

JUNE 1982 \$1.50

Popular Mechanics

A Master
Woodworker's
Great Shop

RETURN OF THE MIGHTIEST WARSHIPS

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

800,000-MILE REPORT

FORD MUSTANG:
Owners Praise
Sporty Styling
And Handling

**PLANS: MAKE
PM's OUTDOOR
ADIRONDACK
FURNITURE**

CAR STEREO:
Add-Ons That Make
A Good Set Great!

**PLANS: BUILD OUR
GIANT GARDEN CART**

**HOW COMPUTERS
ARE DESIGNING YOUR
NEXT CAR**

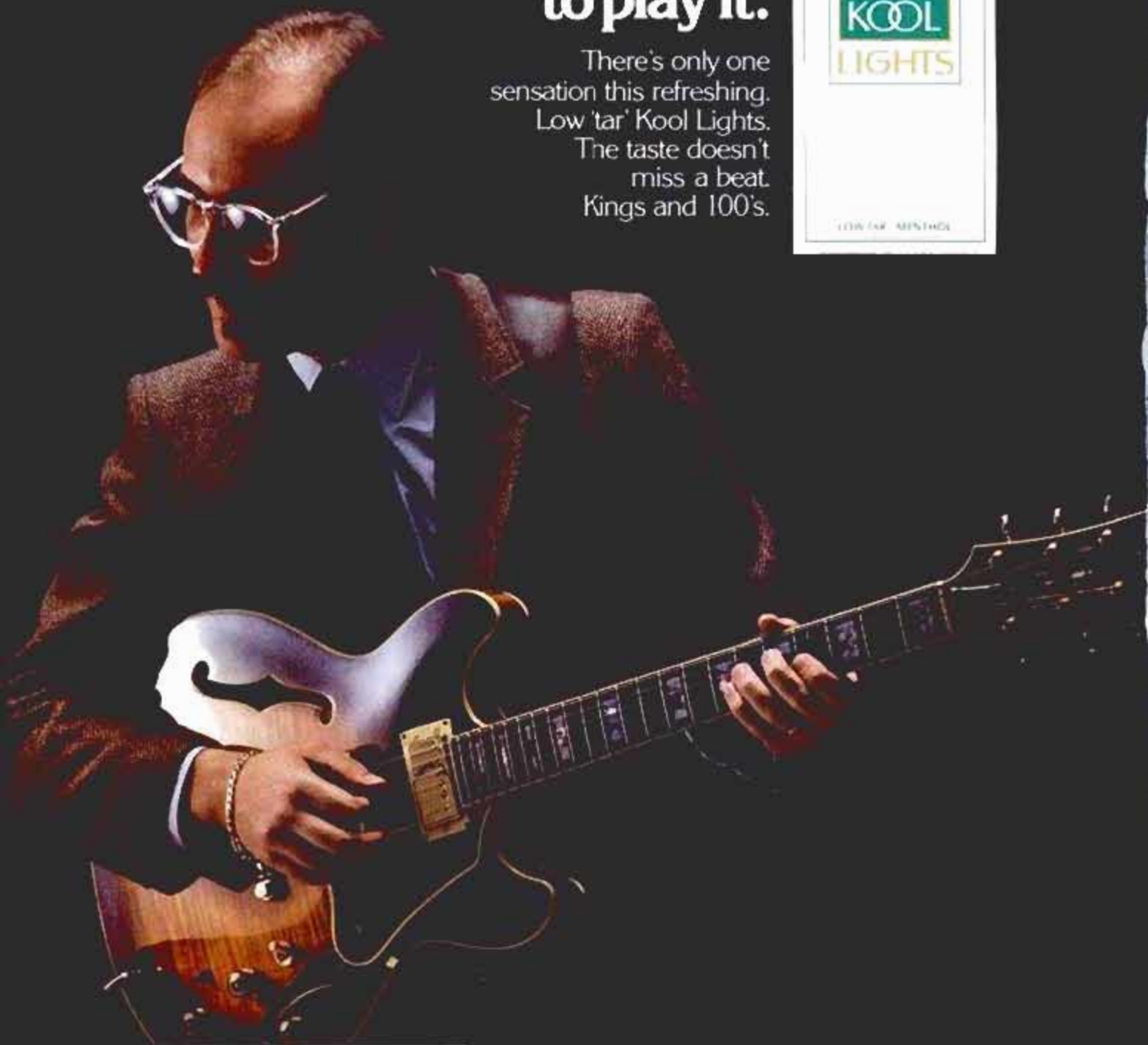


Battlewagon New Jersey
Back At Sea With Rocket Punch

KOOL LIGHTS

There's only one way
to play it.

There's only one
sensation this refreshing.
Low 'tar' Kool Lights.
The taste doesn't
miss a beat.
Kings and 100's.



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

Kings, 9 mg. "tar", 0.8 mg. nicotine; 100's, 10 mg. "tar",
0.9 mg. nicotine av. per cigarette by FTC method.



TWO OF THE WORLD'S GREAT ENGINEERING ACHIEVEMENTS.

Few things in this world are built like Ruth Gordon and the new Subaru Brat.

WHAT OTHER BODIES COMBINE SO MANY IMPRESSIVE FEATURES?

Like Ruth, the Brat is tough. And it has a personality all its own. Besides all new styling, the Brat offers outdoor bucket seats and a Halo Twin Roof.™ *

GREAT PERFORMERS.

The Brat delivers the best gas mileage of any four wheel drive

vehicle. (27) EPA est. mpg, 36 est. highway mpg.** What's more, the Brat has Front and On Demand Four Wheel Drive.

ENGINEERED LIKE FEW THINGS ARE ENGINEERED.

Most importantly, Ruth and the Brat are built to last. So if you're the kind of person who appreciates quality workmanship, look into Ruth Gordon and the new Subaru Brat. Each sold separately.



THE NEW SUBARU BRAT.®

INEXPENSIVE. AND BUILT TO STAY THAT WAY.

*AVAILABLE ON GL MODELS.

**1982 EPA ESTIMATES. USE EST. MPG FOR COMPARISONS. YOUR MILEAGE MAY DIFFER DEPENDING ON DRIVING SPEED, WEATHER CONDITIONS AND TRIP LENGTH. ACTUAL HWY. MILEAGE WILL PROBABLY BE LESS.

© SUBARU OF AMERICA, INC. 1982

100% BLENDED SCOTCH WHISKIES, 86.8 PROOF. IMPORTED BY SOMERSET IMPORTERS, LTD., N.Y. © 1981

THE MOST BEAUTIFUL SUMMER
EVENINGS START WITH RED.

JOHNNIE WALKER® RED
THE RIGHT SCOTCH WHEN ALL IS SAID AND DONE.





On the cover

When it puts to sea for trials in two months, the *USS New Jersey* will be the world's only active battleship. Our artist's view shows the awesome offensive power of the ship provided by its mix of heavy guns and modern missile systems. The story on page 73 tells how the Navy sees the role of its "new" capital ships
—PM painting by Ed Valigursky

Popular Mechanics

JUNE 1982

CONTENTS

VOLUME 157 NUMBER 6

INTERNATIONAL EDITIONS: CARIBBEAN, MEXICO, SOUTHERN HEMISPHERE

Special features:

Great shop for a master woodworker

Old World craft tools coexist with power equipment in the latest in PM's Great Shop series

94

Computers help design your next car

Detroit turns to computers for optimizing design and performance features

76

PM Owners Report: Ford Mustang

Amid the usual quibbles over low power and mileage, high marks for styling and handling.

82

Plans in this issue:

Build terrific-looking outdoor furniture in the "Adirondack" style from our plans

116

Plus a full-size garden cart to handle chores, and carry tools and supplies.

123

Car stereo add-ons

Latest modular refinements can turn an average car system into a mobile concert hall

80

Automobiles and bikes

- 11 Imports and Motorsports
- 33 The PM Garage
- 35 Saturday Mechanic: Troubleshooting Ford's Microcomputer Control Unit—Part 2
- 40 Car Clinic
- 50 Detroit Listening Post
- 58 The high-mileage files: New carburetor and manifold yield better mpg
- 82 PM Owners Report: Mustang 5.0
- 89 PM's long-term car tests
- 90 The hot blast from France . . . and one from Kenosha
- 147 Firsthand Report: Audi Quattro: Germany's 4x4 cruise missile

Electronics, radio and TV

- 20 PM Electronics Monitor
- 76 How computers bring cars to life
- 80 Supercharge your car stereo
- 156 The brain trigger . . .
- 156 . . . And "champions" who shoot blanks

Science and engineering

- 8 Science Worldwide
- 73 The born-again battlewagons
- 86 Back-yard voyage to the stars
- 153 It came from Down Under
- 154 A Fair deal
- 155 6 rms, riv vu

Boating and outdoors

- 60 All Outdoors
- 92 New look for no-fuel boating

Photography

- 54 Photo hints
- 84 Capture the stars on film

PM'S 1982 OUTDOOR LIVING GUIDE

- 101 Cover
- 103 PM's custom deck for a charming home
- 110 Little sheds for your yard
- 116 Build PM's Adirondack lawn furniture set
- 123 Build this garden cart
- 126 Energy-wise guide to spring pool maintenance
- 129 New products for outdoor living
- Shop and crafts
- 48 PM Workbench
- 55 New Now for home and shop
- 66, 137, 140 Hints from readers
- 94 Great Shop: A master craftsman's old world shop
- 98 2 shop tricks from master craftsmen
- 100 Workshop Minicourse: Getting an edge
- 132 Build this Colonial drop-leaf table
- 182 Turning a scaled-down wood replica
- 184 PM looks at new abrasive system

Home and yard

- 24 Homeowners' Clinic
- 46 Appliance Clinic
- 138 Build this tomato trellis
- 180 PM looks at portable blower

Aviation

- 31 Anatomy of a wing-walk
- 154 Everyman's crop duster

Every month

- 6 Letters
- 14 Notes from the Editor
- 27 PM Briefs
- 153 Technology Update

Worth writing for

Looking for more ideas and information? See page 177.

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 0033-450X) 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. Canada and all other countries, add \$18.00 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 20, 1950, c. 1982 by The Hearst Corporation. All rights reserved. Printed in U.S.A.

POSTMASTER: Please send address changes to Popular Mechanics, P.O. Box 10064, Des Moines, Iowa 50330.

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 carriers 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 50330. * Should you have any problem with your subscription, please write Joan Harris, Customer Service Department, Popular Mechanics, P.O. Box 10064, Des Moines, Iowa 50330. 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 50330

POSTMASTER: Please send address changes to this address

What do you do
when the load's
too heavy for
your little Chevy?



Take the Coleman Caboose.TM



The new Coleman Caboose lets your quick little car carry like a wagon.

The Caboose is light, lithe and rolls like a roycce. Just the ticket for spruces and spring seedlings, bricks and boards, luggage and leisure gear, or the antiques you can't pass up at the auction.

You can even get an optional top that keeps out weather, and locks to keep out intruders.

And when your haul is over, the Caboose stands on end and hides against a garage wall, fence or utility shed.

The Coleman Caboose.
It's fun. It's functional. And it
only costs about as much as
a good set of radials.

Hubs available as accessory

Coleman
AUTOMOTIVE PRODUCTS - WICHITA, KANSAS

Popular Mechanics

Editor-in-Chief: John A. Linkletter
Executive Editor: Joe Oldham
Managing Editor: Bill Hartford
Design 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

Science: Dennis Eskow, editor

Technology: Robin C. Nelson, editor

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 Andresen, 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) 262-4800

Classified Advertising Manager: H. E. Kappel
(212) 262-4825

Published by The Hearst Corporation

President

Frank A. Bennack Jr.

Chairman

Randolph A. Hearst

President, Magazines Division

Gilbert C. Maurer

Publisher, Popular Mechanics

Daniel J. Coleman

Publishing Consultant

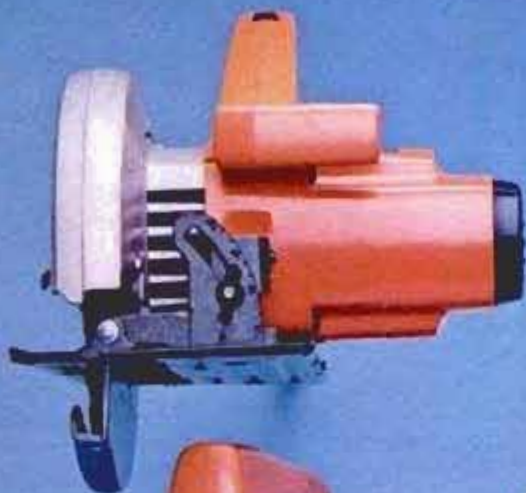
Richard E. Deems

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. Mithick, 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.

HANDYMEN, MEET YOUR MAKERS.

ON SALE
MAY 31 THROUGH JUNE 19

**Black & Decker
7 $\frac{1}{2}$ " Circular Saw:**
With no-ground
double insulation,
power lock-off
button, sawdust
ejection chute,
and permanent
lubrication.
\$42.97



**Black & Decker
1/3-HP Variable
Speed Jigsaw:**
Featuring fingertip
speed control, cali-
brated tilting shoe,
detachable cord,
and no-ground
double insulation.
\$27.97



**Black & Decker 5/8-HP
Router:** Routs, grooves,
trims, decorates.
Featuring all-ball-
bearing construc-
tion, precision
vertical depth
adjustment,
and no-ground
double
insulation.
\$29.97

**Black & Decker
Bench Grinder:**
With 10" wheel
spread for grind-
ing longer objects,
and self-aligning
sleeve bearings for
accurate work.
Includes two
grinding wheels, tool
rests, wheel guard
covers, eye shields,
rubber feet, and 6' cord.
\$34.97



**Black & Decker
Value Plus power
tools are on sale
from May 31 through
June 19 at over 1,900
K mart stores
across the U.S.A.**

Black & Decker quality at a K mart price. Nice.

Kmart
The Saving Place[®]

LETTERS TO THE EDITOR

Some like 'em hot

As a woman considering a new high-performance car, I enjoyed Joe Oldham's article *Detroit Puts Muscle Back In* (page 109, Mar. '82). But in his review of the Mercury Capri, he says: "Most women won't like this car. Most men will."

Unless Oldham has had a sex-change operation, he doesn't know what women will like. I, and many of my women friends, enjoy a car that really goes.

KRISTI CARLSON
LISBON, N.D.

What happened to the Chevrolet Citation X11 and Pontiac Phoenix SJ? I was under the impression these cars were made in Detroit.

ALVIN WASSERMAN
MIAMI BEACH

Oldham writes in glowing terms about superfast acceleration, smoking tires and beating out the next guy at a stoplight. People with driving habits like these are bad news for everyone on the road. A car is a piece of heavy machinery that can mangle people and other cars when driven without caution.

Our roads are crowded with cars, pedestrians, cyclists and children. No one can drive in a vacuum.

FRED DEVIN
NEW HAVEN, CONN.

Author Oldham replies: Maybe our roads wouldn't be so crowded if people didn't poke along at ridiculously low speeds. Seriously, though, we were talking about what seems to be a peculiarly American phenomenon; we certainly weren't advocating reckless driving habits.

We reviewed the Chevy Citation X11 in our January '82 issue (An American Sport Coupe Takes On Four Imports, page 88). It blew the doors off the foreign competition. Pontiac wasn't advertising its Phoenix SJ as a performance car until recently. We tried to get a Trans Am for our muscle-car test, but only one had been built at the time and it was not available.

Missing windmill mystery

Motorists on Interstate 10 near Palm Springs, Calif., will not see those two giant windmills you showed in your March '82 issue (*PM Briefs*, page 96). The vertical Darrieus rotor blew to pieces the first

time it was started, and the propeller type had to be dismantled shortly thereafter because of problems.

If NASA had acted with the same efficiency on the space program, John Glenn would still be waiting on the launch pad.

ADAM BALAS
PALM SPRINGS, CALIF.

It's a bit embarrassing, we admit, but they sure were there when the photo was taken. Word from DOE is that the Darrieus rotor has been temporarily abandoned, but the propeller type is being rebuilt and will be back in service soon.

PM's treetop hideaway

Here's a photo (below) of the tree house I built from your plans (*Build This Treetop Hideaway For Your Youngsters*, page 92, Aug. '80). Because my trees were farther apart



PM's tree house, as built by reader Mario Albano. Open porch ahead of roofed area is nice added feature where space permits.

than the ones you showed, I used 2x8s for the main support beams instead of 2x6s. I also had room to add an open porch in front of the roofed section.

The children love the house, but there's one problem: Now they want me to build furniture for it.

MARIO ALBANO
SHREVEPORT, LA.

Sorry we got you into more work, but you did a great job on the structure. For others who may be interested in this project, photocopies of the article are available for 75 cents from Popular Mechanics, Box 1014, Radio City Station, New York, N.Y. 10101.

No hot air

It was great to see your article *Now We're Ballooning On Solar Power* (page 100, Apr. '82). In 1967, I built a

model of Lee Ashman's solar-powered balloon for a science fair project. My teacher said I was wasting my time and should be working on something "important."

Funny how times change.

SCOTT PARKER
BEAUMONT, TEX.

Zap—you're alive!

I'm very pleased with the NiCd battery rejuvenator I built from your plans (*Zap Your NiCd Batteries To Life*, page 62, Feb. '82). It has made it possible for me to rejuvenate NiCds that I was unable to restore by any other means.

CHARLES J. ASEA
PARSIPPANY, N.J.

Automated gate

In a recent *Homeowners' Clinic* (page 32, Jan. '82), a reader inquired about using an electric garage-door opener to operate a fence gate. We did exactly this to control a 12-foot sliding driveway gate. It works great.

I used a standard opener, modified to operate at 90° from its intended position. I lengthened the rail, chain and cable, readjusted the stop switches to accommodate the longer travel and enclosed the motor assembly in a waterproof housing. Total cost: \$198.

Anyone wishing more information about this procedure is welcome to write to us.

GUS FOSSUM
42052 3rd ST. E.
LANCASTER, CALIF. 93535

A cool idea

In your March '82 issue (*The PM Garage*, page 74), you say that electric cooling fans in cars are more efficient than belt-driven ones. How can it be more efficient to run a fan off the generator, which is driven by the engine, than directly off the engine itself?

W. B. DELONG
HOCKESSIN, DEL.

Auto editor Tony Assenza replies: An engine-driven fan uses 3 to 5 hp and runs all the time, even when it doesn't have to, such as during highway cruising. But a thermostatically controlled electric fan comes on only when water temperature indicates it's needed, and it runs on reserve power already available. Thus, the saving.

PM

POWER RAM 50



Dodge introduces the "Four Wheeler of the Year."

"...the Power Ram 50 is one of the all-around great mini 4x4 pickups to hit the market!" *Four Wheeler, Jan. 1982*

"...any way you slice it, the Power Ram 50 is the best there is among small 4x4 pickups." *Pickup, Van & 4WD, Jan. 1982*

"This is not a mini pickup like all the others from Japan but rather a mini 4x4 that rivals the power and performance of any (small) pickup you choose to stick it against."

4 Wheel & Off-Road, Jan. 1982

That's a sampling of what the experts have to say about the new Dodge Power Ram 50. Here are some key facts behind the raves.

More hauling power than Datsun and Toyota.

Power Ram 50 hauls the biggest standard payload in its wheelbase class. It's got the biggest engine you can get in a small 4x4 pickup. Most horsepower, most torque. Its independent front suspension shows you true grit over rocky terrain.

Drive it yourself. Odds are you'll discover what the experts

already know: in the tough world of 4-wheel drive, Dodge Power Ram 50 is the toughest small pickup of them all.



Dodge Ram 50 4x2. Introducing a new, low-priced Dodge Ram 50 model, available in limited quantity. **\$6199*** Order now while supplies last.

Winners: In 1981 Dodge Ramcharger won *Four Wheeler* magazine's "Four Wheeler of the Year" award. Now Dodge Power Ram 50 is 1982's winner, and *Off Road* magazine's "4x4 of the Year."



	Dodge Power Ram 50 Sport	Datsun Sport 4x4	Toyota SR-5 4x4
Engine, liters, cyl.	2.6 Four	2.2 Four	2.4 Four
Horsepower @rpm	105 @5000	98 @5200	100 @4800
Torque @rpm, lbs.-ft.	139 @2500	127 @2800	129 @2800
Payload, lbs.	1510	1400	1400
Fuel tank capacity, U.S. gal.	18.0	15.9	13.5
Box length, in.	81.5	73.4	72.2
Steering type	Power	Manual	Manual

*Base sticker price excluding title, taxes and destination charges. Price as of 3-15-82.



RAM TOUGH

SCIENCE WORLDWIDE

Water, water everywhere

Calling all scientists: Be on the lookout for 260 million tons of water vapor missing each year. Originally, scientists thought the water that evaporates from the Earth's surface trickles back down as precipitation.

But Lawrence Livermore physics lab sleuth Hugh Ellsaesser has measured the vapor content of the stratosphere and discovered hundreds of millions of tons less vapor than expected. In a recent paper, NASA researcher Ed Danielson suggested that the missing vapor may get supercooled at high altitudes, float partway down, get warmed and rise again. This moving around keeps it from being detected. However, Ellsaesser notes, the large thunderstorm systems in which this supposedly takes place aren't massive enough to hide the vapor. Thus, the mystery continues.

Sunlight

Solar collectors of the future may look like arrays of fluorescent bulbs on a large rectangular frame. Researchers at the General Electric labs in Schenectady, N.Y., report that experimental collectors, using clear plastic glass tubes resembling fluorescent bulbs, gathered more sunlight than standard glass or plastic bubble covers of conventional collectors.

As the sun moves across the sky, the tube shape presents a greater surface area on which to shine. The glass-tube array sits atop slabs of high-temperature plastic foam that serves as a perfect insulator.

When the collector comes to market later this decade, GE expects it to gather three times more solar heat during a northern U.S. winter than conventional models.

Skin-chilling news

Skin taken from a dead donor's back, chest and thighs once could remain "viable" for only 24 hours. But Dr. Randolph May at St. Agnes Medical Center in Philadelphia now reports keeping skin viable for weeks by slowly freezing it to -385° F. for storage, then warming it to room temperature in 15 seconds when a transplant is required.

Viability is the skin's ability to retain moisture, control body temperature and prevent infection. After a few weeks, the body rejects the donated skin. But by then, a fresh layer of skin has grown back to do

Donut-shaped magnets to hold fusion clouds



First of 22 big magnets is delivered to Princeton for the high-energy fusion reactor.

The "conservation" laws of physics say, in effect, there's no such thing as a free lunch. But a bargain is permissible.

Thus, Princeton's donut-shaped Tokamak fusion reactor will begin operations later this year. At temperatures of hundreds of millions of degrees Fahrenheit, the reactor will join single atoms of light-weight deuterium to form heavier elements, while also releasing vast amounts of energy.

Obviously, it takes energy to make energy. But the bargain comes from the fact that the plasma cloud produced in the

reactor will yield more energy than required to create it—if you can keep the cloud from drifting apart.

That's why the Tokamak is lined with 22 high-powered magnets. The 11-ton coils use 1,500 feet of copper to conduct electricity. When wound, each has an inner-circle diameter of 10 feet and a 14-foot outside diameter—a very tight fit. Westinghouse Electric delivered the first of the magnets earlier this year and will complete delivery by early winter. Princeton officials hope to generate a reaction that pays for itself by 1985.

the job. With the new technique, skin has been kept up to 80 percent viable for "several weeks."

New chemical group

A Purdue University team has discovered the first new class of "chondrite" meteorite in 150 years. (Chondrites are the remains of meteors created at the beginning of the solar system.)

Examining a meteorite that fell near Cumberland Falls, Ky., chemist Michael Lipschutz and his assistants dubbed the group "fosterite," after the iron-magnesium fosterite mineral particles found inside the meteor. The chondrite drew the chemists' attention because of its odd interior color—ash white with jet-black speckles. Lipschutz says that analysis has shown it contains carbon, which is odd for a meteorite.

Whistle stop

An unidentified federal agency was about to grant money to a scientist whose work had been exposed as a fraud, when "someone blew the whistle," according to Rep. Albert Gore Jr. (D.-Tenn.). But members of the congressional science and tech-

nology oversight subcommittee—chaired by Gore—met with officials of the agency and the grant money was quickly withdrawn.

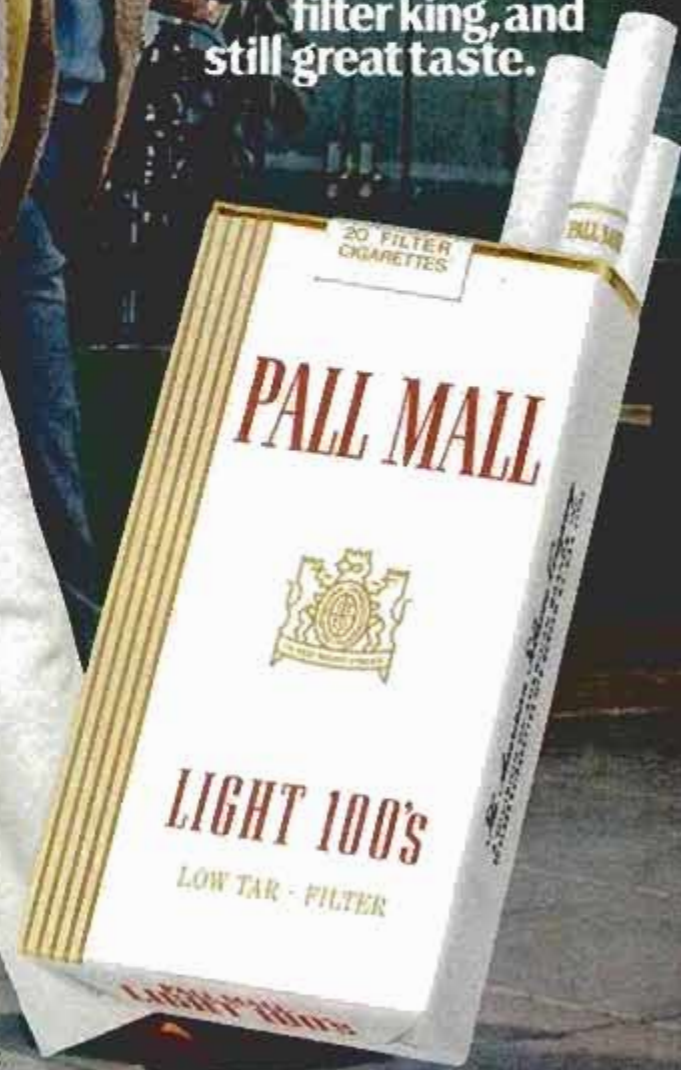
In an exclusive interview with PM, Gore declined to name the agency, but said the subcommittee probably will hold hearings later this year, because he and other members aren't "entirely satisfied with the response" of federal agencies to charges of unchecked fraud by scientists working under federal grants.

During hearings last year, the House panel uncovered several incidents in which scientists knowingly falsified data to get papers published or to qualify for grants. PM



Did you say $\frac{1}{3}$ less tar?

Pall Mall Light 100's.
A third less tar
than the leading
filter king, and
still great taste.



Pall Mall
Light 100's 9mg. tar 0.8mg. nic.
Leading filter king 15mg. tar 1.1mg. nic.
Lowest brand
less than 0.01mg. tar 0.002mg. nic.

9 mg. "tar", 0.8 mg. nicotine av. per cigarette, FTC Report Dec. '81.

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

Windsor's taste beats V.O.!

Over 7,000 drinkers across the country have compared the taste of Imported Windsor Canadian to the taste of Seagrams V.O.

And they chose the mild, smooth taste of Windsor over V.O.—57% to 43%.

If you're a Windsor drinker, that will come as no surprise. But if you're not, try the taste of Windsor and find out for yourself why it's the Canadian that stands alone.

You can't beat the taste of Windsor. And you certainly can't beat the price.

WINDSOR 
ONE CANADIAN STANDS ALONE



IMPORTS & MOTORSPORTS

Cabri-olé!



The 911SC Cabriolet, Porsche's drop-top version of its 3.0-liter, six-cylinder rear-engine Coupe, is now in production.

Spring was in the air when the Geneva Motor Show opened in March, so I made a beeline for the new convertibles.

Best of the bunch, hands down, and top down, is the Porsche 911SC Cabriolet. It's the first all-open car from Porsche since the 1965 Model 356, and it's not to be confused with Targa models which have the built-in roll bar. The cleverly designed soft top lets the Cabrio retain 2+2 seating, and the top's aerodynamic profile, similar to the Coupe's roof, lets the Cabrio run just as fast: 145 mph top speed. There's no production convertible that's faster. One of the options with the Cabrio, which arrives here later this year with a sticker topping \$30,000, is a good ol' tonneau cover. You merely unzip the driver's side and buckle in to blast off.

Not as fast, but maybe even more fun is the much more affordable rag-top Samba. This Everyman's convertible, from the French Talbot firm, is a Pininfarina design that I

would love to see marketed here. No such plans are in the works, however, so VW, with its Rabbit convert, continues to have the four-seat, open-air market to itself.

Show stopper among the nonproduction design exercises was from



Corsa roadster is a show car from Opel.

none other than General Motors. The Opel Corsa show car is a four-seater that's based on the European S-car that will be built in Spain and debut later this year. The production car will be nothing like this one, though.

There's a fairing behind the driver's seat, making the car look like a little racer, and other unique features. What a neat roadster!



Talbot Samba is a mini-convertible with economical 1,360-cc Four and lots of charisma.

Turbos galore

Making its world premiere at Geneva was Mitsubishi's Starion, a turbo-charged 2+2 fastback that'll be the eye-catching car in the new Mitsubishi dealer network. It'll have to buck the tough RX7/Supra/Z-car triumvirate. In Europe, all of Mitsubishi's cars—Starion, Sapporo, Colt, Galant and Lancer—are offered with turbos.

Turbos for diesel and gas engines are showing up everywhere; Rolls-Royce previewed the Bentley Mul-sanne Turbo, one hot luxury sedan,



Mitsubishi Starion Turbo arrives in '83.

with the turbo boosting top end to 130 mph and cutting 0 to 60 to 7.4 seconds. Then there are the VW-Audi cars, which are getting turbodiesels almost across the board. We'll be seeing some this fall.

Gimme a break

A new version of Peugeot's 505 made its debut at the Salon International de l'Automobile: It's the wagon, of course—or "break" as they call it in



Peugeot 505 wagon will get a turbodiesel.

Europe—and it will delight Peugeot fans who have tired of the bulbous old 504 wagon. So, if you're all ready for a really elegant hauler, this is the one. **PH**



It's times like this you've got a Wagner®

3 mins.

*We painted a shutter
in 3 minutes
with a Wagner
Power Painter.
It took us
22 minutes
with a brush.*

4½ mins.

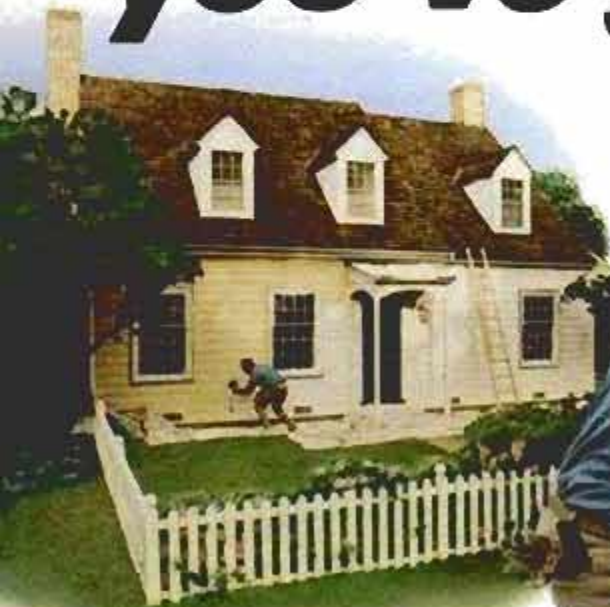
*We painted this wicker
chair in 4½ minutes
with a Wagner Power
Painter. It took us 1
hour with a brush.*

6½ hrs.

*We painted this house in 6½ hours
with a Wagner Power Painter.
It took us 17 hours with a brush.
Both were done excluding trim.*

21 mins.

*We painted an eight-foot
section of this fence
in 21 minutes with a
Wagner Power Painter.
It took us 1 hour and
20 minutes with a brush.*



that'll make you glad Power Painter.™

Every once in a while you come across a product that offers significant advantages over a tried-and-true method of doing things.

In the case of painting, consider a Wagner Power Painter, instead of a brush.

A Wagner Power Painter's speed should quickly make a believer out of you. Just among the examples we've shown, the time saved is astonishing.

And a Wagner Power Painter is ideal for dozens of other painting chores around the house.

Professional-looking results made easier

Of course, speed isn't a Wagner Power Painter's only long suit.

A Wagner Power Painter also makes it remarkably easy to achieve professional-looking results - the spray lays down a smooth, even finish with no brush marks.

And when it comes to intricate painting jobs like wrought iron railings, louvered doors and bicycles, it's amazing the way a Wagner Power Painter reaches into crevices and applies paint.

That's also why a Wagner Power Painter is so effective on rough, textured surfaces like shake shingles.

Spray paints, lacquers, stains, varnishes, and more

Virtually any kind of latex or oil-based paint is compatible with a Wagner Power Painter.

It can also apply stains, varnishes and lacquers. Or spray almost any other liquid, even pesticides.

So a Wagner Power Painter is a lot more than just a "one project" tool.

And cleanup is simple - just run the appropriate solvent through until it's clean.

No air compressor

The secret to a Wagner Power Painter is a precision electric, piston-driven pump.

It creates a pressure that propels liquid out through the tip, which then forms the spray.

There's no bulky air compressor to lug around. And significantly reduced "fogging" that usually accompanies painting with compressor-powered sprayers because a Wagner Power Painter doesn't mix the paint with air.

Helpful attachments

A variety of helpful attachments make Wagner Power Painters even more versatile.

Complete outfits include things like a flexible spray tip designed exclusively for floors and ceilings.

And a tube that replaces the reservoir, so you can draw paint right from the can.

You can even get an optional spray tip that narrows the spray for precision painting.

But rather than simply reading about a Wagner Power Painter, we suggest you visit your local hardware store, paint store, home center or wherever quality paints are sold.



Then ask to examine a Wagner Power Painter first-hand.

Whether you're painting your '57 Chevy or the broad side of a barn, you'll discover there's a Wagner Power Painter that's just right for you.

And we think you'll also discover it's high time you owned one.



WAGNER
Brochures
Dept. L
1770 Fernbrook Lane
Minneapolis, MN 55441

Please send your free "How to..." brochures to help me learn more about painting with a Wagner Power Painter.

Name _____

Address _____

City _____

State _____ Zip _____

Allow 4-6 weeks for delivery.

PS-21

WAGNER

The Right Tool for Painting.™

GUARDING YOUR ★ MILITARY EXPERIENCE

FRINGE BENEFITS

If you have experience in any branch of the Armed Forces, you could not only be earning a good extra income—but enjoying some valuable fringe benefits—while you hold one of the most important jobs in America. In an Army Guard unit close to home.

Here are some of the many fringe benefits you get for serving just two days a month and two weeks annual training each year (after an initial training period) in the Guard:

Free air travel: is available to you as a service member anywhere in the continental U.S., Alaska, Hawaii or Puerto Rico, on a space available basis.

Education Assistance: depending on the state in which you serve, you may be eligible for tuition aid, college loan repayment and other types of education assistance. Your local recruiter has complete details.

A bigger pension: you'll earn extra retirement credits, and you can start collecting your pension at age 60.

PX Privileges: up to 48 visits a year.

Low-cost life insurance: up to \$20,000 in coverage for just pennies a day.

You'll also be helping people in your community and state when natural disasters or other emergencies strike. We think you'll find that's the biggest "fringe benefit" of all.

Fringe benefits. Just one more reason to Guard your military experience in the Army National Guard.

To learn about other reasons—from cash bonuses to new skills—see your local recruiter, or call toll-free 800-638-7600.*

*In Hawaii: 737-5255; Puerto Rico: 723-4450; Virgin Islands (St. Croix): 773-6438; Maryland: 728-3388; in Alaska, consult local phone directory.

**The Guard is
America at its best.**



NOTES FROM THE EDITOR

John A. Sillerton

"It was one of those small, but telling, points," said PM's Steve Willson to sum up a visit to Ernest Glaser's shop (page 94).

While examining some pine cabinets Glaser made, Steve asked why the drawers worked so well. Glaser revealed that he had carefully laminated maple strips to the drawer bottoms and cabinets to gain such effortless movement—instead of using commercial slides.

It was a simple technique, and nothing to rival the elegance of his furniture making. But, such details mark the work of a craftsman.



The cutting edge: PM's Willson makes time-honored inspection in a fine craftsman's great shop.



Out of the Fuego and into the bunkers: Auto buff Assenza becomes a war-history buff while at Omaha Beach.

Are car buffs truly fighter pilots at heart? Seems so. PM's Tony Assenza, after testing a new Fuego and Renault 9 (page 90), toured Normandy's war sites.

Devoted as he is to cars, Tony was finally moved to murmur: "I'd even turn in my driver's license to have been in the cockpit of a P-51 here."



Time capsule: Hand-set type still remains in the mothballed Iowa's newspaper shop.

Touring the mothballed Iowa for our born-again battleship story (page 73), Technology Editor Robin Nelson reports he felt he had entered a time capsule. He found such relics as a complete, 1940s-style soda fountain. But most interesting was the ship's newspaper print shop—with drawers of hand-set type. "Somehow," says our bemused technologist, "I think news that crawls across the inevitable TV monitors of the reactivated Iowa is not going to have the same flavor." **PM**

Michelin radials for every road. Or no road at all.

Michelin 'X' radials are designed to give you the ground-grabbing traction you need on just about any kind of road. Or no road at all.

And you've got a lot more going for you when you're going on Michelins. Like outstanding handling, and traction; fuel savings up to 6% depending on how you drive, and long tread life compared to bias ply tires. Puncture protection, too, and excellent retreadability.

That's why more and more drivers are picking up Michelin radials for their pickups. We pioneered the radial for light trucks and we pioneered specially designed radials for vans, campers and 4-WD's, too.

See your authorized Michelin dealer. You'll find Michelin radials are competitively priced with other leading radials. When you start with Michelins there's no stopping you.

MICHELIN
We put America on radials.





© 1992 PP

GREEN-WINGED TEAL

Plates shown smaller than actual size (9" diameter).

*Announcing
a major new porcelain plate collection ...*

WATER BIRDS OF THE WORLD

by Basil Ede

*An exciting new series of twelve collector's plates
by Europe's foremost wild bird portraitist.*

MADE IN GERMANY BY WILHELM KUNSTWERK

Each plate bearing an original work of art created by Basil Ede exclusively for this collection.

Each decorated with a border of pure 24 karat gold.

Available by subscription only.
Advance subscription deadline:
July 31, 1982

THE ARTIST. Basil Ede, of Sussex, England, has been called "the outstanding wild bird portraitist of his generation, and perhaps of his century." He is widely regarded as Europe's most distinguished bird artist. Indeed, the authority of his style and the distinction of his work have profoundly influenced the way birds are portrayed by artists throughout the world.

After notable exhibitions in London and other major European cities, Basil Ede was honored by a one-man show at the Smithsonian Institution's National Collection of Fine Arts in Washington, D.C. This was followed, during recent years, by important exhibitions at New York's famous Kennedy Galleries.

His paintings have been commissioned by the National Audubon Society and the World Wildlife Fund, among others. And he is represented in many public and private collections, including the Smithsonian Institution and the collection of HRH Prince Philip, Duke of Edinburgh.

Now, at the height of his career, Basil Ede has created an important new series of superlative works of art in fine porcelain — *Water Birds of the World*. Twelve



CANADA GOOSE

collector's plates portraying the wild beauty and majesty of water birds in precise, authentic detail — with Ede's inimitable flair for color and composition.

Each of these twelve plates is, in itself, a masterful work of art. Together, they form an incomparable collection that will be a proud acquisition for every sub-



WOOD DUCK

scriber ... a focus for conversation and admiration when displayed in the home.

THE WATER BIRDS PLATES. The plates will be large in size — 9 inches in diameter — to provide full scope for Ede's finely detailed portrayals of water birds in their natural habitat.

And they will be crafted under the supervision of Franklin Porcelain in Japan, by craftsmen schooled in the delicate, demanding art of fine porcelain.

Franklin Porcelain has devoted more than two years to meticulous preparation for the issuance of these plates, and every detail will be of the highest quality. For example, each plate will be hand-decorated with a border of pure 24 karat gold. And each plate will incorporate as many as sixteen separate ceramic colors.

Ede's very beautiful and marvelously accurate works of art — created especially for this collection and available only on these fine porcelain plates — make this an acquisition that will be enjoyed and prized by all who love the beauty of birds, of art, and of porcelain.

THE SIGNATURE EDITION. The first edition of this collection will be a special Signature Edition. Each collector's plate in this limited edition will bear Basil Ede's signature on the back in 24 karat gold. This signature will appear *only* on the plates in this first edition.

The plates in this unique edition will be crafted exclusively for individual subscribers. The edition is available only until the end of 1982. And the limit of one collection per subscriber will be enforced without exception. Thus, the total number of sets of the Signature Edition will be forever limited to the exact number of original subscriptions entered during the offering period.

ADVANCE SUBSCRIPTION DEADLINE: July 31, 1982. The Signature Edition will be issued to subscribers at the conven-

ient rate of one plate every other month. The original issue price of just \$55 per plate is payable in two convenient monthly installments of \$27.50 per month. Each plate will be accompanied by specially written reference material and a special wall mount. And a Certificate of Authenticity will accompany each collection.

There is no need to send any payment now. But your advance subscription application is valid only if postmarked by July 31st.



----- ADVANCE SUBSCRIPTION APPLICATION -----

WATER BIRDS OF THE WORLD

*Valid only if postmarked by
July 31, 1982.*

Franklin Porcelain
Franklin Center, Pennsylvania 19091
Please enter my subscription for the *Water Birds of the World* porcelain plate collection, bearing new and original works of art by Basil Ede and his signature in 24 karat gold.

I need send no payment now. The twelve plates are to be sent to me at the rate of one plate every other month, and I will be billed for each plate in two equal monthly installments of \$27.50* each, with the first payment due in advance of shipment.

**Plus my state sales tax*

Signature _____
ALL APPLICATIONS ARE SUBJECT TO ACCEPTANCE
Mr. _____
Mrs. _____
Miss _____

PLEASE PRINT CLEARLY

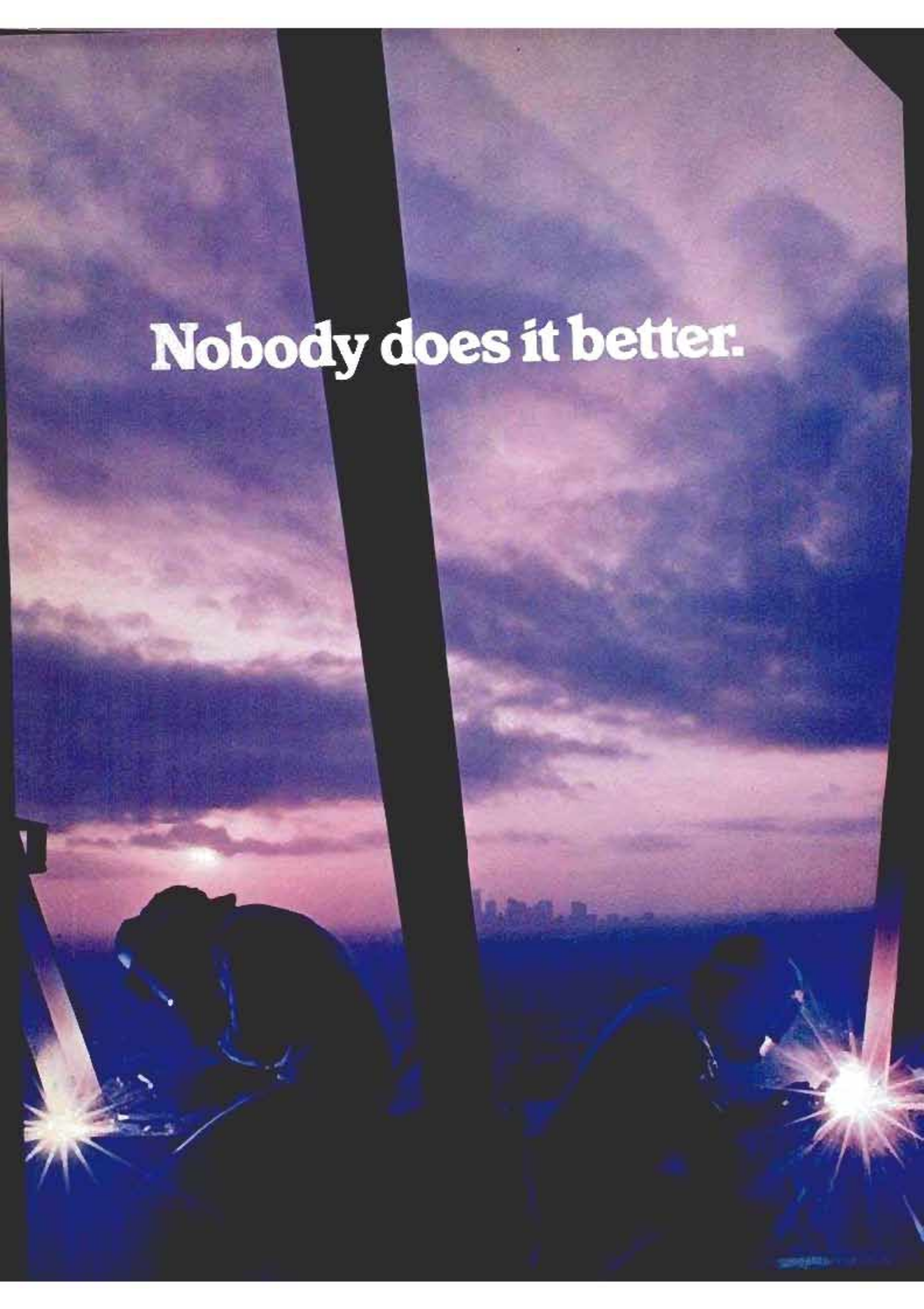
Address _____

City _____

State, Zip _____

Limit: One collection per subscriber.

Nobody does it better.



LIGHTS: 11 mg. "tar", 0.9 mg. nicotine,
LIGHTS 100's: 12 mg. "tar", 0.9 mg. nicotine, av. per cigarette, FTC Report DEC. '81.

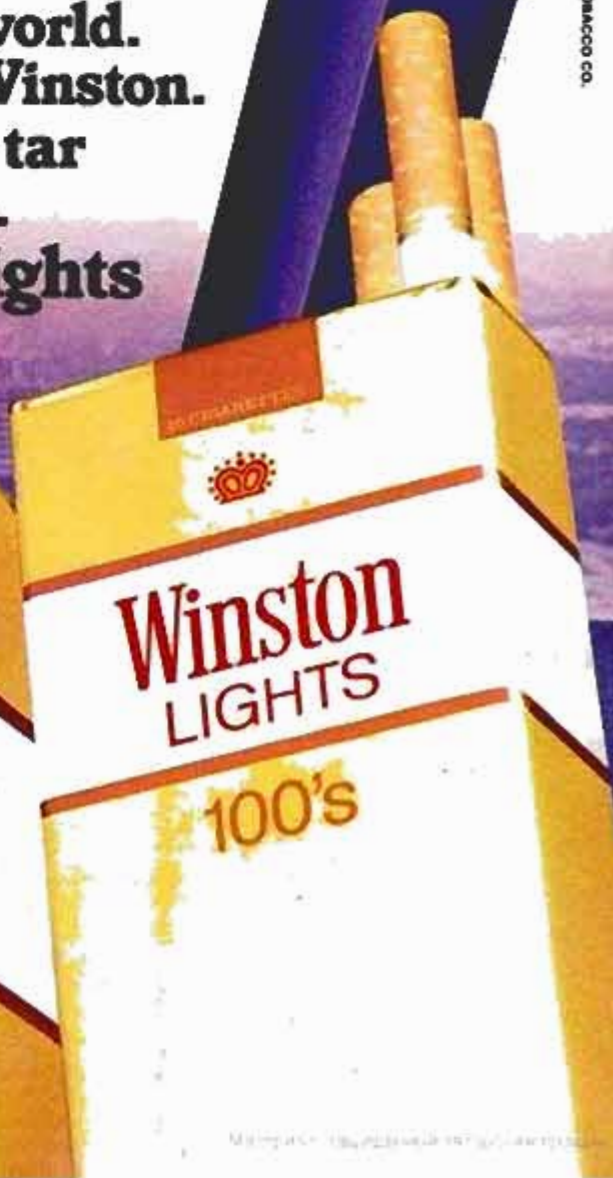
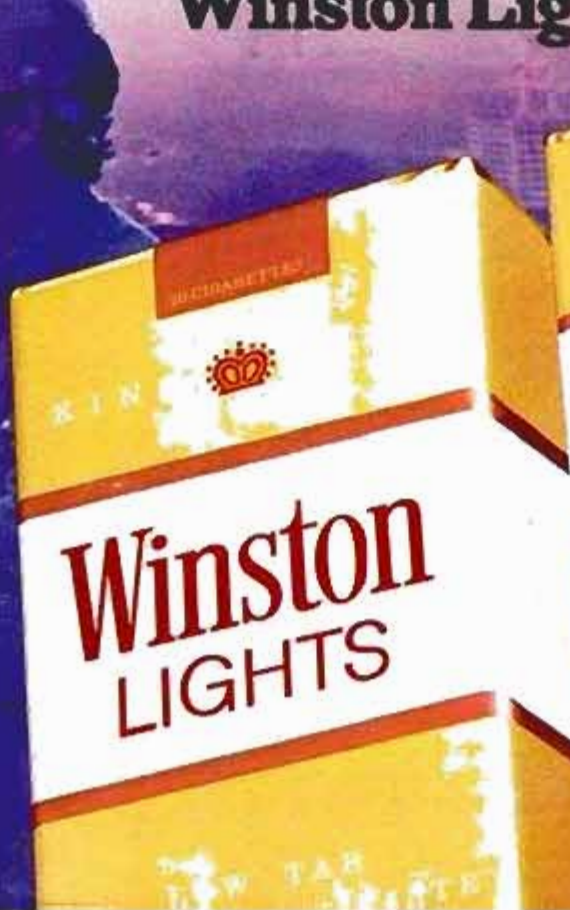
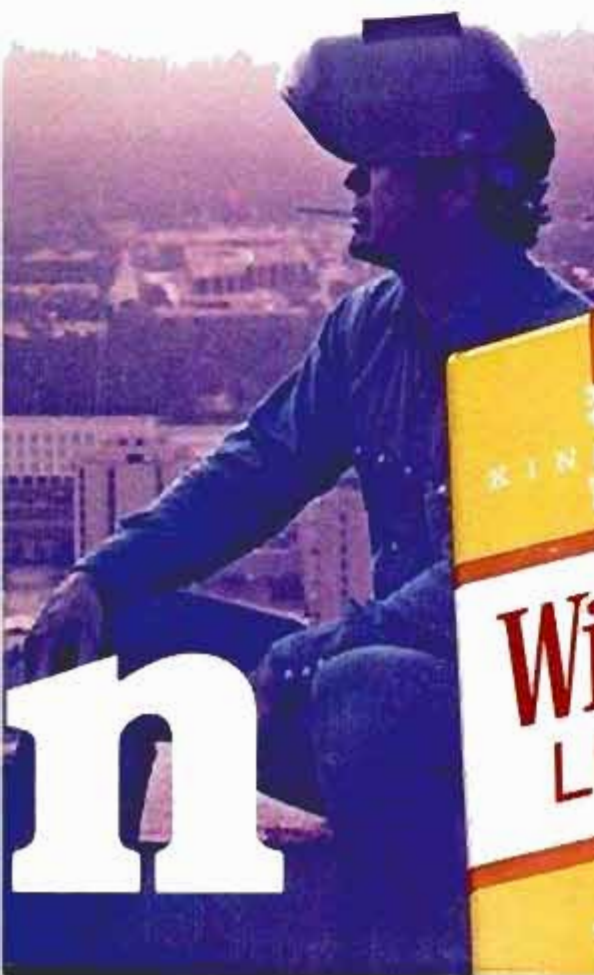


Nobody does it better.

Winsto

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

**This is your world.
This is your Winston.
The only low tar
built on taste.
Winston Lights**



© 1982 R.J. REYNOLDS TOBACCO CO.

Multiple cigarettes per pack. Tar and nicotine content varies by brand and type.

HOMEOWNERS' CLINIC

QUESTIONS ANSWERED

Soundproofing a room

My bedroom is on the second floor of a remodeled house. The studs are 2x6s with 6 in. of insulation in the walls. I sometimes work night shifts and sleep during the day. Since my neighborhood is quite noisy, I wondered if you could tell me how to soundproof the room inexpensively?—Jeff Nelson, Virginia, Minn.

The National Bureau of Standards book, NBS Building Science Series 104, quotes from the 1974 ASHRAE (American Society of Heating, Refrigerating and Air-conditioning Engineers) *Handbook of Fundamentals* that "noise within a room is absorbed by draperies, rather than reflected as from uncovered glass. Also, outside noise transmitted through the glass is partially absorbed (by draperies). The denser the weave and the heavier the drapery, the more effective it is in reducing noise transmission." The same

book mentions that storm windows and weatherstripping aid in stopping sound.

I would add storm windows and, if space permits, a floor-to-ceiling drape the length of the outside wall. A thermal drape installed on a traverse rod would also help.

Insulation removal

The local roofing company that just reshingled my roof told me to remove the fiberglass insulation installed between my ceiling rafters. I installed this insulation about 10 years ago with the vapor barrier facing the living space. When the new roof was put on, I also had a thermostatically controlled fan installed on my roof. The roofer said that unless I removed the insulation, the shingles would curl. Is he right?—James Barber, New Castle, Pa.

James, unless you're not telling me all, I think the roofer has a part

ownership in your heating-fuel supplier. We can't imagine why he would have given you such advice.

Blazing campfires

Our fireplace is about 4 feet below grade in our trilevel house. Two or three days after we have a fire, the family room still smells like a campfire. I added a draft stopper on top of the chimney, installed glass doors and have had the chimney cleaned professionally. However, the problem persists. Any suggestions?—Craig G. Letchner, Livonia, Mich.

Craig, I've checked several authorities, but can only give you some general theories here. The odor could be the result of flow reversal, a situation that is most typical of basement fireplaces in multistory houses. When the temperature of the air within your chimney is lower than in the house, the air in the chimney can flow downward. The higher the chimney, the colder the air and, thus, the better chance you have of downdrafts. Also, your house can become slightly depressurized from exhaust fans in the kitchen, bathroom and clothes dryer. This also causes flow reversal.

To prevent the latter from happening, introduce outside air into your home with a vent to your fireplace, for example. This is discussed in "Having And Eating Cake" (*Homeowners' Clinic*, page 70, June '80). Such problems are covered thoroughly by Jay Shelton in his excellent book, *Wood Heat Safety*; it's \$10.95 postpaid from Garden Way Publishing, 1508 Ferry Rd., Charlotte, Vt. 05445.

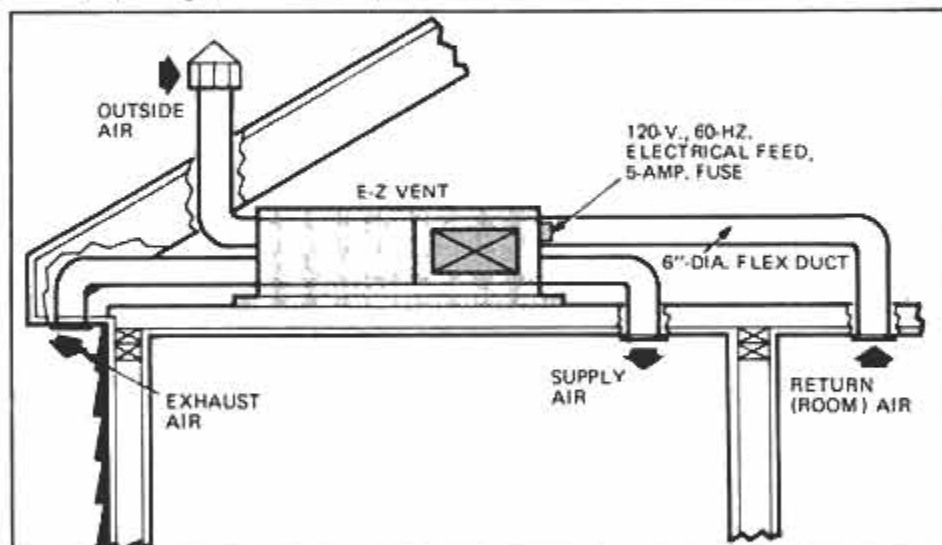
PM

SERVICE TIP

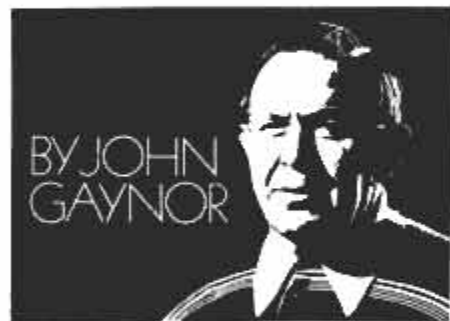
In past *Homeowners' Clinics*, I've mentioned the need—under certain conditions—to introduce fresh, outside air into the living environment. The main problem to overcome is the prewarming of the air in the winter, and the precooling of it in the summer prior to distributing it in the house. E-Z-Vent, by Des Champs Laboratories Inc., accomplishes this by ducting the stale and moist air through a heat exchanger prior to exhausting it to the atmosphere (see drawing below). In the summer, this may be the cooled air, and in the winter, the warmed air. The fresh outside air is then drawn into the heat exchanger, circulated around the heated or cooled (depending upon the season) air and

deposited into the house at temperatures very near those of the exhausted air. (The heat exchanger permits the two airstreams to be brought into close proximity, but doesn't allow them to mix.) The E-Z-Vent "transfers the heat or energy of outgoing air to the fresh air," as the company explains it.

You can install E-Z-Vent in the attic or crawl space of your home. It's approximately 14 x 16 x 62 in.; the unit contains a heat exchanger, two blowers and a filter. It sells for about \$500. For the name of the representative nearest you or for more information, write: Des Champs Laboratories Inc., Box 440, East Hanover, N.J. 07936.



Outside air enters through the E-Z-Vent, is cooled or warmed, depending on the season, and then enters the room via the supply air duct. Stale, moist return (room) air enters the heat exchanger and passes to the atmosphere via the exhaust air duct.



BY JOHN GAYLOR

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.

THE SECRET OF THE LONG-LASTING ROOF SHINGLES.

To understand what makes an Owens-Corning roof so incredibly durable, you have to look inside one of our roof shingles.

There. Right in the middle. The heart of the shingle is a layer of pink Fiberglas® mat.

A HEART OF PINK FIBER GLASS MAKES THEM LAST.

It won't absorb moisture. So the shingles defy years of rain and snow. Without blistering, curling or buckling.

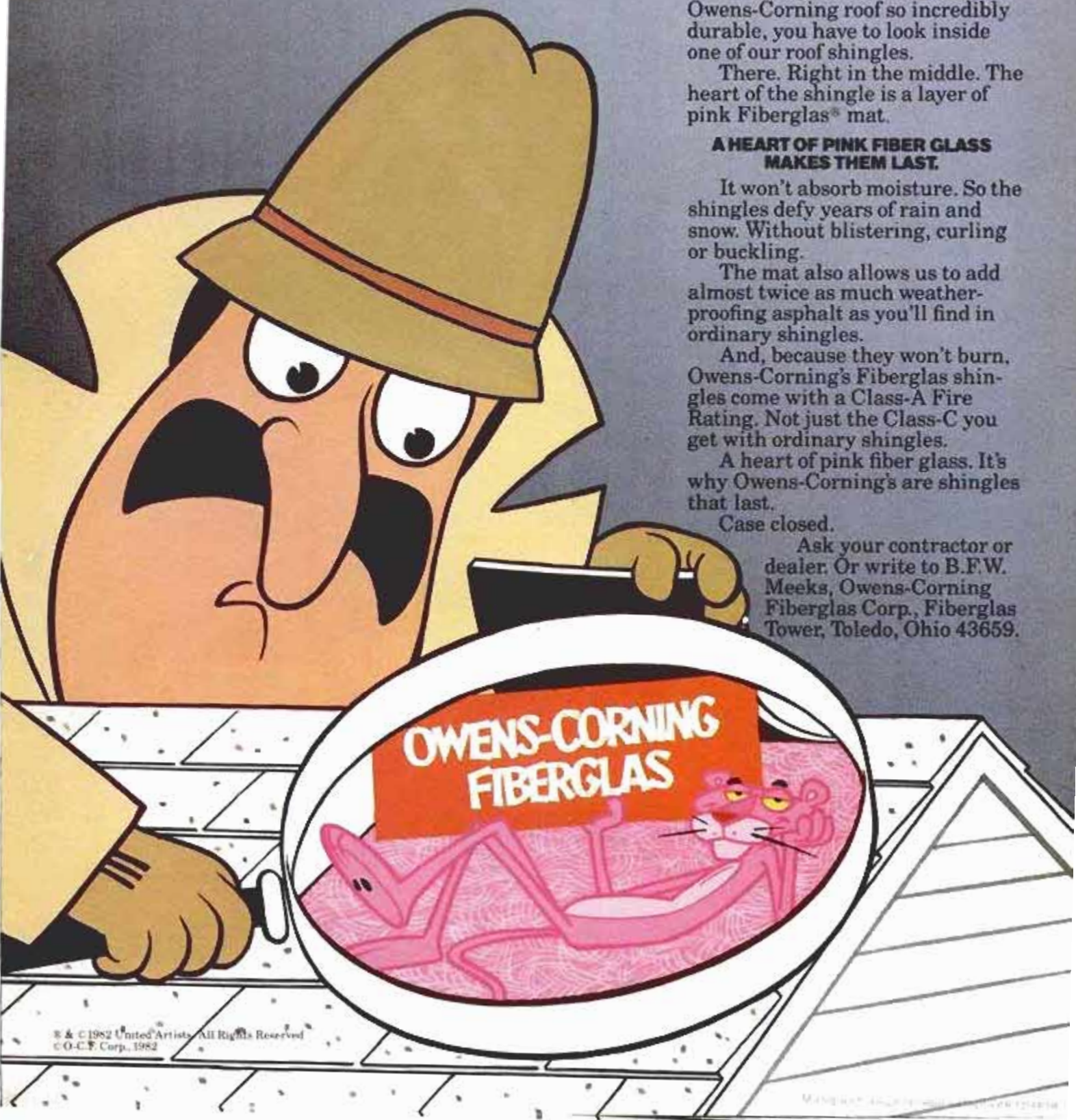
The mat also allows us to add almost twice as much weather-proofing asphalt as you'll find in ordinary shingles.

And, because they won't burn, Owens-Corning's Fiberglas shingles come with a Class-A Fire Rating. Not just the Class-C you get with ordinary shingles.

A heart of pink fiber glass. It's why Owens-Corning's are shingles that last.

Case closed.

Ask your contractor or dealer. Or write to B.F.W. Meeks, Owens-Corning Fiberglas Corp., Fiberglas Tower, Toledo, Ohio 43659.



The impossible is now possible.

With new Minute Wax™ you can wax your car in less than 15 minutes.

That's what we said, less than 15 minutes. And people just like you proved it in an independent research study.

It's another amazing breakthrough from Turtle Wax: the first and only no-wait car wax. All you do is spray it on. And wipe it off. There's no waiting for a haze. No hard buffing for a shine.

Just think, that famous Turtle Wax® finish in less than 15 minutes. The impossible is now possible with new Minute Wax™ silicone car wax.



Spray it on.



Wipe it off.
No waiting.
No hard buffing.

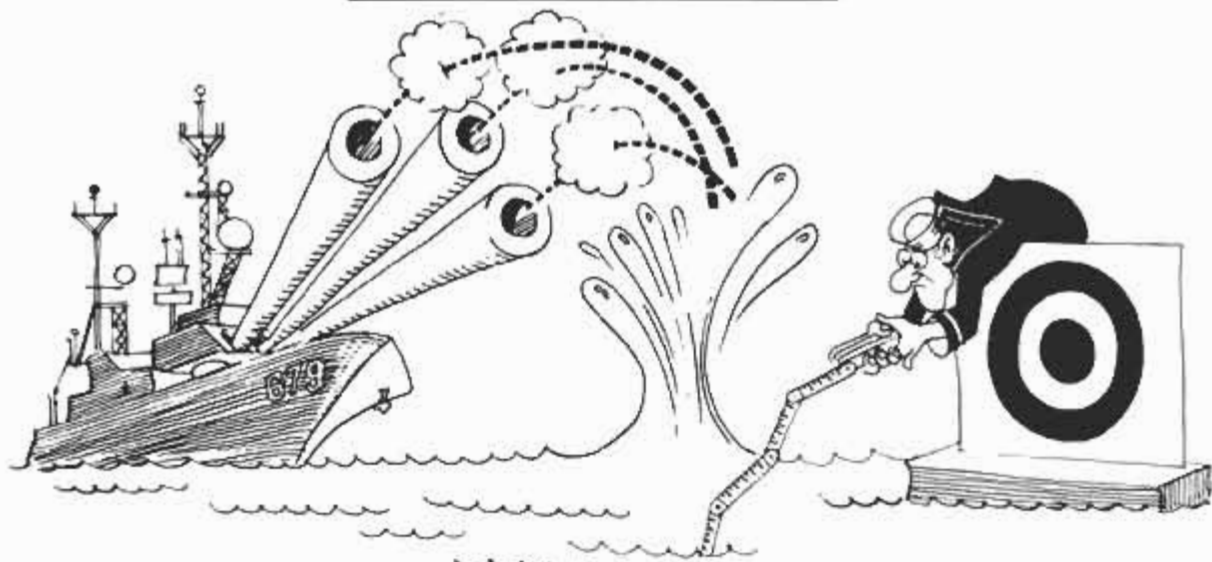


That famous Turtle Wax® finish in less than 15 minutes.

© 1982 Turtle Wax, Inc.



IPM BRIEFS



Great Guns

Fascinated by the information that a 2,700 pound projectile can go from zero to 1,700 mph within the 68 feet of a battleship's 16-inch gun barrel (see page 73), we had a question: How fast, we wondered, was that same shell going at the end of its 20-plus mile trajectory. With the Pentagon on the other end of the phone, we requested to know the 16-incher's "terminal velocity"—aware that proper

terminology is everything when approaching the military. The Navy said it would get back to us.

A few days later, word came that the "terminal velocity" of the shell is zero.

It turns out that the Navy measures "impact velocity" of a projectile at a theoretical point one foot from a target. For a 16-inch shell, it's about 1,100 mph.



PM's Whatsit

Given the culture's inclination for poetry in plumbing, you might easily guess at first sight that the device shown in this photo sprang from the brow of a Frenchman. Correct. In addition, what's happening is quite clearly indicated—all you have to do in this case is believe it. You don't? Turn the page.

Oh, the humanity...

Are you ready for Blimpboard? It's being billed as an *indoor* advertising medium, suitable (it says here) for arenas, gymnasiums, malls and schools. The blimp is 6 feet long and filled with 14 cu. ft. of helium (breathe easier, sports fans). It flies and maneuvers entirely by remote control, powered by batteries driving three gondola-mounted motors. Promotional messages can be silk-screened on the blimp's sides; or, a banner can be flown beneath it. And for getting out of those tight corners, it offers a unique function: It flies in reverse. Blimpboard is at 1636 North Woodland, Provo, Utah 84601.



It comes to grips with almost any condition.



Goodyear's all-season, all-terrain, all-position Wrangler Radial.

Rain, mud, sun or snow. Wrangler All-Season Radial helps you drive through almost any weather.

Its tread and construction give you the traction characteristics of a mud-snow tire.

The fact is, Goodyear Wrangler Radials were developed and proved in off-road racing. Through deep mud and sand, over sharp rocks.

And, unlike some tires of its type, Wrangler Radial has a tread computer-designed for

quiet highway driving.

Wrangler Radial also has steel-belted construction. With the greater strength, flatter footprint, longer tread life, and slightly better fuel economy of radials over bias-ply tires.

So put your truck on the radial that comes to grips with almost any condition. The all-season tire that's identical to the one we race.

Goodyear's all-season, all-terrain, all-position Wrangler Radial.



GOODYEAR
QUALITY AND INNOVATION

CANADA AT ITS BEST[®]

Light. Smooth. Imported Canadian Mist[®]
The whisky that's becoming America's favorite Canadian



Share some tonight.

IMPORTED BY B-F SPIRITS LTD., N.Y., N.Y. CANADIAN WHISKY—A BLEND. 80 PROOF. © 1979.
Photographed at Bow Lake, Province of Alberta, Canada.

Anatomy Of A Wing-Walk

Don't call it a stunt, says a pilot who put a world's record 19 souls on an airplane wing and calls it 'an adventure in engineering.'



Writer Martin Caidin has always been obsessed by airplanes, but his life took on another dimension when he acquired a vintage German Ju-52 transport several years ago. A frequent air-show participant, Caidin was looking for something new to do with his bird, dubbed "Iron Annie," when the idea of a record-setting wing-walk came up. . .

PM Why did you do this stunt?

MC Don't call it a stunt. That's the last thing it was.

PM Then what would you call it and why did you do it?

MC I'd call it an answer to a challenge. An engineering adventure. A dream for a pilot. A lot of people said it simply couldn't be done. That tells you what it was—a challenge, engineering, pilotwise and personal.

PM Describe how you prepared for the, well, let's call it the event.

MC It started a few months before we began getting ready to try for the world's record—14 people

Coed group of 19 'chutists clings to the ancient plane momentarily (top) before making quick but orderly exit into air.

outside an airplane. Around Christmas in 1980, U.S. Army sky diver Phil Rogge asked if I ever tried putting people out on the wing of the Ju-52. We'd done it a few times, but it was small stuff. So we decided to try it by putting people almost all the way out instead of hugging the fuselage?

PM How many people?

MC We figured seven on the wing and a couple atop the fuselage. Remember, we had no idea what would happen. We took off the left door, tied ropes all over the place and went up to 9,000 feet. I figured I'd better cut power so the prop blast

wouldn't dump these guys off the wing. I was hitting about 115 mph when out they went on the wing and . . . good-bye lift! The control yoke in my hands went mad and jumped around and she rolled right over on her back.

PM That plane went inverted?

MC She rolled over on her back as pretty as you please, shaking like mad, and went down in a gentle rolling dive and got up to about 160 mph true airspeed. Those guys out there on the wing were hanging on and yelling like maniacs. At 5,000 feet, I hit power, they let go of the ropes, the shaking stopped and we pulled out. It was a terrific ride.

PM And that gave you the idea for the world's record?

MC It sure did. We figured if we could have seven on a wing and two atop the fuselage, without any power, we could fly with 18 people on the wings.

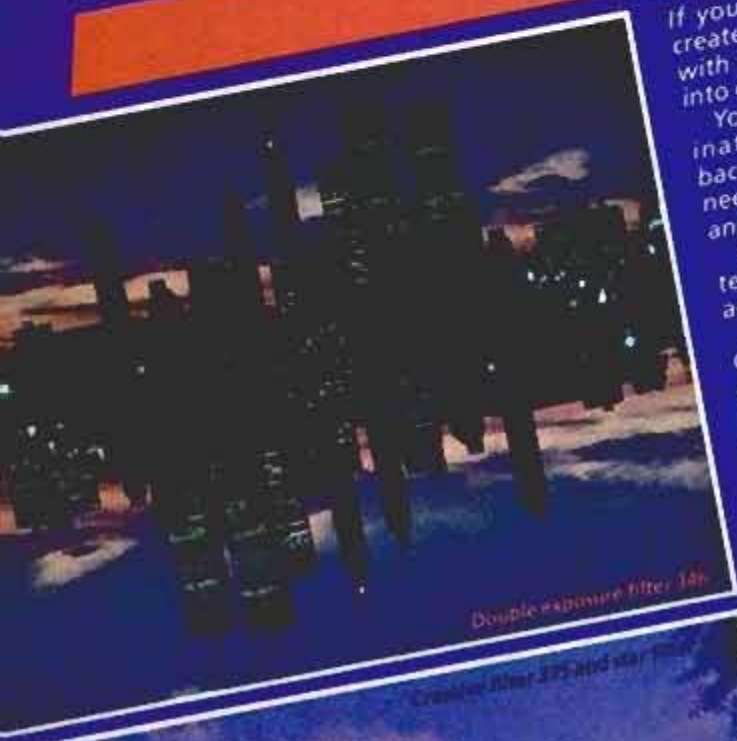
PM You said wings, plural. Did you try it that way?

MC We sure as hell tried. We

(Please turn to page 57)

CHANGE THE WORLD.

It's easy with the Cokin Creative Filter System.



Double exposure filter 146



Creative filter 272 and star filter

If you can snap a picture, you can create a magical city. Light up the day with stars. And turn ordinary things into extraordinary works of art.

You can travel anywhere your imagination will take you — and come back with brilliant pictures. All you need is the amazing Cokin System and any 35mm SLR camera.

Simply attach the unique Cokin filter holder to your lens with an easy-on adapter ring. And the fun begins.

Each filter holder holds up to three Cokin filters. You create dazzling effects, effortlessly, by slipping filters in and out. A look through the viewfinder will let you see what you've created instantly. When you see what you like, press the shutter!

With over 100 filters to choose from, the possibilities are endless. There are rainbows, pastels, prisms and stars. Special effect close-up, diffraction filters and more.

Visit your local camera outlet and ask for Cokin. We've even expanded the System. Cokin filters easily fit medium format, movie, TV cameras and enlargers. And almost all the lenses that go with them. From 36mm to 82mm filter diameters.

Whether you travel around the globe or around the corner, changing the world is simply "funtastic!" With Cokin.

COKIN®

CREATIVE FILTER SYSTEM

Marketed by Minolta Corporation

Find out how easy it is to change the world! Send check or money order for \$1 made payable to Minolta Corp. We'll send you a 40-page booklet with 158 full-color examples of Cokin Filters in action.

Mail to:

Cokin Creative Filter System, Minolta Corp.,
P.O. Box 600, Garden City, N.Y. 11530

NAME (PLEASE PRINT)

ADDRESS

CITY

STATE

ZIP

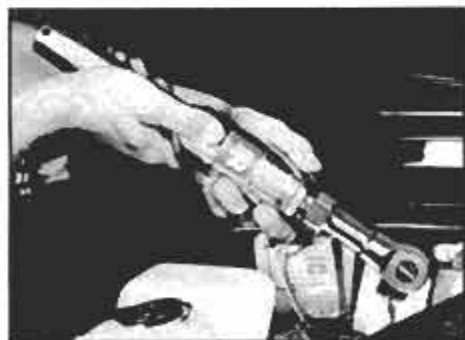
Please allow 4-6 weeks for delivery.
© 1981 Minolta Corporation MEC-6

THE PM GARAGE

CAPSULE REPORTS ON NEW AUTO PRODUCTS

Self-powered ratchet

You've seen the electric-powered wrench and the air-powered wrench. Now meet the battery-powered wrench. The Redi-Ratchet is supposed to spin threaded fasteners on and off all day on a three-hour charge to its NiCd battery pack. We didn't use it long enough to test that, but we did find it strong: The 3/4-inch



Battery-operated Redi-Ratchet provides 20 ft.-lb. of torque. Free speed is 110 rpm.

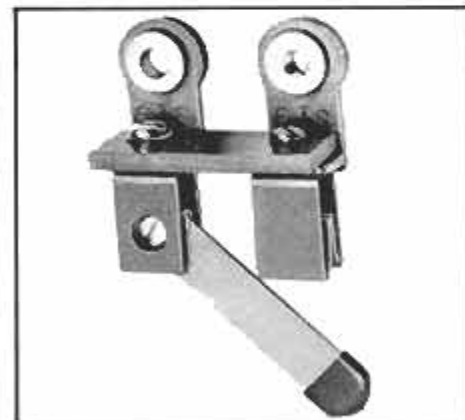
drive tool turns with a free speed of 110 rpm and supplies up to 20 foot-pounds of torque. The wrench can handle up to 100 foot-pounds of torque.

Weighing in at 3 3/4 pounds, the 1 1/4-inch wrench uses a grease fitting to lube its reversible ratchet mechanism. A slim profile and 360-degree rotatable head help you work the tool in tight places.

The price is \$180 for ratchet and battery charger from Ingersoll-Rand, Dept. 50707, 253 East Washington Ave., Washington, N.J. 07882.—T.A.

Battery disconnect switch

If you're looking for a quick and easy way to temporarily disconnect your



Battery disconnect switch for side-terminal batteries will help prevent current drain.

car's battery, you'll find that using a battery disconnect switch is easier than removing battery cables.

Safety/Switch Model ST-9 for side-terminal batteries lets you cut the juice simply by flipping a knife switch.

The unit is rated at 350 amps. continuous use, and uses cast brass and copper construction. We found it to be a well-made, heavy-duty switch, which accounts for its \$19.95 price tag.

Once the power is cut, you can work safely on your car's electrical system.

It's from Paragon Manufacturing Corp., 622 13th Avenue S., Hopkins, Minn. 55343.—T.A.

Clip-on sun visor

Driving into the blinding late afternoon sun is a hazardous condition easily dealt with, thanks to Yankee Products' foldaway sun visor. It's an oldie, but a goody. The smoked plastic shield mounts to the sun visor



Smoked plastic sun visor clips onto regular visor and folds away when not in use.

with two slide-on clips. No tools are needed. When not in use, the visor flips up and out of sight.

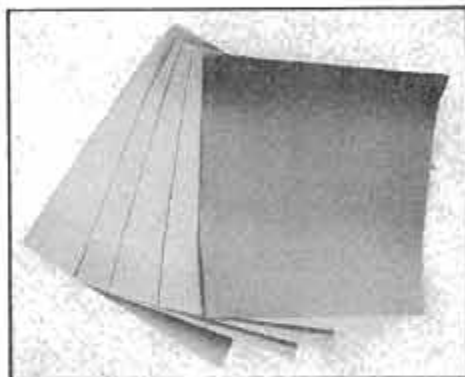
I found this Yankee product in the automotive section of a large department store for \$3. Yankee Products has a free catalog of its wares.

You can obtain one by writing to Box 910, 25 Grand St., Norwalk, Conn. 06852.—Joel Breault

The right stuff

We've found that rubbing out new paint jobs requires a lot of muscle and a really fine-grit sandpaper. If you've got the muscle, Nikken's got a good waterproof sandpaper for either wet or dry use.

The silicon carbide closed coat is available in "C" weight 9 x 11-inch sheets ranging from 80 Type RRCC



Wet- or dry-use sandpaper uses silicon carbide abrasive, comes in variety of grits.

grit to super-fine 1200 Type WTCC.

Each sheet retails for about 75 cents and must be ordered in bulk. Contact Emgee Marketing Co., 5802 Tennessee, Clarendon Hills, Ill. 60514.—Joel Breault

Lifting the fog

The Tracer Chemical Corp., out of Tampa, Fla., has just begun selling its antifogging compound originally developed for NASA.

The TRX Anti-Fog Composition will eliminate fogging on both plastic and glass. It did a good job on my motorcycle helmet face shield and the car windshield, and also worked well on goggles and the bathroom mirror.

The small, 1-ounce bottle I tested is said to be good for 25 applications the size of the average auto wind-



Antifogging compound, originally made for NASA, stops fogging on glass and plastic.

shield. It costs about \$2.50 plus shipping, and you can order the product by writing directly to Tracer Chemical Corp., Box 7494, Tampa, Fla. 33673.

—Joel Breault

Quality is Job 1

**"My job is
to help prevent
wind noise and
water leaks"**

Gary Lilley
Weather Stripping Installer
Kansas City, Missouri
Assembly Plant

Seat belts save lives... Buckle up.

Everybody talks about quality, Ford people make it happen.

Our engineers create a design and specify materials that protect against wind noise and water leaks. People like Gary Lilley carefully fit weather stripping to provide a pleasing interior environment for driver and passengers in every Ford vehicle.

This dedication to quality at Ford Motor Company is paying off. Latest results show a 48% average improvement in quality over 1980 models as reported by new car owners.

Visit a Ford or Lincoln-Mercury dealer and take a close look at what total employee, management, union and supplier involvement can achieve.

At Ford Motor Company,
Quality is Job 1!

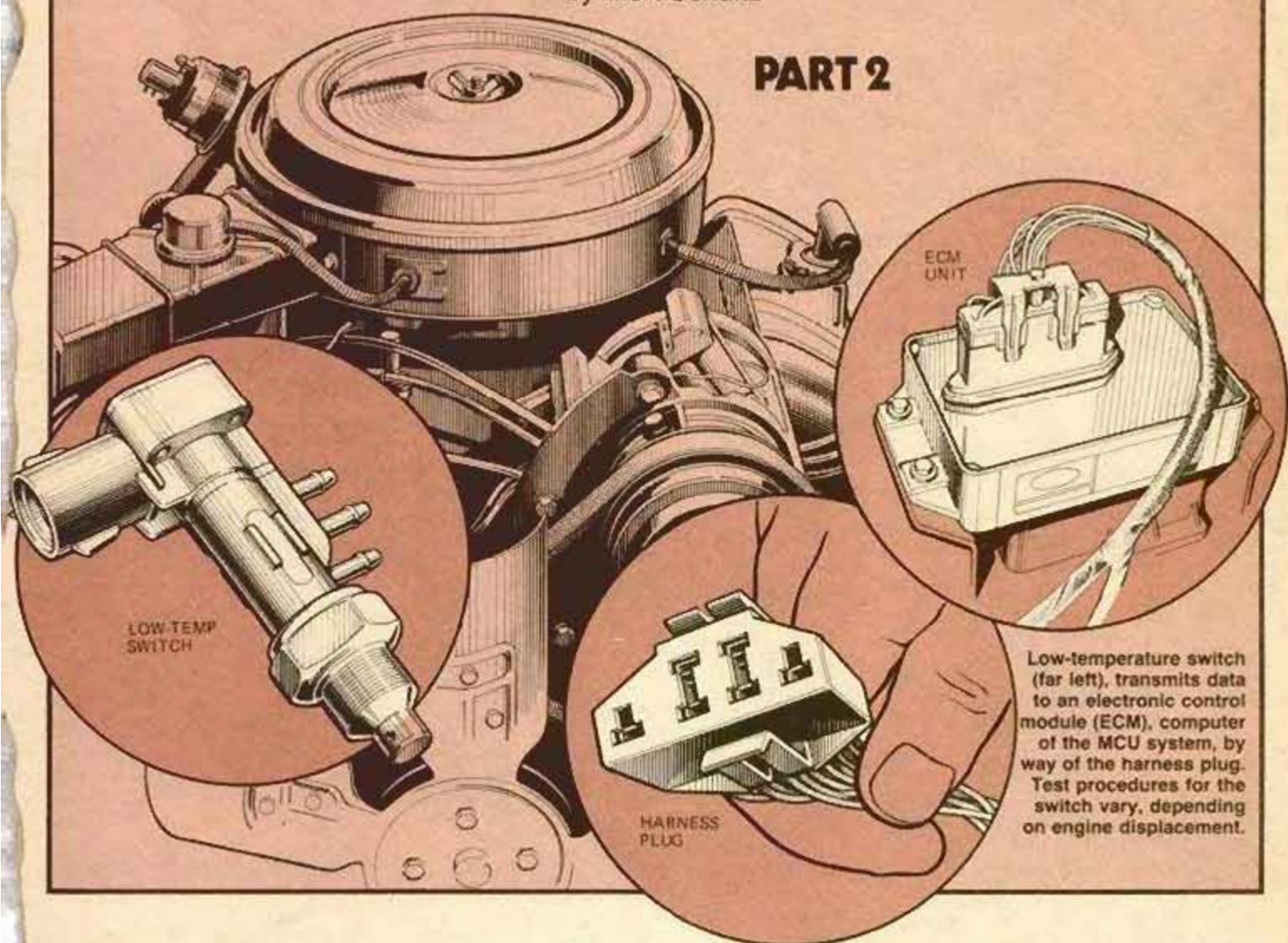


Ford
Mercury
Lincoln
Ford Trucks
Ford Tractors

Troubleshooting Ford's Microcomputer Control Unit

by Mort Schultz

PART 2



Low-temperature switch (far left), transmits data to an electronic control module (ECM), computer of the MCU system, by way of the harness plug. Test procedures for the switch vary, depending on engine displacement.

If you don't have a copy of the April 1982 *Saturday Mechanic* on hand, rustle it up. You'll need the chart it contains that lists parts of the Microprocessor Control Unit (MCU), which is what Ford Motor Co. calls its computerized engine control system.

The April article (Part 1, *Troubleshooting Ford's Microcomputer Control Unit*, page 53) outlines which engines have the MCU. The MCU system regulates various engine functions and includes a self-diagnostic function. The system provides diagnostic messages in the form of numerical service codes, presented

as intermittent voltages. The service codes reveal whether the MCU system is working properly; if it's not, the codes locate the trouble area. And the self-diagnosing feature of MCU makes troubleshooting a job you can do yourself.

The purpose of troubleshooting the MCU is to determine if a part of the system is causing poor engine performance. To check the MCU, you'll need one of two instruments: the Self-Test Automatic Readout (STAR) unit or an analog voltmeter.

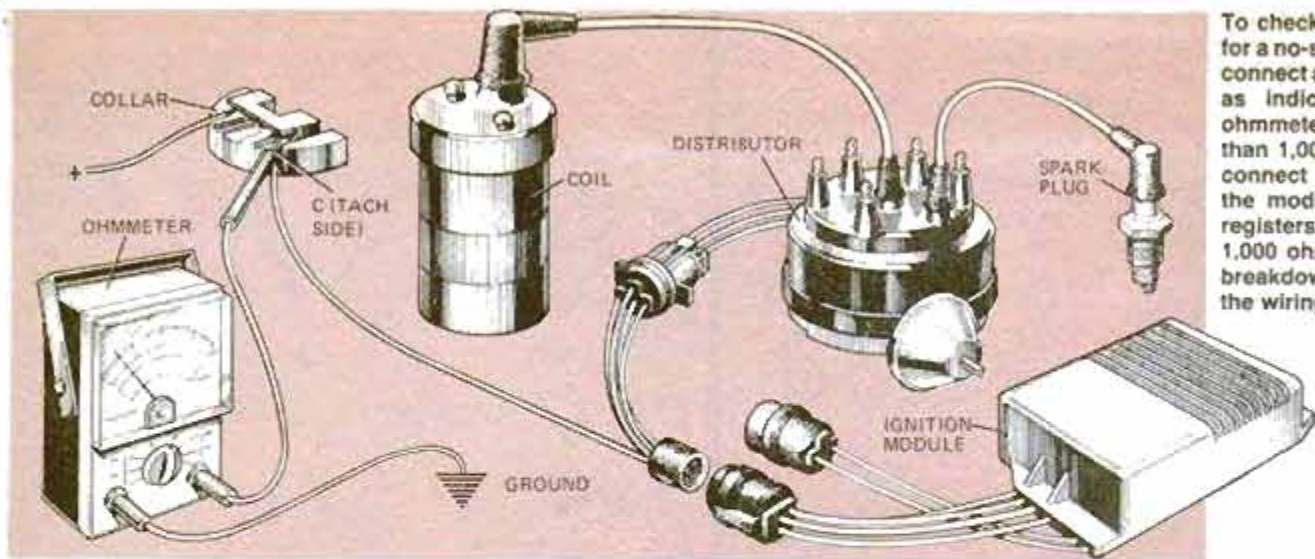
STAR (part No. 07-0004) is about \$125 from Ford/Mercury dealers or

parts and accessories stores that sell Rotunda products. The STAR displays two-digit service codes to let you know the source of a problem.

If you choose to use an analog voltmeter instead of the STAR, it should have a 0 to 20-volt d.c. scale. You'll also need a jumper wire.

With a voltmeter, you have to count pulses of the voltmeter needle to read the service codes. Interpreting this takes practice.

The first pulse or series of pulses is equivalent to the first digit of the two-digit code a STAR unit would display. Then there is a pause, followed by another pulse or series of



To check out an MCU for a no-start problem, connect an ohmmeter, as indicated. If the ohmmeter reads less than 1,000 ohms, disconnect harness at the module. If it still registers less than 1,000 ohms, there's a breakdown present in the wiring harness.

pulses, which is equivalent to the second digit of the two-digit code STAR would display.

If you use STAR, an "11" is displayed to let you know the system is okay. A voltmeter registers an "11" when the needle rises for $\frac{1}{2}$ second, drops to 0 for 2 seconds, then, rises for another $\frac{1}{2}$ second. To verify the reading, keep the voltmeter in place. After a pause of 4 seconds (needle on 0), the cycle will repeat itself.

Take another example. A STAR display of "42" indicates that a rich fuel mixture is affecting engine performance. The trouble could be a sticking choke, high resistance in a fuel-control-solenoid circuit or a malfunctioning exhaust-gas oxygen sensor. The voltmeter would display a code 42 in the manner shown in the illustration on page 36.

Before testing the MCU

Before you begin the MCU diagnostic check, make sure all other potential sources of poor engine performance have been eliminated. This includes general electrical problems, vacuum leaks, ignition component malfunctions, problems in carburetor systems not controlled by the MCU, various emissions-control part malfunctions and internal engine problems.

If problems persist, proceed to troubleshoot the MCU. Warm up the

engine to normal operating temperature—that is, until the upper radiator hose feels hot. Then, shut off the engine, place the transmission in PARK or NEUTRAL, engage the parking brake and make sure all accessories are off.

There are two conditions that can upset this procedure: 1. The engine won't start; 2. The engine problem you're trying to solve occurs only when the engine is cold. In both cases, you can't use the MCU self-test feature, but must try a different troubleshooting procedure.

Engine won't start

The only way the MCU can keep an engine from starting is if the TACH input circuit to the MCU computer is shorted to ground. This causes current to bypass the ignition coil primary. If the ignition coil isn't getting current, neither will spark-plugs. The engine, therefore, can't start.

If a no-start condition exists and all conventional causes have been ruled out, there might be a short. The short could be in the wiring harness from the ignition control module or in the MCU computer. To discover and locate a short do the following:

1. **Disconnect the horseshoe-shaped connector from the top of the coil.** Disconnect the plug that at-

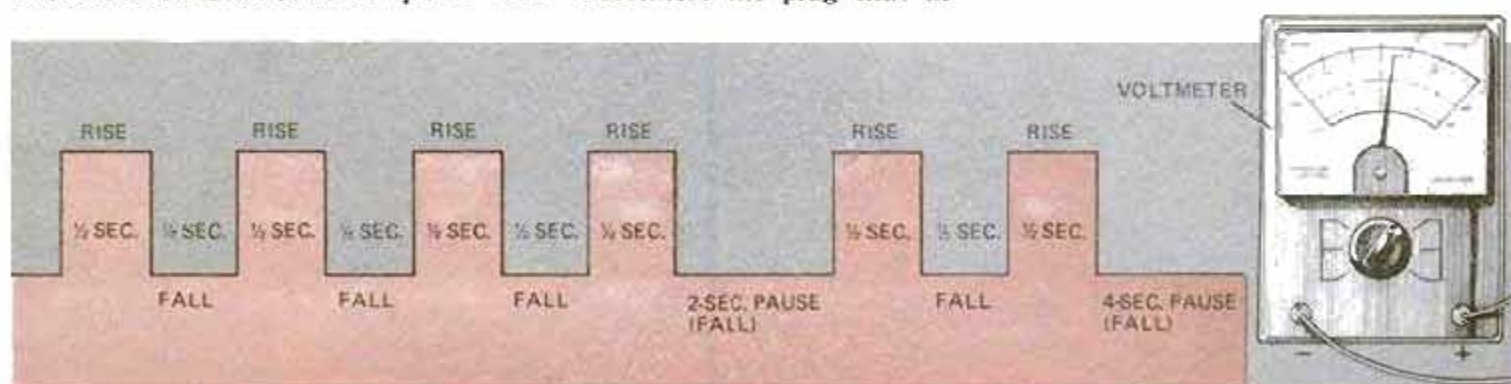
taches the ignition control module to the horseshoe connector and the distributor. Then measure resistance with an ohmmeter between the terminal on the horseshoe connector marked TACH and ground.

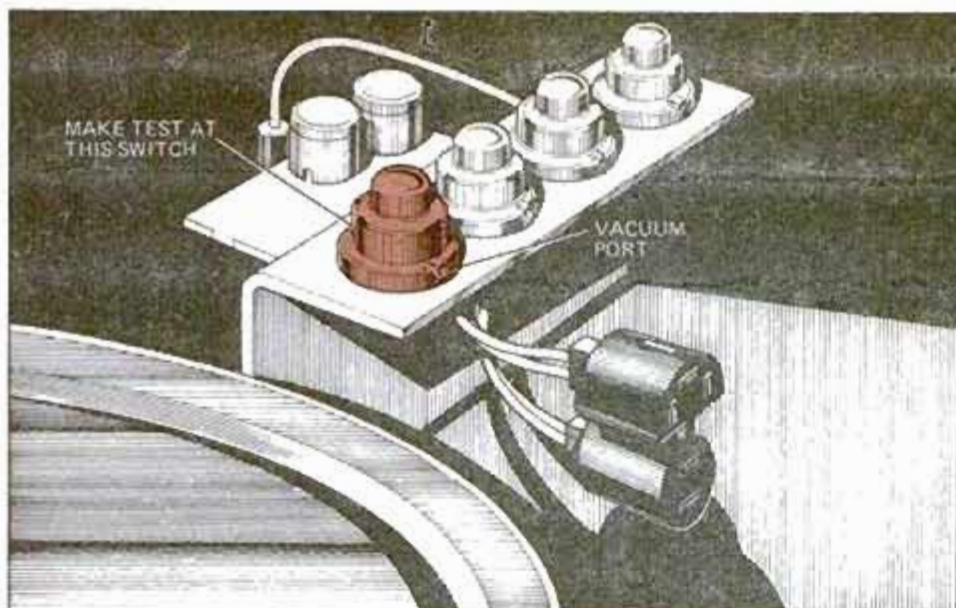
2. **If the resistance is greater than 1,000 ohms, the MCU system is not the cause of the no-start condition.** If resistance is less than 1,000 ohms, disconnect the MCU module from the wiring harness and measure resistance again. If the resistance measures less than 1,000 ohms, the fault is somewhere in the circuit that Ford refers to as circuit 11 in its wiring-diagram manual. If the resistance is greater than 1,000 ohms with the MCU module disconnected from the wiring circuit (but less than 1,000 when connected), the MCU control module is defective.

You can't repair the MCU control module. It must be replaced, but remember that the MCU system, including the control module, carries a 50,000-mile/five-year warranty, whichever comes first. However, if you go back to the dealer, don't tell him you've been troubleshooting the MCU system: He can probably void the warranty.

Handling cold-engine problems

All MCU systems have a low-temperature switch that sends signals





Low-temperature switch on 4.9-liter engine uses vacuum and electricity to signal the MCU. Apply 4 inches of vacuum to the port; take an ohmmeter test at the switch shown.

to the computer. There is a preliminary test for the four- and six-cylinder low-temperature switches that can be performed before the diagnostic test. However, the test sequence can also refer you to the low-temperature switch.

Therefore, if a cold-engine performance problem exists and all conventional causes have been ruled out, the low-temperature switch can be tested. Each size engine requires a different testing procedure, since each uses a different type of low-temperature switch. Test the eight-cylinder engine during the diagnostic sequence.

■ **2.3-liter engine:** This engine utilizes an electrical low-temperature switch. With the engine off and cold (coolant temperature has to be below 95° F.), remove the switch from the engine and connect an ohmmeter across its terminals. If the meter shows switch contacts are closed (meter will read less than 5 ohms), the switch is bad. Replace it.

Note: Cold-temperature switches are supposed to open when the engine is cold and close when the engine is hot.

■ **4.9-liter engine:** The low-tempera-

ture switch of this engine uses both vacuum and electricity. With the engine off and cold (not over 95° F.), disconnect the electrical harness and vacuum hose from the switch. Use a hand vacuum pump to apply at least 4 in. Hg of vacuum to the switch through the vacuum port. As you do this, check across the switch terminals with an ohmmeter. If the ohmmeter shows less than 5 ohms, replace the switch.

If the switch shows an open condition (more than 5 ohms), which it should, start the engine and hold your thumb over the opening of the vacuum hose. (The engine coolant temperature should be below 95° F.) If you feel a strong pull, the low-temperature switch and its vacuum system are okay.

To test the low-temperature switch on V8 engines (right), turn engine off, disconnect the switch and test the resistance across the terminals. You should tap a knock sensor with a light hammer in order to begin the MCU testing cycle.

Attach voltmeter and jumper wire to trigger the MCU system into the self-test mode. The voltmeter needle will begin to pulse, as indicated in the illustration. This particular example indicates a code 42 (four pulses, a short pause, followed by two pulses).

If there's no vacuum, find the ported vacuum switch (PVS) at the other end of the vacuum hose. The PVS controls vacuum to the temperature switch, so that it's supplied only when the coolant temperature drops below 95° F.

Disconnect the vacuum hose that extends from the engine to the PVS. With the engine running, check for vacuum to the PVS by holding your finger over the end of the hose. If there is vacuum, the PVS is bad. Replace it. If there's no vacuum, check the vacuum hose from the engine to the PVS for a leak or blockage.

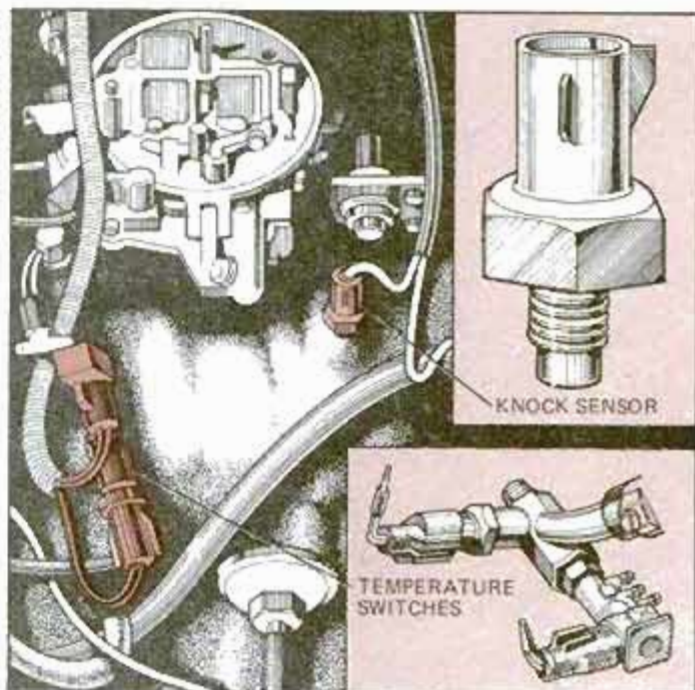
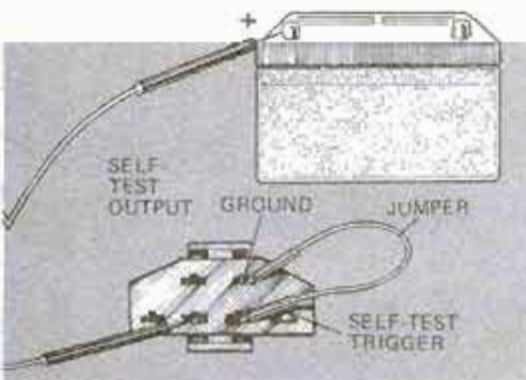
■ **V8 engine:** This engine uses two low-temperature switches that are activated electrically. One should open when engine coolant is below 128° F. The other switch should open when the engine coolant is below 55° F. Those switches are tested during the MCU "functional" or diagnostic test.

Connecting test equipment

To connect the STAR, keep the ignition off and attach the ground (black) lead to the battery negative terminal, test output (red) to the output terminal of the MCU computer self-test connector, and test trigger (white) lead to the self-test trigger terminal of the self-test connector. The self-test connector is a plug attached to the MCU computer (electronic control module).

Once the STAR displays a service code, it will keep showing it even if you disconnect the unit from the vehicle. To erase a code, press the push button or turn off the power switch.

The STAR indicates when its bat-



tery has to be replaced. When the STAR is turned off, LO BAT will appear briefly in the upper left-hand corner of the display window. This is normal. However, if LO BAT stays on, turn off the power switch and replace the 9-volt battery.

To use an analog voltmeter rather than the STAR, make sure the car ignition switch is off. Connect a jumper wire between the self-test trigger and ground of the self-test connector by clipping the jumper alligator clips between two of the terminals you can see in the self-test connector plug.

Hook up the voltmeter (+) lead to the battery positive post, and the voltmeter (-) lead to the self-test output of the self-test connector. Set the voltmeter d.c.-volt selector switch to the 0 to 20 d.c. scale.

If you're testing the MCU system of a four- or six-cylinder engine using a STAR or voltmeter, disable the canister purge valve of the fuel evaporation control system to prevent a wrong signal to the computer, indicating that the engine is operating on a rich fuel mixture. To do this, disconnect the charcoal canister hose from the canister purge valve and plug it with a golf tee or pencil.

If you're testing the MCU of a V8 engine, remove the PCV valve from the valve cover to prevent a wrong signal to the computer when the engine is warmed up, indicating that the fuel mixture is too rich.

On V8 engines equipped with a vacuum delay valve (a wafer-shaped, two-color valve that is spliced into a vacuum line in the air-

pump control system), there's a tee and restrictor in the thermactor vacuum control line. The restrictor must be uncapped during the functional test.

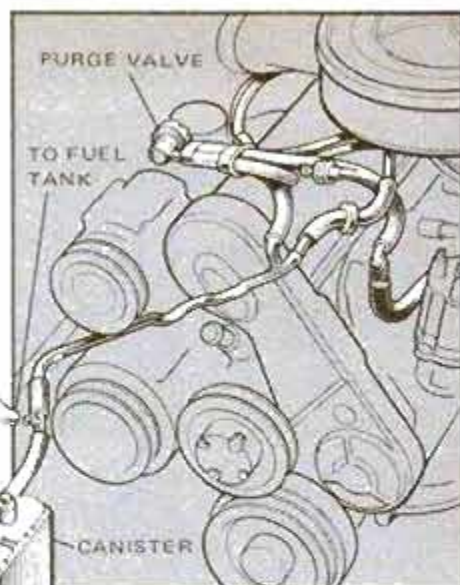
Getting test grades

To perform the diagnostic test on a V8, perform the following:

1. **Make sure the engine is fully warmed and the upper radiator hose is hot and pressurized.** Connect the STAR or your analog voltmeter as described. Turn the STAR on. It should flash "88," then "00." Press the push button. Run the engine at 2,000 rpm for 2 minutes, then shut it off. Restart the engine immediately and allow it to idle.

2. **If you're working with the STAR, a code 40 should appear.** If you're working with a voltmeter, the needle will pulse four times. The throttle kicker will increase the idle speed. Either of these is the initialization code. On cars equipped with a knock sensor, place a 3/8-in. extension on the manifold near the base of the knock sensor. Tap the end of the extension lightly with a small hammer for 15 seconds as soon as the initialization code appears.

3. **After the four initial pulses or code 40 appears, record voltmeter pulses (transcribed into service codes) or the STAR service codes.** Within 90 seconds, the throttle kicker will retract. If a code 11 is displayed, the MCU system is okay. For vehicles equipped with universal ignition modules, however, Ford prescribes additional tests if the vehicle has



To disable the canister purge valve, disconnect it and then plug the hose at the canister or at the valve.

detonation problems at wide open throttle and/or poor performance.

To perform the diagnostic test on a four or six-cylinder:

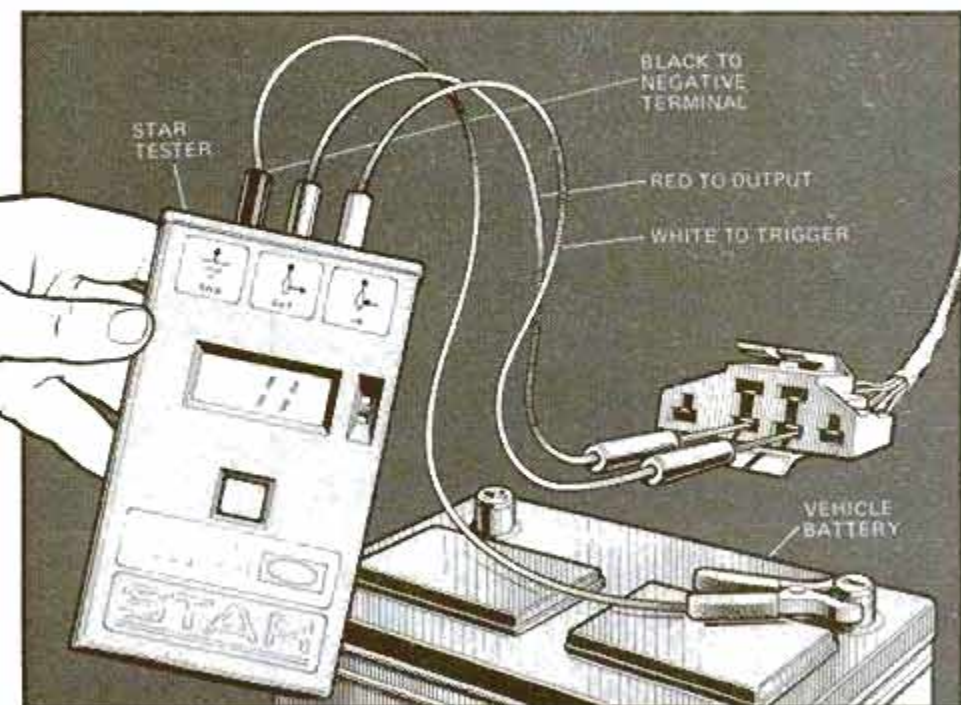
1. **Make sure the engine is fully warmed.** Connect the STAR unit or analog voltmeter as indicated. Turn the unit on. It should flash "88," then record a steady "00." To receive service codes, press the push button. Then turn the ignition key from off to on, without starting the engine. One quick initialization pulse may occur (code 10) immediately after the key is turned on. The service code display will occur after 5 seconds. If you get anything other than a code 11, perform additional tests.

2. **If a code 11 appears, start or restart the engine.** Increase engine speed to 3,000 rpm and watch for a code 20 or 30 on the STAR, two or three pulses on a voltmeter. If code 11 reappears, the basic MCU system is sound, however Ford recommends additional component tests. If a malfunction code appears, additional subtests are necessary.

The chart in the April '82 issue outlines service codes and what components of MCU may be involved.

Note: In a case where a code or pulses indicate a malfunction, a different code or number of pulses may show itself during the "repeat" cycle. This indicates that more than one malfunction exists. Furthermore, during four- and six-cylinder tests, if you get a code 11 during fast (or slow) idle, but a different code during slow (or fast) idle, there's a malfunction. The only time you don't have a problem in the MCU system is when code 11 or pulses equivalent to code 11 appear during both the fast- and slow-idle phases of the test.

FPM



The STAR tester gives you digital readouts of the service codes. It costs about \$125 from a Ford dealer. It reduces the chance of error of the pulsed voltmeter technique.

NOW FIRESTONE LIGHT TRUCK RADIALS COME WITH A SPECIAL BONUS: COLEMAN CAMPING GEAR.

Here's a deal so good no true outdoorsman can pass it by.

It starts with the Firestone line of steel belted light truck radials: ATX,[™] the one that's been winning big in off-road racing; Steeltex,[™] our tough all-position light truck radial; and the Steeltex Radial Town & Country[™] with its special deep biting traction tread.

And now, for a limited time, with each one you buy, we'll give you a coupon good for a special super saver's discount on your choice of a Coleman[®] portable air compressor, cooler, stove, or lantern.

To be sure you don't miss out on this great offer, get the details now at your participating Firestone tire retailer. He's got the tires to get you to that special spot. Plus the Coleman camping gear to help you enjoy it more.

Coleman Inflate-All[®] Portable Air Compressor

\$29.33 plus shipping and handling

Coleman "Lunch Pack"[™] Cooler

\$10.47 plus shipping and handling

Coleman Deluxe 2 Burner Stove

\$35.91 plus shipping and handling

Coleman Double Mantle Lantern

\$28.60 plus shipping and handling



Firestone

Offer ends November 30, 1982

CAR CLINIC

SOLUTIONS FOR MECHANICAL HEADACHES

BY MORT SCHULTZ



Living in the past

My 1981 Dodge Aries (2.2-liter engine and automatic transmission) is a pleasure to drive, except for one thing. Upon starting out, the car hesitates so badly it nearly conks out. Pushing the accelerator pedal down makes it suddenly catch hold. The dealer says he replaced the accelerator pump in the carburetor, but the engine still stumbles badly. Any ideas?—Don Lauderback, Hickory, Pa.

Faulty accelerator pumps are a major cause of hesitation, but not the only cause. There are a number of other possible conditions that can cause initial stumble. They include a sticking secondary throttle valve, a dirty idle-transfer port, or even an incorrect idle-speed or idle-mixture adjustment. If the problem occurs only when the engine is cold, the EGR system may be malfunctioning.

I would, therefore, ask the dealer to get out his 1981 Engine Performance Manual for Aries, Reliant, Omni and Horizon. It explains how to diagnose hesitation problems. Note, in particular, the chart on page 14-6 of the manual. It explains what to do if the hesitation occurs only when the engine is warm, or under both warm and cold conditions.

There's another publication that can help your dealer get to the bottom of this and other driving problems exhibited by both 2.2- and 1.7-liter engines. It's called *Driveability Test Procedure, 1982 Electronic Feedback Carburetor System*. The booklet provides a step-by-step troubleshooting procedure for every component that can conceivably cause the kind of driving problem you're having.

Licking clicking

Not long after purchasing a new 1978 Chevrolet Malibu station wagon, I noticed a faint clicking from the wheels that increased and decreased in intensity with speed. The Chevrolet dealer said he couldn't hear the

noise, so we took the car to an independent brake mechanic who turned the rear-wheel drums on a lathe, thinking that perhaps they were out-of-round. There seemed to be some improvement, but the noise is again as loud as ever. Our brakeman now says the front-wheel rotors are wearing heavily on the side closest to the axle.

The Chevrolet dealer says this is normal and that rotors should be turned when I have new pads installed. I understand new rotors cost \$80 each. Is there anything I can do to correct this condition and avoid the expense of new rotors? Do you know of any remedy for the clicking noise?—Wesley R. Kimbell, West Covina, Calif.

It seems that you are concerned about two separate problems: rotor wear and a clicking noise. I'll assume that they're not related, in that you seem to have determined that the noise is coming from the rear.

First, why do you assume your car needs new rotors? Maybe it does, and maybe it doesn't. Your dealer said rotors would have to be turned—not replaced.

I agree with the dealer that it's normal for rotors to wear more heavily on the axle side. When braking, the pressure exerted by the pistons is on the inner brake pads,

which apply on the inside (axle) part of the rotors.

Rotors can be turned and reused as long as the minimum-thickness dimension embossed into them is not exceeded.

For example, if the finished dimension found on a rotor calls for a minimum thickness of 1.230 inches, and your rotor after refinishing is 1.230 inches or thicker, keep the rotor in use. But if the thickness after turning is 1.215 inches, replace the rotor.

However, due to uneven wear, some rotors have maximum machining specs for each face, in addition to a minimum thickness spec.

In respect to the clicking noise, the fact that it diminished when the rear drums were turned indicates that the brake mechanic was on the right track.

It's quite possible that one of your rear axles is slightly bent. This might cause the drum to contact the rear shoes in such a way as to create the clicking noise. When the mechanic reinstalled the machined drums, he probably loosened up the brake adjustment, which caused the noise to be diminished. Another possibility is a bad rear axle bearing. A faulty rear brake component is a third candidate.

Biting the hand . . .

The front wheels of my Volkswagen Rabbit diesel are extremely difficult to turn when the car is standing still and just plain difficult when underway. My ungrateful little rascal has struck back at me several times, leaving me with fingers that felt as if they were gnawed by a dog. Assuming a power steering unit would solve this problem, I'm wondering if it would wipe out whatever engine power my airconditioned Rabbit now possesses. Can you tell me?—Norman Williamson, Jr., Claremont, Calif.

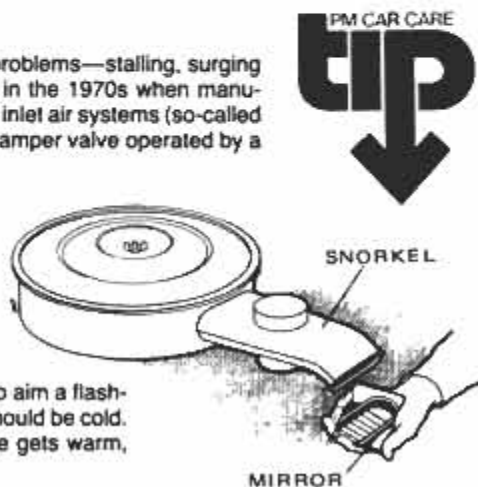
Probably, if you don't have a 1982

(Please turn to page 42)

Say ahh

The number of complaints about cold-engine problems—stalling, surging and hesitation—has risen sharply since early in the 1970s when manufacturers started equipping cars with preheated inlet air systems (so-called thermostatic air cleaners). This system has a damper valve operated by a vacuum motor which, in turn, is controlled by a temperature sensor in the air cleaner. By providing warm air, it allows a cold engine to run at a leaner choke setting than it otherwise would. When you check this system, you may have trouble seeing the damper valve, which is buried deep inside the throat of the air-cleaner snorkel.

A solution is to hold an old rear-view mirror at the mouth of the snorkel and, if necessary, to aim a flashlight down the throat. Start the engine, which should be cold. The damper valve should close. As the engine gets warm, the valve should open slowly.



A Job Important Enough To Become A Career Is Part Of The Navy Adventure.



Most guys go through job after job before they finally land one they can build into a career. In today's high-tech Navy, you can start with a job important enough to become a career.

Learning a valuable career skill is an important part of your Navy Adventure. And it starts when you choose the kind of job or technical training that's right for you. The Navy offers training in fields like electronics, computers, aviation mechanics—over 60

career areas in all.

Then the Navy gives you the training and experience you need to master the career skill you chose. In the Navy you use the most up-to-date equipment and methods in your field. In-school training and on-the-job experience can give you a level of technical skill and professionalism second to none.

Becoming the best at the job you want to do is important to your future, and important to the Navy. Because today's

Navy depends on modern equipment and the men and women who operate and maintain it.

And the modern Navy pays you like the skilled professional you are. You'll earn over \$550 a month, right away, with special pay for sea duty, and other benefits like food and housing, medical and dental care. That's good starting pay for any job, and in the Navy that job can be the start of a career.

Navy. It's Not Just A Job, It's An Adventure.

CAR CLINIC

(Continued from page 40)

model. From the sound of your letter, I don't think you do.

Volkswagen did not equip pre-1982 Rabbits with power steering. Neither does it have a retrofit power steering kit for pre-1982 models, diesel or gasoline.

For 1982, VW is offering power steering as an option. However, the sizes of Rabbit engines have been increased to compensate for the added load. Pre-1981 Rabbit diesel engines are 1,471 cc in size, but the 1981 Rabbit diesel is 1,588 cc. The 1981 Rabbit gasoline engine is 1,715 cc. Previous-year models with gasoline engines have either 1,457-cc, 1,471-cc or 1,588-cc engines, depending on the year.

Make sure your tires are fully inflated. Underinflated tires can make the steering "heavier" than it should be. Tires that are wider than original equipment can produce the same result.

Ins and outs

On five occasions over the last two months, the 5.7-liter V8 diesel engine of my 1980 Oldsmobile Delta 88 has died on me while traveling on a level

road at a speed of about 20 mph. There's never been a problem getting started again. At higher speeds, the engine performs flawlessly. I've changed the fuel filter, but it hasn't helped.

The car had been driven only 6,700 miles when the trouble started. What could be the cause?—Harry Westberg, Portland, Ore.

Since I received your letter toward the end of winter, I would say that the most likely cause of the condition that you describe is fuel waxing.

Although this condition generally causes hard starting, it frequently results in the kind of performance you describe when a garage-kept car is driven in cold weather. Is your car equipped with the fuel-heater option? If not, it should be in an area where the temperature drops below 20° F. It's also important that you use winterized fuel.

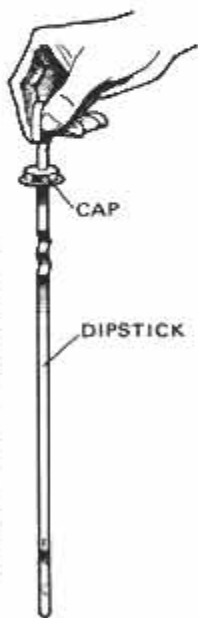
Another possibility is that the mechanical fuel-delivery pump, which looks just like a conventional gas-engine fuel pump, has failed. It can be pressure-tested in the same manner as the conventional pump.

There's also a chance that the cause of your trouble is inside the fuel-injection pump with a sticking

Hat trick

If you get a higher-than-normal fluid level on a dipstick, maybe it's flipped its lid. Suppose the engine oil level reads "overfilled" after an oil change, when you know the engine's been filled with the amount of oil specified by the manufacturer. Check the retaining cap on the dipstick. It may have come loose and been pushed up as you shoved the dipstick into the tube. This will cause the dipstick to sink deeper into the oil than it should, and the level will read higher than it really is. To repair this, position the dipstick so the oil level reads FULL. Slide the cap down until it rests on the tube, remove the dipstick as you hold the cap steady and braze or weld the cap to the dipstick.

Make this repair after changing the oil and the oil filter and running the engine a while when the correct amount of oil is in the engine and the filter is already filled.



WE'RE NOT JUST ANOTHER FLASH IN JAPAN.

It's true that Nippondenso Spark Plugs are original equipment in Toyota, Honda, Subaru, Mazda, and other Japanese cars and trucks, as well as on Suzuki, Yamaha, Kawasaki, and Honda motorcycles.

But then ND plugs also meet the factory specifications for major American and European makes as well.

In fact, Nippondenso is a leader in electronics technology for just about everything that moves on wheels.

So if you thought ND plugs were just for Japanese machines... have we got a flash for you.

NIPPONDENSO

The Fastest Growing Spark Plug
in America.



Does The Sharp-All Pay YOU BET

**\$100.00
a day**

"Recently I had three days in a row here I made over \$100.00 a day."

William J. Mitchell, Tempe, Arizona

**Can't
beat it**

"I have had excellent results with the Sharp-All... you just can't beat it... it is easy to set-up, doesn't take long to change stones... all in all, it is no trouble to work with."

LaVern Helm, Canton, Kansas

**\$32 in
2 hours**

"There's always work in a sharpening business of your own if you want it... Yesterday, I made \$32.00 in two hours."

Dave R. Lewis, Hoquiam, Washington

**Wanted
to
Retire**

"I had dreamed of retiring for years, but was afraid to quit my salaried job. I had never used this type of equipment, but the Sharp-All was real easy to learn. I sharpened 30 blades my first week — without advertising at all. Now, for the first time in my life, I can say that I am content."

Farris Cornelius • Wellington, Texas 79095

**No Selling, No Inventory... Year Round
Cash Profits and YOU Set The Hours!**

**Makes Over \$60.00 EXTRA
a Week In His spare Time
Sharpening Shop!**

"My Sharp-All made me an extra \$3,500 last year. Now I am going full time. It's great to be your own boss."

DAVID SWANSON — Utica, Michigan



**Let FOLEY BELSAW PROVE
You can do it too! On our
30-DAY FREE TRIAL OFFER**

SEND FOR FREE FACTS!

You risk nothing by accepting this offer to see how easily you can turn your spare time into big Cash Profits with your own Complete Sharpening Shop. No selling... no previous experience needed. Our famous Sharp-All and show-how instructions set you up to make \$200, \$500, \$700 a month CASH sharpening Saws, Knives, Scissors, Lawnmowers, Shop and Garden Tools... all cutting edges.

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

**FIND OUT ALL ABOUT IT
No Obligation —
No Salesman will Call**



FOLEY-BELSAW CO.
8713H FIELD BLDG.
KANSAS CITY, MO. 64111

No Obligation... No Salesman Will Call

FOLEY BELSAW CO. 8713H FIELD BUILDING, KANSAS CITY, MO. 64111
Send details of FREE TRIAL OFFER and Free Book "Lifetime Security"

NAME _____
Address _____
City _____ State _____ Zip _____

**FREE
BOOK**

**RUSH
COUPON
TODAY!**

metering valve or a weak governor weight retainer. If so, the pump has to be disassembled to clean or replace the metering valve or to replace the governor unit. This job should be done by a technician trained in handling Roosa Master pumps, which are manufactured by Stanadyne Inc.

However, before getting involved in pump overhaul, there are three more "exterior" conditions that should be checked.

One of them concerns the fuel-return line which comes off the fuel-injection pump and goes to the fuel tank. This line helps maintain a specific differential pressure inside the pump, which is necessary to maintain the right amount of fuel delivery.

If the fuel-return line is partially plugged, the differential pressure is thrown out of whack, upsetting correct fuel delivery.

Another condition that may cause low-speed stalling is an air leak into the fuel system.

The slightest leak in the diesel fuel system—even one so slight that fuel won't drip through to reveal the leak—will draw air into the system to displace fuel. When this happens, a condition occurs that is similar to

vacuum lock in a gasoline engine. Your diesel starves for fuel and may stall, be hard to start or emit excessive amounts of smoke. How it reacts depends on how large the leak is and at what speed the engine is being run.

The air leak could be located at the injection-pump suction line, at the inlet fitting of the fuel filter, at any of the fuel-line clamps or at any one of a number of other places. Determine if there is a leak by splicing a short piece of clear plastic hose into the return line where it leaves the injection pump. Start the engine. If you see foam or air bubbles in the fuel flowing through the plastic hose, there is an air leak. To find the leak, examine all connections for moistness. Check the condition of all clamps and hoses.

It's also quite possible that general fuel-system contamination is causing your low-speed stall. If so, the tank will have to be removed, drained and cleaned.

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

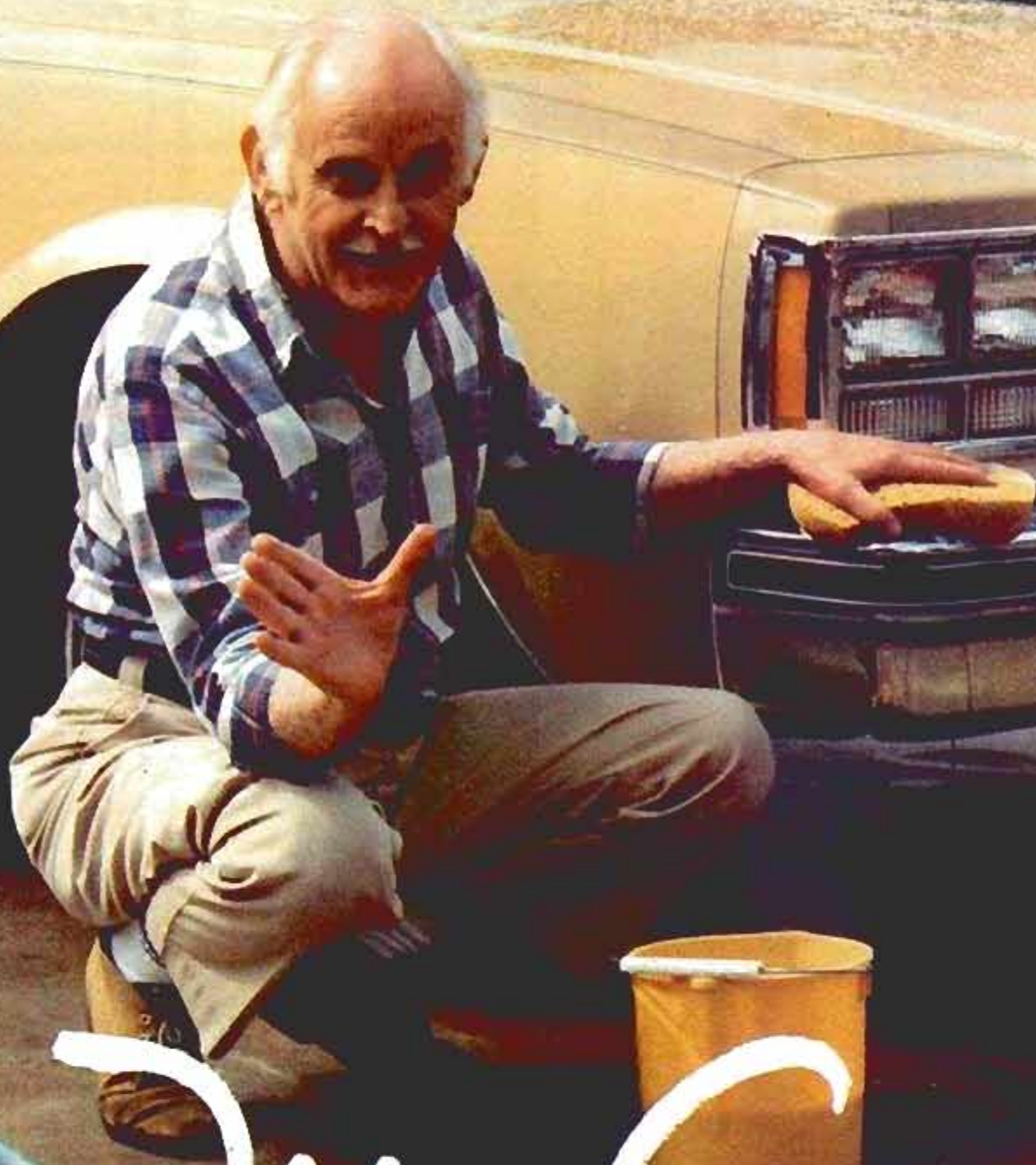
■ According to American Motors, there's something new to worry about if you accidentally reverse the battery cables. You can damage the fuel-feedback module in 1980-82 models, as well as the alternator diodes and radio. So be sure to get them straight.

■ For years, you've heard not to tighten a new oil filter with a wrench. That's changed now for new GM engines using the small 75-mm oil filters, of which the PF 40, PF 45, PF 47 and PF 51 are the most common. If you can't hand-tighten the filter the number of turns specified on the oil-filter label, use an oil-filter wrench.

■ Engine oil leaking from the rear of the intake manifold of a 1980-82 Chrysler Corp. 318- or 360-cu.-in. engine is probably caused by a rear gasket that's slipped from between the manifold and block. Service bulletin 09-04-82 (1/25/82) tells your dealer how to use RTV sealer (part No. 4026070) and a retainer (part No. 4105671) to stop the loss.

■ If you get a miss when you blow the horn of a 1982 GM 2.5-liter, four-cylinder engine with electronic fuel injection built before November 1981, have a .25-.5-mfd capacitor (part No. 1851428) installed between the horn feed wire and ground at the horn connection. Voltage feedback from the horn coil when the horn toots results in irregular injection-unit pulses. Each GM division has issued a service bulletin about this. For instance, the Oldsmobile bulletin is No. 82-T-3.

**I figure it's worth keeping
so it's worth genuine GM parts.**



Mr. Good

And genuine Mr. Goodwrench good service.



Mr. Goodwrench is trained by General Motors to understand GM cars. He knows how to analyze problems. Fix them. And get me rolling again. Fast. And he can get genuine GM parts. To me, it's important to keep my GM car GM all the way through.

I'd expect to pay more, but I find that Mr. Goodwrench is committed to reasonable prices—he has pledged to be competitive with other places I can go around here for service. Besides that, he gives me a written estimate on request so I know what I'm spending before I've spent it. I like that.

So keep that great GM feeling with genuine GM parts at participating independent Mr. Goodwrench dealers selling Chevrolets, Pontiacs, Oldsmobiles, Buicks, Cadillacs, GMC and Chevy trucks



wrench



APPLIANCE CLINIC

QUESTIONS ANSWERED

Plugged up

My problem concerns the automatic ice maker on my Sears refrigerator-freezer, model No. 106-7620661, purchased in 1963. The ice maker worked fine for four or five years, until it suddenly refused to turn out any more ice cubes. I checked every component in the ice cube unit, the water valve and solenoid, but could find no fault.

As a last resort, I removed the water line; at the point where it passes through the back of the box, there was an ice plug preventing water from flowing into the ice maker. All efforts have failed to produce a permanent solution. Your comments and suggestions would be most appreciated.—Stanton Draper, Carmichael, Calif.

Sounds as if the water-fill valve for your ice maker is causing your problem. There's a possibility that the valve is not seating properly. If a few drops of water leak through the valve when they shouldn't, these drops could freeze at the point where the tubing enters the cold freezer temperature. I suggest replacing the water valve as a complete assembly. The part is No. 627558; it costs approximately \$14 at any Sears store.

Blanket blues

Can you provide some information on how to repair an electric blanket that won't heat anymore? If home repair is impractical, I want to buy a new one now, during the summer sales. Thanks for your help.—John Wendling, Chicago

If you think that your blanket isn't heating, try this test: Fold the blanket as it would be in the box or package. Connect the control thermostat to the blanket and to a wall outlet. Next, switch the blanket on and set the dial to HIGH. Wait 10 to 15 minutes. Put your hand between the folds of the blanket; you should feel warmth.

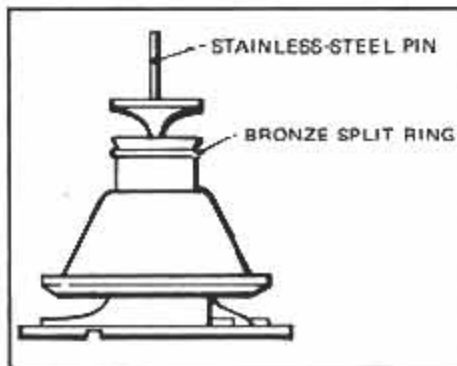
If the blanket is cold, you will need to take it to an authorized service repair facility or buy a new one. It isn't a great idea to make home repairs on the blanket or control. Electric blankets are made according to Underwriters Laboratories' (UL) standards and the electrical components are sealed inside the blanket. Also, the thermostat which controls the amount of heat given off by the blanket is calibrated when

the dial is assembled at the factory.

Tired dishwasher

I have a KitchenAid dishwasher, Model KDS-17. During the wash cycle, dishes aren't cleaned satisfactorily. The soap in the soap dispenser is only partially dissolved. The water temperature is 150° F. Could it be that the pump is worn and not pumping the water with sufficient force to remove all the food particles from the dishes?—Robert H. Artman, Lakeland, Fla.

Sounds like your problem may be in one of several areas: the wash arm (a four-way hydro sweep), the wash-arm support, the water-fill



The stainless-steel pin on the wash-arm support should remain fast to the support; the bronze split ring should be intact.

valve or the drain valve. First, remove the wash arm. Check the spray holes for any blockage. Turn the wash arm over. Check the area inside at the point that the wash arm attaches to the wash-arm support. Look for any deep grooves in the black plastic. Deep grooves can cause a drop in pump pressure being delivered to the wash arm.

Next, check the wash-arm support (see drawing). The support looks like a black tower; it's located under the wash arm. Check the stainless-steel pin which protrudes from the top of the support. You shouldn't be able to turn or move this pin up or down. Look at the bronze split ring below the pin. Check for cracks or possibly a broken ring. If you notice anything wrong with the wash-arm support, you can buy a new one. The support

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.

comes as one assembly for replacement; it's part No. B111431.

Now, check the water level in the tub. Start the dishwasher. Listen for the machine to fill. As soon as the fill cycle stops, open the door. Check the water level. It should be about $\frac{3}{4}$ in. below the bottom of the wash-arm hub. If there isn't enough water in the tub, look for a restricted water-fill valve or a leaking drain valve.

SERVICE TIPS

Saving energy is as important in summer as it is in winter. That's why you should get your air conditioner ready for those hot days ahead with a little maintenance now. Here are some tips from Research Products Corp., makers of Ezkleen room air conditioner filters:

■ If you noticed any mechanical problems toward the end of last summer, have the unit checked by a service specialist; otherwise, basic maintenance will be sufficient.

■ Air conditioners need a strong, steady flow of air to perform properly. Filters are used to trap pollen, dust and dirt, so you have clean air at all times. If the filter becomes clogged, airflow is reduced and you won't get maximum performance from your unit.

■ Cleaning your air conditioner is easy. Remove the front panel. Using a vacuum cleaner, work inside the walls, louvers in the front panel and inlet louvers. You may also want to wipe the inside with a solution of water and mild detergent.

■ Next, check the air filter. If it's made of aluminum, wash it and recoat it with filter adhesive. It can be reused for many years. If it's made of nonwashable material, replace it when it becomes dirty.

When you start using your air conditioner, keep the following suggestions in mind:

1. Use your air conditioner according to current energy recommendations suggested by your local utility.
2. If possible, turn on the air conditioner before the room heats up.
3. Keep windows and doors closed to prevent escape of cold air.
4. Use shades, awnings and drapes to keep direct sunlight out.
5. Keep the grille and register open for proper alignment.
6. Check and clean the air filter periodically.



NO WASHERS NO TOOLS NO SWEAT



HOOK UP ONE WITH YOUR BARE HANDS

It took Peerless® to take the hassle out of hooking up a faucet. Because with this "no-tools" Peerless® faucet, all you need are your own two hands.

Peerless developed a way to drop in the entire assembly and tighten it—by hand. Then you just connect the supply lines with special quick-connectors—by hand. And you're done.

All Peerless® faucets are washerless—so there are no washers to wear out and cause drips. They all come with the *Peerless* warranty.* And nobody gives you as many do-it-yourself faucet designs as *Peerless*. See them all, and choose yours at your *Peerless* dealer's Good-Better-Best display.

Peerless makes it easy to be handy.



PEERLESS FAUCET

PM WORKBENCH

PM EXAMINES PRODUCTS AND SERVICES

Durable finish

A well-known maker of quality wood finishing materials—Deft Inc., 17451 Von Karman Ave., Irvine, Calif. 92714—has introduced a new product called Deftco Danish Oil Finish. It is claimed to successfully combine the superior penetrating qualities of tung oil with the durabil-

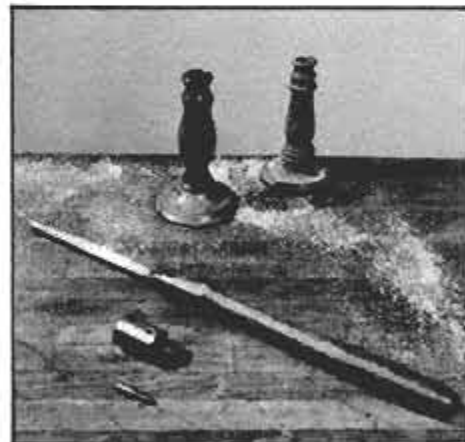


ity of polyurethane finishes. At paint and hardware stores, it comes in three shades of walnut and a natural wood tone.—S.W.

ity of polyurethane finishes. At paint and hardware stores, it comes in three shades of walnut and a natural wood tone.—S.W.

Tools for master woodturners

For the past six months I have had the joy of working with two beautiful woodturning tools. The first, a 1/16-in.-diameter turning gouge, has to be the best gouge I've used. Crafted of M2 tool steel, it's hardened to RC62 and sharpened to a fingernail shape. It comes with a 2 3/4-in. Brazilian hardwood handle for



A lathe gouge and screw chuck for serious woodturners were tried by PM shop editor.



Screw chuck for those who build their own chucks has exceptional holding power.

\$69.50 postpaid. The Screw Chuck is machined out of stainless steel and boasts knife-edge-shaped threads for good end-grain holding power. Available for Rockwell, Shopsmith and Craftsman lathes, it's \$59.50 postpaid from International Woodworking Equipment Corp., 11665 Coley River Circle, Fountain Valley, Calif. 92708.—H.W.

A short fuse

For added protection against the dangers of circuit overload and short circuits, install some Nobility Safety Fused Plugs. Designed for



Fused plug gives added protection against overloads and short circuits. Replacing blown fuse takes seconds: Unplug from outlet (top), dislodge fuse with one plug blade (middle), pull out fuse and discard (above). Insert new fuse, push to back.

use with extension cords, these simple devices come with 7- or 10-amp. fuses that will tell you right away if you're putting unsafe demands on a particular circuit. Each plug is about \$1.50 at hardware stores. Made by New York Merchandise Co. Inc., 32 West 23rd St., New York, N.Y. 10010.—S.W.

Squeezable P-trap

The Squeeze-N-Flow is a new flexible plumbing trap with several good



Flexible trap fits both 1 1/4-in. and 1 1/2-in. plumbing lines. It can be installed quickly, using only a screwdriver.

things going for it. It installs on both 1 1/4-in. and 1 1/2-in. pipe in just minutes, even if they are out of alignment. It can also withstand freezing without breaking, and if it becomes clogged, you remove the obstruction by squeezing it. From Flowtamer Inc., 666 Sugar Lane, Elyria, Ohio 44035, it's \$6.95 at home centers.—Rosario Capotosto

Home and shop update

It seems we got our chemical terminology mixed up in our story, *Here's A Brush Cleaner that Works for All Paints*, (page 168, Mar. '82). Methylene chloride is the compound used in paint cleaners and it is the one we intended to recommend. Chemists tell us that "meth"-compounds are numerous and some are very dangerous, but that methylene chloride is safe if used as we described. **PM**

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.

YOU-CAN-DO-IT STORAGE: UPSTAIRS, DOWNSTAIRS, ALL AROUND THE HOUSE.



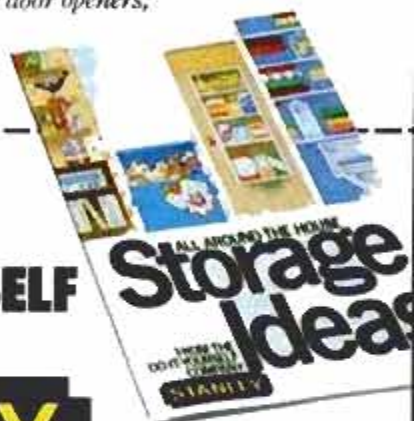
Stanley comes to the rescue! Just when you're absolutely sure you've run out of places to store things, Stanley comes up with a booklet crammed full of great ideas. Free, too. You can build (or build *in*) all these suggestions yourself—just as long as you're somewhat handy with tools and wood.

The list starts with a blanket chest/toy chest. A behind-the-couch bookcase with hidden storage for valuables. A pantry on a door. Useful under-stairs storage, too. There are also some suggestions for a home entertainment wall, between studs shelving and much more.

To build these projects, all you need is wood and some standard hand tools—a Stanley saw, hammer, screwdriver, Powerlock® rule, to mention a few. You'll also want to pick up some basic Stanley hardware—screws, shelf brackets, nails, bolts, etc.

So go to it. There's a lot of satisfaction to be had in finding *and* building extra storage space around your house.

Order this free booklet from Stanley, The Do-It-Yourself Company that makes Stanley tools; hardware; weather stripping; shelf standards and brackets; fasteners; garage door openers; replacement entry doors.



GET FREE BOOKLET FROM THE DO-IT-YOURSELF COMPANY

STANLEY

helps you do things right[®]

The Stanley Works
Ad Services Dept.
Box 1800, PM6-2
New Britain,
CT 06050

Please send me your free Storage Ideas Booklet.

Name _____

Street _____

Town _____

State _____

Zip _____

DETROIT LISTENING POST

The large and small of it

Now that the vast middle ground is pretty well filled in with efficient new products, Detroit is looking hard at the fringes of the new car market—big, luxury cars, mini and microcars, and high performance sports and sporty cars. That's where most of the new product action will be in the next several years.

Honda recently introduced its City mini in Japan. Rumors have it that Mitsubishi, long the supplier of Chrysler's Japanese imports, may begin importing the front-wheel-drive Minica AMI for its own dealers as early as next year. So Detroit is scrambling for baby cars, too.

In Japan, the Mitsubishi AMI seats four, but weighs only 1,250 pounds and measures just 124 in. on a 79-in. wheelbase. Even in U.S.-legal form, it could get 50-plus mpg from its half-liter, two-cylinder engine. Chrysler may negotiate its own version of the AMI.

In 1985, Ford is looking into importing a similar-sized car from its Japanese partner, Toyo Kogyo, maker of Mazda cars and trucks and Ford's Courier mini-pickup. The Ford/Toyo Kogyo car also may offer an optional 50-plus mpg diesel.

Meanwhile, Chevrolet is firming up plans to import its own Japanese-built mini, beginning about the same time.

The vehicle will be styled by Giugiaro of Italy, jointly developed by GM affiliates Isuzu and Suzuki, and assembled by Isuzu. Isuzu already supplies Chevy's Luv mini-trucks and last year established itself as America's newest car and truck importer.

Slightly larger than GM's European S-car, but a foot shorter than the current rear-drive T-car (Chevy Chevette/Pontiac T1000), the diminutive GM/Isuzu/Suzuki four-seater should measure about 150 in. overall on a 90-in. wheelbase, weigh around 1,600 pounds and deliver over 40 mpg in the city. It will be powered by an overhead-cam, four-cylinder engine displacing 1.0 to 1.3 liters and will come with a standard, five-speed, manual transaxle.

With fuel supplies high and prices actually slipping at the moment, short-term U.S. demand for such vehicles is not judged to be very high. But it looks like Detroit has decided to prepare itself for changes in the situation.



The Camaro Z28 (above) and Pontiac Trans Am will both be fighting for your attention on the racetracks this season. The Chevy is the official pace car for the Indy 500 May 30, while the TA will circulate with the Grand National stockers at various NASCAR events.



Full-size futures

At the other end of the market, GM's '84 front-wheel-drive C-cars—Olds 98/Buick Electra/Cadillac deVille and the Brougham—seem to be progressing on schedule. Riding on a 108-in. wheelbase, these will be about 2 feet shorter and a half-ton lighter than their current counterparts and are expected to retail for close to \$20,000.

Ford plans to come in a year later with new fwd, 106-in.-wheelbase LTD/Marquis replacements. Code-named Taurus, these will be four-cylinder, five-speed-powered in their standard form, and about the size of today's Granada. A year or so later, an all-new breed of Lincolns will bow on the Taurus platform.

The new muscle car era

Most everyone in Detroit has gotten the message by now: The market is getting bored with economy and ready for renewed excitement—cars that stir the libido, that people buy because they want to, not because they have to. The rebirth of convertibles is one result, and renewed interest in performance is another.

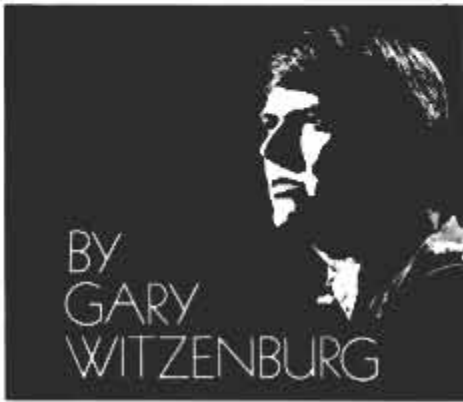
Chrysler engineers are working on supercharging small engines and turbocharging larger ones for extra power at low speeds. Pontiac is investigating a turbo version of its

fuel-injected, 1.8-liter overhead-cam Four for future J2000s, and Buick is developing a turbocharged 3.8-liter V6 with multipoint fuel injection for coming sporty models.

Ford, which is back into racing and marketing excitement for all it's worth, has its Special Vehicle Operations working up super Mustangs and Capris for '83 that'll be "the best-handling cars Ford Motor Co. can do." They will have turbo four-cylinder power and perhaps an optional turbo Six, as well. And Chrysler is on schedule with a Porsche-looking fwd sporty car with optional turbocharging for the '84 model year.

On the convertible front, Chevy has confirmed that its ragtop Cava-

(Please turn to page 52)



BY
GARY
WITZENBURG

We Back Our R.V. Service Coast to Coast

"If we serve you in Seattle, we'll back you in Paducah!"



• **ENGINE & DRIVE TRAIN**

• BRAKES • ELECTRICAL

• GENERATOR • A/C, HEATING

• REFRIGERATOR • PLUMBING

• ROOF COATING • AWNINGS

• CHEMICALS & SUPPLIES

• HITCHES • LOAD EQUALIZERS

• SWAY CONTROLS • SUSPENSION AIDS

• BRAKE CONTROLS • LIGHTING AIDS

• TRANSMISSION COOLERS • LP GAS

Now there's somebody who backs their R.V. service throughout the U.S. and Canada. No matter where you travel, there's a U-HAUL® REC VEE WORLDSM and U-HAUL HITCH WORLDSM nearby to stand behind its parts and service work, coast to coast. U-HAUL has over 1,000 Moving Center locations open seven days a week.

ON-SITE OR IN-SHOP SERVICE

We'll do the job at your place or ours with factory authorized service, parts & supplies.

24-HOUR ROAD SERVICE If you break down while traveling, call 1-800-528-0355 (toll-free).

PARTS, SUPPLIES & ACCESSORIES

Chemicals, directories, maps, hoses, appliances, toilets, pumps, lighting, awnings, TV antennas, tire carriers and more!

COMPLETE TOWING SYSTEMS

U-HAUL HITCH WORLD has everything you need for your tow vehicle and trailer. With over 35 years experience, nobody knows more about trailer towing than U-HAUL.

Hitches for domestic and foreign cars, trucks and motor homes. All from top-brand names such as REESE, DRAW-TITE and VALLEY. Also custom fabrication for unique vehicles and towing needs.

COMPLETE LINE OF TOWING ACCESSORIES

Brake and sway controls, electrical connectors, transmission coolers, ball mounts, suspension aids, tow bars, mirrors and more!



FIND US IN THE WHITE PAGES UNDER U-HAUL MOVING CENTERS.

Join the winning team. We're hiring experienced R.V. technicians. Call Don Noel, 1-800-628-0463.

DETROIT LISTENING POST

(Continued from page 50)

lier J-car will go into limited production for '83. American Sunroof will do the conversions. Ford is already thinking of moving its soon-to-be introduced soft-top Mustang by Cars and Concepts in-house, if demand justifies it. Pontiac displayed a J2000 convertible at the Miami Auto Show last December, and says it may or may not be produced. But the open-air Pontiac was at last February's SAE engineering show.

Automakers should take note,

however, of a recent J.D. Power & Associates automotive consumer profile survey. It showed that, while fuel economy had slipped to third on the list of what buyers want from their new cars, dependability/trouble-free operation, and low purchase price were first and second.

Pontiac pace car

Chevrolet's Camaro Z28 is the Indy pace car for '82 (*Imports and Motorsports*, page 20, May '82). But archival Pontiac has the NASCAR safety car assignment for the 11th straight year. Watch for the bright

red Firebird Trans Ams at Daytona, Talladega, Charlotte, Darlington and other famous NASCAR tracks. One reason, says Pontiac, is that with its drag coefficient of .309, the new Trans Am just may be the most aerodynamic production car in the world today.

Ford's going Aero

Last month, we talked about the Continental Concept 90, the striking new Lincoln-Mercury idea car that's traveling the auto show circuit. Now Ford has confirmed that this new car provides an excellent preview of its products.

It's no secret that this Lincoln of the future—except for details like the grille, wheel covers and pillarless hardtop roofline—looks a lot like the sexy '83 Thunderbird due for introduction in January 1983. Privately, Ford designers say they think everything else will look old fashioned once their slippery new cars start hitting the road.

The truth about diesels

Partly because of their well-known fuel efficiency and range, and partly because they've attained a certain amount of status appeal, diesel-powered cars have enjoyed great sales success in the past few years. But there's talk around Detroit that perhaps diesel growth has just about topped out for the moment.

Now Stanadyne Diesel Systems, America's leading maker of diesel fuel injection equipment, is speaking out in an understandable effort to win more converts. Their pitch:

Diesels are long-lived and, because they're compression-ignited, don't need the regular electrical tune-ups required by gas engines. They do need more frequent oil changes, though.

Diesels are more expensive initially by about \$200 to \$1,000, but offset that cost through fuel and maintenance savings. Of course, the amount depends on how long you keep the car and how much you drive.

Stanadyne says that the diesel's disadvantages—sluggish acceleration, difficult cold-weather starting, water-in-fuel problems—can be taken care of by, respectively, turbocharging, electric engine block and fuel heaters, and warning systems, water separators and filters. Stanadyne, in fact, recently introduced an easily installed aftermarket fuel heater.

Manufacturers have made good progress in reducing other minor diesel annoyances such as noise, smoke and odor, and Stanadyne predicts that diesel acceptance will continue to increase in the future. **PM**

Challengers, A Reflection of Northwoods Craftsmanship

Take the Weinbrenner "Challenge." We don't think you can find a better made, better priced chukka boot anywhere in America! Here is the country's favorite style designed for today's active living. Outside, a smooth grain leather upper and a deep-cleated lug sole and heel provide all-weather protection and super traction. Inside, there's a padded collar and a cushioned Cambrelle lining of absorbent, breathable material to surround your foot in total comfort.

Next time out, look for the Challenger from Weinbrenner—the Craftsmen of the Northwoods.

SINCE 1892
WEINBRENNER
MERRILL, WISCONSIN 54452
A *Florsheim* COMPANY

If your old guzzler is on this list, you're in luck.

AMC

8 Cyl.—1968-76 304", 360" 2 bbl. engines, all transmissions. 6 Cyl.—1970-76 232", 258" 1 bbl. engines, all transmissions.

BUICK

8 Cyl.—1970-76 350"-455" 2 & 4 bbl. engines, all transmissions. 6 Cyl.—1968-75 250" 1 bbl. engines, all transmissions. 1978 231" 2 bbl. engines, all transmissions.

CHEVROLET

8 Cyl.—1968-76 327"-454" 2 & 4 bbl. engines, all transmissions. 6 Cyl.—1963-74 230", 250" 1 bbl. engines, all transmissions. 4 Cyl.—1973-77 140" 2 bbl. engines, all transmissions.

DODGE/CHRYSLER/PLYMOUTH

8 Cyl.—1970-77 318"-440" 2 & 4 bbl. engines, all transmissions. 6 Cyl.—1969-77 170"-225" 1 & 2 bbl. engines, all transmissions. 4 Cyl.—1979-80 1.7 litre 2 bbl. engines, all transmissions.

FORD/MERCURY

8 Cyl.—1962-77 289"-400" 2 bbl. engines, all transmissions. 6 Cyl.—1965-77 170", 200" (Incl. 2800cc) 1 & 2 bbl. engines, all transmissions. 4 Cyl.—1971-74 1977 2000cc, 2500cc 2 bbl. engines, all transmissions.

OLDSMOBILE

8 Cyl.—1975-77 350"-455" 2 & 4 bbl. engines, all transmissions. 6 Cyl.—1968-78 231", 250" 1 & 2 bbl. engines, all transmissions. 4 Cyl.—1976-77 140" 2 bbl. engines, all transmissions.

PONTIAC

8 Cyl.—1967-78 305"-455" 2 & 4 bbl. engines, all transmissions. 6 Cyl.—1970-78 231", 250" 1 & 2 bbl. engines, all transmissions. 4 Cyl.—1975-77 140", 151" 2 bbl. engines, all transmissions.

TOYOTA

4 Cyl.—1975-77 1600cc 2 bbl. engines, all transmissions.

If it's there, then there's an ECONOMASTER® brand Fuel Economy carburetor that can improve your car's gas mileage from 5 to 10 percent* depending on engine. How's that for luck?

The ECONOMASTER brand Fuel Economy carburetor is the only replacement carburetor designed to deliver improved fuel economy. Many models have enlarged metering ports in the carburetor's idle system to improve fuel conditioning. And an exclusive vane-style booster venturi for better fuel atomization. Plus two-stage power valves for improved mid-range efficiency. So you can put that old guzzler on a diet. Fast.



If your car isn't on this list, you may still be in luck. There are ECONOMASTER brand Standard Replacement carburetors for many cars. It can restore your car's original performance. Holley Replacement Parts Division; 11955 East Nine Mile Road, Warren, Michigan 48090.

*Actual economy may vary due to application, engine and driving conditions, engine modifications and driving habits.

For passenger cars only.
*Registered Trademark

Holley Makes Fuel Efficient

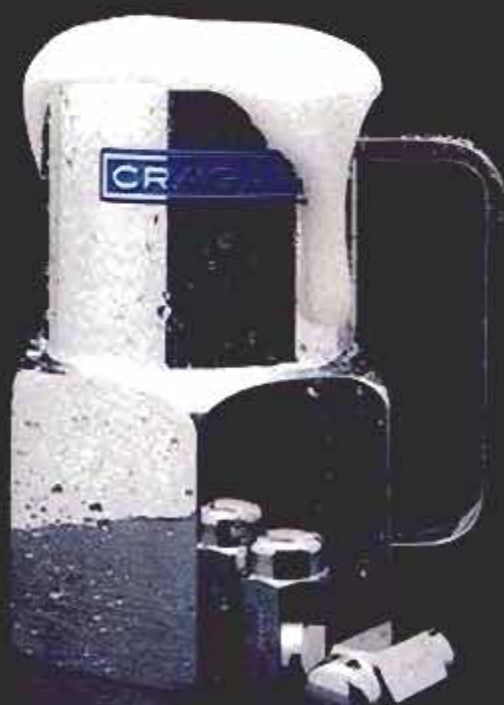
Holley

Replacement Parts Division

Colt Industries



CHUG A LUG. FREE.



At Participating Cragar Dealers

You're invited to a mugging.

Just buy any set of four genuine Cragar wheels between now and November 1, 1982, and get this genuine Cragar lug nut mug. Free.

It's a quality-crafted, polished aluminum beauty ready and waiting for 12 frosty ounces of your favorite brew or soft drink.

And every time you hoist it in good company, you'll be reminded of the great-looking set of Cragar wheels you've got waiting outside.

So drop by your Cragar dealer. Pick up a set of dynamite Cragar wheels.

And get one for the road. Free.



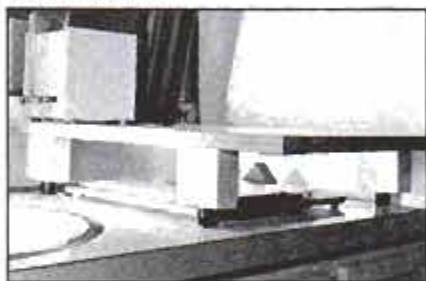
CRAGAR

Our reputation rides on everything we make.

19007 S. Reyes Ave., Compton, CA 90221.

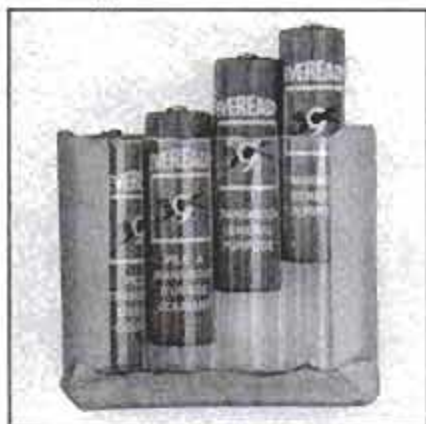
PHOTO HINTS

Free space



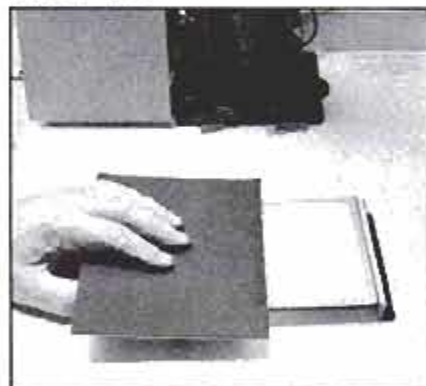
Keep your enlarger off your darkroom table with four scrap pieces of 2x4, each about 3 inches long. This will leave space for a print easel and hundreds of sheets of paper.—*Robert Hertzberg*

Battery pouch



Remove dry cells from equipment when not in use to prolong their life. Store them in bubble material they came in. Cut bubble from cardboard and tape its two sides to form pouch.—*A. Weber*

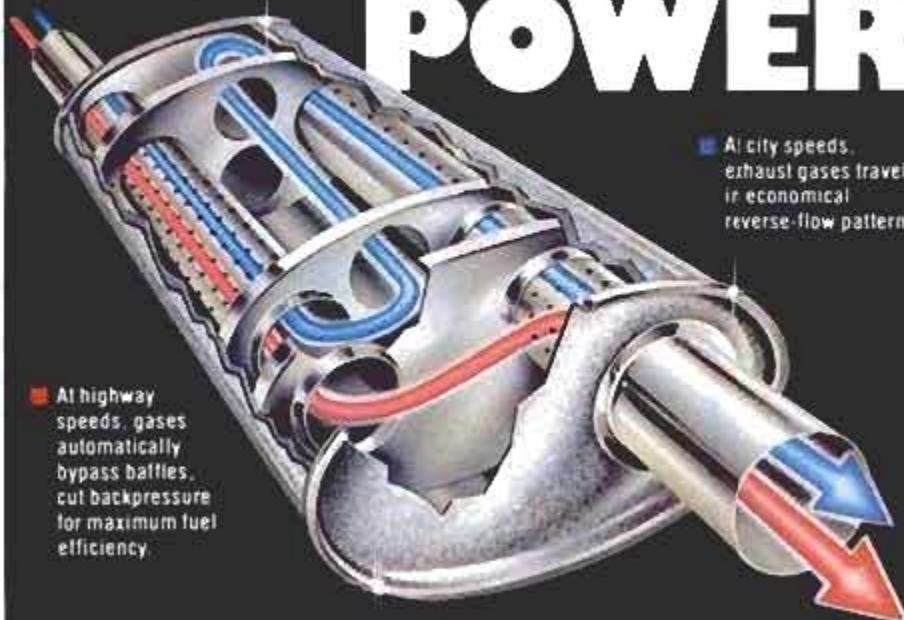
Better safe



An overly bright safelight can fog prints. Cover half a fresh sheet of paper in easel with a black card for two minutes; develop it. If uncovered half is darker, light is too bright.—*Robert Hertzberg*



TURBO POWER



At highway speeds, gases automatically bypass baffles, cut backpressure for maximum fuel efficiency.

At city speeds, exhaust gases travel in economical reverse-flow pattern.

the fuel-efficient muffler!

NEW NOW for home and shop



A The Miser is a new 120-watt reflector lamp designed to produce the same usable light as a 150-watt spot or flood lamp. According to the manufacturer, a new reflector with fluted sides directs the light more accurately, thus providing the same illumination with a 30-watt savings. The new lamps are interchangeable with all medium-screw-base 150-watt lamps and can be used both indoors and out. Made by General Electric Co., Nela Park, Cleveland, Ohio 44112, they cost about \$6 apiece at hardware stores and home centers.

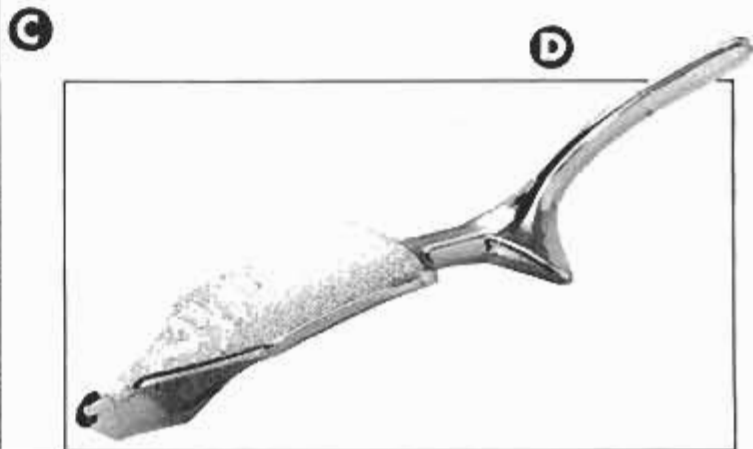
B Heirloom is a new style of replacement plumbing fixtures from Dolly Trim Inc., 3222 East Willow St., Signal Hill, Calif. 90806. The wash basin unit shown features washerless valves, ¼-turn nonrising stems and metal or porcelain handles. A matching bath fixture (not shown) has an adjustable valve stem that compensates for differing valve depths; this allows you to replace most old shower fixtures without having to tear apart the shower wall. Both fixtures are made of solid polished brass and cost about \$280. If they are not available at your local plumbing supply store, write to the manufacturer.



C Pine Crest 2 is Champion's newest style of knotty pine lumber paneling. It comes in ¾ × 3½ × 96-in. reversible tongue-and-groove boards. One side is rough sawn, while the other is smooth, with beaded grooves cut so the surface simulates two 2-in.-wide boards (shown). It can be installed vertically—with the use of blocking between the studs—and diagonally and horizontally by simply nailing boards to the studs. It's from Champion International Corp., 1 Champion Plaza, Stamford, Conn. 06921. A 10-board package (about 24-sq.-ft. coverage) sells for around \$21 at home centers.



D The MasterCutter is a new, all-purpose glass cutter with a nonslip finish made to fit the contour of the user's hand. According to the manufacturer, this design provides better control and less wrist fatigue over extended periods of use. Also featured is a replaceable carbide steel wheel. It can be changed for one of five other wheels that are designed specifically for the type of glass being cut. The tool lists for \$12.99 at hardware stores and home centers. It's from Red Devil Inc., 2400 Vauxhall Rd., Union, N.J. 07083. **PM**



© 1992 R.J. REYNOLDS TOBACCO COMPANY

A black and white photograph of a man with a mustache, wearing a dark jacket, looking out a window. He is holding a lit cigarette in his mouth. The background shows a view of trees and a building through the window. The lighting is dramatic, with strong shadows and highlights.

CAMEL

Where a man belongs.

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

LIGHTS: 8 mg. "tar", 0.7 mg. nicotine av. per cigarette, FTC Report DEC. '81.
FILTERS: 15 mg. "tar", 1.1 mg. nicotine av. per cigarette by FTC method.



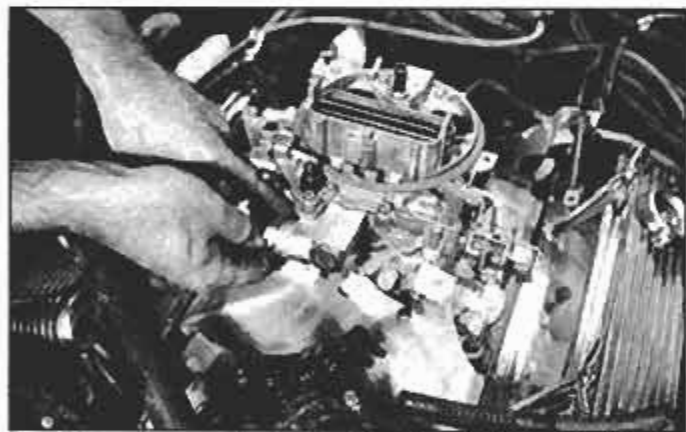
Experience the
Camel taste in Lights and Filters.

New Carburetor And Manifold Yield Better MPG

The Z System certainly works. But your payback period may take too long.



Holley Z Manifold has a divided plenum chamber for better fuel distribution and vacuum signal at low engine revolutions.



The 450-cu.-ft.-per-minute (c.f.m.) carburetor is matched to the manifold's characteristics. All the emissions gear is retained.



The free-flow, paper, air-cleaner element and housing is part of the kit. It lets the engine breathe more freely than stock unit.

You must have noticed the ad: Zora Arkus-Duntov, father of the Corvette, looking tan and fit, is standing next to a Camaro Z28 surrounded by over-size engine parts. The headline reads, "Designed for new levels of efficient performance," and the copy idles on about "optimum performance combined with fuel efficiency and driveability."

Despite appearances, Zora isn't selling Chevrolets, but rather a new intake manifold/carburetor combination. Holley calls it the Z System. And Zora Arkus-Duntov is more than Holley's answer to Ricardo Montalban. Not only is Duntov the celebrity "spokesman" for the Z System, but he designed it and holds the patent.

According to Holley test and development engineer Frank Walter, who worked with Duntov, almost every carbureted engine has a fuel-feed problem; the cylinders farthest from the carburetor tend to run lean. In order to compensate, you have to run a too-rich mixture to the cylinders near the carburetor. The result is wasted fuel, loss of power and a hesitation under low-rpm acceleration.

When Zora Duntov was hired as a consultant, says Walter, he brought with him a manifold design to eliminate this uneven distribution. Duntov's idea was simple, at least in theory. He thought that he could boost the signal in a given manifold runner by the use of a resonating chamber. "He had this all mathematically plotted out," says Walter. "But as is often the case, the theory didn't work on an actual car."

Theory and practice

"What we ended up doing was trial and error development, trying different things: little pocket valves, resonating chambers on all the cylinders, interconnecting the cylinders. We were using the small-block Chevy V8 for development, and found out the most significant improvement was when we tied cylinders seven and eight together.

"There was a lean mixture in these cylinders, and cylinder five tended to scavenge from cylinder seven. By connecting cylinders seven and eight together with a resonating chamber in the manifold, we were able to boost the fuel charge in cylinder seven, and to a lesser extent, in eight. This increases the efficiency of the fuel distribution in the manifold, which in turn allows you to lean out the carburetor for lower emissions, better fuel economy and, usually, better driveability.

"Then we added a divider in the plenum chamber under the carburetor. This isolates one side of the carburetor from the other. The 'open plenum' manifold without a divider is good for breathing at high rpm, but it isn't as sensitive to throttle variations at low

(Please turn to page 69)

Dunlop Light Truck Radials



Durable, Dependable and Economical.

If you carry your livelihood in the back of your truck, you need tires that work as hard as you do. Dunlop light truck radials. Day in, day out they deliver cost saving benefits and dependable performance . . . but that's what you'd expect from one of the pioneers of light truck radial tires in America.

Dunlop radials stretch your tire buying dollars with longer tread life than bias ply tires. And, the lower rolling resistance of radial construction means fewer stops at the gas pump.

Out on the job, Dunlop light truck radials keep working from sun-up to sun-down with twin steel belts that protect against road hazards; sidewalls that resist cuts, bruises and abrasions; and dual polyester body

plies that absorb road shocks. Job after job they deliver comfort, control and easy handling.

There's the Gold Seal LT Rib . . . an all position highway radial with a wide five-rib tread pattern.

Or the Gold Seal LT Traction . . . a rough road, bad weather, mean condition workhorse with a wide, deep traction tread for on and off road service.



LT RIB

LT TRACTION

The Gold Seal LT Rib and Gold Seal LT Traction . . . use them in sets of four, or in tandem with the LT Rib on the front and the LT Traction on the rear. Either way they'll work as hard as you do.

Dunlop light truck radials. Built tough. Built smart. Built for the way you work.

 **DUNLOP**
For the long run

Dunlop Tire & Rubber Corp., Buffalo, New York 14240

ALL OUTDOORS

Better bull's-eyes

Air guns, particularly the new adult models, can supply great accuracy, are quieter than firearms, and can be used for target practice indoors as well as out. With care, a basement or back yard can become a target range. The newest aid to make this changeover easy is a Target Trap Model 850 from Crosman Air Guns. It's true that after studying one in a store you may be tempted to make your own. Behind the bull's-eye are three curtains of material that dampen the impact of a BB or pellet the way a blanket on a clothesline acts as a good backstop for baseball pitching practice. Behind the trap's curtains is a slanted metal plate to deflect and collect the BBs.

But at a price of only \$17, the Crosman model is probably better than a homemade one. A phone book, cardboard box or plywood plank—some of the other favorite backstops—have been known to bounce pellets back at the shooter or around the basement. Even the frame edges of the Crosman target trap have been rounded and slanted to prevent this. The added safety is worth the modest expense.

Equally inexpensive are a set of scaled-down metal silhouettes—the standard turkey, chicken, pig and ram—designed just for air-gun practice and \$5 at Crosman dealers. Beeman Precision Airguns, San Rafael Calif., and their dealers, have printed silhouette targets scaled for a 10-meter (33-foot) air-rifle range. There are five targets of each animal mentioned above for a total of 20 trys. And there's enough border on



Designed for indoor or outdoor air-gunning, new Model 850 Target Trap by Crosman (\$17) is for year-round practice.

the targets so you can see where the shots are going if you miss. There's also a new short, rubber-coated 2.5X-power telescopic sight for air rifles and rimfires for under \$100 from Beeman.

Car camping

Turning your auto into a recreational vehicle is still one of the bargain ways to travel, and new small tents, sleeping bags and cooking gear all



From cool drinks and food to maps and trip notes, handy storage is easy in an Igloo Kool Rest ice chest for auto travel.

help cut costs for a family vacation trip. The Kool Rest, a car-seat ice chest from Igloo, in Houston, can sit between front- or rear-seat passengers, be strapped in with a safety belt, and hold two six-packs or sandwiches, maps, toll coins and dark glasses. Igloo also has a new mid-size, 34-quart ice chest especially designed to fit the luggage compartments of new compact cars.

Places to camp are listed in national directories, like the \$1 *KOA Handbook & Directory*, Box 30558, Billings, Mont. 59114, and various state guides. The Colorado Campground Assn., 5101 Penn. Ave., Boulder, Colo. 80303, has one for \$1 by mail. And a *Family Camping Vehicles Publications Catalog* lists booklets such as *RV Repair and Maintenance*, *Energy-Saving RV Tips*, and *Living in Style—The RV Way* and 33 others. All are available from RVIA, Box 204, 14650 Lee Rd., Chantilly, Va. 22021, if you send a business-size, self-addressed, stamped envelope.

Cool comfort

This month, warmer weather returns to the northlands of the country, but not yet to their waters. Charlie Walbridge of the American Canoe Assn., Lorton, Va., suggests that any time water and air temper-

atures add up to less than 100°F., a wetsuit should be worn under your life vest. Nearly 50 percent of all canoeing accidents occur early in the season, and anyone working near water still chilly from winter runoff should take precautions to prevent hypothermia, especially if there is a chance of falling in. The ACA Safety Committee recommends refresher canoeing instruction at the beginning of the season for paddlers with limited experience, plus a personal flotation device that is worn at all times.

Folding firearm

For camping and survival shooting, a new over-and-under has been announced by the Springfield Armory, Geneseo, Ill. This one folds up conveniently, fires a single-shot .22 long rifle in the top barrel, a 410-bore shotgun shell in the bottom, and stores nine additional .22 cartridges plus four 410 shells in the stock—all at a weight of under four pounds.

It's a modernized version of the World War II Air Force M6, has a mil-



The new M6 Survival Gun from Springfield Armory unfolds to fire a .22 bullet from top barrel and a 410 shot shell from bottom.

itary Parkerized finish and can fire 410 signal flares, as well. Base price is about \$140.

Backpack beast

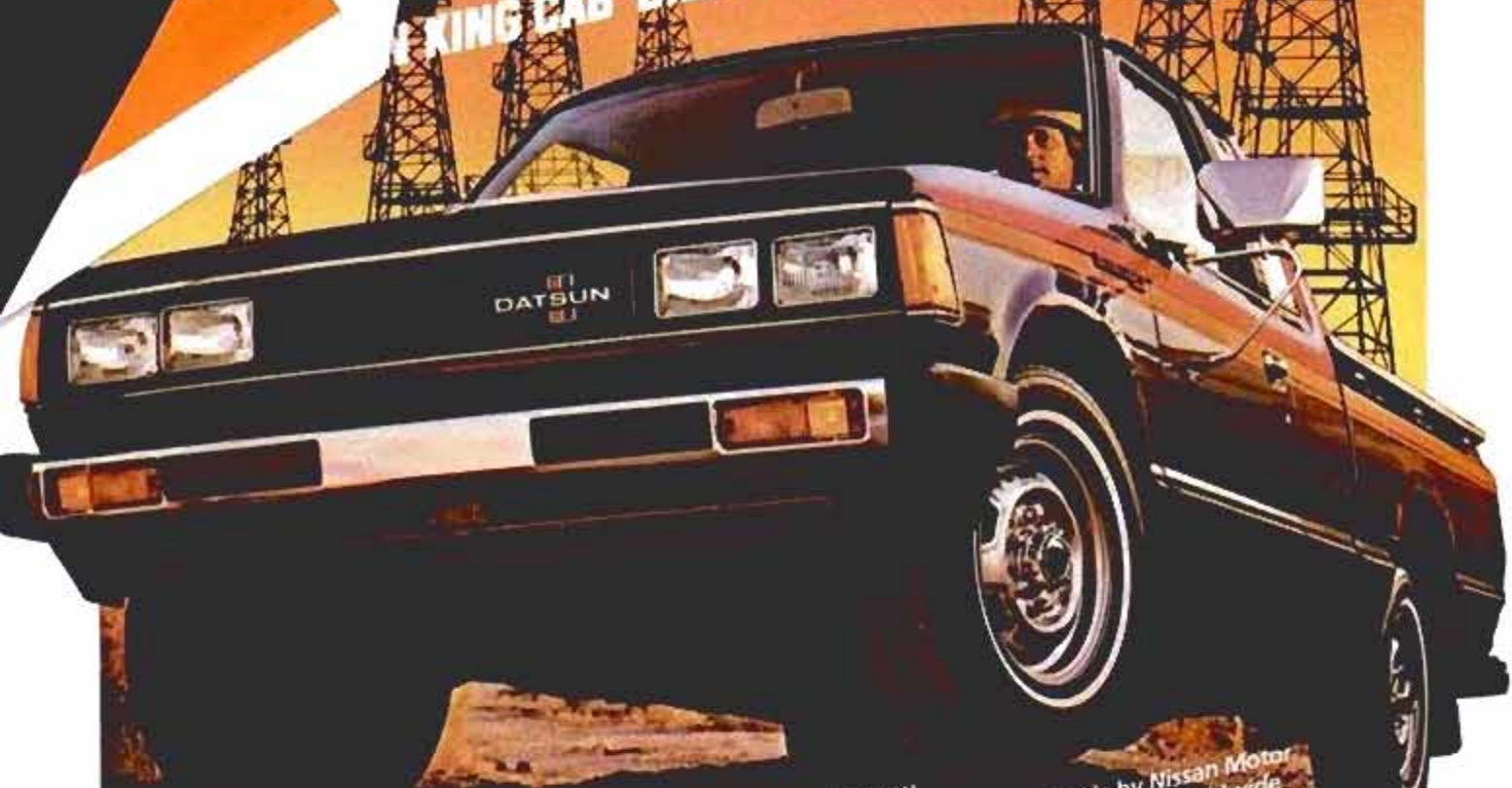
For hikers who like to share the burden, Early Winters Ltd. in Seattle is offering trained and friendly llamas for up to \$2,000 f.o.b. **PM**





KING OF DIESELS

KING CAB DIESEL SQUEEZES FUEL, NOT PEOPLE.



With the price of oil today, you don't dare waste a single drop. Neither does the Datsun King Cab diesel. It gets better mileage than any gas-powered truck.

And while it's conserving fuel, the King Cab is comforting people - with more room than any compact diesel; enough room to recline the bucket seats for regal relaxation. Behind those buckets, up to 7.1 cubic feet of inner space for available jumpseats or safe cargo. (That's a comfort!) King Cab, Long Bed or Standard, you can't buy a better-built compact than Datsun.

They're made by Nissan Motor Company Ltd., the worldwide company who's driven to make it tough on the competition.

39 EPA EST HWY
 33 EPA EST MPG

*EPA estimates for comparison. Actual mileage may differ depending on speed, trip length and weather. Highway mpg will probably be less.

FROM ONE TOUGH CUSTOMER TO ANOTHER.

DATSUN
WE ARE DRIVEN

Product of NISSAN

These four matched volumes tell you and show you everything you need to know about any building or carpentry job...from fixing up an old building to even building an addition or a house!

Take this 4-volume CARPENTERS AND BUILDERS LIBRARY

you everything
building

Cutting to length with miter gauge and stop rod.



FOR ONLY

\$395

(regular price \$35.95)

when you join
Popular Science Book Club

FREE when you join



**POPULAR SCIENCE
20-IN-1 SHOP GUIDE**

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 \$35.95 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 (15 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 at our expense.

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 to the 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...

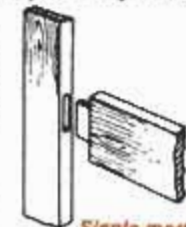
- You get a complete how-to book on woods and woodworking tools, how to do all kinds of joinery and cabinetmaking joints, how to do kitchen cabinet construction... and more.
- You get a complete how-to book on all standard specs of every element in house construction, including how to read plans and 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.

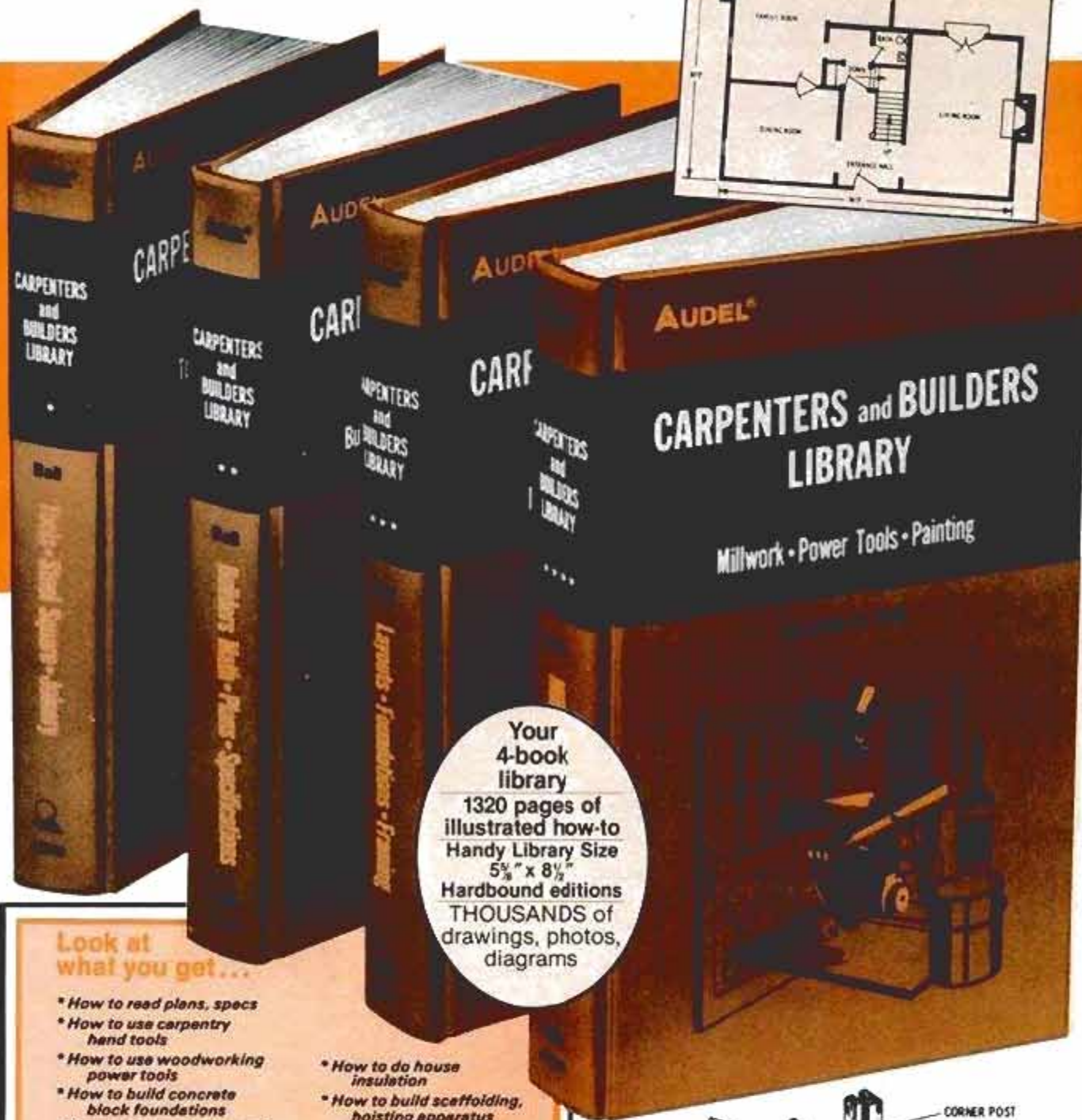
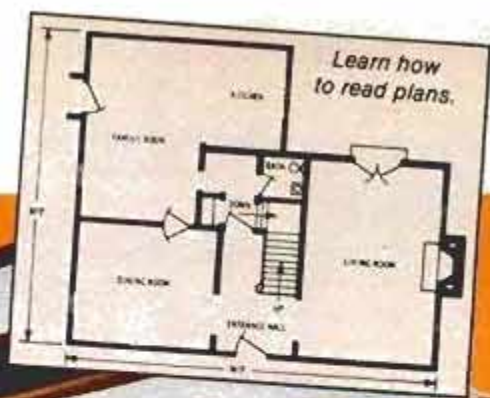
These books teach you scores of tricks and shortcuts used by carpenters for measuring, cutting, raising, fastening, finishing—every technique and job. They give you the answers to just about every carpentry question you'll ever have. And they can save you thousands of dollars in the years ahead.



Single mortise and tenon joint.

Installing metal shingles under wood shingles.

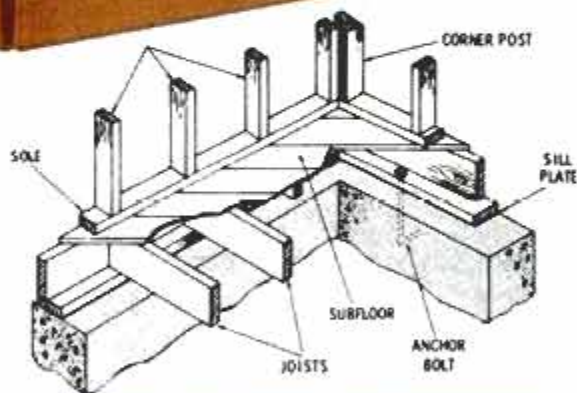
**you need to know to do just about
a foundation, installing new paneling,**



**Your
4-book
library**
1320 pages of
illustrated how-to
Handy Library Size
5 1/2" 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

THE ATHLETE'S FOOT DOCTOR

- Stops the itching
- Kills the fungus
- Speeds the healing
- Prevents the reinfection

Dr. Scholl's Athlete's Foot Products contain clinically proven, doctor-recommended Tolnaftate for treatment and prevention of athlete's foot.

DrScholl's



Read and follow label directions.
© 1982 Scholl, Inc.

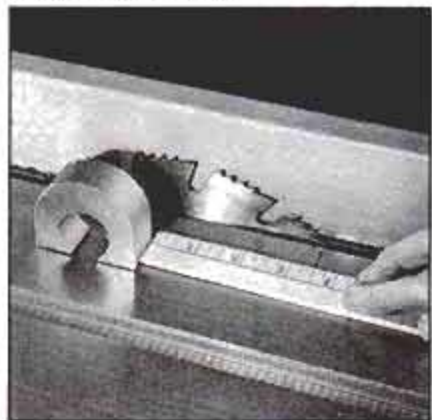
HINTS FROM READERS

Salvaging hacksaw blades

Although I usually buy high-quality tools, when it comes to hacksaw blades, I find that the least expensive ones are the best buy. I try to get a 20-blade pack for about \$1.50. The blades I buy are extremely hard; on the other hand, they also break easily.

These blades are still a good purchase, however, because I save and reuse all the broken pieces. I grind some of them to fit my sabre saw. Recently I cut a 40-gallon hot-water heater in half lengthwise, using some oil and three broken blades. I use other fragments as scrapers; many scraper shapes are formed when the blades break. Sometimes, I grind them to suit a certain job. Last summer, I reglazed and painted all the windows in my house with the help of these broken blades.—*John Nelson*

Magnet saw stop



A strong permanent magnet can serve as an improvised and easily adjustable stop for a circular, band or jigsaw that has a metal table. The stop simply limits the length the workpiece is cut. Toward the end of a cut, feed the work slowly so the magnet won't shift. The photo shows an Alnico magnet used as a table-saw stop. The magnet is a blend of aluminum, nickel, iron and cobalt.

In setup above, the rip fence is positioned close to the saw blade. A stop clamped to the fence would be impractical. When the first series of cuts is completed, adjust the magnet to make the next cut. Alnico and other magnets are available by mail from Edmund Scientific, 101 Gloucester Pike, Barrington, N.J. 08007; catalog, \$1.

—*Walter E. Burton*

Hug the road better...longer.

Bobby Unser, auto expert and champion driver says

"With Gas-a-just Shock Absorbers you'll hug the road better than with ordinary shocks because Gas-a-just's patented design seals in nitrogen gas and all-weather fluid under pressure to give you smoother, consistent performance throughout the full stroke of the shock absorber."



**Gas-a-just[®]
Shock Absorbers**

And this superior performance lasts throughout your trip because Gas-a-just's design eliminates the foaming and aeration which is so common in ordinary shocks and causes their performance to become erratic and fade as you drive.

Insist on
**Gas-a-just[®]
Shock Absorbers**
Modern as
Tomorrow

KYB[®]
KYB Corporation
of America
901 Oak Creek Drive
Lombard, IL 60148

Great with Radial
Tires, too!

ANATOMY OF A WING-WALK

(Continued from page 31)

approached the record slowly and carefully. We made tests. For example, regular nylon rope isn't any good because it stretches. We hunted all over for special rope until we found Larry Caldwell of Pigeon Mountain Industries in Georgia. He had a rope with only 2 percent stretch and an 11,000-pound test strength.

PM What about the right wing?

the right side. We planned it so Steve Weiss would jam his body against the door, plant a foot on the wing, and block the wind for the rest of the guys. But when he did, the airplane shuddered and shook like crazy. Things ripped off the cabin walls; we lost headsets and mikes—they just zapped out of sight. We gave the emergency signal and everybody jumped for their lives.

PM What went wrong?

MC Like I said, this was an engineering adventure. When Weiss put



Pilot Martin Caidin (right) realized that the event would be a one-wing extravaganza after his Ju-52 flipped on a trial run. The practice times (above) on hard ground were far slower than those of the actual mass bailout.

MC We have a forward cabin door, right over the wing-root leading edge. I didn't know of anyone who'd ever flown a Ju-52 with that door off. I checked with a whole bunch of former Ju-52 pilots from Germany and drew a blank everywhere. I went over the possibilities for this and many other things, by the way, with Dr. John Hoover of the University of Florida. He did engineering, air drag and other tests for us. The only way to find out was to try it. So we removed the door, crossed our fingers and took off. We got a strong burble going through 90 mph on the climbout and I did a whole series of maneuvers in the air, going up and coming down. Any time we went through 90 mph, the burble shook the plane, then quit. Great! So we got ready to make a test with six guys on the left wing and six more on the right.

PM And how did that go?

MC It scared the hell out of us. We put Dave Kanamine on the left wing with a bunch of guys, and the Ju-52 was shaking and kicking up a fuss and then six more guys started out

his foot onto the wing, it was at the leading edge and close to the root: the worst possible place. The air ripped around his body, in the door and smashed right through the airplane.

Actually, it was a good thing, because it made us think. If you kill the lift between the outside arc of your prop tips and the fuselage on just one side of this type of plane, you're destroying 40 percent of all your lift.

PM So the decision to use only one wing was made for you.

MC Definitely. It was safer because we'd have more lift and more control.

PM You said you were going for 18 people, but you set a record with 19. How come?

MC Major Don Towner of the U.S. Air Force joined up with us. He took

(Please turn to page 68)



SMALL ENGINES WORK HARDER THAN LARGER ONES

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

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

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

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



FREE: 32 page LUBE TIPS booklet. Information, ideas and discussion about problems, performance and lubrication. Send self-addressed, stamped envelope 4 1/2 x 6 1/2 or larger.

THE SHALER CO.

Waupun, WI 53983

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



LECTRIC SHAVE MAKES YOUR BRISTLES STAND UP FOR A CLOSER SHAVE.

Lectric Shave is putting its money where your face is. Here's the deal: apply Lectric Shave* to one side of your face. Then use your electric razor. Compare the Lectric Shave side with the dry side. The Lectric Shave side should feel closer, smoother. That's because Lectric Shave makes your beard stand up. So you shave closer, faster, with less irritation.

OR YOUR MONEY BACK.

GUARANTEE

If you don't agree that Lectric Shave gives you a closer shave, we'll give you a complete refund. Just send your bottle of Lectric Shave with the unused portion and the cash register receipt with the purchase price ordered to: J. B. Williams, Lectric Shave Guarantee Office, P.O. Box 5036, Hicksville, New York 11816.

ANATOMY OF A WING-WALK (Continued from page 67)

some fabulous films to document the event and he made it 19.

PM *Did you run into any other unexpected problems?*

MC Every time we flew a test. For example, we made our early tests with up to 12 people on a wing. We figured we would need every ounce of lift, so we used 15° of flaps. Big mistake. All of a sudden, the airplane put its nose down sharply and dived almost vertically, out of control. We dumped the crowd and recovered.

PM *What was wrong?*

MC When we put the people on the wing, we added camber, or curve, to the upper surface of the wing. This increases lift and does a couple of other things. The flaps at 15° further cambered the wing. Presto! The center of pressure under the wing moved aft and the center of lift moved forward. The turbulence off the bodies on the wing unloaded the tail surfaces, which went up, and the nose went down, and all together, wow! We became a finned bomb. After that, we changed positions on the wing and left the flaps up.

PM *Tell us about the parameters you finally selected for the record wing-walk.*

MC We had 24 people aboard: I had left seat, Don Yahrling was in the right seat, Bill Tharp flew as crew chief, Art Barchie was jumpmaster and Mike Fuller had a camera, plus the 19 wing-walkers. Out on the left wing was a big vertical boom with a couple of cameras, and Ken Lindsley and Gene Chevalier had stuck cameras all over the plane. We were at 23,000 pounds and had a hell of a lot of drag. We thought that we'd need up to 4,000 feet for the takeoff roll, and my first surprise came when we used 25° of flaps for takeoff and jumped into the air after just 1,200 feet. We flew over Palatka, Fla., our designated drop zone, with three chase and camera aircraft. We had planned to go at 9,500 feet. But people moving around the Ju-52 got me into a bad center of gravity position and I started the final run at 9,000 feet, letting the speed build up so that at 8,500 feet, we were indicating 120 mph.

PM *So they started onto the wing at 8,500 feet?*

MC Yes. About six of them went out fast. Dave Kanamine took a point position behind the left engine and Mike Maguire held lead along the fuselage. They blocked the wind

for everybody else. My first real big surprise in the air was a sudden, severe yaw of the nose to the left. I kicked right rudder as hard as I could and she came around. Our speed went to 140 mph indicated, faster than I believed, and she put her nose down as that gang kept pouring out on the wing. And just like that, she went through a 2,000, then a 3,000, then a 4,000 feet-per-minute rate of descent.

PM *Did you lose control?*

MC For a while, we didn't think we could hang on to her. The buffeting was wild, really bad. We got a pogo effect, up and down. The left wing was twisting wildly—you could see it flexing like mad—and the right wing was drumming like a washboard. Then we heard this terrific booming sound. She was oil-canning. Our speed built up to a true 190 mph and the yaw was terrific. She was trying to roll over on her back. By now, I was holding full left rudder and full right aileron, so there we were, coming out of the sky with full crossed controls. I didn't think the airplane was going to stay together.

The yoke columns were shaking as if they were going to bust right out of the floorboards and I couldn't read the instruments anymore because of the vibration. I had to kill power because we were accelerating so fast. I almost hit the smoke switches for the emergency signal to bail out. Tharp was screaming that we had only four more to go. I thought he meant four more people, but it was four more seconds for the prearranged eight-second ride. I glanced at the left wing and it was twisting and rippling. Then I heard Tharp yelling on the radio, "They're going!" He meant the jumpers, not the wings. As the wing-walkers were spilling off, things were smoothing out and, suddenly, we were back in the real world with a docile airplane, coming downstairs like a bat out of hell, but smooth. And we'd done it!

PM *Did the airplane suffer any damage?*

MC We busted a couple of things, but they were minor. We were amazed at that. One chase plane pilot said the whole right wing was a blur of vibration and the tail was twisting in a crazy whirl mode. He didn't know how it was staying on.

PM *What's next on your agenda of nonstunts?*

MC A new world's wing-walking record.

PM *You're kidding.*

MC I'm serious. All women: 21 or more.

PM *Bikini-clad, no doubt.*

MC You've got it.

PM

THE HIGH-MILEAGE FILES

(Continued from page 58)

rpm. That big plenum acts like a large mixing bowl. By splitting the plenum, we can increase the flow rate in the manifold runners to the cylinders. That's why you get better throttle response at the bottom end.

"We put this manifold together with our small, four-barrel carburetor. Now, most people think that when you go from a two-barrel to a four-barrel, your gas mileage will go down. But at highway speeds, you're driving on just the primaries of the four-barrel, which are smaller than the two-barrel bores. We pick up economy on most two-barrel to four-barrel conversions. It's perfectly logical, when you think about it."

Trying out the Z System

It all sounds perfectly logical, but does it work? We decided to put Duntov to the test.

A complete Holley Z System starts with Duntov's patented manifold, cast in aluminum, Model 300-28Z. With it comes a matching Holley Model 4360 four-barrel carburetor rated at 450 cu. ft. per minute (c.f.m.). Holley also includes a 14-inch, "free-flow" air cleaner and a high-output fuel pump, rated at 80 gallons per hour at 4.5 p.s.i. Finally, there's a pair of polished aluminum valve covers. They don't do a thing for performance, but they make your engine prettier.

All of this is not cheap. Holley's suggested retail price for the complete package is \$684.60, though almost any auto parts store will discount this price to around \$360, which still isn't peanuts.

The Z System is available for a variety of engines, but we used a small-block Chevy similar to that for which it was originally developed. Ours is a 305-cu.-in. version, fitted in a 1979 Nova.

At a steady 60 mph on the highway, the 3,000-plus pounds of the Nova required a gallon of unleaded premium every 22.50 miles with the stock two-barrel carburetor. With the Z System, fuel economy improved to 23.84 mpg, a solid gain of 1.34 mpg or 6 percent. Exhaust emissions were reduced, too: HC dropped from 380 parts per million (ppm) to 36 ppm, CO from .22 percent to .03 percent. CO₂, however, went from 12 percent to 14.9 percent, indicating more efficient combustion and cleaner burning.

But that's not the half of it. Since the day it was born, this Nova has suffered from annoying detonation, asthmatic acceleration and a gener-

al overwhelming feeling of lethargy.

The Z System changed its life. The detonation is gone, at least on 91-octane gas. Acceleration is noticeably snappier. And best of all, for the first time, the car responds when you hit the gas.

According to Holley engineer Frank Walter, this is just the beginning of improvement. An aftermarket camshaft, headers and exhaust system will pull the cork from the exhaust side of the V8, an absolute necessity now that we've opened up the intake side.

The bottom line is cost. Is it worth

replacing your stock intake system with \$360 worth of Zora Duntov's scheming? Well, if you drive 10,000 miles a year and pay \$1.40 for a gallon of gas, you'll save a piddling \$35 a year. So your payback period would be just over 10 years. In other words, it's not worth the trouble if all you're after is saving gas.

On the other hand, our test Nova transformed was just as reliable and easy-starting, but much more enjoyable to drive. **PM**

Produced by the PM Auto Dept.
Text: Rich Taylor



Sometimes It Pays To Have Nosey Friends

... friends that give you a firm grip on fine work in tight places. That make it easy to reach the hard to reach. Long nose pliers by CHANNELLOCK. Slender, perfectly mated jaws with no side wobble. Sharp, hand honed cutters. Beautiful high polished finish. Blue dipped plastic comfort grips. Quality in every detail (at no premium in price). CHANNELLOCK. Be sure that name is on the pliers YOU buy.

CHAN NEL LOCK

CHANNELLOCK, INC. • Meadville, Pennsylvania 16335

Meet The Rest Of The Family. Send For Free Catalog.

THE LEADER OF THE PACK.

Ford wagons. America's best-selling wagon lineup. Again.

Ford, the Wagonmaster, has been pleasing wagon owners for over 50 years. In fact, since 1949, a million more people have bought Ford Wagons than any others.*

LTD Country Squire. A fine car and a wagon, too.

LTD Country Squire, a Wagonmaster tradition, still offers full-size room and quiet comfort. There's room for eight passengers with the Dual Facing Rear Seats option. And LTD has more cargo room than any wagon in America.**

Almost 90 cubic feet with the rear seat down.

Ford Granada. The first Granada wagon ever.

Ford is proud to introduce the first Granada wagon—with all the style of Granada and more cargo room than any American-built wagon in its



*Based on most recent R.L. Polk & Co. registrations.
**Based on EPA Cargo Volume Index.
Comparison excludes other Ford Motor Company products.

FORD

class.** Granada wagon for 1982, built with Ford's commitment to quality.

Ford Escort. The best-selling wagon in America.

Escort is the only American-built wagon with both the traction of front-wheel drive and the smoothness of four-wheel independent suspension. And Escort was designed

with special high-strength steel to achieve lighter weight and excellent fuel economy.

44 EST HWY **28** EPA EST MPG

For comparison. Your mileage may differ depending on speed, distance and weather. Actual highway mileage lower.

Whether you buy or lease, see the LTD, Granada and Escort wagons at your Ford Dealer now.


FORD WAGONS

FORD DIVISION



WAGONS



A cowboy wearing a white hat and a brown vest is riding a dark horse through a grassy field. The background shows a clear blue sky and distant mountains. The overall scene is a classic western landscape.

Come to
**Marlboro
Country.**

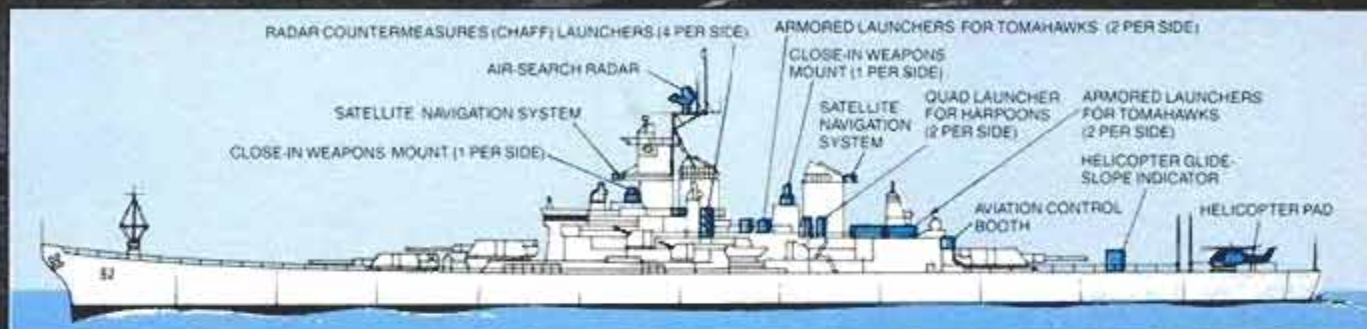


Lights: 11 mg "tar," 0.7 mg nicotine—Kings: 16 mg "tar,"
1.0 mg nicotine av. per cigarette, FTC Report Dec. '81

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

The Born-Again Battlewagons

New Jersey (photo) before 1969 decommissioning. Drawing below shows reactivation profile with aviation area, plus new weapons.



Critics call them tempting targets, but the Navy says the updated mix of missiles and BB guns is worth a lot more than four on the shore.

by Robin Nelson TECHNOLOGY EDITOR

It didn't take long: Only a few days after the Navy's plan to reactivate its four *Iowa*-class battleships was revealed in detail last year during Congressional hearings, the letters started coming in. They read as if from a ditto machine... "I'm ready. Take me. I know that ship." The writers listed either *USS New Jersey* (BB 62), *Missouri* (BB 63), *Wisconsin* (BB 64) or *Iowa* (BB 61) herself.

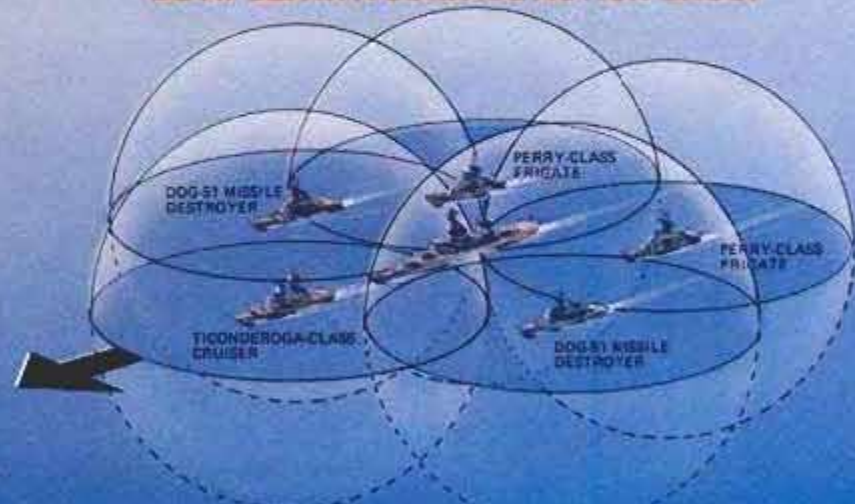
The typical correspondent was in his mid-to-late 50s—a child of the Depression who grew up to sail off in righteous defense of his country in the most

feared ships in the world. Now they are going back to sea, and he wants to cross a gulf of four decades to be there, too.

Insofar as modern military institutions can be touched by such gestures, the Navy was. But official reaction was tempered by the fact that emotions do not justify multimillion-dollar defense appropriations. What *does* justify the return of the battleship, according to the Navy, is a simple matter of cost efficiency in an increasingly complex defense environment. In the case of the

...more offensive punch than any other surface ship

BB AT SEA IN A SURFACE ACTION GROUP



A guided missile (Ticonderoga class) cruiser, plus missile destroyers (new DDG-51s) and missile frigates would put anti-

air, antiair, and anti-sub net around battleship in typical SAG deployment. Escorts' surface-air missiles range to 60 miles.



New Jersey, which will undertake sea trials as early as next September, an outlay of \$326 million will put to sea a capital ship unmatched in offensive firepower by anything even on a drawing board, not to mention in a shipyard or afloat. The same sum applied to building a completely new ship, the reasoning goes on, might be sufficient to produce a

frigate, the least capable escort-type vessel, at today's prices.

New Jersey's sister ships, beginning with *Iowa* in 1985, will follow at approximately yearly intervals if the Navy gets its way. Reactivation costs for each of these will far exceed the *New Jersey's* price tag, since they will have to be brought to the latter's 1969 "baseline" configuration (dur-

ing previous reactivation for Vietnam) before receiving the mix of missiles and defense systems the Navy considers crucial to the update.

Still a bargain, according to the plan, and the logic seems intact: Although the *Iowa*-class battlewagons were all launched between 1942 and 1943, they were, with the exception of *New Jersey*, permanently moth-



USS NEW JERSEY'S COMBAT ARSENAL

- | | |
|---|--|
| <p>1 Land-attack Tomahawk with nuclear warhead; range: 1,700 miles.</p> <p>2 Land-attack Tomahawk with conventional warhead; range: 850 miles.</p> <p>3 Ship-to-ship version of Tomahawk; range: 300 miles.</p> <p>4 Harpoon antiship missile; range: 70 miles.</p> | <p>5 16-inch armor-piercing or high-explosive shells; effective range: 22 miles.</p> <p>6 Dual-purpose 5-inch guns; surface bombardment range: effective to 10 miles.</p> <p>7 Close-in weapons system; target acquisition (missiles or aircraft) at up to 6 miles; firing begins at 3 miles.</p> |
|---|--|



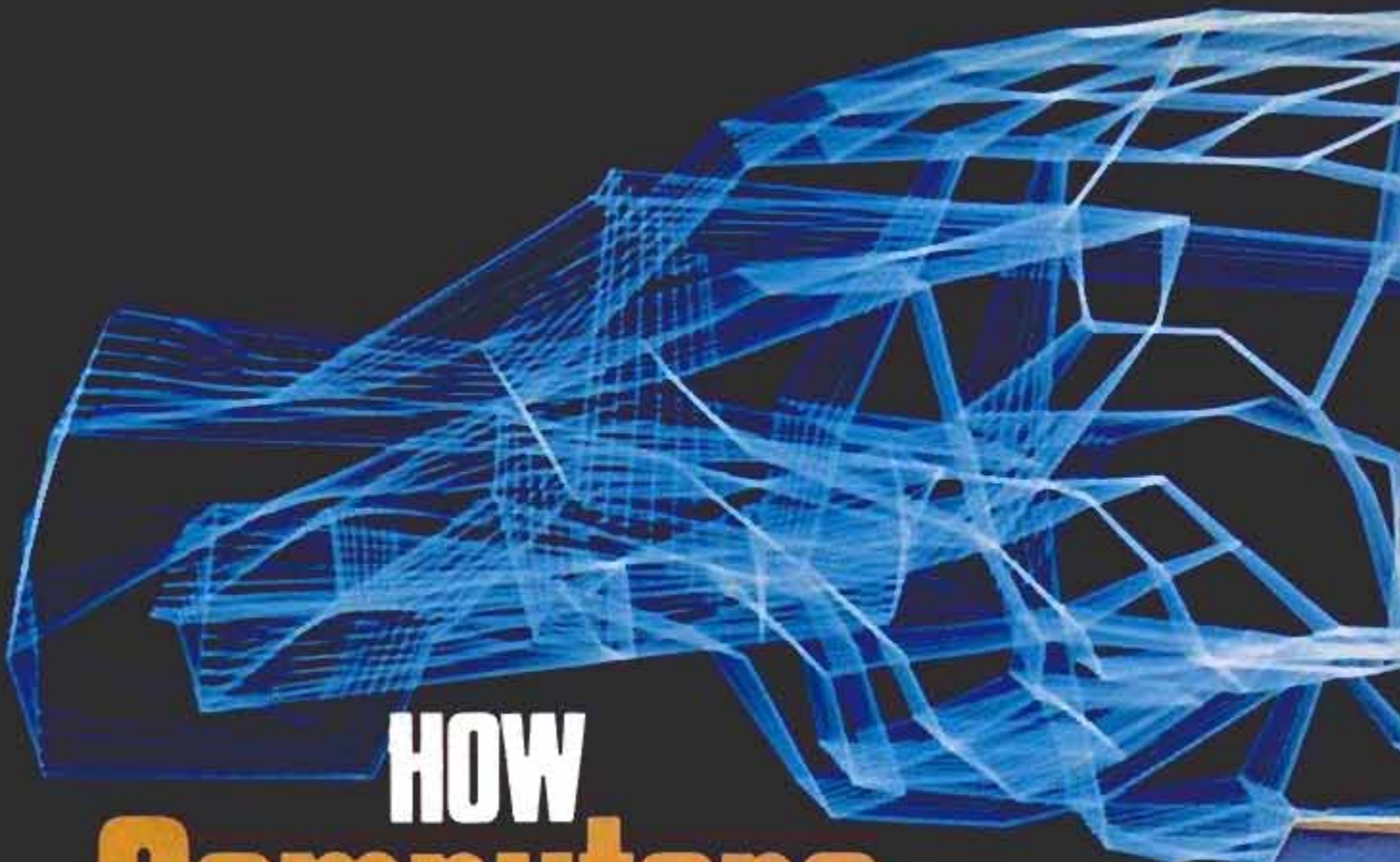
balled by the late 1950s. A ship's technical age is figured by time on the powerplant; even including *New Jersey*, they average only about 12 years' steaming and should look forward to a total lifetime of between 25 and 30. By that standard, curiously, the World War II battleships will emerge from drydock as some of the Navy's youngest ships.

Yet it's impossible to regard a battleship—a dreadnought—merely as a relative bargain in steam boilers and armor plate. Before strategic airpower and nuclear bombs came simultaneously of age, this century's arms race knew only one doomsday machine, one balance-of-power weapon: the battleship.

In planning the original *South Da-*

kota class as early as 1916, the United States was determined to have a ship that could control the seas against *whoever* won World War I—whether it was Germany or Britain—and cancellation of it short of completion in 1921 was as ironclad a guarantee of peaceful intent as a nation could offer. Naval treaties limit-

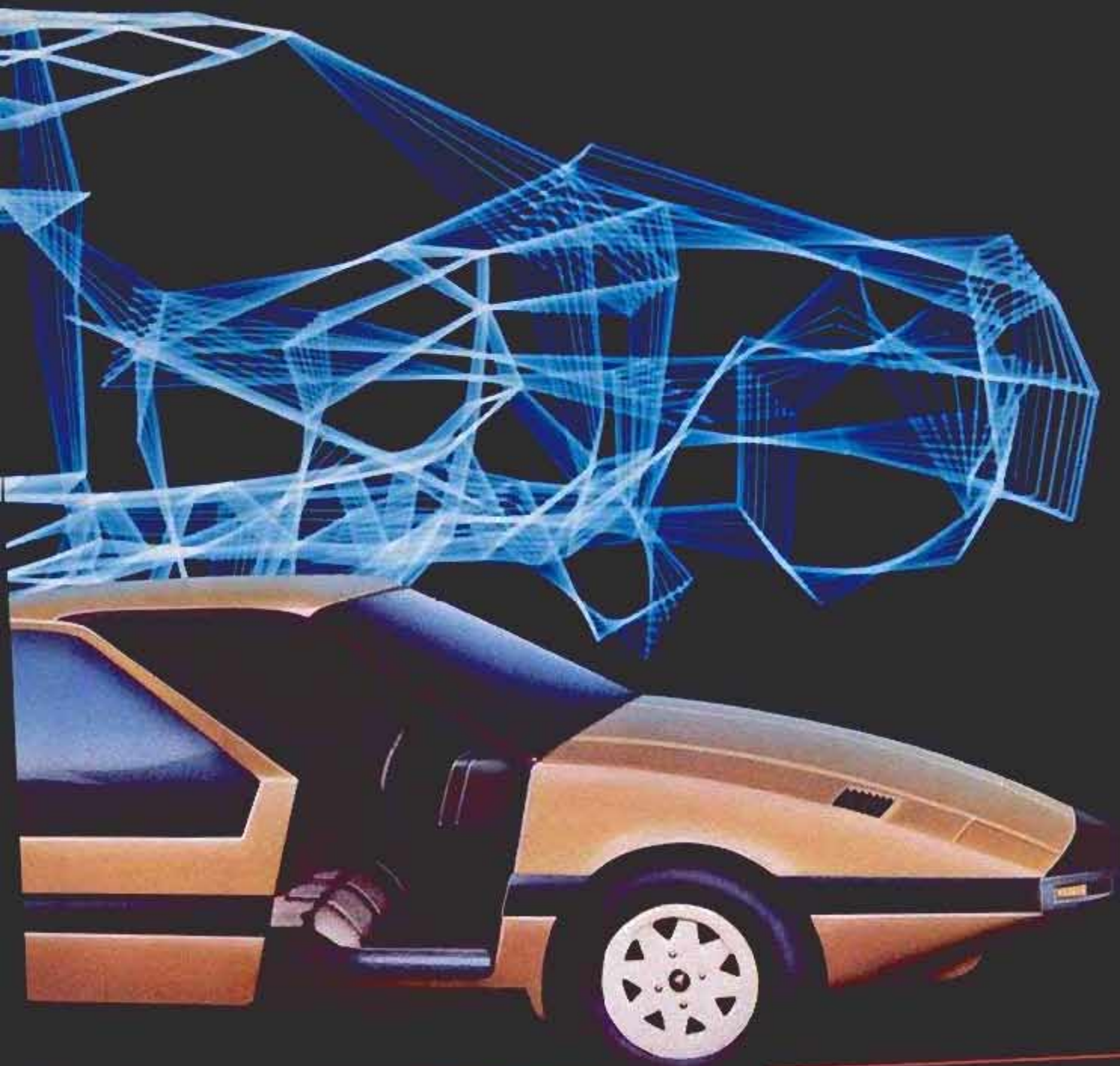
(Please turn to page 141)



HOW Computers BRING CARS TO LIFE



Wire-frame image of a car (top) is displayed on computer screen. Designers can zoom in on one feature, check mechanical design criteria, or even put the car through various stress tests. The image here shows the front end of a car being placed under tremendous stress. Video tests like this can predict how the finished product will perform. Other programs allow for three-dimensional images to be viewed (left). These 3-D views can be used to design everything from the complex ups and downs of a camshaft to machining a wheel. More than ever, computers are getting involved in car design.



Under the guidance of skilled humans who man the keyboards, computers are now designing the look, drive and durability of Detroit's cars of tomorrow.

by Neil Shapiro ELECTRONICS EDITOR

To you and me, a car is a symphony of curvaceous metal, of touchy but stalwart machinery—all wrapped up around a little bit of soul. But to calculating computers deep in the heart of Motown, a car is nothing more—or less—than a collection of 20,000 points to be plotted and replotted, twisted and displayed as ghostly, video images on flickering monitors.

It's all part of Detroit's ongoing commitment to

CAD—Computer-Assisted Design. The shape of many of the cars you'll be driving tomorrow, or even today, is influenced by a computer, guided by human hands, eyes and feelings.

As Frank Biondo of GM Design put it, "We can't forget the human areas."

And human hands still shape the clay from which automotive dreams are made. Full-size clay models—design mock-ups—are exact replicas of what the designers first envision as the finished car.

Just walk through the basement areas of GM's

main design division in Detroit and you'll catch an occasional whiff of clay seeping out from behind locked, no-admittance doors.

The smell of clay is the odor of mystery. Within those secret chambers, the plans and dreams of the corporate car giants begin to take physical form. Smoothed and finished by loving hands, with glossy plastic sheets applied tightly enough to clay sides so that they appear to have coats of shiny lacquer, the clay models wait for the approval of both man and machine.

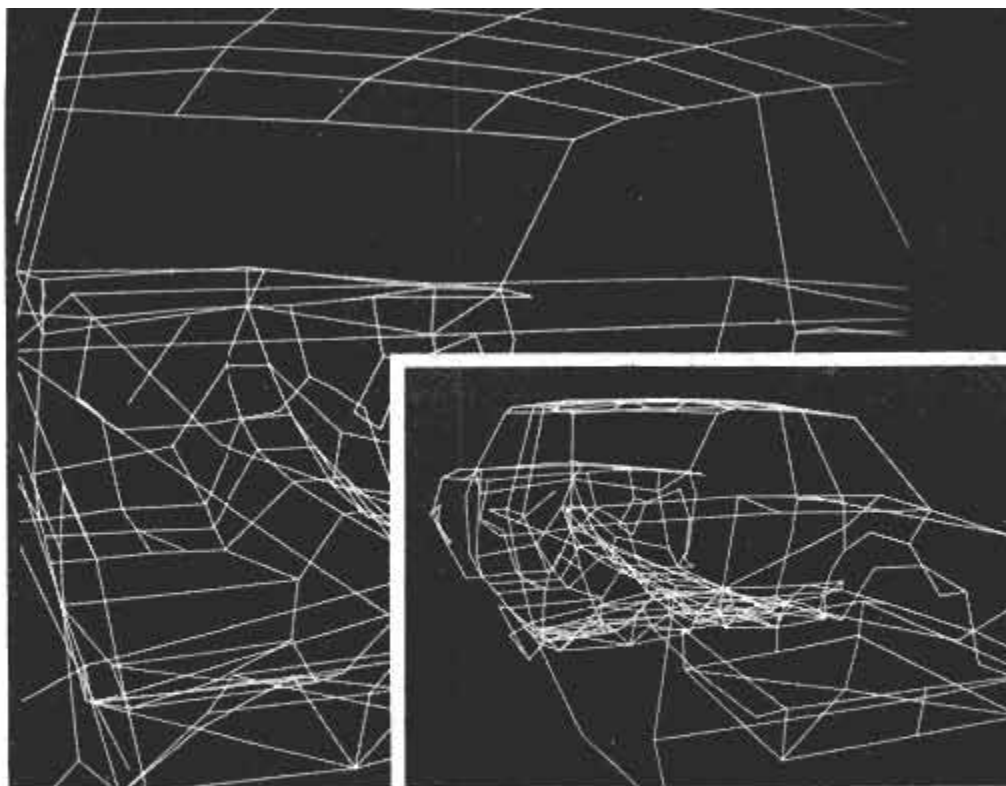
A mechanical scanner, taller than a tall man, but with the delicate touch of a young girl, is rolled into position beside the clay model. The mechanical arm of the scanner reaches out, traces the graceful curves one by one and converts each aerodynamic sleekness, every stylistic bump, into a series of coordinates. Then these coordinates are stored as binary bits on a floppy disc that, to a computer, is more readable than the glossiest clay surface.

From there, the wet smell of clay becomes a background memory to the airconditioned, office-clean cubicles of the design-team people.

The stored points are instantly accessed by desktop computer terminals as clay is converted to video. A car appears on the screen: It's tilted, moved around and examined in detail until every part of the dream can be certified as being worthy of reality. Of course, reality to GM or Ford may differ somewhat from our own consumer-oriented perceptions of a car.

On-screen wizardry

On a recent trip to Detroit, we watched anonymous video cars being put through their computerized paces on monitor after monitor. It was a combination of the Indy 500 and a pinball fantasy. But it was all deadly serious.



On-screen views allow computer-assisted designers to look at every structural part of a car before it's built. The scale may be zoomed in or out. Every part is seen in relation to every other part, so effects of simulated stress or design change can be observed.

The first test we watched involved a procedure as human-oriented as packing your trunk for a long trip. The video display zoomed in, under the guidance of the designer, and became a full-screen view of a car's open trunk. The screen beneath the trunk was filled with a list of options, such as "golf bag" and "lady's overnight."

The designer touched his light pen, like a magic wand, to one of the on-screen choices. Instantly, a golf bag appeared, as transparent as the car it would soon be packed in.

With the light pen, he positioned one piece of luggage at a time. Everything fit. But if it hadn't, it would have been back to the clay for redesign and further study of the car's understructure.

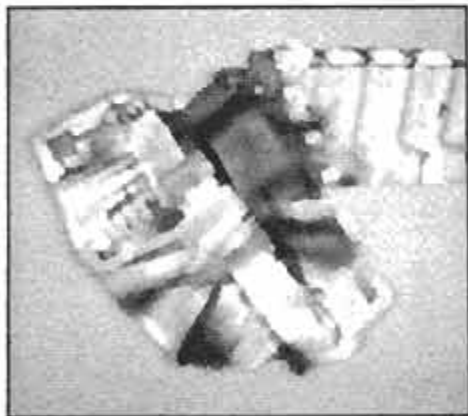
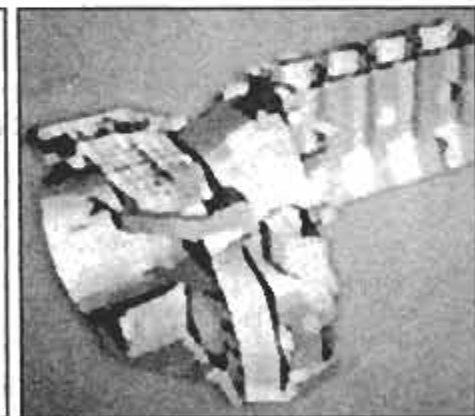
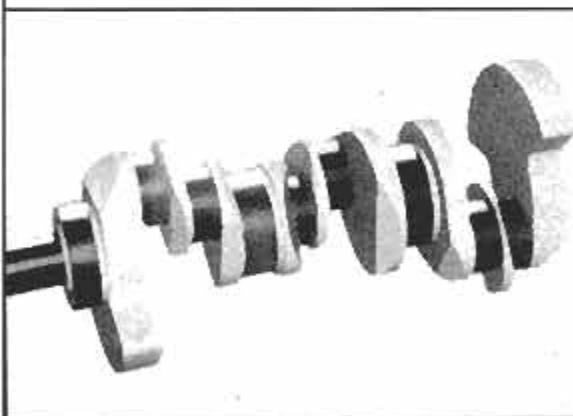
If necessary, the clay model's

trunk could be widened, the hinges redesigned, or room could be added somehow to achieve what the computer-aided designers consider satisfactory space. Any changes would require careful scraping of clay, accompanied by new measurements to be turned into computer coordinates.

Phantom rider

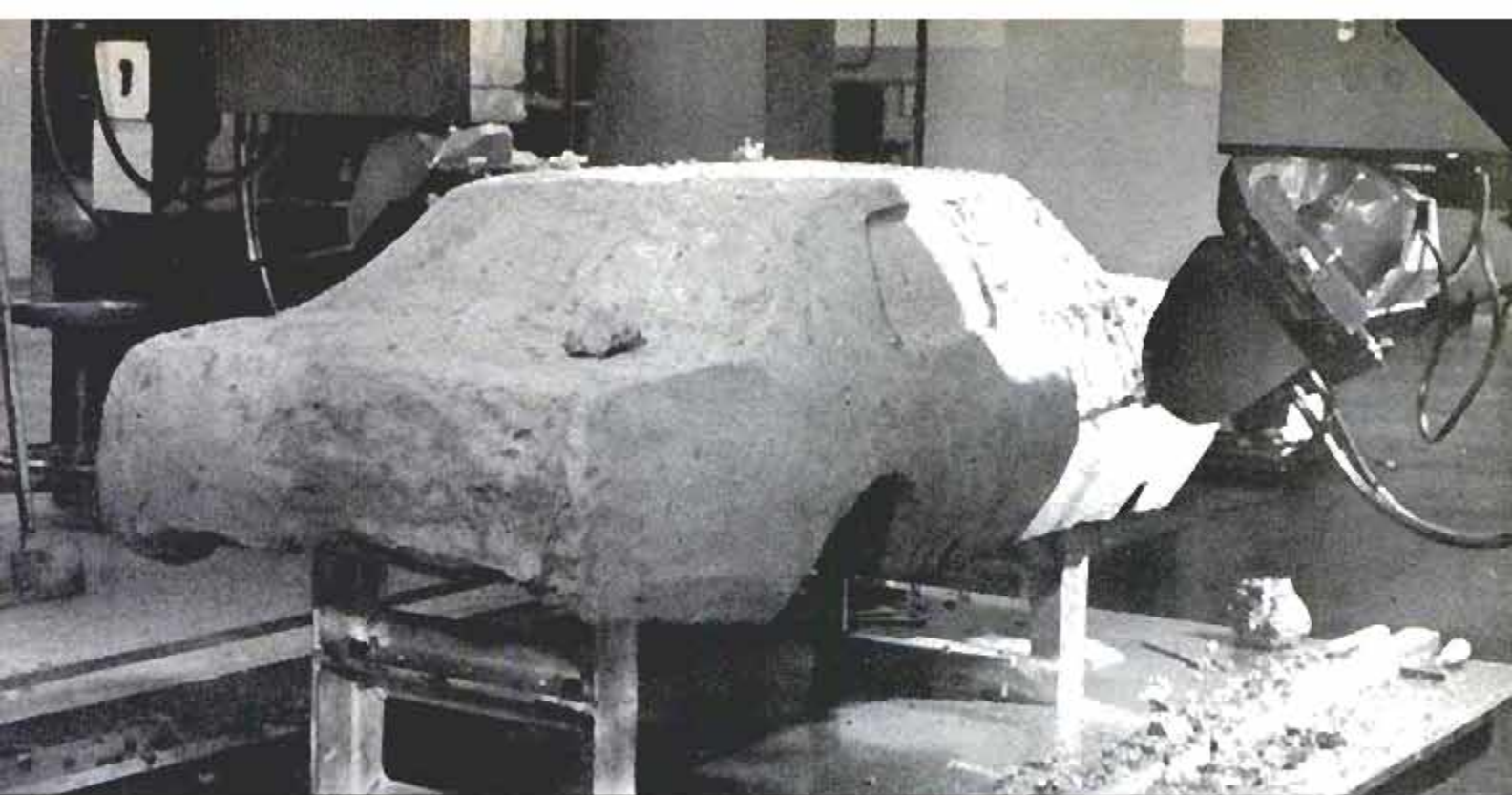
Then we watched as, back on video, a computer's version of a human being took the driver's seat. He looked for all the world like one of Casper the Ghost's best friends.

This time, the light pen was used to choose options that detailed the amount of legroom, ankle flex and other human-machine measurements that drivers of various sizes could expect in the car as designed.



Three-dimensional images are just now being introduced to the computerized design teams. Camshaft (left) was designed by new GM-Solid program that allows for realistically detailed and shaded imagery. Ford also uses three-dimensional techniques. This pro-

gramming lets the computer indicate visually the stress patterns in flexing metal. Spring (right two photos) is shown before and after computer-simulated stressing. Changes in image color indicate to designers what would happen to metal.



Mechanical arms scan clay models and translate model's stylistic detail into coordinates that can be computerized.

A range of people, big and small, stout and thin, could be called on for video duty.

In the old days, the designer would have had to depend on plastic models of people. These plastic likenesses, hinged to move in the same manner as humans and slotted to be adjustable in size, were laboriously compared to diagrams, blueprints and maybe concepts scribbled on a napkin, in order to determine human/machine compatibility.

Now, without ever having built the car, the designer can talk over its comfort features with the auto's first "driver."

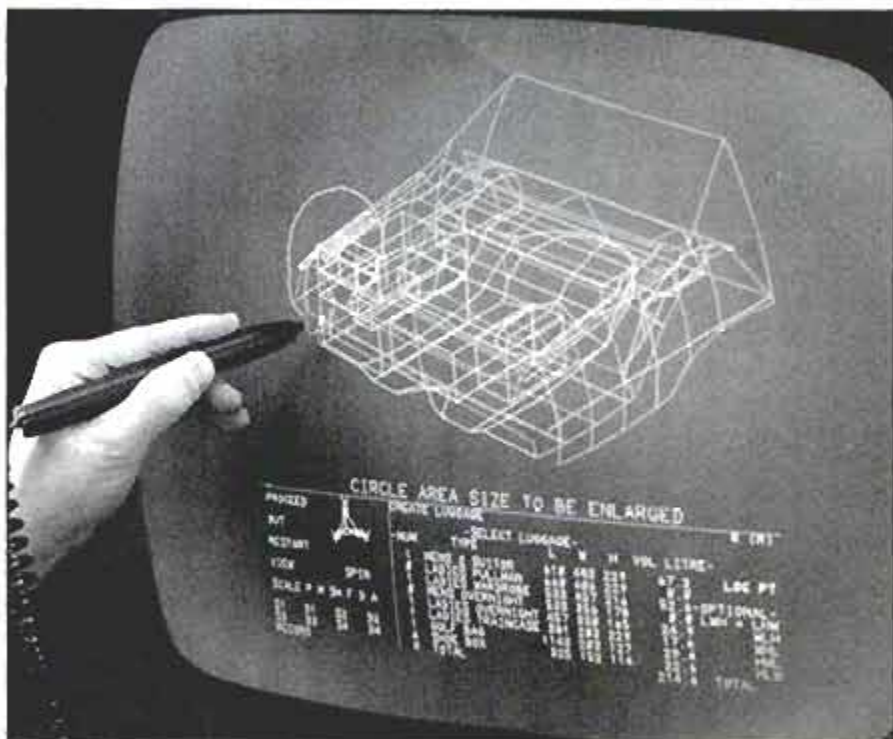
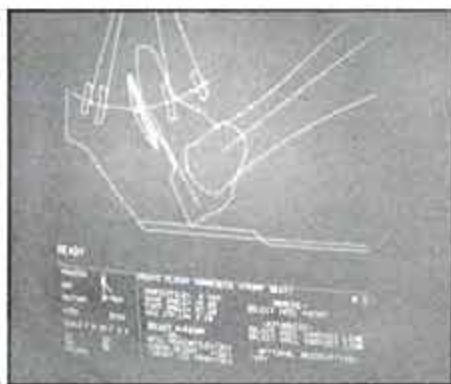
"Without computers," GM's Frank Biondo told us, "the design process would be far more time consuming. The computer is helping us primarily in the definition of design. We're confident it delivers a far greater degree of reliability and value."

Everything on the car is tried out on video. Will the door swing open properly, or scrape against normal-height curbs? Or will it pound the pizzazz out of the car's painted fender? Do the seat backs have sufficient rake? Does the hood open wide enough to allow the engine to be worked on?

Then, when the design is complete artistically, it must be re-examined structurally. The cleanest, smoothest lines don't guarantee a heavenly ride or good gas mileage.

The points whiz from one computer to the next, from the design people to the ones in charge of man-

(Please turn to page 162)



Performance simulation (top left) allows Ford designers to drive a design idea around a racetrack to get feel of a finished car. Legroom and other car-to-human measurements are investigated at GM by a program (top right) that lets the designer see how car will fit driver. Luggage packing program (above) helps design GM's trunks.

Alpine 7138 AM/FM cassette

• TONE TENG
• OFF VOLUME
PUSH PROG/CLOCK

ALPINE 7138

DI-LEVEL AUTO REVERSE
DIGITAL PLL FREQUENCY SYNTHESIS

SCD
HEAD

AM
FM

104.7 ST

MEMORY

DOLBY NR

METAL-STEREO

Supercharge Your

Installing all the car stereo equipment above takes a great deal of patience—as well as the right tools. At right, we show two useful tips. First, purchase a crimping tool. It lets you attach terminals to stripped cables quickly and easily. And don't forget heat-shrink tubing. Applied to bare wire, it shrinks into a tight, insulating sheath with the heat from a match.



Photo by Tony Stone Worldwide

If you already have a good, basic sound system in your car, fear not—you can always upgrade it into a rip-snorting, on-the-road system.

by Gary Stock

There comes a day in the life of every car-stereo owner when his basic sound system—usually an AM/FM cassette unit and a pair of speakers—just doesn't excite anymore. It may lack power, or a solid low end, or "shimmer" in the treble or even a few desired control features—but, somehow, the thrill is gone.

On that day, you have two options: Throw out the whole system and start from scratch on a new megabuck setup, or use your existing equipment as you upgrade, adding new components and accessories, one by one.

To illustrate this second approach, we took a well-known sports GT car—a Mercedes-Benz 450SL roadster equipped with a good, basic sound system—and subjected it to a full range of sound-system improvements. The owner of the car had outfitted it with two excellent components which served as our starting points: an Alpine 7138 full-digital AM/FM cassette unit and a pair of 4½-inch Blaupunkt full-range speakers, fitted into the small speaker enclosures at the sides of the dash. The sound from this combination was smooth and well

(Please turn to page 158)



Altec SW-1
subwoofer (control)

Dbx Model 22
decoder

Alpine 3011
equalizer

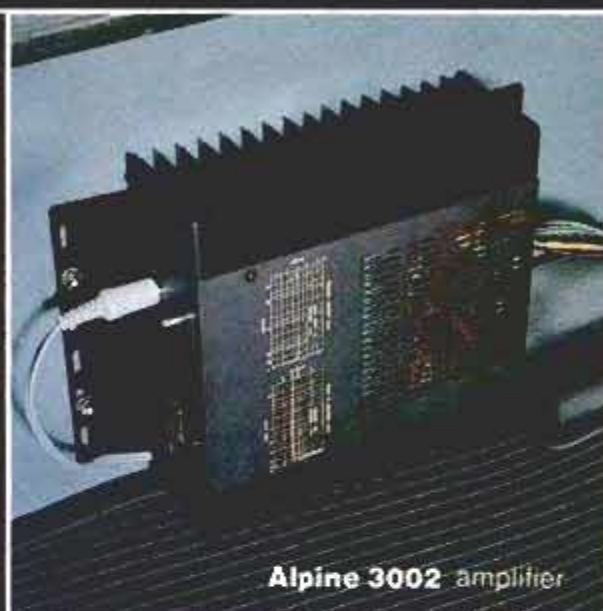
Car Stereo

Fitted into a glovebox (above) or under a dash, high-tech add-ons have a beauty all their own. Alpine's 3011 equalizer, Altec's SW-1 subwoofer, dbx's model 22 decoder and other items (shown elsewhere) turned this Mercedes into a movable feast of sound.



Altec SW-1 subwoofer

The Altec SW-1 subwoofer (above) includes all of the electronics on same chassis as the speaker cone. A subwoofer allows you to take that bone-jarring sound of real bass along wherever you roam. The tuning controls mount separately in the dashboard area.



Alpine 3002 amplifier



ADS 100 amplifier



Philips 8320 tweeter

Philips 8320 tweeter (above) was mounted on each Mercedes door. Placing them forward on doors protected them from slamming impacts. Alpine's 3002 power amplifier (left, above) was mounted in trunk space. It can also be mounted on firewall. ADS 100 power amplifier (left, below) was hidden beneath the driver's seat. Make certain (as shown) that the unit will fit with adequate clearance before you begin the actual installation.

MUSTANG 5.0

"The stalk-mounted horn is dangerous in an emergency."

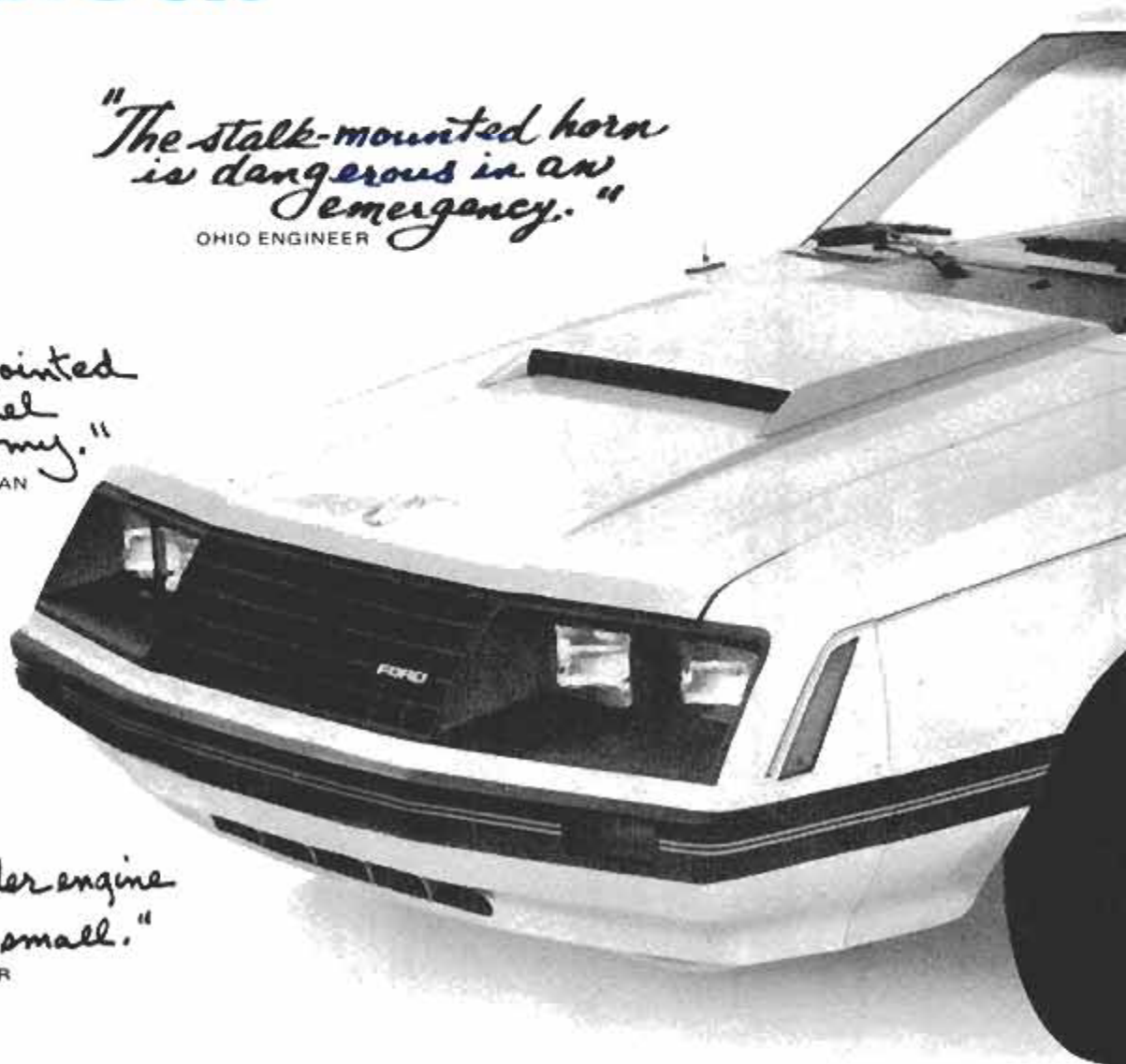
OHIO ENGINEER

"I'm disappointed with the fuel economy."

ILLINOIS FOREMAN

"The four-cylinder engine is too small."

MAINE BANKER



Styling and handling satisfy pony owners.

According to owners, the 1982 Mustang goes a long way toward satisfying their urges and doing the things expected of America's original pony car.

Styling came away with top honors and generous praise from the owners we interviewed—both as a reason for buying the car initially and as a source of long-term satisfaction after purchase.

A West Virginia student beamed, "Styling and fuel economy sold me. My car is black with three shades of orange, which gives it a beautiful



Many owners complained about the stalk-mounted horn button and rattles in dash.

appearance. I also like the fuel mileage; I'm getting 24/30 mpg with this four-cylinder four-speed."

A cola bottler from Georgia told us, "I wanted a small car, but not too

small, and I liked the looks of the Mustang." And a North Dakota sergeant admitted, "Appearance was the overall reason we bought the car."

An Ohio financial vice president confided, "I didn't want a box on wheels." A Michigan realtor added, "This Mustang is a sporty car and more fun to drive than larger models," and a New York secretary smiled, "I've had a lot of people comment on my Mustang's good, clean, sporty looks."

Handling ended up a close second behind styling among the Mustang's best liked attributes. You can order any new Mustang with the TRX handling package, but some fea-



"IT'S CERTAINLY A
SOLIDLY BUILT CAR."

OHIO HOSTESS

"Styling
and fuel economy
sold me."

WEST VIRGINIA STUDENT

"Bottom edges of the doors
had no paint on them."

KENTUCKY
PROGRAMMER

PM photos. Jerry Abramowitz

tures, like alloy wheels and Michelin TRX low-profile tires, along with recalibrated springs, shocks and stabilizer bars, are mandatory.

A Kentucky hairstylist told us, "On the road, it clings and holds fast around curves; is also good on ice and easy to maneuver through traffic. Yet despite the sporting suspension, the ride isn't too stiff, so it's a comfortable car for long trips."

Fuel economy came in for mixed reviews, some owners praising their cars and others telling us they'd expected better. Economy placed among the Mustang's best liked qualities with 26 percent of our respondents, while 15.2 percent rated it below expectations.



The optional 5.0-liter V8 engine makes the Mustang the quickest car on the market.

Most fuel-mileage complaints came from owners with the four-cylinder engine and automatic, and so did gripes about engine power. An Illinois production foreman wrote, "I bought this car for good gas mileage, but I'm averaging barely 18 mpg around town. The EPA said I should expect 22 mpg. The engine doesn't have enough power to get out of the way of other cars and I'm disappointed with fuel economy."

A Maine banker: "The four-cylinder engine is too small. It won't go up a steep hill without the transmission dropping into low range."

And a North Carolina analyst wasn't alone when she observed, "If

(Please turn to page 160)

CAPTURE THE STARS

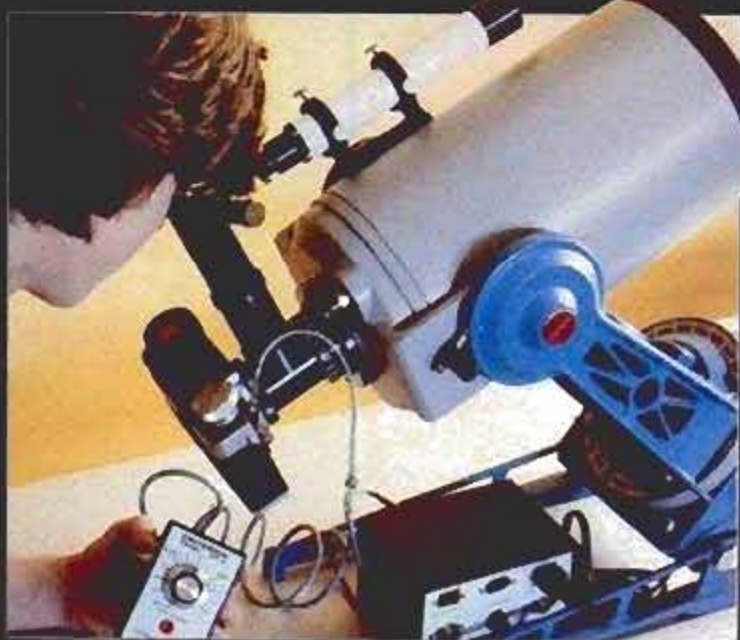
Taking beautiful astrophotographs need not mean a large outlay for equipment. Here's how to use an inexpensive telescope—or how to forego a telescope entirely.

by Robert Little

Almost all amateur astronomers—sooner or later—become sky photographers, and it's not hard to understand why. Many of the most beautiful sky objects can be seen only dimly—or cannot be seen at all—with even a fair-sized telescope.

Unlike the eye, film has the ability to build up an image during a time exposure and will record colors that the eye cannot detect at low light levels. For instance, the translucent, purple veils of the Orion Nebula appear greenish when observed visually in a telescope.

Constellation photos can be taken with modest equipment—you don't even need a telescope (see *Build This Star Photography Platform*, at the



Long exposure times involved in capturing deep-sky shots, like Orion Nebula, call for manual or electronic guidance (electronic system shown). The astrophotographer must keep tracking motor on target.

end of this story). The moon, too, can be captured with only a camera and tripod. But if you do have access to a telescope, the whole universe awaits you.

Although the moon appears large in the sky, it's really a small object photographically. A camera with a 50-mm lens would capture an image on film of only $\frac{1}{2}$ mm in diameter—not suitable for good-size enlargements. A telephoto lens of 300 mm,

however, would reveal many lunar features. (To compute image size on film, divide a lens's focal length by 110. So a 300-mm lens would give a lunar disc slightly under 3 mm across.)

The moon is so bright you can use a 1/500-

[Please turn to page 159.](#)

This solar-eclipse sequence (below) shows some of the spectacular sights a skillful amateur can capture. An inexpensive 4-inch

F/11 telescope was used with proper filters. Exposure was 1/250 second. Note sun's fiery corona around edge in the third photo.



ON FILM

ORION NEBULA (prime focus):
Criterion 6-inch telescope
(F/10) at 45-minute exposure

Sun filter covers end of telescope, and the guidescope is blocked off completely. These and other special precautions must be taken during any type of solar photography.




A "piggyback" camera is mounted on top of a telescope tube. Telescope's motor drive tracks camera through heavens and telescope optics are used to spot targets.

Robert Little's astrophotographs have appeared in many astronomy magazines and on the cover of Life. He works for Criterion Scientific Instruments.

MOON (eyepiece projection):
Criterion 6-inch telescope
(F/10) at 1 second.





Meade reflector

Celestron C-90

The big white Meade and stubby orange Celestron have outstanding optics. Both were able to catch cloud bands on Jupiter.

BACK-YARD VOYAGE TO THE STARS

Visit meteor swarms,
neighboring planets
and distant galaxies for under \$700.

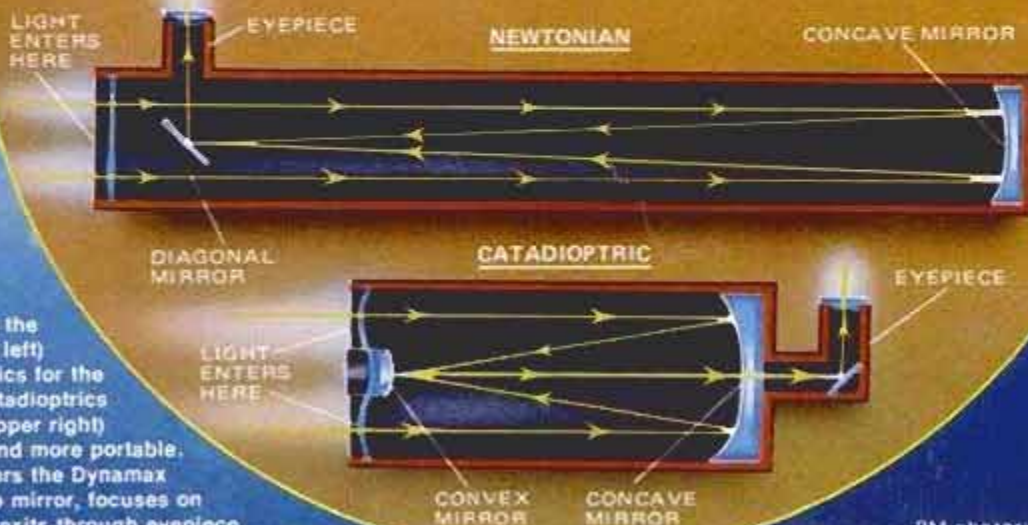
by Dennis Eskow SCIENCE EDITOR

Fasten your seat belts and get yourself ready: This month, the Earth begins a summer-long plunge through a sea of meteor chunks left behind by several streaking comets. As our orbit crosses paths with the meteor swarms, thousands of brilliant chunks of iron will flash across the evening sky, signaling the beginning of the summer meteor showers.

The spectacular nighttime display is enough to send you running to the local shopping mall in search of a hobbyist's telescope. But before you spend good money on what may turn out to be useless telescopic equipment, feast

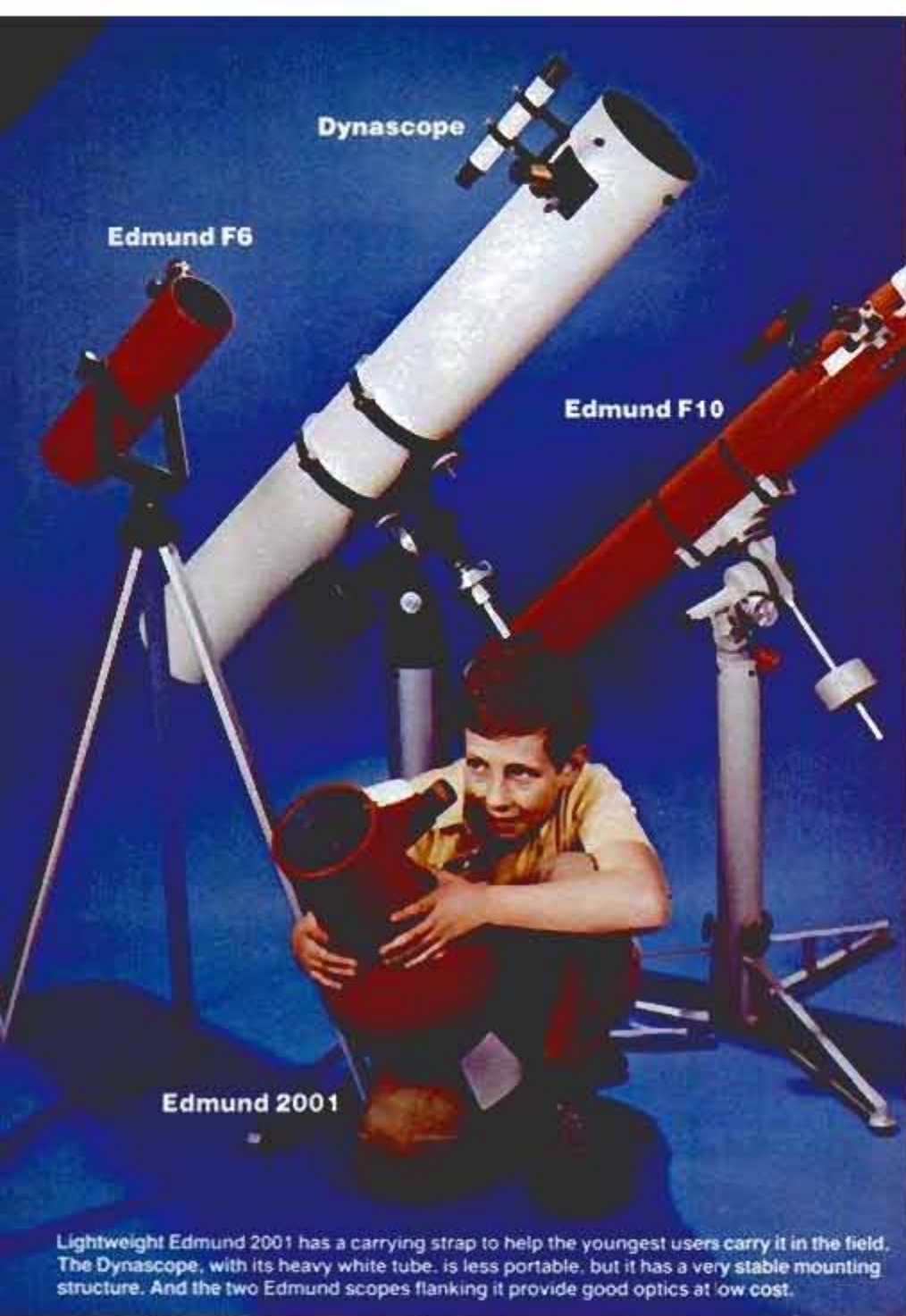
**Edmund
pedestal mount**

Dynamax



Newtonians such as the Edmund unit (upper left) provide the best optics for the money, while the catadioptrics like the Dynamax (upper right) are more compact and more portable. The light which enters the Dynamax bounces off concave mirror, focuses on convex mirror, then exits through eyepiece.

PM photos: Frank Lusk



Dynascope

Edmund F6

Edmund F10

Edmund 2001

Lightweight Edmund 2001 has a carrying strap to help the youngest users carry it in the field. The Dynascope, with its heavy white tube, is less portable, but it has a very stable mounting structure. And the two Edmund scopes flanking it provide good optics at low cost.

TELESCOPE SCOREBOARD

Brand/Model Mirror Diameter	Price	Assembly Instructions	Operating Instructions	Mounting (tripod, etc.)	Weight (lbs.)	Eye- pieces	Camera Adapter
CELESTRON C-90, 5"	\$650	Very good	Very good	Excellent	22	3	Yes
DYNAMAX, 6"	\$610	Very good	Excellent	Good	16	2	Yes
DYNASCOPE RV6, 6"	\$299	Good	Good	Excellent	50	2	Yes
EDMUND PEDESTAL MOUNT, 6"	\$479	Excellent	Excellent	Excellent	40	1	Yes
EDMUND F10, 4 1/4"	\$369	Excellent	Excellent	Good	35	1	Yes
EDMUND F6, EQUATORIAL MOUNT, 3"	\$159	Excellent	Excellent	Fair	8	1	No
EDMUND 2001, 4 1/4"	\$209	Excellent	Excellent	Good	10	1	No
MEADE REFLECTING TELESCOPE, 8"	\$549	Good	Very Good	Excellent	65	2	Yes

your eyes on the eight models tested by PM. In selecting our test telescopes, we tried to avoid the two biggest mistakes made by newcomers to stargazing: spending too little, or spending too much.

"Do you have any idea how many thousands of cheap Japanese telescopes are sitting unused in people's garages?" asks New York Amateur Astronomy Society president John Marshall. "Thousands of them are sold every year—it's criminal."

Cheap is no bargain

The scopes Marshall and others avoid are those slender tubes sold for under \$100 in the camera departments of big stores. No bargain, they generally have inferior optics and they frustrate the new user.

The instruments we tried are all high-quality reflector telescopes. Each is basically a mirror mounted inside a tube. Light from a heavenly object hits the mirror, is focused on a facing mirror and angled out an eyepiece to the stargazer. We avoided refractor scopes—the long, skinny types (with lenses, no mirrors) a sea captain might use in search of a landfall, but never in search of a planet. Good refractor telescopes, for astronomy do exist, but the optics are far more expensive than the mirrors in scopes we tested.

PM found excellent telescopes for no more than \$650 and as little as \$159. Each had advantages—and disadvantages.

For instance, we focused the Meade 8-inch scope—which provided the most spectacular sky show—on what appears to be a single point of light known as "iota" in the constellation Cassiopeia. With the Meade 8-incher, we could see that three bright and distinct stars make up the apparent point. The Meade also gave us breathtaking views of the rings of Saturn and the cloud bands of Jupiter. Its biggest disadvantage was weight and bulk—it weighs 65 pounds and has a tube 50 inches long.

Celestron's 5-inch mirror couldn't resolve the triple star clearly, but it showed us a nebula—or "clouds" of stars—in Orion and yielded good detail of Jupiter's cloud bands. Still, it did have one advantage over the Meade. The C-90 is a catadioptric scope, meaning its optics are arranged in a compact tube. It's easier to carry around than the Meade and other long-tubed Newtonians.

The other catadioptric we tried, the Dynamax 6-inch model, focuses on more outer space details. But our model's mounting structure was a

(Please turn to page 172)

PM's Long-Term Car Tests

Our new durability testing program will put on the miles to learn how some popular makes stand up to the rigors of the road.

by Tony Assenza AUTO EDITOR

There's nothing quite as wonderful as the feel of a brand-new car. It smells good, everything is tight—usually—and everything works. But what happens when the engine has a few miles on it and the chassis is subjected to thousands of miles of bumps, potholes and highway expansion joints? And does that wonderful paint job start bleaching after its first month in the summer sun?

These are the kinds of things we can't find out in our regular road tests. After purchase price and fuel mileage, the next thing prospective car buyers want to know is how well will their new car stand up. We've never been able to fully answer that question before. Now, our long-term test program will help remedy that situation.

To better furnish you with the kind of information you need to make a wise buying decision, we've embarked on an ambitious durability testing program. Obviously, we cannot test every car on the market.

The next best thing is to select a group of cars which we feel is significantly interesting to you—the types of vehicles you'd most probably consider buying—and drive them for thousands of miles under a variety of road conditions.

We'll be keeping careful records of mileage, oil consumption, mechanical problems and general durability. We'll also be maintaining the cars ourselves so, hopefully, we'll be able to give you some insight on serviceability.

Our first group is a varied lot—from a simple economy car to a thinly disguised hot rod. Here are the cars and how they stack up.

Plymouth Horizon

Remember our 'Real People' Road Test Of Economy Cars (page 65, Aug. '81)? We're still scarred from the withering barrage of letters that poured in following our report on the



Omni Miser. If you recall, we weren't exactly fond of that car. And you, along with some powerful Chrysler executives, weren't overly fond of us for ranking it dead last in a field of 10 competitors. So, we decided to take another look at the Dodge Omni (the Plymouth Horizon is the same car with a different grille).

We picked up our test car in Detroit on January 16, 1982. The car had 582 miles on it. It was a deluxe model, loaded down with every comfort and convenience option in the Plymouth book—airconditioning, deluxe cloth interior, automatic transmission, AM/FM stereo, cruise control, rear defogger, bucket seats, console and more. List price of the car came to \$8,595, although you can buy any car at less than list price.

Upon receipt of the car, we immediately started driving it to New York via Canada—in one of the worst blizzards of the year. Thanks to the car's 2.2-liter engine, sport suspension and Michelin XZX radial tires, we found the car very stable and sure-footed, despite the dastardly weather. Except for a minor off-road excursion involving a jackknifed tanker full of deadly chemical waste, we were able to press on with vigor and still managed to get 22.3 mpg for the trip. Really respectable.

Okay, Chrysler, we're not exactly eating our words on the Miser—nib-

bling just a bit, maybe—but this Horizon is certainly heads and shoulders better than the little gobbler we got the first time.

The car was put into regular commuting service upon its arrival in New York and has so far accumulated 3,050 rather uneventful miles. At 2,654 miles, the front spoiler fell off as we were pulling into a parking lot in Atlantic City, N.J., to attend an old-car auction. At 2,834 miles the engine suddenly developed a heavy thirst for oil and gulped down two quarts at a routine gas stop. The car had not used any oil previously, and has not used any since. It must have been the culture shock of being piloted through the asphalt warfare of New York traffic that scared it into ingesting the two quarts of 40-weight lubricant.

Despite the heavy load of options, the 2.2-liter engine in our test car powers out the Horizon with brisk acceleration. Zero to 60 happens in 10.9 seconds, shifting the automatic manually. We've surprised many so-called sports cars with the Horizon's excellent performance and handling. It's great fun to blow off these pretenders on freeway on-ramps. They never quite believe that they're being outcornered and out-accelerated by a Plymouth Horizon.

We've been driving this car ex-

(Please turn to page 149)

The Hot Blast From France...

Renault Fuego



In turbo or normally aspirated form, the Fuego provides sparkling performance and handling.

FIRSTHAND REPORT

by Tony Assenza AUTO EDITOR

For those of you—and you know who you are—who have been calling us about advance information on the Fuego, the word is pronounced Fwaygo. In Spanish it means fire. In French it means an exercise in technologically advanced motoring. And in America it will most certainly mean speeding tickets for those who explore the Fuego's full potential. We know, because we had the opportunity to drive American-specification Fue-

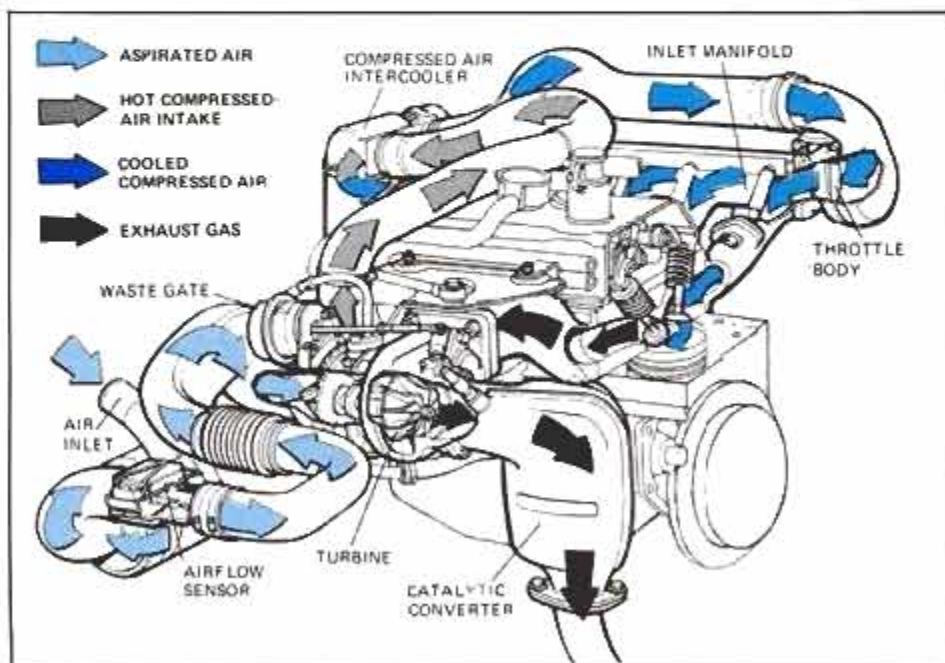
gos on the streets and high-speed *autoroutes* of northern France.

Ordinarily, driving American-spec cars in Europe is an open invitation to being humiliated by domestic cars with half your displacement. Since they have fewer emissions controls, European engines generally make more horsepower than ours

and get better fuel consumption. And the average European driver misses few opportunities to make full use of his available ponies.

This was not the case with the Fuegos. This time, the contest was more evenly matched.

On a run from Paris to Caen—exuberant about driving the turbo for the first time—we averaged a shade over 80 mph, which meant the engine spent most of its time near the red zone in fifth gear. The mile-



Even in base trim, the Fuego comes well appointed. It has excellent bucket seats, thickly padded wheel and lots of gauges.

The 1.6-liter turbo engine has an air-to-air intercooler and an integral waste gate.

age was nothing short of amazing—20.78 mpg for the trip. At more conservative speeds, it would easily have gone over 30 mpg.

All the time and money Renault spent on developing the aerodynamics of the Fuego begins to pay interest at these elevated speeds. Wind roar is hardly more noticeable at 100 mph than it is at 60. Another dividend of the flying hunchback look is the amount of downforce created at speed. Cars with unfavorable aerodynamics tend to lift their front ends as speed increases. This reduces road feel and gives you the impression that the front wheels have the precise control of a couple of chocolate frosted doughnuts.

The only directional stability problems we encountered with the Fuego was in a stiff crosswind as we crested an arched bridge. Apparently, air got underneath the car and tried to make it change lanes.

On the twisty back roads of Normandy the car felt as good as it did on the wide-open *autoroute*.

Kicking up rooster tails

The highway system in France is really good, for the most part, but the rural roads are something else again. You could be on a two-lane blacktop, power through a corner and suddenly find your front wheels kicking up rooster tails of red topsoil and the car power-sliding its way into the local Stella Artois beer dispensary. A hundred yards down the lane it could be cobblestones or dirt, or a combination of road surfaces.

For the uninitiated, this could play havoc with your nerves. But, since the Fuego is a native son, it wasn't overly upset by the sudden change of road surface.

The Fuego is available with either the normally aspirated, 1.6-liter Four or the turbocharged version of the same engine. In either case, the fuel-delivery system is by Bosch L-Jetronic injection. The nonturbo engine is rated at 81.5 hp, while the blown engine is good for 107 hp, both happening at 5,500 rpm.

Like the Audi Quattro, the turbo Fuego engine is fitted with an air-to-air intercooler which reduces the temperature of the compressed air after it exits the compressor and before it's fed into the engine.

As is the case in the Quattro, the intercooler allows for stingier fuel metering and optimizes the power available from the turbocharger. In its transformation from normally aspirated to turbo version, the compression ratio is reduced from 8.6:1 to 8.0:1.

Throttle lag, a problem common to

(Please turn to page 165)

...And One From Kenosha



Renault 9

Although it looks a bit like a toolbox, the Renault 9 is nonetheless pleasant and fun to drive. The U.S. versions will have recessed headlights and 5-mph bumpers.

Unlike the Fuego, the Renault 9 will be built in an AMC plant in Kenosha, Wis. The first U.S. car has yet to roll off the line (it'll go on sale this fall as an '83 model), but we did have a chance to drive the European version in Normandy.

Where the Fuego is more road-scorcher than transportation, the 9 (still unofficially referred to as the Alliance) is utilitarian, yet competent and a satisfying car, nonetheless.

It's powered by a 1.4-liter Four going through a four- or five-speed manual or an automatic transmission, uses front-wheel drive and, uncharacteristically for Renault in this class of car, has a trunk rather than a hatchback.

The French engine, with no pollution-control devices, cranks out 72 hp, which felt adequate for most of the driving chores the 9 would be expected to perform. In American trim, the engine is expected to produce horsepower in the high 60s and yield in-town mileage of around 30 mpg. Final tuning is still to be determined, but we have it on good authority that 1 or 2

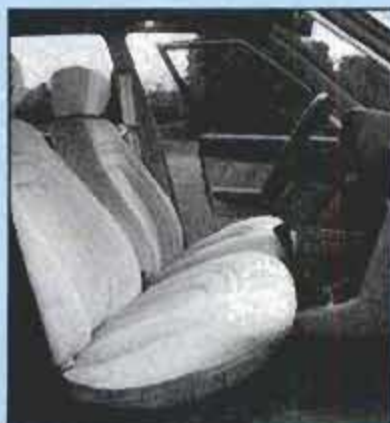
mpg may be sacrificed for better performance—a sensible approach.

AMC engineers and assembly people have been shuttling back and forth between Douai, France (where the European 9 is built), and Kenosha, in an effort to make sure that nothing is lost in the translation.

Both AMC and Renault are concerned that the U.S. versions be as lovingly screwed together as their European Car of the Year winner for 1981.

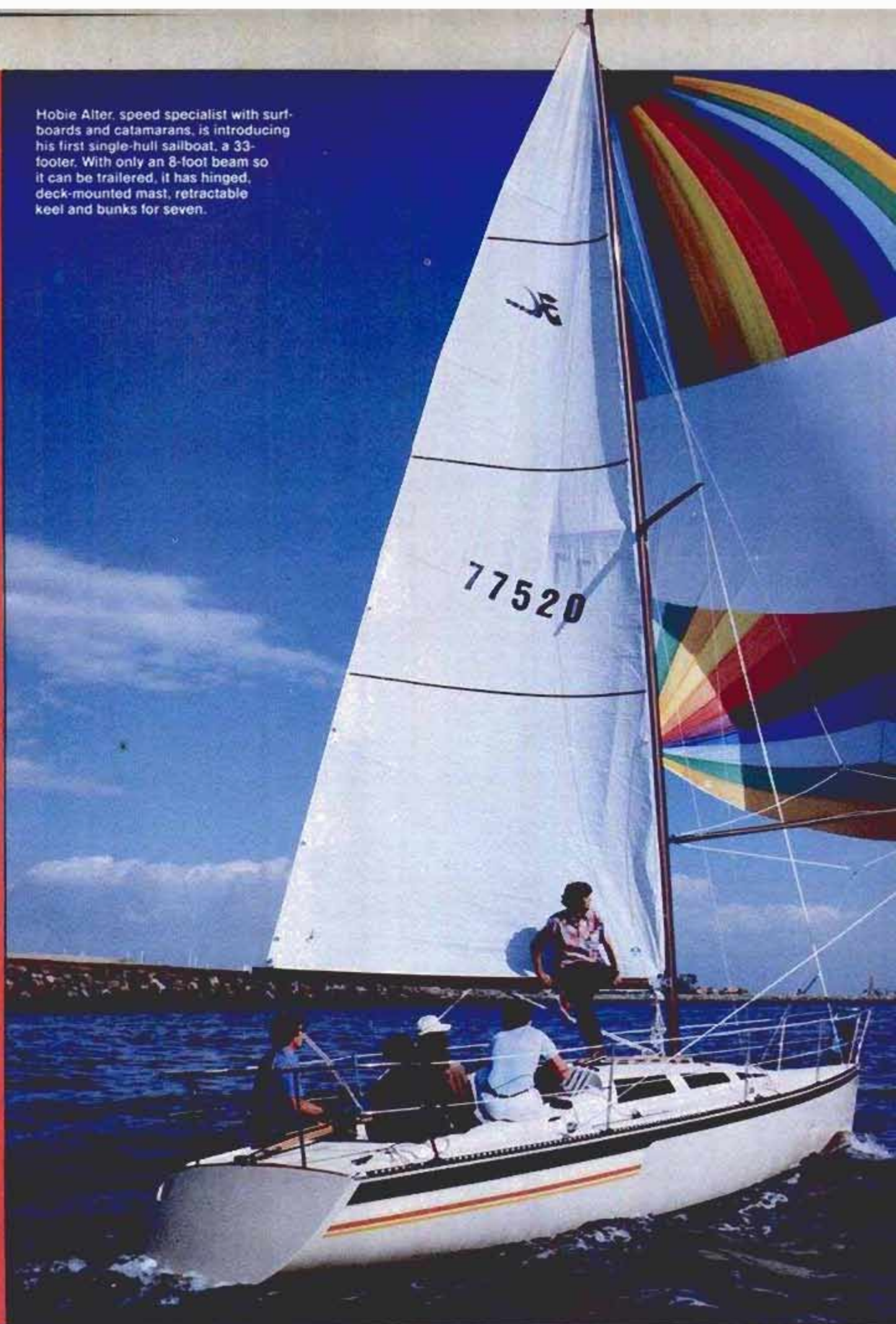
One unique feature of the 9 is the Monotrace seat mount. Instead of the usual two-rail subframe, it has a central pedestal which allows the seat to rock fore and aft for adjustment. This saves space and leaves more room for rear seat passengers' feet.

The 9's most attractive feature to me is the ride quality and that all-important, but undefinable quantity, "feel." The car feels right—stable, precise, compliant, but not billowy. I know AMC will try to "tailor" it for American tastes (i.e., softer ride), but I would leave it alone.—T.A.



Interior of the 9 features Monotrace seats (no tracks) as well as a surprising amount of room. The fit and finish quality is quite good and the dash is very well instrumented.

Hobie Alter, speed specialist with surfboards and catamarans, is introducing his first single-hull sailboat, a 33-footer. With only an 8-foot beam so it can be trailered, it has hinged, deck-mounted mast, retractable keel and bunks for seven.



New Look For No-Fuel Boating

Mono and multihull designers seek more speed on wind power.

by Bill McKeown
BOATING EDITOR

Even though the wind is still free, boat designers keep trying to use it more efficiently. This summer, twin-hull sailboat makers are testing single-hull performance while mono-bottom powerboat builders are expanding sailing catamaran lines. Sailing surfboards are growing in popularity, with one- and two-hull models available. Even inflatable sailboards are here

Hobie Alter, originator of the famed Hobie Cats, has introduced a racer-cruiser sailer that answers a number of expensive problems like: How do you find and pay for deep-water dock space? How do you fit a large family or a lot of friends aboard, yet sail other times alone, or with a minimum crew?

With the new Hobie 33, you don't need a slip. The big 33-footer is only 8 feet wide so it can be trailer-towed without a special permit. The mast is stepped in a tabernacle on deck so that it can be hinged down or raised without a hoist. Roller reefing aids single-handling. Halyards are led down inside the mast. A compartment aft houses an outboard motor that can be tilted down for auxiliary power. Below, in the cabin, the galley

(Please turn to page 164)



- 1 Supercat 20 is the largest catamaran that's built by Boston Whaler Multihulls.
- 2 Like the larger Supercats, the 15 features computer-created elliptical hulls.
- 3 Supercat 17 is sharper forward, needs no daggerboards and has an 8-foot beam.
- 4 Kona Kat has the stand-up action of a sailboard, but with catamaran stability.
- 5 Freesails 1 and 2 are newest sailboards from the O'Brien division of Coleman.

POPULAR MECHANICS
Great Shop

A Master Craftsman's Old World Shop

For every power tool in this workshop, there are scores of hand tools—all used in traditional ways.

by Steve Willson ASSISTANT HOME AND SHOP EDITOR

The latest installment in our Great Shop series has much in common with its predecessors—and something a little different. This time, we tried to focus a bit more on the man behind the tools, and with good reason: His traditional training and old world devotion to craft are more rare and remarkable today than they have ever been.

Ernest Glaser is a master furniture maker schooled in Germany during the early 1920s under the old European Guild System. He came to the United States in 1928 and began work in cabinet shops around the

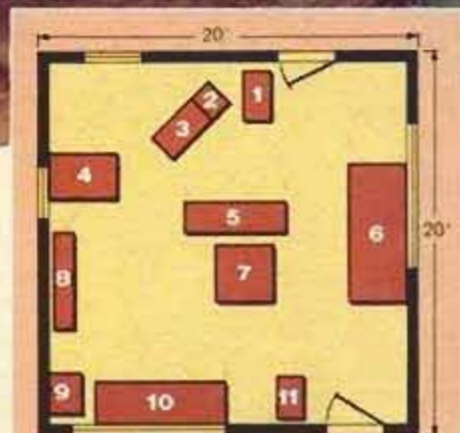
1 Glaser converted a smokehouse (inset) into a comfortable shop. He reinforced the floor and roof, installed bigger windows and added maple flooring and pine boards to interior. As floor plan at right shows, shop is compact, but has plenty of room.

2 Antique toolbox holds seldom used tools, leaving wall space free for others.

3 Shop has nearly 200 different clamps, including bar clamps on a special rack.

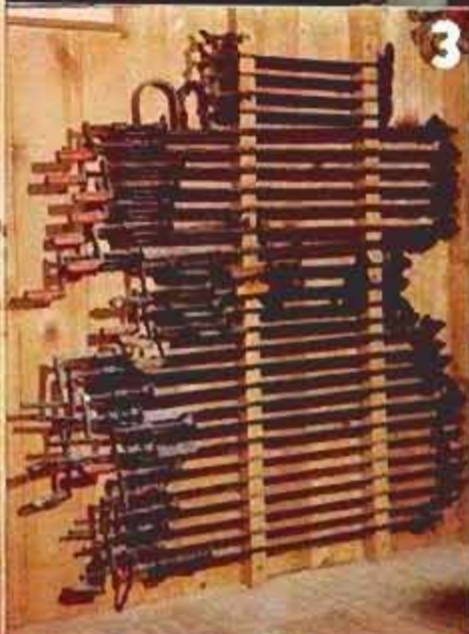
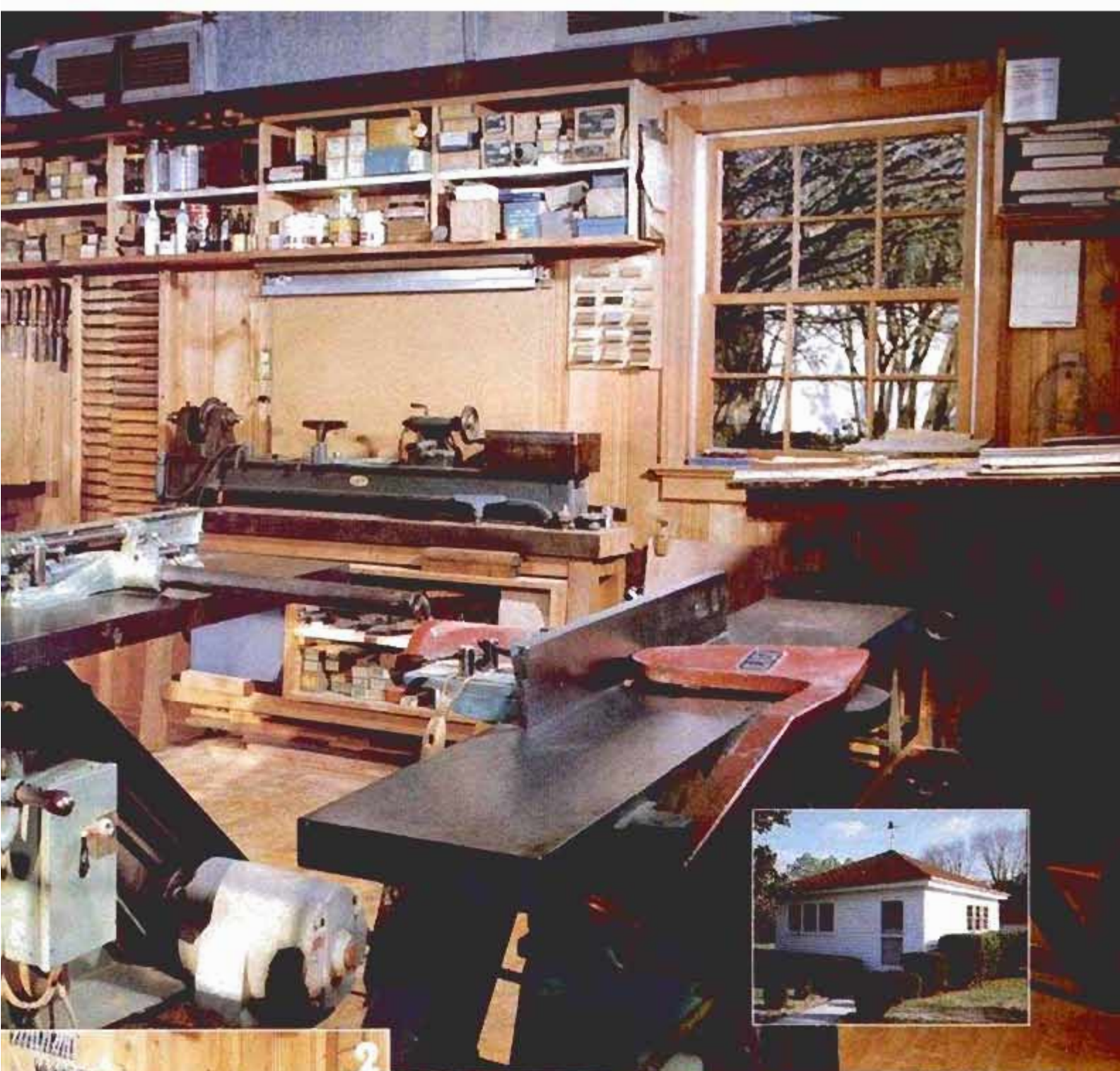
4 Hardwood brackets hold over 40 hand-screw clamps within reach, but out of way.

5 Razor-sharp carving chisels are used for fine-detail carving, precise inlay work.



SHOP FLOOR PLAN

- | | |
|------------------------|-----------------------|
| 1 Band saw | 6 Workbench |
| 2 Grinder | 7 Table saw |
| 3 Jigsaw | 8 Lathe |
| 4 Drawing table | 9 Shaper |
| 5 Jointer | 10 Workbench |
| | 11 Drill press |



PM photos: Fred Ward, Black Star



Shop has collection of 40 wood planes that Glaser still uses to cut rabbets, plow dados and form intricate molding shapes.

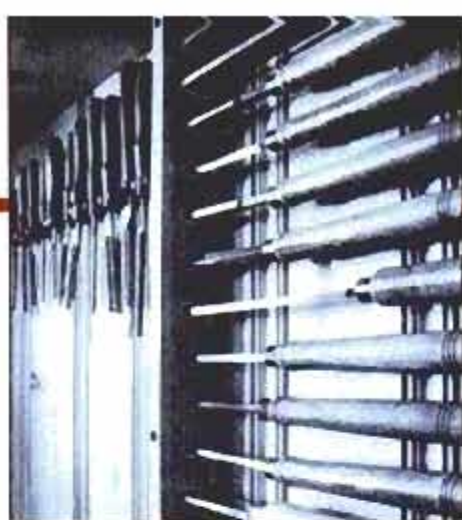
New York City area. By 1945, he earned the B.S. degree in education from Rutgers University and began teaching woodworking in high schools near Plainfield, N.J. He stayed there until 1964, when he and his wife Elizabeth retired to the Eastern Shore of Maryland to begin

a life that was anything but retiring.

Along with refurbishing a huge, two-story house, he gave an old smokehouse a structural and cosmetic face lift, turning it into the great shop shown here. From the maple floors to the knotty pine boards on the walls, he realized his dream: to create a shop where he could make fine furniture as he had been trained to do.

When we arrived to see his shop, Glaser confessed that he'd spent some time cleaning up for us: A working shop is rarely as clean as these photos show. He had four projects in the works, three on commission. The first was a series of six identical boxes made of ash with rosewood inlay. Each had a hand-rubbed finish and showed off Glaser's considerable expertise in making hand-wrought dovetail joints.

The second was a five-drawer mahogany silver cabinet that stood about 42 in. high. It was completely



Heavy-duty carving chisels (left) hang next to turning-tool rack. Make the rack by boring handle holes half through one support, blade holes completely through other.

sanded, but not yet finished or rubbed.

The third was a small chest of drawers in the Virginia style—mahogany again—that was just being readied for shipping. And the last project was for his personal use: a series of four Chippendale side chair reproductions. He used these unassembled chairs to illustrate how he builds a piece of furniture.

His starting point is his drawing board, where he sketches a design, altering it here and there until he is satisfied. For the chairs, this was unnecessary, because he wanted to match some existing chairs. Next, he makes a full-scale drawing which, he says, is crucial. "The eye can play tricks in the smaller scale. It is only when the piece is full size that you can know with certainty how it looks."

After any final design adjustments are made, he cuts full-sized patterns from cardboard or 1/4-in. plywood. He admitted that this was a time-consuming job, but nonetheless recommended it. These patterns eliminate mistakes in measuring and they're also a perfect record that can be used later to duplicate the piece without repeating the design work. Finally, he traces the patterns onto stock and proceeds with the cutting.

As a rule, he performs his joinery by hand. He enjoys the work and is so quick with it that, in many cases, he could rival power equipment if machine setup time were included in the comparison.

One of Glaser's favorite woods is African mahogany. Many of the pieces in his home, as well as those in photos of commissioned work, were made of this wood. Most of it came from one lot of mahogany he purchased over 30 years ago. It was, without a doubt, the best looking mahogany I have ever seen. The grain was extremely tight and the



Glaser (left) shows author the jack plane he made over 50 years ago. Journeyman's Certificate (right) was his after he had completed a Guild-approved apprenticeship.

The European Guild System

Ernest Glaser was born and raised in Hamburg, Germany. When he was 16 years old, his mother signed a legal contract, committing him to a four-year apprenticeship in the cabinetmaking trade. During the term of his contract, he was responsible to just one man, his master. He lived at home and worked in the shop five days a week; on the sixth, he attended a Guild-sponsored school where he learned drawing and mathematics.

When he completed his apprenticeship, he was awarded a Journeyman's Certificate (above), which qualified him for cabinetmaking work. By this time, the Guild no longer required of its members

a literal journeyman. But his master had told so many inspiring stories of his own travels that Glaser chose the traditional path.

For the next three years, he traveled by foot throughout the German countryside, working in various cabinet shops along the way. He was bound by two rules: He could stay no longer than four weeks in each town and he couldn't venture within 30 miles of his home.

Glaser did confess that he sometimes stayed longer than four weeks in one place, but he didn't go home until the three years were complete. And to this day, he's convinced this was the best way to learn his craft.—S.W.



Each room in Glaser's huge, two-story house is filled with his work. Sheraton-period dining table here is an example.

color was deep and rich. He still has some left for special projects, stored in another building with the rest of his hardwood stock.

A craftsmanlike approach

At one point in our conversation, Glaser mentioned that he preferred to work alone in his shop, without distraction from other people. "To do this work properly," he explained, "requires great concentration."

Later, he took me on a tour of his home. Walking through the house was like taking a stroll through a museum. All the rooms were filled with furniture of the highest workmanship—both his reproductions and his original designs.

One of the most remarkable pieces was a desk he made for his wife. Almost self-consciously, he explained that when he was a young man and he became engaged to his wife, he didn't have the money to buy her a ring. So instead, he built her a desk. It is in the Hepplewhite style and has seven, virtually undetectable secret compartments incorporated into the design.

He proudly showed me how the piece "worked," taking off a decorative molding here and there to expose a hidden drawer or a narrow compartment. While admiring his workmanship, I suddenly realized that the piece of furniture, though nearly 50 years old, looked as if it were brand new. There were no cracks in the finish, no rubbing on any drawers, no obvious signs of wear. When I remarked on this, Glaser looked completely surprised, as if my idea of what furniture should be was different than his. He seemed to think it should last forever. **PM**

Do you know a shop that we should include in the *Popular Mechanics* Great Shop Series? If so, send snapshots plus a description of shop and owner to Home and Shop Editor, *Popular Mechanics*, 224 West 57th St., New York, N.Y. 10019. If we agree, we'll visit the shop, photograph it and share it with *PM* readers. (Enclose a stamped, self-addressed envelope if you want your photos returned.)



Scrub, jack and smoothing planes (left to right) are used for surfacing rough stock.



Plane to correct thickness with scrub.



Scrub removes stock fast, leaves grooves.



Use jack after scrub; use smoothing last.

3 Planes To Make

In the "good old days" before power equipment, there was only one way to surface a board: by hand. Without jointers, planers and lumberyards that sell their wood already dressed, most of us would be lost. But when you have the proper hand tools and the know-how to use them, the job is far from imposing. In the photos at left, Glaser shows us how.

He begins with a piece of 1-in.-thick pine stock and a scrub plane, a narrow tool with a convex-edged plane iron which cuts deep grooves in a board's surface. It removes stock rapidly, so care must be taken to set the blade depth properly.

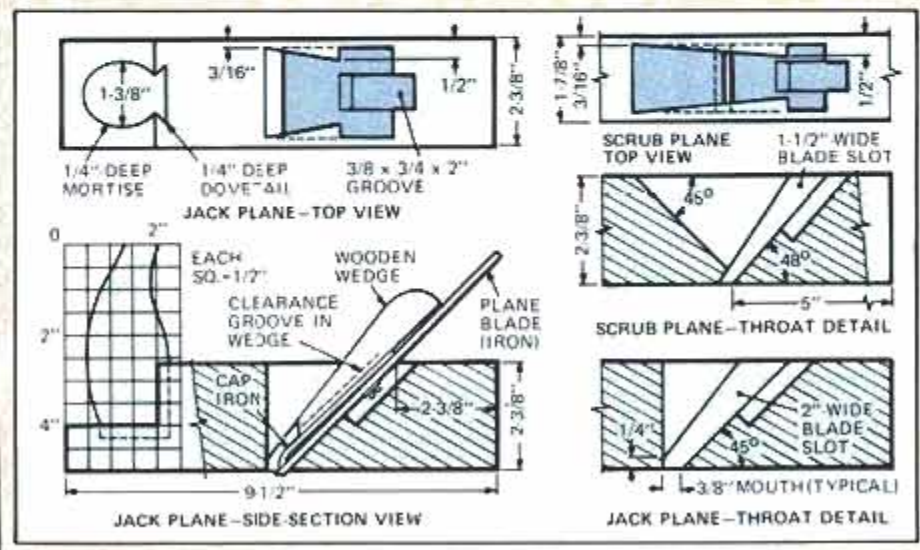
Next comes the jack plane, a real shop workhorse. It quickly removes the ridges left by the scrub and brings the board to desired thickness. Finally, he uses the smoothing plane to remove irregularities left by the jack plane.

In just a couple of minutes the board is planed to a uniform 3/4-in. thickness and, though this sample is soft wood, Glaser says that as long as the iron is sharp, it will work just as well on hardwood.

Both the jack and smoothing planes pictured were made by Glaser over 50 years ago. Plans are shown below.

The jack plane is diagrammed completely; the others are variations based on this style. Because the smoothing plane is identical to the jack—just one inch shorter—it is omitted from the drawing. The scrub plane, however, is different and the appropriate section and top views are provided.

Straight-grained white beech is the preferred material for plane-making. After the plane bodies and 7° wedges are made, they are soaked in linseed oil for four to six weeks to harden them. Plane and cap irons are available in assembled form from tool suppliers like Woodcraft, 313 Montvale Ave., Woburn, Mass. 01888.—S.W.





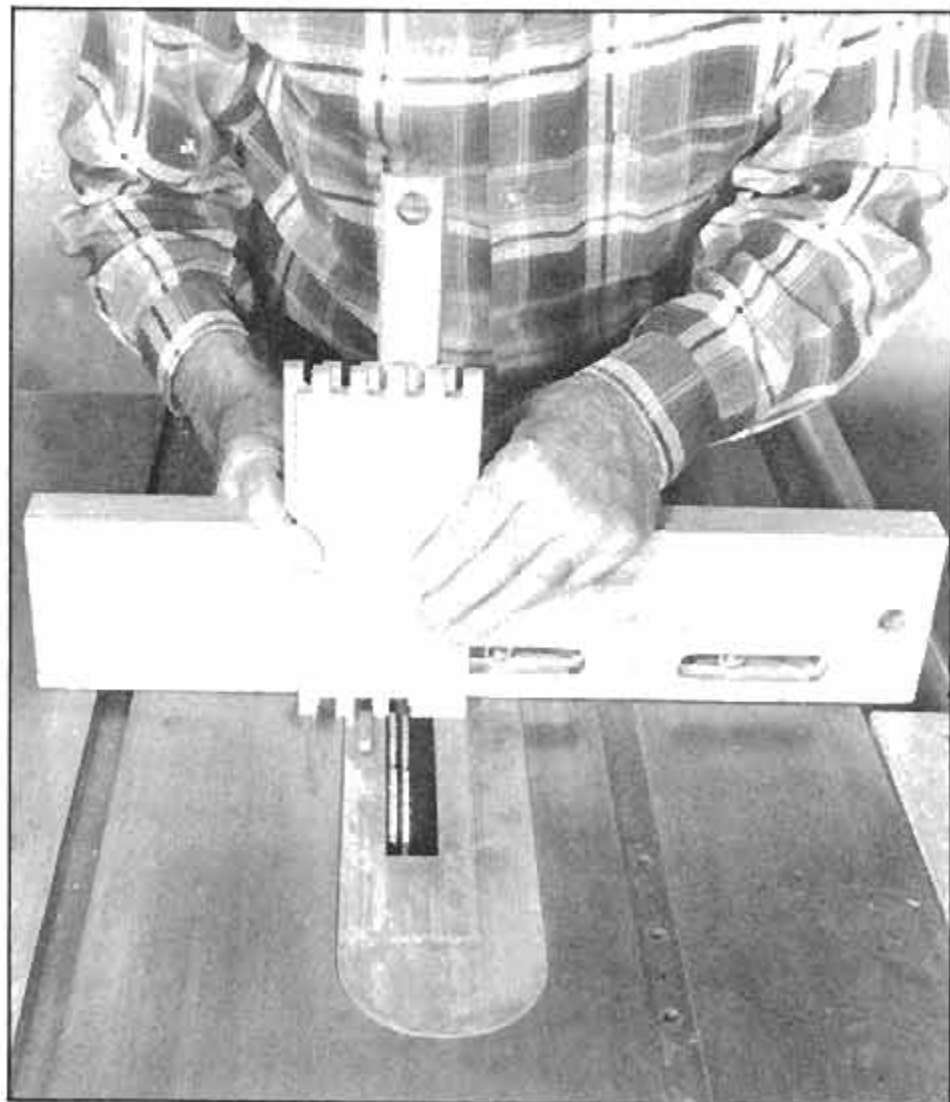
2 Shop Tricks From

Here are two nifty tricks that will make working in your shop even more satisfying. Master craftsman C.E. "Doc" Banister shows the secret of his modified finger-lap jig that will make you want to throw your old one away. Or, you may be able to incorporate this modification into your present jig. Another craftsman shows an easy way to make wooden dowel buttons.

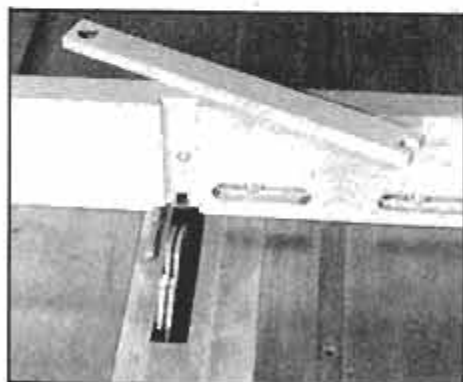
Antisplit Device

Finger jigs, or boxed-joint jigs as they are sometimes called, are among the most common jigs found in a craftsman's shop. Once you've used your jig for several different widths of fingers, however, you know that splitting begins to occur during the cut. This didn't happen the first several times you used the jig because the jig itself was serving as the backup board. The modification shown allows you to renew the kerf immediately behind the workpiece each time you use the jig. The hardwood backup-board insert is simply removed and the previous kerf area is sawed off.

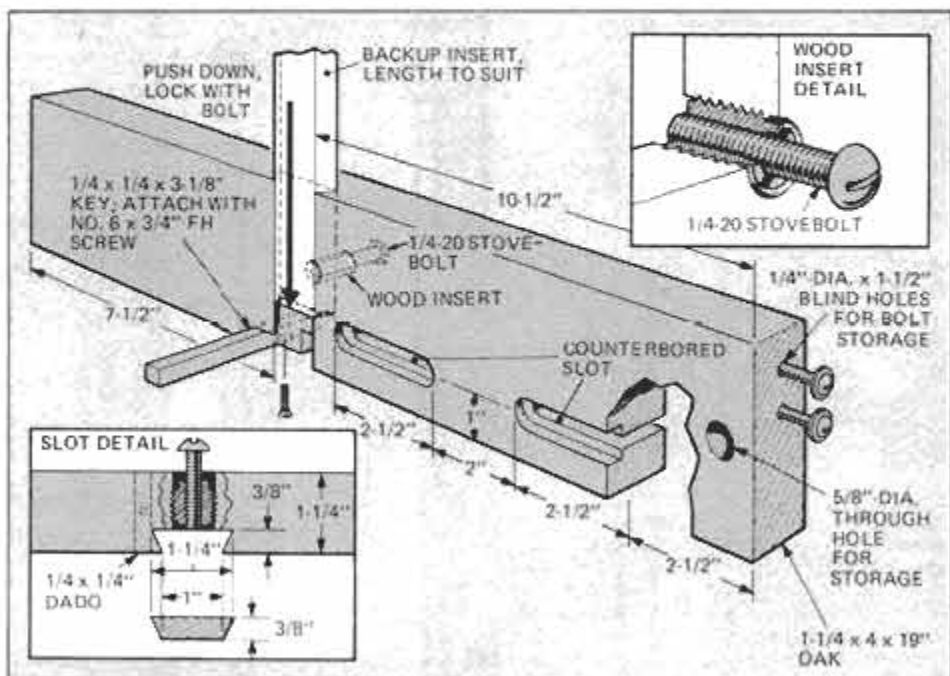
Look over the drawing and you'll see that the jig is very easy to make. Note that the finger gauge key is positioned so that it clears the slot. If you prefer your key closer to the kerf, you'll have to whittle off a bit of the back edge of the backup board each time it's renewed so it clears the key running through the slot. We include a few holes for storing the miter-gauge mounting bolts and the jig itself. The hole shown in one end of the backup-board insert is for the



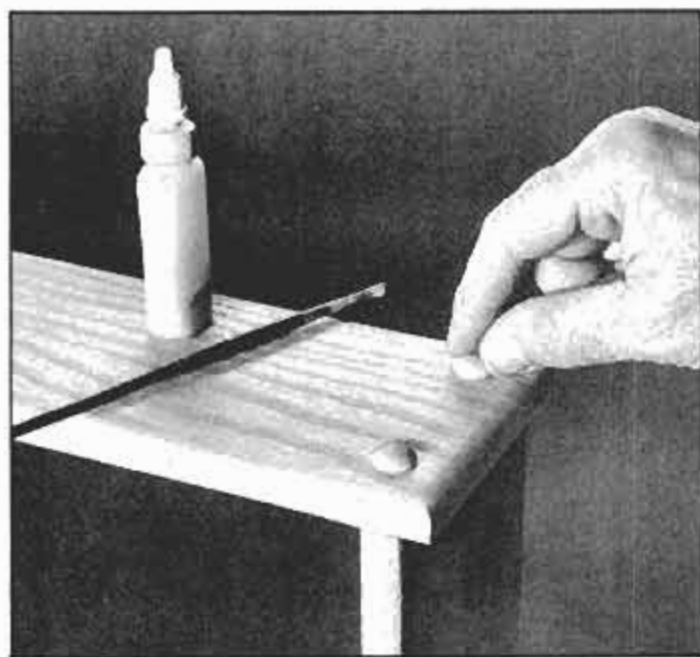
The vertical piece behind the workpiece is a renewable kerf backup board. Jig is attached to miter gauge with bolts in slots. Finger gauge key is attached to bottom of the jig.



Pull backup board out after each session and saw off the length containing the kerf. Wood insert is visible in the slot.



Master Craftsmen



Apply the carpenter's glue with an artist's brush. Insert the dowel buttons into the shank holes; press and remove any glue squeeze-out. You can also cut plugs by using the same general method we describe here. However, making your own dowel plugs or buttons can be so satisfying you may never buy either one of them again.

same purpose. Make a supply of these inserts while you are at it.

Cut the dovetail slot (and the inserts) at 20°. The inserts should be cut for a snug but sliding fit. Bore and tap the hole for the wood insert 1/4 in. below the slot centerline intersection. Install a compatible stove-bolt or wingnut and use this system to lock the backup board in place. Wood inserts are usually available in hardware stores in sizes accepting 1/4- to 3/8-in.-dia. bolts or screws. If you have trouble finding them, write to Albert Constantine & Son Inc., 2050 Eastchester Rd., Bronx, N.Y. 10461. The 1/4-in. size used here comes in sets of 10 for \$3.50, plus postage; catalog No. is 119E25.—C.E. Banister

Dowel Buttons

If you have had difficulty finding wooden buttons for your furniture projects, take heart. You can make your own with this system.

Here's how: Measure the diameter of the hole you wish to fill, then with the appropriate-size dowel, cut dado depth, using table below.

Put a strip of masking tape on the blade insert just in front of the blade. Set your dado head for a 1/4-in.-wide cut. Note that an adjustable dado head was used here. This cuts a dado wider than the tooth width because its design changes the blade angle.

Make a test cut in scrap dowel and mark the tape with a pencil to correspond to gauge side of kerf. Make a second mark on the tape 1/2 in. to-

ward the fence from the shoulder mark. Adjust the tooth height according to the table below. Set the rip fence on the line closest to it. Place the dowel against the miter gauge, allowing the dowel end to just touch the rip fence.

Start the saw and move the miter gauge to engage the dowel with the dado blade. Stop when the dowel is directly over the center of the blade (at its highest point). Then, using your free hand, rotate the dowel until a 1/4-in.-wide cut is made completely around the dowel.

Return the miter gauge and dowel to saw front, loosen the rip fence and move it aside. Slide the dowel to the new position by aligning as shown in the top right photo. Repeat the process for as many plugs as you need. *Caution:* Do not continue working on a length of dowel when the outboard, dadoed section becomes awkward and unmanageable. Use a backup board against the miter gauge, as shown in the pictures. Allow the board to support the dowel to within 1/2 in. of the blade.

Take the grooved dowel to a sanding disc and rotate it while feeding it at changing angles to round the tip. Use a fine miter saw or coping saw to cut off the button at the shoulder. Repeat the sanding and cutting process.—Dr. Robert N. Stapp

DOWEL PLUG TABLE
(In inches)

Plug Shank	Dowel Diameter	Dado Width	Dado Depth
1/4	1/2	1/4	1/8
1/4	3/8	1/4	1/16
3/16	3/8	1/4	3/32



Begin each cut by lining up previous kerf with mark on tape. Set fence by moving it into light contact with dowel; lock fence.



With dowel held firmly against the miter gauge, feed it into blade, then rotate it. This is a delicate procedure; work carefully.



Round over buttons, using a disc sander as shown; then cut segment off the dowel.



Use padded sanding block and drill press as an alternate method for sanding heads.

WORKSHOP MINICOURSE

GETTING AN EDGE

There's at least one time that splitting hairs can be a positive, happy experience. That's when you have the satisfaction of taking a dull plane blade and putting an edge so keen on it that it will, in fact, cut a human hair. Many fear that getting a good cutting edge is beyond their skills. In fact, it isn't.

For openers, you need a grinding wheel. Unless you plan to become a serious woodworker, you can do a

beyond restoration by honing alone.

To grind a blade, hold it at an angle against the grinding wheel and apply slight pressure as the wheel spins. Keep the iron moving back and forth in a straight line across the grinding-wheel edge. Besides reshaping the tool edge properly, you also want to make certain that the stone wears as evenly as possible.

moving back and forth across the wheel, your goal should be to create ever-so-slight rounded corners, as well.

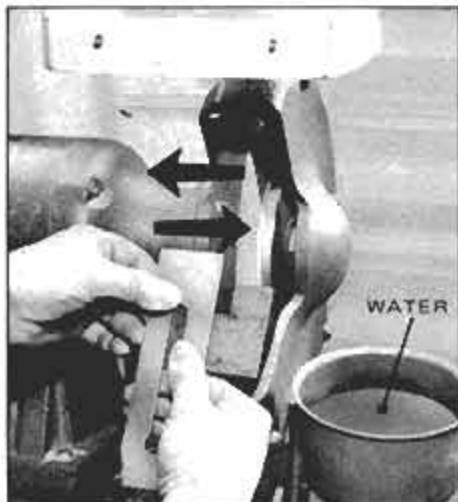
Once you're satisfied with grinding, you can move the iron to the oilstone. The oilstone, in fact, should be carried to any job away from the shop in case a cutting tool needs a quick touch-up during a planing task.

Put a couple of drops of light oil (oil

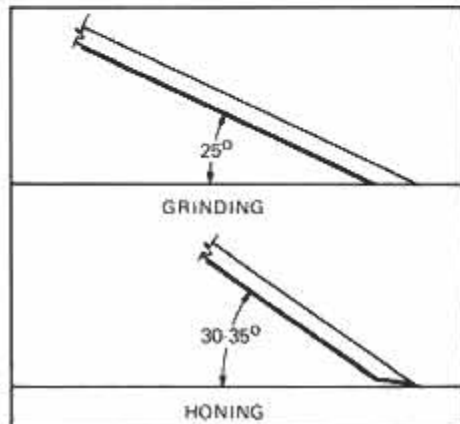
(Please turn to page 150)



Grinding is done to straighten the edge of a cutting tool. It's done before sharpening by honing. The grindstone should turn toward the plane iron (arrow). The guide supporting the plane iron is set so the bevel will be ground accurately. The guide should always be used for that reason.



The iron is moved from side to side so that the full surface on the edge bevel is ground straight. This also keeps the wheel true.



The bevel angle for chisels and irons might vary slightly, depending upon whether the tool will be used in hardwood or softwood. In general use, however, 25° is the acceptable bevel for grinding. Whetting is done at a 30° to 35° angle at the very edge.



A few drops of light oil applied to the stone serve as the vehicle for carrying steel particles away from the cutting edge. Use only quality oil and be sure to wipe the stone with a clean rag after each use.



Whet the cutting edge on the oilstone to create the sharp edge. Hold the bevel edge flat against stone at 30° and work with a circular or figure-eight motion. The stone here is protected by a rosewood box the author made for it several years ago.



The feather edge—often called wire—is removed by placing the flat side of the iron on the stone and making a few strokes. Do not create even the slightest bevel on this side of the iron, however.

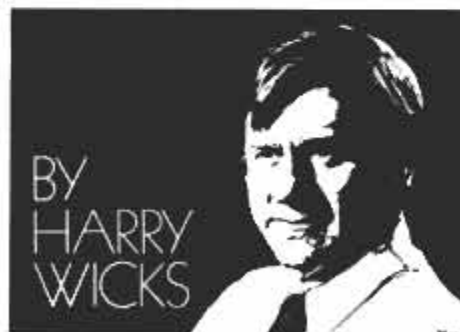
great deal with one of the smaller, less expensive versions, such as Black & Decker's Model 7901 (\$39).

Don't run to your grinder every time a plane iron or chisel's cutting edge needs a touch-up. For the most part, you should master the art of whetting (honing) to keep almost surgical-tool quality edges on all your cutting tools.

Grinding should actually be done only if the edge is nicked or if it is

Have an open can of water nearby—my grinder is equipped with a tool-hung bucket—so that you can quench the tool to prevent it from becoming overheated with resultant loss of temper.

The edge should be ground so that it is almost at 90° to the sides. But professionals have known for years that a plane is easier to handle if you round the iron's corners ever so slightly. Thus, as you grind a bevel

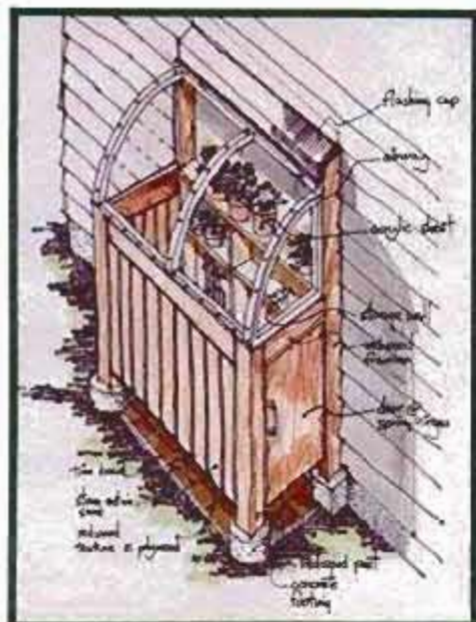




Popular Mechanics

1982 OUTDOOR LIVING GUIDE

It's true. You can find happiness right in your own back yard. Using your do-it-yourself skills and the Popular Mechanics projects on these pages, you can make your home the envy of the neighborhood.



Yard storage structures you can create



Build PM's Adirondack lawn furniture



Elegant pool deck goes with any house

The reason they live
so long in the city is
because they were born
on the farm.

Where we come from, work goes
dawn to dusk and equipment that isn't
built right falls apart in a hurry.

So even though our lawn tractors,
riders and walk-behind mowers may never see a
rutted wheat field, they still have some of the sturdiest
frames and wheel assemblies around.

You probably won't be cutting eighteen hours straight, either. But you can
understand the importance of having an engine that's synchro-balanced and
shielded to run quiet and smooth.

You see, building things that last is kind of an obsession with us. A drive
through farm country'll tell you that.

We want folks who buy John Deere products to appreciate 'em as much as we
do. And we figure the best way to do that is make sure they're going to have
them for an awful long time.

Nothing Runs Like a Deere®



For nearest dealer or for free folder call 800-447-9126,
(Illinois, 800-322-6796) or write John Deere, Dept. 62, Moline, IL 61265.



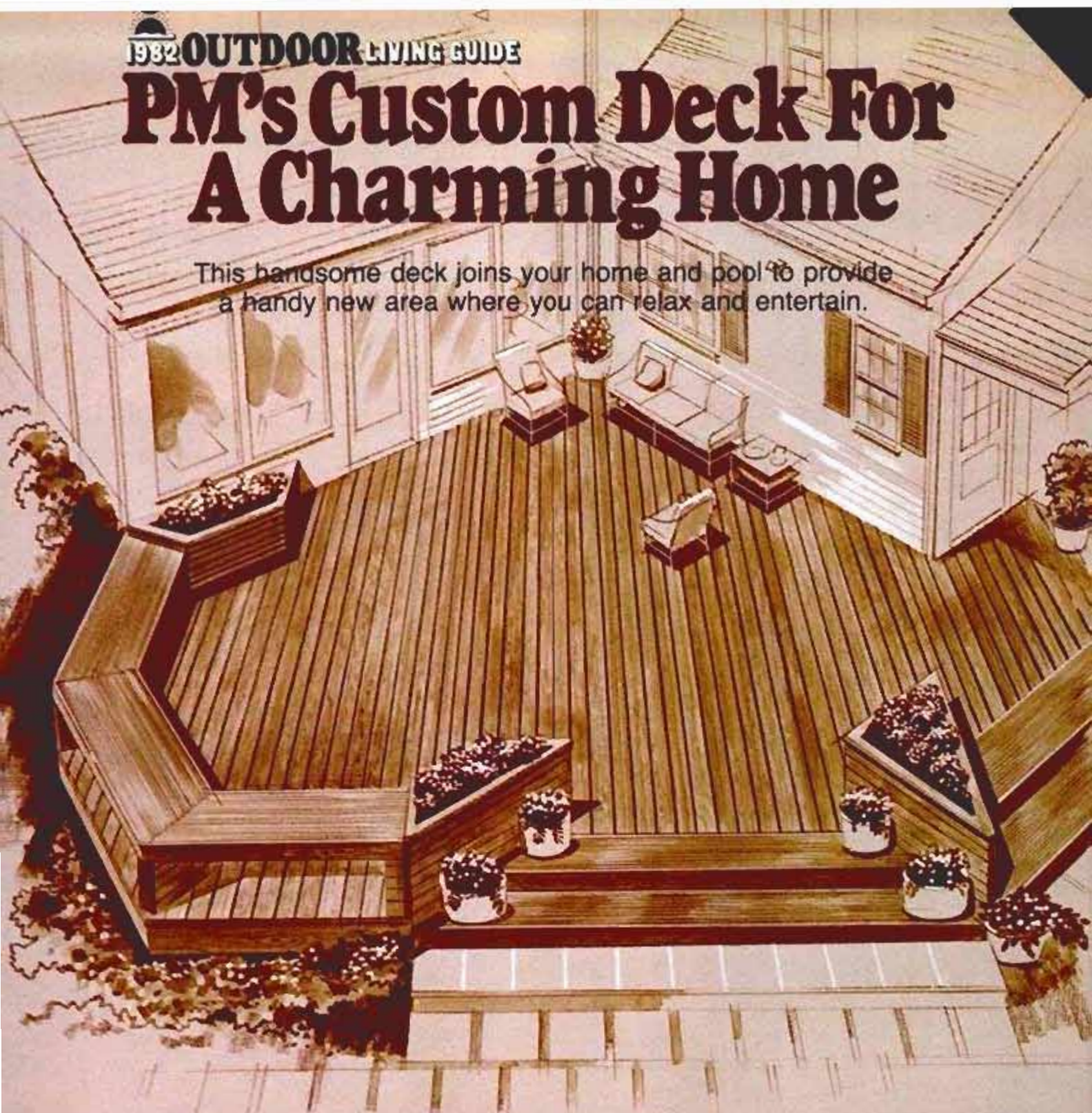
*Walk-behind
Mower*

*Lawn
Tractor*

Riding Mower

PM's Custom Deck For A Charming Home

This handsome deck joins your home and pool to provide a handy new area where you can relax and entertain.



A pocket created by the house walls on a gentle slope of lawn leading to the swimming pool seemed tailor-made for the PM deck. The major access to the house from this deck is through an enclosed sun porch that adjoins the kitchen, making the deck a perfect area for outdoor dining. The deck also has a secondary access to the house, which helps the traffic flow and adds to the deck's appeal as a party spot. Another advantage this deck has for its owner: Situated between house walls, it provides a shady area much of the time, offering a retreat from the sunny pool side.

Ira Grandberg, A.I.A., designed this multiangled deck. The benches and planters follow the deck angles and obviate the need for conventional railings.

The deck is constructed of knot-textured garden-grade redwood. We used construction heart (all heartwood) for



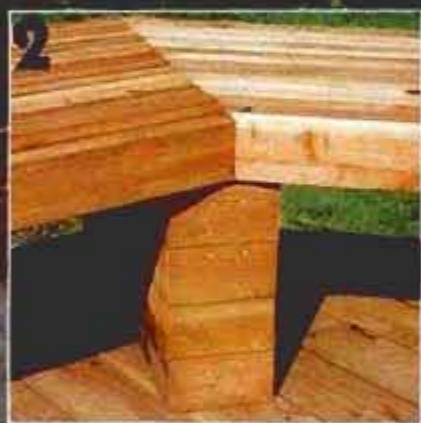
View from across the pool shows how deck is designed to follow the contours of the house, and visually link it to the pool.

1 This deck fits into a pocket made by the walls of the house. Deck is attached to three walls; it can be reached through two doors.

2 The two seating sections form an angle. Joint is centered over a vertical support, a box frame covered by mitered, horizontal 2x4s on edge.

3 Planter on the house wall ends neatly at doorway. The planter is filled with bark and potted blooms, which can be removed for tending.

4 One planter, positioned next to the deck stairs, abuts a seating section at a 45° angle, to continue pattern of angled joints.







NOW DOING IT YOURSELF IS EVEN MORE REWARDING.


You can make anything on a WORKMATE® Work Center. Even money.

Because from May 1 to July 31, 1982, Black & Decker is offering rebates on selected WORKMATE® models. \$10 off the purchase of our dual-height models. And \$5 off our single-height models.

There's never been a better time to buy one. So go see your dealer for details.

After all, with a WORKMATE® plus a rebate, doing it yourself can be twice as rewarding.

\$10 off models 79-001, 79-035, and 79-009.
\$5 off model 79-003.

 **Black & Decker.**

THE WORKMATE® \$5 AND \$10 REBATE.

1982 OUTDOOR LIVING GUIDE

the posts, joists and near-ground applications. Construction common redwood, containing sapwood, makes up the decking, benches and trim.

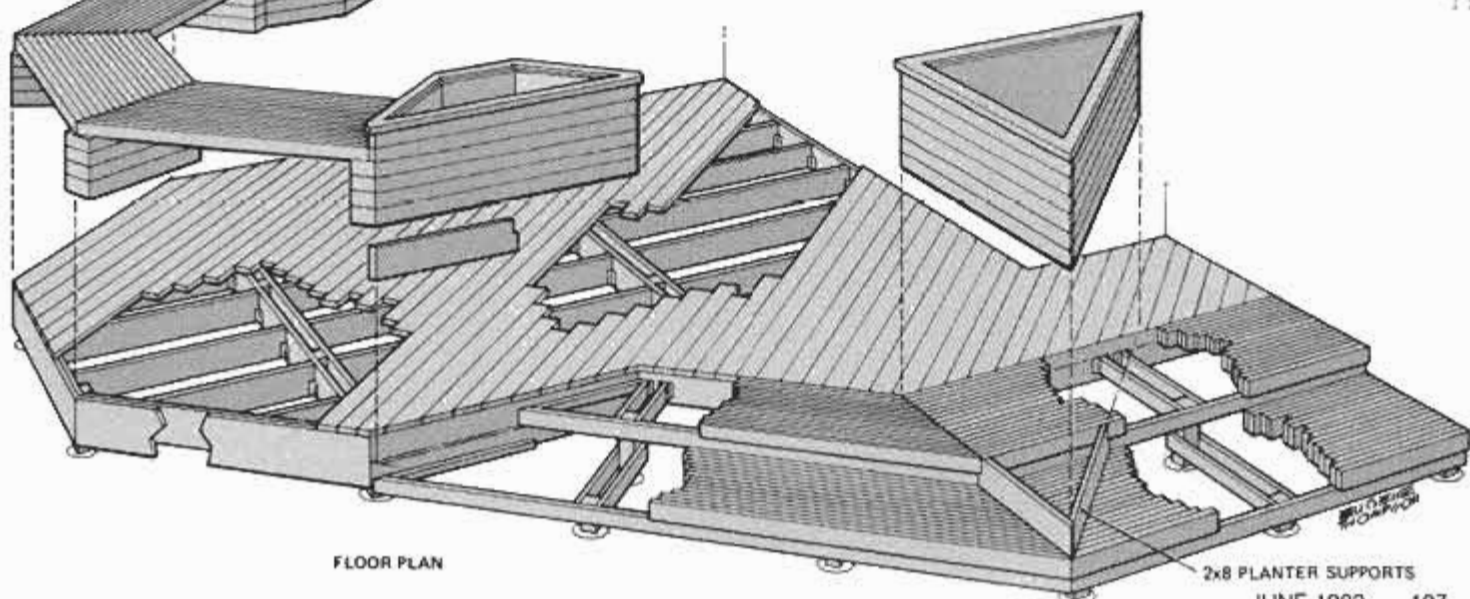
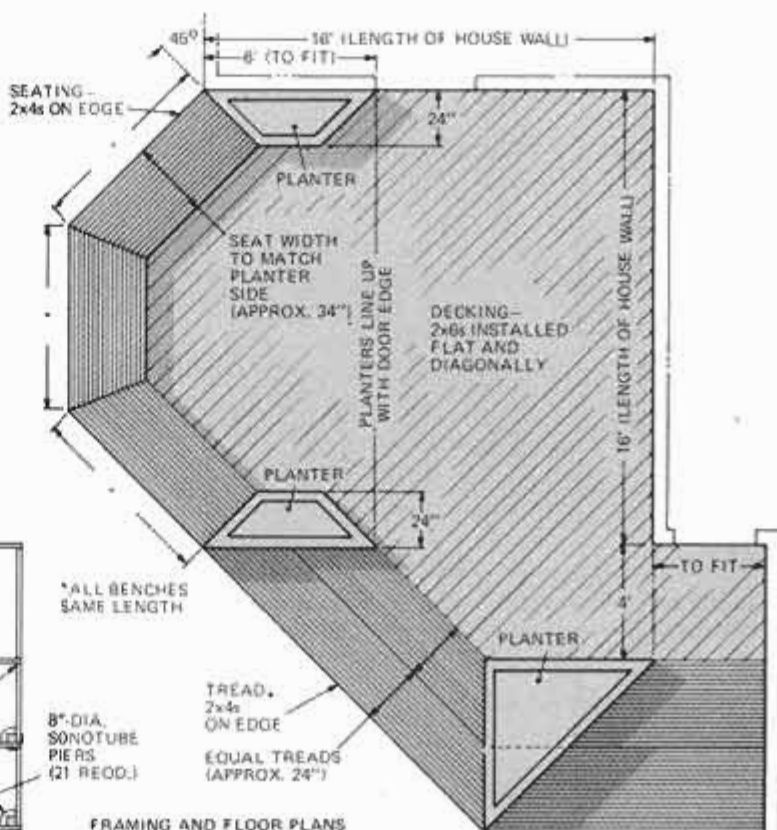
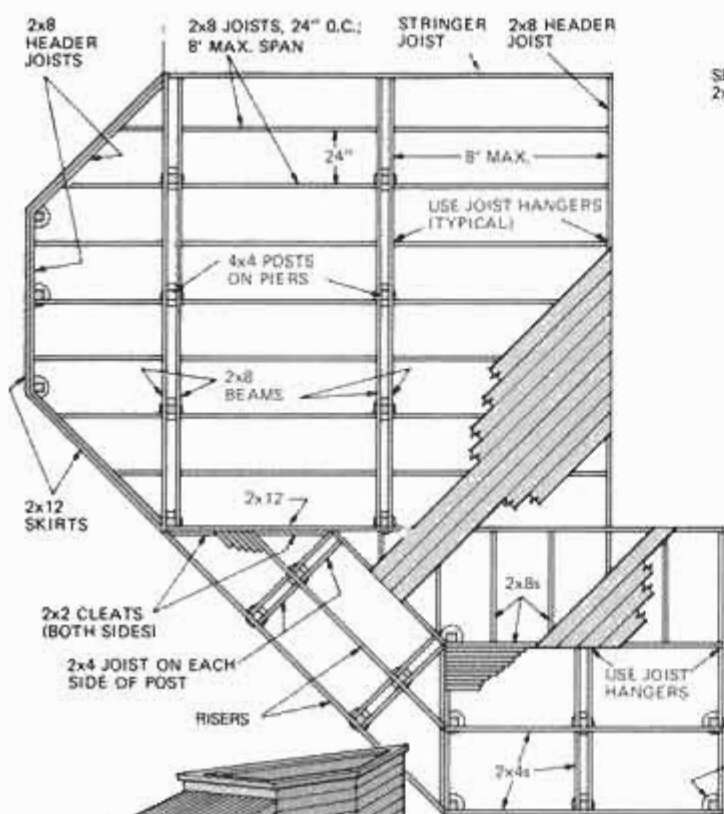
To begin work, lay out the deck area, using a mason's line and stakes, making sure the line is level. To prepare the site, use a spade to remove sod to a 2- to 3-in. depth. Prepare an area at least 2 ft. beyond the perimeter of the deck. You can landscape this later with bushes or with a ground cover, such as gravel or bark chips. Cover the below-deck site with black polyethylene sheet so weeds won't grow through your deck.

Design: Ira Grandberg, A.I.A.; **Construction:** Ross Tiefenthaler; **Technical art:** Eugene Thompson; **Illustration:** Dean Ellis; **PM photos:** George Ancona; **Redwood:** California Redwood Assn., 1 Lombard St., San Francisco, Calif. 94111; **Barbecue:** Model 824J Avanti with cart, Charmglow Products, Box 127, Bristol, Wis. 53104; **Bug light:** Model 8305, Charmglow Products; **Furniture:** dining furniture (Rondo style), lounge furniture (Bayshore style), Winston Furniture, Suite 908, Independence Plaza, 1 Independence Dr., Birmingham, Ala. 35259; **Accessories:** Leisure Unlimited Inc., 606 East Post Rd., Westport, Conn. 06880.

Locate and dig holes for the footings supporting the 4x4 posts. Footings must be below the area frostline to prevent the deck from heaving with the freezing and thawing of the earth. Footings should be spaced no more than 8 ft. apart. We poured concrete piers into Sonotube forms and used a step-flange anchor in each pier. Bore holes in the posts as needed to bolt them to the anchors. When you install the posts, make sure they are plumb in both planes, and in alignment with each other. Use a spirit level to check vertical alignment. While the posts are exposed, apply a water-repellent coating with mildewcide to them.

Next, 2x8 beams are fastened to the posts with 1/2 x 8-in. hot-dipped galvanized carriage bolts. (Note: Hot-dipped galvanized hardware and fasteners are used throughout.) When fastening boards on edge, sight along the edge to determine if there is a crown (convex edge); if so, install the board, crown edge up. The weight of the deck will tend to straighten the stock. A board installed convex edge down will sag after a while. (Boards installed on the flat should also be placed with the

(Please turn to page 108)



(Continued from page 107)

convex surface on top for the same reason.) To calculate the attachment point of the beams, first determine the height you want the deck. This is based upon house floor elevation. The finished deck should be located 2 to 3 in. below the door's sill. Use a mason's line and a spirit level to determine the deck height; subtract the thickness of the deck board. The top of the ledger strips should be located at this elevation.

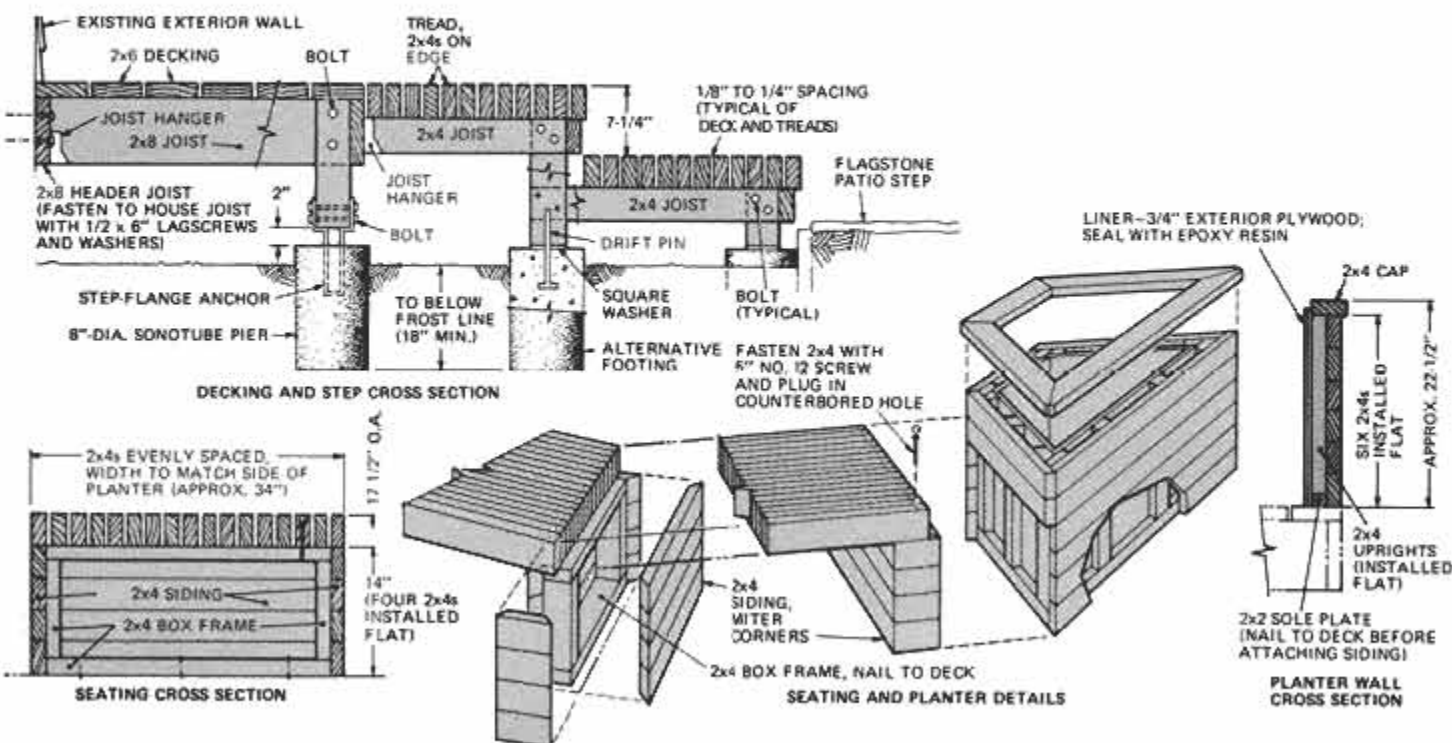
We fastened header and stringer joists to the house joists. To do it, remove the siding so the header and stringer joists can be installed flat against the sheathing. Snap a chalkline along both walls. Then run a hefty bead of caulking along the chalkline and install the joists with $\frac{1}{2}$ x 6-in. lagscrews and washers. If you have a brick house, you must use expansion shields and bolts.

Before you begin fastening, make sure there's no chance of hitting in-the-wall electric or plumbing lines. Play it safe and make a trip to the basement to inspect the wall area. The deck joists are attached to these joists and to the beams with joist hangers. Joists in the area of the steps are of 2x4 stock, which accommodates 2x4 decking installed on edge above (see decking and step cross-sectional drawings). A 2x12 skirt is fastened to the outboard header joists to give a finished appearance.

Install the 2x6 deck boards, using 12d nails. To avoid splitting the wood, blunt the nail points slightly by striking them with



The built-in planters at the steps serve as railings while displaying blooms or greenery. Rather than being cantilevered over the step, both are supported from below (see the drawing).



a hammer. Place the nails no closer to the board edge than half the board thickness; no closer to the board end than board thickness. Set all nailheads slightly below the surface, using a large punch or heavy nailset.

There should be a $\frac{1}{8}$ - to $\frac{1}{4}$ -in. spacing between the boards to allow for water runoff. To add visual interest, the architect specified diagonally installed boards. To ensure a straight deck edge, trim off all the boards at one time after installation. Snap a chalkline at the trim mark and make the cut with a combination blade in a circular saw, its blade set so it just cuts through the decking.

Continuity of pattern

A band of spaced 2x4s on edge at the deck perimeter leads to a step of similar 2x4s on edge. This band continues the wood pattern of the seating. A flagstone step leads to a small flagstone area that provides an attractive transition between the wooden deck and the masonry pool walk. The flagstone is added after the planters and seating are installed.

The bases of the seating units are simple 2x4 box frames nailed to the deck. The frame is sheathed with 2x4s installed on the flat, their ends meeting in miter joints. The seating surface is composed of 2x4s on edge, evenly spaced the length of the bases. The 2x4s are fastened to the bases with 5-in. No. 12 screws; the holes are counterbored and plugged.

The planters are similar in construction to the seating bases. Nail a 2x2 base for each planter to the deck. Then install 2x4 uprights on the base. The planters have a liner of $\frac{3}{4}$ -in. exterior plywood sealed with epoxy resin. Install the 2x4 siding on the flat and top it with a 2x4 cap rail around the top. The two planters flanking the stairs are supported by 2x8s at the point where they overhang the step area.

You can finish the exposed wood members shortly after completing the deck, using a clear water repellent containing a mildewcide, such as Woodlife, Cuprinol No. 20 or Pentaseal.

Before you treat the deck, be sure to remove any dirt with a detergent solution. After washing, rinse the wood thoroughly and let it dry for two or three days before treatment. Lightly sand off any lumber-grade stampings. To ensure an even application, spread the preservative over the wood with a pad applicator or a brush. For the best results, apply two light wetting coats, allowing one day's drying time between each coat.

To keep the deck in top condition, you should reapply the water repellent every two years. Gradually, the wood will weather to a driftwood gray.

IF WHAT YOU'RE PAINTING ISN'T ORDINARY, WHY SHOULD YOUR PAINT BE?



Your father gave you that wagon for your fifth birthday. Now it's your turn to pass it on.

Any spray paint could make it red again. If that's all you wanted.

But Rust-Oleum, with an average of 50% more protective ingredients than its nearest competitor, can do more.

Its protective formula not only prevents rust, it also gives metal better protection from chipping, peeling and fading than other spray paints.

Something you might want to think about next time you're painting something you care very much about.

ANY METAL WORTH PAINTING, IS WORTH PROTECTING.



 **RUST-OLEUM
CORPORATION**

Little Sheds For Your Yard

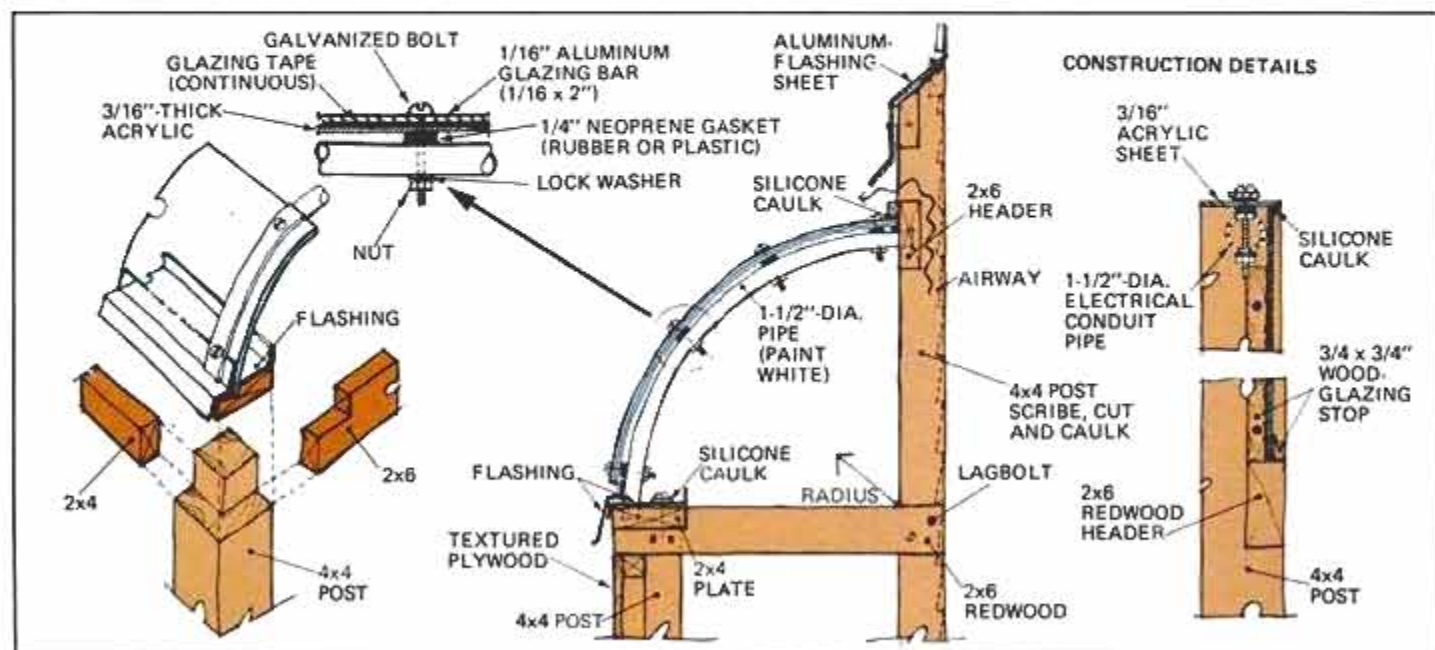
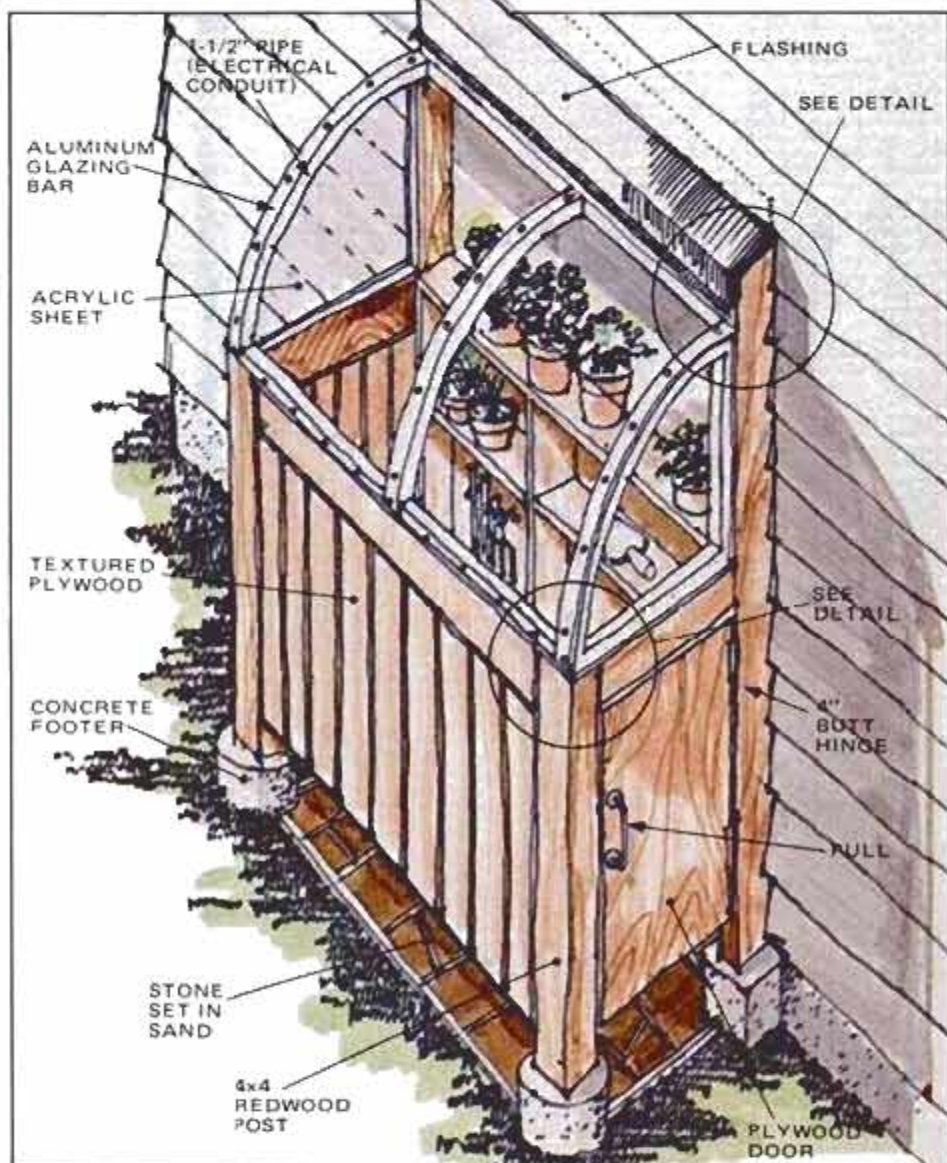
If your garage is already full and your back-yard space is too precious for a yard building, get the storage you need with these lean-to sheds. The designs, done for PM by Ira Grandberg, A.I.A., should inspire you to build your own with the dimensions that work best.

Garden Supply Shed

Use the lower shelves for garden supplies and small tools, and the upper shelves for plants. The acrylic allows the sunshine in, but it protects plants from heavy frost. In the spring, you can make room in your hotbed for delicate garden plants by moving the hardier ones (pepper, cabbage, onion) into the cold frame at the top of this shed. Chrysanthemums and geraniums will continue to bloom in here long after autumn frosts have killed most other plants.

Remember that concrete footings must extend below the frostline in your area. Building suppliers carry a variety of ready-made concrete footing forms. Use 1/4-in. or 3/8-in.-dia. lagscrews 2 ft. on center to secure the shed frame to the house frame. Screws should be long enough to penetrate the siding and studs.

(Please turn to page 112)



POWER TO GO.



The Honda EM-500 portable generator is really going places. The mountains. The lake. The desert. Out to sea. Anyplace people need to power camping accessories. Charge their boat or RV batteries. Run small tools or appliances. Or shed some light on emergencies.

TRAVEL LIGHT

You can carry the EM-500 anywhere. It gives you a maximum 500 watts of power in a lightweight 40 lb. package.

The EM-500's engine is a Honda. Designed and built by the people famous for engine innovations. And like all Honda engines, it's fuel efficient. It'll run up to 4 hours on half a gallon of gasoline.

THE STRONG, SILENT TYPE.

The EM-500's superb engineering design

provides quiet operation. An automatic choke and Capacitor Discharge Ignition make starting fast, easy and reliable.

An Automatic Voltage Regulator gives you steady output to run appliances smoothly regardless of changes in engine speed and load.

Whether you need power in some far-away place, or just want emergency auxiliary power in your home, you'd have to go a long way to beat the Honda EM-500.

To see one, stop by your nearby Honda Generator dealer.

For the one nearest you, just look in the Yellow Pages, or call toll-free 800-447-4400. And in Illinois 800-322-4400.

IT'S A HONDA

Trash Can Hideaway

You may be enjoying your yard more than ever before, but you'll take even greater pride in the view if you can manage to hide away unsightly garbage cans.

This shed does the job without sacrificing accessibility to the cans. Regardless of the size of the cans you choose to keep in the shed, they can be easily removed through the doors below for trash disposal.

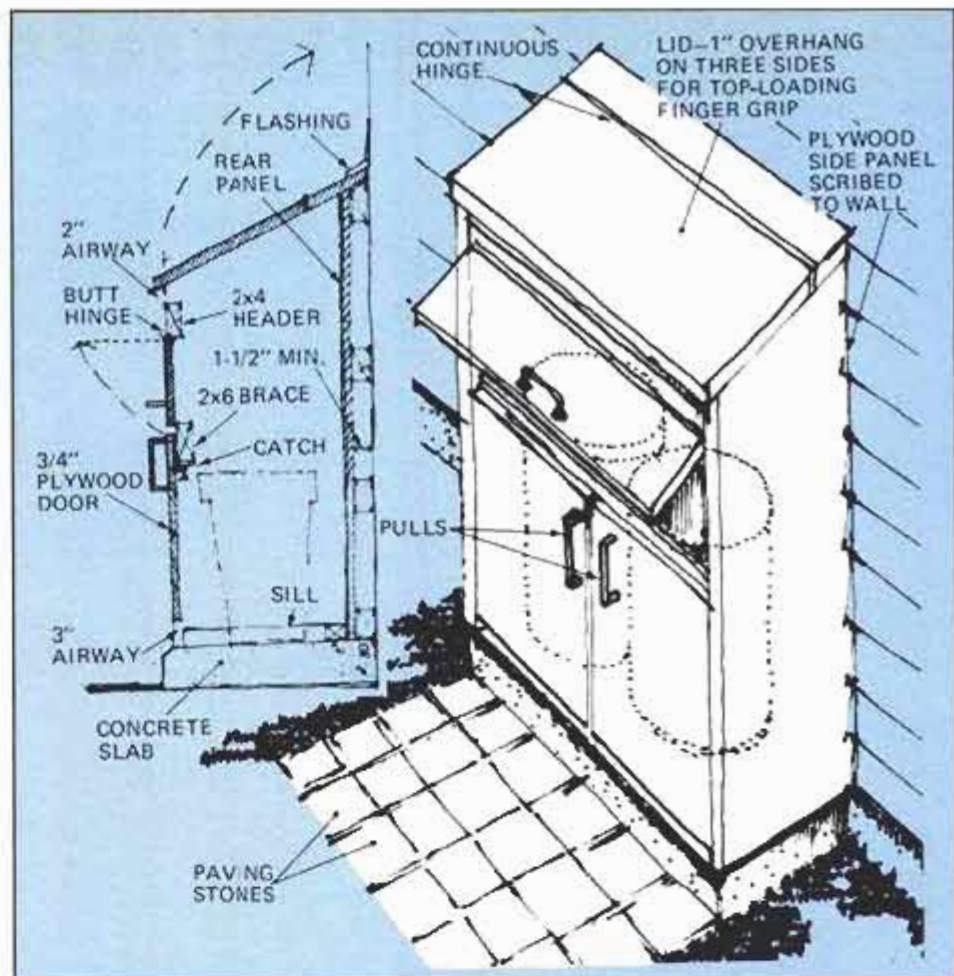
The upper doors allow for easy trash deposit, whether in large quantities (top door) or small scraps through the upper front door.

Pour a rectangular concrete slab, using plywood forms. Install the anchor bolts for the sill.

The "lean-to" design allows for construction without a frame because the house wall provides structural support. Note that the shed dimensions must be based on the size of your trash cans:

It's important that you remember to leave clearance for easy removal of the cans through the bottom doors.

All of the sheds in this collection may be finished to match your house. Whether you use textured or smooth-surfaced plywood, you should make certain that the plywood you select is rated for outdoor use.



WHEN YOU DO IT
YOURSELF DO IT RIGHT...
USE SAKRETE

SAKRETE does it right. **SAKRETE** was the world's first cement mix in a bag. And today, 45 years later, it's still the industry standard for excellence — because the consistent quality of **SAKRETE** is seldom equaled.

SAKRETE is Economical. **SAKRETE** is the best buy on the market because it's strong — long lasting — use it when you want to — buy only what you need. And you increase the value of your property.

SAKRETE is Strong. **SAKRETE** concrete and mortar mixes are designed, batched, and mixed to be strong and workable.

SAKRETE is Easy. No guesswork. Complete step-by-step directions are right on the bag. And the free **SAKRETE** Project Booklet gives you illustrated pages of ideas and easy-to-follow instructions.

When you do it yourself — do it right with **SAKRETE** Cement Mixes.

SAKRETE® Cement Mixes

There's no substitute for the best.



Ask for the **SAKRETE** Project Booklet — it's free at your **SAKRETE** dealer. Or send 75¢ for handling to: **SAKRETE**, Dept. P62, Box 17087, Cincinnati, OH 45217.

SAKRETE is a registered trademark of SAKRETE, INC. © 1982

If you really want to enjoy your backyard, insist on

FLOWTRON® Electronic Bug Killers

Don't let mosquitos and other anti-social insects drive you away from your backyard fun.

Flowtron, the world's most popular electronic bug killer, takes care of those annoying insects so you can relax and enjoy the outdoors.

Flowtron's high-intensity black light lures flying pests to a self cleaning, electrically charged killing grid that disintegrates them on contact. No toxic chemicals or poisons — completely safe for people and pets.

The handsome, lantern-styled Flowtron bug killer operates for just pennies a day and is ruggedly built to last for years.

Enjoy your backyard again with Flowtron, the electronic bug killer. Available now at leading stores in your area.



FLOWTRON™

Two Main Street, Melrose, MA 02176

Tool Storage Shed

Accessibility is the most impressive feature of this shed. Miscellaneous small tools or the unwieldy garden hose can be stored in the upper bin, while heavy equipment can be rolled up the ramp and into the lower area.

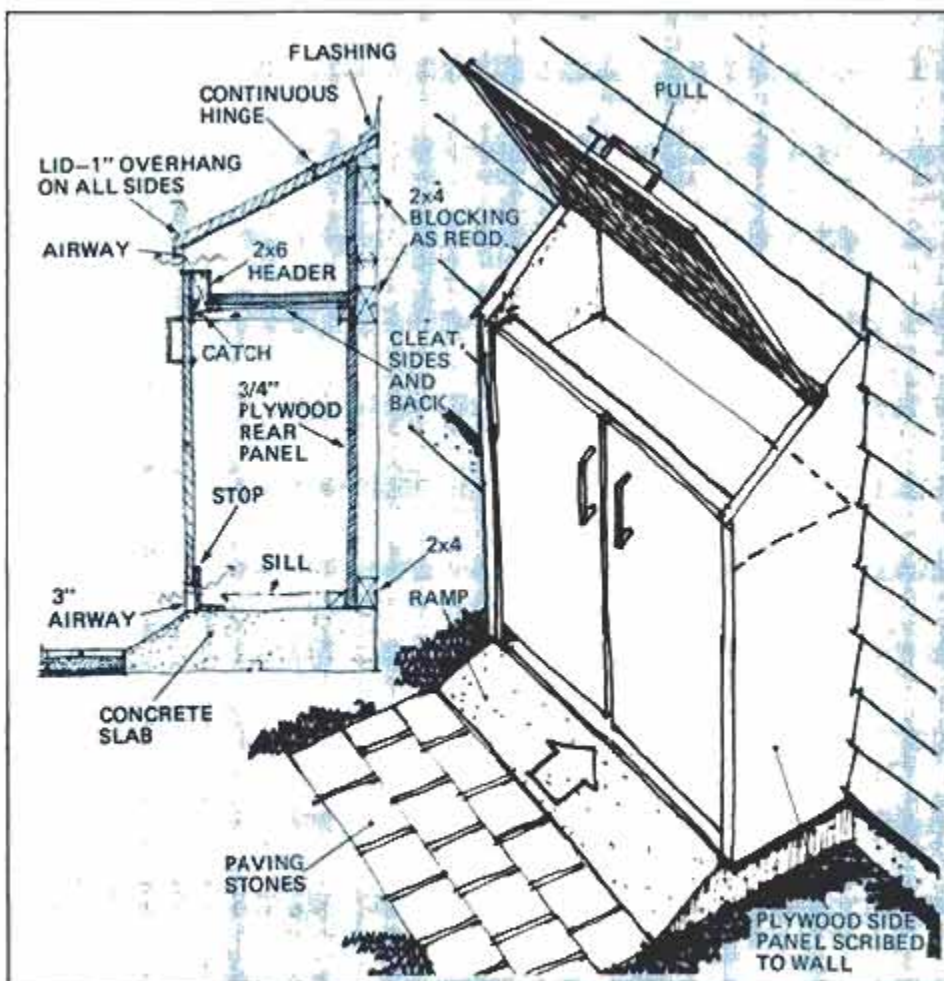
Decide on the dimensions that will suit your storage needs. Then excavate for the concrete slab and footings. Remember that footings must be below the area frostline.

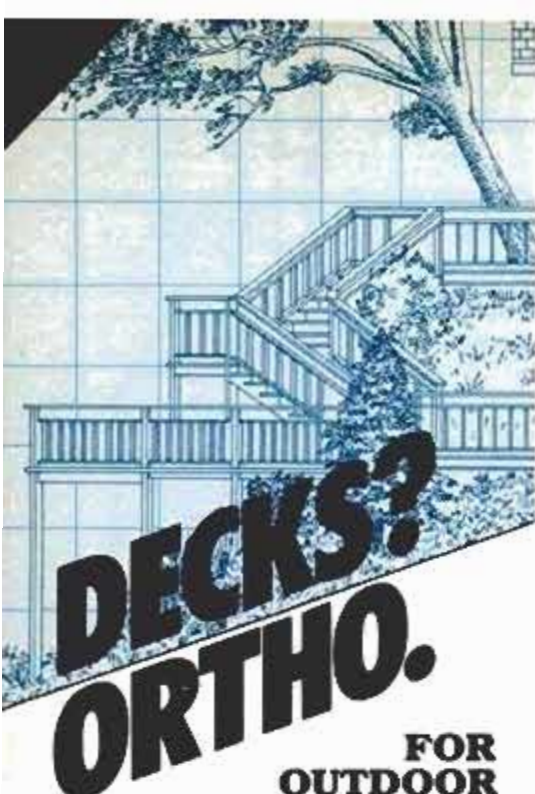
Notice that the ramp is part of the slab and is angled at about 25°. Construct the slab form of plywood and incorporate the ramp into the form. Secure forms with stakes and backfill soil outside between the stakes. This will provide added bracing for the form.

Before the concrete sets, bury the heads of three lagbolts (1/4-in.-dia. x 5 in.) along the sides of the slab for securing the sill. Leave the threaded end of the bolt extending up about 2 in. Make sure it is plumb.

This shed does not have a frame. The doors are hinged directly to the side panels and the panels are attached to headers and to the sills which are bolted to the slab. The floor of the upper bin provides rigidity for the structure.

(Please turn to page 114)





DECKS? ORTHO.

FOR OUTDOOR PROJECTS, ORTHO KNOWS HOW AND SHOWS HOW.

Build the yard of your dreams — it's easy with ORTHO books. *How to Design and Build Decks and Patios* and *Wood Projects for the Garden* are full of imaginative ideas, full-color illustrations and easy-to-follow instructions for everything from planters and patio furniture to full-scale decks. With ORTHO know-how and your handiwork, you'll get good-looking, money-saving results you can enjoy for years.

Look for the complete line of ORTHO how-to books at your nearest home and garden center, at hardware stores and at finer bookstores. Send for a free catalog of all 43 ORTHO Books.

Write:
Chevron Chemical Co., ORTHO Books,
Room 3646, Dept. 82A, 575 Market
Street, San Francisco, CA 94105.



ORTHO

Chevron Chemical
Company

Wood Projects for the Garden

How to Design & Build Decks & Patios

How to create your own outdoor living space with detailed illustrations on design and construction. Includes plans for building and painting decks.



All-Purpose Shed

Long-handled garden tools such as rakes, hoes and edgers practically demand their own storage space. This shed is designed to keep those tools neatly and safely corralled. Its open-outdoors design keeps articles in full view.

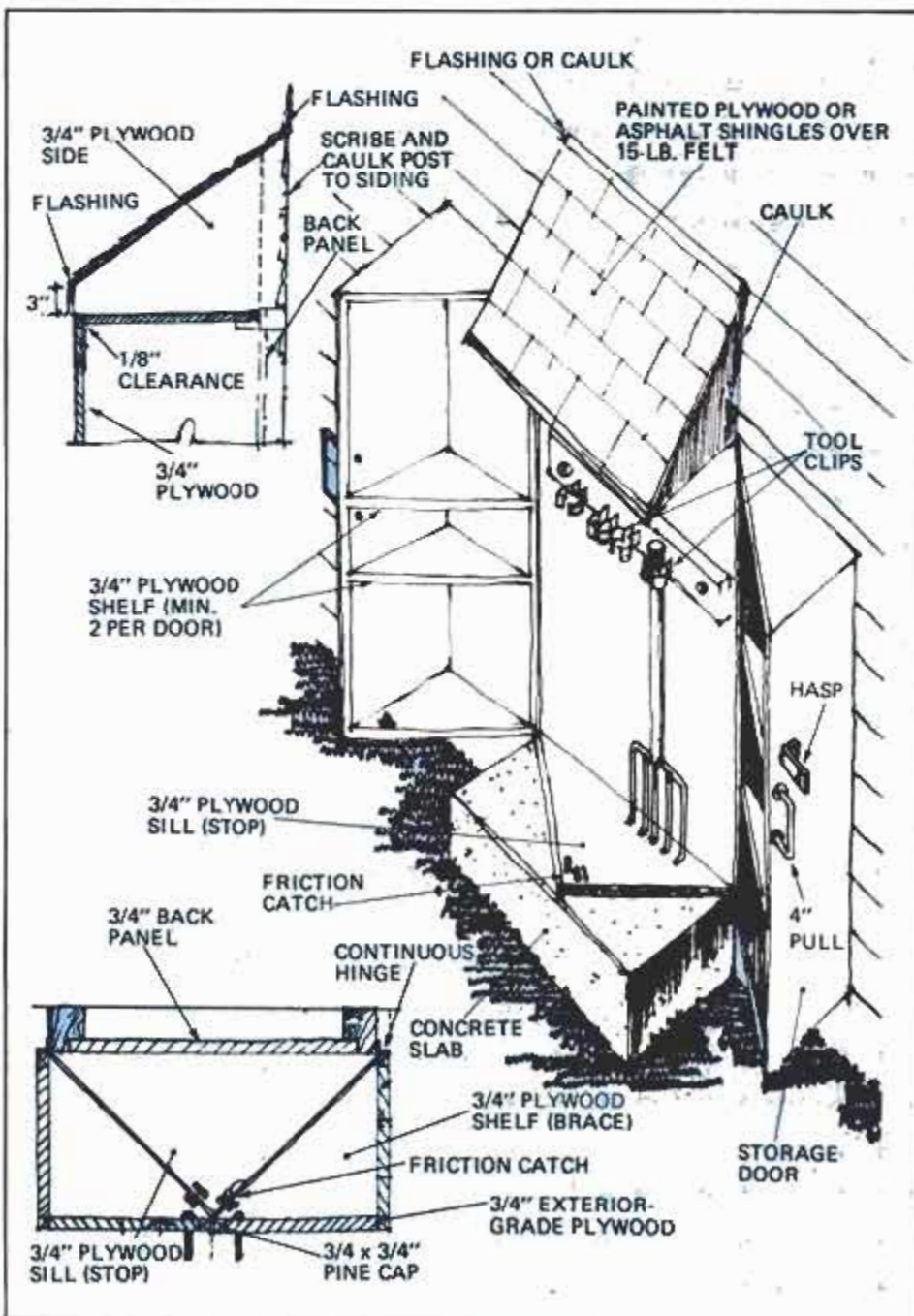
The shed sits on a concrete slab (like the garbage-can shed). Secured to the slab is a partial plywood sill, in the form of a right triangle, which serves as a door-stop. The front and sides of the shed itself are actually the open-out doors. They are attached to the 4x4s which, in turn, are scribed and secured to the house. The continuous hinges run the full length of the doors and are rated for heavy-duty use. Position the hinges carefully to ensure a good fit when the doors are in the closed position.

Available in hardware stores, continu-

ous hinge (often called piano hinge) is usually available in 6- and 8-ft. lengths. Cut the hinge with a hacksaw to suit your needs. Use brass hinge to avoid rust stains on the wood.

Note that the right-angle joints in the doors are rabbeted. Take care when assembling the doors. If the doors are not assembled accurately, they won't come together for a good fit when they are finally attached to the shed.

Cover the shed roof with asphalt shingles. Since you have less than 30 sq. ft. to cover, you won't need more than one bundle of shingles. Install the shingles, using standard roofing techniques. If you plan to use any of the area underneath the shed roof, be sure to snip off all nails through the plywood with nippers, or clinch the nails with a hammer.



A TOP TO BOTTOM COMPARISON OF GAS POWERED TRIMMERS.

All controls and starter up at your fingertips, away from cutting head. For easier operation, easier starting, no bending over.

Top-mounted engine keeps carburetor and air cleaner out of dust and flying debris, for less maintenance, longer life.

Top-mounted Weed Eater Trimmer

Engine is here, on top, for balance and easier handling, not at the end of a long shaft. So there's less fatigue and back strain.

Adjustable handle allows you to change cutting angle for edging. No way with a bottom-mounted engine.

Fuel is in this shaft, instead of a fuel tank.

WEED EATER

Bottom-mounted competitor

Engine mounted down here, at the end of handle. Unwieldy and not well balanced. And right down in the dust and debris of cutting.

Almost impossible to change cutting angle for edging.

Direct drive, with no clutch to stop cutting head from turning while starting and at idle.

Starter is down here, near the cutting head. So you either bend over or lift the whole machine. Awkward.

Bulky engine obstructs cutting under low bushes and shrubs.

Sleek, streamlined and engineered to look like the high-quality machine it is.

Just tap the head on the ground for more cutting line. Clutch automatically keeps head from turning while starting and at idle.

WEED EATER, ON TOP FOR A LOT OF GOOD REASONS.

Build PM's Adirondack

Fifty years ago, lawn furniture like the handsome pieces shown here could be found on the front lawns of mansions and vacation spas. But now, you'll be able to make your own sets.

The very look of this classic wooden lawn furniture conjures up images of more serene times. Though simple in design, this furniture from years past boasts an elegance all its own. Along with mission furniture, country pine and other older styles, Adirondack lawn furniture is currently enjoying renewed interest at antique shops and flea markets.

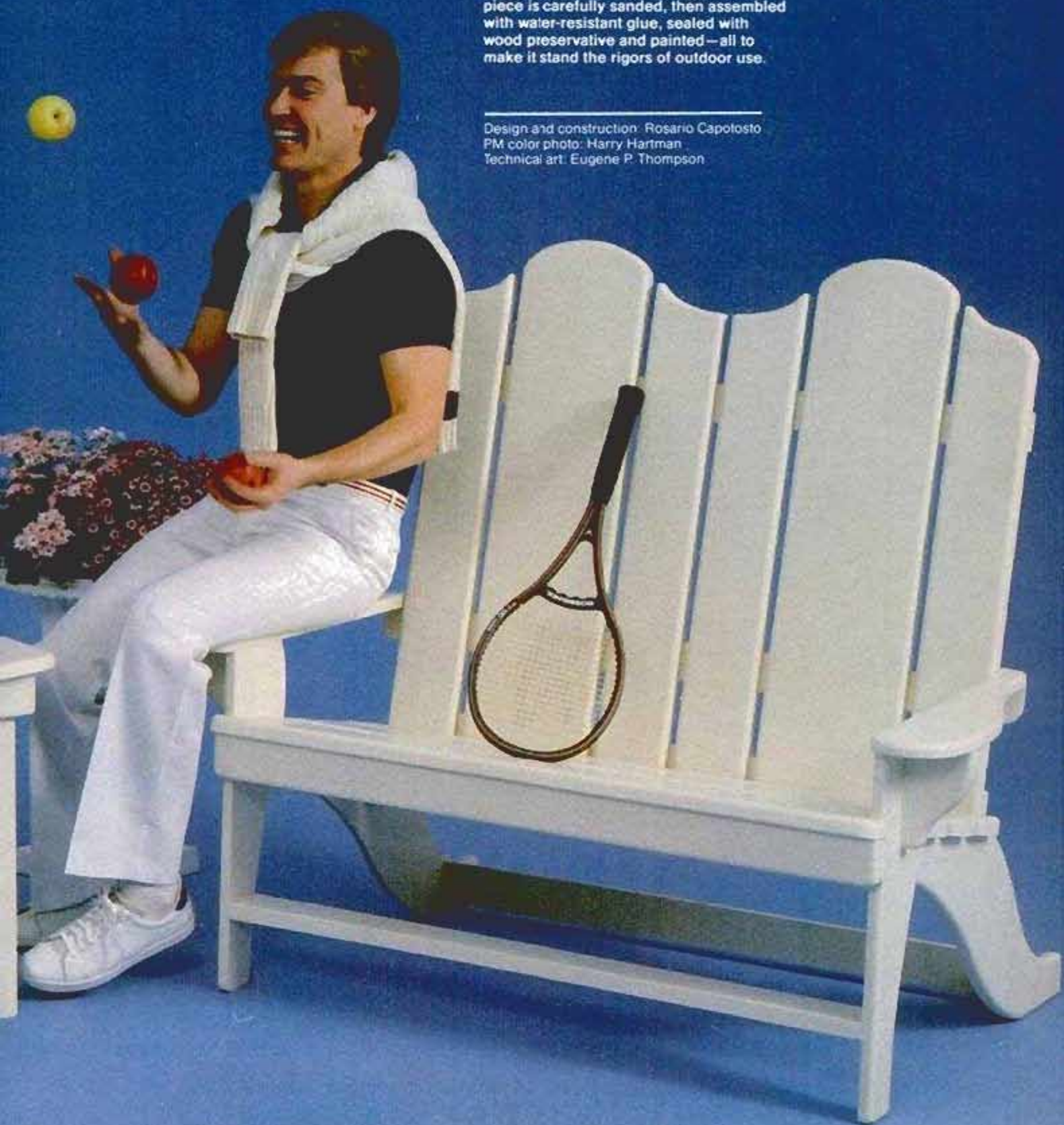
Though you may not have a sweeping lawn like those in front of the old mansions in New York's Adirondack mountain region — from which the furniture gets its name — PM's re-created set of lawn

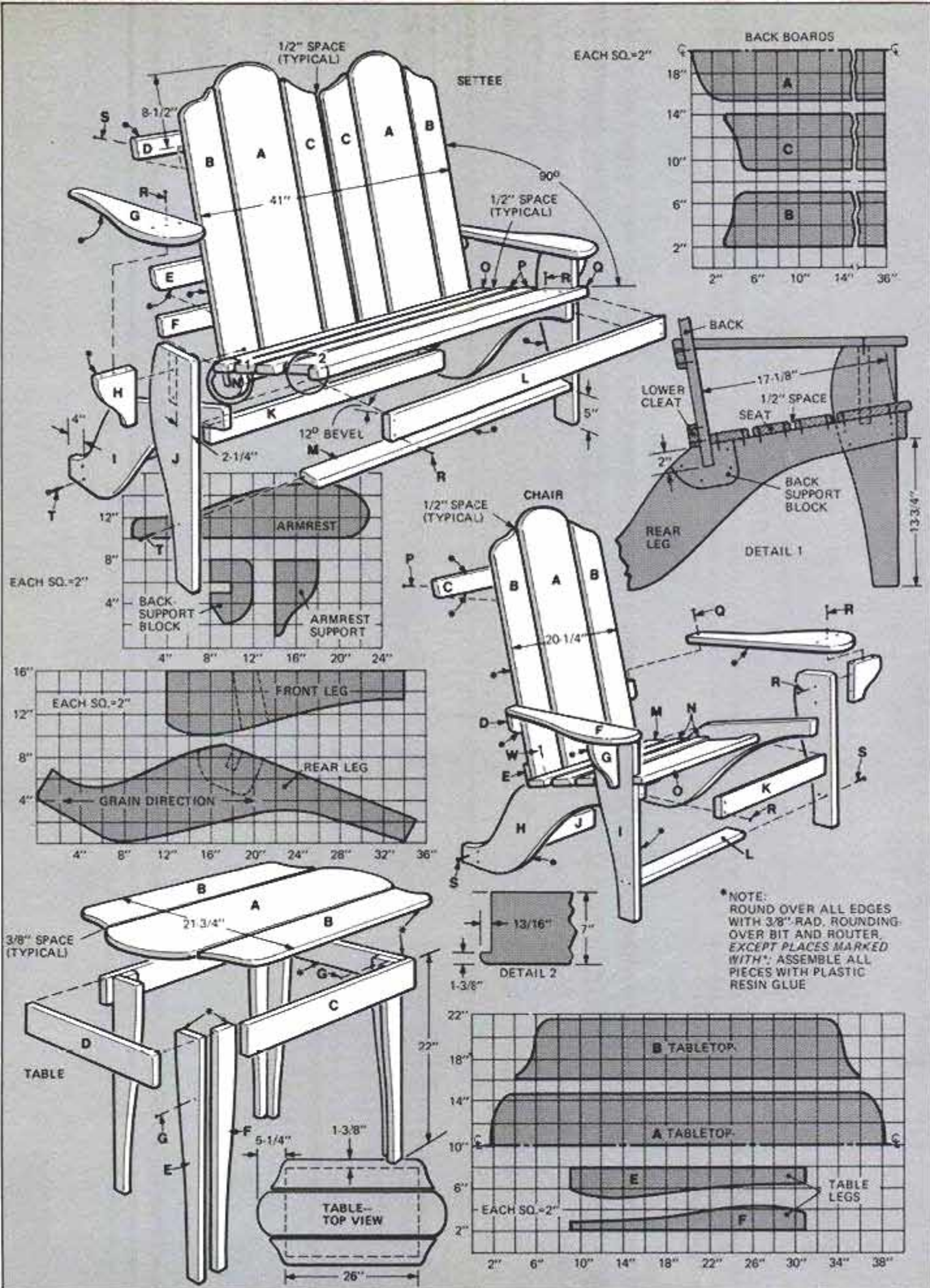


Lawn Furniture Set

Named after the beautiful mountains in upper New York State, this traditional Adirondack furniture is as durable as it is attractive. Crafted of hardwood, each piece is carefully sanded, then assembled with water-resistant glue, sealed with wood preservative and painted—all to make it stand the rigors of outdoor use.

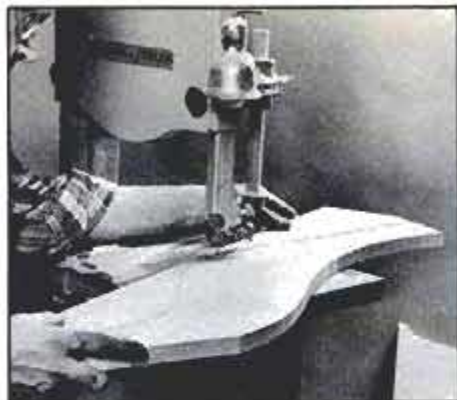
Design and construction: Rosario Capotosto
PM color photo: Harry Hartman
Technical art: Eugene P. Thompson







1 If stock is dressed on the sides only, joint one edge, then rip to proper width.



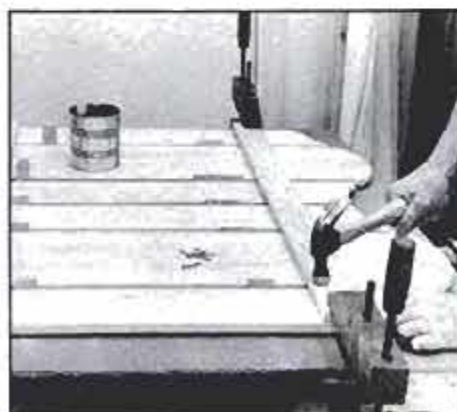
2 Use band saw or sabre saw to cut contours. Slow feed makes for better cut.



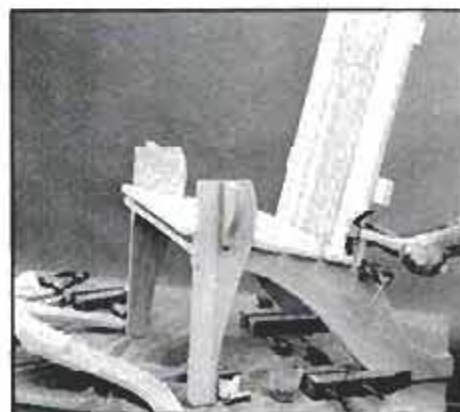
3 Use spoke shave to smooth saw marks. Always work with grain, not against it.



4 Start each assembly with legs. Use plastic resin glue throughout construction.



5 Clamp cleats to back boards, then nail. Use spacers between boards for accuracy.



6 Bar clamp at back and spacing strip on front keep legs aligned while nailing seat.

MATERIALS LIST—SETTEE

Key	No.	Size and description (use)
A	2	1 3/16 x 9 1/4 x 36" poplar (back)
B	2	1 3/16 x 5 x 33 1/2" poplar (back)
C	2	1 3/16 x 5 x 33 1/2" poplar (back)
D	1	1 3/16 x 2 1/2 x 41" poplar (upper cleat)
E	1	1 3/16 x 2 1/2 x 44 1/2" poplar (middle cleat)
F	1	1 3/16 x 2 1/2 x 41" poplar (lower cleat)
G	2	1 3/16 x 5 x 22" poplar (armrest)
H	2	1 3/16 x 4 x 6 1/2" poplar (arm support)
I	2	1 3/16 x 10 x 35" poplar (rear leg)
J	2	1 3/16 x 6 x 22" poplar (front leg)
K	1	1 3/16 x 2 3/4 x 41" poplar (rear stretcher)
L	1	1 1/16 x 3 x 44 1/4" poplar (apron)
M	1	1 1/16 x 3 x 42 3/8" poplar (front stretcher)
N	2	1 3/16 x 4 x 8" poplar (back support block)
O	1	1 1/16 x 3 1/4 x 44 1/4" poplar (seat)
P	2	1 1/16 x 3 1/2 x 44 1/4" poplar (seat)
Q	1	1 1/16 x 7 x 44 1/4" poplar (seat)
R	*	6d hot-dipped galvanized finishing nails
S	*	4d hot-dipped galvanized nails
T	8	2 1/2" No. 10 fh screws

*As reqd.

furniture is sure to evoke oohs and ahs when your neighbors spot it on your patio or deck.

Getting ready

For openers, carefully study the drawings and the materials lists. Do as professional cabinetmakers do. Make certain you understand exactly how the three pieces go together before ever putting a saw blade to a piece of wood.

You can use practically any kind of lumber to construct this furniture. If you apply wood preservative—an undercoat and two top coats of high-quality exterior paint—any species should weather quite well.

We chose a hardwood, poplar, for its added strength.

The chair and table are made from 4/4 stock (1 3/16 in. thick), while the settee uses both 4/4 and 5/4 stock (1 1/16 in. thick). The poplar is easy to work, highly warp-resistant and reasonably inexpensive. In the New York City area, it's only slightly more expensive than common pine and about half as expensive as clear pine.

Most hardwoods are sold surfaced on two sides only (S2S), not on the edges. So your first step is to cut the boards to approximate length, then dress one edge on the jointer. By keeping this straight edge against your table saw rip fence when ripping to the required width, you'll automatically dress the second edge.

Using the drawing grids for reference, make paper patterns for all contoured parts and trace them onto the appropriate-sized stock. The rear legs should be positioned so that the long part of the leg is in line with the grain direction of the board. When assembled, this will make the leg as strong as possible.

Next, cut the contours with either a

MATERIALS LIST—TABLE

Key	No.	Size and description (use)
A	1	1 3/16 x 9 1/4 x 36 1/4" poplar (top)
B	2	1 3/16 x 5 7/8 x 32" poplar (top)
C	2	1 3/16 x 3 x 26" poplar (apron)
D	2	1 3/16 x 3 x 17 3/4" poplar (apron)
E	4	1 3/16 x 3 x 22" poplar (leg)
F	4	1 3/16 x 2 1/4 x 22" poplar (leg)
G	*	4d hot-dipped galvanized finishing nails

*As reqd.

MATERIALS LIST—CHAIR

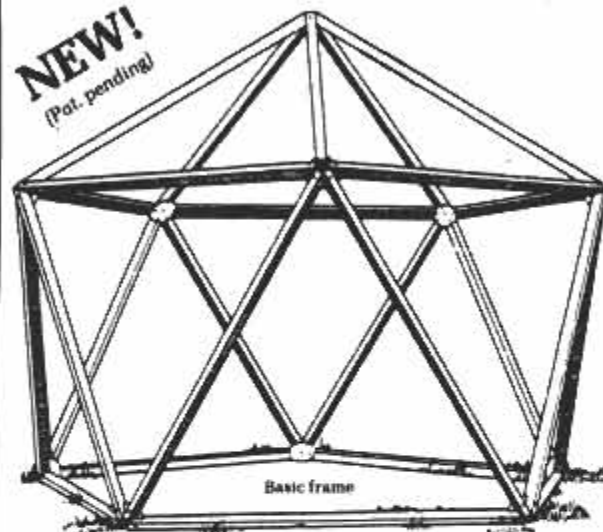
Key	No.	Size and description (use)
A	1	1 3/16 x 9 1/4 x 36" poplar (back)
B	2	1 3/16 x 5 x 33 1/2" poplar (back)
C	1	1 3/16 x 2 1/2 x 20 1/4" poplar (upper cleat)
D	1	1 3/16 x 2 1/2 x 23 3/4" poplar (middle cleat)
E	1	1 3/16 x 2 1/2 x 20 1/4" poplar (lower cleat)
F	2	1 3/16 x 5 x 22" poplar (armrest)
G	2	1 3/16 x 4 x 6 1/2" poplar (arm support)
H	2	1 3/16 x 10 x 35" poplar (rear leg)
I	2	1 3/16 x 6 x 22" poplar (front leg)
J	1	1 3/16 x 2 3/4 x 20 1/4" poplar (rear stretcher)
K	1	1 3/16 x 3 x 23 1/2" poplar (apron)
L	1	1 3/16 x 3 x 21 7/8" poplar (front stretcher)
M	1	1 3/16 x 3 1/4 x 23 1/2" poplar (seat)
N	2	1 3/16 x 3 1/2 x 23 1/2" poplar (seat)
O	1	1 3/16 x 7 x 23 1/2" poplar (seat)
P	*	4d hot-dipped galvanized nails
Q	*	2" No. 10 fh screws
R	*	6d hot-dipped galvanized finishing nails
S	8	2 1/2" No. 10 fh screws

*As reqd.

band saw or a sabre saw. Then sand out the saw marks from the edge with a drum sander mounted in your drill press or portable drill. Or, use a spoke shave. With a little practice, this easy-to-use hand tool will do a better and quicker job. Just be sure to use it as shown in the photo. Never scrape against the grain. Always stroke with the grain.

Next, round over all edges except those indicated with an asterisk (*) on the drawing, using a 3/8-in. rounding-over bit in a router. This will give all the pieces a soft, comfortable look, while also reducing the possibility of wood splinters. All edges that have not been removed by the router

(Please turn to page 121)

NEW!
(Pat. pending)

Greenhouse



Storage Building



Carport



Gazebo



Woodshed



1300 Bushel Corncrib

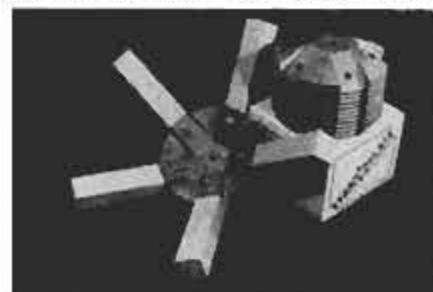
Build the frame in under two hours! Simply drill 50 holes and bolt your 2x4's to STAR*PLATES. Then, enclose it to make any small building you want.

What small building would improve your property?

Build it better, easier, and cheaper, with STAR*PLATE Frame Connectors!

What are STAR*PLATES?

They're heavy gauge steel plates with channels to hold 2 x 2's, 2 x 3's or 2 x 4's, so they can be bolted together to make a basic geometric framework. It takes one set of eleven STAR*PLATES for each framework.



What size framework do they make?

Any size you want. STAR*PLATES hold 25 equal-length struts together. If the struts are short, say 2-3 feet, you've built something small like a dog house or small playhouse. If they're 9 feet long, you've built yourself a greenhouse or back-40 hide-away. The framework is made of 15 triangles, all exactly the same.

Is it hard to build?

Not at all. To build the frame, you only have to drill 50 holes, and bolt the struts to the STAR*PLATES with 1/4 in. carriage bolts. The only tools required are a saw, a drill, and a wrench. It's much simpler than conventional framing. For a roof and walls, or even a floor, our plans (included with each set) give you cutting patterns and tips to make it easy.

How can I finish it off?

Any way you want to. Some STAR*PLATE buildings are elaborate, with shingled roofs, clapboard sides, and fancy doors and windows. Others are merely covered with canvas and used as beach cabanas, or with plastic to make greenhouses. One cus-

tomer told us he was going to thatch his with palm leaves! You can make it as plain or as fancy as you want to.

Could I build a full-size geodesic dome house?

No. STAR*PLATES are designed for smaller structures. We recommend a maximum strut length of 9 feet. That makes a structure 13 feet high and about 14 feet in diameter, with a floor area of 140 square feet.

How can I get a set of STAR*PLATES?

Order them from The Countryside General Store, Waterloo, Wisconsin 53594, for only \$39.95, postpaid. Phone orders are welcome (414/478-2139) and you can use your Visa or MasterCard.

Order today!

Only \$39.95

Postpaid

Complete instructions,
and building advice, included.

Five good reasons why STAR*PLATES will make you proud of your building project:

- 1. Strength** — you'll be amazed at the strength of geodesic dome construction! Much stronger than conventional framing!
- 2. Beauty** — STAR*PLATE mini-domes are unusual and attractive additions to any property.
- 3. Ease of construction** — no special skills or experience necessary.
- 4. Economy** — A dome is the most efficient way to enclose a space; save up to 15% on materials alone.
- 5. Flexibility** — Mini-domes have dozens of uses. Whatever small building you need, make it a STAR*PLATE mini-dome!

Send for the FREE Countryside General Store catalog, describing 100's of unusual and innovative aids to modern "homestead" living!

Money back guarantee!

Please send me _____ sets of STAR*PLATES complete with directions and building tips, @ \$39.95 each, postpaid. (Wis. residents add 4% sales tax.)

Total amount enclosed: _____

Name _____

Address _____

City, state, zip _____

Charge my Visa MasterCard

Expires _____

Please send me more information on STAR*PLATES.

Please send me the latest Countryside General Store Homestead catalog.

Mail today to:

Countryside General Store, Dept. PM, 103 N. Monroe St., Waterloo, WI 53594

1982 OUTDOOR LIVING GUIDE

(Continued from page 119)

should be eased with sandpaper before the parts are assembled.

Use highly water-resistant plastic resin glue for all assemblies. It is far less expensive than waterproof resorcinol glue and will serve quite well for this application. Also, hot-dipped galvanized nails are used throughout. Their dimensions are noted in the materials lists.

Because hardwood is being used, the nailing will be more difficult—a difficulty compounded by using the generally rough and nubby hot-dipped galvanized nails. For this reason, you may want to drill pilot holes for the nails. This will make driving them easier and will reduce the chance of splitting the wood.

In any case, do not nail closer than 1/4 in. to the edge of the board and 3/8 in. to the end of a board without using a pilot hole.

Assembling the furniture

Assemble the chair and settee in the following order: Glue and nail the back support blocks to the rear legs, then attach the rear legs to the front legs. Join the armrest support to the front legs, then assemble the backs as separate units. Use 1/2-in.-thick spacers to keep the back boards aligned properly.

Apply glue, then clamp and nail the cleats to the back boards, as shown in the photo.

Keep in mind that the middle cleat is 3 3/4 in. longer than the backboard assembly is wide to accommodate the armrests. Just center it on the back. When the armrests are finally attached, the cleat ends can be cut to exactly the size and shape needed for a professional-looking fit.

Next, support the leg assembly in the upright position as shown in photo No. 6, and slide the back assembly into the notched supports. Then attach the aprons, stretchers and armrests and you are done.

Assemble the table by first joining the aprons, then nailing the top boards in place. Nail the leg parts together. Then glue and nail the completed legs to the aprons from the inside.

To complete the job, sand all surfaces thoroughly and apply a high-quality wood preservative following the manufacturer's directions on the can. Then give all the pieces three coats of paint. **PM**

PLANS AVAILABLE

If you prefer to build this furniture from larger drawings, you can order a set of plans with instructions printed on 14x22-in. sheets. Send \$5.95 to Adirondack Furniture, Popular Mechanics, Box 1014, Radio City Station, New York, N.Y. 10101.



New Electronic Bug Killer Clears up to a Full Acre of Insect Pests

Insect-Aside™ is a clean, silent version of the government-developed pest killer that can't harm pets, people or the ecology. Try it free for 15 days!

Here they come—the bugs of summer. The buzzing, biting, flying insect pests that drive you off your patio, spoil your outdoor barbecues . . . pool parties, cool-of-the-evening hammock snoozes. But now you can enjoy bug-free comfort, thanks to new Insect-Aside™.

DEVELOPED BY SCIENTISTS TO CLEAR MALARIAL SWAMPS

The heart of the Insect-Aside™ is a special type fluorescent lamp originally developed to clear swamps and protect cotton crops. Mosquitoes, gnats, moths, wasps, midges—almost 300 kinds of light-sensitive insects—are irresistibly attracted to it. And instantly, silently "zapped" by an electronic field.

NO ANNOYING "POP". NO DANGER TO PEOPLE. AND NO HARM TO THE ECOLOGY.

Unlike competitive devices costing up to \$150 more, Insect-Aside™ doesn't make the loud "pop" many people find so annoying. Our state-of-the-art version uses a special low-voltage electronic grid that kills bugs instantly. They drop into a receptacle you empty like a car ashtray. (It makes excellent food for birds or fertilizer for your plants.)

Since there are no poisonous liquids or sprays—no chemicals of any kind—the ecology isn't harmed in the slightest. Humans, pets, birds, even small infants, can't be hurt in any way.

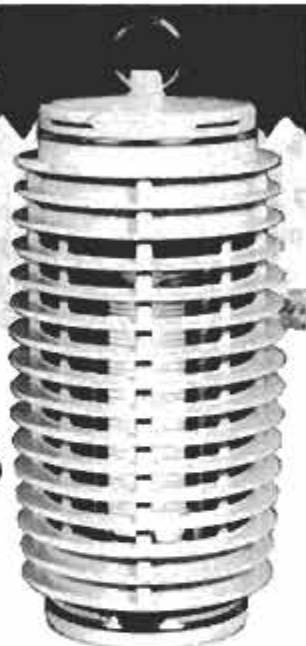
It's so safe, many people use Insect-Aside™ as a nursery night light in summer to protect babies from mosquitoes. The only danger is to the buzzing, biting, irritating flying insect pests who flock toward its cool blue light and die there.

As a matter of fact, Insect-Aside™ won't even bother the useful insects—ladybugs, butterflies, bees—that you want around to help keep your garden and plants healthy.

U.L. LISTED FOR YOUR PROTECTION AND MADE OF SHOCKPROOF, RUSTPROOF MATERIALS

The simple, attractive lantern design stands or hangs anywhere you want protection, plugging into any AC outlet. The case is virtually indestructible plastic—the same used for phones and football helmets.

There are no moving parts. And unlike some imported models, the lamp for this American-made unit is easily replaceable. It's



Attractive, lantern-style Insect-Aside™, 11" high and weighing 3 lbs., rids your yard or patio of mosquitoes and other harmful bugs without sprays, fogs or poisonous chemicals. U.L. listed.

rustproof, shockproof, and UL listed for use both outdoors and indoors.

TRY IT FOR 15 DAYS AT ABSOLUTELY NO RISK

Try Insect-Aside™ for 15 days. If it isn't everything we say, return it for a full refund. You are protected by a 1-year limited warranty of the unit (including lamp) as well as Shelburne's 26-year reputation for satisfied customers.

YOU CAN'T BUY BETTER PROTECTION FOR TWO OR THREE TIMES THE PRICE.

Insect-Aside™ costs just \$49.95 (plus \$3.95 shipping and handling.) It's special type fluorescent lamp uses about 7¢ worth of electricity a month, and lasts 6 to 7 years in normal service. Yet it gives the same type of protection as units costing up to \$200—without their "snap, crackle, and pop."

ATTENTION CAMPERS AND BOATERS

Insect-Aside™ is available in a 12-volt model that plugs into any car, RV, or boat cigarette lighter. The Camper Model lures and kills insects from up to 1/2 acre for \$54.95 (plus \$3.95 shipping and handling). If you'd like to plug your Camper Model in AC current too, order it with the optional AC converter for \$66.95 plus \$4.50.

CREDIT CARD HOLDERS

CALL TOLL-FREE:

24 hours a Day - 7 Days a Week

800-638-6170

OR

800-228-2606

Maryland Residents Call 363-4304

To order by mail, send your check to: The Shelburne Company, 110 Painters Mill Road, Owings Mills, MD 21117. Checks should be made out to the Shelburne Company. (Maryland residents should add 5% tax).

The Shelburne Company

110 Painters Mill Road Dept. K82
Owings Mills, Md 21117 (301) 363-4304

© The Shelburne Company 1982

**DUTCH BOY KNOWS
THIS PAINT IS GOOD.**

THEY MAKE IT.



Available at over 1,900 K mart stores across the U.S.A.

Performer quality by Dutch Boy. The price by K mart.

Kmart
The Saving Place®

Build This Garden Cart For The Big Jobs

This cart holds over eight bushels and stores tools and supplies.



The lawn and garden cart carries long-handled tools in racks and small tools and supplies in boxes over the wheels (above). It can hold more than eight bushels of weeds and clippings (left). With the front gate lifted slightly, the cart can dump a 2-ft.-wide course of sand or gravel (below).



The large garden cart is gaining steadily in popularity, because it hauls so much, so easily. These carts are expensive, but you needn't let the price keep you from owning one. For about half the price of a commercial cart, you can build your own cart with features that make it comparable to anything on the market.

Boxes above the wheels of the garden cart shown here hold small tools and seed packets. Tool racks tote up to 10 lawn and garden tools. Removable gates at both ends quickly give you a 5½-ft.-long bed for oversize loads. And there's no need to bring sawhorses along for outside jobs: Just clamp work to the tool racks.

The design requires two 26-in.-diameter bicycle wheels with front hubs. You can adapt a rear wheel by removing the drive and brake mechanisms and making one of the boxes 1 in. wider. Old bikes are readily available at garage sales or bike shops. New bicycle wheels cost from \$25 to \$40 each.

Begin by shaping the cart handles.

Reduce the ends and round over the edges to make a comfortable grip. Screw-fasten the bottom to the handles with ten 1¼-in. No. 10 flathead screws. The handles should extend 1½ in. beyond the bottom's front edge. Bore ½-in.-diameter pilot screw holes.

Next, attach the sides to the handles with six screws in each side. Notch the bottom corners of the end gates. Each gate is held in place by four lengths of angle iron (M). The upper two are screwed to the gate; the lower two are screwed to the sides so gate can slide up. Round over the gate edges slightly to fit the inside corner of the angle iron.

Attach the wheel angle irons and locate the mounting position by tipping the cart on end. A ¾-in.-thick scrap of wood under the gate will keep the cart steady. A ¼-in. piece under the wheel will give the right clearance. Be sure the 1½-in. No. 12 roundhead screws that secure the angle irons (N) are centered on the handle, rather than on the plywood side. Bore ¾-in.-diameter pilot holes.

With the cart on a hard, level surface, clamp the legs to the handles so that the cart is level. Mark and trim the legs to length. Attach them to the handles about ½ in. from the rear gate with three 1¼-in. No. 10 flathead screws.

Glue and nail the storage boxes together as shown in the drawing. Screw-fasten the cleats to the box bottoms and attach them to the sides of the cart. Align all screw holes carefully and bore pilot holes when screwing into plywood edges.

Bore a ½-in.-diameter hole in the box bottom directly above the axle for the lag-bolt that holds the strut (O). Flatten the bottom 2 in. of the strut. Align the wheels and mark the center of the axle hole on each strut. Punch and bore the holes. Adjust the wheel bearings and attach the

(Please turn to page 124)

1982 OUTDOOR LIVING GUIDE

(Continued from page 123)

strut. It helps to hold it with a pipe wrench or pliers while tightening the lagbolt. Screw the tool racks to the sides, then screw the bottom pieces to the handles.

Finally, paint the cart with a heavy-duty enamel. And it's done.—John M. Nolte

MATERIALS LIST—GARDEN CART

Key	No.	Size and description (use)
A	2	3/4 x 3 1/2 x 72" oak, preferable (handles)
B	1	5/8 x 23 x 48" plywood (bottom)
C	2	5/8 x 18 x 48" plywood (sides)
D	2	5/8 x 18 x 24 1/4" plywood (end gates)
E	2	3/4 x 3 1/2 x 16 1/2" oak, approx. (legs)
F	2	5/8 x 5 1/2 x 23" plywood (box sides)
G	2	5/8 x 4 3/16 x 23" plywood (box bottoms)
H1	2	5/8 x 4 3/16 x 4 7/16" plywood (box ends)
H2	2	5/8 x 4 3/16 x 4 7/16" plywood (box ends)
I	2	3/4 x 3/4 x 23" oak or pine (cleats)
J	4	3/4 x 3 x 23" oak or pine (tool racks)
K	2	3/4 x 4 3/8 x 22" oak or pine (rack bottom)
L	2	26"-dia. bicycle wheels with axle nuts, washers, and lock washers
M	8	1/8 x 1 1/4 x 1 1/4 x 3" angle iron (gate brackets)
N	2	1/8 x 1 1/4 x 1 1/4 x 6" angle iron (wheel brackets)
O	2	1/2"-i.d. x 14 1/2" galvanized water pipe (wheel struts)



To mount wheels, stand cart on its front end. Place a 1/4-in.-thick wood scrap under front gate and a 1/4-in. scrap under wheel. With angle iron attached to wheel, locate screw holes in center of oak handle.

P	*	1 1/4" No. 10 fh screws
Q	16	5/8" No. 8 rh screws (to fasten M)
R	4	1 1/2" No. 12 rh screws (to fasten N)
S	*	4d finishing nails
T	2	3/16 x 2 1/2" lagbolts with 1/2" anchors (to fasten O)
U	4	3/16" washers

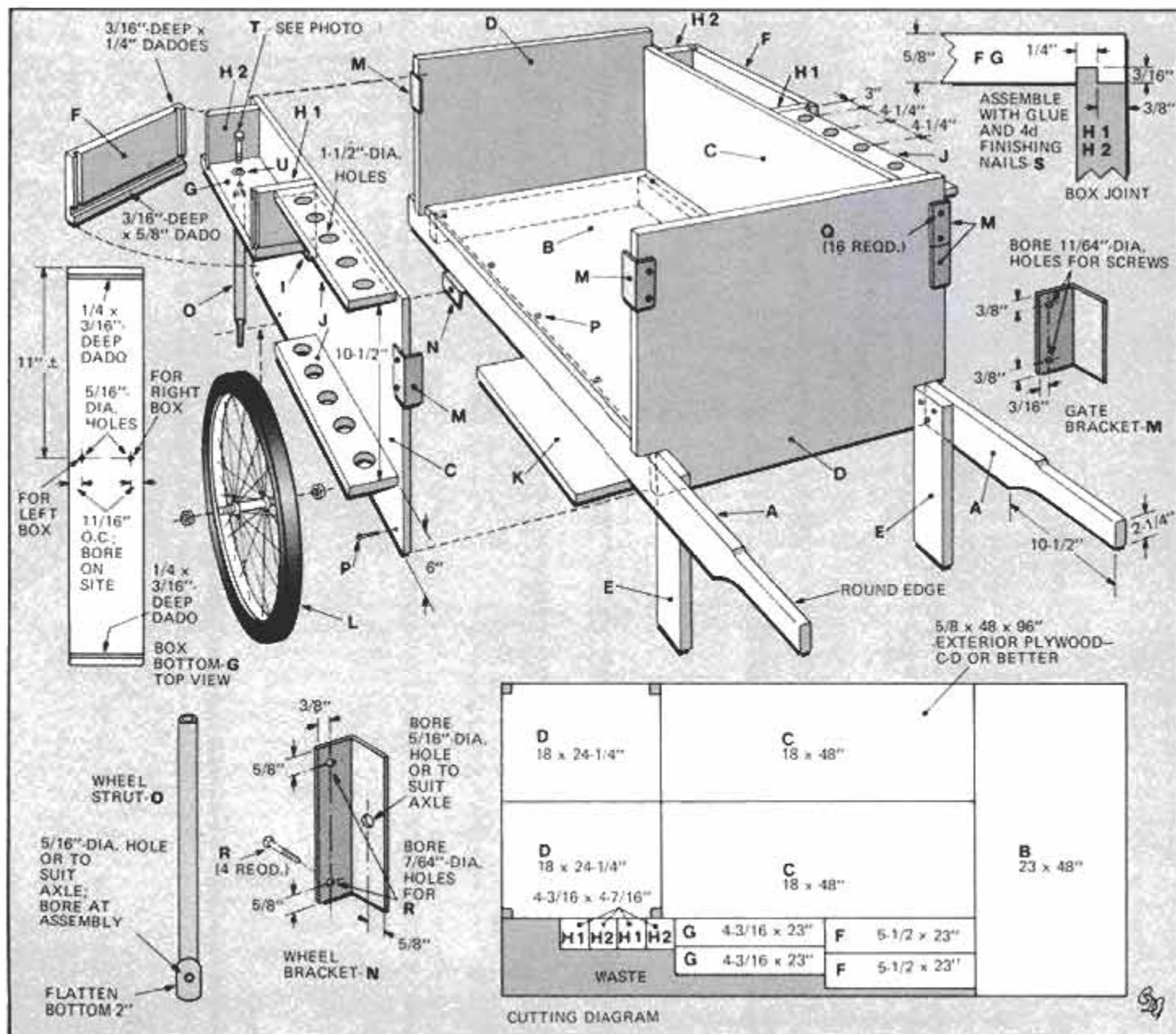
Misc.: Waterproof glue, primer and paint.
*As required.



On a hard, level surface, clamp the legs of the cart to the handles so the cart is level. Double-check with a spirit level. Mark the legs and trim them to length.



Cutaway through a storage-box side and metal strut (O) shows how they're attached. A lagbolt with two washers passes through the box bottom into anchor in the strut.



LIQUIDATION 5-gal. WET or DRY SHOP-VAC

Factory refurbished
just like brand new!
Get a great
bargain on
a terrific
Shop-Vac!



List Price
When New
\$79.95
OUT THEY GO AT
\$30

Offer void outside
50 United States

90 DAY WARRANTY FROM SHOP-VAC!

Got a messy cleanup job? Reach for Shop-Vac. It's perfect for wet or dry pickup, indoors or out. It gulches up dirty, grimy liquids and gobbles up chunky, dry debris that would choke your ordinary household vac! Shop-Vac has plenty of power to pickup nails, broken glass, wet leaves, grass, cinders, etc.

Heavy duty, 5-gal. steel container provides plenty of storage between dumpings. Motor is ABOVE storage tank. Water, dirt, dust, and debris never touch the motor! For wet pickup, a float-type valve automatically shuts off suction when liquid reaches capacity level. There's never an overflow.

Moves around easily on 4 swivel casters. Two wand sections attach to form a 3-ft. shaft that attaches to 6-ft. long, 1 1/2" dia. flexible hose. Swivel action, 10" wide nozzle.

These units have been factory reconditioned by Shop-Vac technicians to look like new, perform like new. Get a great vac at a big savings! But hurry! Our supply is definitely limited. Order today.

Credit card customers can order by phone.

Toll-Free: 1-800-328-0609

If busy signal, or after business hours, or in Minnesota, call **1-800-228-2606** 24 hours a day, 7 days a week.

C.O.M.B. Co. / Liquidators Dept. 8-729-3270

6850 Wayzata Blvd. / Golden Valley, Minn. 55426

Send _____ Shop-Vac(s) at \$30 each plus \$9 each for shipping and handling. (Allow 3 to 4 weeks for delivery. Add 2 to 3 weeks extra if paid by check. Sorry, no C.O.D. orders.)

Minn. residents add 5% state sales tax.

My check or money order is enclosed.

Charge my: Mastercard VISA

Am. Exp. Diners Club

Acct. No. _____ Exp. _____

PLEASE PRINT CLEARLY

Name _____

Address _____

City _____

State _____ Zip _____

Phone _____

C.O.M.B. Co.

ONE OF THE NATION'S LARGEST
AUTHORIZED MAIL ORDER LIQUIDATORS
OF CONSUMER PRODUCTS

6850 WAYZATA BOULEVARD
GOLDEN VALLEY, MN 55426

MUST LIQUIDATE AT BELOW DEALER COST! 4000 Watt, Gas Operated, Emergency Power Generator

FACTORY NEW! FACTORY PERFECT!

DON'T let a storm rob YOUR home of vital electric power! With this 4000 watt generator, you ALWAYS have a reliable standby source of 120V and 240V plug-in power!

- 8 hp. Briggs & Stratton 4-cycle gasoline engine!
- U.S. made, U.S. quality!
- Fairbanks-Ward model!
- Mfgs. 1 year warranty!



FOR HOME! Keep sump pump, well pump, appliances operating in case of any power outage.



FOR WINTER STORMS! No freezeups or burst water pipes when you have this generator on hand.



IN THE FIELD! A reliable source of portable electric power anywhere.



FOR CABIN or CAMP! In the wilderness, you can enjoy comforts of electricity with this generator.



Credit card members can order by phone:



Toll-Free: 1-800-328-0609

If busy signal, or after business hours, or in Minnesota, call **1-800-228-2606** 24 hours a day, 7 days a week.

C.O.M.B. Co.

ONE OF THE NATION'S LARGEST AUTHORIZED MAIL
ORDER LIQUIDATORS OF CONSUMER PRODUCTS
6850 WAYZATA BLVD. MINNEAPOLIS, MN 55426

PUBLIC NOTICE!

Bankruptcy and Financially Distressed Merchandise!

We are authorized liquidators of inventories that must be quickly sold at sacrifice prices due to a variety of reasons, such as:

Overproduction. Last year's models. Order cancellations. Bankruptcy. Out of season. Plant closings. Economic recession. Financial difficulties. Excessive competition.

If you know of a company with surplus inventories that must be liquidated for immediate cash, call us Toll-Free: 1-800-328-0609. Only products in perfect operating condition will be considered.



For home,
farm, cabin,
contractors!

Four
outlets. 16.5
amps on each.
120V & 240V
service.

Wheel Kit
only \$29⁰⁰

For easy-rolling
portability. Big
10" dia. wheels.
Sturdy, rugged!

A storm could knock out your electrical power for hours or for days! Food could spoil in your refrigerator. A motor in your furnace could stop running in winter and leave your family shivering in the cold. A well could stop pumping water needed for cooking or bathroom facilities. The losses could cost you up to hundreds of dollars... or maybe even much more! And think of all the discomfort and inconvenience!

But, you never have to worry when you have this excellent quality portable generator. It's U.S. made! And it provides you with 4 convenient plug-in outlets for 120V and 240V service... 16.5 amps at each outlet. Just pour in the gasoline. Start the engine. And there you are.

Use the Power Generator to run your electric lights, power tools, sump pump, well pump, etc. Plug in small kitchen appliances, a refrigerator, a freezer, etc. Of course, you can't run everything at one time. (Remember the 4000 watt maximum capacity.) But you CAN run enough things to keep vital functions operating as you need them.

- 4-cycle, single cylinder, Briggs & Stratton engine.
- Produces 8 hp. at 3600 rpm.
- Recoil start. Manual choke.
- 4-quart capacity gasoline tank.
- Chrome plated piston and aluminum alloy cylinder help dissipate heat for cooler running.
- Sturdy, durable construction.
- Size: 17 1/2" W x 28" L x 17" H.
- Shipping weight, approx. 150 lbs.

Compare at over
\$1,000.00

OUT THEY GO AT ONLY:

\$488

Price is subject to change after 60 days.
Offer void outside the 50 United States.

Now available at a
huge savings during
this liquidation sale!

C.O.M.B. Co. / Liquidators Dept. 8-722-1180
6850 Wayzata Boulevard / Minneapolis, Minn. 55426

Send _____ 4000 watt Generator(s) at \$488.00 each. I will pay shipping charge to driver upon delivery. (Allow 4-5 weeks delivery. Add 2-3 weeks extra if paid by check. Sorry, no C.O.D.)

Send _____ No. 1185 Wheel Kit(s) at \$29.00 each plus \$10.75 each for shipping and handling.

My check or money order is enclosed. (Minnesota residents add 5% state sales tax.)

Charge my: Mastercard VISA Am. Exp. Diners Club

Acct. No. _____ Exp. _____

PLEASE PRINT CLEARLY

Name _____

Address _____

City _____

State _____ Zip _____

Phone _____

Rural Route Customer: If truck carriers do not normally deliver to your home, include a note with this order stating town address of nearest store, friend or truck terminal to ship to.

Energy-Wise Guide To Spring Pool Maintenance

By taking these steps when you open your pool, you can greatly reduce maintenance and operating costs:

1 Opening the pool

If your pool has been empty all winter, cleaning it is a three-step job: 1. Sweep down the coping, walls and bottom and remove debris. 2. Close the drain plugs and flush the piping; then drain water to the sewer. 3. Remove hard-water and



1 If the pool has wintered full, remove winter cover. The Lid, shown, by Helder Industries, 1 Cory Rd., Morristown, N.J. 07960, is anchored by tubes of water.

rust stains with a commercial pool cleaner. Scrub organic stains with a rust stone or a stainless-steel brush. Remove grease from tile with mild detergent.

If the pool has wintered full, remove the winter pool cover, clean and store it. Close the drain valves on the filter and heater, flush, then drain the pipes.

2 Preparing the pump and filter

To ready the pump and filter, check the filter pressure gauge (or air valve) to be



2 Preparing the pump includes emptying the basket of debris and hosing it clean.

sure it is closed. Also make certain the pump is primed with water. Backwash the filter, then disassemble it and wash away caked diatomaceous earth.

For increased energy savings, set the pump timer to operate the pump a maximum of eight hours a day during heavy pool use and four hours a day during light use. Raise the filtration cycle time only if needed to control debris or algae. Also, run the pump during the less expensive energy-consumption hours.

3 Treating the pool water

The key to clear pool water is maintaining a balance between acidity and alkalinity, referred to as pH balance. Balanced



3 Kits, such as this Aqua Chem, test water balance and help you maintain clear water.

water has a pH range of 7.2 to 7.8. Kits for testing the water's pH level are sold at pool-equipment suppliers. You should also test and adjust the water's total alkalinity, chlorine level and stability.

4 Heating the pool

To prepare your heater, clean all open areas thoroughly. Set the thermostat; to assure that it remains at an energy-saving

(Please turn to page 126)



4 Before lighting the pilot light on the heater, remove debris at top and bottom.



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 TECHNICAL COLLEGE

1737 So. Michigan Avenue, Chicago, Ill. 60616
THE SCHOOL FOR BUILDERS

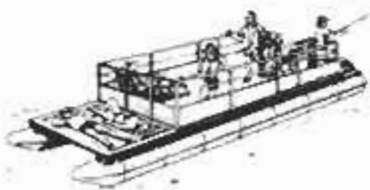
CHICAGO TECHNICAL COLLEGE

Dept. PM-62 1737 So. Michigan Ave.,
Chicago, Ill. 60616

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 _____

HAVE FAMILY FUN AFLOAT WITH A PONTOON BOAT



EASY TO ASSEMBLE KITS THAT SAVE YOU MONEY

- Economical, safe and practically indestructible. Ideal for family parties, fishing or swimming.
- 3 models to choose from. 17', 20' and 24' lengths.
- Polyethylene pontoon sections are urethane foam filled. Retains buoyancy even if punctured. Highly resistant to abrasion and impact.
- Pontoons are maintenance free, colorfast—never needs painting.
- Assembly requires no special tools or equipment. Takes only 12 to 16 hours to complete.
- All kit components are of galvanized or marine grade aluminum.
- Kit contains pontoons, frame, motor mount, helm station, steering, railing and hardware.
- Send \$2.00 for complete information.

CALL TOLL FREE
1-800-351-1363
In Texas call: 915-643-2517

ROTOCAST FLOTATION PRODUCTS
P.O. BOX 1059, DEPT. PM
BROWNWOOD, TEXAS 76801



What a difference a Bilco Door makes!

Replacing that troublesome old wooden door with a modern BILCO Basement Door will add new beauty and convenience to your home. You'll like its neat, trim appearance and rugged construction. Long lasting, watertight, safe and secure, it pays for itself in savings on repair and replacement costs. ■ Ease of operation is a special BILCO feature. Torsion rods provide effortless opening and closing of the heavy gauge steel doors. ■ A BILCO Basement Door is also the ideal addition to your present home or the home you're planning. It saves tracking through first floor rooms, makes the basement useful, convenient, safe. Just like adding a whole new floor of valuable living space.

Bilco

AMERICA'S FINEST BASEMENT DOOR

The BILCO Company Dept. PM-62
New Haven, Connecticut 06505

Please send me:

- Information for replacing a wooden door.
- "How-To" booklet for adding outside entrance to present home.
- Data for new home to be built.

Name _____

Address _____

City _____

State _____ Zip _____



STRIPPED EASE.

Now you can get a dollar rebate on the fast and easy way to strip paint.

The 3M Paint Stripper Kit—nothin' takes it off quite like it.

The adhesive-backed sandpaper sticks firmly in place, so it lasts a long time without tearing. And the padded wheel keeps you from gouging or damaging the wood. Look for it in the power tool and accessories department.

Now there's just one rule for do-it-yourself stripping jobs... Don't do it yourself without 3M.

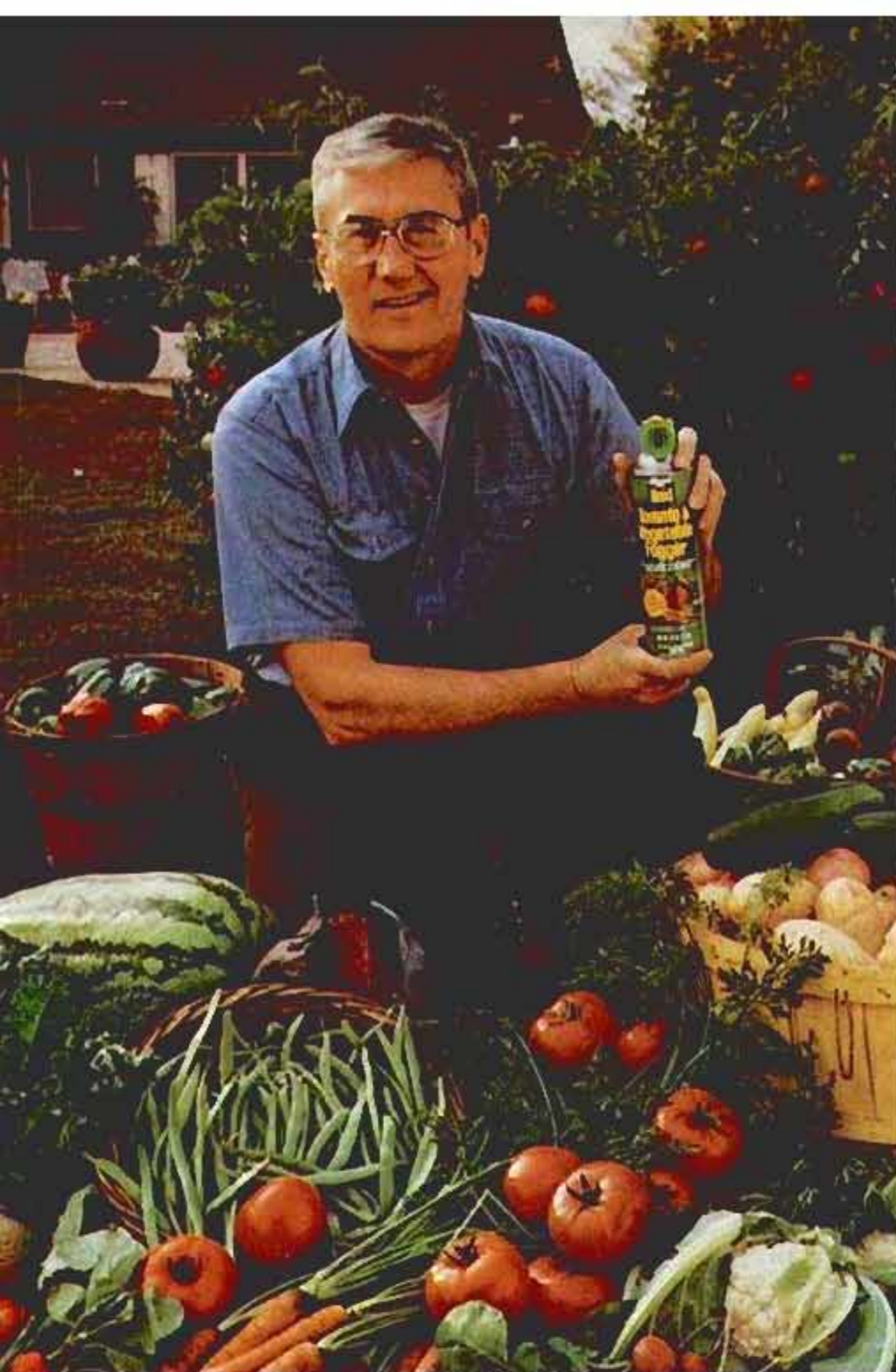
The 3M Paint Stripper Kit



3M hears you...

3M

(Continued from page 126)



"I've never endorsed a garden insecticide before, but this new one's a natural."

Bob Thomson, Gardening Expert

"I've read a lot of garden insecticide labels. And most warn you 'not to pick for at least 24 hours'. That's because they contain synthetic or systemic bug killers. But the bug killer in new Raid Tomato & Vegetable Fogger is all-natural pyrethrum, derived from a type of chrysanthemum flower. So you can use it right up to harvest.

"Raid's unique fogging action covers leaves more quickly than liquids or dusts. And because the insecticide is all-natural, you can pick and enjoy your vegetables anytime.

"Look for it wherever Raid is sold."

Kills garden bugs dead. Naturally.



level (78° F. or below) use a setscrew.

During the swimming season, operate the heater only when your pool is in use. It costs less to heat the water over a weekend than it does to maintain the temperature all week.

5 Using a solar pool cover

For added energy savings, cover your pool with a solar pool cover when no one is swimming. On the average, these covers raise the water temperature during the swimming season by 10° F. or more. They also impede chemical evaporation. Unroll the cover from storage and remove grime and algae with a soft brush and water.



5 Use a soft brush and water to remove grime and algae on the solar pool cover.

If your pool isn't used for long periods, remove and store the solar cover. This retards cover deterioration caused by exposure to ultraviolet rays and pool chemicals. Store the cover away from sunlight and in temperatures below 120° F. Note that a solar cover left on the lawn can kill the grass in an hour.

6 Solar heating systems

A solar heating system extends the swimming season and reduces energy use significantly. Cold pool water pours



6 If you heat pool water with solar panels, hose off accumulated leaves and grime.

through the sun-heated panels, where it is warmed and returned to the pool.

When you're opening your pool, hose accumulated debris off the panels. The panels shown (below) are made by Solar Industries, Manasquan, N.J. 08736. **PM**

The pool-opening procedures above were outlined by Jim Jones, a pool-care specialist. For a free booklet, *Pool Care, A Complete Guide to Pool Maintenance*, write: Jim Jones, Georgia-Pacific Corp., 1001 Dove St., Newport Beach, Calif. 92660.

New Products For Outdoor Living



The Smoker-Grill (cutaway shown on left) is a combination outdoor cooker that lets you wet- or dry-smoke food; roast, bake and steam it; or just grill it by removing the upper smoke barrel, as shown below. It can hold up to 50 pounds of food and comes in charcoal and gas-fueled models that cost between \$70 and \$110. At home centers, it's from Coleman Patio Products, 250 North St. Francis, Wichita, Kan. 67201.



Aladdin's Bug Battler is a new insect killer that operates silently—no popping or zapping. Insects flock to 8-watt black lamp where an electric fan forces them into a water-filled tray below, where they drown. It's \$70 at home centers. From ALH Inc., Box 100255, Nashville, Tenn. 37210.



The Bagger Vac, a new attachment for the Ariens line of garden tractors, can vacuum leaves, grass and other debris from your yard. It includes a 12-bushel, rear-mounted container and an all-steel blower with ABS plastic hose. According to the manufacturer, the unit mounts in less than a half hour. It is driven by the power takeoff at the back of the tractor. The hose hooks over the discharge port on mower deck. The unit is about \$600 at dealers. It's made by Ariens Co., 655 West Ryan St., Brillion, Wis. 54110.



The Solarium is a new glass enclosure designed to be used as a year-round addition to your home. The modular glass sections are made of either clear or tinted insulated safety glass and aluminum frames, colored dark bronze or white. Each module is 30 in. wide, but the lengths differ depending on specific use. Made by Lord and Burnham, Box 255, Dept. 3060, Irvington, N.Y. 10533, the unit shown is about 10 x 25 ft. and costs between \$18,000 and \$19,000 installed. For information, write to the maker.

(Please turn to page 130)



Re-door-it.

Now's a great time to replace your old entry door with a beautiful, secure, energy-efficient Therma-Tru door. It's pre-hung, so you can install it yourself with ordinary tools. Complete step-by-step directions are included.

Or, if you prefer, your Therma-Tru Dealer can recommend someone to help with installation.

Therma-Tru doors feature self-sealing sills and door bottoms that virtually eliminate air and moisture infiltration, arctic magnetic weather stripping that seals like a refrigerator door, and our patented adjustable security strike plate that wraps around the jamb to provide greater resistance to forced entry.

Choose from more than 100 beautiful raised panel or deeply embossed doors, and many leaded, beveled glass designs.



THERMA-TRU

The More Door
Division of LST Corporation

Free Brochure

To receive a free copy of our new replacement door brochure, fill out this coupon and mail it to: Therma-Tru, Division of LST Corp., 4747 Holland Sylvania Road, Sylvania, Ohio 43560



Name _____
Address _____
City _____
State _____ Zip _____

**WATER, FILL,
DRAIN,
TRANSFER,
SPRAY,
WASH.**



**The new Waterbug™
At only 9 lbs., put lightweight, water
pumping power wherever you want it.**



At last, a high-performance, gas-powered pump for homeowners. The reliable, portable Waterbug™ Pump handles a wide range of water-moving chores with ease. Around your home. Around the pool. Dockside. Watering lawns or gardens. Dewatering basements. Washing outdoor surfaces. Emergencies. Whatever the job, Waterbug is a great new idea in pumps.

With a 1350 gallons-per-hour capacity, Waterbug comes complete with couplings, adapters and 12 feet of 1" suction hose with strainer. Discharge is through a standard garden hose.

For the name of your nearest Waterbug dealer, write to Homelite Waterbug, Dept. A82, P.O. Box 7047, Charlotte, N.C. 28217.

HOMELITE Waterbug
MULTI-PURPOSE PUMP

HOMELITE TEXTRON
Homelite Division of Textron Inc.

(Continued from page 129)



Weber's portable griddle for campers and picnickers is a heavy-duty, aluminum-alloy platter designed for use on its Smokey Joe Portable Table Top gas and charcoal grills. To use the 10½ × 13¼-in. unit, place it on the grill and let it heat up. At home centers for about \$20, it's from Weber-Stephen Products Co., 100 North Hickory Ave., Arlington Heights, Ill. 60004.

The Tiller-Aid is a cast-aluminum accessory designed to mount low on the handle of a spade or spading fork and increase the tool's efficiency. The maker claims it reduces the amount of effort required to operate the tool, thus relieving much of the back strain involved in spading work. It holds up to 1½-in.-diameter handles and is \$16.60 post-paid from Gardens for All, Dept. P83B, 180 Flynn Ave., Burlington, Vt. 05401.



The Happy Cooker is a kettle-shaped barbecue grill with a five-way adjustable lid. The best model (shown here) has a 22½-in. diameter and is made of steel with a red porcelain finish. With optional cutting board, it's available for \$90

at home centers. It's made by UNR Home Products, Box 429, Paris, Ill. 61944. **EM**

AIR CONDITIONING, HEATING and REFRIGERATION EXPERTS are in Demand!

You Can Be In Demand Too!

There is a growing demand for trained, top-paid mechanics in the field of air conditioning, refrigeration, heating, and solar energy.

Employment for mechanics and technicians in this field is expected to grow faster than the average of all other occupations in the 1980's, according to the U.S. Department of Labor. And you can be a part of that exciting growth by learning air conditioning, refrigeration, and heating repair and installation today through the Commercial Trades Institute.

More new heating and cooling systems are being installed every day in homes, cars, factories, offices and shopping centers. These systems must first be installed and then maintained and repaired.

With C.T.I. training you can be in demand too — either owning your own business or as a highly paid technician with industrial, maintenance, and construction firms.

Join America's Top Wage Earners!

Because of the increasing demand and the lack of trained people, the earnings of air conditioning and heating specialists are among the top. It is estimated that mechanics in this field are earning more than 50% above the average hourly rate of other production workers. You can join the top wage earners through the C.T.I. home study course.

Best Course Available

The C.T.I. 77 lessons cover every phase of this important field. It is the most comprehensive course available. You learn at your own pace, in the comfort and privacy of your own home. There are no classroom schedules to be met or to hold you back.

C.T.I. Gives You Two Big Pluses

First, you get 20 big job-oriented shop projects and training kits. These are practical projects which give you hands-on training. You do work and projects just as you would do them on the job.

Second, you get everything you need to build a complete working refrigeration system: you assemble the system, you pump it down, charge it, perform experiments, check for leaks, and trouble shoot it! Tools you receive include: volt-amp tester, flaring tools, tubing cutter, torch leak detector, charging lines, gauges, motor test cord, and many more items that

you will use every day on the job. There is no extra charge for this professional equipment. The equipment is yours to keep and use.

You Benefit From C.T.I.'s 40 Years of Training Excellence

Lessons are provided in simple steps with easy to understand examples and clear illustrations.

You learn by the 6-step system. You *read it, write it, repeat it, do it, send in answers and ask questions.* Both your mind and hands quickly learn the skills that put you with the top wage earners.

Mail Coupon Today To Get Free Brochure Which Starts You On Your Way

Get the full story on your unlimited potential for prestige, high earnings, and security. In fact, you can become fully independent for the rest of your life if you decide to start your own business as 25% of the people in the field have done. Remember, today, skilled technicians can and often do out earn the college grad. Put yourself in the picture by sending for your **FREE BROCHURE** today. You'll be on your way to a well-paid, satisfying, life-time career.

If the coupon is missing write:
C.T.I. Air Conditioning, Dept. 110-062
1500 Cardinal Dr., Little Falls, N.J. 07424

No Salesman will call.

SEND TODAY FOR YOUR FREE BROCHURE

Air Conditioning

Other courses available

- | | |
|--|--|
| <input type="checkbox"/> Automation Electronics | <input type="checkbox"/> Conservation |
| <input type="checkbox"/> Color Television Electronics | <input type="checkbox"/> Locksmithing |
| <input type="checkbox"/> Drafting | <input type="checkbox"/> Legal Investigation |
| <input type="checkbox"/> Bookkeeping and
General Accounting | <input type="checkbox"/> Insurance Adjusting |

Commercial Trades Institute

A Correspondence Institution

Dept. 110-062, 1500 Cardinal Drive
Little Falls, N.J. 07424

Name _____

Address _____

City _____ State _____ Zip _____

Phone () _____

Build This Colonial Drop-Leaf Table

This handsome mahogany end table doubles as a serving table when its leaves are raised.

by G.S. Wing

Colonial-style furniture never seems to lose its appeal. For people venturing through flea markets and roadside garage sales or for those frequenting antique shops and new furniture showrooms, the colonial piece is a magnet—and with good reason. Simple design and straightforward function are rarely

combined in a more elegant way.

This reproduction of an 18th-century drop-leaf table is a perfect example. Its solid mahogany construction is eye-catching and versatile. With leaves dropped, it measures less than 12 x 24 in.—just right for an end table. Yet, with leaves raised, the 23-in.-diameter

This reproduction 18th-century drop-leaf table is small enough to fit nearly anywhere.



top is large enough to be a serving table or a casual dining table for two.

Getting started

Before you begin, study the drawings on page 134. Because of its splayed legs, this piece is a bit more complicated than it appears.

Cut all parts to width, using the materials list on page 134 as a guide. Then turn the legs to match the shape shown in the drawing. Finish-sand the legs while they're still in the lathe, using 1-in. strips of abrasive paper in a 100-, 180-, 220-grit progression.

Next, cut the 7½° bevel on the top of each leg and cut 7½° off both ends of the end aprons. Though we have supplied the length of the end stretchers in the materials list, you should take an actual measurement first. Do this by placing the legs and matching aprons on a flat surface and clamping them together lightly. Then take a measurement of the actual size of the end stretcher.

Next, cut the grooves in the aprons for the wood fasteners and bore dowel holes in all parts that will be joined.

I used a boring attachment on a radial-arm saw, but a drill press or a portable electric drill with a doweling jig would work as well. Remember to bore the holes perpendicular to the edge that's being joined. This ensures that mating parts will align. Note that both the stretchers and aprons join the legs ¼ in. in from the sides of the legs.

Assembling the table

Bore the two pivot pin holes in the lateral stretchers 7½° off perpendicular, as shown. Make them ½ in. in diameter—¼ in. bigger than the pins—to allow the support to move freely.

Test-assemble all parts to make sure everything fits, and glue and clamp the entire leg assembly. Check all lateral stretcher and leg joints for square.

Next, glue up stock for the table-top and leaves into one 24 x 24-in. piece. Once dry, rip it into three boards—8, 8½, and 8 in. wide, working from one side to the other. Keep track of which leaf was cut from which side, so when the table is assembled, the grain patterns will match. Now, cut the rule joint in all three parts.

Lay the boards flat on the workbench and place a ¼-in.-thick spacer between each leaf and the top to simulate the joined position of these parts. Without disturbing the arrangement, draw a 23-in.-diameter

(Please turn to page 134)

MUST LIQUIDATE AT BELOW DEALER COST! \$2,500,000 INVENTORY McGraw Edison TOOLS

FACTORY NEW! TOP OF THE LINE!

Sure, you can buy "cheapie" models of "bargain basement" power tools at stores in town. But those tools are made specifically for cut-rate selling... NOT for high quality! But with our huge liquidation of McGraw Edison tools, you get top-of-the-line quality at BELOW dealer cost! These tools are 100% U.S. made. Each one has a One Year Warranty. Although Shopsmith bought out McGraw Edison's power tool division, Shopsmith plans to continue producing these same great tools under their new Benchmark label.

A. — 7 1/4" Circular Saw

Max. 1 1/2 hp., 5500 rpm. Rip/crosscut blade of nickel-chrome. Sawdust ejection chute keeps cutting line visible and sawdust off you! Includes handy rip guide.

Mgr. Suggested Retail **\$69.00**
Liquidation **\$38.00**
Closeout Price

B. — 6" Bench Grinder

Powerful 8 amp. motor for heavy-duty performance. Includes eye shields, end bells, adjustable tool rest, water trough, fine and coarse grit 6" x 3/4" grinding wheels. Has maximum motor speed of 3450 rpm.

Mgr. Suggested Retail **\$95.00**
Liquidation **\$49.00**
Closeout Price

C. — 4" Belt Sander

1.8 hp. with standard 4" x 21 1/4" belt size. 20 sq. in. pad size. Adjustable tracking mechanism. Sands flush to vertical surfaces. Ball bearing construction. Rear handle and hand grip in front for maximum control.

Mgr. Suggested Retail **\$90.00**
Liquidation **\$49.00**
Closeout Price

D. — 1/2" Variable Speed Drill

It's reversible, tool 1/3 hp. with variable speeds from 0-750 rpm. Lock button will maintain constant desired speed. Auxiliary handle included.

Mgr. Suggested Retail **\$55.00**
Liquidation **\$29.00**
Closeout Price

E. — 3/8" Drill Press

1/3 hp., variable speed, 700-1800 rpm. For metal, wood, etc. 3/8" chuck. 12-position handle. Depth adjustment to 2 1/2". 18" column with quick height adjustment. 360° head rotation.

Mgr. Suggested Retail **\$85.00**
Liquidation **\$44.00**
Closeout Price

Also available in heavier duty 1/2" chuck with 1/2 hp. motor for only \$15 more.

F. — 7" Wood Lathe

Max. of 1/3 hp. Large calibrated control switch for variable speed control of 700-1800 rpm. Reinforced aluminum bed. Totally enclosed motor. Adjustable tail stock for drilling, boring.

Mgr. Suggested Retail **\$160.00**
Liquidation **\$88.00**
Closeout Price

PUBLIC NOTICE!

Jefferson City, Mo. — McGraw Edison, manufacturers of products for consumer and industrial use, sells its power tool division to Shopsmith, makers of the famous 5-in-1 home powershop. Shopsmith acquires the remaining inventories of McGraw Edison tools and expects to continue producing the same tools under Shopsmith's own Benchmark label.

Minneapolis, Minn. — Under contract with Shopsmith, the C.O.M.B. Company Liquidators obtains large inventories of McGraw Edison power tools for final liquidation to the public at BELOW DEALER COST!



Drill Press: 3/8" model shown here. Also available in 1/2" 1/2 hp. model.

Buy any THREE tools above and get a BONUS BARGAIN!

McGraw Edison DUAL MOTION SANDER

1/4 hp. model. 3000 orbital or straight motions per minute. Has 7" x 3 1/2" sanding platen; mounted on rubber posts.

Manufacturer's Suggested Retail... **\$40.00**

Yours Now For Only \$5

With purchase of any other three tools described on this page. A sensational BONUS BARGAIN!



**One Year Warranty
On All Tools!**

NOTE: Offer is void outside the 50 United States. Prices subject to change after 60 days.

C.O.M.B. Co. / Authorized Liquidators
6850 Wayzata Boulevard / Minneapolis, Minn. 55426
Dept. B-777

- Please send the following McGraw Edison power tools:
- 7 1/4" Circular Saw \$38.00 Plus \$8 shipping & handling.
 - 6" Bench Grinder \$49.00 Plus \$11 shipping & handling.
 - 4" Belt Sander \$49.00 Plus \$9 shipping & handling.
 - 1/2" Variable Speed Drill \$29.00 Plus \$5 shipping & handling.
 - 3/8" Drill Press \$44.00 Plus \$9 shipping & handling.
 - 1/2" Drill Press \$59.00 Plus \$9 shipping & handling.
 - 7" Wood Lathe \$88.00 Plus \$11 shipping & handling.

Order 3 or more tools above for Bonus Bargain Special!

I have ordered THREE or more of the above tools. Include a Dual Motion Sander for only \$5 plus \$4 for shipping and handling.

My check or money order is enclosed. (Minn. residents add 5% state sales tax.)
Charge to: Mastercard VISA Am. Express Diners Club

Account No. _____ Expires _____

PLEASE PRINT CLEARLY
Name _____
Address _____
City _____
State _____ ZIP _____ Phone _____



Credit card members can order by phone:
Toll-Free: 1-800-328-0609
If busy signal, or after business hours, or if in Minnesota, call **1-800-228-2606**
24 hours a day, 7 days a week.



C.O.M.B. Co.

ONE OF THE NATION'S LARGEST AUTHORIZED MAIL ORDER LIQUIDATORS OF CONSUMER PRODUCTS!
6850 WAYZATA BLVD. / MINNEAPOLIS, MN 55426

COLONIAL DROP-LEAF TABLE

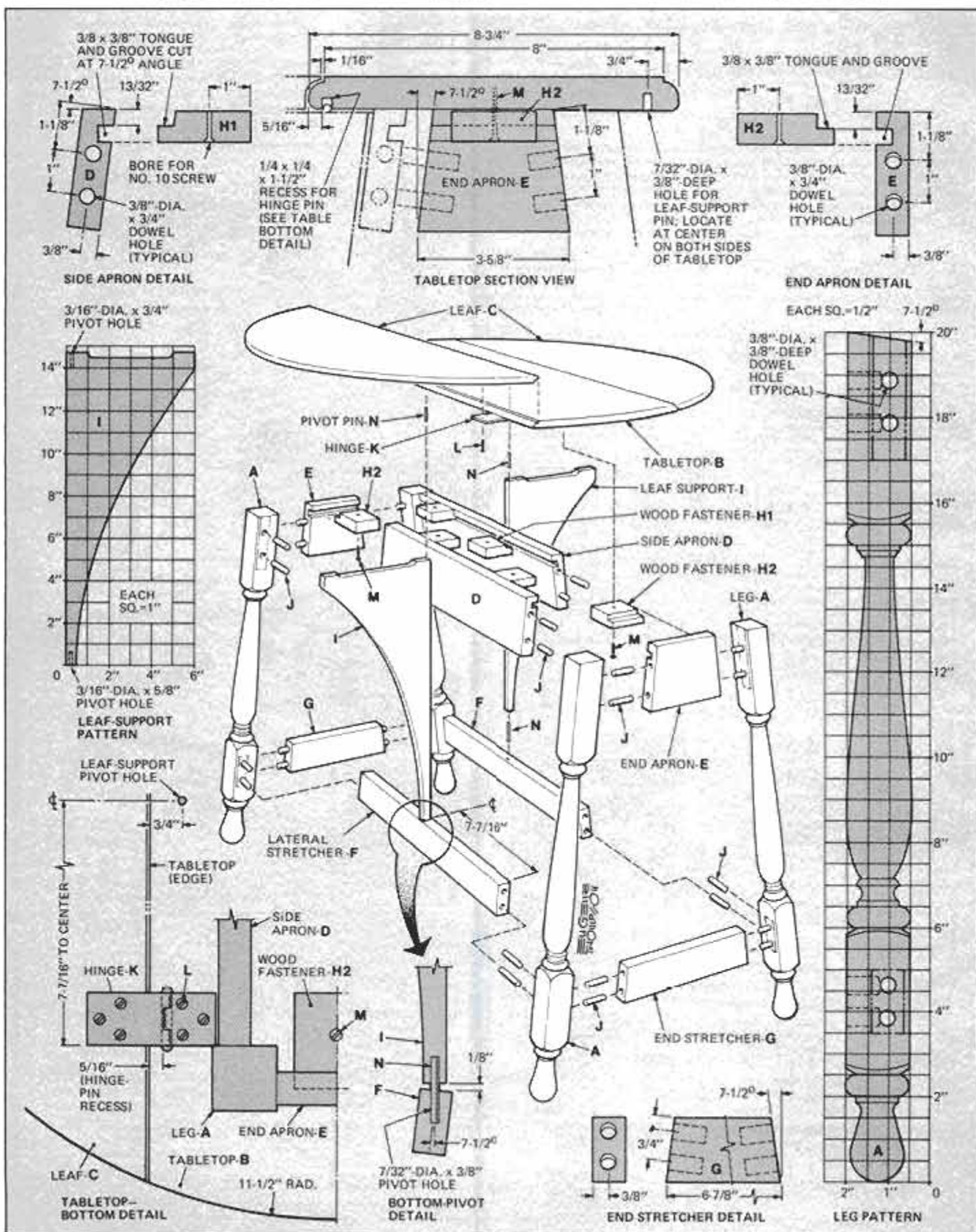
(Continued from page 132)

circle on these boards and cut out the shape. Round over the outside edges on both leaves and top—not the rule joint—with a router and a

(Please turn to page 136)

MATERIALS LIST—COLONIAL TABLE

Key	No.	Size and description (use)	G	2	3/4 x 1-1/2 x 6-7/8" mahogany (end stretcher)
A	4	1-1/2 x 1-1/2 x 20" mahogany (leg)	H	6	3/4 x 2 x 2-1/4" mahogany (fasteners)
B	1	3/4 x 8-3/4 x 23" mahogany (tabletop)	I	2	1/2 x 6 x 14-3/4" mahogany (leaf support)
C	2	3/4 x 7-1/2 x 23" mahogany (leaf)	J	32	3/8"-dia. x 1-1/2" dowel
D	2	3/4 x 2-7/8 x 4-7/8" mahogany (side apron)	K	4	3" drop-leaf hinge
E	2	3/4 x 2-7/8 x 3-5/8" mahogany (end apron)	L	24	1/2" No. 8 fh screw
F	2	3/4 x 1-1/2 x 4-7/8" mahogany (lateral stretcher)	M	6	1-1/4" No. 10 fh screw
			N	4	3/16"-dia. x 1-1/2" steel pin





The computer command console above is set to turn on lamp number 25 at dimmed level 3 at 4PM this afternoon.

Ultimate Button PRICE SLASHED

Was \$149---We sold it for only \$119

NOW JUST \$69.90

With two free modules valued at \$46.90

Regency has a problem. They built thousands of these computerized remote control systems they call the Regency Regulator to compete with the BSR X10 system. They built theirs to be much better.

The Regulator can handle up to 100 modules, the BSR only 16. The Regulator has 3 preprogrammed dimming levels you set and a quartz timing system that automatically directs 16 programmed functions per day. Unfortunately, the Regulator was priced higher than the BSR and competition is rough.

So through a one time large cash purchase, DAK has 1500 master command consoles on sale for the one time sale price of just \$69.90 (\$6 P&H) Or. No. 9313.

EXTRA HOME BONUS—There's more. You get absolutely free one appliance and one lamp module to help you get started. Plus you can buy more modules with your order for the command console for 1/2 price. The Regulator is warranted by Regency, and is compatible with BSR modules. Offer Limited.

Control anything electronic in your home with a preprogrammed command, or the touch of a button. Plus save on your heating and air conditioning bills.

Hats off to BSR. Their X10 remote control system started a whole new technology. Now from Regency comes the Regulator that gives you the ultimate control of your home.

Now you can remote control up to 100 lights and appliances, even those now controlled by a BSR system.

Plus, you can preprogram up to 16 daily commands to any of the controlled lights or appliances with the automatic quartz timing computer. You can let the Regulator take away daily drudgery or use it for security.

???HOW IS IT DIFFERENT???

The BSR system really started the field of remote control lighting. So, how is the Regulator different?

Number One Difference. The Regulator is an intelligent system. While you can manually turn on and off 16 things with the BSR and 100 with the Regulator, only the Regulator can also execute 16 daily preprogrammed commands without buying extra timing units.

You can have your outside lights come on 30 minutes before you are due home from work. Your heat or air can come on an hour before you return so that your home is comfortable.

Great Security—If you are away, you can have lights, radios, and TVs come on and off to give your home a lived-in look. You can even have lights come on and dim if you wish to save electricity.

Number Two Difference. The Regulator tells you what it's doing. It will display 'all on', or number 3 on 'dim', or whatever it is doing. Also there is a review feature that lets you review all preprogrammed commands. And, a standby feature that lets you leave preprogrammed functions 'on hold'.

Number Three Difference. The Regulator has a built-in three level automatic dimming circuit. You can select from the exact dimming levels of 55%, 30%, and 5% of any lamp in the system.

Number Four Difference. The Regula-

tor has a heating and air conditioning module you can add to let you control the times your heat will come on. You can limit the heat at night and while you are at work during the day. But, you can still have the house at the temperature you want when you get up in the morning or come home at night.

SIMPLE INSTALLATION

Really there is no installation required. Simply plug the Regulator into any AC plug. Then plug in an inexpensive UL approved control module at any light or appliance you'd like to control.

The Regulator sends out commands to its modules through your own house wiring. So, there's never any wire to run. Plus your system is just yours, because there are 100 programmable house codes to choose from.

EASY TO PROGRAM

Each module is as easy to program as turning stations on your TV. Each module has a dial, numbered from 00 to 99. Simply set any number. When you push that number on the control console, the light or appliance will go into action.

LOCAL CONTROL

Even though a light or appliance is programmed into the system, you can still turn it on and off with its switch.

It is manufactured and warranted by Regency, the Radio Scanner People.

1/2 PRICE MODULES

We are offering the two most used modules at exactly 1/2 Price.

1) Lamp Module—This is the module to use for controlling lamps plugged into the wall. It has 300 watt capacity, 100 codes and it has automatic 3 level dim. Retail \$21.95, DAK sold it at \$15.95. Now \$10.96. (\$1 P&H) Or. No. 9311.

2) Appliance module—This is the module to use for controlling appliances such as coffee pots, TVs, Stereos, and any home machinery. It has a 15 amp or 1/3 HP rating, 100 codes. Retail Price \$24.95, DAK sold it at \$17.95. Now just \$12.47 Order Number 9312.

SPECIAL MODULES

3) Heat and Air. This unit controls standard 24 volt thermostat wiring so that you can preprogram heat and air. This unit needs to be wired in by an electrician or yourself. Instructions included. Save on your energy bills. 100 code choices. Just \$49.95 (\$1 P&H) Order Number 9314.

4) If you want to control a light that is controlled now by a light switch, such as patio lights or room lights, we have the basic BSR light switch. It only has 16 code choices, but other than that limitation it works perfectly with this system including the 3 preset dimming levels. 500 watt rating. Just \$19.95 (\$1 P&H) Order Number 9217.

TRY THE REGULATOR RISK FREE

It's the professional system. It's built like a tank and it should last for years. If you already have a BSR system, it will be fully compatible.

Try the Regulator in your own home or office. If you aren't 100% satisfied simply return it in its original box within 30 days for a courteous refund.

To order your Regency Programmable Regulator risk free with your credit card call our toll free hotline, or send your check not for the \$149 list price, and not for DAK's \$119 old price, but send only \$69.90 plus \$6 for postage and handling to DAK. Order Number 9313. CA res add 6% sales tax. Remember you also get 1 free appliance module and 1 free lamp module. It's an extra value of \$46.90. Neither Regency nor DAK ever included a free module before.

DAK INDUSTRIES INCORPORATED

Call TOLL-FREE (800) 423-2636
In California Call (213) 984-1559
10845 Vanowen St., North Hollywood, CA 91605

LYNCHBURG HARDWARE & GENERAL STORE

42 Main St., Lynchburg, TN 37352



Jack Daniel Low Ball Glasses

These 8 oz. glasses are perfect for sippin' on-the-rocks or any other way you plan to sip. Each glass in the set boasts a different design in the traditional Jack Daniel black and gold. There's a man-sized feel and a good heft to these glasses, and the designs are fired on for quality and durability. My \$10.00 price includes the set of 4 glasses and 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. Tennessee residents call 615-759-7184.

FREE COLOR CATALOG



Build Your Own
Grandfather Clock
Prices Starting Under

\$255

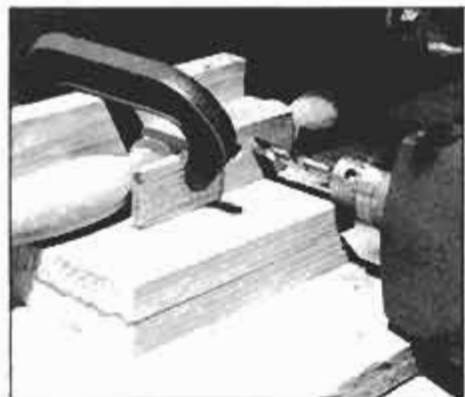
(including movement and dial)

- 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

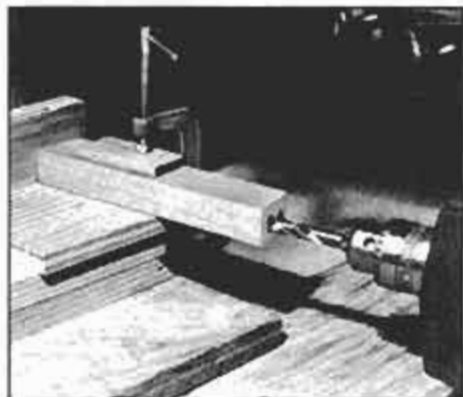
MASTERCARD and
VISA ACCEPTED

EMPEROR®
CLOCK COMPANY

WORLD'S LARGEST MANUFACTURER
OF GRANDFATHER CLOCKS
Dept. 315 Emperor Industrial Park
Fairhope, Alabama 36532



If you use a radial-saw boring attachment, shim leg to proper height and clamp to fence. Use same setup to bore leg holes.



Clamp end aprons to table and fence; bore dowel holes. Adjust boring attachment so holes are bored perpendicular to edge.

COLONIAL DROP-LEAF TABLE

(Continued from page 134)

rounding-over bit, or use a molding cutter of your choice.

Once again, lay the tabletop, leaves and spacers finished side down on the workbench. Then center the leg assembly on top of it. Position the hinges as shown in the drawing and trace their outline and screw-hole positions. Chisel out the groove for the hinge knuckle and bore the pilot holes for the screws.

With the leg assembly still in place, cut the wood fasteners to size and position them. Bore the pilot holes for their mounting screws, but don't install the blocks yet.

Precision measurements

Measure the distance between the inside top edge of the lateral stretcher and the underside of the tabletop. Do this for both sides of the table, then subtract 1/8 in. from each to allow for free movement of the support. The drawing gives a detailed view of this construction.

Next, cut the leaf supports from 1/2-in.-thick stock and bore a 3/16-in.-diameter pivot pin hole in the top and bottom edge of both. (The bottom hole is 3/8 in. deep; the top hole is 1 in. deep.) Then fashion the steel

pivot pins by cutting a 1 1/2-in. clear section from between the head and the threads of four 3/16-in.-dia. x 5-in. carriage bolts.

Using the drawing as a guide, bore the two 1/2-in.-deep pivot holes in the underside of the tabletop. Each is positioned about 1" out of plumb in relation to the hole on the lateral stretcher. This deflection keeps the hole far enough from the edge so the rule joint isn't weakened. It also raises the outside edge of the sup-



Align leaves with tabletop, using spacers; then position and install each hinge, using aprons and legs as reference points.

port slightly, thus ensuring a tight-fit when pushed under the leaf.

Finishing up

Install the support, then attach the tabletop with the fasteners. Set the table upright and test the movement of the supports. If they're too tight, remove the top and sand the upper edge. If they're too loose, glue a small wood block on top of each support. Once the assembly is complete, sand the piece in a 100-, 180-, 220-grit progression and finish with a rubbing of 4/0 steel wool. Because Phillipine mahogany grain is so open, fill the pores with paste wood filler. When it's dry, sand it smooth, wipe with a tack cloth and apply the finish of your choice. I used paste furniture wax.



Transfer leaf-support shape from grid on drawing to stock. Cut out with sabre saw or band saw, using a fine-toothed blade.

HINTS FROM READERS

Neater barbecue cooking



Although food tastes great after it has sizzled over charcoal, cooking can be hazardous when grease hits the coals, flames up and spatters. However, you can soak up greasy drippings and stop flare-up in the grill by putting a layer of cat-box filler beneath the coals. The filler absorbs grease as it drops. You'll also find that you don't have to use as much charcoal.—Susan Parker

Quick freezer defrost



If your food freezer or the freezer section of your refrigerator has to be defrosted manually, do the job before the frost builds up. A heavy frost deposit on the plates or coils reduces the cooling efficiency of the refrigerator.

You can speed your defrosting job by using a portable hair dryer to blow warm air on the freezer surface. *Note:* Make sure you unplug the refrigerator before you begin defrosting. If your vacuum cleaner works as a blower, it will serve nearly as well as a dryer, even though the air it exhausts is at room temperature. Use a sponge and basin to pick up the water. *Warning:* Never use a knife or other sharp metal instrument to scrape the coils or plates. You may puncture them. A plastic windshield scraper or plastic pot and pan scraper both do good jobs.—Ralph S. Wilkes

HARD WORKING OIL FOR HARD WORKING ENGINES.



Here's tough protection for the vehicle that carries the load—the car, truck or RV that performs under stress.

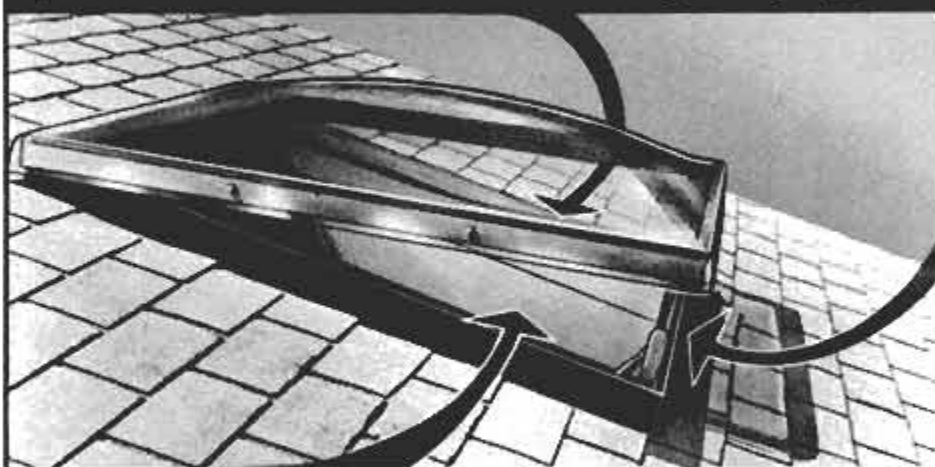
Pennzoil GT Performance Motor Oil is a product of our long on-track experience. It contains the friction reducers that help that hard working engine of yours run easy, increase its efficiency.

Pennzoil GT Performance Motor Oil.
Protection. Quality. Efficiency.

GT WITH IT!



VENTARAMA the plastic-domed ventilating skylight



LET THE SUN SHINE IN... Skylights offer a striking and inexpensive way to improve your day time living. Pleasant, efficient overhead day-lighting will transform dull rooms into bright, cheerful, much more livable space. Each Ventarama brings definite solar winter heat-gain with natural air-conditioning. Complete package, double domed units fit any roof, any roofing, and any climate. Please write for free literature.



VENTARAMA® SKYLIGHT CORPORATION

75 Channel Drive, Port Washington, N. Y. 11050 (516) 883-5000

© Copyright 1978, Ventarama Skylight Corporation

Acrylic-Tough Protection.

**ACRYLIC
KIT**
SOFT PASTE ACRYLIC CAR POLISH

Acrylic-Tough
Protection

KIT

By S. C. Johnson & Son, Inc. NET V

© 1981 S. C. Johnson & Son, Inc.

Build This Tomato Trellis

An easy-to-build tomato trellis like the one shown has several advantages over conventional, single support stakes. To begin with, one 8-ft. rack accommodates more plants—in this case, six—without sacrificing exposure to the sun. It also ensures air space between low-growing tomatoes and the ground. This cuts loss due to rot and insects.

Additionally, the trellis can support cheesecloth or similar material to shade newly transplanted seedlings or protect them against a late frost.

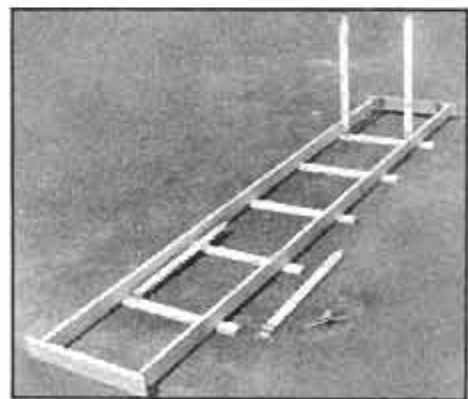
The entire rack is made of 1×2-in. furring held together with 6d (1½-in.) galvanized nails. The side rails are 8 ft. long and the cross-supports and hinged stakes are 22 in. long. But these dimensions can vary, depending on the species of tomato you're growing.

I found that 1½-in. utility hinges worked well for joining the stakes to the cross-supports. And they facilitate easy winter storage: Just fold up the rack and hang it on a garage or basement wall.

These supports can last for many seasons if you coat them first with a wood preservative and two coats of exterior paint.—Wilson G. Walters



Trellis keeps fruit off the ground, thus holds crop loss, caused by rot, to a minimum.



Stakes are hinged to cross-supports for compact winter storage of complete trellis.

AMAZING HARD-TO-FIND SCIENCE BUYS NOW ON SALE!

Bargains in Alternate Energy — Health — Weather Hobbies — Magnifiers — Magnets — Telescopes — More

RADIOMETER LETS YOU SEE THE SUN WORK. The silvered finish gives you a hemispherical mirror. At a glance, you see everything going on around you. Operates on invisible infrared radiation. 5" high, 3" in diameter. No. 60,529 Reg. \$7.95 **NOW \$6.75**



OUR MOST POPULAR MAGNIFIER. Provides 10 power magnification. Sturdily mounted in plastic with a swingout lens system so you can carry in your pocket or attach to key chain. 3" x 1 1/4" closed. No. 30,344 Reg. \$22.95 **NOW \$19.75**



MINIATURE BATTERY POWERED PUMP. Pumps 1 pt. per minute through 4" tube (included). Lifts liquid 24 inches. Self priming. Operates on 2 1 1/2-V flashlight batteries (not included). It is the perfect instrument for darkrooms, science fairs & table displays. No. 50,345 Reg. \$5.95 **NOW \$4.95**



HYDROPONIC GREENHOUSE: GROW PLANTS INDOORS ALL YEAR! Feeds plants a perfect mixture of water, nutrients & light, using no soil at all! Get up to 10 times the yield of conventional soil. Contains nutrient mix & transport system. No. 31,129 Reg. \$42.95 **NOW \$34.95**



RECORD HIGH AND LOW TEMPERATURE EACH DAY. Jumbo size steel and aluminum instrument with 12" diam. Blue and pink indicators are carried to the lowest and highest points of day and left to be read before resetting. No. 72,467 Reg. \$19.95 **NOW \$17.95**



THIS FLASHLIGHT NEVER NEEDS BATTERIES! Electricity is generated when you squeeze the fly-wheel—no recharging! Uses 2.2 V flashlight bulbs. It's compact, take it anywhere & never be stuck for a light! 5 1/2" x 2". No. 61,080 Reg. \$25.95 **NOW \$16.95**



SAVE WATER WITH SHOWERSAVER. Cut hot water bill without giving up a stimulating hot shower. A perfect mixture of air and water provides increased velocity at 75% less volume. Easy to install. Chrome plated brass. No. 31,102 Reg. \$12.50 **NOW \$11.25**



CHEMICAL LIGHT BLOWS AS EMERGENCY MARKER or as a signal for nighttime bikers! Can be seen in daylight, and for 1,000 yds. at night. 6 in. plastic tube lasts 3 hrs. Comes in pkg. of 3. No. P-60,923 Reg. \$7.95 **NOW \$6.95**



GO FISHING WITH THIS MIGHTY MAGNET. Lifts up to 150 pounds. Discover underwater treasures: locate items lost in water. Aluminum frame, bar-handle. Light enough for any fishing reel. Resists corrosion. Wt. 2 lbs. No. 71,135 Reg. \$26.95 **NOW \$24.25**



LISTEN TO YOUR HEART! A sensitive bell diaphragm stethoscope, just like the one your doctor uses. Perfect for teaching children about the wonders of the human body. No. 50,270 Reg. \$12.95 **NOW \$9.95**



NEW! THE 76 MM 1/6 EDMUND TELESCOPE... COMPLETE WITH MOUNT READY TO USE

Journey to the craters of the moon... study skyscrapers or nature's wonders! Expertly crafted in our own plant and specially designed as your first telescope. Precision optics, durable tube, all-metal mount. The 25 mm eyepiece delivers 17X magnification, perfect for all-around viewing. Its sleek design complements living room or den, yet it's sturdy enough to be the perfect companion on a field trip or star party. Weighs just 5 lbs. Measures 13 1/2" x 17 1/2" x 11". Comes ready to use... so your exploration into space can begin right away.

No. 31,677 Reg. \$109.95

NOW \$89.95

BUILD YOUR OWN WEATHER STATION

Accurately forecast weather and check your predictions against TV and radio. Kit includes anemometer with windvane, indoor indicator board to show wind speed & direction; sensitive air tank barometer with 2 ft. indicator; sling psychrometer, rain gauge with calibrated tube to measure as little as 1/100 inch, 100 ft. lead in wire; color cloud I.D. chart, forecasting manual. Powered by 115V AC house current with safety cord.

No. 71,022 \$29.95

NOW \$26.95



SAVE \$8.00 ON THE 30X MICROSCOPE WITH BUILT-IN LIGHT! Ideal for inspecting plants, gems, photos. Center focus wheel, built-in light source; retractable condenser lens. 5 1/4" x 1 3/4" x 3/8". No. 31,291 Reg. \$24.95 **NOW \$16.95**



MAKE YOUR OWN 9 FT. HOT AIR BALLOON. Watch it rise to about 200 ft. on just hot air. Will lift anything up to 1/2 lb. Kit includes 10 precut gores, 6 ft. of 14 gauge wire for ring and core. Instructions included. No. 60,691 Reg. \$5.95 **NOW \$5.35**



8 X 20 SPY SCOPE. So small it fits in the palm of your hand! 288 ft. @ 1,000 yds. field of view. Only 2 oz. Stores easily in your pocket, purse or glove compartment. Brush metal finish. Incl. neck strap and 3 1/2" x 1 1/2" x 2" case. No. 1568 Reg. \$29.95 **NOW \$22.45**

FREE

GIANT SIZE CATALOG

4,000 Unusual Bargains in Hard-to-Find Science Buys for Hobbyists, Schools & Industry

COMPLETE AND MAIL TODAY

TO: Edmund Scientific Co. 7211 H-12 Edscorp Building
Barrington, N.J. 08007

Stock No.	Quantity	Price
Total Price		
N.J. Residents Add 5% Sales Tax		
Total Enclosed		

Send Free Giant Size Catalog

Signature _____
Name (PRINT) _____
Address _____
City _____ St. _____ Zip _____

CREDIT CARD HOLDERS
ORDER TOLL FREE
1-800-257-6173
In New Jersey
1-800-232-6677

Method of Payment:
 Check encl. MC
 Visa Am Exp
 Diners
Card No. _____
Expres _____

Edmund Scientific
7211 H-12 Edscorp Bldg., Barrington, N.J. 08007

When it's your turn to mow, take your turns on a DIXON.

every turn. But take those turns on a DIXON Zero Turning Radius mower, and it shortens the work so fast you'll think your yard got smaller!

Push or pull a pair of hand levers to move the mower forward or back.



no footwork at all. Saves time, saves energy.

Don't take our word for it; see your DIXON Dealer and mow-test 42" or 30" of pure Mowbility™ for yourself. Or write for "Ask Any Owner" and read how ZTR owners praise DIXON.

the first real turnaround in mowing circles.



DIXON INDUSTRIES, INC.
BOX 494, PM
COFFEYVILLE, KS 67337
13161 251-2000

© Dixon Industries, Inc.

NAME _____

ADDRESS _____

CITY, STATE _____

ZIP _____

LUBRIPLATE® "MARINE" LUBRICANTS

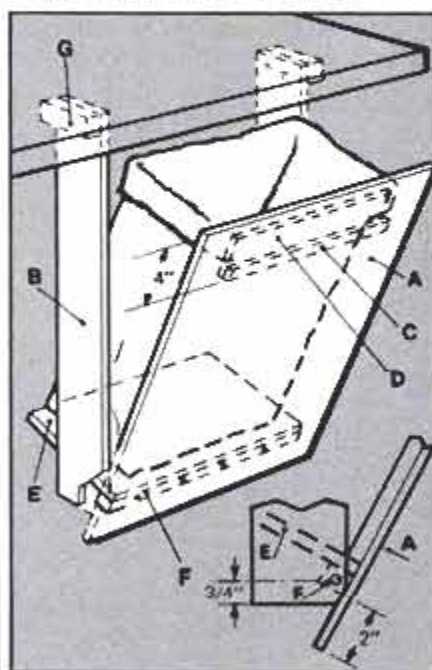
For protection beyond the call of duty!



LUBRIPLATE DIVISION FISKI BROTHERS REFINING COMPANY ONE OF WOODBINE BLVD. NEWARK, N.J. 07102
MANUFACTURING PLANTS IN NEWARK, N.J. 07105 AND TULE DOG, OHIO 43085; DISTRIBUTORS NATIONWIDE.

HINTS FROM READERS

Quick workbench cleanup



The handiest addition to my workbench is a supermarket bag fastened to the bench with a few scraps of wood. This lets me pivot the bag forward to receive debris I sweep into it. The top edge of the bag turns down 1½ in. to form a lip, which hooks onto a bag support fastened to a plywood front.

Cut the parts to size. Locate the front so it fits under the benchtop with a 1-in. space at top. Prebore and fasten cleat C and bag support D across the front, 4 in. from the top edge, with ¾-in. No. 4 screws. Prebore and secure platform E to cleat F with four 1½-in. No. 6 screws. Prebore and attach cleat F to the front from the outside with four 1½-in. No. 6 screws. Prebore and fasten verticals B to cleats G with 1-in. No. 8 screws.

Two 1½-in. No. 10 screws with four washers serve as pivots to open the front. Bore holes in vertical B and cleat F at pivot points and insert screws and washers. Attach G to benchtop with 1½-in. No. 10 screws.—William Lohrand

MATERIALS LIST—WORKBENCH BAG

Key	No.	Size and description (use)
A	1	¼ × 14 × 20" plywood (front)
B	2	¼ × 3 × 19½" plywood (verticals)
C	1	¼ × 1 × 11" plywood (cleat)
D	1	1/8 × 2½ × 11" hardboard (bag support)
E	1	½ × 7½ × 12" plywood (platform)
F	1	¾ × 1 × 12¾" maple or other hardwood (cleat)
G	2	¾ × 1 × 3" pine (cleats)
Misc.		Four 5/8-in. No. 4 flathead screws; eight 1½-in. No. 6 flathead screws; four 1-in. No. 8 flathead screws; six 1½-in. No. 10 flathead screws with washers (4).



Foredeck of *Iowa* with *Wisconsin* lying alongside at Philadelphia Navy Yard. Dehumidifiers keep ships' interiors sound.



Iowa's teak afterdeck (rain-spotted in photo). Wood will be removed for landing pad and to patch other teak deck areas.

ing tonnage of capital ships were the crucibles of the world powers' foreign policies in the two decades leading up to World War II. Things began to fall apart in the '30s: Germany blatantly violated the Treaty of Versailles, building the battlecruisers *Scharnhorst* and *Gneisenau* and the battleships *Bismarck* and *Tirpitz* at tens of thousands of displacement tons in excess of specified limits. Japan had begun planning the huge *Yamato*-class battleships in secret in 1934, violating the Washington Treaty, and continued to maintain secrecy as two ships were built.

The Japanese were after an edge in time, maybe two or three years. In addition, they believed that even if the United States got wind of what the *Yamato* was all about, an appropriate response in dreadnought terms would probably have to be built in an East Coast yard and would be too large to fit through the Panama Canal. The Japanese failure to immediately ratify the London Naval Treaty of 1936 was duly noted by the Roosevelt administration; design work began in earnest

in 1937 on what would be the *Iowa*-class battleships.

They would be fast, capable of 33 knots flank speed, but with a slow-cruising range that would take them three-fourths of the way around the world without refueling. Nine 16-inch guns would each throw a 2,700-pound projectile over 20 miles with accuracy. A full salvo would literally flatten everything within one square mile. They would be 887 feet long and, yes, they would fit through the 110-foot-wide Panama Canal... with slightly less than two feet to spare. Yet, one consideration made the *Iowas* less than the dreadnoughts of their time: armor.

Even though the Roosevelt War Department suspected that the Japanese might field 18-inch guns (which they eventually did—the largest ever sent to sea), the main armor "belt" on the *Iowa*-class was held to 12 inches thick at its maximum to cut weight in favor of speed. It meant that a direct encounter with *Yamato*-class ships might not be survivable. However, even before war broke out, most Naval strategists had moved well away from the idea that one dreadnought alone could be committed to attack another. There was too much to lose on either side. Even so, in the anxious months before Pearl Harbor, an almost ludicrous—considered in retrospect—series of false-intelligence figures was leaked from opposite sides of the Pacific: While we overstated our armor dimensions, the Japanese deflated their gun-barrel diameters.

What could be more unlikely than



A 40-year-old geared analog computer aims the big guns. Electronics can't perform the job any better or more reliably.

Your home workshop can PAY-OFF

BIG...

Earn Extra Income
Right At Home.

START YOUR OWN MONEY MAKING BUSINESS!



BELSAW
3-IN-1
Power Feed
Power Tool.

SEND FOR
FACTS TODAY!

Planer Molder Saw

Three power tools in one—
a real money-maker for you!

The BELSAW Planer/Molder/Saw is a versatile piece of machinery. It turns out profitable precision molding, trim, flooring, furniture...in all popular patterns. Rips, planes, molds separately...or all at once. Used by individual home craftsman, cabinet and picture framing shops, lumber yards, contractors and carpenters.

Never before has there been a three-way, heavy-duty woodworker that does so many jobs for so little cost. Saws to width, planes to desired thickness, and molds to any choice of patterns. Cuts any molding pattern you desire. Provides trouble-free performance. And is so simple to operate even beginners can use it!

30-Day FREE Trial! SEND FOR EXCITING FACTS
NO OBLIGATION—NO SALESMAN WILL CALL

RUSH COUPON TODAY! BELSAW POWER TOOLS
B903H Field Building
Kansas City, MO 64111

BELSAW POWER TOOLS Co.
B903H Field Building
Kansas City, MO 64111

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 _____

BORN-AGAIN BATTLEWAGONS

(Continued from page 141)

to find, 40 years later, an entire new generation of military men forced to issue daily assurances from the Pentagon regarding the no-sweat survivability of those same ships?

This time, dreadnought parity is not the issue, of course, because nobody else has any. Critics of the battleship reactivation program consider this in itself to be a fairly eloquent fact. The battleship is primarily a target today, the argument goes, and even if it could be written off as only a frigate-scale investment, there will be a crew of 1,600 (some 700 less than the WW II complement) to consider. The Navy will have to put so many resources into protecting it that it will actually detract from the overall seapower mission. Furthermore, the critics contend, it is a tempting target, capable of eliciting not only the obvious Soviet countermeasures but also sea- or airborne equivalents of Khaddafi-crazed hit teams—remember the *Maine*?—in any corner of the globe. Such is the liability of residual dreadnought symbolism.

"I've heard it all," says Cmdr. Jack Dennis from his Pentagon office. Dennis is the officer in charge of explaining born-again battleships to the world. He explains that an on-the-horizon presence—parked ominously just off, say, El Salvador—is on the list of battleship missions, but well down in priority. "In any case," Dennis notes, "that would be a political and not a Navy decision."

The more likely mode of deployment of the *Iowa*-class battleships today would be within what the Navy calls a Surface Action Group (SAG), in which a guided-missile cruiser and various smaller escort components would offer the integrity of antiaircraft and antisubmarine defenses (illustration, page 74). Should there be a serious escalation of threat, either worldwide or in a particular high-seas environment, the SAG could be folded into a Carrier Battle Group (CBG), further affording a 500-mile air umbrella, on the average, over the entire flotilla. In the Navy's view, the amount of sheer offensive punch an updated battlewagon would add in these situations is well worth the additional defensive considerations.

In the case of *USS New Jersey*, due to be commissioned next January following sea trials, the initial-phase "upgunning" will include:

■ Tomahawk missiles—32 of them in eight sets of armored launching tubes. These are cruise missiles operating on a turbojet engine after

being launched by solid-propellant rocket, with both land-attack and ship-to-ship capabilities. A (tactical) nuclear-tipped version for land attack would have a range of as much as 1,700 miles; the conventional land-attack version ranges to about half that, and the antiship version can be launched at a range of just under 300 miles. In recent tests, according to McDonnell Douglas, a guidance supplier, land-attack Tomahawks have regularly impacted within a few feet of targets after long-range cruise flight.

■ Harpoon antiship missiles—16 in four quad launchers. These attack hostile ships at about 70 miles, using their own active radar after launch on an approximate target bearing. In the terminal flight phase, after cruising near the surface, they fly a "pop-up" maneuver to foil enemy defenses and enhance their effectiveness.



Visitor gets a taste of hard time in one of *Iowa's* cells. Battleship's brig offers semirecumbent accommodations for six.

■ Vulcan/Phalanx close-in weapon system—four mounts. This is the melding of sophisticated radar tracking and electrohydraulic aiming system with the Gatling-type, six-barrel, 20-mm cannon automatically firing a heavy (uranium-densified) projectile at 3,000 rounds per minute. (In fact, this little gun could get off a higher total weight in rounds over extended times than a 16-incher in the main battery can.) It will be the battleship's primary defensive weapon, able to acquire cruise missiles (or aircraft) on its tracking system at about six miles out and begin rapid fire at about three. As formidable as this sounds, it is well known that the Navy would like something better for "point defense" of ships. Nonballistic systems using laser or particle beams are being researched.

■ Helicopter flight deck on the fantail, with storage area for up to three battleship-based 'copters—adding a dimension in over-the-horizon surveillance and targeting to both missiles and conventional ordnance.

In view of this high-tech reworking, it is rather remarkable that anyone can get excited about something so primitive as a gun, but any Navy man who has seen it fired in anger apparently remains permanently in awe of a battleship's "main battery" (it won't be called that any longer). Completing the anachronism, those 16-inch guns on the *New Jersey* will still be aimed by the 1930s-design mechanical fire-control computer in which not only target range and bearing, but also the rotation of the Earth (still the same old Coriolis force), are ingeniously reduced to a matter of gear ratios, hand-cranked to an instantaneous sum.

Out of mothballs

There are some two dozen unused 16-inch gun barrel liners available from storage depots in the southwestern desert and in the Philippines. Although no facility now exists to manufacture ammunition for these guns, there are about 3,000 armor-piercing and 15,000 high-capacity (less metal, more explosive) rounds in Naval inventory. Although some were 30 years old when loaded for the *New Jersey's* Vietnam tour, they were found to be generally in good working order: Plop one high-capacity round 20 miles away into dense jungle and, *voilà!*—Instant Helicopter Landing Zone (carefully avoiding the imposing central crater) of some 200 meters' breadth, with a generally defoliated perimeter extending out another 100 to 200 meters. Once the battleships are out there again, it's unlikely that the Navy will be able to resist fooling around with adding a "smart" dimension—final trajectory control—to 16-inch ordnance. Lilies were made to be gilded.

Six of the original 10 five-inch twin gun turrets will remain on the *New Jersey*. These guns have a 10-mile range for shore bombardment, but can also be used against aircraft. (The first time proximity-fused projectiles were ever fired at sea, aboard the *USS South Dakota* in October 1942, she shot down 26 enemy aircraft in one day.)

Although it is a 600-pound system, and most of today's Navy ships run on 1,200-pound steam turbines, the *Iowa*-class powerplant is by no means a gross anachronism. Eight boilers feed turbines to provide a total of 212,000 hp to four propeller shafts. Conversion from "black oil" to standard Navy fuel (diesel distillate) will be the bulk of powerplant update work.

The "habitability" area is the one in which the battleships most resemble time capsules (with exception of

BOX OF AIR WITH ANY PAIR.



Save \$11* on a \$29.95 value portable air compressor kit when you buy any two Gabriel special-purpose shocks or struts. Just plug it into your car lighter and use it on tires. On toys. On footballs, volleyballs, and rafts. Ideal for summer. So see your participating auto parts store or service station now. Before the offer floats away July 31, 1982.

*Based on the reg. sugg. selling price of \$29.95.

found plenty of peeled paint; it only means the dehumidification system is doing its job.

Yet appearances, in a larger sense, are what may determine whether the Navy wins Congressional approval to reactivate all four Iowa-class ships. If *New Jersey's* trials and recommissioning prove at least uneventful, the plan stands a chance. But battleships, historically, have tended to attract the wrong kind of attention. Beautiful at sea, they are brutes in close quarters; *Missouri's* losing encounter with the bottom of Chesapeake Bay in 1950 sticks in more memories than the landing at Inchon of the same year. *Wisconsin* wears the bow of her never-completed sister ship, *Kentucky*, affixed as a major repair after she rammed a destroyer in 1956.

It would be worse yet to be hounded down by inferior forces—as dreadnoughts often were in war—to take some popgun nation's lucky shot in the magazines where 1,005 16-inch shells and their propellant charges (a "full bag" for an Iowa-class battleship) are stored. This would be an incalculable blow to national morale.

Small chance? Perhaps, but in any case, it's one the Navy is ready to take.

FM

New Jersey). Today's Navy tries not to stack seamen's bunks more than three tiers high—they're five up on the BBs—and, of course, they must have provision for "privacy curtains." The galleys will need to be equipped to produce the fast-food items modern sailors prefer; space will be reclaimed from the admiral's quarters to provide for a completely electronic Combat Information Center, soul of a modern fighting ship.

While things are looking up for seamen, and down for admirals, the question of whether a battleship will still need a six-cell brig—bigger than most small-town jails—has not yet been decided. An earlier decision to strip what could be as much as \$50,000 worth of teak from the decks of reactivated battleships—giving rise to a sudden interest in woodcraft among Naval shipyard employees—has been reversed. Teak will come off the fantail, in the helicopter landing zone, but will be used to patch other deck areas. The time-honored practice of "holystoning" teak decks, however, is no part of today's Navy, so the decks will stay bone gray in appearance.

Appearances can be deceiving, however, particularly in regard to mothballed ships. Walking through the *Iowa* recently, you would have

Gabriel computer tuned 254 shocks for the world of small cars.



Yours is no exception.

Gabriel
SHOCKS & STRUTS

Road Star, real heavy-duty value. Red Ryder, our best heavy-duty shock for extra control. Striders, adjustable to driving preference. HiJackers, give small cars 750 lbs. extra capacity. Struts & Cartridges, for MacPherson-equipped cars.

Most of the Formula One cars in the Detroit Grand Prix this coming June 6th will be powered by an engine pioneered by Ford Motor Company.

Through 16 years of evolutionary design, the Ford Cosworth

engine is still winning races. In fact, it is the winningest engine in the history of Formula One... and has also won the Indy 500 and the 24 hours of Le Mans.

Not until now, however, has the Ford-developed engine seen

The Motor City One Of



Seat belts save lives – Buckle up.

competition in our home town,
because not until now has there
been a Detroit Grand Prix to run
through the heart of the city.

Come join our cheering
section in the Motor City on June
6th. And watch the Ford power
go by.



There's A Ford In America's Future.

Welcomes Back
Its Own.



If you think STP is only for racing cars... think again.

STP was born on the racetracks of America. STP—The Racer's Edge® throughout the world. And from that discipline... where performance is all that counts... STP brings a complete line of Performance Products to your car. Where performance is all that counts, too.

STP Performance Products. Designed to help you get the best out of your car for a long, long time.

On the world's racetracks. On the world's roads. Wherever performance counts. STP is there. Satisfaction guaranteed.

2. STP PROTECTOR/BEAUTIFIER. STP Protector/Beautifier, with its exclusive "Sunscreen" formula, protects your car's vinyl, leather and rubber surfaces against fading, drying and cracking. It actually screens out the sun's harmful ultraviolet rays. STP Protector/Beautifier... because the STP shine means protection.



1. STP OIL TREATMENT. Even the best motor oils begin to lose their protective properties under the high engine heat of everyday driving.

That's where STP Oil Treatment comes in. It gives your oil muscle. STP's special polymers flex with heat... strengthening the film between vital moving parts, just where it's needed.

Introducing STP "4." Specially formulated for today's 4-cylinder engines that work harder, rev higher and run hotter than larger engines.

Whenever you change or add oil, get STP Oil Treatment... in original or new 4-cylinder formulas. And give your oil muscle.

3. STP GAS TREATMENT. STP Gas Treatment tunes-up your gas... no matter what grade gasoline you're using. Used regularly it keeps water from building up in your tank, helps clear your entire fuel line and cleans dirty carburetors... for better performance and better mileage.



4. AND OTHER PERFORMANCE PRODUCTS. The lineup goes on and on... Motor Oil, Air and Oil Filters, Carburetor Cleaner, Diesel Fuel Treatment, PCV Valves, Breather Elements, Foaming Engine Degreaser and more. All consumer-proven. All satisfaction guaranteed or your money back. If the brand name is STP, you'll get proven performance.

Depend on STP proven performance.



© 1982 STP Corporation, an ESMARK Company, Fort Lauderdale, Florida 33310

FIRSTHAND REPORT

Audi Quattro: Germany's 4x4 Cruise Missile

Four-wheel-drive doesn't necessarily mean getting your hubcaps dirty.

by Tony Assenza AUTO EDITOR

The Audi Quattro is the pet project of one Dr. Ing. Ferdinand Piech, who, it happens, looks a good bit like Frank Perdue and is possessed of one of the gentlest souls you're likely to encounter anywhere. Unlike Perdue, who traffics in poultry, Ferdinand Piech, Audi's head of research, deals out tactical weapons for the open road.

Herr Piech's latest exercise in road-going exotica reads like an incongruous concoction—the genetic splicing of a 4x4 and a sports coupe.

The pieces that make it work are as follows: a 2.2-liter, 156-hp, fuel-injected, five-cylinder engine fitted with a turbocharger and an intercooler, connected to a four-wheel drive system which distributes traction evenly to the four corners without benefit of viscous coupling. Add-



Made for the open road, the Quattro has a top end of 128 mph and it gets there quickly.

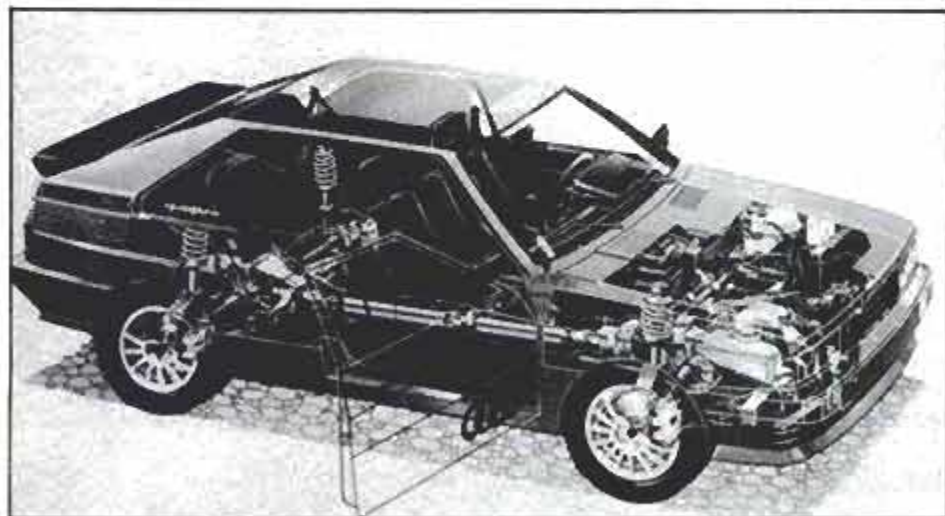
ed to this all-wheel drive system is a differential lock feature, which allows you to lock the rear and center differentials. As we discovered trying to climb a mountain road covered with two inches of ice, this locking system works like road glue. The differentials are locked by pulling a knob on the center of the console. When the two lights flanking the knob light up, that's your indication that the differentials are locked.

Unlike most two-wheelers converted to four-wheel traction, the Quattro doesn't penalize a low center of gravity by sitting any higher off the pavement. Incredibly it has

the same five inches of ground clearance as the Coupe on which it is based.

On dry pavement, in the fully locked mode, the Quattro is transformed into a gravity-enhancement machine. Thanks to the low center of gravity, all-wheel-drive and the 205/60 x 15 Goodyear NCTs, the Quattro feels as if it's defying the laws of physics. Although it feels quite good without the lockup engaged, the car seems to only really come together when it is engaged. Although Audi suggests using the lockup feature only on slick roads, I have a feeling

(Please turn to page 148.)



Compact 4x4 system allows the Quattro to sit a mere five inches above the pavement. This makes it strictly an on-pavement vehicle. Suspension is independent at all four corners.



Differential locking knob is mounted on console; lights show system is activated.



This VET Did It - and YOU Can Do It Too!

"War injuries left me badly handicapped, but now I'm a financial success as a Locksmith, thanks to your training. Besides, the work is fascinating. If I can do it anybody can." — Glen Johnson, Larned, Kan.

Make Up to \$10 an Hour—even while learning!

Train FAST at Home! Be a LOCKSMITH!

If you enjoy fixing things, you're a "natural" to make hundreds of EXTRA DOLLARS a year in the fascinating business of Locksmithing. Rising crime has increased demand for service a thousandfold. Yet there's only one Locksmith for every 17,000 people!

COLLECT CASH PROFITS ALMOST AT ONCE!

You're "in business" ready to make \$5 to \$10 an hour a few days after you begin Belsaw's shortcut training. Easy, illustrated lessons complete with ALL practice equipment PLUS

- ALL TOOLS YOURS TO KEEP
- KEY MACHINE YOURS TO KEEP
- EXPERT PERSONAL ASSISTANCE
- BUSINESS-BUILDING HELP

enable you to get your share of this always-profitable business. Hundreds we've trained are doing it. So can YOU.

MAIL COUPON to discover how Locksmithing can keep the extra money coming in during spare time—or in your own full-time business. Ideal for retirement—good jobs, too.

**BELSAW INSTITUTE, 103H Field Bldg.
Kansas City, Mo. 64111**



FREE

N. Hunt, Wilmington, Del.—"I make \$50 a week extra."

R. Davis, St. Louis, Mo.—"I cleared \$110 last Saturday."

Ed Boyle, Pittsburgh, Pa.—"My business going at top speed. I'm moving to bigger quarters."

MAIL THIS COUPON • NO SALESMAN WILL CALL

**BELSAW INSTITUTE, 103H Field Bldg.
Kansas City, Mo. 64111**

Rush **FREE** book, "Keys to your Future."

Name _____

Address _____

City _____ State _____ Zip _____

THIS DO-ALL PRO KEY MACHINE YOURS TO KEEP!

Can add \$25 to \$40 a week to your income... and doesn't cost you a penny extra!

Full-Size SPORTS CARS Easy to build from kits

Complete New Buyers' Guide



- OFFICIAL PRICES
- INSTRUCTIONS
- PHOTOS - MANUALS

CHILDREN FULLY ILLUSTRATED!

TURN A PRIMO INTO A MERCEDES! THE BLUE BOOK tells how you can use a beat-up Pinto, Mustang, Volkswagen, MG, Triumph or other old car as a base for assembling a gleaming Mercedes, Porsche, Jaguar, MG, Ferrari, Cobra, T-Bird, Auburn, Lola, Bugatti, etc. at a savings of thousands of dollars below dealer prices. See colorful photos of these sporty roadsters, classic autos, GT, futuristic exotics and detailed antiques you will love to drive and be proud to own.

WHETHER YOU ARE A DRIVER OR A MECHANIC... THE BLUE BOOK OF U.S. KIT CARS shows you a complete selection of attention-getting sports cars specially designed by leading U.S. component auto manufacturers for easy assembly at home using ordinary tools.

READY-TO-DRIVE MODELS of these unique autos are available if you do not wish to do the assembly.

30 DAY MONEY BACK GUARANTEE!

FREE BONUS 2 MANUALS

Customers Send me _____ copies of THE BLUE BOOK OF U.S. KIT CARS under your 30-day Money Back Guarantee I am enclosing cash, check, money order or Visa VISA or MC No COD's.

- \$18 (2nd Class-US only)
- \$12 (1st Class-US only)
- \$18 (Foreign-US funds)

**U.S. KIT CARS
P.O. BOX 6304-0528
WILMINGTON, DE 19806**

NAME _____

STREET _____ APT _____

CITY _____ STATE _____ ZIP _____

VISA or MASTERCARD number _____

EXP. DATE _____

24 HOUR ORDERING SERVICE • NO COD'S

TOLL FREE 1-800-228-2028

FREE ASK FOR EXTENSION 300

SEND THE BLUE BOOK OF U.S. KIT CARS



HOW-TO BOOK

Learn to do-it-yourself.

Remove and hang wallpaper.

Prepare surfaces for painting.

Send \$2.00 for your 32-page book.

HYDE TOOLS Southbridge, MA 01550

NAME _____

ADDRESS _____

CITY _____

STATE _____ ZIP _____

AUDI QUATTRO

(Continued from page 147)

that more than one of the 500 lucky people who will own a Quattro this year will pull the knob whenever the spirit of Fangio moves them.

Amazingly, Audi claims that the full-time 4x4 system doesn't penalize gas mileage. According to its tests, there is only a three-percent fuel penalty at low speeds, and virtually identical mileage to the front-drive Coupe at high speeds. This is because a driven wheel has less rolling resistance than a nondriven or freewheeling wheel.



Fender flares and logo on door are only indications that this isn't fwd Coupe model.

Freewheeling or not, the Quattro can cruise at elevated speeds for hours on end without flagging. In Death Valley, where we tested the car, we had a chance to mash the throttle and watch what happened. What happened was a calculated speed of around 128 mph—calculated because, as you might know, government-approved speedometers only register to 85 mph. At top speed, the Quattro does tend to get light in the front end.

The Quattro shares with the Renault Fuego (see story on page 90) the distinction of being one of the only two turbo cars on the market with an intercooler. It does what it sounds like—cools the boosted air between the compressor of the turbo and the intake manifold.

Intercooling alleviates the main problem with turbo engines—heat. Excessive heat causes a variety of problems, the worst being a tendency to detonate. Without an intercooler, the only ways of controlling detonation are by feeding the engine an overly rich mixture of fuel to cool the charge, or retarding spark timing (equally wasteful because it reduces thermal efficiency and results in a loss of power). The intercooler lets you run a fairly lean mixture without fear of detonation and doesn't require greatly retarded timing.

The cost for all this marvelous technology is about \$38,000. Audi will only import 500 units this year, so if you want one, you'll have to hurry. See your local Audi dealer and tell him Dr. Piech sent you. **FPM**

PM's LONG-TERM CAR TESTS

(Continued from page 89)

tremely hard, enjoying its fine performance and lively acceleration with lots of heavy-footed action. Still, we've managed to average 21.7 mpg. Other than the spoiler, nothing else has fallen off or acted up in any way. We'll let you know how things progress.

Toyota Celica Supra

Since about 25 percent of all cars sold in this country are imports, we're going to keep about the same ratio in our long-term test fleet. Our first import is Toyota's newest supercar, the Celica Supra.

Choosing this car was, admittedly, purely subjective. We liked the way it looked and wanted to find out if it had the performance, handling and durability to match.

We picked up our car at Toyota's East Coast headquarters in West Caldwell, N.J., on March 3, 1982. So far, we've only put 100 or so miles on the car so really, there's nothing to report. We can tell you that, next to the Camaro/Firebird twins, this is one of the best looking vehicles extant. And even going through a slushbox (automatic transmission), the dual-overhead-camshaft, 2.8-liter engine yields sparkling performance and decent mileage.

It's equipped with just about every available option, including air-conditioning, power seats, a killer of a stereo system, remote outside mirrors, full instrumentation and digital readouts plus the graphic speed display. The list price of the car is \$15,610, although we've seen Supras discounted in the New York area for \$12,900.

In our next report, we'll have more details on the Supra's performance, handling and fuel mileage, as well as how the car has held up after some hard driving at the hands of the PM staff.

The 5.0-liter HO Mustang

Whereas the Supra is sophisticated and subtle, the Mustang is primitive and a bit brutal. It is precisely because of those qualities that we chose it for long-term testing. You can order it any way you want, from a thrifty 2.3-liter Four to the 161-hp, 5.0-liter, high-output V8.

The only options we chose were those which enhanced performance, rather than creature comforts. Those options were the TRX suspension package which includes Michelin TRX tires, alloy wheels, stabilizer bars and specific shock absorbers. We also added Recaro seats, and the four-speed manual transmission.

Other than that, air conditioning and a leather-wrapped steering wheel are the only comfort options. With all of that, the retail price is \$8,682.

So far, we've put 2,362 very hard miles on the car and the mileage has been a very respectable 14.7 mpg. Not bad, considering all the tire blistering burn-outs and redline runs through the gears at every opportunity. We're not exactly beating on the Mustang, merely using it in the way it was built to be used.

It has consumed precisely 1½ quarts of oil in 2,362 miles and has

developed only one peculiarity. It will occasionally refuse to idle until it's thoroughly warmed and at other times it will idle at 1,400 rpm for a few minutes. These anomalies disappear as quickly as they come and a visit to the local dealer found all systems normal. Curious.

Those two problems notwithstanding, the car has started promptly in the most frigid winter mornings, run unflinchingly strong and given hours of pleasure on spirited back-road missions. The one other problem area is the car's tail-

(Please turn to page 150)

This Father's Day, give the Great American Outdoors.

Schrade's Scrimshaw series makes an exciting and luxurious gift. Each scrimshaw handle depicts scenes from the Great American Outdoors. Every year, new scenes are offered, so each one of these unique knives is destined to become a collector's item. Many different patterns are available. Each one is beautifully gift boxed.



Each knife may be personalized.

SCHRADER

Write for your free Schrade Almanac to Schrade Cutlery Corp., Ellenville, N.Y. 12428-0590.



**English Leather.
DRIVES WOMEN
CRAZY!**

MEM COMPANY, INC., Norwalk, NJ 07047 © 1982

**STOP PAYING RENT TO THE
PHONE COMPANY!!!**

The phone company is charging you as much as \$7.77 a month for each telephone that you are renting. It makes good sense to return those outdated phones to "Ma Bell", and do away with rental fees forever.

Invest in the phones of the future from **US Tron™** Phonanza Model P.H. #1 will automatically redial the last number you have dialed and simplify the calling of busy numbers. The mute switch gives you privacy. All this at the remarkable price of **\$24.95**. Buy your first Phonanza at **\$24.95** and we will offer you a second one at only **\$19.95**. This will include two free wall holsters which value at **\$6.95** each.

Everyone's talking about **U.S. Tron™** being the innovator in the telephone industry. Shouldn't you have your own **U.S. Tron™** phone to talk on?

Other models available from **U.S. Tron™** are:

- DisLog Model DJ:** Last number redial, mute and on/off ringer switch **\$34.95**
- DisLog Model DJ-H:** "Melody on Hold" **\$54.95**
- DisLog Model DJ-11:** Built in 11 number automatic dialer **\$79.95**
- DisLog Model DJ-11H:** Built in 11 number automatic dialer and "Melody on Hold" **\$89.95**

Wall holster **\$6.95**

If you are not fully satisfied, return to us within 30 days for a proper refund.



Order Toll Free
(Credit card holders only)
800-554-3388

Visa and Mastercard are welcome

Checks or Money orders to be sent to:
Consumer Wholesalers, Ltd.
3572 High Green Drive
Marietta, GA 30067
Telephone: (404) 971-3464

* Please add \$2.50 for insured postage and handling for first product and \$1.00 for each additional product.

**Come home to quality.
Come home to Andersen.**



Free window info!

This colorful 20-page booklet uses a question and answer format to explain window and gliding patio door replacement. A replacement job is discussed step by step and photographed before, during and after. It also includes a detailed energy section with tables, shows the complete Andersen line in before/after installations and explains The Andersen Window Replacement System. Mail coupon to Andersen Corp., Box 12, Bayport, Minnesota 55003. 026-0682

Name _____
Address _____
City _____ State _____
Zip _____ Phone (_____) _____
Area Code _____

Andersen Windowalls



© 1982 Andersen Corp., Bayport, MN

PM'S LONG-TERM CAR TESTS

(Continued from page 149)

happiness when powering out of a corner. Due to the light rear end and heavy front end, the instant horsepower conspires with the solid rear axle to move you sideways. To overcome this problem, you'll have to steady-throttle the car through a corner and get back on the gas only after you've gotten the car unwound and back on the straight.

Ease of service is something which Ford seems to have on its list of priorities because the engine box is one of the neatest and least cluttered we've seen in a long time, especially for a V8.

We'll bring you a further report on the Mustang when we get more miles on it.

Pontiac A6000

The GM A-cars are the most significant and, quite probably, the best cars the General has ever produced. Unfortunately, they were introduced simultaneously with the F-cars (Camaro/Firebird) and those two vehicles have stolen a lot of publicity thunder from the A-cars.

We've barely had a chance to turn a wheel on the 6000, so there isn't much to say in the way of mileage, durability or behavior in daily commuting. We can tell you that it is optioned up almost to the limit, with power seats and windows, automatic transmission, super deluxe interior, high-dollar stereo, sport suspension and more. It's powered by the TBI Four which, so far, has yielded close to 20 mpg. A lot more on this car to come.

PM

WORKSHOP MINICOURSE

(Continued from page 100)

thinned a bit with kerosene is perfect) on the stone to float metal particles to the surface and to keep the stone's pores from clogging. Remember that a plane iron's cutting edge actually should have two angles on it—the grinding angle and the whetting angle (see drawing).

In practice, when using the oil-stone you should only be touching that portion of the blade necessary to create the whetting angle.

Use a perfectly flat stone and keep the edge of the iron flat as you move the iron in either circular or figure-eight motion. After you have whetted the 30° angle on the edge, you will notice a slight wire curl on the flat side of the blade. This must be removed by making several passes of the plane iron, flat side down as shown.

PM



If you're not using Mobil 1, you could be shortchanging your engine.

Mobil 1's unique molecular structure is the reason it lubricates better and helps protect engine parts better against friction and wear than conventional oil. So engines stay cleaner and run smoother.

Mobil 1's molecular structure is also the reason it saves gas compared to conventional oil, helps you start at 35°F below and takes you 25,000 miles (or one year, whichever comes first) between oil changes.

Start treating the inside of your car as well as you treat the outside. It doesn't take a lot of effort, just a little Mobil 1.

Mobil 1 The oil that saves you gas. And more.

**Treat the inside
of your car as well as you
treat the outside.**

PONTIAC GIVES ECONOMY A NEW KICK



1982 J2000

Pontiac has charged-up its fantastic J2000 with a newly available 1.8 liter, overhead cam 4-cylinder engine with Electronic Fuel Injection!

A product of advanced technology and our unwavering love of driving, this efficient little beauty delivers the tough and responsive performance you need, with free-breathing excitement you can feel!

Pontiac's fun new overhead cam J2000! Economy with a kick!

THE DRIVER'S CAR

The makings of a sports machine.

- 1.8 liter overhead cam engine with Electronic Fuel Injection, requires avail. auto. trans.
- Front wheel drive
- MacPherson front struts
- Rack and pinion steering
- Power front disc brakes

*Coupe, Sedan, and Hatchback
14 HWY. EST. 27 EPA EST. MPG
With full load (incl. car, wind tunnel, at 55 mph)
with 1.8 liter overhead cam engine. Comparison
fuel mileage may differ depending on speed,
distance, weather. Actual highway mileage from
GM Best Buy program, 1981 model.
14 HWY. EST. 27 EPA EST. MPG
With 1.8 liter overhead cam engine with
engine produced by GM's 1982
division. Substrains of affiliated
companies worldwide. See your
Pontiac dealer for details.

OHC • FUEL INJECTION

PONTIAC  **NOW THE EXCITEMENT REALLY BEGINS**

TECHNOLOGY UPDATE

It came from Down Under

Inventions

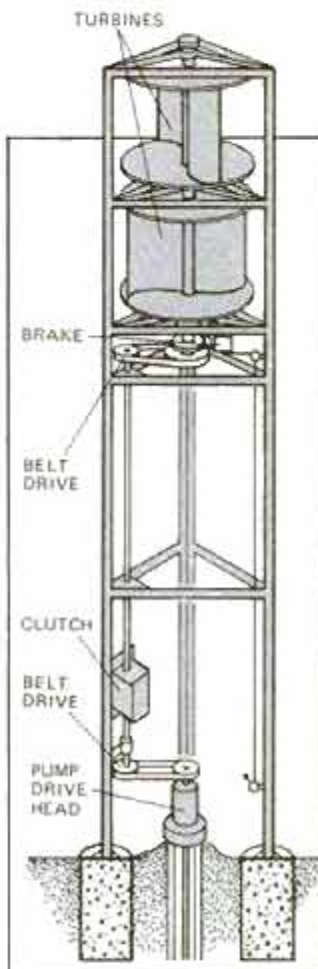
Tinkering and inventing are more than a national pastime in Australia; there's even a television show that celebrates inventors and their hardware. At the recent TechEx technology transfer exhibitions in Lyon, France, and Atlanta, Australian innovations were on hand in abundance. Here are some award winners.

The Marine Thermal Auto-Pilot signals a helmsman when a vessel approaches a current of a desired temperature, such as the critical 72° to 75° F. range required by the tuna industry.

The device is able to interface with an automatic pilot to keep the boat within the thermal current,

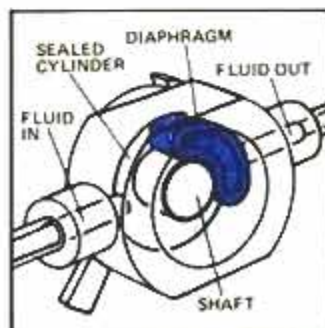
offering considerable savings in fuel. Temperature probes in stainless-steel cases trail in the water on either side of the boat. The 12-volt circuitry operates on a window principle. The operator sets a central temperature and the system steers toward the warmest probe. Developing company is Michael Australia, Box 82, Desmond, New South Wales (N.S.W.) 2299.

The Mono Wind Turbine offers a step up in pumping power for agricultural applications. It couples "S" rotor turbines (efficient at low wind speeds) to a positive displacement helical rotor pump through belt drives and a special clutch. The latter, a centrifugal type, engages (at about twice its cutout speed) when the turbines have stored energy in low

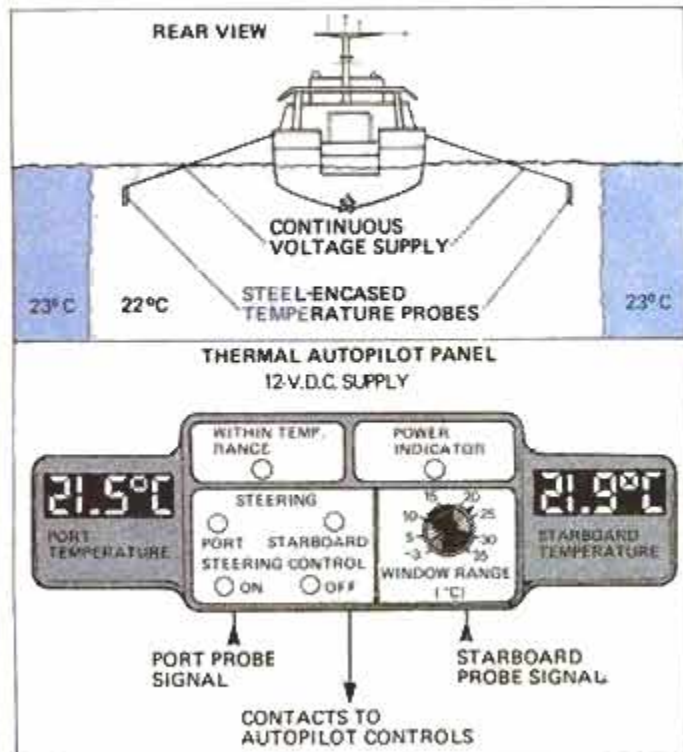


Mill's extra power is from "S" rotors and special clutch.

The positive pressure seal of the diaphragm makes the valve appropriate for a wide range of applications—from domestic water taps to anesthetic gas control, almost anything, except extremely high-pressure or solvent fluids. Design & Technology Ser-



Rolling diaphragm valve: positive seal without any friction.



Thermal steering system allows fishing vessel to find desired currents according to water temperature and stay with them.

winds. The system slows under the drag of the pump, then disengages and the cycle begins again. In moderate (15 to 30 mph) winds, performance is continuous and doesn't need reduction gears to achieve starting torque in low winds. Unisearch Ltd., University of New South Wales, Box 1, Kensington, N.S.W. 2033, is licensing the technology.

The MacLeod Rolling Diaphragm Valve is based on a sealed case containing a short section of silicon rubber tubing which rolls around a central shaft, sealing or opening the valve body. Since there is no sliding friction, wear is reduced; disassembly for maintenance is simple.

vices Pty./Ltd., 225 Colchester Rd., Kilsyth, Victoria 3137 is the licensor.

The Push Cush was invented by housewife Mrs. Joan Stuckey. It's a two-section plastic cushion with a restrictive orifice between sections. The user inflates it partially, then pushes air from one side to the other with the feet. Airplane travelers, arthritics and others have hailed it as the best take-along therapy. Push Cush Co. is at 1166 Burns Rd., Turrumurra, N.S.W. 2074.



Push Cush has been hailed as best therapy for aching feet.

Aviation

Everyman's crop duster

Crop-dusting airplanes come in odd shapes, but this may be the strangest of all—at least to insects lurking on the ground. Looking a bit like a giant bug itself, it's a modified Goldwing ultralight aircraft fitted with sprayers that dispense pesticides, herbicides and other crop-control chemicals.

Dubbed the Gold Duster, it's said



Prop-driven atomizer varies size of spray droplets to control bug-killing pattern.



New role for an ultralight: Spewing twin streams of insecticide, 30-hp Gold Duster covers 40-foot swath at 60 mph, costs \$8,500 as kit, is exempt from FAA licensing.

to be ideal for aerial bug spraying because it can hedgehop close to the ground and land in a peapatch. But the best news for farmers is that it comes as a low-cost, build-it-yourself kit and, under current FAA regulations, its pilot requires no license (though flight instruction is a requisite for an inexperienced owner).

The Gold Duster can cover a 40-foot-wide swath at up to 60 mph, dispensing up to six gallons per minute from each of two spray heads mounted on a boom under the fuselage. In each sprayhead, a tiny, variable-pitch propeller, spinning in the slipstream like a pinwheel, drives a rotating atomizer. Adjusting the

blade pitch varies droplet size from 80 to 1,000 microns. Thus, the spray pattern can be tailored to type of crop, wind and weather conditions.

Originally designed as an ultralight sports plane, the Gold Duster employs a sophisticated three-axis control system, spoilers and an antistall canard wing on the nose—features well suited to the slow, tight maneuvering of crop dusting. (For more on the Goldwing, see *14 New Ultralights You Can Build From Kits*, page 94, May '82.)

It's sold in kit form for \$6,500 and complete for \$9,000. An info pack is \$6 from Goldwing Ltd., Box 1123, Jackson, Calif. 95642.

Attractions

A Fair deal

The 1982 World's Fair opened recently for a six-month stint on a 72-acre fairground in Knoxville, Tenn. Following is a rundown of some technology on display:

Japan—Of the 21 nations taking part, the Republic of Japan steals the show with its industrial robots. The world's robotics leader shows how the automated manipulators perform. Don't miss the unique dome-screen movie theater with a moving floor to transport viewers through Japan's technical history.

Saudi Arabia—The pre-eminence of petroleum in the Middle East energy pic-



Gilded glass "Sunisphere" dominates energy-themed 1982 World's Fair, just opened in Knoxville.

ture has not prevented the Saudis from developing alternatives. The exhibit focuses on domestic uses of solar energy, creating an authentic desert environment.

China—The Chinese consistently tie past and present to the future, so the use of solar energy to power an antiquated, 20-foot "dragon boat" on the Ten-

nessee River seems in keeping. Making propane from local marsh gases is another energy-related demonstration.

Australia—The Australian exhibition houses solar water heaters and a whole family of futuristic windmills that irrigate exotic Eucalyptus trees and similar transplanted flora.

United States—The most impressive pavilion in size and design is the energy-efficient U.S. hall, with 42,000 square feet of exhibit space. The building's roof is a 5,000-square-foot solar collector. And there's a 65-by-90-foot IMAX movie theater, the world's largest, which seats more than 1,200.

The series of exhibit lev-

Design

6 rms. riv vu

We're all familiar with the mobile home as a way to have your house and take it with you, but Gary Dunne of Patchogue, N.Y., has a new wrinkle on the idea. Dunne built his first floating home in 1971 for his own family. Before he knew it, he was in the business.

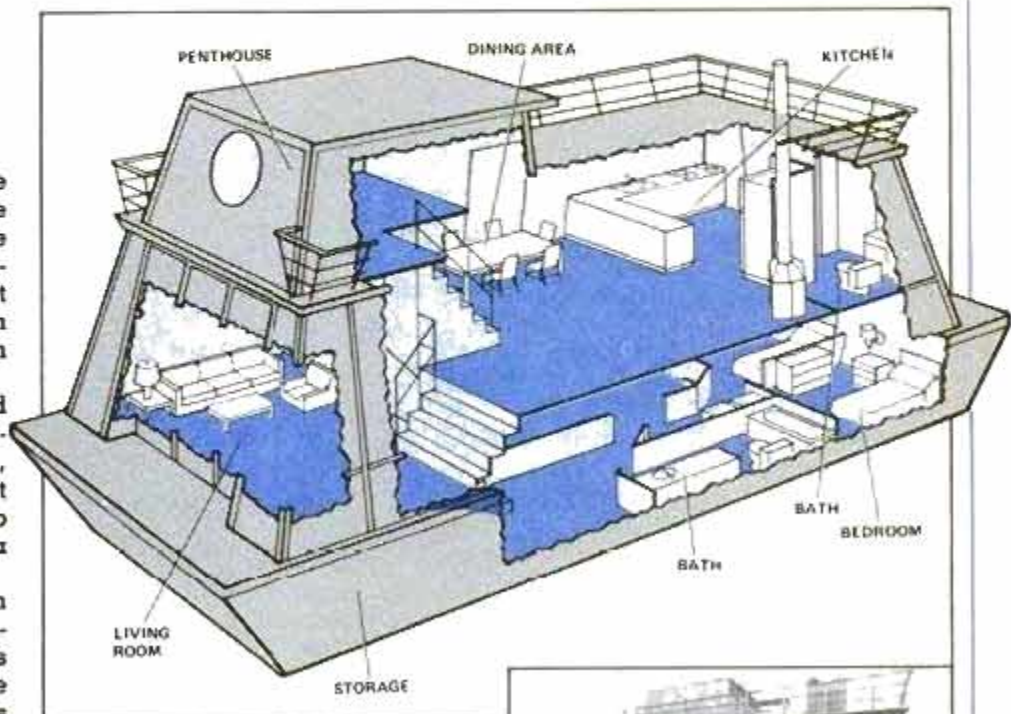
At present, Dunne has completed over 30 homes, from the most popular 1,000-square-foot, two-bedroom, two-story unit to a 1,700 square-foot version with three bedrooms, two baths, a third-story penthouse and a cathedral-ceiling living room.

Dunne's floating house differs from a houseboat because it has no internal power and must be towed to its dock. The homes meet all maritime regulations for floating structures, as well as standard residential building codes, so an owner could lift his home out of the water and set it up on a dry-land foundation.

The house itself is built on a flat-bottom plywood and fiberglass barge which has a draft of only 8 inches. The 4-foot-deep barge is 14½ x 40 feet for the 1,000-square-foot version and 20 x 40 for the three-story model.

The hull is built of pressure-impregnated beams skinned with ¼-inch exterior plywood which has been sealed with a polyester resin. Hot-dipped galvanized nails are used throughout. The whole unit is fused into a monolithic structure with three layers of fiberglass and polyester resin.

Dunne says the key to making a floating house work in terms of comfort is extensive insulation and seal-



ing. He uses double-paned tempered glass for the extensive glass walls used throughout the structure. The ceiling is insulated to a full R-22 value and walls and hull are covered with double-foil-faced fiberglass for an R-11 value.

Warm air is ducted through the house by a propane-fired hot-air furnace. Dunne claims this isn't needed except in the evenings and on overcast days: The large amount of south-facing glass serves as a passive heating system. If the south-facing windows supply too much heat, there is nothing to stop an owner from turning the house around during the hot months.

Mooring is by a pile-and-ring system that allows the house to rise and fall with the tide, but prevents almost all rocking and surging motion.



Builder Dunne (above) with penthouse model floating home. Planned luxury version (below) includes an indoor pool.



els show America's energy history in fabulous, eye-filling detail.

Symbolic of the '82 Fair is the 266-foot-high Sun-sphere, a spectacular 24-carat-gold-coated, energy-efficient glass globe, that houses a split-level restau-

rant and three observation decks.

The Fair is the most energy-efficient way to see how the world plans to cope with its energy needs—at \$9.95 for a one-day admission.

While most of exhibits deal with the future, a brewery-sponsored show recreates a pre-Civil War foundry.



Editor: Robin Nelson
Contributors: Shel Gallagher, John Ross, Harvey Shaman

Electronics

The brain trigger . . .

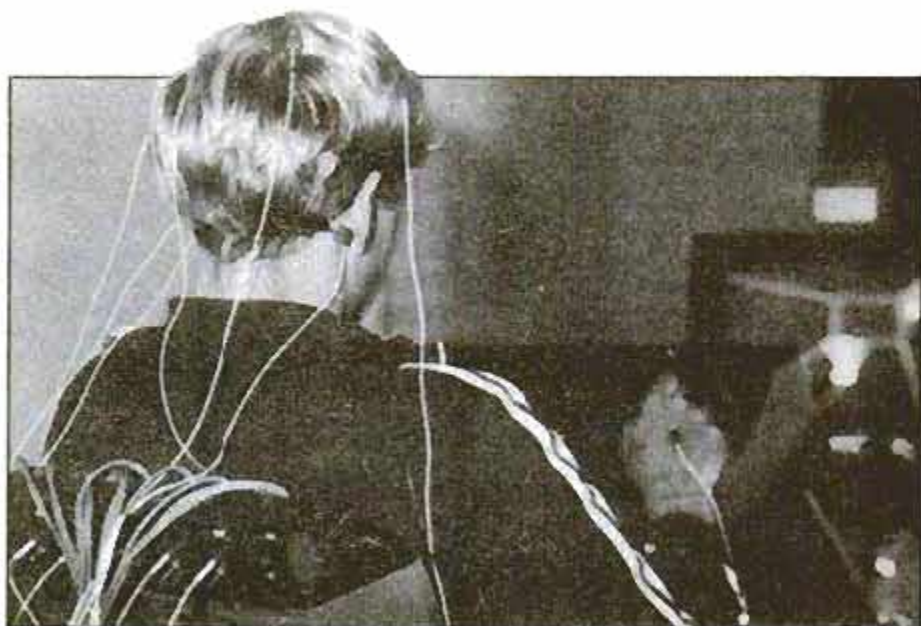
Move over, Freud. The story from the Psychology Dept. of the University of Vienna these days involves sophisticated electronic measurement apparatus and on-line computer monitoring of human brain functions. With systems capable of measuring a d.c. potential change of as little as 1 microvolt (.001 volt) within the cerebral cortex of subjects performing perceptive (reading, memorization) tasks, a major phenomenon has been confirmed:

When there is a slight *negative shift* in d.c. potential in the cortex, a person's learning ability improves immediately by 25 percent. This lets a subject absorb 25 percent more material in a given time, or a given amount of material in three-fourths the time.

So sure are Dr. G. Guttman, department head, and his colleagues of the advantages of learning during cortical negativity, that hundreds of Austrian schoolchildren now spend part of each school day doing relaxant and meditative exercises (see photo) to induce this tiny, critical negative shift in brain electricity.

Guttman's group developed the

Students in Austrian grade schools perform special exercise and meditation routines (inset) to induce brain-wave activity that aids learning.

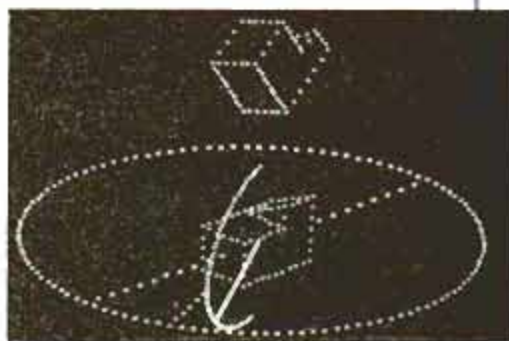


Austrian pilot candidates must solve a series of computer-generated spatial-relation problems (right), while working against resistance machines. Some bomb out under the additional physical stress.

exercises through the use of biofeedback techniques: Negative d.c. potential is picked up via electrode, amplified and converted to a tone which the subject learns to control through trial and error.

. . . And 'champions' who shoot blanks

In a related branch of brain-activity monitoring, the Vienna Psychology



group has developed computer software that presents a subject with perceptual problems while he is undergoing physical stress (on a bicycle ergometer, for example).

Some can hack it; others bomb out on arcade-game type maneuvers that they can perform easily without the added stress. It's led to a system that identifies the "training champion"—the guy who shoots 80 percent from the foul line in practice, but can't convert one out of two in a pressure game situation. And the tests are remarkably consistent: Subjects whose performance isn't altered by added physical stress occasionally even improve slightly; the failures never do.

An outgrowth of these stress games is now used to screen Austrian Air Force pilot candidates, and other NATO military services are considering it.

Is there any hope for the "training champion"? Possibly. Stress performance could be related to the same brain-current shift that regulates perceptual ability—biofeedback training may apply.

28K

PERSONAL COMPUTER

Only

\$299⁰⁰

Special Sale Price



WHAT A SMART INVESTMENT!!!

- For Students and Schools
- Learn to program a computer
- Learn to operate a computer
- For Programmers & Teachers
- For Labs, Engineers, Etc.
- For Small Businesses
- For The Home Owner

PLUG IN EXPANSION

GREATEST BUY IN AMERICA

It has color, sound and music with a powerful 6502 microprocessor (Like Apple). 20,000 Bytes ROM with a 16K microsoft extended Level II Basic built in, 8,000 Bytes RAM plug in expandable to 32K RAM, Cursor, Real time, Full size easy to use 66 key professional typewriter keyboard, 62 keys with graphics symbols, 4 programmable function keys. High resolution graphics, 512 displayable characters, Text display is 23 lines 22 characters, 16 colors. Will accept Tape, Disk-Plug In Cartridges. Has low priced plug in peripherals, Connects to any TV or monitor, includes AC adapter, RF modulator, Switch box, Cables and self teaching instruction book - all in a beautiful Creme Colored Console Case. This is a powerful-full sized-extra featured computer for only \$299.00

WHY SUCH A LOW PRICE

Selling on a direct to customer basis, we save you the profit margin normally made by computer stores and distributors. We are willing to take a small margin to develop volume to cut our cost of operation.

COMPETITIVE LIST PRICES

APPLE \$1125, T. I. \$525, ATARI \$399.95, RADIO SHACK TRS 80 color with only 12K memory sells for \$399.50.

LOW COST PLUG IN EXPANSION

Expansion accessories plug directly into this computer, extra RAM memory, Controllers, a Cassette, A Telephone Modem for only \$109.00, an 80 Column Printer for \$375.00, even the 170K Disk Drive plugs in direct. You do not have to buy an expensive expansion interface.

GET JOB OPPORTUNITIES NOW

Every newspaper has several pages of want ads for computer people. You can learn to operate and program a computer for these opportunities available to those who prepare for the computer revolution. This computer has extended Level II Basic with floating point decimal, Integer and String Arrays, Trig functions, Direct Statement Execution, Multi-statement Lines, Cursor, Full screen editing, Color Command Keys, Graphics, Scrolling, File Management, Upper-Lower Case, Direct Memory Access, Peek and Poke and much more! Assembly machine language is

available. We have easy to follow self teaching books and programs.

INVEST IN YOUR CHILDREN

Educate your children while they play. Every kid wants to play electronic games. (We have some of the best). The next natural step for their curiosity is to try simple programming. They can do this in 20 minutes with our simple self teaching instruction book. High schools are teaching computer math, science and programming - some start in grammar school. If you provide this computer as a Teacher and Tutor at home, before you know it your child will be writing computer programs. You can use your T.V. to EDUCATE not frustrate your family and eliminate T.V. boredom with programs that challenge, stimulate and entertain the whole family. We have a wide variety of games, recreational, home finance and educational programs to choose from. Why pay \$140.00 to \$295.00 for an electronic game when you can buy this powerful computer for only \$299.00.

COMMUNICATE WITH THE WORLD

Plug in your VIC telephone modem. Now you can get a world of information through your telephone, plus electronic mail. Just dial up the information you want. UPI wire service, stock market, historical information by topic from over 60 magazines, including New York times. Airline information, order tickets, get weather information anywhere in the world, restaurant and hotel information, thousands of categories are on line for you, business, finance, education, entertainment, games etc. YOU'LL BE THE TALK OF YOUR NEIGHBORHOOD. Our telephone modem price is by far the lowest available.

IMMEDIATE REPLACEMENT WARRANTY

If your computer fails because of warranty defect within 90 days from date of purchase, you simply send your computer to us via United Parcel Service prepaid. We will "immediately" send you a replacement computer at no charge via United Parcel Service prepaid. No one we know gives you this kind of warranty service. Most computer warranty service takes 30 to 90 days to handle - this fantastic "immediate replacement warranty" is backed by COMMODORE COMPUTER, a MAJOR national brand electronics manufacturer.

SPECIAL SALE PRICE \$299.00

For only \$299.00 you get the powerful 28K COMMODORE VIC with 20K ROM, 8K RAM and Extended Level II Basic, The professional 66 keyboard, color, sound, music, self teaching instruction book, AC adapter, RF modulator, TV switch box, owners manual, plus all of the other extra features listed, in a beautiful Creme Colored Console Case.

SPECIAL SALE PRICE \$379.00

For only \$379.00 you get the more powerful 41K COMMODORE VIC with 20K ROM, 21K RAM and Extended Level II BASIC, plus all of the extra features shown for the 28K COMMODORE VIC!

DON'T MISS THIS SALE -ORDER NOW

- Please send me the 28K Commodore VIC Computer for \$299.00
- Please send me the 41K Commodore VIC Computer for \$379.00
- Special Data Cassette \$69.00

We ship C.O.D. and honor Visa and Master Card.

Name _____

Address _____

City _____

State _____ Zip Code _____

VISA MASTER CARD C.O.D.

Credit Card No. _____

Expiration Date _____

Add \$10.00 for shipping, handling and Insurance. Illinois residents please add 6% tax. Add \$20.00 for CANADA, PUERTO RICO, HAWAII orders. WE DO NO EXPORT TO OTHER COUNTRIES.

Enclose Cashiers Check, Money Order or Personal Check. Allow 14 days for delivery (21 days for Personal Check orders,) 2 to 7 days for phone orders. Canada orders must be in U.S. dollars.



we are
commodore VIC
experts!!

VIC 20
owners register with
us for new product
and program information.

PROTECTO ENTERPRIZES (FACTORY-DIRECT)

BOX 550, BARRINGTON, ILLINOIS 60010
Phone 312/382-5244 to order

20M282

SUPERCHARGE YOUR CAR STEREO

(Continued from page 80)

balanced, with superb radio reception, but it had definite sonic limitations. Here's how we improved it.

We began by extending the frequency range of the system with additional speakers. Most original-equipment car speakers and medium-priced aftermarket units have acceptable response and power-handling capability in the middle ranges; it's in the deep bass and highest treble that their performance is lacking.

To remedy this, we followed the same approach as designers of large home speaker systems: We used specialized speaker drivers that handle the extremes of the music spectrum. At the bass end, we added an Altec SW-1 subwoofer system (\$239.95), which is a 6 x 9 driver with its own built-in amplifier and associated dash-mount control box.

The SW-1 is designed to reproduce the range from 20 to 200 Hz, using what engineers call a "long-throw" cone design—a cone capable of moving long distances in and out, thereby moving enough air to pump out

high-level bass with minimal distortion. It can be mounted in any mid-sized enclosed space: trunk, footwell or even rear side panel, with its control unit up front within easy reach. We dropped one into place behind the seats in the 450SL with about two hours' work. The differences in deep-bass solidity and "oomph" were obvious as soon as we cranked it up.

At the other end of the musical spectrum, a pair of add-on treble units were the key to better high-end definition and a more convincing stereo "image." The idea here was to put the two treble units up as high as possible in the vehicle interior, so that their output blended with and augmented the treble response of the main speakers.

We mounted a pair of Philips 8320 Tune Up Tweeters (\$79.95 per pair) forward in the doors. These speakers consist of 1-inch dome drivers in a sleek, high-tech case with a built-in thumb-wheel level control. In place, their Eurostyled appearance looked just right, and the source of sound had moved upward and acquired a new sharpness—the music now seemed to come from a broad area somewhere on the hood. (All door-mounted speakers, by the way, should be located as far forward as possible to minimize the impact of the slamming doors.)

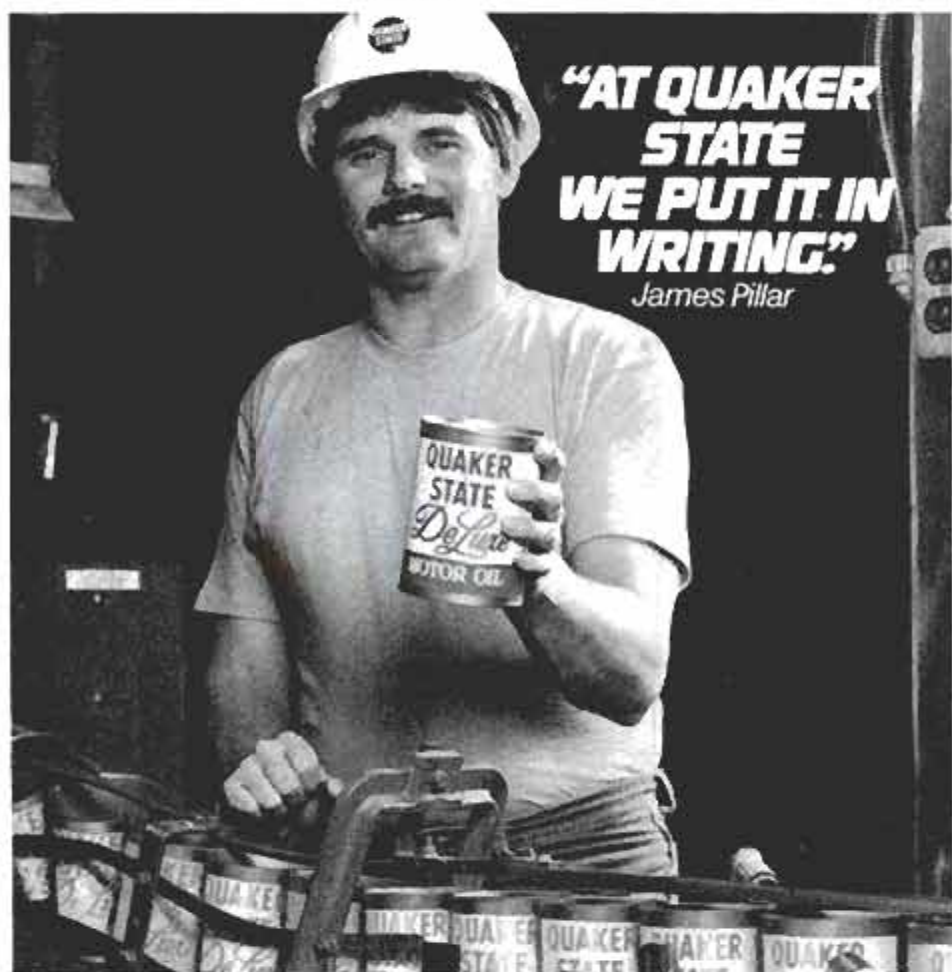
Another deficiency of the car's original sound system had been a lack of power—the Alpine has only 4 watts per channel built into its chassis. (The manufacturer expected most purchasers to use the cassette deck in conjunction with a separate power amplifier.) The owner of the Mercedes had opted to use it without external amplification. Our interest in setting up the system for wider range sound, though, made a separate power amplifier a necessity.

Power to burn

Though only a single, two-channel power amplifier was needed, PM fitted two power amps (shown in the photos on page 81) to illustrate the two basic installation options available. As one approach, we mounted an Alpine 3002 50-watt-per-channel amp in the trunk, fastening it to an inner side panel and routing the speaker and power cables back through the rear panel to the passenger compartment.

As an alternative approach—which might be used in a hatchback, a station wagon or a subcompact car—we installed a low-profile, 50-watt-per-channel ADS Power Plate 100 amplifier (\$320) under the driver's seat, routing its wiring beneath the floor carpeting to the dash. Both of these locations provide the mod-

CAN A MOTOR OIL ACTUALLY HELP YOUR CAR LAST YEARS LONGER?



When you buy motor oil, you can't see it in the can. When you put it in your crankcase, you can't watch it work. So how do you know how good it really is?

At Quaker State, we put it in writing. We back up our quality with a lifetime guarantee. We guarantee every new car engine against oil-related failure for as long as you own your car and use Quaker State. To obtain coverage and for details, write Quaker State, Warranty Department, Oil City, PA, 16301.

And you don't have to buy a new car to benefit from Quaker State quality. When you put Quaker State in your car—old or new—you're putting in America's quality motor oil. Made only from Pennsylvania Grade Crude Oil.

STAYIN' ON THE ROAD WITH QUAKER STATE

est amount of air circulation needed to keep the two amplifiers' operating temperatures within bounds.

Particularly with the convertible top down, the 6 watts per channel from the front-end unit had been adequate for little more than fresh-air background music. The added power from the external amplifiers made it possible to listen at concert-hall volumes and added a sense of unstrained, sonic openness.

In the third phase of our upgrading, we expanded the system's control flexibility—its capacity to be adjusted for proper balance on different types of music. This was accomplished by adding an Alpine 3011 equalizer to the system, mounting it within the driver's reach in the left-hand side of the glovebox. An equalizer is a sort of expanded tone control (see *Get Customized Sound With An Equalizer*, page 110, Apr. '82). It allows the user to boost or cut the system's tonal response more precisely than conventional bass and treble controls do.

By dividing the musical spectrum into many separate bands, each adjustable with a slider control, an equalizer can be used to balance the deep bass with the mid-bass, the lower mid-range and so on, up through the extreme treble.

The Alpine equalizer has five bands per channel, plus illuminated level meters, and an array of secondary controls to be used with rear speakers (which our two-seater project car didn't have).

You can use a car-stereo equalizer two ways: either as a one-time "fix" for your vehicle's acoustical shortcomings, or as a superflexible tone control for the persnickety music listener. In our case, we spent an hour or so adjusting the slider positions, while listening to a variety of musical formats. After that we found that the controls needed little additional fiddling.

We had noticed a lower mid-range hollowness and a bit of mid-treble "sizzle." We were able to rectify both conditions with a few adjustments, further smoothing the sound of what was becoming a first-rate sound system.

Fine tuning

A couple of additional details rounded out the 450SL's sound equipment. To play back the ultra-wide dynamic range, dbx-encoded cassette tapes the car's owner had made on his dbx-equipped home cassette deck, we added an automotive dbx Model 22 decoder to the array of "black boxes" in the glove compartment. We used it in lieu of the Dolby noise-reduction system built into

the Alpine unit, but only on cassettes encoded in the dbx format.

We also replaced the stock Mercedes antenna—which mounts on the right rear quarter—with an extremely sensitive Hirschmann 6900U electronic antenna. It incorporates signal-boosting circuitry built into its cast housing and has a whip length of only 18 inches.

And to connect all of the elements, we used two types of premium low-resistance Monster Cables (that's the company's name, honest)—a heavy-duty, double-jacketed speaker cable that goes by the name Hot-

wires, and a thick shielded wire, called Interlink, for low-level signals. Both are more weather-resistant and freer of stray electrical gremlins like excess capacitance and inductance than conventional wiring. We crimped the speaker connections to spade lugs at each end and covered all wiring splices with heat-shrink tubing.

The final result lived up to our expectations. The upgraded system's sound had an effortless, spacious quality, along with all of the volume and flexibility that an audiophile demands. **PM**

PUT YOUR X-ACTO[®] BLADE TO THE TEST IF IT CAN'T CUT IT ...CHANGE IT

The difference between a dull X-Acto Blade and a sharp one can't be seen. Until it shows up in your work. But before that happens, take a minute to take the X-Acto test.

THE X-ACTO TEST:

1. Put the magazine down, face up.
2. Put your X-Acto Blade on the dotted line and cut along the border.
3. Remove this ad.
4. If your blade didn't cut through three or more pages, replace it. If it did, replace the magazine.

Your X-Acto Blade is designed to make the cleanest cut under the least pressure. When it takes work to make it work, change the blade. And remember: Your X-Acto Knife

is indispensable. But your X-Acto Blade is conveniently disposable.

In a variety of blade types and package sizes wherever X-Acto Products are sold.



Put new life in your X-Acto Knife.



Protect your mileage

Nothing can spoil your engine's performance faster than a balky carburetor.

A piece of grit or rust no larger than a pinpoint can keep needle valves and metering rods from seating properly, wasting fuel and spoiling performance.

The best way to stop trouble is in the fuel line, before it reaches the carburetor.



Clear body lets you check filter performance.

The ProFuel filter has a grit-grabbing element that nabs dirt down to forty microns, protecting vital carburetor parts beyond the original equipment specifications.

And with ProFuel you change only the element, not the whole filter. It's quick and economical.

The ProFuel body is clear, so



Replace only the element, not the whole filter.

that you can check the condition of the fuel and the filter.

The finish is hard chrome that reflects heat and resists rust.

ProFuel is a product of CR Industries, Elgin, IL 60120

Easily installed, it's available in auto stores in your area.

PM OWNERS REPORT: MUSTANG

(Continued from page 83)

sion dropping down into low range."

And a North Carolina analyst wasn't alone when she observed, "If I had it to do over, I'd upgrade my current four-cylinder Mustang to a Six. I miss the performance of a more powerful engine."

In the area of quality and workmanship, nearly half our respondents said "good," but fewer than one-quarter gave Ford workmanship an unqualified "excellent" rating. That's the reverse of the marks given the 1981 Ford Escort, EXP and the '82 Continental.

A Texas aircraft mechanic stated, "Body metal is so thin that if you're not careful, you can dent the car just by leaning on it." A Kentucky programmer noted, "The bottom edges of the doors had no paint on them at all!"

And a New Hampshire secretary: "My Mustang has many body leaks. I'm disappointed in the workmanship of a car that is so costly. I've brought it back to the dealer 10 times in 1,600 miles and the transmission still isn't shifting right. I feel Ford should take this car back and start over!"

However, in fairness, we did hear an impressive number of comments from owners who felt good about quality and workmanship. For example, an Ohio hostess: "It's certainly a solidly built car. I rear-ended another vehicle at a red light and the front bumper and hood of my Mustang came out without a scratch. I hit the other car pretty hard, too."

An Illinois airline pilot: "I think Ford quality has improved greatly in recent times." And a Texas auto parts counterman: "My Mustang is so airtight that, even with the T-top, I have to slam the door to shut it against the air pressure inside."

When we asked owners for suggested changes, several said they'd appreciate higher fuel mileage, bet-



Recaro seat option gives support to enjoy handling of optional TRX suspension.

ter workmanship and a lower price tag. Other recommendations included the following:

From a Michigan insurance manager, "I wish they'd change the horn. Pushing inward on the turn lever is a lousy way to honk, even after you get used to it."

A Minnesota machine operator: "I suggest that Ford expand the size of the glove compartment. Nothing fits in it. The trunk doesn't hold much either—too shallow."

"More legroom in the rear seat," suggested a Wisconsin student. And from an Ohio accountant: "Give us some work space under the hood. Adding oil to the six-cylinder engine amounts to a major operation."

General comfort received high praise for the front seats and, considering the nature of the car, fairly high marks for the rear seat, too. A Michigan salesman noted that, "I'm 6-2, and even when I'm driving with the seat shoved all the way back, passengers tell me there's plenty of room in the rear." But a North Carolina systems analyst countered with, "When my rear passengers get their knees out of their mouths, I'll ask them how they like it back there."

A Tennessee student: "Good driv-

Wild Horses To Go

Try to imagine the automotive equivalent of Genghis Khan pillaging a defenseless village and you'll have some idea of what the 5.0-liter HO Mustang is all about. It's loud and arrogant and it will suck the hubcaps off anything that dares to challenge it.

Granted, it doesn't have the sensuous curves of the new Camaros, the technical sophistication of a Porsche or the exclusivity of an exotic. But the fact that you can buy the 161-hp, 5.0-liter for \$8,682 more than makes up for any def-

icit. At that price, it has to be one of the best go-fast bargains on the market. For that low entry fee, you'll have a vehicle that scatters lesser cars before it like a stiff wind through a pile of leaves.

There is room for improvement, however. The wood-grained dash looks out of place in such a muscular car, the steering effort is too light and the clutch pedal effort is too high. But the fact that you can wipe the smile off the faces of Porsche owners makes those compromises seem minor indeed.—T.A.

ing comfort, smooth ride for such a short wheelbase." A New York factory worker: "I enjoy my AM/FM cassette deck. The sound is beautiful. Interior feels nice and comfortable, and I enjoy my Mustang's ride and the way it handles."

Only about one-third of our respondents had experienced mechanical problems, and among those, dealer service came in for general

praise. The most common malfunctions involved the Mustang's electrical and fuel-intake systems.

In all, then, the Mustang consensus has to be one of owner pleasure and satisfaction. And while only about 75 percent say they'll buy another Mustang next time, most hasten to add that, with growing families, a pony car might not be practical for their next purchase.

The person who summed it all up, however, was a teacher from Utah, who wrote, "I love my Mustang! The luxury and comfort, the smooth ride, handling on curves and slippery roads, the appearance, detail work, service—all these add up to great satisfaction. Besides, the car is fun to drive. I get a lot of compliments and I come from a long line of Ford owners. I'm totally satisfied." **PPM**

SUMMARY OF 1982 FORD MUSTANG OWNERS REPORTS*

Total miles driven 802,115	Specific likes:	Comfort opinion (front seats):	Average 17.3
Average miles per gallon:	Styling 58.0%	Excellent 52.7%	Poor 11.3
2.3-liter Four	Handling 45.0	Good 37.2	
In town 21.0	Economy 26.0	Average 8.2	
Long trips 27.8	Comfort 23.5	Poor 1.9	
3.3-liter Six	Ride 14.5		
In town 17.7		Comfort opinion (rear seats):	
Long trips 23.2	Specific dislikes:	Excellent 14.1%	
4.2-liter V8	No complaints 28.3%	Good 41.8	
In town 16.0	Gas mileage below expectation 15.2	Average 29.3	
Long trips 22.2	Noise and rattles 8.2	Poor 14.7	
Engine choices:	Price too high 7.1		
2.3-liter Four 54.7%	Quality and materials 7.1	Had any mechanical trouble?	
3.3-liter Six 41.3		No 66.7%	
4.2-liter V8 3.5	What changes would you like?	Yes 33.3	
5.0-liter V8 0.5	No changes 21.3%		
Transmission choices:	Better gas mileage 9.3	What type of trouble?	
Automatic 67.6%	Better quality and materials 8.5	Electrical 19.4%	
Manual four-speed 32.4	Lower price 5.9	Fuel intake system 16.4	
	Larger glovebox 4.8	Transmission 14.9	
	Deeper trunk 4.8	Oil leaks 14.9	
		Engine runs on (diesels) 7.5	
Why did you choose the Mustang?	Workmanship opinion:	Dealer repairs satisfactory?	
Styling 67.7%	Excellent 21.6%	Yes 53.2%	
Economy 22.7	Good 48.6	No 46.8	
Size 22.2	Average 23.6		
Past experience 12.6	Poor 6.2	Dealer service opinion:	
Price 10.6		Excellent 34.5%	
		Good 36.9	
			Number of vehicles owned:
			Mustang only 44.4%
			Two cars 34.8
			Three cars 10.1
			Four or more cars 10.7
			Makes of other cars owned:
			Ford 64.3%
			Chevrolet 29.8
			Buick 11.3
			Oldsmobile 9.8
			Mercury 7.8
			Age distribution of owners:
			15-29 years 44.1%
			30-49 years 32.2
			50-plus 23.6
			Would you buy another Mustang?
			Yes 74.7%
			No 25.3
			Would you buy another Ford product?
			Yes 82.3%
			No 17.7

*Percentages might not equal 100% due to rounding or insufficient data.

FINDING THE RIGHT ADHESIVE SHOULDN'T MAKE YOU COME UNGLUED.



Sometimes hunting for the right adhesive is enough to make a grown man cry.

So, Devcon has come up with the self-service Adhesives Store.™ It makes finding the right adhesive easy.

The Adhesives Store has a complete selection of Devcon products. Everything from our new Un-Reel™ 5-Minute® Epoxy Putty to general household cement. You've got it all right at your fingertips. And to make knowing what you need easy, the Adhesives Store comes with a simple-to-read application chart.

The Adhesives Store. It's at your nearby hardware or home center store.



Devcon.

We've taken the guesswork out of adhesives.

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

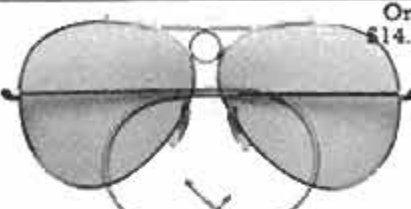
These precision flight glasses are now available to the public for only \$7.95. If you could buy them elsewhere, they'd probably cost you over \$20.00. #20P available in gold or silver frame. A \$20.00 value only \$7.95. Two pairs for \$14.00.



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			
	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.

COMPUTERS BRING CARS TO LIFE

(Continued from page 79)

ufacturing a steel body from a video framework.

"We're always investigating new areas with the computer," Don Parker told us as we were being shown around GM's Fisher Body Div. "With it, we can find inherently weak areas. Or we can see areas that may not do as much work as other areas—and use mass reduction there."

Put to the test

We watched as a doorpost was put through something called finite regression analysis. The video display zoomed in until only a portion of the doorpost, less than a few inches of it, filled the screen. Then, the computer displayed a network of triangles all along the magnified part.

The woman working the console took control of that doorpost's destiny as she entered several variables via keyboard and light pen to simulate lateral stress on that doorpost. Within each triangular area, she questioned the computer for a detailed printout of the stresses and how they affected the stability of the "metal."

We watched spellbound. Had Detroit forgotten how to make a doorpost? What was all the fuss about?

The idea was mass reduction. Less mass means better fuel economy. By using the computer, designers can find out just how much metal to shave away from the finished version so that it would still support the roof, yet have the least possible mass. Almost anyone could figure out that a thick doorpost will support a roof. But how slender can that post become and still hold a roof above your head? Finite regression analysis can tell you.

The computer helped to shave away a little here and a little there—a bit off the top, a slice off the side.

Finally, a computer is used to design the dies from which the actual parts of the car's body will be cast. From clay, through video, to the blazing furnaces of a steel mill, the typical design project takes four years.

There are even more applications of the computer just over the automotive horizon.

At Ford, we watched a video driving simulator. Seated at the console, the operator could "drive" a car through a number of different road conditions. With just a touch of the keyboard, he could drive an entirely different car, or adjust such things as spring rates, shock-absorber rebound and roll steel. When the drive

felt good, then a prototype car could be built for road testing.

But while most of today's computer applications involve structural metal design, engineers are also getting ready to design the functioning parts of automotive machinery on computer. Instead of ghostly, wire-frame images of cars on screen, there are already computer programs that can display exact three-dimensional representations of everything from hubcaps to camshafts.

Dr. J.W. Boyse, of GM's research labs, explained how the new GM-Solid computer program works.

A collection of "primitive" shapes is stored in the computer's memory banks. These simple, 3-D shapes may be combined into any number of very complex shapes.

Suppose, for example, you want to "drill" a few holes into a flat plate of "steel" on the screen. What you do is to "subtract" cylinders whose diam-



Once you've defined a three-dimensional shape, it's easy to design a shape that it "fits into." The GM-Solid program (above) designs matching machined surfaces.

eters match those of the holes from the plate. Presto. The holes are drilled.

We saw a camshaft model that was as accurate and detailed as a photo of an actual part. But the camshaft had yet to be manufactured and existed only in the computer. Ford uses a similar system to analyze stress.

An ever-increasing amount of design work will be accomplished by these computers. Even more exact tests and procedures will be developed. But no matter how important the computer becomes, human ingenuity and appreciation of beauty and utility will be the driving force.

Yesterday's car designers sat in dim classrooms, doodling futuristic autos in their notebooks as the professors droned on. Tomorrow's designers may be doodling, too—and dreaming of a keyboard to call their own.

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-1-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.†



**Built
Ford
Tough**

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



Electronic Water Injection... The Only Accurate Way To Suppress Knock & Ping. VARA-JECTION by Edelbrock!

Electronics allows water injection on a graduating basis as needed; mechanical units do not.

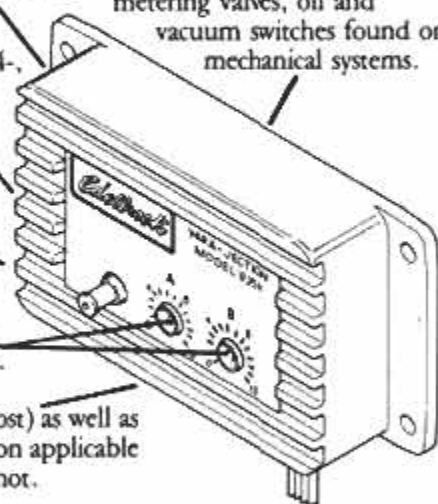
You set the system electronically for 4-, 6-, or 8-cylinder engines specifically; mechanical units do not.

Control module signals variable speed pump to make split second water flow changes; mechanical units do not.

Fine tuning adjustments allow tailoring of system to specific vehicle use, road, weather and fuel conditions.

Components sense positive pressure (boost) as well as depression (vacuum), making Vara-Jection applicable to turbochargers; mechanical units are not.

100% solid state control box eliminates need for additional metering valves, oil and vacuum switches found on mechanical systems.



Reliable, solid state electronics allows essential functions impossible to achieve with any mechanical water injection system. As vehicle and application vary, so do the amount and timing of water required to control detonation. Vara-Jection assures broad adjustment capability through a combination of fine tuning and nozzle selection. Synchronize water delivery to match your specific engine's needs through the accuracy of Vara-Jection electronics.

Receive a free 4-page brochure by writing 411 Coral Circle, Dept. PM682, El Segundo, CA 90245.

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, 16 1/2" drill press, 34" lathe and horizontal drilling machine—powered by a heavy duty 18 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.



MasterShop
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. B206
3728 Benner Rd., Miamisburg, Ohio 45342

NAME _____

ADDRESS _____

CITY _____

STATE _____ ZIP _____

NO-FUEL BOATING

(Continued from page 93)

folds away, and there are bunks for seven. At about \$1,000 a foot, it's no more than big yachts of years ago.

Meanwhile, Supercats of 15, 17 and 20 feet, have been cleaning up at catamaran regattas. They are built by Boston Whaler Multihulls, at Riviera Beach, Fla., with computer-influenced elliptical hulls. Prices are \$4,490, \$5,670 and \$9,950 f.o.b.

New \$995 Freesail board-sailers have been announced by O'Brien;



Assorted color combinations for hulls and sails are new for popular Homar Phantoms.



Twin inflated tubes are said to aid the stability of the British Twinsurfer sailboard.



The New MonArk M-1 14-footer has lockers for oars and outboard if the wind fails.

and Kona, in Oak Hill, Fla., has a \$1,995 catamaran sailboard. Twinsurfer is a British inflatable surfboard. Homar Boats, Edison, N.J., has three new Phantom models for under \$1,400. MonArk is introducing a \$2,915 row-power-sailboat. **PM**

THE HOT BLAST FROM FRANCE

(Continued from page 90)

many early turbo cars, isn't evident in the Fuego. Boost comes on smoothly at 2,500 rpm and stays steady all the way up to red line. Mercifully, the engine isn't saddled with a rev limiter or any of that nonsense, but has a genuine waste gate to blow off excess boost. The turbo itself is a Garrett T3 unit.

Both engines provide lively performance, though the turbocharged version is, understandably, a lot more fun to drive and yields respectable mileage, even at very high speeds.

There was indication from Renault that a two-liter turbocharged version of that engine might eventually be introduced in the United States. If that does come to pass, those extra 400 cc might very well propel the Fuego into a supercar. The Turbo will be available only with the five-speed manual transmission. The shiftless will rightfully be limited to the normally aspirated version.

Traditionally good ride

The French have always been able to dial in a good ride and the Fuego doesn't break this tradition. The ride quality is firm, yet supple, and fords road irregularities without drama.

However, these were European roads, mind you. The car has yet to be tested in the ultimate trial by crater—New York City streets.

The Fuego styling is something no one will be lukewarm about. Comments from knowledgeable observers ranged from "stunning" to "the hunchback of Malmaison." I liked it a lot in European trim, and, with some reservation, like it in its American version, as well. At any rate, it's a refreshing change from the Japanese folded-paper school of design and the quickly vanishing American chiseled-shoebbox approach.

As a strictly technical exercise in packaging, the Fuego is an unqualified success. Even though its wheelbase is a mere 2 inches longer than the R5 (96 vs. 94), Renault has managed to carve out a huge amount of interior space.

The one reservation I have in the American version is the chromed headlight "buckets." By law, manufacturers are not allowed to use flush headlight covers as they do in Europe, a dumb law if ever there was one. But to go with chrome for the bezels is making a bad situation worse. My humble suggestion would be to make them black.

The question that needs to be

asked now is "Can the Fuego find fame and fortune in the United States?"

Judging by how it ran in the high-speed European environment, it's somewhat overqualified for the generally less demanding American driver.

But car enthusiasts should love it. And the price is certainly attractive: \$8,400 for the unblown version and \$10,700 for the Turbo version. With those good things going for it, the Fuego, which is now in AMC showrooms, certainly seems to be destined for success. **FM**

SPECIFICATIONS—RENAULT FUEGO

Engine	Standard/Turbo
Displacement	1.6 liters
Bore	79 mm
Stroke	84 mm
Compression ratio	8.6:1/8.0:1
Maximum horsepower @ 5,500 rpm	81.53/107
Maximum torque (ft.-lb. @ 2,500 rpm)	86.29/120
Fuel/air supply	Bosch L-Jetronic fuel injection
Maximum boost	N.A.:9.5 p.s.i.
Dimensions	
Wheelbase	96.1 in.
Overall length	176.8 in.
Height	50.5 in.
Tread—front/rear	56.4/53.0
Overall width	66.6 in.
Fuel capacity	14.8 gal.
Luggage capacity (back seat up)	13.76 cu. ft.
Tire size—base model	185/70 x 13
Curb weight—base model	2,379 lbs.

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 most of 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 FREE INFORMATION about the *HYDRA-DRILL* and how you can drill your own water well, send your name and address to: DeepRock



Mfg., 462 Anderson Road, Opelika, Alabama 36802. Better yet—call our toll-free number.

VISITORS WELCOME!

**CALL TOLL-FREE
1-800-821-2280**

Ask for Ext. 462

*Call anytime including Sundays
OR CLIP COUPON AND MAIL TODAY!

DeepRock

462 Anderson Rd.
Opelika, Alabama 36802

SINCE
1962

I want an economical dependable supply of good, pure water on my property. Please rush full information kit and prices by **FIRST CLASS MAIL**.

Print Name _____

Address _____

City _____

State _____

Zip _____

1981 DeepRock Mfg.



FOR PRIZED POSSESSIONS & THINGS THAT STICK OR SQUEAK.

NEW TEFLON® *Wet* Lubricant... superior lubrication and rust protection for expensive tools, firearms, sports equipment—even motors and garden tools.
NEW TEFLON® *Dry* Lubricant... clean, non-staining lubrication for cameras, fine furniture, antiques, musical instruments—even windows, doors and zippers.
Keep 'em handy in home, auto, boat and shop

*Teflon is a trademark of DuPont



Better Things for Better Living

NEXT MONTH IN PM

- **Secret spy plane that watches the world's hot spots: Story of the highest flying airplane by the builder.**
- **New motorcycles that give blinding performance.**
- **Test of the world's biggest out-board.**
- **All about building traditional stone fences.**

SUBSCRIPTION SERVICE: Popular Mechanics Magazine will, upon receipt from its reader of a complete new or renewal subscription order, undertake fulfillment of that order 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 Juan 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 WBPM
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. Canadian and foreign prices upon request.)

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
or call toll-free: 800-247-5470
State of Iowa residents call: 800-532-1272

NAME _____ (Please print)

NEW ADDRESS _____

CITY _____ STATE _____ ZIP CODE _____

Motorize your bike. Get over 200 mpg!

Forget expensive mopeds!

- 2-HP or 1.3-HP/Up to 45 MPH
- Fits most bikes
- Fast, reliable — fun
- Allows free pedaling
- Installs easily
- Satisfaction guaranteed

Free information
and rebate offer!
Call toll-free
1 800 821-7700
Ext. 1001R anytime!
In Missouri call
1 800 892-7655
Ext. 1001R
(or write)

Bumble-Bike

Dept. 1R
P.O. Box 1116
Havana, FL
32333



Get Your COLLEGE DEGREE

at Home in Spare Time

NO PREVIOUS
EXPERIENCE NEEDED
Approved for Veterans

- Business Management
- Accounting

Marketing, finance, public relations,
personnel, much more

- Engineering Technology

Be part of the team that designs, tests, builds, and troubleshoots. Work on exciting projects! Every car, bridge, space shuttle requires the knowledge and skills of trained engineering technicians.

FULLY ACCREDITED

Now you can get the same kind of training program used by Fortune 500 Companies. No need to change your working schedule or social life. No traveling to class. Lessons are graded and returned to you by mail. Instructors are as close as your telephone...no charge! Use our toll-free 24-hour home-study hotline as soon as you enroll. ASB College Degree awarded with major in Business Management or Accounting. AST College Degree awarded with major in Civil, Electrical or Mechanical Engineering Technology and Electronics and Drafting Technology.

SEND FOR FREE FACTS!

CS CENTER FOR DEGREE STUDIES, Dept. PBS52
Scranton, Pennsylvania 18515
Rush free facts telling how I can get my College Degree. **CHECK ONE BOX ONLY!**
 Business Management Accounting Mechanical Engr. Tech. Electrical Engr. Tech. Civil Engr. Tech. Electronics Tech. Drafting Tech.
Name _____ Age _____
Address _____
City/State/Zip _____

How Havoline Supreme can help you get the most out of your car.



Proven protection up front.

Backed by improved mileage.

Whether you change your own oil or someone else does, there are some important things you should know about Havoline Supreme.

First of all, Havoline Supreme has a Texaco-developed, balanced additive system with a built-in, special friction fighter.

And its multigrade rating offers the convenience of all-year-round, wide-temperature range protection.

Havoline gives you proven protection.

The final test of a motor oil comes under actual driving conditions. Havoline Supreme has proven it delivers the kind of protection needed in

tough, high-speed state trooper cars and severe stop-and-go driving in New York City taxis.



Havoline helps save gasoline.

Fuel economy tests proved it. Compared to a conventional motor oil, Havoline

3 9 8 2 4 2

Supreme, with its special friction-fighting additive, helps save gasoline.

Havoline is diesel tested.

If you own a diesel, we have good news. Havoline 10W-30 has the API-SF/CC rating required by most engines like yours. And it's been proven in punishing diesel-powered taxis.



Listen to an expert.

Top Indy 500 driver Tom Sneva calls

Havoline Supreme a "very sophisticated oil...one that a prudent car owner should use on a regular schedule." Shouldn't you?



You can trust your car to the products with the Star.

INTRODUCING THE BENCHTOP WORKSHOP

BIG TOOL CAPABILITY AT LITTLE TOOL PRICES.

It's a whole new idea in power tools from Shopcraft® All the precision of stationary tools. For a whole lot less.

In fact, Shopcraft BenchTop Tool prices start where quality portables leave off. So you get a lot more capability for just

a little more money.

Shopcraft tools are tough, remarkably easy to use and they fit right on your workbench.

10-Inch Band Saw So you can do precise mitering and intricate cutting with ease.

¾ & ½-Inch Drill Presses Give you the precision you need for

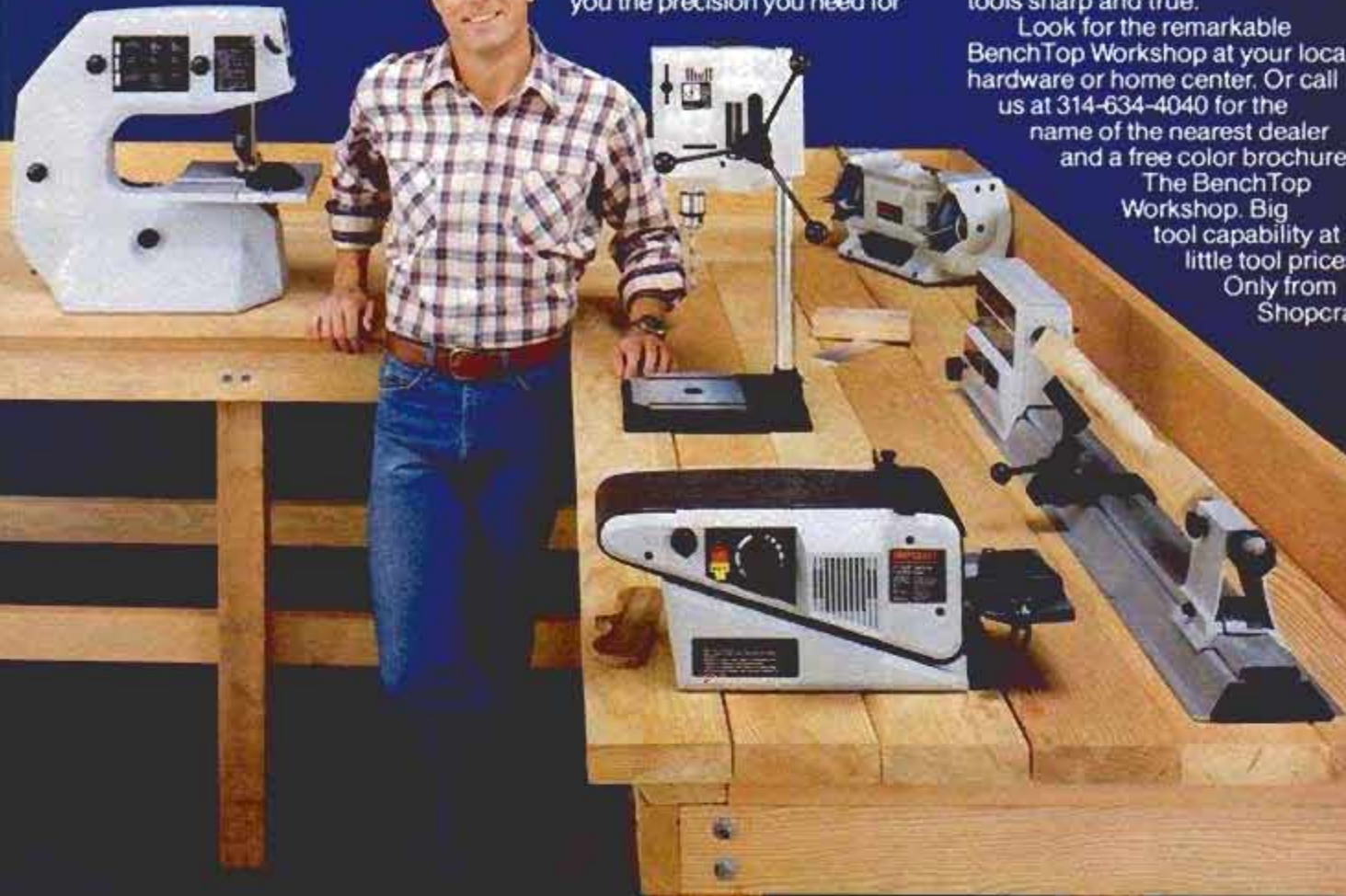
dowel pinning and counter boring. **Wood Lathe** With variable speed to help you shape, sand and turn beautifully.

4-Inch Belt Sander The power you need for satin smooth finishes without hand sanding.

5 & 6-Inch Grinders To keep your tools sharp and true.

Look for the remarkable BenchTop Workshop at your local hardware or home center. Or call us at 314-634-4040 for the name of the nearest dealer and a free color brochure.

The BenchTop Workshop. Big tool capability at little tool prices. Only from Shopcraft.



SHOPCRAFT®
BENCHTOP TOOLS
BenchMark Tool Company
Jefferson City, Missouri 65101

© 1982 BenchMark Tool Company USA

CAPTURE THE STARS ON FILM

(Continued from page 84)

second shutter speed at F/8 with a 400 ASA-speed film. A half-moon requires an exposure four times longer— $\frac{1}{125}$ second. Though the moon is in motion, relative to the Earth, exposure times are short enough to produce a sharp image.

But if you want to get photos that take you right into the moon's craters, mountains and valleys, you will need much higher power—and that calls for a telescope with a motor drive (see *Backyard Voyage To The Stars* on page 86 for more on what these drives do).

The sun

Extreme caution must be exercised in any solar photography. Be sure to use special filters to prevent blindness or camera damage. A beginner should seek expert help.

A solar eclipse is often regarded as one of nature's grandest spectacles. The next major eclipse will occur in Indonesia on June 11, 1983. (If you're interested in seeing or photographing it—with expert guidance—you can write to Sciencefaction Expeditions, Dept. PM, 3 East 54th St., New York, N.Y. 10022.)

The planets

Planets are such tiny objects, as they appear in the sky, that a telescope is an absolute necessity for photographing them with any sort of detail. Venus, Mars, Jupiter and Saturn are within the grasp of amateurs with conventional equipment—the others are too far away, too small or both.

The technique (which can also be used for high-powered lunar photography) is simple, but demanding—it's called "eyepiece projection."

The lens is removed from the camera. The camera is held in a light-tight sleeve above the telescope's eyepiece. In effect, the telescope and eyepiece become the camera's lens.

Exposure times range from a fraction of a second to a few seconds. Start with $\frac{1}{2}$ second and photograph in steps to 10 seconds. But expect a high failure rate. Be happy with even one perfect photo out of 36. Vibrations in the mount or motor drive, slight misalignments, atmospheric disturbances—all these variables will be challenging to overcome.

Surprisingly, some of the best photos of this type have been taken in metropolitan areas under smoggy conditions. City lights don't affect short exposures and, because of inversion layers, smog may mean a steady sky.

Comets

It is only rarely that a comet appears that can be seen in the sky without a telescope (Halley's Comet in late 1985, for example). Then a camera and tripod—with the star platform described here—will be enough to capture the image with only a 45-second exposure.

Faint comets, however, require longer exposures. The camera may be mounted piggyback on a telescope, as detailed below.

Galaxies, nebulae, globular clusters and other heavenly phenomena require patience, skill—and a certain amount of equipment.

With a telescope, high power and detail are both available. A 6-inch telescope, for example, has a focal length of 48 inches or 1,200 mm, if it's one of the popular F/8 variety. This focal length makes such a telescope a superpowerful "long lens."

There are two ways of using such a telescope with a camera. The first is called piggybacking. Most telescopes have an optional mount that lets them serve as a driving mechanism for a camera which is mounted on their tube. The mass of the telescope will support a camera's heavy telephoto lens.

But most camera lenses can't use the actual telescope as a lens. Instead, they use a method, called "prime focus," in which the camera is attached to the telescope through the eyepiece tube. (In some telescopes, it may be necessary to move the mirror; instructions are usually included with the telescope.)

Either method requires that the telescope be guided. This is because deep-sky photos can take as long as two hours to expose. Even the best motor drives have some movement error which can smear the image. An eyepiece with an illuminated cross hair is used along with electronic or manual slow-motion guidance to stop the motor drive from wandering.

Long exposures can make film behave strangely. Color balance goes out of whack and the emulsion stops recording the image. To minimize this problem, film is often treated in one of two ways. One method uses a "cold camera" which keeps film at low temperatures—but this is quite expensive.

A recent discovery is called hypersensitization. You can get at-home kits to treat film or buy already sensitized film.

Final hints

Process your film normally, and do not "push" the development. And be certain that the first and last photos

(Please turn to page 170)

MAKES THINGS WORK BETTER!

BELT-EASE® BELT DRESSING

Long lasting, crystal clear, clean belt dressing gives extra traction and life to automotive V-belts and all drive belts on appliances, blowers, and power equipment. 5.5-oz. aerosol.



LOCK-EASE® GRAPHITED LOCK FLUID

Keeps all locks working smoothly year 'round. Seals out moisture, protects against freezing and rust. Frees frozen and stuck locks. 3.5-oz. aerosol with snorkel; 3.4 oz. can.



LITH-EASE® WHITE LITHIUM GREASE

An all weather grease for auto, farm, marine and shop use. Preferred because of its superior film strength plus water and heat resistance. LITH-EASE provides excellent lubrication and rust protection. 16-oz. aerosol; 1-lb. tub; 1½-oz. tube.



Available wherever fine automotive and hardware products are sold.



American Grease Stick Co.
Muskegon, Michigan 49443



IT ONLY LOOKS HARD...

... but it's really easy!

The secret's in our kits—imported from Europe—where these historic ship models are hand-crafted in walnut and rich woods by some of the finest model makers in the world. Solid brass, cast bronze and detailed wood fittings are used throughout. The hard work is done for you—most parts are pre-cut. Assembly is simple as you follow step-by-step instructions and large scale plans. Everything you need to complete is included, and we guarantee satisfaction.

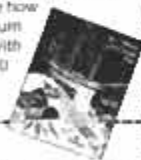
Even if you have never built a ship before, send for our full-color catalog. See how easy it can be to build a museum quality model you will display with pride in home or office. Only \$2.00!

Mail This Coupon Today!

MODEL EXPO, INC.
23 Just Road, Fairfield, N.J. 07006 Dept. PM-62

Please send full color catalog. \$2.00 enclosed

Name _____
Address _____
City _____ State _____ Zip _____



Listen to television on your stereo.



IN SIMULATED STEREO!

TELEADAPTER® easily connects to any TV and plugs into the Aux., Tape, or Tuner input of any stereo amplifier. (TV and stereo can be any distance apart.) All TV programs will come through your stereo amplifier and speakers, even Video Tape, or Cable TV shows. Quality electronic circuitry assures correct 10 to 50,000 OHM impedance matching, for full 50 to 15,000 HZ frequency response. The matrix circuitry actually provides two channels of simulated stereo. Total chassis isolation means protection for both your stereo and TV. TELEADAPTER® is also great for using stereo headphones and taping TV programs. Complete with instructions, and TWO YEAR WARRANTY. 15 day trial or money back if dissatisfied.

The TE-200 Teledapter

only \$39.95 Plus \$3.00 Shipping and Handling

To order: Call toll free
1-800-251-8808 24 hours
or enclose check or
 Master Card VISA

Card # _____
Expiration date _____

Name _____
Address _____
City _____ State _____ Zip _____

SEND FREE CATALOG

RHOADES
NATIONAL CORPORATION
P.O. Box 1052 Dept. PM
Columbia, TN 38401
(615) 381-9001

CAPTURE THE STARS ON FILM (Continued from page 169)

on a roll are of "normal" subjects (people or places). Otherwise, a lab technician may have difficulty in figuring where your frames begin and end. What a disaster it would be to have a constellation shot split in half and returned mounted as two slides!

Bracket your shots extensively for short exposure work. And make certain you try constellation, comet and

deep-sky photography only on moonless nights and away from city lights.

You might also buy a copy of Kodak's *Astrophotography Basics*. It's 45 cents from your dealer or direct from Eastman Kodak Co., Dept. 454, Rochester, N.Y. 14650.

Astrophotography is one of the most rewarding facets of a truly heavenly hobby. **PM**

BUILD A STAR PLATFORM

Here's a simple-to-build Star Platform that will enable your camera to follow the apparent motion of the heavens. A special motor which turns at one revolution per day lets you use long exposures (45 seconds on fast color film for constellations, around three minutes for deep-sky objects) without images streaking.

Construction

Drill two 1/8-in. holes in the tee plate, as shown on template. Bend the plate with three 90° bends, as shown. Solder a 1/4-20 nut over

cord through the plate hole; connect a plug.

Loosely screw the second 1/4-20 nut down the motor shaft (over the threaded shank). Tighten the nut against the mount.

With a sturdy tripod, focus your camera on the North Star and lock tripod's pan-head adjustment. Remove the camera and attach the Star Platform to tripod (the motor's axis will now point to the North Star) by threading tripod's screw into soldered nut. Gently attach your camera on a ball and socket mount (see parts list) to the platform—do not force motor gears counterclockwise (as seen from shaft side) or they'll strip. Tighten ball and socket setscrew if so equipped.

Plug in platform motor once you've positioned camera to photograph any object in the night sky. Don't expect to see the motor move, since it is very slow.—R.L.

PARTS LIST—STAR PLATFORM

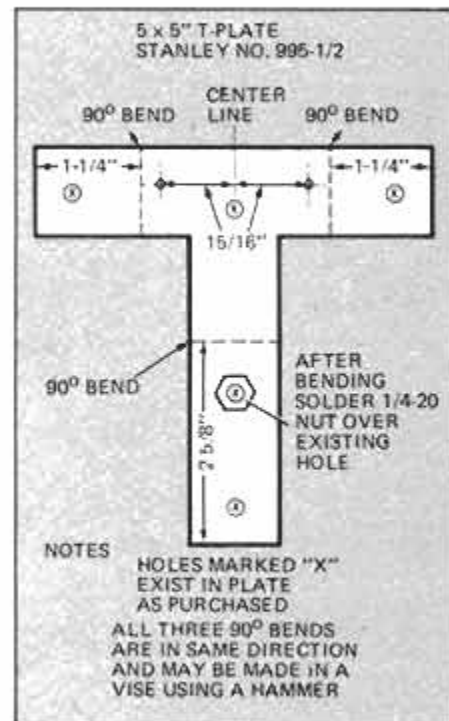
- 1/4-20 brass bolt, at least 1/2 in. long
- 1/4-20 brass nut (2)
- 5/32-in. machine screws and nuts, 3/8 in. long (2)
- 5 x 5-in. flat tee plate (Stanley No. 995-1/2 or equivalent)
- Ball and socket camera mount
- Two-pronged electrical plug
- Synchronous geared motor (should turn one revolution per day and have 1/8-in.-dia. x 3/8-in.-length shaft). This motor is \$12 postpaid from Criterion Scientific Instruments, 620 Oakwood Ave., Dept. PM, West Hartford, Conn. 06110.



Platform mounts directly on the tripod. Pan head is positioned so that the shaft of the motor points to the North Star. Camera attaches to shaft with ball and socket mount.

the hole (inside the bends) using one of the 1/4-20 brass bolts to hold it in position.

To mount the motor, hacksaw the head off a 1/4-20 bolt which will leave approximately a 3/8-in. shank. Holding the shank in a vise, drill a 1/16-in. pilot hole through shank's length and then a 1/8-in. hole. Sandpaper the motor's shaft to clean it and place this threaded shank over it before soldering it in place at the top of the motor shank. Strip a small amount of insulation from the motor's two wires and solder a lamp-cord extension to them (wrap with insulating tape). Knot a strain relief following the splice. Place the motor "inside" the three 90° bends and fasten with the two 5/32-in. machine screws and nuts. Push the



The text details how to use a template (above) to drill and bend a flat tee plate.



Home building, maintenance, and repair . . .
energy conservation, hobbies, and more!

The **HOW-TO BOOK CLUB** shows you
hundreds of ways to do-it-yourself
. . . and save money too!

Select 6 exceptional books
for only **\$2.95** (values to \$132.65)

Join Now, Get a Work Apron FREE!

1336 List \$16.95
1328 List \$17.95
1178 List \$9.95
1315 List \$19.95
1321 List \$10.95
1173 List \$15.95
1287 List \$18.95
1348 List \$16.95
1320 List \$21.95
1279 List \$16.95
1371 List \$19.95
1281 List \$12.95
1307 List \$17.95
1285 List \$16.95
1244 List \$18.95
1227 List \$15.95
1204 List \$15.95
1316 List \$16.95
1159 List \$15.95
1365 List \$16.95
1105 List \$9.95
1359 List \$19.95
1172 List \$15.95

Heavy-duty work apron
free when you join!



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 13 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 my free work apron. I understand the cost of the books selected is \$2.95 (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.

1105 1159 1172 1173 1178 1204 1227 1244
1279 1281 1285 1287 1307 1315 1316 1320
1321 1328 1336 1348 1359 1365 1371 8434

Name _____ Phone _____

Address _____

City _____

State _____ Zip _____

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

PM-582

bit wobbly and the scope wasn't as easy to use as the C-90. The Dyna-scope RV6, however, made by the same company, was a great buy among Newtonians at \$299.

The other four scopes are made by Edmund Scientific, an amateur science mail-order house that provides a great range of products. The 6-inch Edmund gave us excellent views of the planetary surfaces. Standing on the steadiest of mountings, it was one of the easiest telescopes to assemble. You might wince at the \$479 price tag, but it wasn't out of line for the optics.

Big mirrors, big light

The other Edmunds were less spectacular viewing instruments, largely because their mirrors are less than 5 inches across. The larger the mirror, the better the scope. A 4-inch scope collects 16 times the light of a 1-inch model, meaning distant objects will be 16 times brighter.

Large mirrors also have better resolving power—they are better at splitting binary (double) or triple stars, and they provide much more detail of planetary surfaces.

While the three other Edmund scopes provide less mirror than the leader, they have many features to recommend them to the beginner. All three are lightweight and need little or no assembly.

The 2001, Edmund's most popular device, is a perfect field telescope for the novice. Shaped like a basketball, it comes with a carrying strap and weighs 10 pounds complete. Its 4 1/4-inch mirror is ample for starters. The 2001, similar to a Newtonian in design, is a "rich-field" telescope. This means it can show a wider field than other scopes. Of course, this comes at some sacrifice of detail. The 2001, for instance, gave us a view of Jupiter comparable to a good set of binoculars. Yet it gave us brilliant views of wide-area wonders, such as the "seven" stars of the Pleiades constellation, which resolve into scores of luminous star clusters.

The Edmund F10, which also has a 4 1/2-inch mirror, has features that the less expensive 2001 doesn't, such as a large, sturdy tripod and a long-focal length for sharp magnification.

Among the smaller scopes, the Edmund F6, with a 3-inch mirror, is

a bargain at \$159. Its short focal-length ratio of f/6 made distant stars quite bright. The focal-length ratio expresses the mirror size divided by the distance to the eyepiece. With this f/6 scope, then, the distance from the mirror to the focus point is two inches. Short focal lengths provide brighter images and wider fields of view.

Magnification's no big thing

Many a beginner has been taken in by claims of very high magnification. But in astronomy, magnification is relatively unimportant. In fact, there is such a thing as too much magnification. The lens placed in the eyepiece magnifies whatever the mirror is reflecting. To step up the size of the image, however, the lens spreads out the collected light over a larger area. Thus, the object, while growing larger in your field of view, also grows dimmer.

With stars, nebulae and tiny planetary moons, magnification beyond a certain point will blot out the image entirely. For Newtonian and catadioptric scopes, you should allow no more magnification than 50x for each inch of mirror. Thus, a 4-inch telescope should have no more

(Please turn to page 174)

NEW METAL DETECTOR

FIND GOLD, SILVER, COINS, RELICS!

U.S. PATENT NO. 4300097

Find
Buried
Treasure!

New Patented Metal Detector finds lost and hidden valuables! Detects thru dirt, sand, solid rock to find all metals — or adjust to screen out junk like nails and foil, to pinpoint precious items. Find single coins up to 10 inches deep, a bag of coins up to 2 feet deep, large objects up to 6 feet deep!

\$89.95 DELIVERED

VISA, MASTERCARD,
AMERICAN EXPRESS

CALL TOLL-FREE 1-800-351-2274

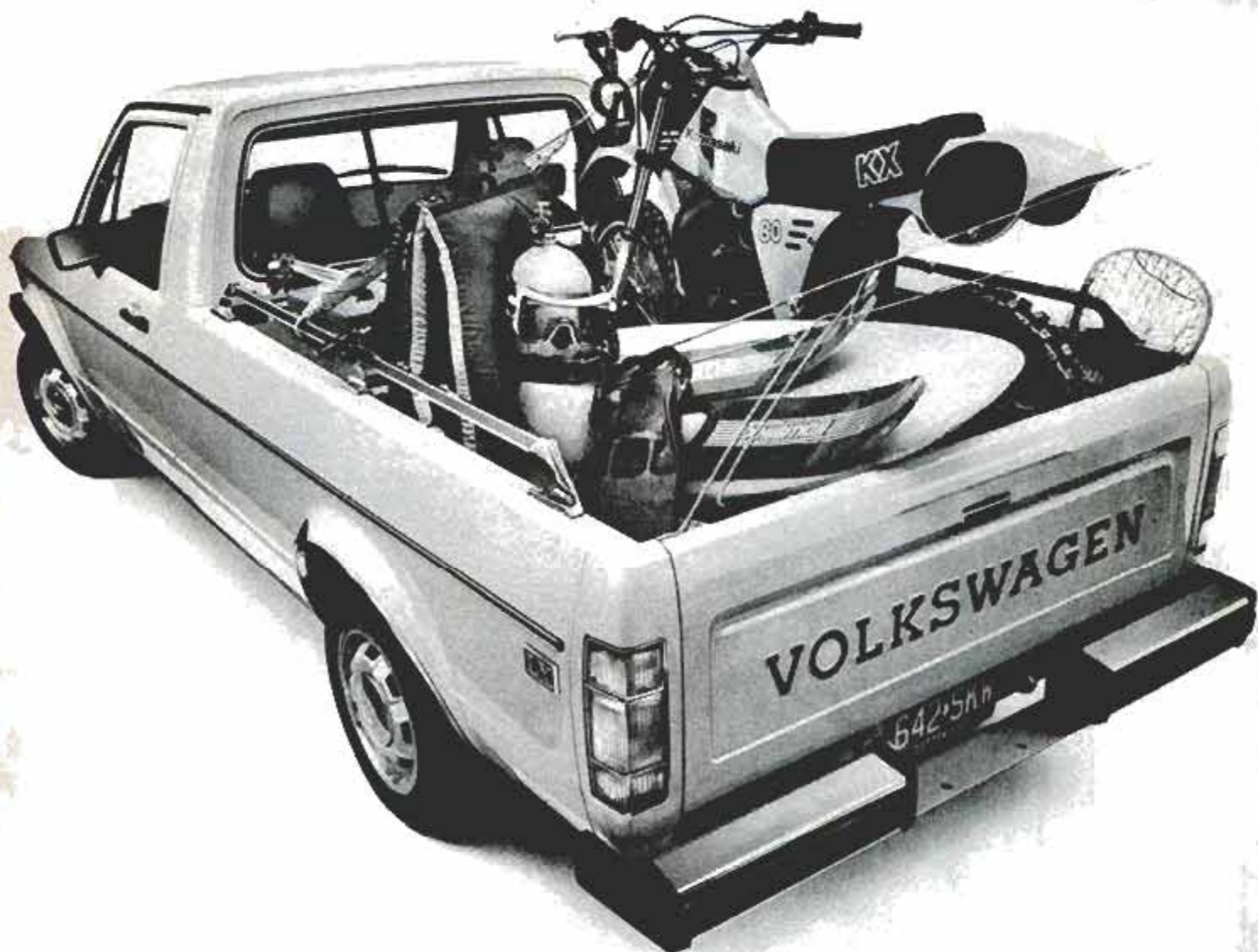
(Texas collect 1-915-593-1115)

OR SEND CHECK OR MONEY ORDER
IMMEDIATE SHIPMENT

TECHNA, INC., 11900 Montana El Paso, Tx 79936

- 5 Year Unconditional Guarantee
- Adjustable Aluminum Stem
- Large View Master Meter
- Cleartone Loudspeaker
- Waterproof Searchloop
- Quality Construction
- Easy to Use

Return within 30 days
for full refund if not satisfied



Loads of fun.

As you can see you can have a lot of fun in your Volkswagen Pickup.

Or if you unload the fun?

You can have 1,000 pounds of almost anything in your Volkswagen Pickup.

Because we built it with a sturdy unitized body surrounding a tough

double-walled bed.

But with all that heft can it still be fun to drive?

Yes.

You see we also built it with front-wheel drive, independent MacPherson front struts, and a dual diagonal braking system.

Not to mention VW's fuel-injected overhead cam engine that can take this pickup from 0 to 50 in just 8.8 seconds.

Which means on top of everything else it gives you something you usually don't get in a pickup.

Pickup.

Nothing else is a Volkswagen.



FREE



THE BIG, NEW HEATHKIT FALL CATALOG

See our **ENERGY SAVERS** — the Solar Water Heating System, low-cost Log Splitter, a 7-day Programmable Thermostat,



the amazing **Power Factor Controller and Portable Power System.** Economical ideas for today's family!



In all, over 450 unique, easy-to-build electronic products in money-saving kits for your home, hobby and business life.

Send for Your **Heathkit Catalog Today**

MAIL TO: Heath Company, Dept. 017-902
Benton Harbor, MI 49022

Please send me your Fall Catalog.

Name _____

Address _____

City _____ State _____

CL-756A _____ Zip _____



CLOCK REPAIR PAYS
Let Your Workshop Earn You Money!

For full details on comprehensive home study Course, brochure, Course outline, repair charges, etc. Send \$1.00.

SCHOOL OF CLOCK REPAIR
Squire Village
7 Cambridge Court RM. M
Totom River, New Jersey 08753

APPROVED FOR VETERANS

Approved by the Commissioner of Education, State of New Jersey

BE A CHIMNEY SWEEP

Your Own Business: A chimney sweep can clean a chimney with the August West System in one hour. Nationally, the average charge is \$45.00.

A Growing Need: The energy crisis has resulted in a dramatic increase in wood burning. Wood smoke deposits flammable creosote in chimneys. Regular cleaning is necessary to prevent fire damage.

The August West System: More sweeps use it than any other method in the country.

Send for our free booklet or call TOLL FREE any time and ask for "The August West Story."

800-243-5166
ask for extension 215. (In CT 206-8750)
August West Systems, Inc.
Box 803 - Dept. 2125
Westport, CT 06881

Solve Everyday Tie-Down Problems...

Strap-All Ratchet Binder & Pick-up Anchor

Aeroquip Stronger than a Rope, Lighter than a Chain.

Corrosive Resistant Nylon Strap extends to 16 ft. in length. Ratchet Buckle allows Precise Tension. Tie-down Boxes. Snowmobiles or any light cargo up to 2000 lbs. on Pick-up Trucks or Trailers. Strap-All Pick-up Ratchet provides a secure tie-down point in any pick-up stake pocket.

MC & VISA
Write or Call today for more info:
TOLL FREE: 1-800-523-0240
IN PR. 1-215-828-2150

RONCO

Rely on Ronco to make the Right Connection.
RONCO, P.O. Box D, Blue Bell, PA 19422

BACK-YARD VOYAGE TO THE STARS

(Continued from page 172)

than 200x magnification. The exception is the rich-field scope, which shouldn't have magnification of more than 10x per inch, unless you're willing to sacrifice that wide field of view for a clear picture of one object.

All the telescopes we tested came with at least one excellent eyepiece. Edmund packs only one eyepiece with each scope. Company president Robert M. Edmund told us: "Generally, when companies pack more than one eyepiece, you're paying for frills you may not want. And those extra pieces are figured into your instrument's price." Although all the extra lenses packed with our test scopes were useful, Edmund is correct about the extras adding unnecessary cost.

All the tested scopes, except the Edmund 2001 and F6, came with clock drives. These motors rotate the telescope automatically and imperceptibly to let you follow a specific heavenly body as the Earth rotates away from it.

Another feature of crucial importance in the better telescopes is setting circles. To find a heavenly body, you refer to a star atlas, a map that uses coordinates of right ascension (similar to longitude), and declination (similar to latitude). Good setting circles should be clearly marked with right ascension and declination coordinates. The Celestron, Dynamax, Dynascope and Edmund pedestal mounts had excellent setting circles.

Free looks first

Before you go hunting for a telescope, find the nearest amateur astronomers' society. There's at least one in every state, and if you can't find a listing in the phone book, call the astronomy department of any nearby university. All astronomical societies have monthly stargazing parties to which the uninitiated are invited.

This summer promises a lot of interesting viewing. There are after-midnight meteor showers in June and late July into early August that you'll be able to see with the naked eye. But on July 6, you'll want at least a good set of field glasses, or, even better, a good telescope to see a total eclipse of the moon, which will be visible throughout the continental United States. When the Earth comes between the sun and the moon, the mountains and valleys of the lunar surface resolve in your lens with a clarity you'll never forget.

POLICE CARS DON'T PULL ANYTHING. WHY DO THEY USE OIL COOLERS?



THE SAME REASONS YOU SHOULD.

To Save Money — City and State officials know it saves money rather than cost money to use engine and transmission oil coolers.

Heat — Your Car's Greatest Enemy.

Today's down sized cars run hotter due to emission controls, smaller engines and higher RPMs. Heat problems develop when you carry extra passengers...extra baggage...drive in stop-and-go traffic...drive on ice or snow...drive in hot temperatures...climb steep grades...and do towing.

Over 11 Million Transmissions Failed Last Year.* 9 out of 10 were caused by overheating.

Low Cost Protection. You wouldn't think of owning a home without insurance and yet the risk of burning up your car's transmission and engine is greater. Repairs can run as high as \$600-\$1500. You can buy transmission and engine insurance by installing a Hayden Oil Cooler for as little as \$34.95.

*Courtesy ATRA



Quick, Do-It-Yourself Installation.

If you can change the oil in your car, you can make the installation yourself in a half hour using Hayden's patented Quik-Mount and Quick Connect. Complete illustrated installation instructions come packaged with every oil cooler.

Beat The Heat. Free Offer.

Purchase any Hayden Trans-Cooler™ or Duo-Cool™ at your local auto parts store, automotive chain store, RV dealer or repair shop and receive a Trans-Lite™ Hi-Temp Warning System absolutely FREE (\$19.95 value. Offer ends Sept. 1, 1982).

Limited Offer**

Purchase a Trans-Lite direct from Hayden for only \$16.95 prepaid.

Name _____
Address _____
City _____ State _____ Zip _____

**Offer expires December 31, 1982. CA residents add 6% sales tax.



PM

For free product brochure, write:



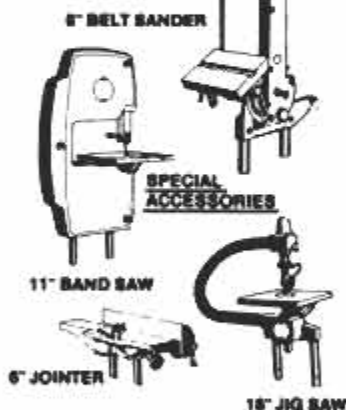
HAYDEN INC.

1531 Pomona Road, P.O. Box 848, Corona, CA 91720

5 in 1 WOODWORKING MACHINE

(2 HP EXTRA HEAVY DESIGN)

- 34" LATHE
- 10" TABLE SAW
- 11 1/2" DISC SANDER
- 18 1/2" VERTICAL DRILL PRESS
- HORIZONTAL DRILL PRESS



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

ONE PLACE FOR ALL YOUR NEEDS...

REGULAR PRICE \$1,250
now only
\$ 999.

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



MAIL NOW!!!

VISA MASTERCARD MONEY ORDER

YOUR NAME _____ PRINT

ADDRESS _____

CITY _____ STATE _____ ZIP _____

PHONE () _____ BEST TIME TO CALL _____

PLANT:

MASTER WOODCRAFT CO.

Div. of American Machine Co.

800 SPRUCE LAKE DRIVE • P.O. BOX 689

HARBOR CITY (Los Angeles), CA 90710

Dealership Available



3-Wheeling to Independence!

Call
1-800-257-7955
for Free
Catalog



One Hand Operation—Rear Differential Drive

CYCLE-CHAIR, the NEW ALUMINUM ELECTRIC BIKE that is *different* and *safer*. It's so easy to handle, you control on, off, forward, reverse, speed, steering, and braking with just ONE HAND!

Use CYCLE-CHAIR indoors as well as outdoors. Share your bike with a friend, travel to the store, or take it to the bank. Be independent on the Cadillac of 3-wheelers. Its low center of gravity and all-aluminum frame makes CYCLE-CHAIR the lightest, strongest, safest 3-wheeler on the market today. Costs only pennies to recharge at home.

Send for free booklet and special offer on CYCLE-CHAIR, PEDALPOWER electric bike motors and pedal tricycles or call toll-free 1-800-257-7955. In N.J. 800-232-6550.

30 Day Trial • Money Back Guarantee

GENERAL ENGINES CO., Dept. 689
591 Mantua Blvd., Sewell, New Jersey 08080

MAGNA-LUX MULTI-PURPOSE MAGNIFIER LAMP



Now, you can enjoy a utility lamp with a clear-vision magnifier. Mounts anywhere or comes with an optional table base. Excellent for hobbies, reading or any type of bench work in the home or office where viewing details requires magnification. Flexible arm movement permits free use of hands. Made in USA.

- 3 3/4" dia. 3-diopter lens
 - 40 watt, A-15 bulb included
 - Full one year warranty
- only \$39.95 plus \$4 Shipping

Optional table base plate \$13.00
Postage incl., Shipped separately.

Allow 7 to 10 days delivery

Mail to: **Hampton Marketing Corp.**
54 Commerce Dr. Farmingdale, NY 11735

— Money Back Guarantee —

Burglar-Fire Protection

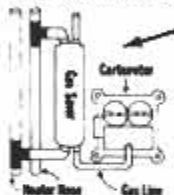
Protect Your Life, Home, Business, Auto, etc.
• Our catalog shows how install your own alarm systems and devices and save \$\$\$\$! We offer FREE write-in engineering service.

FREE CATALOG Lowest Prices on Reliable, High Quality Alarm Systems and Devices

Burdet Security Co. Box 82802-PM Lincoln, Ne. 68501

GAS SAVER

Time tested easy to install
15%-40% increase in MPG & Performance
Preheat & Expand your Gas safely.



For std. adj. gas carb.
ORDER NOW
State present MPG on order for proper size.

Only \$4.50

Cert. Check or Money Order

Global Marketing Inc.
19145 SW Brooklawn Pl.
Aloha, Oregon 97006

BUILD THIS TRAILER KIT

Bed 76 1/2" x 16". For personal Use or Resale. Heavy duty steel precut. 7000 lb. axles. Guaranteed. Haul hay, cars, tractor, freight, etc Good money—Full or Part Time. Kits & trailer parts. Send for prices.

TRAILER MAKER 1218 No. Jefferson
Bldg. C Mi. Pleasant, Texas 75455 Ph. 214-572-5092

MAGNET SCREWDRIVER

Fits in Pocket. Enclose 1.50 plus .25 postage to:
LIPCO
Box 147, Dept. P
Towanda, Ill. 61776

WORTH WRITING FOR

LOOKING FOR IDEAS ON OUTDOOR LIVING, GARDENING, LAWN CARE AND THE HOME? CHECK THESE LISTINGS. THEN USE THE COUPON BELOW.

566 EASY LAWN AND GARDEN CARE

Caring for your lawn and garden need not be difficult according to Wheel Horse. All it takes are the right tools for the job. 20-page magazine illustrates their full-range of lawn and garden tractors and the jobs they do. Free

567 BACKYARD BEAUTIES

A series of do-it-yourself backyard projects are described and illustrated in a new brochure from Koppers Company. Contains drawings and construction details for a picnic table, lounge chair, garden gazebo, storage shed, sun trellis and more. \$1.00

568 FOR A CLEAN SWEEP

Polaris Vac-Sweep, America's best-selling automatic pool cleaner, offers a copy of Nancy P. Bruning's "Swimming for Fitness," a copy of the independent laboratory test report on Polaris, a general information brochure and \$50 trade-up information. Free

569 THE GRASS IS ALWAYS GREENER

Lawn Care, edited by Scott, the lawn and garden people, contains seasonal checklists, how-to articles and the latest information on lawn and garden care. Now in its 53rd year, a 2-year subscription to this colorful publication is available . . . Free

570 BUG OFF!

New Muskol brochure provides complete information about the original "full strength - DEET" insect repellent. Gives you up to 10 hours effective protection against mosquitoes, black flies, chiggers, ticks and gnats. Free

571 THE TELLING OF THE TILLING

Complete information package describes the uses and features of the Masport Home GardenerSM tiller. Combines lightweight design, versatility and maneuverability to handle all your gardening chores. \$1.00

572 BE A STAR BUILDER

Countryside General Store offers an information package about its STAR *PLATE building method. Construct a geodesic design mini-dome that can be used as a greenhouse, gazebo, garden shed, or any of a dozen other uses. Free

573 QUICK AND EASY HOUSE PAINTING

An informative new brochure from Wagner identifies common painting problems and the correct solutions. Topics discussed in the 16-page, illustrated brochure include surface preparation techniques, safety tips, paint selection advice and other hints. Free

574 WOOD APPRECIATION

Wood respects, wood reflects. Booklet describes tips on finishing and refinishing interior and exterior wood finishes. Color chart and name of nearest dealer are also provided. From Minwax. Free

575 IDEAS SET IN CONCRETE

Transform your yard into an outdoor entertainment area in just a few summer weekends. Sakrete Cement gives you step-by-step instruction for 18 different projects in this 16-page booklet. 75¢

576 FEEL STRONGER, WORK LONGER

Dri-Dek[®] is an interlocking, vinyl floor tile that forms a light, portable surface. Soothes the aches, pains, and discomfort of standing. And, with six colors to choose from, adds good looks as well as safety to your shop. Sample and brochure from Kendall Plastics. Free

577 THE FIREPLACE THAT CAME IN FROM THE COLD

Majestic would like you to know that its Warm MajicSM fireplace has been rated 41-43% efficient by the Wood Heating Alliance. Two brochures offer full-color performance report and do-it-yourself installation planner, including chimney system. \$1.00

578 RESILIENT FLOORING

24-page illustrated booklet gives helpful advice on shopping for modern vinyl floors. Information on no-wax surfaces, cushioning, installation and upkeep. Plus, how to decorate and important questions to ask the salesperson. From Armstrong. Free

579 MAKING A REAL ENTRANCE

A Therma-Tru replacement door system can give your house a whole new look. In addition to acquiring an eye-catching "entrance" you can achieve energy savings and more security. 4-color, illustrated brochure. Free

580 THE RENOVATOR'S INNOVATIONS

48-page color catalog of hard-to-find hardware, plumbing and lighting products that will add a distinctive touch to your home. Most are made of solid brass, wrought iron, oak or porcelain. Many are authentic reproductions . . . all newly made. From The Renovator's Supply. \$2.00

581 MAKING THE MOST OF SPACE

Compact range-sink-refrigerator combinations can solve your space problems. King Refrigerator offers an illustrated catalog describing its kitchen units. Free

582 HERE'S INEXPENSIVE LUXURY

Complete ThermaSol Health Spa fits into the same space as a standard size bathtub. Includes a combination bath and whirlpool tub, steam bath and shower enclosed with acrylic walls, ceilings and sliding glass doors. Illustrated brochure. \$2.00

583 SUPER POWER

The Fox Super Shop is a multi-purpose power tool. Seven basic wood and metal functions, including table saw, disc sander and wood lathe. Operator's manual illustrates each function and its many features. 50¢

584 POWER WHEELS

Bike Motor and Go-Kart catalog offers discount prices on fuel efficient front and rear bike motors. Complete Go-Kart and mini-bikes and parts to build your own kart. From Northern Hydraulics. \$1.00

585 TOOL CHEST FOR A MASTER

Compact tool chest looks like a museum showpiece, but is durable enough for a professional. For handling ease, it's actually two boxes with well-organized hand tool compartments that allow easy access. Complete plans, including handy dolly, from POPULAR MECHANICS Project Library. \$4.75

Popular Mechanics 6/82
Box 1718, Sandusky, Ohio 44870

This Coupon Expires August 31, 1982

Please see that I receive the items checked below

<input type="checkbox"/> 566	<input type="checkbox"/> 570	<input type="checkbox"/> 574	<input type="checkbox"/> 578	<input type="checkbox"/> 582 \$2.00	Total money for priced items \$ _____	
<input type="checkbox"/> 567 \$1.00	<input type="checkbox"/> 571 \$1.00	<input type="checkbox"/> 575 75¢	<input type="checkbox"/> 579	<input type="checkbox"/> 583 50¢		Service Charge \$ _____ .50
<input type="checkbox"/> 568	<input type="checkbox"/> 572	<input type="checkbox"/> 576	<input type="checkbox"/> 580 \$2.00	<input type="checkbox"/> 584 \$1.00		Total money enclosed \$ _____
<input type="checkbox"/> 569	<input type="checkbox"/> 573	<input type="checkbox"/> 577 \$1.00	<input type="checkbox"/> 581	<input type="checkbox"/> 585 \$4.75		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.

LOOK WHO'S IN THE



No. 1 album No. 1 song *Centerfold*. plus the hit title. *Rage In The Cage*. *Flamethrower*. more.



Smash *Find Another Fool*. Top 10 *Harden My Heart*. Right *Kind Of Love*. *Valerie*. more.



No. 1 album! Top 10 hit *We Got The Beat*. hit *Our Lips Are Sealed*. *Automatic*. more.



Top 10 album. Top 10 Every *Little Thing She Does Is Magic*: smash *Spirits In The World*. etc.



"Album Of The Year"! Grammy-winner (*Just Like Starting Over*. *Woman*. etc.

- 312322 NEIL DIAMOND
ON THE WAY TO THE SUN
- 312314 CHICAGO'S
GREATEST HITS
- 312306 THE CARS
SHAKE IT UP
- 311864 MARK WILLIAMS, JR.
THE AMERICAN SWING
- 311456 BARRY MANILOW
I SHOULD LOVE AGAIN
- 311423 LUTHER VANDROSS
NEVER TOO MUCH
- 310979 MEATLOAF
DEAD RINGER
- 310961 DEBBIE HARRY
KOOKOO
- 310953 EDDIE RABBITT
STEP BY STEP
- 310946 SLIM WHITMAN
MR. SONGMAN
- 306725 HEROSMITH'S
GREATEST HITS
- 306004 CHEAP TRICK
ALL SMOOK UP
- 305631 LEO SAYER
Living In A Fantasy
- 291203 The Doobie Brothers
Make It Move
- 291021 SUPERTRAMP
Breakfast In America
- 288332 BILLY JOEL
SOUND STREET
- 287003 EAGLES
Their Greatest Hits
- 306324 DIRE STRAITS
MAKING MOVIES
- 306449 NEO SPEEDWAGON
INFIDELITY
- 306563 Barry Manilow
BARRY
- 306571 BOZ SCAGGS
GREATEST HITS
- 309047 STARS ON
LONG PLAY
- 309120 OZZY OSBOURNE
Blizzard Of Oz
- 309133 STANLEY CLARK, GEORGE
DUKE, & THE CLARK
DUKE TRIO
DUKE TRIO
- 309179 JESSE WELCH
THE BEST OF JESSE WELCH
- 313577 WEATHER
REPORT
- 313676 GEORGE DUKE
DREAM ON
- 313684 BONNIE RAITT
GREEN LIGHT

- 312777 ELVIS COSTELLO
ALMOST BLUE
- 312731 Earth, Wind & Fire
RAISED
- 312025 MOLLY HATCHETT
Take No Prisoners
- 312017 OZZY OSBOURNE
Diary Of A Madman
- 311885 MERLE HAGGARD
BIG CITY
- 311829 TAMMY WYNETTE
You Brought Me Back
- 308882 THE WHO
FACE DANCES
- 308635 AC/DC
GIFT OF GIBBS
ONE DAY CLEAR
- 308627 COMING PARTY
& LIPSIC
LIPSIC
- 308148 ROSANNE CASH
Seven Year Ache
- 308075 RAY PRICE
A Matter Of Will
- 302319 AIR SUPPLY
LOST IN LOVE
- 300095 Electric Light Orchestra
ELO's Greatest Hits
- 291500 BEST OF
THE DOORS
- 293944 VAN HALEN
Van Halen II
- 302455 AMBROSIA
ONE EIGHTY
- 304386 PAT BENATAR
Crimes Of Passion
- 304212 QUEEN
THE GAME
- 307827 EMMYLOU HARRIS
EVANGELINE
- 307850 TED NUGENT
WARRIORS IN HEAVEN
- 307888 WILLIE NELSON
SOMEWHERE OVER THE RAINBOW
- 307900 LOVERBOY
- 313452 SAMMY HAGER
Standing Hampton
- 313460 ELTON JOHN
THE FOX
- 313478 DONNA SUMMER
THE WANDERER
- 313486 NICK LOWE
Nick The Knave
- 313688 VAN MORRISON
Beautiful Vision
- 313551 MICHAEL FRANKS
Objects Of Desire

- 310347 JOURNEY
ESCAPE
- 312983 RICK SPRUELL
MAGAZINE
- 312967 FERRI GIBBS
I'M A LADY
- 312959 RICH LITTLE
THE JUSTY RAMP
BOSS ACORN
- 312926 PAUL ANKA LIVE
BLACK TIE
- 310236 The Oak Ridge Boys
Greatest Hits
- 310144 STEVE DAN
GAUCHO
- 310102 STANLEY BROTHERS
YEARS AGO
- 310037 THE GREAT MUPPET CAPER
- 306308 THE DOORS
THE TURN OF A RED HOT CIDER
- 306241 THE DOORS
GREATEST HITS
- 295866 BOB FORD
Don't Look Back
- 293887 WALLE NELSON
STARDUST
- 279067 THE BEST OF
JOHN SAIZ
- 301623 JOURNEY
DEPARTURE
- 301516 BILLY JOEL
GLASS HOUSES
- 300921 Sesame Street 10th
Anniversary Album
- 291856 THE BEST OF
CARLY SIMON
- 291815 THE TRIFLE
THE TRIFLE
- 290596 LAGLES
THE LONG RUN
- 309369 VAN HALEN
FAIR WARNING
- 309385 LEE RITENOUR
RIT
- 309410 COMMODORES
IN THE POCKET
- 309427 AIR SUPPLY
HEART OF THE MATTER
- 309470 MARSHALL TUCKER
BAND DEDICATED
- 313015 CONWAY TWITTY
Southern Comfort
- 312850 RUDY IRICO
HOT NIGHTS
- 309039 AEROBIC DANCING
INSTRUCTIONAL

- 311811 THE BEST OF
BLONDIE
- 311802 Shirley Turnetta
Smother Together
- 311795 G. Scott Heron
REFLECTIONS
- 310920 MICKEY GILLEY
YOU DON'T KNOW ME
- 310911 PRETENDERS
- 310389 Electric Light Orchestra
TIME
- 307967 PHIL COLLINS
FACE VALUE
- 307959 FERRI GIBBS
Somebody's Knockin'
- 278009 JIM LINDY'S
HONEYCREEK
- 278043 ANNIE
ORIGINAL CAST
- 275743 BARBRA STREISAND
Steward Superman
- 271923 MEATLOAF
BAT OUT OF HELL
- 305300 THE B-52'S
WILD PLANET
- 310292 PAT BENATAR
PRECIOUS TIME
- 310300 PABLO CRUISE
REFLECTOR
- 310516 Stacy Lattimore
WITH YOU
- 310126 JOE JACKSON
JUMPIN' JIVE

- 310918 TOM BROWNE
YOUR'S TRULY
- 312884 ROBERT GOULET
CLOSE TO YOU
- 312876 SAMMY DAVIS, JR.
Closest Of Friends
- 313064 KENNY ROGERS
GUIT-UP
- 312868 SHIRLEY BASSEY
ALL BY MYSELF
- 310433 ORIGINAL SOUNDTRACK
ENDLESS LOVE
- 310376 BLACKFOOT
MARAUDE
- 310358 LARRY GRAHAM
Just Be My Lady
- 305792 YES
DRAMA
- 305204 THE DOOBIE BROTHERS
ONE STRIP CLOSER
- 305045 AC/DC
BACK IN BLACK
- 219477 SIMON & GARFUNKEL'S
GREATEST HITS
- 306605 Great Washington, D.C.
WORLDWIDE
- 306654 BLONDIE
Autodestruct
- 306689 WOLFE BRYANT, VOL. 1
Broadway Magic
- 306787 BLUES BROTHERS
MADE IN AMERICA
- 307942 Hank Williams, Jr.
ROWDY

SELECTIONS WITH TWO NUMBERS ARE 2-RECORD SETS ON DOUBLE-LENGTH TAPES AND COUNT AS TWO SELECTIONS—WRITE EACH NUMBER IN A SEPARATE BOX

- 313650 BAKA & GARFUNKEL
THE CRACKER
AN ORIGINAL ALBUM
- 313221 SHIRLEY BASSEY
GREATEST HITS
- 311373 LENA HORNE
THE LEGACY OF LENA HORNE
- 311001 MELVIN NELSON'S
GREATEST HITS
- 307184 JOURNEY
CAPTURED
- 304865 Double-Covered
The Songs Of George
- 306597 EAGLES
LIVE
- 306353 Bruce Springsteen
THE RIVER
- 309054 THE DOORS
THE DOORS
- 309174 GILBERT & SULLIVAN
THE PRINCES OF PANTANZO

- 312892 GEORGE BENSON
1978-84 COLLECTION
- 312173 DIANA ROSS—
All The Great Hits
- 312033 THE BEACH BOYS
THE LEGACY OF THE BEACH BOYS
- 307231 YES
YESHOWS
- 305524 SUPERTRAMP
PARIS
- 303339 Great American
Rock & Roll Revival
- 302265 FRANK SINATRA
FRANK SINATRA PRESENTS
LIFE!
- 306712 FLEETWOOD MAC
LIVE
- 310847 DAN FOGELBERG—
THE INNOCENT AGE
- 311787 RUSH
Exit Stage Left

COLUMBIA RECORD & TAPE CLUB NOW INVITES YOU TO TAKE

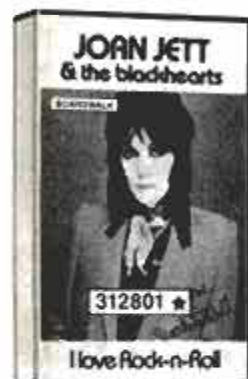
11 ALBUMS-1¢

plus shipping and handling

PLUS THE "GOLD BOX" TV BONUS!

If you join the Club now and agree to buy 8 more selections (at regular Club prices) in the coming 3 years

CLUB NOW!



Top 10 Title hit, *Crimson And Clover*; (I'm Gonna) Run Away; *Little Drummer Boy*.



No. 1 album with smash Top 10 *Juke Box Hero*; *Waiting for a Girl Like You*; *Urgent*.



Top 10 *Open Arms*; *Who's Crying Now*; *Don't Stop Believin'*; *Stone in Love*.



313502* His hit *Through The Years*; Number One *I Don't Need You*; Top Ten title hit and *Blaze Of Glory*; many others.

- 313361* CONWAY TWITTY
MIL T
- 313304* FERRANTE & TEICHER
GOLDEN PLANO WITS
- 313213* EARL KLUGH
CRAZY FOR YOU
- 313197* SHEENA EASTON
NO COASTLINE
BORN WITNESS
- 313171* KIM CARNES
Whispering Identity
- 310084* OAK RIDGE BOYS
FANCY FREE
- 286914* FLEETWOOD MAC
RUMOURS
- 301473* CHRISTOPHER
CROSS
- 300681* NEIL DIAMOND
SEPTEMBER MORNING
- 286285* RED SPEEDWAGON
NINE LIVES
- 307751* QUEEN
FLASH GORDON
- 311696* JAM PRINCE
BROTHERS OF THE FOUR SEASONS
- 311738* THE DOOBIE BROTHERS
The Best Of The Doobies
- 311779* LOVERBOY
GET LUCKY

- 313098* KENNY ROGERS
LOVE ON SOMEONE LIKE ME
- 313049* Barbra Streisand
MEMORIES
- 312843* TONY MARTIN
I'll SEE YOU IN MY DREAMS
- 312835* THE LETTERMEN
LOVE IS...
- 312827* KYDOR GORME
Since I Fell For You
- 236885* CARPENTERS
The Singles 1969-1977
- 313700* KENNY ROGERS
GREATEST HITS
- 260638* CHICAGO IX
CHICAGO'S GREATEST HITS
- 291435* LED ZEPPELIN
FLYING
- 187088* BARBRA STREISAND'S
GREATEST HITS
- 307770* -38 SPECIAL
WILDEYED SOUTHERN BOYS
- 311805* DONALD BYRD AND
QUINTET W/ALC. LOU BRAD
- 311854* HERBIE HANCOCK
MAGIC WOODS
- 312853* STARS ON LONG PLAY

- 312785* GEORGE HORN
STILL THE SAME OLD ME
- 312688* FRANK SINATRA
She Said He Done
- 312678* Greater Washington, Jr.
COME MORNING
- 311658* Grand Funk Railroad
GRAND FUNK LIVES
- 311670* DON WILLIAMS
Especially For You
- 305334* THE POLICE
Zenyatta Mondatta
- 305719* MOLLY HATCHETT
Beatnik The Odds
- 305201* STEVE FORBERT
Like Some Other
- 306969* THE BEST OF EMERSON
LAGE & WALDEN
- 307470* HOWARD TROMBLY AND
BAND - AN '80S
MUSICAL ADVENTURE
- 307702* RUSH
Moving Pictures
- 312330* THE BEST OF
TED NUGENT
SUNNY SIDE OF COCAINE
- 312348* Lindsay Buckingham
LAW AND ORDER
- 312389* AC/DC FOR THOSE ABOUT
TO ROCK IN SILENCE YOU

- 312660* ABBA
THE VICTIMS
- 312652* EMMYLOU HARRIS
CHIMARRO
- 310658* '87 87'S OF
THE 70'S - THE 1
PART 1
- 310482* STEVE NICKS
BELLA DONNA
- 303909* Original Broadway Cast
BARNUM
- 303123* PETE TOWNSHEND
EMPTY GLASS
- 311043* LARRY GATLIN
+ THE GATLIN BROTHERS
NOT GUILTY
- 311050* ORIGINAL BROADWAY CAST
"ARTHUR"
- 311084* AL JARREAU
BREAKIN' AWAY
- 311261* QUEEN
GREATEST HITS

- 311514* GENESIS
ABACUS
- 311505* MAC DAVIS
Midnight Crazy
- 311480* CARLY SIMON
TORCH
- 307819* DIANA ROSS
TO LOVE AGAIN
- 307801* STYX
Paradise Theater
- 307415* MEL TILLIS
SOUTHERN RAIN
- 311209* THE MEMPHIS
OF THE 70'S ON A RECORD
- 311340* BILLY JOEL
Songs In The Attic
- 311381* DEVO NEW
TRADITIONALISTS
- 313080* KENNY ROGERS
THE GAMBLER

© 1982 Columbia House

* not available in reel tapes. Available on records and cassettes only

Yes, just take a look at the superstars and super hits that the Columbia Record & Tape Club now offers. To get any 11 of these records or tapes right away, simply fill in and mail the application together with your check or money order for \$1.86 as payment (that's 1¢ for your first 11 selections, plus \$1.85 to cover shipping and handling). In exchange, you agree to buy 8 more tapes or records (at regular Club prices) in the next three years—and you may cancel your membership at any time after doing so.

How the Club operates: every four weeks (13 times a year) you'll receive the Club's music magazine, which describes the Selection of the Month for each musical interest...plus hundreds of alternates from every field of music. In addition, up to six times a year you may receive offers of Special Selections, usually at a discount off regular Club prices, for a total of up to 19 buying opportunities.

If you wish to receive the Selection of the Month or the Special Selection, you need do nothing—it will be shipped automatically. If you prefer an alternate selection, or

none at all, fill in the response card always provided and mail it by the date specified. You will always have at least 10 days to make your decision. If you ever receive any Selection without having had at least 10 days to decide, you may return it at our expense.

The tapes and records you order during your membership will be billed at regular Club prices, which currently are \$7.98 to \$9.98—plus shipping and handling. (Multiple-unit sets and Double Selections may be somewhat higher.) And if you decide to continue as a member after completing your enrollment agreement, you'll be eligible for our money-saving bonus plan.

10-Day Free Trial: we'll send details of the Club's operation with your introductory shipment. If you are not satisfied for any reason whatsoever, just return everything within 10 days for a full refund and you will have no further obligation. So act now!

Special Start-Your-Membership-Now Offer: you may also choose your first selection right now—and we'll give it to you for at least 50% off regular Club prices (only \$3.99). Enclose payment now and you'll receive it with your 11 introductory selections. This half-price purchase reduces your membership obligation immediately—you'll then be required to buy just 7 more selections (instead of 8) in the next three years. Just check box in application and fill in number you want.



Note: All applications are subject to review; Columbia House reserves the right to reject any application.

Here's the "Gold Box" you've seen on TV—fill it in and get an extra selection

Columbia Record & Tape Club, P.O. Box 1130
Terre Haute, Indiana 47811

I am enclosing check or money order for \$1.86 (that's 1¢ for my 11 introductory selections, plus \$1.85 for shipping and handling). Please accept my application under the terms outlined in this advertisement. I agree to buy 8 more tapes or records (at regular Club prices) in the next 3 years—and may cancel membership anytime after doing so.

Write in numbers of 11 selections

Send my selections in this type of recording (check one):

8-Track Cartridges Cassettes Reel Tapes Records

My main musical interest is (check one): K24/BJ

(But I am always free to choose from any category)

Easy Listening 2 Teen Hits 7 Classical 1

Country 5 (no reel tapes) Jazz 4 (no reel tapes)

Mr. Mrs. Miss
Print First Name Initial Last Name

Address Apt.

City

State Zip

Do You Have A Telephone: (Check one) Yes No 3BL/7ET

This offer not available in APO, FPO, Alaska, Hawaii, Puerto Rico; write for details of alternative offer. Canadian residents will be serviced from Toronto.

Also send my first selection for at least a 50% discount, for which I am also enclosing additional payment of \$3.99. I then need buy only 7 more selections (at regular Club prices) in the next three years.

K26/BL

K25/AF

K27/BQ

NOW! Get in on the PROFITS in SMALL ENGINE REPAIR

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

No doubt about it... as a small engine pro, you can cash in on the huge demand for qualified men in one of America's fastest growing industries. You'll be able to command top hourly rates of from \$10.00 to \$15.00 per hour — and that's just for labor.

Plethora of business waiting for qualified men. **48,000,000 Small Engines Are in Use Today!**

That's the official count from the Engine Service Assn., and one-million new engines are being built each month. With fully accredited Belsaw training, you can soon have the skill and knowledge to make top money servicing these engines.



Professional Tools and Equipment PLUS 4 hp Engine All YOURS TO KEEP... All at No Extra Cost!

NO EXPERIENCE NECESSARY!

You don't need to be a 'born mechanic' or have any prior experience. Lessons are fully illustrated... so clear you can't go wrong, and with our famous 'learn-by-doing' method you get practical 'hands-on' experience.

BELSAW INSTITUTE, 8613M FIELD BUILDING
KANSAS CITY, MO. 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 on me.

FREE

BOOKLET!
Send for your copy today!

NAME _____

ADDRESS _____

CITY _____

STATE _____ ZIP _____

Build Your Own Hand Crafted Grandfather Clock

Semi-assembled kits of cherry, walnut, oak or mahogany for you to create a treasured heirloom. Step-by-step plans. Write for free literature.

Kuempel Chime Clock Works & Studio
Dept. 507 21195 M'ika Blvd. Excelsior, MN 55331

Established in 1916

FACTORY DIRECT! go cart

New plans reveal step by step details on how to build your own Go-Cart! NEW built-together Go Cart frame kits! Free Coupons. Discount parts.

RUSH #3 for plans & Giant Catalogue to:
go cart 8140 W. Dodge, Dept. 984-4 Omaha, Nebr. 68114

TESLA COIL CONSTRUCTION PLANS

CREATE FANTASTIC FORK LIGHTNING DISPLAYS
Build a Tesla Coil that produces 100,000 volts in 1/2 second. With plans to 1,000 Watt Resistorless Tesla Coil, High Frequency Lighting, Greenhouse Ionizer Fork Lightning & Ionospheric Glow. Includes: Tesla Coil Construction Manual, Tesla Coil Design, Tesla Coil Parts List, Tesla Coil Schematic, Tesla Coil Construction & Testing. Also: Tesla Coil Construction & Testing. Includes: Tesla Coil Construction & Testing. Includes: Tesla Coil Construction & Testing.

ORDER YOUR MANUAL AT ONLY \$15 TODAY

B & L SCIENTIFIC 215 WEST FIRST STREET • SUITE 105-67W TUSTIN, CA 92680

SWISS ARMY TYPE KNIFE

All purpose wonder knife. Red handle. Sturdy survival knife with 12 Stainless Steel Blades, perfect for fishing, camping, work and play. Guaranteed 4.50 ea. Add 50¢ Post & Handl.

Westbury Sales P.O. Box 434, 373 Maple Ave. Westbury, N.Y. 11590 Dept. E-6-PM

PM LOOKS AT PORTABLE BLOWER



The Echo PB-200 is a portable, handheld, gas-powered blower. Its compact size and light weight make it easy to handle. It also has an attachable shoulder strap.

The blower's wide range of airstream velocity, from a gentle breeze to a high-speed blast moving at about 103 mph, makes it effective in numerous outdoor cleanup jobs. You can use it year-round for sidewalk, patio and lawn sweeping, light snow removal from drives and walkways and for removing leaves and twigs from rain gutters. The airstream velocity is controlled by a trigger throttle in the handle. The on/off ignition switch is on top of the handle.

When I tried out the blower, the engine started easily. It uses 20 parts of regular-grade gas to one part motor oil. The tank holds 13.5 fluid ounces and fuel consumption is rated at 20.3 fluid ounces per hour.—Rosario Capotosto

SPECIFICATIONS—PORTABLE BLOWER

Model No. PB-200
Dimensions (L x W x H): 8.2 x 11.1 x 14.0 in.
Dry weight: 9.7 lbs.
Engine type: Air-cooled, two-stroke, single-cylinder
Fuel: Premixed two-stroke fuel
Max. air speed: 196.9 ft. per sec.
Max. air volume: 280 cu. ft. per minute
Price: \$129.95
Manufacturer: Echo Inc., Box 578, Northbrook, Ill. 60062

Sweeping gutters is a simple job with the portable blower. Here, a section of pipe (inset) is removed for easier handling.



A trigger throttle and a stop switch are on the handle. A loop to hook on a shoulder strap is at each side of the handle.



The fuel tank holds enough fuel to operate the engine for about 40 minutes.

NOW... FOR YOUR HOME, PATIO, YARD & POOL!

ELECTRONIC

BUG KILLER

**100% SAFE TO USE
INDOOR — OUTDOOR
Looks Like An Antique
Colonial Carriage Lamp**

**PRICE
SLASHED
\$12.95**

**KILLS MOSQUITOES, MOTHS, FLIES,
GNATS; WITHOUT DANGEROUS
SPRAYS, CHEMICALS, POISONS,
OR FUMES AND INSECTICIDES!!!**

**WORKS ON THE SAME
PRINCIPLE AS UNITS
COSTING \$100 OR MORE**

What a pleasure it is to enjoy outdoor living all summer long without being tormented by pesky insects! Now you can really savor outdoor fun, swimming, gardening, cookouts and even naps outside — free from stings and bites! Yes, you can have the most wonderful summer of your life with this new **ELECTRONIC BUG KILLER**. It attracts insects having phototropic vision with an almost invisible **Blue Light**. Then, as they fly to these irresistible rays, they are **killed instantly on contact!**

100% SAFE TO USE!

This **ELECTRONIC BUG KILLER** is absolutely **SAFE** around children or pets because it uses no dangerous chemicals, poisons, fumes or insecticides. Insects are killed by an **Electrified Grid** that uses only 3 Volts of electricity! That's about as much as a small flashlight! Such a small shock that birds, pets, children and adults can scarcely feel it — yet it kills every insect on contact — **INSTANTLY!** Less than 3 pennies keep it going all day and night — **indoors or outside!** This new model is made of rugged, hi-impact material, styled like a charming antique Colonial Carriage Lamp. Just hang it on your patio, in the yard, around the pool or in your home to be free of annoying insects!

TRY IT ON THIS FREE HOME TRIAL!

We'll rush this amazing **ELECTRONIC BUG KILLER** to you on a **30 Day Home Trial**. It comes ready to operate — just plug into any outlet and it's in action. See how safe it is! How it clears your garden or patio of flying insects. You must be **100% satisfied!** Otherwise, return within 30 Days for your money back (Less Postage & Handling).

No. 4855—**ELECTRONIC BUG KILLER** \$12.95 plus \$1.55 for Postage & Handling. **SPECIAL:** Two for \$24.00 plus \$2.00 Postage & Handling. Three for only \$35.00 plus \$2.25 Postage & Handling. N.Y.S. Residents must add Sales Tax.

FOSTER-TRENT, INC., 2345 Boston Post Rd., Larchmont, N.Y. 10538

**FOSTER-TRENT, INC., Dept. 522-S,
2345 Boston Post Rd., Larchmont, N.Y. 10538**

Please **RUSH** the **ELECTRONIC BUG KILLERS** as checked below. I must be completely satisfied or I may return within 30 Days for my money back (less Postage & Handling).

- ONE Bug Killer** — \$12.95 + \$1.55 Postage & Handling
 TWO Bug Killers — \$24.00 + \$2.00 Postage & Handling
 THREE Bug Killers — \$35.00 + \$2.25 Postage & Handling
(N.Y.S. Residents add appropriate Sales Tax)

Name _____

Address _____

City _____

State _____ Zip _____

**An Adult Hobby
Cast Your Own
Metal Miniatures**
Military, Medieval, And Chess
Set Figures. Complete Casting
Sets And Over 100 "Old Time"
Toy Soldier Molds

Cast full round, detailed, 54mm figures. Special offer:
Complete Starter Set, \$29.95. Includes electric stove,
pouring ladle, Coldstream Guard mold, work gloves,
casting metal and more. (Not recommended for children).

Please send Complete Set, \$29.95 enclosed
 Please send me more information on Castings.

NAME _____
ADDRESS _____
CITY _____ STATE _____ ZIP _____

Castings, P.O. Box 3482, Longwood, FL 32750

**Learn how to MAKE MONEY
in DRAFTING**

Train at home in spare time. No previous expe-
rience needed. Tools and materials included with
course. No special talent required. We show you
what to do, how to do it. **LEARN DRAFTING
AT HOME!**

FREE!
"CAREER
KIT"

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

Associated CITY _____ STATE _____ ZIP _____
NORTH AMERICAN SCHOOL OF DRAFTING,
4300 Campus Dr., Dept. PM81 Newport Beach, CA 92660

REPAIR CLOCKS

Home Study Course orders view 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, ad-
vertising, labels, tickets, OSI 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, 22-37 Moridon, CT 06450

**BUMPER STICKER
PRINTING DEVICE**

FUN, INEXPENSIVE, PORTABLE
EASY - NO TRAINING NEEDED
ANY MESSAGE IN MINUTES

Get FREE DETAILS
P.O. BOX 22791 (C)
TAMPA, FLA. 33622

**LEARN
MEAT CUTTING**

Train quickly in 8 short weeks at 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. Di-
visions given. Job help. Thousands of suc-
cessful graduates. **OUR 59th YEAR!** Send
NOW for a big new illustrated FREE catalog. No obligation. G.I.
approved. **NATIONAL SCHOOL OF MEAT CUTTING, No. 71-02-
01977, Dept. 50-C, 33 N. Superior, Toledo, Ohio 43604.**

MOLDS
for making
Ornamental Concrete
Items...

Book about Aluminum
Molds with prices and
production trade secrets
direct from world's larg-
est mold manufacturer.

SEND
\$5.00

CONCRETE MACHINERY COMPANY, INC.
P. O. BOX A99 - HICKORY, N. C. 28601

Turning a scaled-down wood replica

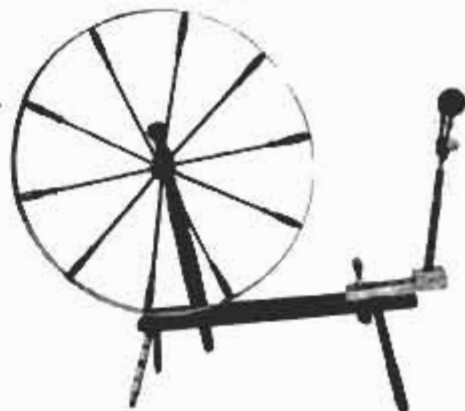
My wife wanted to restore an old (circa 1750) spinning wheel of the type having a long leg and two shorter legs. The shorter legs were missing and had to be reconstructed. My solution involved making a scaled-down pattern of the longer leg and using it as a guide to turn the shorter legs. You can apply the same technique to turn a scaled-down replica or to make an enlarged copy of any other item.

First, I had to calculate the required length of the missing shorter legs. Based on similar spinning wheels seen at museums and in books, I arrived at the approximate length needed (13 in.).

Next, I made a cardboard pattern for the missing legs in the following manner. I took a photograph of the larger, existing leg. Then I used an old magic lantern (an opaque projector will also do) to project the image onto white cardboard taped to the wall. When the projected image was the exact size needed for the smaller legs, my wife traced the shape and cut out the pattern.

You can use this technique to make a pattern by taking a slide of the original item and using a slide projector to enlarge the image on the cardboard.

Next, I used the cardboard pattern to turn the legs. Since a wood-working lathe wasn't available, I built the following setup on my metal lathe. First, I measured the exact center between the head- and tailstocks and made a mark there. Then I placed the workpiece in the lathe. After marking the middle of a 1x2, I centered it across the lathe from

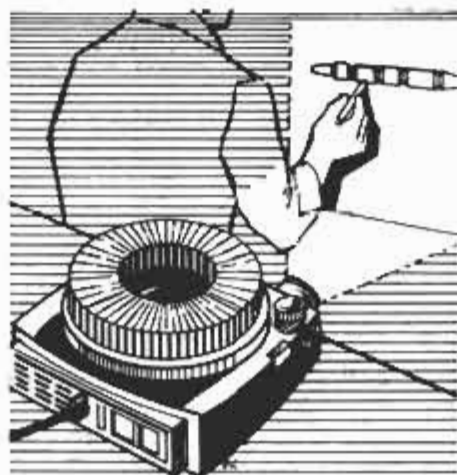


The two smaller spinning-wheel legs are scaled-down versions of the larger leg.

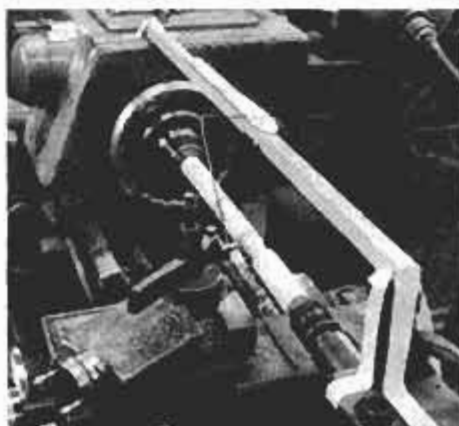
headstock to tailstock (see photo, bottom right). Shims were used to level the 1x2, and it was taped to prevent movement.

I thumbtacked the cardboard pattern on top of the 1x2, directly over the workpiece. I ground a suitable tool to turn the wood and tightened it in the tool holder. I also secured in the tool holder a length of 10-gauge copper wire ground to a point at its free end. The wire was easily bent into a Z-shape so its pointed end touched the cardboard pattern above the workpiece.

The rest of the job was a matter of setting the metal-cutting lathe at high speed and cranking the tool in and out along the length of the workpiece as the pointer followed the pattern. By making a scaled-down pattern of the larger, existing leg, I was able to reconstruct the two shorter legs of my spinning wheel—without ever having seen the original legs.—Ivan E. Prall



Shoot a slide of the leg to be duplicated, then project it the exact size needed onto white cardboard and trace the shape.



Author, lacking a wood lathe, created the scaled legs using his metal lathe and the setup shown above. The cutting tool is locked in the tool holder; the template to be followed by wire is tacked to a 1x2.

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 800-321-2790
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. PMCO682
8615 Usher Road, Cleveland, Ohio 44138

YOUR NAME _____

TEL. _____

ADDRESS _____

CITY _____

STATE _____

ZIP CODE _____

LIVE SATELLITE

\$399 • DISH ANTENNA 24" R. →
• PREAMPLIFIER
• RECEIVER

MDS complete receiving system ready for tv hook-up
All TV Channels included and dish wiring-instructions.

THOROUGHLY UPDATED - 8 1/2" x 11" BOOK Magnificently Illustrated—Graphs • Photos

• Major Sources • Antennas • Low Noise Amplifiers

Our BOOK is not OVERLY TECHNICAL MUMBO JUMBO, but one that will allow a beginner to understand the essential knowledge of satellite technology. Libraries, Colleges and Universities world-wide have purchased our book, including the University of New Zealand and the prestigious Massachusetts Institute of Technology.

Now you can have and enjoy first-run movies, Las Vegas entertainment—everything being telecast on a 90-channel reception system.

T.V. NOW !!!

• \$295 SATELLITE ANTENNA (10FT. x 10FT.)
• BREAKTHROUGH — IBM'S 9-INCH DISH ANTENNA (Special Report page 29)

SATELLITE T.V. INC.

P.O. Box 3108, Dept. M-6
Lantana, FL 33462

Send me your book for \$11.95 plus \$2.50 shipping & handling (US funds) or call our 24-hr Order Line (305) 845-3840

Name _____
Address _____

HYDRAULIC JACK REPAIRS

Earn While You Learn in Your Spare Time


Trained and qualified mechanics needed NOW to service innovative 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. PM6 and free bonus offer.

Hydraulic Jack Repair Manual Co., Inc.

P.O. Box 3 • STATEN ISLAND, N.Y. 10314

The **CIRCUIT TESTER** for Mechanics and Do-it-yourselfers. Ideal for trailer hook-ups, locating shorts & identifying wires. Reaches into confined areas—operates with one hand—handle glows if circuit is live. 6-ft ground wire and 50 amp clamp. Molded nylon body.



Use standard auto bulb for 6 & 12 volts (adapts to 24v). \$11.00 plus \$1.50 postage and handling (total \$12.50). U.S.A. only.

Mail del. money order same day—check 4-6 weeks.

SCHU-KAY, INC.(OH), Box 18343 PM, Cincinnati, Ohio 45219

STOP HUNTING for SMALL mechanical parts!

Giant new 768 page SOP Catalog for 1982 features over 24,000 inch and metric off-the-shelf parts: timing belts, pulleys, chain drives, gears, motors, speed reducers, couplings, shafts, bearings, fasteners etc. for building, repairing, inventing any small machine, engine, motor. Low prices. CATALOG 757 is just \$5.95 POSTPAID.

STOCK DRIVE PRODUCTS, DEPT. A
55 SOUTH DENTON AVE., NEW WYBE PARK, N.Y. 11040

FREE METRIC-INCH CONVERSION SLIDE RULE INCLUDED!

DUNE-BUG

Complete plans & specs on how to build or buy—disc. prices on parts, kits, engines, & raw materials.



Send \$3 for DUNE-BUG pkg to:
K & P Mfg.
230 S. Irwindale, Azusa CA
Call: 91702

FACTORY DIRECT! go cart

GO CART HOT LINE (402) 397-3911

Now go cart kits \$69.95* from \$89.95. *frame only. vgl. NO WELDING. Engine kits, wheels & drums prices FREE COUPONS Catalogue only \$3. *plus freight. SEND \$3 for catalogue and FREE coupons to: Box 34304, Dept. max 4 Omaha, Nebr. 68134

NEW 110v ARC WELDER A.C.

Transformer type heavy duty 50-100 Amp output. Extremely handy 3 portable 10" x 14" x 10" 35 lb. welding cables & M-l box mask kits in case for storage included. Only \$169.00 + \$8.00 handling. Immediate delivery with cert. cheque, money order, pers. cheque, inst. card. Visa & M.C. accepted. (N.Y. State res. + tax)

PARNUSA INDUST. INC. TRYMEX BLDG
ROUTE 11 MOORE'S, N.Y. 12968. Dealer inquiries invited.

MANUAL TIRE CHANGER

Fix your own flat tires. Change brake's bead, demounts and mounts new on rim. \$199.00 p.p.d., satisfaction guaranteed. Call or write:

WIKCO INDUSTRIES, INC.

Box 7 Box 54 306-672-3377
Berkton, Kan. Nebraska 68822

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 instant:

Write or phone for FREE 96 page Career Guide
Granton Institute of Technology, 265 Adelaide St W, Room M05
Toronto, Canada M5H 1Y3 1-(416) 977-1929

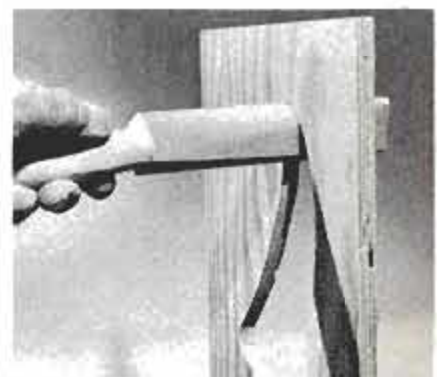
Name _____
Address _____

PM LOOKS AT NEW ABRASIVE SYSTEM

We recently tried three new sanding products from 3M: a sanding-file kit and two sanding-wheel kits. The kits contain adhesive-backed strips of sandpaper—one each in coarse, medium and fine grits. The line is called Press 'n Sand. You simply press the sandpaper on the tool and



The large 4-3/8-in.-dia. sanding wheel runs cool and cuts at a fast rate.



Contours of the sanding file permit sanding a variety of irregular shapes.

begin work. Peel off the paper for replacement. Extra adhesive-backed sandpaper is also sold.

The file kit costs about \$6. Its contours make this tool handy for sanding curves and angles, shaping wood and plastic or cleaning intricate surfaces.

The large 4 3/8-in.-dia. sanding wheel (approximately \$10) attaches to a portable electric drill to strip paint and shape wood or plastic.

A kit that contains two smaller wheels of 1 and 2 1/2-in. dia. (\$7) helps on close work.

The Press 'n Sand kits are sold in hardware and houseware stores.—Rosario Capotosto

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 800-621-6833 (Ill. 800-572-0444) or Write VIP, 2021 Montrose, Dept. 181, Chicago, IL 60618

CLOCK COMPONENTS

Clock Movements, Battery, Quartz, Electric, Urgos Grandmother, Grandfather, Westminster & Triple Chime, 5 Day Key Winder & Westminster, Rim Bams, Barometers, Metal, Bezel, Paper dials, Hands, Brass & Plastic Numbers & Markers. Hundreds of Items. Quantity Prices. Send \$1.00 for 60 Page Catalog. Refunded on \$10.00 Order.

NEWPORT ENTERPRISES, INC. Dept. A
2312 West Burbank Blvd., Burbank, Calif. 91506

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. PM682 Baroda, MI 49011

EARN BIG COMMISSIONS

WORK FULL OR PART TIME!

Show big FREE SALES KIT featuring complete line low priced business printing and ad specialties to business people. Build profitable repeat business. Start now.

NATIONAL PRESS, INC.
Dept. A42 NORTH CHICAGO, ILLINOIS 60064

PUMPS BUY DIRECT AND SAVE

Drain • Irrigate • Circulate • Spray

Heavy duty ball bearing pump. All metal, rust-proof Type XB. Stainless shaft. Use 1/2 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 p.p.d. & handling. Money back Guarantee.

LABAWCO, 80 Hwy 206, Belle Mead, N.J. 08502

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. Disc 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-2052, Melbourne, FL 32901. COD's except. For catalog of transmitters, voice scramblers and other specialty items, enclose \$2.00 to USI Corp.

THE ORIGINAL

It's a hand truck
It's a flat-bed cart
It's a dolly
It's a lawn & garden cart
(special swing up trash bag holder)



PLUS FREE GIFTS!
Just for trying the 4-Wheel Wonder, you'll get a FREE set of Ramp-Dolly cards with both ends. To use as a dolly or to hold loads to a hand truck. You'll also get a FREE Utility Knife. Use it for cutting cardboard, carpet, insulation and more. Plus, while you receive a **Surprise Free Gift** just for ordering. All the gifts are yours to keep, whether or not you keep your order!

© Copyright 1980
D.R.I. Industries, Inc.
Bloomington, MN

Imported from Taiwan and Korea

Check these fantastic features!

- 400 lb. capacity in vertical position.
- 600 lb. capacity in horizontal position
- Heavy 16-gauge steel-tube, metal handle and frame.
- Quick release hitch-pins lock handle in place.
- Toe plate of thick 10-gauge steel, measures 6 1/2" x 14"... quickly converts to upright or flat use.
- Solid rubber, ball bearing, swivel casters... big 3" diameter.
- Large solid rubber, steel hub main wheels... 8" diameter x 1 1/4" wide.
- Handles are height adjustable from 36" to 46".
- Heavy-duty construction... total weight 27 lbs.
- Folds up to a compact 36" long x 19" wide x 11" high.

WORK SHOPS™

4-wheel Wonder™

INDUSTRIAL LOAD CAPACITY HAND TRUCK & DOLLY

Save time, money, effort, damage and most of all back strain... turn tough jobs to easy ones.

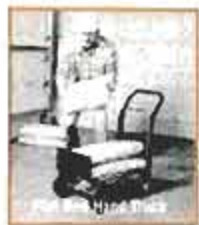
The 4-wheel design and interchangeable handle allows you to use it **vertically** or **horizontally**... it's like having an extra worker for every job! Handymen, yardworkers, homemakers, office workers, maintenance workers and warehouse personnel will all get a helping hand.

The Ultimate Heavy-Duty Helper!

Use it to move furniture, shop equipment, garage items, trash cans, heavy TV sets, appliances, office furniture. Use it as a lawn & garden cart... converts quickly to hold plastic bags for leaves and trash.

Shop and Compare!

Before we invented the 4-Wheel Wonder, you'd pay nearly \$100 for a cart with all these features. But now you pay a fraction of that! Plus you get 100% guarantee of satisfaction, a full 5-year warranty and free gifts besides! Another outstanding value for you from D.R.I.



All For An Amazing LOW

\$29.99

plus \$6.99 shipping and handling



Heavy-Duty, yet versatile & compact!

To Order: Fill in form below and send with check, money order, purchase order or credit card information to D.R.I. Industries, Inc., Dept. #PM-682, 11100 Hampshire Ave. S., Bloomington, MN 55438. **SEND YOUR ORDER TODAY - CHARGE IT IF YOU LIKE.** Credit card buyers can also call our Toll Free number 800-228-5000 (in Nebraska 800-642-8777)

86436 SPECIAL OFFER COUPON MAG-56

Try it FREE of obligation to keep it! If not totally satisfied, you can return your order any time for a complete refund, including shipping and handling.

SEND TO AND MAKE REMITTANCE PAYABLE TO:
D.R.I. INDUSTRIES, INC., Dept. #PM-682
11100 Hampshire Ave. S., Bloomington, MN 55438

INDICATE ORDER _____ 4-Wheel Wonder(s) at \$29.99 plus \$6.99 shipping and handling each.
How many? _____

CHECK METHOD OF PAYMENT
 Check, money order or purchase order enclosed (MN residents add 5% sales tax)
 Charge it to: VISA MasterCard American Express
 Diners Club Carte Blanche

Card No. _____ Exp. Date _____

PLEASE PRINT SIGNATURE X _____
(Need to sign only if charging order.)

NAME Mr. _____
Mrs. _____
Miss _____

ADDRESS _____ Street & No. _____
CITY _____ STATE _____ ZIP _____

™4-Wheel Wonder is a trademark of D.R.I. Industries, Inc. Patent pending

QUALITY ACCEPTED 100% GUARANTEE OF SATISFACTION

You must be completely satisfied or you can return your order anytime for replacement or a complete refund including shipping and handling charges.

PLUS A FULL FIVE YEAR WARRANTY

D.R.I. Industries warrants this product to be free from defective materials and workmanship for 5 (five) years from the purchase date and will repair or replace any such defective part without charge for 5 (five) years. To make a claim under this warranty, written notification of such defect must be given to D.R.I. Industries at the address stated below. Any product or parts needing repair or replacement should be shipped postpaid to D.R.I. Industries.

D.R.I. INDUSTRIES WILL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES CAUSED BY BREACH OF THIS WARRANTY AND UNDER NO CIRCUMSTANCES SHALL ITS LIABILITY EXCEED THE PRICE OF DEFECTIVE PRODUCTS OR PARTS. Some states do not allow the exclusion or limitation of incidental or consequential damages, so that the above limitation or exclusion may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

D.R.I. Industries, Inc. 11100 Hampshire Avenue South, Bloomington, MN 55438

A BEAUTIFUL GREEN LAWN FOR ONLY 10¢

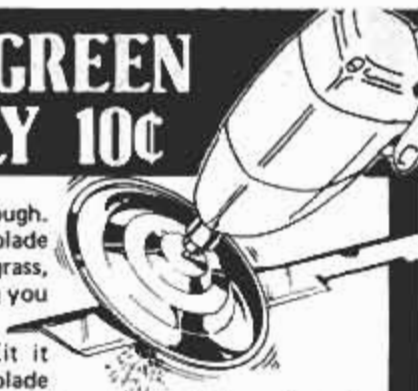
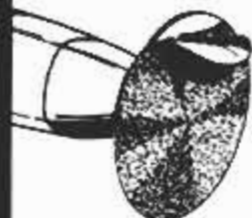
Fertilizing and watering your lawn isn't enough. It is very important to keep your mower blade sharp, too. A dull mower blade tears your grass, causing the tips to turn brown, and leaving you with an unhealthy looking lawn.

With Ali-Gator-Grit[®] Tool Sharpening Kit it only cost you 10¢ to sharpen the mower blade

yourself. Our big 7 inch size makes a high speed grinder out of any make electric drill.

It's fast and easy to sharpen mower blades, hoes, shovels, axes and all your garden tools.

One Ali-Gator-Grit[®] Disc can sharpen 20 mower blades. Each kit contains 6 discs. that's 120 sharpenings-at 10¢ each, equals \$12.00.



A COMPLETE TOOL SHARPENING KIT for \$11.95

(Add \$1.65 for shpg. & hdg. Outside U.S.A. add \$3.10 shpg. & hdg. Ohio residents add 5% sales tax)

Consists of: Six extra coarse ALI-GATOR-GRIT[®] Stick-On Discs,
One 7 inch size Back-up Pad and One steel arbor (fits all drills)
Plus FREE BONUS Mower Blade Balancer.

VISA or MASTERCARD customers CALL TOLL FREE 1-800-543-7796

15 Day Money Back Guarantee

(Except in Alaska, Hawaii & Ohio)

Or send check or money order to:

Sanding Tools of Ohio
P.O. Box 1677, Dept PM
Fairborn, Ohio 45324
(513) 878-3948

ALI-GATOR-GRIT

Makes Sanding Fast & Easy!



All credit card orders, be sure to include account number & exp. date.

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

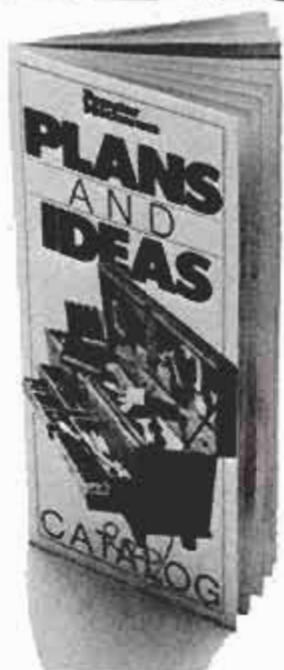
log splitter easy to build and a fun thing to use. And, you'll save your back from aching as you split logs the easy way.

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.

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**

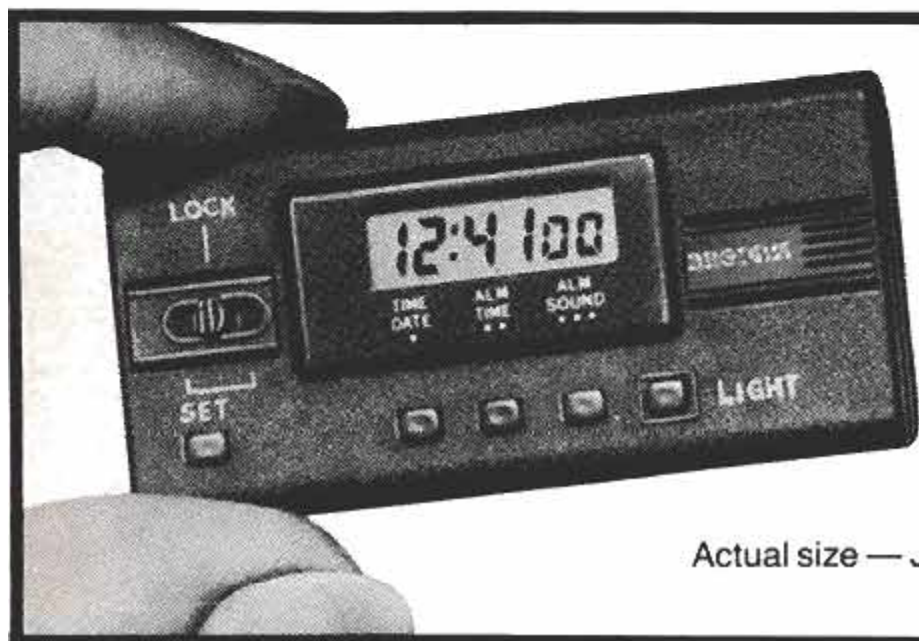
NEW EDITION
order today!

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

SALE! \$9.77 EACH

Exact Same Clock Sells Elsewhere for \$26.95



8 GREAT FEATURES:

- Hours • Minutes
- Seconds • Day
- Date • Alarm
- Snooze Alarm
- Light-up Display

PLUS Fold-Out
Easel Back

Actual size — Just 2⁹/₁₆”!

Incredible "Everywhere" Alarm Clock

Really amazing — Convenient, dependable, and accurate to within seconds per year! This LCD Quartz marvel will stick-up anywhere... stand on a desk or counter... and travel along with you in pocket or purse. Lots of great features: hours, minutes, seconds, day, date, alarm, snooze alarm, and light-up display. Plus, a handy easel back and a FREE WALL HOLDER for instant stick-up. Handsome, sturdy, super-compact... This very same clock sells in catalogs for \$26.95! Now yours for just \$9.77 each... *Great Gift Idea!*

FULLY GUARANTEED

The quartz-crystal mini alarm clock runs at exactly 32,768 cycles per second — We guarantee it to be accurate within two minutes per year. If not totally delighted, simply return for full refund (except shipping & handling). Our policy is to process all orders promptly. Credit card orders are processed upon credit approval. Delays notified promptly. Shipment guaranteed within 60 days. (Dealer inquiries welcome.)

Old Village Shop, Hanover, PA 17331



* SATISFACTION GUARANTEED — MAIL TODAY!

OLD VILLAGE SHOP, Dept. VZ-7858
340 Poplar Street, Hanover, Pa. 17331

Yes! Please rush my LCD Mini Alarm Clock(s) (Z513200) as indicated below, on Full MONEY BACK GUARANTEE.

- One Clock for \$9.77 plus \$1.50 shipping and handling.
- Two Clocks for \$18.77 plus \$2.50 shipping and handling.

Enclosed is \$_____ (PA res. add sales tax)

CHARGE IT: American Express Carte Blanche
 Diners Club VISA MasterCard

Acct. No. _____

Exp. Date _____

NAME _____ (please print)

ADDRESS _____

CITY _____

STATE _____ ZIP _____

- Check here and send 50¢ for year's subscription to our full-color catalog of fine gifts (Z389965X).

© H.H.I. Inc. 1982



FOUND!

IN GUARDED VAULTS!

5,000 ORIGINAL, U.S. GOV'T. MORGAN SILVER DOLLARS that escaped Gov't. meltdown!

Rare Surviving Hoard of Original U.S. Gov't. Coins To Be Released To U.S. Citizens For Only \$30 Each
...Acceptance Deadline: June 28



Tonight at midnight, history will be made when the National Monetary Center opens its vaults and releases to the public some of the last surviving ORIGINAL, U.S. GOV'T MINTED MORGAN SILVER DOLLARS IN EXISTENCE IN ALL THE WORLD. Yes, a valuable hoard of 5,000 Morgan Silver Dollars... that escaped Gov't. meltdown over a half a century ago... and have become one of the rarest coins on the face of the earth.

THE DAY THE SILVER DOLLAR ARMY MARCHED OFF TO WAR!

You see, in World War I, due to severe silver shortages, the U.S. Gov't. drafted from circulation and melted down some 270 million Morgan Silver Dollars. In one single action—"Operation Meltdown"—the Morgan suddenly became one of the rarest coins ever minted. Which is why the release of this hoard of 5,000 original U.S. Gov't. Morgans is such a significant event in the world of valuable coins.

FOR THE RELEASE TO INDIVIDUAL CITIZENS ONLY— FOREIGN AND DEALER ORDERS WILL NOT BE HONORED!

Most significant, each of these original Morgan Silver Dollars, is guaranteed to "contain 412.5 grains of ninety per cent fine silver," to measure 38.1 mm in diameter with weight of 26.73 grams and will be accompanied by a Certificate of Authenticity to this effect for your own insurance purposes.

PRICE GUARANTEED FOR THIS SPECIAL RELEASE ONLY! SUPPLY GUARANTEED FOR ONLY AS LONG AS THEY LAST!

Due to limitations of our available supply, and the acute scarcity of original U.S. Gov't. Morgan Silver Dollars still in good condition, we can only guarantee this initial offering price of \$30 per coin plus \$2 postage, handling and insurance per coin for this special release only.

In addition we must set a strict limit on no more than twenty (20) original Morgan Silver Dollars per order, AND SINCE THIS OFFER IS BEING MADE AVAILABLE TO PRIVATE U.S. CITIZENS ONLY NO ORDERS FROM DEALERS OR INDIVIDUALS FROM OUTSIDE THE UNITED STATES WILL BE ACCEPTED and uncashed checks will be returned.

But once again... this is a STRICT LIMITED OFFERING TO U.S. CITIZENS ONLY. All orders will be filled on a first-come, first-serve basis; and of course your purchase price refunded in full, anytime within 14 days if not completely satisfied. **SPECIAL COLLECTOR'S DISCOUNTS: 3 COINS for \$75 plus \$5 postage, handling & insurance; 5 coins for \$120 plus \$5 postage, handling & insurance; 20 coins for \$425 plus \$5 postage, handling & insurance.** To avoid disappointment or future regret, you must place your orders immediately. ACT NOW!

**NATIONAL MONETARY CENTER, DEPT. SWNV-24
Box 37438, WASHINGTON, D.C. 20013**

NATIONAL MONETARY CENTER, INC. is a private non-profit corporation not affiliated with the U.S. Mint or any other agency.

BUILD YOUR OWN SWIMMING POOL



KITS - PLANS - FULL SIZE BLUEPRINTS

You can build an inground pool for 1/2 or less than retail value. Join the thousands who build each year and save \$\$\$\$. Our methods are especially intended for amateurs. Over 20 designs, complete construction blueprints and layout kit for \$5.95 + \$1.50 postage and handling. Pool kits available on request.

LOREN'S
Pool & Spa

400 Lincolnway
La Porte, Indiana 46350
Phone (219) 362-1334

THE QUALITY ALTERNATIVE TO HIGH-COST INFLATABLE BOATS!

A new series of heavyweight canvas, dinghies and motorboat hulls \$110. to \$540. All pack small. All last for years. Send for our FREE color brochure.



See Eagle
Dept. PM-66
St. James, NY 11780
or phone 516-724-8900

SEA EAGLE

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

1-800-257-0426

Radio Shack Associate Store

1758 N. Deane Drive, Vineland, N.J. 08360 609-691-7100

"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 44 1/2" 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 44 1/2" 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 FREE color brochure call TOLL FREE 1-800-253-1030 (in Michigan call 616/849-3400) or write:



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. NYC
P.O. Box 1148, Benton Harbor, MI 49022

**TRS-80™
DISCOUNT
DIRECT
PRICES**

Learn To
"Do It Yourself" & Save PURE RADIO SHACK EQUIPMENT

1-800-841-0860 Toll Free:

**MICRO MANAGEMENT
SYSTEMS INC.** YOUR TRS-80
Parcel Division PERSONAL
DEPT. NO. 33 COMPUTER
115C Second Ave S.W. HEADQUARTERS
Cairo, Georgia 31728 WRITE FOR
912-377-7120 Ga. Phone No. FREE CATALOG

Satellite TV

We don't just sell information!
We Manufacture Hardware!

Our 94-page catalog and information book tell the whole story! Inexpensive dialers, high pre-feds, computer aiming software! Specs, kits and more! Send \$7.95 today!

24-hour C.O.D. Hotline • **SPACECOAST**
(305) 338-7800 RESEARCH CORPORATION
Dept. G, P.O. Box 42, Andalusia, Ga. 31701

**NOW
BRASS BAR RAILS**

and other solid brass bar accessories

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 restaurants and pubs.

For Catalog send \$1.00 to:
MIDWEST CUSTOM BRASS
206 E. Main Street, Dept. PM62 Round Lake Park, IL 60073

BUILD THIS OUTSTANDING 45' x 30' BRICK HOME FOR UNDER \$14,000—APPRAISED AT \$45,000 PLUS. MANY ATTRACTIVE FEATURES SUCH AS 2 LARGE BATHS, THREE BEDROOMS, FIREPROOF WALLS AND FLOOR, A FIREPLACE THAT WILL HEAT ENTIRE HOUSE, ETC. ENGINEERED AS A DO-IT-YOURSELF FOR THE AMATEUR BUILDER. NO BLUE PRINTS, EASY TO FOLLOW STEP BY STEP INSTRUCTIONS ONLY \$12. SAVE THIS AD. APPEARS ONLY ANNUALLY. R.E. WHITEHEAD RT. 3 BOX 317 VINTON, VA. 24179

LOG SPLITTER PARTS
2-STAGE CAST IRON GEAR PUMP

Supplies 10 1/2 GPM at 650 PSI until more pressure is needed. Then kicks down to lower GPM and up to 2500 PSI. Right hand rotation (direct couple). 3600 max. RPM, WI.

12 lbs. \$125
15 gal. 2 stage, use 8 plus hp. \$183
22 GPM use with 10HP or greater \$240

4-WAY CONTROL VALVES

Built-in relief valve, 1/2" in-out ports, 1/2" cylinder ports. Item E102V \$40
With pressure sensitive detent, an return stroke you don't have to hold handle. Item E102VO \$59

Double-Acting Cylinders

3"x24" stroke, 1 1/2" rod, 52 lbs. \$115
4x24x1 1/2" Rod Can go UPS \$138
4x24x2" rod M.D. \$150
5x24x2" rod \$204

NEW ENGINES

5 HP Tecumseh or Briggs recoil start 1/2" shaft \$125
8 HP Tecumseh, recoil start 1" shaft \$178
10 HP Tecumseh, recoil start 1" shaft \$205
10 HP Tecumseh, electric start \$240
Verticle Shaft Engines available.
Heavy duty 15Ton Splitter complete \$630

Send \$1.00 for discount catalog on Valves, Cylinders, Hoses, Frames, Tanks, Wedges, Slides, Wheels, Go Cart Parts, Splitters, Trailer Parts, Generators, or \$6.00 for Catalog & Splitter Design & Fact booklet. We ship UPS.

NORTHERN HYDRAULICS
P.O. Box 1221 Dept. PM6
Burnsville, MN 55337 (612)894-8310

SEE 175 FULL SIZE SPORTS CARS
You Can Build at Home from Kits

For the low-price of an ordinary compact, you can own a full-size antique, classic or modern gull-wing sports car. Choose from over 175 exciting replicas including 50mpg roadsters to mid-engine V-8s. Manufacturers from all over the country offer these low-cost bolt-on body kits for easy home assembly. They're serious automobiles designed for power, economy and performance. And, all are made to sell for a fraction of their apparent value.

Transform your old clunker into a classic roadster or exotic GT sports car. Read all about kits for Pinto, Mustang, Capri, Volkswagen, Corvair, Chevy/Ford V6-V8, Datsun, Toyota, dozens more! Too many to list here!

Here are just a few of the full-size kit cars you'll discover

- Porsche • T-Bird • MG-TD • Ferrari
- Pantera • Mercedes • Bugatti • Jaguar
- Cobra • Auburn • Lamborghini... and more

Giant all-new 1982 Complete Guide to Kit Cars includes

- Over 175 Kit Cars • Front, Rear, Mid-Engine Kits
- Assembly Articles • GT's, Gull-Wings, Electrics
- Do-It-Yourself Info • Money Making & Saving Facts... more

Special 1/2 Price Bonus Offer!!! ... Kit Car Monthly...
See hundreds of used kit car bargains and new kit intros. Only \$11/year. Order both. Everyone does!

Get the Official
FREE!
when you order either
The Complete Guide to Kit Cars
or The Kit Car Monthly

600 Photos
196 Pages

30 DAY MONEY BACK GUARANTEE

AUTO LOGIC PUBL. INC. Mail Kit Car Buyer's Guide
P.O. Box 2073
Department PM62
Wilmington, DE 19809

Master Charge Visa Expire Date _____
Order TOLL-FREE Day or Night
Master Charge or Visa REQUIRED!
Operator CANNOT answer questions! No COD's!
(800) 331-1000, Operator 666

Mailed immediately. Sold Only By Mail.

Find twice the treasure...

with a **WHITE'S ELECTRONIC MINERAL/METAL DETECTOR**

In half the time

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 \$79.95. Covered by U.S. Patents.

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 97386

ONE MAN SAWMILL

NOW! BEST Inflation and HIGH Lumberyard Prices!
No need to stop your important projects. Use this portable mill right in the trees—run out smooth, like lumber every time—no experience needed. Saw your own logs of lumber for sheds and more excellent splintery items—no crew needed. Use any power—tractor PTO, diesel, electric. Time payments may be arranged. Send for FREE details—mail coupon below or postage 100¢ only. No Obligation and No Salesman Will Call.

BELSAW MACHINERY Co. 363H Field Bldg., Kansas City, Mo. 64111

Name _____ (Please Print)
Address _____
City-State _____ Zip _____

LEARN UPHOLSTERY
PROFESSIONAL AT HOME! SPARE OR FULL TIME

MEN & WOMEN ALL AGES! Send for free book on learning to reupholster chairs, divans, footstools, all furniture for **BIG MONEY** in spare or full time. No experience needed, no age or educational limits. We show you how and provide **EVERYTHING** needed to start: (1) Self-study program covering all phases. (2) All tools and 3 big furniture kits for practice. (3) ... all supplies, frames and materials to build \$300 worth of furniture, yours to keep or sell. Write for big, free opportunity book. No obligation, no salesman will call.

MODERN UPHOLSTERY INSTITUTE,
6803H Field Building, Kansas City, Missouri 64111

GARDENING? WANT A WEED FREE GARDEN WITHOUT HARD WORK?

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 Fast**

NOT SOLD IN STORES. FREE BROCHURE WRITE TO:
AGCO PO Box 75 Southampton Pa 18966 Dept P

Name _____
Street _____
City _____
State _____ Zip _____
Last 215-947-8855 24 hrs a day. Charge card orders accepted.

WEEDS FAST AGCO TILLER-POWER HOE... TILLS DEEP... WEEDS FAST AGCO TILLER-POWER HOE... TILLS DEEP...

Special introductory price of **\$4,695.**

1000's OF TV PROGRAMS WITH A SATPRO ANTENNA.

No monthly program charges.

Receive up to 100 channels or more, depending on your location, on a SATPRO precision-built antenna.

- Three models to choose from, with special introductory prices as low as \$4,695.00.
- Easy to assemble and install.
- Exclusive single-pole mounting.
- One-year warranty on electronic components, three years on other parts.

For a FREE brochure, call toll-free, 1-800-356-9461. In Wisconsin, call 608-752-2176. Or, write: SATPRO, P.O. Box 1017, Janesville, WI 53547.

SATPRO COMMUNICATIONS INC.
A Satellite Communications Company

Build a picnic table you can store indoors

READY TO USE

FOLDED

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. 682

Popular Mechanics is a Publication of Hearst Magazines, a Division of THE HEARST CORPORATION!

BURRO Fiberglass Travel Trailer Kit
Build Yourself! Save Gas

TRAILER FOR THE '80's—Burro Travel Trailer kit sleeps four. Under 1,000 lbs. Fiberglass. Ready to tow. Finish interior only. Write Burro PM6 14143, 21st Avenue North, Plymouth, MN 55441. For full color catalog send \$3.00 to cover postage and handling. Dealers Wanted.

SAVE UP TO 85% GOV'T SURPLUS and NEW EQUIP'T

1/4 HP, 1725 RPM, REVERSIBLE, 115 V. UTILITY AC MOTOR
GENERAL ELECTRIC

Normal Retail Over \$80.00 **\$19.95** F.O.B. LINCOLN

- ITEM #18-996 1 - Perfect for wide variety of moderate hp/mhp applications as fans, blowers, speed reducers, tools, pumps, etc. Supplied with removable cast iron pulley for 3/8" V-belt, Shaft diameter 1 1/2"
- Split phase, rated cont. duty, reversible by electrical connection, thermal protection, NEMA 48 frame, resilient cord motor. Size 7" x 6" x 3 1/2" (1 1/2 lbs.)

100-Page Catalog Send 50-CENTS COIN or STAMPS 100's of BARGAINS

SURPLUS CENTER PM062 Lincoln, Nebraska Zip Code 68501

WOODWORKERS!

A magazine for both novice and veteran bringing you over 75 project plans per year...for building the best of Early American, Shaker, English, Contemporary furniture, clocks, toys, lamps, gifts and much more...

ALL FOR LESS THAN 20¢ PER PLAN

PLI'S Regular articles on shop tips, jig-building, finishing techniques and money-making ideas.

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!)

The Woodworker's Journal
P.O. BOX 1629-16 NEW MILFORD, CT 06776

NAME _____
ADDRESS _____
CITY _____ STATE _____ ZIP _____

money back if you're not satisfied

SHOPCRAFT® 4 INCH BENCHTOP BELT SANDER

NEW!

With Exclusive Three Surface Sanding

4" by 36" large sanding belt. Sands and polishes three ways: flat surface, on mitered edge on curved surface. All this with a variable speed control, (160-500 SFM). No burning of woods. Ready to run out of the box. Vac. port. Power cord storage, spring loaded tensioning with tracking control. Tilt Table with Miter Gauge. 3.2 Amp Mtr., yet light weight, can be moved or stored out of the way.

76790-20... Shopcraft Benchtop Sander (Our Price)... \$99.95

Send For Our 4th Edition Illustrated Discount Tool Catalog
Americraft, Benchmark, Diamond Tool, Dison, Dramel, Evans, General, Intermatic/Air, Makita, Maxon, Moody, Pascoche Air Brush, Sherline, Triumph Twist Drill, Wahl, X-Acto Tools, etc. and more!

Send \$2.00 for catalog or free with order for above tools. We ship U.P.S. Prepaid Coast to Coast in the 48 States. No extra charge for using your MasterCard or VISA. Personal Checks take two weeks in clear. New Jersey Residents, Add 5% Sales Tax. Call 201-342-5097.

PATTY'S CORNER, INC.
P.O. BOX #326 DEPT. PM HALESDON, N.J. 07538

PARKS 12" THICKNESS PLANER

The PARKS NO. 95 is a compact, modestly priced planer with mill planer precision and ruggedness. More than 50,000 in use around the world. Write NOW, for complete details!

THE PARKS WOODWORKING MACHINE CO.
Dept. PM, 1501 Knowlton St., Cincinnati, Oh. 45223
Mfrs. of Quality Woodworking Machines Since 1887!

BUILD YOUR OWN SWIMMING POOL

SAVE THOUSANDS OF DOLLARS \$5 WITH OUR EASY-TO-DO KITS OR MAKE THOUSANDS OF DOLLARS \$5 INSTALLING OUR POOL KITS FOR OTHERS.

Your own full-size in-the-ground pool can be installed by yourself and only one helper.

Write Today for Free Information
WONDER INDUSTRIES Dept. PM
P.O. BOX 1526, PARAGOULD, ARKANSAS 72450
OR PHONE 501-239-8295 TODAY!
If you already have a pool, write for our free catalog of pool equipment and chemicals

Handy Dandy

Solid red oak home workbench. Butcher-block construction. Accessories optional.

Write for free brochure and price list.

GAMBLE BROTHERS
4661 Almond Avenue
Louisville, Ky. 40209

Be an ELECTRICIAN

MAINTENANCE CONTRACTOR CONSTRUCTION

Make more money! Check out Electrician's wages against the kind of money you make now!

TRAIN AT HOME IN SPARE TIME

Make extra money in spare time while you train for a full-time job. Do odd jobs for friends and neighbors. Save money doing your own electrical work. Learn everything from repairs and maintenance to complete electrical installations. No previous experience needed. Everything explained in easy-to-understand language with plenty of drawings, diagrams and photos. Tools, materials, test equipment included with course. Approved for Veterans and G.I.'s. Be ready to take almost any electrician licensing examination offered by state, city or county. No cost, no obligation, no salesman will call!

MAIL COUPON TODAY!

ICS Electrician School, Dept. PB052
ICS Center, Scranton, PA 18515

Rush free facts that tell how I can train at home in spare time to be an electrician

NAME _____
ADDRESS _____
CITY/STATE/ZIP _____

ELECTRICIAN ONLY MONEY-MAKING CAREER

Heavy Duty Log Splitters

Horizontal and vertical at discount prices. 12 thru 24 ton models available. Also all parts for building your own. Send for free splitter brochure or \$2.00 for complete discount parts catalog.

15-Ton \$830

**Northern Hydraulics, P.O. Box 1221, Dept. PM56
Burnsville, MN 55337 612-894-8310**

**Save \$100 to \$200 per year
On Your Hot Water Bill**



- with the amazing new **WATER WIZARD**
- uses up to 75% less water
 - 1-2 month payback
 - powerful even spray
 - 5 year warranty
 - fits any showerhead
 - installs in minutes
 - 30 day money back guarantee.

Stop throwing money down the drain. Order your WATER WIZARD today.

Please enclose \$12.95 each plus \$2.00 shipping and handling. Please send check, money order or Visa/Mastercard (include account number and expiration date) to:

THERMALITE PRODUCTS
Dept. PM 682, 1119 Alger, S.E., Grand Rapids, MI 49507

SHEET METAL WORKER

**TRIOK
MULTI-PURPOSE**

- SHEAR
 - PRESS BRAKE
 - SLIP ROLL
 - 24" WIDE 20 GA. MILD STEEL
- ALL FUNCTIONS OPERATE SIMULTANEOUSLY



PACIFIC ONE CORPORATION
410 W. Pacific Coast Hwy. Suite K210
Newport Beach, CA 92663 (714) 645-5962

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-13
940 West Broadway, Jackson, WY. 83001

Brown's Second Alcohol Fuel Cookbook
Learn to make your own economical alcohol motor fuels... how to build a still, make diesel fuel from soybeans, and more. It's all here in this outstanding book written by one of the best-known authorities in the field! 304 pp., 218 illus. Hardbound. Only \$13.95, Order No. 2094.

Dept. PMX-882X
TAB BOOKS Inc. Blue Ridge Summit, PA 17214

GENUINE HANDMADE BOOTS
Bootmakers for over 20 years. Top quality leather-many styles-reasonable prices. WRITE FOR FREE CATALOG.

Austin-Hall Boot Co.
P.O. BOX 12368-PM B Paso, Tx., 79912

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 NJ - Appd for Veterans. Send Name and address for FREE book.

Locksmithing Institute, Dept. 110-062
Div. Technical of Home Study Schools, Little Falls, N.J. 07424

**WENTY-SPLITTER
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

BEND-A-LIGHT



CAST SHADOWS AND REFLECTED GLARE MAKE THE JOB MISERABLE? NOT WITH BEND-A-LIGHT, A HIGH INTENSITY LIGHT SOURCE WITH A FLEXIBLE SHAFT. GETS LIGHT INTO THE SMALLEST HOLES SEND ONE TODAY TO: M.H. ENTERPRISES, P.O. Box 1220, Dept. 2821, Northbrook, IL 60062

Make \$15⁰⁰ an hour

Assemble **MAGNATRAC**
Crawler Tractor Kit



Use it for your toughest jobs, then earn extra cash doing work for others. Buy factory-direct for greatest savings! Over 30 Attachments. Resale opportunities are great. For more information send now to:

- STRUCK KIT, Dept. PM62 Cedarburg, WI 53012**
- CATALOG** - showing Magnatrac Kit construction & money making uses - \$1.00
 - PLANS** - for fabricating Magnatrac Tractor from local materials - \$7.00
 - MOVIE** - of Magnatrac in action (8mm Color) - \$9.50
- Name _____
Address _____
City, State, Zip _____
(Money refunded on any purchase)

NON-GUNS!



That's right, these precision built replicas of famous firearms CANNOT CHAMBER OR FIRE REAL AMMUNITION! Made of machined metal they look, feel and weigh same as the original. CAN BE DISASSEMBLED. Over 30 Grains, hand-finished parts. Comes fully assembled. Safe and perfect for display. **MONEY BACK GUARANTEE.** Send for FREE CATALOG of over 60 different models. Models shown U.S. GOVT. AS AUTOMATIC. 3001-331 \$50.00 (U.S. only)

THE COLLECTOR'S ARMOURY, Inc., Dept. PM
300 SLATERS LANE, ALEXANDRIA, VIRGINIA 22313 (Shipping in U.S. only)

GARDENERS

A Small Wonder.



The Masport Home Gardener™

So light and versatile you can use it for most of your gardening chores. Many use it every time they garden!

- **Lightweight.** Just 76 pounds.
- **Tills, Cultivates, Weeds, and more!**
- **Tills like a Rear-Tine.** To 9" deep.



For information, send to:
Masport America Inc.
200 Gate 5 Rd., Dept. PMH-2656
Sausalito, CA 94965

Name _____
Address _____
City _____
State _____ Zip _____
Phone (____) _____

©1982 Masport America Inc.

**LIQUIDATION
AT BELOW DEALER COST!
ELECTRIC, AIRLESS
Super Painter**

FACTORY NEW! FACTORY PERFECT!

No air compressor needed! Just plug into a 110-120V three-prong socket and start spray painting! Simple to use!



Multiple-purpose! It sprays liquid insecticides, pesticides, fertilizer, also!



The quick and easy way to paint!

Just fill the sturdy 1-quart plastic container with paint. Plug the 3-prong plug into a household outlet. Press the trigger and spray!

To adjust the rate of flow, turn a knob. For a larger spray pattern, stand a little further away from the object being painted. For a smaller spray pattern, stand closer. When you have a tough painting job... like brick walls, concrete, stucco... the Super Painter sure beats a brush or roller! For fussy jobs like fences, louvers, radiators and metal patio furniture, Super Painter is simply terrific! And for big jobs such as a house, garage, barn, etc., Super Painter is a real timesaver.

- Use it with latex, oil base paints, shellac, lacquer, varnish, stains and enamels. Use it with insecticides and pesticides, too.
- Includes a 6-foot cord with 3-prong plug
 - Sprays up to 10 1/4 oz. per minute of average weight latex paint
 - Includes 0.7mm spray nozzle that can handle a variety of liquids.

Manufacturer's Suggested Retail

\$139.95

OUT THEY GO AT

\$58

Price subject to change after 60 days. Offer void outside 50 United States.

Credit card customers can order by phone.
Toll-Free: 1-800-328-0609
If busy signal, or after business hours, or in Minnesota, call **1-800-228-2606** 24 hours a day, 7 days a week.

C.O.M.B. Co. / Liquidators Dept. B-770-3009
6850 Wayzata Blvd. / Minneapolis, MN 55426

Send _____ Super Painter(s) at \$58.00 each plus \$3.00 each for shipping and handling. (Allow 3-4 weeks for delivery. Add 2-3 weeks extra if paid by check. Sorry, no C.O.D. orders.)

Minnesota residents add 5% state sales tax.
 My check or money order is enclosed
Charge my Mastercard VISA
 Am. Exp. Diners Club

Acct. No. _____ Exp. _____
PLEASE PRINT CLEARLY
Name _____
Address _____
City _____
State _____ Zip _____
Phone _____

C.O.M.B. Co.

ONE OF THE NATION'S LARGEST
AUTHORIZED MAIL ORDER LIQUIDATORS
OF CONSUMER PRODUCTS

6850 WAYZATA BOULEVARD
MINNEAPOLIS, MINN. 55426

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 \$5.00, 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-6
Riverside, Calif. 92517



TILLER USERS...

Can your machine do all of this?

Save \$129.80 NOW

- ★ Handle with just ONE HAND.
- ★ EVENLY break, turn & till soil.
- ★ Shred vegetation without tangling.
- ★ Leave NO WHEELMARKS or FOOTPRINTS.

The TROY-BILT® ROTO TILLER-POWER COM-POSTER can do all this and more! That's why serious gardeners consider it the finest tiller available. See for yourself! For complete details, OFF-SEASON SAVINGS, and FREE 32-page booklet clip this and mail today to:



TROY-BILT® Tillers
102nd St. & Ninth Ave.,
Troy, N.Y. 12180

TROY-BILT® Roto Tiller-Power Composters
Dept. A1320
102nd St. & 9th Ave., Troy, N.Y. 12180

Please send the whole wonderful story of TROY-BILT® Roto Tillers including prices and OFF-SEASON-SAVINGS now in effect for a limited time.

Name _____

Address _____

City _____

State _____ Zip _____

© 1982 Garden Way, Inc.

AMAZING SCIENTIFIC and ELECTRONIC DEVICES

PHASER shockwave and invisible FORCE FIELD generators. LASERS for weapons, cutting, burning, cloud writing, photography 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

MINI-STROBE LIGHT

- ★ Magnetic Base For Dash Or Roof Mounting Send \$39.50 and \$2 P & H
- ★ 8ft. Cord Plugs Into Cigarette Lighter
- ★ 75,000 Candlepower
- ★ Weather and Impact Resistant
- ★ Specify Red, Amber, Blue or Clear Lens



NORTH SHORE CO.
2212 B Shannondale Dr.
Libertyville, IL 60048

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 9594, Dept. E
Detroit, Michigan 48240



GAS TO ELECTRIC CONVERSION KIT

GAS LAMP BURNS \$72 TO \$120 OF GAS PER YEAR
RELITE OPERATES ON ONE TENTH THE COST OF GAS

Easy to install RELITE™ duplicates the charm and increases the light output on any gas light. Automatic ON-AT-DUSK—OFF-AT-DAWN photo electric control. Safe 12 volt or 115 volt 2 bulb fixture.

Good opportunity for high profit business, installing Relite.
Call 800-325-6504 or write:

YARDLIGHTING SYSTEMS INC.

1039 CHARLES AVE., DEPT. 33 • ST. PAUL, MINN. 55104



Free Plans for decorative chess board with a purchase of 15 furniture plans for bedroom, kitchen and family room. These plans give you instructions and construction drawings for only \$15. Send a check or money order to: U-Build-It, 551 Sixth Avenue West, Craig, Colorado 81625

LEARN BANDSAW BOX TECHNIQUE FOR FUN AND PROFIT

Make small unique bandsaw boxes from common lumber. Big demand in gift shops and craft fairs. Send \$10.00 for fully illustrated instruction booklet of 15 original designs (over 70 photos and illustrations)—or request free information. Satisfaction guaranteed. BOX-ART, DEPT. B, BOX 125, CLARENDON HILLS, ILLINOIS 60514.



Solve your Hauling Problems



950 lb. Capacity

The Stowaway...Just...Folds Away



The Garden Cart

500 lb. Capacity



Standard Dump Front

Call Toll Free
1-800-243-8550
For Free Color Brochures

Hayes
ESTABLISHED 1943

HAYES EQUIPMENT CORPORATION
P.O. Box 526 PM Unionville, CT 06085

© 1982 HAYES

BUILD A ROBOT, "ARMEGA 33"

Armega 33 is a full six-axis manipulator arm. Easy construction from commonly available materials. Matches the dimensions of a human arm, fits 2 lbs. at max. reach of 33 inches. Suited for microcomputer control, or may be manually directed as a remote manipulator. Complete plans, construction drawings, materials list, and instructions. \$34.95 postpaid, or send \$4.95 for illustrated information package. Send check or money order to: Micro-Mega, P.O. Box 6265, Arlington, VA 22206 (VA residents add 4% sales tax)

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

SATELLITE TV

FANTASTIC 80 TV CHANNELS

New antenna construction plans plus big 8x11 book loaded with aiming info, kits, LNAs and receivers at wholesale prices. Far better than cable TV! Enjoy crystal clear reception. Send \$9.95 today. Add \$2.00 for 1st class (air mail) or call our 24 hr. COO order line (305)862-5068 Now

Global TV Electronics, P.O. Box 219-B, Maitland, FL 32751

ALUMINUM FURNITURE KITS

Buy Foundry Direct
Save up to 80%
Large Selection
Benches Benches Benches

FREE INFORMATION—Gervis Furnishings-D-P
2171 India St., Suite A • San Diego, CA 92101

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: I.T. Sound, Dept. PM, P.O. Box 338, Stone Mountain, GA 30086. Phone (404) 493-3298. COST: \$349.00

**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
1975-1981
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

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 **AUGUST**. The closing is **JUNE 4th**.

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

OLD CAR FANS: subscribe to **HEMMINGS MOTOR NEWS**, world's largest old car marketplace since 1954. Over 450 pages of ads each month, crammed with thousands of old cars for sale — plus parts, literature, restoration shops and more. Only \$13.75 for 12 giant issues. Subscribe to the 'Bible' of old car nuts today. Send to: Hemmings Motor News, Dept. MP, Box 100, Bennington, Vermont 05201

FIRE Injectors Increase Power To Plugs 100 Times. Guaranteed Fires So Hot Plugs Fire Through Oil. 4 Cylinder \$6.00, 6 Cylinder \$8.00, 8 Cylinder \$10.00. Imperial Corporation, P.O. Box 215, Otto, MO 63052

MOTOR—In-Wheel. Electric Motor, Gear Reduction, Tire, in one unit. Yost, Rt. 1, Box 37, Sauk City, WI 53583

PREVENT RUST Forming. Simple and Inexpensive. Details \$2.00. P.O. Box H, Auburn, KS 66402

ENGINE OIL — 10s A QUART. Details \$2.00, SASE, P.O. 1715, Crystal Bay, NV 89402

SAVE GASOLINE! Bypass pollution devices — easily, reversibly! Posco (GB-8), LaGrangeville, NY 12540

PROPANE-METHANE-NATURAL GAS Conversions. CARS-TRUCKS-Build Yourself. THOUSANDS SATISFIED USERS! Write: Fleming Engineering, KPM, Remsen, NY 13438

INCREASE MPG — REDUCE TUNEUPS. Electronic Ignition \$39.95, for any car with points and condenser. Complete information \$1.00, Refundable with Purchase. ENGINEC, POB 9700, Long Beach, CA 90810

FREE Car Every Year. Indefinitely Little Known Legal Method. Saves Thousands. \$2.00, M. Justynowicz, P.O. Box 35, Middle Village, NY 11379

10-30% MILEAGE INCREASE. Inexpensive, \$8.95 GUARANTEED. Complete information \$1.00, Refundable with Purchase. Enginec, POB 9700, Long Beach, CA 90810

BIG Dollars Savings with Gas and Car Care Tips. Loads of Proven Driver Tricks. \$2.00. Setco, Box 24, Springfield, Mass. 01108

AUTOMOBILE RETUNING FOR MAXIMIZED ECONOMY. Simplified techniques increase MPG 50 + %! DETAILS FREE! Technering, Box 15068, Princeton, NJ 08540. CALL TOLL FREE (800)-528-0907. In NJ: call (201) 359-6048. (Recordings)

FREE Brochure! Save Gas! Metalog Ring-Valve Replating Job \$10.00! Moneyback Guaranteed! Arrow Products, PO Box 374, Broken Arrow, Okla. 74012

STOP Thiefs Cold with the most amazing device in electronics history. Protects your vehicle front to back, inside and out. Send \$34.95 to: 4521 Culbertson, LaMesa, CA 92041

SAVE MONEY ON GASOLINE! Pump regular into unleaded tanks using our adapter. Moneyback guarantee. \$4.95. AABCO, 4905 Main, Yorba Linda, CA 92686

GOODBYE GASOLINE?!! Breakthrough "Water-Fuel" Carburetor! Enquire, SASE: ARO, Box 8636, Wichita, Kansas 67208

PROPANE/GASOLINE DUAL-FUEL AUTO! Conversion Plans and Instructions, Parts Sources. Only \$10.00! RDA, Box 873, Concord, NC 28025

SAVE GAS! HOW? 282 Practical Ways, Professional Report. \$5.00. R.S. Enterprises, Box 67A, Magna, Utah 84044

TIRES Last Longer With New Product! Write: Products, 3610 Bowen, Lancaster, N.Y. 14086

SAVE HUNDREDS. Do your own body and fender repairs. Professional results with step by step booklet. \$3.00. R & K Enterprises, Box 94534, Schaumburg, IL 60194

DOUBLE even TRIPLE your MPG! FREE details. Knies, R2-PM, Bowling Green, MO. 63334

DOUBLE YOUR AUTOMATIC TRANSMISSION'S LIFE. Proven Method, Easy Instructions. \$4.95. Martin Schoonover, 1561 Fremont St., Sims, California 93065

BURN Water vapor in engine. Build with locally obtainable materials. Easy installation. \$2.00 For Plans. J. M., P.O. Box 767, North Bend, OR 97459-0060

157 MPG AT 55 MPH! Sleek, Comfortable Three Wheeler Of Guinness World Record Fame. Street Legal. 82 MPH Speed. Information \$3.00 Plans \$15.00, California Commuter, 14962 Merced, Irvine, CA 92714

SAVE GAS! INCREASE POWER! Boiler Produces Dramatic Results. Brochure \$1.00. FREE \$2.00 coupon. MPG Steam Injector, Box 97PMC, Collinsville, Illinois 62234

WHEEL ALIGNMENT GAUGE Instantly Can Tell When Wheels Get Out Of Alignment. \$5.95. Pacific Wheel, 3005 E. 15th, Tulsa, OK 74104

EDELBROCK Vane-Jection Water Injectors \$69.95, Plus \$4.00 Postage And Handling. CA Residents Add 6% Sales Tax. T.C. Distributing, 430 Fourth Ave., San Diego, CA 92101

NO Pussyfootin'. Everything in "Automobiles" Column Examined—Researched! Save TIME—MONEY—POSTAGE. Sample \$1.00. Review, Box 1095, Klamath Falls, OR 97601

DRIVE Late Model Cars At No Cost, Using Dealer Method. Details: Insider, Box 9051P, Richmond, VA 23225.

MAKE Money Using Your Car. Free Report, Tap, Box 309, Collegedale, TN 37315

AUTO SUPPLIES & EQUIPMENT

MOLY™ THE SECRET TO INCREASING THE LIFE OF YOUR 4 CYLINDER ENGINE BY 66%

THESE new light weight, thin walled, high revving, small aluminum engines simply can't match the endurance of iron V8s and 6s.

But a highly efficient friction reducer can extend the life of your 4 cylinder engine. **TESTS PROVE IT.** The government knows it. Car makers aren't about to recommend it.

MICRON SX OIL BOOSTER ... a half of a lot cheaper than buying a new engine.

Patented breakthrough blend of ***MOLYBDENUM DISULFIDE** and selected microscopic particles create a ball bearing effect between moving parts.

Improve performance. Extend oil life. **INCREASE ENGINE LIFE.** Send \$25 for two 15 oz. cans to: **DEPT. M14, MICRON INDUSTRIES, 813 NAVAJO, DENVER, CO 80204.**

HYDRAULIC Jack repair kits, parts and supplies. Catalog \$2.00. Hydraulic Jack Packing & Tool Co., Inc., General P.O. Box 3, Staten Island, N.Y. 10314.

SIMPLE TOOL Multipurpose Frees Stuck Engines Plus Know How To Make Tool To Repair Worm Ball Joints, Free Frozen Brake Calipers \$8.95 Postage Paid. Novis Hydraulics, 218 North 301 Hwy., La Plata, MD 20646

RECYCLE BATTERIES, Instruction Manual and Product Kit to Recondition Your Battery. \$6.95. POWER, Box 7326, Colorado Springs, Colorado 80933

PROFESSIONAL AUTOMOTIVE WINDOW TINTING FILM, Easily Applied. For yourself or start business. Info. \$2.00. TTT, P.O. Box 188, Harrover, NH 03755

PARTS: Army Jeep and truck parts. Spare Parts & Equipment Co., P.O. Box 751, Lexington, Kentucky 40501-0751

ALTERNATOR Generator Rebuilding Book. Details: Hedelund Engineering, 7505 Barkentine, Las Vegas, Nevada 89128.

VW PARTS: Stock, Baja, Dune Buggies; Free Catalog **MOVE** Enterprises, P.O. Box 792, Redwood City, CA 94064

BRIGHT ROAD SUPERSIGN! 4 Foot Lifesaver, Attaches in Seconds With 4 Suction Cups. All Cars, Hatch Backs, Vans. "Danger Stopped Vehicle" 4 Way Satellite Signs & Pouch. \$3.98 Plus \$1.50 Postage & Handling. PA Residents Add 6%. Satisfaction Guaranteed. Ray Snow, 803 Evergreen Ave., Pittsburgh, PA 15209

CAR COMPUTER Check your Car's Electrical System in Seconds. Plugs into your Car's Cigarette Lighter. 5 yr. Money Back Warranty. Send \$12.95 Plus \$1.50. P&H L&R, Box 837, Hopkins, MN 55343

EMERGENCY Service Stickers save parking tickets—\$2.50. Box 264, Westogue, Conn. 06089

AUTO PARTS, ACCESSORIES, Big Discounts send SASE for Lists. Standard Parts, Box 227, Lincoln, N.J. 07738

STOPS AUTO THEFT. If a thief starts your car in any way, **GARD-A-CAR** will stall engine dead in less than 8 seconds. The thief can't restart it, and must flee or be caught!! **GARD-A-CAR** control box is easily hidden. No holes to drill, connect two wires. **WARRANTY GUARANTEE.** For any ignition. \$29.95. **MIDWEST DISTRIBUTION,** 1015 South 30th Street, Milwaukee, Wisconsin 53215

MAKE Coffee Right in your Vehicle. Coffeemaker Plugs into Cigarette Lighter. Complete with 2 Cups. \$13.50. B. Schwarz, Route 2, Pinckneyville, IL 62274

PLATINUM VAPOR INJECTOR Works on most Cars. \$69.95 Postpaid or C.O.A. to: Continental, 4017 Lincoln, Chicago, Ill. 60618. Free Details.

DO YOUR \$10 CAR CASSETTE TAPES SOUND LIKE \$2 KNOCK-OFFS? Get good vibes back safely, easily with new **CLEAN 'N TEST.** "Plays" cleaning cycle and test tone. Regularly \$4.95, introductory offer \$3.50. Expires 7/1/82. Add 75¢ handling. Guaranteed. Magnetic Information Systems, Box 806M, Shelton, Connecticut 06484

PERFECT CIRCLE ENGINE KITS — Ex. Re-Ring Kit for 350 Chevy. \$59.95 other available, Will UPS. For information Write: Engine Kits, P.O. Box 187, Old Hickory, Tenn. 37138

MOTORCYCLES, BICYCLES, MOTORSCOOTERS & SUPPLIES

GO KART, MINI-BIKE, MOTORBIKE PARTS. Tires, Clutches, Motors and Complete Carts and Mini-Bikes at Discount Prices. 3 1/2 Hp. motors \$106. 5 Hp. \$123. Send \$1.00 for Booklet. Northern Hydraulics, P.O. Box 1221, Dept. PM-4B, Burnsville, MN 55337

GO-KARTS, Lawnmowers, Engines, Trailers, Wheels. Wholesale Catalog \$1.00. Lorenzo, Danville, Ill. 61832

TOURING & Camping By Motorcycle \$4.50 Postpaid. Dorset Products, 5580 La Jolla Blvd #4018, La Jolla, Cal. 92037

GO KARTS, Minibikes, Assembled, Kits, Parts. Catalog \$2.00. Kart World, Dept C, 1488 Mentor Ave., Painesville, Ohio 44077

BE YOUR OWN MINIBIKE MECHANIC. An easy way to save money; do-it-yourself! Buy a photocopy of article as it appeared in P.M. for only \$1.25. Send orders to: Popular Mechanics, Dept. PMC6, Box 1014, Radio City Sta., New York, N.Y. 10101

HANG GLIDING - AVIATION

ULTRALIGHT AIRCRAFT Proven Cross country capability. 80 hour kits. Dealership network with instruction. Color information pack \$5.00. Parodycyl, Box 191PM, Watsonville, California 95076

CHOPPY Ultralight Single Seat Helicopter. Simplified Construction - Motorcycle Engine. Information \$3.00. Polynova, Box 670M, St. Remi-Napierville, Quebec, Canada J0L 2L0

RAMJET Helicopter Engine! Plans/Instructions/History \$15.00. EGF, 3202 Oneida, San Antonio, TX 78230

AIRBOAT Propellers. Catalog \$3.00. Askey Propeller Co., Route 2, Box 174B, Keller, TX 76248

BUILD A "FLYING VOLKSWAGEN!" The Teenie Two an all-metal plane. It's a challenging project made from materials and parts that are readily available in any metal-products shop. Package includes a booklet of instructions plus the plan sheets. Price \$35.00. Send orders to: Popular Mechanics, Dept. PMC6, Box 1014, Radio City Sta., New York, N.Y. 10101

SPACE, ROCKETS & ASTRONAUTS

ANTIgravity Propulsion Device. Free Brochure! RDA, Box 873N, Concord, NC 28025

BOOMERANGS—INCREDIBLE returns! Enjoy exciting Sport ... 50 amazing USA/imported shapes. Free catalog. Personal service. BoomerangMan, 306 Park, Monroe, LA 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 08909.

NEOVA VV Hovercraft Kit-information \$8. Neoteric, Terre Haute, IN 47804

BARTLETT FLYING SAUCER Complete Plans and Supply Sources \$5.00. Write: Herb Bartlett, P.O. Box 156-M, Silverdale, WA 98383

HOVERCRAFT Plan All Sizes. Catalog \$1.00. Universal Hovercraft, Box 281, Cordova, Illinois 61242

PLANS Study Package. 4 Different Designs - Blueprints & Details \$5.00. Vantura, 871 Moe, Akron, Ohio 44310

CB-RADIO & HAM EQUIPMENT

POLICE Scanners, Crystals, Antennas, CBs, Radar Detectors. HPR, Box 19224, Denver, CO 80219

LINEARS - Send Stamp for Details - MATCO Electronics, Box 316C, Cadillac, MI 49601

BEARCAT Scanners. Discounted. **CRYSTALS** \$2.75. **ROSALES**, 3482 Oakland, Oshkosh, Wis. 54901

TOWERS - Beautiful Aluminum Telescopic Ham - CB Crank-Up Towers - Also Steel, To 100'. Buy direct Factory. Free Brochure. Alum-Towers, Box 2906, Vero Beach, Fla. 32980

ELECTRONICS

GOVERNMENT Surplus receivers, transmitters, sniffer-scanners, parts. Catalog 25c. Meshns, Nahant, Mass. 01908

NEW! REPAIR TV'S. Anyone can. . . . Easy. . . . Write: Research, Box 517Y, Brea, CA 92621

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: **ELECTRONICS DEVELOPMENT LAB, BOX 1560PM, PINELLAS PARK, FL 33565**

COMPUTER, Digital, Analog, RF, Radio Noise-Reducing Circuits, Etc. Plans, Kits, Complete. Catalog \$1.00. Herringtronic, Box 1485, Mineral Wells, TX 76067.

COMPUTERS

LEARN COMPUTER BASICS. Ph.D. reveals new approach. Fast Guaranteed. \$6.95. **EDUTECH**, Dept. 746, 64 Waverly, Clarendon Hills, IL 60514

STEREO, CASSETTE TAPES, ETC.

OLD RADIO Programs on Cassettes. Free Catalog. Williams, 181 Meadow Drive, Elyria, Ohio 44035.

OLD RADIO SHOWS. Free Catalog. Creative Adventures, Box 5445A, Fort Wayne, IN 46895

OLD RADIO SHOWS Cassette Tape. Catalog and Sample Tape \$4.00. Radio Gems, Box 668901, Charlotte, NC 28208

SPEAKER COMPONENTS For serious kit builders. Complete kits include Cabinets, Advance Drivers, Mylar Pila Cross-overs, Manual. Discount Prices. Send \$1.00 for Catalog. Speaker Components, Box 297, Marlborough, Conn. 06447

TV - VIDEO EQUIPMENT

FREE Information-Complete Systems Below Component Cost!! Stamped Envelope— Tradewest, PM62, 3632 Royalscoff, West Valley, Utah 84120

MOTION PICTURES & SOUND EQUIPMENT

MOVIE and Video services. CHMS, Inc., 614 Washington St., Allentown, PA 18102

CAMPERS AND TRAILER KITS - PLANS

CARBON MONOXIDE TEST KIT: Test cabin heater in minutes. 10 test kit \$18.00, includes P&H. Eagle Manufacturing Co., P.O. Box 151, Boise City, Oklahoma 73933

BOATS, OUTBOARDS, TRAILERS & KITS

BOATKITS - PLANS - PATTERNS - FRAMEPCS - 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-Flex - **CATALOGS** \$2.00 - "Includes FREE Materials Brochure - Hardware - Fasteners - Equipment - Rigging - Glue - Etc." - (Book "AMATEUR BOATBUILDING" - In fiberglass - Plywood - Epoxy/Wood Saturation Technique - \$6.00). **CLARKCRAFT** - 16-P Aqua Lane, Tonawanda, NY 14150

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

COMPLETE Plans & Instructions for 14' Sailing & Rowing Sloop. Build Nesting Hull in 4' Sections. Send \$15. R. Alan, 242 Grove St., Lexington, MA 02173

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-82, 3800 West Highway 13, Burnsville, Minnesota 55337. 612-890-3000

EVINRUDE 1981 Bargains . . . all sizes . . . Scott McCulloch parts . . . \$1. handling . . . Electra Marine, 610 Merrick Road, Lynbrook, New York 11553

FIBERGLASS - RESINS - Foams - cloth - epoxies - mat - etc. Factory prices - **CATALOGUE** \$1.00 - (Book "COMPLETE FIBERGLASSING" \$8.00) - Clarkcraft, 16-PI 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 - Fasteners - Fiberglass - Resins - Glues - Spars - Books - Trailer Plans. Huge 144-page catalog - \$2.00. Includes Free 'Boatbuilding Supplies' brochure. Glen-L. Marins, 9152 Rosecrans, Box 756MP, Bellflower, CA 90706

PLANS. Air Power for Small Boats. 2-5 H.P. \$15.00. Information \$3.00. Hartan, Box 1904, Carson City, Nevada 89701

CAMPING EQUIPMENT & TENTS

FREE Catalog. Everything for camping. Campmor, Box 407N, Bogota, New Jersey 07603

SWISS-STYLED ARMY KNIFE \$19.95, Telescoping Fishing Rod \$12.95, Spinning Reel \$6.95, Pakistan Defender Knife \$12.95. Robert Carr, 143 Silverbeach, Lake Park, FL 33403

ATHLETIC AND BODY BUILDING COURSES

KUNG-FU Free Literature. McLisa, Box 1755, Dept. PM-82-F, Honolulu, Hawaii 96806

SECRETS Of Powerful Muscles. Guaranteed. Free Booklet. John Associates, Box 1172, New Braunfels, Texas 78130

SPORTING GOODS AND EQUIPMENT

SPORTSMEN HUNTING KNIFE - 5 inch Heavy Gauge, High Carbon Steel Blade; Leather Handle; Aluminum Butt. Quality Made. Leather Sheath included. Moneyback Guarantee. Send \$14.75. Desert Enterprises, Box 20037, Riverside, CA 92506.

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 75c. Send order to: Popular Mechanics, Dept. PMC8, Box 1014, Radio City Sta., New York, N.Y. 10101

ELECTRICAL SUPPLIES

GENUINE LESTER CHARGERS AT DIRECT-FACTORY PRICES! Dual-output chargers for EV's in all popular voltages. Lester Electrical, Dept. 201, 625 West "A" Street, Lincoln, Nebraska 68522

BATTERIES, GENERATORS

SENTRY Generators With/Without engine. Big discount. JJ Enterprises, Box 693, Oshkosh, WI 54902

ENGINES, MOTORS, MAGNETS

ENGINES to 19 h.p. for Mowers, Tillers, Hobby parts. Repair Manuals, Tremendous Savings, Fast, Dependable. Illustrated Price Catalog \$1.00. Ashland Small Engines, Ashland, MO 65010

REPAIR ELECTRIC MOTORS! ILLUSTRATED INSTRUCTIONS!! ModEquip, Box 7266, Kansas City, Mo. 64113

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. Mart Electronics, Inc., Box 998, Nokomis, FL 33555.

GARDEN TILLERS, ENGINES Lowest Prices in USA Catalog \$1.00 (Cash). AJ Products, P.O. Box 2090, Wilkes Barre, PA 18702

MOTORS - Three-Phase Run on House Current for under \$20.00. Complete Instructions \$6.00. Converter, Box 740, Virginia Beach, VA 23451

BUILD 1-hp versatile **AIR COMPRESSOR.** Maximum pressure 125 PSI. For plans send \$5.95 to: **POPULAR MECHANICS**, Dept. PMC6, Box 1014, Radio City Sta., New York, N.Y. 10101

TOOLS FOR SALE

TOOL catalogue - \$1.00 - Hoosier Distributing, 3009 Sample, South Bend, Indiana 46619

SHEET METAL TOOLS: form metal to any shape. Shears, mallets, shrinkers and stretchers, bead rollers, etc. Catalog \$1.00. Eastwood, Box 5247, Berwyn, PA 19312

UPHOLSTERY SEWING MACHINES

UPHOLSTERY Sewing Machines with Walking Foot, complete ready to use—only \$459.00. Thompson Model PW103-AGBP AVAILABLE FROM YOUR LOCAL DEALER, or order direct. (Master Charge-Visa) Datho Mfg., Inc. P.O. Box 12110, Lubbock, Texas 79452—Phone: (806) 744-6774

MACHINERY, TOOLS & SUPPLIES

FREE Industrial Buyers catalog for home craftsmen. Buy equipment at same **LOW** prices as large industrial plants. Turnkey, 36PH Letchworth St, Buffalo, NY 14213

HOBBYIST STOCK Plastics, Steels, Aluminums, Brass. Material cut to order. Send order plus \$1.00 for handling to: Scott Manufacturing, P.O. Box 3245, San Jose, CA 95156

MAGNET Screw Driver - fits in pocket. Enclose \$1.25 plus 25c postage to: Lipco, Box 147P, Towanda, Illinois 61776

BANDSAW BLADES, Carbide Tipped Saws, Any Size, Free literature. King Saw, 6541 Tidewater Drive, Norfolk, Virginia 23509

1400 Catalogs Listed and Described. Sources for Everything Imaginable. \$4.00. Masterlog, Box 879-B, Fairfax, CA 94930.

STEEL, Aluminum, Brass - Sheet - Bar - Tube, Shop Supplies, Plans. Write: CEI, Box 152A, Knoxville, IL 61448

SMALL FOUNDRY Furnaces, Supplies. Free literature. Pyramid Products, 3736 South 7th Avenue, Phoenix, Arizona 85041

CARBIDE TIPPED BLADES—BANDSAW BLADES. Direct From Manufacturer. Free Literature. Box 567, Lancaster, PA 17603

LATHES— Unimat—Maximat—Sherline—Enco. Catalog \$1.00, Shop Supplies \$1.00. Campbell, 2100 D Selma Road, Springfield, OH 45505

LATHE Top Wood Turning Duplicators. Literature, P.O. Box 8315, Tampa, FL 33674-8315

4" METAL Cutting Lathe \$80.90. Taig, 1504B Proctor, Industry, CA 91746

BUILD your own sandblast cabinet - from a 55 gal. drum for under \$100. Detailed plans and a list of common parts you have around the house. Send \$5.00 check or money order to: American Coachcraft, PM6, 34 Goffe Road, Hawthorne, N.J. 07506

CROSSCUT SAWS And People-Powered Tools. Crosscut Saw Company, Two Leland Place, Seneca Falls, New York 13148.

HOW TO DO IT. Technical books for the model engineer, steam buff, collector & hobbyist. Catalog \$1.00. AZTEX Corp., Box 50046, Tucson, AZ 85703-1046

BUILD YOUR OWN SAWMILL! Easy, inexpensive. Free details. Write: Sawmill, 35045K Ede Road, Lebanon, Oregon 97355

BUFFING & POLISHING

REFINISH all metals: Find-The-Propor Tools, Buffs, Compounds, Buffing Motors. Catalog \$1.00. Eastwood, 720 Lancaster, Box 524M, Berwyn, Pennsylvania 19312

ALUMINUM CLEANER - Removes Dirt, OXIDATION. Formula \$2.00. Squirehill Enterprises, P.O. Box 30376, Cincinnati, Ohio 45230

BLACKSMITH & FOUNDRY SUPPLIES

FORGES; gas, coal - hammers - tongs - anvils - anvil benches - all blacksmith supplies. Catalog \$1. (refunded first order). Market Blacksmith Shop, 7836 Cannonsburg, Cannonsburg, MI 49317.

ENERGY SAVING

METHANE FROM MANURE: For free information write: **AGROGAS** Inc., 2115 North Elm, Cresco, Iowa 52138

REDUCE HEATING BILLS 70%. Consultants Report-\$3.00. Guaranteed. Harris, 112-30 176 Street, St Albans, NY 11433

ENERGY SAVING SHOWER - Convert existing 1/2" shower head without altering appearance. save over \$100.00 annually (family of 4). Send \$6.00. O & R Enterprises, 104 Hill Street, Hartland, Wisconsin 53029

(Continued on next page)

ENERGY SAVING

(Continued from preceding page)

CUT YOUR ELECTRIC BILL. Peak Limiter Plans. \$10.00. Jameson Electric, 7905 T 237, Findlay, Ohio 45840

FREE Energy! Controversial Survival Publications. Three Dozen—Electricity, Gas, Gasoline, Guns, etc. Catalog \$1. Consumertronics, Drawer 537, Alamogordo, NM 88310

NEW Energy! Air Conditioner Modification Kit, Save 15% On Electric. Easily Installed. 118 Leconey Circle, Palmyra, NJ 08065

ENERGY SAVING CLOTHES DRYER—convert used dryer and save up to 90% operating costs incorporating hot water, solar or wood furnace. plans \$6.00. Raccoon Valley Co., Box 341, Dept. 10, Granville, OH 43023

ENERGY SAVINGS IDEAS! Valuable Architect compiled residential remodeling/building information. \$2.00. Hearstone, Box 219H, Eagle, Idaho 83616

HOW To Slash Your Energy Costs. Easy Instructions \$2.25. Ivanhoe Sales, 217 Trenton, Plymouth, MN 55441

SLASH ENERGY BILLS. Amazing Device Saves Consumers \$60 Annually. Send \$9.95 to: BP Products, Box 347M, Northfield, Ohio 44067

"HOT WATER" Heater, instant or two gallon tank. Portable. Propane. For Emergencies, Boats, Camping, Etc. Brochure .50c. Williams Inventing, 1230 North 2nd, Union, Oregon 97883

REDUCE AIR CONDITIONING COSTS up to 40%. Proven Method. Send \$5.25 Cash, Check, Money Order for Approved Plans. Energy Research Inc., P.O. Box 518, Silver Springs, Florida 32688-0516

SLOW DOWN YOUR ELECTRIC METER LEGALLY and Save. Send \$2.00 to: Energy Specialist Inc., Box 22382PM, Indianapolis, IN 46222. Guaranteed.

HEAT PUMPS. Solar, Air Conditioners, Furnaces. Buy Wholesale! Save! Packet \$1.00. Reckinger Heating, Dept. 102T, 2050 Monroe, Dearborn, Michigan 48124

SOLAR & ALTERNATE ENERGY

COST Effective. solar and conservation Booklet, \$6.95. Energy Savers, Box M1, 2899 So. Ingalls, Denver, CO 80227

BUILD Your Own Electric Plant. Full Details. \$6.00. Gilco, 850 W. Cotati, Cotati, CA 94928

SOLAR Cube, Cells, AM-FM Radio, Flashlight, Power Panels and More. Free Brochure. Write: Syntar, P.O. Box 1067, Woodbridge, VA 22193

FREE ELECTRICAL POWER From Your Brook, 6 Ft. Water Wheel, Easy Construction, 38 Pages. Instructions, Photos, Drawings, Materials List, Full Size Patterns. \$6.95. CR Enterprises, P.O. Box 521, North Adams, Mass. 01247

WHOLESALE Solar Catalog Over 1000 Products \$11.45 Postpaid. Catalog, Box 2278, Lynchburg, Virginia 24501

WIND GENERATORS, TOWERS, BATTERIES, INVERTERS, SOLAR PANELS. The most complete Catalog of up to Date Material with Wholesale Prices of Major Manufacturers. \$5.00. Pat Barrows, 4660 Lemona, Sherman Oaks, California 91403

HYDROGEN FUEL! Complete Electrolyzer and Auto Conversion Plans. Plus information on Safe Storage and Generating Hydrogen Free. Complete Package: \$10.00. FDA, Box 873, Concord, NC 28025

COMPLETE 1982 SOLAR HEATING PRODUCTS CATALOG!

EVERYTHING for Active and Passive Solar Heating, including Kalwall's Sun-Lite® Glazing and Thermo Storage Systems, plus difficult to find energy savers. Order all materials from one expert source. 80 pages, 18 sections, \$3 ppd. Visit our retail store. **SOLAR COMPONENTS CORP.**, Dept. M, Box 237, Manchester, NH 03105.

MAKE/SELL ELECTRICITY: Hydroelectric \$1.00 For Further Info: Camas Dist., P.O. Box 235PM, Camas Valley, OR 97416-0235

SOLAR, WIND, HYDRO, HYDROGEN GEN., NEARLY 1000 COMPANIES, ORGANIZATIONS World Wide have Provided Brochures, info. Compare, SAVE, Satisfaction Guaranteed. Send \$9.95 To: **ALTERNATE ENERGY INFO.**, Dept. PM, P.O. Box 1420, Craig, Colo. 81626

\$500.00 BUILDS PROFESSIONAL LOOKING AND WORKING SOLAR AIR SYSTEM. ENGINEER APPROVED. COMPLETE PLANS \$15.00. CLASSIC SOLAR, DEPT. C, 2890 SO. GOLDEN WAY, DENVER, COLO. 80227

SOLAR Source Book—\$7.00 - 350 pages. Midwest Solar Supply Co. Inc., 8708 Morrell, Independence, Missouri 64053

ELECTRIC & Magnetic Energy Patents - Original Nikola Tesla patent copies. Fascinating little known theories relevant today for research or development. Send \$20.00 for set of 10 patents and order blank detailing other sets available or \$1.00 plus SASE for order blank only. Testatronics, P.O. Box 7, Paw Paw, MI 49079.

SOLAR. Differential Thermostats. For Information, Send SASE to: R.T.O., 3206 Prospect Ave., Cleve., OH 44115

DESIGN your own inexpensive solar water heating systems. Fully illustrated 40 page manual. Material lists, instructions, setup and operation. Only \$12.00 postage paid. **MIDTOWN ENERGY DEVICES.** 4118 Rebecca. Mobile, Alabama 36609

ATTENTION swimming pool owners, save thousands of dollars in heating costs by building your own solar pool heater. Learn the do's and don'ts. The solar handbook "FREE HEAT" gives complete, illustrated, step by step instructions. Makes excellent gift. Rush \$9.95 to: **FREE HEAT P.M., P.O. BOX 823, SYLVANIA, OHIO 43560**

SOLAR COLLECTORS—WATER, AIR—NEW IDEAS— Do-It-Yourself Inexpensively. Material Lists, Plans \$5.00. Bruce Mosher, Box 1087, San Luis Obispo, CAL. 93406

FREE YOURSELF FROM THE ENERGY GAME. Plans and Information Only \$10.00. Satisfaction Guaranteed. Hi Highfill, Box 6001, Los Ocos, CA 93402

HOME HEATING, FUEL SAVERS

FREE Hot Water, Low Cost Home Heat. Fantastic Do-It-Yourself, Woodburning Furnace Plans. \$9.00. Pattersons, 16962 Kennick, W-63, Lakeview, Minn. 55044

LOG SPLITTER PLANS. Build your own, Save Hundreds, Superior Quality, \$10.00. M. Franssen, P.O. Box 483, San Lorenzo, CA 94580-0483

A FIREPLACE that doesn't draw warm air from the room! Uses outside air for combustion. For drawings. Send \$5.00 to: Harold's Methods, Rt. 1, Box 206, Mokenca, Illinois 60954

ROOM TEMPERATURE CONTROLLER for wood stoves. Hyde Specialty Products, RD2, Jewett, Ohio 43986

HOME CRAFTSMAN

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

ULTRASTRONG picnic table plans. \$3.00. Duribuilt Tables, 495 Smith Avenue, Sharon, PA. 16146

WATERBED. Hot Tub Plans. Instructions \$4.00. Traditionals, P.O. Box 25481, Tempe, Arizona 85282

OVER 75 PATTERNS! Enjoy making profitable Wooden Gifts, Toys, Household Accessories. PLUS "Shop Secrets". Only \$5.00. Accents (P-62), Box 262, Danvers, MA 01923

SCRAPS BOOK I, use those woodscraps for fun/profit. ideas, instructions, 4 plans, \$4.00. Tim Sykes, P.O. Box 740787, Houston, Texas 77274.

LACE WITH THE BEST! Patented Leather Lacing Needs. \$2.00 Each, 3 For \$5.00. Texas Residents Add 5% Tax. PPD. Rus-Weg Company, P.O. Box 569PM, Crowley, Texas 76036

WOODTURNERS Tired Of Bows? Packet #1 Plans of 5 Interesting Projects. \$7.00. Turners, P.O. Box 211, St. James, Winnipeg, Manitoba, Canada R5J 3R4

MAKE TOYS— Plans: Hardwood Wheels, Parts- Catalog \$1.00. Cherry Tree Toys, Mills Road, St. Clairsville, Ohio 43950

UNFINISHED picture frame moulding. Factory closeout. 50% discount. 200 styles. Write: Japs, 126-PF Seventh North, Hopkins, MN 55343

CARBIDE TIPPED BLADES—BANDSAW BLADES. Direct From Manufacturer. Free Literature. Box 567, Lancaster, PA 17603

WOODEN Toys Are Better. Lot Of Plans \$1.00 U.S. Currency Only. Woodbutchers Toys, Box 514, Leslie, Mich. 49251

AUTHENTIC WHISKEY BARREL FURNITURE. Building Plans or Complete Kits. Send \$3.00 for information (Refundable). Music City Barrel Furniture, Dept. C, P. O. Box 517, Madison, Tenn. 37115

WHIRLIGIGS - American Folk Art Plans. Catalog \$1.00. Dick Parkman, P.O. Box 29351, Dallas, Texas 75229

MAKE LAWN Furniture from wood. Six different easy to follow plans. Send for free list. Joe Bulanda, Dunmore, Alberta, Canada. J0J 1A0

UPHOLSTERY And Caring Supplies. Catalog \$1.25 (Refundable.) Jack's Upholstery and Caring Supplies, Dept. PM7, Oswego, ILL. 60543

BUILD THIS UNIQUE WALL SHELF WITH ADJUSTABLE BOOKEND. Plans \$1.50. Project B, P.O. Box 775, Boynton Beach, Fla. 33435

LARGE selection of plans. Furniture designs, loom, spinning wheel, clocks, dollhouses, cradles, toys, alphabets, bird houses, weathervanes, kites, and more. Catalog 50c. Craftplans Co., Rogers, Minnesota 55374

PORCH SWINGS. Free lumber source and plans \$5.00. Sminchak, P.O. Box 83, Frankfort Heights, IL 62840

WOODEN CRADLE Plans. For Someone Special. \$4.00. S. Myers, Box 6896, Oakland, CA 94603

PLANS—TOY BARN finely detailed—\$5.50. Bradley Mehn, El Paso, Illinois 61736

NEW - \$500.00 from one sheet of plywood. Your own easy lifetime business. Huge demand. Guaranteed. Free Details. Oakstump, 3630 Pacific Way, Longview, Washington 98632

TAN Pelt, Furs—Simple. Easy Instructions \$3.00. Eckerts, Box 141, Lac Du Flambeau, Wisc. 54538

WOODWORKERS Five Profitable Gift Ideas, Plans \$5.00. Woodco, P.O. Box 1221, Killeen, Texas 76540

5 BIRD FEEDER PLANS Tips, Complete Instructions \$4.00. Cal's Woodworking, 1805 W. 37 -PM Sioux Falls, S. Dak. 57105

BENCH Vise Secure Boards For Sawing, Planing or Sanding. Send \$5.75 to: Hand Crafts, Box 247, Branson, M.O. 65616

WOODWORKERS, 3 Full-Size Shelf Patterns. Enclose \$5.00. Projects In Wood, Box 1485, Alton, IL 62002

UNIQUE CIRCUS TRAIN 8 Wooden Cars, 5 Animal Templates, Large easy to read plans \$7.50. Heavy duty DUMP TRUCK plans \$2.50. Instructions included. Trains "N" Trucks, 812 Crest Drive, Encinitas, Calif 92024

COLONIAL Doll's Hutch 25" high. Plans and instructions, info on precut kit. \$2.50. Country Road Productions, Route 418 Box 339, Warrensburg, NY 12885

ANTIQUE TOOL CHEST. Plans and instructions, \$2.00. Muldren, Box 453A, Arnold, MO 63010

BEND WOOD proven wood steamer from ordinary inexpensive materials complete plans, instructions involving fundamentals \$5.00. R&R Carvax, 334 Broad, Waverly, N.Y. 14892

EXTERIOR wood light fixtures. Three Plans \$3.00. Platte, Box 17541, Jacksonville, FL 32216

FULL-SIZED PATTERNS FOR WOODEN TOYS - New, fully-illustrated catalog. \$1.00. Manly Kelly Enterprises, Box 79062, Dept. P-6, Saginaw, Texas 76179-0062.

CONVEYOR ROLLERS, Brackets, Stand Plans for Supporting Long Lumber. Free Literature. Freese Associates, Rushville, N.Y. 14544

OAK FILE CABINET - Plans, Beautiful Companion Piece to Roll Top Desk. Details and Instructions \$4.00. Woodline Designs, Box 51, Valley City, N.D. 58072

2x4 FURNITURE PLANS! Send \$3.00 For 4 Plans: 2x4's Unlimited. P.O. Box 401621, Dallas, TX 75240

YOU CAN BUILD Furniture, Toys, Accessories and Shop Equipment. Five Free Plans with Illustrated Catalog 700 Items. Send \$1.00 for Details. Mayco Sales, Box 2931PM, Mesa, Arizona 85204

WESTERN Burlwood Slabs, Myrtlewood, Maple Lumber, Redwood Burlwood, PM-6, 1454 Orchard Home Drive, Medford, Oregon 97501

OVER 150 Patterns, Trucks, Cars, Gifts, 4 Wood Wheels, Axels \$5.00. Lawsons's, (PM-42), 220 Florence, Libertyville, Ill. 60048

PM'S PLATFORM BEDS—Make your own! Take your pick of a king-sized platform with movable end tables or an economy, easy-to-build single sleeper. Full set of working drawings of both beds, plus a six-page instruction booklet with how-to-photographs and construction tips available for \$7.95. Send order to: Popular Mechanics, Dept. PMC6, Box 1014, Radio City Sta., New York, N.Y. 10101

CONSTRUCTION PLANS, BLUEPRINTS

HOUSE Garage, Portable, 16' x 24' Plans \$4.00. (Refundable). B152, Emmett, Idaho 83617

LOG CABINS AND "A" FRAMES

ROUGH, RUGGED & RUSTIC. LOG PROJECTS! Make chairs, benches, tables, gates, fences. A summer house, birdhouses, signs and house numbers, lamps, tables, shelves, bookends. Photocopy of articles as they appeared in Popular Mechanics available for \$4.00. Send order to: PM, Dept. PMC6, Box 1014 Radio City Sta., New York, N.Y. 10101

HOME BUILDING & REMODELING

LEARN TO INSTALL, MOVE your TELEPHONES expertly, legally. **EX-BELL TELEPHONEMAN TELLS ALL.** Booklet, catalog \$6.95- Complete Installation Kit \$13.95 includes booklet, catalog, 50' wire, universal connector. Telephone Enterprises, P.O. Box 1182-PM, Belleville, Illinois 62223

SAVE THOUSANDS! BEAUTIFUL HOMES \$15/Sq. Ft. We Did — You Can. Details \$3.95. J & J. P.O. Box 13, Cotton, Oregon 97017

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. 82G-PM, Box 391, Woodstock, IL 60098.

AIR CONDITIONING

HOW TO BUILD IN-A-ROOM AIR CONDITIONER. PM's Steps will show you how. A photocopy of this article is available for \$1.00. Send Order to: Popular Mechanics, Dept. PMC6, Box 1014, Radio City Station, New York, NY 10101

DO-IT-YOURSELF

BUILD this Table with one Sheet of Plywood. Rugged, no Hardware needed, assemble's and disassemble's in seconds. \$2.95. DLN, Box 20243, Reno, NV 89515

SAVE steps, money. Use your telephones as an intercom. Plans \$5.00. dB Enterprises, Box 453A, Westwood, NJ 07675

GATE — Radio Controlled — Simple Plan's \$10.00. Gate Opener, Box 977, Ocean Springs, Mississippi 39564

HOW to make home electrical repairs yourself... Safety! Free details... or... \$7.95 for book! Stewart Enterprises, P.O. Box 2842-PM6, Longview, Texas 75608

POWER MOWER SHAFT STRAIGHTENER Straighteners Most On Deck Plans \$5.00. Basham's General Repair, 1744 Cragmont St., Madison, IN 47250

CORRUGATED STORAGE BOXES: Make your own and save money! 12 unique and functional designs. Complete plans \$5.95. DesignCo., P.O. 1264, Muncie, Ind. 47305

WATERBEDS: Build your own. Complete plans and instructions. Guaranteed. \$3.00. Baker Co., Box 242, West Columbia, S. C. 29169

DO-N'T be left out! Summer's just around the corner. Order Picnic Table Plans Now! Only \$2.00. Post Enterprises, 1511 Post Avenue, Dept. PM, Torrance, CA 90501

ELECTROPLATING. Complete amateur's textbook. All metals Electroplate metallic/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.

WATERBEDS. Plans and Accessory Catalog \$1.00. Waterbeds, 1210A Z Street, Vancouver, Washington 98661

SMALL ENGINE Parts Catalog And Trouble Shooting Guide \$3.00. E-Kon, Box 547, PM682, Twin Lakes, WI 53181

POLE Buildings—Illustrated Catalog, Do-It-Yourself-Over 40 Variations For Garages, Stables, Etc. \$2.00. (Refundable). Jem Buildings, Dept. F, Box 611, Chardon, Ohio 44024

HOT TUB. Build your own. Step by Step—Illustrated 85 page instruction book. Send \$9.50 to: Unicraft, Box 338, Franklin Square, New York 11010

SAVE on parts for Lawnmowers, Minibikes, Karts, Chainsaws, Small Engines. **THOUSANDS OF PARTS.** Send \$3.00 For Catalog. Sav-On-Parts, P.O. Box 231, Somerville, Mass. 02143

BUILD and **UPHOLSTER** your own **SOFA.** Free Brochure. Ketter Furniture, P.O. Box 3855, Lacey, WA 98503

BARBECUE Make your own Gas Barbecue from old hot water heater. Send \$5.00. P.O. Box 691, Goleta, Calif. 93117

NEW Tent Home Kits, sell at your profit Two Large Rooms plus Garage, Make \$1,000 in spare time. Easy. Inexpensive. Fun. \$2.50 instructions. Ross, P.O. Box 371, Cedar Park, Texas 78613

MAKE YOUR OWN LUMBER With Two Pound Chain Saw Attachments. Contact: Boyce Industries Inc., 406 South Chester, Gastonia, NC 28052

LOG HOUSE Builder's Apprentice program. Train nine months with master builder, in conjunction with Log House Builder's Association of North America. Become journeyman. \$2,000.00 tuition. free brochure. Write: Apprentice Program, 22203 State Route 203, Monroe, Washington 98272. 206 885-4972.

ION GENERATORS Create Mountain Fresh Air electronically. Better breathing vitality claimed. Also kits. **PROFESSIONAL IONIZERS,** 2146 Wellington Place, Wichita, KS 67203

TELEPHONES - Build, Repair, Install. Plus Buy Below Wholesale. Send \$2.00 For Details. Telephones, 1934 Dewey Dr., New Port Richey, Florida 33552

WATERPROOF Your own basement. Simple Step by Step Illustrated Instructions \$9.98.—Box 342, Wyoming, MN 55092

REFRIGERATOR Repair, includes troubleshooting guide, solutions and much more. Only \$5.00. Alan Shultz Repair-1, P.O. Box 96, Tumacacori, AZ 85640

CHAIN LINK FENCING Install It Yourself. Instruction Booklet Send \$4.00 To: Pyramid Installation, P.O. Box 14055A, Chicago, Ill. 60614

HOW TO KILL ROACHES FAST!!!! Professional results guaranteed. . . . Details free. . . . Pestcontrol, 5848 Victoria, PM 6, St. Louis, MO. 63110

REVERSE YOUR DRILL MOTOR! CONVERT your "cheap" drill into an "expensive" reversible drill. Complete plans \$2.50. Hill House Innovations, P.O. Box 175, Donna, Texas 78537.

CARPET LAYING INSTRUCTIONS \$7.00. W.P. HAFENBREDL, 311 SOUTH PALMETTO, MARSHFIELD, WIS. 54449

SAVE money on Home Maintenance. 25 proven ways to protect your property investment. Booklet \$3.00. Rockdale Press, P.O. Box 987 FDR Station, New York, N.Y. 10150

ALCOHOL! 100 PROOF! Make Cheap Fuel/Booze With Simple Still, Plans/Recipes! Information Free! Desert-PM, Box 8233H-B, Kingman, AZ 86412.

AT LAST A Small Battery Charger That Really Works. Even Charge Lantern Batteries. Easy To Build For Under \$3.00. Complete Instructions. Send \$3.00. Al Walker, P.O. Box 3885, Baytown, Texas 77520

GARAGES - All Materials Including Overhead Door, Passenger Door, Preapainted Exterior. Delivery. 24x24 \$1,987.00. 20x20 \$1,687.00. Strat-O-Span Buildings, Inc., Rt. 50, Breese, Illinois 62230

NEVER PAINT WINDOWS AGAIN! Use Aluminum! Save Money... Illustrated Instructions... Money Back Guaranteed \$7.00. W. Rothweiler, 634 Lehigh Ave., Lancaster, Pennsylvania 17602

INGROUND Swimming Pool Kits, From \$1695.00 For Complete Kit. Free Brochure & Prices. Burnett, 4601 Bunkerhill, North Little Rock, Arkansas 72116

TESLA TURBINE—Here's a simple modelmaking project: no pistons, so no close tolerances! Runs on air or steam. Complete plans, easy to make. Photocopy of article available for \$1.25. Send order to: Popular Mechanics, Dept. PMC6, Box 1014, Radio City, N.Y. 10101.

ARTS & CRAFTS

PLASTERCRAFT, CANDLECRAFT, RUBBER MOLDING for Fun - Profit! Make Figurines from Complete Kits! Catalog \$1.00 (Refundable). Wooley Company, Box 68PM, Peoria, Illinois 61601. Established 1917.

"GETTING Started in Stained Glass" \$1.00. Whitmore, Box 2065T, Hanover, Mass. 02339.

STAINED GLASS Catalogue-P. \$1.00. Supplies, Kits, Books, Tools, Glass. Saylescrafts, 171 Main, Nyack, N.Y. 10960

CRAFT Jewelry Supplies (Wholesale Catalog 25c). Rousseau, 107-1630 Dow, Arlington, MA 02174

NEW LEATHER company has craft supplies. Send \$1.00 (Refundable with first order) for latest catalog to: The Leather Factory, Dept. PM682, P. O. Box 2430, Chattanooga, TN 37409

CREATE beautiful wind chimes with old spoons and forks. Photo illustrated directions \$4.00. Habbi Pub, Box 106, Lincroft, N.J. 07738

WOODWORKERS - Frame patterns for Cross Stitch 25 Best Sellers. \$6.00. King Crafts, Box 1727C, King, NC 27021-1727.

STAINED GLASS Supplies. Complete line, reasonably priced. Catalog \$1.50 (Refundable) Sunshine Glassworks, 785 Millersport, Dept. CT, Amherst, NY 14226

CARTOONING, COMMERCIAL ARTS & SIGN PAINTING

LEARN PINSTRIPING!! E-Z Guide with Brushes. Money Back Guarantee. \$13.95. VDP, Box 0048PM, Hebron, IL 60034

MODERN Cartooning taught by mail. Write for free brochure Cartoonorama—Box 283-3F, 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

35 LESSON cartooning course. Cartoonists Magazine, both \$4.00. Hartman, Box 30367, Lincoln, Nebraska 68503-0367

LEARN Sign Painting At Home. Tricks Of The Trade. \$6.00 Value For \$1.00. Eureka Press, Box 931-B, Fitzgerald, Georgia 31750

CARTOON PRO. 1st Instruction Free. Simple, Easy Method. Send Samples of your Work with a SASE: Hermans Studio, 1912 E 11th, Davenport, Iowa 52803

SIGN PAINTING — Complete line of instruction Books. FREE Brochure. Creative Arts, 2610 N. Broadway, St. Louis, MO 63102

MODELS—CARS, SHIPS TRAINS, PLANES ETC. . .

MODEL AIRPLANES — Huge Catalog \$2.00. Sig Manufacturing Co., Inc., Montezuma, IA 50171

RADIO CONTROL - Airplanes, Boats, Helicopters, Systems, Supplies. Big Discount Catalog \$4.00 (Refundable). Modelers Supply, Box 7185, Montgomery, AL 36107

FIRING CIVIL WAR Model CANNON Plans: Catalog free. Green—PM-62, Box 892, Shalimar, Fla. 32579

MAGIC TRICKS, JOKES, VENTRILOQUISM

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 Offering. Castings-PM, P.O. Box 3482, Longwood, Florida 32750

DECALS, EMBLEMS, PATCHES

PATCHES, Decals, Custom Made. Free Catalog - Emblems, Box 35, Tappan, New York 10983

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

STAMP COLLECTING

U.S. 25 Different mint Including Souvenir Sheet \$1.00. Free list. Brooks, Box 62, Brooklyn, NY 11229

50 YEARS Old fifteen different United States, over fifty years old—25c with approvals. Jaxon, Box C11-P, New Rochelle, New York 10804

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. E62PM, Jamestown, NY 14701

1,000 DIFFERENT WORLD + 100 DIFFERENT MONGOLIAN BEAUTIES \$3.00. Attractive approvals (pictorials). Cancel service anytime. **ADULTS ONLY.** Gouge, Box 1320-MG, Elizabethton, Tennessee 37643.

TOPS! 100 Popular Poland Stamps (all different) only 25c. Mystic, Dept. PS1, Camden, New York 13316.

INVEST in Rare Stamps. Send For Free Booklet. Joseph Kardwell, Inc., Dept. 775-PM, Orient, N.Y. 11957.

FREE Wholesale Singles and Plate Block Price Lists. Six 4c Plate Blocks \$1.00. AMPBCO, Box 26066P, St. Louis, MO 63136

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. A62PM, Jamestown, NY 14701

ABSOLUTELY FREE- 50 different British Colonies **COMMEMORATIVES.** Approvals. Gobestamps, Box 690, Saco, ME 04072

BREATHTAKING Beautiful. 50 Different mint Monaco pictorials commemoratives only \$1.50 with mint complete set approvals. Pagoda, Box 132P, Sidney, Ohio 45365.

PENNY! Approvals! Regardless catalogue! Kloster, 4164 52nd St., San Diego, Calif. 92105.

UNITED NATIONS 3 Complete Mint Sets 25c. Approvals. Cornetta, POB 1509-M, Lake Placid, Florida, 33652

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

(Continued on next page)

STAMP COLLECTING

(Continued from preceding page)

FREE U.S. Mint Set. Approvals: Hildebrand, Box 4867, Santa Clara, California 95054

STUNNING! 100 BEAUTIFUL MINT PICTORIALS. All Different Only 25 Cents with Attractive Worldwide Approvals. **VANSTAM,** Dept. PM-682, P.O. Box 11272, Chicago, Illinois 60611

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 1065, Jamaica, N.Y. 11431

WORLDWIDE, 100 Different Beauties, 25c. Approvals. J.D. Michael, P.O. Box 2273, Martinez, California 94553.

RUSSIA— 50 Different Including Many "Oldies", Just 10c. Approvals. Tarheel Philatelics, Siler City, North Carolina 27344

"INVERTED ERROR" + 100 Different United States, 50c with approvals. Lurray, P.O. Box 7088, Silver Spring, MD 20907

FREE INCREDIBLE STAMP OFFER! GIANT WORLD-WIDE COLLECTION: 125 different genuine postage stamps including beautiful large colorful animals, sporting activities, space exploration and much more, absolutely FREE when you request exciting "Stamps on Approval" selection for examination at home. Buy any or none, cancel service anytime. **SEND TODAY!** Mission PMS, Placentia, CA 92670-0009

80 TOPICALS 25c when requesting low priced approvals. Stewart Kant, Box 2398U, Bellingham, WA 98227

CANADA, 50 different 25c. Approvals. Oroszky, Box 1-C, Sarnia, Ontario, Canada N7T 7H8

"WHOLESALE" U.S.—Foreign Pricelist and catalog Free! Everything Guaranteed. Schneider, Box 1240, Grand Rapids, Michigan 49501

U.S. 6 Commemorative plate blocks \$1.00! Approvals. Gordon Davison, Contocook, New Hampshire 03229

FREE New Disney Set. Request Approvals. Alpaugh, Box 225, Highbridge, NJ 08829

PENNY Approvals. 1 - 2 - 3c. CK Stamps, 17902 Marklee Drive, Jamul, CA 92035

OLD U.S. BARGAIN stamps issued before 1930! Uncommon used issues. "Upline" condition. Worthwhile money-saving approvals. Adults only. (No Mint, No Packet Material). Rivertown, Dept. 188P, Ada, Michigan 49301

STAMP Collectors: Offer 30-3c U.S. Commemorative Mint @ \$4.80; 4 St. Vincenta Mint @ \$1.00; One St. Vincent Souvenir Mint @ \$1.00; Post & Handling \$1.00. S. Cohen, 112 No. 3rd Ave., Highland Park, NJ 08904

MINT - U.S. 6 Different—4c Commemoratives. 25c with approvals. Tom & Jerry, Box 5052-PM, Mission Hills, CA 91345

FREE 100 Canada with request of World Wide Approvals. Briner's, P.O. Box 5607, San Mateo, Calif. 94402

LIQUIDATING Tremendous Accumulation. Collections, Miscellaneous. Lists Free. Alatalo, Maynard, Mass. 01754

FREE! 25 Mint British Empire. Approvals. Bonuses! Hoischen, Dept. PM1, 7789 Pinehurst, Woodbury, MN 55125

45 DIFFERENT U.S. AIRMAILS \$2.00; Mint \$15.00. Eberling, Box 2216, Neptune City, NJ 07753

FREE 10 Iraq. Approvals. W-B Stamps, Wilkes-Barre, Penna. 18703-0758

COINS, TOKENS, CURRENCY

FREE 40 year old German or Japanese banknote. Approvals, Box 1427PM, Bellflower, CA 90706

OLD United States Wheat Pennies. Five Different 25c. With Approvals. Pricelist. Rogers, Box 2807, Sparks, Nevada 89431

BINOCULARS, TELESCOPES, MICROSCOPES, MAGNIFIERS

SPACE-AGE TELESCOPE PLAN. It's a 3/4 in. refractor type. Portable, weighs 50 lbs. fully assembled with tripod. Make it yourself. Photocopy of the articles are available for \$3.75. Send order to: Popular Mechanics, Dept. PMC6, Box 1014, Radio City Station, New York, NY 10101

PHOTOS & PHOTO SUPPLIES

SAVE \$\$\$. Free Photographic Catalog - 35mm, Super 8, 18mm. Supplies. Superior, 442-503, Welfs, Chicago, IL 60610

DARKROOM SINK WITH A BUILT-IN PRINT WASHER. Make It Yourself, It's easy! For 75c you can buy a Photocopy of the Article as it appeared in P.M. Send Orders To: Popular Mechanics, Dept. PMC6, Box 1014, Radio City Sta., New York, N.Y. 10101

BOOKS & PUBLICATIONS

SAVE THOUSANDS on your mortgage. Information your bank withheld. Guaranteed. \$4.95. Austen House, Box 1122A, Chattanooga, TN 37401

"SURVIVALIST'S Book Catalog" Rush \$1.00. Ken Hale, (202). McDonald, OH 44437-0395

REDUCE your Social Security tax. The book that tells how \$10.85. Refundable. Ed System Pub., Box 51052, Salt Lake City, UT 84151

OUT-Of-Print Books Found. Send Wants, Booklook, 51 Maple Ave., Warwick, N.Y. 10980

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. Megiddo Mission, Dept. 63, 481 Thurston Road, Rochester, N.Y. 14619.

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. PMF, 84 Fifth Avenue, New York 10011.

HOW TO WITNESS FOR JESUS CHRIST! "Soul Winner's New Testament." Send \$8.45. JMG and Associates, 565 Hewitt St., San Jacinto, Calif. 92583

EXCITING Personality self-improvement! Maltz's Psycho Cybernetics. \$4.00 postpaid. Send to: Cortez Research-1, 633 Ferry St., Salem, Oregon 97301

FREE Self-Improvement Book Catalog. L. Parson, Box 744 - M. Sun Valley, Calif. 91352

KEEP YOUR INVENTORS HAPPY! The Management of Inventive People, \$6.50 Check or Money Order. COVE Press, Box 325, Severna Park, MD 21146

BE PREPARED - Summary of Professional Investment Advisers and Forecast for Future of the U. S. Economy - \$10 - GHP Newsletter. P.O. Box 388, Enka, N.C. 28728.

MONEY-SAVING GUIDES. Free details. Lister, Box 15754, New Orleans, LA 70175.

"SAVE MONEY with our informative booklets. List, \$1.00 to: Scroll Publishing, P.O. Box 5144, Station "E", Hamilton, Ontario, L8S 4L3

FREE CALCULATOR with one year subscription to deductible mail order newsletter. Starting up, advertising, maintaining plus indispensable information articles. \$29.95. Renaissance Ltd., 1512 Victoria, Teaneck, N.J. 07666.

GUARANTEED Lowest Rates On America's Most Popular Magazines! Free List! Midwest, Box 14564C, St. Louis, Missouri 63178

BOOK BINDING

REBIND YOUR DAMAGED BOOKS. With a few common tools and a homemade book press (plan included) you'll be able to handle anything from a torn hinge to a complete rebinding. Photocopy of article as it appeared in P.M. available for \$1.75. Send orders to: Popular Mechanics, Dept. PMC6, Box 1014, Radio City Sta., New York, N.Y. 10101

MUSIC INSTRUCTIONS & INSTRUMENTS

MUSICAL SAWS - Since 1921. Details, "Sawing News". Mussehl-Westphal, 130PM, Delavan, Wisconsin 53115

MUSICAL Instruments Hot Line! Incredible Prices: Amps, PA Gear. All Instruments. Huge Selection. Sam Ash, Established 1924. 800-845-3518. NYS (212) 347-7757

PIANOS, PLAYERS, PUMP ORGANS. Rebuild and repair. Catalog of "How-To" books, \$2.00 (refundable). Vestal 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.

ACCORDION Top Brands. Cardovox, 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 (BPM), RD3, Box 142, Olean, NY 14760

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. FF, 4026 W. Belvedere Ave., Baltimore, MD 21215.

BAGPIPES - \$60 Up. Brochures \$2. Midwest, 2817 Cameron, Melbourne, FL 32901

BLUEGRASS BANJO - Roll pattern exercises and chords. \$3.00. Lewis Harden, Rt. 1, Box 357, Bokaesia, Fla. 33922

EDUCATION & INSTRUCTIONS

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. 8th Street, Dept. PE, Phoenix, AZ 85006

AIR-CONDITIONING Know your system, names parts, diagrams, functions diagnosis. \$12.95. **BKW SERVICES,** Box 2179, Spring, Texas 77383

FREE CATALOG - LEARN AUCTIONEERING! Full and partial scholarships available. Nashville Auction School, 233 E. Gaines St., Box 190, Department 2, Lawrenceburg, TN 38464

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. PC, Phoenix, AZ 85006

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

FINANCIAL AID for High School Seniors. **RESULTS GUARANTEED.** Write: Scholarship Research Agency, Dept. 44, Box 1173, Mountainside, N.J. 07092.

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. PBC42, 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

SERVICE KEYBOARD INSTRUMENTS Piano Tuning - Electronic Organ Servicing. **ACCREDITED NHSC - Free Booklet.** **NILES 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-PM6, Tustin, California 92680.

EXTENSION And Post-Graduate Awards in Philosophy, Art, Science, Botanic, Medicine, Homeopathy, Radionics, and others. 30 subjects Curricular free (airmail \$1.00 refundable). Registrar, Sussex College of Technology, Highfield, Danehill, Sussex, England.

RADIESTHESIA, Radionics. Dowsing E.S.P. Courses and Equipment Illustrated Catalog \$1.00 (refundable) Established 27 years. Dept. PM/R, Bruce Copen, Highfield, Danehill, Sussex, England RH17 7EX.

LEARN Asleep or awake. Records, tapes, equipment! Free catalog! Drawer PM-400, Rudoso, 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 ViaLopez, Pacific Palisades, California 90272.

COLLEGE DEGREES BY SPECIAL EVALUATION OF EXISTING Credits & Job Experience. Fast. (814) 863-1791. Write: Box 13151-M6, Columbus, Ohio 43213.

ACCREDITED College Degrees By Mail. Details. **GRADUATE REFERRAL SERVICE,** 3010 Santa Monica Blvd., Suite 173-PM, Santa Monica, CA 90404

CLOCK AND WATCH REPAIR Books. Free catalog. North American. Box 77-ASA, Fox River Grove, Illinois 60021.

LEARN Sewing Machine repairing. A profitable Trade. Easy to learn. Free details. Sewing Center, 187 FR, Rochelle, GA 31079.

BE A DETECTIVE. Free Information -Equipment. Global, Box 191, Hanover, MA 02339

(Continued on next page)

EDUCATION & INSTRUCTIONS

(Continued from preceding page)

ELECTRICIAN. Learn at home in spare time with no previous experience. Installation, maintenance, construction, lighting, heating, air conditioning applications. Get free facts. Write: ICS Electrician School, Dept. PBC32, Scranton, Pennsylvania 18515.

GET JOBS WHEN OTHERS FAIL. \$5.00. Jasoo, 924 Shasta, Walla Walla, WA 99362

COLLEGE DEGREES By Mail!!! Accredited Bachelors, Masters, PhD's NO CLASSES. FREE Information. MARC-PM6, Box 45886, Tulsa, OK 74145.

KARATE HOME STUDY COURSE. Learn Oriental fighting secrets quickly and easily. Certificate awarded. Free brochure. New Orient Karate School, Dept. T45, Box 5, Avon, N.J. 07717

STOP SMOKING IN 90 MINUTES! New Cognitive Method. Send \$4.95, American M. O. Press, 1750 Kalekua, #3633, Honolulu, Hawaii 96826

USED Courses! Books! Lists 25¢. Smith's, 124 Marlborough, Salem, Massachusetts 01970

TYPEWRITER Repair at home. Money-making career. Typewriter Inst., 147A Crooks, Paterson, N.J. 07503

EMPLOYMENT INFORMATION

COULD you lose your job? Protect yourself. Learn rules you can follow to make sure you will always have a job. \$5.00. Penpalz, Dept. 1002, P.O. Box 1331, Troy, MI 48099

AUSTRALIA - The World's 50,000 Jobs! Top pay. Transportation. Computerized reports \$2.00. Jobworld, Box 681E, Cypress, CA 90630.

RIVERBOATS - Tugs top pay. No exp. needed. For info send \$10.00. Marine Employment Service, P.O. Box 207, Central, IN 47110

JOBS OVERSEAS . . . (Including Alaska.) Free Details. Global Employment, Box 808-PM, National City, California 92050

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

JOBS Overseas-Big money fast. \$20,000 to \$50,000 plus per year. Call 1-718-642-6000, Ext. 360.

TRADESMEN - \$18.00 + Work in north. Must join Union. Send \$10.00 Money Order to: B. Dales, Box 3318, Station D, Edmonton, Canada T5L 2K0

ELECTRONICS Employment Directory 500 Companies with Addresses, Excellent Jobs Available \$10.95. Uni-List, 280 Main Street, Massena, NY 13662

COMMERCIAL DEEP-SEA DIVING Exciting career opportunity! High Pay/Demand, Worldwide Travel, Adventure!! Details \$5.00. Advance, Box 2906, Huntington, W.VA, 25728

GOOD JOBS ABOUND Even in hard times. Will show you how to get one. \$7.95. Satisfaction Guaranteed. Concepts, 179 Cascade (PM6), Indian Head Park, IL 60525

EFFECTIVE JOB HUNTING. Free Information. LFEPMA, 3047 Hawthorne, N.E., Washington, D.C. 20017.

OFFSHORE JOBS! (Latest information!) Companies now hiring! Send long stamped envelope to: Offshore Guides, Box 4478 - PM, Biloxi, MS 39531

NEED A Job? We Can Help! Guides \$5.00 Consultation offered. Motive consultants, Case 10, Box 4606, Lincoln, Nebraska 68504

JOBS—Jobs—Jobs 25,000 Available. Free Details. Sunbelt Opportunities, Box 20303-SR1M, Houston, Texas 77225

FLORIDA EMPLOYMENT NEWSLETTER. Complete State Coverage Weekly. All Occupations. Free Details: FEN, Box 845-PM, Jupiter, Florida 33458.

JOBS IN NEW MEXICO, THE LAND OF ENCHANTMENT. Complete Job Finder's Guide. \$3.00. P.O. Box 11633, Albuquerque, N.M. 87192

ANOTHER "DEAR JOHN?" - Personnel Consultant exposes 27 Fatal Mistakes Job Applicants Make. \$2.00 to Consultant, Box 6214, Greensboro, NC 27405.

JOBS: COLORADO, WYOMING, UTAH, IDAHO, MONTANA! Computerized newsletter with 200+ new jobs each week. Free details. MOUNTAINWEST, 925-PM Canyon, Logan, UT 84321.

WINNING JOB INTERVIEWS! Comprehensive guidebook \$4.25. LIFEWORK OPTIONS INTERNATIONAL, P.O. Box 4466, Harrisburg, Pennsylvania 17111

TRUCKING JOBS!!! LITTLE NO EXPERIENCE Reason/Deregulation SECRETS!!!! Booklet \$5.95 Information \$2.00. Former "TEAMSTER", Box 475, Sheboygan, Wisconsin, 53081

PIPELINE Jobs: Construction, Operation. 15,185 miles to be installed this year. List of 132 employers. \$10.00. Pipeline, Box PM-243, Deer River, Minnesota 56636

JOB Hunters: Tactics revealed in complete guide. \$4. Fulcoite, Box 211, Manhasset, NY 11030

WYOMING JOBMARKET REPORT Energy Boom Jobs Send \$3.00: Box 1848A, Jackson, WY 83001

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

DISK JOCKEY AND SPORTCASTER JOBS! How to start Manual covers twelve Radio Departments. \$5.00. VES Publications, Box 6333-PM, Tyler, Texas 75711

OVERSEAS Employment . . . \$20,000 - \$60,000+ . Free Report! Employment, Box 29384-AF, Indianapolis, Indiana 46229.

AUSTRALIA WANTS YOU! Jobs! Big Pay! Paid Transportation! Newest Handbook—\$2.00. AUSTRALIAN INTERNATIONAL, Box 19107-AF, WASHINGTON, DC 20036.

CALIFORNIA EMPLOYMENT Hundreds of Jobs. Satisfaction Guaranteed. Send \$3.00 To: Pacifica, 415 West Colorado, Monrovia, California 91016. Subscription Information 213-359-0851.

FOR INVENTORS

INVENTORS: Free Information on offering your invention for sale. Kessler Sales Corporation, C-5-F1, Fremont, Ohio 43420

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) 267-5552.

THINGS TO Invent Inventors Club, Box 19611, Fayetteville, Ohio 45118. Free Information.

MAKING Money With Inventions. Ten Successful Methods Used By Inventors. \$10.00. Cully Publications, 6710 N. Riley, Indianapolis, Indiana 46220

NONPROFIT Foundation helps inventors. Widest range of services. 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.

PROTECT Your invention. Registered Patent Attorney. Many Years Experience. All Fields. Individual Inventor's Problems Given Special Consideration. Very Reasonable Charges. Write for Free Information. Paul H. Gallagher, 2530 Crawford Ave., Evanston, Illinois 60201

REGISTERED PATENT ATTORNEY Washington D.C. Suburb. Donald A. Kettlestrings, 414 Hungerford Drive, Rockville, Maryland 20850

PATENT IT ECONOMICALLY! Free Details. N. Raner, 2006 Fondulac, Richmond, VA 23229

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, DC 20018. Since 1896.

PROTECT YOUR INVENTION. Registered Patent Attorney FREE Preliminary Review Of Your Description. Box 392PM, Milwood, NY 10548

INVENTORS NEWSLETTER INFORMATIVE Free Details. Inventing Components, 204 Gordon Road, Monticello, IND. 47960

INVENTION Evaluated Confidentially By Nonprofit Experts. Send \$2.00 for Information. American Society of Inventors, Box 544, Valley Forge, PA 19481.

SCIENTIFIC rules handy for inventors \$1.00. P.O. Box 4191, Lancaster, PA 17604

PATENT YOUR Invention Yourself!! Inexpensively! Retired Examiner, 7400, Washington, DC 20044

INVENTIONS WANTED

INVENTORS: If you have an invention for sale or license, write for free booklet explaining how we can help you. Kessler Sales Corp., C-5-1W, Fremont, Ohio 43420

INVENTIONS MARKETED! Cash Royalties! FREE INVENTION PROTECTION CERTIFICATES. George Spector Manufacturers Representatives, Woolworth Building, New York, N.Y. 10007.

IDEAS, INVENTIONS, NEW PRODUCTS WANTED! MARKETING Assistance available to individuals, inventors, Universities, companies. Write for Kit-PM. INVENTION MARKETING, INC., 701 Smithfield Street Pittsburgh, PA 15222

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, 58 Interstate Drive, Dept. PM, West Springfield, MA 01089. (413)737-5375. A Fee Based Marketing Company.

RECREATIONAL INVENTIONS MANUFACTURING, MARKETING Write: Fredburnhart, Box 933, Rochester, Indiana 46875

REAL ESTATE & FARMS

FREE! Big Summer Catalog! Over 5400 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., P.O. Box 4528 G.S., Dept. 5800, Springfield, MO 65808. Call toll free: 1-800-641-4266.

NEW . . . FREE . . . SUMMER 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.

HOMEBUYER BEWARE, Money saving GUIDE for anyone who owns or hopes to own a home. Send \$5.95 to: Albo Residential Appraisals, P.O. Box 10421-PM-6, Elmwood, CT 06110

SELL YOUR HOME YOURSELF. Save Thousands. Fast Proven Procedure. 24 Years Experience. \$5.00 TO: Whitaker, P.O. Box 20401, Indianapolis, IN 46220

OUZARKS: Scenic; Peaceful; Clean Environment, Information. Umbenhower Realty, Box 15, Willow Springs, Missouri 65793. 417-469-2764.

HUNTING, FISHING PROPERTIES From \$47. to \$107. per acre in Canada! Send For FREE CATALOG. Investment potential. 2 year exchange privileges. Canadian Estate Land, Dept. 23C, 286 Lawrence Ave. W., Toronto, Ontario, Canada M5M 3A8. (416) 789-4536.

HOUSE HUNTER'S CHECK LIST. Over 300 items you must remember about every home you inspect. 30 sheets, padded (1 per house). \$6.00. Ronaldson, 61/2 Lewis (PM), Norwalk, Conn. 06851

"BUY A HOUSE -6- DOWN. Receive \$10,000 to boot! Guaranteed. \$3.00. Evergreen, Box 21-PM, Issaquah, Washington 98027

BUY Real Estate with No Money down. Send \$6.95 for booklet. P.O. Box 18623, Tucson, AZ 85731.

CALIFORNIA. Acreage Lots. \$40 down. \$40 monthly. Box 35291, Los Angeles, 90035

EXPORT-IMPORT

+2500 "Fast-Sellers." Free Brochures! Ballinghoo, Box 91309-S6, Cleveland, Ohio 44101

NEW "ASIAN SOURCES DIRECTORY", Fantastic savings importing directly. Details: Monroe, 1056M, Rt. 32, Saugerties, NY 12477

AMAZING Sources of China's Import/Export Revealed—Exclusive Report. Details \$5.00. Ling Chow International, 4445 Nasa Road 1, Suite 324, Seabrook, Texas 77586

PLASTIC BAGS

ALL Sizes. Buy Small Quantities. Free Catalog. SAKet, 6151-C Colbath, Van Nuys, Calif. 91401

BUY IT WHOLESALE

BARGAIN 8x1 1/4 Wood Screws \$3.50/100. Brookside, Box 43036, Chicago, 60643

BELOW Wholesale: Clothing, Jewelry, Closeouts. Free List. Torrow Mac, P.O. Box 3333PM, Anderson, SC 29621

BELTS and Buckles. Complete line fast sellers, including trucks, 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 54425

(Continued on next page)

BUY IT WHOLESALE

(Continued from preceding page)

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¢). Rousaeis, 107-1631 Dow, Arlington, MA 02174.

BATTERY CLOCK MOVEMENTS. Hands, Hardware, Finest quality. Discount prices. Catalog \$1.00, refundable. Yankee, Box 26, Thompson, Connecticut 06277.

WORLDWIDE BARGAINS: Imports... Dropship... Closeouts... Freebies... Surplus... SASE Marnes, Box 1717-PM, Highland, Indiana 46322.

SAVE MONEY... brassware, cameras, diamonds, stereos, etc... A to Z... over 15 countries... where and how... 60% savings - \$5.00 - Kings-Crown Publications, Dept. PM682, 113 Peppercorn Place, Sterling, VA 22170.

CLOSEOUTS! Discounts! Below wholesale! Freebies! Samples! DDN, Box 20152-PM, Ferndale, Michigan 48220.

BARGAINS on Jewelry, Watches, and More \$1.00 For Catalog. Thomas, Box 9350, Baltimore, Maryland 21228.

ADV. AGENCIES, ADV. SERVICES MAILING LISTS

MAILORDER Advertisers: Expert assistance. Ratebook leading magazines, newspapers \$1.00. Chicago Advertising Agency, 28 E. Jackson, Chicago 60604.

RUBBER STAMPS

DISCOUNT COUPON. Eddie's Rubber Stamp's. 3781 Menlo St., San Diego, CA 92105.

BARCO Type Founders. Type and Rubber Stamps catalogue. Mail \$1.00 refundable on first order. 237 S. Evergreen, Bensenville, 60106.

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, Brownsville Road, S-110, Mt. Vernon, Illinois 62864.

COMPLETE Rubber Stamp Outfits. Supplies. Same day shipment. Sign Engraving Machines. Wholesale Catalog \$1.00 Deductible. Star Stamp, 1720 N. Marshfield, Chicago, 60622.

PRINTING Presses, Type. Supplies. List 50¢. Turnbaugh Printers Supply, Mechanicsburg, PA 17055.

TYPE for printing. Catalog \$1.00 deductible 1st order. Quaker City Type, P.O. Box 134, Honeybrook, PA 19344.

PHOTOENGRAVING Cuts Made. Delouse, Box 106, Islip Terrace, New York 11752.

PRINT YOUR OWN— Printing presses, type, supplies direct from factory. Send \$1.00 for catalog and samples to: Kelsey Co., DM, Menden, Conn. 06450.

PRINTING AND SUPPLIES

QUICK Copy Printing. Low Prices. Write: Nationwide, 614 North Main, Bloomington, Illinois 61701.

LETTERHEADS. 2 Colors. w. env. \$17.50. Low. 24 Post. Newfoundland, NJ 07435.

QUALITY Printing! Lowest Prices. Shipped in Four Working Days. Write To: Print Press, Box 65P, Dublin, IN 47335.

BUSINESS CARDS (Raised Printing) Free Samples. BG, 2501 Sapling, Glenahaw, PA 15116.

GUMMED LABELS

1,000 Deluxe Gummed Address Labels \$3.00. Free Literature. Acme, 55 Tornoka, Pittsburgh, Pennsylvania 15229.

GIFT SHOPPING

SWISS ARMY TYPE KNIFE. PRECISION QUALITY All STAINLESS STEEL 3 1/4". KNIFE is 12 tools in one \$8.98. Satisfaction Guaranteed. W.C. PESCHKEN, 13014 W. 67th Street, P.O. Box 3564, Dept. PM, Shawnee Mission, KS 66203.

ISRAEL By Mail. Free Details. Shroitman, Box 2688, Tel-Aviv 61026, Israel.

SHOP By Mail, Catalog \$2.00 Refundable. AJD Enterprises, 1523 Labrea, Hollywood, California 90028.

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. 1058, Chicago, 60603.

BELT BUCKLES, FREE CATALOG. Union Buckle Co., 6123 Wentworth-C, Minneapolis, MN 55419.

WATCH And Clock repairing books, tools, materials. Free Catalogs. North American, Box 77-AS, Fox River Grove, Illinois 60021.

TAKE NO CHANCES. Deal with oldest, most reliable firm in old gold business. Established 1934. We buy Gold, Silver, Platinum, Diamonds. Highest Cash. Free Information. Rose Industries, 29-A East Madison, Chicago 60602.

GOLD

GOLD - Silver Analysis. Rocks, Ores, Concentrates: Free Details. Prospector Labs, P, P.O. Box 111, Golden, CO 80401-0111.

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: Greger's, Dept. 1, 900 South Arroyo Pkwy., Pasadena, California 91109.

TREASURE FINDERS

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.

FIND Lost coins, jewelry, buried treasure, gold nuggets, relics. New revolutionary patented detector analyzes objects, tremendous range - no ground pickup. Free catalog. Gardner, 4729M N. 7th Ave., Phoenix, Arizona 85013.

TREASURE. Locate quarter mile away with ultra sensitive locator - brochure free. Research Products, Box 270270 - AMC, Tampa, Florida 33688.

PROFITABLE OCCUPATIONS

TECHNICAL WRITERS make big money! Free details. Tek Pubs, Box 2458-P, Oroville, CA 95965.

REPAIR Lawnmowers thousands of parts and tools. Wholesale list 35¢. Elwanger's, 15 Canal St., Port Jarvis, NY 12771.

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. Veteran Approved.

PLASTERCRAFT!!! Profitable home business. Molds available. Details. Lynnette, 6251C Mentor Park, Mentor, Ohio 44060.

SALESMEN-DISTRIBUTORS

MAKE EXTRA MONEY DURING YOUR SPARE TIME! Show 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. PMC6, Newton, Iowa 50208.

SELL SENSATIONAL LOW-COST PRE-ENTRY PROJECTOR for Automobiles-Buildings. Exceptional Distributor margin. Northwest Electric, 3018, Box 1046, Mitchell, SD 57301-1046.

AGENTS WANTED

SPARE TIME CASH. Sell famous Hanover Shoes. Samples, sales kit free. No experience needed. No age limit. Big commissions. Hanover Shoe, Dept. 3329, Hanover, Pa. 17331.

PRINTING Advertising Salesmen—Excellent money making sideline selling Decalcomania Name Plates, small quantities. Advertising Specialties, sign letters. Free samples. Rasco XL, Boston, Mass. 02119.

BUSINESS OPPORTUNITIES

IMPORT-Export opportunity, profitable world-wide, mail order business from home, without capital. We ship plan for no risk examination. Experience unnecessary. Free Report. Mellinger, Dept. R2706, Woodland Hills, California 91367.

PREPARE Tax Returns - Housewife Jo Ann Netzey made \$5,500 last season. Train at home. VA Approved. National Tax School, Monsey 2FP, New York 10952.

MAKE MONEY WOODWORKING - Easy profits making unusual gifts, toys, novelties. Free details. Williams, 32K Titus, Glen Cove, NY 11542.

SELL Books By Mail. Profitable. Write. Musgrove-1A5, Altus, AR 72821.

MAKE Millions!!! **MANUFACTURING BATTERIES.** Free details. Everlast, Box 365, Bogota, NJ 07603.

MAILORDERS GOLDMINE !!! 85 Abroad Successful Money-making Methods..... Free Information !!! Digest Press Assoc., Box 69A05, Los Angeles, CA 90069.

\$1104.00 Monthly For Ten Hour Work Week! Guaranteed!! Homework... Start immediately... Paid Daily - Free Information/Application - AHV, Box 1028-A6, Kalaheo, Hawaii 96741.

MAILORDER OPPORTUNITY! Start profitable home business without experience or capital. Write for free book, case histories, plus complete details. No obligation. Mail Order Associates, Dept. 701, Montvale, NJ 07645.

MAKE MONEY Dowsing for Water Wells - Always Successful. Dowsers Tool and Instructions \$2.00. Dowsers, 130 North 32, Camp Hill, PA 17011.

PROFITABLE Mailorder Business Opportunity. Free Details. Richard, Box 1040, Fowlerville, Michigan 48836.

FLEA MARKET OPERATIONAL GUIDE... Profits 12 Months A Year... Send \$3.00. Rainbow House, Box 932, Peaslee, Illinois, 60067.

\$30 Hour, New Service Business. Details. Wichers, 790 Fairway, Litchfield Park, Arizona 85340.

IMMEDIATE PROFITS Using Our Proven Methods. Spectacular Home Wholesaling Opportunity. Free Details. VLR Marketing, Dept 2682, 927 Raleigh Drive, Toms River, N.J. 08753.

\$ SWEEPING \$. Profit in sweeping parking lots. We'll help you start. No fees, write: Air Sweepers, 1577 Almaden Exp., San Jose, CA 95125.

ARAB BUSINESSMEN Have Money to Buy & Invest. Top Finders Fees Paid. Int. MiddleEast Assoc., 682PM1, 8291 Flaxman, Huntington Beach, CA 92646.

MAKE Rubber Stamps. Highly Profitable Business. Free Details. Stamper, POB 22809 (GC), Tampa, FL 33622.

1982 "Home Business Directory" describes over 120 companies that set you up completely! Send \$2.. Directory, Box 10024A, Chicago, IL 60610.

SUCCEED IN ANY BUSINESS - Send \$5.98 For Guide. Lambinger, Box 2659, Huntington Station, New York 11746.

EQUIPMENT Dealer Opportunity! Profitable National Equipment Business from Home. Without Capital. We ship Cassette Training Tape for no Risk Examination. Experience Unnecessary. Free Report. IPE-G, Box 18586, Irvine, CA 92713.

GET RICH!! Secret Law smashes debts—brings cash and credit!! Details FREE! WealthKit-WB-6, Billings, NY 12510.

MAKE MONEY! Spare Time, Full Time. Your Own Carpet Cleaning Business. Revolutionary NEW Method! Free Details. Rug Doctor, Inc., 997 Horan Drive, Fenton, MO, 63026.

MAKE HOMEMADE BOOKLETS. I've earned \$187.00 with mine. Free Information: Falcon, Box 548, Woodville, Texas 75979.

SPARETIME DISTRIBUTORS NEEDED. Unlimited Profit! Proven Automotive Product. Free Details! MOTALOY, Box 4457-PM-6, Downey, CA 90241.

WOODWORKERS - IDEAL HOME BUSINESS. Free Brochure! Pine Shop, 78P, West Peterborough, NH 03468-0078.

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 78520.

DEBTS WIPED OUT with secret Federal Law!! Fortune building FREE REPORT! Blueprints #B-6. LaGrangeville, NY 12540.

FREE BOOK 2042 Unique Proven Enterprises. Fabulous "unknowns," Second Inflation Income. HAYLINGS, Carlsbad, CA 92006.

(Continued on next page)

BUSINESS OPPORTUNITIES

(Continued from preceding page)

LEARN Sewing Machine Repairing. Men, Women. Lucrative Profits. Gresslin Correspondence School, Box 927, Spencer, Iowa 51301.

\$480 Weekly. Home mailing program. Goodworld, Box 26233-R, Tamarac, Florida 33320

\$92.00 From Square Foot Plywood. (Huge Demand). Revealing Proof 25¢. (Refundable). Woodwin, Bridgewater, Mass. 02324

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

SCREEN PRINT T-SHIRTS. Inexpensive kits. Free Details. "T-Printer," POB 23991(GC), Tampa, FL 33623.

GET RICH using OTHER PEOPLE'S MONEY!! Unique — amazing business!! Details FREE!! Finance Consultants. 5B-6, Billings, NY 12510

MAILORDER \$1,000.00 POSSIBLE MONTHLY Selling Information. Free Details. RSYV, Chatsworth Ave., Box 301-E, Larchmont, New York 10538

NEW Discovery in Battery Reconditioning . . . Eighteen Months Guarantee Means "Big Profits Fast." Electone, 7415 Gable Drive, Little Rock, AR 72205

DISTRIBUTORS, EARN SEVERAL TIMES YOUR COST ON THOUSANDS OF PRODUCTS. GIFTS, NOVELTIES, TOYS, OTHERS. FREE INFORMATION. W & W GIFTS, BOX 6, PILLOW, PA 17080

RECONDITION JUNK BATTERIES!! Profitable Home Business! . . . J&M, Box 771-PM6, Battle Ground, WA 98604

VENDING MACHINES. No selling. Routes earn amazing profits. 32-Page Catalogue \$1.00 (Refundable). Parkway Corporation, 1930 PMB Greenspring Drive, Timonium, Maryland 21093

WYNYL'S Where the money is! Professionally repair, re-finish, 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

\$300.00 Weekly Possible. Spare Time Mailing. Box 24063-PM6, Philadelphia, Pa. 19139

PIANO Tuning learned quickly at home! Free information. Empire School, Box 1014, Jupiter, Florida 33458

TAKE Catalog Orders. We drop-ship 2500 best-selling specialty products. Lowest below wholesale prices. Immediate delivery. Spectacular home business opportunity. Free Book. SMC, 8061 De Soto Ave., Dept 20-18, Woodland Hills, CA 91385

BUMPER STICKER PRINTING DEVICE. Cheap. Simple. Portable. Free Details. Bumper, POB 22791 (GC), Tampa, FL 33622

I MADE \$40,000 Year by Mailorder! Helped others make money! Details 25¢. Torrey, Box 318YY, Ypsilanti, Michigan 48197

MAILORDER Course free. Secrets starting home mailorder Business. Specialties, Box 7206X, Dayton, Ohio 45407

SOLAR Heating learned quickly at home! Free information. Empire School, Box 193, Rockville, IN 47872

MAKE \$2,000 MONTHLY. Spare time. Unique proven enterprises. No selling. No capital to start. Free brochure. Kashaubler, Box 1132-19K, Indianapolis, Indiana 46225

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). M.E. KAPPEL, POPULAR MECHANICS, DEPT. P, 224 WEST 57TH ST., NEW YORK, NY 10019

CLIP newspaper items — \$2 - \$25 EACH!! FREE Report! Clippings-KB-6, Billings, NY 12510

STILL CHASING RAINBOWS? Stop Running! Independence, PM682, 1148 Sixth Avenue, Bristol, Penn, 19007

\$\$\$\$\$ NOW!— How to use the 1980's opportunities to become wealthy!!— Action Books, Box 517-1, Maysville, Oklahoma 73057

RIP-OFF?? Genuine??—Review hundreds—"Get Rich" ads—one publication!!— Action Books, Box 517-4, Maysville, Oklahoma 73057

1000% Profit Bronzing or Chinakoting Baby Shoes. Free Literature. NBSMP, 398 Airport, Sebring, Fla. 33870

TAKE pictures for profit. Cameramoney, 14589 West 32nd, Golden, CO 80401

ASSEMBLE PROFITABLE DEVICES AT HOME. Exceptional opportunities without investment: Enterprises, 1133-MP Linwood Place, Utica, NY 13501

PROFITABLE GOLD FOIL PRINTER. Personalize business cards, pencils, matches. Free Details. Gold, POB 24986 (GC), Tampa, FL 33623.

IRRESTIBLE Offer!! Complete Ready-To-Go Mailorder Programs. Proven Profits. Full Details. Fortune's Guide, Box 6242 PM6, Nassau, Bahamas.

\$85 Hourly Selling Boats at Home. Spare Time. Comprehensive Report \$8.00. Huntington, Box 414, Greens Farms, CT 06436

MAKE PVC Furniture!! Profitable Home Business. Easy! Free Information. J&M, Box 771PF, Battle Ground, WA 98604

MONEY Rototilling. Complete Condensed Instructions \$2.25. Limbach, 7 Spruce, East Northport, N.Y. 11731

WORK WITH INSURANCE COMPANIES. Excellent profits. Negligible investment. Your money assured. Works anywhere. I made \$60,000 in first nine months. Booklet \$5. Cash, American checks and M.O.'s no problem. Successful Enterprises, 101 Professional Bldg., 740 Fourth Avenue South, Lethbridge, Alberta, Canada T1J 0N8

I MADE tremendous income . . . **YOU CAN TOO!** . . . Free Details. Southwest Distributors, Box 625, Lake Jackson, TX. 77566

AMAZING PROFITS! New Super Money-maker! FREE DETAILS! Send Stamp, Flowco, Box 257-P, Rockford, Ill 61105

GAIN FINANCIAL SECURITY! Start your own home business. Easily double your cost on hundreds of hot-selling specialty products. Catalog, \$1.50. Refundable on first order. Hathorn's Specialty Merchandise Center, P.O. Box 18471-B, Oklahoma City, OK 73154.

EARN greater income, work smarter, and **GROW RICHER** by using **ADVANCED** Trading and Bartering techniques. Powerful, little known Trading secrets revealed by expert. Details: ValuWrite, Box 2000D, Provo, Utah 84603.

HUNDREDS MONTHLY!!! Guaranteed. Start immediately in spare time. Free details. IIC, Box 19633, Irvine, CA 92714

WHOLESALE — Easy-to-start Business. \$10.00 for Kit or write for Details. Davis & Company, P. O. Box 468, Tacoma, WA 98401-0468

PROSPER With paperbacks! Be Your Own Boss. Sell books you receive free. How to take \$4.00. Librisis, 8940 Lyndale, Bloomington, MN 55420

LEARN The secrets of repairing junk batteries "Fabulous Profits." **FIRST ESTABLISHED COURSE.** Apex Engineering, 5454 Bolsa, Alhambra, Calif. 91422

"HOW TO Be An IMPORTER And Pay For Your WORLD TRAVEL" Insider Secrets Revealed! 189 Pages Send \$6.95 To: The Entrepreneurs' Library, R. R. 5, Dept. 27, Duncan, B.C., V9L 4T6 Canada

FREE Money And Oil Leases Can Make Millionaires. Details: Panoramic Book Sales, 202 Ford St., Schenectady, N.Y. 12306

START YOUR OWN MULTILEVEL MARKETING CO. LMS, Box-492, Parlin, N.J. 08859

MAILORDER! Profitable home business. Capital, Experience Unnecessary. Free detailed information. Associate, Box 4267, Morgantown, WV. 26505

HOW TO START YOUR OWN EXCITING IMPORT BUSINESS!! Numerous contacts included!! Booklet. Details Free. Kent Marketing Company, 21 Independence, Box 280, Broomfield, Colorado 80020

I HAVE made a fortune in mailorder, selling information. Let me show you how. Write: KASH 6000, Box 31051, Indianapolis, IN 46231.

COMPLETE HOME MAIL ORDER START UP GUIDE \$9.95. Parke Brooke, 2554 Lincoln Blvd., Suite 260, Marina Del Rey, Calif. 90291

JANITORIAL CONTRACTING Your own business. New manual shows you how. Free details. Gingco, Box 4547A, Station D. Hamilton Ont. L8V 4S7

MULTI-LEVEL marketing combined with the Simplicity of Mail Order Writer TM Enterprises, P.O. Box 5158, Largo, Florida 33540

VIDEO Taping Service — Instructions Tells How to Start. Equipment Needed and who to Contact. \$12.95. Hall's, 68 Park Ave., Flemington, N.J. 08822

MAKE A Lot of Money Fast. Free Information. Ronnie Del Pilar, 923 Realty Street, Carson, Calif. 90745

\$50,000 POSSIBLE!!! FREE-LANSING Bathtub and Sink Refinisher. FREE DETAILS. Shepard, 4418 West 30th St., Los Angeles, CA 90016

OWN Your Own Business in Fast Growing Synthetic Lubricants. For Info. Send \$2.50 to: Synthetic Lubricants, 59590 Longbow, Mishawaka, Indiana 46544

YOUR NAME Sent To 500+ "Free Details" Opportunity Ads! Saves Time and \$95.00 Postage! Send only \$5.00. Mailerv, 1022D Collings, Collingswood, NJ 08107

MAKE Multi-Level Fortune Promoting Outstanding New No Stock Plan!! Garen, 1070 Demorest, Columbus, Ohio 43204.

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-6, 1145 Reservoir Avenue, Cranston, Rhode Island, 02920

EXCITING "Mileage Stretcher" Catalog pays you \$100+ evenings without investment! CARSAVERS™, GTGF, Millford, PA 18337

INCOME BY DIRECT MAIL for the ins and outs send \$5.00 to: Scroll Publishing, P.O. Box 5144, Station "E" Hamilton, Ontario, L8S 4L3

DISTRIBUTORS Wanted for fast Selling Specialty Items. No Starting Capital- Big Profits. Free Details. E. L. Kerr, 2836 N.E. 117th, Portland Oregon 97220

SUCCEED in Mailorder, Proven Facts Not Theories. Free Literature. Universal Marketing, 4055 Wilshire Blvd., Suite 418, Los Angeles, Calif. 90010

ADVERTISE to 68,000,000 "Buyers" Free!! Thru America's 20th Top Pulling Magazines. Details: Budget-Ads, Box 189PM, Buena Vista, GA 31803

MONEYMAKING OPPORTUNITIES

GOOD INCOME Building Items for Craft Shows, 2 Plans \$5.00. Aircraft Marketing, Box 2075, Florence, Ala. 35630

DISTRIBUTORS Urgently Needed! Big Profits! Dist-PM682, Box 2133, Sandusky, OH 44870

MONEYMAKING FORMULAS - THOUSANDS! CATALOG \$3.00 (REFUNDABLE): GWA4, Box 193, Brookfield, Wisconsin 53005-0193

GET RICH!! Secret law smashes debts — brings Cash. Credit! FREE Report!! WealthKit-WBM-6, Billings, NY 12510

FANTASTIC earnings mailing from home!! Offer: Rush Stamped Addressed Envelope. Imperial, P-8 X17410, Fort Lauderdale, FL 33318

SPARE time fortune in Vinyl Repair. Huge demand creates exceptional profits. We supply everything. Details free. VIP, 2062 Montrose, Chicago, 60618

FREE! 5 monthly issues of Opportunity Magazine. Learn the secret to earning extra cash. Issues full of profitable success stories. FREE. Write: Opportunity, Dept. 724, 6 N. Michigan, Chicago, 60602

FREE REPORT! "Making money with classifieds." Moneycraft PM, Ceres, CA 95307-0845.

EARN Extra Money! Make \$2000.00 From \$13.00 Investment. Rush \$2.00 To: Thomas Ringlor, 169 East York St., Akron, Ohio 44310

I MADE \$6,000.00 Monthly in Mailorder . . . Helped Others. Free Proof . . . Greentree, Dept. D3, Dunkirk, NY 14048

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). M.E. KAPPEL, POPULAR MECHANICS, DEPT. P, 224 WEST 57TH ST., NEW YORK, NY 10019

MONEY-MAKING MEETINGS: 97 Keys to Marketing Your Knowledge in the Multi-Million Dollar Workshop and Seminar Industry. By William G. Williams. Hard Cover. 154 pages from Share Publishing Company Success Series. \$8.95 at Bookstores.

FUND Raisers!! Sell Your Members Kodak Film At Fantastically Low Prices. Make \$500/100 Members Sold. Detailed Plans Free. National Photo, 627 Shallowford - Suite 4APM, Chattanooga, TN 37411.

HIGH Profit Impulse Items! Universal Appeal! Tremendous Potential! Free Details. Snow, Box 739X, Jamestown, ND 58401.

RECEIVE 2 Benefit Checks From The Federal Government. Information: \$2.00. Muschalek Information Service, 311 East 29th, Odessa, Texas 79762

GAMES for Fairs and Amusement events. Be your own boss. Information \$5.95. Leigheber's Game Co., Box 19611, Fayetteville, Ohio 45118

DEPOSIT \$100—Get Back \$314. Divinamica, Box 1867-PM, Covina, Ca. 91722

GET "INSTANT BUSINESS!" Details SASE. Newera, Box 1389, Brookings, Oregon 97415

CANADIAN Million\$ in mail. Instant money information. Write: Million\$, Dept. PM, Box 1038, Station Q, Toronto, Canada M4T 2P2.

MULTI-LEVEL MARKETING. No meeting etc., leads provided. Free Details. AEA, 9406PM Bataan St., Minneapolis, MN 55434

EARN \$9 ON EVERY \$10 SALE! Ellenbogen Enterprises, 49P Crocker, Daly City, CA 94014

WEALTH can be yours. **SUCCESS HINTS**, \$1.00. 7475 LaPalma, Suite 218, Buena Park, CA 90620

(Continued on next page)

MONEYMAKING OPPORTUNITIES

(Continued from preceding page)

START IMMEDIATELY! Assemble small products at home. Enclose \$3.00. Robert Carr, Carr Bldg, 143 Silverbeach, Lake Park, FL 33403

"SOMETHING SHARED" tells how I earned over \$2,000 one weekend; over \$25,000 annual average sales for ten years from part-time hobby-job. Unlimited potential. Send stamped envelope for information or \$12.95 for book. MCInc., Box 605, Norcross, GA 30071

LOOK Good—Feel Great! Make Money! Donica, 332PM North 12th Street, New Castle, IN 47362

MILLIONAIRE Reveals secrets behind his riches! Easy plan! Write Today! Victor Enterprises, Box 1316-PM, Yuba City, California 95992

MONEY—FANTASTIC OPPORTUNITY PART-TIME JOB—FULL-TIME WAGES HARD WORKER, FINE—LAZY, FORGET IT. FREE DETAILS: R. F. ENTERPRISE, P. O. BOX 402-F, FORDS, NJ 08863

BUSINESS Success Blue-Print! Fortune Building Information. Details. Ambry, 1 Patrick Dr., New Port Richey, Florida 33553

WIN \$200.00 daily playing slot machines! **GUARANTEED!** System \$2.00: Box 13526, Las Vegas, Nevada 89112.

MONEYMAKING OPPORTUNITY! Make Your own "Wind Chimes." Sell for \$10.00 up. Send \$3.95 For Complete Instructions. Wind Chimes, Box 388, Randolph, Texas 75475

RUSH \$1.00 for easy money opportunity. Bundle Ent., P.O. Box 25836, Colorado Springs, Colo. 80936

NEED Extra DREAM VACATION Money? Get Your Proven Part-Time, Full-Time Instant Money-making Kit TODAY! And by Christmas "1982", You too could be Rich. Start Now. Send \$15.00 To: Rankard Wholesale Distributors, 1784 Stow Ave., Simi Valley, Calif. 93063

FREE information on how to make it Rich in the 80's. Illinois Copy Co., Dept. PM, 107 S.W. Adams, Peoria, Illinois 61602

BIG Profits Small investment. Sell add on wood burning furnaces Starter kit \$5.00 Refundable. J. E. I., 107 N. Boss, Kewanee, IL 61443

WIN at Poker, Races, Billiards. Free Pamphlet. Joseph's, Dept. PM61, P.O. Box 127, Baldwin Place, N.Y. 10505

AFRICA WOOD CARVINGS. Wide assortment, shipped to you direct. Send \$1.00 for catalog. Nora Nemhard Co., Dept. PM.1, P.O. Box 519, Stone Ridge, N.Y. 12484

WHOLESALE OVER 700,000 Items: Cars, Radios, Toys, Etc. No Gimmicks! Make Big Money At Home. Guaranteed Send \$10: TCM, 911 Florida Grove Road, Keasby, N.J. 08832

FIVE items that can make you Rich. \$5 to: Publications, 10394 N. Stelling Road, Cupertino, CA 95014

WIN at Horses, Blackjack, Dice, Etc. Free Literature. Universal Marketing, 4055 Wilshire Blvd., Suite 418, Los Angeles, CA 90010

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.

RAISE RABBITS SUCCESSFULLY 68 Page Booklet Tells How. 50c. American Rabbit Assn., H1, P.O. Box 426, Bloomington, Illinois 61701

\$500-\$1000 Month Plan raising rabbits for us. Free details. White's Rabbery, Box 1388PM, Hudson, Ohio 44236

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

GOSLINGS, DUCKLINGS. Chicks and Books. Catalog 50c. Pignin Goose Hatchery, PM-82, Williamsfield, Ohio-44093

OF INTEREST TO ALL

ANSWERING MACHINE messages. Script of 12 messages \$2.00. Dhu-Glas Ltd., Box 1664, Sausalito, CA 94966

HOTTEST NEW COLLECTIBLE - RARE GEMS! Details Free! Taylor's, 113PM Martin, Indian Harbor Beach, Florida 32937

FREE Promotional Albums, Concert Tickets, Stereos, etc. Information: Barry Publications, 477 82nd Street, Brooklyn, NY 11209

NEED CREDIT? Get Visa, Mastercard—with no credit check. Guaranteed! It's simple, Legal. Plus other credit secrets. Free details! Send SASE to: Inflation Reports, PMF, P.O. Box 80148, Los Angeles, CA 90060

LIFESAVING Sportsman's Guide To Exposure, Illnesses— \$3.00. EMT, Box 5102, Cookeville, TN 38501

TAX Deductible IRA's Made Easy. Worksheet: \$1.00 Refundable. Learnex, 120 Main St., Box 265P, Mt. Kisco, NY 10549

PAY Off your 30-Year Mortgage in Half the Time. Save Thousands. Facts. Tables. \$2.00. Almar, Box 51, Victoria, TX 77902

YOU ARE MANIPULATED. By Understanding Simple Principles. You Use Their Manipulation To Make Life Better. **FREE DETAILS.** ADSINC, 1459 Betty Drive, Xenia, OH 45385.

GOLD Coin: \$50. Silver Necklace: \$25. Nation, PM, Fairfield, IL 62837

DMSO— Pure- (Solvent). 8 ounces. \$12.95. Midwestern Sales, Box 25061, St. Louis, MO 63125-0061

RECEIVE a tax refund this year? If not, you probably missed some deductions you were legally entitled to. Send \$1.00 (tax deductible) and a stamped business size self-addressed envelope for a six page list of deductions and exclusions. Consumer Financial Information, Inc., P. O. Box 8277, Chicago, Illinois 60680

USE LESS MONEY To Live! Let Us Show You How! Free Details. Write: Dollarless Buying, 432 S. 1045 W, Orem, Utah 84057

FREE MESSAGES WORLDWIDE — Send/Receive — Anytime. Details \$10 — Fernando Bay, 2160 Diego de Almagro, Santiago - Chile

ELIMINATE ROACHES! Easy household Formula. \$2.00 Plus SASE. Skuba, 12111 Hawthorne Way, Hawthorne, CA. 90250

SURVIVE NUCLEAR ATTACK! Free information. Send stamp. RADSADS, P.O. Box 40-A, Castor, LA. 71016.

SELF IMPROVEMENT Books. Pamphlet listing 400 Titles Free. Joseph's, Dept. PM62, P.O. Box 127, Baldwin Place, N.Y. 10505

WIN At Blackjack. \$3. RES, P.O. Box 635, Edison, N.J. 08818

SAVE On Credit Interest Send \$4.00 to: Ken Caudle, 3261 S.W. 29St., Miami, Fla. 33133

DISNEY artist shows you how to draw. First easy lesson **FREE!** Get started today! Drawing-PM3, 3471 Crownsworth, Corona, CA 91720

MONEY Back. Income Tax Aid. Simplified Insurance — Claim — Filing and Medical Record System. Send \$6.00 For "System" To: Michs Enterprises, P.O. Box 1246, Richland, Wash. 99352

GRAPHOPOWER: Power in Personality is Revealed in Handwriting. Sample Page, \$15.00. Graphopower, Box 325, Brintree, MA 02184

ATTRACTIVE Income Opportunity with Simple Solar Energy Projects. Complete Information \$3.00. Timberhill, Chestnut Ave., Box 51, East Aurora, NY 14052

OF INTEREST TO WOMEN

QUILTING CAN BE A LOT MORE FUN And go twice as fast when done on a frame. This one comes apart for easy storage and you can make it in a weekend. Send \$2.25 for plan to: Popular Mechanics, Dept. PMC8, Box 1014, Radio City Sta., N.Y. 10101

GOVERNMENT SURPLUS

MOTORCYCLES — JEEPS — HELICOPTERS — AUTOMOBILES . . . GOVERNMENT SURPLUS DIRECTORY — MONEYSACK GUARANTEE— How, where—\$2.00. GS Information, Department 18, Federal Building, Box 3913, Springfield, Massachusetts 01101

SURPLUS Jeeps, Cars And Trucks Available. Many Sell For Under \$200. Call 312-742-1143 Ext. 7133. For Information On How To Purchase.

GOVERNMENT SURPLUS . . . Millions of items (including Jeeps) . . . low as 1c on dollar! Most complete Directory available — \$2.00 (guaranteed). **DISPOSAL**, Box 19107-AF, 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-AF, Washington, DC 20036

GOVERNMENT SURPLUS! JEEPS - AUTOMOBILES - PICKUPS - \$25.00! Millions Of Items! Complete Directory - How, Where To Buy Your Area - \$2.00. **EASTERN DISPOSAL**, Box 392, VALLEY FORGE, PA 19481

"GOVERNMENT" SURPLUS JEEPS CARS \$30.00! 800,000 Items! Complete Information Your Area. **LARGEST OFFICIAL DIRECTORY.** \$2.00 (Guaranteed). **SURPLUS**, Department A123, 4620 Wisconsin Northwest, WASHINGTON, D.C. 20016

YOUR CHANCE TO BUY, RIGHT! Loads of people are doing it. Why not you? For detailed booklet on buying direct from U.S. Government, Send \$3.95 to: C&H Industries, P.O. Box 7198, Lakewood Ohio 44107

1982 Surplus Army, Navy store 64 pages illustrated catalog. Send \$2.00. Ruvel, 3037 N. Clark, Dept. J-6, Chicago, IL 60657.

LOANS BY MAIL

RAISE \$10,000 overnight! Fast-Simple-Method. Fully Guaranteed! Send \$4.00 to: IPS, Box 10858-C, Tampa, FL 33679

BORROW By Mail! Free Details! MBG-PM682, Box 2298, Sandusky, OH 44870

BORROW INTEREST FREE! \$500-\$30,000! All eligible. Repay anytime. No gimmicks. Free Details! Infohouse, Box 1004-PM6, New York, NY 10003.

QUICK MAILOANS! Free application rushed! Lanco, Box 724-B18, McMinnville, Oregon 97128

BORROW \$25,000 "overnight." Any Purpose. Keep indefinitely! Free Report! Success Research, Box 29070-AS, Indianapolis, Indiana 46229.

MONEY Problems? Free Book describes Loans, Cash, Government Grants, Other Benefits, available to individuals. Write: Associates, Box 98-A4, Brooklyn, New York 11235

BORROW \$1,000—\$5,000.00. Difficult loans arranged. Personal, business, venture capital. **RESEARCH UNLIMITED**, #300, Dayton, Washington 99328.

BORROW \$25,000 Without Interest, Credit Cards. Box 696PM, Norwalk, Connecticut 06856-0696

BORROW \$100-\$100,000! Instant Reply! No Co-signer! Rush Stamped Envelope! Financial, Box 5487(P), Richardson, TX 75080

BORROW \$125,000 EVEN IF REFUSED ELSEWHERE! No gimmicks. IFC, Box 1146-PM6, Lawrenceville, Georgia 30246

PAY No Interest. \$5,000 Financing. All Eligible, Never Repay. Rush Stamp. ABC-PMA, Box 668, Lomita, CA 90717

BORROW \$30,000-Interest free!!! Keep indefinitely! Free report. American, 1601 Main, Plainfield, IN 46168.

THE ARABS HAVE MILLIONS to Loan! **FREE DETAILS!** Arab-PM, 935 Main, Vidor, TX 77662

MASTERCARD! Visa By Mail! Write! Credit-PM682, Box 2298, Sandusky, OH. 44870.

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-6, 1145 Reservoir Avenue, Cranston, Rhode Island 02920

NEED CREDIT? Receive Master Card, VISA, No Credit Check, Guaranteed Legal, Simple, All by Mail, Free Details. Send Self Addressed Stamped **BUSINESS** Envelope: PMCP, Box 187, Boys Town, Nebr. 68010

PERSONAL

RAISE \$10,000 overnight! Fast-Simple-Method. Fully Guaranteed! Send \$4.00 to: IPS, Box 10858-C, Tampa, FL 33679

BIBLE Questions answered. Stamped envelope. Byron, 17167 Bentler, Detroit, Michigan 48219

COLLEGE DEGREES BY SPECIAL EVALUATION of EXISTING Credits & Job Experience. Fast. (614) 863-1791. Write: Box 13151-T8, Columbus, Ohio 43213.

FINANCE YOUR DREAMS with Government and Foundation Grants. Details \$1.00. **TOU-PM6**, 432 PCH, Hermosa Beach, California 90254

COLLEGE DEGREES BY MAIL. Renowned Universities offer fully-accredited Bachelors, Masters, PH.D.'s . . . Free revealing details. Counseling, Box 317-MP-6, Tustin, California 92680.

CREATION story re-examined. God created, but method not given in Genesis. Different king of creation meant. (After all, no sun till fourth day but light and plants first and third days!) If not physical creation, what? Explained in **PARABLE OF CREATION**. Send \$1.00 to: Swedenborg Information M, Bryn Athyn, PA 19009

DIVORCE? Winning information \$2.00. **MEN'S RIGHTS ASSOCIATION**, 189B, Forest Lake, MN 55025

PAY Bills When Due. New Record System. Free Details. A. H. Products, P.O. Box 11306, Baltimore, MD 21239

BORROW By Mail! Free Details! MBG-PM682, Box 2298, Sandusky, OH. 44870.

CONFIDENTIAL Chicago Mailing Address: Business, Personal. Since 1944! Mail Center, 323(x) Franklin, Chicago, 60606

REMAILING SERVICE

SASKATCHEWAN Remailing. Central, Box 101, Foam Lake, Saskatchewan, Canada S0A 1A0

CONFIDENTIAL MAIL and **PHONE** Calls Received and Forwarded Daily. Central, Box 369PM, Claymont, DE 19703

WORLDWIDE MAIL FORWARDING 25 years experience. **NATO**, Box 1418, Sarasota, FL 33578

HAVE A Confidential Mailing Address. Berkshire Mails, Box 1469, Pittsfield, Massachusetts 01202

(Continued on next page)

REMAILING SERVICE

(Continued from preceding page)

DEPENDABLE, Confidential Remailing, Postal Shoppes, 369 East 900 South, Salt Lake City, Utah 84111

WORLDWIDE Remails Confidential \$1.00 Each. Service, Box 9519, Bakersfield, CA 93389

UNLISTED ADDRESS, Discreet and confidential. Remail \$1.00 Single Mail Forwarding Service, 8050 S. Main, Houston, Texas 77025

SOUTHERN CALIFORNIA Remails, Stamped \$1.00, P.O. Box 11692, Costa Mesa, California 92627

DIRECTORY Reliable Remailers, \$10.00. International Remail-Forwarding Association, Box 1538M, Hilo, Hawaii 96720-0332

REMAILS \$1.00. Ask about Receiving/Forwarding. Letter Box, 11010 York, Cockeysville, MD. 21030

PITTSBURGH Remails, Receiving, Lowest Prices. **MOORE**, Box 17024, Pittsburgh, PA 15235

PENNSYLVANIA REMAILS: Pre-stamped Mail Forwarding/Receiving \$1.00 each. Brancato, Box 46988A, Suite 1308, Land Title Bldg., Philadelphia, PA 19110

MISCELLANEOUS

PRIVACY, Pocket door latch made for under \$1.00. Need vice, hand tools, several store bought items. Make several. \$2.00. Rod's Repair, 2720 Parkdale Ct., Ft. Collins, CO 80525

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**, 2071-46 Emerson, Jacksonville, Florida 32207

PHOTO IDENTIFICATION CARDS . . . Certificates . . . **GUARANTEED!** Samples 25¢ . . . Basco, Box 3461-PM-82, Providence, R.I. 02909

ORNAMENTAL Iron Designs. Book of 1600 beautiful practical designs for railings, columns, etc. Free Literature. Cunningham, Box 20005, Salt Lake City, Utah 84120-0005 — (3881 South 3200 West)

LAND-FOR-TAXES! Get For Almost Nothing! Easy Understood instructions. \$2.00. Grandcoes, PM6, Hamilton, GA 31811

PERSONALIZED Key Tag, Black with White Lettering. Send \$2.98 to: Huhs, 10C Centennial, Welland, Ontario, L3C-2M4

FREE LCD PEN WATCH. Details Send SASE. ODC, Box 14335P, Opportunity, WA 99214

IDENTIFICATION CARDS . . . **CERTIFICATES** . . . \$2 SELECTIONS. Samples 25¢. Documents, Box 5684-T, El Monte, Calif. 91731

WANTED MISCELLANEOUS

ROLLED-OUT Elongated Coins. Elongates, 228 Vassar Rd., Poughkeepsie, NY 12603

BUYING Carbide, Silver Solder, Silver Contacts, Tantalum & Stellite - Poley's Salvage, 12389 Mingos, Battle Creek, MI 49017

GOLD, Silver, Platinum, Mercury, Tantalum wanted. Ores assayed. Free circular. Wholesale Terminal, P.O. Box 191, Norwood, MA 02062

SCRAP SILVER CONTACTS, FORKLIFT CONTACTS, Silver Solder, Sterling, Gold Plated. Robert Leszczak, 652 Myrtle St., Elizabeth, NJ 07202

HEARING AIDS

HUGE SAVINGS. Eliminate dealer mark-ups. Free Trial. Batteries Wholesale. Terms arranged. Lloyds-PMC, Rockford, Illinois 61104

FREE HEARING AID CATALOG - Save 1/2 by mail! Write: "MoneySavers", 9530-PM8, Langdon, Sepulveda, California 91343. NOT sold in California.

SAVE Half by Buying Hearing Aids Direct. Month Trial. Res Company Inc., Box 364, Bridgeport, Ohio 43912

FREE Hearing Aid Catalog. Huge Savings. No Salesman Will Call. Try Before You Buy! Rhodes, Dept. 132-S, Brookport, IL 62910

TOBACCO

MAKE Pipes, Information: Pmo, Inc., P62, Box 59211, Chicago, Illinois 60659

WALL PIPE RACK WITH HUMIDOR Make your own. Photocopy of article shows all details. Price 45¢. Send order to: Popular Mechanics, Dept. PMC6, Box 1014, Radio City Sta., New York, N.Y. 10101

SCIENCE & CHEMISTRY

LABORATORY Chemicals, Glassware — Apparatus. Catalogue \$1.00. Deluxe Scientific, 934 S. 13 Street, Manitowoc, Wisconsin 54220

HOW TO LIVE IN A EARTHQUAKE ZONE. "Earthquake New England" Shows how to Protect Home and Family . . . Shooking History . . . Effects on Cities . . . Predictions . . . Tidalwaves . . . Lots More! Illustrated. Only \$6.95 ppd. (MC and VISA include Number, Expir. Date). Home-Science Publishers, 839 Beacon St., Boston, MA 02215

FORMULAS, PLANS, ETC.

MONEYMAKING FORMULAS - THOUSANDS! CATALOG \$3.00 (REFUNDABLE): GWA3, Box 193, Brookfield, Wisconsin 53005-0193

ANY Formula \$10.00. Catalog - Treatise \$1.00. Belfort, Box 568, Chicago, 60690

LASER Plans \$10. Celestial Research, 420 Pier Avenue, Suite 158, Hermosa Beach, Calif. 90254

TRAVEL & RESORTS

VACATION Beautiful Montana. See the Wilderness while you can. Rush \$2.00 for information. Vacation, Box 199, Condon, MT. 59826

SPECIAL SERVICES

INFORMATION On anything. Ferguson Research Specialists, 60-15 Woodside, Woodside, New York 11377

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

BETTER HEALTH

BACKPAIN RELIEF \$3.00. Dumat, 616 Fletcher Street, Clearfield, Penna 16830

FIGHTING Fat? Self-cure obesity quickly, safely, permanently. Free details. Caballero Press, 1936 Caballero M1, Las Vegas, NV 89109

HERBS for health and healing. Teas, capsules, books, from: **HARTENTHALER**, Folcroft, PA 19032

VITAMINS! What you should know. Copy — send \$1.00 to: **MALLERY**, P.O. Box 182, Hopewell, VA 23860-0182

FOR THE HOME

GUARANTEED TO SAVE THOUSANDS AND YEARS Off Your Mortgage. An Unpublished Completely Legal method. Send \$5.95 J. T. M. Enterprises, Box 217, Middle Island, New York 11953

CASTIRON Teakettles, popover pans, Bread, Curing Procedures, free. Iron Craft, Freedom, N.H. 03836

REPAIRS AND SERVICING

REFRIGERATOR TUNE-UP THAT CUTS OPERATING COSTS. Remember a refrigerator in good condition runs less and saves dollars. Photocopy of article available for \$1.00. Send order to: Popular Mechanics, Dept. PMC6, Box 1014, Radio City Station, New York, NY 10101

GARDENING & LAWN CARE

LEARN Gardening and Landscaping at home. Free booklet. Lifetime Career Schools, Dept. A-988, 2251 Barry Avenue, Los Angeles, California 90064

BUILD Professional Propagation Germination table thermostatically controlled area 63" x 36". Plans \$5.00. Taydoe Enterprises, 1311 Elkhorn Crescent, Prince George, B.C. Canada V2M 6L9

FLOWERS, PLANTS & NURSERY SUPPLIES

HOUSEPLANTS FLOURISH! Amazing new discovery containing 100% **NATURAL** minerals essential for plant health. Restores "Fresh nursery green" look plus new growth within six weeks or money back. Rush \$3.95 to: Provider Products, Inc., 2100 Lancaster Dr. NE, Suite 2-D6, Salem, OR 97305

PROFESSIONAL TECHNIQUES AND EXPERT ADVICE FOR GOOD PLANT CARE. Now on cassette tape! Author has 25 years nursery experience. Send \$12.00 and address to: Marvin L. Rester, 6254 Firetower Road, Theodore, Alabama 36582

GROW Plants For Fun or Profit. Instructions of Plant Propagation plus One Dozen Sets to Start You Multiplying Plants. Send \$5.00 Plus \$1.00 Postage and Handling to: Layer-Aid, P.O. Box 15392, Orlando, FL 32858

RECIPES, COOKING, ETC.

EXCITING Korean Recipe For Curries \$3.00. Kelly, 2271 Hazel St. #5, Beaumont, Texas 77702

ITALIAN HOT SAUSAGE seasoning recipe. \$2.00. Food Park, Box 112, Verona, PA 15147

FRONT Range Chili Recipes & Tips, \$5.00. Trail's End Chili, Box 2027, Longmont, CO 80501

30 ECONOMIC Meat Recipes - \$3.50. W. Shuttleworth, Box 8532, Michigan City, IN 46360

PRIZE Winning Recipe - Sausage and Pepper - \$3.00. Twist Cookies - \$3.00. Both \$5.00. John Hall, Box 64P, Lighthouse Point, FL 33074

GRANDMA BAKER'S Potato Salad plus three other Family Recipes. Send \$2.00 to: Recipes, P.O. Box 23304, San Jose, Calif. 95153

7 ORIGINAL Mexican Family Recipes. Fideo, Chilaquiles, Others. Easy, Economical, Delicious. SASE \$2. Cindy, Box 2026, Englewood, CO 80150

25 ITALIAN recipes \$8.00. 469 Hyde Park Blvd., Niagara Falls, New York 14303

AUTHENTIC Polish Bigos and Potato Pancake Recipes, \$2.00. Danto Reg'd., P.O. Box 203, Montreal, Quebec H3X 3T4

CHOCOLATES: Rum filled rich delicious gourmets delight. Easy to make \$3.00 SASE. J. V. Enterprise, P.O. Box 2683, Ft. Arthur, Texas 77640

COOKING IS PROFITABLE! Your kitchen caters local restaurants. Kit \$7.95. Sheila Toomey, Box 5531, Vallejo, CA 94591

SALAMI — Homemade Easy Recipe. Send \$2.00. E.T.C. Recipes, P.O. Box 16160PM, Orlando, Florida 32811

WINEMAKING & OTHER RECIPES

WINEMAKING-BEERMAKING-GASOHOL. Free Supply Catalog. Yeast Equipment. Continental, Box 68016-PM, Indianapolis, Ind 46268

WINEMAKERS-BEERMAKERS: Free illustrated catalog of supplies. Sempex, Box 12276R, Minneapolis, Minnesota 55412-0276

MAKE QUALITY BEER, Wine. Free catalog. Village Store, Box C-51PM, Westport, MA 02790

WINEMAKERS-BEERMAKERS — Free Catalog — Fast Service — Large Selection: Kraus, Box 7850-L, Independence, Missouri 64053

WINEMAKERS-BEERMAKERS Fresh Stocks, Fast Service, Free Catalog. O'Brien's, Box 2840, Wayne, IL 60184

BEERMAKING SUPPLIES — Quality Selection, Free Price List. Brew It Yourself, Box 121, Freeport, IL 61032

BEERLOVERS! Brew American and European beer. Complete kits, Equipment, Supplies. **FREE** details. Duane Imports Inc., Department PM, P.O. Box C-500, Hershey, PA. 17033

BEER LOVERS — Brew your own. Delicious! Inexpensive! Free Catalog. Beer Gear, Box 25093M, Lansing, Michigan 48909

FREE Encyclopedia Winemaking Beermaking Supplies, Equipment, Ingredients. Send \$1.00 shipping, handling. Vynox, Box PM7498, Rochester, NY 14615

"WINEMAKING Simplified" plus dandelion recipe. \$3.00. **WINES**, Box 1165, Bloomfield, New Jersey 07003

FREE BEERMAKING BOOK Plus Catalog. Finest Equipment, Ingredients. Fully Guaranteed. SPI, Box 784-M, Chapel Hill, NC 27514

WORLDS finest wines made easily at home. Complete instructions & Recipes \$5.00. **OWL** Publishing, 1559 Ritchie, Stow, 44224

MOONSHINE MAKING. Whiskey, Gin, Vodka, Alcohol. Illustrated Manual, \$2.00. Homebrewer, 5133A Fairhill, Philadelphia, PA 19120-3195

BEERMAKERS! Free Specialist Catalog/Newsletter. William's, Box 461MJ, Oakland, California 94604

WINEMAKERS/BREWERS Catalog! Beginner Kits/Advanced Material. Inexpensive. **AMAZING GRAPES**, 1131-A6, South 46th Street, Philadelphia, Pennsylvania 19143

"ALL ABOUT BEER." 16 Page Newspaper. Send \$1.00. Wine Beer Catalog. Fermenters Cellar, 6938-6 Daneby, Indianapolis, Indiana 46220

BURGLAR ALARMS & HOME PROTECTION

PREVENT BURGLARIES! Protect Your Home and Family! Home Security Techniques. Tells how to **START NEIGHBORHOOD WATCH PROGRAM**, "Do It Yourself" Window Security for 12¢ — Garage Doors — 60¢! How to Install your own Window Bars — Send \$3.00 Today! Brandywine Publications, Box 197M, Gillette, NJ 07933

Subscription price Slashed to \$2.97!

Moneysworth monthly has stunned the magazine world by announcing an offer of full-year subscriptions for just \$2.97. This is as little as some magazines charge for a single issue.

"We're doing this to celebrate our Tenth Anniversary," a spokesman said, "and to solidify Moneysworth's position as America's Number One Biggest Publishing Bargain. Ever since it began publication a decade ago, Moneysworth has consistently lowered subscription rates, while other periodicals have been raising theirs. We started out at \$10 a year and now we are offering Tenth Anniversary Special Subscriptions at the *UNREAL PRICE OF ONLY \$2.97!*"

Moneysworth, which tells how to get the most for your money and the most out of life, is read by an estimated 5,000,000. Its chief competitors are Consumer Reports, which sells for \$14 a year, and Money magazine, for \$17.95.

How to place your order

Readers of this magazine who wish to take advantage of this unparalleled offer should send their name and address along with \$2.97 to: Tenth Anniversary Special Subscriptions, Moneysworth, P.O. Box 404-PM, New York, NY 10101.

Typical of the savvy, wallet-fattening articles Moneysworth prints are these:

Recession-Proof Jobs

Cars that Are Stingiest with Gas

How to Earn 10½% on Your Savings

Canada's FREE Land Giveaway

How to Qualify for Food Stamps

The Only Diet that Really Works

The Long and Short of Hair Transplants

How to Collect Social Security from the

U.S. and Canada—BOTH

Are Hay Fever Shots Pointless?

Mercedes' New "Lifetime" Car

How to Reduce Exorbitant Doctor Bills

States with Best Unemployment Pay

How to Get a Low-Cost Divorce

The Kinds of Cars Mechanics Own

How to Hold On to Your Auto Insurance

How to Turn Boxtops into Gold

Contact Lenses that CURE Poor Vision

Happiness Is a Hick Town

A Gourmet's Guide to Free Cookbooks

How to Stop Snoring

Air Travel at 50% Off

Today's Soldiers Command High Pay

Prosperity in Alaska

Low-Cost Insurance for Non-Smokers

Mattresses to Turn Hand Springs Over

How to Save 20% on Your Food Bill

Scholar Dollars for the Middle Class

Where Retirement \$\$ Goes Farthest

The "Yurt": Incredible \$350 House

How to Get 7 Bestsellers for Price of 1

Ski Areas Without Steep Prices

How to Burn Wood Efficiently as Fuel

Resumes that Get Jobs

How to Avoid Alimony

How to Travel and Get Paid for It

Fifteen Fabulous Free Maps

Don't Sneeze at This Cold Remedy

Starting a Retirement Business

Videotape: The Last Word in Wills

The World's 100 Best Free Calendars

Landing an Executive Job After 40

How to Cope with Dunning Letters

Sailboats that Are Real Winners

Getting a Job as a Forest Ranger

The Amazing New Two-Engine Car

As you can see, Moneysworth is an easy-to-follow instruction manual for building a better life. Each day, it is inundated with ecstatic testimonials like:

• "You're not going to believe this, but I have parlayed \$146 into \$90,000, due to your informative article on how to break into real estate. How can I ever express my gratitude sufficiently?"

—H.T. Pinrose; Montgomery, Iowa.

• "Your advice on Social Security resulted in a \$3,135 lump-sum cash payment to my wife and \$171 monthly pension. The best investment I ever made was my subscription to Moneysworth."
—Dr. Herman Hortop; La Grange, Ill.

• "Your article on high interest paid by foreign banks has enabled me to retire in style. I cannot thank you enough."
—E. Svenson; Fallbrook, Cal.

• "Your news reports on investments have brought me, in just months, \$12,996 profit, tripling my money. You can bet I'll be a Moneysworth subscriber for life."
—L. Grey; Ypsilanti, Mich.

• "Your article 'Inaccurate Billing by the Phone Company' led me to discover four years of overcharges. I got a \$1,593 refund!"
—A. DiRienzo; Bristol, Pa.

• "Moneysworth's product ratings sure stretch the dollar. I bought the 35mm camera you recommended, saving 30%."
—R. Goodrich; Tucson, Ariz.

• "Your article 'How to Avoid Paying an Exorbitant Doctor Bill' saved me \$65. Here's my subscription extension."
—C. Wagner; Yorktown Heights, N.Y.

• "Thanks to your article 'How to Buy a New Car for \$125 over DEALER's Cost,' I just bought a Chevy at a saving that I conservatively estimate at \$350."
—Rudy L. Grange; Anita, Iowa.

• "Moneysworth is aptly named. To paraphrase Churchill, never have so many paid so little for so much."
—Dave Alpern; Pittsburgh, Pa.

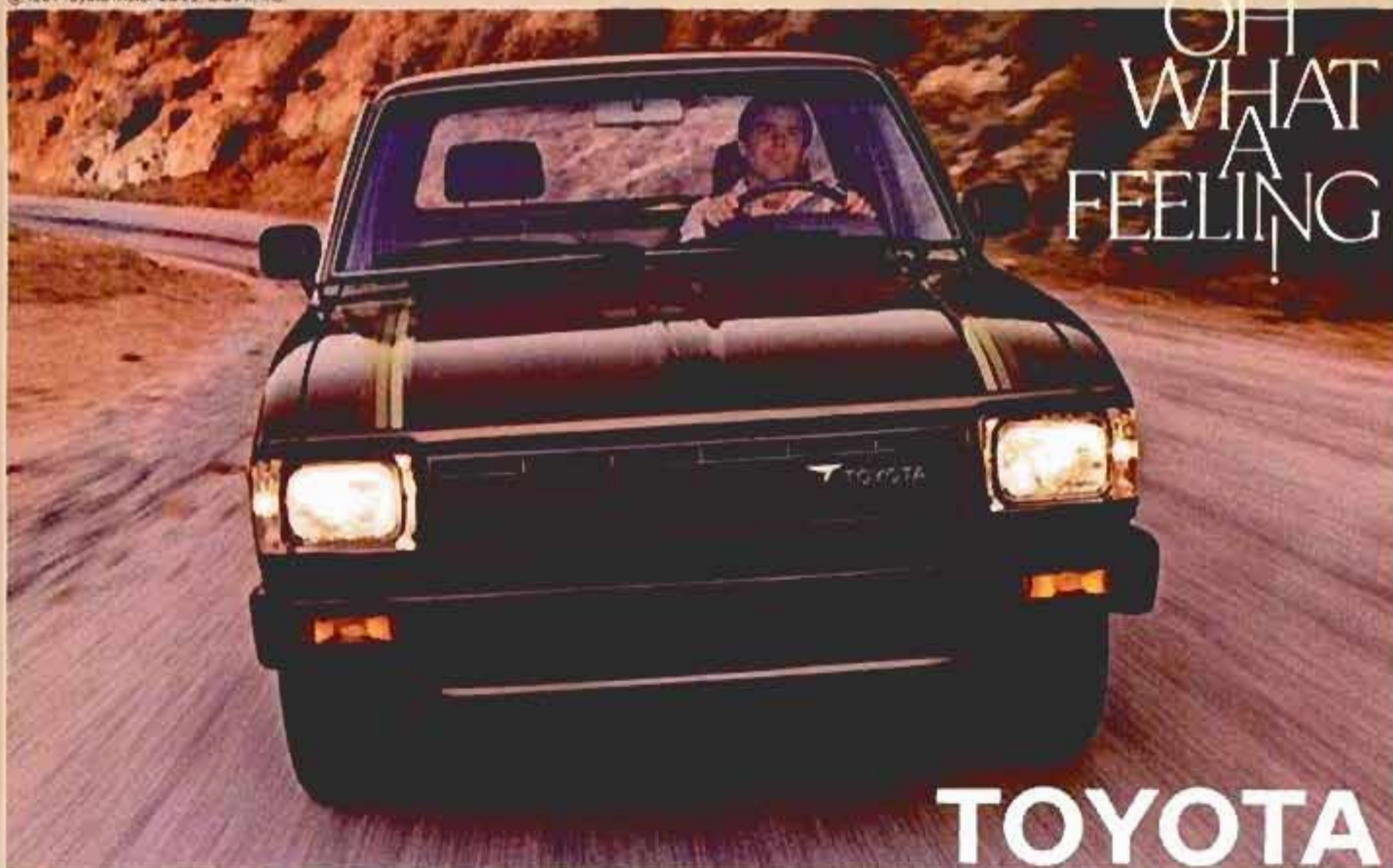
To take advantage

To take advantage of this GIVEAWAY offer, readers of this magazine should send their name and address with \$2.97 to: Tenth Anniversary Special Subscriptions, Moneysworth, P.O. Box 404-PM, New York, NY 10101.

(Note: There is a limit to the number of years that may be ordered under this special rate. No subscription may exceed three years—at \$8.91.)

If ever a publication was accurately named, it's Moneysworth. This offer is highly recommended.

OH
WHAT
A
FEELING



TOYOTA

A TWO SEAT SPORTS CAR WITH A 7-FOOT TRUNK.

THE 1982 SR5 SPORT TRUCK. Two-seat sports cars are fine...if all you travel with is driving gloves and sunglasses.

But if you like to bring your toys when you go places, take this two-seat sports machine.

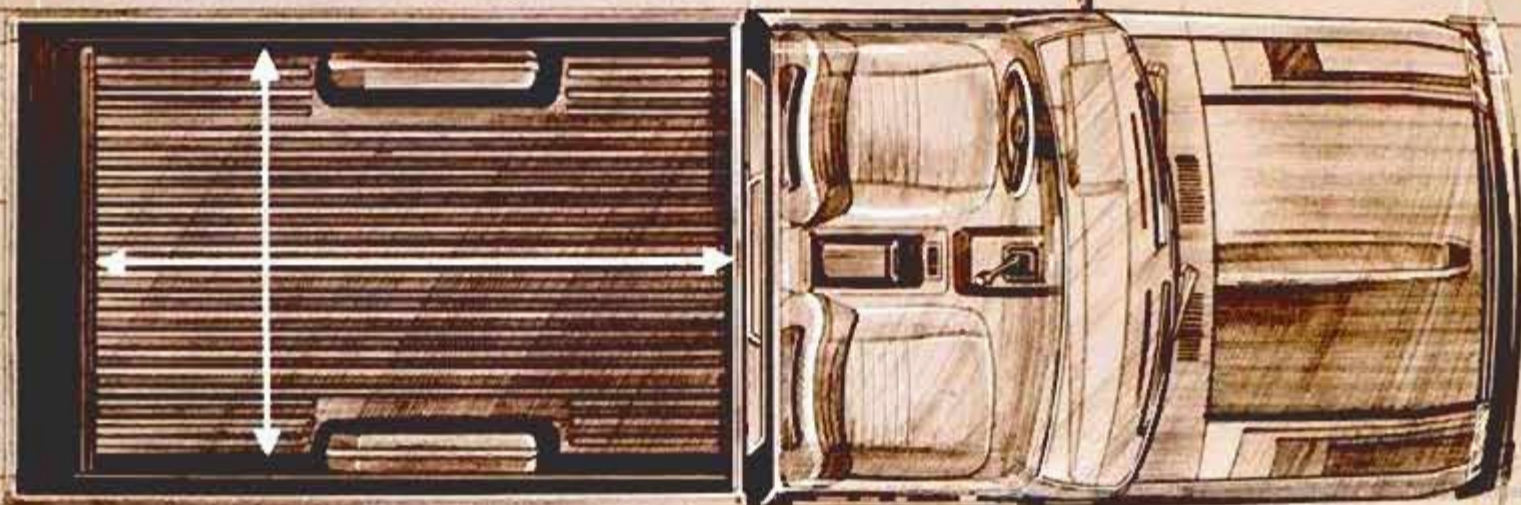
Its 7-foot trunk holds a dirt bike, a snowmobile...almost any payload up to 1100 pounds.

And inside, the Toyota SR5 Long Bed Sport Truck really is outfitted like a sports car. With bucket seats. Big, blacked-out gauges. Even an AM/FM/MPX stereo radio. All standard.

Start the 2.4 liter 4-cylinder overhead cam engine and the sports car feeling gets even better. You've got power-assisted disc brakes up front. A sporty 5-speed overdrive transmission. Or you can order Toyota's innovative 4-speed automatic overdrive.

And one more thing — mileage you wouldn't expect from a sports car! The Toyota SR5 is rated at 34 EPA Estimated Highway MPG, (24) EPA Estimated MPG. Remember: Compare this estimate to the EPA "Estimated MPG" of other small trucks. You may get different mileage, depending on how fast you drive, weather conditions, and trip length. Actual highway mileage will probably be less than the EPA "Highway Estimate."

The Toyota SR5 Sport Truck. It isn't hard to believe you really are in a sports car. Just don't look back!



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

NOW is the lowest menthol 100s. But it's easy to see why some people aren't sure. They've had a lot of confusing numbers thrown at them for quite a while.

Just look at the chart at the right and see for yourself.

The truth is that NOW 100s Soft Pack Menthol

2 mg tar contains less than half the tar of Carlton 100s Soft Pack Menthol at 5 mg.

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

Which is the lowest 100s menthol?

No need to guess—NOW.



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

	100's <small>soft pack regular</small>	100's <small>soft pack menthol</small>	100's <small>box</small>
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.

©1994 R.J. REYNOLDS TOBACCO CO.

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.