

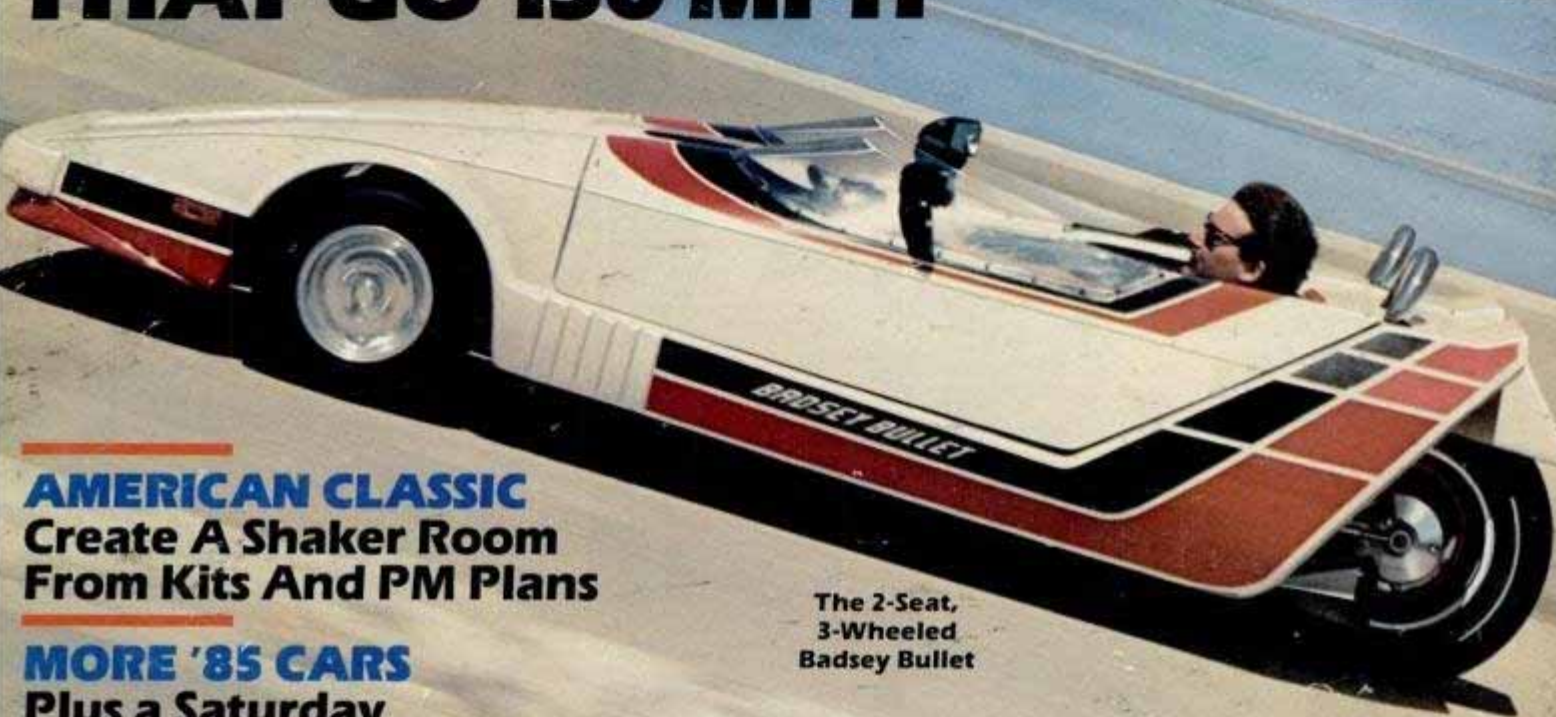
OCTOBER 1984 \$1.50

Popular Mechanics

HOW THEY DID 1984'S BEST MOVIE STUNTS
Harrison Ford Escapes The Temple Of Doom



NOW: 3-WHEELERS THAT GO 150 MPH



The 2-Seat, 3-Wheeled Badsey Bullet

AMERICAN CLASSIC
Create A Shaker Room From Kits And PM Plans

MORE '85 CARS
Plus a Saturday Mechanic's Look Under The Hood

WOODWORKING
10 Expert Ways To Make Wood Surfaces Smooth

HOME ENERGY
New Super Efficient Heating Plants

COMPUTERS
How To Choose The I

TOOLBOXES
2 Portable Tool Carriers To Make



PLANS INSIDE





Buckle up—for life!

Without Isuzu, it would've been a dark day in Searchlight, Nevada.

There's never exactly been a giant list of recreational activities available to the residents of Searchlight. Whittling was very big a couple of years back, but it wasn't always easy to find a good piece of wood. Still isn't.

When it came right down to it (and that happened a lot in Searchlight) watching movies at the local theatre was about it. With a capital "I." That and watching the road for the Isuzu truck that delivered the films.

When a town was as anxious for movies as Searchlight, the delivery man couldn't afford to be anxious about his pickup truck. It had to be reliable. It had to literally make the grade (a 22 mile one at that) around Baker way. A grade that forced 18 wheelers into low gears and high

radiator temperatures. The Isuzu also had to make the grade between El Centro and San Diego. A place so nasty, there are four places to stop and replace the water and coolant for a truck's engine.

Whether it was trudging through flash floods at Parker, or passing up the fella's that didn't make it through the Cajon Pass, Movie Delivery Service had their headlights confidently aimed at Searchlight. They realized that if their Isuzu failed, they failed. And that'd mean a whole lot more whittling by the town's residents. It'd be a dark day in Searchlight, indeed.

The good news is that the Isuzu never failed to deliver a movie. And that fact itself would've made a darn good adventure film.



Isuzu. Our wheels are always turning.



ISUZU PUP trucks starting from \$5,775 manufacturer's suggested retail price P.O.E. excluding tax, license, transportation.

Unfortunately, if the telephone you buy today isn't a Panasonic, it may be out of date tomorrow. If it lasts that long.

Choose a built-in answering machine. Speakerphone. Built-in dialer. But choose carefully, because it's built to last. After all, it's a Panasonic.

Now you can buy your own telephone. So it's important to buy the one that's right for you.

On one hand, you don't want to spend too much for a phone. Or buy one that does more than you need. On the other, you don't want to spend too little. Or the phone may become out of date in a few months. If it lasts that long.

Let Panasonic help you reach the right decision. We have the right phone for you. And the right price to go

with it. No matter what your needs or budget.

Choose from phones with answering machines built in. Speakerphones that let you talk without holding the phone. And phones with automatic dialers. And most of our phones are compatible with alternate long distance services. Such as Sprint® and MCI.

Whichever Panasonic telephone you choose, it will have one thing in common with our entire family of phones. Panasonic dependability.

And should your phone ever need service, we have a nationwide network of service centers.

Panasonic telephones. They won't be out of date today. Or tomorrow.

Speakerphone. Dialer. And answering machine. Even lets you call in for messages. Without a remote device. From any push-button tone phone.

KX-T 2425



This phone remembers 28 numbers. And will dial them for you automatically. Even redials a busy number. Up to 15 times in 10 minutes.

KX-T 2130



This slim-line phone has an automatic dialer. Call family. Friends. Emergency numbers. Up to 16 digits long. At the touch of a button.

KX-T 2203



This phone lets you connect two incoming lines. So you can put your first call on hold, while you answer a second. Also has an automatic dialer.

KX-T 3203



This One

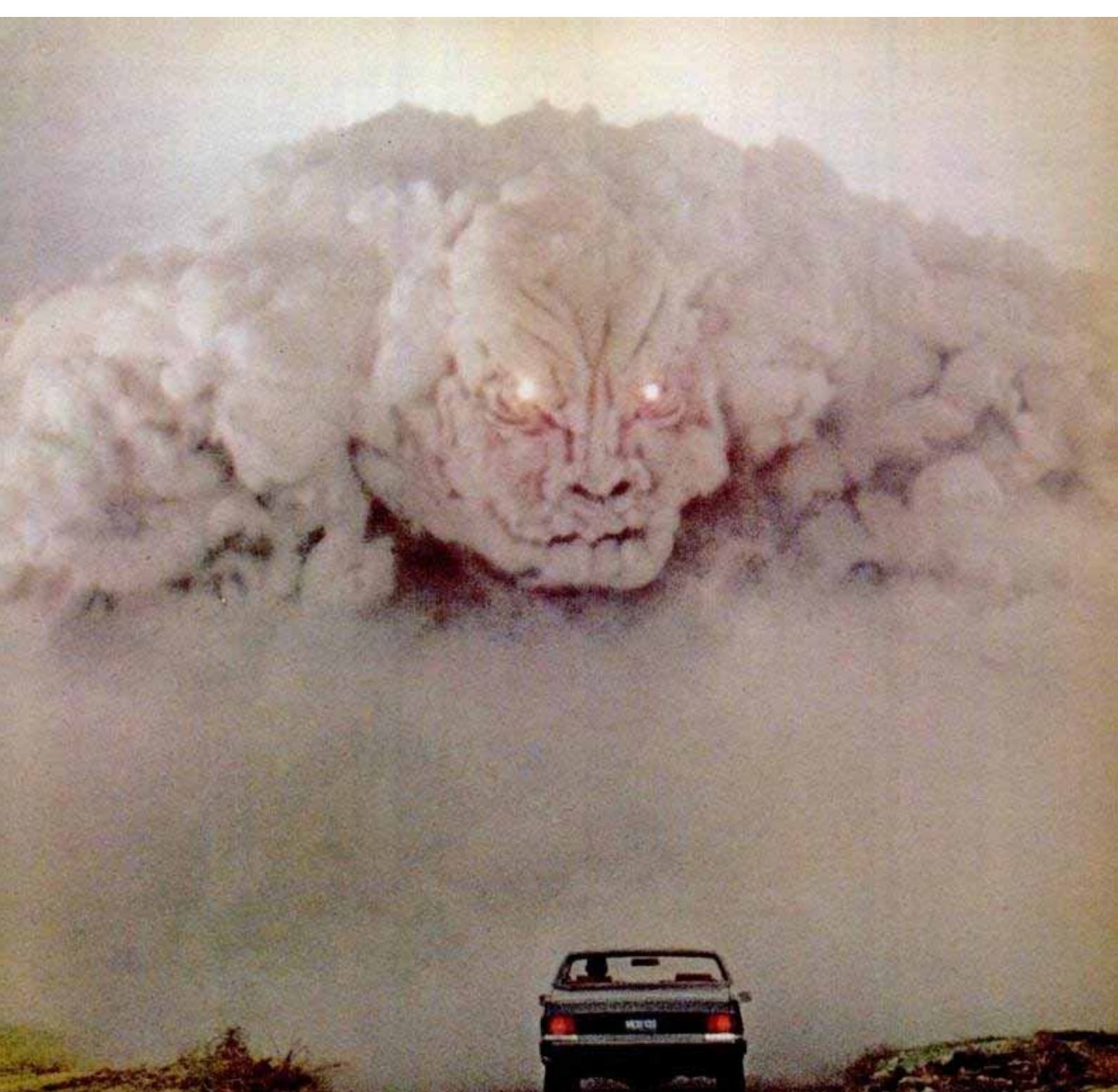


TDOF-C9Q-OKKD

®Sprint is a registered service mark of GTE Sprint Communications Corp.

Panasonic
just slightly ahead of our time.

Материал защищен авторским правом



**THE MICHELIN XA4 ALL-SEASON TIRE CAN HANDLE
JUST ABOUT ANYTHING THE WEATHER CAN THROW AT YOU.**



Weather.
It can change from good to bad faster than Dr. Jekyll became Mr. Hyde. And be just as monstrous. Particularly if you're driving through it.

That's why Michelin decided to design an all-season tire that could take on the weather.

That could handle snow like a snow tire. Drive through rain as if that were its only purpose in life. And perform like a highway tire when the weather's

fine. The result: the Michelin XA4 All-Season Radial.

We put it through 20,000,000 miles of testing to prove it did everything we wanted it to do.

It did. And then some.

The XA4 can actually give you increased gas mileage. Because it reduces rolling resistance. And with proper care, it can get up to 60,000 miles of tread life. That's a lot of miles.

But then again, the XA4's a lot of tire.



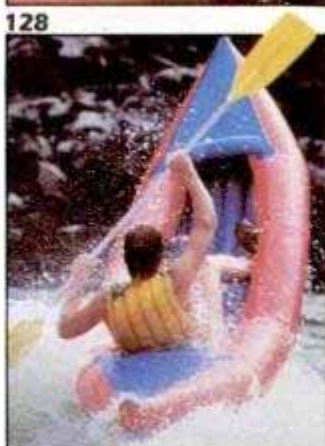
MICHELIN. BECAUSE SO MUCH IS RIDING ON YOUR TIRES.



ON THE COVER

Breaking along at up to 150 mph, the Badsey Bullet is one of a growing number of fast, sporty three-wheeled cars that are reviving an age-old concept in low-cost road travel. Read how these agile, easy-to-handle fun machines can make you feel like you're driving a racing car. Story on page 91.

—PM photo by Don Green



AUTOMOBILES AND BIKES

- 12 Imports and Motorsports
- 20 The PM Garage
- 26 Car Clinic
- 35 Saturday Mechanic:
Clean your car like a pro
- 42 Detroit Listening Post
- 64 Jeep Cherokee and Wagoneer
- 90 16-valve engines
- 91 3-wheelers are back!
- 94 GM's variations on a theme
- 96 Ford's foreign power play
- 98 Ford's antilock brakes
- 99 AMC's sunny side up
- 100 AMC/Renault's new engines
- 101 Chrysler tackles the details
- 129 Easy road control
- 182 Dodge Omni GLH
- 185 Chevrolet Sprint

SHOP AND CRAFTS

- 16, 74, 75 Hints from readers
- 50 The PM Workbench
- 60 PM looks at Micro II lathe
- 62 Minicourse: Using planes
- 110 10 ways to surface boards
- 114 2 portable toolboxes

HOME AND YARD

- 24 Appliance Clinic
- 32 Homeowners' Clinic
- 54 New Now for home and shop
- 56 Tune up your oil burner
- 66 Patrick Macnee, gardener
- 104 Create a Shaker room
- 162 New home-heating systems
- 170 Install a new flue
- 187 Solve ice problems
- 189 Add a fireplace damper

BOATING AND OUTDOORS

- 14 All Outdoors
- 88 Inflatable kayaks

AVIATION

- 87 Nonstop flight around the world
- 130 Pedal power again
- 131 Wings of the future
- 131 Moving cargo
- 131 Harrier tests



SCIENCE AND ENGINEERING

- 52 Science Worldwide
- 83 Greatest movie stunts of '84
- 128 Fusion on the particle beam
- 128 Pulse space heater
- 128 Squirm Drive rotating machine
- 128 Rescue breathing unit
- 129 Mining asteroids
- 129 New street cleaner
- 130 Squeezing rain from clouds
- 130 New robots are flexible
- 131 Army gets new gun

ELECTRONICS, RADIO AND TV

- 46 PM Electronics Monitor
- 70 Smallest stereo yet
- 102 Buy a computer monitor
- 129 Electronic acid test
- 192 Superdensity disks and drives

PHOTOGRAPHY

- 128 Camera for firefighters
- 188 Photo Hints

EVERY MONTH

- 6 Editor's Notes
- 9 Letters to the Editor
- 128 Technology Update
- 208 PM's Time Machine

WORTH WRITING FOR

- 177 Looking for more ideas?

INTERNATIONAL EDITIONS:
CARIBBEAN, MEXICO,
SOUTHERN HEMISPHERE

POPULAR MECHANICS (ISSN 0032-4558) 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, \$11.97 for one year, \$21.97 for two years; Canada and all other countries, add \$16.00 for each year. Second-class postage paid at New York, N.Y. and additional mailing offices. Authorized second class mailing-in-Canada privileges by Canada Post, Windsor, Ont. Registered as second-class matter at the Post Office at Mexico D.F., Mexico, June 20, 1950. © 1984 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 50350.

SUBSCRIPTION SERVICE: Popular Mechanics Magazine will, upon receipt from its reader of a complete new or renewal subscription order, undertake fulfillment of that order so as to provide the first-copy delivery either to the Postal Service or alternate carrier within six to twelve weeks. If for some reason this cannot be done, you will be promptly notified of the issue date that will begin your subscription, with a request for any further instructions you may have concerning your order. Please address all such orders to us at Popular Mechanics, P.O. Box 10064, Des Moines, Iowa 50350. • Should you have any problem with your subscription, please write Joan Harns, Customer Service Department, Popular Mechanics, P.O. Box 10064, Des Moines, Iowa 50350 or call toll-free 1-800-247-5470; Iowa residents call 1-800-532-1272. Please enclose your mailing label when writing to us or renewing your subscription. • Renewal orders must be received at least eight weeks prior to expiration to assure continued service.

Use this address for subscription orders & inquires: POPULAR MECHANICS, P.O. Box 10064, Des Moines, Iowa 50350. POSTMASTER: Please send address changes to this address.



**Proven
protection
up front.**



**Saves
gasoline
in back.**

Havoline Supreme's formula blends nine additives with highly refined base oils. It helps protect against friction, wear and harmful acid, sludge and varnish deposits. It also helps save gasoline.

All Havoline motor oils exceed tough API-SF requirements, and Havoline Supreme 10W-30 and Havoline single grades exceed the API-CC requirements for diesel engine oils. For high performance engines, there's SF/CC rated Havoline Super Premium High Performance 20W-50.

Get the Havoline that's right for you, and get proven protection you can trust.

TEXACO 

Popular Mechanics

Editor-in-Chief: John A. Linkletter

Executive Editor: Joe Oldham

Managing Editor: Bill Hartford

Graphics Director: Bryan Canniff

Special Editorial Features: Sheldon M. Gallager, editor

Automotive: Wade A. Hoyt, SAE, editor; Norman S. Mayersohn, assistant; Michael Lamm (West Coast); Daniel Charles Ross (Detroit)

Home and Shop: Steven Willson, editor; Penelope Spangler, Home Improvement editor; Joseph Truni, Shop and Tools editor

Electronics: Stephen Booth, editor

Boating, Outdoors and Travel: Ray Hill, editor

Science: Dennis Eskow, editor

Editorial Production: Peter Francesconi, chief; John Bostonian Jr., art; Rebecca Harth, David Meyer, assistants

Design Director: Ira Herrick

Art: John Johaneck, director; Alan Andresen, Ann Bennett, 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.

Reader Service Department: John Ginsberg, manager; 224 West 57th St., New York, N.Y. 10019; (212) 262-4292

Advertising Offices:

New York: 224 West 57th St., New York, N.Y. 10019; (212) 262-8824

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

Director of Marketing: Edward Vaquero

Production Manager: Lori Ellwood

Advertising Production: Patricia Woods;

(212) 262-4800

Classified Sales Manager: Sophie Gronowicz;

(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; Harvey L. Lipton, Vice President and Secretary. Hearst Magazines Division: Gilbert C. Maurer, President; K. Robert Brink, Executive Vice President and General Manager; George J. Green, Executive Vice President; Raymond J. Petersen, Executive Vice President; Thomas J. Hughes, Vice President and Resident Controller; William S. Campbell, Vice President, Director of Circulation; Daniel J. Coleman, Vice President for Popular Mechanics.

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

There's a menace in your motor oil. Microgrit—the dirt you can't even see. In yesterday's engines it just went along for the ride. But today's engines are smaller, harder working and Microgrit is leaving its mark. Scratching, scoring, grinding away at bearing surfaces. Your engine won't tolerate it. Why should you?



A super magnification of Microgrit scratching and scoring vital piston bearings.

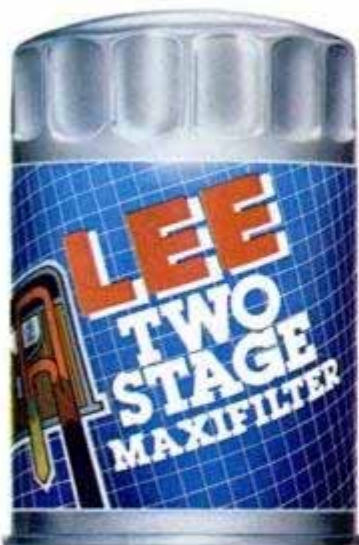


LEE TWO-STAGE TRAPS MICROGRIT.

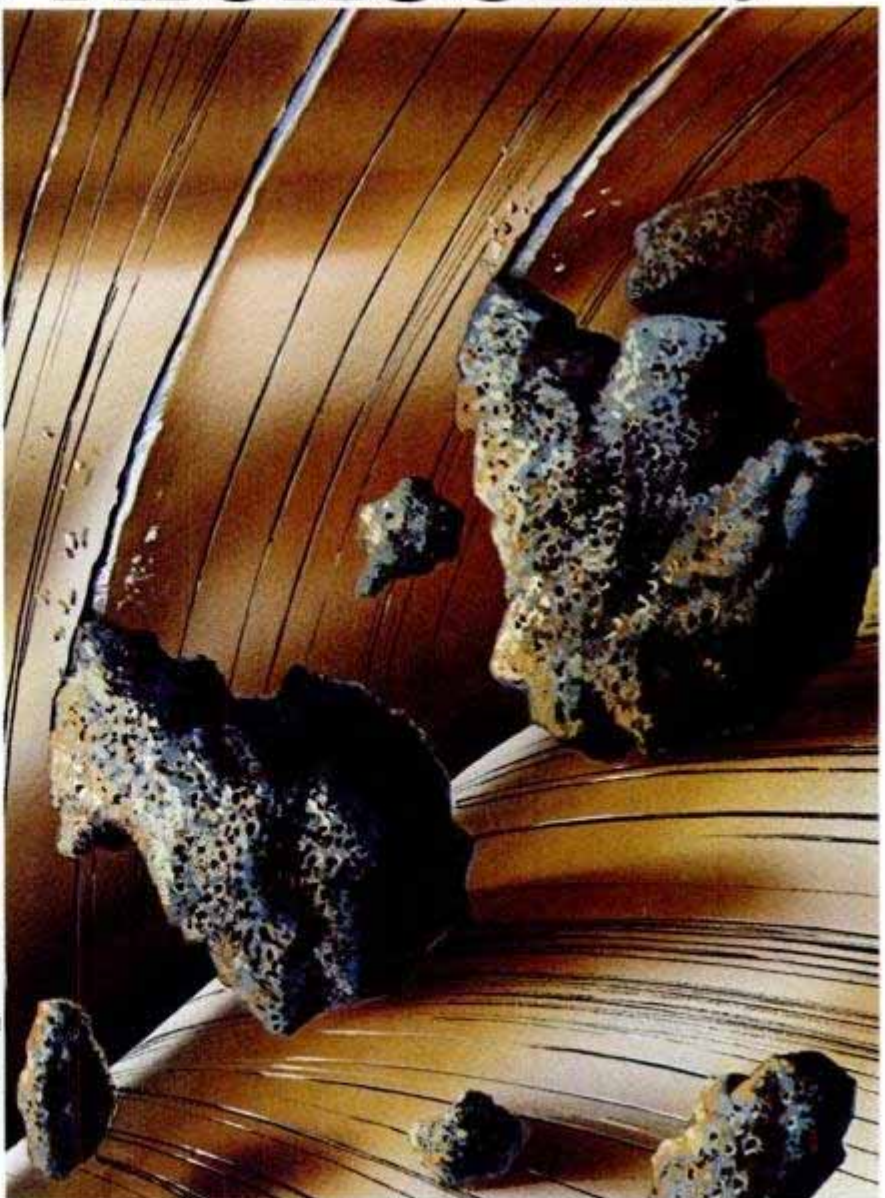
Finally, an oil filter for today's engines. The Lee Two-Stage Maxifilter. In lab tests, the Lee proved so effective at cleaning oil, it even trapped particles to ten microns. That's one-fifth the width of a human hair. That's protection. That's clean oil.

Get Maxi protection for today's smaller, harder working engines with the filter that lives up to its name.

Lee Two-Stage Maxifilter.



TRAPS MICROGRIT
FOR U.S. AND IMPORT CARS.



True Value
HARDWARE STORES®

TOOL VALUE OF THE MONTH



Master® MECHANIC Propane Torch

Solid brass burner assembly with disposable propane cylinder, ideal for soldering, thawing pipes, even starting charcoal! But hurry! Offer good from Sept. 10 only while supplies last, at participating True Value Hardware Stores.



649

HARDWARE VALUE OF THE MONTH



Scotchgard® 16-oz. Fabric Protector

Guards fabric, coats, outdoor gear, auto upholstery from water & stains. But move fast! Offer good from Sept. 20 only while supplies last, at participating True Value Hardware Stores.

\$2 REBATE
coupon when
you buy two!

344

There are more than 6,000 True Value Hardware Stores and Home Centers in 50 states. Look under "Hardware" in the Yellow Pages.



EDITOR'S NOTES

While we generally don't publicize bacchanalian pursuits of staff members, we think it's worthwhile reporting on this wine tasting. The third hand, at right, is that of a new robot demonstrating how it can hoist a delicate, wine-filled glass without spilling a drop. The robot is in Matsushita's brand-new line of Panarobo robots and is designed to perform delicate tasks with chemicals without creating chaos. Other Panarobo models appear in this month's *Technology Update* (page 128). Science Editor Dennis Eskow claims that he and Keiichi Takeoka, president of Matsushita of America, were almost as skillful as the robot in hoisting filled glasses. . . . **The elegant simplicity** of Shaker furnishings and architecture has a constant



Takeoka, Eskow and Panarobo say "Skoal!"

appeal, no matter what the current decorating fads may be. PM went back to the source—Mt. Lebanon, N.Y.—for the projects that appear in *Create A Room In The Shaker Tradition* (page 104). Mt. Lebanon is the site of the first incorporated Shaker community (1787). The designs, as you'll see, have survived two centuries very well. . . . **Vanity plates**—those auto licenses that spell out words or messages—are the best reading on the road since the demise of Burma Shave signs. They can be a proud statement of one's profession—like the I FARM message on an Ohio car I saw in Florida a few months back. Or simply a clue to one's profession: SUBPOENA on attorney Jeffrey Bernbach's car gives you an idea of what he does in New York. You might even want to confirm that you're driving an EDESEL, as Jim Abbott (shown with grandson Glenn Price) does in Connecticut. I've learned that vanity plates have become available in every state, so if you want to flaunt something, now's your chance.



The vanity plate lets you know that he's a prominent New York attorney.



It's an Edsel—what else? This one comes from Old Greenwich, Conn.

John A. Sillitto

9 mg. "tar", 0.7 mg. nicotine av. per cigarette, FTC Report FEB. '84.



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

VANTAGE. THE TASTE OF SUCCESS.

Great Taste
with Low Tar.
That's Success!



© 1984 R. J. REYNOLDS TOBACCO CO.



**Now they last even longer.
(Obviously, we're on the right track.)**

You'd think we'd have left well enough alone.

DURACELL® batteries are, after all, famous for their long life.

At Duracell, however, well enough isn't quite good enough.

So over the years, we've kept trying to find ways to improve them.

The result: Today's DURACELL batteries last up to 20 percent longer than the ones we made just three years ago.

And we'll go right on improving them.

Because on that score, we have a one-track mind.



**When it comes to making them last longer,
we never stop.**

LETTERS TO THE EDITOR



From one, many

In your June '75 issue, you published an article on making a colonial cupboard (*Make This Colonial Cupboard To Display Your Best China*, page 102). The plans were so complete and easy to follow that I adapted the measurements and techniques to build not only one cupboard, but enough other pieces in the same style to furnish a whole new room we recently added.

In addition to the cupboard and the combination roll-top desk and wall unit shown in the photo (right), I made a second straight cupboard, a matching corner cupboard and a console for our TV set. Thank you for such an inspirational project.

G.W. MELHERT
BRAMPTON, ONT.

We're glad the design proved to be so adaptable. For others who may be



A colonial-style hi-fi cabinet, roll-top desk and overhead wall unit—all adapted from PM's cupboard plans by reader Melhert.

interested, photocopies of the article are available for \$2.50 postpaid from Popular Mechanics, Box 1014, Radio City Station, New York, N.Y. 10101.

Star wars pro and con

I was sorry to see PM turned into a forum for such blatant military propaganda as that expressed by Edward Teller (*Bringing Star Wars Down To Earth*, page 84, July '84).

Teller's entire career has been as a developer of, and apologist for, weapons of mass destruction. He would have us believe that we can engage in nuclear war and still look forward to next month's PM in the mail.

GRANT BURNS
FLINT, MICH.

Edward Teller's article was like a breath of fresh air. His concept of basing a deterrent to war on defensive, rather than offensive, weapons is certainly the only way to avoid a nuclear nightmare.

As he so rightly points out, "Two camps armed with swords are apt to do more harm than two camps armed with shields."

JOE WORRALL
BON LOMOND, CALIF.

Two votes for Terraplanes

In your June '84 *Letters* column (page 8), you explained how it was Fords, not Terraplanes, that won all those races back in the '30's. That may be, but just

let me tell you this. My dad and I rebuilt a '35 Terraplane convertible and it would blow the doors off any Fords around. I wish I still had it today, but we finally had to give it up during the war years because you couldn't get any gas or tires for joyriding.

TOM CROTTY
BEECHER, ILL.

Fords may have won the Pikes Peak Hillclimb in '34, but they never came close on the Mount Washington run in New Hampshire. There it was Essex Terraplanes all the way.

J.T. HORSTMEIER
PASADENA, CALIF.

No squawks for squawker

I'd like to express my satisfaction after having built your squawker car alarm (*PM's Morse Code Auto Alarm: Build The Name Caller*, page 76, Jan. '84). I'm pleased not only with the way it functions, but also with the flexibility it gives the user—the various cutoff options, the delay and no-delay taps and of course the personalized beeper code that tells you instantly if it's your car that's being broken into. It's a great idea.

MICHAEL J. CHAMPAGNE
CUMBERLAND, R.I.

Better 3-D pictures

I've been interested in 3-D photography since the early '40s and enjoyed your article *3-D: More Thrilling Than Ever* (page 72, June '84). I have a couple of suggestions for those who wish to make 3-D pictures. Have your photos printed wallet size because the on-center spacing between the two prints should be no more than the distance between your eye pupils.

When photographing wide scenes, such as the Grand Canyon, it's best to move sideways 3 to 4 feet, not just a few inches, to take the second picture. Some of the foreground detail may be lost, but you'll get a better 3-D separation of distant elements.

ROBERT H. GENTRY, M.D.
KNOXVILLE, TENN.

Rustproofing tip

In your otherwise excellent *Car Care Guide* (page 103, May '84), you suggested that readers finish off their bodywork repairs by applying undercoating. I must point out that a far better choice is rustproofing compound. Undercoating is primarily a sound deadener and has very limited rustproofing qualities. It hardens with age and eventually flakes off.

A true rustproofing agent, such as our Car N' Farm product, is designed to remain pliable, won't chip, flake or peel off and can provide indefinite protection against rust.

KEN YAEGER
YEL CO.
PEWAUKEE, WIS.

Workbench kits do exist

I was very interested in the *Shopsmith* workbench kits you reported on (*PM Looks At A Workbench Kit*, page 151, June '84). Unfortunately, your author didn't do his homework or he would have discovered that these kits have been discontinued and are no longer available. What gives?

CARL CARLSEN
SANTA PAULA, CALIF.

Although the kits are not listed in the Shopsmith catalog, they are available. Shopsmith is alerting its dealers to this fact so there should be no further misunderstanding.

PM

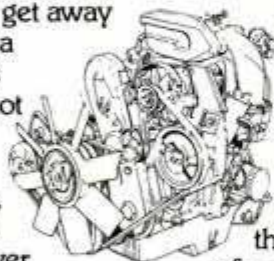
Tough team to beat.

Ford's tough Ranger 4x4 is the small pickup more people team up with than any other. For '85, this Ford best seller* adds the performance of a new fuel-injected 2.3L four.



"My Ford Ranger & Me"

When you're heading for the high country, you want to get away from it all in a pickup that's tough, but not too tough to handle. Fun to drive, easy to park and maneuver, with room for a couple of

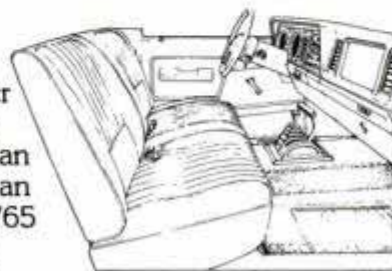


dirt bikes plus a weekend's worth of gear!

If this sounds like your kind of fun, the tough Ford Ranger is your kind of pickup—with the most powerful V-6 in any small truck... the extra performance of a new 2.3L fuel-injected four!

Only in a Ranger.

Only Ford Ranger gives you the comfort of a cab that's wider than other small pickups... an optional payload of 1,765 lb... plus double-wall box construction. And Ranger 4x4 has Ford's unique Twin-Traction-



Beam front suspension to smooth your way... plus Ford's proven four-wheel drive to keep you rolling when the going gets tough. A 5-speed transmission comes standard.

You can't team up with a tougher truck!

Quality is Job 1.

This isn't just a phrase. It's a commitment to total quality, which begins with the design and engineering of our trucks and continues through the life of the product. And the

commitment continues for 1985. Ford is determined to build the finest trucks in the world.

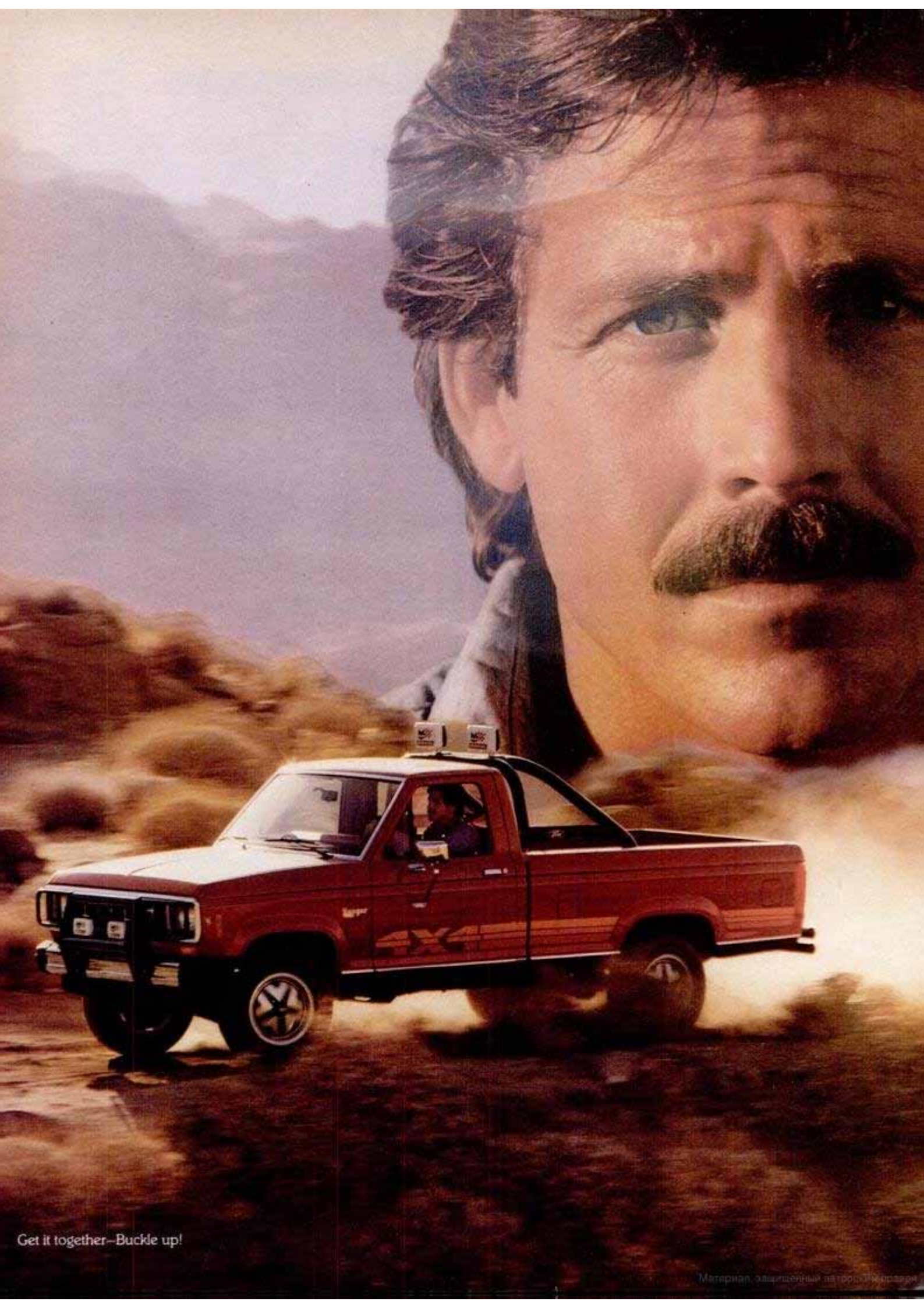
Lifetime Service Guarantee

As part of Ford Motor Company's commitment to your total satisfaction, participating Ford Dealers stand behind their work, in writing, with a Lifetime Service Guarantee. No other car companies' dealers, foreign or domestic, offer this kind of security. Nobody. See your participating Ford Dealer for details.

*Based on most recently available MY manufacturer's reported retail deliveries.



FORD RANGER
AMERICA'S TRUCK BUILT FORD TOUGH



Get it together—Buckle up!

Материал, эдиченный автором. Журнал

IMPORTS & MOTORSPORTS



Gone racing

Some motorsports months you wish you could be at a half dozen circuits at the same time. July was like that.

Meadowlands—By race day we knew the circuit well, having been driven around on fast laps in the PPG Fiero pace car by several CART drivers. The inaugural U.S. Grand Prix on July 1 brought big-time auto racing back to the New York area—to stay, we hope. Fans who braved the downpour early in the day were treated to Mario Andretti drying out the track with his speed.

Daytona—This year's Fourth of July Firecracker 400 saw Richard Petty win his 200th NASCAR Grand National at a speed of 171.204 mph. And, watching King Richard edge out Cale Yarborough for the win was the President of the United States. The country's Commander in Chief became Petty's honorary crew



Al Unser, Sr., '83 CART/PPG Indy car champ, is ready for Meadowlands, but it was Mario who ruled the track.

PHOTO: BILL HARTFORD

chief following the race.

Watkins Glen—They're racing again at the Glen and we wish we could have

been there for the July 8 Camel Continental. The Holbert/Bell/Adams Porsche won the IMSA GT. We'll risk N.Y. 17 speed traps to be there for the New York 500 Sept. 29-30.

Dallas—The battle for the World Driving Championship visited Texas for the first time and a packed fairgrounds saw Keke Rosberg win in the Williams/Honda Turbo V6.

Brands Hatch—What a day for Niki Lauda! He won his 22nd GP tying the record for GPs run (151). And, in winning the British F1 race, he became highest scorer in GP history.

Mid-Ohio—There were no crowds at this beautiful track on the 25th—just resident goldfinches feasting in the thistles, oblivious to our trying out VW's new Golf and Jetta. By the time the VWs are on sale (in Nov.) a lot of fans will have enjoyed this circuit.

It's going to be a record year for motorsports attendance.

Racing of a different stripe



Jeep Cherokee is set up for desert racing.

Yellow and black are the colors of Renault/Jeep Sport. The trim on this white off-road racer tells you that Jeep is on the trail with its latest vehicle. The XJ Cherokee Sportwagon with its 250-hp V6 is running in the High Desert Racing Association's new Class 12 events. Don Adams is the pilot of the often-airborne XJ; he's in charge of four-point landings that are cushioned by 18 shock absorbers.

Watch for it in the sky near you, desert racing fans.

Overboard for Jags

It sounded like a great idea for a change of pace: a weekend of boats instead of cars. The Newport, R.I. Yachting Center was chockablock with a different kind of performance craft—slim, sliding-seat rowing shells; single-seater, mini Twelves (see *Sailin' Small!*, page 80, Aug. '84) and a fleet of other fuel-efficient little hulls. The North American Small Boat Show saw a great gathering of trailer sailors and car toppers, and it had my undivided attention until the Jaguars started rolling into town. Little did I know that Newport was also hosting a whopping Jaguar festival over the Memorial Day weekend. The cats were everywhere, purring along Thames St., prowling the waterfront and stalking my determination to keep it a boating weekend. But at first sight of an absolutely pristine '52 XK 120 I knew I was on a busman's holiday. The 120s I saw were the real thing, all very rare and, happily, in the hands of owners who know how to keep corrosion at bay.

Another version of the 120 became

available just this year: a replica from British Motor Cars, Ltd. The owner-built sports car can pass as a '52 XK 120 unless you're a master at distinguishing hand-rubbed finish on sheet metal from



XK 120 is a replica from British Motor Cars.

luster gel-coat on fiberglass. The replica runs on Pinto, Bobcat or Mustang II underpinnings with either Four V6 or V8 power, and your choice of stick or automatic.

We were impressed with the assembly manual from BMC (100 Sonwil Industrial Park, Buffalo, N.Y. 14225), and the fact that you can carport it for about \$10,000. It's better than a boat any day.

FM

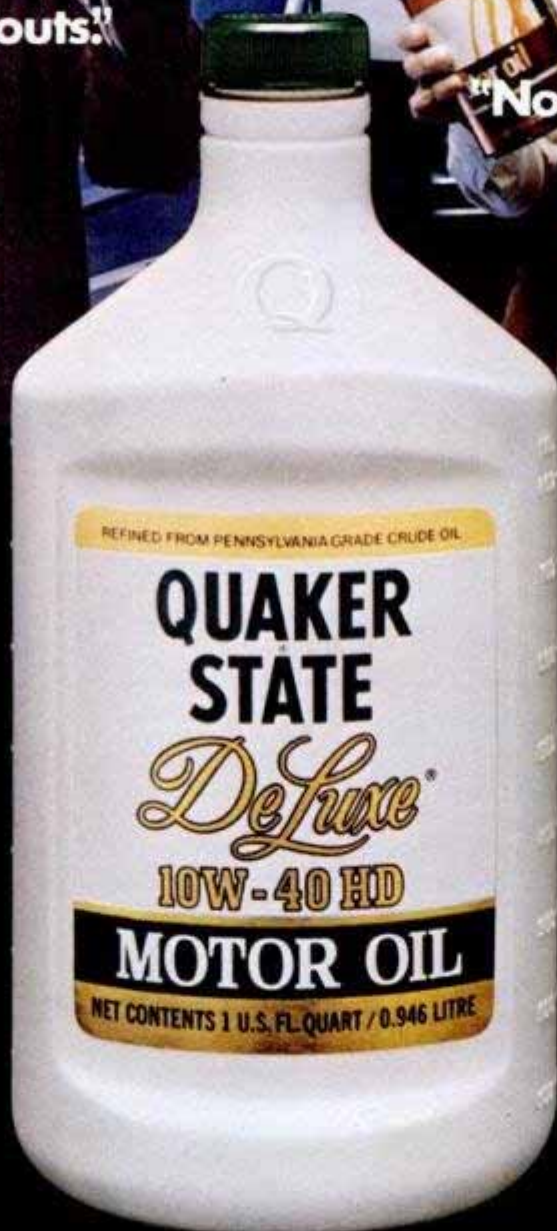
Now, Quaker State comes in clean, easy to pour plastic bottles. Exclusively.



"So long spouts!"



"No more leaky cans."



REFINED FROM PENNSYLVANIA GRADE CRUDE OIL

**QUAKER
STATE**

DeLuxe

10W-40 HD

MOTOR OIL

NET CONTENTS 1 U.S. FL. QUART / 0.946 LITRE

That Quaker State quality America has trusted for over 70 years now comes in the most convenient containers you can buy. They're a cinch to open, pour and reseal. That means if your oil is less than a quart low you can top it off and save the rest for later.

Quaker State's leading motor oils are refined from 100% Pennsylvania Grade Crude. So now you get 100% Penn-Grade protection. And 0% mess.

Best of all, it's made to cost you nothing extra.

And if the new bottle isn't in your store now, it'll be there soon.

Today you need an oil this good in a package this good.

ALL OUTDOORS



Sleek motor home



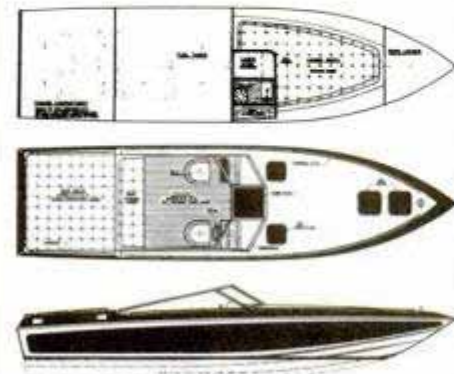
Rounded aerodynamic look is in, even in motor homes. Note the steeply raked windshield.

Winnebago is getting away from the boxy look in motor homes. Its new Elandan model, available in 28-, 31- and 34-foot lengths, features integrated automotive-type styling with a more aerodynamic 40 rake to the windshield. The improved aerodynamics increases fuel economy from the 454-cu.-in. Chevy engine so that it can now achieve 9 to 10 mpg as compared to the former 6 to 8 mpg. Another new feature for a Class A motor home is the design of the passenger door. The front end is designed like a truck's, with a steel substructure attached to the chassis for extra strength.

The large windshield is mounted in steel, not fiberglass. Steps are mounted inside the door frame and the batteries are mounted in the stepwell for an additional measure of security. To prevent leaks, the water and holding tanks are now seamless—molded of ABS plastic. Also, there is extra thick insulation installed in the roof, sidewalls and tail cap for quieter running and better heating and air conditioning efficiency.

Back-yard-built boat

Frankly, we can't think of a more challenging build-it-yourself project than a



The ultimate challenge for the do-it-yourselfer: a high-performance offshore boat.

30-foot high-performance offshore boat designed to handle speeds of 50-plus knots.

So, if you're in the mood for a good challenge, check out the plans for the Bandido from Glen L, 9152 Rosecrans, Bellflower, Calif. 90706; (213) 630-6258. Building options include epoxy cold-molded wood or one-off fiberglass in several variations. These include high-tech C-Flex, PVC foam or balsa sandwich core, plus more exotic techniques. Power options include surface propeller drive units, outboards, I/Os and V-drives. Hull design is a full length deep-V, while the keel features a radiused bulbous section for a soft ride and smooth turning. In all, this project offers a mighty challenge for the home builder.

Awesome outboard

Want a bigger outboard? How about the most powerful production outboard ever built? Two brand new blasters are available from Evinrude, both developed from their Formula 1 racing motor.

Using what are essentially two V4s stacked into a single cylinder block, the 2-stroke, 90 V8 motors each displace 220 cu. in. (3.6 liters) and employ loop charging. Loop charging is a highly efficient method of combustion and exhaust scavenging which enables engines to improve both their fuel economy and their performance.

Model 275 pumps out 275 horsepower at 5,500 rpm, which is really cranking for an outboard. For the real speed freaks, there's the Model 3.6 XP. Evinrude hasn't yet released horsepower figures for the XP, but it'll be higher than 275, as XP stands for extra performance. Standard features of both engines include variable ratio automatic oiling, 35-amp. alternator and dual-stage cooling. Full throttle rpm range is 5,000-6,000 rpm, and the motors have a .57 gear ratio for use with V6 props. Get outta the way!



Multipurpose security padlock

Lock is practically impervious to any type abuse.

If a security lock can make it in The Big Apple, it can make it anywhere. And the lock protecting more bicycles in New York City than any other is the vinyl coated, U-shaped padlock by Kryptonite.

The newest model, Kryptonite-4, will stand up to assaults by 42-inch bolt cutters, hacksaws, hammers and chemical freezing agents. And while you'll find it used mainly to protect bicycles, it's also ideal for any number of security jobs. Available in five sizes ranging from 4 x 9 inches to 7 1/2 x 14 inches, the Kryptonite-4, with its Ace key locking mechanism, can be used to securely fasten fence doors, lock accessories to your RV and hitch up garden implements and car and boat trailers to poles so that your possessions don't leave home without you.

FM

IT PULLS MORE THAN ITS OWN WEIGHT.



A Kubota tractor has lots of pull. It pulls a rotary tiller, disc harrow, front loader, box scraper, mower, cultivator, plow and more than 40 other matching tools.

Of course, not every Kubota tractor pulls every one of these implements. But with the widest selection of tractors under 40 hp and matching implements, you're sure to find the combination you need.



Whatever that is, Kubota tractors and implements are made for each other.

And our implements work even harder because of the special features built into our tractors. Like a fuel-efficient diesel engine. Four-wheel drive. Power steering. Three-point hitch with position and draft control.



On some models, shuttle-shift.

Stop by your Kubota dealer. He can tell you all the reasons why Kubota tractors and implements pull ahead every time.



Tractor Models	HP	CYL	Choice of Transmission
B5100	12*	2	Standard
B5200	13*	3	Standard
B6200	15*	3	Standard
B7200	17*	3	or
B8200	19*	3	Hydrostatic
	PTO HP		
L235	19	3	Mechanical shuttle-shift
L245 HC	21*	3	Standard
L275	23	3	Mechanical shuttle-shift
L305	26	3	Standard
L345	29	4	Standard
L355 SS	29*	4	Hydraulic shuttle-shift
L3750	36*	5	8 x 8 or
L4150	40*	5	Hydraulic shuttle-shift

*Manufacturer estimate

 **KUBOTA**
Nothing like it on earth.™

WHAT SOME STORES MAKE YOU GO THROUGH JUST TO BUY HARDWARE.



Finding the hardware section in most stores is frustrating enough. Finding the items you want can be even worse.

But when you look for hardware in a Sentry Hardware

store, you won't get lost among women's apparel and children's toys.

Instead, you'll get all the help you need from people who work with hardware every day.

They can show you where to find what you want, and give you helpful advice that can save you time and money.

Next time you need hardware, shop Sentry. The difference is easy to see.



Where hardware isn't a sideline.

Check the Yellow Pages under Hardware for the Sentry store nearest you. Sentry Hardware Corporation, Cleveland, Ohio 44113. Merchandise shown in this advertisement is available from participating dealers only. Offer expires November 1, 1984. All Sentry dealers own their own stores. They select their merchandise and set their own prices. There may be variations in products, available quantities and prices in individual stores.

VERMONT AMERICAN
7-7/16" 16T
Carbide Tip Blade
(146) M737H1 \$4.44

3M
Window Insulator Kit

42" x 62" Window Insulator Kit
w/25¢ Instant Rebate (2140A)
You Pay \$2.63

DAP
4-Pk. Acrylic Latex w/Silicone.
Buy 3, Get 1 Free (118119)
Cost After Mfr. Rebate, \$3.99

SKIL
7 1/4" Circular Saw
(576) \$43.88

Warp's
4 Mil 10' x 25'
Coverall
(12-4CH10) \$5.99

DEMERS
"Y" Seal Alum.
& Vinyl Door Set
(95Y) \$3.99

Faultless CASTERS
Four 2" Wheel Casters,
Stem/Plate, Your Choice.
(31675) (31676) \$4.88

kwikset
Entry Lock
(400BX3CP) \$9.99

HINTS FROM READERS

Protecting PM hints



Laminated clipping hangs on a hook.



Cut two pieces of clear, self-adhesive sheet plastic a little larger than the clipping.



Laminate clipping between both pieces of self-stick plastic and trim with 1/4-in. margins.

Self-adhesive plastic sheet (available at houseware and hardware stores) laminated to magazine clippings preserves them for shop use. Cut two pieces of plastic to rough size with scissors or knife and straightedge. Sandwich clipping between two plastic panels. Trim and punch a hole for hanging.

—Wayne Rivers and Rosario Capotosto



ROBOTICS!

The leading edge in electronics technology



Explore exciting new home-study training programs in electronics-from microcomputers to robotics-with equipment you build and keep.

ROBOTICS: NTS has a new training program that teaches you both analog and digital skills as related to process and control technology. Start with basic elements, advance to principles of industrial electronics, microprocessor troubleshooting skills, then progress to fundamentals of mechanics and robotic applications in industry. Learn radio control, fluidic, pneumatic and servo-mechanisms, as well as computer interfacing and robotic programming. Your course includes training and test equipment as well as the fantastic HERO-1 robot. He moves, talks, picks up objects. He's programmable, with memory. The most exciting training ever offered in a home study program.



CONSUMER ELECTRONICS/VIDEO SYSTEMS: Courses feature state-of-the-art test equipment, the NTS/HEATH System 3 advanced Color TV set, the NTS Compu-Trainer, lessons and current texts.

OTHER PROGRAMS OFFERED: Auto Mechanics, Air Conditioning/Solar Heating, and Home Appliances.

NTS training emphasizes hands-on experience with the kind of equipment you'll often find on the job. You learn by assembling, step-by-step, equipment that meets highest industrial standards. And, depending on the NTS program you select, you can earn up to 30 CEU credits for successful completion. NTS has taught industrial skills for over 78 years—a record that has no equal.



Simulated TV Reception

MICROCOMPUTER PROGRAMS:

Master Course includes the NTS/HEATH HN89A Microcomputer featuring floppy disc storage, "smart" video terminal, two Z80 microprocessors and 48K RAM memory on board, (expandable). Training includes computer fundamentals, thorough coverage of semiconductor devices and digital logic circuits, microcomputer programming and software. Catalog describes in detail all equipment furnished, projects, lessons and texts.

Use the mail-in card or fill out and mail the coupon. Indicate the field of your choice. (One, only please.) FREE full color catalog will be sent to you by return mail.

NATIONAL TECHNICAL SCHOOLS

Dept. 201-104

4000 South Figueroa Street, Los Angeles, CA 90037

Please send FREE color catalog on course checked below

- | | |
|---|---|
| <input type="checkbox"/> Robotics | <input type="checkbox"/> Computer Electronics |
| <input type="checkbox"/> Digital Electronics | <input type="checkbox"/> Video Servicing |
| <input type="checkbox"/> Auto Mechanics | <input type="checkbox"/> Home Appliances |
| <input type="checkbox"/> Air Conditioning/Solar Heating | |

Name _____ Age _____

Address _____ Apt. _____

City _____ State _____

Zip Code _____ Phone () _____

- Check if interested in G.I. information.
 Check if interested ONLY in classroom training in Los Angeles.

NO OBLIGATION



TECHNICAL TRADE TRAINING SINCE 1905
Resident and Home-Study Schools
4000 So. Figueroa St., Los Angeles, CA 90037

THE PM GARAGE



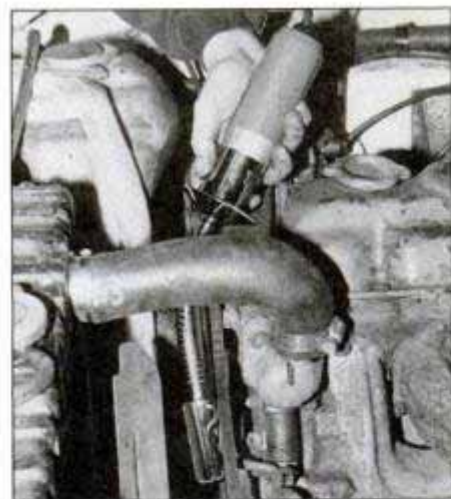
Sitting pretty

Because I'm now raising my third child, I'm also on my third child restraint seat—the first two seats just didn't last. Had this sturdy, practical Bobob 2 seat been available when I bought my first one, I think I'd still be using it. It combines sleek European styling with maximum comfort and safety for a child. Well worth its cost (\$150), the Bobob's flat bottom doesn't dig into and ruin my upholstery. The seat's padding is attached with Velcro, so it pulls right out for easy cleaning. A big lever on the side reclines the seat and the five-point harness is easy to adjust, hook up and release, which encourages its use. The seat itself is made from high-strength, corrosion-resistant materials. It's imported from the Netherlands by Z.B. Sales Inc., 601 Eastover Parkway, Locust Grove, Va. 22508.—*W.H.*



Stylish and clever, the Bobob 2's most important feature is that the kids love it.

Flexible viewpoint



Gooseneck light keeps fingers from fan.

It's very easy to end up with a timing light (or your hand) against a moving part as you try to position the light on the timing marks. I found a neat solution to this potentially painful problem—a timing light with a thin head and a flexible gooseneck.

You can twist the thing any way you want to clear belts and accessories, while keeping your hand safely away from the action. The timing light lists for \$137.50 from Amtest, 8202 West ML Ave., P.O. Box 726, Kalamazoo, Mich. 49009.—*Pete Warren*

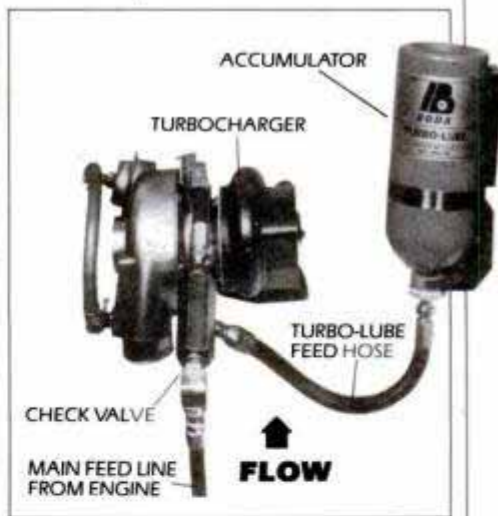
Numbers racket

Even some relatively simple underhood jobs require you to undo lots of wiring connectors and hoses. If you're like me, you start wrapping numbered pieces of masking tape around everything. To avoid a confusing jumble of adhesive and the painstaking process of clearly marking masking tape, a new dispenser made by 3M is the answer. It contains 10 rolls of thin tape numbered from zero to nine, plus a cutting bar. Just wrap the same number on each half of a wiring connector or both the hose and its neck. Make up numbers past 10 by placing two strips side by side. The tape sticks well to rubber, plastic and wire, and replacement rolls are available. The dispenser is about \$15 at auto parts stores that carry the 3M line of body repair supplies.—*Pete Warren*



Numbered tape can help make labeling electrical connections an easy and neat job.

Positive pressure



Turbo-Lube protects turbo bearings, seals.

Turbocharger failures most often stem from the spinning turbine coasting to a painful stop after engine shutdown, when pressurized oil is cut off. Boda Industries sells an oil reservoir that keeps a supply of lubricant flowing. Turbo-Lube's accumulator is charged by the running engine, then dispenses oil through a check valve when pressure drops. Turbo-Lube model N-8700 sells for \$47.25, plus \$3.50 shipping and handling, from Boda Industries Inc., 125 W. 43rd St., Union City, N.J. 07087.—*N.S.M.*



Champion Copper Plus. All Plus.No Fuss.

Copper alone does not make a spark plug superior. That's why Champion added more than copper. We added the plus. In fact, we added several.

We added design and technological improvements that allowed us to lengthen the insulator nose. Which vastly improved our plug's fouling protection. We also gave it a broader heat range, surer

starts, and superior performance in stop-and-go city driving.

Then we added the "plus-de-resistance." An exclusive Performance Guarantee: "If you don't think your engine runs better with fresh Champion Copper Plus® spark plugs, return them to Champion within sixty days and we'll refund your money!"*

The next time you need a set of

superior spark plugs, don't just settle for copper. Ask for the plus. Champion Copper Plus. Get all the plus, with none of the fuss.

*Offer expires December 31, 1984. Aviation and industrial plugs excepted.



©1984 Champion Spark Plug Company
Toledo, OH 43661

COPPER PLUS THE PLUS IS PREMIUM PERFORMANCE.

Материал защищенный авторскими правами

**MILLIONS OF PEOPLE HAVE
ALREADY BOUGHT OUR
WATERPROOF, INSULATED
WORK BOOTS.**

THIS JUST MIGHT PERSUADE THE REST OF YOU.



Subzero temperatures, waist-high snowdrifts, and pouring rain have always been the obvious reasons for buying a pair of Timberland* work boots.

Now, however, they aren't the only ones.

Because, at hundreds of stores across the country, Timberland is sponsoring a big "Workmates" Sweepstakes that gives you the chance to win some terrific Black and Decker work tools absolutely free.†

A 7¼", 1½ horsepower circular saw with a combination blade. A dual-action sander that combines orbital and straight-line finishing action in a single sander. A double-insulated jig saw. And Black and Decker's brand new ¾" variable speed drill.

What's really nice is that you don't have

to buy anything to enter. But we have a feeling that once you see our boots, you might want to anyway.

To keep your feet dry, we use silicone or oil-impregnated leathers that are waterproof to standards equal to the U.S. Military's.

To keep your feet warm to temperatures well below zero, we fill our boots on both sides and under the innersole with several layers of dense, closed-cell nitrogen insulation.

Finally, to insure that keeping your feet warm and dry doesn't come at the expense of keeping them comfortable, Timberland boots come with an exclusive four-layer innersole, glove leather linings, and padded leather collars.

Stop by a Timberland dealer to register in the Timberland "Workmates" Sweepstakes. And while you're there, why not try on a pair of our boots.

That way, even if you don't win anything, you'll still come out ahead.

Timberland*



The Timberland Company, P.O. Box 7005, Portsmouth, New Hampshire 03801
*Registered trademarks of The Timberland Company.

†Sweepstakes ends 12/31/84. Entrants must be 18 or older. Void where prohibited.

Available at: Open Country.

APPLIANCE CLINIC



Dishwasher on the rampage

Help! My wife's Sears portable dishwasher, model No. 587.760614, serial No. 1706574-1077, is acting up, and she is threatening to buy a new one. With the controls set on pots and pans and normal temperature, the machine will run through four cycles and then fill up with water and never go into the wash cycle. The timer will run on through the other cycles but the machine doesn't drain the water. If you open the door (to a cloud of steam) and

leave it open for 15 to 30 minutes to let it cool down, then the machine goes right into the wash cycle and completes the other cycles normally.

I have replaced both thermostat and timer, and checked the incoming water temperature (125° F.) with a candy thermometer. The Sears serviceman said the main motor was bad, but that doesn't make sense. I know there is a simple solution to this but I can't find it. Any help you can offer would be great-

ly appreciated—George Meister, Chilli-cothe, Ill.

I think the service people are probably right. It is very possible that water has gotten in the main motor upper bearing due to a slight leak in the water seal. The water may have formed rust in the bearing which puts a drag on the motor and causes it to overheat. When this happens, the temperature overload in the motor opens and the motor stops. When the motor cools down in 15 to 30 minutes, the overload again makes contact and the motor begins to run again.

Frozen line on ice maker

I am having a peculiar problem with the ice maker in our 10-year-old Amana refrigerator, model TM18J, serial No. A30802527. Every so often the feed tube for the water freezes. I have had Amana repair service come to see about the problem twice. They've replaced the water valve, the feed-through tube from the back of the refrigerator and the ice maker itself. Any suggestions?—V.C. Hoe, Sunnyvale, Calif.

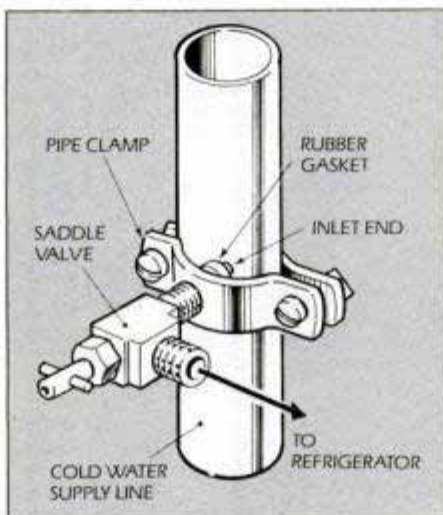
It sounds as if your problem may be with either the water line going to the ice maker water valve or possibly in the saddle valve which attaches to your domestic water supply.

A buildup of calcium in the tubing can cause the water pressure to be reduced. Or, sometimes a piece of nonsoluble material may be trapped under the seat of the water fill valve, causing the valve to seat improperly. This, in turn, would cause the water to drip past the valve and eventually freeze the water in the fill tube to the refrigerator's ice maker.

To check the tubing, follow the water fill tubing to the saddle valve. Turn the handle on the saddle valve clockwise until it seats.

Then, loosen and remove the nut which holds the tubing to the valve. Inspect the inside for any crustations or foreign objects. If there is a buildup inside the tubing, it would be advisable to replace it.

Next, turn off the water supply to the saddle valve. In some cases, you may have to turn off the water supply to the whole house. Once the water is off, remove the saddle valve and disassem-



Remove the tubing between the saddle valve and the refrigerator and inspect it for foreign objects or sediment buildup.

ble it. Inspect it carefully and remove any sediment found in the valve.

Also check the water line where the saddle valve was removed to be sure the hole is unrestricted. After reassembling the valve and turning on the domestic water, open the saddle valve and catch the water in a bucket. Let the water run until it runs clear. Then, you should close the saddle valve and attach the tubing.

Note: A sediment-type filter installed on the ice maker water-fill line might help correct your situation.

Refrigerator freezes food

I have a General Electric combination refrigerator/freezer, Model TC466VD, that quite often freezes everything in the refrigerator portion of the unit.

What is wrong with it?—H.W. Graves, Oak Harbor, Wash.

It sounds as if your 1961 refrigerator compressor may need to be replaced. Over the years, the compressor may have worn internally. Now it is unable to compress enough of the refrigerant to satisfy the temperature control inside the unit. The refrigerator has to run and run to try to satisfy the control, and thus freezes the food.

To help get a little more life out of your refrigerator before you decide to have the compressor replaced or buy a new refrigerator, try cleaning the condenser thoroughly. To do this, unplug the refrigerator and remove the bottom grille cover. Use a vacuum cleaner and a long narrow brush, similar to a bottle brush, to remove whatever dust has accumulated on the condenser.

Most appliance parts stores sell a condenser cleaning brush if you can't locate a brush to do the job. Once the condenser is thoroughly clean, plug the refrigerator back in and make sure the condenser fan motor is running.

SERVICE TIP

To remove burned-on food and other matter that can clog holes in the cook-top burners of a gas range, periodically remove and soak the assemblies for several hours in a solution of hot water and soap. Clean the burner surface with a stiff nylon-bristle brush. Clear the burner holes and the hole at the base with a stiff wire or pin. Then rinse and dry.

PM

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

A world of flavor in a low tar.

MERIT



Low Tar
'Enriched Flavor'
Kings & 100's.

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

© Philip Morris Inc. 1984

Kings: 9 mg "tar," 0.6 mg nicotine — 100's Reg: 11 mg "tar," 0.7 mg nicotine —
100's Men: 10 mg "tar," 0.7 mg nicotine av. per cigarette, FTC Report Mar.'84



Springtime in the Alleghenys

I have a 1978 Pontiac Bonneville that has a 301-cu.-in. engine. The choke plate doesn't close by itself, making cold-engine starting difficult unless I close the plate by hand. Two garages can't find the cause, but they both cleaned the plate and choke linkage. Can you help?—Clair R. Stover, Bellefonte, Pa.

One of two conditions exists: The

bimetallic thermostatic spring that forces the choke plate closed is shot, or the carburetor is warped and keeping the choke plate open. In your case, the spring possibility is the most likely. I doubt the carburetor is warped, so replace the spring. Then, check all choke, vacuum break and fast-idle adjustments, following procedures in the GM manual or a general repair manual.

Rocked by a block

Last Halloween, the detent blocker in the manual transaxle of my 1981 Plymouth TC3 Miser snapped and dropped into the gearbox. It broke teeth off the main input shaft, causing a mess that cost \$350 to get fixed. Is there anything I can do to prevent this expensive damage from recurring?—James Schnur, Manassas, Va.

"Anything" hopefully was done when you had the transaxle fixed. No one admits that the original A-460 transaxle was deficient. However, a beefier blocker assembly, installed in 1984 Chrysler models, is being issued to replace A-460 transaxles in pre-1984 models needing overhaul. The new assembly has a thicker detent spring which should prevent the trouble you had last year.

Be poised for noise

Between this month's and last month's column, I encountered two noise conditions I want to bring to your attention. The first concerns a 1982 Pontiac Grand Prix equipped with a 3.8-liter V6 driven more than 50,000 miles. The noise was a continuous clicking that became more rapid as engine speed increased. It came from inside the engine compartment, but not from the engine itself. The culprit was the air diverter valve of the Air Injection Reaction (AIR) system. Corrosion had eaten through the steel pipe containing the valve. That's the pipe that extends from the air pump to the exhaust manifold. The solution is to replace the steel pipe, which costs \$30 to \$50.

This problem is common on GM engines with AIR systems when they hit 40,000 to 50,000 miles. Even if your car exceeds the 50,000-mile emissions

system warranty period when the noise starts, ask your dealer to contact a zone office to request free repair. The problem should not recur, since the new pipe is stainless steel.

The second noise I came across was on a 1984 Thunderbird. It occurred mainly on acceleration, but was also heard at idle. The best way I can describe it is a resonance. The cause of this noise turned out to be the heat shield vibrating against the catalytic converter. I solved the problem by removing and reshaping the shield.

Can't bear it any longer

We have experienced bearing failure with the five-speed transmissions of 1981 and 1982 Toyota diesel pickup trucks. The problem has hit us like clockwork every 25,000 to 30,000 miles. Since these trucks are driven 30,000 miles in six months, the situation is becoming very costly. The 1981 truck has had five new bearings; the 1982, one so far. It's our understanding from speaking with other owners of Toyota pickups and transmission mechanics that this is widespread. Do you know anything about it?—G.M. Burnett, Bione Truck Service, Christopher, Ill.

The reason for the failure is quite simple. The bearing originally put into these transmissions was inadequate. So, in June 1982, a new elliptical bearing that provides more roller surface was issued.

This fact raises a rather interesting question: If this improved bearing is supposed to prevent failure, why are the bearings in your trucks still falling

(Please turn to page 28)

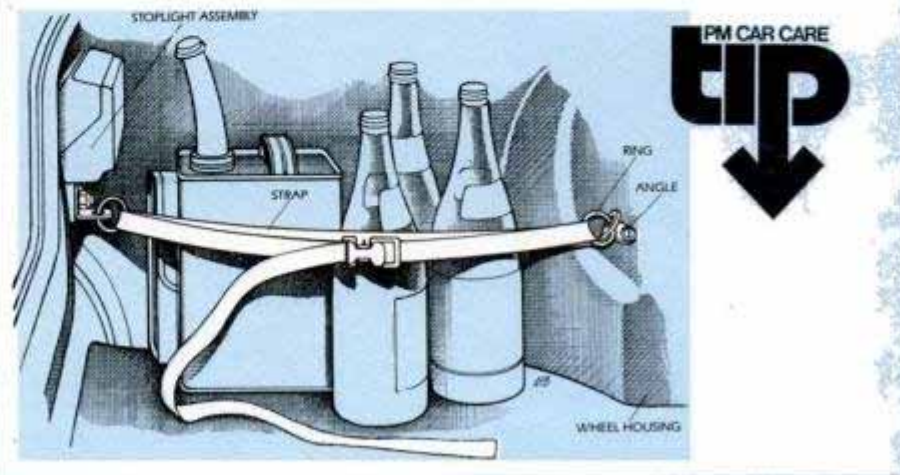
Strapped

Here's a super idea from Dwight Williamson of Mission Viejo, Calif., on stowing objects kept in the trunk:

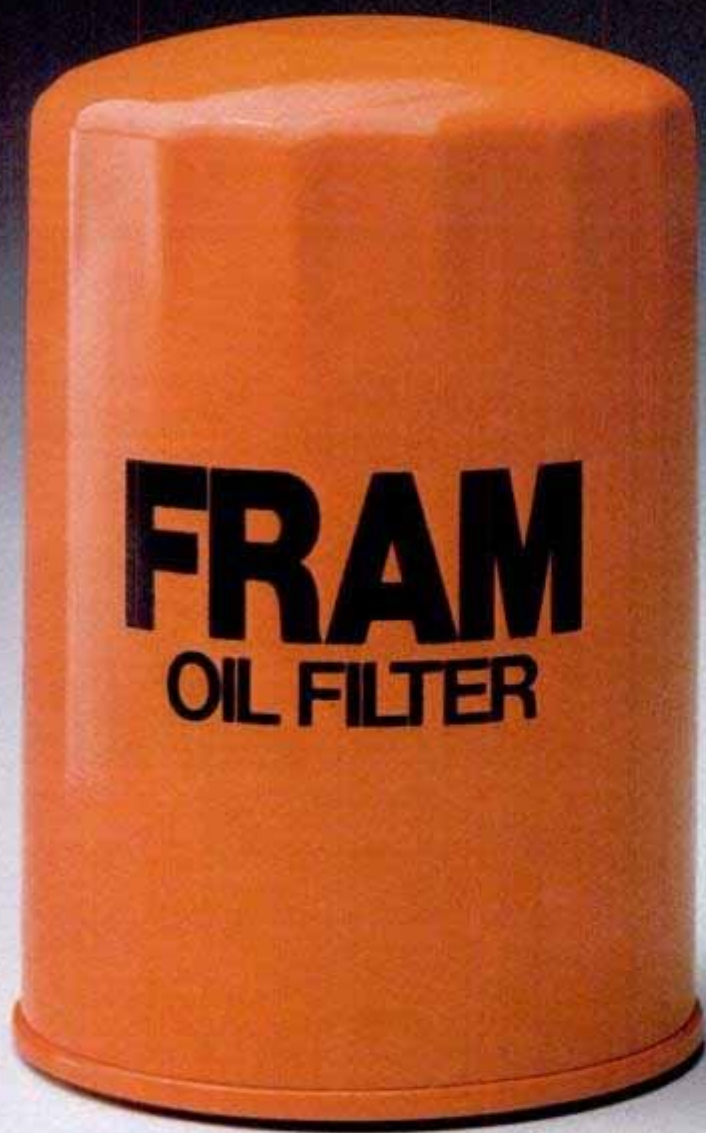
To keep articles from tumbling and making messy spills, install adjustable cargo straps using two 90° metal angles, two round key rings and one 4- or 6-foot strap that has a quick release. Start by removing one of the nuts on a stoplight assembly bolt, slip one of the metal angles

on the bolt and reattach the nut. Now, drill a hole in the rear fender liner to accommodate the heavy-duty sheet metal screw that holds the other metal angle. **Caution:** Stay away from the gas tank filler pipe.

Slip the strap through each of the key rings and attach the rings to the metal angles. Adjust the strap to provide sufficient tension against the objects you're carrying.



LOW-COST LIFE INSURANCE FOR YOUR CAR.



Not so long ago, it was easy to buy an economy car for three or four thousand dollars.

Today, you're lucky to find one for *seven* thousand.

And replacement engines haven't gotten any cheaper, either.

So it makes sense to change your oil and put in a new Fram oil filter *at least* as often as your owner's manual tells you to.

After all, a new Fram oil filter doesn't cost much.

A new engine does.

But, the choice is yours.

You can pay a little now.

Or a lot later.

Fram Division
Providence, RI 02916

 **ALLIED** Automotive

CAR CLINIC

(Continued from page 26)

apart? The answer is that Toyota is depleting the old stock of bearings before making the new ones available. Make sure you get the new bearing if you have another failure by giving your dealer this part number: 90356-32011.

Grease-free diet

A greasy film keeps forming on the inside windows, especially the windshield, of my 1983 Plymouth Reliant. Two Plymouth dealers have failed to correct the condition. Neither can they explain the cause. Any suggestions?—*W.J. Ross, Riverdale, Ill.*

Yes—several. All car owners should take heed. This problem can affect any car or pickup truck that has interior vinyl components, if only a vinyl-covered instrument panel.

A plasticizer is added to vinyl to keep it soft and flexible, and to prevent cold-weather cracking. The plasticizer boils off when it gets hot in the vehicle, and the vapor settles on the glass.

Manufacturers admit there is no solution for the problem, but you can minimize the condition by doing the following:

Alphabet soup, second serving

"I read your PM Car Care Tip on GM letter designations of cars (*Car Clinic*, page 14, Apr. '84)," writes Glenn Stinn of Columbus, Neb. "It was very interesting and informative. But how about the rest of the story—how do Chrysler and Ford designate their cars?"

Here's how—



Chrysler Corp. (1985 domestic designations)

Cars	CV	E	G	H	K	KC	L	M	S
Chrysler	LeBaron	New Yorker	Laser	LeBaron GTS		Limo		Fifth Avenue	
Dodge		600	Daytona	Lancer	Aries		Omni, Charger	Diplomat	Caravan
Plymouth		Caravelle			Reliant		Horizon, Turismo	Gran Fury	Voyager

Ford Motor Co. (1985 domestic designations)

Cars	Erika	Topaz	Fox	L	S	Panther
Ford	Escort, EXP	Tempo	Mustang	LTD	Thunderbird	LTD Crown Victoria
Lincoln				Continental Mark VII		Town Car
Mercury	Lynx	Topaz	Capri	Marquis	Cougar	Grand Marquis

Save \$1.50 on Gillette Atra razor & cartridges....

"This deal is so good, I'm ready to start shaving again."

...when you buy 3M Sandpaper.



Look for the specially-marked 3M sandpaper packages. Millions are out.

Each package has an on-pack coupon and a mail-in rebate. The first gives you an immediate 50¢ off a Gillette Atra® shaving cartridges purchase. The second gives you a \$1 refund by mail on the Gillette Atra razor with proof of purchase.

It's a smooth deal! Buy America's leading sandpaper—shave \$1.50 off Gillette's best razors.

"Don't do it yourself without 3M!"

3M hears you...

© "Atra" is a reg. trademark of the Gillette Company
© 1984, 3M

EASY PLANS FOR EASY WAYS TO STORE AWAY WHAT'S IN YOUR WAY.



Board, Plywood, Insulation, Gypsum Board, Hardboard, Siding, Paneling, Oriented Strand Board, Weyerhaeuser, Nails, Screws, Fencing, Shelving

If your household clutter's out of hand, turn to Georgia-Pacific—for creative solutions to all kinds of storage problems.

You'll find them in "The Storage Book." It's full of ideas for making a place for just about anything: books and albums, linens and luggage, shirts and shoes and a whole lot more. All designed to make the most of premium space. All easy and economical, too.

To get your copy of "The Storage Book," send just \$2.00 to P.O. Box 48408, Dept. PM, Atlanta, GA 30362.

"The Storage Book"—just one of the ways Georgia-Pacific helps do-it-yourselfers do things around the house. Because we're more than just America's largest building products company. We're a name you can build on.



For the location of the Georgia-Pacific Registered Dealer nearest you, call 800/447-2882 toll-free (except in Alaska and Hawaii). In Illinois, call 800/322-4400.

Great Possibilities is a registered trademark of the Georgia-Pacific Corporation. You Can Build On Our Name is a trademark of the Georgia-Pacific Corporation. © 1984 Georgia-Pacific Corporation.

YOU CAN BUILD ON OUR NAME.™

Georgia-Pacific



1. Leave the windows rolled down to let vapors escape if you park the vehicle in a secure location.

2. Wash vinyl once a month with one part of a mild liquid detergent like Lux, Ivory or Joy, mixed into 50 parts of warm water. Rinse with clear warm water and dry with a soft cloth. *Caution:* Never clean vinyl with a solvent—such solutions can be corrosive and may leave the vinyl sticky.

3. Whenever you wash the outside of the vehicle, wipe vinyl components with a damp cloth.

4. Manufacturers suggest that you clean windows with a household glass cleaner. I find ammonia and water just as effective. Remember that the longer you allow film to remain on glass, the tougher it is to get the film off the windows.

I've also encountered film forming on the outside of the windshield that smears as the wipers work. This is caused by liquid wax left on the glass after it has been washed in an automatic car wash. To avoid this condition, clean the windshield after having the car washed.

Clean wax from the wiper blades with a 50/50 windshield washer fluid and water solution or a 50/50 methanol

and water solution. Then, rinse the blades with clear water.

Fair-weather friend

Two months after I bought a 1984 Ford Bronco II, its V6 engine began stalling in wet weather. The engine starts promptly, but it stalls persistently unless it's sunny. The dealer can't pinpoint the source of the problem. Can you help us?—Joel MacDonald, Halifax, Nova Scotia.

Quite possibly. There's a choke relay on the right side of the engine compartment that receives signals from the microprocessor. In wet weather, dampness causes it to short out. Have this relay replaced.

The new one, which has no part number yet, comes with a cover to protect it from moisture.

If this does not solve the problem, ask your mechanic to check all other electronic components for possible moisture exposure. **PM**

DO YOU HAVE A CAR PROBLEM?

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

SERVICE TIPS

■ If all else fails to rid a 1984 2.5-liter GM engine of spark knock, install a new PROM (part No. 1226909) in the electronic control module. This fix applies only to cars with automatic transaxles.

■ Chrysler also has a cure for spark knock that occurs under acceleration. The repair involves 1982½-1984 2.2-liter engines with two-barrel carburetors. Install a 1.5-inch vacuum reducer valve (part No. 4275688) as called for in technical service bulletin (TSB) 14-03-84.

■ Ford warns that loss of power, misfiring and rough running from 1984 Tempo and Topaz 2.3-liter High Swirl Combustion (HSC) engines can be symptomatic of preignition. Preignition can cause burned or melted sparkplugs, valves, pistons and cylinder heads. Procedures for checking these symptoms are outlined in TSB 84-10-8.

■ If you find water in the air cleaner of a GM car equipped with a 1.8-liter turbo engine, drill a 4-mm (¼-in.) hole in a lower rib of the air cleaner cover. Refer GM dealers to Buick TSB 84-6E-13.

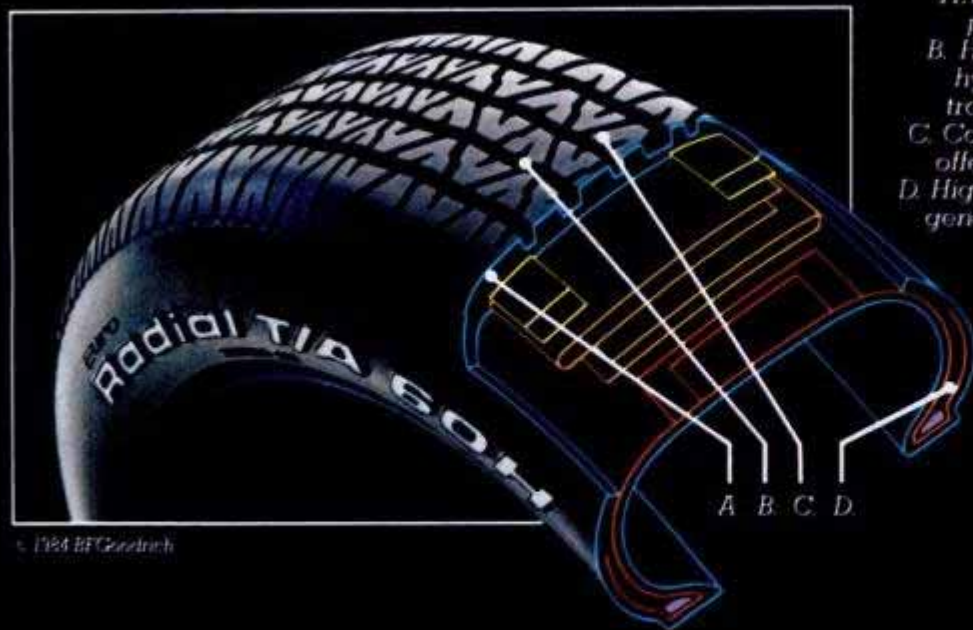
■ Honda has issued a kit (Honda Control No. 1796176) to prevent sparkplug fouling in 1984 1.3-liter Civic and CRX engines during short-range, low-speed, cold-weather driving. Details are spelled out in TSB 84-025. The company has extended the warranty to repair this condition to five years or 50,000 miles.

HOW BF GOODRICH MAKES SPORTS COUPES PERFORM: THE INNOVATIVE RADIAL T/A 60H.

The Radial T/A[®] 60H—and Radial T/A[®] 70H—were designed specifically for outstanding car performance. Professional test drivers recently tested the Radial T/A 60H on unmodified foreign and domestic sports coupes. The result: impressive performance. The test vehicles generated as much as 0.812 g's during lateral acceleration under dry road conditions and as much as 0.768 g's in the wet. 60 to 0 mph dry stopping distance was as low as 158.0 feet. Most importantly in autocross and road course evaluations, the tire provided the cars with a high level of predictability and control at the limit of adhesion.

The speed-rated Radial T/A 60H and Radial T/A 70H are engineered with advanced materials and technology:

- A. Special tread rubber compound promotes outstanding traction.
- B. High void-to-rubber ratio reduces hydroplaning for optimal wet traction.
- C. Computer-optimized tread design offers excellent handling.
- D. High-modulus bead fillers help generate quick steering response.



© 1984 BF Goodrich

BF GOODRICH **T/A[®] HIGH TECH[®]**
RADIALS



The BFGoodrich Radial T/A 60H and Radial T/A 70H—a unique combination of advanced handling characteristics derived from the world-recognized Comp T/A*, raised white letter styling, and the European H speed-rating. These tires are designed to make sports coupes perform.

WE MAKE CARS PERFORM

HOMEOWNERS' CLINIC



Ridge vent retrofit reduces heat load

My ranch home is about 20 years old. It has a 90-ft.-long roof and the width of the house is about 30 ft. The roof deck is in excellent condition, but the shingles need to be replaced soon. I was told that this would be the right time to retrofit the roof with a ridge vent, which would eliminate the need of running the attic fan for hours on a hot summer day.

Can you advise me on the feasibility of this project and also if this is a do-it-yourself job?—Wallace Reidlinger, Far Hills, N.J.

From your letter, I assume you have asphalt composition shingles on your

roof. These shingles generally have a projected life of 17 to 22 years. Yes, this would be a good time to install a ridge vent (a low-profile continuous louvered opening that runs almost the full length of the roof ridge). Actually, anytime, weather permitting, is the right time to retrofit a roof with a ridge vent. The installation is independent of the condition of the shingles. It is a do-it-yourself project providing that you observe the normal safety precautions when working on the roof.

I installed a ridge vent on my house about 12 years ago. I have been living in my house for 18 years, and found

that the ridge vent is very effective in reducing the heat load during the summer months and minimizing the moisture buildup in the attic during the winter.

For maximum airflow through the attic, the ridge vent should work in conjunction with soffit vents. If you don't already have soffit vents, you should install them when you put in the ridge vent.

You can buy ridge vents at home centers and lumberyards. One supplier, the Leslie-Lock Building Products Co., Box 723727, Atlanta, Ga. 30339, makes ridge vents in interlocking 4-ft. sections called Ridge Runner. They sell for \$12.50 per section.

Noisy furnace fan

I have a problem with my forced-air furnace. The cold-air return chamber is right under the unit in the front. When the heater is on and the fan is running, there is a high fan noise. Is there any way that I can dampen this noise?—Ray J. Swensen, Eureka, Calif.

Fan noise is usually caused by vibrations of the fan-motor assembly or, if the return is inadequately sized, by air rushing through the grille. Sometimes it's a combination of both.

Since the louvers on a grille will reduce the effective opening, try removing the grille. If there is no change in noise level, you've eliminated the return size as a problem. If the noise level decreases, you will need a larger return or a grille with less air resistance.

Next, check the fan and motor assembly. Resecure any loose sections.

You can decrease the noise level

from the fan and motor by lining the blower compartment with a matted fiberglass acoustic liner. The liner comes in 1/2- and 1-in. thickness and can be glued to the sides of the compartment. The acoustic liner is manufactured by insulation companies such as Owens-Corning and should be available through heating/air-conditioning contractors.

You can further reduce the noise (if space permits) by covering the return opening with a lined duct that has an open end several feet away from the fan compartment.

Auxiliary hot-water tank

Our domestic hot water is provided by a coil in the boiler, a common method which is inadequate when a large quantity of hot water is wanted, since there is no storage beyond the small contents of the coil. Is there a way that a well-

insulated storage tank could be connected into the system and kept hot by thermal convection from the present furnace coil? Would any special precautions or valving be required?—Edward Caldicott, Huntington, N.Y.

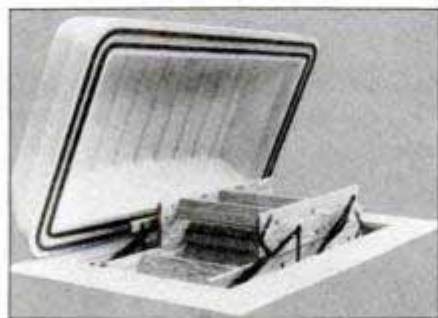
Yes to both questions. A tank will greatly improve the effectiveness of your hot-water system. The tank which should have a minimum capacity of 30 gal. can be connected directly to the hot-water coils. If possible, the tank should be positioned above the coil outlet so that the hot water will circulate between the tank and the coil by gravity (hot water rises, forcing cooler water down).

If, because of space limitations, the tank cannot be positioned above the coil, recirculate the hot water by using a circulating pump. There is one big precaution. There must be a relief valve either on the tank or on the hot water outlet pipe which is both temperature and pressure sensitive.

A combination tank/pump assembly, available through plumbing supply companies, is called an Aqua Booster. The 30-gal. unit lists for about \$400, although you may be able to get a discount. Installation is extra. **PM**

SERVICE TIP

When insulating an attic, most homeowners tend to overlook the area over the folding attic staircase. This passage allows living area heat to escape in winter and intensify in summer. The Styro/Dome Corp. has developed a dome-shaped, insulated attic door that fits over the stair opening. The unit, which has a thermal resistance (R-value) of 13.25, costs about \$189. It can be installed in minutes, and is sized to fit the standard folding attic stair with a rough opening of 25 1/2 x 54 in. For more information, write to: Styro/Dome Corp., Box 220, Yorktown Heights, N.Y. 10598.



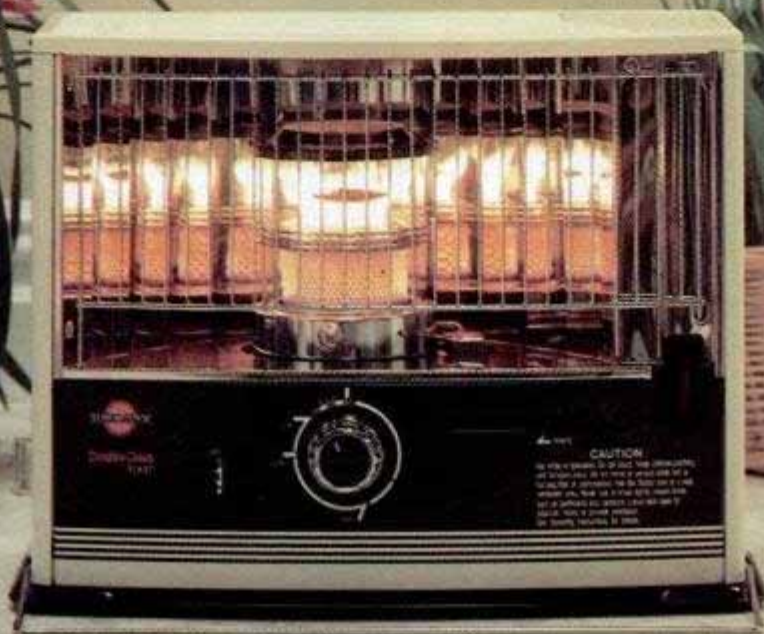
The Styro/Dome cover seals off the unheated attic to eliminate winter heat loss and summer heat gain in the living area.

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 the column. For more home-repair and maintenance help, get PM's Home Care Guide, \$4.95 postpaid. Send your order(s) to Popular Mechanics, Box 1014, Radio City Station, New York, N.Y. 10101.

"I want a kerosene heater that's more efficient."



"I want a kerosene heater that's cleaner burning."



The revolutionary Toyostove™ Double Clean Heater makes a clean break with the past.

This is the Toyostove™ Double Clean Heater, the most advanced kerosene heater ever made.

It could change your mind about kerosene heaters. Because it makes a clean break with the past in the way it works.

It's the only heater with two burning chambers. First, the bottom chamber burns most of the fuel, giving off radiant heat. Then, the remaining unburned fuel rises to the top chamber where it ignites for total combustion, giving off additional convective heat.

The result is a cleaner, more efficient heater for your home.

The double-chamber concept has another benefit. This exclusive design gives you precise control over room temperatures. With the twist of a knob, you can raise or lower heat output so you're always just comfortable. And you'll never waste fuel by having your heater deliver more heat than you need.

Toyostove is made by Toyotomi, the largest kerosene heater manufacturer in the world (20 million heaters sold). Our commitment to quality and innovation is the reason we're biggest. And because we're biggest, we have the resources to develop a breakthrough like the Double Clean Heater.

It comes in various sizes and in both round and hearth-style models. See a demonstration at your local independent retailer.

Toyotomi America Inc., 604 Federal Road, Brookfield, CT 06804.

TOYOSTOVE™

The stress-tested oil for your high performance car.



Stress-Tested at 24-Hours of Daytona, USA.

Stress-Tested at 12-Hours of Sebring, USA.

Stress-Tested at Laguna Seca, USA.

Stress-Tested at 24-Hours of LeMans, France.

Stress-Tested at Brands Hatch, England.

Pennzoil GT Performance Motor Oil has been stress-tested under the toughest conditions to meet the challenges of today's precision-engineered cars. Higher rpm... higher crankcase temperatures of turbo-charged engines... and the high technology of electronic fuel injection.

Pennzoil GT Performance is specially formulated in an SAE 20W-50 weight. Extra weight to meet the severe stress high performance cars put on oil. (GT Performance is also available in an SAE 20W-40 weight.) GT Performance

provides superior stress resistance to heat build-up, too, and protects your engine with special cleaning, cooling, sealing and lubricating properties.

Pennzoil doesn't just keep up with the stress of today's modern engine needs, it stays ahead. So you can depend on the latest Pennzoil state-of-the-art technology to give your high performance car the quality protection it needs.

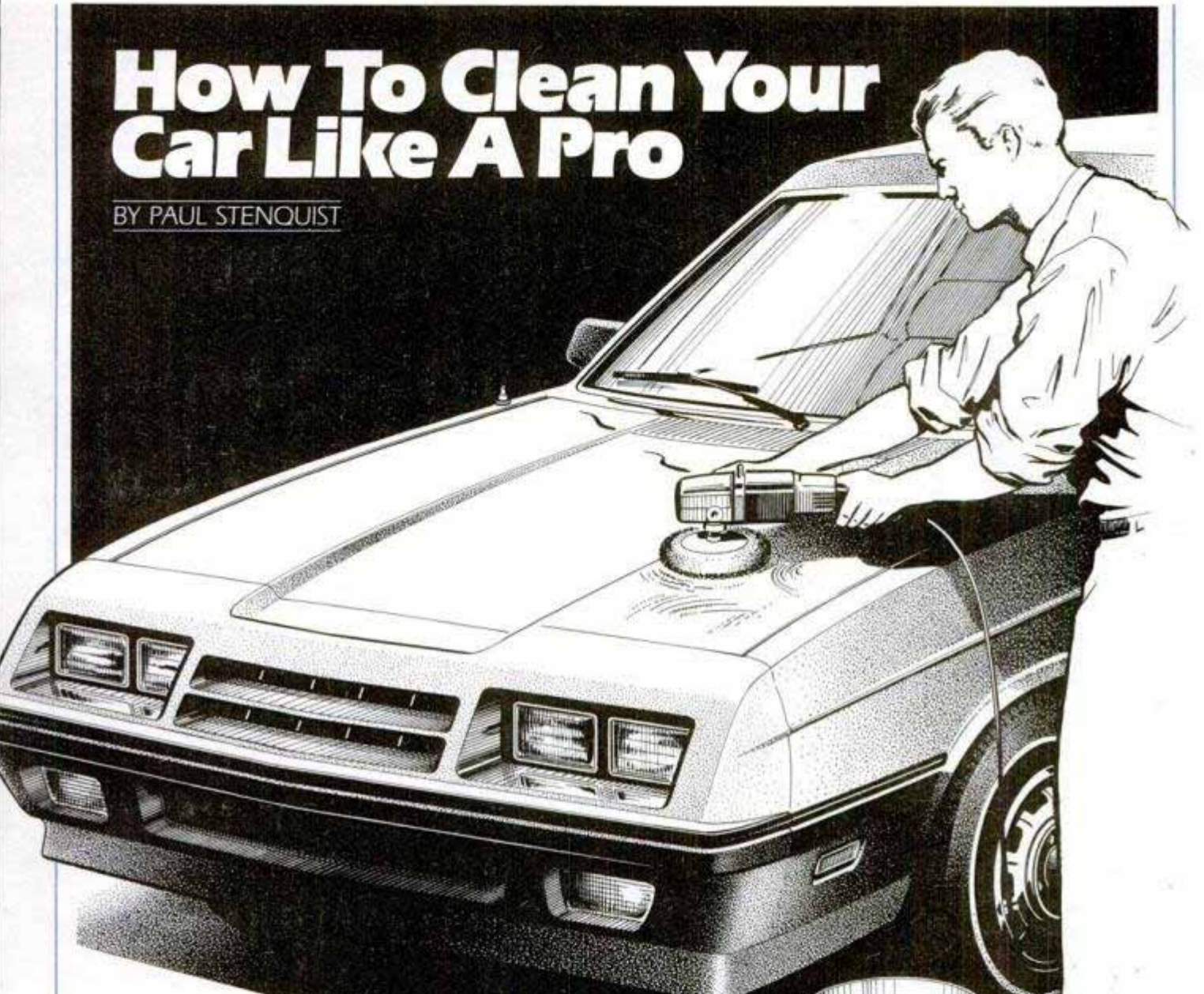
With all that testing behind it, why would you use any other motor oil.



HIGH TECHNOLOGY
QUALITY = **PENNZOIL**

How To Clean Your Car Like A Pro

BY PAUL STENOQUIST



They call themselves "detailers," and they clean cars inside and out for very demanding customers—auto-show exhibitors, car dealers and fussy owners of expensive luxury and sports cars. Their methods are as far removed from a quick spritz at the corner carwash as their prices—\$100 and up per car! When they're finished, the car looks immaculate.

In general, the procedure includes washing, surface restoration and polishing. With cars that haven't been neglected, the last two steps can usually be combined. If a finish has become severely oxidized and sun-faded, however, more extensive measures are called for. We'll cover the restoration of faded and chipped paint as well as minor body repairs in a future *Saturday Mechanic*. This month we'll focus our

attention on washing and polishing.

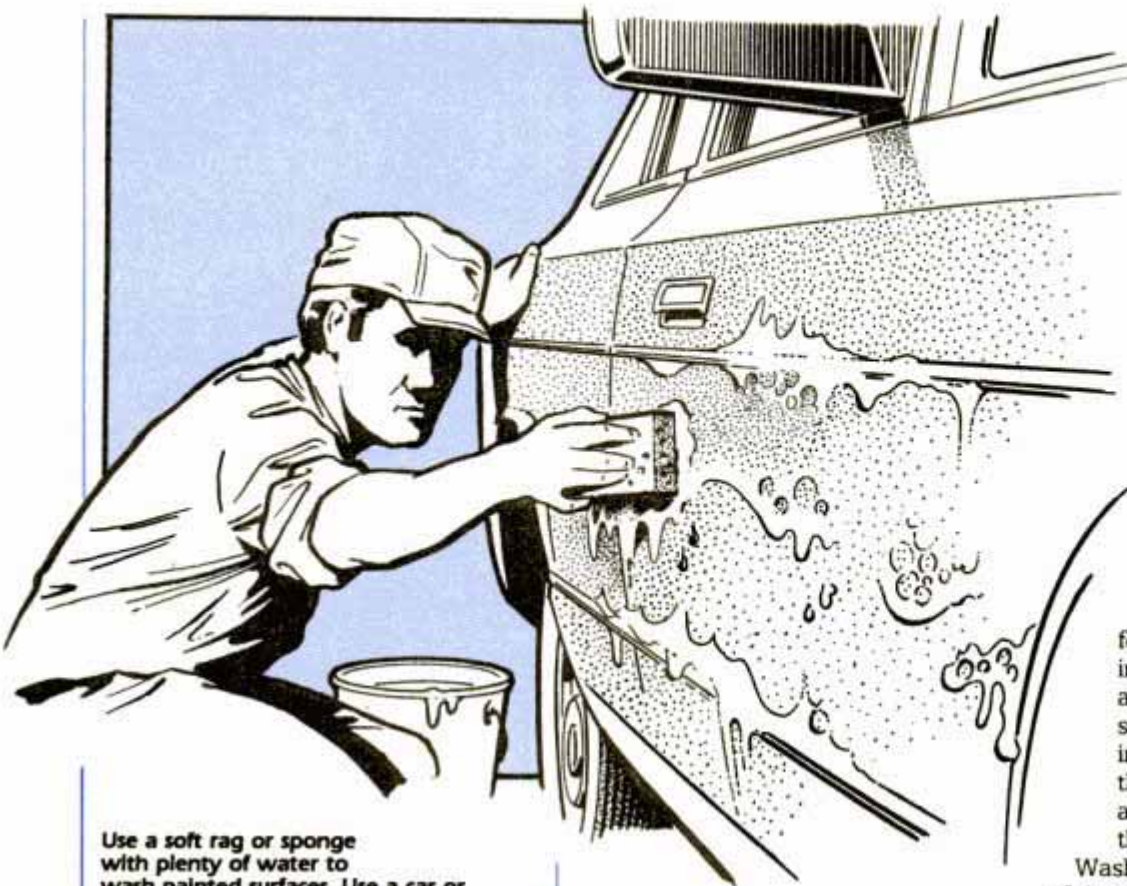
Frequent washing is a critical part of exterior car care. Industrial fallout and pollution, road salt, acid rain, tree sap, dead insects and bird droppings are constantly assaulting the finish of your car. Removal of all that accumulated crud once a week is not excessive.

Taking care of the shining exterior won't do much to extend the car's life if you ignore the greasy side. Most corrosion begins somewhere on the underside of the car and works its way through to the top. You can help prevent this by cleaning road salt and other foreign material from the underside panels and

inspecting to make sure the undercoating is in good condition.

The easiest way to wash the under-





Use a soft rag or sponge with plenty of water to wash painted surfaces. Use a car or household soap made for these surfaces.

side is to use the pressure washer wand at a self-service carwash. But you can do the job at home with a brush, soap and a garden hose if a self-service facility isn't available.

Using a soft brush, scrub the inside of the wheel wells, the inside of the door-mounting areas, the underside of the front and rear bumpers and as much of the chassis as you can reach. Rinse off all of the soap with the pressure washer or with your garden hose.

Make sure you don't knock off any undercoating while you're scrubbing. After the wash job, inspect the bottom for missing undercoating or corrosion. If you find bare spots, get rid of any rust and apply an aerosol rustproofers. Undercoating (a thick sound-deadener) is less critical—restore it if you like.

Soap it up

Once you've cleaned and inspected the nasty parts, you can trade in your coveralls for a swimsuit for the rest of the job.

Don't use laundry or dish detergent for washing your car since their grease-cutting formulas can remove wax. A general household cleaner, recommended for use on painted walls, is okay, but the best choice is one of the carwash soaps sold in auto parts stores. Make sure you get a product that is

meant to be mixed with water and rinsed off. The flushing action of a good rinse is an important part of the wash job. Use a garden hose for rinsing—a bucket of water isn't enough. It's best not to use a high-pressure spray wand on the exterior but, if you must, keep it well away from the car and use cold or lukewarm water, not hot.

If you're using a household cleaner, mix a solution somewhat weaker than what is recommended for painted walls. If you're using a commercial

carwash product, mix according to directions on the label. Unless otherwise indicated, use warm water, not hot.

Never attempt to wash or wax a car in the sun—a cloudy day or well-shaded area is best.

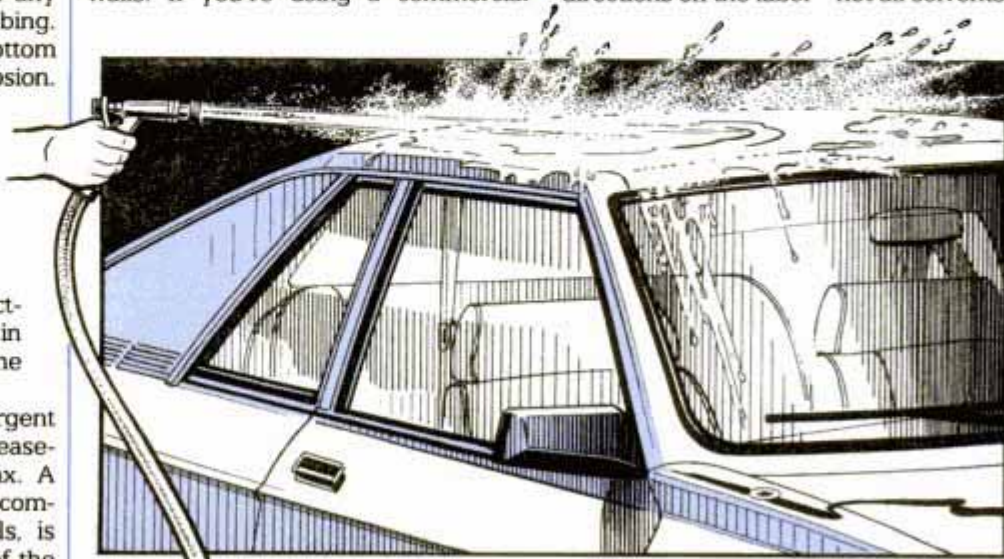
Before you begin washing, have the garden hose standing by, ready to rinse. You can't allow soap to dry on the car or it can cause streaks and spotting in the wax (if any) remaining on the car.

Begin by washing the roof. Use a sponge or soft cloth and rinse immediately. Then move on to the hood or deck lid and finally the doors, fenders and quarter panels. Work in areas that are small enough to allow complete rinsing before the soap dries. After a thorough rinsing, dry the car with a chamois that has been water-saturated and wrung out. Keep wringing the chamois as it collects water.

Wash tires and whitewalls with one of the cleaners sold specifically for this purpose. Use a stiff brush and follow the directions on the product's label. Use clean, soft rags and a liquid glass cleaner to wash the windows. To remove the film that accumulates on the inside surface of the windows, use an ammonia cleaner.

Surface spots

Check the vehicle's painted surface. If there are bug or tar spots, use a commercially available paint-cleaning solvent to remove them. Follow the directions on the label—not all solvents



Rinse each area of the car immediately after it is washed. Wash a small area at a time and do not allow the soap to dry, or it will leave marks on the paint.



Special cleaners are available for tires and for cast aluminum wheels. Use a stiff brush to remove brake dust and grime.

are fully compatible with every type of paint. Test in an inconspicuous place, such as the door-mounting area, before applying solvent to the exterior.

If the finish is lightly scratched or spotted with material that cannot be removed with solvent, you can probably clean it up with a little polishing compound. Apply fine polishing (not rubbing) compound to a small area with a damp cloth. Rub only until the foreign matter has been removed or the scratch has disappeared. Don't overdo it and don't rub on an edge or you'll end up with a bare spot. Don't try to compound areas larger than a couple of inches across in this manner.

Beautify with polish

The polishing operation is next. This is important because it beautifies and protects the finish. While two- and three-step polish systems are available, there are many single-step products that give excellent results. In fact, there are a tremendous number of products available and a couple of different ways to do the job. For our purposes, we'll use the term "polish" to describe all the types of paint-beautifying products that are intended for use as a final operation.

The newest category of polish products includes compounds called *polymer glaze* or *protectant*. This is the type of coating the new car dealer tries to sell you for upwards of \$100. They are now available in kit form from auto

parts stores for \$6 to \$30. The higher-priced kits include preparatory cleaning compounds.

Polymers are shiny by nature, so buffing is not required. The products reportedly screen ultraviolet rays, which cause paint to fade, and they last for six months to a year. A restorative is packaged with some of the more expensive kits that will preserve the shine over an extended period of time if applied at six-month intervals.

Protection vs. sheen

Most detailers feel that polymers offer long-term protection and a certain amount of gloss, but that they can't produce the type of deep, lustrous sheen that some other products can, particularly those that are applied with an electric or air-powered polisher.

Most polishes contain wax, silicone, abrasives, and/or chemical solvents. The abrasives or solvents are for removing dirt and faded paint, while the silicone and wax produce the glaze. These products are available as one- or two-component systems. Some are intended only for hand application, while others are designed to be applied with a power polisher.

Products containing a high percentage of wax produce the best initial luster, but wax breaks down faster than most other polishing products. Silicone polishes form a more durable barrier than waxes—they don't oxidize—but initial gloss is not quite as good. You can tell which type of glaze is predominant in the formula by reading the label and list of ingredients. One-component products clean and polish in one step, while two-component compounds require separate operations.

Many of the one-component products—particularly those sold for metallic paint finishes—do not contain abrasives. These usually contain a cleaning solvent of some type to remove dirt that washing can't dislodge. Use this non-abrasive type of polish if your car does not have surface scratches.

Remove stains and scratches

If the car has surface scratches or a moderate amount of faded paint and oxidation, use a two-component polish or a one-component type that contains abrasives. (Heavily faded, oxidized or stained paint calls for machine compounding of the entire car.) If a product's label doesn't tell you whether abrasives are included, you can tell by rubbing some between your thumb and finger. If it's abrasive, you'll feel a slight grit.

You also have liquid and paste prod-

ucts to choose from. In general, liquid products are not as prone to rub through the paint. This is particularly important if you're going to apply the product with a machine.

If you want to use a wax and/or silicone polish and you don't mind polishing at fairly frequent intervals—like once a month—you can do a reasonably good job by hand. But, if you'd like to produce an ultrahigh-gloss shine that will last for six months or more, you should rent an automotive polishing machine.

Machine polishing

Auto parts stores that specialize in supplying body shops sell polishes of all types that are intended for use with a polishing machine. The counterman should be able to tell you what type of pad to use and how fast the machine should run with the product you choose. Polishing machines can be rented from tool-rental stores.

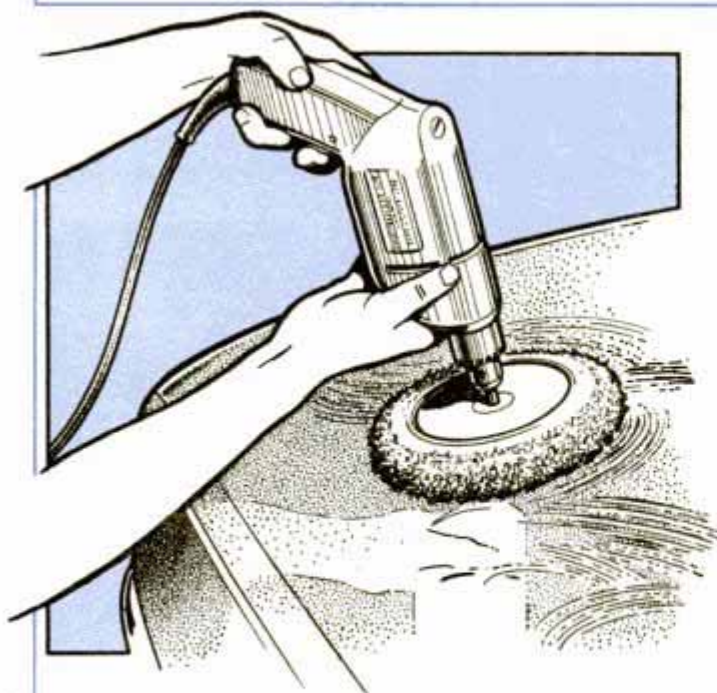
It's very important that you get a machine that runs at the right speed so the surface glaze will harden. Too fast



Remove stubborn stains and light scratches with fine polishing compound (not rubbing compound). Rub lightly with a damp cloth.

and you'll burn through the paint. Too slow and the glaze won't last as long as it should.

A third alternative is a polishing pad mounted on an electric drill. Available through a variety of consumer-oriented outlets, these are generally okay for use with polishes intended for application by hand because they run at relatively low speed and will stall if a significant



Polishing pads can be fitted to an electric drill for buffing. A power polisher, used with a product formulated for power buffing, will give a longer-lasting shine.

amount of pressure is applied.

There are some general guidelines to follow, although you should always follow label directions. Work in the shade or on a cloudy day whether you're using a machine or applying by hand. Apply the polish to a small area—about 2 feet square.

If you're using a polishing machine, begin by rubbing a small amount of polish evenly into the pad. Work it in well, coating the entire surface. This will condition the pad so it won't soak up the polish you'll be applying to the vehicle.

Apply the polish directly to the vehicle, using only the amount specified in the instructions to avoid clogging the pad. Then, spread the polish around the 2-sq.-ft. work area before turning on the machine. Experts suggest four full passes with the polishing machine to produce a perfect gloss—if the machine is used at the right speed, with the correct amount of polish, and if the pad is not gummed up and dirty. Keep the pad flat against the paint surface and don't bear down.

You might not be able to reach some areas with the machine, so, polish these sections by hand.

If you use a carpet-type pad and it starts to block up, you should clean it by loosening the accumulated polish with a dull screwdriver or similar tool. If you're using a lambs wool- or sponge-type pad, it shouldn't block up unless you've been applying too much polish. When you've finished the polishing

operation, clean the pad in your washing machine and save it for future use.

Finally, wash the car with lukewarm water and a soft rag to remove any polish residue. Make sure to remove any polish that is caught in crevices. If you leave it there, it will attract moisture that will eventually lead to corrosion. Dry the car with a chamois.

If you used abrasive polish on the painted surfaces, don't use it

on chrome, aluminum or anodized aluminum (black chrome) trim. Instead, use a nonabrasive polish sold specifically for use on these surfaces. There are even some that are specifically formulated for anodized aluminum and for plastic.

Some detailers and body shop mechanics use engine oil to protect the chrome-plated steel parts of their vehicles. Believe it or not, this offers terrific rust protection and a fairly good shine. The drawback is that it collects dirt. But, if you adhere to once-a-week washing and reapplication of the oil, dirt shouldn't be a big problem. When cleaning oiled chrome, don't use the rags that you use on the rest of the car.

Before applying oil, cover the driveway under the bumpers with a drop-cloth or newspapers. Liberally apply the oil with a rag and allow it to soak for several minutes before wiping off the excess with a clean rag.

Tricks of the trade

Detailers use a few other tricks to make cars look new. The application of black rubber dressing on the tires, for example, will make them look very nice. If you don't take a good look at the tread, the tires might pass for new. The dressing may also help preserve the rubber. Applied with a paintbrush, the coating leaves the tire sidewalls shiny black. Check the instructions on the can to make sure it's compatible with all types of tires before using it.

Engine cleanup is a part of the detailing job as well. Engine-cleaning compounds are available from auto parts stores for this purpose. They are sprayed on, allowed to soak in for a while, then hosed off. Make sure you

cover all electronic components with plastic bags before attempting to clean an engine. Avoid spraying water directly on these components.

Once the engine is clean, the pros will sometimes spray the entire engine compartment (except the exhaust manifolds) with a clear high-temperature paint. This paint will make hoses look like new and will brighten up what is left of the engine's original paint job.

The inside story

There are special products made for cleaning vinyl upholstery. Harsh detergents, abrasives or cleaning fluids just won't do—instead, they'll damage the surface. Vinyl repair kits are available from specialty mail-order houses.

For cloth upholstery, use a whisk-broom or a vacuum cleaner to remove ordinary dirt. Car upholstery is unlike home-furniture upholstery in that it is



Rubber dressing, applied to the sidewalls, will make your tires look dark, shiny and new. It also helps preserve the rubber.

chemically treated with a flame retardant, and sometimes with other products that make it stain resistant. Work on any stain immediately or blot up or scrape off as much of the stain as you can, and treat it as soon as possible.

Leather upholstery should be cleaned only with saddle soap and treated with preservatives made especially for leather.

Detailing is more work than a pass through the carwash, but it can literally make an old car look like new. **PM**

NRI gives you ALL the training you'll need to repair ALL microcomputers.

When you've learned the basics the NRI way, you can troubleshoot the entire system—and earn good money doing it!

For business owners, lost computer time means lost money. For customers, it usually means frustration, delay and a strong temptation to take a walk to the nearest competitor.

But for the NRI-trained computer service technician, a down computer can mean higher earnings or even the opportunity to start a profitable business.

Fixing computers: fastest growing occupation in the U.S.

Whether the flaw is in a circuit board, a disk drive or a printer, everybody wants it fixed fast.

The U.S. Department of Labor recently projected that the number of computer service jobs will double before 1995. Median earnings of full-time computer service technicians are \$430 per week (with much higher earnings for experienced service persons). And while all computer-related job opportunities are expanding, the computer service technician is the fastest growing job category of all.

The trained computer technician can choose between: working for a large corporation or an independent; making office calls or staying in the shop; working for a retailer or for a specialized service firm—even starting his own computer repair business.

Total System Training from NRI

As an NRI graduate, you'll be qualified to fix just about everything



IBM is a Registered Trademark of International Business Machine Corporation.
Epson is a Registered Trademark of Epson America, Inc.
Apple and the Apple logo are Registered Trademarks of Apple Computer, Inc.
Compaq is a Registered Trademark of COMPAQ Computer Corporation.
© 1984 AT&T Technologies, Inc.

that can go wrong, for any major brand of desktop microcomputer (and a large chunk of the aging minicomputer population, as well).

Only a person who knows and fully understands all the underlying fundamentals of microcomputers can hope to be able to tackle all microcomputers. NRI has known the need for thoroughly understanding fundamentals since 1914.

NRI's training is hands-on training. You get practical experience in writing programs in BASIC, testing and debugging systems. You'll learn how to install an expansion board, how to troubleshoot pesky circuit flaws. Using NRI's exclusive Discovery Lab®, you'll perform over 60 experiments. You'll learn how to fix the slipped disk drive and how to fix the #@!!!@ printer.

Learn at home, in your spare time

You learn at your convenience, at your own most comfortable pace. Without classroom pressures, without rigid night-school

schedules, without wasted gasoline. Your personal NRI instructor and the NRI staff will answer your questions, give you guidance—even give special help if you need it.

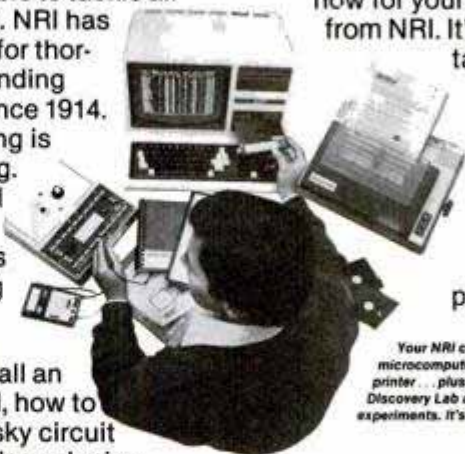
Computer, disk drive and printer—all yours to keep

As part of your training, you work with a TRS-80 Model 4, a powerful microcomputer with many of the features and capabilities of machines costing three times as much.

You'll install a double-density disk drive and a dot-matrix printer. The entire system—computer, drive, printer and manuals—is yours to keep, as part of your training.

Your NRI catalog is free; send the card today

Send the postage-paid card now for your free 100-page catalog from NRI. It's the first step you'll take toward joining the growing, exciting world of microcomputers. (Note: if the card has been removed, please write to us today and ask for our free 100-page catalog.)



Your NRI course includes this modern 64K RAM microcomputer, dual-density disk drive, dot matrix printer... plus a professional LCD multimeter, NRI Discovery Lab and hundreds of demonstrations and experiments. It's all yours to keep.

NRI SCHOOLS

NRI School of Electronics
McGraw-Hill Continuing
Education Center
3939 Wisconsin Avenue
Washington, DC 20016
We'll give you tomorrow.



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

DETROIT LISTENING POST



Avanti garde



Convertible Avanti should be available by Christmas. Modern chassis design by Herb Adams (right) will slip into '86 cars.

Just when we were getting used to Steve Blake's Avanti company as a reliable producer of the neoclassic Studebaker design, the folks in South Bend, Ind., spring two new items on us.



The first to see production will be a convertible variant of the original Loewy design. When it's available late

this year, buyers will get a choice of two new suspension packages—a soft-ride special and a GT option.

Even more exciting is the emergence of a two-seater, scheduled for introduction late in '85. This car will be Avanti's first use of an all-new chassis design by former Pontiac engineer Herb Adams that will find its way under the current body shell in early '86. With backbone construction, a torque tube and '85 Corvette aluminum IRS rear end, the chassis is expected to be hundreds of pounds lighter than the present framework. Eight inches of wheel travel, full side frame rails and solid mounting to the body are all aimed at retaining Avanti's exceptional noise and bump isolation. And the classic Avanti kingpins have been retired in favor of a modern A-frame front suspension. Initial testing will take place on the racetrack, just like in the grand old days of car building.

Jeep Comanche XJ pickup

As reported here almost one year ago (*Cherokee XJ Pickup*, page 14, Nov. '83), AMC/Jeep is set to introduce its XJ pickup derivation of the downsized Cherokee/Pioneer/Wagoneer utility vehicles. The pickup will be called the Comanche and be released in the '86 model year.

The new pickup will be available in two-wheel and four-wheel drive. Standard equipment will include the Command-Trac shift-on-the-fly 4wd.

All three engines in the XJ lineup will be available with the Comanche, in combinations of short box, long box, two- or four-wheel drive. They are the GM-built, 2.8-liter gasoline V6; the Renault 2.1-liter turbodiesel Four and AMC's own 2.5-liter gasoline Four with throttle-body fuel injection. AMC's 2.5 will be the standard powerplant. The standard gearbox is a five-speed manual, with a Chrysler-built three-speed automatic as an option.

Other standard equipment will include power-assisted front disc/rear drum brakes, 1,200-pound cargo capacity, P195/75R15 steel radial tires and a three-year, no-rust-through corrosion warranty.

According to AMC's preproduction specs, the Comanche XJ sports an

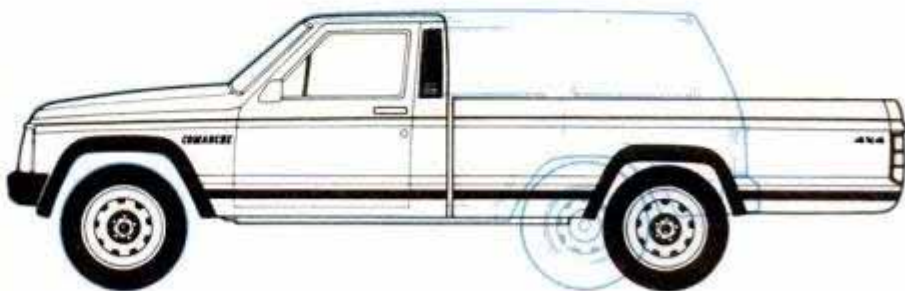
overall length of 194.1 in. and overall width of 66.1 in. on a wheelbase of 119.7 in. This is competition for the 130.8-in. wheelbase of the full-size J-10 and J-20 Jeep pickups and the 101.4-in. wheelbase of Cherokee/Wagoneer. Standard Comanche cargo box specs show a length of 88.6 in., width of 55.4 in., depth of 16.1 in. and 43.7 in. between wheelhouses. Its wheelhouse width, a major factor in load-carrying convenience, is about 3 in. wider than the Chevy S-10 and Ford Ranger small pickups, though both of those trucks hold greater volumes. If the incredible popularity of the downsized XJ wagons is any indicator, the new Comanche ought to be another grand-slam success for AMC/Jeep.

Bag it or buckle it?

After 15 years of wishy-washy delays, the federal government has ruled that carmakers must install automatic seat belts or air bags in 10 percent of their cars by the '87 model year. The percentage of equipped vehicles will rise in successive increments to 100 percent after five years unless, loophole lovers, states with two-thirds of the U.S. population pass mandatory seat belt-use laws.

The Big Three automakers are praising the DOT's loophole provision and crossing their fingers, hoping states pass seat belt legislation—this way they can avoid installing the bags. All three—GM, Ford and Chrysler—said

(Please turn to page 44)



AMC's downsized Comanche pickup will be a cut-down and extended Cherokee XJ. Options will include a short box, long box, 2wd, 4wd, three engines and two transmissions.

To each his own four wheel drive.

At Subaru we believe the extra measure of safety and traction of four wheel drive should be available to every driver.

Subaru presents the only full line of "On Demand"™ four wheel drive vehicles in America.

And we don't mean Jeeps® or trucks. We mean a family size Wagon, sporty Two Door Hardtop, open back BRAT®, practical Hatchback, even a luxurious Four Door Sedan.

Four Wheel Drive for everyone, because everyone needs Four Wheel Drive.

A sudden shower, a snowy road or a steep hill can cause a sharp loss of traction. Under conditions like these, "On Demand" Four Wheel Drive gives you an extra measure of safety and traction at the flick of a lever or a push of a button. Without stopping. So any time conditions look hazardous you can switch the odds in your favor. And your passengers'.

Extra safety that doesn't cost a lot of extra money.

Another feature of our "On Demand" Four Wheel Drive is its

affordability. It adds very little to the cost of a Subaru. And it's also economical to operate. In fact, our four wheel drive Hatchback is among the mileage* leaders in its size class.

Clearly, Subaru has done more with four wheel drive than anyone else.

So much that now Subaru not only has a car that's perfect for every driving condition, we have a car that's perfect for every driver.

SUBARU.
Inexpensive. And built to stay that way.



Seatbelts save lives.

27 EPA EST. MPG. 37 EST. HWY. 1984 EPA estimate for our 4WD Hatchback. Use EST. MPG. for comparisons. Your actual mileage will probably be less.

© Subaru of America, Inc. 1983

DETROIT LISTENING POST

(Continued from page 42)

they would lobby legislatures to pass the laws. Could this mean American automobile customers will pay for it (in higher car prices) to cover their lobbying expenses?

It would take a good 10 to 15 years for air bags to work their way into most of the cars on the road, and most experts I've talked to feel that they're less effective than properly designed seat belts. The bags provide less protection in fewer kinds of routine impacts than the less-costly three-point

seat belt systems already in cars.

The federal ruling coincides with the New York State law that says all front-seat passengers and children under 16 must buckle up or face a fine of \$50. New York is the first state to pass a belt-up-or-pay-up law. However, the home-state of the auto industry put off a mandatory seat belt proposal late last year. Michigan's legislature backed off the proposal after two state congressmen were unceremoniously dumped for their support of an unrelated tax measure. Recall fever was in the air, so the belt bill was put off until this year and, thus far, languishes in obscurity.

If you're like most weekend wood cutters, you want a chain saw that will run and run and run.

Well, that's the kind of performance you get from a Husqvarna Rancher.

Every part of a Husqvarna Rancher—from its fully automatic chain brake to its excellent anti-vibration system—is built to run hundreds and hundreds of hours without stopping.

And, if by some chance, anything should ever stop running on a Husqvarna, it can be repaired quickly and easily at a Husqvarna dealer. Because we won't let a dealer sell our saws, unless he can service our saws.

So if your chain saw isn't running the way it should, run out and get a Husqvarna Rancher at your local Husqvarna dealer.



MARATHON RUNNER

UP TO \$40 OFF ON A 50 RANCHER

Save up to \$40 off the manufacturer's suggested retail price on the Husqvarna 50 Rancher chain saw at participating dealers from September 1 through December 31, 1984, or while supplies last.

 **Husqvarna**
SWEDEN
The Chain Saw Professionals.

For the dealer nearest you consult your Yellow Pages. Or write Husqvarna, 224 Thorndale Avenue, Bensenville, Illinois 60106.

Turbo Fiero

Yes, that's a photo of a turbo under the hood of a Pontiac Fiero. No, you can't buy it from the factory because it's just an engineering exercise. However, if you really want one, you can have it. The engine is the 150-hp overhead cam 1.8 turbo already being installed in the Sunbird 2000, so if you check the wrecking yards you might find one. The



The 150-hp 1.8-liter Four is a slick fit in the Fiero's engine bay. You can do it.

engine is almost a drop-in according to a Pontiac engineer. Aftermarket turbos for the 2.5-liter engine are another possibility, but the 1.8-liter turbo leaves the engine compartment more serviceable. Or you can do what the factory is doing for '85: stuff in a 2.8-liter Chevy V6.

Ear to the ground

Spy shorts: It seems certain that Buick's two-seat sports car will be under public scrutiny by the spring of '87. This will follow the late-'86 introduction of the Pininfarina-bodied Cadillac Callisto, the \$50,000 two-seater likely to be finished at GM's ultramodern plant in suburban Hamtramck. Also spotted is a possible two-way Opel deal: Opel would send its sporty Ascona J-car front-driver here as an '87 replacement for the Cadillac Cimarron, and get Europeanized Pontiac Fieros in return.

Better headlights: Responding to petitions sponsored by GM and AMC, NHTSA has started making rules for a new GM-designed sealed-beam headlamp system. The Type F-class system is a four-lamp rectangular installation about half the size of the smallest lamps now legal. And, according to GM, it offers an aerodynamic design with better aim and more candlepower at less weight.

Joint Venture II: GM and Korean carmaker Daewoo inked a pact worth nearly a half billion dollars to produce 167,000 front-drive subcompacts for the '87 model year. Fifty percent of the brand-new designs could be sold here through Pontiac. Take that, Chevy! **PM**

Save Gas, Save Engine with 'POLY'

The following introduces one of the most fully tested and credentialed gas-saving, friction-reducing engine treatments ever to reach the market!

WHAT IS POLY? "Poly" is short for polytetrafluoroethylene (TFE). It is the slipperiest substance known to man (1981 Guinness Book of World Records, p. 188). The Petrolon Corporation, makers of Slick 50, has invented a way to permanently bind this slippery chemical to your engine with one treatment. All you do is add one quart of Slick 50 to your oil during oil and filter change. By reducing engine friction, Slick 50 increases gas mileage and horsepower and reduces engine operating temperature, thus causing your oil and engine to last longer. Just as important, it reduces metal wear, defraying costly overhauls.

HOW DO I KNOW THIS ISN'T A FRAUD? Slick 50 has some very impressive credentials. The "Consumers Digest" magazine (March/April, 1982, p. 35) states "Slick 50 does reduce engine heat and ordinary wear, and our informal tests indicate that it will improve gas mileage by about 2 or 3 miles per gallon." Researchers at the Franklin Institute Research Laboratory, after applying a powerful ultrasonic cleaning process to a Slick 50 treated engine, were surprised at its permanence. They stated, "We actually expected the Petrolon Slick-50 TFE Resin coating to also be removed, but later found it was still there."

The FAA (Federal Aviation Administration) has fully accepted Slick 50 Aircraft Piston Engine Treatment (F.A.R. #33.49). An FAA test simulating 1400 hours of engine use (equivalent to about 70,000 miles on a car) showed almost zero engine wear!

2500 miles after removing Slick 50 from the crankcase, lab tests at a leading university engineering experiment station showed that the benefits of Slick 50 were still there. They reported a horsepower increase of 16.9% and 9.9% for light and heavy loading respectively. The senior engineering researcher at the University of Southern California in San Diego stated this, "Slick 50 does increase horsepower and decreases fuel consumption in tests done at the university." The Space Shuttle Columbia uses the chemical "poly" in its gears and bearings because it is the only chemical lubricant which can withstand the heat and corrosive elements of space.

Perhaps most dramatic of all is a tor-



ture test overseen by the Automotive Services Council for Pennsylvania and shown on television station WTVE. Three cars with between 75,000 and 129,000 miles on them were treated with Slick 50. Six months later the oil was drained from each vehicle, and the cars were driven without the oil plugs for about a half hour. The water temperature never rose, and the engines sustained no apparent damage. There are many more tests available. If you are still skeptical, send \$2.00 to defray printing and postage costs, and we will send you additional, more detailed test information, etc.

HOW DO YOU TREAT AN ENGINE? Very simply. A few minutes before oil and filter change, add engine flush (sent free with each order) to clean out the engine. Let the engine idle for 10 minutes. Then drain the oil, change the filter, and add the proper amount of oil less one quart. Add one quart Slick 50, drive for 30 minutes, and leave it in the crankcase for 3,000 miles. As the engine operates, the oil carries the polytetrafluoroethylene between the parts where it is burnished into the pores of the metal. Once impregnated, it is permanent, so you do it only once, not each time you change oil. One quart of Slick 50 will treat all standard 4-, 6-, and 8-cylinder gasoline and diesel engines.

WILL IT WORK WITH MOST OILS? Yes, Slick 50 will work with all petroleum-based oils and all synthetics that are compatible with petroleum-based

oils. An exception is graphite oils. However, once an engine is treated, you can go back to a graphite type if desired.

WHAT ARE THE BENEFITS OF SLICK 50? Your actual benefits in percentages may vary, depending on the kind of driving you do, vehicle condition, weather, and geographic area. By reducing friction, Slick 50 does all of the following: It increases gas mileage. It increases horsepower—small economy cars and large RV's really need this! It reduces operating temperatures, thus increasing the lubrication and life of the oil and the engine. Last but not least, the drastic reduction in engine wear defrays or eliminates costly overhauls which could save you up to \$1,000. Slick 50 eliminates the "lubrication starvation" that all cars experience when first started before the oil has a chance to circulate. Up to 90% of the engine wear on a car can be caused by this lubrication starvation. You receive all of these benefits for \$34.95, less than the cost of two tanks of gas.

WILL SLICK 50 HARM MY ENGINE OR AFFECT MY WARRANTY? No! Slick 50 is suspended in an excellent grade of petroleum oil which meets or exceeds every manufacturer's engine warranty requirements. In addition, Slick 50 is the only product of its kind to have both an API (American Petroleum Institute) and an SAE (Society of Automotive Engineers) rating imprinted on the package. It also has a SF-CC-CD service classification.

ARE DEALERSHIPS AVAILABLE? Yes. Here's an opportunity to make handsome profits. Having such solid test results from major institutions makes Slick 50 easier to sell than many other products. Free dealership information is sent upon request.

Free engine flush sent with each order. Free shipping with orders of 2 or more.

For purchase or further information, call toll-free 1-800-525-8624 (in Colorado call 1-303-762-1385) or send to SLICK 50, 3148 S. York St., Englewood, CO 80110.

I enclose \$34.95 + \$4.00 shipping and handling.
 I want 2 or more (free shipping and handling).
 Check C.O.D. Visa/MasterCard
 Card No. _____ Exp. Date _____
 Name _____
 Address _____
(Give street address if possible for UPS delivery)

PM ELECTRONICS MONITOR

Rolling thunder

The Compact Disc revolution is thundering out of the home and going for a ride. Laser-read digital audio disc players from Sony, Pioneer and others will be available soon for in-dash mounting. This means your car stereo system will be equally capable of reproducing distortion-free concert hall dynamics as CD-based home systems are.

Sony's the first company to fit all the parts of a CD player into a dashboard cavity. The company's CDX-5 and CDX-7 models boast a laser playback assembly one-third the size of home units. Contributing to the shrinkage feat is a single, very-large-scale integrated circuit, newly developed to handle all laser-tracking mechanics and digital



AM and FM radio fits right into the dashboard with Sony's model CDX-7 automotive Compact Disc player. Pioneer's autosound Compact Disc player, the CDX-1, offers motorists multiple convenience features.

signal processing functions.

While Sony's CDX-5 is a CD-player-only model, the CDX-7 adds FM stereo and AM radio to the mobile jukebox. All CD player and radio functions are controlled from the dashboard unit, but to conserve space, some components of the radio tuner assembly are housed in an outboard module. This is mounted out of sight behind the dashboard.

Pioneer's CDX-1 is a CD player only. Like the Sony CDX-7, the Pioneer model is a two-piece system. The CD loading mechanism and function controls are mounted in-dash, and the digital signal processing components are contained in another chassis for discrete installation elsewhere in the car.

Micro computer newcomers



Epson's briefcase-size Geneva PX-8 computer offers built-in word processing for \$995.

Three new computers make news this issue: desktop systems from AT&T and Compaq, and a briefcase-size system from Epson.

AT&T's first micro is based on the 8086 microprocessor and runs on the Microsoft MS-DOS operating system. The phone company's PC can be had with two floppies with 128K of RAM (\$2,745), or one floppy and one 10-megabyte hard disk model (\$4,920). Add another \$65 for the MS-DOS system.

Compaq's Deskpro, the company's first non-portable unit, also is based on the 8086 chip. You can buy it in a variety of storage arrangements, from the \$2,495 single-disk 128K model, to the \$7,195 model with one floppy, one

10-megabyte hard disk and built-in streaming tape backup (normally a \$2,000 feature in itself).

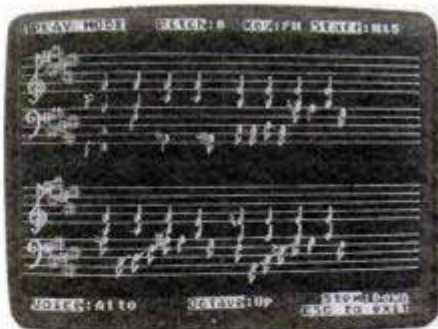
Epson's long-awaited Geneva PX-8 is \$995 compared to the \$3,000 price range of comparably sized models. The 4-pound machine uses a Z80A microprocessor, has an 8-line-by-80-character liquid crystal display, 32K of ROM and 64K of RAM. There are two sockets for plugging in ROM-based software, and the unit comes with WordStar, Microsoft BASIC, and CP/M operating and utilities—all in the ROM. It's the first lap computer with a full-scale word processing program rather than a simplistic text editor.

Add-on accessories include a snap-on memory expansion modem, and a built-in microcassette recorder that can store files and special programs for downloading. The PX-8 is software compatible with office-type CP/M computers, and can exchange files with PC-DOS/MS-DOS (IBM-type) computers.

Kid stuff

One of the hottest areas right now in computer software is educational programs for children. Some of the most innovative and challenging software comes from Mindscape Inc. in conjunction with the highly esteemed Bank Street College of Education.

Storybook lets a child draw pictures on the screen using a joystick. Then, using the keyboard, the child can edit and color the design and also write the text for an original, self-paced animated



Musicwriter, a program for Commodore and Atari machines, can help young Mozarts.

story. The completed drawings and narrative can be printed out and bound in a hard copy storybook.

Musicwriter, for Atari and Commodore 64 computers, lets a child compose music by sound and placing notes (whole to 32nd) on two staves visible on the screen. The child can program, and play back, four voices (soprano, alto, tenor and bass) at one time, and the program will store about 8,000 notes.

Musicwriter truly breaks new ground. Mindscape Inc. promises more to come.

PM

Formulated for the fast track.



Announcing... THE NEW CITGO RACING OIL

To meet the increased demands of today's turbocharged and other high performance engines, the new CITGO RACING OIL SAE 20W-50 offers superior levels of: • EFFICIENCY • POWER • PROTECTION. □ Originally developed for 200 MPH competition racing engines, the new turbo performance CITGO RACING OIL formula contains a special additive system. □ This extra measure of lubrication provides harder working protection against the damaging effects of extreme internal

temperatures, deposits, friction and wear. □ It is recommended for use in turbocharged and high speed gasoline and diesel engines, off-road, recreational and tow vehicles, as well as 4-cycle engines in motorcycles and boats. Protect your investment. Switch to premium quality turbo performance CITGO RACING OIL 20W-50. □ CITGO RACING OIL meets or exceeds all gasoline and diesel engine warranty requirements for API service SF, SE / CD, CC.



CITGO Petroleum Corporation
SUBSIDIARY OF THE SOUTHLAND CORPORATION

CITGO RACING OIL
BORN ON THE TRACK. READY FOR THE ROAD.

NEW LUCK LIG

**Extra Mild!
Low Tar!
Great Taste!**

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

Lights: 8 mg. "tar", 0.7 mg. nicotine; 100's: 9 mg.
"tar", 0.8 mg. nicotine av. per cigarette by FTC method.

Y HITS!

100's:
Only 9 mgs. tar.
0.8 mg. nic.

Kings:
Only 8 mgs. tar.
0.7 mg. nic.



THE PM WORKBENCH



Sawbuck for safer chain sawing



The Woodlander Sawbuck has two braces mounted down low so they won't interfere with chain saw cuts. Aluminum construction keeps weight to 12 lb., yet supports up to 800-pound log bundles so they can be cut safely.



The real danger in using a chain saw comes from cutting at awkward angles or too close to the ground. The Woodlander Sawbuck supports up to 800 pounds of logs at a safe, convenient cutting height. Three crossed aluminum angles have heavy-duty elastic

cords to secure bundles of smaller logs. Cross braces 2 in. above the ground hold the frame rigidly without blocking saw cuts. The unit sells for about \$60. For more details contact Timbermate Inc., Box 375, Rockaway, N.J. 07866.

—Angus Laidlaw

Wood cutting handbooks



In *Sharp Advice For Chain Saw Owners*, Stihl tells you all about saw chains and chain maintenance in 18 pages. It's available by sending 50 cents to Marketing Dept., Stihl Inc., 536 Viking Dr., Virginia Beach, Va. 23452.

McCulloch's Guide To Firewood Cutting On Public Lands, free from McCulloch dealers, provides information for obtaining firewood permits in national and state forests.—J.T.

Saw chain power sharpener



Sharpening kit uses car battery power to keep saw chains cutting most effectively.

Keep McCulloch Eager Beaver, Electramac 100, 300, and 500 series chains cutting efficiently. Kit (\$35) has a 12-v. motor with a 7-ft. cord, cigarette lighter plug or alligator clips, 9mm and 10mm wrenches and a 5/32-in.-dia. sharpener. Contact McCulloch Corp., Box 92180, Los Angeles, Calif. 90009.—J.T.

Three-way work support

The BuckHorse is a self-stabilizing sawhorse with a removable 2x4 top capable of supporting up to 500 pounds. It is also a sawbuck for holding logs. By working a pair together, they become scaffolding for painting and wallpaper r- ing. Two BuckHorses come in a 20-pound package with a postpaid price of \$39.95 from Patterson & Patterson Inc., 2216 Sandridge Rd., Dayton, Ohio 45439.—Angus Laidlaw



Sawhorse is self-stabilizing, zinc-plated and can be folded into a portable package.

Heat gun strips paint

Heat 'N Strip electric heat gun is ideal for heat-shrinkable tubing and for softening adhesives, putty and linoleum. The Heat 'N Strip gun blisters oil or latex paints and varnishes with 830° F. output. Model 9751 retails for \$7.49. A scraper kit for \$5.49 is also available. It's made by Black & Decker, 701 East Joppa Rd., Towson, Md. 21204.

—Angus Laidlaw



Concentrated electric heat gun can be used effectively and safely.

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.

INTRODUCING THE TRUCK DESIGNED TO CARRY A TUNE.

A tune you can shape with the Equalizer V.

Now the Delco Electronics Equalizer V option makes the sound of great music part of the driving enjoyment of selected '85 model Chevy and GMC trucks.

With this graphic equalizer you can separate and blend the bass, midrange and treble responses in your favorite tunes, while the system-designed speakers deliver fidelity unexpected in a truck.

That's because, unlike some other truck radios, the Delco music system wasn't an afterthought. When these trucks were on the drawing board, so was Delco Electronics, determining the precise location for the system's speakers

for optimum audio performance.

The result is a music system that's designed into the truck as carefully as the suspension. Visit



your nearest GM dealer for a test-listen of the Equalizer V.

And look for the Delco-GM name on music systems in all Chevrolet and GMC trucks. Wherever the music goes, there's Delco Electronics bringing you the art of music through the science of sound.



Delco Electronics

A DIVISION OF GENERAL MOTORS

BRINGING YOU *THE ART OF MUSIC* THROUGH THE SCIENCE OF SOUND.

SCIENCE WORLDWIDE



Solar eclipse brings the unexpected



Shot of sun's atmosphere (left) was taken by Leif Robinson as PM eclipse team (right) got rained out.

PHOTO BY DONALD F. TROMBINO

An annular solar eclipse, which the Eastern United States experienced May 30, takes place when the moon is far enough from Earth so that it doesn't completely block the solar disc. When that happens, astronomers aren't supposed to be able to capture on film the solar corona, or outer atmosphere. But *Sky and Telescope* editor Leif Robinson in South Carolina captured an unexpected corona when he photographed the eclipse for us. How? Robinson speculates that the sun was glowing brighter than predicted on the day of the eclipse. From our observation post in Williamsburg, Va., astrophotographer Robert Little and I had a less pleasant surprise. We had cloudy and rainy weather. Here we are (above, right) looking through an antique 5-in. telescope with the same resolving power as the compact Criterion 4000 sitting beneath it.

Tooth enamel: from mice to men

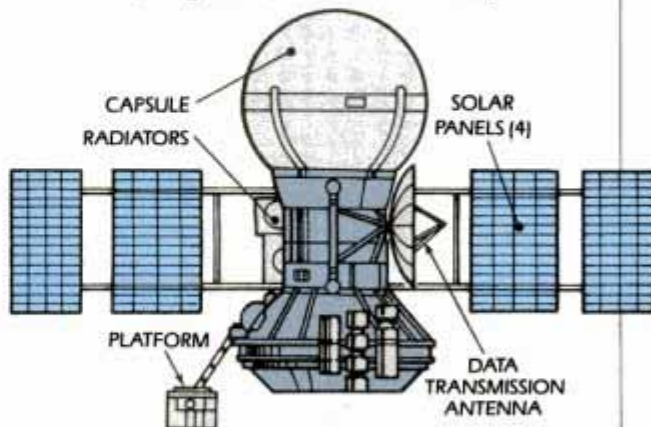
Dentists of the 1990s may be filling decayed teeth with the same enamel that naturally protects your teeth from decay. Scientists at the National Institute of Dental Research have succeeded in cloning enamel from a cell taken from a mouse's tooth. They are now using a similar technique to duplicate human tooth enamel. Next step: Expose the enamel to antibodies

Finally: man-made drugs

A decade ago, scientists working at independent laboratories around the world reported that they had discovered a new pain-killing drug. Called endorphins, it is produced in the human brain. But the drug—which acts somewhat like heroin—has lately been produced synthetically in labs. The discovery of endorphins has opened up new avenues of study on how our brain functions. And medical scientists are using the drug experimentally to treat pain and some rare nerve diseases. This exciting subject is sewn neatly together in a new book, *Endorphins*, by Joel Davis (Doubleday, \$16.95). In it, Davis calls the human brain the next frontier of science. It's exciting reading.

Vega unveiled

At the invitation of the Soviet Union, American Planetary Society director Louis Freedman visited Russia to look at its twin Vega satellites. They will be launched on a photographic mission to Venus in December. Until now, little has been known about the Vegas. But we can report each craft has a balloon-shaped capsule containing computers. Solar panels provide on-board power, and radiators shed solar heat. A data transmission dish will send to Earth video pictures of the Venusian



All creatures?

In the 1950s, biologists listed over 1 million animal species. If it seems most species have already been discovered, take note of a paper published in the journal, *Cryptozoology*. The paper conservatively estimates that a catalog made in the year 2000 will list 250,000 new species, mostly sea life.

New heavenly bodies

In an average year, astronomers discover about 20 new asteroids orbiting the sun between Mars and Jupiter. But Jet Propulsion Labs astronomer Eleanor Helin says 10 new asteroids were discovered in the first quarter of this year alone. Lab officials speculate the new discoveries are coming faster because astronomers are paying more attention to asteroids these days.

Is there a monopole?

The physics world was excited in 1982 when Stanford researcher Blas Cabrera detected what was thought to be the first known monopole. A monopole is a theoretical subatomic particle that can be either positively or negatively charged. If confirmed, physics will have a particle to explain the behavior of magnets and to help develop a unified theory that can explain all physical phenomena. Stanford is now building a newer, larger monopole detector to increase Cabrera's chances of confirming the existence of a monopole.

atmosphere with cameras mounted on an outboard platform. The Vegas carry enough fuel for their planned 1986 encounter with Halley's comet. **PM**



There's a lot to appreciate behind the wheel of a new Grand Prix. While its finely detailed interior harbors you in private luxury, its brightly accented exterior invites longing glances.

But it's out on the open road that Grand Prix really shines! Feel the power of its responsive 3.8 liter V-6 engine or the available 5.0 liter V-8. Enjoy the control of its power steering and power brakes and ride

**Aren't you
glad we use dials?
Don't you wish
everyone did?***

PONTIAC GRAND PRIX

WE BUILD EXCITEMENT

on the sure-footed comfort of its full coil suspension.

But there's one more thing we're sure you'll appreciate: the available Rally gage instrument panel with tachometer that keeps you dialed in to many of Grand Prix's most vital systems.

Grand Prix... it's undeniably Pontiac!

Pontiacs are equipped with engines produced at facilities operated by GM car groups, subsidiaries or affiliated companies worldwide.

*Courtesy of Armour-Dial, Inc.



LET'S GET IT TOGETHER ♣ BUCKLE UP.

Quicker, safer chain-sawing

The Lift 'N Guard chain saw attachment allows you to cut wood right where it



Start cutting with the arms of the Lift 'N Guard extending under the log (above). Then lower the saw, lifting the log off the ground, and cut clean through (right).

lies—no more lifting heavy logs onto a sawbuck or similar log-holding device.

This unique attachment eliminates chain pinching while protecting the bar and chain from hitting the ground. When cutting larger logs or when felling trees, the Lift 'N Guard pivots upward, allowing the saw to be used normally.

The product comes complete with a new bar and chain in 14-in. (\$80), 16-in. (\$85) and 20-in. (\$95) lengths. Add \$3 for shipping. For more information or to place orders, write to Energy Equipment Co., Box 385, Clackamas, Ore. 97015.



Cordless drill/screwdriver



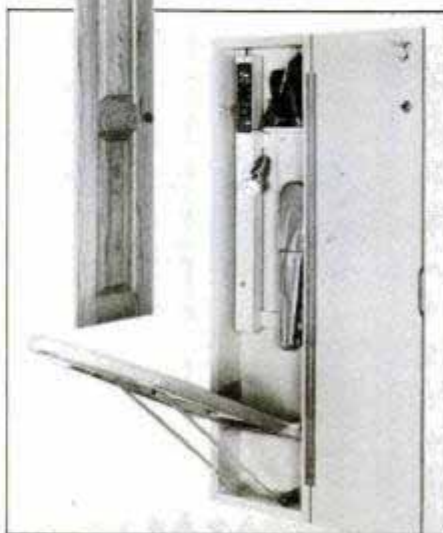
Replaceable, rechargeable battery packs keep Skil's latest 3/8-in. cordless drill/screwdriver, Model 2011, on the job full time. While one pack powers the drill in the yard or on the boat away from power lines, an optional second pack, available for \$42, plugs into 115-v. power to build up a full charge from zero in one hour. A built-in temperature sensor prevents overcharging. Variable-speed trigger with lock and on/off/reversing switch controls the tool. Its no-load speed is 600 rpm. Suggested retail price is \$94.95. It's made by Skil Corp., 4801 West Peterson Ave., Chicago, Ill. 60646.

Dual wheelbarrow kit

Double your wheelbarrow's ability to tote heavy loads across rough or soft ground by adding a second wheel. If your barrow has a wheel with a 4x16-in. pneumatic tire, the T2W Two-Wheel Kit converts it easily. Kit includes longer axle shaft and a four-ply tire with inner tube on a ball-bearing wheel. T2W kits for Trallfa T525 and T600 barrows are \$40. For other makes with 4x16-in. tires, \$44 from Alexander Marketing Inc., Box 2722, Livonia, Mich. 48150.



Iron hider

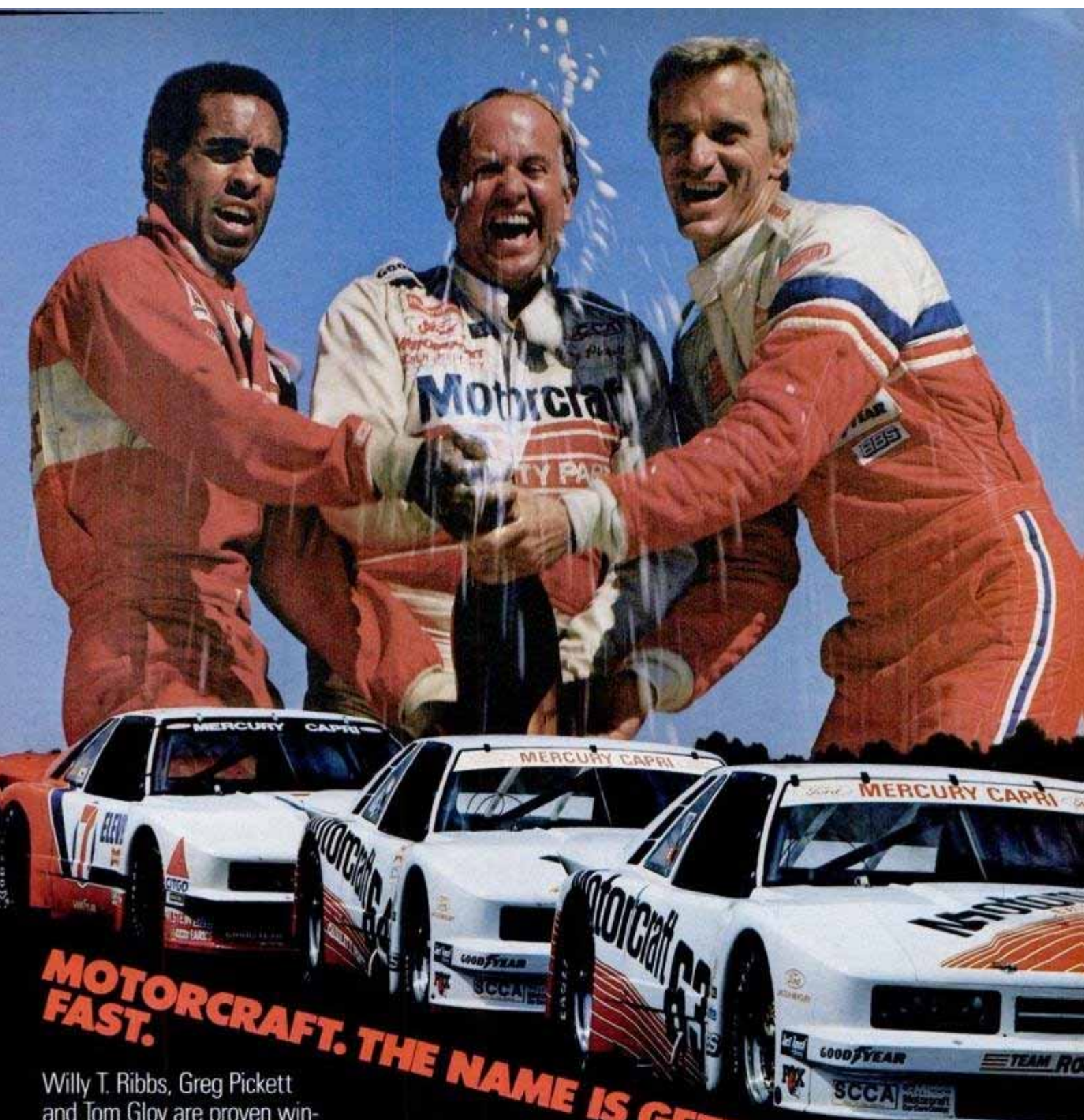


Once a cabinet-built feature in high-class homes, the recessed ironing board has gone the way of the skilled craftsmen who could build it. Now, for \$159 to \$299, you can get a prefab steel ironing center with piano-hinged door designed to fit between studs on 16-in. centers. A hot iron compartment, 42- or 46-in. board, sleeve board, power connections and a spotlight are other features. It's from Iron-A-Way Inc., 220 West Jackson, Morton, Ill. 61550.

Cat on a hot oil stove



This catalytic filter mounts above the burner in a kerosene stove to do the same job as the catalytic converter in your car's exhaust pipe. Called pure • a • fire, the catalyst kills kerosene odor and eliminates soot buildup on walls and drapes, in the process converting hydrocarbons and carbon monoxide into harmless and odorless carbon dioxide and water vapor. It retails for \$14.95 from Catalytic Damper Corp., Box 188, Flint Hill, Va. 22627. **PM**



MOTORCRAFT. THE NAME IS GETTING AROUND. FAST.

Willy T. Ribbs, Greg Pickett and Tom Gloy are proven winners on this year's Trans-Am circuit. They've been winning everywhere from Detroit to Daytona. Not surprising really. Because not only are they first-rate drivers, but their winning Mercury team had quality

Motorcraft parts with them all the way to the finish line.

Put Motorcraft in your car and join the winner's circle. Motorcraft. Quality parts for all makes of cars and trucks.

Motorcraft
EXCEEDS THE NEED



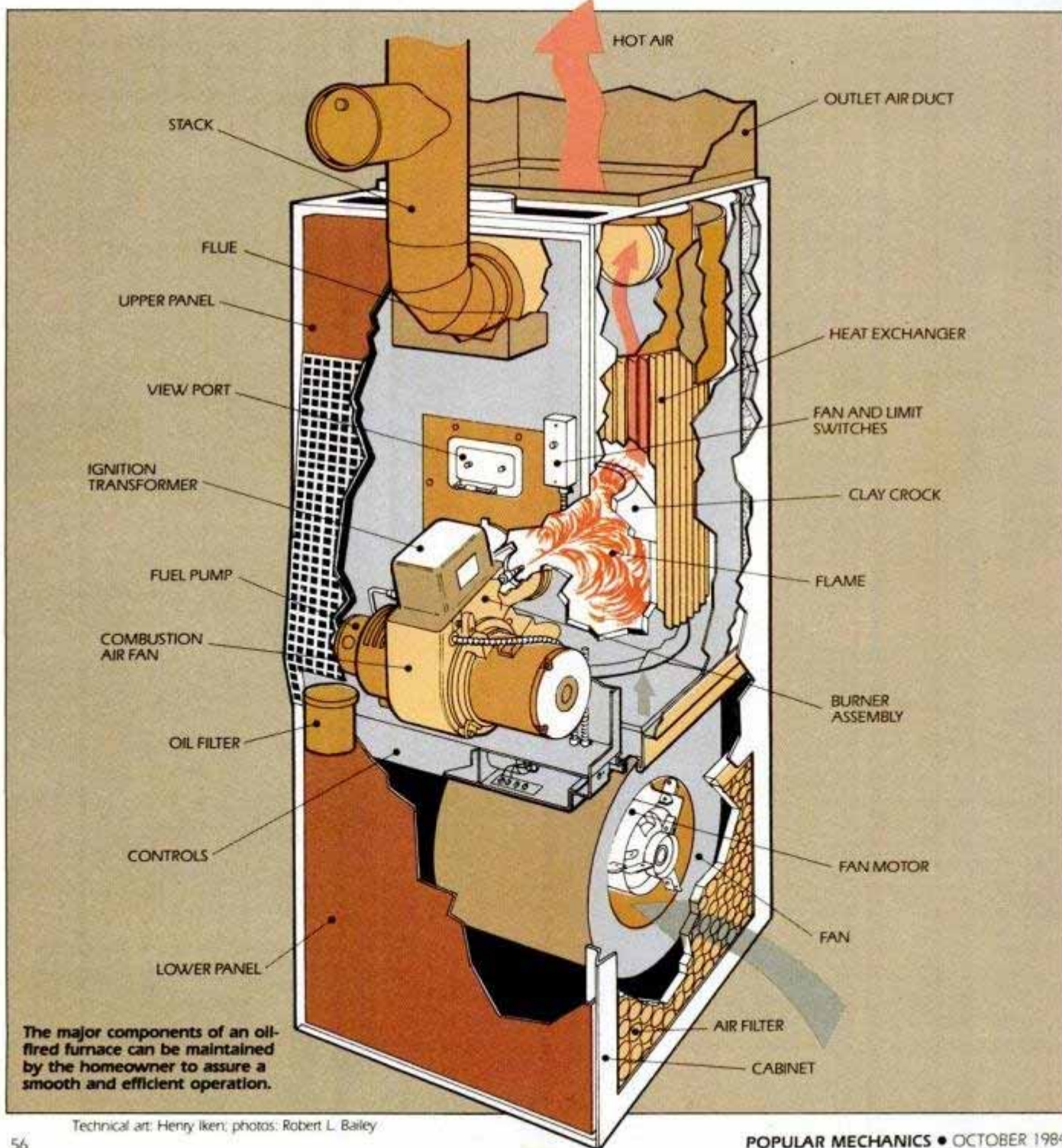
TUNE UP YOUR OIL BURNER FOR WINTER

One good reason to service your oil-fired furnace yourself is to save the service technician's fee. Another, perhaps more important, is that you may well do a better job. The procedures outlined here should be performed once every two years. They're aimed at main-

Follow our step-by-step service guide to run your furnace at peak efficiency.

BY ROBERT L. BAILEY

taining an older furnace at peak efficiency, prolonging its life and minimizing air pollution in the home. Some modifications and improvements are also suggested to ease maintenance and make your furnace run better than new. Oil-
(Please turn to page 178)



Technical art: Henry Iken; photos: Robert L. Bailey

Start your own money making business!

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

*Train FAST
at home!*

*Get into this booming high-profit business that's
Easy to learn—Easy to do—Easy on You!*

Never before have money-making opportunities been so great for qualified Locksmiths. Now lucrative regular lock and key business has multiplied a thousandfold as millions seek more protection against zooming crime. Yet there's only one Locksmith for every 17,000 people!

Start Collecting CASH PROFITS Right Away

You're "in business" ready to earn \$5 to \$12.50 an hour a few days after you begin Foley-Belsaw's shortcut training. Take advantage of today's unprecedented opportunities in locksmithing for year-round EXTRA INCOME in spare time—or fulltime in a high-profit business of your own. Hundreds we've trained have done it. So can YOU! All tools plus professional Key Machine given you with course. These plus practice materials and equipment, plus simple, illustrated lessons, plus expert supervision, plus business-building guidance will enable you to KEEP THE MONEY COMING IN! Ideal for retirement—good jobs, too.

SEND FOR EXCITING FACTS—No Obligation

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

No Extra Cost! Included With Your Locksmith Training



BURGLAR ALARM and SECURITY SYSTEMS

training Covers all phases of Burglar, Hold-Up and Fire Alarm servicing and installation. This valuable and timely instruction includes all special tools and supplies. ONLY Foley-Belsaw offers such extensive training in this rapidly expanding field as a part of your Locksmith training.

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

Be Your Own Boss!



BE A LOCKSMITH!

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

"Before enrolling I checked other courses and also asked for advice from several locksmiths in my area. They all said yours was tops and has the most versatile Key Machine."

"I always wanted to be in business for myself and now I am... thanks to Foley-Belsaw Institute."



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

10-DAY NO RISK TRIAL!
Send for details!

THIS PRO KEY MACHINE IS YOURS TO KEEP!



FREE This Pro Key Machine can alone add up to \$200 a month to your income... and it won't cost you a penny extra with your training.

Find out all about it! Send for FREE Facts TODAY!

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

RUSH COUPON!



ALL SPECIAL TOOLS AND EQUIPMENT INCLUDED!

FOLEY-BELSAW INSTITUTE
10512 Field Bldg., Kansas City, Mo. 64111

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

RUSH COUPON TODAY FOR THIS FACT-FILLED

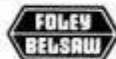
FREE BOOKLET!

Tells how you quickly train to be your own boss in a profitable Sparetime or Fulltime business of your own PLUS complete details on our 10-Day NO RISK Trial Offer!



Send for your copy today!

FOLEY-BELSAW INSTITUTE
10512 FIELD BUILDING
KANSAS CITY, MISSOURI 64111



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

Name _____
Address _____
City _____
State _____ Zip _____



"I opened my own business, spare time, seven months after I enrolled and made a profit of \$329 for the first week."
B. A. Deberry Littleton, Colorado

"No more hard, nasty work for me. Now I have my own business and with hardly any effort I average around \$50 a day. Thanks for my new start in life."
Sam Walker Prichard, Alabama



... YOU Can Do It Too!

PM LOOKS AT...



Micro II Lathe

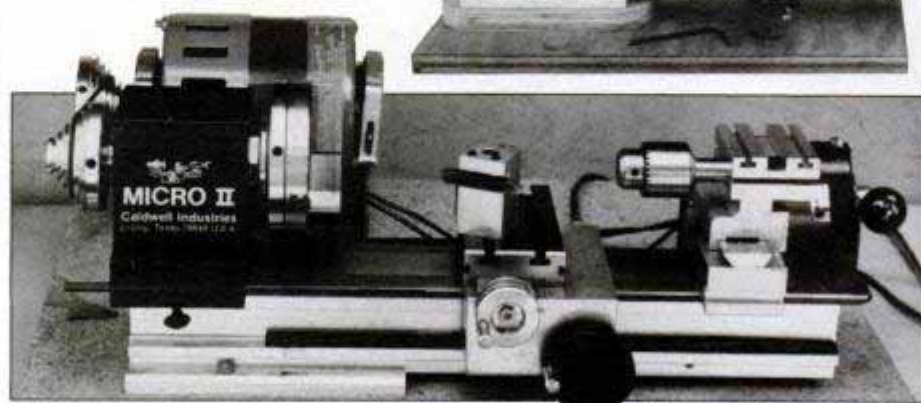
Metal cutting has always been a fascination for the home craftsman. But basic small lathes, built around expensively machined iron castings, cost \$600 to \$1,000 these days. By applying space-age engineering to manufacturing and do-it-yourself assembly, Caldwell Industries' Micro II offers the basics at \$75 for an 11-in. bed or \$99 for a 15-in. bed. Total cost for an effective mini machining center comes to about \$300—roughly half that of competing tabletop lathe systems.

The basic Micro II has a 4 1/2-in. swing, which means you can turn a workpiece nearly 9 in. in diameter. The short bed handles up to 5 3/4 in. between centers while the more versatile 15-in. bed takes 9 3/4 in. Accessories allow the Micro II to be set up to perform all kinds of machining within its size limitations. For example, a \$49.63 milling attachment converts the Micro II into a precision machining center capable of making almost any metal part including many lathe tools and fixtures.

The basic lathe kit gives you extruded sections, a milled steel plate to form ways, headstock assembly with permanently lubed precision ball bearings, carriage depth stop, grout and complete instructions. Add your own 1/10- to 1/4-hp motor and drive pulleys. Or you can buy them, cutting tools, chucks and other accessories from Caldwell. Assembly is a nuts and bolts job.

The Micro II bed is an assembly of

Micro II Lathe with 15-in. bed gives high quality basics for \$99 (right) but requires about \$200 in options to turn it into a mini-machining center (below). Total cost is still much less than most other small lathes.



extrusions with a 2 1/4-in.-wide by 5/16-in.-thick bevel-edged steel plate solidly bolted on top to form the ways. The grout fills the space under the ways.

The extrusions are accurately and smoothly finished, but the way plate must be lapped so the tool post and optional tail stock can slide along it accurately and smoothly. This is a half-hour job—you must slide the tool post assembly along the ways with an abrasive compound made from kitchen scouring powder and motor oil.

Other parts of the lathe are just as innovative and ingenious as its built-up bed. Specialized extrusions have dovetails and T-slots wherever there's room. These make it easy to devise setups and accessory mountings to solve machining problems.

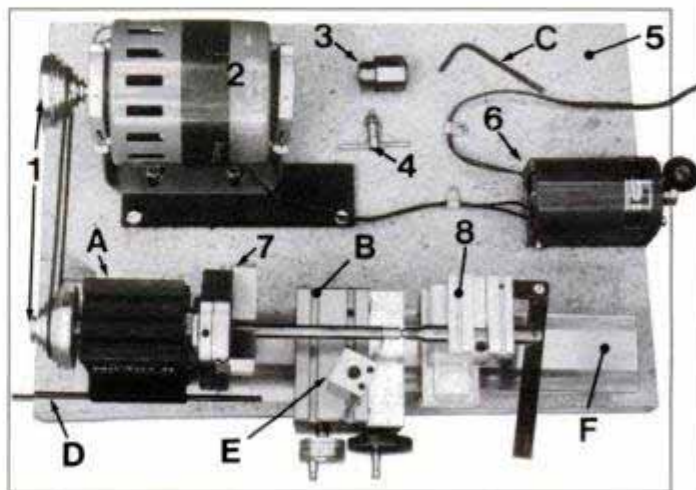
I found the Micro II a fascinating tool to assemble and use. The lathe has a rugged feeling. Its six speeds from 525 to 5,200 rpm can easily hog a 1/8-in. cut in 1-in. mild steel or precisely dust off a few tenths.

I think I would prefer stepped, reversible jaws in its optional three-jaw scroll chuck in place of the straight ones provided. Holes for a rod to hold the front half while tightening or loosening the chuck would be helpful as well. An adjustable depth stop that limits carriage movement toward the chuck controls drilling depth. This is one of the Micro II's nicest features. The Micro II is available from Caldwell Industries, 603-609 East Davis St., Luling, Tex. 78648. Send \$1 for a catalog.

—Walter E. Burton



Lap lathe ways before assembly (above) with compound of scouring powder and oil. Stock parts at right are: head stock (A), cross slide (B), allen wrench (C), carriage stop (D), tool post (E),



lathe bed (F). Available options for the lathe are: pulley and belt set (1), motor (2), chuck (3), key (4), mounting board (5), motor switch (6), 3-jaw chuck (7), and tail stock assembly (8).

NEW EXXON UNIFLO.®

A New Age of Engine Protection Has Dawned. Imagine. One motor oil for all cars. Exxon brings you a motor oil that can ensure super premium protection for every car on the road today... every gasoline, diesel, turbo, even vans and light trucks. It exceeds the Industry's most severe protection rating for gasoline and diesel automobiles. It's also fuel-saving. **New Exxon Uniflo.** Our most advanced protection ever.



Quality you can count on.



WORKSHOP MINICOURSE



Using hand planes

In this day and age of specialized power equipment, it's refreshing to know that a human-powered tool like the bench plane is still indispensable. When properly sharpened, it excels at smoothing rough surfaces, trimming stock to size and cutting rounds and chamfers.

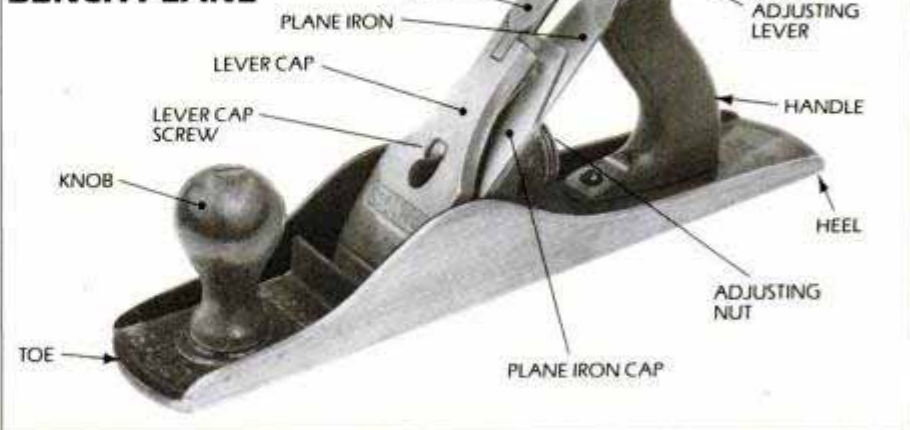
These tools are available in a wide variety of sizes and configurations with the most common being the block, smoothing, jack, fore and jointer planes. These measure 6, 9, 14, 18 and 22-in. long, respectively. The function of each overlaps its neighbors considerably, so you certainly don't need all of them in the average shop.

The basic operating techniques are the same for all these planes. Begin by resting the toe of the tool flat at one end of the board. Then, apply a bit more pressure to the knob than the handle and begin the stroke. When you reach the other end of the board, relax the knob pressure slightly and continue the pass with a smooth motion directed from the rear handle. Do not stop or start in the middle of a board, and always work in the uphill direction of the wood grain.

It does take some practice to properly sharpen the blade—which is essential—and to adjust the blade projection and angle for the best cut. For these reasons, always test the tool on scrap before starting on a specific project.

—Rosario Capotosto

BENCH PLANE



Steel woodworking planes come in a variety of lengths, widths and configurations. Most have the same basic design and components as those shown on the bench jack plane above.



For a plane to work well, its iron (blade) must be sharp. While this can be done by hand, a sharpening guide like the one shown yields the most precise bevel angle.



Depth and evenness of cut are determined by amount of blade projection below tool's base and side-to-side angle of projection. Adjust both while sighting down bottom.

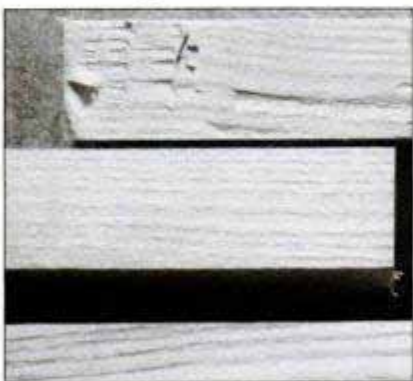


A long jointer plane excels for straightening board edges that will be glue-joined later. Work from one end of a board to the other using smooth, uninterrupted strokes.

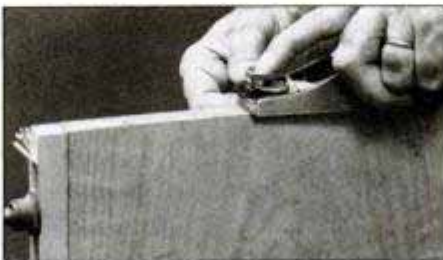


A jack plane works well on warped stock. Begin with diagonal strokes to remove high spots, then lengthwise for final smoothing. Check progress often with a straightedge.

Planing With Grain



Plane in uphill direction of grain to get smooth cut (middle). Here, proper direction is left to right (bottom). Working in other direction (top) causes gouges.



A block plane will smooth end grain easily, but you must use a scrap block clamped to the outboard edge of stock. Otherwise, the corner will split, like the scrap above.



To chamfer or round edges with plane, mark depth limits in pencil, then make repeated continuous passes until lines are reached. Tool cuts best when held at slight angle.

Eastwood's Home Autobody Repair Shop



The Sure Way to Kill Rust. Eastwood's Cost-Effective Sandblaster.

When rust cuts deep, the only way to get it out **completely** is with a sandblaster. With thousands sold, our sandblaster is field-proven and cost-effective. This tool will let you do the jobs you once had others do: Dispose of rust, scale, paint and corrosion in minutes.

The Eastwood professional sandblaster package includes our all-metal, power gun (same as used on our larger units), ten-foot hose, 14" pickup tube, spare nozzle and detailed instructions. Just hook up to a one H.P. compressor, insert the pickup tube into dry sand or other abrasive and you're ready to go. The blaster's suction head draws abrasive easily. No surging. No skipping.

Three operations in one: Sandblaster, liquid blaster, air gun. With degreasing solutions, you can use it to remove buildup on engines and parts. Also get a high-velocity flow of air to dry or clean parts. All spare parts are available through our catalog.

- #8532 Sandblast Gun \$30.95
- OPTIONAL: Sandblast hood with replaceable lens.
- #9536 Sandblast hood and lens \$19.95

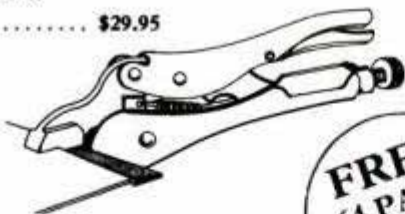
Flangers Make Patch Panels Fit Flush

Make professional patch panels that fit perfectly using this newly designed panel flanger. It's the easy way to replace rust or collision damage.

This design uses strong cam action leverage to make effortless offsets, even on heavy, 18-gauge metal. The tool's crimping jaws are made of forged steel with heat-treated alloy inserts for long life.

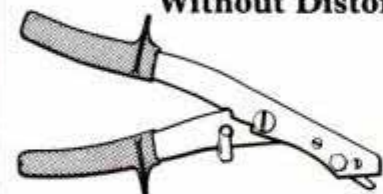
To use, adjust the panel flanger to the proper gauge metal and compress the handles. After every offset, the jaws automatically open ready for the next position. Works in tight areas and on high-crowned panels and sculptured contours.

- #6286 Panel Flanger \$29.95



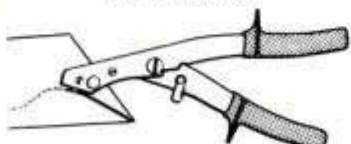
FREE 64 PAGE CATALOG
With Each Order

Our Nibbler Cuts Body Metal Fast—Without Distortion



Featured in Hot Rod Tool Crib Aug. '83

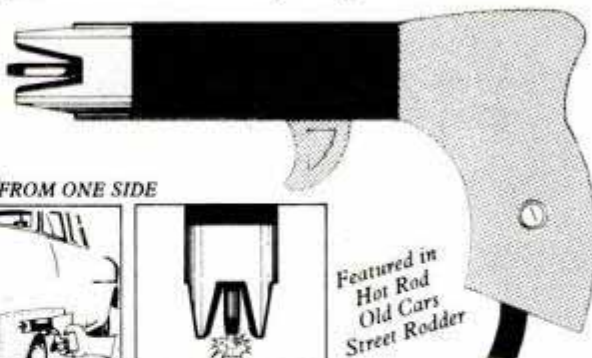
The cutting process is done by holding the metal in stationary jaws with movable center jaw shearing the metal against the stationary jaws. This eliminates the curling and rough shear effect of ordinary snips. Will cut up to 15 gauge on aluminum, brass or copper and to 18 gauge on mild steel. This unique design allows cutting curves, straights - any shape you need. The cutting jaws are made of heat treated tool steel and replace easily after long hard use.



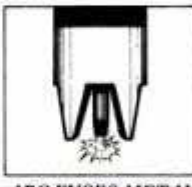
Cuts sheet metal and tubing without distortion. Cutting can be started by drilling a 1/4" hole to start the cutting jaws. Uses less effort than conventional tin-snips. These nibblers are great for auto body work removing collision damage and "rust-outs".

- #6281 Nibbler \$28.95
- #6284 2 Center Blades 9.95

Spot Weld Perfectly In Just 6 Seconds



WELD FROM ONE SIDE



ARC FUSES METAL

Featured in Hot Rod Old Cars Street Rodder

MAKE FAST DISTORTION FREE WELDS

Spot welding has some distinct advantages. It's very fast - a few seconds for a sound weld. Because the heat is confined to a small area (the 1/4" dia. electrode) it avoids warpage or distortion. Allows for accurate control that lets you make consistently uniform welds.

EASY TO USE - EVEN FOR BEGINNERS

Become a pro in just a few minutes. Hook it to the electrode holder of your arc welder (set at 50 amps) and ground to car body. Just pull back the trigger to retract electrode, line up weld point and press head against the metal. Metal must be free of paint, rust or grease. Release the trigger and allow the electrode to contact the metal and glow for 1-2 seconds. Then raise the electrode with the trigger and allow an arc to form a molten puddle of metal (always use welding goggles or shield). Each weld takes about 5- 6 seconds. Automotive manufacturers used spot welds to build your car and you can restore it with the same authentic technique.

CONVERTS AN ARC WELDER TO A SPOT WELDER

It welds any steel between 18-26 gauge. (Auto body steel metal is between 18 and 22 gauge). Ideal for welding replacement panels, floors, brackets, clips, braces, channels, etc. Welds from one side so it can even do blind panels that ordinarily can't be spot welded. Comes with two pressure heads - four prong for control on flat areas and two prong for reaching into edge and recess work. Proper replacement electrodes available through Eastwood. Gun comes complete with connection wire, spare electrode, 2 pressure heads and complete instructions.

- #4355 Spot Weld Gun \$32.95
- #4321 Package of 10 extra electrodes \$9.75
- #4367 Welding Goggles \$6.95

TO ORDER CALL TOLL FREE

1-800-345-1178 In Penn. (215) 644-4412

30 DAY MONEY BACK GUARANTEE

Send me the following: CODE PMA4

_____ Item(s) # _____ \$ _____

_____ Item(s) # _____ \$ _____

_____ Item(s) # _____ \$ _____

_____ Item(s) # _____ \$ _____

_____ Item(s) # _____ \$ _____

Packing and Guaranteed Delivery Charge if your order is:

\$1.00 to 20.00 - \$3.50 30.01 to 40.00 - \$4.40 50.01 to 75.00 - \$6.00
20.01 to 30.00 - \$3.95 40.01 to 50.00 - \$4.95 75.01 and up - \$6.50 ▶ \$ _____

Send me your 64-page catalog — \$2.00 \$ _____

Check Enclosed. TOTAL \$ _____

VISA MasterCard C.O.D. (Add \$2.00)

Credit Card _____ Expiration Date _____

Name _____

Address _____

City _____ State _____ Zip _____

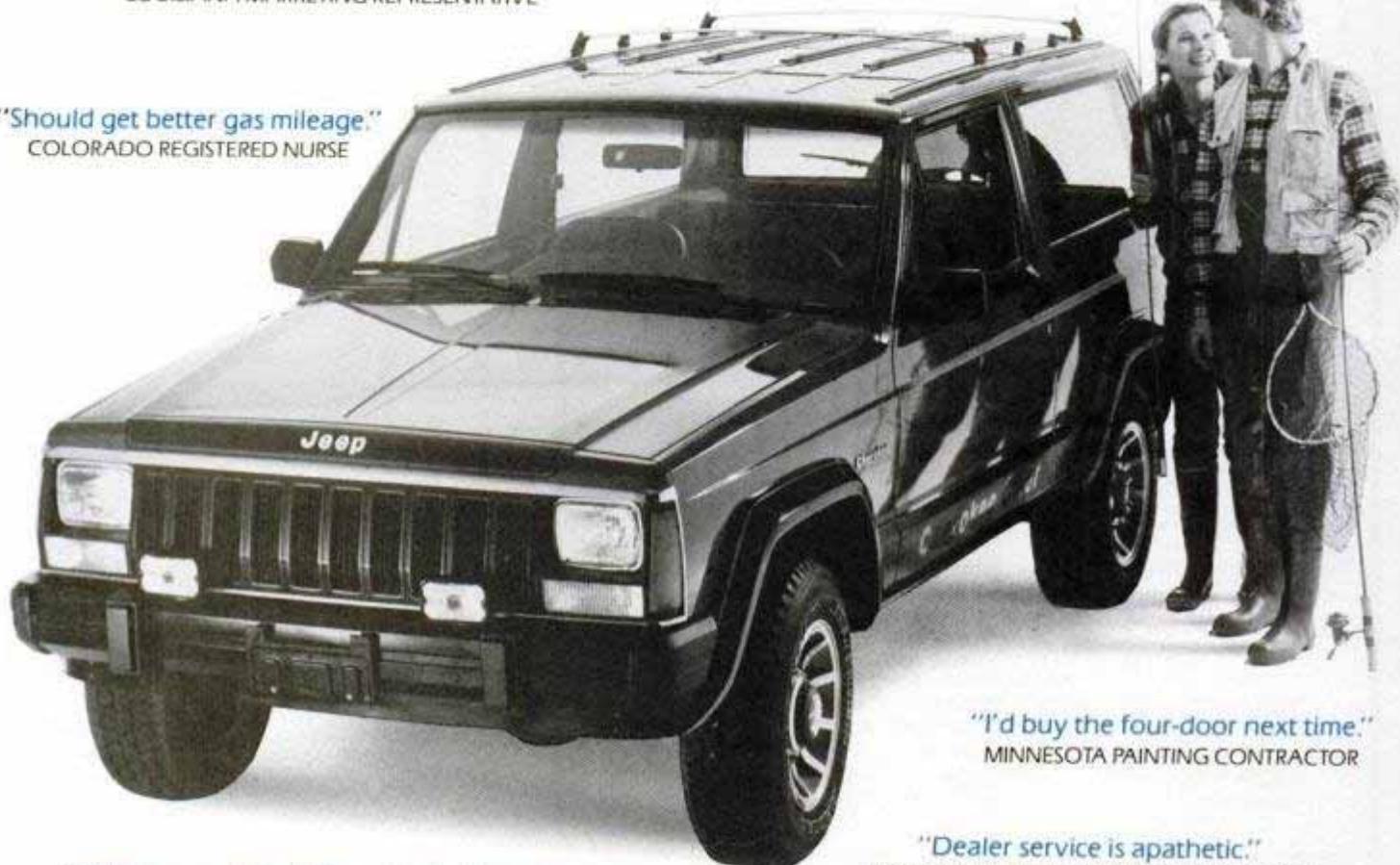
EASTWOOD COMPANY
147 Pennsylvania Ave., Box 296, Malvern, PA. 19355 (215) 644-4412
(PA residents add 6% sales tax)

JEEP CHEROKEE/WAGONEER

"I'm planning on driving it at least 200,000 miles."
LOUISIANA MARKETING REPRESENTATIVE

"Should get better gas mileage."
COLORADO REGISTERED NURSE

"Jeep is the Cadillac of four-wheel drives."
NEW YORK REALTOR



"I'd buy the four-door next time."
MINNESOTA PAINTING CONTRACTOR

"We've owned eight Jeeps in the last nine years—
we believe in the product."
MICHIGAN SALES MANAGER

"Dealer service is apathetic."
MASSACHUSETTS MARKETING CONSULTANT

PHOTOS BY BILL ASHE

Owners say that downsized SportWagons offer utility that the competition can't beat.

When Ford and Chevrolet downsized the Bronco and Blazer, sales of both took off like bats. That left American Motors with the big Wagoneer—king of the country-club cowboys, maybe, but a sluggish seller and way beyond its prime. (The full-sized Wagoneer, now called the Grand Wagoneer, lives on. It still uses the basic 1963 body, giving it the longest lifespan of any mass-produced automobile in America.)

AMC's response to Ford and Chevy was to introduce a miniwagon. Call it a



Jeep owners like the passenger-car-plush appearance of the dashboard layout in their rugged four-wheel drives.

Jeep. Nothing's more American than Jeep. In its latest rendition, the Jeep Cherokee/Wagoneer SportWagons are 21 inches shorter, 1,000 pounds lighter, considerably thriftier, and yet you'll find 90 percent of the big Wagoneer's cargo capacity inside. The newest Jeep

Cherokee and Wagoneer are identical except in name, trim, and standard equipment.

All Wagoneers have four doors, while some Cherokees come with two. Since they entered the fray so late, AMC's game strategy has been to beat the new Bronco II and Blazer S-10 in very way possible.

On paper, the Cherokee and Wagon-

A NATIONWIDE SURVEY BASED ON 1,459,738 OWNER-DRIVEN MILES

eer do offer more: more carrying capacity, more payload, more doors, more wheelbase, greater ground clearance, better EPA gas mileage. Question is, do the advantages go beyond paper? What

(Please turn to page 76)

**MEN
WOMEN**

BALD? BALDING?

CLINICAL RESEARCH REPORTS:

100% REGROWTH- 8 OUT OF 10 CASES!

Scaring scalp transplants are out!
Minoxidil, Propenones and Butyl
compounds regrow full heads of hair

**"For the first time ever
men who have been bald for
20 years and more are
growing full heads of hair."**

**#1
BEST
SELLER**

FEATURES:

- Fold Flap Techniques
- Scalp Reduction
- Amazing New Topical Compounds
- Sources and Manufacturers
- Efforts for FDA Approval
- Nutritional Myths
- Hair Loss and Aging
- Diseases
- Pathology and Treatment

**AS SEEN
ON
THE
PHIL DONAHUE
SHOW**

**AVAILABLE
IN LEADING BOOKSTORES
EVERYWHERE**

Pharmaceutical Technology Magazine

Suite 630 - Dept. H-10
808 Post Street
San Francisco, CA 94109

Please RUSH my copy of **HAIR - Pathology & Treatment** to me today. I am enclosing \$14.95 plus \$2.00 shipping and handling charges.

NAME _____

ADDRESS _____

City _____ State _____ Zip _____

C.O.D., MASTERCARD and VISA

(415) 829-HAIR



\$14.95

**IF YOU ONLY READ ONE BOOK
THIS YEAR, THIS SHOULD BE IT!**

**STOP
LOSING HAIR TODAY!**

**This couple did it
...so can you!**

**COMPLETE SHELLS
UNDER \$2,400**



"Our actual shell cost, including labor, was only \$2,130. Now we have our retirement dream house, room for the grandchildren, and best, no mortgage payments. Thanks Certified, your 'proven' plans were the best investment we ever made — and here's the proof!"

Mary & Bob M.
Stony Brook, NY

10 PROVEN DESIGNS ...PROVEN SUCCESS

Our Guarantee

Our ten most popular, award winning house plans are unconditionally guaranteed to be proven and tested designs — actually constructed by Certified.

ONLY \$9.95

10 fully detailed sets of construction drawings — "Everything you need to build, except the wood and nails." Each package features:

- Framing Dimensions
- Electrical
- Plumbing
- Air Conditioning
- Elevations
- Cost Estimates

Our **DELUXE** package contains all of the above materials plus:

- Detail Framing Construction Plans
- Monolithic Slab Drawings
- Detail Foundation System
- Detail Truss System

Perfect for First Timers —

**ONLY
\$19.95**

CERTIFIED CONSTRUCTION, INC.

931 South Ridgewood Avenue, B-7
Edgewater, FL 32032



Certified, enclosed is \$9.95 plus \$2.00 postage and handling. RUSH me your **10 Proven Designs** so I can get started immediately.

I'm serious about constructing my new home, but I've never really tackled a project this big and I would like the additional details as shown in your **DELUXE** package. Enclosed is \$19.95 plus \$2.00 postage and handling.

NAME _____

ADDRESS _____

City _____ State _____ Zip _____

Or call **Certified Hotline** at (904) 428-2999 for immediate delivery on C.O.D., MASTERCARD and VISA orders.

OVER 400 HOMES BUILT

A PROFESSIONAL BUILDER



"This year we've already built 150 homes using Certified plans. As a professional builder, energy efficiency, beauty and building costs are top priorities. Certified's proven designs work. We are 1000% satisfied — and we owe our success to you. Many thanks." *F&S, Central Florida*

A RETIRED ELECTRICIAN

"As a retired electrician I've seen it all — my neighbor spent \$200 cash for their house plans. I ended up moving walls and completely rewiring the whole project. Some people just don't listen — I've built three homes using Certified's proven plans and never a problem. In fact, Certified taught me a few new tricks. Thanks Certified."



**ORDER
TODAY!**

You remember Mr. Steed, the handsome, debonair detective of *The Avengers* on TV? It started in the 1960s, but the reruns are still hot today. And there's the cheerfully devious corporate executive who starred last year in the CBS sitcom *Empire*. In real life, both characters turn into Patrick Macnee, California's desert gardener extraordinary. Born and very well bred in Britain, Macnee has lived in Palm Springs, where the prickly quirks of desert gardening have sometimes gotten the best of him over the past 10 years.

"Putting that bougainvillea in the shade was a mistake. It won't bloom, you see. Now I won't be able to take it out because you can't transplant bougainvillea," he says, pointing out the recalcitrant plant beginning to climb over the porch in his bungalow's backyard.

Macnee both loves and detests the sight of a desert garden. He loves it enough to cultivate lush green lawns here and there around his land. But he wonders often and out loud if development and amateur gardening won't eventually destroy the desert. Still,

"You have to look
into the desert to
see its subtle colors."

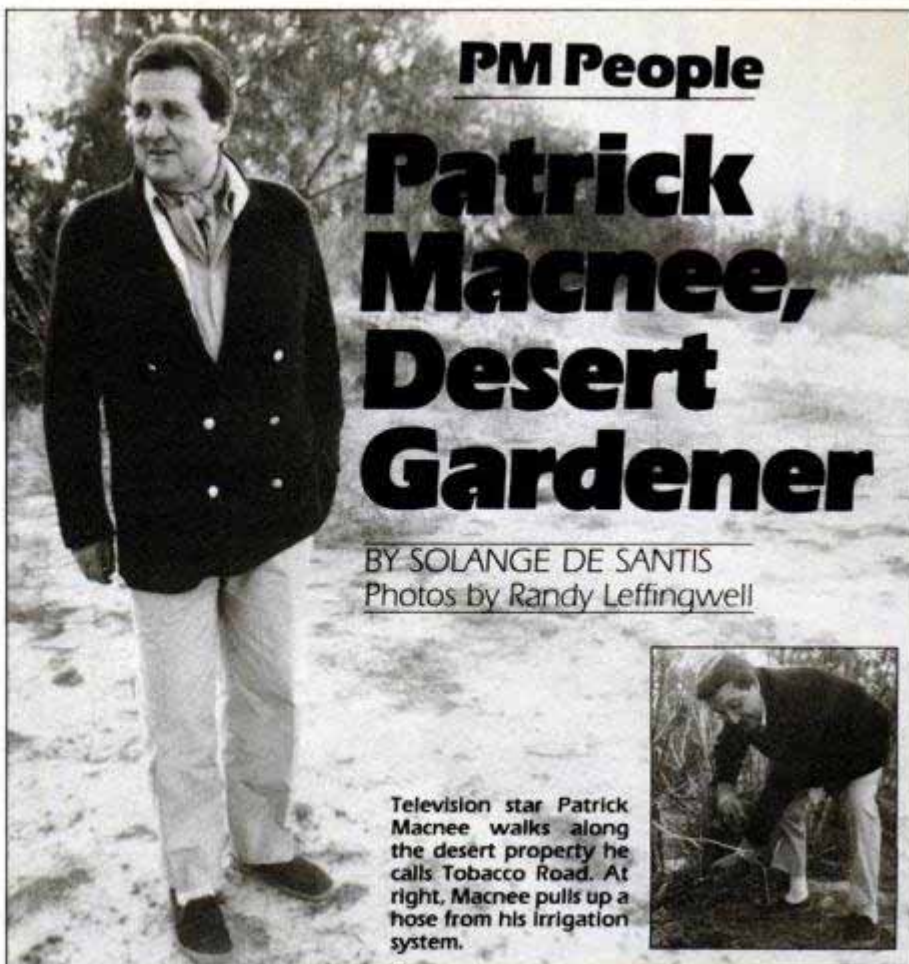
month by month he carries on the good fight with temperatures that soar above 100° and sandy ground that quickly swallows up water and fertilizer.

Along one section of his land, Macnee can walk along a row of cottonwood and tamarisk, two great fans of the irrigation system he devised after making a film in Israel.

The Israeli system, developed at the Weitzman Institute in the 1960s, is simple to lay out and understand, and it oozes water at a productive but economic pace.

The system starts at an irrigation pump. A 1-inch hose runs from the pump down the tree line. Every few feet along the way the irrigation hose is capped on one side and a 1/4-inch tube extends outward for 1 foot. The slow and steady trickle of water is better for the trees, he says, than a splash every other day.

"You have to look into the desert to see its subtle colors," Macnee muses, strolling amid the sycamore and jasmine in the yard outside his bungalow. The 125 by 125-foot grounds, close to the center of Palm Springs, are neat but not lavish. It's another story at Tobacco Road, his term for a six-acre property

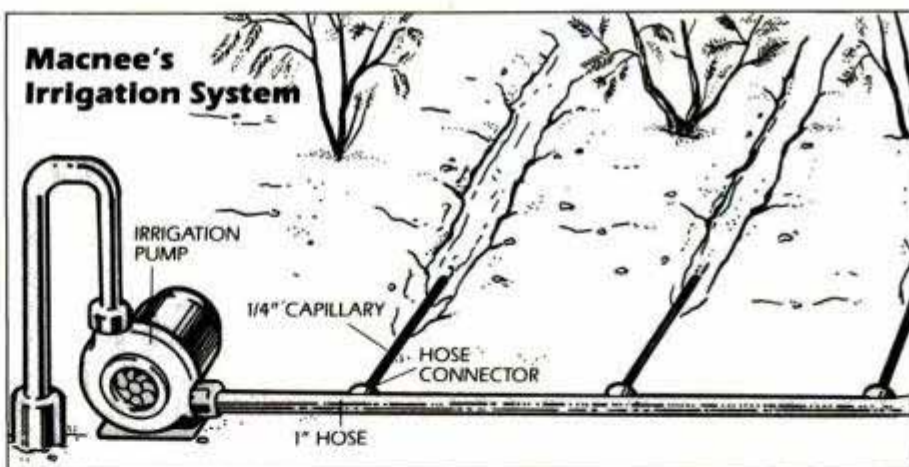


PM People

Patrick Macnee, Desert Gardener

BY SOLANGE DE SANTIS
Photos by Randy Leffingwell

Television star Patrick Macnee walks along the desert property he calls Tobacco Road. At right, Macnee pulls up a hose from his irrigation system.



DRAWING BY ED LIPINSKI

Macnee's Irrigation system consists of a 1-inch hose that runs from the irrigation pump. Every few feet the hose is capped and a 1/4-inch hose feeds water to the trees.

farther out into the dry country where cacti and mesquite grow nearly wild and two cats chase lizards across mini sand dunes.

A desert gardener must always reckon with the sun. Desert winters, with days in the 80s and nights in the 40s, are kind to plants. But the intense summer seems to confound them so much that they never behave even in winter quite the way you'd expect them to behave.

In one of Macnee's gardens, a contrary sycamore plays dead in winter, its naked ash-gray branches crooking toward the sun. "It's pruned in winter so

it won't shed all over the neighbors' yard in fall," he explains.

Horticulturists say most desert plants require less fertilizer than subtropicals, but the urbane Macnee says he takes few chances and uses "all the fertilizers all the time."

Macnee's sycamore may thrive on days when the thermometer soars past 100, but his lawns quickly resemble rush mats unless the grasses are carefully rotated and just as carefully watered.

"I seed Bermuda grass in October and rye in winter. When the rye dies off in May, the Bermuda grass comes up.



At the bungalow property, Macnee keeps the lawns green with rotated grass crops.

It's really a miracle that they survive at all."

Do you remember the scene from *The Avengers* when the villain planned to poison London's water supply? Mr. Steed and his sexy sidekick Mrs. Emma Peel (memorably played by actress Diana Rigg) trapped the villain and his henchmen in a pump station and gave all of the bad guys a thorough karate-style thrashing. When Patrick Macnee considers the damage progress has done to the desert around him, he gets that Mr. Steed look on his face and you think he's ready to spring into action again.

"Palm Springs has become highly desirable since Gerald Ford came here," he says with an air of indignation. "Developers have polluted the desert, raised the humidity with their condo estates, green grass and golf courses. Now I'm in the middle of Frank Sinatra Drive and Bob Hope Drive. It's Beverly Hills again."

Desert horticulture has become an important branch of botany largely due to the research performed in Israel. The Israelis have learned to transform vast deserts into citrus groves. But in Palm Springs, where landowners are at cross-purposes, the arid ground is not so easily reclaimed. Its salt content is higher than that of the Middle East, a phenomenon that makes irrigation next to impossible since salt retains water. Several California research institutes have only recently begun looking into the problem.

For his part, Tobacco Road is a major contribution to maintaining the integrity of the desert. The soil here has been kept sandy for the most part. The flora that borders the sand is a profusion of tough grass, agave, mesquite, cottonwood and an ill-fated stand of tamarisk trees. He says the 30-foot trees were destroyed when a new homeowner, desiring an unobstructed mountain view, had the audacity to climb over a low fence on the Macnee property and cut away at the trees. They died within days.

"I was absolutely furious," Macnee says, walking along a row of newly planted tamarisk. But Macnee will avenge the destruction of the trees.



Macnee shows us the lathed trellis he built to accommodate his subtropical plants.

New trees have already sprouted to heights bigger than a tall man. They'll grow about 15 feet per year with help from his irrigation system.

Macnee says he gets periodic inquiries from neighbors about his intentions for Tobacco Road. Thus far, he has staved off all criticism by saying he eventually plans to "do something" with the six-acre property. For now, it remains a wild preserve where his cats and a peacock find room to run and shade against the intense sun.

Back at the bungalow, Macnee has a veritable botanical garden. A swimming pool and attached hot tub are ringed with red honeysuckle and oleander hedges, a natural wall to give him privacy for sunbathing and skinny dipping. Citrus, although fussy to maintain, grace the bungalow itself. Macnee prides himself on having the sweetest pink grapefruit in Palm Springs. He feeds them lovingly on a diet of micro-nutrient supplements: tiny amounts of such minerals as zinc, cobalt and molybdenum. And he follows a precise watering timetable.

Macnee adds colorful accents to a covered patio with petunias and begonias in large terra-cotta pots, along with what must be one of the few Italian marble picnic tables in town. He also built a lathed trellis—he calls it the gibbet—where jasmine is proving to be less a disappointment than bougainvillea.

He raised the bungalow garden from nothing. When he bought the property it was a desert lot a block from one of Palm Springs' main drags. The avenue a block away has an auto dealership and stores, and the traffic coming through during midday is a fairly steady flow. Still, the work he has done with the grounds cuts him off from the nearby din.

It's a curious mass of contradictions, like Palm Springs itself. And Macnee's ambivalence about the land shows through as a visitor brings up for the last time that untouched piece of desert land he calls Tobacco Road.

"Someday," Macnee sighs, looking out to the craggy mountains that cradle the desert. "I really must do something with this land."

FALL SPECIAL FOR Clock Builders

**INCREDIBLE
VALUE!**

*A Solid Cherry
Mantel Clock
for ONLY \$19.90!*

Imagine, in just an hour, you can make a beautiful gift **WORTH OVER \$60!**

Wood parts are completely pre-cut, ready to assemble and finish. Includes ultra-accurate quartz movement and pre-assembled ivory dial with convex crystal. 6"H x 4-1/2"W x 2"D.

#178011 Mantel Clock Kit ONLY \$19.90
(Plus \$1.50 Shipping and Handling, IL Res. Add 6.25% Tax)



**CLOCKBUILDER'S
CATALOG**
100 PAGES

- Over 50 Clock Kits
- Quartz and Brass Movements
- Dials and Hands
- Weather Instruments
- Music Box Movements

\$2.00 postpaid (FREE with order)

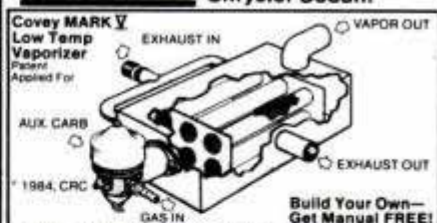
WRITE or CALL (312) 584-9600

Craft Products Co.

Dept. PM4C, 2200 Dean Street, St. Charles, IL 60174
Serving America's Craftsman Since 1940

Super Carb Breakthrough!

72 MPG On-Board Computer
Reveals, Big V8
Chrysler Sedan!



Rebirth of the legendary "200 MPG" Carburetor? Possibly. Fogue got reported mileage with light car, small engine, "clean" fuel of 1930s.

Finally, after four years research, Ray Covey premieres the new Mark V — a proven-workable, simple but highly efficient, vapor carb! With available options, it's almost fully automated. Or, use manual controls for economy. Build basic vaporizer, or buy factory-made unit. Other parts are stock. Cost can be surprisingly low!

"PRE-CARBURETION" IS KEY TO SUCCESS!
Mark V has a top or side-mount auxiliary carb to spray an air/fuel mix (not raw gasoline) into vaporizer. This new concept vastly-reduces heat needed for 100% fuel vaporization, assures full-power under load! Stock carb-computer ended years of guesswork; provides precise vapor temperature for best mileage, all fuel blends, engines. It's optional; use Covey data and you'll be nearly "on" WITHOUT computer! Many safety features.

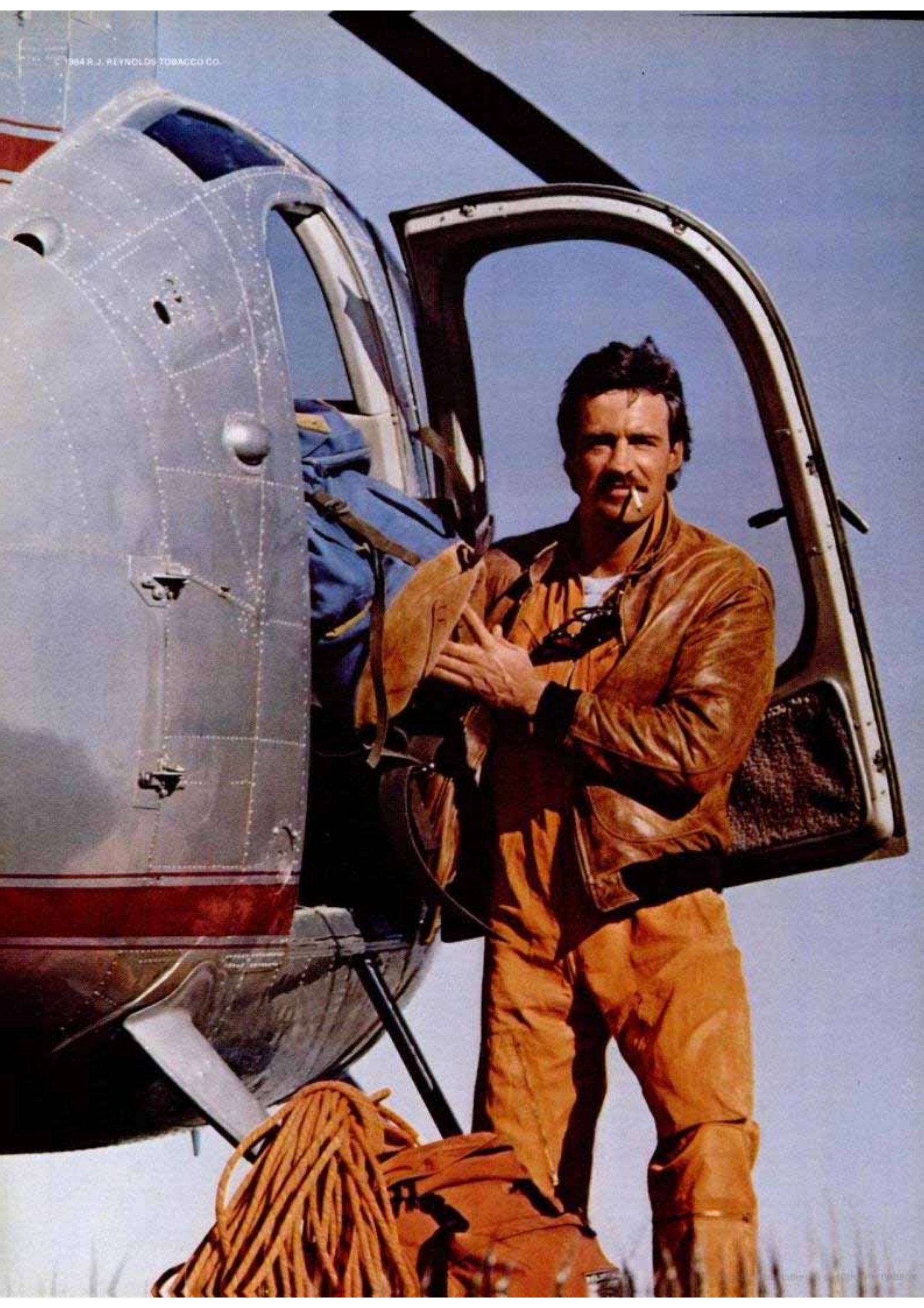
Device fits under hood, is only 10" to 12" long x 5" wide x 3" high. Dual system, vacuum-operated. Dash controls divert fuel and air to regular carb, or to aux. carb. Fuel mix enters exhaust-heated, screen filled tubes, changes to vapor, is sucked into modified air cleaner, and present carb. Runs on high as 100 to 1 air/fuel ratio.

Options include computer, transducer crystal (under aux. carb) to pre-vaporize fuel; automatic vacuum controls to regulate exhaust flow through vaporizer (which governs vapor temp.); and air flow into main and aux. carbs. There's also an electric vapor hose heater, for cold winters!

SHARE IN THIS EXCITING ADVENTURE!
Join our Road Test Team. Discover how you may greatly increase MPG of your car, truck, RV, or boat! Big Mark V How To Manual makes construction/assembly easy. It's free, when you furnish info requested. Send for Road Test Application, Hi-Mileage Report, full details. Everything's FREE (Enclose \$1.00 for RUSH shipment)

**CRC Carb Research Center, Dept. PM10
Box 1 Foyil, OK 74031**

© 1984 R. J. REYNOLDS TOBACCO CO.



© 1984 R. J. REYNOLDS TOBACCO CO.

Winston. America's Best.

Excellence.
The best live up to it.



KING: 17 mg. "tar", 1.3 mg. nicotine, 100's: 17 mg. "tar",
1.4 mg. nicotine, av. per cigarette by FTC method.

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

Smallest Stereo Yet

Any smaller, and those angels dancing on the head of a pin will be wearing earphones and listening to AM/FM stereo.

BY WALTER SALM; Photo by Layman/Newman

A pocket stereo so skinny you can slip it in between your Visa and American Express cards is the newest red-hot item to come out of Japan. Made by Japanese giant Matsushita and sold here under the Panasonic trademark, the AM/FM unit is said to be the world's thinnest stereo receiver—a claim that we're not about to dispute.

Called Stereo to Go, this second in a series (1977's "Mr. Thin" was the first) is officially Model RF-H25 and weighs in at a minuscule 1.34 ounces. This weight includes the built-in, rechargeable nickel-cadmium battery.

Hybrid chip circuitry

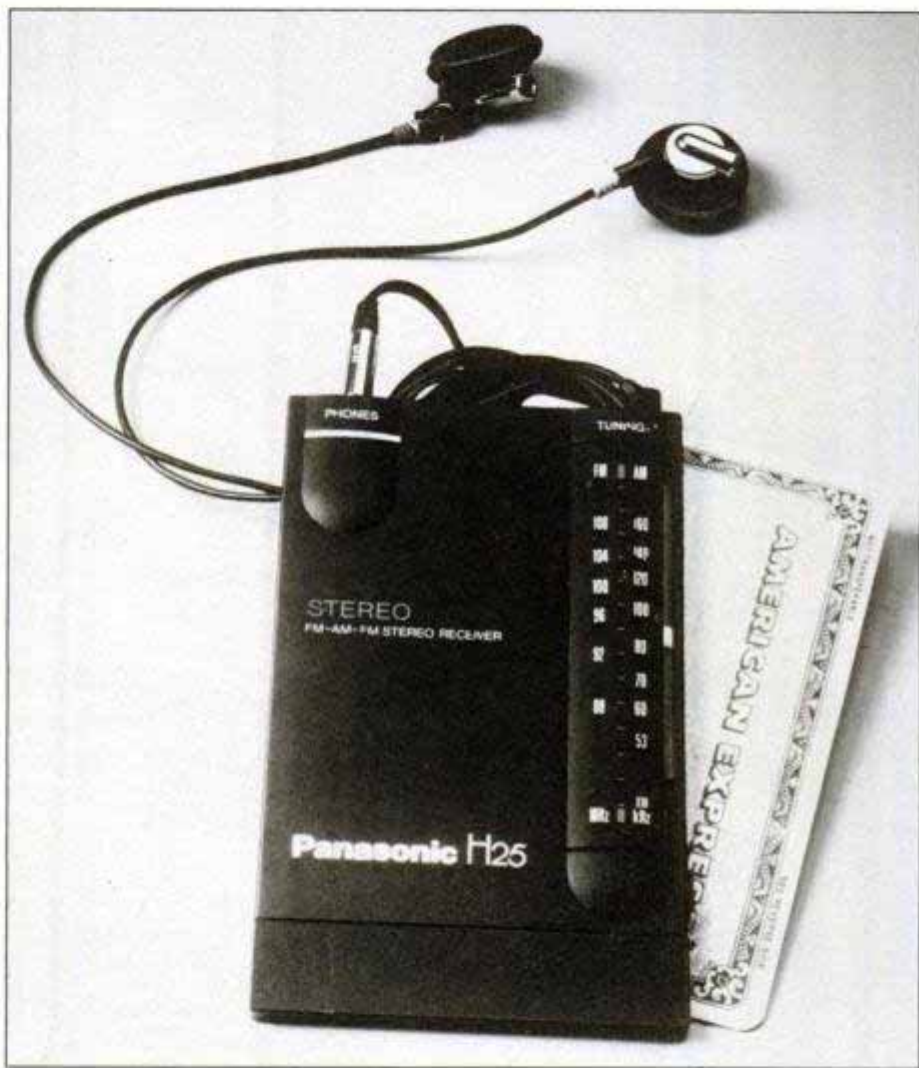
Key to the superthin design is the use of four new RHC (Radio High-density Circuits)—superchips. The first chip in the signal path is an RF amplifier; the second contains the oscillator/converter and the IF amplifier circuits. Chip number three is the detector/demodulator, and the last in line is the audio amplifier chip.

The circuits contained in these fingernail-size superchips are designed to do two things: provide king-size performance and operate at ultralow voltage with very little current drain.

Panasonic's design uses many transistors in a tiny chip to do the job formerly done by fewer but beefier components. Each of the RHC chips is really a *hybrid* containing six chips that are even smaller. Inside is a three-dimensional patchwork of circuits and transistors that are interconnected by signal paths that are sometimes only molecules thick.

To keep it all thin, the RHC chips don't even go into the usual protective plastic IC cases. Instead, they're finished off by spraying them with a 2-mil-thick insulating/potting compound.

It all works together very nicely, because the stereo is powered by a single-button, single-cell battery. Recharging this battery works almost the same way as reading a magnetic stripe on a regular credit card. The super-skinny radio slips into a slot on its companion charger where it can sit overnight, soaking up microamperes. Because the battery is a single, tiny cell, it is capable of putting out only 1.2



Credit card-size case houses new minibattery and low-power-drain AM/FM stereo circuits.

volts, but the Stereo to Go's power requirements are, like its size, super-small. It'll play for five hours on a single charge of this tiny button.

Slim component parts

Possibly more difficult than designing these multipurpose supertiny chips was creating the separate components that go with them—such as the variable capacitor for tuning in the different stations, the volume control, tantalum capacitor chips, the IF amplifier filters and an ultrathin AM antenna. Each one of these items had to be less than 1/8 inch thick.

To successfully produce the wafer-thin receiver, even the printed-circuit chassis board had to be specially designed. The board is only 0.012 inch thick and becomes part of the rear cabinet panel to conserve space.

Naturally, in a set so tiny, there's just no room for a speaker, but that's no handicap in this era of headphone-sporting personal stereo listeners. Stereo to Go's headset is a pair of foam rubber pads that hang on your ears.

What's the bottom line? Great personal listening in a credit-card size for under \$100, and just in time for early Christmas shoppers. **FM**



The wrong gasoline could void your new car warranty.

But using Amoco® gasoline is a sure way to protect it.

Almost every new car manual you see today is warning against gasolines that contain methanol.

They warn that this cheap ingredient can cause performance problems and even damage your engine's fuel system. And, methanol added to gasoline will reduce your mileage.

One way to protect your warranty is to use Amoco gasoline. Because Amoco doesn't put methanol in any of its gasolines. None of them.

Amoco gasoline helps you keep your new car warranty valid.

Filling up at Amoco is the best way to ensure your new car won't be left in a void.



We go that extra mile

Popular Mechanics PLANS

FURNITURE AND CRAFTS



Barn/Garden Shed Our well-designed yard building provides handsome storage for yard tools, hand tools, power equipment, gardening supplies and a gardening center for the whole family. It also has an upstairs loft! Dim.: 12 x 16 ft. Plans, instruction manual & material list. (1 plan: PL-1278—\$10.50) (2 plans: PL-1278A—\$17.50)



For Nostalgia Buffs: A Roll Top Desk You Can Build Back in the era of the trolley car and Model-T, the roll top desk was popular in both home and office. Today it's a cherished antique. Build one yourself in fine cherry and you can own and take great pride in this charming heirloom. You build it as two separate units, a base and a roll top. Plans and material list are included. (PL-1736—\$3.95)

Send your name and address with check or money order payable to **POPULAR MECHANICS**. Mail to: **Popular Mechanics, Box 1014 Radio City Station, New York, N.Y. 10101**



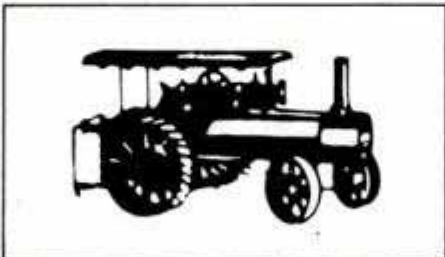
PM's Computer Home Workstation—This three-piece desk keeps everything neat and gives you plenty of room to work. This is for a state-of-the-art home computer system. An efficient work station you cannot buy, it can blend with your home decor and, it is more advanced than any office workstation you've seen. Plans and material list. (PL-1828—\$6.95)



Desk—For Home/Office Electronics—Here are plans for building the desk and matching bookcase storage cabinets for your electronically equipped up-to-date home office. Both pieces are carefully designed to meet your needs. Plans and material list. (PL-1818—\$5.95)



Model SS United States—The glorious, record breaking flagship of the U.S. Merchant Marine. Though now retired at Norfolk, VA, no passenger ship has ever approached her top speed. The professional quality model is described in detail on 3 full size blueprints. Over 2 ft. long of wood and metal. (PL-1200—\$10.00)



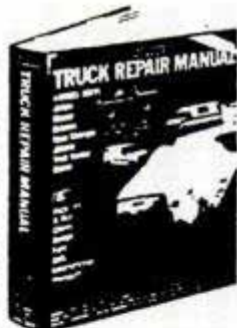
Model Steam Tractor—Challenge of a lifetime! The famous J.I. Chase threshing machine steam tractor, 16 separate plans sheets plus instruction booklet. The finest detail work. Stacks firewood but burns alcohol. 9 separate gears in the transmission alone. What a thrill to see it huffing and puffing under its own power. (PL-1272—\$12.00)



Glass-Doored Display Cabinet of solid oak in Mediterranean style. Can serve many purposes. **SHOW OFF YOUR GUNS**; has locking storage for ammo. Or, fitted with shelves, it makes a fine trophy, knickknack or china cupboard. (PL-1720—\$4.95)

Home Appliance Repair Manual Provides step-by-step repairs for more than 50 different kinds of appliances. More than 800 closeup photographs, 200 diagrams and charts. Lists appliance part suppliers. Gives a basic instruction to electricity and instructions for operating electrical testing equipment. Illus. Explicit instructions explain how to correct most problems and tell you when to stop and get professional help. (B-1752—\$23.00)

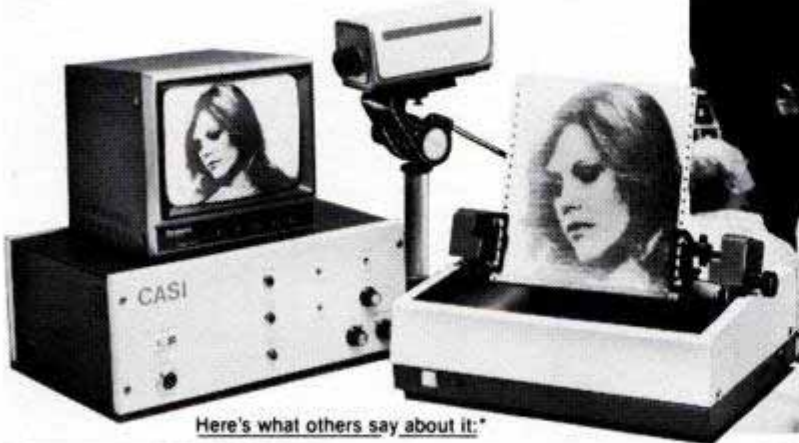
Truck Repair Manual (36th Edition) Over 2,800 models of trucks, vans & 4-wheel drives—1974-1983. 2,000 cutaway pictures, 1,500 pages of step-by-step, easy to follow repair instructions. A complete reference book. Includes all popular makes of trucks and utility vehicles, plus the new mini trucks. (B-1503—\$27.50)



Dream Stuff: PM's Platform Beds The raised design of this king-size sleeper combines the look of luxury with down-to-earth practicality. Roll-out under-bed drawers turn waste space into useful storage. Movable night tables hook on side rails. Also included in plans is single-size version. Both take stock-size mattresses. (PL-1713, \$7.95)

MAKE MONEY

Would you like to own a business, with people waiting in line scrambling to buy from you?



Here's what others say about it:

"This system is a TRAFFIC STOPPER. We had a line at all times. We were so busy we couldn't even take a break!"

Mr. William S., Calif.

"The system is my second, follow-up after purchase is beyond the call of duty."

Ms. Peggy J., Illinois

"... we no longer have to concern ourselves with watching each dollar. What I mean to say is we watch each dollar fall into our pockets. What a great change"

Ms. Jessica S., N.Y.

"I am thrilled with my system. Bill's eyeballs have turned to dollar signs."

Ms. Susy G., Illinois



This picture above was taken at an actual location and is often a typical scene with the CASI. The booth is almost lost from the massive crowd waiting for their portrait or comparing it with friends.

Imagine yourself in the middle of that crowd, with a fist full of bills so large you are having trouble holding on and making change.

*These testimonials and more are on file in our main office and open for inspection.

CASI™ Computer Portraits in black & white or Vibrant Color Draw the Crowds - and Crowds Mean Money!

Being in the right place at the right time and getting in on the ground floor can make you rich.

Back in the fifties if someone had suggested you buy a McDonalds or Kentucky Fried Chicken, you probably would have laughed. Most of us did. But there were a handful of smart people that didn't laugh. They bought—and today they don't have a worry in the world. The secret is to find a business that is so right . . . and so ripe . . . that you can ride it like the crest of a wave.

There is Such a Business

It's called CASI Computer Portraits. Ideal full time, part time, or weekends. Perfect for—absentee owners and families. There's no need to quit your present job.

It's affordable—about the price of a car—and the payback can be fast. It combines three of today's hottest trends, T.V., Computers and Instant Pictures.

Here's How It Works

With the CASI you take someone's picture with a TV camera and instantly print it out with a computer. Don't flinch about using a T.V. camera or computer. You drive your car without knowing about motors. You switch on your T.V. set without being an engineer. The same holds true for the CASI. It's so push button simple a child can run it. But the profits aren't kid stuff.

Healthy Profit Margins

It's an all cash business and the profits come in healthy gulps. The going price for a computer portrait is \$2⁹⁹ to \$3⁹⁹. Your cost? Ten cents. And that's not all! You can print Computer Portraits on T-Shirts — Calendars — Tote Bags — Aprons and many other wanted items. The profits are 100% yours. It's not a franchise. There are no royalties or fees.

All this for about the price of a car.



THESE ARE JUST A FEW OF THE MONEY MAKERS THAT KEEPS THE CASH COMING YOUR WAY—EVERY DAY!

Successful Locations are Everywhere

The CASI System is portable—ready to go. Sets up in 30 minutes. You set up anytime, anywhere — Malls, Department Stores, Flea Markets, Resorts, Conventions, Trade Shows and on and on. Travel with it. The world is your territory.



The First Step is Up to You

You need to know more about us. But an ad is not the best place to do that. Send the coupon below. Better still, call Toll Free 800-221-7660. We'll give you every answer, every fact and figure you want and need. You'll see for yourself that the CASI Computer System offers a remarkable opportunity to make an impressive income.

ACT NOW! CALL TOLL-FREE 800-221-7660—Ext. J-194
New York Call Collect 212-929-8355 CASI, 95 Morton Street, New York, N.Y. 10014

Send to: CASI, Computer Amusement Systems Inc., Dept. J-194
95 Morton Street, New York, N.Y. 10014

Yes I want to learn more about the lucrative CASI Computer Portrait business! Please send me your free brochure on how to get started.

Name _____

Address _____

City _____ State _____ Zip _____

Home Phone () _____ Bus. Phone () _____

Own this classic "Roll Top" OAK DESK

from our pre-cut partially assembled Kit.



Here's the turn-of-the-century "Roll-Top" you've always wanted. A full size oak desk (oak and oak-veneers) now yours at extraordinary savings... because you put it together yourself from pre-cut Kit parts. No special tools needed. When finished, you'll possess a magnificent showpiece for your home or office — worth at least twice what you paid for the Kit! Send for details without obligation.

FREE FULL COLOR CATALOG
gives you all the facts

Please send my free Craftsman's Corner color catalog featuring the Classic Roll Top Desk and many other quality hardwood kits. I understand I am under no obligation.

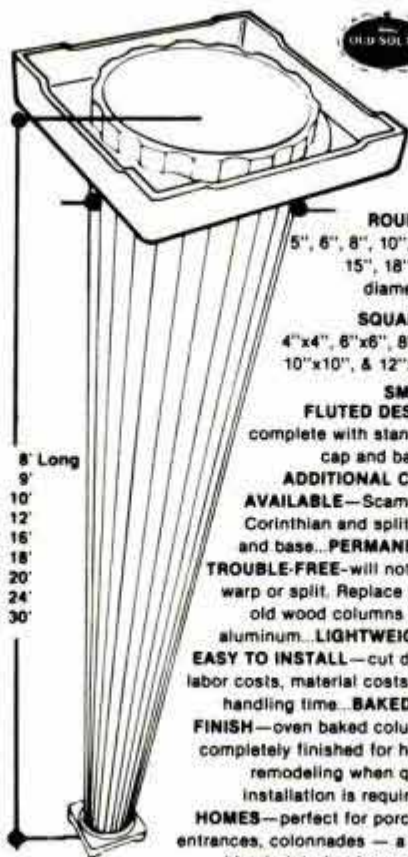
Print Name _____
Address _____ Apt. _____
City _____ State _____ Zip _____

Craftsman's Corner Dept. 4MR • 4012 N.E. 14th Street • Box AP • Des Moines, IA 50302



OLD SOUTH COLUMNS IN EXTRUDED ALUMINUM CAN BE USED TO REPLACE ROTTING WOOD COLUMNS IN 8 EASY STEPS!

1. Call 1-800-841-8674 for literature and prices.
2. Study literature and price sheet to determine that aluminum columns are less expensive and easier to obtain than wood columns.
3. Sell spouse on all advantages of aluminum columns.
4. Call factory at same toll-free number and place order for columns to be shipped immediately from stock of 50,000. Use credit card or mail check.
5. Schedule Saturday morning do-it-yourself project.
6. Columns will arrive in approximately 10 days.
7. Arrange for moral support, 2 soft drinks, 1 can elbow grease, hammer, saw, level, and jack.
8. Follow directions and install columns on Saturday morning, eat lunch, then play golf with friends.



ROUND—
5", 6", 8", 10", 12",
15", 18", 24"
diameters.

SQUARE—
4"x4", 6"x6", 8"x8",
10"x10", & 12"x12".

SMART FLUTED DESIGN complete with standard cap and base...
ADDITIONAL CAPS AVAILABLE—Scamozzi, Corinthian and split cap and base...**PERMANENT, TROUBLE-FREE**—will not rot, warp or split. Replace your old wood columns with aluminum...**LIGHTWEIGHT, EASY TO INSTALL**—cut down labor costs, material costs and handling time...**BAKED-ON FINISH**—oven baked columns completely finished for home remodeling when quick installation is required...**HOMES**—perfect for porches, entrances, colonnades — a new idea in interior decorating.

Moultrie Manufacturing Company
Phone 800/841-8674 toll-free
Moultrie, GA 31768

HINTS FROM READERS

Quick paint masking

When you paint a room that's carpeted, you can avoid splattering paint on the carpet. The conventional method of taping dropcloths to the wall doesn't work because as you walk on the carpet the tape pulls away from the wall. Instead, try this. After you lay dropcloths, mask off the base molding. Then slip a single sheet of newspaper under the edge of the tape and press firmly. This masks the molding and tapes the newspaper to it, making the newspaper float on top of the dropcloth. The dropcloth is now free to move slightly as you walk on it—and of course it will—without pulling completely away from the wall.—Arthur R. Lee



Lay the dropcloth over the carpet, mask off the molding and slip a single row of newspaper under the edge of the tape.



Press the masking tape down firmly over the edges of the papers to secure them.



The result is a paintproof seal along the molding. You can walk on the dropcloths without fear that they'll pull from the wall.

HINTS FROM READERS

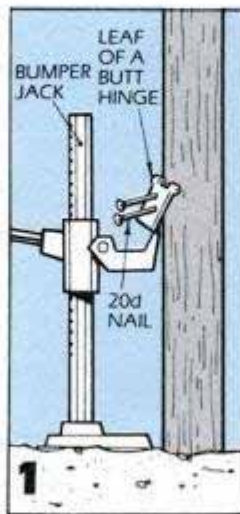
Chain oil bottle

If you use your chain saw for any length of time, you must take a number of tools and containers with you on a job. One such item is a large bottle of chain oil. An old dishwasher detergent bottle with a closeable spout is handy to carry, and it isn't messy to pour.—George McGuire

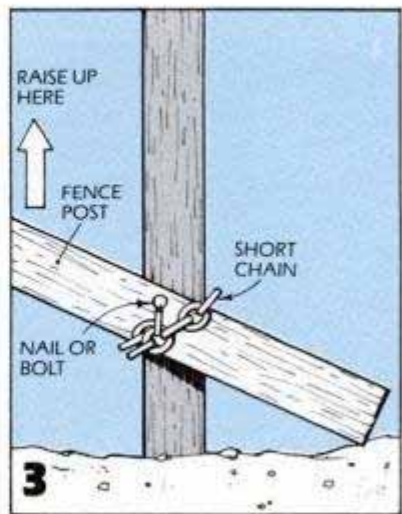
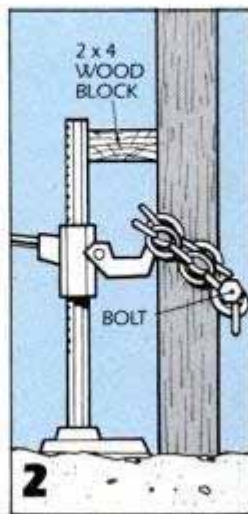
Removing fence posts

Here are three good methods PM readers use to pull fence posts:

1. Fasten one leaf of a butt hinge on the post about 1 ft. from ground level using 20d common nails angled upward. Let the nails protrude 1/2 in. Insert the working end of a bumper jack under the edge of the hinge. Work the jack until the post is high enough to lift. A prybar helps remove nails for the next job.—G. Amati



2. Combine a bumper jack and a doubled length of chain secured to the post with a bolt. Use a 2x4 block to keep the top of the jack away from the post.—John K. Echernacht



3. Secure a second post to the set post with a short chain, nailed or bolted in place. Use the auxiliary post as a lever to pry the set post out of the ground.—Walter W. Weber

Train at Home for One of These 30 Career Opportunities

CALL TOLL-FREE OR WRITE FOR FREE CAREER FACTS ABOUT DIPLOMAS OR DEGREES

If you want more money, more security and a better way of life, the decision to train for a better career could be the most important one you will ever make. And now you can train at home in your spare time for a diploma or even a degree to help you get a better job. This is the same kind of training program that has been used by nearly 2,000 American Corporations to train their employees... Union Carbide, Ford, DuPont and many others.

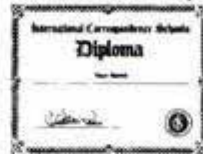


Could a Career Diploma or a Degree Be Worth Thousands of Dollars to You?

Compare your present salary with the amount of money you could be making in any of the careers shown below. Training in a trade or earning an Associate Degree in Specialized Business or in Specialized Technology could make a giant difference in your lifetime earnings. But it's not the money alone... think of the security, satisfaction and the fun of working in a job you like. Get more information at no cost! Check the career you're most interested in and mail the coupon today. There's no obligation and no salesman will call.

Or Get Your Degree Without Attending College

Now without attending class, you can get your degree in business with a major in Marketing, Business Management, Accounting and Finance. Or get a technical degree in Civil, Mechanical or Electrical Engineering Technology. If you already have some college or if you have worked in the field, you may be entitled to advanced standing toward your degree.



CALL TOLL-FREE

1-800-358-5858 / Dept. PBT94

...or mail coupon for free facts!

CALL ANYTIME—Operators to take your call 24 hours a day, 7 days a week. No cost. No obligation. No salesman will call.

ICS
SINCE 1891

International Correspondence Schools, Dept. PBT94
ICS CENTER, Scranton, Pennsylvania 18515

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

BUSINESS ASSOCIATE DEGREE PROGRAMS

- Business Management
- Marketing
- Finance
- Accounting

TECHNICAL ASSOCIATE DEGREE PROGRAMS

- Civil Engineering Technology
- Mechanical Engineering Tech.
- Electrical Engineering Tech.
- Electronics Technology

CAREER DIPLOMA PROGRAMS

- High School
- Auto Mechanics
- Hotel/Restaurant Management
- Surveying & Mapping
- Drafting
- Air Conditioning & Refrigeration
- Travel Agent*
- Wildlife-Forestry Conservation*
- Art
- Police Sciences*
- Veterinary Asst.*
- Diesel Mechanics
- Electrician
- Small Business Management
- Electronics
- Bookkeeping*
- Computer Programming
- Microcomputer Repair
- Gun Repair*
- Motorcycle Repair*
- Catering/Gourmet Cooking
- Small Engine Repair

*These courses are offered by North American Correspondence Schools.

NAME _____

AGE _____

ADDRESS _____

CITY/STATE/ZIP _____

Mail coupon today for free facts and color brochure.

Handcrafted Excitement

Style and engineering join together to create the best, most authentic component car money can buy. Complete, affordable, and easy to build, the 1937 Jaguar[®] SS 100 reproduction by Antique & Classic Automotive, Inc.



For the full story
write or call TOLL FREE 800-245-1310.
PA residents call (412) 283-4663



ANTIQUE & CLASSIC AUTOMOTIVE, INC.

100 SONWIL DR., DEPT. PM-1084
BUFFALO, NY 14226

- \$3.00 enclosed for complete full-color brochure
 - \$20.00 enclosed for assembly manual (VW version)
 - \$20.00 enclosed for assembly manual (front engine version)
 - I am interested in a fully assembled model
- CHARGE MY MASTER CHARGE VISA OWNERS CLUB AMERICAN EXPRESS Account # _____ Expiration Date _____

NAME _____
ADDRESS _____
CITY _____ STATE _____ ZIP _____
HOME PHONE (____) _____ BUSINESS PHONE (____) _____

OWNERS REPORT: JEEP

(Continued from page 64)

do Jeep SportWagon owners think of their vehicles now that they've had time to live with them?

"I shopped the various 4wds," responded a Florida letter carrier to our questionnaire, "looking for an economical wagon with enough room for me and all my stuff. I found the Bronco II and Blazer too small and overpriced."

A Michigan dentist: "Best-riding truck I've ever owned, and I've had both Broncos and Blazers." A West Virginia emergency aide went one step further: "I feel that the small Jeep Wagoneer is

(Please turn to page 80)

SUMMARY OF 1984 AMC JEEP CHEROKEE AND WAGONEER OWNERS REPORTS*

Total miles driven 1,459,738	Full-time 4wd (Select-Trac) 22.1	Workmanship opinion:	Good..... 42.1
Average miles per gallon	Why the Cherokee/Wagoneer?	Excellent..... 43.9%	Average..... 20.6
Four-speed manual	Four-wheel drive 49.1%	Good..... 50.2	Poor..... 16.7
In town..... 20.1	Styling..... 27.2	Average..... 5.2	
On the highway..... 24.8	Past experience..... 15.2	Poor..... 0.7	Number of vehicles owned:
Five-speed manual	Economy..... 15.2		This car only..... 23.1%
In town..... 19.3	Size..... 14.8	Comfort opinion:	Two cars..... 45.2
On the highway..... 23.7	Specific likes:	Front seats	Three cars..... 21.7
Three-speed automatic	Styling..... 46.1%	Excellent..... 48.4%	Four or more cars..... 10.0
In town..... 17.4	Four-wheel drive..... 35.2	Good..... 40.8	
On the highway..... 22.0	Handling..... 34.8	Average..... 8.7	Makes of other cars owned:
Body style choices:	Economy..... 26.2	Poor..... 2.1	Chevrolet..... 17.0%
Four-door wagon..... 68.0%	Ride..... 22.5	Rear seats	Ford..... 15.7
Two-door wagon..... 32.0	Specific dislikes:	Excellent..... 29.2%	AMC Jeep..... 14.3
Series choices:	Disappointing mileage..... 15.5%	Good..... 58.1	Oldsmobile..... 10.8
Standard Wagoneer..... 42.7%	No complaints..... 10.9	Average..... 12.3	Buick..... 8.5
Cherokee Pioneer..... 32.2	Uncomfortable, narrow seats..... 10.0	Poor..... 0.4	Would you buy another Cherokee/Wagoneer?
Standard Cherokee..... 13.6	Needs more powerful engine..... 8.8	Had any mechanical trouble?	Yes..... 71.3%
Wagoneer Limited..... 6.6	Rattles and noises..... 6.7	Yes..... 50.7%	No..... 4.5
Cherokee Chief..... 4.9	What changes would you like?	No..... 49.3	Maybe..... 24.1
Engine choices:	No changes..... 21.8%	What type of trouble?	
2.5-liter Four..... 92.0%	Headrests, wider front seats..... 12.1	Rear window wiper..... 15.9%	Another AMC/Renault product?
2.8-liter V6..... 8.0	Better fuel mileage..... 6.3	Transmission..... 10.3	Yes..... 66.9%
Transmission choices:	More horsepower..... 4.6	4wd shift mechanism..... 9.7	No..... 5.3
Three-speed automatic..... 68.6%	Conventional spare tire..... 4.2	Electrical system..... 9.0	Maybe..... 27.8
Five-speed manual..... 19.7	How much did you pay?	Fuel induction..... 7.6	
Four-speed manual..... 11.7	Range..... \$10,600-18,000	Oil leaks..... 7.6	Age distribution of owners:
Drive-train choices:	Average..... \$13,881	Dealer repairs satisfactory?	15-29 years..... 12.1%
Part-time 4wd (Command-Trac)..... 77.9%		Yes..... 64.2%	30-49 years..... 58.2
		No..... 35.8	50-plus..... 29.5
		Dealer service opinion:	
		Excellent..... 20.6%	

*Percentages might not equal 100% due to rounding or insufficient data.

EARN up to \$10,000 per MONTH

using the same EASY MONEY techniques

I used to earn over —

\$1,000,000.00

Hello... My name is Scott Wilcox

In the next few minutes I'm going to tell you about a little known money-making technique that can change your entire life. It has certainly changed mine. I've made over ONE MILLION DOLLARS with it!

But wait — things haven't always been this good. I can remember when I had no regular job, my home was in foreclosure, the bank was going to repossess my only car, and I was over \$200,000 in debt. Bankruptcy seemed to be the only way out.

A MILLIONAIRE'S ADVICE

On the way to my attorney's office the answer finally hit me. Almost a year earlier a friend of mine (a self-made millionaire) had told me about a little known money making technique that was actually making people rich. At the time it seemed very difficult to believe. But, considering my present situation — what did I have to lose?

During the next few days my friend and I discussed this technique in great detail and I learned from A to Z how he was able to make thousands of dollars each and every day.

IT DOESN'T TAKE MONEY TO MAKE MONEY

To my surprise, I learned that you don't need money to make money. (After all, I was almost penniless.) I also found out that you don't need an office or retail store, and no special training is required. Age or sex is no barrier. The most important thing you need to know is some "inside information" and how, where, and when to make the RIGHT MOVES! I decided to put the plan into action.

ALL AT ONCE — IT HAPPENED

At first it seemed too good to be true! Within a few short days the money started rolling in. Almost overnight I was making \$200-\$300-\$500 per day and more. Day by day my wealth continued to multiply until I was earning from \$7,000 to \$10,000 per week!

The money was pouring in so fast that I was able to pay off all my bills, save my home and my car, and enjoy life with my wife and children.

THE GOOD LIFE

Now we live in a new 3,500 square foot luxury home, my wife and I both drive Mercedes automobiles, and neither of us rarely has time to "work".

We now have money in the bank, we can afford almost anything we want, and most of our financial affairs are handled by Certified Public Accountants and Corporate Lawyers. My wife and I both know that the only reason we are able to enjoy this kind of life style is because we took full advantage of a very unique income opportunity.

Copyright © 1984



Here is my briefcase — JAM PACKED WITH CASH — ready for deposit in my bank!



Here is my favorite sports car I like to drive on Sundays!

Now that the proof of the cash is on the table, even the blindest should be able to see that my EASY MONEY PLAN can actually work for YOU!!

HERE'S YOUR CHANCE

What I'm going to offer you is the chance of a life time. Not the same one I had... but a much better one. And I'm going to ask you to send me ten dollars for sharing this information.

Sure, I could send it to you free — but I won't. You should also know that I stand to make a reasonable profit on the material I will be sending you. But, why should you care? After all, the information contained in my PROVEN EASY MONEY PLAN has taken me five years to perfect and will show you how to make more money than you have ever made in your life. Not a few measly nickels and dimes — but twenty-five, fifty, one hundred thousand dollars or more PER MONTH!

I'm so confident that my PROVEN EASY MONEY PLAN can work for you that I'll make you this \$10,000 GUARANTEE!

IT'S GUARANTEED

This guarantee entitles you to use my PROVEN EASY MONEY PLAN for a full 31 days with absolutely NO RISK. Then, if you don't agree that my EASY MONEY PLAN is worth at least \$10,000 in cash to you (one thousand times it's meager price), just return it to me and I'll refund your \$10.00 plus ONE EXTRA DOLLAR for your time, trouble, and postage. What could be more fair?

GET STARTED NOW

My PROVEN EASY MONEY PLAN will show you how to start receiving money within 48 hours after you begin. Continued use can bring you more money than you ever thought possible. Think what life could be like with:

- *NO MORE BUDGETING
- *NO MORE BANK LOANS
- *NO MORE MORTGAGES
- *NO MORE HOUNDING CREDITORS

Sound to good to be true?—NOT REALLY! All that is needed is a sincere desire to get ahead and the belief that my EASY MONEY PLAN can work for you.

BECOME WEALTHY AND INDEPENDENT

Mr. V.F. of Nashville, Tennessee knows how well my plan works. Within 30 days after he put the plan into action he received an avalanche of cash — almost \$35,000! Here are his own words:

"When your plan arrived I stayed up until 4 A.M. just to study it. I finally decided to give the thing a whirl. Now, just 6 weeks later I've made almost \$35,000! It's unbelievable. Thank you."

(Sworn AFFIDAVIT on file)

You can easily learn the same money making techniques that I taught him. They are all spelled out in exact detail in my PROVEN EASY MONEY PLAN. And with my \$10,000 GUARANTEE — YOU CAN'T LOSE. Now, the rest is up to you.

To receive your PROVEN EASY MONEY PLAN, simply print the words "EASY MONEY" along with your name and address on any size piece of paper. Mail this along with \$10.00 in cash, check, or money order to Scott Wilcox at 1601 East Main Street Dept. O-30, Plainfield, IN 46168.

If you wish to use your MASTERCARD or VISA-make sure to include your card number and expiration date. Also include your interbank number on MASTERCARD orders.

Your order will be processed the same day it is received and ALL orders are covered by my unique \$10,000.00 money back guarantee.

Pride In Being One Of The Best Is Part Of The Navy Adventure.



You set out to learn a skill. You end up with a kind of pride you didn't know was possible. You're Navy-trained and now you know how it feels to be one of the best.

The Navy Adventure starts with a choice of over sixty career fields including advanced communications, micro-electronics, aviation, even nuclear power.

You choose. You train.

Then, on-the-job experience turns what you've learned into a skill you can call your own. But more than that, you've learned to take charge and lead. To motivate people to work together like a team.

You start out earning over \$550 a month plus housing, food, and special pay for sea duty. And as your skill and experience grow so does the pay. But the biggest

benefit is something money can't buy.

One day you feel yourself standing a little taller, straighter. You're proud of who you are, of what you can do, of being one of the best. And it feels great.

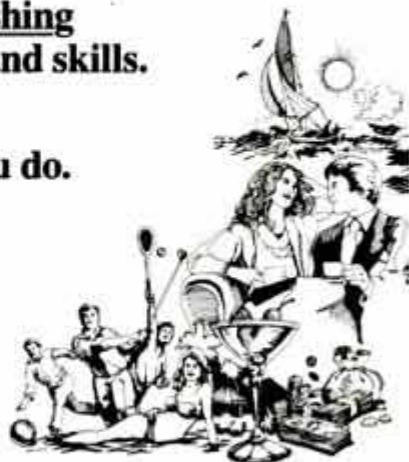
It's a part of the Navy Adventure you'll remember for the rest of your life. Call toll-free, 800-327-NAVY. Find out more about it.

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

INSTANT MEMORY®

The New Natural Self-Improvement Breakthrough!

- A quantum leap in unleashing hidden abilities, talents, and skills.
- Guaranteed to improve your performance in everything you do.
- Used by over 150,000 for insight, creativity, knowledge, and profit.



Success depends on it . . .

INSTANT MEMORY is the fastest, surest, most enjoyable method ever devised to acquire a perfect memory *without even trying*.

No memorization, no word association.

It helps you solve problems *fast*. Reduces stress, fatigue. And even improves your tennis game!

Release your photographic memory. Nothing is forgotten! Learn "how" you remember, "why" you forget. Discover a natural ability of your mind to instantly recall everything you see, read, hear.

INSTANT MEMORY® is the first, original, and trademarked natural learning system. It is the source of dramatic and authentic mind power.

You can have a photographic memory.

With **INSTANT MEMORY**, anyone can remember anything . . . *without even trying!* It unshackles your perfect memory from self-imposed exile instantly. This new way to remember is so simple, quick and usable, *everyone* can use it immediately.

Age is no barrier.

Why? Because the results are automatic. It is the easiest way to remember names, faces, dates, speeches, formulas, music, phone numbers, and even entire books.

Pass exams easily!

If you are in school, with **INSTANT MEMORY** you can *permanently* remember all you will ever study. Now you can *easily* pass every exam with less study, no worry and no "test trauma." Increases your vocabulary, improves spelling, masters foreign languages.

Here's how it works . . .

Science has proven the accumulated experience of a lifetime is preserved perfectly in your mind. **INSTANT MEMORY** simply releases it! Without word associations. Just the natural powers of your mind. It's a spectacular way to put a lifetime of learning at your fingertips. And it's your birthright!

About the INSTITUTE

For over 22 years, the Institute of Advanced Thinking has earned a reputation of proven reliability and integrity. It has gained international acclaim as the world's first and only instruction in Natural Memory.™ The Institute is a member of the American Association for Adult and Continuing Education, Direct Marketing Club of Southern California, and Pacific Palisades Chamber of Commerce.



Play any sport better!

INSTANT MEMORY means your game just got better *without practice*. Why? Because the "perfect game" exists inside you *right now!* Simply learn how to "unleash" it.

Learn any skill.

INSTANT MEMORY means learning new skills at a speed you didn't think possible. Because it's a natural state of mind. It comes built-in. So you don't have to work for it. *No repetition, no relearning!*

Win at cards, give speeches, overcome stage fright.

This is far more than just a "memory" course . . . *it is a new way of living.* **INSTANT MEMORY** enables you to play any musical instrument, find lost articles, awaken the exact moment you desire, tell stories and jokes without nervousness, improve your typing, think faster, and much more!

There's no end to the things you can do with **INSTANT MEMORY**.

MINDSTORMING® - your key to creativity.

With this amazing technique originated by the **INSTITUTE**, you can *instantly* liberate your inner creative abilities and *natural* intuitive powers. It floods your mind with a fortune of money-making ideas. There is no limit to what you can discover, invent or produce!

Instant speed reading.

The first time you read something should be your last! Now you can *instantly* remember *all* you read. Because you will read a page like a photograph! With **INSTANT MEMORY**, there is no limit to the words you can read per minute.

© INSTITUTE OF ADVANCED THINKING 1981

YOU WILL LEARN

- How to remember as fast as you think
- Poise and self-confidence in any situation
- Your mind has NO limits
- Hidden talents you didn't know you had
- Why all other memory courses are obsolete
- How to excel in everything you do
- Forgetting is antinatural and 'curable'
- Real ESP is using your mind correctly
- How to relax your entire body in seconds
- Why concentration improves automatically
- To express yourself persuasively
- There's a library already in your mind
- To advance your career by staying informed
- How to 'unlearn' psychological obstacles
- To recall even tough technical material
- Popularity, prestige, recognition is yours . . . and much, much more!

PLUS the added benefit of being able to quickly read all the magazines, newspapers and books you desire . . . and retaining all of it more clearly and accurately than ever before . . . at a surprisingly low cost.

FULL MONEYBACK GUARANTEE

If you are not satisfied, simply return your book within 30 days for a complete refund. Absolutely no risk!

Institute of Advanced Thinking

845 Via de la Paz, Dept. PM1084
Pacific Palisades, California 90272

Yes, please send me your unique **INSTANT MEMORY** book for only \$10 complete by First Class Mail at no extra cost.

Name _____

Address _____

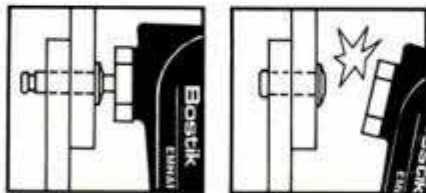
City _____ State _____ Zip _____

Or charge my VISA MasterCard

Card No. _____ Exp. Date _____

POP[®] RIVETOOL. Whenever nuts and bolts aren't holding their own.

- Easy to use – POP[®] brand Rivets fasten two surfaces from one side in seconds, permanently.
- POP brand Rivets won't strip, can't shake loose like screws, nuts and bolts.



Rivets insert easily, even when working from one side. When end is fully expanded, rivet stem pops and rivet locks in place permanently.

- Hundreds of uses inside and outside. Lets you: assemble gutters; install downspouts; make auto repairs, customize cars and vans; fix lawn furniture; repair storm doors, leather goods and much more.
- Fastens metal, wood, cloth, plastic, leather, etc.
- Ideal for year-round gift giving.
- Available wherever hardware is sold.



Bostik
CONSUMER DIVISION

Reading, PA 19605

EMHART

OWNERS REPORT: JEEP

(Continued from page 76)

superior to the Toyota Land Cruiser."

The main reason people bought the Cherokee/Wagoneer, though, had to do with four-wheel drive. "I like 4wd for the beaches in the summer," smiled a Massachusetts attorney, "and for snow traction in wintertime. Styling and performance, too, are better than the Blazer or Bronco II."

All Cherokees and Wagoneers come with 4wd. The so-called Command-Trac part-time 4wd is standard and is meant for occasional light-duty use in snow and on slippery roads. The optional, more rugged Selec-Trac turns these Jeeps into true off-roaders. Both 4wd



Most buyers chose AMC's first home-grown Four, a short stroke, 2.5-liter model.

systems can be ordered with either manual or automatic transmissions and can be shifted from 2wd to 4wd and back at will. You can engage or disengage the Command-Trac transfer case at any road speed, without stopping to lock or unlock front hubs. Even so, 9.7 percent of our respondents mentioned gear grinding and stiff 2wd/4wd shifts, particularly in cold weather.

Another minor beef focused on the front bucket seats. "They need higher seatbacks or headrests," suggested a New York cable TV installer, and a New Hampshire developer added, "The front seats are too narrow." In all, 12.1 percent of our owners told us they'd like better front seats.

Quality and workmanship came in for another set of high marks, with 94.1 percent rating them good to excellent. That's up there with the best imports. "Great paint job," beamed a California marketing rep, "and all body moldings fit straight. We plan to drive the Cherokee at least 200,000 miles."

"I'm very pleased with the quality of my Wagoneer," echoed a retired North Carolinian. "All five doors, including the plastic liftgate, open and shut like bank vaults, no rattles anywhere, no orange peel in the paint, upholstery very good; overall excellent!"

Owners with automatic transmis-
(Please turn to page 166)

Now there's a tough new anti-freeze for today's hotter running cars.

Today's fuel-efficient cars run hotter by design. And to keep their weight down, they use light ...but corrosion-prone ...metals like aluminum in their engines and cooling systems.

All this puts tremendous new demands on your anti-freeze/coolant. To protect your engine against costly heat damage, it has to cool with maximum efficiency...and fight against corrosion and sludge formation that can block your radiator.

That's why we developed STP® Anti-Freeze/Coolant...a tough new anti-freeze product designed specifically for today's hotter running cars. It delivers extra protection because it's

formulated with ALUGARD® 340-2. And it's the only anti-freeze formulation approved by all 4 major U.S. car makers for effective use in all their cars. It's also recommended for use in imports. But we haven't stopped there...

New Easy Pour, "No Glug" Jug.

Tired of spilling and wasting anti-freeze when you pour it? Our unique new Easy Pour jug puts an end to anti-freeze mess. Its convenience is another good reason to switch to STP Anti-Freeze/Coolant.



Depend on STP proven performance. 

STP Corporation, an ESMARK Company, Boca Raton, Florida 33431

© 1984 R. J. REYNOLDS TOBACCO CO.

PRESENTING STERLING



IT'S ONLY A CIGARETTE
LIKE THE CONCORDE
IS ONLY A PLANE.

Available in Regular
and Menthol.

CONCORDE is a trademark of British Aerospace & Société Nationale Industriale Aérospatiale who do not make or license STERLING® Cigarettes.
12 mg. "tar", 1.0 mg. nicotine av. per cigarette by FTC method.

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

Датум издана: 1984 год. Фотограф: [неизвестно]

NOW SHOWING

Popular
Mechanics

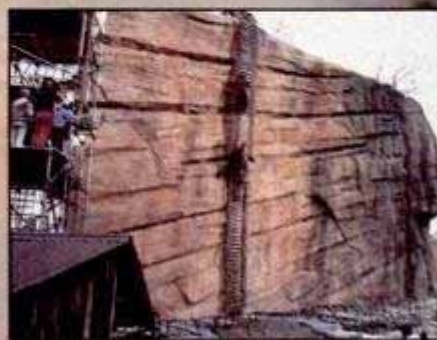
GREATEST MOVIE STUNTS OF 1984

Hollywood stuntmen are riding the crest of competition to get the biggest box office gasps.

BY SOLANGE DE SANTIS

A pack of sword-wielding cult murderers thunders out of the woods and Indiana Jones has only one place to run—onto the rope bridge slung across the canyon. Your heart leaps as Indy makes it to the bridge with its ancient creaking floor of wood planks. About 300 feet below there's a crocodile-infested river. One false move and Indiana Jones will do his last swan dive into the toothy oblivion.

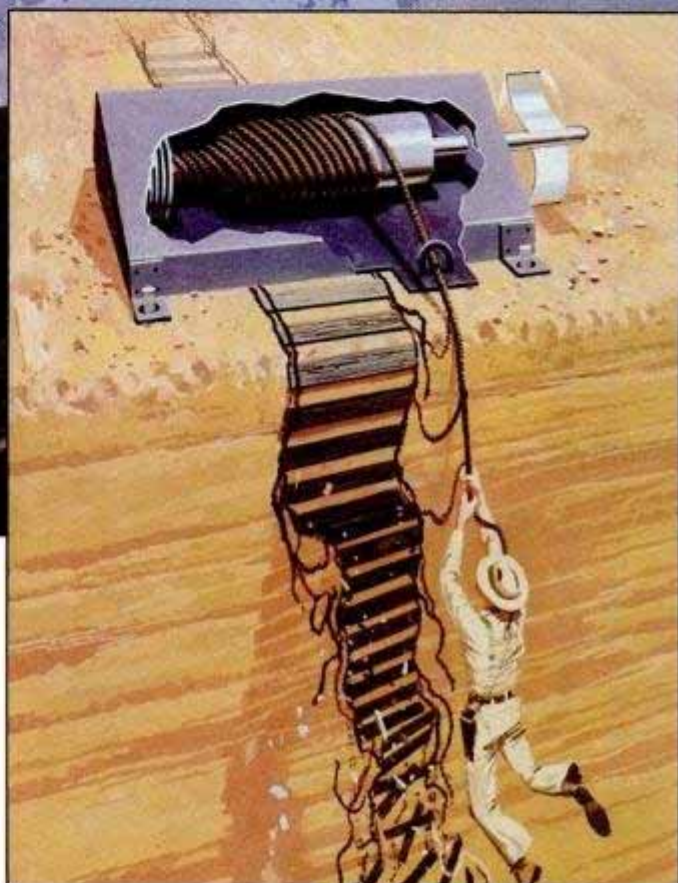
But wait! As the fleet-footed



Villain Mola Ram plunges from fallen rope bridge (top) in *Indiana Jones And The Temple Of Doom*. Mats and airbags (above) break the stuntman's fall.

GREATEST STUNTS

Villains spill into crocodile-infested river after Indiana cuts rope bridge. Before cutting, Indy ties cable to his hand. Cable runs to an unseen descender (right), which also was used in climactic scene (far right). Harrison Ford did some stunts himself, like rafting (below).



killers mount the bridge, Indiana sees the sword-swinging villain Mola Ram waiting for him on the other side. What to do? He whips out his knife, ties the bridge rope cable to his hand, then cuts the cable in half. The bridge breaks in two, spilling Mola Ram and the blood-thirsty Thuggies into the river below. Our hero, clinging to the rope he tied around his hand, bids his adversaries a sarcastic adieu.

So it goes throughout the movie *Indiana Jones And The Temple Of Doom*, the latest installment in the adventures of Steven Spielberg and George Lucas's intrepid archaeologist. The movie, which grossed over \$45 million in its first week, leaves audiences gasping at the nearly nonstop "gags," as stunt people call their bone-crunching stock in trade.

While the Indiana Jones extravaganza reigns as 1984's hottest action flick, there's no skimping on gags in a half-

dozen other new Hollywood releases. Stunt people set themselves on fire in *Firestarter*, leaped 20 stories in *Stick* and hung on for dear life as an entire set flipped over on its side in the shooting of *2010*, the sci-fi thriller scheduled for release this winter.

Caught between the pressure to invent more thrilling and dangerous stunts and the desire to live through them, stunt coordinators are building and modifying gadgets borrowed from paratroopers, firefighters and race car drivers to increase the margin of safety on the set.

Their jobs are hazardous by nature, but more than one Hollywood daredevil told PM that no one wants another *Twilight Zone* case. During the making of that movie in 1981, director John Landis and two associates were charged with involuntary manslaughter in the deaths of actor Vic Morrow and two children. The three perished when

a series of special effects explosions caused a helicopter to crash on them as they were filming a Vietnam war scene.

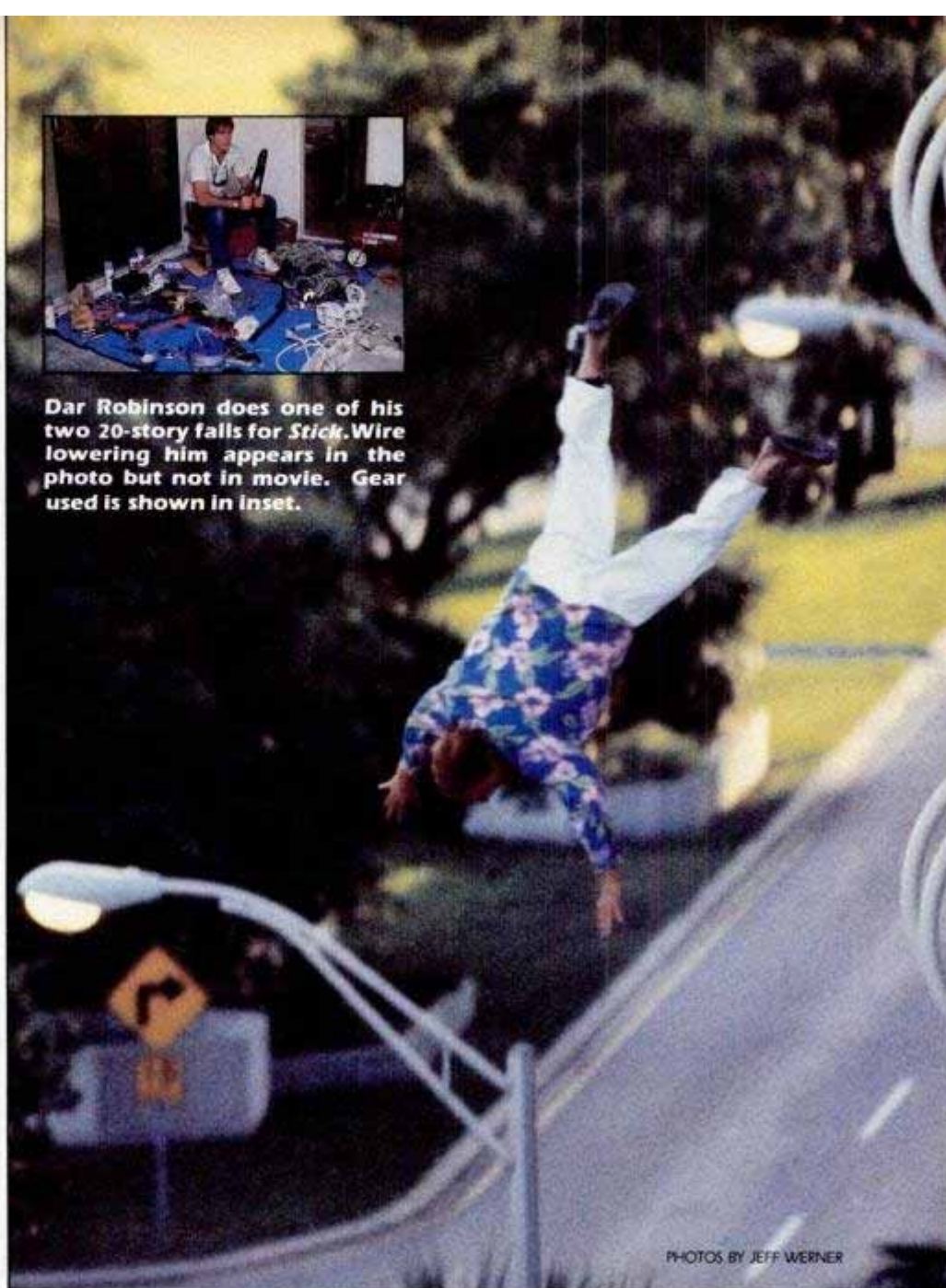
A star is injured

When a stunt comes off without a hitch, the action stops as cast and crew give the stand-in an ovation. But sometimes the wear and tear on the performer leaves scars even without a major accident. Harrison Ford, who plays Indy, underwent surgery for an injured back after doing several stunts himself.

Still, for the death-defying work they do every day, stunt people have a remarkably good safety record. Much of the credit goes to machines like the "descender," used in several big falls in *Indiana Jones*. The descender was adapted from a rig used to teach British paratroopers how to set their bodies for a landing in a drop zone. "I asked about it and tracked it to a parachute regiment at Aldershot," stunt arranger Vic Arm-



PHOTOS: LUCASFILM



Dar Robinson does one of his two 20-story falls for *Stick*. Wire lowering him appears in the photo but not in movie. Gear used is shown in inset.



PHOTOS BY JEFF WERNER

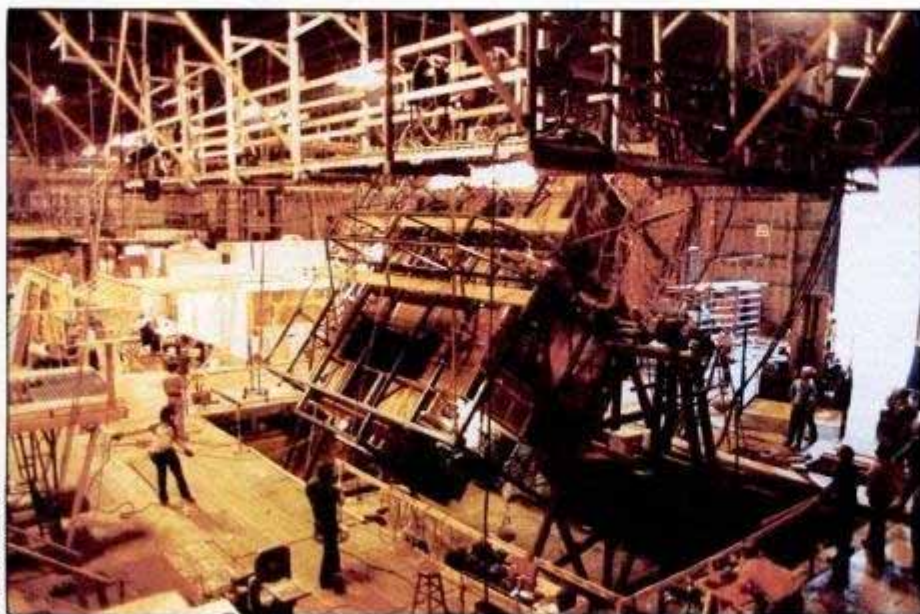


PHOTO: MCMILAN

Crew from *2010* stands by as interior of the spaceship *Leonov* is turned on its gimbaling mechanism. The lightweight metal unit was turned 90°, tossing stuntmen and props.

strong recalls. "I've elaborated on it since then, because the paratroopers used it for a 30-foot drop and I needed a 300-foot drop."

For the bridge scene, the descender was mounted on a cliff, its cable camouflaged by the bridge's ropes and vines. When Ram plunges into the river, he is hooked to the descender by a special cable attached to an upper body harness. The cable runs to the descender, which lowers the bad guy at a slow, steady, safe pace. The fall is speeded up by the camera.

In the same scene, we see Indiana painfully working his way hand-over-hand up the cliffside on the rope cable. But off-camera, the real work is being performed by the descender as it hoists Indy up the cliff.

The device is simply a drum mounted on a shaft attached to an A-frame about 40 inches high and 5 feet long. On one end of the shaft is the motor housing,

GREATEST STUNTS



In the Stephen King story *Firestarter*, the stuntmen were set ablaze for nearly two minutes. Stuntman (inset) wears fire-retardant suit. He wore a protective mask, too.



which is tapered and capped by two fan blades. With the clutch engaged, the blades can be pushed to operate the descender manually. A motorcycle brake on the shaft's opposite end stops the fall of a stuntman on a dime.

Stuntman Chuck Waters, who worked on *Indiana Jones*, modified the rig by installing a gear mechanism for winding stunt people up from the ground to shoot a fall halfway down a building. "It's almost foolproof," he asserts. "The only thing that can go wrong is if the cable breaks. It's strong enough to hold a horse."

High falls are clearly the trademark of a great stunt performer. And in this bumper-crop stunt season, the dean of the fall-guys had his day in the Burt Reynolds film *Stick*. Dar Robinson took a pair of 20-story falls, one as a stand-in for Charles Durning, and the other as a murderer played by the stuntman himself.

Robinson designed and built a special contraption for the big leaps. Dubbed

[\(Please turn to page 122\)](#)



Romancing The Stone co-star Kathleen Turner did her own stunt, a river crossing.

ON TV: IT'S SOAPS, STUNTS AND SWEEPS

Every precaution was taken to make sure no lives would be lost, yet cold fear and tension filled the cavernous studio on the set of the CBS soap opera *As The World Turns*. The set was hot and noisy with a carefully started but frighteningly big fire. Despite the presence of a 6-foot fan designed to blow smoke out of the studio's air ducts, half the people standing by were coughing and one even had to be helped off when he became dizzy from the smoke.

"The whole problem was breathing in smoke," says Sandy Richman, one of only five stuntwomen working in New York. She coordinated the fire

scene and doubled for featured actress Hillary Bailey, who plays a policewoman on the highly rated show.

As with Hollywood movies, TV soap operas are running increasingly intricate and daring stunts in hopes of pulling bigger audiences. In the past two years, stunt people have jumped from six-story waterfalls, crashed cars through plaster walls and raced out of exploding buildings. Most of the stunts are written into the scripts when "sweeps week" comes up.

Sweeps week happens twice a year when the A.C. Nielson survey does in-depth research for one week to see how TV shows are faring. While the

news broadcasts feature sex-oriented reports and talk shows bring on bombshell guests, the soaps go for the big numbers with spectacular "gags," as the stunts are called. "It does wonders for the ratings," Bailey acknowledges. "But the stuntwork also inspires the whole cast and crew."

For the fire stunt, the production company worked two straight 12-hour days to shoot and reshoot the fire until they had on tape exactly what the director wanted.

"We had auxiliary firefighters on the set, and of course, we had to clear everything with New York City fire officials," Richman says. The fire was started with a patented ignition fluid that burns slowly and smolders easily.

To go through the fire, Richman donned a protective suit and wore Zell's Gell on her skin. The malodorous gell protects the skin from fire and staves off a heat transfer burn from the stunt person's own sweat.

Richman, who has coordinated gags for several other soaps, says the higher ratings will encourage TV to go with more stunts. "Love affairs and crooked deals can get boring," she says. "But an explosive stunt will always grab your attention." —D.E.



As The World Turns co-star Hillary Bailey (left) helps Sandy Richman make up to double for her in a fire scene.

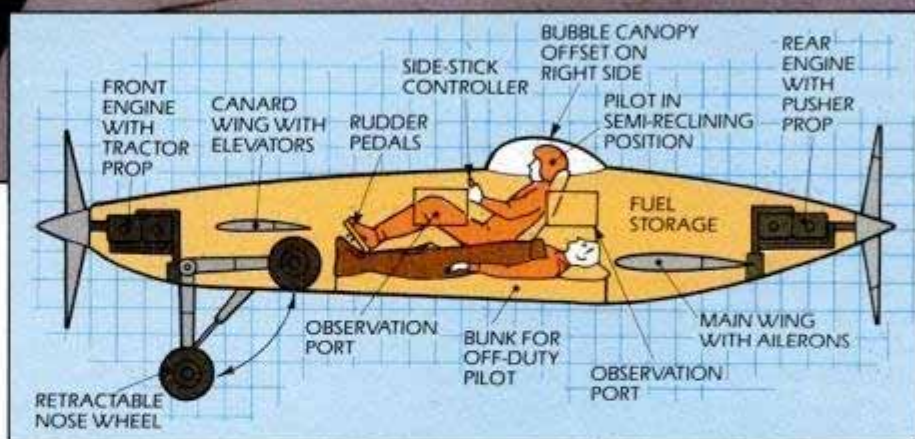


PHOTOS BY BRIAN WOLFF

Voyager's awesome 111-foot wingspan is 3 feet longer than that of a 727 jetliner. Note tiny bubble canopy on right side of cigar-shaped fuselage.

Soon: First Nonstop Flight Around The World

BY SHELDON M. GALLAGER
Photo by Bruno R. Michetti



Cutaway of fuselage shows cramped quarters where pilots may live for up to two weeks.

Sometime in the next few months, two daring young pilots will shoe-horn themselves into a cockpit not much bigger than a bathtub and set off to accomplish what no man before has ever attempted—the first nonstop, non-refueled flight around the world, a distance of some 25,000 miles. If successful, they will mark one of the great milestones in aviation achievement. No one else has even come close. The current record for nonstop, non-refueled flight was set in 1962 by an Air Force B-52 on a 12,532-mile hop from Okinawa to Spain.

The craft that will attempt this global feat, called the Voyager, is a weirdly awesome sight. Conceived by Burt Ru-

tan, famous for his innovative home-built sports planes, it represents a striking departure from traditional aircraft design. Its long, slim main wing stretches an incredible 111 feet from tip to tip—3 feet longer than the wingspan on a Boeing 727. A shorter canard wing on the nose, a familiar Rutan trade-

mark, adds lift and stability without the drag of a conventional aft-mounted horizontal stabilizer.

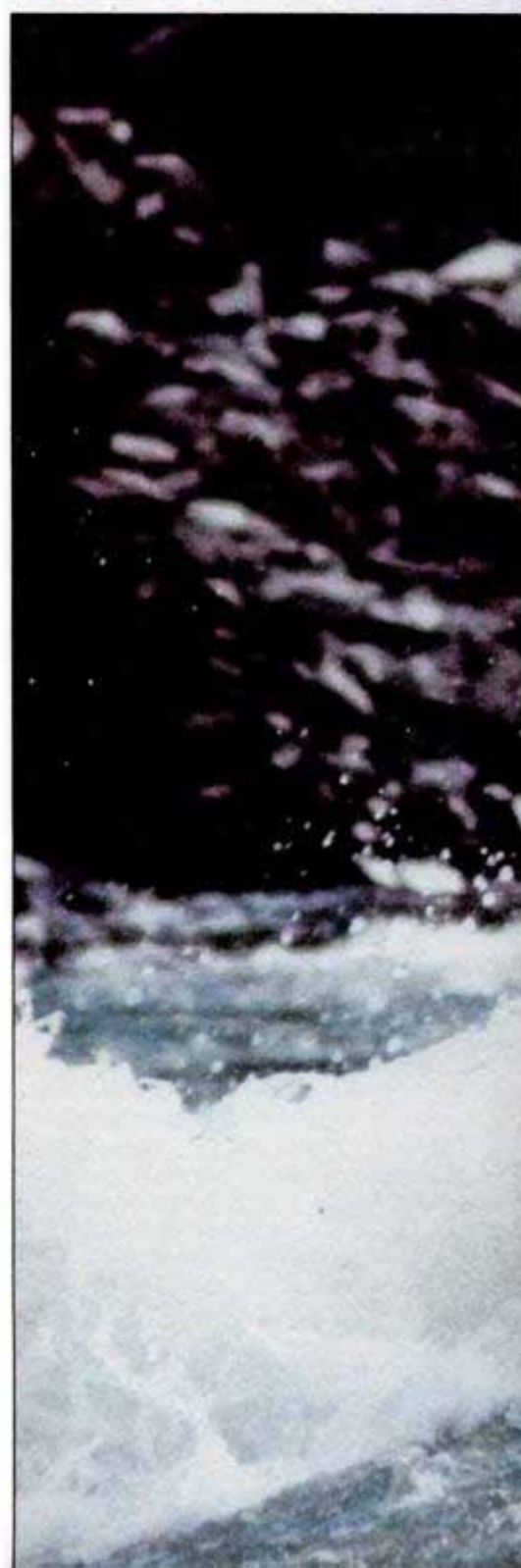
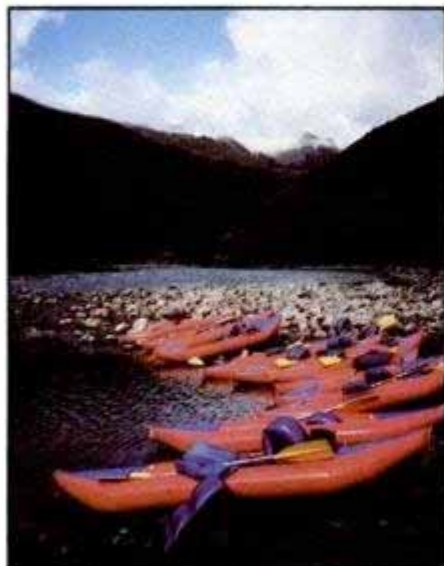
At the center, flanked by two 29-foot-long outrigger tail booms, is a small, cigar-shaped fuselage pod less than 40 inches wide with an engine at either

(Please turn to page 124)

An inflatable kayak is all that separates you from whitewater on this

TORPEDO RUN!

BY CLIFF GROMER



The water is calm beneath our inflatable kayaks. Little more than a few ripples break the surface smoothness of the Klamath River in the deepest reaches of Northern California. The 15 of us on this run know that this is, perhaps, the only calm water we'll see in the next few hours. We try to enjoy the serenity, but we can all feel the underlying tension. The sun is warm, but the water looks cold and, yes, menacing.

The water is noticeably quicker now, lapping against the rock outcroppings to our right as we continue down the river. It's getting closer to that time. We think back to our preparation, to our boats, to our own skills and nerve and wonder how it'll all go together at combat speed when the moment arrives.

What are we doing here?

Initially, the idea of shooting whitewater rapids in a small, inflatable plastic boat does not seem the product of a rational mind. As *Star Trek's* Mr. Spock would say, it's not logical to mix rocks with boats that go pop.

Using inflatable kayaks to run sections of whitewater rivers is the specialty of Orange Torpedo Trips, Box 1111, Grants Pass, Ore. 97526, telephone (503) 479-5061. The people at Orange Torpedo Trips pioneered this new kind of water sport about 16 years ago and have become the foremost outfitters of this type of craft. They currently offer over a dozen different river adventures.

Our escapade began much earlier with a van ride from a central meeting point—where our group had assembled from various parts of the country—to the put-in site on the Klamath.

Orientation had been given at the edge of the Klamath. The hour and a half presentation by the senior of our three guides had gone far in calming the group's initial high anxiety level. The only river experience most of us had had was crossing them at 30,000 feet in the comfort of a 747. We'd been told how to paddle and control the boat—an orange-colored, torpedo-shaped kayak. It's called a Tahiti and is made in France by Sevylor.

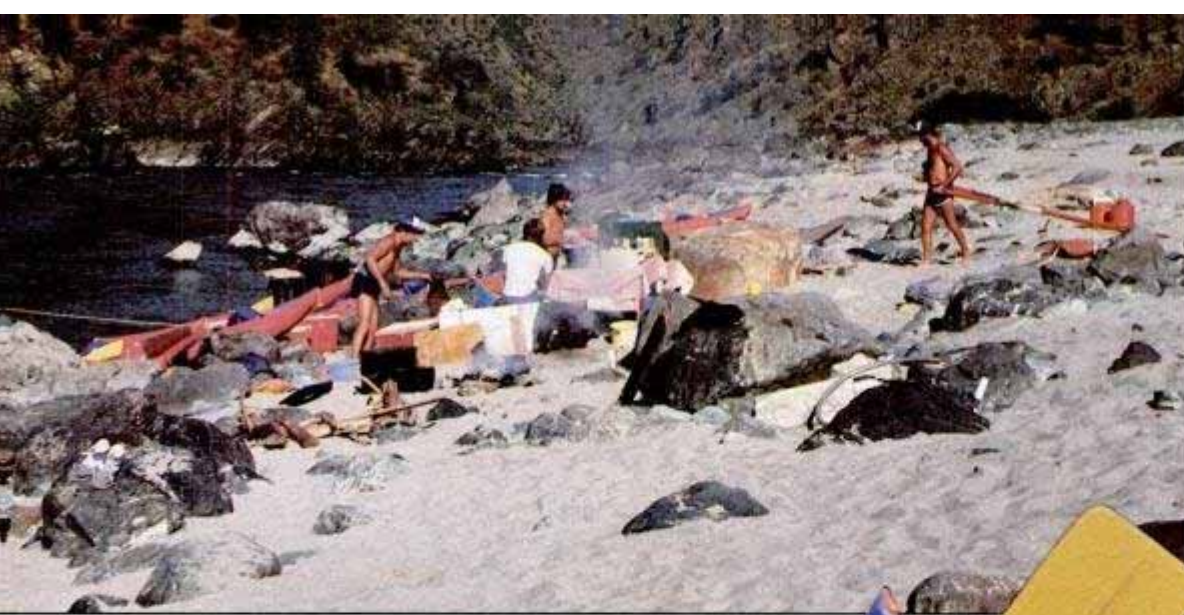
The unreinforced PVC construction of the 10-foot craft is not what you'd call confidence inspiring. These things were supposed to carry us down 38 miles of water, through rock-infested, froth-angry rapids bearing names such as Devil's Toenail, Mixmaster and Trench?

Some of the other whitewater trips use an inflatable that's a bit more sturdy and stable than our Tahitis. Constructed of fabric-reinforced PVC, these larger kayaks are called the Narwhal Totem T300 and T350 and are made in Spain by Dayfer, S.L.

The guide explained what we were to do when (not if) we flipped out of the Tahiti into the water—flatten out on the water to avoid getting caught or banged up on underwater rocks. Thanks.

Most of the danger from rocks would

(Please turn to page 125)



Fifteen inflatable kayakers are ready to roll on the white water (facing page, far left). Once the rush of the first rapids is past, confidence levels increase rapidly. Some trips down the Klamath River in California combine camping (left) with whitewater adventure. If you handle your kayak correctly on The Big Ride (below), you can launch straight up and experience the thrill of mastering the water. Or, the water may master you.



16 VALVES, NO WAITING

Four-cylinder engines with four valves per cylinder put instant performance at the tip of your toe.

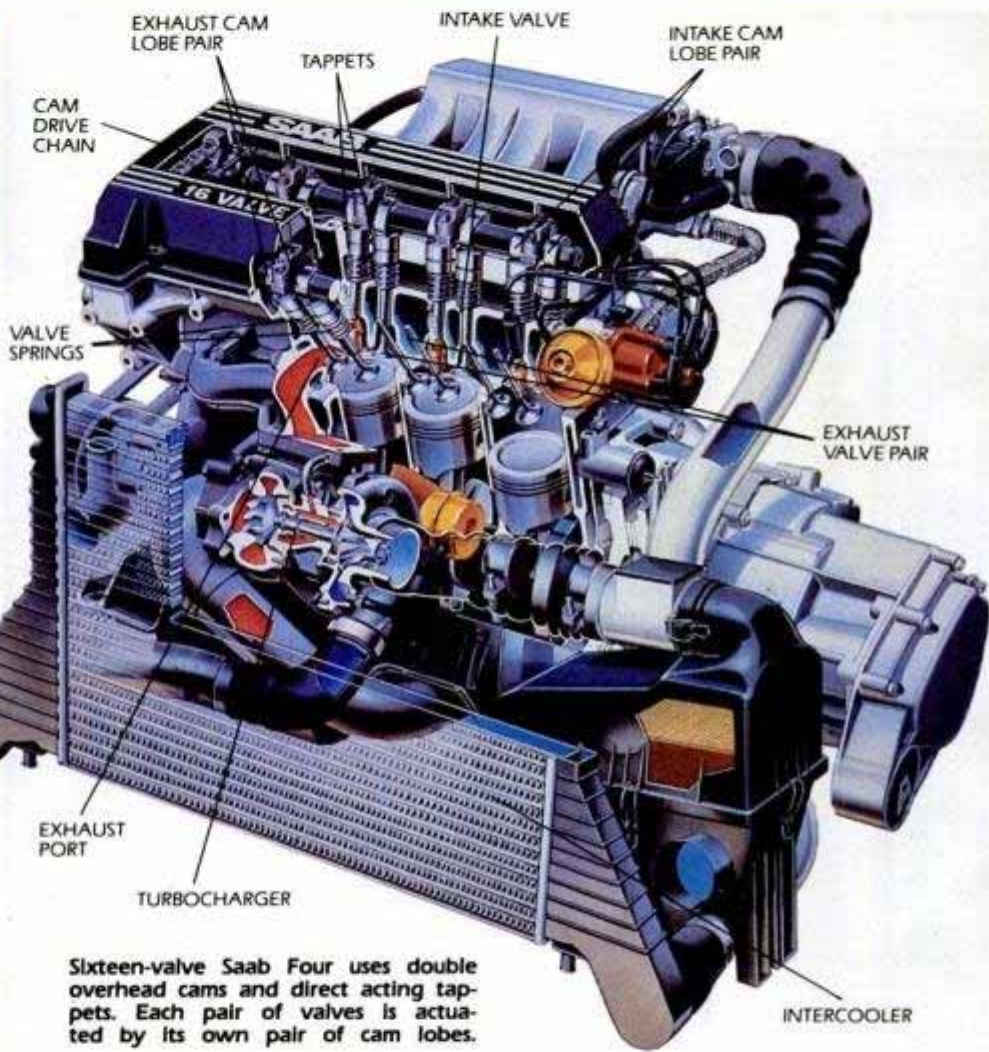
BY NORMAN MAYERSOHN
Assistant Auto Editor

Twenty-five years ago, nobody thought or cared much about trying to combine high performance with low fuel consumption. With gasoline at 30 cents a gallon and blue skies over our cities, all we worried about was making horsepower. From the quadruple-carbed flathead Ford V8s of the '50s to the awesome Chrysler Hemis of Detroit's next horsepower war, it was only raw power output that counted.

When the Clean Air Act and two fuel shortages permanently changed automobiles in the '70s, the term performance was perverted to mean a four-cylinder econobox with vinyl racing stripes, alloy wheels and fat tires.

Today, carmakers are learning how to build high-performance cars that combine driving thrills with economy and ecology. Not surprisingly, one key to this new wave of high-efficiency motoring is an idea nearly as old as the car itself—the four-valves-per-cylinder engine design. First used in 1909 by Fiat and soon turned into a winning Grand Prix racing design by Mercedes and Peugeot, the four-valves-per-cylinder arrangement is used today in nearly every sort of racing, from Formula One and the Indianapolis 500 to the World Rally Cup for production cars.

We're starting to see this design show up in new road cars for one simple reason—it makes more power. Internal combustion engines are easily pleased. The more air/fuel mixture you can squeeze into the cylinders, the more powerful the explosions will be. Turbochargers are one great way to accom-



Sixteen-valve Saab Four uses double overhead cams and direct acting tappets. Each pair of valves is actuated by its own pair of cam lobes.

plish this, but they only flex their muscle when boost (positive pressure) has been built up. Four-valve designs increase power over a broader engine speed range and take nothing away from driveability.

The improvements are far more than a simple matter of four valves being better than two. Airflow into and out of the cylinder is improved, but the reason is not so obvious. Two small valves replacing a single large one might have a larger total valve area, but the really critical increase comes in valve circumference. Air can't flow through the center of a valve anyway—it enters and exits the cylinder around the valve seat edge. Even for equal valve areas in the two designs, the four-valve head will

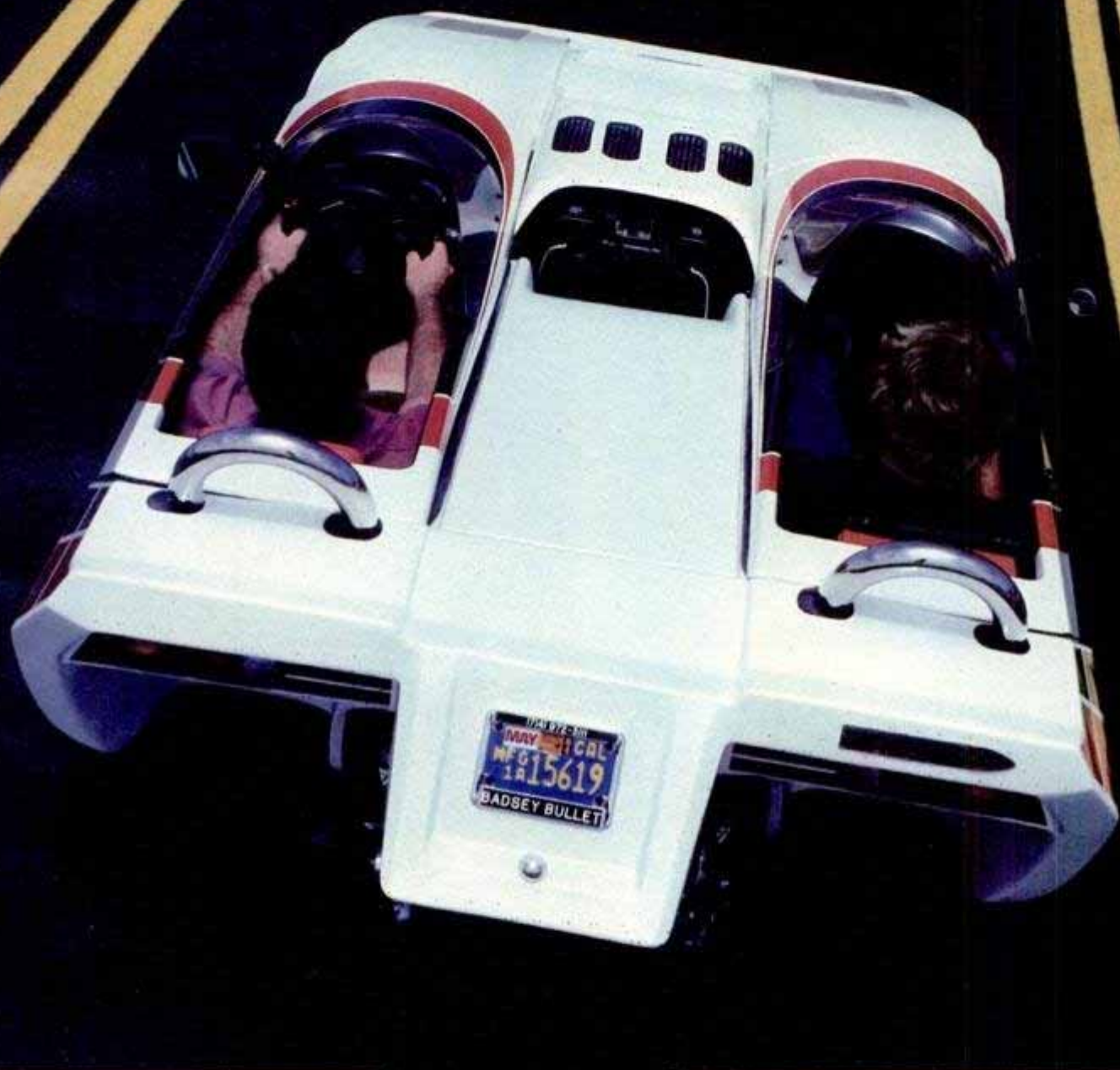
have an advantage of almost 40 percent greater curtain area, which is where the real action takes place.

There are other factors only slightly less important. Smaller valves are lighter than the ones they replace, so rpm potential and power output are again raised. For proof, look at the Mercedes 2.3-liter Four used in the 190 series cars. The standard version puts out 120 hp at 5,000 rpm. The new 16-valve model serves up 185 hp at 6,200 rpm. Ford's SVO Mustang needs a turbo and intercooler to make equivalent power from the same 2.3-liter displacement. Each cylinder's valves are usually arranged in opposing pairs—two intake valves opposite a pair

(Please turn to page 158)

3-WHEELERS ARE BACK!

Why use four wheels when three will do?



BY ANDREW COE
Photos by Don Green

Badsey Bullet has individual compartments for its driver, passenger and a four-cylinder 1,200-cc Yamaha motorcycle engine. Comparison with the Batmobile is inevitable.

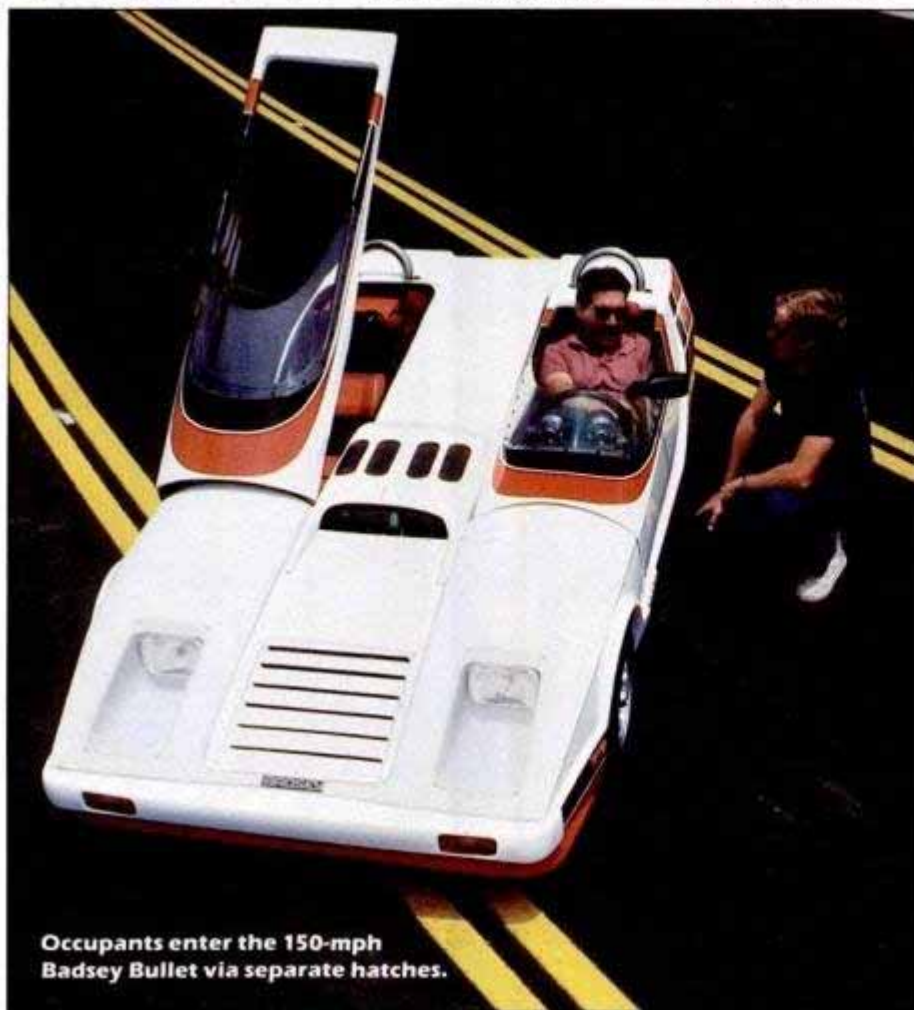
The concept of three-wheeled cars makes perfect sense: Three points define a plane, four are redundant. In fact, two California companies are producing three-wheelers that are so fast and so much fun, they might become the sports cars of the late '80s. And some of the most popular European three-wheeled cars are about to be imported into this country. Even

those big guys in Detroit have a few tricks up their sleeves.

The history of three-wheelers is as long as that of motorized transport. One of the first self-propelled vehicles, Cugnot's 1769 steam tractor, had only three wheels. Karl Benz is credited with building the first true automobile (a three-wheeler) in 1886. The Morgan three-wheeler with its V-Twin motorcy-

cle engine was one of the most popular sportscars in England during the first third of this century when only the rich could afford four wheels. Since then, three-wheelers have had a few ups—Buckminster Fuller's Dymaxion Car, the German Messerschmitt bubble car and Mazda's post-War three-wheeled truck—but, in the last several decades, it has been mostly downs. Today, three-

3-WHEELERS ARE BACK!



Occupants enter the 150-mph Badsey Bullet via separate hatches.

wheeled vehicles are making a comeback, and they're looking to hit the big time.

Three-wheelers flourish in Europe, Japan, India and Asia, but they have almost disappeared from U.S. roads. The three-wheeled, seven-seat Davis of 1947-49 looked like any big post-War American car, except for its single front wheel. But the company went bust. One reason is that Americans are prejudiced in favor of four-wheeled vehicles. In our minds, four wheels are the defining feature of an automobile. Anything with less than four wheels is either a motorcycle or an indefinable something else. Another deep-set belief is that three-wheelers tip over easily on turns.

A properly engineered three-wheeled vehicle should not tip over or have any other odd handling characteristics. Some three-wheelers tip over less easily than any four-wheeled car. What's important here is that the vehicle must have a wide track and a low center of gravity close to the two-wheeled end. As for handling, a couple of the three-wheelers in this article make you think you're driving a racing car. Very few four-wheelers can compete with them.

Three-wheelers with squared off



Ligler's 125-cc delivery van delivers up to 100 miles per gallon at a \$3,500 price.

bodywork do look weird. From some angles, the single wheel is hidden and one end of the car seems to be levitating.

One happy side effect of our prejudice for four wheels is that legislators have made it the law: If it has four wheels, it's an automobile. Anything with less than four is legally a motorcycle. This means insurance for three-wheelers is drastically less expensive. In New Jersey, for example, a 16-year-old driver on the biggest bike might only pay \$215 a year for insurance,

while the same kid with a car would have to pay almost \$500.

These definitions also affect licensing. In some states, you need a motorcycle license to drive a three-wheeled car. In others, you only need a regular driver's license if the three-wheeler has an automotive-type steering wheel and an enclosed cab. (Licensing and insurance regulations vary from state to state. Check with your state's department of motor vehicles and insurance board for local interpretations.)

If there is any car that breaks down prejudices against three-wheelers, it's the Trihawk. Hawk Vehicles Inc., 34091 Coast Highway, Dana Point, Calif. 92629, builds the Trihawk, which retails for \$14,888. It's a pure front-wheel-drive, front-engine car—74 percent of its weight is in front. In the back, there's just a wheel. Powered by a 1,299-cc, air-cooled, flat Four Citroen engine, it goes from zero to 60 mph in 9.7 seconds with a top speed of 97 mph. As you zip around turns at G-forces that are right up there with the Lamborghini Countach, remind yourself that the Trihawk tips over *less* easily than any four-wheeler. It has been in production since January, 1983, and it's already a classic sports car. Harley Davidson has recently



Citroen-powered, front-drive Trihawk has been in production for almost two years.

purchased Trihawk and is studying the feasibility of substituting Harley's V-Twin for the Citroen Four, which would make the Trihawk a modern Morgan.

Another California firm, Badsey Bullet USA Inc., P.O. Box 9275, Anaheim, Calif. 92802, is on the verge of producing a three-wheeler that combines racing and motorcycle technology in one innovative three-wheeled package.

Their wedge-shaped Badsey Bullet is a two-seater with a Yamaha 1,200-cc engine positioned Batmobile-style between the driver and the passenger. The center section is a wind tunnel that cools the engine and produces some of the suction effect that keeps race cars on the ground.

The Bullet rides on two small front wheels that steer and a big rear driving wheel. The combined widths of the front wheels approximately equal the rear wheel's width. According to inventor Bill Badsey, this patented wheel

configuration produces a gyroscopic effect that stabilizes and centers the Bullet on the road. The sum of all these technologies is amazing performance: zero to 60 in 4.6 seconds and a top speed over 150 mph are claimed (a prototype was clocked at 167 mph in South Africa, but keep it under your hat). Gas consumption is better than 55 mpg in more normal driving. For \$16,900, you can stroll right on out to the edge in the Badsey Bullet.

Back in the staid world of commuter [\(Please turn to page 154\)](#)



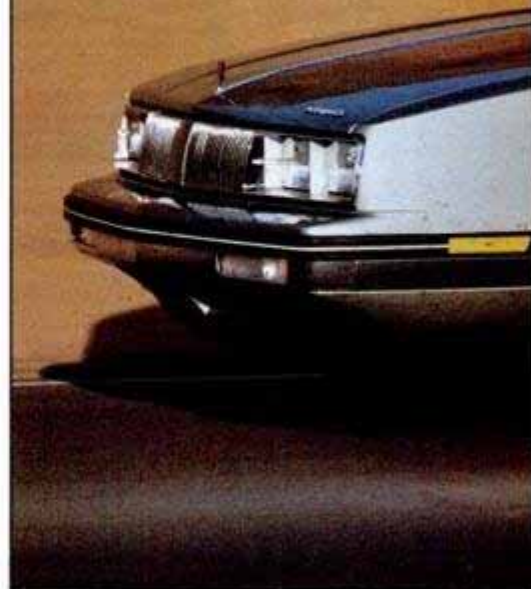
Reliant van and sedans blend real car looks with 70-mpg economy. Rogers Rascal microvan is assembled of parts from 15 countries!



GM's VARIATIONS ON A THEME

How many ways can you slice one platform?
Multiply the answer by five divisions.

BY MICHAEL LAMM, West Coast Editor,
AND DANIEL CHARLES ROSS, Detroit Editor



The N-car, the latest member of General Motors' JAXN family, is probably the most important ingredient in GM's 1985 alphabet soup. GM isn't saying so, but the N-car will slowly replace the aging and troubled X-car. The N-car closely resembles the X-car in size. The X-car, you'll remember, begat the J-car, which begat the A-car, which begat this new N-car (now called the GM-20 under a new code name system).

For 1985, Oldsmobile will drop its Omega X-car and will introduce the Calais in its place. Pontiac will discontinue the Phoenix X-car and introduce its own version of the GM-20, called the

Grand Am. Buick, meanwhile, will begin offering the Somerset Regal GM-20 alongside the X-car Skylark, which has been selling well in '84. The Skylark will slowly fade from the scene late in 1985.

All three versions of the GM-20 will bow this month, first as coupes, then soon afterward as four-door sedans. Toward 1987-88, the GM-20 platform will be the basis for Oldsmobile's rumored 2+2 sport convertible. Maybe. Olds hasn't yet decided.

These variations, including those from sister divisions, will follow the X-car/A-car layout of front-wheel drive, MacPherson-strut front suspension,

semi-independent trailing arm/twist-beam rear axle with coil springs, and unitized body. The GM-20 springs more directly from the A-car than the X, but all three share engines, powertrains, suspension parts and even some inner body structure. (The X-car won't disappear completely in 1985. Chevrolet will continue to offer the X as the Citation II until its 1987 L-car, or GM-25, is ready.)

N-car powertrains

GM-20 performance is adequate from both engines: the Pontiac-supplied, 2.5-liter Iron Duke Four and the optional 3.0-liter port-injected V6. This new Buick-built V6 is a sweet-running engine that runs and sounds just like an inline Six. It has that same incomparably steady, smooth staccato beat. The slightly open-throated exhaust note of an Olds Calais Supreme we drove sounded great.

Trouble is, you'll be able to get the V6 only with the Turbo Hydra-Matic 125C transaxle. This four-speed overdrive automatic makes for an easy-driving powertrain, but it means that acceleration with the V6 automatic is roughly equal to that of the Four with a five-speed manual.

While the GM-20's basic chassis and suspension carry over from the A-cars, there's one major difference: no separate rubber-bushed subframe up front. Rather, the powertrain cradle is welded solid to the main unibody and has

Chevy's rwd Astro van has more hauling capacity than Chrysler's minivan and is more conservative in styling than Ford Aerostar.





PHOTO BY VIC HUBER

longitudinal rails that run back under the floorpan. The welded-up platform causes a tiny bit of ride harshness, but it also gives a stiffer, more rigid structure for better handling.

The GM-20's ride tends to be a little noisier than the A-car or even the X-car. While it handles better than the A-car, it still understeers. Understeer gives way to oversteer when you lift off the throttle during hard cornering or braking—common conditions on slippery roads and in emergencies.

Driving the Olds version

The V6 Olds Calais Supreme we drove had the optional F-41 sport suspension which, at \$35 or so, has to be one of the greatest bargains going. RPO F-41 makes the Calais steer, track and respond quite a bit better than the



Oldsmobile's version of the GM-20 (above) is dubbed Calais. Buick Somerset Regal and Pontiac Grand Am will share the same silhouette. Buick supplies the port-injected, 3.0-liter V6 powerplant (left).

standard suspension, and the small sacrifice in ride isn't enough to detract. The advantages of the F-41 suspension far outweigh the little added jiggliness.

Those advantages include 14:1 rack-and-pinion steering instead of the standard 16:1, 205/70R13 tires rather than the conventional 185/80R13s, a 24-mm front stabilizer bar as opposed to a 22-

mm standard, harder grommets and bushings, different strut and shock valving plus a rear stabilizer bar (the standard rear suspension has none).

GM's interior designers have done a commendable job with the seats and instrument panel. It's a very comfortable car. There's an amazing amount of

(Please turn to page 146)

Cavalier Z24 is Chevy's high-performance J-car, with a 140-hp EFI 60° V6 and uprated suspension.





FORD's FOREIGN



Fresh from Germany: Merkur is hot competition for the sports-sedan builders.

For those who think Europe gets the best cars, Ford is importing Merkur, its rear-drive sedan that's designed and built in Germany.

BY DANIEL CHARLES ROSS
DETROIT EDITOR
AND NORMAN MAYERSOHN
ASSISTANT AUTO EDITOR



Merkur's trick spoiler was first seen in the U.S. on SVO Mustang.



Sunroof is one of the few possible options on the well-equipped, \$16,400 list Merkur.



Five-passenger hatchback has split rear seat and convenient cargo accommodations.



Merkur's turbo Four is set at 15-psi boost, and puts out 170 hp (160 hp with automatic).

POWER PLAY

Five-liter Mustang GT is once again Detroit's hottest muscle car, with its 210-hp V8 engine and Goodyear's unidirectional "gatorback" tires.



For 1985, Ford puts the message right up where you're sure to see it: Front and rear, their new Merkur marque carries identification badges bearing the words "Ford Werke A.G. Köln, Germany." Instead of trying to make customers forget the country of origin for their offshore-built cars, Ford is hooking onto the American infatuation for Eurosedans. This fast-growing segment of the market has been on a steady upward beam in recent years and seems just about recession-proof.

Designed and developed in Germany, and sold in Europe since 1982, the Merkur XR4Ti (Sierra in the home market) is a high-spirited three-door coupe with a 2.3-liter turbo Four underhood. Ford's commitment to the Merkur as an all-around driver's machine shows in its rear-wheel-drive design. Ford's opinion, shared by other performance-car builders, is that roadholding is best when steering and driving force is divided between two sets of tires.

From the beginning, the car was built with both fast driving and the American market in mind. But most European imports, particularly those brought to market by American manufacturers, suffer from mechanical anemia, so by the time they land on our shores, they fall far short of their original potential. Ford went to great lengths to preserve the European character of this model, and it shows.

One place where they actually improved the U.S. version is the powerplant. Replacing the 2.8-liter V6 of the Euro version is a 15 psi-boosted 170-hp Four (160 hp with automatic transmission). The smaller Four makes equivalent horsepower to the European engine, and far more than would an emissions-certified V6. And, as is the fashion on the Continent, the suspension is rather compliant, with plenty of body roll. But the tires always stay firmly in contact with the road so the car will corner comfortably *and* fast.

Aerodynamic advances

The Merkur's shape is a further offshoot of the Probe show cars and, with a Cd figure of .32, is a few steps beyond the aero-styled T-bird. Some of the

devices that contribute to this great reading for a five-passenger sedan are subtle, like plastic body side-cladding. Others are radical—the bilevel rear wing comes directly from the Euro version, and helps cut lift and drag by trapping turbulent airflow between the wing layers.

Inside, the Merkur is loaded with the kinds of clever details we've come to expect of Japan's best offerings. Below the Grundig radio are convenient pop-out storage racks for four tape cassettes, and the trunk section features an elastic cargo net hooked to the floor for secure package stowing. The rear seat is a split folding design, and the package tray behind it removes quickly for full hatchback storage capacity.

New marque for Ford

The XR4Ti is the first U.S.-bound model in a complete new line of cars that will be sold through 800 franchised Merkur dealers. As delivered, it will be a fully equipped vehicle with only a short list of options to be added on top of the projected \$16,400 price. The performance, size and price place the Merkur squarely in the hotly contested territory of BMW, Saab, Audi and Volvo.

Our initial driving impressions tell us that the Merkur ought to be a leading contender right away, and the genuine [\(Please turn to page 135\)](#)



Highest tech yet: Comtech touch-screen control panel option for the Mark VII.

LOOKING UNDER THE HOOD:

1985
DETROIT
MICHIGAN

ANTILOCK BRAKES: FORD'S FIRST

Do company lawyers block safety-related systems that are not required by law for fear of litigation? They certainly didn't at Ford, where the '85 Continental and Mark VII will have the first four-wheel antiskid disc brake system on an American car.

However, the lawyers also got in their licks, including the fact that Ford won't call it an "antiskid" system. The approved term is "antilock," which means that Ford doesn't claim it prevents skids, only that it prevents wheel lockup on hard braking. Yes, the whole idea is to prevent skids, but don't tell that to the Ford counselors—they get big bucks to come up with things like this.

Legal influence also is apparent in the design. Of course it's fail-safe, so you have normal braking even if the antilock system dies. It also has two control computers, one to back up the other, which should prove that good intentions won out over cost savings if the subject ever comes up in court.

Ford buys the basic system from Teves, a European brake manufacturer—everything but brackets, wiring harness and power relays. Teves reportedly is obligated to pay any warranty costs, and there's probably a clause or two in the contract about lawsuits.

Fully hydraulic system

The antiskid, sorry, antilock system is integrated into a fully hydraulic power braking system (it has no vacuum booster) that is pressurized by an electric pump on the hydraulic booster. An accumulator atop the assembly stores enough pressure for up to 15 power-assisted stops in case of pump failure.

There's an electromagnetic sensor at each wheel. A toothed ring attached to the rotor spins past the sensor, continuously breaking the magnetic field, to signal the computers. A bank of six hydraulic solenoid valves on the side of the master cylinder also is wired to the computers to control the three brake lines. There are two valves for each front wheel, and one pair for both rear wheels. One valve in each pair is normally open, the other normally closed.

The master cylinder is a dual design, but because there are separate circuits

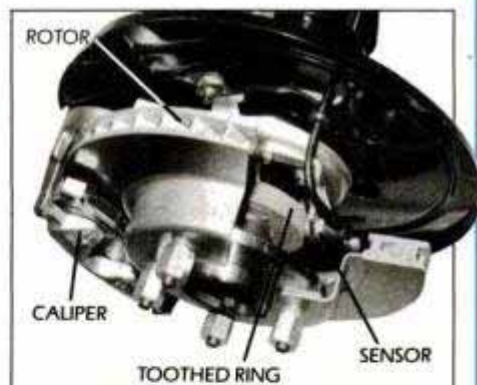
(Please turn to page 136)



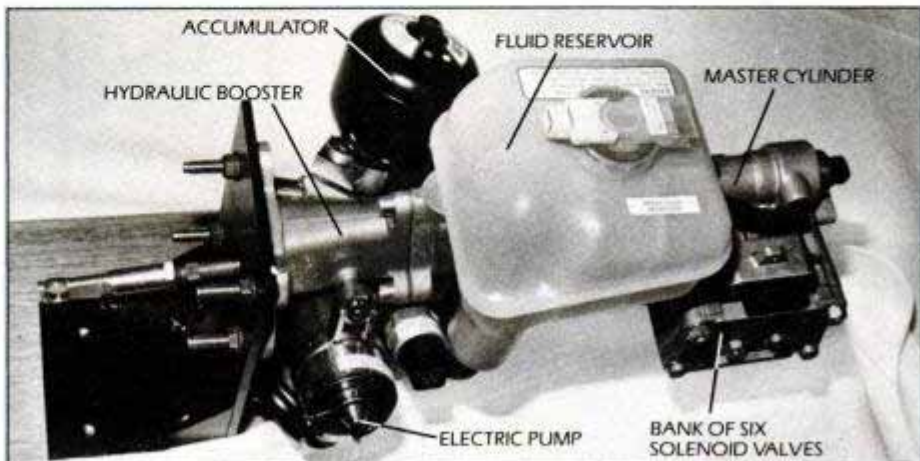
Mustang's two-speed belt drive turns all accessories (except the air pump) half speed.



Merkur's turbo Four isn't intercooled, but part of the air delivery plumbing sports cooling fins. This might allow future racers to install intercoolers and still meet "factory trim" rules.



Antilock brakes use speed sensors on each wheel to warn computer of impending skid.



Antilock system uses six solenoid valves to retain or bleed off brake line pressure.



AMC's SUNNY SIDE UP

The American Motors and Renault team adds a little spice to its economy mix.

BY DANIEL CHARLES ROSS, Detroit Editor

American Motors' first convertible passenger car since the 1968 Rebel will go a long way to change AMC's conservative image. With the help of Renault, the company is also introducing a pair of entirely new French-designed engines, one gas and one turbodiesel.

Both AMC/Renault's new gasoline engine and its new soft-topper are combined in the 1985 Alliance. Power is supplied by the Renault F-engine, a 1.7-liter overhead-cam Four with 77 hp at 5,000 rpm and a peak torque of 96 lb.-ft. at 3,000 rpm. This engine will be standard equipment in the Alliance Limited sedan and convertible and Encore GS models. It's optional in other Alliance/Encore models and helps offset the terrible power shortage Alliance/Encore models have suffered since their introduction. The pending 1.4-liter turbocharged Alliance ought to eliminate this problem once and for all.

Bendix single-point fuel injection replaces the Bosch LU multipoint units used on last year's 1.4-liter Four, still

the standard powerplant in most Alliance/Encore models.

Convertible collaboration

The Alliance convertible is a well-done piece of work—a design AMC/Renault developed in conjunction with the convertible experts at American Sunroof Corp. (ASC). The collaboration produced a special subassembly line at the Kenosha, Wis., assembly plant where U.S. Alliances are built, with little deviation from normal manufacturing techniques.

After the roof, B- and C-pillars are amputated, reinforcements are attached to the A-pillar and to a variety of body sections. Torsional rigidity appeared to be up to the task during our test drive. The new top is power-operated and has a color-coordinated boot and zip-out rear window. The trunk can be opened and closed without difficulty when the top is down and boot is installed, however, some of the trunk space has been sacrificed to the sun god—perhaps too much for large suit-



Alliance drop-top, AMC's first since 1968, gets a new 77-hp, 1.7-liter Four, too.

cases. But, we were happy to trade that trunk room for wide open space over the passenger compartment. Power windows are available as an option on the Alliance convertible.

For the Encore line, the GS model has been upgraded with the 1.7-liter Four, five-speed manual transaxle, 14-in. aluminum wheels and performance tires, a

(Please turn to page 140)



Overwhelmingly successful Cherokee series now has a French-built turbodiesel option.

LOOKING UNDER THE HOOD:

1985
DETROIT
MICHIGAN

AMC/RENAULT'S TWO NEW ENGINES

Is the new 1.7-liter four-cylinder for the '85 Alliance the strongest Four in the industry? AMC chief powertrain engineer Dan Hittler concedes its 77 horses from 105 cubes isn't tuning-to-the-hairy-edge, but claims its durability is beyond anything he's tested.

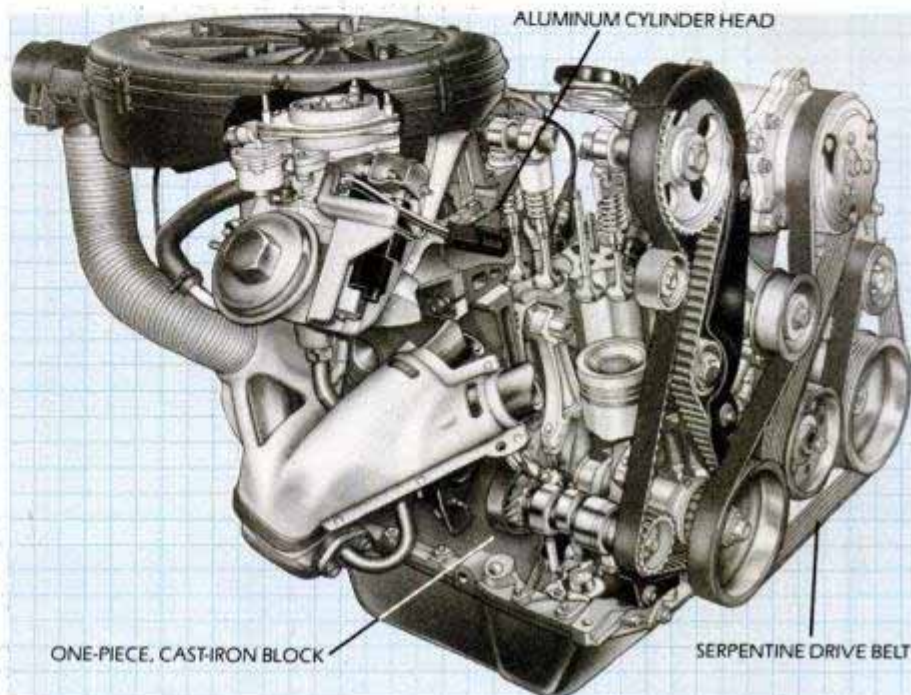
The engine is built by Renault in France (production soon will switch to Mexico) and "dressed" with accessories in the United States. It is the first one AMC has had that passes the company's 1,000-hour dyno test (500 hours at peak horses, 500 at peak torque) and comes back ready for more. "We tore down the engine at 1,000 hours," Hittler says. "The parts looked just nicely broken in, so we reassembled it with the same parts and found we could run it for 300 hours more." The standard 1.4-liter engine barely makes 1,000 hours and the 2.5-liter Jeep engine falls a bit short, he admits.

The 1,000-hour test, also used by Renault, is more severe than typical tests by U.S. manufacturers because domestic engines have traditionally been big on cubic inches and loafed along, nowhere near peak horsepower or torque. All that is changing, Hittler says, because, in general, engines have been downsized even more than the cars have.

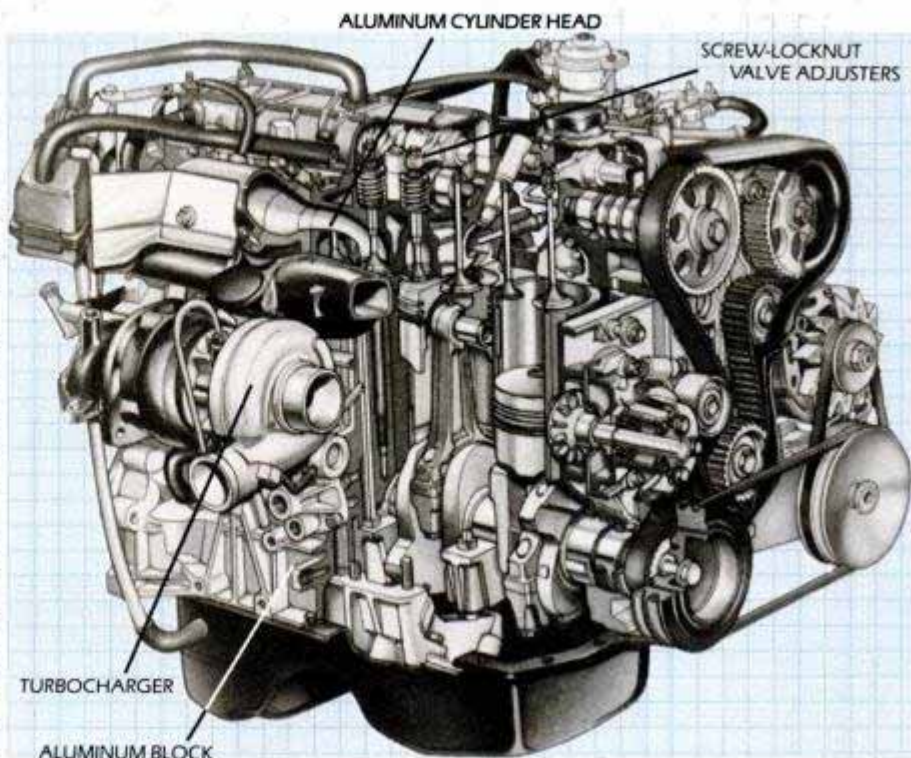
Although dyno testing of some small U.S. engines has been upgraded to as high as 800 hours, all are below the 1,000 mark and many are still tested for as few as 200 hours, Hittler says. He adds that other dyno testing does not come near the percentage of peak operation in AMC procedures.

The dyno test isn't absolute proof that an engine will last long because operating conditions, maintenance and build quality are also factors that figure into the equation. However, Hittler says, the 1.7 was engineered both for gas and diesel—not as a conversion—so the basic design is strong. The block is one-piece cast iron, not the usual Renault wet-sleeve type, so it deflects less. After its infamous 20,000-mile engines of the '50s and '60s, Renault learned to build in durability with wet-sleeve designs, so with the rigid block it can do even better. The crank is a five-main-bearing design. The layout of the

(Please turn to page 142)



AMC's torture-tested 1.7-liter gasoline engine might be the toughest new Four made.



The all-aluminum 2.1 turbodiesel for Cherokee/Wagoneer makes 85 hp with intercooling.

LOOKING UNDER THE HOOD:

1985
DETROIT
MICHIGAN

CHRYSLER TACKLES THE DETAILS

Most of the engineering work Chrysler did for 1985 was to correct a variety of customer objections and headaches.

The 1985 four- and five-speed manual gearboxes should no longer suffer the shifting difficulties of previous years. The problem occurred because as many as three forks had to move back and forth along a single rail. Any looseness between a fork and the rail could easily cause the fork to cock against a synchronizer and bind. A double-rail design is being introduced for 1985 that holds the forks in better alignment. Also, all the forks have been beefed up to reduce deflection.

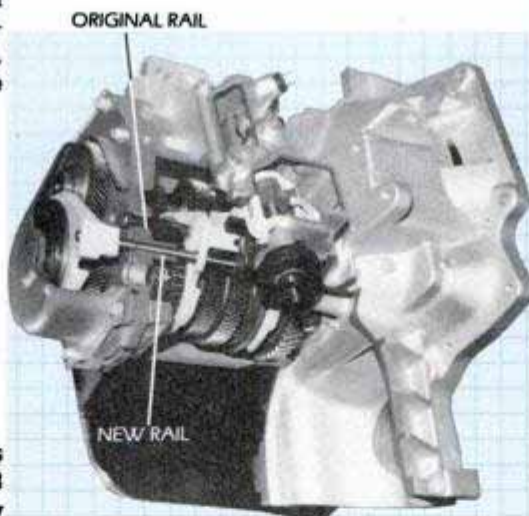
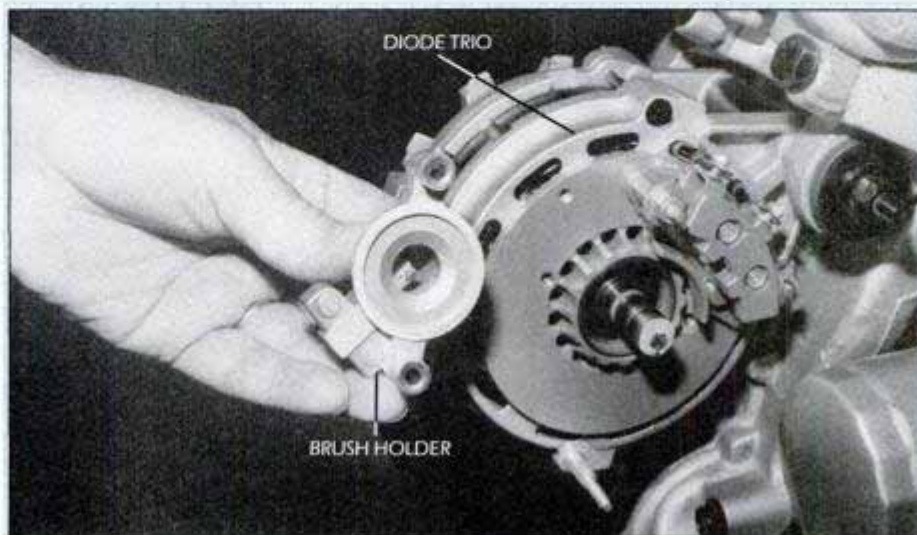
The 2.2-liter four-cylinder engine gets some rework to reduce engine compartment vibrations and noises. The most significant change is the solid mounting of the air-conditioning compressor to the engine, using a shallow, very rigid bracket instead of the large one with rubber bushings. Previously, the bracket and compressor were subject to engine shaking forces that created a droning sound, particularly at idle.

The air intake ductwork, a source of noise when inrushing air causes it to vibrate, is a new blow-molded design. It's much more rigid than the pre-1985 type, so it will vibrate less.

The carburetor has been the bane of Chrysler's existence since emissions controls stiffened, almost causing a 1.3 million-car recall for stalling. Factory fixes for driveability problems have had limited success. The answer for Chrysler is fuel injection, which is being phased in across the board on the 2.2 Four by the next model year.

But there is still a year to go and many hundreds of thousands of carburetor customers. So Chrysler has attended to one of the remaining headaches: driveability and poor hot restarts with gasoline containing alcohol additives (particularly methanol). The 2.2's fuel lines were rerouted to move them farther away from hot spots in the engine compartment, and a fuel reservoir was installed near the carburetor. This reservoir separates out vapor, helping to ensure a supply of liquid fuel

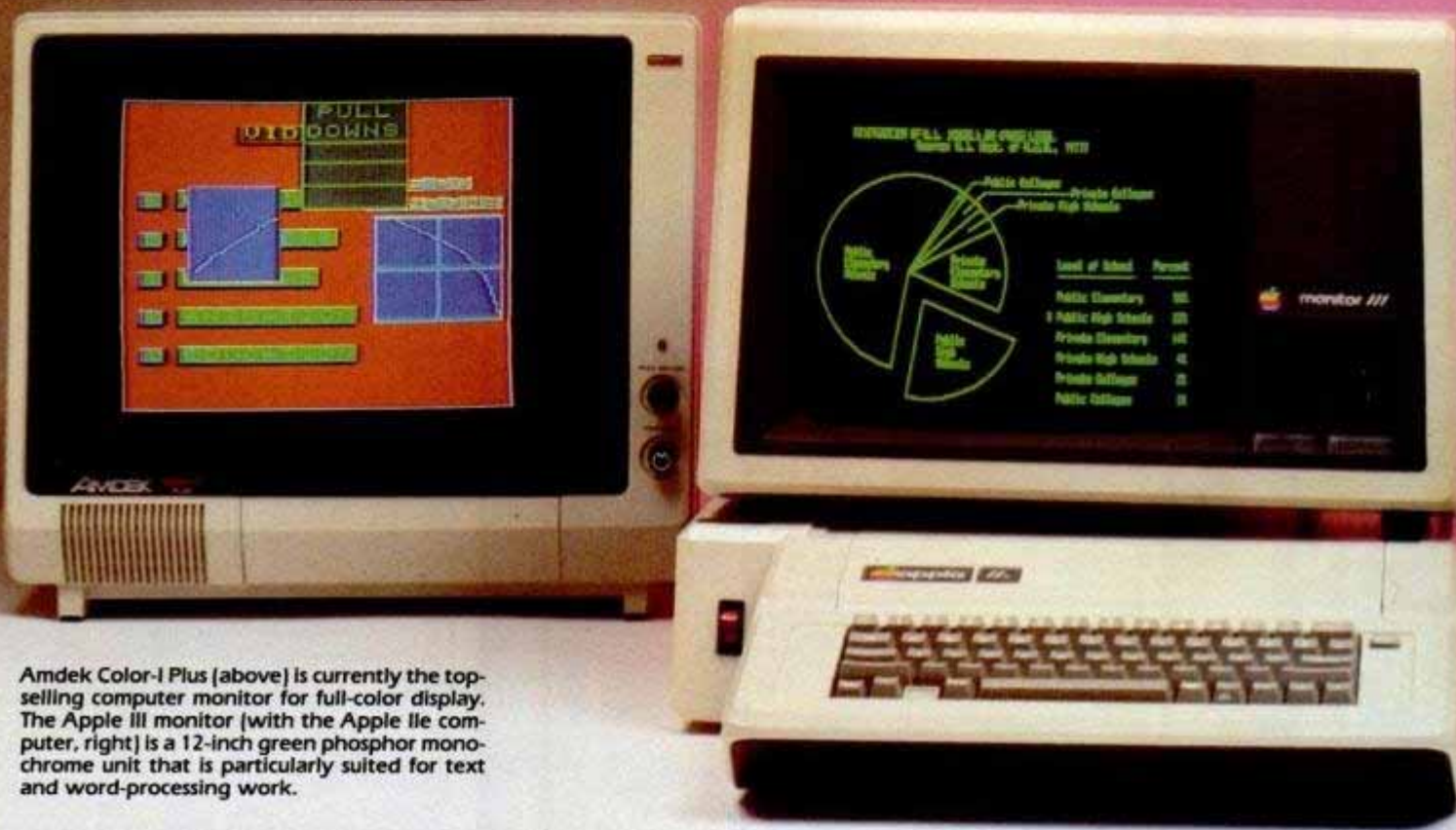
(Please turn to page 144)



Chrysler leads the way in ease-of-repair advancements with a new alternator design (above). Routine failure items—brushes and diodes—can be serviced by removing a plastic cover. Unbolting the alternator from the engine is unnecessary. Voltage regulators have been eliminated on EFI-equipped Fours and replaced by two engine computer modules. Balky shifting on the four- and five-speed manual gearboxes has been fixed by a double rail design for shift forks to keep them in better alignment (left). Forks have been strengthened to resist deflection, too. Onboard computer diagnostics are now part of the carbureted 2.2 Four engine package. A special Chrysler digital readout instrument (lower left) pinpoints trouble. Starting problems caused by gasoline with alcohol additives have been cured by rerouting fuel lines away from underhood hot spots and installing a vapor separator (below) to keep liquid gasoline flowing into the carburetor.



Buying A Real Computer Monitor



Amdek Color-I Plus (above) is currently the top-selling computer monitor for full-color display. The Apple III monitor (with the Apple IIe computer, right) is a 12-inch green phosphor monochrome unit that is particularly suited for text and word-processing work.

If your computer has been sharing the family's TV set, it's time to get it a monitor of its own. Computer and video game images will be sharper and easier on your eyes.

BY WALTER SALM; Photo by Layman/Newman

If you're using your computer hooked up to the family TV set, you've already discovered that this arrangement is far from ideal. For one thing, it upsets television viewing for family members who'd rather watch *M*A*S*H* reruns than Microsoft BASIC, WordStar or VisiCalc. It also gives you less-than-ideal screen display of text, graphics and games because a TV set is designed to pluck programs off the airwaves, not for high-precision computer screening.

A television receiver has a lot of tuning and demodulating circuitry that's simply not needed in a computer or video monitor. Also, because a direct-connect monitor receives a much cleaner signal than an off-the-air program, the monitor is theoretically capable of producing much sharper images on the screen. Monitor makers have capitalized on this ability by designing units that do, indeed, produce images that are cleaner and sharper.

The signal that goes from the computer to the monitor's input is clean, unhampered *video*. It can come in one of several flavors, but the most common are called *composite* and *R-G-B*. There's also pure monochrome, in some cases called *TTL*, such as produced by the IBM monochrome graphics board.

Monochrome and/or composite color signals usually come out of the computer in a good old RCA-type phono jack—the same kind of receptacle that's on the back of your stereo receiver. An R-G-B signal—separate TV primary color signals for red, green and blue—comes out in a multiple-pin connector. The most frequent kind is a nine-pin D-type, which looks an awful lot like the connector on an Atari-type joystick.

What you see on the screen with these various types of systems varies from type to type. For instance, on monochrome monitors, you'll see either green or



Amber monochrome Zenith ZVM-122 (top left), Zenith ZVM-133 R-G-B color unit (left) and Princeton Graphic HX-12 (above) are popular monitors. Driving all the monitors on these pages is the Apple IIe computer shown with Kensington SystemSaver. Inside the IIe is the new Video 7 R-G-B hi-res graphics color board, providing color graphics quality previously thought to be impossible with the Apple. Screen photo on HX-12 was created with Koala touch pad and Coloring Series I software. Other screens were taken from a demonstration disk supplied by Video 7. Multiple screen shots were possible with an Amdek-supplied hand-wired demonstration monitor box.

amber text on a black background. An R-G-B monitor and a composite monitor both produce full-color images on the screen, the only discernible difference being one of image sharpness and clarity. The R-G-B monitor will clearly have an advantage here, or will be said to have higher resolution.

Why the different kinds of color signals? It's the old tradeoff of cost vs. quality. R-G-B gives much sharper images than composite if the monitor is up to it. But the needed computer circuits and the monitor are more expensive. This sharpness is called resolution.

The more lines of resolution a monitor can produce, the sharper the image. The fly in the ointment is that most R-G-B monitors are much more expensive than composite video color displays and will not work with all computers.

The monitor's improvement over a conventional TV set depends on several design features: the way the picture tube is constructed, the quality of the components used in the circuits and the design of the circuits themselves, both in the monitor and computer. But

(Please turn to page 132)

COMPARING FIVE POPULAR MONITORS



Amdek Color-I Plus is a low-res color set good for games and some graphics, poor with text.



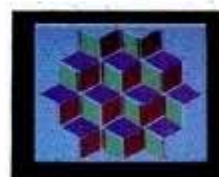
The green monochrome hi-res Apple III monitor works well with text and mono graphics.



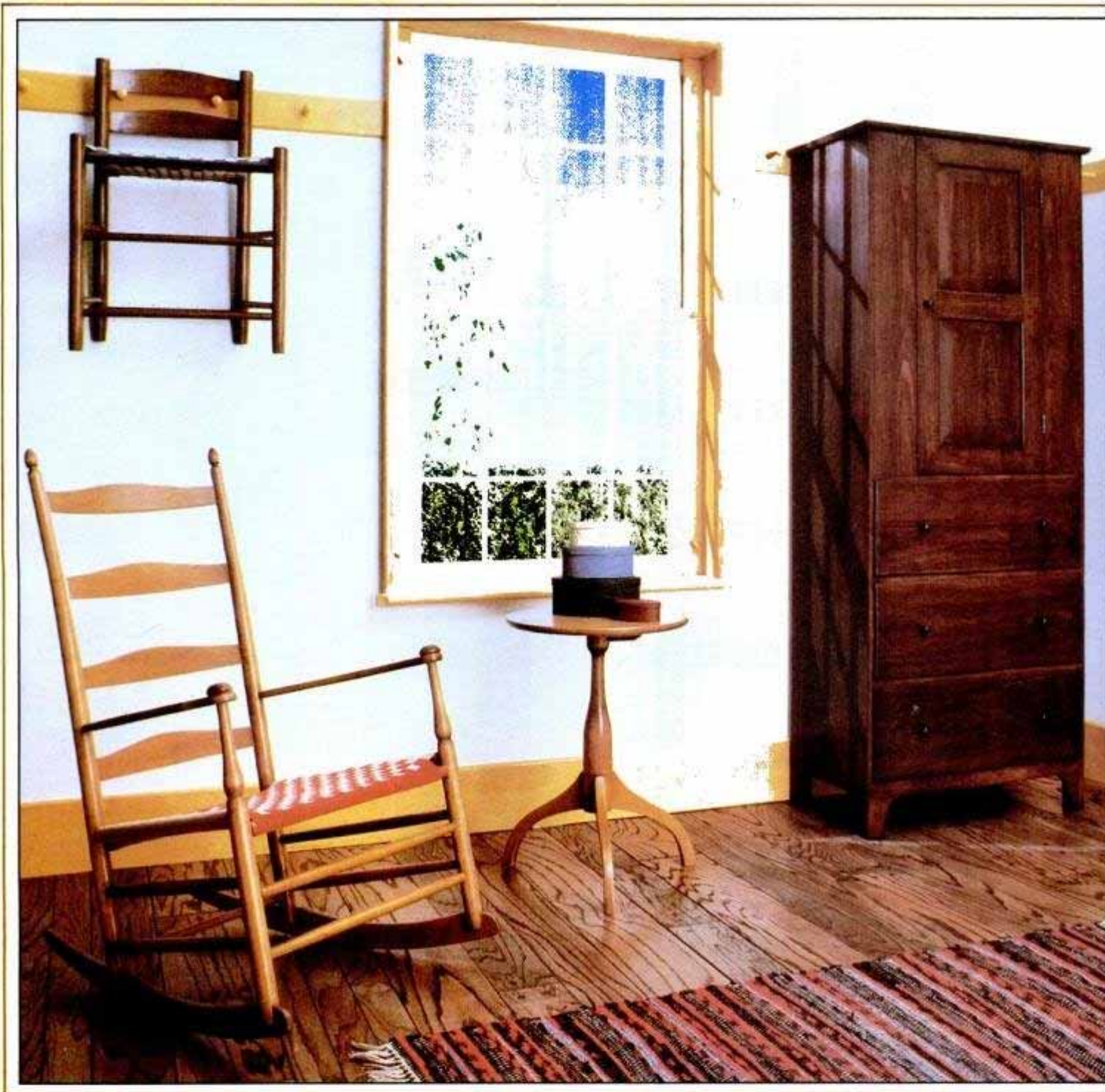
Zenith ZVM-133 is a hi-res R-G-B color monitor with many controls to zero in on good picture.



Zenith ZVM-122 is a top-selling hi-res monochrome monitor, especially good for business use.



PGS HX-12 is a hi-res R-G-B color monitor which is especially popular with IBM computer owners.



CABINET BOTTOM



Detail shows joint of front leg, side and glue block. Bottom support is rabbeted to accept bottom.

MITERED DOOR FRAME

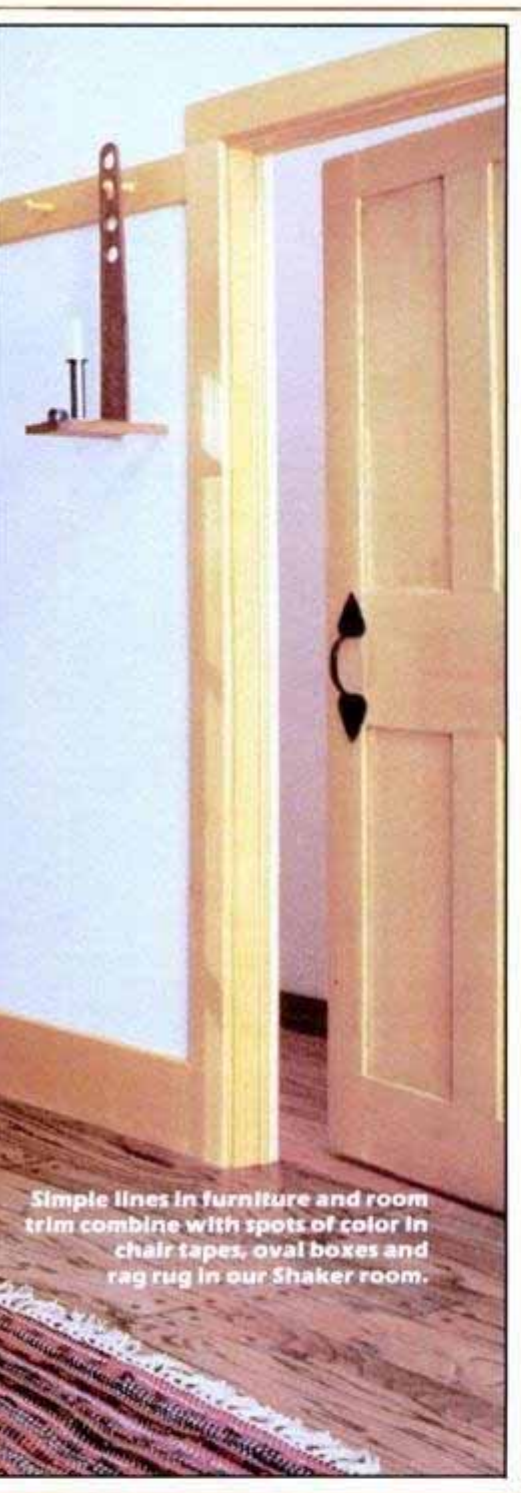


Door frame members join by mortises and tenons. Frame parts have partial miters at joints where panels meet.

DOOR FASTENER



The door fastener consists of a turned maple pull (background) and a maple latch secured by a wedge.



Simple lines in furniture and room trim combine with spots of color in chair tapes, oval boxes and rag rug in our Shaker room.



Create A Room In The **Shaker** **Tradition**

From cabinet to moldings, we show you how to reproduce the functional simplicity of a Shaker room.

Superb craftsmanship, ingenuity and a sense of design are much admired in Shaker furniture. Here, we show how to recreate the simple appeal of a Shaker room. The Shakers, an American communal sect, live by strict guidelines. At their height in the 1850s, there were about 6,000 Shaker members. After the Civil War, their population declined. Today, only a handful of Shakers exist. While some of the religious aspects of their life hold little appeal for us today, Shaker architecture, furniture and household accessories are quite popular.

PM's room reflects the Shaker belief in functional simplicity. The plain but well-proportioned baseboard molding, peg rail, door and window surrounds in the photo are adapted from those in the North family residence, built in 1818 in Mount Lebanon, N.Y. This was the site of the first Shaker community founded in 1787, and the central headquarters of the church. The medium-yellow finish on the woodwork is similar to that in the interior of a Shaker brick dwelling built in 1830 in Hancock, Mass. The yellow paint is covered with a coating of shellac for protection.

Peg rails are distinctive features of almost all Shaker rooms. They were placed at different heights with varying numbers of pegs to hold hats, coats, extra chairs or to suspend almost everything in a room while the floor was thoroughly cleaned. For construction details on the woodwork see page 109.

In keeping with their sense of cleanliness and order, the Shakers used many storage cabinets, both free-standing and built-in. The cabinet detailed here is based on one from Mount Lebanon. As in PM's example, many free-standing cabinets were finished in a

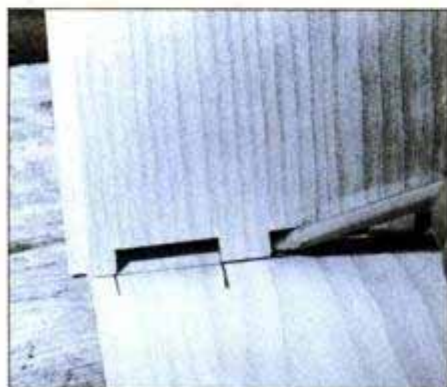
DRAWER ASSEMBLY



Drawer back and side (right) are joined by dovetails. Note side is tapered from top to bottom.



1 To rout the cabinet sides for dovetail and regular dadoses, clamp sides together back edge to back edge (arrow). Strips on front edges guard against splintering.



4 Using a very sharp pencil and the cut dovetail pins in the drawer front as a template, carefully mark the dovetails in the sides of the cabinet drawers.

reddish stain covered with shellac. Built-in cabinets were painted the same color as the woodwork in the room. Today, as then, these cabinets can be used in the dining room, kitchen, bedroom or other room where storage space is needed.

Shaker communities sold many objects to the outside world. Perhaps best known are the chairs, simplified versions of the slat-back chairs common in America in Pilgrim days. The Shakers reduced the turned members to an extreme, functional delicacy. At a factory in Mount Lebanon, chairs were sold to outsiders. The slat-back rocker and the low-back chair shown here are assembled from kits based on the Mount Lebanon pattern. The smaller chair was used most often in the communal dining halls.

Chair seats were made of rush, splint, cane or, most commonly, tightly woven cotton tape, which came in many

Cabinet design and construction, and molding construction: Ralston Furniture Reproductions

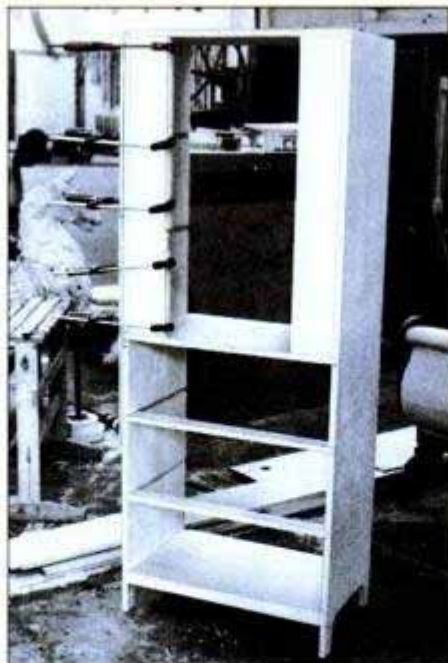
Rocking chair and low-back chair kits, rag rug, oval nesting boxes and rail pegs: Shaker Workshops, Box PM 1028, Concord, Mass. 01742.

Shaker table, tin candleholder, Cohasset Colonials, Box 514JK, Ship St., Cohasset Harbor, Mass. 02025.

Color photos: Harry Hartman Studios

Room stylist: Gabe Herrick

Technical art: Eugene Thompson



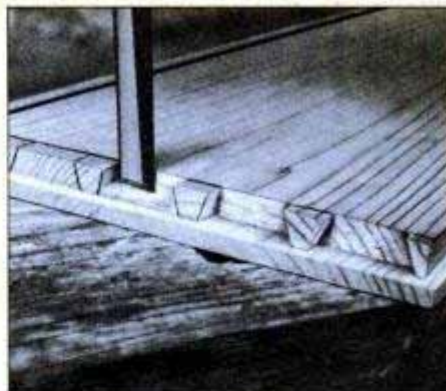
2 After the main parts of the cabinet are glued together, glue the front pieces flanking the door. Use wood strips to cushion the cabinet from the clamp jaws.

color combinations. Tape fit perfectly into the Shaker tradition, as it was inexpensive, comfortable and attractive. Finishes varied from thin yellow or red stains to a shiny clear or dark-brown shellac.

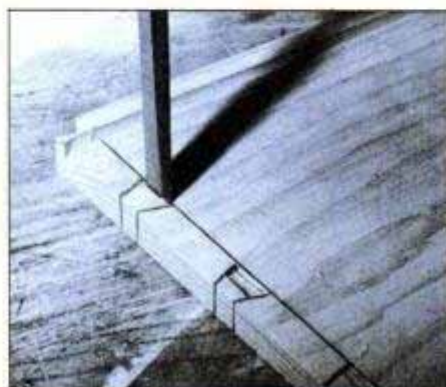
As in the chairs, the Shaker table is a result of a standard form reduced to its simplest extreme. Tables, like the round one in the color photograph, were used as candlestands and next to looms for holding weaving equipment. (For more information on kit furniture, see page 108.)

The wooden scone in the color photo again exemplifies the plain and simple design philosophy of the Shakers. The scone has large holes that allow it to be hung from peg rails in whatever room candlelight might be needed.

The fabrication of boxes, often oval in shape, was another important industry for the Shakers. Simple in design and well made, they have been popular because of their beauty and function. The boxes were often painted blue, red



3 After cutting out the shape of the dovetail pins in the drawer fronts, use a sharp chisel to remove waste between pins. A wooden mallet propels the chisel.



5 After cutting the dovetails in the drawer sides, use a sharp chisel to remove the waste. Note: Scribe lines have been penciled in to clarify the photograph.



6 Drawer pulls are turned on a lathe. Turn a maximum of four pulls at a time to avoid vibration. Three pulls can be turned with greater comfort and less risk.

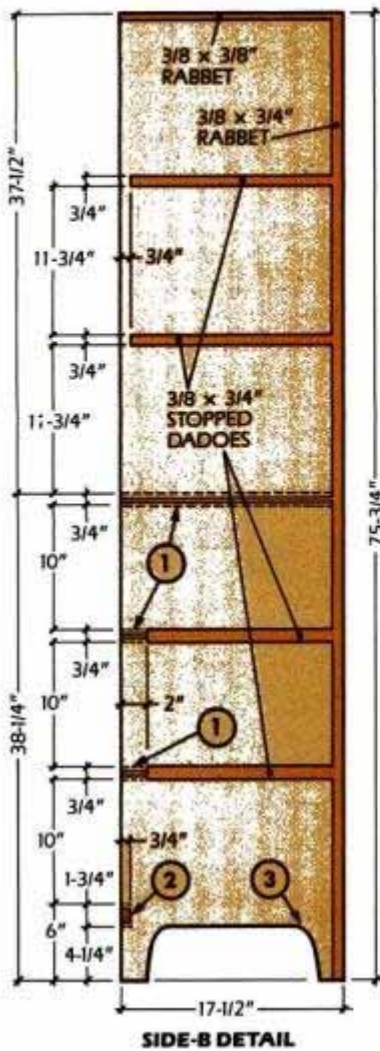
MATERIALS LIST—SHAKER CABINET

Key No. Size and description (use)

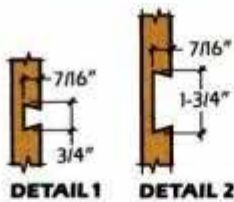
A	1	3/4 x 28 1/4 x 75 3/4" O.A. pine (wide boards tongue and grooved; back)
B	2	3/4 x 17 1/2 x 75 3/4" pine (wide boards edge-grooved; side)
C	2	3/4 x 5 1/4 x 36 3/4" pine (front panel)
D	1	3/4 x 17 1/2 x 28 1/4" pine (top)
E1	2	3/4 x 3 1/4 x 18 1/4" pine (quarter round; side trim)
E2	1	3/4 x 3/4 x 30 1/2" pine (front trim)
F	2	3/4 x 16 x 28 1/4" pine (shelf)
G	1	3/4 x 16 3/4 x 28 3/4" pine (shelf)
H	2	3/4 x 2 x 28 3/4" pine (upper drawer rail)
I	1	3/8 x 1 3/4 x 28 3/4" pine (lower drawer rail)
J	4	3/4 x 1 1/2 x 14 1/4" pine (drawer slide)
K	2	1 1/2 x 1 1/2 x 16" pine (bottom support)
L	1	3/4 x 16 x 26" pine (bottom)
M	4	1 x 1 x 4 1/4" pine (glue block)
N	2	3/4 x 3 1/4 x 4 1/4" pine (front foot)
O1	2	3/4 x 3 x 17" pine (rail, door end)

O2	1	3/4 x 3 1/4 x 17" pine (rail, door center)
P	2	3/4 x 3 x 36 3/4" pine (door stile)
Q	2	1/2 x 11 1/2 x 14 1/4" pine (panel)
R	3	3/4 x 10 1/4 x 28" pine (drawer front)
S	3	1/2 x 9 x 27 1/2" pine (drawer back)
T	6	10 x 16 1/2" pine; taper from 5/16" at top to 9/16" at bottom (drawer side)
U	3	1/2 x 16 1/2 x 27" pine (drawer bottom)
V1	6	1 5/16"-dia. x 1 7/8" maple (drawer pull)
V2	1	1 5/16"-dia. x 2 1/4" maple (door pull)
W1	1	1/4 x 1 1/2 x 2" maple (door latch)
W2	1	1/8 x 1/2 x 1 1/2" maple (door latch wedge)
X	2	2" tight pin butt hinge
Y	8	1 3/4" No. 10 flathead screw
Z	6	1 1/4" No. 10 flathead screw
AA	13	3/4"-dia. x 3/4" dowel pegs
BB	*	2" finishing nails
Misc.		80-, 120- and 240-grit abrasive, carpenter's glue, stain, varnish
		*As required

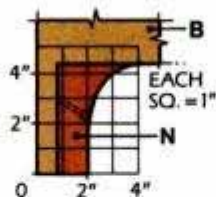
SHAKER CABINET



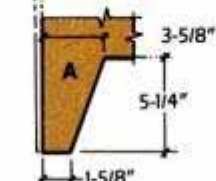
SIDE-B DETAIL



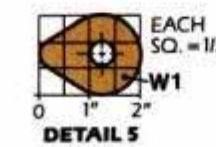
DETAIL 1 DETAIL 2



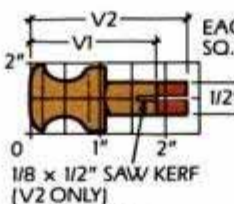
DETAIL 3



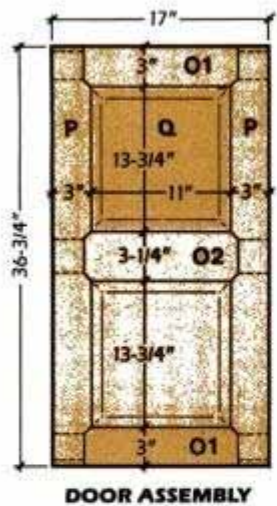
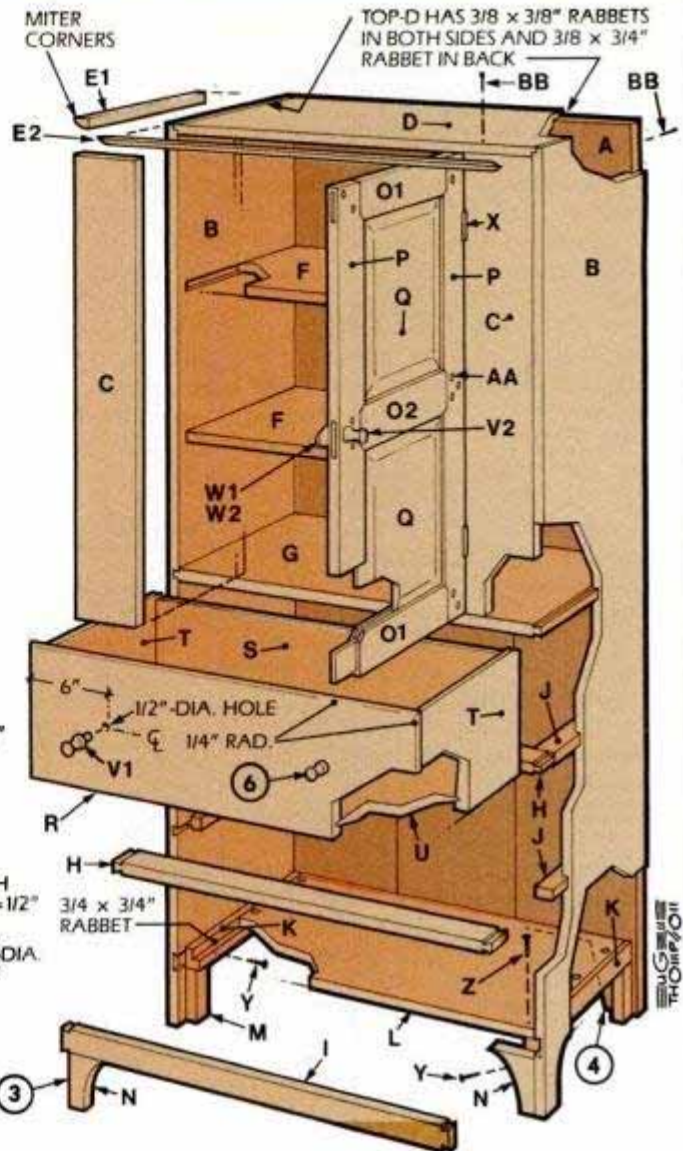
DETAIL 4



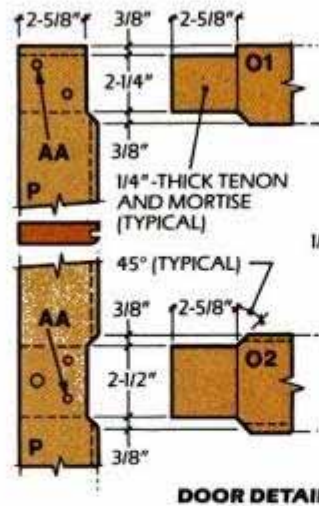
DETAIL 5



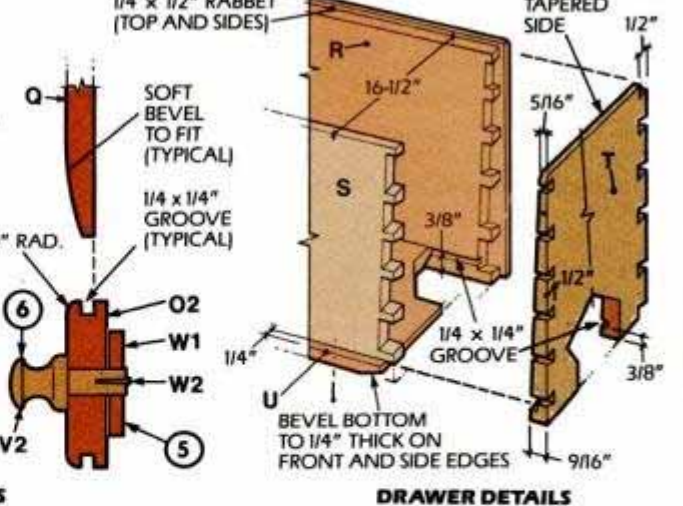
DETAIL 6



DOOR ASSEMBLY



DOOR DETAILS



DRAWER DETAILS

or yellow. Later, they were simply covered with shellac. The boxes came in nests of up to 12.

Curtains were often used in sleeping rooms. However, windows in other rooms were usually left bare. Shaker law forbade red, checked, striped or flowered curtains. A single piece of

plain white cotton or linen was simply hung over the lower half of the window.

There were very few restrictions on the type of rugs used, other than a ban on realistic imagery. Rugs were woven, braided, sewn or hooked. Many were as colorful as the rag rug shown here.

—Gilbert Tapley Vincent

Building a Shaker cabinet

The Shaker cabinet shown in the color photo is built of clear white pine, except for the back piece, which can be knotty, and the drawer pulls and door knob and latch, which are maple. The pine is nominally 1 in. thick. The actual measure is 3/4 in. or 13/16 in., depending

on your source. Because $\frac{3}{4}$ in. is the most common thickness, it's used in the materials list (page 106). The bottom support and drawer backs, sides and bottoms are of other thicknesses.

Begin work by cutting the sides (B, see materials list) to size and cutting the feet out at the bottom (see detail 3 in the drawing on page 107). Use a single board for each side if possible, or glue up boards if necessary.

Mark the dovetail dadoes for the upper two drawer rails (H) and bottom cabinet shelf (G). Mark the regular dadoes for the two remaining shelves (F) and the drawer sides (J).

To rout the dadoes, clamp the two cabinet sides together, back edge to back edge. In this way, both sides can be routed with the same setup. Because a $\frac{3}{4}$ -in. dovetail bit is not common, use a $\frac{1}{2}$ -in. bit and make two passes. Don't change the fence, just add a $\frac{1}{4}$ -in.-thick shim to the fence for the second pass. It's also a good idea to clamp a small strip along the front edges to avoid splintering (see photo 1 on page 106).

Next, cut to length the top (D), the three shelves (F, G) and all three drawer rails (H, I). Rabbet the top and sides and cut the dovetails on the rails and on the bottom shelf. Hold the bottom rail in place against the front edge of each side piece and mark the dovetail. Remove waste with a dovetail or backsaw and a chisel.

Cut and rabbet the bottom supports (K) and cut the bottom (L) to size. Before assembly, sand all pieces with 80-grit abrasive. Screw the bottom supports to the sides with $1\frac{3}{4}$ -in. No. 10 flathead screws. Glue the rails and shelves to the sides, nail on the top with 2-in. finishing nails and screw in the bottom with $1\frac{1}{4}$ -in. No. 10 flathead screws. Check for square and let the cabinet dry.

When the glue is dry, cut the pieces (C) that flank the door. Sand them with 80-grit abrasive, glue them to the sides and nail with 2-in. finishing nails from above and below. Cut and nail in the drawer slides. They are about $\frac{1}{2}$ in. shorter than the space of the cabinet side they occupy so that, as the sides shrink, the slides won't push out the rails or the back. Cut the front feet (N). Glue and screw them in place with $1\frac{3}{4}$ -in. No. 10 flathead wood screws.

Cut the back boards (A) to size, cut tongues and grooves in them and nail them in place. It's a good idea to reinforce all four feet with glue blocks (M). Finally, cut the crown molding (E1 and E2). Sand the outside of the cupboard with 80-grit abrasive and nail the trim in place.

Constructing the door

Next work on the cabinet door. Cut the door rails (O1 and O2) and door

stiles (P). Cut $\frac{1}{4} \times \frac{1}{4}$ -in. grooves in these members for the door panels (Q). Mark, bore and chisel out mortises in the stiles. Mark and cut the tenons. Mark and cut partial miters at points where frame members join (see door details on the drawing).

Dry-fit the door frame together. Then, disassemble and rout the inside edges of the frame members with a $\frac{1}{4}$ -in. rounding-over bit.

Cut and slightly bevel the panels (Q) with a plane and 80-grit abrasive. Glue the door together, panel bevels facing out. Glue the mortise and tenon joints only—panels are never glued. Make sure the door is square and flat. Let it

dry. Then, bore and peg the joints with dowels (AA). Sand the frame.

Constructing the drawers

Cut the drawer fronts (R). Rabbet the side and top edges for a $\frac{1}{4} \times \frac{1}{4}$ -in. lip. The drawer sides (T) on this piece are beveled from $\frac{5}{16}$ in. thick at the top to $\frac{9}{16}$ in. thick at the bottom. This adds strength to the lower portion where the bottom groove is cut, without making the drawer excessively heavy.

An efficient way of making the drawer sides is to resaw a $10 \times 16\frac{1}{2}$ -in. board of nominal $\frac{5}{4}$ in. thickness (actual measure is 1 or $1\frac{1}{16}$ in.) using a band saw, to get two side pieces tapered as



Shaker Furniture From Kits

Three furniture pieces in our Shaker room were made from kits: the slat-back rocker, the low-back chair and the round Shaker table. Kits such as these provide an affordable way for anyone to own a quality piece of furniture.

The kits come complete with furniture parts, tapes for chairs in colors that you specify, sandpaper, glue, fasteners and stain. Be certain to check the parts list to make sure your kit is complete before you begin assembly. Also, read the instructions carefully before you begin. All parts of the furniture shown are rock maple. The parts come already sanded, but I resanded each part with 150-grit abrasive to ensure a smooth finish.

The chair kits come with preassembled backs which make assembly as easy as possible. First, dry-assemble the chair to familiarize yourself with the assembly sequence. Some of the tenons may have swollen slightly from absorbed moisture and must be sanded lightly.

Next, apply glue to the mortises and assemble the chair using a hammer and a protective wood block. Before the glue sets, make certain that all chair legs rest evenly on a flat surface. If necessary, twist the chair frame slightly. Allow the glue to dry overnight. The rocker is shown (left, above) at this stage. Then

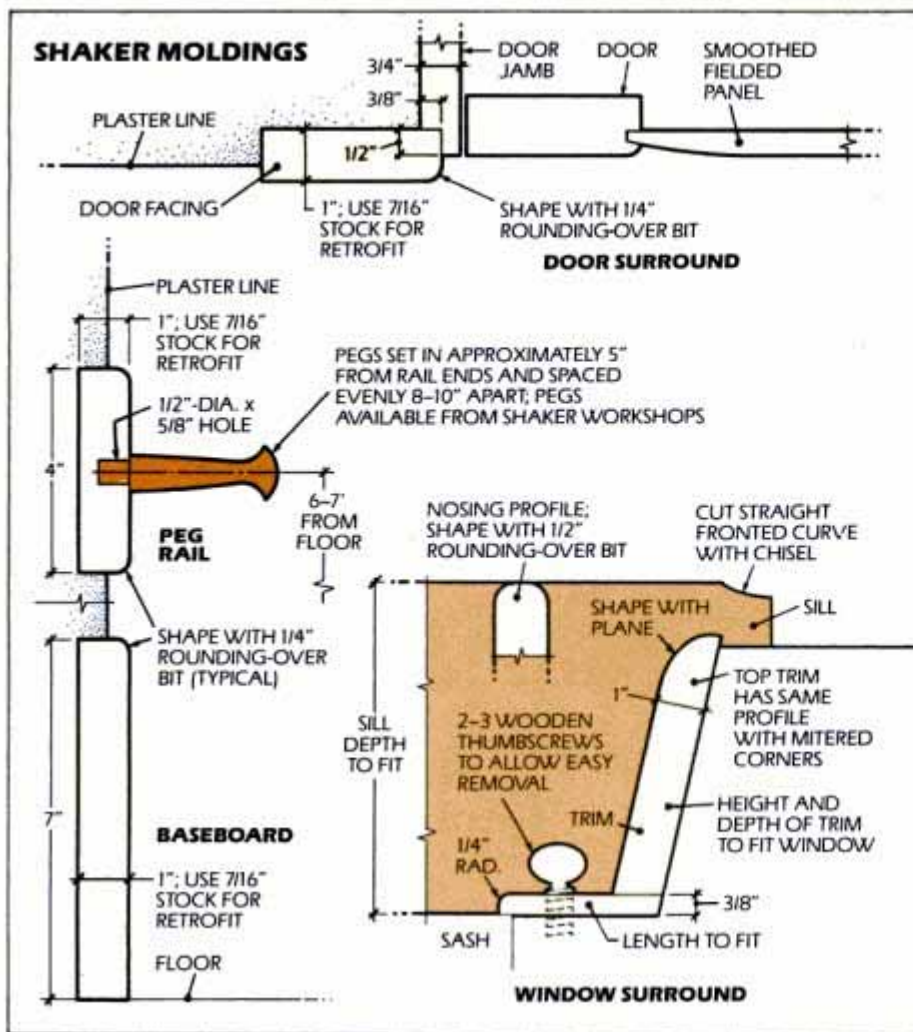
finish-sand, stain and finish the chair as desired. The purchaser supplies the top-coat finish. I used varnish followed by a protective coat of paste wax.

Clear instructions are provided for weaving the chair seat with cotton canvas chair tapes. Chair tapes are available in $\frac{5}{8}$ -in. and 1-in. widths in a wide variety of colors. Chair taping is a simple, but tedious, operation. A first-timer could weave the rocker seat in two to three hours.

The round Shaker table (right, above), also known as a candle stand, was assembled in less than 30 minutes. Simply screw the cleat to the post and attach the tabletop to the cleat. Then, glue the legs into the dovetail joints milled into the post bottom.

The slat-back rocker (\$128 postpaid) and the low-back chair (\$63.75 postpaid) are made by Shaker Workshops, Box PM1028, Concord, Mass. 01742 (catalog: 50 cents). They are also available assembled and finished: rocker, \$270; low-back chair, \$120. Shipping is extra.

The Shaker table (\$54 postpaid) is available from Cohasset Colonials, Box 514 JX, Ship St., Cohasset Harbor, Mass. 02025 (catalog: \$1). Both companies have a variety of Shaker kit furniture and accessories.—J.T.



A line level and a string determine placement for a peg (or chair) rail. With a helper, run the string across the wall. When bubble is centered (above), mark string ends.

needed. Since the beveled sides may not be exactly interchangeable, it is a good idea to number the pieces for each drawer and to mark the sides left and right. Groove the sides and front for the drawer bottom.

To make dovetails, use a marking gauge set at $\frac{1}{2}$ in. Scribe both ends of each drawer side for dovetails. Scribe the fronts and backs by holding the side in place on them.

Although, in most hand made furniture, dovetailing was done by eye, the Shaker pieces have a regularity that suggests a pattern was carefully made and used to mark out all the dovetails. This is especially true for the front dovetails. Use a dovetail saw or small backsaw to cut. Then, chisel out the

dovetails on the fronts and backs (see photo 3).

Mark out the sides using the respective fronts and backs as a pattern (photo 4). Then, cut and chisel.

Round over the front edges of the drawer fronts with a $\frac{1}{4}$ -in. rounding-over bit, sand all pieces and glue. Check for square.

Cut the drawer bottoms (U) to size, leaving an extra $\frac{1}{4}$ in. sticking out the back of the drawers to allow for future shrinkage of the bottom. Bevel with a plane and sand. The bottoms are held in place with 2 or 3 nails driven up through the bottoms into the backs of the drawers.

Before finishing, fit the hinges (X) for the door, turn the drawer and door pulls

(V1 and V2) and shape the cabinet latch (W1, see detail 5). The hinges are 2-in., tight-pin, steel butt hinges from a hardware store. Originals were cast hinges. However, now these cost about \$30 per pair.

For ease in finishing, bore the drawers and door for the pulls after the finishing is done. Sand the completed piece with 120-grit abrasive. A fairly acceptable finish can be had by using a pigmented oil stain, sanding with 220-grit abrasive and dusting, followed by applying one or two coats of white (clear) shellac or varnish.

A much better finish will result if a red mahogany penetrating stain is used under the shellac. In this case, we used Benwood Interior Stain No. 237-23 (Phillipine mahogany) with 70 units of red universal tinting color added per quart. Benwood is made by Benjamin Moore and Co., 51 Chestnut Ridge Rd., Montvale, N.J. 07645.

Apply two coats of the mixture followed by one coat of shellac. Rub the shellac with 2/0 steel wool and wax with a good paste wax.

—William Ralston

How to make shaker molding

Shaker baseboard moldings and door surrounds are quite simple, as shown in the drawings (above, left). In retrofit applications use $\frac{7}{16}$ -in.-thick straight pine shaped with a router and a $\frac{1}{4}$ -in. rounding-over bit.

Peg rails for holding shelving, candleholders and other accessories, although simple in design and construction, are quite functional. You can turn the pegs on a lathe or purchase them.

Shaker window surrounds are somewhat unusual. The window trim is beveled (about 15°) as shown in the drawing. The window sash is kept in raised or closed position by a facing that is screwed into the window frame by two or three wooden thumbscrews on each side of the window.

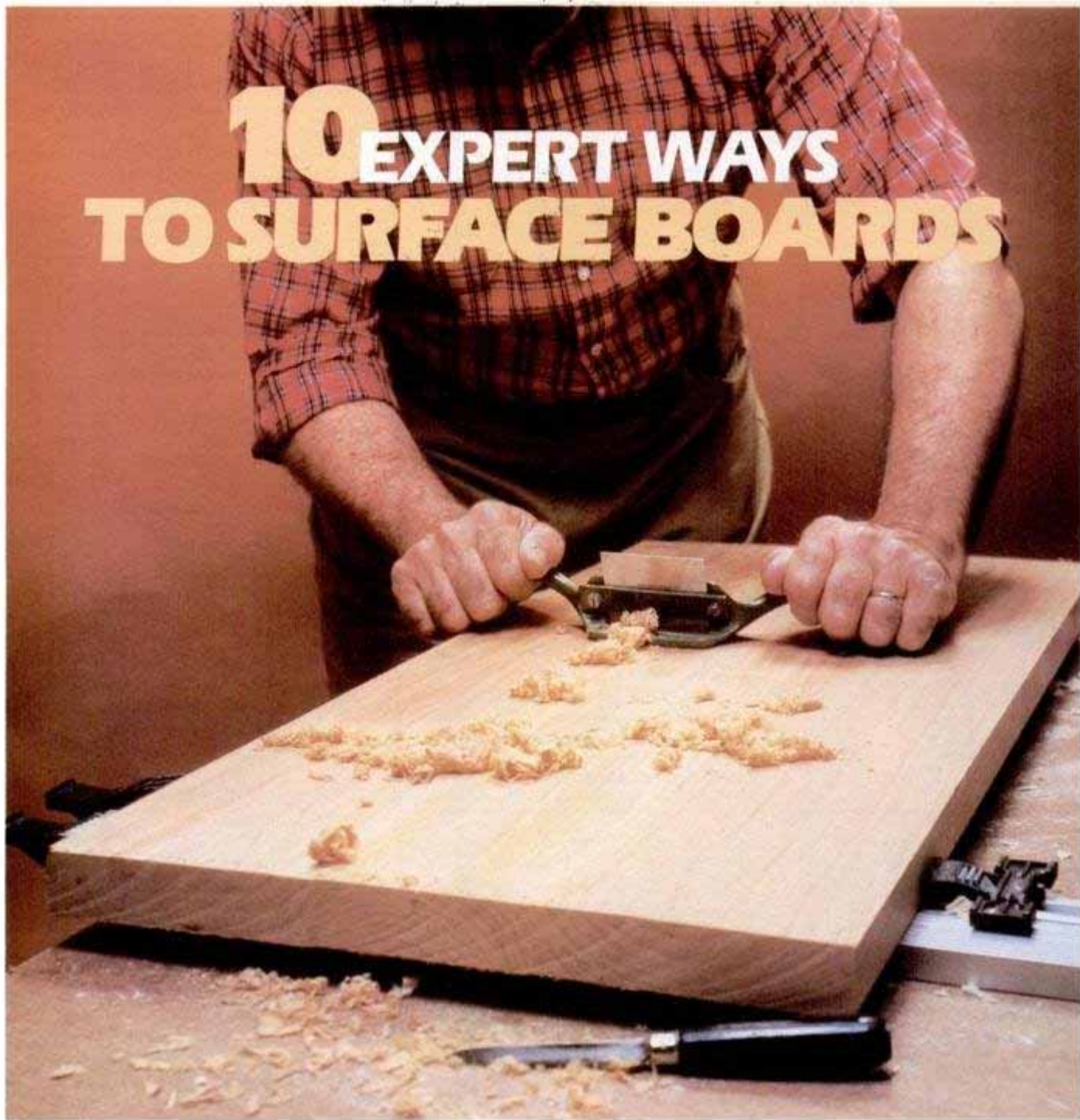
To duplicate the thumbscrew setup, you'll need a $\frac{1}{2}$ -in. wood screw box and tap. Cut a wooden blank about $1 \times 1 \times 4$ in. Turn a shank for the screw threads about $\frac{1}{2}$ in. dia. $\times 1\frac{1}{2}$ in. long on a lathe. Begin shaping the thumb part by turning a 1-in.-dia. ball. There will be waste on both ends of the blank.

Next, thread the screw in the screw box. Create flat surfaces in the thumb area by putting the blank in a vise and using a coping saw to cut off two sides of the ball. Saw off the waste ends. Tap the window trim and frame to accept the thumbscrew.

To produce a finish similar to an authentic finish, we used Benjamin Moore Tone latex satin finish base enamel YL 9. On top of this, we applied two more coats of full-strength orange shellac.

PM

10 EXPERT WAYS TO SURFACE BOARDS



Getting stock smooth and flat can be a time-consuming and frustrating chore. Here are 10 clever solutions, each of which makes use of a different shop tool.

TEXT AND PHOTOS BY ROSARIO CAPOTOSTO

When a woodworking project like a table, desk or cabinet calls for wide, solid-lumber panels, your chance of getting single boards to do the job is almost nonexistent. And even if you could find them, the chance that the boards are flat is just as slim. Usually, you have to edge-join a number of boards to arrive at the required widths.

Ideally, you should be able to glue up the proper number of flat and true boards and then merely finish-sand the piece to complete it. But in reality it doesn't work that way. The boards are bound to have defects that are compounded once they are joined.

Such faults as cup (a crosswise warp), bow (a lengthwise warp) and

1. Cabinet scraper—The cabinet scraper is an ideal tool for final surfacing of any assembly. It removes little stock and yields a smoother surface than sanding.

twist (a diagonal warp) will be present to one degree or another. Sometimes a combination of these faults occur in a single board. The stock may also come in varying thicknesses, not only between different boards but also within a single board. All will require surfacing to obtain smooth and flat stock.

Surfacing options

Depending on the amount of material that has to be removed and the equipment you have in your shop, surfacing can be done with hand tools, portable power tools and stationary shop equip-



2. Jack plane—To surface wide panels by hand, first make rough diagonal cuts with a jack plane. Follow with end-for-end cuts made in the direction of the wood grain.



3. Jointer plane—If individual boards—or components of a larger assembly—are particularly warped, smooth with a long jointer plane before parts are glued together.



4. Belt sander—When the grain direction varies across a wide panel, use a belt sander for surfacing. It works by abrasion instead of cutting, so it won't chip the surface.



5. Power plane—This tool is used most often for planing door edges, but it works well for rough surfacing, too. Direct it diagonally across the stock to remove high spots.



6. Jointer—A properly adjusted and sharpened jointer flattens and smooths narrow boards in one operation. You should remove only $\frac{1}{16}$ in. of stock—or less—per pass.



7. Planer—A planer quickly removes stock from wide boards and creates a uniform thickness. It's nearly indispensable if you want to work with rough-sawn hardwood.



8. Router—Use a router with the jig shown to flatten deeply worn or gouged surfaces. The cut is made to a uniform depth from above using a $\frac{1}{8}$ -in.-dia. straight cutter.



9. Circular saw—Make repeated kerf cuts with saw and sliding jig to remove stock from rough assemblies and to act as depth guide marks for hand planing later.



10. Radial-arm saw—A rotary planer attachment for a radial-arm saw has a cut depth capacity of $\frac{1}{8}$ in. The cutter unit is fixed and stock passes underneath.

ment. A cabinet scraper, jack plane and jointer plane are all good tools for light surfacing, especially when they are properly sharpened. A belt sander—followed by an orbital finishing sander—is also a good surfacing choice when removal requirements are thin.

But if a board or assembly is especially warped, heavier duty equipment makes more sense. A router and a circular saw, when used in conjunction with easy-to-build jigs, can make short work of flattening any large panel, as can a rotary planer attachment in a radial-arm saw. And, a jointer and a thickness planer can mill boards smooth and flat before assembly, which drastically reduces the surfacing time once the panel is glued up.

Preparation

Regardless of the surfacing method you choose, there are certain things you can do prior to assembly in order to minimize the distortion. First, you should arrange your component boards so that the flattest possible surface is obtained before assembly. If boards are bowed, make it a policy to butt the edges with opposing curves together so the inherent stresses in one board will tend to neutralize those in the other and keep the assembly flat.

Also, if boards are cupped, you can avoid cumulative warp by inverting alternate boards so that an end view of the grouping will reveal a shallow up-and-down wave pattern instead of one deep curve (see page 113). Another

way to effectively reduce warp is to rip the defective board or boards into narrower pieces and then edge-join these smaller boards into a larger slab. While this may seem like extra work, the time required is significantly less than surfacing a severely distorted panel, especially if you're using hand tools.

Finish surfacing

Once you have your stock flat and relatively smooth, finish-sanding is required when using any method except the cabinet scraper. This is best done with a progression from coarse (80-grit) through fine (180- to 220-grit) sandpaper. Each grit should remove scratches from the previous abrasive until no scratches are noticeable to touch or eye.

1 Cabinet scraper

This tool makes a very fine cut and is ideal when the stock requires only minimal surfacing, such as flattening wood fibers along a joint line. It also works well for removing previous tool marks like planer ripples. For wide panels, it is best used in a tool handle. When properly sharpened it produces extremely thin shavings. The tool can be used across the grain, but the finish passes should always be with the grain.



When a cabinet scraper cuts powdery shavings like those above, it's time to resharpen. To do so, pull a burnisher over each edge 4 or 5 times at a 10 to 15° angle.

2 Jack plane

A jack plane can remove stock quickly, and with practice it's simple to control. But it does have two basic requirements: The plane iron must be very sharp, and the tool should never be worked against the grain.



One clever way to find high spots on a wide panel before hand surfacing is to rub a straight stick—with carbon paper taped to its bottom edge—over the workpiece.

First, find the high spots on the slab by using either a metal straightedge or the carbon paper trick shown below. Then make the initial cuts diagonally to remove the highest spots. Finish up by making continuous full strokes from one end to the other with the blade adjusted for a fine cut.



When using a bench plane to surface a wide panel, begin by making diagonal strokes to chop down high spots. Finish with strokes that match the direction of the wood grain.

3 Jointer plane

Jointer planes, sometimes called trying planes, are the ancestor of today's power shop jointers. They are available in steel or wood models and come in a variety of lengths: 20, 22 and 24 in. for steel planes and up to 26 in. long for some wood planes.

Their extreme sole length allows them to smooth stock easily without following the minor ups and downs in

the surface like shorter planes would do. Because of this, they are effective for surfacing both individual boards and rough subassemblies—like the ones shown below—before they are joined into wider assemblies.

They are used in basically the same way as jack planes, but their length does limit their usefulness to longer stock. (For more information about hand planes in general, see *Workshop Minicourse* on page 62.)



If you don't have a planer and are building a wide panel from rough stock, assemble the top in sections first, then use a jointer plane to smooth sections before final joining.



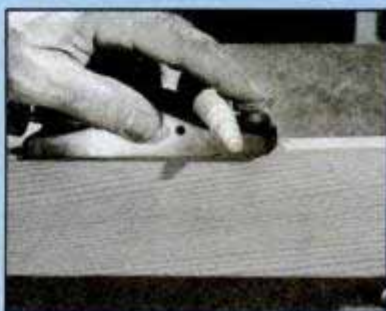
Once sections are planed to the same approximate thickness, join them with glue and dowels. The closer the sections are to matching, the less work required later.

READING WOOD GRAIN

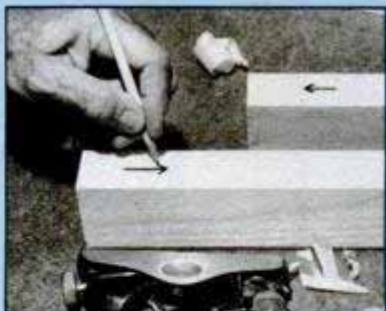
If you plan on surfacing with a cutting tool such as a hand plane, jointer or planer, the cut should always be made with the grain, that is, in the uphill direction of the grain. Cutting against the grain will tear out rough pockets of wood and mar the board's surface.

The best way to read the grain is to view the side edge of the board. Sometimes the pattern will not be clear, especially in light-colored soft woods. In such cases, rip one edge of the stock with a planer blade in your saw. This smooth cut should clearly expose the pattern.

Proper grain alignment is particularly crucial when joining boards into a wider assembly. The grain in all boards should run in the same direction so that surfacing can be done as if the assembly was one board with a uniform pattern.



Side view shows board grain running uphill, left to right, and planing in same direction. If cut was made right to left, surface would be gouged.



Before assembly, mark grain direction on each board. Align all marks in same direction. If you can't read grain by eye, plane a light test shaving.

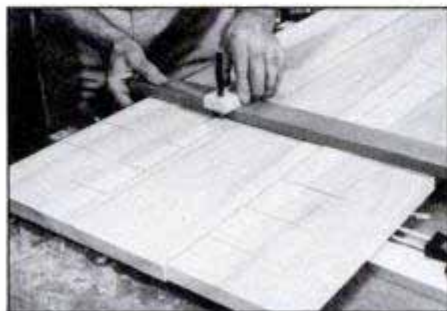


Sometimes, a board's grain direction changes. If such stock must be used, surface with a belt or finishing sander instead of a hand plane.

4 Belt sander

This tool is better for surfacing wide assemblies than narrow individual boards and is the tool of choice when the grain direction alternates from end to end within a panel or one of the component boards. It works by abrasion instead of cutting so there is no risk of chipping the surface. The tool, however, is very powerful and can dig deep depressions in stock if it is not kept moving continually. Even a slight hesitation in one spot can cause damage.

For initial surfacing on rough assem-



blies, the tool does require some finesse. Use an 80-grit belt and hold it firmly in both hands. Apply more downward pressure when the sander is in contact with the high spots, and release the pressure so it will glide over the low spots. Once the panel is basically flat, install a 120-grit belt and apply equal pressure across the entire surface.

Be careful when you reach the ends of a panel because this machine will quickly grind away the edge. When you are done, switch to a finishing sander and work through a progression of coarse to fine grits (120 to 220) until the surface is free of all scratches.

When belt sanding at the end of a panel, apply greater downward pressure at the rear of the tool and lift the front slightly to prevent rounding over the edge.



5 Power plane

For rough surfacing, a power plane performs well. It does not, however, yield a ready-to-sand surface because the cutters are narrow and the tool base is relatively short. It must be followed with a hand plane or belt sander for best results.

After making diagonal cuts to knock over the high spots, direct the tool in the direction of the grain. Begin at one edge and make continuous passes from end-to-end, barelylapping each cut.

(Please turn to page 150)



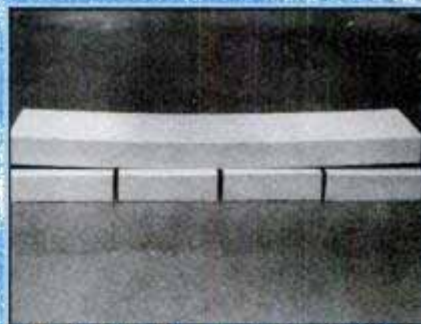
A power plane removes stock quickly but can be difficult to control. Keep depth of cut shallow and begin working diagonally. Then, plane lengthwise in grain direction.

THREE SIMPLE WAYS TO JOIN BOARDS

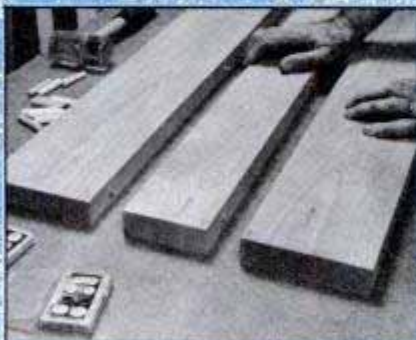
There are several ways to edge-join boards to make up wider assemblies. If the finished slab will be subject to stresses, such as a workbench or kitchen countertop, a dowel-reinforced joint is suggested. But when the joint line won't be stressed as much, the nail/pin method can be used. These serve to keep slightly warped boards aligned during clamping. They do not add much strength to the joint. If your stock is flat and smooth before assembly, aliphatic resin glue is all that's required. It becomes tacky when exposed to air for five minutes and provides enough grab to keep boards from sliding out of alignment when clamped. To make all edges straight and square before assembly, use a power jointer or hand jointer plane.



Alternate the cup direction of the boards before assembly (top), or the finished panel will have a deep cup (bottom) once it is joined. The straight board in the middle is shown for reference.



A cupped board also can be partially straightened prior to assembly by ripping it into narrower boards which will lie flatter. The boards above were cut from the same piece of stock.



1. To join stock with dowels, bore $\frac{3}{4}$ -in.-deep holes every 12 in. in both boards. Use dowel centers for accuracy. Insert a $1\frac{1}{4}$ -in.-long dowel in each hole.



2. Make pins from 4d finishing nails by cutting off heads. Bore pilot holes in one board and insert blunt end of pins. Glue board edges and clamp together.



3. Edge-gluing is all that's required to join straight flat boards. Use a thin layer of aliphatic glue on edges, let it set for 5 minutes and clamp boards together.



This spacious tool chest features a lift-out tool tray and a convenient lid-mounted handsaw holder. A shoulder strap makes transporting the tools easy (left).

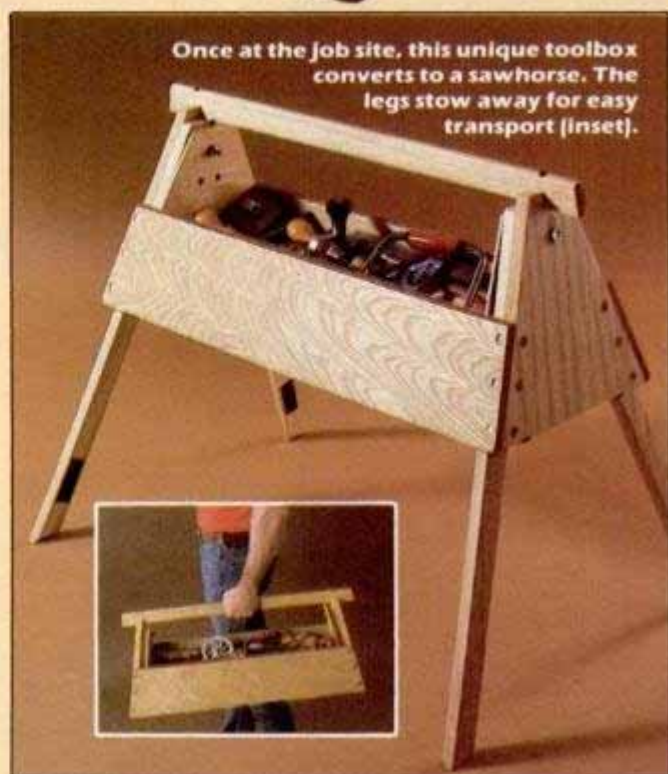


2 Portable Toolboxes You Can Build

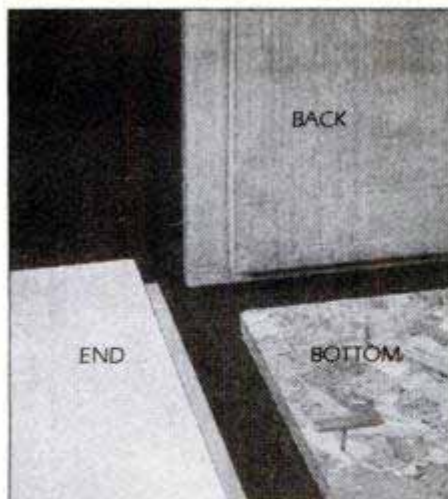
Treat yourself and your tools to one of our designs. Build the carry-all tool chest or the sawhorse toolbox.

A carpenter's toolbox must protect and house all the basic hand tools, yet be compact enough to be carried to the job site. Unfortunately, most store-bought toolboxes are either too big or too small. Here are plans for building two toolboxes that combine adequate storage with portability. And both designs can be altered easily to accommodate your tool collection and work requirements. The carry-all tool chest is an updated version of the boxes used by house builders around the turn of the century. The sawhorse toolbox is an open box with legs that stow underneath.

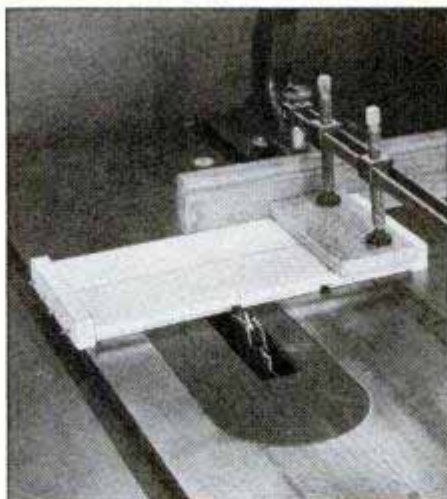
Once at the job site, this unique toolbox converts to a sawhorse. The legs stow away for easy transport (inset).



CARRY-ALL TOOL CHEST



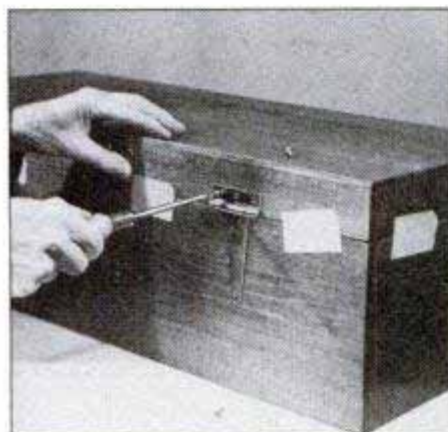
Assemble the tool chest with rabbet joints. Note that the back is rabbeted on two edges to receive the bottom and tool chest end. Rabbet the end on bottom edge only.



This time-saving setup allows you to dado both tool tray end pieces simultaneously. Nail wood blocks across both ends to prevent shifting and to ensure alignment.



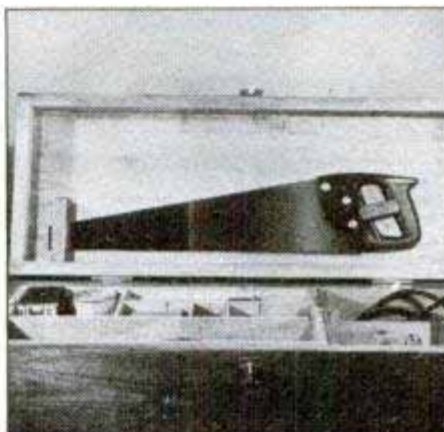
After assembling the tool chest, screw bottom panel in place. Use wedges to obtain more pressure from nylon band clamp.



Attach T-hinges about 4½-in. from each end of the toolbox. Use several pieces of masking tape to keep toolbox lid in place.



Make shoulder strap from seat-belt material. To prevent the strap from fraying, heat-seal ends with a soldering gun.



The handsaw holder feature was saved from the original tool chest design. Custom-cut handle block and turnbutton to fit saw.

This is an updated version of a carpenter's tool chest which was popular more than 90 years ago. The original was much larger and, therefore, less portable than our scaled-down model.

The chest is dimensioned to give the maximum tool storage without sacrificing portability. The measurements can be altered easily to accommodate your specific needs. The tool chest length is generally determined by what size handsaw is stored in the lid. The chest shown houses a 20-in. saw.

Assembly

Build the chest from ¾-in. poplar. Pine or cypress would also be suitable. Note that the lift-out tool tray parts are

resawed to 5/16- and 1/2-in. thick. Also keep in mind that the tool chest is assembled as a solid box, then the lid is cut from the chest on a table saw.

Start by cutting the chest top, ends, bottom, front and back. Form the 11½-in.-wide top by edge-gluing two boards together. Be certain to cut the front, back and end pieces 9⅜ in. wide to allow for the 1/8 in. of wood removed by the saw blade when the lid is cut.

After sawing the chest parts to size, cut the rabbet joints, as shown, using a router and a rabbeting bit. Rabbet the tool chest front and back on three edges, the end pieces on the bottom edge and the top on all four edges. Next, assemble the box with glue and 1¼-in. finishing nails. Allow the glue to dry overnight, then sand all sides of the box smooth using a belt and finishing sander.

Cutting off the lid

Set the table saw fence for a 2-in.-wide cut. It's important that the saw

blade and fence be perfectly parallel. Otherwise, the start and finish point of the cut will not meet evenly.

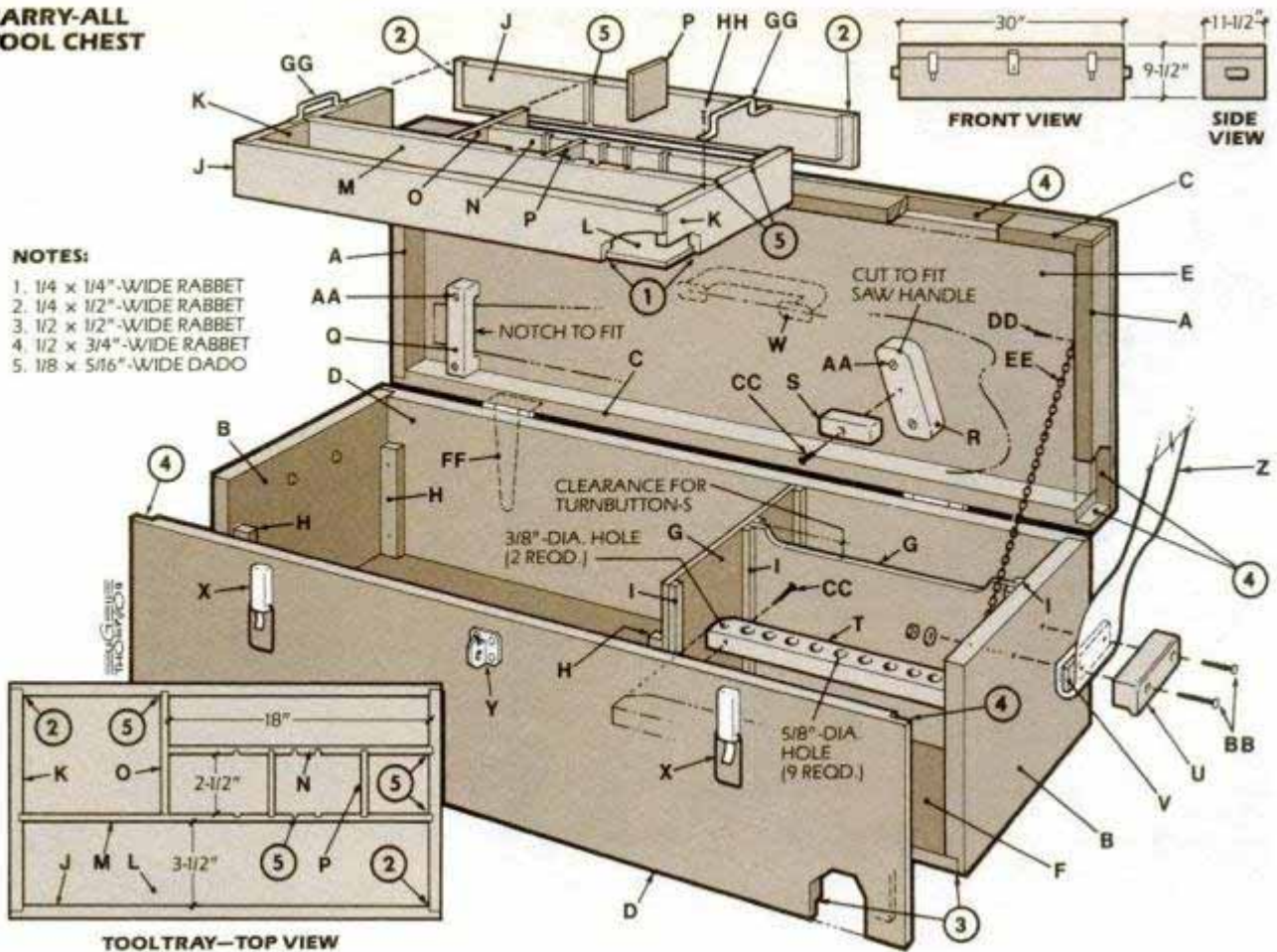
Start cutting with the chest standing on end and the top against the fence. Cut the end and then saw through the front. Cut the other end and, finally, through the back. *Caution:* Always cut clear through each side; never roll the box back onto the saw blade. On the final cut that frees the lid from the box, use a stick to push the lid beyond the spinning saw blade. Now, place the lid on the chest and check for any wobbling or unevenness. Knock down any high spots with a sanding block and 80-grit abrasive paper.

Next, make the two removable interior partitions from 1/4-in. plywood. Note that one partition is cut down to provide clearance for the turnbutton which holds the handsaw in place.

Cut the pieces needed to make the lift-out tool tray. Arrange the tray dividers to accommodate your tools. Then, nail four corner posts inside the chest to

Color photos: Harry Hartman Studios
Carry-all tool chest design, construction and black and white photos: Walter E. Burton
Sawhorse toolbox design, construction and black and white photos: Joseph M. Wilson
Technical art: Eugenie Thompson
Hand tools supplied by Garrett Wade, 161 Avenue of the Americas, New York, N.Y. 10013.

CARRY-ALL TOOL CHEST



NOTES:

1. 1/4 x 1/4"-WIDE RABBET
2. 1/4 x 1/2"-WIDE RABBET
3. 1/2 x 1/2"-WIDE RABBET
4. 1/2 x 3/4"-WIDE RABBET
5. 1/8 x 5/16"-WIDE DADO

MATERIALS LIST—TOOL CHEST

Key No.	Size and description (use)	Key No.	Size and description (use)	Key No.	Size and description (use)
A	2 3/4 x 1 3/4 x 11" poplar (lid end)	K	2 1/2 x 2 1/4 x 9 3/4" poplar (tray end)	V	2 1/4 x 1 x 4" hardboard (strap cleat)
B	2 3/4 x 7 1/2 x 11" poplar (chest end)	L	1 1/4 x 9 3/8 x 17 3/8" lauan plywood (tray bottom)	W	1 plastic luggage handle
C	2 3/4 x 1 3/4 x 30" poplar (lid front and back)	M	1 3/16 x 2 x 17 3/8" poplar (divider)	X	2 1 1/4 x 3 1/2" pull-down chest latch
D	2 3/4 x 7 1/2 x 30" poplar (chest front and back)	N	1 5/16 x 2 x 11 1/8" poplar (divider)	Y	1 3 1/2" latching safety hasp
E	1 3/4 x 11 1/2 x 30" poplar (top)	O	1 5/16 x 2 x 5 3/16" poplar (divider)	Z	1 2 x 70" nylon seat belt strap
F	1 7/16 x 11 x 29 1/2" flake board (bottom)	P	2 5/16 x 2 x 2 3/4" hardboard (adjustable divider)	AA	4 1 1/4" No. 6 fh screw
G	2 1/4 x 6 5/8 x 9 7/8" lauan plywood (divider)	Q	1 3/4 x 1 x 4" poplar (saw blade holder)	BB	4 1/4"-dia. x 2 1/2" fh bolt, washer and nut
H	4 1/2 x 3/4 x 4 3/4" poplar (corner post)	R	1 1 1/8 x 1 1/8 x 4" poplar (handle block)	CC	3 1 3/4" No. 10 fh screw
I	6 5/16 x 5/16 x 7" poplar (cleat)	S	1 5/8 x 1 x 2 1/2" poplar (turnbutton)	DD	2 3/4" No. 8 rh screw
J	2 1/2 x 2 1/4 x 18 1/4" poplar (tray front and back)	T	1 3/4 x 1 1/4 x 9 1/2" poplar (tool rack)	EE	1 12" chain
		U	2 1 x 1 1/4 x 4" oak (handle)	FF	2 4" T-hinge
				GG	2 1/8 x 1/2 x 5" steel (tray handle)
				HH	4 1/2" No. 6 rh screw

support the tool tray. Now, custom-cut the three parts that form the holder for your handsaw. Screw each part to the lid underside while holding the handsaw in position.

Finish-sand and stain all wood surfaces. Next, install the two 4-in. T-hinges about 4 1/2 in. from each end. If you build a chest more than 36 in. long,

add a third, middle hinge. Now, screw the chain lid support in place. Install a safety latching hasp and two chest latches.

Next, make the 2-in.-wide shoulder strap from automobile seat-belt material, available at most auto parts stores and auto seat cover shops. To install the strap, first cut two oak handles for each

end of the chest. Then, wrap the strap around a 1/4-in. hardboard spacer and bolt through the handle, belt and spacer. To complement the shoulder strap, add a 5-in. luggage handle to the top, center of the lid.

Finish all wood surfaces, inside and out, with three coats of polyurethane varnish.—Walter E. Burton

EQUIPPING A BASIC TOOLBOX

Every homeowner should have a well-equipped toolbox for tackling home repair and maintenance chores. But how do you know if your toolbox is adequately stocked?

Listed below are the tools needed for a basic toolbox. These tools are not intended to cover every possible situation, but they will handle most minor repairs. And remember, quality tools are a good investment, so buy the best you can afford. The

basic tool kit should contain:
 16-oz. claw hammer
 3-in. standard screwdriver
 6-in. standard screwdriver
 No. 1 pt. Phillips screwdriver
 No. 2 pt. Phillips screwdriver
 16-ft. steel measuring tape
 8 1/2 or 10-pt. combination handsaw
 6-in. adjustable wrench
 slip-joint pliers
 combination square

hacksaw
 utility knife
 two 4-in. C-clamps
 1 1/4-in. putty knife
 small ripping bar
 nail set
 electric drill and drill bits

Think of the basic toolbox as a foundation from which to build your tool collection. Then, as your skills and interests grow, you can add to it.—J.T.

SAWHORSE TOOLBOX

This cleverly designed project combines a compact toolbox and a sturdy sawhorse in one portable package. Four hardwood legs are stored neatly in the shallow cavity under the toolbox. To set up the sawhorse, slide the legs into the channels built in the toolbox ends.

Build the toolbox from ash-veneer plywood and ash hardwood. The 29-in.-long toolbox is shown with 26-in. legs—the longest legs this length box will accommodate. As a sawhorse, it stands at a comfortable working height of 25 in. For a lower working height, simply cut shorter legs. To obtain a higher sawhorse, you'll have to make the toolbox longer to store the legs.

The drawing also shows plans for making an optional canvas dust cover. When not in use, roll up the cover and tuck it into the box.

Cutting procedure

Study the technical drawing and materials list carefully before starting. This project requires cutting several compound angles.

Start by crosscutting a 12-in.-wide piece of $\frac{3}{4}$ -in. ash-veneer plywood. Next, recut this piece to $10\frac{3}{4}$ in. wide on a table saw with the blade set at 11° . Then, lay out and cut the triangular-shaped end pieces from this board using a portable circular saw. Cut the ends slightly oversized to allow for trimming to the precise angles on the table saw.

Now, with the table saw blade set at 4° and the miter gauge set at 21° , cut one edge of each end piece. Be sure to hold the wider, bottom edge of the ends against the miter gauge. Orient the 4° bevel so that the inside face of the end is slightly wider than the outside surface. Turn the piece over, inside surface up, and cut the other edge. Change to a $\frac{1}{4}$ -in.-wide dado blade set to 11° and cut a $\frac{1}{4}$ -in.-deep dado on the inside face of each end piece. These dados hold the toolbox bottom.

Next, make the four legs 2 in. longer than needed. The angled leg ends will be cut later. Lay out the two $\frac{3}{4}$ -in. plywood spacers that are sandwiched between the toolbox ends and the $\frac{1}{4}$ -in. plywood leg guides. These triangular-shaped spacers form a channel for the legs. Cut the spacers using the miter gauge set at 21° , but adjust the saw blade to a perpendicular position and cut the edges square. Then, screw one spacer to the inside face of each end.

Note that the top 2 in. of each spacer is beveled about 7° . This allows tightening the leg clamping bolts to prevent the legs from slipping out when the sawhorse is lifted. To make these beveled cuts, first clamp or screw an 8-in.-

wide auxiliary plywood fence to the table saw fence to help stabilize the workpiece and prevent tipping. Next, position the fence so that the blade removes about $\frac{1}{4}$ in. of the spacers' thickness, and make the two cuts.

Now, set the saw blade to 21° and rip the toolbox sides from $\frac{1}{2}$ -in. plywood. Readjust the saw blade to 4° and use the miter gauge set at 11° to cross-cut the sides. Next, reverse the 11° angle on the miter gauge and move the gauge to the other side of the saw blade. Crosscut the other end of both sides.

Use a $\frac{1}{4}$ -in.-wide dado blade tilted 21° to groove the side pieces for accepting the toolbox bottom. These grooves must align with the dados cut earlier in

the end pieces. Now, tilt the dado blade 4° , set the miter gauge to 11° and dado the side pieces at each end to accept the $\frac{1}{4}$ -in. plywood leg guides.

Cut a $\frac{3}{4} \times \frac{3}{4}$ -in. notch in the top of each end piece for installing the handle. Then, cut the $\frac{1}{4}$ -in. plywood toolbox bottom. Notch the bottom's four corners to allow the legs to pass through. Next, temporarily assemble the toolbox and mark the screw-hole locations in the sides. Also, mark the end pieces for boring $\frac{1}{2}$ -in.-dia. dowel holes opposite each screw. The $\frac{1}{2}$ -in.-dia. $\times \frac{11}{16}$ -in. dowels are glued into the ends to provide solid wood for driving in screws.

Next, cut the two $\frac{1}{4}$ -in. plywood leg guides which screw to the spacers.



Cut the toolbox ends 1-in. oversized with a portable circular saw. Use a fine-tooth saw blade to prevent splintering the veneer. Move to table saw for final trimming.



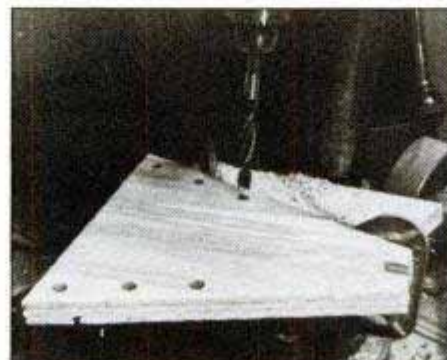
Trim the edges of each end piece with the blade angled 4° and miter gauge set at 21° . Orient the 4° bevels so that the inside surface is wider than the outside face.



Trim spacer tops with blade set at 7° . Note that an auxiliary fence is clamped to the saw fence to stabilize workpiece.



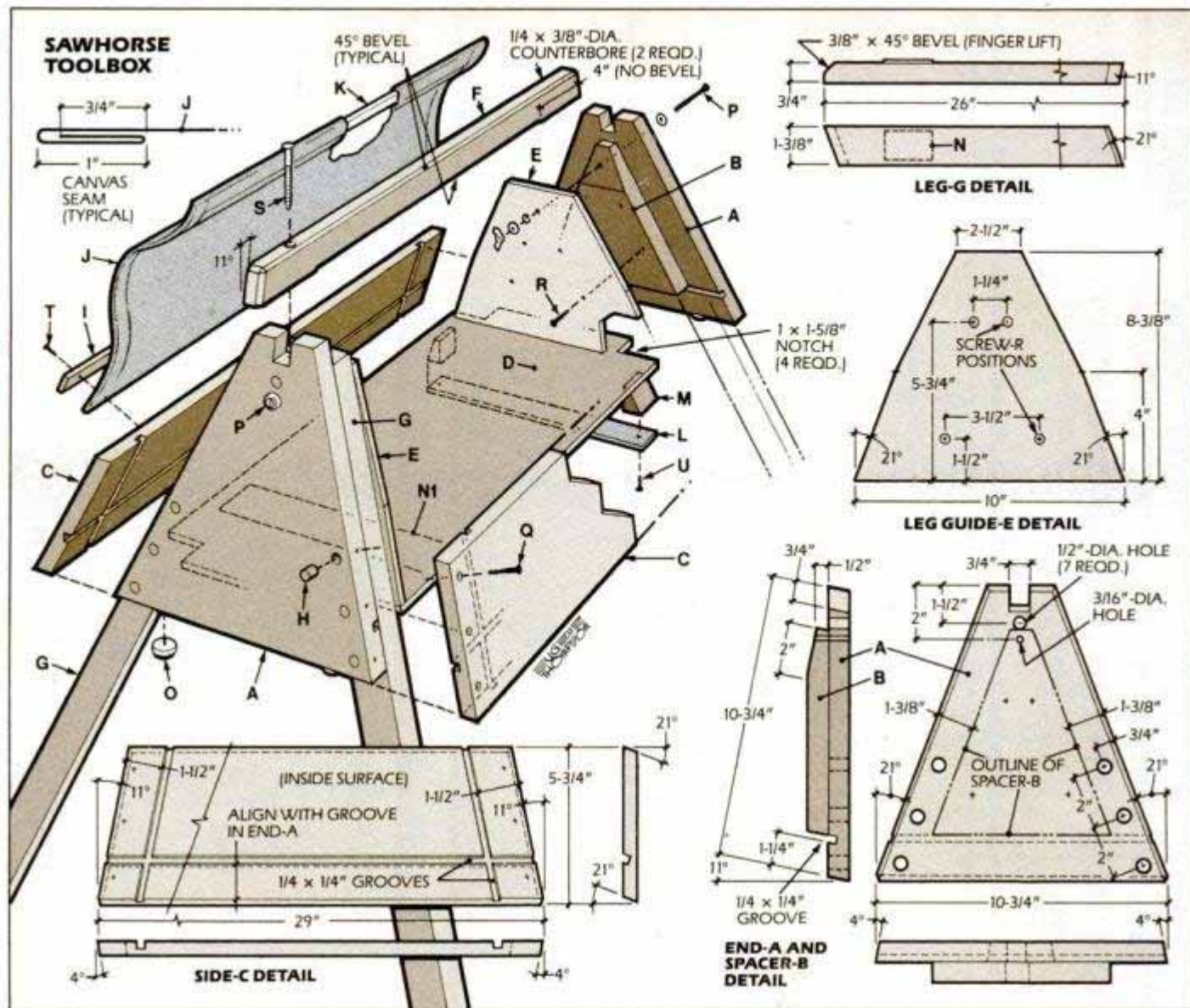
When cutting the $\frac{1}{4}$ -in.-wide dados for the toolbox bottom, be certain that dados align in the corners of the box (arrow).



Bore $\frac{1}{2}$ -in.-dia. holes in the toolbox ends to accept hardwood dowels. The dowels provide solid wood for driving in screws.



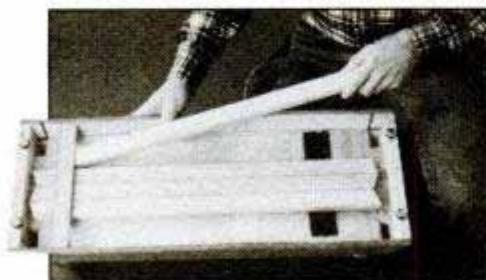
Partially assembled toolbox is shown with the left leg guide screwed to end. Right leg guide stands in dado cut in box side.



MATERIALS LIST—SAWHORSE TOOLBOX

Key No.	Size and description (use)	QTY	Material	Notes
A	2 3/4 x 11"-wide x 12" ash veneer plywood (end)	F	1 3/4 x 1 1/2 x 29" ash (handle)	
B	2 3/4 x 9"-wide x 11" ash veneer plywood (spacer)	G	4 3/4 x 1 3/8 x 26" ash (leg)	
C	2 1/2 x 5 3/4 x 29" ash veneer plywood (side)	H	14 1/2"-dia. x 1 1/8" hardwood dowel	
D	1 1/4 x 11" x 30" ash veneer plywood (bottom)	I	1 1/4 x 3/4 x 23 1/4" ash (cover retainer)	
E	2 1/4 x 8 3/8 x 10" ash veneer plywood (leg guide)	J	1 16 1/2 x 25 1/2" canvas (dust cover)	
		K	1 1/4 x 1/2 x 21" steel (weight strip)	
		L	1 1/2 x 1/4 x 10 9/16" aluminum (leg retainer)	
		M	2 3/4 x 1 x 1 1/2" poplar (mounting block)	
		N	4 1 x 2 1/2" Velcro fastener (leg strip)	
		N1	1 2 x 9" Velcro fastener (box strip)	
		O	4 3/4"-dia. furniture glide	
		P	2 3/16"-dia. x 2 1/2" fh machine screw, wing nut, finish washer and lockwasher	
		Q	12 1 1/2" No. 10 fh screw	
		R	8 1 1/4" No. 8 fh screw	
		S	2 2 1/4" No. 12 fh screw	
		T	5 1/2" No. 6 fh screw	
		U	2 1/2" No. 6 rh screw	

*Approximate dimension; trim to fit.



The four legs store neatly on the bottom of the toolbox. They're held by Velcro strips at one end and a retainer strap at the other.



An optional canvas dustcover protects tools from sawdust and dirt. A steel weight sewn in the hem holds the cover in position.

Prepare for final assembly by finish-sanding all parts.

Screw and glue a side to one end. Then, add the bottom and the second

end. Position the leg guides in the dadoes and screw the second side in place. Screw the leg guides to the spacers. Next, bore a 3/16-in.-dia. hole

for the leg clamping bolt through each end, spacer and leg guide. Now, cut the handle and mount it to the toolbox.

Crosscut the hardwood legs with the saw blade set at 11° and the miter gauge set to 21°. Cut one end of all legs, then move the miter gauge to the other side of the saw blade and cut the remaining ends. Now, glue Velcro fastener strips to the inside surface of each leg and to the underside of the toolbox bottom. Be sure that the Velcro on the toolbox aligns with the Velcro on the legs. Screw the aluminum leg retainer to the toolbox bottom to hold the leg ends that don't receive Velcro. Finally, finish the toolbox with several coats of Watco Danish oil.—Joseph M. Wilson

Your home workshop can PAY OFF BIG!



This One Low-Cost Power Tool—
SAWS to desired Width...
PLANES to desired Thickness...
MOLDS all popular Patterns...

—All at once or separately... All By Power Feed!

The Only Complete Workshop Tool Of Its Kind In The World!

From the Day It Arrives... The Planer will make and save you money. With shortages and inflation driving lumber prices sky-high, this versatile power tool quickly pays for itself by easily converting low cost rough lumber into high value finished stock. In just one pass turn out your own quarter-round, door and window stop, casing, tongue-and-groove... all popular patterns. Other operators are making cases for grandfather clocks, furniture, picture frames, bee hives, bed slats, surveying stakes... all kinds of millwork.

Built For Pros... Priced For Home Craftsmen... it is engineered and built to industrial standards, but factory-direct selling keeps the price low. Handles tough oak and walnut as easily as pine, and so simple to operate even beginners with no experience can use it.

Start Your Own Business!
Earn Extra Income Right At Home.

With just this one low cost power-feed machine in a corner of your garage or basement, you're set up to supply lumberyards, cabinetmakers, carpenters, remodelers, contractors and hobbyists in your area with custom-planed lumber, trim, molding... ALL of their millwork requirements. You can supply picture molding to art shops, hardware and department stores, or sell direct to framing shops. All standard patterns are available from stock, or we'll custom grind a knife to your own special design or sample.

Does The Foley-Belsaw Pay? YOU BET!

READ WHAT OWNERS SAY:

A Good Investment • Robert Sawyer, Roseburg, Oregon: "I believe that the Foley-Belsaw is the best investment I ever made. I've been a planer man for years and am now retired. The Foley-Belsaw has earned me \$60,000 extra income in the past eleven years."

Pays For Itself • R.S. Clark, Springfield, Ohio: "I bought a batch of walnut in the rough, and after planing it on the Foley-Belsaw I figured up the money I saved. It was enough to pay for two-thirds the cost of the Planer. It really does a good job!"

More Than Expected • Stephen Schultz, Orangeville, Penna.: "This machine pays for itself by making money out of scrap boards. It is a very well built machine and I confess it is more than I really expected for the price. It does everything you say it will."

... And Foley-Belsaw Is The Choice Of Professionals:
"I recommend Foley-Belsaw Planer-Molder-Saw as the most useful shop tool any craftsman could own. We use one every day in the Workbench model shop, and couldn't get along without it."

JAY HEDDEN — Editor WORKBENCH Magazine

Try The
Foley-Belsaw In Your
Own Shop On Our
**30-DAY FREE
TRIAL OFFER**

Mail Coupon Below
For Complete
Details!

**You Take NO RISK! The Planer/Molder/
Saw Is Backed by Our Exclusive 100%
Guarantee of Satisfaction:**

• "Try the Foley-Belsaw in your shop for a full 30-Days and put it to work for you. Give it a thorough test and make it prove that it can do everything we say it will... use it just as much as you want. Then if you are not completely satisfied, just send it back and we'll return every penny you sent. And YOU are the sole judge! There are no questions asked... there are no fine print 'use' charges. Our flat guarantee is that YOU must be 100% satisfied or you get your money back!"

**FREE
BOOKLET!**

Get FREE
Book with
facts and
full details

... RUSH COUPON TODAY!



If coupon has been removed, just send postcard with name and address to:

FOLEY-BELSAW CO.
90527 FIELD BLDG.
KANSAS CITY, MO. 64111

**Just Mail Coupon...
NO OBLIGATION and
NO SALESMAN Calls!**

ACT NOW!
Coupon
Brings
Full Details!



FOLEY-BELSAW CO.
90527 FIELD BLDG.
KANSAS CITY, MO. 64111

YES, please send me the FREE Booklet that gives me complete facts about your 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 _____

(Continued from page 86)

Travel with the Old Timer.



The Wrangler makes a great traveling companion. The high carbon Schrade + Steel® blades are completely rust resistant. Expertly made with over 100 hand operations. Also available with 3 blades. You're in good company with an Old Timer.

Write for your free Schrade Almanac to Schrade Cutlery Corp., Ellenville, N.Y. 12428-0590.

the "high-speed decelerator," Robinson describes the device as "basically, a slack line."

Dwindling velocity, no recoil

"I wear a full body harness attached to 1/8-inch wire," Robinson explains. "As I'm hanging there (from a 20th-story balcony), the line is hanging below me. It comes back up to a ratchet wheel." As he falls, the ratchet goes into action, playing out the line. Just as Robinson's body exerts the slightest tension on the wire, the ratchet reverses and lets him down at a dwindling velocity with no perceptible recoil.

In the finished film, the shot looks too real to be a stunt. Robinson's fall is photographed from Reynolds' point of view on the balcony. There is no camera cutaway until the last 20 feet of the drop. In most film falls, the camera has to cut away long before the body hits the ground to keep the theater-goer from seeing the mats and airbags piled up to take the impact out of the fall. The only sign of stunt rigging in Robinson's fall is a gleam of sunlight that strikes the wire. That was captured in the photo on page 85, but it didn't show in the movie.

No fall guy has been able to touch Dar Robinson's 311-foot drop from a helicopter done for a 1970s commercial, but many have tried—and one died in the attempt. In 1980, stuntman A.J. Bakunas attempted a 327-foot fall in the movie *Steel*. Bakunas used an air-bag arrangement, but it collapsed under his weight, killing the stuntman. Possibly reflecting on such mishaps, Robinson sees a day coming when stuntmen won't use airbags for scenes where descenders and accelerators can do the job.

Special effects designer

Behind every truly great stunt coordinator there's more than just equipment. There's the special effects designer. For *Firestarter*, the Stephen King tale of a girl with the power to set anything afire with a glance, special effects artists Mike Wood and Jeff Jarvis came up with several ways of torching stunt people—safely.

"Utmost in our mind is safety," Jarvis emphasizes. "We don't want anybody hurt, no matter what, especially working on a show with a little girl (Drew Barrymore). Coming out of what happened in *Twilight Zone*, everyone is extremely conscious of what could happen."

Using state-of-the-art materials developed for firefighters and race car drivers, Wood and Jarvis thinned down the fire-retardant suits stunt people

wear under their costumes from 3/8 inch to about 1/8 inch in thickness. The suit's outer layer is Kevlar, a flexible fabric so durable that the Army is using it to make experimental protective helmets for infantrymen.

"Then, there's a layer of Insulite, an insulating material almost like neoprene in texture but nothing like it in construction," Jarvis notes. "Under that, they wear a layer of Nomex or FR2 cotton treated with a fire retardant." That inner layer helps absorb perspiration. If a stuntman sweats inside the heavy insulation, he can get a "transfer burn," which is just as dangerous as a direct burn from a flame.

On fire for film

Using their new fire duds, custom-fitted on each stunt person, Jarvis and Wood were able to achieve one minute, 45 seconds of full burn before heat transfer began. That was plenty of time for the *Firestarter* shots, all of which lasted less than a minute.

Each stunt person wore a rigid Pyrex face-plate before being ignited. "The rule of thumb was that once you covered his face, you had three minutes to set the man on fire, let him do his dance and put him out and get the faceplate off," Jarvis says. The stand-ins had tiny air bottles tucked beneath their suits, but Jarvis and Wood rigged the stunt so that the air bottles weren't needed until the last seconds. That reduced the chances of feeding air to the flames.

"We developed (air) pockets in the suits so the man actually didn't go on the air bottle until the very last second," Jarvis says.

For a scene in which Heather Locklear (Drew Barrymore's screen mother) wore a cooking mitt which burst into flame on her hand, the special effects men treated the glove with a fire retardant and applied lighter fluid. They hid a tiny electronic igniter in the glove and ran lead wires to an off-camera neon transformer about half the size of a car battery. The wires were encased in a hard plastic shell and the transformer created a spark between them, setting off the lighter fluid.

Flipping the set

Perhaps less spectacular than a fire but no less difficult to produce was a colossal stunt for *2010*, the sequel to *2001, A Space Odyssey*. Stunt artists wearing harnesses padded with lambs' wool flew about the Russian spacecraft *Leonov* as it left Jupiter's orbit. Actually, the entire set, mounted on gimbals, rotated 90°, bouncing stuntmen and props off the walls.

Flipping the *2010* set was made

difficult not just by virtue of bodies and props flying around, but also by the sheer mass of the set. The rectangular arrangement, almost three stories tall, was constructed of lightweight metals. The motorized and geared rocking shaft on which the set twirled could be moved at speeds varying at the director's discretion. Still, it took a fair-sized crew just to man the brakes and hang onto anchoring cables to keep the *Leonov* set from lurching over, rather than turning smoothly.

Actors get involved

There's plenty of work for stunt professionals, but many actors and actresses today choose to do at least some of their own gags. Generally, movie companies discourage big-ticket attractions from getting involved, but there's no holding back some stars from getting a hand in. While Harrison Ford was taking his licks on the *Indiana Jones* set, Michael Douglas and Kathleen Turner pitched in on the stunts for *Romancing The Stone*.

For a mudslide scene, the two allowed themselves to be covered in stage slime and then drenched in a reported 100 gallons of water. And Turner served as a gymnast in a stunt scene where she had to swing by rope across a lagoon, a la Tarzan.

Not since the days of Steve McQueen has a performer taken on the deadliest stunts in a film. McQueen jumped moving railroad cars, took motorcycle spills and leaped ramps in rigged cars for two decades. Even so, the stunts performed in McQueen's day were mild compared with the maniacal "gags" pulled off today.

Thus, Jeff Bridges and James Woods took back seats to stunt coordinators in the shooting of a *Sunset Boulevard* chicken race in the film *Against All Odds*. The script simply read: "chase on *Sunset Boulevard*." Stunt coordinator Gary Davis plotted it—Bridges would be in a red Porsche, Woods in a black Ferrari.

"We storyboarded it shot for shot," Davis recalls. "On location, I used toy cars to plot out the scene. Without those, there probably would have been accidents." In 1980, stuntwoman Heidi Von Beltz was paralyzed in a head-on crash during a car chase on the set of *The Cannonball Run*.

Avoiding a collision

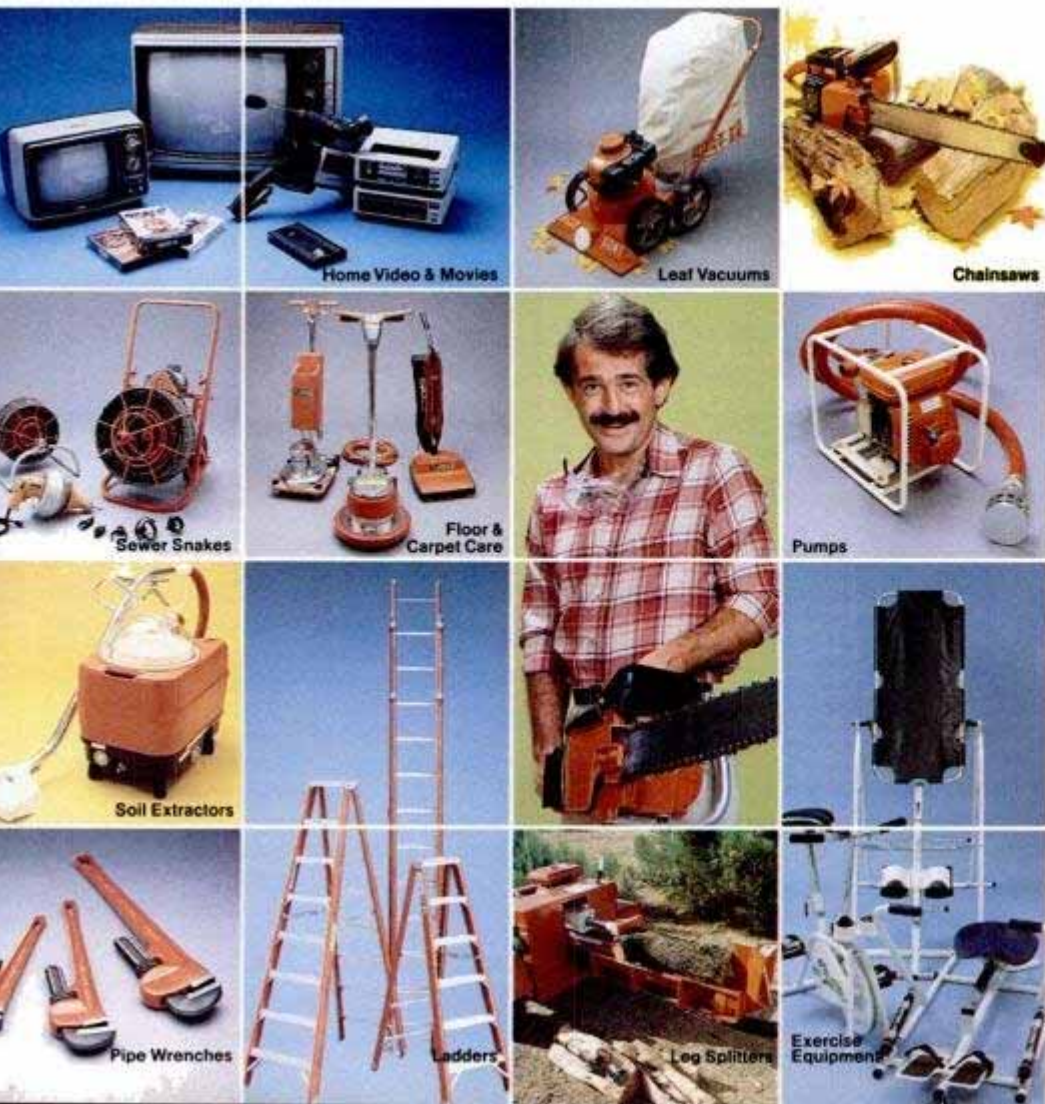
For *Against All Odds*, each stunt driver was told exactly how fast to drive and at what precise point to swerve to avoid a collision. Pickup trucks are usually used to carry the cameras for such scenes, but a Porsche Turbo Carrera—

its back seats removed to hold the equipment—was used because of its exceptional handling.

With *Sunset Boulevard* blocked off on a July Fourth weekend, the four-mile race was shot in half-mile to three-quarter mile runs. Davis handled the red Porsche and driver Carey Loftin wheeled the black Ferrari. "At our slowest we were going 80. We got close to 100, but never held it for very long," Davis says.

And although the camera-bearing Porsche—with two cameras mounted on the front, one on the side and two facing backward—was used for most of the chase, it couldn't be used in the medium shots of Bridges and Woods shouting at each other as they passed one another. The filmmakers discovered the cars' shiny finishes reflected the camera car. So, Davis drove alongside Bridges with a cameraman seated behind him. The three-and-a-half minute finished scene contains almost 100 separate shots.

They don't give an Oscar for stunts, and some in Hollywood say the six-figure salaries paid to the best gag-riggers is reward enough. But, as Steve McQueen once told an interviewer: "The stunts make a film really big. Whoever does the stunts—he's the real star." **PM**



WHY BUY? NOW RENT IT AND SAVE AT YOUR U-HAUL® CENTER

Now you don't have to buy an expensive tool that you may use only once a year.

Rent it at U-Haul for a fraction of the cost. Your U-Haul Center rents everything you need for the wood-burning season and home fix-up.

Plus you'll find other money-saving rentals—everything for home, garden and play.

Stop by your neighborhood U-Haul Center and pick up a free Rental Catalog (free glove offer inside) today. For the location nearest you, look in the white pages.

Rent it all at U-Haul



The best shock for your money.

Experience the ride of Gabriel Gas Ryder™ shocks. Gas pressure helps minimize vehicle sway and reduce the chance of your car bottoming out.

GAS RYDER™

\$19.95*
each

Installation not included



RED RYDER®

\$14.95*
each

Installation not included

And the best for less money.

Gabriel Red Ryder® is the premium heavy-duty shock that helps you get maximum performance from radial tires.

Buy now and save!

*Suggested sale prices end October 31, 1984. Prices may vary at participating outlets.

Gabriel®

SHOCKS & STRUTS

FLIGHT AROUND THE WORLD

(Continued from page 87)

end—one pulling, the other pushing. The two pilots who will share these cramped quarters for as much as two weeks are Dick Rutan, Burt's brother, and Jeana Yeager, holder of several records of her own. The two will take turns at the controls, one navigating while the other sleeps. Just trading positions will require the agility of a circus acrobat.

The key to the Voyager's unorthodox configuration lies in the deft blending of



Voyager team: Designer Burt Rutan (left) and copilots Jeana Yeager and Dick Rutan.

low drag, light weight and little power—all designed to produce maximum range on minimum fuel.

Constructed of featherlight plastic composites, the craft has an empty weight of only 1,858 pounds, yet will be filled with 1,489 gallons of fuel weighing nearly 9,000 pounds. Thus, it will carry almost five times its own weight in fuel. The fuel will be stored in 16 separate compartments in the wings, fuselage and tail booms.

The flight will not be fast. At an average speed of less than 100 mph, it may take 12 to 14 days, depending on wind conditions. The two engines are needed to lift the tremendous fuel load at takeoff, but as part of this weight is burned off, the front engine will be shut down and its prop feathered to save fuel. At this stage, flying on its rear engine alone, the craft will need less than 25 hp to sustain it.

Although its exact course is not yet known, the flight will start and end at Edwards Air Force Base in California, following a great circle route diagonally across the equator to pass under Africa and Australia.

Maximum altitude will be 12,000 feet to save the weight of oxygen equipment and a pressurized cabin. The crew wants weather radar to avoid the threat of thunderstorms, but even though it weighs only 18 pounds, it may have to be sacrificed—so critical is the weight factor to the flight's success.

The Voyager has been under development for more than three years at the Rutan Aircraft Factory in Mojave, Calif. It's taken a long time to get it right. Now comes the crucial test—a perilous, grueling journey no man has ever made before.

FM

SHARPEN YOUR OWN CHAIN SAW!



You save time and money!

By keeping your saw GAMN sharp . . . even on the job . . . you'll cut more wood and extend the life of your saw and chain.

The GAMN Chain Saw Sharpener is easy to use . . . even on the job . . . with professional results! A few turns of the handle uniformly sharpens each tooth for top cutting performance.

The durable all metal construction and precision carbide cutting burr of the GAMN Sharpener should provide years of service.

For name and address of nearest dealer
call 1-800-457-3392 Indiana 1-812-867-6469.

Dealer Inquiries Welcome.

Gamn'

11427 Darmstadt Road
Evansville, IN 47711

TORPEDO RUN!

(Continued from page 88)

be in the shallow parts of the rapids. Our guides told us they would take us through the safer, deeper sections. We'd been given a list of dos and another of don'ts. All this time, our other two guides, who would lead us through unquiet waters, had been inflating the boats. There would be one for every member of the group.

Smooth water warmup

Then, suddenly, it was launch time. Everyone slid an orange torpedo into the flat, lazy current of the Klamath. The boats, a good size when hefting around their 20 pounds on land, seemed to shrink into puny nothingness in all this water. Eager to plunge ahead, we were all haunted by the uneasiness of the unknown. Fifteen orange torpedos fired into the Klamath. Our heads were full of paddling instructions and boat handling techniques. We were ready, we thought.

Our flotilla could best be described as comical, maybe even hysterical. First-time paddlers, eager to make a good impression on the guides and each other, revved up their paddling arms to about 7,000 rpm. Some boats spun around in circles, others rocked back and forth over the same piece of water as if to stake out a claim. Still others drifted slowly away, as if to secede from the group, their paddles producing a random effect or none at all.

Gradually, the group got its act together. The guides broke us into three subgroups. We had to practice lining up single file—the formation used when attacking the rapids—close behind the guide, follow-the-leader style. Unfortunately, we still looked like a bunch of helicopters in distress.

But skills develop quickly with inflatable kayaks, and it began to take less effort and concentration to make the boats do what we wanted them to. Hard-shell kayaks, by comparison, are very tippy and require a longer training period. One fundamental maneuver you need to know with a hard-shell is the Eskimo Roll. When your kayak tips over, you remain in the craft and continue to roll it underwater in a 360° movement until you pop back out of the water, still seated in the boat—tricky, but neat.

Positioning the inflatable seat in the kayak determines the boat's riding characteristics. A slightly forward position keeps the bow down and makes the kayak easier to control, but the boat tends to plow in the waves. Moving the seat back sacrifices some control in favor of a more exciting ride. The bow comes up and you ride over the waves. Riding a big wave with your seat well

(Please turn to page 126)

Heavy-duty muffler at a lightweight price!

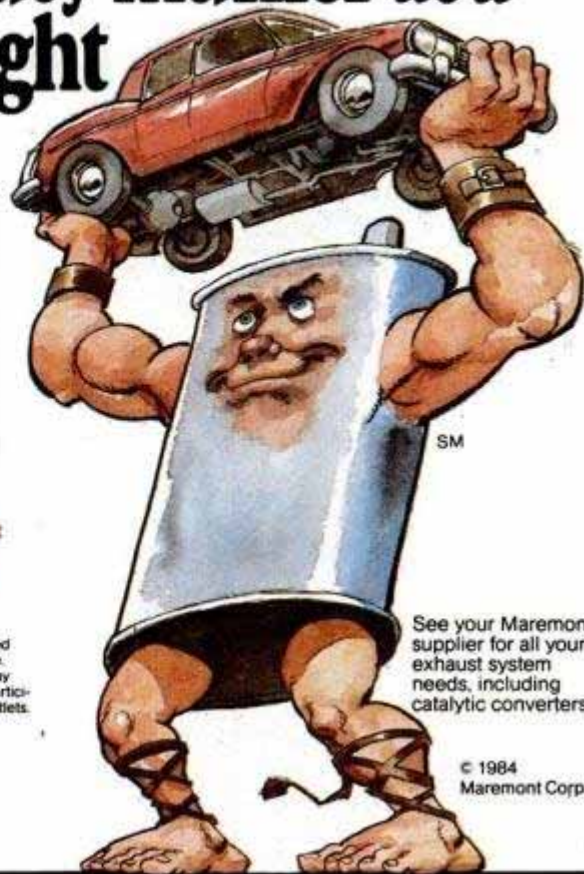
The Maremont Defender is the heavy-duty muffler for most domestic and import cars and trucks. With its aluminized outer body wrap, you know it's built to last. It's designed for easy installation, too!

So replace your noisy old muffler now and save! Sale ends October 31, 1984.

\$19⁹⁵*

*Suggested sale price. Prices may vary at participating outlets.

MAREMONT DEFENDER
Heavy-duty Muffler



See your Maremont supplier for all your exhaust system needs, including catalytic converters.

© 1984 Maremont Corp.

Try this Carey pipe "FREE" for 30 days

and we'll even give you the tobacco FREE!

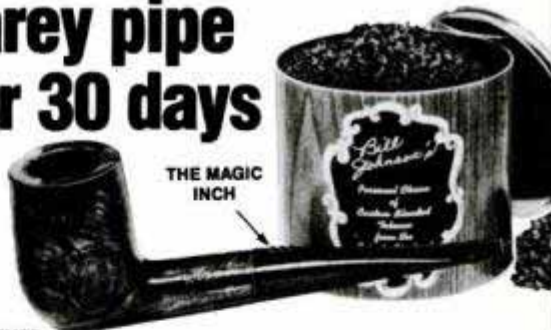
Pre-carbonized!
No "Breaking In"

Smokes like no pipe you've ever known! Be delighted or smash it with a hammer and the trial will cost you nothing.

It's a new concept in pipe smoking. Top grade Mediterranean briar with patented innovation—"Magic Inch"—harnesses Nature's own laws to provide the sweetest, smoothest, coolest, most satisfying smoke of your life! Not a filter, or a trap. No sludge, moisture or bitterness. Nothing but pure smoking satisfaction you've never known before.

Whether you're a pipe smoker or merely wish to cut down on cigarettes, you're invited to take advantage of this unusual offer. After 30 days, if you don't agree that no other pipe gives you the full rich aroma, deep down smoking pleasure and peace of mind only a Carey pipe can give, smash it with a hammer. The trial has cost you nothing. Even the half-pound humidifier of tobacco is yours to keep free.

Send for a free color brochure and select the style and shape pipe you want for your free 30 day trial. Send in the coupon today.



HOW THE "MAGIC INCH" COOLS, DRIES AND MELLOW'S YOUR SMOKE



Cool Air
Fresh air enters through vents, mixes with smoke from bowl... cooling and condensing it.



Condensation
Condensation "squeezes" excess moisture from smoke and is absorbed by the "Magic Inch"



Evaporation
Moisture evaporates into outside air... You get a cool, dry smoke.

EACAREY, INC. Dept. 8511X

65 East SouthWater, Chicago, IL 60601

Yes! Send me your full color brochure so I can select a pipe to smoke for 30 days on a free trial basis.

Name _____

Address _____

City _____

State _____ Zip _____

My Telephone is (_____) _____

FOR FAST INFORMATION
Call 312-977-2855

EACAREY, INC.
65 East SouthWater, Chicago, IL 60601



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

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



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

THE SHALER CO.

Waupun, WI 53983

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

TORPEDO RUN!

(Continued from page 125)

back makes your boat shoot out of the water at a 45° angle. It's called "The Big Ride," and there's not much, except maybe a roller coaster, that can compare to it, so we're told.

On the brink

We're still in the gentle flatwater current. On this type of water, one can tuck in with the rest of the group or drift off alone. Little or no evidence of civilization intrudes upon our river world. The river's doing all the work and . . . what's that sound?

Rapids!

This is it, the moment of truth. Everybody into a single line behind the guide. Nerves tighten and we brace ourselves. The current increases. Paddle like crazy to keep the bow pointed in the right direction. Blobs of spray fire up at us like anti-aircraft flak. Are we going to get sucked down an endless whirlpool, into some black hole in the river? Will our plastic toys be torn to shreds?

We float through the Class 1 rapid—little more than a few riffles and a touch of whitewater—without incident. It's a stretch any 10-year-old in an inner tube can float through with no sweat. Still, we make it, and we're jubilant.

Here comes a second set. Whoosh! We're through. Another rush, another high.

If you've ever climbed a mountain, you know the exhilaration you get when reaching the top. Then, it's all over. Running an inflatable kayak over whitewater gives you the same exhilaration. Only you get it a lot more often—and with a lot less work.

All of a sudden we're back in flatwater, and two torpedoers are going at each other in a massive water fight. Two more join in with their paddles. The activity is not discouraged by the guides. We're all here to have fun.

The entire group is more relaxed, now that we have a couple of sets of rapids under our belts, but we still feel that special excitement. It permeates the entire trip. It's the constant anticipation of what lies around the next bend in the river. In this case, it's a Class 2 rapid.

Rapids generally are rated Class 1 through 6 to denote degree of difficulty. Class 1 is the easiest. You'd have to look twice to see that it really is a rapid. Classes 2 and 3 have increased turbulence, larger waves and the rapids sections are longer. Class 4 and higher rapids require more technical skill because you must maneuver your boat to get through. There may be several rocks you have to navigate around, while the easier class rapids generally are a straight shot through.

The current is picking up now, much faster than before. We're getting sideways. Got to hit the waves straight on. One person washes out, and a guide is right there to help him back in his boat. We're really getting the feel of bouncing along in the waves. You have to move fast to keep this thing straight. Uh, oh. I stick the paddle into the upstream side of the current. The paddle acts as an anchor and the current whips the kayak around. I paddle like crazy and make it through the rapids—backward.

There are easier ways to do this—rafting, for instance. You would hardly feel water like this in a big six- or eight-man raft. But rafting the rapids is passive. Sure, you have to shift your weight around some, but the thrill is nowhere near that of piloting your own craft—especially one as responsive and sensitive as our kayak. Rafting is like getting driven around the Indianapolis Motor Speedway in a bus.

Several more rapids and we reach what is called the rerun area. This is usually the biggest water of the day, and today is no exception. We stop and climb the rocks back to the head of the rapids for another ride down—a rerun.

We rerun the big water 10 times. I get my boat completely airborne a couple of times and I get it to launch straight up like a Saturn rocket a couple of times. I dump five times out of the 10. Each time, a guide is right there.

A wall of water

The trip ends with a big finish—the biggest rapids of all. One look at this Class 4 section puts my heart back in my throat. Sure, it's scary. If it wasn't, it wouldn't be fun. The waves look to be about 10-footers. I get my seat back in the boat for The Big Ride. And I get one. A wave catches me in a forward pass. Now it's the water's turn to have some fun. I get out of shape and head straight for a wall.

We were told that rocks and walls have a natural cushion of water coming off them. And the rocks are rounded from eons of polishing by the river. The secret is to lean toward a force coming at you whether it be a strong wave or rock or wall. This technique takes the best advantage of the cushion of water, and you will bounce off the obstruction.

I panic, of course, and lean away from the wall. Wrong. This depresses the far side of the boat. The water cushion flowing off the wall catches the uplifted near side of the kayak and spins me into the water. I'm under for a second in the seething currents, and have to be rescued. I wonder if I should quit now. I don't.

What I do instead is what most of the others do: sign up in advance for another Torpedo Run next year. **FM**



In Japan, where high-tech electronics are a way of life, they pay \$714.93 for an American-made radar detector

(You can get the same one for considerably less)

Even we were a little surprised. All we did was build the best radar detector we knew how. We shipped our first ESCORT in 1978, and since then we've shipped over 600,000. Along the way the ESCORT has earned quite a reputation—among its owners, and also in several automotive magazines.

Credentials

Over the past five years, *Car and Driver* magazine has performed four radar detector comparison tests. Escort has been rated number one in each. Their most recent test concluded "The Escort radar detector is clearly the leader in the field in value, customer service, and performance..." We think that's quite an endorsement.

Our Responsibility

One of the reasons for our reputation is our attention to detail. If we don't feel we can do something very well, we simply won't do it. That's why we sell Escorts direct from the factory to you. Not only can we assure the quality of the ESCORT, but we can also make sure that the salesperson you speak to is knowledgeable. And if an ESCORT ever needs service, it will be done quickly. And it will be done right.

50 States Only

And that's the reason we don't presently sell ESCORTs outside of the United States. Even in the countries that use identical radar (Japan and Australia, to name two) we know that we couldn't provide the kind of customer service that ESCORT owners expect. So we pass up the additional sales rather than risk our reputation.

"Dear Sir..."

So we'll admit we were surprised when a letter from one of our customers included an advertisement from a Japanese automotive magazine. The ad pictured an ESCORT, and the price was 158,000 yen. Our customer was kind enough to convert that to U.S. dollars. Using that day's rate of exchange, an American-made ESCORT was worth \$714.93 in Japan. Further translation revealed the phrase "The real thing is here!" and warned against imitations.



This 1/2 page ad was a total surprise.

Econ 101

Needless to say, we were flattered. We knew that ESCORT had an impressive reputation, but we never expected to see it "bootlegged" into other countries and sold at such a premium. But the laws of supply and demand are not so easy to ignore. When there is a strong need for a product, there is an equally strong incentive for an enterprising capitalist to fill that need. And apparently, that's just what happened.

The Moral

We still don't sell out of the country. And the price in this country is still \$245. The price we've had for the last five years.

Quite a deal for what the Japanese must think is the best radar detector in the world.

Try ESCORT at no risk

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

ESCORT is also backed with a one year warranty on both parts and labor. ESCORT \$245 (Ohio res. add \$13.48 tax)

TOLL FREE..... 800-543-1608
IN OHIO..... 800-582-2696

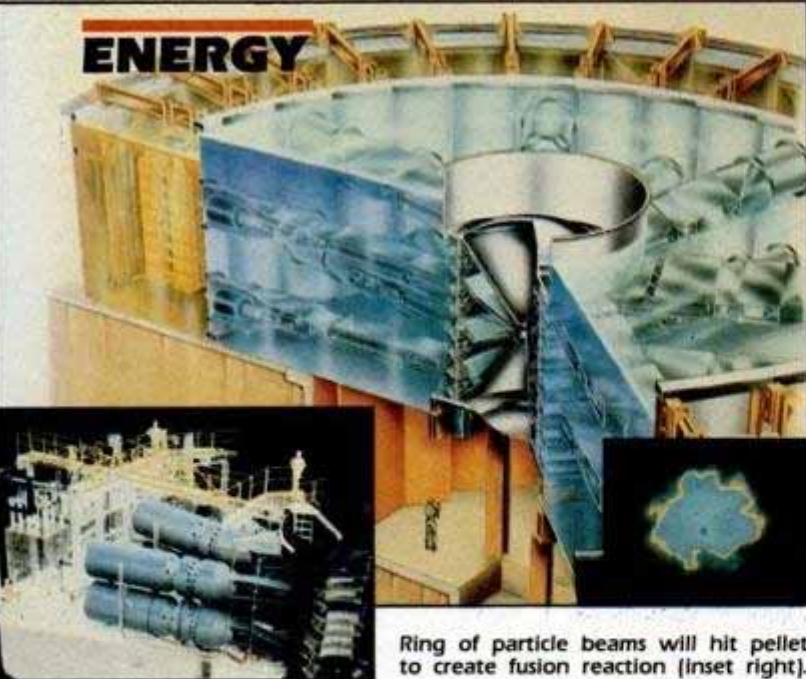


By mail send to address below. Credit cards, money orders, bank checks, certified checks, wire transfers processed immediately. Personal or company checks require 18 days.

ESCORT
RADAR WARNING RECEIVER

Cincinnati Microwave
Department 100-1068
One Microwave Plaza
Cincinnati, Ohio 45296-0100

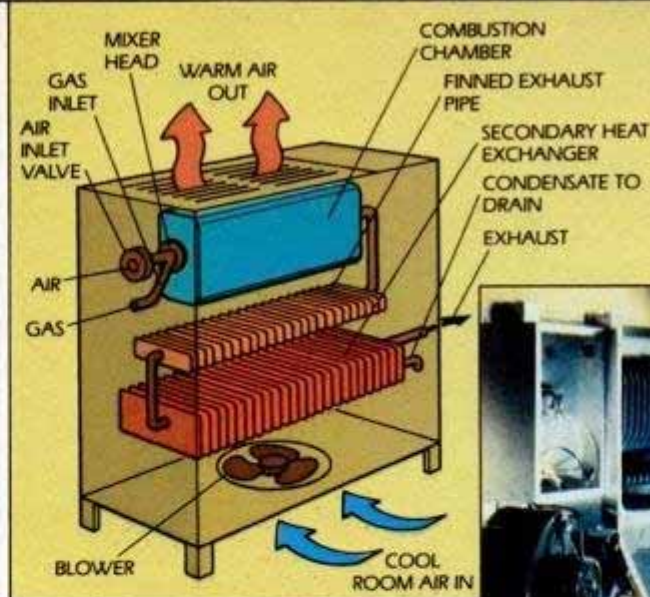
ENERGY



Ring of particle beams will hit pellet to create fusion reaction (inset right).

Fusion goes on particle beam

If fusion energy ever gets off the ground, we'll be able to create enough electricity to power a big city for weeks on a tiny pellet of fuel. Sandia National Labs has brought us a step closer by focusing a powerful proton beam on a target the size of a pin head. That sharp focus was thought impossible a decade ago. But particle beam technology has accelerated. Sandia also is building an experimental fusion reactor that will begin operation in 1986. A circle of particle beams will focus on a tiny deuterium and tritium pellet, yielding a tiny nuclear fusion reaction. Confined in the small reaction vessel, the pellet will produce millions of watts of power.



Experimental pulse space heaters are built to be self-ventilating and energy efficient.

Pulse on energy developments

Electric space heaters cost a lot to run and gas models require a good deal of ventilation. The perfect solution may come on the market in a few years: the pulse space heater. The American Gas Association is working with 12 prototypes to see if they merit marketing. A gas-air mixture ignited within a combustion chamber creates a pressure pulse that closes air and gas inlet valves, and ejects the combustion products. The resulting pressure drop draws in more air and gas which is ignited by residual flames and heat. Flue gases are forced out in the process, making a pulse space heater self-ventilating, and, therefore, highly desirable for home use.

INVENTIONS

The Worm Turns

First came the wheel, then the screw and later the worm drive, which united the first two inventions to create a rotating machine. The worm drive has served mankind for about 2,000 years. But now the Maxamam Corporation is introducing the Squirm Drive. It resembles a worm drive, but instead of ripping at the screw with brass teeth to transmit power from the wheel, the Squirm Drive nudges it gently with lubricated ball bearings. The resulting reduction of friction gives added life to the driving mechanism and increases its over-all efficiency. Inventor George Bracket says his Squirm Drive will be used in power turbines, big motors and other large machines.



Squirm Drive's ball bearings replace the bronze teeth used in traditional worm drive rigs.

Editor: Dennis Eskow
Contributors: Sheldon M. Gallager, Jack Hammond, James Oberg,
Jerry Cheslow, Ida Beck, Michael A. Fillon, Fran Wenograd Golden



Breathing easy Hot video

The Bureau of Mines is testing a new rescue breathing apparatus. The closed-circuit unit provides breathing air for two hours and will cut by half the weight carried on the backs of mining rescue workers. The device uses a gill filtering system to keep the air clean. Positive pressure keeps the dirty mine air out of the apparatus.



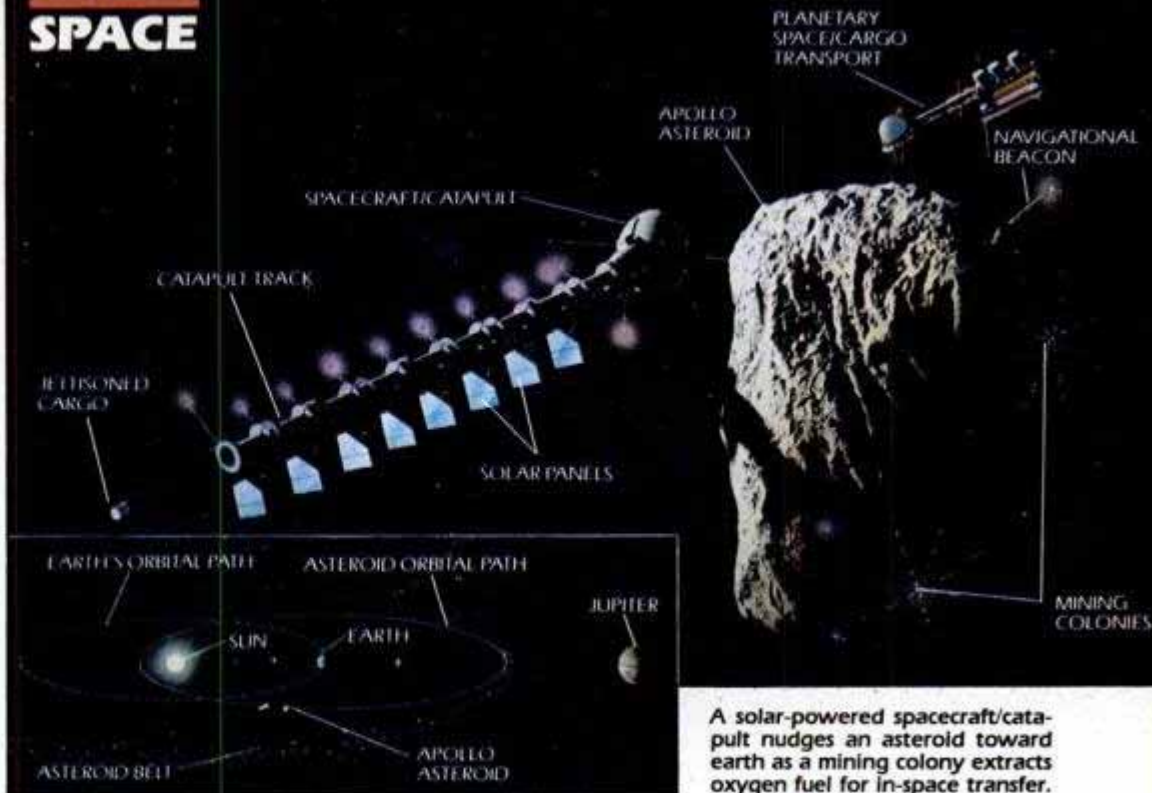
The English Electrical Valve Company, Ltd. has developed a new infrared camera for firefighters. In a smokey blaze, firefighters can use the camera to find their way through a room to a victim or to the source of the blaze. After the fire is extinguished, investigators can look at video recordings to help determine what started the blaze.

Mining Asteroids

On the NASA drawing board is a plan to visit within two decades a large asteroid, perhaps one of a handful of Apollo Objects that cross earth's orbit. The mission would have two goals: extracting gold, silver, platinum and other precious metals; as well as oxygen from water for fuel. And determining how future missions could break up the very largest asteroids that might threaten to smash into the earth. While scientists are charting new asteroids and studying their geological composition, aeronautical engineers are working on the design of spacecraft to perform the tasks involved. The velocities needed to reach some Apollo Objects are lower than those needed to reach the moon. But travel time to the nearest objects may be up to three years. For robots or for astronauts with advanced recycling life support systems, that may not be a problem. In fact, many spaceflight theorists predict we'll put men on asteroids before we set them down on Mars.

Since more than one-third of the weight brought into orbit by a moonbound Saturn rocket is for oxygen propellant, the dearest commodity astronaut miners will seek is oxygen-

SPACE



A solar-powered spacecraft/catapult nudges an asteroid toward earth as a mining colony extracts oxygen fuel for in-space transfer.

bearing water. Thus, factories to convert an asteroid's contents to rocket fuel may become big business with the arrival of 21st century space travel. A planetary space/cargo transport could be used to pick up fuel and transfer it to a space station or a docking ship. Meanwhile, a spacecraft/catapult could gently nudge the asteroid toward earth over a three-year period. The catapult would heat pebbles from the asteroid and expel the exhaust as a propellant.



Road control

Chrysler cars of 1988 will be equipped with switches that will be mounted on the steering hub just below the driver's line of sight. The switches will allow drivers to operate electric door locks, lights, wipers and other controls easily. The car's computers will use low current information pulses requiring less wiring and less power to run the controls.



Electronic acid test

The Battelle Memorial Institute in Columbus, Ohio has devised a new electronic acid rain detector. Mounted on a 150-ft. tower above a forest, the instrument samples air for sulfur content. Field measurements already have shown higher sulfur deposition above forests than over crops and grass. Such information helps pinpoint acid rain sources. It also allows foresters to decide whether acid rain collected on the ground will continue to fall or subside. This helps to determine whether to treat trees that absorb the rain. Such treatment is expensive and complicated to perform, and foresters try to avoid treatment wherever possible. Prototype acid rain detectors went into operation in the Midwest this summer.



Cut corners

England's new StreetKing suction sweeper has a selling point much like many household vacuum cleaners: It gets into corners. With a 13 ft. turning radius, the StreetKing can make a clean sweep over 215,000 sq. ft. of street per hour and has the capacity to carry 52 cu. ft. of rubbish in its hopper. Sanitation engineers should pick up on this.

WEATHER



When it rains . . .

The Israelis, who know how to make a desert bloom, have come up with a seeding method that can wring 25 percent more rain out of certain types of clouds. With the new method, a plane flies into a thermal updraft below the cloud and fires silver iodide pellets into the air. The pellets are swept into the cloud by the upward turbulence and form ice crystals. As the ice crystals get large and heavy, they fall down toward earth and melt, making rain.

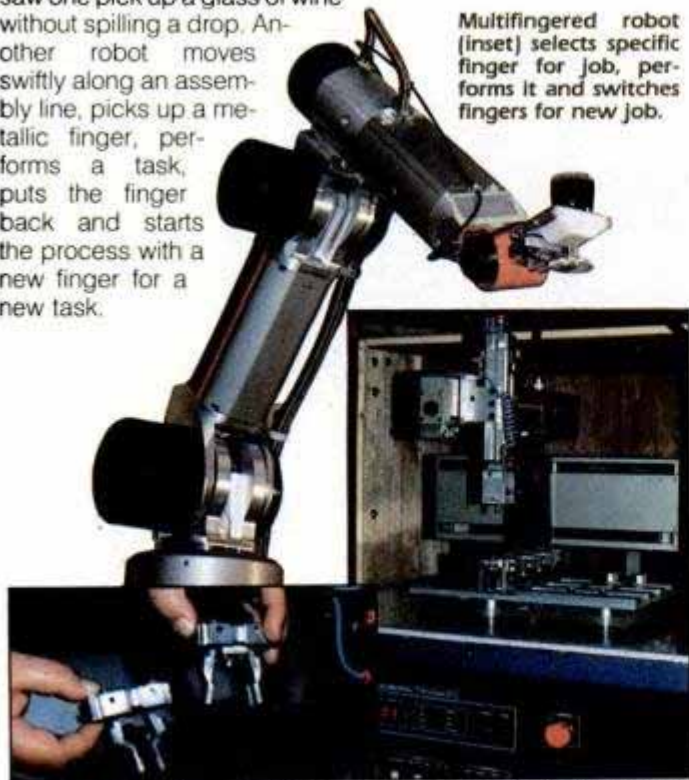
The silver iodide-firing rig on a plane wing shoots pellets into a cloud to form rain drops.

ROBOTICS

That touch of class

Factories that shy away from using robots do so for two big reasons, cost aside. First, robots are klutzes and can't do many delicate jobs. Second, most robots have hands and fingers designed to perform just one task. Panasonic Industrial Company recently introduced a new line of robots that overcome both problems. A multi-axis robot arm has such a light touch that we saw one pick up a glass of wine without spilling a drop. Another robot moves swiftly along an assembly line, picks up a metallic finger, performs a task, puts the finger back and starts the process with a new finger for a new task.

Multifingered robot (inset) selects specific finger for job, performs it and switches fingers for new job.



The multi-axis robot arm can hoist a wine glass, without a spill.

AVIATION

Pedal power makes another try

The elusive British-sponsored Kremer Prize for man-powered flight may have finally been won by a group of aeronautical engineering students at the Massachusetts Institute of Technology. Their frail-looking, pedal-driven monoplane, called the Monarch after its similarity to a butterfly, recently flew the mandatory 1,500-meter (4,921-foot) triangular course in two minutes, 49 seconds for an average speed of just over 21 mph.

The Monarch is a hybrid design, permitted under the latest provisions of the Kremer rules. It combines pedal power with a slight assist from a small battery-run electric motor. The foot pedals and motor are both geared to a common shaft that drives a large-bladed prop mounted in front of the cockpit. An earlier attempt to capture the prize by Dr. Paul MacCready's Bionic Bat (page 71, Feb. '84) was disallowed for allegedly using too much electric power. If the Monarch's claim stands up, the M.I.T. students will be \$30,000 richer.



Airy pedal plane weighs only 74 pounds. At right is tiny, bathtub-like cockpit.

Wings of the future

The U.S. Air Force is always dreaming up exotic new shapes for future aircraft. The two concepts shown here, both for long-range strategic bombers, are straight out of the 21st century.

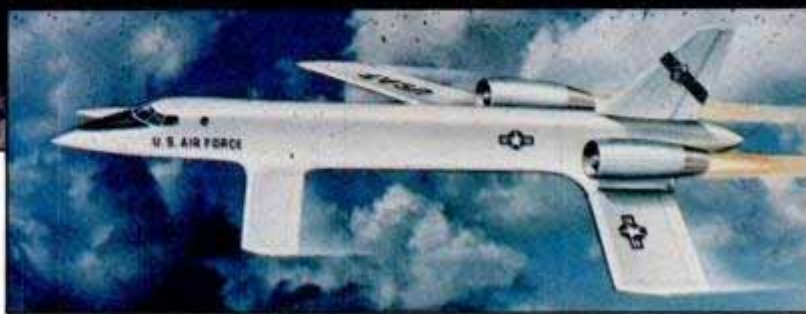
The plane above right has a swiveling wing that swings crosswise for low-speed landings and takeoffs. For high-speed flight, the wing retracts into the top of the fuselage (center) to reduce drag and the plane cruises solely on lift produced by its broad, flat underbelly.

The other design features forward-swept wings and canards for improved lift and maneuverability. Both concepts were developed by Rockwell International.



OFFICIAL U.S. AIR FORCE PHOTOS

Tomorrow's bombers? They just might be. Both of these futuristic concepts are the work of Rockwell International, already noted for development of the mighty B-1B strategic bomber.



GIs get back an old friend

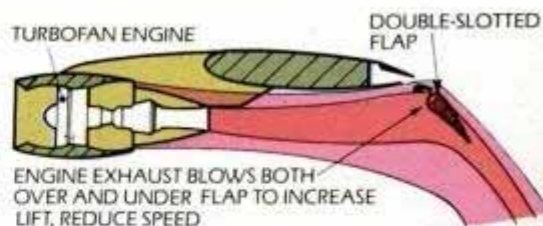
Remember the old Browning Automatic Rifle of World War II? Now, for the first time since the BAR was abandoned, the Army and Marines are adopting a similar weapon. Called the MINIMI, it's light enough to be handheld, yet fires up to 1,000 5.56mm rounds a minute from a clip-on, belt-feed magazine. It's made by the Belgian firm Fabrique Nationale Herstal.

New BAR replacement can be fired from hip or on a tripod with scope sight.



Getting cargo where it counts

The problem with giant military cargo planes like the C-5A is that they require long runways and can't deliver supplies directly to frontline battle areas. Now, the C-17, a new STOL-type transport, can drop an 86-ton payload—almost as much as a C-5A's—into airstrips as short as 3,000 feet. Its secret lies in its blown wing. Exhaust from its four powerful turbofan engines is blown over and against huge double-slotted flaps, increasing low-speed lift to shorten landing and takeoff distance. Developed by McDonnell Douglas, the C-17 can thus fly troops, tanks and other heavy equipment right into battle. **TU**



Engine exhaust is blown through slotted flaps to add lift and to permit short-field operation.

Frozen bird to go

Earlier this year, the Marine Corps' newest jump jet, the Harrier II, went through two months of harrowing weather. It faced 60-below temperatures, 46 mph winds and layers of ice formed on its wings. It all happened in a McDonnell Douglas test hangar in St. Louis. The Marines say the new Harriers will be deployed later this year.



McDonnell Douglas Harrier II undergoes severe weather test.



New C-17 can deliver a mechanized force right to the front lines.

BUYING A REAL COMPUTER MONITOR

(Continued from page 103)

even the best of the high-resolution color monitors reviewed here fall down badly when it comes to reproducing text—words and letters used in writing programs, doing spreadsheets or word processing.

If you're planning to do a lot of business-type work, you're much better off getting a monochrome monitor, which typically has high resolution. If you also plan to do color bar charts, play some computer games and otherwise find that you need a color monitor, you

might want to get two monitors and connect them to the computer through a selector switch, an inexpensive item available in most computer stores. Some computers may have two monitor outputs. If you have such a machine, you can forget about buying a selector switch, and simply connect both your monochrome and color monitors.

Monitor controls

Controls are another thing that you'll find much different on a monitor than

on a regular television set. Naturally, there's no channel selector. While some monitors have a built-in speaker and audio amplifier for playing games, the majority don't have this feature. It's something like watching a silent movie. The Atari and Commodore computers have an audio channel output which will give you sound if you buy a monitor with a built-in speaker and amplifier. Both of these computers use a five-pin DIN (European) connector. To use a

(Please turn to page 134)

HOW THE MONITORS STACK UP

MANUFACTURER	MODEL	TYPICAL PRICE (\$)	COLOR/MONO	SCREEN SIZE (in.)	BUILT-IN AUDIO	SIGNAL INPUTS	STATED RESOLUTION	GLARE SHIELD	SPECIAL FEATURES
Amdek Corp. 2201 Lively Blvd. Elk Grove Village, Ill. 60007	Video-300	179	Mono/Green	12	No	Comp.	Med.	Yes	
	Video-300A	199	Mono/Amber	12	No	Comp.	Med.	Yes	
	Video-310A	230	Mono/Amber	12	No	TTL	High	Yes	
	Color-I	300	Color	13	No	Comp.	Low	Yes	*
	Color-I Plus	300	Color	13	Yes	Comp.	Low	Yes	*
	Color-II	500	Color	13	No	R-G-B/TTL	High	Yes	*
	Color-II Plus	520	Color	13	Yes	R-G-B/TTL	High	Yes	*
	Color-III	450	Color	13	No	R-G-B/TTL	Med.	Yes	*
	Color 300	350	Color	13	Yes	Comp.	Low	No (R)	**
	Color 400	400	Color	13	Yes	Comp.	Low	No (R)	**
Color 500	400	Color	13	Yes	R-G-B/Comp	Med.	No (R)	**	
Color 600	650	Color	13	Yes	R-G-B	High	No (R)	**	
									** . Switchable 16-color mode ** . Switchable 16-color mode, green text
Apple Computer Inc. 20525 Mariani Ave. Cupertino, Calif. 95014	Monitor II	229	Mono/Green	12	No	Comp.	High	Yes	
	Monitor III	249	Mono/Green	12	No	Comp.	High	Yes	
Commodore Business Machines 1200 Wilson Rd. West Chester, Pa. 19380	C-1701	300	Color	13	Yes	Comp.	Low	No	
Computer Technology Int'l. 200 Murray Hill Parkway East Rutherford, N.J. 07073	CTI-83X	169	Mono/Amber	12	Yes	Comp.	Med.	No	
Comrex International Inc. 3701 Skypark Dr. Torrance, Calif. 90505	CR-5600	135	Mono	12	No	Comp.	High	No (R)	3 colors: light green, green, amber
	CR-6500	324	Color	13	Yes	Comp.	Low	Yes	
	CR-6800	649	Color	13	No	R-G-B	High	No (R)	16 colors
Dynax Inc. 5698 Bandini Blvd. Bell, Calif. 90201	Fortes GM-30	176	Mono/Amber	12	No	Comp.	High	Yes	
Princeton Graphic Systems 1101-1 State Rd. Princeton, N.J. 08540	MAX-12	249	Mono/Amber	12	No	TTL	High	No (R)	
	HX-12	695	Color	12	No	R-G-B	High	No (R)	
	SR-12	799	Color	12	No	R-G-B	Super-High	No (R)	(C)
Sakata U.S.A. Corp. 651 Bonnie Lane Elk Grove Village, Ill. 60007	SG-1000	129	Mono/Green	12	No	Comp.	High	No (R)	
	SA-1000	159	Mono/Amber	12	No	Comp.	High	No (R)	
	SC-100	300	Color	13	Yes	Comp.	Low	No	
	SC-200	649	Color	13	No	R-G-B	High	No	
Teknika Electronics Corp. 1633 Broadway New York, N.Y. 10019	MJ-22	499	16-color	13	Yes	R-G-B/Comp	High	No	Tilt stand
USI International 150 Northhill Dr. Brisbane, Calif. 94005	900/G (PI-1)	159	Mono/Green	9	No	Comp.	High	Yes	(I) (M)
	1200/G (PI-2)	199	Mono/Green	12	No	Comp.	High	Yes	(I) (M)
	900/A (PI-4)	199	Mono/Amber	9	No	Comp.	High	Yes	(I) (M)
	1200/A (PI-3)	239	Mono/Amber	12	No	Comp.	High	Yes	(I) (M)
	1400/C	399	Color	14	Yes	Comp.	Low	Yes	(M)
Zenith Data Systems 1000 Milwaukee Ave. Glenview, Ill. 60025	ZVM-123	149	Mono/Green	12	No	Comp.	High	Yes	
	ZVM-122	169	Mono/Amber	12	No	Comp.	High	Yes	
	ZVM-124	199	Mono/Amber	12	No	TTL (IBM)	High	Yes	
	ZVM-134	379	Color	13	Yes	Comp./R-G-B	Low/Med.	No	(Gr) (L)
	ZVM-133	559	Color	13	No	R-G-B	High	No	(Gr)
	ZVM-135	599	Color	13	Yes	Comp./R-G-B	Med./High	No	(Gr) (L)
	ZVM-136	799	Color	13	No	R-G-B	Super-High	No	(Gr) (Ph)

Three types of color inputs are listed: composite (combined color signals), which will also drive mono monitors; R-G-B color, which requires a special connector (usually a 9-pin "D"-type); and TTL, which is mono version of R-G-B and also uses special connector.

* Discontinued, but generally still available on store shelves. New replacement models are marked "***."

** New models have optional swivel base; may coexist on store shelves with previous series for a time.

(R) No glare shield needed; improved black mask CRT is said to reduce screen glare.

(C) Requires special color graphics display plug-in card in computer to double number of horizontal scan lines available from some third-party manufacturers.

(Gr) Color monitor has Green-only selector switch for viewing text as green on dark background.

(I) Inverse video switch to reverse white and black elements—provides black text on green or amber background.

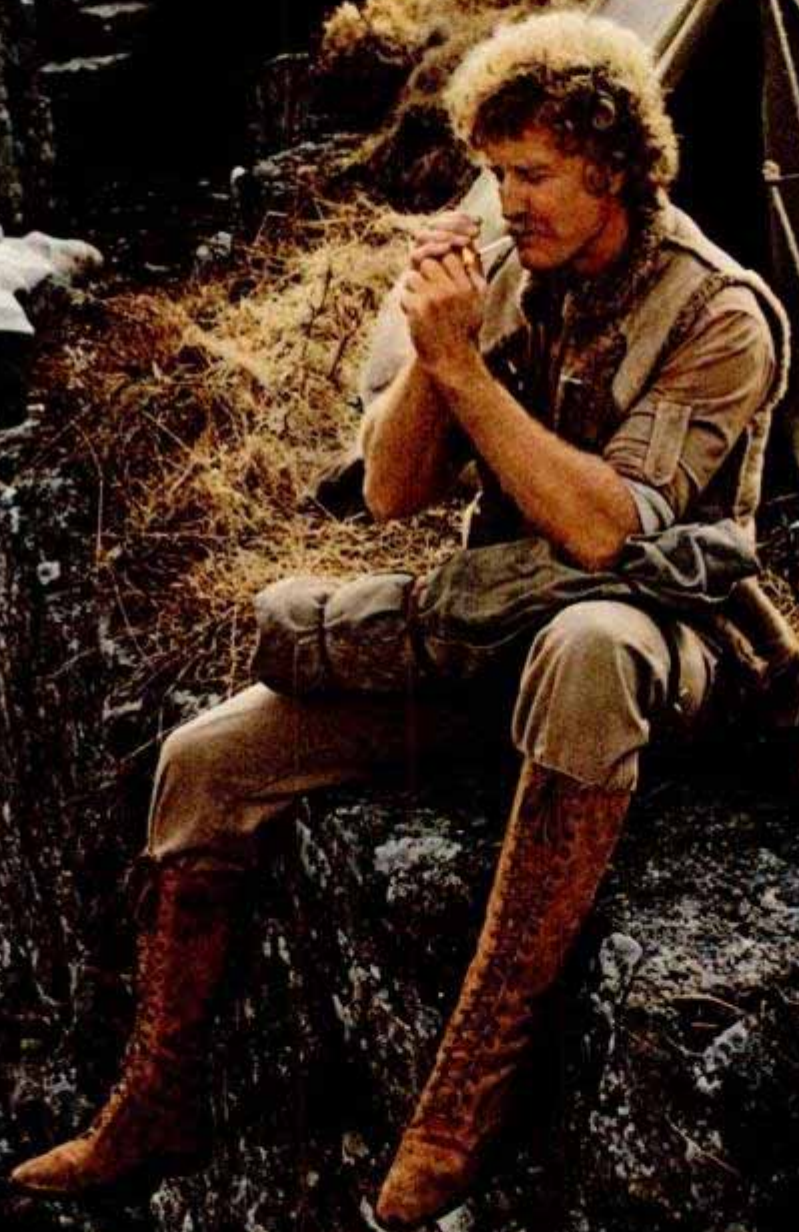
(M) Metal case, said to prevent magnetic contamination of computer disks by monitor's operation.

(L) "Loop-thru" provides video output jack for connecting several monitors to the same video source.

(Ph) Has long-persistence phosphor screen for reduced flicker in interlaced operation, which provides extra-high resolution.

CAMEL LIGHTS

It's a whole new world.



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

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

Today's
Camel Lights,
unexpectedly mild.



Save Time! Save Money!
Mill Supply Sells Over
1,000 Different Top Quality



STEEL REPLACEMENT PANELS

To Repair Rust or Collision Damage
on Many American Cars, Pick-up
Trucks and Vans and Most Imports



96-Page MILL U.S. Car,
Truck and Van Catalog **\$300**

Lists sheet metal parts available for most popular U.S. cars, vans and
pick-ups. Tools and body shop accessories also are included. (\$4.00
Canada, U.S. funds)

TABCO. Import
Car & Truck Catalog **\$200**

Lists steel replacement panels, fenders, hoods, grills, rockers, rear
quarters, etc. (\$3.00 Canada, U.S. funds)
Send check or money order, allow about 3 weeks for delivery. VISA or
Mastercard accepted ON PARTS
ORDERS ONLY.
Send self-addressed stamped long
envelope for FREE information on
any ONE American or import car
or truck.



Mill Supply Dept. PM-410
3241 Superior Avenue • Cleveland, OH 44114
Phone (216) 241-5072

Greenhouses



... Professionally designed,
featuring:

- Curved glass eaves
- Aluminum frames
- Steel substructures
- Automatic venting
- Free standing,
lean-to and
window
styles

SINCE
1948



TEXAS **TGC**
GREENHOUSE
COMPANY®

2711 St. Louis Avenue
Ft. Worth, Texas 76110
(817) 926-5447

Send off now for free catalog.
For 1st class mail enclose \$1.00.

BUYING A REAL COMPUTER MONITOR

(Continued from page 132)

monitor, you'll have to get an adapter with RCA-type jacks on it. This costs about \$5.

Some monitors are really bare bones when it comes to controls. This article is being written using a high-resolution R-G-B monitor from Princeton Graphic Systems, and it has an extraordinarily Spartan set of controls. On the front are two knobs labeled PULL-ON and BRIGHT. That's it. Others, such as the Zenith hi-res color monitor, have enough controls and knobs to operate a Space Shuttle.

Many of the names in the monitor business are unfamiliar. Others carry the well-known brand names of TV sets. Most TV manufacturers, in fact, have some kind of monitor for sale or are getting them ready for the market.

Options

There are also the component television systems—separate monitor, separate tuner, separate sound system—put together the way a component stereo system is hooked up. And some so-called monitor-quality TV receivers have a separate jack field in the back so you can bypass the tuning section and use just the video. This is especially good for watching videotapes and discs, but isn't all that great for computer use. The reasons: Screen size is usually much too big and chances are you'd want to keep the unit where you do your TV viewing—possibly not the same place you use your computer.

Screen size, by the way, doesn't follow the rule that more is better. The best screen size for a monitor for close-in work is 12 inches diagonal measure, whether it's monochrome or color. This is because most computing is done with your eyes approximately 18 to 20 inches from the screen. If you plan to use the monitor for a lot of game play, then 13 inches is an ideal size. If you think that one inch doesn't make much difference, please take our word for it.

There are a couple of other things to look for in monochrome monitors. We don't call them black-and-white any more (white text on a black background). A screen with green phosphor (green letters on a black background) is popular because it's very legible and causes less eyestrain. Amber screens are also gaining in popularity, and are just about the only kind you can buy in Europe.

Some monitors have a window-screen-like mesh attached to the front. This is an antiglare shield, and it's very effective in eliminating annoying reflections. It's available on both monochrome and color monitors, or can be added later. The one problem with antiglare shields: They're hard to clean.

Some of the newer models have an antiglare mask right behind the screen's faceplate.

How much?

What should you spend on a monitor? Monochrome models range from \$99 to about \$250, and color models retail from \$300 to \$700. If you prefer, you can spend thousands of dollars on a color monitor for special scientific uses, but it's not likely that you'll find such units in your department or computer store. Here's a rundown of some of the more popular monitors you'll find in the stores.

Amdek Color-I Plus—This is probably the biggest-selling color monitor on the market because it will run with just about anything that calls itself a computer. Color-I has no sound. Color-I Plus has an audio channel and speaker and sells for about \$300. While Amdek is replacing this and all of its other color units with its new line of color monitors, you'll find this best-buy on dealers' shelves for a while.

Commodore C-1701—This is a runaway best-seller in stores that handle the Commodore line, but it's often out of stock. It will operate from any computer's composite output, and for the money, the picture quality is generally better than a lot of its rivals. While the list price is \$300, it's frequently packaged as part of discounted all-Commodore systems.

Princeton Graphic Systems HX-12—An enormously popular hi-res R-G-B set for the IBM PC and its clones, you'll see it in lots of computer advertising photos. At \$695, it's priced about the same as other R-G-B sets. Operation is almost too simple. The only accessible controls are ON/OFF and BRIGHTNESS. This kind of ties your hands, but the colors and resolution were excellent in all our tests.

Sakata SC-100—A price leader item for under \$300 in many discount specialty stores, this color monitor is rapidly approaching the Amdek in sales in some areas. The reason is the price, and picture quality that's as good as others in its price range.

Zenith ZVM-133 and ZVM-122—Top-selling monochrome monitors for text work, the two models have green and amber screens at retail prices of \$149 and \$169. Zenith's ZVM-135 at \$599 is a real all-purpose workhorse of a high-res color monitor. It also has a green-screen switch which lets you view text in green on black background, but this feature doesn't add an awful lot of clarity to the text. We like the straight white-on-black better for this kind of work.

FM

FORD'S FOREIGN POWER PLAY

(Continued from page 97)

German lineage will make it all the more desirable to buyers in that league. There are some rough edges to be smoothed, certainly, but this is the most undiluted European import for sale in the American market right now.

The rest of the 1985 story at Ford Motor Co. is about refinement. New cars are few, and changes to carry-over models are limited to new fascias, taillights and some instrument cluster modifications. There are, however, a few nuggets of gold among the routine changes this fall.

Escort/Lynx and EXP continue virtually unchanged from '85. Reverse gear has been moved from the next-to-first position and placed to the right of the third-fourth slot on the four-speed manual, below the fifth position on the five-speed. Lynx drops its five-door, LTS, RS and Turbo RS models.

The Mustang Turbo GT (the 145-hp version) is dropped, too. Five-liter Mustang GTs get different gear ratios, and transmissions are improved in shifting effort and throw distance. Mustang GTs also receive an SVO-inspired front fascia and integral air dam, and standard P225/60VR15 unidirectional Eagle GT tires with the gatorback tread design. SVO models get 16-inch, 50-series gatorbacks.

Higher performance

The Tempo/Topaz models are upgraded with a higher performance 2.3-liter Four. This fuel-injected high swirl combustion powerplant has a new cylinder head, freer breathing and a 3.73 final drive for a tangible increase in the fun factor. We drove it, and we like it a lot. The GLX model gets a sport instrument cluster, and standard equipment now includes power steering, tilt wheel and a 15.2-gallon fuel tank (up from 14).

Ford's LTD LX is a top-performing four-door family sedan. Standard power train is Ford's HO 5.0-liter EFI V8 with four-speed automatic overdrive and 3.27 Traction-Lok rear axle.

Mark VII buyers will have the option to select an infrared-actuated, touch-screen, CRT control panel to tune the radio and adjust the interior heating/ventilation systems. Known as the Comtech system, this futuristic device will first show up in a test run of 50 cars, then be generally available after the first of the year. Reported tab will be near \$3,000, so start saving.

LSC models get articulated, six-way power sport seats to ride out the power of an uprated 5.0-liter V8 with tubular headers and dual exhaust, a new aluminum intake manifold and higher flow rate throttle body. **PM**

Get on the right track.

Get your new career growing with the Number 1 training program.

Changing careers takes more than courage. It takes training. And at CENTURY 21® offices we offer the most comprehensive training in the industry. It's the CENTURY 21 CareerTrak™ Program. Whether you want to specialize in commercial, residential or investment properties, CareerTrak

training can help make a new career in real estate a success. And it's only from Number 1.

Call the CENTURY 21 career hotline, 1-800-228-2112. In Nebraska, 1-800-642-8788. In Alaska and Hawaii, 1-800-862-1100. Or visit the CENTURY 21 office nearest you.



Put Number 1 to work for you.™

© 1984 Century 21 Real Estate Corporation as trustee for the NAE.

® and TM—trademarks of Century 21 Real Estate Corporation.

Equal Opportunity Employer.

EACH OFFICE IS INDEPENDENTLY OWNED AND OPERATED.

THE FIRST STEP IN INSTALLING A DUVINAGE SPIRAL STAIR KIT: SEND FOR OUR FREE BROCHURE.

DUVINAGE



FREE

Find out how easy and economical it is to install the best spiral stair kit. Mail the coupon today. Duvinage, Box 828, Hagerstown, Md. 21741.

Name _____

Address _____

City _____ State _____

Zip _____ Phone (____) _____

area code

PM1084

FREE



CATALOG

Earn extra income! Make beautiful gifts! Enjoy a fun and rewarding hobby!
Our free 68 page catalog contains hundreds of items all at the lowest prices ever! We offer a wide range of quality products including:

- Clockmaking and repair components
- Furniture and clock kits • Music movements
- Wood toy parts and plans • Lamp parts
- Forstner cutting bits • Unique finished clocks and much, much more!



TOLL-FREE
1-800-KLOCKIT

(in Wisconsin call 414-248-1150)



DEPT. PM104 P.O. BOX 542
LAKE GENEVA, WI 53147

NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

CALL TOLL-FREE... Today!

UNDER THE HOOD: FORD

(Continued from page 98)

for each front wheel, it only serves the front disc brakes. Hydraulic pressure for the single rear brake line comes off the hydraulic booster.

When deceleration reaches a certain level (at least 1.4 Gs), the computers go to work. If they find a wheel slowing down significantly more than the others, they first close the normally open solenoid valve to that wheel, trapping whatever hydraulic pressure is in the lines, but preventing further pressure. If the wheel now starts to pick up speed, or if the others slow down to its speed, the solenoid valve opens again and normal braking is restored.

If the speeds don't equalize, the computers open the normally closed solenoid valve, bleeding off hydraulic pressure in the line. The computers can pulse the solenoids as required—four to 10 times per second—to keep a wheel from locking up.

You feel nothing in normal braking, but if you mash the brakes on a wet surface, inducing lockup, you can feel the pulsating hydraulic pressure in the system through the pedal. You realize the wheels aren't skidding because you can still steer the car.

A fail-safe system isn't just a lawyer's demand—it's good engineering practice. Both computers monitor all the wiring and sensors continuously, and check the solenoid valves instantaneously without operating them. The computers, which share the same housing, even check up on each other. If they find something wrong, they turn on a dashboard warning light and bypass the antilock system.

When the antilock system is out of service, there's still normal power-assisted braking. The only exception is if the electric pump circuit fails. In that case, you not only lose the power assist but, because of the configuration of the system (with the master cylinder feeding only the front brakes), after you exhaust the accumulator, you lose the rear brakes as well. Of course, if the master cylinder goes, you could still have rear brakes, which would be a plus.

Some 15 years ago, Ford installed a vacuum-operated antilock system on some rear brakes. Several years later, Ford tried a hydraulic system. These primitive systems didn't catch on, but the idea was revived when precise electronic controls became available.

Two-speed accessory drive

The 1985 "gas guzzler" tax has brought some creative engineering to Ford's high-output four-barrel 302 V8. To get this engine up to 21 mpg, and avoid a huge per-car tax, Ford not only

installed roller tappets (like Chrysler) but a two-speed accessory drive system. During normal operation (above 900 rpm, coolant temperature under 236° F, and blower on the lower speeds), all belt-driven accessories except the air pump run at half speed, reducing the loads on the engine.

The two-speed setup features two pulleys on the end of the crankshaft. The small inner pulley is half the diameter of the outer one and rides on a one-way clutch. A multigroove serpentine belt wraps around this inner pulley and all the accessories including the air pump, which also has two pulleys and an electromagnetic clutch much like that used to engage an air-conditioning compressor.

A second belt wraps around the large outer crankshaft pulley and the outer pulley of the air pump. When the crankshaft turns, the large outer crank pulley drives the outer pulley of the air pump at full speed.

Simultaneously, the smaller inner pulley drives all the other accessories at half speed. Although its serpentine belt goes around the inner pulley on the air pump, this inner pulley merely free-wheels like an idler pulley.

When engine speed drops below 900 rpm, the engine runs hot or blower speed goes up (indicating heater or air conditioning usage) and the engine computer engages the electromagnetic clutch.

Now the two air pump pulleys are locked together. The large outer crank pulley drives both air pump pulleys at full speed. The inner air pump pulley turns the serpentine and all the accessories at full speed, too. At the crankshaft, the one-way clutch now permits the small inner pulley to freewheel, turning faster than the crank.

This complex system boosts economy by only 0.4 mpg, the same as the roller tappets. Installing so much expensive equipment for a total of 0.8 mpg seems like overkill, but all the easy mileage boosters have already been used.

TV screen

A 3 × 6-in. television picture tube, part of a \$3,000 option, will be installed in the dashboards of some 1985½ Lincoln Continentals after a 50-car trial run this fall (see *Ford's Foreign Power Play*, page 96). Ford will be on the heels of Buick, which will have the boob tube out a bit earlier.

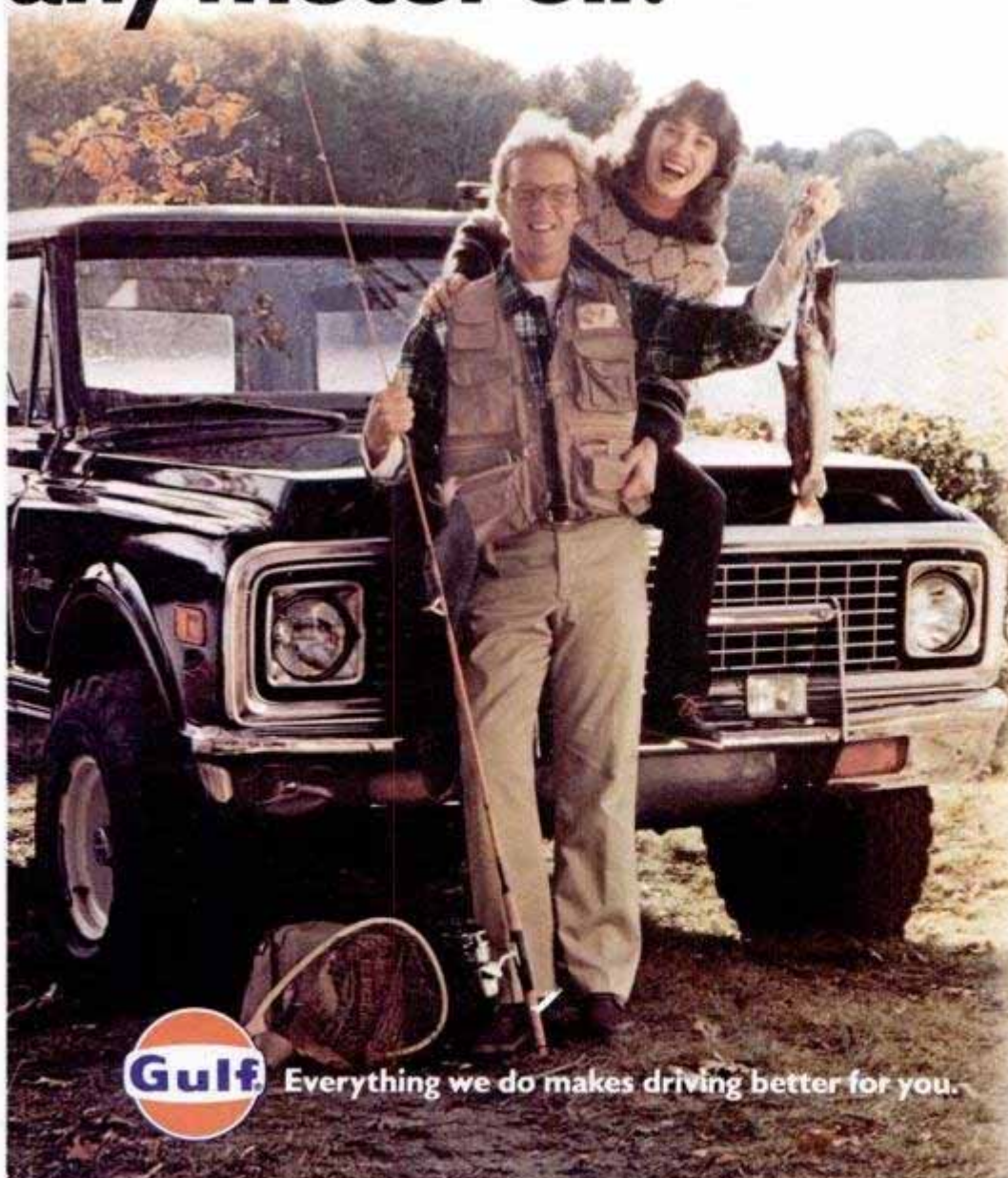
You won't be able to watch *Dynasty* or *Hill Street Blues*, but you'll be able to call up information from a 64K microprocessor, equal in capacity to the typical personal computer. Just press a button to pick the information you want, such as the car's maintenance schedule, a calendar (any year between 1905 and

(Please turn to page 138)

In '72, I drove this car to Lauderdale for Spring Break.

The girl I caught staring at it married me the next year.

Do you think I'd use just any motor oil?



A '72 Blazer, raised on Gulfpride.[®]

To this day, my wife swears she married me for it. So you could say I have a stake in keeping it running right.

Which is why there was Gulfpride in the crankcase back then. And why it's still there now.

Of course, after 12 years, you can bet this car has had its share of dents and dings. What 4x4 hasn't? But for all the rough road work I've put it through, the engine still purrs like a kitten.

So I'll keep changing the oil every couple of months. And I'll keep right on using Gulfpride.

After all, my wife says she'd leave me if it weren't for this car.

I know she's kidding. But still, I'm not taking any chances.



WHEN IT'S A MATTER OF PRIDE.

Get a \$2.00 rebate when you buy 5 quarts of any grade of Gulfpride oil. For details, look for Gulfpride displays at participating retailers.

 Everything we do makes driving better for you.

Better than Jogging, Swimming, or Cycling...



NordicTrack

Jarless Total Body
Aerobic Exerciser
Duplicates X-C Skiing for the
Best way to Fitness

Cross-country skiing is often cited by physiologists as the most perfect form of cardiovascular exercise for both men and women. Its smooth, fluid, total body motion uniformly exercises more muscles so higher heart rates seem easier to attain than when jogging or cycling. NordicTrack closely simulates the pleasant X-C skiing motion and provides the same cardiovascular endurance-building benefits—right in the convenience of your home, year 'round. Eliminates the usual barriers of time, weather, chance of injury, etc. Also highly effective for weight control.

More Complete Than Running

NordicTrack gives you a more complete work out—conditions both upper body and lower body muscles at the same time. Fluid, jarless motion does not cause joint or back problems.

More Effective Than Exercise Bikes

NordicTrack's stand-up skiing motion more uni-

formly exercises the large leg muscles and also adds important upper body exercise. Higher pulse rates, necessary for building fitness, seem easier to attain because the work is shared by more muscle mass.

Even Better Than Swimming

NordicTracks have been in production since 1976. NordicTrack is quiet, motorless and has separately adjustable arm and leg resistances. We manufacture and sell direct. Two year warranty. 30 day trial period with return privilege.

A Proven, High Quality Durable Product

NordicTrack is in its 7th year of production. NordicTrack is quiet, motorless and has separately adjustable arm and leg resistances. We manufacture and sell direct. Two year warranty. 30 day trial period with return privilege.

Folds and stands on end to require only 15" x 17" storage space.

Call or write for...

FREE BROCHURE

Toll Free 1-800-328-5888

Minnesota 612-448-6987

PSI, 124PM Columbia Court, Chaska, MN 55318



UNDER THE HOOD: FORD

(Continued from page 136)

2050), trip computations and air-conditioning temperature selections.

You operate the computer by touching boxes on the screen. You don't have to actually touch the picture tube since an infrared beam just forward of the screen picks up your finger position, basically the way the Hewlett-Packard personal computer works.

Although the initial uses of the computer and tube are limited, there is future potential, such as tying in to a future satellite navigation system, and using the cassette tape player to hold computer programs.

Air bags

The U.S. government is ordering 50,000 Tempos with a driver-only air bag in the steering wheel, much like the Mercedes-Benz type. So Ford will make it standard for the Feds and offer it to fleets. But it's not even available as an option for the public—yet.

Any of four crash sensors (one on the radiator support, one in each of the front side members and a fourth on the cowl) can deploy the system. They're calibrated to discriminate between minor impacts and the serious stuff.

Like the antilock brakes, the air bags rely on an on-board computer that constantly monitors the entire system. If it detects a fault, it disarms the air bag so it can't deploy, and turns on a dashboard light when the driver switches on the ignition. The light flashes a certain number of times (or glows steadily) to pinpoint the fault.

The Merkur

The Merkur that Ford is importing from Germany has the high-tech Euro-look, but its powertrain is basically Thunderbird—a 2.3-liter turbo Four. In the Merkur, this engine gets a water-cooled center bearing on the turbo-charger. There's no intercooler radiator in this turbo installation, but one cast-aluminum section of the pressure-side plumbing has built-in cooling fans. Reportedly, this feature is included to allow future racers to use real intercoolers while still living up to the spirit of "factory-equipped" trim.

The engine mounts are a neat European design that combines rubber for fore-aft and side-to-side control and a fluid-filled diaphragm chamber with calibrated orifices for vertical control. The mounts control engine vibration so well that at idle you feel nothing from the steering wheel. You have to put your hand on the transmission shift lever to realize that the vibration really isn't gone, just well-damped. A simpler version of this mount also will go into the T-Bird.

PM

GIANT SCREEN TV

SAVE \$45. NOW ONLY \$59.95
\$104.95 VALUE

Includes DUAL LENS - tube mounted and CABINET PLANS



BUILD YOUR OWN...
with our 8" tube mounted DUAL LENS SYSTEM!

Quality lens—don't confuse with cheap single lens units.

FREE! Easy to follow design plans for cabinet (\$15.00 value) included FREE with order for 8" DUAL LENS SYSTEM.

Enjoy a larger-than-life quality picture using 12" to 15" TV

Easy to construct, build this 5-foot BIG SCREEN TV with less than \$100 worth of particle board, screws, corner braces, etc. Finish as you like—laminare, paint, varnish or antique.

- Save \$2,000 or more! Equals \$2,000 to \$3,000 systems.
- Satisfaction Guaranteed

Send \$59.95 plus \$3.00 shipping & handling
R.E. MYERS, INC. — TV Proj. Div., Dept. PM104
4940-73rd Ave. No., Pinellas Park, FL 33565

1(813)546-5129

MC or VISA orders accepted

MOLDS

for making
Ornamental Concrete
Items...

Book about Aluminum Molds with prices and production trade secrets direct from world's largest mold manufacturer.



SEND \$5.00

CONCRETE MACHINERY COMPANY, INC.

P. O. BOX 499 - HICKORY, N. C. 28601

Low-cost logsplitter kit splits 24" logs with a 10-ton punch!

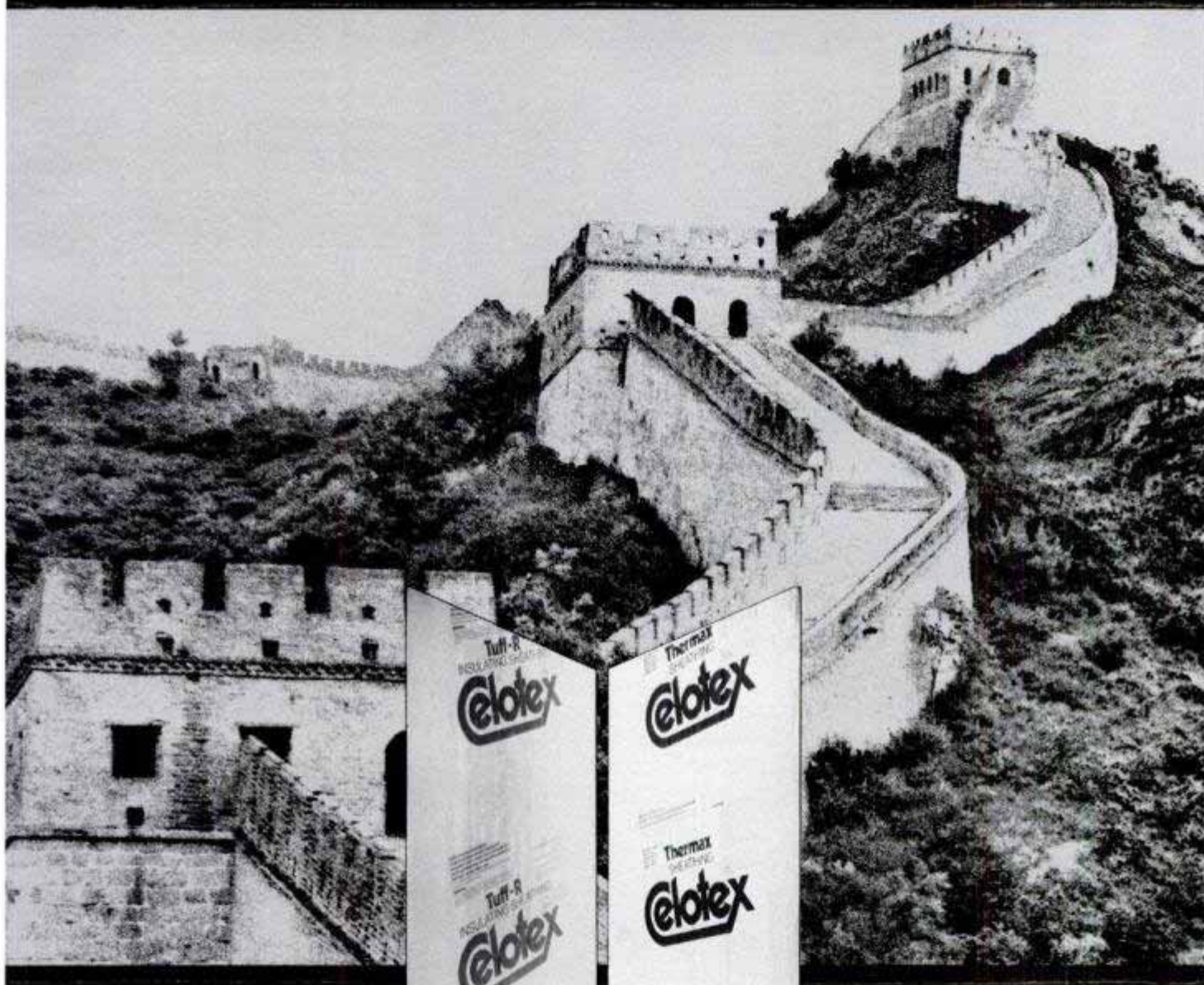


• HEALD WOODHOG splits 2' log every 28 seconds... every 14 seconds with two-stage pump. • Hydraulic cylinder packs powerful 10-ton punch. • Solid construction. • You bolt kit together at BIG labor cost savings. ALL PARTS and ACCESSORIES available separately. FREE color brochure - complete details on haulers, other semi-kits. Call TOLL FREE 1-800-253-1030 (in Michigan call 616/849-3400)

Carl Heald, Inc.

Dept. N99, P.O. Box 1148, Benton Harbor, MI 49022

THERE ARE TWO WAYS TO MAKE A WALL GREAT. CELOTEX® FOAM INSULATING SHEATHING IS THE OTHER.



The walls of your new home may look impressive on the outside, but it's how they're constructed *inside* that really helps them withstand the test of time.

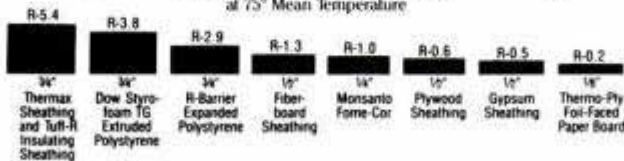
That's why it's so important to insist on Thermax® Sheathing or Tuff-R™ Insulating Sheathing when you build your new home.

Inch for inch, no other insulating sheathing gives you greater energy efficiency than Thermax or Tuff-R. And, like all architectural marvels, these superior foam sheathings are



engineered to last. (See Celotex literature on Thermax and Tuff-R for product details, recommended uses, application instructions and warnings.)

Next time, make sure your walls are built with Thermax or Tuff-R Insulating Sheathing. When it comes to energy efficiency, we're miles ahead.



Celotex

BUILDING PRODUCTS DIVISION
THE CELOTEX CORPORATION
POST OFFICE BOX 22602
TAMPA, FLORIDA 33622

a Jim Walter company

CELOTEX FOAM INSULATING SHEATHING. ONE OF THE SMALL WONDERS OF THE WORLD.

*SOURCE: ASHRAE Handbook 1981 Fundamentals and manufacturers published product literature. Forre-Cor — Reg. trademark of Monsanto Co. • Styrofoam — Reg. trademark of Dow Chemical Corp. • R-Barrier — Trademark of W. R. Grace & Co. • Thermo-Ply — Reg. trademark of Simplex Industries. *The higher the R-value, the greater the insulating power. Ask your seller for the fact sheet on R-values.



SAVE THIS AD TO SHOW FUTURE GENERATIONS HOW WE USED TO GLUE.

Once upon a time, gluing meant getting into a sticky situation. It meant messy mixing. Inhaling unhealthy fumes. Clamping. And very often waiting hours at a time for the glue to dry.

Thermogrip® brand Hot Glue Guns put an end to the days when gluing was a bother. They apply glue hot and neat. They give off no unpleasant odor. The glue dries in just one minute. And you never have to worry about mixing or clamping or waiting, again.

You can use Thermogrip brand Hot Glue Guns on almost anything—wood, paper, tile, cloth... almost any porous material. Whatever the job, from hobby projects to caulking to construction, there's a Thermogrip brand Hot Glue Gun and a Thermogrip brand Adhesive to do it.

Save yourself the bother other adhesives can cause you. With Thermogrip. And remember to save this ad. It may soon be the only reminder we have left of the way we used to glue.

Bostik
CONSUMER DIVISION
Reading, PA 19605 **EMHART**



AMC'S SUNNY SIDE

(Continued from page 99)

front air dam, dual-outlet exhaust and a special handling suspension which includes gas-pressurized shocks and struts.

Renault news

The Renault half of the partnership continues to offer the 18i Sportwagon and two Fuego models, the 1.6-liter turbocharged Four and the 2.2-liter normally aspirated Four that was introduced several months ago. The real Renault news this year is the inter-cooled aluminum 2.1-liter turbodiesel Four that the French are supplying for the Cherokees.

The oil-burner is expected to deliver 28 mpg, and produces 85 hp at 3,750 rpm with 132 lb.-ft. of torque at 2,750 rpm. The air is forced in by a Garrett T-2 turbo with integral wastegate. Fuel is monitored by a water separator, integral with a fuel-line filter and heater. A battery blanket and block heater for cold-weather operation are options.

The turbodiesel has quite the feel of AMC's own 2.5-liter gasoline Four. We found driving the turbocharged Cherokee less satisfying than we'd anticipated, though. The turbo power comes on smoothly and without the hard charge of some installations, but power is still lacking despite the addition of an air-to-air intercooler. The GM-supplied V6 is still the way to go for economy-be-damned power.

A five-speed manual transmission is standard with the turbodiesel, and that's truly the only way to buy the new engine. The automatic-transmission version is extremely slow, taking several seconds to spool up to boost from a standing start.

Other Cherokee improvements are minimal—it's pretty tough to improve a vehicle that's had such a successful first year. AMC sold 30,000 more Cherokees than it thought it would even build.

Those changes include a Laredo trim package for two- and four-door models, addition of the Systems Sentry fluid-monitoring device to the Cherokee line (the device was introduced last year on Alliance/Encore) and the wing-back rocker/recliner seats from those cars. Systems Sentry is not available on Cherokees with turbo, 3.31 axle ratio or limited-slip differential, however, because those items aren't tooled for sensor installation to monitor their fluid levels. Cherokees also get Alliance/Encore's infrared remote control door lock/unlock system.

AMC also will add "shift-on-the-fly" capability to the Selec-Trac full-time four-wheel-drive system, previously only available on the part-time Command-Trac version.

PM

AMERICA'S CIGAR

**Dutch Masters.
The best-selling
cigar in America.**

There are two reasons more people spend more money on one brand of cigars than on any other—taste and quality. Taste and quality that come from fine tobaccos blended by craftsmen who care. So when you step up to Dutch Masters, you're in lots of good company. The smokers who have made Dutch Masters "America's Cigar."



**There really are Masters
at Dutch Masters.**

**FOR
INSULATION**



**FOR
CEILING
TILE
OR
1001**



**DO-IT-YOURSELF HOME
FIX-IT FASTENING JOBS**

**THERE IS NO BETTER TOOL
THAN THE**

ARROW

**T-50
STAPLE
GUN**



**SHOOTS A STAPLE WHEREVER YOU'D
DRIVE A NAIL! FASTER! CHEAPER! BETTER!**

Made in
America
to the
Highest
Standards
of Quality
and
Excellence.

SEND FOR
FREE HOW-TO
BROCHURE
containing
application tips
and money-saving
ideas for home
fix-it fastening
uses of heavy-
duty staple gun.



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

ARROW FASTENER COMPANY, INC.

271 Mayhill Street, Saddle Brook, N. J. 07662

In Canada: 6505 Metropolitan Blvd. East, Montreal H1P 1X9 Quebec

UNDERHOOD: AMC/RENAULT

(Continued from page 100)

block and cylinder head fluid passages contributes to superior lubricant and coolant flow and performance, key factors in longevity, Hittler says. Engine cooling, he adds, is close to a wet-sleeve engine, which is normally far better in this area.

The cooling system is fully pressurized, including the overflow reservoir, which is exposed to atmospheric pressure in a standard system. This keeps oxygen out of the coolant, reducing corrosion in the aluminum cylinder head.

The cooling system setup also is used on the 1.4-liter engine, which continues as the standard powerplant. The 1.4 also has received some other cooling system improvements, which it needed badly because the water pump is located at the top of the engine. The top location means that a neglected coolant leak can allow the fluid level to drop below the pump, almost stopping circulation in the system. The result: The engine will overheat and may even blow a head gasket.

So, for 1985, AMC has redesigned the system to eliminate nine connections, resulting in fewer potential leak points, and improved clamping of the 17 remaining connections.

The Jeep line also gets a significant powertrain change—a 2.1-liter Renault turbodiesel rated at 85 horses at just 3,750 rpm, and peak torque of 132 lb.-ft. at 2,750 rpm. The torque curve is almost flat, even through 4,200 rpm, so the engine is very flexible.

The turbodiesel is a mix of high-tech and old-fashioned ideas that die hard. The head and block are both aluminum, rare for a diesel.

The engine, an overhead-camshaft design, uses the Garrett AiResearch T-2 turbo, a lightweight version that reduces low-end lag. The turbo also has an air-to-air intercooler, a heat exchanger that uses outside air to cool down intake air after it has been compressed. Cooling down the compressed air increases its density so, in effect, more air flows into the cylinders for better performance. The '84 Mustang SVO engine was the first American intercooled turbo.

In addition to a conventional wastegate, the turbodiesel is protected according to coolant temperature by a thermal valve in a coolant hose. Turbo boost pressure normally flows from the intake manifold through the thermal valve and to the injection pump, where it moves a metering valve to increase fuel flow with turbo boost.

When coolant temperature in the hose hits about 235° F., the thermal valve closes the boost line and vents the line to the injection pump. This cuts fuel flow, slowing the turbo process to protect the engine. Yet, this same engine has solid valve lifters with screw-locknut adjusters on the rocker arms. Renault still doesn't accept hydraulic lifters because of the higher rate of oil contamination with the diesel.

AMC's full-time four-wheel-drive system on Eagle and Jeep gets a significant change for '85—shifting on the fly between 2wd and 4wd, previously available only on part-time 4wd systems. The change didn't cost AMC a cent. In fact, AMC saved money in the process because the capability was there all along.

Previously, AMC had a disconnect at the front axle, where a dog clutch joined or separated halves of the right axle shaft. With the dog clutch off, the front differential was motionless in 2wd, which improved fuel economy by about 0.5 mpg. However, because of the dog clutch, the vehicle had to be stopped to shift between 2wd and 4wd.

AMC decided that with stable fuel supplies it could just eliminate the dog clutch, and the complex vacuum diaphragm unit that activated it. The front axle now turns all the time, and hang the lost 0.5 mpg.

PM

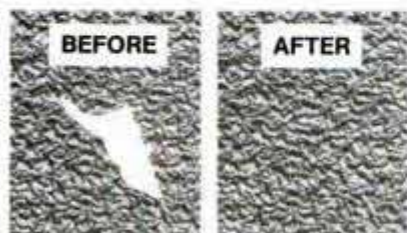
It's hard to find another trade that can PAY SUCH HIGH HOURLY RATES



UP TO **\$20 TO \$30** PER HOUR

DOING PROFESSIONAL
VINYL REPAIR

You get paid for a pleased customer rather than for a fixed hourly rate



**ONE DAY SERVICE
CASH-ON-THE-LINE**

You can start this business of your own within a few days of receiving your VIP kit...start making money on a cash basis even before you have paid for your equipment and materials. No need to maintain a shop or excessive inventory. We can quickly supply your additional material needs so you can render an uninterrupted service. Business is so easy to get—you'll find most prospects asking "where have you been" with this wonderful money saving service.

This is a unique business where the customers compare how much you'll save them repairing their damaged vinyl to the high expense of having the furniture re-upholstered. Professional vinyl repair is easy to do and requires no back-breaking drudgery or large capital investment.

BIG DEMAND FOR REPAIRS

Walk into any restaurant, motel or doctor's office and the chances are you'll see a few torn or damaged chairs or booths. Many have cigarette burns. Chances are good, too, you'll see them temporarily "repaired" with masking tape, because the owner knew of no way to repair them. But, you as a VIP Vinyl Repair Specialist, could repair the damaged piece, right-on-the-spot...and be paid right-on-the-spot.

WE HELP YOU ALL THE WAY

Complete training manuals, help you get started. Circulars, business cards, yellow page ads and promotion help is part of our no-extra-cost service to you. We can put you *in business* and help you *stay in* and make it profitable.

EVERYTHING YOU NEED TO START YOUR OWN BUSINESS WITHIN A FEW DAYS!

Vinyl repair is easy to master. Just a few days practice and you can be ready to tackle your first money making job. You'll find enough equipment and materials in your VIP kit to last a long time. Then you can reorder just those items or colors you use most often.

**FREE
DETAILS
BY MAIL...
NO SALESMAN
WILL EVER
CALL!**

VINYL INDUSTRIAL
PRODUCTS®
2021 Montrose Ave.
Dept. 1810
Chicago, IL 60618

V131T



**CAR INTERIORS
AND VINYL TOPS
\$10 to \$25**

**FURNITURE AND
CAR DEALERS
BECOME REGULAR
CUSTOMERS**

**BEAUTY SHOPS
RESTAURANTS
AND CLUB JOBS
PAY \$100 to \$400**



STEADY WORK FOR 20 CAR DEALERS

"20 car dealers give me all their repair work. I call on two or three every day, take care of what's needed."

R. Lanning, Ky.

CHARGES \$30 PER HOUR!

I charge \$30 per hour for my work, and I'm averaging earnings of \$700 per month, working only part-time. In three hours I re-colored an auto interior, and got paid \$95. I'm hoping to expand this business, and drop my other lines of work.

John Boswell, Calif.



Mail the Coupon Below or Phone

Toll Free: **1-800-621-0660**

VIP VINYL INDUSTRIAL PRODUCTS®
2021 Montrose Ave., Dept. 1810
Chicago, IL 60618

PLEASE RUSH BY MAIL FREE FACTS about VIP Vinyl Repair and how I can start making money in a few days. No salesman is to call. I am under no obligation.

Print Name _____
Print Address _____
Print City/State/Zip _____

FREE

 COLOR CATALOG

Build Your Own Grandfather Clock Prices Starting Under

\$300

(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

Write for **FREE** information



EMPEROR CLOCK COMPANY

WORLD'S LARGEST MANUFACTURER
OF GRANDFATHER CLOCKS

Dept. 1318 Emperor Industrial Park
Fairhope, Alabama 36532 • Phone 1-205-928-2316

I am interested in (please print) Do-It-Yourself Kits Finished Clocks

Name _____

Street _____

City _____

State _____ Zip _____

PSSSSSSST!!!

The Most Affordable Helicopter in the World!



The Dream of owning your own personal whirlybird with the speed and style of a corporate helicopter (but not the expense) is here! The Exec is a 20-year evolution in design. Everything RotorWay ever dreamed of producing in a light helicopter can be yours for much less than you would expect. **Take the First Step**—Order our beautifully illustrated information package and exciting full color brochure to evaluate the all new **RotorWay Exec**. Included is a step-by-step description of the RotorWay program three-view drawings, a colorful 24" x 36" poster size view of all major components, autorotational information, pricing details and a special offer, plus a separate testimonial brochure that doubles as a unique wall poster.

Credit Card Customers, Call Toll Free NOW!!!

U.S. (800) 824-7888, opr. 169
Alaska and Hawaii (800) 824-7919, opr. 169
Charge to Mastercard, VISA, Am. Ex.

Expiration Date: _____

Signature: _____

Exec Information \$12.00 (\$25.00 overseas)

Name _____

Bus./Occup. _____

Address _____

City _____ State _____ Zip _____

ROTORWAY AIRCRAFT, INC. 4PM10

7411 W. Galveston, Dept 4PM10, Chandler, AZ 85224

UNDER THE HOOD: CHRYSLER

(Continued from page 101)

to the carb. The 2.2 carburetor system also gets some onboard computer diagnostics to make troubleshooting easier. You can't get the trouble codes from a pulsing light on the dashboard, as on fuel-injected Chrysler products and other makes, but a mechanic can pull them out with a special digital readout instrument.

Chrysler has eliminated voltage regulators as part of a redesign of the charging system on fuel-injected four-cylinders. The regulator functions are now shared by circuits in the two engine computer modules. Chrysler claims the design is bulletproof—even if you hot-wire or ground a charging system terminal, you won't blow computer circuits. This was a must, for one of the side effects of putting the regulator function into the computer is that voltage regulation is now covered by the same five-year or 50,000-mile warranty as the computer, not the 12-month/12,000-mile charging system warranty.

The new alternator is also unique. If it suffers a routine failure—brushes or the diode trio—you don't need to replace the alternator, just remove a plastic cover from the back and unscrew the brush holder or diode trio.

Increasing mpg

In 1985, a gas guzzler law says any models that don't deliver at least 21 mpg will be hit with a huge tax. So, some heavy engineering effort was expended to juice up the 318-cu.-in. V8's mileage. The combustion chambers were redesigned so they wrap around the valves to form a shroud, which causes the incoming fuel mixture to swirl rapidly. This is called a fast-burn design and it reduces the octane requirement of the engine. Chrysler was then able to raise the compression ratio from 8.4:1 to 9.0:1, to improve mileage. These modifications, which include new pistons, also increase horsepower from 130 to 140 and torque from 235 to 265 lb.-ft. The 318 also gets roller tappets for reduced engine friction, another mileage improver.

To make sure it would go over the 21 mpg hump, Chrysler picked up a technique from GM: the use of 5W-30 oil. This oil, which is sold only in the snowbelt to help winter starting, is lighter than 10W-40, so it also reduces engine friction enough to improve mileage by 0.2 mpg. It doesn't make sense to use such a lightweight oil in the real world (except for harsh winters) and although the car manufacturers officially have to recommend it, their engineers would really rather you didn't look too hard for it.

PM

OWN A LEGEND

K A - B A R

Depended on by outdoorsmen since 1898, Ka-bar knives were a natural choice of the U.S. Marines, who relied on and fought with them in World War II.

But legends aren't created overnight. It takes an exacting piece of workmanship to become a legend. Plus a proud record of quality and performance.

And today, Ka-bar is a leader in new design development. Our knives feature fine honed stainless and carbon steel blades combined with handsome functionally designed handles. Ka-bar knives are built to last — and we back that promise with a lifetime warranty.

Ka-bar. Our experience has made us a legend.

KA-BAR®

by

COLE



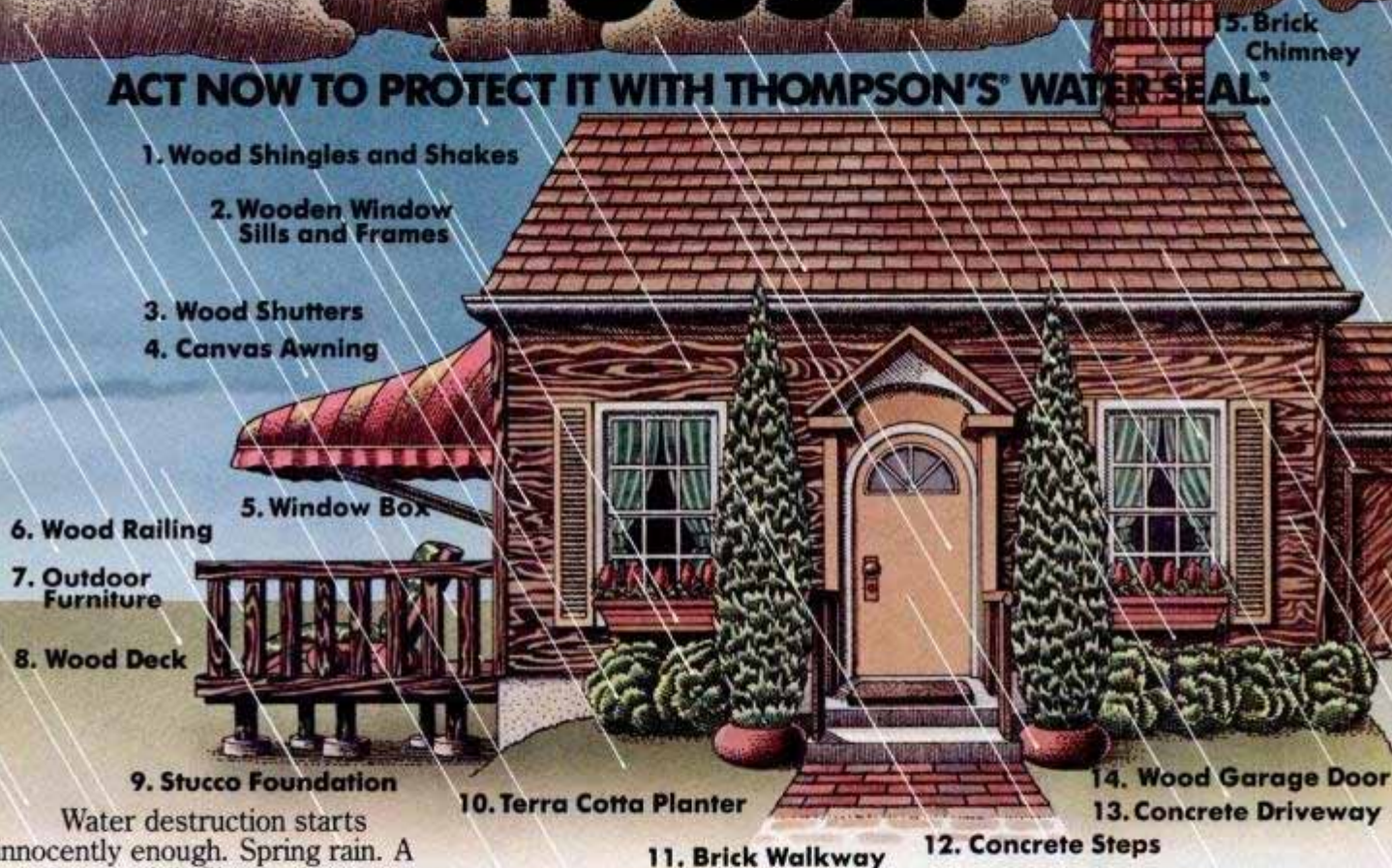
FREE SHARPENING STONE

Purchase any Ka-bar knife and get a free sharpening stone complete with leather case. Simply pick up a coupon at your Ka-bar dealer, or send the end flap with model number from your Ka-bar knife box along with your register receipt and your name and address to:

KA-BAR STONE OFFER
P.O. BOX 6983
CLEVELAND, OHIO
44101

15 PLACES WATER CAN BE SILENTLY DESTROYING YOUR HOUSE.

ACT NOW TO PROTECT IT WITH THOMPSON'S WATER SEAL.



Water destruction starts innocently enough. Spring rain. A gentle snowfall. Slowly the water creeps...drip...drip. And seeps...drip...drip. Penetrating into tiny airpockets and crevices. Until shingles warp. Concrete walls crack and chip. Even

the very foundation of your home can begin to crumble.

That's why more and more people are protecting their homes with Thompson's Water Seal waterproofing formula. Apply Thompson's to brick, wood, or concrete. It penetrates to form a protective shield. Watch how water just beads up and rolls right off. And where water can't get through, it can't do any costly damage.



For years architects and construction engineers have used Thompson's to waterproof wood, brick,

and concrete on multi-million dollar projects. It's always been an effective way to protect their investments. And now it can protect your investment.

But you don't have to be an expert to use Thompson's. It easily brushes, rolls, or sprays on. And it dries clear, so it never changes the color of what's underneath. Protect your home with Thompson's Water Seal.

Because where water can't penetrate, it can't devastate.

Thompson's Water Seal is available at better paint, hardware, home and building centers.



OCTOBER IS NATIONAL WATERPROOFING MONTH.

Материал, защищенный авторским правом

The Dillon's better! We can prove it!
EVEN welds Unibody!

SAVES GAS



PISTOL-GRIP Swiss welding and cutting torch makes all repairs easier—regardless of your welding experience! **Tests prove** this award-winning new handpiece easily welds or cuts aluminum, stainless steel, cast iron and **even unibody** high-strength steels! Burns with a deoxidizing flame and low gas speed. Unique mixing chambers and precision brass tips offer a more concentrated flame for greater precision, ease and savings. Uses 60.5% less oxygen and 53.5% less acetylene! Dillon's flame also protects the weld puddle and **reduces oxidation** like costly, complicated machines. You'll use less flux and fewer tips to do it all, too! Dillon **also brazes or solders** with soft-flame tip. It's the new state of the art, and we have test results to prove it! Guaranteed! Complete kit only \$285 (sugg. retail price.)

Call toll-free 1-800-228-2009 for free brochure & more information, plus dealer nearest you!

Name _____
 Address _____
 City _____ St _____ Zip _____
 To Shannon Marketing, Inc. POB 378, Welches, OR 97067 Toll-free 1-800-228-2009 (622-4055 Ore.)
 In Canada contact Eurotech Enterprises, 711 Russell Ave., Burnaby, B.C. V5J 4R8 Phone: (604) 433-4111 Ron Stewart

No Previous Experience Needed!

MAKE MONEY FIXING SMALL ENGINES

Be the Small Engine Pro in your neighborhood. Experts show you what to do, how to do it.



This 3½ horsepower gasoline engine included with course ... yours to keep!

Train at home in spare time! Just imagine how much money you can make fixing small engines right in your own neighborhood! Hundreds of ordinary machines rely on small engines for power—lawn mowers, chain saws, snowblowers, snowmobiles, outboards, mopeds, minibikes, rototillers, riding mowers—and many more. And they break down regularly. Need a trained repairman to do everything from minor repairs to major overhauls.

Whether you want to go full or part time, work for someone else or start your own business, there's money to be made. And now there's a quick, easy way to get the training you need at home in spare time. No need to quit school or your regular job. Experts show you everything step by step with easy-to-read lessons, detailed pictures and diagrams.

Engine, Tools and Equipment Included with Course.

Your own engine, plus professional tools and ICS "know how" help you become a skilled repairman fast. We send you complete tool kit... including wrenches, sockets, feeler gauge, ring compressor, spark plug tool and more. You learn servicing, repair, inspection, cleaning, maintenance. And you do it all on your own engine...with the tools in your hands! **Mail Coupon today!**

ICS School of Small Engine Repair, Dept. PB094
 Scranton, PA 18515

Flush free color brochure and full information on how I can learn small engine repair at home in spare time.

Name _____ Age _____
 Address _____
 City _____ State _____ Zip _____

GM VARIATIONS

(Continued from page 95)

legroom in the back seat plus plenty of headroom front and rear.

The carryover models

The engineering news we all wanted to hear from Chevrolet this year was *tuned port injection* (TPI). This refers to GM's extraordinary 5.7-liter V8 power pumper under the hood of the 1985 Corvette. At 240 hp, Chevy asserts a 10 percent increase in ponies over the '84 Cross-Fire throttle body-injected 350. Torque is up, too, from 290 to 330 lb.-ft. And all this with a claimed 11 percent increase in fuel economy.

Tuned intake runners produce more power at lower rpm. Fuel injectors are mounted in the manifold base plate, and a computer calculates precisely how long the injectors are open based on signals it receives from a hot-wire mass airflow sensor mounted in the intake ducting. How hot is it? The golf shirts Chevy personnel wore at the press meeting bore a Corvette logo and the words *Life Begins at 150* (mph!).

Chevy's downsized van

The Chevrolet Astro van is among the General's most interesting new models. Chevy calls it the in-between van because it's smaller than conventional vans but larger than the Chrysler T-van and like-sized minivans.

Astro can be had in '85 with a choice of two engines: a standard 90-hp 2.5-liter fuel-injected Four, and an optional 4.3-liter V6 pumping 155 hp.

Astro, a conventional front-engine/rear-drive van, will have a standard four-speed manual transmission. A five-speed manual and a four-speed

automatic transmission are optional.

In the Camaro stable, the IROC-Z joins the Z28 as a performance model. You can choose from the 190-hp L69 four-barrel 5.0-liter 305-cu.in. V8 with five-speed manual, or the 215-hp LB9 TPI version with a four-speed automatic. The standard Z28 motivator remains Chevy's LG4 5.0-liter Eight of 165 hp, now tame by comparison.

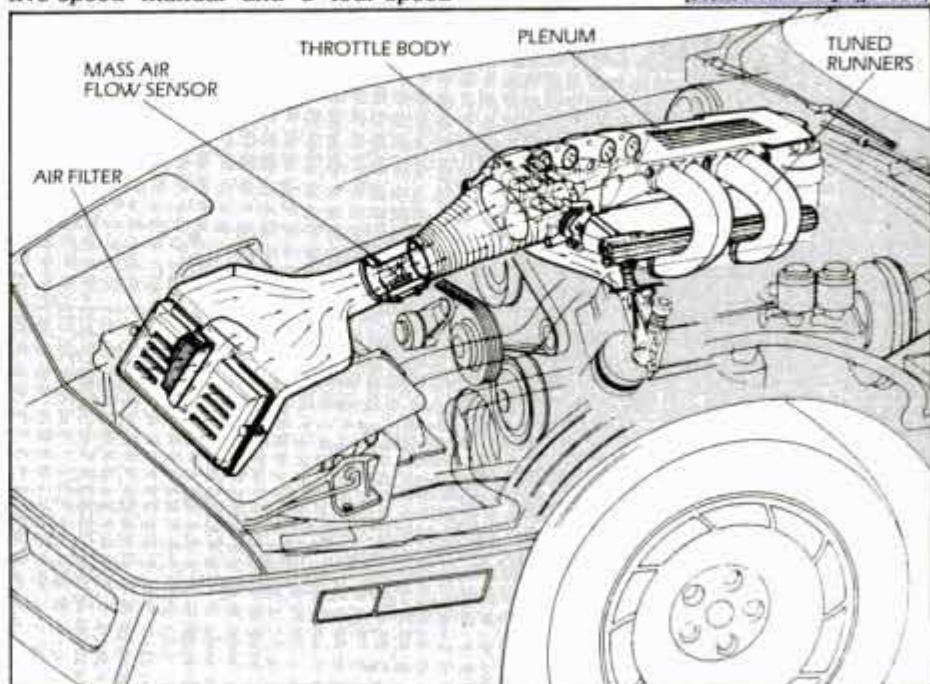
The J-cars are getting massaged this year as never before. The Cavalier will be available this year in an exciting Z24 model, in notchback and hatchback two-door coupes. It's powered by an LB6 2.8-liter V6 rated at 125 hp at 4,800 rpm and 155 lb.-ft. of torque at 3,600 rpm.

The Z24 is as aggressive visually as it is physically, with flared rocker panels, rally wheels, special front end and digital instrumentation. Because GM has retained 1984 J-car production deep into '85 to bolster its CAFE ratings, the Z24 won't debut until spring.

The Celebrity lineup is unchanged for 1985. The 130-hp 2.8-liter multiport-injected (MFI) V6 replaces last year's carbureted HO V6 engine.

Chevy showed the new Isuzu-built Spectrum at its press meeting this year, but we weren't permitted to drive it because it wasn't representative of "production intent." Spectrum will be available at East Coast Chevy dealers this winter as a four-door sedan or three-door hatchback sitting atop a 94.5-in. wheelbase. With an overall length of 158.9 in., it's only 1/10-in. off the Toyota Tercel. It's powered by a 1.5-liter Four coupled to a five-speed manual transmission. Suggested EPA figures are 45 city/60 highway for the gas motor, and an amazing 55 city/72

(Please turn to page 157)



Tuned-port injection system as used on Corvette. Injectors are at the base of the runners.

MUST LIQUIDATE

\$13,650,000 Inventory

Desktop Phone and Cordless Handset

New! Factory Sealed Cartons!



You get TWO phones in one!

MURAPHONE

Wall St. Journal
July 26 - Major phone manufacturer reports second quarter results adversely affected by \$26 million write-down of consumer telephone inventories.

C.O.M.B. authorized to liquidate inventory of phones at **BELOW** manufacturing cost!

1,000-ft. range on cordless handset!
4000 private security codes!
Electronic voice guides you in programming and retrieving stored phone numbers!

Just one **LOW** shipping charge, regardless of quantity you order!

For TouchTone® AND Rotary. Can access MCI, Sprint, etc.

Remember a few years ago when 23 channel CB radios were all the rage? The FCC allowed expansion to 40 channels . . . and manufacturers panicked to liquidate their 23-channel CBs at "giveaway" prices!

It has happened now with cordless phones! The FCC allowed manufacturers to add a **SIXTH** channel. (Big deal!) Now we have the **LAST** big inventory of a highly sophisticated 5-channel model. Out they go!

- **TWO PHONES IN ONE!** You get a Desktop phone and remote Cordless Handset. Push a button to use on TouchTone® or Rotary phone system!
- **COMPUTERIZED OPERATION!** Sophisticated integrated micro-processor circuitry.
- **INTERCOM!** Make calls from base unit to cordless unit, or from cordless unit to base unit.
- **FOR HOME OR OFFICE!** Use on commercial 4-wire systems and 2-wire residential systems.
- **AUTOMATIC HOLD!** Allows you to transfer calls from main unit to cordless handset.
- **PROGRAMMABLE MEMORY!** For storing up to 32 different phone numbers . . . even long foreign ones . . . for easy 3-button speed dialing.
- **AMAZING ELECTRONIC VOICE!** It guides you, step-by-step, in storing phone numbers in memory! On pushbutton command, will tell you any or all numbers in coded storage.

- **AUTOMATIC LAST NUMBER REDIAL!** Push one button for redial of last number called.
- **MUTE BUTTON!** Lets you hear what caller is saying, but caller can't hear your private conversation to persons in room with you.
- **ACCESS MCI, SPRINT, ETC!** Most people with a Rotary phone system can't access MCI, Sprint, etc. But with this Muraphone, you CAN!
- **DUPLEX SYSTEM!** Talk back and forth . . . same as on your present phone.
- **UP TO 1000-FT. RANGE!** Place and receive local or long distance calls with the Cordless unit from your garage, yard, or neighbor's home.
- **4000 SECURITY CODES!** For maximum privacy from any other phones in the neighborhood.
- **RECHARGEABLE!** Cordless unit has removable charging adapter. Plugs into standard 115V outlet.

NOTE: This is a liquidation item. All sales are final. **1 year limited factory warranty and service from Mura.**

Thousands sold at **\$249.95**

OUT THEY GO AT ONLY:

\$68

Price subject to change after 60 days. Offer void outside original 48 states.



Model 8000 KODAK Disc Camera

Factory new! First quality! Now at BELOW dealer cost!

Liquidation of a surplus inventory! Kodak's most advanced Disc Camera. Just aim and shoot. Electric "eye" and automatic lens do the rest. Unique disc film gives 15 snapshots. Take photos of objects as close as 2 inches! Self-timer, so you can get in your own pictures. Built-in LCD Alarm Clock! Built-in flash, automatic lens, shutter and other electronic functions are powered by long-life energy cell. Camera size: 4 1/4" x 3 1/4" x 1". **5 YEAR LIMITED WARRANTY FROM KODAK**

Mfgs. Suggested Retail . . . **\$150.00**
Liquidation Closeout Price Now Only **\$58**

Order No. 62715 Ship. handling: \$4.00



Use in horizontal and vertical positions! Wheels included.

Power to slice through steel up to 4 1/2" thick! Use it for any shape stock! Saw lumber, plastic and even soft metals! A standard 1/2" saw blade (64" long) is included.

- 1/3 hp. capacitor-start 1725 rpm motor.
- Three-prong plug fits 115V outlet.
- Worm gear-drive provides smooth, long-lasting performance.
- Adjustable work stop lets you repeat the same length cut, time after time.
- NEMA 56 motor frame.
- Quick change of V-belt for your choice of three speeds: 80, 120 or 200 ft/min.

Mfgs. Sug. Retail . . . **\$499.00**

Liquidation Closeout Price . . . **\$188**

Order No. 1053 Shipped freight collect



Credit card members can order by phone, 24 hours a day, 7 days a week.
Toll-Free: 1-800-328-0609
If busy signal, or if no answer, call:
Toll-Free: 1-800-328-5727
In Minnesota, call: **1-800-742-5685**

C.O.M.B. CO.®
Authorized Liquidator
14615 28TH AVENUE NORTH
MINNEAPOLIS, MINNESOTA 55441-3357

SEND ME THE ITEMS I HAVE LISTED BELOW
(All prices subject to change after 60 days. Offers void outside original 48 states.)

Item No.	How Many	Item	Ship/Handl.	Price

C.O.M.B. CO./Liquidators Dept. X-147
14615 28th Ave. N., Minneapolis, MN 55441-3357

Send the items indicated at left. (Minnesota residents add 6% sales tax. Allow 3-4 weeks for delivery. Add 2-3 weeks extra if paid by check. Sorry, no C.O.D. orders.)

My check or money order is enclosed.

Charge: VISA MasterCard Am. Ex. Diners Club

Acct. No. _____ Exp. _____

PLEASE PRINT CLEARLY

Name _____

Address _____

City _____

State _____ Zip _____

Phone _____

Sign Here _____

LOOKING UNDER THE HOOD:

1985
DETROIT
MICHIGAN

GM POLISHES ITS ACT

General Motors has made the first major change in automobile air conditioning in a quarter century—a system that varies cooling by automatically changing the cubic-inch displacement of the compressor. This eliminates the surge on small Fours and Sixes when the compressor clutch clicks on and off. Displacement can vary infinitely from 9.2 cu. in. to as little as 0.3 cu. in.

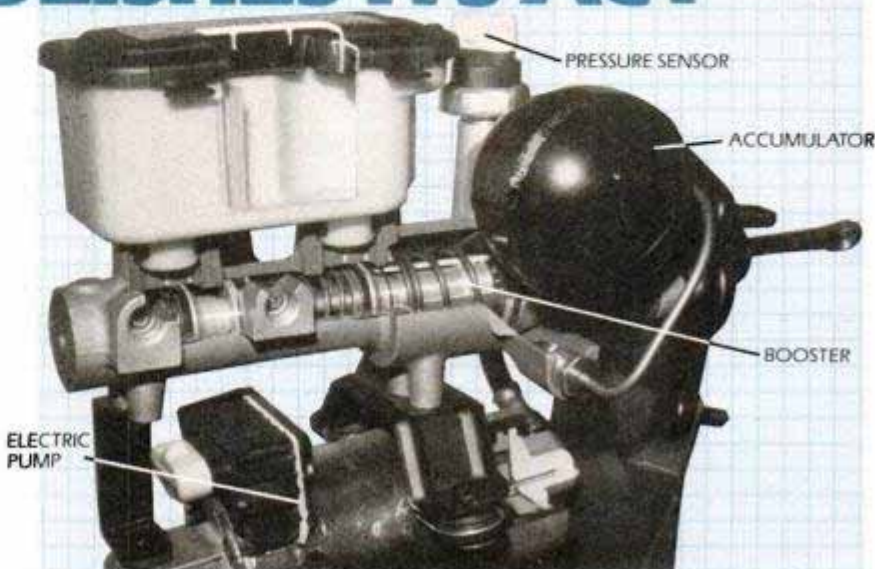
The variable-displacement compressor—the lightest in the world at just 12 pounds—is a five-cylinder, similar to one GM used before 1960. The cylinders are arranged in a circle, and the pistons are connected by rods and socket joints to a circular wobble plate. This plate, driven by the compressor shaft in an eccentric manner so that it wobbles fore and aft, operates the pistons. The wobble plate can also slide back and forth on the shaft to increase or decrease piston stroke. The plate is moved forward or back by venting high- or low-pressure Freon into the compressor's crankcase. High pressure forces the plate toward the minimum displacement position. Low pressure allows the gas in the cylinders to push the plate toward its long-stroke position. The compressor will be used first on cars with Pontiac's 2.5-liter and Chevy's 2.0-liter Fours.

Chevy engines

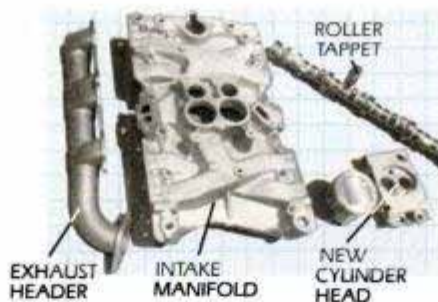
Chevy has yet another spinoff from its 30-year-old small block V8—a 263-cube (4.3-liter) 90° V6. It has an even-firing crankshaft, throttle-body fuel injection, plus J-shaped intake ports and combustion chamber modifications that cause the incoming air and fuel to swirl and mix well, resulting in a fast burn of the mixture for greater efficiency. The engine produces 130 horses, compared with 110 for the 229 (3.8-liter) odd-firing V6 it replaces.

Chevy will also be making other GM divisions' cars run faster in 1985. The 2.8-liter Chevy V6, which will go into the Pontiac Fiero and the Cadillac, Chevy and Olds J-cars, will be available with individual-port fuel injection in 1985. Along with a tuned intake manifold, this boosts output from 112 to 125

(Please turn to page 157)



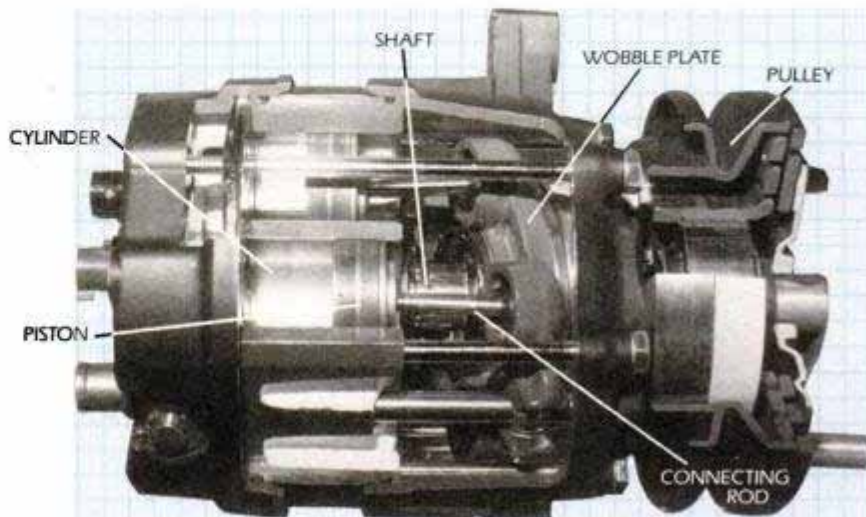
All-hydraulic brake system for rear-drive cars has no vacuum boost. Pump generates 650 psi.



Olds V8s get roller tappets, stainless headers, new combustion chambers and manifold.



Diesels now come with a miniature bedpan that lets you drain water from the fuel filter.



New a/c compressor uses a sliding wobble plate to continually change displacement.

Come to where the flavor is.



Marlboro Red or Longhorn 100's —
you get a lot to like.

17 mg "tar," 1.1 mg nicotine
av. per cigarette, FTC Report Mar '84

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

© Philip Morris Inc. 1984

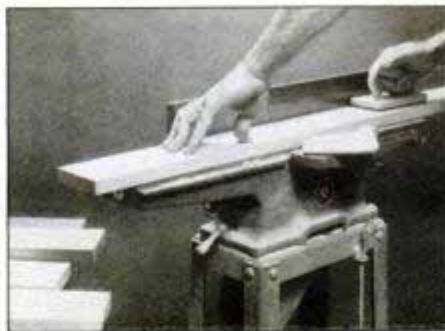
6 Jointer

If you are considering buying a 4-in. jointer (like the one shown) only to joint board edges, keep in mind that the tool also can be a valuable surfacing aid. Although its capacity is small, many projects like cabinet door rails and stiles and table aprons are frequently no wider than 4 in.

To use the machine, just slide the

board along the bed and over the cutters taking off $\frac{1}{16}$ in.—or less—stock per pass until the board is flat. Be sure to cut with the grain and always use a rubber faced push block in your rear hand to keep your fingers away from the moving cutters.

The jointer is ideal for truing board edges prior to joining, but it can also be used to surface narrow stock. Be sure to feed boards so that cut is with—not against—grain.



7 Planer

To begin with, keep in mind that a thickness planer is designed to smooth boards, but not necessarily to flatten them. This is because the feed rollers that draw the stock into the cutters tend to flatten out any warped board before it's cut. A uniform shaving is taken off the entire surface, not just the high

spots. When the board emerges from the other side it will revert back to its original shape, the warp still intact.

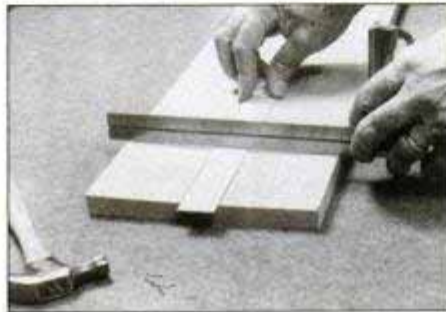
A good way to avoid the problem is shown below. When the tool is used in this manner, it will smooth and flatten stock at the same time. And, it can be used either for individual boards or for subassemblies that are to be joined into wider panels later.



Cupped board above is typical of stock normally available to woodworkers. It can be flattened by hand, with a wide jointer or with a thickness planer as shown below.



Hardwoods, like maple above, are not flattened by feed rollers. Push board through with convex side of cup pointing up, then turn board over and push through again.



Softwood stock, like pine above, will be flattened by rollers. To avoid this, nail shim into cup hollow, even with board edges. Use short brads that clear path of cutters.



Run board through planer again with shim in place. Shim prevents rollers from flattening board so proper stock is removed. Then, turn board over and plane other side.

8 Router

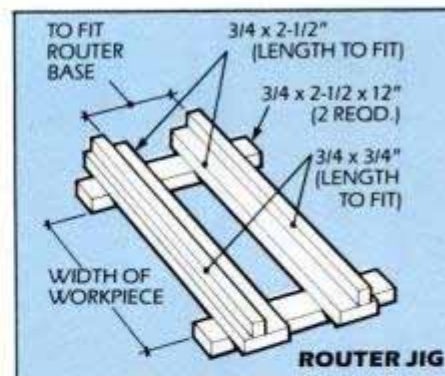
To use your router as a surfacing tool, you must first build the jig shown at right. This can be made from scrap wood but all parts must be straight and flat. The width of the jig between the top cleats should match the width of your router base, and the distance between the lower jig boards should be just slightly wider than the workpiece.

Once the jig is built, nail a support

strip to both sides of the workpiece, letting each extend about 6 in. beyond both ends. Position these strips so that their top edges align perfectly.

Then, with a $\frac{3}{8}$ -in.-dia. carbide-tipped straight cutter in the router, begin cutting. When each pass is complete, slide the jig over $\frac{1}{8}$ in. and make another cut until the whole surface is smooth and flat. Finish up with a hand plane or belt sander.

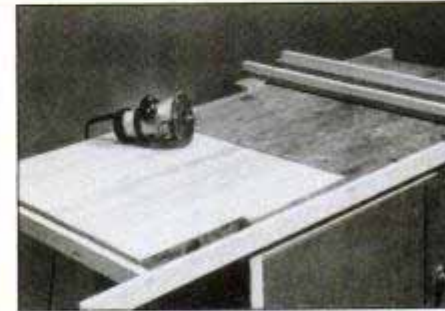
(Please turn to page 153)



Before using any method to flatten old surfaces, including the router and jig shown here, remove or sink imbedded nails and other impediments that could harm tools.



Nail level guide strip to each side of top, then build jig. Measure down from jig to find lowest point. Adjust bit projection to cut slightly deeper than the low point.



Start router and push through jig. Make passes about $\frac{1}{8}$ in. apart, sliding jig along as you go. Half-finished surface above shows difference between old and new.

FREE TRIAL
BEFORE YOU BUY

HEARING AIDS

UP TO **50% OFF** COMPARABLE AIDS

SPECIAL OFFER TO READERS OF POPULAR MECHANICS

BODY AIDS Model 59B

- Small, slender
- Inexpensive
- Lightweight

\$99⁵⁰



BEHIND THE EAR AIDS Model 270

- Inconspicuous
- Comfortable
- High/Low Range

\$199⁵⁰



CUSTOM IN-THE-EAR AIDS Model 180-A

- Made for your ear & hearing loss
- High technology

\$299⁵⁰



GET QUALITY HEARING AIDS AT AMAZINGLY LOW PRICES BECAUSE WE SELL DIRECT BY MAIL • YOU PAY NO DEALER MARK-UPS OR COMMISSIONS.

HUGE SAVINGS

Buy direct—Eliminate dealer markups and commissions.

30 DAY FREE TRIAL

We send you the Aid of your choice—FREE TRIAL—no obligation.

TIME PAYMENTS

Time payments arranged after you are satisfied with the Aid of your choice.

1 YEAR WARRANTY

One year warranty on all Hearing Aids from LLOYD'S.

NO SALESMAN WILL VISIT YOU

We promise no salesman will ever visit you.

LLOYD'S TRUST THE CUSTOMER PLAN

This plan has been a resounding success for over 20 years. We've sent thousands of Hearing Aids to customers in all 50 states. Over 250,000 Hearing Aids sold. Except for Custom In-The-Ear Aids, no down payment is required with approved credit. We have thousands of letters from satisfied customers . . . and from medical clinics, hospitals veterans organizations and institutions.

FOR FREE INFORMATION AND HEARING LOSS QUESTIONNAIRE, CALL

1/800/323-1212*
TOLL FREE

*Illinois Residents please use coupon.

LLOYD HEARING AID CORP. • 128 Kishwaukee St. • P.O. Box 1645
Rockford, IL 61110 Dept. PM3

Please send me FREE Literature and Low Prices on all types of Hearing Aids.

WE PROMISE
NO SALESMAN
WILL VISIT!

NAME _____
ADDRESS _____
CITY _____ STATE _____ ZIP CODE _____

WE EVEN PAY THE POSTAGE . . . Just tape or paste this Postage-Paid label to the front of any envelope. No further postage or addressing is needed.

Dept. PM3

NO POSTAGE NECESSARY
IF MAILED IN THE
UNITED STATES

BUSINESS REPLY LABEL

FIRST CLASS PERMIT No. 1891, ROCKFORD, ILLINOIS

POSTAGE WILL BE PAID BY ADDRESSEE

LLOYD Hearing Aid Corporation
128 Kishwaukee St.
P.O. Box 1645
Rockford, IL 61110

*Medical Care. For more information, call toll free, 1-800-USA-ARMY.

19 KILO

ARMOR

Become a member of an exclusive club. "19 Kilo" is Army shorthand for a tank crewman — one of a close-knit team who look out for each other and 60 tons of rolling steel. From Armor to X-rays, we have over 300 career training areas. Qualify, and we'll guarantee your choice of training. Which means you can serve your country in the way that best suits your talents.

So if it's not 19 Kilo, it might be 91 Bravo.*

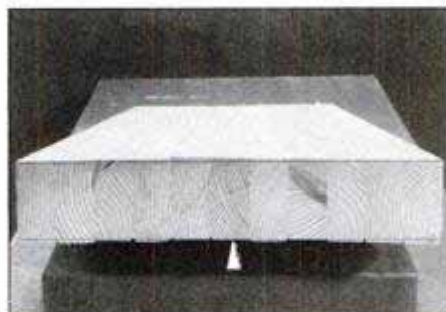
**ARMY.
BE ALL YOU CAN BE.**

9 Circular saw

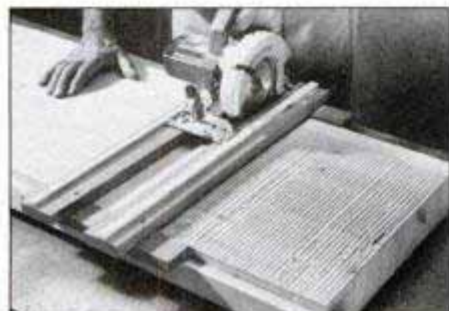
The key to surfacing all stock is to set up a milling arrangement that will cut to the same depth relative to a true horizontal plane, not to the surface that is being milled. In the router method, shown on page 150, this was accomplished with a wood jig that moved along two guide strips on the sides of the slab. The same technique is used to turn a circular saw into a surfacing tool. The jig is built in the same way, but with the dimensions altered so the top cleats are spaced to match the width of the saw's shoe.

As before, nail the guide strips to the slab so their top edges are parallel and so the strips extend 6 in. beyond both ends of the workpiece. Place the jig onto the strips and slide it up and down the slab to determine what the low point of the surface is relative to the jig. Set the

saw blade depth to just graze this low point. Then, start kerf-cutting the surface. Move the jig about 1/2 in. between cuts. When the surface is all cut, remove the jig and plane across the grain to chip off the waste. Plane with the grain for final surfacing.



Saw kerf-cutting is a good choice for surfacing wide soft wood assemblies like fir bench top, above. First step is to mark both ends square to find the approximate cut depth.



Install level guide strips on each side of top and build jig similar to one shown for router. Start saw and push through jig making all successive cuts about 1/2 in. apart.



Shave waste to bottom of saw kerfs using hand plane across grain. Then, plane with grain to remove tool marks. Surface will be smooth, flat and straight.

10 Radial-arm saw

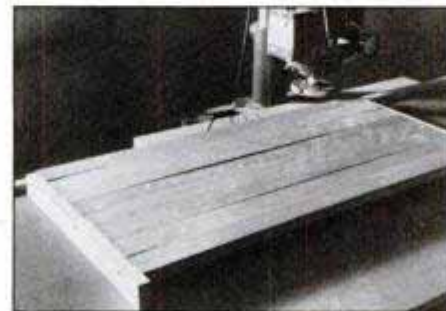
To use your radial-arm saw as a surfacing machine requires a rotary planer attachment. The one shown here is from the Sears Tool Catalog. Its cutting head has three carbide-tipped blades and is attached directly to the saw arbor. It can surface widths twice the length of the saw arm and lengths equal to one-half the length of the saw table. To surface longer panels, add tempo-

rary extension tables to the sides of your saw table.

Add support strips and adjust the cutter height so the blades will graze the lowest part of the slab. Position the cutter at the rip fence and lock in place. Then feed the work under the cutter from left to right, advancing the yoke outward after each pass until the slab is completely surfaced. The tool does leave marks that will have to be removed with a plane or belt sander later. **FM**



Rotary planer attachment for radial-arm saw has three carbide-tipped cutters with a cut depth of approximately 1/8 in. Sears model shown is only for 3/8-in.-dia. arbors.



Tack-nail straight board on each end to support slab at one level as it passes under cutter. Check before starting to make sure boards rest flat on table without rocking.



The Only ONE-MAN PORTABLE

SAWMILL Of Its Kind In The World!

If you need good, high-quality lumber, don't let inflated lumber prices stop your important building projects. The Foley-Belsaw goes right to the trees and turns out smooth, true-cut lumber... even beginners get excellent results. Just one man (no crew needed) can easily cut enough on weekends to save hundreds of dollars over high lumberyard prices. For power use tractor PTO or other low HP diesel or electric unit. Factory-direct selling keeps price low, and convenient time payments may be arranged.

Send for FREE BOOK! Just mail coupon below for "How To Saw Lumber" booklet and complete facts on the One-Man Sawmill. There is NO Obligation and NO Salesman Will Call on you. Do it TODAY!

FREE BOOK **Foley-Belsaw Co.**
30430 Field Building
Kansas City, Mo. 64111

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

Name _____
Address _____
City-State _____ Zip _____

MODELTEC

AMERICA'S FASTEST-GROWING MONTHLY MAGAZINE FOR

METAL-WORKING HOBBYISTS

TECHNICAL PROJECTS EVERY MONTH

- ENGINES • FIRING CANNON •
- PUMPS • VALVES • TRACTORS •
- LOCOMOTIVES • TOOLING •
- SHOP HINTS • DESIGN •
- STEAMBOATS • MORE •

SUBSCRIBE NOW
\$22.00 PER YEAR USA

\$25.00 OTHER COUNTRIES SURFACE
VISA - MASTERCARD ACCEPTED

MODELTEC

BOX 286-M—CADILLAC, MICHIGAN 49601
PHONE (616) 775-6296

Richard Petty says, "If you really want to learn how to repair cars, check out new NRI home training!"

**They give you all the training
and equipment you need to get
you started in a hurry.**

My Dad made auto mechanics out of us long before he'd let us enter a race... so I learned the importance of a good mechanic early... and the opportunities that are out there for well-trained men. That's why I'm sure glad to see training like the NRI course come along. With NRI, you learn at home in your spare time, at your own pace. And get solid, "hands-on" training for practical experience. It's a lot of training for the money.

Learn Auto Servicing Fast

NRI starts you right out on the high-demand under-hood services. You learn the latest tune-up and diagnostic techniques, plus tire and brake work. Then you follow through to cover the entire car from bumper to bumper. Lessons cover transmissions, engine rebuilding, suspension and alignment, power steering, air conditioning, and much more. You even get extra training on automotive diesel engines and six special reference manuals covering foreign cars, body and frame work, running your own business, and more.



Includes professional Sun instruments you keep to use on the job.



**Richard Petty, NRI Automotive Consultant and
America's Winningest Stock Car Driver.**

Includes Famous Sun Equipment

Your hands-on equipment includes the famous Sun Gun® inductive timing light with focused daylight xenon strobe... heavy-duty Sun compression tester, vacuum gauge, and remote starter... and the Sun 7-function diagnostic analyzer for precision tune-ups and trouble shooting. You also get the master mechanic's master instrument, the Autocraft 9" Ignition Analyzer Oscilloscope. Its big screen lets you "see" engines in action, handle 4-, 6-, or 8-cylinder motors, even high performance and racing cars. Use all these professional instruments for learning, keep them all for earning.

Train with the Leaders — NRI and McGraw-Hill

No other school has NRI's experience in home training or McGraw-Hill's background in continuing education. More than 67 years of experience and over a million students prove that they really know how to get you started on a good future. Mail the coupon for a free catalog telling all the facts, describing the complete course, and showing all the professional tools you get. Get your training at home, the convenient NRI way.

If the coupon has been removed, write:
NRI Automotive School, 3939 Wisconsin Avenue,
Washington, D.C. 20016

RUSH FOR FREE CATALOG

Please check for one free catalog only.

- Automotive Mechanics Course
- Air Conditioning, Refrigeration, Heating and Solar Technology Courses
- Building Construction Course
- Appliance Servicing Courses
- Industrial Electronics
- Small Engine Repair Course
- TV/Audio/Video Servicing, Communications Electronics, Microcomputers, Electronic Design Technology, Electronics Courses

All career courses
approved under GI Bill.
 Check for details.

946-104

3-WHEELERS ARE BACK!

(Continued from page 93)

and suburban cars, Zoe Inc., of 1722 Kettering St., Irvine, Calif. 92714, is poised (pending EPA approval) to introduce two of the most popular European three-wheelers. Reliant Motors of Tamworth, England, has been manufacturing three-wheeled cars since 1938. Zoe will distribute three Reliant vehicles: a two-door, four-seater; the same in hatchback; and a van. All three incorporate an 850-cc engine with one front and two rear wheels. The English version has a top speed of about 80 mph,



Ford's Cockpit show car features a motor scooter engine and tandem seats for two.

goes from zero to 40 in 12 seconds and gets up to 70 mpg. Inside, it's roomy enough for four adults and has a regular automobile dashboard and instrumentation. Reliants will sell for around \$5,300.

Ligier, of Vichy, France, is best known in this country for their Formula One grand prix race cars. They also manufacture the most popular line of three-wheelers on the Continent. Zoe plans to market a line of five vehicles with 125-cc engines that can go up to 50 mph and get 100 mpg. The passenger version will include a two-seater hardtop plus a sand and surf canvas-top model. They also will distribute three models of a three-wheeled mini delivery truck (the Paris Post Office uses thousands of them). The Ligier line will sell for \$3,500 to \$4,000. Zoe is presently reassembling the Ligier and Reliant lines with new bodies, plus engine modifications that meet EPA standards for motorcycles.

Rogers Inter Auto of Vancouver, British Columbia, has introduced a prototype of their Rogers Rascal. The Rascal is a three-wheeled microvan assembled out of components from 15 nations. With an 852-cc, rear-mounted Polish Fiat engine, the Rascal can do 75 mph and gets up to 60 mpg. It seats two adults and five bags of groceries or two adults plus two children, provided neither child is larger than 2½ grocery bags. The body is made of energy-

(Please turn to page 156)



NRI Schools
McGraw-Hill Continuing
Education Center
3939 Wisconsin Avenue
Washington, D.C. 20016

We'll give you tomorrow.

Name _____ (please print) Age _____

Street _____

City/State/Zip _____

Accredited by the Accrediting Commission of the
National Home Study Council

Popular Mechanics

Helps those who help themselves

NEW 1984 EDITION.

Over 900 detailed plans and innovative ideas to improve your living environment, save money on repairs and enjoy your leisure time.



ONLY \$1.00

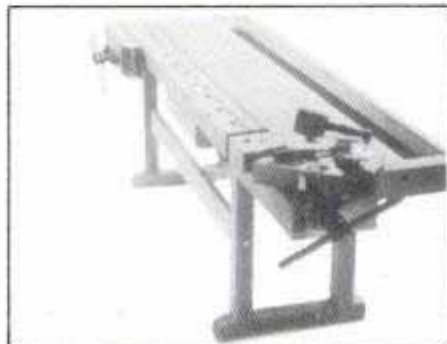
- Toolchests and workbenches.
- Tools and equipment.
- Recreational vehicles.
- Sports equipment.
- Fine Furniture.
- Storage structures.
- Invaluable and inexpensive photocopy service of past POPULAR MECHANICS articles.

Send for your catalog today! Be more self-sufficient tomorrow!

Send your name and address with check or money order payable to POPULAR MECHANICS. Mail to: Popular Mechanics, Box 1014 Radio City Station, New York, N.Y. 10101



Pegasus-Float above the ground on a 7' dia.craft designed for flying. Built from plywood, this lawn mower engine powered hovercraft will run for 3 hours on a gallon of regular gas. Cruise on air. Complete plans and photo illustrated instruction booklet. (PL-1800-\$9.95)



Classic Workbench-Build this classic European workbench for half the price of the factory version. Dovetail joints give the drawer super resistance to racking. Our drawings will show you how to make these joints. In addition you get detailed plans, instructions and material list. (PL-1748-\$5.95)



Garden Shed-This superbly designed shelter provides excellent storage for tools and lawn equipment. An upstairs loft (without using extra lumber) adds extra space to the 12 x 16 ft. structure. Plans, instruction and material list. (1 plan: PL-1278-\$10.50) (2 plans: PL-1278A-\$17.50)



PM's Master Keys to Car Care Helps you keep your car in top notch shape. 38 areas of Car Care are compiled in 13 individual folders. Each folder has step-by-step instructions combined with easy-to-follow illustrations and diagrams.

Need to replace your coolant hoses... folder #4 tells you how to do it. Time to change your air filter, check folder #10. Conveniently fits in glove compartment. (PL-1750-\$4.95)

SOTZ GARAGE SHOP HEATER

USED BY U.S. ARMY

- PRODUCES MORE HEAT THAN 2 OR 3 HIGH PRICED WOOD STOVES
- TREMENDOUS RADIATING SURFACE AREA GIVES YOU MORE HEAT WITH LESS WOOD
- Airtight design and draft control engineered to limit the amount of oxygen entering stove for controlled, safe, efficient heat. Prevents overfiring so drums can't burn up.
- Use of draft control allows you to heat large or small areas. Basement installation heats your entire home. Great for your garage, workshop, or cabin.
- Top drum squeezes 60% more BTU's from heat normally lost up the chimney. Heavy steel kit bolts together quick and easy.

VISA AND MASTERCARD RUSH ORDERS
CALL 1-800-321-9892
(INSIDE OHIO CALL 1-216-236-5021)
or SEND CHECK OR MONEY ORDER...
Sorry, no C.O.D.'s

WOODSTOVE KITS	DELIVERED TO YOUR DOOR	FACTORY PICK-UP
15-30 Gal. Bottom	\$31.47	\$27.47
55-Gal. Bottom	\$38.99	\$34.98
Top Kit Fits Both	\$20.93	\$17.97
AUTO-THERMOSTAT		
Spin Draft Stoves	\$28.97	\$26.97
Sotz Heaters Only	\$25.97	\$23.97

"NOW" ALSO MADE IN CANADA

Prices: Call 1-800-222-2323 or write
"SOTZ" P.O. Box 1000
Ear Falls, Ontario POV 1T0

SAFETY TESTED TO UNDER-WRITERS LAB. SPEC., BY GEISSER ENGRS.



55 KIT SHOWN

Burns over 24 hours

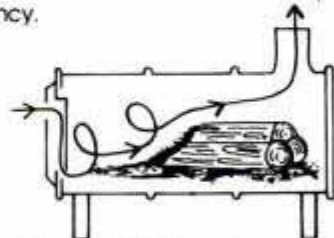
SPECIFICATIONS: Door, door frame, flue collar, draft control, internal draft channel of 13 ga. steel, legs, 1/8 in. steel, hinges, latch, catch of 3/16 in. steel, nuts and bolts. Top Drum; Connector flanges, pipe assembly, 4 nesting brackets, nuts and bolts.
55 Gal. stove has KING SIZE 15 1/2" diagonal door opening.
30 Gal. stove has 9 1/4" round door.

AS LOW AS \$27.47



Kit converts 55 gal., or 30 to 15 gal., drum (not supplied) into high capacity stoves.

Patented INTERNAL DRAFT CHANNEL-Air entering top draft control is preheated as it is drawn down inside of door and is sucked into bottom of heater with a turbulent action, mixing with the wood gases. This makes the Sotz stove tops in efficiency.



SPARK-PROOF DESIGN... Because of our internal draft channel, hot sparks cannot jump out of heater as in others with draft straight open to fire.

GUARANTEE

TRY A SOTZ at our risk. If (within one year) you don't agree it out performs any woodstove money can buy, your money will be refunded including shipping charges. Guaranteed against cracking, warping and burn up for life.

Sotz Inc., 13643-OH Station Rd., Columbia Station, OH 44028

Start your own money making business!



Get in on the PROFITS in SMALL ENGINE service and repair



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

In just a short time, you can be ready to join one of the fastest growing industries in America... an industry where qualified men are making from \$10.00 to \$15.00 per hour... and that's just for labor. Parts, engines and accessories add even more to the profits. Because the small engine

industry has grown so quickly, an acute shortage of qualified Small Engine Professionals exists throughout the country. When you see how many small engines are in use today, it's easy to understand why qualified men command such high prices—as much as \$17.50 for a simple tune-up that takes less than an hour.

65-million small engines are in service today!

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

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



RUSH COUPON TODAY FOR THIS FACT-FILLED

FREE BOOKLET!

Tells how you quickly train to be your own boss in a profitable Sparetime or Fulltime business of your own PLUS complete details on our 10-Day NO RISK Trial Offer!



Send for your copy today! No obligation

No experience necessary.

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

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



Learn At Home In Your Spare Time.

INCREASED INCOME

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

Walter H. Strick
Campbell, California



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

Send Today for FREE facts!

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

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



FOLEY-BELSAW INSTITUTE of SMALL ENGINE REPAIR
50572 Field Bldg., Kansas City, MO. 64111

No obligation... No salesman will call

Foley-Belsaw Institute

50572 Field Bldg. • 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.

NAME _____

ADDRESS _____

CITY _____

STATE _____

ZIP _____

3-WHEELERS ARE BACK!

(Continued from page 154)

absorbing plastic to withstand some of the shock of a collision. The Rascal will be marketed for around \$5,000.

Finally, Detroit has been experimenting with some three-wheeled designs. Ford's Cockpit city car has two tandem seats. The combination of advanced aerodynamics and a 200-cc Piaggio engine gives it better than 95 mpg in city driving. The hydraulic-mounted canopy provides exit and entry in tight city parking. The Cockpit show car was designed to be practical and get the best possible fuel economy.

General Motors' Lean Machine is an experimental three-wheeler that does what no car but all motorcycles do: It leans into a curve. Using a combination of hand and foot controls, the driver tilts his cab and the front wheel into the turn. The engine and the rear two wheels stay horizontal to the ground. Foot pedals control the amount of lean and handlebars steer the front wheel. In the Lean Machine, you feel you're in touch with the raw physics of driving,



GM's experimental Lean Machine is a single-seater with a cab that leans into corners.

just like riding a bike. A little 185-cc engine pushes the aerodynamic pod from zero to 60 in seven seconds, and it gets up to 200 mpg. You can see the Lean Machine in the "World of Motion" exhibit at Walt Disney World's Epcot Center. Neither General Motors nor Ford have any present plans to market their vehicles, but if we get another oil crunch, you never know.

Three-wheelers can be inexpensive to buy, to insure and to operate. They're a practical way to cut down on the use of fossil fuels. And, they're fun. In the driver's seat of a three-wheeler you know you're driving the car, not vice versa. You drive more alertly, more exuberantly—with the zest of the first racing drivers and the thrill of the early sports car enthusiasts.

The time has come for us to rediscover the basic joys of the road, and here is a growing herd of three-wheelers ready to help us do just that. **PM**

GM POLISHES ITS ACT

(Continued from page 148)

or 130 (depending on the model). In the Celebrity and Citation, the 2.8 will rest on motor mounts that combine the conventional rubber cradle with a hydraulic shock absorber.

Other GM engines

Cadillac and Oldsmobile have tweaked their rear-drive V8s to avoid the gas guzzler tax that applies to any car that doesn't get at least 21 mpg. Caddy reworked the cylinder heads of its 4.1-liter V8 to install swirl-type intake ports, reprogrammed the engine control computer and fitted low-rolling-resistance tires to raise fuel economy from 20.8 to 21.4 mpg. Olds changed to a new intake manifold with smaller runners for higher fuel-mixture velocity, swirl ports, and a modified combustion chamber with a more centrally located sparkplug to improve combustion on its 5-liter 307 V8. Oldsmobile has also fitted roller tappets for reduced friction. These changes raise fuel economy from 20 to as high as 22 mpg.

Scattered improvements

Several significant '85 GM engineering developments are not under the hood.

Many rear-drivers get a new fully hydraulic power brake system pressurized by an electric pump mounted to the bottom of the master cylinder. A pressure sensor triggers the pump when boost pressure drops below 500 psi, and the pump operates until pressure is up to 650 psi. If the pump fails, the dashboard warning light goes on. A hydraulic accumulator atop the unit provides up to six assisted stops in case of a pump or electrical failure. Although the master cylinder and hydraulic boost cylinder are in line, the master cylinder operates independently, and there's still conventional unassisted braking.

This fall, Buick will street test 100 Rivieras that contain a dashboard computer with a cathode ray tube. Unlike the Lincoln system, to get response to commands you actually have to touch what seems to be the TV screen, but is really a clear switch just forward of the tube. As at Lincoln, functions are currently limited to radio, heater, air conditioning, defroster, day-date-time and trip computations. But functions will be expanded on later models.

Cadillac's Seville Elegante becomes the first U.S. car with a European-type antilaceration windshield. Conventional windshields have two layers of glass sandwiching a plastic layer. This one adds two extra sheets of plastic on the inside to prevent glass shards from entering the passenger space in an accident. **PM**

GM VARIATIONS

(Continued from page 146)

highway for the thrifty diesel motor!

Pontiac, Buick and Olds

Most Pontiac offerings other than the Grand Am are carryover models. Fiero gets a long-awaited GT package with aerodynamic modifications and the 2.8-liter multiport-fuel-injection (MFI) V6 standard. A revised instrument graphics treatment is part of the GT package as well. Unfortunately, the new five-speed manual can only be had with the 2.5-liter Tech-IV inline Four. (Tech-IV is the new tag for the old Iron Duke.) For '85, roller hydraulic tappets have been added to the Duke of Tech.

Oldsmobile also carries over many of its models, and adds the corporate 2.8-liter MFI V6 to several car lines including the new Firenza GT. Engine width was reduced a few millimeters by going to a serpentine accessory belt system, permitting the V6 to nestle into the Firenza's front track.

The Olds Ciera becomes a GT for the first time this year. Its standard package includes the Buick 3.8-liter MFI V6 bolted to a four-speed automatic overdrive transmission and dual-outlet exhaust. A firm ride and handling suspension is also part of the deal, as are Goodyear Eagle GT tires.

The rear-drive Cutlass Supreme can be optioned up to become a 442, which replaces last year's Hurst/Olds, but without the Mickey Mouse Lightning Rod triple-stick console shifter. The 442 is powered by Olds' 180-hp 307-cu.-in. V8. With a final drive of 3.73:1, Olds claims a zero to 60 time of nine seconds.

Diesels and Cadillacs

Changes in the 4.3-liter V6 and 5.7-liter V8 diesels make them more reliable and better citizens, too.

An electronic control module (ECM) has been added to both engines. This computer adjusts exhaust gas recirculation with input from two sensors to result in better emissions control. Both engines meet federal standards of 1.0 gram NOx per mile of operation. The ECM also monitors injection timing and limits wide open throttle fuel delivery at high elevations, so they'll produce less smoke.

The biggest Cadillac news for 1985 is the introduction of the new C-car Fleetwood 75 Limousine. The front-driver, carrying the standard 4.1-liter digital fuel-injected V8, hauls eight passengers in style and traditional Cadillac luxury. A seven-seater Fleetwood Formal Limousine will debut later.

Finally, all divisions will offer limited availability of high-mounted rear stoplights, about one year ahead of the federal requirement. **PM**



Go ahead
HELP!
yourself.

Even if you've never done any work on your car yourself, HELP! makes it easy to take care of those pesky little repair jobs. Like broken window-crank handles, loose arm rests or noisy starters, to name a few of hundreds for which HELP! has answers. No more weekends hunting parts in auto junkyards.

This booklet lists 100 of the most popular HELP! items that can save you big bucks in solving small repair problems. Parts come in handy packages with complete, easy-to-follow instructions. Send for your FREE copy of "One hundred auto repairs for under ten bucks."

Motormite Manufacturing Dept. P.M.
a division of R&B Inc.
2695 Philmont Avenue
Huntingdon Valley, PA 19006

Send me a FREE copy of the helpful HELP! booklet.

NAME _____

ADDRESS _____

CITY _____

STATE _____

ZIP _____

BEAT the HIGH COST of LIVING!

HERE IS A BEAUTIFUL WAY TO MAKE MONEY!

UPHOLSTERY BOOKLET MAILED FREE!

LEARN UPHOLSTERY AT HOME... restore old chairs, sofas to like-new condition! A clean, enjoyable way to put spare hours to profitable use. Old cast-offs picked up for dollars, worth hundreds when reupholstered. Fascinating home study course includes tools, kits, supplies. Earn as you learn — start your own business!

SEND FOR OUR FREE BOOK TODAY! YOU'LL GET A BIG ILLUSTRATED 24 PAGE BOOK ON UPHOLSTERY and the upholstery business and a sample lesson showing how the fabulously successful MUI system is taught. It costs you nothing to get the information and there's no obligation. No salesman will call.

Modern Upholstery Institute,
80342 Field Bldg., Kansas City, Mo. 64111

GET STARTED NOW • MAIL THIS COUPON TODAY

Modern Upholstery Institute,
80342 Field Bldg., Kansas City, Mo. 64111

Please mail me a copy of your book, "PROFESSIONAL UPHOLSTERY for Fun and Profit." I understand no one will call and there is no obligation.

Name _____ Age _____

Address _____

City _____ State _____ Zip _____

TRAIN FOR A GREAT CAREER IN ELECTRONICS

LEARN AT HOME IN SPARE TIME... The fast-growing Electronics field offers excellent career opportunities... even at the entry level. A knowledge of BASIC ELECTRONICS can help you get your foot in the door, qualify for good jobs like Inspector, Electronic Sales, Junior Technician/Tester and more. Easy-to-follow home-study course starts you at the very beginning... explains everything step by step with plenty of photos, charts, diagrams. Multimeter, parts kits, calculator, digital VOM included. Hands-on training lets you learn by doing. Get FREE FACTS. No salesman will call. MAIL COUPON TODAY!

ICS SINCE 1971
BASIC ELECTRONICS COURSE
Dept. PB094 Scranton, PA 18515

Name _____ Age _____

Address _____

City/State/Zip _____

do-it-yourselfers

115-VAC Centrifugal Blower

ITEM 16-922 **\$15.00** POSTAGE PREPAID

• Ideal room space ventilation or use as exhaust for darkrooms, bathrooms, kitchens, etc. Use to increase the efficiency of your wood stove, solar heater, fireplace. Use to cool electronic gear. Use limited only by your imagination.

• 115-VAC, 60-cycle, 200-CFM, Intake 3" diameter. Rectangular discharge 3" x 3-1/4". Size 8-1/4" x 8-1/4" x 7-1/4".

FREE Equipment Catalog

USE YOUR VISA, MASTERCARD AND THE AMERICAN EXPRESS CARDS

A Division of Burdon Sales Company
SURPLUS CENTER
Box 82709/DEPT PM-104/Lincoln, NE 68501
For Ordering Call TOLL-FREE 800-228-3407

16 VALVES

(Continued from page 90)

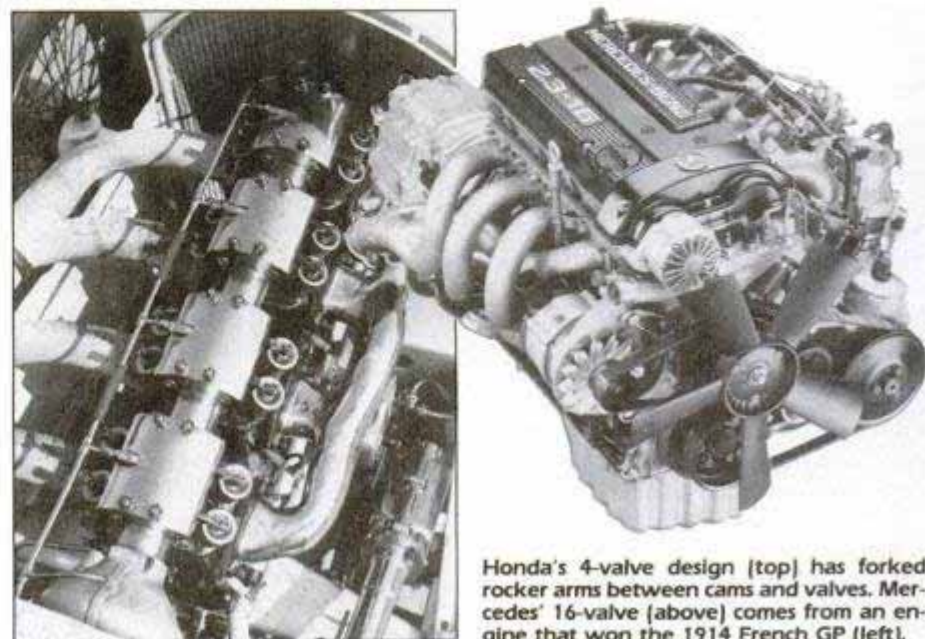
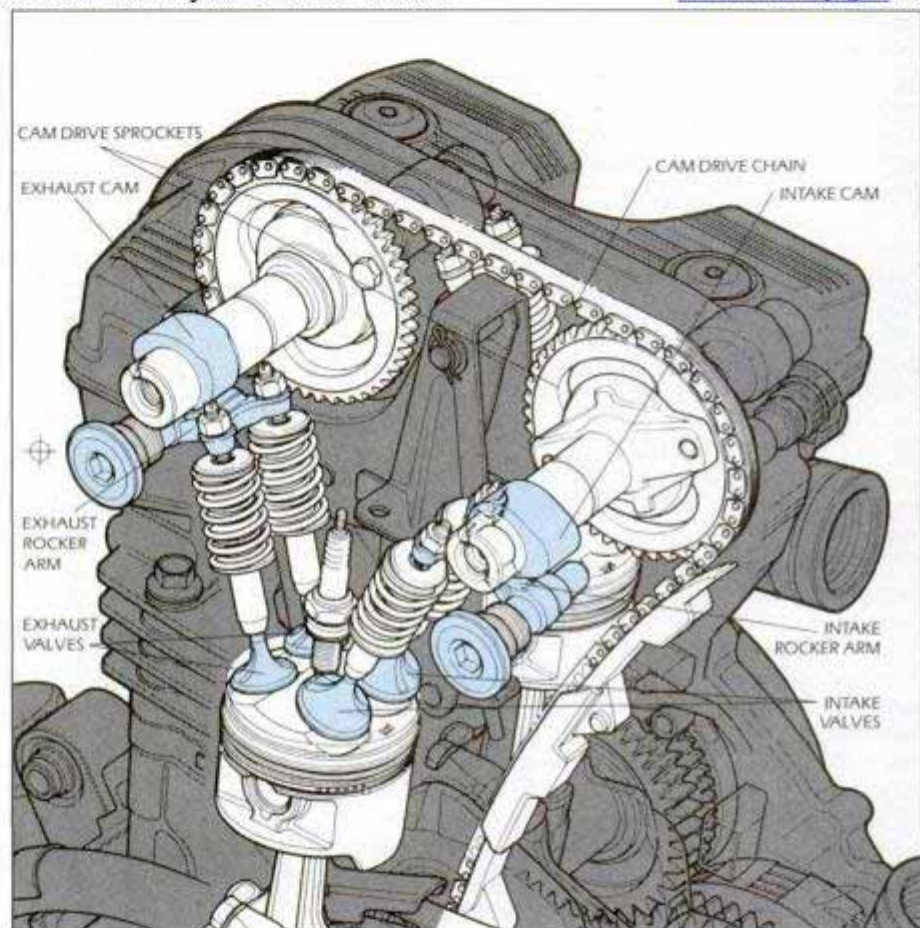
of exhaust valves—in a pent-roof combustion chamber. In most cases, they are operated by double overhead camshafts, one opening the intake valves, the other the exhaust valves.

On modern engines, such as the Saab and Mercedes 16-valve Fours, the cam works directly on an inverted-bucket-style tappet. This cup is fitted over the valve stem and spring, and the cam lobe bears down right on the hardened top surface. Lash adjustments are handled

by shims, either recessed into the top of the tappet, or underneath in the valve retainer. Saab and Mercedes avoid the whole adjustment issue by employing hydraulic tappets.

Direct acting tappets are the simplest way to open and close the two rows of valves, but certainly not the only way. Honda and Suzuki motorcycle engines use a forked rocker arm assembly to actuate two valves from a single camshaft lobe. The cam lies between the rocker arm fulcrum and the valve stem, so the extra weight of the rocker doesn't

(Please turn to page 160)



Honda's 4-valve design [top] has forked rocker arms between cams and valves. Mercedes' 16-valve (above) comes from an engine that won the 1914 French GP (left).

BIG FOUR

NEW 128K —MEGA BYTE DUAL DISK DRIVE—80 COLUMN

COMPUTER SYSTEM SALE!

HOME • BUSINESS • WORD PROCESSING



\$895⁰⁰
(If ordered before 11/1/84)

List Price \$3717.95

LOOK AT ALL YOU GET FOR ONLY \$895.

	LIST PRICE
① B128 COMMODORE 128K 80 COLUMN COMPUTER	\$ 995.00
② 8050 DUAL DISK DRIVE (over 1 million bytes)	1795.00
③ 4023 100 CPS 80 COLUMN BIDIRECTIONAL PRINTER	499.00
④ 12" HI RESOLUTION 80 COLUMN GREEN OR AMBER MONITOR	249.00
• BOX OF 10 LORAN LIFETIME GUARANTEED DISKS	49.95
• 1100 SHEETS FANFOLD PAPER	19.95
• ALL CABLES NEEDED FOR INTERFACING	102.05
TOTAL LIST PRICE	\$ 3717.95



Printer replacement options (replace the 4023 with the following at these sale prices)

	LIST	SALE
• Olympia Executive Letter Quality Serial Printer	\$ 699.00	\$ 399.00
• Comstar Hi-Speed 160 CPS 15" Serial-Business Printer	\$ 779.00	\$ 499.00
• Telecommunications Deluxe Modern Package	\$ 199.00	\$ 139.00

Plus You Can Order These Business Programs At Sale Prices

	LIST	SALE		LIST	SALE
Professional 80 Column Word Processor	\$149.95	\$99.00	Payroll	\$149.95	\$99.00
Professional Data Base	149.95	99.00	Inventory	149.95	99.00
Accounts Receivable	149.95	99.00	General Ledger	149.95	99.00
Accounts Payable	149.95	99.00	Financial Spread Sheet	149.95	99.00
			Program Generator	149.95	99.00

15 DAY FREE TRIAL We give you 15 days to try out this SUPER SYSTEM PACKAGE!! If it doesn't meet your expectations, just send it back to us prepaid and we will refund your purchase price!!

90 DAY IMMEDIATE REPLACEMENT WARRANTY If any of the SUPER SYSTEM PACKAGE equipment or programs fail due to faulty workmanship or material we will replace it IMMEDIATELY at no charge!!

Write or Call For Free Catalog and Spec Sheets!!

Add \$50.00 for shipping and handling!!

\$100.00 for Canada, Puerto Rico, Hawaii orders.

WE DO NOT EXPORT TO OTHER COUNTRIES.

Enclose Cashiers Check, Money Order or Personal Check. Allow 14 days for delivery. 2 to 7 days for phone orders. 1 day express mail! Canada orders must be in U.S. dollars. We accept Visa and MasterCard. We ship C.O.D. to U.S. addresses only.

PROTECTO ENTERPRISES (WE LOVE OUR CUSTOMERS!)

BOX 550, BARRINGTON, ILLINOIS 60010
Phone 312/382-5244 to order



YOU MIGHT SAVE \$2.00 TODAY BUYING AN OFF BRAND VALVE COVER GASKET... AT 3,500 MILES IT COULD COST YOU A BUNDLE!

The money you might save buying an off-brand gasket now, could cost you a bundle in as little as 3,500 miles... in lost oil and possible engine damage. Look for the Blue Stripes on FEL-PRO Valve Cover Gaskets. Your assurance of superiority.

FEL-PRO BLUE STRIPE VALVE COVER GASKETS:

- Made from high-quality materials for a better seal
- Free of voids (holes) that allow oil leakage
- Excellent flexibility, won't break in handling.

Do the job right, do it once—buy where FEL-PRO quality sealing products are sold.

FREE! "Get the complete story from the #1 gasket manufacturer on how the value of brand name gaskets benefits you".

MAIL TO: FEL-PRO INCORPORATED

7450 N. McCormick Blvd., Box C 1103, Dept. No. PM-1084, Skokie, IL 60076

Name _____
 Address _____
 City _____ State _____ Zip _____

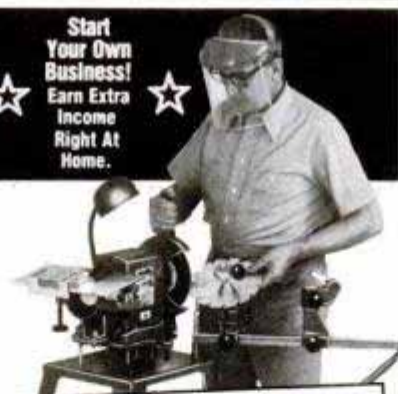
\$12 AN HOUR
YOU CAN EARN UP TO THAT AMOUNT

Sharpen Saws...
...ALL Garden and shop tools for home and industry

Get In On The Profits!

Yes there's plenty of business waiting for the man who can professionally sharpen saws and all types of edge-cutting tools. SHARP-All does them all, and at big profit for you. No inventory is involved... no selling. You earn a year-round Cash income and make 90¢ profit out of every dollar you take in. Work sparetime hours or fulltime right at home, and no experience is needed.

Send TODAY for details of our 30-Day FREE Trial Offer!



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

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

There are **NO franchise fees** of any kind. With Sharp-All **YOU** are the boss... **YOU** set the hours you want to work... you put the profits in **YOUR** pocket.

There is NO OBLIGATION and NO SALESMAN Will Call!



FOLEY-BELSAW CO.
 60394 FIELD BLDG.
 KANSAS CITY, MO. 64111

RUSH COUPON TODAY!

YES, please send me the FREE booklet "Lifetime Security" and full details on your 30-Day Free Trial Offer. I understand there is No Obligation and that No Salesman will call on me.

NAME _____
 ADDRESS _____
 CITY/STATE _____ ZIP _____



FREE BOOKLET!
 Send for your copy today. No obligation.

LIFETIME SECURITY
 with YOUR OWN BUSINESS

If coupon has been removed, just send us a postcard with your name and address to—

FOLEY-BELSAW CO.
 60394 FIELD BLDG.
 KANSAS CITY, MO. 64111

16 VALVES

(Continued from page 158)

cut into the rpm potential of the engine.

The valve pairs are splayed at an angle from the cylinder bore and each other. The angle between them is known as the included angle and is a good guide to an engine's performance potential. Modern engines have a narrow included angle, 45° or less, which results in a shallow combustion chamber that promotes rapid and complete combustion.

A narrow included-valve angle (and the resulting shallow chamber) allow high compression ratios to be reached with a flat-topped piston. Domed piston crowns, required in deep chamber designs for efficient compression ratios, tend to block combustion flame front travel. By design, four-valve heads create high mixture turbulence, and this allows higher-than-normal compression ratios, which further boost efficiency. Honda V4 motorcycle engines use up to 10.5:1 compression ratios, and can still run on regular gas.

Centralized location of the sparkplug, right in the middle of the valve quartet, is also easy to accomplish in this type of combustion chamber. This ups fuel mileage and cuts down emissions simultaneously.

How long before the four-valve-per-cylinder craze sweeps over this country? It's happening now, the ground broken years ago by Chevrolet's daring Cosworth Vega limited production run. Those of you with \$54,000 can already buy a V8 Ferrari 308 GTSi Quattro valvole (which means four valve in Italian). Saab's Turbo 16S, an advancement of the current 900, will be here early in '85 and Mercedes' 190 16-valve the next year. Toyota's four-valve-per-cylinder Corolla is coming on line and has already been shown to the U.S. press. Domestically, Oldsmobile and Chrysler are both working on 16-valve Fours for future production. Jaguar's new AJS Six and the already-awesome Porsche 928 will all be hooking onto the four-valve trend. Ford, Volvo, Maserati and Peugeot each use the design in their competition cars, so we can expect that the lessons they learn on the track may soon trickle down to their consumer cars.

There's bound to be an interim period during which the 16-valve Four becomes the fashionable buzzword of all auto advertising copy, just as front-wheel drive, MacPherson struts and turbochargers served as showroom traffic builders in the past. But we're talking about more than gimmickry here. We're talking efficiency—high horsepower with good fuel mileage and low emissions—that makes the 16-valve Four such a desirable design. **PM**

SUPER UNLEADED POWER



Order direct
the 104 + product
designed for your
engine.

104 + OCTANE BOOST.

12 oz. can — \$9.

SUPER 104 +
OCTANE BOOST.

16 oz. can — \$12.

(Prices include shipping
and handling.)

The new super unleaded gasolines prove what we've been saying for years: to get better performance your engine requires higher octane fuel. Teaming 104 + Octane Boost with these super unleaded gasolines will give your engine super performance potential.

104 + Octane Boost in your super unleaded will put an end to knocks and pings. And prevent detonation damage to pistons, valves and rings. Your engine will run cooler, cleaner, smoother than ever before.

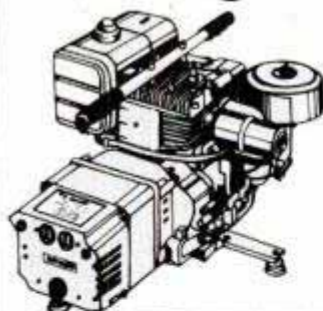
So unleash your super unleaded. With 104 + Octane Boost.

**NEXT TIME,
DON'T JUST FILL UP.
POWER UP!**

OCTANE BOOST CORPORATION
Box 271148
Dallas, Texas 75227



**We save you a trip to the hardware store.
You save gas and money! Order by mail!**



5000 Watt Power Generator

Be prepared should a storm knock out your electricity! Take along the convenience of electrical power anywhere! This excellent quality generator is U.S. made and is powered by an efficient, 4-cycle, 8-hp. Briggs & Stratton gasoline engine.

The rotary field design is 100% copper wound for greater efficiency and longest life. There are no power brushes to arc or replace and full power conduction is assured.

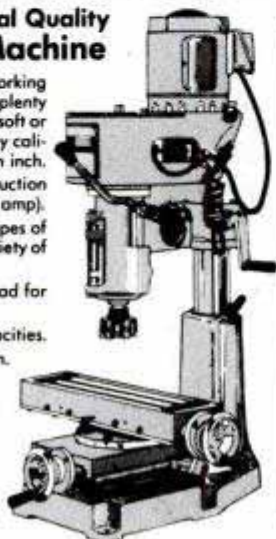
Three convenient plug-in outlets for 120V and 240V service. 5000 watts surge, 4000 watts continuous power. Measures: 24" x 20" x 18". Weighs: 128 lbs.

\$449

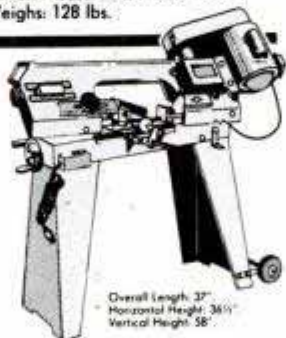
Heavy Duty, Professional Quality Milling/Drilling Machine

Solidly constructed, with a hardworking 3/4-hp. motor, this big 385 lb. unit has plenty of muscle to power its way through soft or hard metals with ease... with finely calibrated accuracy to within 1/1000th inch.

- Single phase, capacitor start, induction motor. 1720 rpm, 110/220V (12/6 amp).
- R-8 collet lets you use different types of milling heads and chucks for a variety of milling and drilling processes.
- Hand crank lever easily raises head for up to 10" of working clearance.
- 3" cutter, 1" drill, 3/4" end mill capacities.
- Five speeds from 240 to 2930 rpm.
- Column rotates 360°. Spindle tilts 30° left, right, fore and aft. Table swivels 45° left and right.
- Bed: 19 1/4" x 5 1/4". Overall 40" H.



\$588



Overall Length: 37"
Horizontal Height: 36 1/2"
Vertical Height: 58"

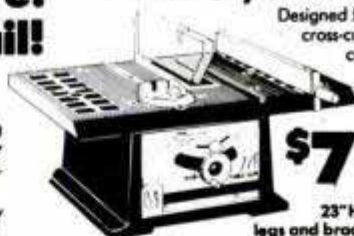
Metal Cutting Band Saw

Designed for full efficiency and operator convenience in either vertical or horizontal position. • All ball-bearing 1/2-hp. motor. • 3 speeds for a variety of metal densities (65, 120, 220 FPM). • Cutting range: 4 1/2" round, 7" rect.

\$166

Bench Style 10" Table Saw

Designed for precision rip-sawing, cross-cutting, rabbet and dado cuts. • 1 1/2-hp. ball bearing motor. • 17" x 26" cast aluminum table. • Miter gauge. • Self-aligning rip fence. • Sturdy steel cabinet.



\$79

23"H sturdy steel legs and brackets for saw: **\$20**



1-800-826-3403



In Wisconsin, or if "800" line is busy call: 1-715-874-5000

Wholesale America, Inc.

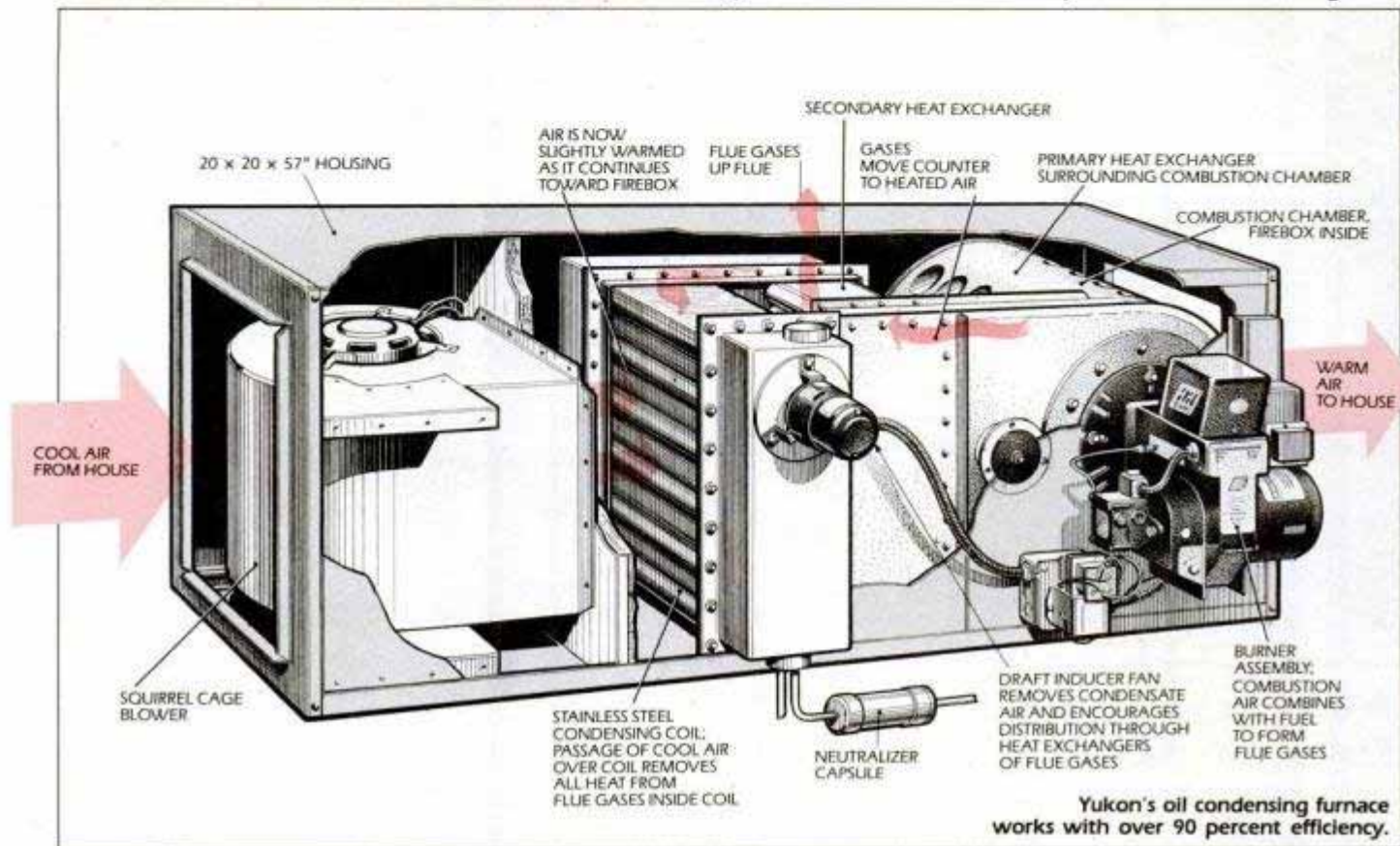
4777 Menard Drive, Eau Claire, Wisconsin 54703

- Order No. 240-1018: Send ___ 5000 Watt Generator(s) at \$449.00 each (shipped freight collect).
- Order No. 240-2402: Send ___ 10" Table Saw(s) at \$79.00 ea. plus \$12.00 ea. for shipping and handling.
- Order No. 240-2363: Send ___ Table Saw Leg Kit(s) at \$20.00 ea. plus \$2.00 ea. for shipping and handling.
- Order No. 240-2952: Send ___ Milling and Drilling Machine(s) at \$588.00 each (shipped freight collect).
- Order No. 240-3029: Send ___ Metal Cutting Band Saw(s) at \$166.00 each (shipped freight collect).
- I've enclosed \$1.00 for latest money-saving Tool Catalog. (Allow 2 weeks for delivery. Add 3 weeks for clearing of personal checks. No C.O.D. orders. Prices for 48 cont'U.S. only.)
- My check or money order is enclosed. (WI add 5% tax.)
- Charge my credit card: MasterCard VISA

Acct. No. _____ Exp. _____
PLEASE PRINT CLEARLY PM-2
Name _____
Address _____
City _____
State _____ ZIP _____
Phone Number _____
Signature _____

Efficient, New HOME-HEATING SYSTEMS

Oil-fired furnaces and boilers now operate with over 90 percent efficiency.



Yukon's oil condensing furnace works with over 90 percent efficiency.

BY JOHN H. INGERSOLL

This year, those of you who use fuel oil for heating your house have an option you didn't have last year when *PM* reported on the first high-efficiency furnaces and boilers (see *Cut Your Fuel Bills Up to 40%*, page 102, Sept. '83). Then we noted that four companies were producing equipment—all fueled by gas—with over 90-percent efficiencies: Amana, Heil-Quaker (also sold by Sears), Hydrotherm and Lennox. Joining that elite group now is GlowCore Corp. However, Yukon Energy Corp. will soon make available a furnace—this one fueled by oil—with over 90-percent efficiency.

Yukon's forced warm-air system has a squirrel-cage blower, combustion chamber and heat exchanger which are conventional. Yukon also employed condensing furnace technology (a highly efficient means of releasing latent thermal energy for use) to add the following: a secondary heat exchanger of

alloyed stainless steel, a stainless-steel condensing coil and a low-CPM draft inducer fan at the flue opening which removes condensate air and encourages the distribution of flue gases through the exchangers (see drawing above).

Here's how it works: Cooled house air goes to the furnace, passing first over the condensing coil which acts as a third heat exchanger; then through the secondary heat exchanger and finally over the primary heat exchanger which surrounds the combustion chamber. As the air moves through this battery of exchangers, it extracts heat from them. This heated air continues into the furnace bonnet, or discharge plenum, into the ducts and finally into the house through the registers. Gases formed at the burner by combustion of air and fuel travel in the opposite direction of the air that's being heated, from the burner to the flue, where they are discharged.

The pass of cool house air over the condensing coil removes the last bit of

heat from the flue gases inside the coil. The vapor condenses and the condensate air is pulled into the flue at a temperature below the dew point (140°F). The slightly warmed air continues over the second exchanger, pulling out some heat, but not enough to condense vapor. Finally, it goes past the primary exchanger.

Since condensate from oil fuel gases tends to be more acidic than flue gases from natural gas, Yukon attaches a neutralizer capsule of calcium carbonate pellets to the condensate evacuation line. This line is usually directed to a floor drain or to a storm sewer, so the neutralizer prevents sewer line damage.

Besides the advantage of reduced fuel consumption, which can be 40 percent, a condensing-mode furnace or boiler does not require a standard furnace flue. Because the flue gas temperature is so low, gases may be directed from the furnace, by means of plastic pipe, through a house wall to the outside.

(Please turn to page 164)

NEW!

Woodmaster Variable Speed Power-Feed

PLANER/MOLDER JOINTER/SANDER



**FREE
30-DAY
TRIAL!**

SAVES YOU MONEY! Put this versatile power-feed tool to work in your own shop. See how fast it **pays for itself!** Quickly converts low-cost rough lumber into valuable finished stock. Turns out perfect quarter-round, casing, base mold, tongue & groove ... all popular patterns ... any custom design. Joints super-true edges, squared stock, bevels and chamfers.

MAKES YOU MONEY! Now you can start your own high-profit business selling all types of millwork to lumberyards, carpenters, contractors, picture framers, do-it-yourselfers. Use it to make grandfather clocks, gun cabinets, furniture, toys, planters, porch swings, benches, paneling, flooring. In fact, this one power-feed tool opens up a truly astonishing range of products you can make and sell.



Jointer lets you move back to planing without changeover.



Produces tongue & groove with one set-up, two boards in same pass.



Turns out high-value, satin-smooth custom moldings plus all popular patterns.



Optional sanding head converts planer to power-feed drum sander!

**FREE
INFORMATION
KIT**



**WOODMASTER TOOLS, INC., DEPT. PP38
2849 TERRACE • KANSAS CITY, MO 64108**

New Sanding Attachment

Quickly converts machine to one of the finest drum sanders available. Consistent power feed eliminates "low spots" and irregularities caused by hand sanding method.

Revolutionary Quick-Change Molding Head!

Exclusive patented design lets you mold up to six patterns in a single pass! Eliminates time-consuming set-ups. Uses low-cost cutterbits. Makes it easy to produce patterns impossible to duplicate on any other planer.

YES! Please rush me your **FREE** Information Kit plus details on your **30-DAY FREE TRIAL GUARANTEE!**

NAME _____
ADDRESS _____
CITY _____
STATE _____ ZIP _____

Copenhagen... It satisfies!

**SPECIAL
LIMITED TIME
OFFER!**



**\$6.95 VALUE
FOR ONLY \$3.00!**

Limited Edition COPENHAGEN Cap Offer!

FILL OUT AND SEND WITH THE DATE CUT OUT FROM THE BOTTOM OF YOUR CAN OF COPENHAGEN AND A \$3.00 CHECK OR MONEY ORDER TO:

**COPENHAGEN GEAR
P.O. Box 729
Sparta, N.C. 28675**

PM 401

I certify that I am _____
years of age.*

NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

ALLOW 4-6 WEEKS FOR DELIVERY.
*OFFER NOT AVAILABLE TO MINORS.

OFFER EXPIRES 12/31/84.

HOME-HEATING SYSTEMS (Continued from page 162)

There are, however, at least two basic caveats about these heating systems: You can contemplate a rise, albeit minimal, in the use of electricity. Second, these units usually cost more.

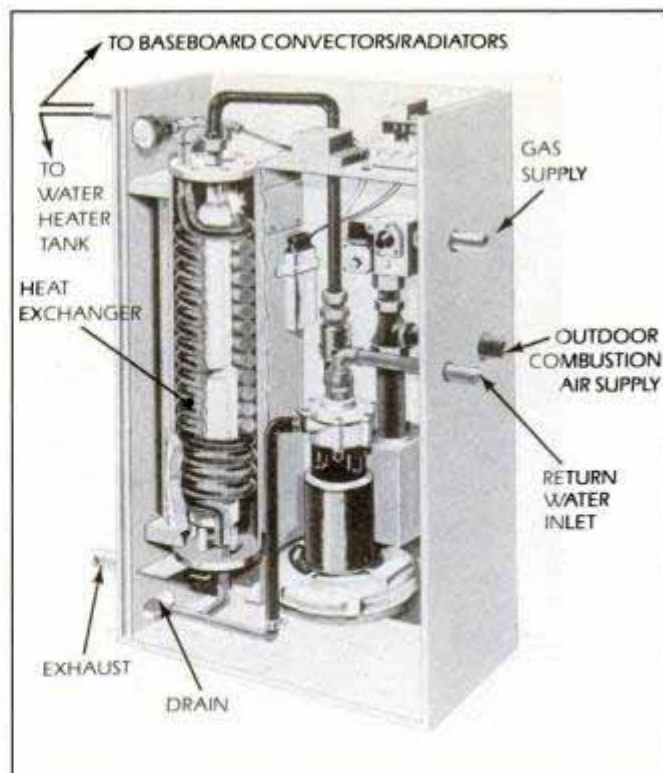
While Yukon is the first U.S. producer of high-efficiency oil-fired furnaces, Flamecor Energy Products Inc. of Canada was the first to install a unit in a U.S. home. Presently, Flamecor's distribution system is only in Canada since the American Society of Mechanical Engineers permits only mild-steel combustion chambers in furnaces sold in the U.S. Flamecor's firebox is stainless steel. You must order directly from the maker (see chart). Flamecor boilers have a domestic hot water heater ready for installation directly below it. Heated water from the boiler is circulated through coils immersed in the domestic hot water tank. Thus, hot tap water and house heat are produced at the same efficiency.

The latest gas, condensing-mode furnace is from GlowCore Corp. The unique feature of this unit is a cylindrical water tank/heat exchanger within the unit that serves as: 1) the heat exchange medium for either hydronic or forced warm-air systems, and 2) the source of heat for domestic hot water.

The heated water in the heat exchanger is in a closed circuit. It heats by circulating water to baseboard convectors (or to a heat transfer coil in a furnace) and through a copper coil in the water heater to heat domestic water, before it returns to the furnace.

Two final notes: While the new Borg-Warner HeatPipe furnace isn't as efficient as condensing units, its initial cost is much lower. And, TRD Corp. is included in the chart below to provide an update on progress of this Rankine-turbine-driven furnace, which needs no electricity.

FM



The heat exchanger in GlowCore's gas boiler warms water that goes to baseboard convectors which heat the house, and to the hot water tank to heat domestic water for home use. As the water cools, it returns to the boiler.

HIGH-EFFICIENCY HEATING UNITS: CONSUMER INFORMATION

COMPANY	PRODUCT NAME	SYSTEM	FUEL	EFFICIENCY	INSTALLED COST	AVAILABLE	NOTES
Borg-Warner Central Environmental Systems Inc. Box 1592 York, Pa. 17405	Borg-Warner HeatPipe Furnace	Forced warm air	Gas	84.6% AFUE*	About \$1,400	Now	The HeatPipe furnace stops just short of the condensing mode. B-W claims better economies because of lower initial cost.
Flamecor Energy Products Inc. 99 Bruce Crescent Carleton Place, Ont. K7C3T3	Flamecor	Hydronic, forced warm air, or both	Oil, gas or propane	Up to 96% AFUE, although company says that during operation, range is between 90% and 96%	About \$2,500, including duty and difference in U.S. and Canadian exchange rate	Now	System has capability of burning oil, gas or propane. Combustion chamber is made of stainless steel. Buyers must deal directly with Canadian office. Boiler or furnace is delivered with domestic hot water heater.
GlowCore Corp 700 Liverpool Dr. Valley City, Ohio 44280	GlowCore	Hydronic or forced warm air	Gas	Over 90% AFUE, according to GlowCore; exact percentage not certified at press time	About \$2,000	Now available in Midwest; working toward national distribution	Both boiler and furnace also provide heat for domestic hot water. Thus both house heat and hot water at the tap benefit from high efficiency.
TRD Corp. 5181 W. 161st St. Cleveland, Ohio 44142	TRD	Forced warm air	Gas	83.9% seasonal (based on Honeywell's H-Flame modeling program)	No estimate yet	Estimate 1987-88 delivery	Modest 83.9% efficiency, but system uses no electricity, thus saving power in addition to conserving heat loss. Done with Rankine turbine, which turns with vapor pressure produced by gas-heated fluid (see <i>Cut Your Fuel Bills—Up To 40%</i> , Sept. '83, page 102).
Yukon Energy Corp. 9890 N.E. Highway 65 Minneapolis, Minn. 55434	Ultima-EX95	Forced warm air	Oil, gas	93.5% steady state; company estimates that AFUE will be only slightly less, since off-cycle losses are low	\$2,200 to \$2,500	Estimate fall 1984	Current model is a horizontal unit, one of few on the market. Standard upflow version anticipated for market in 1985.

*AFUE (Annual Fuel Utilization Efficiency) expressed in percent is a ratio of: Annual Output Of Useful Energy Delivered To The Heated Space ÷ The Annual Fuel Energy Input To The Furnace (Boiler). The ratio is determined according to Department of Energy furnace test procedures.

If you like to build things, NRI can show you how to make money building homes.

Learn professional contracting techniques at home in your spare time with NRI's new Building Construction Course.

Within the next 10 years, this country will need 18 million new homes... and the contractors to build them. Right now, there's heavy demand for remodeling and renovation experts. And NRI can get you ready... teach you everything you need to know, get you ready for management and supervisory jobs, even your own business.

Learn to Read Plans, Estimate Costs

We start you right at the beginning, with key lessons on site selection and planning. Then, you learn to lay out a home, read blueprints, and estimate costs accurately. Working with a complete set of plans for an NRI energy-efficient home, you get experience in every stage of construction.

Learn Professional Secrets

You're trained to work with all the trades. You learn the basics of carpentry, masonry work, electricity, plumbing and heating, and more. And because you know what it takes to do the job, you know what to look for when supervising and inspecting.

Training Built Around Energy-Efficient Home

You learn better because NRI training is practical training. You get over 100 action projects from

scale-model construction to building actual framing sections. Lessons and projects are coordinated with a contemporary energy-efficient home designed especially for NRI. You keep these plans to build your own home or select from more than 50 low-cost optional plans.

Includes Regional Seminar

As an exclusive service, graduates may participate in optional owner/builder seminar. You'll get expert advice on local building codes and conditions, meet builders, learn more about energy efficiency, receive tips on financing. There'll be demonstrations, insider info on remodeling, hands-on programs to take part in.

Send for Free Full-Color Catalog

Get all the facts on this big new opportunity. Send the coupon for your free copy of NRI's Building Construction Catalog. Now is the time to build a future for yourself! If coupon has been removed, write to NRI Schools, 3939 Wisconsin Avenue, Washington, D.C. 20016-9973.

OWNERS REPORT: JEEP

(Continued from page 80)

sions tended to grouse a little about a shortage of horsepower. "I have the V6 Wagoneer, but my main complaint," stated a New Mexico researcher, "is that with three or four people plus cargo, the engine has to strain to keep up with traffic, especially on hills."

Chevrolet supplies the optional 2.8-liter V6, and AMC's automatic transmissions are made by Chrysler Corp. Relatively few people in our survey had ordered the V6—only 8 percent—but the majority owned cars with automatics (68.6 percent). The lack of power was formally noted by only 8.8 percent of our respondents, so it's not really that big a thing, and we heard plenty of comments like the following:

"After owning a 1968 CJ-5 for 10 years," commented a New Hampshire electrician, "I was a little leery about going from the V6 to a Four, but I find the Cherokee engine to be very peppy. I've had no trouble, even in passing. The first week I owned it, I drove the Cherokee to the top of Mount Washington. It came through with flying colors. It's also very good in snow."

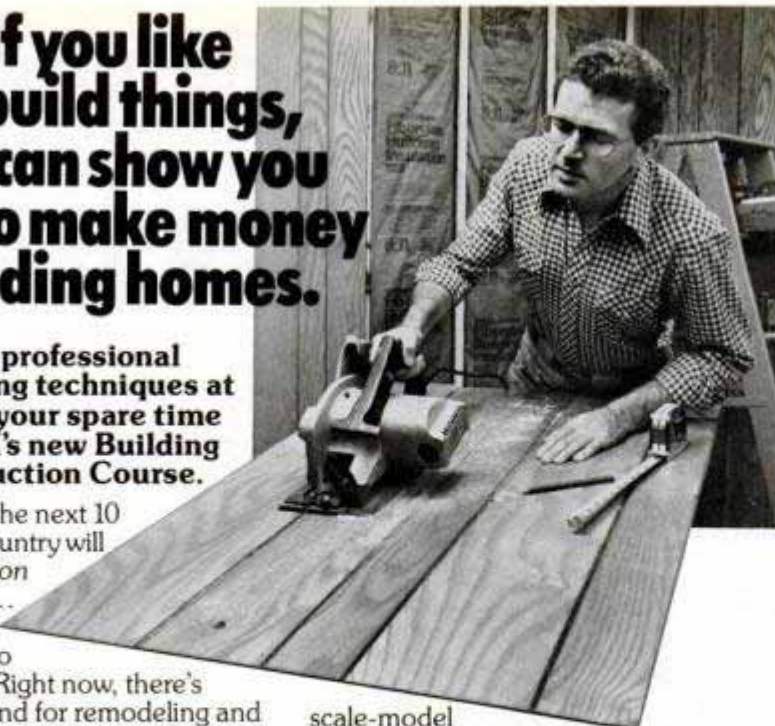
And an Ohio food service director agreed: "Responsive 2.5-liter Four in the Cherokee has a lot more punch than the 2.0 in the Blazer."

Fuel mileage

Another instance of mild disappointment came when fuel mileage didn't match up to the EPA estimates. They never do, of course, but 15.5 percent of our respondents complained about the size of the gap. The EPA feels that the thriftiest Cherokee should deliver 24/33 mpg city/highway. In our survey, the best figures realized with any engine/transmission combination came to 20/25. This was with the ohv Four and four-speed manual. The automatic transmission ate up another 3 mpg.

Then, too, a vociferous minority grumbled about slow, inept service and long waits for parts. Just over 37 percent rated dealer service average to poor, and that's not good. Some blamed their dealer's uncaring attitude on the fact that AMC wasn't his main line. "He's mainly a Ford dealer," opined a Texas manufacturer, "and to him Jeeps are a pain."

On the whole, however, most owners sounded more than pleased with their SportWagons. A New York homemaker summed it up: "The Cherokee Pioneer is, I think, the most beautiful 4wd vehicle on the road. Its sharp interior has a modern design that's still warm and comfortable. I was given an excellent trade-in, the dealer was and remains helpful and, as you've guessed by now, I love my Jeep!" **PM**



NRI Schools
McGraw-Hill Continuing
Education Center
3939 Wisconsin Avenue
Washington, D.C. 20016-9973



Please rush me the one free catalog I have checked. I understand there is no obligation.

- Building Construction
- Air Conditioning, Refrigeration & Heating Courses with Solar Technology
- Automotive Mechanics
- Small Engine Service & Repair
- Electrical Appliance Servicing
- CB/Communications
- Color TV/Audio/Video Servicing
- Computer Electronics Including Microcomputers
- Industrial Electronics
- Data Communications
- Industrial Control & Robotics

All career courses approved under GI Bill.
 Check for details

Name _____ (Please print) Age _____

Address _____

City/State/Zip _____

Accredited by the Accrediting Commission of the National Home Study Council

FREE!



Radio Shack's Advanced Technology Radar Detector Brings Satellite Engineering Down to Earth

The Micronta Road Patrol® XK Superhet is the first of a whole new generation of radar detectors. With it you get incredible range, up to ten times the distance of conventional detectors. And it detects all types of speed radar from every direction. Around curves. Over hills. Even from behind you. It's by far the longest-reaching protection you can get on the road.

A unique GaAs (gallium arsenide) Schottky Barrier Diode front end makes it all possible. It's the same advanced technology that detects a satellite TV picture through over 25,000 miles of space. Just think of what it can do for you on earthbound roads and highways.

The XK Superhet is extremely quiet until an authentic signal is received, thanks to the most advanced filter circuit on the market today. Interference caused by other radar detectors is virtually eliminated.

And Micronta's exclusive triple warning system lets you choose your own alert signals. Select the flashing caution light and/or Geiger-type audio alarm. Or you can monitor signal strength on the sequential LED bargraph display. Any way you choose, you'll always be alerted to speed radar before it's aware of you.

Come see it today. Our new radar detector with satellite technology is at a down-to-earth price, too. Just \$199.95. And you can use your Radio Shack/CitiLine credit card.



Radio Shack®
A DIVISION OF TANDY CORPORATION

GET YOUR FREE 1985 CATALOG

Mail to Radio Shack, Dept. 85A-272,
300 One Tandy Center, Fort Worth, TX 76102

Name _____
Address _____ Apt. # _____
City _____ State _____ Zip _____

Price applies at participating Radio Shack stores and dealers.
Not sold where prohibited. Use may be regulated by state or local laws.

NORTHERN HYDRAULICS

8 TON ELECTRIC LOG SPLITTER

NEW!

Item# 1110

**ONLY
\$525!!!**

1 1/2 HP Briggs vertical electric motor, with 1.6 GPM 1 stage pump, 3 gallon hydraulic reservoir, in-tank suction strainer, heavy duty beam & slide with grease zirks (Will ship 48 states \$35 prepaid with order) **SOME ASSEMBLY REQUIRED**

12 1/2 TON HOMEOWNER SPECIAL

**ONLY
\$749!!!**

Item# 1125

The Best 12 1/2 ton splitter on the market! Designed for easy operation and minimal service. 25,000 lbs of splitting force! Powered by a 5 HP engine with 11 GPM 2 stage cast iron pump.

(Will ship 45 states \$55. Cal., Oregon & Washington, \$65 Prepaid with order)

LOG SPLITTERS 15 1/2 TON HIGH PROFILE

(Will ship 45 states \$80, Cal., Oregon, & Wash. \$95 prepaid with order)

**ONLY
\$869!!!**

#1130

Our most popular model! 31,000 lbs. of force! The 27" work height saves on your back! This is a \$1400 value at a super low price! Catch it!!

MORE SPLITTERS!

12 1/2 TON	.....Low speed wheels! Item # 1128.....	Only \$729
15 1/2 TON	.....Low Profile Splitter Item # 1132.....	Only \$869
15 1/2 TON	.....Vertical Splitter Item # 1160.....	Only \$1190
15 1/2 TON	.....3 Point Hitch Vertical Splitter Item # 1156.....	Only \$649
24 1/2 TON	.....Low Profile Splitter Item # 1142.....	Only \$1399
24 1/2 TON	.....Vertical Splitter Item # 1162.....	Only \$1895
24 1/2 TON	.....High Profile Splitter Item # 1140.....	Only \$1599
35 TON	.....Commercial Timber Splitter Item # 1170.....	Only \$4075

LOG SPLITTER PARTS



11 Gal. 2 Stage Pump \$109
Use with 5 HP Motor #1011

13 Gal. 2 Stage Pump \$127
Use with 5 1/2 HP Motor #1013

16 Gal. 2 Stage Pump \$157
Use with 8 HP or larger motor #1015

22 Gallon Pump \$247
Use with 10 HP or larger motor #1017

Standard Control Valve \$43.75
Built in relief valve #2010

Detent Valve \$58.50
Pressure sensitive detent. You don't have to hold handle on return stroke! #2020

8" High, 6" Deep Wedge \$23
Item # 3060

Hydraulic Filter \$12.95
To 20 gallon/min #4020

3 1/2" x 24" x 1 1/2" Welded Cylinder \$133.50
Item # 905516

4" x 24" x 2" Welded Cylinder \$115
(Can Go UPS) Item # 902424

5" x 24" x 2" Tie Rod Cylinder \$222
Ship wt 100 lbs. Item # 909524

CHAIN SAW SHARPENER

Lightweight and powerful, reaches 14,000 RPM, powered by 12 volt battery. (Not included) Durable ball thrust bearing for long life!

(Will ship 48 states for \$2)



Item# 15081....Lists for \$24.95....Only \$16.75

CHIMNEY CLEANERS

These cleaners are designed to provide the best and least expensive method for cleaning the inner walls of chimneys where soot and other deposits accumulate.

These cleaners List for \$32.50!

Item#	Type	Fits	SALE PRICE
1540	Round	6-11"	\$21.50
1541	Square	6-11"	\$19.50
1542	Rectangular	6x10", 7x11" 8x12", 9x13" 10x14"	\$29.95

(Will ship 48 states for \$2.50)



HOMELITE XL-14 CHAIN SAW

Two cycle, 1.6 cubic inch, auto-chain oiling, solid state ignition, 14" bar. You can't find a saw of this quality at a price like this!

Item#	Sh.Wt.	List	Sale Price
1920	12Lbs.	\$189.95	\$114.00



MANY SIZES & MODELS AVAILABLE!!!



Oregon Chain Loops

This is standard "Chipper Chain" available in 3/8" pitch, with .050 (72DP10) & .058 (73DP10) gauge. Please specify length on your order.

Item#	Bar Length	Gauge	Sale /ea.
1951	14-17"	.050	\$10.75
1952	14-17"	.058	10.75

For Chisel Chain add \$2.00 per loop

**WE HAVE
ALL SIZES**

**USE COUPON
AT RIGHT
FOR YOUR**



DISCOUNT PARTS & EQUIPMENT

PRICES GOOD THRU OCTOBER 31, 1984!

GAS ENGINES

(Horizontal)

- 5 HP Tecumseh 3/4" shaft #6051..... \$134
 5 HP Briggs 3/4" shaft #6053..... \$144
 8 HP Tecumseh cast iron sleeve #6081..... \$186
 10 HP Tecumseh cast iron sleeve #6010..... \$224
 10HP Tecumseh 1" shaft electric start #60101 \$269
 3 to 20 HP Horizontal & Vertical available at discount prices!

SAVE UP TO 50%



UTILITY TRAILER KIT

Complete road ready kit. Easy assembly with basic tools. Load capacity 1060 Lbs. Bed size 40" x 48" overall width 46 1/2"

Item #12542
List \$279

Sale \$165

(Will ship 48 states for \$25)



(Includes Fenders!)

GENERATORS

- 4000 Watt**
 8 HP Briggs, 33 amps @120 volts. 16.6 amps @240 volts. Item #16402
 List \$1,009 Sale Price \$485
- 5000 Watt**
 11 HP Briggs, 42 amps @120 volts. 21 amps @240 volts. Item # 16404
 List \$1124..... Sale Price \$699
 Electric start available for both models



(Will ship 48 states for \$45)

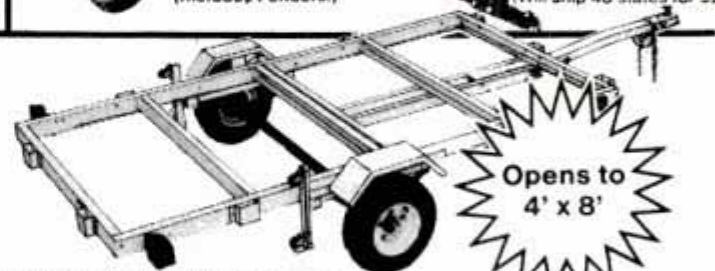
Folding Utility Trailer

Designed for consumer and commercial use. Takes a full 1000 lb. load. Folds to a compact 5' 3" width, 6' height, 2' depth. Tilting bed. Heavy-duty 13 gauge steel frame with baked on enamel finish. Stop and turn signals with red reflector included.

(Some Assembly Required)

Item # 1257..... **\$269.95**
 (Will ship 48 states \$40)

Opens to 4' x 8'



- 750 WATT** Quiet Kawasaki 1.7 HP. 4 cycle engine. 120/240 volt dual receptacles. Item #16401..... **\$289**

LEATHER PALM WORK GLOVES

LEATHER PALM WORK GLOVE
 Item #1701..... **SUPER SALE PRICE**

Only \$2.50/pr
 \$24.60/dz



TARPS

Constructed of polyethylene. Rust proof grommets every three feet. Will not rot or mildew.

ITEM	SIZE	WT.	PRICE
1770	6X8	3 Lbs.	\$4.75
1771	8X10	4 Lbs.	6.85
1772	10X12	4 Lbs.	10.75
1774	12X20	11 Lbs.	20.00
1776	20X30	23 Lbs.	50.00



Strong Tarps
 Other sizes available

TRAILER PARTS

TRAILER WHEELS



4 hole or 5 hole are interchangeable with nearly all standard trailers. All include valve system.

ONLY!

8 inch
\$8.75

12 inch
\$11.50



TRAILER COUPLERS

- 2"channel, fits 1 1/2"ball. 2000 lb. capacity. Item# 1280..... **\$6.45**
 3"channel, fits 2"ball. 3500 lbs. capacity. Item# 1281..... **\$9.75**
 2 7/16"channel, fits 2"ball. 5000 lb. capacity Item# 12811..... **\$16.90**

HIGH SPEED HUB & SPINDLE SET

2,000 lb. capacity. Set has 4" bolt circle, 4 hole, 2 hubs, 2 spindles, dust caps, tapered bearings, lug bolts and cotter pins.



ONLY \$37.50 SET

HIGH SPEED TRAILER WHEELS AND TIRES

Fits all 4 hole boat and snowmobile trailers! **SALE!**

Item#	Size	Ply	Cap	Price	Tire Only
1211	480x8	4	590	\$19.95	\$15.50
1212	570x8	4	715	\$33.00	\$22.00
1216	480x12	780	\$36.00	\$29.00	

(OTHER SIZES AVAILABLE)



TRAILER SPRINGS

Width of spring is 1 1/4", with eye center of 25 1/2"

Item#	Capac.	Springs	Leaves	Price/pr
1250	1000Lbs.	2	2	\$22.00
1251	2000Lbs.	2	3	\$24.00
1252	3000Lbs.	2	3	\$27.00
1253	4500Lbs.	2	4	\$29.00

Single Spring Shackle. Item#1255..\$10.00/set

AIR COMPRESSORS

Campbell Hausfeld Power Pro Air Compressors

Comes complete with 15 feet of air hose and tire chuck.

Specs	1/2 HP	1 HP	2 HP	3 HP
No. of Cylinders	2	2 Twin	2 Twin	2 Twin
Tank Size	7.5 gal	11 gal	20 gal	30 Gal
Max Pressure	100 PSI	100 PSI	100 PSI	125 PSI
SCFM @40 PSI	2.7	7.2	7.6	9.7
SCFM @90 PSI	2.0	5.6	6.1	8.0
Voltage	115V	115/230V	115/230V	230V
Item No	15949	15951	15952	15953
Ship Wt	65 lbs.	105 lbs.	155 lbs.	165 Lbs
List Price	\$140	\$520	\$710	\$799
Our Discount Price	\$189.00	\$279.00	\$399.00	\$472.00

5 Hp., 60 Gallon Vertical Air Compressor,
 List 1160.00 Item# 15954..... **\$599.95**

We also carry air tools & accessories.



ORDER TOLL FREE 1-800-533-5545

Send for free catalog or send \$6.00 and receive catalog and splitter design booklet.

Mail To: Northern Hydraulics
 901 E. Cliff Rd.
 Box 1219
 Burnsville, MN 55337
 Dept. 90104

Name _____
 Address _____
 City _____
 State _____ Zip _____

Please rush me my FREE Discount Catalog!

Use your Mastercard or Visa



NH Northern Hydraulics



We Ship UPS, Bus or Truck

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

- Log Splitters & Parts
- Air Compressors and Tools
- Gas Engines and Generators
- Trailer Parts and Tarps
- Lawn and Garden Power Products

How To Put A NEW FLUE In An Old Chimney

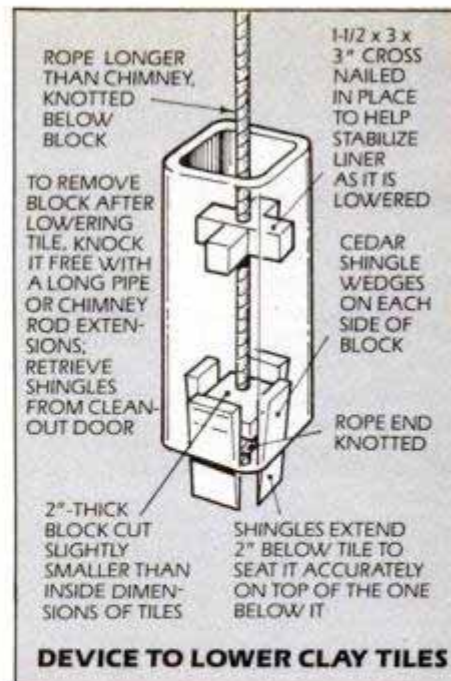
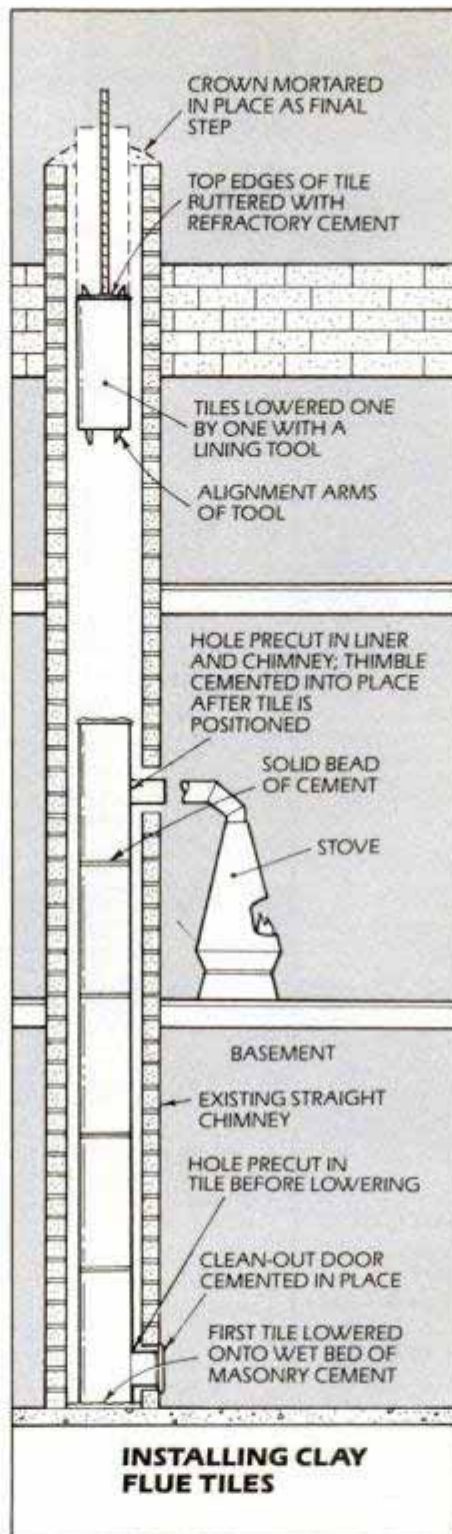


A liner installed in your chimney can promote combustion and reduce creosote buildup.

BY MARK McCAIN

There are two reasons for installing a new chimney liner: First, chimneys deteriorate as they age. Operation may become inefficient, if not dangerous. Especially in cases where a chimney was not originally lined, installing a liner can be a more practical, economical alternative to rebuilding a chimney. Second, if you plan to hook up a wood stove to a chimney—lined or unlined—that was formerly used to vent a fireplace, you can improve draft and reduce creosote buildup by installing a liner of the same size as the stove's rear vent.

There are three types of flue liners to choose from: clay flue tiles, stainless-



al \$150 for a rain cap, tees and other essentials. Since stainless steel pipe needs to extend down from the roof only as far as the appliance it serves, it can be a real moneysaver if you're installing a stove on an upper floor. Never substitute galvanized stovepipe for stainless steel when lining a chimney.

The third option is having a molded concrete liner installed by a contractor. Costs vary from \$25 to \$60 a foot. One method involves inserting an inflated tube down the entire length of the chimney and pouring cement slurry around it. After the slurry hardens, the tube is removed, leaving a round or oval flue. Another method for molding a flue involves dumping a putty-like mixture into the existing flue and cranking a vibrating cone up through the passage from the bottom to compact the material. The resulting flue is coated with glaze.

Both molding methods can produce a continuous, well-insulated flue, but the training and skill of contractors vary widely. Royal Edwards, technical director of the National Chimney Sweep Guild, says, "You should ask (your contractor) a lot of questions first, for instance, 'How do you ensure adequate wall thickness throughout the flue?' At every bend, the contractor should break open the chimney to make sure the liner is well positioned. He's flying by the seat of his pants if he does anything else."

Inspect your chimney

Inspect your chimney carefully before selecting any lining method. A molded liner will strengthen a chimney, but deteriorated sections may be displaced by pressure during installation.

(Please turn to page 172)

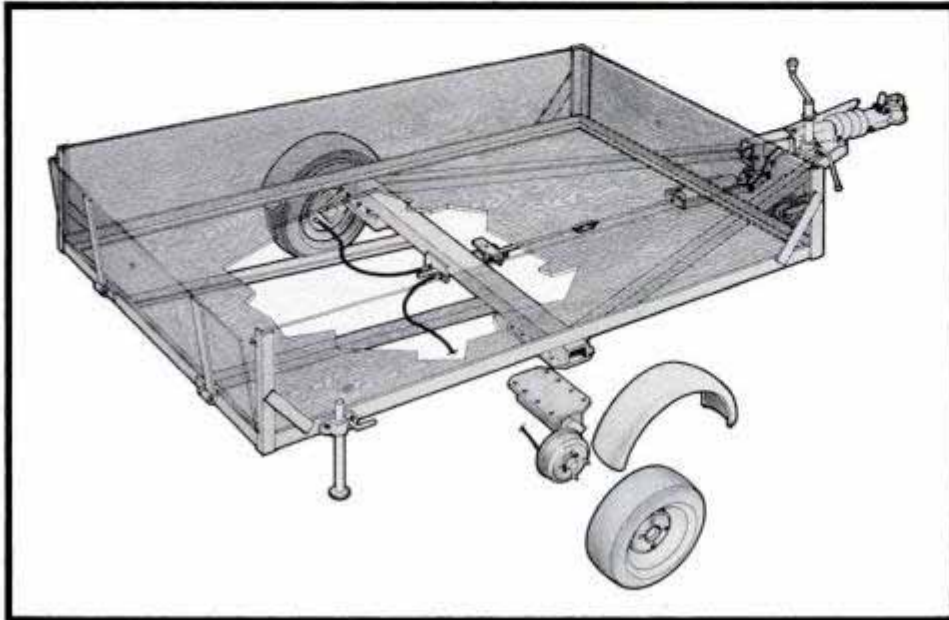
steel pipe and poured in place refractory cement.

At about \$5 per foot, clay tile can't be beat for economy. The fire-hardened terra-cotta tiles are available with apertures in several standard sizes, usually in 2-ft. lengths. Clay tiles work well only in straight chimneys and can be awkward for homeowners to install.

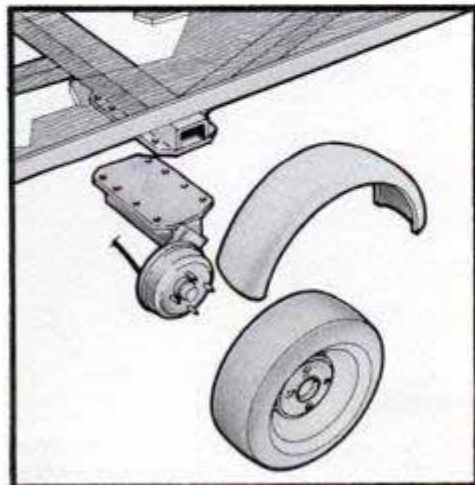
Stainless-steel pipe is manufactured in rigid sections which work well in straight chimneys, and flexible coils can be snaked through chimneys with bends. Two people can usually install a stainless-steel liner in a day for about \$10 a foot. Expect to lay out an addition-

Complete trailer kits, parts, and accessories...

Build-it-yourself with the Trailer Works®



We are now offering the world's largest selection of build-it-yourself utility, boat, motorcycle, snowmobile, car transport, and horse trailers. We've got a complete line of trailer parts, accessories, plans, and even a comprehensive Build-It-Yourself Trailer Manual. Whether you're planning on building a kit, or a complete trailer from the ground up, we can help. We're the build-it-yourself trailer company...we're the Trailer Works.



Independent Torsional Systems eliminates the need for costly leaf spring suspension.

Trailer Works build-it-yourself trailer kits.

The Trailer Works manufactures the most complete line of build-it-yourself trailer kits available anywhere. You can choose from over 22 different models of utility trailers, ranging in size from a 4' x 3' all the way up to an 8'6" x 5'3"; 12 different boat trailers, including everything from a hand launcher to a 14' x 5' version capable of handling an 18' boat with a 7' beam. We've got motorcycle trailers, snowmobile trailers, car transport trailers, horse trailers, and more.

Trailer Works parts and accessories.

And if you want to do-it-yourself from scratch, we've got parts and accessories for every size and type trailer imaginable. Building from our patented Indespension® Suspensions, a revolutionary approach to trailer systems employing independent rubber torsional suspensions. We've got chassis and brakes, lighting packages and fenders, couplers, cables, rollers and pads, ladder

racks, jockey wheels, nuts, bolts, and clamps. And that's not all!

Trailer Works plans.

In addition to stocking everything you need to build your own trailer, the Trailer Works has a complete inventory of trailer plans and assembly instructions designed to assist you at each stage in the assembly process. Detailing everything you need to know to build a Trailer Works kit, or even fabricate your own chassis, the Trailer Works has the answers with copyrighted material developed specifically for the do-it-yourselfer.

Build-it-yourself with the Trailer Works.

If you're thinking of building your own trailer, you need to talk to the Trailer Works...today. Send in \$3.95, and we'll rush you a copy of our Build-It-Yourself Trailer Manual. It's a 100 page book detailing everything you need to know to build, own, and operate a trailer. And if you write us today, we'll include a coupon worth \$3.95 off your first order.



the build-it-yourself trailer company.

Please rush me a copy of the Trailer Works Build-It-Yourself Trailer Manual.
 Check or money order for \$3.95 enclosed.
 Please charge to my MasterCard/Visa
Account # _____ Exp. Date _____
Signature _____
Name _____
Address _____
City _____ State _____ Zip _____
Mail to: The Trailer Works
Department 103, P.O. Box 39164
Detroit, Michigan 48239

HOW TO PUT A NEW FLUE IN AN OLD CHIMNEY

(Continued from page 170)

No liner will save a crumbling chimney.

Start your inspection in the basement. Check for cracks, missing mortar, crumbling and loose bricks, creosote

leaks and traces of overheating in structural members adjacent to the chimney. You should look for bends, narrow sections and protruding bricks by inserting a mirror through the flue clean-

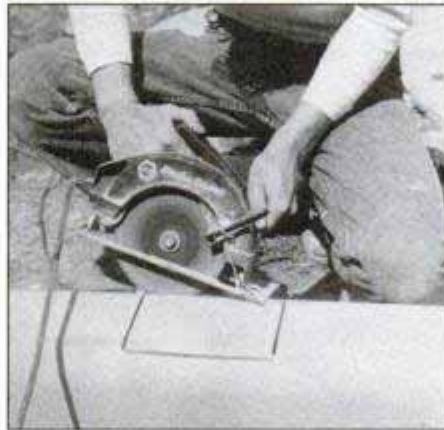
out door and directing it upward on a sunny day.

If you plan to install a clay or stainless-steel liner yourself, first ascertain whether it will fit. Secure a rope to a

INSTALLING CLAY FLUE TILES



Inspect clay flue tiles before purchasing. All the tiles that you select should have identical inside dimensions and should be free of any warps and cracks.



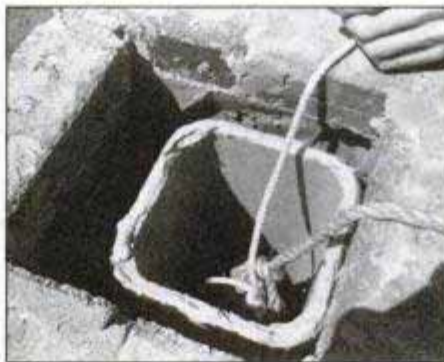
Cut holes in tiles that will align with cleanout and thimbles using masonry-cutting blade. Dimensions of cleanout door frame and thimble diameter determine cutouts.



Metal arms of Chimney Tile Aligner tool are slipped inside tile. Outward pressure of arms holds tile as it is lowered. A sharp tug on rope releases the tool.



The first tile, precut with a hole for the cleanout, is lowered into a wet concrete bed at base of chimney. The scaffold is from CTA Corp. (See manufacturers list.)



Top edge of each tile is buttered with refractory cement before being lowered. Tiles must seat perfectly on top of one another to create a continuous seal.



A 2 in. deep crown of masonry cement sloping away from flue is created to stabilize liner and prevent rainwater from seeping into chimney where it can cause damage.



For an airtight seal, masonry cement is applied around the cleanout hole in the liner. Then, a cast-iron frame for the cleanout door is mortared into the proper position inside the fireplace.



A galvanized steel thimble for hooking up the stovepipe is inserted into a pre-cut hole in the tile, exactly flush with the inner flue wall. The space around the thimble is then sealed with mortar.



A final brick is tapped into the hole which was broken in the wall for thimble installation. The two layers of brick that surround the thimble protect the wall's wood structural members from intense heat.

liner section (or a weighted can of the same size) and lower it down the chimney. It should reach the chimney base unimpeded. Measure the length of the rope used to lower the can to estimate the amount of liner you need. Measure the inside dimensions of the chimney at both the top and bottom. Draw a diagram of the chimney and show it to a chimney sweep or mason. Ask a building inspector about local regulations and inspection requirements.

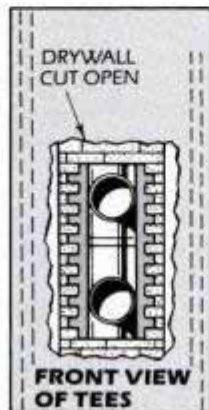
Installing a clay tile liner

To install a clay liner, you will need premixed refractory cement and ma-

sonry cement in addition to the tiles themselves. Choose the flue tiles carefully. It is not unusual to pick through a stack to find tiles varying in inside dimensions by as much as 1/2 in. Choose tiles that are all the same size and free of cracks and warping. Before you start installing tiles, close off any unused stovepipe openings with bricks and mortar.

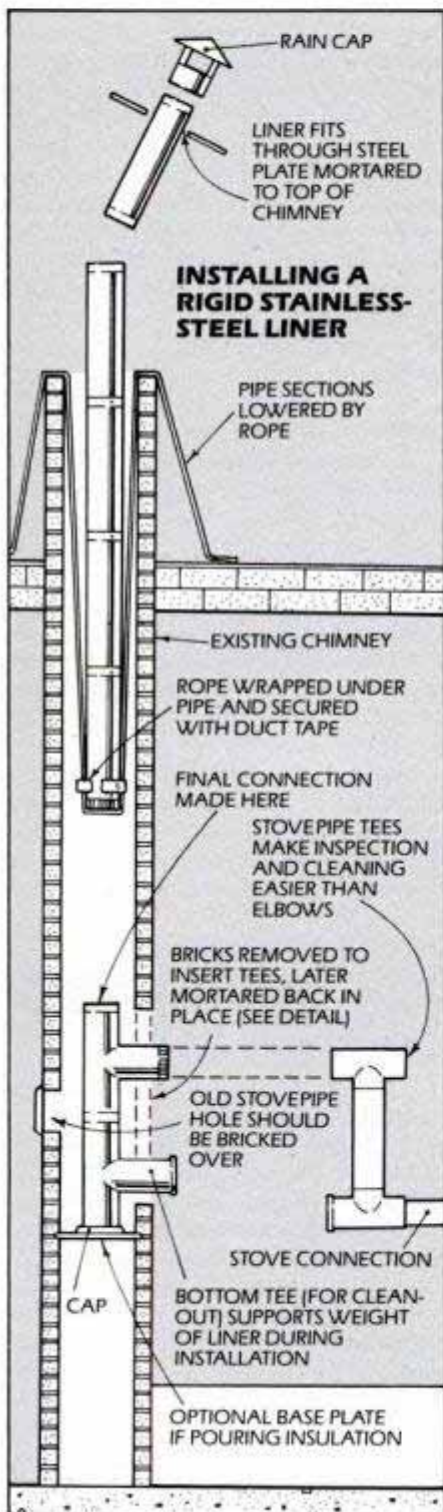
If you're installing a wood stove in a new location, you'll need to install a *thimble*—a heavy-gauge steel pipe that leads through the chimney wall into the liner. After deciding on the thimble location, cut through the wall finish

material in the area and use a hammer and cold chisel to break out enough bricks to accommodate the thimble. Also break into the chimney in any places where internal repairs are necessary and where you must remove obstructions or create an opening for a



cleanout door.

Using a circular saw equipped with a masonry-cutting carborundum wheel, [\(Please turn to page 174\)](#)



A standard installation of a stainless-steel liner requires components shown above: Raincap is attached to rigid section fitted to tee, thimble and base cap. Individual rigid sections are also shown (right).

SUBURBAN GARDENERS:

At Last! A Small Tiller That Works!



Forget about big, clumsy, yank-you-along tillers ... forever!

The Mantis tills and weeds a *sensible* 6"-9" wide (not 20" or more like big tillers). Mantis weighs just 20 lbs. (not 200 to 300 lbs.). Mantis' engine is so durable we give you a *lifetime replacement* agreement. The secret is *speed*. Mantis' 36 "tine teeth" spin at 240 RPM (*twice* the speed of big tillers)! As a result, Mantis' tines go through tough soil like a chain saw goes through wood. *No jerking ... no yanking you along ... and Mantis turns on a dime!* Mantis also has a variety of *useful* attachments. Tiller. Cultivator. Furrower. Edger. Lawn Aerator. Lawn De-Thatcher. Hedge Trimmer. Best of all, Mantis costs a *fraction* of what you'll pay for a big tiller. *Put the fun back in gardening!* Join the move to Mantis!

4 Reasons to Buy in October

- 1) Beat the upcoming price increase
- 2) New 1985 models with electronic ignition now ready
- 3) Turn your garden into a "living compost pile" for super-rich soil next season
- 4) Last chance to get a FREE \$41.00 Border Edger!

**OCTOBER BONUS:
FREE \$41.00 EDGER**

Mantis Mantis Manufacturing Co.
1458 County Line Rd., Dept. 548
Huntingdon Valley, PA 19006

Please RUSH me more information on the Mantis Tiller/Cultivator and FREE Edger!

Name _____

Address _____

City _____

State _____ Zip _____

LEARN COMPUTER REPAIR



**Train at home in spare time...
No previous experience needed**

Sales of small computers are running over a billion dollars a year. That's why a whole new business is starting up—devoted entirely to small computer repair. And right now is the time to get in on the ground floor—either working for someone else or in your own computer repair business.

Start making money in electronics

No need to quit your job, change your daily routine or take time from family responsibilities. And you don't waste time going to and from class because you train at home in spare time.



You receive microprocessor trainer, digital V.O.M. and much more included with course.

The ICS Microcomputer Repair Course is designed for beginners—people with no previous experience who want to get started fast. And you should be ready for an entry-level job repairing small computers even before you finish this course.

Experts show you what to do... how to do it! We start you fast with the basics, and everything is explained in easy-to-understand language complete with plenty of diagrams and drawings.

**GET INTO
SMALL
COMPUTER
REPAIR**

SEND FOR FREE FACTS!

ICS School of Computer Repair, Dept. PB094
SINCE 1981 Scranton, Pennsylvania 18515

Send free facts and color brochure telling how I can get into computer repair at home in my spare time. No obligation. No salesman will call.

Name _____ Age _____
Address _____
City/State/Zip _____

**Our 12th year
cut FUEL bills**
Modernize your fireplace with
HEARTH AID II
America's favorite fireplace
heat exchanger

Increases Heat Output by 500%

- *Custom Fit to any Fireplace.
- *Easy to install. No tools required.
- *Thermostatically controlled, works automatically.
- *Super Efficient titanium stainless Heat Exchanger.
- *Best Value. No extras to buy.
- *No dangerous Creosote Buildup.

And best of all you can enjoy your fireplace while saving on your heating bills because with Hearth-Aid II * you don't need to sacrifice your fireplace's appearance or the delight of an open fire to be energy efficient.

For Free Information, Write or Call:
**Thermalite Dept. PM, 120 Holiday Ct.
Franklin, Tn. 37064
Nationwide Toll Free: 1-800-431-1953
N.Y. Only: 1-800-942-1935**

NEW FLUE IN AN OLD CHIMNEY

(Continued from page 173)

cut a rectangular hole in the tile that will line up with the cleanout door. To make a circle cut for a thimble, first scribe the shape. Bore a series of holes on the scribe line with a masonry bit. Remove the cutout with a masonry chisel and hammer.

Tiles are lowered into the chimney from the top. A simple device that you can make for lowering tiles is shown on the first page of this article. To remove the device from a tile that has been lowered into place, strike the block with a long rod and pull the block back up the chimney. Retrieve the shingles from the bottom cleanout.

You may wish to buy or rent more efficient tools such as the Chimney Tile Aligner, (see top, right photo on page 172) or the Acu-Set tile lining tool which has a pneumatic clamp. The Chimney Tile Aligner costs \$196 post-paid from the manufacturer. The Acu-Set sells for about \$550 and requires a compressor. (See the supplier list at the end of the story.)

Before lowering each tile, butter up the top edges with refractory cement. The first tile is lowered onto a wet bed of masonry cement at the chimney base. Lower the tiles gently. If a tile catches as it's being lowered, haul it back up and try lowering it from a

different side of the chimney. Have a high-wattage lamp at the base of the chimney and inspect the joint of each freshly seated tile.

Tiles and mortar must create a continuous airtight seal. After a tile is in place, use a trowel or wire loop on a stick to smooth the interior of the joint to discourage creosote buildup. Make necessary corrections before continuing. This may require breaking into the chimney wall for access. Be sure to insert the tile precut for the thimble at the right point.

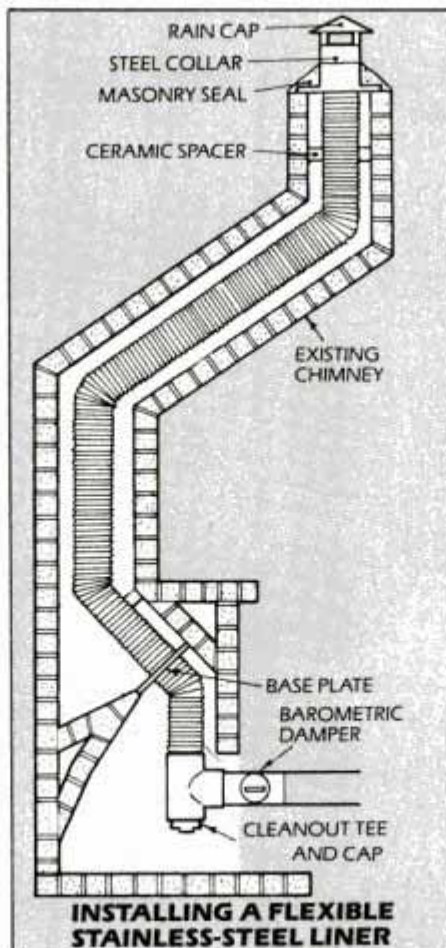
If there are more than 2 in. of space between the liner and the chimney walls, install lateral supports. A good way to improvise supports is to bolt metal studs end to end and jam them into the space around the flue. Never cement tiles directly to the chimney walls. They must be able to expand and contract independently. When all tiles are in place, mortar the cleanout door frame and thimble into place. Finish off the chimney top with a masonry cement crown (wash) sloped to the outside for drainage.

Stainless-steel liner

Stainless-steel liners are available in many different designs. Generally speaking, stainless steel is easier to work with than clay tile and more likely to withstand the intense heat of a chimney fire. No universally accepted standards have been developed for stainless-steel liners, however, so shop for a brand whose maker substantiates performance claims with independent lab test results.

Types of stainless-steel liners differ according to the composition of the material used (indicated by a number in the metallurgical industry's 300 series), the wall thickness and rigidity or flexibility characteristics. Three types of flexible liners are as follows:

- **Type 304, or heavy flex,** looks like oversized flexible metal electrical conduit. It sells for \$20 to \$30 a foot in coils up to 50-ft. long. It bends easily and can be cut with a hacksaw. Manufacturers' warranties range from 5 to 10 years.
- **Type 316, or light flex,** resembles clothes dryer vent hose. With much thinner walls than heavy flex, it punctures and tears much more easily. It can be cut with a pocket knife and bends readily. Light flex sells at about half the price of heavy flex. One manufacturer, Z-Flex, offers a five-year limited warranty.
- **Type 321,** sold only under the Ventinox name, is made of corrugated stainless steel rolled in a spiral and bound with welds. It comes in straight 20-ft. sections for about \$20 a foot and



carries a 10-year limited warranty.

Type 321 is difficult to work with and recommended only for pros.

Rigid pipe is available in 4- to 9-in. diameters for \$6 to \$15 a foot. Most professionals favor 24-gauge or heavier Type 304 rigid stainless-steel liners. With regular cleaning, a Type 304 rigid flue should last 20 years or more with a wood stove.

Rigid stainless-steel liner

Rigid liners are designed for straight chimneys. Order enough sections to make the flue extend at least 7 in. above the chimney with 2-in. overlap at the joints. Start installation by chiseling holes in the chimney walls for tees to connect to each heating appliance the flue will service. Add a tee (not an elbow) at the bottom of the flue to provide a cleanout. Cover the bottom and wall opening of the cleanout tee with caps. Join as many pipe sections as you need for each run between tees before lowering them into the chimney. Joints should be fitted so that an upper section fits *inside* the one below it. Most brands require three screws at each joint, although some merely snap together.

Loop a rope around the bottom of each run of pipe and secure it with duct tape. Lower the pipe down the chimney. Get a helper to make connections to the tees. If the chimney is much larger than the liner, spacer rings, available at your stove shop, should be used to stabilize the flue.

Attach a rain cap to the top of the flue. If possible, seal the chimney around the flue with a coverplate to keep out rain and improve efficiency. The coverplate should be a little loose around the flue pipe to allow the heated flue to expand freely. Finally, seal around all tees with bricks and mortar. Wait at least two days before using the chimney.

Installing flexible liners

Flexible liners can be snaked down through chimneys that have twists and turns. First, chisel holes through the chimney walls for any tee connections that may be required. Also, remove bricks at turns in the chimney so you can gain access.

If you need a tee at any but the lowest point of the chimney, use the type with a removable snout. Carefully measure from the top of the chimney to the hole for any intermediate tee and attach a measured length of pipe to each side of the tee's vertical section. Butter up each flexible pipe connection with refractory cement. Then, secure the connection with stainless steel screws or, in the case of light flex, nuts and bolts. The fewer connections the better.

Tie a rope to the bottom of the pipe

and remove the snouts of the tees. Feed the pipe into the chimney as a helper below tugs gently on the rope. Wedge masonry spacers between the liner and the chimney walls to maintain at least 1-in. clearance. Fasten the lower end of the pipe to a tee. If you're venting a stove through a fireplace, pull the liner through a custom-cut plate mounted where the damper normally sits when closed. Hook up the snouts to any intermediate tees and seal around them with bricks and mortar. Also seal other openings you may have made to insert spacers.

The chimney cavity around light flex can be filled with noncombustible insulation such as vermiculite, if suggested by the liner maker. However, the pros and cons of insulating are still being debated by professional installers. Many installers also insulate around heavy flex to keep the flue warm so it operates at peak efficiency. If your liner extends only part way down your chimney, seal off the area below the flue with a steel plate cemented into place before insulating.

Level off insulation 2 in. below the chimney top and fill the remainder with masonry cement. Attach the top of flexible pipe to a chimney collar, sloping mortar away from the collar, and slip on a rain cap.

Whether it's clay, steel or cement, a liner makes safety sense when you decide to hook up a wood stove. Without a liner, creosote can cling to bricks, cracks and weak mortar. Once the creosote starts to burn, getting it in hand becomes a major problem. While a flue liner doesn't eliminate chimney fires, it certainly reduces the odds. **PM**

MANUFACTURERS CHIMNEY LINERS AND EQUIPMENT Stainless steel liners

American Boa Inc., 200 Jay St., Albany, N.Y. 12210
(Type 321 flexible)

Columbia A Flex, Box 48, Ghent, N.Y. 12075 (Type 316 flexible)

Condensation Engineering Corp., Vitroliner Chimney Div., 3511 West Potomac Ave., Chicago, Ill. 60651
(rigid and porcelain-coated)

Copperfield Chimney Products, Box 664, Fairfield, Iowa 52556 (rigid and Type 304 flexible)

Mirror Patented Stove Pipe Co., Drawer A, Bloomfield, Conn. 06002 (rigid and Type 304 flexible)

MPT Energy Products, RD 2, Marion, Wis. 54950
(square rigid)

Sleepy Hollow Chimney Sweeps & Supply Ltd., 22 Fire Island Ave., Babylon, N.Y. 11702 (Type 304 flexible)

Z-Flex Inc., Box 4035, Manchester, N.H. 03108

Poured liners

American Chimney Lining Systems Inc., 9797 Clyde Park S.W., Byron Center, Mich. 49315

National Supafu Systems Inc., Box 289, Central Bridge, N.Y. 12035

Thermocrete Chimney Lining Inc., Box 119, Stowe, Vt. 05672

Two-layer molded liner

Ahrens Chimney Techniques Inc., 2000 Industrial Ave., Sioux Falls, S.D. 57104

Flue-tile lining tools

CTA Corp., 208 West Broadway, Gardner, Mass. 01440 (Chimney Tile Aligner)

Mazzeo's Chimney Sweep Suppliers, RFD 1, Box 1245, Rockland, Me. 04841 (Acu-Set)



FACTORY DIRECT WHOLESALE PRICES

DO-IT-YOURSELF and SAVE

NOW

YOU CAN BUY YOUR OWN COMPLETE HIGH QUALITY/NAME BRAND SATELLITE TV SYSTEM AT FACTORY DIRECT WHOLESALE PRICES
YOU CAN INSTALL YOUR OWN SYSTEM WITH OUR FULLY ILLUSTRATED EASY TO UNDERSTAND/EASY TO INSTALL "DO-IT-YOURSELF" MANUAL INCLUDING:

- SYSTEMS AVAILABLE • COST
- HOW TO INSTALL/ FROM START TO FINISH
- SHARING THE SYSTEM WITH A NEIGHBOR
- LEGALITY/SCRAMBLING
- PROGRAMMING/ SELECTING A TV GUIDE
- MUCH, MUCH, MORE

(We Take the Confusion Out of Owning a Satellite TV System)

FOR YOUR DO-IT-YOURSELF MANUAL AND SYSTEMS PRICING PLEASE SEND CHECK OR MONEY ORDER FOR \$12.95 TO

DOWN LINK INTERNATIONAL
P.O. BOX 518
GLIDE, OREGON 97443

Understand Satellites & Know What Works - Before Your Purchase

Camera Support Stock



Made out of wood. Holds any 35 MM and zoom. Satisfaction guaranteed. Send \$6.50 for plans to:

Unique Gift Idea

B-KRAFTS
Rt. 2 Box 330 Dept. P.M.
Libby, MT. 59923
406-293-2555

LYNCHBURG HARDWARE & GENERAL STORE

OUR town is world famous for "sippin' whiskey" How I wish we could sell it by mail! But we DO carry wonderful things like hand-blown glass decanters, brass-buttoned blue denim "hog washer" overalls, old fashioned oil lamps, real Tennessee country hams, "Jack Daniel's Country Club" hats—even pure bred Red Bone Coon Hound pups. "ALL GOODS WORTH PRICE CHARGED," and we mean every word of it. Send just one dollar for full color catalog. Let's hear from y'all!

Herb Fanning and Eddie Swing, Proprietors
LYNCHBURG HARDWARE & GENERAL STORE
97A Main Street, Lynchburg, Tennessee 37352

Do It Yourself... & SAVE!



●Build a road or landscape your home ●Dig a swimming pool or pond ●Clear brush and haul firewood ●Excavate for a patio, basement or solar addition...Do it all yourself & SAVE with a Magnatrac Bulldozer Kit! Earn extra cash doing jobs for others! SEND FOR:

- Catalog showing construction & uses of "factory-built" Magnatrac Kit.....\$1.00
- Plans for building a Magnatrac from "locally-made" components.....\$7.00

STRUCK KIT, Dept. PM104, Cedarburg, Wis. 53012

PRE-CHRISTMAS SALE!

SAVE \$16.00
off advertised price*

Entire 21-Piece Set of Old-Fashioned Christmas Ornaments

Nationally
Advertised
At

~~\$19.95~~

Your
Price
Only

\$3.95



21 Pieces—every one different!

Hard to believe, but true!

During its fabulous Pre-Christmas Sale, the giant multi-million dollar New York firm of Abernathy & Clother will distribute its most expensive set of holiday decorations—the famous **Old Fashioned Christmas Ornament Set** nationally advertised at \$19.95—for the astonishing Pre-Christmas Sale price of only \$3.95 per set to every reader who mails this ad to the company before Midnight, December 25, 1984.

This original Pre-Christmas Sale ad must accompany your request. Copies or photostats are not acceptable.

*This is the same famous **Old Fashioned Christmas Ornament Set** advertised by others in leading media for \$19.95. *And well worth the price*—for it is the best-selling, most expensive Christmas Ornament Set ever sold by this giant New York firm. But the entire set is yours for only \$3.95 during this Pre-Christmas Sale. *You save \$16.00—a full 80% off the nationally advertised price!*

You get the entire set of 21 delightful miniatures. Each piece is different and hand-painted in colorful detail. Jolly Santas and roly-poly snowmen, toy wooden soldiers, cuddly bears and animals, merry-go-rounds, sleds, cuckoo clocks,



and much more. Not cheap plastic but rich natural wood, hand-crafted with the loving old fashioned skill you hardly see anymore.

These valuable Christmas Sets will not be sold at this price by the company in any store. There is a limit of two (2) sets per address at this price, but requests mailed early enough (before Dec. 17) may request up to seven sets.

Mail this original printed ad together with your name and address and \$3.95 for each set. Add only \$2 shipping and handling no matter how many sets you are requesting. Mail to:
Abernathy & Clother, Christmas Ornament Offer, Dept. 114-16, Box 1789, Hicksville, NY 11802.
(A24900)

© 1984 Abernathy & Clother

WORTH WRITING FOR

LOOKING FOR IDEAS ON CAR CARE, TOOLS, LEISURE, HOME IMPROVEMENTS & MORE? CHECK THESE LISTINGS. THEN USE THE COUPON BELOW.

885 RACING FASHIONS

12-page, full-color catalog from the Racing Shop features an exciting collection of hats, jackets and shirts geared to auto racing buffs. Featuring Copenhagen, Skoal and Skoal Bandits logo. Also, photos of famous drivers. \$1.00

886 CAR COLLECTOR'S CATALOG

32-page catalog from Kanter Auto Products contains every car restoration need. Everything from carpet to upholstery . . . tires to shock absorbers. Parts for all models 1935-1980. Free

887 VALUABLE PROTECTION

8-page, full-color brochure from Cannon Safe, shows how you can help increase security. Its hard steel construction protects your valuables from damage and theft. Free

888 FABULOUS FLOOR CARE

12-page illustrated brochure from Bruce Wood Floor Care Products provides complete wood floor care tips. Information on daily cleaning, spot removal and refinishing. Suggestions for products best suited for your floor. Free

889 THE FOUNDATION OF INSULATION

If the foundation of your home isn't insulated, you may be losing heat and money. Brochure from Insul-Guard discusses the advantages and savings produced by do-it-yourself installation of exterior foundation insulation. Free

890 GET THE PICTURE?

Three brochures from Valscot Enterprises focus on the world of satellite antenna systems. Includes model descriptions, installation instructions and operation specifications. Free

891 YOU CONDUIT

FrameMaker clamps from Bullseye Products join sections of ordinary 3/4-inch electric conduit to construct frameworks for greenhouses, awnings, TV antenna towers, etc. Wrenches and hacksaw are only tools needed and adjustable angle clamps eliminate tube bending. Brochure free.

892 LOCK, STOCK AND BARREL

A handy colorful wall chart with information on how differences in padlocks make them suited to specific security or safety applications. Includes interesting cut away diagram of padlock construction. Answers specific questions about using padlocks. 50¢

893 NEW WAY TO REMEMBER

A unique approach to memory improvement is provided by this easy-to-read, easy-to-apply book entitled INSTANT MEMORY. Uses natural ability of your mind to recall . . . no word association. Introductory information. Free

894 LIFE-SAVING SIGNALS

8-page catalog from Sigma Scientific describes their survival systems. Signals and complete kits for mountaineering, aviation, marine and wilderness enthusiasts. Includes U.S. Coast Guard approved Skyblazer® aerial flare and special offer of up to \$15.00 off first order. Free

895 SWEET DREAMS

Build PM's platform bed. The raised design of this sleeper combines the look of luxury with down-to-earth practicality. Roll-out under-bed drawers turn wasted space into useful storage. Movable night tables hook on side rails. Includes instructions for king and single sizes. Complete plans and materials list for only \$7.95.

896 FLOOR DECOR

8-page booklet from Bruce Hardwood Floors includes over a dozen color photographs of the varieties of wood floors available, tips on proper care of wood flooring, and a questionnaire for the consumer to fill out to help the Bruce dealer determine which of the over 70 Bruce Floors will best suit the buyer's decor and budget. Free

897 DO-IT-YOURSELF GEOTHERMAL HEATING

Geothermal heating/cooling systems may save you up to 70% on your yearly energy bills. Save even more by installing one yourself. Brochure on American Energy Products' exclusive "do-it-yourself" system. \$1.00

898 KNIFE KNOW-HOW

16-page, informative booklet from Buck Knives shows how to sharpen a knife, field-dress a deer, skin/fillet fish. Also includes safety techniques and much more. Free

899 DO-IT-YOURSELF LIBRARY

Carbook's 32-page catalog of do-it-yourself books covers virtually everything of interest to people who enjoy working with their hands. Over 1,000 titles, ranging from cars and trucks to aircraft and boats . . . woodworking and metalworking to electronics and computers. \$1.00

900 KEEPING DIESELS HAPPY

Tips on keeping your diesel car, pick-up or van in tip-top running condition. Describes diesel operation and proper fuel and lubrication selection. From Kendall. Free

901 BEAT THE HEAT

Full-color brochure from Phifer Wire Products tells how SunScreen solar screen helps block up to 70% of the sun's heat. Do-it-yourself installation. Free

902 FASCINATING APPROACH TO TIME AND TEMPERATURE

Computemp 3 is a unique digital thermometer/clock. Features include continuously alternating LED display, high/low temperature memory, time and temperature alarms. From RODCO Products. Brochure Free.

903 QUICK AND EASY HOUSE PAINTING

An informative new brochure from Wagner identifies common painting problems and the correct solutions. Topics discussed in the 20-page, illustrated brochure include surface preparation techniques, safety tips, paint selection advice and other hints. Free

904 INCREASE ENGINE POWER

Knocks. Pings. Stalling. Slow starts. Hesitation. Poor performance. Fact-filled brochure from 104+ Octane Boost explains some of the common culprits of poor engine performance. What causes them and what you can do to prevent them. 50¢

905 WONDERFUL WOOD FINISHES

8-page, 4-color booklet from Watco-Dennis shows how to create professional finishes the first time with all types of wood. Watco Danish Oil seals, primes, finishes, hardens, protects, beautifies and penetrates . . . in one application. No pre-staining needed. Free

906 COMPUTER CABINET

Do-it-yourself instructions for building a home workstation for your state-of-the-art computer system. This three-piece desk design helps keep everything organized and gives you plenty of room to work. Complete plans and material list . . . \$6.95.

Popular Mechanics 10/84
Box 1718, Sandusky, Ohio 44870

Please see that I receive the items checked below

- | | | | | |
|-------------------------------------|----------------------------------|-------------------------------------|-------------------------------------|----------------------------------|
| <input type="checkbox"/> 885 \$1.00 | <input type="checkbox"/> 889 | <input type="checkbox"/> 893 | <input type="checkbox"/> 897 \$1.00 | <input type="checkbox"/> 901 |
| <input type="checkbox"/> 886 | <input type="checkbox"/> 890 | <input type="checkbox"/> 894 | <input type="checkbox"/> 898 | <input type="checkbox"/> 902 |
| <input type="checkbox"/> 887 | <input type="checkbox"/> 891 | <input type="checkbox"/> 895 \$7.95 | <input type="checkbox"/> 899 \$1.00 | <input type="checkbox"/> 903 |
| <input type="checkbox"/> 888 | <input type="checkbox"/> 892 50¢ | <input type="checkbox"/> 896 | <input type="checkbox"/> 900 | <input type="checkbox"/> 904 50¢ |

Total money for priced items \$ _____
Service Charge \$.50
Total money enclosed \$ _____
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.

TUNE UP YOUR OIL BURNER

(Continued from page 56)

fired furnaces are conceptually simple. Fuel is pumped at high pressure through a nozzle that atomizes it. A combustion air fan, which is usually run by the same motor as the pump, provides a continual stream of swirling air around the nozzle port.

The fuel-air mixture is ignited by an arc between electrodes mounted near the nozzle. The flame burns inside a clay crock which gets red hot. Heat radiates and convects to the inside walls of a metal heat exchanger. A fan at the bottom of the furnace cabinet draws in cool house air and forces it over the heat exchanger fins. From there, the warm air circulates throughout the house through a network of ducts.

A limit switch turns off the furnace if, for some reason, the heat exchanger gets too hot. A master control unit mounted on the stack senses whether the flame is ignited once the fuel pump is activated and shuts it down if ignition does not occur after about a minute or so to prevent a hazardous condition.

Service procedures

Early fall is the best time to tackle routine maintenance chores on your furnace. Before you start any service procedure, trip the breaker or pull the fuse that controls power to the furnace circuit. Begin with the burner assembly. Disconnect the two fuel lines at the fuel pump. The burner assembly is usually mounted with three large nuts. Remove the top nut last while tightly holding the burner assembly. If the armored power cable connected to the burner assembly is too short to place the burner in a convenient spot for disassembly, disconnect it at one end. Remove the screws that hold the burner support plate in place and remove the burner shroud casting. Clean the soot from these parts with lacquer thinner and a wire brush. Then paint both with quick-drying high-temperature aluminum paint. **Caution:** Use the thinner and spray paint outdoors in a well-ventilated area.

Wipe the nozzle tip, electrodes and

porcelain insulators clean with a solvent-dampened rag. Use two wrenches to remove the nozzle from the adaptor. Then unscrew the sintered filter, without crushing it. Clean the filter by heating it red hot with a propane torch. The torch will burn off trapped fuel and tar-like contaminants.

Remove the screw insert from the nozzle tip. Soak both parts in a jar of lacquer thinner and scrub them with a stiff brush. Hold the parts up to a strong light. The nozzle port and the tiny grooves of the screw insert should be perfectly clean. Reassemble the nozzle and reinstall it in the adaptor.

If you wish to replace the nozzle, note stampings that indicate mist angle and the flow rate. With periodic cleanings, the nozzle could last 20 years or more.

Inspect the tips of the igniter electrodes. If they are rounded, remove the tips by loosening the setscrews that hold them in place and grind each electrode to a sharp point. After reinstalling the tips on the burner, adjust them to the exact settings recommended in your owner's manual.

Combustion chamber

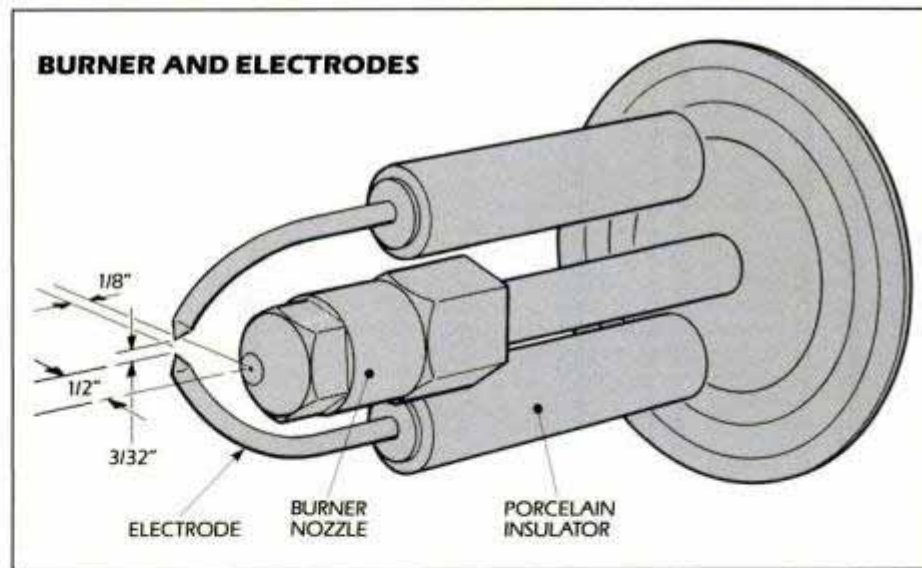
Cleaning the combustion chamber is a dirty job. Wear a quality respirator

during this task, and place a light inside the combustion chamber. Remove the wire holding the two halves of the clay crock together and take them out of the furnace one at a time. Clean soot and residues from the crock surfaces.

Remove the disc-shaped flame deflector from the top of the chamber along with the soot tray at the top of the outlet flue. Using a putty knife, a wire brush and 80-grit garnet abrasive paper, clean the soot and other residues from the sides of the combustion chamber. A shop vacuum is handy for removing the scrapings.

Use a light and a mirror to inspect the insides of the cleaned combustion chamber. Look closely for holes in the heat exchanger. If you have noticed unpleasant odors around the furnace or in your home when the heat is on, suspect a leaky heat exchanger. If you find any leaks, your furnace is in dangerous condition and should be checked out by a pro.

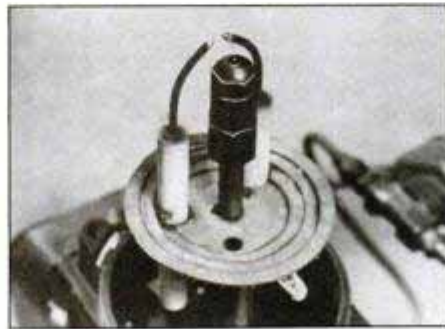
Before reassembling the crock and other chamber parts, clean the outlet flue. Disconnect the stack from the outlet near the top of the furnace and remove as much accumulated residue as you can by hand. Then, vacuum it out. Work the hose deep into both sides



The correct electrode settings are critical if the oil burner is to work properly. Shown above are the gaps that are required for a 112,000-B.T.U. General Electric oil furnace.



Clean soot from burner with wire brush and solvent. Then spray shroud and plate with high-temperature aluminum paint.



Grind electrodes to sharp points and set the gap to the manufacturer's specifications. Clean insulators with lacquer thinner.



Vacuum accessory for cleaning soot from flue heat exchanger can be made from aluminum hose hammered to oval shape.

of the flue. Using a homemade vacuum cleaner accessory can make this operation easier.

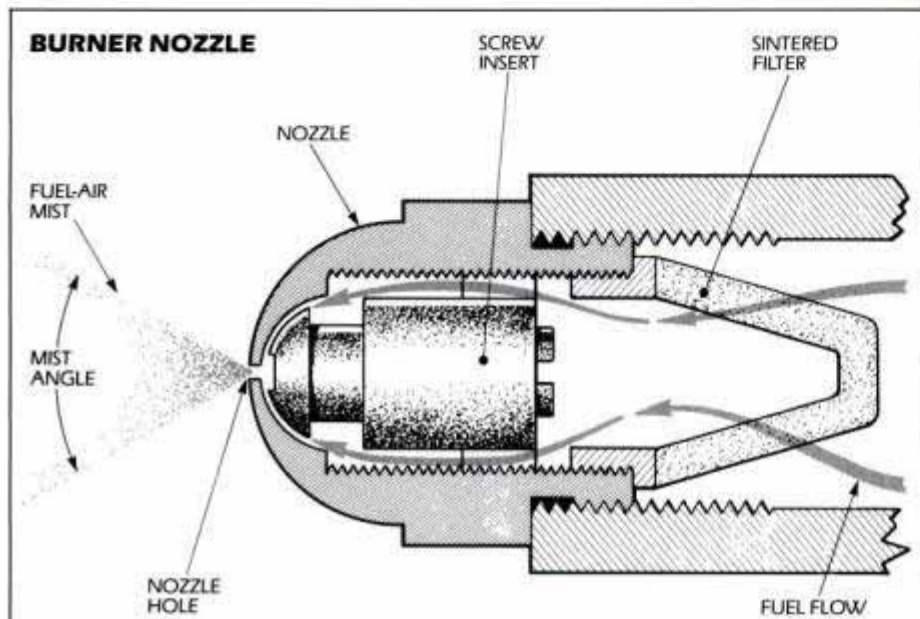
Before reconnecting the stack, check the furnace outlet for cracks and corrosion. If you find some minor defects, clean the outlet with solvent and a wire brush, then lay a bead of refractory cement around the outlet flue before joining the stack pipe to the outlet near the top of the furnace once again.

Restore the cleaned soot tray, flame deflector and crock. Use aircraft wire to bind the crock halves together if the old wire can't be reused. Finally, bolt on the freshly painted burner support plate and reinstall the burner.

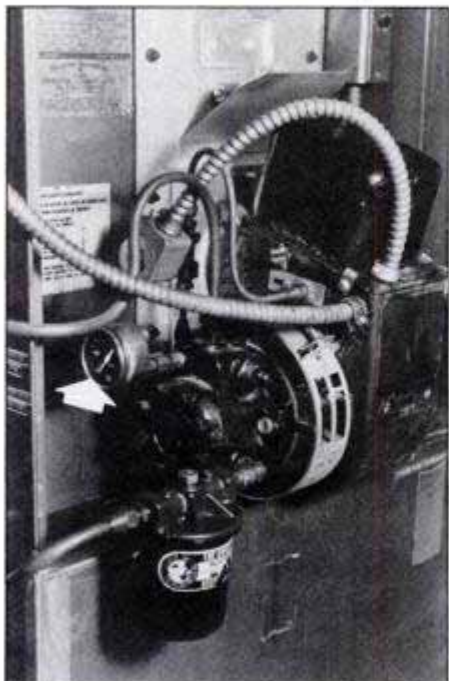
Ignition transformer

Unscrew the base of the ignition transformer and fold back the cover to reveal the terminals. Dust off the terminals and check the secondary circuit with an ohmmeter. If resistance is infinite, replace the transformer. Also check the resistance of each terminal to ground. If your furnace transformer has no grounded center tap, resistance should be infinite. If it is a grounded center-tap unit, resistances should be equal or infinite between tap and terminals. If that is not the case, it means some secondary turns are shorted and the voltage is too low to reliably strike

(Please turn to page 180)



Unscrew nozzle from burner. Clean sintered filter by heating with a torch until red hot. Clean the screw insert with lacquer thinner and inspect the passages for blockage.



Adding a pressure gauge (arrow) to existing port in the pump-pressure regulator is an improvement that helps diagnose various problems. Coat gauge nipple threads with sealant to prevent possible fuel leaks.



Antidribble solenoid (arrow) installed in fuel line leading to nozzle shuts off flow immediately when thermostat shuts down igniter. This prevents wasteful fuel trickle that occurs after pump comes to full stop.

SHOPMASTER TOOLS — 40+ YEARS OF AMERICAN MADE QUALITY.

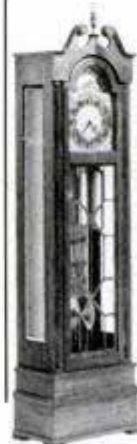


The 26" deep throat band saw, a 12" band saw with 9" deep cut. Roller guides, 4 & 2 wheel principle adds versatility to the most important tool in your shop... the Band saw.

ALL STEEL RUGGED CONSTRUCTION. Metal cutting Band saw. Sanders. Lathe, custom welded Band saw blades for all tools, accessories, plans. FREE CATALOGUE, DIRECT FACTORY SHIPMENTS. SHOPMASTER TOOLS CORP. 1651-94th Lane, N.E., Mpls., Minn. 55434

A Family Tradition Since 1916

Kuempel Chime BUILD THE FINEST We Know You Can Do It!



Easy to assemble quality Red-I-Kut Clock kits. A variety of designs hand made by our Grandfathers in solid 3/4" cherry, oak or walnut with beveled glass. Tubular Bell or Rod movements. Original bronze etched dials and hand painted moonwheels.

Or start from scratch. American Classic Plan - \$3.00

Write for Free Literature or Call

1-800-328-6445

Between 8 a.m. & 4 p.m.

Kuempel Chime

Dept. 517, 21195 Minnetonka Blvd. Excelsior, MN 55331

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 50c

Post

&

Handl

Westbury Sales P.O. Box 434, 373 Maple Ave. Westbury, N.Y. 11590 E-10-PM

WOODWORKERS CATALOG

SEE 116 pages of hard-to-find products to build, restore, refinish anything of wood! Choose from 14 fine hardwoods, 109 veneers, 76 inlays. Cabinet & furn. hardware. Pro finishes. Uphol. supplies. Chair & table legs. 33 pic. moldings. Cane. Lamp parts. Carving tools. Specialty tools, shop equipment, 100's plans, how-to books. 2,000 products. Send \$1 for Catalog now. Get DOUBLE your money back!

CONSTANTINE Est. 1812

2051 Eastchester Road, Bronx, N.Y. 10461

★ Here's \$1 for 116-page Woodworkers Catalog

DOUBLE Your money Back!

Get \$2 BACK

Mail coupon now for dollar Catalog. We include \$2 refund Certificate good on 1st catalog order!

Name _____

Address _____

City/State/Zip _____

NOW! PEAK PERFORMANCE Can Be Yours!

LEARN THE SECRET

Used by thousands of athletes, doctors, lawyers and top scientists to achieve that **WINNING EDGE!**

Developed by noted Beverly Hills psychologists, **PEAK PERFORMANCE** is the fastest, surest, most enjoyable method ever devised to unleash the inner self. **PEAK PERFORMANCE** gives you confidence and improved concentration. Soon you will see a spectacular change in your ability to think creatively. With **PEAK PERFORMANCE** there is no limit to what you can produce, invent or discover. **PEAK PERFORMANCE** enables you to achieve financial security, prestige, recognition — and much, much more!

THE NEW SUPERIOR WAY TO CREATE:

- Instant Wealth \$\$
- Energy & Mental Power
- Success & Happiness
- Superior Memory
- Sexual Freedom
- Money Making Ideas

ORDER NOW
SUCCESS DEPENDS ON IT!

INSTITUTE OF EXCELLENCE
12021 Wilshire Blvd. Suite 19
Los Angeles, CA 90025

Please send me your **PEAK PERFORMANCE** book for only \$10.00 complete by First Class Mail at no extra cost. Money back guarantee.

Name _____
Address _____
City _____
State _____ Zip _____

TUNE UP YOUR OIL BURNER

(Continued from page 179)

the arc gap electrodes. The transformer should be replaced.

Clean the motor externally with a cloth and mineral spirits. If the motor has oil holes, put a few drops of household oil in each. If there aren't any oil holes, the bearings are sealed and the motor requires no further maintenance.

Remove the pump and the combustion air fan. Clean the fan blades with solvent and repaint them with high-temperature aluminum spray paint. Check the inlet airflow setting and be sure it is set to the manufacturer's specifications.

If your fuel pump is older than 15 years, it's a good idea to replace it. Check your pump for leaks around the shaft seal. If you decide to keep your pump, remove the capscrews and end cover. Clean the screen filter with mineral spirits, then reassemble and reinstall the pump.

If you decide to replace the pump, you have the option of getting a new or rebuilt one. Most often, it pays to spring for a new one. Make sure the part number on the new pump casting is identical or equivalent to the number on the old one. Be sure to ask the salesperson to supply a bypass screw which inserts deep inside the fuel line.

Improve the fuel pump by adding a 0 to 100-psi pressure gauge. With appropriate brass fittings, the gauge can be screwed into a hole in the pump that's sealed with a threaded plug. The gauge will tell you when the pump is


NEW AFFORDABLE BANDSAW MILL



The **WOOD-MIZER** is a one-man portable sawmill with a huge 30" dia x 48" long cutting capacity. This safe, easy-to-operate mill cuts with an efficient traveling bandsaw carriage. Why waste lumber and money by cutting with an old fashioned circular mill when the **WOOD-MIZER** can give you 30% more usable lumber out of each log on less than half the fuel and horse power? This accurate cutting system is everything a sawmill should be and more.

For More Information Send \$1.00 to:
WOOD-MIZER, Dept. DG
4004 W. 10th St.
Indianapolis, IN 46222
(317) 243-7545

Gas to Electric Conversion Kit



GAS LAMP BURNS \$72 TO \$120 OF GAS PER YEAR. OUR CONVERSION KIT OPERATES ON 1/2 THE COST OF GAS. Easy to install 2-bulb fixture duplicates the charm and increases the light output of any gas light. Includes automatic On At Dusk — Off At Dawn photo electric control. Available in 12 volt or 115 volt.

FOR MORE INFO WRITE:
Gaslight Conversions, Inc.
1039 CHARLES AVE. ST., PAUL, MN 55104

CLOCK COMPONENTS



We Feature Battery, Pendulum, Chime Quartz Movements of All Types, Urges, Hermle, Grandmother, Grandfather Cable Drive and Chain Drive, Key Wind Movements of All Types, 400 Day Clocks, Music Box Movements, Flat and Bezel Type Dials — Plus a Vast Assortment of Weather Instruments. Hundreds of Clock Items. Very Competitive Prices. Write or Call for Free 75 Page Catalog. (931) 845-0555

NEWPORT ENTERPRISES INC. Dept. P.M.
2313 W. Burbank Blvd., Burbank, Calif. 91505

GET YOUR BUSINESS DEGREE
... at home in spare time!

Marketing, finance, public relations, personnel... and much more. Get a fully accredited 2-year Associate Degree in Business Management. Learn the same subjects offered by many two and four-year colleges! How to manage and motivate people. How to make the right management decisions and sharpen your business instincts. Learn where and when you choose, without interrupting your job or social life. No obligation! SEND FOR FREE FACTS on how to get your Business Degree at home. Write:

ICS
Center for Degree Studies
Business Management Dept. PB094
Scranton, PA 18515

PHONE LISTENING DEVICE




Record telephone conversations in your office or home. Connects between any cassette or tape recorder and your telephone line. Starts automatically when phone is answered. Records both sides of conversation. Stops recorder when phone is hung up.

19⁹⁵ ea. Qty discounts available.

WIRELESS MIC Super powerful!
10 times more powerful than other mics. Transmits up to 1/4 mile to any FM radio. Easy to assemble kit. 15V battery (not incl.) Call (205) 725-1500 or send \$19.95 + \$1 shipping per item to USI Corp., P.O. Box PM-2052, Melbourne, FL 32901. COD's accepted. For catalog of transmitters, voice scramblers and other specialty items, enclose \$2 to USI.

HYDRAULIC JACK REPAIRS




A Business of your own.
Earn while you learn at home. Millions of jacks in gas stations, trucking firms, etc. need servicing. We show you HOW. Start spare time in your basement or garage. Big opportunity for mechanics.
Write for folder No. PM10 and free bonus offer.

HYDRAULIC JACK INC.
P.O. BOX 18, ACCORD, NY 12404

This is the truck that Jack built.

He saved \$1000.
You can too!



Easy-to-build semi-kit can save you money. Engine is completely assembled; frame is welded and painted. You just bolt everything together (using common tools and our 22" x 34", fully illustrated instruction sheet) and start hauling!

- 16 H.P. or 11 H.P. Briggs & Stratton engine
- Hydraulic disc brakes with parking brake standard.
- Electric start standard.
- Automatic transmission with forward and reverse.
- Full, one-quarter ton payload capacity.
- Dumping bed measures 44 1/2" x 40" x 11".
- 4-wheel models with cab also available.

Carl Heald, Inc.,
Dept. NZ9, P.O. Box 1148,
Benton Harbor, Michigan 49022

For your FREE color brochure call or write:
TOLL FREE: 1-800-253-1030;
in Michigan call 616/849-3400.



Replace old corroded galvanized flue pipes with new pipes that are made from stainless steel sheets. The joints should be sealed with 3M's metal repair tape.

not operating at the correct pressure which indicates a fuel-line blockage, a nonoperative motor or the need for regulator adjustment.

Another improvement to make is adding an antidribble solenoid in series with the nozzle fuel line.

Blow out the fuel lines with compressed air to eliminate possible blockages. Make sure no kinks constrict the flow. If there are, cut out constricted sections with a tubing cutter and sweat in new tubing. Install a filter on the suction fuel line (from the tank) if your furnace doesn't have one. Attach it to the line at the fuel pump intake. Clean the filter rings every two years.

The master control unit is mounted on the stack. Remove it and clean the bimetal. You may also want to file the contact points inside the unit.

Clean and inspect the stack carefully, from the basement up to the roof. If you find any rust spots, replace the affected flue pipe sections. Sealing the joints between sections helps to cut down on particulate leakage.

Finally, replace the air intake filter. It's a good practice to tape the seams around the filter access door to keep fumes from being drawn in with air.

Furnace maintenance is definitely not a fun job. But it's one that will pay off handsomely in the long run. **PM**

1985 Duke Introductory Sale

You can now build this beautiful \$30,000 1939 Jaguar SS-100 reproduction for a fraction of the completed car price. Models, as seen in major airports, magazines, and television, also include the 1952 MG TD and 1962 Austin Healey. Special incentives on airport displays and factory demonstrators. **Limited Numbers. Buy Now and Save!**

Call 1-800-437-4342
toll free for complete information, or send \$2 for new 28-page color catalog.



Classic Roadsters, Ltd.
1617 Main / Fargo, North Dakota 58103

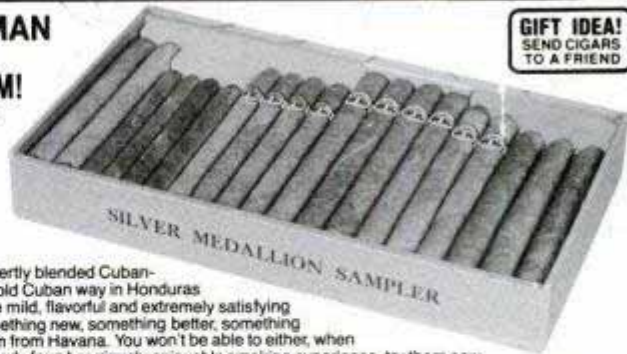
PM 10/84

YOU DON'T NEED CASTRO'S PERMISSION TO SMOKE CUBAN-SEED HANDMADE CIGARS!

HANDMADES FOR THE MAN WHO THOUGHT HE COULDN'T AFFORD THEM!

I'll send them to you from Tampa, the fine cigar capital of the world. Sample the cigars in my new Silver Medallion Sampler and enjoy a wonderful new smoking sensation. I'll include a generous sampling of Honduras handmades plus a nice selection of vintage-leaf, long-filler and cut filler cigars, all perfectly blended for mildness and flavor.

These superb smokes are made with expertly blended Cuban-seed-leaf tobaccos grown and cured the old Cuban way in Honduras from seed smuggled out of Cuba. They're mild, flavorful and extremely satisfying to the cigar smoker who's looking for something new, something better, something exceptionally tasty. Experts can't tell them from Havana. You won't be able to either, when you try them. Natural wrapper. If you're ready for a luxuriously enjoyable smoking experience, try them now.



GIFT IDEA!
SEND CIGARS
TO A FRIEND

MY OFFER TO CIGAR LOVERS

I'll send you postpaid a selection of 42 factory-fresh cigars—a special selection of Honduras handmades, vintage-leaf long-filler and cut filler smokes. If these cigars aren't all you expected, return the unsmoked ones by United Parcel or Parcel Post within 30 days and I'll refund your money. No questions asked. Your delivered cost is only \$10.90 for 42 factory-fresh, Cuban-seed-leaf cigars.

OFFER GOOD IN U.S. ONLY
CREDIT CARD USERS
SPEED DELIVERY BY CALLING

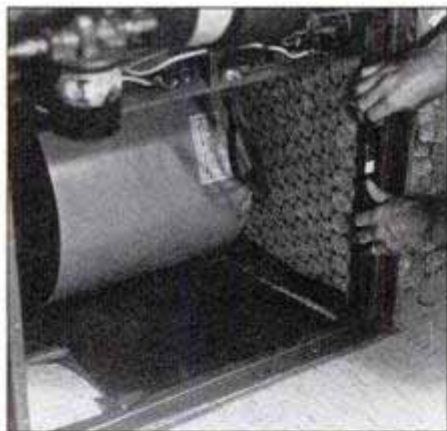
To order, fill in and mail coupon to **THOMPSON CIGAR CO.** B-271

5401 Hangar Ct., Dept B271, Box 30303, Tampa, FL 33630
O.K., TOM! Ship me the Silver Medallion Sampler under your money-back guarantee for only \$10.90.

- Check for \$10.90 enclosed (Fla. residents add 5% sales tax)
 Charge \$10.90 to my VISA American Express
 MasterCard Diners Club

Credit Card No. (Print all digits) _____ EXP. DATE _____
name _____
street _____
city _____ state _____ zip _____

TOLL-FREE 1-800-237-2559
IN FLORIDA, CALL 1-800-282-0646



Installing two filters back to back will improve the filtration of intake air. These filters are secured with duct tape to minimize any leakage around the edges.



For maximum efficiency, set pressure to 100 psi with an adjustment screw on pump regulator. In many models, a protective cap must be removed to get at screw.

FIRSTHAND REPORT



Omni/Horizon styling closely mimicks the VW Rabbit. Now Shelby has modified the engine and suspension to compete with the hot VW GTI.

PM Drives The DODGE OMNI GLH

Carroll Shelby has turned Chrysler's plain little commuter car into a hotrod in sheep's clothing. It's lots of fun!

BY DANIEL CHARLES ROSS, Detroit Editor

Chrysler's Dodge Omni has had a checkered past. Born as an import fighter, but unable to excel in that role due to a higher cost, it nevertheless gives fair service for a fair price. Sales, however, never have set the world on fire because the Omni commuter just doesn't have much spark.

Dodge's court magician, Carroll Shelby, has now taken the econocar Omni five-door and turned it into a powerful, lithe sedan which is just as suitable for full-throttle trips between zero and 60 as it is for trips between home and the corner store.

Shelby extracted the plebian 1.6-liter Four from the Omni and installed the Shelbyized 2.2-liter Four with a Holley two-barrel carburetor, thus bumping the performance figures considerably. The compression ratio is 9.6 to 1, and horsepower goes from 64 at 4,800 rpm to 110 at 5,600. Torque rises from a staid 87 lb.-ft. at 2,800 rpm to a lusty 129 lb.-ft. at 3,600.

The difference is startling. Our test vehicle was spec'd out in what might be

called the Road Runner mode—that is, standard equipment without luxury and power-operated items to distract from the fun of driving. The clue to this car's role in life is hinted at by the model designation GLH. GLH, we've been told, stands for Goes Like Heck, or something close.

The standard Omni is family transportation and little more. The GLH, however, provides the acceleration and handling improvements that make this the true all-purpose family car—one that's routinely capable in normal use, but a real stormer when under stress.

The GLH is targeted squarely as competition for the Volkswagen Rabbit GTI, and is perfect in this role. Twenty more horsepower and 29 lb.-ft. more torque than the hot VW will cause some consternation among GTI owners, and

the \$7,350 GLH sticker price clocks it in at about a grand less than the Volkswagen.

Shelby didn't forget anything in upgrading the Omni to GLH status. The GLH gets the same underpinnings as the Shelby Charger 2.2, with stiffer springs and struts than the standard Omni. Better handling in the Dodge front-driver is abetted by low-profile



Interior of the GLH is standard-issue Omni, with the addition of full instrumentation. Seats lack side support.

POPULAR MECHANICS • OCTOBER 1984

195/50HR15 Goodyear Eagle GTs mounted on attractive cast-aluminum wheels. Power from the transversely mounted ohc Four is transmitted through a five-speed manual transaxle with a final drive of 2.78, up 10 percent from the standard Omni ratio.

Rack-and-pinion steering is a real joy, with excellent road input to the driver and good on-center feel. The direction



Transversely mounted 2.2-liter ohc Four is crude-looking but efficient, with 110 hp.

changes are quick and responses are right to the point.

Problems with the prototype

The GLH we drove, however, didn't measure up to its potential. It suffered from a dismaying and routine ping at low-rpm, full-throttle acceleration, despite our use of premium unleaded fuel. This is undoubtedly the reason that our 0-60 mph runs were limited to a best time of 9.1 seconds. Chrysler claims a 0-50 mph time of about 5.7 seconds, so we should have been able to do a good deal better.

There was an occasional tendency to bog almost dead on full throttle in first gear that also plagued our test vehicle. This would always occur after the car had been run hot and then allowed to sit for about 30 minutes or so.

Fit and finish characteristics of the Omnis have always been Detroit-average. Our GLH was no exception. Nothing was radically ill-fitting, but the paint showed a lot of tiny scratches and the GLH decals were inexpertly applied, showing creases where one had not been properly smoothed down. Still our test car was a hand-built prototype. Production cars will hopefully get more attention to detail.

Insight on the inside

The standard interior was just spartan. Omni dashboard design permits only two fresh air vents, one located at either end of the dash panel. This fails to provide adequate circulation in the passenger compartment, making air conditioning a must due to the large amount of glass area.

Speaking of the glass area, the Omni GLH has enough greenhouse to grow *(Please turn to page 184)*

MICRO COMPUTERS
Disk, Disc, Modem
Manufacture for the Far East, low U.S. costs. New from profit opportunity. Complete study available from \$220.

GOLLE
Stuffed dolls, porcelain dolls, plastic dolls, dolls made to order dolls, 1,000's designs

LOCK BLADE KNIFE
Hundreds other models below wholesale

FIELD GLASSES
Out and powerful 1x35. Beautifully balanced \$3.50

DIAMONDS AND GEMSTONES
Low low price from Bangkok

B.L. MELLINGER, Famous World Trader.
Internationally known Mail Order Expert. President, Mellinger Co. "I started only a few years ago, part time, in my garage with less than \$100. Today my business empire spans the globe. I will help you succeed using my personal experience. Mail coupon for FREE REPORT!"

START WITH 24,221 PRODUCTS!

Many you can buy one at a time or order in quantity. Example: one 35mm camera with hot shoe and carry case \$13.00 plus or 12 for \$74.13 plus. Price drops to only \$5.80 in larger quantities. New government ruling makes thousands of imports free of any duty whatsoever. You deal direct my International Traders way. Cut out greedy U.S. specialty merchandise middlemen. Really deal direct.

EXERCISE MACHINE
Buy below wholesale to cash in now on today's booming health care market. 11 membership gives you confidential reports.

COMPUTER LOCK
No key. Can't be picked. For homes, offices. Millions sales possible.

35mm CAMERA
with hot shoe and carrying case \$5.80

1000's more dazzling products you can buy DIRECT!

Confidential information on these products is currently given to I.T. members. Monthly reports change product offers to give you latest money making discoveries.

PERSONAL GUIDANCE!

I believe in giving you my personal help! Regularly I meet I.T. Members at regional closed door Seminars across the country. You will be invited to these meetings.

THE MELLINGER CO., 6100 Variel Ave., Dept. K225A Woodland Hills, CA 91367-3779

SAMPLE IMPORT FREE!

...and I'll tell you exactly how to turn it into big money!



How to start your own big profit HOME IMPORT BUSINESS

MY PLAN STARTS YOU FAST... Shows you how to Buy Below Wholesale

MEN - WOMEN... Turn Spare Hours or Full Time into INCOME!

DISCOVER PROFITS OF IMPORT! My Home Mail Order Import Business Plan guides your every step... it is based totally on my personal success. Shows how to deal direct and cut out costly middlemen... so you keep all the profits! I do the "hard work" for you... by traveling the world to find dazzling "first time offered" new imports. The actual sample I will send you Free is typical of my import discoveries. You can pick and choose from more than 24,000 products. Deal in one product or 1000's. Buy below wholesale.

YOU CAN START IMMEDIATELY. I arrange free membership in exclusive International Traders organization... instantly puts you in direct contact with suppliers abroad. I show how to operate anywhere. Age no barrier. Ideal for spare time husband/wife or retirement business. My report, "How to Import and Export" tells how to do it. No obligation. No salesman will call. Certificate brings your free gift sample import and everything else.

FREE CATALOGS!
Now! Quick Double Profits
As a Member of International Traders you also get free catalogs of specialty merchandise to order at rock-bottom prices from big U.S. Warehouse.
Products subject availability, price fluctuation.

PET CARRIERS COLLAPSIBLE
\$5 each for cats, dogs to 150 lb. load. Easy clean polyureth. Cash or best offering to pet shops & markets.

GENUINE JADE NECKLACE
ONLY \$4.60!

RECONDITIONED CARS AND TRUCKS
Toyota, Nissan, Buick, Meru, etc. Also conditioned to get from like new. Make great profit shipping to Alaska states, Caribbean islands, England etc.

MINK COATS
Mink styles below wholesale.

GENUINE JADE NECKLACE
ONLY \$4.60!

PET CARRIERS COLLAPSIBLE
\$5 each for cats, dogs to 150 lb. load. Easy clean polyureth. Cash or best offering to pet shops & markets.

24,221 IMPORTS

MICRO LIGHT AIRCRAFT
EASY TO FLY!
1 and 2 seat. 30 mph at less than 11' high. Made in U.S. Shows diversity of import opportunities.

BENCH DRILL
Power tools all types. Buy top quality below wholesale. Make big profits.

RECONDITIONED CARS AND TRUCKS
Toyota, Nissan, Buick, Meru, etc. Also conditioned to get from like new. Make great profit shipping to Alaska states, Caribbean islands, England etc.

GENUINE JADE NECKLACE
ONLY \$4.60!

PET CARRIERS COLLAPSIBLE
\$5 each for cats, dogs to 150 lb. load. Easy clean polyureth. Cash or best offering to pet shops & markets.

CORDLESS DRILL
Superior quality below wholesale.

GENUINE JADE NECKLACE
ONLY \$4.60!

PET CARRIERS COLLAPSIBLE
\$5 each for cats, dogs to 150 lb. load. Easy clean polyureth. Cash or best offering to pet shops & markets.

RECONDITIONED CARS AND TRUCKS
Toyota, Nissan, Buick, Meru, etc. Also conditioned to get from like new. Make great profit shipping to Alaska states, Caribbean islands, England etc.

MINK COATS
Mink styles below wholesale.

GENUINE JADE NECKLACE
ONLY \$4.60!

PET CARRIERS COLLAPSIBLE
\$5 each for cats, dogs to 150 lb. load. Easy clean polyureth. Cash or best offering to pet shops & markets.

EXERCISE MACHINE
Buy below wholesale to cash in now on today's booming health care market. 11 membership gives you confidential reports.

COMPUTER LOCK
No key. Can't be picked. For homes, offices. Millions sales possible.

35mm CAMERA
with hot shoe and carrying case \$5.80

1000's more dazzling products you can buy DIRECT!

Confidential information on these products is currently given to I.T. members. Monthly reports change product offers to give you latest money making discoveries.

PERSONAL GUIDANCE!

I believe in giving you my personal help! Regularly I meet I.T. Members at regional closed door Seminars across the country. You will be invited to these meetings.

THE MELLINGER CO., 6100 Variel Ave., Dept. K225A Woodland Hills, CA 91367-3779

This Certificate Good for ONE SAMPLE IMPORT - FREE

B. L. Mellinger/The Mellinger Co.
6100 Variel Ave., Dept. K225A
Woodland Hills, CA 91367-3779

Send FREE REPORT, "How to Import and Export"... also actual Free Sample Import. Everything you send me is mine to keep without obligation. Show me how I can start a profitable home business of my own.

Name _____ Age _____
Address _____
City _____
State _____ Zip _____

IMPORTANT!
Your initials must appear below to qualify for Free Sample Import. Because of high cost and limited supply, I hereby agree to limit my request to one, and one ONLY, Free Sample Import. I have not previously requested this Free sample. I am over 18 years of age. Initial here _____

Unclog

DRAINS FAST!
with **drain king**

EASY AS 1 2 3

1. Connect to Hose
2. Put in Drain
3. Turn on Water - Drain King expands to seal pipe

The Rest is Automatic

GUARANTEED TO WORK OR YOUR MONEY BACK!

Available in Better Hardware Stores or For Drain King 1 1/2" to 3" drains. Send \$8.99 to

G.T. Water Products, Inc.
19438 Business Center Dr. Dept. PM10
Northridge, CA 91324

OIL FILLER EXTENSION extendo-tube

Helps prevent oil spills on engine and driveway
No tools needed to install
Remains attached to engine
Steel Construction
Patent pending
Made in U.S.A.

Fits most domestic autos and light trucks including:

Buick Pontiac AMC Dodge
GMC Chevrolet Jeep Ford
Chrysler Oldsmobile Cadillac Mercury
Plymouth International Lincoln

*Some Ford, Lincoln, and Mercury models may require an extension of hose running from oil cap to carburetor.

Please send me... chrome black Extendo-Tubes at \$6.95 ea.
Enclosed is a check or money order for \$ _____
or charge to my Visa / M/C Ex. Date _____
Card No. _____
NAME _____
ADDRESS _____
CITY _____ STATE _____ ZIP _____

Rockford Enterprises, Inc.
10399 Northland Dr. • Rockford, MI 49341 • (616) 866-4451

Full-Size TRADITIONAL ROCKING HORSE PLAN



Bring back the magic of childhood using our full-size plan for the Traditional Rocking Horse. Easy to build - body, legs and head are shaped using files. Rockers are curved for maximum action and shaped for desirable safety. Use pine or any available hardwood - paint to resemble live pony. Tomorrow's heroism today!

Plan No. 121 \$10.75

CATALOG 180diff., full-size prof. furniture plans-\$2.00 (catalog free with order)

FURNITURE DESIGNS, Dept. PZ-104
1425 Sherman Ave., Evanston, IL 60201

AMAZING SCIENTIFIC and ELECTRONIC DEVICES

PHASER shockwave and invisible FORCE FIELD generators. LASERS for weapons, cutting, burning, cloud writing, holography and special effects. NUCLEAR particle accelerators and detectors. PLASMA, ION, HIGH VOLTAGE, HIGH FREQUENCY TESLA COILS and LIGHTNING generators. TRANSMITTERS and CONTROL devices for security, telephones, intrusion detection, nature listening. PLUS PLUS INFRASONICS, ULTRASONICS, ENERGY, CHEMICAL and PERSONAL PROTECTION and SAFETY DEVICES. SEND \$1 for catalog of plans, kits and completed items to:

INFORMATION UNLIMITED, INC.
P.O. Box 716, Dept. M8
Amherst, N. H. 03031

DODGE OMNI GLH

(Continued from page 183)

tomatoes. Its visibility is outstanding in all quarters, though the tiny door mirrors could be larger for increased safety. With the quick steering response of the GLH, knowing where the surrounding traffic lies is a must.

Seating isn't up to the Shelby standards, as the GLH still wants to be a family car. Seats are the standard Omni fare, lacking the lumbar and thigh support which is needed for hard cornering. They are comfortable enough, but not up to handling the GLH driving style.

Instrumentation, however, is complete with a full complement of engine and operating monitors in easy-to-read black-on-white.

Like a sports car

Driving the GLH brings out the significance of its parentage. What Shelby has wrought is a five-door sedan that pulls through tire-frying acceleration maneuvers like a sports car, with competent handling and steering that puts the power to good use.

Rear passenger doors increase its utility without decreasing sportiness, and the cavernous "trunk" can be enhanced by dropping the rear seat forward for bulky cargo.

The Omni GLH comes at just the right time. Chrysler is gearing to produce its P-car replacement for the Omni/Horizon commuters, and the GLH could cause some late needed excitement in a car line that has been conspicuously without it. **PM**

Rare TECHNICAL BOOKS!

Discover hundreds of manuals, industrial handbooks, paperbacks, reprints, and privately published papers on unusual technical subjects ranging from melting metal to building windmills, and from tanning hides to video technology.

You'll see instantly why this is the most remarkable mailorder bookstore ever! You don't know what you've been missing! We probably have just the information you've been searching for years!

CHARCOAL FOUNDRY

by Dave Gingery

Learn how to build a powerful little furnace from a 5 gal. pail, fire clay, a blower and other scrap materials. Use it to melt pot metal, aluminum, even brass, and pour custom castings!

You'll learn how to make the furnace, cure it, build a crucible, select, load and melt scrap metal. It's easy! Dave will show you how to make the molding flasks, tools, even the foundry sand you need to pour custom castings. When you're finished you'll have a complete, versatile foundry and the knowledge to use it.

Imagine how much easier building machines and equipment would be if you could turn out a custom casting rather than have a part custom machined from solid stock. This foundry can save you money! (And you can make your friends think you're a genius!)

Order a copy of this hot-selling book, today. Jam-packed with practical, proven how-to! 5 1/2 x 8 1/2 paperback 80 pages. Cat. no. 163 \$6.95

CHARCOAL FOUNDRY!

by Dave Gingery

Build a complete foundry!

Pour custom castings!

Melt Metal!



JAM PACKED CATALOG!

HOW TO ORDER

Send your name and address, the name, number and price of the books you want along with check or money order. Or send your VISA or MASTERCARD numbers and your signature. Include 75¢ shipping for the first book and 25¢ for each additional book. (Ill. residents add 6% sales tax.) Satisfaction guaranteed. You may return any book within 7 days for refund. Free catalog sent with order. Or send \$1.00 for catalog without book order (\$3.00 foreign airmail).

Technical Books



LINDSAY PUBLICATIONS

Box 12-XE Bradley IL 60915-0012

Name _____

Street _____

City _____

State _____

Zip _____



RUN THREE PHASE MOTORS ON SINGLE PHASE POWER!

Run three phase motors on single phase! Learn three proven methods in use since turn-of-the-century! Two are easily installed! No motor rewinding! Booklet. Cat. no. 81 \$3.00

ALTERNATOR SECRETS!

Get thousands of watts from common auto alternator! Run tools, lights, AC-DC appliances, charge batteries, light arc welding, and more. Tips for building custom regulator! Great info! Low price. Booklet. Cat. no. 80 \$3.00

POWER INVERTER TECHNOLOGY

Convert low voltage DC into 110 AC! Learn how they work, why some won't, why some will! Covers smallest up to large industrial models. Sources of plans supplied. Rare info! Large booklet. Cat. no. 83 \$5.00

OTHER GREAT BOOKS

Motor Test & Repair - Troubleshoot, rewind and repair small motors. Cat. no. 303 \$7.25

Chemistry of Powder & Explosives - Detailed survey of explosive technology of early 1940's. Cat. no. 515 \$14.00

Electroplating & Electroforming - Formulas and how-to for plating precious metals, copper, nickel, and more. Cat. no. 153 \$8.95

Radios That Work for Free - Design and build high-performance crystal set radios. Cat. no. 314 \$5.00

Liquid Piston Stirling Engines - Hardcover industrial reference on specialized Stirling engines. Cat. no. 1146 \$24.95

Art & Craft of Handmade Paper - Make your own paper. Complete how-to by Vance Studley. Cat. no. 43 \$9.95

Complete Details in Catalog!

Other books! Tan hides, build sheet metal brake, troubleshoot hydraulic systems, spin metal, build kilns, clocks, telephone accessories, melt brass, and much, much more. Every book of highest quality. Guaranteed!

THE PM REPORT CARD

OMNI GLH	GRADE	COMMENTS
Acceleration	A-	Brief but routine detonation at low speed.
Handling	B+	Predictable cornering.
Braking	A	Strong pedal pressure and no fade.
Steering	B+	Positive control; good road feel.
Transmission	B+	Good action with short throws.
Ride	A	Firm, but not harsh.
Fuel economy	A-	24.1 mpg in hard use.
Seating	B	Comfortable; lacks support under stress.
Vision	A	Enough greenhouse to grow tomatoes.
Gauges/Controls	A	Complete, readable.
Ventilation	C-	Needs more fresh air vents.
Noise @ 55 mph	B	Usual 4-cylinder intrusion.
Cargo capacity	A	Big trunk space holds plenty.
Engine serviceability	A	Room to work, good accessibility.
Fit and finish	C+	Lots of tiny annoyances.

FIRSTHAND REPORT



Driving The New CHEVROLET SPRINT

Chevrolet's 1-liter leader has only three cylinders.

BY MICHAEL LAMM
West Coast Editor

In a lot of ways, the Chevrolet/Suzuki Sprint reminds me of my old 36-hp Beetle. It's similar in seating space, just as much fun to drive and every bit as well built. Like my VW, it has its share of quirks. Yet, the Sprint is a lot smaller, quieter and more comfortable than the Beetle. If you're looking for a change-maker, even beyond its base price of \$4,949, this car's got fuel economy in spades.

On a recent 316-mile trip from Sedona, Ariz., to Palm Springs, Calif., I posted 45 mpg buzzing along at 65-70 mph over a combination of mountain roads and freeway. Not bad, I thought. Then I surprised myself with 47.9 mpg on my second fillup, which represented all city driving. Finally, on a 220-mile run at legal speeds in the high California desert, the Sprint chalked up 56.4



Sprint's interior is modern and convenient, like that of most Japanese economy cars.

mpg and probably would have done better at sea level.

Technically, the Sprint's main marvel is its 48-hp, three-cylinder engine. Why three? Mostly to keep the block short and light, to reduce the number of parts and, perhaps, to be novel. The aluminum block has siamesed cylinders, cast-iron liners, four mains, a crossflow iron head and a belt-driven overhead cam. The entire engine, fully dressed including the flywheel, weighs only 147 pounds! The cam and crankshaft are

hollow, the cam carrying oil to lubricate its own bearings.

The classic four-stroke Three—as opposed to a two-stroke Three—has always run rough. Because of that, the Sprint carries its entire front-drive powertrain—the crosswise engine plus transaxle—in a very loose, heavily rubber-bushed system composed of half a dozen mounts, links and torque rods.

Does it work? Mostly yes, but it also leads to the car's main quirk. The only time you feel major roughness is when the engine is cold. That's probably because the rubber mounts are still stiff. Once the engine and mounts warm up, the Sprint's idle settles down to a steady and amazingly smooth purr. By watching the gearshift lever, you can see that the powertrain does shake independently from the rest of the car.

Problems start when you try to pull away from a stoplight. Because the engine/transaxle mounts are so loose, it's very hard to get smooth clutch engagement. The soft mounts wind up, and the clutch grabs as torque reaction

(Please turn to page 186)

WOODWORKING MACHINES 5 in 1 Combination

WITH ELECTRIC MOTOR WHICH
DEVELOPS 3 HP.

- 34" LATHE
- 10" TABLE SAW
- 11 1/2" DISC SANDER
- 16 1/2" VERTICAL DRILL PRESS
- HORIZONTAL DRILL PRESS

REGULAR PRICE \$1,200
Now only \$895
During this special
low clearance sale



VERY IMPORTANT

The only machine built with
A. ALL CAST IRON TABLES
B. HEAVY DUTY DESIGN
C. DEVELOPS 3 HP MOTOR
D. BUILT AS AN INDUSTRIAL MACHINE

ONE PLACE FOR ALL YOUR NEEDS...

CALL NOW!!! FOR FREE GIFT
Toll Free (1-800) 421-2467

IN CALIFORNIA CALL COLLECT (213) 549-0761

VISA MASTERCARD MONEY ORDER

PLANT:

MASTER WOODCRAFT CO.
800 SPRUCE LAKE DRIVE • P.O. BOX 669
HARBOR CITY, CA 90710
(A Republic-Lagun Group)

Dealership Available

CHEVROLET SPRINT

(Continued from page 185)



Rough-running three-cylinder Suzuki engine is cradled in a rubber-cushioned sub-frame. Short powerplant fits narrow car.

lays the power train over against the cradle. This makes for very quick, reverberating clutch action. Not that the driver can't get used to it, but clean clutch-and-gear engagement demands practice.

The same torque reaction takes place when shifting gears. It requires some thought and effort to finally master smooth up- and downshifts. Even changing throttle position—going suddenly from acceleration to deceleration and vice versa—brings out this slack in the drivetrain. Simple speed transitions feel harsh due to the spongy mounts.

Chevrolet intends to offer an automatic transaxle for the Sprint at the beginning of 1985, which might nullify most or all of these objections.

Good handling

The Sprint's good acceleration and handling go beyond most all-out economy cars. I was impressed, for instance, that the rear axle, mounted on single-leaf rear springs, stayed well controlled during hard cornering on washboard dirt roads. The only quibble I have with the Sprint's handling is when driving at speed in high winds—crosswinds or when buffeted by trucks. You definitely feel the breezes in this flyweight 1,504-pound car.

My particular Sprint had the optional air conditioner, which worked great without unduly bogging down the engine.

I also appreciated the split folding rear seat—part of the Comfort and Convenience Group—which fit my two guests plus all our luggage. It's amazing what you can cram inside this car. I comfortably transported two passengers, two large suitcases, one soft bag and one overnighter and could still see out the rear windows. In all, with both rear seatbacks folded flat, the Sprint has 22.5 cubic feet of luggage capacity—1.6 cubic feet more than the trunk of a Caprice sedan!

Another reason I like the Sprint has to do with all the thoughtful, unexpected touches that come as standard

equipment: the front stabilizer bar, disappearing A-pillar antenna, three-way dome light, day/night mirror, twin visors with visor pocket, map pockets in both doors, storage bin and ashtray in the rear seat, folding rear seatback, reclining front buckets, hinged rear windows, full carpeting, trip odometer and a usable glovebox. This car is definitely not a stripper. The one item I did miss was a security shade over the rear cargo compartment.

1-liter invasion

Under current quota agreements, only 17,000 Sprints will be imported through March 1985. That's a mere drop in the bucket to Chevrolet, but it's important to the division to be first with the smallest because Detroit automakers see the U.S. market for 1-liter cars as gigantic.

"We're at the edge of a one-liter invasion," Chevrolet Director of International Programs Tom McDaniel told me. Importable cars in this class include the Nissan Micra, Honda City, Subaru Justy, Diahatsu Charade plus possible minis coming from the Mazda Minx program as well as the Toyota Starlet's replacement.

Chevrolet dealers in 16 eastern states will sell the Isuzu-built Spectrum this winter. The Sprint has been available through 506 dealers in nine western states since late summer. **PM**

THE PM REPORT CARD

CHEVY SPRINT	GRADE	COMMENTS
Acceleration	B	Great for an all-out economy car.
Handling	B	Good in all normal driving situations.
Braking	A	No fade after repeated hard stops.
Steering	B	Accurate enough, but car is susceptible to sidewinds.
Transmission	C	Hard to shift smoothly due to soft powertrain mounts.
Ride	B	Slightly choppy.
Fuel economy	A	An honest 45-55 mpg.
Seating	A	Amazing amounts of leg- and headroom.
Vision	A	No blind spots; sloping hood.
Gauges/controls	A	Well-placed, visible.
Ventilation	A	Good flow-through with rear panes open.
Noise @ 55 mph	C	Mostly from the tires.
Cargo capacity	B-	Needs security screen.
Engine serviceability	B	Good powertrain access but no caster/camber adjustment.
Fit and finish	A	Searched but could find no flaws.

KANTER AUTO PRODUCTS 800-526-1096
TOLL FREE ORDER LINE

FRONT END REBUILD KITS FOR ALL CARS 1937-78

Over 100,000 satisfied customers worldwide.

For Any Cars Not Listed Please Inquire

Chevrolet, 55-79 all models	\$110
GM Compacts, 64-78	\$110
Buick Full Size, 61-79	\$120
Olds Full Size, 63-79	\$125
Pontiac Full Size, 59-79	\$110
Corvette, 53-62	\$240
Corvette, 63-82	\$110
Chrysler Products, 57-78	\$135
Ford & Mercury, 54-56	\$200
T-Bird, 55-57	\$200
T-Bird, 58-60, 67-78	\$130
T-Bird 61-66	\$300

Ford, Mercury, Mustang, Cougar, Comet, Falcon, Edsel, Fairlane, Meteor, Montego, Torino, Maverick, Pinto, Bobcat, Monarch, Granada, Elite 57-78 \$130

Each kit includes four ball joints, 2 tie rod ends, upper and lower inner rubber bushings, and stabilizer links and/or strut bushings as required. Add 10% postage & handling on all items.

Kanter Auto Products offers a complete selection of restoration parts and supplies for all cars dating 1937-78.

Call or write for our free catalog of 1000's of parts or send payment and we will ship your order to you FAST, with satisfaction guaranteed. We've been supplying fellow collectors with quality and value since 1960. FOR INFO, CALL (201) 334-9575

4 Shocks
\$60

Most Cars
1937-78

C.O.D.

Kanter Auto Products
76 Monroe St., Boonton, NJ 07005

10 Ways To Solve

ICE PROBLEMS

With winter, comes ice. Besides the obvious risk of falling, ice inside and out makes problems for your home and you. While some may seem minor, they can lead to expensive difficulties ranging from rotten roofing to floods—either upstairs or in the basement.

Taking it from the top (the roof), here are 10 ways—most are simple, inexpensive and easy—to deal with ice-caused problems in your home.

1. Clean drain systems. When ice in your gutters melts from the heat that leaks through your roof, water seeps up under the shingles and soaks the wood. It can rot roof structure and drip down inside walls soaking insulation and staining or damaging walls. To help prevent these ice dams, clean leaves and debris out of gutters with a whisk broom and hose it out of downspouts. Replace leaf baskets.

2. Install adequate attic insulation. Some roofs are prone to ice-dam problems even when gutters and downspouts are clean due to a lack of insulation. Heated house air rises through the roof and melts the bottom layer of snow only. Uneven melting results in ice dams. Install insulation and maintain it with adequate attic ventilation. A continuous vent at the ridge combined with soffit vents lets cold air circulate so snow on the roof can melt from the top rather than up from the bottom. This lets water run off without soaking under the shingles.

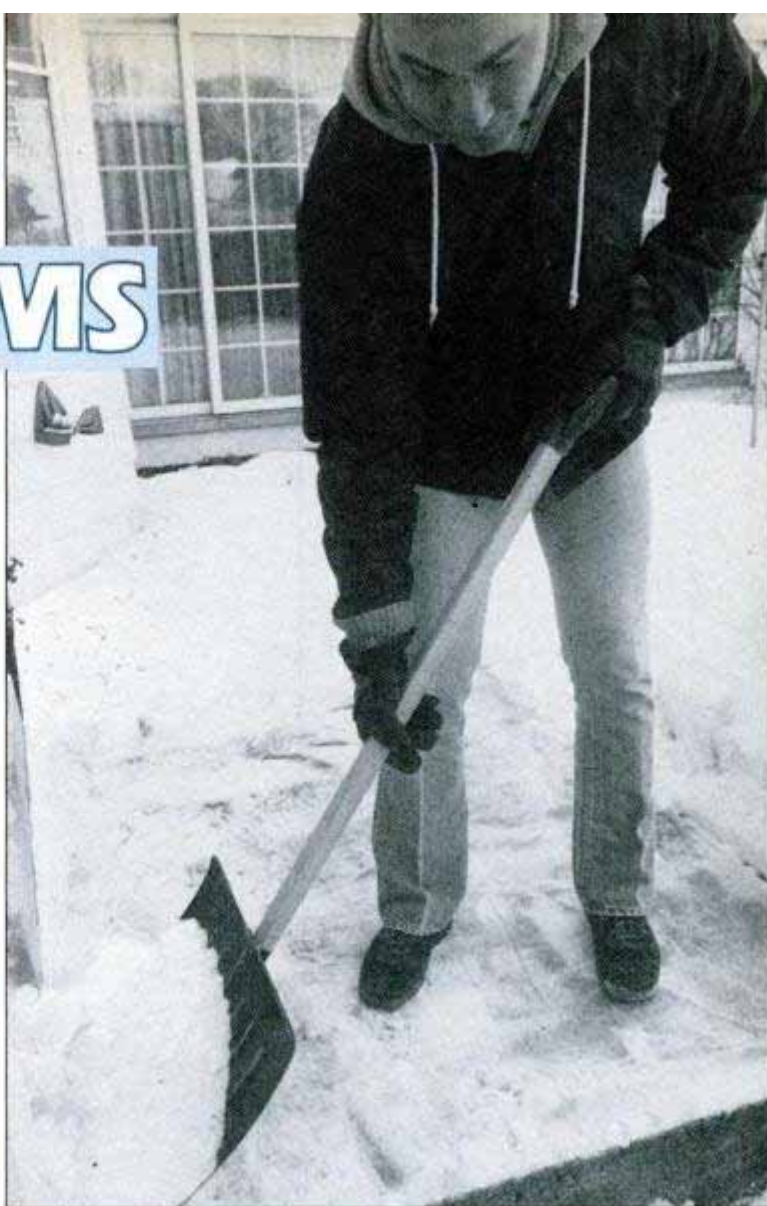
3. Seal the lower roof. If adding insulation or correcting insulation problems is impossible (as in a finished attic), attack the seepage problem from the outside. Temporarily remove several bottom courses of shingles, install rubberized asphalt/polyethylene sheets under the lower shingle courses and bond them to the roof. The undersheet is available in rolls from roofing suppliers.

4. Install roof heating cables. A commonly-used but often expensive ice-dam solution is to install electric heating sheets or cables. These can be effective. However, they are power-hungry and must be turned on and off. They should not be operated when not covered by snow, as this could cause overheating and possible fire.

5. Remove snow with the proper tools. Use good-quality shovels, pushers and/or snowthrowers. Steel tools are



After shoveling (right) save your back by not trying to scrape off the ice that remains. Scatter calcium chloride pellets (above) to melt the ice that shoveling leaves.



more durable than aluminum ones. However, the latter are lighter and easier to lift. Wipe dry after each use.

6. Use deicing agent on ice. Shoveling normally leaves behind a thin layer of ice and hard-packed snow. If snow is packed or ice has formed, deicing chemicals like sodium chloride (rock salt) work to about 20° F. Calcium chloride pellets by Dow Chemical Co. and others work faster and can be effective to minus 25° F. Read package labels to make sure you're getting calcium chloride pellets, not rock salt.

7. Apply a nonskid surface to steps. Wooden steps and smoothly finished concrete can become slick with a skin of ice, or even when merely wet. Calcium



Wrapping insulation around water pipes in an unheated basement or crawl space keeps them from freezing during cold months.

chloride pellets can melt the ice; but they cannot put a nonskid surface where none exists. By roughening painted surfaces with builder's sand in the final coat or using nonskid paints, you can make steps safer.

8. Caulk windows, doors and cracks. Cold air seeping through cracks and openings around windows and between the foundation and the building can condense water from warmer inside air and then freeze it. Caulk all such openings to reduce heating costs and to stop ice. Weatherstrip where needed.

9. Insulate basement pipes and water tank. Pipes exposed to subfreezing temperatures freeze and split. When they unfreeze, comes the flood. Insulation can keep pipes from freezing, if water is flowing through them. Insulation adds no heat and a pipe full of water, even a hot water pipe, will freeze at cold enough temperatures. Insulate water tanks to help them retain heat, too.

10. Drain outdoor pipes. The exterior connection for your hose can freeze and split either outside the house or in the basement if it gets cold enough. The cure is to drain the sillcock or install a frostproof hose bib. The hose can also split if it freezes. **PM**

NEW BOOK OF WOOD/COULD II



featuring 23 REDWOOD PROJECTS

... created by professionals in fine woodworking. Complete plans, working with wood tips, plus the fascinating story of redwood. \$3.95

Enclosed is \$3.95. Please send me a copy of the Redwood Book of Wood/Could II. (CA residents add 6% tax)

Name _____
Address _____
City _____
State _____ Zip _____

Simpson

Simpson Timber Company, California Operations,
P.O. Drawer V, Arcata, CA 95521 Dept PM-41

BARTLETT FLYING SAUCER



Ultra light hovercraft powered by ordinary lawn mower engine—easy to build—fun to fly—complete plans, kit brochure and supply sources \$6.00—Money Back Guarantee. write:

HERB BARTLETT
P.O. BOX 156-M
SILVERDALE, WA 98383

Full Size Plans



This Roll Top Desk is one of our finest furniture plans. It is similar to those of the 1800's and is made of oak lumber. Size: 55" x 21" x 49"H. Plans include base and roll-top unit. You do not have to purchase two separate plans. Desk - 311 \$14.50



Mr. Goodbank is a thrifty fellow who just loves to save coins. This cute guy is actually a bank and is 10 1/2" tall. Bank Plan - 329 \$3.00. Plan with eyes and nose \$4.50
Our Rocking Horse features a soft saddle and flowing mane. Easily made of pine with basic tools. 36" x 25". Kit available containing foam, mane, eyes, rings, etc. Horse Plan - 245 \$7.00 Accessory Kit - HAK \$9.00
This collection of five toy vehicles will make any child happy. Made of pine they are easily built with hand or power tools. The trailer truck is 18" long and 7" tall. 5 Toy Vehicles - PLD \$6.50
This great Name Train spells out your child's name in 3" tall letters. Complete full-size alphabet included. Name Train Plan - 323 \$3.50

Catalog \$1.00 - Free with plans. Phone (516) 667-3328
We accept Visa & Master Charge orders if over \$15.00

ARMOR Dept. C Box 290, Deer Park, NY 11729

At Least a New Amazingly Simple GAS TURBINE JET ENGINE



Build from easy to follow plans. Length 15", Dia. 8 1/2", Wt. 15 lbs. Fuel Gasoline or Kerosene. "Screaming Demon" develops 20 H.P. Ideal project for serious-minded hobbyists, students; scientific and industrial arts classes. Make on 9" metal cutting lathe with milling attachment. For use on small racing boats, midget cars, etc. Full size assembly drawings with critical dimensions, bill of materials and photos. Price \$8.00. No. C.O.D. SAVOY SCIENTIFIC 1510 28th St. P.O. Box 1398 SANTA MONICA, CALIF. 90406

Portable Steam Cleaner

Steam in 60 seconds

CLEAN: Engines, Air Filters, Lawn Mowers. 3-yr. guarantee on fire box, coils. Uses liquid soap, propane fired. Wt. 120 lbs. Aux. pump required on low water pressure.

WEDCO MFG. INC., Dept. M-15
P.O. Box D, 940 West Broadway,
Jackson, Wyoming 83001

NEW!

Learn Dental Drill
Repair. Never Before
Offered To The
General Public.



SECRET IS OUT

Repair dental drills in your own home. Thousands of drills go unrepaired every day. Big Demand. Few Competitors. Immediate income, steady customers. Special tools furnished. We'll show you how to start your own profitable business in a matter of days.

MAIL COUPON TODAY!

SOUTHWEST DENTAL 1501 E. Chapman Ave., Ste. 252
Fullerton, California 92631

Rush FREE Details to me about Dental Drill Repair.

NAME _____
ADDRESS _____
CITY, STATE/ZIP _____

PM PHOTO HINTS

Avoiding camera shake



When using a long telephoto lens on a handheld camera, attach a short tabletop tripod to the camera and brace its legs firmly against your chest. This added support will lessen the risk of camera shake.—*Bob Berger*

Handy reflector stand



A floodlamp holder with a spring clamp makes a handy adjustable stand for a reflector board when you're doing tabletop photography. The clamp's swivel allows you to tilt the reflector to any angle.—*David W. Roberts*

Easy-to-read markings

Make the markings on graduates easier to read by writing them on white tape with India ink.

—*Robert Hertzberg*



STOP

STOP

VEHICLE THEFT ULTIMATE

PED-AL-LOC

BECOME INTERESTED IN YOUR VEHICLE
BEFORE SOMEONE ELSE DOES!



MANUAL AUTOMATIC

SPECIAL OFFER \$44.99

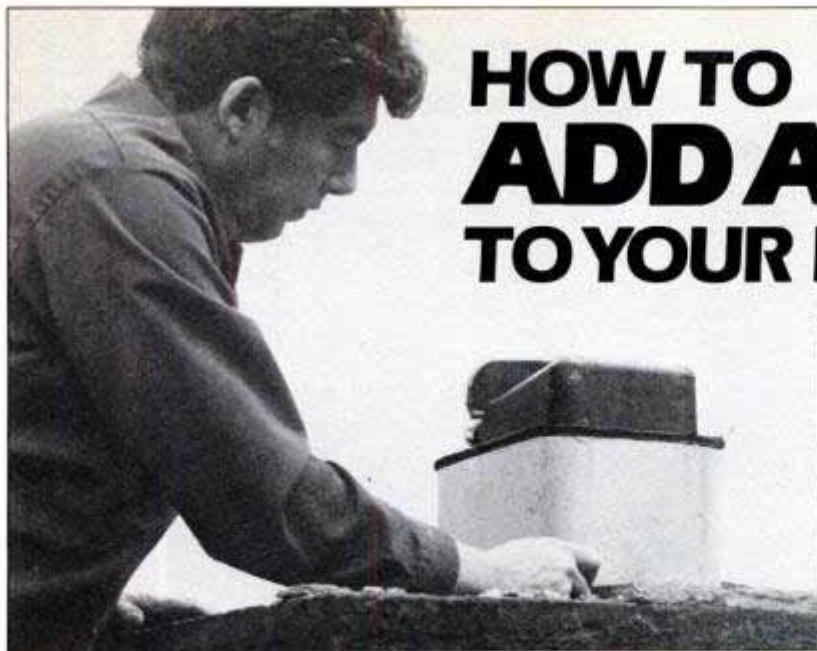
QUALIFIES FOR INSURANCE REDUCTION

NAME _____
ADDRESS _____
CITY _____ STATE _____ ZIP _____
Year _____ Make _____ Model _____
 Manual Shift Automatic Shift
 VISA M/C EXP. DATE _____

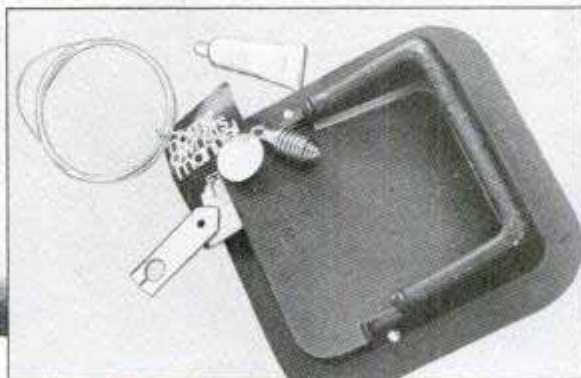
Signature _____ (Required for all charges) PM-8

OR MAKE CHECK PAYABLE TO PED-AL-LOC
Amount: \$44.99 + 3.50 P&H Per Unit (Pa. Res. add
PED-AL-LOC MFG. INC. 6% Sales Tax)
P.O. BOX 17107 PGH PA 15235 (412) 828-0635

HOW TO ADD A DAMPER TO YOUR FIREPLACE



Damper kit (right) has everything needed but flue tile (above) and concrete.



Fireplaces in many old homes do not have dampers. Also, dampers in older installations often become inoperative or warped, making them very inefficient. In new construction, a movable damper installed within the fireplace flue involves masonry work and can be quite time-consuming and costly.

A damper located on top of the chimney is the answer to all of the above problems. It is a much less expensive way of sealing both new and existing fireplaces against heat loss, water infiltration and birds than conventional dampers. With a top-sealing damper, the air in the flue is warmer than the outside air. On opening the damper, the warmer air rises immediately, creating a good updraft.

The Lymance top-sealing fireplace damper shown here is made of noncorrosive cast aluminum and stainless steel, which have less of a tendency to warp than older style dampers. The damper is sold in sizes that will cover standard terra cotta flue tiles of 9 x 13 in., 13 x 13 in. (both \$66.80) and 13 x 18 in. (\$87.12).

The damper lid is spring-loaded in the open position. You close the damper from indoors by pulling a stainless-steel cable that's attached near the front of the firebox.

Installation can be done in one hour's time. However, you should clean the chimney flue before adding the damper. Use ready-mix mortar and a trowel to install a top flue tile that projects out of the chimney. Then lower the weighted cable down to the firebox. Install the damper with adhesive. From indoors, install the cable-holding bracket.

For a dealer in your area write: Lymance International, Box 505, Jeffersonville, Ind. 47131.—P.S.



After removing hardware cloth or chimney cap, install flue tile. Use ready-mix concrete or mix mortar to pudding consistency and apply with a trowel around the tile.



Use a Vise-Grip pliers to weight the cable that moves the damper. Lower the cable from the chimney to the firebox. A helper below can alert you when cable is visible.



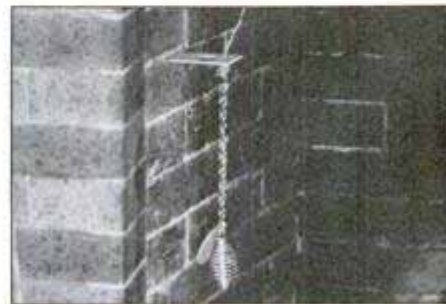
Apply two beads of the silicone rubber adhesive included in the kit to the top edge of the flue tile. The adhesive cures in 24 hours to bond the damper in place.



Press the damper in place. Make certain that it is working smoothly by opening and closing it several times. The spring-loaded lid (arrow) should remain open.



Indoors, toward the firebox front, install the bracket to hold the cable. Bore three 2 in.-deep holes spaced 3/4-in. o.c., apply epoxy resin and hammer the bracket in place.



Pull the cable until damper lid closes and you feel a slight tension. Secure setscrew of handle chain 3/4 in. above bracket. Cut extra cable, then secure clamp under bracket.

Take your
family
beyond
Computers.



Enter the
fascinating
world of
the home robot.

HERO JR. will wake you in the morning, guard your home at night, remind you of your appointments for the week, and entertain your family throughout the day with engaging small talk, songs, poems, games... even strolls around the house.

Introduce your family to the wonders of robotic living... for less than the cost of a computer. For the name of your nearest dealer,

**"Call me, HERO JR.
at 1-800-253-0570"**

Ask for operator 4

(In Michigan, call 616-982-3454)

Heath/Zenith

COMING NEXT MONTH

PM'S SPECIAL WOODWORKING GUIDE



HOW TO SET UP A GREAT SHOP

Here's all you need to know about organizing your tools and work surfaces in the space available.

Plus:

- Plans for our maple workbench and companion pieces.
- Dozens of woodworking tips and new tools that'll smooth your way to better projects.
- What you should know about the nature of different woods.

BLAZER AND BRONCO II

Owners level with us about what it's like to live with these sporty, 4 × 4 trail busters.

NEW TYPEWRITERS

This familiar household machine has entered the computer age—we show what the amazing models can do for you.

SPORTS CARS FOR SNOW

The '85 snowmobiles, packed with power and pizzazz, now have bucket seats and steering wheels.

FAMILY CAR TEST

We drive the cars Detroit makes best—the big ones with seats for six and trunks for everything.

Know your car inside and out.

Your car can run better, last longer and get better gas mileage.

Know how to fix it . . . to tune it . . . to keep it running right. The TOTAL SERVICE MANUAL for your car will show you how to do everything from a minor adjustment to a major repair.

TOTAL SERVICE MANUALS are digests of official-

factory workshop manuals. Each one is carefully rewritten for use by the do-it-yourself car owner. Clear and easy to follow, yet complete and detailed enough even for professional use. You get all the important information plus hundreds of the best pictures, diagrams, and specifications.



TOTAL SERVICE MANUALS

CREDIT CARD ORDERS CALL 516 676-8043

- 1713 Alfa Romeo 62-78 Giulia, Spider, plus \$12.95
- 9641 Aletta 73-80 all GT, GTV & sedans \$12.95
- 0448 Alliance 83 all models plus Fuego \$11.95
- 1244 AMC 70-83 all Gremlin/Spirit, Horn/Concord \$12.95
- 8194 AMC 75-82 AMX, Eagle, Matador, Pacer, + \$11.95
- 0991 Arrow 76-80 covers all models \$12.95
- 0919 Aspen 76-80 for all 6 & V8 models \$11.95
- 7122 Audi 100 70-77 all models inc 100LS \$12.95
- 1229 Audi 4000 80-82 all sedan & coupe \$12.95
- 9699 Audi 5000 77-83 factory shop manual \$39.95
- 0726 Audi Fox 73-79 covers all models \$12.95
- 0379 Barracuda 65-72 all 6 & V8 inc Cuda \$11.95
- 1042 BMW 2002 59-77 all inc 180i, no CS \$12.95
- 9813 BMW 320i 75-82 covers all models \$12.95
- 8199 BMW 528i, 530i 75-80 for all models \$12.95

- 3720 Citation 80-83 all + Buick Skyhawk \$12.95
- 9588 Citroen ID, DS 67-75 all DS19, 20, 21 \$12.95
- 8732 Colt & Champ 78-83 front whl drive \$12.95
- 8212 Corvair 71-75 covers all models \$11.95
- 8032 Corvair 60-69 all models inc turbo \$11.95
- 0478 Corvette 57-65 all 283 & 327 models \$12.95
- 9481 Corvette 66-82 all engines & models \$12.95
- 9585 Corvette 84 factory shop manual \$26.95
- 1756 Cricket 70-73 all + Hillman Avenger \$12.95
- 8188 Dart & Demon 68-76 covers all models \$11.95
- 9592 Datsun 200SX 80-82 \$12.95
- 8065 Datsun 1200/8210 71-78 all models \$12.95
- 0783 Datsun 210 79-82 for all models \$12.95
- 8127 Datsun 240Z, 260Z, 280Z 70-78 all models \$12.95
- 9152 Datsun 280ZX 79-82 all inc turbo \$12.95
- 1657 Datsun 310 76-81 all models + F-10 \$12.95
- 9583 Datsun 510, 610, 710 68-77 all models \$12.95
- 0392 Datsun/Nissan Sentra 82-83 all models \$12.95
- 7138 Datsun/Nissan Stanza 81-83 all models \$12.95
- 9297 Datsun 70-79 pick-up all 2-whl dr \$12.95
- 0925 Datsun 80-82 pick-up 720 2 & 4 whl dr \$12.95
- 0871 Dodge 68-77 all Monaco, Polara models \$11.95
- 8064 Dodge Aries 81-83 for all models \$12.95

- 8848 Honda Accord 76-82 covers all models \$12.95
- 9787 Honda Prelude 69-82 \$12.95
- 8694 Honda Civic 73-83 covers all models \$12.95
- 1259 Honda Horn 78-83 all + TC3, Turumo, Scamp \$12.95
- 8565 International 62-80 wagon, pick-up, Scout \$12.95
- 8206 Intl Scout 67-73 A, B, K, 8000 mds \$11.95
- 1043 Jaguar E-Type 61-72 all 6-cyl models \$12.95
- 9399 Jaguar XJ6 68-79 for all models \$12.95
- 9617 Jaguar XJ12 72-80 all inc XJS \$12.95
- 9769 Jeep, Willys 46-65 sta wgn & pick-up \$21.95
- 8207 Jeep 66-79 Cherokee, Wagoneer, Commo \$11.95
- 9805 Jeep Wagoneer J-series w/230 ohc eng \$19.95
- 8155 Jeep CJ 68-81 all CJ-5, 6, 7 models \$12.95
- 0596 Jeep Lancer Beta 76-80 sedan, coupe & HPE \$12.95
- 1254 Land Rover 59-77 2, 2A, 3 mds + diesel \$12.95
- 0481 Maverick 69-71 all 6-cyl models \$11.95
- 8211 Maverick 72-77 all models + Comet \$12.95
- 1550 Mazda GLC 77-82 rear whl drive mds \$12.95
- 8012 Mazda GLC 81-82 front whl drive mds \$12.95
- 0444 Mazda 71-78 includes RX4 & Cosmo \$11.95
- 9941 Mazda RX7 79-83 covers all models \$12.95
- 8105 Mazda 626 79-81 covers all models \$12.95
- 0593 Mazda 808, 818 72-78 covers all mds \$12.95
- 9486 Mazda 72-82 pick-ups R-1600, R-1800 \$12.95
- 1746 Mercedes 220 59-65 for all models \$12.95
- 8197 Mercedes 65-68 1900, 2000, 2200, 250, + \$11.95

- 8066 Plymouth Reliant 81-83 all models \$12.95
- 0851 Pontiac 66-76 Bonneville, Catalina, GP, + \$12.95
- 8710 Pontiac 74-84 LeMans, GTO, GP, GrandAm, + \$11.95
- 1108 Pontiac Fiero 84 factory shop manual \$27.95
- 0489 Pontiac Tempest 68-73 + GTO, LeMans \$12.95
- 9835 Porsche 911 65-82 inc E, S, SC & T \$12.95
- 9639 Porsche 914 70-76 all inc 914/6 \$12.95
- 0903 Porsche 924 76-80 all inc Turbo \$12.95
- 8908 Porsche 928 78-81 also covers 924 \$12.95
- 0372 Renault LeCar 75-83 covers all models \$12.95
- 0429 Renault 17 69-79 for all models \$12.95
- 0645 Renault 15, 17 71-79 all except Ti \$12.95
- 0506 Renault 18 78-81 all inc GTL, GTS, LS \$12.95
- 0750 SAAB 99 69-79 covers all models \$12.95
- 9613 Saab 900 79-83 all models inc Turbo \$12.95
- 8058 Subaru 72-82 all 1300-1800, Brat, MPV \$12.95
- 8584 Subaru 80-83 all mds, 2 & 4 whl dr \$12.95
- 8896 Sunbeam Alpine, 250 Tigris, Rapier mds \$10.95
- 8189 Torino 68-75 all inc Elite, Ranchero \$11.95
- 0829 Toyota Celica 71-81 all except Supra \$12.95
- 9002 Toyota Celica 82-83 all except Supra \$12.95
- 9812 Toyota Corolla 68-82 all inc 5-sp \$12.95
- 7132 Toyota Corona 70-82 all 4-cyl models \$12.95
- 8198 Toyota Cressida 78-82 all models \$12.95
- 0923 Toyota Starlet 81 covers all models \$12.95
- 0576 Toyota Supra 79-81 covers all models \$12.95
- 8524 Toyota Tercel 80-82 for all models \$12.95
- 0647 Toyota Land Cruiser 68-82 all mds \$12.95
- 1200 Triumph Spitfire 62-81 all models \$12.95
- 1015 Triumph TR7, TR6 67-76 all inc TR250 \$12.95
- 8693 Triumph TR7 75-81 for all models \$12.95
- 0192 Vauxhall 68-76 all inc Scamp, Signette \$11.95
- 8513 Vega 70-77 all mds except Cosworth \$12.95
- 1009 Volvo 76-80 covers all models \$11.95
- 1227 VW Beetle 54-67 for all models \$12.95
- 0140 VW Beetle 68-77 for all models \$12.95
- 8300 VW Rabbit 75-83 gas & diesel mds \$12.95
- 8294 VW Scirocco 75-83 for all models \$12.95
- 8383 VW Jetta 80-81 gas engine models \$12.95
- 1125 VW Van 61-79 all transporter mds \$12.95
- 9626 VW Busgen 80-82 for all models \$12.95



- 9760 BMW 2500, 2800, 3.0 all models, no CS \$12.95
- 0504 Bronco 66-81 all 2 & 4 whl dr mds \$11.95
- 8692 Bronco 81 84 all 2 & 4 whl dr mds \$11.95
- 6308 Buick 68-76 Electra, LeSabre, Wildcat \$12.95
- 8473 Buick 77-83 Electra, LeSabre, Estate \$11.95
- 8082 Buick 74-80 Century, Regal inc Turbo \$12.95
- 8459 Buick 81-83 Century, Regal rear whl dr \$11.95
- 0851 Buick 82-83 Skyhawk & Cad Cimarron \$12.95
- 0727 Cadillac 68-74 all except Eldorado \$12.95
- 6016 Cadillac 75-84 all full size models \$11.95
- 8678 Camaro 67-81 all 6 & V8 models \$12.95
- 9490 Camaro 82-84 covers all models \$12.95
- 6557 Capri 70-76 all 2000, 2600, 2800 mds \$12.95
- 9386 Capri 79-83 all engines & models \$12.95
- 9851 Cavalier 82-83 all + Pontiac J-2000 \$12.95

- 1259 Dodge Omni 78-83 all + 024, Chrg, Rmp \$12.95
- 0953 Dodge 67-84 pick-up all 4 whl dr mds \$11.95
- 1298 Dodge 71-82 pick-up all 2 whl dr mds \$12.95
- 2497 Dodge 79-81 D-50 pick-up plus Arrow \$11.95
- 8203 Dodge 67-70 vans to 1 ton + Plymouth \$11.95
- 6070 Dodge 71-83 vans to 1 ton + Plymouth \$12.95
- 8192 Duster 70-76 all models inc Scamp \$11.95
- 9688 Escort 81-82 all mds inc EXP \$12.95
- 8189 Fairlane 62-70 for all models \$11.95
- 8366 Fairmont 78-83 for all models \$12.95
- 9776 Fiat 124 67-82 all, Spyder, 2000, turbo \$12.95
- 9640 Fiat 128 72-79 all mds + SL, Rally \$12.95
- 8106 Fiat 131 75-80 all 1.8 & 2.0 engs \$12.95
- 0399 Fiat X1/9 71-82 covers all models \$12.95
- 6022 Fiat Strada 79-80 all models \$12.95
- 1073 Fiats 78-80 covers all models \$12.95

- 9485 Mercedes 250, 280 68-72 all plus 230 \$12.95
- 0416 Mercedes 68-73 230, 300 + diesel mds \$11.95
- 8308 Mercedes 350, 450 71-80 for all mds \$12.95
- 8439 Mercedes 74-84 230, 240, 280, 300, dsl + \$11.95
- 9688 Mercury Lynx 81-82 all mds inc LN7 \$12.95
- 1098 MG Midget 68-80 all + Sprite 58-71 \$12.95
- 6038 MG 55-62 covers all models \$12.95
- 1710 MGR, MGRTG 62-81 roadster, coupe mds \$12.95
- 0917 Mini 59-78 all mds inc Mini-Cooper \$12.95
- 0884 Monza, Chev 75-80 + Astre, Strir, Skyhk \$11.95
- 0479 Mustang 68-69 65-73 covers all models \$12.95
- 8272 Mustang 74-78 all 4, V6 & V8 mds \$12.95

- 9386 Mustang 79-83 all engines & models \$12.95
- 0951 Nova 71-79 covers all models \$12.95
- 6308 Oldsmobile 68-76 all 88, 98 models \$12.95
- 7107 Olds Cutlass 70-83 rear whl dr mds \$12.95
- 8465 Olds Cutless Cirra 82-83 + Pont 6000 \$11.95
- 9851 Olds Firenza 82 all mds + Pont J2000 \$12.95
- 3720 Olds Omega 80-83 all + Pont Phoenix \$11.95
- 8273 Old 66-75 all GT, Kadett, Monto, 1900 \$12.95
- 7124 Peugeot 504 68-79 all gas eng models \$12.95
- 0711 Peugeot 504 Diesel 74-80 all models \$12.95
- 0883 Pinto 70-80 all mds + Mercury Bobcat \$12.95
- 0874 Plymouth 68-76 Fury, VP, Gran, Suburban \$11.95

- 8465 Celebrity 82-83 all + fwd Century \$12.95
- 0379 Challenger 70-72 all 6 & V8 models \$11.95
- 9462 Challenger 78-83 all inc Sapporo \$12.95
- 8331 Charger 67-70 for all inc 500 & R/T \$12.95
- 8212 Charger 71-75 covers all models \$11.95
- 0383 Chevelle 64-69 for all inc Malibu \$11.95
- 8469 Chevelle 70-83 + Malibu, Monte Carlo \$12.95
- 0838 Chevette 76-83 all + Pontiac T1000 \$12.95
- 1038 Chevrolet 29-40 all 6-cyl models \$22.95
- 0888 Chevrolet 49-54 reprint factory manual \$12.95
- 1001 Chevrolet 55-65 BelAir, Biscan, Impala \$12.95
- 0919 Chev 69-81 BelAir, Biscan, Capric, Impa \$12.95
- 8187 Chevy II 62-68 all 4, 6 & V8 models \$11.95
- 0779 Chev LUV 72-82 all 2 & 4whl-diesel \$12.95
- 1260 Chev 82-83 10, S-15 pick-up + GMC \$12.95
- 8849 Chev 83 5-10, S-15 Blazer & Jimmy \$11.95
- 8154 Chev 67-82 pick-up, Suburban, Blazer, GMC \$12.95
- 1662 Chev 67-83 vans all models + GMC \$12.95
- 0020 Chrysler 74-79 factory manl, give year \$23.95

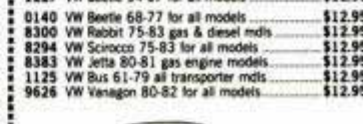


- 0675 Firebird 67-69 covers all models \$12.95
- 6309 Firebird 70-81 all V8 mds + TransAm \$12.95
- 6490 Firebird 82-84 covers all models \$12.95
- 9611 Ford 71-82 Elite, LTD II, Rchro, Tbird \$11.95
- 9672 Ford 68-83 Custom, Galaxie, LTD, XL, + \$11.95
- 9369 Ford Courier 72-82 covers all models \$12.95
- 8205 Ford 65-68 pick-up 2 & 4 whl to 1 ton \$11.95
- 0451 Ford 69-83 pick-up 2-whl F-mds + deslx \$12.95
- 8458 Ford 73-79 pick-up 2 & 4 whl F-mds \$12.95
- 9322 Ford Ranger 83 all 4 cyl, 2 & 4 whl dr \$12.95
- 8204 Ford 61-68 vans all to 1 ton \$11.95
- 0453 Ford 69-82 vans all 6 & 8 cyl mds \$12.95



- 9485 Mercedes 250, 280 68-72 all plus 230 \$12.95
- 0416 Mercedes 68-73 230, 300 + diesel mds \$11.95
- 8308 Mercedes 350, 450 71-80 for all mds \$12.95
- 8439 Mercedes 74-84 230, 240, 280, 300, dsl + \$11.95
- 9688 Mercury Lynx 81-82 all mds inc LN7 \$12.95
- 1098 MG Midget 68-80 all + Sprite 58-71 \$12.95
- 6038 MG 55-62 covers all models \$12.95
- 1710 MGR, MGRTG 62-81 roadster, coupe mds \$12.95
- 0917 Mini 59-78 all mds inc Mini-Cooper \$12.95
- 0884 Monza, Chev 75-80 + Astre, Strir, Skyhk \$11.95
- 0479 Mustang 68-69 65-73 covers all models \$12.95
- 8272 Mustang 74-78 all 4, V6 & V8 mds \$12.95
- 9386 Mustang 79-83 all engines & models \$12.95
- 0951 Nova 71-79 covers all models \$12.95
- 6308 Oldsmobile 68-76 all 88, 98 models \$12.95
- 7107 Olds Cutlass 70-83 rear whl dr mds \$12.95
- 8465 Olds Cutless Cirra 82-83 + Pont 6000 \$11.95
- 9851 Olds Firenza 82 all mds + Pont J2000 \$12.95
- 3720 Olds Omega 80-83 all + Pont Phoenix \$11.95
- 8273 Old 66-75 all GT, Kadett, Monto, 1900 \$12.95
- 7124 Peugeot 504 68-79 all gas eng models \$12.95
- 0711 Peugeot 504 Diesel 74-80 all models \$12.95
- 0883 Pinto 70-80 all mds + Mercury Bobcat \$12.95
- 0874 Plymouth 68-76 Fury, VP, Gran, Suburban \$11.95

- 9582 VW Type 3 62-73 squareback, fastback \$12.95
- 9778 VW 411, 412 68-74 covers all models \$12.95
- 8748 VW Dasher 74-79 covers all models \$12.95
- 1750 Volvo 142, 144, 145 66-74 all models \$12.95
- 9558 Volvo 164 68-75 for all models \$12.95
- 3729 Volvo 242, 244, 245 75-83 all models \$12.95
- 8311 Volvo 264, 265 75-80 for all models \$12.95



- 9582 VW Type 3 62-73 squareback, fastback \$12.95
- 9778 VW 411, 412 68-74 covers all models \$12.95
- 8748 VW Dasher 74-79 covers all models \$12.95
- 1750 Volvo 142, 144, 145 66-74 all models \$12.95
- 9558 Volvo 164 68-75 for all models \$12.95
- 3729 Volvo 242, 244, 245 75-83 all models \$12.95
- 8311 Volvo 264, 265 75-80 for all models \$12.95

FUEL SYSTEMS

- 0706 Bypass Ford Emission Controls 73-77 \$15.95
- 8474 Bypass GM Emission Controls 71-77 \$14.95
- 1711 Basic Carburetion & Fuel Systems \$6.95
- 9976 Carb Basics, textbook, rebd all U.S. \$8.95
- 0882 Carter Carburetors, all 4-bbl models \$10.95
- 8534 Holley Carburetors, all 4-bbl models \$10.95
- 9411 Holley Carburetors, all 2 & 4-bbls \$9.95
- 9652 Rochester Carbs, all 1, 2 & 4-bbls \$9.95
- 9423 Stromberg CD Carburetors all thru 76 \$9.50
- 6354 SU Carburetors all models thru 76 \$9.50
- 1511 Weber Carburetors all models thru 79 \$9.50
- 3759 Bosch Electronic Fuel Inj, thru 77 \$10.95
- 9773 Electronic Fuel Inj Man, all sys to 83 \$29.50
- 9410 Turbochargers, best on the subject \$9.95
- 0791 Fuels & Lubricants, gas, diesel & oils \$6.25
- 8872 Propane Conversion of Cars, Trucks, RVs \$9.95

BOOKS BY CAR MAKE

- 8094 Barracuda/Challenger, Source Book \$12.95
- 9534 Buick Power Manual, tuning the V6 \$8.95
- 9409 Chevy Small-Block, How to Hotrod \$7.95
- 8125 Chevy Small-Block, How to rebuild \$9.95
- 8421 Chevy Racing Engine, prep small blk \$10.95
- 1243 Chevy Small-Block, Racing the 152 p \$8.95
- 9795 Chevy Performance, from small block \$10.95
- 1601 Chevy Big-Block, How to Hotrod \$7.95
- 9938 Chevy Big-Block, How to Rebuild \$9.95
- 8303 Chevy Heavy Duty Parts Book \$5.00
- 0830 Chevy Super Sports 61-76 info on all \$14.95
- 0487 Chevelle SS: A Source Book, factory info \$12.95
- 3725 Building the V6/Vega, step-by-step \$7.95
- 8060 Corvette Restro./NOs Parts Book, 53-82 \$8.95
- 0949 Corvette Restroin Source Book, 53-67 \$21.95
- 8683 Datsun, How to Hotrod & Race, 510-280Z \$15.95
- 8683 Datsun, How to Hotrod & Race, 510-280Z \$15.95
- 0794 Firebird, Source Book, factory info \$12.95
- 1725 Firebird, Trans-Am High-Peef Hook \$8.95
- 0946 Ford Small Block, tuning & rebuilding \$9.95
- 8494 Ford Big Block, How to Rebuild, 160 p \$9.95
- 9497 Ford V8, How to rebuild your \$9.95
- 8195 Ford Performance, from all V8 engines \$10.95
- 1076 Fearsome Fords 59-73 tech data, pics \$14.95
- 9498 Ford, Rebuild your OHC, 4-cyl Pinto \$9.95
- 7115 How to keep your Honda alive, 73-82 \$14.00
- 0390 Mazda RX-7, road tests, tech data, plus \$8.95
- 8384 Mopar Small Block, How to rebuild \$9.95
- 8736 Mopar Suspension Tuning \$10.95
- 8307 Mopar Performance, hi-perf eng bldg \$10.95
- 8532 Mopar Engine Modifications, 355 pgs \$15.00
- 8095 Nova SS: A Source Book, factory info, pics \$12.95
- 8144 Olds 4-2: Source Book, factory info \$12.95
- 9963 Opel GT, road tests, tech data, plus \$11.95
- 9965 Pontiac Racer/Hi-perf from 60s, 70s \$19.95
- 6012 GTO: Source Book, factory info & hist \$14.95
- 8054 Big "Little GTO" Book, 64-74 mds \$14.95
- 6351 Porsche Buyer's Guide, 210 illus \$13.95

BOATS & MOTORCYCLES

- 8506 Chrysler 08 66-81 3.5-20 hp \$9.95
- 8507 Chrysler 08 66-82 25-140 hp \$9.95
- 8508 Evinrude 08 65-81 all 1.5 to 35 hp \$9.95
- 8509 Evinrude 08 65-82 all 40 to 140 hp \$9.95
- 8510 Johnson 08 65-81 all 1.5 to 35 hp \$9.95
- 8511 Johnson 08 65-82 all 40 to 140 hp \$9.95
- 8512 Mercury 08 64-82 all 4 to 40 hp \$9.95
- 1217 Mercury 08 64-82 all 50 to 200 hp \$9.95
- 8186 Stern Drive, repair OMC, Merc, Volvo \$9.95
- 1085 Mercruiser stern drive shop manual 64-83 \$22.95
- 0929 Motorcycler Manl 68-81 all Jpn & U.S. \$24.95

LAWNMOWERS & TRACTORS

- 9651 Small Tractors 65-81, 8-30 hp, 960 pgs \$19.95
- 8301 Atlas-Chalmers B, C, CA, G, RC, WC, WD, WF \$10.95
- 9822 Ford 2N, 8N, 9N \$10.95
- 8490 Ford 501, 600/J-900/1, 1801, 2000 \$10.95
- 1028 IH A, B, C, H, M, MTA, 4, 6, W6TA, 9 \$10.95
- 8518 John Deere A, B, D, G, H, M, MT \$10.95
- 1020 Massey-Ferguson TE20, T020, T030 \$10.95
- 8755 Riding Lawnmower Serv, all pop makes \$8.95
- 9770 Lawnmowers, push-type, all 2 & 4 cyl eng \$8.95
- 9147 Excavator Operation, all earthmoving \$9.95
- 9807 Heavy Equip Repair, earthmoving \$19.95
- 8658 Large Air Cooled Eng, 1.5 cid & up \$9.95
- 9419 Small Engine Service man, under 15 cid \$12.95
- 0557 Chain Saw Service Manual, 24 top makes \$9.95

TV, HOME REPAIR, ETC.

- 8024 All About Home Satellite TV \$12.95
- 9959 Beginner's Guide to TV Repair, 224 pgs \$9.25
- 0533 TV Field & Bench Servicer's Handbook \$9.95
- 0450 Television Electronics: theory & service \$29.95
- 0809 Service Home Video Cassette Recorder \$13.95
- 0396 Videocassette Recorders Handbook \$10.25
- 8023 Home Video Equipment, all sys & compnt \$9.95
- 3752 Master Handbook of Telephones \$12.50
- 0568 Electrical Appliances, repair all \$12.95
- 7133 Repair Your Own 35mm Camera, all SLR \$10.25
- 1268 Sewing Machine Repair, 308 pgs \$9.25
- 9804 Typewriter Repair, manual & electric \$12.50
- 8724 Locks & Locksmithing, 392 pgs info \$15.50
- 9971 Oil Burners, install, service, repair \$16.95
- 9426 Electrical Wiring, home, barn, garage, + \$15.95
- 9447 Home Electricity from Wind, Water, Sun \$8.25
- 9525 Machining Fundamentals, 512 pgs \$25.95
- 8397 Cast Small Metal & Rubber Parts \$7.25
- 8231 Welding Guidelines, gas & electric \$8.95
- 1652 General Carpentry const wood houses \$24.95
- 0843 Concrete Technology, very thorough \$18.95
- 9427 Industrial Plastics, 270 page textbk \$20.95

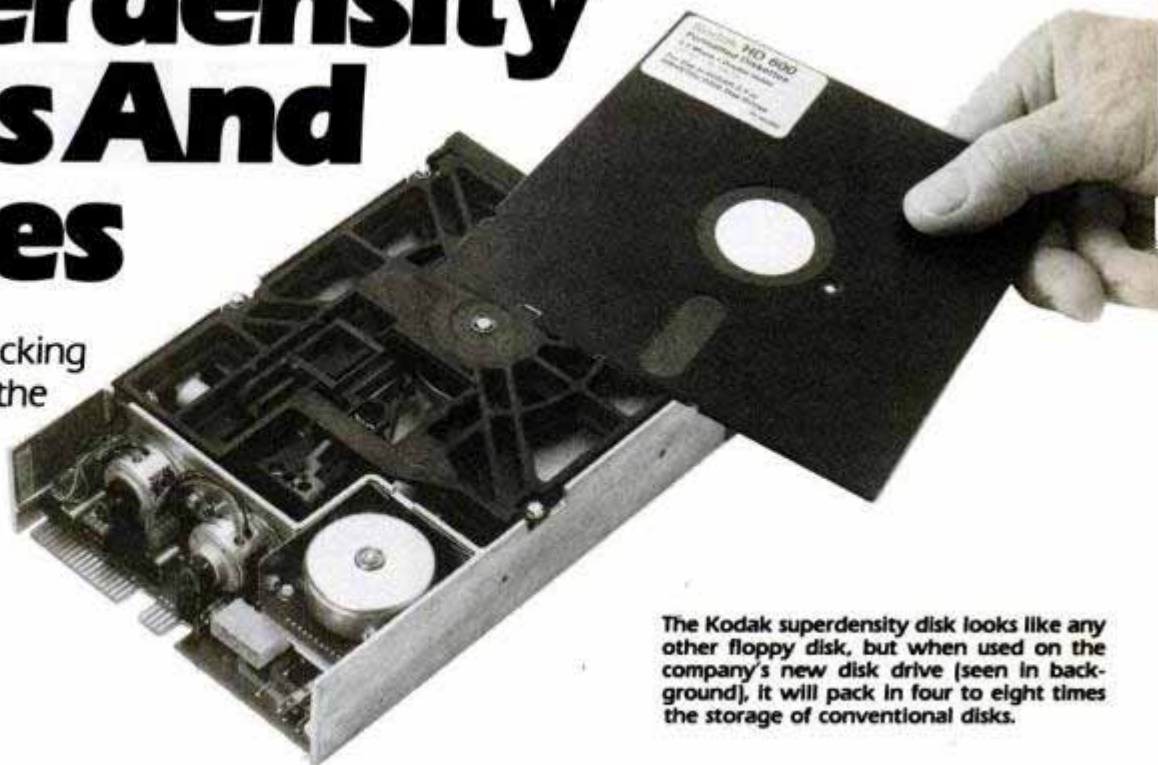
CHASSIS & BODY REPAIR

- 0662 Save Your License, survival guide \$9.95
- 1223 Brakes, Steering & Suspension 76-83 \$14.95
- 1706 Basic Chassis, Suspension & Brakes \$6.95
- 8478 Customizing Cars, inside & out \$12.95
- 3720 Auto Body Repair, tech training manl \$22.95
- 1659 Auto Body Repair, the fundamentals \$14.95
- 8712 Metal Fabricator's Handbook, custom \$9.95
- 5104 Auto Body Repairing & Reupholstering \$14.95
- 0745 Auto Collision Work: vocatnl train manual \$19.95
- 0827 Automotive Refinishing, for the

Superdensity Disks And Drives

A new way of packing information onto the familiar 5¼-inch floppy disk will turn it into a megabyte storage system.

BY WALTER SALM



The Kodak superdensity disk looks like any other floppy disk, but when used on the company's new disk drive (seen in background), it will pack in four to eight times the storage of conventional disks.

A new superdensity floppy disk drive developed by Eastman Kodak makes it possible to store four to eight times as much computer data on a conventional-size floppy disk. The new disk drive can pack up to 3.3 megabytes (million characters) on a 5¼-inch floppy disk—a disk size that until now has been able to hold a maximum of about 800 kilobytes (thousand characters).

The technology involves using an extra-fine, ultra-pure thin magnetic coating to create a superdensity floppy disk. It also involves a new servo-driven disk drive with newly developed read/write heads that can write and read tracks of data packed so closely together that 1 inch of disk surface contains 192 parallel tracks (192 tracks per inch, or TPI).

There once was a time when 91 kilobytes of disk storage on a 5¼-inch disk was a lot. This was what you got on the old Osborne I, and even today on the typical single-density Atari. Track spacing for this kind of storage is 20 TPI, and only one side of the disk is used.

Other computer manufacturers have opted for double-density storage, which puts about 180K on a single side of a disk. Double-density systems use track spacing of 40 to 48 TPI.

Double-sided disk drives have two sets of read/write heads and work on both sides of a disk at the same time. Naturally, they're more expensive than the single-sided type, but they double the disk's storage space—usually 320K instead of 160.

There's also *quad* density, which can

pack up to 390K on one side of a disk and 780K on double-sided versions. But quad has always been very chancy—it uses two disk read/write heads *on the same side of the disk* trying to make those limited magnetic particles do more than is really physically possible.

The very fine coatings used on 800K disks are nothing compared to the precision of the new superdensity floppies. The superdensity disks have to be *preformatted* at the factory—with special magnetic "sector" dividing lines and magnetic signals that tell the disk drive where its heads are at any time.

At the moment, at least three companies are involved in producing these systems. The first to actually put an add-on product on the market, Rana Systems, has introduced a floppy disk drive that stores 2.5 megabytes on each disk. The first unit in the line is a \$1,550 add-on for IBM-PC computers, but an Apple version is also coming, and compatibility with others may follow.

You get a 10-pack starter set of superdensity disks when you buy the Rana drive. Extra disks cost \$16 each, which works out to \$160 a box—compared with \$30 a box for conventional disks.

How's that compare with cost per K

MANUFACTURERS

Data Technology Corp., 2775 Northwestern Parkway, Santa Clara, Calif. 95051 ("3.3" drive)
Drivetec Inc., 2140 Bering Dr., San Jose, Calif. 95131 (OEM products only)
Kaypro Corp., Box N, Del Mar, Calif. 92014 (Robie computer)
Rana Systems, 21300 Superior St., Chatsworth, Calif. 91311 (superdensity disk drive)

of storage? Let's see, if you're looking at \$30 for a box of disks for the IBM-PC at 360K per disk, that comes to about \$.83 per 100K. Using the same formula, the new Rana disks cost about \$.64 per 100K. They're 23 percent less in cost, and they're probably a whole lot easier to use, since you have far fewer disks to contend with. One 10-pack will hold as much as 1½ "Elephant Trunks"—those flip-top plastic disk file boxes that store 50 floppies.

Kodak has been quietly making disk drives, which are now being marketed by Data Technology Corp. DTC, which specializes in making disk controller plug-in cards, is offering the new superdensity drives (called the "3.3") in versions for other manufacturers to use and is also marketing them separately through computer dealers. The retail version, called "TeamMate," is available as a caseless drive for building into an IBM or Apple, and retails for \$895 (including the controller). You can also get it in a box for add-on installations for \$1,295. Blank disks are \$15 each.

According to Data Technology, the new drives will also "read down"—working with more conventional disks that use quad format (780K per disk) and double density (360K per disk).

To make the whole scene even more interesting, Kaypro is now selling its first desktop computer, called "Robie" with two of those superdensity disk drives at 2.6 megabytes each. The retail price for this computer is \$2,395 and it includes a ton of software—all of it on *one* disk.

PM

THE FASTEST, EASIEST \$100,000

You'll Ever Make in Your Life, Yours Now

- WITHOUT A PENNY OF INVESTMENT
- WITHOUT LEAVING YOUR HOME
- WITHIN 90 DAYS
- "WORKING" ABOUT ONE HOUR A DAY (OR EVENING)

There are all kinds of ways to make money. Good golly, Molly — if anyone knows that, I do! For the past 20+ years I've concentrated on finding, investigating, creating and specifically singling out only the very finest legal and ethical methods for carving out a mass of wealth in a hurry. But believe me, in all those years never have I experienced anything remotely as exciting as this one!

Recently, I came across a fairly new way to make big bucks, but after a thorough study I discarded it because it required too much investment of time, money and personal effort. But my study did serve as inspiration to develop yet another fantastic and unusual wallet-batterer — something that until now has never been done — yet fully complies with the tough set of standards I'm noted for demanding of any potential wealth-producing concept:

- Must be able to be started with **minimum investment**
- Must be possible to **start at home** and not interfere with family life.
- Must be able to be started and run initially by one man or woman
- Must require only a **few hours of spare time per week**
- Must have realistic annual profit potential of **\$40,000 or more**

Well, this one goes way beyond my usual rigorous test. Get this: This extra-ordinary money-maker® allows you to:

- Start at once — **within 30 seconds** of studying my report
- Invest **not a single cent**
- Accomplish everything **without leaving your home** — heck, you can do it from your favorite easy chair whilst eating pizza or petting the dog (or vicey versey!)
- Have a potential **net profit** (not gross ... net!) of **\$100,000.00** by the end of 90 days — tops. And that's **cash**, not theoretical or paper profits.

Naturally, you're wondering what all this is — but I'm not going to tell you here. No, it's going to cost you ten

For the past two decades Du Vall has captured the imagination of men and women the world over by providing solid, unique direction for their quest for financial freedom. His firm is headquartered in Michigan with international marketing offices in Hong Kong (known as DAX International, John W. Lane, President). In addition to producing some three dozen publications on money-making/self-improvement themes, DuVall is also the creator of the popular Derek Dax adventure/mystery/romance series and the author of the political intrigue novel, "The Big Dream" (published by Lyle Stuart, Inc., New York). Unlike most, he has never had to resort to outlandish money-back guarantees to attract only the finest DAX-DOERS worldwide and no such policy is expressed or implied.

His writings have been used in numerous style and content workshops and accredited courses at such institutions as California State University, UCLA, Fordham, University of Illinois and Worcester Polytechnic Institute.

smackers to find out. But I will tell you what it *isn't* so you'll not be off on some wild goose chase:

- ★ No sex or off-color stuff
- ★ No chain letter, pyramid or multi-level scam
- ★ No mail order, envelope stuffing or drop-shipping
- ★ No writing or self-publishing how-to stuff
- ★ No loan brokerage scheme
- ★ No stocks, commodities, real estate, etc.
- ★ No gambling, betting or wagering
- ★ No arts, crafts or special skills
- ★ No party-plan, door-to-door or phone selling
- ★ No catalogs, mailing lists, postage, etc.
- ★ No equipment to buy or rent
- ★ No bothering friends, relatives, etc.
- ★ Not anything you have ever seen advertised anywhere

WHO CAN DO IT

Anyone with even a smidgen of ambition.

WHAT IS REQUIRED

Other than my step-by-step detailed report ... nothing. I have thought long and hard about it: A person virtually without a shirt on their back or a pot to plant petunias in could do it. You will of course, have to put my plan into motion — but that's both fun and easy and totally accomplished from the comfort of your own home. (By the way, no one will be coming to your home, either.)

Finally, let me make this clear: Once you have my report, **that is all you need to get going!** I have nothing else to sell you for this deal. Your purchase of this extraordinary report is NOT a "foot in the door" to get you to buy some extra or expensive "course" or whatever ... this is all you need from me!

WANT PROOF?

We have over 10,000 'tasty testimonials' from housewives, doctors, lawyers, laid-off factory workers—all sorts of good people. These excerpts sum up their feelings:

"Thanks a million times . . . you have proved 100% accurate in what you said in your advertisement. Doing this work is so easy! I sometimes work while in bed. Should you come up with another ingenious thing, please let me know."

Mohidin Mohammed, Sweden

"We are so impressed . . . have our 13 and 16 year olds involved . . . thanks for giving our family new hope."

MacClear Family, Indiana

" . . . man in economically depressed area left \$35,000 secure job to put this method to work . . . made \$120,000. First man I've ever met who really made money on idea purchased through mail."

David Roman, Editor, ROMAN REPORTS, Ohio

WHAT TO DO NOW

You've got two choices:

1. Put this ad aside, wait 90 days or so and perhaps lose your chance at \$100,000.



Nifty Bonus!

A few months back in our DAX MONEY-MAKER® CONFIDENTIAL NEWSLETTER, we reported on another business that can easily net \$1,000 a week for life. It's a bit more involved and does require getting out and about, but our readers were so delighted with it that I'm including it as an extra **free bonus** when you order our new special DAX report, "\$100,000 in 90 Days."

2. Do the only sensible thing. Send me the ten bucks and get started on wearing in that path to the bank.

P.S. One more thing (say, this Du Vall is a windy so and so, isn't he!). There are lots of people right now in bad financial straits. I hope you're not one of them, but if you are, having read this ad you now have absolutely no excuse for being broke, because as the saying goes, "This is it!" This could truly be the once-and-for-all solution to any money miseries you have. I guess you'll have to take my word for it until you receive these fabulous reports — but if it eases your mind any, over 1,000,000 men and women worldwide have been, over the years **repeat buyers** of my books, courses, reports, cassette tape programs and newsletters. There must be a reason . . .

— Dean F. V. Du Vall

Du Vall Press Financial Publications
920 W. Grand River, Williamston, Michigan 48895

For same day DAX processing mail to: BOX 14-ND 101 WILLIAMSTON, MI 48895

Dean — this sounds like just what I'm looking for — a chance to make mega-bux without any investment or having to leave the house. The same day you receive my order rush me your new DAX Special Report, "\$100,000 in 90 Days" plus the Free Bonus Report, "\$1,000 A Week for Life." Enclosed is ten dollars.



For Personal Success

_____ Zip _____

Optional: Add \$2 for individual handling/first class postage. ©1983

Dome Home Kits



Affordable. Ready to Assemble.

A Monterey Dome is the home for all seasons. Engineered in kit form for the novice builder. All parts are pre-cut and color coded. Prices start at \$3995.

Send now for Monterey Domes 100 page color Catalog & Plans Book. \$6.00.

Please send my 100 page copy of Monterey Domes Catalog & Plans Book. Enclosed is \$6.00.

Also please send me the Monterey Domes Basic Home Assembly Manual for an additional \$5.00. Thank You.

Name _____

Address _____

City/State/Zip _____

Send To: MONTEREY DOMES

1760 Chicago Ave., Dept. AQ-10
Riverside, Calif. 92517



Richard's

The Clothier for the Man Under 5'8"

Suits, Shirts, Sweaters and Sportswear sized to fit the man under 5'8".

FREE Catalog:
Richard's, Dept. PM
2535 Pilot Knob Rd.
Mendota Heights, MN 55120
1-800-328-8322 Ext. 524

Name _____

Address _____

City _____

State _____

Zip _____

Phone # _____

A SINGER'S DREAM!



REMOVES VOCALS FROM RECORDS!

Our VOCAL ELIMINATOR can remove most or virtually all of a lead vocal from a standard stereo record and leave most of the background untouched!

Write or call for a free brochure and demo record.
LT Sound, Dept. PM, P.O. Box 338, Stone Mountain, GA 30086 In Georgia—(404)493-1258
TOLL FREE: 1-800-241-3005—Ext. 52

SOLAR WATER HEATING SYSTEMS SAVE \$1,000

Do It Yourself
No Solder or Threading
All Brass Compression Connections.
Drain Down Valve, Pump, Differential
Controller, 4 - 10 Black Chrome on Copper
Glazed Collector, Mounting, 80 Gal. Solar
Water Heater.

Everything You Need. Just

\$1,590.
TOTAL DELIVERED PRICE

(\$636.00 Federal Solar Credit Available)
Send Check or Money Order to
6204 Benjamin Rd. Suite 205 Tampa, Fla. 33614
Call 1-800-237-8679 ext. 292k
Florida Res. Call 1-800-282-3554 ext. 294J
Solarite, Inc.

GREAT SAUSAGE RECIPES

227 page illustrated book explains sausage making plus home curing and smoking of meat, fowl and fish. Over 100 recipes. We now have Low Salt Seasonings. Free equipment and supply catalog has more information.

The SAUSAGEMAKER

177-6 Military Road Buffalo, N.Y. 14207

GOVERNMENT SEIZED PROPERTY

Could Make You RICH!

LITTLE-KNOWN SECRET REVEALED!
Buy Dirt Cheap—Automobiles, Trucks, Vans, Boats, Furniture, Stereos, Appliances & TVs—thousands of other items seized in narcotics raids—Resell at Big Profit!

Write Today! Free information!
MARCEL Dept. MB
Box 7557, Monroe, LA 71211

PRINT FOR PROFIT

Cards, stationery, envelopes, advertising, labels, tickets, QSL cards, announcements, greeting, sympathy, prayer cards, tags, etc. Save money.

Own a Printing Business. Own 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, Dept. B4BJ, Meriden, CT 06450



SATELLITE TV



ANTENNAS BUILD YOUR OWN!

Complete easy to assemble kits for home construction by anyone. Catalog \$2.00. Jansen Electronics, P.O. Box 168 - M2, Dundee, OR 97115.

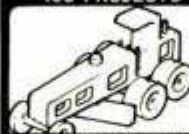
FREE CATALOG!

Outstanding How-To, Electronics, Computer, Aviation, and Automotive books!

Over 700 titles.

TAB BOOKS Inc. Dept. PMX-1084X
P.O. Box 40, Blue Ridge Summit, PA 17214

150 PROJECTS • BUILD NOW FOR XMAS



• TRUCKS • PLANES • BOATS
• TRAINS • JUMP & WIGGLE TOYS
• FURNITURE & HOME PROJECTS
• KID RIDE-ON VEHICLES
FREE XMAS PLAN WITH ORDER

ILLUSTRATED CATALOG \$1.50 (US)

DUTCHMAN'S SAWMILL • DEPT. P
P.O. BOX 5381 • PHOENIX, AZ 85010

LIGHT BULB SAVER



Don't change another light bulb! Our new light bulb saver will extend the life of a bulb 100 times... it'll burn up to 75,000 hours or about 10 years, even if used 24 hours a day. Works by converting alternating current to pulsating direct current—which means a cooler burning, long lasting bulb. Comes in a set of 6. **\$9.95**

Snyders Unlimited
10656 Sudan
Portage, MI 49002

Plus \$2.40 shipping
(Add 4% tax Mich. residents only)
Satisfaction Guaranteed

Say Merry Christmas

With White's NEW Series 3 Metal Detectors



Sensitive detectors locate the rare and valuable for fun and profit.
\$99.95 & up!

Call Toll Free: 1-800-547-6911
WHITE'S ELECTRONICS
Dept. PA-4 Sweet Home, OR 97386

POPULAR MECHANICS Helps those who help themselves

With our new 1984 Plans and Ideas catalog

Easy-to-follow plans and projects

- Tools, toolchests and workbenches.
- Recreational vehicles.
- Fine furniture.
- Storage structures.

... complete with illustrations, diagrams and materials list.

Send for your catalog today!

ONLY \$1.00



Organize Yourself

Start your own Popular Mechanics Library. Keep up to one years supply in an attractive sturdy file box. With every order you receive FREE self-adhesive labels covering the years from 1975 to 1984.
1 file box \$2.95 2 file boxes \$2.75 ea.
3 file boxes or more \$2.50 ea.

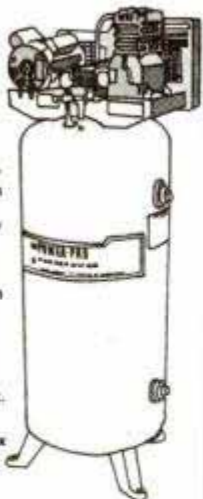
To order your new 1984 Popular Mechanics Plans and Ideas Catalog, and/or File Boxes, Send your name and address with check or money order payable to Popular Mechanics Mail to: POPULAR MECHANICS
Box 1014, Radio City Station
New York, N.Y. 10101

Popular Mechanics is a Publication of Hearst Magazines, a Division of The Hearst Corporation

POPULAR MECHANICS • OCTOBER 1984

We save you a trip to the hardware store. You save gas and money! Order by mail!

- 5-hp. motor.
- 230V, 15 amp.
- Twin cylinder.
- 932 rpm.
- Air delivery: acfm at 40/90 psi: 11.8/9.4.
- 125 lbs. maximum pressure.
- ASME rated 60 gal. vertical tank.
- 28½" L x 23½" W x 71½" H.
- 340 lbs.

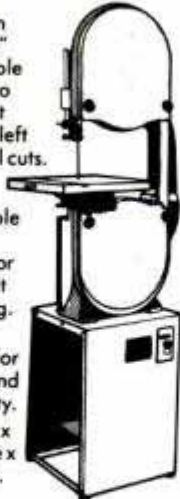


Campbell-Housfeld 5-hp. Air Compressor

This heavy duty, commercial model, workhorse of a compressor is ideal for hundreds of applications. You'll be able to run paint sprayers, polishers, grease guns, impact wrenches, drills, or almost any labor saving pneumatic tool and more. For home, farm, industrial use.

\$588

- Cast iron 14" x 14" work table tilts up to 45° right and 10° left for bevel cuts.



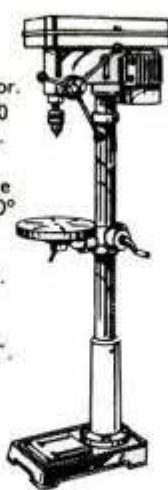
- Adjustable motor mount for easy belt adjusting.
- Wheel guards for safety and durability.
- 20" long x 25" wide x 65" high.

14" Band Saw

This rugged machine is ideal for straight cutting and for cutting intricate shapes in all woods and plastics. Capacity: 2" high and 13" wide. The dependable 3/4-hp. motor can handle most any cutting need. Pushbutton, capacitor start with permanently lubricated bearings. Sturdy steel stand.

\$249

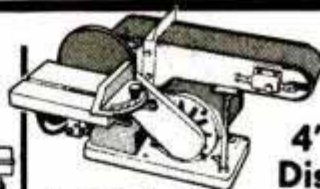
- ¾-hp. motor.
- Speeds: 210 2,580 RPM.
- 10" dia. round table rotates 360° tilts up to 45° and swings 14".
- ¾" chuck capacity.
- Height: 68".
- 118 lbs.



16-Speed Drill Press

This heavy duty floor model drill press is built to withstand many years of rugged use. The base and head are made of fine grained cast iron and the column is extremely heavy for rigid and smooth drilling. It's perfect for home workshops or for light industrial use.

\$177



5" x 8" table tilts 0° to 45° and is interchangeable for belt or disc use.

4" Belt/6" Disc Sander

Sturdily built. Gives you professional-looking results on all your woodworking tasks. • Rough and smooth sands and shapes. • 4" W. x 36" L. belt, 6" dia. disc. • Adjustable belt tension. • 1/3-hp. motor. • Weighs 44 lbs. • Mount to bench/table.

\$77

MasterCard 1-800-826-3403 VISA

In Wisconsin or if "800" line is busy call: 1-715-874-5000

Wholesale America, Inc.

4777 Menard Drive, Eau Claire, Wisconsin 54703

- Order No. 207-2094: Send ___ Air Compressor(s) at \$588.00 each (shipped freight collect).
- Order No. 240-2936: Send ___ 14" Band Saw(s) at \$249.00 each (shipped freight collect).
- Order No. 240-2114: Send ___ Floor Drill Press(es) at \$177.00 each (shipped freight collect).
- Order No. 240-2693: Send ___ Belt/Disc Sander(s) at \$77.00 ea. plus \$15.00 ea. for shipping and handling.
- I've enclosed \$1.00 for latest money-saving Tool Catalog. (Allow 2 weeks for delivery. Add 3 weeks for clearing of personal checks. No C.O.D. orders. Prices for 48 cont' U.S. only.)
- My check or money order is enclosed. (WI add 5% tax.)
- Charge my credit card: MasterCard VISA

Acct. No. _____ Exp. _____
PLEASE PRINT CLEARLY PM-3

Name _____

Address _____

City _____

State _____ ZIP _____

Phone Number _____

Signature _____

THE HEAVYWEIGHT

BUILT FOR THE PROFESSIONAL / PRICED FROM \$239

The Heavyweight is entirely American-made with top-quality materials and construction. It's priced for the hobbyist, but tough enough for the professional wood worker. A 1/2HP motor with four-step pulley provides power to spare for turning, sanding, grinding, buffing and drilling. Accessories include a complete tool turning set and a face plate and sanding disk for outboard turning.

12" Wood Lathe
Ground steel ways.
100% American-made.
Cast iron head & tail stocks.
52" long; 38" between centers.
Sealed ball bearing head stock.

Free brochure on request.

WILLIAMS & HUSSEY MACHINE CO.
Dept. 51, Milford, NH 03055
Toll-free: 1-800-258-1380 In NH: 1-673-3446

Hundreds of Woodworking Patterns, Wood Parts, Project & Instruction Books, plus many Hard-to-find Tools.

TIMBERS COUNTRY STORE
FREE Woodworking Catalogue
Dept. PM11 Carnelian Bay, CA 95711-0850

TO MAKE TOYS & WOOD PROJECTS

100's of plans, kits, colored and unfinished hardwood parts for toys, crafts and furniture (Colonial, Shaker, primitive & modern). Bulk prices available. Color catalog \$1. (614) 484-1746
Cherry Tree Toys • Box 369-24, Belmont, OH 43718

POWER HACKSAW

\$66.75 (Plus Frt.)

BUILD-IT-YOURSELF
Complete Kit of all HACKSAW parts less pulley. Cuts 120 strokes/min. Use any 1/4 hp motor. 1/2" drill press required for finishing. Catalog of this and 51 other Kits - \$1.00. Write Casting Specialties, Dept. PM104H, Cedarburg, WI 53012

DISH ANTENNA DOWNCONVERTER RECEIVER

\$397

New Multichannel MOS complete receiving system ready for TV hookup.

Satellite TV, Inc.
P.O. Box 3108, Dept. M-9 Delray Beach, FL 33447. Send for REFERENCE BOOK for \$11.95 plus \$2.95 shipping & insurance (U.S. funds) or call our 24-hour C.O.D. Order Line (305) 276-2941



Satellite TV

NEW! 4-FOOT SATELLITE TV SYSTEM
This total package will receive TV signals directly from the satellites. It's ready for TV hookup with all TV cables included.

"WE HAVE IT ALL" - ANTENNAS • SYSTEMS RECEIVERS • LNA's • SOURCES

Our **BOOK** takes the mystery out of satellite technology. The distinguished AT&T Bell Labs. prestigious M.I.T., U.S. Army, Navy & libraries worldwide have bought our best selling **BOOK**. The featuring of any product in this ad is strictly for the purpose of highlighting our new 1984 updated **BOOK**.

USE
ZIP CODES
WHEN ANSWERING
ADS



HOME
SATELLITE SYSTEM
\$949.95

TAKE ADVANTAGE

of all the movie, sports, and specialty channels that other people have to pay for through cable subscription. All of that and much, much more; children's, adult, religious, music, ethnic, foreign and public programming. In all there are well over 100 channels of more program variety than you have ever dreamed of.

TAKE ADVANTAGE

of these fantastically low prices brought to you from the first national home satellite company. Satellite reception systems are becoming very popular in the U.S. but most people are paying artificially high prices because they buy through companies that can't afford huge volume discounts.

TAKE ADVANTAGE

of this complete, high quality, full fledged satellite system. The Valscot system is not a cheap roof-top imitation, it's the real thing. This system includes a 9 foot parabolic antenna (large enough to receive all 17 satellites over the continental U.S.), a top quality signal receiver, a polarity control, and a high power, low noise amplifier. This is not a kit, it is a fully manufactured satellite system ready to install and enjoy after just a few hours hook-up time. The Valscot satellite system is manufactured and warranted for five years by Ross Electronics, a leading manufacturer in the satellite industry.

TAKE ADVANTAGE

of this offer and order your satellite system now for

ONLY

\$949.95

call or mail your order in to:



Valscot Enterprises

1-916-527-5960

P.O. Box O

Red Bluff, CA 96080



QUALITY CLOTH SANDING BELTS HOME—WORK—HOBBIES

	Per Doz	Per Doz	
1 - 42 Mead etc.	\$ 7.95	3 - 27 Porter Cable	\$11.00
1 - 44	8.10	4 - 21 3/4 Skel	12.90
2 - 17 3/8 Burgess	9.25	4 - 24 Misc	13.50
2 - 21 Porter Cable	8.50	4 - 27 Porter Cable	14.50
2 1/4 - 21 5/16 Skel	8.95	4 1/2 - 26 Skel	15.50
2 1/2 - 16	9.25	4 - 36 Hammond	17.75
3 - 18 Wren, etc.	9.50	4 - 37 13 1/8 Atlas	18.25
3 - 21 Porter Cable	10.00	4 - 52 1/2 Walker	20.95
3 - 23 3/4 Skel, Thor	10.85	4 - 54	21.75
3 - 24 Porter Cable	10.90	6 - 48 Delta-Sears	39.75

- Specify for wood or metal
- Will ship assorted—or specify grit
- Others sizes available—Please Inquire
- MONEY BACK GUARANTEE**

Include \$2.75 for postage & handling. Send check or money order. American Express honored (send card no. & exp. date). NYS res. add tax.
Ask for FREE CATALOGUE with more savings and offers

JACKSON TOOL CORP. Dept. AM
27-55 Jackson Ave., Long Island City, NY 11101
(718) 392-4330

BUILD A BIKECAR

The Amazing Mini Car Built with Bicycle Parts! Electric-Pedal Powered! Fun to Drive! Easy to Build!

PLANS \$7.95
Postage and Mailed First Class
Send To:
SPORTRAN CO.
P.O. Box 7077-R, Endicott, NY 13760

Plans include Optional Body Design!

BASEMENT TOILET

FLUSHES UP To Sewer or Sump Tank

No Digging Up Floors—Installs Easy, Anywhere!

Write McPherson, Inc., Dept. 16
Box 15133 Tampa, Florida 33684

Popular Mechanics PLANS

Barn/Garden Shed Our well-designed yard building provides handsome storage for yard tools, hand tools, power equipment, gardening supplies and a gardening center for the whole family. It also has an upstairs loft! Dim.: 12 x 16 ft. Plans, instruction manual & material list. (1 plan; PL-1278—\$10.50) (2 plans; PL-1278A—\$17.50)

Send your name and address with check or money order payable to **POPULAR MECHANICS**. Mail to: Popular Mechanics, Box 1014 Radio City Station, New York, N.Y. 10101

THE PERFECT GIFT...

For the designer, engineer or craftsman, a walnut base desk pen set with an actual drafting compass mounted in the center. Comes complete with two pens and a silver brass plate for engraving name or initials. Just \$48.95 + \$3.00 P&H. Visa and MC accepted.

ADV. POLLUTION CONTROL PUB.
P.O. Box 530741 • Miami, FL 33153

MAKE THIS SHADE FOR LESS THAN \$75.00

Send \$1.00 for our big catalog of stained glass supplies.

WHITTEMORE,
Box 2065EM, HANOVER, MASS. 02339

BE AN EXPERT IN CARPET LAYING

CARPET LAYERS EARN \$150 PER DAY AND UP. Big demand. Thousands of firms are looking for carpet craftsmen. We train you in spare time at home for big paying all-weather, clean fascinating work. Many of my students make extra money doing carpet service work in their neighborhood while learning. You get valuable carpet tools and equipment with your training.

WRITE TODAY FOR FREE INFORMATION!
Carpet Crafts Inst. 390 Dawson, Camarillo, Ca 93010

EMCO COMPACT 5
5" x 14" C.C.

LATHES 3" TO 15"
PRICES STARTING AT \$259.00
... LATHES CATALOG \$1.00 Precision Tools, Inch or Metric, Aluminum, Brass, Steel - all shapes. Small Screws, taps, drills, Saws, Collets
... TOOL CATALOG \$1.00

CAMPBELL TOOLS CO.
21000 Selma Road
Springfield, Ohio 45505
(513)322-8562

TURNING MILLING
DRILLING THREADING
BORING DIVIDING

SMALL PRECISION LATHES

For Metal Working or Plastics
See Your Dealer—Unimat 3"-1259
Compact 5"-795—Refund Guaranteed
Send for FREE Catalog. Order From:

HOBBY PRODUCTS COMPANY
Dept. S.A. P.O. Box 07848
Columbus OH 43207
614-445-9621

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. State of NJ Approved. Send Name and address for FREE book. No salesman will call.

Locksmithing Institute, Dept. 110-104
1500 Cardinal Drive Little Falls, NJ 07424

NEW SHIPMENT JUST ARRIVED

Hardened Steel. For filing, drilling, milling, carving, routing any metal or wood. Cutting edges from 1/4" to 1", all shanks 3/8". Brand new in air-tight G.I. packs.

12-Tool Set, G.I. cost 1295⁰⁰ now 126⁰⁰
14-Tool Set, G.I. cost 1126⁰⁰ now 118⁰⁰
Save Even More: Both Sets now 138⁰⁰
Two 138 Sets (limited time) 53⁰⁰
Money Back Guarantee. Add 13⁰⁰ for shipping
Texas orders add 5% tax. Export orders add 4.
U.S. SURPLUS CENTER, Dept. 503
715 Cambden, San Antonio, Texas 78214

New from Burro! 17 ft. fiberglass travel trailer and original 13 ft. model. Assembled or kit. 750-1500 lbs. Ready to tow. Sleeps 4. Color Catalog. Send \$3 to Burro, 12775 Co. Rd. 43, Chaska, MN 55318 PM-1084

POPULAR MECHANICS • OCTOBER 1984

CLASSIFIED ADVERTISEMENTS

Sophie Gronowicz, Classified Sales Manager Kathy Ramirez, Classified Service Manager

Rate: \$5.70 per word payable in advance each insertion. Minimum insertion ten words.

Bold face capitalized words—\$1.00 per word additional (First word set in Bold Face at no extra charge, Zip Code Free.)

The next available issue to place an advertisement in America's No. 1 Classified Section is **DECEMBER**. The closing is **OCTOBER 5th**.

Send remittance payable and order to Popular Mechanics, Classified Department, 224 West 57th Street, New York, New York 10019.

Please indicate Heading under which ad is to appear. As a consumer service and in cooperation with our mail-order advertisers

who use post office box addresses for their convenience in handling your order, Popular Mechanics maintains a register of such mail-order advertisers containing their complete names and street addresses.

Advertisers using P.O. Box number must furnish complete name and street address for our records.

To avoid delay in the publication of your ad, please send samples and descriptive materials with your request.

**NOTICE! WE WILL HAVE A SPECIAL "CHRISTMAS GIFT SHOPPING" HEADING IN DECEMBER.
AD CLOSING DATE FOR DECEMBER IS 10/5.**

PUBLISHER'S MART BOOKS & PUBLICATIONS

COLLEGE SCHOLARSHIPS—LET OUR COMPUTERS LOCATE A COLLEGE SCHOLARSHIP FOR YOU! Free Information on Computer Search, Financial Aid Guide, Newsletter, and Hotline Phone Service. Call or Write: NSS, 18862 River's Edge Dr., Chagrin Falls, Ohio 44022. (216) 543-1334.

FREE copy—THE END TIME Newsletter. 'SURVIVE WW3'. Box 'C', Chino, CA 91708

PROOF Earth visited by Alien Astronauts! Incredible Facts; Scientific Data Revealed. Send \$5.95 for "The 6,000 Year Old Spacesuit", to: Merlin, 548 Elm, San Bruno, Calif. 94066

PUBLISHERS' OVERSTOCKS, BARGAIN BOOKS 2,000 titles, all subjects! Free catalog: Hamilton, Box 15-A, Falls Village, CT 06031

SELL Books. We Wholesale, dropship. Catalog. \$1.00. Youngers-Books, Princeton, Iowa 52768

FREE list Self-Improvement Books. Hunter's, #293, 1501 E. Chapman, Fullerton, CA 92631

FREE Interesting Illustrated **SELF-IMPROVEMENT** Catalog. Write: Better Books, Dept. PM1084, 206 Aldershot, Manhasset, NY 11030

NUCLEAR WAR CIVIL DEFENSE INFORMATION Send \$3.00 to: Seahawk Civil Defense Co., 236 So. Rainbow Blvd., Suite 102, Las Vegas, Nevada 89128.

BANK YOUR BUSINESS IDEA! Order the Starting a Business money guide . . . "How to Write a Business Plan the Banker's Way". \$10. Ventura Publishing, Dept. 402, Box F110-206, Blaine, WA 98230

ELECTRIFYING Book!! Think And Grow RICH!! \$3.00 to: Esquisite Discounts, 133 Newport Street, Brooklyn, N.Y. 11212

OUT of Print Books Located. Write: Stilson, P.O. Box 1040, Glendale Heights, IL 60139

AUTO'S BIOGRAPHY — Here's the "car-baby" book for the person who babies his car. 32-page, colorful diary helps you keep a complete history of your car. Record your trips, insurance, mileage, service and repairs. Also includes pages for photos. Fits nicely in the glove compartment. \$3.50. Send order to: P.O. Box 10140, Radio City Station, New York, NY 10101

CATALOGS

WHOLESALE Prices: For Clubs, Individuals: Satin Jackets, Caps, Bags, Bandanas, Shorts, Shirts, Camouflage Apparat. Send \$3.00 Catalogue. LSAD, Inc., Box 214, Palestine, Texas 75801. 800-527-2178

PERSONALIZED GIFTS, Jewelry, & Business Opportunities Send \$1.00 for Catalog to: McBean Gifthouse, 3 Fairfield Circle, Dept. 15A, Brentwood, N.Y. 11717

BIRDHOUSES, Birdfeeders, Gifts, Free Catalog. Audubon Boutique, Box 581463, Tulsa, OK 74158

FREE catalog loaded with fun things. Berkley House, 817 New York, Martinsburg, WV 25401

GIFTS- JEWELRY- BOOKS. Specify. \$1.00, refundable first order. J. Smith, Box 536, Eleale, Hawaii 96705

POPULAR MECHANICS Helps those who help themselves with our new 1984 Plans and Ideas catalog. Easy to follow plans and projects—Tools, toolchests and workbenches—Recreational vehicles—Fine furniture - Storage structures—Complete with illustrations, diagrams and materials list. Send for your catalog today! Only \$1.00. P.O. Box 10140, Radio City Station, New York, NY 10101

**FREE CATALOG - BEST IN THE INDUSTRY
A COMPLETE CAMERA STORE IN A CATALOG**

ONE of the World's Great Catalogs, and it is Photographic. Send to Porter's Camera Store, Inc., Box 628, Dept. PM, Cedar Falls, Iowa 50613 for your Free Copy (US Only). 112 tabloid size pages filled with 4,000 items many of them exclusive and very unusual. Plus popular brand cameras, lenses, flash, etc., at discount prices. Huge inventory, fast service, great packaging. You must see it to believe it. Order your Free copy today.

CHRISTMAS GIFT SHOPPING

LEATHERCRAFT KITS & TOOLS Over 75 kits and 100 tools get you started in leather carving. Plus over 100 emboss-stamping tools, 35 "How-to" books. All the supplies needed for the beginner or expert. 32 Page Color Catalog \$2.00 (Refunded First Order). Berman Leathercraft, 145-PM South St., Boston, MA 02111-2882

BEAUTIFUL Full Color Catalog loaded with Gift items. Send \$1.00. Rockett's Gifts, Dept. PM, Box 359, Portage, WI 53901

SAVE 50% + \$3.00 (refunded) brings giant wholesale gift catalog. Satisfaction guaranteed. Giorgio Distributing, 92A Robinson St., Binghamton, NY 13901.

CAR EMBLEM BELT BUCKLES solid Brass Classics Hand Inlaid Camaro, Chevrolet, Corvette, Datsun Z, Ford, Mustang, Porsche, Rxf7, Trans-Am \$12.95 PP Check or MO. Roma, P.O. Box 9926, Alexandria, VA 22304-0482

HOLIDAY GIFTS From Around The World - Catalog. \$1.00 Refundable. Mansion House, RR3, Dept. 278, Danville, VA 24540.

PERSONALIZED tee shirts. Put **ANYTHING** on. \$10.50. State size. Coneril Enterprises, P. O. Box 2136, West Helena, Arkansas 72390. MC/Visa. Account Number. Expiration.

NINA NICHOLS - Distinctive Gifts by Mail Catalog - \$1.00 Refundable On Purchase. 14937-2 Satcoy, Van Nuys, CA 91405.

AUTOMOBILES

SAVE GASOLINE!! Bypass pollution devices—easily, reversibly! Posco (GB-10), LaGrangeville, NY 12540

60 SECOND tire inflator. Tube-tubeless \$3.98. Mes Enterprises, 3800 Knox, Ft. Worth, TX 76119

YOU CAN OWN A JAGUAR. Send \$3.00 for proven method. P.O. Box 2164, Muncie, IN 47302

FREE Brochure: Guard Against Auto Theft, P.O. Box 32027, Euclid, OH 44132

AUTO Finders Mailorder Magazine: Picture Info. \$25.00 All Type Listings, Buy-Sell-Trade. Auto Finders, Rt-2, Box 118, Canton, TX 75103

FIBERGLASS TOPPER easily built from detailed plans. Streamline, super strong, and insulated. **SAVE 50% / 70%.** Brochure \$1.50. Holmer Designs, 2710 Nathan Lane, Plymouth, Minn. 55441

SUPER MPG? Explore Limits! Workbook \$3.75. Engineer, Box 965, Sonora, California 95370

SAVE MONEY—AVOID RIP-OFF—AUTO REPAIR. Repair Guide shows how. Free Details. Ranfeld Publications, Box 1515R, Centralia, Illinois 62801-1515

STOP BANGING. use **QUICKEE DEFROSTER GUN** to melt ice, snow, sleet from car windows in seconds. Just plug into car lighter socket. Sprays out a steady stream of super heated air to clean off windows quickly and easily. Comes with case. \$19.95 plus 6% PA sales tax. Culmer Associates, Box 20577, Philadelphia, PA 19138

CHRYSLER 400 Cid gets 79.8 MPG. New Vaporizer Carburetor. Easy to build your own. Send Stamps. Kriess, R2PM, Bowling Green, MO 63334

AUTOMOTIVE SECURITY CATALOG: Largest selection available. Do-it-yourself. Pagers, alarms, hood/locks, glass detectors. Send \$2.00. Automotive Security Equipment, Dept. 2, P.O. Box 382, Plainview, New York 11803.

AUTO REPAIR MANUAL VINTAGE CAR EDIT II (1953-1961). A must for the owner/restorer of vintage "Golden Oldie" cars. This limited edition shows how to restore, repair & maintain 31 models. Special-service-section includes information on air conditioning, alternators, brakes, distributors, nonslip differentials & starting motors, automatic transmission. (B-1500-\$35.00). Send order to: P.O. Box 10140, Radio City Station, New York, NY 10101

AUTO SUPPLIES & EQUIPMENT

ALTERNATOR Generator Rebuilding Book. Information: \$2.00 (Refundable). Hedelund Engineering, Box 26024, Las Vegas, NV 89126

PARTS: Army Jeep and truck parts. Spare Parts & Equipment Co., P.O. Box 751, Lexington, Kentucky 40501-0751

AUTOMOTIVE AIR CONDITIONING Replacement Parts and Service Tools. Send \$4.00 for Catalog and Price Lists. Auto Air Supply, P.O. Box 1261, Seguin, Texas 78155.

UPGRADE PRE-73 GM PRODUCTS to later model alternators. Eliminates voltage regulator. Guaranteed details \$10.00 PPD. VID-COM Technical, #PM, Box 3337, York, PA 17402

HYDRAULIC JACK Repair Manuals and Kits. Catalog \$2.00. Hydraulic Jack Inc., P.O. Box 18, Accord, NY 12404

TURN Almost any Manual Transmission into an Overdrive Unit for as little as \$190.00 and 6 Hours. Complete Plans including Photographs, \$9.00. To: Innovative Gearing Research, P.O. Box 2927, Flagstaff, Arizona 86003

FREE Details! Save money, gas and repairs. Save the life of your engine. Fight back engine friction now! Get the facts! Distributors welcomed. B. Nathan & Company, 41 Carnegie Avenue 15-E, East Orange, New Jersey 07018

(Continued on next page)

AUTO SUPPLIES & EQUIPMENT

(Continued from preceding page)

BLEED BRAKES SINGLEHANDEDLY! No partner needed. Never enter the car. Absolutely new handbook gives the facts. Saves time, money, aggravation. Order now! \$5.49. Northeast Business Group, Box 441, Simsbury, CT 06070

TIRED OF COSTLY CAR REPAIRS? Eliminate diagnostic costs and spot trouble before it gets serious with the Oil Analysis Sampling Kit. Complete laboratory evaluation supplied. \$12.95 per kit; \$11.95 per kit (4 or more). Check/money orders only. Oil Sampling Company, 4823 West Marconi, Glendale, AZ 85306

LATEST IN AUTO ACCESSORIES - Retractable aluminum slat venetian fans easily installed inside your windshield. Protects front interior from sun when parked. Send for free brochure or order a pair for \$32 plus \$3 shipping. **ROBERT'S**, 9071 Metcalf, Suite 116B, Overland Park, KS 66212

DISCOUNT Stereo Indashes . . . 200W+ Speakers . . . ECHO Boosters. **HIPOWER**, Box 1424P, Dover, DE 19903

ENGINE, Chassis Parts List. Honda, Datsun, Toyota. **SPECIFY** Year/Make/Model/Engine Number. Manufacturer's Supply, Box 157PMC, Dorchester, WI 54425.

CARPETS, top, shocks, suspension parts for all cars 1935-1980. Free catalogue. Kanter Auto Products, 76P Monroe, Bonton, NJ 07005. 800-526-1096.

MOBILE HOMES

MOBILE Home Repair Made Easy— Learn How. **JD**, Box 60, Paw Paw, MI 49079

MOTORCYCLES, MOTORSCOOTERS & SUPPLIES

MOTORCYCLE MECHANICS TRAINING see our ad under Education & Instruction Page 202.

GO Karts, Minibikes, Atv's. Kits, Parts, Engines. Lowest Prices. Largest Selection. 64 Page Catalog \$3.00. Refundable. Kart World, Dept. C., 1488 Mentor Ave., Painesville, Ohio 44077

AVIATION, HANG GLIDING

GYROCOPTER, Hovercraft, Ultralight, Airboat. Landyacht, Dunebuggy, build your own. Drawings \$10.00. Aircraft Supplies, 7932 Ontario, Omaha, 68124.

BOOMERANGS—INCREDIBLE RETURNS! You can do it. Exciting! Order your **FREE** Catalog Now! BoomerangMan, 306 Park, Monroe, LA 71201.

FLY WITHOUT A LICENSE! Learn how today. Catalog \$1.00. Ultralight Publications, Lock Box 234-PM04, Hummelstown, PA 17036

MASTER Guide To Small Helicopters, \$6.95. H-C Guide, Box 50485, Midwest City, OK 73140

HOBBY HELICOPTER. "Choppy" Ultralight Single-Seat Helicopter. Simplified Construction—Motorcycle Engine. Brochure \$3.00. Polynova, Box 670M, St. Remi, Quebec, Canada J0L 2L0

SPACE & ASTRONAUTS

ANTIGRAVITY Propulsion Device! Free Brochure. **RDA**, Box 873NM, Concord, NC 28025

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 08809.

HOVERCRAFT Plans All Sizes. Catalog \$1.00. Universal Hovercraft, Box 281, Cordova, Illinois 61242

HOVERCRAFT PLANS & PUBLICATIONS! Catalog, \$1.00. Venture, 13820B Greenland, Uniontown, OH 44685

CB'S, RADIO & HAM EQUIPMENT

POLICE Scanners, Bearcat, Regency, HPR, Box 19224, Denver, CO. 80219.

CB MODIFICATIONS, Conversions, Books, Plans, Kits. Catalog \$2. **CBCL**, Box 31500M, Phoenix, AZ 85046

BEARCAT, Regency, Fanon, Fox, Scanners! Discounted. **CRYSTALS**: \$2.95. **RADIO SALES** 414-231-4431.

CB RADIO Books, Kits, Modifications. Catalog \$1.00 Refundable. **APS**, POB 263, Newport, RI 02840

ROBOTS

BUILD YOUR OWN PERSONAL ROBOT. World's Largest Supplier of Kits, Parts, Publications. Catalog/Photos \$5.00 refundable. Design Handbook \$10.00 ppd. **ROBOT SHOP**, Dept. 30, P.O. Box 582, El Toro, CA 92630

ELECTRONICS

GOVERNMENT Surplus receivers, transmitters, snooper-scopes, parts. Catalog 25c. Meshna, Nahant, Mass. 01908.

ELECTRONIC EAVESDROPPING DEVICES. \$1.00 Cash Or Stamps/Refunded. **HUNTER**, Box 3132, Winston-Salem, NC 27102

LINEAR Transistors, Tubes, Hard-to-find Parts; MRF454 \$16.00, MRF455 \$12.00, Catalog \$1.00. P.P.R.S., 1320-4 Grand, San Marcos, CA 92069. (619) 744-0720.

COMPUTERS & SOFTWARE

RENT SWAP your software. **FREE** catalog. Super Library, Box 27125, Orlando, FL 32867

AMAZING Machine Re-links Microcomputer Printer Cartridges. Free Details. Zygtron, Box 27, Fremont, Michigan 49412

OVER 1,000 pc name brand disk programs for Apple IBMPC each US \$8.00 up details US \$1.00. Reliant, P.O. Box 33610, Sheungwan, Hong Kong.

FREE programs! Send stamps! Specify computer! eZRAEZA, Box 5222-MSE, San Diego, 92105.

BIGGEST TI-99/4A selection. Newest exciting software and hardware bargains. Hard to get items. Send for free catalog. Fast Service. Dynamic, Box 690, Hicksville, N.Y. 11801

EDUCATIONAL COMPUTER SOFTWARE CATALOG. Write: Educational Software Company, Dept. 104PM, 505 Cathedral Street, Baltimore, MD 21201.

APPLE II secrets, Pokes and peeks, graphics short-cuts send \$5.00. Computer-M, P.O. Box 800427, Houston, TX 77280-0427

STEREO, CASSETTE TAPES, ETC.

THOUSANDS OF OLDIES! Hard-to-find 45rpm hit records from the last 40 years including pop, country, rock, and soul. Send \$2.00 for catalog to: American Pie, P.O. Box 66455, Dept. PM, Los Angeles, CA. 90066

LOWEST Possible Prices On All Major Brands Of Home Hi-Fi and Video Equipment. Free Shipping. Free Catalog. Global Electronics, 438 Albemarle Rd., Cedarhurst, N.Y. 11516

TV & VIDEO EQUIPMENT

NOTICE: USE OF CERTAIN ITEMS IN THIS CLASSIFICATION REQUIRES STATION AUTHORIZATION.

CABLE Facts Informative booklet tells how modern cable systems work. History, Equipment and Supplier's List - \$8.95. ACS, Box 711PM, Pataskala, OH 43062

ENJOY SATELLITE TELEVISION. Save money with easy, guaranteed, do-it-yourself antenna plans/kits. Send \$1.00 for catalog or \$8.95 for "Consumer Guide to Satellite Television." GFI-38, Box 910B, Missoula, MT 59807.

MICROWAVE ANTENNAS \$89.95 Visa Master Charge or COD. National Micro-Tronics, 2303 North 44th Street, Suite 14-315, Phoenix, AZ 85008. 602-968-0196, Dealers Welcome

VIDEO MOVIES. VHS-Beta-Disc. Giant Catalog \$3.00 (refundable). Tower, Dunkirk, MD 20754-0213

FED up with Cable TV, Watch Hundreds of Free Movies with your own Satellite Television and Microwave Television. Send \$3.95 and \$1.00 shipping to: Cable Vision, 6546 Hollywood Blvd., Suite 201, Hollywood, CA 90028

MAKE BIG MONEY IN HOME SATELLITE TELEVISION. Be a Dealer. Earn \$50,000.00 - \$75,000.00 yearly. Send \$3.00 for valuable report. Wholesale Satellite Supply, Box 1044, Lake Oswego, OR. 97034. 503-246-8335.

CAMPERS & TRAILERS—KITS, PLANS

BUILD YOUR OWN - Travel Trailer - Fifth Wheeler - Motorhome - Camper - Pickup Cover - Plans - Patterns - Kits - Catalog \$1 - Glen-L R-V's, 9152PM Rosecrans, Box 756, Bellflower, CA 90706.

TRAILER PARTS

TRAILER PARTS WHOLESALE Build or repair your own save 50%. 80 page parts catalog \$2.00 refundable. Ampos Corporation, 204 S. Center, Santa Ana, CA 92703

BOATS, OUTBOARDS, TRAILERS, & KITS

BOATKITS - PLANS - PATTERNS - FRAMEPACS - LARGEST CATALOG - 300 Designs 8'/80' - Plywood Fiberglass - Steel - Strip Planking - **POWERBOATS** - Inboards - Outboards - Cruisers - Sportfishers - Hydroplanes - Runabouts - Houseboats (**KAYAKS CANOES** - Largest Selection) - **SAILBOATS** - Daysailers - Trailersailers - Multihulls - **FIBERGLASS MATERIALS** - Cloth - Resins - Foam - New improved - "EPOXYPLUS" - "EPOXYGLUE" - "EPOXY-SURFACER" - Wood/Epoxy construction - **CATALOG \$2.00** (\$4.00 Airmail) - Includes **FREE** Boatbuilder Materials Brochure (Book - "AMATEUR BOATBUILDING" Fiberglass-Plywood - Wood/Epoxy - Steel \$6.00) **CLARKCRAFT**, 16-P Aqualane, Tonawanda, NY 14150

EVYRUDE-MERCURY 1983 Bargains . . . all sizes . . . Scott McCulloch parts . . . \$2. handling . . . Electra Marine, 610 Merrick Road, Lynbrook, New York 11563

FIBERGLASS - RESINS - Foams - cloth - epoxies - mat - etc. Factory prices - **CATALOG \$1.00** - (Book "COMPLETE FIBERGLASSING" \$6.00) - Clarkcraft, 16-P Aqualane, Tonawanda, NY 14150

BOAT PLANS - FRAME KITS - PATTERNS - Hundreds of designs - Wood - Fiberglass - Steel - Sailboats - Powerboats - Outboards - Canoes - Kayaks - Rowboats - Duckboats - Dorries - Houseboats. Proven methods include instructions especially for amateurs. Professional results! No Lofting! "Supplies" - Fasteners - Fiberglass - Resins - Glues - Books. Send \$2.00 for Huge 144-page catalog or \$4.00 Airmail. Includes Free "Boatbuilding Supplies" brochure. Investigate our "Poxy-Shield" / "Poxy-Grip" wood/epoxy boatbuilding system - Manual - \$2.00. **GLEN-L MARINE**, 9152 Rosecrans, Box 756MP, Bellflower, CA 90706.

BOAT KITS - 27 trailerable models - **POWER and SAIL** - 11'-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-84, 3800 West Highway 13, Burnsville, Minnesota 55337. >12-890-3000.

QUEST KIT BOATS—Four models to choose from: 19', 25', 33', 36'. Basic kit prices start at \$2558.00 (19'), \$5900.00 (25'), \$14,600.00 (33'), \$19,500.00 (36'). All hulls complete including deck, headliner, steering, lead keels and diesel engines (diesel engines installed only on 33' and 36'). Additional packages available for interior, deck hardware and rigging. Offered as complete kits or you can build in stages. Write Quest Kit Boats for free catalogs and prices, P.O. Box 1030, Alachua, Florida 32615 or send \$10.00 for complete "How To" Quest manual.

BOATBUILDER'S PLANS, Patterns - Kayaks, Canoes, Sailboats, Pirogues, Fishing Boats, Duckboats, 40 models. Catalog 25c. Outdoor Sports, Box 871C, Brentwood, TN 37027

ATHLETIC EQUIPMENT AND BODY BUILDING COURSES

BIGGER, More Powerful Muscles - faster!! Free Booklet! Universal, Box 6694A, Detroit, Michigan 48240

KUNG-FU Free Lessons. Send \$1.00 for Postage. McLisa, Box 1755, Dept. PM84J, Honolulu, Hawaii 96806

BUILD your own gym out of wood for \$200. 8 projects. Designed and used by world class champion. Plans \$9.95. School Of Natural Bodybuilding, P.O. Box 495, Sandston, VA 23150

SPORTING GOODS AND EQUIPMENT

CROSSBOWS and SLINGSHOTS. Most Complete Catalog Available \$1.00. **M&M ENTERPRISES**, Box 64, Dept. PM, Island Lake, IL. 60042

FISHING, TACKLE, LURES

MORE Cat, Panfish, then you can eat. \$5 To: C. Bendele, Box 346, Onalaska, Texas 77360

BATTERIES, ALTERNATORS

SENTRY generators with/without engine big discounts. JJ Enterprises, Box 693, Oshkosh, Wisconsin 54902

BATTERY REBUILDING SCHOOL

BATTERY Rebuilding Tools, Instructions \$544.00. Manual \$65.00. Training Available. Sun Battery, 10415 98, Sebring, Florida 33870

ENGINES, MOTORS

NEW Engines For Mowers, Tillers, Etc. . . Fantastic Savings! Illustrated Catalog - \$2.00. (Refundable First Order.) Discount Engines, Box 166PM, Ashland, MO 65010.

UPHOLSTERY SEWING MACHINES

UPHOLSTERY Sewing Machines with Walking Feet, complete ready to use—only \$489.00. Thompson Model PW200—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

PHASE-CONVERTER runs 3 phase electric motors on single phase. Static rotary new, rebuilt. Biodec, Inc., 7123 Bridges Rd, Cincinnati, OH 45230. 513-231-6713

TOOLS-Shop-Mill Supplies. Free list. Alan Tools, 2516 1/2 W. Rosecrans, Dept PM-1, Gardena, CA 90249

GENERATOR—electric 30kw. 3 phase Detroit-diesel \$6000.00. Biodec, Inc., 7123 Bridges Rd, Cincinnati, OH 45230. 513-231-6713

SMALL FOUNDRY Furnaces, Supplies. Free literature. Pyramid Products, 3736 South 7th Avenue, Phoenix, Arizona 85041

SILVO Hardware, 188 Page Hand & Power Tool Catalog \$1.00. Dept. PM-4-10, 2205 Richmond St. Philadelphia, PA 19125

4" METAL Cutting Lathe \$87.25. Taig, 15048 Proctor, Industry, CA 91746

STEEL, Brass, Aluminum. Catalog: \$1.00. MBM, 3719 Fremont, Chicago, IL 60613

BANDSAW BLADES, Any Size, Free literature, King Saw, 6541 Tidewater Drive, Norfolk, Virginia 23509

BOLTS, SCREWS, TOOLS, WHOLESALE, DIRECT. Guaranteed. Catalog \$1.00 (Refundable). Camelot, Dept. 44, Box 65, Bristol, Wisconsin 53104

STEEL, Aluminum, Brass—Sheet, Bar, Shop Supplies. Plans. Write: CEI, RR1, Box 163, Cameron, IL 61423.

BELSAW SHARP-ALL OWNERS—Save to 30% on name-brand wheels, files, belts, parts. Free catalog. Immediate shipment. Woodmaster, Dept. H31, 2849 Terrace, Kansas City, MO 64108. (800)821-6651.

INDUSTRIAL jig saw and reciprocating blades and Hole Saws. Order direct and save. Catalog \$1.00 (Refundable). Widder Corporation, Box 1069, Naugatuck, CT 06770

OREGON Files 5/32 7/32 \$6.95 dozen plus \$2.00 handling. Oregon Chain at Super Savings! Murdock Hardware, 387 Main, Oneonta, N.Y. 13820

"SHARPENERS REPORT" Monthly Newsletter, Sharpening Guidebook, Wall Chart. Send for brochure. Skog Company, Dept. P10, P.O. 22559, Minneapolis, MN 55422

OVER 1700 Catalogs! Everything Conceivable **MANY FREE! GUARANTEED!** Directory \$4.00. Stremco, P.O. Box 6757-B, Towson, MD 21285

9 CLAMPS IN 1. RIGHT ARM CLAMP. Use as Mitre, Extended C, C, T or Facing Clamps, Bench Vise, Bench Stop, or a pair as Framing Vise or Bar Clamps. Guaranteed. \$13.95 each. LEADAC, Box 3055, Dept. B, Hattiesburg, MS 39403

JEMCO LEVER-PUSHES, PULLS, CLAMPS, LIFTS. Inexpensive. Brochure- \$1.00, Refundable. JEMCO, Box 91726, West Vancouver, B.C., Canada V7V 4S1

BRASS, Steel, Aluminum, Stainless, Acrylic, Nylon, Teflon. No minimum. Catalog \$1.00 (Refundable). METALS, Box 11204, Clayton, MO 63105

1400 Catalogs Listed and Described. Sources for Everything Imaginable. \$4.00. Masterlog, Box 879-B, Fairfax, CA 94930.

BANDSAW BLADES any size **SAVE 20/30% EUROPEAN** Wood and Metal Working Machinery. Free information. Suffolk Machinery, Suite B, 16 Shore Road, Patchogue, NY 11772

JOINTER BLADE SETTING GAGE—Measures Chordal Travel—\$21.95 PPD. B-Square, Box 11281, Fort Worth, Texas 76109

ENERGY SAVING

SOLAR, GREENHOUSE, AND ENERGY SAVING PRODUCTS CATALOG!

COMPONENTS, Complete Systems. 88 pages, 18 sections. Our 11th year! Order from one expert source — the country's largest energy saving mail order house! Send \$1.00 postpaid. Solar Components Corporation, Dept. M, P.O. Box 237, Manchester, NH 03105

INSTANT WATER HEATER U-Build SASE. C&L, Box 1701, Sanford, FL 32772

POCKET 20% ON Utility Bills! Send \$2.00. DutyCom, 1975 So. Main, Orem, Utah 84058

COLD Drafty Garage? Heavy Duty Solid Rubber Seals **ALL FOUR EDGES** overhead folding door. Complete Easy installation 7' x 9' single \$13.99 7' x 18', double \$18.99. **SEAL A DOOR**, RD2, Box 374B, New Kensington, PA 15068

AIRTIGHT WOODBURNER! Double Barrels **HEAT** Home, Garage, Basement, Etc. Materials at **LOCAL HARDWARE**—Approximately \$40.00 **NO WELDING**. Complete plans **MAIL \$6.00**. Justin Stoves, Box 6145, Kansas City, Kansas 66106

SENSIBLE Energy Saving Ideas For Fellow Do It Yourselfers, Descriptions \$1.00. **MAGNUS**, 335 Olive, Cromwell, IN. 46732

SAVE on Utility Bills. Insulate your Water Heater with Space Age Insulation. \$29.00 Saves \$250.00 Year Plus. Information \$2.00 (Creditable). MD Enterprises, RD 1 Box 257, Millington, MD. 21651

FREE DETAILS-FANTASTIC Opportunities With Solar Energy. SD Mail Service, Box 593, Opp, Ala. 36467

SAVING Tips Guaranteed \$1.00 SASE. Helping Info, Box 463E, Lake Zurich, IL 60047

U-BUILD SOLAR COLLECTOR, Easily, Save \$100's, Plans \$5. Craig, 921 Roosevelt Blvd., Ephrata, Washington 98823

10%-25% SAVINGS ON ELECTRIC BILLS with new device - completely legal. Savings **GUARANTEED!** Full information in 16 page report. Send \$5.00 (refundable) to: Marketing Solutions, P.O. Box 552, Woodward, OK 73802.

SOLAR & ALTERNATE ENERGY

FREE Solar Heat. Complete instructions. Slash bills 30%. Easy. Free details. Reid, Box 5 PM10, Albert Lea, MN 56007.

SOLAR Collector Parabolic Type Plus Active Converter for Complete Plans Send \$8.00. P.O. Box 1385 Station "T", Calgary, Alberta, Canada T2H 2H6

HEATING, FUEL SAVERS

FACTORY DIRECT: Gas, Grills, Unvented Gas Heaters, Kero Heaters, Water Heaters, Camping Heaters. \$1.00 for complete catalog. IDM, Bldg. 33, HIA, Middletown, PA 17057

HARDY Outside Woodburning Heater, fuel saver, heats your home and hot water. Heater sits outside, no space lost inside home. No fire danger, smoke, wood, trash, inside home. For home and commercial use. For information contact: Hardy Manufacturing Company, Route 4, Box 156, Philadelphia, Miss. 39350.

AIRTROL SUPER BOOSTERS High Capacity Duct Fan Enjoy More Comfort, Savings, From Your Heating Air Conditioning. Solar. 115 VAC 5'-6" \$30.00, 7'-8" \$35.00. Shipping/Handling \$5.00. Other Models. Free information, Send SASE to: Airtrol, P.O. Box 0326, Rockton, Illinois 61072-0326

HOME CRAFTSMAN

WOODWORKERS, CRAFTSMEN, over 250 plans, patterns for do-it-yourself furniture, toys, storage cabinets, decorative items. \$1.00 refundable. Pattern Pak, Dept. 37K, 3838 N. 38th Ave., Phoenix, AZ 85019

GIANT catalog: patterns, parts, books for making wooden toys: \$1.00. **TOYMAKER SUPPLY CATALOG #PM20**, Tahoe, CA 95730-5459

OVER 75 FULL SIZE PATTERNS! Enjoy making profitable wooden gifts, toys, household accessories. **PLUS** "Shop Secrets" only \$6.00. Accents, (P-104), Box 262, Danvers, MA 01923

HUNDREDS woodworking patterns, books, tools, wood parts, best values; **TIMBERS FREE CATALOG #PM20**, Carnelian Bay, CA 95711-0850

35 FULL-SIZE TOY PATTERNS! — Cars, Trucks, Train, Airplanes, Earthmovers—Only \$5.00! Franks, 1202P24 Second, Booneville, MS 38829

WOODEN Swings, Tables, Playgyms, Etc. for Kids. Plans or Kits. Catalog \$1.00. Refundable with Purchase. Design Tree, Dept. A, Rt. 1, Box 83, Castroville, TX 78009

CUTE — Rocking Horse Planter, easy to build, Free information. Martin Enterprises, Box 2687(PM), Flagstaff, Arizona 86003

MAKE WOODEN TOYS-PROJECTS- 100's plans, kits, hardwood parts (toy, craft, furniture)- Catalog \$1.00. Cherry Tree Toys, Belmont, Ohio 43718

WOODEN Toy Parts and Patterns, Fun With Wood Catalog \$1.00. Howard Co., Dept. PM, Box 442, New Albany, IN 47150

UNFINISHED picture frame moulding. Factory closeout. 50% discount. 200 styles. Write: Japs, 126-PF Seventh North, Hopkins, MN 55343

WORLD'S LARGEST CATALOG? Three pounds 704 pages. Every Tool, Supply, Machine imaginable \$5.00. Refundable. McKilligan, PM-1084 Johnson City, New York 13790

FAVORITE WOOD TOYS, Patterns, Parts, Wheels, Catalog \$1. Toys And Joys, Box 626M, Lynden, Wash. 98264

BATTERY CLOCK MOVEMENTS. Below wholesale prices. Best Quality Catalog \$1.00 (refundable). Yankee, Box 26, Thompson, Connecticut 06277

WOODCRAFT PATTERNS, Windmills, Wishing Wells, Bird Houses, Feeders, Flying Duck, Pheasant, Outdoor Planters, Catalog \$1.00. Crafters, 11840 US. 27 North, DeWitt, Michigan 48820.

BOOMERANGS! REAL-SIZE PLANS . . . Two 20", easily made/proven designs. Rush \$3.00. Yours for fun/profit! BoomerangMan, 306P Park, Monroe, LA 71201

WOODEN Toy Parts, Patterns - Details. 50c. A's Pine Works, Box 228, Lake Hopatcong, N.J. 07849

CATALOG FULL-SIZE FURNITURE PLANS - \$2.00. Refunded with first order. Traditional, Early American, over 180! Furniture Designs, 1425 Sherman, Dept. CP-84, Evanston, IL 60201.

12 PVC Pipe Furniture Plans. \$9.95. J&L Casual Furniture, Box 208, Tewksbury, Mass. 01876

ROCKING Horse Pattern \$3.00. JML, Box 360012, Melbourne, FL 32935

OVER 400 WOODWORKING DESIGNS! Shop-tested plans/full size patterns. Create profitable toys, gifts, household accessories. Brochure **PLUS** Sample Pattern \$1.00. Accents, (G-104), Box 262, Danvers, MA 01923

TOYMAKERS! . . . Free catalog . . . patterns, wheels, dowels, parts, supplies! Hurry!! Morgan, PO1B12, 1123 Bardstown, Louisville, Kentucky 49294.

WALNUT Lumber cabinet grade. Squares, Gunstock blanks, Veneer. Iowa-Missouri Walnut Co., Dept. M, Station A, Box 66, St. Joseph, MO 64503

FREE Catalog: Furniture Plans. Flexiplan-PP, 48 Lowell, Westwood, NJ 07675

DOLL HOUSE PLANS FOR THE HOME CRAFTSMAN. Several styles. Detailed, complete instructions. For free brochure write: **NEW ENGLAND DOLL HOUSES**, P.O. Box 1282, Boston, MA. 02205

EASY Plans Mantel Clock \$2.00 LSASE. Pendleton, P.O. Box 427, Clewiston, Fla. 33440

12 CHRISTMAS PATTERNS Display Scene, Santa, Elves and More. Details \$1.00. **EDBAR**, Box 605, Lakeport, CA 95453

NATIVITY SCENE \$5.00, SANTA & REINDEER \$4.00. Full size jigsaw patterns. Easy to make. Prepaid to: MC Patterns, Box 319, Park Ridge, IL 60068.

MUSIC BOX WORKS 700 Tunes, Free List. Music Box World, Dept. MB, Avon, NJ 07717

DOLL CRADLE— is a reproduction of an 18th century cradle Ours is handcrafted of mellow pine with varnish finish. Any little girl will enjoy playing with this beautiful cradle. (10 3/4" x 22 1/2") plans and material list. (PL-1820-\$3.95). Send Order To: P.O. Box 10140, Radio City Station, New York, NY 10101

WOOD, WOODWORKING

FREE Brochure Unique Items For The Woodcraftsman. Box 133, North Attleboro, MA. 02761

BEAUTIFUL AND EASY WIPE-ON WOOD FINISHING explained in **FREE** wood finishing guide and products catalog. General Finishes, Box 14363P, Milwaukee, Wisconsin 53214

FREE supplies catalog! . . . Hundreds veneers, toymaking, hardwoods, patterns, books, cane, dowels, pegs, spindles, more! Bargain offers included!! Hurry!! Morgan, PO1M14, 1123 Bardstown, Louisville, Kentucky 40204.

THINK Christmas! Wooden Toy Plans, Catalog \$1.00. Free Plan With First Order. Toycraft, 601-PM East Main, Waynesboro, PA 17268

(Continued on next page)

WOOD, WOODWORKING

(Continued from preceding page)

CONVERT YOUR RADIAL ARM SAW TO A RADIAL ARM ROUTER SEE ROUTER KIT FEATURED IN NOVEMBER ISSUE POPULAR MECHANICS FREE Brochure. Convert A Tool, Inc., 412 Langdon, Alton, Illinois 62002

WOODWORKING WORLD CHICAGO, October 12-14, Exhibits, Demonstrations, Sales & Seminars on: Everything For Woodworking Professionals and Hobbyists from Abrasives to Machinery to Veneers. For more information: Convention Designs, Box 485, Plymouth, NH 03217. (603) 536-3768.

FREE Catalogs, Hardwoods, Plywood, Veneers. Timberline Forest Products, Box 858A, Lake Elmo, MN 55042

DRY YOUR OWN LUMBER Economical Build-It-Yourself Kit. Write for Free Details. Ebac, 8726 East 33rd, Indianapolis, Indiana 46226

PLANS, BLUEPRINTS, PROJECTS

EASILY GENERATE LOTTERY NUMBERS FOR PROFIT! \$4.95 plus S.A.S.E to: Richards Corp., P.O. Box 7541, Hampton, VA 23666

COUNTRY FURNITURE PLANS, Trestle Table, Mini-Barn and more. Send \$2.00 (refundable) for our catalog. Hammermark Associates, Box 201 PM, Floral Park, NY 11002.

GDANSK CHESS SET, High-Tech style/assembled from electrical hardware. Plans \$2.00. Architect, 1 South Portland Ave., Brooklyn, NY 11217

HUMIDIFY dry motel air using items found in the room! Plans, photos, \$4.95 from: Fifth Avenue Products, Inc., Box 8076, Youngstown, Ohio 44505.

ELECTRIC GATE OPENER Plans \$9.95 SASE. D&W, Box 858, LaMarque, Texas 77568

WOODSTOVES - Build Inexpensive Freestanding or Insert. Heats 2000 - Detailed Instructions. \$9.00. Dalmar Co., 20029 Occidental, Seattle, WA 98148

MAGNET TYPE Coin Finder Plans \$5.00. Ron Muterspaugh, 17125 Lake, Panama City, FL 32401

BARN/GARDEN SHED—Build your own storage shed from Popular Mechanics Plans. Complete plans, instruction manual and materials list help keep the job simple. This backyard barn is great for storing lawn and garden equipment as well as providing extra storage for those cluttered closets and shelves in the house. Additional space on top of the barn allows for more storage. Dim: 12x16' 1 plan: PL-1278—\$10.50, 2 plans: 1278A—\$17.50. Send order to: P.O. Box 10140, Radio City Station, New York, NY 10101

77 SUPER PLANS, BARNs, Garages, Workshops, Homes. Catalog \$4. (Refundable). **ASHLAND BARNs,** 990PM Butlercreek, Ashland, Oregon 97520

FOR THE HOME

DOES YOUR SUMP PUMP WORK During power failure. Ours does. Without a plumber. Free catalog. Residential Safety Systems Inc., 899 Boulevard East, Room 2, Weehawken, N.J. 07087.

LEARN Fold your napkins \$2.00. Publico, 17813 Wilton, Torrance, CA 90504

BOOK How to cut your mortgage in half. \$11.00. **SKILLS IMPROVEMENT,** Box 595, Aurora, CO 80040. **FREE CATALOG.**

FIRE Extinguisher, ABC Rated Halon 1211, eliminates flame w/no mess. Only \$14.95 plus \$2.00 postage & handling, 60% less than comparable dry chemical extinguishers. 10 yr. life, maintenance free, compact 3"x6" size. Write for details: New Expressions, 976 W. Foothill Blvd., Suite 324, Claremont, CA 91711.

AMAZING Miracle Cloth Cleans And Polishes All Metal, Wood And Tile! Hundreds Of Uses! \$3.00 Guaranteed! EDCO Merchandising, 20 Jerusalem Ave., Suite 304-1012, Hicksville, N.Y. 11801

WOODGRAIN STEEL DOORS - Experience the easy and realistic woodgrain beauty with the Old Masters Woodgraining Kit. Information write: Master Products, Box 274PM, Orange City, IA 51041.

COMPUTER DESK—Build your own three-piece computer station. This state-of-the-art desk is both stylish and efficient and cannot be bought anywhere else. (PL-1828-\$6.95)

DESK FOR HOME/OFFICE ELECTRONICS—Build your own two-piece desk, matching bookcase and storage area. Make your office up-to-date in designer fashion. (PL-1818-\$5.95). Send order to: P.O. Box 10140, Radio City Station, New York, NY 10101

HOME BUILDING & REMODELING

CARPENTERS, BUILDERS, HOMEOWNERS! Adjustable device for Drilling Handle Holes in Cabinet Doors, Drawers. **HANDLE MASTER,** P.O. Box 391, Wyoming, RI 02898

BUILD YOUR OWN HOME. New illustrated book shows how we did it. \$10. Ron Graves, Gra-Tech Inc., RT 3, Box 199J, Seminole, Oklahoma 74868

VACATION COTTAGE 24'x32' you can build. Plans, material list, instructions \$12.95. Daves' Const., P.O. Box 811, Mishawaka, Ind. 46544

FREE! Builder-Remodeler Newsletter! Creative, Money Saving Ideas: Builder, Box 731N, Santa Barbara, CA 93102.

PLASTICS

CASTOLITE Liquid Plastics. Crystal clear, colors. For casting, embedding, coating, fiberglassing, in industry, laboratories, craft work. Reproduce your designs with our mold materials. Catalog \$1.00. **CASTOLITE,** Dept. 84M/PM, Box 391, Woodstock, IL 60096.

DO IT YOURSELF

OIL CHANGE, LUBE JOB. Easy instruction booklet. \$3.00. John Marek, P.O. Box 398, West, Texas 76691

2500 Catalogs, Wholesale Sources, Most Free, 146 pages, \$4.00. Ultra Log, Box 13418, Salem, OR 97309.

PROJECTION TV . . . Convert your TV to project 7 Foot picture . . . Results comparable to \$2,500 projectors . . . Total Cost less than \$30.00 . . . **PLANS AND 8" LENS \$19.95** . . . Illustrated information **FREE.** Macrocoma-BB, Washington Crossing, Pennsylvania 18977. Creditcard Orders 24HRS. (215) 736-3979.

1600 CATALOGS Every Subject Imaginable!!! Many **FREE!** Directory \$4.00, Catalogs Galore, 7914-R, Springfield Village, Springfield, VA 22152.

TRAILERS! Horse, stock, utility, etc. Write for information. Pride Trailer Plans, 41969P Holden Creek, Springfield, OR 97478

MAJOR Appliance and Refrig. Repair. Any Brand. Do it yourself repair instruction & repair manual. Write with problem. Specify brand name & model number. \$22.50. Fix Rite, 1527 Wapping Rd., Middletown, R.I. 02840

BACKHOE OWNERS Build on powerful log splitter easily and inexpensively. Plans and pictures \$10.00 to: **SPLITTER,** 1248 Crosby, Oak Harbor, WA 98277.

3667 CATALOGS listed and described. Big 216 page directory provides sources for hard to find items, and everything else imaginable. Details **FREE,** or order now \$10.95 postpaid. Satisfaction guaranteed. Hilltop Publishers, Box 1364, Chula Vista, CA 92012

CLEAN Your Chimney free. \$2.00. for complete Details. C. J. Bendele, P.O. Box 346, Onalaska, TX 77360

DOLLHOUSE decorations. Fast, easy, inexpensive. \$4.00. Regal Books, Box 232, Fort Lee, NJ 07024

3 PHASE MACHINES run on single phase power. Catalogue! Kit from \$2.00. Fulton Electric, 1975 South Main Street, Orem, Utah 84058

OVER 1700 Catalogs! Everything Conceivable **MANY FREE! GUARANTEED!** Directory \$4.00. Stremco, P.O. Box 6757-A, Towson, MD 21285

1400 Catalogs listed and Described. Sources for Everything Imaginable \$4.00. Masterlog, Box 879-F, Fairfax, CA 94930.

ELECTROPLATING. Complete amateur's textbook. All metals Electroplate metallic/nonmetallic items \$11.95. Details free. Tropic, Box 95-P3, Palm Bay, Florida 32905.

"HELP YOURSELF," "LEARN TO SPEAK." Free Information, **"GARRY MANUALS,"** Box 112, 1235 Pembina Highway, Winnipeg, Manitoba, Canada. R3T2A9

COCKROACH GET RID. \$15 Purchase Information Permanent. Kenyatta Service Company, P.O. Box 1297PMB, Flint, Michigan 48501

PAINTING - STAINING - WALLPAPERING. Handbook Written By A Contractor For Homeowners. \$4.95. Kress Contracting, Box 404, Gibsonsia, PA. 15044

DISCOUNT CATALOG: Chainsaws, Three-Wheeler, Log-splitters, Motorcycle, Snowmobile, Small Engine, parts, accessories (\$1.00). Manufacturer's Supply, Box 157-PM10, Dorchester, WI 54425

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. 02145

FREE Quartz Clock Movement Catalog. Discount Prices. F. Mett's Specialties, P.O. Box 356, Worthington, Ohio 43085

HOT Tubs and Spas install your own. Save Money, 35 pgs. Detailed Instructions. Send \$10.00. Lakeside Enterprises, 37176 N. Cremona, Lake Villa, Ill. 60046.

UPHOLSTERING SUPPLIES \$1.00 for Prices. Variety Products, Box 566P, Lathrup Village, Mich. 48076-0566

"13 WAYS ??? To Become A Happy Go Lucky For The Rest Of Your Days." To receive your copy just mail \$3.00 to: P.O. Box 345, Beatrice, Nebr. 68310

REPRODUCTION MOLDS

LEAD SOLDIER MOLDS. Scarce Civil, WWII, Cannon Fantasy. Illustrated Brochure \$1.00 (Refundable). Dunkens, Calvert, TX 77837

ELECTROPLATING CHEMICALS & Anodes Sold by the Pound. List - \$1. Electroplaters Supply, Box 38AB, Shady, N.Y. 12479

ARTS, CRAFTS, SUPPLIES

"GETTING Started in Stained Glass" \$1.00. Whittemore, Box 2065T, Hanover, Mass. 02339.

LEATHERCRAFT Catalog. Tools, Leather, Dyes, Dressings, Saddle Stamps. Buckles much more. Send \$2.00 (refundable with order) to: MacPherson Leather, P.O. Box 882783, San Francisco, Calif. 94188-2783

LEATHERCRAFT Supplies Catalog, \$1.00 (refundable). Craft-LS, 1909 75N, Sherman, TX 75090

STAINED GLASS SUPPLIES: EXCITING SUPER CATALOG-PM \$3.00. **CORAN-SHOLES INDUSTRIES, 509 E. SECOND, BOSTON, MA 02127.**

STAINED GLASS SUPPLIES Complete Catalog \$2.00 (refundable). Sunshine Glassworks, 3690 Harlem, Dept CT, Buffalo, NY 14215

CARTOONING, COMMERCIAL ARTS, SIGN PAINTING

SIGN Painting — Easy method. Free catalogue. Kaufmann Company, Centertown, Missouri 65023

CARTOON for Fun and Money!!! Free booklet!!! Cartoons, Box 40614A, Detroit, Michigan 48240

MODERN Cartooning taught by mail. Write for free brochure. Cartoonerama, Box 263-12Y, Branford, Conn. 06405

35 LESSON cartooning course. Cartoonist's Magazine, both \$4.00. Hartman, Box 30387, Lincoln, Nebraska 68503-0387

CARTOONING - Money, fun, popularity!!! Learn by mail. Free booklet!!! Cartooning, 72 Kendal, Toronto, Canada, M5R 1L9

MODELS, MODELS SUPPLIES

RADIO CONTROL- Airplanes, Boats, Helicopters, Supplies. Big Discount Catalog \$5.00 (Refundable). Modelers Supply, Box 7185, Montgomery, AL 36107.

FIRING CIVIL WAR Model **CANNON** Plans: Catalog \$1.00. Green—PM1084, Box 892, Steamar, Fla. 32579

FASCINATING LIVE STEAM MODELS! "Roadster" \$147.95 "Steam Roller" \$109.95 "Tractor" \$109.95 "Engine" \$39.50 Complete "Locomotive Set" \$239.95 Steam Book \$4.95 Colored Circular. Price List \$1.00 refundable. Diamond Enterprises, Dept. PM, Box 537, Alexandria Bay, NY 13607. In Canada: RR#3, Brighton, Ontario, K0K 1H0

TOY SOLDIERS Metal - All Periods 99 cents, up Catalog U.S. War Games Military Academy, Post Box 105, West Point, New York 10996

RC MINIATURE Main Battle Tank, 24"x13", Main Gun Fires, \$170.00. Specs \$2.00. Starr Miniatures, Suite #251, 4471 N.W. 36 Street, Miami Springs, FL 33166

TOYS, GAMES, KITES, PUZZLES, NOVELTIES

BEAN Bag Game Kit - 24x36 inches Bags Assembled, Instructions Included \$35.00. David Lumber Inc., Box 23, Potosi, WI 53820

MAGIC TRICKS, JOKES, VENTRILOQUISM

LEARN VENTRILOQUISM! Guaranteed Instruction, Supplies. **DUMMIES.** Information Free! Maher, Box 420-PM, Littleton, Colorado 80160.

FREE! World's Leading Novelty Catalog, 1600 Jokes, Tricks, Science, Sports, Hobbies. Johnson-Smith, C-6013, Mt. Clemens, MI 48043

(Continued on next page)

MAGIC TRICKS, JOKES, VENTRILOQUISM

(Continued from preceding page)

PROFESSIONAL Magic! Huge catalog, over 1,000 tricks and books. \$2.50. Hank Lee's Magic Factory, Dept. PM10, 24 Lincoln Street, Boston, Massachusetts 02111

MAGIC Catalog with over 1000 tricks. Amateur to Professional. \$2.00. Magicland, 12801 Midway, Dallas, Texas 75234

HOBBIES & COLLECTIONS

TOY SOLDIER MOLDS plus Chess, Medieval, Fantasy 25MM. For hobbyists, collectors. Fun and profit! Rush \$1.00 (refundable). Castings, P.O. Box 3482-PM, Longwood, FL 32779.

POSTERS, Movies, Scenes, Comic. List \$1.00. Refundable. Abacus, Box 6494PM, Lakeland, FL 33803

NAZI war souvenirs. **FREE** illustrated catalog. Delta, Box 31224PS, Honolulu, Hawaii 96820

MILITARY Medals Catalogue 50c. Yearly Subscription \$4.50. Vernon, Box 1387PM, Baldwin, NY 11510-1387

DECALS, EMBLEMS, PATCHES

GUARANTEED Lowest Emblem Prices! Free Catalogue. Stadri, 61P Jane, NYC 10014. (212) 969-0009.

FREE CATALOG - Patches, Cloisonné Pins, Decals, Stickers, T-Shirts, Jackets, Caps, Group Incentives. Eastern Emblem, Box 828PM, Union City, NJ 07087. 201-867-3159

BUTTONS - Campaign - Promotional. Outstanding Metalized Business Cards. Free Samples. Buttonprinter, 1747AB Selby, St. Paul, MN 55104. (612) 646-5069

ANTIQUES, RELICS, INDIAN GOODS & CURIOS

FREE List to Serious Collectors. 30,000 Indian Artifacts. Pots, Spears, Axes, Slate, Beadwork. Caddo Trading, Box 669, Murfreesboro, AR 71958

ORIGINAL HAND MADE Mexican Aztec Idols. 4x2 1/2" Each Decorative or Collection. Set of 6, \$19.95. Latintrade, P.O. Box 4590, McAllen, Texas 78501

ARROWHEADS \$16.50 doz. Secrist's Identification Guide \$8.81 ppd.. Artifacts list 40c. Secrist's, Deerfield, MO. 64741

STAMP COLLECTING

50 YEARS Old fifteen different United States, over fifty years old—25c with approvals. Jaxon, Box C11-P, New Rochelle, New York 10804

25 RAILROADS 20c With Foreign Approvals. **WEBLOR**, Box 3180M, Leeds, Me. 04263.

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. E104PM, Jamestown, NY 14701

GREAT Gift free with 1st purchase—line United States approvals and want list service. Send .15c for handling. The Stamp Boutique, P.O. Box 456, Madison, NJ 07940

BREATHTAKING Beautiful. 50 Different mint Monaco pictorials commemoratives only \$1.50 with mint complete set approvals. Pagoda, Box 132P, Sidney, Ohio 45365.

FREE - U.S. Discount Catalogue. Shelron, Box 547B, North Miami, Fla. 33161.

WORLD Wide Stamps mounted in books on approval 2c and up. **TRUST STAMP COMPANY**, P.O. Box 100-P, Jamaica, N.Y. 11435

50 DIFFERENT Old U.S. between 1861 and 1939 - \$1.00. Ed Roush, 423 Shepard, Mansfield, Ohio 44907.

BARGAIN 100 World-wide Stamps 25c. Quality Approvals. R. Parker, Box 143, West Brookfield, MA 01585

35 DIFFERENT Old U.S. Revenue Stamps \$1.00. Winchester Stamps, Box 3592, Mansfield, Ohio 44907

FREE Surprise Collection with approvals. Gould, Box 2130, Petaluma, CA 94953

EXOTIC ANIMALS 25c Worldwide Approvals, Bimell, 8525 North Lamar, Suite 185, Austin, Texas 78753

PENNY Stamp approvals. Regardless Catalog. Kloster, 17902 Marklee Dr., Jamul, CA 92035

100 Different U.S. 25c. Approvals. Bradley, Box 425P, Midlothian, VA 23113

U.S. 30 mint commemoratives \$1.00! Approvals. Gordon Davison, Contoocook, N.H. 03229

"INVERTED ERROR" + 100 Different United States, 50c with approvals. Luray, P.O. Box 7088, Silver Spring, MD 20907

200 WORLDWIDE 50c when requesting low priced foreign approvals. Stewart Kent, Box 2398E, Bellingham, WA 98227

FREE U.S. Mint Set. Approvals. Hildebrand, Box 4867, Santa Clara, California 95054

101 Large Pictorials 50c when requesting worldwide approvals. Benat, P.O. Box 210244, Dallas, TX 75211.

300 Worldwide 70c to approval applicants. Send today. **J. MARTIN**, P.O.B. 245, New York, NY 10023

50 BEAUTIFUL MINT BRITISH COLONIES 25c with Worldwide approvals. Mid-Atlantic Stamps, Box 476, Edgewater, MD 21037

ISRAEL 15 Different 10c Approvals. Sam Chazen, Box 666, Delray Beach, Florida 33444

4 FOREIGN Sets - only 40c when requesting Approvals. R.G. Sales, P.O.Box 1065M, Jamaica, N.Y. 11431

OLD U.S. Stamps on Approval. Sherman, Box 15355G, Philadelphia, PA 19111.

LIQUIDATING Tremendous Old Accumulation. Bargain Lists Free. Alatalo, Maynard, MA., 01754.

1,000 DIFFERENT WORLD + 100 DIFFERENT MONGO-LIAN BEAUTIES \$3.00. Approvals. **ADULTS ONLY**. Gouge, Box 1320-MT, Elizabethton, Tennessee 37643

FREE— \$2.00 Packet! Request approvals. Gains, 716-S Sixteenth, Mattoon, IL 61938

AFFORDABLE U.S. Year Sets. Cottage Stamps, Box 16, Peiharn, N.Y. 10803

REQUEST Approvals **RECEIVE** 40 **FREE**. Majestic, Box 51, Kaaswa, Hawaii 96730

CANADA. 50 different 25c. Approvals. Oroszky, Box 1-C, Samia, Ontario, Canada N7T 7H8

100 Worldwide 20c. Approvals. Corbin, 2145 S.W. Westfield, Portland, OR 97225

25 DIFFERENT older U.S. 10c with approvals. Hill Co., Box 51, Defiance, Ohio 43512

SPECTACULAR! 200 **BREATHTAKING** WORLDWIDE, from over 30 **COUNTRIES**, 25c with Approvals. Sharvin-9, Box 982F, Toronto, Canada M4Y 2N9

"WHOLESALE" U.S.—Foreign Pricelist and catalog Free! Everything Guaranteed. No Approvals. Schneider, Box 1240, Grand Rapids, Michigan 49501

FREE 100 Canada with request of World Wide Approvals. Briner's, P.O. Box 5607, San Mateo, Calif. 94402

HOW TO FIND STAMP COLLECTING PENPALS ABROAD. \$3.50. Pyramid Ranch Research, North 6282 Government Way, Dept. 1P, Coeur d'Alene, Idaho 83814.

COINS, TOKENS, CURRENCY

NORTH RIVER Coins, 5399 Hixson Pike, Hixson, TN 37343. 10 different Indians \$7.95 with holder. Silver Dollars Before 1934 \$15.00 ea. Dates our choice.

WORLD Banknote Approvals. Examine 10 days, Return Balance. Upton, Box 37, Coalville, Utah 84017-0037

WHEAT Pennies Roll \$3.50. **SILVER** dimes 10 Different \$15.00. A. Grein, 68 Glendale Street, Brockton, Mass 02402

PHOTOS & PHOTO SUPPLIES

PHOTOGRAPHY TIPS from a 30 year Professional. \$4.00. R. Woodhouse, Box 98, Balsam, N.C. 28707

CAR CLUBS

MUSTANG Club of America! Join Over 6000 Members and 90 Regional Groups. Mustangs, Shelby's and Bosses. Send \$2.00 For Sample Magazine. MCC, P.O. Box 447PM, Lithonia, Georgia 30058-0447

PLAYS, SONGS, MANUSCRIPTS

POEMS, Songs Wanted. Free Recording/Publishing. Broadway Music Productions, Box 7438PM, Sarasota, FL 33578

MUSIC INSTRUCTIONS & INSTRUMENTS

ACCORDION Top Brands, Cordovox, Buy Direct. Tremendous Discounts. Trades accepted. Free brochure. PM, Accordion-O-Rama, 16 West 19th Street, New York, NY 10011

PIANOS, PLAYERS, PUMP ORGANS. Rebuild and repair. Catalog of "How-To" books, \$2.00 (refundable). Vestal Press, Vestal 11, New York 13850.

INTERNATIONAL VIOLIN COMPANY, LTD., Catalog For Makers, Repairers of Stringed Instruments, Imported Tone-wood, Tools, Varnishes, Parts, Accessories, Strings, Cases. Fine European Instruments, Bows. Assemble Yourself Carved Violin Kit. Catalog \$1.00, Includes 10% Discount Certificate. Dept. G.J. 4026 W. Belvedere Ave., Baltimore, MD 21215

PLAY PIANO-ORGAN! "Newest Method Guarantees Instant Results!" Free information: Music-PM, 4001 East Fanfol, Phoenix, Arizona 85028.

ELECTRIFY Player Pianos, Pump Organs Quickly. Inexpensively with Lee Silent Suction Units. Write: Lee Music, P.O. Box 308F, Culver, Oregon 97734

SELF IMPROVEMENT

HOW-TO Achieve Financial Independence. An informative report. \$4.00. MJM, P.O. Box 1017, Lafayette, Colo. 80026

HOW TO accomplish anything you want in life. Free Details! Write: DIR, 340 North 100 West, Provo, Utah 84601

APTITUDE TESTS. Professionally developed, self-scoring. Get the right job/education. Measure your abilities. \$10.00. Tego Enterprises, Dept. 100, 11790 Parish, Bridgeton, MO 63044

HOW to turn \$1,000, into \$1,000,000. **SAFE**, \$1.00. MEGAPM10, Box 1147, Marion, Ohio 43302.

SUCCESS - Financial, Personal. Free, illustrated, self-improvement book catalog. JMI. Books, W20367R Parker, Muskego, WI 53150

SELF HELP Books. Free Catalog. Bookstore, 8940 Lyndale, Bloomington, MN 55420

SUCCESS CASSETTES and more. Free big catalog. Automated Learning, Dept. CAF-105, 336 Old Hook Road, Westwood, New Jersey 07675

STOP SMOKING KIT \$2.50. ACW, 163, 1269 Broadway, El Cajon, CA 92021

EDUCATION & INSTRUCTIONS

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. PBC94, Scranton, Pennsylvania 18515.

DEGREE Programs/Off-Campus Quality for California Bar. Registered Law School. Bachelors-Masters-Doctorate in Business, Engineering, Public Administration and Health Service Management. Authorized with California Department of Education. Credit for work & life experience - Southland University, 35 N. Craig Ave., Dept. M-8, Pasadena, CA 91107. Toll-free, 800-423-4530, CA toll-free, 800-362-7052, local 818-795-5558.

"JET/GAS TURBINE CAREERS!" Homestudy courses — theory, maintenance, overhaul — Established 1957. **AMERICAN JET SCHOOL**, Department PM-3, Darby, Montana 59829. (406) 349-2100

LEARN Asleep or awake. Records, tapes, equipment! Free catalog! Drawer PM-400, Fluidoso, New Mexico 88345

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

LEARN Sewing Machine, repairing. A profitable Trade. Easy to learn. Free details. Sewing Center, 187 FR, Rochelle, GA 31079.

LOCKSMITHING, Universal School of Master., Correspondence and Shop Training. Box 214652PM, Sacramento, CA 95821

FREE 120 page Career Opportunities Guide - shows how to train at home for top paying jobs. Granton Institute, 263A Adelaide Street West, Toronto, Canada M5H 1Y3.

AUTOSUGGESTION. Sleep-learning headquarters! Tapes, records, books, Gigantic catalog free. Research Association, Box 24PM, Olympia, Washington 98501.

HIGH SCHOOL DIPLOMA AT HOME. NO CLASSES. Low cost. Information FREE. Call toll free 1-800-228-5600 or write: American School, Dept. #31045, 850 E. 58th St., Chicago, IL. 60637.

UNIVERSITY DEGREES BY MAIL. Accredited, economical, fast. Bachelor's, Master's, Doctorates. Dr. John Bear, P.O. Box 11447PM4, Marina del Rey, Ca 90295.

(Continued on next page)

EDUCATION & INSTRUCTIONS

(Continued from preceding page)

START AN EXCITING CAREER AS A MOTORCYCLE MECHANIC. Study At Home or resident school. Nationally accredited. Federal Guaranteed Student Loans & Grants available. Write: AMS, Dept. PM, 10025 Shoemaker, Santa Fe Springs, Ca. 90670 or call free 1-800-423-4678. California Residents call collect 213-944-0121.

REISCH WORLD WIDE COLLEGE OF AUCTIONEERING, INC. The original - 50 yrs. - World's largest! Term soon. Approved for VA. Free Catalog. 515-423-5242 Col. Gordon E. Taylor, P. O. Box 949, Dept. 19, Mason City, Iowa 50401

LEARN SMALL ENGINE REPAIR At Home. Free Book. Dept. 71-310-104, Commercial Technical Institute, Little Falls, NJ 07424

PREPARE to better handle your business, political and social opportunities. The Blackstone School of Law has met the law training demand for almost a century. Information: P.O. Box 790906, Dallas, Texas 75379

UNIVERSITY DEGREES BY SPECIAL EVALUATION OF EXISTING Job Experience, Education, Achievement. Fast, Inexpensive. Call (614-863-1791). Or Write: Box 13151-T10, Columbus, OH 43213

LOCKSMITHING. Free book. Locksmithing Institute, Dept. 01-310-104, Little Falls, NJ 07424

TRIPLE YOUR INTELLIGENCE! Free Lesson! **EDEMP**, Box 1462, Glendora, CA. 91740

BE A BOOKKEEPER. Learn at home! Free book. Dept. 60-310-104, Commercial Technical Institute, Little Falls, NJ 07424

UNIVERSITY DEGREES BY MAIL! Accredited Bachelors, Masters, Ph.D.s... Free revealing details. Counseling, Box 317-PM10, Tustin, California 92680.

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.

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.

BOOKKEEPING Or Accounting! Easy home-study plan prepares you quickly to start your own bookkeeping business or work for others. Free "Accounting Career Kit." Write: Accounting School, Dept. PBC94, Newport Beach, CA 92660.

LEARN ELECTRONICS at home. Free Book. Dept. 67-310-104, Commercial Technical Institute, Little Falls, NJ 07424

DESIGN STRESS CALCULATIONS MADE EASY. "Your Stepladder to Independence." Designers Manual, Box 1073 B, Scottsdale, AZ 85252

CANADIAN University Degrees and Diplomas Send \$10.00 for Directory. Off-Campus, P.O. Box 22 Station "T", Calgary, Alberta, Canada T2H 2G7

DETECTIVE TRAINING HEADQUARTERS: For Home-study Education That Works. Exciting. Easily Learned Cassette Courses, Diploma. Free Details: **GLOBAL INVESTIGATION**, Box 191PM, Hanover, MA 02339

HOW TO Get What You Want. Free Details. Campbell, P.O. Box 163330-P, Sacramento, CA. 95816

COLLEGE Scholarships Available. Write: National College Direction Services, 112 Trout Brook Circle, Reisterstown, Maryland 21136

BELL'S BUILDING MAINTENANCE SCHOOL. Details. P.O. Box 17095, Kansas City, MO 64132

PIANO TUNING PAYS - Piano tuning - Electronic organ servicing. Learned easily at home. Free booklet. Niles Bryant School, P.O. Box 20153, Sacramento, CA 95820

UNIVERSITY DEGREES By Mail. Accredited Bachelors, Masters, Ph.D's. Free Facts Revealed. Careers-PM10, Box 470886, Tulsa, OK 74147.

UNIVERSITY Degrees! Economical home study for Bachelor's, Master's, Doctorate. Prestigious faculty counsels for independent study and life experience credits. Free proof - Richard Crews, M.D. (Harvard), President, Columbia Pacific University, 1415 Third Street, Suite F608, San Rafael, CA 94901; Toll Free: 800/227-1617, Ext. 480; California: 800/772-3545, Ext. 480.

BE A LEGAL INVESTIGATOR. Learn at home. Free Book. Dept. 11-310-104, Commercial Technical Institute, Little Falls, NJ 07424

LEARN To Repair gas and paraffin refrigerators. Write: Absorption Repairs, Box 43168, Industria 2042, South Africa.

PROTECT YOURSELF From Vindictive Employers. Free details. EmPro, Dept. M-3, Box 10837, St. Louis, MO 63129

BE AN AUTO MECHANIC: LEARN at home. Free book. Dept. 70-310-104, Commercial Technical Institute, Little Falls, NJ 07424

SCHOOLS

WHY NOT INVESTIGATE COMMERCIAL DEEP SEA DIVING AS YOUR CAREER? Our Graduates are working worldwide making excellent money. Send for free catalog containing disclosures, credentials, course outline, employment statistics, instructor qualifications, progress standards, financial assistance to: Divers Institute of Technology, Inc., P.O. Box 70312, Dept. PM, Seattle, WA 98107

EMPLOYMENT INFORMATION

RIVERBOATS - Tugs \$15,000-\$60,000. Expenses paid. Work month. Home month. Experience unnecessary. All water-ways including Alaska, Hawaii. Free report. Send stamp envelope. Marine Employment, Box 207, Central, Indiana, 47110

SALES Managers Needed. Contact P.O. Box 52752, New Orleans, LA. 70152. Name is Chester.

GO DATA PROCESSING NOW!!! C60 Cassette Tells How. \$5.00. DPPM1, 2309 Morningglory, Oklahoma City, Okla. 73159

AUSTRALIA!!! \$3.98. H. B. Associates, P.O. Box 14473-PM, North Palm Beach, FL 33408

GET 95% to 100% on POSTAL EXAMS. FREE DETAILS. Unique, 310 Front, Newport, AR 72112

OVERSEAS EMPLOYMENT DIRECTORY of U. S. Oil Companies, Construction Firms, Government Agencies, Defense Contractors. Over 265 Potential Employers. Send \$10. Directory, P. O. Box 801, Tonawanda, New York 14151

NASHVILLE! Music City U.S.A. Latest Sunday Classifieds and Top 50 + Employers. \$10.00. Lamar Dixon, 1518 Belvidere Drive, Nashville, TN 37215

WORK Overseas \$20,000 - \$60,000 opportunities! For information Call 317-839-1712 Ext 24

OVERSEAS AND U.S.A. EMPLOYMENT Guide with hundreds of addresses for Oil and Exploration Jobs, submitting Resume. Send \$8.00 To: OECO, Route 1, Box 255A, Macclenny, Florida 32063

ARE YOU LOOKING FOR EMPLOYMENT? Try our Classified Section! It costs only \$5.70 per word. And, if you wish to run all or part of your ad in bold capital letters-you can do so for as little as \$1.00 per word additional. Act now! Send your ad to: **POPULAR MECHANICS, CLASSIFIED DEPT., 224 WEST 57TH STREET, NEW YORK, NY 10019**

HELP WANTED

AUSTRALIA WANTS YOU! Jobs! Big Pay! Transportation! Newest Handbook - \$2.00. **AUSTRALIAN INTERNATIONAL**, Box 19107-AJ, WASHINGTON, DC 20036.

OVERSEAS Employment . . . \$20,000 - \$60,000+. Free Report! Employment, Box 19760-AJ, Indianapolis, Indiana 46219.

AUSTRALIA Plus Overseas! Big Bucks. Openings now. Report \$2.00. Austco, Box 772-E, Cypress, CA 90630.

FOR INVENTORS

LEARN how to offer your invention for sale or license. Free booklet outlines procedures, royalty rates, requirements. Kessler Sales Corporation, C-5-FI, Fremont, Ohio 43420.

PATENT IT ECONOMICALLY! Free Details. N. Raner, 2008 Fondulac, Richmond, VA 23229

NONPROFIT Foundation helps inventors. Widest range of services. Free recording forms. Free evaluation. Affiliated Inventors Foundation, 501-B Iowa, Colorado Springs, CO 80909, Or Call 1-800-525-5885.

REGISTERED PATENT ATTORNEY Washington D.C. Suburb. Donald A. Kettlestrings, 414 Hungerford Drive, Rockville, Maryland 20850

INVENTORS! IDEAS HAVE VALUE! Ever think of an idea, forget it and see it later on the market? Many people don't forget, act quickly and are rewarded by American industry. Write down your idea! We offer free disclosure registration and initial consultation regarding your idea's potential value. Call or write without delay for your free information package. **AMERICAN INVENTORS CORPORATION**, 82 Broad Street, Dept. PM, Westfield, MA 01086. (413)568-3753. A Fee Based Marketing Company. Offices Coast to Coast.

PROTECT YOUR INVENTIONS AND TRADEMARKS. Registered Patent Attorney. **FREE** Preliminary Review, Box 3922PM, Millwood, NY 10546

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

INVENTORS. Designers, Songwriters: Protect creative ideas **NON-DISCLOSURE AGREEMENTS:** Pkg. \$3.00. Capital Invention Center, P.O. Box 12054, Washington, D.C. 20005

PATENT Protect/Sell Your Invention! Retired Examiner, 7400, Washington, D.C. 20044

PATENT AND DEVELOP Your Invention. Registered Patent Agent and Licensed Professional Engineer. Send for **FREE PATENT INFORMATION** Every Inventor Should Have. Richard L. Miller, Woolworth Building, 233 Broadway, Suite 3612-M, New York, N.Y. 10007. (212) 267-5252.

INVENTORS-AVOID BEING RIPPED OFF! You Could Save Thousands And Protect Your Idea With This \$5.00 Report. Innovative Press, Fontana Center, Suite 1213B, Tulsa, Oklahoma 74145

(415) 886-4440

PATENT PROTECTION BY ATTORNEY. Silicon Valley Patents, 3732 Oakes, Hayward, California 94542

INVENTIONS WANTED

INVENTORS: Free information on offering your invention for sale. Kessler Sales Corporation, C-5-IW, Fremont, Ohio 43420.

INVENTORS! Ever had an idea for a product or invention, didn't know what to do? Call AIM for free patent & info kit Toll free 1-800-225-5800, in Calif 1-800-225-5800.

EARN ROYALTIES. NUPRODUX INTERNATIONAL, 1377 K. NW 182, WASHINGTON, DC 20005

INVENTION MARKETING. FREE INFORMATION. REPRESENTING MANUFACTURERS. Patmart, 26D, 77 Fulton, Financial District, New York, NY 10038

REAL ESTATE & FARMS

FREE! FALL-HOLIDAY CATALOG! 266 pages; over 5400 properties, 2300 pictures! Values in every type of real estate, many owner financed! From 800 offices in 43 states. Get your **FREE COPY NOW!** STROUT REALTY, Plaza Towers, Dept. 5800, Springfield, MO 65804. Call toll free: 1-800-641-4266.

REAL ESTATE FOR SALE 500 offices . . . 45 states! 30,000 listings on computer, 16,000 under \$50,000! Free printouts & regional catalogs! **UNITED FARM AGENCY**, 612-PM West 47th, Kansas City, MO. 64112. Ph: 1-800-821-2599; in Mo. 1-800-892-5785.

FREE REAL ESTATE CATALOGS. Midwest and Southeast Sun Belt States. Specify Property and Area Desired. Call or Write: **COUNTRY NETWORK**, Box 368PM, Gainesville, MO 65655. 417-679-4632.

AS LOW As \$29.00 An Acre Purchased through Estate Liquidations. Canada's most popular hunting and fishing lake-front properties. Great investment. Easy Payments. Credit Cards Accepted. Title guaranteed. 2-year buy back guarantee. Send for Free catalogue. Canadian Estate Land, Dept. 22C, 2411 Yonge Street, Toronto, Ontario, Canada. M4P 2Z1. Or telephone 7 days a week, anytime, 416-488-0444.

WESTERN NORTH CAROLINA Mountain Acreage, Farms, Cabins, Homes. Waterfront Property. **FREE** Brochures. Call Toll-free: 1-800-438-8159. Raper Realty Inc., P.O. Box 619, Murphy, N.C. 28906

CANADIAN Country Properties. Our 69th year. Terms available. Catalogue airmail \$1.00. Dignam Corporation, Suite 496, 85 Bloor East, Toronto, Ontario M4W 1B5.

FREE CATALOG #60 lists farms, ranches, dairies, acreage, & other properties in MO and 15 other states. **FREE!** American Farm Digest, 3546 Watson, St. Louis, MO 63139. (800) 325-9943

CALIFORNIA. Lots. Acreage. \$40 Down. \$40 Monthly. Box 35291, Los Angeles, 90035.

EXPORT-IMPORT

CHINA TRADE ADDRESS DIRECTORY Resource Guide To Hundreds of Chinese Merchants of Every Imaginable Product Available in China. Send \$6.50. Listing's, Box 1207, Southfield, Mich. 48075

PLASTIC BAGS

ALL Sizes. Buy Small Quantities. Free Catalog. SAKET, 6151-C Colbath, Van Nuys, Calif. 91401

HUNDREDS Of Sizes. Lowest Prices. Free Catalog. Action Plastics, 1460D 93rd Lane N.E., Minneapolis, Minn. 55434

BUY IT WHOLESALE

WHOLESALE Gifts Jewelry. Hartwood Products, 9211 Bryant, Bloomington, MN 55420

NATION'S LARGEST WHOLESALE and **BELOW WHOLESALE BUYING DICTIONARY**. 96 pages of reliable suppliers from A-Z. Send \$6.95 (Shipping & Handling Included) to: Debco, 930 West 16th St., Houston, TX 77008

BELTS and Buckles. Complete line fast sellers, including truckers, motorcycles, wildlife, westerns etc. Big Profits. Complete dealer set up. Catalog \$1.00. Anchor Specialties, Box 3958-BPM, North Providence, RI 02911

EARN MONEY selling rings, jewelry, buckles, watches—buy direct. 130% below retail. Catalog \$1.00 (refundable). Anka-PM, 90 Greenwich Ave., Warwick, RI 02885.

CLOSEOUTS! Discounts! Below Wholesale! Freebies! Information/stamp: DDN, Box 20152K, Ferndale, Michigan 48220.

400,000 BARGAINS Below Wholesale: Many Free! Liquidations . . . Closeouts . . . Job Lots . . . Single Samples. Free Details. Bargainhunters Opportunities, Box 730-A, Holland, Michigan 49423.

WORLDWIDE BARGAINS . . . Imports — Dropship — Closeout — Surplus — Freebies — (Stamped Envelope). Mamees, Box 1717PM, Highland, Ind. 46322

DIRECTORY By Product Type! **342 ASIAN FIRMS**. \$5.95. Monahan, Box 951, Pearl River, NY 10965.

BELT BUCKLES \$1.55 each. Wholesale only. Country, Western, Sports. Hundreds more. Minimum order 24 buckles. **FREE** catalog. Write now. Hilltop Wholesale, Box 1364, Chula Vista, CA 92012

500,000 ITEMS BELOW WHOLESALE—EVERYTHING IMAGINABLE! **FREE** Catalog of Bargains! World Bargains, Box 931PM, Cullman, AL 35055

WORLDWIDE BARGAINS . . . Imports — Dropship — Closeout — Surplus — Freebies — (Stamped Envelope). Mamees, Box 1717PM, Highland, Ind. 46322

CLOSEOUT Jewelry 55¢ dozen. (Catalog 25¢). Roussels, 107-1631 Dow, Arlington, MA 02174

RINGS, WATCHES, JEWELRY—400% Profit. Free Sales Kit/Catalog. Spotlight, 2265, 600 Third Avenue, New York, NY 10016

ADVERTISING AGENCIES, ADV. SER. MAILING LISTS

FREE Mailing List Analysis. Details. GOC-8P, Box 1107, Stuart, FL 33494. (305)334-5205.

FRESH, Hot, Responsive Name Lists of Mailorder Buyers. Most Categories. Computerized in Zip Code Order. Peel and Stick Labels. Guaranteed Deliverable! For Brochure Rush To: WL Chapman & Son Service Co., 301 Loganberry, Greenville, SC 29609

MAILORDER BUYERS LISTS Available for immediate use computerized on peel and stick labels in zip code order Guaranteed Deliverable For Details Send SASE to: Christopher Keane, 253 Sudbury Rd., Concord, MA 01742

FRESH, HOT, RESPONSIVE NAME LISTS of mailorder buyers. Most categories. Computerized in Zip Code order. Peel and Stick labels. **GUARANTEED DELIVERABLE!** Rush SASE for details to: Names Unlimited, P.O. Box 311-A, Haughton, La. 71037.

MAILING LISTS—POWER-PACKED. Computerized to special interests. SASE to: **CORNELL**, Amberlands, 5L, Croton-On Hudson, NY 10520

OPPORTUNITY SEEKERS/MLM NAMES. FREE SAMPLE. Venture-PM, Box 336, Riviera, AZ 86442

BUSINESS SERVICES

INCORPORATE without legal fees! Free booklet tells how, includes forms. Call now 800-345-CORP.

RUBBER STAMPS

SELF-INKING STAMPER. Prints your Name And Address. \$2.00. **CUSTOM STAMPS**, Box 12211, Arlington, VA 22209.

PRINTING PRESSES, RUBBER STAMP OUTFITS

TYPE for printing. Catalog \$1.00/deductible 1st order. Quaker City Type, R.D. 3, Box 134, Honeybrook, PA 19344

TYPE Fonts. Hand Printing Presses, Supplies. 120 Pages. \$1.00 Deductible first order. Acme Type, 1720 N. Marshfield, Chicago, 60622

COMPLETE Rubber Stamp Outfits, Supplies. Same day shipment. Sign Engraving Machines, Wholesale Catalog \$1.00 Deductible. Star Stamp, 1720 N. Marshfield, Chicago, 60622

BARCO Type Founders. Type and Rubber Stamps catalogue. Mail \$1.00 refundable on first order. 237 S. Evergreen, Bensenville, 60106.

PRINTING SUPPLIES

QUICK Copy Printing. Low Prices. Write: Nationwide, 614 North Main, Bloomington, Illinois 61701

DELUXE BUSINESS CARDS \$9.99! Samples. Mr. Zee, Box 581, Libertyville, Illinois 60048

PRINT Booklets 3¢. Print 1000 8 1/2 x 11, \$12.42. Booklet Planner—Pricer Free. Speedbooks, 23800-1A Aurora, Bedford, Ohio 44146

GUMMED LABELS

1,000 Address Labels \$3.00. Free Literature. Acme, Box 44089A, Pittsburgh, Pennsylvania 15205

1000 PARCEL POST SHIPPING LABELS \$9.95 Postpaid. **FREE** sample. Write now. Hilltop Labels, Box 1364, Chula Vista, CA 92012

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, 10 South Wabash, Dept. 258, Chicago, 60603.

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

TREASURE FINDERS

TREASURE—Locate quarter mile away with ultra sensitive locator - brochure free. Research Products, Box 270270 - AMC, Tampa, Florida 33688

FIND coins, jewelry, nuggets, treasure. New revolutionary patented detector. Astounding range. Unaffected by black sand, mineralized ground. Rejects metallic trash. Free catalog. Gardiner, 4729M N. 7th Avenue, Phoenix, AZ 85013

TREASURE Hunters. Complete line. Electronic Detectors. Pendulums. Books. Hobby or profit. Free catalogue. Detectors, Apartado 7-905, 06700 Mexico.

SAVE up to 40% on new metal detectors. All major brands including White's and Garrett. **FREE** discount price list. Northwoods General Store, P.O. Box 9874PM10, Madison, WI 53715. (608)274-4680.

PROFITABLE OCCUPATIONS

FT. SMITH Auction School, Ft. Smith, Ark. 72903. Resident & Home study. Veteran Approved.

REPAIR lawnmowers thousands of parts and tools wholesale list 40¢. Ellwanger's, PM, P.O. Box V, Port Jervis, NY 12771

PLASTERCRAFT . . . Profitable Home Business 3000 Molds Available. Details. Lynette, 6251C Mentpark, Mentor, Ohio 44060.

FREE Catalogs. Repair air conditioning Refrigeration. Tools, supplies, full instructions. Doolco, Inc., 2016 Canton, Dallas, Texas 75201.

INSPECTORS of machine-parts get high earnings. This book will qualify you. Free details. Jewett, Box 2863W, Santa Fe Springs, CA 90670.

HOW TO BE FINANCIALLY INDEPENDENT selling information! Free details! Titanin, 1711PM1084C Turquoise, Flagstaff, AZ 86001

SALESMEN-DIST.

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 75th year. No investment or collections. Weekly Commissions. Set your own hours. Full Time Potential. No experience necessary. Write to: Kevin Peska, **NEWTON MFG. CO.**, Dept. BPM10, Newton, Iowa 50208

INDEPENDENT REPS full or part time. High commissions paid weekly. Write: Allen Travis Advertising Specialties, Inc., 2062 McGregor Blvd. #8, Ft. Myers, Florida 33901

AGENTS WANTED

1/2¢ ADDRESS "AbleLabels" (Peel-Stick). Details-Samples \$1.00. Heins, Box 215K, Port Reading, NJ 07064.

MAKE MONEY IN SPARE TIME. As a subscription sales representative for leading national magazines, you can earn generous commissions while learning the art of selling. Instructions and supplies will be sent to you free. Send this ad with your name and address to: **POPULAR MECHANICS**, Dept. AB-L, 250 W. 55th St., New York, NY 10019

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. M270C, Woodland Hills, California 91367

YOUR OWN PROFITABLE HOME Business. Guaranteed. Free Details: Quality Products, 1181 Devonshire, Box 10P, Buffalo Grove, Ill. 60090

SELL Wholesale for us. No investment needed. Details free. Green Meadow, Dept. 10, 650 Seashore Rd., Cape May, NJ 08204

HOW to Succeed in Your Own Small Business! Free details. Falcon Publishing, AX, Box 688, Ben Lomond, California 95005

MAILORDER Opportunity! Start profitable home business without experience or capital. Write for free book, plus details. No obligation. Mail Order Associates, Inc., Dept 51, Montvale, NJ 07645.

EARN \$1 billion within 25 years **GUARANTEED**. Billionaire, 506-S Churchli, Girard, OH 44420

MAKE MONEY WOODWORKING - Easy profits making unusual gifts, toys, novelties. Free details. Williams, 32K Titus, Glen Cove, NY 11542

\$1,000 Weekly—Spare Time—Second Income. Best 175 Business Opportunities. 750% Profit Within 30 Days! Free Details! Karp Enterprises, 323 Franklin #804/K111, Chicago, 60606-7095.

GET STARTED in Business on a Shoestring! Make Money Quickly! Send For Free Valuable Report! Guaranteed! All Ages. Pineview, 844 Brookdale, West Jefferson, Ohio 43162

NEW Discovery in battery reconditioning. Give eighteen months guarantee! This means Big Profits Fast! Electone, 7415 Gable Dr., Little Rock, AR 72205

1000'S Weekly. Mailorder. Details: Delights, 210 Welch 1014 PM, Ames, IA 50010

RELAX AND GET RICH - Counseling-Information - \$5.00. Michael-James, P.O. Box 546, San Diego, Calif. 92112

EARN \$2000 Month Selling Information By Mail. Free Details. Regal, 16040 Milvirn, Whittier, California 90604

START and Operate your own profitable business at home. SASE. Avatar Enterprises, Box 353, Belleville, MI 48111-0353

5,001 Moneymaking Opportunities - Free Catalog! Dynamics, Box 1306 G, Stow, Ohio 44224

GOLD Scrap Recycling. Free Information: Recycling, Box 11216P, Reno, NV 89510

MAKE Money by the minute around the clock for doing 8 hours a week paperwork from home. Grows to life-time income. Totally new ultra-modern project unlike anything before. Still ground floor. No experience or education requirements. 10,500 people already doing. Division of major U.S. corporation. For details dial (216) 452-2171, 24 hrs., 7 days. Ask for ext. 115.

PROJECTION TV . . . Make \$\$\$'s assembling Projectors . . . Easy . . . Results comparable to \$2,500 projectors . . . Your total cost less than \$20.00 . . . **PLANS, 8" LENS & Dealers** information \$17.50 . . . Illustrated information **FREE** . . . Macrocoma-BBX, Washington Crossing, Pennsylvania 18977, Creditcard orders 24HRS. (215) 736-2880.

VINYL'S Where the money is! Professionally repair, refinish, recolor furniture, luggage, car tops. Quick, easy. Two small \$20 jobs a day earn you \$1,000 a month. Homes, cars, offices, restaurants, unlimited customers. Start earning after a few days practice. Sensational details free. VIP, Dept. 7B, 2013 Montrose, Chicago, 60618. Or, Call Free 1-800-621-0660.

(Continued on next page)

BUSINESS OPPORTUNITIES

(Continued from preceding page)

TAKE Catalog Orders. We drop-ship 2500-best-selling specialty products. Lowest below wholesale prices. Immediate delivery. Spectacular home business opportunity. Free Book. SMC, 9401 De Soto Ave., Dept. 20-46, Chatsworth, CA 91311-4991

ALUMINUM SCRAP - Recycle Yourself - MAKE \$25.00/ POUND! Free Information: Industrial - PM410, Box 127, Alexandria Bay, New York 13607

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 Telfer 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.

LEARN Sewing Machine Repairing. Men. Women. Lucrative Profits. Gresslin Correspondence School, Box 5104, Spencer, Iowa 51301.

CONCRETE Block Machines: Catalog \$1.00. Route One, Box 3740, Rapid City, South Dakota 57702-3740

REPAIR HYDRAULIC JACKS — DETAILS FREE. WRITE: HYDRAULIC PARTS SUPPLY, BOX 4157, BROWNSVILLE, TEXAS 77520.

VENDING MACHINES. No selling. Routes earn amazing profits. "Big Catalogue FREE." Parkway Corporation, 1930 PMB Greenspring Drive, Timonium, Maryland 21093

NEW Mercedes Benz, \$120.91 monthly, or BMW, \$81.51. . . . Guaranteed. . . . Write: FoxCo, Box 2655-410, Springfield, VA 22152

PRODUCE BEAUTIFUL COPPER OR BRASS SIGNS. Fast, inexpensive, Profitable. Details. Signet, 50 High, Suite LL7-C, Buffalo, N.Y. 14023.

SEIZED IN GOVERNMENT NARCOTICS RAIDS!! Automobiles . . . Vans . . . Boats . . . Furniture . . . Thousands other items. Buy Dirt Cheap - Resell for Big Profits! Free Information: Marcel, Box 7557-M, Monroe, LA 71211

ALTERNATOR/ Starter Rebuilding Made Easy Start With-out Capital. ADM, Box 33, Buffalo, N.Y. 14207

MULTILEVEL MAILORDER! YOU TOO, Can "MAKE BIG MONEY" at Home. Free Cassette Reveals How!! SSCA, 6940 1/2 70 Avenue North, Pinellas Park, FL 33565

MAIL Order Profits! For Disclosure. CRIA, Box 257, Stuart, FL 33495

BUY DIRECT FROM TAIWAN. Catalogue listing 500 SOURCES BIG PROFITS. Only \$10.00. O'Reilly Marketing, Suite 0-51, 323 S. Franklin Bldg., Chicago, Illinois. 60606-7095

\$480 Weekly. Home mailing program. Goodworld, Box 26233-R, Tamarac, Florida 33320

CLIP newspaper items—\$2 - \$25 EACH!! FREE Report! Clippings-KB-10, Billings, NY 12510

\$25,000 LOANS INTEREST FREE!! Secret Federal law WIPES OUT DEBTS!! Details FREE!! Moneywise-B, LaGrange, NY 12540

GET RICH!! Secret law smashes debts—brings Cash, Credit! FREE report!! WealthKit-WBM-10, Billings, NY 12510

SCREEN PRINT T-SHIRTS. Inexpensive Kits. Free Details. "T-Printer", POB 23991 (GC), Tampa, FL 33623

PROFITABLE GOLD FOIL PRINTER. Personalize business cards, pencils, matches. Free Details. Gold, POB 24986(GC), Tampa, FL 33623

HIGH PROFITS WITH CUSTOM T-SHIRTS AND CAPS. Inexpensive, professional heat transfer machines. All Supplies. PRESS MAGIC, P.O. Box 22809 (GC), Tampa, FL 33623

BUMPER STICKER PRINTING DEVICE. Cheap, Simple, Portable. Free Details. Bumper, POB 22791(GC), Tampa, FL 33622

MULTI-Level Mailorder, Two Opportunities. Details. O'Neil-M, 10 Oak Lane, Suisun, CA 94585

MAKE MILLIONS MANUFACTURING BATTERIES!! Supplies available. Everlast, Box 365, Bogota, NJ 07603.

EARN Big Money! Easy business. Start part-time. National firm trains, assists. Opportunity, Box 6489P, Laguna Niguel, CA 92677

BUY Wholesale, Catalog \$2.00, Refundable. Chazy Mail Order, Chazy, New York 12921

MONEYMAKING OPPORTUNITIES. Easy, Lucrative Mail Order Plans. Details Free: Enterprises, Box 937, Chicopee, MA 01014

\$1.00 sends your name to every business opportunities ad in this issue! Krause, Box 6232, Flint, MI 48506

HOW To start and operate your own tool rental business \$4.95. Unger's, 2013-P Eilda Rd., Lima, OH 45802

MANTEL KIT - TURN \$4.00 MATERIAL INTO \$49.95. SEND \$4.95 TO: WINGATE, RT. 2, BOX 129-L, YULEE, FLA. 32097

GET RICH, Start your own home business, no investment, guaranteed, act now. FREE details. Arcadia Gifts, 377 Las Tunas, Arcadia, CA 91006

BORROW \$30,000 without interest! All eligible. Repay anytime. Free details! Infohouse-PM, 808 Post, San Francisco, CA 94109.

MULTILEVEL MAILORDER CAN MAKE YOU RICH! Ground floor opportunity. FREE cassette reveals how! WMC-1, 7249 Amhurst Way, Clearwater, FL 33546

MAILORDER BUYERS LISTS available for IMMEDIATE USE! Computerized on Peel and Stick labels in ZIP CODE ORDER. GUARANTEED DELIVERABLE! For Complete Details SEND SASE TO: INGRAM ADV., PM10, BOX 6577, LINCOLN, NE 68506

MONEYMAKING BUSINESS - Seal mobile home roof leaks with the ultimate elastomeric-polymer. Distributorships available. Details \$4.00. JOMAR, P.O. Box 920952, Suite 457, Houston, Texas 77292-0952

ARAB BUSINESSMEN Have money to buy & invest. Top finders fees paid. International MiddleEast Associates, 8291 Flaxman, Dept. 1084PM1, Huntington Beach, CA 92646.

WANT your own lucrative home business? Free Details: Information Bureau, 55 Sutter, Suite 725-C, San Francisco, CA 94104.

BATTERY RECONDITIONING made easy. Proven big cash profits! Spare time. Free details. Owen, 771 PM, Battle Ground, Washington 98604

MAKE lots of EXTRA CASH without lots of extra effort. Free Subscription to Opportunity Magazine offers hundreds of proven ways. Write: Opportunity, Dept. C83, 6 N. Michigan, Chicago, IL 60602.

MAILORDER WEALTH!! Complete profit-making kit. FREE details. CKSC, Box 39712, Solon, Ohio 44139

PREPARE Tax Returns. Earn high fees, dignified work. Train at home. Accredited Program. National Tax Training School, Monsey 2KR, New York 10952.

"SELL MONEY!" Become a Loan Broker! Free details. Financial Planning, Dept. PM-203, 210 5th Avenue, New York, 10010, (212) 768-6803 Ext. 200.

RECYCLE METALS. NO, NOT BEER CANS! Easy \$458 weekly! Free information. Recycler, Box 1657, Brenham, TX 77833

\$700 Per month earnings possible preparing income tax returns at home or tax office. We show you how. Quickly learned. Details free. No salesman. Federated Tax, 2065 Montrose, Chicago, 60618

\$40,000 ON 1/2 ACRE! New Hydroponics—inexpensive, practical! Little manual labor! Free information. Robin's, Box 1657, Brenham, TX 77833

EARN \$30 - \$40 + PER HOUR. Clean windows professionally. Free information. P.O. Box 7062, San Jose, CA 95150-7062.

SOLAR Heating learned quickly at home! Free information. Empire School, Box 1014S, Jupiter, FL 33458

GET RICH!! Mailorder Opportunity . . . Free Details. Chanticleer, 20196 Millerton Road, Prather, California 93651

HOW TO SUCCEED IN MAILORDER PROVEN METHODS. FREE DETAILS. Guhl Publishing Company, 424 Sand Creek Road, Suite 316, Albany, NY 12205

OPPORTUNITY IS KNOCKING! Be successful at your own home business. \$5.00 booklet shows how. Golden Idea, 9122 Carraway Lane, Magnolia, Texas 77355.

HUGE profits! Reconditioning used car batteries. Secrets others don't tell. Stamp please. Battery Outlet, Box 3300, Hickory, N.C. 28603.

PIANO Tuning learned quickly at home! Free information. Empire School, Box 1014, Jupiter, FL 33458

\$3,000 MONTHLY Selling information by mail. Free information. Box 10179, Alexandria, VA 22310

MAKE Money Consulting! Free details! JLA/P, 50 Follen, Cambridge, MA 02138

NAME YOUR OWN INCOME. Guaranteed. Profits daily. Grow big fast. New book reveals secrets, tells how. FREE details. Write now. Hilltop Publishers, Box 1364, Chula Vista, CA 92012

\$1,000.00 WEEKLY Possible Bronzing Baby Shoes FREE BROCHURE SHOWS HOW. NBPM, 398 Airport, Sebring, FL 33870

EARN Up to \$5,000 Yearly Growing Garlic in 100' x 100' Garden Plot. Information \$4.00. OB&G Garlic Grower Wholesaler, 9572C Thompson Creek Road, Applegate, OR 97530

AUTOMOTIVE BUSINESS OPPORTUNITY! Cash in on your automotive enthusiasm. Innovative program provides comprehensive details for establishing your own profession in the automotive industry. Free Information! Headliner Publications, P.O. Box 6352A, Reading, PA 19610

WOODWORKERS - Free "Turn \$4 into \$39.95". Mulhall, 2 Morrill, Hooksett, NH 03106

HOW to MAKE BIG MONEY selling information! Free details! Titanin, 1711PM1084A Turquoise, Flagstaff, AZ 86001

MAKE Money in Self-Publishing! Write: Stella, Box 855, Oakland, NJ 07436.

EARN High Commission Mailing Our Burglar Alarm Advertisements To People On Our Mailing List. RBM Merchandising, P.O. Box 59314, Chicago, Illinois 60659.

SELL SENSATIONAL LOW-COST BURGLAR ALARM. Lightning seller. Exceptional Margin. Samples for trial. Northwest Electric-PM10, Box 1046, Mitchell, S. Dak. 57301.

SALES Agents Wanted part time or full. New Exciting Money making opportunity. No experience required. Details \$1.00. Wed Publishers, 1G10, Box 135, Tulsa, Oklahoma, TN 37388

HOMEOWNERS SAVE BIG \$\$\$ Save Hundreds of Dollars by doing your own Roofing For Step by Step Detail Send \$6.50 Check or money order to: Roofing, 1693 Nashville Hwy., Lewisburg, TN 37091

HOME Businesses Make Money! Details Free. SASE To: 300 S. Belt, St. Joseph, MO 64506

MONEY UNLIMITED: Your First Step to Financial Success. Send \$10.00. Nina Trading, PO Box 2272, Stn "C" Downsview, Ontario, Canada M342T1

MAKE MONEY in Mail Order! Simple, profitable. FREE information! SUNRISE, 44-A Second St., Waterford, NY 12188

\$1,000 Weekly Home Business Directory. Box 2019-PM, New York, New York 10163.

STAY Home! Make Money Easily, Quickly. Valuable, Free Details. Lindbloom, 3636-POM Peterson, Chicago, 60659

MAKE MONEY with microcomputers! How Publishing, Box 218, Washington, IL 61571

SASE, \$1.00 sends your name to all October "Business Opportunities", PLUS. Box 711, Joliet, IL 60434-0711

SELL Books by Mail. Dealership-25c. Midwest, Box 44R2-PM, Shawano, Wis. 54166

NEED credit cards? Bankrupt? Slow Credit? No credit? Let us help. Call Now! 1-317-839-1712 Ex.C5e

FREE! — Make Money Writing — Selling Simple Information! — Pacific, Box 1015, National City, California 92050

BORROW By Mail! \$500-\$25,000 Fast! Easy! Confidential! For info application write: Accurate, 2120 Crestmoor, Nashville, TN 37215.

\$92.00 From Square Foot Plywood. (Huge Demand). Revealing Proof 25c. (Refundable). Woodwin, Bridgewater, Mass. 02324

NEW Luxury Car without cost! Write: AMCO9, 1601 Main, Plainfield, IN 46168

FIFTEEN "ANTI-CRIME" Reports with reproduction rights. \$12.00. Check. Money Order. New World Enterprises, P.O. Box 44444, Columbus, OH 43204

MAKE BIG MONEY REPAIRING WINDSHIELDS & Plate Glass! Up to \$60,000 yearly! Call TOLL-FREE for Valuable FREE report. 1-800-321-2597. Glas-Weld Systems, Box 5755D, Bend, OR 97708.

FREE Details - Start Your Own Profitable Business At Home. JVR, Box 582A, Marion, Ohio 43302

"HOW To Start A Day Care Business At Home". EASY Steps. FREE Details. Write: Master Guides, Dept 1840, 624 Church St., Royersford, PA 19468

(Continued on next page)

Материал, защищенный авторским правом

BUSINESS OPPORTUNITIES

(Continued from preceding page)

MULTILEVEL That Works . . . Earn Money Eating . . . Rizzo, SR105, Cloudland, Georgia 30709

CONCRETE BLOCKS Make by hand for business or own project. Little investment, only basic skills needed. \$5.95. D. Norman, P.O. Box 16144, Clayton, MO 63105

NEW — \$500.00 From one sheet of Plywood. Guaranteed. Oakstump Woodcraft, 3630-PM9 Pacific Way, Longview, Wash. 98632

BREAKTHROUGH IN FUEL-EFFICIENT AUTOMOTIVE CARBURETION IS HERE: TURBO-EVAPORATOR. DISTRIBUTORS WANTED. OUTSTANDING FINANCIAL OPPORTUNITY. INFORMATION \$1.00. PALMIERI, INC., BOX 3291, NEW HAVEN, CT 06515.

MAKE MONEY. Be successful in your own business in exciting field. Details free. Associates, 5A Howard Circle, Ft. Oglethorpe, GA 30742

I MADE \$40,000 Year by Mailorder! Helped others make money! Details 25c. Torrey, Box 318YY, Ypsilanti, Michigan 48197.

LEARN The secrets of repairing junk batteries. "Fabulous Profits." **FIRST ESTABLISHED COURSE.** Apex Engineering, 5454 Boisa, Atascadero, Calif. 93422

MAKE Lots of Money During The Next 30 Days? Here's How: Write For Free Details No Obligation. How To Start And Operate Your Own Profitable Business At Home. River Point Dist. Co., 711 W. Main, Dept. PMB, Benton Harbor, Michigan 49022

E-Z EST Business on Earth . . . **FREE** Details! Schmidt's, Suite 1104, 16760 Alondra, San Diego, CA 92128

RINGS, WATCHES, JEWELRY— 400% profit. Free Sales Kit/Catalog. Spotlight, 2263, 600 Third Avenue, New York, NY 10016

MAKE HOMEMADE BOOKLETS. I've earned \$187,000 with mine. Free information: Falcon, Box 37169, Fort Worth, TX 76117

MONEY Now with mailorder success new approach. Free details. Smart Books, 13703-A 22 St., Tampa, FL 33612

MULTILEVEL MARKETING/MAILORDER Will work for YOU! Progressive company and ultramodern products produce **LIFETIME FINANCIAL SECURITY.** Free Detailed cassette, **RIEHL**, Dept. PM10, 1118 Columbia, Bristol, TN 37620

GET RICH using OTHER PEOPLE'S MONEY!! Unique—amazing business!! Details **FREE!!** Finance Consultants, 5B-10, Billings, NY 12510

MONEYMAKING OPPORTUNITIES

TRIVIA CAN MAKE YOU RICH!! Details - \$1.00. Trivia-8, Box 532, Owosso, Michigan 48867.

GET RICH Dynamic Book Tells How. Free Details. Creative Enterprises, 4702 Thornton Circle, Houston, Texas 77018

FRESH, HOT, RESPONSIVE NAME LISTS of mailorder **BUYERS.** Most categories. Computerized in **ZIP CODE ORDER.** Peel and Stick labels. **GUARANTEED DELIVERABLE!** For Brochure **RUSH SASE** to: **HEWITT PUBLICATIONS, P.O. BOX 220, SUNNYSIDE, GA 30284**

EXTRA MONEY! Turn hobby into a money making venture. Booklet tells how. \$3.00. Michael Kranz, 91 Tulip Avenue Juniper Building, Apt. B4, Floral Park, NY 11001

CASH FOR YOUR SIMPLE IDEAS Corporations Pay \$100's Daily to Anyone. For Details Send Two 20c Postage Stamps to: **MGMCO, Box 14645B, Spokane, WA 99214**

FLEA MARKETERS, wagon-jobbers. Smooth leather handbags, wallets, vests. Free Brochure. Clement, P.O. Box 3335, Chula Vista, CA 92011.

EASY Extra Income, Selling Gift Items in Flea Markets. Mail-Order. **GORDON**, Dept. 8, 1135-A Kearny St., San Francisco, CA 94133

FREE!! Money-making Details!! **Wilhelmina Publishers**, P.O. Box 502-PM10, Mena, AR 71953

BUMPER STICKER PRINTING DEVICE. Cheap, Simple, Portable. Free details, **Bumper**, POB 22791 (GG), Tampa, FL 33622

FANTASTIC earnings mailing from home!! Offer: Rush Stamped Addressed Envelope. **Imperial**, P-B X17410, Fort Lauderdale, FL 33318

MONEY from discarded tires! Details. **Brownie**, Box 53, Fishers, Indiana 46038.

GET RICH!! Secret law smashes debts—brings Cash, Credit! **FREE** report!! **WealthKit-WBM-10**, Billings, NY 12510

\$500.00 WEEKLY From Junked Tires. (Rush Stamp). **LeValleys**, Fountain, FL. 32438

MEDICAL Data-card multi-level. **HALLCO**, 25 Curve, Stoneham, Mass. 02180

DO DRAFTING? Keep your Job/Make more \$ Doing **PATENT DRAFTING** Tech Bulletin \$3.00. **Freelancers**, Box 14954C, Cincinnati, OH 45214

BECOME ENTREPRENEUR!! Self-Scoring Test Reveals Success Potential. Send \$2.00. **Entrepreneurial Workshops**, 4000A1 Aurora Avenue, Seattle, Washington 98103.

REVEALED!—SECRETS OF THE RICHEST PEOPLE!— \$3.00. **Startron**, 109 Forest Park, Forest, VA 24551

BARGAINS! Buy Wholesale and Below! Name Brands. Appliances . . . Furniture . . . Sports Equipment . . . Televisions . . . Cameras . . . Watches . . . Jewelry . . . Thousands More. Free Details. **Worldwide Bargainhunters**, Box 913-A, Holland, Michigan 49423.

EXCITING!! Profitable!! "How-To" Booklets. Details. **Fuller Enterprise**, P.O. Box 1283PM, Okmulgee, Oklahoma 74447

STREAMLINE GUIDE TO SELLING INFORMATION BY MAIL. Profitable Mailorder Opportunity. **FREE** details. **R. Anderson**, 3628-A2 3rd Avenue, Los Angeles, CA 90018

DISCOUNT Postage stamps! Save 35%! Discover how. **Exclusive Report \$1.** **Dunne**, 7 White, Arlington, Massachusetts 02174-8835.

HOW TO MAKE a FORTUNE selling information! Free details! **Titanin**, 1711PM1084B Turquoise, Flagstaff, AZ 86001

\$1000+ a WEEK IN YOUR MAILBOX. FREE REPORT. **LIBERTY RESOURCES, BOX 1060P, SIERRA MADRE, CA. 91024.**

MAKE BIG MONEY: No Inventory, Bookkeeping, Small Investment. Free Valuable Report. **J. Kulesa**, 13035 Brady Rd., Chesaning, Mich. 48616

GET THE FACTS! Expert shows which opportunity offers will make you Rich! Free Details: **Capital**, 6344 Fall River, Sacramento, CA 95824

MILLIONS are profiting from Garage Sales and Craft Shows. So Can You! Booklet shows how \$5.00. **Deerfield Marketing**, 1502 Brinckerhoff Ave., Utica, N.Y. 13501

EARN Extra Income! **Pioneer Foods**, Box 986(L), Tualatin, OR 97062

AUTOMATIC donut machine can make **\$120/HR PROFITS.** Portable. Free literature. **LIL' ORBITS**, 8851-A Research Center, Minneapolis, Minnesota 55428

MAKE Money at home. Send for free details. **MA Stuart**, 1219 Willow, Independence, Missouri 64052

GET RICH! Opportunity Books tell how! **FREE** Details! **Ranfeld**, Box 1515PM10, Centralia, Illinois 62801-1515

START A Profitable "Home Based" Business Of Your Choice. "How To" Information \$1.00. **Timberhill Co.**, Dept 1104, Box 51, East Aurora, NY 14052

BORROW by Mail! \$500-\$25,000 Fast! Easy! Confidential! For info application write: **Accurate**, 2120 Crestmoor, Nashville, TN 37215

"HOW TO MAKE MONEY IN DIRECT SALES" (\$3.00). **General Products Company**, Box 36, Farmington, CT 06032

NEW Luxury Car Without Cost! Write: **AMCO 9E**, 1601 Main, Plainfield, IN 46168

\$570.00 + Weekly—Sparetime, Assembling PVC Pipe furniture. Send self-addressed, stamped envelope. **Blossom**, Box 5938, Richardson, Texas 75083

BARGAINS GALORE. Buy United States Customs Confiscations. **M. Hearon**, 2766 Pineridge Drive, Titusville, Florida 32780.

OVER 100% Mark Up! Start your own books by mail business. Professional Guidance; For complete details send \$1.00 to: **Graham Enterprises**, 36505 Florida #23, Hamet, Cal. 92343

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). **S.S. GROWNICZ, POPULAR MECHANICS, DEPT. PMC1, 224 WEST 57TH ST., NEW YORK, NY 10019**

MAILORDER OPPORTUNITIES

USE Our Unlimited Lists of Mail Order Buyers. R and V Distributors. 478 W. Hamilton Ave, Suite 325, **Campbell, CA 95008**

MAILORDER Buyers! All Categories Computerized in ZIP Code Orders. These people will respond to Mailorder Offers. Guaranteed Deliverable for Full Details **Rush To: Western Service**, 62 Richardson Dr., Henderson, Nev. 89015

RABBITS-CHINCHILLAS-FUR BEARING ANIMALS

CHINCHILLAS: Have top record Pelt Prices. Information, facts. \$2.00. 22 Thunder Road, **Alamogordo, NM 88310.**

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. \$1.00. **American Rabbit Assn.**, H1, P.O. Box 426, Bloomington, Illinois 61701

\$500-\$1000 Month Plan raising rabbits for us. Free details. **White's Rabbitry**, Box 908PM, Palm Harbor, FL 33563-0908

EARTHWORMS, LIVE BAIT

FREE Literature. Raise Fishworms, Crickets, Redworms—1000-\$8.95. 5000-\$42.50. Book on How and Where to Sell with Order. **Carter Fishworms**, Plains, GA. 31780.

OF INTEREST TO ALL

SUCCESS is yours! Follow this proven plan today and enjoy the life you desire tomorrow. Send \$5.00. **P. T. L. Publications**, 4018 Edmondson Avenue, Baltimore, MD 21229

VISA Card!! No Credit Check. **Credit Consultants**, 6421 Siegal - Suite 28B, Commerce City, CO 80022.

LEARN Secrets of the rich rush \$1.00. **K&M Services**, 3396 Braeburn, Ann Arbor, Michigan 48104

DISNEY artist shows you how to draw. First easy lesson **FREE!** Get yours today! **AVIES-PM10**, 1014 North Wright, Santa Ana, CA 92701

FREE Promotional Albums. Concert Tickets. Stereos, etc. Information: **Barry Publications**, 477 82nd Street, Brooklyn, NY 11209

THE SECRETS OF FAST, PERMANENT WEIGHT LOSS. \$4.50 tells all. Write now. **SMB-Weight**, Dept. P-B, Box 263, Little Falls, NJ 07424.

BULLET PROOF VESTS and Protective Outer-Wear: All Types. Highest Quality! Lowest Prices! Adjustable, Comfortable, Lightweight. Guaranteed. **Colorful Catalog \$1.00.** Refundable. Write Today: **A-1 Body Armor**, Department PM, 170 Broadway, New York, NY 10038

POST Cards of Historic Luxury Liner S/S Sea Venture \$10.00 each. **Captain Kerry Scott**, 10 Windflower Court, Hilton Head, SC 29928

VACUUM Cleaners "Discount Prices" "New" Rainbow \$399.95. Kirby, Filter Queen, Compact. Details: **ABC Vacuum Warehouse**, 6720 Burnet-PM, Austin, Texas 78757.

FREE! SECRETS OF SUCCESS. Write now. **SMB-MO**, Dept. P-B, Box 263, Little Falls, NJ 07424.

> 1/2 # Solid Brass Duck- Head- Hooks, 4" High, Holds Hats To Guns; Equally Graceful and Classy When Not in Use. Order Set of Two for \$15.00 Postpaid From: **Kristen**, Old Redford P.O. Box 19008, Detroit, MI 48219. Valid Thru Dec 1984.

GENUINE RATTLESNAKESKIN BELTBUCKLES \$14.95, guaranteed. Hatbands, belts, wallets, custom made from Rattler, Python or Cobra. Rush \$1.00 for photos/prices! **Snakeskin Products**, Box 4318, Dept. PM, S. Daytona, FL 32021.

FREE! Over 100 Fascinating Consumer Information Publications. **Infosystems**, Box 10484, Glendale, CA 91209

SECRETS FOR WINNING CONTESTS REVEALED! \$3.00--- **ALCO**, Box 1590PMO, Miami, Florida 33265

BEAUTIFUL FM Stations Listed Maine to Florida. Avoid Dial Fumbling \$3. **Romigs**, Box 259, Quakertown, PA. 18951

THE SILENCER. A switch to stop ringing phones when you're napping, bathing, or just relaxing \$5.95. **N.L. Harry**, P.O. Box 4498, Harrisburg, PA 17111-0498.

WIN PRIZE CONTESTS! Booklet Explaining Secrets—\$1.00. Sweepstakes Information Included. **Timberhill**, Dept. 1104, Box 51, East Aurora, NY 14052

HOW To Get 1001 Things Free. Amazing Book Tells Where To Write For Free Items. Send \$5.00 Today—Guaranteed!! **Lakehurst's**, Box 1956-PM2, Wichita, Kansas 67201

MORMONISM'S TRAGIC TRUTH, Stamp Appreciated. **Astrid**, Box 577, Greenwood, Texas 76246

GOVERNMENT SURPLUS

IS It True You Can Buy Jeeps For \$44 Through the U.S. Government? Get The Facts Today! Call (312) 742-1142 Ext. 7133.

HOW To Get 1001 Things Free. Amazing Book Tells Where To Write For Free Items. Send \$5.00 Today—Guaranteed!! **Lakehurst's**, Box 1956-PM2, Wichita, Kansas 67201

MORMONISM'S TRAGIC TRUTH, Stamp Appreciated. **Astrid**, Box 577, Greenwood, Texas 76246

GOVERNMENT SURPLUS

IS It True You Can Buy Jeeps For \$44 Through the U.S. Government? Get The Facts Today! Call (312) 742-1142 Ext. 7133.

HOW To Get 1001 Things Free. Amazing Book Tells Where To Write For Free Items. Send \$5.00 Today—Guaranteed!! **Lakehurst's**, Box 1956-PM2, Wichita, Kansas 67201

(Continued on next page)

GOVERNMENT SURPLUS

(Continued from preceding page)

MILLIONS OF SURPLUS BARGAINS! Many 1% original cost. Jeeps included! "Nationwide Government Buyer's Guide Directory" — \$2.00 (Guaranteed.). **DISPOSAL**, Box 19107AX, WASHINGTON, DC 20036.

"GOVERNMENT SURPLUS" JEEPS \$30,000! 5,000,000 items! Complete Information Your Area. **1984 OFFICIAL DIRECTORY**, \$2.00 (Guaranteed). **SURPLUS**, (A783), 4620 Wisconsin Northwest, WASHINGTON, D.C. 20016

LOANS BY MAIL

LOANS By Mail Guaranteed! Borrow Any Amount! Free Details. Application Rushed! Creditmasters, Box 507-PP, Floral Park, New York 11002

BORROW \$25,000 "overnight." Any Purpose. Keep Indefinitely! Free Report! Success Research, Box 19739-AX, Indianapolis, Indiana 46219.

MONEY Problems? Free Book describes Loans, Cash, Government Grants, Other benefits, available to individuals. Write: Associates, Box 98-A4, Brooklyn, New York 11235

1/2% Loan Grant \$1,000 to \$5,000. Nobody Refused. P.O. Box 420, Brookhaven, Miss. 39601

BORROW \$30,000 without interest! All eligible. Repay anytime. Free details! Infohouse-PM, 808 Post, San Francisco, CA 94109.

CASH Loans—Borrow by Mail \$500.00 to \$25,000! Free details. Application! LTD-PM, Box 937, Ft. Lauderdale, FL 33302

LOANS ON SIGNATURE TO - \$100,000! Any purpose. Write: Elite, Box 206P, East Rockaway, New York 11518.

BORROW \$100-\$100,000! Instant Reply! No Co-signers! Rush Stamped Envelope! Financial, Box 5487(P), Richardson, TX 75080

BORROW: Money from **ARAB'S**. Details **FREE**. Send **SASE**. Arabco, Box 2267PM, Davenport, Iowa 52809

NEED credit cards? Bankrupt? Slow Credit? No credit? Let us help. Call Now! 1-317-839-1712 Ex.C5

BORROW Up To \$100,000 Immediately! Guaranteed; All Eligible! No Co-Signers. Send \$5.00. K Sanders, Rt. 4 Box 640-T, Iuka, Miss. 38852

LOANS \$30,000! Interest Free! Repay Anytime—All Eligible! Details Free! Millionaire, Dept. A-40, P.O. Box 607, Elk Grove Village, IL 60007

BARCLAYSAMERICAN/LOANS BY MAIL Convenient, Confidential. No Collateral. P.O. Box 5425, Alexandria, LA 71307. Toll Free 800-551-6572. Not Available in AL, AR, CA, DC, FL, IA, IN, KS, ME, MD, MA, MI, NM, OH, OK, OR, SC, SD, TX, WA, WI

DIVORCE

WINNING Information \$1.00. **MEN'S RIGHTS ASSOCIATION**, 17854 (Lyons), Forest Lake, MN 55025

PERSONAL

PICKPOCKETS Cry New Police recommended device attaches to wallets in seconds. Also prevents accidental loss. Mail \$2.50 to: Zuckerman Manufacturer, P.O. Box 3518, Chula Vista, CA 92011

MAKE Friends worldwide through international correspondence. Details free! Hermes-Verlag, Box 110660/PM, Berlin 11, W. Germany

UNIVERSITY DEGREES BY SPECIAL EVALUATION of **EXISTING** Job Experience, Education, Achievement. Fast, Inexpensive. Call (614-863-1791). Or Write: Box 13151-T10, Columbus, OH 43213

ASIAN, European Friendship! Free details: Inter-Pacific, Box 304PM, Birmingham, Michigan 48012.

BIBLE Questions answered. Stamped envelope. Bylon, 17167 Bentler, Detroit, Michigan 48219

UNIVERSITY DEGREES BY MAIL! Accredited Bachelors, Masters, Ph.D.s... Free revealing details. Counseling, Box 317-MP10, Tustin, California 92680.

MEN Comfort Hemorrhoids End Embarrassing "Skid Marks". Soft Fabric Tapes Comfortably Inside Briefs. Disposable. Six \$3.95. M M Sales, P.O. 613, Ellsworth, Wis 54011

REMAILING SERVICE

REMAILS/FOREWARDING. Singles \$1.00 Monthly \$2.00. P.O. Box 711, Joliet, IL 60434-0711

GERMANY: Remails \$2.00, includes postage. Confidential Forwarding, Receiving, TWG Postfach 1145, 6460 Geinhausen, DBR.

DEPENDABLE, Confidential Remailing. Postal Shoppe, 369 East 900 South, Salt Lake City, UT. 84111

SASKATCHEWAN Remailing Central, Box 101, Foam Lake, Saskatchewan, Canada S0A 1A0

UNLISTED ADDRESS. Discreet and confidential. Remail \$1.00 Single. Mail Forwarding Service, 8050 S. Main, Houston, Texas 77025

MAILING Service from Calif. and Europe prestigious address. Executive Mailing Services, 1712 Newcastle Dr., Los Altos, Calif. 94022

FREE Remailers List. Agents Needed. PS, Box 29656, San Antonio, Texas 78229

CONFIDENTIAL, reliable forwarding-remailing. Diamond-H, Box 129A, Caddo, TX 76029.

MAILERS CHOICE Saves Money, Privacy, Dependable, Reasonable. Box 504, North East, MD 21901

REMAILING: Envelope, \$1.00, Package, \$2.00. J.A.M.-1, Box 485, O'Fallon, IL 62269.

START YOUR OWN REMAILING service. Kassouf, 11632 Las Lucas, Santa Ana, CA 92705

NATO MAIL FORWARDING Dependable service nationally and internationally for 27 years. Write: NATO, Box 1418, Sarasota, Fla. 33578.

CONFIDENTIAL Mail Receiving Forwarding. Mail Drop, Box 18039PM, Orlando, FL 32860

MISCELLANEOUS

LIVE WITHIN INCOME AND SAVE. Thousands do, using "5 points" family money management 12-months record book. \$3.75 postpaid. Publisher, P.O. Box 7196 A, Orlando, FL 32854

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)

PHOTO ID. Sealed in plastic. Good in all states, Canada. Fast. **GUARANTEED**. Send \$6.00 (2-\$10.00), photo, name, address, height, weight, hair, eyes, birthdate. Cardinal Publishing, 2071-46 Emerson, Jacksonville, Florida 32207.

SAFETY FUSE 1/2" Green Waterproof Fuse, 100' — \$10.00, 300' — \$25.00. Postpaid. Greenman, Box 9026K, Peoria, IL 61614.

SURVEY. To indicate interest in math puzzles, mail a card during 1984 to: Post Office Box 427, Berea, OH 44017.

REGISTRATION Papers for unregistered fullblooded dogs. Free Information. APRF, P.O. Box 111, League City, Texas 77573

TERMPAPER CATALOG — 306 pages — 15,278 papers available. Rush \$2.00. **RESEARCH**, 11322 Idaho, #206PM, Los Angeles, 90025. (213) 477-8226.

AMAZING Calorie Counter For Everything You Eat And Drink! Also Shows Calories For All Fast Food Restaurants. Send \$2.00 Today—Guaranteed. Lakehurst's, Box 1956-PM1, Wichita, Kansas 67219.

WANTED MISCELLANEOUS

GOLD, Silver, Platinum, Mercury, Tantalum. Samples evaluated free. Ore assaying service. Call Wholesale Terminal toll free: 1-800-932-1010.

BUYING Tungsten Carbide, Tungsten, Molybdenum, Silver Solder, Silver Contacts, Gold, Platinum. 800-321-6914 Ohio 216-531-8333 collect.

SCRAP SILVER CONTACTS, FORKLIFT CONTACTS, Silver Solder, Sterling, Gold Plated. Robert Leszczak, 652 Myrtle St., Elizabeth, NJ 07202

HEARING AIDS

TREMENDOUS SAVINGS On Brand Names. LeBarron Company, RR7C, Saratoga Springs, NY 12866

HUGE SAVINGS Eliminate Dealer Markups. Free Trial. Batteries Wholesale. Terms Arranged. Call Toll Free 1-800-323-1212. Or Write: Lloyds-PMC, Rockford, IL 61110

SAVE Half Buying Aids by Mail. All Major Brands Available. REA Company, Box 364, Bridgeport, Ohio 43912

FREE HEARING AID CATALOG - Save 1/2 by mail! Write: "MoneySavers", 9530-PM-10, Langdon, Sepulveda, California 91343. **NOT** sold in California.

GIANT SAVINGS All Types. Custom In-The-Ear Specialists. Month Trial. Terms. Box 59451PM, Chicago, Illinois 60659

PLEASE CALL DR. SONG FOR BIG SAVINGS. **SIGMOTEK INTERNATIONAL CORPORATION**, 1560 Newell Ave., Walnut Creek, California 94596. (415) 943-7411. **NOT** sold in California.

SMOKER'S SUPPLIES

NEW DISCOVERY! ELIMINATE 90% of The Poisons From Your Favorite Brand of Cigarettes. Healthsystems, Box 10484, Glendale, CA 91209.

TOBACCO

CIGARETTES - Roll Your Own Custom Tobaccos, Papers, Filters, Rolling Machines, Accessories. Free Catalog And Sample. Green River Tobacco, P.M., Box 1313, Owensboro, Kentucky 42302

FREE Mildest Pipe Tobaccos. Gabe Imports, Box 741, Hays, KS. 67601

PIPESMOKERS! Discover Great Smoking Pleasure Distinctly Flavored, No-Bite Tobacco. "Free Sample" or 5 1/2oz. Packets \$4.00. House of Tobaccos, Dept. PM10, Palmer Mall, Easton, PA. 18042

SCIENCE & CHEMISTRY

LABORATORY Chemicals, Glassware—Apparatus, Catalogue \$1.00. Deluxe Scientific, 934 S. 13 Street, Manitowoc, Wisconsin 54220

FORMULAS, PLANS, ETC.

MONEYMAKING FORMULA CATALOG \$5.00 (REFUNDABLE!): GWA3, Box 193, Brookfield, Wisconsin 53005-0193.

ANY FORMULA \$10.00. Catalog \$1.00. J. Belfort, Box 568, Chicago, 60690

SPECIAL SERVICES

INFORMATION On anything. Ferguson Research Specialists, 60-15 Woodside, Woodside, New York 11377.

SPEECHES, Letters General Verse, Information. Thompson, Box 04119, Cleveland, Ohio 44104

HEALTH, VITAMINS

SECRET Health Tips for: Better Health, Happier & Longer Life. Send \$3.00 for condensed. (Refunded if not satisfied). Edward CR Fisk, 1007 Lambert Crosse St., Apt. 1, Montreal, Quebec, Canada H3H 1Y9

RESPIRATORY ILLNESSES, SINUS, BRONCHIAL etc. A unique health appliance helping thousands is available for trial. Free literature. Write: **RESPIRIZER CO.**, 1685 Baltimore Pike, Gettysburg, PA 17325

LOSE weight naturally, no pills, no starvation, send \$3.00. Diet-M. P.O. Box 800427, Houston, TX 77280-0427

BRAIN FOOD! Powerful algae extract helps revitalize physical and mental alertness. Free Brochure. NNC Labs, Box 74PM, Merrick, NY 11566

WORK CLOTHING

CLEAN Reconditioned Rental Uniforms. 4 Pants with 4 Coordinated Shirts - \$11.99 (Check or Money Order). Satisfaction Guaranteed! Sizes to: Antioch Wholesale, P.O. Box 581C, Antioch, TN 37013

WORK CLOTHES Save 80% Shirts, Pants, Coveralls. Free folder write: Galco, 4004 East 71st Street, Dept. P-10, Cleveland, Ohio 44105

GARDENING & LAWN CARE

GREENHOUSING/GARDENING - Free Supply Catalog... Greenhouses to Hand Tools. Gothic Arch Greenhouses, P.O. Box 1564P, Mobile, AL 36633.

FLOWERS, PLANTS & NURSERY SUPPLIES

GROW GINSENG, Very Profitable. Have seeds, roots. Goldenseal. Complete information. K. Collins, Viola, Iowa 52350

DEADLINE FOR ADS: Copy and Payment must be in by the 5th day of the 2nd preceding month for the issue in which the ad is to appear. See Head of Classified Section.

HOW TO COUNT WORDS: Name and address must be included in counting the number of Words in your ad. Each initial or number used counts as 1 word: J.J. Smith, 224 West 57th Street, New York, New York 10019: 9 WORDS. Zip codes are not counted. Phone #: 2 Words. Symbols used as keys are charged for. City or State count as 1 word each: New Brunswick, New Jersey: 2 words. Abbreviations such as C.O.D., F.O.B., R.P.M., U.S.A., P.O., 5x7, 16mm are counted as 1 word. (P.O.Box 392 counted as 3 words) Webster's International Unabridged Dictionary will be used as our authority for spelling, compound words, Hyphenations, abbreviations, etc. Please make checks payable to **POPULAR MECHANICS**.

Only \$57.00 for 10 word minimum

\$5.70 each additional word
BOLD FACE CAPS add \$1 per word

(First Word: No Charge For Bold Face)

Remittance of \$ _____ is enclosed to cover _____ insertion(s) in the _____ issue(s). _____ Classification

No Charge for CAPS	2	3	4	5	6	7
8	9	10-\$57.00	11-\$62.70	12-\$68.40	13-\$74.10	14-\$79.80
15-\$85.50	16-\$91.20	17-\$96.90	18-\$102.66	19-\$108.30	20-\$114.00	21-\$119.70
22-\$125.40	23-\$131.10	24-\$136.80	25-\$142.50	26-\$148.20	27-\$153.90	28-\$159.60
29-\$165.30	30-\$171.00	31-\$176.70	32-\$182.40	33-\$188.10	34-\$193.80	35-\$199.50
36-\$205.20	37-\$210.90	38-\$216.60	39-\$222.30	40-\$228.00	41-\$233.70	42-\$239.40
43-\$245.10	44-\$250.80	45-\$256.50	46-\$262.20	47-\$267.90	48-\$273.60	49-\$279.30
50-\$285.00	51-\$290.70	52-\$296.40	53-\$302.10	54-\$307.80	55-\$313.50	56-\$319.20

YOUR NAME _____ (PLEASE PRINT) PHONE: _____

FIRM (NAME IN AD) _____

YOUR ADDRESS _____

CITY _____ STATE _____ ZIP _____

DATE: _____ YOUR SIGNATURE _____

(PLEASE PRINT OR TYPE COPY • FOR ADDITIONAL WORDS ATTACH SEPARATE SHEET)

RECIPES, COOKING, ETC.

TORTILLAS, Make flour tortillas, eat fresh off griddle. \$2.50. Cruz, P.O. Box 56157, North Pole, AK 99705

CASSEROLE Cookbook: 110 Southern Recipes. \$5.00. Coleman, 202 Weluvt, Titus, AL 36080

FRUIT CAKE Best I ever tasted \$2.00 SASE. DuBose, 3341 Cicalla, Memphis, Tenn. 38122

HEAVENLY Chocolate Desserts! Don't Delay! 50 Exciting Recipes - \$4. Conner, 859 Ferngrove Dr., Cupertino, CA 95014

ITALIAN Family Favorites. Sauce to Desserts. \$4.00. Recipes. 8816 Cheryl M.S.R., Prescott, AZ 86301

OLD SOUTH BUTTER PIE - Mouth Watering Good - Recipe \$2 - SASE. Wesleys, Dept. 23PM, Box 20711, Birmingham, Alabama 35216

VEGETARIAN Delights! Tantalize your tastebuds with delectable delicacies. Prepare breads, desserts, pickles and delicious entrees, 101 recipes, \$2.00. Sally Nordstrom, 3089 C Clairmont Drive, Dept. 232, San Diego, CA 92117

TEN Unique Breads including SOURDOUGH \$3.00. Recipes, 1908 North "H", Midland, TX 79705

GRANDMA'S NO FAIL PIE MERINGUE, Proven Recipe That Works Time After Time, If You Have Trouble With Other Recipes, This One Is For You. Send \$2.00. SASE. To: LR Keller, Box 44, Luning, Nevada 89420

DELICIOUS Low Calorie Recipes: Send \$5 To: C. Bendele, Box 346, Onalaska, Texas 77360

CHICKEN! Fifty Easy World-wide Recipes. \$5.00. Miss Handy, P.O. Box 2000, Sarasota, FL 33578

LOUISIANA GUMBO FILE RECIPE. Original. Delicious. Seafood? Yes. \$3.00. R. Anderson, 3629-A1 3rd Avenue, Los Angeles, CA 90018

INCREDIMILL ROUTER Attachment will produce FRESH FLOUR of all kinds, nut-butters coffee in minutes. Fits any router. \$39.50 Free Brochure. Incredimill Products, P.O. Box 1298, Blaine, Wash. 98230

ORIGINAL Lemon Cake Recipe! Easy! State Fair Winner! Starts with Mix! \$1.00. JotLins Publications, Route 2, Box 165A, Lincoln, Ala 35096

20 DELICIOUS Chicken Recipes. \$3.25. Publico, 17813 Wilton, Torrance, CA 90504

DELICIOUS PORK STEAK \$2.00 SASE. Gramma's, 11917 W. Valley Rd., Galena, Ill. 61036

101 EASY HOLIDAY RECIPES - Rush \$3.95. Mansion House, RR3, Dept. 278, Danville, VA 24540.

LIQUEURS U-MAKE, Cheaply, Tia Maria, Irish Cream, \$2.00 + SASE. Craig, 921 Roosevelt Blvd., Ephrata, Washington 98823

PERFECT BREAD EVERY TIME. HOMEMADE YEAST plus 8 bread \$3.00 and large SASE. C. Clay, 33 Timberlane Trail, Conway, AR. 72032

ORIGINAL Saltless Seasoning And Sweet Relish Recipes. \$2.00 Each. Rt. 1, Box 19, Decatur, TX 76234

SPECIAL! SOUPS! OLLA PODRIDA, Minestrone, Oxtail, Labemodellsuppe, Recipes, Hints \$3.00. Vishwa Lamba, Box 6886, Station J, Ottawa, K2B 6E8

WINEMAKING, BEERMAKING, ETC.

WINEMAKING-BEERMAKING-GASOHOL. Free Supply Catalog. Yeast Equipment. Continental, Box 188PM, Casselberry, FL 32707

LARGEST SELECTION 59 beer malts, 60 different wine concentrates, supplies, equipment, free catalog and recipes. Mountain Cellar Supplies, 346 Weaverville Highway, Asheville, N.C. 28804 Telephone (704) 645-6949

WINEMAKERS-BEERMAKERS— Free Catalog—Fast Service—Large Selection: Kraus, Box 7850-L, Independence, Missouri 64053.

FREE BEERMAKING BOOK Plus Catalog. Finest Equipment, Ingredients. Fully Guaranteed. SPI, Box 784-M, Chapel Hill, NC 27514

WINEMAKERS-Beermakers: Free illustrated catalog of supplies. Semplex, Box 12276R, Minneapolis, Minnesota 55412-0276

WINEMAKERS-BEERMAKERS Fresh Stocks, Fast Service, Free Catalog. O'Brien's, Box 284D, Wayne, IL 60184

BEERMAKERS ONLY! Free Catalog/Newsletter. Williams's, Box 461M, Oakland, California 94604.

BEER LOVERS—Brew your own. Delicious! Inexpensive! Free catalog. Beer Gear, Box 25093M, Lansing, Michigan 48909

WINEMAKING/BEERMAKING, Equipment, Supplies, Free Catalog. ASC, P.O. Box 335, Berwyn, Illinois 60402

WHISKEY, GIN, VODKA MAKING. Instructive Manual. \$2.00. Homebrewer, 723(A) Disston, Philadelphia, PA 19111.

MAKE QUALITY BEER, Wine. Free catalog. Village Store, Box C-51PM, Westport, MA 02790.

HOMEMADE LIQUEURS - Irish Cream, Coffee Liqueur - \$3.00. SASE. JBS, Rt. 11, Box 205, Pine Bluff, AR 71603

LIQUEURS make your own 15 most popular: \$4.00. Moneysaver, Box 6660PM, Reno, Nev. 89513

PRESTO WINE CRYSTALS. Makes gallon 12% Wine. Specify Red or White. \$3.00/pkg., 3 for \$8.00. Home Brew, Inc., P.O. Box 965, Morrisville, PA 19067

FREE ENCYCLOPEDIA Winemaking, Beer-making Supplies, Equipment, Ingredients. Vynox, P.O. Box PM15498, Rochester, NY 14615

BEERMAKERS-WINEMAKERS. Large selection. Lowest prices. Fast service, Homebrew, Box 158M, Haslett, MI 48840

BURGLAR ALARMS & HOME PROTECTION

BURGLAR Proof Your Double Hung Windows. **SIMPLE-INEXPENSIVE-FOOLPROOF** Illustrated Instructions, \$2.00 S.A.S.E. M. Silvers, Box 8767, Pittsburgh, PA 15221

PM'S TIME MACHINE

75 YEARS AGO: October 1909



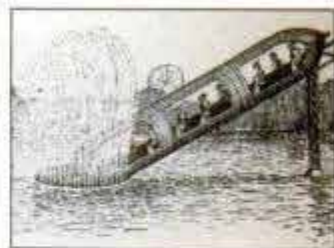
A portable street shower.

A truly public bath

Through the genius of E.T. Bingham of Kansas City, several thousand children in that city's tenement district stayed cool during the hot summer days of 1909 thanks to a shower bath that could be moved to various locations. It was fabricated from several lengths of 2-in. iron pipe with a water plug connection on one end and four common shower heads at the other. The whole deal cost only \$5 to make. Kansas City provided the water free. Men, women and even horses used it to cool off.

Play it again

A Minneapolis inventor designed a phonograph alarm to alert the fire department. But it depended on someone discovering the fire, then turning on a switch which sounded a gong and played the recorded alarm. We wonder what happened when the record ran out.



Water coaster

A roller coaster under construction at Coney Island, N.Y., included a dip under water. The cars glided on a single-rail track. They entered a glass tube which had its entrance and exit just above the water's surface.

Seeing eye phone

Two Danes announced that they had invented an apparatus that let callers see what was going on at the other end of a telephone wire. Details were kept secret.

50 YEARS AGO: October 1934



Strange craft hits water.

Boat was on target

Inventor Gar Wood changed the course of naval training maneuvers with his high-speed pilotless target ship. Controlled by a gyroscope and 12 compressed air cylinders, the vessel could run at 40 mph. Today's target vessels are takeoffs on the Wood prototype.



Floating hangar on pontoons

The first floating steel hangar for seaplanes was anchored in the Yangtze River. It sat on a hull consisting of

two pontoons held together by transverse girders, the first non-military application of this type of construction.

New midget car

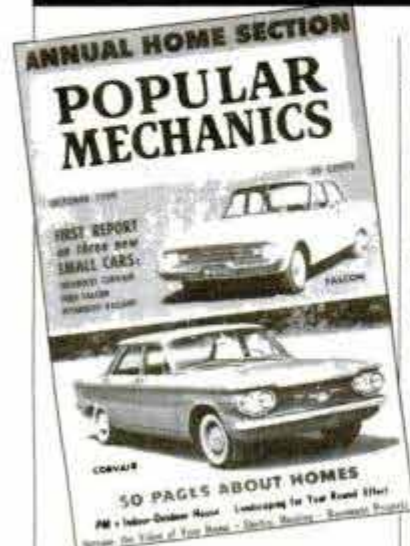
A midget motor car, equipped with a 1-hp motor and carrying one passenger made its London debut. Its best selling point was that it could pass under a horse.

Glare meter tests auto headlamps

The newly invented instrument was so sensitive, a wisp of cigaret smoke passing between a car's head-

lamps and the meter's photoelectric cell registered immediately on the tester's dials.

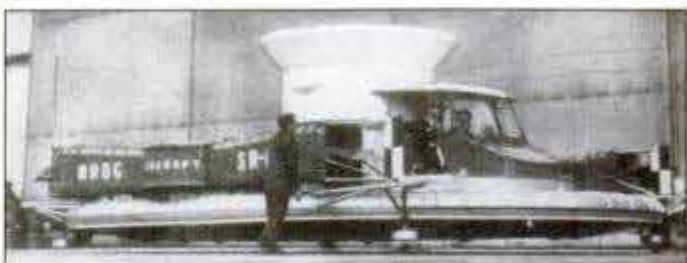
25 YEARS AGO: October 1959



Small car testing.

Detroit's small cars

Taking the bold approach, the Chevrolet Corvair offered more innovations than any car ever to come out of Detroit. The Ford Falcon had a more conventional design. The Plymouth Valiant was more highly styled than the competition. The cars would not last the decade.



Air sleds have bright future

Development of vehicles which operate on a cushion of compressed air was pro-

gressing rapidly. Air sleds flew a few inches above any smooth surface.

Hot jet fuselage

The T-38 Talon trainer was one of the first jet fighters to have fuselage contouring to eliminate high-speed pitch, a pioneering effort in supersonic aerodynamics.

A new metal made of fibers

Fiber metal, like sheetmetal but 90 percent air, was developed at Illinois Institute of

Technology. The material helped shape aeronautical design's future. **PM**

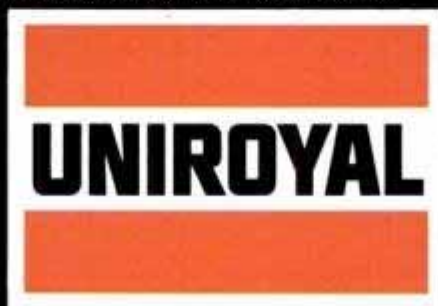


When the going is this tough, you'll want an off-road tire this good.

Conditions can get plenty tough when you're off-road. That's when you need a tire that's engineered to keep you moving—Uniroyal Laredo LTL steel-belted radial.

It's a new generation of off-road tire developed by Uniroyal's advanced technology. The Laredo LTL delivers the aggressive performance required off-road. Yet it won't remind you of it every minute you are on the road. Uniroyal's computer design system aided in achieving

a balanced, interlocking tread arrangement. The tread is self-cleaning for good traction in mud or snow. And its wide flo-



tation design helps in loose surfaces by distributing vehicle weight over a broad area.

Of course, all of the advantages of owning Uniroyal's LTL aren't found only off-road. On the highway its steel-belted radial construction helps squeeze miles out of a tank of fuel. And its variable-pitch tread design helps reduce road noise.

The Uniroyal Laredo LTL. It's a tough radial off-road tire that you won't mind driving on the road.

You may never need a tire this good. Laredo LTL.

There's only one way to play it.



Wherever the music is hot,
the taste is Kool. At any 'tar' level,
there's only one sensation
this refreshing.

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

© 1984 B&W T Co.

Milds Kings, 11 mg. "tar", 0.8 mg. nicotine; Filter Kings, 17 mg. "tar",
1.1 mg. nicotine av. per cigarette, FTC Report Mar. '84.