-decade.

The current, *big*, C-body cars (Olds 98, Buick Electra, Cadillac deVille and Fleetwood) should remain unchanged through the 1984 model year, but then will be dropped entirely. Front-wheel-drive replacements, most bearing the same well-established names, will be considerably smaller and will spring from the just-introduced A-car platform, itself derived from the X-car.

Pontiac already has scuttled its related but slightly smaller and less expensive Bonneville B-car, Chevy will ditch its B-car Impala/Caprice after this year, and the immediate futures of the Olds and Buick Bs (88 and LeSabre) are uncertain. By 1985, the current B-cars will be gone and their names probably transferred to dressier A-cars.

This means that those who still want full-size, rear-drive GM family cruisers may soon have to pop for one of the luxury C-cars and by '85 will be out of luck entirely. The current Cs may also go the Mercedes route of diesel-only availability, unless GM reverses its policy of refusing to market any vehicle on which it has to pay the government's "gas-guzzler" tax—which will likely apply to '83 and '84 gas-powered, rear-drive C-cars.

The good news is that those future front-drive C-cars will pack a lot of usable room into much more efficient bodies despite being only a few inches longer than the new "intermediate" A-cars. If the passive-restraint air-bag requirements don't materialize, they'll legally be able to package six passengers in about 107.5 inches of wheelbase, just a bit tighter than the much bigger current models. With gasoline four-cylinder engines, they will deliver near-30-mpg EPA city fuel economy, too.

Luxury coupe downsize

About six months before the big cars' dramatic changeover, in '84-1/2, GM's fwd, E-body luxury coupes (Toronado, Riviera, Eldorado) and K-body (Seville), and G-body (Monte Carlo, Grand Prix, Cutlass Supreme, Regal) coupes will be downsized to a



The regular production version of Probe III will probably look much like the prototype.

stretched front-drive J-car platform about 103.5 inches in wheelbase—just slightly larger than the current Cavalier/J2000/Cimarron. The rear-drive G-body (formerly A-body) sedans (Malibu, Bonneville Model G, Cutlass, Regal) will disappear.

What this boils down to is the virtual end of rear-wheel-drive at GM (except for sports cars: Corvette, Camaro, Firebird and the coming '84 mid-engine Pontiac P-car) and a confusing array of car lines on two basic platforms in a small spread of wheelbases. The X-car, GM's fwd pioneer, may be dropped to simplify things a bit, but there won't be much difference in exterior size between a low-line J-car and top-line C-car.

Sticking to these plans will take a lot of nerve in light of the currently stable price and availability of fuel, and the resulting revival in demand for traditional, family-size cars. Dealers—the ones who yelled the loudest when they couldn't get enough small cars or move bigger ones during the last panic—are already screaming about losing profitable big cars just when the market seems set for a comeback!

But GM doesn't want to repeat the same mistake that led to the debacle of '79, when trouble in Iran panicked buyers away from those same inefficient models and into a few million Japanese and European small cars. Complacency following recovery from the first fuel crisis ('73-'74) delayed world-class small-car development, and Detroit was caught with its product pants around its ankles when Iran hit the fan.

Making such decisions much easier, though, are the competition's similar plans. Chrysler already has dropped its full-size lines and will phase out the remaining rwd inter-

mediates over the next couple of years, leaving its domestic lineup on just two fwd platforms. Ford will likely have rwd big cars through 1985, but will go to three fwd platforms by the '86 model year.

75-mpg Chevette?

What about the T-car (Chevette, T1000) you ask? It will stay around in rwd form as the GM price leader for two or three more years. However, it will probably be replaced by either a version of the fwd, S-car subcompact (available in Europe by late 1982) or a Japanese-built, fwd mini evolving from the Isuzu/Suzuki deal (see *Detroit Listening Post*, page 20, Dec. '81) by '85 or soon after.

It is this car, whatever future form it may take, on which the company is counting to combat the 75-mpg VW rumored for the '86 model year. GM engineers say that at least one three-cylinder prototype is already in the 70-mpg neighborhood, and that 75 or even 80 mpg are not out of reach.

Future Ford at Frankfurt

One attraction at this year's Frankfurt, West Germany, Auto Show was

(Please turn to page 24)



America's lowest priced pickup. Dodge Ram Miser. \$5899[†] Equipped. Not stripped.



"No other full-size pickup gives you so much for so little," says ex-Ford owner Walt Garrison.

Best mpg increase: 29 est. hwy. [21] EPA est. mpg.*

The new generation of Dodge Rams—toughest Dodge pickups ever—just got gas stingier than ever. New 1982 Ram

	Dodge Ram Miser	Ford FS-100	Chevy Spec. Econ.
Price	\$5,899 [†]	\$7,097 [†]	\$7,094 [†]
Trim Material	Deluxe	Standard	Standard
Floor Covering	Carpet	Rubber	Rubber
Body Tape Stripes	Yes	No	No
Grille Insert	Chrome	Painted	Painted
Horns	Dual	Single	Single
Cigar Lighter	Yes	No	No
Day/Night Inside Mirror	Yes	No	No
Bright Wheel Covers	Yes	No	No
Axle Ratio	2.94	2.47	2.56
Fuel Tank (gal.)	20	16.5	16
Ammeter Gauge	Yes	No	No
Galvanized Steel (sq. ft.)	310	217	250

Miser gives Dodge the biggest mileage increase of all full-size pickups. Yet it still delivers Ram Tough performance, thanks to a *standard* drivetrain that teams a 4-speed overdrive manual transmission and hardworking 2.94 axle ratio with Dodge's famous Slant Six engine. No Ford or Chevy standard model matches that tough combination.

But Ram Miser is a lot more than just your basic brute force. From its chrome-bright grille to its easy operating tailgate, Ram Miser is loaded with handsome styling features—inside and out. At \$5,899[†] nobody else gives you so much for so little.

See your dealer about buying or leasing a new generation Dodge Ram today. You'll discover the pickup that made an ex-Ford owner out of Walt Garrison.



DODGE TRUCKS ARE RAM TOUGH

*Use EPA est. mpg number for comparison. Your mileage may vary depending on speed, distance and weather. Actual hwy mileage will probably be less. Calif. est. lower.
†Base sticker price excluding title, taxes and destination charges. Prices effective September 28, 1981.

DETROIT LISTENING POST

(Continued from page 22)

a super-aerodynamic, four-door Ford bearing the "Probe" name that the company has used on other extra-slippery prototypes. The difference is that this one may be very close to production. Insiders say a new fwd car called "Sierra," very similar to the round-nosed, rear-winged Probe sedan, will replace Ford of Europe's Taunus and Cortina as early as next fall. We may see it here as the next-generation LTD/Mercury Marquis in a few years.

Ford owner's manuals upgraded

Other Ford news includes simplified owners' manuals for '82 and a low-oil-level warning light that may be available by '83.

"We've redesigned and rewritten our passenger-car and light-truck Owner Guides across the board," says Ford training and publications manager E. J. Riley. "They'll be easier to read and easier to understand. With the increasing complexity of today's vehicles, it is important that owners understand their manuals." Subject matter, contents and indices are revised for easier references,

there are more illustrations, fold-out "operating guides" and forms to order more detailed technical publications for do-it-yourselfers.

Secondly, says Ford, with the growth of self-service gas stations, too many car owners are neglecting to check their oil often enough. As a result, engineers are developing an instrument panel "add-a-quart" idiot light that could help prevent expensive engine failures in the future. It won't be available until at least the '83 model year.

Sneak preview: '83 AMC

Based on recent extra-early information, I already feel good about AMC's '83 state-of-the-art fwd car. Jointly developed by partner Renault from the new European Renault Nine, the X-42 (code name) will debut next fall in four-door sedan and exclusive-to-the-U.S., two-door notchback coupe form. Product planners stress that it's 75-percent domestic in content, not a warmed-over version of the French car, and that they see no need for a hatchback.

From the beginning, they say, they knew it would have to have excellent fuel economy, quality and both weight and space efficiency just to compete on the same level as the competition—Chevy Chevette, Ford Escort, Plymouth Horizon, Toyota Corolla, Datsun 210 and 310, Honda Civic, VW Rabbit, and so on. As a result, it has an electronically fuel-injected, 1.4-liter, transverse four-cylinder engine that "should make it the most fuel-efficient, gas-powered car built in America. Everything but moving the factory to Tokyo has been done to insure outstanding quality," says AMC. It weighs about 100 pounds less than the Escort, but its 3-inch-longer wheelbase (97.2 inches) gives 1.7 inches more rear-seat legroom. It also has a whopping 8.2 inches more rear hip room for realistic five-passenger capacity.

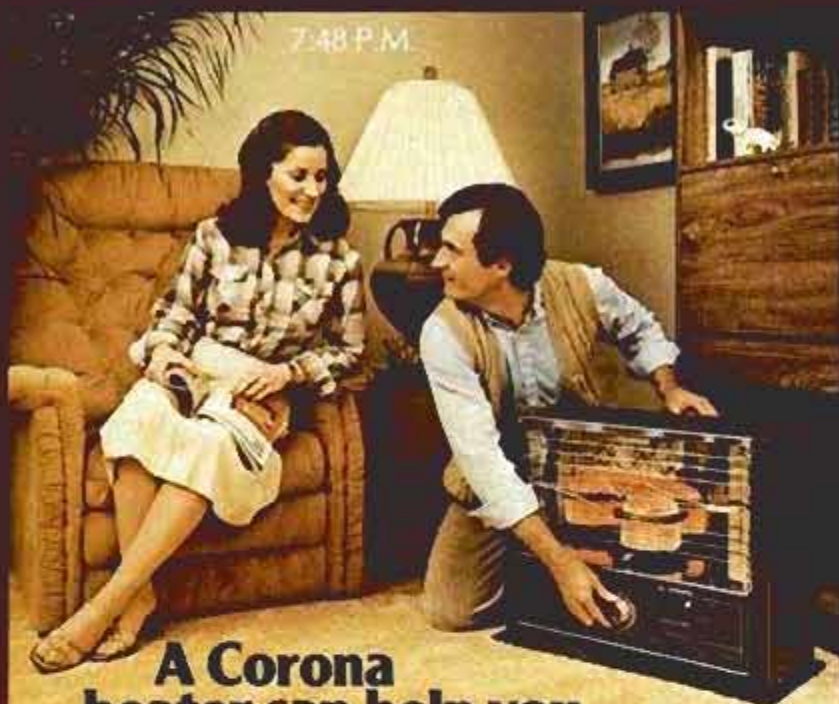
Beyond that, say the planners, the X-42 needed some "uncommon advantages" to set it apart in that ultracompetitive market. These are in the areas of styling, ride and handling, comfort and convenience. Examples: attractive, quality-look appearance inside and out (the coupe, especially, is said to have a VW Jetta/Audi 4000 sort of Germanic flavor) that makes it look more expensive than it is. AMC says it will be "mid-pack" competitive in price. That should mean around a \$7,000 base price. It will have unique pedestal-mounted front seats, rather than track mounted, to provide extra foot room for rear-seat passengers. **FM**



7:23 A.M.



3:57 P.M.



7:48 P.M.

A Corona heater can help you stay warm and save money.

You've turned down the thermostat to save energy... but you don't have to be cold!

A Corona portable kerosene heater lets you move the heat where you want it, when you want it, without heating your entire home.

A Corona heater is easy to use. It burns clean. It's Underwriters Laboratories listed.* Corona is a

sensible heating alternative that lets you stay warm and save.

Cozy up to
CORONA

World leader in portable kerosene home heating appliances.

© 1981 GLO-International, Corporation

*Models SP-DK, 17-DK, 22-DK are U.L. listed. Check local codes for permitted use. The manufacturer reserves the right to make product modifications without notice.

**FACTORY
DIRECT SALE
NOW IN PROGRESS!**

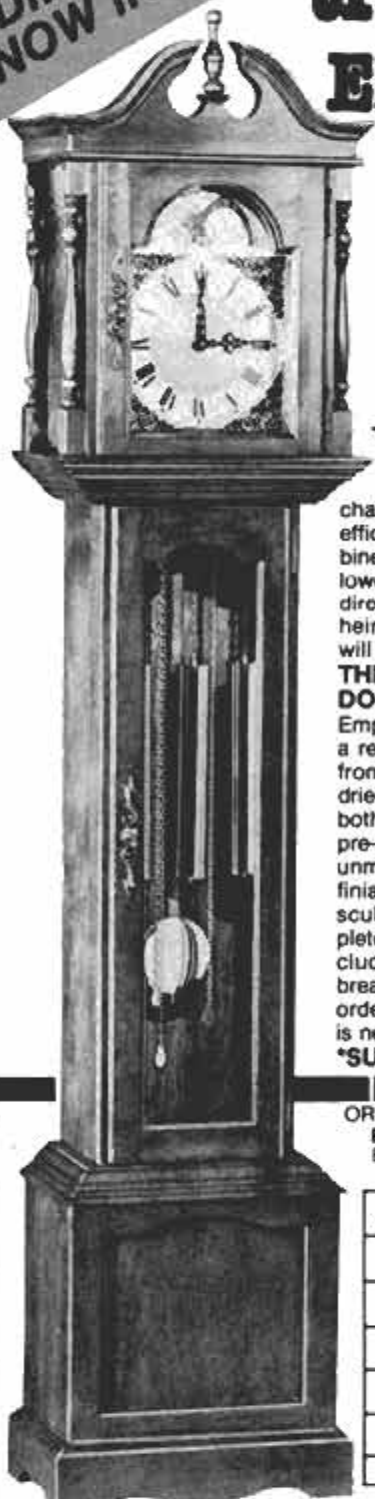
Building this treasure is a real pleasure.

EMPEROR CLOCK COMPANY'S

MODEL 120-K DO-IT-YOURSELF CASE KIT

SOLID 3/4" CHERRY

\$119.50* **FACTORY DIRECT
SALE PRICE**
Regular factory direct price \$199.50
MOVEMENT EXTRA
COMPARE YOUR FINISHED CLOCK TO THOSE
RETAILING AT \$850 AND MORE.



MODEL 120-K
SOLID 3/4" CHERRY
74" x 16 1/2" x 10"

THIS TREASURE DOESN'T COST A FORTUNE.

Emperor Clock Company's enormous purchasing power, high sales volume and operating efficiency in our own woodworking factory combine to bring you the highest quality product at the lowest possible prices. Our limited-time factory direct sale brings you even lower prices on this heirloom-quality grandfather clock your family will treasure for generations. Buy now and save!

THE PLEASURE OF OUR DO-IT-YOURSELF KIT

Emperor's do-it-yourself kit makes woodworking a real pleasure, even if you don't know a rabbit from a dovetail! Kit pieces are pre-cut from kiln-dried, solid 3/4" cherry and sanded smooth on both sides. Miter, mortises and tenons are also pre-cut. (If you prefer, your kit may be ordered unlimited for \$10 less.) Divided swan neck and finial, waist and dial face doors, dial frame and sculptured basefront are pre-assembled. Complete instructions, all screws and hardware included. Glass is not included due to possible breakage in shipment. Each piece may be re-ordered separately. No woodworking experience is necessary.

*SUBTRACT \$10.00 FOR UNLIMITED KIT

SOLID BRASS, SELF-ADJUSTING EMPEROR MOVEMENTS AND DIALS

One Week • Weight Driven • Westminster Chimes
Emperor's Model 101-M movement, with dial, is made of solid brass by a well-known West German family firm. Choose from either Tempus Fugit (Time Flies) or Moving Moon with lunar calendar. Both movements are self-adjusting to tick smoothly and accurately so you never have to level your clock. They sound the Westminster chimes each quarter-hour and count the hour with a Big Ben tone. Movements include weights, solid brass weight shells, brass finished bob, pendulum and chimes. All plates are solid brass with pinions of hardened steel. Installation and adjustment are simple, following step-by-step instructions. **MOVEMENTS CARRY A ONE YEAR WARRANTY**



**LYRE
PENDULUM
WITH
SOLID
BRASS
RODS NOW
AVAILABLE**

\$25.00

EXTRA

NO RISK! MONEY BACK GUARANTEE

If for any reason you are not completely satisfied, return in original shipping carton within thirty days for prompt refund. No questions. No excuses.

ORDER NOW! SALE ENDS MARCH 15, 1982

ORDER DIRECT WITH THIS FORM • ORDERS SHIPPED 2 TO 3 WEEKS • SHIPPING CHARGES COLLECT

EMPEROR CLOCK COMPANY, Dept. 39-G

Emperor Industrial Park, Fairhope, Alabama 36532

Please Check: New Customer

Previous Customer

CREDIT CARD TELEPHONE ORDERS WELCOME CALL 205/928-2316

QTY.	DESCRIPTION	WT.	REG. PRICE	SALE	EXT.
	Model 120-K Solid 3/4" Cherry Do-It-Yourself Case Kit (Movement Priced Separately Below)	50	\$199.50	\$119.50	
	Model 120-A Solid 3/4" Cherry Completely Finished Clock with Self-Adjusting Movement, Tempus Fugit Dial, Westminster Chimes	97	\$684.50		
	Model 120-A Solid 3/4" Cherry Completely Finished Clock with Self-Adjusting Movement, Moving Moon Dial, Westminster Chimes	96	\$699.50		
	Model 101-M Movement Complete with Tempus Fugit Dial, Westminster Chimes for Model 120-K	33	\$144.50		
	Model 101-M Movement Complete with Moving Moon Dial, Westminster Chimes for Model 120-K	33	\$159.50		
	Lyre Pendulum for Both Model 101-M Movements	5	\$ 25.00		

We accept personal checks.

Enclosed \$ _____ () Check () Money Order

Charge to my () MasterCard () Visa

ACCOUNT NUMBER

MasterCard Inter Bank No. (above your name)				Expiration date required		Mo	Yr			



PLEASE SEND FREE COLOR BROCHURE

Please check

Send Kit Unlimited

Subtract \$10

TOTAL \$ _____

Alabama residents only.

add 4% sales tax \$ _____

GRAND TOTAL \$ _____

NAME _____

STREET _____

CITY _____

STATE _____ ZIP _____

TELEPHONE NUMBER _____

(PLEASE PRINT)



**EMPEROR®
CLOCK COMPANY**

WORLD'S LARGEST MANUFACTURER
OF GRANDFATHER CLOCKS
© 1982 Emperor Clock Company
All Rights Reserved

VISIT OUR FACTORY SHOWROOMS MON.-FRI., 8 A.M. TO 5 P.M., EMPEROR INDUSTRIAL PARK, FAIRHOPE, AL

CAR CLINIC

SOLUTIONS
FOR MECHANICAL
HEADACHES

BY
MORT SCHULTZ



Ergo—EGR!

Two mechanics (one in a dealership—the other, an independent) have told me the problem with my 1978 Pontiac (301-cu.-in. engine) is one of the most baffling they've experienced. I'm enclosing a list of services they've performed. As you can see, it's extensive. Still, the engine maintains a rough idle bordering on the absurd. The problem starts only after the car has been driven and brought to a halt. The mechanics said, "Ask Mort." Okay—I'm asking. What's ruining the performance of an otherwise fine automobile?—Matthew Arthur Long, Elmhurst, Ill.

Probably the exhaust-gas-recirculation (EGR) valve. A bunch of problem valves found their way into the field in 1978 and 1979 aboard the Pontiac-built, 301-cu.-in. V8 and Buick-built, 231-cu.-in. V6 engines. If a GM car has either of these two engines and it has developed a severe rough idle after deceleration, the EGR valve may be sticking in the open position. You can check valve performance by following these steps:

- Drive the car until it's warmed up and then park it. Keep the engine running.
- Put on a pair of gloves to avoid burning your fingers when you touch the valve.
- Place your fingers under the EGR valve, into contact with the diaphragm. Have someone rapidly increase engine speed to around 2,000 rpm, and then take his foot off the accelerator pedal so the engine returns to idle. Repeat this sequence five times, pausing several seconds between accelerations. If engine idle gets rough during any one phase of the sequence, tap the top of the EGR valve with a mallet. Does the diaphragm drop and does idle become smooth? If these things happen, replace the valve. It is sticking.
- If no up-and-down diaphragm movement is felt as the acceleration-deceleration sequence is done, remove the hose from the EGR valve nipple and place your finger over it

(glove off) to see if there's vacuum. If vacuum is present, replace the EGR valve. If vacuum is not present, check the other end of the hose to see that it's connected. Then, examine the hose to make sure it isn't split.

If you can't get the engine to idle rough in this way, drive the car until rough idling occurs. Then, pull well off the road and perform the test.

Replacing the EGR valve is the only way to rid yourself of this problem, if the valve is to blame. Cleaning the valve and returning it to service is, at best, of temporary help.

Solid tip

Twice, the speedometer cable in my AMC 1980 Concord has broken. Has this problem been covered by an AMC service bulletin?—Lyman Schultz, Cranston, R.I.

There have been cases of the plastic tip on the end of the cable breaking, but not enough have been reported to warrant a bulletin. The plastic tip is fragile and prone to shattering where it fits into the speedometer lug. If this has happened, don't throw away the cable. It can be salvaged. Besides, a new cable with the same old plastic tip can fail again. To avoid a recurrence, buy a speedometer repair kit from an auto-parts and accessories store (the kit contains metal tips). Trim off

the plastic tip and select a tip from the repair kit that will fit in its place. Crimp the metal tip, which won't break, onto the end of the cable.

Suppose your speedometer cable is breaking somewhere along its length. Then, either the cable wasn't lubricated sufficiently when it was installed, or the outer sheath is too taut or not aligned properly. Cable failure caused by such conditions is usually preceded by a chatter.

Signed, sealed and delivered

I have a 1980 Buick Skylark with a four-cylinder engine. So far, the Buick dealer has replaced the rear main-bearing seal, transmission gasket and oilpan gaskets, but he has not stopped an oil leak. He now says there's a chronic problem and nothing further can be done to correct it. I can't believe there's no cure for an oil leak in a car with only 5,000 miles on it.—Ed Jannis, Elmira, N.Y.

Good for you, Ed. Don't believe it. Although oil leaking was a problem with the Pontiac-built 2.5-liter (151-cu.-in.) L4 engine, the trouble seems to have been resolved with the introduction of a new rear oilpan seal. The new seal is designated for use in 1981 models, but it's for 1980 engines, as well. The part number is 10021323.

Four separate seals have to be installed when the 2.5-liter engine oilpan is reassembled to the engine. There is this new rear seal, a front seal and two side seals. One slip-up when installing any of these will cause an oil leak, so be sure that the service manual is followed.

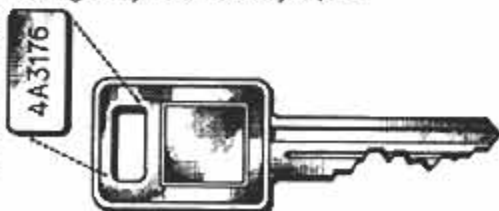
Cast in Iron

My 1980 Dodge pickup truck with standard transmission broke one throw-out bearing several thousand miles after I bought the vehicle. It was replaced by the dealer at his expense. This week, the new bearing

(Please turn to page 28)

A key element

Many people don't consider the possibility of needing another set of car keys when they buy a new automobile. This mistake could come back to haunt them. I'm talking about noting ignition and trunk key numbers when you take delivery of a new car. These numbers are imprinted on tabs the dealer knocks out of the keys. The tabs should be turned over to you. However, a lot of people just throw them away without recording the numbers. A number helps a locksmith to match the correct key blank so he can make you a new key if the old one wears out or is lost. If you don't give him a number, the locksmith has to remove the lock cylinder. At this point, making a key becomes very expensive—from \$30 to \$100 says the Automotive Information Council. So, if you don't have these important numbers, call the dealer from whom you bought the car. He may have recorded them. Note the numbers (usually, there are two—one for the ignition key and one for the key that fits all other locks) and keep this record with your car papers.



Now! Start a MONEY-Making Small Engine Repair Business Of Your Own!

EARN EXTRA CASH INCOME
Working Right At Home In Your
SPAREtime or FULLtime
as a Small Engine Repair Expert!



Beat Inflation!
NO LAYOFFS...
NO STRIKES!
Be Your
Own Boss!



YOU GET THESE QUALITY
TOOLS AND INSTRUCTIONS
PLUS THIS
3 1/2 HP
BRIGGS & STRATTON ENGINE
YOURS TO KEEP!

ALL TOOLS, MATERIALS AND EQUIPMENT COME WITH YOUR COURSE
HERE'S WHAT YOU RECEIVE

- 3 1/2 HP Briggs & Stratton Engine
- Foley's In-Depth Training Manual
- Factory manuals from major manufacturers
- All the specialty tools you require to perform repair work from simplest tune-ups (at an average of \$15-\$20) to major engine overhauls that will pay you handsomely.

Earn Money Fast!

Long before you complete your studies you'll be able to begin earning money on tune-ups and minor repairs. And sooner than you think, you'll be through the course and qualified to perform all major repairs and overhauls that really bring in the cash. To help you start earning fast, as part of your training you receive the specialized tools and equipment you'll need to service these engines, including the 3.5 HP Briggs and Stratton 4-cycle engine... all yours to keep at No Extra Cost.

No Experience Needed — Any Age Can Succeed

If you can read, you can master this craft right at home in your spare time with Foley's time-tested "hands on" training methods... even while working at your regular job, without missing a single paycheck. Age, education or minor physical handicaps are not a barrier, and you need no previous experience or special mechanical training. Each lesson explains every part and procedure clearly in everyday language with plenty of pictures and diagrams to plainly show each phase step by step. You

learn everything from simplest troubleshooting and tune-ups to complete overhaul on all 2-cycle and 4-cycle engines.

Foley Will Help You Every Step of The Way

For more than 50 years Foley has been helping men, probably much like yourself, build their own successful service shops... and we can help you, too. In addition to the finest training available in learning to repair engines, you also receive valuable business building guidance. You learn how and where to get business, how much to charge, and where to get parts at wholesale... all the shortcuts and inside 'tricks' you'll need to get your business off to a fast and profitable start.

FREE INFORMATION KIT

Tells how to quickly start your own business, how to grow, how Foley will finance you, and how you can inspect Foley's Small Engine Repair Course on our 15-Day NO RISK Trial Offer.

ACT NOW!

NO OBLIGATION!
NO SALESMAN
WILL CALL!

**RUSH
COUPON**

Over 65,000,000 Small Engines in Use Today

Yes, small engine repair is a wide open field. With over 65 million small engines in use, and a million new units being built each month, there's a lot of business and big profits available for qualified men who can service and repair them. But industry growth has been so fast that there is a severe shortage of small engine repair pros. That's why NOW is the time for you to get into this profitable and enjoyable field, and find out how Foley's home study training course can easily teach you the skills that can soon have you earning hourly rates equal to any other skilled craft... up to \$18.00 an hour. And that's just your labor charge — parts, engines and accessory sales means even more profits... profits YOU earn and keep in YOUR pockets.

Be Your Own Boss in A Fulltime Business of Your Own

As a fulltime business, small engine repair offers many advantages. When you're the boss, you work the hours you want. There is never a worry over a strike or layoff, and you earn year round profits repairing items such as chain saws, tillers, garden tractors, lawnmowers, mini-bikes, mopeds, go carts, edgers, power rakes, generators, paint sprayers, abrasive saws, snowblowers, snowmobiles... all these items and more. A good small engine man usually has a weeks work backlog even during 'slack' periods and is three to four weeks behind during the summer. There is no huge investment in equipment, no expensive inventory. You can work right out of your garage, basement, spare room... even a van makes a suitable mobile shop.

Or Make Extra Cash Working Part Time

It's the ideal sparetime business too. In just evenings and weekends you can earn plenty of extra cash to build a 'rainy day' or retirement fund, or use the extra money NOW to provide your family with the 'extras' you want them to have. Many men begin by working just their idle hours until their shop grows to the point they can switch to fulltime. When it's your business, you make the decisions and the choices are up to you.

Act Today for A More Secure Tomorrow

Find out how Foley training can start you on the road to being your own boss in a recession-proof, money-making business of your own. Just fill in and mail the coupon below (or send postcard) to receive full information and your FREE School Information Kit by return mail.

Do it TODAY! Send to —

Foley Manufacturing Co.

Small Engine Repair Division
7830 Foley Building
Minneapolis, Minnesota 55418

Foley Manufacturing Co.
7830 Foley Building
Minneapolis, Minnesota 55418

YES, please send me the FREE Data Kit that gives me full details on how Foley can start me in a profitable Small Engine Repair business of my own, and facts about Foley's exclusive 15-Day No Risk Trial Offer. No obligation. No salesman calls.

NAME _____

ADDRESS _____

CITY _____

STATE _____

ZIP _____



CAR CLINIC

(Continued from page 26)

failed. Now I have to stand the cost, because the truck is out of warranty. I'm willing, but how can I be sure it won't happen again?—Tom McCarthy, Roanoke, Va.

Funny you should ask, because arriving with your letter was an advisory from Dodge saying that a "much sturdier" throw-out bearing has been issued. The one you've been using is made from stamped steel. The new one (part No. 2405077) is of cast iron.

Don't be in a hurry to fork over money, Tom. The problem was in the truck to start with. If your dealer doesn't agree to pay for the repair, have a factory representative from the zone office decide the matter, as long as he decides in your favor. If he doesn't, take the next step, which is to tell the representative you want the case put before the Customer Satisfaction Arbitration Board. The board (there's one serving every state) consists of a local consumer advocate, an independent technical representative certified by NIASE (National Institute for Automotive Service Excellence), a member of the general public, the Chrysler zone

manager, and a Chrysler-Plymouth or Dodge dealer. Contesting parties have to agree that the vote taken by the board is binding. The people representing Chrysler Corp. on the board do not vote.

The Chrysler Corp. Customer Satisfaction Arbitration Board for your area is located at Box 15033, Richmond, Va. 23227.

History lesson

I hear a distinct engine knock after the 460-cu.-in. V8 engine in my 1976 Ford Torino is warmed up and the car is moved from a standstill. I bought the car from a private party who has left the state, so I have no idea of its history. Can you tell me if there has been a problem with the engine and, if so, whether I can do anything about it?—Harry Walsh, Cambridge, Mass.

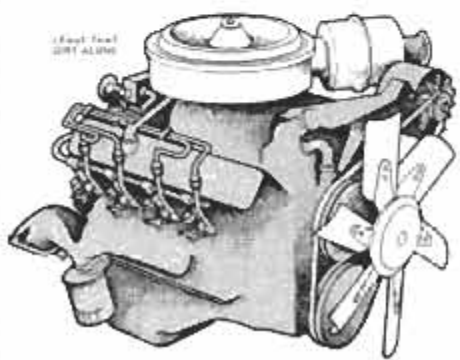
Some 1975-77 Ford and Mercury 460-cu.-in. V8 engines were fitted with oversize front main bearings that produced a cyclic thumping noise, because they came in contact with the block. New upper and lower main bearings that are smaller have been issued. They provide ample clearance. However, before tearing down the engine to install them, verify that the problem is related to the

Oh, that beautiful grime



If you ever get a hankering to clean the grime off your diesel engine, don't! If you don't want to take this advice, at least wait until the engine is stone cold—otherwise, the diesel fuel-injection pump may end up stone-cold dead. Cold water sprayed on a hot injection pump could alter the already minute clearances (some as narrow as 15 millionths of an inch) between parts inside the pump. If this happens, parts can seize and the pump will fail. All you'll get for being tidy is a \$300 bill for a new pump.

As GM says: "The diesel engine does not need periodic cleaning, nor does GM recommend it be cleaned." In this case, dirty is better.



30 Ways To Help You Qualify For The Job You Want!



FREE CAREER FACTS ABOUT DIPLOMAS AND COLLEGE DEGREES

Send for free facts and color brochure to find out what career training in the field of your choice might do for you—no obligation to buy anything now or ever—Now at home in your spare time, you can train for a money-making career...even get a college degree if you want...to help you get a better job. Find out everything you need to know about any one of these 30 career programs—with no obligation to buy anything, now or ever, and no salesman will call. Just check the one program that interests you most. You will receive free facts, 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 your present job.

Open Book Exams...Adult Training
Your diploma or college degree is given to you for what you learn—not what you memorize. We send lessons and training material to your home. You decide when you are ready to take each "Open Book" exam. Then mail it to your instructor. Graded papers are returned to you with comments when needed to tell you how to correct your wrong answers. "Open Book" exams have proven so successful for adults, they are now used in many colleges. Our graduates tell us they like our method of independent study because it's so convenient and easy to do. You choose your own study hours in the privacy of your own home. You move ahead one step at a time, as fast or as slow as you want. And every Diploma or College Degree is fully accredited.

An Ideal Way to Learn

You waste no time traveling to and from class. And you never have to miss a pay check. Skilled instructors are ready to help you at any time.

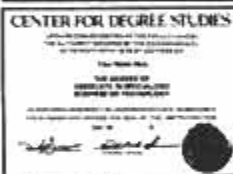
You get the same high-quality training that ICS has been known for since 1891...the same kind of training program that's offered by giant companies to their employees...corporations like Union Carbide, International Paper, 3M, Bethlehem Steel, United States Steel, etc.

No one can promise success but if you want more security, more day-to-day satisfaction and more of a future, send for free facts and the color brochure of your choice. There is no obligation and no salesman will call.

MAIL COUPON TODAY

ICS and NACS are the Independent Study Divisions of National Education Corporation which is now training over 10,000 students a year in more than 30 schools from border to border and coast to coast. ICS and NACS are both accredited members of the National Home Study Council.

MAIL COUPON TODAY FOR FREE FACTS
EDUCATION SERVICE CENTER, Dept. PBSC1
Scranton, Pennsylvania 18515



Could a Career Diploma Help You Earn \$25,000 to \$100,000 More in Your Lifetime?
Compare your present salary with the amount of money you could be making in any one of the careers listed below. Electricians average \$11.25 an hour, auto mechanics over \$8.00 an hour. And it's not only the money, but the fun of working in a job you like.

Could a College Degree Be Worth Thousands of Dollars to You?
A two-year degree that gives you an Associate in Specialized Business or in Specialized Technology could make a giant difference in your lifetime earnings compared to the average earnings of a high school graduate. Check the degree or career course you are most interested in and...

MAIL COUPON TODAY FOR FREE FACTS AND BROCHURE

EDUCATION SERVICE CENTER, Dept. PBSC1
Scranton, Pennsylvania 18515

Please send me free facts, color brochure and full information how I can study at home for the career I have chosen. I understand I am under no obligation and no salesman will call. **CHECK ONE BOX ONLY!**

- | | | | |
|----------------------------------------------------|---------------------------------------------------------|---------------------------------------------------|--------------------------------------------------------------|
| <input type="checkbox"/> Electrician | <input type="checkbox"/> Van, Car and Truck Customizing | <input type="checkbox"/> Interior Design | <input type="checkbox"/> College Degree in Civil Engineering |
| <input type="checkbox"/> Auto Body Repair | <input type="checkbox"/> Police Sciences | <input type="checkbox"/> Appliance Servicing | <input type="checkbox"/> College Degree in Electrical Eng. |
| <input type="checkbox"/> Auto Mechanics | <input type="checkbox"/> High School | <input type="checkbox"/> Home Building/Renovating | <input type="checkbox"/> College Degree in Mechanical Eng. |
| <input type="checkbox"/> Carpenter | <input type="checkbox"/> Drafting | <input type="checkbox"/> Small Business Mgmt. | <input type="checkbox"/> College Degree in Electronics |
| <input type="checkbox"/> Diesel Mechanics | <input type="checkbox"/> Plumbing | <input type="checkbox"/> Veterinary Assistant | <input type="checkbox"/> College Degree in Accounting |
| <input type="checkbox"/> Air Conditioning | <input type="checkbox"/> Bookkeeping | <input type="checkbox"/> Motorcycle Repair | <input type="checkbox"/> College Degree in Business Mgmt. |
| <input type="checkbox"/> Heating and Refrigeration | <input type="checkbox"/> Travel Agent | <input type="checkbox"/> Machine Shop Technology | <input type="checkbox"/> Surveying & Mapping |
| <input type="checkbox"/> Firearm Repair | <input type="checkbox"/> Electronics | | <input type="checkbox"/> Motel-Restaurant Mgmt. |

NAME _____ AGE _____

ADDRESS _____

CITY/STATE/ZIP _____

MasterShop... cast iron tables make the difference!

MasterShop measures up to the toughest woodworking project with the accuracy of cast iron tables, like those used in industry—to give you results you can be proud of every time!

A complete home workshop in one easy to handle unit equips you to tackle almost any job. Converts in seconds to a powerful 10" table saw, 12" disc sander, 16½" drill press, 34" lathe and horizontal drilling machine—powered by a heavy duty 15 amp ball bearing motor. A variable speed range from 900 to 5400 RPM's allows the precise speed selection necessary for any operation.

Make your own furniture, remodel a room—build any project large or small. You can do it easily and professionally and save money too! Even beginners find themselves quickly achieving beautiful results on every project.

MasterShop is affordable—More value, quality and accuracy for substantially less money than other home workshop systems.

Send for free information or call today and learn why more and more people are turning to MasterShop to satisfy their home workshop needs.

**Master
Shop**
MULTI-TOOL



FOR INFORMATION
CALL TOLL FREE
1-800-543-5620
In Ohio Call (513) 866-5300

For Free Information Package Mail to:

MasterShop Multi-Tool Division
ABCA, Inc. Dept. B112
3728 Benner Rd., Miamisburg, Ohio 45342

NAME _____
ADDRESS _____
CITY _____ STATE _____ ZIP _____

front bearings. No sense doing this job if it isn't. Check it out this way:

1. Make sure ignition timing is set to specification and run the engine until it is warmed up.

2. Park the vehicle in a clear area with the engine idling, windows closed and accessories turned off.

3. Place your foot firmly on the brake pedal and put the transmission into DRIVE. If your car or truck has a manual transmission, raise the car so rear wheels hang and place the transmission in low gear.

4. Increase engine speed slowly to about 1,500 rpm and then let it return slowly to idle.

A rhythmic cyclic thump coming at regular intervals verifies that the front main bearing problem exists.

Two different sets of modified bearings have been issued to correct this problem. After the engine is dismantled, install upper main bearing D7AZ-6333P and lower main bearing D7AZ-633AB. They are .001-in. undersize. Hold the crankshaft against the block as you torque the bearing cap bolts. Then, test to see if clearance is adequate by inserting a Plastigage between the lower bearing and block. A clearance of .0004 to .0015 in. is suitable. If this clearance is not attained, remove these bear-

ings and install upper main bearing D7AZ-6333R and lower main bearing D7AZ-6333AC. They are .002-in. undersize.

Li'l Orphan Sunbeam

"Hi, Mort, I'm the technical editor for the Sunbeam Car Club of America. May I use your column to offer our services to not only Sunbeam owners, but also to owners of other cars in the Rootes Group—Hillman, Humber, Commer, Singer and Plymouth Cricket?"

Be my guest!

"We realize these cars have become orphans on the American scene, and people who own them may feel neglected. Our club can offer technical advice and parts information; since we are a nationwide group, we can often provide on-site assistance. We will gladly render any help we can to fellow owners of these cars, if they contact me. Thanks."—Marc James Small, 1205 Duncan Dr., Williamsburg, Va. 23185.

GOT A PROBLEM WITH YOUR CAR?

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

SERVICE TIPS

■ Black smoke and lack of power in a GM 1981 diesel engine may result from a malfunctioning exhaust-pressure-regulator (EPR) valve. The valve, which closes at idle to increase EGR flow to the engine, is supposed to open when engine speed is increased. If it doesn't, you'll be driving under conditions that cause the problems of smoke and poke, so replace the EPR valve.

■ Ford has extended the warranty on the electronic-ignition module of all 1977-80 models to 36 months or 36,000 miles, whichever occurs first. The ruling applies only to original owners. If the module fails and your dealer isn't aware of the change, have him call 800-241-3673 or the zone office for details.

■ Are you getting lousy gas mileage (less than 17 mpg) while driving your 1981 Chrysler K-Car in urban and suburban areas? If it has a 2.6-liter engine, the carburetor primary nozzle may be dripping as the engine idles down at a stoplight or in traffic. Service bulletin 14-18-81 (7/27/81) tells your dealer how to fix the trouble.

■ The new noncog, four-ply, alternator drive belt used on 1981 GM diesel engines is also the replacement belt for your 1980 GM diesel when your present cogged belt fails. Be sure to get the correct size. If your car has an alternator pulley with an outside diameter of 2.4 in., get part No. 22511772. If the outside diameter is 2.6 in., get belt No. 22511773. **PM**

APPLIANCE CLINIC

QUESTIONS ANSWERED

Frosty freezer

I have a Sears Coldspot refrigerator model No. 106-6657621. The freezer ices up in three to four days. After I defrost it, the unit works well for about two hours. What is my problem and what do I have to replace?—Charles Gotard, Maspeth, N.Y.

Sounds as if your problem is in the defrost system of the refrigerator. One of three components could cause this problem: the defrost timer, defrost heater or evaporator thermostat (bimetal).

For a quick check to narrow down which components are at fault, find the defrost timer, located behind the front bottom grille. Remove the grille and look near the drain pan. You'll see a black metal box with a small knob or shaft protruding through the front. The shaft is part of the timer. Listen for the sound of the compressor running. Turn the timer shaft clockwise slowly. You will hear a clicking sound as the shaft rotates. When you hear a loud "snap," you've reached the beginning of the defrost cycle. Stop at this point and listen for the compressor to shut off. Wait 5 to 10 minutes; water should be entering the drain pan. If it does, the defrost heater and bimetal are working properly and the defrost timer is at fault. This could be due to a bad motor, shaft binding, chipped teeth on the gear or a bad electrical contact in the timer. The timer (part No. 530557) is

available at Sears for approximately \$14. Installation instructions are included.

If no water appears in the pan, we suggest calling a service technician to check the defrost heater and bimetal. Specific tools are required for this job.

Stubborn dryer

I have a Sears electric dryer, Model 110-76655100. When the selector knob is turned to high heat, the fuses blow. Also, the drum seems to be more difficult to turn by hand than it was when the dryer was new. I've lifted the top and front panels, removed the drum and cleaned everything thoroughly. I lubricated the drum-support rollers and idler pulley. According to the Sears service manual, the front-drum bearing is Teflon-impregnated felt. I'd like to try a little lithium white grease or some other high-temperature lubrication on the front bearing. I would be interested in any information on this subject.—Ralph Schowalter, Berkley, Mich.

By adding grease to the bearing, you increase the possibility of grease being drawn into the drum and staining the clothes. As far as the fuses blowing, we would look in the area of the fuse box. Perhaps a loose connection or bad contact in the box is causing the fuses to blow only at the high-heat position. We would have an electrician check the fuse box and wiring to the dryer.

Slow dishwasher

My neighbor and I both have General Electric Pot Scrubber dishwashers, Model GSD 461. Strangely enough, both of us have had the same trouble. After a few years, the machine begins to discharge the water ever so slowly until it becomes a hit-or-miss affair, finally stopping altogether. I've checked the discharge solenoid valve and it operates well. I've also cleaned out the discharge tube going to the sink wasteline elbow.

To check the discharge, I disconnected the discharge tube from the wasteline, filled the machine with a few gallons of water, put the timer on the discharge cycle, started the machine and watched the tube. When I held the tube at the same height as the pump, it pumped the water out, as it should. But as I began to raise the tube to the required height, the discharge stopped. Any assistance on this matter would be appreciated.—Michael Wojtusik, Union, N.J.

Sounds as if the gate valve inside the pump housing has slipped on the metal gate-arm shaft. Apparently, the valve is not sealing the wash port in the housing properly. The gate valve is part of the pump. The valve comes with the complete pump assembly. You can order the assembly from General Electric.

Replacing the pump assembly is a fairly involved procedure. GE sells an excellent do-it-yourself repair manual which gives pictures and step-by-step instructions. (See *Service Tip* on this page.) The pump assembly is part No. WD-19X42; it costs about \$25.30

SERVICE TIP

■ General Electric has recently introduced a new do-it-yourself repair system for five of the GE and Hotpoint major appliances: range, refrigerator-freezer, dishwasher, clothes-washer and dryer.

The five appliance-repair manuals (see the photograph at right) comprise the Quick Fix System. These informative booklets are written specifically for do-it-yourselfers; they feature step-by-step photo sequences of all the most common repair procedures. GE has combined the repair manuals with 94 of the most widely used replacement parts in a handy display for hardware and houseware stores. Each manual costs \$6.95 and can be purchased at any Quick Fix System display or at GE replacement-parts centers.

You can order the manuals by mail from General Electric Co., Box 1000, New Concord, Ohio 43762. In addition to state sales tax, include a handling charge of \$2 total if you order one to five manuals. For orders of more than five manuals, send an additional \$2 per manual.



GE's five new appliance-repair manuals.

ENERGY-SAVING TIPS

Here are five energy-saving ideas on microwave ovens from Whirlpool Corp.:

- Use utensils recommended for microwave ovens. The wrong utensils slow cooking.
- Turn off the oven just before the food is done. This uses the oven's residual heat to finish cooking.
- Use high power whenever possible.
- Reheat foods in the microwave oven, instead of a conventional oven. Use a range, rather than a microwave oven, to cook large quantities of food.
- Cover most foods (such as vegetables and casseroles) to speed up cooking. **FME**

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

Build a HAHSA® — a safe, outdoor wood furnace that supplies your indoor heat and hot water.

Praised by energy experts, a proven way to cut heating costs down to as low as \$0.00



The energy experts in the press agree. So do homeowners and do-it-yourselfers. A HAHSA may be the best answer to the sky high cost of heating your home.

Build a HAHSA and cut down your heat and hot water utility bills to as low as zero — yes, that's \$0.00. Many smart homeowners have. What's more, a HAHSA is a far better and safer investment than a wood or coal stove.

THE HAHSA BASICS

A HAHSA (*Heating and Heat Storage Apparatus*) is a wood burner located outside your house in its own little 8' x 10' block structure — a self-contained heating system connected to your house by 4 pipes buried underground.

Popular Mechanics, and *Handyman* have praised a HAHSA as safe, simple, practical, clean — and ingenious. One secret of the HAHSA: it's insulated by more than 18 tons of sand.

It burns wood and paper, cardboard or scraps and stores heat until you need it, thanks to the 18 tons of sand.

Chances are that it will pay for itself in 12 to 18 months. That's what users tell us. After that, it's like having a little gold mine in your backyard—year after year.

HAHSA IS 10 WAYS BETTER THAN A WOOD OR COAL STOVE



1. Safe. Unlike a stove, it's outside. No fear of fire, explosions or choking gases.

2. Clean. No smoke, dirt, ashes, termites or bugs inside your house.

3. Efficient. Uses less wood than a stove as well as paper, cardboard or scraps.

4. Stores Heat. Because a HAHSA is well insulated, it supplies heat for hours, even days, after the fire is out. Burn it only a few hours every other day in summer — yet your water always stays hot.

5. Healthy Heat. Not the dry, irritating, smoky heat of a wood or coal stove.

6. Versatile. A HAHSA can work with the solar system you have or plan to install.

7. Simple. The HAHSA ties in directly to your hot water radiators, hot water baseboard or hot air systems via a heat exchanger.

8. Long Lasting Performance. Every part of a HAHSA is custom designed, tested and proven in use.

9. You Can Do It Yourself. Our plans give you step by step instructions. The cost of all materials is about \$1600. Or you can save time and put your HAHSA to work faster by purchasing key parts from us.

10. Supplies Domestic Hot Water Year Round. Because the HAHSA is outside, it can be used during the warm months also — so it never stops saving you money!

We are licensing franchised dealers for HAHSA — a terrific business opportunity. Write or phone today.

START SAVING NOW

Don't delay. Mail the coupon now. Send \$1.00 for general information or \$20 for complete plans and everything you need to know to go HAHSA.

Call 717-388-6172.

To: HAHSA, Box 112-P
Falls, Pennsylvania 18615
I want to go HAHSA. Please send me:
 Complete plans, drawings, instructions, material cost lists, plus general information. \$20.00
 General information about HAHSA. \$1.00 to cover printing and mailing.
 My check or money order is enclosed.
 VISA or Master Charge
(Please print or type)

Exp. date _____ Interbank (MC) _____

Name _____

Address _____

City _____

State _____ Zip _____



Feature articles in publications such as *The Mother Earth News*, *The Christian Science Monitor*,

HOMEOWNERS' CLINIC

QUESTIONS ANSWERED

Painting block walls

Both Dane H. Corey, Troy, N.Y., and Raymond J. Fradette, Parker, Fla., want to paint and seal concrete-block walls. Ray's have been painted previously, but are now a chalky disaster.

The Concrete Masonry Handbook, a publication of The Portland Cement Assn., is adamant about one thing: Surfaces must be free of dirt, grease, oil and old, chalky paint. If steam cleaning won't do the job, wet or dry sandblasting is suggested.

Paints that can be used on Portland cement are latex, oil-based, oil-alkyd and rubber-based. Latex is the most commonly used, as it breathes and isn't damaged by alkalis.

To waterproof and seal the block walls, you may want to use one of the products mentioned in "Porous Brick Wall" (*Homeowners' Clinic*, page 6, Aug. '81). The maker of Thompson's Water Seal suggests waiting a week after application before painting, then using an oil-base paint. The maker of White Roc 7 doesn't recommend painting over the sealer; some sealers, however, are available in colors. For the record, the information on sealing brick walls was given to us by Region Nine, Brick Institute of America.

Venting propane tank

I plan to enclose the propane gas tank for my new barbecue in a brick patio table with a marble top. Do I have to vent the enclosure in case of a leak in the system? I remember reading about boats exploding when the engines were started while gas fumes were trapped in the enclosed engine wells. Should I leave a few bricks out for ventilation?—Floyd C. Carver, St. Clair Shores, Mich.

As long as the gas is piped out of the enclosed space to the barbecue, there's no technical reason to vent it. If it were mine, however, I know I'd vent it against the extremely high odds of a leak in the valve or tubing. A louvered door for easy tank access might be the answer.

Aluminum on plywood siding

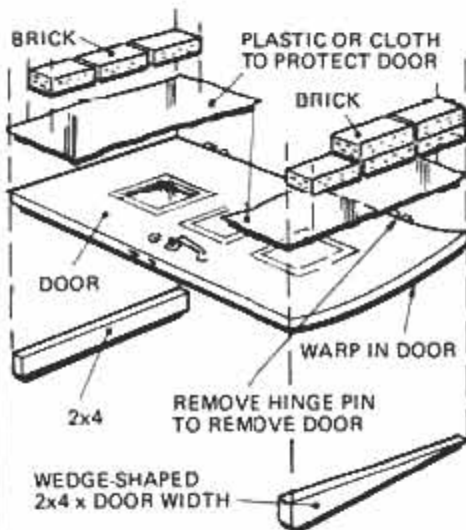
My plywood siding has reached the point of no return. Paint keeps flaking off, and after numerous bouts of sanding, scraping and repainting, I'm considering aluminum siding. Will there be any problem of rot of my plywood siding due to condensation

under the aluminum?—Ralph Cox, Salem, Ore.

No; in fact, the plywood will act as sheathing would in a normal aluminum-sided house. If the budget will allow it, a layer of 15-lb. builder's felt (tarpaper) over the siding and under the aluminum will aid in stopping drafts. You may also want to consider the merits of vinyl siding.

Warped doors

I had wood doors installed on the front and rear of my house in November 1980. A sticker on the doors stated, "No guarantee if the door isn't painted on all sides and edges." I



Place a warped door on 2x4s, warped edge over a wedge; add weight until the warped area is slightly beyond alignment.

couldn't paint the bottoms because of the cold weather. As you may guess, they warped. The firm that sold them to me said it was my headache. Can I straighten them?—Walt Mangin, Warminster, Pa.

I called several door manufacturers; they thought it was a waste of time to try to straighten a warped door. Since you're concerned about a waste of money, you might try the method shown in the drawing, if you have a large piece of plywood to cover your door opening while you attempt the straightening.

Do you have a home maintenance or repair problem? Send it to Homeowners' Clinic, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. Letters cannot be answered individually, but problems of wide interest will be discussed in this column. For more home repair and maintenance help, get PM's Home Care Guide, \$4.95 postpaid. Send orders(s) to PM, Box 1014, Radio City Station, New York, N.Y. 10101.

Rest the door on 2x4s, with the warped edge protruding upward on a wedge. Place protective material over the door. Add bricks or other weights, first to the straight edge and then to the warped edge until it is brought down slightly below straight. Leave the weights on the door at least 48 hours.

If this method works, seal all edges and both sides of the door. You also may have to relocate the strike plate and the doorstop. On exterior doors, I would replace the stop with a wood stop that has a foam rubber bead on the edge. This allows it to conform to the warp of the door, at the same time keeping out drafts.

Automatic gate opener

I don't recall seeing any article or mention of using an automatic or electrically controlled garage-door opener as a gate opener. After receiving prices of up to \$1,000 more for a gate opener than for a garage-door opener, I'd like to modify a garage-door unit to operate the gate across my driveway. It appears that I'd have to modify the opener to apply proper leverage to open the gate. Do you know if anything has been developed toward this end?—Carl W. Tapfer, Tacoma, Wash.

Carl, I don't know of any such modification. Possibly this letter will trigger response from our readers. Aside from leverage, you must also overcome the water-freeze problem. Some residential gate openers are capable of swinging a 300-pound gate 8 ft. wide.

Stanley Automatic Openers, Div. of the Stanley Works, 5740 East Nevada Ave., Detroit, Mich. 48234, makes such an opener. The price is in the \$800 range; installation costs vary depending upon geographical location. Although concrete is required for setting the unit, a very handy do-it-yourselfer can probably install one himself. Write Stanley for further details. **PM**



BY JOHN GAYNOR

Simply beautiful to look at. Beautifully simple to install.



Armstrong introduces a great new look in ceilings and a system that makes installation easier than ever.

The great new look is the Armstrong Masters Collection™. Dramatic ceilings with the realistic look of oak, pine, marble, and cork.

The great new system is "the Armstrong Easy Up™ Installation Kit." It makes putting up tile and plank ceilings a snap—even if you've never installed one before. No cumbersome furring strips. No stapling. No exact measuring. Easy to buy, too. Easy Up track, nails, and clips are in one convenient package. And all the materials for a 10'x12' Masters Collection Ceiling come to less than \$200*.

Nothing could be easier than the Armstrong Easy Up Installation System. And nothing could be nicer to come home to than a Masters Collection Ceiling.

For more information, plus the name of your nearest dealer, call this toll-free number 800/233-3823 (in Pennsylvania, 800/732-0048)



1. Nail up tracks.



2. Position tiles.



3. Snap in place.

Armstrong
so nice
to come
home to™



*Estimate based on manufacturer's survey of retail pricing.



How the Pickup works: The front-wheel drive train.

When man first hooked up horses to plows and carts, he quickly discovered that pulling things was a lot easier than pushing them.

Yet after centuries of transportation, VW was the first to use a front-wheel drive train on a pickup truck.

By pulling its load instead of pushing it, the VW Pickup can pull its weight more easily than equivalent trucks with rear-wheel drive. Up to half a ton. And, don't worry about what you carry. Its double-walled construction can handle anything you throw into it.

The VW Pickup has certain other advantages. Namely, excellent traction and exceptional directional control. The pickup also comes with VW's unique upshift light which tells you exactly when to shift for optimum mileage.

Nothing else is a Volkswagen.

And, when hooked up to VW's famous diesel horse, you can enjoy the best mileage to be found on a pickup, anywhere.

EPA 49 mpg highway estimate, and an estimated 42 mpg. (Use "estimated mpg" for comparisons. Your mileage may vary with weather, speed, and trip length. Actual highway mileage will probably be less.)

And that ain't hay.

THE PM GARAGE

CAPSULE REPORTS ON NEW AUTO PRODUCTS

Getting unscrewed



Screwdriver with a handle lets you remove stuck screws.

We've just come across something that has virtually eliminated the problem of removing a stuck screw. It's called the Screwrench. It's a 14-inch, vanadium-plated screwdriver that has a swing-out torque lever attached to the handle.

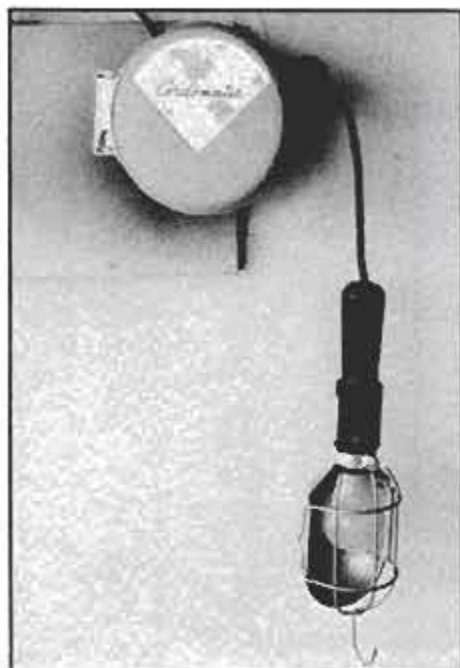
You just bear down on the screwdriver and twist the handle to back the screw out. We've used it numerous times and have had notable success with it. When the lever is closed, a magnet holds it securely to the handle.

The price is \$14.95 plus \$1 postage from Screwrench, Box 2070, Pasco, Wash. 99302.—T.A.

Reel it in

Cordomatic Reels has a portable trouble light called the Handy-Lite Reel.

It features a grounded, 20-foot, 18-gauge cord, mounts to either wall or



Hang-up reel has a 20-ft., 18-ga. grounded cord as well as a handy power outlet.

ceiling, folds flat when not in use and allows the user to relocate the unit to other job locations. The plastic light handle has a built-in power outlet and a swing-open steel guard.

The reel operates like a window shade. Just pull out enough cord to reach the work and it locks in place. A slight tug retracts the light into the housing.

I found the Handy-Lite at my local hardware store. The retail price was \$22.95. Cordomatic Reels' address is 17th and Indiana Ave., Philadelphia, Pa. 19132.—Joel Breault

Soft-front-end patch

Soft-plastic front ends are coming into wider use and, as they do, people are discovering that although the plastic resists damage, it's not immune. So when you get a gouge in your soft bumper, you'll probably want to repair it.

Now you can buy a repair kit from



Plastic body filler for soft front ends cures without use of heat blowers or lamps.

parts jobbers specializing in body supplies. It's a special patch material that, when mixed with a hardener, forms a compound that will fill and adhere to the gouge. Just spread it on and sand it smooth after curing. It sets in a half hour and cures in two, without heat or special lamps.

After sanding (just like plastic body filler), you can apply touch-up paint.

It costs \$13 from SEM Products Inc., 120 Sem Lane, Belmont, Calif. 94002.—Paul Weissler

Quick snow removal

If you're looking for a quick way to get snow and ice off your car's windshield, Hoppy's Snowbrush and ice-



Combination ice scraper and snowbrush has a 19-in. reach, won't scratch glass.

scraper combination tool could well be the answer. This item features a heavy-duty, 19-inch plastic handle for maximum reach, a sturdy nylon-bristle brush and a hang tab for easy storage that's designed specifically so that it won't scratch your windshield.

The Hoppy Snowbrush is manufactured by the Hopkins Manufacturing Corp. 428 Peyton, Emporia, Kan. 66801. The brush retails for about \$2.—Joel Breault

The contortionist

This has got to be one of the most original tools we've ever seen. It's a screwdriver with a flexible shaft and a ratchet action to boot. It comes with four bits that store in the plastic handle and an adapter that can be used with 1/4-inch-square drive sockets.

A three-position selector switch lets you ratchet clockwise or coun-



Unique flexible screwdriver will drive in or take out screws up to a 90° angle.

terclockwise and you can also lock it for conventional screwdriving. It will operate to just over 90°. However, if you bend the shaft more than that, the mechanism will begin to bind.

It's priced at \$15.95, including postage, from the Summit Tool Co., 4150 Fox St., Denver, Colo. 80215.

—T.A.

Which is the lowest 100's? (Hint: it's not Carlton.)

Now is the lowest tar 100s. But it's easy to see why some people think the right answer is Carlton. Carlton's been advertising itself as lowest for a very long time. And, in fact, at one time, it was.

But that time is long gone. Look at the chart on the right and see for yourself.

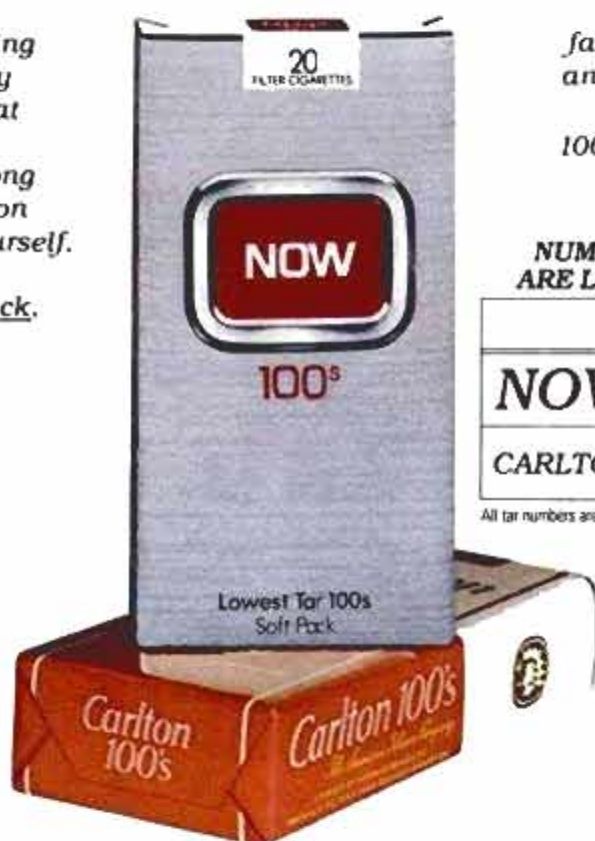
The truth is that today, Now 100s Soft Pack,

at 2 mg., contains less than half the tar of Carlton 100s Soft Pack, at 5 mg. (Is any

cigarette with 5 mg. of tar even seriously competing for the title of "lowest?")

And Now 100s Box is by far and away lower in tar than any other 100s whatsoever.

Which is the lowest 100s? No need to guess - Now.



NUMBERS DON'T LIE. NOW 100s ARE LOWER THAN CARLTON 100s.

	100's soft pack regular	100's soft pack menthol	100's box
NOW	2mg	2mg	Less than 0.01mg
CARLTON	5mg	5mg	1mg

All tar numbers are av. per cigarette by FTC method.

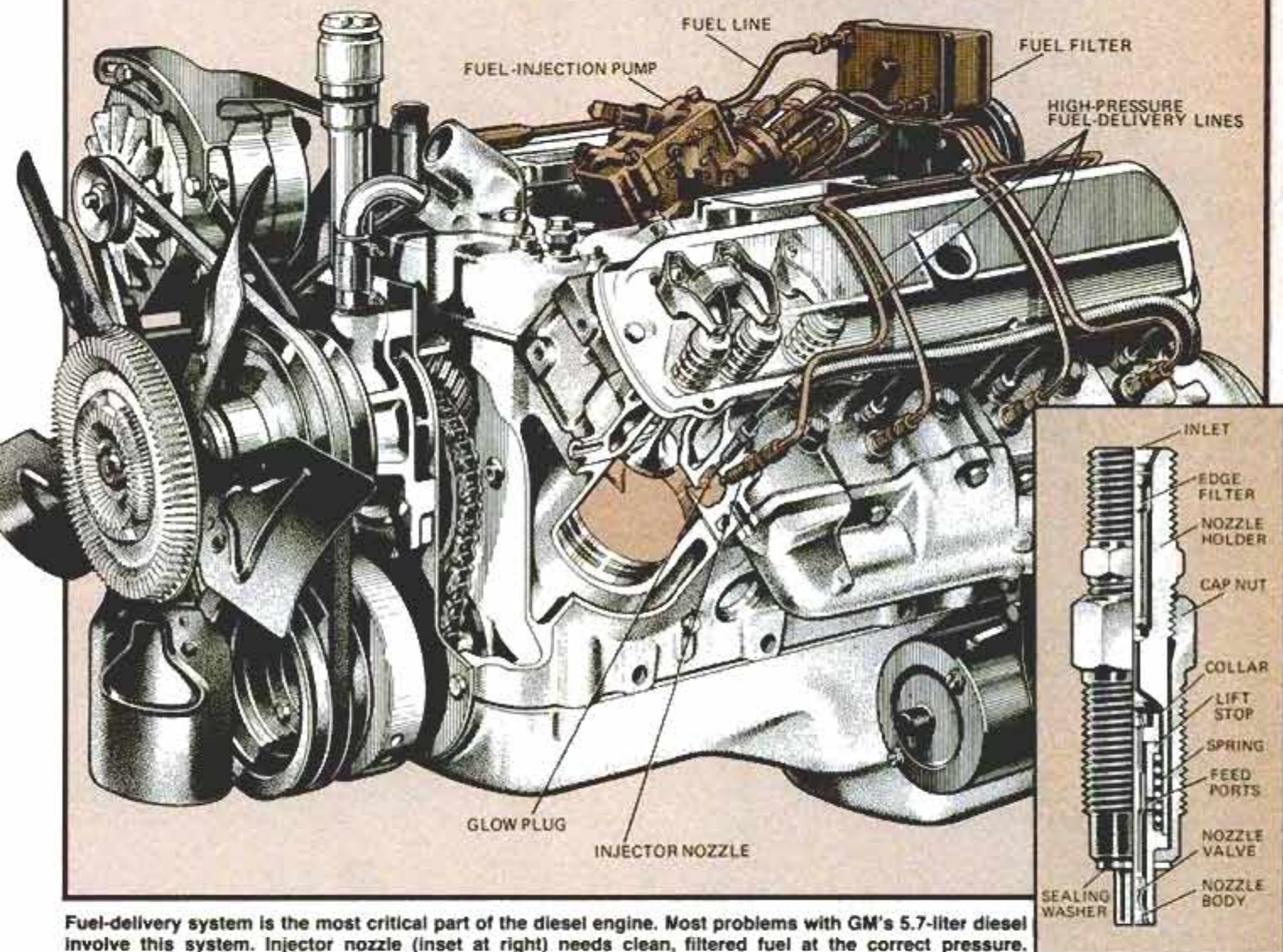
NOW
The Lowest
The lowest in tar of all brands.

Warning: The Surgeon General Has Determined That Cigarette Smoking Is Dangerous to Your Health.

BOX, BOX 100's: Less than 0.01 mg. "tar", 0.001 mg. nicotine, SOFT PACK 85's FILTER, MENTHOL: 1 mg. "tar", 0.1 mg. nicotine, SOFT PACK 100's FILTER, MENTHOL: 2 mg. "tar", 0.2 mg. nicotine, av. per cigarette by FTC method.

Troubleshooting GM's 5.7-liter diesel V8

by Mort Schultz **PART I**



Fuel-delivery system is the most critical part of the diesel engine. Most problems with GM's 5.7-liter diesel involve this system. Injector nozzle (inset at right) needs clean, filtered fuel at the correct pressure.

Passenger cars with diesel engines are selling like hot cakes. General Motors and Volkswagen dealers are barely getting enough of them to satisfy the demand.

"Sales of diesel-powered automobiles in the U.S. continue to buck the nation's overall car-sales trend, posting a healthy 31.45-percent increase during the first five months of 1981," *Automotive News* reported in June.

From Jan. 1 through May 31, GM sold 138,893 diesel-powered cars and light trucks, bringing the total number of GM diesels on the road to over

one million. By 1985, GM expects to be equipping at least 25 percent of the cars and light trucks coming off its production lines with diesel engines.

VW/Audi diesel sales for the first five months of 1981 were 51,655, bringing the total number of its diesels on the road to over 250,000. Diesel-engine output accounts for over 50 percent of total production by VW in the United States and is expected to remain at this level at least through 1985.

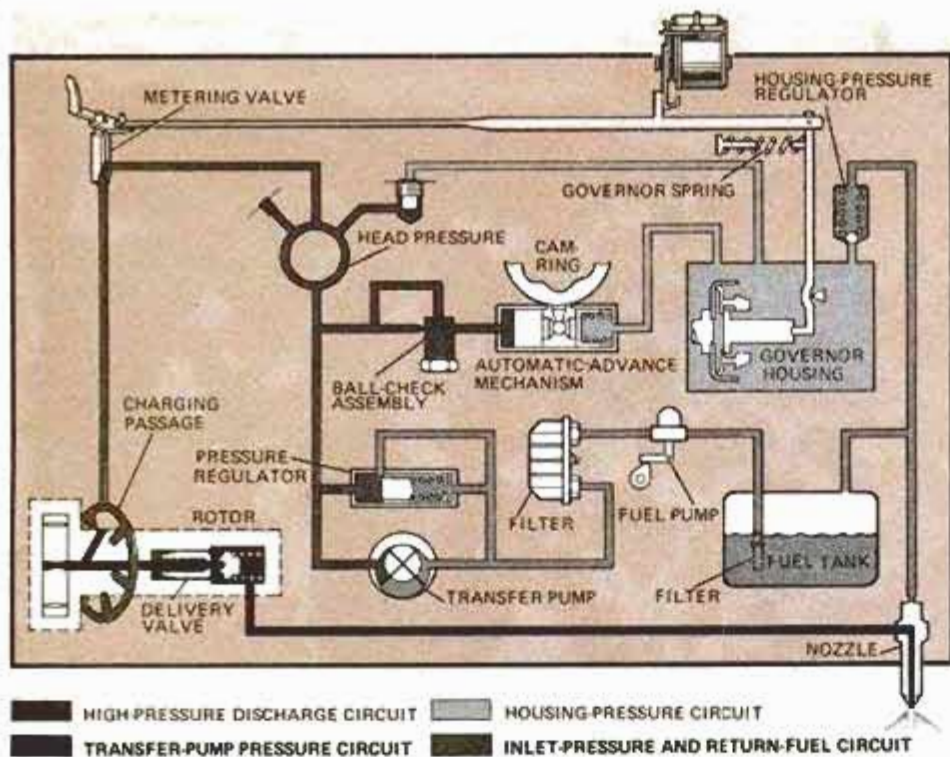
Also contributing to the diesel engine population in the United

States are cars manufactured by Mercedes, Peugeot, Volvo, Isuzu and Datsun.

I cite these figures to convince you that diesel-powered cars deserve to be considered by the Saturday mechanic. Although you may not own a diesel today, you may own one tomorrow. Besides, someone with a diesel-equipped vehicle may need your help.

Meet the leader

Practically all diesel-powered GM cars and light trucks use the Oldsmobile-made, 5.7-liter (350-cu.-in.)



Schematic (left) illustrates complex path of diesel fuel prior to its delivery to injection nozzle. The metering valve determines how much fuel is injected into the engine. In cold weather, the improved fuel pickup (below) prevents wax from clogging the system. Not all GM diesels have it.



V8 engine. In terms of numbers, it's the most popular diesel engine in the United States. So, we'll discuss it thoroughly, starting here and continuing next month, since January and February are the most trying months for diesel owners.

Wintertime is a bad time

"Cold-starting has been an area of traditional concern with diesel passenger cars in cold climates. In some cases, engine starting at temperatures nearing 0°F. has been difficult, if not impossible," GM states.

No doubt about it—74 percent of the letters we receive at Car Clinic are from diesel owners complaining about cold-weather-related problems.

Fortunately, diesel owners don't have to put their cars on blocks when the ambient temperature dips below freezing.

Unless your diesel engine has an internal mechanical problem, there are only three reasons why it won't start or keep running in cold weather. They are:

- Diesel fuel thickens (develops paraffin, a waxy substance that blocks fuel flow to the engine).
- Insufficient cranking speed, because engine oil thickens.
- Glow-plug failure.

Fuel facts

Diesel fuel that thickens is the main reason diesel engines fail to start or stop running after they start in cold weather. The recommended fuel to use in your GM diesel engine, No. 2-D, has a cloud point of 5° to 20° F. The "D" in 2-D stands for diesel.

The cloud point is the temperature

at which paraffin starts to form in the fuel. Wax clogs fuel filters, cutting off all or most of the engine fuel supply.

To prevent this, you should use a grade of fuel that better resists the formation of cold-temperature waxing. This fuel is either No. 1-D or a blend of No. 1-D and No. 2-D. Blended diesel fuel is sold under names such as "winterized," "climatized" or "blended."

The cloud point of blended diesel fuel varies depending on the blend, but any blend should suffice in most cold areas of the country. The cloud point of No. 1-D fuel is about -20° F.

In the past, owners of diesel-powered cars found themselves in a fix when cold weather set in, because they couldn't get No. 1-D or blended fuel. But as the diesel-engine population has grown, more service stations have installed diesel-fuel facilities. Obtaining blended or No. 1-D fuel shouldn't be as much of a problem now as it once was.

Still, what do you do if No. 1-D or blended fuel isn't available, or there's a sudden drop in temperature and you have a load of No. 2-D in the fuel tank? Truckers often mix some gasoline in with No. 2-D fuel to prevent waxing. However, before trying this, be aware of the danger.

Until the addition of gasoline is completed, mixing gasoline and diesel fuel produces vapors which are extremely combustible and can be ignited by static electricity. General Motors' Tony Plewa explains it this way:

"On a scale of 0 to 10, say, gasoline vapor by itself has a combustibility

rating of 5. Diesel-fuel vapor by itself has a combustibility rating of 0. A small amount of gasoline added to diesel fuel gives the vapor mixture a combustibility rating of 10, with the greatest hazard present when less than 1 percent of the mixture is gasoline. As more gasoline is added to the mixture, the combustibility lessens."

In other words, the greatest danger of an explosion exists during the first few seconds, as you begin pumping gasoline into the car's diesel-fuel tank. When the proper ratio of gasoline to diesel fuel is reached—that is, the ratio at which combustion takes place, but waxing won't—the combustibility rating of the mixture is about the same as straight gasoline. The proper ratio is one-quarter gallon (or one quart) of gasoline to one gallon of diesel fuel.

Plewa says he's never heard of any passenger cars blowing up as gasoline is added to diesel fuel. In fact, at

one time, GM suggested adding gasoline to No. 2-D fuel in winter to prevent waxing. GM no longer suggests this, because there have been incidents of the mixture exploding in trucks.

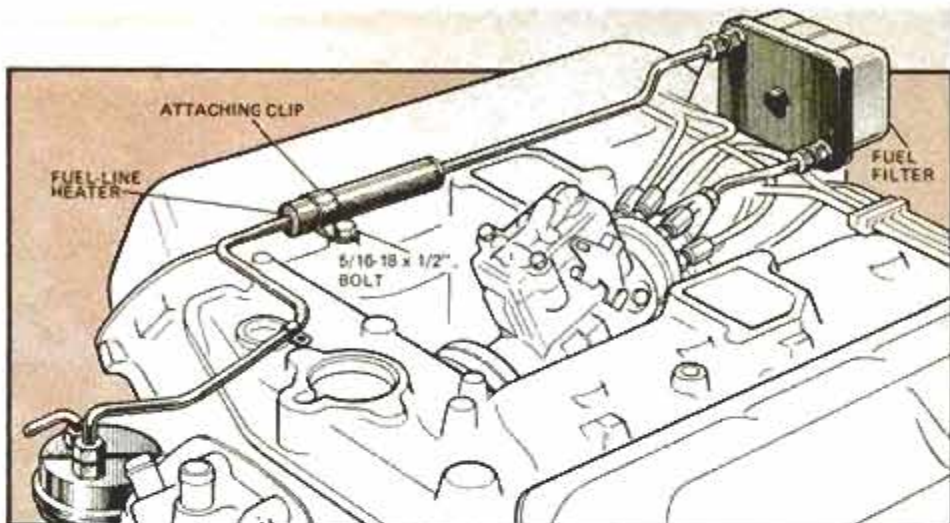
Starting fluid? No! No! No!

A former gasoline-engine owner may have a tendency to reach for a can of starting fluid the first cold morning his new diesel engine fails to start. Don't. Fluid injected into the air intake of a diesel engine could ruin the engine.

Pistons slamming against fluid with the force needed to attain the required 22:1 compression ratio is tantamount to an irresistible force meeting an immovable object. GM says, "Up to a 50-percent overload can be obtained by injecting ether (starting fluid) into the air intake." The result could be hydrostatic seizure, broken pistons, bent or broken connecting rods, or a broken starter or flywheel ring gear. Nothing except air should enter a diesel engine through the air intake!

Intake safety

While on the subject of the air intake, here is a note of caution: When the air cleaner or air-cleaner cover is off and the engine is running, keep loose objects away from the air intake! Air enters the intake with force enough to suck rags and other unattached material into the engine.



Fuel-line heater should be retrofitted to any GM diesel without one. It melts wax before it reaches fuel-injection pump, stopping your engine.

This is partly because diesel engines inhale a constant amount of air. Engine speed is determined by amount of fuel injected, not the opening of a throttle valve.

There is equipment that allows you to work safely near the air intake and intake manifold openings. It is the Manifold Cover Set (part No. J26996) from KentMoore Tool Div., 29784 Little Mack, Roseville, Mich. 48066, for \$16.55.

The set consists of a cover that fits over the air intake and two screws that fit over the intake manifold openings. The cover and screws also prevent foreign objects from falling inside the engine. When ordering the set, specify whether your car has a

pre-1980 or a 1981-'82 5.7-liter engine.

Fuel additives? No! No! No!

Additives are available that supposedly reduce waxing of diesel fuel in cold weather. Maybe they do. However, many additives contain alcohol, which will ruin the Elastocast material used by GM in seals and other parts of the fuel-injection pump. When these parts fail, the fuel-injection pump has to be overhauled.

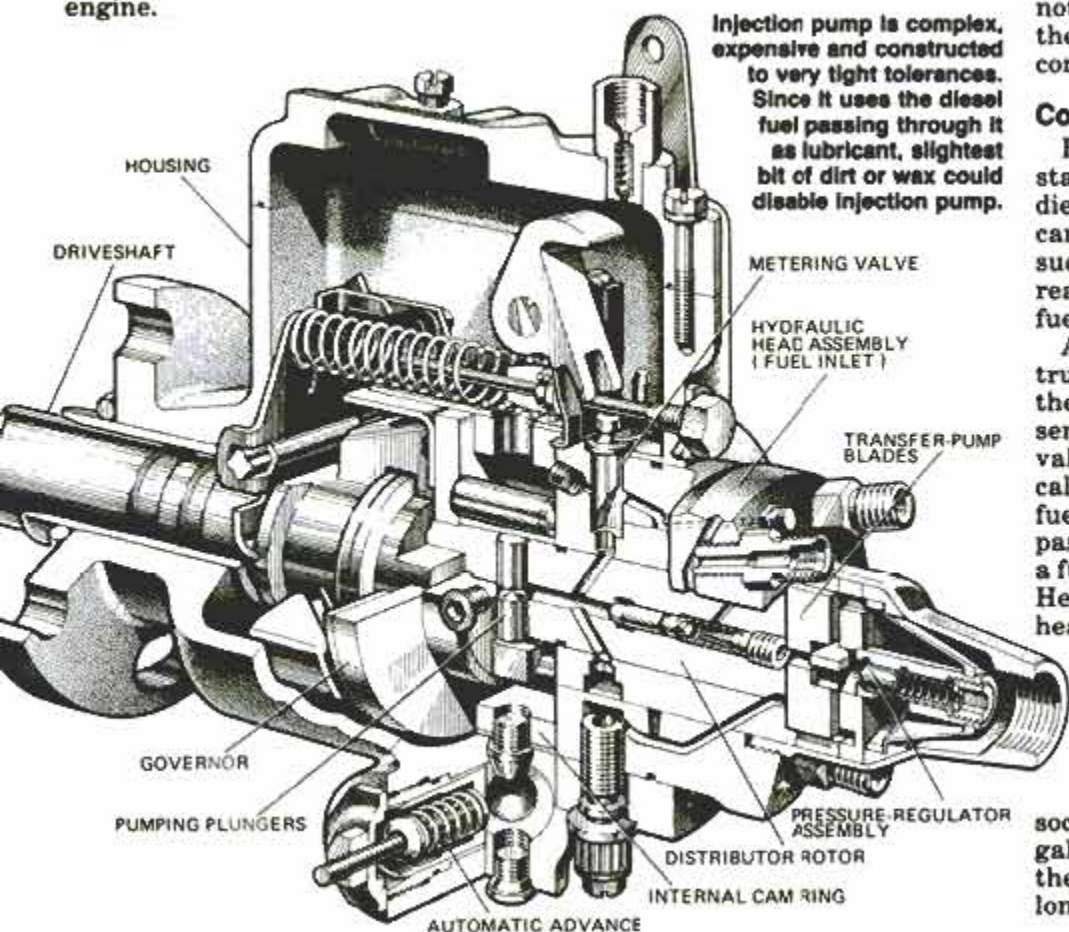
GM admits that there are some additives which don't contain any alcohol and may effectively prevent the formation of paraffin in diesel gasoline. However, "It has been found that these depressants are not effective in all diesel fuels and, therefore, are not universal," according to the company.

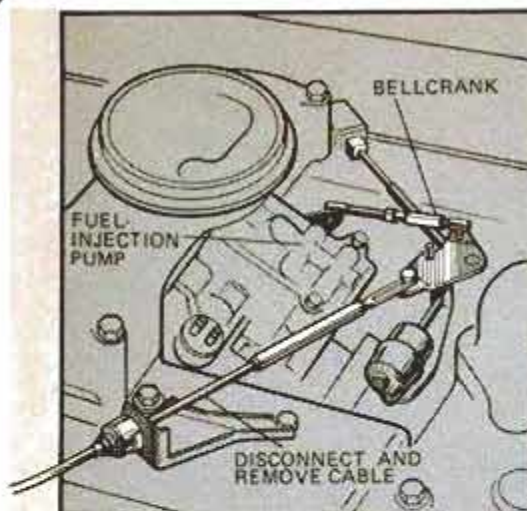
Cold-weather starting equipment

Rather than using fuel additives, starting fluid or prayer to keep a GM diesel perking in cold weather, you can install special equipment. One such piece of equipment may already be in your car: an improved, fuel-tank sending unit.

All '81 and '82 cars and light trucks with diesel engines, except the LUV, have the new, fuel-tank sending unit, which features a check valve in the fuel-tank filter, usually called the sock. This valve allows fuel, containing wax flakes, to bypass a wax-clogged sock and flow to a fuel-line heater, if the car has one. Heat generated by the fuel-line heater melts wax, so wax won't clog the fuel filter between the fuel-delivery pump and fuel-injection pump.

The check valve of the new fuel-tank sending unit is placed on the upper end of the sock, above the level of the last four gallons of fuel left in the tank. Once the fuel level drops below four gallons, that's it. Fuel can't get through





The throttle-cable mechanism is connected to the metering valve on the injection pump (left) via the bellcrank. Installation instructions vary for different model-year cars (see text). When you install the fuel-line heater, which runs under the throttle cable, first disconnect the cable. The metering valve determines the amount of fuel that's injected on each power stroke. The more fuel injected into the engine, the faster the engine will rev.



When you're working near the air intake of a diesel engine that's running, keep loose objects, like rags and tools, away from the opening. The air-intake velocity on diesels is very high and will suck up anything that's near it. You can buy a metal screen from your dealer to prevent this while you're working.

the clogged sock. The fuel level is below the bypass.

"Customers should be advised to keep their fuel tanks above the one-quarter mark at temperatures below 20° F. to prevent running out of fuel," is the way GM puts it.

What do you have?

The fuel-line heater and new fuel-tank sending unit were introduced three years after GM sold its first diesel-engine car. The equipment was developed when reports of cold-weather fuel problems started reaching GM.

The fuel-line heater is standard equipment for diesel-powered Cadillacs and pickup trucks produced from March '81 onward and all cars and trucks made for sale in Canada produced from March '81 onward. It's optional on all other new-model diesel-powered GM cars.

The option also includes an engine-block heater which prevents oil thickening, so the engine can crank normally in cold weather. I'll discuss the engine-block heater, which can also be installed, in next month's *Saturday Mechanic*.

Why has GM installed the new fuel-tank sending unit with its wax-passing check valve in practically all diesel vehicles from 1981 on, but installed the fuel-line heater only in some models? Because the new fuel-tank sending unit performs several

functions other than passing wax-laden fuel. It also acts as a strainer to keep water in fuel out of the fuel system where it can ruin the fuel-injection pump and other injection-system parts.

If your car doesn't have a fuel-line heater and you live in a cold-weather area, you can get a fuel-line heater kit from a GM dealer. It costs \$60 to \$100, depending on your vehicle. You will also need the new fuel-tank sending unit if your car doesn't have one. Without it, the fuel-line heater is useless, since wax-laden fuel won't reach the heater.

Installing the fuel-line heater

Install the fuel-line heater, using this procedure:

1. **Disconnect the negative (ground) cables from both batteries.**
2. **Remove the air cleaner** and cover the exhaust crossover to prevent an object from falling into the engine.
3. **Remove the brace at the rear of the airconditioning compressor.** If the car doesn't have airconditioning, remove the bracket on the upper part of the alternator.
4. **Disconnect the throttle-valve (TV) cable at the bellcrank.** Undo the TV-cable bracket and swing it over the top of the fuel pipe.

Note: As you proceed, disconnect and move any vacuum hose or electric wire that gets in your way.

5. **On 1981-'82 cars, remove the**

crankcase-ventilation pipe from the rear of the intake manifold. On 1980, '81 and '82 cars, disconnect the fuel-return-line pipe from the fuel-injection pump. Set it aside.

6. **Remove the fuel pipe that extends between the fuel-delivery pump and fuel filter.** If you want, you can cut the pipe off and unscrew the ends from the fuel-delivery pump and fuel filters.

7. **Install a 1/8-18 x 1/2-inch stud bolt in the right-hand side of the water outlet.** Most 1981-'82 models already have this stud bolt in place.

8. **On 1978-'80 models, find the tab that holds the electric harness on the right-hand valve cover.** Bend the tab 45°.

9. **Install the fuel-line heater and pipe assembly.** Attach it securely.

Important: There has to be a clearance of at least 1/2 inch between the new fuel line and the injection-line bracket. If there isn't, do not bend the fuel line. You may damage the fuel-line heater. Instead, loosen the right-hand side of the fuel-filter bracket and place a 1/8-inch front-end shim under the bracket. Then, bend the injection-line bracket down. Place a screwdriver under the fuel-heater clamp and pry up until you get a clearance of 1/2 inch between the fuel line and injection-line bracket.

10. **On 1980, '81 and '82 cars, reconnect the fuel-return-line pipe to the fuel-injection pump.**

11. **Using a tie strap, tie the electric harness to the injection line on the right-hand valve cover.**

12. **On 1978, '79 and '80 cars, connect the female electrical connector from the fuel-line heater to the injection-pump fuel solenoid.** Connect the fuel-solenoid connector to the pigtail on the fuel-line heater.

13. **On 1981 and '82 models, disconnect the connector in the EGR switch lead.** Connect the fuel-line heater into this circuit.

14. **After reassembling the parts, start the engine and check for any fuel leaks.**

To test the hookup, wait for the ambient temperature to drop below 20° F.

Allow the engine to run for several minutes. Then place one hand on the inlet pipe to the heater and the other hand on the outlet pipe. If the heater is working, the outlet pipe will feel warmer than the inlet pipe.

Next month, we'll discuss how to keep engine oil from thickening and causing sluggish cranking, and how to troubleshoot and repair glow-plug systems—conditions that give wintertime headaches to a lot of car owners with 5.7-liter diesel engines.



The world's greatest stamps silver miniatures

A complete collection of the 100 most significant stamps ever issued—each portrayed in remarkable micro-detail by The Franklin Mint.

And you can acquire these sterling silver miniature stamps—at just \$4.75 each by entering your subscription now.

Your eye is first attracted by the brilliance of silver. But as you look closer, the lines of an intricate design begin to take shape before you. Then, you place the sterling silver miniature under a magnifying glass—and there, in astonishing detail, is one of the world's greatest stamps!

This is the pleasure that awaits you with each new issue of *The 100 Greatest Stamps of the World*—as you discover the intriguing world of the minted miniature. A world that combines the beauty of solid sterling silver with the fascination of painstaking detail in the tiniest possible area.

This exciting new collection, to be produced by The Franklin Mint, will consist of 100 meticulously crafted miniatures—each one portraying one of the greatest stamps of history.

The rarest and most coveted of all stamps

A panel of distinguished authorities on world philatelic issues has selected, out of the many thousands of stamps issued throughout the world, the 100 greatest of

all. And these are the stamps that will be *authentically re-created* for this exceptional—and very beautiful—collection.

Among them are: the British Guiana One-Cent Magenta, which brought the record price of \$850,000 at an auction in 1980—the Penny Black of Great Britain, the first adhesive postage stamp in the world—the U.S. 24¢ Airmail Invert, one of the rarest of all American stamps—the Japan 500 mon Dragon, which was first thought to be a forgery but is now a prized rarity. And such famous issues as the Double Geneva, Moldavian Bull, Trinacria of Naples—100 great stamps in all, from every part of the world.

Superbly crafted works in miniature

Each sterling silver miniature will recapture the stamp it portrays with absolute authenticity. You'll actually be able to see every detail of the American biplane which is shown on the 24¢ Airmail Invert. Every feature of Queen Victoria's portrait on the Penny Black. The intricate background pattern that distinguishes the One-Cent Franklin "Z" Grill.



The 1869 United States 24¢ Inverted Center is one of the rarest of all American stamps. It bears the famous John Trumbull painting portraying the signing of the Declaration of Independence. But through a printing error, the image is shown upside down on the stamp. (Silver stamp shown at left actual size; at right, enlarged to show fine detail.)

The winged headdress on the "Hermes Head" stamp of Greece.

So that you will be able to study and enjoy each miniature in close-up detail, a special *magnifying glass* and *collector's tongs* will be provided. And you will receive a custom-designed *presentation case* to house and protect the complete collection of silver miniatures.

A limited edition at a guaranteed price

You will receive your silver miniatures at the convenient rate of two per month, and the issue price of just \$4.75 will be *guaranteed* to you for each miniature in the collection—regardless of inflationary pressures.

Your advance application is valid only until February 28th, and the edition will be permanently limited to the number of subscriptions entered by the end of 1982. After that, it will *never* be offered again.

No payment is required at this time. But be sure to mail the attached postpaid card to The Franklin Mint, Franklin Center, PA 19091, by February 28, 1982.

These three prints, made by the Ektaflex process, illustrate fine results obtained from system.



Kodak's Ektaflex makes color prints easy

PM tests a revolutionary new system for color printing that's easy to learn and use.

by Frank Lusk

Kodak's one-solution, color-printing process should be welcomed by the two million darkroom hobbyists in this country. Using instant-film technology, the Ektaflex process is so simple that it makes the task of printing in color easier than in black and white.

The system consists of a Model 8 printmaker, paper (which comes in two surfaces, glossy and smooth

luster), film and activating solution. There are films planned for printing from both color negatives and slides, although film used with slide originals is not yet available. The film is exposed by your enlarger, soaked in the activator solution and then laminated to the paper by the processor.

During lamination, dyes in the

(Please turn to page 46)



System includes a printmaker, film, paper and an activating solution; the list price is \$135.

1 To begin the process, place paper on Ektaflex printmaker's paper shelf. Steps 1 and 2 are done in darkroom lighting.

2 Next, expose film at your enlarger and put in printmaker. Paper soaks while printmaker is closed for about 20 seconds.

3 After the soak, push the crank and film-advance handle. Laminated film and paper emerge. (Lights may be on.)

4 Peel back lamination to reveal finished print. We found the print quality comparable to harder, multisolution processes.



LOOKING FOR IDEAS ON HOME IMPROVEMENT, ENERGY, LAWN CARE, ELECTRONICS, TOOLS, ETC.? CHECK THESE LISTINGS. THEN USE THE COUPON BELOW.

WORTH WRITING FOR

491 Compute Your Future

The future is now with the new personal computers. 48-page, full-color catalog describes hardware, software, accessories and books. From Radio Shack. Free

492 Real Work Horses

Illustrated brochure describes the full line of 12-81 horsepower Kubota two and four wheel drive diesel tractors. Versatile tractors handling a variety of chores: mowing, gardening, landscaping and farming. 25c

493 Take Your Stereo on the Road

Kenwood Electronics offers a complete family of in-dash and under-dash cassette receivers, components and speakers. Fully-illustrated brochure pictures most stereo units full size and includes features and specifications. Free

494 Marketbasket of Merchandise

Hudson's 56-page catalogue offers a complete line of wearing apparel, cold-weather gear, camping equipment and more. Unique items for both men and women. Free

495 For a Slow Burn

Cast iron, porcelain finished convection coal heater heats up to 24,000 square feet. Designer-styling, hopper fed, liquid thermostat. Up to 60,000 BTU's. Brochure from McNamara Import Sales. Free

496 Tool Good to be True

Screwdrivers, pliers, wrenches and solderless connectors. All kinds and more in this 16-page catalog from Vaco Products. 25c

497 Your Own Business that Cleans Up

Start your own radiator repair business for as little as \$4,995. State-of-the-art training included in purchase price. Descriptive information from Inland Manufacturing. Free

498 More Power to You

Easy and fun to run, Power King Tractors, provide top workpower. Full-color, illustrated brochure details systems, attachments and accessories. From Engineering Products. \$1.00

499 The Art of Painting

Here's information for do-it-yourself painters. The Pado Products Kit contains information about the latest products in painting tool technology. Designed to make your next painting project quick, easy and neat. 25c

500 Eye of the Camera

Handy full-color 32-page pocket folder describes the complete line of Tamron SP and Adaptall-2 SLR lenses. Includes features and specifications. Free

501 The Nitty-Gritty

New brochure lists over twenty "tough" materials and the Remington "Grit-Edge" blade to cut them. Grit selection, blade type, speeds and other information for cutting ceramic tile, marble, glass, stainless steel and more. Free

502 Save Dollars and Your Energy

Colorful brochure full of helpful hints on weatherproofing. Identify problem areas, products and tools to use. From Macklanburg-Duncan. 25c

503 Tune In & Tune Up

Peerless Instrument has a catalog offering a full complement of auto test and tune-up instruments. Products to take the mystery out of tune-ups. Free

504 Now You're Cooking!

The full line of Weber barbecue products is illustrated in a 24-page brochure. Includes gas and charcoal kettles, portable grills, knives and accessories. Free

505 Making Time

Klockit would like you to have its catalog of clock movements, dials and accessories. Build clocks as a hobby or for income. Free

506 The Power of the Outdoors

Tough, outdoor jobs need power equipment. In a four-color, illustrated brochure, Echo introduces you to its line of chain saws, weed and grass trimmers, brush cutters, hedge trimmers and power blowers and sprayers. Free

507 Strike the Right Blow

Vaughan & Bushnell Mfg. would like you to know they have been making striking tools for over 100 years. 20-page catalog shows their complete line of hammers, axes, sledges, chisels and more. 50c

508 Soften Painting Jobs

Portable electric heat gun offered by Master Appliance softens paint quickly for easy scraping. Illustrated brochure shows how, plus other uses for home and shop. Free

509 Stop Costly Energy Leaks

TOUCH 'N FOAM Instant Insulation can be used in summer and winter for spot insulation. Fills cracks in walls and around windows, doors, electrical outlets and pipes. Brochure from Convenience Products. Free

510 Go Along For the Ride

16-page brochure features riding mowers, lawn and garden tractors, and heavy-duty models for year long productivity. From Simplicity Manufacturing. Free

511 Powerful Workshop

Dremel Moto-Tools perform a variety of cutting, shaping and polishing jobs. Illustrated brochure shows how they can add up to a complete creative power workshop. Free

512 Keeping Clear Vision

RAIN-X is a liquid polymer intended primarily to improve driving visibility during rain, sleet and snow. A technical data guide provides product description, properties and performance. From Zaddock. Free

513 Clear Cornering

Tri-Guards protect the corners of your rooms with a clear plastic shield. Can keep your home looking beautiful and save on redecorating costs. Sample clear corner protector and informative brochures only 50c.

514 Wear Your Security

Brochure describes new security garment to protect valuables. Ideal for campers and backpackers, as well as while traveling. Worn under shirt, ultra-lightweight. From Travel Safest. Free

515 Products for the Space Age

Here's an electronic parts and equipment catalog for school instructors, video buffs, technicians, hams and hobbyists. Unusual items from the world of electronics, science and technology. From ETCO Electronics. Free

516 For the Lawn and Garden Pro

This illustrated 12-page brochure of lawn and garden tractors includes "engineering closeups", an accessories guide and specifications for all models. From Gilson Brothers. Free

Popular Mechanics 1/82
Box 1718, Sandusky, Ohio 44870

Please see that I receive the items checked below

- | | | | |
|----------------------------------|-------------------------------------|----------------------------------|----------------------------------|
| <input type="checkbox"/> 491 | <input type="checkbox"/> 497 | <input type="checkbox"/> 502 25c | <input type="checkbox"/> 507 50c |
| <input type="checkbox"/> 492 25c | <input type="checkbox"/> 498 \$1.00 | <input type="checkbox"/> 503 | <input type="checkbox"/> 508 |
| <input type="checkbox"/> 493 | <input type="checkbox"/> 499 25c | <input type="checkbox"/> 504 | <input type="checkbox"/> 509 |
| <input type="checkbox"/> 494 | <input type="checkbox"/> 500 | <input type="checkbox"/> 505 | <input type="checkbox"/> 510 |
| <input type="checkbox"/> 495 | <input type="checkbox"/> 501 | <input type="checkbox"/> 506 | <input type="checkbox"/> 511 |
| <input type="checkbox"/> 496 25c | | | <input type="checkbox"/> 512 |
| | | | <input type="checkbox"/> 513 50c |
| | | | <input type="checkbox"/> 514 |
| | | | <input type="checkbox"/> 515 |
| | | | <input type="checkbox"/> 516 |

Total items requested _____

Name (Please Print) _____

Address _____

Town _____

State _____

Zip Code _____

(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.

This Coupon Expires March 31, 1982

Total money for priced items \$ _____

Service Charge \$ _____ .35

Total money enclosed \$ _____

KODAK'S EKTAFLIX PROCESS

(Continued from page 44)

film migrate to the paper where they are held. The sandwich is then peeled apart and the print is done. No washing is necessary. The only thing the user needs beyond what is required to make black and white prints is a set of light-balancing filters. If your enlarger is already equipped with a color head, that's even better.

If you've worked only with black and white, obtain a copy of Kodak's *Color Darkroom Dataguide* or some similar publication. You might otherwise find working with light-balancing filters and producing a good color print a bit tricky—not to mention costly in both materials and time.

If you've had some color printing experience, you should have little trouble cranking out good-quality color prints with this process. Here's how it's done.

Step by step

The Ektaflex processor comes partially disassembled and must be put together as shown in the owner's manual. It should be rinsed out to remove packing material and dirt. Screws are provided to mount the unit to the table surface. (I used a sheet of plywood and placed it on the table next to my enlarger for easy access.)

Open the unit, and with the drain-tube valve closed, fill to the proper level with activator solution. While the room lights are on, place a sheet of paper, emulsion side down, on the paper shelf. In darkness, or by the light of a No. 13 safelight, expose a sheet of Ektaflex film much as you would a sheet of black and white paper.

Make sure that your negative is placed in your enlarger, emulsion side up, so your final print won't be backwards. The brochure which comes with the system suggests a means of making test prints and a starting filter pack.

The exposed film is placed emulsion side up on the film-loading ramp. Reset your timer to 25 seconds and start the timer. At the 20-second mark, push the film into the activator.

At the end of the film's 20-second soak, simultaneously turn the crank and push the film-advance handle until the laminated film and paper are completely out of the printmaker. The room lights may now be turned on as the film-paper sandwich is light-tight.

After the proper lamination time has passed, simply peel the sand-

wich apart to reveal your finished print. The entire process should take less than 10 minutes.

When your print session is over, drain the activator back into its bottle by opening the drain valve. You should wear gloves when handling the activator. It is said to be caustic and similar to the chemicals used to unclog drains. The unit is then rinsed of all traces of the activator and left to dry for the next printmaking session.

Final results

Frankly, I was amazed that prints so good could be produced with so little fuss. They are certainly as good as any produced by other amateur printmaking systems. The only difficulty you may encounter will be in making that first print. You should choose a colorful, well-exposed negative of average contrast to work with.

Kodak suggests several trial exposure times to use with a 40R filter pack. My enlarger, equipped with a No. 211 lamp, required a filter pack containing 70M+10Y filters. Your pack should also contain an infrared cutoff filter and a heat-absorbing glass. My average exposure for an 8x10 print is 12 seconds at F8.

Once you have your basic filter/exposure combination, simply making a contact print of negatives you intend to work with will provide you with enough information to make good prints on the first try, and excellent prints with a little fine tuning.

Special effects

If you ever get bored making straight prints, you can try flashing a used negative and running it through the processor a second time on a fresh sheet of paper (your soak time should be just a few seconds) for solarization effects, or try printing two negatives on the same sheet of paper.

The Ektaflex processor has a list price of \$135. However, you will probably be able to get one for under \$100. With a cost per print of just under \$2, Ektaflex prints are about a third more expensive than those produced by conventional printmaking processes, but—considering that you're freed from the burden of mixing and storing chemicals, frequent washings and maintaining the close processing and temperature tolerances required for repeatable results—it's certainly well worth it.

Think of the MONEY YOU CAN MAKE...

When You Buy Merchandise Like This At Prices Like These!

MAN'S DELUXE LEO WATER
Retail Value — \$26.95
Your Cost — \$2.50
Your Profit — \$24.45

SOLID BRASS BELT BUCKLE
Retail Value — \$4.95
Your Cost — \$1.50
Your Profit — \$3.45

PORTABLE FOOT PUMP
Retail Value — \$14.95
Your Cost — \$4.00
Your Profit — \$10.95

Nationally Advertised LOCK-SLAM POCKET KNIFE
Retail Value — \$5.50
Your Cost — \$1.70
Your Profit — \$3.80

PLUS! 2,496 more fast-selling big-profit items shown in our exciting 100-page full-color catalog.

PLUS! Detailed step-by-step plans that show you exactly how to sell our merchandise 21 different ways... from Mail Order to Swap Meets, Fund Raising to Party Plans. Part time or full time from your home.

PLUS! Every printed promotional piece and selling aid you need to make any plan work to perfection.

PLUS! Complete directions explaining how to set up and run a business—covering everything you need to know to make instant profits.

PLUS! Always-available business counsel, new selling ideas, additional merchandise and special extra-discount bonuses.

PLUS! Take the 1st Step Toward A Business of Your Own... **MAIL THIS COUPON!**

Specialty Merchandise Corp. Dept. 308-13
8081 De Soto Ave., Woodland Hills, CA 91365

FREE! Tell me about your 2,500 items which I can purchase at your amazingly low prices. Also send me information on your 21 home business plans. No cost or obligation, of course.

Name _____
Address _____
City _____ State _____ Zip _____

3-Wheeling to Independence!



Call
800-257-7955
for Free
Catalog*

One Hand Operation—Rear Electric Drive

Fred Prosch wanted to keep his independence after he stopped driving a car. He said he needed safe, reliable transportation he could afford. He found it. A CYCLE CHAIR, the New Aluminum electric 3-wheeler that is different and safer. Read what he says about it:

"I'm 85 years old and use my CYCLE CHAIR for local transportation. It's very comfortable, easy to operate, and has two safe speeds—6 mph and 15 mph. I take it to the store, to the bank, the post office and also to ride to just enjoy myself and get some fresh air. I feel it's better than driving a car and much less expensive, too."

*FOR A FREE CATALOG on CYCLE CHAIRS, 3-Wheelers, and Electric Bike Motors CALL TOLL FREE: 800-257-7955 (In N.J. 800-232-6550). CALL NOW OR WRITE:

GENERAL ENGINES CO., PEDALPOWER DIV.
5477 Mantua Blvd., Sewell, New Jersey 08080
10 Day Trial and Money Back Guarantee

Turn Extra Time Into **Extra Income!** Earn \$5 TO \$8 an Hour

Be your own boss
in a money-making
business of your own.

No
Experience
Needed

Sharp-All lets you Sharpen Saws

garden and shop tools
for home and industry

Start Earning FAST—No Experience Necessary.

With 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 sparetime or fulltime 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 in Sharpening.

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, lawnmowers, axes and other garden, shop and home tools. 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.



It's EASY To Get Started—No Franchise Fees!

You don't have to invest thousands of dollars to get started in business for yourself. Low Cost SHARP-ALL and our 45 years of experience in helping sincere men earn extra income, plus the desire to get ahead is all you need. Fully illustrated Operators Manual gives clear, step-by-step instructions, shows exactly how to sharpen each tool, where to get business, what to charge, how to get free advertising... all the "tricks of the trade". And, SHARP-ALL does the kind of precision job that brings customers back time after time.

Send for FREE Book "Lifetime Security." Do It Today!

There is NO OBLIGATION and
NO SALESMAN Will Call!

ACT NOW!
Coupon
Brings
Full Details!

No Obligation... No Salesman

BELSAW SHARP-ALL CO.
712J Field Bldg.
Kansas City, MO 64111

Please send my FREE copy of your book
"Lifetime Security" and full details on
your 30-Day Free Trial Offer!

Name _____

Address _____

City _____

State _____

Zip _____

FREE
BOOK

RUSH
COUPON
TODAY!

SEND FOR FREE FACTS TODAY!

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

FREE Booklet gives full details—

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

Send for
your copy
today. No
obligation.



BELSAW SHARP-ALL Co., 712J Field Bldg., K.C., MO 64111

ALL OUTDOORS

10 that are tops

All year we examine outdoor equipment—gear that's claimed to be the latest or the best. Some items are innovations and others have survived the test of time for suitability, durability and portability.

Here, from our 1981 year-end list, is PM's pick of items that seem to be particularly useful and successful.

For boating

The most remarkable recent mechanical development for outboarders is OMC's biggest-ever motor. So new it still has not been assigned a horsepower rating or gone into full production, the V8 is already winning races, and guesses have put its muscle as high as 400 hp. Who needs so much motor? Actually, a lot of big-boat owners who will get home faster in safety ahead of a storm, and can throttle back to cruise on less fuel than they would need at the same speed with higher rpm from a smaller engine.

Less dramatic, but a strong step forward in boating safety, is Attwood's new electric bilge pump that incorporates an anti-airlock design. No longer will the pump in a rolling boat suck air momentarily and then



Berkley Fishin' Partner keeps tackle ready.

lose suction right when you need it most. Special mention should also go to Olin Corp. for developing Coast Guard-approved day-night distress signal kits to meet the new requirements for all boats, at less than \$20.

For hunting

Companion to the famous AR-7, .22-cal. survival rifle is the new Explorer II .22 pistol from Charter Arms. This new autoloader, which can interchange three lengths of barrels, trades an unpolished finish

that's more useful than attractive for an attractive price of under \$100. It should pack away easily for plinkers and campers.

Not brand-new, but upgraded this year, is Remington's Model 4 high-power, autoloading rifle with a number of refinements. An improved pump-action Model 6 centerfire rifle was also introduced.

For fishing

With outdoorsmen traveling more, it's no wonder that telescopic rods are getting popular. Two of the best we've tested are a 6½-foot Sapphire spin/fly combo that retracts to 14½ inches, and a 46-inch SW-10 that extends to a remarkable 10 feet for surf fishing. Both are from Power-Scopic of 1111 East El Segundo Blvd., El Segundo, Calif. The spin/fly No. 1805 reverses the handle for fly reel or spinning use, and we've found it is successful with a bait-casting reel, as well.

Particularly convenient is a new little tackle box you wear on a waist belt. It can hold lures, lunch and a small camera, we've found. Berkley, of Spirit Lake, Iowa, calls it a Fishin' Partner II. The most interesting of bait-casting reel developments is the Magforce from Daiwa, and production models should be on the market soon. Internal magnets are reported to prevent overspeeding and backlash.

For camping

Ice chests and coolers are nothing new for outdoor use. Even little refrigerators that can run off a car, boat or trailer battery have been on the market for some time. But now there is a model with no moving parts—no compressor, fan, or buzzing motor—that works in silence from a 12-volt battery or from 110 v.a.c. with a converter. Called the Bilan SSR (for solid-state refrigerator), the unit from Bilan, 412 Harrison St., Kalamazoo, Mich., was originally developed for the Army to transport blood or plasma.

For traveling

Sportsmen who have suffered from motion sickness in boats, planes or cars, would probably rate a reliable cure as a high point of any year.

Reports on the Transderm-V, a small disc that is stuck behind the ear, indicate that this new system of getting antmotion chemical into



New Suci case custom-pads fragile gear.

the bloodstream will work for several days with fewer side effects than any other method. The product requires a prescription from your doctor, but if you suffer from seasickness or any other motion distress, the product is worth your personal test. It's made by CIBA Pharmaceuticals.

The Suci reel case, a light rigid plastic box with shoulder strap, is so useful for fishermen that this writer and others have urged the manufacturer to make one for traveling photographers. Now it's available, at \$21, in the same water-resistant floatable plastic, with cushioning foam inside that can be custom-cut to hold any fragile gear. Suci Sporting Goods, 2341 Morton St., Flint, Mich., is the maker.

And the best of books for the photographer on the go is the new *Carl Purcell's Complete Guide to Travel Photography*. Where to go, what to take, and how to get the right exposures day or night, rain or shine, are covered. **PM**



AMERICA'S TRUCK. BUILT FORD TOUGH.



New high-MPG Ford pickup rated 22 MPG.

Introducing Ford's new fuel-saving FS pickup. It's a tough, full-size pickup with comfort for three, and a big 4.9L Six. For even heavier hauling, pick Ford's F-150. This rugged truck delivers 20 EPA estimated MPG plus 2,500 lbs. of payload. And there's more for '82:

Adjustable Twin-I-Beam. Ford's tough suspension is now designed with lubed-for-life ball joints and adjustable camber.
New V-6 engine. Modern 3.8L V-6 is a high-technology engine with excellent horsepower per liter. Standard in F-100 models.†



NEW FORD FS [†] WITH 4.9L SIX	31 ^{EST. HWY.}	22 ^{EPA EST. MPG*}
FORD F-150	29 ^{EST. HWY.}	20 ^{EPA EST. MPG*}

*Requires optional 4-speed over-drive. Compare these estimates with others. Your mileage may differ depending on speed, distance and weather. Actual highway mileage and California ratings lower. FS model and V-6 not available in California.



FORD

FORD DIVISION



Driving the 1982 Ford Ranger mini-pickup

Ford enters the mini-pickup wars with an efficient, good-handling truck.

by Gary Witzenburg
DETROIT AUTO EDITOR



Here we are, barely into the 1982 model year and already testing '83s. But this is a very special '83, one that Ford plans to introduce late next month. The Ford truck people obviously are concerned that GM's compact S-truck has beaten them to market by nearly half a year, so they want to get the word out to potential buyers. They're hoping people wait until they see the Ranger before buying something else.

Initial planning for a smaller, more fuel-efficient pickup began back in 1976, and serious design and development started in November 1979. The objectives were to go head-to-head with imported pickups in fuel economy without sacrificing payload or utility; to have the toughness of a full-size pickup with outstanding quality, durability and reliability; and to appeal to a broad spectrum of buyers for both functional and personal use.



Big-truck ride quality in a little-truck package is what Ford has managed to build into the new Ranger. It gets 25 mpg city.

A significant contributor to fuel economy is aerodynamic efficiency, which is tough to achieve with a drag-producing open box behind the cab.

But Ford says its Ranger will be the lowest-drag pickup on the road, thanks to nearly 500 hours of wind-tunnel testing and development. They also aimed for the typical American pickup's aggressive stance and broad-shouldered visual appeal, and we think they've achieved it nicely.

Also crucial is weight, and Ford

claims several lightweight-material innovations for the Ranger. Among these are clutch housings and both brake-and clutch-pedal support brackets made from magnesium, an aluminum 4x4 differential case, and high-strength, light-alloy (HSLA) wheels. Sophisticated computerized structural analysis techniques also contributed to the Ranger's 2,526-pound (short-bed) and 2,559-pound (long-bed) base curb weight.

Existing passenger-car engines, a 73-hp, 2.0-liter Four as standard and an optional 80-hp 2.3-liter, were modified for truck use with redesigned intake manifolds, camshafts and valve trains for better low-end torque and long-term durability. A 3.08 to 1 rear-axle ratio was chosen as standard with the four-speed manual gearbox, while an optional 3.45 to 1 ratio is available with either engine. Three-speed automatic

(Please turn to page 54)

TILLER USERS!

Just ONE HAND!

The wonderfully different and better idea in Tillers!

The TROY-BILT® Roto Tiller-Power Composter is so easy to handle, you guide it with Just ONE HAND!



- Has its revolving tines in the REAR instead of the FRONT!
- Has POWER DRIVEN WHEELS!
- You leave NO footprints nor wheelmarks!
- Now has 4-SPEEDS! "Whisper Quiet" Power Reverse!
- The TROY-BILT® Roto Tiller-Power Composter is built by the builders of the original famous ROTOTILLERS, which introduced rear-end tillage over 50 years ago. This latest and greatest of them all is now, more than ever, the favorite coast to coast with home gardeners, growers, nurserymen, tiller renters, landscape gardeners!
- Several models, including ELECTRIC STARTING!
- Does NOT tangle near as much as ordinary Tillers!
- It chops garden residues, weeds, green manure crops, old mulch, any kind of organic matter right into your garden soil without unbearable tangling!
- It turns your whole garden into one big fabulously fertile "compost pile"!
- Does NOT require great strength... older people, ladies, too, operate it easily. We have many delighted owners in their 70's, 80's, even 90's who tell us they would have given up gardening if they did not have our Tillers!
- Instant depth control! Hood encloses tines for safety and for close cultivating!
- Furrowing, snow removal and other attachments available!
- Automotive-type engineering — precision gears, tapered roller bearings, no chains to stretch, wear or work loose!
- Sold direct to keep prices down—would have to be at least \$125 higher if sold ordinary ways!
- Comes with our famous no-time-limit promise to you!
- Will GREATLY increase your gardening joy!

Why, for heaven's sake,



suffer any longer with the FRONT-END type of tiller shown at left—the type with the revolving blades in FRONT and NO POWER to the wheels—the type that shakes the living daylights out of you—the type that leaves Wheelmarks and Footprints in the nice smooth soil you have just tilled or cultivated?

SO, PLEASE don't buy any other Tiller—don't put up any longer with the Tiller you now have! Mail the coupon NOW for complete details, prices, OFF-SEASON SAVINGS for this wonderfully different and better idea in Tillers — The TROY-BILT® Roto Tiller-Power Composter!

**TROY-BILT® Roto Tiller-Power Composters
102nd Street & Ninth Avenue
Troy, New York 12180**

CLIP AND MAIL THIS COUPON TODAY

**TROY-BILT® Roto Tiller-Power Composters
Dept. A1026C
102nd St. & 9th Ave., Troy, N.Y. 12180**

Please send me the whole wonderful story of your Tillers, with and without electric starting, including prices, OFF-SEASON SAVINGS now in effect.

Mr.
 Mrs.
 Ms. _____

Address _____

City _____

State _____ Zip _____

Be a DIESEL MECHANIC

Trucks, Cars, Buses, Boats, Machinery!



LEARN AT HOME IN SPARE TIME!

Here's what growth of the diesel industry means! In the 1980's, job opportunities for diesel mechanics will be better than most other occupations. And now you can get the same home-study training as hundreds of other men now working on diesel engines.

Experts show you what to do, how to do it

Easy-to-follow lessons with plenty of pictures cover everything you need to know to be a diesel mechanic. No need to quit your present job or school. Learn at your own pace with no time wasted going to and from class. Instructors as close as your telephone. No charge! Use our toll-free 24-hour home-study hotline as soon as you enroll.

Tools, materials, everything you need included with course at no extra cost.



Mail Coupon for FREE FACTS!

ICS SINCE 1961
ICS DIESEL SCHOOL, Dept. P80C1
ICS Center, Scranton, Pennsylvania 18515

Rush free facts on how I can learn Diesel Mechanics at home in spare time. No obligation. No salesman will call.

NAME _____ AGE _____
ADDRESS _____
CITY _____ STATE _____ ZIP _____

"PAY" YOURSELF \$1000+ to BUILD THIS NEW 4-WHEEL HAULER

- 16 or 11 H.P. Briggs & Stratton electric start engine • automatic torque converter transmissions
- 500 lbs. payload plus two passengers • dump box 44½" x 40" x 11"
- steering wheel, foot pedal controls
- forward and reverse gear • rear dual hydraulic disc brakes

Tough Mark Series Haulers lug 500 lbs. of cargo plus you and a passenger almost anywhere. 16 H.P. opposed Twin-Cylinder or 11 H.P. Synchro-Balanced Briggs & Stratton engine, automatic torque converters (no manual shifting), alternator and electric start. Steering wheel, foot pedal accelerator and brake (rear dual hydraulic disc), forward and reverse gear let you maneuver easily with speeds up to 25 MPH. Dump bed 44½" x 40" x 11" extends to over 4' with tail gate opened. Many accessories.

Build it yourself and SAVE \$1000+. Engine mounts to welded & painted frame. Tires mounted on rims. You bolt parts together and pocket assembly costs. Only simple tools needed. Thousands from eight to 80 have built a Carl Heald Kit.

For more information call 616/849-3400 or write for FREE brochure today:



Heald Hauler Mark 4 Model HH-4 16 shown with optional headlights and knob tires.

Also 3-wheel models and with steel cab

Carl Heald, Inc. Dept. PM-21
P.O. Box 1148, Benton Harbor, MI 49022

DRIVING THE 1982 RANGER

(Continued from page 50)

transmission is an option with the 2.3-liter Four.

Twin-I-beam front suspension (a Ford truck trademark), spring rates that are balanced front-to-rear to minimize pitch and bounce and computer-selected according to each vehicle's options and payload, and plenty of suspension travel account for the Ranger's surprisingly smooth ride. It's still no Lincoln on rough roads, especially unloaded, but it's remarkably free of impact harshness.

For durability, quality and reliability (which Ford calls DQR), engineers set the same criteria as for the



Author (right) and Ford development engineer Bob Kohl discuss the Ranger's mechanicals, designed for easy servicing.

full-size, F-series trucks and subjected Ranger prototypes to the same rigorous testing. Along with the quality program, the engineers worked to eliminate maintenance operations where possible and ease those that remained. These efforts led to such features as lubed-for-life suspensions, a self-adjusting clutch linkage, pinrail caliper front disc brakes, rubber-lined steering ball joint sockets, rattle-free weld-on (rather than bolt-on) front sheet metal, tire-wheel matching, and computerized electrical testing and front-end alignment.

The pickup box features double-wall construction, a one-piece, quick-release tailgate, integral stake pockets and rope-tie holes, and even support pockets in the side-walls for horizontal carrying of those all-important 4x8 sheets of plywood. There's also extensive corrosion protection. Ranger carries

Ford's three-year, unlimited-mileage, rust-perforation warranty. Standard payload is 1,200 pounds, but a 1,600-pound capacity is optionally available, as are trailer towing and camper packages. The midship fuel tank holds 14.5 gallons, and an optional 13-gallon auxiliary tank increases fuel capacity to 27.5.

At 175.6 inches on a 108-inch wheelbase, the basic six-foot-bed model is a bit larger than the average Japanese pickup, but considerably smaller than the standard 192-inch, 116.5-inch-wheelbase, F-series truck. The long-bed version is six inches longer in wheelbase, a foot greater in length and carries a seven-foot bed.

Both Rangers we drove (a base 2.0-liter four-speed and a 2.3-liter automatic) were low on performance (18 and 16 seconds 0 to 60), but high on ride quality, sound and vibration isolation, creature comforts, features and styling. Obviously, a 2.3-liter with the four-speed would give the best acceleration, but we weren't able to try that combination. By contrast, GM's S-truck offers an optional 2.8-liter V6 for those who want zippy performance in their downsized pickup, but Ford believes that fuel economy is more important in this sort of vehicle. The automatic transmission, though slow, is very smooth, and its slotted shift gate is an enormous improvement over the one in Ford's Escort/Lynx cars.

Impressive instruments

We were impressed with the Ranger's simple but attractive instrument panel, which Ford says is computer designed. It looks functional, but high-quality, not cheap, is intelligently arranged, and even has a handy open bin above the regular glovebox. The high-line version's bucket seats are predictably much better than the base bench, but one comfort problem for long-legged people is the basic cramped-cab syndrome common to most small pickups. There's just not enough fore-aft room for sufficient seat adjustment travel, and you can't recline the seatback when it's up against the cab wall. Ford says there may be an extended cab version eventually.

In addition to the items already mentioned, the long option list includes the usual: airconditioning, power steering and brakes, various trim and convenience packages and stereo sound systems plus larger tires, a step bumper, tilt steering wheel, sliding rear window, vent windows, swing-away outside mirrors, transmission oil coolers and cast-aluminum wheels. **PM**



Design it, build it, repair it, use it!

HOW-TO BOOK CLUB shows you how to do-it-yourself, and save hundreds of dollars, too!

Select 6 fact-filled books for only **\$1.95** (total value up to \$125.65)

1982 How-To Projects Calendar **FREE!**



1217 List \$16.95



1247 List \$15.95



1214 List \$13.95



1323 List \$10.95



1232 List \$14.95



1188 List \$14.95



1257 List \$15.95



8434 List \$31.90 2 vol. in 1



1264 List \$16.95



1265 List \$18.95



1294 List \$10.95



920 List \$13.95



1371 List \$19.95



1149 List \$12.95

1982 How-To Projects Calendar
FREE when you join!
Publisher's List \$5.95

7 very good reasons to try How-To Book Club
Blue Ridge Summit, PA 17214

- **Reduced Member Prices.** Save up to 75% on books sure to increase your know-how
- **Satisfaction Guaranteed.** All books returnable within 10 days without obligation
- **Club News Bulletins.** All about current selections—mains, alternates, extras—plus bonus offers. Comes 14 times a year with dozens of up-to-the-minute titles you can 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
- **Continuing Benefits.** Get a Dividend Certificate with every book purchased after fulfilling membership obligation, and qualify for discounts on many other volumes
- **Bonus Specials.** Take advantage of sales, events, and added-value promotions
- **Exceptional Quality.** All books are first-rate publisher's editions, filled with useful, up-to-the-minute info

HOW-TO BOOK CLUB
Blue Ridge Summit, PA 17214

Please accept my membership in How-To Book Club and send the 6 volumes circled below, plus a free copy of the 1982 How-To Projects Calendar. I understand the cost of the books selected is \$1.95 (plus shipping/handling). If not satisfied, I may return the books within ten days without obligation and have my membership cancelled. I agree to purchase 4 or more books at reduced Club prices during the next 12 months, and may resign any time thereafter.

920 1128 1149 1159 1172 1188 1214 1217
1232 1244 1247 1257 1264 1265 1268 1269 1279
1291 1294 1304 1323 1342 1371 2074 8434

Name _____ Phone _____
Address _____
City _____
State _____ Zip _____

(Valid for new members only. Foreign and Canada add 20%.) PM-182

1279 List \$16.95



1172 List \$15.95

IMPORTS & MOTORSPORTS

1982 Volkswagens

Scirocco gets aerodynamic reskinning for '82; under hood is tried-and-true, 1.7-liter, ohc, fuel-injected Four.



Its grandfather was the design-award-winning Karmann Ghia, so you'd expect this second-generation Scirocco to be quite a handsome automobile. All the world's automakers are in a low-drag race, and companies good at aerodynamic design—like VW—are producing cars with better mpg, naturally, and



Scirocco interior has been redone roomier.

some really clean coachwork. The '82 Scirocco has a Cd of .39, which is 10 percent better than the '81 model. (Soon, we expect, drag coefficient will be included in technical specifications, along with dimensions and weight.)

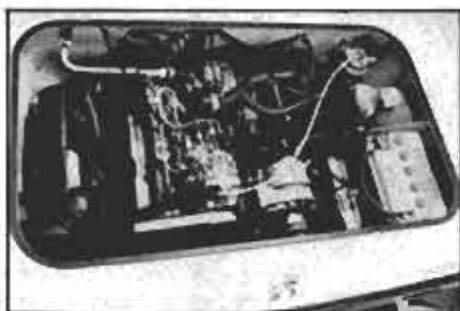
Amazingly, Scirocco's .39 Cd is matched by the new Quantum hatchback coupe, which is VW's successor to the Dasher. The new name for '82 is on a car that is bigger, better in almost every way and flagship priced—\$10,250 to start. Coupe and wagon models are rolling out of showrooms now; a four-door sedan



Quantum wagon cargo volume is 64.7 cu.ft.

won't be available until spring. The fwd Quantum is on a 100.4-inch wheelbase, length is 178.1 inches, width is 66.2 inches and weight is 2,271 pounds, making it slightly larger and heavier than the Dasher. Still, fuel economy is better, with the five-speed EPA-rated at 28/41 mpg city/highway. The 1.7-liter Four, VW's adaptable gasoline powerplant, is rated at 74 hp at 5,000 rpm.

Volkswagen's other engine is its four-cylinder, 1,588-cc diesel. This year it finds a new mount: in the Vanagon. It's laid over 50° just over the rear driving wheels. You can tell an '82 diesel Vanagon from the gas-powered model by its second grille (needed for the front-mounted radi-



Diesel in Vanagon is under the rear floor.

ator). A four-speed manual transmission (no automatic available) gives adequate performance: 65-mph top speed, 22 seconds 0 to 50 mph; fuel consumption 29 mpg city and highway. Remember, that's for a vehicle that will carry an entire Little League team or take the family on vacation when it's set up as a camper.

The rest of the VW line—Jetta, pickup and Rabbit—just keeps sipping along. For the fifth straight year, the Rabbit diesel is the most fuel-efficient car you can buy. Ho-

Hot Hondas

The demand for Hondas hasn't slackened since I owned one back in '69: One morning, I locked my shiny, new 125-cc motorcycle by its rear wheel to a cast-iron fence in New York City. Ready to ride at five, I found the... rear wheel, still locked to the fence.

Honda four-wheelers are also very appreciated vehicles—even more in demand now that there's an import quota. Soon, at least one Honda model won't be imported, but made in Marysville, Ohio, site of the automaker's new U.S. plant. The car to be built here is the second-generation Accord. It's a subtle redo, evolu-

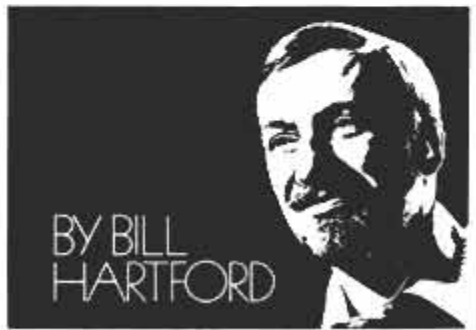


Hatchback Accord has new hindquarters.

tionary outside, inside and underneath—the first major change for the hatchback, introduced in '76, and the four-door, new in '79. The car is slightly larger overall, with wheelbase longer by 2.8 inches, yet it's actually 70 pounds lighter. And fuel economy is up: 30 mpg city and 41 highway is the EPA rating for the 49-state car with five-speed transmission. A larger, 15.8-gallon fuel tank now feeds the 1,751-cc Four, so range is increased, too. The Accord looks even more like a BMW this year. So, when you consider performance and quality and the fact that you can get a loaded hatchback for under \$9,000, you know why Hondas are hot—a steal, you might say. **PH**



Don't mistake '82 Accord sedan for a BMW.



**SOMETHING
NEW**

Popular Mechanics FILE BOXES & SEPARATE INDEXES

No more untidy shelves or magazines stacked on top of each other.

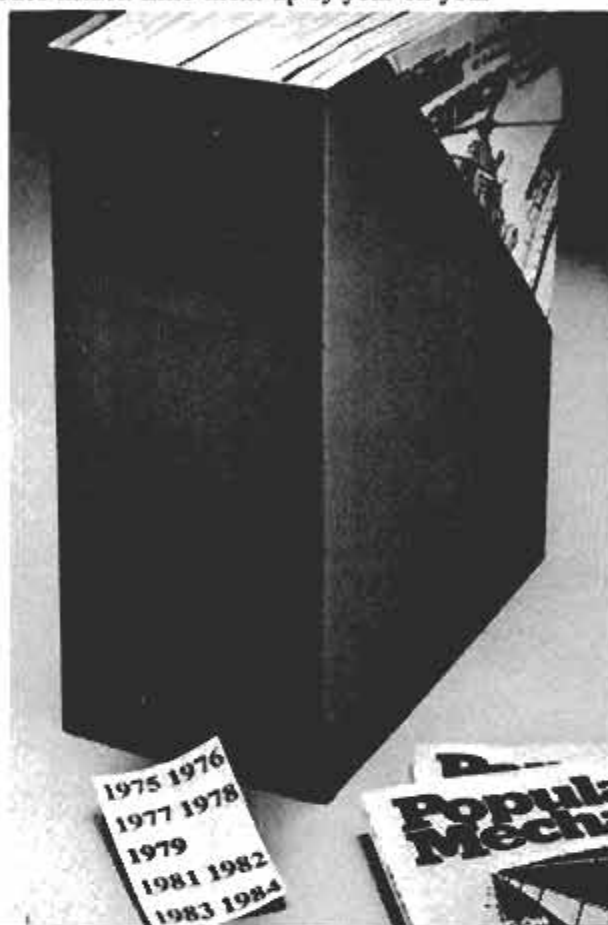
POPULAR MECHANICS FILE BOXES will help you keep your magazines and bookshelves trim and orderly. PM is now offering a sturdy glossy lacquered File Box to keep a year's supply of PM issues neatly together. The FILE BOX stands alone with all twelve issues intact! Line them up by year on your bookshelf and always have a wealth of do-it-yourself information at your fingertips.

With every order you will receive FREE self-adhesive labels covering the years 1975 through 1984. Peel off the year required and place on appropriate PM File Box. Turn the File Box any way you choose. Place the year on the side that's convenient for you. Expose all the magazines on the shelf, or keep the solid side in view. It's your choice! Either way you'll have a valuable, convenient and very attractive reference library.

Price for 1 File Box,
\$2.95

Price for 2 File Boxes,
\$2.75 each

Price for 3 or more
File Boxes, \$2.50 each



**PM Indexes
for the years
1975-1980
are here!**

Find the answers to your shop, home and car problems faster than ever. Thousands of entries cross-reference the articles that have appeared in PM over these years.

Broad category listings help you locate articles on home remodeling, boats, car maintenance, shop projects and many other subjects.

**ORDER BY YEAR! PRICE
for each index is \$2.25.**



SEND YOUR ORDER TODAY!

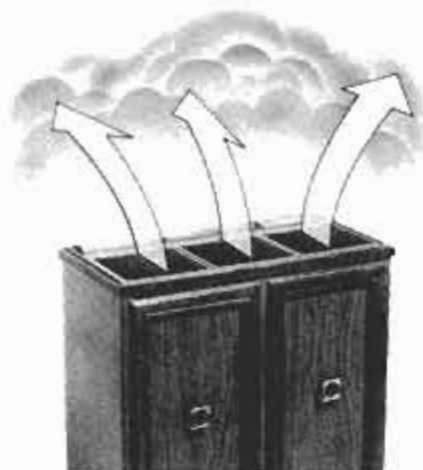
Make Check or Money Order Payable to Popular Mechanics

Please allow three to four weeks for delivery

POPULAR MECHANICS

Box 1014, Radio City Station, New York, NY 10101

Add moisture to reduce heat bills



Proper indoor relative humidity depends on outdoor temperature. The humidistat on a power humidifier maintains proper level.

If your thermostat is lowered to 68° F. to cut heat costs and you find yourself shivering, the house air may be too dry. In other words, the relative humidity may be too low.

This is a common problem during the heating season when cold outdoor air is brought inside and heated. As the air is heated, its moisture-holding capacity increases greatly and it extracts moisture from any available source, including your skin. When you feel cold, you're actually experiencing excessive evaporation of skin moisture.

Adding moisture to the air by means of a humidifier lets you lower your thermostat and still feel comfortable. The ideal relative indoor humidity level depends on the outdoor temperature, as shown in the chart below. When the outdoor temperature is 40° F., for example, you should maintain the indoor relative humidity at 45 percent. Without additional humidification, however, indoor humidity at the same outdoor temperature ranges from only 2 to 36 percent, if your thermostat is set at 68° F. For the free booklet, *Humidification Facts*, write: Research Products Corp., Madison, Wis. 53701. PM

WHEN OUTDOOR TEMPERATURE IS	RELATIVE HUMIDITY SHOULD BE
40° F.	45%
30° F.	40%
20° F.	35%
10° F.	30%
0° F.	25%
-10° F.	20%
-20° F.	15%

TURN YOUR
TIMBER INTO
CASH!



Goes right to the TREES!

The only ONE-MAN PORTABLE SAWMILL of its kind in the world . . .

. . . and still worthy of its 50-Year reputation for turning out accurately cut lumber at a LOW-COST!

Yes, if you're needing good, high-quality lumber don't let today's inflated lumber prices stop your important building projects. Take the Belsaw right to the trees and turn out foot-after-foot of smooth, true-cut lumber . . . even beginners get excellent results. For power use your tractor PTO or other gas, diesel or electric unit as small as 25-HP. Our factory-direct selling keeps the price low, and convenient time payments may be arranged.

And the Belsaw can earn you EXTRA CASH! Just one man (no crew needed) can easily saw enough on weekends to SAVE hundreds of dollars over high lumberyard prices. But you can also Custom-Saw for others or sell the lumber produced from your timber and EARN excellent Cash Income—with a Belsaw the choice is YOURS. And when YOU are the Boss YOU pick the hours to work and ALL the Profits go in YOUR pockets.

Send TODAY for FREE BOOKLET!



Just mail coupon for "How To Saw Lumber" Booklet and complete facts on the One-Man Sawmill. Send to:

Belsaw One-Man Sawmill
362J Belsaw Building
6301 Equitable Road
Kansas City, MO 64120

There is NO Obligation and NO Salesman Will Call!

BELSAW ONE-MAN SAWMILL
362J Belsaw Building
6301 Equitable Road
Kansas City, Missouri 64120

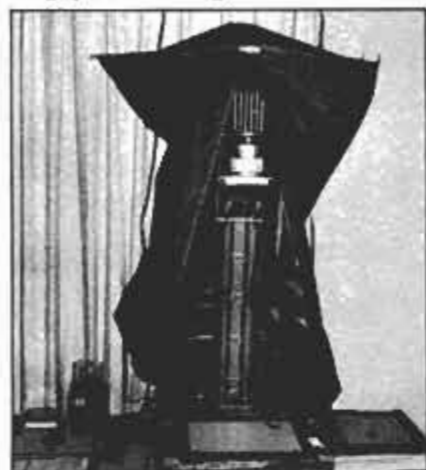
Please send all facts and details
PLUS FREE "How To Saw Lumber" Booklet I understand there is
No Obligation and that No Salesman will call on me.

NAME _____
ADDRESS _____
CITY _____
STATE _____ ZIP _____

FREE
BOOKLET

PHOTO HINTS

Bag your enlarger



Protect your enlarger and its optical system from dust particles with a plastic garment bag zipped around it.—Mike Plake

Up against the wall



The 20-inch, four-way stretch cords available at auto stores can secure developing trays on a wall or table.—E.V. Reyner

Double the room



A coupling ring will join two lenses together so they'll fit more easily in a bag. Cement two rear lens caps back to back with epoxy, then wrap electrical tape around the joint.—Clinton G. Meier

HINTS FROM READERS

Ferrules from cartridges



If you are a hunter or know someone who is, you'll have little difficulty accumulating a supply of empty cartridges. You can use them as ferrules for small, shop-made hand tools, such as this chisel.—*Bob Berger*

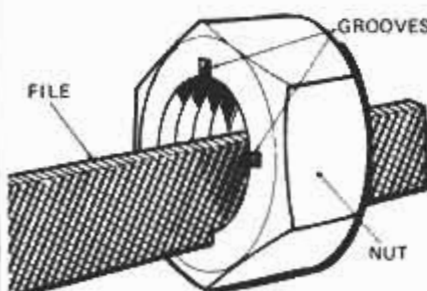
Hobby-knife holder



You can safely store a hobby knife and a selection of blades in a scrap piece of plastic foam.

—*Ken Patterson*

Substitute die



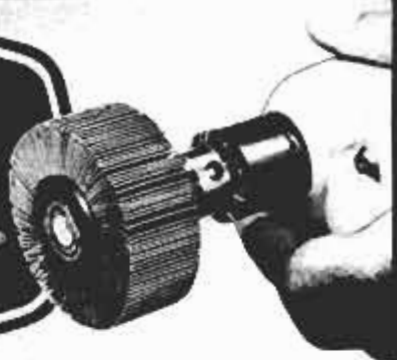
When you don't have a die to restore battered threads on a bolt or screw, you can file or saw a few radial grooves in a nut of matching inside diameter and thread count and use it as a die. Heat the nut to dull red. Sprinkle the threads several times with granulated sugar until the sugar burns. This produces a very hard surface, similar to casehardening.—*Harry Miller*



NOW!

Strip 'n' Sand

in one operation



MERIT MINI-STRIPPERS ELIMINATE HAND SANDING

Never gouges or damages surface. Replaces sandpaper, wire brushes, wire strippers and elbow grease. Mini-Stripper is 2-1/2" x 1" rotary flap wheel made of heavy-duty industrial abrasive cloth. It fits any 1/4" or 3/8" drill. Perfect for stripping and sanding woodwork, sash and furniture. Assures proper surface preparation, essential to a good refinishing job.

3 Wheel Kit, Only... \$8.99

- Mini-Stripper Kit contains 3 wheels \$8.99 in fine, medium and coarse. Order by mail. Add \$1.00 for postage and handling.
- FREE full color catalog. PM

MERIT ABRASIVE PRODUCTS, INC. Dept. PM, 201 W. Manville, Compton, CA 90224



GENERATE YOUR OWN ELECTRICITY! BUILD A WINDMILL FOR UNDER \$1,000.

Windpower is a practical low cost energy alternative that could save you thousands — even supply all your electricity. Efficient 2 KW machine generates 2,000 watts, ABSOLUTELY FREE. No batteries; plugs into 110V outlet.

A GOOD SITE SUPPLIES 100% OF YOUR ELECTRICITY NEEDS!

If you live in the northern states and can see an unobstructed view of 1-2 miles, chances are that you have a good windmill site; a longer view would indicate an excellent site.

ACTUALLY REVERSES ELECTRIC METER!

It's true. When the windmill generates more electricity than you consume, the utility meter will rotate in reverse. In effect, you would be selling electricity to the utility. How's that for fighting back?

EASY TO ASSEMBLE PLANS.

100-page manual guides you step-by-step in building your own windmill from our tested blueprints. Virtually all parts can be found locally. You save by supplying spare time labor. Or, we can sell you some or all parts or even the completely assembled windmill.

I'm ready to FIGHT BACK! Send me:

- Complete plans and 100-page manual to build my own windmill — \$59.00
- Fact filled Information Kit — \$5.00
- Assembled windmill machine and blades (less pole of course) — \$3600.
- Check enclosed VISA MC

Card # _____ Exp. Date _____

Name _____

Address _____

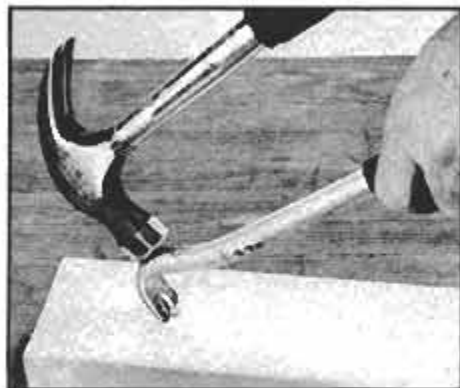
Vt. Residents add 3% sales tax.

Clip and mail to: **FIGHT BACK, Dept. P-182,
Box 162, Windsor, Vt. 05089**



WORKSHOP MINICOURSE

TWO MORE SPECIAL TOOLS



To lift a buried nail, the "cat's paw" nail puller is positioned as shown and struck firmly with a hammer. The tool causes some damage to the surrounding wood, so use it only for rough carpentry chores.

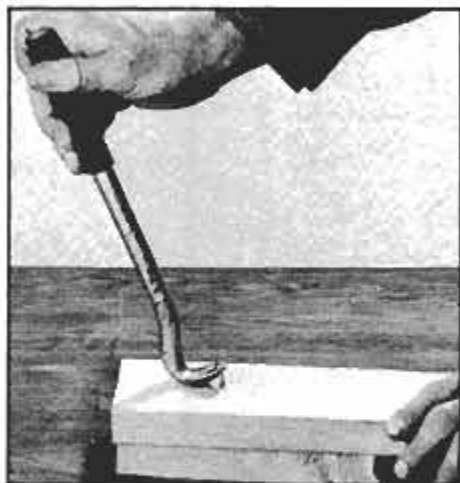
Last month, we discussed two tools that have been around a while, yet are "new" to many workshopers—the brad pusher and the French joiner's hammer. The same is true for the tools shown here.

The 'cat's paw'

This tool's name, obviously, is derived from its shape. It's a nail puller that's used on carpentry projects—not for removing driven nails from cabinets and the like. In fact, it's generally used to make framing changes in house carpentry. Homeowners will find it useful for home-improvement projects.

To use it, position the work end of the tool so that its claws will dig into the wood beneath the nailhead and straddle the shank below. Once it's firmly embedded beneath the nailhead, use the puller alone to raise the nail. Then remove the nail conventionally, with a hammer claw and a fulcrum block (if necessary).

Since a nail puller of this type



When the nailhead is lifted slightly, stop hammering. Then use the puller alone to raise the head enough for conventional hammer claws to get beneath the nail. This method will minimize damage to wood.

damages only the surface of the stock, lumber can be reused in most instances (for example, framing). However, don't drive new nails through holes left by old nails. Reposition your board and start nails into solid wood.

Cabinet scrapers

Chances are your hardware store no longer stocks these tools. You can order them from many craftsmen-supply houses. Woodcraft Supply Corp., 313 Montvale Ave., Woburn, Mass. 01888, offers three versions: gooseneck, \$2.55; convex-concave, \$2.40; and straight, \$1.75 (all prices include postage).

In use, a cabinet scraper is held between thumbs and index fingers, as shown, and the blade is literally dragged across the board's surface. More often than not, the tool is used with a pulling action, but it is per-



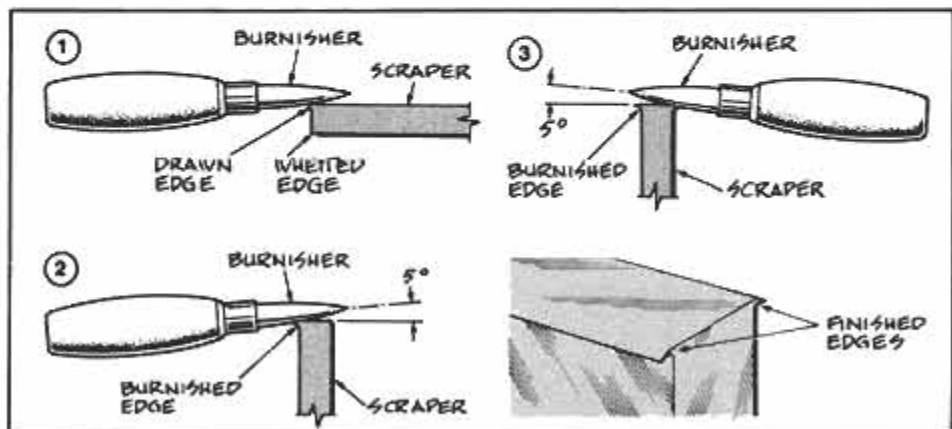
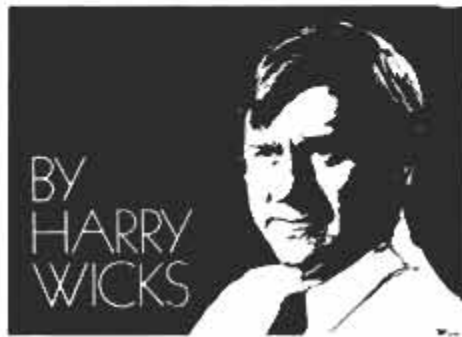
fectly acceptable to use a pushing motion. In fact, the task at hand often dictates such action. The important point is that a sharp, well-burnished cabinet scraper leaves a very smooth surface. If it's used properly, I estimate it will eliminate about 75 percent of your sanding. Since sandpaper is expensive these days, the tool can quickly become a favorite.

I use my scraper frequently, especially in those difficult-to-sand areas where grains merge from perpendicular directions. For example, if you use sandpaper to sand a butt joint between stile and rail, you'll get scratches across the grain of the second piece when sanding the first (with the grain). Using a cabinet scraper, you can start at the joint and avoid scratches.

If you decide to use a scraper, it's important to master the burnishing operation shown here. Since the wire edge formed by burnishing does the cutting and smoothing, it's essential that you keep this edge on your scraper.

PM

BY HARRY WICKS



The best way to sharpen a scraper is to whet it; then, use a burnishing tool to finish the edge. The burnishing creates the wire edge, or curl, that does the actual scraping.

Start your own money making business!

Make up to \$12⁵⁰ an hour—
even while learning!

Train FAST
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!

Start Collecting CASH PROFITS Right Away

You're "in business" ready to earn up to \$12.50 an hour a few days after you begin Belsaw's shortcut training. Take advantage of today's unprecedented opportunities in Locksmithing for year-round EXTRA INCOME in-sparsetime—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 to KEEP THE MONEY COMING IN! Ideal for retirement—good jobs too.

SEND FOR EXCITING FACTS—No Obligation

Discover what's in Locksmithing for you—how Belsaw's Master-Locksmith-approved training can give you the skill you can depend on to EARN MORE—ENJOY LIFE MORE.

BE A LOCKSMITH!

Hundreds of Belsaw trained men
have succeeded in this fascinating
and highly profitable field...

"Before enrolling I checked other courses and also asked for advice from several of the professional locksmiths in my area. They all said Belsaw was top and h's the most versatile Key Machine. "I always wanted to be in business for myself and now I am... thanks to Belsaw Institute."



David Fairbrother—Dave's Locksmith Service
Milwaukee, Wisconsin 53209



"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

"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



No Extra Cost!



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 Belsaw offers such extensive training in this rapidly expanding field as a part of your Locksmith training.

ADVANCED Locksmithing! How to change combinations, install and service Safe, Vault and Bank Safe-Deposit Box locks. You learn-by-doing on the locks that we supply. You'll find it fascinating and highly profitable work.



Be Your Own Boss!

10-DAY NO RISK TRIAL!
Send for details!



THIS PRO KEY MACHINE IS YOURS TO KEEP!

This Pro Key Machine can 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! Send for **FREE** Facts TODAY!

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

RUSH COUPON!

ALL SPECIAL TOOLS AND EQUIPMENT INCLUDED!



BELSAW INSTITUTE
102J Field Bldg., Kansas City, Mo. 64111

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

RUSH COUPON TODAY FOR THIS FACT-FILLED

FREE 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 **10-Day NO RISK** Trial Offer!



Send for your copy today!

BELSAW INSTITUTE, 102J FIELD BUILDING
KANSAS CITY, MISSOURI 64111

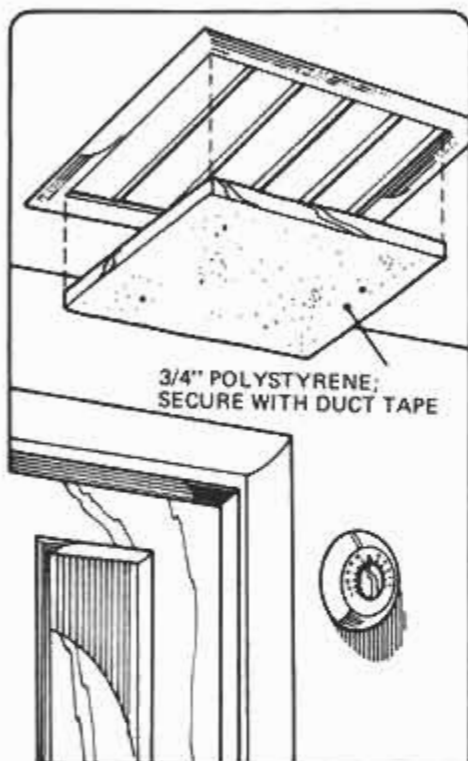
YES, please send me the **FREE** booklet that gives full details about starting my own business in Locksmithing. I understand there is no obligation and that no salesman will call.

Name _____
Address _____
City _____
State _____ Zip _____

... YOU Can Do It Too!

5 energy-saving tips from PM readers

Attic fan louvers

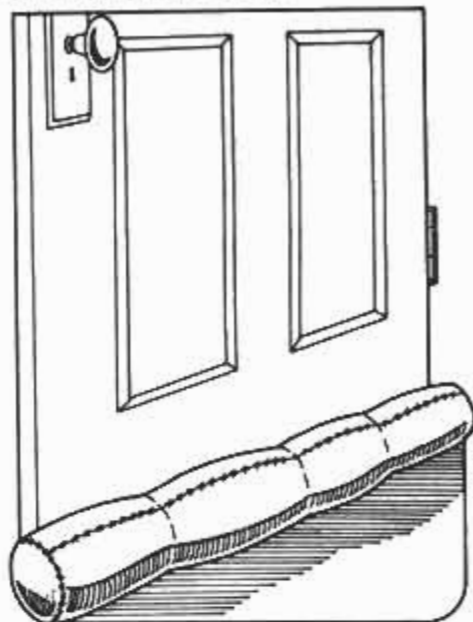


After installing attic insulation and sealing our fold-up attic stairs, I was sure that my gas bill would drop. To my chagrin, the next month's bill was \$5 more than usual. My wife and I were standing by the thermostat in the hallway, when she noticed smoke from my cigaret spiraling up through the louvers in our fan and into the attic. Looking down at the fan from the attic, I saw 1/4-in.-wide cracks around every louver. Each crack served as a flue to draw heat into the attic and cold air off the floor over the thermostat.

To seal the louvers, I bought some 1/4-in.-thick rigid polystyrene and a roll of 2-in.-wide duct tape. I cut the polystyrene to fit inside the louvered frame and secured the edges with duct tape. Also important, I put a strip of duct tape across the fan switch. The polystyrene matched our white, textured ceiling perfectly.

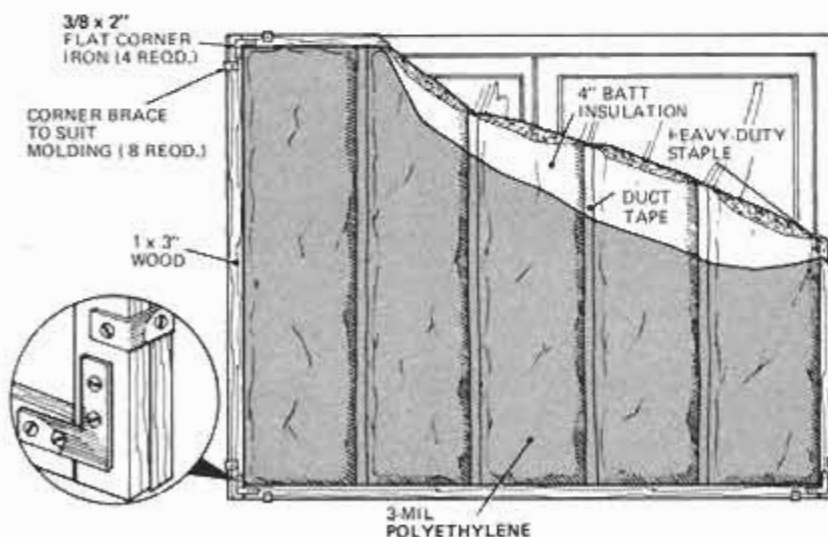
Our next gas bill showed a \$19 decrease. Our yearly savings have been over \$120.—*Lawrence A. Stuck, Marietta, Ga.*

Snake in the draft



To stop cold drafts from whistling under doors, I use a draft stopper. It's an 8-in.-wide piece of fabric, slightly longer than door width. I sew the long edges together and one end closed. Then I partially fill the fabric with sand, and seam the other end closed.—*Elizabeth Mills, Oxford, Nova Scotia*

Patio-door insulation

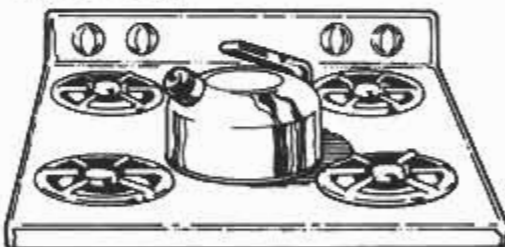


To minimize heat loss and cold-air infiltration through the sliding-glass patio door in my family room, I made an insulation package that I install indoors each winter. It consists of fiberglass batt insulation, cut to fit the height of the door. I tape each piece to the adjoining one. The result is a large piece of insulation that covers the entire door. I fasten it around the edge of the door frame with a staple gun. With the

insulation in place, I cover the entire door with a sheet of 3-mil polyethylene. Then I tape the plastic around the edges for an airtight fit. Next I install a frame of 1x3s joined with flat corner irons; I fasten the frame to the door trim with corner braces.

Since my patio door faces north, I don't lose any solar gain by blocking it.—*John D. Roberts, Liverpool, N.Y.*

Kettle's on



I always leave my teakettle, filled with water, sitting on the pilot light of my gas range. It takes less time and energy to bring this prewarmed water to a boil.—*Charlene Tuck, San Diego, Calif.*

Shell shocking

If you think nutshells burn well (see *Energy-Saving Tips from PM Readers*, page 144, Sept. '79), you should try coconut shells. They burn hotter and last longer. They burn for 5 to 10 minutes and give off a blue-white flame that periodically flares much like torch flame. If I could buy coconut shells by the truckload, I would be able to stop burning wood permanently.—*John W. Owen, Newark, Del.*

Share your home energy-saving ideas. PM will pay \$25 for each published idea. Include sketch or photo, if necessary, and a stamped, self-addressed envelope if you want unused material returned. Send to Energy-Saving, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019



Market Court is one of six patterns you can get in 12-ft.-wide, do-it-yourself carpet.

Wall-to-wall carpet you can install yourself

Installing wall-to-wall carpet used to be a job left strictly to pros. Now a carpet collection called the Sculptured Touch is geared for do-it-yourself installation. Made by Armstrong World Industries Inc., the

carpet comes in 12-ft.-wide rolls and costs under \$13 per sq. yd.

The carpet is 100-percent nylon and comes with its own foam backing, so you don't have to buy extra padding. The backing has improved resistance to cracking and crumbling. It also resists mold and mildew, so you can install the carpet in a basement or over a concrete slab. The only installation tools you need are double-faced adhesive tape, shears, and crayon or chalk.

The 10 embossed patterns offered include, among others: a basket weave brick, an octagon look, a wood parquet and three medallion designs. Each pattern comes in a variety of colors.—P.S.



1 Run a crayon or chalk line around the room's perimeter; mark floor and wall.



2 Roll the carpet onto the floor; allow a few inches of excess to run up the wall.



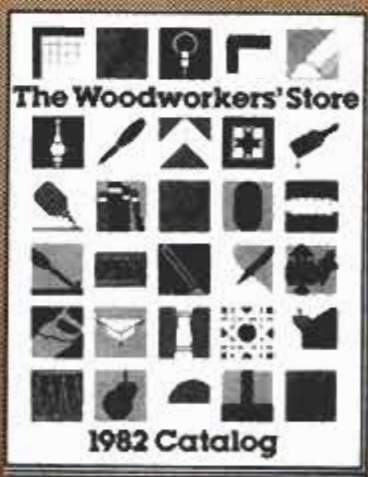
3 Press carpet firmly into floor-wall joint to transfer chalk marks, then cut.



4 Use double-face tape at seams and doors to ensure that the carpet stays flat.

The Woodworkers' Store™ is

Teners
 Hardwoods
 Inlays
 Carvings
 Mouldings
 Framing
 Hardware
 Finishing
 Books, Plans
 Tools
 and Kits



in a
Catalog

Please send me your 1982 catalog. I enclose \$1.00 (for third class postage) or \$2.00 (for first class postage).

Name _____

Address _____

City/State/Zip Code
 The Woodworkers' Store Dept. D701
 21801 Industrial Blvd. Rogers, MN 55374

4 handy items to make for your home

Spend a pleasant afternoon in the shop with any one of these projects and we bet you'll soon return to make the others.

Few workshop products provide as much satisfaction as those which you use in your home. Here are four projects that are sure to be popular with the entire family.

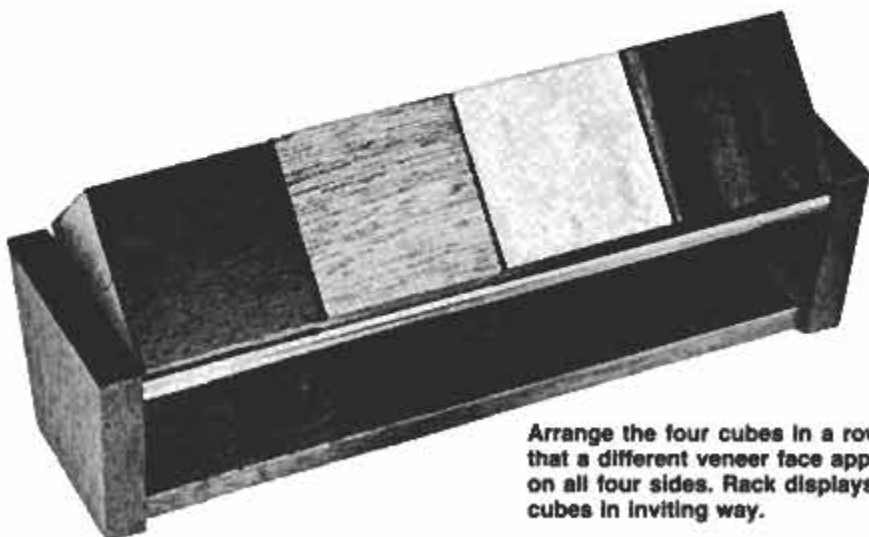
The first item is a puzzle which is great fun when you're looking for a challenge. The other three items—an antique model quilt rack, king-size salt and pepper shakers and a Corian carving board for the kitchen—are more functional projects.

1 Puzzle cubes

The object of the puzzle (caption, far right) sounds easy. But it's probably easier to make the puzzle and let the teen-agers in your home figure it out.

Cut the hardwood cubes slightly larger than $1\frac{1}{2}$ in. square. Then true them up as shown in the photo (near right). Choose four contrasting veneers and fill in their names in the drawing chart. The chart gives the number of 2-in. squares of each veneer needed to glue up all sides of the four cubes.

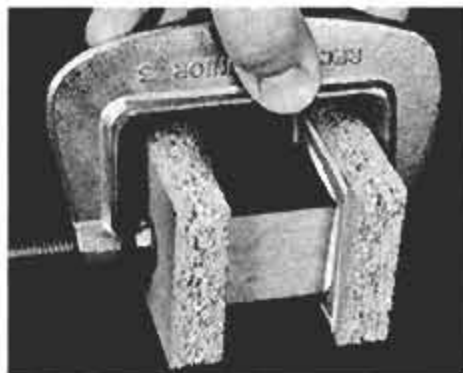
Mark the cubes according to the four diagrams in the drawing. Imagine that the diagrams fold down around the cube. Then mark the back of each veneer square accord-



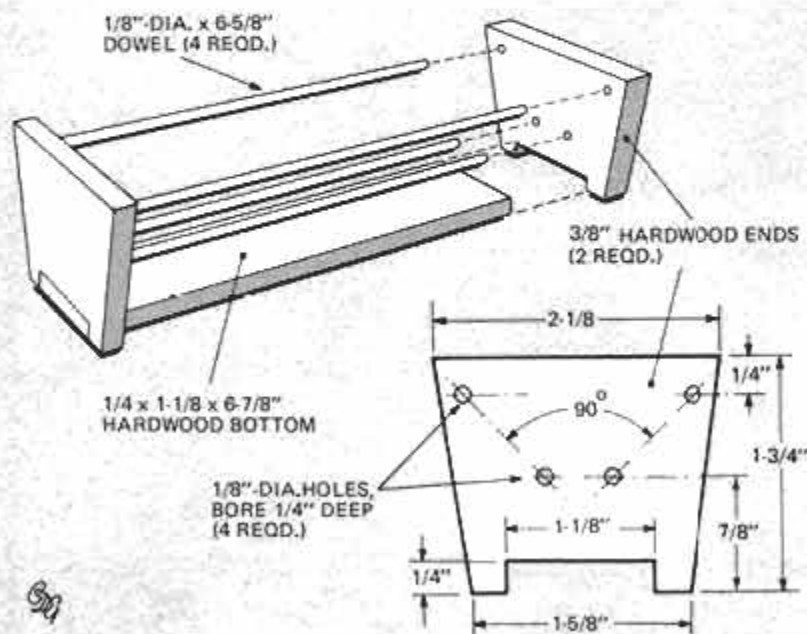
Arrange the four cubes in a row so that a different veneer face appears on all four sides. Rack displays the cubes in inviting way.



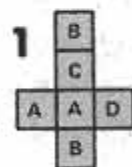
To create square cubes, hold them in a piece of angle iron secured in a lathe tool post. Use medium-grit paper on faceplate.



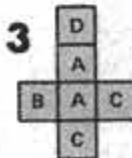
Use C-clamps and two pieces of particleboard to glue veneers. Paper between the board and veneer will prevent sticking.



	NO. OF SIDES	VENEER
A	8	
B	6	
C	5	
D	5	



ALL FOLDS FOLD DOWN





Display heirloom quilts on this handsome hardwood model of antique quilt rack.

ing to its letter designation in the chart. Match these letters, face to face, as you glue the veneers to the cubes. Use the gluing process shown in the photo on page 66. After the glue has set, trim away excess veneer with a sharp knife.

Make the puzzle-cube rack according to the dimensions shown in the drawing on page 66. The rods can be stainless steel or dowels, but I prefer the warm color of brass.

Both cubes and rack may be finished with three coats of polyurethane varnish. For a superior finish, rub the first and second coats lightly with steel wool before applying the final coat.—*Kenneth Wells*

2 Quilt rack

If you're a do-it-yourself kind of craftsman, this is an ideal project for you. The grid drawing provides the information you need to scribe patterns for cutting the tops and the bases for an average-size quilt rack. The overall size of the parts can be changed by simply giving the squares larger or smaller values, according to your needs. In practice, the base of the largest rack wouldn't

be wider than 14 in.; the smallest rack base wouldn't be much less than 9 in.

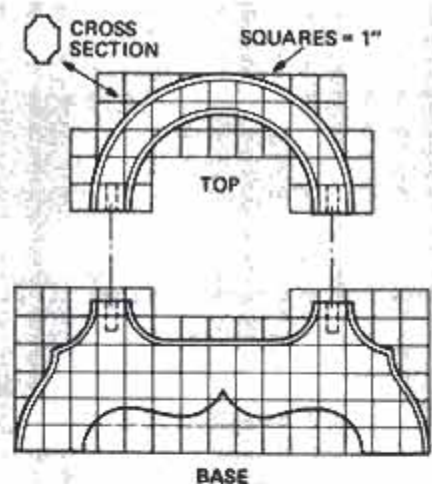
The design of the turning details on the bars and uprights has been left up to you. For the size of base and top given in the grid drawing, the bars and uprights should be cut from 1-in.-sq. stock, 26 in. long. When turning, try to leave a minimum diameter of $\frac{3}{4}$ in.

For all uprights and bars, turn tenons to a $\frac{1}{2}$ -in. diameter, $\frac{3}{4}$ in. long, at both ends. On the original antiques, the bars usually join the uprights in a section left square on the upright (leg).

The lower bar joins the uprights 3 to 4 in. below the upright center point. The uppermost bar joins the arcs, and the other two bars join uprights 3 to 4 in. below the upright joint with the arc.

After the pieces are completed, test-fit all the parts together. If you're satisfied with the fit, disassemble and apply carpenter's glue to all joints and clamp them as shown in lower right photo on this page. If any glue squeezes out, be sure to wipe it off promptly with a damp

(Please turn to page 158)



To make tops, cut a disc to size and complete detail work on lathe. Then cut disc in two and cut out centers to form arcs.



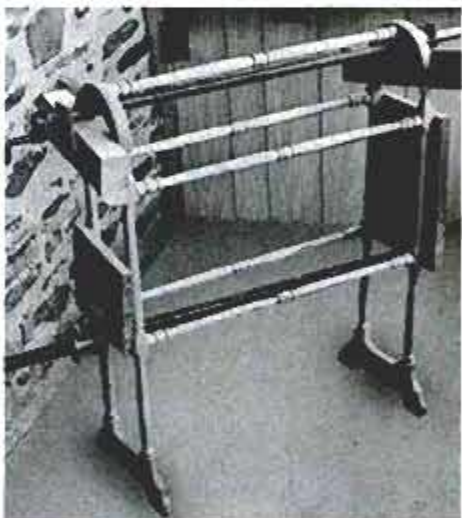
Using grid to scribe a pattern, cut out two slightly oversized feet with a sabre saw.



After sanding the sides and shaping the tops and the feet as shown here, the feet may be trimmed to their final size.



Shape the bars and uprights on your lathe according to a pattern of your own design.



After test-fitting all parts of the rack, add glue to all joints and clamp as shown.



Build PM's Loudmouth sound-effects machine

The Loudmouth will whistle, chug, tweet, screech and pop—but it may not make you a popular neighbor!

by Walter Sikonowiz



Mention sound effects to most people and you will probably conjure up images like the flapping of sheet metal (for thunder) or the slapping of inverted coconuts against a board (for horse hooves).

But today's sound effects, like almost everything else, have been revolutionized by electronic technology. In fact, it is now possible, thanks to the integrated-circuit (IC) designers at Texas Instruments, to build your own sound-effects generator using only one IC. Not only will you be able to generate everyday sounds, such as the shriek of a siren or the deafening blast of an explosion, but you can also produce unearthly sounds like the zap of a phasor gun or the gurgling warble of a flying saucer.

Sounding out the circuit

To get an idea of how the sound-effects generator works, examine the schematic diagram. IC1, a type SN76477, 28-pin integrated circuit, is a very complicated device, but the overall circuit of the generator remains relatively simple. The easiest way to understand this circuit is by considering the various controls one by one.

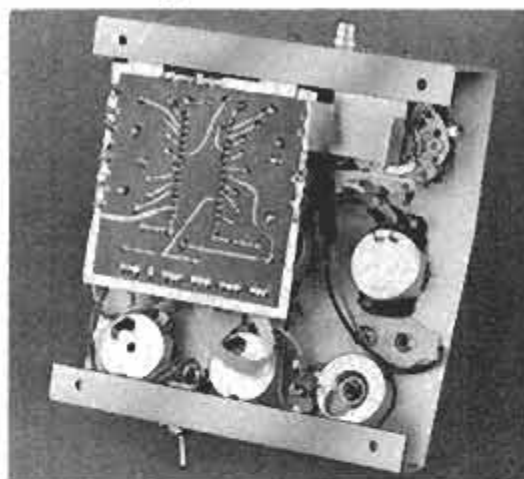
Trigger switch S2 is used to initiate momentary sounds. Potenti-

ometer R10 controls the length of time necessary for the sound to build up to maximum volume from zero. This period is known as the attack time of the note. For example, the clarinet's attack time is about 50 milliseconds, while that of the tuba is a much longer 400 milliseconds.

Two other equally important characteristics of a sound pulse are its sustain and decay times—the former controlled by potentiometer R14 and the latter by R12. Sustain time is simply the interval during which the sound remains at a maximum level, while the decay time specifies how long it takes the sound to fade back to zero.

What happens when you wish to generate a continuous, rather than momentary, sound, like a siren's wail? In such an instance, attack, sustain and decay are unimportant, since the sound is always "on." So, when generating continuous-type sounds, you simply ignore the four controls mentioned above.

For sounds of either type, pulse or continuous, *pitch* is another characteristic of the utmost importance; it is controlled here by potentiometer R4. The difference between Big Ben and your alarm clock is largely one of pitch—not to mention volume.



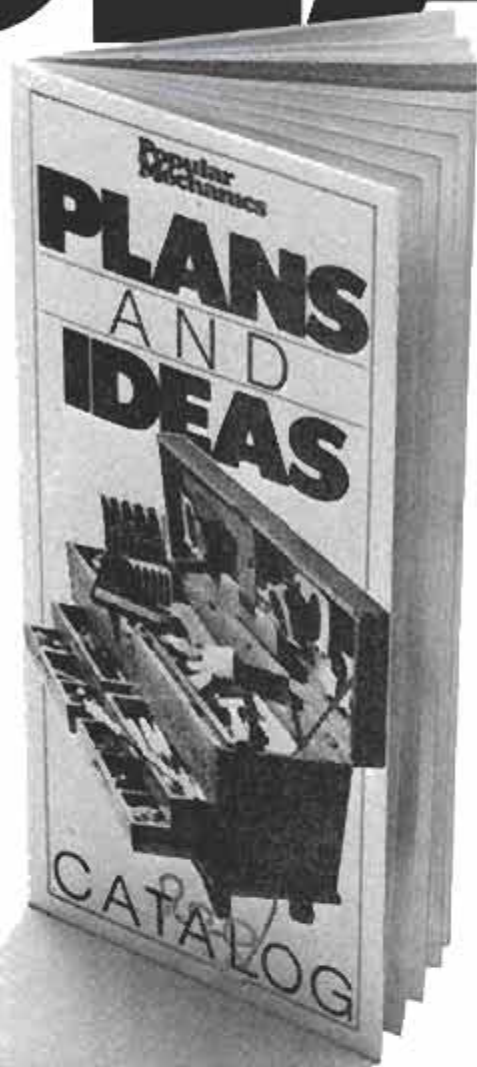
Simple printed-circuit board connects a newly designed integrated circuit to various switches for sound effects.

Some sounds—in particular, several naturally occurring sounds—have no identifiable pitch. Instead, their vibrations are best characterized as *noise*—a collection of many frequencies (pitches) all vibrating together simultaneously. When generating such sounds—and this includes explosions, gunshots, the sound of the surf, plus others—you will need noise-control potentiometer R8.

Getting back to pitched sound,

(Please turn to page 70)

SMART IDEAS



If you're looking for ideas to save time and money — while enjoying what you're doing — send away for PM's catalog immediately.

We have plans for shop tools, boats, storage houses, campers. Scuba tow, ACV, log splitter, air compressor. Smart ideas in furniture! Also dollhouses! Projects the whole family can enjoy.

And best of all — we offer a special and unique service — photocopies of past PM articles.

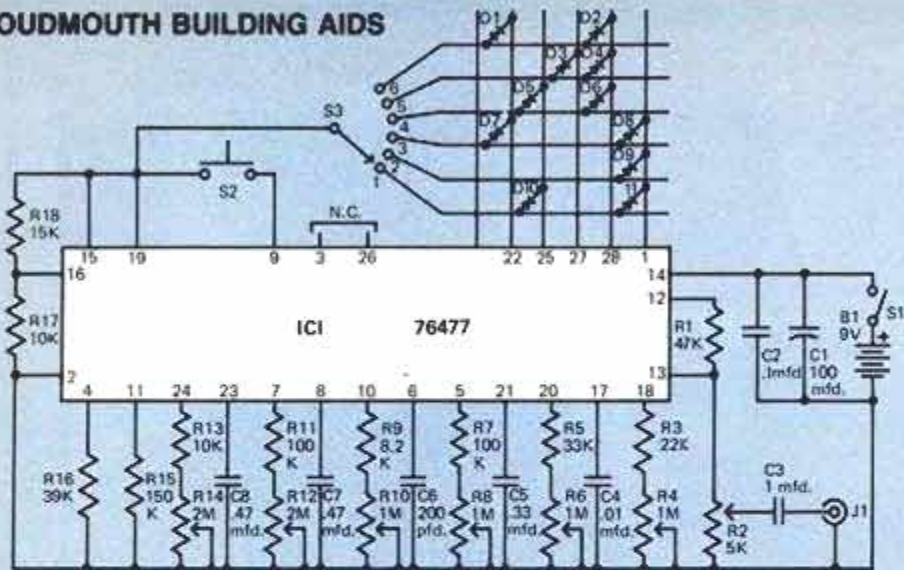
What's more, we tell you the year the projects were published. It may be as early as a 1902 glider to a most recent 1981 solar garden shed. You'll have fun just browsing through the approximately 900 different plans and projects. You'll find our GREAT WORKSHOP series listed. Also our SHOP MINI-COURSES. Timely energy-saving ideas! You'll see it all in our new POPULAR MECHANICS PLANS AND IDEAS CATALOG.

Price \$1.00

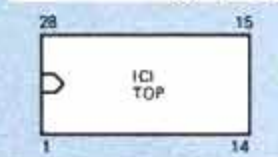
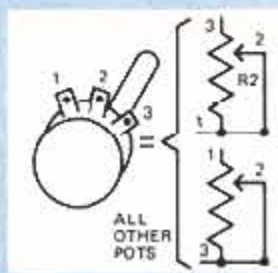
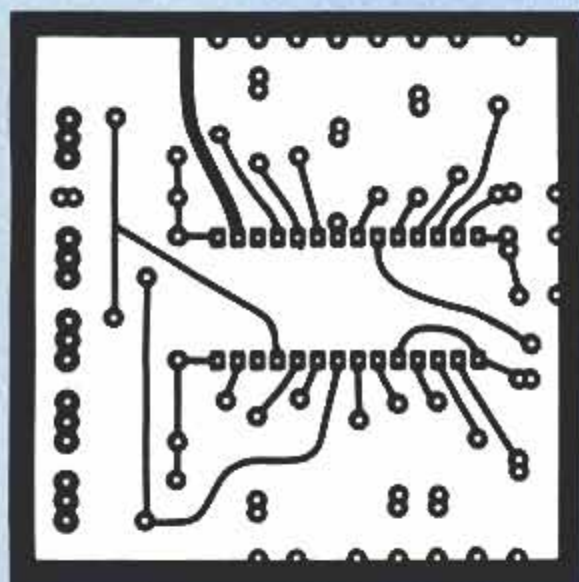
SEND FOR YOUR CATALOG TODAY!

Send Your Name and Address with Check or Money Order to
Popular Mechanics, Box 1014, Radio City Station, New York, N.Y. 10101

LOUDMOUTH BUILDING AIDS



Schematic (above) shows proper orientation of Loudmouth's parts. Template and component-side view (below) can help you to fashion a printed-circuit board.



CONTROLS	
S1 - POWER	R8 - NOISE
S2 - TRIGGER	R10 - ATTACK
S3 - MODE	R12 - DECAY
R2 - VOLUME	R14 - SUSTAIN
R4 - PITCH	J1 - OUTPUT
R6 - SPEED	

BUILD PM'S LOUDMOUTH

(Continued from page 68)

there are times when it is convenient to vary the pitch automatically. A familiar example is the musical effect called tremolo, in which the pitch is cyclically shifted up and down a small amount, at a rate of about six cycles per second. This adds a pleasant flutter that imparts extra "warmth" to the sound. Frequency sweeps of this type can be accomplished with the aid of speed potentiometer R6, which controls how fast the pitch (selected by R4) is swept up and down.

Next we come to Mode switch S3. This is an important control that coordinates the effects of all the other controls mentioned so far. Modes 1, 2 and 3 produce sound pulses that, after triggering by S2, last for a time interval determined by the settings of R10, R12 and R14. Mode 1 is noise based, Mode 2 produces a pitched sound, and in Mode 3 the pitched sound is swept. Modes 4, 5 and 6 yield continuous sound output. Mode 4 supplies pure noise, Mode 5 yields a combination of noise and pitched sound, and Mode 6 is based on a tone whose pitch is swept.

Diodes D1 through D11 serve as switching devices. Note that the horizontal and vertical lines of the grid in which the diodes are situated do not connect together. Each diode connects to one horizontal line and one vertical line.

Potentiometer R2 is the volume control. The signal from R2 is coupled through capacitor C3 to the

(Please turn to page 72)

PARTS LIST—LOUDMOUTH

- B1—Battery, 9 v.d.c.
 - C1—100-mfd. capacitor, electrolytic, 16 v. or higher
 - C2—.1-mfd. capacitor, ceramic disc
 - C3—1-mfd. capacitor, mylar
 - C4—.01-mfd. capacitor, mylar
 - C5—.33-mfd. capacitor, mylar
 - C6—200-pfd. capacitor, polystyrene
 - C7, C8—.47-mfd. capacitor, mylar
 - D1 through D11—1N914 diode
 - IC1—Sound generator, type SN76477 (or Radio Shack 276-1765)
 - J1—Phono jack
 - R1—47,000-ohm (47K) resistor*
 - R2—5,000-ohm potentiometer, audio taper
 - R3—22,000-ohm (22K) resistor
 - R4, R6, R8—1-meg. potentiometer, audio taper
 - R5—33,000-ohm (33K) resistor
 - R7, R11—100,000-ohm (100K) resistor
 - R9—8,200-ohm resistor
 - R10—1-meg. resistor
 - R12, R14—2-meg. potentiometer, linear taper
 - R13—10,000-ohm (10K) resistor
 - R15—150,000-ohm (150K) resistor
 - R16—39,000-ohm (39K) resistor
 - R17—10,000-ohm (10K) resistor, 5% tolerance
 - R18—15,000-ohm (15K) resistor, 5% tolerance
 - S1—S.p.s.t. switch
 - S2—Pushbutton switch, momentary contact and normally open
 - S3—Switch, 6-position, single-pole rotary style
 - Misc.—Case, battery holder, wire, knobs, IC socket
- *All resistors 10%, 1/2-watt unless otherwise noted.
- An etched and drilled printed-circuit board, complete with instructions, is available from Lectrographix Inc., Box 537, Auburn, N.Y. 13021. Specify board No. SEG-9. \$5.25 in continental U.S. and Canada; for others, add \$1.50 for postage and handling. New York State residents include 8.25% tax.



FREE Drafting Aptitude Test You Grade Yourself!

Discover if you have ability for drafting—send for free Aptitude Test plus Drafting "Career Kit." No cost or obligation! No salesman will call. Drafting requires no special drawing skill or technical ability. Everything you need supplied with course—plus easy-to-follow, step-by-step lessons and personal guidance from our instructors.

READ WHAT 2 OF OUR BEST STUDENTS SAY!

We are proud of these comments sent to us by students when we asked them to evaluate our course. They may or may not be typical, but show what can be done by those who set their goals high and go after what they want.

SALARY INCREASED BY 56%. "Upon earning this diploma, I was made senior draftsman and my salary increased by 56%. I owe such an achievement to North American School of Drafting and its wonderful staff."
Mr. Elrie Farrell



MAKES UP TO \$200 A WEEK. "The training I have gained from North American School of Drafting has enabled me to work independently. I am now an assistant architect of Summit Development Company, and make up to \$200 a week. The course was very helpful to me."
Mr. Copeland Mozey



North American School of Drafting
4500 Campus Dr., Dept. PBOC1 Newport Beach, CA 92660

Men! Women! Learn at home in spare time with no previous experience.

Be a DRAFTER!



3 BIG DRAFTING KITS INCLUDED WITH COURSE

When you train at home with us for a job in Drafting.

In addition to your full course of instruction, training aids, supplemental textbooks and personal consulting, you get this beautiful drafting outfit that includes sturdy, adjustable tilt-top drafting table with board, drafting tools—including T-square, paper, etc... plus valuable drawing triangles, lead holders, sharpener and quality steel precision drawing instruments in attractive lined case.



Get Into a Career Where Pay Has Been GOING UP!

Salaries for draftsmen climbed 23% during the 3 years from 1973 to 1976, according to 1977 survey of 12,000 draftsmen by American Institute for Design & Drafting. Graduation from this course does not insure that you will get a job. To find out how our graduates have done, send for our job placement record. And because opportunities vary from one area to another, check the job market in your area and see how many jobs are available in the field of drafting.

RUSH COUPON FOR FREE "DRAFTING CAREER KIT."

Color Brochure, "Careers in Drafting"—jam-packed with revealing facts on opportunities in drafting and how to train at home in spare time...plus, valuable 5-way Drafting Instrument. Everything sent free and without obligation.

MAIL COUPON TODAY

Accredited Member, National Home Study Council Careers by Home Study

NORTH AMERICAN SCHOOL OF DRAFTING, Dept. PBOC1
4500 Campus Dr., Newport Beach, CA 92660

Rush aptitude test and drafting career kit...ALL FREE
No salesman will call. Check here for GI or VA

NAME _____ AGE _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____



SOTZ MONSTER MAUL

FAST-N EASY WOOD SPLITTING



\$24.95 DELIVERED

OUR 25th YEAR



SPECIFICATIONS

- Weight: Head-12 lb. (Total weight 15 lb.)
- Construction: High-carbon steel head, hardened edge. High strength steel handle.
- Guarantee: 1-YEAR TRIAL OFFER + 10 years against failure.
- Price: \$19.95 Factory pickup. \$24.95 Delivered to your door.

- Splits most logs in one lick—won't stick.
- No struggling lifting heavy logs up to high priced power splitters.
- Drop 'em, saw 'em, stand 'em up, and split 'em!
- Forget about lost, stuck, or flying wedges.
- No gasoline, no set-up, no take-down.
- No wooden handles to replace.
- No gimmicks. Just simple physics!

We at Sotz have been making the same quiet offer for years: Try a Monster Maul at our risk! Within one year, if you don't think it's the fastest, least tiring method of splitting firewood, let us know, and we will give you your money back, including shipping . . . Plus, it's guaranteed against failure for 10 years.

VISA or MASTERCARD RUSH ORDERS
CALL TOLL FREE 1-800-321-9892
Inside Ohio 1-216-236-5021
OR SEND CHECK OR MONEY ORDER.
Sorry No C.O.D.'s

Sotz Corporation, 13643 Station Rd., Columbia Station, OH 44028

MAKE BIG MONEY

selling **Lace**

SENSATIONAL SEAMLESS SPRAY



PACE 1-COAT ROOF CARE SAVES CUSTOMERS THOUSANDS!

PAYS \$1,000

ONE AVERAGE SALE or more!

Seamless Spray — the fast, money-saving way to repair roofs — is creating big income sales for men with no experience in maintenance products—many who'd never sold anything before! With Pace one-coat process, you show schools, motels, plants, shopping centers how to save thousands of dollars on roof repairs, using their own men and Seamless Spray equipment we furnish free. They repair, waterproof and insulate with just 1 coat. No costly roofing contractor. No delays. One average order pays you \$1,000 or more! **BIG SALES, BIG INCOME FOR YOU!**

1 SALE PAID

\$1,831.84

to
Gus Dethlefs

\$2,458.40

to
Ray Wells

\$1,666.21

to
John Napier



PACE "LIVE SELLING" CLOSES BIG SALES IN YOUR OWN COMMUNITY

In just 3 minutes, your customer proves to himself how Pace 1-coaters work. With our LIVE SELLING demonstration, he cuts a hole in a sample roof felt, then brushes on Seamless Spray for the fast 3-minute repair! You take Pace LIVE SELLING to any big building in your community — hospitals, warehouses, factories — every place that has an old roof. See how fast your convincing proof makes the sale and your big commission! And PACE's Maintenance Policy providing continuous product service is your final clincher! PLUS the big savings they can't pass up. See for yourself how fast you can be in Pace big-sale earnings! Mail the coupon for quick, free information.

I'LL SHOW YOU HOW TO MAKE \$1,000 A WEEK PART TIME! FREE FACTS BY MAIL NO SALESMAN WILL CALL MAIL COUPON NOW



Dick Rogers
Pres. Pace
Products Inc.

Dick Rogers, President
PACE PRODUCTS, INC. Dept. PM-182
81st & Indiana, Kansas City, Mo. 64132



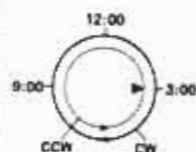
PLEASE RUSH BY MAIL all the facts about making big money with Pace. I am under no obligation. No salesman will call.

Name _____
Address _____
City/State/Zip _____

TRIGGERED SOUNDS							
Mode	Attack	Sustain	Decay	Noise	Pitch	Speed	Effect
1	CCW	CCW	12:00	2:00	X	X	gunshot
1	CCW	9:00	3:00	CW	X	X	explosion
2	9:00	11:00	3:00	X	4:00	X	foghorn
2	9:00	2:00	11:00	X	8:00	X	whistle
3	8:00	12:00	3:00	X	1:00	1:00	phaser gun
3	8:00	8:00	9:00	X	8:00	3:00	bird chirp

X: control has no effect on a particular sound. CW: clockwise. CCW: counterclockwise. Times indicate pointer position relative to the face of a standard 12-hour clock.

CONTINUOUS SOUNDS				
Mode	Noise	Speed	Pitch	Effect
4	3:00	X	X	surf (see text)
5	1:00	2:00	X	locomotive
5	CCW	CCW	X	prop plane
6	X	4:00	1:00	siren
6	X	2:00	12-3:00	flying saucer
6	X	2:00	CW	motorboat



Tables above detail how to get some amusing sound effects from the Loudmouth. Simply set your controls to correspond with the sound you want—and *voilà*, everything from the starship Enterprise's phasers to the sweet song of an electronic canary.

BUILD PM'S LOUDMOUTH

(Continued from page 70)

input of an audio amplifier. For the most realism, especially with loud sounds like explosions and gunshots, an amplifier rated at a minimum of 10 to 20 watts is recommended. Battery B1 supplies nine volts; use either six AA cells in series or a 9-v. transistor-radio battery of the alkaline type. (A standard 9-v. battery will work, but won't last.)

Putting sounds together

Construction of the sound-effects generator is straightforward and should pose no problems, even for a beginner. The first thing to do is choose a construction method; either perfboard or a printed circuit will do nicely. For those going the PC route, a complete pattern is supplied in this article. An etched and drilled PC board is also available by mail (see parts list). Regardless of the method chosen, be certain to use only rosin-core solder and a low-heat (25 watts or less) soldering iron for the project. Acid-core solders are too corrosive, and a soldering gun is almost certain to damage delicate components.

The use of a 28-pin socket for IC1 is strongly recommended. Be absolutely certain to orient all polarized devices correctly. This applies specifically to IC1, electrolytic capacitor C1, the 11 diodes, the battery and all the potentiometers. Note, in the pictorial diagram accompanying the schematic, that the terminals of volume control R2 are wired differently from those of the other six pots. From the parts list, you can see that

some potentiometers have an audio taper, while others have a linear taper; do not confuse the two.

Almost any kind of cabinet can be used. A commercially available aluminum case was used for the prototype, but a plastic or wood box would serve equally well. Any convenient layout of the controls can be used.

The table contains a dozen suggested sound effects, and you should try these before going on to create sounds of your own. Listed in the table are approximate settings for each potentiometer, relative to the face of a standard 12-hour clock and relative to the extreme clockwise (cw) and counterclockwise (ccw) positions of each pot. As the pictorial inset shows, the 12 o'clock position is upward if the cw and ccw extremes are downward. (Note: The standard potentiometer rotates through an angle of about 270°.)

A few sound effects require further comment. Set your amp for maximum volume when simulating a gunshot or explosion. To create the surf sound, you must also manipulate the volume control; alternate peaking and diminishing of the volume will mimic the crash and ebb of the surf on a beach. When simulating the prop plane or motorboat, you might want to cut your amp's high-end response with its treble control. This is not absolutely necessary, however. For the flying saucer, slowly rotate the pitch control back and forth between its 12 and 3 o'clock positions. Finally, the sustained setting should, in most cases, be equal to or more clockwise than the attack setting for the best possible results.

SYNTHETIC FUEL MADE FROM GRASS CLIPPINGS, WEEDS, CORN, ETC.



Gas FOR LESS THAN 12¢ A Gallon! Make Your Own

Government officials predict gasoline will be priced at \$2.50/gallon. This means that a tankful of 20 gallons will cost you \$50!!

Beat High Fuel Costs!

This brand new technical achievement will let you make your own fuel for your car, truck and boat at a cost of under 12¢ a gallon. Hundreds of television and radio stations as well as over 1,000 newspapers worldwide carried this amazing news. You can, by combining grass clippings or weeds or corn — in fact any organic material — and water and distilling the mixture, obtain hundreds of gallons of high energy fuel. This is not to be confused with gasohol which is a mixture of 90% gasoline and 10% alcohol — our unique method of distillation allows you to use the fuel directly in the tank of your car or truck. This new manual shows you how to build a legal solar powered still for about \$30 worth of locally available materials from your lumberyard. Your fuel will cost you from 11¢ to 12¢ a gallon — compare that to the prices you are now paying for gasoline or diesel fuel. You don't have to be the victim of greedy oil companies or bad-tempered gas station attendants — you don't have to wait in line for hours to pay ridiculously high prices for fuel — you don't have to worry about taking weekend drives

Easy to Build!

With our fully detailed plans and instructions you can build a solar powered still in about 7-8 hours — all you need is a hammer, nails, screwdriver and pliers. Even if you're not handy, you can build this solar still by following our step-by-step directions — no technical language is used. We even show you how to get government approval for your still. Best of all is that the still is completely solar powered — using the free rays of the sun. With this fuel you can run any car, truck, boat, lawnmower, or motorcycle engine — our fuel can be used in place of leaded or unleaded gasoline — or in place of diesel fuel.

Beat Gas Rationing and Shortages!

For the small investment of about \$40 for materials and a few hours of work, you can beat the fuel crisis and have your own ENERGY INDEPENDENCE from now on. The time will come when gasoline will be rationed and your allocation might only be 8-10 gallons a week (or less). Or there

might come a time in the near future that gasoline and diesel fuel will be unavailable at any price — because of strikes, OPEC shutdowns, etc. Even if you don't build the solar powered still now — it's good insurance to have the plans available for future use. You can easily put the entire still and fuel holding tanks in an area of six feet by eight feet. Build the solar powered still for your own use — or resell them to others for \$400 and \$500 each. Order this valuable and exclusive manual MAKE FUEL INEXPENSIVELY today by mail — it's not available in bookstores.

Simple Carburetor Adjustment!

We have a SIMPLE ADJUSTMENT guide that shows you how to make several adjustments on your carburetor so that your car or truck can use this new fuel efficiently. No technical or mechanical knowledge is required — just follow our easy instructions. You can readjust the carburetor anytime to convert your engine back to using gasoline if you desire.

Other Energy Saving Books!

We have two other very helpful and timely books — the first, BUILD A SOLAR POWERED HEATER shows you how to harness the sun's free energy to build a complete home heating system. Remember how high your fuel bills were last winter — with this heater in place, you can heat your water and home for practically nothing. Our step-by-step instructions show you how to build your solar heater for about \$80 to \$90 in locally available materials — it will take only about 10 to 12 hours to build and no special tools are needed. Our plans will let anyone who can hammer a nail, build this solar heater easily.

By spending under \$100 for parts, and investing 10-12 hours of your time you can get a solar heating system that would be commercially available at a cost of \$2,500 to \$3,000!

Send for your copy now!

Our second book is 3,000 WAYS TO SAVE ON FUEL COSTS. In it, you'll learn how to save from \$30 to \$75 a month on your utility bills. You'll find over 3,000 different practical hints to make your home super energy effi-

cient. Our giant 8½ x 11 inch book has over 170 fact-filled pages. Just the savings from one idea will more than pay for the entire cost of the book. Order it today.

We've got a brand new book on HOW TO BUILD YOUR OWN ENERGY EFFICIENT HOME FOR \$9,000. You'll get all the step by step instructions in clear non technical language. With about 2-3 months of work and under \$9,000 for materials you can build a home easily worth \$50,000-\$60,000.

FREE HOME TRIAL COUPON

ENERGY DEVELOPMENT • DEPT. VPM

Box 488 • Jarrrell, Tx 78637 USA

I'm fed up with the energy crisis, high prices, OPEC, etc. — and I want to do something about it now — send me:

- MAKE FUEL INEXPENSIVELY manual and plans\$19.95
- SIMPLE ADJUSTMENT guide\$ 5.00
- BUILD A SOLAR POWERED HEATER book.....\$19.95
- 3,000 WAYS TO SAVE ON FUEL COSTS book.....\$19.95
- BUILD YOUR OWN HOME FOR \$9,000 manual.....\$19.95

SAVE All 5 books (Save \$25.00!)\$59.95

Please send a check or money order. No COD's. We pay postage to all 50 states. Add \$2 per book for shipment to foreign countries. Add applicable tax.

My name is _____

Address _____

City _____

State _____ Zip _____

I'm in a hurry — send everything by priority RUSH mail. I've enclosed an extra \$2.00 to cover costs.

15 DAY MONEY-BACK GUARANTEE

© Energy Institute

A super-slick oil additive that works!

There are lots of slick oils on the market, but we've found one that does what it promises.

Tufoil is an oil additive that contains polytetrafluorethylene, or PTFE. PTFE is not new. DuPont has been selling a form of it for years under the trade name of Teflon. Its basic property is slipperiness, whether it's coating a frying pan or a piston. But this very slipperiness is also part of PTFE's undoing in certain formulations. It's very difficult to keep it in dispersion or make it adhere to any surface.

There are a number of oil additives on the market that contain PTFE in one form or another, and most of them don't work. Typically, the molecules of PTFE tend to agglomerate, forming clumps which drop out of dispersion and end up in your oil filter. Eventually, the filter and oil galleries clog and you have a major problem.

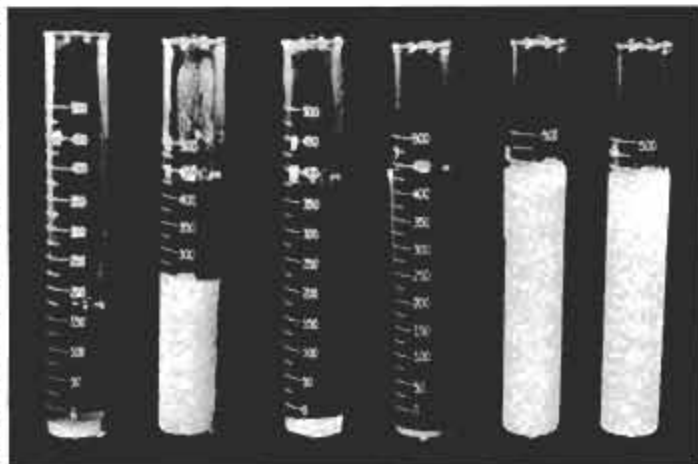
According to the Tufoil people, their product doesn't do this. In 1973, a lubrication engineer, Franklin Reick, developed a way of making PTFE stay in colloidal dispersion indefinitely in motor oil. Normal PTFE oil additives start with particles around 1.0 micron in size. Reick's particles are less than 0.3 micron in size.

The difference is that Reick gives his PTFE particles a uniformly negative charge, so they constantly repel each other.

What does all this mean to you? Well, Tufoil is claimed to reduce emissions, improve performance, make starting easier and increase the life of your engine—while picking up a couple of miles per gallon,

besides. We decided to put the recommended Tufoil treatment in our long-term Renault LeCar test vehicle.

The Renault is hardly a slouch when it comes to fuel economy, even without Tufoil. It was already deliv-



Tufoil keeps slippery chemical, PTFE, properly dispersed, as in the two test tubes at right. In other products it settles out.

ering 33.9 mpg, in mostly highway driving.

With this baseline firmly established, we changed the oil and filter, then added the 8-ounce bottle of Tufoil. Nothing happened for 200 miles, then the fuel average suddenly went to 35.5 mpg and stayed there. According to the Tufoil people, the Renault's idle speed *should* have increased because of the reduced boundary layer friction in the engine. In this car, nothing—except an increase of 1.6 mpg.

We changed the oil and filter again, and dumped in a second bottle of Tufoil to see if we could speed up the process. Again, nothing happened for a few hundred miles, then the mileage jumped to an average of 37.4 mpg—an additional 1.9 mpg. There was no increase in idle speed, no measurable change in performance or emissions, just a total increase of 3.5 mpg over the baseline.

That's an increase of 10.3 percent—absolutely spectacular for a car that's already one of the most

Beware of snake oils

There are literally dozens of so-called slippery oils and oil additives on the market—most made by companies that have sprouted on the scene in the wake of the fuel panic. Some of these firms have done nothing more than mix up a batch of DuPont Teflon micropowders with low-grade motor oil, slapped a fancy label on it and called it a high-mileage oil additive, without bothering to find out what raw Teflon will do to your engine. In that formulation, the Teflon will clog up your engine's oil filter and passages. These clogging problems became so widespread that DuPont began getting complaints from dissatisfied users with cooked engines who thought DuPont made the product. DuPont, essentially, was a victim of these ripoff artists, who were using a legitimate, widely accepted product (Teflon) and the name of a most reputable firm (DuPont) to sell a worthless and sometimes harmful snake oil.

The problem became so acute that as of Feb. 1, 1980, DuPont issued a public statement that no one could market an oil additive bearing DuPont's corporate name or its trademarked Teflon name. DuPont even refused to sell any of its Teflon micropowder to anyone who would be using it for that purpose.

Still, we've run into companies who have sworn they were exempt from the ban. At a New York trade show last year we found four companies, each saying they were the only ones granted an exemption from DuPont. DuPont vehemently denies this and will start legal proceedings against anyone who continues using its name on worthless products.

Be careful. If you see a high-mileage oil additive with Teflon written all over it, stay away. It's got something in it which might ruin your engine.—T.A.

economical around. Auto Editor Tony Assenza owns an earlier Renault LeCar with less restrictive emissions equipment that started with a baseline of 38.0 mpg. After a single dose of Tufoil, his mileage increased to 41.9. After 12,000 miles, the effects of the Tufoil seem to have worn off slightly, and his car has settled into a consistent 40-mpg groove, 2.0 mpg better than before. That's a

(Please turn to page 76)

Produced by the PM Auto Dept.
Text: Rich Taylor

STOP WASTING FOOD, Time, Energy, Money SAVE! MAKE BREAD

Total Juices[®], hot soups, all grain cereals, flour, instant dinners, salads, hamburgers, cakes, peanut butter, baby foods, bland diets, purees, party drinks, chopped ice, freeze "ice cream."

"3600" VITA MIX[®] makes them all INSTANTLY ...
SIMPLE AS ONE, TWO, THREE ...

TOTAL JUICER[®]

The one that throws NOTHING away!

Now is the time to start saving money and the nutrition in your food

Use patented "impact" method—not old separation "throw-away" method.

U.S. Dept. Agriculture handbook says:

	extracted juice only*	peel and everything**
LEMONS (VIT. C)	90 mg.	346 mg.
ORANGES (VIT. C)**	109 mg.	319 mg.

**Fresh, ripe Cal. Valencia *per pound of fruit

Now you can get up to the nutrients shown above the Vita Mix way.

("Peel and everything" is the VITA MIX[®] way)

SUPER 3600 STAINLESS STEEL VITA MIX[®] BREADMAKER

The easy way to make home made bread — not only fresh-baked but of fresh-ground grain with precious, fragile vitamin oils retained for that yummy "3-minute fresh" flavor.

Only VITA-MIX[®] can grind grain, mix and knead the bread all in one easy 3-minute operation.*

No need for old fashioned, oversized bowls, kettles, dough hooks or stone grinders that clutter your kitchen and take so much time.

* 3 minutes for us
5 minutes for you if you are new at it

CHECK THESE FEATURES

- Full 5-Year Free Parts Replacement
- U.S. Made, Nationwide Service
- Self-Cleaning
- Super-Powered Motor
- Save Food, Time, Money—Now!
- (UL) Listed
- Heavy Duty
- 265 MPH Blade Tip Speed—Instant head-on impact in safe, heavy, stainless steel concussion chamber
- No Other Appliance Has Vita Mix[®] Features



1. MERELY PUT FOOD IN PATENTED "SPASH GUARD ACTION DOME"[®]

Allows steam to escape safely when using hot liquids! Your 3600 Juices, Freezes, and Cooks without Burning, Scorching or Lumping foods.

2. FLIP THE FULL IMPACT LEVER

to activate patented reversing motor. Hammer blades smash into foods — as they revolve and reverse — with tremendous HEAD-ON IMPACT. Instead of merely pushing them around the container.

3. OPEN THE PATENTED PRESSURIZED SPIGOT

serve Total Juice[®] "ice cream", hot soup—over 800 recipes—by dish, glass or by gallons. No lifting, pouring or lid handling. The first time—right at the table. Large or small quantities.

Free Recipe Book

**TOTAL JUICES!
COOKS!
FREEZES!**

WRITE TODAY! — Phone (216) 235-4840 or outside Ohio call TOLL FREE 800-321-2700
Alaska and Hawaii call TOLL FREE 800-321-8640

We will RUSH TO YOU A GIANT FOLDER giving you the complete, never-before, exclusive details ... plus WHERE TO BUY information ... and SPECIAL PRICE.

SPEED IS IMPORTANT — Supplies are limited. We will do everything possible to prevent slowdowns due to lack of materials. WE WILL FILL ORDERS AS THEY ARE RECEIVED - on a strict and fair first-come basis.

SEND THIS COUPON TODAY to:

VITA MIX[®] Corporation: "3600" Division, Dept. PMC0182
9615 Usher Road, Cleveland, Ohio 44138

YOUR NAME _____

TEL. _____

ADDRESS _____

CITY _____

STATE _____

ZIP CODE _____

HEAVY DUTY SPLITTERS

More power per dollar

4 gallon hydraulic oil tank.

Hydraulic oil filter.

High speed demountable wheels.

Replaceable slide and wear plates.

Splits 25" logs.

Detent valve automatic return.

2 stage roller bearing pump.

Heavy duty rectangular tube frame.

Low profile 15-ton unit.

Now you can have all the power you need to shatter those stubborn hardwoods, knots and gnarls at a price that's a lot lower than the competition. Our splitters are made of the finest heavy duty components and are built tough to last. Compare our features. Then compare price. You'll see some powerful reasons to buy Northern Hydraulics.

12 TON

Low profile, 24" stroke, 2 stage pump, low speed wheels, 5 H.P. 8" wedge, 6" I" beam frame

\$738

(high speed wheels & detent valve optional)

15 TON

High or Low profile, 24" stroke, 2 stage pump, high speed wheels, 5 H.P. 8" wedge, 6" tube frame

\$825

(detent valve optional)

24 TON

High profile, 30" stroke, 2 stage pump, high speed wheels, 12 H.P. 12" wedge, 7" tube frame, detent valve (auto return)

\$1550

NORTHERN HYDRAULICS

P.O. Box 1221, Department PMS-12 • Burnsville, MN 55337
(612) 894-8310

Send for a Splitter Brochure; or if building your own... send \$1.00 for low price parts catalog

OIL ADDITIVE THAT WORKS

(Continued from page 74)

5.2-percent improvement over the baseline.

All of this is consistent with what the Tufoil people say should happen. The average fuel-economy gain seems to be between 6 and 10 percent, depending on the condition of your engine going in, the way you drive, and so forth. The only thing that confused them was why our test Renault didn't exhibit the increased idle-speed phenomenon which they experience with three out of four cars they test.

We're not going to worry about it. In our real-world experience with two different LeCars, Tufoil works. It didn't clog the oil filter, didn't leak out all the gaskets, didn't thin out at high speeds. It stayed in dispersion and cut the fuel bill 10 percent.

The bottom line: savings

Is it worth it? Yes—provided that you use it the way Tufoil recommends. They say one 8-ounce treatment (one bottle) will last 10,000 miles without an oil change. Essentially, the Tufoil will extend your oil-change interval to 10,000 miles, if you have a new car with a 7,500-mile oil-change interval. Following their oil-change interval, our test Renault would save 27.6 gallons of fuel in 10,000 miles or \$38.64, since we bought gas at \$1.40 per gallon. That's considerably more than a bottle of Tufoil you buy for about \$10. Thus, our payback period is a reasonable 3,300 miles.

For older cars with a 3,000-mile recommended oil-change interval, Tufoil will extend that interval to 6,000 miles, the company states. The payback period will vary, depending on percentage of mileage increase. Tufoil's research found the mileage increase to be over 10 percent on these older cars, so the payback period was still reasonable.

Assenza has been chugging along with Tufoil since the 14,000-mile mark and, with 28,000 now showing on the clock, has experienced excellent results. We can't guarantee that Tufoil will work the same magic on your car. However, the distributor, Flotech, 801 Water St., Suite 203, Framingham, Mass. 01701, offers a money-back guarantee if you're not satisfied. Don't forget, though: Additives not specified by the manufacturer could void your warranty.

If you do decide to use this product, we'd like to hear your results. Just send a postcard to The High-Mileage Files, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019.

PM

now the whole family can REPAIR OR MAKE CLOCKS

FOR FUN & EXTRA INCOME

With SUPER ACCURATE New Mini Quartz Movement Made In The U.S.A.! Two Year Guarantee. FREE HANDS! Other Quartz Movements, Dials, Numerals and Accessories also available at Super Low Prices!

Call Us Today!
414-248-1150

Or Send Your
Order To:



NEW
48 Page
Catalog!

KLOCKIT

P.O. BOX 629, DEPT PM182

LAKE GENEVA, WISCONSIN 53147

Send for a Free 48 Page Catalog (You may include 75¢ for 1st class catalog mailing)

FREE CATALOG



Q-71 MINI-QUARTZ

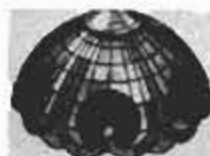
Super LOW Prices

1-4: \$6.50 ea. 10-24: \$5.40 ea.

5-9: \$6.00 ea. 25-49: \$4.95 ea.

Include \$2.50 for shipping
& Handling - Sent U.P.S.

S-200 Sweep - \$.20 each
Red, Black, or Brass



STAINED GLASS

Send 50¢ for fascinating
catalog of kits, tools, ideas,
books and supplies.

BIG STARTER KIT
Only \$17.95 ppd.

WHITTEMORE,

BOX 206SEM, HANOVER, MASS. 02339

PARTS CATALOG

Super Edition for
Late Model to Classics
Only \$1 for a full year

Rick's Automotive Parts
2754 Roe Lane - Dept. 2301
Kansas City, Mo. 66103



PM WORKBENCH

PM EXAMINES PRODUCTS AND SERVICES

A professional's saw

Homelite's chain saw model No. 410 is a heavy-duty professional saw designed for high-production wood cutting. According to the maker, its vertical-cylinder design maximizes the power-to-weight ratio and its new front-mounted muffler reduces operating noise. Weighing 15.5

pounds, the saw has 24-oz. fuel and 12-oz. oil capacities. Its 4.1-cu.-in. engine displacement achieves a chain speed of 3,775 feet per minute at 9,000 rpm. Made by Homelite Div. of Textron Inc., Box 7047, Charlotte, N.C. 28217, it costs \$479.95 at distributors nationwide.—M.S.



Homelite saw features the Safe-T-Tip anti-kickback device shown at the end of the blade. This device helps prevent the most common hazard involved in chain-saw use.

Energy-saving fluorescents



The Circlite 100 is as bright as a 100-w. bulb, but it uses only 44 watts of power.

Screw-in fluorescent lights are now available in two-way 100/50-watt and 60-watt brightnesses, besides the original 100-watt level. The Circlite fixture is a circular, fluorescent

tube with a cone-shaped adapter that screws into an incandescent bulb socket and saves lighting energy. The Circlite 60, for example, uses only 22 watts of electricity to deliver the same light level as a standard 60-watt bulb. Approximate costs of the lights: Circlite 100/50, \$20; Circlite 60, \$11; Circlite 100, \$16. They're made by General Electric Co., Nela Park, Cleveland, Ohio 44112.—P.S.

Powerful scissors

For a good, all-purpose pair of scissors, try the Power Cutter made by Acme United Corp., 100 Hicks St., Bridgeport, Conn. 06609. This tool



Lightweight stainless-steel blades and contoured acrylic handles make use easy.

will cut practically anything from aluminum, carpeting and linoleum to leather, canvas and burlap. The serrated, stainless-steel blades are offset so the plastic handles remain above what is being cut, thus protecting your hands. The snips are 7 inches from end to end, and the maker claims they will never need sharpening. They're at home centers and hardware stores for \$5.50.—S.W.

Mini-lathe chuck

Dremel's model No. 1005 Chucker is a new chuck for use in its mini-lathe; it allows safe and accurate turning of small-sized stock. The Chucker is ideal for making miniature furni-



To change chuck size, simply remove or install inserts until proper size is exposed.

ture, model ship and airplane parts and dollhouse furnishings. The six rectangular inserts accommodate the following stock sizes: $\frac{1}{16}$, $\frac{3}{32}$, $\frac{1}{8}$, $\frac{5}{32}$, $\frac{3}{16}$ and $\frac{1}{4}$ in. Round stock can also be used by first filing a square shape on the chuck end.

Manufactured by the Dremel Div. of Emerson Electric Co., 4915 21st St., Racine, Wis. 53406, it sells for \$9.95 at craft and hardware stores.—S.W.

Update

The original supplier for the Crazy Saw Blade reviewed in *PM Workbench* (page 47, July '81), is no longer filling orders for the tool. It's now available from The Saw Shop, 5518 North Market, Spokane, Wash. 99207.—S.W.

If you've come across a new product with some special features, let us know about it. Write to PM Workbench, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019.

©1997 B&W T Co.

Warning: The Surgeon General Has Determined
That Cigarette Smoking Is Dangerous to Your Health.

15 mg. "tar", 1.2 mg. nicotine av. per cigarette, FTC Report May '81



**There's only
one way to
play it...**

Wherever the music
is hot, the taste is Kool.
Because there's only one
sensation this refreshing.



12 hot, new sports planes you can build

Here are the latest build-your-own fun planes—
from nostalgic, vintage warbirds to exotic
shapes of the future—plus a few surprises.

by Sheldon M. Gallager



In battle camouflage, an Italian Reggiane 2000 (center, above) gets an escort of two American P-51 Mustangs—all authentically scaled-down replicas of famous World War II fighters that you can build from plans.

As some 1,500 homebuilt flying machines descended on Oshkosh, Wis., in the latest annual Experimental Aircraft Assn. Fly-In, you had the feeling that it somehow couldn't all be real: The mighty roar of vintage warbirds streaking over the field in brilliant battle paint...sporty little speedsters in strange, exotic shapes...incredibly tiny single-seaters looking more like toys than airplanes you get in—a mind-blowing mecca of the world's newest and most spectacular recreational aircraft.

In this, its 30th year of EAA support, the homebuilt movement is booming. Never before have there been so many different and exciting sports-plane designs to choose from. One of the latest surprises is the development of a new class of "superlights" that offer the speed, comfort and performance of conventional licensed aircraft, with the economy and simplicity of unlicensed ultralights. Ultralights, meanwhile, have been pulling their own switch: In their steadily improving performance and growing sophistication, they're



Award-winning Glasair is sporty, fixed-gear, side-by-side two-seater for engines up to 160 hp and speeds up to 230 mph. Rate of climb is a brisk 1,600 f.p.m. Kit, less engine, is \$8,200.



Looking like old-time barnstormers of the 30s, these nimble, single-seat Skyotes are actually high-performance biplanes designed for aerobatics. Stressed for +9 Gs and -6 Gs, they feature dual ailerons, can be built from plans and partial kits.



On dawn patrol, two British S.E.5a fighters hunt the Red Baron. The nostalgic WWI biwingers are 85-percent-scale, wood-and-fabric replicas with speeds up to 120 mph—just about what the originals managed.



Sleek new Q2, two-place version of famed canard-wing Quickie, gets 180 mph and 60-mpg economy from small, 64-hp mill. The futuristic, all-composite craft has wheels and elevators in nose wing. Kit is \$10,495.



Legendary P-40, complete with shark mouth on nose, represents a new concept in kit building. You build basic airframe from plans, then apply molded fiberglass skins from Thunder Wings. This assures authentic appearance, often hardest part of job.

actually, becoming more like licensed airplanes.

This curious turn of events has prompted some homebuilt watchers to speculate that the two breeds may eventually meet—and maybe even pass each other. The thought may not be entirely whimsical. Three of the 12 new sports planes shown here—the Cricket, Hornet and Moni—have

specs that read more like those of an ultralight than a real airplane. The French-designed Cricket is a twin-prop, aerobatic single-seater that manages 127 mph on a pair of tiny, 12-hp chain-saw engines. With radio and seat-pack parachute, it weighs just under 160 pounds—less than many ultralights.



A 22-hp engine powers this long-winged, V-tailed Moni, an unusual cross between an airplane and motor glider. An electric starter permits power-off soaring with in-flight restarts. Top speed is 120 mph; weight, 260 pounds; wingspan, 27½ feet. Note single, sailplane-style wheel for low drag, easy rough-field landings. Kit is \$5,000.



Originally a factory-built aircraft, this Italian-designed Falco is now a homebuilt. A racy, retract-gear, side-by-side two-seater, it tops 200 mph on 160 hp, is fully aerobatic. Kit is \$20,300, less engine, but cost can be cut using homemade parts.



Airplane or ultralight? Weighing only 230 pounds, this Australian-designed Hornet does 127 mph on tiny, 30-hp engine, stalls at 35 mph, has a 16:1 glide ratio. A tailless flying wing, it's controlled by "elevons" in wing and wingtip rudders. Its light wing loading of just 3 pounds per square foot puts it in a class with ultralights, but, regrettably, it does require a pilot's license. Kit price, including engine, is \$9,500.

FIM photos: Howard Levy

With the FAA currently considering a 155-pound weight limit for unlicensed ultralights, this raises an interesting question: If the Cricket should shed five pounds, which it easily could, would it be considered an ultralight? Probably not, but the notion is intriguing anyway. No one seriously believes that the FAA would allow un-

trained, unlicensed pilots to zip around in 100-mph-plus airplanes. Still, deciding how to deal with such borderline mavericks as the Cricket could prove to be an Excedrin-size bureaucratic headache. (Most experts think the FAA will ultimately have to impose additional restraints,

(Please turn to page 122)

Our pick of best buys: PM COMPARES 6 TOP COMPUTERS

Here are the six best buys in home computers; one is the perfect machine for you.

by Neil Shapiro ELECTRONICS EDITOR

Now that you've discovered what computers can do for you—from word processing to database management, from better-than-arcade games to educational programs—you may also find that choosing which machine to buy can seem hopeless. If you're thinking of joining the computer revolution, consider these six best buys that we chose out of the dozens in the computer world.

Even these best buys will be right.



Radio Shack TRS-80

Radio Shack's TRS-80 Model 3 (above) is new flagbearer of the company's popular computer line. A black-and-white display is built into the same case as computer and drive. IBM Personal Computer (left) marks that giant's entry into field. It features color, full-size screen, detachable keyboard on 6-ft. cord.

IBM Personal Computer



Apple II

The Apple II (above) features color and sound. It is also the easiest of the computers to expand upon and considered a leader in the industry. The Atari 800 (right) has fantastic graphic capability in color. More software has become available for it just this year. (Both are shown with Amdek Color-1 monitor.)

Atari 800



PM COMPARES THE SIX BEST BUYS IN HOME COMPUTERS*

	APPLE II	ATARI 800	IBM	PET	RADIO SHACK	TEXAS INSTR. 99/4A
Cost: Computer/ Disc drive	\$1,295/595	\$1,280/600	\$1,565/790	\$1,295/595†	\$1,995†	\$925/800
Text (lines x char.)	24 x 40	24 x 40	25 x 40 25 x 80	25 x 40	16 x 64 16 x 32	24 x 32
Graphics (in pixels)	40 x 40 Color 280 x 192 Color	Nine modes up to 360 x 192 Color	320 x 200 Color 640 x 200 B&W	Special graphics char- acters (128) B&W	48 x 128 B&W	192 x 256 Color
Sound	One voice	Four voices	One voice	No sound	No sound	Three voices
Service	Excellent	Very good	Not yet proven	Very good	Excellent	Good
Component Availability	Excellent in all areas	Good, getting better	Many manufacturers are gearing up	Fair	Excellent software, good hardware	Not well supported by other manufacturers
Comment	Greatest selection of both hardware and software	Best graphic capa- bility, secondary support is taking off	If interest holds, should be contender by year's end	Graphics characters are very easy to program	Most popular of the personals	New keyboard should generate interest

*All with 48K programmable memory. †1 B&W monitors built into Radio Shack and PET units. Others display color on home TVs or an additional-cost color monitor.

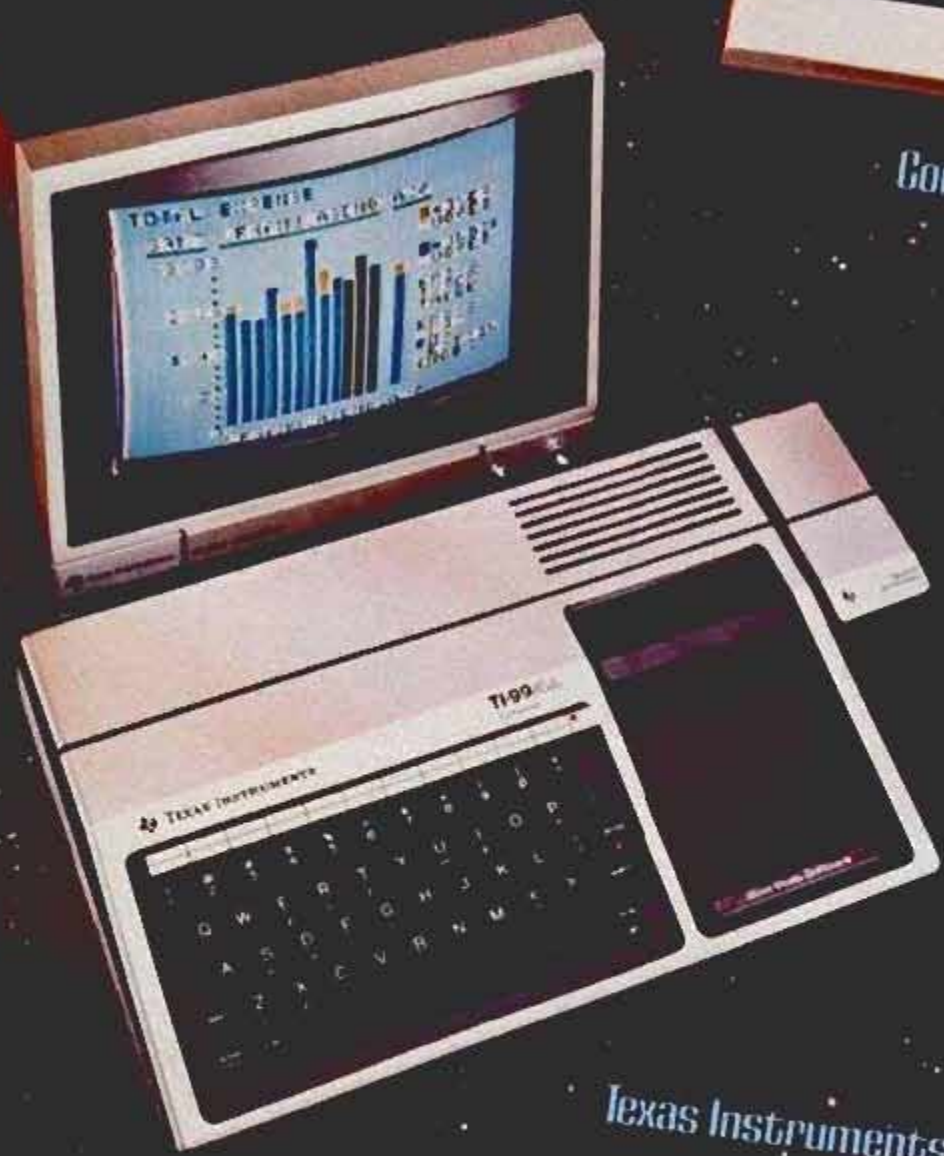
...for some buyers and wrong for others. But you need not throw yourself on the mercy of the first computer salesman you meet—here's how you kick a computer's tires:

Computers are priced a bit differently from other things you may have bought. For one thing, there is no "standard" setup recognized by all the companies. It's as if all four wheels were standard on one model of automobile and optional on another. The variations can make comparison shopping a chore.

All six computers we chose (Apple II, Atari 800, IBM Personal Computer, Commodore PET, Radio Shack TRS-80 and Texas



Commodore PET



Commodore PET (above) was one of the first entries into the field. Now, with a good keyboard and an optional 80-column screen, it's a serious contender. Its many special graphics characters are remarkably easy to program. The Texas Instruments 99/4A (left) replaces earlier machine, the 99/4. Only change is to the keyboard—and that alteration has made this a truly great machine. The company has recently released the Logo language for the 99/4A—and it's the best educational program that we've seen for any of these home computers.

Texas Instruments 99/4A

WAYS TO 'TALK' TO YOUR COMPUTER

If you own a record player, you can take one of your discs to a friend's house and play it on his stereo, even if you have two different brands of gear. But if you have a computer program, it won't run on your buddy's computer system—unless he has the same brand computer. Even if the program is the same as one for that brand computer, but formatted for a different brand, it won't load.

All computers use different formats for storing and retrieving programs. Here are the three formats.

Cassettes: Many people start out with a tape recorder to save and load programs. This allows you to use a \$30 to \$50 tape recorder, instead of a disc drive that costs hundreds of dollars. Information is stored on tape as a series of two tones. Computers think in a binary language; all information coded as series of ones and zeroes. (Each one or zero is called a bit; the computer organizes these into words called bytes.) Each binary "pulse" is assigned an audio frequency. By recording the binary pulses as tones, programs are stored. By decoding the tones into pulses, the programs can be loaded into the computer. On tape this is slow, but it's better than typing in a 100-line program every time you want to use it.

But for data storage—forget tape. If you have an hour-long tape and the information you need is at the tape's end, it will take an hour to search for it.

Floppy discs: Made out of the same material as audio tape, floppy discs are housed in plastic jackets that

never come off. Instead, jacket and all are inserted into a disc drive, where a record/playback head reads the disc through a cutout in the jacket.

The discs spin at thousands of revolutions per minute. A disc with a radius of only 5¼ inches can store about 200,000 bits of information (each "bit" has room for a letter of English). A disc stores or retrieves programs and data in just a few seconds.

Cartridges: Many computers accept plug-in cartridges. We don't like them for many reasons. First, they're expensive, compared to tape or disc. But more important, their programs can't be studied or changed.

On the plus side, even a child can use a cartridge. They load instantly and are impervious to fingerprints and other abuse.

Protection worries

It used to be that programs were easy to copy and change. But manufacturers began to lose money as many people made copies of software and gave them to their friends.

Now, many manufacturers have figured out how to "copy-protected" discs. A copy-protected disc—like a cartridge—can't be copied or changed.

To our mind, this is a disaster: Most people learn programming by changing programs to fit their own needs. This capability of customization is what makes computers so attractive. New ways of copy protection will probably be found soon. Until then, a computer owner may have to put up with being "locked out" of his own machine.—N.S.

Software comes in various forms (below)—cassette, cartridge or disc. What fits one computer won't fit a computer from a different manufacturer.



Instruments' 99/4A) have various features in common. For one thing, they're all programmable in BASIC, which is the most popular of all personal-computer languages. It is similar to English and easy to learn.

But what happens when you find that the Apple II offers two forms of BASIC and so does Radio Shack?

Our chart does a lot of the fact-finding work for you. All the computers are specified with floating-point BASIC (which includes decimal numbers and integers), and approximately 48K (48,000 bits) of programmable memory (as much as all but the Apple—64K—and the IBM—256K—will accept). We've also priced these computers with one disc drive apiece (a disc drive lets you retrieve and store programs and data far better than a tape recorder). And our pricing includes all the additional hardware each computer requires to use that drive.

The one thing not included in our pricing structure is the cost of the color monitor or TV set that you must buy for the color-capable computers. A TV set is fine to start with, but you'll likely want a color monitor soon. We tested the new Color-1 from Amdek with the Atari and Apple. For about \$500, we consider it a best buy. (See the manufacturers list at article's end.)

Text displays

The new IBM computer offers two modes of text display—25 lines of 40 characters, which can be switched to 80 across. Because of the full-width screen, we consider the IBM best fitted for many business uses as it "comes from the factory."

Though the factory-equipped Apple has just 40 columns across, an additional plug-in board (Videx Videoterm) can bring it to 80-column capability, too. "Columns" and "characters" are used interchangeably in computer talk.

The Radio Shack TRS-80 Model 3 has a 64 character line. In most cases, this is sufficient for columnar matter. The PET is available as the CBM, which features an 80-column line length. But the CBM doesn't have the PET's graphics capabilities. The other computers on our best-buy list have line lengths that may prove too cramped for some home or business uses.

You can't use the same monitor

(Please turn to page 156)

Now BB guns join the big leagues

Accuracy, popularity—and prices—are all going up for these new grown-up arms.

by J. I. Galan

A "Adult air guns," they are called, and they've come a long way from the \$8.95 plinkers for which so many kids saved their pennies. The wide variety currently available indicates a great and growing interest in these guns. Each year more new models are introduced. Today you can choose models that range from designs for strict international-style competition to back-yard plinking, from high-power hunting air rifles to firearm-trainers.

Some of the new air guns have been introduced during the last year; others are standards that have been improved. Both American and foreign-made models are available and most match, or in some cases surpass, the strict quality-control standards applied to firearms. They all have precision-rifled bores and are powerful enough to cause serious injury or even death if misused or handled carelessly.

One of three different powerplant systems can be chosen as the mechanism to push a pellet down a barrel:

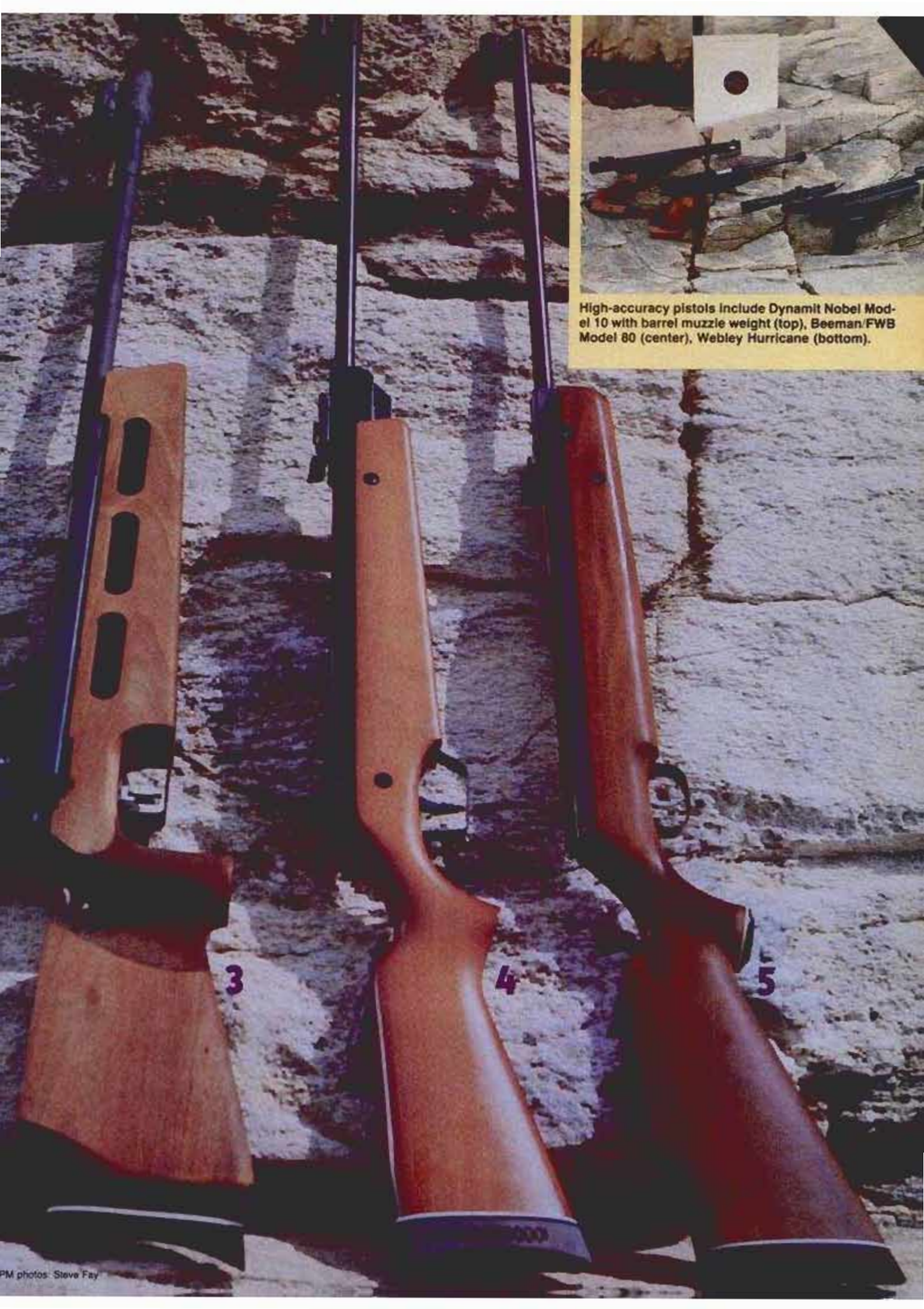
■ The spring-piston or sequence-compression type consists of a powerful spring behind a heavy piston. When the spring is cocked and the trigger is pulled, the spring pushes the piston forward, compressing the air in front of it in order to generate enough pressure to drive the projectile out. Most of the very sophisticated European air guns of today, as well as the simple Daisy BB guns produced in the United States, are of this type.

■ Pneumatic or staged-compression air guns generally require repeated pumping in order to store compressed air behind a valve prior to each shot. These guns usually have their pumping mechanisms attached below the barrel and shooting power can be varied according to the number of pump strokes used. Although a European design, these guns are almost exclusively the

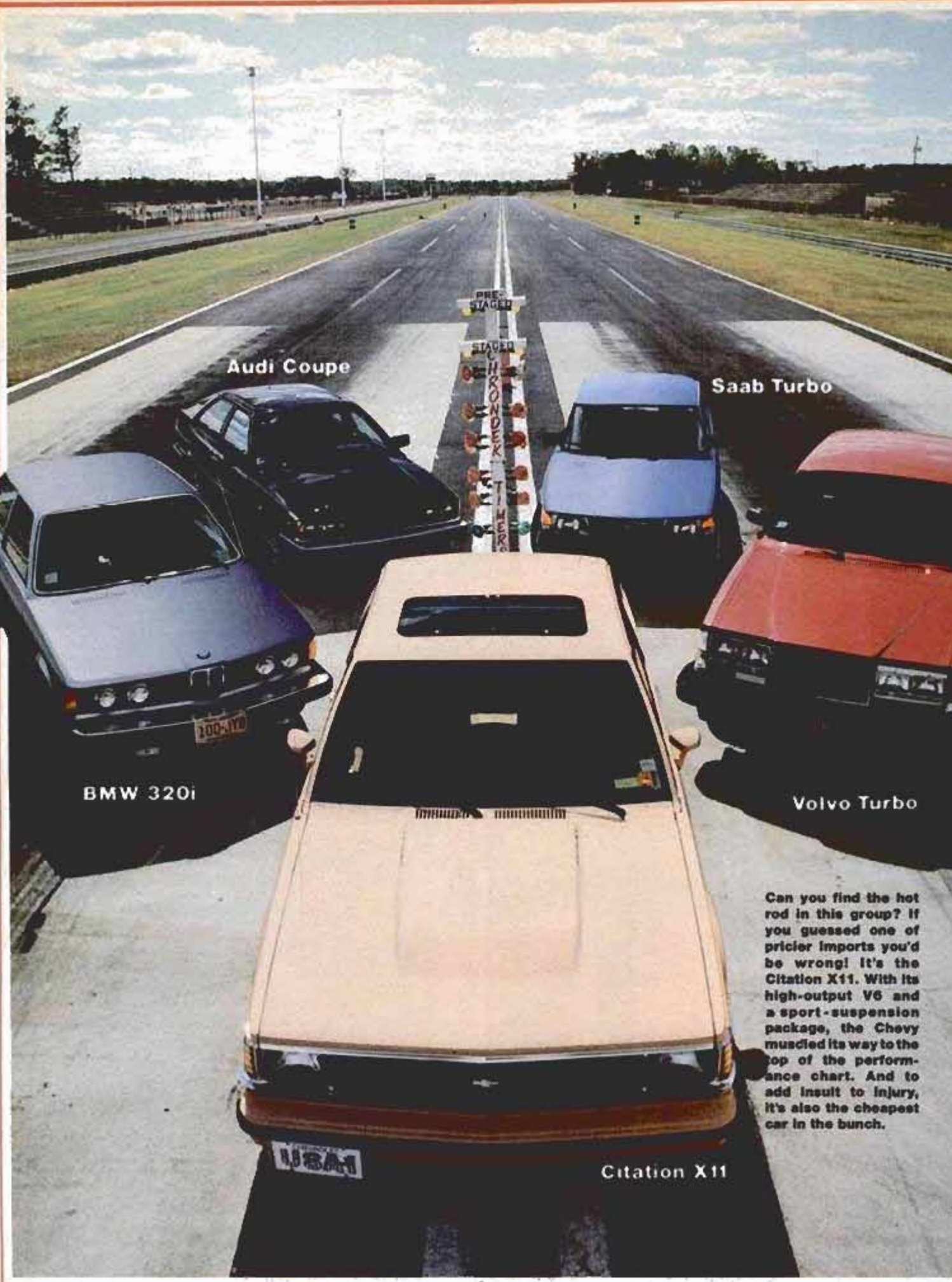
(Please turn to page 130)

- 1** A 2-to-7-power telescopic sight tops off Beeman's specially stocked R1 prototype magnum with an adjustable trigger.
- 2** Beeman/Feinwerkbau Custom Sporter 124 in., .22 cal. has a velocity of 820 feet per second, changeable sight inserts.
- 3** Model 75 target special from Dynamit Nobel features trigger adjustments, micrometer peepsight, adjustable stock length.
- 4** The eight-pound Dynamit Nobel Model 45 magnum provides a two-stage trigger, .177 or .22 calibers with up to 820 f.p.s.
- 5** Beeman's new magnum, .177-caliber R1, is most powerful spring-piston rifle, with its 940-f.p.s. velocity rating.





High-accuracy pistols include Dynamit Nobel Model 10 with barrel muzzle weight (top), Beeman/FWB Model 80 (center), Webley Hurricane (bottom).



Audi Coupe

Saab Turbo

BMW 320i

Volvo Turbo

Citation X11

Can you find the hot rod in this group? If you guessed one of pricier imports you'd be wrong! It's the Citation X11. With its high-output V6 and a sport-suspension package, the Chevy muscled its way to the top of the performance chart. And to add insult to injury, it's also the cheapest car in the bunch.

PM ROAD TEST

AN AMERICAN SPORT COUPE TAKES ON FOUR IMPORTS

On a performance-per-dollar basis, Chevy's Citation X11 left Audi, Volvo, Saab and BMW in its tire smoke.

It was BMW that invented the modern sport coupe when the automaker introduced the legendary 2002 in 1968. The idea was simple enough. The 2002 was a sport car—fun to drive, with a zippy, little, high-revving engine, close-ratio gearbox, excellent brakes and wish-quick handling—but it was fitted with a boxy two-door body that had ample room for four adults.

Over the years, the sport coupe market grew to include cars from nearly every European manufacturer. True sport coupes and sedans have traditionally come only from Europe—American cars were too big and until only a few years ago, Japanese cars were short on performance and handling.

Which brings us to this five-



Raw horsepower, balanced handling put Citation atop drag-strip and skidpad charts. It was the only test car with automatic transmission.

car comparison test. Of course, we had to have a BMW 320i, the direct descendant of that seminal 2002 and the "standard of comparison" in the sport coupe ranks. Next, we added the new turbo-charged version of the Volvo 242 GT, called the GLT, which looked, on paper, to be the hottest car in this class. Then there is Volvo's traditional rival, Saab, with its Turbo version of the 900, available as an aerodynamic three-door hatchback and widely ac-

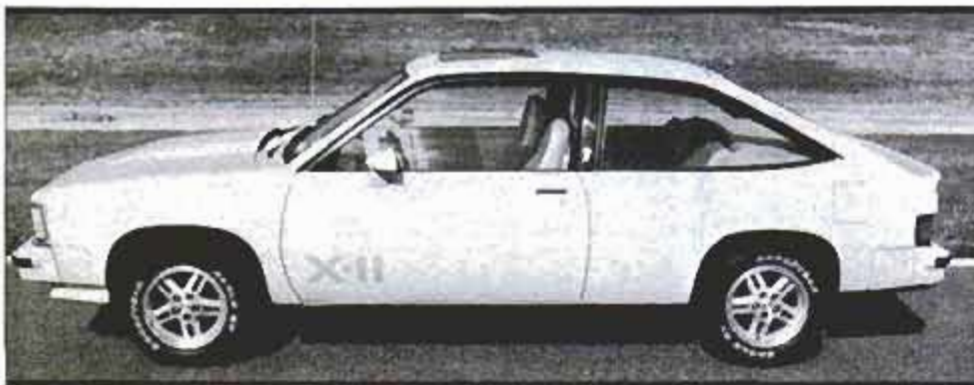
claimed as the race-winningest coupe you can buy.

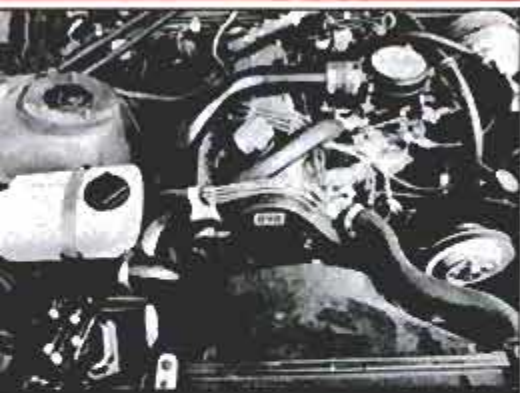
We also had two wild cards. Audi has taken the Audi 4000 chassis, stuffed in a five-cylinder engine and created a sleek two-door called the Audi Coupe, which looks like the very embodiment of what this class of cars is

all about. And finally, we have Chevrolet's X11, a high-performance package for the Citation which transforms it into a genuine sport coupe.

Just as important were the cars we left out: Cadillac would like to think its J-car Cimarron competes with the 320i, but while it's roughly the same size and price, it's nothing more than an optioned-up economy car woefully short of sports-sedan performance. The Japanese, too, build sedans of this size

PM ROAD TEST





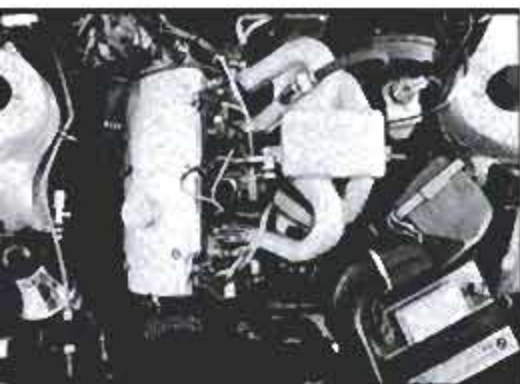
VOLVO TURBO

High quality, excellent workmanship, rock-like solidity and a zappy engine are the qualities that endeared the Volvo to our testers. "A real wolf in sheep's clothing."



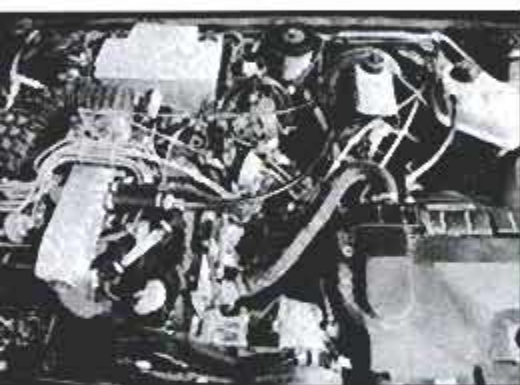
CITATION X11

Outstanding straight-line performance and flat cornering attitude is offset by so-so interior and a general lack of sophistication. Still, as a cheap, go-fast, roomy, '80s version of a muscle car, you can't beat the X11 for value.



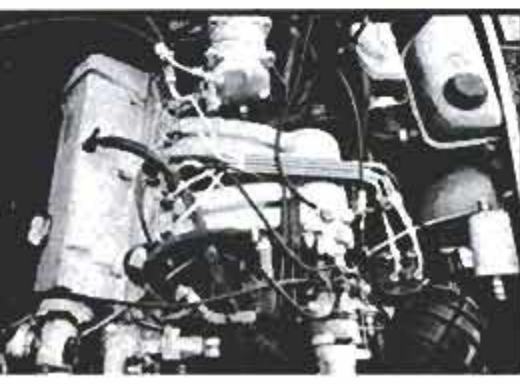
BMW 320i

Severe body lean and pronounced oversteer makes this pocket-rocket of yore a real handful to drive fast. The interior was faulted for being cramped and just a bit overdone.



AUDI COUPE

The willing, high-revving engine, well-spaced gear ratios and nimble handling are the three outstanding features of the Coupe. Though not as nicely done as the Volvo or Saab, the interior is comfortable and quite roomy.




SAAB TURBO


Still eccentric after all these years, the Saab is well put together. It got the lowest mileage of any car in this group (15.3 mpg), but has the best brakes of the lot.



Volvo Turbo



Saab Turbo



Citation X11

PM ROAD TEST

and price, but with their velour interiors and electronic gadgetry, the orientation is toward passive luxury rather than elan.

We also excluded big performance cars like the BMW 528 on the grounds of price, size and clumsiness. Our two-liter-class sports sedans share a happy nimbleness, which makes them fun to drive for the sheer enjoyment of driving fast. And that's an integral part of the sports car—and therefore, sports

coupe—mystique. This magical ability to wring enjoyment out of the mundane act of driving is shared by few four-passenger cars outside this select group.

Our testing comprised two phases. First, we went to the track, and compared the group in back-to-back runs through the quarter-mile, the slalom, the skidpad and the braking lanes. We measured everything from sound levels under acceleration to the number of grocery bags you can fit in the trunk.

Phase Two of the test had us conveying down a variety of roads, from back-country asphalt to four-lane freeway, including stop-and-start

traffic jams. Each driver drove each car, and wrote out his comments on a rating sheet.

Finally, after two full days of testing and hundreds of miles of driving, with 20 tires reduced to shreds, we sat down and tallied up the scores. Ranking our five contenders for the title of "BMW beater" was surprisingly easy. Each car had clear-cut strengths and weaknesses, but some were simply better than others. Here's how we ranked them.

Volvo GLT Turbo

The Volvo Turbo is far and away the most well-rounded car in this

(Please turn to page 144)



Though not outstanding in any one area, the Volvo did enough things well to win four of our five testers' top vote. The Saab had the best braking performance. The Citation was the best down the quarter mile. The BMW failed to make it to the top in any of the performance tests. The Audi Coupe was easily the most nimble, winning the slalom contest despite its being fitted with a bad choice of tires.



BMW 320i



Audi Coupe

PM'S PERFORMANCE-TEST RESULTS

	Volvo Turbo	Citation X11	BMW 320i	Audi Coupe	Saab Turbo
Price	\$15,147	\$10,398	\$16,055	\$13,815	\$15,950
Curb weight (lbs.)	2,950	2,600	2,500	2,300	2,800
Transmission	4-speed manual, overdrive	3-speed automatic	5-speed manual	5-speed manual	5-speed manual
Engine	SOHC 2.1-li. in-line 4, f.i., turbocharged	OHV 2.8-li. V6, carbureted	SOHC 1.8-li. in-line 4, fuel injection	SOHC 2.1-li. in-line 5, fuel injection	SOHC 2.0-li. in-line 4, f.i., turbocharged
Fuel economy (mpg)					
EPA city/PM test					
1/4-mile acceleration (sec. @ mph)	17.42 @ 78.06	17.31 @ 80.08	17.94 @ 75.07	18.29 @ 74.32	17.92 @ 78.60
700-foot slalom (mph)	57.44	57.30	53.39	58.79	54.18
Skidpad (cw/ccw)*	.629/.663 G	.689/.736 G	.618/.659 G	.631/.670 G	.630/.671 G
Braking (60 to 0 mph)	152.5 ft.	142.0 ft.	160.2 ft.	158.1 ft.	135.2 ft.
Interior noise (dB)					
Constant at 30 mph	67	61	63	70	74
Constant at 60 mph	71	69	71	71	70
Full throttle: 30 to 60	75	75	78	75	77
Shopping bags in trunk	10	11/20†	11	12	12/22†
Interior-space index	162.1	149.5	145.1	170.8	157.9

All cars but BMW have independent/rigid-axle suspension, front/rear. BMW has independent suspension front and rear. Volvo and Saab have disc brakes front and rear. Rest have disc/drum brakes front/rear. Skidpad was 200-foot-diameter circle, measured in G force. Interior noise was

measured in decibels (dB). Interior-space index is (front headroom x elbowroom x legroom) plus (rear headroom x elbowroom x legroom) divided by 1,000, with front seat at 40 in. of legroom. *cw: clockwise; ccw: counterclockwise. †Rear seat folded.

The Duofone ET-300 from Radio Shack features a "call" button on the base of the unit. Pushing it will beep the remote—much like a pager. The Freedom Phone 400 from Electra (base shown below, remote in the model's hand) is also a full-feature cordless phone.



Duofone ET-300

Freedom Phone 400



New

by Marc Stern

Cobra Cordless Telephone

The ITT Cordless Phone System, the Cobra Cordless Telephone and the Electra Freedom Phone 3500 are all examples of the trend toward smaller units in portable phones. The Freedom 3500 is the smallest cordless telephone currently available.

ITT Cordless Phone System



Freedom Phone 3500

phones go where you go

They're cordless and portable. Some even have memories and automatic dialing.

How many times have you thought, as you headed out to work in the yard: "Boy, I wish I could take the phone with me, so I won't have to run to answer it"? There's an answer: the portable telephone. It can keep you in touch within a 400-foot radius of your house.

A few years ago, a portable phone would have been impractical, because the components would have been too large. But the widespread introduction of solid-state and integrated circuitry and

microprocessors have made miniaturized portable phones possible.

A portable phone consists of two units, a base/repeater and a handset. A few years ago, if you had tried to cobble together a portable phone, the base station/repeater alone would have taken up half a table and the phone instrument would have required a suitcase to carry. But, thanks to modern circuitry, true portability is here.

Size is one unique aspect of a modern portable

(Please turn to page 142)

PM photos: Peter Tenzer

Duofone 12



The Radio Shack Duofone 12 lets you talk and listen to the other party from anywhere in the room. The ITT Multi-Feature telephone, although not a portable unit, has many advanced features. Its highlights include computerized memories and automatic-dialing capability.



ITT Multi-Feature Phone

Driving the Nissan Stanza

Nissan serves up a slippery new shape with enough room to get lost in.

by Michael Lamm West Coast Editor



Smooth, aerodynamic body is good for a Cd of .38, almost as good as the 280ZX's .36. Spacious cockpit is well appointed, even in bottom-of-the-line cars. Overhead-cam, two-liter Four (right) cranks out 88 hp at 5,200 rpm; it is only available mill.



FM photos by the author

Nissan's '82 Stanza has five-seater innards, yet it has the external dimensions of a car designed for four—along with the smaller car's advantages of easier maneuverability, light weight and good fuel economy.

If you gather together all the cars in the Stanza's size class, you'll find that this particular model's dimensions pit it against some formidable competition.

The Stanza is aimed, though, principally at GM's J-cars (its code name in Japan was even JX during its development). With identical horsepower, 400 fewer pounds and one more ratio in its overdrive manual transmission, the Stanza's trump card over the J-cars (and others) remains its spaciousness.



Stanza prices start at \$6,800 but can be optioned up to \$8,000 as shown here. It will go head to head with the GM J-cars.

I don't imagine there's a town in America that puts an automobile to a greater test than San Francisco—SFO in airline slang. The San Francisco driver needs the reflexes of an electronic-games champ. His car has to have the claws of a cat, the agility of a rhesus monkey, plus an oversized clutch and brakes. Nowhere

does a car get as brutalized as on the cobbled hills and fog-slicked cable-car tracks of SFO, where I drove the three-door hatchback.

The Stanza's front-wheel drive helps on steep grades. Under hard, low-gear acceleration, as in shooting up the spectacular roller-coaster hills, I noticed a little torque steer to the Stanza's right. The car goes great, though, and it's certainly powerful and quick enough. But in this particular red hatchback, I also detected a split-second's engine hesitation at full throttle. Neither quirk showed up as anything dramatic, but they were present.

The steering is quick and positive, via rack and pinion (power optional), and I found the brakes likewise. Out on the road, the gap between second

and third might be narrower, but third gear is good for up to 70 mph, the tach showing 5,000 rpm at that speed.

I found fit and finish excellent, both inside and outside the car, the only visual annoyance being a graph-like grid silk-screened across the front of the instrument cluster. This grid is one of many extra and unexpected touches—the only one, though, that in my opinion doesn't come off. It just looks too busy.

Among those nice touches are nine storage compartments and bins spotted throughout the Stanza's interior. These give plenty of room for maps, coins, books, glasses and so on. The only problem perhaps is to remember where you put what. You could literally lose things in this spacious car.

The rear sideglass opens and shuts via levers at the back of the tunnel console. These levers attach to the panes through long, stiff flex cables. The levers are accessible to both front and rear riders. It may sound primitive but it's a simpler, more clever and less expensive approach to good rear ventilation than electric motors and switches.

Elbow room benefits from thin doors with space-saving, strap-type window regulators. There are also recesses in the rear-area side panels. These recesses again have storage bins in their lower sills. Rear seatbacks fold individually, so you can reach the cargo deck either through the liftback or via an open car door.

Mechanically speaking

The Stanza uses what's essentially a monocoque unitized body without the usual welded-in subframes. Nissan puts about 176 pounds of high-tensile-strength steel into the body—rather than mild sheet steel—which saves weight in the long run.

Suspension and power train mount directly to the body, with only minor gussets and lightweight braces at stress points.

Nissan calls the Stanza series the T-11 in Japan. In that country, there's also a notchback four-door, in addition to the three- and five-door hatchbacks available State-side. Also, home-market versions offer 1,600- and 1,800-cc engines, as well as the U.S.-tailored, two-liter, NAPS-X powerplant.

The 1,974-cc engine continues the technology developed for the NAPS-Z Four in the Datsun 200-SX, yet it's 77 pounds lighter. It pares weight by "half-skirting" the lower engine block; that is, the outer block skirts end at the crankshaft centerline.



Sharply raked and chopped rear end of the Stanza is part of the reason for its very low coefficient of drag (Cd). Rear trunk volume with the seats up is 20 cu. ft.



Rear-window opening levers are convenient for both front and rear passengers.



Storage bins like this one, with lid on front doors, abound throughout the Stanza.

Bottom end strength comes partly from a heavier-than-normal oilpan.

Combustion chambers are hemispherical, the belt-driven overhead cam activating rocker arms and mechanical tappets. The Stanza's crossflow aluminum head contains two sparkplugs per cylinder, as in the NAPS-Z. Electronic controls for the ignition cut the spark to the exhaust-side plugs during heavy-load acceleration. This diminishes noise and improves driveability.

The Stanza's standard transmission is a manual five-speed, with overdrive on the top two ratios. I found the lever a little flaccid in its shift action.

There's also a three-speed automatic optional, but I didn't get a chance to try it. The automatic's ratios are 2.826, 1.542, and 1.000 to 1. This Jatco automatic uses a 3.48

rear-axle ratio, while the stick's is 3.55.

Fully independent front and rear suspension employs MacPherson struts all around, the rears located by twin, parallel transverse links and single longitudinal ones. In all, it's a light, simple, space-saving system.

The Stanza rides very well on all surfaces, and for normal cornering the suspension feels well behaved and straightforward. I managed to put some open-highway miles on the Stanza in Marin County, and I found it a very pleasant-riding road car.

The Stanza's optional air conditioner is unique and, although it wasn't a hot day, I made sure I tried it. Refrigerated air spilled out almost immediately, but the surprise came in the system's silence. This is

(Please turn to page 134)



How to master fine wood joinery

In this last installment, we take you through the basics of the romantic dovetail joint and the lesser known fingerlap joint.

by Harry Wicks HOME AND SHOP EDITOR

PM photos: Rosano Capotosto and the author; color by the author

PART 3

Few home workshopers turn automatically to the dovetail to make joints on a furniture project. Still, interest in this good-looking, rugged joint never flags: Semester after semester, one of the most-asked questions in my adult-education class is, "How do you make a dovetail joint?" The following question is usually, "Will I be able to make them?"

The answers are that they are made with knowledge, patience and precision tools. And, yes, anyone can make a dovetail joint if he really wants to. All you need are the guidelines. The rest is up to you.

The truth of the matter is that it generally takes several attempts before you feel comfortable making such a joint and are capable of producing a neat one. That's understandable; after all, we are talking about fitting *multiple parts* to create a joint. And the problem—which I

Pins for the dovetail joint are laid out employing the same techniques that are used for cutting the tails. All the know-how you need to make a successful dovetail joint is shown on the following pages.



haven't seen discussed in any major magazine or book—is compounded when you stop to consider that the joints must be tight at *four corners*, and the box, case, or drawer must end up in the desired dimensions.

Thus, the first rule for attempting dovetail joints is to practice carefully. You must first lay out the challenge on paper. Since the joint interlocks, bear in mind that you shorten the run of the board when you use a dovetail (as compared to a butt joint). And that loss of length is doubled if dovetails are used at both ends.

Save yourself frustration and solve all layout and dimension problems by working full scale on either paper or 1/4-in. plywood (as the professionals do).

Making a dovetail

For clarity, we have used a multiple dovetail throughout the photo

series on these pages. In some cases, of course, you may want to use a single dovetail. The latter is a common joint; single dovetails are frequently found in early American primitive furniture, for example. They are made using exactly the same principles and techniques as for the multiple dovetail. But, because there is only one tail, obviously the job goes a lot faster.

Determining the slope

There is no specific rule for determining dovetail slope, other than the fact that most craftsmen I know prefer a slope about like that shown in the photos (a one-in-seven slope). For design reasons, you may switch to a one-in-six (or so) slope, but keep in mind that the dovetail appearance starts to approach a "butterfly" look as the slope gets sharper.

In practice, many craftsmen use a steep pitch—one-in-six, for exam-

ple—when working in softwoods. However, I think it's a matter of personal preference. Unless you have a specific reason for a steeper slope, stick to one-in-seven or one-in-eight.

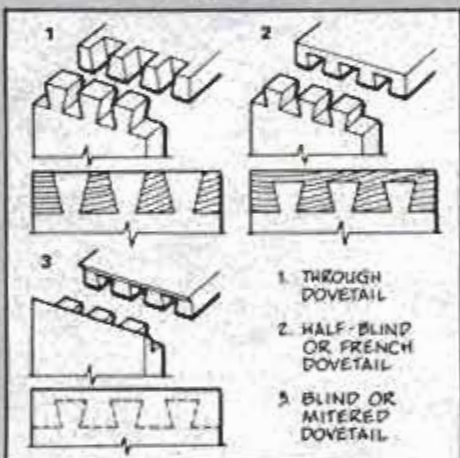
You have considerable leeway when laying out dovetails to be cut by hand (we'll get into machine dovetails later). The dovetails should be laid out so as to be eye appealing. Stock thickness determines how deep to cut your sockets.

Tips for laying out dovetails

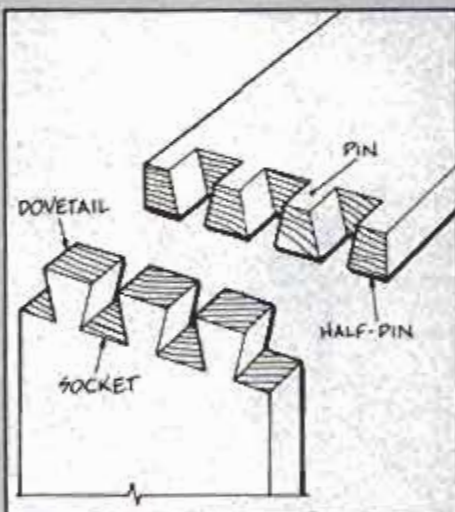
■ If you plan to do a lot of dovetail work, you can make permanent dovetail templates by doing your layout on wood and boring a wall-hanger hole through.

■ When you complete a dovetail layout on a piece of wood, take the time to mark Xs in the waste areas. Also, erase any unneeded lines: Once you

Dovetail joints—the craftsman's favorite



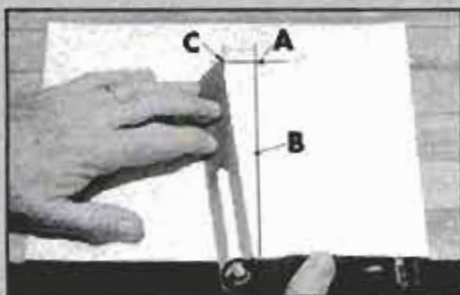
The three types of dovetail joints. The through dovetail should be mastered by aspiring woodcraftsmen before tackling the half-blind or mitered dovetails.



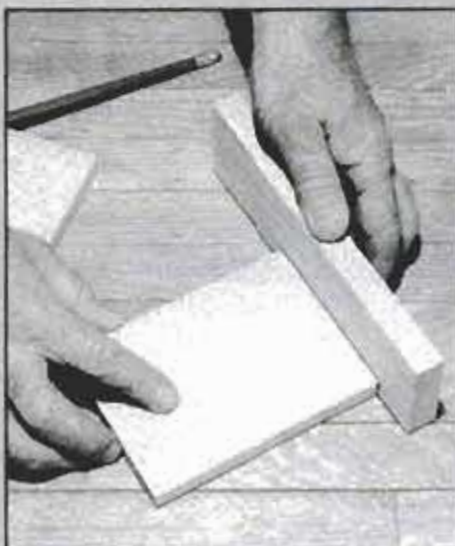
Here's what the parts of a dovetail joint are called. The number of tails is optional.



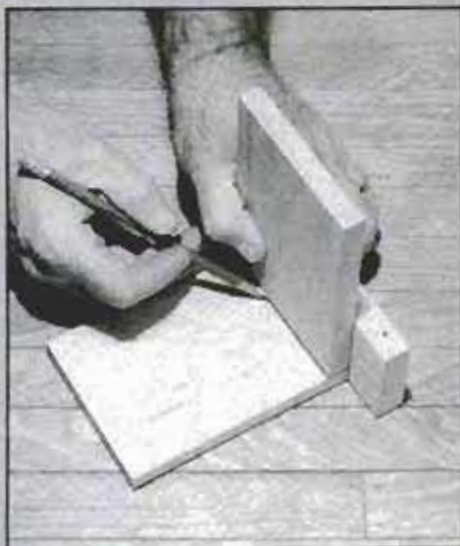
Basic through dovetail joint. A good dovetail joint always has half-pins at its ends. The dovetail gets strength by being glued to pins. The term half-pin refers to the fact that only one side is sloped; the other side is the square edge of the board.



First step is to determine the slope of the dovetails. Using a slip of paper, which is easier to work with than wood, draw a parallel line 7 or 8 in. from the end (A). Next, draw in centerline (B). Then locate point C 1 in. away from the point where lines A and B intersect. Since line A is located 7 in. from the edge in the sample shown here, the slope that is produced will have a one-in-seven pitch. Finally, use the template that you have just drawn to set the slope angle on your T-bevel square.



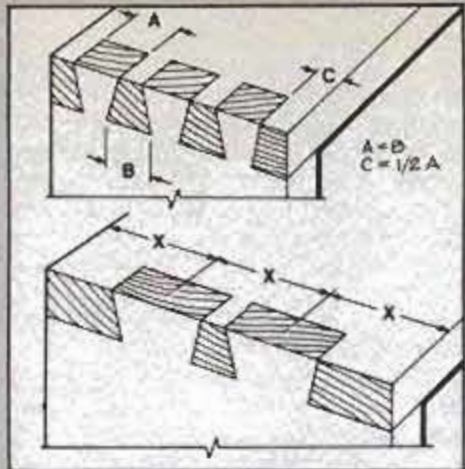
To determine the depth of dovetails, align the first board against a straightedge.



Butt the mating piece against straightedge; use it to mark the depth of the tails.



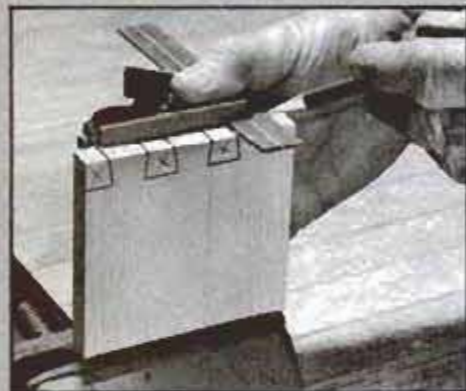
Hand dovetails can be laid out by eye or with the help of a ruler. The author recommends using a ruler to obtain a mathematical, craftsmanlike proportion.



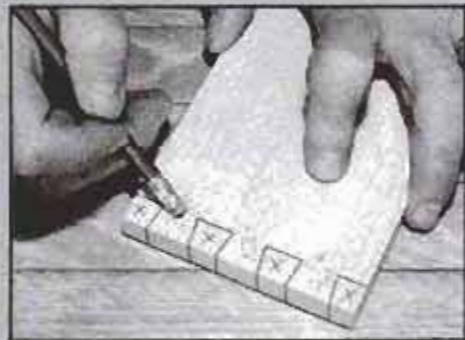
The drawing above shows the usual practice for laying out multiple, uniform dovetails. Spacing and arrangement of dovetails are, more often than not, shifted about to suit the craftsman's eye. Don't be hesitant about using such license.



Once dovetail centerlines have been laid out on the board to be cut, use your previously set bevel square to mark the dovetails. (Some craftsmen prefer to do the pins first; this is a matter of personal preference.) Note that tails are laid out with their centerlines at dead center.



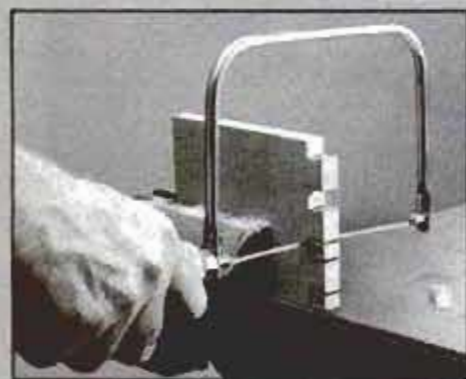
Using a sharp pencil and a combination square, accurately transfer the cutting lines for dovetails to the board's end.



At this stage, make it your practice to mark all waste areas—the wood to be cut out—with Xs. Also, take the time to erase any lines that aren't needed for the cutting step (to prevent chance of error).



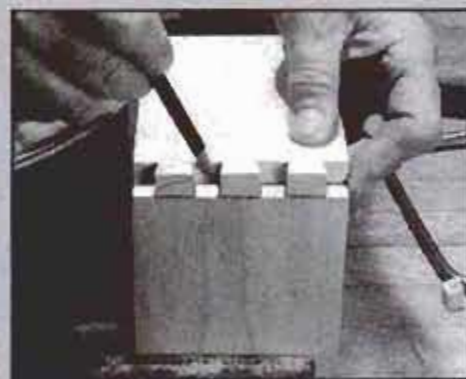
Clamp the board in a vise and cut along sloped lines, using a dovetail saw. Make certain the blade stays exactly on line, or slightly inside on the waste side.



Rotate the board in the vise and finish rough-cutting the sockets with a coping saw fitted with a narrow blade.



Select a sharp chisel to clean tails and sockets. Here, a 1/2-inch is used to true the sockets and tails to layout lines.



Use the finished tail member to lay out the pins to be cut on the mating piece. Make certain you keep all edges aligned.

get absorbed in the cutting of the tails, there is a strong chance of cutting the wrong line, thus wasting a piece of wood.

■ In general, I find that it is better to keep all cuts on the shy side; that is, on the waste side of the pencil lines. Assembling a dovetail joint is generally a matter of repeated test-fitting until you are satisfied with joint appearance and strength. Thus, it makes sense to kind of "sneak up" on the finished dovetails,

especially on the first attempt. ■ A stunt used by many professionals is to cut mating pieces slightly overlong with sockets slightly over-deep. This results in a dovetail joint with tails and pins that extend slightly beyond the corner. After assembly, the excess stock is removed and the corner sanded flush, using a belt sander.

My preferred method when making a dovetail joint is to do the tails first (as shown in the photographs),

then the pins. Some craftsmen prefer exactly the opposite sequence.

The pins are cut and finished using the same techniques as for the tails. As work progresses, you must stop frequently and test the pieces for fit.

Keep in mind that all hand dovetails have some degree of irregularity; this, in fact, simply adds to their charm. Your aim as a craftsman should be to make certain that you create only tight dovetail joints.

However, a minor irregularity will not affect joint strength.

About machine dovetails

It's possible to make very uniform dovetails using a router and a dove-

tail template. If you own a router, you can be certain that the manufacturer has included in the instruction manual information for making dovetails with it. The manual will also contain information on router

dovetail accessories that you can purchase.

In router dovetailing, the two pieces to be joined are clamped in position in the dovetail template and

(Please turn to page 135)

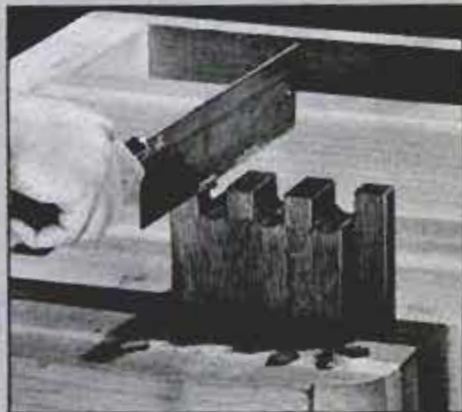
The fingerlap, or box, joint



Fingerlap joint is easier to make than a dovetail and almost as good-looking. Shown in this series of photos is a fingerlap joint with full-stock-width fingers. Joint is even handsomer if half-stock-width fingers are used, but these require more cutting. You should start by aligning the boards to be joined as shown—offset equals finger width. Clamp the setup in a vise.

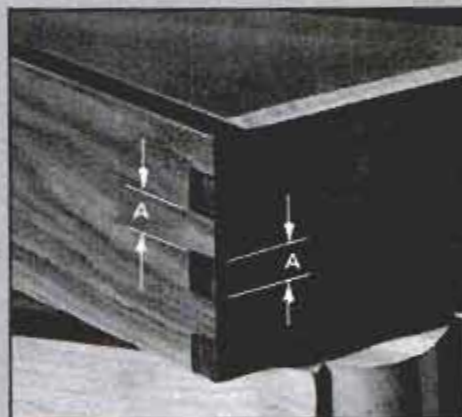


Once parts to be cut are laid out and marked, locate center points for your drill bit and bore holes through waste areas so holes are tangent to socket bottoms.

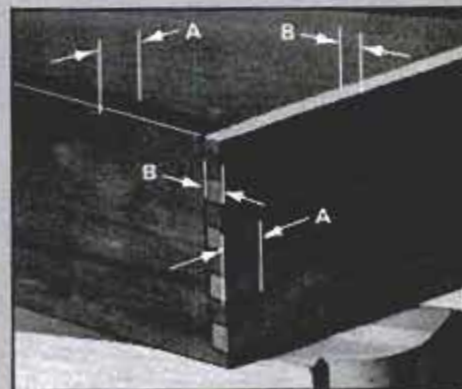


Use your dovetail or a very fine backsaw to cut the straight lines through the hole circumference to the bottom of the socket.

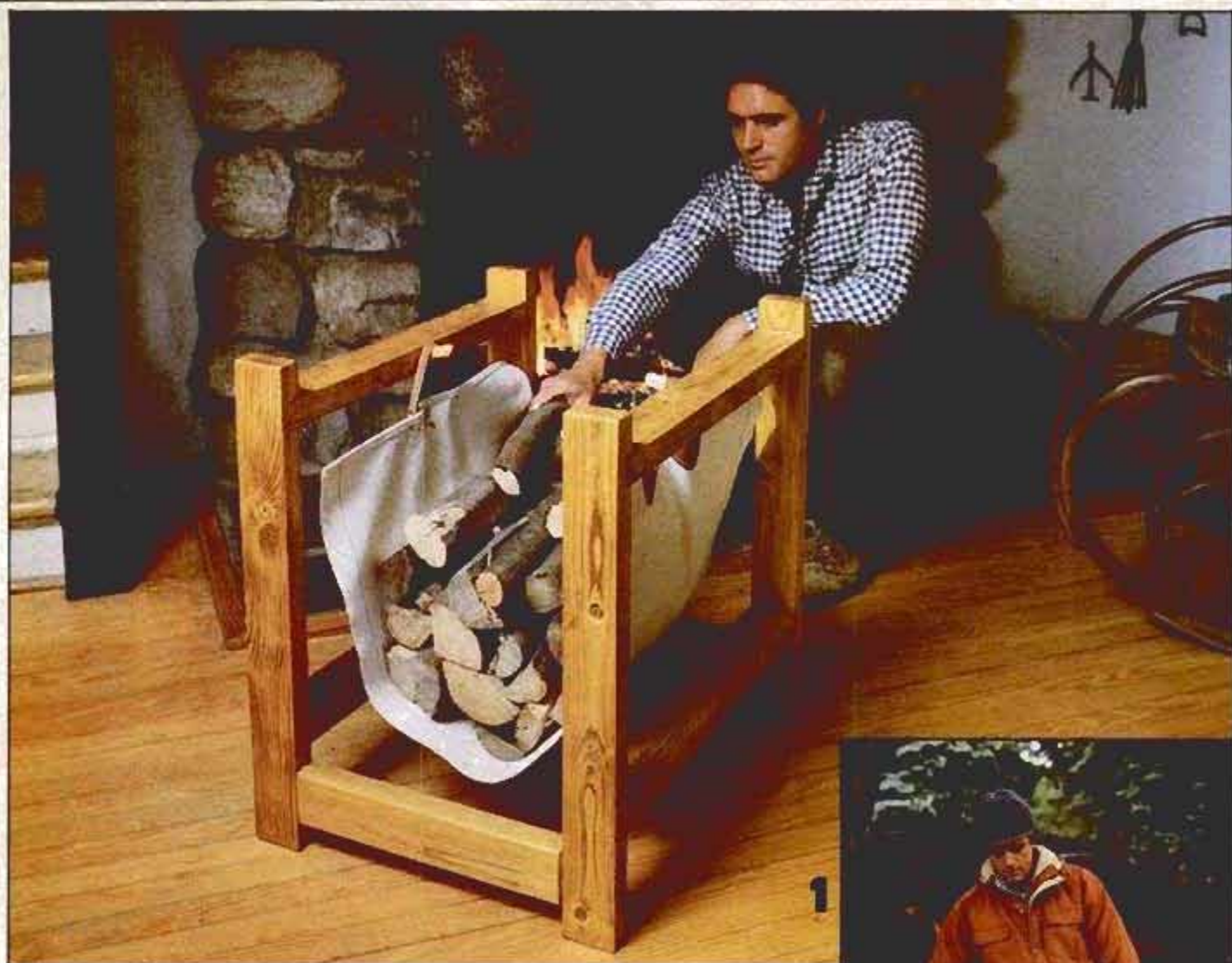
Finish shaping the fingers by cleaning out the corners by hand using a sharp chisel.



Use the above formula when laying out a box joint where both pieces to be joined are of the same thickness. Since the width of the board will rarely provide an even number of spaces—as in the example that we cut for photographic purposes—you can readily adjust for any difference by making the end pins the same width.



When joining two members of different thicknesses, lay them out as shown. Depth of cut in thinner piece must suit the thickness of the thicker piece—and vice versa. Thus, the fingers on the thinner piece will be longer than those on the thicker one.



Firewood holder (above) easily supports heavy-duty canvas tote used to transport logs (right). Simply hang loaded carrier onto protruding dowels and remove wood as needed.

3 firewood holders you can build

Keep your indoor firewood neatly stacked with one of these distinctive and easy-to-build log holders.

Having a supply of firewood next to your wood stove or fireplace is handy, but it can be unsightly. Here are three log holders designed to spruce up your hearth. Each is a different style and each involves different shop skills. The oak holder was designed by Van R. Hutchinson, while the other two were inspired by PM staff members. Complete plans and instructions follow.

1 Canvas tote holder

The support frame for this holder was made from relatively inexpensive 2x4 lumber. Because the good-sized dadoes and lap joints provide ample gluing surfaces for a sound assembly, nails and screws are not needed. (There is one minor exception: 3d finishing nails are used when gluing and clamping the bottom cross members to the uprights to keep them from sliding out of alignment.)

Begin by selecting straight, kiln-

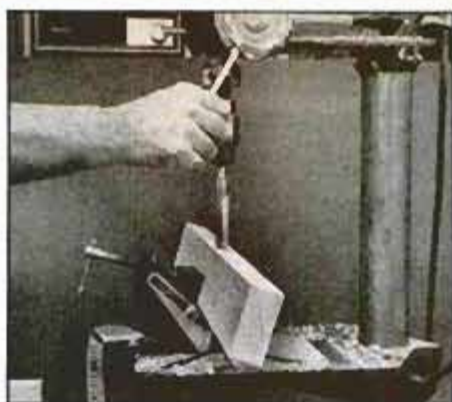
dried 2x4s with small, tight knots. Cut them to length, then rip $\frac{1}{4}$ in. from each edge to obtain a finished 3-in. width. This removes the factory rounded corners, making for flush joints later.

Then cut the $\frac{1}{2}$ -in.-deep dadoes and lap joints in the uprights and bottom cross members, using a dado head or saw blade and overlapping saw cuts. Next, bore the two angled dowel holes in the upper-side cross members as shown. A drill press with an adjustable angle vise is ideal for this job, but a portable drill can





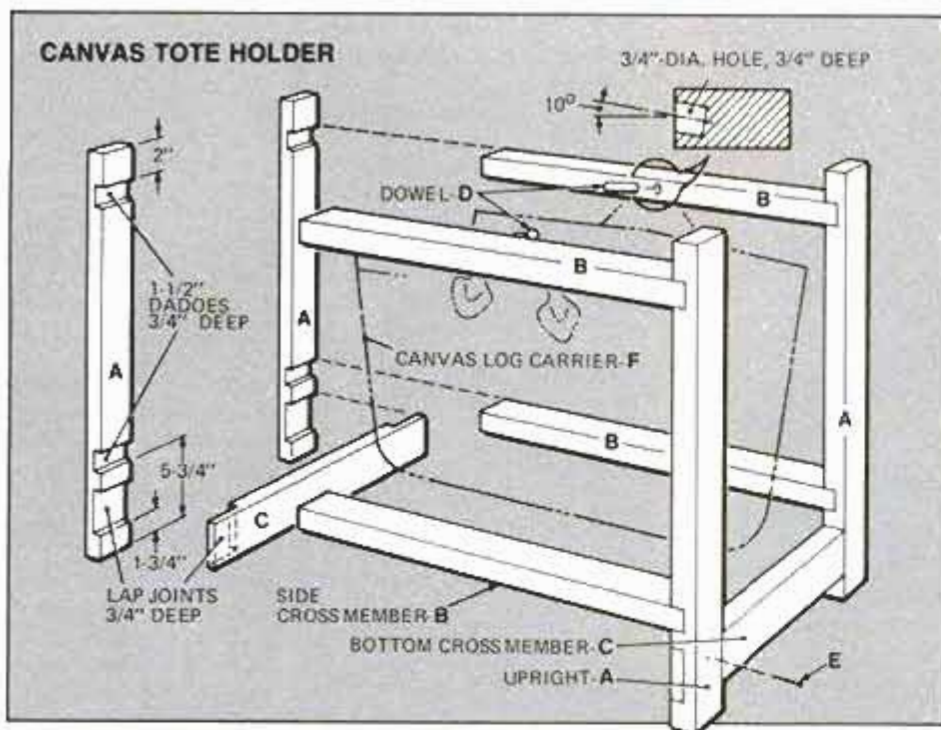
Uprights are cut in pairs with radial-arm saw to assure aligned dados. Use masking tape (A) to keep boards aligned.



Clamp stock to drill-press table with angled vise, then bore dowel holes. Brad-point bit works best, but spade bit will do also.



Assemble and finish-sand side pieces, then join them by adding the cross members.



work if a sliding T-bevel is clamped to the board as a guide.

After a satisfactory test assembly, glue and clamp the side-section parts together. When they're dry, sand these units with a pad sander and 120-grit paper.

Next, glue, nail and clamp the bottom cross members in place; when dry, ease all sharp corners by sanding as desired. Finally, apply the stain and finish of your choice. We used ZAR Teak Stain and ZAR Wipe-On clear Tung Oil Finish.

One source for the tote is L.L.Bean Inc., Freeport, Me. 04032 for \$9.75 postpaid. It's model No. 8731M.

MATERIALS LIST—CANVAS-TOTE HOLDER

Key	No.	Size and description (use)
A	4	1-1/2 x 3 x 27" fir (upright)
B	4	1-1/2 x 3 x 25" fir (side cross member)
C	2	1-1/2 x 3 x 22" fir (bottom cross member)
D	2	3/4"-dia. x 3" dowel
E	8	3d finishing nails
F	1	Canvas tote

Misc.: Glue, stain, tung oil.

2 Oak holder

Begin making this sturdy and decorative log holder by cutting the legs and slats to approximate length from 1-in. nominal stock. (The actual thickness of such material is 13/16 in.) Using the grid supplied in the drawing on the next page, sketch the leg outline on one board. Then tack-nail this pattern to the other leg board, driving the nails on the waste side of the line as shown.

Use a band saw to cut the outline, leaving the top nailed sections uncut.

A sabre saw can also be used, but the legs would have to be cut separately; the doubled-up oak would be thicker than a sabre saw's cutting capacity.

Next, cut a block of wood the same width as the slats and make a "step" in one end, as shown in the drawing. This simple jig is the most effective



The open design of this solid oak holder accommodates nearly any size or shape log.



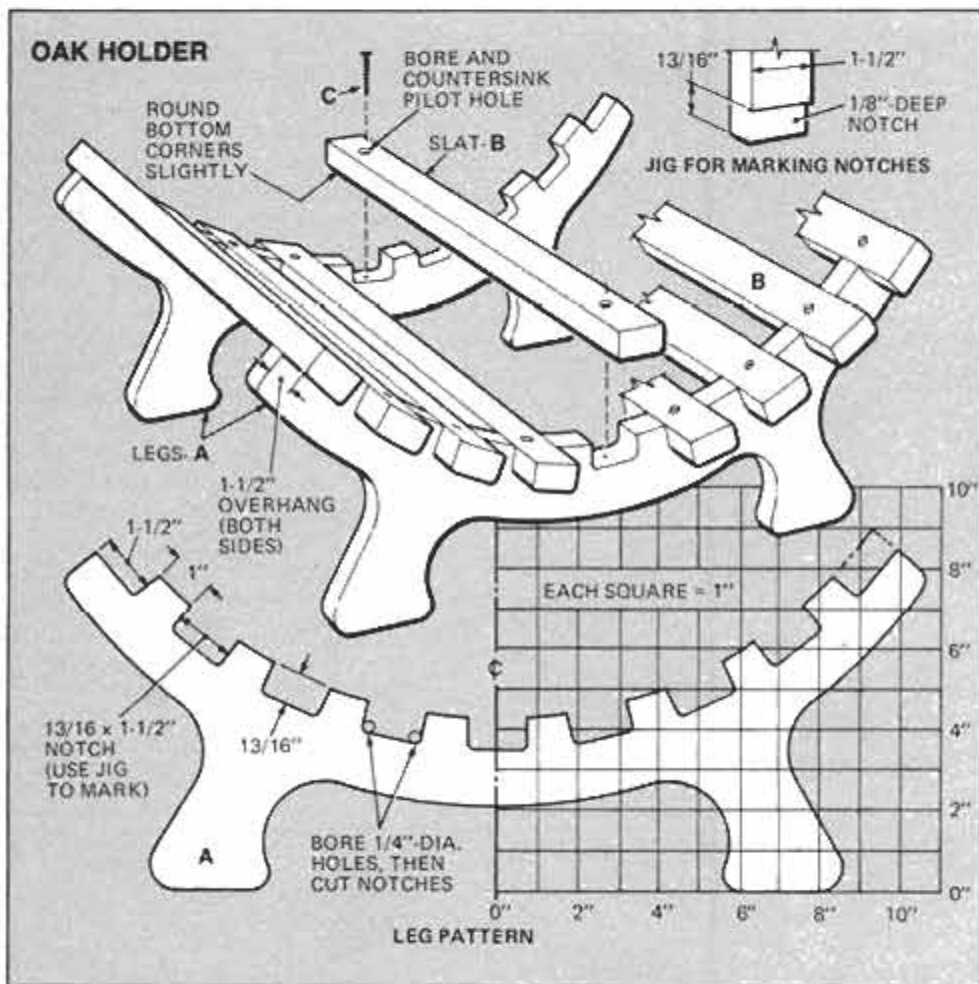
Gang-saw the legs. Nails driven on the waste side of outline hold pieces together.



With legs still nailed together, lay out the arc for proper position of notches. Use a stepped block as marking template.



Bore a hole at each notch corner and cut out the waste. Holes simplify cutting and give completed notches a finished look.



way to mark the notches along the curved edge.

Once the layout is complete, bore a hole in each notch corner, then cut out the waste. The small radii in the corners give the blade room to maneuver and, at the same time, also impart a finished look to the notch corners.

With the legs still nailed together, sand the scrolls with a 3-in. drum sander. Then cut off the waste areas, separate the pieces and finish-sand each of them individually.

Next, rip the slats to the required width and sand off the sharp corners—especially on the bottom edges—so the slats will sit flush in the slightly rounded notch corners. Cut the slats to length and finish-sand them.

Bore and countersink pilot holes for the flathead screws, then glue and screw the slats to the legs.

Finally, apply a stain and the clear finish of your choice. We used McCloskey's Tungseal with a satin finish.

MATERIALS LIST—OAK HOLDER

Key	No.	Size and description (use)
A	2	1 3/16 x 10 x 24' oak (leg)
B	9	1 3/16 x 1 1/2 x 20 1/2' oak (slats)
C	18	1 1/2' No. 8 th screws

Misc.: Glue, stain, clear finish of choice.

3 Wrought-iron holder

This versatile unit is made from 1/2 x 1-in. hot-rolled mild steel. Such flat stock is available at welding or iron-work shops, but be sure to specify hot-rolled steel. Cold rolled is too tough for the bending procedure outlined here.

Begin by making the simple bending jig shown in the drawing. The first part is made of 3/4-in.-thick plywood and two pieces of 1/2-in.-thick aluminum stock. Before nailing it to the platform, bore clearance holes through it so the small piece of plywood won't split. Once the nails are driven, grip the projecting nail ends in a bench-mounted vise.

Next, cut the stock for the up-rights and feet and mark all bend lines indicated on the drawing.

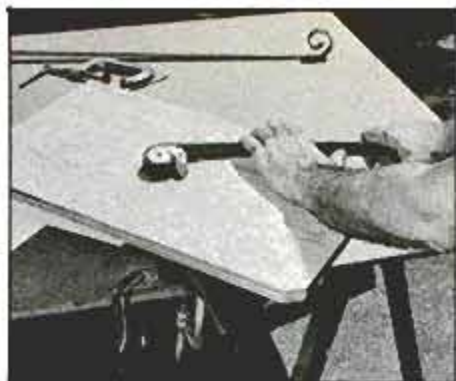
One by one, insert each end of the uprights and feet into the jig slot and make the scroll bends. Then, tack-nail the second part of the jig onto the platform and make the reverse bends on the uprights only.

Make all corner (sharp-angle) bends by securing the stock in vise jaws and using a wood block to push. The position of the stock relative to the jaws—given on the drawing—is critical. If you are careless, the unit won't fit together properly.

Assemble the unit in the following way: Clamp the uprights and feet together, then center-punch and



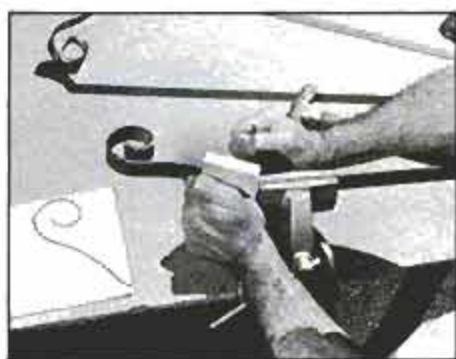
Wrought-iron holder stores good supply of logs, as well as newspaper and kindling.



Bending jig is nailed to jig platform with 10d common nails. After projecting nail ends are gripped in vise (under platform), insert stock into jig and make first bend.



Nail the second block to jig as shown, then make reverse bend on the uprights only.

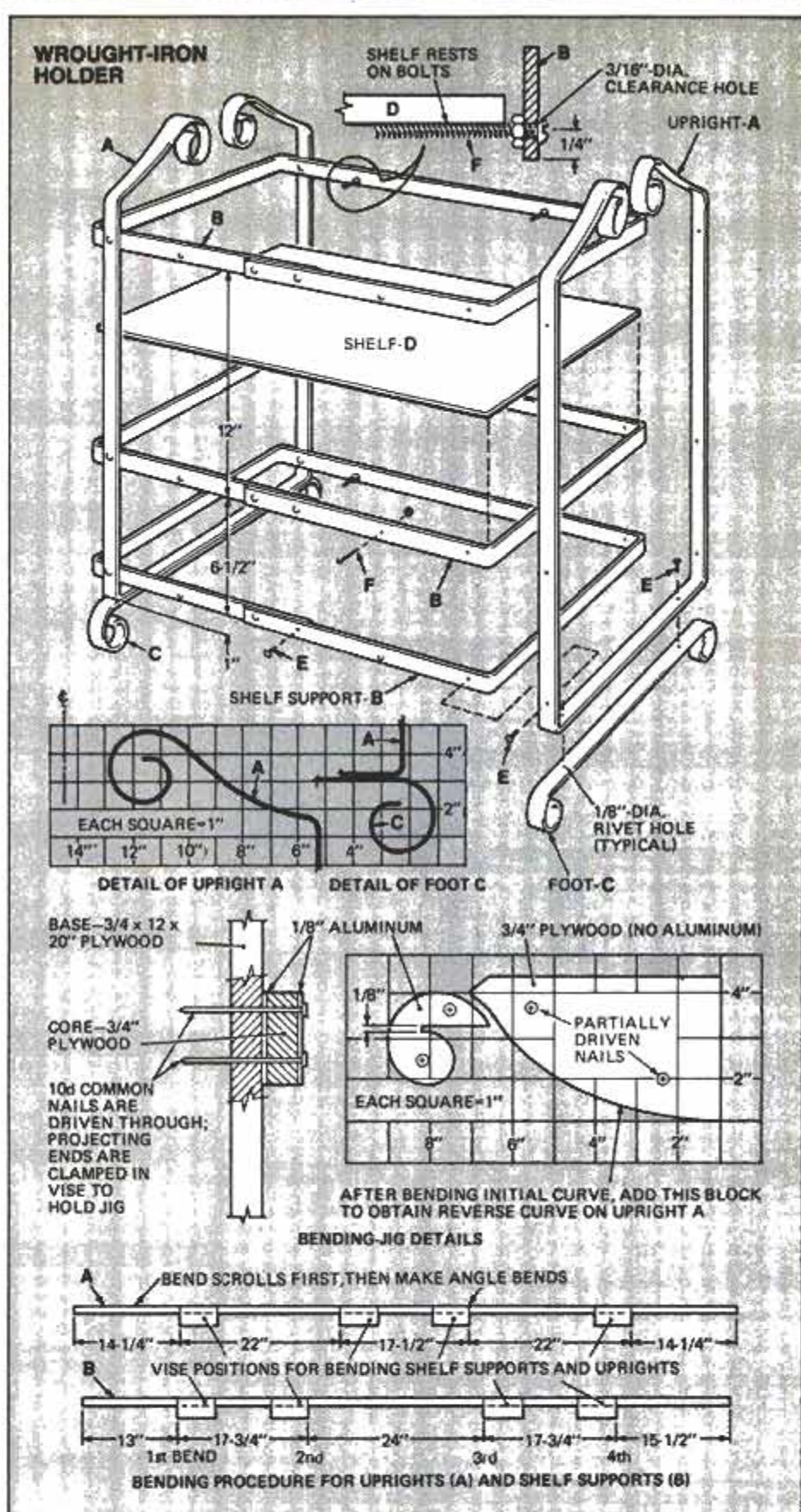


To make corner bends, clamp stock in vise and bend back, using wooden block. For position of vise jaws see drawing at right.



Join pieces by drilling holes and inserting aluminum rivets. Flatten rivets using ball-peen hammer and a steel block.

drill the rivet holes through both pieces at once. Join these, using aluminum rivets. Next, join the ends of each shelf support with rivets and drill clearance holes for the shelf-supporting bolts. Then clamp each shelf support in place, drill rivet holes and install rivets the same way.



Apply primer and two coats of a semifat black paint such as Krylon No. 1613. Cut the plywood shelves to fit, using measurements taken from each support. Seal each shelf with two thin coats of shellac on both sides and install them on the supporting bolts.

Best tools for your electronics workbench



Well-equipped work center: Note the Pana-Vise (left) and small drill press (right). Cube-shaped table vacuum is in the center.

Electronics projects are easy to build—with the right tools. Here are a few that will have you working like a pro.

by Bill Kanner

A poor workman blames his tools," goes the adage. With these tools, however, you'll have no excuse for poor workmanship. They'll make your electronics work easier and better. Many of the small items can be found under the brands of several manufacturers in good electronics stores.

If you find that the wire from the soldering iron gets in your way or you want to solder in places where there's no access to an electric outlet, try a cordless iron. One from Weller sells for \$21.95. The other major companies in the field make cordless versions and all are available with a variety of tips. An overnight charge

of our sample's NiCd battery lasts for about 100 solder joints.

Since soldering is such a major part of electronics work, it's no surprise that there are many items on the market designed to make the job easier for you. While the iron and solder are essentials, other gadgets that come in handy include tools like those contained in Radio Shack's four-piece soldering-tool kit (\$2.99).

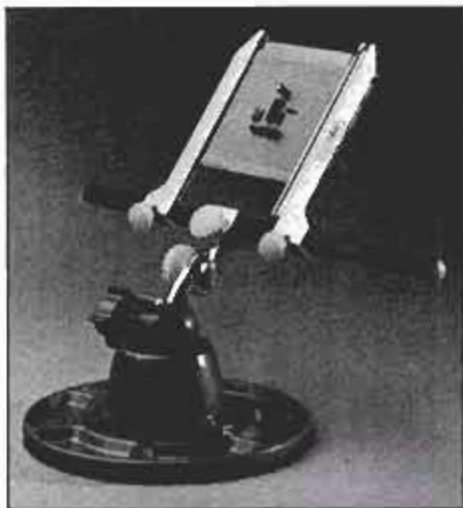
This kit includes a heat sink (spring-loaded), brush/scraper and two slotted probes. Another useful item is a heat-resistant sponge to clean your iron's tip. These items are also available at stores such as Lafayette or from various other manufacturers.

Unsoldering can be more difficult than soldering. Here are a couple of products that will help solve that problem.

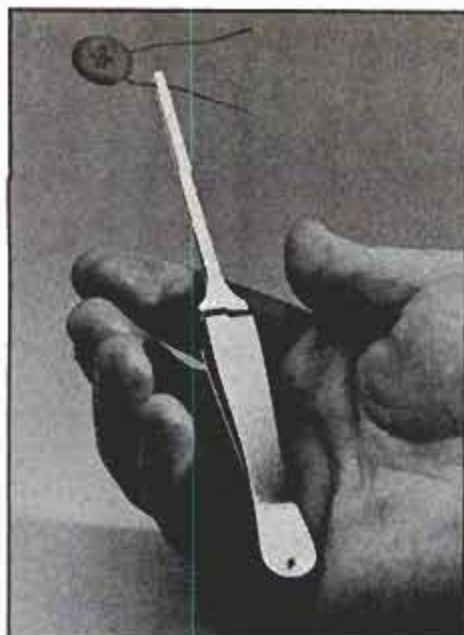
Rather than heat, wipe and shake, you can heat and absorb solder with a solder wick. Place the copper wick on the solder joint and heat it with your iron. The wick leaves a clean

joint. A 5-foot roll costs about \$1.50.

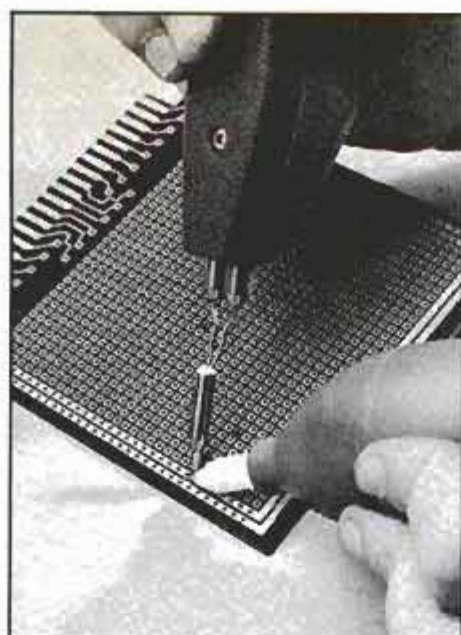
Flux, which helps solder flow, can interfere with electrical connections if there's too much spread around. A quick spritz of flux-remover spray (about \$1.50/can), however, will



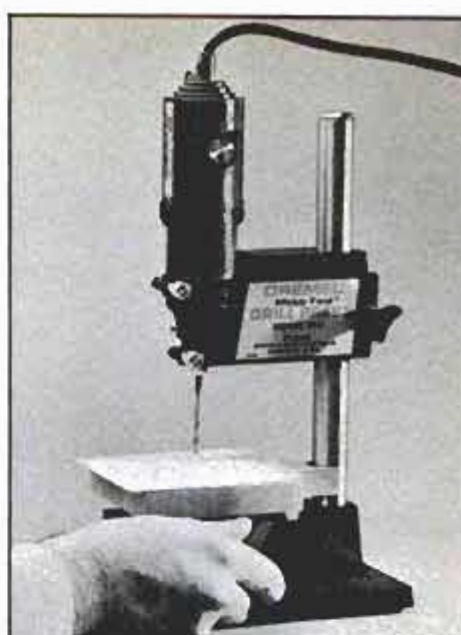
Pana-Vise system lets you hold any size PC board in any position. You can set it to get your soldering iron into even the most inaccessible places on the circuit.



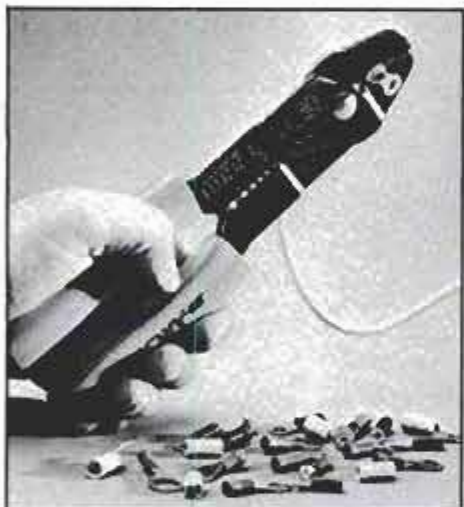
Locking forceps will hold a small component tightly; you don't have to apply any pressure. Surgical hemostats may also be used to hold small parts.



Rubber bulb with nylon tip makes a good "solder sucker." Just heat up mistake and, when solder turns to molten, release the squeezed bulb to pull solder off the joint.



Dremel makes a drill-press platform for its popular Moto-Tool. With it, you can drill holes to fabricate PC board quickly, and with the accuracy that's required.



Why solder if you can crimp? All sorts of connectors are available that, with the crimping tool shown, can be applied to the ends of wires or cables—solderlessly.



Even the best soldering pro needs scrapers and other tools along with a heat sink. For more information on heat sinks, see *PM Electronics Monitor* on page 18.



If you have to heat a large area, as when joining two sheets of metal, you will want to use a miniature torch such as this. They're inexpensive and easy to use.

wash any excess flux away from the connection.

Crimping and heating

While some component and point-to-point soldering is unavoidable, some cables can use crimp connections instead of solder-on terminals. An assortment of connectors costs less than \$3.

While a pair of pliers can generally do the job, a good crimp tool does it better and has other uses, as well. Radio Shack's All-Purpose Crimper/Cutter (\$9.95) doubles as a wire stripper and triples as a bolt cutter.

There are some jobs where neither the heat of a soldering iron nor the brute force of a crimper are enough, however.

You may need a small, blowtorch-type device. A miniature gas-brazing torch not only does resoldering jobs, but will join unsolderable metals, as well. Bronze, brass and copper can be joined, as can tin, steel, iron, silver and gold. With a special flux and brazing rod, aluminum can be worked. Most brands are priced under \$35.

Handy helps

Most of the items we've discussed are "joiners" in one way or another, but what about the aids to actual construction?

A small vise can hold parts while you are working on them. Radio Shack has a minivise with a miniprice of \$2.99 for the vacuum-base model with notched jaws for holding

small PC boards. If you need something more permanent or larger, investigate the versatile Pana-Vise system. The standard base bolts to the table, but the company also offers a vacuum base. Remember, though, a vacuum-base model will work properly only on a smooth, non-porous surface.

Pana-Vise has assembled several components into what it calls a Workcenter.

Model 324 is made up of a standard base, a soldering stand made up of a solder-spool holder and iron cage, a component tray which fits like a skirt around the base and a PC-board holder with a spring-loaded jaw. The combination sells for \$9.95, a saving of \$3 compared to buy-

(Please turn to page 141)

10 clever ways to put



1 Use an old electric-meter magnet to separate steel screws from brass screws. These powerful magnets are easy to find and can handle many home and shop tasks.

Mysterious and invisible, magnetic force can be put to many uses in the home and shop. Here are 10 particularly handy ways to use magnets.

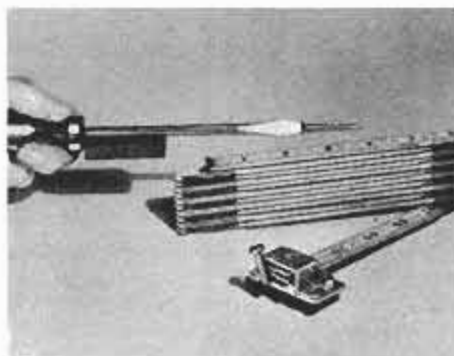
by Walter E. Burton

All ferrous metals (containing iron) and a few others are attracted by magnetism. Modern technology, however, has found ways of magnetizing practically anything, including nonferrous metal alloys and ceramics; even rubber and plastics are impregnated with ferrite particles to make them "magnetic."

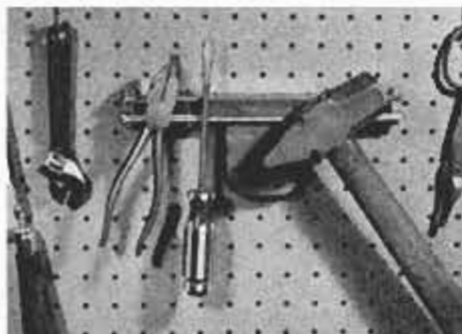
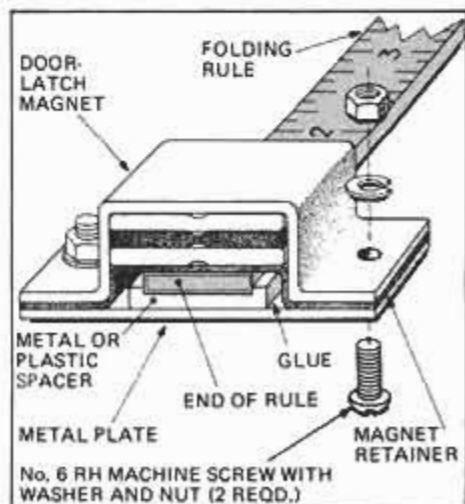
Some of these magnets can be found around the house or in discarded appliances. Many are commercially available for less than \$5, and the uses you can find for them in your home are practically limitless. Try some of the ways we've put together on these pages and you're sure to invent more of your own.



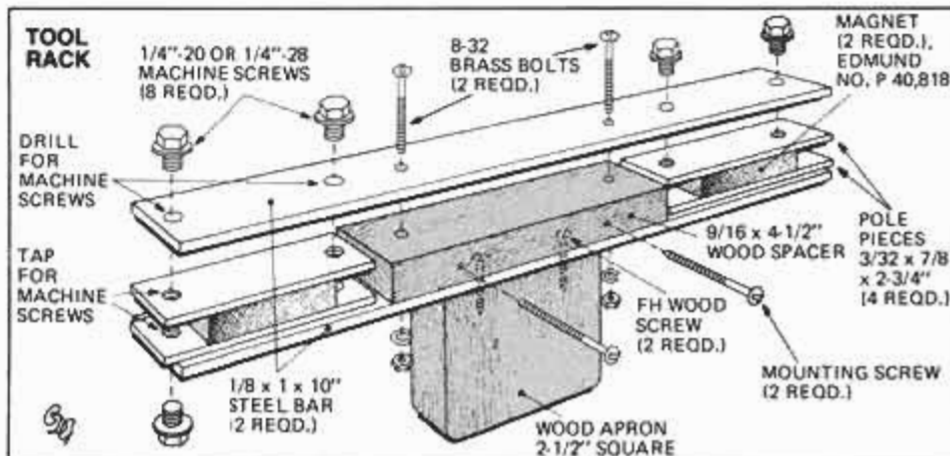
2 Wrap a horseshoe magnet in a plastic bag and search sweepings for missing small metal objects. The plastic keeps the magnet free of metallic dust and debris.



3,4 To hold screws steady, magnetize this. To make a handy retriever, add a door-latch magnet to end of folding rule.



5 A magnetized tool rack may hold those tools that do not easily fit other racks or perforated-board hangers. Surprisingly heavy tools may be held by such racks.



magnets to work

The magnets used for the 10 ways shown are displayed individually, and a source list appears at the bottom of this page.

1 Many old electrical meters contain a magnet that is roughly U-shaped. Using this magnet to separate ferrous screws from my brass screws (now expensive) allows me to keep stock and avoid buying more brass screws than I need.

2 It seems I'm always looking through sweepings or piles of dust for lost things like a special washer or tiny spring. An Alnico horseshoe magnet is dandy for this job, but it will soon become encrusted with all kinds of metal debris. To avoid this nuisance, I wrap the magnet in a piece of plastic. Debris is still attracted, but it is easily removed along with the plastic.

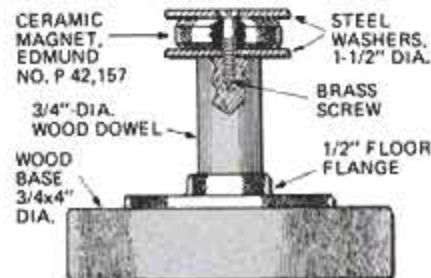
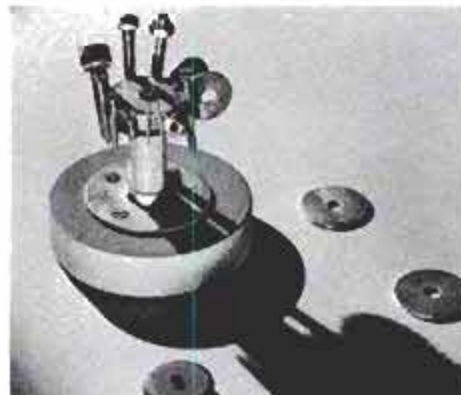
3 Because a magnet's force field can be transferred to a piece of metal with which it is in contact, you can magnetize the tips of screwdrivers. The magnet I used here came from a door latch, but any kind of bar magnet will work. Just place the magnet on the driver shaft. I use this trick in tight places when I cannot align and hold the screw with my other hand. You'll find this idea useful for ferreting out small metal items from certain machines like typewriters, without taking them apart.

4 Many kinds of magnetic door latches are available in hardware stores. Most look similar to the one shown in the drawing. They usually come with a strike plate, but the plate is too small to use in this arrangement. Instead, cut a 1/2-in.-thick piece of sheet metal to the

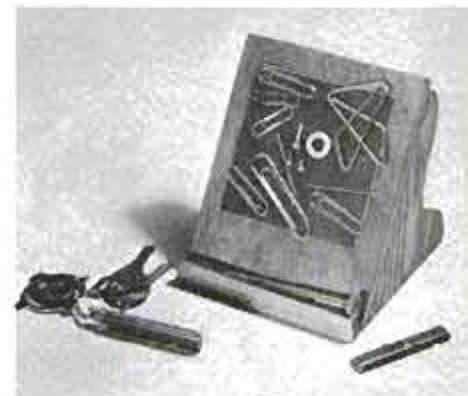
required size of the bottom metal plate, using your latch as template. You may need to glue a spacer to the plate for a snug fit against the rule. Keep this accessory in your toolbox next to the rule.

5 If you sometimes get annoyed when trying to wrestle a tool free from a hook, this idea is for you. The toolholder is easily made by referring to the drawing on the facing page. A magnet's poles (referred to as north and south) are not usually marked. So, secure one magnet, then flip the other one so it is in the cor-

(Please turn to page 140)



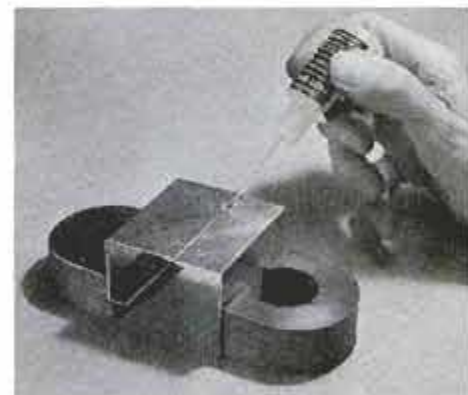
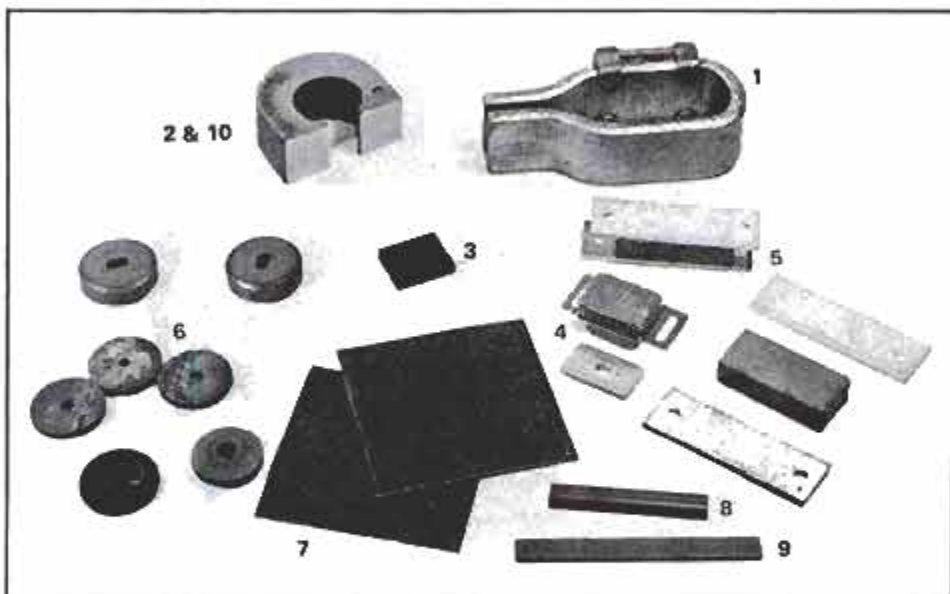
6 Park odds and ends on the magnetic "toadstool" where they can be seen easily. After sanding, you can quickly twist a 3/4-in.-dia. dowel into a 1/2-in. flange.



7,8 Use plywood scraps to make a stand for sheet magnets like that shown here. For an emergency, keep a magnet handy in a U-shaped holder on your key chain.



9 Slip a key into a small paper envelope along with a magnet and seal with a paper clip. Hide the key under any convenient metal shelf or other metal surface for easy retrieval whenever you need it.



10 For one of the handiest uses of magnets you can have in your shop, position sheet-metal work for gluing as shown here. These superstrong Alnico magnets are capable of holding large pieces.

MAGNET SOURCE LIST

Key Description and source

- Magnet from electric meter
- Alnico horseshoe magnets (Edmund No. 41948)
- Magnets from cabinet-door latches available in hardware stores
- Complete cabinet-door-latch magnets with strike plates
- Rectangular magnets (Edmund No. 40818)

- Ceramic-ring magnets (Edmund Nos. P42157 and P41988)
 - 1/2 x 3 x 3" flexible sheet magnets (Edmund No. P40159)
 - Flexible magnetic strips from refrigerator-door gaskets
 - Flexible magnet strips (Edmund No. 60092)
 - Alnico horseshoe magnets (Edmund No. 41948)
- Note: The 1981 fall/winter Edmund catalog is free of charge. Write to Edmund Scientific Co., 101 East Gloucester Pike, Barrington, N.J. 08007.

How to protect your home from thieves

OUTDOOR FLOODLIGHTS
LIGHT ENTIRE YARD. CONTROL
FROM AN AUTOMATIC SYSTEM
OR SINGLE SWITCH

AUTOMATIC LIGHTING CONTROL
TURNS ON DESIRED LIGHTS AND RADIO
OR TV FOR LIVED-IN LOOK

MOTION DETECTOR
GENERATES INFRARED OR
ULTRASONIC WAVES THAT
OPERATE LIKE RADAR TO
DETECT INTRUDERS

**ELECTRONIC (WIRELESS)
DETECTION SYSTEM**
SOUNDS ALARM AT OPENING
OF DOORS OR WINDOWS

SLIDING-GLASS-DOOR LOCKS
INSTALL STRONG LOCKS AND A
BREAK DETECTOR

SHRUBBERY
TRIM AWAY FROM
DOORS AND WINDOWS

**COMPUTERIZED
DETECTION SYSTEM**
CONTROLS MOTION AND
IMPACT SENSORS.
SOUNDS ALARM. MAY RUN
AUTOMATIC PHONE DIALER

**ELECTRICAL (WIRED)
DETECTION SYSTEM**
SOUNDS ALARM AT OPENING
OF DOORS OR WINDOWS, OR
WHEN WINDOWS ARE BROKEN

WINDOW LOCKS
ADD OR STRENGTHEN

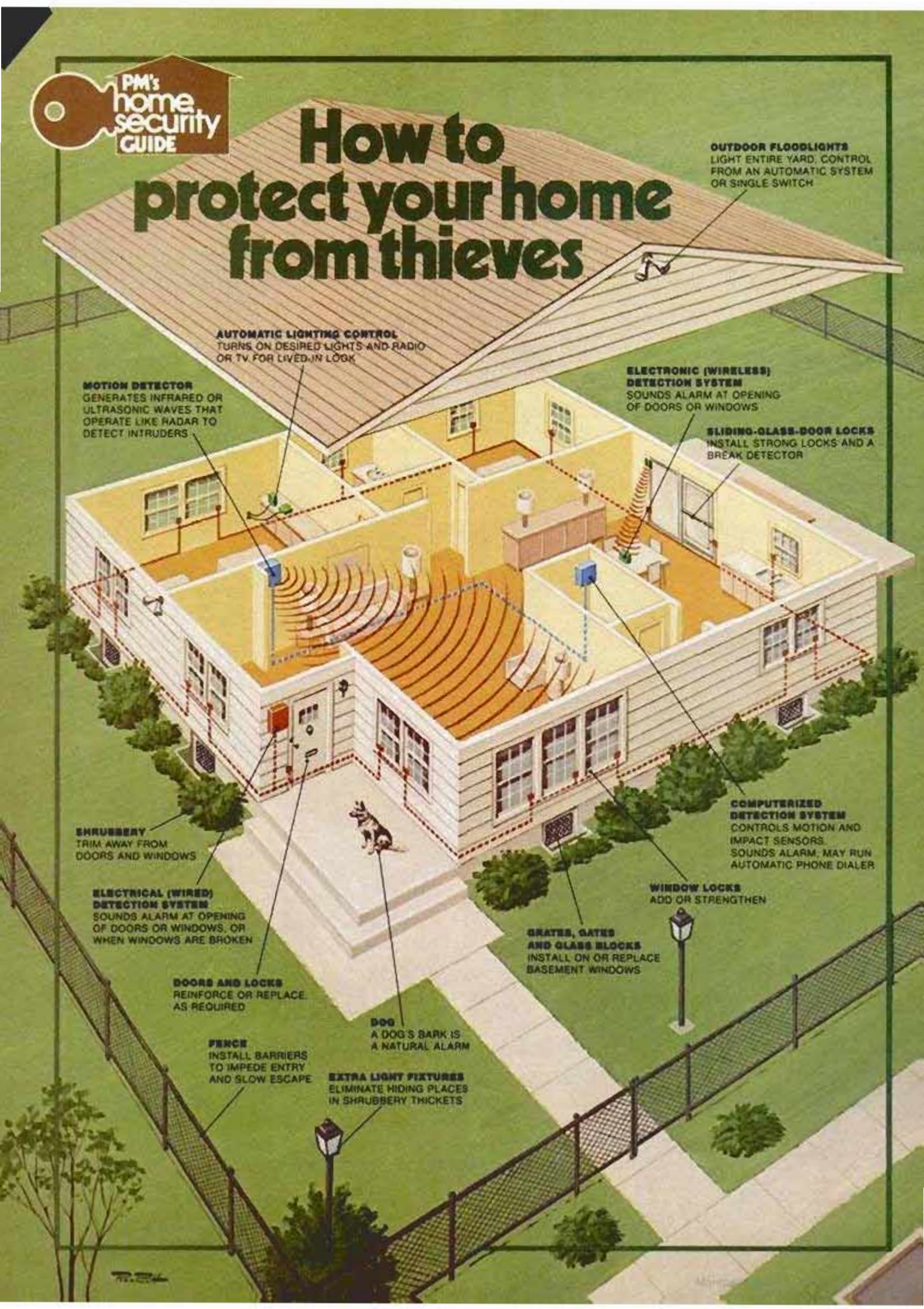
DOORS AND LOCKS
REINFORCE OR REPLACE
AS REQUIRED

**GRATES, GATES
AND GLASS BLOCKS**
INSTALL ON OR REPLACE
BASEMENT WINDOWS

FENCE
INSTALL BARRIERS
TO IMPEDE ENTRY
AND SLOW ESCAPE

DOG
A DOG'S BARK IS
A NATURAL ALARM

EXTRA LIGHT FIXTURES
ELIMINATE HIDING PLACES
IN SHRUBBERY THICKETS



As home-theft figures rise, so do the number of products that help fight burglary. PM looks at your home in terms of defense, and what's available to help you make a decision.

A deputy inspector in the New York City Police Dept. recently purchased a house in a "safe" neighborhood on the north shore of Long Island. As the family was moving in, they were shocked to discover that none of the door locks worked.

"The previous owners must have been living in a dream world," the inspector said. "I know better than most what a threat burglary is today. I would never leave my house unlocked, especially in a suburban setting."

Confirmation comes from the FBI's Uniform Crime Report for 1980, just released. Suburban burglaries were up 14.8 percent over 1979 figures; city thefts jumped 14 percent and rural burglaries 12.9 percent. Total residential burglaries rose to 2,380,708—19 percent over 1979 data—a "significant increase," according to an FBI spokesman. The figures represent only reported burglaries. Unreported thefts could easily double the figure, educated guesses indicate.

The yard: your first line of defense

If you don't have a fence around your property, you should consider building one. Any kind of a barrier, even decorative fences common in suburban neighborhoods, serve as a deterrent to thieves who are always mindful of easy entry and quick routes of escape. The common chain-link fence can be 3 to 10 ft. high and topped with barbed wire—but only if local laws permit. They're certainly not appropriate for the front yard, but high fences are a real barrier and are often used in back yards, where they serve to protect the rear of the house from the most probable route for an intruder.

Shrubbery

The second point to consider is your landscaping and shrubbery. While thieves know fences as barriers, they see overgrown shrubs, trees and thickets as hiding places. Trim all plantings and, most particularly, those close to doors and windows.

Proper trimming of most shrubs, however, is not a task for the novice. Buy a good garden handbook with pictures showing where to trim without nipping buds, stunting growth or killing the plant.

Lighting

If you just don't want to trim the shrubs, take the area they conceal

into consideration when planning a lighting system for the house exterior. Of all the steps one can take to safeguard his home, perhaps the most effective is a good system of powerful lights strategically placed so that the entire property surrounding the house (particularly areas of thick plantings) is well illuminated.

Outdoor floodlight fixtures are inexpensive and easily installed. It is preferable to have outdoor lights wired so they can be activated at once, either manually, or by an automatic detection device. BSR (see electronics section of this guide, page 117) makes a unit consisting of a timer and on/off switch in a handy central unit and modules which plug into existing house receptacles. All lights plugged into these modules will be turned on instantly at the flick of the switch in the central control panel. Wiring is kept to a minimum and both outdoor and indoor lights can be operated with this convenient device.

When installing lights in a defense system, don't forget to consider existing porch lights and lamp posts or to add other lights in dim areas. Keep bulbs protected by decorative globes or mount the fixtures high enough so the bulbs are not easily unscrewed.

A natural alarm

Like light, noise is one of the thief's greatest foes. A barking dog, regardless of how fierce he sounds, has scared away many a thief. However, this shouldn't be the only reason for a family to consider having such a pet.

Knowing your enemy is your best defense. Most thieves are young, inexperienced and seek the easiest route into your house. The smallest obstacle, like a simple engaged lock, will stop many potential thieves.

Some thieves are caught, however, get convicted and serve time. Eventually they emerge from our "correctional systems" as semiprofessionals. "Rather than corrected," according to a former New York City probation officer, "they've had the opportunity in prison to associate with and learn from professionals." These bolder thieves will force a window or door with a weak lock. They know the common hiding places for valuables and are often armed.

An important rule for your family is: Never confront a thief, if possible. The best plan is to discourage him from even approaching your house. Next, secure all doors and windows with good locks. Then consider the electrical and electronic systems now available to protect against burglary.



Fences are barriers to thieves. Napco makes a vibrator detector (about \$9.50) to detect a thief climbing over a fence. For more information, see page 117.



Install floodlights high up, where bulbs cannot be easily removed by an intruder.



This overgrown rhododendron may provide cover for a thief breaking in front door. Trim shrubs from doors and windows.

Text: John Ingersoll, Neil Shapiro, Conrad Stowers
PM photos: Rosano Capolosto, Steve Fay
PM color art: Ray Ploch
Electrical consultant: Jeff Sandler



If doors and frames are weak, replace them. Stanley U-install doors, complete with frame, start at \$179. Stanley Door Systems, 1225 East Maple, Troy, Mich. 48064.



You can reinforce the door jamb by letting-in a metal plate. This heavy-gauge metal security plate costs \$10.28 and is available from Keefe Lock Co., 1324 Parkside Ave., Trenton, N.J. 08638.



This jimmyproof dead-bolt lock will prevent a thief from entering your home, even if he breaks the window. Available for \$32.99; write to Ideal Security Hardware Corp., 215 East Ninth St., St. Paul, Minn. 55101.



Two hefty screw eyes and a 1/4-in.-dia. by 48-in. steel rod make a simple keyless lock. Wood block spacer holds door shut.



Use keyless locks on some doors to ensure fire escape route. This barricade lock is \$9.95 from Radio Shack, 500 Tandy Center, Fort Worth, Tex. 76102.



Cut a 1-in.-dia. wood dowel or aluminum pipe to length and place it in the channel to secure a sliding glass door. Tie a string around this lock for easy removal.



Doors and windows: Second line of defense

The strongest lock you can buy is no stronger than the door and frame in which the lock and the strike plate are mounted. Many entries are made by thieves kicking in poor-quality doors between connected garages and house. Replacing such doors with solid core or metal-clad doors will provide added protection. The metal cladding on the garage side, in fact, also provides greater fire protection.

If you're satisfied that your door is strong enough, but you're concerned about the strike plate in the jamb, reinforce the jamb by letting-in a sheet-metal plate about 15 in. long. You can also buy a ready-made security strike plate like the one shown in the photo atop center column.

Many front doors have only one lock incorporated in the doorknob. These locks are attractive, but they're easily manipulated by a semiprofessional thief. Replace such locks with a dead-bolt lock. In this

type, only a key can open the lock.

Dead-bolt locks can replace the doorknob lock or can be used in addition to it. A dead-bolt lock requires a key to open it on both sides and thus it's a good lock to use on doors containing glass panels. Even if the thief breaks the glass, he still cannot unlock the door.

Avoid creating fire hazards

Care must be taken to keep keys to these locks out of sight, but near the door. If keys aren't readily accessible, these locks could be a hazard in case of fire.

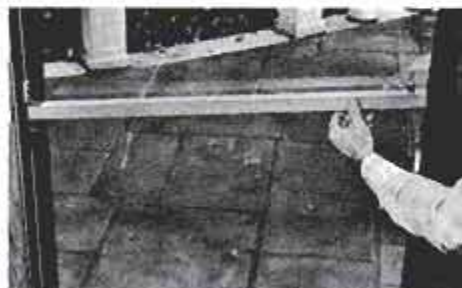
In regard to the possible fire hazard inadvertently developed by security measures, it is advisable to use keyless locking devices on at least one door to the outside. A number of the devices are shown in the photos on this page.

The popular patio sliding-glass door is usually equipped with a very flimsy lock, but due to the design of these doors, they are easily secured with keyless locks. For this reason, it's a good idea to consider the sliding door the best family escape route in case of fire.

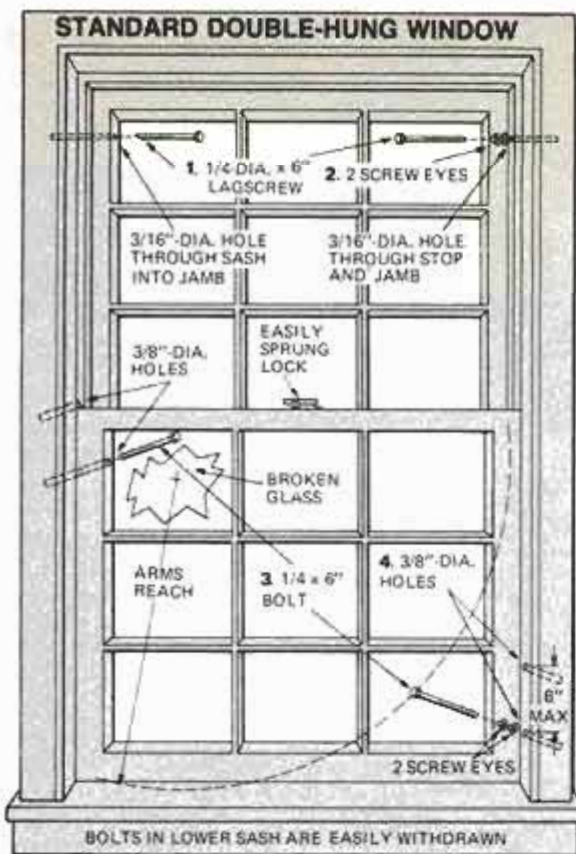
Check all doors to see that the



This adjustable patio door lock will fit any sliding glass door. It's about \$11.50; write to Ideal Security Hardware Corp., 215 East Ninth St., St. Paul, Minn. 55101.



Make your own patio door lock from 1 1/2-in. square stock, 1x2 in. hinge and button magnet. Lock rests on door bumper when down; any small magnet will hold lock in up position when door is in use.



1 Secure upper sash with lagscrews through stile into jamb; **2** if sash is too thin, mount two screw eyes on face; **3** place lagbolts diagonally (out of reach) in case thief breaks pane; **4** angle lower sash holes so that the bolts can't jiggle free. Use the upper diagonal holes to lock window open a maximum of 6 in.



This sliding aluminum window key lock can lock windows closed or open. Under \$8; write to Ideal Security Hardware Corp., 215 East Ninth St., St. Paul, Minn. 55101.



If you don't want to buy a lock, use the old nail trick. You can get a fancy version for \$1.49 from Radio Shack, 500 Tandy Center, Fort Worth, Tex. 76102.

Burglary insurance: a typical policy

Increasing concern about theft and burglary is leading many homeowners to inquire about insurance protection. According to the Institute for Property and Liability Underwriters, Malvern, Pa., the typical homeowner policy covers loss due to theft in the same broad terms that it covers loss due to fire. There is usually a \$100 deductible per loss, though some policies may differ.

Specific limitations on coverage are usually spelled out in the policy. But there is a large range of items that are specifically *not covered* by all policies. These include: pets, unlicensed motor vehicles (power mower may be covered, but not a golf cart), transmitters operated by a car, property of boarders, stored inventory for a business and business property.

Then there's a long list of items which are treated with too much diversity in policies to generalize about them. These include: cash, bank notes, gold, jewelry, silverware, securities, notes, passports, tickets, stamps and other valuables.

The important thing to remember about most items is that claims are figured on an "actual cash value" basis. This means replacement cost less depreciation.

According to the Institute, "this surprises lots of people, who have come to value certain things more with age." But for the identical reason, the insurance company considers the same item valueless.

As most homeowners have their insurance policies reviewed annually, it's a good idea to make a list of items about which you are specifically concerned and discuss these with your agent. Additional coverage may be necessary.

It's possible to have policies written to insure practically anything, but you'll discover it's very expensive to cover large quantities of gold, silver, jewelry, cash and negotiable securities in the home. Insurance companies would much prefer that you use another, less expensive method of loss control, such as a bank safety deposit box.—M.S.

locks are in good working condition and that mounting screws are tight in solid jambs and doors. Make sure that a previous owner didn't mount a door with removable hinge pins exposed to the exterior. If you find this situation, rehang the door with pins on the inside.

Windows

As the conventional route of entry is a door, many people invest in good door locks, but ignore their windows. "But thieves are not conventional," according to one authority. "Usually young and nimble, they will climb or crawl through an apparently inaccessible window just like a cat. When securing your home, think of the potential burglar as nimble as a cat and strong as an ox."

The standard double-hung wooden window is usually equipped with a thin sheet-metal lock that can be easily and quietly sprung with a crowbar. There are also a large number of new window locks designed with keys. Many of these locks are installed in a position that still allows a thief to force open the window—usually by springing the screws.

While the old reliable nail or bolt trick (see drawing, upper left) is not very attractive, it is still one of the

easiest and best ways to lock these windows.

Many newer homes have sliding aluminum windows which can be secured as shown in the photographs on this page.

The locks shown here allow you to lock windows in an open position for ventilation. Note that 6 in. is usually the recommended maximum width for an opening. Once you've installed a lock that allows you to lock the window open, be sure to get in the habit of using it. "You'd be surprised at the number of homes that get burglarized because people forget to use the locks they have," according to an FBI spokesman.

Basement windows are often the entry route of the burglar because they are sometimes considered unsightly and are concealed by shrubbery (the burglar's friend). Metal frames are often rusty and easily forced or the glazing has been damp for years and is easily pushed or scraped out.

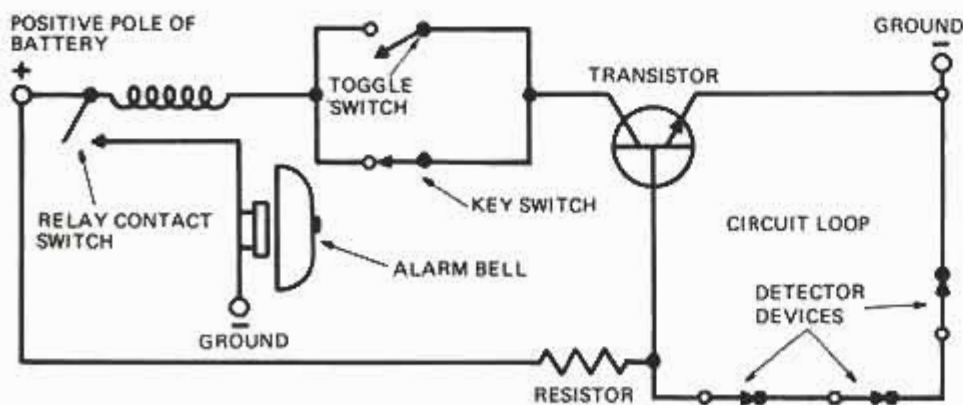
The three most common ways of securing basement windows are to install a metal grate over the area-way opening, install a metal grate over the window from inside or, if ventilation is not a concern, replace basement windows with glass block.



Central component of Radio Shack system is an alarm-control box. Basic kit has (from left): magnetic detectors, 100 ft. of wire,

switches, keys, pressure detectors, foil terminals, foil, instructions. Detector spacers and extra wire are also shown.

SIMPLIFIED SCHEMATIC OF PERIMETER SYSTEM



Key switch is closed to arm perimeter system. Resistor allows a small current to travel through the loop to ground. If current is broken anywhere around circuit loop, the

transistor amplifies current and sends it through the key switch to a relay contact switch. This switch turns on full current to the alarm bell, sounding the alarm.

Install a perimeter system

Among the many electrical perimeter systems now being made to detect intruders is one sold by Radio Shack for \$99.95. Complete with wiring and protection devices for at least three rooms, it includes an alarm bell and battery enclosed in a heavy-gauge metal box. The box is mounted outside, close to the main entrance. There is an on/off key-lock switch on the bottom of the box, just behind an "armed" indicator light. When leaving or entering the house, the system is armed or disarmed with the key switch.

The box also includes electrical controls which cut off the alarm after five minutes. It's a closed-circuit system, a common arrangement for perimeter systems: A number of different detectors are mounted on windows and doors and wired into the system. In these devices, contacts are closed and a small amount of current is always passing through them. If there is a disturbance of any of the parts on which the devices are mounted, the circuit is broken. The current is then instantly amplified and diverted through a relay-coil-operated switch to operate the alarm. A simplified schematic of this system is shown at left.

Your first step in installing this system is to mount the alarm-control box just outside the main entrance to the house.

For convenience, it makes sense to mount the box on the side from which the door opens. It will be necessary to bore a hole about 1/4-in. dia. through the wall of the house just behind the box. Two wires must pass through this hole. One wire is the lead wire for the circuit and the other goes to a toggle switch mounted



Remove masking tape from plunger switch before closing and securing door of alarm-control box. Switch sounds alarm if door is pried open while system is armed.



Test key and toggle switches and current in circuit wire. With either switch turned on, alarm should sound when wires are separated. If system is okay, turn switches off, mount toggle switch; then install and wire detectors at windows and doors.



Attach unwired half of a magnetic detector to a door with screws. Often, surfaces are not flush, so use spacers available from Radio Shack. Cut and attach only one wire of the circuit line for each detector.

just inside the door. The system is also armed and disarmed by this switch.

This arrangement of two switches on each side of the door allows you to use the main entrance as often as necessary without tripping the alarm.

After the box is mounted and battery and wire connections are made, and the wires have been run through the wall, make two simple tests.

First, remove the tape from the plunger switch inside the box. The bell should ring if the system is armed. Then close the box and secure with the screws provided. Now test for current in the circuit. Hold circuit wires together and turn on one of the switches. The alarm should ring when the wires are separated.

For good contact, all splices in the wiring should be soldered and taped. Also remember that detectors are wired in series, not parallel. This will be no problem if you remember to splice into or cut only one wire for each detector in the two-wire circuit

line. It doesn't matter which one, as long as it's just one splice per connection.

You will probably begin the inside wiring with the front door itself. As the wire is quite small, you can run the circuit line along the top of the baseboard without it being very noticeable. If you keep door detectors close to the circuit wire you save wire and minimize visibility of the system.

Install magnetic detectors carefully: They should not be spaced more than $\frac{1}{4}$ in. apart or the force of the magnets will not be strong enough to control the switch.

Installing a second detector will protect your windows when open, but note that the recommended maximum space for the opening is 6 in.

Also included in this alarm system kit is 120 ft. of self-sticking metal-foil tape. Use this tape on stationary glass panels such as the one usually found adjacent to a sliding glass door. Since the glass doesn't move, a thief would have to break it to enter the house. Breaking the glass would



Priced around \$130, Valueguard S-5 floor safe may be installed in any floor. Write John D. Brush & Co., Inc., 900 Linden Ave., Rochester, N.Y. 14625.

SAFE AT HOME?

During a recent press conference held by a major lock manufacturer, a former "cat burglar" gone straight described with pride how he entered a house in which the family was sound asleep. Without waking anyone, he scouted around quickly until he found the painting which hid a wall safe. With little effort, he broke the combination and took some \$80,000 in negotiable securities, cash and jewelry.

Wall safes, especially those hidden behind paintings, are vulnerable because Hollywood movies have been telling audiences for 40 years or more that wall safes are hidden behind pictures.

Somewhat more secure is the relatively new floor safe—a box with combination lock that installs unobtrusively beneath a floor. When the safe is covered with carpet or rug, there's a good chance a thief will miss it.

Or, follow the example of a family in New London, Conn. They're semiretired after years of operating a grocery. In their spare bedroom sits the safe that once served their store. It's in plain view—in fact, there's a lamp right on it.

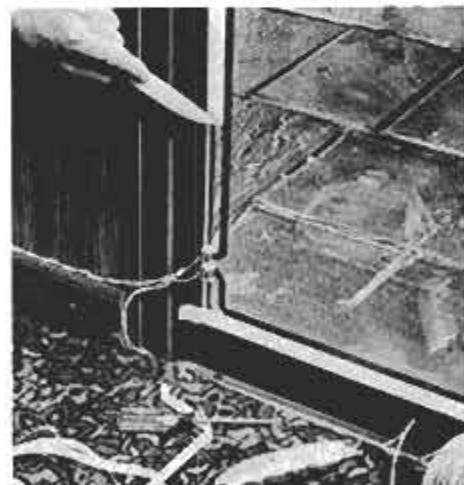
However, only a safecracker could get at its contents. The safe—about the size of a small chest—weighs over 500 pounds.—J.I.



Conceal circuit line under the door's saddle. Keeping circuit line close to the floor will minimize needed wire.



Attach second unwired detector to a window so it can be protected while open for ventilation. It is also a good idea to lock the window in the open position.



Use self-sticking foil tape on stationary glass panels. Masking tape was used to frame the window first and thus serve as a straightedge guide for the foil tape.



Panic switch is usually mounted close to the bed, but a perimeter system may have panic switches anywhere you choose. Since this switch is the last one in our circuit, ends of the two circuit wires are attached directly to the switch terminals.

break the foil and the circuit and, thus, sound the alarm.

The panic button is usually mounted near the bed, but may be placed anywhere. In this device, the contacts are closed. When you press the button, you break the circuit and sound the alarm.

Installing a perimeter system in most cases is easy and requires no more than an afternoon's work. The system shown here is available from Radio Shack, 500 Tandy Center, Fort Worth, Tex., 76102.



In wireless system, a door being opened will separate a magnet (on door) and magnetic switch (in transmitter on trim), causing transmitter to send radio signal to receiver in main control box on table. Box (above) has digital keypad that allows you to program unit. Transmitter (left) is opened to show the magnetic switch (circled).

A wireless alarm

By now you realize that most perimeter-protecting systems require running quite a bit of wiring (although we presented a fairly easy-to-install version on the preceding pages). If you don't mind snaking wires through walls, connecting a veritable rat's nest of wires at the control box, and figuring out manufacturer's diagrams, then, installing a wired system is relatively easy for many do-it-yourselfers.

But a *wireless* system will save you even that work. The only thing that's awesome about installing a wireless system is the price: compared to the wired variety, it's about four times the total cost.

Wireless systems are similar to

wired ones in *what* they do, but they differ in *how* they accomplish it.

Like wired systems, a wireless model must have transmitter sensors installed at every perimeter location—doors, windows—that you want protected. And, of course, a wireless system must also be wired to an alarm in the house or outdoors.

The most interesting part of the wireless system is the design of the tiny transmitter. The unit, just about the size of a pack of cigarets, is the heart of the system.

Inside each is a radio transmitter and a magnetic switch, powered by one 9-volt battery that—according to both manufacturers—should last for a year of operation.

Setting up these units is quick and simple. Each one has a bar magnet

supplied—the bar magnet inside a matching plastic case. When the transmitter (on trim) and bar magnet (on door) are positioned close to each other, the magnetic switch in the transmitter is pulled shut by the magnet on the door. But, if the magnet is pulled out of position—as a door or a window opens—the switch in the transmitter opens and causes the transmitter to go into operation.

The unit broadcasts its electronic warning directly to the master control box. While not very powerful, each transmitter is capable of having its warnings received throughout most wooden frame houses.

The control box, which contains the receiver, may be placed on a shelf or a table—or even hidden away in a closet. The only thing to watch is that you don't put it in a place that's shielded from radio waves (where it might be surrounded by wall insulation containing layers of aluminum foil, for example).

You'll also want to keep it somewhere that it will be readily accessible, but not obvious to thieves who have entered your home. The keyboard atop the unit allows you to do such things as set delay times and turn the unit on and off (often by entering a three-digit code).

The alarm on these units is built into the control box (another reason for keeping the box out in the open) and can only be heard within your house. It is possible, however, to hook up accessory outdoor alarms and horns to the units if you'd like your neighbors to respond.

As mentioned, just about the only drawback to this type of system is the price. The transmitters (about \$30) are quite a bit more expensive than the simple switches in a wired system. So, if you have many doors and windows to protect, the cost could mount swiftly.

But, for ease of installation and reliability, it's hard to beat a good wireless installation.

Computerized alarm system

A few companies are offering *wired* systems that use small microprocessors in the control box. Because they are computerized (although only to a small degree) they can do things that the typical wired systems can't do.

Rather than depending solely on remote sensors that open and close mechanically, as in normal wired systems, these control boxes can accept input from a variety of sensors: motion, impact and/or vibra-



Automatic lighting-control systems use two control boxes (and modules detailed on following page) which may be placed at bedside or any convenient spot (BSR system shown). Main control box (top right) lets you manually control your lights and appliances. You need the programmer box (bottom right) for automatic control.



tion detectors can be wired to the control box.

As mentioned previously, vibration detectors are great to use on a fence. Put the sensor anywhere along the fence line and just adjust it to the sensitivity you need. If someone tries to scale or cut your fence, the computer in the control box will sense the intruder's presence from the detected vibrations.

Similarly, impact sensors protect the windows of a dwelling or even the walls. Any harsh blow in their area will set off the alarm.

Some of these computerized systems will accept motion-detector sensors. Infrared motion detectors wired into this type of system are very popular. The infrared sensors are like remote thermometers that keep watch on the room's temperature. They do not respond to gradual changes in temperature, but let a thief at 98.6° F. enter the room and they will communicate this to the master control box's computer, which will sound the alarm.

Remember, all of these sensors must be wired to the main control box in the house. Installation requirements are very similar to those discussed under wired perimeter systems.

Another option with computerized systems is an automatic telephone dialer. You just supply the computer with the phone number to call and it will dial the police for you. Then, a prerecorded message on a cartridge tape plays back and tells the police that your house is being broken into. Sounds great, but re-

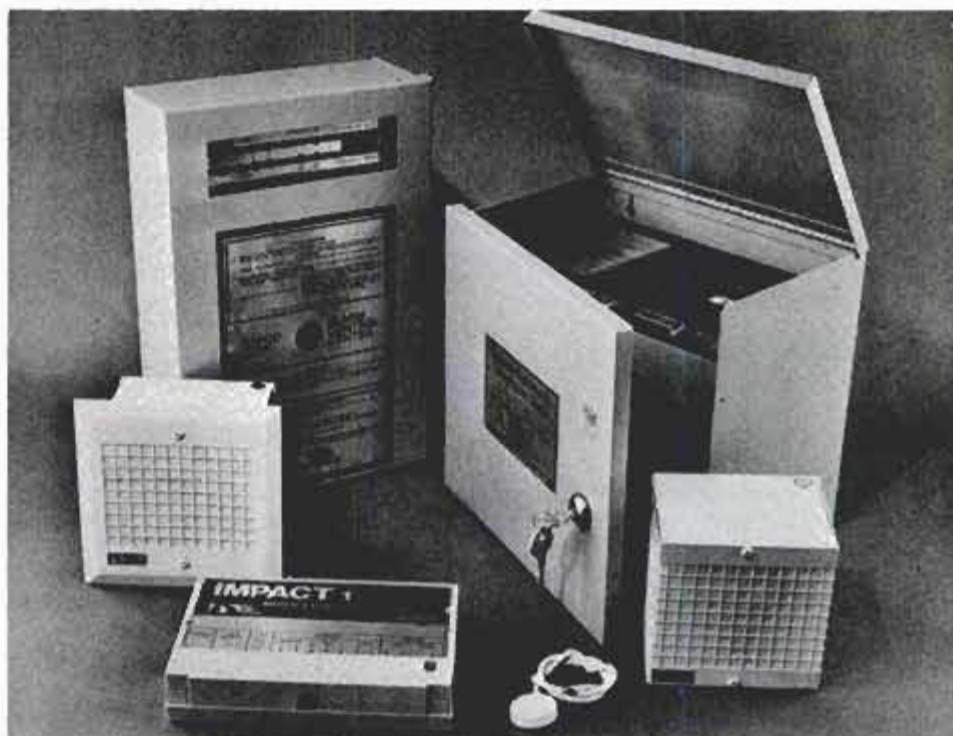
member, many police headquarters are not happy with this system. The police precinct we spoke with on Long Island, N.Y., told us: "We don't encourage people to use those things because it seems like it's one false alarm after another." Many people sooner or later forget to set a delay time and leave the house, or a guest inquisitively hits a "panic button," or the house electricity goes off or has a voltage surge and there goes

the phone call to the police.

After a few false alarms, police will inform you that they will no longer respond to automatic calls.

Self-contained motion detectors

You don't need a complete computerized system to use motion-detecting technology. Many types of motion detectors are available that



Computerized system, such as this one from Napco, can accept inputs from many types of sensors. Two boxy-looking infra-

red sensors are shown along with an impact sensor. Automatic telephone dialer (background) is optional with the system.



Plug-in module (above left) is heart of lighting system. Programmable outlets (center) can replace wall outlets. Programmable switch (right) is also available. Module detail (left) shows codes.

Using modules in automatic-lighting control systems is easy. Just plug a module into the wall and then plug the light or appliance into the module (as shown at left). In the BSR system, as many as 16 lights and appliances can be used.

appear to be just simple, small boxes. Self-contained, with a built-in power circuit and alarm, these detectors can be mounted on walls, hidden in niches or just placed on shelves.

Those that operate passively are the light-sensitive and infrared varieties. Both are sensitive to a room's environment. The light-sensitive detector will react if a burglar enters a dark room and turns on the lights, or if he turns the lights off with the detector adjusted for a lights-on condition. And they are sensitive enough to sound the alarm if an intruder changes the light level at the detector, by walking past a window during the day, for example. The infrared detectors operate like a remote-sensing thermometer (as detailed above).

Other units—called active detectors—actually transmit waves of energy and detect the movement of any object or person in the room, much like radar in principle. These units are ultrasonic and microwave detectors.

In the case of ultrasonic detectors, the energy is sound waves (not audible). When they bounce off an object or person that's moving, the alarm will sound. A disadvantage of ultrasonic detectors is that heat sources such as radiators can set them off: That's because heat sources cause air in the room to "shimmer."

Microwave detectors aren't affected by heat sources and can be positioned anywhere, as long as they are facing the protected area. Like the ultrasonics, microwaves are re-

flected from a moving object or person, and that sets off the alarm. Since wooden doors are not a barrier to microwave energy, don't point your detector at the front door with the sensitivity set so the mailman sets off the alarm on his appointed rounds.

No matter what brand or type of motion detector you choose, be certain that it has a sensitivity control. Also, many of these units protect areas quite different in shape from others. Best bet is to find a store that will let you try them out in your own location; that way, you can make certain they will protect the area you want them to.

Oh, and once set up, you'll have to stop your dog from walking through those rooms at night.

Automatic lighting control

If a burglar thinks you are at home, he is less likely to break in. When they leave the house, many people use simple timers to turn a light or two on and off, but—if you're on a long vacation—just about any burglar can figure out the ruse in a day or two.

The answer is an automatic lighting control. The system uses some fancy computer technology to turn all your home's lights and appliances into wireless remote-control devices.

The basic system is composed of a control box and "modules" that plug into the wall. And you can add the programmer-timer unit, too.

It couldn't be simpler to use: All you do is plug each module into an outlet. And then plug whatever you want to control into the module. (Two wattages of modules are available, one for lights and the other for current-demanding appliances.)

Then, you set two dials on each module. One dial, called the "house code," tells which control box will control that module. Ordinarily, everything in your home can be controlled with one box, so all dials will be set to the same code. The second dial, called a "unit code," sets the number you want to assign to that module.

For example, set up a bedroom light as "Module No.1." Now, go anywhere in your house and plug in the control box. Push the No.1 button and you'll turn the bedroom light on and off—even dim or brighten it. Sixteen modules can be controlled by each box. You can even turn everything being controlled on or off in unison. If you don't want to use the plug-in modules, you can replace entire wall switches or outlets with built-in types (see photo above).

The modules are really transmitter/receivers that use the household electrical system to communicate with the control box. This communication is digitally coded, each appliance with a different digital code.

But what makes these systems more than remote-control devices and makes them security devices are timer and programmer units. A programmer looks more or less like an electric clock, but the front of the

(Please turn to page 155)

Now you can train at home in spare time...

Be an ELECTRICIAN

ELECTRICIANS average more than \$11.00 AN HOUR!

Don't count on getting into a union or earning union wages as soon as you graduate, but these figures from the U.S. Dept. of Labor Occupational Outlook Handbook show that electricians are among the highest paid construction workers. In 1978, wage rates in metropolitan areas for electricians averaged \$11.25 an hour after regular apprentice training program. Union wages were even higher.



Construction, Maintenance, Electrical Contractor... No previous experience needed. Experts show you what to do, how to do it... guide you every step of the way!

Train now to join the thousands of skilled electricians who are employed from border to border and coast to coast. Even before you finish your course you will understand how to specify and install wiring, how to operate and control electric motors and generators, and how to use and maintain basic electrical equipment like transformers and storage batteries. You'll learn how to use electrical instruments to check voltage and current, how to trouble-shoot for short circuits, overloads and open wires, and you'll be ready to take almost any electrician licensing examination offered by city, county or state.

Tools, Materials, Testers, All Included With Course!



You get texts, lessons, tools, multi-tester, plus all the materials you need for your lab experiments—rheostat, fuse, wiring receptacles, switches—everything to get you off to a fast start.

Here are just a few of the subjects covered in your course: Switches, thermostats, relays. Fuses, circuit breakers, GFCI's. Electrical boxes and fittings. Electrical for heating, lighting and motors. The National Electrical Code Book...how to use it. Estimating and pricing. Residential, commercial and industrial wiring practices. How to go into business for yourself...plus much, much more!

No need to quit your job or regular school

Everything is explained in easy to understand language with plenty of drawings, diagrams and photos. And you learn at your own pace...at home in spare time so there's no need to quit your job or change your daily routine. No time wasted travelling to class. Consultants are as close as your telephone, and we pay the bill! Use our toll-free 24-hour home-study hotline as soon as you enroll.

MAKE EXTRA MONEY! Save money on your own electrical work!

Even before you're ready to go after a full-time job as an electrician, you could be making extra money doing odd jobs for friends and neighbors. And think of the money you'll be able to save doing your own electrical repairs and installing new electrical outlets and lighting.



Approved for Veterans

REMOVE AND MAIL ENTIRE PAGE

FIRST FOLD HERE

FIRST FOLD HERE

NO POSTAGE NECESSARY when you mail this ENTIRE Postage-Paid ad

To Mail—Fold ad in following manner:

1. Remove entire page—tear or cut on dotted line to left
2. Fold page in half on 1st fold lines
3. Fold page again, on 2nd fold lines
4. Tape or glue the 3 open sides and drop in the mail box today.

SEND FOR FREE FACTS AND COLOR BROCHURE



ELECTRICIAN GREAT MONEY-MAKING CAREER

Sent FREE

APPROVED FOR VETERANS

Find out about the employment outlook for electricians. Check on the exciting opportunities with construction companies, big corporations and power companies as well as starting your own full or part-time business. Send for big color brochure filled with information how you can learn at home to be an electrician. We will also send you results of a survey showing the employment success of our graduates.

Accredited by the Accrediting Commission of the National Home Study Council

Rush me free facts and full information on how I can train at home to be an electrician. No obligation. No salesman will call.

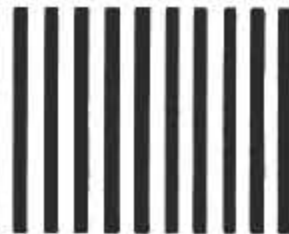
Name _____ Age _____
Address _____
City/State/Zip _____



ELECTRICIAN SCHOOL, Dept P80C1
ICS Center, Scranton, PA 18515

SECOND FOLD HERE

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES



BUSINESS REPLY MAIL

FIRST CLASS Permit No. 1000
Scranton, PA

Postage will be paid by addressee

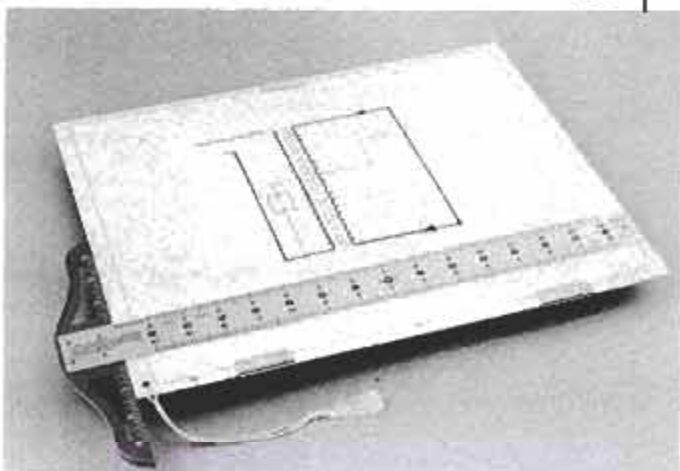
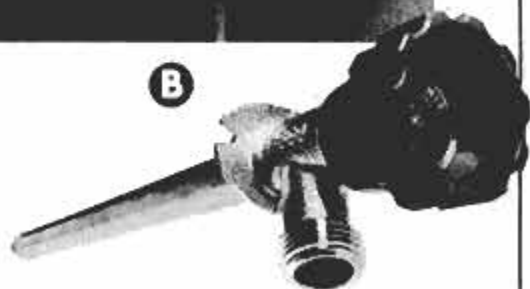
ICS ELECTRICIAN SCHOOL

ICS Center,
Scranton, PA 18515

SECOND FOLD HERE

REMOVE AND MAIL ENTIRE PAGE

NEW NOW for home and shop



A

A The Woodburning Tool Kit consists of a 25-watt, 6- $\frac{3}{4}$ -in.-long woodburning pen, three interchangeable pen points and a sturdy wire holder to rest the tool when in use. According to the maker, the pen develops temperatures up to 950° F., consequently permitting faster and darker woodburning. The kit, \$18.95 at craft stores, is made by Dremel Div. of Emerson Electric Co., 4915 21st St., Racine, Wis. 53406.

B Two new plumbing fixtures have been introduced by Nibco Inc., Box 1167, Elkhart, Ind. 46515. The Pressure Equalizing Valve is a solid brass tub and shower fixture with a replaceable rubber diaphragm that maintains constant water temperature and pressure to the tub or shower—even while water is being used in other parts of the system. It costs \$78 at plumbing-supply stores.

Nibco's frostproof outdoor faucet is available from the same suppliers. It comes in lengths from 4 to 14 in. and costs \$10 to \$15, depending on length. When its recessed handle is removed, the valve stem is inaccessible from the outside, thus reducing the chances of vandalism.

C The Spotlitter is a new rechargeable flashlight, made of ABS plastic that can operate up to 1 $\frac{1}{2}$ hours without recharging. The replaceable bulb works on either high or low beam, and a small light indicates when the unit is being charged. Total weight of the light, charging base, 6-ft. cord and plug is 2 lbs.; the price is \$25. Made by Black & Decker Inc., 515 Glebe Rd., Easton, Md. 21601, it's available at hardware stores and home centers.

D The Line-Up Idea Table is a small portable drawing table that weighs 3 lbs. and measures 13 × 16 in. Its $\frac{1}{16}$ -in.-thick aluminum top—supported by four rubber feet—must first be covered with mat board before drawing is done. Included are three hold-down clips for the mat board and drawing paper and a calibrated T-square. Made by Fairgate Rule Co. Inc., Box 278, 22 Adams Ave., Cold Spring, N.Y., 10516, it costs \$36.30 at art-supply stores.

YOUR PRESENT STORM WINDOWS ARE NOT ENOUGH!!!

TORLITE Can Double or Triple Insulate Windows

SAVE MONEY ON HEATING COSTS

One **Torlite** kit can cover over 160 square feet of window area. This means you can stop heat LOSS and PREVENT cold air infiltration from ten average size home windows. With an energy savings that may equal ten times the cost of one kit.

The **Torlite** window system has been used exclusively by industry both here and abroad for many years. Now limited supplies are available for public and private use. The **Torlite** window system installs in five minutes, using no nailing strips, screws or tools. **Torlite** is a totally new 100% optically clear and tough film with no cloudiness or haze.

Even should you have storm windows, you can form another insulation barrier against heat LOSS and SEAL OUT cold air infiltration. The **Torlite** window system creates an insulating pocket of air inside your window area by keeping cold air OUT and keeping IN your heated room atmosphere.

Any type window, be it casement, bow, jalousie, steel, aluminum, wood can be made 100% air tight. Trailers, factories, farms, apartment buildings, churches, hospitals, schools, motels and virtually every business can use this system to realize substantial energy savings.

No other window kit available on the market today offers the amount of window coverage and energy savings of the **Torlite** system.



Durable, strong, high tensile strength



Fits any size, shape window



Easy as a zipper to open for access

- **Torlite** is 100% optically CLEAR. You don't even know it's on your window.
- We have developed an exclusive acrylic polypropylene fastening system that allows the **Torlite** film to fasten to the inside window frame, molding or wall.
- No tedious measuring or cutting to exact dimensions. All excess is trimmed after **Torlite** film has been installed.
- Designed for use on the inside. No climbing ladders or difficult outside installation unless you want to.
- Can be taken down, stored and reused for next year.
- The **Torlite** system offers the same cost saving benefits for saving on your air conditioning costs.
- The sun's ultraviolet rays have a minimal effect on the **Torlite** film.
- The **Torlite** comes packaged on a roll, not folded or creased, so you are assured of receiving a quality product.
- **Torlite** film is a Giant 50 inches wide by over forty feet long. For a total of 160 square feet for one kit. 108 feet of fastening system is included plus complete instructions and pictures showing step-by-step installation. Reorder forms are included for fast and easy ordering. TWO kits - one roll 50 inches wide by 80 feet long. THREE kits - 50 inches wide by 120 feet long.

You can test **Torlite** in your own home without risk. Trial test any two windows in your home. Compare the temperature and overall comfort. Should you feel that our system does not perform and you are convinced that it is not every bit as effective as we say, return the unused portion for a complete refund LESS POSTAGE.

This offer is made direct from the manufacturer. The **Torlite** material is not available to the public thru any retail outlet or store. We regret that we are unable to accept credit cards or telephone orders.

ONE COMPLETE KIT FOR A LOW

14⁹⁵
+ Postage

GUARANTEE

SHOULD YOU NOT BE COMPLETELY SATISFIED, RETURN UNUSED PORTION WITHIN 15 DAYS FOR FULL REFUND, LESS POSTAGE AND HANDLING.

Supplies are limited. So please don't delay.

RPT Manufacturing
Torlite Division Dept. PM-3
470 Easton Rd., Horsham, PA 19044

Please rush me _____ kits complete with easy instructions at the low price \$14.95 PLUS \$1.50 POSTAGE for ONE kit that contains 160 square feet. TWO KITS 320 square feet for \$28.00 PLUS \$1.95 POSTAGE. A savings of \$1.00 if purchased separately. THREE KITS 480 square feet for \$41.95 PLUS \$2.25 POSTAGE. A savings of \$2.00 if purchased separately. TOTAL ENCLOSED _____ CHECK or MONEY ORDER ONLY.

NO C.O.D.'s PLEASE

All shipments made UPS unless other instructions given.

NAME _____

ADDRESS _____ APT. NO. _____

CITY _____ STATE _____ ZIP CODE _____

Orders to CANADA - check or money order must be made payable in U.S. DOLLARS and \$1.00 MUST BE ADDED TO COVER POSTAGE.



FREE BLUEPRINTS and TRIAL LESSON

—for your greater success in Building

Beginners, craftsmen, even foremen and superintendents, have sent for these free blueprints and trial lesson in Plan Reading as a means of trying out Chicago Tech's home-study Builders training. Learn how you can master Plan Reading—Estimating—and the practical details of all types of construction in your spare time at home. Mail coupon below or phone TOLL FREE—see how you, too can prepare for a better job—higher income, or start your own contracting business.

• PHONE TOLL FREE (24 HRS.)
1-800-528-6050 Ext. 810

CHICAGO TECH/School for Builders
1737 S. Michigan Avenue, Chicago, Ill. 60616

CHICAGO TECH/School for Builders Dept. PM-12 1737 S. Michigan Ave., Chicago, Ill. 60616

Veterans Check Here

Please mail me a Free Trial Lesson, Blueprints and Builders Catalog. I understand there is no obligation—no salesman will call.

NAME _____ AGE _____
ADDRESS _____
CITY _____ STATE _____ ZIP _____



CLOCK KITS

Complete

FUN TO MAKE - GREAT GIFTS
KIT INCLUDES:

- Redwood Burl or Cypress, 12" to 16"
- Mini Quartz Movements
- AA Battery and Hanger
- Goldtone Serpentine Hands and Second Hand
- Goldtone Stick-On Numbers
- Prerouted, Predrilled, Sanded & Sealed
- Complete Instructions

ALL FOR ONLY
\$19.95

Redwood Burl - Dark Red Grain
Cypress - Light, Soft, Tan Grain

(Additional movements including hands & numbers only \$5.50 plus \$1.50 shipping.)

TO ORDER send check, cash or M.O. (Sorry, no C.O.D.)
to WOOD-N-THINGS
3128 W. Turrey, Phoenix AZ 85017
(602) 246-0578
ADD \$2.50 for Package/Handling
CYPRESS REDWOOD BURL

NAME _____
Address _____
City _____
State _____ Zip _____

12 SPORTS PLANES YOU BUILD

(Continued from page 81)

such as a maximum limit on wing loading for unlicensed aircraft in order to keep airplanes and ultralights in their proper places.)

The almost toylike Cricket, with a wingspan of 16 feet and a length of less than 13, has to be the world's smallest twin-engine airplane. The engines are mounted in outrigger pods, but sit so close to the nose that no adverse yaw is said to occur if one prop loses power. Full-span "flape-



A pair of twin-prop Crickets, performing a "mirror-image" routine, show off their aerobatic skills. The tiny single-seaters are powered by two 12-hp chain-saw mills.

LYNCHBURG

HARDWARE & GENERAL STORE

42 Main St., Lynchburg, TN 37352

JACK DANIEL'S FIELD TESTER SHIRT



These are just like the shirts old Wallace Beery used to wear. Of course, my shirts have the added feature of a "Jack Daniel's Old No. 7 Field Tester" in brown on the chest. Made of 50% cotton and the rest polyester, so they wash easy and keep their shape. Natural cotton color. Order by size—XS, S, M, L, XL. My \$15.00 price includes delivery.

Send check, money order or use American Express, Visa or MasterCard, including all numbers and signature. (Add 6% sales tax for TN delivery.) For a color catalog full of old Tennessee items and Jack Daniel's memorabilia, send \$1.00 to the above address in continental U.S. or call 1-800-251-8600. Tennessee residents call 615-759-7184.

AUTOMATIC GARAGE DOOR SYSTEM

- NO PLASTIC PARTS - ALL STEEL
- AUTOMATIC REVERSE
- 1/2 HORSEPOWER
- LIGHT TIME DELAY
- DIGITAL REMOTE CONTROLS
- SHIPPED UPS OR PARCEL POST
- UL & FCC APPROVED
- MADE IN U.S.A.



FREE INFORMATION

MOTORDOOR P.O. BOX 1565
NORTH WALES, PA 19454

USE YOUR ORBITAL SANDER AS A PAINT CAN SHAKER!

Prepare paint for use the spill-free way... no stirring... no paint paddles... no mixing buckets... no wasted paint. The New INTEREP Can Shaking attachment consists of a base to protect the sander pad and a rubber strap to hold the can—quart, pint, half-pint and the squat-size pint. At 4,000 to 10,000 rpm, the content of the can is thoroughly shaken with the can lid on—ready to use in about one minute.

INTEREP Can Shaking Attachment costs only \$12.00 plus \$2.00 for shipping and handling. Residents of Connecticut add 9% State Sales Tax. Order from:

INTEREP COMPANY

766 Main Street, Newington, CT 06111
Allow four weeks for delivery. Specify the length of your sander pad—7 1/4" or 9 1/2".



Look familiar? This smartly styled, twin-tailed Acapella is based on defunct BD-5. Using BD-5 fuselage and wings, it does 240 mph and is built from new conversion kit.

rons" in the wing function as both flaps and ailerons. Deployed collectively as flaps, they reduce stall speed to 42 mph.

For aerobatics, the Cricket has an inverted fuel system, a fast roll rate of 180° per second, and a rugged airframe stressed at +9 Gs and -4.5 Gs. Construction is sheet aluminum over foam. With the wings removed—a job that takes less than five minutes—the entire craft fits in a specially made 5 x 13 1/2-foot "han-

gar-trailer" for towing and storage.

U.S. distributor for the Cricket is Chris Heintz, famous for his own Zenith, Tri-Z and other homebuilts. Plans are \$150; airframe kit, \$3,857; twin-engine package, \$1,981. An info pack is \$10 from Zenair Ltd., 236 Richmond St., Richmond Hill, Ont. L4C 3Y8.

More new superlights

Not much bigger than the Cricket is another imported mini, the 30-hp, 230-pound Hornet from Australia. An unusual flying-wing design with no tail, the tiny single-seater em-



Providing good performance on low power, little single-seat Starlets take VW engines from 30 to 75 hp, are semiaerobatic and can be built for \$5,000 to \$6,000.



Kit-built Spitfire, an 8/10ths-scale replica of the historic WWII British fighter from Thunder Wings, is authentic down to camouflage and actual squadron markings.

employs a clever system of dual-function controls to achieve the same effect as a tail. Combination "elevons" in the wing serve as both elevators and ailerons. Pivoting fins on the wingtips can be used individually as rudders or collectively, like spoilers, for speed and glide-path control.

But what really sets the Hornet apart from conventional airplanes is its remarkably low wing loading—at only 3 pounds per square foot, no more than that of most ultralights. (Wing loading is total aircraft weight, with pilot, divided by wing area; the larger the wing, the lighter its loading per square foot.)

While light wing loading generally

(Please turn to page 124)

2nd MOST IMPORTANT TOOL FOR EVERY WOODWORKING SHOP

VERSATILE W&H MOLDER-PLANNER

Almost as basic as your saw... molds, planes, rabbets.

From \$410

- Master Charge
- VISA



FREE BROCHURE

WILLIAMS & HUSSEY MACHINE CORP.
Dept. 17, Millford, N. H. 03055
Toll-free 1-800-258-1380

SPECIAL OFFER!!

1943 Steel Cent Set

Due to shortage of copper during the critical war year 1943, the POSTPAID Treasury Dept. resorted to the use of zinc coated steel for our cents. One coin from each mint, attractively displayed.

\$225



14K GOLD JEWELRY CO.

Box 62, Glen Cove, N.Y. 11542 Dept. PM-1

The Worden System Antique Lamp Designs



W18-1 Wisteria

Build Tiffany Style Lamps For Hobby & Profit At Most Stained Glass Dealers BIG COLOR CATALOG \$1.00

H.L. Worden Co. Dept. PM81
P.O. Box 519, 118 Main St.
Granger, WA 98932
Telephone 509-854-1557

Free!

Edmund Scientific Catalog



4,000 Unique Items

Astronomy, Microscopy, Bioteedback, Weather, Alternate Energy, Binoculars, Optics, Magnets, Magnifiers, Tools, Unique Lighting, Lab Equipment, and much more. Over 4,000 unique and fascinating products. Send for our FREE, colorful 1982 Edmund Scientific Catalog... Today!

Rush me your free catalog!

Name _____

Address _____

City _____

State _____ Zip _____

Clip And Mail Coupon Today To:
Edmund Scientific Co., Dept. 8211 H-02
Edscorp Bldg., Barrington, N.J. 08007

No. 3455 *1982 Edmund Scientific Co.

Do-it-Yourself WOODWORKERS

You can build it cheaper than buy it...

You can restore & refinish it cheaper than hire it!

Here's everything you need



Mail Coupon for—

CONSTANTINE'S Woodworker Catalog

IF YOU are at all handy with tools—or willing to learn in easy steps—here's the modern-day way to SAVE considerable sums of money. Build what you need. Restore and refinish what you own. Save on every project.

Everything you need—fine woods, veneers, specialty tools, wood finishes and how-to guidance—can be ordered by mail from Constantine. Read this partial list of CATALOG OFFERS: 14 kinds of cabinet & furniture woods, 90 veneers plus 19 flexible veneers to cover beatup or unpainted furniture, 76 inlays, 59 borders, 54 carving blocks, 118 carving tools & chisels, 32 upholstery tools & essentials, 39 clamps, 33 finished picture moldings, 72 lamp parts, 500 plans, 96 how-to books. Kitchen cabinet space-savers, carved molding, drill attachments, carbide saw blades.

ALSO: cane, fiber rush, reed. Period & modern hardware: latches, locks, hinges, pulls, escutcheons. Small-box hdwe. Framing clamps, wood-threading tools, angle-cutting jig, circle cutter, veneer saw, bow saw, mat cutter, miter trimmer, deep-throat fret saw. Turned, carved, square-taper furniture legs, wood bowl seal. Kits: gameboards, guitar, lazy Susan, furniture, clocks, coffee mill & pepper mill. Sliding & revolving hdwe. Plus page after page of useful products for shop, home and crafts.

50 Beautiful Wood Samples

Accept this offer to own a prize selection of colorful richly grained veneers, each 4"x9". Use to identify fine woods. Use as ordering guide. Use in craftwork. Woodworking is more fun when you know your woods.

CONSTANTINE Est. 1812
2051 Eastchester Road, Bronx, N.Y. 10461

Send new Woodworker Catalog, \$1 enclosed.

Also send 50 Wood Samples, \$9.95 extra for this treasure chest of beautiful veneers from around the world. The helpful, perfect supplement to your Woodworker Catalog.

Name _____

Address _____

ZIP _____

FREE! NEW CLOCK BUILDER'S CATALOG

FREE!
Send
Today
No
purchase
required.



- Grandfather, Wall, Mantel Clock Kits
- Traditional Designs
- Movements
- Dials

NEW! OAK SCHOOL CLOCK

The Richmond —

Solid red oak school clock . . . now includes authentic 8-day German going strike movement. Retail value over \$200.00.

ONLY \$99.50

COMPLETE — READY TO ASSEMBLE KIT

INCLUDES: Pre-cut wood parts, factory tested brass German movement, metal dial, glass, hardware and step-by-step instructions. Immediate delivery.



CRAFT PRODUCTS COMPANY

Dept. 01 2200 Dean St. St. Charles, IL 60174

□ Richmond K4 - \$99.50 (+ \$4.00 shipping)

□ FREE 24 pg. Clock Builder's Catalog

Name _____

Street _____

City/State/Zip _____

Serving America's Craftsman Since 1940

LYNCHBURG HARDWARE & GENERAL STORE

42 Main St., Lynchburg, TN 37352



JACK DANIEL'S FIELD TESTER CAP

This is a comfortable sportsman's billed cap. Black mesh (air cooled) and adjustable to any size head, with an official "Jack Daniel's Field Tester" patch on the front. Guaranteed to shade your eyes and start a lot of conversations. My \$6.50 price includes postage and handling.

Send check, money order or use American Express, Visa or MasterCard, including all numbers and signature. (Add 6% sales tax for TN delivery.) For a color catalog full of old Tennessee items and Jack Daniel's memorabilia, send \$1.00 to the above address. In continental U.S. of A. call 1-800-251-8600. Tennessee residents call 615-759-7184.

12 SPORTS PLANES YOU BUILD

(Continued from page 123)

means low performance, the Hornet is a prime example of the kind of new superlight that could give the FAA fits. Despite its modest 30-hp engine, it has a top speed of 127 mph—hardly what you'd consider "low" performance. Its broad, 26-foot wingspan also gives it a near-sailplane-like glide ratio of 16 to 1 for leisurely power-off soaring. Stall speed is a tame 36 mph.

The Hornet has a novel "backward" tri-gear arrangement—the two main wheels are in front—to permit safer rough-field landings that might snap off a single nose wheel. For trailering and storage, the wings fold back flat against the fuselage. Construction is aluminum tubing with fiberglass skins. Complete kits, including engine, are \$9,500 from Free Flight Aviation Pty. Ltd., Lot 3, Kitawah St., Lonsdale, South Australia 5160.

80-mpg Moni

Still another new superlight is a trim little V-tailed single-seater called the Moni, the latest in a long line of successful homebuilt designs from John Monnett. Conceived along the lines of a motorized sailplane, it weighs 260 pounds and does 130 mph on a bitty, 22-hp powerplant that would be considered barely adequate in many ultralights. The engine operates on ordinary auto gas and delivers 80 mpg. At a cruise speed of 100 mph, fuel cost thus works out to less than \$2 per hour—compared to \$18 to \$20 per hour for a Cessna 172.

With a wingspan of 27½ feet, the Moni has a glide ratio of 20 to 1, climbs at 400 feet per minute, stalls at 40 mph and is fully aerobatic. An electric starter permits the engine to be switched off and restarted in flight for power-off soaring. Full-span flaperons work as both flaps and ailerons, and "ruddervators" in the V-tail combine the functions of rudders and elevators.

Like most sailplanes, the Moni has a single, semirecessed landing wheel, plus skids on the wingtips. When taxiing, it heels over on one wingtip, but at speeds above 5 mph it rides level on the center wheel. The purpose of the single wheel is to reduce drag, simplify construction and permit easier landings on rough terrain.

Construction is all-aluminum, and the wings are removable for trailering. Complete kits, plus engine, are around \$5,000 from Monnett Experimental Aircraft Inc., 895 West 20th Ave., Oshkosh, Wis. 54901.

Flying the 'big iron'

Flying your own P-51 or Spitfire is probably a Walter Mitty dream for all but the most affluent, but flying something that looks like a P-51 or Spitfire doesn't have to be. The mighty warbirds shown on this month's cover are authentically scaled-down replicas of famous World War II fighters that can be built from plans at a fraction of what a genuine vintage warplane would cost. But only the measurements are scaled down; the romance and thrills are full scale.

The battle-camouflaged Italian fighter flanked by two American P-51s on page 79 is a ¼ths-scale reproduction of the Reggiane 2000, a fast, versatile single-seater used by Italy's Mediterranean squadrons in the early '40s. The Reggiane was actually patterned after the American-built Seversky P-35 fighter.

The replica has a wingspan of 26½ feet, does 200 mph on a 200-hp Lycoming and is fully aerobatic. Construction is aluminum, wood and fabric at a cost of about \$20,000. Plans are around \$150 from Robert Tesori, No. 2005, 11135-83 Ave., Edmonton, Alta. T6G 2C6.

Mini Mustangs

The two P-51s shown with the Reggiane are 2/3rds-scale replicas of the immortal World War II Mustang, one of the most devastating prop-driven fighters of all time. The one in the foreground is the P-51D model with full bubble canopy. The one in the background is the earlier P-51B "razorback" version with raised fuselage behind the cockpit. Both are powered by 200-hp Ranger engines and have speeds approaching 300 mph—not bad considering that the originals used 1,400 horses, seven times as much power, to do around 420 mph.

Of all-wood construction, the mini Mustangs have a wingspan just under 26 feet, climb at a brisk 1,800 feet per minute and are fully aerobatic. Despite their hot performance, landing speed is a relatively mild 62 mph. Features include constant-speed prop for improved control in aerobatics, hydraulically retractable main gear and steerable tail wheel. Cost ranges from \$26,000 to \$30,000.

Plans are around \$250 from A&B Sales, 36 Airport Rd., Industrial Airport, Edmonton, Alta. T5G 0W7. An alternate source of plans and additional information is the replica's original designer, Marcel Jurca, 2 Rue des Champs Philippe, 92 LaGarenne-Colombes, France. Plans for a half-scale version are also available from War Aircraft Replicas, 348

South 8th St., Santa Paula, Calif. 93060.

New kits for added realism

Getting just the right look and detail in a warbird replica is usually the hardest part of the job. Now, from an outfit called Thunder Wings, comes a new concept in kit building to assure authentic results. You build the basic airframe from Thunder's plans, then apply a set of pre-molded fiberglass skins to complete the exterior. The skins, meticulously shaped and painted—right down to actual WWII squadron markings—produce a scaled-down warplane that, except for its slightly smaller size, is just like the real thing.

Thunder Wings currently offers plans and skins for 1/10ths-scale replicas of three historic World War II fighters—the American P-40C of Flying Tiger fame, the British Spitfire, legendary hero of the Battle of Britain, and the deadly German Focke-Wulf FW-190A. The P-40C and Spitfire have speeds in excess of 200 mph and are designed around a mighty 300-hp, V12 engine patterned after the famous Merlin. The FW-190A takes a 240-hp Continental and cruises at 185 mph.

All three have retractable gear and are stressed to plus/minus 6 Gs for aerobatics. Wingspans range from 27 feet for the Spitfire to 30 for the P-40C. Average construction cost is \$16,000, less engine. An info pack is \$15 from Thunder Wings, 7326 East Evans, Scottsdale, Ariz. 85260.

Build a WWI fighter

Take another giant step back into history and you can build a nostalgic biwing fighter from World War I—the classic British S.E.5a single-seater that was flown by both English and American airmen. An 85-percent-scale, wood-and-fabric replica, it has a 23½-foot wingspan, is powered by a 115-hp Lycoming and does around 120 mph. It even follows the original's unusual machine-gun array—a Lewis over the top wing and a Vickers on the engine cowl (dummies, of course).

Plans are \$100 from Replica Plans, 307-8680 Fremlin St., Vancouver, B.C. V6P 3X3. Construction cost is about \$6,000. An info pack is \$5.

Equally nostalgic, though considerably more modern, is the little single-seat Skyote. Looking a bit like an old-time barnstormer from the '30s, it's actually a high-performance biplane designed for unlimited-class aerobatics. Stressed to +9 Gs and -6 Gs, it takes engines from 90 to 120 hp, does up to 125 mph, climbs at 1,800 feet per minute and features

dual ailerons (ailerons in both the top and bottom wings) for quick roll control. Wingspan is 20 feet.

Construction is metal and fabric at a cost of \$7,000 to \$10,000, depending on engine used. Plans are \$275 from Skyote Aeromarine Ltd., Box 808, Clark, Colo. 80428. Wing kits are \$1,275.

For those who want a low-power, economical monoplane, there's the Corby Starlet, a frisky, low-wing, semiaerobatic single-seater designed for small VW engines of 30 to 75 hp. With a 50-hp VW, it does 135 mph, climbs at 625 feet per minute and stalls at 35 mph. Of all-wood construction with a wingspan of 18½ feet, it can be built for as little as \$5,000 to \$6,000. While the Starlet is an Australian design, plans and engines for it will soon be available from a new U.S. distributor, HAP1 Inc., Eloy Municipal Airport, RR 1, Box 1000, Eloy, Ariz. 85231. Prefab parts will also be sold by other suppliers.

Sporty new two-seaters

Homebuilts occasionally go on to become production-line aircraft, but here's a switch: The Italian-designed Falco, originally a factory job, is now available as a homebuilt kit. A sporty, side-by-side two-seater, it's designed for both exciting aerobatics and comfortable cross-country cruising. With a 160-hp Lycoming, it tops 200 mph and climbs at 1,140 feet per minute.

The Falco has a wingspan of 26½ feet, retractable gear, flaps and a full bubble canopy. Construction is wood, metal and fiberglass. Kit price is \$20,300, less engine, from Sequoia Aircraft Corp., 900 West Franklin St., Richmond, Va. 23220. An info pack is \$10.

Another sleek, side-by-side two-seater is the Glasair, winner of the EAA's Outstanding New Design Award for 1981. Like the Falco, it's powered by a 160-hp Lycoming and is stressed for sportsman-class aerobatics. Its top speed is 230 mph.

Of all-composite fiberglass construction, the Glasair has a wingspan of 23½ feet, fixed gear and a sizzling climb rate of 1,900 feet per minute. A kit of pre-molded parts is \$8,200, less engine. Estimated total cost is around \$15,000. An info pack is \$7.50 from Stoddard-Hamilton Aircraft Inc., Box 1222, Issaquah, Wash. 98027.

Wild new shapes

If you remember the short-lived but spectacular BD-5, you know it was a slick, bullet-nosed beauty right out of the next century. Now

(Please turn to page 126)

SUPER KNIFE SPECIAL

Compare These Prices Anywhere

1 BUSHWHACKER

- 19" overall
- 15" edge
- steel blade
- canvas sheath

2 MACHETE

- 23" overall
- 18" edge
- steel blade
- canvas sheath

3 BOLO MACHETE

- 26" overall
- 18" edge
- steel blade
- canvas sheath

4 SAWTOOTH MACHETE

- 23" overall
- sawtooth on back

5 HATCHET

- wooden handle
- 15½" overall
- 2 lbs.

6 CAMP AXE

- fiberglass handle
- 13½" overall
- 1½ lbs.

7 COMBAT KNIFE

- 12" overall
- 7" edge
- steel blade
- sheath

8 MARINE KNIFE

- 10½" overall
- 5" edge
- steel blade
- sheath

9 SURVIVAL KNIFE

- 9½" overall
- 5" edge
- steel blade
- sawtooth on back
- sheath
- whetstone

LIMITED TIME OFFER

\$6.95

Each

Plus Postage:

Send \$2.00 for complete catalog. Catalog free with order.

Please send me ___ knife(s) at the Limited Time Offer of \$6.95 each or \$6.00 each in quantities of 3 or more. Add \$1.50 postage for first knife and 50 cents for each additional knife. Make checks or money orders payable to TIFFIN INTERNATIONAL.

Alabama residents add 6% sales tax

Knives Available (Enter number(s) desired)			
Quan.	Quan.	Quan.	Quan.
1	3	5	7
2	4	6	8
			9

Name _____

Address _____

City _____ State _____ Zip _____

VISA MASTER CHARGE

Exp. Date _____ Card Number _____

Signature _____

Mail to: TIFFIN INTERNATIONAL,
P.O. Box 881, Dept. PM-1 Guntown, AL 35045
Dealer Inquiries Invited

JANUARY 1982 125

FREE COLOR CATALOG



Build Your Own
Grandfather Clock
Prices Starting Under

\$255

(including movement
and dial)

- Do-it-yourself case kit, parts pre-cut
- Finished clocks
- Solid 3/4" hardwoods: black walnut, cherry, oak
- Heirloom quality
- Factory direct prices
- Solid brass West German chiming movements
- Money back guarantee
- Prompt shipment

MASTERCARD and
VISA ACCEPTED



**EMPEROR
CLOCK COMPANY**
WORLD'S LARGEST MANUFACTURER
OF GRANDFATHER CLOCKS
Dept. 230 Emperor Industrial Park
Fairhope, Alabama 36532

Underground Homes



Plans For The Future -

44 page book features full color artist's renditions of 26 new underground home designs. Includes floor plans, sketches of the different types of earth sheltered homes and a discussion of the most desirable sites and climates for building each type. Blueprints available. \$7.95 ppd.

Earth Shelter Resource Guide -

Where and how to find everything you want to know about earth shelter living - listing of books, magazines and articles plus names and addresses of earth shelter builders, contractors, architects and associations. 218 different sources of information. \$4.95 ppd.

Earth Shelter Water Proofing -

At last! A 44 page comprehensive guide. Details the need for total moisture control, points out where problems are most likely to occur and clearly explains and illustrates successful water proofing methods. Includes 36 illustrations and photos plus a reference guide of 32 manufacturers/suppliers of water proofing materials. \$6.95 ppd.

Special Offer - Save 24%

Order all three books (a \$19.85 value) for only \$14.95 ppd. - a \$4.90 savings.

Order Today! • Satisfaction Guaranteed

Underground Homes • Dept. PM1
700 Masonic Bldg. • Portsmouth, OH 45662

IT'S STILL FREE



That's right!

The new expanded
CRUTCHFIELD Catalog is still
free! 116 pages of photo filled
pages of state of the art
electronic masterpieces at low
discount prices!



- Find out why CRUTCHFIELD offers the best value in personal computers
- Place and receive calls up to 700 feet with a cordless phone
- Learn about the new infrared controlled stereos
- Also Car Stereo, Security Systems, Electronic Gifts and Personal Stereos

Call or write now for
your FREE catalog!

Use the coupon below or call toll free

800-446-1640

In Virginia call toll free 800-446-3961

Send me your FREE catalog by
Third Class Mail

Rush me your FREE catalog! I'm
enclosing \$1 for First Class Mail

Name _____

Address _____

City _____

State _____ Zip _____

CRUTCHFIELD

1 Crutchfield Park, Charlottesville, VA 22906
Department G

12 SPORTS PLANES YOU BUILD

(Continued from page 125)

imagine it with a shortened fuselage and a pair of rakish-looking tail booms, and what have you got? You've got the Acapella, a stunning new high-speed, twin-tailed single-seater with the jaunty lines of a World War II P-38 fighter.

The unusual hybrid is designed around the original BD-5 fuselage and wings—parts still available from specialty suppliers or stored away unfinished in forgotten barns. The Acapella retains the BD-5's pusher-prop drive, but is powered by a much bigger 200-hp Lycoming (the original BD-5 had a 45-hp snowmobile engine).

The added push gives the Acapella speeds approaching 250 mph. Using the extra-long BD-5 soaring wings, it has a span of 26½ feet. The twin tail booms, designed to counterbalance the short fuselage, are joined by a wide horizontal stabilizer that incorporates the elevator. Other features include retractable tri-gear for less drag and folding wings.

Construction is metal with pre-molded fiberglass skins. Kits for the conversion job are sold by Option Air Reno, Box 20085, Reno, Nev. 89515. Their cost, including engine but not the BD-5 components, runs to around \$20,000. A less expensive 100-hp version is expected soon. An info pack is \$15.

Exotic Q2

For the ultimate in futuristic engineering, there's the new Q2, a two-seat version of the widely acclaimed, canard-winged Quickie. With its exotic tandem wings, its gracefully arched fuselage and super-slippery streamlining, it looks as much like an exquisite piece of museum sculpture as it does a flying machine.

Like the Quickie, the Q2 is a "tail-first" design with a forward wing (canard) on the nose for added lift and anti-stall control. The elevators are in the canard, along with two deftly molded-in landing wheels at the wingtips. A small 64-hp Revmaster VW conversion gives the Q2 a remarkable top speed of 180 mph, a climb rate of 800 feet per minute and an economical fuel consumption of 60 mpg.

Q2 construction is all-composite foam/fiberglass, with premolded parts that go together much like a plastic model airplane—to assemble the fuselage, for example, you just glue two halves together. The complete kit, including engine, is about \$10,500 from Quickie Aircraft Corp., Hangar 68, Mojave Airport, Mojave, Calif. 93501. An info pack is \$10. **PM**

NRI can show you how to make money repairing small engines!

There's plenty of opportunity for the man who can service mowers, garden tractors, chain saws, outboards, mopeds, motorcycles, snowmobiles, etc.



There are 50 million small engines out there, and many are waiting for qualified servicemen to fix them. NRI can give you the training you need to cash in on this opportunity, and you learn at home in your spare time, at your convenience.

Includes 5 HP Engine

You learn by doing with NRI "hands-on" training. As part of the NRI Master Course, you get a brand-new 5 HP Tecumseh commercial engine to work on. You learn to diagnose problems, tuneup and adjust, even tear down for valve and ring jobs. And your training includes professional tools like an inductive tachometer, volt-ohm meter, torque wrench, valve spring and ring compressors, complete wrench set, and more...all to equip you for learning and earning.

Choice of Two Courses

NRI's Basic Course puts special emphasis on lawn and garden equipment, teaches you the theory and practice of ignition, lubrications, cooling, and starting systems. Its 30

"bite-size" lessons concentrate on one subject at a time to let you move at your own pace, give you greater clarity and faster learning.

The same teaching techniques give you advanced training on the 45-lesson master course...training in the repair and servicing of a wide range of other motors including generators, industrial equipment, even motorcycles. You learn to service electrical systems, transmissions, clutches, power take-offs, and more.

Exclusive Factory Training

Although not required for graduation, your Master Course includes five intensive days of optional training at the Tecumseh Factory Service School. Here, you'll work with master technicians and instructors, getting first-hand

experience in subjects like solid-state testing, transmissions and transaxles, engine tear-down, two and four cycle carburetors, magneto theory, troubleshooting, and more. All designed to prepare you for success.

Send for Free Catalog

Find out for yourself how much NRI training can do for you. Send for the free catalog with all the facts, descriptions of each lesson, and factory training curriculum. No salesman will call. Get started on your future today! If postcard has been removed, write to address below.

Other income opportunities from NRI.

Air Conditioning/ Refrigeration/Heating with Solar Technology

Covers both residential and commercial fields, including lessons on solar heating, heat pumps, etc. Complete with professional tools, including top-grade vacuum pump, system analyzer, tubing and joint tools, leak detector, and more.

Electrical Appliance Servicing

Good appliance people are hard to find. NRI trains you for your own full- or part-time business fixing everything from toasters to microwaves and refrigerators. Includes professional tools and instruments.

Auto Repair and Servicing

A qualified mechanic can work just about any place he wants. NRI trains you at home from headlight to rear bumper with pro tools included. Approved by Richard Petty, NRI automotive consultant.

Building Construction

Save up to 50% building your own home, get a better job, even start your own contracting business. Covers everything from foundations to rafters with practical projects emphasizing energy-efficient construction.



NRI Schools
McGraw-Hill Continuing
Education Center
3939 Wisconsin Avenue,
Washington, D.C. 20016

We'll give you tomorrow.

DIRECT FROM U.S. OPTICS QUALITY SUNGLASSES AT FACTORY PRICES

Each pair features: Impact resistant lenses • Handcrafted • Polished glass lenses • Hardened metal frames • No non-sense guarantee. FREE—limited time only—deluxe velour lined case with each pair of glasses ordered (a \$3.00 value). Credit cards accepted. Dealer inquiries invited.

NOTICE: Don't be fooled by cheap imitations. These glasses are made exclusively for U.S. Optics®. To make sure you get the best, order now and if not completely satisfied return for refund within 30 days.



Only \$7.95

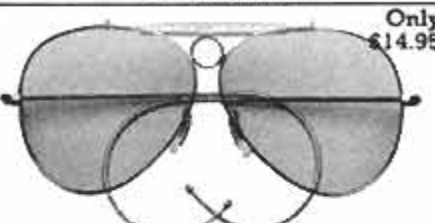
World Famous Pilot's Glasses

These precision flight glasses are now available to the public for only \$7.95. If you could buy them elsewhere, they'd probably cost you over \$20.00. #30P available in gold or silver frame. A \$20.00 value only \$7.95. Two pairs for \$14.00.



Only \$9.95

Aviator Teardrop Flight Glasses
Flexible cable temples. #30A gold frame only. A \$30.00 value only \$9.95. 2 pairs for \$18.00.



Only \$14.95

Professional Driving & Shooting Glasses
Wide angle amber lens brightens visibility. #30D gold frame only. A \$30.00 value only \$14.95. 2 pairs for \$28.00.

To order send check or money order to U.S. Optics, Dept. 616, P.O. Box 14206, Atlanta, Georgia 30324. Credit card customers please fill in card # and Exp. date.

QUANTITY	MODEL #	GOLD	SILVER	PRICE
	20P	X		
	30A	X		
	30D	X		

Add Postage, Handling, and Insurance \$1.00 per pair

Total

Credit card orders may call 1-404-252-0703.

Visa or Master Charge # Exp. Date

Name

Address

City State Zip

FREE case with each pair.

BB GUNS JOIN BIG LEAGUES

(Continued from page 86)

domain of American manufacturers.

■ Air guns using carbon dioxide (CO₂) are, again, produced almost exclusively in the United States, although they were invented in France about 100 years ago. Current CO₂ guns use either an 8- or 12-gram

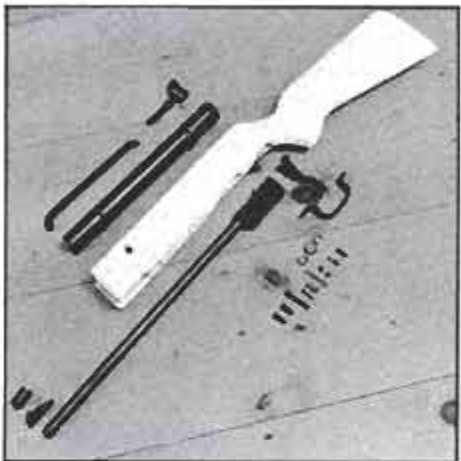


A match-grade, single-stroke air pistol that looks like an automatic, Ravizza Air Match C.U. 400 fires at 400 feet per second.

cartridge. The main advantage of CO₂ guns is that they lend themselves admirably to the use of repeater mechanisms. Basically, they're pneumatic guns that don't require any pumping.

Beeman Precision Airguns (47 Paul Drive, San Rafael, Calif. 94903) is the leading importer of European adult air guns. Its current catalog lists over 40 different models, from Olympic-grade recoilless match rifles and pistols selling for several hundred dollars, to quality plinking pellet guns that retail for under \$100.

One of the latest match-grade guns available from Beeman is the



For a bargain in customizing, Beeman offers Norica air rifle kit for \$80, with an unfinished stock that can be carved to fit.

Ravizza Air Match C.U. 400 made in Italy. This pneumatic pistol, using the relatively new single-stroke powerplant, stores enough compressed air from one stroke of its pump mechanism to push a .177-caliber pellet at about 400 feet per sec-

ond. In profile, the Ravizza looks like a cartridge handgun. Its design shows a purely functional approach to Olympic-style match shooting, with no unnecessary fripperies or gadgets. At the official 10-meter distance, it can put successive pellets through the same hole. It retails for almost \$800.

In the rifle department, Beeman



New from Crosman, Model 1 has a hardwood stock and forearm, rifled barrel in .22 caliber, muzzle velocity of 625 f.p.s.

has introduced a do-it-yourself air rifle kit produced by Norica in Spain. It comes with a basic spring-piston powerplant already assembled; the buyer puts together barrel, sight and trigger groups. The wooden stock is unfinished, ready for customizing to your taste. All metal parts are already blued, and the finished rifle develops a muzzle velocity of 550 to 600 feet per second (f.p.s.) in .177 caliber. The Model 61 kit is about \$80.

The increasing demand for more



Replica of 1861 Remington caplock six-shooter, Crosman's 1861 Shiloh is 12½ in. long and is CO₂-cartridge powered.

power in air guns intended mainly for small-game hunting and varmint control has resulted in several models in a so-called "magnum" category. Common denominator for these rifles is a muzzle velocity of more than 750 f.p.s. in .177 caliber and over 580 f.p.s. for .22 caliber.

Beeman recently announced a new Model R1 which produces a muzzle velocity of approximately 940 f.p.s. in .177 caliber. That makes the R1 the most powerful spring-piston air gun in current production. Sizzling power and superb accuracy are combined with top-notch German craftsmanship in a rifle that measures 45.2 inches and weighs 8½ pounds.

Among refinements for the R1 are all-metal, fully adjustable sights; adjustable, heavy-duty match trig-

ger; automatic trigger safety, and an elegant, walnut-stained, beech stock with checkering, Monte Carlo comb and cheek piece. The receiver grooves permit telescopic sight installation. This rifle is definitely a hot performer, judging by my initial chronograph tests with one of the prototypes. The R1 will be available in both left- and right-hand models, with prices from under \$300 to



Top of the Daisy Power Line is the 777 single-stroke, world-class target model for Olympic-grade shooting at about \$250.

over \$2,000 for fancy customizing. Crosman Air Guns has been known for decades as a leader in the production of pneumatic and CO₂ guns in the United States, and now sells a full line of air rifles and hand-



Daisy markets Models 780 and 790, formerly from Smith & Wesson, that are .22 and .177 caliber, look like S&W's Model 41.

guns internationally. Early last year, Crosman introduced the Model 1, a full-fledged adult air rifle with an American hardwood stock and forearm, a fully adjustable Williams open rear sight and a brass barrel featuring decagonal rifling, in .22 caliber only. The maximum-recommended 10 pumps develop a muzzle velocity of about 625 f.p.s.—plenty for small-game hunting and pest control. The polygonal bore, com-

(Please turn to page 132)

WATER FROM YOUR OWN BACKYARD WELL!

Opelika, Alabama—What can you buy for a nickel and still get some change back? 500 gallons of water, that's what! As a matter of fact, the electricity to pump 500 gallons from your own backyard well costs only 3 or 4 cents!

With this reliable, convenient source of water you can supply your home, your garden, and with a water well heat pump you can even heat and cool your home for a fraction of the cost of conventional systems!

In the past, the cost of drilling a well made it uneconomical for anyone who could hook on to city water mains. However, as city water becomes much more expensive, backyard wells have become more and more popular. To hold the cost of drilling a well to an affordable level, an easy-to-use low-cost machine has been developed for the homeowner who wants to drill his own. Called the *HYDRA-DRILL*, it is already in use around the world, and an estimated 60,000 Hydra-Drill wells have been drilled to date.

The *HYDRA-DRILL* can drill to depths of 200 feet, which puts you within reach of 90% of all the good fresh ground water in the world. The typical *HYDRA-DRILL* well can produce over 4,000 gallons of water each day—just compare that with the average U.S. family consumption of 500 gallons of water per day!

The *HYDRA-DRILL* is remarkably simple to operate. It is completely portable, and can be operated anywhere ... even in places a truck-mounted drilling rig can't get. Yet it can drill most anything the big, truck-mounted rigs can drill, and drilling speeds range up to 40 feet per hour.

FOR MORE INFORMATION



about the *HYDRA-DRILL* and how you can drill your own water well, send your name and address to DeepRock Mfg., 198 Anderson Road, Opelika, Alabama 36802. Better yet—call our toll-free number. Call anytime including Sundays.

TOLL FREE (800) 821-2280

(Ext. 198)

In Alaska and Hawaii, call TOLL-FREE (800) 821-3777

VISITORS WELCOME!

We're 90 miles SW of Atlanta
I-85 at exit 64

CLIP COUPON AND MAIL TODAY!

DeepRock

198 Anderson Rd.
Opelika, Alabama 36802

**SINCE
1952**

Please mail your free information kit immediately. I understand there is no obligation, and no salesman will call.

Print Name _____

Address _____

City _____

State _____

Zip _____

© 1981 DeepRock Mfg.

WOODWORKERS !

the world's finest
tools **NOW** at

FAIR PRICES !

send **\$1 NOW** for

our catalog

FAIR PRICE TOOL CO.

Box 627V

La Canada, CA 91011

MAKE MONEY WITH YOUR OWN CRAWLER



CATALOG of Magnatrac 1000
Crawler Tractor Kit construction & uses...\$1.00

MOVIE of Magnatrac in action
(8mm color)...\$9.50

PLANS to build Tractor
yourself...\$7.00

(All money refundable)

STRUCK KIT

Dept. PM 12
Cedarburg, Wisc. 53012

Do it
yourself
with



- For anything that Sticks or Squeaks.
- Dries ignitions in boats, RV's.
- Protects reels, guns against rust.
- Cleans, lubricates.

It really works.

FREE DUTCH BULB AND TULIP CATALOG



Breck's Advance Sale Catalog, with 60 beautiful full color pages, offers you an opportunity to fight inflation by reserving your plants for fall planting now. Includes newest varieties of Tulips, Hyacinth, Crocus and many more exotic bulbs you may have never seen before. Shipped to you direct from Holland.

PLUS FREE TULIP BULB OFFER

Details included with your catalog.

BRECK'S

Serving American Gardeners Since 1818
BRECK'S, Peoria, Illinois 61632 E6242

Please rush money-saving FREE Garden Catalog with Free Plants offer.

Name _____

Address _____

City _____

State _____ Zip _____

BB GUNS JOIN BIG LEAGUES

(Continued from page 131)

bined with fine sights and smooth trigger, produces nickel-size groups at 25 feet. Telesights with tip-off mounts can be installed on the grooved receiver. The Crosman Model 1 sells in the \$80 range and can hold its own against some European models costing more than twice as much.

Also new from Crosman is the 1861 Shiloh, a .177 caliber, CO₂-powered, single-action revolver modeled after the famous 1861 Remington caplock revolver. This big six-shooter (12½ inches long, weighing almost 2 pounds) uses a 12-gram CO₂ cartridge that delivers about 42 shots at a muzzle velocity of 330 to 350 f.p.s. with pellets. Strictly a fun-gun for back-yard-style plinking, the Shiloh is capable of rolling tin cans or even dispatching feisty mice at short



Newest from Daisy, the Power Line 850 is a streamlined single-stroke in .177 caliber with reported muzzle velocity of 480 f.p.s.

range. At around \$30, this revolver should become popular with youngsters and adults alike.

Daisy, the undisputed champion of American BB guns, also entered the adult air gun field a few years ago. Its Power Line series became an immediate success. Recently, Daisy has introduced two new pistol models and a new rifle. The Daisy Power Line 777 single-stroke, pneumatic match pistol is a highly refined version of Daisy's popular Model 717/722. Intended primarily for Olympic-grade match shooting, the 777 seems to have everything necessary to take on the best from Germany. At less than \$250, it's an outstanding value for world-class target shooting.

In 1980, Daisy took over Smith &

Wesson's air gun operation and added the S&W CO₂ pistol models 78G (.22 cal.) and 79G (.177 cal.) to the Power Line group as Models 780 and 790. These are almost identical copies of S&W's well-known Model 41 auto-loading target pistol. At the high-power setting, the 790 has a muzzle velocity of 425 f.p.s., while the .22 cal. Model 780 produces 365 f.p.s. Accurate and relatively power-



Imported by Dynamit Nobel, Model 75 HV Universal for match competition is rated as one of world's three most accurate rifles.

ful, the 780 and 790 cost about \$70.

Daisy also has a new adult long gun, the Model 850, with single-stroke pneumatic system and sleek rifle profile. It's rated at a muzzle velocity of about 480 f.p.s. with .177 pellets and is priced under \$65.

Dynamit Nobel of America (105 Stonehurst Court, Northvale, N.J. 07647), is a leading importer of the outstanding air guns produced by Dianawerk in West Germany. The latest are a "magnum" air rifle and a super-match air rifle. The magnum is the Model 45, a spring-piston barrel-cocker that rates at over 820 f.p.s. in .177 caliber and about 630 f.p.s. in .22. Superbly balanced, with a two-stage adjustable trigger and a micrometer rear open sight, the Model 45 weighs nearly eight pounds and measures 45½ inches. The beech stock has a plain, functional design suitable for both right-handers and southpaws, and comes with a thick rubber recoil pad. It packs lots of power and quality for \$205.

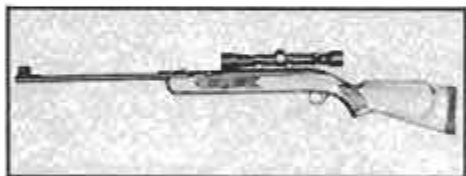


Called best target pistol, Beeman/Feinwerk Model 80 has optional weights, recoilless design, 525-f.p.s. velocity.

At the 1980 European Airgun Championship in Oslo, Norway, the Model 75 HV Universal match air rifle took one of the gold medals. This exceptional rifle neutralizes recoil with an ingenious system developed by Dianawerk in which two opposing pistons cancel each other out during the firing se-

quence. The accuracy level of the 75 HV is on the order of .06 of an inch, center to center, at 25 feet. Features of this model include adjustable cheek piece and raised sights, plus a match trigger adjustable four ways. The \$650 price includes a top-quality sight system.

BSA (Birmingham Small Arms) air rifles have been a leader among quality spring-piston guns for years. These guns are currently imported by Precision Sports (Box 30-06, Itha-



A British-made magnum air rifle, the BSA Airsporter S is of high-powered underlever design, .177 or .22 caliber, 825 f.p.s.

ca, N.Y. 14850). The latest air rifle model available from BSA, the Airsporter "S" (for "Super"), falls in the magnum category and is the premier model in the BSA line. It develops over 825 f.p.s. in .177 caliber, and around 635 f.p.s. in .22 caliber from a cleverly designed spring-piston powerplant that utilizes the underlever cocking system. Highly accurate, powerful and reliable, the Airsporter S comes with a fine set of interchangeable sights, and receiver grooves for scope installation. An



Cutaway shows twin spring power, adjustable trigger, recoilless balance of match-grade Dynamit Nobel 10.

outstanding example of Britain's air gun industry, it sells for approximately \$250.

Complementing the sophisticated mechanics of the new adult models are a fitting assortment of refinements and accessories. Custom stocks from beautiful woods are available. Add-on weights adjust barrel balance. Pellets with pointed, rounded, wad-cutter and hollow-point tips can be compared for accuracy and impact. Lead BBs are offered as well, with claims for less ricochet danger indoors. Pellet traps, silhouette targets and special 10-meter target holders that can be used indoors or out, combined with the quiet operation and short range of the adult air gun, all contribute to its growing popularity.

PM

Your home workshop can PAY OFF BIG!

This One Low-Cost Power Tool—
SAWS to desired Width...
PLANES to desired Thickness...
MOLDS all popular Patterns...
All at once or separately... All By Power Feed!



TRY THE BELSAW
IN YOUR OWN SHOP
**30 DAY FREE
TRIAL OFFER**

Only 3-in-1-Workshop Tool Of Its Kind!

From the Day It Arrives... the Belsaw will make and save you money. With shortages and inflation driving lumber prices sky-high, this versatile power tool easily pays for itself by quickly converting low cost rough lumber into high value finished stock. In just one pass turn out your own quarter-round, door and window stop, casing, tongue-and-groove... all popular patterns. Other Belsaw operators are making cases for grandfather clocks, furniture, picture frames, fencing, bee hives, bed slats, surveying stakes... all kinds of millwork.

Built For Pros... Priced For the Home Craftsmen

It is engineered and built to industrial standards, but factory-direct selling keeps the price low. Handles tough oak and walnut as easily as pine, and so simple to operate even beginners with no experience can use it.

Start Your Own Business Earn Extra Income Right at Home

With just this one low cost power-feed machine in a corner of your garage or basement, you can set up a profitable business by supplying lumberyards, cabinetmakers, carpenters, remodelers, contractors and hobbyists in your area with custom-planed lumber, trim, molding... ALL of their millwork requirements. Supply picture molding to art shops, hardware and department stores, or sell direct to framing shops. All standard patterns in stock... custom knives ground to your design or sample.



If coupon has been removed, just send postcard with name and address to:

BELSAW POWER TOOLS CO.
902J Belsaw Building
6301 Equitable Road
Kansas City, MO 64120

NO RISK 100% Guarantee of Satisfaction

"Try the Belsaw in your own shop for a full 30-Days and put it to work for you. Give it a thorough test and make it prove that it can do everything we say it will... use it as much as you want. Then if you are not completely satisfied, just send it back and we'll return every penny sent with your order. And YOU are the sole judge. There are no questions asked... there are no fine print 'use' charges. Our flat guarantee is that YOU must be 100% satisfied or you get your money back."

Does The Belsaw Pay? YOU BET!

READ WHAT OTHER BELSAW OWNERS SAY:

A Good Investment: "I believe that the Belsaw is the best investment I ever made. I've been a planer man for years and am now retired. The Belsaw has earned me over \$60,000 extra income in the past eleven years."

Robert Sawyer, Roseburg, Oregon

Pays For Itself: "I bought a batch of walnut in the rough, and after planing it on the Belsaw I figured out the money I had saved. It was enough to pay for two-thirds the cost of the Planer. It really does a good job."

R. S. Clark, Springfield, Ohio

More Than Expected: "This machine pays for itself by making money out of scrap boards. It is a very well built machine and I confess it is more than I expected for the price. It does everything you say it will."

Stephen Schultz, Orangeville, Petina

... And Belsaw Is The Choice Of Professionals: "I recommend Belsaw's Planer-Molder-Saw as the most useful shop tool that any craftsman could own. We use ours every day in the WOODENCA model shop, and couldn't get along without it."

(J) HEDDEN—Editor of WOODENCA Magazine

NO OBLIGATION and NO SALESMAN Calls!

BELSAW POWER TOOLS CO.
902J Belsaw Building
6301 Equitable Road
Kansas City, Missouri 64120

SEND FOR
**FREE
BOOKLET**

YES, please send me the FREE Booklet that gives me complete facts about Belsaw's Planer-Molder-Saw and full details on how I can qualify for a 30-Day Free Trial right in my own shop. I understand there is No Obligation and that No salesman will call.

NAME _____

ADDRESS _____

CITY _____

STATE _____

ZIP _____

FOR THE RENEWABLE ENERGY PIONEER FOLLOW THESE WIRES!

TO START YOUR ENERGY INDEPENDENCE
WITH A THERMAX LOW RPM DC GENERATOR

SO SENSITIVE it even acts like a selsyn when connected to a small dc motor.

SO EFFICIENT it can produce 12 volts at under 400 rpm.

SO POWERFUL it can deliver over 6 amps into a short circuit.

Thinking of generating your own electricity? This inexpensive, light-weight, low rpm generator is just what you've been looking for.



DESIGNED FOR THE NEW ERA OF RENEWABLE ENERGY SYSTEMS. The need for a small low rpm dc generator was discovered during development of our Helius Rotor kit, a low cost wind generator. Thermax engineers started from scratch to design the perfect generator for home-size alternate energy systems. It had to be inexpensive, light, and operate efficiently at low rpm (which no other small generator could do).

The result is the new TC25G permanent magnet dc generator... exactly the generator you've been looking for if you intend to start generating your own electricity. In addition to windmills the versatile TC25G is ideal for small waterwheels, pedal power, solar engines, fuel powered generators and more.

BEGIN YOUR ENERGY INDEPENDENCE TODAY Your choice of free plans (\$9.50 value) and a special User's Guide include all the information you need to take advantage of the free power around you. Join the thousands of Thermax generator owners who produce electricity with a small windmill, waterwheel or bicycle. Perfect for cottages, RV's, battery charging, emergency power and more.

DIMENSIONS:

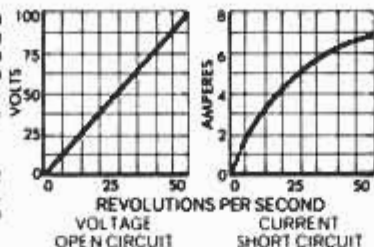
Case length 4-7/8 inch (124 mm)
Case diameter 3-1/2 inch (89 mm)
Shaft diameter 5/16 inch (7.94 mm)
Weight 4 lbs. (1.8 kg)

PERFORMANCE:

Commonly used in 12 volt systems but designed for 6, 12, 24, or 36 volt operation.

SPECIFICATIONS:

Two pole permanent magnet dc generator. Rated 2 amps, 12.5 volts (25 watts) at under 800 rpm. Heavy-duty, long-life brushes. Mounts easily with two 10-32 studs at shaft end of case.



Send this coupon today, or call toll free to charge your order on Visa/Mastercard
1-800-451-3402. In Vermont 802-658-1096. In Canada 613-678-3322.

SATISFACTION GUARANTEED PLUS OUR ONE-YEAR LIMITED WARRANTY

Please send me _____ Thermax TC25G generator(s) for only \$69 each (two for \$130) plus \$4 each for shipping and handling in continental USA. Vermont residents add 3% state tax. Total enclosed \$ _____

NAME _____ PHONE _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____



THERMAX CORPORATION

Dept. PMA, One Mill Street
Burlington, Vermont, 05401

The Thermax product line includes affordable voltage regulators, power monitors, inverters, and the Helius Rotor windpower system, all usable with the TC25G generator. Send me more information. **FREE PLANS** — Choose one set free per generator ordered. Additional plans \$9.50 each.

Wind Power Water Power Pedal Power

DRIVING THE NISSAN STANZA

(Continued from page 97)

due to the fact that Nissan puts the blower motors and fans on the engine side of the firewall and also lines the airconditioner ducts with foam rubber: another thoughtful touch.

The Stanza comes in two models—Deluxe and XE. The Deluxe's standard equipment includes a quartz clock, styled steel wheels, halogen headlights, reclining seats, power-disc brakes, and a maintenance-free battery. The XE adds tilt wheel, tach, lumbar and cushion adjustments for the driver's seat, power steering, a four-speaker AM/FM radio, cloth upholstery, body side moldings, rear wiper/washer, and larger radial whitewall tires.

Thanks partly to good aerodynamics and a Cd of .38, (the 280ZX has a Cd of .36) the Stanza's estimated top fuel mileage is 46 mpg highway and 32 city. And that's from a car that doesn't compromise spaciousness, performance or comfort.

Nissan's other '82 offerings

I did get a chance to drive Nissan's long-awaited, five-speed rendition of the 810 Maxima. This transmission makes a great car even greater and a lot more fun to drive. It's a silent, pleasing, extremely comfortable, super-accessorized, luxurious touring sedan in the BMW tradition.

The five-speed makes a considerable difference in over-the-road fuel mileage, too. The EPA says 34 mpg highway with the manual gearbox, but 28 mpg for the automatic. And there's now a diesel 2.8-liter Four for the Maxima. That engine delivers 42/30 with the five-speed or 38/28 with the automatic.

Other changes of import in Nissan's 1982 model lines include more standard equipment for the 210 and 310, plus increased horsepower for the 310, 200SX and 280ZX. The 200SX also comes in for minor styling revisions.

And no report on new Nissan products would be complete without some mention of the cars' expanded vocabulary. You'll recall that last year the Maxima learned to speak. That mechanical female voice could repeat only one phrase: "Please turn off your headlights."

This year, not only the Maxima but also the 200SX and 280ZX chatter on. Included in their metallic mellifluousness are reminders that "lights are on," "fuel level is low," "parking brake is on," "right door is open," "left door is open" and "key is in ignition." Nag, nag, nag! **PM**

QUICK START

250
AMPS
12 VDC



100%

STARTER and Charges Too

Weighs only 15 1/2 lbs.
Easy! Just Clamp to
Battery and Plug into 120 V Outlet

Quick Start Will Start your Engine in Seconds.

Send check or money order for \$99.50 to:

GREAT PLAINS PRODUCTS

P.O. BOX 82632, Okla. City, OK 73148

Add an affordable INSTANT MONEY-MAKER to your home workshop

... **Woodmasters Power-Feed
PLANER/MOLDER/JOINTER**



Makes you money... saves you money. Turns low-cost rough lumber into profitable finished stock for grandfather clocks, furniture, house trim, picture frames... sell to lumberyards, carpenters, do-it-yourselfers. Plane or joint without changeover. Molds all popular patterns including tongue & groove. Also, any custom design. Comes complete with motor and stand... ready to use. Easy terms.

30-Day FREE Trial!

Just call toll free 1-800-227-1617 Ext. 489
In Calif. 1-800-772-3545 Ext. 489 or
write: Woodmaster Tools, Inc., 3323
Roanoke, Dept. PPIO Kansas City, MO 64111

FREE Information Kit!

FINE WOOD JOINERY

(Continued from page 101)

a dovetail cutter is used in the router. The cutter is sized so as to be compatible with the template in use. It must also work with the collar that's installed on the router shoe to follow the template.

To avoid any problems in this area, buy only dovetail accessories made for your router by its maker.

A very important point about machine-made dovetails: The router shoe must be in good contact with the template at all times or you run a high risk of the cutter damaging the template (it's made of plastic) and workpiece. Similarly, unless you are super skillful with a router, never approach the template or remove the router from it with the cutter spinning.

The fingerlap joint

The fingerlap joint is kissin' cousin to the dovetail joint. Because it does not interlock like the latter, it is somewhat easier to create. In fact, a neophyte woodworker should really start with this joint, then advance to the more complex dovetail joint.

The general rule is to cut the fingers to equal the stock thickness.

This provides a joint with a great amount of glue-up area, thus strength.

Start by tackling a fingerlap with fingers equal to stock thickness—such as the sample in our photos—then you can move on to making box joints with fingers equal to half thickness. (You'll note thinner fingers on fine old furniture.)

To make the joint with hand tools, follow the steps shown on page 101. The pieces to be joined are clamped together in a vise with an offset equal to one finger (board thickness). Since the pieces being worked will rarely be equally divisible, you may have to adjust finger width on the two outside fingers.

Use a square and a sharp pencil to lay out the joint. Then select a bit to bore out the mass at center; use your square and an awl to locate the center points for the bit. Then bore holes through—just until the bit point exits the far side. Stop the bit and complete the boring from the second side to prevent splintering. My choice of bits for this task are the Power Bore bits from Stanley.

Next, use your dovetail saw to cut the shoulders. Finally, clean out the sockets with a very sharp chisel.

Assemble the joint to check for fit

and use chisel, knife and sandpaper to tidy up the fit, if necessary.

You can make fingerlap joints quickly on the table saw. To do so, the workpieces should be clamped together and a long backup board attached to the miter gauge. After laying out the finger joints, raise the blade to the desired height and cut the sockets, using repetitive, overlapping cuts (kerfs). The task is speeded up considerably if you own a dado-head set, which will let you cut each socket in one pass.

About joints in general

Though we have devoted three installments and better than 12 pages to the subject of joints, we have just scratched the surface of this very important part of woodworking—covering just those joints that you will use most of the time.

Because there are many other joints that you should know about, you owe it to yourself to buy a good reference book on joints. The best on the subject in my opinion is *Woodworking Techniques: Joints and Their Application*, by R.J. DeCristoforo. It is sold at bookstores for \$14.95; if you can't find it locally, write to the publisher, Reston Publishing Co., Reston, Va. 22090. **PM**

5 in 1 WOODWORKING MACHINE

(BETTER THAN SHOPSMITH)

- 34" LATHE
- 10" TABLE SAW
- 11½" DISC SANDER
- 16½" VERTICAL DRILL PRESS
- HORIZONTAL DRILL PRESS



SAVE \$251. Today

Special offer good thru the 30th of the month.
ONLY \$999.

CALL NOW!!! (1-800) 421-2467
TOLL FREE INFORMATION
IN CALIFORNIA CALL COLLECT (213) 549-0761

VERY IMPORTANT

The only machine built with:

- A. ALL CAST IRON TABLES
- B. HEAVY DUTY DESIGN
- C. 2 H.P. ELECTRIC MOTOR
- D. BUILT AS AN INDUSTRIAL MACHINE

MAIL NOW!!!



MASTER WOODCRAFT CO.
800 SPRUCE LAKE DRIVE • P.O. BOX 669
HARBOR CITY, CA 90710

YOUR NAME _____
ADDRESS _____
CITY _____ STATE _____ ZIP _____
PHONE: () _____
 MY CHECK OR MONEY ORDER
 VISA
 MASTERCARD
ACCOUNT NO. _____ EXP. DATE _____

Shown as a
Vertical
Drill Press



Dealership
Available

These four matched volumes tell you and show you everything any building or carpentry job...from fixing a roof to building even building an addition or a house!

Take this 4-volume CARPENTERS AND BUILDERS LIBRARY



FOR ONLY **\$395** (regular price \$27.95)

when you join
Popular Science Book Club

FREE when you join



**POPULAR SCIENCE
20-IN-1 MEASURING TOOL**
As a new member of Popular Science Book Club, you get this handy shop tool FREE.

How Popular Science Book Club Works

Just mail the postpaid card to get your \$27.95 4-VOLUME CARPENTERS AND BUILDERS LIBRARY. Send no money now. We'll bill you later for only \$3.95 plus delivery and handling.

Then, about every four weeks (13 times a year), you'll receive a Club bulletin describing the coming main selection and alternate books also available. In addition, up to 4 times a year, you may receive selected mailings on seasonal products of special interest to the membership — many at giant bargains! If you want the main selection only, do nothing. It will be sent automatically. If you don't want the main selection, or want alternate books, or no books, simply indicate your wishes on the Instruction Form that comes with the bulletin and return it to us by the date shown. Club mailings are carefully scheduled to assure you at least 10 days in which to do this. But in the unlikely event that you don't have 10 days, and you receive an unwanted selection, you may return it.

After receiving your joining shipment, your only obligation is to buy two more regular selections or alternates in the next year. After that, membership may be cancelled at any time, by either you or the Club.

Club books are comparable in every way — paper, printing, binding, jacket — to original publishers' editions, yet you may save up to 50% and sometimes more on many special bargains offered each year in the Club. To become eligible for these bargains, mail the card today!

AS A CLUB MEMBER, you'll have the opportunity to choose from hundreds of superb, up-to-date books on a wide range of home handyman subjects every year. (Your only obligation is to buy two of them.) You'll be offered books on home improvement, repair and workshops, remodeling, house building, energy, insulation, wiring, plumbing, cars, car repair, electronics, appliance repair, furniture building, machines, technology and more. It's always your choice and there are many bargains to choose from!

This information-packed 4-VOLUME CARPENTERS AND BUILDERS LIBRARY brings you professional, easy-to-understand how-to on just about every build-it-yourself question you'll ever have...

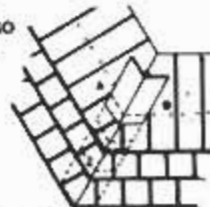
- You get a complete how-to book on woods and woodworking tools, how to do all kinds of joinery and cabinetmaking joints, how to do kitchen cabinet construction... *and more.*
- You get a complete how-to book on all standard specs of every element in house construction, including how to read plans and make your own... *how to lay out a home workshop... and more.*
- You get a complete how-to book on laying out the foundation, how to do concrete block construction, house framing, chimneys, fireplaces, porches, patios, insulation... *and more.*
- You get a complete how-to book on every aspect of roofing, flooring, doors, windows, stairs, plus how to use stationary and portable power tools, plus tips on painting, maintenance, repairs, termite protection... *and more.*

You get step-by-step instructions on everything from reading a building plan to building a house (including the foundation), doing all the carpentry in it—and keeping the house in A-1 shape for a lifetime. And thousands of show-how pictures make it all amazingly easy, even for a novice. Let's look at a few of the remodeling and fix-it jobs you learn how to do... You learn how to replace worn or missing shingles. How to fix chimney flashing leaks. How to repair stairs (or build them from scratch).

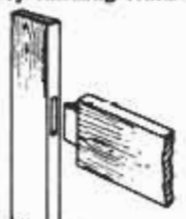
If doors need fixing or fitting, you can find out how to do it from these books. If you want to lay new flooring, you can just turn to these books to find out how to do a first-rate job with wood-tile, linoleum, asphalt, rubber or ceramic tiles. If you want to build a fireplace, you'll find out exactly how from these books...

This marvelous 4-book library also tells you how to use all kinds of power tools to maximum advantage (most of them have great versatility). You learn about woods—their characteristics, strengths, best uses. You learn about fasteners—nails, screws, bolts, more—their holding power, size-strength ratio, and how to use each.

These books teach you scores of tricks and shortcuts used by carpenters for measuring, cutting, raising, fastening, finishing—every technique and job. They give you the answers to just about every carpentry question you'll ever have. And they can save you thousands of dollars in the years ahead.

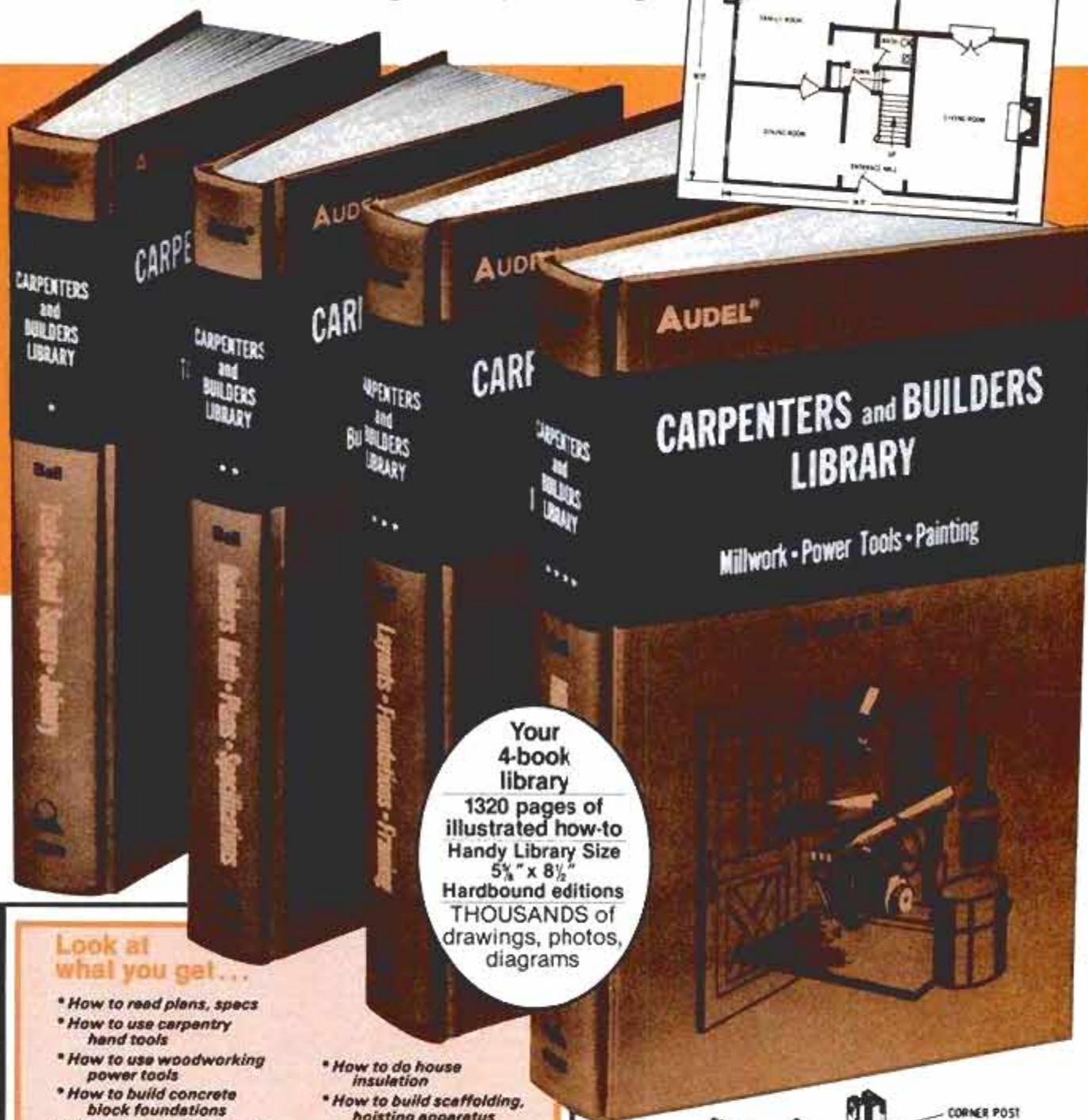
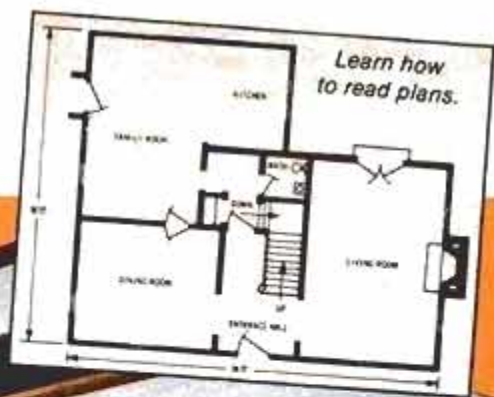


Installing metal shingles under wood shingles.



Single mortise and tenon joint.

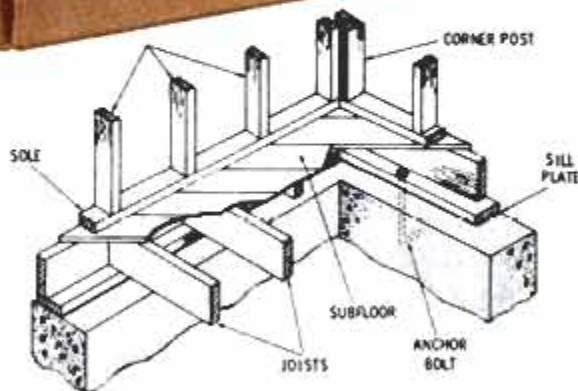
**you need to know to do just about
a foundation, installing new paneling,**



**Your
4-book
library**
1320 pages of
illustrated how-to
Handy Library Size
5 1/4" x 8 1/2"
Hardbound editions
THOUSANDS of
drawings, photos,
diagrams

**Look at
what you get...**

- * How to read plans, specs
- * How to use carpentry hand tools
- * How to use woodworking power tools
- * How to build concrete block foundations
- * How to choose best woods, materials, fasteners
- * How to plan and build roofing, flooring
- * How to construct walls, doors, windows
- * How to make joints
- * How to build stairs
- * How to build chimneys and fireplaces
- * How to use builders' math, do surveying
- * How to make kitchen cabinets, counters
- * How to do cabinetmaking joinery
- * How to build A-frame, 1- and 2-story houses
- * How to plan a home workshop
- * How to do house insulation
- * How to build scaffolding, hoisting apparatus
- * How to do wood pattern-making (for castings)
- * How to do sheathing and siding
- * How to do cornice construction
- * How to plan termite protection
- * How to do interior-exterior painting
- * How to build girders and sills
- * How to make concrete forms (and molds)
- * How to sharpen saws
- * How to build skylights
- * How to do house maintenance and repair
- ... and much more



MAIL THE ATTACHED CARD OR WRITE TO:

Popular Science BOOK CLUB
P.O. Box 2006, Latham, N.Y. 12111

CAN YOU SEE THE RAIN-X DIFFERENCE?



Without RAIN-X



With RAIN-X

Photographs of the windshield were taken on a drizzling, rainy day. No wipers were used.

**RAIN-X, THE "INVISIBLE WINDSHIELD WIPER" IS HERE . . .
FOR RAIN, SLEET OR SNOW.**

- For AMAZING VISIBILITY all year round even in the worst kinds of weather, treat your windshield and windows with RAIN-X, a rigorously tested aerospace development.
- Actually makes rain, sleet and snow "bead" and roll off . . . Drive down the highway and simply watch water disappear like magic.

AND THAT'S NOT ALL!

- Because of its polymeric structure, RAIN-X even restricts the build-up of frost, bugs, salt, tree sap and road grime.
- Just remove SNOW and ICE with the rubber end of your scraper . . . Makes automotive glass (windows, lights, etc.) uniquely water and soil repellent.
- Excellent for your car, RV, boat, van or aircraft or any glass or ceramic surface in your home.
- Effective and long lasting

Order one year's supply of RAIN-X per auto (15 fl. oz.) for only \$9.95 plus \$1.00 postage and handling, and take advantage of our EMERGENCY LIGHT OFFER.

***** BONUS OFFER *****

"MAGIC" FOREVER FLASHLIGHT

Just squeeze the trigger and it lights up every time.

- NEVER NEEDS BATTERIES
- NEVER NEEDS RECHARGING
- LASTS FOREVER
- PERFECT EMERGENCY LIGHT
- EVERY CAR NEEDS ONE

LIGHT ONLY \$5.95 postpaid
CALL TOLL FREE 24 HRS
1 - 800 - 621 - 5282
(Orders Only)



ONLY \$3.95 with
RAIN-X order.

FOR ILLINOIS CUSTOMERS OR FOR INFORMATION CALL (312)782-4514

Send check or money order to:

ZADDOCK & CO., INC.—180 W. WASHINGTON—SUITE 1203RJ—Chicago, IL 60602

Satisfaction Guaranteed

We help you see clearly

E-Z MARKER CHAIN SAW GAUGE

Firewood Too Long?
Frustrated Again?

STOP!

Now you can cut firewood to perfect lengths every time. From 6" to 24". Attaches to any chain saw in seconds. Saves time and eliminates measuring.

\$8.50



pat. pending

Send \$8.50 plus \$1.50 shipping and handling.

Send cash, check or money order to:

ENERGY RESOURCES
P.O. Box 2788
Rapid City, SD 57709

Allow 3 - 6 weeks for delivery.

Name _____

Address _____

City _____ State _____ Zip _____

Saw Brand _____ Model _____

DO-IT-YOURSELF



WITH
**CUSTOM
CABINET DOORS &
DRAWER FRONTS!**

NEW LIFE for
Your OLD CABINETS

- SOLID WOODS . . . oak, cherry, etc. . .
- ANY SIZE . . . many designs . . .
- CUSTOM quality . . .
- FACTORY direct prices . . .
- MAKES SENSE . . . SAVES . . .
- Conversion system for existing cabinets . . . easy-to-do . . .
- Thousands of uses . . . kitchen, bath, family room, etc. . .

- **SAVES 50%-70%**
- Send \$2.50 for literature, refunded with purchase.



WOOD-PRIDE™
5214 M. Hoag Lane
Fayetteville, N.Y. 13066
(315) 455-5951



GARAGE DOOR OPENERS

• Radio
Controlled

- Buy Factory Direct and Save
- Thousands In Use • Free Brochure
- Easy Homeowner Installation
- Immediate Shipment by UPS or PP

HELPMATE Equipment Co. Dept. PM 182 Baroda, MI 49101

10 CLEVER USES FOR MAGNETS

(Continued from page 109)

rect position to magnetize the entire length of the two steel bars. (The poles should be aligned, with like poles facing up at both ends.) Then tighten all screws and mount the holder to the wall.

6 A "toadstool" is a very handy device for keeping screws, bolts and the like corralled in one place and yet readily accessible. Cut the base from scrap stock and attach the flange with wood screws. Be sure the magnet assembly is attached with a brass screw.

You can use any of Edmund Scientific's round ceramic magnets for this purpose. The thinner magnets that look like washers in the assortment can be sandwiched together to act as one magnet.

7 You can do all kinds of things with sheet magnets, like the 3-in. square shown on page 117. I use double-stick tape to attach the magnet to a sloping stand I make from 1/4-in. plywood. I add a trough at the bottom to hold a special tool required by any item I keep on the magnet.

8 Keep a magnet on your key ring. You can use a piece of flexible magnetic strip or a magnet from a door latch for this purpose, and it could come in handy in an emergency. Cut a piece of tin from a tin can to form a U-shaped holder. Make the holder a little longer than the magnet so you can put a hole in one end for the chain. The holder does not need to be carefully formed, as the magnet holds itself in place. However, you will want to file off any sharp corners if you usually carry your keys in your pocket.

9 Small magnetic strips from gaskets in electrical appliances can also be used to hide a key. A good way to do this is to enclose the key in a small bag along with the magnet. Then seal the bag with a paper clip and hide it under a metal shelf.

10 Various kinds of magnets, usually of the "horseshoe" design, can be used to position workpieces for soldering or gluing. The Alnico magnets shown in the lower right photo on page 109 are holding two pieces of tin-can material while instant glue is applied so it will crawl into the lap seam and produce a bond. To apply pressure to the area of bonding, attach a bar magnet shielded with a piece of a plastic bag.

These horseshoe magnets can be used to hold much heavier pieces, of course, but the greatest benefit of this procedure is that it allows you to keep oily fingers off the workpieces once they have been cleaned for bonding.

ELECTRONIC-WORKBENCH TOOLS

(Continued from page 107)

ing all the components separately.

Of course, devices like that are great for holding large pieces, but for smaller ones, a pair of long-nosed clamping tweezers can come in handy. However, surgical hemostats are the hobbyist's delight and salvation. They are locking forceps that look like scissors. The jaws are ribbed to hold firmly. Lafayette has two models in its catalog, one with a straight nose and the other curved. Each sells for \$4.49. A wider variety of sizes and shapes can be found in surgical supply-house catalogs. Hemostats and tweezers can double as heat sinks.

Wrapping and nibbling

Wrapping wire by hand can often be as frustrating as trying to place a small component in an awkward place. It seems almost as infallible as Murphy's Law that as soon as you get to the end of a perfect coil, your hand slips and the coil opens up. A good wire-wrapping tool ends that frustration and insures an even, tight wrap. The wire is fed through the tube and the tool placed over the terminal and rotated. The tool even has a cutter to snip the wire at the desired point.

If you do your own chassis and PC-board assembly and construction, try a nibbler. It looks and operates like a paper punch. Put a sheet of metal or a PC board in its jaws and squeeze. Off comes about 1/16th of an inch. Keep going and you can cut out virtually any shape you want—or cut all the way through a sheet. You can buy Radio Shack's model for \$8.95.

Drilling holes

Parts boxes and PC boards need holes as well as slots and those holes had better be aligned perfectly. You can't get pinpoint accuracy with a handheld drill. It's just too big to use in mini-spaces. One answer is to use a Dremel Moto-Tool in a Dremel drill press. The Moto-Tool is probably more familiar to metal and wood craftsmen than it is to electronics hobbyists. It's a handheld drill with a variety of bits that can be fitted to its miniature chuck. The Moto-Tool can be used for grinding, polishing and cutting, in addition, of course, to drilling.

A neat clean-up appliance is Hitachi's battery-powered, TV-100 table vacuum. It's a 3½-inch cube with a vacuum fan inside, and four rows of stationary bristles and a magnet on the bottom. It will let you clean your workbench quickly.

FM



Cash in on the PROFITS in a Welding Business of Your Own

Be Your Own Boss

You can work part time . . . full time, right at home, no special shop needed. You don't have to be a skilled mechanic. No experience needed. Foley Institute will help you every step of the way. Young men and women can make welding a profitable career. Retired persons can supplement their income.

Many Welders Earn up to \$20.00 an Hour

Many skilled welders earn up to \$20.00 an hour. After you complete the Foley basic and advanced courses you probably can too. The opportunities for business are unlimited. Any metal product can break—and in most cases the best way to repair it is by welding. As the replacement cost of tools and machines go up, more and more companies and individuals are seeking professional welders to put their tools and machines back together again.

You Can Make Simple Repairs in a Matter of Weeks

You receive illustrated, easy-to-understand instructions prepared by skilled, professional welders plus supplies and equipment to help you do "hands on projects". We counsel you on how to start your own business; how to price your work; where to buy supplies . . . information that will help you start earning money fast.

We'll Show You How to Weld:

- Autos
- Pick-up Trucks
- Lawn Mowers
- Farm Machinery
- Industrial Equipment
- Motorcycles
- Lawn Furniture
- Moving Equipment
- Tricycles & Bikes
- Playground Equipment
- Scaffold
- Snow Blowers
- Snowmobiles
- Hand Carts
- Farm Hitches
- Handyman Tools
- Landscape Equipment
- The List is endless!

Send for FREE Information

For complete details on how you can start your own money-making business and receive your FREE Profits in Welding Information kit, write to:

Foley Institute of Welding,
8020 Foley Bldg.,
Minneapolis, MN. 55418

NO OBLIGATION

NO SALESMAN WILL CALL.

Foley Institute of Welding
8020 Foley Bldg.
Minneapolis, MN. 55418

YES, send me my FREE Profits in Welding Information Kit. I understand there is no obligation and no salesman will call.

NAME _____

ADDRESS _____

CITY _____

STATE _____

ZIP _____

FREE PROFITS IN WELDING INFORMATION KIT

PROFITS IN WELDING KIT

UPHOLSTERING JUST ONE CHAIR MAY PAY YOU AS MUCH AS YOUR PRESENT WEEK'S PAYCHECK . . . AS MUCH AS \$150 IN A DAY!



WE STARTED WITH THIS OLD CHAIR COSTING \$5.00 AT A THRIFT STORE.

We used about \$40 worth of new material and invested some very enjoyable hours, with this result! We never imagined the huge profits to be made in restyling and restoring old discarded furniture! But, MUI showed us how. Mr. & Mrs. W. Morrow, Calif.

FROM THE START, YOU JUST SLIP INTO THE IMMENSE FLOW OF UPHOLSTERY WORK! Think of all there is...SOFAS, CHAIRS, BREAKFAST NOOKS, BOATS, VANS, PLANES, hotels, motels, theaters, libraries, the list is

COMPARE THIS CHAIR SELLING FOR \$349.00 IN A WELL-KNOWN DEPARTMENT STORE.

endless! When we finish showing you, you'll have one of the most fascinating money-making skills in America built into your head and hands! No one can ever take this skill away from you . . . and no one can ever fire you - because you're the boss of a business you can take with you, anywhere. And from then on, you can make money, any time.

TO GET STARTED, JUST GET THE COUPON in The Mail...Today! It costs you nothing at all to get all the information and there's no obligation. No salesman is going to call. Modern Upholstery Institute, 802J Field Bldg., Kansas City, Mo. 64111

It's easy to do, the M.U.I. way...No need to quit your present job - start now...in your spare time!

AT HOME OR IN THE GARAGE - no outside classes to attend, if you can tie a knot and drive a tack you can get into this fascinating business/hobby, quickly, easily. You start on the basics right away in the proven, practical M.U.I. Upholstery Program. And before you're barely into it you can start doing the simple upholstery jobs that are all around you, waiting to be done... chairs, cushions, seats, footstools. Probably you too will find that long before completing the program people will start bringing you their upholstery jobs.

Modern Upholstery Institute,
802J Field Building
Kansas City, Mo. 64111

Please mail me a copy of your book, "PROFESSIONAL UPHOLSTERY for Fun and Profit."

Name _____ Age _____

Address _____

City _____ State _____ Zip _____

MAIL COUPON TODAY!

SEND FOR FREE BOOK

FREE HEATING

A professional midwest engineer has designed a genuine solar heat collector which is **quickly and easily** constructed. It is attractive, easily handled, sits in direct sunlight, and safely absorbs and releases heat. The heater is **guaranteed** to reduce your heating bill, and to last over **20 years**. The materials can be bought at any hardware store for under \$14.00 and the only tools required are a saw and a hammer. One set of plans allows you to make **many** heaters, so send your name, address, and a check or money order for \$7.95 to: Andersen Engineering, Dept. A, P.O. Box 7, Prospect Heights, Illinois 60070.

Enjoy Satellite TV Now



Better than Cable TV—Over 200 TV and radio services. Why waste money? Learn the whole story and build a video system the family can enjoy. No commercials, **FREE** movies, sports and Vegas shows—worldwide, crystal clear reception connects to any TV set. Big (8 x 11 in.) book loaded with details, photos, kits—**TELLS EVERYTHING! Satisfaction Guaranteed.** Send **\$8.95 TODAY!** Add \$2.00 for 1st class (air mail) or call our 24 hour C.O.D. rush order line (305) 862-5068. **GLOBAL ELECTRONICS,** P.O. Box 219-D, Maitland, Florida 32751

NEW PHONES GO WHERE YOU GO (Continued from page 95)

phone: Versatility is another. Not only will these small units transmit and receive telephone calls, they can have built-in last-number-called capability and can be used as intercoms.

Some have more functions than others, but the way they all work is essentially the same. When you open the box of your new portable, you'll see two parts—as noted—the handset and the base station/repeater. The larger unit, the base station, is powered by standard wall current. You plug it into an electrical outlet

and answers the incoming phone call.

When the circuit is completed, the base and receiver units are kept in contact by FM radio transmission. Such short-range, unlicensed transmissions are allowed under Part 15 of the Federal Communications Commission regulations.

Both the handset and the base station operate with built-in and telescoping antennas. The antennas facilitate hand set-to-base station communication. The base station uses the home's electrical wiring to

Duofone-16 features a two-way amplifier for hands-off conversations and stores 16 phone numbers in memory. Privacy button turns off handset's microphone.



LOG SPLITTER PARTS



3-STAGE CAST IRON GEAR PUMPS

11 GPM at 650 PSI. Kicks down to lower GPM and 2500 PSI. Right hand rotation (direct couple). 3600 RPM max use with 5 HP or greater and 3/4" to 4 1/2" bore cylinder. \$123
15 gal 2 stage, use 8 + hp. \$161
22 GPM use with 10HP or greater. \$272



4-WAY CONTROL VALVES

Built-in relief valve, 1/4" in-out ports, 1/2" cylinder ports \$40
With pressure sensitive detent, hands free on return stroke \$49

DOUBLE-ACTING CYLINDERS



3 1/2" bore x 18" stroke x 1 1/2" rod \$93
3 1/2" bore x 24" stroke x 1 1/2" rod \$106
4" bore x 24" stroke x 1 1/2" rod \$137
Welded type (can go UPS) \$140
4" bore x 24" stroke x 2" rod (Heavy Duty) \$140
5" bore x 30" stroke x 2" rod \$228



NEW ENGINES

5 HP Tecumseh or Briggs Recoil start 1/2" shaft \$123
6 hp Tecumseh \$138

CAST IRON SLEEVE ENGINES

8 HP Tecumseh Recoil start 1" shaft \$177
10 HP Tecumseh Recoil start 1" shaft \$202
10 HP Electric start \$240
Vertical shaft engines available. 3/2 to 16 HP
8 H.P. Briggs Vertical \$205

Send \$1.00 for Catalog on Valves, Cylinders, Hooses, Frames, Tanks, Wedges, Slides and Wheels, Engines, Go Kart parts. Or send \$5.00 for Catalog and Splitter Design Fact Book.

NORTHERN HYDRAULICS

P.O. Box 1221 Dept. PM1
Burnsville, MN 55337 • (612) 896-8216

(and telephone jack, of course). The handset fits into a cradle on the base and is powered by two or three NiCd batteries which are charged by the base unit. Once charged, these batteries power the handset.

These portable units work in what is called the full duplex mode. This means you can talk and listen at the same time, as in a normal phone conversation. There's only one difference: no phone cord.

A portable phone is actually a two-way radio system which interfaces with Ma Bell's line at the wall terminal. Most sets come equipped with modular wall plugs. The base unit contains the circuitry needed to maintain contact with both the phone line and the handset.

The base unit contains the dialing and answering circuitry. However, it won't react until it's triggered by the proper radio signal from the handset, which is the ultimate control.

The base unit receives an incoming call and transmits a ringing tone to the handset. To answer the call, the user flips a switch, which "takes the phone off the hook." Then he moves this switch into the correct position, which sends another signal to the base unit, completes the cir-

radiate signals directly to a built-in antenna loop in the handset. The signals are then returned through the telescoping antennas.

What's available

The most advanced cordless, portable phone on the market at this moment seems to be the new Freedom Phone from Electra. Although a duplex unit, it operates strictly in the 49-MHz. range. This frequency gives it greater range, because it is not restricted to using only a house's a.c. wiring as the antenna.

On two of the five channels allocated for low-power use, these phones also have advanced features such as total microprocessor control, four-number memory for automatic dialing and a last-number-redial feature. These units also act as an intercom. And the Freedom Phone determines the type of system to which your phone is interfaced (rotary or pulse), and acts accordingly. (There are two types of phone systems operating in the United States today—rotary dial and pulse. Although both have similar dial tones, the pulse system is compatible with a pushbutton Touch-Tone-type phone. It is a computer-generated system. In a rotary-dial setup, the

system must recognize mechanical-type rotary-dial pulses in order for it to operate correctly.)

Portables aren't the only units with microprocessor-controlled functions. There are other full-feature phones such as ITT's Superphone or the Multi-Feature Phone which, while not actually portable, seem to be able to do everything except butter your toast in the morning.

The ITT Multi-Feature Phone is a regular telephone, as well as a memory dialer. You can store up to 24 numbers in memory and dial them with a push of a button. And the Multi-Feature Phone has a built-in calculator in case you have to compute figures while you're conversing.

Then, when you're through with

the calculations, you can hit another button to determine how long you've been on the phone.

Right now, there are other phones on the market with such features as voice-actuated recording, which operates as long as the caller is talking. They tell you how many calls you've received and even transmit your messages to you at a pay phone.

Bright future

There's even more on the horizon, too. According to Bell Labs and American Telephone and Telegraph, the phone will become a communications terminal, able to interface with national computer networks. In fact, one day the phone system itself will become a huge computer system. **PM**

How to add extension phones

If you're not yet ready for a portable telephone, you can still get more convenience from your telephone service by adding one or more new phone lines and extensions.

You can install a line directly from the junction box outside your house. Observe the wiring in the box carefully. Since phone company wires are color coded, make sure your connections match the coding connections. Then run the new line to the new spot you want it to enter the house.

Inside, it's a much easier matter. Simply find a conveniently located phone block—called a 42-A (see photo)—and remove the cover. Study the wiring and color coding.

Then take the wiring you purchased for the new extension outlet and attach it, following the color coding (green to green, black to black and so on). Then, close up the first 42-A block. Use insulated staples to secure the wire along a baseboard and to the area you would like the new outlet.

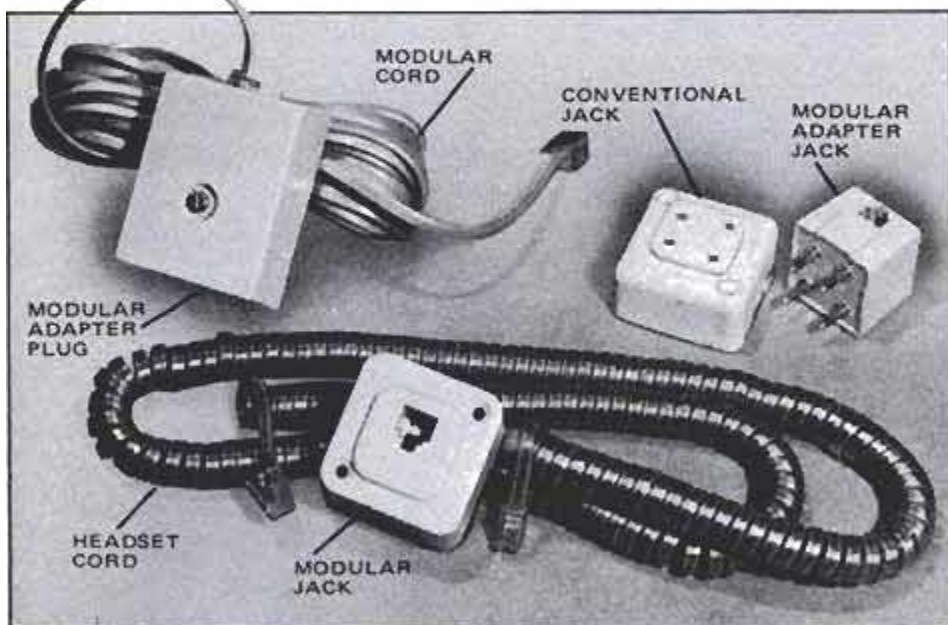
At this point, take apart the new 42-A block you'll need and attach the rear member to the wall. Then wire it up, according to the letter coding—also included on these blocks—and attach your phone.

It's easy to convert a 42-A (or standard) phone block to the newer modular plug. There are kits available at any radio or electronics-supply shop.

Simply remove the cover of the old 42-A block and tighten down the new converter. There are four terminals inside which will touch the contacts inside the block and make the contact (see photo).

If your home is equipped with modular plugs to begin with, buy a double modular plug and install it in an existing outlet. Then take some hookup wire equipped with a modular plug and a new plug block and run it to where you want the new extension outlet.

Federal Communications Commission rulings allow you to rig up such interconnects, but you're supposed to notify the phone company.



The adapters and jacks shown above make it easy to convert older-style, conventional jacks to the newer, modular system. Then you can just plug in your telephone extensions.

NEW FREE BOOK DISCUSSES

HOW TO SELL YOUR INVENTION

Do you have an invention you intend offering to manufacturers on a sale or royalty arrangement? If so, by all means write for our free booklet as a guide, whether you do it yourself, or employ us to help you.

It's free for the asking and here are just some of the subjects it covers.

- How to Describe Your Invention so Manufacturers will take Notice
- The Next Step to Take if a Manufacturer Shows Interest
- Approximate Royalty Rates Manufacturers are Currently Paying
- If Your Invention is Sold Outright for Cash
- Or, Part Cash, Part Royalty
- Submitting Your Invention Before Patenting

Our reason for giving away information we've gathered over our 26 years in this business is simply that we hope you read it and employ us at our reasonable fee rather than do it yourself. But that will be for you to decide.

But understand, we are not promoters, developers, brokers. Ours is a technical service of writing descriptive materials for your invention and selecting the right manufacturers who potentially should be interested in it. The materials we prepare are your property.

We are not patent attorneys. For questions relating to proprietary rights, searches, patentability, you should consult a Registered Patent Attorney.

But back to the booklet. We want you as a client but only if, after reading it, you think you need us. Otherwise the booklet will show you how to do it yourself.

So use the coupon below or call us Toll Free. We'll rush the booklet to you. No obligation whatever. But please do not send models.

REFERENCES: Your own bank, attorney, or Chamber of Commerce.

Mail this coupon or CALL TOLL FREE 800/537-1133, Ext. 51 In Ohio CALL 419/332-6496, Ext. 51 Mail the coupon or call today.

MAIL THIS COUPON

Mr. K. O. Kessler, President
Kessler Sales Corporation,
Dept. D-51, Fremont Ohio 43420
Please mail me a copy of your FREE Booklet explaining how to go about selling my invention. It is understood that this does not obligate me in any way to use your service.

Name _____
Street Address _____
City _____ State _____ Zip _____

PM'S SPORT-COUPÉ ROAD TEST

(Continued from page 92)

bunch. Why? Well, the Volvo GLT was perfectly balanced and enviably predictable. Unlike cars which were faster or quicker in one particular test but mediocre somewhere else, the Volvo did everything well.

Even more impressive, the GLT not only did everything well, it did it with insolent ease. It's a cinch to drive fast. Volvo has managed to capture that "King of the Road" feeling which used to be the exclusive province of Mercedes-Benz. In-

deed, our testers were unanimously convinced that in a head-to-head confrontation, the \$15,000 Volvo GLT would come out in front of a \$31,000 Mercedes 300D Turbodiesel in general fit and finish, high quality of materials, ride quality and handling performance.

As one tester put it, "The Volvo has a massive, solid feel. It's heavily built, and you can tell there's a lot of weight to throw around. But it has excellent road feel, lots of power and usable performance at all speeds."

Another driver wrote, "It feels like a steamroller—invulnerable.

It's an adult car, not a toy masking its deficiencies with electronic doodads. It's a car you can get in and go, without any hesitation. The Volvo isn't 'cute' or 'sporty,' it just feels right."

There is nothing in the chart on page 101 to indicate why this Volvo should be so "right." The basic chassis and body are from the old 144, which was introduced exactly 15 years ago and was dull as dishwater even then. There is no independent rear axle, no front-wheel drive, no versatile hatchback—not even a five-speed.

What makes the Volvo right is 15 years spent refining a basically sound design until all the details fall neatly into place. The instruments are legible, the seats as comfortable as a chiropractor's couch, the cavernous trunk softly lined and the overdrive button on top of the shifter engages instantly, then disengages automatically when you downshift into third.

Detail oriented

This overdrive is a perfect example of Volvo's attention to detail. Certainly the engineers at Volvo are capable of designing a workable five-speed transmission. But after a few hours, you realize that their overdrive is actually more convenient than a fifth speed. It requires less movement, and the automatic disengagement puts you right in the third-gear power band for highway passing with a single flick of the wrist.

Unlike most turbocharged engines, the old Volvo Four exhibits no throttle lag, no sudden burst of power as the turbo boost pressure goes positive and no high-pitched turbo whine. The Volvo just moves out, gathering speed swiftly and smoothly. You won't even know there's a turbo in the system, unless you see the boost-pressure gauge on the dash or the "Turbo" emblem on the trunk.

The Volvo GLT is high in what marketing men call "perceived value." The chairlike bucket seats are covered in high-grade, silvery velour. The paintwork is flawless. The dashboard looks as if it's carved from a seamless block of leather. Everything, from the electric mirrors to the sunroof, works effortlessly.

Most manufacturers save a few dollars by using cheaper original equipment (OEM) parts where they don't really show—not Volvo. Even the tires are expensive Pirelli P6s—mounted on equally high-priced alloy wheels—which are no doubt responsible for much of the car's

Buy Tools DIRECT at Rock-Bottom Prices!

Black & Decker

STANLEY

SKIL

WEN

Rockwell

CHAN NEL LOCK

DISSTON

Crescent

**6,000
NAME BRAND ITEMS**



Who buys from U.S. General?

Thousands of individuals and companies. Here's a partial list of firms from our last 6 to 9 months customer list:

General Electric • IBM • Procter & Gamble
E.I. DuPont • Honeywell • Union Carbide • RCA
General Motors • Westinghouse • Mobil Oil
Goodyear • GTE Sylvania • Burroughs • NBC
Dow Chemical • General Foods • Corning
Kodak • Bristol Myers • Standard Oil

**Same low prices for you—
no minimum order required!**

U.S. General Supply Corp., Dept. A-22
100 Commercial Street
Plainville, N.Y. 11803

I enclose \$1. Please send your new 196-page fully illustrated Tool & Hardware Catalog with Rock-Bottom prices. Also send a Special Discount Check worth \$1 off on any purchase. If I am not 100% satisfied with the Catalog, my \$1 will be immediately refunded.

(Print)
Name _____

Address _____

City _____ State _____ Zip _____

Buy direct from U.S. General's catalog and enjoy ROCK-BOTTOM prices on hand tools, power tools, automotive tools, motors, handyman supplies—6,000 nationally advertised name brand items at OFF prices. Save on all the famous names you know and trust—Stanley, Wiss, Proto, Skil, Crescent, Lufkin, Rockwell, Black & Decker, plus many, many more.

Thousands of serious minded craftsmen, mechanics, homeowners and hobbyists each send us \$1.00 just to get this big 196-page catalog of fantastic buys on brand name tools, hardware, and accessories.

Our bargains are too great and our prices too low for us to give away this big catalog to people who aren't really interested. So we ask for \$1 simply to discourage curiosity seekers.

But the way we look at it, the Catalog is REALLY FREE! We'll send you a Special \$1 Discount Check. Spend the Check just like money on any order and get your \$1 back. OR if you're not 100% satisfied with the catalog, just return the back cover which has your name and address on it and we'll refund your dollar immediately—(you keep the catalog).

As an extra "thank you" for acting now, you'll also receive with your first order no matter how small—a 10 piece High Test Steel Drill Bit Set (worth about \$4.00) absolutely FREE.

U.S. General Supply Corp., 100 Commercial Street, Plainville, N.Y. 11803

©COPYRIGHT 1962 U.S. GENERAL SUPPLY CORP.

excellent handling, braking and ride. P6s are quasi-racing tires for street use and they work wonders for the antique Volvo chassis.

The GLT is good, but not perfect. The shift lever is surprisingly wobbly for a conventional front-engine/rear-wheel-drive car with direct shift linkage. There's very little antidive geometry in the front suspension, which allows too much nose dive under heavy braking. The engine gets a bit noisy and rough at anything over 4,000 rpm and there's an awful lot of body lean in the corners—though it doesn't seem to affect the handling.

But despite all this niggling, the Volvo GLT was everybody's favorite sports sedan. It feels safe and solid and you can understand why Volvo advertising plays up the fact that the car will last a long time: It really does feel unbreakable.

At \$15,000, the Volvo may seem expensive for a two-liter sedan, but not when you look around at what else you can buy in this price range. To find the same performance, sophistication, style and quality elsewhere, you'd have to spend twice as much for a Mercedes 300D Turbodiesel. So if you think of the GLT as a Mercedes for half the price, it becomes an automotive bargain, indeed.

Chevrolet Citation X11

If there is a surprise in this group, it's the X11. One driver ranked it first and the others put it second or third behind the Volvo. It's easy to see why: performance.

With its automatic transmission, the Citation was still quickest and fastest at the drag strip, fastest around the skidpad, second in braking and nearly tied for second in the slalom. It was even the quietest car in the group.

The Citation is also the cheapest car in the group, in both senses of the word. At just over \$10,000, the X11 is a fat \$5,000 less than the winning Volvo. And you can see where the GM bean counters saved every penny.

The all-plastic interior is, frankly, tacky. The sound of a Citation at speed is dominated by the chirping of little pieces of plastic rubbing together. Nothing about the interior gives you the feeling that it will still be in place and functioning six months from now. And most of the controls would be an embarrassment on a transistor radio from Taiwan.

The U.A.W. comes in for its share of blame, too. You can find every weld in the body just by following the grinder marks. And you can spot

the grinder marks because the paint is thin enough to read through. At least half the trim screws on the interior seem to have missed their holes, and the worker who applied the weatherstripping cement all over the inside of the hatchback should be made to register with the U.S. government as an agent of the Japanese car industry.

A driver's car

But there are compensations. The X11 is a genuine joy to drive. The "high-output" V6—larger valves, 9 to 1 compression ratio, high-lift cam and fat exhaust system—revs willingly to 6,000. And the terrific three-speed automatic lets it go right to the redline in every gear. Chevrolet says that its four-speed manual will deduct another second from our quarter-mile times, but I don't see how. The automatic is as nice a transmission as you'll find and it makes you wonder why other sports sedans need shifters to feel sporty.

That old myth about "European handling" is finally dead. Our X11 would run rings around a BMW. As one tester wrote, "It shows absolutely flat cornering, no body lean; the suspension is taut and supple at the same time. There are no surprises." The Goodyear Polysteel GT tires on our test car not only performed well, they wore smoothly and evenly, too, which indicates that the suspension is doing its job.

The sole area where the GM chassis engineers have fallen down is in steering. The Citation is difficult to drive really fast, because the steering is way too slow and it wanders all over the map. Set up to cut an apex and you'll find yourself two feet from where you want to be. Splice in a new steering gearbox, and the X11 chassis would be just about perfect.

The basic Citation hatchback package accomplishes the magic of being compact on the outside—the shortest car in this group of smallish cars—yet spacious on the inside. It seemed far roomier than any car, except the Volvo, with the important plus of a hatchback rear and folding rear seat. The stowage space revealed is truly impressive.

The X11 even looks good. This particular car was beige over beige, which led one wit to tag it "Mr. Bland." But the styling is clean, uncluttered and aggressive. That's been characteristic of GM "muscle cars" since the old Impala SS days, and the formula still works.

If it's so good, why didn't the X11 win? Well, the power, the handling, the styling, the interior room are

(Please turn to page 146)



Finish this exciting CLOCK Yourself and Save!

Fun and easy... everything included.

- Cedar "Burl" 14-17" x 1 1/4" thick, prerouted and predrilled, Easy to finish
- Superb #756 quartz movement (West Germany's finest)
- Goldtone Serpentine Hands, elegant.
- Goldtone Roman Numerals, self-adhesive.
- Complete, easy-to-follow instructions.

Introductory price just **\$19.95***

plus \$2.50 shipping & handling, each quan.

Create your own clocks, order add! #756 quartz movements! Accurate to 1 min. year. Runs up to 4 years on one "C" battery. Goldtone hands incl. with this ad. Warranted full year. Only \$7.95* plus \$1.50 per order shipping & handling quan. *Colo. residents add tax.

Free catalog

Please send me the merchandise checked above:

Total order _____ Ship. & hand _____ Total _____

VISA/M.C.# _____

Exp. Date _____

Name _____

Address _____

City/State/Zip _____

CLOCK CRAFTERS

5605 NO. PETERSON AVE., SEDALIA, CO 80135

ATT: DEPT. K

FREE GARDEN CATALOG



★ Over 80 Beautiful Color Pages

★ Money Saving Values

★ Satisfaction 100% Guaranteed!

FREE PLANTS

Details included with your catalog.

SPRING HILL NURSERIES

Spring Hill Nurseries N6102

6523 N. Galena Road, Peoria, IL 61632

Please rush money-saving FREE Garden Catalog with Free Plants offer.

Name _____

Address _____

City _____

State _____ Zip _____

Build your own air compressor from PM's plans



Once you have an air compressor in your home shop, you'll wonder how you ever got along without it. You can spray paint with it. You can inflate swimming gear, toys, auto and garden tractor tires. More important, you can sandblast parts and rivets in metal seams. You can blow-clean fine mechanisms and, with PM's unit you can vacuum pump your car's airconditioning system prior to adding Freon—something you can't do with most ordinary air compressors. Finally, this unit features a filter/water trap—which is an optional extra on most commercial air compressors.

PM AIR COMPRESSOR

You can do all these things with this versatile 1-hp compressor and, happily, you can build it for less than \$200. **PM**

Compressor evacuates car's airconditioning system prior to adding new refrigerant (far left). At left, routine inflation of tires saves trip to gas station.

HOW TO ORDER PLANS

Send check or money order for \$5.95 to Air Compressor, Popular Mechanics Plans Library, Box 1014, Radio City Station, New York, N.Y. 10101. Allow two to three weeks for delivery; for first-class mail send 75 cents extra.

Popular Mechanics is a publication of Hearst Magazines, a division of the Hearst Corporation.

PM'S SPORT-COUPÉ ROAD TEST

(Continued from page 145)

beyond criticism . . . it's a modern-day Z-28. Without question, the car is more fun to drive than the others in this group.

Unfortunately, it's not more fun to be inside. One driver said the Citation interior was "like riding inside a kitchen appliance," and that's as good a description as any. Plus, the car seems poorly built and cheaply equipped.

In sum, the X11 is a terrific platform on which to build yourself a car. Repaint it, redo the interior, add some Recaro seats and detail the whole thing like a show car and you'd have a machine that's as good as—maybe better than—a Volvo GLT. You'd also have a \$15,000 Citation. For that much you can buy a Volvo and not have to do anything except drive it.

BMW 320i

The 320i is a disappointment. It's been the standard of comparison among sports sedans for so long that you tend to assume it's also the best. Wrong. Like all BMWs, the car is exquisitely turned out. In terms of assembly quality and materials, it's everything the Citation isn't. The paint is lovely, the fit of panels is true, there's not a ripple in the body stampings, and the interior looks like an expensive German corporate jet. It also costs \$6,000 more than a Citation, of course, so you pay generously for that care and attention.

The BMW falls down almost everywhere. Not only is it the most expensive car of the group, it's the smallest. Honestly, this is a two-passenger car with occasional 2+2 seating in the rear. The driving position is early go-kart: head back, knees up, legs spread. Headroom is very limited, and the seats are so small, they lack thigh support, lateral support and shoulder room.

Surprisingly, the 320i has fewer instruments in the dashboard than any other car in the group, the steering wheel rim is too narrow and hard, the sunroof is hard to open and even the radio is difficult to operate. The other four cars in the group all have nicely lined trunks; the 320i has a small, poorly finished, unlined trunk. For \$16,000, you have a right to demand attention to details.

The BMW was a disappointment at the track. It was next to last in the quarter mile, slowest through the slalom, slowest on the skidpad and worst in braking. It has a serious case of trailing throttle oversteer that makes the chassis feel all loose

(Please turn to page 154)

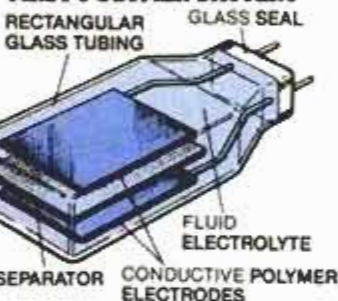
TECH LINES

Conductive-plastics battery

Energy

The scene in New York City just recently had its eerie side. There was a small glass cell, containing no metal components (outside of connectors and wires), pumping out enough real electricity to run a small motor. It was the first demonstration, outside the lab-

FIRST POLYMER BATTERY



oratory, of batteries made from conductive polymers—plastics.

This new technology was pioneered by research at the University of Pennsylvania. At the same time, Allied Corp. researchers had been following a parallel course in trying to develop new conductive polymeric materials. On behalf of its C&D Batteries Div., Allied has licensed Penn's technology,

and the completion of a working plastic battery was announced jointly by University and corporate spokesmen.

Batteries which employ polymeric electrodes are a different breed. When charging or discharging (see below), no actual chemical changes occur in the electrodes or electrolyte (a fluid, usually lithium salts in solution). This implies stability and reliability over many charge/discharge cycles. Test cells have also shown a capacity for fast recharging.

But the most exciting potential of polymeric batteries is the expected lightness and high power density that production units could evolve within the next five years. C&D researchers estimate that a plastic battery, weighing the same as a conventional lead-acid automotive battery, would produce 10 times the power output. If so, the electric automobile would become a practical alternative immediately. In other applications, battery weights and sizes could be dramatically reduced. In addition, conductive polymer units could be designed and



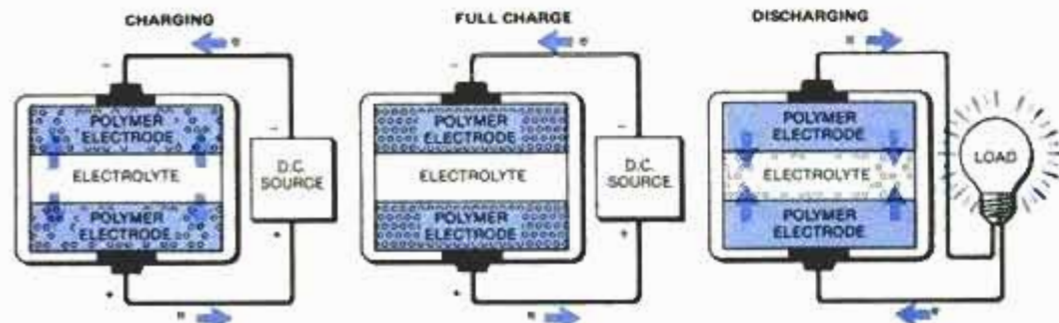
David Boden, technical director of C&D Batteries Div. of Allied Corp., shows experimental polyphenylene battery and parts.

molded to virtually any shape—a car door, for instance, could contain the battery.

Some basic problems must be solved before the new technology can yield economical, easily manufactured batteries. Polyacetylene, the electrode

material first used in the Penn experiments, degrades in a normal atmosphere, so it would have to be manufactured in inert-gas conditions. Polyphenylene, used as an electrode material by Allied researchers, is too brittle to be formed into the thin sheets that provide maximum power density in a battery. Laboratory batteries have also exhibited low shelf life, with self-discharge rates far too rapid for a practical unit.

Allied executives don't expect to have a marketable battery based on conductive polymers for another three to five years. But keep an eye out for other interests with breakthroughs employing "plastic metals."



Current flow (e) causes electrons to move out of positive electrode and into negative as charging begins (at left); at same time, ions (arrows) from

electrolyte move into polymer, balancing charges, until battery is fully charged (center). Discharging reverses migration of ions (right).

Aviation

Air Force 'homebuilt'

The Air Force may soon be using a "homebuilt" airplane to train new fighter pilots. The tiny, twin-jet, twin-tailed craft at right is a 62-percent-scale prototype for a new military trainer proposed by Fairchild Republic to replace the aging T-37 trainer.

Called the NGT (for Next Generation Trainer), the plane is one of five rival designs that will participate in a competitive "fly-off" for the Air Force.

What's unique about the NGT is that it's the work of noted homebuilt designer Burt Rutan, famous for such innovative sports planes as the Vari-Eze and Quickie (see *The Wizard of Homebuilts*, page 116, Feb. '79). Incorporating the latest in homebuilt technology, the NGT, like the Vari-Eze and Quickie, is made of foam/fiberglass composites—a radical departure in military-aircraft construction. Even the landing gear is straight out of Rutan's little Vari-Eze.

The prototype NGT is a single-seater, but the full-scale version will be a two-seater with instructor and



Proposed new Air Force trainer is designed like a homebuilt sports plane. Prototype above is a single-seater, but production version will have two seats side by side.

student sitting side by side in a broad, dual-control cockpit—unusual for a jet-powered trainer. This will enable instructor and student to observe each other's techniques firsthand—not possible in conventional tandem-seat trainers.

The NGT, only 18 feet long, is powered by two 220-pound-thrust turbojet engines and does nearly 300 mph. Along with Fairchild, others in competition will be Cessna, General Dynamics, Rockwell International and Vought.

SST in the works?

U.S. Patent 4,287,715 has been granted for a supersonic jet engine designed by Garry Klees and assigned by him to the Boeing Co. Boeing has no current plans to build a supersonic transport, but that's not to say it never will. Klees's engine has a variable-bypass passageway downstream of the combustion chamber. At low power, all combustion gases are directed through the turbine stage; at high power, some are bypassed, so turbine flow is constant.

Alternatives

Thing that ate upper Michigan

A firewood processor, designed by La Font Corp., Prentice, Wis., turns a one-man operation into a logging company. Known as the SM-80, the single-handed unit is completely mobile, propelled by a John Deere diesel-powered, hydraulic drive wheel. A built-in fork lift hoists logs to the log deck, which moves them hydraulically to a cutting trough where a chain saw, also hydraulic, cuts them into splitting lengths. A 20-ton hydraulic ram, operating on an 11-second cycle, then splits the wood.

The production rate, with one operator, was calculated at 1.5 cords (about 192 cu. ft.) per hour by Total Tree Products, a small logging firm operating in Michigan's Upper Peninsula. Total Tree has contracts with individual property owners for precise spot-logging, which pays off part of the deal in instant firewood.

The SM-80's drive wheel and splitter are retractable for over-the-road trailering. Options include a conveyor for easy loading. (FM stereo and a Recaro seat aren't mentioned in the official literature.) At Total Tree Products, everyone, including a former Merrill Lynch stockbroker who is one of the principals, can run the SM-80.



The built-in lift brings logs up to the conveyor system.



Diesel-source hydraulic power does all the positioning.



Trough holds logs as small as 3.5-in. diameter for cutting.



The splitter can exert up to 20 tons of hydraulic pressure.

Transportation

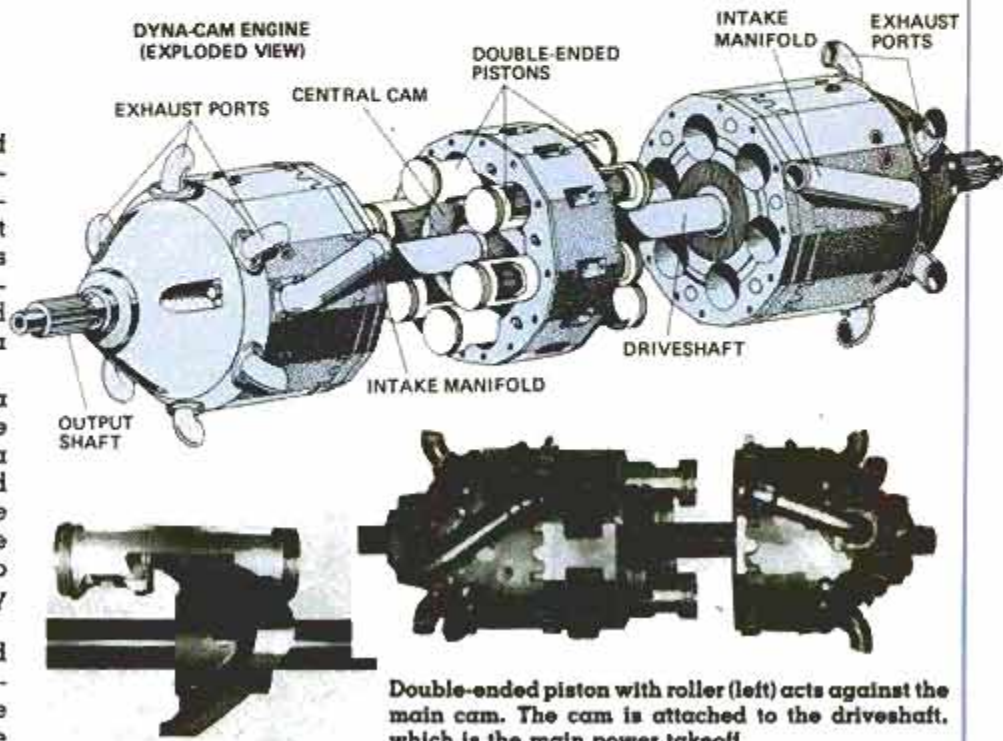
Pistons times two

There seems to be no shortage of clever ways to package the internal-combustion engine, and the one pictured on the right is the latest attempt to breathe new life into this old powerplant. It's called a Dyna-Cam engine, and it's manufactured by Dyna-Cam Industries in Santa Ana, Calif.

Instead of using pistons tied to a conventional crankshaft, this engine uses double-ended pistons with a roller where the connecting rod would normally be. The pistons slide back and forth in their bores and the rollers act on a large central cam to convert linear motion into rotary force.

It uses conventional ignition and fuel-delivery systems, but the pistons fire on both ends. When one side is on the power stroke, the other side is on its compression stroke. Therefore, even though it has six pistons, it's actually a 12-cylinder engine.

The advantage, according to the manufacturer, is extremely light weight for such high power output. In its current state of tune, it produces 210 hp at 2,000 rpm and 650 foot-



pounds of torque at a mere 1,200 rpm. The engine weighs 264 pounds. It can be turbocharged to produce about 300 hp.

At 373 cu. in., this new engine isn't small, but according to Dyna-Cam, fuel consumption is much less than

that of a conventional engine of like displacement. Due to its small frontal profile, the Dyna-Cam motor has found a ready home in the engine bays of small aircraft and has been certified by the Federal Aviation Agency.

Environment

Gun down pollution

How much of the carbon-based pollution in our air is due to fossil-fuel burning? What amount of the same pollutants comes from "living" sources—firewood and the natural aspiration of trees? A National Bureau of Standards research chemist is using a unique apparatus to find out. Lloyd Currie reasoned that measurements of the unstable carbon-14 isotope could determine the relative contributions of "dead" versus live sources to the pollution of air samples. But the measurements would have to be

made on minute samples—far less than is normally considered adequate for radiocarbon dating.

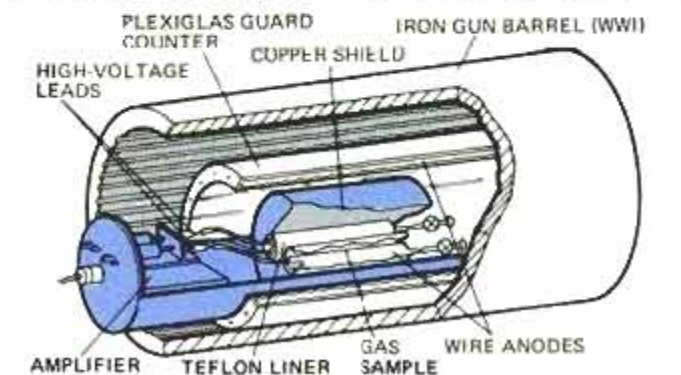
This meant that the pollutant samples would have to be shielded from radiation found in the natural background—even human researchers' emanations.

Currie decided to use a section of a WWI naval gun barrel as a shield. Unlike modern metals, vintage iron has no inherent radioactivity due to fallout.

To determine the C-14 content, a carbon sample must be burned completely to convert all the carbon to CO₂. This gas sample is

introduced into a quartz cylinder ("counter") lined with copper foil and containing a central tungsten wire (anode). The counter is encased in a shield of high-purity copper and inserted in the gun barrel. By applying negative potential to the foil lining, electrons emitted by decaying C-14 atoms are picked up as electrical pulses in the wire anodes, recorded by computer and stored.

Then a second counter, surrounding the copper-shielded sample, registers and discounts high-energy particles from cosmic-ray sources. Thus far, living carbon in air samples has been found to range from 10 to 55 percent, primarily due to residential wood burning.



Radiocarbon dating apparatus is shielded in WWI gun barrel.

Engineering

City against the sea

Gale winds from a severe Atlantic storm system whip the North Sea into a fury, driving it south through its eternal bottleneck, the Dover Straits. A spring tide coincides with the storm. The swollen waves can only run inland, up the estuary of England's Thames River. Miles of embankments and retaining walls shield the coastal flatlands east of London, but also force a catastrophic tidal surge towards Britain's capital. It foams into the heart of the city, 60 square miles of dense population. Hundreds are drowned in homes and offices. London blacks out; its phones go dead.

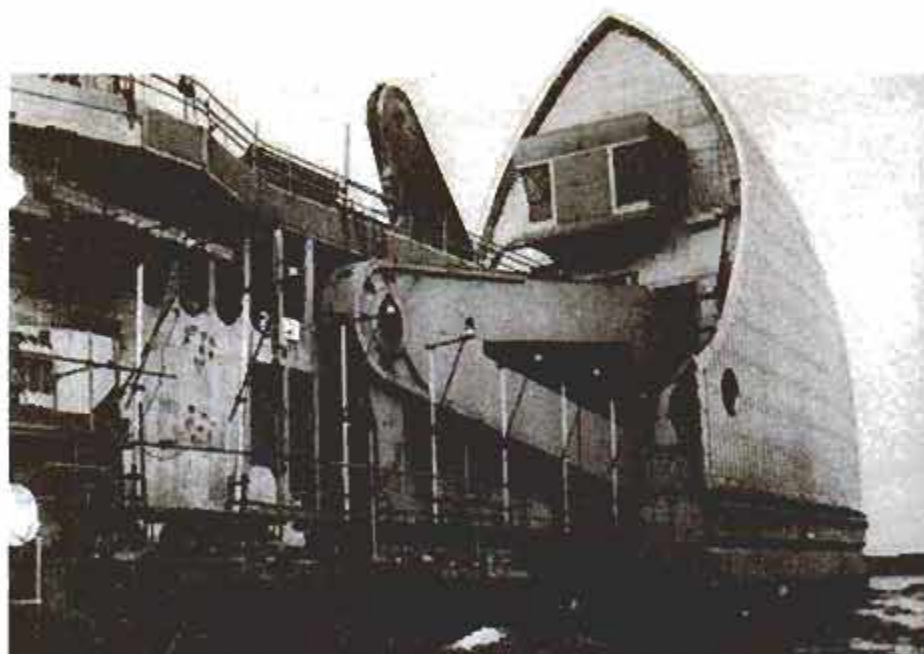
The foregoing is not a horror-film scenario, but a realistic projection by Britain's meteorologists and flood-control authorities. Tide levels are rising; Britain itself is gradually tilting, lowering its southeast corner by a foot every century. And London is sinking into the clay upon which the Romans built it in 43 A.D.

Flood walls put up after a disastrous surge in 1928 can no longer be heightened, and another killer flood is now considered more likely than an earthquake on the San Andreas fault. Enter Charles Draper, a civil engineer whose scheme to provide the Thames with a flood-control system was chosen over 40 other formal proposals.

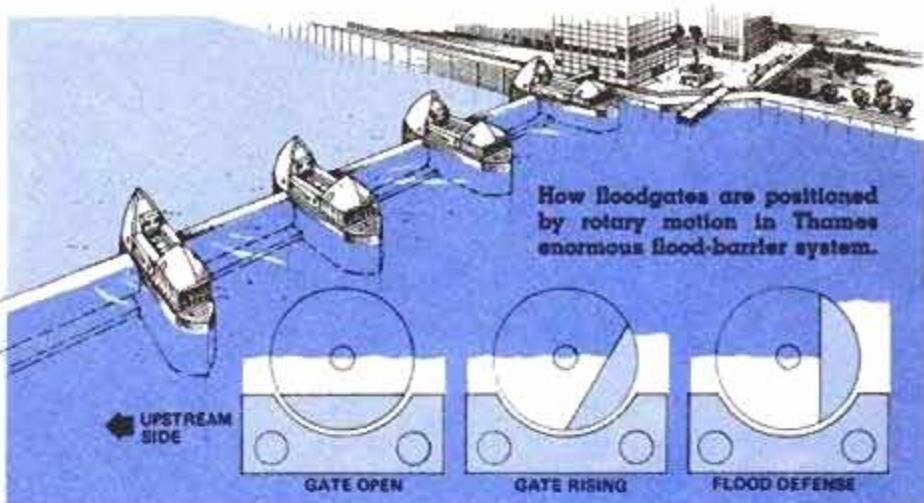
Draper's brainchild, the largest adjustable flood barrier in the world,



Site of the barrier, known as Woolwich Reach, is 12 miles from center of London. Retaining walls seaward of barrier need strengthening to stand return surge.



Flood barrier's nine piers are each 214 feet long and rise 165 feet from riverbed.



is nearing completion 12 miles downriver from Big Ben. It will include 10 huge, D-shaped floodgates rotated by steel discs pivoted between concrete piers—which also house control rooms and operating machinery. In normal conditions, the system resembles giant stepping stones; of the nine piers, the four in mid-channel are spaced widely to give safe clearance to shipping. The floodgates, each half the size of a football field, will be out of sight, cradled flat-face up within concrete sills sunk into the river bed.

But should the meteorological conditions that presage a flood appear, the Barrier Controller, in a

stainless-steel operations shell atop one of the piers, would make his decision. The great gates—four largest weighing 3,200 tons apiece—would rotate upward on hydraulically powered rocker arms through a 90° arc, presenting the oncoming tidal surge with a continuous steel wall, five stories high. In 15 minutes, London would be sealed from disaster.

As of now, Charles Draper's marvel is scheduled to go into operation in early 1983. Since construction began in 1975, delays, disputes and slowdowns among the project's 2,000 workers have boosted the barrier's cost to over \$1.5 billion. Twice in recent winters, the river has risen to only inches from cresting the existing flood walls. Until next year, Londoners are praying the North Sea keeps its distance.

Editor: Robin Nelson
Contributors: Tony Aseneta, Shel Gallagher, Len Gultridge.

Innovations

Complete Satellite Receiver System brings you movies, concerts, sports events.*

The Heathkit Earth Station includes a heavy-duty, 3-meter antenna, an integrated low-noise amplifier/down-converter, and a receiver with electronically-synthesized tuning for stable, drift-free reception. 24 channels let you receive just about everything the satellites have to offer. Special Earth Foundation Kit anchors your antenna firmly to withstand winds of up to 100 mph. And it's all yours at a very affordable price.

Complete computer system in one compact unit.

The Heathkit All-In-One Computer takes the guesswork out of selecting a balanced computer system. It includes built-in floppy disk drive, smart video terminal, heavy-duty keyboard, 12-key numeric pad, two Z80 CPU's, and 48K RAM—all in one compact unit. Save 30% over comparable assembled units. Heath makes it easy to build with detailed, step-by-step assembly manuals that anyone can follow. A complete line of software for home, work and play is also available.



The first fully programmable keyer stores commands as well as text.

You HAM's will love the Heathkit μ Matic Memory Keyer with custom microprocessor to store up to 240 characters of text or commands. Variable-length buffers eliminate wasted memory space. Command strings take several text buffers and string them together in any sequence for most efficient use of memory. Command strings can also select speed, weight, spacing and auto-repeat count. Integral capacitive touch paddles unplug and store in their own compartment. Put the fun back in CW.

Solar Water Heater saves you up to 80% on hot water costs.

As fuel costs rise, the Heathkit Solar Water Heater keeps paying you back. Because you build it yourself, you build it better, for less. And with Federal and State tax credits, solar pays for itself in no time. Based on computerized data, we help you select the correct system size to produce 50 to 80 percent of the annual BTU requirement for water heating, based on available sunlight in your area. So you know it's practical before you buy. The system includes solar panels, pumps, heat exchanger, storage tank, and complete assembly and installation instructions.

Heathkit®

If coupon is missing, write Heath Co.
Dept. 017-852, Benton Harbor, MI 49022
In Canada, write Heath Co.
1480 Dundas Highway East,
Mississauga, Ontario L4X 2R7.

Heathkit Products are displayed, sold and serviced at Heathkit Electronic Centers† in major cities in the U.S. and Canada. See your telephone white pages for locations.

†Units of Veritechnology Electronics Corporation in the U.S.

*Viewing of some satellite TV channels may require the customer to obtain permission from, or make payment(s) to, the programming company. The customer is responsible for compliance with all local, state and federal governmental laws and regulations, including but not limited to construction, placement and use. For use only in Continental U.S.

Free Catalog

See all the newest innovations in build-it-yourself kits in the new, free Heathkit Catalog.

Send to: Heath Co., Dept. 017-852,
Benton Harbor, MI 49022.

Yes. Send me a Heathkit Catalog.
I am not currently receiving one.

Name _____

Address _____

City _____ State _____

CL-753 Zip _____

PM'S SPORT-COUPÉ ROAD TEST

(Continued from page 146)

and wobbly during any kind of hard driving, and it picks up the inside rear wheel with little provocation.

Resonance is a way of life in a 320i. At idle, there's an annoying vibration, at highway speeds there's a lot of road, wind and engine noise. The whole car is buzzy, in a way that economy cars used to be five years ago. It's tiring to drive for long.

But all is not gloom. For everyday grocery-getting, the 320i is fine. The little engine is willing enough and likes to be kept spinning. The shifter is crisper than any other you'll find, in or out of this group, and except for the lack of a reverse lockout, it couldn't be better.

This is a very expensive, high-quality car that's overdue for a total redesign to 1982 standards. As one of our test crew wrote, "I like the car well enough, but it really doesn't give you anything more than a Honda Accord, except a higher price tag. It's well made, but not much car for the money."

Audi Coupe

The Audi provoked more discussion than any other car. One of our testers thought it looked like a Lamborghini, one thought it looked like a cartoon. It measured the largest in interior space, yet was uncomfortably cramped to sit in. At the track, it was equally uneven in performance, being by far the fastest through the slalom, yet only mediocre on the skidpad and slower than slow in acceleration.

It's easy to see why most of this occurred. The Audi was slow in the quarter mile because the car is geared for high-speed cruising, not acceleration. As one tester said, "I love this engine—it's willing, able and free-revving and the transmission has perfect gear ratios for normal driving. The engine is the best thing about the car."

The Audi was fast through the slalom because the basic front-wheel drive chassis is excellently balanced. The steering is light and solid and the car handles superbly with very little lean or sway. It's also easy to drive fast. Some cars have to be tricked into going fast; the Audi Coupe drives itself up to the limit.

The Audi was slow around the skidpad circle because the Firestone 500 tires fitted to our test car were just one step up from rim protectors.

The tread rubber chunked off in golf-ball-size lumps during our testing, exposing the cords—a dangerous condition that Audi has promised to investigate. Given decent tires—say the Pirelli P6s of the Volvo—the Audi would surely have scored much higher in not only the handling tests, but braking and acceleration, as well.

One tester called the exterior styling "exotic and spacey, a poor man's Countach." Another said simply "superb." But not everyone agreed: "too compromised to be useful; strained and overwrought; too flashy for my taste." We all did agree that the car was by far the sportiest looking of the group, sleek and attention-grabbing. Whether that's good or bad, we couldn't decide.

One place Audi missed the boat was in not making the Coupe a hatchback. There's plenty of volume inside that body, but you can't get at it. The trunk is beautifully finished and detailed, but the floor is so uneven, it's practically useless. Cutting a hatchback roof and a flat floor into this car would alleviate a lot of its utility problems.

But not all. The Audi Coupe interior is basically that of the Volkswagen Scirocco/Rabbit, which isn't quite what you expect on a \$14,000 car. One tester said, "The car deserves a BMW interior; the flimsiness of all the interior trim is its biggest drawback." Said another, "The interior is bizarre; it looks like an old Fiat, poorly laid out and poorly assembled of poor materials."

The Scirocco seats came in for special criticism. "You sit on them, not in them, the side bolsters are useless in hard cornering, so there's little lateral support. The construction is so light, the seat is loose in the tracks." Said another tester, "The seats are too low, uncomfortable and shabby-looking."

All in all, the Audi is seriously compromised. The engine, the gearbox and the brakes are excellent, and the handling is sharp. But the quality isn't very high and the interior isn't well thought out. But the car has potential. It's a more livable design than a Porsche 924, for example, needing only a high-line interior and hatchback to come together. The Audi Coupe is relatively inexpensive, exotic-looking and a nice road car. It's just not finished yet.

Saab 900 Turbo

Nobody was really thrilled by the Saab. The exterior styling evoked comments like "silly," "blah" and "I still can't get used to it after all these years." The interior was just as unpopular. "Weird at best," and

"poorly designed" were typical comments.

The Saab is almost willfully different. A gas-station attendant refused to check the oil level because he'd had experience with Saab's forward-hinging, hood on rollers, and didn't want to break another one. The ignition key is hidden between the seats on the floor, while the windshield header blocks overhead traffic lights and the heavy roof pillars hamper vision in all directions.

Unfortunately, the Saab doesn't make up for all these discomforts when you get to the track. The shift lever is "flat terrible," a rubbery stalk that needs encouragement to go into gear. At the drag strip, there was so much wheel hop under acceleration that we had to hold the shifter in first to keep it from popping out of gear, and then the Saab would just sit there and hop up and down, spinning the tires.

The Turbo has terrific acceleration once you get it launched—you end up having to just drive it off the line before hitting the throttle—about the same as the Volvo. But between the poor shifter and inadequate front suspension, it's hard to accelerate fast.

Not fun

The Saab is also hard to drive fast around a corner. Even with Pirelli P6 tires, the car understeers massively because of too much weight on the front end, wearing out the front tires in the process. The X11 has a much more sophisticated front-wheel-drive chassis, and is much more rewarding to drive. The Saab suspension seems under-damped, so it gets upset easily on anything but a pool table. It's not fun.

The Saab has excellent brakes, predictable and well modulated. The turbo engine is smooth and powerful, once you get beyond the low-speed stumbles. There's a lot of luggage space with the rear seat folded down, and the seats are comfortable for straight-line driving, though they have too little lateral support.

Otherwise, there's not much we liked about the Saab. For \$16,000, it's just not in the same league as the Volvo GLT. When a tester says the feature he likes best about the car is "the electric rear-view mirror control" and what he particularly dislikes are "the styling, the interior, the handling, the shifter and driving it," then you've got a problem. The Saab appeals to its own little world of enthusiasts who won't buy anything else. But as our Auto Editor wrote, "I'm really puzzled by this car. I think I should love it, but it really irritates me." **PM**

Produced by the PM Auto Dept.
Text: Rich Taylor
PM photos: Brad Hess

HOW TO PROTECT YOUR HOME

(Continued from page 118)

case opens to reveal the controls.

You can set a whole week's worth of operations. Turn lights on and off in various rooms or leave lights burning after sundown in the den and turn them off at night.

Best of all, the programmer has a bit of randomness thrown in. On and off times will change within a half hour's space of time each night.

Most automatic lighting systems use computer-encoded data. So the ultimate protection is to program a home computer with an automatic lighting system. You can program a full month's worth of on-off cycles for lights and appliances. For example, we used Mountain Hardware's program for the Apple II Computer and found that, with it, and the BSR automatic lighting system, we could simulate a frenzy of activity in our house—while not a soul was home. **FM**

When choosing equipment, check your classified directory under "Burglar Alarm Systems." Inquire about systems you can install yourself; many need professional installation to keep their warranties valid.

SOURCE LIST

- Alarm systems and accessories, wired and wireless**
Controller Systems Corp., 21363 Gratiot Ave., East Detroit, Mich. 48021.
G.C. Electronics, 400 South Wyman, Rockford, Ill. 61101.
General Electric Corp., Consumer Products Dept., Syracuse, N.Y. 13221.
George Risk Industries, GRI Plaza, Kimball, Neb. 69145.
Guardian Electronics, 31117 West Via Colinas, Westlake Village, Calif. 91362.
Honeywell Inc., Home Security Div., Honeywell Plaza, Minneapolis, Minn. 55408.
Napco Security Systems Inc., 6 Ditomas Court, Copiague, N.Y. 11726.
Nitone Div., Scoville Inc., Madison and Red Bank Rds., Cincinnati, Ohio 45227.
Pittway Corp., 780 McClure, Aurora, Ill. 60505.
The Shelburne Co., 110 Painters Mill Rd., Owings Mills, Md. 21117.
SOS Alarms, 31822 Village Center Rd. No. 202, Westlake Village, Calif. 91362.
Stratitrol, 140 South Union Blvd., Lakewood, Colo. 80228.
Universal Security Instruments Inc., 10324 South Dolfield Rd., Owings Mills, Md. 21117.
- Automatic light controls and timers**
AMF, Paragon Electric Co. Inc., 606 Parkway Blvd., Box 28, Two Rivers, Wis. 54241.
BSR Industries, Route 303, Blauvelt, N.Y. 10913.
Dynascan Corp., 6460 West Cortland St., Chicago, Ill. 60635.
Intermatic Inc., Intermatic Plaza, Spring Grove, Ill. 60081.
Leviton Manufacturing Co. Inc., 59-25 Little Neck Parkway, Little Neck, N.Y. 11362.
- Locks, safes and security hardware**
Cable Lock Systems Inc., 3100 Airport Ave., Santa Monica, Calif. 90405.
John D. Brush and Co., 900 Linden Ave., Rochester, N.Y. 14625.
Lori Corp., Southington, Conn. 06489.
Meister Atlanta Corp., 3701 Clairmont Rd. N.E., Atlanta, Ga. 30341.
The Tufnut Works, Div. of Santa Fe Systems Inc., 236 Montezuma St., Santa Fe, N.M. 87501.
- Miscellaneous devices, electrical and nonelectrical**
Emhart Industries Inc., 560 Alaska Ave., Torrance, Calif. 90503.
J.C. Penny Co. Inc., Catalog Div., 90 Annex, Atlanta, Ga. 30390.
Master Lock Co., 2600 North 23rd St., Milwaukee, Wis. 53210.
Montgomery Ward, 2101 East Kemper Rd., Sharonville, Ohio 45255.
Mountain West Security Equipment Distributors, 4215 North 16th St., Box 10780, Phoenix, Ariz. 85064.
Radio Shack, One Tandy Center, Fort Worth, Tex. 76102.
Sears, Roebuck and Co., Sears Tower, Chicago, Ill. 60684.

Here's *all* you need to garden—and *more*!

A Small Wonder.

The Masport Home Gardener™

is so light and versatile you'll probably want to use it for most of your gardening chores. In fact, 79% of Masport owners we surveyed use their Home Gardeners at **least every 2 weeks**—not once or twice a year like most tillers! Here's why:

- **Lightweight.** One-third the weight of big rear-tine tillers, just 76 pounds. So, you can handle it easily. No extra muscle needed.
- **Tills, Cultivates, Weeds.** Just adjust the working head to fit the job.

Use it all season long—not just Spring and Fall.

- **Easy to Handle.** Anyone can use it—from older folks to youngsters. It's small and light so it won't bounce and shake you to death! Enjoy easy control.
- **Affordable. Half to one-third** the cost of big rear-tine tillers—with **four times** the uses!

For complete information, return this coupon or call 1-800-227-2864 (in California, 1-800-772-3589)



Send to: Masport America Inc.
Dept PM-21, 200 Gate 5 Rd.,
Sausalito, CA 94965

Name _____

Address _____

City _____

State _____

Zip _____

Phone _____

©1982 Masport America Inc.

Build This Popular Mechanics Air Compressor.

It adds a new dimension to your home workshop.



When you build the rugged Popular Mechanics air compressor, you'll get one of the most versatile shop tools around. It's a tough workhorse that can tackle jobs you never dreamed of doing before—riveting, sandblasting, spray painting, inflating and countless other projects. And, unlike ordinary compressors, the PM air compressor can evacuate your car's air conditioning system. But best of all, it's affordable. With plans from the Popular Mechanics Plans Library, you can build the PM air compressor yourself and save up to \$200.

Popular Mechanics is a publication of Hearst Magazines, a Division of THE HEARST CORPORATION

Send today for your Popular Mechanics Air Compressor plans, and add a new dimension to your workshop. Only \$5.95 (add 75¢ for first-class mailing).

Send check or money order to: 182
Air Compressor, Popular Mechanics Plans Library,
Box 1014, Radio City Station, New York, NY 10101.

(Make checks payable to Popular Mechanics.)
Please send me _____ sets of Popular Mechanics air compressor plans at \$5.95 each (add 75¢ each for first-class mailing). I enclose my check or money order for _____

Name _____

Address _____

City _____ State _____ Zip _____

Please allow four to six weeks for delivery.

Mill Supply Sells Over
1,000 Different Die-Formed

STEEL REPLACEMENT PANELS

To Repair Rust or Collision Damage
on Many American Cars, Pick-up
Trucks and Vans — and Some Imports



Part #FRP-79 — Left or Right
PICK-UP FENDER REPAIR PANEL

2895 Each Fits 73-90 Chevrolet and GMC Pick-ups, Blazers, GMC Jimmy, and Suburans
Freight Prepaid Ohio Residents add \$1.43 Tax per panel

FREE! 60-PAGE CATALOG
Our catalog of panels for U. S. Vehicles sent free to you with any order

OUR 80-PAGE CATALOG \$3.00 (without order) 30-PAGE TABCO CATALOG of Foreign Car wheel metal (with or without order) \$2.00

HOW TO ORDER: Order parts by check, money order, credit card. If credit card, include kind of card (Visa or MasterCard), card number, and expiration date. Be sure to indicate the quantity of merchandise you want, left or right panel. Include your name, address and zip code, and phone number with area code.

Sorry, no C.O.D.'s.
Send self-addressed, stamped long envelope for FREE information on any ONE car or truck.

Allow three weeks for delivery of catalog. In Canada add \$1 postage.

Dept. PM-201 **Mill Supply**
3241 Superior Ave. • Cleveland, OH 44114
Phone (216) 241-5072

PM COMPARES 6 TOP COMPUTERS

(Continued from page 85)

for color graphics as for 80-column lines. So, for the IBM and the Apple (modified with the Videx plug-in) you need two monitors. (Color monitors blur tiny black and white letters.) But, by the time you read this, that may have changed; Amdek will soon be releasing a color/80-column monitor for both of these computers.

Graphics capability

As writers, we're loathe to admit that a picture can be worth a thousand words; but that's often the case. And it's no different in the computer world.

All these computers will let you draw designs, bar graphs, pictures and artistic graphics—the Radio Shack and PET in black and white, the others in color (on a color display, of course).

Computers' graphics capabilities are rated in pixels or points of resolution. Different computers divide the same size screen into points of different sizes that can be turned on and off. The Apple's low-resolution screen (40 points high by 40 points wide) gives a total of 1,600 possible points (at this resolution, the points are more like square blocks on most displays). But a resolution of 280 by 192 (the Apple's high-resolution screen) produces 53,760 addressable points. Obviously, it's easier to draw a very smooth curve with a screen of 53,760 points than with one of 1,600.

As would be expected, the two black-and-white computers are easier to program graphically than their color counterparts. The PET, in particular, offers a unique system of 128 special characters. One special character, for example, is a heart shape. So programming a picture of the ace of hearts is easy. When the image you wish to program is not among the special, preprogrammed characters, you can "stack" lines, curved sections and other shapes to form the character you want.

Radio Shack uses large, blocky points or a collection of special shapes. The Shack's shapes are irregular building blocks, rather than objects.

IBM, by the way, requires a \$300 graphics interface to run color. We have included that in the price in the chart.

IBM uses a new system of drawing in which you give the computer commands like U20R10 for "up 20 units, turn right 10." The system is easy to use for line drawings, but, as on the other computers, things do get more complex.

The Atari 800 has two brains—and it's no dinosaur. One of its CPU (central processing unit) chips is devoted entirely to graphics. This makes the Atari capable of swifter animation than the other machines and also allows for nine different modes of graphics. But complex graphics are very difficult to program (though a lower level of graphics offers little difficulty).

But no matter which you choose, graphics won't come overnight. If you're like 999 out of 1,000 people, you'll be depending on prewritten software to help you design graphics.

The next purchase: software

All the companies which make these computers—Radio Shack, Apple and the rest of the group—are referred to as "primary manufacturers." Companies which make software or hardware to "fit" one of the machines (see *Ways to 'Talk' to Your Computer*, page 85) are called "secondary manufacturers." It's a bit like the automobile aftermarket, with one major difference: What you buy after you get the computer is as important as the computer.

When you bring them home, you can do more with the Apple II and the Radio Shack TRS-80 than with the other units. Because these two have sold the most units and have the greatest number of users, they've attracted the most secondary manufacturers. For either computer, you can buy thousands of programs.

Besides the disc drive from the manufacturer, you may want other add-ons, such as a printer, a modem (to communicate via the phone with other computers), a speech synthesizer, appliance control, voice-input and others.

In this category, Apple is the winner, with Radio Shack second and the others far behind. That's because the Apple was designed with eight plug-in slots on the main circuit board. These slots—called I/O or input/output ports—were an open invitation for others to design accessories to plug into them.

The Atari 800 has just begun to catch on. If the trend continues, by year's end, the Atari owner, too, will have access to a world of software add-ons.

The IBM computer has already inspired quite a few manufacturers to begin programming and tooling up. However, it may be more than a year before these efforts appear in the computer stores.

The Texas Instruments 99/4A

POWER HACKSAW

\$55.75 WORKS BEAUTIFULLY
Easy to assemble kit of cast iron parts. Use your own 1/4 hp. motor. 1/2" drill press needed for finishing work. Moves approx. 120 strokes/min. Send \$55.75. Catalog describing this and 51 other kits, only \$1.00. Write: Casting Specialties, Dept. PM12H, Cedarburg, Wis. 53012

CALL TOLL FREE NOW!

AMAZING VINYL REPAIR
—\$10 to \$20 in an hour!
Big earnings, repeat business. Car shops, homes, motels, restaurants, bars, etc. FREE FACTS BY MAIL.
Call toll-free 800-621-6633 (Ill. 800-572-0444) or Write VIP, 2021 Montrose, Dept. 181, Chicago, IL 60618

Learn ACCOUNTING at home
Learn about careers in Accounting, Bookkeeping, Tax Returns. Send for FREE "ACCOUNTING CAREER KIT" INCLUDED WITH COURSE.
NAME _____ AGE _____
ADDRESS _____
CITY _____ STATE _____ ZIP _____
FREE BOOK NORTH AMERICAN SCHOOL OF ACCOUNTING, Dept. P8003
16001 North Beach, Miami Beach, FL 33563

**USE
ZIP CODE
WHEN ANSWERING
ADS**

used to be the 99/4—same machine with a small keyboard. The new, full-size keyboard makes the 99/4A far more attractive, both to the buyer and secondary supplier. And Texas Instruments has been going out of its way to keep the 99/4A alive with company-offered software. (The new LOGOS educational language, for example, is the best educational program we know of for any home computer.)

When it breaks

One thing about computers—they're all going to fail, sooner or later.

Radio Shack has, we think, the best service setup. Any Radio Shack store can send your computer to a regional service center. Usually, it's returned within a week.

Apple is considered to have good to excellent service. Apple depends on dealers as a first line of repair support. Many dealers are very good at repairs; other are slow (at \$40/hour) or simply incompetent. But Apple, too, has regional centers to back up its dealers. (If you find a dealer with really good repair facilities, the system can work for you.)

IBM will likely have excellent service support, too. As of this writing, though, the service is unproven.

Texas Instruments has a number of regional centers. Work is precise and priced reasonably. But we've heard that repair can take two weeks.

Commodore used to have the worst service of all, but has improved lately to about the same level as Texas Instruments.

None of these computers will prove to be orphans. All the companies will stand behind them.

There are dozens of other comparison points between these fine machines. But now, instead of walking into a computer store and asking, "What have you got?" you should be able to say, "Show me this, this and that."

Just remember, you're the one who'll be using the machine. Like any other tool, it should fit the job you want to do.

MANUFACTURERS LIST

Amdex Corp., 2420 East Oakton St., Suite E, Arlington Heights, Ill. 60005
 Apple Computer Inc., 10260 Bandley Dr., Cupertino, Calif. 95014
 Atari Inc., 1265 Borregas Ave., Sunnyvale, Calif. 94086
 Commodore International Ltd., 761 Fifth Ave., King of Prussia, Pa. 19406
 International Business Machines Corp. (IBM), Information Systems Div., Box 1328, Boca Raton, Fla. 33432
 Tandy Corp. (Radio Shack), Computer Div., Fort Worth, Tex. 76102
 Texas Instruments Inc., Consumer Products, Box 225012, M-S 84, Dallas, Tex. 75265
 Videx Inc., 897 Northwest Grant Ave., Corvallis, Ore. 97330

The Curtis Affordables!

A NEW collection of practical, comfortable and energy efficient homes.

Don't make or break your plans for a new home until you have seen our new line of affordable homes. You'll like their looks ... and price.



YOU COMPLETE IT... SAVE \$1000's!

Curtis professional carpenters do the heavy, difficult framing on your lot and foundation. You finish it with Curtis materials and step-by-step instructions and save high professional labor costs.

You, too, can join the Curtis family of new homeowners. For full details send coupon or call today. There's no obligation.

There's a representative near you! Call Toll Free:

Complete It Yourself

Curtis Homes 
If you have desire... We have the trust!

AFFORDABLE FINANCING...TOO!

We make homeownership possible now!

- No big down payment/deposit.
- Below market interest rate.
- Land may not have to be fully paid for.
- First installment delayed until Fall 1982.*
- Long term mortgage money.

Send me your **FREE** Homes Catalog
CURTIS HOMES, DEPT. PM-1
 2201 Florida Ave. So., Minneapolis, MN 55426
 (Please Print)

Name _____

Address _____

City _____ State _____ Zip _____

County _____ Phone() _____

I own or can get a lot.
 Enclosed is \$1.00 for priority handling.

Telephone Listening Device

Record telephone conversations in your office or home. Connects between any cassette or tape recorder and your telephone or telephone line. Starts automatically when phone is answered. Records both sides of phone conversation. Stops recorder when phone is hung up. This device is not an answering service.



Each
\$19.95
 QTY. DIS. AVAIL.



Super Powerful Wireless Mic

10 times more powerful than other mics. Transmits up to 1/2 mile to any FM radio. Easy to assemble kit. 15V battery (not incl.). Call (305) 725-1000 or send \$19.95 + \$1.00 shipping per item to USI Corp., P.O. Box PM-2062, Melbourne, FL 32901. COD's accept. For catalog of transmitters, voice scramblers and other specialty items, enclose \$2.00 to USI Corp.

SPORTSMAN FOLDING KNIVES



- Safety Lock Prevents Accidental Closing.
- Brass Bolsters And Brass Lined.
- Handmade Custom Features.
- Surgical Steel Blades.

BLACK BELT CASES

N-22 4" Closed \$1.25 Add 75¢ Handling Money
 N-20 5" Closed \$1.25 Back Guarantee.
 N-21 6" Closed \$1.50

WESTBURY SALES CO. DEPT. R-1-PM
 373 Maple Avenue, Westbury, New York 11590

175 FULL SIZE SPORTS CARS You Can Build from Kits

KIT CARS All 1981-1982 New
Giant Buyers Guide 192 Pages, 600 Photos
 For less than the price of an ordinary compact car, you can own a full-size antique, classic or GT sports car. Giant all-new 1981-82 Kit Car Buyers Guide reveals over 175 exciting replicas you can assemble at home including Porsche, Cobra, Pantera, MG, Ferrari, Jaguar, Mercedes, T-Bird and more dozens you've never even seen.

See • All the models/manufacturers • In-depth articles • Reviews • Specs • How-to info • Front, Rear and Mid-Engine Power • 40 MPG VW's • Sizzling V8's • Electrics (Also available. Kit Car Monthly, features hundreds of used kit car bargains and new kit announcements, sixteen value-packed pages monthly.) Order both—almost everyone does!

★ 14 Day Money Back Guarantee ★



AUTO LOGIC, INC. Mail Kit Car Buyers Guide
 P.O. Box 2073 \$10 (3rd Class—US only)
 Department PMA 2 \$12 (1st Class—US only)
 Wilmington, DE 19899 \$15 (Foreign—US funds)
 Kit Car Monthly \$11/year

Name _____

Address _____

City/State/Zip _____

Master Charge Visa Expire Date

Order TOLL-FREE Day or Night
 Master Charge or Visa **REQUIRED!**
 (800) 331-1000, Operator 666
 Operator **CANNOT** answer questions! No COD's!

4 HANDY ITEMS FOR YOUR HOME

(Continued from page 67)

cloth. This is particularly important if you plan to apply a stain.—*Ralph S. Wilkes*

3 Salt shaker and pepper mill

Traditionally, salt and pepper shakers have been made on lathes, but this pair requires only a table or radial-arm saw. Hardware kits are available by mail from craftsman-supply houses.

Begin by making the setup shown in the photograph at far left. Setting your blade to 30° can be tricky; I suggest cutting test pieces to make sure you've got the correct angle. Cut the pieces 1 × ¼ × 1½ in. and arrange them in a hexagon. If the joints are



This handsome pair will add a touch of charm to your dining-room table. Made with use of a table saw, it is both an unusual and welcome project for shops without lathes.



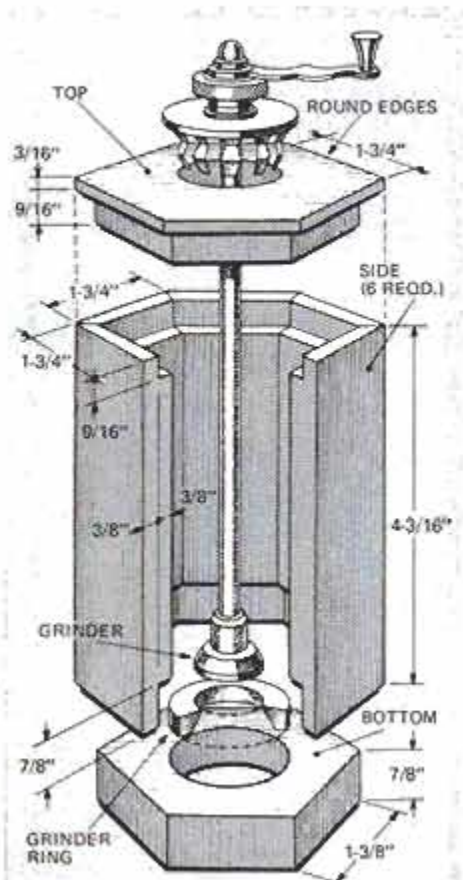
Centerpieces of this preliminary setup were test-cut for setting of blade at 30°. Surrounding pieces are used later.



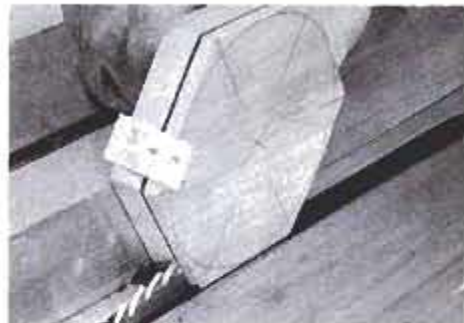
After 30° setting is made, cut beveled sides. Mark stock as shown: flip over after each cut for economical use of wood.



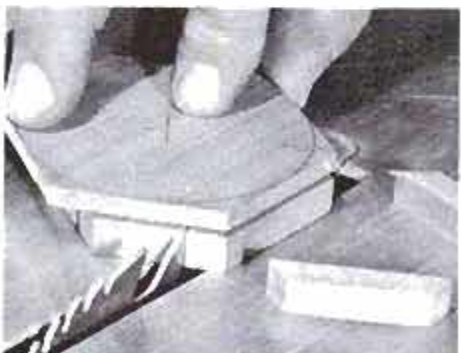
Cut a rabbet in the bottom of the 12 sides. The rabbet at the top has already been cut. Make the vertical cuts first.



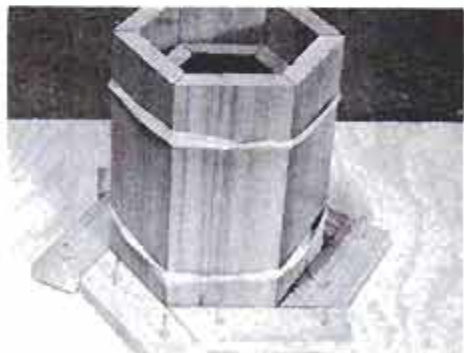
Use a miter gauge (not shown) to cut hexagonal top from ¾-in. stock. Saw blade should just touch the circle's perimeter.



To form top undercut, the first series of cuts are shown here. Use rip fence and keep fingers well away from the blade.



Still using the rip fence (not visible in photo), make second series of cuts in the top. Make these cuts slightly oversize.



Remove test pieces from the preliminary setup and use the frame as a gluing jig. Glue sides first, then top and bottom.



Resembling marble, carving board is made from a synthetic material, Dupont's Corian.

slightly open at the outer edges, increase blade set toward 31° and cut another set of test pieces.

When you've obtained a good fit, glue up your test pieces and frame them as shown in the photograph. The photos show the main steps in cutting and assembly. Be careful

when you're working with small pieces on a table saw.

Use the test pieces to measure the tops and use your hardware to determine the size holes needed in tops and bottoms for each piece. A simple tung-oil finish is the most attractive, in my opinion.—*Frank H. Day*

4 Carving board

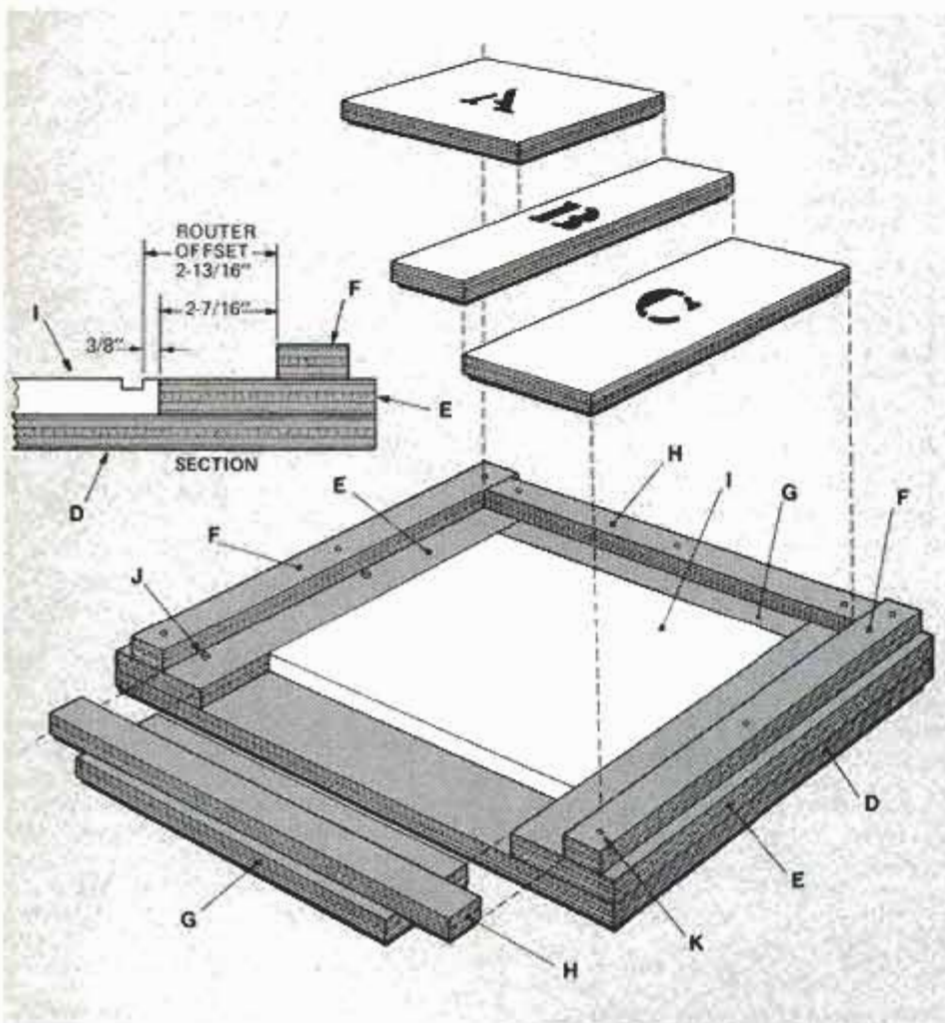
You can do away with the cumbersome job of washing carving boards if you make this beauty out of Dupont's Corian, now widely used for countertops in bathrooms and kitchens. A Corian carving board makes a handy and unusual Christmas gift.

This synthetic material is tough and durable (see *Two Bright Ideas for Shop-Made Lamps*, page 113, Jan. '80). It doesn't absorb water and it

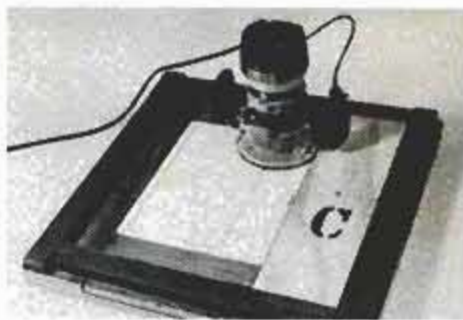
(Please turn to page 160)

MATERIALS LIST—CARVING-BOARD JIG

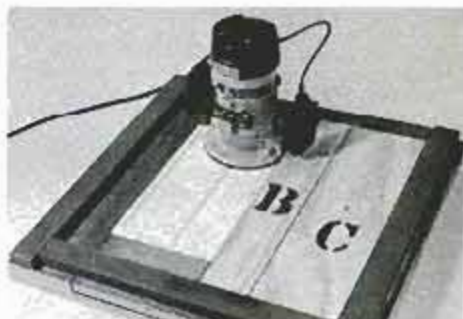
Key	No.	Size and description (use)
A	1	3/4 x 7 3/4 x 9 7/8" plywood (filler guide)
B	1	3/4 x 27 5/8 x 16 5/8" plywood (filler guide)
C	1	3/4 x 4 1/2 x 16 5/8" plywood (filler guide)
D	1	3/4 x 20 3/4 x 21 3/4" plywood (keeper base)
E	2	3/4 x 4 1/2 x 20 3/4" plywood (keeper)
F	2	3/4 x 1 1/2 x 20 3/4" plywood (guide)
G	2	3/4 x 4 1/2 x 12 3/4" plywood (keeper)
H	2	3/4 x 1 1/2 x 17 1/4" plywood (guide)
I	1	3/4 x 11 3/4 x 12 3/4" Corian
J	10	1 1/4" No. 6 th wood screws
K	12	1 1/2" ringed nails



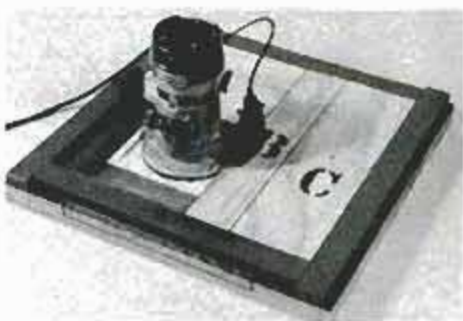
After making routing jig according to the drawing, rout the outer groove 1/8 in. deep.



Add piece C of jig as shown and make a pass across board, using edge as guide.



Add piece B and repeat step above. Switch pieces to the other side and repeat steps.



With B and C back in their original positions, add A and rout the well 1/8 in. deep.



Remove the keeper and guide to allow for easy removal of completed carving board.



Incredible UTILITY QUARTZ HEATER

Perfect for:
workshop, utility
room, garage,
basement, kitchen,
office, anywhere!



**Saves money and energy!
Heats people, not air. Gives
comforting heat in minutes.**

Create heat instantly! Space-age, quartz tube converts ordinary heat to infrared radiant heat. The incredible Solar Beam Utility Quartz Heater creates its own comfort zone even in the coolest room. You can turn down your thermostat and save money while the Solar Beam Quartz Heater keeps you cozy and warm—even in the garage. Look at these features: Heavy-gauge steel construction, 36" length for broad coverage, heat deflectors for large comfort area, 1400 Watts, 30" snap in-out quartz tube, 3-foot chain for easy hanging, 8-foot line cord and plug, no complicated installation—plugs into any outlet, on and off pull cord, weight 10 lbs.

You must be delighted with your Solar Beam Utility Quartz Heater or we will refund your full purchase price.

Sensational \$49.95 Plus \$3.50
price break! for postage
& handling

BAC Marketing
1027 Newark Avenue
Elizabeth, NJ 07208

Credit card customers call toll-free:
1-800-321-1148 or 1-800-321-1147.

Add \$3.50 per heater for shipping & handling

Enclosed is \$ _____

Charge my VISA MC Exp Date _____

Card # _____

Name _____

Address _____

City _____

State _____ Zip _____

4 HANDY ITEMS FOR YOUR HOME

(Continued from page 159)

can stand high temperatures without warping or showing surface damage. This means you can toss it in the dishwasher.

Sharp knives will score Corian, but the scoring doesn't cause deep grooves or water absorption. For this reason, it wears less quickly than wood. Because it does score, knives are not dulled too quickly.

Corian is widely available at hardware and home-supply centers. It comes in a number of shades and patterns resembling marble. Various thicknesses are usually available. If you have trouble finding Corian, write to Dupont in Wilmington, Del.

Making the routing jig

This project will take longer to plan than to build. Carefully measure and plan the jig shown in the drawing on page 159. I chose a carving board (11 $\frac{3}{4}$ × 12 $\frac{3}{4}$ in.) that would fit in my dishwasher. Dimensions also include the offset of my router, which is 2 $\frac{1}{16}$ in. You may have to make adjustments in the dimensions to suit your requirements.

Although you can make the jig from $\frac{1}{4}$ -in. scrap plywood, cut the guides carefully. Rough guide edges will produce rough groove edges in your carving board. Assemble the jig as shown in the drawing, and remember to leave one section of keeper and guide attached only by screws. Removing this section allows for easy removal of the finished board.

Routing the carving board

Use carbide cutters to rout cuts in Corian. After routing the perimeter groove, as shown in the top right photo on page 159, add insert C, as shown in the photo below. Rout the groove in several passes to $\frac{1}{8}$ -in. depth.

Next, add piece B as shown in the next photograph on that page. Repeat the steps above. Now switch C to the other side and rout another groove. Then add B and repeat the steps.

Switching both pieces back to the right side, add piece A, and then rout the well to a depth of $\frac{1}{4}$ in. This may sound complicated, but you can arrange pieces B and C any way you wish to get several combinations of center grooves. You can also put the well in any corner.

After you've finished all the routing, and the board is removed from the jig, remove rough spots and sharp edges with medium-grit sandpaper.—*John E. Gaynor*

BEEMAN: the Leader in Adult Airguns

**Beeman
Silver
Jet**

What makes an ADULT airgun? Extremely high power, marksman-grade accuracy, no pumping, no CO₂, no valves, quiet and safe shooting indoors and out—that's what! Beeman has precision airguns from \$90 to \$800, quality accessories, and the world's finest pellets:

**Beeman
Silver
Bear**



**Beeman
H&N
Match**



**Beeman
Ram
Jet**



Send for 92-pg Adult Airgun Catalog/Guide, \$1.50 or FREE by mentioning code PO1. Add \$1 for fast first class mailing.

BEEMAN INC. 47-PO1 Paul Dr., San Rafael, CA 94903

BE YOUR
OWN
BOSS!

Now you can cash in on the huge demand
for SHARPENING SAWS and TOOLS.

Make \$8⁰⁰ an hour...

or more. Work part time, full time, right at
home. No layoffs. No strikes. Provides
a steady source of year round income.

**Read What These Foley
Shop Owners Say:**

**Shop will gross \$40,000 ...
... likes being independent**

"I worked in various industrial jobs for years, and always wondered if I could make money for someone else, why I couldn't do it for myself. So after losing my regular job, I opened my Foley sharpening shop in the basement of my home. I only had a minimum of cash to start with, but Foley financed the balance. My shop will gross over \$40,000 this year, and I like the feeling of running my own shop without answering to someone else."

William Weescott

Willoughby, Ohio 44094



**Husband and
wife have a
going spare
time shop**

"I'm a construction foreman, and my wife is a nurse's aide. Our Foley shop fits in nicely with our regular jobs, and we earn extra money. Our sons help out too, so ours is a real family business."

"I'm still too young to retire, but when I do I'll have a very good business built up. Foley equipment helps us to do good work and brings customers back with more jobs on a regular basis... we have a lot of repeat business the year around."

Victor Kosloski

Sturgis, Michigan 49091



**Glad he
chose Foley
for his saw
shop**

"I worked as a carpenter all my life, but when a back injury forced me to quit I decided to go into sharpening full time. I'm very proud of my shop and glad my choice was Foley equipment... it is superb. I made over \$48,000 last year, and this year it will go more than \$50,000."

Victor Johnson

Lincoln, Nebraska 68507

**This can be one of the most
important decisions you ever make**

Going into business for yourself can be the most exciting and rewarding decision you're likely to make in your lifetime.

Owning your own business brings you a sense of independence. You're the boss, setting your own work hours. Your own effort builds the business for yourself and your family. You can achieve great satisfaction and profits, if you choose and manage your business wisely. That's why so many men, just like you, are cashing in on the big profits to be made in this fast-growing service field.

The sharpening business allows you to get started with only a minimum investment, requiring little space and effort for a successful operation. It lets you build and expand as fast, or as slowly as you like. You pocket most of the money you take in, because there are exceptionally high profits with no investment in merchandise.

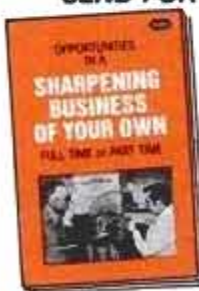
If you need only \$200 or \$400 extra income each month, a sharpening business is ideal for spare time. The additional dollars can be SPENT for more of the good things of life. Or they can be SAVED in a rainy-day fund that the family can bank on.

**More sharpening businesses are
needed every year**

As original equipment continues to climb in cost, owners are becoming more concerned that the equipment be maintained so that it performs like new. This means more companies, contractors, carpenters and home owners are having their old saw blades and tools resharpened many times, where in the past, they would have replaced them with new blades or tools. This is where you

can step in with the much needed service of sharpening saws and practically any kind of tool.

SEND FOR FREE FACTS TODAY!



**This FREE
booklet has
helped
thousands**

Thousands of good men have been inspired by this fact-filled book into making that first important step of starting their own

business. It can be yours just for the asking.

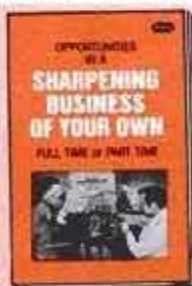
- It covers these important subjects...*
- How much money can you make
 - Age, education not a factor
 - No selling is required — customers bring their business to you
 - Lawn mowers and chain saws
 - Sharpening business is year-round
 - Sharpening opportunities in small towns and large cities
 - A sharpening business provides excellent retirement income
 - How Foley helps you start
 - No experience needed, any age can succeed

**Act today, so you can have a
brighter, more secure tomorrow**

Right now, while this is still fresh in your mind, fill-in the coupon below. We will send your FREE copy of "Opportunities in a Sharpening Business of Your Own". There is absolutely no obligation and there are no franchise fees in starting your Foley Sharpening Business.

Send your name and address to: Foley Manufacturing Co.
7100 Foley Building, Minneapolis, Minnesota 55418

**CLIP OUT AND MAIL THIS COUPON TODAY — OR CALL TOLL FREE 1-(800)-328-7140,
(Except in Hawaii or Alaska), 24-HOUR ANSWERING SERVICE.**



**FREE
BOOKLET**

This little book has helped change the lives of thousands of good people, just

like you. Just complete the coupon, clip it out and mail it to us today. Get started now for a brighter, more prosperous tomorrow!

Foley Manufacturing Company
7100 Foley Building
Minneapolis, Minn. 55418



YES, I would like to receive complete details about how I can easily start a profitable, Foley-equipped sharpening shop. Please rush me your FREE booklet, without any cost or obligation, that gives me full details on how I can quickly start my own business.

NAME _____

ADDRESS _____

CITY _____

STATE _____ **ZIP** _____

AREA CODE _____ **PHONE NO.** _____

GIVE YOUR GARDEN A CHRISTMAS PRESENT

NEW AGCO TILLER - POWER HOE TILLS DEEP WEEDS FAST. NO HARD WORK OR PAINFUL BACKACHE!



Works 8 hrs. on 1 gallon of fuel!



TILLS DEEP



WEEDS NARROW ROWS FAST!

9 INCHES WIDE WEIGHS 20 LBS.!

GASOLINE POWERED - EASY TO USE 15 DAY MONEY BACK TRIAL PERIOD

NOT SOLD IN STORES - FREE BROCHURE

WRITE TO AGCO P.O. BOX 75 Dept. P SOUTHAMPTON, PA. 18966

Name _____

Street _____

City _____

State _____ Zip _____

FREE BROCHURE - Call 215-947-8855

CAREER OPPORTUNITIES—Looking for a new job? A pay raise? A new career? No need to miss out on job opportunities—ask for your FREE copy of our new guidance book 'Career Opportunities' and learn how a home study course can help you get ahead. Check interest.

Accounting	Advertising	Business Administration	Computer Science	Construction	Education	Engineering	Finance	Health Services	Human Resources	Information Systems	International Business	Law	Marketing	Mathematics	Management	Manufacturing	Media	Operations	Public Administration	Real Estate	Science	Software Development	Social Work	Teaching	Transportation	Writing
------------	-------------	-------------------------	------------------	--------------	-----------	-------------	---------	-----------------	-----------------	---------------------	------------------------	-----	-----------	-------------	------------	---------------	-------	------------	-----------------------	-------------	---------	----------------------	-------------	----------	----------------	---------

Write or phone for FREE 96 page Career Guide, Granton Institute of Technology, 263 Adelaide St. W., Room M12 Toronto, Canada M5H 1Y3 1-(416) 977-1929

Name _____ Address _____

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.

Send \$5.00 CONCRETE MACHINERY COMPANY Today To ➔ P.O. BOX A99 - HICKORY, N. C. 28601

FREE QUIKRETE Concrete Project Instructions

at your hardware, building supply or home center.

DO IT YOURSELF directions for a wide range of projects using QUIKRETE



concrete, mortar and sand mixes.

THE QUIKRETE COS. COLUMBUS, OHIO 43229

PM LOOKS AT A LOW-COST MITERBOX

The new Stanley Workmaster Mitre Box offers top quality at a reasonable price, a winning combination for woodworkers who must be able to cut consistently

accurate miters and right angles. Constructed of cast aluminum, the unit comes with a 4x18-in. backsaw. The vertical travel of this saw permits cutting a 2x4.



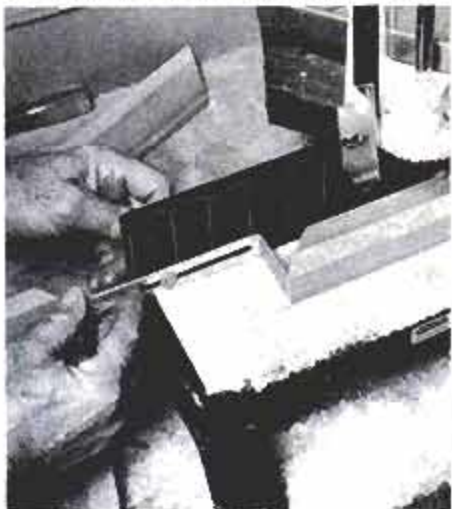
Stanley miterbox with 4 x 18-in. backsaw.

I tried the box for cutting four-, five- and six-sided figures and found the results equal to those obtained with my radial-arm saw. The unit has several fine features: A spring-loaded wedge arrangement for quick, easy angle setting; an adjustable board stop for repeat cuts; and a board clamp for holding the workpiece against the back plate.

The box costs \$56.40 with the backsaw, \$42.30 without it, from Stanley Tools, Dept. PID, Box 1800, New Britain, Conn. 06050.—H.W.



Tough, free-floating plastic guides hold saw in accurate alignment throughout while a five-sided figure is being cut.



Adjustable board stop can be quickly set to obtain multiple, same-length cuts.



Spring-loaded wedge is pulled back to disengage the saw guide so it can be swung to new cutting position desired.



A wingnut is turned to clamp the work to the back plate. The clamp and stop can be mounted on either end of the miterbox.

PM LOOKS AT DREMEL'S CHAIN SAW SHARPENER



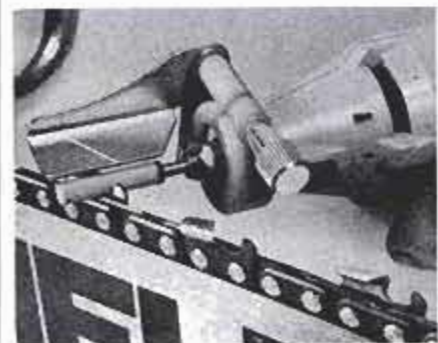
Besides sharpening attachment with 25,000-rpm motor, aluminum-oxide grinding stone, kit has wrench, gauge, two spacers, two other grinding stones.

Working with a sharp chain saw is safer and more efficient than using a dull one. You can maintain the chain quickly and accurately with the Dremel Chainsawer. Kit Model 1246 has a motorized sharpening attachment, three grinding stones, two spacers and a gauge. It's \$39.95 at art and craft stores, from Dremel Div., Emerson Electric Co., 4915 21st St., Racine, Wis. 53402.

—Rosario Capotosto



Select a stone and adjust it in the tool by inserting a spacer, if needed, depending on the tooth dimensions.



When sharpener operates, the guide plate rests on the shoulder of a tooth.

Enjoy a roaring fire . . . the easy way, with PM's Log Splitter!

What could be more pleasant on a cold, cold day than the warmth of a roaring fire. And, you can have all the firewood you need and save time and money by splitting that firewood yourself. **POPULAR MECHANICS LOG SPLITTER**

exerts some 10,000 lbs. of pressure and will easily split 2 ft. lengths of maple and ash logs 12 to 14 inches in diameter. With an I-beam backbone, double-acting hydraulic cylinder, control valve oil filter, 3-hp. gasoline engine and other features, you'll find this log splitter easy to build and a fun thing to use. And, you'll save your back from aching as you split logs the easy way.

Have more time to enjoy the crackling fire in your fireplace. Use it through this year, or start getting ready for next winter. Either way, it's a very sound investment. Send for complete plans and step by step instructions for just \$8.95. Send a check or money order to PM Plans Library-Log Splitter, Box 1014 Radio City Station, N.Y. N.Y. 10101

PM LOG SPLITTER

Popular Mechanics is a publication of Hearst Magazines, a Division of THE HEARST CORPORATION

An ATLAS BODY? In 7 days

my method of DYNAMIC-TENSION starts giving results you can feel and your friends will notice. Big, useful muscles. Gain weight, if needed. Lose "pot belly." Send your name and address for 32-page book—FREE. CHARLES ATLAS, 49 West 23rd St., New York, N.Y. 10010 Dept. 8N



HYDRAULIC JACK REPAIRS

Earn While You Learn in Your Spare Time

Trained and qualified mechanics needed NOW to service informative hydraulic jacks. BIG opportunity for ambitious men. We show you HOW — in your basement or garage to earn spare time cash in an expanding industry. Don't wait, ACT NOW! Get the facts.

Write for folder No. PM1 and free bonus offer.

Hydraulic Jack Repair Manual Co., Inc.

G.P.O. BOX 24 STATEN ISLAND, N.Y. 10314

CLOCK COMPONENTS



Clock Movements: Battery, Quartz, Electric, Ugros Grandmother, Grandfather, Westminster & Triple Chime, 8 Day Key Winder & Westminster, Bin Bams, Broomcases, Metal, Bezel, Paper dials, Hands, Brass & Plastic Number- & Markers. Hundreds of Items. Quantity Prices. Send \$1.00 for 60 Page Catalog. Refunded on \$10.00 Order.

NEWPORT ENTERPRISES, INC. Dept. A
2313 West Burbank Blvd., Burbank, Calif. 91508

LEARN MEAT CUTTING



Invest quickly in a short career in Toledo for a bright future with security in the vital meat business. Big pay. Full-time jobs—HAVE A PROFITABLE MARKET OF YOUR OWN! Time payment plan available. Distinctions given. Job help. Thousands of successful graduates. OUR 3 1/2 YEAR! Send NOW for a big new illustrated FREE catalog. No obligation. C.E. approved. NATIONAL SCHOOLS OF MEAT CUTTING, No. 71-02-01977, Dept. 50-N, 33 N. Superior, Toledo, Ohio 43604.

TRS-80 COMPUTER DISCOUNTS

- Low Discount Prices on All Computers, Printers and other RADIO SHACK - TRS-80 Equipment
- Factory Direct • No Out-of-State Sales Tax
- Full RADIO SHACK Warranty • Best Prices Anywhere
- We Ship Nationwide • FREE DISCOUNT PRICE LIST

SCOTT TASSO

Radio Shack Associate Store

1750 N. Dalea Drive, Vineland, N.J. 08360 609-691-7100

LANDSCAPING

Growing demand — good income for trained Landscape Contractors and Garden/Nursery personnel. Start your own business part- or full-time or hobby. Home study course prepares you in 6 months. Certificate awarded. Free booklet describes opportunities. No salesman.

LIFETIME CAREER SCHOOLS Dept. A-973
2251 Barry Ave., Los Angeles, CA 90064

Name _____
Address _____
City _____ State _____ Zip _____

REPAIR CLOCKS

Home Study Course prepares you for Good Income — Professional Status. Free Details. No salesman will call. Approved by Pa Dept of Education

NAME _____
ADDRESS _____
CITY _____ STATE _____ ZIP _____

CLOCKMAKERS INSTITUTE
P.O. BOX 449, LEWISTOWN, PA. 17044

Print For Profit

Cards: stationery, envelopes, advertising, labels, tickets; QSL cards; announcements; greeting, sympathy, prayer cards; tags, etc. Save money. Own a Printing Business. We supply everything direct from factory. Easy instructions. Also raised printing like engraving. Have home shop. Add to income. Send \$1.00 for catalog.

Kelsey Presses, 82-8A, Meriden, CT 06460



HINTS FROM READERS

Turnbuckle aids boring



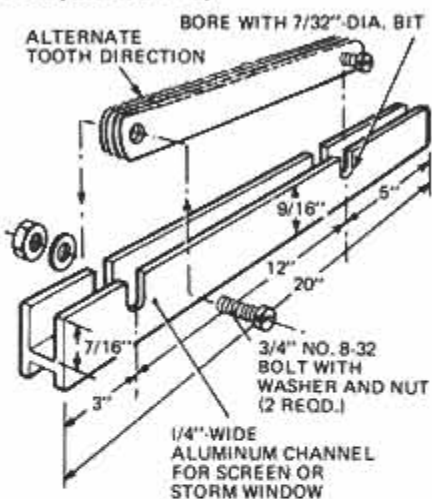
You can use a turnbuckle as a handle for an auger bit or tap. With a turnbuckle, you can work in spaces too tight for a carpenter's brace or a conventional tap holder. When choosing a turnbuckle, don't get one made of brittle cast metal because it will break under excessive stress.

—Hilbert Caniello

Tidy trash cans

Save workshop shavings and sawdust for use in the bottom 2 inches of your garbage cans. The wood absorbs any wetness that seeps from the trash and it keeps the area beneath the trash cans clean.—Billy Hill

Shopmade rasp



Make a rasp by clamping used hacksaw blades in a scrap aluminum window channel. The teeth of the blades should be slightly exposed. To make the slots for the blade-holding bolts, bore holes, then hacksaw waste from the top of the channel to the holes. Fill the channel with blades. The rasp is virtually nonclogging and works well on aluminum.

—George Obradovich

Convert Your Drill Press Into a Milling/Drilling Machine



By attaching our Mill Table to your drill press you can perform facing, slotting, milling and drilling operations on almost any machinable material. The Mill Table allows precise positive movement of any workpiece in two directions relative to the drill press spindle, just like a full size milling machine. Adding our Swivel Vise - as shown above - lets you hold small or round parts and add angle machining to the operations you can perform.

MILL TABLE - 17" x 5.5" work surface, aluminum construction, satin finish, 11" long travel, 7" cross travel wt. 10#, \$69.95 + 3.00 S&H

SWIVEL VISE - 3" wide jaws, aluminum construction, satin anodized finish, wt. 7#, \$39.95 + 2.00 S&H

END MILLS - Four flute, HS steel, 1/8, 3/16 & 1/4" dia. available, any 3 for \$13.95 PFD.

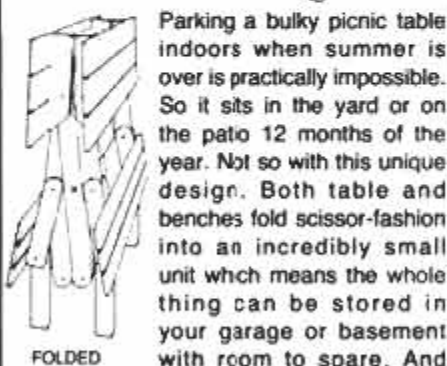
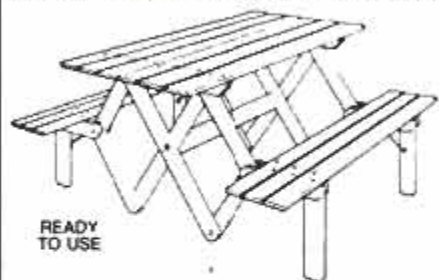
Your satisfaction is guaranteed. If you are not 100% pleased with your purchase, you may return it for a full refund.

Michigan residents please add 4% sales tax.

M.J. LAWRENCE, INC. Dept. 201

P.O. BOX 118A, Washington, Michigan 48094
313-798-3598 VISA & MASTERCARD ACCEPTED

Build a picnic table you can store indoors



Parking a bulky picnic table indoors when summer is over is practically impossible. So it sits in the yard or on the patio 12 months of the year. Not so with this unique design. Both table and benches fold scissor-fashion into an incredibly small unit which means the whole thing can be stored in your garage or basement with room to spare. And if made of redwood, the table will last for years. To obtain plans and instructions for building this stowaway table send \$3.95 to Popular Mechanics Plans Service, Box 1014, New York, N.Y. 10101.

192 Popular Mechanics is a Publication of Hearst Magazines, a Division of THE HEARST CORPORATION!

NEXT MONTH IN PM

- Treasure diving with high-tech underwater gear.
- The 1982 imported cars.
- How to make kitchen cabinets.
- First report: Driving Chrysler's convertible.
- Best bets in boats.

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 to the Postal Service 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, Iowa 50350.

Should you have any problem with your subscription, please write Joan Harris, Customer Service Department, Popular Mechanics, P.O. Box 10064, Des Moines, Iowa 50350. To assure quickest service, please enclose your mailing label when writing to us or when renewing your subscription. Renewal orders must be received at least eight weeks prior to expiration to assure continued service.

Popular Mechanics

P.O. Box 10060, Des Moines, Iowa 50350

YES! Please enter my subscription to POPULAR MECHANICS for:

- 1 year \$9.97
 2 years \$18.97

Payment of \$_____ is enclosed.

Bill Me _____
Initial here

Name _____ (please print)

Address _____

City _____ State _____ Zip _____

Your first copy will be on its way to you in six to twelve weeks. Watch for it!

A publication of the Hearst Corporation.

Charge orders subject to publisher's acceptance (Above prices apply in U.S. & Possessions only. All other countries add \$8.00 per year).

CHANGING ADDRESS?

If you're planning to move, please let us know at least eight weeks before changing your address. Attach current address label and fill in your name and your new address. This will serve to insure prompt service on your subscription.

Send old label with your name and new address to:

POPULAR MECHANICS
P.O. Box 10064, Des Moines, Iowa 50350

NAME _____ (Please print)

NEW ADDRESS _____

CITY _____ STATE _____ ZIP CODE _____

THROWING AWAY \$5 per lb.?

Everyone has thrown this little-known asset away. It is thrown away in every office, home, and all other buildings. Industries throw tons of it away annually. Only one person out of 1,000 save it, the other 999 don't realize its value, and the buyers want it kept that way! Millions of dollars worth go unclaimed, discarded each year!

We pay \$5 per lb. for all of this material that you collect. Save yours, buy it from other uninformed persons for \$2 to \$3 per lb. Our buyer's handbook will detail this \$5 a lb. item plus 3,000 others worth \$1-\$7,440 per lb. (Average price we pay is \$12.42 per lb.) Two of these (metals) are worth more than Gold! Learn how to find them, buy for huge profits, and how to ship (we pay shipping). This is a new field with huge income potential, can be done part time. Handbook cost is \$12 plus \$3 postage and handling. We gladly refund book cost \$12.00 with 1st shipment, or within 10 days if dissatisfied.

For Credit Card Orders only call: 616-979-4075.
Poley's Industrial Salvage Co.
Supply Dept. PM-1
12389 S. Mingos Rd., Battle Creek, MI 49017

Brush-Quality Finish With Roller Ease!

- Durable — a long-life real brush
- Rough or smooth surfaces
- Finest quality polyester bristles
- Broomstick socket for ceilings
- 8" coverage — no spatter, no waste



NEW!

Only \$7.95

plus \$2.00 handling
N.J. residents add 5% sales tax

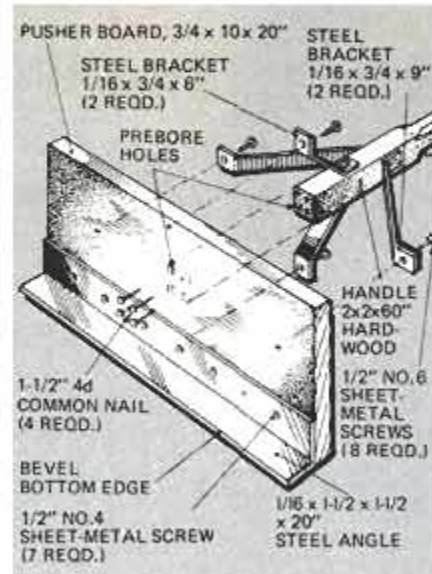
Order Model
FHL

J.B. WARD & SONS, INC.

170 5th Ave., Hawthorne, N.J. 07506
America's Finest Brushmaker Since 1855

HINTS FROM READERS

Snow pusher



I built this pusher to move the snowdrifts that collect on my walks and driveway. First, I cut a hardwood handle and chamfered the edge, so I could grip it comfortably. Next, I cut a $\frac{3}{4}$ x 10 x 20-in. length of strip steel served as a skid on the board. Before attaching it with screws, I bent the steel to form a 90° angle by sandwiching half of it lengthwise between two blocks of wood in my vise, and applying pressure to the free half with another wood block until it bent to the desired angle. I secured the pusher board to the handle with $\frac{1}{4}$ x $\frac{3}{4}$ -in. steel brackets: two 6-in.-long and two 9-in.-long brackets. I varied the lengths so their fasteners wouldn't enter the handle at the same height and weaken it. I pre-bored nail holes through the board and the end grain of the handle, so the hardwood wouldn't split when the nails were driven. The steel skid is much lighter than a structural angle. Its protruding edge acts as a guide and keeps the pusher at the desired level for removing snow.—*William Slamer*

Knockout washers

Save the round knockout parts on electrical boxes for use as washers. Their large surface keeps them from sinking into wood when you're bolting two pieces together. You can bore a small attachment hole to suit the fastener.—*Stewart R. Sickles*

Unimat 3

A Small Machine
System for Metal
Wood and Plastic



1 PRECISION LATHE (Basic Machine)

Distance between centers, 8". Swing-over bed, 3.6". 8 spindle speeds. 115 V 2-speed motor.

2 COMPLETE MACHINING CENTER



Vertical milling and drilling accessories can be used for fly cutting, grinding, slotting, parting-off and can be swiveled up to 90°

3 WOOD WORKING

This version makes your workshop complete with circular, jig and fret sawing, combing, grooving, coving, grinding and polishing.



Basic units costs \$375.00, accessories extra.

EMCO-LUX CORPORATION

2050 Fairwood Ave. • P.O. Box 07824
Columbus, Ohio 43207 • (614) 445-8328



Please send me a Free catalog and name of dealer in my area.

NAME _____

ADDRESS _____

CITY _____

STATE _____ ZIP _____

LIVE VIA SATELLITE

\$399 • DISH ANTENNA
• PREAMPLIFIER
• RECEIVER
• MOD COMPLETE RECEIVING SYSTEM

JUST PUBLISHED: 8½ x 11 BOOK gives a wealth of updated information on
• Antennas • Low Noise Amplifiers • Sources • Receivers • Services • Equipment • Manufacturers • Much More.

Our book takes the mystery out of the sophisticated technology of satellite transmission and reception. This volume represents all the essential knowledge made easy to understand, and will show you how easy it is to have a 90 channel reception system so that you can enjoy: first run movies, foreign films, Las Vegas entertainment, live sports, and much more. Everything being telecast in the world could be yours at a twist of a knob!

LIVE VIA SATELLITE, INC.
P.O. Box 2561, Dept. M-1, Delray Beach, FL 33444

Send \$9.95 plus \$2.50 shipping & handling or call our 24 hr. C.O.D. order line (305) 845-4447

Name _____
Address _____

CARBIDE SAW and BANDSAW BLADES

SAVE! Buy direct from manufacturer. Industrial quality 10' combination saw with 40 carbide teeth, \$37.50, plus \$2.50 shipping and handling. Bandsaw blades from 1/4" to 1" wide. Odd lengths also available. Write for Free literature. Send check or money orders to:

Pennsylvania Saw • P.O. Box 567 • Lancaster, PA 17603

MAKE MONEY Repair Fishing Tackle - Build Custom Rods

BE YOUR OWN BOSS
LEARN HOW EASY YOU CAN MAKE YOUR OWN TACKLE REPAIR BUSINESS
START AT HOME IN YOUR BASE TACKLE WITH A VERY SMALL INVESTMENT
FREE DETAILS Send Today
WLD RIVER • P.O. Box 223 • PM26 • Hwy. 93 N.E. • Marine, WA 98047

Build this beautiful Dome Home by yourself!



Enjoy super-low energy bills and house payments

Save up to 50% on utilities, and up to 60% on building costs. Beautiful Monterey Domes geodesic homes are extremely energy-efficient, unbelievably strong, earthquake resistant, and easy to assemble. No special tools or skills necessary. Our unique, patented building system makes home construction a reality for the novice.

Monterey Domes pre-cut, color-coded shell packages start at \$3995. Models up to 3,500 sq. ft.

Send for our color Catalog & Plan Book — 90 fact-filled pages of exciting, affordable homes. Sales representatives available for all 50 States.

Write today!

- Rush me your 90 page CATALOG & PLANS BOOK. Enclosed is \$6.00, postage included.
 Also send your ASSEMBLY MANUAL for an add'l \$5.00.

NAME _____

ADDRESS _____

CITY, STATE, ZIP _____

Mail To: MONTEREY DOMES
 1855 Iowa, Dept. AQ-1
 Riverside, Calif. 92517



The clockbuilder's choice.



Send today for our New Free Catalog of the most magnificent heirloom quality antique reproduction clocks you can build.

Your choice of Grandfather, Grandmother, wall, mantle, desk clocks and more. Available from plans or ready-to-assemble kits for all levels of skill. With solid 1/4" hand-matched hardwoods in walnut, oak, cherry or Honduras mahogany. Imported precision movements and chimes. Solid brass dials plus loops, hardware, books and accessories. You've never seen a finer catalog. You'll never build a better clock.

- Please send me your Free 32 page color Catalog. I enclose \$1.00 for postage and handling.

Name _____

Address _____

City/State _____ Zip _____

Mason & Sullivan Co.
 Dept. 1125 Osterville, MA 02655

Super Magnet Lifts 100 Pounds

Powerful, pocket size magnets lift up to 100 pounds solid steel. Tested & Proven on steel blocks! Stronger than any other magnet of comparable size. Go treasure hunting. Or amazing stunts. Fish underwater. 1001 uses. 2 sizes available: 50 lb. lift magnet, 2" long, \$4.99 each; 100 lb. lift magnet, 4" long with sturdy steel handle, \$7.99 each. Add \$1.75 shipping & handling. Johnson Smith Co., Dept. 151, 35075 Automation, Mt. Clemens, Mich. 48043.



175 Lb. Lift Magnet

With Stainless Steel Handle

Our most powerful magnet weighs only 1 lb., but lifts up to 175 lbs. Made of 4 ceramic magnets sandwiched in slots between 4 steel plates that concentrate magnetic power for maximum pull. Convenient stainless steel handle. Easy hand carrying of magnet & loads. For sport, hobby & industrial uses including "magnetic fishing" & tool retrieval. Only 1" x 1-1/4" x 4-3/8". Has hole drilled in handle to accept 1/4" screws. Send \$15.99 each. Add \$2.00 shipping & handling. Johnson Smith Co., Dept. 151, 35075 Automation, Mt. Clemens, Mich. 48043.

FREE 1800 NOVELTIES TRICKS + JOKES

Things You Never Knew Existed
 Send order for 1983 world famous catalog. Latest Edition. Fun for all ages. Thousands of scientific curiosities. Pages of novelties, bargains, puzzles, hobbies, sports, science, electronics, jewelry, amusements, books, school supplies, art supplies, toys, tools, magic, books, photo-optical, musical, original, authentic home, medical, jewelry, etc. etc. etc. many more. Send name, address, etc. 10¢ per mailing.
 Johnson-Smith, Dept. 101, Mt. Clemens, MI 48043

BUILD YOUR OWN POWER TOOLS

METAL PARTS KITS AT LOW FACTORY DISCOUNT PRICES FOR:

- 12-IN. BAND SAW
- 18-IN. BAND SAW
- 10-IN. TILT/ARBOR SAW
- COMB. DRILL PRESS-LATHE
- 9-IN. TILT TABLE SAW
- 6-IN. BELT SANDER
- SPINDLE SHAPER

PLANS Full-Size \$4.00 per plan Deductible. 85,000 in use. Sold for 35 years.

KITS FROM \$39.99 TO \$169.99

Featured in Workbench, Popular Science, Mechanics Illustrated. No machining, no welding. Step-by-step plans, photos, full-scale patterns show how. 3-Year Full-Service Guarantee. Send \$4.00 each plus \$1.00 for postage, stating tool plans wanted. Catalog included. Or, send \$1.00 for Catalog. BILLYM MFG., INC., Dept. PM-1, St. Charles, Mo. 63301

SMART IDEAS

If you're looking for ideas to save time and money — while enjoying what you're doing — send away for PM's catalog immediately.

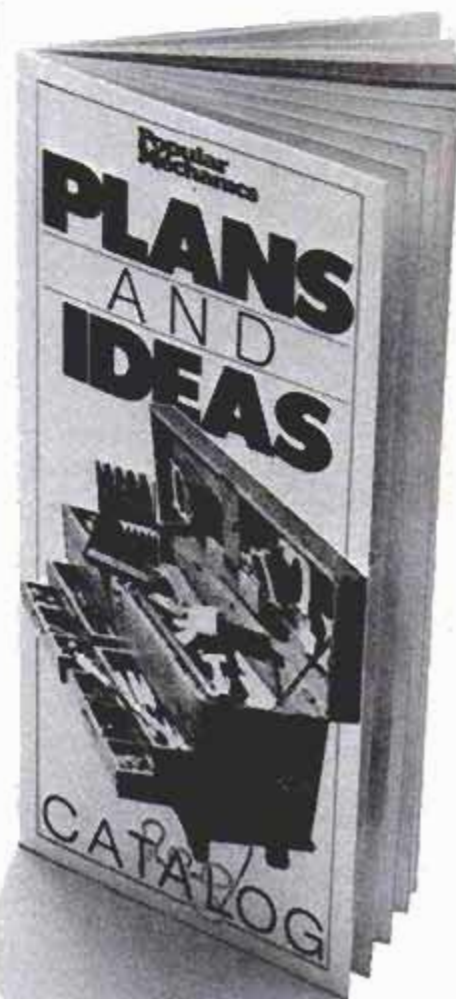
We have plans for shop tools, boats, storage houses, campers. Scuba tow, ACV, log splitter, air compressor. Smart ideas in furniture! Also dollhouses! Projects the whole family can enjoy.

And best of all — we offer a special and unique service — photocopies of past PM articles. What's more, we tell you the year the projects were published. It may be as early as a 1902 glider to a most recent 1981 solar garden shed. You'll have fun just browsing through the approximately 900 different plans and projects. You'll find our GREAT WORKSHOP series listed. Also our SHOP MINI-COURSES. Timely energy-saving ideas! You'll see it all in our new POPULAR MECHANICS PLANS AND IDEAS CATALOG. Price \$1.00

SEND FOR YOUR CATALOG TODAY!

Send Your Name and Address with Check or Money Order to Popular Mechanics, Box 1014, Radio City Station, New York, N.Y. 10101

Popular Mechanics is a publication of Hearst Magazines, a Division of THE HEARST CORPORATION



Moped
\$220

Tiger Eye Ring
\$3.75

Surplus JEEP
\$850
FOB
Germany
Can order one

Ecuador
Orlon
Poncho
\$6.38

Diamonds
& Sapphires
Low, low prices
from Bangkok

Lock Blade Knife
\$1.34



B.L. Mellinger, Famous World Trader, Internationally-known Mail Order Expert; President, Mellinger Co. "I started only a few years ago, part time, in my garage with less than \$100. Today my business empire spans the globe. I will help you succeed using my personal experience. Mail coupon for **FREE REPORT.**"

START WITH 24,221 PRODUCTS!

Many you can buy one at a time or order in quantity, like one LCD Watch \$9 ppd. or 50 for \$7.95. MOPED \$265 FOB or \$220. for 200. New government ruling makes thousands of imports free of any duty whatsoever. You deal direct my International Traders way. Cut out greedy U.S. specialty merchandise middlemen. Really deal direct.

L.C.D. Watch
\$7.95

STEREO PLAYER
Many Models
Below
Wholesale

Mink Coat
\$299.

Metal Detector
\$9.25

Field Glasses
\$3.55

Jade Ring
\$1.28

TVs
Many Models
Below
Wholesale

Reel Brass Beds
Many Styles

Mechanics 15 Piece
TOOL SET
Only 3.75

From
Orient
Genuine JADE
NECKLACE
Now \$4.60

Spinning
Reel
\$1.30

Electric
Razor
\$3.70

STEREO
CASSETTE
RECORDER
PLAYER
AM/FM
\$42.

PERSONAL GUIDANCE!

I believe in giving you my personal help! Regularly I meet I.T. Members at regional closed door Seminars across the country. You will be invited to these meetings.

1000's more dazzling products you can buy DIRECT!

- Walkie Talkie
- Golf Balls
- Baseball Glove
- Telescope
- Electric Calculator
- Sapphire Ring
- Spinning Reel
- Radio
- Cigarette Lighter
- Beer Steins
- Rifle Scope
- Phone Amplifier
- Movie Camera
- Fishing Rod
- Swords
- Black Forest Clock

SAMPLE IMPORT FREE!
...and I'll tell you exactly how to turn it into big money!

MAIL FREE SAMPLE CERTIFICATE - Get Full Facts
How to start your own big profit
HOME IMPORT BUSINESS

**24,221
IMPORTS**

MY PLAN STARTS YOU FAST... Shows you how to
Buy Below Wholesale

MEN-WOMEN... Turn Spare Hours or Full Time into INCOME!

DISCOVER PROFITS OF IMPORT! My Home Mail Order Import Business Plan guides your every step... it is based totally on my personal success. Shows how to deal direct and cut out costly middlemen... so you keep all the profits! I do the "hard work" for you... by traveling the world to find dazzling "first time offered" new imports. The actual sample I will send you Free is typical of my import discoveries. You can pick and choose from more than 24,000 products. Deal in one product or 1000's. Buy below wholesale.

YOU CAN START IMMEDIATELY. I arrange free membership in exclusive International Traders organization... instantly puts you in direct contact with suppliers abroad. I show how to operate anywhere. Age no barrier. Ideal for spare time husband/wife or retirement business. My report, "How to Import and Export" tells how to do it. No obligation. No salesman will call. Certificate brings your free gift sample import and everything else.

FREE CATALOGS!
Now! Quick Double Profits As a Member of International Traders you also get free catalogs of specialty merchandise to order at rock-bottom prices from big U.S. warehouse.

This Certificate Good for
ONE SAMPLE IMPORT - FREE

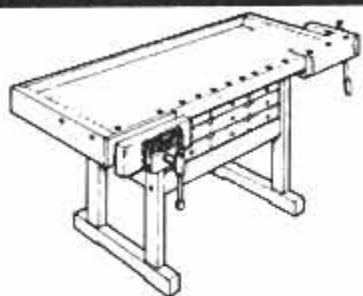
B. L. Mellinger/The Mellinger Co.
6100 Variel Ave., Dept. T2251
Woodland Hills, CA 91367

Send **FREE REPORT**, "How to Import and Export"... also actual Free sample import. Everything you send me is mine to keep without obligation. Show me how I can start a profitable home business of my own.

Name _____ Age _____
Address _____
City _____
State _____ Zip _____

IMPORTANT
Your initials must appear below to qualify for Free sample import. Because of high cost and limited supply, I hereby agree to limit my request to one, and one ONLY, Free sample import. I have not previously requested this Free sample. I am over 18 years of age.
Initial here _____

WOODWORKERS!



This fine Cabinetmaker's Workbench is just one of the projects that have appeared in the past issues of

The Woodworker's Journal.

Whether you're a novice or a veteran woodworker, you'll enjoy the detailed drawings and instructions for building all types of practical projects including Early American and Contemporary furniture, toys, clocks, gifts, and much more.

In addition to plans, each issue contains shop-tips, money-making ideas, antique repair tips and cabinetmaking techniques.

Subscribe now to the project magazine that features 70 plans each year.

1 YEAR (6 bimonthly issues)—only \$12.00
2 YEARS (12 bimonthly issues)—only \$22.00
Foreign Rates: 1 year—\$14.00, 2 years—\$26.00
(Please make payment in U.S. Funds)

GUARANTEED: A full refund on all unmailed issues if not completely satisfied.

Send check or money order to:
THE WOODWORKER'S JOURNAL, Dept. 11
P. O. Box 1629, 25 Town View Drive
New Milford, CT 06776

6 issues—\$12.00 12 issues—\$22.00

Name _____
Address _____
City _____ State _____ Zip _____

Here's what one customer said:



"If I had the tools and materials to build my own bike from scratch, I don't think I could build one any better."
John Jurenka,
Santa Monica, CA

Save assembly costs when you build your rugged work or play machine (in just 6 — 12 hours) with an easy kit from Carl Heald, Inc. Choose from 10 bike, 8 trike models; engines from 5 to 16 H.P. All have Comet torque converters (no shifting); full suspension (smooth ride); tubular steel frames (shrugs off rough going). Optional electric start, lights for licensing, other accessories.



NEW SST-1621
(16-hp)
SUPER
TRYKE
shown with
accessories

Special Offer
— One FREE
accessory
with bike or
trike order!

Carl Heald, Inc.
Dept. PM-12 P. O. Box 1148
Benton Harbor, MI 49022

Write today for free brochure

AMAZING SCIENTIFIC and ELECTRONIC DEVICES

PHASER shockwave and invisible FORCE FIELD generators. LASERS for weapons, cutting, burning, cloud writing, holography and special effects. NUCLEAR particle accelerators and detectors. PLASMA, ION, HIGH VOLTAGE, HIGH FREQUENCY TESLA COILS and LIGHTNING generators. TRANSMITTERS and CONTROL devices for security, telephones, intrusion detection, nature listening. PLUS PLUS INFRASONICS, ULTRASONICS, ENERGY, CHEMICAL and PERSONAL PROTECTION and SAFETY DEVICES. SEND \$1 for catalog of plans, kits and completed items to:

INFORMATION UNLIMITED, INC.
P. O. Box 716, Dept. M8
Amherst, N. H. 03031

**BUILD A JET HELICOPTER
EASY TO FLY—INEXPENSIVE TO BUILD!**

- Carries one person-plus
- Uses low-cost fuel

Plans—completely illustrated: \$9.00
**HELICOPTER EXPERIMENTER'S
HANDBOOK** (many illustrations): \$5.00
PLANS and HANDBOOK: only \$12.00
HELICRAFT

P. O. Box 16488 Baltimore, MD 21217

NEW SHIPMENT JUST ARRIVED

Hardened Steel. For filing, drilling, milling, carving, routing any metal or wood
Cutting edges from 1/2" to 1", all shanks 1/2" Brand new in air tight G.I. packs.

32 Tool Set, G.I. cost \$295.00	now	\$29.00
14 Tool Set, G.I. cost \$126.00	now	\$18.00
Save Even More. Both Sets now		\$38.00
Two 138 Sets (limited time)		\$58.00

Money Back Guarantee. Add 13% for shipping
Texas orders add 5% tax. Export orders add 14%
U.S. SURPLUS CENTER, Dept. 503
115 Camden San Antonio, Texas 78215

**"MAKER'S MARK"
BRANDING
TOOL**

SEND FOR YOUR FREE INFO PAK!
NO OBLIGATION

NOW! Brand your own name permanently on wood and leather hand-crafts! Simple to use. Long lasting U.L. approved electric handle. Brands full name. Guaranteed.

CRAFTMARK PRODUCTS, INC.
P. O. Box 6308- PM1 Marietta, GA 30065

TRAILER FOR THE 80's — Super Trailer Trailer with sleep four, under 1000 lbs. Fiberglass. Ready to tow finish interior only. Drive Burro (1981) 14342 31st Avenue North, Plymouth, MN 55441. For full sales listing send \$2.00 to cover postage and handling.

Be a **LOCKSMITH!**
EARN WHILE YOU LEARN
Send for FREE BOOK

Big opportunities. Big profits. Earn quickly. Full or part time. Learn at home it's easy. Do real jobs. All Tools — Materials Supplied. Lic. State of N.J. — Appd. for Veterans. Send Name and address for FREE book

Locksmithing Institute, Dept. 113-012
Div. Teacher at Home Study School, Little Falls, N. J. 07424

GAS SAVER PATENTED
New low-cost water/vapor injector VAPOR-JET® increases mileage, horsepower, performance, and reduces engine knock. \$29.95 + shipping.

For purchase or information, contact Progressive Energy Corp., 3148 S. York, Englewood, CO 80110 or call TOLL FREE 800-525-8624 (in Colo. 303-762-1385).

170 POPULAR MECHANICS

**POCKET WORKSHOP
FINEST BRITISH STEEL IMPORT**

GLASS CUTTER
SPARES SHARPENER FOR KNIVES SCISSORS
WIRE STRIPPER
SELF SHARPENING BLADES

(ACTUAL SIZE 4-1-77)

"CLEMAC"—only combination tool of its kind with replaceable parts.
SHARPENS knives, shears, scissors, mower blades etc.
CUTS glass of any thickness, including plate, like STRIPS electrical wiring and cables.
CUTS paper, hardboard, Inoleum, formica etc.
HUNTERS—excellent for dressing deer and other game.
"CLEMAC" hundreds of uses, the last word in D-I-Y tools.
Money back guarantee. Full instructions included.
Send check or M.O. for \$8.95 plus 75 cents postage to **Clemac, 149-09 Beech Ave, Flushing, N.Y. 11355**
For orders of 2 or more we pay postage
Note — N.Y. Residents add 8% sales tax

110 VOLT A.C. GENERATORS

60 cycles, 3000 watts, WT 27 pounds, 5' x 10" Fanbelt driven from car or pickup Operates, T.V. All power tools. Over 17,000 in service. This is our 31st year. Guaranteed 6 months. \$189.00. Our X1200-watt generator needs no battery. Special price \$179.00. Add \$7.50 for postage & handling, per unit. Send for our free catalog.

**VIRIDEN PERMA-BILT Box 7160 PM
2621 Mays, Amarillo, TX 79109
Phone: 806/352-2761**

**\$40 AN HOUR AND UP!
REPAIRING RADIATORS**

Basic Shop \$4,995, F.O.B. Omaha.
Add package auto air, alternator repair, heliarc welding. Factory training included. Mail ad - name, address & phone to Inland Mfg., Dept. PM-1, 1108 Jackson St., Omaha, NE 68102.

**SNOW?
GO!**

NEW! Beat Snow and Ice—even when already stuck—with Instant-On™ Tire Chain Conversion Kit, (Patent 1981)

- Now chains can be put on in under 1 minute — without jacking or moving vehicle!
- Connects inner circumferential chain from front of tire... then unique toggle device tightens chains as never before. Convert 14" 15" or 16" tire chains for more safety, less chain wear, unbelievable roadability and traction — \$24.95 USA PP

Penna Residents add 6% Sales Tax, Outside USA add postage
© 1981 INSTANT-ON, INC.
PO Box 231 Bensalem, Pa 19020
Free Brochure

3000 WATT SAVONIUS WINDMILL SYSTEM

Build this SAVONIUS WINDMILL SYSTEM from simple parts and generate up to 3000 WATTS of valuable electricity! Ideal for homes, farms, cottages! Operates more efficiently than conventional windmills, even in low wind speed areas! Simple, Economical Construction! COMPLETE PLANS \$8.95

**GLENEVALE PRODUCTS, Dept. VN,
Box 358 Station D,
Toronto, ONT M6P 3J9**

FACTORY DIRECT!

go cart

New plans reveal step by step details on how to build your own Go Cart! NEW welded Go Cart frame kits! FREE coupons!

RUSH #3 for plans & Giant Catalogue to:
Box 34304, Dept. PM 1 Omaha, Nebr. 68130010

Now! Enjoy a complete home shop at a substantial savings ...

in no more space than a bicycle!

Now you can own the woodworking tools you need to turn out precise, top-quality projects. And you don't need a large workshop area, because Shopsmith's space-slingy MARK V uses no more space than a bicycle!

Over a quarter-million American woodworkers have discovered the joys of woodworking the Shopsmith way — while becoming better woodworkers in the process.

You see, a man's work is only as good as his tools. And Shopsmith builds in the precision and quality you need to add the professional touches to your woodworking projects. In other words, you don't have to be a master craftsman to create impressive projects. But with patience, practice and a MARK V, you'll be hard-pressed to tell the difference.

You'll Save Money . . . We call the Shopsmith MARK V "the complete woodworking system". Why? Because this extremely versatile tool gives you the five basic woodworking functions — sawing, drilling, horizontal boring, lathe turning and sanding

And all five functions are powered by one rugged, variable-

speed motor. That means you save money because it costs you lots less than five individual power tools. You also save a roomful of space!

But that's just the beginning. The Shopsmith system lets you add on quality accessories when you're ready, such as, molding, shaping, routing, dadoing, mortising, and more.

Use the MARK V to create custom hardwood furniture at half the price of retail, do household repairs, add a tool shed, or craft special toys for your children . . . the list is endless. You could even build your own house with it!

We can only begin to tell you the entire story with this ad. But we'll be happy to send you additional information about Shopsmith and the incredible MARK V. So fill in and mail the coupon below. It's FREE, so do it right away!



Shopsmith Inc.

The Home Workshop Company
750 Center Drive
Vandalia, Ohio 45377

Shopsmith, Inc. 1981

Send for your FREE fact kit and find out why... the Shopsmith MARK V is the tool to start with ... the system you grow with.

HANDS ON!

YES! Please send my FREE Information Kit on the Shopsmith MARK V, including the booklet, "What to look for when buying power tools", PLUS all the details on how I can use the MARK V in my home for 30 days at no risk. Also enter my name for a FREE one-year subscription to *HANDS ON!*, the woodworking magazine. I understand this information is FREE and I am under no obligation.

Name _____

Address _____

City _____

State _____ Zip _____

Mail to: **Shopsmith, Inc.**
The Home Workshop Company
750 Center Drive
Vandalia, Ohio 45377

Dept. 352P



MODULAR COMPONENT KIT!

This all American roadster comes pre-assembled on its own frame. Uses Ford components and gets in the 40 m.p.g. range. Send \$5.00 for full color literature or \$35.00 for assembly manual.

BLAKELY AUTO WORKS
1248 Fulton Street Princeton, WI 54988
Phone (414) 888-8881

LEARN Sign Painting HOME STUDY OR IN CLASS COMB.

The Midwest School of Lettering and Design, an established full-time private career school, has trained students from all parts of the United States who are now successful sign painters and graphic designers in their own communities.

We now offer an exciting and thorough Home Study or in class combination course. There are no educational prerequisites — all you need is a genuine interest.

CHECK BOX AND RETURN THIS AD
FOR FREE CATALOG AND SAMPLE LESSON

MIDWEST SCHOOLS, 2610 N. BROADWAY
ST. LOUIS, MO. 63102

At Least a New Amazingly Simple GAS TURBINE JET ENGINE

Build from easy to follow plans. Length 18", Dia. 8 1/2", Wt. 18 lbs. Fuel: Gasoline or Kero.

"Screaming Demon" develops 20 H.P. Ideal project for serious-minded hobbyists, students, scientific and industrial arts classes. Works on 5" metal cutting lathe with milling attachment. For use on small racing boats, model cars, etc. Full size assembly drawings with critical dimensions, bill of materials and photos. Price \$60.00. No. C.O.D. 1510 24th St., Box 1399
SAVOY SCIENTIFIC SANTA MONICA, CALIF. 90406



GREAT SAUSAGE RECIPES

227 page illustrated book explains sausage making plus home curing and smoking of meat, fowl and fish. Over 100 recipes. Free equipment and supply catalog has more information.

For yours, send to:

The SAUSAGEMAKER

177-6 Military Road Buffalo, N.Y. 14207

PLANS AND INSTRUCTIONS FOR	
Go Kart	\$2.90
Mini Bike	\$2.00
Mini car	\$3.00
1/2" Ball Boat	\$4.00
Front Traction Go-Kart with Gearless Differential	\$10.00
Mini Jeep	\$2.00
Profil Boat	\$4.00
4 H.P. Tractor	\$10.00
Kump Box	\$3.00

Mini Vehicles Plan Dept. C
Chazy, N.Y. 12821

FACTORY DIRECT 40 PC. RATCHET SET



- Combination Metric and Inch
 - 1/4" & 3/8" Drives, Drop Forged
 - Chrome Plated and Rust Proof
- Send \$10 and \$2.50 Postage and Handling To

\$10.00

ANALOG TOOL CO.

1284 E 56 St. Dept.-J

Brooklyn N.Y. 11234

- Retailer for \$19.99
- Money Back Guarantee

AMERICA'S 7 BEST POWER TOOL BUYS

1  **8" TILT ARBOR SAW**
8" tilt arbor saw crosscuts, rips, mitres, cuts compound angles, dados, coves, moldings. Less blade, motor. Rip fence for easy alignment \$6.50 add'l. Ball bearing model \$12.50 add'l. Takes 1/3 hp. motor or larger, standard blades, attachments. **\$52.50**
22 lbs. f.o.b. factory

2  **BELT SANDER**
Changes from horizontal to vertical in seconds
Precision heavy duty sander includes a 4" x 36" sanding belt. Uses 1/3 h.p. or larger motor V-pulley drive and multi-purpose drive spindle. Disc sander accessory, \$17.00 add'l. Mitre gauge, \$3.50 add'l. 18 lbs. f.o.b. factory. **\$52.00**

3  **4 FOOT WOOD LATHE**
12" swing industrial size 7 speed pulley
Does the job of \$150 unit. Tubular steel bed rails, screw action tail stock. Use any size motor. 4" face plate. \$4.50 30 lbs. f.o.b. factory. **\$67.75**
DELUXE HEAVY DUTY LATHE
Double shielded, lubricated for life ball bearings. 30 lbs. f.o.b. factory. **\$79.50**

4  **LONG BED WOOD LATHE**
55" version of the deluxe heavy duty lathe. Has ball bearing live center in tail stock and extra heavy bed tubes. 40 lbs. f.o.b. factory. **\$94.00**

HIGH SPEED TURNING CHISELS
Set of 3 \$11.00
Set of 8 \$29.00

5  **JOINTER-PLANER**
4" x 22". Cast iron and steel, precision ground adjustable tables. For planing, joints, bevels. Cuts to 1/8" depth. Fence adjusts from 0" to 50". Steel knives and dual guards. Use any motor. Precision ball bearing industrial model. \$15.70 add'l. 19 lbs. f.o.b. factory. **\$63.30**

6  **1 TON ARBOR PRESS**
Many uses such as pressing bearings or shafts, controlled bending and riving. Has a 4 position anvil and machined rack and pinion drive. Cast iron camel back frame for rigidity and strength. 3 1/2" depth of throat. 37 lbs. f.o.b. factory. **\$64.95**

7  **HORIZONTAL-VERTICAL METAL CUTTING BANDSAW**
Use any size motor.
A vertical bandsaw and horizontal cut-off machine with automatic shut-off. Cast iron body, ball bearing blade guides, worm gear reduction, adjustable tension spring. 3 speeds. With stand and blade 1/2" x 64 1/2", 137 lbs. f.o.b. factory. **\$300.00**

These power tools have no chrome, embossed nameplates or any other useless extras — but they do the same job as tools costing 2 to 3 times the price! And their performance has been proven in the shops of literally millions of professionals and serious amateurs.

Don't be misled by AMT's low prices, these are quality tools. They are full scale, full speed and offer top performance and precision. There are good reasons why we are able to offer such values. Here is how we do it:

Engineered for simplicity. After years of engineering refinements, virtually all the frills have been eliminated in order to save you money. **Faster machining:** Specially designed automatic machining equipment cuts costs by cutting production time. **Standard parts:** Ordinary hardware items replace custom parts for enormous savings.

Volume: Our own foundry, our huge mass production facilities and our large buying power — all keep costs down. **Direct factory purchase:** You pocket the savings but we still offer our two terrific guarantees!

POWER SAW: Our tilt arbor saw comes completely assembled with ground cast iron table, safety guard, splitter and mitre gauge.

In addition you get a free set of cabinet base plans that show you how, with one sheet of 3/4" plywood, you can convert this saw into a floor model with a big 27" x 24" top. Cabinet rip fence only \$7.50 additional. And you can use your new saw to cut out the cabinet base!

BRAND NEW ELECTRIC MOTOR
Develops a full 1 h.p., 17 lbs. f.o.b. factory. (purchased separately \$54.55) \$49.50.

AMT OFFERS TWO GUARANTEES:

OUR 10-DAY MONEY BACK GUARANTEE
Try any of these power tools and compare it with any similar machine at any price. If not satisfied return it for prompt no questions asked refund! We pay the return shipping charges.

10 YEAR LIMITED WARRANTY
Any part or parts of these AMT power tools (except motor which carries a 3-year limited warranty) which becomes inoperative for any reason within 10 years after purchase date will be repaired or replaced by the factory with no charge to the purchaser other than postage.

AMERICAN MACHINE & TOOL CO., 4TH AND SPRING STS., ROYERSFORD, PENNSYLVANIA 19468

BUY DIRECT . . . USE THIS HANDY ORDER COUPON TODAY

AMT American Machine & Tool Co., Dept. PM12, Fourth & Spring Sts., Royersford, Pa. 19468
Please send me the units checked. Payment in full enclosed \$ _____ or \$5 deposit each item enclosed, balance C.O.D. I must be fully satisfied or will return unit within 10 days for full refund. No questions asked.

1 <input type="checkbox"/> 8" tilt arbor saw, \$52.50 <input type="checkbox"/> Standard rip fence, \$6.50 <input type="checkbox"/> Long cabinet rip fence, \$7.50 <input type="checkbox"/> Ball bearing spindle, \$12.50	4 <input type="checkbox"/> Long bed wood lathe, \$94.00 <input type="checkbox"/> Face plate, \$4.50 Turning chisels for any lathe <input type="checkbox"/> Set of 3, \$11.00 <input type="checkbox"/> Set of 8, \$29.00	7 <input type="checkbox"/> Horizontal-vertical metal cutting bandsaw, \$300.00 General Electric Motors <input type="checkbox"/> \$49.50 (with other item) <input type="checkbox"/> \$54.55 (purchased separately)
2 <input type="checkbox"/> Belt sander, \$52.00 <input type="checkbox"/> Disc sander attachment, \$17.00 <input type="checkbox"/> Mitre gauge for sander, \$3.50	5 <input type="checkbox"/> Jointer-planer, \$63.30 <input type="checkbox"/> Ball bearing spindle, \$15.70	Visit our Royersford factory showroom for these same low prices. 4th and Spring Sts. From 9 to 4:30 on weekdays and 9 to 12 on Sat.
3 <input type="checkbox"/> 12" swing, 4' lathe, \$67.75 <input type="checkbox"/> Deluxe ball bearing lathe \$79.50 <input type="checkbox"/> Face plate, \$4.50	6 <input type="checkbox"/> 1 ton arbor press with four position anvil, \$64.95	

NAME _____
ADDRESS _____
CITY _____ STATE _____ ZIP _____



Now available with optional wooden floorboards!

The Quality Alternative to High-Cost Inflatable Boats!

Why pay \$600. to \$1000. or even more for an inflatable boat?

Sea Eagles pack small, last for years and cost \$110. - \$540.

Canoes, dinghies and motormount boats for fishing, river running, camping and yacht tending.

Sea Eagle 8, shown: • 9'7" x 4'6" • 31 lbs.
• Holds 4 adults • 3 hp capacity • Costs \$220.

Write for our FREE brochure: Sea Eagle, Dept. PM1B, St. James, NY 11780

Or phone:

516-724-8900, 8:30 AM to 4:30 PM EST.



SEND FOR OUR ILLUSTRATED DISCOUNT TOOL CATALOG

Shop at Home and Save

Modelers Hand and Power Tools Discounts for the Professional and Hobbyist

Fast Service 92 Pages Send \$2.00

Coastal, Devcon, Diamond, Dorton, Dremel, Easydriver, Evans, General, Hot Stuff, Intermatic/Air, Jarmac, K&S Engineering, Edison, Merit, Microflame, Moody, Morris, Northwest Shortline, Pasachs, Plastruct, Sandvix, Sherline, Swenson, Triumph, Wahl, X-Acto.

PATTY'S CORNER, INC.
P.O. BOX 8326 DEPT PM HALEDON N.J. 07538

MAKE TOP MONEY IN STAINED GLASS

Learn at home in your spare time. We have taught the art of Stained Glass from age 16 to 60. Our program includes completely illustrated lessons... all professional tools, interesting projects, and more. Everything needed to start you on your way to success. You can earn big money working from your home or a studio, making new stained glass lamp shades, windows, jewelry, sun catchers and the restoration of antique stained glass pieces. For information send \$1.00 to REGINA CAREERS, LTD. Dept. PMG 12 33 E. Main Street, Round Lake Park, Illinois 60072

FOR THE HOME **Satellite TV**

We don't just sell information! We Manufacture Hardware!

Our 94-page catalog and information book tell the whole story! Inexpensive dishes, high-pro-feeders, computer aiming software! Specs, kits and more! Send \$7.95 today!

24-hour C.O.D. Hotline • **SPACECOAST** RESEARCH CORPORATION
(305) 230-7800 Dept. G, P.O. Box 842, Altamonte Springs, FL 32701

Hydraulic Log Splitter

PARTS ALSO AVAILABLE TO BUILD YOUR OWN

- 10-1/2 tons splitting force
- Fast splitting cycle (10-sec.)
- Splits logs up to 26" long
- 5 hp BRIGGS gas engine
- Powerful 2-stage hyd. pump
- Detent control valve returns to neutral automatically

Shpg. wt. 300 lbs.

BRAND NEW **\$789.50** F.O.B. Lincoln

Split wood for your own use, split logs for profit, earn money on rentals. Built from finest quality components.

"BUILD-YOUR-OWN". Save Money! Top quality components at lowest prices. See our catalog. 100's of other items, BIG SAVINGS!

SURPLUS CENTER PM012 Lincoln, Nebraska Zip Code 68501

POOL TABLES BUILD YOUR OWN

- High quality
- Professional styling
- Solid construction
- Low cost
- Kits for special items available
- Plans include drawings, instructions, templates, information brochure, etc.
- Plans for 8ft ball return model \$5.95
- Plans for 8ft deep pocket model \$5.95
- Plans for both models \$9.95

All prices US currency. Brochure alone \$1.00. Pa. residents add 6% tax.

TIERCRAFT, Dept. B, Box 8151, Erie, Pa. 16505

PUMPS BUY DIRECT AND SAVE

Drain • Irrigate • Circulate • Spray

Heavy duty ball bearing pump. All metal, rust-proof Type XB. Stainless shaft. Use 1/4 HP or larger. 1 HP 1,200 GPH 60" high or 3,000 GPH 25' well. 5,200 GPH max. 1 1/4" in. 1" out. Belt or direct drive. \$21.95

Type P won't rust or clog. Bronze bearing. To 2,400 GPH. 1" in. 3/4" out. \$15.95

ADD \$2.00 postage & handling. Money back Guarantee.

LABAWCO, 80 Hwy 206, Belle Mead, N.J. 08502

A \$2.00 WOODWORKER'S CATALOG FOR 50¢

50¢ REFUNDED FIRST ORDER

Jam packed full color woodworker's manual and catalog includes simplified veneering & refinishing instructions, veneers, lumber, toy plans, parts, cane, upholstery supplies, furniture plans, books, tools, moldings & more! Send 50¢ Now!

BOB MORGAN WOOD, DEPT. PS
1123 Sardstown Rd., Louisville, Ky. 40204

Portable Steam Cleaner

Steam in 60 seconds

CLEAN: Engines, Air Filters, Lawn Mowers, 3 year guarantee on fire box, coils. Uses liquid soap, propane fired. Weight 120 lbs. Auxiliary pump required on low water pressure.

WEDCO MFG. INC., Dept. M-12
940 West Broadway, Jackson, WY. 83001

A SINGER'S DREAM!

REMOVES VOCAL FROM MOST STEREO DISCS

The Thompson Vocal Eliminator can actually remove most or virtually all of a solo vocalist from a standard stereo record and yet leave most of the background music untouched! Not an equalizer! We can prove it works over the phone. Write or call for a 24 page brochure and demo record.

Write to: **LT Sound**, Dept. PM, P.O. Box 338, Stone Mountain, GA 30086. Phone (404) 493-1258. COST: \$295.00

HOW TO BUILD A MORE POWERFUL BODY!!

Fantastic muscle pumping methods!

FREE BOOKLET!

HOW YOU CAN HAVE

- Wider Shoulders
- Trimmer Waist
- Powerful Chest
- Bigger Arms

YOU CAN:

- Gain Strength
- Lose Fat

Universal
Box 8694, Dept. E
Detroit, Michigan 48280

TOOL WORLD - SAVE \$\$

Name Brand Tools at Low Discount Prices NOW! 1981 Catalog featuring professional tools at Low Discount Prices \$2.00 refundable

TOOL WORLD - Dept. 33
21165 Euclid Ave.
Cleveland, OH 44117

For every man who has ever wanted to build his own home. With his own two hands.



Now this dream can be a reality for you with a Lincoln Logs "STACK 'N BUILD" Log Home Package.

You build it yourself... and you don't have to be an architect. We supply all blueprints, plans and easy-to-follow instructions.

You don't have to be a structural engineer. Our log homes are designed and engineered for quick, easy construction in as little as 3 weeks.

You don't have to be a designer, but it helps to know what you want. Lincoln Logs will even assemble a custom log home package based on your interior or exterior configuration AT NO EXTRA COST.

You don't have to be a building contractor.

We supply everything you need from the beautiful logs themselves, to all the hardware down to the very last nail.

You don't need a lot of fancy tools. Just what's probably in your tool box already and a power saw.

You *do* need your own two hands... and a little help from a good friend is always nice.

If you ever wanted to build your own home, then it's time for you to make your move to Lincoln Logs.

Send just \$5 for your complete Log Home Planning Kit to:



THE ORIGINAL

Lincoln Logs Ltd.

1 CHESTNUT ROAD,
CHESTERTOWN, N.Y. 12817

SOTZ GARAGE SHOP HEATER

- PRODUCES MORE HEAT THAN 2 OR 3 HIGH PRICED STOVES
- TREMENDOUS RADIATING SURFACE AREA GIVES YOU MORE HEAT WITH LESS WOOD
- BURNS VERY LONG WITHOUT ADDING WOOD
- ENGINEERED TO PREVENT DRUM BURN OUT
- TESTED TO U.L. STANDARDS
- EASILY HEAT YOUR BIG FARM BUILDING

SPECIFICATIONS

- **Heating Capacity:** 152,000 BTU/hr. bottom drum 243,000 BTU/hr. double drum.
- **Construction:** Door, door frame, flue collar, draft control internal draft channel of 13 ga. steel legs, 1/8 in. steel hinges, latch, catch of 3/16 in. steel nuts and bolts. Top Drum: Connector flanges, pipe assembly, 4 nesting brackets, nuts and bolts.
- **Guarantee:** 1-year trial offer. 10 years against failure.
- **UL testing** conducted by R.F. Geisler, Engineers.

	PRICE: DELIVERED TO YOUR DOOR	FACTORY PICK-UP
Bottom	\$38.98	\$34.95
Top	\$20.98	\$17.95

VISA AND MASTERCARD RUSH ORDERS
CALL 1-800-321-9892
(INSIDE OHIO CALL 1-216-236-5021)
or SEND CHECK OR MONEY ORDER...
Sorry, no C.O.D.'s.



OUR 25th YEAR

FREE info. about 55-GAL HEATER (SHOWN), heating water, drying wood, fireplace-to-woodstove. 15-30 gal. kits also available.

\$34.95 bottom kit
factory pick-up

Before you spend \$500 to \$600 on a wood heater, try the Sotz Heater Kit for under \$60...at our risk. If (within one year) you don't agree it out performs any wood heater money can buy, or (within 10 years) if the kit cracks, warps, or burns up, your money will be refunded, including shipping charges.

Kit converts a 55 gallon drum (not supplied) into a high capacity wood burner. Features large 11 3/4" square door opening, cam-lock door catch, and spark-proof design. Patented internal draft channel, draft control, and airtight design allow controlled, efficient heat, while limiting metal temperatures of barrel to prevent burnup.

Use of draft control allows you to heat large or small areas. Basement installation heats your entire home. Great for your garage, workshop, or cabin. Top drum squeezes 60% more BTU's from heat normally lost up the chimney. Heavy steel kit bolts together quick and easy.

Thousands in use by U.S. Army, Navy, Depts. of Nat. Resources, Agriculture, Federal, state and local government agencies.

Sotz Corporation, 13643 Station Rd., Columbia Station OH 44028



Find twice the treasure . . .

with a WHITE'S ELECTRONIC MINERAL/METAL DETECTOR

White's instruments detect rings, jewelry, coins, plus other valuables and it's profitable! Metal detecting is a hobby for the whole family to enjoy. Models from \$59.95. Covered by U.S. Patents.



In half the time

FOR THE NEAREST WHITE'S DEALER AND A FREE CATALOG CALL TOLL FREE 1-800/547-8911 PA-2

WHITE'S ELECTRONICS, INC. 1011 Pleasant Valley Rd., Sweet Home, OR 97286

Splits EASIER & FASTER! **THE BOSS LOG SPLITTER!**
Only \$49.95 plus \$5 p. & h. for adaptable cone. or \$99.95 plus \$8 ready-to-attach to hub of car or light truck (specify vehicle). Pa. — send 6% sales tax. Free info — send stamped self-addressed envelope. Good Products, Route 3 Box 88-A PM, Kutztown, Pa. 19530

FULL-SIZE FURNITURE PLAN ROLL-TOP DESK



Catalog—\$2⁰⁰

Over 170 different full-size professional furniture plans. Early American, English, Mediterranean, Spanish, Danish Modern. Chairs, Hutches, Cradles, Beds, Tables, scores more! Your remittance refunded with first order. Send today. No woodworking shop is complete without it.

Just like the one Grandfather had. Authentic double pedestal desk 30" deep, 52" wide, 30" high. Roll-Top Unit adds 14" to height. Both single curve and double curve full-size profiles included. You'll love making it. You'll love using it. Adds luxurious decor to any room. A woodworker's delight!
Plan #139 (Double Pedestal Desk) \$9.00
Plan #140 (Roll-Top Unit) \$9.00
Complete Desk Plans ... \$18.00



FURNITURE DESIGNS, Dept. PD-12
1425 Sherman Ave., Evanston, Ill. 60201

VELOCITY SKITTER
ENDS WOOD SPLITTING DRUDGERY
New low cost COMPACT MODEL with trailer type wheels and hitch coupler for farmers, camps, cottagers. 10 ton ram. 2 cycles per min., splits logs 25" x 18". Also available for 8" wheels for trunk transport. For details write: Piqua Engineering, Inc., Dept. P, Box 605 Piqua, O. 45356

RUPTURE AGONY DISAPPEARS...
When you slip into a genuine Brooks Appliance! Your rupture will be held securely, yet gently, night and day at work or at play. Send for our free booklet today. **BROOKS APPLIANCE CO.** 770 State St., Marshall, MI 49068 (Medicare Pays 80%)

GAS TO ELECTRIC
2 bulb fixture duplicates the charm and increases the light output of any existing double mantle gas-lamp. Kit includes on-at-dusk, off-at-dawn photo control, fixture, bulbs, detailed instructions. The 'RELITE' kit is available in both 115 volts and 12 volts. Ask for the 'RELITE' kit at your local hardware store or write for more information. Dealers and retailers required only. Call 1-800-328-6564
Yardlighting Systems, Inc.
1039 Charles Ave., Dept. 45 • St. Paul, Minn. 55104

ORECK FREE Catalog

The World's Largest
Seller Of Vacuum
Cleaners By Direct
Mail Offers For The
First Time A

"FREE" Comprehensive Catalog

Featuring the latest advancements
in **XTENDED LIFE** Professional
Vacuum Cleaners and Shampooers.

Used by Businesses, Industry and
Homes throughout the world.
Not available in retail stores. © 1982
Oreck Corp.

Buy Direct From The Manufacturer

Money Back Guarantee On Every Product
More Than 1 Million Customers

SEND FREE CATALOG TO: PM7-150

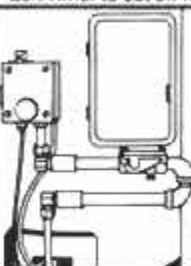
NAME _____
ADDRESS _____
CITY _____
STATE _____ ZIP _____

OR CALL TOLL FREE **800-535-8810**

ORECK Corporation
100 Plantation Rd., New Orleans, LA 70123

CUT HOT WATER COST UP TO 1/2

Install it yourself on gas heater. Set 24 hour Gas-
Lok Timer to cut off when you're away or asleep.



Turns on automatically at
the pre-set time. Pilot light
remains on and manual
override provides hot water
during the "off" set-
ting. 24V transformer, UL
and AGA approved. Free
bulletin.

Minnesota NRG Co.,
202 3rd St. N.,
Minneapolis, MN 55401.

FREE

THE GREAT ELECTRONIC THINGS & IDEAS BOOK!

HUNDREDS OF
UNUSUAL PARTS, GADGETS & IDEA ITEMS UNAVAILABLE IN
STORES OR CATALOGS ANYWHERE! Bargain prices on everything
New items in every issue! Rush postcard for your copy!

ETCO ELECTRONICS
Dept. 323
Pittsburgh, N.Y. 15201

GO INTO BUSINESS WITHOUT SPENDING YOUR OWN MONEY

You are advised: various ways to enter busi-
ness; the field you should enter; what you need
to know to start; about record keeping, taxes, in-
surance; how to do it all on the other man's money.
A sample contract for starting business is includ-
ed. To run your own business brings a sense of
independence, allows you to adjust to inflation and
gives you a chance to use your own initiative to
reach your goals. \$7.95, prepaid. Send check or
money order to: JoDor, Box 602D, Cedar Park,
Tx. 78713. If not satisfied, return in 10 days for
refund.

QUALITY CLOCK MOVEMENTS

450 \$4.75
Quartz In Quantity

1 or 2 @ \$8.00—3 to 9 @ \$7.00—10
to 24 @ \$6.00—25 to 49 @ \$5.50—
50 to 99 @ \$5.00—100 to 299 @
\$4.75.

EXTREMELY ACCURATE QUARTZ MOVEMENTS
ARE NOW AVAILABLE AT VERY MODERATE COST
FOR THOSE THAT DEMAND PRECISE TIME-
KEEPING. QUALITY FEATURES SUCH AS HIGH

Delivery From Stock - Prices Include Hour, Minute &
Second Hand - Please include \$1.50 for Delivery.
Please send _____ Send \$1.00 For Catalog - Refunded
on First Order.

NAME _____
ADDRESS _____
CITY _____ STATE _____ ZIP _____

Esslinger & Co.



500N
Quartz
Pendulum

\$8.95
In Quantity



QUARTZ OSCILLATION OF 4.194364 MHZ
ASSURES RELIABILITY AS WELL AS
ACCURACY. REGULAR POSTS FIT 1/4"
DIALS - LONG POSTS UP TO 1/2" - FULLY
WARRANTED 1 YEAR. PENDULUM
LENGTHS AVAILABLE FROM 8" to 16".

1 or 2 @ \$8.00—3 to 9 @ \$7.00—10
to 24 @ \$6.00—25 to 49 @ \$5.50—
50 to 99 @ \$5.00—100 to 299 @
\$4.75.

P.O. BOX 43861 ST. PAUL, MN 55164
NATIONAL WATS-ORDERS ONLY — 800-328-0206
MINNESOTA WATS-ORDERS ONLY — 800-382-0334
INQUIRIES-INFORMATION — (612) 452-7180

AIRCRAFT KITS

Complete Detailed Plans
Fuel-efficient & High-performance
Aerobatic & Cross-country



SEND TO LIGHT FLIGHT PRO.
Dept. A • P.O. Box 19826 • Houston, Texas 77024

LEARN TO BE A DENTAL MECHANIC

SECURITY PRESTIGE



Learn at home, in your spare time, to make
Crowns, Plates, Bridge-work, etc. Dental Me-
chanics are employed by Dentists, Dental Labo-
ratories or open your own shop, full or spare
time. FULL EQUIPMENT OF TOOLS AND MA-
TERIALS INCLUDED WITH COURSE. Low tu-
ition. Easy Terms. Write for FREE BOOK about
this career that's not affected by automation.

THE MCCARRIE SCHOOLS INC. 215-105-8155
132 N. 12th St., Dept. PM111 Phila., Pa. 19107

NOW BRASS BAR RAILS

For Your Home

Now you can have solid brass bar
rails, standoffs, and caps, flanges,
etc. for your home bar. The same
quality as you see in the finest res-
taurants and pubs.
For Catalog send \$1.00 to:
MIDWEST CUSTOM BRASS
204 E. Main Street, Dept. PM 12 Round Lake Park, IL 60073

GOVT. SURPLUS. SEND FOR CATALOG

Save up to 90%
Bargains in marine, aircraft, auto, hardware, industrial,
mfg. etc. A must for hobbyists, conservationists,
mechanics, handymen, outdoorsmen. Send \$1 for great,
big catalog (deduct \$1 from first order of \$10 or more)
AIRBORNE SALES CO. Since 1945
8501 Steller Dr., Dept. PM82
P.O. Box 2727, Culver City, CA 90230

TUNE YOUR GUITAR Like A Professional



This new invention is ideal for every guitarist—begin-
ner or professional. Six precision tuned reeds make
exact tuning a snap. Just clamp onto your guitar,
then adjust the strings. When the proper pitch
is reached, the corresponding reed vibrates
just as easy as that! Ideal for
hands or unskilled. Tune
all instruments to exactly
same pitch.

\$9.95 plus \$1.
shipping and handling
Money back guarantee.

ED SALE, Studio 57A, Grand Island, Fla. 32735

SHEET METAL WORKERS

TRIOK MULTI-PURPOSE

- SHEAR
 - PRESS BRAKE
 - SLIP ROLL
- ALL FUNCTIONS
OPERATE SIMULTANEOUSLY



Special Buy before Dec. 31, 1981 & receive
FREE SHEAR-NOTCHER
Send for your FREE literature &
Sheet Metalworker Bulletin

PACIFIC ONE CORPORATION
410 W. Pacific Coast Hwy. Suite K201
Newport Beach, CA 92663 (714) 645-5962

HELP



FOR PEDALPOWER® OWNERS

Smooth Start™ SPECIAL \$99.95

Add-on a speed control that
eliminates squeezing lever and tire
wear. Easy Twist Grip throttle
gives reverse too!

For all electric bike needs

Call: **800-847-1304**
PALMER INDUSTRIES, BOX 707BD
ENDICOTT, NY 13760

WOODEN Toy Kits- Parts & Patterns

Catalog Free
By 3rd Class Mail
(9 week delivery)
\$1 For 1st Class Mail
Zoo-Built Toys, Inc. Tahoe City, CA 95730



FREE 1982 DISCOUNT SURPLUS ELECTRONICS CATALOG

- We Offer:
- Computer Peripherals • Audio Equipment
 - Solar Products • Rechargeable Batteries
 - And Much Much More!
- Send Name & Address to:
Poly Paks, Inc.
P.O. Box PM 1
S. Lynnfield, MA 01940
- Quality Surplus Elec-
tronics For Less!
(617) 245-3028



Build Your Own Storm!
Use your ideas and our plans and our doors compare
with door controls, hinges, handles, spring bolts, gaskets,
angle seat and touch of graphite and tapered nails to
insure a mount - simple design.

SINGLE DOORKIT \$59.95 11" x 16" 22 lbs.
DOUBLE DOORKIT \$89.95 12" x 21" 41 lbs.

\$7 Handling plus Shipping Charges. C.O.D. For residents add
6% sales tax. Send check or money order to:
Colonial Masonry & Supply Co.
RD #2, Box 174, Hanover, PA 17331

Write or call for free literature 717-637-6780

CLASSIFIED ADVERTISEMENTS

Rate: \$5.25 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.) The next available issue to place an advertisement in America's No. 1 Classified Section is **MARCH**. The closing is **JANUARY 5th**.

Send remittance payable and order to Popular Mechanics, ATT.: Hildegard E. Kappel, Class. Adv., Mgr., 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 descriptive materials with your request.

AUTOMOBILES

AUTOMOBILE RE-TUNING FOR MAXIMIZED ECONOMY. Simplified techniques increase MPG 50+%! **DETAILS FREE!** Techneering, Box 12191B, Norfolk, VA 23502. Telephone (804) 485-2033 (recording).

SECRET 200 MPG Carburetor Revealed! MPG-PM 182. Box 2133, Sandusky, OH 44870

INSTALL DIESEL in car, PU, RV for under \$1,000. Get 30 MPG. Overlooked source US diesels, 550P, 6 cylinders. Thousands cheaper than Perkins, Deutz or Murphy. Send Self Addressed Stamped Envelope for free info. Diesel, Dept., Box 1933, Walla Walla, WA 99362.

SAVE GASOLINE! Bypass pollution devices - easily, reversibly! Posco (GB-1), LaGrangeville, NY 12540

PROPANE-METHANE-NATURAL GAS Conversions. CARS-TRUCKS-Build Yourself. THOUSANDS SATISFIED USERS! Write: Fleming Engineering, KPM, Ramson, NY 13438

HIGH-MILEAGE COMMUTER CARS - ELECTRICS - 100MPG HYBRIDS - EXOTIC VANS - SUBMARINES - HOVERCRAFT. Beautiful designs. Endorsed by major publications. Complete plans available. Send \$1.00 for catalog. Quincy-Lynn, Box 28061B, Phoenix, Arizona 85068

USED CAR Buying Guide. Free Information. David Publications, 210 Edwards, Pittsburgh, PA 15209

PATENTED gas saver that works. Fuel savings proved in economy tests. Government certified laboratory. Easy installation. \$12.95 to Milton's Enterprises, P.O. Box 3124, Houston, Texas 77001

FREE FACTUAL REPORT - "BUILD YOUR OWN PROVEN 200 MPG CARBURETOR!" Write: Research-PMAN, Box 184, Antioch, Tennessee 37013

1969-1948 FORD PARTS! 80-page catalog of new parts for your old Fords. \$3.00. Specialized Auto Parts, P.O. Box 9405, Houston, Texas 77261. Serving The Restorer Since 1959!

FOUND; THE LEGENDARY "200 MPG CARBURETOR," Mileage Documented. Complete "How-To" Secrets. Information, \$1.00 (Refundable). Moran's, P1, 1434 Argonne Blvd., Winston-Salem, NC 27107

FOUND: 200 MPG Carburetor. Documented evidence. How to report, \$1.00. Satisfaction Guaranteed. Wealthtime, 1100 Beaverton Rd., Suite 5PM12, Knoxville, TN 37919

WANTED: Companies that Sell & Rebuild Catalytic Converters: Persons who Distill Methanol. Oscar (313) 464-0300 Anytime.

CHEAP AUTOMOBILE and Heating Fuel from easily built \$40 Solar Still. Homemaking Guide, \$1.00. Sunpower, 5133 Fairhill, Philadelphia, Pa. 19120-3195

SUPER MILEAGE CARBURETOR! A special report .50c. RoadRunner Publications, Raymondville, TX 78580

HOW TO BUY A GOOD USED CAR. Professional, easy to follow Step By Step guide. \$10.95. Shamrock Press, P.O. Box 782PM, Alamo, Calif. 94507

END WINTER DRIVING WORRY FOREVER! Instant-On™ Tire Chain Conversion Kit. Look for our ad on page 170. Free Brochure. P.O. Box 231, Bensalem, Pa. 19020

ELECTRIC CONVERSION PLANS, PARTS. Engineered. Maximized Performance. Economical. Uncomplicated. Details Free. 3E, Box 19409-CE, San Diego, CA 92119

2ND OPINION TESTS and PHOTOGRAPHS every item in this column every month. Also in-depth articles and research. January issue—\$1.00. 2nd Opinion, Box 1095, Klamath Falls, OR 97601

CAR WON'T START? ONE CAR JUMPER STARTER! \$8.95 each. Free Details: Quickstart, P.O. Box 321, Evanston, Ill 60204

NO BULL—STOP FUEL CONSUMPTION gain 5 to 6 MPG city—9 to 10 Highway—Instructions for Vacuum Gauge included, plus 15 minutes of your time is all that's needed. Send \$9.50 to—Wendy Jill, 809 Jefferson Street, Baldwin, NY 11510

ULTRAMIST!! - Fantastic Water Injector! - Simple, inexpensive - Plans \$5 - Avtek, Box 5202A, Rockford, Illinois 61125

MIDGET CARS

BUILD "THE BUG" Your own personal sports car, completely different than anything else on the street! Engineered to make construction as simple as possible. Photocopy of article available as it appeared in Popular Mechanics past issues. Available for \$2.25. Send order to: Popular Mechanics, Box 1014, Dept. PMC11, Radio City Sta., New York, N.Y. 10101

AUTO SUPPLIES & EQUIPMENT

DIGITAL LOCK. Four Digit Combination Activates 12 Volt Relay to Control Ignition and Other Devices. \$19.95. Limited Quantity. Electronic Brokers, 1647 E. Geddes Circle No., Littleton, CO 80122. 303-794-3458.

BROKEN Belts, Bad Waterpump, Leaky Hoses Freeze Plugs. SAVE Your Truck Engine From Over Heats With HOT FUSE. Information: Hot Fuse, Box 315, Paxton, Ill 60957 (Ph-217-379-4396)

INCREASE MPG, Performance, Engine Life. \$20. Guaranteed. Free details for SASE to: Box 457P1, Corona, CA 91720

PARTS: Army Jeep and truck parts. Spare Parts & Equipment Co., P.O. Box 751, Lexington, Kentucky 40501-0751

NEW Book — 200 MPG Carburetors. \$10. Moneyback Guarantee. Free Information. IAS, Route 1, Hitchcock, South Dakota 57348

ALTERNATOR/Generator Rebuilding Book. Details: Hedlund Engineering, 7505 Barkentine, Las Vegas, Nevada 89128

WIPER BLADE SHARPENER. Lifetime Guarantee. \$5.00. STATE Products, Department M, P.O. Box 542, Bethpage, New York 11714

SAVE: "Auto Restoration Tips & Techniques." Illustrated. 256 Page How-To manual. \$5.95. Eastwood, 720 Lancaster, Box 524-PM1, Berwyn, Pennsylvania 19312

SPACE AGE TECHNOLOGY! F.E. Resin Engine Coating. ONE TIME Engine Treatment. Last 50,000 Miles — Reduces Wear — Friction — Operating Temperature — Increases Gas Mileage. Satisfaction Guaranteed. Send \$39.95. Energy Resource Products, R#2, Box 385, Alva, Fla. 33920

COMPLETE Automotive Shopping by Mail — Save Half — No Obligation Quotations — Major Manufacturers. (Not available in Idaho). Countrywide Marketing, Dept. B, Box 1418, Caldwell, Idaho 83605

GASOLINE FROM FIREWOOD With Hydrogenation Equipment. Detailed Report \$2.00. **INCREASE MPG.** Easily Prepared Octane Boosters. Unleaded Formulas. Instructions \$2.00. United Research, Box 164, Youngstown, NY 14174

SNOWMOBILES

MAKE YOUR OWN SNOWMOBILE. Propeller driven by a Continental aircraft engine. Drives over snow and ice. Becomes a "self contained" trailer in 15 min. when necessary to transport snowmobile over dry highways. Buy a photocopy of article as it appeared in P.M. for \$1.25. Send orders to: Popular Mechanics, Dept. PMC11, Box 1014, Radio City Sta., New York, N.Y. 10101

MOTORCYCLES, BICYCLES, MOTORSCOOTERS & SUPPLIES

PARTS, Accessories for all motorcycles. Discount Prices. Catalog \$2.00. EUROBIKE, RD2, PM1, Guys Mills, PA 16327

MOPED & MOTORSCOOTERS — Repair Manuals. — Parts & Accessories. Mopeds, 5651 Mayfield Rd., Lyndhurst, Ohio 44124

GO-KARTS, Mini-Bikes, Kits, Engines. Discount Catalog \$1.00. Lorenzo, Danville, Illinois 61832

MOTORBIKE 35 mph Details \$5.00. Refund Available. Box 169, Sharpes, FL 32959

100+ PAGE KARTS & PARTS CATALOG plus track directory - \$3.00. GEM Products, Dept. P.M., 496 St. Charles, Carol Stream, Illinois 60187

GO KART, MINI-BIKE, MOTORBIKE PARTS. Tires, Clutches, Motors and Complete Carts and Mini-Bikes at Discount Prices. 3 1/2 Hp. motors \$95, 5 Hp. \$123. Send for Catalog. Northern Hydraulics, Dept. PM-MB, P.O. Box 1221, Burnsville, Mn. 55337

HANG GLIDING, AVIATION

OWN your own plane and FLY FREE. It can be done. Write for free information. **GREAT AMERICAN FLYERS,** P.O. Box 2026E, Downey, CA 90242

CHOPPY ultralight single seat helicopter. Simplified construction - motorcycle engine. Information \$3.00. Fully detailed plans manual \$40.00. Polynova, Box 670M, St. Remé-Napierville, Quebec, Canada J0L 2L0

DESIGN Build Airplanes, Hang Gliders, Simplified Publications. Brochure 20c. McCoy Aircraft, 12820 S. Figueroa, Los Angeles, CA 90061

FREE information: Dozens powered ultralights. Enclose stamped envelope: Box M, Salda, CA 95368.

SPACE, ROCKETS & ASTRONAUTS

ANTIgravity Propulsion Device. Free Brochure! RDA, Box 873N, Concord, NC 28025

SPACE Shuttle Color Photographs. **LAUNCH** (Scenic or Close) Day/Night: 8x10, \$5.00; 11x14, \$8.00. **SPECIAL** 8x10 Packages. Choice of: any (3), \$12.00; any (4), \$15.00. Postage-Handling, \$1.50. Shuttle Photos, Box 759P, Titusville, Florida 32780

GRAVITY Like Propulsion. Mechanical Action Reaction. Complete Detailed Plans \$20.00. Howard, PM 1, Foster, KY 41043

BOOMERANGS—INCREDIBLE RETURN! You can do it. Exciting! Order your Free catalog today. BoomerangMan, 306 Park, Monroe, Louisiana 71201

HOVERCRAFT

AERO-CAR Amazing Hovercraft built easily with ordinary tools. Lawnmower engine power. Carries one man plus. Hovers, flies forward, backward. Sideways over land/snow/water. Complete construction plans and brochure. \$9.95. Aero-Projects, Box 5118PM, Clinton, New Jersey 08009.

HOVERCRAFT Plan All Sizes. Catalog \$1.00. Universal Hovercraft, Box 281, Cordova, Illinois 61242

BARTLETT FLYING SAUCER Complete Plans And Supply Sources \$5.00. Write: Herb Bartlett, P.O. Box 156-M, Silverdale, WA 98383

NEOVA VW Hovercraft Kit-information \$8. Neoteric, Terre Haute, IN 47804

CB-RADIO, TV & HAM EQUIPMENT

LINEAR PLANS, parts, other goodies. Free catalog, "Skipper", Box 130-B1, Paradise, CA 95969

POLICE Scanners, Crystals, Antennas, CBE, Radar Detectors. HPR, Box 19224, Denver, CO 80219

LINEARS - Send Stamp for Details - MATCO Electronics, Box 318C, Cadillac, MI 49601

SATELLITE TELEVISION Receive Over 100 Channels. FREE Information. Satellite Television, Box 787A, LaVergne, Tenn. 37085

SHORTWAVE RADIO LISTENERS COURSE. Details.... Meier, Maple St.-R, Charlevoix, Michigan 49720

BEARCAT Scanners. Discounted. **CRYSTALS** \$2.75. **RADIOSALES,** 3462 Oakland, Oshkosh, Wis. 54901

ELECTRONICS

MECHANICALLY INCLINED INDIVIDUALS! Assemble Electronic Devices in Your Home. Knowledge or Experience not necessary. Get Started in Spare Time. Turn your Spare or Full Time into Cash. No Investment — Write for Free Details: **ELECTRONIC DEVELOPMENT LAB, BOX 1586PM, PINELLAS PARK, FL 33565**

GOVERNMENT Surplus receivers, transmitters, snoozers, scoopers, parts. Catalog 25c. Meshna, Nahant, Mass. 01908.

PROTECT YOUR PRIVACY! Your phone May Be tapped. Your premises May Be bugged. Manual shows how to detect them. \$5.00. B. Hemenway, 5519 Hawthorne Pl., New Orleans, LA 70124

(Continued on next page)

ELECTRONICS

(Continued from preceding page)

BIO-FEEDBACK and Emotion Monitor. Easy to build. Plans \$1.00. Bert, 806 Darlington, Carnegie, PA 15106

STEREO, CASSETTE TAPES, ETC.

PRESIDENT ASSASSINATED! "Kennedy Presidency" — Valuable, Historical Cassette Tape. Mail \$5.00. Tower, Dunkirk, MD 20754-0213

GOLDEN Age Radio — Complete Taped Shows. Box 25215-M, Portland, Oregon 97225

CAMPERS AND TRAILER KITS-PLANS

TAG-ALONG, A Single Swivel Wheel Trailer Especially Designed For Motorhomes, Suspension Parts Using 13" Car Wheel Available From Auto Wrecking Yard, Proto Type Proved on Alaska Highway. Plans — \$10.00. Frank Konola, 2038 Argyle St., Butte, Montana 59701

BOATS, OUTBOARDS, TRAILERS & KITS

BOATKITS - PLANS - PATTERNS - FRAMEPACS - FIBERGLASS MATERIALS - World's largest catalog - 300 Designs - 8'/'80' - Plywood - Fiberglass - Steel - **POWERBOATS** - Inboards - Outboards - Cruisers - Sportfishers - Hydroplanes - Runabouts - **KAYAKS CANOES** - Large Selection - **SAILBOATS** - Daysailers - Trailersailers - Multihulls - Motor Sailers - **FIBERGLASS** - Cloth - Resins - Foam - C-Flax - **CATALOGS \$2.00** - Includes **FREE** Materials Brochure - Hardware - Fastenings - Equipment - Rigging - Glue - Etc. - (Book "AMATEUR BOATBUILDING" - In - fiberglass - Plywood - Epoxy/Wood Saturation Technique - \$6.00). **CLARKCRAFT** - 16-P Aqua Lane, Tonawanda, NY 14150

SECRETS OF TUNNEL Boat design - Exciting Research Results - **RACE** Tested Design Manual - Plans. **FREE** Information Package - Aeromarine Research, Dept. PM-1, Box 3032, Cambridge, Ontario N3H 4S1

KAYAK-CANOES-PLANS-KITS-PATTERNS - Large selection in fiberglass-plywood-CATALOG \$1.00 (with Boat-builders Guide - \$2.00) - Clarkcraft - 163 Aquilane, Tonawanda, NY 14150

CANOES - Strip Method - Home Construction, 16', 17', Wood Beauty, Fiberglass Maintenance. Plans \$7.00. Brochure 50c. Canoes, Box 1552, Lexington, NC 27292

EVINRUDE 1981 Bargains... all sizes... Scott McCulloch parts... \$1. handling... Electra Marine, 610 Merrick Road, Lynbrook, New York 11563

BOAT KITS - 27 trailerable models - **POWER** and **SAIL** - 8'-30'. Molded fiberglass hulls and decks come factory assembled - you install factory supplied interior. Save half factory-built cost. No experience required. **FREE** 48-page catalog. Luger, Dept. BC-62, 3800 West Highway 13, Burnsville, Minnesota 55337. 612-890-3000

FIBERGLASS - RESINS - Foams - cloth - epoxies - mat - etc. Factory prices - **CATALOGUE \$1.00** - (Book "COMPLETE FIBERGLASSING" \$6.00) - Clarkcraft, 16-P Aquilane, Tonawanda, NY 14150

BOAT PLANS - Frame Kits - Patterns - Hundreds of designs - Wood - Fiberglass - Steel - Powerboats - Sailboats - Outboards - Canoes - Kayaks - Rowboats - Houseboats - Duckboats - Sportfishers. Easy, proven methods include instructions especially for amateurs to assure professional results. No Lifting! 'Supplies' - Fastenings - Fiberglass - Resins - Glues - Spars - Books - Trailer Plans. Huge 144-page catalog - \$2.00. Includes Free "Boatbuilding Supplies" brochure. Glen-L Marine, 9152 Rosecrans, Box 756MP, Bellflower, CA 90706

OUTBOARD MOTOR Do-It-Yourself Service Manuals and Parts Catalog. Send \$9.95. Specify Motor. Aqua Marine Sales (Since 1963), Box 403, Granite City, Illinois 62040

CAMPING EQUIPMENT & TENTS

FREE Catalog. Everything for camping. Campmor, Box 407N, Bogota, New Jersey 07603

ATHLETIC AND BODY BUILDING COURSES

FITNESS Newsletter, Dept. 400, PO 195, Western Springs, IL 60558. Introductory Copy \$1.00.

KUNG-FU Free Literature. McLisa, Box 1755, Dept. PM-82-A, Honolulu, Hawaii 96806

SUPER PERFORMANCE TRAINING WEAK AREAS IN YOUR GAME? Amazing breakthrough in home sports training. **FREE** profile only from: Andross, P.O. Box 849, Champlain, NY 12919-0849

SPORTING GOODS AND EQUIPMENT

BEST Mail Order Retail Prices On Your Sporting Good Needs. Name Brands Write: L.S. Enterprises, 2933 Sullivan, St. Louis, MO 63107

BOWLING - THE EASY WAY. Exciting new book for the once a week bowler who wishes to carry a 175-plus average. Reveals many tips/secrets/illustrations. Increase average 20-40 pins. \$10.00. Tanker, RL 1, Box 100-C, Hampstead, NC 28443

DMSO 99.9% PURE SOLVENT!! Full 4-OZ—Only \$10.00!!—**SOLOTECH RESEARCH**, Box 94-DPM, Moline, Illinois 61265

DOGS AND KENNELS

INSULATED DOG HOUSE PLAN. Floor slides out for easy cleaning. Roof is water proof. Photocopy of plan as it appeared in P.M. available for 50c. Send order to: Popular Mechanics, Dept. PMC11, Box 1014, Radio City Sta., New York, N.Y. 10101

ELECTRICAL SUPPLIES

POWER LOCK - Stop unwanted use of electrical equipment and phones. At Home. Shop. Business. Office; Tools, Appliances, T.V., Stereos, Typewriters, Recorders, Hairdryers, etc. Easy to use and very effective. Send \$7.95 to: Jaded, 111 E. Market St., Danville, PA 17821

BATTERIES, GENERATORS

SENTRY Generators With/Without engine. Big discount. JJ Enterprises, Box 693, Oshkosh, WI 54902

ENGINES, MOTORS, MAGNETS

SMALL ENGINES - For Tractors, Mowers, Mini-Bikes, Discount Prices Catalog \$1.00. Factory Branch, 440 E. Prospect, Jackson, Mich. 49203

ENGINES to 19 h.p. for Mowers, Tilers, Hobby parts. Repair Manuals, Tremendous Savings, Fast, Dependable. Illustrated Price Catalog \$1.00. Ashland Small Engines, Ashland, Mo. 65010

REWIRE Car Alternator for 110 AC. Plans for \$4.00. Sweatt, Box 591, Titusville, Florida 32780

SPEED UP or SLOW DOWN any AC type motor up to 1/2 HP. RPM to 8000 Variable frequency 15 to 300 Hertz. \$132.00 includes shipping. Marx Electronics, Inc., Box 996, Nokomis, FL 33555.

SMALL Diesel Engines 4hp Through 20hp \$475.00 to \$1470.00 The Revolutionary Wankel Gas Engine. Only two moving parts, 4 hp \$149.00 Complete. Send \$1.00 for Catalogue. Adams Discount Engines, 3333 Adams Ave., San Diego, CA 92116

TOOLS FOR SALE

FREE Tool Catalog—Hoosier Distributing, 3009 Sample, South Bend, Indiana 46619

NO CLEAN-UP SPRAY GUN—\$49.95 & \$2.00; ph. PPW, Inc., 244 Hamline Ave. S., St. Paul, MN 55105. 612-899-4394

ROCKWELL and **MAKITA** THICKNESS PLANERS AND **BANDSAWS** at Low Low Prices. Catalogs \$1.00 each. Proshop 312-832-3803.

ROUTER Shaper Cutters 5/8" Bore 10, \$10.00 Prepaid, Catalog. **SUR-TOOL**, 1625 Milwaukee, Chicago, Illinois 60647

MACHINERY, TOOLS & SUPPLIES

4" METAL Cutting Lathe \$60.90. Taig, 15048 Proctor, Industry, CA 91746

2 HP. Vertical Milling/Drilling Machine \$1,095.00. Info. \$1.00. Star, Box 160, Tamarac, Fl. 62888

REPAIR Parts for chainsaws, lawnmowers and small engines combine top quality and low prices. Shop tools. Guaranteed. Free Catalog. For special dealer information also give tax no. and company name. Repair Parts, Dept. 40803, Box 10308, Erie, PA 16515.

BANDSAW BLADES, Carbide Tipped Saws, Any Size, Free literature. King Saw, 6541 Tidewater Drive, Norfolk, Virginia 23509

LATHES - Unimat - Maximat - Sherline - Machinex. Catalog \$1.00, Shop Supplies \$1.00. Campbell, 2100D Selma Road, Springfield, Ohio 45505

1400 Catalogs Listed and Described. Sources for Everything Imaginable. \$4.00. Mastellog, Box 879-B, Fairfax, CA 94303.

STEEL, Aluminum, Brass — Sheet — Bar — Tube, Shop Supplies, Plans. Write: CEI, Box 152A, Knoxville, IL 61448

COMPLETE LINE of high quality, low-priced **CUTTING TOOLS, HOLDING FIXTURES, PRECISION INSTRUMENTS AND TOOLS, TOOL STEEL, PORTABLE ELECTRIC-AND AIR-TOOLS, HAND TOOLS AND MUCH MORE.** Most items delivered free. Send \$3.00 for 320 page 1982 catalog, refundable with first order. **KBC TOOLS**, P.O. Box 343, Sterling Heights, Michigan 48079

LATHE Top Wood Turning Duplicator. Literature, Duplicators, P.O. Box 8315, Tampa, Florida 33674-8315.

BLUEPRINTS & Construction Manuals For 12" Swing, 4" Thread-cutting Metal Lathe, 15.00; Surface Grinder, \$10.00; Vertical Mill, \$10.00. Designmaster, P.O. Box 5651, Kingsport, TN 37663

CARBIDE TIPPED BLADES—BANDSAW BLADES. Direct From Manufacturer. Free Literature. Box 567, Lancaster, PA 17603

SMALL FOUNDRY Furnaces, Supplies. Free literature. Pyramid Products, 3736 South 7th Avenue, Phoenix, Arizona 85041

RUN 3 Phase Motors on Single Phase. No Power Loss. Complete Plans — \$10.00. Triphase, P.O. Box 182, Warrenville, Illinois 60555

BUY Equipment at the same **LOW** Price as large industrial plants. Write for **FREE** Industrial Catalog for Home Craftsmen. Turnkey, 36-PC Latchworth St., Buffalo, NY 14213

BUFFING & POLISHING

REFINISH all Metals: Hard-To-Find, Buffs, Compounds, Buffing Motors. Catalog \$1.00 (Refundable). Eastwood, 720 Lancaster, Box 524-PM1, Berwyn, Pennsylvania 19312

BLACKSMITH & FOUNDRY SUPPLIES

FORGES: gas, coal — hammers — tongs — anvils — anvil benches — all blacksmith supplies. Catalog \$1. (refunded first order). Mankel Blacksmith Shop, 7836 Cannonsburg, Cannonsburg, MI 49317.

ENERGY SAVING

SHIVER NO MORE. ... Portable **INFRARED** heaters. Better than Quartz. **UNBREAKABLE.** Warmth & Comfort for pennies per hour. Free Literature. PM-1, 6584 Ruch Road, Bethlehem, PA 18017

SLASH outrageous Fuel Oil prices. Proven steps - Savings to 66%. Free Details: Winter Hill Publications, 304 Winter St. (PM-1) Brockton, Mass. 02402

A BAR-B-QUE BREAKTHROUGH! Needs No Electricity, Compact, Portable, Re-usable. "Guaranteed" to work in all Charcoal Grills. Money Back Guarantee. Send \$7.00 B&G Breakthrough, 4929 Castle Court, Anchorage, Alaska 99504 Postage Paid.

METHANE, HYDROGEN, FUEL CELLS, WIND SOLAR. Enjoy free heat and power. Send for Energy Encyclopedia. Complete list of Mfg. on most Sources of Energy, plus Catalog of Plans and Books with Electric and Propane Vehicles. Send \$5.00 to: Energy Service, 14a Hughey Ave., Nashua, N.H. 03060.

FREE Energy! Controversial Survival Publications. Three Dozen—Electricity, Gas, Gasoline, Guns, etc. Catalog \$1. Consumetronics, Drawer 537, Alamogordo, NM 88310

BILLS WILL SKYROCKET with deregulation of natural gas! "72 Ways to Save Natural Gas". Send \$2.00 - Energy Savers, Box 54288-PM, Tulsa, OK 74155

LITE SAVER - Lengthens bulb life 100 times. Saves on energy consumption. 8 Year Warranty. \$3.00. Send For Free Details Today. Long, P.O. Box 3456, Redding, CA 96049

NEW SHOWER HEAD. Save 70% on hot water. Free brochures. Cado Inc., Box 426-PM1, Parsons, TN 38363

SUNLITE SOLAR CELLS 4" rated .45 volt 2 amps each \$6.00, ten \$55.00. Sunlite, P.O. Box B3084, Centerville, Mich. 48015

SAVE thousands on energy. Easy methods. \$3.00. Real Info, Box 2893, Springfield, VA 22152

LITE-SAVER - Revolutionary Invention. 8 years Warranty. **FREE** Details. Send Stamp. Mary Lou Associates, PM, Box 1035, Somerville, NJ 08876

AIRTEIGHT Woodstoves or insert plans \$8. Save Hundreds. Proven design. Brochure \$1.00. B.A. Woodsaver, Box 892, Glen Burnie, Md. 21061-0892

SAVE 50% and more of your charcoal cooking/operating costs. Send self-addressed, stamped envelope and \$2.00 to: **CHAR-MISER**, RD4, Box 132A, Carlisle, PA 17013

SAVE Water Heat—Write: P-W Aqua Sales, 11932 Covert Rd, Philadelphia, Pa. 19154

SAVE MONEY SHOWERING! SEVENTY PERCENT ENERGY SAVINGS WITH UNIQUE BRASS SHOWER HEAD. Send \$8.95. Jopa Sales, Four Jeffrey Road, Canton MA 02021

SOLAR & ALTERNATE ENERGY

COMPLETE 1982 SOLAR HEATING PRODUCTS CATALOG EVERYTHING for ACTIVE and PASSIVE solar heating, including Kalwall's Sun-Lite® Glazing and Thermal Storage Systems, plus difficult-to-find energy savers. Order all materials from one expert source. 68 pages, 15 sections. \$3.00. ppd. Visit our Retail store. **SOLAR COMPONENTS CORPORATION**, Dept. M, P.O. Box 237, Manchester, NH 03105

WIND Odometer Kit Box 399, RR 1, Portage, PA 15946. Details? SASE.

(Continued on next page)

SOLAR & ALTERNATE ENERGY

(Continued from preceding page)

SAVE ON Heating Bills with this Portable Interior Solar Heater. You can build for pennies. Plans Tell How. \$5.00. Solar, 2333 Calvert Street, Virginia Beach, Virginia 23451

WOOD-BURNING RADIAL STEAM TURBINE Generates 3Kw of Electricity! Simple Construction! Compact! Complete Plans: \$8.95. Glenvale, Box 358a, Station D, Toronto, Ontario, M6P 3J9

ENERGY INTEGRATION — Book on Alcohol, Methane, Electricity & Solar Systems for Homesite Energy Production. \$2. AEnSy, P.O. Box 707, Leander, Texas 78641

SMOKELESS WASTE OIL STOVE KIT — Information \$1.00. P.O. Box 4356, Rochester, NY 14611-0356

WINDMILL ROTOR SYSTEM 9 Ft. Diameter Complete Drawings And Instructions. Send \$15.95 To: MWRS, P.O. Box 2843, Kokomo, Ind. 46902

VACU-STACK CHIMNEY CAPS ELIMINATES WIND INDUCED DOWNDRAFT, KEEPS OUT DEBRIS, ANIMALS, SNOW. ICP, Box 1264-PM1, Attleboro Falls, MA 02763

STEAM ENGINES, Boilers, generate electric with your Woodstove, Complete Components, Parts, Plans. Catalog \$5.00 U.S. To: Steam Power Products, Rt. 2, Box 295B, Waynesville, NC 28786

FABULOUS Solar Guide Saves \$1,000 Hot Water ... Surprise Free Bonus ... \$5.00 ... Lenny Kachadorian, P.O. Box 634, Rockville Center, N.Y. 11571

HYDROGEN FUEL! Complete Electrolyzer and Auto Conversion Plans. Plus information on Safe Storage and Generating Hydrogen Free. Complete Package: \$10.00. RDA, Box 873, Concord, NC 28025

500 Ways To Save Energy - Send \$2.00 to: Energy, 91154 River Rd., Junction City, OR 97448

UNITED STATES Patterned Solar Collector Plans, You Build, Send \$6.00 To: J. Drow, 6250 El Cajon Blvd., Suite 103-805, San Diego, CA 92115

BUILD Inexpensive Solar Distillery!!! Home/Automobile Fuel—Pennies Gallon! Grant Enterprises, Box 67(P3), Mansfield, Arkansas 72944

SOLAR WATER HEATER—Installing a system that heats water with the energy from the sun is no more difficult than installing a conventional-type water heater that uses gas or electricity. You can do it! Photocopy of Popular Mechanics article available for 85¢. Send order to: Popular Mechanics, Dept. PMC11, Box 1014, Radio City Sta., New York, N.Y. 10101

HOME HEATING, FUEL SAVERS

SAVE ON Heating, stay warm. Build an Energy Conservation Timer. Plans and Instructions \$3.50. ECONTIM, P.O. Box 5093, Hacienda Heights, Calif. 91745

CENTRAL heat thru your existing ducts with this all steel fireplace. Twelve pages dimensioned plans and instructions \$14.95 R. & D. Enterprises, Box 483, Woodbine, GA 31569

SEASONS GREETING with GIFTS, ACCESSORIES and NECESSITIES for the wood/coal burner - FREE catalog. Energy Etc., Dept. PM1, Box 689, Glen Cove, NY 11542

LEGALLY reduce your mortgage in half. Cut your heating bills by thirty percent. Send \$2.00 to: Department PM-J, 4806 Wasilla Way, Powder Springs, Georgia 30073

WARMSWINGER: the stack damper that is not in the stack, for oil burners. Costs \$35 by mail, install yourself in 15 minutes. Details \$1 refundable. Warmswinger Inc., 10 Oak Circle, Colchester, Vermont 05446—1564 Herron Rd., Dorval, Que., Canada H9S 1B7

HEAT AND COOL Home Or Business With GEOTHERMAL Energy Using Heat Pump Technology. Also Excellent For Apartment And Condominium Complexes. Comprehensive, Detailed Report On Efficiency Including Plans, Parts List, Suppliers List. \$7.50. Geothermal-ZA, Box 622, Paxin, IL 61554

REDUCE UTILITIES 20% plus Home/Office Energy Management System Heating and Central Air Conditioning. Satisfaction Guaranteed. Send \$2.00 Energy Investments, P.O. Box 80085, St. Paul, MN 55108

WOOD STOVE, Efficient Downdraft, Bolt-Weld, Detailed Plans. \$2.00. 136 Streamview, Troy, Mich. 48068

WASTE oil burner, plans \$5.00. "Burner", 91 Cameron, Essex, Ont., N8M 2L4

BARREL Stove Kiln Factory, Catalog. Winwood, 4203 Birmingham, Kansas City, MO 64117-2897

HOME CRAFTSMAN

WOODWORKERS, Hobbyists, 1982 Catalog Containing Chair Cane, Swiss Musical Works, Wooden Wheels, Lamp Parts, Tools, Finishing Materials, Hardware, Plans, etc. Send \$1.00 (Refundable with Order). Berap Specialties, PM182, 835 Bellows, Frankfort, MI 48635

OVER 75 PATTERNS! Enjoy Profitable Wooden Gifts, Toys, Household Accessories. PLUS "Shop Secrets". Only \$5.00. Accents (P-12), Box 232, Danvers, MA 01923

RIPSTRATE SAVES FINGERS. Mounts on Saw Fence. Guides Work Straight, No Hands Near Blade, No Kickbacks, Straighter Cuts. Free Brochure. Ripstrate, 3 Fisher Hill, Fitzwilliam, N.H. 03447

MAKE TOYS- Plans- Hardwood Wheels, Parts- Catalog \$1.00. Cherry Tree Toys, Mills Road, St. Clairsville, Ohio 43950

CATALOG OF WORKBERCH COMPONENTS 3 sets of plans \$1 refundable. Itaska Trading Co., P.O. Box 26367, Minneapolis, MN 55426

FINE CABINET PLYWOOD Cut sizes - Full sheets. Many species and thicknesses. Free Catalog! Plywood Depot, Box 897, Gaylord, MI 55334

UNFINISHED picture frame moulding. Factory closeout. 50% discount. 200 styles. Write: Japs, 126-PF Seventh North, Hopkins, MN 55343

FREE GUIDE to Beautiful Wipe-On Wood finishing. General Finishes, Box 14363P, Milwaukee, WI 53214

UPHOLSTERY and Caring Supplies, Catalog \$1.25 (Refundable). Jack's Upholstery and Caring Supplies, Dept. PM 7, Oswego, Ill. 60543

WOODEN Toys are Better, List of Plans \$1.00. Woodbutcher's Toys, Box 514, Leslie, Michigan 48251

YOU Can Build All the Furniture, Toys, Accessories and Shop Equipment you may ever need. Select 5 Free Plans from our illustrated Catalog of over 700 items. Send \$1.00 for Complete Details. MAYCO SALES, Box 2931PM, Mesa, Ariz. 85204

TURNING STOCK, Cherry Ash, Maple, lengths to 30 Mil. Direct Brochure 25¢. Cryder Wood Shoppe, Box 19-P4, Whitesville, N.Y. 14897

BATTERY CLOCK MOVEMENTS. Hands, Hardware. Finest quality. Discount prices. Catalog \$1.00, Refundable. Yankee, Box 26, Thompson, Connecticut 06277

WOODWORKERS — You can build "Marble Raceway" easily ... Kids love it !!! Order Plans Today. \$3.00. Jancy's, Box 1653, Palm City, FL 33430

CATALOG FULL-SIZE FURNITURE PLANS — \$2.00. Refunded with first order. Traditional, Early American, over 170! Furniture Designs, 1425 Sherman, Dept. CP-82, Evanston, Illinois 60201

PICNIC Table Plans and Material List. \$4.00. Jay Miele, 327 Hitchman Street, Mount Pleasant, PA 15866

WOODEN TOY PATTERNS - All new - illustrated Catalog - \$1.00. Manly Kelly Enterprises, P.O. Box 79062, Saginaw, Texas 76179-0062

WALNUT Lumber cabinet grade, Squares, Gunstock blanks, Veneer Iowa.—Missouri Walnut Co., Dept. M, Station A, Box 66, St. Joseph, MO 64503

FURNITURE PLANS, MULTI-SIZE Full-scale. Illustrated Listing \$1.00. Refundable. Flexplan-Q, 48 Lowell, Westwood, NJ 07675

FURNITURE FINISHING SECRETS, Step-By-Step, From A Successful Yankee Craftsman. Send \$2.00. Box 4931, Manchester, NH 03108

BUNK BEDS! How To Build a Sturdy Wood set for under \$25.00. Send \$4.00. 9407 Ingalls, Westminster, Colo. 80030

PICNIC TABLE PLANS. Unique design! 56" round top with attached seats for eight. Everyone is seated without stepping over benches! Complete plans and material list only \$3. Larchwood Plans, Box 835, Storm Lake, IA 50588

CARBIDE TIPPED BLADES—BANDSAW BLADES. Direct From Manufacturer. Free Literature. Box 567, Lancaster, PA 17603

QUARTZ BATTERY MOVEMENTS, low prices, from \$3.50 to \$6.95. Send \$1.00 for catalog. CALIFORNIA TIME SERVICE, P.O. Box 2930, Dept. #110SA, Long Beach, CA 90806. (213)595-5415.

COUNTRY PINE and TOY PATTERNS. 140 popular designs Catalog, \$1.00, (Refundable) ... Country Craftsman, Box 67-A, Dauphin, Pennsylvania 17018

DRAWERS. Save time on drawer construction with our snap-together system. Many sizes. Free Information. Storageworks P182, Box 7174, Madison, Wisconsin 53707

FANTASTIC Revolutionary System that solves Clamping and Strapping Problems. Starter Kit \$11.25 Del'd Guaranteed. Stamp brings info. Mity-Tite Systems, 3712 Lakeridge Dr. West, Sumner, WA 98390

UNIQUE Colonial Quilt Rack, Big Seller. Full Size Plans \$3.50. Pinehurst, Box 325, Tilsonburg, Ontario N4G 4H8

PM'S GREAT, NEW MASTER HOME CARE GUIDE. The latest and greatest in the Popular Mechanics Master Guide Series. Lays out all you need to know about home repairs. from basement waterproofing to roof repair. 24 laminated, wipe-clean sheets on 12 stand-up, hang-up boards. 150 charts and illustrations. Properly used, it can save thousands of dollars. \$4.95 + 50¢ to cover postage and handling. PM Master Home Care Guide, Dept. PMC11, Box 1014, Radio City Sta., New York, N.Y. 10101.

HOME BUILDING & REMODELING

SAVE \$25,000 Building Your House. Detailed Report: Send \$1 Refundable to: Consumer Associates, Box 13257-F, Pittsburgh, PA 15243

"BUILDING WITH NATURAL STONE" Booklet—Techniques & Projects—\$2. Stonehouse, 81012, Sweet, Idaho 83670

PLASTICS

CASTOLITE Liquid Plastics. Crystal clear, colors. For casting, embedding, coating, fiberglassing; in industry, laboratories, craft work. Reproduce your designs with our mold materials. Profitable. Illustrated Catalog \$1.00. CASTOLITE, Dept. 82A/PM, Box 391, Woodstock, IL 60098

PLASTIC LAMINATES. How to work with! You can turn out elegant finished products just by using hand or power tools. Resurface kitchen countertops. Correct countertop bubbles. Shows you laminating tricks you should know about. Photocopy of PM articles. Price \$1.80. Send order to: Popular Mechanics, Dept. PMC11, Box 1014, Radio City Sta., New York, N.Y. 10101

DO IT YOURSELF

HELPFUL Guide-Basic Facts On Relocating. Brochure \$2.00. Lewis, 2 Windrift, Grand Haven, MI 49417

UPHOLSTERING SUPPLIES, Fabrics, Vinyls, Tools, Care, Instruction Books. Free Catalog. Jim Dandy Sales, Box 30377P, Cincinnati, Ohio 45230

ELECTROPLATING. Complete amateur's textbook. All metals Electroplate metallo/nonmetallic items \$9.95. Details free. Tropic, Box 95-P3, Palm Bay, Florida 32905.

1400 Catalogs Listed and Described. Sources for Everything Imaginable \$4.00. Masterlog, Box 879-F, Fairfax, CA 94930.

"PROFESSIONAL" GIANT SCREEN PROJECTION TV ... Don't be fooled by cheap imitations! ... "Build the best!" ... Simple Construction! ... Information and parts catalog \$1.00 ... POLI-VISION, 168M Dunmore St., Throop, Pa. 18512

REPAIR TV'S. Anyone can ... Easy ... Write. Research, Box 517PM, Brea, CA 92621

MAKE Your Own Traps, Cages. 2500 cage traps, clincher \$17.95 prepaid. 999 picture pet hobby supply catalog \$1.00. Stomberg Pets Unlimited, Pine River 59, Minnesota 56474

BEER DRINKERS-Convert your spare refrigerator into a keg beer dispenser and save 30% to 50% of the cost of bottle or can beer. Send \$1.00. AKB, PO Box 1138, Bonita, Calif. 92002. Dept-PM 2.

HOW To Clean Carbon From Engines Without Removing Heads. Send \$2.00. Kerr Enterprises, Box 1897, Spring Valley, CA. 92077

BECOME An Expert — How To Hand Sharpen Drills On Your Bench Grinder by Journeyman Tool Grinder \$9.50. Larry McClorey, 5946 Kelly, Cass City, Mich. 48726

12 VOLT ELECTRIC WINCH FROM SCRAP PARTS FOR UNDER \$25. DETAILED INSTRUCTIONS—\$5.00. WINCH, BOX 8514, MADISON, WI 53708

UNIQUE Space Saving Foldaway Picnic Table—Plans \$3.00. Phil. 44 Parmelee, Hawthorne, NJ 07506

PROJECTION TV ... Convert your TV to project 7 Foot picture ... Results equals to \$2,500 projector ... Total cost less than \$100 ... **PLANS & LENS \$16.00** ... Illustrated Information FREE ... **MACROCOMBEE**, Washington Crossing, Pennsylvania 18977. Creditcard Orders 24 HRS. 1-215-736-3979.

FLUE CLEANING Complete Details From Professional Chimney Sweep \$4.50. Sutton Construction, Box 622A, Davis, W.VA. 26260

SILVER, Dead Batteries contain it. How to reclaim it. \$4.00. —Goldbond Ltd., Box 10669A, Pittsburgh, PA 15235

HOW To Repair Your Gas Furnace. Free Details. Storm, 319 Capitol Hill, Reno, NV 89502

BUILD YOUR OWN WATERBED! Save Hundreds. EASY Instructions with Illustrations. \$5.95. McClimate, 3301 S. Bear, 52D. Santa Ana, Calif. 92704

SANDBLASTER built from hardware parts. Plan \$5.00. Seville Engineering, 1446 Sylvan Glen, Okemos, MI 48864

INCOME Tax Preparation. Write immediately for free information. Charles Lynn, Certified Public Accountant, P.O. Box 15407, Del Valle Station, Los Angeles, California 90015

PVC Pipe Projects \$2.00. Geisenhaver, 3342 E. Pierson Rd., Flint, MI 48506

ALCOHOL CAR STILL. YOU Make it Easily, DIRT Cheap. Complete Plans and Car Conversion. \$2.70. A.F. Incorporated, 640 23rd. Ave. N.W., New Brighton, Minnesota 55112

AT LAST! THE BREAKTHROUGH! Amazingly simple leather method shows you how to repair your own shoes at a fraction of the usual cost. So easy, anyone can do it. Results guaranteed or return in 10 days for refund. Rush \$4.95, Check or Moneyorder. Suncrest Sales, Box 8331PM, Van Nuys, CA 91409.

(Continued on next page)

DO IT YOURSELF

(Continued from preceding page)

SECRETS STAINING Woodwork Furniture, etc. \$2.00. R Lindblom, 3007 Rice Ave., Rockford, IL 61103

VICES—Metal Prints With Procedures—Toolmakers, Soldering, Drill Press \$3.00 Each. G&B Designs, 9241 South Sherwood Drive, Franklin, Wisconsin 53132

HOT TUB SPA Prints, Instruction \$5.99. Luville Ent., 542 Hammond Street, Bangor, Maine 04401

GEODESIC DOMES—Easy To Build. Free Information—Thalon, 2939 Winfred, Riverside, CA. 92503

PVC PIPE FURNITURE KITS Maintenance free contemporary outdoor furniture that won't rust, fade or chip. Build yourself over the winter. Free catalog. Pipe Design, P.O. Box 8511, Reading, PA 19603

MONEY Saving, Five Easy Steps On Home Sewing Machine Repairs—\$3.95. Conx, 110 Andrew Street, Green Brook, New Jersey 08812

MUSICAL WIND CHIME, Six Notes, Plays Tunes, Use scrap, Six Page Illustrated Instructions—\$2.00. D. Preston Carlson Co., Dept. PMC1, 10034 Plum Road, Erie, PA 16510

REPAIR own denture professionally, **SAVE** without special tools. Complete instructions, materials several repairs \$14.95. Surefit, 1623 Ventura Dr., Nampa, Idaho 83651

POOR MAN'S DUMP TRUCK. Cheap. Supplies local. Simple Instructions. Photo illustrated. Guaranteed. P.P. \$2.00. L. Shearer, Margate, NJ 08402

BIG SCREEN TV. Brilliant 7' Picture. Lens Kit \$16.00. 2 for \$25.00. **GREAT GIFT**. Theatre TV, Augusta Road, Box 801, Waterville, Maine 04901

FREE GIFTS BY MAIL! Books . . . Records . . . Samples! Giant Listing \$1. Meier, Maple St.-F, Charlevoix, Michigan 49720

ARTS & CRAFTS

PLASTERCRAFT, CANDLECRAFT, RUBBER MOLDING for Fun - Profit! Make Figurines from Complete Kits! Catalog \$1.00 (Refundable). Woolley Company, Box 68PM, Peoria, Illinois 61601. Established 1917.

"GETTING Started in Stained Glass" 50c. Whittemore, Box 206ST, Hanover, Mass. 02339.

STAINED GLASS Catalogue-P. \$1.00. Supplies, Kits, Books, Tools, Glass. Saylescrafts, 171 Main, Nyack, N.Y. 10960

TATTOOING SUPPLIES — Color catalog \$3.00. Spaulding & Rogers Mfg., DEPPM, Voorheesville, N.Y. 12186

DRIFTWOOD — Unusual For Lamps, Bookends, Ornamental, Unfinished, Instructions To Finish 3 Pieces, 12" \$5.00. Other Sizes Available. Q.E. Inc., Box 18121, Dept. DWA, Louisville, Kentucky 40218

STAINED Glass Supplies. Complete Line. Reasonably priced. Catalog, \$1.50. (Refundable). Sunshine Glassworks, Dept. CT, 785 Millersport, Eggertsville, NY 14226

LEATHERCRAFT Catalog. Tools, Leather, Dyes, Dressings, Saddle Stamps, Buckles much more. Send \$1.00 (refundable with order) to: MacPherson Bros., P.O. Box 99442, San Francisco, CA 94109

CARTOONING, COMMERCIAL ARTS, & SIGN PAINTING

MODERN Cartooning taught by mail. Write for free brochure. Cartoonorama—Box 263-3A, Branford, Conn. 06405.

SIGN Painting — Easy method. Free catalogue, Kaufmann Company, Centertown, Missouri 65023

CARTOON for Fun and Money!!! Free booklet!!! Cartoons, Box 40614A, Detroit, Michigan 48240

MODELS-CARS, SHIPS, TRAINS, PLANES, ETC . . .

MODEL AIRPLANES — Huge Catalog \$2.00. Sig Manufacturing Co., Inc., Montezuma, IA 50171

FIRING CIVIL WAR Model CANNON Plans: Catalog free. Green—PM-182, Box 892, Shalimar, Fla. 32579

RADIO CONTROL - Airplanes, Boats, Helicopters. Systems, Supplies. Big Discount Catalog-\$4.00 (Refundable). Modelers Supply, Box 7185, Montgomery, AL 36107

LIVE Steam engine Kits. Marine, Stationery, Walking Beam, Boilers, Fittings. H.P.K.'S Fascinating Models. Catalog \$3.00. Centuck 34, Yonkers, "F", New York 10710

STUART Steam Engines, Castings, Catalog \$1.75. Carolus Models, 3082 South 200 East, Bountiful, Utah 84010

BEAM SCALE PLANS, .001 to 16.000 oz. Instructions, Photos, Adhesive Templates. \$3.50. Micro-Air, P.O. Box 1129P, Richland, WA 99352

MAGIC TRICKS, JOKES, VENTRILOQUISM

PROFESSIONAL Magic! Huge catalog, over 1,000 tricks and books. \$2.50. Hank Lee's Magic Factory, Dept. PM1, 24 Lincoln Street, Boston, Massachusetts 02111

FREE! Illustrated Ventriloquism/Puppetry Catalog. Maher, Box 420PM, Littleton, Colorado 80160

FREE! World's Leading Novelty Catalog. 1800 Jokes, Tricks, Science, Sports, Hobbies. Johnson-Smith, C-10, Mt. Clemens, Mich. 48043

PROFESSIONAL MAGIC 1981 Catalog, \$2.00. Same day Service, No Substitutes. Fabulous Magic, 3319 E. Charleston, Las Vegas, Nevada 89104

HOBBIES AND COLLECTIONS

COLLECT Military Medals. List 50c. Vernon, Box 387 PM, Baldwin, New York 11510.

"**OLD** Time Soldier Molds," Chess Set Figures. Write for Free Information and Special Offer. Castings-PM, P.O. Box 3482, Longwood, Florida 32750

DECALS, EMBLEMS, PATCHES

CUSTOM Designed Embroidered Emblems. Low Minimum. Catalog & Sample Emblem \$1.00. Southern Emblem, Box 8PX, Toast, North Carolina 27045

SAVE Big. Buy Patches, Decals, Pins & Caps Factory Direct. Free Catalog. Free Pricing. Eastern Emblem Co., Box 828-PM, Union City, N.J. 07087

ANTIQUES, RELICS, INDIAN GOODS AND CURIOS

FREE List to Serious Collectors. 30,000 Indian Artifacts. Pots, Spears, Axes, Slate, Beadwork. Caddo Trading, Box 669, Murfreesboro, AR 71958

STAMPS FOR SALE

\$000 stamps \$6.00. 10 pounds on paper \$38.00. Contains regulars, commemoratives, high values, older stamps, etc. Large size only commemoratives on paper \$12.00 per pound; 3 pounds \$30.00. Choose USA or foreign. Delivered. Meyers, 5321 Fleming, Richmond, CA 94804

STAMP COLLECTING

50 YEARS Old fifteen different United States, over fifty years old—25c with approvals. Jaxon, Box C11-P, New Rochelle, New York 10804

SEND Only 25c for nice collection of U.S. stamps including \$5.00 issue and scarce mint pipe Souvenir Sheet. Attractive price lists of other beautiful stamps and collectors supplies included. Mystic Stamps, SS-1, Camden, New York 13316

WOW! 50 All Different Germany-10c! Super collection of genuine German Commemoratives, Definitives, Airmails, High Values. Free Big Catalog. Also fine stamps from our approval service. Buy what you like. Return balance promptly. Send 10c today! Thank you Jamestown Stamp Co., Dept. A12PM, Jamestown, NY 14701

5 SOUVENIR Sheets, Only \$1.00. Approvals. Catalog. Holbrook, Box 9106, Richmond, Virginia 23227

OLD USED U.S. Unusual approvals. Hard to find stamps. Enjoy our inspiring presentations, quality, prices. Adults Only. Kentway, Box 88091-Z, Kentwood, Mich. 49508-0991

FREE! The 1948 U.S. Jubilee Airmail Stamp, Mint, with your request for our U.S., U.N., and Foreign Approvals. Fast Service - Low Prices. Colonia, Box 12113, Albany, NY 12212

FREE! Big Bargain Catalog - New Edition listing thousands of bargains including U.S. & B.N.A. stamps, packets, albums, accessories and supplies. Also fine stamps from our approval service. Buy only what you like. Return balance promptly. Thank you Jamestown Stamp Co., Dept. E12PM, Jamestown, NY 14701

CANADA Ten late Commemoratives 10c. Canadian approvals. Harley Boardman, Little Valley, New York 14755

50 TOPICALS 25c when requesting low priced approvals. Stewart Kent, Box 2398K, Bellingham, WA 98227

OLD U.S. BARGAIN stamps issued before 1930! Uncommon used issues, "Unfine" condition. Worthwhile money-saving approvals. Adults only. (No Mint. No Packet Material). Rivertown, Dept. 188P, Ada, Michigan 49301

ABSOLUTELY FREE- 50 different British Colonies **COMMEMORATIVES**. Approvals. Gobestamps, Box 690, Saco, ME 04072

FREE! Discount United States Price List. Shelton, Box 610547C, North Miami, Florida 33161

BREATHTAKING Beautiful. 50 Different mint Monaco pictorials commemoratives only \$1.50 with mint complete set approvals. Pagoda, Box 132P, Sidney, Ohio 45365.

FREE Worldwide packet. Penny approvals. Froelich, Box 412-A, Morton Grove, Ill. 60053.

PENNY! Approvals! Regardless catalogue! Kloster, 4164 52nd St., San Diego, Calif. 92105.

75c BRINGS You 100 pictorial plus worldwide approvals. Capt. Shaw's Stamps, Box 277, Ocean Park, Maine 04063.

UNITED NATIONS 3 Complete Mint Sets 25c. Approvals. Cornetta, POB 1509-M, Lake Placid, Florida, 33852

50 DIFFERENT Old U.S. between 1861 and 1939 - \$1.00. Ed Roush, 423 Shepard, Mansfield, Ohio 44807.

OLD U.S. Stamps on Approval. Chester, Box 15355G, Philadelphia, Pa. 19111.

WORLD Wide Stamps mounted in books on approval 2c and up. **TRUST STAMP COMPANY**, P.O. Box 100-P, Jamaica, N.Y. 11435

FREE Surprise collection sent with approvals. Gould, 1784 Union, San Francisco, 94123.

FREE 220 United States and Worldwide Stamps. Approvals. Stamps PM, Box 1427, Bellflower, CA 90706

100 Different U.S. 25c. Approvals. Bradley, Box 425P, Midlothian, VA 23113

BARGAIN 100 World-wide Stamps 25c. Quality Approvals. R. Parker, Box 143, West Brookfield, MA 01585

2,000,000 Stamps—150 Countries—2c Each. Belden, Box 4149, Dearborn, 48126

30 BEAUTIFUL TOPICALS 25c when requesting low priced approvals. **DATASTAMPS**, Box 5552, Jacksonville, FL 32207

WORLDWIDE COLLECTION — 100 Different Stamps — only 10c with Fantastic Worldwide Approvals. Nazto, Box 423-PE, Audubon, Pennsylvania 19407

PLATE Blocks — One Each 3c, 4c, 5c. \$1.00. Bryson, 612A, Toledo, Ohio 43605

FREE U.S. Mint Set. Approvals. Hildebrand, Box 4867, Santa Clara, California 95054

STUNNING! 100 BEAUTIFUL PICTORIALS. All Different Only 25 Cents with Attractive Worldwide Approvals. **VANSTAM**, Dept. PM182, P.O. Box 11272, Chicago, Illinois 60611

FREE 100 Canada with request of World Wide Approvals. Briner's, P.O. Box 5156, San Mateo, Calif. 94402

PRINCE CHARLES ROYAL WEDDING first day cover - a beauty with both stamps only \$3. postpaid. Earlier Coronations available - free lists. **K. M. WALSH, BOX 308, TUCKAHOE, N.Y. 10707**

300 Different Worldwide Stamps 30c With Approvals. R.G. Sales, Box 1085, Jamaica, N.Y. 11431

U.S. Year Sets At Affordable Prices. Send For List. Cottage Stamps, Box 16, Pesham, N.Y. 10803

ISRAEL 15 Different 10c Approvals. Sam Chazen, Box 666, Delray Beach, Florida 33444

WHOLESALE Discounts—Worldwide approvals. Gains, 716-A South Sixteenth, Mattoon, IL 61938

U.S. STAMPS. Wholesale plate blocks and mint singles. **SPECIAL:** Five .5c plate blocks for \$1.00. **FREE** Price Lists. **BIG DISCOUNTS. AMPBCO**, Box 26068P, St. Louis, MO 63138

FREE Attractive Foreign Pictorials with approvals. Tom & Jerry, Box 5052, Mission Hills, CA 91345

UNUSED United Nations Set And Price List .10c. Baron, Box 569, St. Clair Shores, Mich. 48080

U.S. 25 different mint including Souvenir Sheet \$1.00. Free list. Brooks, Box 62, Brooklyn, NY 11229

CANADIAN First Day Covers, Sample 50c. Stamps, 582 Dilworth, MN 56529

LOOK! 342 World Stamps \$1.00, Worldwide Approvals. Klondike, Harrisburg, IL 62946

50 SPORTS PICTORIALS 35c. Approvals. Arbour, 3727M Downeydale, Randallstown, MD 21133

45 DIFFERENT U.S. AIRMAILS \$2.00; Mint \$15.00. Eberling, Box 2216, Neptune City, NJ 07753

WORLDWIDE, 100 Different Beauties, 25c. Approvals. J.D. Michael, P.O. Box 2273, Martinez, California 94553.

GREAT Gift free with 1st purchase—fine United States approvals and want list service. Send 15c for handling. The Stamp Boutique, Box 86M, Wheeling, Ill. 60090

RUSSIA— 50 Different including Mary "Oldies", Just 10c. Approvals. Tarteel Philatelia, Siler City, North Carolina 27344

FANTASTIC! 225 Different Colorful Worldwide—25c. Attractive Approvals. RCP, Dept. PM182, Box 2455, Evansville, Indiana 47714

INCREDIBLE Offer! 207 Different Triangles, Diamond Shapes, Space, Animals, Olympics. Much More. \$8.00 Value. Only 25c. Approvals. Fayette Stamps, Fayetteville, New York 13066

FREE Gift With Quality Approvals. Chapmans, Box 487-G, Galesburg, Michigan 49053

"INVERTED ERROR" + 100 Different United States. 50c with approvals. Luray, PO Box 7088, Silver Spring, Md. 20907

"WHOLESALE" U.S.—Foreign Pricelist and catalog Free! Everything Guaranteed. Schneider, Box 1240, Grand Rapids, Michigan 49501

40 PAGE U.S. List Free. Stone, Box 604, Boston, Mass. 02103

(Continued on next page)

STAMP COLLECTING

(Continued from preceding page)

"TRIANGLES" Pre-Historic Animals, Mongolia's latest Commemoratives — Free! Approvals plus 101 Bonus Sets. William Deems, 226B Race, Ravenswood, West Virginia 26164

U.S. & COMMEMORATIVE Plate Blocks \$1.00! Approvals. Gordon Davison, Contoocook, NH 03229

COINS, TOKENS, CURRENCY

FOURTEEN Different Mint Error Coins \$5.00. Coin Lists Free. Sayars, 1000 Unaka, Johnson City, Tennessee 37601

FREE 1920 Penny and price list. Coins, 1829 E. Charleston Blvd., Las Vegas, Nevada 89104

NEW U.S. Coin Value Guide. Order Now Only \$3.95. Send To: Charles Chope, P.O. Box 21368, Columbus, Ohio 43221

THREE Uncirculated Lincolns, 1968S, 1969S, 1970S and Catalogue 25c. Mac's Dickson, Box 197, San Ramon, California 94583

RUSSIAN Ruble. Collect original note. Specially obtained. \$5. TransTrade, Box 123, Edam, The Netherlands (Eur.)

BINOCULARS, TELESCOPES, MICROSCOPES, MAGNIFIERS

BINOCULARS Repaired. Expert Professional Service. Tele-Optics, 5514 Lawrence, Chicago, ILL. 60630

PHOTOS & PHOTO SUPPLIES

100 ROLLS COLOR FILM KODAK \$10.00. Film, P.O. Box 18082, San Francisco, Calif. 94118

BOOKS & PUBLICATIONS

OUT-Of-Print Books Found. Send Wants. Booklook, 51 Maple Ave., Warwick, N.Y. 10990

PUBLISHER'S OVERSTOCKS, BARGAIN BOOKS, 2,000 Titles, all Subjects! Free Catalog: Hamilton's, 98-51 Clapboard, Danbury, CT 06810

FREE Book, Prophet Elijah Coming Before Christ. Magiddo Mission, Dept. 63, 481 Thurston Road, Rochester, N.Y. 14619

BARGAIN BOOKS! 400 Titles, Many Subjects. Free Catalog. Michael Stemen, P.O. Box 975, Lima, Ohio 45802

NEW! "Santa's Odyssey" — Child's delight. — \$9.95. Blue Chip Enterprises, Box 453-PM, Biggar, Sask. S0K 0M0.

PUBLISH Your Book! Join our successful authors. Publicity, advertising, beautiful books. All subjects invited. Send for fact-filled booklet and free manuscript report. Carlton Press, Dept. PMA, 84 Fifth Avenue, New York 10011.

FREE Book, "Christendom Astray" Write: The Cristadelphians, 36516 Parkdale, Livonia, Mich. 48150

SELF IMPROVEMENT BOOKS. You Can Do Better! Send For FREE Literature - D. E. Benson Publications, Dept. 30, 1563 Hall St., New Brighton, MN 55112

FALSE PROPHETS - \$2.00 Booklet Reveals Their Exact Identity. Sunnycrest Publications, Rt. 6, Greenville, IN 37743

MOTIVATION, Your Key To Success. For Free Article Write: MSM-PA, Box 3086, Detroit, 48231

SELF IMPROVEMENT. Hundreds of Books, Free Circulars, Price List. Mathis Allgood, Dept. PM, 1521 Parker Street, Berkeley, CA 94703

PRACTICAL stimulating books to help you achieve Success, Wealth and Happiness. Free Descriptive List. A. Hoffman Marketing, 1814 12th, Oregon City, Oregon 97045

TECHNICAL Magazines, Runs, Volumes or Issues. Send Wantlists. Mapleton House, 112 Crown, Brooklyn, NY 11225. (212) 493 0505

HOW To Choose A NURSING HOME. Write: Lifeshouse Publications, 806 11th Ave. So., Onalaska, WI 54650

FREE CATALOG. HUNDREDS OF INTERESTING HOW-TO BOOKS. HOW-TO BOOK CLUB, BOX 3332, WAYNE, NEW JERSEY 07470

PLAYS, SONGS, MANUSCRIPTS

WANT Your book published? Learn how we publish, advertise, promote, distribute. All subjects. Free booklet PM. Vantage, 515 W. 34th Street, New York City, 10001.

MUSIC INSTRUCTIONS & INSTRUMENTS

MUSICAL Instruments Hot Line! Incredible Prices: Amps, PA Gear, All Instruments. Huge Selection. Sam Ash, Established 1924. 800-645-3518. NYS (212) 347-7757

BAGPIPES - \$60 Up. Brochures \$2. Midwest, 2817 Cameron, Melbourne, FL 32901

GUITAR, Banjo, Mandolin Cassette Courses. Fallproof Number System! Catalog: MBM, 8837-CP-1, Drake, Chattanooga, Tenn. 37418.

PIANOS, PLAYERS, PUMP ORGANS. Rebuild and repair. Catalog of "How-To" books, \$2.00 (refundable). Vastal Press, Vestal 11, New York 13850.

SUPER-SAVINGS Guitar Strings, Accessories, Effects Pedals, Microphones, etc. Free Catalog, Super-Save Music, Box 944, Morganton, N.C. 28655

FREE Catalog! Kits and Completed. Harpsichords, Hammered and Appalachian dulcimers, guitars, banjos, mandolins. Hughes Dulcimers, 4419 West Colfax, PM, Denver, Colo. 80204.

POEMS Set To Music. Nashville Music Productions, Box 40001-PM, Nashville, Tennessee 37204.

ACCORDION Top Brands, Cordovox, Buy Direct. Tremendous Discounts, Trades accepted. Free brochure, PM, Accordion-O-Rama, 16 West 19th Street, New York, NY 10011

PLAY MUSIC BETTER through understanding Chords as used to create "Musical Ideas". - FREE INFORMATION - Music Learning Systems Publishing (1PM), RD3, Box 142, Olean, NY 14760

VIOLIN, Guitar, Banjo, Mandolin Making Materials, Accessories, Books, Piano Tuning Kits. Catalog \$1.00. International Luthiers Supply, Box 15444, Tulsa, OK 74112

PLAY GUITAR IN SEVEN DAYS, 66 Page Proven Method Includes Songbook, Chord Finder, Tuner, \$5.98 ppd. Kemco Products, 851 Bladen Circle, Fayetteville, N.C. 28301

BEAUTIFULLY SIMPLE KITS—SIMPLY BEAUTIFUL DULCIMER. Mountain and Hammered Dulcimer Kits of exceptional quality. Send two stamps for 12 page catalog. Green River Dulcimers, Box 28-A, Elkhorn, KY 42737

ELECTRIFY Player Pianos, Pump Organs Quickly. Inexpensively with Lee Silent Suction Units. Write: Lee Music, P.O. Box 308F, Culver, Oregon 97374

INTERNATIONAL Catalog valuable to makers, repairers of stringed instruments. Imported woods, parts, accessories, kits. Fine German-made violins, violas, cellos, basses and bows. Send 25c for catalog. 10% Credit Certificate will be enclosed. International Violin Company Ltd., Dept. FA, 4026 W. Belvedere Ave., Baltimore, Md. 21215.

EDUCATION & INSTRUCTION

TRAVEL Agent/Tour Guide! Home-study plan explains exciting Travel Careers, how to qualify for travel benefits. Approved for Veterans. Free Brochure. Travel School, Dept. PBCC1, Newport Beach, CA 92660

HOLOGRAPHY 3D LASER IMAGING CLASSES. MUSEUM SCHOOL, 1134 Washington, Chicago, 60607. (312) 226-1007

LEARN Flower Arranging and Floristry. Start business or hobby. Free information on home study course. Lifetime Career Schools, Dept. 8-896, 2251 Barry Avenue, Los Angeles, California 90064.

DRAFTING is a great career! Men, women. No previous experience or special talent needed. We train you at home in spare time. Get free facts. Write: North American School of Drafting, Dept. PBCC1, 4500 Campus, Newport Beach, CA 92660

"JET/GAS TURBINE CAREERS!" Homestudy courses — theory, maintenance, overhaul — Established 1957. AMERICAN JET SCHOOL, Department PM-3, Darby, Montana 59829. (406) 349-2100

AUCTIONEERING AND SOUND EQUIPMENT, Free brochures. McDonald Continuing Education Division, Box 1805, Victoria, Texas 77901

SERVICE KEYBOARD INSTRUMENTS Piano Tuning - Electronic Organ Servicing. ACCREDITED NHSC - Free Booklet. MILES BRYANT SCHOOL, Dept. P, PO Box 20153, Sacramento, CA 95820

REISCH WORLD WIDE COLLEGE OF AUCTIONEERING, INC. World's Largest-46 Years. Term soon, Free Catalog. Approved for VA. Modern Auction Library "FREE" with enrollment. 515-423-5242 - Col. Gordon E. Taylor, P O Box 949, Dept. 19, Mason City, IA 50401

BARTENDING - Bar Management Home Study. Bartending Training, 3843-C San Fernando Road, Glendale, CA 91204

UNIVERSITY DEGREES BY MAIL Programs! Bachelors, Masters, PH.D's... Free revealing details. Counseling, Box 317-PM1, Tustin, California 92680.

EXTENSION And Post-Graduate Awards in Philosophy, Art, Science, Botanic, Medicine, Homeopathy, Radionics, and others. 30 subjects Curricular fee (airmail \$1.00 refundable). Registrar, Sussex College of Technology, Highfield, Daneshill, 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, Daneshill, Sussex, England RM17 7EX.

FREE CATALOG - LEARN AUCTIONEERING! Nashville Auction School, Box 190, Department 2, Lawrenceburg, Tenn. 38464

LEARN Asleep or awake. Records, tapes, equipment! Free catalog! Drawer PM-400, Ruidoso, New Mexico 88345

AUTOSUGGESTION. Sleep-learning headquarters! Tapes, records, books. Gigantic catalog free. Research Association, Box 24PM, Olympia, Washington 98501.

DETECTIVE Profession, Easy home study; free tie-tack or lapel pin, certificate future. Professional Investigators Training School, Dept. CP, P.O. Box 41256, Los Angeles, CA 90041

INSTANT MEMORY... NEW WAY TO REMEMBER. No memorization. Release "photographic" memory. Forget nothing! Liberates extraordinary knowledge, talents, ESP. Immediate results! Free information. Institute of Advanced Thinking, 845PM ViaLapaz, Pacific Palisades, California 90272.

COLLEGE DEGREES BY SPECIAL EVALUATION OF EXISTING Credits & Job Experience. Fast. (614) 863-1791. Write: Box 13151-M1, Columbus, Ohio 43213.

ACCREDITED College Degrees By Mail. Details. GRADUATE REFERRAL SERVICE, 3010 Santa Monica Blvd., Suite 173-PM, Santa Monica, CA 90404

BOOKKEEPING Or Accounting! Easy home-study plan prepares you quickly to do your own books... or others. Approved for Veterans. Free "Accounting Career Kit." Write: Accounting School, Dept. PBCC1, Newport Beach, CA 92660

CLOCK AND WATCH REPAIR Books. Free catalog. North American, Box 77-ANA, Fox River Grove, Illinois 60021.

MECHANICAL CAREERS, Automotive, Small Engine, Motorcycle. Look Over What TRANSPORT CAREERS' Nationally Accredited (N.H.S.C.) Courses Can Offer You. Enclose \$15.00 (Refundable On Enrollment) And Receive Your First Lesson, Introduction Book, Catalog, Financial Aid Information, Enrollment Materials. 325 Taylor Rd., Garrett, Indiana 46738

SAVE MONEY!! Avoid Mailorder Rip-Offs new Booklet tells What to Expect, What to Avoid. Only \$5.95. Money Back Guarantee. Singer, Dept 11201, 1403 99th Ave., Tampa, Florida, 33612

BOOKLET on operating lounges—\$5.00. Consultant's, Box 210789, Dallas, Texas 75211

COLLEGE SCHOLARSHIP INFORMATION Send \$1.00. Educational Associates, 2106-114th Dr. N.E., Lake Stevens, Wash. 98258

SPEAK MORE EFFECTIVELY. \$3.00. Communication Techniques, 610 Preston Drive, South Bend, Ind. 46515

ADULTS-FINISH High School At Home No Classes. Write for full information on accreditation, diploma awarded, low no interest tuition. No salesmen. Call free day or night 1-800-821-5809 (Illinois 800-972-5858) or write: American School, Dept. #30145, 850 E. 58th St., Chicago, 60637. Give last year High School completed.

WELDING TRAINING. Basic and Advanced for Major Processes—Arc (Stick), MIG, TIG, Gas, Pipe all processes. A non-profit school. Approved for eligible veterans. Accredited member NATTS. Approved Ohio 70-12-0064 HT. Write for school bulletin and course schedule. HOBART SCHOOL OF WELDING TECHNOLOGY, Box 82, Troy, OH 45373.

FREE booklet lists INDIANA UNIVERSITY'S correspondence courses. Write: Independent Study, Owen Hall, Bloomington, Indiana 47405. Attn: Erik Coppage. Specify: University, High School, or Continuing Education.

HELP your child become a better student. Send 4.50 to: Student, 3614 Richmond Ft. Collins, Colo. 80526

ROMANS Evangelism Unproved. Tracts, 1127 5 St. NE, Ocala, Fla. 32670

BLOCK LETHAL RADIATION Absorption from accidents/bombs. Engineer reveals Safe, Self-administered Chemical Antidote. \$5.00. "Living," Box 2603 P, Brooklyn, NY 11202

SUCCESSFUL YET? NEAR 30? Tired of reading success stories? Amazing self improvement breakthrough for all! FREE profile only from: Andross, P.O. Box 849-A, Champlain, NY 12919-0849

COLLEGE DEGREES by Mail!!!... Accredited Bachelors, Masters, PH.D's... NO CLASSES! FREE Information. Macro-PM1N, Box 45886, Tulsa OK 74145

REPAIR Coleman And Other Outdoor Camping Equipment. Learn How In Your Spare Time. Proven Home Study Method. Accredited School. Send For Full Details Now! Modern Schools Of America, 2538 N. 8th Street, Dept. PM, Phoenix, AZ 85006

CAREER OPPORTUNITY! Accounting homestudy. Introductory lesson - Remit \$5. Accounting Academy, 9588 Davona, San Ramon, Ca. 94583

(Continued on next page)

EDUCATION & INSTRUCTION

(Continued from preceding page)

SMALL Engine Repair, Start Your Own Money Making Business. Learn At Home In Your Spare Time. Nationally Accredited Home Study School. Send For Full Details Now! Modern Schools of America, 2538 N. 87th Street, Dept. PM, Phoenix, AZ 85006

LEARN Sewing Machine repairing. A profitable Trade. Easy to learn. Free details. Sewing Center, 187 FR, Rochelle, GA 31079.

EMPLOYMENT INFORMATION

A GUIDE TO FINDING AN HOURLY JOB IN FLORIDA CITRUS PLANTS. \$6.00. Techaudit, Box 5291, 5050 Florida Avenue, Lakeland, Florida 33803

AUSTRALIA - 68 Countries! 50,000 Jobs. Big Pay. Transportation. Listings \$2.00. Austco, Box 772E, Cypress, CA 90630.

RIVERBOATS - Tugs top pay. No exp. needed. For info, send \$10.00. Marina Employment Service, P.O. Box 207, Central, IN 47110

JOBS OVERSEAS . . . (including Alaska.) Free Details. Global Employment, Box 808-PM, National City, California 92050

JOBS Overseas-Big Money Fast. \$20,000 to \$50,000 plus per year. Call 716-842-8000, Ext. 1743.

ROCKY MOUNTAIN EMPLOYMENT NEWSLETTER! Colorado, Idaho, Montana, Wyoming!! Current Openings — All Occupations!! Free Details . . . Intermountain-L, 3506 Birch, Cheyenne, Wyoming 82001.

WEEK ON, WEEK OFF! Offshore Oilfields. Information \$5.00. UNCO, Box 17103, Pensacola, FL 32522

OVERSEAS EMPLOYMENT All Occupations needed. Free Details. Write: L & A Publishing Co., P.O. Box 35186-PM, Detroit, Mich. 48235

FLORIDA EMPLOYMENT NEWSLETTER!! Complete Sunshine State Coverage!! All Occupations — Updated Weekly!! Free Details: FEN, Box 845PM, Jupiter, Florida 33458

SELF PLACEMENT. How to conduct an effective job search. Recognized Consultant's New Manual. \$4.95 (Refundable). DDH Inc., Box 1324-PM, Dearborn, MI 48121

END THE FEAR OF JOB INTERVIEWING. Get Self-Confidence and Know-How to win one on one. Do's and Don'ts. Questions and Answers. Plus How To Get The Highest Salary. \$6.95. Money Back Guarantee. Robbins Publishing, 31-D Hearshatone, Pittsford, NY 14534

JOBS: COLORADO, WYOMING, UTAH, IDAHO, MONTANA. Computerized weekly newsletter with 200+ jobs. Free Details. MOUNTAINWEST, 925-PM Canyon, Logan, Utah 84321

NATIONWIDE Employer listings. Resume Preparation. Free Details: AVI, Box 264-PM1, Buffalo, NY 14215

EMPLOYMENT WANTED

ARE YOU LOOKING FOR EMPLOYMENT? Try our Classified Section! It costs only \$5.25 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

OVERSEAS Employment . . . \$20,000 - \$60,000+. Free Report! Employment, Box 29217-AA, Indianapolis, Indiana 46229.

HEAR US OUT! Texas Refinery Corp. offers an opportunity for high income PLUS cash bonuses and fringe benefits in your area. Regardless of experience. Write: W.C. Sears, Pres., Box 711, Ft. Worth, Tx. 76101

WORK AT HOME JOBS available! Substantial earnings possible. Call 504-641-8003 Ext. 10 For Information.

TRANSLATORS Wanted - All Foreign Languages. Engineering, Box 411166, Chicago, IL 60641

AUSTRALIA WANTS YOU! Jobs! Big Pay! Paid Transportation! Newest Handbook — \$2.00. AUSTRALIAN INTERNATIONAL, Box 19107-AA, WASHINGTON, DC 20036.

WRITERS NEEDED. Electronics. Technical. Others. Phone-A-Writer, Inc., 175 Hills Point Road, Westport, CT 06880. 203-226-7624

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, Woolworth Building, 233 Broadway, Suite 3612-M, New York, N.Y. 10007. (212) 267-5252.

MAKE Your Invention Pay. Fact-Filled Booklet Only \$2.95. Box 935, Morgantown, WV 26505

NONPROFIT Foundation Helps inventors. Widest Range of Services Including: Patent Services (by Patent Attorney); Model Making; Straight Commission Marketing. Free Recording Forms. Free Evaluation. Affiliated Inventors Foundation, 501-B IOWA, Colorado Springs, CO 80909.

INVENTORS - United States Patent Office Searches. Patent Development Engineering and Marketing of your inventions, ideas with manufacturers contracts. Send for **FREE INVENTION CERTIFICATES** and Invention Information. Serving Inventors Since 1948. **GEORGE SPECTOR, LICENSED PROFESSIONAL PATENT ENGINEER, FORMER UNITED STATES PATENT OFFICE EXAMINER—3615 Woolworth Building, New York, 10007**

U.S. PATENT OFFICE Searches, 234 Broadway, Room 3615. New York 10007. Free invention certificates.

REGISTERED PATENT ATTORNEY. Applications and Searches. Mail Service. Free Preliminary Review. Box 392PM, Millwood, N.Y. 10546

PROTECT Your Invention. Registered Patent Attorney. Many Years Experience, all Fields. Individual Inventor's Problems Given Special Consideration. Vary Reasonable Charges. Write for Free Information. Paul H. Gallagher, 105 W. Adams, Chicago, Illinois 60603

REGISTERED PATENT ATTORNEY Washington D.C. Suburb Donald A. Kettlestrings, 414 Hungerford Drive, Rockville, Maryland 20850

PATENT IT YOURSELF! Materials proper size, form, for filing with U.S. Patent Office. Copyright forms to guide you. PCM, Box 1491, Fremont, California 94538

LEARN How to offer your invention for sale or license. Free Booklet outlines procedures, royalty rates, requirements. Kessler Sales Corporation, C-5-F1, Fremont, Ohio 43420.

MAKE Money Marketing your Invention. Info. \$2. Market Developers, 1105 Tower Ct., Iowa City, Iowa 52240

INVENTORS Patent Your Invention. Free Initial Consultation. We are Registered by the U.S. Government. Victor J. Evans & Co., 4637 Eastern Ave. N.E., Washington, D.C. 20018. Since 1898.

INVENTIONS WANTED

INVENTIONS WANTED - FREE CONSULTATION. NO IDEA TOO SMALL. Disclosure registration. Potential cash or royalties from manufacturers seeking new ideas. For free information on how to register your idea, call or write: **AMERICAN INVENTORS CORPORATION** 59 Interstate Drive, Dept. PM, West Springfield, MA 01089, (413) 737-5376. A Fee Based Marketing Company.

INVENTIONS MARKETED! Cash Royalties! **FREE INVENTION PROTECTION CERTIFICATES.** George Spector Manufacturers Representatives, Woolworth Building, New York, N.Y. 10007.

MANUFACTURER SEEKING INVENTIONS. ADVANTEK INTERNATIONAL, 1100 17TH NW, WASHINGTON, DC 20036.

IDEAS, INVENTIONS, NEW PRODUCTS WANTED! MARKETING Assistance available to individuals, tinkers, Universities, companies. Write for Kit-PM.

INVENTION MARKETING, INC.,
701 Smithfield Street
Pittsburgh, PA 15222

INVENTORS: Free information on offering your invention for sale. Kessler Sales Corporation, C-5-1W, Fremont, Ohio 43420

\$10,000 plus royalties for usable inventions. Rob Marcum, General Equipment, Box 37290, Louisville, KY 40233. (502) 969-2386

NEW - OLD patents wanted for marketing. Gold Nugget Enterprises, Waukon, Iowa 52172

CASH FINDER FEE - ROYALTY - INVENTIONS. Molds, Formulas. Ideas, 7518 N. 13 Ave., Suite M1, Phoenix, AZ 85021

REAL ESTATE & FARMS

NEW! FREE! Big Spring Catalog! Over 5,400 country properties described, pictured! Land, Farms, Homes, Businesses, Recreation, Retirement buys! Selected best thruout the U.S. Over 700 offices, 43 states All Across America! Yours FREE from the World's Largest! **STROUT REALTY, INC.,** 7 S. Dearborn, Dept. 5800, Chicago, IL 60613. Call 1-800-641-4266.

NEW . . . FREE . . . SPRING 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

LIVE in Costa Rica. We supply facts you need. Fertile Land. No Heating Problems. Great for Survival Homestead. Send \$1.00 for information. Vmerdan, Apartado 587, San Jose Costa Rica, American Central

CALIFORNIA. Acreage Lots. \$40 down. \$40 monthly. Box 35291, Los Angeles, 90035

FISH, Garden, Homestead, Retire or Invest in Florida's Unique Pine Lake Community. Lots for Mobile Homes or Conventional. \$495 down, low monthly. Illustrated brochure. Val-U, 611-P U.S. 41 So., Inverness, FL 32850.

CANADIAN LAND FROM \$47.00 AN ACRE. Recreational & Investment Properties Across Canada. Exchange Privilege, 6 Yearly Issues \$5.00. Canadian Estate Land, Dept. 23C, 286 Lawrence West, Toronto, Canada M5M 3A8

BUYING & SELLING

SCRAP Silver Electrical Contact Points, Forklift Contacts, Industrial Scrap Silver, Silver Solder, Sterling and Gold Jewelry, Gold Plats. (Computer Scrap.) Send Sample for My Offer. All Samples Returned. Bob Leszczak, 562 Myrtle St., Elizabeth, NJ 07202. (201) 353-5049.

EXPORT-IMPORT

+2500 "Fast-Sellers." Free Brochure! Balrightco, Box 91309-B1, Cleveland, Ohio 44101

PLASTIC BAGS

ALL Sizes. Buy Small Quantities. Free Catalog. SAKet, 6151-C Colbath, Van Nuys, Calif. 91401

BUY IT WHOLESALE

BELTS and Buckles. Complete line fast sellers, including truckers, motorcycles, wildlife, westerns etc. Big Profits. Complete dealer set up. Catalog \$1.00. Anchor Specialties, Box 3958-BPM, North Providence, RI 02911

SAVE! FREE CATALOG! Motorcycle, Snowmobile, Small Engine Parts, Woodstoves, Log Splitters, Energy Items. Manufacturer's Supply, Box 157-PM3, Dorchester, WI 54451

RINGS, JEWELRY Priced 130% Below Retail. Catalog \$1.00 (Refundable). Ankapm, 95 Washington, West Warwick, RI 02893.

400,000 BARGAINS Below Wholesale: Many Free! Liquidations . . . Closeouts . . . Job Lots . . . Single Samples. Free Details. Bargainhunters Opportunities, Box 730-A, Holland, Michigan 49423.

CLOSEOUT Jewelry 55¢ dozen. (Catalog 25¢), Rousselet, 107-1631 Dow, Arlington, MA 02174

CLOSEOUTS! Discounts! Below wholesale! Freebies! Samples! DDN, Box 20152-PM, Ferndale, Michigan 48220.

WORLDWIDE BARGAINS! Imports . . . Dropship . . . Closeouts . . . Freebies . . . Surplus . . . SASE. Marnees, Box 1717-PM, Highland, Indiana 46322

HEARING Aids. Batteries. Wholesale. Catalog 25¢. Fiston, Box 1444, New Preston, Conn. 06777

ADVERTISING AGENCIES, ADV. SERVICES MAILING LISTS

MAILORDER ADVERTISERS!! CLASSIFIED ADVERTISING CAN BE MOST PROFITABLE AND REWARDING. PROBLEM IS TO KNOW WHAT TO DO. WHAT NOT TO DO. COLUMBIA CAN HELP YOU WITH YOUR MAILORDER PROGRAM. OVER 20 YEARS CLASSIFIED ADVERTISING EXPERIENCE. KNOWLEDGE OF BEST PULLING PUBLICATIONS. EXPERT COPY SERVICE IS ALL YOURS AT NO INCREASE OVER PUBLISHER'S STANDARD RATES. CHANGES ARE YOU WILL SAVE MONEY. WRITE TODAY FOR FREE DETAILS PLUS YOUR FREE COPY OF "MAILORDER ADVERTISER'S RATE GUIDE". COLUMBIA ADVERTISING AGENCY, BOX 1285-PM-1, RICHMOND, INDIANA 47374

RUBBER STAMPS

BARCO Type Founders. Type and Rubber Stamps catalogue. Mail \$1.00 refundable on first order. 237 S. Evergreen, Bensenville, 60106.

NAME And Address Stamp - \$2.00 Postpaid. Monitor Stamps, Box 80433, San Diego, CA 92138-0433.

OFFICE SUPPLIES

HOW TO MAKE MONEY THROUGH CLASSIFIED ADVERTISING. Booklet shows you how to start your own business with Classified Advertising. **ONLY \$1.00 FOR BOOKLET - (\$2.00 coupon refundable with first order).** H.E. KAPPEL, POPULAR MECHANICS, DEPT. P, 224 WEST 57TH ST., NEW YORK, NY 10019

PRINTING PRESSES—RUBBER STAMP OUTFITS

TYPE Fonts. Hand Printing Presses, Supplies. 120 Pages. \$1.00 Deductible first order. Acme Type, 1720 N. Marshfield, Chicago, 60622

RUBBER Stamp supplies catalog. Jackson, Brownville Road, S-110, Mt. Vernon, Illinois 62964

COMPLETE Rubber Stamp Outfits, Supplies. Same day shipment. Sign Engraving Machines, Wholesale Catalog \$1.00 Deductible. Star Stamp, 1720 N. Marshfield, Chicago, 60622

(Continued on next page)

PRINTING PRESSES—RUBBER STAMP OUTFITS

(Continued from preceding page)

PRINT YOUR OWN—Printing presses, type, supplies direct from factory. Send 25¢ for catalog and samples to: Kelsey Co., DM, Menden, Conn. 06450

PRINTING AND SUPPLIES

THERMOGRAPHED BUSINESS CARDS \$10.99. Free Samples. BG, 2501 Sapling, Glenshaw, PA 15116

LETTERHEADS, 2 Colors, \$17.50. New Designs. Low, 24 Post, Newfoundland, NJ 07435

QUALITY Printing! Lowest prices. Shipped in four working days. Write to: Print Press, Box 65, Dublin, IN 47335.

QUICK Copy Printing. Low Prices. Write: Nationwide, 614 North Main, Bloomington, Illinois 61701

GUMMED LABELS

1,000 Deluxe Gummed Address Labels \$3.00. Free Literature. Acme, 55 Tomoka, Pittsburgh, Pennsylvania 15229

GIFT SHOPPING

BUY Swiss-Style Army Knife. Eleven Blades. \$19.95. Bargain Galaxy, Dept. 251, P.O. Box 29474, Denver, CO 80229-0474

CLOCKS, WATCHES, OLD GOLD, JEWELRY

HIGHEST CASH for Gold, Jewelry, Gold Teeth, Rings, Diamonds, Watches, Silver, Platinum, Mail Articles Today. Free gift with information. Chicago Gold & Precious Metals, 6 E. Monroe, Dept. 558, Chicago, 60603

TOP PRICES - PLUS BONUS PAID IMMEDIATELY FOR ANY GOLD, SILVER, OR PLATINUM ITEM: Class Rings, Jewelry, Diamonds, Gold Teeth, Silverware, Etc. **ANY CONDITION!** Details . . . Sunnysvale-PM1, 2627-19th Street, Rockford, Illinois 61109

TAKE NO CHANCES. Deal with oldest, most reliable firm in old gold business. Established 1934. Highest Cash. We buy Gold, Silver, Platinum, Diamonds. Highest Cash. Free information. Rose Industries, 29-A East Madison, Chicago, 60602.

WATCH And Clock repairing books, tools, materials. Free Catalogs. North American, Box 77-AN, Fox River Grove, Illinois 60021

CYPRESS WOOD CLOCKS, Quartz Movement. High Gloss Epoxy Finish, 16 To 20 Inches. \$29.95, \$5 Shipping. Clock Store, Drawer C, Bonita Springs, Fla. 33923

PRECIOUS STONES & MINERALS

GET Free catalog no serious rockhound, gem cutter, jewelry maker, hobbyist or craftsman can be without. Full of bargains, exclusive items, low prices from largest suppliers and authorities in the field. Free new catalog just off the press. yours for the asking. Write: Gnegers, Dept. C-12, 900 South Arroyo Pkwy., Pasadena, California 91109

TREASURE FINDERS

FIND Lost coins, jewelry, buried treasures, gold nuggets, relics. New revolutionary patented detector analyzes objects, tremendous range, no ground pickup. Free catalog. Gardiner, 4729M N. 7th Ave., Phoenix, Arizona 85013

GOLD, SILVER, Coins, Relics - Find with unique patented treasure finder units - None better. Low prices. Free information. Write: Techna, Dept. C3, 11900 Montana Avenue, El Paso, Texas 79935

TREASURE- Locate quarter mile away with ultra sensitive locator - brochure free. Research Products, Box 270270 - AMC, Tampa, Florida 33688

PROFITABLE OCCUPATIONS

START PROFITABLE TOOL RENTAL business, spare-time, with little cash. Instruction Manual, \$4.00. Lincoln, PM21, Box 558, Clifton, NJ 07012

FREE Catalogs. Repair air conditioning Refrigeration Tools, supplies. full instructions. Doolin, 2016 Canton, Dallas, Texas 75201.

FT. SMITH Auction School. Ft. Smith, Ark. 72903. Resident & Home study. Valerian Approved.

PLASTERCRAFT!!! Profitable home business. Molds available. Details: Lynnette, 6251C Mentor Park, Mentor, Ohio 44060

TECHNICAL WRITERS make big money! Free details: Tek Pubs, Box 2458-P, Oroville, CA 95954.

\$30 hourly Repairing Air Conditioners. Sample Lesson "Maintenance Saves 30% On Operation Costs." \$10. Je-Mi's, Box 16433, Wichita, KS. 67216. 316-688-0723.

SALESMEN-DISTRIBUTORS

MAKE EXTRA MONEY DURING YOUR SPARE TIME! how our New Line of Calendars, Pens and Popular Advertising Gifts to local firms. Prompt, friendly service from small town AAA-1 Company in our 73RD year. No Investment or Collections. Weekly Commissions. Be your own Boss. Full time potential. No Experience Necessary. Write to: Frank Buckley, NEWTON MFG. CO., Dept. PMC1, Newton, Iowa 50208

SELL SENSATIONAL LOW-COST PRE-ENTRY PROJECTOR for Automobiles-Buildings. Exceptional Distributor margin. Northwest Electric, 3013, Box 1046, Mitchell, SD 57301-1046

IT'S WORTH \$1,000 - GUARANTEED! The ROAD-MAP TO RICHES. \$4.95. Cardot 888 Industrial, Box 806A, San Carlos, CA 94070

AGENTS WANTED

PRINTING Advertising Salesmen—Excellent money making sideline selling Decalcomania Name Plates, small quantities. Advertising Specialties, sign letters. Free samples. Rakco XL, Boston, Mass. 02119

SPARE TIME CASH. Sell famous Hanover Shoes. Samples, sales kit free. No experience needed. No age limit. Big commissions. Hanover Shoe, Dept. 3220, Hanover, Pa. 17331.

MAKE MONEY IN SPARE TIME. As a subscription sales representative for leading national magazines, you can earn generous commissions while learning the art of selling. Instructions and supplies will be sent to you free. Send this ad with your name and address to: POPULAR MECHANICS, Dept. AB-L, 250 W. 55th St., New York, N.Y. 10019.

BUSINESS OPPORTUNITIES

STOP Wasting Money Answering Questionable Advertisements. 1000 Offers Explained. Globe, Box 20588PC, St. Louis, Mo. 63139.

FREE BOOK. BECOME OPPORTUNITIES AGENT. Earn Thousands. Opportunities, Box 1564-A1, Fair Oaks, CA 95628

MAKE HOMEMADE BOOKLETS. I've earned \$187,000 with mine. Free Information: Falcon, Box 548, Woodville, Texas 75979

VITAMIN POWER. . . Buy direct from factory. Build steady, repeat order high profit business. Distribute 200 highest quality natural nutritional supplements. This is not a multi-level sales deal. For catalog and confidential distributor's price list write: Vitamin Power, Dept. PM, 51 Franklin Ave., Valley Stream, NY 11580

MAKE Extra Cash! No Experience or Capital Required. Independence, PM-182, 1148 Sixth Avenue, Bristol, Pennsylvania 19007.

MAILORDER OPPORTUNITY! Start profitable home business without experience or capital. Write for free book, plus details. Mail Order Associates, Dept. 634, Montvale, NJ 07645

GET "INSTANT BUSINESS". Free Details! Newera, Box 1389, Brookings, OR 97415

WICKS, Igniters for any Kerosene Heater. Become your town's center for repairs, parts. Send \$2.00 for catalogue. VIP Repair Co., 124 Welsh Rd., Horsham, PA 19044. (215) 857-1556 Wholesale, Retail.

MONEY SECRETS! Help People and businesses get money. Easy home business. Fantastic Profits. No Experience—Own Hours. Continuous Assistance. Free Details: DFC, Dept. 10-G-1, 1145 Reservoir Avenue, Cranston, Rhode Island. 02920

SELL Books By Mail 2000% Profits! NLRC, 55 Sutter, 663A, San Francisco, California 94104.

SPARETIME DISTRIBUTORS NEEDED. Unlimited Profits! Proven Automotive Product. Free Details! MOTALOY, Box 4457-PM1, Downey, CA 90241.

YOU CAN MAKE an extra \$50,000 THIS YEAR—with your own business! For Free Details. Write: VICTOR ELIAS, 6515 Sunset Bl., Suite 202, Hollywood, Calif. 90028

WOODWORKERS - IDEAL HOME BUSINESS. Free Brochure! Pine Shop, 78P, West Peterborough, NH 03468-0078

SURPRISE EVERYBODY. Become Notary Public now. We guide you, free. We sell notary needs. Raise your image, job value, income. Assistance nationwide. Brochure: Gulf, 234 Club-A, San Antonio, Texas 78201

GET RICH!!! Secret Law smashes debts—brings cash and credit!!! Details FREE! WealthKit-WB-1, Billings, NY 12510

DEBTS WIPED OUT with secret Federal Law!! Fortune building FREE REPORT!! Blueprints #B-1, LaGrangeville, NY 12540

ASSEMBLE PRODUCTS AT HOME. Many opportunities paying High Weekly Profits presently available without investment. Write: Businesses, 92B Brighton 11th, Brooklyn, New York 11235.

PIANO Tuning quickly learned with home study courses. Diploma granted. American Tuning School, 17050 Teller Drive, Morgan Hill, Calif. 95037.

PICTURE Framing—Profitable full or spare-time business. Easy to learn with handbook-course "Guide To Picture Framing Profits." \$3.00 Guaranteed. Free framing-supplies catalog included. Japs, 126-PM Seventh North, Hopkins, Minnesota 55343.

REPAIR HYDRAULIC JACKS — DETAILS FREE. WRITE: HYDRAULIC PARTS SUPPLY, BOX 4157, BROWNSVILLE, TEXAS 77520.

FREE BOOK 2042 Unique Proven Enterprises. Fabulous "unknowns." Second Inflation Income. HAYLINGS, Carlsbad, CA 92008

BECOME REAL ESTATE INSPECTOR - \$100.00 HOURLY Potential. Be Boss. Part/Full Time. Home Operation Eliminates Investment. Simplified Instruction, Forms, Assistance. Free Information. Box 400, Arnold, MO 63010

I MADE \$40,000 Year by Mailorder! Helped others make money! Details 25¢. Torrey, Box 318YY, Ypsanti, Michigan 48197.

LEARN Sewing Machine Repairing. Men, Women. Lucrative Profits. Gresslin Correspondence School, Box 927, Spencer, Iowa 51301.

CLIP newspaper items — \$2 - \$25 EACH!! FREE Report! Clippings-KB-1, Billings, NY 12510

\$1104.00 Monthly For Ten Hour Work Week! Guaranteed!! Homework . . . Start immediately . . . Paid Daily - Free Information/Application - AHV, Box 1028-A1, Kalaeo, Hawaii 96741

SELL information Books, by mail. Write: Grahamco, PMBX 99371, Tacoma, WA 98499

\$480 Weekly. Home mailing program. Goodworld, Box 26233-R, Tamarac, Florida 33320

\$20,000 - \$100,000 yearly. Start your own JANITORIAL business. Write: CLEANPRO, PO Box 17060-PM1, Portland, Oregon 97217.

\$92.00 From Square Foot Plywood. (Huge Demand). Revealing Proof 25¢. (Refundable). Woodwin, Bridgewater, Mass. 02324

LEARN The secrets of repairing junk batteries "Fabulous Profits" small investment. Apex Engineering, 5454 Bolsa, Atascadero, Calif. 93422

REVEALING FACTS, about Rip Off's in Opportunity Offers. Details Free. State Shop, 507-56 Sutherland, Stockdale, PA 15483

GOOD INCOME WEEKLY Processing Mail! Free Supplies, Postage! Information: Rush stamped envelope! Foodmaster-CPM, Burnt Hills, NY 12027

MAKE Millions!!! BATTERY MANUFACTURING. Details \$1.00. Everlast, Box 365, Bogota, NJ 07603

PERSONAL Business Loans, No Collateral, Write: GELCO, Box 34293Z, Indianapolis, IN 46231

CONCRETE Block Machines: Catalog \$1.00. Route One, Box 95, Rapid City, South Dakota 57701

SELL Books By Mail. Free Dealership. Midwest, Box 44R2-PM, Shawano, Wis. 54166

GET RICH using OTHER PEOPLE'S MONEY!! Unique — amazing business!! Details FREE!! Finance Consultants, 5B-1, Billings, NY 12510

DON'T leave home! 1982 HOME BUSINESS DIRECTORY lists over 50 companies that completely set you up in your own low cost/high profit home operated business. Newly updated. \$2. Business Information Service, Box 10024, Chicago, IL 60610.

HOW TO MAKE MONEY THROUGH CLASSIFIED ADVERTISING. Booklet shows you how to start your own business with Classified Advertising. ONLY \$1.00 FOR BOOKLET — (\$2.00 coupon refundable with first order). H.E. KAPPEL, POPULAR MECHANICS, DEPT. P, 224 WEST 57TH ST., NEW YORK, NY 10019

MAILORDER \$1,000.00 POSSIBLE MONTHLY Selling Information. Free Details. RSVP, Chatsworth Ave., Box 301-B, Larchmont, New York 10538

"FREE Interest Capital!" (Free Details.) Sources, Box 99-PM, Uleta, FL 33184

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. R2701, Woodland Hills, California 91367

BECOME Tax Consultant. Our students earn \$1,000-\$3,000 every tax season preparing returns evenings. State approved. National Tax School, Monsey 2AP, New York 10952.

MAKE 2 to 3 times your cost. Over 2500 specialty products. \$2.00 brings giant below-wholesale catalog refundable on first order. Graham, Dept. A-1, PO Box 366, New Paltz, NY 12561

EARN Hundreds mailing our school bulletins! Supplies! Stamps! Details! For samples enclose stamped envelope. Consumer Services, B9-P, Orangeburg, NY 10962

MAKE Durable Building Plastic Easily. Waterproof, Fireproof. Economical. Bays Laboratory, 2086-2075 Drive, Cedaredge, CO 81413

SELL Books By Mail. Profitable. Write: Musgrove-1A1, Altus, AR 72821.

(Continued on next page)

BUSINESS OPPORTUNITIES

(Continued from preceding page)

MAKE MONEY WOODWORKING - Easy profits making unusual gifts, novelties. Free details. Williams, 32K Titus, Glen Cove, NY 11542

START Your Own "HOME REMODELING BUSINESS"! Free Details! Remodeler, Box 262, Massapequa, New York 11758

NEW Discovery in Battery Reconditioning - Eighteen Months Guarantee Means "Big Profits Fast." Electone, 7415 Gable Drive, Little Rock, AR 72205

SELL Books By Mail. Jones, Box 24484, S81, Vancouver, Canada V5T 4E1

DISTRIBUTORS, EARN SEVERAL TIMES YOUR COST ON THOUSANDS OF PRODUCTS, GIFTS, NOVELTIES, TOYS, OTHERS. FREE INFORMATION. W & W GIFTS, BOX 6, PILLOW, PA 17080

INFRARED THERMOGRAPHIC energy audits for home and industry. Exciting! Innovative! Profitable! Details: RSA (The Infrared People), P.O. Box 523, Phillipsburg, N.J. 08865-0523

RECONDITION JUNK BATTERIES! Profitable Home Business! . . . J&M, Box 771-PM1, Battle Ground, WA 98604

WHOLESALE OPPORTUNITY! Start profitable home business without experience. Toys to Stereos - Incredible Profits. FREE Information. Hamlet House, 1776E Jackson Street, Maplewood, Minnesota 55117

\$32 per hour driving. More possible. Trade secrets revealed. Send \$5.00 to: Williams & Sons, PO Box 25604, Colorado Springs, CO 80936

GROUND FLOOR OPPORTUNITY Hottest multi-level program ever! Unparalleled growth, company exceeding previous records for growth. **UNLIMITED EARNING POTENTIAL.** Unique product that nearly everyone uses. No inventory requirements. No bookkeeping. Send Stamp For Information. Katz Enterprises, 1019, B-5, Merchant, Effingham, Ill. 62401

FREE INFORMATION How To Get Rich In Mail Order. Simco Enterprises, 2128 East Main Street, P.O. Box 526, Snellville, GA 30278

NOW'S your chance to get in on the ground floor of the newest business sweeping America. **EARN \$1000 WEEKLY** for 10-15 hours work writing Professional Resumes. **START IMMEDIATELY! ONLY \$5.00 FOR THE COMPLETE 20-PAGE REPORT AND INSTRUCTIONS** from. Watt, D-106, C.P. 1383, Bonaventure, Montreal, Canada H5A 1H3

VENDING MACHINES. No selling. Routes earn amazing profits. 32-Page Catalogue \$1.00 (Refundable). Parkway Corporation, 1930 PMB Greenspring Drive, Timonium, Maryland 21093

GUARANTEED Wealth System can change your life. Stop struggling and start living! Write for Free Details. Roy Thomason, P.O. Box 3670, Englewood, CO 80155

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

MAKE OVER \$22.50 an hour. Spare time at home! Rubber Stamp industry needs small manufacturers. We furnish all equipment and know-how! Particulars free! Write: Roberts, Room RC-2-LA, 1512 Jarvis, Chicago, IL 60626-1997

FREE Details: Start At Home Without Capitol! Become Millionaire Fast! **BEST MONEYMAKER** for 1980s! Write Today! Heamco, 323 Franklin Building, #804, Dept. H-146-PM, Chicago, Illinois 60606

SCRAP PLASTIC available free everywhere. Operate your own profitable recycling center. Details: Plastic Recyclers, Box 241-R, Hamilton, OH 45012

\$\$\$ FORMICA COUNTERTOP REPAIR AND RESURFACING \$40 + hr. Burns, cuts, stains look like new! Market wide open! Photos - Information \$3.00 (Refundable). Renew, Box 19730-105, Portland, Oregon 97219

REFRIGERATION & Air Condition Learned Quick and Easy. Low Cost. Free Details. Frost Air, Box 10067, San Antonio, TX 78210

\$21,840.00 Year Selling Huge. Cartoon Character Balloons. Details \$2.00. Post, 4805-D Rosny, Anniston, Ala. 36201

UNIQUE CLASSIFIED MARKET INFORMATION Details, Send 20cts. Poststamp. A.F. Incorporated, 640 23rd. Ave. N.W., New Brighton, Minnesota 55112

\$300.00 Weekly Possible. Spare Time Mailing. Box 24063-PM1, Philadelphia, Pa. 19139

MAILORDER FORTUNE! Start Home Business. Most Successful Plan. Free Booklet. Mailbox Publications, 4821 Babylon, Dayton, Ohio 45439

CONVERT ELECTRIC CARS, your garage. **YOUR** Customized Moneymaker! Free Report. 3E Engineering, Box 19409-CM, San Diego, CA 92119

MAILORDER: SELL 70 MONEYMAKING REPORTS. FAST—EASY—100% PROFIT. Venab, Box 19033, Las Vegas, NV 89119

SAVE POSTAGE! Your name sent to more than 70 free Business Money-making Advertisers, including all in this issue. \$1.00. Advertiser's Referral, PCB 81513, Fairbanks, AK 99708-1513

\$100,000 OPPORTUNITY SELLING INFORMATION BY MAIL. It's Easy! Let me show you how with my valuable FREE report. Terbo Enterprises, 302 McQueen Rd., Aberdeen, NC 28315

\$200 Weekly From Wood Scraps. Hot Craft Sellers. Plans \$5.00. No Cash. TMT, 10 Browning, Shrewsbury, MA 01545

END MONEY WORRIES WITH GUARANTEED WEALTH SYSTEM! No Investment. Details: WEALTH, Box 5281, Station B., Victoria, Canada V8R 3N4

START OVER 100 BUSINESSES AT HOME, PART TIME FOR \$10 OR LESS. SCHUMAN HOUSE, 680 RAVENNA, REYNOLDSBURG, OHIO 43068

YOUR NAME TO ALL BUSINESS OPPORTUNITIES THIS ISSUE—\$1.00. Bestever, Box 19713, Las Vegas, NV 89132

MONEY Selling Paperbacks, You Receive Free. Information—\$4.00. Libreria, 8940 Lyndale, Bloomington, MN, 55420

MONEY In Mailorder! Janowski Distributors, P.O. Box 21725, Milwaukee, Wisconsin 53221

FREE Information! Multi-Level Mailorder Sales. Ground Floor Opportunity. NMD, Inc., 509B Capitol Dr., Benicia, CA 94510

FANTASTIC MAILORDER OPPORTUNITY! Sell Booklets And Reports By Mail. Huge Profit!!! Bennington Parke, 307 Maplewood Ave., Dept. 182PM, Mohnton, PA 19540

PIANO Tuning learned quickly at home! Free information. Empire School, Box 1014, Jupiter, Florida 33458

MAKE \$15.00 Hourly Building Custom Luggage Cases at Home. Huge Nationwide Demand. Fill Mail Orders. We Supply Materials, Instructions . . . Everything. Free details. Custom Case, 6067 De Soto Ave., Dept. C20-13, Woodland Hills, CA 91365.

MAKE Rubber Stamps. Highly Profitable Business. Free Details. Stamp Magic, POB 22809 (GC), Tampa, FL 33622

CABINET FRONT BUSINESS. Excellent part time or full time, 50% to 70% profits. Kit includes: 150 page Operations Manual, Solid Hardwood Raised Panel Doors and Veneers at Wholesale, Info: \$2.50. Kit: \$148.00. Nu-Cabinet Systems, 106 Pickard Dr., Syracuse, NY 13211

GOLD FOIL PRINTING FOR PROFIT. Personalize business cards, pencils, matches. Free Details. Gold Magic, POB 24986 (GC), Tampa, FL 33623.

EARN a continuing income. 50% profit selling to local businessmen. One sale can automatically repeat for years. Sells on sight. \$7 for Sales Kit and Sample. Omega Associates, Box 461, Franklin, New Jersey 07416

BECOME A PROFESSIONAL. Business Cards for all Professions, Private Detective, Lawyers, etc. Brochure \$1. Refunded on 1st Order. JS Enterprises, Box 3201, Springfield, IL 62708

FINANCIAL INDEPENDENCE! Incredible Method! Diversified P1. 23 Sunset, Framingham, MA 01701.

SUPER Profits Three Times Your Cost On Hundreds Of Items. \$5.00 Brings Giant Catalog Refundable. House of Specialties, 7 E. Fourth Street, Dept. 820, Dayton, Ohio 45402

SCREEN PRINT T-SHIRTS, other items, inexpensive, professional kits. Free Details. "T-Printer," POB 23991 (GC), Tampa, FL 33623.

BUMPER STICKER PRINTING DEVICE. Cheap, Simple, Portable. Free Details. Bumper, POB 22791 (GC), Tampa, FL 33622.

SELL Over 2000 Products. Wholesale, to Retail Stores or to Consumers in Flea Markets. No experience necessary! Details \$1.00, refundable on first order. Reisers Wholesale Products, Dept. 111, 74 Holster Rd., P.O. Box 1172, Bloomfield, NJ 07003

TAKE Catalog Orders. We drop-ship 2500 best-selling specialty products. Lowest below wholesale prices. Immediate delivery. Spectacular home business opportunity. Free Book. SMC, 6061 De Soto Ave., Dept 20-12, Woodland Hills, CA 91365.

SOLAR Heating learned quickly at home! Free information. Empire School, Box 193, Rockville, IN 47872

HUNDREDS Weekly, Reading Classifieds - U.S.A., Canada! Instructions \$1.00: Garant, Box 2895, Thunder Bay, Ontario, P7B 5G3

EXPERIENCED Bookkeepers. Operate A Profitable Book-keeping Service. R. I. Systems, P.O. Box 7064, Warwick, RI 02887

ADVERTISE at the same time in 11 small towns weekly newspapers. Weekly cost under \$15.00. Details: Advertising, Box 236, Independence, OR 97351

FANTASTIC Profits - 1001 Best Selling Products at Wholesale Cost. Free Catalog. Cameo Company, Dept. 101, 4213 Cameo Drive, Bridgeton, Missouri 63044

BIG Profit Selling Information by Mail. Details: Box 482-P, Dallas, OR 97338

HUNDREDS WEEKLY POSSIBLE! MAILING PROGRAM Nationwide, Box 58806, Dallas, TX 75258

MAKE \$2,000 MONTHLY. Spare time. Unique proven enterprises. No selling. No Capital to start. Free brochure. Kashiholder, Box 1132-19K, Indianapolis, Indiana 46225

DISTRIBUTE BURGLAR ALARM EQUIPMENT, Great Profit Potential, Home Business Opportunity, Name Brand Equipment, Below Wholesale Prices, Free Information. RG Sales Co., 7030 15th Ave. N.W., Seattle, WA 98117

MONEYMAKING OPPORTUNITIES

BECOME Financially Independent through Writing. Free Details. Key Press, 7782-P Brockway, Boulder, CO 80303

MONEY MAKING BUSINESSES AND INFORMATION FOR THE 1980's! Free Details. Hamel Enterprises, Box 30049, Dept. PM-1-3, Midwest City, OK 73110

EARN Extra Money! Make \$2000.00 from \$13.00 Investment. Rush \$2.00 to: Thomas Ringkor, 169 East York Street, Akron, Ohio 44310

\$600 WEEKLY Potential. SASE. Barker, 620 W. Gutierrez, #45, Santa Barbara, CA 93101

WIN AT POCKET BILLIARDS! Perfect your technique. \$4.50. J.D. Enterprises, 9348 Santa Monica Blvd., Suite 101, Beverly Hills, CA 90210

OIL LOTTERY citizens with \$40.00 Fee. Win VALUABLE LEASES. Free Details. Knebel, 6205 Joyce, Washington, DC 20031

MONEY SECRETS now disclosed! Start as low as you like! Use other people's money! Tricks galore! Don't miss! \$9.95. MacDonald Enterprises, Box 74-P, Newton, MA 02164

1500% RETURN On Investment Guaranteed. Details Free. Stamps Appreciated. RAF Cruz, Box 462, Atlantic Beach, Florida 32233

\$175.00 Weekly Correcting Pupils' Lessons! Samples, \$1.25! Castle's, 234 LP Fifth, New York City 10001

WE BUY NEWSPAPER CLIPPINGS of Wedding Announcements for \$1.00 each, Instructions \$1.00. Clippings, Box 491-PM, Gatesville, Texas 76528.

GET RICH!! Secret law smashes debts - brings Cash, Credit! FREE report!! WealthKit-WBM-1, Billings, WY 12510

MAKE Imitation Marble, Statuettes. Start Gift Shop. Details 50c. Marbleizing, 41 Waverton, St. Louis, MO 63124

PLASTERCRAFT! Money-making home business. Details. Mailway, 24949-BF-1, Nashville, TN 37202

\$2000 MONTHLY Possible Selling Information by Mail. Free Report. State Shop, 507-53 Sutherland, Stockdale, Pa 15483

BARGAINS! BUY WHOLESALE AND BELOW! Name Brands, Appliances, Furniture, Sports Equipment, Televisions, Cameras, Watches, Jewelry, Tools, Closeouts, Surplus. Thousands More. Free Details. Write Today: Worldwide Bargainhunters, Box 730-A, Holland, Michigan 49423.

HOW To earn 239% to 2,900% interest on small sums. Details free. Guaranteed. Schneider, 55 Sutter Street, Suite 842-PM3, San Francisco, CA 94104

FANTASTIC earnings mailing from home! Offer: Rush Stamped Addressed Envelope. Imperial, P-8 X17410, Fort Lauderdale, FL 33318

ARE All These Ads True? FIND OUT! Details: Swartz, Box 20195-C, Lansing, MI 48901

FREE typewriter repair course. Send \$1.00, postage-handling, receive instruction packet. Athey, B-1, Saxonburg, PA 16056

MAKE MONEY IN SPARE TIME. Earn generous commissions 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 York, N.Y. 10019.

\$500-\$1000 WEEKLY, AT HOME, or more possible. 12 unusual ways. Report. Send \$2.00 and SASE to: Mars Enterprises, P.O. Box 38001-F, Washington, D.C. 20020

FREE Million-\$-First Million-\$ Free Plus Big Chance At More Cash—Write: Million\$. Dept. PM. Box 1038, Station Q, Toronto, Canada M4T 2P2

BIG MONEY Mail Ordering. Send SASE. P.O. Box 12751, San Diego, CA 92112

MOONLIGHTER'S Manual Trade time for cash. Factual proven, profitable method. Details. Moonlight, 611-B Pawling Ave., Troy, NY 12180

\$100,000.00 in four months! Millionaire reveals secrets. 336 page manual \$11.00. Free information kit! Diversified, Box 41201-PM, Brecksville, Ohio 44141

\$57.40 DAILY STARTING next week. Details Send 20 cts. Poststamp. Sbiamek, Drawer 4308, California 91607-0308

85 MONEY - MAKING REPORTS- Complete Details Free - WT Enterprises, Box 734, Wharton, Texas 77488

TREMENDOUS Profits, With Proven, Easy Beginners Program. Free Information. BMO Enterprises, Box 8129-L, Kitchener, Ontario N2K 2B6

(Continued on next page)

MONEYMAKING OPPORTUNITIES

(Continued from preceding page)

STRIKE IT RICH! Vast hidden wealth now being found. Learn how/where. Free details: Greenhollow Associates, Box 4264, San Clemente, CA 92672

SPARE time fortune in Vinyl Repair. Huge demand creates exceptional profits. We supply everything. Details free. VIP, 2062 Montrose, Chicago, 60618

BIG PROFITS in becoming supplier to major industry through electroplating small parts and metalizing non-metals. Write for free particulars: Mason, Room MC-2-LA, 1512 Jarvis, Chicago, IL 60626-1997

UNLIMITED INCOME — Anyone Can Profit, Work Full or Part Time. Send \$3.00. P.O. Box 310, Decatur, Indiana 46733

GET RICH in Mail Order. FREE Information. Send Stamp. Mary Lou Associates, PMJ, Box 1035, Somerville, NJ 08876

WANT MAILORDER SUCCESS? Bigger Profits? Free Literature Tells You How! Write: Cosmos-PM-2, 424 W. Commonwealth Avenue, Fullerton, California 92632

100% Interest, 1.000% profit Guaranteed. \$5.00. Details, SASE. Lotz Corporation, 2350 W47P, Denver, CO 80211

LAMINATE PROFITABLY AT HOME. Social Security, Medicare Cards, Recipes, Luggage Tags, Newspaper Clippings. Samples, Information \$1.00. Refund \$2.00 first order. DON Corporation, 86 Stafford Avenue, Box 445, Manahawkin, New Jersey, 08050

GET RICH "Money Making Secrets" Free Details. White Star, Dept. PM1, 520 Mill Street, Grass Valley, Calif. 95945

EASY MONEY WRITING LETTERS!!! Details, Workshop, 7219 Promaneda, Salt Lake City, UT 84121

FREE! 5 monthly issues of Opportunity Magazine. Learn the secret to earning extra cash. Issues full of profitable success stories. FREE. Write: Opportunity, Dept. 719, 6 N. Michigan, Chicago, 60602

2000% PROFIT — Selling information! Become publisher! Eastern Specialties, 377 Antenor, Pittsburgh, Penna. 15210

MAIL Business Really Works. All you need is an idea. Send \$2.00 for 100 plus ideas To: D.D., P.O. Box 813, Ellensburg, WA 98926

TAPES—DROP SHIPPED — Large Profits—Great Opportunity—Free Literature, SASE. Psychodynamics—PM7, 20 East Sahara, Tucson, Arizona 85705

BUILD PARTS For Us, For Specification And Prices. Send \$3.00 (Refunded First Job) To: Woodworkers, Box 33324, Denver, Colorado 80233

GOLD FOIL PRINTING FOR PROFIT. Personalize business cards, pencils, matches. Free Details, Gold Magic, POB 24966 (GG), Tampa, FL 33623.

BUMPER STICKER PRINTING DEVICE. Cheap, Simple, Portable. Free details. Bumper, POB 22791(GG), Tampa, FL 33622

SPARE TIME CASH. Sell Famous Hanover Shoes. Samples. Sales kit free. No experience needed. No age limit. Big Commissions. Hanover Shoe, Dept. 3224, Hanover, PA 17731

RABBITS-CHINCHILLAS-FUR BEARING ANIMALS

AMAZING Profits! \$10,000 Yearly Raising Rabbits for Wool and Breeding. Details—\$2.00. American Angora, Malta 12, Montana 59538.

\$600-\$1000 Month Plan raising Rabbits for us. Free details. White's Rabbitry, PM, Hudson, Ohio 44236.

RAISE RABBITS SUCCESSFULLY 68 Page Booklet Tells How. 50¢. American Rabbit Assn., H1, P.O. Box 426, Bloomington, Illinois 61701

PETS- BIRDS, CATS, HAMSTERS, ETC.

TROPICAL FISH. Heaters, Filters, Airpumps, 1,000's. By Mail. Catalog 25¢. Aqua, Orionville, Michigan 48462

EARTHWORMS, LIVE BAIT

FREE Literature. Raise Fishworms, Crickets, Red Wigglers — 1000 — \$8.95. 5000 — \$42.50. Postpaid with Free Book on How and Where to Sell. Carter Fishworms, Plains, GA 31780

POULTRY & GAME BIRDS

SWANS, Peacocks, Ornamental Poultry, Waterfowl. Hatching eggs, adults. "Everything—You Name It!" Specialized books, incubators, equipments. 999 picture color catalog \$1.00. Stromberg's Pets Unlimited, Pine River 59, Minnesota 56474

OF INTEREST TO ALL

SURVIVAL Equipment Food Books. Send \$2.00 For Catalog. American Survival, Suite 299H, 2005 Balboa, Newport Beach, Calif. 92663

HOTTEST NEW COLLECTIBLE - RARE GEMS! Details Free! Taylor's, 113PM Martin, Indian Harbor Beach, Florida 32937

NEED CREDIT? Get a Visa, Master Charge Card . . . with no credit check. Guaranteed! It's simple, legal. Plus other credit secrets. Free details! Send S.A.S.E. to: Inflation Reports, PM-A, P.O. Box 60148, Los Angeles, Ca. 90060

HOW TO MAKE MONEY THROUGH CLASSIFIED ADVERTISING. Booklet shows you how to start your own business with Classified Advertising. **ONLY \$1.00 FOR BOOK-LET** — (\$2.00 coupon refundable with first order). N.E. KAPPEL, POPULAR MECHANICS, DEPT. P, 224 WEST 57TH ST., NEW YORK, NY 10019

GOLD Coin; \$50. Silver Necklace; \$25. Nation, PM, Fairfield, IL 62837

VISA Card! No Credit Check. SASE to: Credit Consultants-PM, 2101 Delamo, Bakersfield, CA 93305

AMAZING FLASHY PHOTO BADGE. SEND SNAPSHOT. \$3.00. Joe Poits, Dept A, 6451 Ashton, Detroit, MI 48228

SUCCESS TECHNIQUES! Achieve wealth and happiness! **FREE DETAILS.** Tertaire Enterprises, PM-1, 3009 Brookwood Rd, Ellicott City, MD 21043

SAVE Money on Groceries! 5 Ways — \$2.00. Peachy's, Post Box 3102, Columbus, GA 31903

MICE-RATS? Exterminators Secret Without Traps Electronics Poison \$2.50. R Lindborn, 3007 Rice Ave, Rockford, IL 61103

"AUTOMATED Plant Watering Systems—For lush and lively plants. Latest methods booklet \$2.50. Aqua/Trends, Box 290085PM, Davis, FL 33329

SCWL SUBLIMINAL "audio" tapes - POSITIVE SELF ACHIEVEMENT - eliminate weight, stress - GAIN health, confidence. Release **ULTIMATE SUBCONSCIOUS ABILITIES** - discover **TOTAL CONTROL** of your life. **EXTRAORDINARY** popularity over hypnosis. Free brochure, university studies - **MIDWEST RESEARCH**, 1755 Williams Lake Road #22, Pontiac, Michigan 48054

SAVE TAXES- 21 ideas —\$3.00. Zelinsky, CPA, 535 Main St., Placerville, CA 95667

FREE Promotional Albums, Concert Tickets, Stereos, etc. Information: Barry Publications, 477 82nd Street, Brooklyn, NY 11209

OF INTEREST TO WOMEN

PROTECT yourself - Super loud sound alarm emits a piercing shriek at flick of a finger! Scares off muggers, etc. Send \$4.95 plus 50¢ P&H. Carlisle House, 923R Hollywood Ave., Bronx, NY 10485

GOVERNMENT SURPLUS

1982 Surplus Army, Navy store 64 pages illustrated catalog. Send \$2.00. Ruvel, 3037 N. Clark St., Dept. F-1, Chicago, IL 60657.

MILITARY Equipment Manufacturers Plus Government Surplus Sources. Proven List Free Bonus, \$2.00. Surplus Sales, P.O. Box 294, Trumbull, Connecticut 06611-0294

MOTORCYCLES — JEEPS — HELICOPTERS — AUTOMOBILES . . . GOVERNMENT SURPLUS DIRECTORY — MONEYBACK GUARANTEE — How, where—\$2.00. GS Information, Department 11, Federal Building, Box 3913, Springfield, Massachusetts 01101

SURPLUS Jeeps, Cars and Trucks available. Many sell under \$200! Call 312-742-1143 Ext. 7133 for information on how to purchase.

J-E-E-P-S, C-A-R-S FROM \$35.00! - 700,000 ITEMS! - GOVERNMENT SURPLUS - MOST COMPREHENSIVE DIRECTORY AVAILABLE TELLS HOW, WHERE TO BUY - YOUR AREA - \$2 - MONEYBACK GUARANTEE - "SURPLUS INFORMATION SERVICES," BOX 3070-B1, SANTA BARBARA, CALIFORNIA 93105.

GOVERNMENT SURPLUS . . . Millions of items (including Jeeps) . . . low as 1¢ on dollar! Most complete Directory available — \$2.00 (guaranteed). **DISPOSAL**, Box 19107-AA, WASHINGTON, DC 20036.

GOVERNMENT LANDS FROM \$7.50 ACRE! Homesites, farming, vacationing, investment! "Land Buyer's Guide" plus nationwide listings - \$2.00. Lands, Box 19107-AA, Washington, DC 20036

BUY Gov't Surplus. Free information — Name, Address to: **SURPLUS**, R1B1679, Anthony, Fla. 32617

LOANS BY MAIL

BORROW \$30,000 without interest! All eligible. Repay anytime. Free details. Infohouse, Box 1004PM, New York, NY 10003

BORROW By Mail! Free Details! MBG-PM 162, Box 2298, Sandusky, OH 44870.

BORROW BY MAIL! \$1,000 - \$25,000. Bad credit? Refused elsewhere? Write: Worldwide, Box 27191-PM5, Atlanta, Ga. 30317

QUICK \$Cash\$ Signature Loans! Write: Elite, Box 454-P, Lynbrook, New York 11563-0454

BORROW FROM HOME! Any amount, any worthwhile purpose, within 30 days. Competitive Rates. Also, you can earn substantial income as a Money Agent. No Experience — Own Hours. National Company to assist every way possible. No Gimmicks! Free Details: DFC, Dept. 10-C-1, 1145 Reservoir Avenue, Cranston, Rhode Island 02920

QUICK MAILLOANS! Free application! Lanoo, Box 724-B13, McMinnville, Oregon 97128

BORROW \$25,000 "overnight." Any Purpose. Keep Indemnity! Free Report! Success Research, Box 29070-AM, Indianapolis, Indiana 46229.

BORROW \$1,000—\$5,000,000. Difficult loans arranged. Personal, Business, Venture Capital. **RESEARCH UNLIMITED**, Drawer 300, Dayton, Washington 99328

MONEY Problems? Free Book describes Loans, Cash, Government Grants, Other benefits, available to individuals. Write: Associates, Box 98-AA, Brooklyn, New York 11236

BORROW BY MAIL! \$500.00 - \$50,000.00 No collateral. Bad credit, No problem!!! Write: GELCO Financial Services, Box 34293 B, Indianapolis, IN 46234

GET cash grants—from Government. (Never repay.) Also, Cash Loans. All Ages Eligible. Complete information, \$2 (Refundable). Surplus Funds-PM, 1629 K St., Washington, D.C. 20006

BORROW \$1,000-\$50,000 Secretly—"Overnight." Anyone! Credit unimportant. Repay anytime. No interviews. Collateral, Cosigners. Unique "Financier's Plan." Full information, \$2 (Refundable). Spectrum, 120 Wall St-7, New York 10005

BORROW \$125,000 EVEN IF REFUSED ELSEWHERE. No Gimmicks. IFC, Box 1146-PM1, Lawrenceville, Georgia 30245

PAY No Interest, \$5,000 Financing. All Eligible, Never Repay. Write: ABC-PMJ, Box 668, Lomita, CA 90717

PERSONAL

PHOTO ID. Sealed in plastic. All states, provinces. 24-hours. **GUARANTEED.** Send \$6.00 (2/\$10.00), photo, name, address, height, weight, hair, eyes, birthdate. **CARDINAL**, Box 5200-404, Jacksonville, Florida 32207.

BIBLE Questions answered. Stamped envelope. Bylon, 17167 Bertier, Detroit, Michigan 48219

COLLEGE DEGREES BY SPECIAL EVALUATION of EXISTING Credits & Job Experience. Fast. (614) 863-1791. Write: Box 13151-T1, Columbus, Ohio 43213.

BUG Detection Equipment. Literature, \$1.00. Citron, Box 220-P, Miami, FL 33168

DIVORCE? Don't Lose! Literature, Attorneys. **MEN'S RIGHTS ASSOCIATION**, 1896, Forest Lake, MN 55025

FINANCE YOUR DREAMS with Government and Foundation Grants. Details \$1.00. TOL-PM1, 432 PCH, Hermosa Beach, California 90254

DIVORCE! Know Tax Consequences Before Settlement. Information That Can Save Money and Problems. \$5.95. PGM Services, Box 65, Dravosburg, PA 15034

VISA Credit Cards, issued quickly without investigation. Free details. Stampund, 625 Post, San Francisco, California 94109

BACK PROBLEMS Self-help — Send \$3.00 to: Self-help, P.O. Box 474, Craigsville, West Virginia 26205

COLLEGE DEGREES BY MAIL. Renowned Universities offer fully-accredited Bachelors, Masters, PH.D.'s . . . Free revealing details. Counseling, Box 317-MP-1, Tustin, California 92680.

REMAILING SERVICE

CALIFORNIA Confidential Prestamped Remails, Received, Forwarded, \$1.00 Each. Marquis, Box 1866, Covina, CA 91722

CONFIDENTIAL, Reasonable, Complete Mail Services. 801-322-5358. Postal Shoppe, 369 East 900 South, Salt Lake City, Utah 84111

VIRGINIA BEACH Remails Stamped 50¢ Single. Madera, P.O. Box 5416, Virginia Beach, VA 23455

PRIVACY—Confidential Mail Forwarding/Receiving. Orlando Mail Drop, Box 18039 PM, Orlando, FL 32860

UNLISTED ADDRESS. Discreet and confidential. Remail \$1.00 Single. Mail Forwarding Service, 8050 S. Main, Houston, Texas 77025

FLORIDA REMAILS Receiving-Forwarding. Allen, 6326 Aultan Drive, Jacksonville, Florida 32210

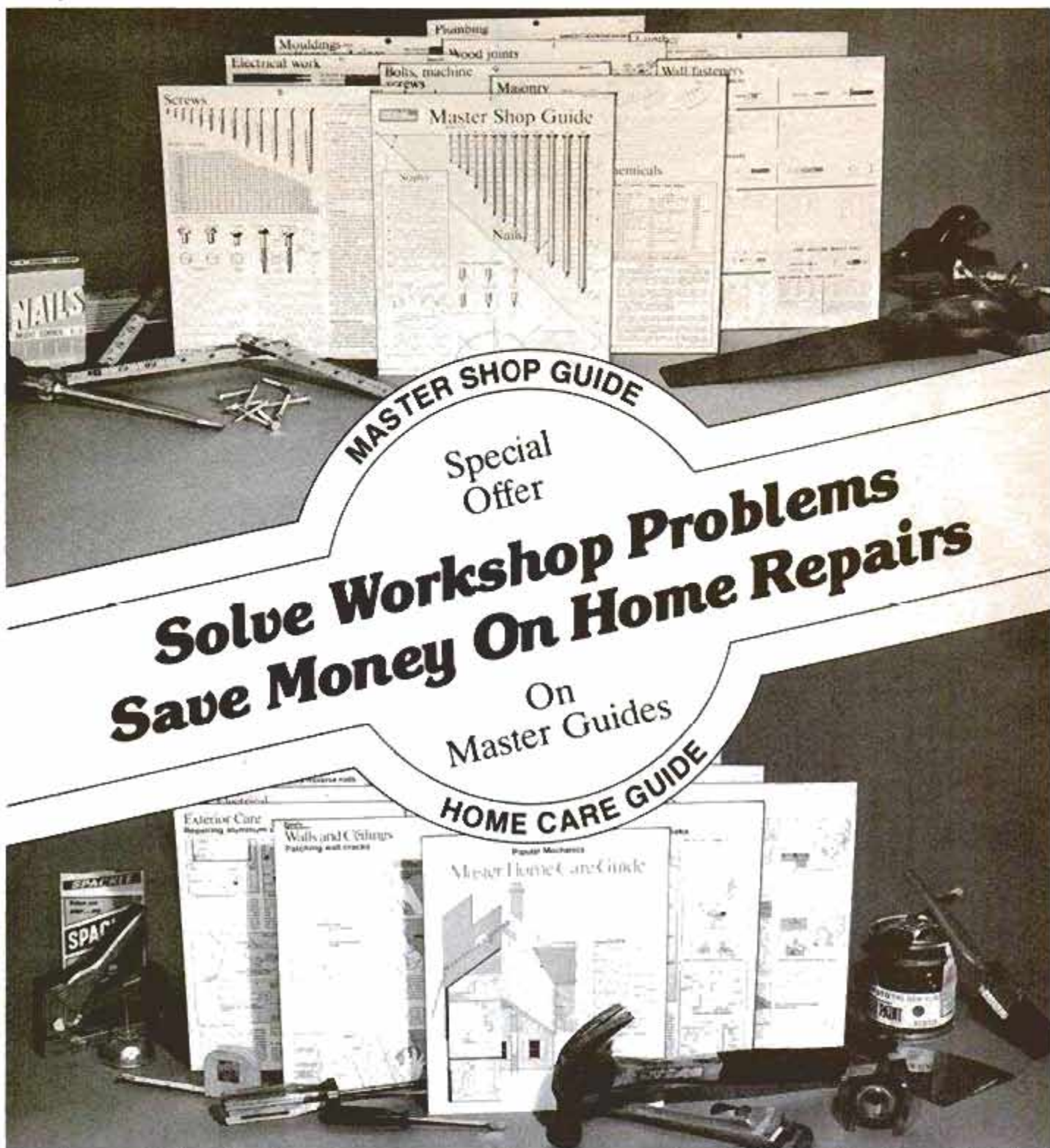
CONFIDENTIAL MAIL and PHONE Calls Received and Forwarded Daily. Central, Box 387PM, Claymont, DE 19703

HEART of the BERKSHIRE REMAILS. Stamped-\$1.00. P.O. Box 1469 Pittsfield, Massachusetts 01201

CONFIDENTIAL UNLISTED ADDRESS !!!! WRITE TO DAY !!!! REMAILCO, BOX 32, BEDFORD, MASSACHUSETTS 01730

INTERNATIONAL Directory of Remailers \$10.00. IRFA, Box 1536-M, Hilo, HI 96720-0332

(Continued on next page)



Take advantage of this special offer on Popular Mechanics' famous Master Guides.

The POPULAR MECHANICS MASTER SHOP GUIDE has helped hundreds of thousands of do-it-yourselfers solve workshop problems. We think it is one of the most important tools you'll ever buy.

The Shop Guide lays out everything you need to know, graphically and ready-to-use. All about nails, screws, bolts, wall fasteners, drills, abrasives, lumber, plywood, gypsum, adhesives, paneling, shop math, stair construction, masonry, wood finishing, plumbing, pipe fittings, electrical work, gutters,

concrete, remodeling measurements plus a built-in ruler, protractor, 45° triangle and compass.

The perfect companion to the Shop Guide is the POPULAR MECHANICS MASTER HOME CARE GUIDE. The Home Care Guide will enable you to tackle common home repair jobs like an expert. You'll be able to patch wall cracks, paint your house or apartment, hang wallpaper, hang drapery rods, hang a door and install a lockset, repair scratches in furniture and much more. The Guide also instructs you on methods of saving energy to help cut your fuel bills.

By using the coupon that appears on this page you can order both Guides for

\$7.95 postpaid. You'll save \$2.95 off the regular price. ORDER NOW! They also make great gifts.

PM MASTER GUIDE OFFER, Dept. 182
Box 1014, Radio City Station
New York, N.Y. 10101

Yes! Please send me the POPULAR MECHANICS MASTER GUIDES that I have indicated below:

___ Set(s) of both Guides at \$7.95 per set \$ _____
___ Home Care Guide(s) only at \$5.45 per Guide _____
___ Shop Guide(s) only at \$5.45 per Guide _____

TOTAL AMOUNT REMITTED \$ _____

Name _____

Address _____

City _____ Zip _____

Make check or money order payable to Popular Mechanics.

**THERE'S NEVER BEEN
A TRUCK LIKE IT BEFORE.**



CHEVY

S-10

TOTALLY NEW. QUALITY BUILT!

A new-size, high-quality pickup. The new Chevy S-10 is longer than the import pickups and smaller than full-size pickups. It's American-built and engineered for accurate metal-to-metal fit—for quality you can see, hear and feel.

Twice the towing power of the imports with available V6. An optional 2.8 Liter V6 and optional Heavy-Duty Towing Package let a properly equipped Chevy S-10 haul up to 4,000 lbs., including trailer and cargo. What's more, a Heavy-Duty Payload option lets Chevy S-10 haul bigger payloads than many full-size pickups.

Chevy S-10, shown with optional Tahoe trim, in Cinnamon Red.

Higher gas mileage ratings than any of the best-selling import trucks. The S-10's standard 1.9 Liter four-cylinder engine has some very impressive gas mileage ratings.

49 STATES

CALIFORNIA

39

28

40

28

EST. HWY. EPA EST. MPG (CITY) EST. HWY. EPA EST. MPG (CITY)

Use estimated MPG for comparisons. Your mileage may differ depending on speed, distance, weather. Mileage will be less in heavy city traffic. Actual highway mileage lower.

Some Chevrolet trucks are equipped with engines produced by other GM divisions, subsidiaries, or affiliated companies worldwide. See your dealer for details.

Totally new Chevy S-10. There's never been a truck like it before. A great combination of features. High mileage. Available V6. Big payload and towing capacity. Quality fit and finish. Roomy cab. Smooth ride. Double-wall construction. There's never been a truck like it before.

DON'T WAIT. ORDER YOURS TODAY.



**CHEVY IS THE POWER
IN TRUCKS.**

100's, 1.1 mg. nicotine av. per cigarette by FTC method.

© 1981 R.J. REYNOLDS TOBACCO CO.

Winston

Nobody does it better.

This is your world.
This is your Winston.
Smooth. Rich.
Taste it all.

Warning: The Surgeon General Has Determined
That Cigarette Smoking Is Dangerous to Your Health.

