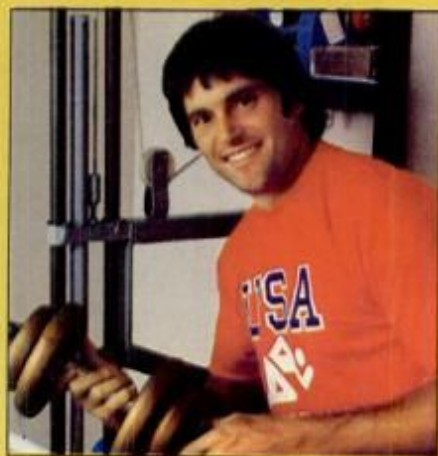


JANUARY 1977 75 CENTS

Popular Mechanics

**75th ANNIVERSARY SPECIAL: PM's
GREAT EVENTS OF 75 YEARS—AND A LOOK AHEAD**



**Build a home gym!
Olympic champion
Bruce Jenner & PM
show you how...
PLUS
Shape-up tips**

**4 PROJECTS: You can be
a master woodcarver**

**Make an old-time
crystal radio set**

**PLANS: Hide-it-all
laundry cabinet**

**Beyond CB—
the next
step up**

**...and
MUCH
MORE**



**6 WHEELS:
HOTTEST NEW
RACING MACHINE**



Come to

Marlboro Country.



Marlboro Red
or Longhorn 100's—
you get a lot to like.

This One



AN9J-1AG-FKB6

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

Kings: 18 mg. tar, 1.1 mg. nicotine av.
100's: 17 mg. tar, 1.1 mg. nicotine av. per cigarette, FTC Report Apr. 78

Popular Mechanics®

On the cover
Bruce Jenner, Olympic decathlon winner (near right) works out in home gym he designed with PM.
Photo: Harry Hartman

Jody Scheckter (right) in six-wheel Formula 1 car, hottest new racer on the Grand Prix circuit.
Illustration: Ed Valigursky



JANUARY 1977

CONTENTS

VOLUME 147 NUMBER 1

INTERNATIONAL EDITIONS: AUSTRALIA, CARIBBEAN, MEXICO, SOUTHERN HEMISPHERE

Special features:

Our diamond anniversary

Twelve prominent Americans identify key developments of the past 75 years and look to the future.

63

PM marks its 75th year on the way to a century of service to its readers.

72

Make an old-time crystal radio set

For the fun of it, you can build this original solid-state radio for about \$5.

60

Be a master woodcarver

Four projects to start with: snack dish, trinket box, partridge mirror and cat.

94

Plans: Hide-it-all laundry cabinet

PM's design combines several operations in one area.

90

Super-radio: The next step beyond CB

There's a world of adventure open to you in ham radio.

82

Automobiles and bikes

- 13 [The PM Garage](#)
- 24 [Detroit Listening Post](#)
- 34 [Imports and Motorsports](#)
- 40 [Car Clinic](#)
- 45 [Your motorcycle:](#)
 - Do-it-yourself overdrive
- 47 [What's behind those four little wheels?](#)
- 86 [Saturday Mechanic: Viva la differential!](#)
- 132 [Driving the new Mercedes Intermediates](#)

Shop and crafts

- 16 [Telephoto gunstock](#)
- 30 [Tool test: Havco grinder](#)
 - puts microfinish on metal or wood
- 33 [Drill drives new rotary rasps](#)
- 94 [Woodcarving: Four projects to introduce you to this age-old art](#)
- 120, 150 [Hints from readers](#)
- 146 [Tool test: Belt sander—almost in the bag](#)

Boating, outdoors

- 16 [Build this telephoto gunstock](#)
- 21 [All Outdoors](#)
- 54 [Newest speed machines for snow](#)
- 76 [New runabouts—faster, flashier than ever](#)

Photography

- 16 [Telephoto gunstock](#)
- 143 [This old-time handmade camera is brand new](#)
- 144 [Photo hints](#)

PM's 75th anniversary

- 63 [Great events of the past and a look ahead](#)
- 68, 70 [New Then](#)
- 72 [How Popular Mechanics grew from 1902 to 1977](#)

Electronics, radio, TV

- 56 [Medium-price speakers offer top-value sound](#)
- 60 [Build a crystal set—the original solid-state radio](#)
- 82 [Super-radio: The next step beyond CB](#)
- 89 [Expanded ears for better CB listening](#)

Home and yard

- 10 [Appliance Clinic](#)
- 14 [Homeowners' Clinic](#)
- 50 [Bruce Jenner designs a home gym with PM](#)
- 90 [Six good ways to upgrade your utility room](#)
- 102 [Wood flooring: How to pick it and take care of it](#)

Science and engineering

- 22 [Science Worldwide](#)
- 78 [Engineering the death rattle out of quakes](#)
- 98 [Pinball's back! Now it's the latest fad in home entertainment](#)

Every month

- 6 [Letters](#)
- 59, 62, 69, 71, 124 [It's New Now](#)

Worth writing for

Looking for more ideas and information? See page 172.

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

POPULAR MECHANICS IS PUBLISHED MONTHLY by The Hearst Corporation, 224 West 57th Street, New York, N.Y. 10019, U.S.A. Single copy for the United States, 75 cents; for Canada, 95 cents. Subscription prices: United States and Possessions, \$7.00 for one year; \$13.00 for two years; \$18.00 for three years. Canada and all other countries, add \$6.00 for each year. Second-class postage paid at New York, N.Y., and at additional mailing offices. Authorized as second-class mail by the Post Office Department, Ottawa, and for payment of postage in cash. Registered as second-class matter at the Post Office at Mexico D.F., Mexico, June 20, 1950. © 1976 by The Hearst Corporation. All rights reserved. Printed in U.S.A.

POSTMASTER: Please send Forms 3579 to Popular Mechanics, P.O. Box 10061, Des Moines, Iowa 50340.

SUBSCRIPTION SERVICE: Popular Mechanics Magazine will, upon receipt from its reader of a complete new or renewal subscription order, undertake fulfillment of that order so as to provide the first-copy delivery to the Postal Service within six to twelve weeks. If for some reason this cannot be done, you will be promptly notified of the issue date that will begin your subscription, with a request for any further instructions you may have concerning your order. Please address all such orders to us at Popular Mechanics, P.O. Box 10064, Des Moines, Iowa 50340. ■ Should you have any problem with your subscription, please write to John Harris, Customer Service Department, Popular Mechanics, P.O. Box 10064, Des Moines, Iowa 50340. To assure quickest service, please enclose your mailing label when writing to us or renewing your subscription. ■ Renewal orders must be received at least eight weeks prior to expiration to assure continued service.

How to convince your wife that sawdust isn't dirt.

You could show her a four-sided taper, of course. Or a locked rabbet miter. A tongue and groove. Even a true tenon.

But she'd probably yawn. What it really takes is

something she's always wanted. Like the new kitchen she's always needed.

And what that takes, we don't have to tell you, is a tool designed to do all of the above and

then some. To perfection.

The new Rockwell 10" Homecraft[®] Motorized Saw, for instance. For some very good reasons.

A truly functional table,

load-protected, ball-bearing motor that puts out a whopping 2½ horsepower.

And possibly the best reason of all, \$254.99*.

What it buys you, besides some other nice features like a self-aligning rip fence and a mighty sturdy stand, is one heck of a saw. As good as you could ever want, short of actually having our biggest industrial equipment.

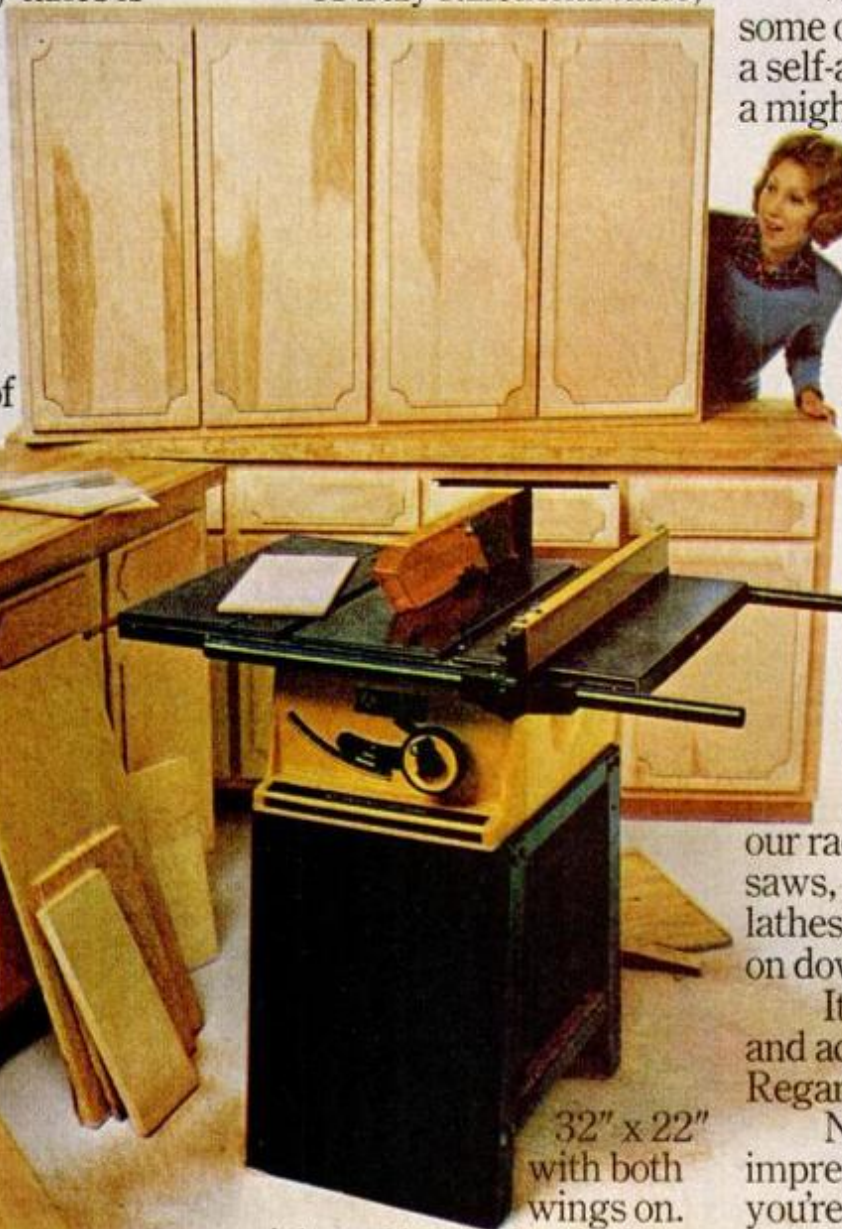
The only reason for that is just plain good engineering. The kind that only comes with half a century of experience and on-the-job performance.

It goes into all seven of the table saws we make, from our \$179.99* nine-inch model on up. And into our radial-arm saws, band saws, jointers, drill presses, lathes, wood shapers and so on on down to our 3/8-inch drills.

It's why they're all tough, and accurate, and powerful. Regardless of price.

Now, that may not impress your wife. But since you're the one who has to build the kitchen, we thought you ought to know.

You can depend on it. *Rockwell. It's the same name industry's been depending on for 50 years.*



32" x 22" with both wings on.

A long 11¾ inches in front of the blade. And 24 to the right or left, enough to rip a 4' x 8' sheet.

A depth capacity that's good and deep. Up to 3¼ inches at 90 degrees, and 2⅛ at 45.

A heavy-duty, over-



Rockwell International

*Manufacturer's suggested retail price.
For your local Rockwell dealer, phone toll free 1-800-243-6100
(In Connecticut 1-800-882-6500). Excluding Alaska and Hawaii.

Материал, защищенный авторскими правами

JOHN A. LINKLETTER
Editor
SHELDON M. GALLAGER
Executive Editor
DANIEL C. FALES
Managing Editor
WAYNE C. LECKEY
Senior Editor, Special Projects
ALVIN KIETZ
Art Director

BILL HARTFORD
Automotive
JOHN F. PEARSON
Science and Engineering
WM. T. McKEOWN
Boating, Outdoors and Travel
IVAN BERGER
Electronics and Photography
MICHAEL S. McCLINTOCK
Home and Shop
PENELOPE ANGELL
Assistant, Home and Shop
MICHAEL LAMM
West Coast
ROBERT LUND
Detroit Automotive
GARRY WINTER
Copy Chief
JOHN BOSTONIAN JR.
Production
SHARI E. GREEN
Assistant, Production
IRA HERRICK
Associate Art Director
DON MANNES
Technical Art Director
DAVID KOMITAU
Assistant Art Director
ED MENTKEN
Assistant Art Director
CLIFFORD B. HICKS
Special Publications
SOPHIE GRONOWICZ
Director, Bureau of Information
EVERETT JOHNSON
Cabinetmaker

DANIEL J. COLEMAN
Director of Advertising

ADVERTISING OFFICES: New York: 224 W. 57th St., (212) 262-4282; Chicago: 520 N. Michigan Ave., (312) 527-2400; Detroit: General Motors Bldg., (313) TRinity 5-8711; Cleveland: 20310 Chagrin Blvd., Shaker Heights, Ohio, (216) 283-7788; Los Angeles: 601 N. Vermont Ave., (213) 666-6263.

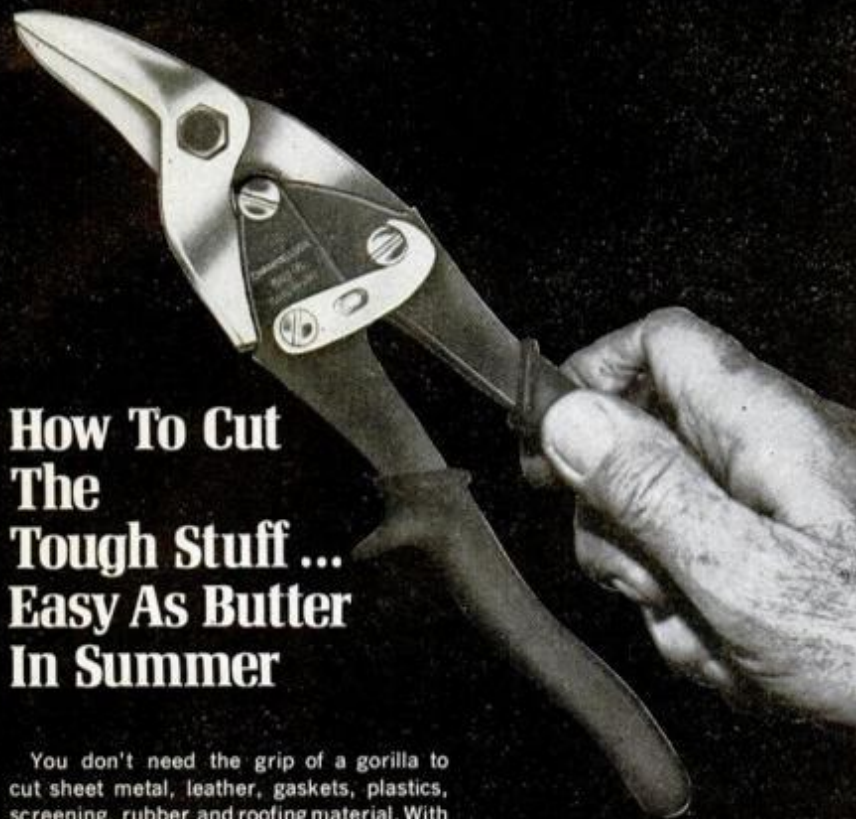
JOHN A. REGINA
Advertising Production Manager

Published by The Hearst Corporation

JOHN R. MILLER
President
RANDOLPH A. HEARST
Chairman
FRANK A. BENNACK JR.
Executive Vice President
RICHARD E. DEEMS
President, Magazines Division
GILBERT C. MAURER
Executive Vice President, Magazines Div.
JOSEPH F. KERN
Publisher

POPULAR MECHANICS IS PUBLISHED MONTHLY by the Hearst Corporation, 224 West 57th Street, New York, N.Y. 10019, U.S.A.; John R. Miller, President; Randolph A. Hearst, Chairman; Harrison A. Mitnick, Treasurer; Harvey L. Lipton, Vice President and Secretary; Hearst Magazines Division: Richard E. Deems, President; Gilbert C. Maurer, Executive Vice President; Raymond J. Peterson, Executive Vice President, Advertising; William S. Campbell, Vice President and General Manager; John F. D'Avolio, Vice President and Resident Controller; Albert A. Rachol, Vice President and Director of Circulation; Joseph F. Kern, Vice President for Popular Mechanics.

ADDRESS ALL EDITORIAL COMMUNICATIONS to 224 West 57th St., New York, N.Y. 10019. For additional sources of information on the articles and products in this issue, write to the Bureau of Information, Popular Mechanics, for free "Where-to-Find-It" list.



How To Cut The Tough Stuff ... Easy As Butter In Summer

You don't need the grip of a gorilla to cut sheet metal, leather, gaskets, plastics, screening, rubber and roofing material. With the perfectly mated, precision cutting edges of a CHANNELLOCK snip, you'll ease through such "tough stuff" . . . smoothly; accurately, positively. And happy day! No more blisters. The handles are cushion coated with durable, blue dipped plastic. Drop forged of highest grade tool steel, scientifically heat treated . . . your assurance of tough, dependable service for years to come.

CHANNELLOCK, INC. • Meadville, Pennsylvania 16335

CHAN NEL LOCK
Precision Made Snips



Send For Our Free Catalog

THE QUALITY HEIRLOOM FAMILY by SMI



- The Famous Americana Collection of Decorator Trunks
- Duchess Curio Cabinets
- Grandfather Clocks
- Princess Hall Trees

Buy at Lowest Prices ever offered!

Send \$1.00 for Color Catalog

Southern Mobile Industries, Inc.
Dept. 128, Bay Minette, AL 36507

HELPMATE

GARAGE DOOR OPENER Buy Direct and Save

- RADIO CONTROLLED from car transmitter or wall switch
- SAFETY night and day year 'round
- SECURITY door locks tight when closed
- CONVENIENCE in car control any weather
- LIGHTING garage lights automatically
- VERSATILE fits all lifting type wood, metal or fiberglass doors sectional and 1-piece
- EASY HOME INSTALLATION in just 2-3 hours
- SAVE up to 50% direct factory purchase and PP or UPS home delivery
- GUARANTEED one year
- FREE brochure

HELPMATE Equipment Co., Box 81PM Baroda, MI 49101

NEW KIT CAR BOOK

The first and only book that tells ALL about kit cars. Beautiful photos and illustrations, how-to articles and comparison guides. And much more! Same day shipment.

Send \$5.95 + .50 postage & handling to:
WEIGEN GRAPHIC CENTER
8840, 7th Av. N., Golden Valley, MN 55417

MOTORCYCLES
STP
 OIL
 * MARCA REGISTRADA
 ① REGISTRADA
 SQUEEZE MOUTH OF CAN TO FORM POURING SPOUT
 15 OZ. LEVEL AT
 NET 15 FL. OZ.

DIRECTIONS

CRANKCASE—First time you need oil and every time you change oil, add **STP** Oil Treatment to your engine when it is running and warmed up. New and low mileage cars use one can **STP** to 4 or 5 U.S. quarts of oil (or 10% **STP** when oil capacity is below 4 or exceeds 5 quarts.) Engines with excessive wear, use **STP** up to 20% of oil capacity. **MANUAL TRANSMISSIONS, GEAR**

BOXES AND DIFFERENTIALS—Add 10% **STP** Oil Treatment to regular lubricant. **POWER STEERING**—Use a maximum of 10% **STP** Oil Treatment. **GENERAL SHOP USE LUBRICATING OIL**—Use 1% **STP** Oil Treatment. **ENGINES AND MECHANICAL ASSEMBLIES**—Use 1% **STP** Oil Treatment.

50% motor oil, and cast oil. **STP** Oil Treatment is not for use in 2-stroke engines. **STP** Oil Treatment is not for use in 2-stroke engines.

If you want to help reduce engine wear and oil consumption, follow the simple directions.

Use STP Oil Treatment at every oil change and the first time you need oil and you'll be taking a helpful step toward reducing engine wear and oil consumption in your car. STP's effectiveness was confirmed in a series of tests conducted by Automotive Research Associates, Inc. in 27 cars driven over half a million miles. In those tests it was clearly shown that STP Oil Treatment helps reduce engine wear, and oil consumption, too. That's because STP fortifies and toughens oil... even a premium 10W-40 to help reduce the wear rate of lubricated parts in an automobile engine. And if you'd like to know what's in STP Oil Treatment and how it works you can read about it, plus detailed

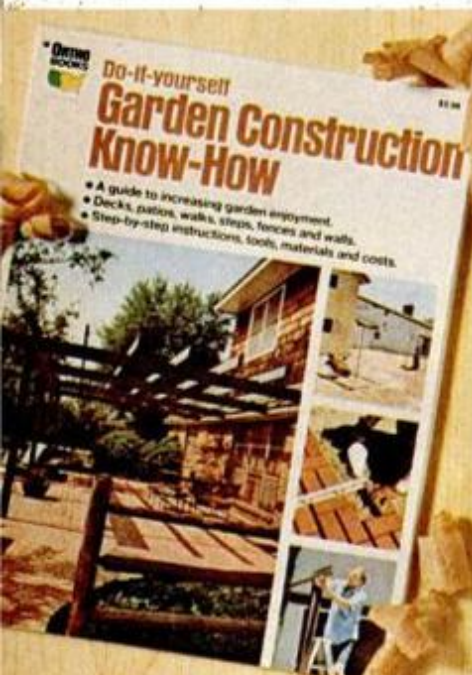
test results, in a free booklet available from STP. But while that takes four pages to explain, the directions are simple enough to fit on the side of the can. And if you want the security of knowing that you're helping your engine live a longer life, that's the next thing you really ought to read. For your free booklet, write to: STP Corp., 1400 W. Commercial Blvd., Ft. Lauderdale, Fla. 33300.

Wood Projects for the Garden

• Detailed plans for 87 easy-to-build garden accessories
• Containers, trellises, benches, tables, duckboards, seashouses—and more
• Step lists on selecting and using tools, materials, finishes
• Easy-to-follow instructions... full-color diagrams... many variations



ORTHO has
2 indispensable
tools for the
home carpenter.



These two beautiful and colorfully illustrated ORTHO books are loaded with useful information and weekend projects for the home carpenter. They're available at a suggested retail price of \$3.98 each, wherever ORTHO products are sold or at better bookstores.

Your tool kit isn't complete until you get them.



ORTHO Chevron Chemical Company

ORTHO, CHEVRON and CHEVROLET are trademarks of CHEVRON OIL COMPANY, 1500 N. W. 22nd St., Ft. Lauderdale, FL 33304

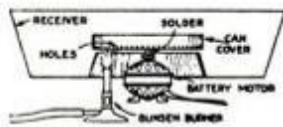
LETTERS

TO THE EDITOR

Sweet project from past

Many years ago your magazine ran plans for building a cotton candy machine. I remember it involved a round aluminum dishpan, but do not recall the rest. I am very anxious to secure plans or instructions so that we may make a present for our granddaughter. MRS. DON C. HENSON
HILLSBORO, ILL.

A photocopy of the article, How to Make a Candy Floss Machine, is on



its way. It appeared in the Oct. 1914 issue and was illustrated as shown above. A Bunsen burner may be obtained from a well-stocked hobby shop, but we're not sure everything else in the 62-year-old "plan" is still available. (At any rate, it's a nice bit of nostalgia on our 75th anniversary.)

World's biggest oil leak

Responding to your article, *World's Biggest Oil Leak*, (page 30, Sept. '76), the ready-made solution to the do-it-yourself oil problem is to utilize that dependable, dedicated source of "small labor"—the Boy Scouts.

It has to be planned and organized as follows: 1) Your local Scout Committee should appoint a parent as an "Environment Chairman." 2) The chairman instructs his troop to collect all suitable containers—plastic bottles or tin cans. They should be undamaged, clean and have screw caps, and should be at least a gallon in size. 3) The chairman should get as much publicity as possible and include a phone number in announcements. 4) A DYI can then call this number when he is planning to change oil, saying when and how much oil (or give the model and year

of car, if he doesn't know the capacity). 5) The Environment Chairman arranges for a scout to drop off containers and to leave pickup instructions. 6) On collection day, the containers are either emptied into larger drums at the troop headquarters, taken to the local Conoco collection point, or handled in accordance with other local arrangements.

There should be some way of measuring the amount delivered so money can be collected and paid into the troop fund. The empty containers, wiped clean, go back into storage for re-use. It is just the kind of thing to appeal to the Scouting spirit.

GWYN WILLIAMS
CHESTER, N.J.

I am surprised your article on disposing of drained oil did not include what I have been doing for years.

I find it expedient, clean and now, economical, to pour it into my heating oil tank in the front yard.

EDWARD J. CAROLAN, D.D.S.
ELIZABETH, N.J.

I thought Robert Lund's article was great. Discarded engine oil is a problem that should be faced up to. I was surprised, however, at the statement that "oil is almost forever." I had been under the impression that it was biodegradable, maybe not speedily but noticeably faster than "almost forever."

Mr. Lund may be interested in another use for old engine oil. A farmer-rancher friend is glad to have people give him their old oil, which he uses as a wood preservative. He claims it works at least as well as creosote

H.C. DOENNECKE
TULSA, OKLA.

The Environmental Protection Agency stresses that motor oil is a complex substance. Some of its components are readily biodegradable, but some may persist. Meanwhile, research into the bacterial and chemical breakdown of oil goes on.

Tubedoring in Texas

Permit me a brief comment about *Tubedoring—Bargain Water Sport* (page 58, Sept. '76). About 1956, I owned a fine 16-foot wooden boat (built in Houston by Ralph Zin-

(Please turn to page 8)

BLACK MAX.™ 175-HP V-6. THE MEANEST, TOUGHEST, MOST BEAUTIFUL MACHINE WE'VE EVER BUILT.

Meet the ultimate outboard: the Black Max.
A whopping 175-hp outboard that's ready to
tame the toughest water. Yet the power is
compact thanks to our 60° V-6 design. And it
delivers better fuel economy because of our
improved carburetion system.

Black Max was six years in the making.
It's built with rugged dependability through-
out, right on down to its stainless-steel,
corrosion-resistant drive train.

Count on quick starts with the
Thunderbolt® CD sealed ignition
system. Fewer tune-ups because of
preset carburetion and long-life
plugs. And even in choppy water,
you get smooth, sure control with
Mercury® Power Trim.

Black Max makes every Mercury
a little better.

See your Mercury dealer.

BLACK MAX™



Proud symbol
of Mercury power and dependability

BC
BRUNSWICK

MERCURY
MARINE

A BRUNSWICK COMPANY

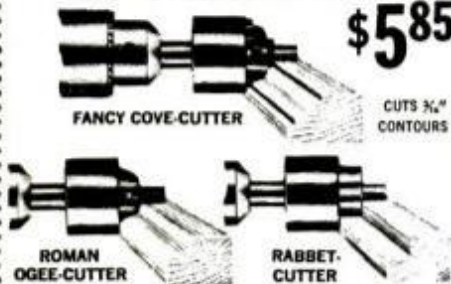
Mercury Marine, Ford (U.S.A.), Wisconsin,
Canada, Australia, Belgium

FINISH CORNERS • CUT MOULDING WITH ANY ELECTRIC DRILL NO \$50 ROUTER OR \$6 BITS NEEDED!

You don't have to buy an expensive Router to finish corners, moulding & trim. "ARCO" Cutters do the work at a fraction of the cost. Simply slip the Cutter's 1/4" shank in any drill and it's ready to produce! Dual Guides assure accurate cuts along entire length & width of workpiece. Cuts wood, plastics, soft metals. Quality-made in U.S.A. of hardened steel. These Cutters also fit & work with all Electric Routers.

No. 6—3 PIECE CUTTER SET

\$5.85



FANCY COVE-CUTTER

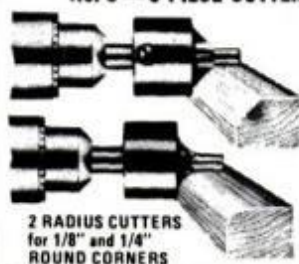
CUTS 3/4" CONTOURS

ROMAN OGEE-CUTTER

RABBET-CUTTER

No. 3—3 PIECE CUTTER SET

\$6.25

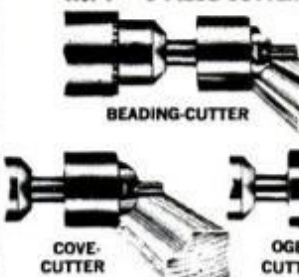


2 RADIUS CUTTERS for 1/8" and 1/4" ROUND CORNERS

ADJUSTABLE BEVEL-CUTTER cuts 45° bevels from 1/32" to 5/16" wide

No. 7—3 PIECE CUTTER SET

\$5.85



BEADING-CUTTER

CUTS 3/4" CONTOURS

COVE-CUTTER

OGEE-CUTTER

MAIL THIS COUPON TODAY!

ARCO PRODUCTS CORP., Dept. PM-1
110 West Sheffield Ave., Englewood, N.J. 07631
Ship at once on your 30-day Money Back Guarantee:

- No. 3, 3-PIECE CUTTER SET \$6.25
 No. 6, 3-PIECE CUTTER SET 5.85
 No. 7, 3-PIECE CUTTER SET 5.85
 No. 6703, ALL OF ABOVE 9 CUTTERS 14.95
 I enclose Check, M.O.—SHIP POSTPAID.
 (No C.O.D.'s)

Name _____
 Address _____
 City _____ State _____ Zip _____

SPECIAL SAVING!

Order all of above 3 Sets at our Special Money-Saving Price. No. 6703, total of 9 Cutters, only.....

\$14.95

These & over 300 other ARCO Tools available at Hardware Depts. everywhere, or order direct on 30-day Money Back Guarantee.

AMAZING & HARD-TO-FIND SCIENCE BUYS! ALTERNATE ENERGY • SPACE AGE • HOBBIES

NEW WIDE FIELD TELESCOPE

Enjoy clearest, brightest, most spectacular wide angle views of stars, moon, comets with our unique, easy-to-use portable 4 1/4" f/4 Newtonian reflector. Only 17", 10 lb.! Take it anywhere.

No. 2001H...\$149.95 Ppd.

There is no other telescope like it.



SAVE 50%! 8 x 20 MONOCULAR

Top quality Spy Scope, a \$30 value, now \$14.95! Special purchase saves you 50%. 100% coated optics; 393 ft. field of view. Only 2 oz.—stores in pocket, purse, glove box.

No. 1588H...\$14.95 Ppd.



NASA-CHOSEN FOR APOLLO/SOYUZ

The Astronauts used this super 20X60 binocular (modified) to view Earth! Big 60 mm objective lenses; 173-ft. field of view at 1000 yds. Relative brightness, 9.0. Fully coated optics, more!

(9 1/4 x 8 1/4"; 47.5 oz)
 No. 1556H...\$99.95 Ppd.



GIANT MAGNET, LITTLE PRICE!

Tie a line to our over-150 lb.-lift ceramic magnet and haul up treasure from the sea. 4 ceramic magnets, in series, between steel plates. A 1-lb. "giant" (1 x 1 1/4 x 4 3/4")

No. 42,318H...\$10.95 Ppd.



BUILD A WORKING STEAM ENGINE

Exact 6x8 1/4" hi replica of Single Acting Engine can power erector set assemblies, runs on tap water; you control speed, make whistle blow. Adult supervision. 35 parts.

No. 72,202H...\$27.50 Ppd.



SUPER POWER FOR ANY AM RADIO

Antenna assist has pulled in stations 1000 miles off! No. wires, clips, grounding. Solid state—uses no elec., batts., tubes.

No. 72,095H...\$19.95 Ppd.



GIANT FREE 164 PG. CATALOG



4500 UNUSUAL BARGAINS FOR HOBBYISTS, SCHOOLS, INDUSTRY

EDMUND SCIENTIFIC CO.
300 Edscorp Bldg.
Barrington, N.J. 08007
America's Greatest
Science • Optics • Hobby Mart

COMPLETE AND MAIL COUPON NOW

EDMUND SCIENTIFIC CO. 300 Edscorp Bldg., Barrington, N. J. 08007



SEND FREE 164 PAGE CATALOG "H"

Charge my American Exp.
 BankAmericard Master Chg.

Interbank No. _____

Card No. _____

Expiration Date _____

30-DAY MONEY-BACK GUARANTEE. You must be satisfied or return any purchase in 30 days for full refund.

Send me the following:

Stock No. _____ Quantity _____ Price Ea. _____

Enclosed is _____ check, M.O. in amount of \$ _____

Signature _____

Address _____

City, State, Zip _____

Add handling charge \$ _____ 1.00

LETTERS

(Continued from page 6)

maker). I wear glasses and decided that skiing would be a bit risky, so one hot day we tied the rope to an old 670x15 inner tube and dragged it behind the boat. The 55-hp Mercury had a tough time getting the tube "up" in the water, but when it did it was a wild ride.

Before that time I'd never seen anyone crazy enough to ride an inner tube, but next weekend the river was covered with them.

I enjoyed the article and think the guys from Glastron are a "crazy" bunch indeed. But the sport isn't new by at least 20 years.

R.W. MCMINN
ROUND ROCK, TEX.

Guess you can't keep a good sport down. Unless we receive a stronger claim, we'll consider Mr. McMinn the No. 1 pioneer of tubediving.

It's anybody's guess

Who knows what far-out thing may be buried on Oak Island (7 Great Quests of Man, page 92, Sept. '76). Maybe even Leif Ericson's remains.

RAYMOND A. THOMAS
QUINCY, WASH.

Call for shelf wrappers

I would like the *Popular Mechanics* index and shelf wrappers for 1971, 1972, 1973, 1974, and 1975. I enjoy *Popular Mechanics* very much (even to reading the advertisements). The tips and shop projects are my favorites.

KENNETH W. PHELPS
MANNING, S.C.

Index-shelf wrappers are available at \$2.69 each. Send your order to: Popular Mechanics, Box 1914, Radio City, New York, N.Y. 10014. Incidentally, the 1976 wrapper will be available in March.

A lasting quality

In our rapidly changing world, it is satisfying to know that some things last. In the article *Working Works of Art* (page 72, Oct. '76), you describe the \$108 Record multiplane as a "most unbelievable tool." I agree. And my grandfather would have, too.

As a cabinetmaker, he possessed a Stanley No. 45 beading, rabbet and slitting plane, which is an identical twin of the multiplane. The Stanley plane appeared for sale in the 1902 Sears catalogue for \$4.90. It's still an excellent plane, which I'm proud to own. Considering the rate of inflation since then, the price of \$108 for the Record doesn't seem unreasonable.

WILLIAM G. ZIBART
NORTHFIELD, ILL.

BLACK MAX™ MAKES EVERY MERCURY® A LITTLE BETTER.

The 175-hp Mercury Black Max may be more outboard than you'll ever need.

But Black Max makes every Mercury a little better.

Black Max was six years in the making. What we learned in developing this engine gave us improved electrical components in our Thunderbolt™ CD sealed ignition system. Result: even more dependable starting on every Mercury, all the way down to our fishing Mercs.

And the stainless-steel, corrosion-resistant drive train on Black Max is now standard on every Mercury.

Thanks to the same intake silencing system and carburetors first used in Black Max, our 70-hp and 85-hp Mercs now feature quieter running plus improved fuel economy.

These are just a few examples of what Black Max technology has done for Mercury all through the line. See your Mercury dealer for the full story.

We don't cut corners when we build a Merc.™

So you don't have to when you buy one.

BLACK MAX™



Proud symbol
of Mercury power and dependability



Mercury Marine Fond du Lac Wisconsin
Canada Australia Belgium



APPLIANCE CLINIC

BY PAUL MANN



Turned off by rivets

My Tensor high-intensity light quit last night. Bulb, wire and plug aren't at fault. The unit is held by rivets, so I can't check inside. Do I simply assume the problem can't be fixed and discard the lamp for a new one?
—Don King, Roanoke, Va.

Let me tell you what John Dalton of Houston, Tex., did when he ran up against the same problem. Unlike others who would simply assume the lamp couldn't be repaired because it was riveted together, John figured he had nothing to lose, so he drilled out the rivets. Inside the lamp he found a small fuse similar to the kind used in cars. He cut the fuse out and soldered a new one in its place. He then closed the lamp, using sheet-metal screws in place of the rivets.

At the time John wrote, the fixed lamp had been working for two years. John asks a good question: "How many people do you reckon have thrown away perfectly good Tensor lights because they were turned off by rivets?" How many, indeed?

When the chips are down

Can you tell me how to repair chipped porcelain on the inside of a dishwasher? I'm afraid the damage that was accidentally done to our unit will get worse.—Leo Greenberg, Huntington, N.Y.

By and large, dishwasher manufacturers supply repair facilities with epoxy kits for doing this job. For example, Whirlpool issues a kit consisting of the epoxy, hardener and applicator stick. You can, of course, buy an epoxy in a hardware store and it will be just as effective. But I refer to manufacturer kits because they are available to match their tub colors.

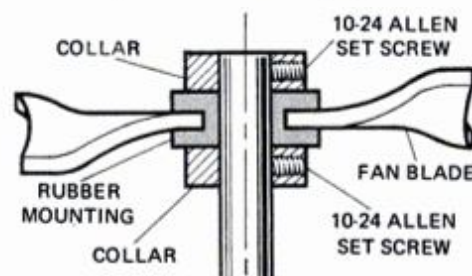
To make the repair so it will last, the damaged area should first be thoroughly cleaned with a solvent containing acetone, ketone or toluol. If the edges are rough, they should be made as smooth as possible by chipping them carefully with the tip of a screwdriver. Now, measure out equal amounts of epoxy and hardener and mix the two thoroughly. Apply the compound to the damaged area, and smooth out the spot with a

small brush that is dipped into the solvent.

Epoxy takes about 24 hours to cure, but you can hasten the process if you're in a hurry by applying heat to the area with a heat lamp or by closing the dishwasher door and putting the appliance into its drying cycle.

Collaring a problem

Here is one to pass on to your readers, Paul. It concerns my hassock fan that developed a loud rattle. At first, I thought the bearing was shot and I would have to discard the unit, but then I noticed the fan blade was loose in the rubber mounting. The mounting had lost its grip on the



blade, causing it to rattle on the motor shaft.

I repaired the unit by placing a collar equipped with a setscrew against each side of the rubber mounting. Tightening the setscrews exerted pressure against the rubber mounting and blade, restoring the grip.

The fan now runs just as smoothly and as quietly as ever. I'm enclosing a sketch so you can see what I did.—Walter Freese, Chicago Heights, Ill.

Thanks for a valuable idea, Walt.

Postponing the wake

The Kenmore automatic clothes dryer in our basement sounds as if it's in the midst of its death throes. The unit makes the most terrible rumbling and scraping sounds you've ever heard. The dryer is 9 years old. How much longer will it be before the funeral, Doc?—Tom Manning, Detroit, Mich.

That's hard to say, Tom. The kind of noise you're describing is very often caused by nothing more serious than an object having gotten wedged

behind the drum or a buildup of lint behind the drum. I would remove the back panel or panels and clean out all lint and any objects. Do a thorough job, removing lint from all parts and chassis areas. Check, too, to see that pulleys and belts are properly aligned. Misalignment may cause noise. Secure the panel and test the machine.

If the noise persists, probably the drum bearing is worn. An indication of this is a "beating" effect of the back panel as the machine operates—that is, the panel will pulsate like a diaphragm, because the drum pushes back and forth against it. If this is the case, you have a choice to make: repair the damage or replace the dryer.

Repairing the damage will probably cost about \$75 to \$100. Compare this to the cost of a new dryer. If you decide it's worth your while to replace the dryer, you can use the old unit until it goes completely bad—if you can overlook all the noise, that is.

Getting appliance parts

Oz Walker of Jacoby Appliance Parts in Hackensack, N.J., contacted us as soon as he read our discussion in the August *Appliance Clinic* relative to parts for appliances sold by the defunct W.T. Grant Co. Jacoby carries a full line of parts for appliances sold by Grant and practically every make of major appliances such as refrigerators, washing machines, gas and electric ranges, dishwashers and the like. You can't buy parts for small appliances from Jacoby.

The company has eight stores, the main one at 269 Main St., Hackensack, N.J. 07601. Easterners may be interested in knowing that other stores are in Trenton, Irvington and New Brunswick (all N.J.) and in the Bronx, Suffern and Albany (all N.Y.). Orders sent by mail will be honored, according to Walker.

If you have a question about any appliance, send it 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.

What's holding you back?



An AC-Delco tune-up may be all you need to get going again.

Does your car get surly when you want it to start? Has an annoying sputter crept into your life? Does it seem like all your driving is uphill, even when you're on the level? And — worst of all — is your car starting to hog more than its share of gasoline?

It can help restore performance... and economy.

Then it's probably past time for an AC-Delco tune-up.

Chances are there's a place right in your neighbor-

hood with the AC-Delco solutions to help with your problems. What's more, AC-Delco makes expert training and top-notch equipment available to your retail service dealer.

AC-Delco supplies tune-up parts for almost every car you see on the road today. From AC Fire-Ring Spark Plugs to Delco Remy Ignition Parts, AC-Delco offers General Motors quality in a full line. When it's tune-up time, have spark plugs, points, PCV valve, air and gasoline filters checked. If replacement is needed, demand AC-Delco quality parts.

So don't hold back. And don't monkey around with bad performance and poor economy. Tune up with AC-Delco.

Ask for an AC-Delco tune-up.



Go with the names you know.



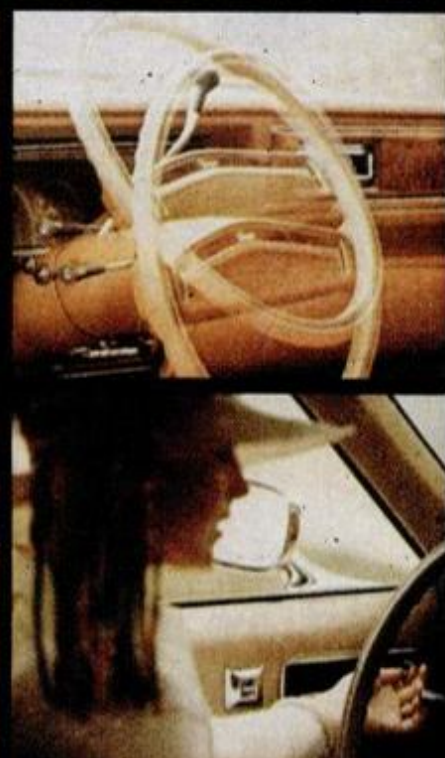
AC-DELCO DIVISION OF GENERAL MOTORS CORPORATION

CONCOURS

by Chevrolet



GM



We're showing it to the world.

Concorso. A world class luxury compact from Chevrolet. Built with a quality that's fully in tune with today's world and its attitude toward automotive value.

The trim, elegantly designed Concorso exterior is at home anywhere in the world.

Inside, Concorso displays a luxurious, finely detailed interior that will stand up

proudly to international standards. But Concorso is far more than appearance. Its sensible size and refined engineering allow it to feel completely in charge on Europe's autobahns or America's freeways.

When we build a luxury compact, we build one you'll want to tell the world about.

CONCOURS. A world class luxury compact.

 Chevrolet

THE PM GARAGE

CAPSULE REPORTS ON NEW AUTO PRODUCTS BY THE EDITORS

Two regulars to go



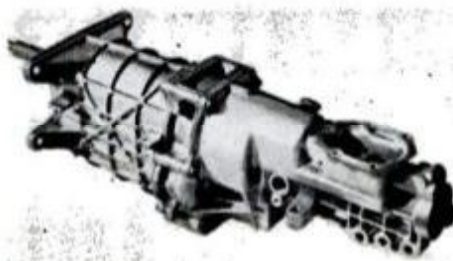
The space between the bucket seats in my old Volvo was wasted until I banged together a console to fit over the tunnel. Actually, I got carried away and spent quite a bit of time designing in a coffee-mug holder and coin tray, cutting out mahogany pieces, countersinking screws, sanding and varnishing.

There is an easier way, though. If you've got a Pinto, Bobcat, Mustang, Monarch or Granada—and \$60 (\$8 more for a custom color)—you can buy a console from Frank M. Smith Enterprises, Inc., 2700 South Main St., "C" Santa Ana, Calif. 92707.—B.H.

Bolt-on gearbox

This new Borg-Warner overdrive unit lets you pull out your four-on-the-floor and go more economically with a five-on-the-floor. The fully synchronized, five-speed manual transmission replaces the four-speed box in Four, Six and V8-powered General Motors cars. The Retro T-50, as it's called, can be adapted to other make cars, but its bellhousing bolt pattern, shaft sizes and mount design are standard GM.

The retrofit is an advanced Saturday mechanic job, make no mistake about it, and it'll take years of getting better mpg to break even on the project (the T-50 has a suggested list of \$560). Still, it's the



kind of challenge that mpg buffs and engine pamperers will tackle with enthusiasm.

Fifth gear is .80 to 1 and provides a 20-percent reduction in engine speed over direct drive (the other ratios are 3.40 for 1st, 2.08 for 2nd, 1.39 for 3rd, 1.00 for 4th and 3.36 for reverse). The T-50 weighs 65 pounds, is 24 inches long, holds 3.5 U.S. pints (1.66 liters), and is rated for an input torque of 210 lb. ft. (29.0 kg. m.).

For details on installation and more information on the Retro T-50, check with your local Borg-Warner rep, or write Borg-Warner Corp., Automotive Parts Div., 11045 Gage Ave., Franklin Park, Ill. 60131.—B.H.

Free heat



Ever notice how long your engine stays hot after you've turned it off? There's a lot of heat under that hood—heat that would keep you warm these cold days if you could just get it into the passenger compartment. Well, here's how you do it: Throw a dash switch and let Autotherm pump hot coolant through the heater core after you've turned off the engine. You'll get at least an hour of "free" heat.

It's a simple idea that saves gas, reduces engine wear and cuts emissions (in many places it's illegal to idle more than three minutes).

The \$40 Autotherm kit includes circulator pump (lifetime guarantee against leakage), switch, hose clamps and instructions. Arden-Mark, Inc., Box 333, Barrington, Ill. 60010.—B.H.

Get up your guard

If you plan to beat the brush with your new pickup, you'd better have your guard up. Driving-light lenses



are particularly vulnerable, and your radiator could be punctured if you don't have the right kind of guard up front. The front end of this Ford pickup is protected by the installation of two guards—an Anderson brush guard (\$56.15) and grille guard (also \$56.15). Guards are available for popular pickups, 4WDs and mini trucks. Wholesale Tire Co., 5005 Market St., Youngstown, Ohio 44512.—B.H.

Remote pressure readout

How much air's in your spare? Any? If you're not on the ball, you'll find out the answer to that question when it's too late. Most people would check the air pressure in their spare tire more often if it were more convenient. Right? Well, with this Inflate-a-spare kit it is



convenient: You mount a valve stem in a handy place and then connect it to the spare with the tubing provided. You can read pressure without opening the trunk or climbing under your pickup or motor home. Slick. It's \$5 for a standard valve stem unit, \$6 for long stem. Lawrence's Ltd., 3896 Via Real, Carpinteria, Calif. 93013.—B.H.



HOMEOWNERS' CLINIC

Cure for rusty nailheads

I plan to paint my home this spring, but first I must find a remedy for rusted nailheads that show through the paint. Is there some way to check the rust under new paint?—Wm. R. Hudson, Madison Heights, Va.

Spotting with shellac is recommended to check the rust, but I've had better success by spot-spraying with a varnish before painting. For this purpose I've used a product called Deft. Spotting nailheads in this fashion can be quite a time-consuming chore as you must be careful to apply just the right amount to cover the nailhead but prevent drips or sags that will show under the paint. In any case, the siding should be wire-brushed and hosed to remove paint chalkings, dust and grime before repainting.

Furniture marks in carpets

I have wall-to-wall carpeting. Whenever I rearrange furniture there are always deep indentations in the carpeting left by the furniture legs. Is there some way of raising the nap to the original level?—C. Mann, Dallas, Tex.

If you are referring to textured carpeting rather than the shag types, I think I can help. I've used a suede shoe brush for this purpose. It works out well where the pile is deeply textured. Brush lightly and in several directions. On some types of carpeting a few drops of water will do the trick. Plastic leg pads to prevent such indentations are also available. Check your local hardware or floor coverings dealer.

New tires for an old bandsaw

I have an Atlas 10-in. bandsaw and need replacement rubber tires for the wheels. I wrote to the manufacturer and learned that this unit is no longer made and that new tires are no longer available. Can you suggest any way of making or improvising tires?—Edw. Hodan, Lancaster, N.Y.

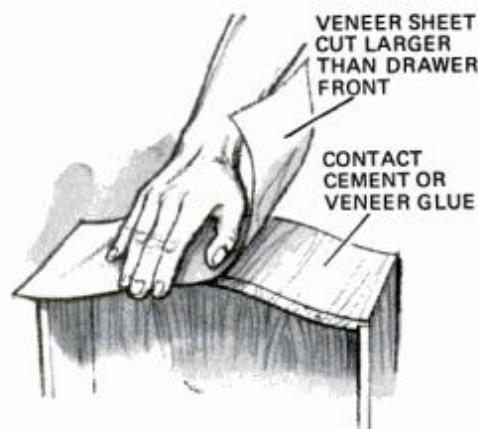
Rockwell International makes a 10-in. bandsaw and it is quite possible that the tires would fit, or could be made to fit, your Atlas bandsaw. If too wide, they might be trimmed. I'd suggest you contact Rockwell International, Power Tools Div., 400

N. Lexington Ave., Pittsburgh, Pa. 15208, or check your local directory for a distributor of Rockwell power tools in your area.

Applying veneer

I have a chest of drawers that I bought used. The drawers have lost nearly all their veneer due, I suppose, to dampness or flood. I'd like to salvage the piece by placing new veneers on the drawer fronts. But these are curved and I have no way of clamping the veneers in place. Any suggestions for salvaging the chest?—Frank Atherton, Atlanta, Ga.

I'd suggest you use the specially processed, paper-thin wood veneers ($\frac{1}{64}$ -in. thickness). These can be applied with contact cement, which requires no clamping. The veneers come in a variety of common cabinet



woods in sheets 8 ft. long and widths of 18, 24 and 36 in. Before laying the veneer, clean the drawer fronts thoroughly, removing all old veneer and glue. Then cut the sheets about $\frac{1}{2}$ in. oversize and coat both sheet and drawer front with cement. Allow to dry tacky, as instructed on the containers, then locate the sheet and roll on by hand as illustrated. Press firmly into contact with a roller. An old wooden rolling pin covered with felt works nicely. When the veneer is firmly bonded in place, trim the excess edges carefully with a sharp utility knife.

Constantine Veneer Glue can be used to glue thicker $\frac{1}{8}$ -in. veneer without the use of clamps. It is available from Albert Constantine and Son, 2050 Eastchester Rd., Bronx, N.Y. 10461.

Value of added insulation

My attic has 6 in. of pour-type insulation. Would adding more insulating material be of value in reducing heat loss? How much ventilation should I have in the attic?—C.H. Stocking, Hutchinson, Minn.

More than 7 in. of pour-type insulation in attics is generally conceded to be of marginal value, but over the present insulating material you might add 2 in. of a pour type at relatively little cost and probably some gain. According to the photos you enclosed, you have minimal room for installation of lower-type ventilation in the gables. You may have to go to roof ventilators. Normally, about 1 sq. ft. of louver or ventilator area to each 100 to 200 sq. ft. of attic floor space is considered adequate, but before you install roof ventilators, get the manufacturer's recommendations.

Sponge-painted walls

Many years ago I recall seeing what looked like stipple-painted walls. It seemed to have been done in a kind of random figure that was most attractive. Can you tell me how it was done?—Geo. Alden, South Bend, Ind.

Perhaps you are remembering interior painting in which a base coat was applied, followed by paint of a harmonious contrast applied with a sponge. Properly and carefully done, this procedure results in an attractive paint job for interior walls. A natural sponge is used with one side trimmed flat. The sponge coat of paint is poured into a shallow container, a small amount at a time; the sponge is dipped in the paint and pressed lightly against the wall. The trick is in varying the pattern so as to avoid a repetition of the imprint of the sponge pattern each time it is pressed lightly against the wall. Any water-soluble paint can be used, but rinse the sponge frequently. ★★★

Do you have a home maintenance or repair problem? Send it to Homeowners Clinic, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. Letters cannot be answered individually, but problems of wide interest will be discussed in this column. For more home repair and maintenance help, get PM's Home Care Guide, \$4.49 postpaid. Send orders to PM, Dept. HCG, Box 1014, New York, N.Y. 10019.

Treat yourself to light menthol Belair.

*Now's the time for the
light menthol cigarette.*



Day/Date watch by Seiko.
Yours for free B&W coupons,
the valuable extra on
every pack of Belair.

To see over 1000 gifts,
write for your free Gift Catalog:
Box 12B, Louisville, Ky. 40201

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

Build this telephoto gunstock for \$10

by Bob Grewell

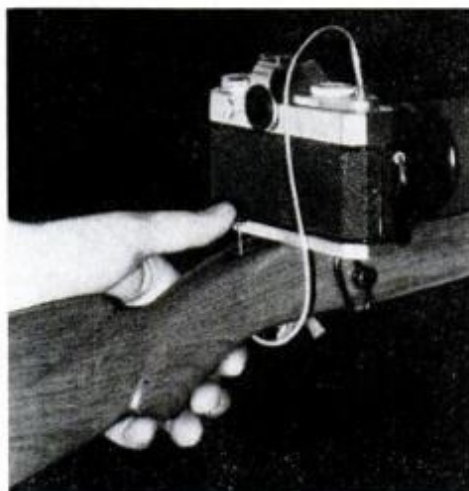
Are your telephoto shots blurry? A gunstock will steady your camera without tying it down as a tripod would. And though commercial camera stocks run about \$30 to \$50, you can build one easily for about \$10.

Start with a used or unfinished gunstock (about \$5 and up at gunsmiths). Check its size by taping your camera in place and holding it. You can cut down the stock (after allowing for thickness of the butt plate) or add a thicker butt plate as needed.

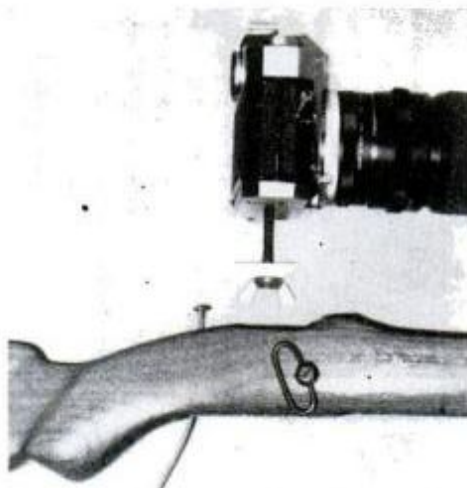
The camera mounts with a bolt through the stock's trigger slot. Cut a 1/4-inch metal plate a bit longer and wider than the slot and drill a 5/16-inch hole in it for the camera bolt (you can try a large, heavy washer if no means are handy for cutting metal).

If you can find a 1/4-20 thumb-screw long enough to reach the camera through the slot, use it. Otherwise, force-fit, braze or epoxy a wingnut to the head of a 1/4-20 bolt. Start with a bolt a trifle long, then grind it back, a bit at a time, until it just holds the camera snugly by its tripod socket.

Drill a hole down through the stock for a cable release. You can run the release up from under the stock, but I find it more convenient to press it from the top with my thumb. Now all that's left to do is to finish or re-finish the stock. You can also add sliding swivels, if you like. ★ ★ ★



Cable release makes it easier to hold stock steady as you squeeze off a shot. Mount it as shown, or from below.



Screw and mounting plate, inserted from under stock, hold camera by tripod hole.



Steady, aim, shoot! A gunstock keeps your telephoto shots steady, just as it steadies rifle shots. And a stock from a real gun (this one's from a Mauser) is easy to adapt for camera use. Note how forearm has been cut to clear zoom lever on lens.

65,000 more technicians needed by 1980*

Learn Air Conditioning, Refrigeration and Heating.

Learn at Home With NRI's Master Course Program In Your Spare Time

Start a well-paid career in the field of air conditioning, refrigeration & heating with practical at-home training from NRI. The NRI program was developed with technical assistance from the York Division of the Borg-Warner Corporation and it uses bite-size texts, fine professional instruments and tools, and "hands-on" kits to make learning easy.

Air Conditioner System comes with Course for Trouble Shooting.

You get a Circuit Demonstrator, Control Simulator, tubing and joint-making demonstrator, leak detector, system analyzer, and a window air conditioner unit for hands-on experiments.

Optional Resident Training at Famous York Institute

Graduates of the Master Course may take advanced work at the world-famous York Institute Resident School at no extra charge. Working with expert instructors you will receive practical experience equal to months of on-the-job work.

Send for your free catalog.

Just check the card opposite. No salesman will call.

Approved for career training under GI Bill.



*U.S. Dept. of Labor Bulletin 1824

Материал, защищенный авторским правом



Richard Petty,
NRI Automotive Consultant,
and America's Winningest
Stock Car Driver.

Richard Petty says, "If you really want to learn how to repair cars, check out 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 early the importance of a good mechanic . . . and the opportunities that are out there for well-trained men. That's why I'm sure glad to see home training like the two NRI courses come along. With NRI training, hands-on experience

is going to come fast, and come right. It's a lot of training for the money.

Learn Auto Servicing Fast

NRI's Basic Professional Repair Course covers the basics of auto repair in 30 lessons. From headlight to tail-light, you'll learn all you need to know, quickly. Basic home

training includes eight important service items, including an Inductive Pick-Up DC Power Timing Light, Ignition and Electrical Systems Diagnostic Analysis and Tune-Up Instrument, tune-up tool kit, and more.

Become a Professional Mechanic

NRI's 70-lesson Master Automotive Technician Course includes all the equipment, tools and training materials you need to be a real pro. In addition to personal services and "bite-size" lessons, you receive 10 pieces of auto service equipment, including an Ignition Analyzer Scope, Diagnostic Engine Analyzer, Inductive Pick-Up DC Power Timing Light, full set of tools, Torque

Wrench, 4 different test gauges, and more. You'll learn to service electronic ignition systems, and even auto air conditioning . . . with an air conditioning systems analyzer and a refrigerant systems leak detector.

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. Mail the coupon and check out what they have to offer. Over a million students have trained at home the NRI way, and you can too.

If the coupon is missing, write: NRI Automotive School; 3939 Wisconsin Avenue, Washington, D.C. 20016.

RUSH FOR FREE CATALOG



Pictured above is just some of the professional equipment included in NRI's Automotive training programs.



NRI SCHOOLS
McGraw-Hill Continuing
Education Center
3939 Wisconsin Avenue
Washington, D.C. 20016

- AUTOMOTIVE MECHANICS COURSES
- CB, Color TV/Audio, Communications and Computer Electronics Courses
- Air Conditioning, Refrigeration, and Heating Courses.



Please check for one free catalog only. NO SALESMAN WILL CALL.

Approved under GI BILL if taken for career purposes. Check for details.

Name _____ (Please Print) Age _____

Address _____

City/State/Zip _____

A National Home Study Council Accredited School

946-017

HOW YOU CAN SOLVE THE FOUR BIG TIRE PROBLEMS OF THE FAMILY PICKUP TRUCK.

By Steve Petrasek, Firestone Tire Engineer



(1) "Our family pickup truck is used like a car so it needs good riding tires."



(2) "Where we go sometimes, we need traction tires."



(3) "Our pickup is good looking — we need sporty tires."



(4) "We carry a lot of heavy stuff around so we need tires to handle loads."

Those are common comments often made by different family members about the same truck. Four tire needs, all for the same truck.

If they sound familiar to you, there's one man who can handle all four of your problems with one set of tires — your Firestone tire retailer. He's the only one with the famous Firestone 500 Wide Oval System that works like this:

On the front go Firestone's Transport 500 Wide Oval® — strong nylon cord body, long mileage truck tires. They're the steering part of the system, and those big, wide treads help stabilize your truck, help float it over soft stuff, and give you a nice ride down the road.

On the rear we put Firestone's Town & Country Wide Oval™. It is a really strong traction tire with nylon cord body and long mileage tread rubber that can stand up under heavy loads and claw its way through fields and ruts, yet still behave gently on street and highway.

Nice ride, big loads, good looks, bad roads? Now you know Firestone has a truck tire system for handling them all.

Transport 500
Wide Oval®

Town & Country
Wide Oval™



Firestone

Ask a friend about The Wide Oval System from Firestone.

ALL OUTDOORS

Retirement vehicle

The travel that many people plan for, once they quit their jobs for good, sometimes gets difficult or impossible if they're less mobile with advancing years and have trouble getting in and out of their recreational vehicle. Recently the Xplorer Motor Home Div. of Frank Industries, Brown City, Mich., tackled a similar problem for an upstate New York doctor and his wife. Because of leg paralysis, the doctor's wife uses a wheelchair, but their 26-foot Xplorer 307 Motor Home has been customized by the builder so that travel is no longer difficult.

Low on the side of the vehicle, a key can be inserted to open electrically a wide side door and lower a platform. With the push of a button, the person in the wheelchair rises to floor level, rolls inside and activates the servomotor which closes the door and folds the lift up against it. Aisles are wide for easy wheelchair maneuvering and storage compartments plus kitchen and bathroom shelves and facilities are low enough for use by a seated person. The pedestal chair next to the driver can be lowered or raised and slid forward electrically. Additional custom features are available and the model should prove particularly suitable to many handicapped travelers.

Records—on order

If you'd like to see your name in the world record books of freshwater fishing, there's a new way to do it quite simply. Recently the Freshwater Fishing Hall of Fame in Hayward, Wis., added 14 species which have not previously been recorded. All you have to do is catch one, have it properly documented, and the record is yours until someone else lands a bigger one.

The only "catch" to making a record catch is that most of the newly recognized species are, like the mahseer, found in the mountain streams of India, sections of Africa which the Nile perch and the tiger fish favor, or perhaps South America's Uruguay and Paraguay for golden dorado, Hawaii and Panama for peacock bass. Try the Amazon basin for the world's largest catfish, the 500-pound piraiba, or the unfriendly black piranha.

Setting 14 records could get somewhat expensive, but if you're willing to settle for less, the Braniff Outdoor Council, Exchange Park, Dallas, Tex., has arranged trips to the waters where the record-breakers should be waiting, and can provide details. Entry blanks are available from the Freshwater Fishing Hall of Fame.

Men against the sea

For an insight into man's age-old struggle against the sea, see the upcoming television documentary *Voyage of the Hokula*. This 90-minute program details the attempt of 17 men to sail along an ancient, 3000-mile route from Hawaii to Tahiti. Their sailboat is a 60-ft, double-hulled replica of an 800-year-old Hawaiian canoe. The men use no navigational instruments. Even though it's 1976, they planned to make this voyage as their ancestors did with only a knowledge of stars, wave direction and currents. Most films of this nature deal just with the physical aspects of the actual trip. But this film touches on something else. It deals with the very real problems caused by lack of leadership and by crew dissension—problems that have plagued voyages ever since man attempted to sail to new territories. The program is a special from the National Geographic Society, and is scheduled for showing Jan. 18 on the stations of the Public Broadcasting Service.

Better bags

While the trend today is to travel with minimum clothes and accessories, all packed into the carry-on bag that fits under an airline seat, that's not enough for the sportsman. Weather can turn wet and raw almost anywhere, even tropic desert nights are cold when the dew comes down, and we seldom leave home without a compact down jacket from Recreational Equipment. Extra sweaters, rain gear, gloves and boots can make the difference between comfort and misery. Add fishermen's waders and tackle, gun and ammo, or even a couple tennis rackets or a set of golf clubs or scuba equipment, and there's no way you can pack everything you need along into an overnight kit.

So the good news is the new over-size bags that hold more and are

easier to carry. Eddie Bauer, the quality mail-order outfitter at Third and Virginia, Seattle, Wash. 98130, and in the firm's various stores, is offering a magnum duffel bag for \$37.50 that can be carried in one hand or, best of all, no hands with an adjustable shoulder strap. Holubar, in Boulder, Colo., has a \$25 Travelpak that can convert from handbag to backpack by adjusting the straps, then leaves your hands free for other cases or chores. Gladding recently introduced a cargo bag big enough to rival the wonderful old war-surplus parachute bags. Carrying a well-packed one was next to impossible as the huge bundle banged against your legs. But shared with a companion to walk on the other side of it and hold one handle, the bag could hold two flocks of decoys or a complete suit of sails for an offshore sloop. The new shoulder, convertible and oversize bags are a boon for the outdoorsman and well worth looking for.

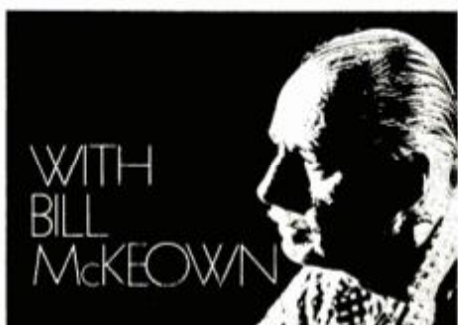
Good gadgets

Light, compact and often multipurpose accessories for outdoor sportsmen are continually being introduced. Several we've seen recently that rate attention include:

■ A skier's Swiss Army knife imported by Precise, 3 Chestnut St., Suffern, N.Y. It has a new ski wax remover and smoother as one of 11 tools. The knife is latest of 28 Wenger models available.

■ Burt retractable ski bindings, from Lange USA division of Garcia, have spring-loaded retractors to release the ski during a fall and then immediately reel it back into place automatically.

■ Maxi-Mini Thermometer, \$6.50 postpaid from L.L. Bean, Freeport, Me., is a circular 3-inch pack model that also records how hot and cold it has been. ★ ★ ★



SCIENCE WORLDWIDE

Energy collector in orbit

Space-based power-conversion systems that can beam up to 10 million kilowatts to Earth are now under study by NASA. At right is an artist's concept of one such system—a huge structure fabricated from materials delivered to a low Earth orbit by shuttle vehicles. The collector would absorb solar energy and transmit it in the form of microwaves to receiving stations on Earth for conversion to electricity.

New tools for deep-sea work

The first complete tool rack designed exclusively for underwater work has been developed for the Naval Sea Systems Command by Battelle Laboratories of Columbus, Ohio, and is now being evaluated off the coasts of Hawaii and Florida.

Called a work systems package, the rack is a tubular network of aluminum to which hydraulically operated tools are attached. These tools—from drill bits to wrenches and cable cutters—are designed for salvage and repair work and can be used to depths of 20,000 feet.



The package can be attached to a small submersible and controlled by an operator inside, or submerged and run remotely from a ship with the aid of TV cameras. Two "hands" extend from the unit for gripping its supporting surface; a third (shown above) manipulates tools as directed. Most tools are made of anodized aluminum; chrome-plated tool steel is used for those requiring extra strength.

A better way to examine heart

The standard way to determine heart damage is by catheterization—passing a tube through a vein to the heart. Dyes are introduced through the tube and the heart



X-rayed. This takes about two hours, involves some risk and discomfort and can't be repeated at close intervals.

Now a new and reportedly better method has been developed at Duke University Medical Center, Durham, N.C. A radioactive fluid is injected into a neck vein, allowing it to flow to the heart. Heart action is monitored with a gamma camera, and what the camera "sees" shows up on a color TV screen. This allows doctors to study a patient's heart function as the heart beats.

The procedure takes about five minutes, causes little patient discomfort and can be repeated fairly frequently.

ERDA, NASA plan big windmill

A windmill with a 150-foot tower and two slender fiberglass rotor-blades spanning 200 feet will be built during the next two years, according to plans of NASA and the Energy Research and Development Administration (ERDA). It will be the largest windmill ever built.

Although experimental in nature, the system will be located at a utility company site (still to be selected) and will supply electricity to the local electric system for public use. The wind turbine will produce a maximum of 1.5 megawatts (1500 kilowatts). The purpose of the test is to determine the economics and

operating characteristics of large wind turbines when coupled to conventional powerplants.

The windmill's blades will rotate at 30 to 40 rpm in winds of above 11 mph and the system will reach full power output at winds of 22 mph. At a site with average wind speeds of 18 mph, the machine could produce enough energy annually to supply more than 500 homes. Largest currently operating wind turbine has blades that span 125 feet.

Solar energy information guide

Solar energy is a hot topic these days, resulting in a flow of books, pamphlets and reports. Now there's a guide to help you find your way through this thicket of information—a pamphlet listing 200 publications (including how-to books) in the field. The cost is \$2. For a copy, write: International Compendium, Dept. P, 10762 Tucker St., Beltsville, Md. 20705. ★★★



Home is too nice to leave at home



Being able to pack the family off at a moment's notice for a week-end at the mountains or a week at the beach. It's a delicious kind of freedom that you have to experience to appreciate.

But should you have to give up home for it?

At Prowler, we think an at-home feeling is too important not to take along. And for over 25 years now, we've been designing travel-trailers with that feeling in mind.

That's why you have a choice of 18 different Prowler floor plans...with a variety of tasteful coordinations of furniture, colors and fabrics.

With Prowler, you have a selection of model sizes from 17½ to 31 feet, including two 5th wheel models, all covered by our full, one-year Ownercare warranty.*

By the time you've picked the plan and model of your choice, we want you to feel your Prowler was designed personally for your family and your family alone.

That's what home is all about. Isn't it?

*Tires warranted by manufacturer.

Fleetwood Enterprises, Inc. P.O. Box 7638
Riverside, California 92503 PM-3
Please send me a free, full-color brochure
on Prowler Travel Trailers.

Name _____

Street _____

City _____

State _____

Zip _____


PROWLER BY FLEETWOOD 

DETROIT LISTENING POST



GM testing an electric

GM has been showing a one-of-a-kind electric car to small groups. It is a new version of an experimental electric GM demonstrated several years ago.

GM uses the car as an operating lab, to keep up with progress on electrics and give the company something to show when people in government bug GM about its development of alternate engines that do not run on gasoline. GM's goal is to put a small electric or partial electric car in production by 1981-82. This will be a one-seat, two-passenger vehicle to run on batteries for city driving and switch to a conventional four-cylinder engine for highway use.

Vega, Astre not out yet

This was to be the last year for Chevrolet's Vega and Pontiac's derivative of Vega, Astre. But it now looks as if the cars will be around, until the summer of 1978. How come?

GM had it figured that Chevrolet's mini, Chevette, would take over when Vega was discontinued. Pontiac would then get a reworked version of Chevette to replace Astre. But Chevette hasn't received the reception GM anticipated. GM never kills one car until it has a strong follow-up car and Chevette hasn't cut it as the follow-up car—yet. So Vega and Astre will be continued another year.

Pontiac eyeing Olds diesel

Pontiac is still in line to get a son-of-Chevette when the small-car market picks up again. Meanwhile, it has a couple deals brewing with other GM divisions. If and when Chevrolet decides to drop its four-cylinder aluminum engine, possibly as early as next September, it will probably replace it with Pontiac's new 151-c.i.d. L-4. Pontiac has a me-too eye on Oldsmobile diesel engine, would like dibs on the diesel for a 1979 car.

Son-of-Fiesta for Mercury?

If GM adds a pull-off of Chevette to the Pontiac fleet, will Ford counter with a pull-off of Fiesta under the Mercury name? Ford is looking at the idea and has started to do some preliminary engineering work—on

paper. If sales of small cars bounce back in a big way, Ford will be ready with a Fiesta derivative for Mercury. But there are no plans for a Fiesta offshoot before 1979.

Chevrolet tooling a V6

Chevrolet will put a V6 engine in production this year, at least a pilot version, but you won't be able to order it on a car before 1978. Probably at the beginning of the 1979 model run. Chevy has ordered tooling for the engine and is lining up suppliers to produce parts. Somewhat smaller than Buick's V6 used by Buick, the engine is viewed by Chevrolet as a possible answer to meeting the miles-per-gallon government standards set for the 1980s.

Small label rankles GM

GM is taking a lot of flak this model year because its big cars aren't as big as they used to be. If you want a biggie, you have to buy a Ford or Chrysler product. GM doesn't take kindly to the kidding and keeps explaining that its full-size cars are just as regal and roomy—but not as heavy—as last year's.

It will be another three years, 1980, before all cars have been resized. I don't know the exact dimensions of the 1980 cars, but I have a rough idea, I'll bet that when the dust settles and all automobiles have been reworked, GM will again have the biggest cars in the industry.

Ford reworking mid-sizers

Speaking of downsizing, Ford will chop 8 to 10 inches off the overall length of Granada and Monarch and reduce the wheelbase by 5 inches when those cars get a new body in 1979. Wheelbase will be 110 inches. But Ford may not complete its downsizing program until the 1981 model year (fall of 1980). It is now working on its 1981 product program.

How the '77s rate on MPG

Here's how the Environmental Protection Agency rates the '77 cars made by U.S. companies on mileage:

American Motors	19.2 mpg
General Motors	18.4 mpg
Ford	17.1 mpg
Chrysler	16.6 mpg

The government has a complicated formula for determining mpg. It involves testing cars in the city, on the highway and allotting so many plus or minus points depending how many big, mid-size and small cars a company sells and the average mileage scored by cars in each category. EPA then averages the averages. There are a lot of qualifiers and you can't take the figures at face value. Although AMC tops the list and Chrysler is at the bottom, some Chrysler cars will run rings around some AMC cars.

The good thing about the government rating cars on fuel economy is that it puts the whip to the companies to compete with each other to improve mileage. That benefits everybody.

Loophole in mileage law

Talking about mpg, there's a big loophole in the law coming next fall that says cars have to average a certain number of miles to a gallon of gas. There's nothing in the law that says the car owner has to maintain the same mpg the car was measured at when it came off the line. Detroit has to build them so they will give a specified number of miles to the gallon. But the owner can cobble up the car any way he wants after he takes possession. So what?

So let's say the factory has trouble getting the weight down on the Mighty Mastodon Model to meet the mpg requirement. According to the car companies, they would have to discontinue the Mastodon. Not so. There's an easy way to keep the Mastodon in the line without violating the law.

The big cars are loaded with hundreds of pounds of options. All the factory has to do is remove some of the extras—take as many things off the car as necessary to get the weight down to comply with the law on mileage. After the owner takes delivery, he can have the extras installed by a dealer or accessory shop. There's no violation of the law.

I have no inside information that the companies will resort to the loophole. But you can bet it's an angle they will check out before they drop any cars due to poor mileage. ★ ★ ★

Why put up with
hot taste?

Only KOOL has the taste
of extra coolness.
Refreshingly smooth
puff after puff.

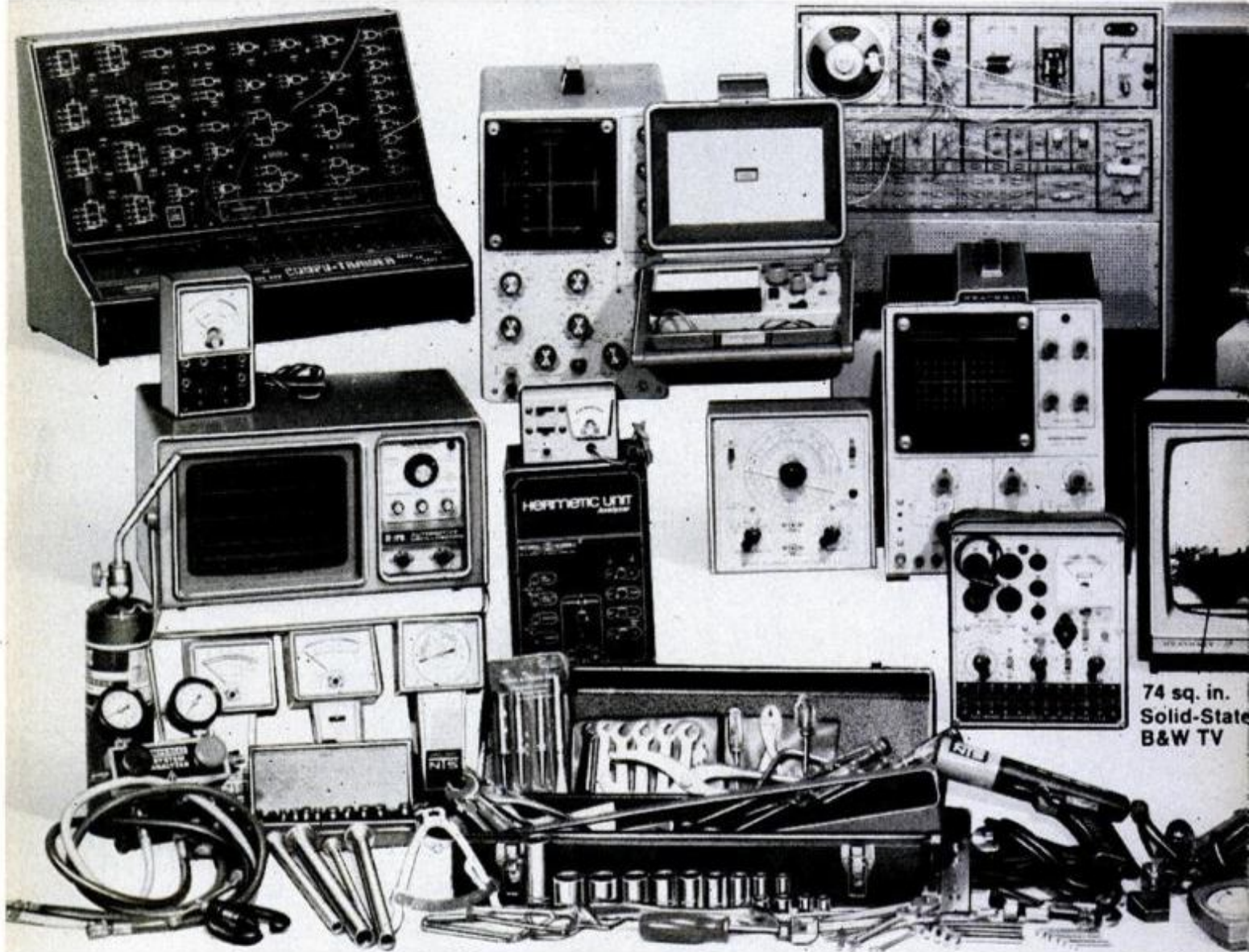
Come up to KOOL.



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

The better the training the better you'll

Send for one of these **FREE** Illustrated



74 sq. in.
Solid-State
B&W TV

Build and keep some of the finest technical equipment made when you train with an NTS Project-Method home study course. And it's usually the same type of equipment you'll meet in the field and use on the job. It will help you acquire first-hand experience and skill — help prepare you better for a variety of exciting technical careers:

ELECTRONICS DIVISION: Courses include professional equipment like 5" solid-state oscilloscope, transistor and tube-tester, vector monitor scope, 74 sq. in. B&W TV, and solid-state stereo AM-FM multiplex receiver, speakers. Color TV courses feature advanced NTS/HEATH DIGITAL GR-2000 Color TV with silent varactor diode tuning; digital read-out channel selection (with optional digital clock), big 315 sq. in. screen.

MECHANICS DIVISION: Learn engine diagnostics, motor overhaul, transmissions, automotive maintenance. Courses include 9 in. solid-state automotive oscilloscope, testers, tools, mechanic's steel tool box, & more.

AIR CONDITIONING, REFRIGERATION/HEATING DIVISION: Learn servicing of commercial, industrial and residential heating and cooling equipment. Courses include hermetic unit analyzer, leak detector, charging testing-purging manifold set, tools and more.

HOME APPLIANCES DIVISION: Courses cover repair and maintenance of washers, dryers, ranges, smaller appliances. Equipment includes NTS Circuit-Trainer and professional multimeter.

and the equipment be equipped.

Career Guides:

COMPARE OUR
KITS AND LESSONS.
COMPARE OUR
TUITION.



(Simulated TV Reception)



LOWER TUITION FOR YOU: We employ no salesmen, pay no commissions. You receive all home-study information by mail only. Make your own decision, your own comparisons. Send card today or write for illustrated catalog in field of your choice, all details.

NO OBLIGATION. NO SALESMAN WILL CALL.

APPROVED FOR VETERAN TRAINING
Get facts on new 2-year extension.

NATIONAL TECHNICAL SCHOOLS

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

NATIONAL TECHNICAL SCHOOLS Dept. 201-017
4000 South Figueroa St., Los Angeles, Calif. 90037

Please send **FREE** Color Catalog and Sample Lesson.
NO OBLIGATION. NO SALESMAN WILL CALL.

- Electronics Division
- Mechanics Division
- Air Conditioning/Refrigeration/Heating Division
- Home Appliances Division

NAME _____ AGE _____

ADDRESS _____

CITY _____ STATE _____

Please fill in Zip Code for fast service _____

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

**10 years ago
your hair didn't need
the protein it needs
today to look its best.**

Chances are, your hair looked healthier ten years ago. It was thicker, fuller, and it had more protein. And that's what hair is made of. But as time goes by, your hair loses protein—continuously. Which is why you need Protein 29 Hair Groom. Because Protein 29 actually adds protein to individual hair shafts. It helps your hair look thicker, fuller, healthier. More like it used to look.

Your hair is irreplaceable. Wouldn't it be a good idea to get some Protein 29 now and do something about the next ten years?



**Protein 29
Hair Grooms**
Liquid, gel and sprays

**Do something about
the next 10 years.**

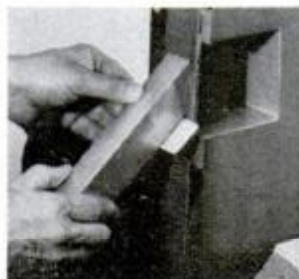


Havco grinder puts microfinish on metal or wood

I've been sold on belt grinders ever since they were first introduced, and I wouldn't be without one. Not only will a belt grinder remove stock twice as fast as a pedestal grinder, but with aluminum-oxide belts you can finish and polish metal parts much more smoothly and evenly. And with an open-coat garnet belt, you have a handy machine for sanding wood and plastic.

In trying Havco's 2-in. belt grinder for the first time, I was aware of a raft of features not

found in other machines. It has a unique cover which permits internal grinding and sanding of open-ended parts. It has a 5-in. solid-rubber drive wheel which permits chatter-free, blemish-free grinding. And by loosening just four bolts you can set the machine at any angle from vertical to horizontal. The ½-hp Model 236 sells for \$287 f.o.b. from Havco, 24 State St., Oshkosh, Wis. 54901.—*Wayne C. Leckey, Senior Editor, Special Projects*



Belt platen guarantees flat surface without compensating for wheel curvature.



Belt can be adjusted to very edge of platen for grinding square corners.



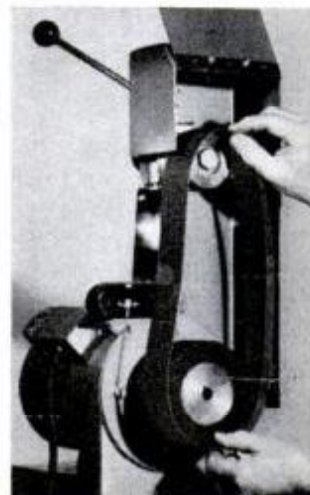
Grinding against rubber drive wheel produces a blemish-free surface.



Single-phase ½-hp motor drives 2x36-in. belt 4500 f.p.m. Workrest tilts and locks at any angle, can be adjusted by hand.



Strong spring won't let belt-tracking adjustment shift during belt change.



Belt is easily changed. Cam lever locks in down position to free hands.



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



BEAT INFLATION!

Cash in on the huge demand for small engine repair.

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

making business!

You receive trade secrets and business plans.

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

Increased Income

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



Walter H. Strick Campbell, California

With our famous 'learn-by-doing' training method, you get practical 'hands-on' experience with specialized tools and equipment that you'll receive with your training plus a brand-new 3 HP engine - all yours to keep!

SEND FOR FREE FACTS!

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

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

BELSAW INSTITUTE OF SMALL ENGINE REPAIR

5171 Field Bldg., Kansas City, MO. 64111

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

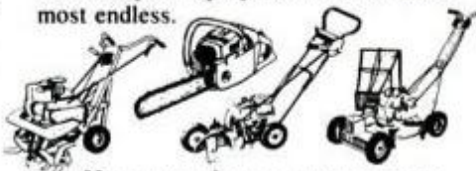
BELSAW INSTITUTE, 5171 FIELD BUILDING
KANSAS CITY, MISSOURI 64111

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

Name _____
Address _____
City _____
State _____ Zip _____

46-million small engines are in service today!

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



No experience necessary.

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

In just a short time, you can be ready to join one of the fastest growing industries in America...an industry where qualified men are making from \$10.00 to \$15.00 per hour...and that's just for labor. Parts, engines and accessories add even more to the profits.



Because the small engine industry has grown so quickly, an acute shortage of qualified Small Engine Professionals exists throughout the country. In fact, it's not unusual for a good small engine man to be three to four weeks behind in the summer and at least a week behind in the winter. When you see how many small engines are in use today, it's easy to understand why qualified men command such high prices—as much as \$17.50 for a simple tune-up that takes less than an hour!

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

PLUS... you get this 3 HORSEPOWER CLINTON ENGINE YOURS TO KEEP!

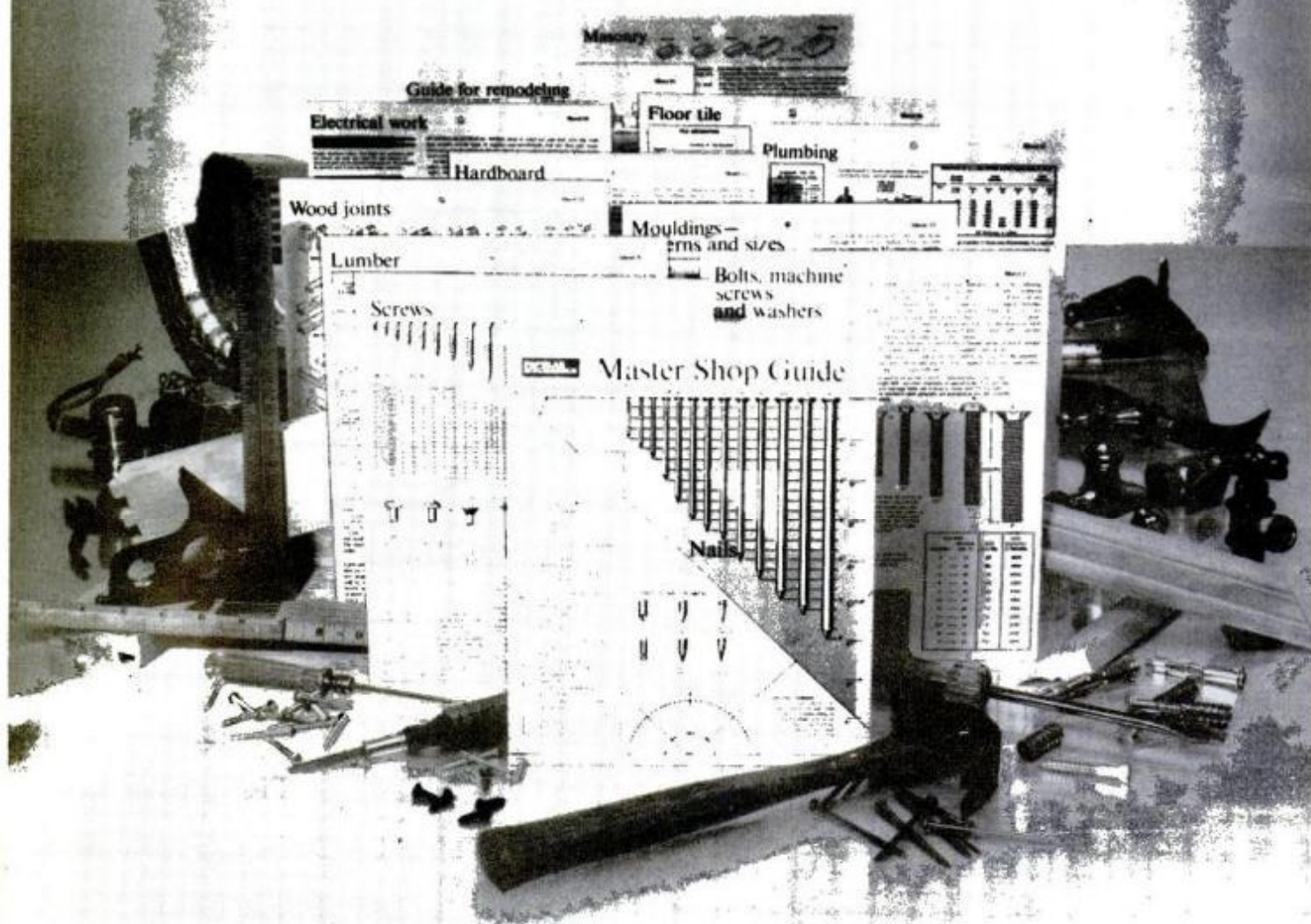


Send TODAY for this fact-filled **FREE BOOKLET!**



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

One of the most important tools you'll ever buy.



Why? Because MASTER SHOP GUIDE lays out everything you need to know, graphically and ready-to-use.

What? All about nails, screws, bolts, wall fasteners, drills, abrasives, lumber, plywood, gypsum, adhesives, paneling, shop math, stair construction, masonry, wood finishing, plumbing, pipe fittings, electrical work, gutters, concrete, remodeling measurements *plus* a built-in ruler, protractor, 45° tri-

angle and compass. *You'll use it in every job you tackle.*

How? Twelve hang-up, stand up boards. 24 surfaces of laminated-to-last wipe-clean plastic. 56 charts. *The fundamental workshop reference tool.*

Who? Chances are, your "shop-wise" neighbor already has one. Nearly two hundred thousand sets have already been purchased by Popular Mechanics readers and shop enthusiasts.

When? *Right away!* You can get your set in a few days by mailing this coupon along with your check or money order for \$4.95 plus 50¢ shipping.

PM Master Shop Guide, Dept. D-5,
Box 1014,
New York, N.Y. 10019

Please send me _____ set(s) of Popular Mechanics
MASTER SHOP GUIDE. I enclose \$4.95 plus 50¢
for each set ordered.

Name _____

Address _____

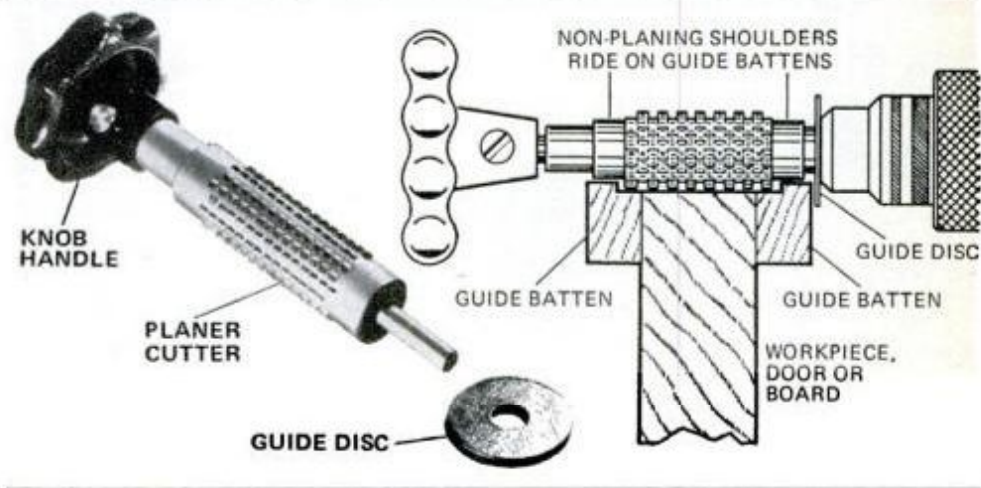
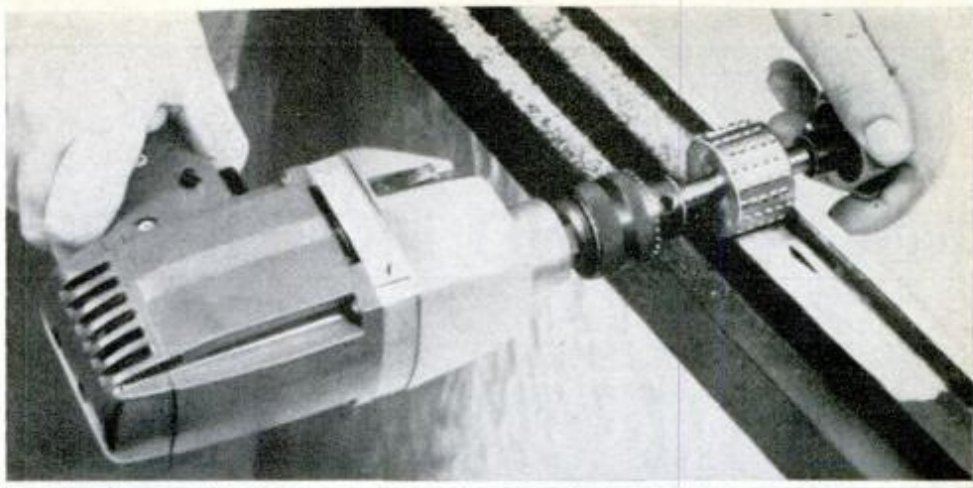
City _____ State _____ Zip _____

Drill drives new rotary rasps

Your 3/8-in. electric drill becomes handier than ever with a new rotary-rasp attachment from Germany. In three sizes (plus a hole rasp), the No. 170 shown will plane edges up to 1 3/4 in. wide; No. 178 to 1 in.; and the 175 to 1 3/16 in.

You guide the tool by gripping a free-turning knob. For straight cuts, you clamp a guide batten to each side of the work. A noncutting shoulder at each end of the cutter rides the battens for depth. A guide disc (washer) provides a 90° fence. To use the cutter, you draw it toward you with light, sweeping strokes.

I found the tool very good for planing tough end grain (such as sticking door bottoms), for chamfering edges and freehand sculpturing. Rasps are \$7.95 each postpaid (hole rasp, \$7.45). Coastal Abrasive, Trumbull, Conn.—*Wayne C. Leckey, Senior Editor, Special Projects.*



No "cuss words" around this beauty.



Installation of Rockwell's Single Control faucets is quick and easy. There are no special, costly tools needed. Just a pair of wrenches makes the most hesitant handyman the hero of his household. Our do-it-yourself instructions are right on the box. There's even a pamphlet inside for extra help if needed.

When it is installed, our single control faucet reflects your own good taste. And they're available for kitchen, lav, and bath.

Building Components Division, Rockwell International, 400 N. Lexington Ave., Pittsburgh, PA 15208.



Rockwell International



IMPORTS AND MOTORSPORTS



Mucho macho

This Capri's wearing street clothes, believe it or not. Don't let the European-Grand-Touring-Championship-race-car look fool you. It's an Americanized street version of the European R/S Capri II, and its creator, Roger Chastain, calls it the Shadow Stage Three S/3 Capri.

It's not just a one-off exercise in customizing or a limited-availability set of wheels from Jake's Garage: it's available through Lincoln-Mercury dealers coast to coast.

The S/3 conversion consists of full front and rear fender flares, front air dam, rear spoiler, rear window louver, gate-shift console, wide wheels and tires, and special stripes, graphics and paint. Tires are B.F. Goodrich Lifesaver Radials, T/A Series; and the louver (Chastain's own "Shadow" design) cuts heat buildup in the car on hot days.

In the works for future S/3s are handling and performance accessories. Roger Chastain Associates, 2180 Temple, Long Beach, Calif. 90804.

Jody's story

We had the exciting experience of seeing Jody Scheckter drive the six-wheel Tyrrell to a decisive win at the Swedish Grand Prix (and his teammate, Patrick Depailler, place second). We next saw Jody at Watkins Glen in October when he finished second to James Hunt. At that time, our cover painting of the car was being completed by artist Ed Valigursky, and *Jody, An Autobiography*

was arriving at local bookstores.

Our story about the six-wheel Formula 1 car (page 47) concentrates on the machine. For more about the driver who piloted it so successfully the first year on the Grand Prix circuit, turn to his autobiography, \$12.50, from Motorbooks International, 3501 Hennepin Ave. South, Minneapolis, Minn. 55408.

BMW tours

Want a dream vacation? Fly to Munich, Germany, pick up a new BMW motorcycle, tour Europe three weeks, fly back to New York with it and ride it home! You can do just that as part of an organized tour. Prices start at just under \$4000 for the Swissair flights and a new R60/6. First 1977 tour goes May 29. Wish I could be on it. Bob Beach Motorcycle Adventures, 2763 West River Parkway, Grand Island, N.Y. 14072.

Vintage Auto Almanac

Old-car enthusiasts are well acquainted with *Hemmings Motor News*, the world's largest paper featuring antique and vintage automobiles, and it's Hemmings that publishes this First Annual 1977, 224-page "bible" for old-auto hobbyists. It lists clubs, parts dealers, restoration shops and museums, and feature stories, too (two by PM's West Coast Editor, Michael Lamm). \$4.50. Vintage Auto Almanac, Box 945, Bennington, Vt. 05201.



Look out, student driver!

Is that Al Pacino at the Skip Barber School of Performance Driving? None other. The professional actor is getting tips from another old pro, Skip Barber, on handling a Formula 1 car for a film about a fictional Grand Prix driver, Bobby Deerfield, it will be released this spring. Pacino will drive a Brabham-Alfa in the film.

By the way, anyone can follow in Al Pacino's footsteps (tire tracks?), maybe not in Hollywood, but at Skip Barber's School of Performance Driving, 1000 Massachusetts Ave., Boxboro, Mass. 01719. ★★★



Jody's autobiography



BMW tour book



Vintage Auto Almanac

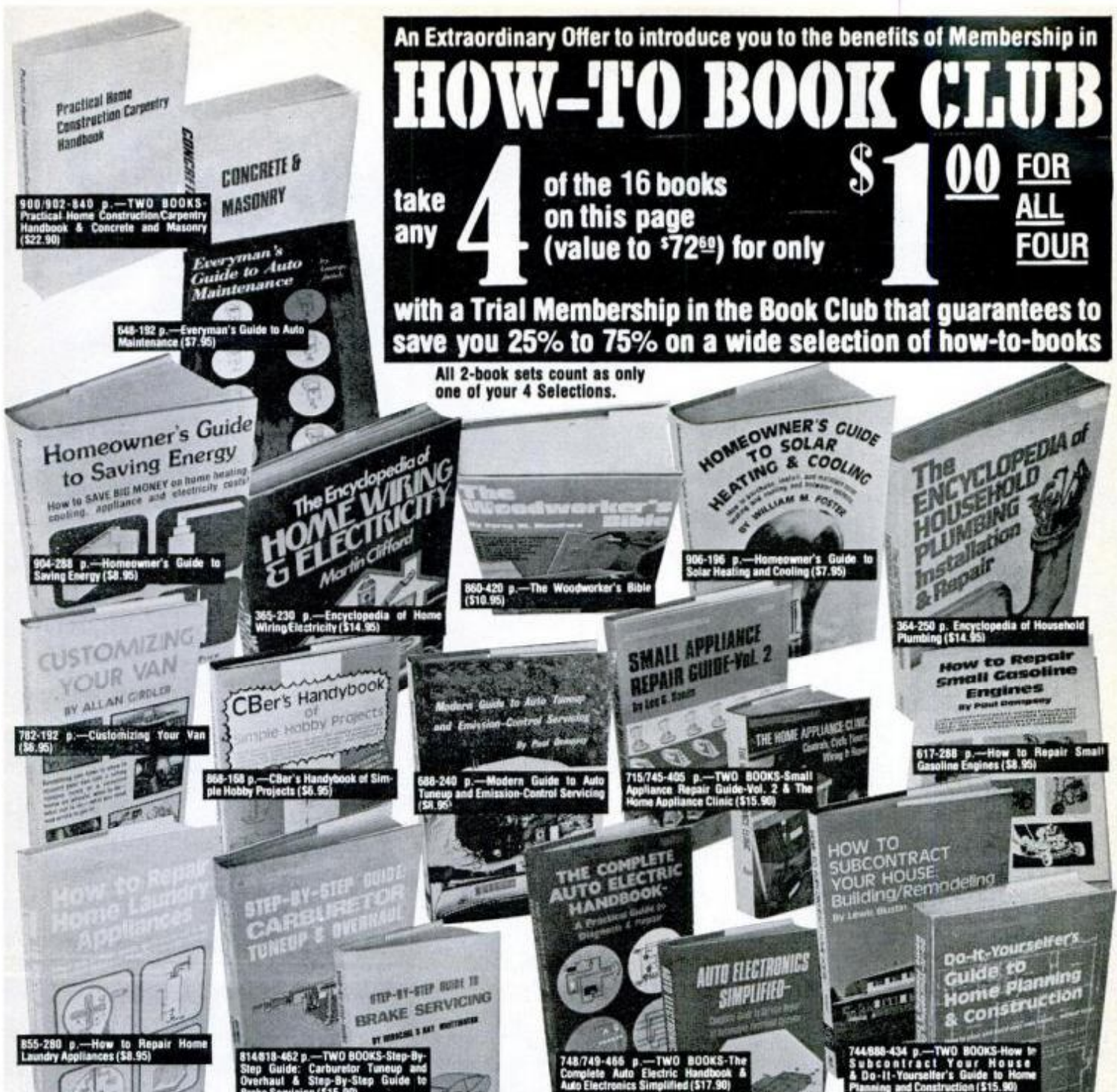
An Extraordinary Offer to introduce you to the benefits of Membership in

HOW-TO BOOK CLUB

take any **4** of the 16 books on this page (value to \$72.60) for only **\$1.00** FOR ALL FOUR

with a Trial Membership in the Book Club that guarantees to save you 25% to 75% on a wide selection of how-to-books

All 2-book sets count as only one of your 4 Selections.



Let us send you your choice of 4 of these 16 practical, time-and-money-saving books as part of an unusual offer of a Trial Membership in How-To Book Club.

Here are quality hardbound volumes, each especially designed to help you increase your know-how, to save you money, and to make your leisure hours more enjoyable. Whatever your interest and needs, you'll find How-To Book Club offers practical, quality books that you can put to immediate use and benefit.

This extraordinary offer is intended to prove to you, through your own experience, that these very real advantages can be yours...that it is possible to keep up with the literature published in your areas of interest, and to save substantially while so doing. As part of your Trial Membership, you need purchase as few as four books during the coming 12 months. You would probably buy at least this many anyway...without the substantial savings offered through Club Membership.

To start your Membership on these attractive terms, simply fill out and mail the coupon today. You will receive the 4 books of your choice for 10-day inspection. **YOU NEED SEND NO MONEY!** If you are not delighted, return the books within 10 days and your Trial Membership will be cancelled without cost or obligation.

HOW-TO BOOK CLUB, P.O. Box 8, Blue Ridge Summit, Pa. 17214

Facts About Club Membership

- The 4 introductory books of your choice carry publishers' retail prices of up to \$72.60. They are yours for only \$1.00 for all four (plus postage and handling) with your Trial Membership. • You will receive the Club News, describing the current selection, alternates, and other offerings, every 4 weeks (13 times a year). • If you want the selection, do nothing: it will be sent to you automatically. If you do not wish to receive the selection, or if you want to order one of the many alternates offered, you simply give instructions on the reply form (and in the envelope) provided, and return it to us by the date specified. This date allows you at least 10 days in which to return the form. If, because of late mail delivery of the Club News, you do not have 10 days to make a decision and so receive an unwanted selection, you may return it at Club expense. • To complete your Trial Membership, you need buy only four additional monthly selections or alternates during the next 12 months. You may cancel your Membership any time after you purchase these four books. • All books—including the Introductory Offer—are fully returnable after 10 days if you're not completely satisfied. • All books are offered at low Member prices, plus a small postage and handling charge. • **Continuing Bonus.** If you continue after this Trial Membership, you will earn a Dividend Certificate for every book you purchase. Three Certificates, plus payment of the nominal sum of \$1.99, will entitle you to a valuable Book Dividend of your choice, which you may choose from a special list provided Members.

HOW-TO BOOK CLUB

P.O. Box 8
Blue Ridge Summit, Pa. 17214

Please send the 4 books circled below and invoice me.

Please open my Trial Membership in HOW-TO-BOOK CLUB. I understand the cost of the books I have selected is only \$1.00 for all 4, plus a small shipping charge. If not delighted, I may return the books within 10 days and owe nothing, and have my Trial Membership cancelled. I agree to purchase at least four additional books during the next 12 months, after which I may cancel my membership at any time.

364	365	617	648	688
715/745	744/888	748/749	782	814/818
860	868	900/902	904	906

Name _____ Phone _____

Address _____

City _____

State _____ Zip _____

(This offer valid for new Members only. Foreign and Canada add 10%) PM-17



**AMERICA NEEDS ONE MILLION MORE
SKILLED MEN BY 1985.**

Материал, защищенный авторским правом

THE FUTURE BELONGS TO THE FEW OF US STILL WILLING TO GET OUR HANDS DIRTY.

If you like to work with your hands, you've got two advantages over people who work at a desk.

First, you're likely to end the day with a smile on your face rather than a knot in your stomach. Because you can see the results of your work right in front of you. Real. Satisfying. It's good to be able to say, "I built that...I fixed that...I made that happen." And to walk away from the job with no doubts about it or yourself.

Second, when you consider how technologically complex our life has become, with cars, appliances, and factories full of machinery—all in need of maintenance—you realize that America cannot do without her skilled craftsmen, repairmen, and mechanics. And it's satisfying to know you're needed and appreciated.

Why do we tell you this? We're ICS, International Correspondence Schools. And while we can't guarantee you a job—no school can do that—we can give you the first-rate training you need, especially if you're interested in one of the grow-

ing fields where ICS concentrates its training.

As an ICS student, you study at home, on your own schedule. You waste no time traveling to and from class. And you never have to miss a paycheck.

But you're never alone. Skilled instructors are always ready to help you.

If you ever have doubts or problems or just want to talk to an instructor, you can call ICS from anywhere in the continental United States or Canada using our special toll-free Dial-a-Question® service.

Since 1890, millions of men and women around the world have turned to ICS for career training.

More than 70 of America's largest 100 corporations (including Gulf Oil, Bethlehem Steel, Westinghouse and 3M) use ICS training for their own employees.

No one can promise success, but if you want more—more money, more security, more day-to-day satisfaction and more future—our free Career Booklet and free Demonstration Lesson can help you get started in the right direction. Just check the box next to the

field that interests you most and mail the postpaid card today. There's no obligation.

A lot of Americans these days are allergic to dirt under their fingernails.

That means more opportunity for those of us who aren't. Remember, it's your life. You might as well make the most of it.

©1976 Intext, Inc. G

CHECK BELOW FOR A FREE CAREER BOOKLET & DEMO LESSON.

- | | |
|---|--|
| <input type="checkbox"/> Electrician | <input type="checkbox"/> Civil Engineering |
| <input type="checkbox"/> Engineering | <input type="checkbox"/> Interior Decorating |
| <input type="checkbox"/> Accounting | <input type="checkbox"/> Construction Electrician |
| <input type="checkbox"/> Drafting | <input type="checkbox"/> Appliance Service & Repair |
| <input type="checkbox"/> Electronics Technician | <input type="checkbox"/> Income Tax |
| <input type="checkbox"/> TV Service & Repair | <input type="checkbox"/> Motel/Restaurant Management |
| <input type="checkbox"/> Surveying & Mapping | <input type="checkbox"/> Diesel Mechanic |
| <input type="checkbox"/> Air Conditioning & Refrigeration | <input type="checkbox"/> Mechanical Engineering |
| <input type="checkbox"/> Automotive Mechanics | <input type="checkbox"/> High School Business Management |

Name _____ Age _____

Address _____

City _____

State _____ Zip _____

Phone _____

ICS

XA902Z

INTERNATIONAL CORRESPONDENCE SCHOOLS
SCRANTON, PA. 18515

Veterans: Taken for career purposes, ICS Programs qualify for VA Benefits. Canadian residents use Scranton, Pa. address for service from ICS Canada, Ltd. In Hawaii: 931 University Ave., Honolulu, Hawaii 96814.

Careers	Average annual job openings, 1972-85†	% increase new job openings, 1972-85‡
Auto Mechanics	22,300	18.4%
Air Conditioning, Refrigeration and Heating Mechanics	13,100	96.3%
TV and Radio Service Technicians	4,400	18.1%
Electricians (Construction and Maintenance)	20,900	30.0%
Engineering and Science Technicians	39,600	48.9%

*Source: U.S. Office of Education publication, "25 technical careers you can learn in 2 years or less."
†Source: 1974 U.S. Dept. of Labor Occupational Manpower and Training Needs

CAR CLINIC

BY MORT SCHULTZ



Book of knowledge

My 1975 Chevrolet Nova is equipped with an eight-cylinder, 4.2-liter engine with electronic ignition. It is also "equipped" with a chronic misfire from day one that no one has been able to cure. When taking off from a dead stop, the engine misses and coughs back through the carburetor. At cruising speed, the car performs like a champ. We've done thorough tune-ups, but no success. What do you suggest?—Bill Wilson, Middletown, Ill.

If the engine is set according to the book, Bill, the first thing I would do is regap the sparkplugs. The book calls for a gap of .060 in., but we've been finding that where misfire occurs a reduction of this gap to .045 in. will eliminate the misfire.

However, if the condition persists, I would switch to a hotter plug than

tioning properly, the carburetor air cleaner is seated squarely and is sealing, and there are no vacuum leaks. Any of these conditions could cause misfire.

Salty tale

The EGR system in my 1973 Maverick Grabber with 302-cu.-in. engine has been a headache. Before I got wise, I ruined two valve-mounting spacers and gaskets. Now I check and clean out the hole in the EGR valve mounting spacer every two weeks. Always, I "spoon" out 1/2 ounce of a substance that looks like wet salt. If it is allowed to accumulate, this substance clogs the large hole that enters the intake manifold, causing the spacer to burn out. However, the job is getting to be a drag, and I'd like to know if there's a way to avoid having to do it this often.—

keep such deposits from forming, Mike, is to switch to unleaded gas. If you don't do this, frequent maintenance will be required, but I do think you're overreacting. You should not have to clean the system every two weeks. Once every six months is more like it.

Uncomfortable clutch

I recently bought a 1976 Toyota Corolla, and I'm experiencing an uncomfortable feeling with its five-speed transmission. Whenever I upshift from first to second gear, it feels as if the synchronizer ring is shot. As a result, I fear that I will strip the gears. There is no problem when I'm downshifting. My dealer advises that this is characteristic of the car, because the synchronizer ring is too small. What can be done, if anything?—Rainer Soehnon (address not given)

I disagree with your dealer regarding the makeup of this transmission, which is a sound unit. However, clutch adjustment is critical and also unique. Normally, clutches are adjusted for a free play of 3/4 to 1 inch. With the Toyota, you should adjust for a free play of 1 to 1 1/2 inches. This will do away with the feeling of weakness, which is brought on by the the double-clutching effect that reduced free play provides.

Some like it hot

Since purchasing my 1973 Dodge Monaco, I've been having a problem starting the engine when it's cold. I have to depress the gas pedal at least five times and sometimes 10 before the engine kicks off. It stays at low idle for 20 to 30 seconds before revving up to fast idle. After the engine warms up, you couldn't ask for a better running car. The dealer, whom I've visited more times than I can count, has rebuilt the Holley two-barrel carburetor twice. Please advise.—Michael Haday, Gloucester, N. J.

Okay, Mike, here's the way to tackle the problem. Do each step at a time and test to see if the trouble clears up before you proceed:

■ Make sure the choke linkage, shaft

(Please turn to page 42)

Six steps to gasket-replacement success

Here are six important steps to keep in mind when replacing rubber valve cover gaskets: 1. Use only a fast-drying adhesive, which is specially formulated for gasket installation. 2. Apply adhesive sparingly, in thin dabs. Use just enough to keep the gasket in place. Gaskets are designed to seal on their own. 3. Apply adhesive to metal surfaces only—

not to the gasket. 4. Test the gasket for slippage

before installing the cover using light finger pressure (illustration). If the gasket slides, don't install the cover. Wait. Premature tightening can cause the gasket to slide-slip when the cover is installed. 5. Avoid overtightening. Torque to manufacturer specification only. Overtightening will result in distortion and impair the gasket's ability to seal. 6. The quality of the job depends on the quality of installation. A gasket is no better than the job done by the person installing it.



VALVE COVER GASKET

the one recommended in the book. The suggested plug is R44TX (AC). I would switch to R46TX. Gap the plug to .060 in., but if misfire doesn't stop, reduce gap to .045 in.

If the trouble doesn't clear up after experimenting with sparkplugs, then I would look for a breakdown in sparkplug wiring. A switch to new cables may help.

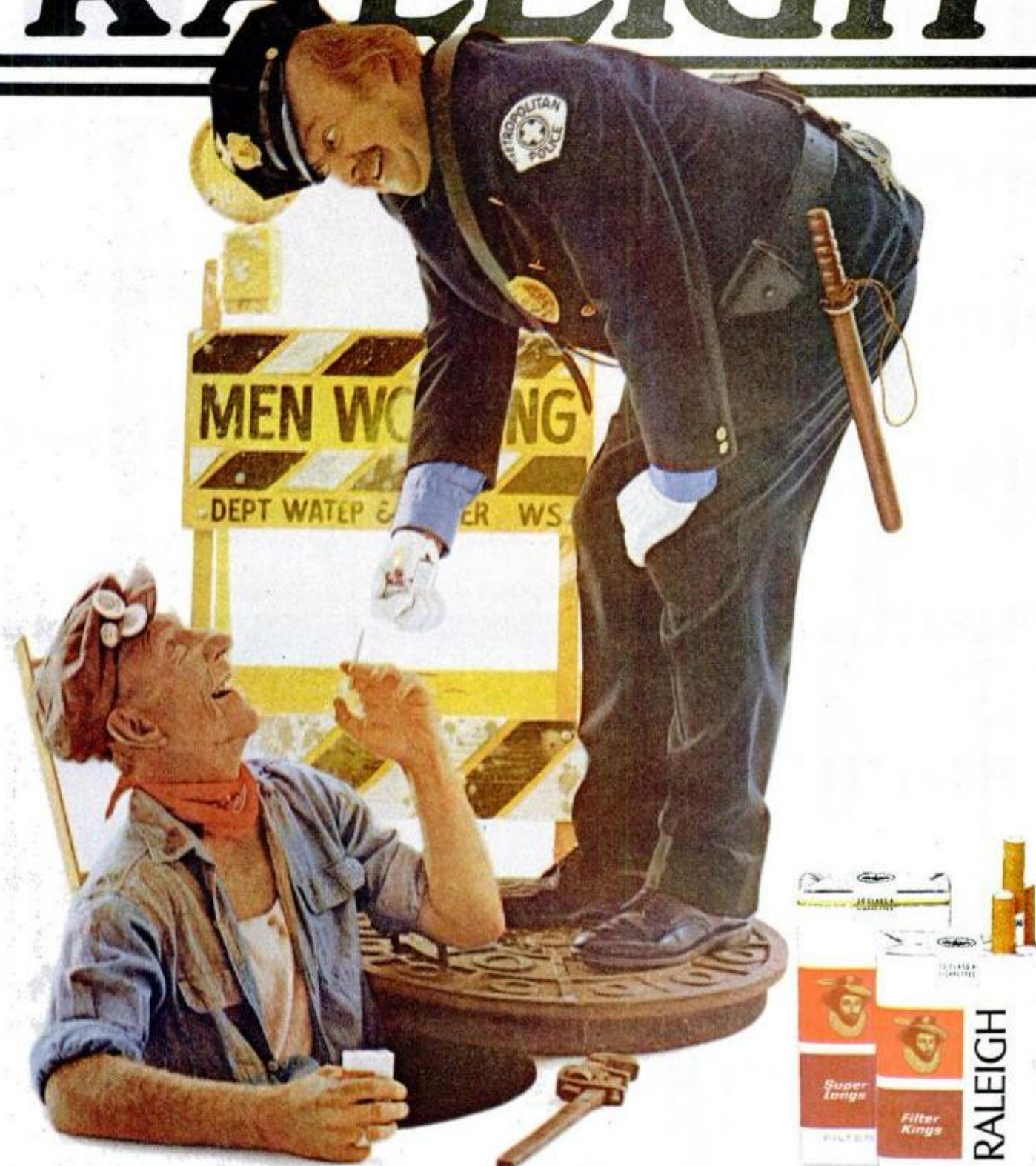
My answer assumes, Bill, that in performing your "thorough tune-ups" you have made certain that the carburetor accelerator pump is func-

Michael S. Gresko, Huntingdon Valley, Pa.

The substance that looks like wet salt has been identified as lead halide compound (lead salts). Deposits are associated with the use of leaded gasoline. According to an official of the Ford Motor Co., its Improved Combustion (IMCO) emission-control systems on later-model cars that are required to use unleaded fuel "do not indicate any buildup of these deposits."

The only way you are going to

TASTE THE GOOD TIMES. RALEIGH



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

Raleigh's good time gifts. Get this original Zippo lighter with Raleigh coupons, the valuable extra on every pack. See over 1,000 Raleigh gifts, write for your free Gift Catalog: Box 12, Louisville, KY 40201.

You'll remember Raleigh. The genuine tobacco flavor. The valuable gift coupons.

Filter Kings, 16 mg. "tar," 1.1 mg. nicotine; Longs, 17 mg. "tar," 1.2 mg. nicotine, av. per cigarette, FTC Report Apr. '76

© B&W T Co.

Материал, защищенный авторским правом

CAR CLINIC

(Continued from page 40)

and related parts aren't bent and move freely.

■ Make sure the fast idle cam isn't bent and jamming in its housing.

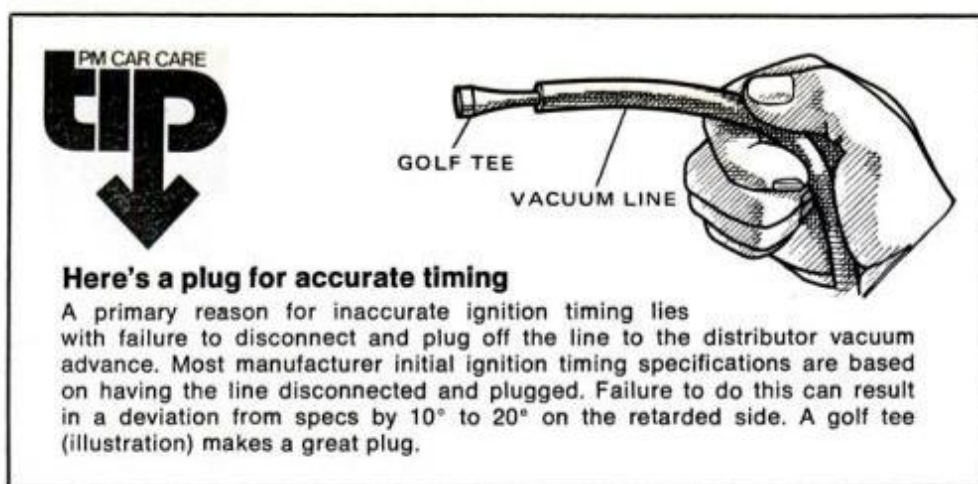
■ Make sure the air-cleaner gasket is seated right. We've found cars where gaskets were sticking out and actually blocking the operation of the choke.

■ Make sure the carburetor air horn is not warped by laying a straight-edge across the top of the carburetor and checking the center. If the center is higher than the edges, the air horn is warped and should come off for repair or replacement.

Important: The primary cause of air-horn warpage is overtightening the air-cleaner wingnut.

■ Make sure the fast idle speed is right on. With the engine warmed up and the fast idle screw on the second highest step of the cam, the engine should rev at 1900-2000 rpm.

■ See that the carburetor float is set right. The fact that the carburetor has been rebuilt is no guarantee. The setting is measured between the top of the float and the float stop. If your car has a 360-cu.-in. engine,



Here's a plug for accurate timing

A primary reason for inaccurate ignition timing lies with failure to disconnect and plug off the line to the distributor vacuum advance. Most manufacturer initial ignition timing specifications are based on having the line disconnected and plugged. Failure to do this can result in a deviation from specs by 10° to 20° on the retarded side. A golf tee (illustration) makes a great plug.

float travel should be .250 in. If you have a 400-cu.-in. engine, travel should be .285 in.

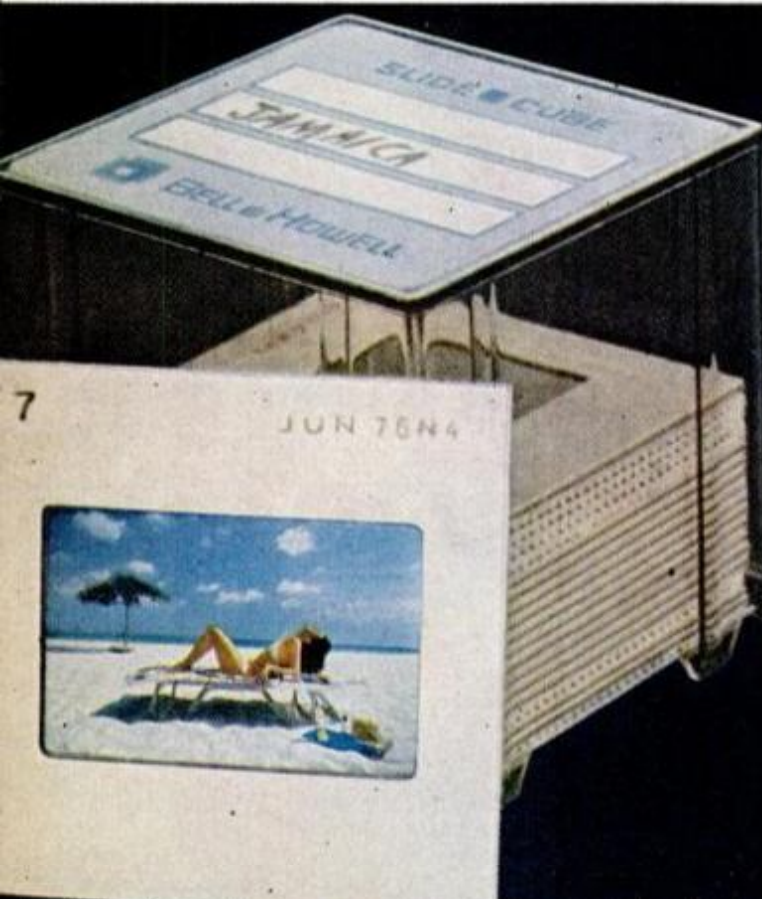
Telling it like it is

Recently, due to accidental breakage of the plastic front plate or escutcheon on the heater/airconditioner control unit of my 1974 Pinto, I had to buy the entire control unit assembly (part No. D4FZ-19980). Instead of paying a couple of bucks for a simple part I had to pay \$40.31 for a complex assembly I did not need. It is something akin to needing a front

tire and having to buy the whole front end. This seems to me to be either a classic case of design stupidity or marketing cupidity. Thanks for letting me sound off.—Clyde S. Angel, Colonial Beach, Va.

You've given me a great idea, Clyde. If I can get cooperation from readers of *Car Clinic*, we can start a "sound off" department. If you have a complaint about your car or anything automotive, write me, but on top of the letter add the words "sound off."

If your letter is printed, the com-



Pack Jamaica in a 2" cube.

Slide Cube™ Cartridges are the efficient, space-saving way to store the slides of your favorite subjects. 40 slides fit in one 2-inch cartridge. So you can store 640 slides in the same space conventional round trays will store 80. And at one-third the cost!

Slide Cube™ Projectors offer you features like remote control, zoom lenses, convenient storage lids, and more.

See your dealer soon and take advantage of the Bell & Howell "Switch 'n Swap" offer. We'll trade all your bulky round trays for compact Slide Cube Cartridges, when you buy your Slide Cube Projector. So get packing.

BHMC

BELL & HOWELL/MAMIVA COMPANY

© 1978 BELL & HOWELL/
MAMIVA COMPANY
All Rights Reserved
Bell & Howell and
Slide Cube are
trademarks of
Bell & Howell
Company



BELL & HOWELL

pany or agency involved will be given the opportunity to reply. In this way, a rapport can be established between you and the manufacturer of your car or automotive equipment. The result, I'm sure, will make for better understanding.

Regarding *your gripe*, Clyde, here is what Ford has to say:

"During the middle of the 1974 model year, the material of that particular assembly was changed to a polycarbonate which is much stronger and will not break nearly as easily. In addition, for the 1975 model year there were new service procedures established which enabled that assembly to be replaced in separate components. As of 1975, the particular part would cost \$22.65.

"It is significant to note concerning this type of problem that we try to design assemblies in the most efficient manner possible to meet the majority of anticipated instances of replacement. While it is true that the manufacture of one-piece units is less expensive, there are other considerations as well. The more multi-piece assemblies we carry, the more parts that have to be manufactured, cataloged, stored and eventually discarded as they become obsolete. In

the long run, the customer would have to pay more. However, we constantly are working on new designs and testing new materials which will result in lower replacement costs for our customers."

Live and learn

Hey, Mort, your August 1976 Car Clinic had a letter from Andrew Weinstein of Flushing, N.Y., regarding the possibility of contaminated automatic transmission fluid remaining in a transmission after the pan is drained and the filter is changed. The car is a 1973 Oldsmobile Cutlass. With your permission, we would like to pass on to your readers the method we use when fluid is contaminated.

When removing the transmission oil pan, we inspect the bottom of the pan for signs of metal filings or clutch composition. If there are none, we assume the transmission is mechanically sound. The next step is to replace the filter and oil-pan gasket. With the oil pan in place, add four quarts of fluid, but do not start the engine. Remove the return oil line from the oil cooler in the radiator, and install a suitable fitting and hose to direct fluid into a drain pan.

Start the engine, and the contami-

nated fluid will be pumped from the torque converter and oil cooler into the drain pan. It is important to continue to add new fluid to the transmission as the old fluid is pumped out. When clean fluid appears in the drain pan, shut off the engine, re-connect all lines and fill the transmission to the proper level.

We find that this method requires about two quarts in addition to the capacity of the transmission. A person must be careful not to confuse natural darkening of Dexron II with burning of the fluid. Of course, if an appreciable amount of metal filing or clutch composition is detected during inspection of the oil pan, the transmission should be repaired.—Paul Arthur and Brian Campbell, automotive instructors, Iowa Lakes Community College, Emmetsburg, Iowa

My thanks, gentlemen. ★★

GOT A PROBLEM WITH YOUR CAR?

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



You've made your mark. Now make your Bradley GT.

Make it with the Bradley GT sports car kit. The sleek, classic Bradley GT is custom-designed for assembly on a Volkswagen chassis. So you enjoy the economy and dependability that comes from the world's most popular compact... and the style and performance that comes from the world's finest car kit. You've made your own mark. Isn't it time to make your own sports car?



Send \$1.00 for brochure or \$7.00 for Assembly Manual, write to BRADLEY, 7669 Wash. Ave. So., Edina, MN 55435.

BRADLEY, Automotive Division of Thor Corporation, Dept. PM1 7669 Washington Ave. So., Edina, Minnesota 55435.

Send \$1.00 for brochure or \$7.00 for Assembly Manual

Name _____ Age _____

Address _____

City _____ State _____ Zip _____

Bus. Phone () _____ Home Phone () _____

This Assembly Manual and Bradley GT may be charged to your BankAmericard.

Account No.

Best travel deal on the map!



Limited offer... Buy a Solid State Apache... get a Johnson CB radio free.

Get on the road with Apache, and get on the air with the all-new Johnson 191 CB radio. This compact, 23-channel transceiver is a \$159.95 retail value. And it's yours free when you buy any 1977 Solid State Apache.

Johnson is the automatic CB. You get great performance without fussing with unnecessary knobs and switches.

Above all, your free CB comes with a new Solid State Apache, the folding trailer with the solid features of a travel trailer.

Fold it down and it tows with a minimum of weight and wind resistance. Open it up and you enjoy the comfort and protection of Apache's exclusive Solid State construction: solid walls and insulated roof of rugged ABS, the

space-age material so tough it's used to make football helmets.

It's got tinted, sliding windows, too. Plus, a spacious interior with big beds, full kitchen, and much more.



Don't wait. This valuable offer expires March 31, 1977. See your participating Apache dealer today, and get the best travel deal on the map!

For a free Apache catalog, write Vesley Company, Box 1011, Lapeer, Mich. 48446.



The Travelers' Trailer

APACHE

**VESELY
COMPANY**

Maker of Apache and Empire Recreation Vehicles

Your motorcycle: Do-it-yourself overdrive



With a motorcycle it's easy to select the gearing you want—all you do is change sprockets. If you're into hill climbs or competition events (as shown at left), you can run with a lower ratio for better performance. If you want fuel economy and longer engine life, just set up with a higher ratio.

On a motorcycle, changing gear ratio is as simple as changing a sprocket. You can go to a lower overall ratio to blast off the line, or higher to baby your machine. But before you start switching sprockets, you should know more about them and your chain.

Unlike shaft-drive motorcycles which have vital working parts protected, most chain drives operate in adverse conditions of moisture and dirt.

In operation, the chain makes a continuous circuit between the driven rear-wheel sprocket and the smaller, driving front sprocket called the countershaft. You might think that the chain travels around these sprockets in a circular path. It would—if it were flexible like a drive belt. But it doesn't.

Jerky chain

A chain is composed of inflexible links which are hinged together. This results in a jerky movement as the links change direction and speed while going around the sprocket—a phenomenon known as *chordal action*. This becomes more severe as sprocket size gets smaller, putting more stress on the chain and sprocket teeth. Each tooth on a driving sprocket is basically a lever as it engages the chain and pulls it around the sprocket. The fewer the teeth, the more load each must bear.

Two other conditions exist that make life unpleasant for your chain. As the links move around the sprocket, the outer areas must cover more distance in the same time as the inner areas. Which means the outer portion of the chain is traveling faster than the inner area re-

sulting in a centrifugal force that tries to throw the chain off the sprocket. The faster the chain speeds, the greater the centrifugal force.

Also, as the chain comes around the sprocket, it wants to continue in a circular motion. But it's pulled in a relatively straight line toward the other sprocket. The end result is a chain that appears to do the Bunny Hop, Watusi and Bump at the same time. The smaller the sprocket, the stronger this total effect.

Load rating

Surprisingly, changing sprocket size also affects the load rating of a given chain. The rating is based on a 19-tooth drive sprocket. Running the chain on a larger 21-tooth drive sprocket increases the chain's load rating 10 percent. Reducing the size of this sprocket decreases the chain's load rating. Fifteen teeth is the minimum number you should have on a drive sprocket although 17 is recommended.

The driven, or rear-wheel sprocket, should have no more than 70 teeth. Unlike a small driving sprocket, a large rear-wheel sprocket won't accelerate chain wear. What happens is that the more worn links there are wrapping themselves around a large sprocket, the greater the tendency for the chain to try to climb the sprocket teeth. All this pressure near the apex of the teeth will cause them to "bend" or hook. This situation is aggravated as the chain becomes worn. Trying to compensate for a worn chain by increasing its tension beyond normal limits will only accelerate chain and sprocket wear.

Changing sprocket size is one of the simplest ways to get quicker acceleration, more power at lower speeds for 2-up-plus-baggage touring or better gas mileage. Many motorcycles will respond to modest sprocket swapping, up or down in ratio without engine modifications for a change in power characteristics. Going to a lower overall ratio produces higher engine revolutions for a given road speed—thus, more power. Higher gearing produces the opposite effect. A slower-turning engine will help your mileage and prolong engine life.

Changing either front or rear sprocket will alter your overall gearing. Just bear in mind that you don't want to drop below 16 or 17 teeth on the front sprocket. Going to a rear sprocket having *three more* teeth will give you the same ratio as using a front sprocket having *one less* tooth.

When replacing sprockets, try to use one with an odd number of teeth. For some reason, sprockets with an even number of teeth tend to wear more unevenly.

To determine the ratio between a pair of sprockets, simply divide the number of teeth on the driving (front) sprocket into the number of teeth on the driven (rear) sprocket. If, for example, the front sprocket has 20 teeth and the rear 48, the final-drive ratio is 2.4:1. For overall gear ratio, you determine the primary-drive ratio (figured in the same manner as the final-drive ratio) and multiply it by the final-drive ratio.—Cliff Gromer

RATIOS FOR SPROCKET COMBINATIONS
Countershaft sprocket teeth

	15	16	17	18	19	20	21
36	2.40	2.25	2.12	2.00	1.89	1.80	1.71
37	2.47	2.31	2.18	2.06	1.95	1.85	1.76
38	2.53	2.38	2.24	2.11	2.00	1.90	1.81
39	2.60	2.44	2.29	2.17	2.05	1.95	1.86
40	2.67	2.50	2.35	2.22	2.10	2.00	1.90
41	2.73	2.56	2.41	2.28	2.16	2.05	1.95
42	2.80	2.63	2.47	2.34	2.21	2.10	2.00
43	2.87	2.69	2.53	2.39	2.26	2.15	2.05
44	2.93	2.75	2.59	2.44	2.32	2.20	2.10
45	3.00	2.81	2.65	2.50	2.37	2.25	2.14
46	3.07	2.88	2.71	2.56	2.42	2.30	2.19
47	3.13	2.94	2.76	2.61	2.47	2.35	2.24
48	3.20	3.00	2.82	2.67	2.52	2.40	2.28
49	3.27	3.06	2.88	2.72	2.58	2.45	2.33
50	3.33	3.13	2.94	2.78	2.63	2.50	2.38
51	3.40	3.19	3.00	2.83	2.68	2.55	2.43
52	3.47	3.25	3.06	2.89	2.74	2.60	2.48
53	3.53	3.31	3.12	2.94	2.79	2.65	2.52
54	3.60	3.38	3.18	3.00	2.84	2.70	2.57
55	3.67	3.44	3.24	3.06	2.90	2.75	2.62
56	3.73	3.50	3.29	3.11	2.95	2.80	2.67
57	3.80	3.56	3.35	3.17	3.00	2.85	2.71
58	3.87	3.63	3.41	3.22	3.05	2.90	2.76
59	3.93	3.69	3.47	3.28	3.11	2.95	2.81
60	4.00	3.75	3.53	3.34	3.16	3.00	2.86
61	4.07	3.81	3.59	3.39	3.21	3.05	2.91
62	4.13	3.88	3.65	3.44	3.26	3.10	2.95
63	4.20	3.94	3.71	3.50	3.32	3.15	3.00
64	4.27	4.00	3.76	3.56	3.37	3.20	3.05
65	4.33	4.06	3.82	3.61	3.42	3.25	3.10
66	4.40	4.13	3.88	3.67	3.47	3.30	3.14
67	4.47	4.19	3.94	3.72	3.53	3.35	3.19
68	4.54	4.25	4.00	3.78	3.58	3.40	3.24
69	4.60	4.31	4.06	3.83	3.63	3.45	3.29
70	4.67	4.38	4.12	3.89	3.68	3.50	3.33



Announcing the perfection of a breed... the all-new Chrysler 300

Chrysler announces the all-new, all-American "Chrysler 300" with the first two major patents in the stern drive industry in years.

When Chrysler engineers designed the "300," they incorporated into it all proven-best stern drive features ever invented. Refined them. And then, added to them!

Patented Steering System

The "300" introduces a husky "inverted yoke" steering/suspension system that noticeably lessens steering torque, giving amazingly easy control at all speeds.

Patented Self-Energizing Clutch

Incredibly compact and lightweight, the "300's" patented self-energizing clutch makes all shifting surprisingly smooth with no noisy jolts when it is engaged.

And that's not all. The "300" lower unit was thoroughly tested in one of the world's few computer-controlled water test tunnels. The unit cuts turbulence and cavitation to practically nothing at high speeds.

Plus, the "300's" big capacity, advance-design exhaust located above the cavitation plate increases top speed. Significantly increases reverse thrust. Makes steering easy on quick take-offs.

The "300" is precision-mated with five proved-dependable Chrysler quality powerplants: the 265, 240 or 195 hp. gas and the 130 or 105 hp. diesel. It accommodates all standard stern drive controls and can replace competitive stern drives with a simple reshaping of transom cut-out.

The "Chrysler 300" Stern Drive. One more reason why Chrysler keeps on earning its reputation as the pacesetter in modern marine power.

For more information contact: Marine Division, Chrysler Corporation, P.O. Box 1, Marysville, MI, 48040.

MARINE DIVISION



CHRYSLER
CORPORATION

**A lifetime of engineering.
For the time of your life.**



Photos by the author

New challenge on the Grand Prix circuit:

What's behind those four little wheels?

The six-wheel Formula One racer is fast and furious, and has proven itself in only one season . . . but it's still funny-looking!

by Bill Hartford
AUTO EDITOR

The Grand Prix circus had come full circle and was back in the United States for the next to the last race of the '76 season. Five hours at 55 and I was at the Glen again.

In Watkins Glen, N.Y., everyone is a race fan—at least once a year. Even the street signs are in the shape of little race cars. But they hark back to the glorious days when the cars roared through the streets and in no way do the signs resemble today's Formula One cars with their wings and wide tires . . . and none of them are in the shape of a six-wheel car!

Six wheels . . . for a Grand Prix car—the most sophisticated and exotic of all racing machines? The front four wheels looked even smaller than I remembered them when I first saw the car at the Swedish Grand Prix. There, Ken Tyrrell's two drivers stole the show: Jody Scheckter and Patrick Depailler, one-two in the race, beamed on the winners' circle while Niki Lauda was last to swig



Nosing in on the six-wheeler (above), you can see details; mounting tiny, 10-inch wheels is easy for Tyrrell team's mechanic. At top: Jody Scheckter speeds to victory at the '76 Swedish Grand Prix.

the champagne—he was third. James Hunt, destined to win the 1976 World Driving Championship from Lauda in Japan by a single point, was fifth and at that time still way behind Niki in points.

But now it was the Glen, and race day broke clear and cold after days of rain. The hills around the circuit were thick with fans, all watching, waiting for 26 cars to thunder into view all bunched and battling for that No. 1 slot. From the chicane at the esses I could hear the start. Within seconds Scheckter was snapping the six-wheeler around the striped curbing and leading the pack up the hill. After some dueling, though, Hunt took the lead and kept it. Jody collected six points for a second-place finish. That made it 49 for the season. Depailler, in the second six-wheeler, finished out of the points. In Japan, however, the last GP of '76, he finished second, drafting Mario Andretti a lap down as the pair passed the checkered

Designed by Derek Gardner, fielded by Ken Tyrrell and sponsored by Elf, the six-wheel Grand Prix cars carried Jody Scheckter and Patrick Depailler to third and fourth-place finishes for the 1976 World Driving Championship.



flag. He wound up with 39 points for the season, fourth in the drivers' standings.

What it all adds up to is an extraordinary performance for a new GP car in its first year of competition. The whole idea started with Derek Gardner, the racing car designer for the Tyrrell team. What he wanted to do was improve the aerodynamics by lowering the front profile in order to reduce turbulence and drag and be faster on the straights. You can do that by using smaller wheels, but how do you maintain the necessary cornering force in the front? Simple: four wheels instead of two. Their size was determined by specifying the same degree of road-holding that two larger wheels would provide.

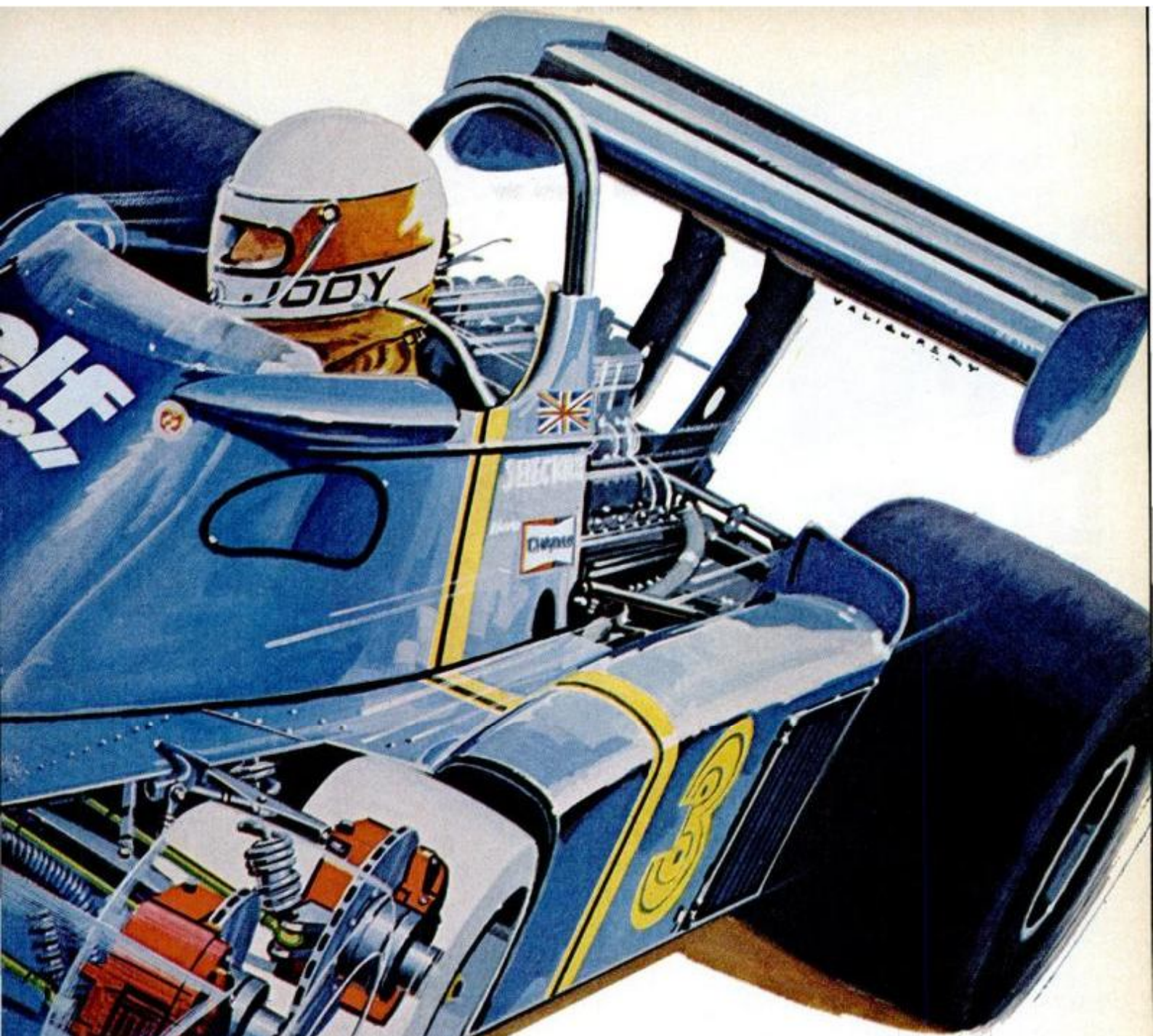
Chuckles turned to cheers

Gardner designed a car that had fans chuckling early in the season, but cheering as it started finishing

in the money. It didn't even take long to sort out the problems unique to the six-wheel design. Front-end geometry and suspension—a double wishbone—was easy enough, the only variable being the track angle for the two sets of wheels. Very little difference is felt by the driver whether the angle is the same or whether the car runs with the front set of wheels turning slightly more than the rear set, as shown by angles A and B on the opposite page.

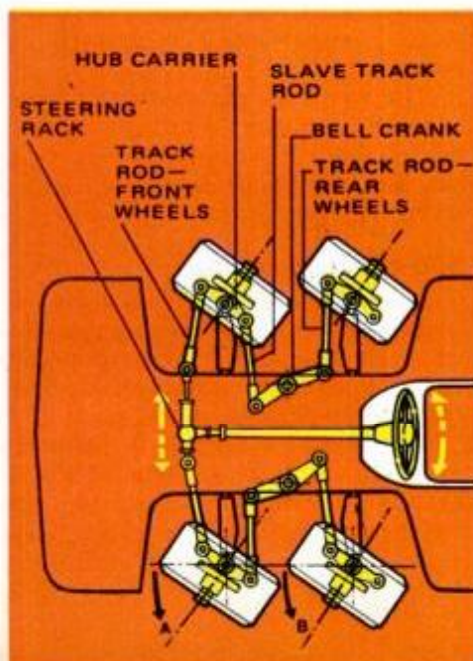
Steering required some attention. With four small tires there's more

self-aligning torque and it took some testing by Scheckter and Depailler to arrive at the best steering ratio (which is quite high but preferred by both drivers). Brakes are venti-



PM art: Ed Valigursky

Operation of the four front steering wheels is deceptively simple. The steering rack turns the front set of wheels in the conventional manner by means of the front track rods. Attached to the rear of the hub carriers, however, are the slave track rods which are connected to the front ends of the bell cranks that pivot as shown at right. Attached to the other end of the bell cranks are the rear track rods. They are attached to the hub carriers of the rear set of wheels to turn them. In turns, the front wheels turn slightly farther than the rears (track angle A less than angle B). Suspension is a conventional double wishbone setup.



lated discs on both sets of front wheels, as shown above, and were perfect as they came off the drawing board—no reworking of balance, displacement or pedal effort needed.

The relatively short wheelbase (wheelbases, actually!) acts to lower the car's polar moment of inertia. Simply, this term refers to the ease or difficulty with which a race car (or any vehicle) can be made to change direction—either by a steering input, or by hitting a bump or taking a side wind. Too high a polar moment and the car's a stone, too low and it's excessively twitchy. The early project car was too twitchy

(Please turn to page 104)

Bruce Jenner designs a home gym with PM

The Olympic decathlon winner and world record holder tells how to stay in shape—plus how he trained for his gold medal performance.

by Mike McClintock
HOME AND SHOP EDITOR

What's your New Year's resolution? Every January 1, millions of Americans solemnly vow to remove excess inches from their bodies. Half an hour is reserved each evening for sit-ups, push-ups and jogging, but somehow, after a few short days of aching muscles, the resolution fades. Well, here's how to get (and keep) a shape-up habit.

PM went to Bruce Jenner, world record holder and Olympic gold medalist in the decathlon, for expert advice on keeping the whole family in shape—and having fun while doing it. Bruce's training philosophy fits right in with this goal. "One reason I was able to keep training

day in and day out was that I really enjoyed it. Even though I'm retired from competition, I still work out every day."

The room we planned with Bruce is small and simple enough to be a reasonable renovation project. Once you set it up, your family will enjoy using it every day.

Too much, too soon

About the biggest mistake you can make is to set up a crushing schedule of exercises and jump right into them. Your body (and your mind) isn't ready for the shock.

Tip No. 1: Start your shape-up program with a *short series of simple exercises*. Bruce says consistency is the key to getting in shape. "Just walking up and down the stairs 5 or 10 times is good for you—as long as

you do it every night. Granted, it'll take you a few months to see results if that's all you do, but even a simple routine *will* get you in shape.

You can sneak yourself into a shape-up program by making an exercise out of some routine you do daily. Whether it's picking up mail or cooking dinner, you can find a minute to jog 50 steps in place or lift a frying pan over your head 10 times. It may sound silly, but if you do it regularly you'll start feeling and looking better. So don't start January 1 with 50 sit-ups—your stomach won't like it.

Although Bruce went through specific exercises for each of the 10 decathlon events, he also trained for general conditioning and stamina.

Tip No. 2: Bruce told us that "for general conditioning, do *more* of



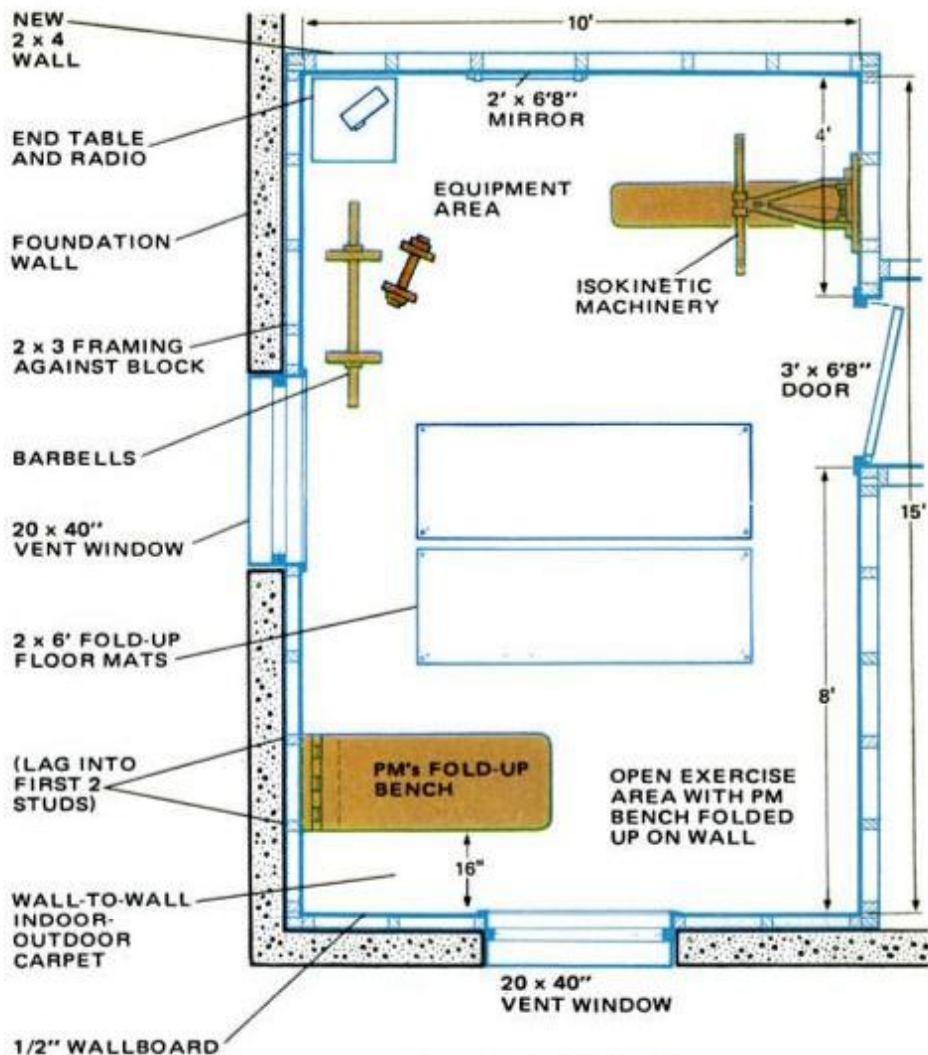
PM photos: Harry Hartman

something *easy*, rather than a *little* of something *tough*." You'll be more likely to stick to your exercises if you can do them at home. If you rely on jogging to keep in shape, a few weeks of bad winter weather can put a crimp in your conditioning.

PM's shape-up room

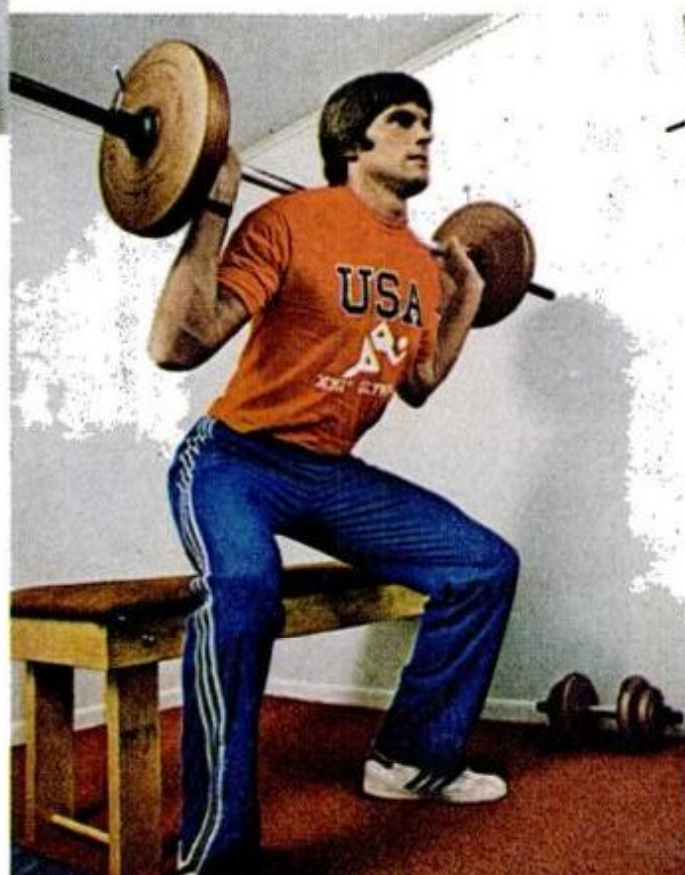
You don't need a lot of building experience to set up your own exercise room. PM's plan (10x15 ft.) is easy to build and will fit nicely into a corner of your basement (see page 119 for construction details). Here are guidelines Bruce gave us on how to set up your room and enjoy it.

- Keep it at a comfortable temperature. It should have some ventilation, but doesn't need special heating or airconditioning.
- The floor should be resilient—



SHAPE-UP ROOM PLAN

PM's plan (10x15 ft.) is small enough to fit into a corner of your basement, but big enough to hold the features recommended by Bruce. Among them are a padded floor (we used indoor/outdoor carpeting), an exercise bench, isokinetic machines, barbells, a mirror and a radio.

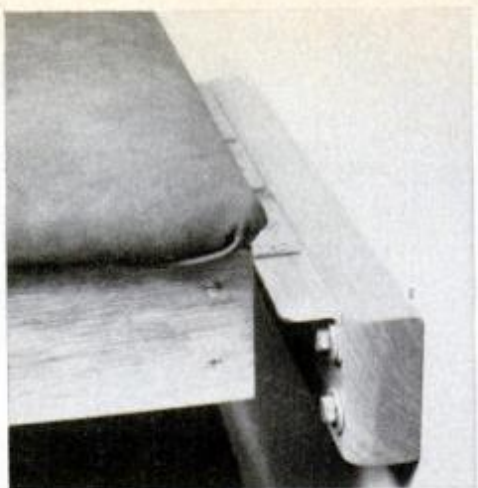


Low basement ceiling (typical in many new homes) is no drawback. Even if you're as tall as Bruce (6-foot-2 and 190 lbs.), you can adapt the way he did by lifting from a sitting position. For general conditioning, he advises a lot of bar motion covering many exercises, with a low weight total on the bar. Don't strain muscles by trying a few big lifts. For decathlon, building strength was not enough. Bruce also trained for speed, stamina and quick explosion with an arsenal of exercises. Long daily routines developed arm muscles known only to professors of anatomy.

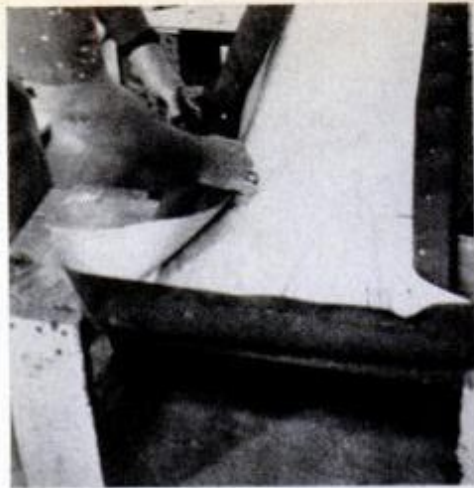
working out on a concrete floor will be hard on your feet. PM's plan calls for indoor/outdoor carpeting to cushion your feet and make the room look attractive. Bruce told us, "A padded floor is fine as long as it's firm—you shouldn't sink into it."

■ You should have an exercise bench. You can use it for bench presses, sit-ups, squat-lifts and other exercises. PM's bench is simple and inexpensive to build. The whole assembly is hinged to a wall so you can fold it out of the way. You can leave the legs tucked up and fold the bench down to the floor for inclined sit-ups.

■ A barbell set is a good investment. For overall conditioning, Bruce says,

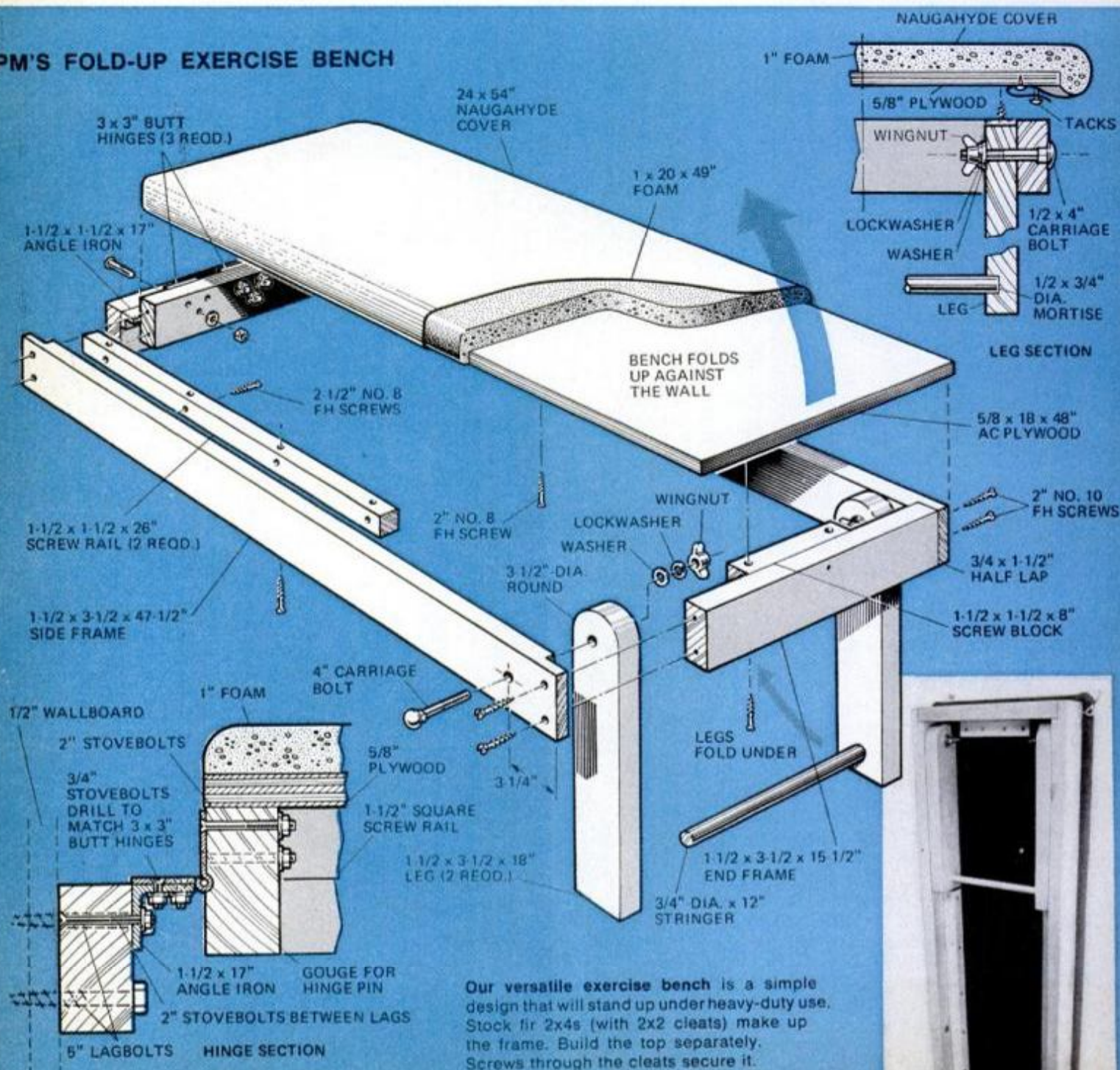


The heavy-duty wall attachment (see the details shown below) lets you fold the bench up and out of the way.



A 1-in. foam pad is wrapped with a layer of Naugahyde to make a comfortable, long-lasting and attractive benchtop.

PM'S FOLD-UP EXERCISE BENCH



Staying in shape



Squat lifts strengthen a lot of muscles simultaneously. Standing, load the bar on your shoulders and balance it with your hands. Bend your knees (head and shoulders erect) until you touch the bench seat. Return to standing.



Overhead presses can be made from a sitting position. A barbell set (like the one that PM used from Sears—about \$40) is a valuable workout tool. Start with a low weight total and work your way up gradually.



Specialized gym equipment is not essential, but isokinetic devices (like the one shown above) are good for all ages. Bruce suggested the mirror and the radio. They'll make your room more attractive and more fun.

Sit-ups are a crucial part of staying in shape. Bruce says, "Sit-ups are really essential. They strengthen your stomach

and your lower back." For the best results, you should hook your feet underneath the bar and bend your knees.



"The idea here is not to lift a lot of weight, but to carry some weight through a range of motion. That's a lot more interesting than repetitive bench presses." Don't try for a big lift right off. Always warm up with some jogging in place or calisthenics. ■ For family fitness, *isokinetic* ex-

ercises are ideal. PM tried one isokinetic device (Mini-Gym, made by Mini-Gym, Inc., Box 266, Independence, Mo. 64051). You tension your muscles by pulling on a counterweighted rope. The resistance will depend on how hard you pull, so

(Please turn to page 118)


Bruce attracts crowds, especially kids. They tried all the gym equipment, stared in amazement at muscles in his arms, and respectfully whispered, "He's the best athlete in the world."



Newest speed machines for snow

Wider tracks, slicker styles, softer shocks and liquid or air-cooled engine options are '77 snowgo features.

by Bill McKeown
OUTDOORS EDITOR



Streamlined ski-strut fairing and lower lines are latest look for Bombardier's orange Moto-Ski Sonic and yellow RV (rotary valve and liquid-cooled) Ski-Doo models.

Fewer makes with more improvements—that's the snowmobile story again this year. The 100 manufacturers of a few winters ago have narrowed down to less than 10, and the survivors are introducing a variety of hot machines for fun in the cold.

Most models are quieter

Practically all new models are now down to moderate noise levels testing out at 78 dB at 50 feet at full throttle, considerably less than many trucks and motorcycles. New trails are also being extended back country to keep drivers away from road hazards, residential areas and private property. The problems of motor racket, trespassing and reckless operation are being tackled by owners, clubs and the industry. Now if the weatherman could just be persuaded to provide enough of the white.

More options

A horsepower race has not developed in the snowgo field since most machines deliver sufficient speed already, but more builders are offering liquid-cooled, free-air and fan-cooled engines. Liquid cooling is reported to supply more even and controlled engine temperatures over conditions ranging from warm melting slush to subzero storms.

Outboard makers drop out

Outboard motor companies have dropped out of the snowmo sweepstakes, but Arctic Cat, Ski-Doo and Moto-Ski, John Deere, Kawasaki Sno-Jet, Massey-Ferguson, Polaris, Scorpion, Skiroule and Yamaha will be skimming the snow fields this year. ★★★



Kawasaki, now selling Sno-Jet snowmobiles, expects soon to offer Kawasaki machines too. Sno-Jets are available in two family Astro models and two high-performance SST units.



Seven models, from new lightweight 250-cc Enticer up to SRX 440 stock racer (above) are in '77 Yamaha line.



John Deere, with a rugged reputation from cross-country marathons, has liquid-cooled 440 Liquifire (left), plus five more models.

Bull Whip rotary-valve liquid-cooled competition machine by Scorpion (right) is newest of 10 models.



Largest line still comes from Ski-Doo with the 11 models at left and additional high-performance rigs to total 17. Bombardier has 12 Moto-Skis.

Polaris Electra (below) features wide 18-inch drive track. New liquid-cooled TX-L tops 11-machine Polaris line.



Medium-price speakers offer top-value sound

PM tests 8 speakers in the price range that gives you the most for your money—plus 2 less-expensive alternates.

by Hans Fantel

“Nothing but the best” is a bust if you want the most for your money in loudspeakers. If you’re a canny shopper, you can pick speakers sounding *almost* like the best at a fraction of the price. In cost/performance ratio, the best of the medium-priced speakers are far better bargains than the all-out best.

With this in mind, PM checked out eight such speakers selling for \$129 to \$169 each.

We found there’s nothing middling about these middle-bracket models. As a group, they put out first-rate sound, satisfying even highly demanding listeners. Improvement beyond this performance level—regardless of cost—will be surprisingly slight, except in low-bass performance below 35 Hz or so. (And those frequencies don’t occur on record all that frequently.)

These “middle-class” speakers differ in several important ways from the small-budget speakers we tested just a year ago (page 66, Jan. ’76). Here’s how:

- Their larger woofers enable them to reach lower frequencies and pump out hefty bass down to about 35 Hz.
- Their heavier magnets let them handle higher power levels without overload distortion.
- Their more sophisticated tweeters give them better treble dispersion, fanning the highs out evenly to just about every part of the room.

Test methods

Judging speakers is partly subjective, because technical specs alone don’t really describe the character of their sound. That’s why, as in previous speaker tests, we pooled the opinions of several experienced listeners. Aside from myself, the listening panel included Ivan Berger, PM’s electronics editor, and Christopher Greenleaf, who, as a restorer of pipe organs, re-builder of pianos, and recording engineer, has a pair of unforgiving ears. The three



SPEAKERS TESTED:

1. Heathkit AS-1373, \$150
2. Avid 101, \$149
3. Advent, \$140
4. Acoustic Research AR-14, \$160
5. Polk 7, \$129
6. Rectilinear 2, \$169
7. Hegeman HB-120V, \$150
8. Hegeman HB-80V, \$84
9. Smaller Advent, \$89
10. Pioneer HPM-40, about \$150

of us agreed on the following criteria for judging speaker quality:

■ **Clarity**—the ability to render unblurred sound, even in full orchestration played at high volume.

■ **Lack of coloration**—letting instruments and voices emerge with their natural tone color, rather than striving for artificial brilliance.

■ **Versatility**—the ability to sound natural and convincing with different types of music: symphony orchestra, small chamber groups, jazz combos, operatic and pop singers.

Technically, the test setup consisted of Pioneer's excellent and inexpensive PL-112D turntable, fitted with Shure's new, superwide-range M24H cartridge, and a Yamaha 800 amplifier, notable for its extremely low distortion. The amplifier's output was fed into a speaker comparator (made by Advent), which permitted instant A-B switching between any pair of speakers in the test group, with all speakers matched in sound volume, regardless of differences in their efficiency.

This level-matching is vital for fair comparison, since the louder of two speakers will always *seem* to sound better, regardless of its true merit. That's especially true if the difference in volume is just a fraction of a decibel, too small to be consciously noticed.

Our test room was about 18 by 25 feet, with plaster walls and a rug, approximating the acoustics of a typical living room. Since speakers gain added bass when they're near a wall or floor, all were raised to bookshelf height, and were placed asymmetrically so that the speakers closest to the wall on one side of the room would be farthest from it on the other.

How they sound

First the good news: All eight speakers tested sounded remarkably good, not a single dud among them. As a group, they had good-to-excellent bass and lucid highs, even at



Test setup included Pioneer turntable (left), Yamaha amplifier (right) and Advent speaker comparator (under amplifier).



Avid 101 had extra tweeters firing left and right for more spacious sound. For floor use only; it won't fit bookshelves.

high power levels, resulting in excellent definition of voices and instruments. Their similarities were more striking than their differences; but if you listened carefully, each speaker's individual character was quite noticeable.

It took a bit of argument before our panel could settle firmly on two favorites: the Pioneer HPM-40 (about \$150) and the Advent (\$140). (The Advent has no model number—it's just known as the "big" Advent to distinguish it from the smaller Advent 2 and "Smaller Advent.") Both speakers sounded fine with all kinds of music, from classical to rock. They have deep but tightly controlled bass (no phony boom), smooth highs, and sound that stays clear even at triple forte.

Yet there were subtle differences between them. The Advent produced a slightly more blended, unified and somewhat more subdued sound. The Pioneer, by contrast, sounded more dramatic and immediate. Its mid-bass tones (the cello's lower range, for example) had more weight, and there was more impact at the top.

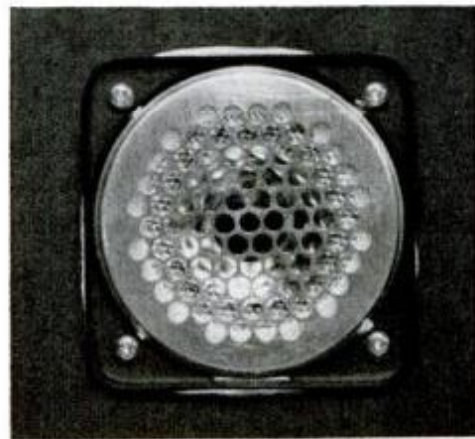
The Heath AS-1373 (\$150), the only speaker in this group to come in kit form, is also definitely of top rank. Its bass is honest, without a trace of false boom, its treble is sweet and evenly spread by its dome tweeter. In fact, the Heath is so good that you just aren't aware of any particular characteristics. (If you take its tweeter control down a

notch at 10,000 Hz, its sound is practically indistinguishable from the Pioneer.) Putting this speaker together from a kit took about six hours and required no special skill except the ability to read the instructions and follow them exactly.

The Polk Audio Model 7 (\$129) came next in the panel's preference. Its sound is so well balanced that you're not aware of any special bass or treble characteristics and, like the other speakers mentioned so far, it sounded well with any kind of music. This wasn't quite true of the remaining speakers in the group.

Rock sound or classical?

The question of whether a speaker should be designed for a particular type of music has been debated by audio engineers for many years. One group of designers favors a natural, unobtrusive sound, while another group likes to put a little extra oomph in the bass, and maybe a bit of sizzle up on top. Listeners with classical tastes generally prefer the



Hegeman tweeter has an aluminum cone for stiffness (to avoid break-up distortion) without high mass and inertia.

first kind of sound; rockers and jazz buffs groove more on the latter, more flamboyant kind. In our group of speakers, though the differences were slight, tendencies in both directions were apparent.

The Acoustic Research AR-14 (\$160) and Rectilinear 2 (\$169) definitely fit the classical pattern: The sound is all there, but nothing shouts at you. The overall quality is restrained, and this kind of balance works beautifully for the sound texture of a classical orchestra. You can listen to these speakers for a long time without tiring of their sound. As one panel member put it, "They don't come on big but they stay with you."

A trace more on the sonically flashy side were the Hegeman 120V (\$150) and the Avid 101. (\$149) The Hegeman rolls out a huge bass, with an obvious hump in the lower



Pioneer tweeter is unique, piezoelectric type. Plastic half-cylinder shown here flexes with signal to produce sound.

part of its response curve. Yet though the bass is emphasized, it is not boomy, because resonances are carefully held in check. The result will appeal to those who like a solid bottom to their music, especially since the Hegeman's special aluminum-cone tweeters produce a bright top end, well matched to this speakers' "big" sound.

The Avid is the only speaker in this group that's not designed for bookshelf mounting (though the others can also stand on the floor). It's a vertical square column with three tweeters near the top: One faces forward, while the others shoot the treble out both sides to create an "ambience effect" through multiple reflections from the walls.

The result is exceptionally spacious sound. However, the side-firing tweeters make the Avid sensitive to where it's placed in the room; unless it's in just the right spot for a particular room, the highs may get jumbled by the multiple reflections, causing phase interference and a loss of clarity. But if properly placed, these speakers produce the kind of "big" sound that appeals to many rock and jazz fans even if it may not quite suit some classical listeners.

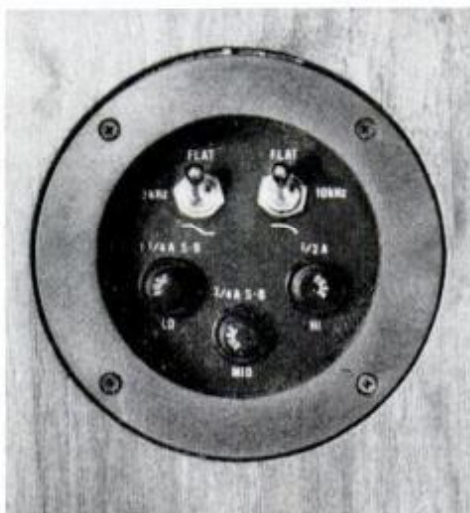
Design details

Several of the speakers tested feature new and unusual design concepts. Pioneer, for example, uses a new principle for the super-tweeter that handles the uppermost frequency range. This tweeter consists of a curved plastic film coated with an ultrathin aluminum film with piezoelectric properties—that is, it expands and contracts in response to the electrical audio signal applied to it, and this movement produces sound. There are no moving parts except the thin film itself—hence there's a minimum of moving mass

and inertia. This accounts for the Pioneer's exceptionally clear highs, and its crisp transient response, which adds impact to drum-beats, plucked strings and other sonic details. The otherwise conventional cones of the Pioneer's tweeter and woofer incorporate carbon fibers, for added stiffness without added mass.

The Hegeman's snappy transients come in part from the unusual aluminum cones of its two tweeters; an aluminum insert in the woofer aids dispersion of the upper middle frequencies.

The Polk speaker owes its exceptional low-frequency smoothness partly to a passive bass radiator cone that isn't driven electrically by the amplifier. Instead, the cone is energized by the back pressure in the cabinet from the real woofer, which is amplifier-driven. The passive cone



Heath "control panel" showed frequency curves for mid-range and tweeter controls, had separate fuses for each driver.

smooths out low-frequency resonances. Polk also provides an angled stand that tilts their bookshelf speaker slightly upward, to optimize sound distribution when it's mounted down at floor level.

Speakers in this group tend to use either sealed, acoustic-suspension enclosures for smoother low bass, or vented enclosures for greater efficiency. (The Polk's passive radiator design is actually a variant on the vented box.)

Efficiency has nothing to do with the quality of sound produced; it merely tells how loud a sound the speaker puts out for each watt of signal it receives from the amplifier. An amplifier output of 20 watts per channel suffices for any speaker in this group, so unless you have a very skimpy amplifier, efficiency needn't be a major concern. If it is, though, the Avid was the most efficient of the group, followed by the Rectilinear,

Polk, Hegeman, AR, Advent, Pioneer and Heath, in that order.

Most speakers in this group are two-way systems, with woofers handling the low frequencies and tweeters handling the highs. Heath and Pioneer are the only three-way systems, each with its own approach: Pioneer splits off the uppermost highs (10-25 kHz) for its super-tweeter. Heath divides the spectrum differently, feeding frequencies between 500 and 3000 Hz to a separate, 4½-inch mid-range driver. Assigning the mid-range energy to a separate driver gives the Heathkit by far the greatest power-handling capacity of the group; it will take program output from amplifiers rated as high as 200 watts per channel, without risk of damage.

Class warfare

Our final comparison was deliberately unfair. We matched the top models in this medium-price group against the best of the budget speakers we tested in last January's issue, to hear just what the more expensive class of speakers give you for the extra money.

Just as we'd expected all along, the more expensive speakers had deeper bass and greater power-handling capacity. But in the treble clarity and dispersion, the two stand-out budget speakers (the Advent 2-W, \$74, and Hegeman HB-80V, \$84) were practically equal to their more expensive counterparts.

Listeners who can do without the lowest frequencies, and who don't play their music loud, can save a chunk of money by opting for the smaller speakers. But our listening panel felt that the bigger speakers' extra lows and their easy sound when the musicians really cut loose do make a big difference—and in our opinion, at least, are worth the extra cost. ★★★

WHERE TO WRITE FOR INFORMATION

Acoustic Research, 10 American Dr., Norwood, Mass. 02062

Advent, 195 Albany St., Cambridge, Mass. 02139

Avid, 10 Tripps Lane, East Providence, R.I. 02914

Heath, Benton Harbor, Mich. 49022

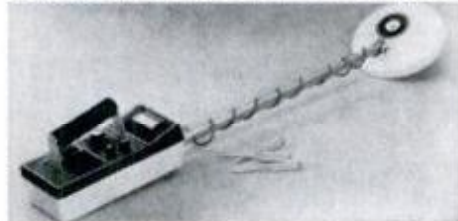
Hegeman, 555 Prospect St., East Orange, N.J. 07017

Pioneer, 178 Commerce Rd., Moonachie, N.J. 07074

Polk, 4900 Wetheredville Rd., Baltimore, Md. 21207

Rectilinear, 107 Bruckner Blvd., Bronx, N.Y. 10454

IT'S NEW NOW



Treasure finder with claim stake

Metal detector for treasure hunters has a search coil allowing a prospector to mark the exact spot of a find with a "tee" that's inserted into the ground through a slot. The accurate "claim" marker is said to reduce probing and digging. Three models offer a variety of features including a waterproof case for stream-bed searching. Prices range from about \$50 to \$230. Treasure Sensor Corp. 4215 McEwen Rd., Dallas, Tex. 75240.

Solar reflective glass for summer comfort

The same bronze-tinted glass used in skyscrapers now comes in $\frac{1}{8}$ and $\frac{3}{16}$ -inch heat-reflecting panes for single or multiple glazing in home windows and doors (below). The $\frac{1}{8}$ -inch Solarcool pane transmits 60 percent less solar heat than clear glass, reducing airconditioning cooling load. It cuts out 80 percent of ultraviolet light—cause of fabric and carpet fading. Visible light is reduced 70 percent, shading the interior from bright sun. The removable Solarcool panels can be replaced in winter by clear storm sash to let in light and warmth. PPG Industries, Inc., One Gateway Center, Pittsburgh, Pa. 15222.



Ten-inch power miterbox makes quick angle cuts

Easier operation, greater stability and less operator fatigue are claimed for this new self-powered miterbox run by a powerful $1\frac{1}{2}$ -hp gear-drive motor. A trigger-release miter-pivot handle and lock, operated by one hand, permits fast, smooth miter angle selections up to 47° in either direction. There are also five positive precision stops at 0° , $22\frac{1}{2}^\circ$ and 45° to the right or left. Another feature of the power tool is an automatic brake. A higher pivot point on the arm, lower center of gravity, and an open handle are said to allow easy operation with either hand. A lock-off switch prevents accidental starts and insures against use by unauthorized persons. A removable blade guard permits quick blade changing. About \$240 at retail outlets handling Black & Decker DeWalt tools.



Chain mail for truck tires

Heavy-duty trucks operating in a Swiss cement quarry ran through tires in only 500 hours of use, the tread being chopped to ribbons by sharp-edged rocks. Now the tires wear flexible chain-mail armor that provides a lacework of steel mesh over the tread surface, allowing tires to ride over razor-sharp rocks without slashing the rubber. Trucks equipped with the Erlau chains, shown at a recent Hanover, Germany, fair, have survived 12,000 hours without damage.



Compact bore-sight does it without a shot

When your scope points one way and barrel another, the usual solution is to head for the nearest gunnery range. Now a "Cross Preset Bore Sighter" allows sighting-in anyplace, including your den or family room, without firing a shot. The unit consists of a simple, pocket-size device with a socket into which the muzzle of the gun is inserted. An artificial target attaches to top, then unit is preset to the rifle's bore and scope setting for quick checks. Kit price for specific rifles is about \$40 from Stefco Enterprises, 17838 S.E. Lincoln St., Portland, Ore. 97233.

Return with us now to those thrilling days of yesteryear, when radio listeners crouched over crystal sets, black headphones clamped over their ears, as they adjusted a "cat's whisker" and a coil in the hopes of hearing one of the few stations then on the air.

But don't laugh. Because those crystal sets, simple as they were (any child could build one—and most boys did), were forerunners, in their way, of today's solid-state radios. In fact, you can build one today around a modern, solid-state crystal diode.

You've certainly heard about those crystal sets of yesteryear, but you may never have realized exactly what they were. They were very popular, though, back when radio (and PM) were young—first because vacuum tubes hadn't been invented yet, then later because tubes were scarce and terribly expensive, and also because the batteries to

run tube sets were a further nuisance and a further—and constant—expense.

The ingredients of a crystal set were—and remain—simplicity itself: There's nothing to one but a coil, a variable condenser, a crystal and a headset, plus a long, plain wire as an antenna.

Just for fun, and to rehear the kind of reception that our fathers and grandfathers heard, try building a crystal set. Using inexpensive, store-bought parts, you can build this receiver for about \$5.

You'll be surprised at the purity of its tone, too. Since the crystal set has no amplification, no tubes and no transistors, its distortion is just about zero. Voices and music sound pure.

However, it has its drawbacks. Since there's no amplification of the incoming signal, the set is not too sensitive—it can only receive strong signals from powerful or nearby stations. And since it has but a single

Build a crystal set—the original solid-state radio

by Conrad Miller



tuned circuit and no intermediate-frequency (i.f.) amplifier to act as a filter, it's unselective—it has a hard time separating signals from different nearby stations unless their frequencies are quite far apart.

But we can forgive its weaknesses. After all, it uses no power, has no batteries, no tubes or integrated circuits, so there's nothing to wear out, and no expense beyond the original cost of building it.

The crystal set's theory of operation is as simple as its construction: The coil and condenser together make a tuned circuit that resonates within the broadcast band. The diode acts as a detector, rectifying the signal to strip off the radio-frequency carrier and leave only the audio information. The schematic shows how little there is to it. Hooked up as shown and attached to a long antenna and a good ground, the set should pull in several stations.

They used to call it a 'cat's whisker'

In the good old days, the coil would have been hand-wound, and the detector would have been an open crystal of galena, touched lightly by a fine wire called a "cat's whisker." Since open galena crystals are hard to find these days, we opted for a modern germanium diode (1N34 or similar), costing about a quarter. But that's the only modern part of the set.

We did roll our own coil, the good, old-fashioned way. Our coil form was a Diamond Crystal salt box, (which seemed appropriate). Salt or oatmeal boxes were standard ingredients of crystal sets, and any round box or cardboard tube of 3¼-inch diameter will do. But avoid boxes or tubes with metal ends or end rings.

The coil is basically one piece, tapped at both ends and in the middle. The primary portion comprises 14 turns of No. 24 AWG enameled wire, and the secondary takes 24 turns. Both coils are tightly wound, with no space between turns or between the primary and secondary windings. Use Scotch tape to hold the windings in place.

The precise number of turns on the primary winding

isn't critical. But the number of turns on the secondary determines what part of the broadcast band the set will receive. Test your coil in your set. Should the rig receive only stations toward the bottom of the AM band (550 kHz), remove a few secondary turns as required to receive the entire band. When the coil assembly works to your satisfaction, you might want to apply a coat of varnish, or spray it with clear Krylon.

Hand-wound coil is best

If you don't want to wind your own coil, you can use a factory-made broadcast-band antenna coil or ferrite loop stick of about 240 microhenries inductance, such as a Miller No. 2004 antenna coil (about \$2.80). But the signal is much louder with the hand-wound, salt-box coil than with the commercial one (which, frankly, delighted us).

The variable tuning condenser should have a value of about 365 picofarads (pF)—a standard value—such as Calectro's No. A1-227 or Radio Shack's No. 272-1344.

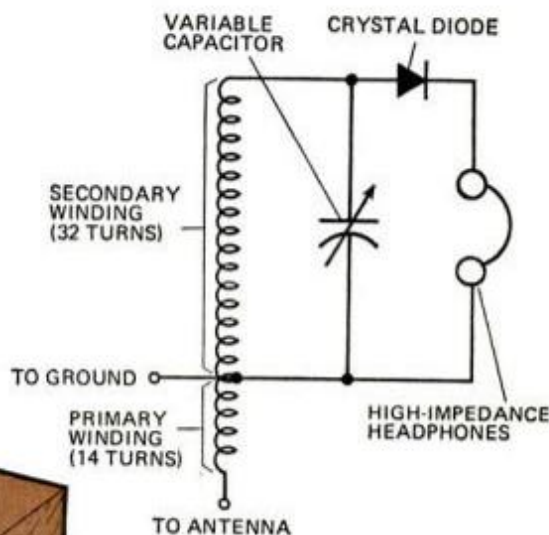
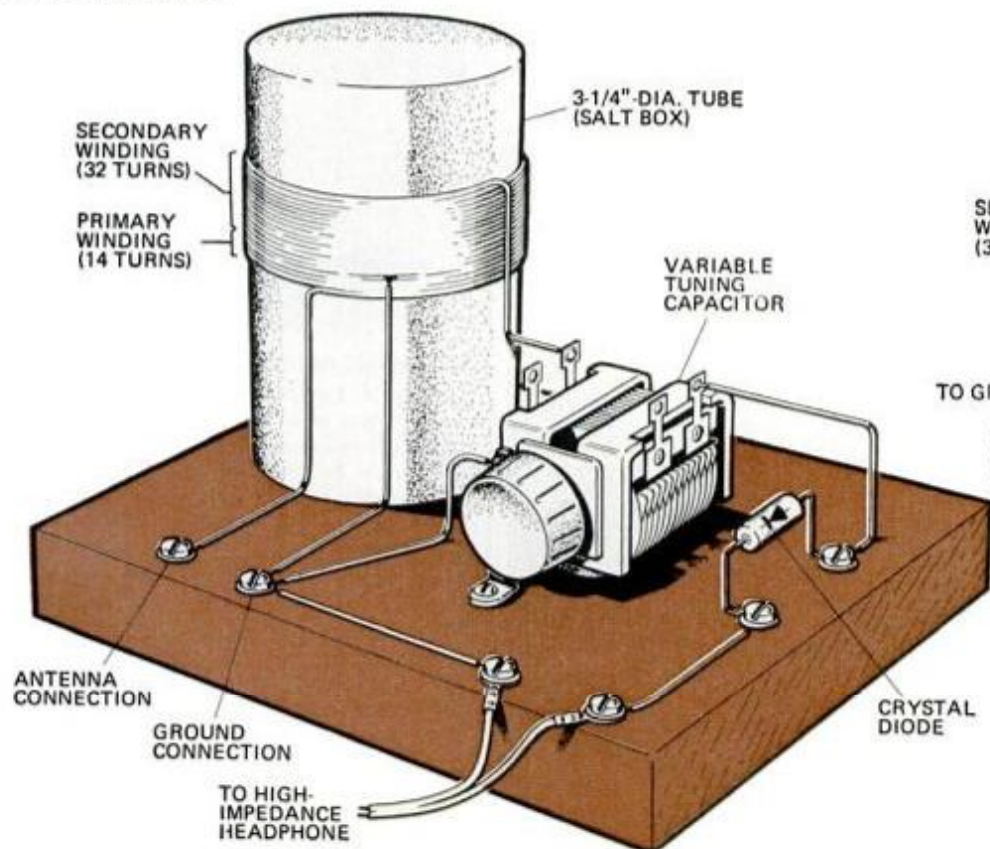
The headphones must be high-impedance types—2000 ohms or more—not hi-fi headphones, which are typically 8 ohms, and rarely more than 600. We used a Saxon No. 285, priced at \$3.35; you could also use Cannon BA-2 (Lafayette 40 P 81071, \$4.15) or BA-5 (40 P 81097, \$4.70) or Lafayette's lightweight, stethoscope-type 99 P 25504 (\$2.59).

A long antenna is a must

One more thing is essential: a good, long antenna, the longer the better. 50 feet is about the minimum, 100 feet is very good, and 150 or 200 feet is great. String the antenna between buildings, poles or trees and bring a lead-in to the set. Since the antenna could attract lightning, it's a good idea to provide a lightning arrester, or to ground the lead-in wire to a water pipe when you're not listening to the set.

A good ground connection is also required: Attach the ground to a water pipe or radiator, keeping the lead as short as practicable. ★★★

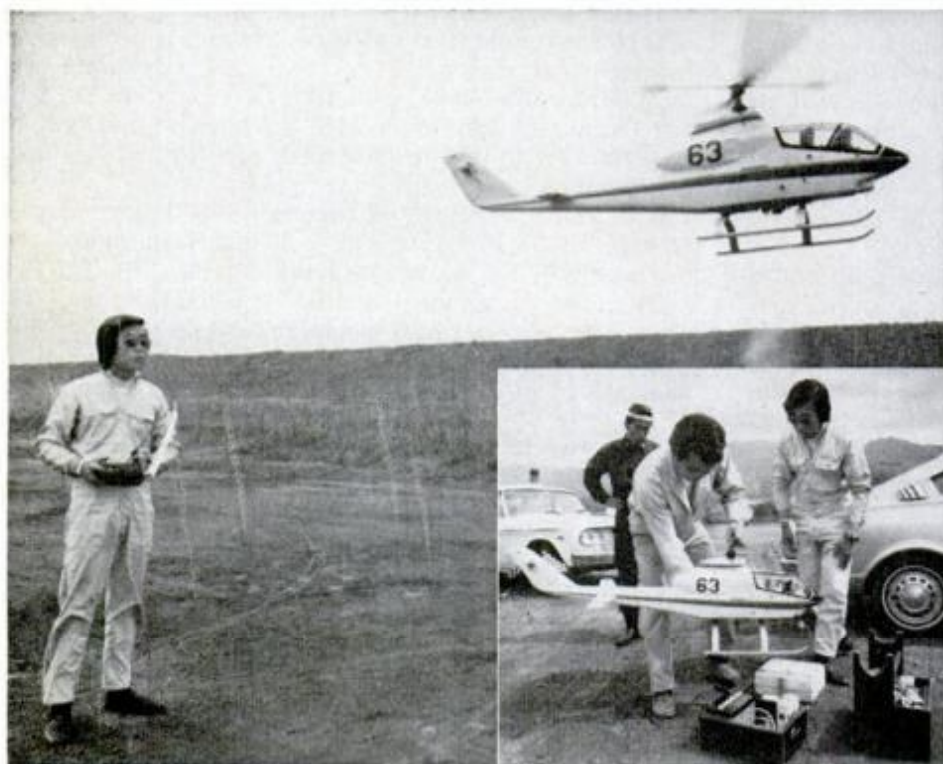
PM art: Walken Graphics



PARTS LIST

- Germanium crystal diode, 1N34 or equivalent (Lafayette 32 P 8774V)
- Variable condenser, about 365 pF (Calectro A1-227, Radio Shack 272-1344 or 272-1341)
- High-impedance headphones (Saxon No. 285, Cannon BA-2 or BA-5)
- 3¼"-dia. salt or oatmeal box
- No. 24 AWG enameled wire (Lafayette 278-004)

IT'S NEW NOW



Radio-controlled mini-chopper rescues mountaineers

Only four feet long, a scale-model helicopter, electronically controlled from the ground, is a working aircraft especially designed for Japanese police. It is used in rescues, carrying lines to climbers stranded on rock ledges or remote places inaccessible to full-scale craft. It also mounts cameras for aerial photography.



Power-out won't stop the clock

When power kicks off in a storm, the clock in this new electronic digital clock-radio doesn't—thanks to a "power reserve" feature that keeps the clock circuit working up to four hours in a power failure. Though the digits disappear, a rechargeable battery keeps the clock circuit going. When power returns, the digits reappear. A flashing light signals that a time-set button must be pushed to reset the circuit. Three models in Zenith's 1977 line, available through most radio retail stores, range in price from about \$50 to \$100.



Wipe-on varnish saves time

Brush marks, runs and "missed" areas are said to be eliminated with a clear phenolic resin varnish that can be applied to furniture and other interior surfaces (except floors) with a lintless cloth instead of a brush. What's more, the wipe-on technique requires less time and produces a more even finish. The varnish dries to a hard, semigloss finish that the makers claim is resistant to spills from hot or cold water, alcohol and most other liquids used around the house. Called Wipe-on ZAR, the new varnish is available at most hardware and paint stores. United Gilsonite Laboratories, Box 70, Scranton, Pa. 18501.

Pressurized can alarm system

Burglars or fires are detected by a system that uses a pressurized sensing line. Burglar alarm is triggered by a window or door being opened, causing energy stored in a power cell to blast a 119-decibel trumpet. Fire alarm involves metal heat fuses in strategic locations. "Knightguard" is made by John Weil Co., 1770 Lexington Ave., New York, N.Y. 10024.



Water-jet skimmer for two

Only 11½ feet long overall and 4½ feet wide, a hot new two-seater water jet is so highly maneuverable she can be spun around in her own length at full speed. The boat, called the "Meteor," is fiberglass in a monocoque construction—a water-jet version of the Seafire powerboat. She is rammed through and over the water by a 637-cc twin-cylinder Rotax two-stroke, water-cooled engine that develops 40 hp. As indicated by the top photo above, there are no projections beneath the hull that can be damaged. Built in Britain by Almarine, Ltd., the craft is available in America from KMS Marine, Krause Rd., Edwardsburg, Mich. 49112.



Popular Mechanics was started in 1902, a year before man flew in a powered plane, 67 years before man landed on the moon. Since 1902, the ways we work and live have been drastically changed by science and technology. Here, 12 prominent Americans identify key developments of the past 75 years and look to the 75 years that lie ahead.

What were the most significant inventions and discoveries over the past 75 years? What major developments can we look to in the future?

The editors of *Popular Mechanics* put these questions to a panel of experts. Some respondents restricted their views to their own field; some cast an eye over the entire spectrum of science, technology and industry. Whatever their approach, all contributed thought-provoking papers to the "forum" created to mark the 75th anniversary of the founding of PM.

One of the first contributions to reach the editor's desk was that of Dr. Morris Fishbein, the well-known writer, editor and spokesman for organized medicine. The *Popular Mechanics* staff notes with sadness that he died at age 87 while this editorial was in preparation.

PM editors also chose significant inventions, discoveries and events of the past 75 years. Their choices appear below the experts' views.

Harold C. Urey

A university teacher for many years, Dr. Urey was awarded the 1934 Nobel Prize in chemistry for work in heavy hydrogen.



The important discoveries of the last 75 years are those of the quantum theory by Max Planck and the discovery of relativity by Albert Einstein. E.O. Lawrence's development of the cyclotron and Otto Hahn and Lise Meitner's discovery of fission were very important experimental, scientific and engineering developments. The flights to the moon and Mars were the culmination of an enormous engineering development during the past 75 years.

There have been outstanding discoveries in chemistry and biology. A most important discovery in biochemistry was made by J. D. Watson and F. H. C. Crick in the development of the mechanism by which deoxyribonucleic acid (DNA) carries the inheritance characteristics in animals.

My predictions of the future are not definite, and are perhaps discouraging. I hope this is not true. Possibly science and engineering are going to give us more trouble in the future.

The nuclear bombs, in particular, are very frightening, and, up to the present time, we have prepared a method of destroying all civilization and perhaps the human race. Possibly the great fright from these bombs will

finally induce people to be more careful with them.

We are trying to do things by modifying the genes which might, if applied to people, make difficulties. We also hear reports that we will cure old age and people will live twice as long, thus increasing a population that is growing too rapidly all over the world.

Glenn T. Seaborg

Former chairman of the Atomic Energy Commission, Dr. Seaborg shared the 1951 Nobel Prize in chemistry. He is a co-discoverer of several elements.



I would identify the key developments in the field of nuclear science as follows:

1. Discovery of radioactivity by Becquerel in 1896.
2. Discovery of polonium and radium by the Curies in 1898.
3. The conception of the nuclear atom by Rutherford in 1911.
4. The first nuclear transmutation effected by Rutherford in 1919.
5. The first nuclear transmutation by artificial means by Cockcroft and Walton in 1930.
6. The invention of the cyclotron by Lawrence in 1929-30.
7. The discovery of artificial radioactivity by the Curie-Joliotis in 1934.
8. The discovery of fission by Hahn and Strassmann in 1938.
9. The synthesis and identification of the transuranium elements beginning in 1940.
10. The first nuclear chain reaction under the leadership of Fermi in 1942.

I think that the most significant development in science and technology during the next 75 years will be in the general area of biology and biochemistry—possibilities include great advances in genetic engineering, the artificial creation of life, a significant slowing of the aging process, and a greater understanding of the functioning of nerve and brain, leading to control of our memory.

Harold E. Edgerton

Professor emeritus at MIT, Dr. Edgerton is best known for inventions in field of stroboscopic high-speed photography.



Congratulations to *Popular Mechanics* magazine on attaining its 75th anniversary and best wishes for continued success.

The development of practical electronic flash photography occurred during the past 40 years, which is well within your time bracket. True, there were much earlier applications of sparks for photography at a prior period.

The flood of applications came just before World War II. Since then, the tempo has increased so that today electronic flash equipment is at work almost everywhere.

The next 75 years will see many specialized uses in science and industry of electronically produced flashes of light.

I feel that such developments are necessary due to the lack of ability of the human eye to "see," to observe, or to evaluate everything or anything that operates quickly.

Morris Fishbein, M.D.

Writer and educator, Dr. Fishbein was long associated with the *Journal of the American Medical Assn.*



I would say that the outstanding developments of the last 75 years have been the vitamins, which were given that name in 1910; insulin around 1918; liver extract, culminating in vitamin B12 (for pernicious anemia) around 1920; Domagk's discovery of the sulpha drugs in 1930, and the antibiotics, beginning with penicillin and now including 20 or more commonly used, by 1940; the discovery of cortisone in 1936 by

Kendall, Hench and Reichstein.

Next come the mind-controlling drugs beginning with the tranquilizers and proceeding to the mind-stimulating drugs; more recently, those that have revolutionized psychiatry by enabling earlier discharge from institutions of patients whose mentality has been disturbed by schizophrenia, manic-depression, and mood-changing drugs.

There have been innumerable investigations which can be grouped under the immunology of cancer, including those which make the outer edges of the cancer cells susceptible. Already, certain forms of cancer are yielding. This includes a combination of cancer-static chemicals used, for instance, in leukemia.

Perhaps the discovery most to be anticipated in the next 20 years will be a chemical substance that can delay the changes brought about by aging in the brain and perhaps some specific, widely effective antiviral chemicals.

Peter C. Goldmark

An electronics expert, Dr. Goldmark is well known for his development of the LP record.

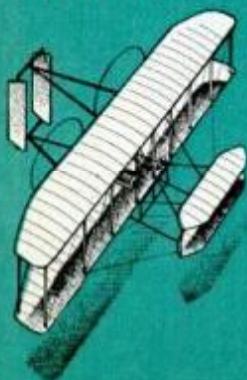


It's befitting that, on the 75th anniversary of *Popular Mechanics*, we assess the role that science and technology have played in man's development. Seventy-five years is virtually a record in the life of a magazine, yet these years represent almost half of the most crucial period in man's history during which he brought about the most radical changes in the world around him.

I've tried in a single graph to illustrate the impact of science and technology over the past 10,000 years in terms of change. The horizontal section of the curve with the dashed extensions shows man's physical, mental and behavioral development, which according to anthropologists have remained essentially constant during this period.

1902-1910

First successful electric typewriter—Blickensderfer Electric—marketed in United States (1902).
First powered flight.



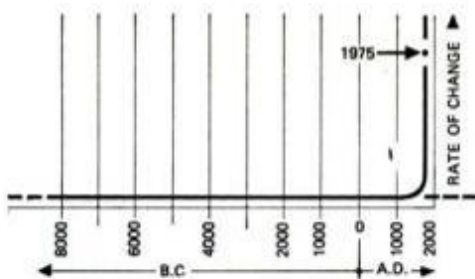
Orville Wright (1903).
First car—a Gobron-Brillie—driven over 100 mph in Belgium (1904).
Diode radio tube invented by Fleming in Britain (1905).
Auto safety glass patented in Britain (1905).
Einstein publishes "Special Theory of Relativity" (1905).
First electric washing machine—the Thor (1907).
First photocopier—the Rectigraph—marketed in the United States (1907).
First neon light displayed in Paris (1910).
Steel-shafted golf club U.S.-patented (1910).

1911-1920

Deico self-starter, designed by Charles Kettering, demonstrated (1911).
Gyrocompass invented by Sperry (1911).
X-ray tube invented by Coolidge (1913).
Cellophane manufactured in Paris (1913).
Heterodyne radio receiver developed (1913).
Aspirin marketed in tablet form (1915).
First direct transatlantic telephone conversation—between United States and France (1915).
First motorscooter—produced by Auto-Ped



Co., New York (1915).
Mass spectroscope developed (1918).



The factors which were combined in the vertical axis are typical data reflecting the developments in science and technology, such as population growth, life expectancy, power of explosives, speed of travel and energy use.

But the sudden upturn of the curve, which occurred only during the last 200 years, also indicates the alarming rate at which we are consuming our irreplaceable resources. The extremely rapid changes now pointing in a vertical direction were neither anticipated nor planned and the slow rates prevailing during most of man's history did not equip us to cope with the critical stresses and strains that befell our civilization.

Because our national resources are far from inexhaustible, the trend of this runaway curve must be stabilized.

We should assess, in the most critical way, where we are and where we are heading as a nation.

Admittedly, it is difficult to think no longer of America as a country of plenty. Since our birth, not only did our population multiply more than 50-fold from the initial 4 million, but our appetite for our earth and environmental resources multiplied as well. They are indeed being exhausted at a rate far higher than they can be replenished.

But we have hardly begun to put to use our human resources, which could reshape our way of life to create long-term stability without the loss of quality.

To accomplish this, it is urgent that we match our needs to our resources and redirect our scientific and our industrial strength toward this end.

- Automatic toaster invented (1918).
- All-metal plane, a Junkers, made in Germany (1918).
- First nonstop transatlantic flight—from Newfoundland to Ireland—by Capt. John Alcock and Lt. Arthur Whitten-Brown (1919).
- First international airline service begun—between Paris and Brussels (1919).
- Factory-made radio sets for home listening made by Westinghouse (1920).
- First successful flight of gyroplane (autogyro) in Spain (1920).
- First car—a Duesenberg—to be equipped with hydraulic brakes (1920).

1921-1930

- Insulin isolated by Dr. Banting, Toronto (1921).
- First canned baby food, Rochester, N.Y. (1922).
- First electric windshield wipers produced (1923).



Frank Borman

Chief executive officer of Eastern Airlines. Mr. Borman commanded Gemini 7 flight and Apollo 8, the first lunar orbital mission.



The 75th anniversary of *Popular Mechanics* virtually coincides with the first 75 years of aviation. In 1903 the Wright Brothers conducted their successful experiment at Kitty Hawk, certainly the key that unlocked the future of aviation.

Another major development came the following year, with the invention of radiotelephony. Although it was to be years before aviation and radio became intertwined, there can be no doubt that the applications of surface-to-air and air-to-air radio voice transmissions represent a major breakthrough for aviation.

Twenty years after the Wrights flew their fixed-wing craft, Spanish aeronautical engineer Juan de la Cierva successfully tested his autogyro, a rotary-wing prototype of today's helicopters.

The next major step forward in aviation history took place in 1938, with the development and practical application of radar—Radio Detecting And Ranging device. Like many other developments, this tool was developed for wartime use, to be converted in peacetime as a key element in safer, efficient air transportation.

One year later, in 1939, Englishman Frank Whittle developed the first jet propulsion engine for powering a full-size aircraft. While there have been numerous major revisions and improvements on his initial concept, his achievement ranks as a major development in the aviation field.

The final major development in the first 75 years of aviation occurred in 1957 when the Russians successfully launched Sputnik I, and took the world into the Space Age.

While the reader may not agree with my selection of these six major 20th century developments, I believe they represent unique, first genera-

tion efforts which opened entire new fields of aviation endeavor.

Looking 75 years ahead, about the only certainty is that even the wildest crystal ball would produce understatement, underestimation, inadequacy. Today's scientific mind cannot foresee transportation systems at warp speeds using next week's science fiction for the next year's human accomplishment.

Walter M. Schirra Jr.

Retired Navy captain, now executive of Johns-Manville Corp., Schirra commanded Gemini 6 and Apollo 7 space flights.



To my mind, the key event that moved us from the age of aviation into the age of space was the successful orbiting in 1957 of the Russian Sputnik. There had been significant developments before that: the early Chinese rockets, the work of Robert Goddard and the work by the Germans at Peenemünde. Though Sputnik was nothing more than a small beacon in the sky broadcasting a beeping tone at regular intervals, it had a tremendous impact on all of us in aviation. I was in the Navy Test Pilot School at Patuxent River, Md., at the time and I recall thinking that I was finishing a test report on an airplane that went about Mach .95 (a little over 700 mph) while overhead a small vehicle was circling the Earth at 18,000 mph.

After World War I, it took years to "sell" aviation to the world, but a tiny Sputnik sold space to the world in one day. Our first manned flight was in '61—I had orbited in '62, '65 and '68—and we had men on the moon by '69. Those events were significant, but also inevitable. The most exciting event since then was landing the Vikings on Mars. These vehicles, carrying highly technical equipment, have demonstrated that we can send unmanned vehicles on lengthy probes, land, do a job and communicate find-

- First Leica camera made in Germany (1924).
- Dynamic loudspeaker developed (1924).
- Successful firing of liquid-fuel rocket by Robert Goddard (1926).
- Mechanical scanning TV systems developed in Britain and United States (1926).
- First successful talking picture—*The Jazz Singer*—shown. (1927).
- First nonstop transatlantic solo flight—by Charles Lindbergh (1927).
- Penicillin discovered by Dr. Fleming, England (1928).
- Cyclotron particle accelerator invented by E.O. Lawrence (1930).

- First individual frozen-food packs sold in United States (1930).

1931-1940

- Electron microscope, Germany (1931).
- Electric razor invented (1931).
- First nonstop flight between Japan and United States by Clyde Pangborn and Hugh Herndon (1931).
- Neutron discovered by Chadwick, England (1932).
- Radar developed in Germany (1933).
- First parking meters used in Oklahoma (1935).
- Cortisone developed (1936).
- Nylon developed by Du

ings back to Earth.

In the years ahead, our exploration of the universe will have to be with unmanned vehicles. Man must be aware that it is not easy for us to leave this planet. To go some place else in the universe is, in fact, one difficult task. Traveling at the speed of light, it takes about 1.25 seconds to reach the moon, 8 minutes to reach the sun and 4.3 years to reach the next nearest star. So with that as a yardstick, many people tend to believe that you just don't go to many places—even with unmanned probes.

In the foreseeable future, there may be more manned flights to the moon, and I think we'll definitely see larger space laboratories in Earth orbit. I hope that someday there will be a manned flight to Mars. But that would be well beyond the time frame of the next 50 years.

Henry Ford II

Mr. Ford is the grandson of the automobile pioneer. He has been the Ford Company's chief executive officer since 1960.



In 1902 when *Popular Mechanics* was just getting started and Ford Motor Company was still a year away from being founded, it would not have been possible to predict the developments in science and technology that the auto industry alone would produce in the next 75 years.

The growth of the United States during the past 75 years was made possible by the unprecedented convenience, flexibility, comfort and low cost of motor vehicle transportation. You can't look back within this time span without focusing on the Ford Model T. The "Tin Lizzie" chugged into history on Oct. 1, 1908, and started a rural revolution. It became the symbol of low-cost, reliable transportation and is credited with putting the world on wheels.

In 1913 and 1914, the moving assembly line was introduced into automotive industry and it started an indus-

trial revolution. My grandfather reasoned that with each workman remaining in one assigned place the automobile would take shape more quickly as it moved from section to section, and countless man-hours would be saved. He eventually saw Model Ts rolling off the assembly line at the rate of one every 10 seconds. The moving assembly line, with later refinements, pointed the way to mass production and mass distribution.

In the same era, the \$5 day started a social revolution. On Jan. 5, 1914, the Ford Motor Co. announced a minimum wage of \$5 a day for eight hours of work—more than double the existing minimum rate for nine work hours. My grandfather felt that since it was then possible to build inexpensive cars in volume, more could be sold if employees could afford them. From \$5 a day, the average U.S. hourly labor cost for our company rose to \$10.96 per hour in 1975.

The industry's early years also produced more than just automotive advances. In 1925, the Ford Tri-Motor airplane carried the first commercial airmail in the United States and was used by the country's first commercial airlines. Other historic highlights were the introduction of the V8 engine and Detroit's conversion, almost overnight, from peacetime to World War II wartime production.

The most significant development in recent years has been the shift of forces governing our decisions from the marketplace to the political arena. Our greatest concern lies in the outlook for escalating government regulation. I am confident the auto business will survive in this atmosphere, but I'm not overly confident that more regulation can avoid unnecessary higher costs for customers.

As for what technology can be expected in the next 75 years in the transportation business, I cannot provide a definitive picture of the automobile and the automobile business over the next 20 years—much less for the more distant future.

By 2052, however, I am sure that the form of our personal transportation is certain to change dramatically,

partially because of the potential of automotive electronics. But, changed though vehicles may be, I am reasonably certain that personal transportation bearing some resemblance to what we know today will be in use.

Margaret Mead

A noted anthropologist long associated with Columbia University, Dr. Mead is curator emeritus, the American Museum of Natural History.



Cultural anthropology was just becoming a science at the turn of the century, with its own research methods as distinct from armchair philosophizing on the basis of the reports of travelers and missionaries. The concept of culture, as human learned behavior transmitted by all the members of a society to its children, and between adults of different societies (diffusion and acculturation), required ways of recording material which could be re-analyzed by other scientists.

These methods have proceeded from the phonetically recorded verbatim text, sound recordings of speech and music, photographic, cinemagraphic and videotaped recordings. The development of theory has gone hand in hand with instrumentation so that the better the instrumentation, the more human and inclusive the record became, in developing a human science dependent upon the cooperation between disciplined strangers and cooperating natives, to produce a product which neither could produce alone.

Roy D. Chapin Jr.

Mr. Chapin, chairman of the board of the American Motors Corp., entered industry in 1938 as an experimental engineer for Hudson Motor Car Co.



Popular Mechanics and American Motors in 1977 share one thing in

Note: Dr. Mead's comments originally appeared in the March 1976 issue of Science, © AAAS; 1976.

Pont (1937).
Xerography invented (1938).
First jet—Heinkel He 178
—flown in Germany (1939).
Plutonium produced at the
University of California
(1940).



1941-1950

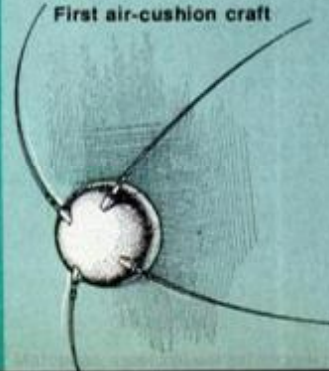
Aerosol spray developed
(1941).
Chain reaction of uranium

by Enrico Fermi (1942).
Ballpoint pen patented in
Argentina (1943).
Streptomycin developed
(1945).
Electronic computer
(ENIAC) developed (1946).
Transistor invented (1947).
Polaroid Land camera
invented (1948).
Long-playing record
invented by Dr. Peter
Goldmark (1948).
Aureomycin (antibiotic)
developed (1948).

1951-1960

Double helix structure of
DNA (top, left) established
(1951).
Polio vaccine developed

by Dr. Jonas Salk (1953).
First nuclear sub, the
Nautilus, launched at
Groton, Conn. (1945).
Sputnik, first artificial
satellite, launched by
Russia (1957).
Van Allen belts discovered
(1958).
First air-cushion craft



common—they both are observing their 75th anniversaries. In fact, the two organizations were born scarcely a month apart.

Over the 75 years that have passed since the first one-cylinder Rambler car was built in Kenosha, Wis., in February 1902, American Motors and its forerunner companies have produced nearly 20 million passenger cars, commercial vehicles and trucks. We have made numerous contributions to the growth of the industry.

In the Hudson we introduced one of the most successful, high-performing six-cylinder cars ever built; in the 1922 Essex coach, we introduced the first low-priced closed car to be produced in volume; in the Nash, we gave the automotive world frameless single-unit construction, fresh-air heating and practical, low-cost conditioning; in the modern Rambler, we introduced the first compact car; in the Gremlin, we brought out the first subcompact car, and in the Pacer we introduced the industry's first wide small car.

Importantly, over the years we have pioneered in countless new ideas—all part of a corporate "philosophy of difference," under which we strive to offer the American motoring public a wider choice.

As we move forward in serving the transportation needs of a growing and expanding America, I believe the most significant change we can look to will be the development of alternate sources of power to replace our dependence on fossil fuels.

With *Popular Mechanics*, we face the future with confidence in our joint capacity to serve.

Lee Wulff

An outdoors writer and television producer, Mr. Wulff is a designer of fishing gear and holds a number of world fishing records.



The field of outdoor sports, particularly fishing and hunting, has

changed drastically during the period of *Popular Mechanics'* lifetime and mine, which happens to be only three years shorter.

The mechanical changes are extremely important and have changed the patterns of the sport. The main factor is transportation with the coming of outboard motors, autos and ATVs and airplanes. They've let us spread out over the world to fish and hunt with a minimal effort. They've let us put fantastic pressure on the wildlife resources and caused both a dramatic reduction in the wildlife and/or a change in its character. We now control our wildlife much as we control our cattle. It is semiwild, living in man's domain, under his control. Fishing and hunting are now practiced, in some cases, under completely artificial conditions where the fish or game are raised to be killed or caught and placed in a semiwild area for harvest.

Paralleling this change from completely wild to semitame has come a view of sport that it, like all our living problems, should be made simple. We have come to want instant success in our sport, just as we have instant success in the kitchen with a prepared cake-mix. There are still a lot of trappers and outdoorsmen today, but there are no Kit Carsons or Jim Bridgers. The sports have changed and so have the participants. They will never again be the same.

Olin J. Stephens II

A noted yacht designer and naval architect, Mr. Stephens is a principal of Sparkman & Stephens, Inc.



My experience in yacht design began in 1927 and the first boats built to Sparkman & Stephens plans came out in the spring of 1929. I have seen a good deal happen to sailing boats since then, but I do not think that the basic principles have changed.

Major changes in detail have oc-

curred everywhere. Today, the vast majority of new boats are standardized and built in series. In the '30s they were primarily "one off." Then they were mainly built of wood or, when very large, of steel. Today the standardized boats are nearly all fiberglass while the one-offs are nearly all aluminum. Fortunately, there are still a few wooden boats being built which, in the hands of the better builders, can be works of art, but they are priced accordingly and are expensive to maintain.

Equipment has changed almost more than the boats themselves. In the '30s, diesel engines were installed only in very large boats whereas today there are relatively few inboard installations which are not diesels. I believe this has produced a great improvement in safety. The biggest change of all may be in the widespread use of electronic equipment, largely for communication but also for warning as in the case of radar, navigation as in the case of loran and omni, and to measure performance as in the case of speedometers, anemometers and wind direction indicators.

The designer's approach has changed from the intuitive and the comparative to the analytical and the quantitative. This direction was given by the late Prof. K.S.M. Davidson's work at Stevens Institute of Technology in the 1930s while the wide-spread use of the towing tank and the computer have led to the greatly expanded use of performance analysis and prediction in the yacht design offices. The application of such methods within the framework of new rating rules and under the pressure of intense racing has influenced design trends toward short ends, high freeboard and light hulls with keel and rudder appendages separated from each other, and each shaped for its specific function rather than as a part of the hull.

Appearance, above and below the water, has changed greatly, especially in the offshore racing field.

While I consider most of these changes improvements, it goes without saying that there are many sailors who do not agree. ★★★

launched in Britain (1959).
Laser developed at Hughes Research Labs, Malibu, Calif. (1960).
First commercially made oral contraceptive marketed (1960).

1961-1970

First manned space flight—orbit of Earth by Russia's Yuri Gagarin (1961).
Astronaut Alan Shepard makes suborbital flight—first American in space (1961).
First transatlantic TV transmission—Maine to Cornwall, England (1962).
Quasars—quasi-stellar radio sources—discovered



by U.S. astronomers (1963).
First human heart transplant, Dr. Christian Barnard, Cape Town, South Africa (1967).
First pulsar (pulsating star)

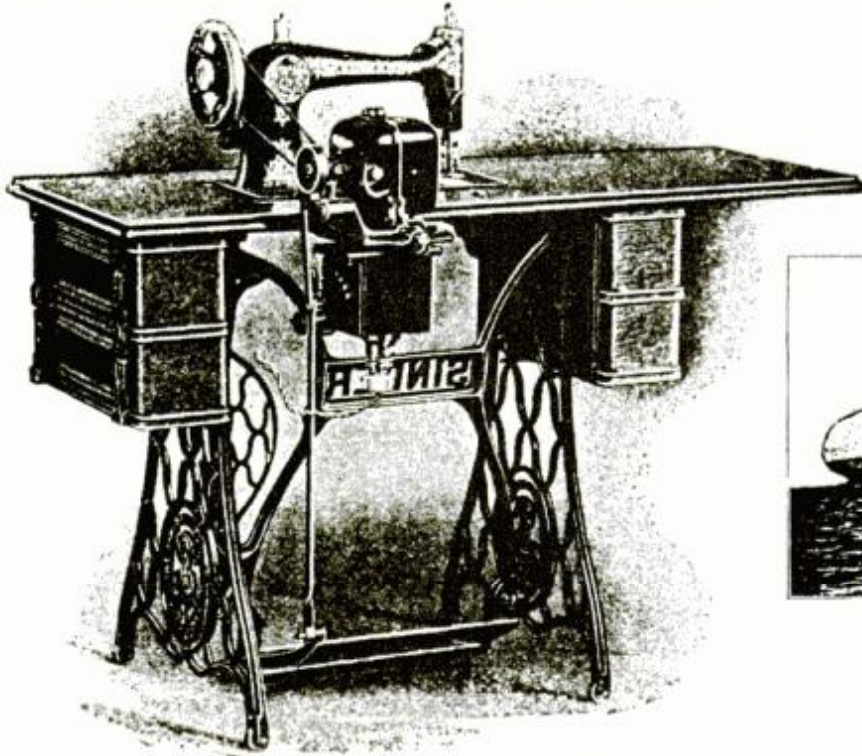
discovered (1967).
Boeing 747—first jumbo jet—initial flight (1969).
Apollo 11, first manned landing on moon (1969).
Video disc introduced (1970).



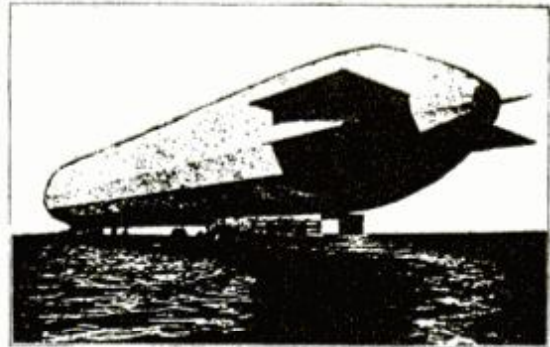
1971-1977

First flight of British-French supersonic Concorde jetliner (1971).
Electronic digital watch introduced (1972).
Skylab—America's first space laboratory—launched from Kennedy Space Center (1973).
CAT scanning X-ray introduced (1973).
Viking Landers reach Mars in first search for life on that planet by space probes traveling 460 million miles (1976).
Rollout of first Orbiter in U.S. Space Shuttle Program (1976).

New Then

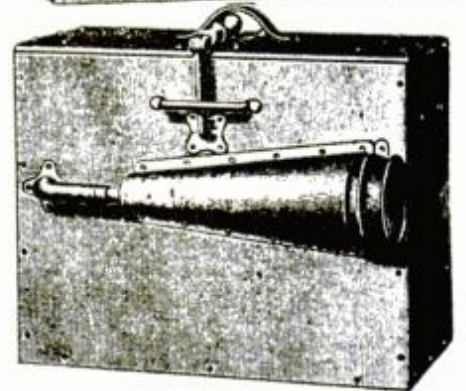


1906
Count Zeppelin's 420-foot "balloon" was the forerunner of 1000-foot airships built years later.



1902
First electric sewing machine used motorized attachment made by Diehl to fit Singer foot-powered models. True electrics came 20 years later.

1902
Runners replaced wheels on winter "velocipede." It used pedals and gears to drive spiked discs.



1902
Portable foghorn had a five-mile range, handle to pump bellows, no blowing, and came in a briefcase.



1907
"Runabouts" for rural mailmen brought PM forecasts of buggylike autos at \$225 for all. First ones in '02 cost \$1000 up.



1902
"Twenty-strap sandals" of patent leather, 26 inches high, were one-of-a-kind for famed actress Anna Held.

IT'S NEW NOW

Phoney pony prods a winner

"Arty Ficial," a \$10,000 creation of a harness racing driver, is a replica of a quarter horse mounted in front of a sports car that shoves it along at a record speed of 2:07 on Wolverine Raceway in Detroit. The trick is to coax Dominate, a real two-year-old pacer, to better the times the horse already has made by providing a competitor that, with a programmed accelerator, always maintains a slight lead position.

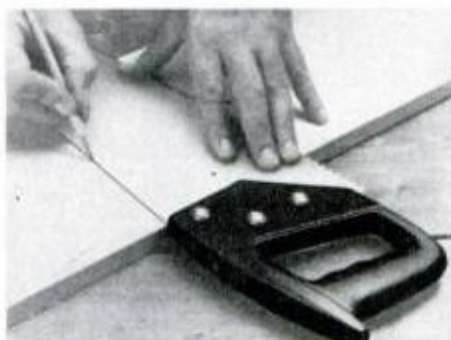


Build your own air-cushion RV

Plans, information packs—and perhaps build-it-yourself kits—are in the works for a sporty three-passenger air-cushion vehicle engineered by Neoteric Engineering Affiliates Pty, Ltd. of Melbourne, Australia. The sleek, streamlined design, called Neova Super Sports, will be handled in this country by Neoteric USA, Inc., Fort Harrison Industrial Park, Terre Haute, Ind.

Flash of inspiration

Interfacing electronics with mechanics results in a 35-mm camera with fewer parts—and more automatic functions. One example in this new Canon AE-1 is a link between the camera and its flash gun which automatically sets lens and shutter for flash when the gun is in place and turned on, but switches back to non-flash exposure settings when the flash is turned off, or it's still recycling. Camera Division, Canon USA, 10 Nevada Drive, Lake Success, N.Y. 11040.



Double-duty 'square' saws

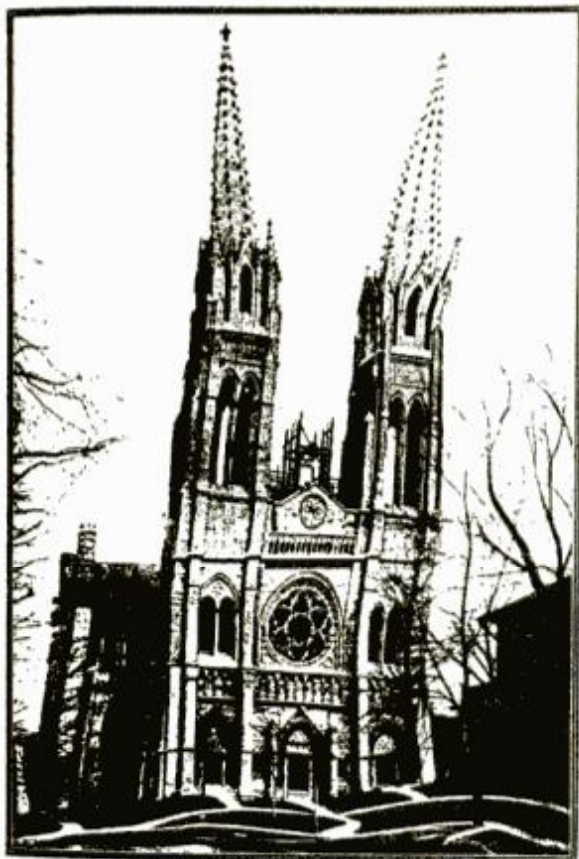
Handles on two new Stanley panel saws have 90° square and 45° miter edges, permitting marking and cutting with the same tool. About \$5 for 26-inch model and \$4.60 for 20-inch size.

Outdoor flavor indoors

Utilizing meat drippings to make smoke and duplicate the outdoor cooking process, a new "GRILL-ette" can be used to produce steaks, chops and other meats with the char and taste of campfire charcoal broiling. The compact unit is designed to sit right on a kitchen counter. Smoke and odor are carried to the outdoors by a built-in exhaust system that vents them through a baffle inserted in the nearest window. The flexible vent hose can also be tied into range hoods to carry off smoke and smell. Optional accessories include a rotisserie and a storage cart. Price of GRILL-ette from Jenn-Air Corp. of Indianapolis is about \$100 (less optional attachments) at retail stores.



New Then



1905
Alcohol in the photo developer produces same "tipsy" effect as it does in people, said PM with the example above.



1907
Haynes' handsome brougham featured brass lamps, window draperies, flower vases and "reliability."



1902
New double-duty furniture included convertible divan that turned into metal baby crib "for dwellers in flats or small homes."



1907
In Britain, new pumper could be towed by a classy "tourer" to fire then run by raising car's wheels to contact pumper's friction drive.



1902
Fancy car for snow and ice sported runners, center drive wheel and carriage-like contours.



1902
Dramatic radial fan powered by electric motor was the latest GE product for desk or table on hot days.

IT'S NEW NOW

Noise detector for CB sets

Radio frequency interference can be generated by some two dozen car engine components. Now there's an electric noise detector, "Sleuth," consisting of a 25-inch rod on 17 feet of coaxial cable, which connects to the antenna terminals of a CB transceiver. Merely point the end of the rod at a suspected noise source in the engine. Detected noise producers can be heard on the radio and stopped with suppressors for those particular components. Unit is made by Channel Master Division of Advent, Inc., Ellenville, N.Y. and is available at retail stores for about \$17.



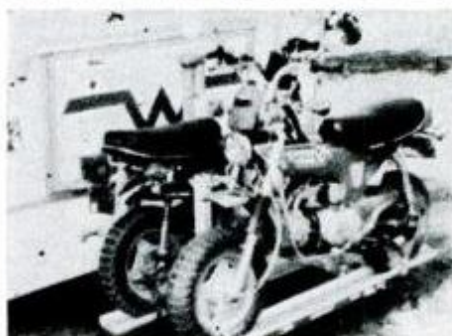
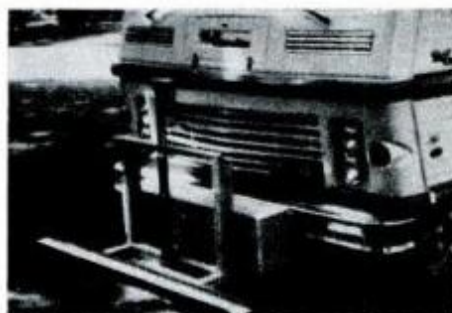
Steam locomotive fireplace

An ex-steam engineer in England cured his nostalgia for the old locomotives by facing his living-room fireplace with a Castle Class Great Western engine boiler panel. The replica is complete with control levers, dials, gauges and piping. The engineer, John Burnett of Leyland, Lancashire, who now drives a deisel, plans to hook up his domestic hot water boiler in the old fireplace pit so he can really "stoke" the fires again to a practical end. His wife, who found the living room "redecorated" after a vacation, is not as enthusiastic as "Pop."



If you don't have a seat, just ride on top

Billed as the "Human Fly," a Hollywood movie stunt man claims to be the first human ever to fly on top of a DC-8. During rehearsals, the jet reached speeds of 250 mph. Secured by cable guys, the daredevil high-rider used hand signals, monitored by an electro-optical device in the cockpit, to indicate any problems.

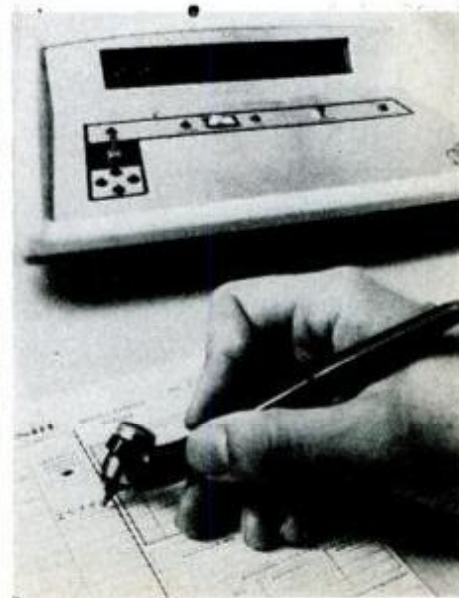


Power-lift motorbike rack

Two motorcycles of any type can be carried in this rack for the front end of RVs. It lowers to road level for mounting the bikes, then is raised by hydraulic or electric jack to riding position. It's priced from \$295. Tote-N-Stow, 6301 Arthur St., Merrillville, Ind. 46410.

Pen 'talks' to computers

Keyboards for entering data in computers may be replaced by a "talking" pen. The operator writes the program. The pen, which handles 10 digits and six control symbols, is wired to the system. Characters are "read" by computer and transmitted to a data center. Pens will cost up to \$50. Stanford Research Institute, Menlo Park, Calif. 94025.



Seventy-five years ago this month Popular Mechanics arrived on the American scene. For the first time, progress in science and technology was presented to people graphically and in simple language. Today, geared to a modern world, PM is still at it—heading for a century of service to its readers.



Founder Henry H. Windsor and son, Henry Jr., who succeeded him, led *Popular Mechanics* through 57 successful years. First issue (left) featured Britain's new "submarine boat" on a black-and-white cover.

by Richard F. Dempewolff

Early in 1902, Ransom Olds of Detroit had just produced 400 curved-dash horseless carriages priced at \$650—more automobiles at less cost than ever in history. In Chicago, an outfit called Black Mfg. Co. was marketing a "motor runabout" that it claimed would go up hills and through mud at 2 to 25 mph. "SPEED! I GUESS YES!" screamed the ads. An inventor named Dumont was building an "airship" to race the New York Central's crack *Twentieth Century Limited* from New York to St. Louis as an opening gambit for the upcoming World's Fair. In California, steam-powered tractors had replaced 20-horse teams to haul trackless wagon trains on the "finest highways in the country," which were "kept sprinkled at public expense." Dr. Guglielmo Marconi was transmitting 15 words a minute by wireless telegraphy from Glace Bay, Nova Scotia, to Poldhu, on England's Cornish coast.

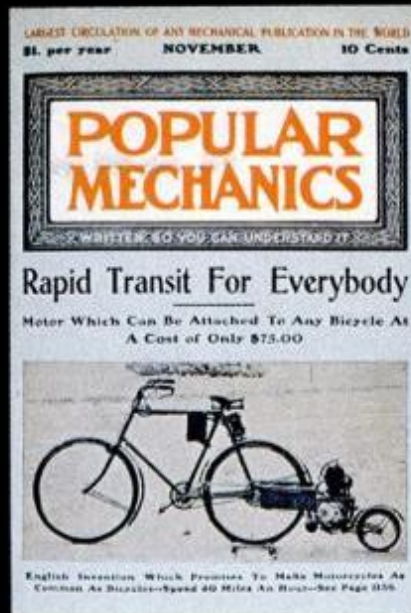
And, on Jan. 11 of that auspicious year, a magazine called *Popular Mechanics*—reporting on all these events and many more—first made its appearance. Describing itself precociously as "An Illustrated Weekly Review of the Mechanical Press of the World," the doughty little periodical's first issue boasted all of 16 pages, one of which carried a few small advertisements. The writing, editing, space-selling, proofreading, production and circulation mailing were handled in a rented loft on Washington St., in Chicago, by one man—the founder himself, Henry Haven Windsor, aided only by a few clerical helpers.

Not an instant success

The "launching" was, according to a generous understatement by a latter-day vice president of the company, "not an instantaneous success."

In fact, young Windsor's first bookkeeper, Miss Helen E. "Nellie" Toole—who agreed to "try" the job for a few weeks, then stayed 45 years—once revealed that "...subscribers to that first issue barely outnumbered the three employees." There were, actually, five subscribers and a few hundred newsstand buyers.

During its first year, *Popular Mechanics* was published weekly in standard magazine size, and cost 5 cents. Physically, it was little different from dozens of other



PM covers were often a "window on tomorrow." November 1904 issue featured first motorized bike (top left). March 1912 forecast a dim future for dirigibles (top right). You think motor homes are new? PM showed one in March 1921 (center left). Kite surfing was a cover subject in May 1930 (center right). Snowmobiles showed up in December 1910 and rockets in August 1940 (bottom).



magazines. But the concept was unique. Its founder—a man of ideas and convictions—had been born in a log cabin in Iowa, the son of a Congregational minister who'd gone West with the wagon trains. After graduation from Grinnell College, Henry Windsor did some newspapering and, in spare time, published several industrial magazines—one in the transportation field, *Street Railway Review*, another for the building trades called *Brick* and a third for rural postal workers, *R.F.D. News*.

Early goof causes laugh

It had become obvious to him that science and technology were on the march and that no publication was reporting the fast-moving developments for ordinary people in simple, everyday language. *Popular Mechanics* was his carefully considered answer. To symbolize his concept, he coined a phrase that, for years, appeared beneath his magazine's title: "Written so you can understand it." Old-timers in the company still chuckle over the issue in which part of a cover painting hid

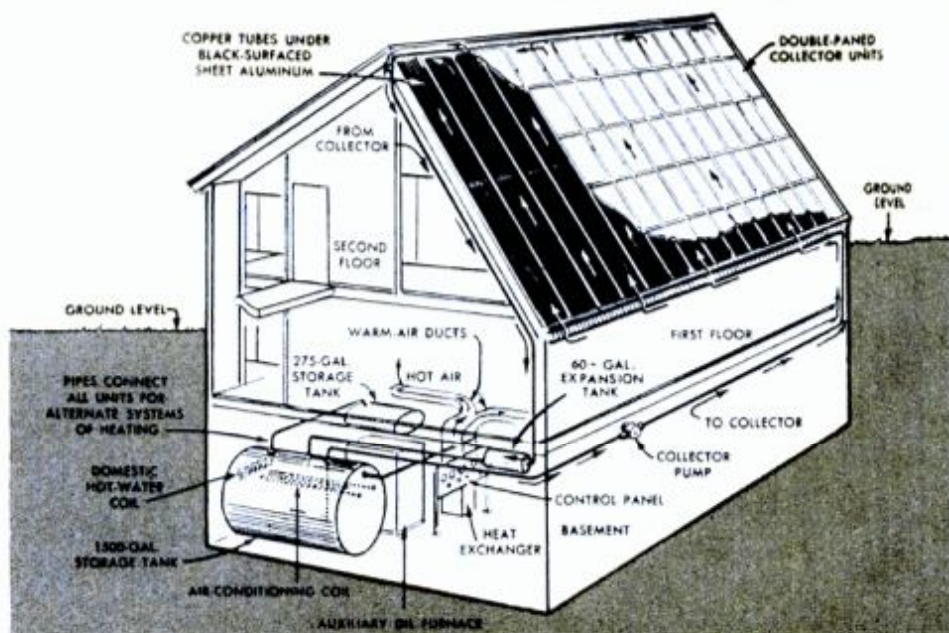


Looking to the future in 1974, PM reported on a new revival of "rigid" airships" (above), a concept that never has died. Latest versions proposed are 1000 feet long, whale-shaped with metal skin, carrying huge cargo and passenger loads. Standout build-it-yourself project was ranch house (left), one of several PM homes. B70, first of many controversial SSTs, was covered in '59 (below).



PM was among the first magazines to explain color television and show, in color diagrams, how various concepts would work. Two systems above were among the first electronic concepts using (top) a separate tube for each color and (bottom) a two-color tube.

The Race to Explore Outer Space



Some "cars of the future" produced by automobile stylists for PM articles actually turned up on roads later. Model at right, by George Walker, was in the November 1940 issue, along with the far-out "bubble" above, and closely approximated a later Hudson.



the first half of the word "understand" so the line came out reading: "Written so you can stand it," which wasn't too far afield, either.

From the start, Windsor was determined to present the excitement of technical and scientific breakthroughs in terms that related them to everyday life. The first issue carried an article on a device demonstrated for King Leopold and Belgian scientists by an American named James Sylvester. Used with Bell's new telephone

(then numbering 2,278,717 U.S. subscribers), it transmitted light signals over the wire. "Soon," reported young Windsor, "it will be possible for people to see each other while talking between Chicago and New York." It was a sample of the foresight that was to become standard fare in the magazine. There were also items on Britain's first "submarine boat" and a new electric car that had run a mile in the unheard-of time of 63 seconds. Do-it-yourselfers discovered a new way to re-

Back in March 1930, PM ran scenes from a movie on a moon expedition that came closer to portraying an accurate configuration of real moon rockets and terrain than most artist concepts that showed up through the '40s and '50s. Note rocket above, being crawled from hangar to launch pad. Think solar houses are something new? M.I.T. house (above, left) was on the October '57 cover. And scene above, from an underwater skin-diver shark-fight film sequence, was part of an article on underwater filming that appeared, surprisingly, in Sept. '14.

pair iron tanks with cement, and to etch glass. They were introduced to a series of basic articles on electricity and its applications around the house.

The fact is that Volume 1, Number 1 set the pattern for what was to become—and still is—the leading magazine in its field. It reported proliferating scientific and technological developments on a worldwide front, and provided its readers with projects and accurate instructions for carrying

(Please turn to page 106)

First preview of the fast ones for this coming year shows sleeked-up hulls with a swifter look. Even 20 mph seems speedy when you're sitting at water level in a small craft crossing a wake, and many models now can more than double or triple that velocity. A number of runabouts come with low windshields or none at all for an added blast of breeze. A long, slick snout ahead of the driver is favored at the cost of extra seating.

More speed

Some racing hulls this year will be able to top 100 mph with outboard or inboard power, and among our runabout selections here are a number that go well over 50. If you must have the fastest rig on the lake, it's now possible to match up the necessary hull and motor, but speeds over 40 are excessive for most water skiing and can shake up boat and passengers in any kind of chop. Smooth unobstructed water is needed for speed runs in a small boat; putting on more power than a hull is rated for is dangerous and illegal. Overpowering constitutes reckless operation and can invalidate your insurance as well.

More performance

Real satisfaction from your new runabout comes in matching the new speed propellers available to the correct top rpm of your engine. The latest good hull designs can be turned sharply without flipping, and have added flotation positioned to help them float upright and level if swamped. With deliberate abusive handling, many runabouts can be capsized, but are more likely to throw out driver and passengers instead.

Deep-V hulls cut comfortably through rough water, but tend to be tippy at anchor. Tri-hulls are more stable, but may pound in rough water. An innovation this year is a molified-V by performance expert Jim Wynne for some Crestliner, Cobalt, Cruisers, Larson and Starcraft boats he designed recently. Stability at speed and at rest has been added, and the innovation may well start a trend. Glastron has also introduced an SSV hull with similar advantages for bow-rider designs. This season's runabout rider should find more action along with more comfort. ★ ★ ★



Ski boats, once a West Coast specialty, now appear across the country. The 23-foot Glastron/Carlson CVX-23 (above) can take engines to 320 hp to drive a Berkeley jet.

Metal-flake deck decor, back-to-back bucket seats, low wraparound windshield and foam flotation are features of this GT-150 15-foot Glastron runabout using up to 90 hp.



Big action in a small package is supplied by compact speedsters like the 12-foot Little Hustler, powered with a 25-hp Johnson and built by the Hydra Stream Div. of W. E. Pipkorn.



A Sleek-Craft speedster, Santa Fe, Calif., ski boat, takes 200-hp Evinrude.

B Twilighter 19-foot Baja by Aeroglastics can top 64 mph when powered by a 280-hp MerCruiser I/O.

C Chrysler's Conqueror, a 21-foot deep-V hull is now pushed by new Chrysler 300 sterndrive and gas or diesel power, 105 to 265 hp.

D Challenger 21—an East Coast look with a West Coast look—can clock 54 mph with Merc Black Max 175.



New runabouts—faster, flashier than ever!

by Bill McKeown BOATING EDITOR



Engineering the death rattle out of quakes

Crumbling buildings cause most earthquake casualties. Last month PM told how the quakes occur. Now the push is on to design buildings that protect the people inside—not kill them.

by Mike McClintock
HOME AND SHOP EDITOR

At 5:13 in the morning, April 18, 1906, San Francisco started to fall apart. Cups rattled in their saucers, chandeliers swayed wildly, windows exploded from their casings, and people screamed as masonry buildings crumbled. For the next 40 seconds, the earth under the city tore itself apart with thundering shakes.

That quake (8.3 on the Richter Scale of 1 to 10) caused 600 deaths and \$400 million in property damage. What about next time? Many scientists say that California is likely to be rocked by another big quake in the next five to 10 years.

Government scientists at the United States Geological Survey estimate that when the next Richter 8-or-higher quake hits a populated area in California it will cause between 8500 and 10,000 deaths, approximately 40,000 injuries and between \$10 and \$40 billion worth of property damage.

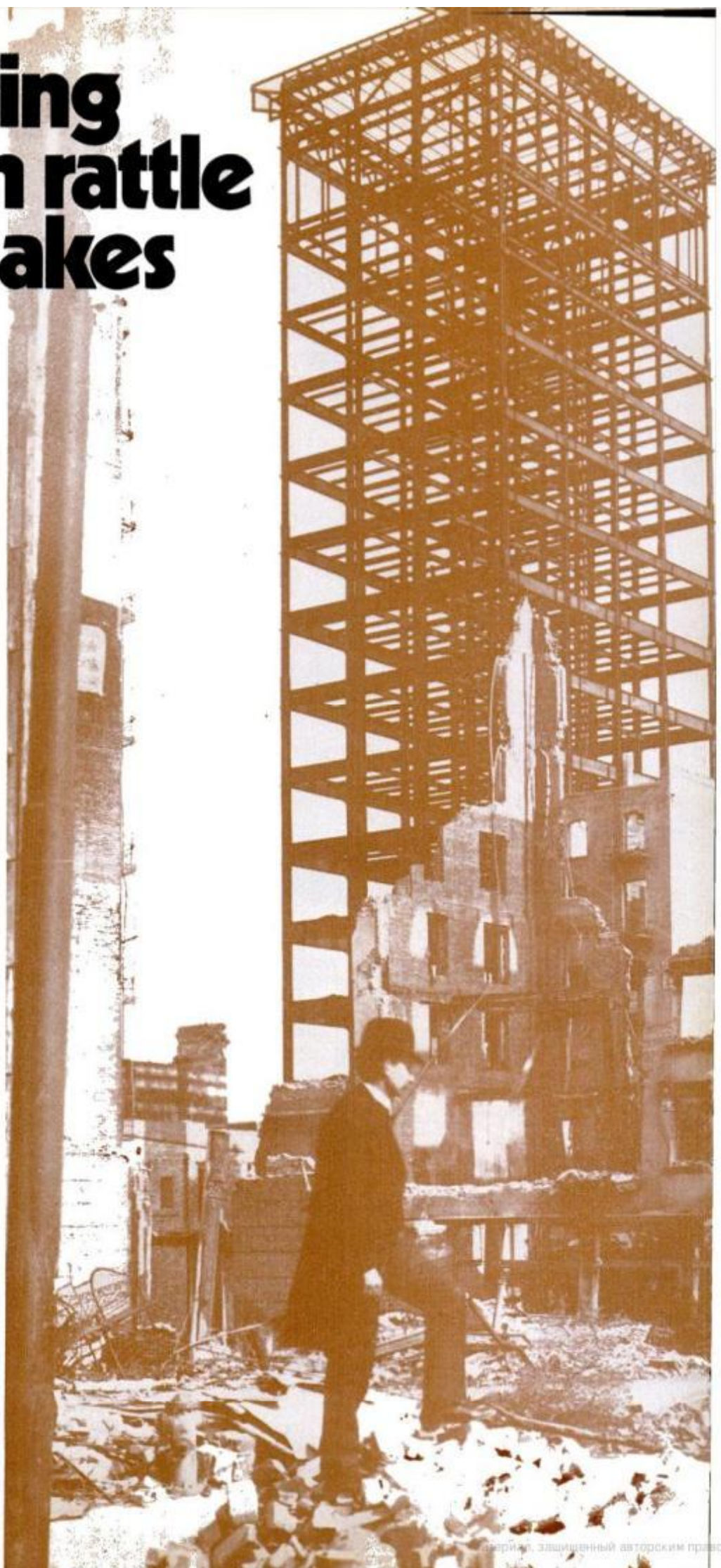
The real killers

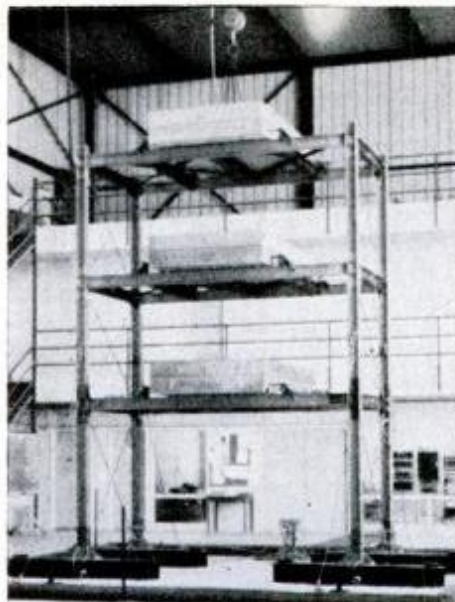
If you were standing in a flat, open field when a big quake hit, you might be tossed around a little, yet chances are you'd be bruised but alive. Earthquakes are only the force behind the destruction. Man's own masonry, metal and glass environment is almost always the cause of the tremendous casualties.

Dr. Ray Clough, director of the Earthquake Engineering Research Center at the University of California-Berkeley, told PM that quake prediction (see page 63, Dec. '76) is only half the battle.

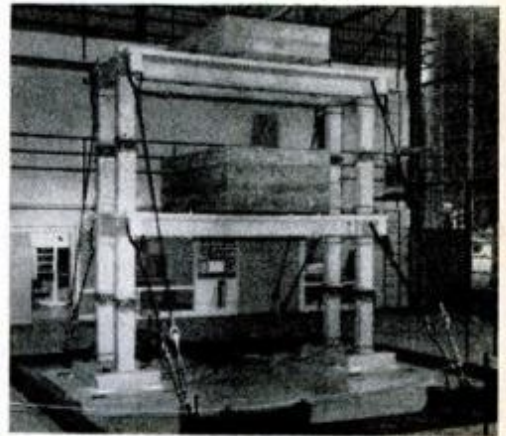
"We expect damage in an earthquake," he points out. "But what we're endeavoring to learn is the way various types of structures and

Photo: Bettman Archive

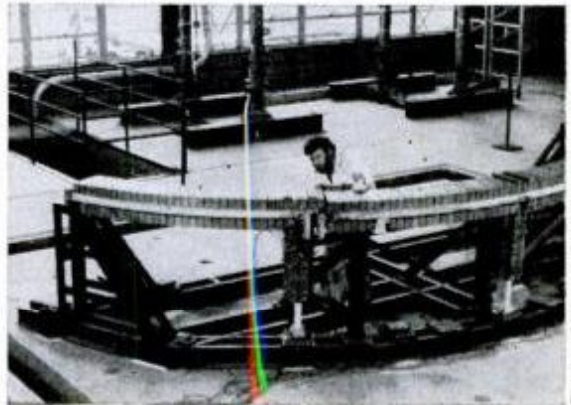




Quake-simulator tests models of reinforced concrete, below; of steel frames, left, plus designed structures like 1/30-scale highway bridge, bottom.



Masonry buildings are the first to crumble in quake. At left, the devastating California quake of 1906 shattered the building in the foreground but left the steel building under construction intact. Tests conducted on model buildings (above) simulate quake conditions on a massive shake table at the University of California earthquake simulator lab.



Photos: Univ. of California, Berkeley

materials behave in earthquakes, and how they fail under the stress imposed on them. If we know these things, we can make buildings strong enough so they won't collapse."

The Berkeley team (one of many working on this problem) is pursuing the answers in a cavernous laboratory that holds massive quake-simulating machines. The lab has

The reinforced-concrete bank building in Managua, Nicaragua, was flexible enough to withstand severe quake forces. Lightness, strength and resilience are the ideal qualities for a quakeproof building.

one of the few large Universal Testing machines in the United States. It's used primarily for full-scale structural component testing and can apply 3 million pounds in tension and 4 million pounds in compression to sample building sections.

But it's the shake table that's most impressive. This giant 20-by-20-foot steel platform, weighing 95,000 pounds, serves as the foundation for scaled-down model buildings. A computer-controlled system of huge hydraulic rams can move the table and the structure on it through the com-



Photo: Univ. of Michigan, Ann Arbor

WEST: San Andreas

The white line on the photograph below shows how the San Andreas Fault cuts across populated areas of California. There have been many quakes along this active fault line and scientists expect them to continue.

A blue-ribbon panel of earthquake specialists stated, in a report issued by the National Academy of Sciences, that a

tics of the quake.

The printout recorded at the U.S. Geological Survey's Center in Reston, Va., marks the arrival of seismic vibrations (A) from the 7.5 Richter Scale Managua quake on February 4 at 4:07 a.m. Slower-moving surface waves (B) continued to arrive an hour after the quake. A 5.0 quake in Prescott, Ariz., the day before caused only



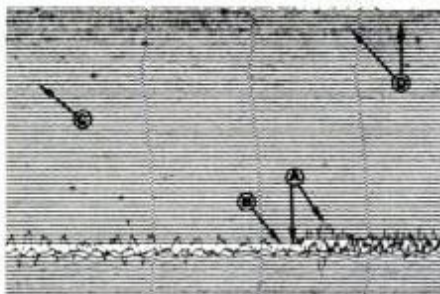
major quake is likely to hit southern California in the next five to 10 years. The effects may amount to one of the worst disasters in the history of the United States. Government estimates of property damage alone reach as high as \$50 billion, representing 16 percent of the total Federal Budget.

Buildings are still going up along the fault. Along with other notable structures, the football stadium on the Berkeley campus of the University of California sits directly on top of the fault.

Ironically, it's only a short walk to the Earthquake Simulator Laboratory where Berkeley scientists are conducting tests on structural systems in an effort to learn how buildings react to quakes and how to build new structures that will be quakeproof.

Quake signatures

Quake vibrations are recorded on sensitive seismometers. Scientists can then read the long printouts to determine the characteris-



a slight ripple (C) on the recorder. The sensitive equipment even picks up vibrations from the elevators in the building (D). The lines are read for strength duration and distance to the quake center.

licated horizontal and vertical motions caused by any type of quake.

While PM was there, a 1/3-scale model of several floors of a reinforced-concrete multistory building was being laid out on the test pad, ready to be stress-tested to destruction. Hydraulic jacks with shiny steel pistons were placed against opposing points on the test structure, ready to apply what Professor Clough called "controlled displacement forces."

The giant rams (about 5 feet long and 5 inches in diameter) were activated, simulating the forces that would be exerted on a building constructed on top of a fault—half moving in one direction, half in the other. "What we're trying to find out," said Clough, "is how to rein-

Mercalli quake

Whenever you hear about an earthquake, the reports mention how high it was on the Richter Scale (the 1-10 scale that measures the physical force of a quake). But scientists also use the Mercalli Scale (1-12 using Roman numerals) to measure quakes.

This system, called the Modified Mercalli Intensity Scale, measures



effects of an earthquake on people and objects.

The map above shows the Mercalli interpretation following the great 1906 California quake which had a Richter rating of 8.3. Here's an abridged version of the categories in the scale.

- I Not felt except by a very few under especially favorable circumstances.
- II Felt only by a few persons at rest. Delicately suspended objects may swing.
- III Felt quite noticeably indoors. Standing motorcars may rock slight-

force beams and other building components. To do this, our facilities are presently being used to give us the figures we need to devise mathematical models, which will be fed into the computers. The computers will then give us the data needed to build the real, practical structures that will stand up under the most severe quakes."

Scientists have already learned a lot about how different types of buildings are affected by quakes.

Key structural connections

In reinforced-concrete structures, the amount of steel and the way it is mounted determines the strength, and more importantly, the resilience of the building when the ground be-

(Please turn to page 126)

measuring

Iy. Vibration like passing of truck.

IV During the day, felt indoors by many, outdoors by a few. At night, some awakened. Dishes, windows, doors disturbed; walls make creaking sound. Sensation like heavy truck striking building.

V Felt by nearly everyone, many awakened. Some dishes, windows, and glass broken; a few instances of cracked plaster; unstable objects overturned.

VI Felt by all, many frightened and run outdoors. Some heavy furniture moved; a few instances of cracked plaster or damaged chimneys. Damage slight.

VII Everybody runs outdoors. Damage considerable in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving cars.

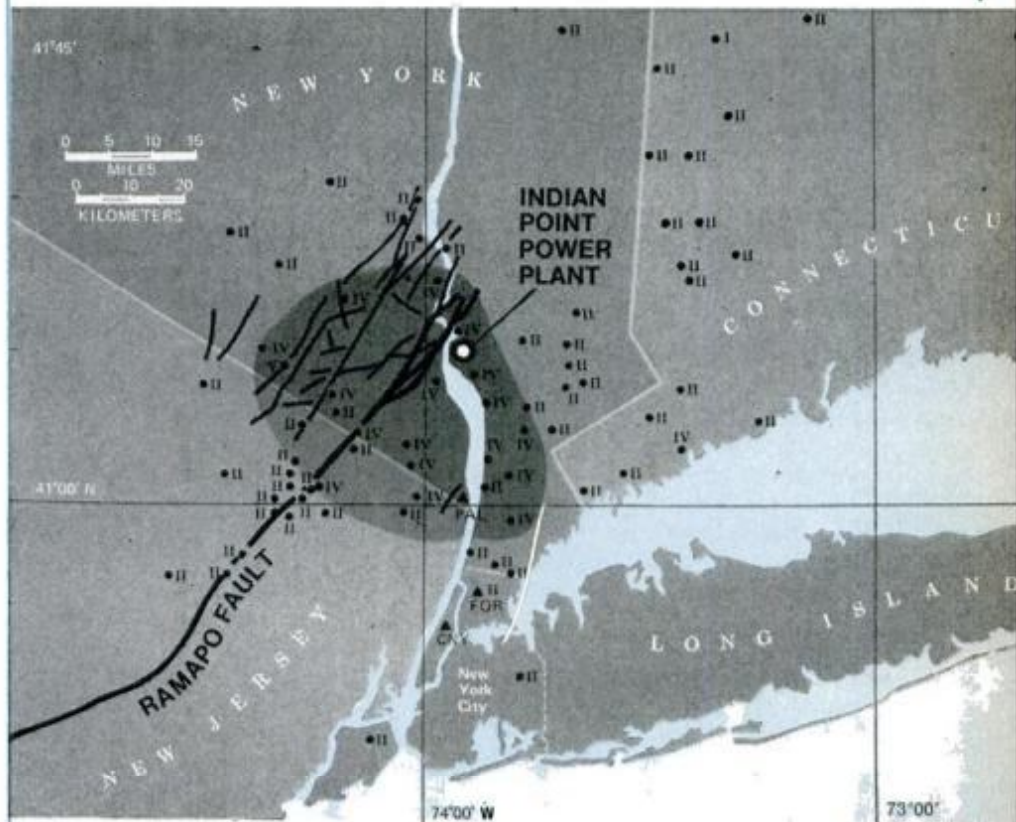
VIII Damage considerable in ordinary, substantial buildings, with partial collapse; panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. IX Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Buried pipes broken.

X Most masonry and frame structures destroyed with their foundations; ground badly cracked. Rails bent. Landslides considerable from river banks and steep slopes. Shifted sand and mud.

XI Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.

XII Damage total. Waves seen on ground surfaces. Lines of sight and level distorted. Objects thrown upward into the air.

EAST: Ramapo Fault



California does get all the publicity—but not all the quakes. The map shows the Mercalli intensity ratings from a 1951 quake with a concentration of seismic activity in the neighborhood of the Indian Point nuclear power plant at Peekskill, N.Y. There have been quakes in the northeast felt from the end of Long Island to southern Pennsylvania.

Consolidated Edison, the metropolitan New York utility giant, finally overcame efforts of environmental and scientific groups to prevent the construction of the three-unit nuclear generating plant, one within 3000 feet of the Ramapo Fault. Testimony before the Nuclear Regulatory Commission centered around conflicting scientific opinions from Dr. Charles F. Richter, inventor of the Richter Scale, and Dr. Lynn R. Sykes (photo), head of seismology at the Lamont-Doherty Geological Observatory branch of Columbia University.

Dr. Richter and Con Ed took the position that the Ramapo Fault is not capable of generating large, damaging quakes. Dr. Richter observed, that quakes in the Ramapo region are "of relatively rare occurrence, of minor magnitude and relatively trivial."

Lamont scientists, however,



Photo: Lamont-Doherty

argue that the fault is indeed active and has the potential to release more energy than the power plant structure can withstand. Con Ed says the units were built to withstand a quake of the highest intensity reported in the region.

Dr. Yash Aggarwal, a Lamont scientist who made the first fully accurate earthquake prediction in the United States, revealed in an interview with PM that the Con Ed researchers may have been looking in the wrong place for evidence of seismic activity along the ancient fault line. He explained that the rocks along the system are so old that examining them for recent seismic activity would inevitably prove fruitless.

The size of future quakes in the area will decide which of the conflicting scientific opinions is correct.

The coming of CB has given millions their first taste of two-way radio. And with this taste has come an appetite for other adventures in hobby radio.

There are hobbyists who've been using two-way radio since long before there was a citizens band, even before commercial broadcasting. They talk around the world as casually as CBers talk around the next curve, applaud sunspots instead of curse them, and have many more ways of getting messages across than just picking up a microphone.

Amateurs are radio's pioneers

They're amateur radio operators—hams. Hams were the first to fling radio signals into the air. From their early efforts 75 years ago have come today's commercial broadcasting, police and fire radio, aircraft communications, telephone satellites, microwave links—and, yes, even CB.

The government long ago recognized ham radio as a positive force: Hams form a trained communications reserve, ready to volunteer in an emergency and technically qualified to improvise their way around the communications difficulties that always arise under those confused circumstances. Between emergencies, hams offer a voluntary, non-commercial communications service that ranges from keeping servicemen abroad in touch with their families at home to bringing bedridden children the chance to talk, by radio, with "Santa Claus."

Ham license subject to test

Almost anyone of any age can get a ham license. But, unlike CB, it's not just a matter of sending in \$4 and a form. Before hams can start

playing with a dozen different frequency bands, high-power transmitters, worldwide transmissions, and exotic signals such as teletype and television, they have to pass a technical and International Code (formerly Morse Code) exam to prove they know how to use these properly.

Sunspots improve some signals

Those technical examinations aren't a roadblock set up to keep hams an elite group. Hams use their knowledge, and the wide choice of bands and equipment available to them, for better communication. For instance, when sunspots interrupt local CB communications over the next few years (page 92, Dec. '76) hams will actually use these sunspot conditions to improve their long-distance communications. A ham who wants to chat with a friend across town can use a frequency on the two-meter band—immune to sunspot interference—then switch to the 20-meter band to talk with hams in England, Russia or Japan. Once you know how signals travel, you can make natural phenomena work for you, not against you.

Every aspect of the knowledge you need to get a ham license can come in handy—even code. Code transmissions can get through under the most adverse conditions. And there are occasions when code is all you can send.

The helping ham

Take WA6INJ, for example, a California ham whose jeep went over a cliff in a storm last February. He was able to call for help via his two-meter rig, but as the search progressed, he grew unable to speak. Still he was able to stay in touch with his rescuers by tapping

out code with his microphone push-to-talk button.

Hams have a tradition of helping with others' emergencies, too. They pitched in last June, for instance, when the Teton Dam burst and million of gallons of water poured down the Snake River Valley.

The tiny college town of Rexburg, Idaho, was lazing in the warm, green afternoon when it was smashed by a five-foot wall of water, followed immediately by a 12-foot wall which washed away homes, floated organs from a music store, and drove thousands of scrambling residents up College Hill to dry ground.

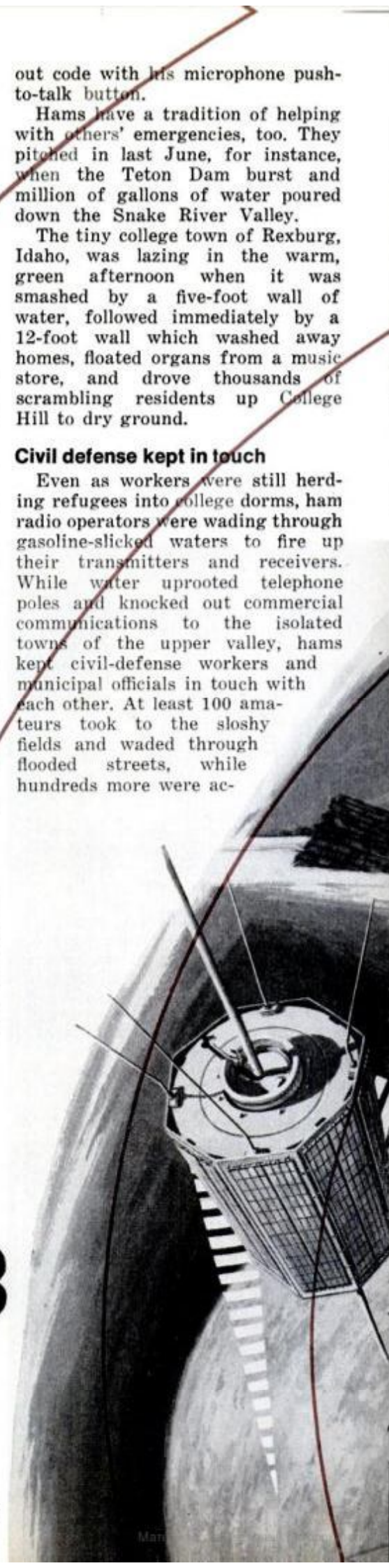
Civil defense kept in touch

Even as workers were still herding refugees into college dorms, ham radio operators were wading through gasoline-slicked waters to fire up their transmitters and receivers. While water uprooted telephone poles and knocked out commercial communications to the isolated towns of the upper valley, hams kept civil-defense workers and municipal officials in touch with each other. At least 100 amateurs took to the sloshy fields and waded through flooded streets, while hundreds more were ac-

Super-radio: The next step beyond CB

by Anthony Curtis

PM art: Jack Doyle



Amateur—"ham"—radio spans the world, direct and via satellite. And hams don't just listen in on what's happening around the globe—they participate.



tive from their home communications stations.

Radio stations KBOI, Boise, Idaho, and KSL in Salt Lake City, invited local hams to set up two-way gear inside their studios to handle reports from the flood-stricken areas. KSL even gave hams on its staff time off to join outside hams who drove in to spell exhausted, local ones.

Citizens band radio might have handled much of the load. But hams could do it better: Ham equipment covers more channels and can reach greater distances.

Disaster relief in Guatemala

Ham help can extend thousands of miles. During last February's earthquake disaster in Guatemala, hams operated in shifts around the clock for many days to provide a link in and out of the ravaged country. The American Radio Relay League, the national ham fraternity, even assembled and shipped to Guatemala an entire communications station package, including portable, mobile and base radios.

The saving of the *Sorcery*

Help reached across the ocean last May, too, when the 62-foot racing sloop, *Sorcery*, rolled 360° and lost her masts, marine radios, lifeboats and power in the Pacific, 1200 miles north of the Hawaiian Islands.

On board, Mabel Walters, W6YLT, of Poway, Calif., rigged an antenna, got a ham radio operating on the 20-meter band under battery power and sent out a "Mayday" signal.

Her signal reached Hal Berry, KL7HAY, in Homer, Alaska, about 2500 miles away. Hal was talking with Fred Boggs, W7SRU, Port Townsend, Wash., and another ham from Indiana when his south-pointing antenna picked up the distress call.

"Hal informed me and the other station," says Boggs. "The Indiana station cleared and signed out, and I turned my beam antenna west till I also picked Mabel up.

Pick up weak 'Mayday' call

"She was very weak, but between my beam and Hal's we were able to get her location and condition. While Hal went off to notify the Coast Guard (he had no phone at the time), I maintained communication with Mabel and kept the channel clear by warning off other traffic.

"WA6EAZ, Bill, in San Francisco, heard me broadcasting the alert and broke in. He couldn't hear Mabel, so I asked him, because of his strong signal, to help keep the

channel clear by notifying other stations just below and above our frequency not to interfere with ours. Then he got the San Francisco Coast Guard base on his phone patch, connecting his rig (and our conversation) to the phone.

"By this time, Hal was back at his rig, and we filled in the San Francisco Coast Guard, which in turn notified the Coast Guard in Juneau, Alaska, which would handle the search. Since Hal had no phone, Juneau Coast Guard called me long distance to confirm that it was no hoax, and to get further information.

More hams aid the search

"After about an hour, ham stations in Kodiak and Ketchikan, Alaska, and Widbey Island, Wash., came on. They all were hearing Mabel somewhat better than we were, so we confined ourselves for the next

Ham radio is not all talk

The portable TV flickered on, and snow blanketed the tube. A radioteletype machine ticked quietly alongside, awaiting a message. Outside my van, a long, green meadow dropped away from the Pennsylvania mountainside where I had parked.

"Okay, Bob," I said into my microphone. "Okay, Woody. Start transmitting."

Bob's face popped into the tube as signals from his homemade television transmitter hummed across the 30 miles from town to my mountaintop. I could see him pick up his microphone and say "Here it comes." But the sound of his voice was drowned out as the radioteletype's bell jingled twice, and it began to type out Woody's "Here we go."

The rush of excitement was like electricity in the air as I realized we had done it! We had engineered, in basement, den and garage workshops, an ultramodern communications system.

Like many hams around the world, Woody, Bob and I like to tinker with new ways to keep in touch over long distances. We use a mixture of store-bought and home-brewed gear to talk across town or across the country.

Radioteletype, facsimile, slow-scan TV all sound like engineers' dreams and laymen's nightmares; but the hams experimenting with them in home workshops around the world are basically like us: I teach—but nothing technical. Woody runs a retail store. And though Bob is an electrical engineer, our other ham friends in town include movie projectionists, bookkeepers, traveling salesmen, business executives, TV news-film cameramen, high-school and college students, retired railroad workers, housewives and a policeman. What they all share is a common desire to communicate by radio with others.

But the ways in which they do it are just as diverse as they are. Here are some examples:

CW—transmissions in International Code, a modification of the old-time Morse code (which is no longer used), are called "CW" for continuous wave: The transmitter is full on, sending a continuous, unchanging wave for

25 to 30 hours to monitoring and guarding the channel," Boggs concluded.

During those hours, an Alaska-based cutter and airplane searched for and found *Sorcery*. The plane and cutter both were equipped with ham gear for the 20-meter band. A nearby merchant ship, alerted by the Coast Guard, put its transmitter on 20 meters, too, and the ship was first on the scene after the wreck was spotted. The Coast Guard cutter reached *Sorcery*, removed the crew, treated the injured and took the craft in tow. But for more than 24 hours between the first Mayday and the final rescue all the necessary communications were handled by amateur radio.

Spanning the world

Hams have a choice of several ways to communicate across great distances. First of all, hams aren't

the duration of each dot and dash, and fully off between them.

CW is the oldest form of radio communication, yet still one of the most popular. Many hams like the thrill of knowing an almost secret, personal language. And CW can get a message through static and other interference when voice, RTTY, SSTV, facsimile or other modes can't be understood.

Facsimile—called FAX, for short—is a way of sending drawings, charts, graphs or maps—even games you can play—over the air in the same way news services get photos from around the world.

Fast-scan TV—action pictures in full motion, just like any other TV show. With fast-scan, I can watch Bob hook up a new circuit at his home, even if 18 inches of snow keeps me from driving there.

Moonbounce—signals beamed from a point on Earth to the face of the moon will bounce back to other points on Earth. Ham experimenters have been talking over long distances this way for years.

OSCAR—ham space satellites have been in orbit for years (page 76, Feb. '76). The five letters stand for Orbital Satellite Carrying Amateur Radio. OSCARS 6 and 7 are in 900-mile-high orbits now, and more OSCARS will be launched soon. Hams use their satellites to communicate by voice, code and RTTY around the world.

RTTY—radioteletype transmission I can type a message in my own home and send it to Woody's receiver, which types it out even if he's away; the words will be waiting for him when he gets home. Hams have been typing at each other for years with teletypes cast off by the news services; now there are electronic TV typewriters which display their messages silently, on TV picture tubes, rather than running noisily through rolls of paper.

SSTV—slow-scan television. Strictly for still or slowly-moving images, it sends its images one frame at a time like the TV pictures you see from the moon or Mars. Hams look at each other around the world via SSTV—and sometimes look at space pictures directly, long before they're shown on TV news programs.

AMATEUR RADIO OPERATOR LICENSE CLASSES

Class of license	Required code speed (Words per minute)	Material covered on written exam	Operating privileges
Novice	5	Radio operating procedures, FCC regulations, elementary electricity, radio theory.	Code on portions of the 80, 40, 15 and 10-meter bands. Soon to have VHF voice.
Technician	5	Procedures, regulations and intermediate radio theory.	Same code privileges as Novice plus voice, teletype, TV, satellite, etc., at VHF and UHF
General	13	Same as for technician.	Code, voice, teletype, satellite and all other modes on portions of all ham bands.
Advanced	13	Advanced radio theory.	Same as General plus more frequencies in each band.
Extra	20	More radio theory.	All privileges granted to U.S. hams.

Before an FCC written exam is administered, the applicant must have passed a test in receiving and sending International Code at the speed indicated for that license class. A grade of 75 percent is passing on written tests. The Novice license is good for two years, renewable, and there is no fee for the exam. All other licenses are for five years, renewable, and have a fee of \$4. The transmitter power for Novices is 250 watts and for all other classes is 1000 watts.

restricted to one frequency band as CBers are; as transmitting conditions change with time of day, sunspots and other factors, they can pick the band that will carry best to the area they're trying to reach. Power of up to 1000 watts is legal on all ham bands, too. And hams can adjust their antennas for best results.

If a ham signal can't reach its destination directly, it can be relayed there. Amateur-built satellite relays have been operating on and off since 1961, with hams from four countries (including the United States) cooperating to build the most recent Oscar (page 76, Feb. '76). Hams use these satellites to talk by voice, code and radioteletype around the world. And they have been bouncing signals off the moon to other points on earth for years.

Signal-hopping by repeater

Even more important, to most hams, are the 2000 amateur radio repeater stations located atop mountains, tall buildings and towers across the United States. Repeaters are supersensitive receivers combined with high-power transmitters. They pick up weak signals from portable and mobile ham sets and then retransmit them over a wide area.

These repeaters are mostly in the VHF and UHF portions of the radio spectrum (page 72, Aug. '76), especially in the two-meter ham band. Without repeaters, two-meter sig-

nals would only travel line-of-sight and would be reflected by large buildings and hills. But with repeaters, mobile or portable stations many miles apart can chat freely together.

Car phone calls arranged

For icing on the cake, most ham repeaters are equipped with "autopatch," which permits telephone calls from your car. Hams carry small Touch-Tone pads which send direct-dialing tones right through their rigs to a repeater, where the tones command the repeater to hook itself to a telephone line. Then the tones can be sent into the line, dialing a number. In an emergency, in many areas, you just dial 911 to get quick help from the police.

There are repeaters almost everywhere in the United States, with several in each metropolitan area. Repeaters are often linked to provide coverage over thousands of square miles and several states. For instance, several repeaters are interconnected at Los Angeles, San Diego and Las Vegas to provide one giant network covering most of Southern California, Nevada and Arizona.

Most repeater-relayed calls are routine, but by no means all of them. The Chicago Eye Bank, for example, uses a local repeater to expedite transfer of eyes between hospitals and to and from airports.

Four lives saved by repeater

The lives of four hams were saved on a Sunday last January when they

were able to call for help via repeater. Ironically, they were returning by snowmobile from a service trip to their repeater, atop 9600-foot Mount Harrison in Idaho, when one of them, Vance, WA7FDR, went off the trail into a deep ravine. Ken, W7NPO, went down after him, found him okay, but then discovered that neither one could get back on the trail through 10-foot snowdrifts.

A call for help from the small hand-held portable ham transceivers they carried was relayed by their repeater and heard all across Idaho, and even into Utah. As search and rescue squads braved zero temperatures and high winds, nearby hams guided them in with communications through the same repeater.

When tornadoes hit the Chicago area last March, killing five and injuring 50, local police and fire radio channels were so clogged that a Des Plaines, Ill., repeater provided, for an hour, the only link to telephone lines, via its autopatch hookup. Illinois Governor Dan Walker, in the area on a campaign tour, used the autopatch to order emergency equipment to the scene.

Clearer copy, too

Another reason amateur radio is both more reliable in emergencies and more relaxing for just, plain rag-chewing than CB is that its sound comes through so much more clearly.

More channels for fewer users helps, of course. So does the ability to switch bands when interference becomes a problem on some frequencies.

And on two-meter, hams use FM, rather than the noisy, low-fidelity AM of the citizens band. FM doesn't pick up most of the static generated in our electrical systems, and its "capture effect" means that you can't get confused by hearing two stations at once—if one signal is just a few dB stronger at your lo-

(Please turn to page 130)

U.S. Amateur Radio Ham Bands

160-meter band	1.8-2.0 MHz
80-meter band	3.5-4.0 MHz
40-meter band	7.0-7.3 MHz
20-meter band	14.0-14.35 MHz
15-meter band	21.0-21.45 MHz
10-meter band	28.0-29.7 MHz
6-meter band	50.0-54.0 MHz
2-meter band	144.0-148.0 MHz
1 1/4-meter band	220.0-225.0 MHz
70-cm band	420.0-450.0 MHz
UHF	1215.0-1300.0 MHz
UHF	2300.0-2450.0 MHz

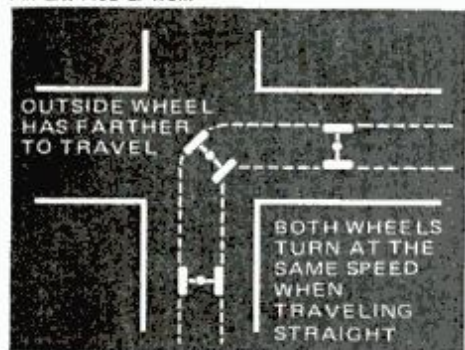
Citizens Band (CB)

11-meter band (channels 1-40) 26.965-27.500 MHz

Viva la differential!

The rear end, rear axle or differential, as it's variously called, is an important part of a car's drive train. Here's what you should know about it and how to take care of it.

PM art: Fred L. Wolff



by Mort Schultz

Quick now—what does the differential do? Not the “differ-what”—the differential, also known as the rear end or rear axle.

If you answer, “It transmits power to a car’s wheels by increasing torque from the power train,” you’re only scratching the surface. This is the least important role performed by the differential.

In fact, if cars traveled only in a straight line, differentials wouldn’t

be needed. Power from the engine and transmission could be applied directly to the wheels through a geared driveshaft.

Why it's needed

But cars turn, making it necessary for an outside wheel to travel farther than an inside wheel. If there were no differential, the outside wheel would skid in an effort to keep up with the inside wheel. The car would be hard to control, and you’d be buying a lot of new tires.

So you can bless the differential. It allows wheels to rotate at different speeds during a turn, permitting the outside wheel to catch up with the inside wheel.

In most cars, the differential is

Differential is cut away to show all of the gears, shafts and bearings in detail.

TRANSMISSION ENGINE

DRIVESHAFT

Differential allows axle shafts to rotate at different speeds in a turn, preventing excessive tire wear. Layout of conventional front-engine/rear-drive car is shown at left.

AXLE

DIFFERENTIAL

AXLE

RING GEAR

DIFFERENTIAL CASE

PINION SHAFT

PINION GEAR

DIFFERENTIAL PINION GEAR

SIDE GEAR

AXLE SHAFT

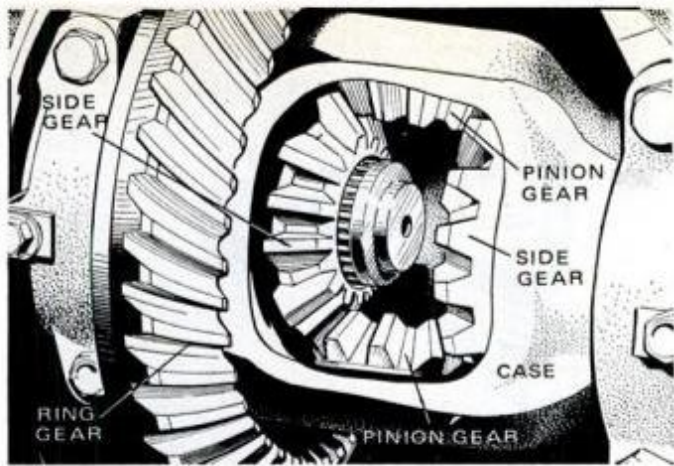
SIDE GEAR

DIFFERENTIAL PINION GEAR

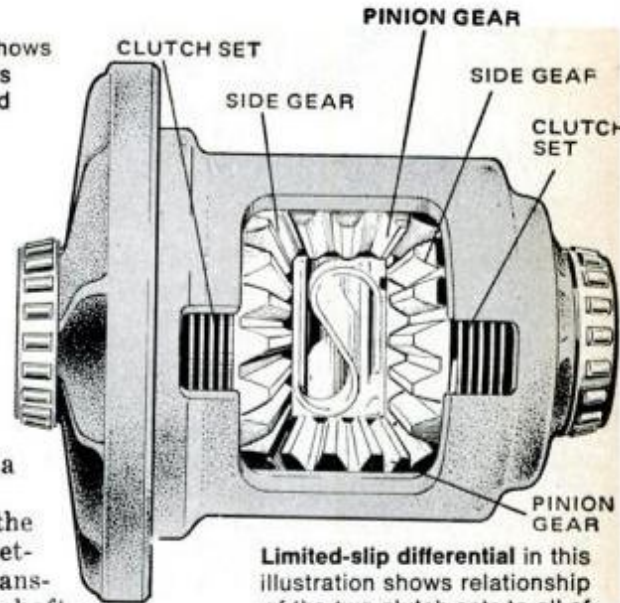
DIFFERENTIAL BEARING

AXLE SHAFT

DIFFERENTIAL PINION SHAFT



Conventional differential, illustrated here, shows meshing of various gears as explained in the text.



Limited-slip differential in this illustration shows relationship of the two clutch sets to all of the other components.

in the rear and is connected to the transmission by a long driveshaft. The system—consisting of the driveshaft, differential and rear-axle shaft—is commonly referred to as the final drive.

In other cars, the transmission is connected directly to the differential. This is true of front-wheel-drive cars that have driving components up front and in which the front wheels provide thrust. It is also true of cars having engines in the rear.

Conventional or limited-slip

Two kinds of differentials are made for passenger cars: conventional and limited-slip.

Limited-slip differentials have a variety of common and trade

A pinion is a gear with a small number of teeth that is designed to mesh with a larger gear or wheel.

(We're describing here the common, ordinary kind of set-up—differential in rear, transmission up front and driveshaft between the two.)

How it works

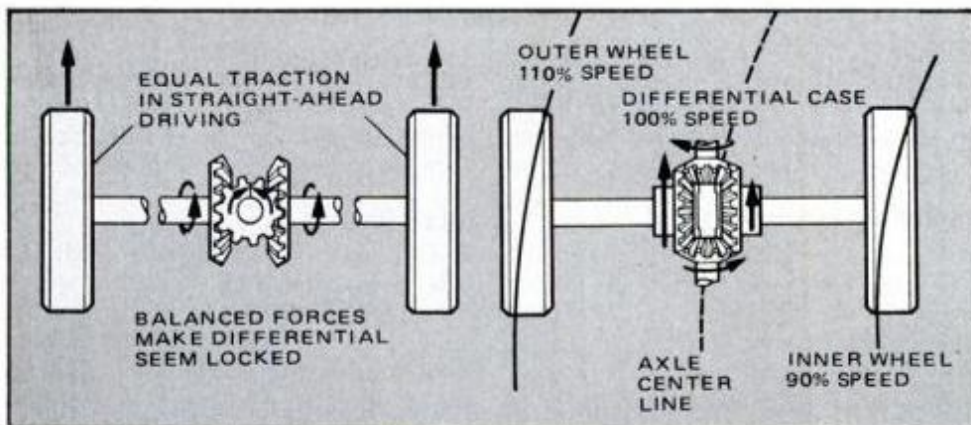
The differential case rotates on the axle shafts by means of a bearing between the case and a shaft.

Two side gears, each connected to the differential case and attached to its individual axle shaft, exert power laterally through the axle shafts to the wheels. Other key parts of the differential are the two differential pinion gears. These are held

two side gears, so the side gears turn at the same speed as the ring gear. This allows both axle shafts, and therefore both wheels, to turn at the same speed.

When the car rounds a curve, the balance is disrupted. The inner wheel slows down, and the side gear to the inner axle shaft also slows down. The pinion gears start rotating on the pinion shaft because of this disruption in equilibrium, which allows more speed to be applied to the outside gear and, hence, to the outside axle shaft and wheel.

If the differential case speed represents 100 percent and the inner wheel slows to 90 percent of this speed, the outer wheel would respond by speeding at 110 percent.



When you're driving straight ahead with equal traction, the input force is equally divided between the two side gears.

On a turn, inner wheel slows down and side gear also slows down. Axle shafts are allowed to rotate at unequal speeds.

names, including positive traction, Positraction, nonslip, Sure-Grip, and Traction-Lok. Whatever, a limited-slip differential is a conventional differential with clutches.

In a conventional differential, a pinion gear on the end of the pinion shaft (which is the output end of the driveshaft) meshes and turns with a large ring gear that is bolted to the differential case.

by a differential pinion shaft in the differential case so they mesh with the two side gears.

When the car is on a straight run, the pinion gear turns the ring gear, which causes the differential case and all parts to turn as a unit without any relative motion.

The two differential pinion gears don't rotate on the pinion shaft, but they do exert equal pressure on the

Testing limited-slip

As mentioned above, a limited-slip differential differs from a conventional differential because of the addition of two sets of clutches, each serving one axle shaft. The purpose of the clutches is to lock the axle shafts to the differential case when either wheel hits ice or mud, which would cause the wheel to lose traction.

Locked in, the "tractionless" wheel can't spin since it cannot turn faster than the other wheel.

Clutches in some recent limited-slip differentials, such as Ford's Traction-Lok, are not applied at all times, but lock up only when engine torque is applied. This keeps clutch plates from wearing on every turn, which extends their usefulness.

The operation of these units is



Test most limited-slip differentials by trying to rotate wheels (manual transmission in first gear, automatic in park). If unit is okay, it should be very difficult or impossible to budge wheels.

sometimes misunderstood because on surfaces where unequal traction exists, the differential may allow a wheel to spin unless engine torque is applied. An effective way of avoiding this is to engage the parking brake lever two or three notches and accelerate, allowing the differential to lock up.

If your car is equipped with a parking brake foot pedal, hold it down using light foot pressure and then accelerate. You should not use your regular foot brake in either case, because this would apply the front wheel brakes, which defeats acceleration off the slippery surface.

To test the performance of a limited-slip differential not possessing the torque feature, next time the car is on the lift, place an automatic transmission in Park or a manual transmission in low gear. Grip the tire and try turning the wheel.

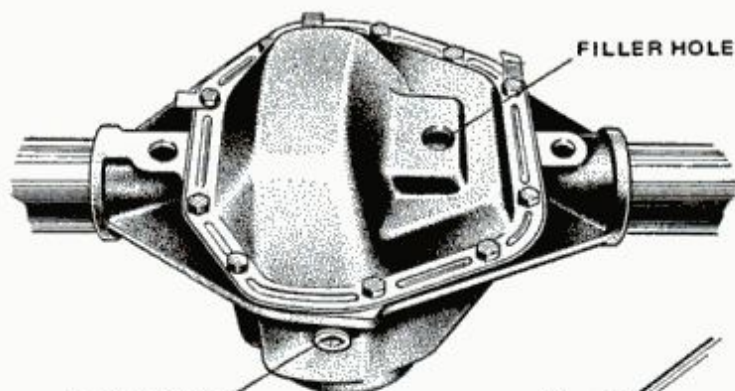
The differential is in good condition if it is very difficult, if not impossible, to turn the wheels. If either wheel turns easily, the limited-slip unit is not performing properly.

If the car has a limited-slip differential which locks under load only, a road test is necessary to judge performance. Make the test on a dry pavement, preferably asphalt. Accelerate from a dead stop at full throttle.

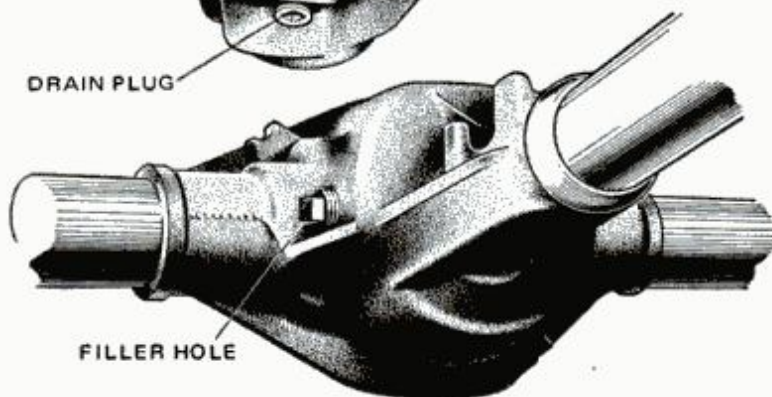
Go about 50 or 100 feet and stop the car. Check the pavement for signs of breakaway from both rear tires. If both tires leave marks, the axle is performing properly.

When you buy a new car, a limited-slip differential is normally an option. It's of greatest value if you do much of your driving in mud, snow or on ice.

When you buy a new car, you will also be faced with a choice of several gear ratios. Higher axle ratios provide more wheel-turning force to make it easier to haul heavy loads (trailers, for example). Low axle



DRAIN PLUG



FILLER HOLE



Both filler holes and drain plugs are used on some differentials, as shown at top. Other differentials have only a filler hole, as shown above. When the differential has only a single filler hole, fill and drain it with a special suction tool, as at left.

ratios provide less power to the wheels, reducing the amount of work an engine has to do. This saves gasoline and increases engine life.

Checking lubricant level

Whichever differential you have in your car, you can feel pretty good about it. There aren't many assemblies in your vehicle that need less maintenance than a differential. All that's involved for most is checking lubricant level whenever the chassis is lubricated.

To check level, remove the differential housing filler-hole plug and insert a clean finger in the filler hole to feel for the lubricant. If you feel the lube, reinsert and tighten the filler-hole plug. If lubricant is needed, add it using an inexpensive syringe.

Important: When checking lube level, make sure the car is parked level. In many cars, the filler-hole plug can be loosened and tightened with an ordinary open-end wrench. Other differentials are equipped with a recessed plug having a spec-

ial hex-type wrench to fit the recess. You can get this tool from an auto-supply dealer or parts department of a dealer selling your make of car.

More tips

■ If from one time to the next, the lube level drops appreciably, watch out. Low lubricant in a differential just doesn't happen. There has to be a reason, and that reason is usually a leak.

Look for a loose filler-hole plug, a leak between the housing and housing cover that indicates loose bolts or a ruptured gasket, or a crack in the housing itself. Loss of lube can also occur because of worn axle-shaft oil seals and a worn drive-pinion oil seal.

■ Most cars go a lifetime without having to have their differential drained. Others aren't so lucky.

If a differential is ever submerged in water and lubricant is suspected of having become contaminated, it should be drained at once to prevent differential failure. Also, manufac-

(Please turn to page 116)

Better CB: a handful and an 'earful'

By Ivan Berger ELECTRONICS EDITOR

One of the two CB gadgets on my dash (below) improves my "ears"; the other puts a lot of convenience in my hands. But since the preamplifier would be useless without a CB set, let's start with the set—Radio Shack's One-Hander.

A handy handful

As the name implies, the Radio Shack set has all its main controls on the microphone: the tuning dial (easily visible in our photo) and the power, volume and squelch controls (out of sight on the rear corners of the mike). That means safer driving: I can run the set with one hand, and I don't have to glance down below the dash to see the channel numbers.

I'd appreciate a channel dial that's easier to read, though, like the digital readout on the Hy-Gain 9 (Nov. '76, page 93). But, at \$150, the Radio Shack set is cheaper than the Hy-Gain. And the small blobs of glue I added at the channel 9, 10 and 19 positions make those channels easy to find, so I can count the clicks from there to any other channel I might want, then just flick a glance at the dial to confirm my tuning.

The set is a good performer, and the sound through the speaker built into the box that houses all the other circuits is quite good, though the sound you get when you use the mike as a speaker is tinny. Since the only control on the box is the speaker selector switch (which also offers a jack for an external speaker), it's no problem mounting the box upside down in my floor mount, so that the sound comes straight up to my ear.

Expanded ears

An antenna preamp—the other gadget on my dash—is something of a rarity. Most people would rather talk than listen, so devices to help you hear others' signals better do get a lot less attention than gadgets—power mikes, compressors, illegal linear amplifiers—that make your signal easier for others to hear.

But if you want to hear weak signals better, a preamp will help. It's just a help, though, not a panacea. Let's get one thing straight about antenna preampli-

fiers. They don't boost your output signal in the slightest. That would be strictly illegal. In fact, when you transmit, a special circuit built into the preamplifier senses it and shuts the circuit off—not to prevent illegal operation (antenna preamps put out far less power than transmitters do) but to keep your transmitter's output power from burning out the preamp. On the Kris Antenna-Fire III preamp shown in the photo, the "receive" pilot light blinks off and a "Transmit" light blinks on when you key your mike, just to show you that the preamp and your transceiver are working.

I tried the preamp under a wide variety of reception conditions: In New York City, where the airwaves are so crowded you're lucky to get a range of two blocks; along a major express highway; and way out in the country, where signals are few and far between. How much good it did depended quite a bit on what reception problems I was encountering.

In the city, a preamp is about as useful as a cocoon on a Caterpillar tractor. Preamps preamplify *everything* that comes down your antenna lead—good signals, bad ones, and ignition noise. In the city, you're better off reducing sensitivity to cut out some of the garbage than you are increasing it. I'd like to see a preamp, some time,

with a three-position switch: off, amplify and attenuate. That last position would also help with ear-blasting signals from the car right on your tail.

Out in the country, though, the preamp showed real, if limited, utility. The thinner CBers are spread, the more likely you are to want to hear someone whose signal is lost in the noise level due to distance. With the Antenna-Fire, I could pick up signals that were otherwise simply inaudible.

Preamp limitations

But there were limitations aplenty to what the preamps could do. Most of the time, I couldn't talk with the stations the preamps brought in for me; I could hear them just fine, but without preamps of their own, they couldn't hear me.

Under some circumstances, the preamp amplified noise and undesired signals enough to make some marginal signals become unlistenable. And nearby signals did come blasting through unless I turned my volume down, while noise got louder till I raised my squelch.

So, since some signals get better with a preamp while others get worse, you find yourself switching the preamp on and off as you click from channel to channel. This increases the number of stations you'll pick up, but increases the effort and attention involved. ★★

PM photo: Madeline Silver



Mike at right has a tuning dial; the antenna preamp atop dash boosts weak signals.

6 good ways to upgrade your utility room

PM's plan features a hide-everything laundry cabinet in a good-looking room with fire safety built in.

by Mike McClintock
HOME AND SHOP EDITOR





Behind closed doors. The Formica-finished, $\frac{3}{4}$ -in. plywood is sturdy, good-looking and easy to keep clean. Access to the hamper is provided through two spring-loaded door panels that always swing closed. Custom-build the cabinet to fit the height of your room by adjusting dimensions for shelf space at the top of the unit.



Fold-down shelf. Centered in the cabinet is a door that folds down to make a laundry sorting and folding shelf. It pivots on butt hinges and is held in place by a set of lid supports. You can apply laminate to the interior surfaces or simply sand them carefully and paint. Raw plywood edges can be covered with laminate as well.



Open for business. The adjustable shelves behind the upper doors are made of $\frac{3}{4}$ -in. plywood edged with a strip of pine. They are supported by recessed shelf standards and clips along the side panels. At left, the cabinet in full use shows the pull-out hamper section with the upper part of the front panel folded down for easy access to the clothes.

PM photos: George Ancona

The utility room is the workhorse of your house. In many home designs it holds the furnace, water heater, laundry and bulky items that can't be stored elsewhere. You can use PM's renovation projects to make this overloaded room efficient, good-looking and safe.

New wall coverings

Recovering the walls and ceiling of your utility room will make it clean and attractive but, more important, if you pick the right material you can improve the fire rating of this potentially hazardous room. We used $\frac{5}{8}$ -in. fire-code gypsum wallboard—more expensive than standard board, but in this situation well worth it.

An average utility room has a much greater fire risk than other rooms. It holds the furnace, water heater, gas or electric lines for a dryer and, in many cases, the main fuse box. Fire code wallboard is applied the normal way—no extra labor is involved. The material is treated with chemicals that make it fire-resistant. A three-coat taping job, plus a coat of washable latex paint, will make the walls good-looking and easy to clean. The extra margin of fire safety is built in.

Custom-built laundry cabinet

PM's design combines several laundry operations into a single, functional cabinet. Here's how it works. Dirty clothes are dropped into the hamper through two, spring-loaded door panels. The hamper section below them has a center divider (light and dark washes can be separated with the two-door system) and rollers so you can pull the hamper out for easy access. You can hinge part of the face panel to get at clothes in the bottom easily.

Above the spring-loaded panels, a full-width door folds down to make a counter for sorting and folding laundry. Behind the upper doors are adjustable shelves to hold washing supplies and clean clothes.

Fire-safe doors

This renovation project has a lot going for it. Steel-skinned doors are easy to install, fire-resistant, warp-free and energy-saving. We used doors from Pease, 7100 Dixie Highway, Fairfield, Ohio 45023. A foam core cuts down dramatically on heat loss and a unique sill lets you make a height adjustment after the door is hung to lock out drafts and get a perfect fit. The warp-free door is a good buy (\$80 and \$100 for a 2-ft. 6-in. width) when you consider Class B fire-rating (1½ hours).

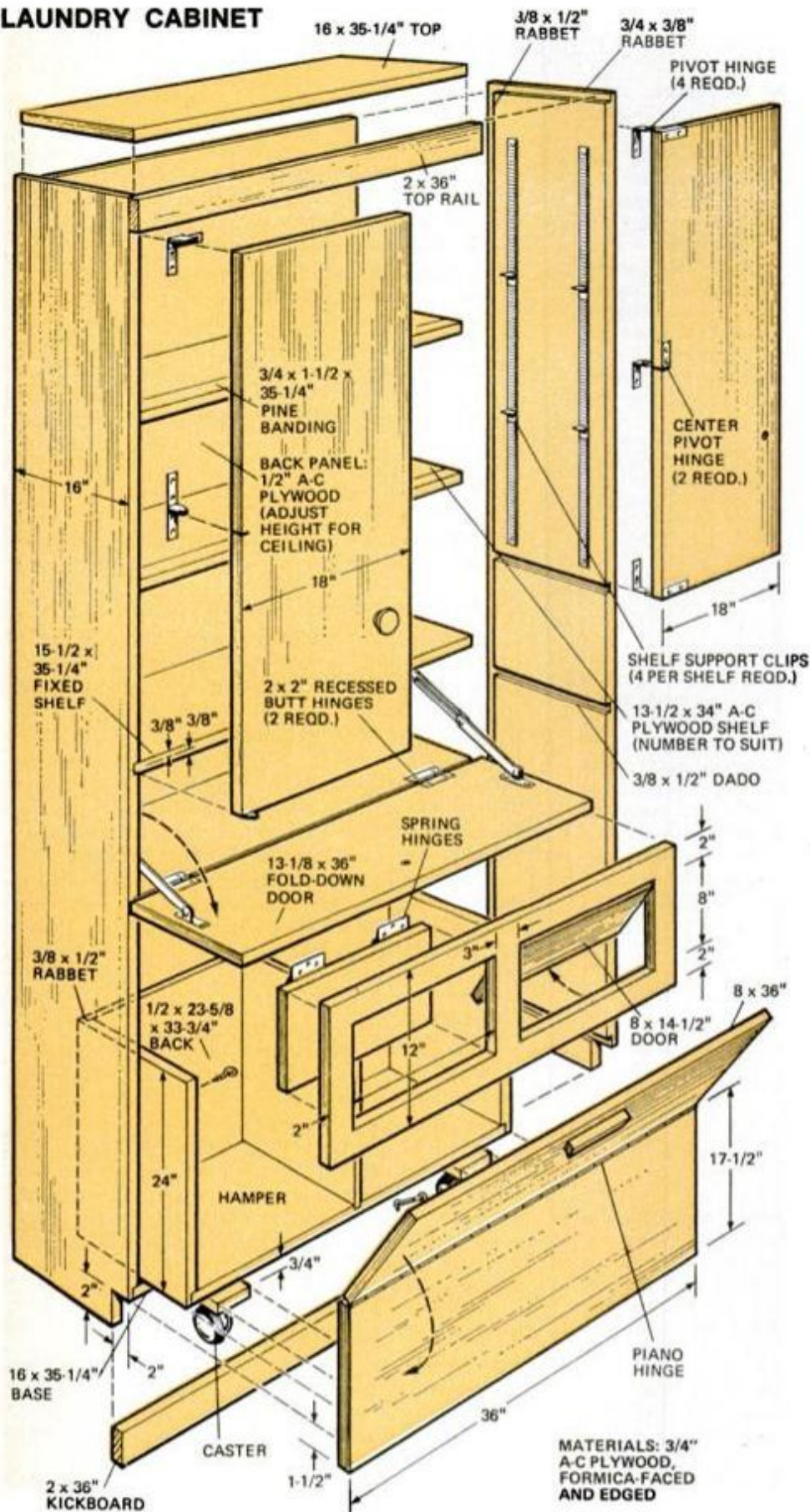
New washer and dryer

Installing a new, efficient laundry goes a long way to updating your utility room. The Maytag units we used are easy to install. The drain hose is provided with a siphon break and the supply hoses come with fittings to make connections between the back of the washer and cutoff faucets in your water lines.

Sprinkler heads

You've seen them in commercial buildings but there's no reason why you can't use them at home. We used an upright and a pendant type from Viking, Hastings, Mich. 49058. You

LAUNDRY CABINET



HEIGHT OF SIDE PANELS, BACK AND UPPER DOORS VARIES DEPENDING ON CEILING HEIGHT

PM art: Fred L. Wolff

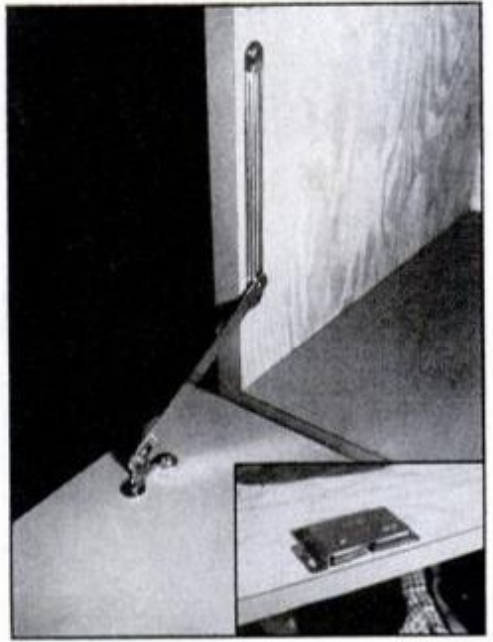
Store clean clothes and supplies behind closed doors on the upper shelves; sort and fold using the drop-down door above hamper. We covered the outside with Formica. Hardware is from Stanley, New Britain, Conn. 06050.

can adapt the 1/2-in. male pipe thread to the nearest cold-water line.

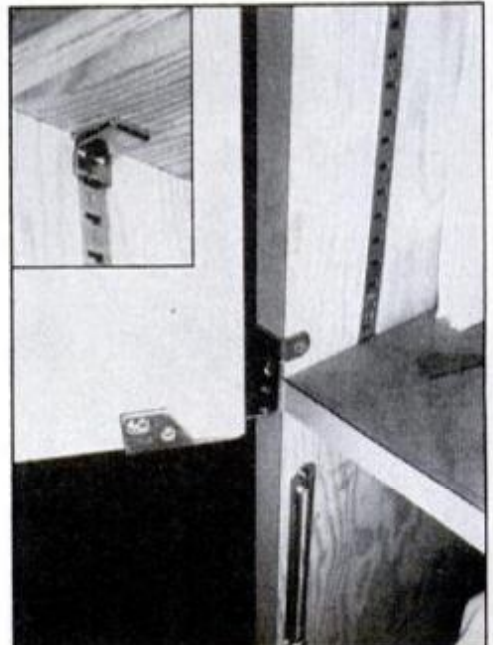
Quarry tile floors

Laying a heavy-duty quarry tile floor is a good way to start renovating your utility room. The job is too involved to describe here. We covered it in depth in PM's December issue (see page 106).

There are other measures you can take to increase the safety factor in your utility room. Adding a fire extinguisher has a high priority. A wall-mounted unit should be located in an obvious place. As a preventive measure you should have your heating plant inspected and cleaned at the start



Attach the slotted bar to the side of the cabinet, then brace the shelf in the down position (allow 1/8-in. for settling of the screws) and attach the other end of the slide bar. Double magnetic catches hold the doors closed. Shelf standards below are recessed to allow full-width shelves.



of every heating season. Accumulated deposits in the system can lead to puff backs which cause a mess, and could trigger a blaze.

PM's projects will make your utility room more efficient, and give you built-in fire protection for your peace of mind. ★★★

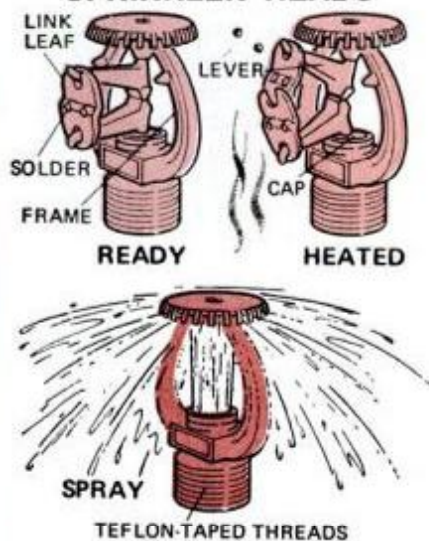
STEEL FIRE DOORS



Install a 2x4 header that's supported by an extra (jack) stud at each end. The sills on some doors are adjusted with washers stacked on top of each other. New sills on the Pease doors we used can be adjusted for a perfect fit after the door is installed, making it easy to lock out drafts.



SPRINKLER HEADS

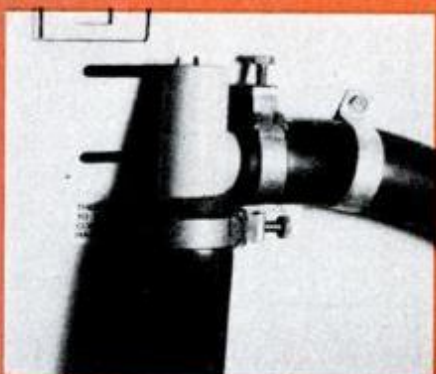


The 1/2-in. male thread adapts to a cold-water line. Even if you're not home, flames will release the solder and activate the 16-ft.-dia. spray.

WASHER AND DRYER HOOKUPS

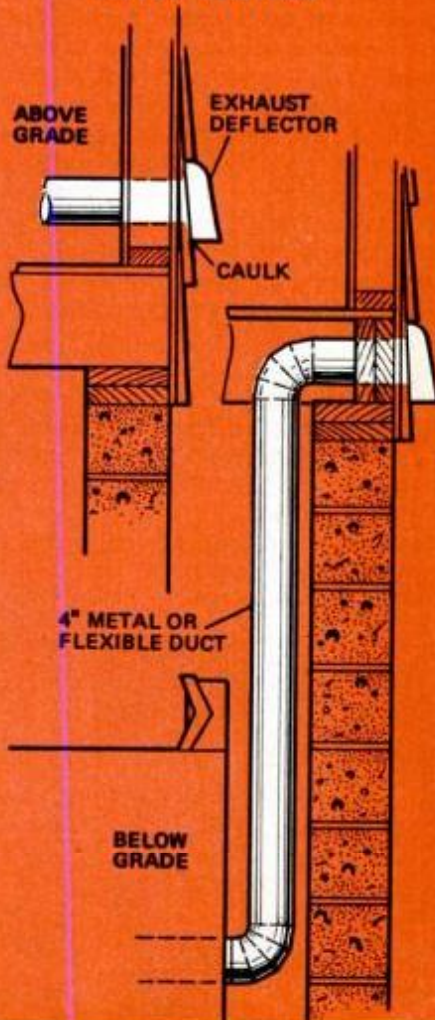


Fittings on the washer supply hoses are screwed onto valves cut into the hot and cold-water lines, above. The other ends screw into the fittings that are provided on the back of the machine, upper right. The antisiphon valve, lower left, comes set up on the Maytag unit we used. To exhaust the dryer air through the wall, you'll need a vent kit, below right. Flexible duct can be used.

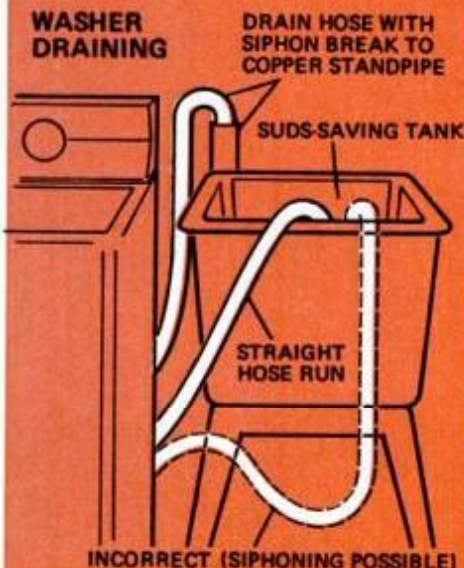


Proper drainage for your washing machine is one of the critical steps in a successful installation. To prevent siphoning action, a siphon-break fitting should be used. For a suds-saving model that uses a storage tank, the drain hose should run in a straight line with no loops. The dryer must be vented to an exhaust deflector on the outside of the house. Be sure to follow the manufacturer's installation rules.

DRYER VENTING



WASHER DRAINING

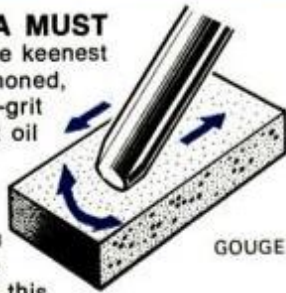




Woodcarving

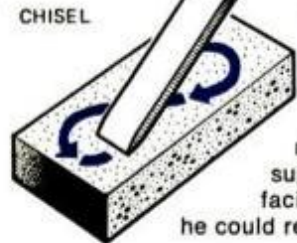
SHARP TOOLS ARE A MUST

To sharpen new tools to the keenest edge and keep them finely honed, you'll need a medium/fine-grit sharpening stone with light oil and a slipstone. Sharpen the gouge by rubbing it back and forth on oiled sharpening stone, while you rotate it from edge to edge until a burr forms. Remove this burr with a slipstone, holding it flat on the inside of the gouge and square across the end. To sharpen both sides of the chisel, place each bevel on the



GOUGE

oilstone and move the chisel in a figure-eight pattern. Continue honing each side until you break off a burr. After extensive use and a great deal of sharpening, these tools must be reground. Your local supplier most likely will have facilities for such work. If not, he could recommend a proper source.



CHISEL

oilstone and move the chisel in a figure-eight pattern. Continue honing each side until you break off a burr. After extensive use and a great deal of sharpening, these tools must be reground. Your local supplier most likely will have facilities for such work. If not, he could recommend a proper source.

These four projects are your introduction to the age-old art of woodcarving.

by Penelope Angell ASSISTANT HOME AND SHOP EDITOR

Carving and finishing even a simple object is one of the most satisfying forms of woodworking.

Many carvings are made with just two basic types of tools: gouges and chisels. Gouges, as shown in the drawing on the left, are made of steel that is curved to varying degrees to "gouge" out excess wood. A "quick" gouge has a very deep curve that's intended especially for use in deep and rough cutting. "Slow" gouges have flatter curves and are used in finishing work. Widths at the cutting edge of these tools can vary from $\frac{1}{16}$ to $\frac{5}{8}$ inch.

Chisels are beveled on both sides and used by carvers to cut in designs and clean out wood in detailed areas during the finishing stages. Their ends can be square or skew (angled) in widths to accommodate rough or fine work.

Your first purchase of carving tools should include three or four sizes of gouges and chisels, a mallet to drive the tools, clamps or carver's screws to secure your work, and sharpening stones.

1 Snack dish

Scooping out this handy dish is a good way to become familiar with your carving tools and how to handle them. You'll need a 9 x 6 x $\frac{1}{4}$ -in. block of wood. Mahogany or walnut both have fairly even grain and finish nicely. Very sharp tools will make your carving easier and safer.

Tools: 1-in. fantail gouge, $\frac{5}{8}$ -in. bent gouge, $\frac{5}{8}$ -in. skew chisel, wood mallet and bandsaw or other saw. We used tools from Marples Blue Chip Sculpture set of Record Ridgway Tools.

Method: Draw the dish design either directly on the wood or on paper and transfer it. This design is a freehand "avocado" shape with part

of the rim slightly thicker to serve as a handle.

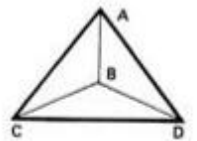
Note: In this and the following projects the wood should be securely fastened to a worktable so you can work with both hands safely behind the cutting edge of the tool.

With the fantail gouge (the working end of this gouge is fanned out) and wood mallet, hollow out the dish. Then with the bent gouge finish hollowing and giving texture to the inside of the dish. (This gouge is actually bent and was designed to hollow shallow areas.)

Next, saw or use a gouge to remove excess wood. Work so that the sides are cupped inward toward the

bottom. Then turn the dish over, secure it, and with the gouge shape and give the outside texture.

Last, the finishing decoration, a series of triangles, is carved on the dish top. Draw the number of triangles you wish as in the illustration. Then cut along the center lines with a skew chisel held vertically, tapering the cut from $\frac{1}{8}$ in. at the center (B) to nothing at the triangle tips. Cut A to B, B to C and B to D. Remove the waste, tapering and paring the wood away from the sides to the center. Pare A to C, A to D and C to D.



Tools used are (from bottom): fantail gouge, bent gouge, skew chisel and wood mallet.

The right hand exerts pressure and the left hand guides as the bent gouge gives texture.

The wooden mallet exerts extra pressure on the fantail gouge as the dish is shaped.

The skew chisel is used for chip-carving of the finishing triangle decoration.





PM photo: Jeff Platts

Master carver, Tony Walker of Record Ridgway Tools, carves a bowl. The four finished projects explained on these pages are shown on the workbench.

2 Trinket box



Tools used are (from bottom): straight gouge, bent gouge, skew chisel, mallet, slipstone.

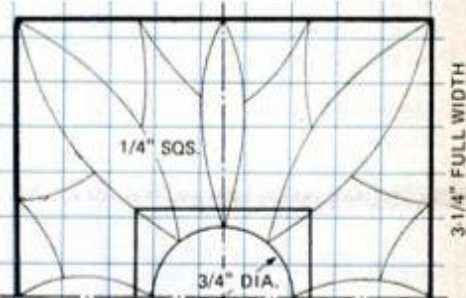
Here's a walnut trinket box with a low-relief flower design. For this you need a 4½ x 3½ x 8-in. block.

Tools: ⅝-in. flat straight gouge, ⅝-in. bent gouge, ⅝-in. skew chisel, mallet, 1-in. carpenter's chisel, bandsaw and coping saw.

Method: Make sure the wood is square, then with a circular saw or bandsaw halve it along the 4½-in. depth to make the box and lid. Go over the box with a flat gouge to give it texture. The box legs are ⅞ x 1¼ x ¼-in. deep. Mark off the first two dimensions and cut along marks to a ¼-in. depth with a coping saw. Remove excess wood with a carpenter's chisel or gouge. Mark in-

ner space to be hollowed out, leaving a ¼-in. lip. With mallet and bent gouge, scoop out the interior to a 1⅜-in. depth.

Inside the box lid make a ¼-in.-wide by ⅞-in.-deep lip with a skew



Box legs are marked and sawed to a ¼-in. depth. Here excess wood is gouged out.

Inside of the box is hollowed with a bent gouge to a 1⅜-in. depth, leaving a ¼-in. lip.

Shape the three levels on the lid. Texture and beveled corners are made on lowest level.

The flower design is drawn then incised with a chisel; excess wood is chiseled away.



chisel. Find the center of the outside of the lid. Mark off a 1-in. square for the knob and a 2¼ x 3¼ in. rectangle for the flower petal area. Using a ⅝-in. straight gouge and mallet, level the area outside the rectangle sloping down to the corners. With the same gouge, level the petal area about ¾ in.; draw the petal design.

With skew chisel, round the knob, incise petal lines and cut away petal background. Texture the lid with a flat gouge. Finish with oil.

3 Partridge mirror

Our "partridges in a pear tree" mirror was carved from a single piece of white pine.

Materials: White pine board, 1¼ x 11 x 14½ in.; mirror, 6½ x 9½ in.; glazier's points or ½-in. brads; brown wrapping paper; white glue; hanging device; Minwax No. 224 Special Walnut Stain and Minwax Antique Oil Finish.

Tools: ⅝-in. flat, straight gouge; ⅜-in. flat, straight gouge; ¼-in.

quick, straight gouge (remember "quick" means the end has a deep curve); ⅝-in. skew chisel; mallet; jigsaw.

Method: Begin with a smooth, flat board with square corners. Draw the frame including the 5¾ x 8¾-in. center mirror area on paper and transfer it to the wood. Saw the frame outline with a jigsaw. With the skew chisel, silhouette the birds. They are on the highest plane. Using the ⅝-in. flat gouge and mallet, reduce the depth of the rest of the frame about ¼ in. Remove the center mirror area with a jigsaw.

Mark off then remove with a ⅝-in. flat gouge a ridge about ½ in. within the outer border and a second ridge ½ in. away from the inner border where the mirror will be placed. With the ⅝-in. gouge make a cove ⅜-in. away from the second ridge toward the mirror area.

Next, define the partridge detail with a skew chisel. Cut along the lines already drawn.

On the back, mark off ¾ in. around the inner frame perimeter for the rabbet that will hold the mirror and cardboard backing. With a skew

chisel (you can cheat by using a router), remove the wood to accommodate the mirror and backing (½-in. depth).

After sanding the surfaces smooth, apply stain and oil finish to the frame.

Place the mirror and cardboard backing in the rabbet and secure them with glazier's points or ½-in. brads. Then dampen brown wrapping paper slightly larger than the mirror frame and glue it to the back. When the glue becomes tacky, trim the



Make a ½-in. ridge from the inner border.



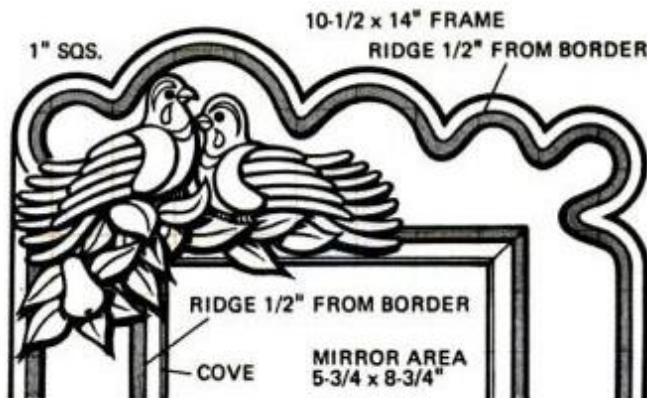
Cut the design along the drawn lines.

paper ¼ in. in from the border with a utility knife. As the paper dries, it will shrink and provide a smooth backing. Finally, add the hanging device.

Hint: You might first practice gouging and cutting scrap wood.



Tools needed: ⅝ and ⅜-in. flat gouges, quick gouge, chisel, mallet.



paper ¼ in. in from the border with a utility knife. As the paper dries, it will shrink and provide a smooth backing. Finally, add the hanging device.

Hint: You might first practice gouging and cutting scrap wood.

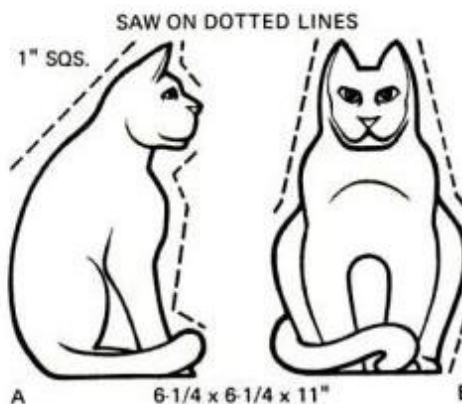
4 Cat

Tools you need for this project (from the bottom): 1-in. fantail gouge, ⅝-in. bent gouge, ⅝-in. flat gouge, ⅝-in. skew chisel, ¼-in. quick gouge and wood mallet.



Carving in the round will test your ability to visualize a three-dimensional object. Our lifelike cat was carved from a 6¼ x 6¼ x 11-in. mahogany block.

Tools: You'll need a 1-in. fantail gouge; ⅝-in. bent gouge; ⅝-in. flat, straight gouge; ⅝-in. skew chisel;



¼-in. quick, straight gouge; mallet; wood rasp and bandsaw.

Note: You might get a clearer idea of how your finished piece should look if you make a clay model before you begin carving. It also helps to secure the bottom of your block of wood to the worktable with

carver's screws, or by running screws through a piece of plywood and the wood block and clamping the plywood to the work surface. Doing so allows you to see all sides of the object and work on it in an upright position.

Method: Sketch the side views (A) of the cat on the wood block. Then cut away the waste with a bandsaw. Sketch the front view (B) of the cat and do the same.

As you work, it will help to draw in guide lines. With the 1-in. fantail gouge and mallet, continue



Finishes for wood carvings

Often the simple action of a carving tool on wood acts as a burnisher. When the tools serve as a burnisher you may want to leave your work in its natural state without applying a finish. Before burnishing, strop the tools on a piece of leather containing a mixture of emery powder and petroleum jelly, immediately after they've been sharpened.

Another simple way of burnishing a carving is by rubbing it with wood shavings.

Newly cut timber that will attract dirt and grease should be sealed. Several coats of white French polish applied with a soft brush and rubbed down with fine steel wool will seal it and leave a slight gloss.

Or you might choose to give a carving several coats of linseed oil. It can be burnished with beeswax applied with a coarse cloth.

The soft luster of wood doesn't lend itself to lacquering, varnishing or finishing with a method that gives a high gloss. But distressing of softwoods can make an interesting finish.

One method of distressing wood is to burn the surface slightly with a blow torch and later brush the wood in one direction with a steel brush. This treatment highlights the harder growth of the wood and improves the form of the object, but it should not be used with very resinous timbers or woods containing large knots.

Another method of distressing softwood is to poke holes in it with an awl or ice pick. This is generally followed by a dark stain for an effect like wormwood.

Use a good furniture polish occasionally to protect the finish.



Additional weight can be added to the mallet (above) by boring small holes up to $\frac{3}{8}$ -in. diameter evenly spaced in the head and filling them with lead. Besides the common tools (below) an advanced carver will need V tools (2-sided chisels) and small gouges called "fluters" or "veiners."



How to order PM's carving kit

Shown above are a few of the top-grade Marples Blue Chip tools you'll get in our six-piece starter carving set. It includes a beautiful 24-oz. lignum vitae carver's mallet and five different chisels; a 1-in. fantail gouge for rough cutting, a $\frac{3}{8}$ -in. flat gouge for finishing, a $\frac{5}{8}$ -in. straight gouge for roughing and smoothing work, a $\frac{5}{8}$ -in. bent gouge for hollowing and a skew chisel for cutting. Order by sending \$36.95 to Popular Mechanics, Dept. CTK, Box 1014 Radio City Station, New York, N.Y. 10019.

WOOD CHARACTERISTICS

- Basswood: A pale yellow, fairly soft, easily cut wood; not for detail work.
- Birch: A light-toned, fairly stable wood, but not too durable.
- Boxwood: Very hard; good for small, delicate work.
- Cherry: Fine working qualities; grain often adds to quality of carving.
- Chestnut: Similar to oak in appearance, but much softer. Tools must be very sharp to avoid crushing the fibers.
- Elm: Very strong grain which can enhance a carving. However, uneven grain can cause working difficulties.
- Lime: Excellent wood. Perhaps the best all-round wood for carving and sculpting.
- Mahogany: Various types available; American has good all-round qualities; cuts and polishes well.
- Pine: A soft wood, light in color and very easy to work. However, dull tools will crush and tear the fibers.
- Walnut: A dark, easy wood to work; it has even, close grain, cuts and polishes well.

WOOD AND TOOL SUPPLIERS

- Pacific Home and Foreign Trade, 744 Harrison St., San Francisco, Calif. 94107 (tools only).
- Wood Carvers Supply, 3112 28th St., Minneapolis, Minn. 55416.
- Woodcraft Supply Corp., 313 Montvale Ave., Woburn, Mass. 01801.
- Garrett Wade Co., Inc., 302 Fifth Ave., New York, N.Y. 10001 (tools).
- Albert Constantine, 2050 Eastchester Rd., Bronx, N.Y. 10461.
- Marples carving tools, Record Ridgway Tools, Ltd., Sheffield, England (available from distributors).



Work on the cat's neck is done with a $\frac{1}{4}$ -in. quick gouge. Note the center line drawn to help maintain symmetry.

to remove the excess wood and begin making rough details (C). A center line drawn down the cat's front will help you keep the proportions.

Begin to refine the details. The $\frac{5}{8}$ -in. bent gouge is good for round-

ing areas like the cat's haunches. The $\frac{5}{8}$ -in. straight gouge can be used to smooth the gouge marks made by the fantail gouge, and to further refine details. Use the skew chisel to outline and make small details like the cat's mouth and paws. The $\frac{1}{4}$ -in. quick gouge can be used to define small places like the neck, tail and between the legs.

Remember, whenever you must exert a great amount of force, your tools probably need sharpening—either with a slipstone or with both oilstone and slipstone.

Smooth the cat with a wood rasp followed by three grades of sandpaper. Apply three or more coats of linseed oil, allow 24 hours between coats, and finish with butcher's wax.



A smooth finish is one key to producing this sleek, lifelike cat.



Thumping bumpers, ringing bells, free games and drop targets are just a few of the action features. PM tells you how to tap into the little-known world of low-cost, secondhand pins—and set one up for hours of fun at home.

The fast-paced arcade game is the latest fad in home entertainment.

by Mike McClintock
HOME AND SHOP EDITOR

The prototype for the first pinball machine in the United States, called "The Log Cabin," was built in 1898. The simple playing field was dotted with holes of different values that were obstructed by metal pins (that's how the game got its name).

Pins have come a long way since then. The colorful playfields are filled with devices so intricate and play combinations so varied that it can take you a week of solid playing to discover all of them.

The driving, nonstop action is powered and controlled by an arsenal of electronic equipment. Each machine has a transformer, rows of contact points, dozens of electromagnetic coils and nearly 500 yards of wire.

Ingenious designers (some have devoted followers who can recognize their work by how the games play) combine these components into complicated mechanical action built around brightly colored playfields.

You can play pins in arcades, diners and bars but, until now, never at home. The pinball industry (actually four companies make most) is coming out of its arcade closet into the lucrative world of home entertainment.

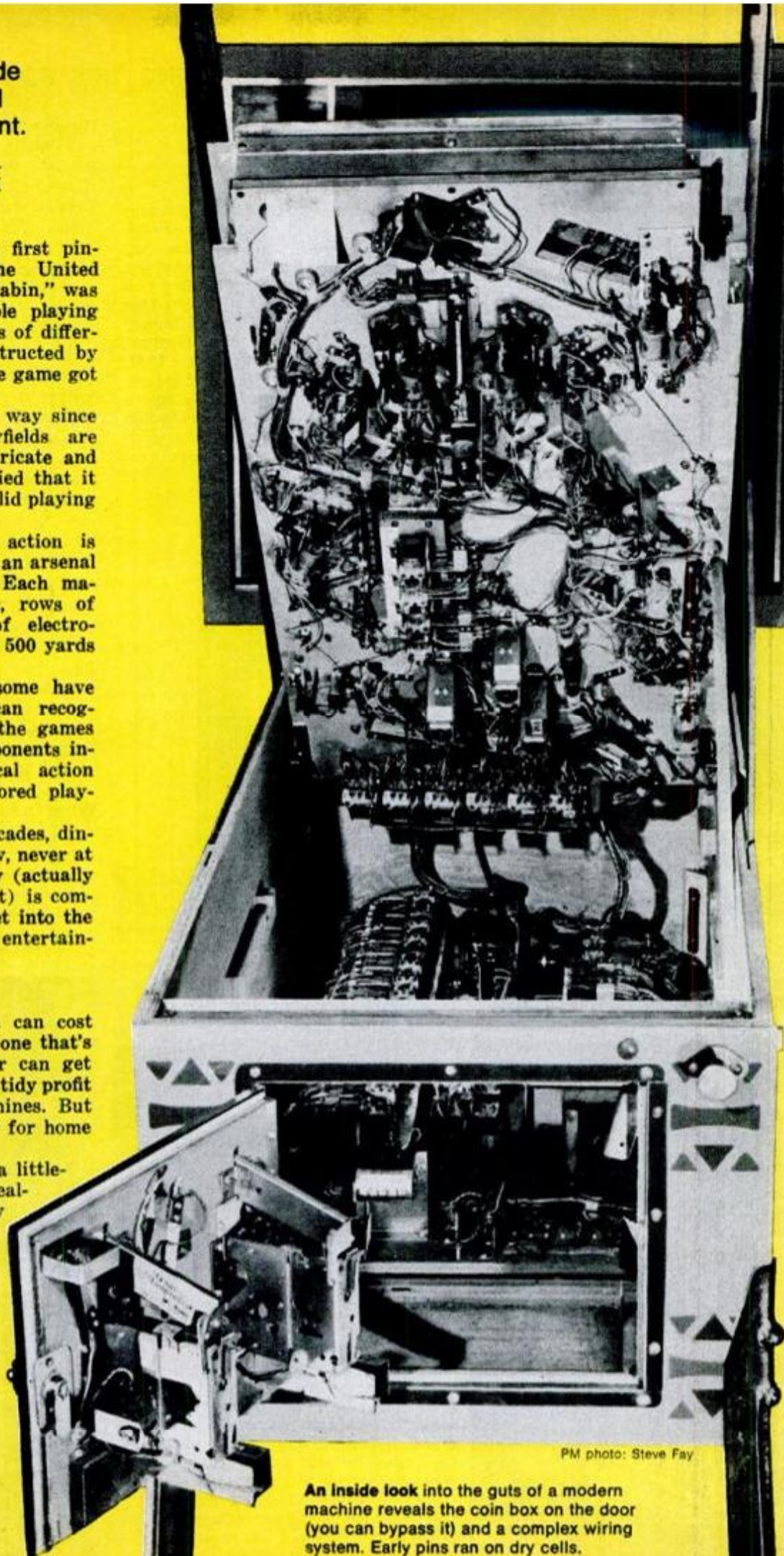
Reconditioned pins

A new multiplayer pin can cost \$750 and up to \$1500 for one that's popular. An arcade owner can get his investment back with a tidy profit on the coin-operated machines. But that price tag is a bit stiff for home entertainment.

PM has found there is a little-known network of small dealers (in almost every city having public pins) who buy, recondition and sell used pinball machines. Prices, even from operators who completely clean the pins and rebuild or replace faulty parts, run about half the cost of a new one.

The pinball cycle

The nice part is that the refitted games are just about as good as the new ones—they're just older models. A well-re-



PM photo: Steve Fay

An inside look into the guts of a modern machine reveals the coin box on the door (you can bypass it) and a complex wiring system. Early pins ran on dry cells.

BUYING TIPS FOR USED PINS

conditioned pin, originally built for constant commercial use, will last 10 or 15 years with minimal maintenance. For the hours of fun your family will get, it's a good investment.

"Coin-operated" is the name to look for. Local classified directories and entertainment magazines like *Cashbox* list sources for new and used machines.

Here's how the pins become available: Once a company salesman convinces an arcade owner that the game will make money for him, it's installed in his lineup. Generally, it gets only enough maintenance to keep the game operational. As it gets dirtier and requires more service calls to keep it going, it will be sold to a used-pin dealer.

Some pin dealers we talked to, like Ira Warren who runs *Antique Amusements* in New York City, used to buy secondhand pins for next to nothing. Warren told us: "About the best buy I ever made was for a warehouse full of water-damaged pins for about \$15 each. A lot of them couldn't be salvaged so we used them for spare parts and reconditioned the rest."

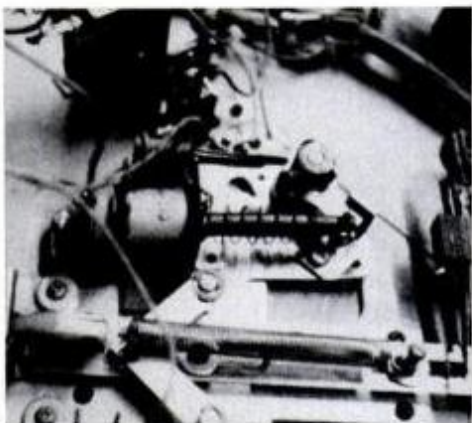
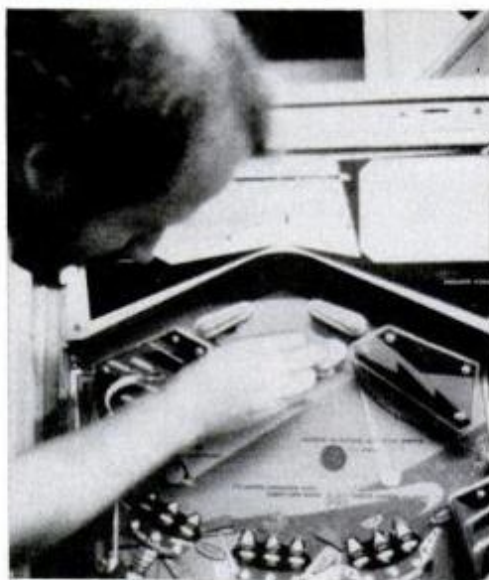
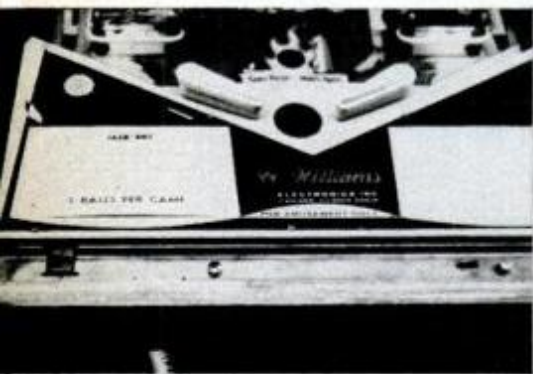
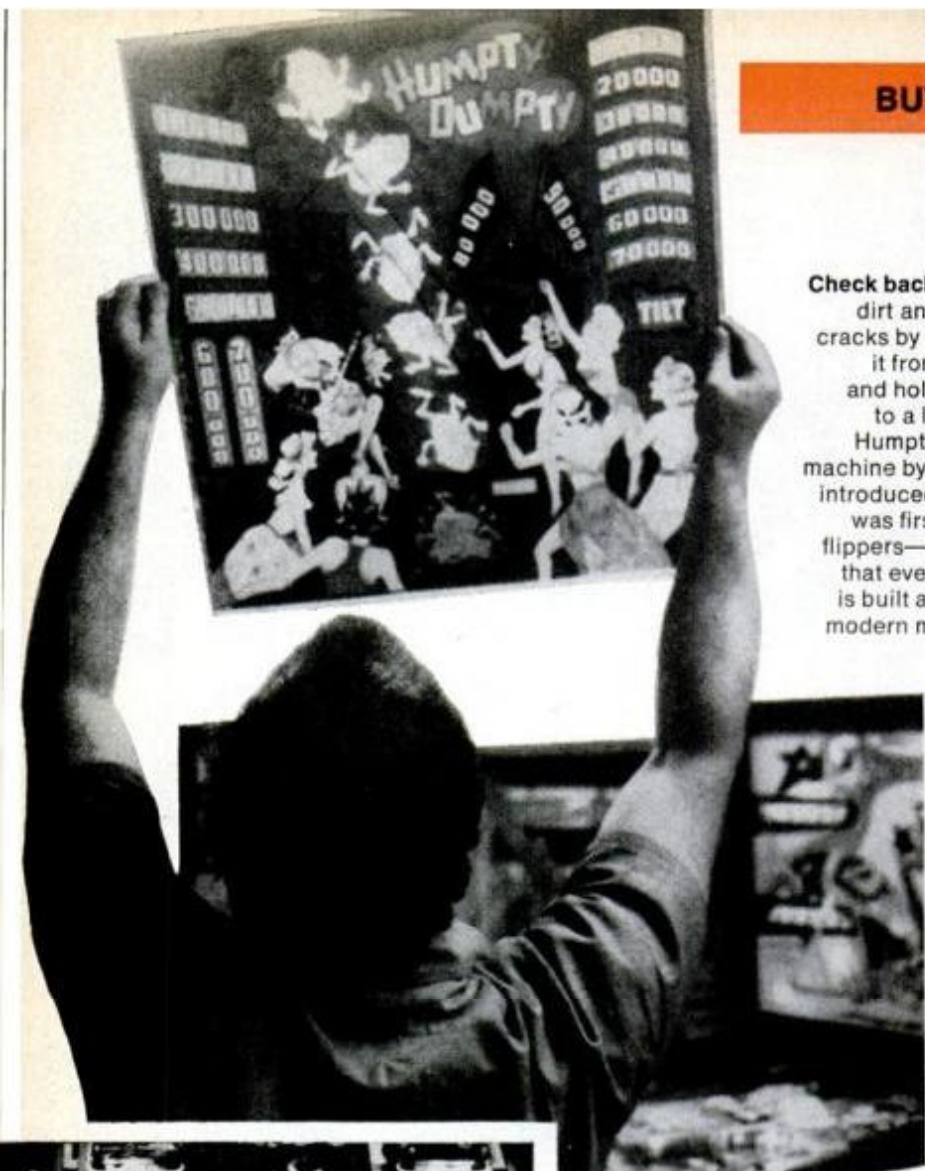
What to look for

Here are some guidelines that will

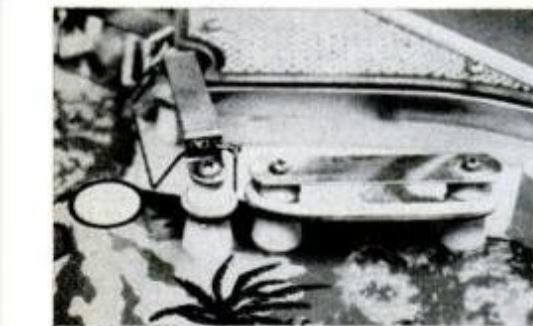
Playfield should be cleaned periodically (left) with a nonabrasive cleaner. The paper wrappings on the coils (below) can give you an idea of the machine's overall condition and provide wiring information.

Check backglass for dirt and hairline cracks by removing it from cabinet and holding it up to a light. This *Humpty Dumpty* machine by Gottlieb, introduced in 1947, was first to have flippers—a feature that every design is built around on modern machines.

PM photos by the author



Here's what to look for on a used pin: See if manufacturer's playing card instructions (top, left) are in place (or at least a copy). Be sure the gates (middle, left) are in good working order, and the bumpers are clean and white. Those shown are yellowed, dirty, cracked—just about dead. Look under the flippers (left) to be sure there is no dirt for the ball to pick up and track across the playfield. Make sure there's no debris on the transformer board (right). Dust and wire clippings can be vacuumed out to clean contacts.



help you pick out a good used pin.

■ **The playfield:** Check for dirt buildup around the edges of the flippers and bumpers. Ask for a copy of the schematic wiring diagram and check for copies of the original play instructions.

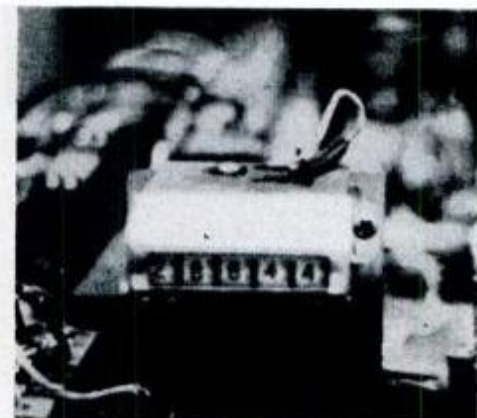
The rubber bumpers should be clear and white. Old ones that are yellowish, cracked and dirty will deaden the game. Check for missing parts like bumper caps. On old machines they may be hard to replace unless the dealer has a used-parts stock. The most important test is to play the pin as many times as possible to see if it keeps your interest.

■ **Inside the machine:** Components should be free of dirt and small wire clippings left over from service calls at the arcade. The ball-return tracks should be clean with no residue buildup from liquid spills (another arcade leftover).

The cover papers of the coils should be intact, hopefully with readable code numbers. If they're tattered, the thump may be gone from your bumpers. The game counter should still be there. As with a car odometer, if the number is unreasonably small, you can figure the counter has already been by the 100,000 mark.

A good dealer should be willing to maintain the machine he sells you. Pins can take more punishment than you'll give. With minimal care, a machine should last a long time. ★ ★ ★

Game counter drum (below) should still be in place. If you find a low number (like 5000 or 10,000), the counter may already have passed the 100,000 mark. It still may be a great-playing game.



Coils and transformer of machine (left) show complexity of the new pinball systems. That's why it's wise to ask about service policies and guarantees from the dealer who sells you the machine. Safest bet is to buy from a dealer who will be willing to provide service for the pins in your area.



NEW PINBALL TRENDS



Elton John of Captain Fantastic fame is promoting Bally's new pin. Tagging of a new machine to a well known theme and star is a symptom of the arcade-to-home transition.

size pin designed by Bally for home use, packs a mini-computer called the "Game Brain" that keeps track of scores, bonuses and tilts for as many as four players at a time.

"Cosmic Pinball" by Sears is another indicator of how much home pinball is growing. The \$300 machine is compact and, though lacking a full array of intricate devices of bigger pins, it sports two sets of

Decorative themes of some new pins are being designed around images of current movies and celebrities. Most obvious (and already successful) candidate for this new move is the original pinball wizard in the movie *Tommy*.

You can get a lot of information from big manufacturers on makes and models as well as parts and service.

- **Bally**, 2640 Belmont Ave., Chicago, Ill. 60618
- **Williams**, 3401 North California, Chicago, Ill. 60618
- **Gottlieb**, 165 West Lake St., Northlake, Ill. 60164
- **Chicago Coin**, 1725 West Diversey, Chicago, Ill. 60614

The "Fireball," the first full-

flippers.

About the biggest pinball-industry development is the switch-over to transistorized machines.

The final test of a pin (new or used) is still how well it plays. In general, machines with more features are more exciting—but it's really a personal choice. Some best playing features to look for are a free-ball or free-game bonus system, multiple flippers, flipper posts that rise and fall arbitrarily, blocking or opening the ball exit, and multiple-ball games where as many as three balls can be caroming around scoring points, ringing balls and thumping bumpers.



Sears' new Cosmic Pinball has many devices found on commercial machines: lights, bells, thumper bumpers, flippers. \$300 unit is only for home use.

Wood flooring: How to pick it and take care of it

Here's a look at what's on the market and the advantages wood flooring has to offer.

by Penelope Angell
ASSISTANT HOME AND SHOP EDITOR

If you're remodeling a basement or den or building a new home or an addition, wood flooring is a handsome, long-wearing finishing touch you should consider seriously. New materials and easier installing techniques make it a good do-it-yourself project. To begin with, laying a wood floor over your subflooring adds structural strength to your home that isn't offered by tile or carpeting.

While the initial cost of wood flooring varies widely from low-grade strip flooring to fancy block parquet, some of it is comparable in price to carpeting, but has a higher resistance to wear and will last longer—often the life of the house.

Wood flooring will require very infrequent refinishing if it is cared for regularly. Even if it's neglected for years, you can still restore it to its original beauty by sanding and refinishing. Most manufacturers suggest a regular dust mopping and a more thorough cleaning and waxing (if your wood flooring is the type that needs wax) two or three times a year.

For richness, warmth, pattern variety and beauty, wood flooring has strong appeal. It's also versatile. One flooring pattern can complement a variety of architectural and furniture styles, colors and textures. Wood can also be stained to take on



Village Plank by E.L. Bruce Co. can be glued to concrete floor or laid directly on wood and tile floors. Average materials cost is about \$1.75 per square foot.



Clear-finished teak flooring is a practical choice for an area where liquid spills occur. This Checkerboard Teak by Wood Mosaic costs about \$1.75 per square foot.

color tones or used with area rugs.

Studies on flooring conducted by the U.S. Department of Agriculture Forest Service, comparing hardwood, carpet and composition tile, concluded that overall, in long-term cost, wear life and maintenance time, hardwood floors appeared to be the best choice for homeowners.

Choosing your wood flooring

Wood flooring isn't what it used to be. Modern methods and materials have made even intricately designed parquet patterns available to do-it-yourselfers for good-looking, long-lasting installations.

There are loads of new products on the market. Here's how to sort through them and make the choice

that will work best for you. First consider where the flooring will be laid. Will it be in an area like a dining room where beauty is the most important factor? Or in a place where traffic is heavy and water abuse is frequent like an entrance or a kitchen. If the latter, your best bet is one of the new types of specially finished flooring that's almost damage-proof.

Next consider the special characteristics some floors have that you might want. Do you need a floor that absorbs sound, is particularly easy to maintain, is specially colored or designed, or falls within a certain budget? The tremendous range of wood flooring and the versatility that

(Please turn to page 136)



Chrysler outboards set the pace. Again! With unique underwater engineering.

This year, Chrysler announces a major breakthrough in underwater marine design: the incredibly new and advanced "Power Flow" underwater drive unit. It's built into every 65, 105, 120 and 135 Chrysler makes.

The Big Power 4's. The Chrysler 105, 120, and 135 are "Power Flow" designed all the way. Perfected in one of the world's few computer-controlled water



tunnels (in Berlin, Germany), the new "Power Flow" shape means more speed from the same horsepower. More than 2 mph at speeds over 40 mph, or the equivalent of more than 10 extra horsepower free!

The Super 65. This clean, compact power package is the most powerful 2-cylinder anywhere. Also designed with a "Power Flow"

lower underwater unit, it's economical, dependable and just what a boater needs to get going. Fast!



The Thrifty "Sailors"

Available in 6 and 10 hp., these workhorses with their unique underwater unit design are the most powerful sailboat auxiliaries in the industry. With a 3-to-1 gear ratio and 10" prop, they give 40% more forward thrust and double the reverse thrust.



The Zippy 4. This brand-new single-cylinder beauty is water-cooled to run silent and loop-charged to run fast. It's an extremely powerful,



compact, lightweight outboard.

As you can see, it's a better time than ever to join the Chrysler Crew. Check the Yellow Pages today for your nearest Chrysler Marine dealer.

Chrysler manufactures an entire family of pacesetter marine power:

inboard, outboard, jet, and stern drive; and also, a complete fleet of fine powerboats, sailboats, and accessories.



**A lifetime of engineering.
For the time of your life.**

Relieves Tormenting Rectal Pain And Itch, Helps Shrink Swelling Of Hemorrhoidal Tissues

...Due to inflammation. Gives prompt, temporary relief from such burning itch and pain in many cases.

The burning itch and pain caused by inflammation in hemorrhoidal tissues can cause much suffering. But there is an exclusive formulation that in many cases gives prompt relief from this itch and pain. It helps shrink swelling of such tissues caused by inflammation.

Tests by doctors on hundreds of patients reported similar successful results in many cases. This medication is available at drug counters everywhere, under the name *Preparation H*®.

There's no other formula like Preparation H. Ointment or suppositories.

FOUR LITTLE WHEELS

(Continued from page 49)

and that's why the batteries are mounted far forward in the nose structure of the final version. Moving weight farther away from the center of gravity increases the polar moment.



Designer of the six-wheel Tyrrell racer, Derek Gardner.

The sorting out was surprisingly smooth, but still you don't develop a car to its fullest potential in a single season. Designer Gardner is confident that the potential of the design is barely tapped. For '77, he sees his six-wheel design greatly refined.

There is very little in motor racing that remains uncopied if it is successful (someone once said that if a car won Indy with a lunchbox welded to the dash, the following year all cars would have a lunchbox welded to the dash). We talked to several Formula One car constructors at the Glen to see if they had any six-wheel plans. Not yet is the consensus. But they're watching developments.

By the time this issue of PM is on the newsstand, or shortly thereafter, the shapes of the '77 cars will be known, and the shuffling of drivers from one team to another will be over. It's no secret that Scheckter has joined a team put together by Canadian Walter Wolf and will be driving a car designed by Harvey Postlethwaite, who designed the Hesketh racers. Postlethwaite's last car had a solid-rubber suspension so it's obvious he's not averse to new ideas. And certainly Jody will bring with him a great deal of knowledge about the Tyrrell six-wheeler.

Meanwhile, Ken Tyrrell has signed Ronnie Peterson as one of his drivers for the new season. And who knows what Tyrrell and Gardner have up their sleeves for '77—what about using those tiny wheels on all four corners for an eight-wheeler? If someone told you in '75 that a six-wheeler would win a Grand Prix in 1976, would you have believed it?

1977 Grand Prix Calendar

Argentina, Jan. 9; Brazil, Jan. 23; S. Africa, March 6; United States GP West, Apr. 3; Japan, Apr. 17; Spain, May 8; Monaco, May 22; Belgium, June 5; Sweden, June 19; France, July 3; Britain, July 17; Germany, July 31; Austria, Aug. 14; Netherlands, Aug. 28; Italy, Sept. 11; United States, Oct. 2; Canada, Oct. 9. ★★★

"INSIDER'S" Confidential Catalog 6,000 Tools & Hardware at Rock-Bottom Prices!

STANLEY **SKIL** **B&D** **DISSTON** **RIDGID** **CHAN NEL LOCK** **Millers Falls** **WEN** **Rockwell** **Milwaukee** **KENNEDY** **PROTO**

WHY PAY RETAIL? BUY DIRECT AT BIG SAVINGS!

Name brand Tools & Hardware at Low Industrial Prices!

Black & Decker 2-speed jig saw
FREE GIFT FOR YOU

Rockwell 3/8" drill
 AT A PRICE BREAKTHROUGH

INCREDIBLE VALUES

Black & Decker 10-Pc. SOLDERING SET	Mfrs. List \$9.99	Your Price \$4.95
Rockwell 3/8" DRILL	Mfrs. List \$14.99	Your Price \$10.90
Swingline PROFESSIONAL RIVETER for 1/8 to 3/16" Rivets	Mfrs. List \$17.95	Your Price \$14.55

Buy direct from U.S. General's catalog and enjoy "Insider's Confidential" prices on hand tools, power tools, automotive tools, motors, handyman supplies—6,000 nationally advertised name brand items at rock-bottom prices. Save on all the famous names you know and trust.

Thousands of serious minded craftsmen, mechanics, homeowners and hobbyists use this big 204-page catalog for saving big dollars. Our bargains are too great and our prices too low for us to give away this big catalog to people who aren't really interested. So we ask for \$1 (refundable) simply to discourage curiosity seekers.

However, the catalog is REALLY free! You get a \$1 Cash Certificate with it that you can spend just like money with your first order. Or, if you're not 100% satisfied with the catalog, send the Certificate back to us and we'll refund your dollar. (You can still keep the catalog.)

LAST CHANCE TO SAVE!

Act now while our supply of current catalogs lasts. Rush coupon at once to: U.S. General Supply Corp., 100 General Place, Jericho, N.Y. 11753 - Dept. 51

AMERICA'S TOP QUALITY NAME BRANDS!

U.S. General Supply Corp.
100 General Place, Dept. 51
Jericho, N.Y. 11753

I enclose \$1. Please send your new 204-page fully illustrated Confidential Tool & Hardware Catalog. Also include a Certificate worth \$1.00 on my first purchase. If I am not 100% satisfied with the Catalog, my \$1 will be immediately refunded.

(Print) Name _____

Address _____

City _____ State _____ Zip _____



Got a problem ceiling?

Cover it up! Dress it up! Light it up! Quiet it down! With a new Armstrong suspended ceiling.

Introducing the suspended ceiling that doesn't look like a suspended ceiling. Look closely. You can barely see the metal grid. Armstrong has carefully designed this new ceiling so the color-matched grid is part of the ceiling pattern, not an interruption. And because this is a suspended ceiling, wall-to-wall beauty is just one of the benefits. It's easy to install and easy to keep looking fresh and new. If a panel gets damaged, just lift it out and lay in a replacement. No staples or glue, no muss or fuss.

The pattern above is called Royal Oak. It has the rich textured look of sculptured plaster inset in wood. It's washable, fire-retardant, and acoustical to help quiet down kitchen clatter. And because it's a suspended ceiling, you can put lights where you want them, like



over the stove or counter. And the ceiling panels lift up and out of the way for easy access to pipes and wires above.

You can install a beautiful new Armstrong suspended ceiling almost

anywhere in your home. Briefly, here's how:

1. Hang the Armstrong Super White metal runners at least six inches below existing ceiling or open joists.
2. Attach the Armstrong lights directly to the grid—no special hangers required—and arrange for proper electrical connection.
3. Snap the Super White cross tees into the main runners and lay in the new Armstrong ceiling panels. It's easy!

Your Armstrong ceiling retailer can show you a broad selection of suspended ceilings. He has everything you need: ceiling panels, Super White Grid, lights, and easy-to-follow instructions. Find him under "Ceilings" in the Yellow Pages. Or send us this coupon, and we'll send you his name and our free full-color brochure.

Armstrong
7701 Watch Ave.
Lancaster, PA 17604

I'd like more information on your new suspended ceilings. Please rush it to me, free of charge.

Name _____
Street _____
City _____
State _____ Zip _____

Armstrong

CREATORS OF  THE INDOOR WORLD®

Материал, защищенный авторским правом

THE NO SPRAY WAY TO CONTROL WETNESS ALL DAY



Switch to a Roll-On with a clinically tested formula that provides effective 24 hour odor and wetness control.

OLD SPICE® Roll-On
Anti-Perspirant.

Quick drying man-sized protection comes out of that big ball applicator.

All that and our great OLD SPICE fragrance.

So make the switch!

Protect yourself like a man.

Old Spice®

PROTECTION YOU DON'T HAVE TO CHECK.

SHULTON

PM'S 75TH ANNIVERSARY (Continued from page 75)

them out. Later, PM editors would travel the globe for up-to-the-minute eye-witness reports, and projects would include things like houses, yachts, motor vehicles and even aircraft. But even in January 1902, the basic formula was in the test tube—and bubbling.

Ingenuity saves the day

In spite of it, the magazine floundered, growing slowly but suffering for lack of working funds. By 1906, creditors were making wolfish noises at the door. Windsor's printer—who was owed thousands—threatened to take everything, including Windsor's home, if the debt wasn't cleared. In his new book, *With Warm Regards*, W. H. Fetridge who subsequently became a vice president of PM, tells how the young publisher responded to the crisis with a real stroke of genius. In his *R.F.D. News*, which he still owned, he ran an offer of a new mail wagon to any country mailman who sent him 100 paid subscriptions (at \$1 per). From all over rural America, a blizzard of subscriptions poured in and the day was saved.

In those days, before TV or radio, Fetridge points out, country folk read everything in a magazine—including all the ads. Mail-order advertisers quickly discovered that *Popular Mechanics* was the new "mother lode." When the century's first decade had ended, Henry Haven Windsor was a multimillionaire, and his new magazine had become an American institution.

With the September 1903 issue, *Popular Mechanics* became a monthly. Circulation had grown to 17,000 and its size went to the 6½ by 9½ inches that became a trademark for 70 years. Profuse with illustration, it also became one of the first picture magazines. Early on, readers were introduced to the wonders of X-ray with photos of a bullet in the skull of a man whose life had been saved, thanks to the picture. Photo spreads of the Peary and Cook expeditions took readers to the North Pole and dealt with the controversy over "who got there first." Pictures and cross sections of the Panama Canal accompanied a definitive article on that huge undertaking.

A 1903 illustrated article on the first "wireless telephone" described an experiment in New York in which signals were transmitted through water by means of copper conductors. The first motor home—a 20-foot "automobile house car" in which one could "live in comfort and tour the world"—was described and pictured

in 1903. It was a forerunner of many to come, including the one on the March 1921 cover (see page 73).

No project too big to tackle

The fact is that *Popular Mechanics* was a natural medium for the exciting developments in the most scientifically productive century in all history. Through ensuing decades, the magazine would reflect highlights from horse-and-buggy to automotive age, air age, electronic age, jet age, nuclear age and the rocket and space age.

Early issues displayed a preoccupation with cars and aircraft, just coming into their own. "Why not make your own automobile?" Windsor asked his readers, for openers, in a 1903 item that referred them to available plans and supply sources for the parts.

One of the first projects—with complete do-it-yourself plans and instructions—was a full-scale biplane glider. Two enthusiastic readers adapted the plans to a powered aircraft driven by a 30-hp engine and propeller, and got themselves featured in a later issue.

One early contributor was Barney Oldfield, famous racing driver, with an indictment of the earth tracks that were taking the lives of many courageous drivers. In those years, the automobile was still a device for daredevils and a toy of the rich. But Arthur Brisbane of Hearst's *New York Journal* wrote in an early issue of *Popular Mechanics* that it would soon become the conveyance of the common man.

Important names in PM

From the outset, *Popular Mechanics'* pages featured articles by distinguished personalities in many fields. In 1903 Guglielmo Marconi predicted "full and efficient [telegraph] service between Great Britain and the United States within a year." It arrived in four. M. Pierre Curie wrote, in 1904, on "The Future of Radium" which he predicted would find use "in the domain of medicine rather than of warfare and commerce." Contemplating "The Future of Submarines" that same year, Jules Verne, author of *Twenty Thousand Leagues Under the Sea*, prophesied for it "... wholly a war future ... that will bring us peace."

Over the years, other contributors included Winston Churchill, Theodore Roosevelt, Thomas A. Edison, Alexander Graham Bell, Adm. George Dewey, Adm. Richard E. Byrd, Charles Kettering, Glenn Curtiss, Dr. Lee De Forest, Dr. Harold

Urey, Dr. E.U. Condon, Dr. Vannevar Bush, Dr. Karl Compton, Gen. David Sarnoff, Dr. Roy Chapman Andrews, Capt. Eddie Rickenbacker, Lowell Thomas, Tex Rickard and many other familiar names.

Two of the most prophetic were Churchill and Urey. Sir Winston, in a 1932 article entitled *Fifty Years Hence*, forecast, with specific examples, the coming of "nuclear energy" that would "transform beyond all description our standard of values." He described in detail its explosive force as well as its peaceful uses. He discussed the coming of genetic control through "the chemical messengers in our blood," and prophesied that one day living material and even beings would be "grown under glass."

In November 1941, Dr. Urey—in a typical "written-so-you-can-understand-it" article—explained for *Popular Mechanics* readers, with charts and diagrams, how atomic energy worked and how the prodigious energy thus generated could be transformed into useful, or destructive, work. It was explicit enough so that the FBI paid a visit to the magazine and asked the editor to stop publishing material on the subject for the "duration." The article got too close for comfort to actual technical breakthroughs. The top secret Manhattan Project would soon be underway in Chicago, and Dr. Urey would become one of the principals in the business of unlocking the atom's power.

No future for airplanes

Not all prognostications in *Popular Mechanics* were "on the nose." A notable "miss" was Wilbur Wright's forecast that "aeroplanes" could never be used for bombing enemy troops since they would have to rise above 1000 feet to escape shellfire. At such altitudes and flying speeds up to 50 mph, said Mr. Wright, practical accuracy would be impossible.

Windsor misjudged the airplane, too. In 1910, commenting on the first air delivery of freight (a 100-pound roll of silk from Dayton to Columbus, Ohio), he observed that the feat was "more scientific than practical," and that airplanes would never amount to much commercially.

For the most part, however, Henry Windsor's crystal ball was not that clouded. Long after he was able to afford a staff of editors he continued to write articles for the magazine himself as well as an editorial page he called *Comment and Review*. He covered the International Balloon

Race of 1907 in St. Louis and, though he termed it "the greatest event in aeronautics ever seen in this country," he had no illusions about balloons. For passengers or mail transport they would never, he prophesied, "reach the efficiency and reliability of steam or electric cars on tracks, while for carrying freight, the suggestion is absurd."

Most descriptions of *Popular Mechanics'* editorial policies have emphasized that politics and controversy are ignored, that the magazine has always been dedicated only to reporting man's accomplishments and progress in science and technology.

Strong opinions

To the contrary, Windsor used *Comment and Review* as a frequent sounding board for opinion, and his pen trespassed indiscriminately wherever his energetic mind took him. Readers got everything from a friendly dissertation on Father's Day to an unfriendly critique of the national budget ("what the government needs is more workers and less slackers"), a grumble about federal income taxes, and a need for more practical courses in colleges. He wrote in favor of independence for the Philippines; he deplored government getting into operation of the railroads and forecast their eventual demise as a consequence.

In one column he put in a plug for "syndicated sermons" for country clerics, so rural folk could have the benefit of "the best thoughts of universal men" on Sundays. He cheered the use of radio by campaigning presidential nominees, and condemned students coming out of college ". . . filled with or ripe for bolshevism." As for the "advanced thinkers" among teachers and university presidents who encouraged such goings on, he wrote, with some heat, "Turn the traitors out!"

By the end of its first decade, the magazine's circulation had risen to nearly half a million. A book department, established in 1904 with the first publication of *Shop Notes*, soon added *What to Make*, *Amateur Craftsman* and a popular volume entitled *Telegraphy Self Taught* by Thomas A. Edison, M.A. The book division was on its way to the millions of volumes produced today, including the familiar *Popular Mechanics Encyclopedia*, automotive and crafts annuals, and other special titles.

An editorial coup in 1912 was a survey of 1000 scientists who were

(Please turn to page 108)

THE NO-SPRAY WAY TO CONTROL ODOR ALL DAY



Switch from your spray deodorant to the number one Stick Deodorant. **OLD SPICE.**

It's so effective, it protects up to 24 hours.

What's more, it's guaranteed not to stain or your money back. (see package for details)

And to top it all, it's got that great OLD SPICE fragrance.

So make the switch! And protect yourself like a man. Also available in Lime, Musk and Herbal.

Old Spice®

PROTECTION YOU DON'T HAVE TO CHECK.
SHULTON

Материал, защищенный авторским правом

4000 ITEMS FOR THE

WOOD

CRAFTSMAN and HOME WORKSHOP

144 Pages!

• Amaranth • Cocabolo • Red Oak • Siam Teak • Vermilion • Cherry • Ebony • Rosewood • Satinwood • Zebra • Mahogany • Aromatic Red Cedar

Discounts on STANLEY Power Tools

Domestic and imported hardwoods! Also thousands of Lamp Parts, Cabinet Hardware, Upholstery Supplies, Clock, Furniture and Picture Kits, Inlays, Picture Frame Moldings, Hand and Power Tools.

MAIL COUPON FOR NEW CATALOG

CRAFTSMAN WOOD SERVICE CO. Dept. A-17
2729 S. Mary St., Chicago, IL. 60608
Send new 144 page Craftsman Catalog. I enclose 50c for handling, postage.

Name _____
Address _____
City _____ State _____ Zip _____

BEFORE **\$10 to \$20 in an hr!** **AFTER**

AMAZING VINYL REPAIR

Big, fast earnings with amazing VIP Vinyl Repair. Big profits, repeat business, car shops, homes, motels, bars, restaurants, etc. Easy, quick.

FREE details by mail. No salesman will call.
VIP, 2021 Montrose, Dept. 181, Chicago 60618

NEW Improved Accurate Scope-Shot

SCOPE SHOT COMPLETE WITH 200 EXPLODING PELLETS \$3.75

World's Finest Precision SLINGSHOT Scope-type sight!

Patent No. D-178 837

Pure gum rubber slings. Beautifully polished cast aluminum stock.

Pistol grip. So powerful it kills small game. Fits pocket perfectly!

Guaranteed. **FREE** shooting manual. 2 Leather Pouch & Sling Assemblies only \$1.50.

Add 75c postage and handling. ORDER NOW from: GENERAL SPORTS, INC., Dept. MX, Lawrenceburg, IN. 47027

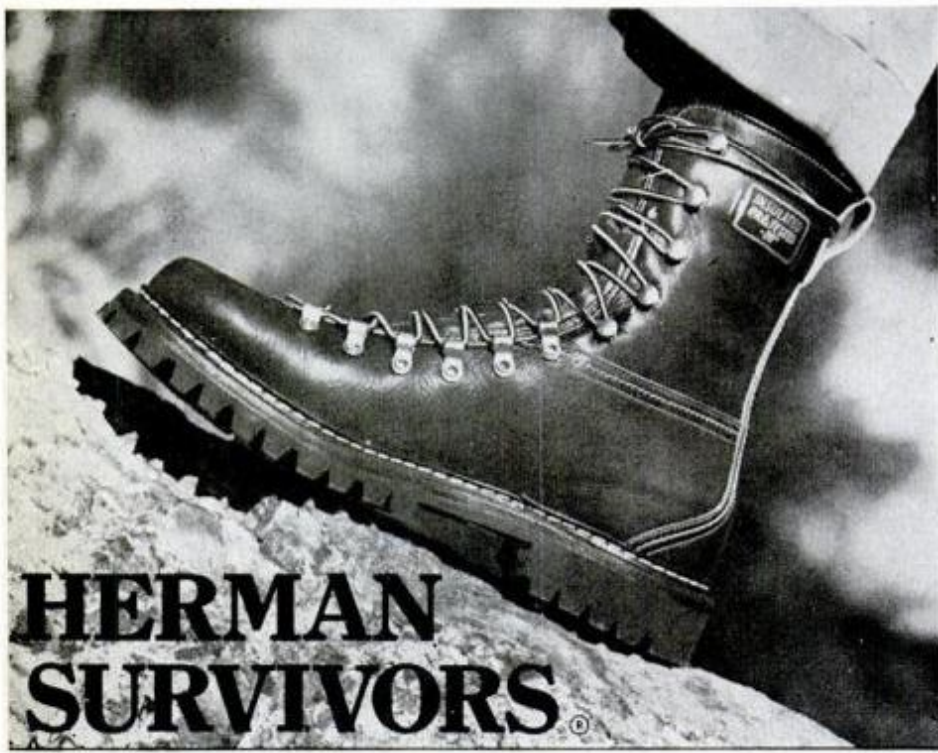
Price without pellets \$2.25
225 1/2" Steel Hunting Balls \$2.00

Wife Beater!

Your faithful wife-navigator may be right most of the time — an Airguide auto compass is right all of the time. Versatile adhesive mount. Self illuminated. Adjustable compensators. At retail auto stores. Write for Catalog 76A.



Airguide
2210 Wabansia Chicago 60647



HERMAN SURVIVORS

In New England, where we build Herman Boots, most things are made a little better. Partly, it's pride in craftsmanship. But mostly, it's because things up here have to be made a little better. That's why we build Herman Mountaineers out of the best materials we can find. Tough green pebblegrain full grain rawhide vamps and quarters for long wear. Soft full grain shafts and tongue for suppleness. Ensolite[®] insulation for warmth. Even at -20°. Tan full grain cowhide lining . . . right down to the cushioned insole. And once the upper is built, we lock it to the surest footing you'll find: The Vibram[®] sole and heel. 8" boot—#7197. 6 1/2" boot—#7197-6. Mountain Shoe—#4606. All in green rawhide with Vibram[®] sole and heel. When you're looking for the best, look up a pair of Hermans.



FREE CATALOG



J. M. HERMAN SHOE COMPANY, DEPT. 34, MILLIS, MASS. 02054
I'd like to try a pair of Survivors for myself. Send me your catalog and the name of my nearest Herman dealer.

Name _____ PM-MB-7-1
Address _____
City _____ State _____ Zip _____

PM'S 75TH ANNIVERSARY
(Continued from page 107)

asked to name the "seven wonders"—reflecting the most significant developments—of the then "modern" world. Winners were: wireless telegraphy, airplanes, radium, antiseptics, antitoxins, spectrum analysis and X-ray—in that order.

Ads pay off

As editorial stature grew, so did advertising. In 1905, Mr. King Camp Gillette was telling the world—on *Popular Mechanics* pages—about his newfangled safety razor, only five of which had sold before the ads began. By 1906, his company was paying dividends in six figures.

Subscribers were intrigued by ads that told them how to "Be Your Own Boss and Make \$2000 a Year"; how to double a weekly \$15 salary by taking mail-order courses from an organization called International Correspondence Schools. They saw coal ranges at \$8.75, and handsome Morris chairs available from an outfit named Sears, Roebuck. Exciting new products like vacuum cleaners, electric sewing machine motors, phonographs, bench-saws, electric lathes portable typewriters and hundreds of other brand-new inventions found their way to *Popular Mechanics'* ad pages.

One inventive gentleman named Ole Evinrude, tired of rowing a boat across a lake to see his girlfriend, cobbled up a little motor-driven propeller to do the work. So many neighbors wanted one that Evinrude found his time taken up making duplicates. One friend—a *Popular Mechanics* space salesman named Charles Miner—talked him into trying a two-inch ad "to see what would happen," and thus helped to launch an outboard motor industry in America.

War years saw the magazine's editorial pages devoted to reports of newly mechanized battles, dramatic new weapons, the wonders of submarines, airplanes and radio. Adaptation of these marvels to peacetime use filled the postwar years. In 1920, the magazine's radio department was launched with plans for building crystal sets that soon became larger tube sets, then transistor sets with intricate circuit diagrams.

New building, bigger staff

Then, in 1923, *Popular Mechanics* moved into its own Chicago building on Ontario St., and the size of its staff gradually grew to include editorial experts in a wide variety of fields. Some 20 carloads of paper

were required to feed the presses each month in order to meet the burgeoning readership.

Less than a year later, Henry Windsor died of pneumonia. His only son, H.H. Windsor Jr.—then 26—picked up the reins. His natural flair for publishing and inherently sound editorial judgment enabled him to carry the magazine through the Great Depression, another world war, and a dozen postwar years of spectacular technological development. It was still a *Popular Mechanics* world. Photography went from pinhole boxes to elaborate multilens cameras and motion pictures in full color with sound. Automobiles became a common necessity, as Brisbane had predicted. Jet aviation, radio and television were born (the magazine's first article on TV, *Television in Your Home*, appeared in April 1928), the atom gave up its secrets and the world was well into the space age with manmade satellites in orbit. There was plenty of material to fill *Popular Mechanics'* pages.

Young Henry, and the capable management staff he put together, believed in firsthand, on-the-spot re-

porting. To get material for articles, writers were likely to find themselves any place in the world on short notice. They tramped Venezuelan jungles on diamond hunts, jounced over the Alcan Highway in Jeeps, rode "Target" submarines off Key West so readers could be told what it was like to be depth-charged by destroyers in Navy exercises. They cruised on aircraft carriers, flew the first jets and new helicopters. They rode in the cabs of transcontinental diesel locomotives, in the Army's new tanks and on the first air-cushion vehicles. Some of their experiences were memorable.

Adventuresome editors

One editor lived with the first team of astronauts and went through some training with them—including a high-flying jet in which he found himself floating around in mid-cabin for several "weightless" moments. Another jumped from a parachute tower at Fort Benning to "get the feel" of Ranger training. One rode an ice breaker to the Antarctic with a four-month IGY (International Geophysical Year) expedition, and lived on the ice to produce a series

of articles culminating in his journey to the South Pole and back.

Popular Mechanics houses were designed and prototypes built to produce plans and do-it-yourself instructions. Some still are available, and many thousands were built across the country by happily housed readers who continue to write letters of "thanks."

Henry Windsor Jr. expected much from his staff, but his generosity was far-famed. A top executive might find himself the recipient of a Cadillac for a job well done. Staff members might be rewarded with expensive cameras, TV sets, hi-fi consoles and the like. In return he demanded—and usually got—loyalty and dedication to himself and the magazine.

Personal airlift fails

Henry Jr. was the kind of man who believed that anything desired was at least worth shooting for. While no tyrant, he expected prompt and effective attention to those desires—and often they were apt to be eyebrow-raisers.

He once called an editor via ship-

(Please turn to page 114)

Plenty of Jobs, Good Money in Drafting — according to U.S. Government Forecasts and Surveys of Private Industry



INCLUDED! WITH COURSE

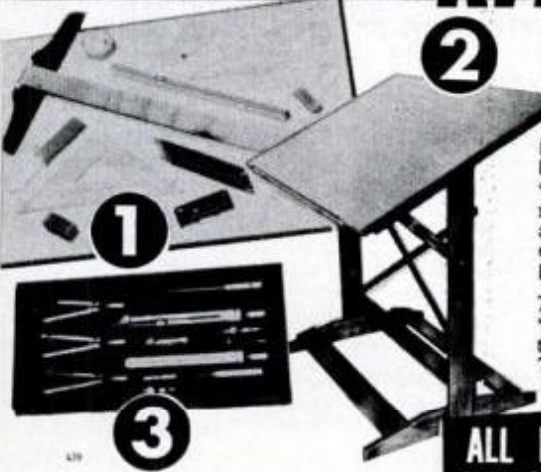
THESE 3 BIG DRAFTING KITS*

U.S. Dept. of Labor reports future for draftsmen "favorable" . . . predicts rise in demand for qualified draftsmen. The Grantindustrial Company (Bruning Co.) reveals 94% of firms recently surveyed anticipate current demand for entry-level technicians will continue at least 5 more years. Salaries for draftsmen climbed 25% during last 3 years, according to 1974 survey of 6,000 draftsmen, by American Institute for Design & Drafting. Same survey reveals 78% believe there is *shortage* of good draftsmen.

YOU NEED NO DRAWING SKILL . . . NO TECHNICAL ABILITY

We supply necessary equipment plus easy-to-master, step-by-step instructions. Our staff of professional draftsmen guides you all the way. Even students not eligible to train elsewhere, because they lack high school diploma, have completed our course successfully.

... when you train at home with us for a GOOD PAY JOB IN DRAFTING



MAKES \$\$\$ WHILE LEARNING!

"Imagine, I haven't even received my diploma yet, and I am already earning extra money!"
R. C. Nolan, Conn.

72% SALARY INCREASE!
"The Course helped in my promotion to senior estimator, with a 72% salary increase!"
Ollie Cook, Ft. Worth, Tex.



RUSH COUPON FOR FREE KIT...

Mail coupon today for FREE "DRAFTING CAREER KIT," 16-page book. "Your Future in Drafting" — jam-packed with revealing facts on your opportunities to enjoy good pay and job security in drafting . . . plus, valuable 5-way Drafting Instrument. Everything sent FREE and WITHOUT OBLIGATION. No salesman will call.

GI and VA Benefits!

North American School of Drafting, Dept. PBOC6
4500 Campus Dr., Newport Beach, CA 92663
Rush free "DRAFTING CAREER KIT"! Show me how, for just a few dollars a month, I can prepare for a good-pay job in Drafting. No salesman will call.

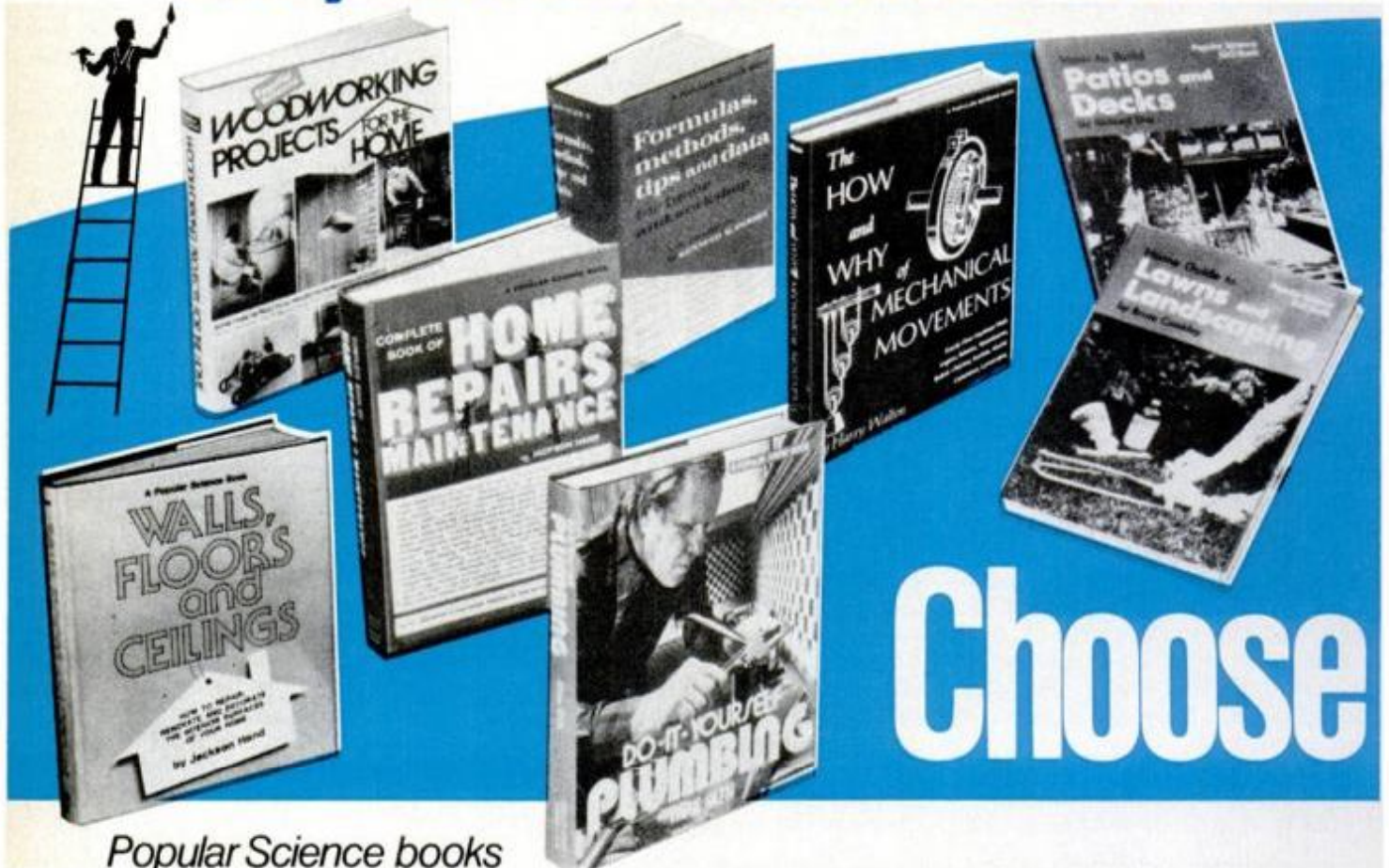
Name _____ Age _____
Address _____
City _____ State _____ Zip _____

ALL FREE!
Rush Coupon today!



* Precision Drawing Instrument Set, Professional Tilting Drafting Board Outfit & Fingertip Tilting Drafting Table are included with your complete North American Course in Drafting

Every book here was custom-written* for



Choose

Popular Science books show you how to SAVE by doing it yourself.

097. DO-IT-YOURSELF PLUMBING by Max Alth. How to do every plumbing job step by step, from fixing a leaky faucet to installing all the plumbing in a new house 471 show-how illustrations. Retail \$11.95.

075. HOW IT WORKS ILLUSTRATED by Rudolph F. Graf and George J. Whalen. Detailed technical drawings and easy-to-understand explanations on a wide variety of tools, appliances, machines and gadgets. Retail \$10.95

085. COMPLETE GUIDE TO HOME APPLIANCE REPAIR by Evan Powell. How to repair dozens of large and small appliances including toasters, fry pans, sewing machines, skillets, refrigerators, more. Over 500 how-to pictures. Retail \$11.95.

101. WOODWORKING PROJECTS FOR THE HOME (from Popular Science magazine). Construction plans for more than 100 projects—tables, desks, chairs, storage units, much more Retail \$11.95.

042. FORMULAS, METHODS, TIPS AND DATA FOR HOME AND WORKSHOP by Kenneth Swezey. Thousands of methods, calculations, tables for every home or workshop job Retail \$10.95.

050. COMPLETE BOOK OF HOME REPAIR AND MAINTENANCE by Jackson Hand. How to make home repairs expertly, modernize as you repair. Retail \$9.95.

130. HOMEOWNER'S HOW-TO TREASURY (by contributors to Popular Science magazine). How-to instructions for remodeling, wallpapering, wiring, plumbing, woodworking, pool care, more—make your home more attractive, comfortable and more economical to run. Over 1000 show-how illustrations. Retail \$13.95.

105. COMPLETE BOOK OF WOODWORKING by Rosario Capotosto, 2000 step-by-step illustrations make you a master of every woodworking technique plus wood identification, selection, purchasing, handling . . . working with hand and power tools (portable/stationary). Retail \$13.95.

1062. 2-VOL. SET: HOME GUIDE TO LAWNS AND LANDSCAPING by Bruce Cassiday and **HOW TO BUILD PATIOS AND DECKS** by Richard Day. Professional advice, plans, and hundreds of illustrations show you how to improve your property. Retail \$13.90.

036. THE HOW AND WHY OF MECHANICAL MOVEMENTS by Harry Walton with brilliant explanatory drawings by Ray Ploch How six basic mechanical elements power every machine ever invented. Retail \$10.00.

056. HOW TO SERVICE AND REPAIR YOUR OWN CAR by Richard Day. How to prevent car troubles, pinpoint trouble, fix it. 900 step-by-step illustrations, charts. Retail \$10.95.

044. COMPLETE BOOK OF HOME WORKSHOPS by David X. Manners. Everything about how to design, plan and build an efficient home shop for every purpose. Retail \$11.95.

090. WALLS, FLOORS AND CEILINGS by Jackson Hand. How to build, repair, renovate or decorate any interior wall, floor or ceiling in your home. Nearly 300 show-how illustrations, building diagrams, construction details, charts. Retail \$9.95.

113. SMALL GAS ENGINES: How to Repair and Maintain Them by Paul Weissler. Illustrated how-to on care, troubleshooting of all two- and four-cycle gas engines: mowers, blowers, chain saws, more. Retail \$10.95.

053. HOW YOUR CAR WORKS by Sam Julty with brilliant explanatory drawings by Ray Ploch. How all the systems of your car work—engine, fuel system, exhaust system, drive line, brakes, more. Retail \$11.95.

POPULAR SCIENCE BOOK CLUB

P.O. Box 2006, Latham, N.Y. 12111

POPULAR SCIENCE BOOK CLUB members



when you join the Popular Science Book Club

And then keep saving up to 60% on books covering a wide range of subjects . . . home improvement and repair, house-building, cars and car repair, home workshop, appliance repair, electronics, how things work, home protection, mathematics, masonry and carpentry, modern technology, science, space and more.

*The Popular Science Book Club regularly offers custom-written books to its members. These are specially commissioned books written by the leading authors in the popular science field on all the subjects of greatest interest to members. Men like Ralph Treves, R. J. DeCristoforo, Richard Day and many more.

These books are offered at discount exclusively to Popular Science Book Club members. Nobody else can get these books at the discounts available to Club members. And, in addition to these Popular Science original books, you're offered the best books on popular science subjects from all other publishers. These books are available at the same giant discounts: up to 60%!



Repairing screens.



Simple homemade jig permits cutting tapered pieces on the radial arm saw

HOW POPULAR SCIENCE BOOK CLUB WORKS

- You get any 4 of these books (up to \$53.75 worth of books) for only \$1 plus postage and handling when you join Popular Science Book Club.
- About every four weeks, you receive a bulletin describing the coming selection and alternate books also available. If you want the selection only, do nothing. It will be shipped to you automatically. If you don't want the book, or want alternate books, or no books, just indicate your wishes on the form that comes with the bulletin and return it by the date shown.
- Your only obligation is to take two more books within your first year of membership. You may cancel any time after that. To retain all membership benefits, you need take only a book a year thereafter.
- You save up to 60% on every book, yet virtually all PSBC books are identical to publishers' editions. Same binding, paper, jacket—same everything except price.
- You may return any book within 10 days, after examining it, if you're dissatisfied with it for any reason.

Mail the attached card or write to the address at left

The Whammer drives nails 6 times faster than a hammer!

(and countersinks automatically)

- Nail paneling, molding, trim faster;
- Panel walls without dents or scratches;
- Install quarter round molding without "flying nails";
- Install window and door trim without hammer dents.

In short, the Whammer® is the difference between a tough, tedious job and an easy, satisfying job.

No wonder the pros use the Whammer 2001 Nail Gun.



Whammer® nail strips available in four wood tone colors.

THE Swingline®
A Division of Swingline Inc., COMPANY

32-00 Skillman Avenue, Long Island City, N.Y. 11101

PM'S 75TH ANNIVERSARY (Continued from page 109)

to-shore during the SS *United State's* maiden voyage return trip and asked him to get New York City to lift him and his party ashore by helicopter to avoid the tedium of docking and Customs. A phone call by the editor determined that Margaret Truman had just asked the same favor for her dad, and had been turned down. So the airlift effort failed. Had it not been for former President Truman's presence aboard, one PM editor might have been in real trouble.

Two of everything

Windsor the younger had a widely known penchant for indulging himself by buying at least two of anything that struck his fancy, whether neckties, automobiles, diamond bracelets for his wife or cameras for the magazine's photo department. With pride, he told friends about having bought two barrels of whale oil because it was "great for watches." An editor might find himself relieved of office duties for a week to drive one new Lincoln to a Windsor residence in Florida, while an advertising salesman drove the other to the boss's Lake Shore Drive apartment in Chicago.

Despite such idiosyncrasies, Henry Windsor Jr., commanded the affection of those close to him, and the respect of those around him, for his genuine ability to call the shots astutely in the pinches. In the mid-'40s—thanks to those loyalties—he was able to rescue the magazine with prompt, imaginative action from a scheme to buy it out from under him. In the end, he had built a team captained by himself and guided by a capable retinue of corporate officers that included his wife, Dorothy, two sons—Henry III and W.T. Windsor—and Executive Vice President William Harrison Petridge. Together, they carried the magazine through 35 years of growth to a circulation of well over a million and (in January 1952) to a 50th anniversary 500-page issue.

PM gets a new publisher

Then, in the late '50s, for personal and health reasons, Henry Windsor Jr. decided to sell out. He spent more than a year looking for a publisher with the interest and resources to carry on the magazine's traditions. Long an admirer of the big Hearst publishing organization, Windsor accepted an offer from them in late 1959 and the *Popular Mechanics* properties moved to the Hearst Magazine Division's New York offices in 1962.

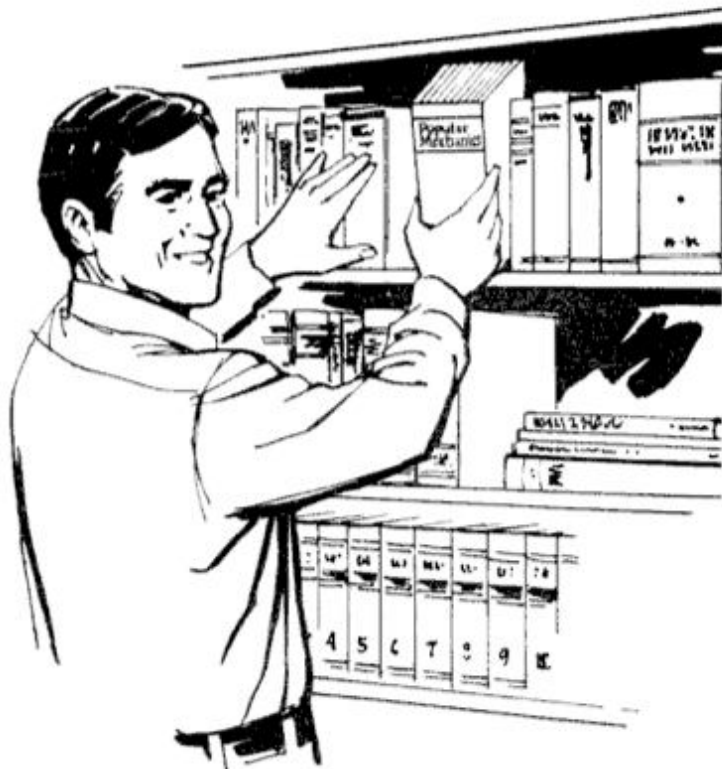
Since that time *Popular Mechanics* has moved into the final quarter of the century with an eye to dramatic developments in science and technology no longer as simple as steam and gasoline engines, but that need, perhaps more than ever, to be "written so you can understand them."

In January 1975, the magazine went back to its original large-size format in order to provide more space for larger, more informative, more exciting graphic displays. This issue sees the completion of the most successful year in the history of *Popular Mechanics*. Under the guidance of Publisher Joseph Kern and Editor John Linkletter, plans for the future include increased reader services, both within the magazine itself and in additional aids such as projects, plans, kits and hard-to-find materials and supplies that will be available through the magazine.

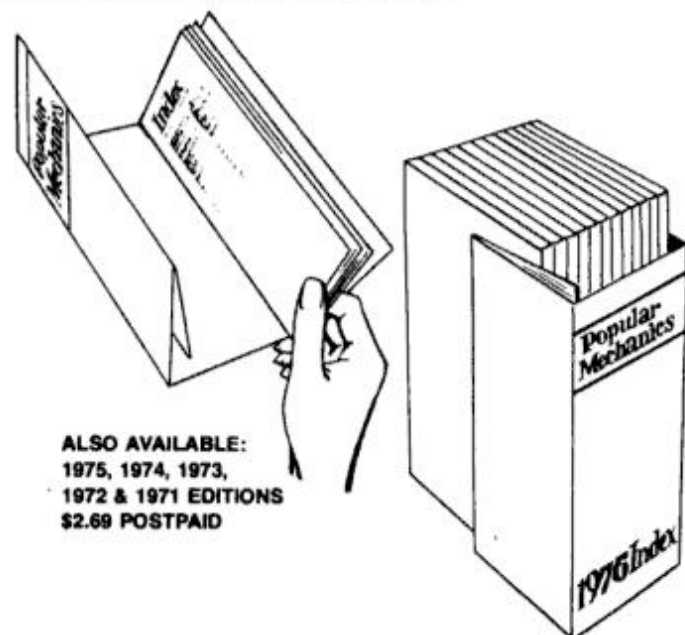
PM will also continue to be the leader in practical car care help and in reporting on new cars. Boating, fishing, aviation, space exploration, electronics, scientific advances—all will be featured in authoritative articles as the magazine continues in its traditional role of up-to-the-minute coverage of technological progress through the most exciting times in world history. ★★

ANNOUNCING
**1976
INDEX & SHELF
WRAPPER**

Here's a great idea that will multiply the value of your back issues of PM. Find any article you want in seconds.



Want to find an article on a rolltop desk you can build yourself? How to pick and install the best CB car antennas? How to repair electric coffee percolators, overhaul drum brake systems, patch cracks and potholes in your asphalt driveway?



ALSO AVAILABLE:
1975, 1974, 1973,
1972 & 1971 EDITIONS
\$2.69 POSTPAID

Your copies of Popular Mechanics are crammed with this type of information. Sometimes, though, it can be frustrating to find an exact article that you recall appeared several months ago.

The Popular Mechanics 1976 *Index and Shelf Wrapper* solves that problem. Each of those thousands of items that appears in PM throughout the year is not only referenced, but thoroughly cross-referenced as well. You can find *any* article you want in seconds! Or you can find *all* the articles on broad categories such as auto repairs, boats, drills, photography, woodworking and other subjects at a glance!

Best of all, the *Index* is bound into a handsome wrapper made of heavy board. The wrapper precisely encloses the 12 issues which are cross-referenced in the *Index*, and makes a beautiful and useful addition to your bookshelf.

The entire package — *Index and Shelf Wrapper* — is yours for only \$2.69 postpaid.

Send for your copy today! You'll be happy you did.

Send Check or Money Order to:

POPULAR MECHANICS INDEX, Box 1014, Radio City, N.Y. 10019

Please reserve the 1976 Index & Shelf Wrapper and rush it to me as soon as it is available in early 1977. Also send me immediately the 1975 1974 1973 1972 1971 Index-Wrappers as checked. I enclose \$2.69 postpaid for each index ordered.

Name _____

Address _____

City _____ State _____ Zip _____

The TOOL BOX

251 WEST NINE MILE ROAD, FERRDALE, MI 48220 - (313)541-5330

All Tools Are Brand New with Full Factory Warranty.

RODAC
PNEUMATIC TOOLS

STRAIGHT LINE AIR FILE

- Professional
- Great for sanding bondo or filling lead filler!
- Made in U.S.A.



Reg. Price \$99.95
Our Super Discount Price **\$64.95**

Chicago Pneumatic
1/2" DRIVE AIR IMPACT WRENCH

- The Original Model CP-734
- Top Quality Heavy Duty
- Torques up to 275 ft./lbs.



Reg. Price \$149.95
Our Super Discount Price **\$74.95**

RANDOM ORBITAL RODAC AIR SANDER

- Designed for swirl-free sanding
- Professional
- Dual action
- Made in U.S.A.



Reg. Price \$99.95
Our Super Discount Price **\$64.95**

ROCKWELL 3/8" DRIVE AIR RATCHET

- Fast Ratchet
- Up to 45 ft./lbs. Torque
- Heavy Duty



Reg. Price \$99.95
Our Super Discount Price **\$64.95**

AIR SPRAY GUN

- Highest quality finishes
- Lacquer or enamel
- Professional
- Includes qt. cup



Reg. Price \$99.95
Our Super Discount Price **\$74.95**

Reversible-Blend
1/2" DRIVE ELECTRIC IMPACT WRENCH

- Torques up to 140 ft. lbs.
- Heavy duty
- Reversible
- 1 yr. warranty



Reg. Price \$99.95
Our Super Discount Price **\$69.95**

FREE \$2.00 ILLUSTRATED CATALOG WITH EACH ORDER!

Send Certified Check, Money Order or Charge on Your 

Include: card expiration date, Account No., 4 digit Bank Number and your signature!
C.O.D. ORDERS 25% DEPOSIT * Do Not Send PERSONAL CHECKS * Include \$2.00 per order for SHIPPING Michigan Residents ADD 4% Sales TAX.

For NEW 1976 - 77 • 32 Page Catalog Send \$2.00

THE TOOL BOX, Dept. PM
251 W. 9 Mile, Ferndale, MI 48220

Name _____
Address _____
City _____ State _____ Zip _____
Card _____



VIVA LA DIFFERENTIAL (Continued from page 88)

turers generally recommend that differentials of cars used for towing trailers should have the lubricant drained periodically. Check lube instructions in your owner's or service manual for the interval.

■ There are two ways to drain a differential. Some units have drain holes as well as filler holes. Remove the drain-hole plug and let lube pour out. If your differential has a filler hole only, draining and filling is done there with a special suction pump. Clean dirt from around the plug and remove it from the differential case. Draw out old lubricant by pulling it into the suction gun. After old lube has been removed, add fresh fluid by shooting it into the unit with the suction gun.

■ The kind of lube used is important, especially if you have a limited-slip differential. Check the maker's recommendations.

Conventional multipurpose lubricant should not be used in a limited-slip differential. Noise will result. The special lube has additives necessary for differential clutch performance and long life.

■ Check lubricant data for the temperature range at which lubricant can perform. There are multiviscosity differential lubricants that protect to minus 40° F.

If instructions don't call for a multiviscosity lube, keep in mind that viscosity-grade SAE 90 differential lube is generally used where the anticipated temperature will go no lower than minus 10° F. If the anticipated temperature is expected to go as low as minus 30° F., an SAE 80-grade lube will probably be prescribed.

If you're really in the deep freeze, where temperatures below minus 30° F. are expected, use viscosity-grade SAE 75 lubricant.

Troubleshooting

If something happens to the differential in your car, the chances are you're not going to be able to repair it yourself due to lack of experience, special equipment and facilities. But that doesn't mean you shouldn't familiarize yourself with the way differentials signify they're in trouble—noise. Much of the confusion caused by such noise should be cleared up.

First, any time two gears mesh, there will be a certain amount of sound as the teeth come in contact. This should be a low-decibel sound no louder than normal driving noises from the engine, transmission and tires.

It's only when noise becomes loud

that you should begin to worry. If caught early enough, differential noise often can be reduced by re-adjusting gears to mesh properly. Don't let anyone sell you a bill of goods that noisy gears will get quieter with added mileage. They will either stay noisy or get worse.

Try a road test

It is sometimes tough to distinguish differential noise from other noises. The best way to do it is with a road test, as follows:

1. Drive the car an appreciable distance to get differential lube warm. Noise coming from the differential is loudest when the lube is warm.

2. Shut off all accessories.

3. Try to isolate the noise to a particular area. Differential noise is similar to noises that come from tires, wheel bearings, engine and transmission. Tire noise, for example, is a continuous sound that varies with car speed. The sound changes pitch as tires encounter different road surfaces.

In comparison, differential noise is not affected by road surface changes. It tends to fade out below 30 mph. And it often changes between driving and coasting conditions, while tire noise remains the same.

Noise coming from wheels and axle-shaft bearings is normally a continuous growl or whirring sound unaffected by the road surface. Often, you can pinpoint it by applying brakes lightly while holding car speed steady. If it's a bearing sound, it may vary in tone.

Another way to pinpoint bearing noise is to swerve the car sharply so body weight is shifted to the outside of the turn. Bad bearings will be louder when more pressure is put on them.

It's easier to isolate automatic transmission noise that is being mistaken for differential noise. Run the car under different transmission ranges. If changing the selector position causes the sound to come in at a higher or lower speed, you've isolated the noise to the transmission.

To single out engine or exhaust sounds, run the car and check the road speed at which the sound is most noticeable. Stop the car, put the transmission selector in neutral and again listen for the sound as you rev up to the approximate engine speed where the sound was heard. If you hear it again, the noise is coming either from the engine or exhaust. ★★★

FREE COLOR CATALOG



Build Your Own Grandfather Clock starting under **\$200** (Including West German Movement)

- Do-It-Yourself Case Kits, parts pre-cut
- Solid 3/4" Black Walnut, Cherry, Mahogany, Oak
- Solid Brass Movements, Dials
- Finished Clocks
- Direct Factory prices

WRITE FOR FREE COLOR CATALOG

EMPEROR CLOCK COMPANY
Dept. 833 Fairhope, Ala 36532

WORLD'S LARGEST MANUFACTURER OF GRANDFATHER CLOCKS

Visit our Factory

Henry Morgan says: **“GOOD APPLIANCE REPAIRMEN ARE SCARCER THAN DOCTORS WHO MAKE HOUSE CALLS.”**

Did you know that there are over a billion appliances in use in the United States today? And three repairmen. At least that's the way it seems when one of mine goes on the blink. With more than two dozen electrical gadgets in my house going snap, crackle and pop, I finally got tired of trying to locate a guy with enough ambition to take my money and I decided to learn how to make the repairs myself.

When a well-aged comic like me decides to go back to school, you can bet the family jewels it won't be back at P.S. 93. I'm going to learn at home, or not at all. So I sent away for NRI's home study course in Appliance Repair . . . and I took the course.

With a mechanical aptitude slightly below that of King Kong, I needed a course that started at the beginning and didn't move ahead too fast. Well, NRI did just that. They started with electricity—what it is and what it does—and went from there. You proceed at your own rate of speed. Whip through it if you want to, or take your time. What counts is the fact that you learn, in a way that it sticks with you.

You learn two things: how to repair appliances—from washers, coffee makers, cooking appliances and refrigerators to room air conditioners, and more . . . and how to get started in your own appliance business. That can mean money for you either way. If NRI can turn old ten thumbs Morgan into a reasonable facsimile of a repairman, think what they could do for you!

NRI's no fly-by-night outfit. They've been training men for more than sixty years . . . and they've had over a million students. It's the oldest and largest home study school in the field of electronics and electricity, so they know it better than anyone else around.

The NRI course is really easy to understand . . . with lots of pictures to show you what they're talking about. They even send you a professional appliance tester at no extra cost.



With the tester and a few basic tools you probably have already, you're ready to service most electrical appliances. After a few months, you'll be fixing your own appliances like I do, and then you can start earning spare time money fixing them for your friends and neighbors. Before you know it, you can have your own full-time business and be independent.

Take my advice and clip the coupon. Even if you don't know which end of a screwdriver is the handle, they can give you real professional training that'll help you break into the appliance repair field. It's one of the few things I've ever sent for that was even better than they said it would be . . . so why not invest a postage stamp to see if it's right for you. The NRI catalog is free and there's no obligation. No one will knock at your door or bug you at home. NRI doesn't use salesman. They don't need them.

Take it from Henry Morgan, the appliance repair field could sure use some good men. Now.

Henry Morgan

NRI NRI SCHOOLS
 McGraw-Hill Continuing Education Center
 3939 Wisconsin Avenue
 Washington, D.C. 20016

APPROVED UNDER GI BILL if taken for career purposes.

Check for facts

Sounds interesting. Send me your free book on Professional Appliance Servicing. I understand that there is no obligation, and no salesman will call.

600-017

Name _____ Age _____

PLEASE PRINT

Address _____

City _____ State _____ Zip _____

A National Home Study Council Accredited School

BRUCE JENNER'S HOME GYM

(Continued from page 53)

it's just as good for a 10-year-old as for a 50-year-old.

■ There are a few "extras." Bruce suggested a radio and mirror. After we mounted a mirror in the room, everybody who went in managed to take a quick look at himself. "One of the most important parts of any exercise program is to see some progress. When nobody's looking, you check those muscles—seeing some results really keeps you at it."

Olympic power

To prepare for the '76 games, Bruce followed a unique training program designed to provide explosive speed and power for the decathlon, as well as the tremendous stamina needed to keep up the pace during the two grueling days of competition.

"The closer the games got, I spent less time training for stamina and more for explosion. Instead of lifting a long series of low-weight bench presses, I'd psyche myself up and go for the one big lift." Although he actually spent less and less time working out, this method simulated the once-in-a-lifetime pressure of the actual Olympic events.

Some of the strength-building routines Bruce used in training are mind-boggling. For Olympic fitness, Bruce powered a simple exercise like sit-ups into a repetitive series of 50, with a 25-lb. weight in *each* hand, clasped behind his head.

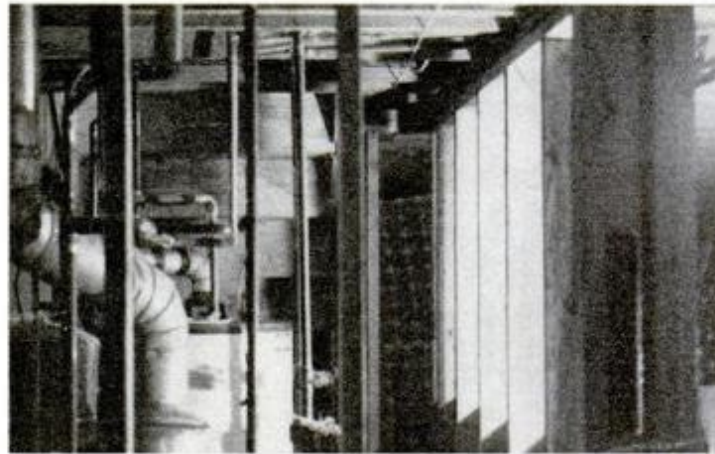
Aside from natural ability, determination and consistency have made Bruce the world's best all-around athlete. The hurdle set up in the Jenners' living room and long, daily training routines are signs of someone who wants to win. "At the Munich games in '72, I made the decision to enter the '76 Olympics, win the decathlon and quit while I was on top."

Since winning the gold medal, Bruce has been ushered into the world of celebrities. He has recently signed a multiyear contract with ABC-TV for sports and entertainment, and now keeps up with a hectic schedule of public appearances.

Although his gold medal has qualified Bruce for money-making endorsements, a lot of his time goes to charity fund-raisers like the RFK Celebrity Tennis Tournament (he paired with Rafer Johnson and lost to Ethel Kennedy's team).

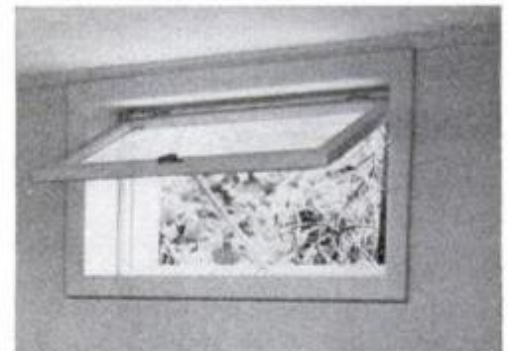
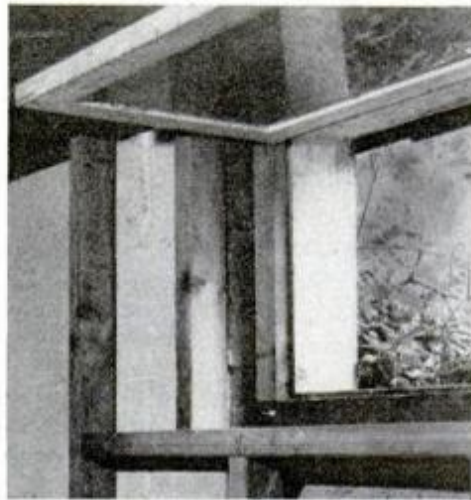
Christie Jenner, Bruce's wife, told us, "I still can't get used to the way people treat us. It's so different now—even though Bruce is still the same."

Exercise room construction



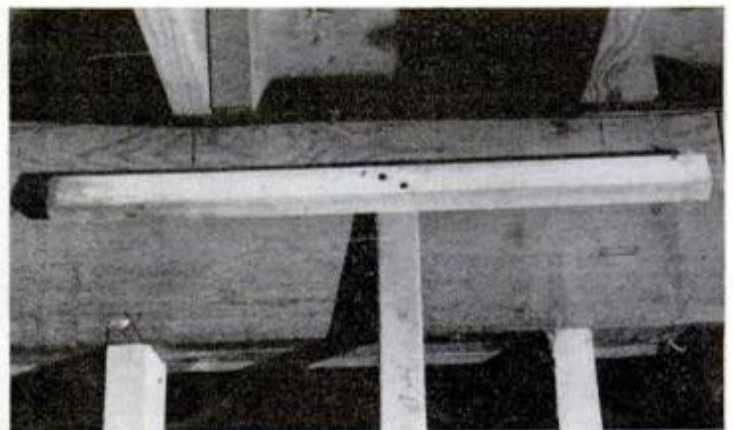
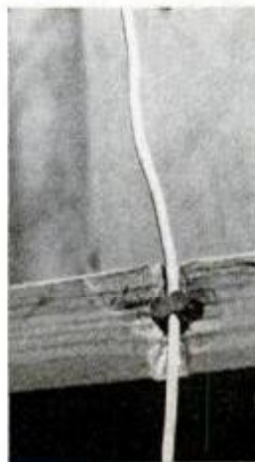
We boxed in basement furnace with standard 2x4 walls covered with 1/2-in. wallboard. You can simplify job by framing one of inside walls under basement girder. This way you can also box in the lally column. Cut the 2x4 shoes (wide side on the concrete) to notch around bottom of columns as shown in the detail below.

Use 2x4s for the new interior walls. Rather than nail on 1x2 strips that can cause leaks, we used 2x3s against the outside walls. Nail studs to a 2x3 shoe on the floor and another 2x3 plate nailed on the flat to first-floor joists. No special tools are needed.



Cellar vent windows can be boxed in with 2x3s. Extend the casing flush to the inside of the new wallboard. Narrow, 1/2-in.-thick trim and a coat of paint finish the job.

Recess exposed lines like the telephone wire below. Protect them as shown from nails.



The "deadman" (shown above) is simply two pieces of 1x2 stock nailed in a tee and cut about 3/4 in. shorter than the height from the floor to the joists. It supports one end of the unwieldy wallboard for the ceiling while you nail the other end.

LOOK AT ALL YOU GET!

1,862 nuts, bolts, screws, and other fasteners • Heavy-duty, all-steel cabinet, 12"W. x 5½"D. x 9"H. • 25 pre-printed I.D. labels • 51 individual compartments • 25 high-impact plastic bins

HEAD STYLES INCLUDED



THREADS INCLUDED



DIAMETERS INCLUDED



LENGTHS INCLUDED



168 SHEET METAL SCREWS: 6 Sizes (Panhead)



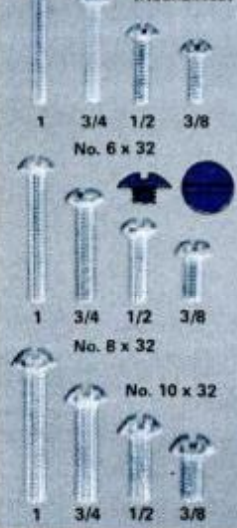
168 WOOD SCREWS: 6 Sizes (Flathead)



68 MACHINE SCREWS: 2 Diameters, 3 Lengths of Each Diameter (Hex Head)



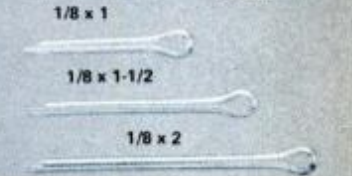
312 MACHINE SCREWS: 3 Diameters, 4 Lengths of Each Diameter (Roundhead)



274 HEX NUTS: 5 Sizes



92 COTTER PINS: 4 Sizes



WASHERS: 3 Styles, 4 Sizes of Each Style



Only \$24.95
plus \$3.30 shipping and handling
Half the price you'd pay at a hardware store!

Just about every nut, bolt, screw, washer, and cotter pin you'll ever need - nearly 2,000 pieces - all in one, organized steel cabinet.

- Now... your own hardware store for home, shop, or office!
- 1,862 fasteners total - all high-quality, zinc plated (rustproof) steel.
- No more piece-at-a-time trips to the hardware store.
- Heavy-duty, all-steel cabinet, high-impact plastic bins and bin dividers, printed I.D. labels.
- Truly a \$50 value.
- Unconditional 30-day money back guarantee.
- The most important tool in your workshop.
- The hit of the Minneapolis Builder's Show. As featured by the editors of: MECHANIX ILLUSTRATED, POPULAR SCIENCE, WORKBENCH, FAMILY HANDYMAN, HOT ROD AND OTHERS.

Now you can have just the right nut, bolt, screw, washer, or cotter pin at your fingertips... whatever the job! And for an almost unbelievable low price!!

With the NUT & BOLT SHOP—a complete size range of just about every kind of hardware you'll ever need. All organized in one all-steel, 25-tray, 51-bin cabinet. Perfect for auto repair. Home projects and hobbies. Office maintenance. And industrial shop use. Great as a gift, too!

No more time-consuming trips to the hardware

store. No more less-than-professional looking repair jobs. No more searching through old coffee cans of fasteners.

Order today! Send check, money order, or company purchase order for just \$24.95 (plus \$3.30 shipping and handling). If you're not completely satisfied—if you're not truly amazed at all you get—return it within 30 days for a full refund. No questions asked! And keep the FREE \$2.50-value wall chart for your trouble!

OUR CUSTOMERS ARE AMAZED AT THE VALUE!

"I don't see how you make a profit at such a low cost! I found it much more than I expected!!"

M.D. Dorsette, Rockville, Maryland

"An excellent buy. At retail prices, would have cost far more... usually a minimum of 3¢ to 5¢ a piece!"

G.L. Steiger, Enfield, Connecticut

"Quality is excellent. Great for do-it-yourselfers... and convenient!"

G.R. Dalmadge, Sunnyvale, California

"I've priced these items separate—it would have cost far more for them (at a hardware store)."

J.D. Russell, Cicero, Illinois

30 DAY UNCONDITIONAL MONEY BACK GUARANTEE

DRI INDUSTRIES, Dept. 3N
8200 Humboldt Avenue So., Minneapolis, MN 55431

I have enclosed my check, money order, or company purchase order for _____ Nut & Bolt Shop(s). (Minnesota residents add 4% sales tax.)

PLEASE PRINT

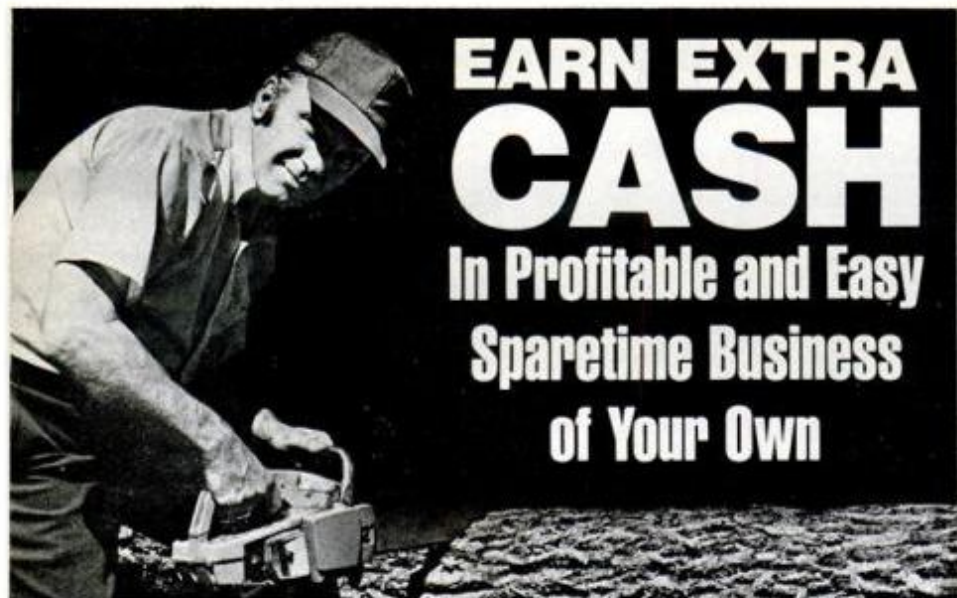
NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

17½" x 24" wall-size Specifications Chart—a \$2.50 value. Tells you everything you need to know for a quick professional job every time. What thread types and head styles are available. What size nut and wrench to use. What size "starting" and "tapping" holes to drill. When to use what kind of washer. Instantly measures sizes. And much, much more. Yours FREE just for trying the Nut & Bolt Shop!





EARN EXTRA CASH

In Profitable and Easy Sparetime Business of Your Own

Satisfy America's Growing Market

In the last few years chain saws have become one of the most popular cutting tools in America. They're used by loggers, tree trimmers, park maintenance departments, fire and rescue departments and tool rental companies. And thousands of homeowners own chain saws for their own use. Every one of these chain saws need to be sharpened periodically. The demand for qualified professional chain saw sharpeners is very great. You can cash in on the profits to be made... right from your own home... in your sparetime.

Fast Precision Sharpening

The Foley Saw Chain Grinder sharpens all makes of saw chains on the market today. It does it fast and efficiently. In

your sparetime you can earn from \$50 to \$100 a month or more.

No Experience Needed

The Foley Saw Chain Grinder is simple to operate. It has easy-to-follow, easy-to-read operating instructions. With very little practice you'll be operating the Model 308 like a professional. Receive it one day... open for business the next.

Foley Will Finance You

You can start your money making sparetime business in your garage, basement or tool shed. There's no large inventory to keep. No large investment needed. Foley helps you start with no money down. No franchise fee. Your earnings will easily cover the low monthly payments.



Call Toll-Free 800-328-8488 or Send Coupon Now



MANUFACTURING CO.

116-7C Foley Bldg. • Minneapolis, Minn. 55418

I'm interested in the Foley Model 308 Saw Chain Grinder.

Please send more information about starting my own sparetime business.

Name _____

Address _____

City _____

State _____

Zip Code _____



Repair any watch

... LEARN AT HOME

Unique Sweeney System develops your watch repair skills step by step at home in spare time. No previous experience needed. Low tuition. Free sample lesson and full information.

CHICAGO SCHOOL OF WATCHMAKING
Dept. 117, Fox River Grove, Ill. 60021

FAT-BURNING SYSTEM

...in just days...

our methods begin to give you fast, immediate results that you can see and feel!! Lose up to 5 pounds overnight!!

FREE REPORT

Write

AMAZING Dept. X2
27313 Plymouth
Detroit, MI 48239

WOOD-SPLITTING MAUL

MAKES SHORT WORK OF THAT WOOD PILE



20 LB. HARDENED TOOL STEEL HEAD WITH STEEL HANDLE UNCONDITIONALLY GUARANTEED FOR AS LONG AS YOU LIVE. ONE BLOW USUALLY DOES IT. TOOL SELDOM STICKS. ENDS BROKEN HANDLES. STUCK HEADS ON AXES OR LIGHTWEIGHT MAULS. FORGET ABOUT STUCK, FLYING OR LOST WEDGES. A SUPER TOOL FOR ONLY \$15.70 PLUS SHIPPING. \$3.25 EAST AND \$5.50 WEST OF THE MISSISSIPPI. FREE INFO ABOUT MORE WOOD HEATING AND COOKING PRODUCTS.

SOTZ CORPORATION
COLUMBIA STA., O. 44028

ANYONE CAN SOLDER WITH —

DO-IT-YOURSELFERS!

Let Kester solder aid you in your home repairs or hobbies. A radio, TV, model train, jewelry, plumbing, etc. Save money — repair it yourself. Send self-addressed stamped envelope to Kester for a FREE Copy of "Soldering Simplified".

KESTER SOLDER

4201 Wrightwood Ave.
Chicago, Ill. 60639

HINTS

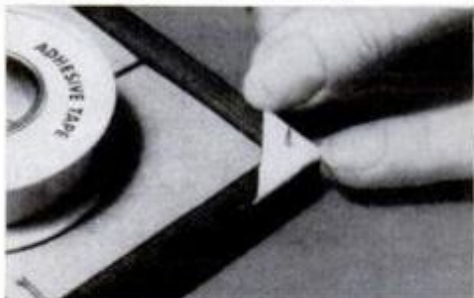
FROM READERS

Double lace for a good fit



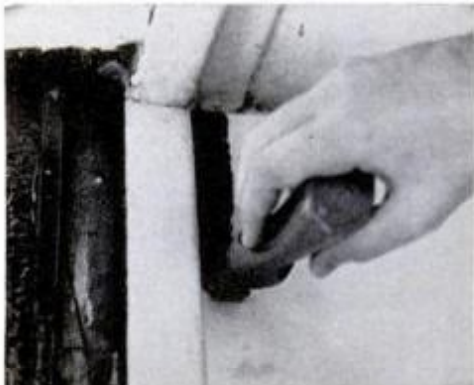
To get a good fit on ice skates, use two sets of laces. You can adjust the upper or lower parts of your shoe separately.—*Margie Neibert*

Keep your pictures straight



To keep your pictures from tilting due to vibration, tape a thumbtack (point side up) to both bottom corners of the frame back. Hang the frame and press the corners lightly against the wall.—*William Swallow*

Recycled polish applicator



After you've finished the shoe polish, use the cleaned applicator to paint window moldings and small areas. It'll last until the foam tip begins to shred.—*Marc Bonem*



MAKE MONEY FAST IN BURGLAR ALARM BUSINESS protect homes, apartments, offices. Work from home... spare or full time. Starting demonstration with new type alarm convinces 3 out of 4. Plugs in! No installation. No experience needed. Unseen beam stops brooks 'cold'. Plan shows every step. FREE Report. also Free Alarm Offer. Write:



BE A



JOHN KOLIELNIK
(Los Angeles, Cal.)
"Now that I'm a locksmith, I've increased my salary by at least \$175 a week. Even earned \$550 before completing the course! I think the Locksmithing Institute is the best!"



HARRY PROVART, JR.
(Duquoin, Ill.)
"Locksmithing Institute has the best course that money can buy, and my instructor was tops. Earned \$200 while training . . . since then I've earned \$350 spare time."



IDEAL F. BALDONI II
(Riviera Beach, Fla.)
"Enrolled because I eventually want to be self-employed. As a result of my training, I've assumed locksmith jobs my company formerly hired outside people to perform."

LOCKSMITH

TRAIN AT HOME—EARN WHILE YOU LEARN
Add to **YOUR INCOME**—even double it with easy spare-time earnings. Cash in on the nationwide shortage that demands hundreds more trained locksmiths. Quickly step into a big pay opportunity, full- or part-time job or start a high-profit shop of your own! Even earn as you learn.

EARN EXTRA MONEY RIGHT AWAY!
You can quickly qualify as a skilled locksmith. Age, education, even minor physical handicaps don't matter in this ever-growing trade. So easy to learn—it's easy, it's fun, it's just like a fascinating new hobby!

Study at home as little as one hour a week. All special professional tools, supplies, including files, tweezers, cylinders, door handles, assemblies, gauges, pins, springs, extractors, picks, wrenches, and different kinds of locks and keys—even key machine—supplied to you! Gain practical experience by doing real jobs

on car locks, house locks, padlocks, safe locks, etc. Just follow well-illustrated lessons under the guidance of experts.

For a future as your own boss or in a high-pay job, get all the facts, complete details. Write today for **FREE Illustrated Book**, **FREE Sample Lesson Pages** give exciting facts. (No cost, no obligation, and no salesman will call.)

Our School, (Established 1948) is licensed by the State of N.J. and an Accredited Member of the National Home Study Council. Also approved for Veterans Training, under the new G.I. bill.



LOCKSMITHING INSTITUTE

Div. Technical Home Study Schools
Dept. 1110-011, Little Falls, N.J. 07424

THIS KEY MACHINE
PLUS 306
pieces of equipment
LOCKS, PICKS & TOOLS
supplied for use with course

SEND TODAY FOR FREE BOOKLET

LOCKSMITHING INSTITUTE
Division Technical Home Study Schools
Dept. 1110-011, Little Falls, New Jersey 07424
Please send without obligation the **FREE** illustrated booklet, "Your Opportunities in Locksmithing." I understand no salesman will call.

NAME _____
ADDRESS _____
CITY _____ STATE _____ ZIP _____
 Check here if eligible for Veteran's Benefits



South Carolina. It's a lot of great vacations.

Whatever kind of vacation you're looking for, you'll find it in South Carolina.

And to help you plan your vacation, we'll send you the new South Carolina Trip Kit—free! It'll tell you about things to do and places to stay. And there are maps to show you how to get there once you get here.

Wherever you go in South Carolina, you'll find a lot of great vacations. Just clip the coupon to find out how they can all be yours.

FREE SOUTH CAROLINA TRIP KIT

Name _____

Address _____

City _____ State _____ Zip _____

South Carolina Division of Tourism, Room 460, Box 78, Columbia, S.C. 29202



Learn at Home... Be a MOTORCYCLE MECHANIC...

Now's the time to "grab a piece of the action" in America's fast-growing motorcycle industry. Big demand for skilled mechanics.

Earn steady pay—or start your own business. We show you how! No need to quit school or job. Learn at home in spare time. **RUSH COUPON FOR FREE INFORMATION**

SPECIAL CYCLE TOOLS & TEST INSTRUMENTS INCLUDED...



Careers by Home Study

NORTH AMERICAN SCHOOL OF MOTORCYCLE REPAIR
4500 Campus Dr., Dept. 99066, Newport Beach, CA 92663
Rush FREE information on how I can learn to be a motorcycle mechanic for only a few dollars a month.

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



IF YOU CAN SING, WHISTLE, OR HUM A TUNE...

you can play the Musical Saw. No notes to read, no musical knowledge required. If you are 10 or 70, you play or no pay. Musical Saw, soft hammer, bow, resin and lessons mailed on 5 days' trial. Write today for details and free copy of "Sawing News of the World," picturing successful saw musicians. **MURSEHL & WESTPHAL**, 107 Fort St., Fort Atkinson, Wisconsin, 53538.

THE ORIGINAL BASEMENT TOILET

Genuine Porcelain
FLUSHES UP TO
SEWER OR SEPTIC TANK



-No Digging Up Floors-
INSTALLS EASY. ANYWHERE!

Write **McPHERSON, Inc., Dept. PM**
Box 15133 Tampa, Florida 33684

Future Light

- Needs no power
- Safe underwater
- For camping, boating, auto, home
- Wherever nontoxic, nonflammable safe light is needed



Send check or money order to:
Lite Co., P. O. Box 41132 Chicago, Illinois
1 pkg. - \$1.95 3 pkg. - \$4.50

Name _____

Address _____

City _____ State _____ Zip _____

Be a Marine Mechanic ...in 90 Days

AMERICAN MARINE INSTITUTE Phone Toll Free
1445 Skytrooper Rd., Daytona Beach, Fla. 32015 800-874-0645
Name _____ Age _____
Address _____
City _____ State _____ Zip _____
Phone () _____ 76-13-31

A BUSINESS OF YOUR OWN REPAIR HYDRAULIC JACKS

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. PM-13 and free bonus offer **HYDRAULIC JACK REPAIR MANUAL CO., INC.**
P. O. BOX 3 • STATEN ISLAND, N. Y. 10314



Send 25¢ for Details
LEARN Coleman CAMP GEAR REPAIR

MODERN SCHOOLS
Dept. No. PMC
4225 North Brown Avenue
Scottsdale, Arizona 85251

LANTERNS
STOVES
HEATERS
COOLERS
(All Models)
TENTS
CONVERSIONS
BACK PACKS
25,000 students since 1946

IT'S NEW NOW



Ripoff preventer

This lock resorts to sneaky tricks to foil thieves. A revolving shackle guard just spins when hacksawed, keeping the blade from cutting. Shackle itself is too big a bite for most bolt cutters. Dual levers lock shackle legs independently, and a pin tumbler makes tough pickings. About \$6. Master Lock Co., 2600 North 32nd St., Milwaukee, Wis. 53210.



Precision knife sharpener

Precision sharpening jig is said to put a razorlike edge on any knives of stainless or high-carbon steel up to 10 inches long. It holds a blade at exactly the proper angle for honing with coarse, medium and fine oilstones. Sharpening angle is adjustable to 17°, 20° or 25°. \$22 from Loray Sharpeners, 16740 Indian Hollow Rd., Grafton, Ohio 44044.



'Sociable' belt buckle

Unusual belt buckle sports a prairie dog on saloon doors for a nostalgic touch of the Old West. It's also inscribed with a friendly "I'm a sociable spirit." In antique silver with dog in gold, it will fit belts 1 1/2 to 1 3/4 inches wide. \$5.50, plus 45 cents shipping, from Prairie Dog Sales, Box 494, Bedford Hills, N. Y. 10507.

look what this special coupon brings to you

Helps You BUILD... RESTORE... REFINISH anything of wood! Easier!

Start Now getting more fun out of woodworking. Let this newest, biggest product-finder Catalog *make every workshop project a crowning success!*

In Constantine's picture-packed Catalog you'll find instantly *whatever you need* for easier, better woodworking. You'll save time and money shopping from the world's largest mail-order source for imported and domestic wood. Endless variety.

See page after page of finest CABINET-MAKING woods, many in full color. Kiln-dried. First quality. Thicknesses from 1/4 to several inches.

Select from world's finest — walnut, rosewood, teak, purpleheart, lacewood, ebony, zebra, satinwood, lignum vitae, cocobola, cherry, avodire, mahogany, maple, many more. Solid wood. Inlays. Plywood. Veneers.

Discover amazing values for woodworkers. **WOOD FINISHES.** Match anything!

FURNITURE HARDWARE. Period. Modern. Cabinet pulls, latches, hinges, leaf supports, hi-fi slides. Miniature hardware too!

UPHOLSTERY. Caning, rush-seating, etc. **SIMPLIFIED VENEERING.** Discover Constantine's easy method of veneering without clamps! Quickly cover beat-up tables, chests, cabinets with beautiful veneer.

PICTURE KITS. All-wood, pre-cut parts. Ready for easy assembly. Ideal table-top hobby. Success assured.

TRAY MOLDING. Ready to use around wood pictures or richly grained plywood panels. Molded fingergrip. Grooved. Needs no handles. Beautiful.

SIMPLIFIED SHELVES. Revolutionary brackets with hanger installed. Hang forever on one screw or toggle in any wall. Terrific!

NEWEST MATERIALS. LATEST TOOLS. Hundreds of most-needed products. Time-savers. Labor-savers. Many found nowhere else.

Plus WOOD CARVING tools, patterns, instructions. **Plus BOOKS** and **PROJECT PLANS** on every subject.

Big, new Catalog offers large selection of marquetry picture kits including famous "America" series. Available nowhere else.

ACT NOW. Don't lose a day of workshop fun. Benefit from unsurpassed values in new Catalog. Enjoy beautiful **WOOD SAMPLES.**

Mail Coupon for Special Offer

Accept this offer to own a fascinating set of 2 x 4 specimens of world's most glamorous veneers. *Compare!* Then instantly identify finest woods wherever you go. Send only \$1. *Dollar refunded on first order.* Mail Special Coupon **TODAY!**

CONSTANTINE

2051 Eastchester Rd., Bronx, N.Y. 10461
Serving Craftsmen Since 1812

20 WOOD SAMPLES

Finest woods from around the world! Purpleheart, Lacewood, Mahogany, Rosewood, Satinwood, Zebra, Walnut, Teak, etc. Rich colors, fascinating grains, exotic aromas. Compare 20 most-wanted woods. *Learn to identify!*

20 wood samples from around the world

Plus World Famous
CONSTANTINE'S woodworker CATALOG

Discover Veneer Magic!



Creative Veneer Craft

ONLY \$1.95
Postpaid

Here's the fascinating book that reveals everything you need to know about the easy art of creating decorative veneer cutouts! It's the perfect supplement to Constantine's giant 100-page Catalog/Yearbook!

Your complete how-to guide!
Techniques, patterns, ideas.

100 PICTURE-PACKED GIANT PAGES

CONSTANTINE'S WOOD CATALOG YEARBOOK



CONSTANTINE 2051 Eastchester Rd.
Bronx, N.Y. 10461

Enclosed \$1 for Wood Samples & Woodworkers Catalog. (Dollar refunded on first order.)

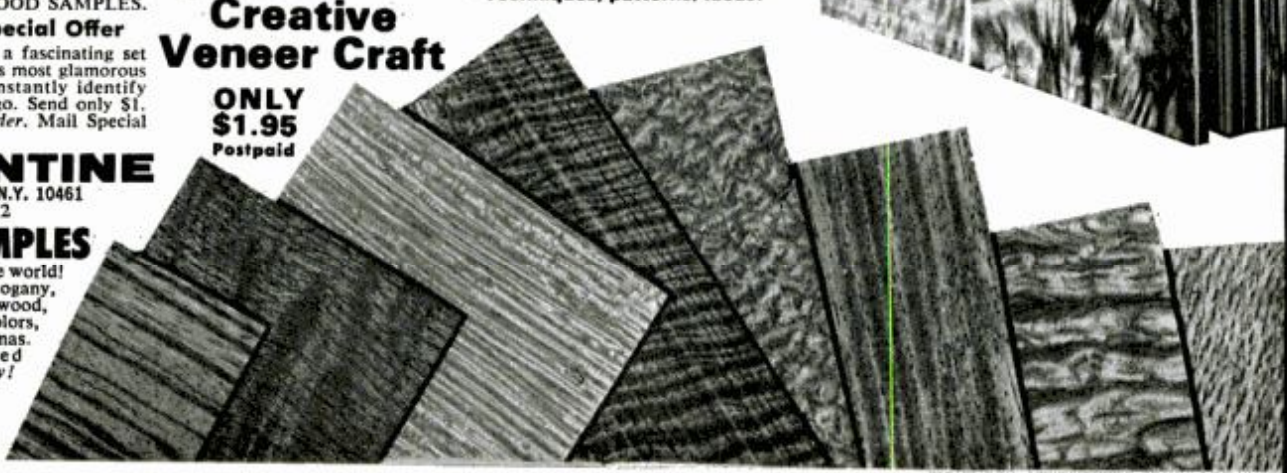
Also enclosed \$1.95 for Creative Veneer Craft, the how-to book. Catalog only 50¢

TEAR OUT! MAIL NOW!

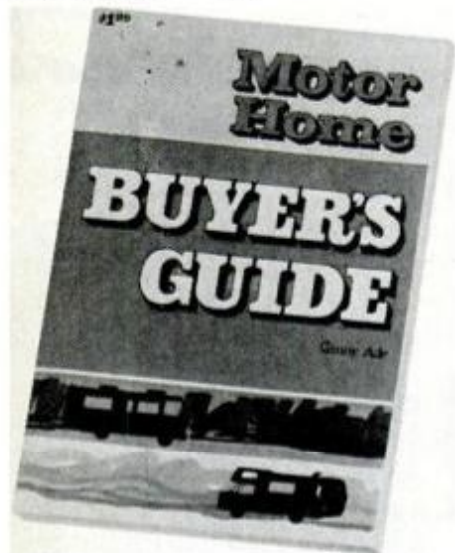
Name.....

Address.....

City..... State..... Zip.....



What the ads don't tell you about buying a motor home. Just \$1.⁹⁵



When you buy a motor home today, there are a lot of choices. And a lot of ways to go wrong. The *Motor Home Buyers Guide* can help you get the best motor home for your money. It tells you what to look for, what questions to ask before you buy. More than 100 pages, packed with facts about costs, models, floor plans, features and construction.

This guide is published by Winnebago. It's authoritative. And honest. We honestly believe the more you know about motor homes, the better you'll like ours. Send \$1.95 now. It could save you a lot of grief. And money.

Winnebago Industries, Inc. 01D20
Consumer Information Dept.
1909 East Cornell, Peoria, Ill. 61614

Enclosed is my check or money order for \$1.95. Please send my *Motor Home Buyers Guide* to the address below.

NAME _____

ADDRESS _____

CITY _____

STATE _____ ZIP _____

WINNEBAGO
The name that means the most in motor homes.

EARTHQUAKES

(Continued from page 81)

neath it shakes. A University of Michigan study of the recent devastating earthquake in Managua, Nicaragua, found that many reinforced-concrete buildings were flexible enough to resist severe structural damage.

The report points out though, that rigid interior finishes like tile and brick should not have been used on the resilient buildings. The two elements just don't mix. The motion of the quake caused clay tile walls to break loose, turning the interior into a nightmare of flying debris. Rigidly framed staircases, another example of poor design, were pulled away from landings as the buildings flexed.

In steel-framed buildings, the way that welded and riveted joints are made can spell the difference between a structure standing through a quake or collapsing. "The most critical area in steel and concrete structures," says Professor Clough, "is the interface between the two materials. We are coming up with new designs that will help make them work together for mutual support."

Quakeproofing research

The structural material getting the biggest workout on Berkeley's shake table is masonry. Bricks, block and mortar are notoriously bad materials to be near in an earthquake. Window and door lintels are often the first components to go, causing walls to buckle and collapsing roofs and upper floors on those people trapped below.

The solutions for concrete-block structures are available right now. Clough says, "Running steel reinforcing rods down through the block cells, then filling the cells with concrete, goes a long way toward preventing disintegration in violent movement."

Brick and mortar walls are another story. Steel corner ties and bracing devices are under study at Berkeley. The feeling is that quake-proof brick houses are possible but may prove too costly to be practical.

The structure of any building is based on the downward force of gravity. Beams and girders are supported to keep them from falling. But the gargantuan forces of an earthquake can cancel out the force of gravity with powerful upward thrusts. This special kind of stress, called reverse shear, can cause massive girders to fail as the first shock hits because they have little resistance to upward pressure. Quake-proof girder joints, called stirrups,



Quakes cause key supports to give way.

which resist shear in either direction, have been developed to replace bent-up reinforcing rods.

Concentrated field work is also underway across the country to quake-safe (if not to proof) older buildings. The culprits here are crumbling masonry facades and decorative details. Occasionally a decorative stone gargoyle will break loose all on its own. There have been several fatalities as a result; one in Chicago spurred a city-wide search for potential masonry bombs by building inspectors with binoculars.

Step-by-step destruction

What happens to a major building during a devastating quake? Experts believe a typical scenario would go like this:

- People are terrified. The drama starts when the thundering of the earth is felt by everybody inside the building, particularly on the upper floors. Anyone looking out the window will see the horizon move up and down, then side to side. People inside the building become petrified and disoriented.

- Too much to cope with. Things start to happen very fast—large desks start moving, chairs tip over, file cabinets spill their contents. Interior spaces become a shambles as people head for the elevators in panic.

- No way out. The structural frame of the building is moving from the forces of the quake. The interior structures and systems can't take the deformations; phone connections are ripped apart, steel fire doors seize against their casings, steel staircases start to separate from their landings.

- Elevators are out. Some electric

(Please turn to page 128)

Start your own money making business!

Make up to \$12⁵⁰ an hour—
even while learning! *Train FAST
at home!*

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

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

Start Collecting CASH PROFITS Right Away

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

SEND FOR EXCITING FACTS—No Obligation

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

No Extra Cost! Included With Your Locksmith Training



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

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



Be Your Own Boss!

BE A LOCKSMITH!



"I began earning right after starting... made \$1,200 while I was still learning."

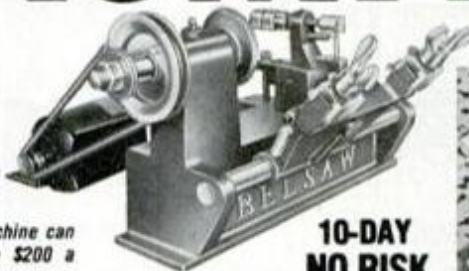
HARVEY COLE Charlevoix, MI 49720

PRO KEY MACHINE YOURS TO KEEP!

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

Find out all about it!

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



APPROVED Under GI Bill FOR VETERANS

ALL SPECIAL TOOLS AND EQUIPMENT INCLUDED!



10-DAY NO RISK TRIAL!

Send for details!

RUSH COUPON!

BELSAW INSTITUTE
107J Field Bldg., Kansas City, Mo. 64111

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

"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



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

RUSH COUPON TODAY FOR THIS FACT-FILLED

FREE BOOKLET!

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



Send for your copy today!

BELSAW INSTITUTE, 107J FIELD BUILDING KANSAS CITY, MISSOURI 64111

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

Name _____
Address _____
City _____
State _____ Zip _____

... YOU Can Do It Too!

Beautiful Dreamer...

Sleep On An
INFLATE-A-BED®
INFLATE-A-BED

From
\$49.95



The World's Most Comfortable Bed — You "Adjust" it to Your Own Personal "Firmness Level" — End backaches forever!

Also ... The Only Guest Bedroom You Can Store On A Shelf!

Inflate-A-Bed. The most natural way to sleep or relax. Instead of your body fighting with steel coils, wooden frames, stuffing and cloth, you can sleep in suspended luxury — on a cushion of air, just like a cloud on a summer afternoon. We guarantee your sleeping comfort will be markedly improved, that you'll sleep deeper, more restfully and with less morning aches than you ever thought possible. Tens of thousands of people are sleeping on one nightly, and chiropractors all over the nation are recommending them to many of their patients.

Inflate-A-Bed is the most exciting bedding product ever developed since early man discovered straw. It is a specially patented "air coil" bed you inflate in minutes with a vacuum cleaner or any air pump. The innovative air coil system works to support your body evenly. You don't sink in the middle and the sides don't fly up. Two people can sleep on a full, queen, or king bed virtually undisturbed by each other's movements. The bed shapes itself to your body almost like cradling it — with unheard of flexibility in a mattress. You inflate it to suit your taste. No frame or innerspring is needed, although it will fit into any standard bed frame.

Inflate-A-Bed is incredibly light and incredibly tough (20 mil Poly Vinyl Chloride). It cleans easily with soap and water. It deflates in minutes for you to hold up and take with you — visiting, camping, beach (a dynamite water raft) or moving to a new home. Store it easily on a closet shelf when not in use. It is everything a bed should be — delightfully sensual, highly therapeutic, and conveniently mobile. Sleep on it for a 7 night trial. If you're not pleased, return it for an immediate refund.

Please send the following Air Bed(s). If not fully satisfied I can return within 2 weeks for an immediate refund.

Twin Size @ \$49.95 Full Size @ \$69.95

Queen Size @ \$79.95 King Size @ \$99.95

(Add \$4.95 for shipping and insurance)

Instead I prefer the Original Inflate-A-Bed (same as above plus a pocket between feet)

Twin @ \$59.95 Full @ \$79.95

Queen @ \$69.95 King @ \$119.95

(Add \$4.95 shipping per bed)

Also send high-powered AC air pump @ \$29.95 ea.

Also send high-powered DC air pump @ \$29.95 ea.

Check or M.O. Enclosed (Ill. residents add 5% sales tax)

Charge My Credit Card Checked Below

American Express BankAmericard Carte Blanche

Diners Club Master Charge

Credit Card # _____

Master Charge Bank # _____ Exp. Date _____

Name _____

Address _____

City _____ State _____ Zip _____

Signature _____ **PM 1/77**

Send Coupon To:
Contemporary Marketing, Inc.
790 Maple Lane, Bensenville, Ill. 60106
Call Toll Free: 800-671-6318 Ill. call: 312-585-9461

EARTHQUAKES

(Continued from page 126)

supply lines to the elevators are broken. In other shafts, the counterweights slip out of their guides and the elevators seize in their tracks.

■ Nowhere to hide. The interiors of most floors now look as though a bomb has gone off; suspended ceilings are falling, jumbled wires are shorting out, small fires start, partition walls are collapsing and heavy pieces of furniture are tumbling across the debris-covered floor.

■ Destruction from above. As the ceilings fall, large sections of heating and airconditioning ducts begin to pull apart, sending boxlike chunks of sheet metal crashing down on the people below. As the lights go out, water and sewage lines break at their welds and smoke starts to filter through the hallways.

■ No rescue in sight. Many people have given up, but some cling to the hope of rescue. It may not be coming. In many cases, masonry firehouses have collapsed on the emergency equipment inside them. Police communications have been disrupted.

■ The structure survives but not the people. Curtain walls have been thrown from the exterior of the building to the streets below. Glass windows have shattered. As the shuddering stops (it may last only 20 or 30 seconds), the building is still standing but the inhabitants are not.

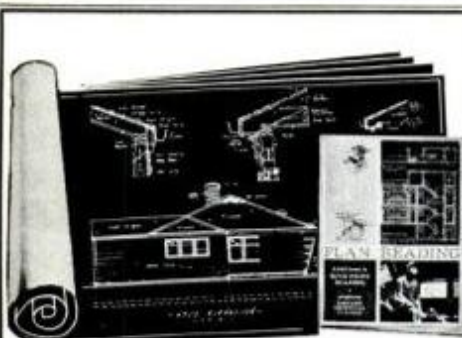
New design emphasis

Real scenes like this hypothetical one have spurred architects and engineers to plan buildings that will protect the people in them instead of killing them. This research has led to many interesting design approaches.

One is the "soft-story" concept. In this system the foundation and lower stories are massively constructed. The bulk of the upper building is linked to the foundation section through a flexible story that absorbs much of the quake's energy, thereby minimizing damage to the upper floors.

Engineers also see the possibility of computer-controlled, self-tensioning structures. In this system the construction is tied to a tubular core. A computer would activate massive tensioning cables in the core to compensate for the violent quake motions and keep the building stable.

The push is on in the fields of earthquake prediction and earthquake engineering. The question is, how much lifesaving progress can be made before the next massive quake hits? ★★★



FREE BLUEPRINTS and TRIAL LESSON

—for your greater success in Building

Beginners, craftsmen, even foremen and superintendents, have sent for these free blueprints and trial lesson in Plan Reading as a means of trying out Chicago Tech's home-study Builders training. Learn how you can master Plan Reading—Estimating—and the practical details of all types of construction in your spare time at home. Mail coupon below today—see how you, too can prepare for a better job—higher income, or start your own contracting business.

CHICAGO TECHNICAL COLLEGE/School for Builders
2000 S. Michigan Avenue, Chicago, Ill. 60616

CHICAGO TECHNICAL COLLEGE Veterans Check
Dept. PM-17, 2000 S. Michigan Ave., Here
Chicago, Ill. 60616

Please mail me a Free Trial Lesson, Blueprints and Builders Catalog. I understand there is no obligation—no salesman will call.

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

MILLING MACHINE KIT

DESIGNED BY PROS TO BE BUILT BY AMATEURS



Uniquely designed milling machine can be made by amateurs to give them a powerful tool at 1/10 the cost of conventional machines. At least look at the drawings to see if you can build it.

- Milling Machine Drawings \$2.95
- Milling Machine Work how to use a mill in your shop 7.00
- Lathe Accessories how to make and use them efficiently 3.50
- How to Work Sheetmetal 4.00
- Hardening & Tempering Tools 4.00
- Electroplating for the Amateur 3.50
- Foundrywork for the Amateur 3.50
- Clockmaking for the Amateur 9.95
- Beginner's Workshop everything you need to know to set up a shop. 7.00
- Virginia Building a live steam locomotive you can ride behind. 10.95
- GIANT 1977 CRAFTSMANSHIP CATALOG FREE with any order, otherwise 1.00



CALDWELL INDUSTRIES
609 E. Davis St., P. O. Box 170
Luling, Texas 78648

Earn \$8 an Hour

in the Evenings or on Weekends in a

Business of Your Own Sharpening Saws

Excellent Full Time Earning Potential



Every City & Neighborhood Needs This Service Business

All over America, in small towns and big cities, people just like yourself are earning big money in the saw sharpening business. Industry, home handymen, professional carpenters all need their equipment sharpened. It's a business that's growing every year.

No Experience Required

Here's a business of your own that lets you start earning right now. You need no experience or special training. Anyone who can handle a tool can operate Foley equipment. Simple, easy-to-understand instructions tell you how.

Sharpening IS Profitable

Your profit on every dollar you take in is about 90 cents. You can make \$50 to \$100 a week by working evenings and on weekends. By operating your sharpening business full time, you can make as much as \$1,000 a month... and more.



Send For Free Booklet

Part Time Shop Makes \$30,000 In Profits

Floyd B. of New York started his saw sharpening business in his spare time. But before long, his business made it necessary to quit his regular job and devote full time to his new business of his own. Today he has a fully-equipped saw sharpening shop. In his first year, he did over \$30,000 in business.

No Town Too Small

There are many Foley Associates who operate profitable sharpening businesses in communities of less than 500 people. There is a large variety of customers and more than just saws to sharpen.

Foley Will Finance You

Foley will help you finance you and show you how to start and maintain a profitable sharpening business of your own. There's no huge inventory to carry. You can set up in your garage, basement or spare room...wherever there's electricity.

No Franchise Fees To Pay

Foley assists you in every way possible but...your business is totally your own.

Start Earning Money Now

You can start earning profits as soon as you receive your equipment. For more information on how you can earn big money in the saw sharpening business, write today for fact filled booklet. There is no obligation.

Foley Manufacturing Company

116-7 Foley Bldg., Minneapolis, Minn. 55418

CALL TOLL FREE 1-800-328-8488

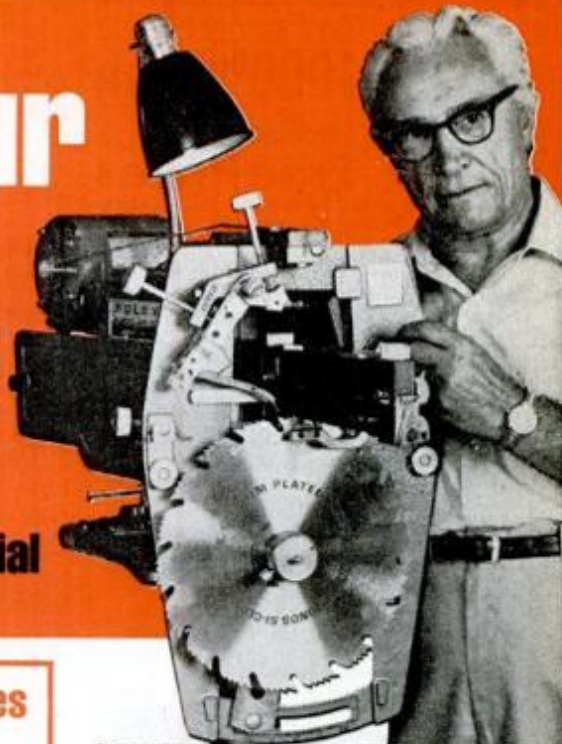
Please send information on the potential profits in a Sharpening business of my own and how Foley will help finance me.

Name _____

Address _____

City _____

State _____ Zip _____



Professionally Sharpen Carbide Saw Blades, Too

The tremendous growth of Carbide Tipped Saw Blades is an extra bonus for saw sharpening shops using Foley's Carbide Grinding Equipment. It takes just 15 minutes to renovate a carbide blade... 15 minutes that earns you \$8—practically all profit, too! Customers are limitless because Carbide tipped saws are being used almost exclusively to cut metals, plastics, laminated woods, hard woods and giant logs. More and more carbide sharpening shops are needed every day.

Instant Winner Sweepstakes

Fun Lovers! You May Have Already Won



\$1000⁰⁰ Cash
or
one of 1084
Free Prizes

YES, FUN-LOVERS, YOU CAN WIN one of 1084 CASH or other FREE PRIZES including all-expense paid trip to Disneyland or Disney World, Color TV'S, Honda Motorbikes, Stereo Hi-Fi Systems, Polaroid Cameras, CB Radios, etc. NOTHING TO PAY OR BUY. Everyone has equal chance.

Special Offer to Introduce New Catalog of 1600 NOVELTIES, JOKES, TRICKS

This offer is to get you acquainted with Johnson Smith's world famous catalog of unusual and marvelous items including Jokes, Tricks, Gadgets, Jewelry, T-Shirts, Emblems, Sports, Hobbies, Magic, Science & Electronics, Unique Bargains, etc. Called the "most unusual catalog in the world" by columnists, famous people, customers.

RULES: Mail coupon for Secret Instant Winner Lucky Number. Winning numbers already selected by independent judges and prizes can be claimed at once. Employees & relatives not eligible. Void where prohibited by law.

MAIL THIS INSTANT WINNER COUPON TODAY

Send To: Johnson Smith Co., Dept. 101
Mt. Clemens, Mich. 48043

Check one: (Send Your Name and Address)

Send new catalog and Instant Winner Lucky Number. Enclosed is 10¢ for mailing.

Send Free Instant Winner Lucky Number.

LEARN PROFESSIONAL

UPHOLSTERY

AT HOME! SPARE OR FULL TIME . . .

MEN & WOMEN ALL AGES!

Send for free book on learning to reupholster chairs, divans, footstools, all furniture for BIG MONEY in spare or full time. No experience needed, no age or educational limits. We show you how and provide EVERYTHING needed to start: (1) Home training covering all phases. (2) all tools and 6 big furniture kits for practice.

(3) ...all supplies, frames and materials to build \$300

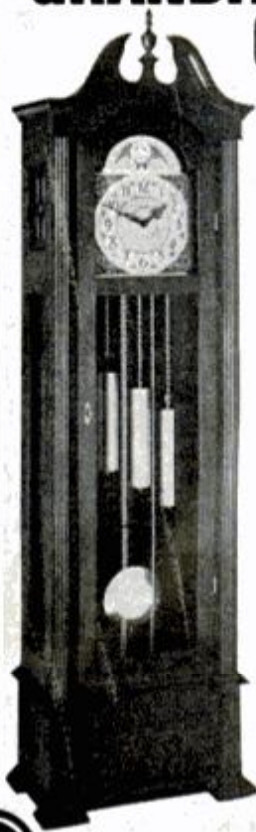
worth of furniture, yours to keep or sell. Write for big free upholstery career book. No obligation, no salesman will call. Veteran Approved. MODERN UPHOLSTERY INSTITUTE, 1205 W. Barkley, Box DNF, Orange, CA 92668



FREE BOOK!

Build Your Own Pre-Cut

HEIRLOOM GRANDFATHER CLOCK



Compare feature by feature

- Solid 3/4" kiln dried wood
- All parts precision pre-cut, mitred and dowelled
- Lumber sanded on all sides
- Fully Assembled/precision-made West German movements
- All hardware included—even screws

Write now for FREE Color Brochure of complete line of Grandfather and other clocks.

HENTSCHEL CLOCK COMPANY
Department 702-J
16 Atlantic Avenue
So. Dennis,
Mass. 02660

SUPER-RADIO

(Continued from page 85)

cation, that's the only one you'll hear. Sounds from a ham's two-meter radio are music to the ears of a CBer used to squeaks, squawks, static whines and whistles.

Not that expensive

It really doesn't cost much more to get into ham radio than it does for CB. Two-meter gear is available for \$200 or less—you can even build your own ham gear from kits (you can't for CB).

Used ham gear is readily available, too, from individuals, at "ham-fest" picnics, or from dealers who take the equipment in trade on new gear. With used equipment, a new ham can get on the air for under \$100.

But deluxe gear is available, too: You can spend \$800 for a 200-watt transceiver which operates on six ham bands, or thousands for an outfit including separate receivers, transmitters, linear amplifiers and a tower for your antenna—not to mention radioteletype, TV and other exotic gear.

At the other end of the scale, many hams go QRP, trying to see how far around the world you can go with a low-cost "flea-power" set having less power than a CB rig.

Once you're on the air you'll find plenty of people to talk with—American amateurs total about 300,000 now, with more in Canada and hundreds of thousands more around the globe.

There's so much to do

You'll hear hams chatting "solid copy" without interference about almost any subject under the sun. Some talk electronics, while others pass along weather reports and driving tips. Students study homework together. Oldsters discuss politics while youngsters talk about the latest flick.

Hams "chase DX" (long-distance reception), sharpen operating skills by competing in contests, and take part in elaborate "fox hunts" in search of transmitters that other hams have hidden from them.

Hams build and operate sophisticated radioteletype, TV, facsimile and satellite receiving stations in basements, attics and garage workshops. Still others are adding home computers (page 112, Sept. '76) to their shacks, for such tasks as deciphering coded transmissions, and orienting their antennas to follow orbiting satellites.

Yes, ham radio gives you somewhere to go from CB: up. ★ ★ ★

* Now— ... YOUR CAR WILL START

- even with a LOW BATTERY!
- even in COLD WEATHER!
- even in DAMP WEATHER!



... THANKS TO:

Coil Foil®

AUTOMATIC STARTING BOOSTER
... the Amazing New Invention!

* GIVES YOU
"Sure-Fire" STARTS
EVERY TIME...



If your Cold or Weak Battery can turn the Engine over just ONCE... COIL/FOIL will START your Car, even under the worst weather conditions, by Automatically providing a STRONG Spark from its OWN Power Source.

- EASY-TO-INSTALL (Only 4-Wires & 2-Bolts). Fits ALL Vehicles with Battery/Coil Systems.
- COIL/FOIL Prolongs Car Battery Life... and reduces wear and tear on Starter-Motor.



No one in your Family need ever be STRANDED with a Car that WON'T START! No more running the Car Battery "DEAD" trying to start the Car! COIL/FOIL uses its own Power (2-Dry Cell Batteries, not included) ONLY in Starting, and Batteries usually last a Year.

TESTED and APPROVED by Leading Automotive Magazines and Authorities!

Comes with... FACTORY WARRANTY. Copy available on written request. ADVANCED ELECTRONICS, N.V., 1625 EYE ST., N.W., Washington, D.C. 20006

ORDER NOW! ... and never be caught with difficult Starting AGAIN! Install the COIL/FOIL and prove to yourself that it works or your money back.

SPECIAL Introductory Offer Only \$1995

ADVANCED ELECTRONICS, N.V.
P.O. Box 1579 — PM, 1, Washington, D.C. 20013

Please RUSH _____ COIL/FOIL Units to:

NAME _____

ADDRESS _____

CITY _____

STATE _____

ZIP _____

MAKE/YEAR of Vehicle _____

Add \$2 for Postage, Insurance & Handling. Canadian & Foreign Add \$3.

Enclosed: Check, M.O., in amount \$ _____

30-DAY "NO RISK" TRIAL... SATISFACTION GUARANTEED or Return Unit in 30 days for Full Refund.

NEW FROM NRI

Small Engine Repair Course from the leading technical home training school

More than 50 Million Engines Mean Unlimited Opportunities for Part-Time or Full-Time Income.

Every lawn mower, chain saw, garden tractor or other machine powered by a small engine represents a potential need for professional service and maintenance. NRI can give you the training you need to cash in on this opportunity . . . at home and in your spare time. You get the tools you need to troubleshoot and maintain two-cycle, four-cycle, diesel, outboard, air and water-cooled engines.

Only NRI supplies you with an Engine Component Kit designed for training.

Hands-on experience comes quickly with the NRI Small Engine Repair Course. Along with the bite-size lessons fully illustrated, you receive all the components of a versatile 3½ HP Clinton Engine. Using NRI

Power-On training principles, you assemble the complete engine, to use in your workshop or to install at a profit on one of your first jobs.

Where other courses give you inexpensive hand tools, NRI includes with its training an *inductive tachometer, professional volt ohm meter, torque wrench, valve spring compressors, ring compressors, and all the wrenches and specialized tools you need to start your own repair shop.*

Two courses available

The 30-lesson Basic Repair Course covers the theory and practice of small engine operation and repair, including lubrication, ignition, cooling and starting systems. You specialize in professional lawn mower and



other lawn-and-garden equipment repairs. You learn in depth . . . with up to 10 times as much information provided as in competitive courses.

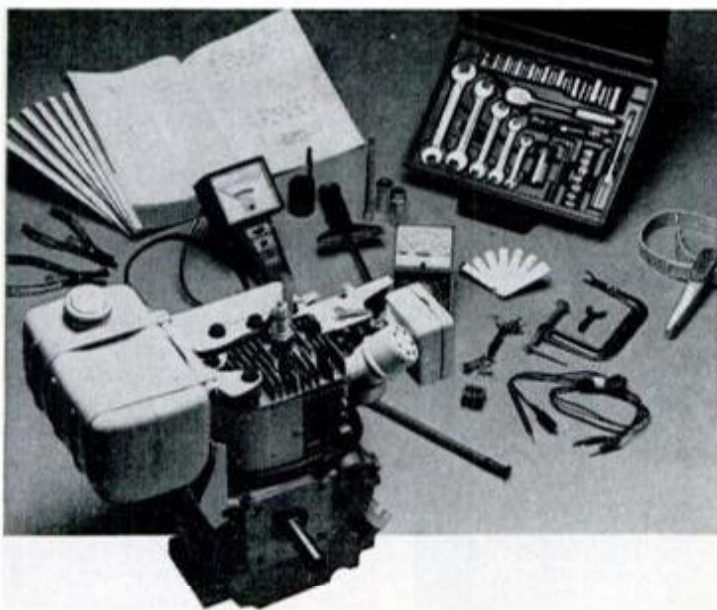
With NRI's 45-lesson Master Repair Course, you move into more advanced training. Lessons cover chain saws, minibikes, mopeds, outboard engines, snowmobiles, golf carts, all-terrain vehicles, welders, generator sets, and other industrial equipment . . . plus six lessons on motorcycle repairs.

You learn the specific engine requirements for power take-offs, charging systems, electrical systems, etc. Practical working knowledge of clutches, torque converters, transmissions, and other drive train parts gives you the professional's edge.

You get more training and more equipment for your money with NRI.

NRI is the unquestioned leader in technical home training, with more than a million students in its over six decades of instructional service. The oldest and largest school of its kind in the country, NRI offers you expert help every step of the way. You'll move ahead at your own speed, earning as you learn, with small engine repairs for your family, friends, and neighbors.

Send for the free catalog and discover how big your future can be in small engines. No salesman will call. If the coupon has been removed, write to: NRI Small Engine School, 3939 Wisconsin Avenue, Washington, D.C. 20016.



NRI SCHOOLS
McGraw-Hill Continuing
Education Center
3939 Wisconsin Avenue
Washington, D.C. 20016

- SMALL ENGINE SERVICE & REPAIR COURSE** • Basic and Master Courses
- AUTOMOTIVE MECHANICS** Basic and Master Courses
- AIR CONDITIONING, REFRIGERATION, & HEATING COURSES**
- ELECTRICAL APPLIANCE SERVICING**
- CB/COMMUNICATIONS**
- COLOR TV/QUADRAPHONIC STEREO**

Please rush me the one free catalog I have checked below. I understand there is no obligation. No salesman will call.



Approved under GI Bill if taken for career purposes.
 Check for details.

Name _____ Age _____
(Please Print)

Address _____

City/State/Zip _____

A National Home Study Council Accredited School

1102-017

Driving the new Mercedes Intermediates You've come a long way, diesel

by Bill Hartford AUTO EDITOR

1952 170D



1977 300D



I have gone faster and felt more secure in a go-kart, but driving the old Mercedes 170D was still fun.

It's not often that the first post-war diesel sedan (the world's first was the 260D of 1935) leaves the Mercedes museum in Stuttgart, but we took it out and even had it at its skitterish limit on some lovely, but rough, country roads.

You can't take a museum piece like the 170D and put it next to the latest from Mercedes and call it a comparison test, but it does remind you that it's a lot different driving today's diesel than yesterday's.

The astounding difference is that at the wheel of the 300D you're hardly aware the engine is a diesel; in the 170D there's no mistaking the fact: It sounds as if all the marbles of your childhood are loose under the hood.

The five-cylinder 300D is rated at almost twice the horsepower as Mercedes' early passenger-car diesels, and it represents over 30 years of careful

refinement. After all, it's the diesel that powers a third of all Mercedes cars made, and it's the diesel that powers almost half of all Mercedes sold in the United States.

Same engine, new body

As smooth and strong as it is, the 300D engine is essentially the same as last year (it's the four-cylinder 240D that's more refined for '77 with

improved engine response and simplified key starting). The significant change for Mercedes-Benz's 1977 line is the completely new body for the intermediate range of cars. The 300D, 240D, 230 and 280E now appear as scaled-down versions of the S-Class, or 450 sedans, introduced in 1973 (see *Cars the Red Baron Would Love!*, page 138, July '73).

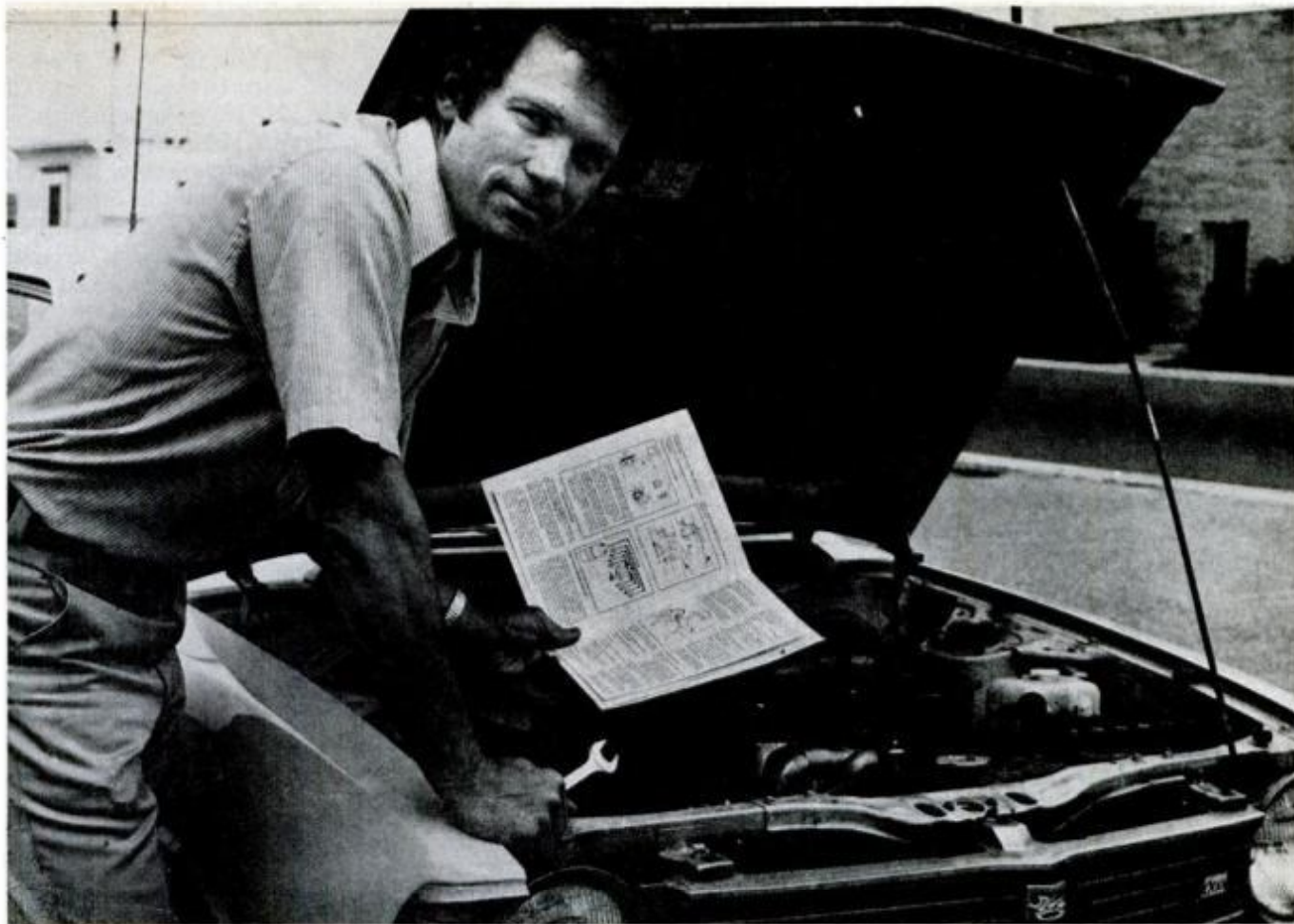
The W123 body, as it's known within Daimler-Benz, was introduced in Europe earlier in the year (and customers there are content to wait over a year for delivery). The U.S. versions went on sale last month with normal delivery times).

The new body replaces the intermediate body introduced in 1967. With the W123, Mercedes has improved safety, comfort and ease of repair and service. Moreover, the new body has provision to accept airbags if they're mandated. The new body replaces the most popular model line in Mercedes' 90-year history: Of the 4.7

(Please turn to page 134)



Instruments and controls are almost identical to those of full-size 450s. Climate control is standard on 300D and 280E, airconditioning optional on 230, 240D.



Only a pro can tune your car. Turn pro for \$2.00

Let's face it. Many of us don't think we can tune-up our own cars. Now, you can do it as well, maybe better, than the mechanics who have been tuning your car for years. (DIXCO test and tune-up tools work on all OEM electronic, standard and add-on ignitions.) And, you'll save a bundle of money. The cost of a DIXCO Test and Tune-Up Set is about the same as one tune-up by a mechanic. Think of all the tune-ups you won't have to pay for at his place when you do it yourself with DIXCO.

Just fill out the coupon and send it to us with \$2.00 in check or money order and we'll return to you: 1) a full-color catalog of DIXCO Test and Tune-Up

Sets, precision tune-up tools, gauges and tachometers; 2) an easy-to-follow test and tune-up manual for American and foreign cars; 3) a postage-paid order envelope.

That's a small price to pay when you think of all the money you'll save after you turn pro.

DIXCO®

Precision test and tune-up tools, tachometers and gauges.
P. O. Box 1449, Grand Junction, CO 81501
303/242-8863

All DIXCO precision products offer a Lifetime Warranty.



Send me the DIXCO Catalog, test and tune-up manual and postage-paid order envelope. A \$2.00 check or money order is enclosed.

Name _____

Address _____

City _____ State _____ Zip _____

PM-2

DRIVING THE NEW MERCEDES

(Continued from page 132)

million passenger cars made since 1886, more than 1.9 million were the intermediates made between 1967 and 1976.

Over half the intermediates Mercedes sells here in 1977 will be 300Ds, so it was this car that I drove more than the others. Almost all refinements of the new body that assure comfort and safety are so well integrated you're not aware of them: The inboard anchor point for the three-point safety belts, for example, is now on the seat itself. That means it's always in the same place regardless of how the seat is moved. The steering column (which inflicts more injury to a driver than any other part of the car in a collision) uses a corrugated metal housing so it not only telescopes in a frontal impact, but bends sideways in diagonal impacts. Rod-type linkages, such as that used for the parking brake, have been replaced with chain connections to eliminate potentially dangerous projections. Such safety refinements are, of course, in addition to the safety of the body design itself which is like the 450s.

Those extra refinements

Things you will notice about the new body include better visibility: Rear-view mirror is 25 percent wider, wipers clear 78 percent of the windshield and C pillars are slimmer. Also:

- Hood opens a full 90° for servicing. And the hood release is unique: The release pops out from the grille when you pull the release handle.

- Doors overlap the sills so in wet weather legs and trousers, which so often rub this area when you get in and out, stay clean.

- Optional sunroof has built-in, self-storing deflector that really works in eliminating wind buffeting.

Fine points in automotive design like those above deserve mention because so much of what a Mercedes is goes without saying. You take for granted because it's standard equipment: fully independent suspension, zero-offset steering, power steering, four-wheel power-assisted disc brakes, central locking system, tinted glass, radial tires, quartz clock, fog lights and so on. Automatic transmission is standard on 300D, 280E and 230. And standard on 300D and 280E are climate control, power win-

dows, cruise control and AM/FM.

Most impressive in driving these new cars is the absence of any type of creak or squeak from *anywhere*. That's not to say that the driving experience is so quiet you can hear a watch tick—it's not that kind of silence: Drive train, wind and tire noise are there, but that's as it should be. The "thump" when you hit a rut in the road comes through to you, but it's mostly a reassuring sound: You know that the car was in no way affected by the impact.

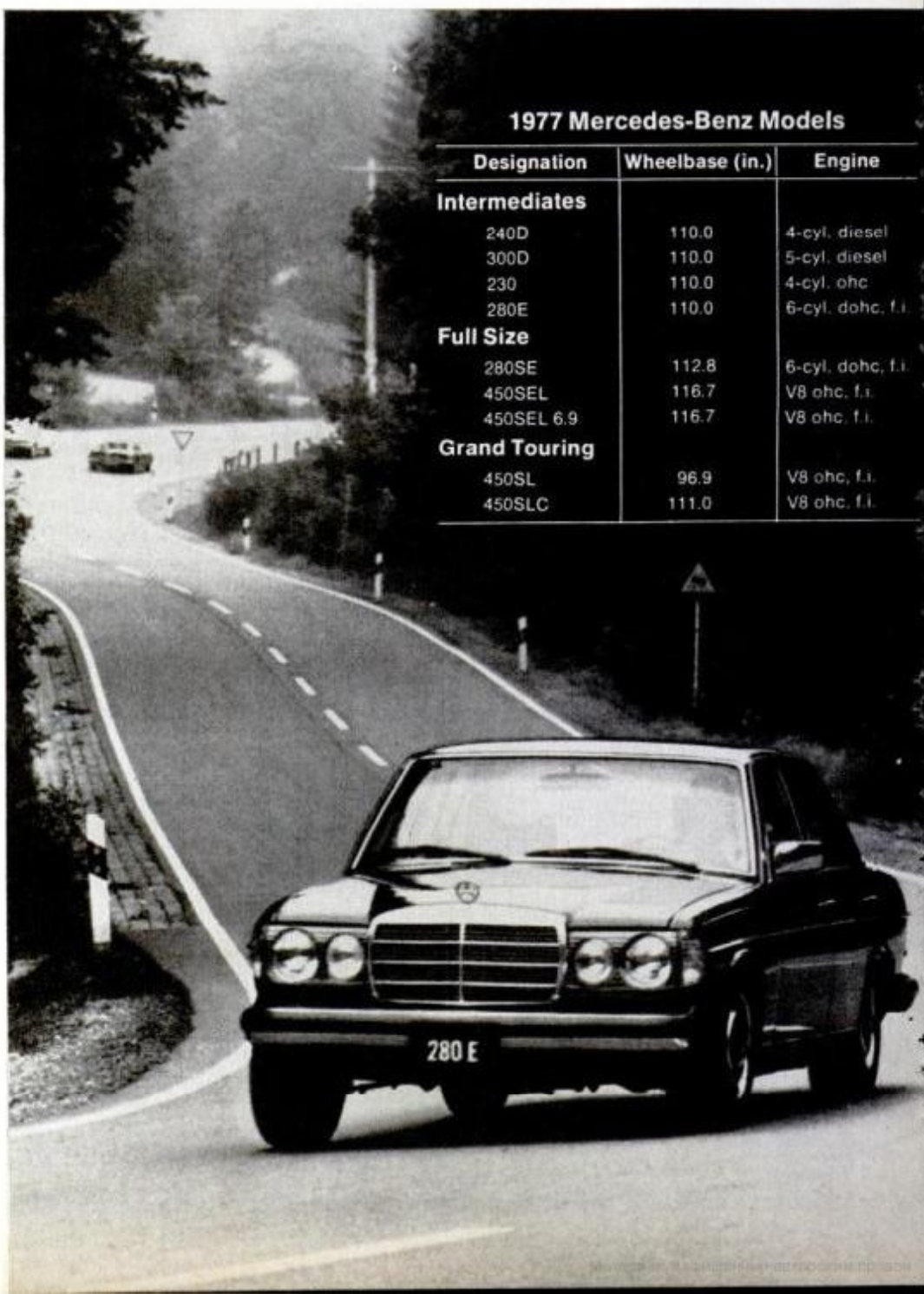
Missing noises

What's missing are those noises that are sure clues to something less than perfect workmanship, something less than a perfect fit of all parts: a slight buzzing from behind the dash, a squeak from two vinyl

surfaces rubbing, an almost imperceptible rattle from under the hood, the soft booming of a sheet-metal panel at harmonic frequency. There's none of this in the new intermediates and that's what makes driving them an uncanny experience, indeed.

The craftsmanship in these cars is guaranteed to evoke the admiration of everyone who appreciates fine automobiles, and it will lead many to pay the steep price to own such an example of automotive excellence.

There is a hitch, however. Service. Be forewarned: It costs an arm and a leg. We know. The ordeal of maintenance is the kind of thing owners write to PM about. Even do-it-yourselfers have to buy replacement parts, and they come dearly. How dearly? If you have to ask, you're not ready for a Mercedes-Benz. ★ ★ ★



1977 Mercedes-Benz Models

Designation	Wheelbase (in.)	Engine
Intermediates		
240D	110.0	4-cyl. diesel
300D	110.0	5-cyl. diesel
230	110.0	4-cyl. ohc
280E	110.0	6-cyl. dohc, f.i.
Full Size		
280SE	112.8	6-cyl. dohc, f.i.
450SEL	116.7	V8 ohc, f.i.
450SEL 6.9	116.7	V8 ohc, f.i.
Grand Touring		
450SL	96.9	V8 ohc, f.i.
450SLC	111.0	V8 ohc, f.i.

Fastest of the new ones is the 280E. K-Jetronic fuel injection helps boost horsepower to 142—up 18-percent over last year's carbureted dohc Six.

WOODWORKERS:

The Best Is an Economy



Do Better Woodwork with Garrett Wade Tools

Your woodworking tools are your constant companions in your leisure hours. Pick them as carefully as you do your friends — for their good qualities and compatibility.

Your friendship with your Garrett Wade tools will last for years, whether you make your own furniture, carve, sculpt, do occasional repairs, or are a cabinet-maker. Garrett Wade offers you "a beautiful and extensive line of imported hand tools" and "the most complete selection" of workbenches in the U.S. (*Popular Mechanics*, March, 1976.)

It takes fine tools to do your best woodwork. Get your copy of Garrett Wade's Yankee Wood Craftsman Catalog—packed with exciting gift ideas, and information for beginner and expert.

SEND TODAY FOR FREE 64-PAGE FULL-COLOR CATALOG/WOODCRAFT MANUAL Garrett Wade Company, Inc., Dept. 7PP, 302 Fifth Avenue, New York 10001

Yes, I want a FREE Garrett Wade Catalog.

I'm in a hurry; send it first class mail. I enclose \$1.00 postage and handling.

Name _____

Address _____

City _____ St. _____ ZIP _____

MEN! WOMEN! Train At Home to be a VETERINARY ASSISTANT

• Combine your love of animals with a rewarding career. Thousands of trained men and women needed to help handle the growing volume of animal health care.

Accredited Member, National Home Study Council Mail Coupon for FREE CAREER KIT...



... Helping those who can't help themselves!

North American School of Animal Sciences Dept. P80C6

Careers by Home Study
4500 Campus Dr., University Plaza, Newport Beach, CA. 92663

Career Kit tells how you can train for an exciting job as Veterinary Assistant, Lab Aide, Zookeeper, Pet Shop or Kennel Owner, etc.

Name _____ Age _____

Address _____

City _____ State _____ ZIP _____

POWER HACKSAW

\$41.95

WORKS BEAUTIFULLY

Easy to assemble kit of cast iron parts. Use your own 1/4 hp. motor, 1/2" drill press needed for finishing work. Moves approx. 120 strokes/min. Send \$41.95. Catalog describing this and 51 other kits, only 50c. Write: Casting Specialties, Dept. PM17H, Cedarburg, Wis. 53012.



SAVE MONEY

Assemble our unique Mini-Dozer Tractor Kit. Buy factory-direct. Catalog of Kit construction and uses — \$3.50 "Build-it-yourself" Plans — \$6.00 (refunded on any purchase!)



STRUCK KIT, Dept. PM 17 Cedarburg, WI 53012

WOOD FLOORING

(Continued from page 102)

enables each pattern to look good in a variety of settings makes wood a very flexible flooring. And you can find a type you like to fit your budget.

Last, consider the type of floor framing and subfloor you have. There is a type of wood floor that can be placed over just about any existing level flooring other than below grade where water and dampness are constant.

Wood flooring is made from both hard and soft woods. It can have an edge grain when the wood is cut so the annual tree rings run at right angles to the face of the board, or a flat grain where the annual tree rings run parallel to the surface of the board.

The two different grain patterns come in a number of sizes of cuts: Strip flooring is available in widths from 1 1/2 to 2 1/4 in.; wider plank flooring comes in 3 to 9-in. widths; and parquet blocks range from 4 1/2 to 11-in. square.

Strip flooring

Although strip flooring is probably the most widely used type, great increases have been made in plank and parquet sales. Southern pine and Douglas fir are the most common types of softwood strip flooring. Oak is probably the most common hardwood strip floor though beech, birch and hard maple are used as well.

The thickness of strip flooring varies from 3/8 in. to 1 1/16 in. If you are laying over existing flooring, you'll probably want a thinner 3/8 to 1/2-in. thickness. The thinner

strip will not raise the floor level much or create as great an unevenness with adjacent flooring. It's also less expensive.

Plank flooring

Plank flooring is made with much wider boards than strip flooring and usually contains round pegs of a contrasting wood. For example, Colonial Plank by Harris is oak plank with either walnut or oak pegs. Westminster Plank by Bruce is distressed oak with wrought-iron nails. The wooden pegs usually are purely decorative, but sometimes when the flooring is attached to the subfloor by screws, they cover the screw heads. The pegs combined with the wide plank widths laid in random lengths from 4 to 8 ft. are usually designed for casual, informal areas.

Block parquet flooring

Block parquet is formed by smaller pieces of wood set in a pattern and held together by paper, wire splines or other means. The ability to lay the floor in blocks rather than a small piece of wood at a time reduces installation work greatly.

Countless patterns are being produced, some having other advantages besides beauty and durability. For example, Hartco Wood Foam-Tile by Tibbals Flooring is a block parquet with a foam cushion that helps deaden impact sound.

Softwood is graded differently from hardwood. Within the hardwood category, birch, maple and beech have separate grades from oak, which itself has several grading systems. It's easiest to remember

(Please turn to page 138)



Dura Blok by Harris is a smooth parquet with a Dura Seal finish that actually penetrates the wood. Materials cost is about 90 cents per square foot.

Star SAPPHIRE
14K GOLD
RING sells
for \$200.00
... cost of materials \$40

MEN! WOMEN!
Make Precious

Turquoise BRACELET
sells for \$395.00
... cost of materials \$60



MAKE REAL MONEY
plus all the jewelry you can
... design, manufacture,
repair bracelets, earrings,
brooches, necklaces, rings ...
just like a professional.

Solid SILVER and
TURQUOISE NECKLACE
sells for \$800.00
... cost of materials \$195.



Channeled
SILVER EAGLE
inlaid with coral and
turquoise sells for \$700
... cost of materials \$85.



JADE
EARRINGS in 14K
gold sell for \$200
... cost of materials \$50.



**BIG PROFIT
HOME BUSINESS**

A family business full
or part-time.

SEND FOR FREE COLOR BROCHURE...
SHOWS WHAT YOU CAN DO ... HOW EASY IT IS ...
HOW MUCH MONEY YOU CAN MAKE ... A
PROFITABLE HOBBY FOR MEN AND WOMEN OF
ALL AGES. **MAIL THIS COUPON TODAY!**



JEWELRY DESIGN CENTER
4401 Birch St., Dept. PBOC6, Newport Beach, CA 92663

NO PREVIOUS EXPERIENCE NEEDED!

JEWELRY

Start in Spare Time at Home!

We Show You What To Do ... How To Do It ... Guide You Step-By-Step

Materials to make gorgeous gold and silver jewelry with semi-precious and precious stones cost only a few dollars. Retail value of comparable rings, bracelets, etc., runs to hundreds of dollars. You need no special skill—everything explained in easy-to-understand language with plenty of photos, diagrams and drawings.

IT'S EASY TO START! NO BIG OUTLAY FOR RENT, TOOLS OR MATERIALS! BEGIN AT HOME ON KITCHEN TABLE! Learn trade secrets of the professionals—casting, inlays, channeling, how to cut, polish and mount stones. Work with silver, gold, pewter right in your own kitchen. Make original designs or copy from others. So quick and easy you'll hardly believe it possible until you know the simple tricks that many skillful jewelers use. We tell you where to buy, what to charge, everything you need to make and sell jewelry for big profits.

No matter where you live—city, town or rural area—jewelry is always "big business." Figuring the usual 100% mark-up, you can pocket a fantastic profit, even selling at a discount, when you design and manufacture jewelry at home.

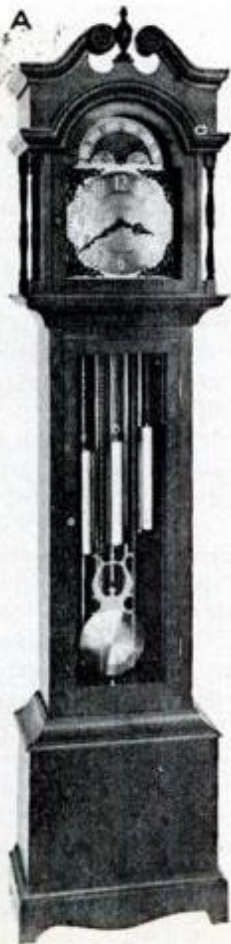
START MAKING MONEY FAST! Basic tools, materials, everything you need included with course ... yours to keep!

Easy to follow step-by-step instructions are complete with drawings, diagrams and photos. You get tools for handling your jewelry, for polishing, cleaning, oxidizing. Instructions tell how to make your own gravers and wax pen, use of tools for setting stones, surface decoration, cutting, sawing, filing and soldering. You get silver, tools and much, much more.

Mail This Coupon for FREE Information

Careers by Home Study • **JEWELRY DESIGN CENTER**,
4401 Birch, Dept. PBOC6, Newport Beach, CA 92663
Send me free facts and color brochure on how I can learn all about
Jewelry as a hobby or career for just a few dollars a month.
I understand there is no obligation and no salesman will call.

Name _____ Age _____
Address _____
City _____ State _____ Zip _____



The difference in an M & S Clock is its obvious *Quality*

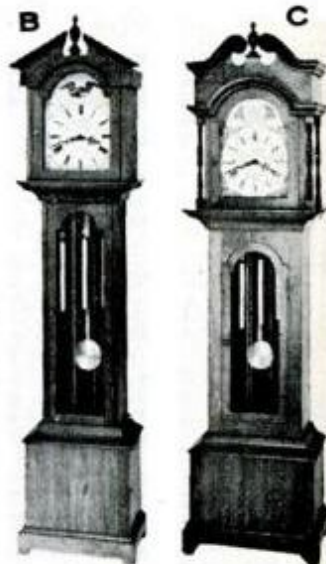
All lumber supplied by Mason & Sullivan is the finest solid, kiln-dried wood available from domestic and foreign sources. The hardware, dials, West German movements and chimes are similarly selected for their superior workmanship, materials and performance.

Only with such components can you capture the beauty and enduring qualities which are the essence of all heirlooms ... the qualities which distinguish every Mason & Sullivan masterpiece reproduction ... which are worthy of the skill and patience you put into their creation.

SEND \$1 FOR NEW 32-PAGE COLOR CATALOG & PLAN TO BUILD your choice of any 1 of the 4 clocks shown (check coupon). Catalog shows the many Grandfather, Grandmother, wall, desk & mantel clocks available in do-it-yourself, pre-cut or semi-assembled forms. Send \$3.50 for catalog & all 4 plans.

CATALOG ALONE 50¢

MASON & SULLIVAN CO.
OSTERVILLE, CAPE COD, MASS. 02655



MASON & SULLIVAN COMPANY
Dept. PM17, Osterville, Mass. 02655
Please Rush the following plans:
CLOCK A B C D @ \$1.00 each
Send all 4 plans @ \$3.50
Send catalog only @ 50¢

Name _____
Street _____
City _____ State _____ Zip _____

BIG PROFIT HOME BUSINESS

Make Real Money at Home in Spare Time. No Previous Experience Needed

LEARN GUN REPAIR!

BECOME AN EXPERT! KNOW-

- Gun Repair, Customizing, Accurizing • Moders & Black Powder Ballistics
- Reloading, Custom-Arms Making • Stock Carving Design, Checkering.
- Firearms Importing Plus Much, Much More FIRST & ONLY COURSE OF ITS KIND!

• Your love of guns and shooting can lead to an exciting career opportunity! Let leading Arms Experts train you in the many proven ways to make \$\$\$ with guns! Booming fire-arms sales create big demand for skilled craftsmen, qualified sales-advisory personnel. Fed. Gun Laws permit licensed trainees to sell arms, ammo without inventory. Order for others on cost-plus basis. Save up to 30% and more on fine guns, accessories, gunsmith supplies! Start your own business; or prepare now for a high-pay "Gun-Pro" Career with manufacturers, importers, gun shops, sports stores. We show you the way!

"GUN-PRO" Book FREE!

North American School of Firearms, Dept. #8066
Careers by Home Study • 4500 Campus Dr., Newport Beach, CA 92663

Rush me your free "Gun-Pro" Career Kit. Show me how I can learn gun repair for just a few dollars a month... No Salesman Will Call.

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

"Finally, I've found a MAN-SIZE tractor"

ECONOMY tractor handles bigger, tougher jobs. Mow, plow, till, bulldoze. 20 attachments. More work-power, lower fuel cost, all-gear drive. Free catalog.

ECONOMY TRACTOR

1005 K-1 Anoka Avenue
Waukesha, Wisconsin 53186

WHAT'S HE DOING!

Making a Concrete Flower Pot! ... and SO CAN YOU!

Make and sell your own Ornamental Concrete items. Rush \$5.00 for Book about Aluminum Molds with prices and production trade secrets direct from world's largest mold manufacturer. Over 350 designs to select from.

Send \$5.00 CONCRETE MACHINERY COMPANY
Today To ➔ P. O. BOX A99 - HICKORY, N. C. 28601

Be a MOTORCYCLE Mechanic in 90 Days

AMERICAN MOTORCYCLE INSTITUTE 77-1-21 Phone
1445 Skytrooper Rd., Daytona Beach, Fla. 32015 Toll Free
800-874-0645

Name _____ Age _____
Address _____
City _____ State _____ Zip _____
Phone () _____ Vet _____

ELECTRIFY YOUR BIKE!

PEDALPOWER exciting new bike drive tames tough hills. Be independent. Shop when you want. Fits all Bikes, Adult Trikes. Installs in minutes. Thousands sold. Recharges overnight. Travels 100 miles for a dime. Send for FREE illustrated booklet.

GENERAL ENGINES CO.,
5097 Mantua Blvd., Sewell, N.J. 08080

DRILL YOUR OWN WATERWELL

With this low-priced outfit you can drill your own water well at a cost of about 12¢ per foot! Also, this unit can be operated horizontally to drill free-flowing springs in hill-sides. A big, fact-filled package and 24-page book "How To Drill Your Own Water Well" is just \$3.00 PPD. (Refundable) "WRITE TODAY"

DEEPROCK MFG. CO.
703 Lafayette Pkwy., Dept. PM17, Opelika, Ala. 36801

GET LOST

FIND NEW FREEDOM WITH THE UNIQUE

How To Disappear Manual

REVEALING STEP BY STEP REPORT

FORGET: BAD RELATIONSHIPS, DEBTS, LOUSY JOBS
CREATE A: NEW IDENTITY! NEW LIFESTYLE! NEW FORTUNE!
\$5.00 POSTPAID SATISFACTION GUARANTEED

Current Corporation Box 108 Miami Fla 33148

WOOD FLOORING

(Continued from page 136)

that the top grades are primarily clear wood and the lower grades have natural characteristics such as bird pecks, small knots and scattered worm holes.

Don't discount the lower grades. Their natural imperfections can add character and warmth to your floor. As an added attraction, a lower grade is also less expensive.

Highly durable flooring

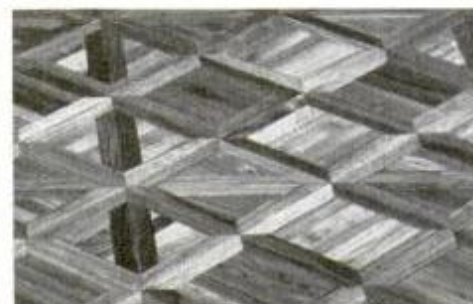
If you like the look of wood flooring, don't hesitate to put it in areas of your home where it will get hard use. As a general rule, hardwood like oak is more durable than a softwood and better in high-traffic areas. Woods with natural oils like teak are also good in areas that are heavily used, particularly in entryways where snow and water are carried inside and kitchens where liquid spills occur.



MONTICELLO



RHOMBS



SAXONY

The parquet patterns above are part of the Bondwood collection by Harris. A facepaper on top of the tile holds the pieces together and protects the wood until the job is completed. The water-base paper glue is easily removed.



This VinylWood II plank flooring by Wood Mosaic is covered with a thin layer of clear vinyl for use in high-traffic areas. Materials run about \$2.10 per square foot.

Several floor types have protective finishes particularly made for heavy wear. VinylWood II by Wood Mosaic is a wood plank floor covered with a thin coat of vinyl. It is designed for areas requiring extra protection and ease of maintenance. This kind of flooring runs about \$2.10 per square foot.

Bruce PermaGrain is a wood flooring with a colored liquid acrylic forced into the pores of the wood. The acrylic permanently hardens, making cigaret burns, stains or other marks easily eliminated by spot sanding with no refinishing required. Cost of this flooring is from \$2.25 to \$2.50 per square foot.

Flooring costs

Cost of wood flooring varies considerably per square foot from well under a dollar for some softwood strip flooring to over \$10 per square foot for parquet designs with walnut burl centers. If you're willing to do much of the work, you can buy a very low grade of strip flooring inexpensively and cut out the worst parts. You can also save by buying unfinished flooring and finishing it yourself. This enables you to match the finish to furniture you have.

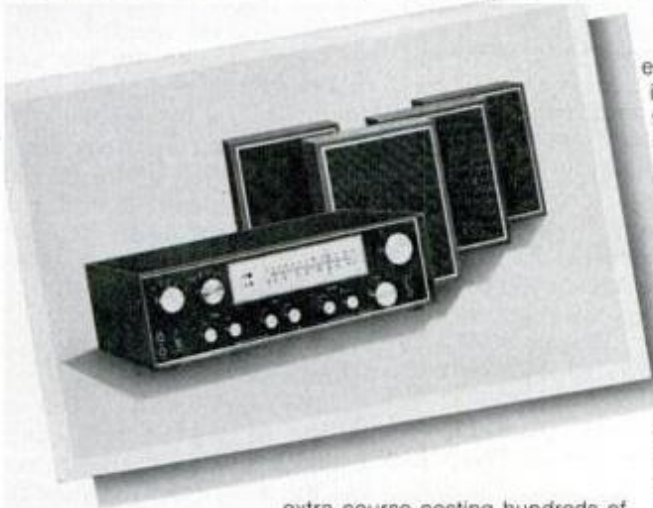
Laying the flooring

The basic preparation involves removing the base moldings and checking that subfloors are level, clean, smooth and dry. In the case of plywood or wood subfloors, be sure they are well nailed and free of protruding nail heads.

Strip flooring is usually tongued and grooved and laid by blind nailing diagonally through the tongues. Some strip flooring is square-edged and is simply butted together and face-nailed; then the nailheads are set and the holes filled. One way of installing strip flooring on concrete slabs is to nail the strips to wood blocks glued to the cement with mastic. It's very important to use the amount of nails specified by the manufacturer. Skimping on nails may result in a squeaky floor.

Plank flooring is blind-nailed like (Please turn to page 142)

Only NRI gives you this 25" DIAGONAL designed- for-learning Color TV...plus complete Quadraphonic Audio Center!



Two home training schools give you a hobby-kit Color TV to assemble. Two others give you a commercial set right off the shelf. Neither was designed to teach you how to repair Color TV's. Only NRI invested the time and money to design equipment with learning in mind!

No other home training school gives you both a solid state Color TV and SQ™ Quadraphonic Receiver complete with four speakers...all in one course. In fact, to even match this kind of thorough training at another school, you'd have to take an

™ Trademark of CBS, Inc.

extra course costing hundreds of dollars more. And only NRI courses in Color TV/Audio servicing let you learn on equipment designed specifically for training.

It's the only way you can (1) get the feel of typical commercial circuitry, (2) learn bench techniques while building complete units from the "ground" up, (3) perform over 35 "in-set" experiments during construction, and (4) end up with a 25" diagonal solid-state Color TV with cabinet and a 4-channel Audio Center.

NRI passes the savings on to you

NRI engineering eliminates the cost of buying from an outside source. We pay no salesman's commission. Students are

enrolled by mail only. The savings are passed on to you in the form of low tuition fees, extras like the TV's console cabinet and the Quadraphonic System; professional test instruments like a 5" triggered sweep oscilloscope, CMOS digital frequency counter, and integrated circuit Color TV pattern generator. You can pay hundreds of dollars more for similar courses and not get a nickel's worth more in training and equipment.

More know-how per dollar

It all boils down to the quality of training you get for your money. In our 62-year history, more than a million students have come to NRI and we're fully approved for career training under the G.I. Bill. We know the right way to make home training pay dividends for you.

Some of those "right" things are bite-size lessons to ease understanding and speed learning... personal consultation, and prompt grading of all tests...a full-time staff of engineer/instructors to help if you need it...the right kind of kits and experiments to give you hands-on training...and fully professional programs oriented to full or part-time career needs.



Also CB, Computer, & Other Courses

NRI offers not one, but five TV/Audio servicing courses so you can tailor your training to your budget. Or you can study other opportunity fields like Digital Computer Electronics, Citizens Band Radio, Communications, Aircraft or Marine Electronics, Mobile Radio, and more. Send for your free catalog and see for yourself that no one gives you more training and equipment for your dollar. There's no obligation and no salesman will call.

If card is missing, write to:



NRI SCHOOLS
McGraw-Hill Continuing
Education Center
3939 Wisconsin Avenue,
Washington, D.C. 20016



Cards, Stationery, Advertising, labels, tickets, announcements, QSL cards, greeting, sympathy, prayer cards, etc. Save money. **Print for others, good profit.** Have home print shop. Pays for itself in a short time. Sold direct from factory. Easy rules sent. We supply everything. Send 25¢ for catalog. **KELSEY PRESSES** Meriden, Conn. 06451

MAIL THIS COUPON TODAY **Kelsey Presses Dept. 77-8h** Meriden, Conn. 06450

I enclose 25¢ send big catalog and free samples.

Name _____

Address _____

City _____ State _____ Zip _____

An Atlas Body -in 7 Days

my method of DYNAMIC-TENSION starts giving you results that you feel and your friends will notice. Big, useful muscles. Gain pounds in weight where needed. Lose "pot belly." Send me your name and address for my 32-page book—FREE.

CHARLES ATLAS
49 West 23rd St.,
New York, N.Y. 10010
Dept. 8A



LEARN SMALL ENGINE REPAIR

at home in spare time-quickly!
Good Business-Great Hobby!
10¢ BRINGS BOOK, FULL FACTS

MODERN SCHOOLS

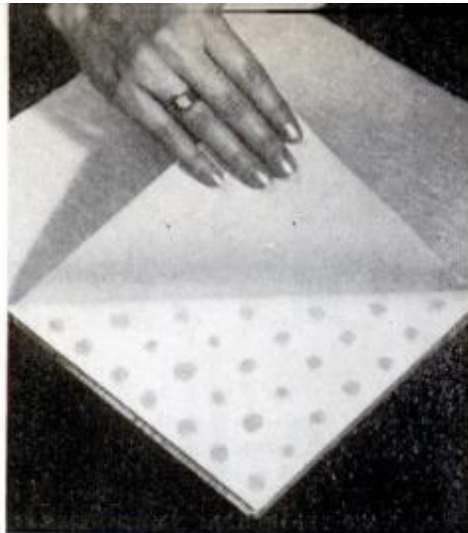
4225 N. BROWN AVE. DEPT. PM SCOTTSDALE, AZ 85251
EARN WHILE YOU LEARN

(Continued from page 138)

strip, but because many of the boards are wide, it needs more than nails to hold it. The usual method is to place one or two screws nears the ends of the boards and additional screws or face nails at about 30-in. intervals. These are countersunk, then covered by pegs. Village Plank by Bruce is one plank flooring that can be directly glued to concrete without first gluing down wood blocks.

Parquet is usually tongued and grooved and can be laid in mastic over concrete or blind-nailed to a wood subfloor.

If the floor is laid in mastic, the cleanup procedure after the molding is nailed in place involves the taking up of adhesive smears with mineral spirits.



To lay this Hartco Wood Foam-Tile, just peel away the protective paper. The adhesive dots hold the tile in place. Cost of materials is about \$1.30 per square ft.

because they are moisture and stain-resistant.

Floor maintenance

Floor manufacturers vary in their recommendations for keeping your floors in good condition. Several suggest the floor be swept or dust-mopped daily, buffed weekly and re-waxed yearly, with heavy-traffic areas re-waxed monthly. Others suggest only weekly buffing and re-waxing two or three times a year. Several maintenance products suggested by flooring manufacturers are: Minwax Paste Wax, Wood Mosaic Paste Wax, Johnson's Beautiflor Cleaner and Buffing Wax, and Hartco Paste Floor-Wax.

Refinishing

Under normal circumstances wood floors need refinishing every 10 years at the very most. Then the floor should be sanded with coarse sandpaper (with the grain) to remove the old finish. Gradually finer sandpaper should be used to smooth the wood.

The floor should be vacuumed to remove the dust, and floor finishes should be applied following the manufacturer's directions. After the finish has dried, it should be waxed and buffed. This will keep your wood flooring in fine condition. ★★★



Brittany by Wood Mosaic is a luxury parquet flooring 3/4-in. thick of prime-grade oak. Materials cost per square foot for this pattern is from \$4 to \$6.

Self-stick parquet with adhesive directly on the wood blocks is made by several manufacturers. Wood Mosaic has a 12 x 12-in. "peel and stick" tile. Hartco tile by Tibbals sticks to the floor with adhesive dots on the tile back.

As a final preparation, plan to have your flooring delivered at least 72 hours before it is to be laid to give it a chance to acclimate to the house conditions. Unpack it in the room where it is to be laid and keep the room close to 70° F.

Finishing wood flooring

If you buy unfinished flooring, the first step is to sand it smooth. You can rent floor sanders at hardware stores and tool rental centers. The most widely used finishes are penetrating sealers, which actually penetrate the wood fibers and become part of the wood itself. The finish wears along with the wood. Scuffed areas can be retouched to blend in with the rest of the floor.

Urethane and amino-resin finishes cost somewhat more than the penetrating sealers. They are particularly good in bathrooms and kitchen areas

Aromatic Cedar Closets Do-it-yourself!

This booklet shows how

It's easy and inexpensive to have the fresh aroma of real cedar in your closets. Giles & Kendall Cedar Panels are applied with nails like any paneling, butt snugly at joints. 100% red cedar. No finishing needed. Send 25¢ for this booklet of easy plans.

Plans for 4 handsome Cedar Closets you can build



... with fragrant moth-repellent GILES & KENDALL cedar closet panels

GILES & KENDALL, INC. PM-3
P.O. Box 188
Huntsville, Alabama 35804

Please send me your Cedar Closet Plans Booklet. I enclose 25¢.

Name _____

Address _____

City _____ State _____ Zip _____

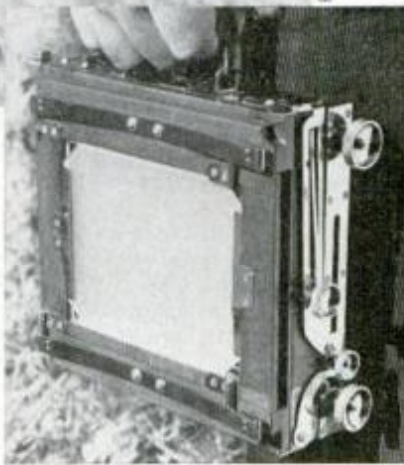
SOURCES OF INFORMATION

- Arkansas Oak Flooring Co., Box 7277, Pine Bluff, Ark. 71601.
- E.L. Bruce Co., Inc., Box 16902, Memphis, Tenn. 38116.
- Harris Manufacturing Co., Box 300, Johnson City, Tenn. 37601.
- Hartco, Drawer A., Oneida, Tenn. 37841.
- Wood Mosaic, Box 21159, Louisville, Ky. 40221.



PM Photos: Benn Mitchell

No period piece, the Nagaoka is a fine, working camera.



Easy to carry, this 4x5 folds compactly, weighs just 2.6 pounds.

This old-time handmade camera is brand-new

by Ivan Berger
PHOTOGRAPHY EDITOR

Gleaming, polished wood and shiny, metal fittings don't make this camera an antique, even if it is handmade. The Nagaoka 4x5-inch folding field camera is made today, as a real working tool.

It's light and folds compactly for easy carrying. And its features are great for portrait, scenic and nature photography: It has a long, 13-inch bellows for life-size close-ups, perspective-correcting front and back tilts and a rising front (front swings are coming soon), and a back that accepts 4x5-inch sheet-film, Polaroid and roll-film holders.

Studio 4x5 view cameras offer a greater range of swings and tilts and longer bellows extensions, but they're heavier and usually more expensive, too: The Nagaoka costs just \$217.50 without lens and shutter, \$395 with an Acuton 150-mm, f/4.8 lens that converts to a 300-mm, f/10 when you remove the front element, plus a Copal No. 1 shutter. Lensboards are interchangeable with

those used by the Linhof and Toyo.

My only complaint about the camera is that it's possible to extend the bellows out so far the focus rack falls off the pinion, but you can set that right in a minute, and a stop to prevent it would be easy to add. The importer is Graphic Imports, 2632 South King St., Honolulu, Hawaii 96814. ★★★



Good, old-fashioned hand craftsmanship is demonstrated in this factory view.

FREE catalog
over 2000
unique tools,
handy kits,
precision
instruments,
technical
supplies.



Over 23 years of service to the world's finest craftsmen and technicians.

National Camera
3000 West Union Ave., Dept. EAB
Englewood, Colorado, 80110

Send a **FREE** copy of the NC Flasher

name _____

address _____

city _____

state _____

zip _____

National Camera
3000 West Union Ave., Dept. EAB
Englewood, Colorado, 80110

SURVEYING PAYS BIG

Join a Surveying Team — get in on planning of America's highways, bridges, dams, subdivisions, etc. 1000s exciting big pay jobs open now to qualified men. Wonderful outdoor careers in government offer security. Many exciting positions open in private construction too. No previous experience needed. Our easy step-by-step home-study plans have helped 1000s beginners toward prestige salary, security.

Thousands of Surveyors got their start through home-study. You can too! Send for "SURVEYING CAREER KIT" — ALL FREE! Write & state age, G.I. and V.A. Benefits. No salesman will call. 95*

APITUDE TEST
SAMPLE LESSON
ALL 3 FREE!

NORTH AMERICAN SCHOOL OF SURVEYING, Dept. PB0C6
4500 Campus Dr., University Plaza, Newport Beach, CA 92663

Rush me "Surveying Career Kit" ALL FREE!
Name _____ Age _____
Address _____
City _____ State _____ Zip _____

BIG MONEY AS A
Professional Clocksmith

Learn clock repair in your spare time. **LOW** tuition. Specialized knowledge in this **VITAL** field makes **YOUR** time valuable. **ACT NOW!** Free details. No obligation. No salesman will call.

NO TEDIOUS WATCH REPAIR
School of Professional Clocksmiths
P.O. Box 178 (PMIA)
FRANKSTON, TX. 75783

NAME _____
ADDRESS _____
ZIP _____

Inventions Ideas Wanted

Developed, Marketed for
Cash/Royalty.
Sales or Licensing to Industry.

"NO IDEA IS TOO SMALL"

LAWRENCE PESKA ASSOCIATES

500 Fifth Ave., Dept. P05
New York, N.Y. 10036

CALL TODAY
(212) 391-6350

Offices throughout the U.S.A. & Canada

Send for **FREE** booklet:
"How to Safeguard,
Develop and
Market Your
Ideas to Industry."



(Please print)

Name _____

Address _____

City _____

State _____ Zip _____

Phone No. _____

Make Extra Money in Spare Time Fix Chain Saws

You'll find all the in-
formation you will
need to know in the
new 5th edition of —



CHAIN SAW SERVICE MANUAL

Only repair manual of its kind. **312 pages** of easy-to-understand and easy-to-follow information. Shows and tells you how to tear down, repair, reassemble and adjust 26 of the most popular chain saws. Exploded diagrams. Clear photographs. Lists symptoms of common saw failures and gives troubleshooting procedures. The only universal Chain Saw service Manual. **\$7.95.**



New 11th edition — **Small Engines Service Manual.** Tells how to fix small gas engines on Lawn Mowers, Garden Tillers, Tractors, Power Equipment. Over **300 pages \$7.95.**

SPECIAL OFFER — Save \$1.90
Order both Chain Saw Service Manual and Small Engines Service Manual for only **\$14.00** — You save **\$1.90.** Send check or money order and we send postpaid. **Satisfaction Guaranteed.**

TECHNICAL PUBLICATIONS Div., Dept. PM-177
P.O. Box 12901, Overland Park, Kansas 66212

New Free Book Reveals HOW TO OFFER YOUR INVENTION FOR SALE

If you have an invention that you are planning on offering to manufacturers on an outright sale or royalty basis, the booklet we offer free may be valuable in saving you time and money, whether you present your invention to manufacturers yourself or employ us to help you.

We are specialists in helping inventors submit their inventions to manufacturers. We are in contact continuously with scores of manufacturers from coast to coast, and we are well informed which manufacturers may be interested in your particular kind of invention. Our service is designed to do all those things the average inventor lacks the knowledge or facilities for doing, or does not have time to do. We prepare your letters, folios, duplicate drawings, handle correspondence, select the firms. We have been serving inventors for over 20 years.

For our service we charge a fee and if a manufacturer expresses serious interest in your invention, you may, if you so desire, employ us on a commission basis to assist you and/or your attorney in negotiating.

We are not patent attorneys, and if your invention is unpatented we encourage all inventors to consult a patent attorney as to rights, searches, patentability. If you do not know a patent attorney, write us and we will tell you how to obtain the names of all U.S. Patent Attorneys in your area and you can make your own choice.

The free booklet you can obtain by merely sending us your name, contains such information as royalty rates paid by manufacturers, and many other subjects about inventing. It also discusses the methods of presenting your invention to manufacturers, whether you employ us or do it yourself.

If you wish to write us for answers to any questions you may have, please do. We make no charge for consultation. But please do NOT send drawings or models. Send your name and address on the coupon below.

MAIL THIS COUPON

Mr. K. O. Kessler, President
Kessler Sales Corporation,
Dept. D-51, Fremont Ohio 43420

Please mail me a copy of your FREE Booklet "How to Offer Your Invention For Sale." It is understood that this does not obligate me in any way to use your Service.

Name _____

Street Address _____

City _____ State _____ Zip _____

PHOTO HINTS

FROM READERS

Keep your washer drain clear



Standpipe devices like this Gantz DeHypo turn your sink into a print washer. But if the prints should float over the pipe's drain opening and block it, as they often do, they could turn your kitchen into a wading pool. To prevent that, roll a 2x3-inch piece of hardware cloth (chicken wire mesh) into a tube, and insert it in the device's drain hole. The water will still flow, but the prints won't be able to block it.—Robert Kay.

Marbles keep chemicals longer



As you pour small amounts of photo chemical from a full bottle, you leave room for air inside that can oxidize the remaining chemical and shorten its life. But drop in marbles to make the liquid rise in the bottle's neck, and the air is squeezed out.

—Ken Brooks.

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

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

No
Experience
Needed

Sharp-All

lets you Sharpen Saws

garden and shop tools
for home and industry

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

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

Big PROFITS — Plenty of business waiting for qualified men.

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

SEND FOR FREE FACTS TODAY!

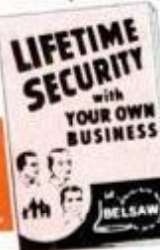
You risk nothing by accepting this offer to see how easily you can turn your spare time into Big CASH Profits with your own Complete Sharpening Shop. Send coupon or mail postcard for full details on our exclusive

30-Day FREE Trial Offer!

FREE Booklet gives full details —

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

Send for
your copy
today. No
obligation.



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

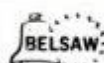
You don't have to invest thousands of dollars to get started in business for yourself. Low Cost SHARP-ALL and our 45 years of experience in helping sincere men earn extra income, plus the desire to get ahead is all you need. Fully illustrated Operators Manual gives clear, step-by-step instructions, shows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

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

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

ACT NOW!
Coupon
Brings
Full Details!

No Obligation . . . No Salesman



BELSAW SHARP-ALL CO.
717J Field Bldg.
Kansas City, MO 64111

**FREE
BOOK**

**RUSH
COUPON
TODAY!**

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

Name _____

Address _____

City _____

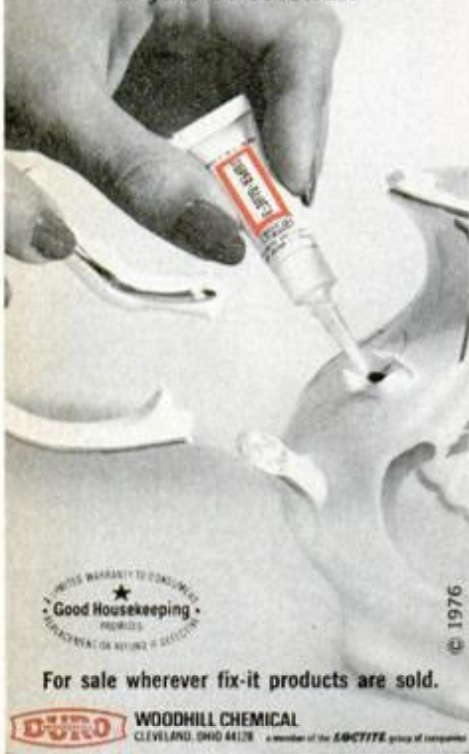
State _____

Zip _____

BELSAW SHARP-ALL Co., 717J Field Bldg., K.C., MO 64111

BAD BREAK? SUPER GLUE®-3

makes it good
in just 10 seconds.



1 YEAR WARRANTY TO CONSUMER
★ Good Housekeeping
PRODUCT
MANUFACTURED OR IMPORTED IN U.S.A.

For sale wherever fix-it products are sold.

DURO WOODHILL CHEMICAL
CLEVELAND, OHIO 44128 a member of the **LOCTITE** group of companies

© 1976

Cut Fuel Bills

NEW Electrically-powered "Hearth-Aid"
increases heat output of your fireplace by 500%



- ★ Adjustable. Fits all fireplaces.
- ★ Easy to install. No tools required.
- ★ Thermostatically controlled. Works automatically.
- ★ Produces over 20,000 BTU's of heat. Uses less than 20 watts of electricity.
- ★ Hi-Temp stainless steel construction.

The heat of a fire is sensed by a thermostat which activates a fan. The fan pulls cool air from the room through the tube where it is heated to over 400 degrees and forced back into the room at the rate of 120 cubic feet per minute, easily heating any size living area. **\$67.95**

Guarantee: 30 day satisfaction or money back.
1 year defect, workmanship.

For Free Pamphlet Write:

THERMALITE CORP.

P.O. Box 658, Dept. PM Brentwood, Tn. 37027

Almost in the bag



Handles are sturdy, good-sized and well placed. Milwaukee has gone to impact-resistant plastic (on handles and part of casing) to keep weight and the cost down. The most outstanding feature has to be low price—about \$150 for the 4-in. model—up to 40 percent less than most other good-quality sanders.

A belt sander, particularly a 4-in. model, is often one of the last "basic" tools bought for a home shop. There are two reasons: First, most of the good ones cost well over \$200 and second, you can usually scrape by with your orbital sander.

Milwaukee's price of about \$150 for its 4-in. model helps to eliminate the first barrier. A belt sander will cut down your finishing time and improve your results. A five-minute run with coarse, medium and fine-grit belts will take almost any surface down to the bare wood.

To load the belts you flip a tension lever and push in on the front roller. When it locks, the belt will slide on easily. On PM's test tool the roller occasionally slipped from the belt-load position after hours of use had caused sawdust to build up around the rollers.

Packs plenty of power

Once the belt is on, releasing the tension clip springs the front roller against the belt, taking up the slack. The 9.5-amp. motor has plenty of power and you'll really have to keep a solid grip on the tool.

The next step is to adjust the tracking screw on the side of the housing. This changes the angle of the roller so the belt will track in a straight line. If the angle is off, the belt will creep sideways, exposing the metal roller to the wood beneath and possibly tearing the belt against the casing of the sander.

I found the Milwaukee tracking adjustment more sensitive than most. In many cases the initial track alignment (made in free spin before the belt contacts wood) had to be made again when sanding.



You do have to keep a tight grip on the tool, but its ample power is easy to control. You don't have to press down to get results, although the beefy motor won't drag if you do. Well-placed handles make it easy to feather the ends of straight runs and avoid digging into the wood. The tool did well during these tests:

- Continuous on-off operation.
- Continuous heavy-duty work.
- Cutting down high spots only.
- Controlled sanding, 1/2-in. edges.

Dustbag drawback

On fir and pine projects, no matter how I used the tool, not much sawdust ever made it into the dust collector. I reinstalled the plastic pick-up foot several times, even removed the casing to blow out all traces of built-up dust. But after about 10 passes the system clogged. I had much better luck with finer hardwood dust. The flaw in the pickup system seemed to be only at the small plastic foot. Milwaukee's 4-in. belt sander is a solid, well-built, heavy-duty tool at an economy price. —Mike McClintock, Home and Shop Editor

Create beautiful, unusual and original lamps.



This great craft book includes complete step-by-step instructions for making standing lamps of all kinds, light fixtures for ceiling or wall, and shades. It covers designs, elements, materials, wiring, safety, and all techniques — gluing wood, veneering, texturing, sanding, staining, finishing. 642 photos and diagrams in color and black-and-white.

THE LAMP AND LIGHTING BOOK

by **THELMA R. NEWMAN, JAY HARTLEY NEWMAN, and LEE SCOTT NEWMAN**

Crown Publishers, Dept. 653
One Park Ave., N.Y., N.Y. 10016

Please send me THE LAMP AND LIGHTING BOOK as indicated below for which I enclose check. If I wish, I may return book(s) postpaid within 10 days for full refund.

_____ cloth copy(ies) @ \$10.95 (518627)
_____ paper copy(ies) @ \$ 5.95 (518635)

Name _____
Address _____
City _____ State _____ Zip _____
N.Y. and N.J. residents, add sales tax.

INVENTORS

RECOGNITION... FINANCIAL REWARD... OR CREDIT FOR "INVENTING IT FIRST" MAY BE YOURS!

If you have an idea for a new product, or a way to make an old product better, contact us, "the idea people" We'll develop your idea, introduce it to industry, negotiate for cash sale or royalty licensing.

Write now without cost or obligation for free information. Fees are charged only for contracted services. So send for your FREE "Inventor's Kit." It has important Marketing Information, a special "Invention Record Form" and a Directory of 500 Corporations Seeking New Products.

RAYMOND LEE ORGANIZATION
230 Park Avenue North, New York, NY 10017

At no cost or obligation, please rush my FREE "Inventor's Kit No. A-12".

the idea people

Name _____ Please Print
Address _____
City _____ State _____ Zip _____

HOW TO BECOME A LOCKSMITH



COMPLETE BOOK OF INSTRUCTIONS How To Fit Keys, Change Combinations, Master Key Locks, Keys By Number, Tools To Use, etc. Detailed illustrations. Easy to follow. Get started! Order today.

Only \$5 ppd.

AX Ancele, P. O. Box 69234, Los Angeles, Ca. 90069

LEARN MEAT CUTTING



Train quickly in 8 short weeks at Toledo for a bright future with security in the vital meat business. Big pay, full-time jobs — HAVE A PROFITABLE MARKET OF YOUR OWN! Time payment plan available. Diploma given. Job help. Thousands of successful graduates. OUR 5th YEAR! Send FREE illustrated FREE catalog. No obligation. G.I. approved. NATIONAL SCHOOL OF MEAT CUTTING, No. 71-02-0197T, Dept. 50-0, 33 N. Superior, Toledo, Ohio 43604.

FREE Blackhawk Films Catalog...

Listing thousands of 8MM and 16MM silent & sound films... The most comprehensive listing of home entertainment films available... and it's yours free, just write or call today.

Call Toll Free: 800-553-1163
In Iowa Call: (319) 323-9736
Please mention order #3233

Blackhawk Films, Inc.
3233 Eastin-Phelan Building
Davenport, Iowa 52808

At Last 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 Kero. "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 \$5.00. No C.O.D. **SAVDY SCIENTIFIC, 1510 26th St., Box 1398 SANTA MONICA, CALIF. 90408**

Be an Aircraft Mechanic ... in 17 months!

SPARTAN School of Aeronautics Dept. PBOCS International Airport, Tulsa, OK 74151

Name _____ Age _____
Address _____
City _____ State _____ Zip _____

Check here if eligible for GI Bill benefits. Approved for VETERANS

ORIGINAL W.W.II HELMET \$24.95

PLUS \$2.00 POSTAGE AND HANDLING MONEY BACK GUARANTEE

COLLECTORS! 32 PG. COLOR CATALOG \$1.00
W.W. II Medals, Civil War Hats, Flags etc. 100's of Items CATALOG FREE

UNIQUE IMPORTS, INC. Dept. PM2
610 FRANKLIN STREET, ALEXANDRIA, VIRGINIA 22314

MAKE MONEY

Train at Home in Spare Time WE FURNISH EVERYTHING YOU NEED TO LEARN THIS NEW CAREER... Even Show You How and Where to Buy Equipment & Supplies at Low Prices!



CUSTOMIZING CARS, VANS, CYCLES, BUGGIES INSIDE & OUT!



START YOUR OWN SHOP - FULL OR PART TIME We won't waste your time telling you how big the market is — or how much money you can make. You already know — or you wouldn't be reading this!

What we want you to know is how fast and easy we can train you to do this kind of work in your own garage or back yard — without charging you an arm and a leg for learning. Just spend an hour or two a day following our step-by-step instructions... and only weeks after you start you'll be handling an air gun and stripping brush like you were born with them in your hands.



YOU DON'T NEED ANY SPECIAL ART TALENT

We show you how to do everything so easy you can't miss... Fading, fogging, flames, scallops, lace, cowwebbing and other special effects. Included with your course is a wild assortment of patterns, decals and ideas that turn you into an expert with just a little practice. Not only do you learn how to use the air brush, but we show you secrets of pin-stripping, gold-leafing, custom lettering, decals, taping, masking, preparation — everything you need to know and want to learn about custom paint jobs.



Get Ready for the Kind of Career that Pays You to Do What You Enjoy Doing Anyway!

Careers Through Home Study
CUSTOMIZING CENTER Dept. PBOC6
4401 Birch St., Newport Beach, CA 92663

Rush free color brochure and full information on how I can learn customizing for only a few dollars a month. No salesman will call.

Name _____ Age _____
Address _____
City _____ State _____ Zip _____

YOU LEARN INSIDE CUSTOMIZING, TOO!

Only the Customizing Center puts it all together for you — teaches you the complete "ins and outs" of van and car customizing. The same course teaches you with step-by-step lessons how to do paneling, upholstery, carpeting, drapes, built-ins, everything! Work with wood, vinyl, cloth and other materials. Learn how to mix or match colors. Includes basic information on installing high-back swivel and reclining seats, as well as beds, bunks, tables, etc.



SAVE BY CUSTOMIZING YOUR OWN VAN OR CAR
... Start Earning Good Money Doing Vans for Others in Spare Time... Even Before You Finish Your Course!

Learn How To Put On The Add-Ons!
Make more money selling and installing portholes, flares, custom windows, sun- and moon-roofs, air scoops, side pipes, spoilers and racks. We show you how... help you get set up for dealer discounts to save you money on your own jobs, or make more money on the jobs you do for others.

CUSTOMIZING CENTER Dept. PBOC6
4401 Birch Street, Newport Beach, California 92663

**DENMARK
GERMANY
SWEDEN
ENGLAND
UNITED STATES
THE WORLD!**



WOODWORKING

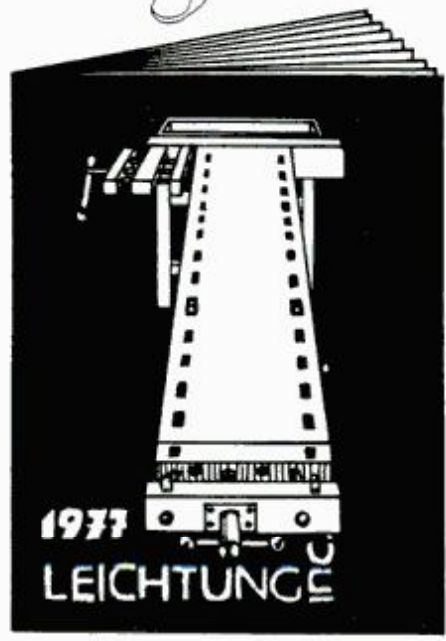
TOOLS

**FROM
LEICHTUNG INC.**

Tools can make the difference.

You can do better work with the right tool for the job.

Treat yourself to the pleasure of owning the world's finest. If they come from Leichtung you know your tools are the best from the great tool centers of the world.



Yes, Ric Leichtung,

Please send me **FREE** your full-color brochure on Lervad's complete line of benches.

Enclosed is \$1.00. For this, send me the full-color brochure on Lervad benches, your newest catalog of fine, hard-to-get tools **PLUS** all catalogs, brochures and new-tool bulletins **FOR THE NEXT TWO YEARS!**

Name _____

Address _____

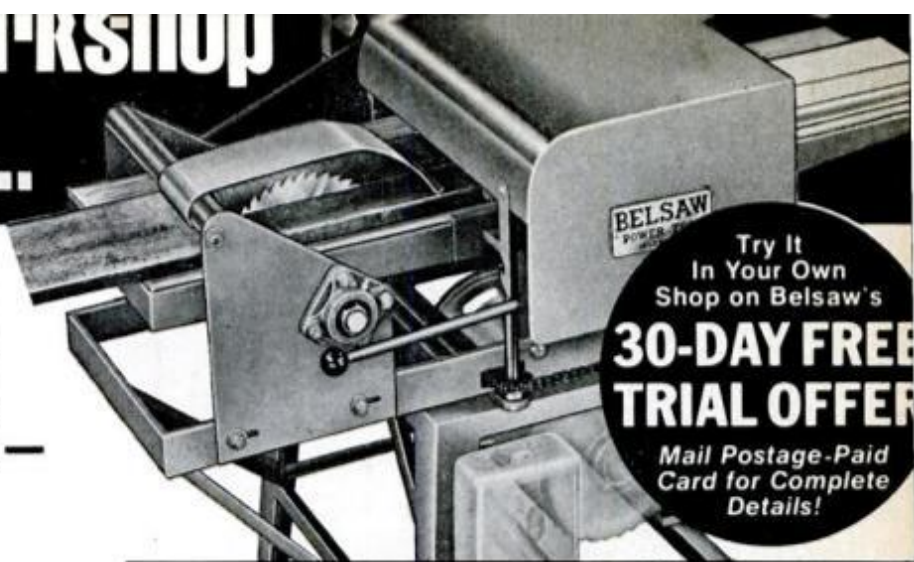
City _____ State _____ Zip _____

Mail to: **Leichtung, Inc., 701 Beta Drive,
Suite 177P, Cleveland, OH 44143**

**Your Home Workshop
can PAY-OFF....**

...BIG!

This one power-fed tool—
SAWS to desired Width...
PLANES to desired Thickness...
MOLDS all popular Patterns...
— all in one fast operation!



Try It
In Your Own
Shop on Belsaw's
**30-DAY FREE
TRIAL OFFER!**
Mail Postage-Paid
Card for Complete
Details!

Here's a versatile power tool that literally pays for itself. In just one pass, you can quickly turn low cost rough lumber into high value finished stock. From the day it arrives your Belsaw will make and save you money. Low cost cutter bits let you make quarter round, base mold, door and window, stop, casing, tongue and groove...all popular patterns. Other Belsaw operators are making and selling picture frame molding, fencing, clock cases, furniture, bee hives, bed slats, surveyor's stakes...all kinds of millwork. *These men report profits up to \$100 a day.*

**Your
Own
Business
Part Time
or Full Time—
Right At
Home!**

Men and women everywhere are using this one low-cost power-feed machine to start and build their own new businesses...and YOU can do the same. Supply lumberyards, carpenters and contractors in your area with door and window trim...base shoe...bed mold...cove and quarter round...ALL of their trim. You can sell picture frame to custom framing shops, paint stores, department stores and direct to users. All patterns available or design your own.

Does The Belsaw Pay? YOU BET!
READ WHAT OTHER BELSAW OWNERS SAY:

"I've been a planer man for years and am now retired. The Belsaw has earned me \$60,000 in eleven years...it's the best investment I ever made."
Robert Sawyer—Roseburg, Oregon

"I bought a batch of walnut in the rough, and after planing it on the Belsaw I figured I saved enough money to pay for two-thirds the cost of the Planer. It really does a good job."
R. S. Clark—Springfield, Ohio

"I recommend the Belsaw as the most useful shop tool any craftsman could own. We use one every day in the Workbench model shop... couldn't get along without it."
**Jay Hedden, Editor
Workbench Magazine**

"This machine pays for itself 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."
Stephen Schultz—Orangeville, Penna.

Find Out NOW How You Can Get In On The Profits!

Cut Out Ready-to-Mail Coupon. No Postage Stamp Needed.

**No Stamp
Needed—**
—just fill out
coupon, cut on
dotted lines,
fold and seal
with tape or
staple and mail.
We'll rush full
details about
this amazing

**3 in 1
Power
Tool!**

Do It Today!
If coupon has been
removed, just send
postcard with name
and address to:
BELSAW POWER TOOLS
907J Field Bldg.
Kansas City, MO 64111

Yours FREE!
NOW YOU CAN...
**Turn Extra Time
Into
Extra Income!**
BELSAW POWER TOOLS

**Send TODAY for
fact-filled
FREE
BOOKLET!**

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

YES, please send me the FREE Booklet that gives me complete facts about Belsaw's Planer-Molder-Saw and full details on how I can qualify for a 30-Day Free Trial right in my own shop. I understand there is No Obligation and that No salesman will call.

Name _____

Address _____

City _____

State _____ Zip _____

Send for your copy Today!

POSTAGE WILL BE PAID BY—

BELSAW POWER TOOLS Co.
907J Field Building
Kansas City, MO 64111

BUSINESS REPLY MAIL
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

**FIRST CLASS
PERMIT NO. 1014
KANSAS CITY
MISSOURI**

↑ DO NOT CUT BUT FOLD HERE... Seal and Mail. ↓

▲ CUT ALONG DOTTED LINES...FOLD IN HALF...SEAL AND MAIL. ▲



removal. It's the tool designed to save work, time and muscle while removing snow at over twice the speed of a shovel.

SNO-HAWK requires no lifting, tossing or bending and can be used by every member of the family quickly and efficiently. Many medical authorities warn against over-exertion and lifting while bending.

To operate, simply slide your SNO-HAWK into the snow, rock it back on its radius and then glide to your deposit area. A push-pull action will easily release the snow from the bucket and you're ready to move another load (up to 4 cubic feet per scoop).

The SNO-HAWK is molded from high-impact polyethylene with a stainless steel cutting blade. The handle is made from rigid 18 gauge weather-resistant carbon steel and operates at the user's own height. Snow will never stick to the SNO-HAWK'S surface, and temperatures as low as 50° below zero won't affect its durability.

SNO-HAWK is the only tool of its kind which offers an alternative to the old-fashioned snow shovel. With a SNO-HAWK there is no need to invest in an expensive, potentially hazardous snow-blower.



Our Guarantee
Satisfaction or your money back,
simply return within 14 days for full refund.

SNO-HAWK is also ideal for many businesses and industries where snow blowers or heavy snow removal operations are restricted.

SNO-HAWK's big 24" wide scoop is big enough to clear a sidewalk in one swath. Its rugged stainless steel blade is strong enough to chip up frozen snow and dislodge small frozen drifts. In fact, SNO-HAWK has a built-in kick plate for that purpose.

SNO-HAWK has handle repositioning slots for wall storage. Four wing nuts are all that have to be loosened.

SNO-HAWK
1555 North Sheffield Avenue
Chicago, Illinois 60622

Yes, I would like to avoid the back-breaking drudgery of shoveling snow this winter. Please send me _____ SNO-HAWKS at the low price of \$29.95 each, (the same product retails nationally for \$34.95) plus \$3.95 each for freight and handling.

Name _____
Address _____
City _____ State _____
Signature _____

OR CALL TOLL FREE
800-325-5900

Enclosed is
 Check or Money Order for
(Sorry no C.O.D.)
SNO-HAWKS \$29.95 ea.
Freight & handling \$ 3.95 ea.
Illinois residents
please add 5% sales tax \$ _____
TOTAL \$ _____

Charge it
 Bank Americard. American Express. Mastercharge Carte Blanche
Int. Bank # _____ Acct. # _____
Exp. Date _____

PERMANENT WHEEL BALANCE



\$19.95 a Pair
Unconditionally
Guaranteed

Calif. Add Sales Tax
BankAmericard, Master
Charge OK...Give Wheel
Size, No. Lugs, Make,
Year & Model

ROAD HUGGERS

483 EAST TAYLOR • P.O. BOX 1081 • SUNNYVALE, CA 94088

ATTENTION TAXPAYERS DON'T STAY IN THE DARK WHEN FILING TAXES!

Public accountant discloses little known tax loopholes, that all may benefit from stop losing your money because of ignorance of these facts. Send \$3.00 today for complete details.

C.F. & B TAX ACCOUNTANTS

555 McKinley Ave.
Hulmeville, Pa. 19047

earn more in electronics...

Sooner than you may have thought possible. Send for a FREE booklet which describes how you can learn to become an ELECTRONICS TECHNICIAN at home or at our resident schools.

PM17
**HERZING
INSTITUTES**
174 W. Wisconsin Ave.
Milwaukee, WI 53203

Name _____
Address _____
City _____ State _____ Zip _____
Phone _____ Home Study Resident



IMPORTED NORDIC WOODLAMP

Pre-cut pieces easy to assemble. Be the first to own this beautiful and expensive looking lamp priced for everyone's budget. Available in glowing orange or light natural woodcolor. Use it natural, or lacquer or paint it to your taste. Size 21" diagonal x 13" high. Electric wire and bulb socket not included, but easy to attach. No C.O.D. Send check or money order for \$15.75 (Tax incl.) plus \$1.00 handling, shipping chgs to:

KATRINA IMPORTS
132 South Laurel Ave., Los Angeles Ca., 90048

You can save \$50...\$100 or more on car repairs!

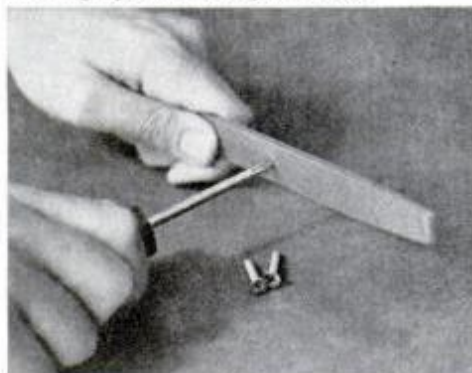
You can do it yourself! Easy to follow manual shows you, step by step, how to do tune-ups . . . work on brakes, ignition, transmission, carburetor, alternator, and more! Spot and fix nearly 600 possible causes of over 100 possible car troubles. Covers 2,300 U.S. models, 1971-77. Over 1,300 giant pages, 3,000 illustrations. The indispensable auto-repair "bible"! 7,500,000 copies sold to car owners, garages, schools, the U.S. Armed Forces.

For FREE, no-obligation information—and details on 10-day TRIALOFFER—write to MOTOR BOOKS, Dept. R-106, P.O.Box 2316, FDR Station, New York, N.Y. 10022

HINTS

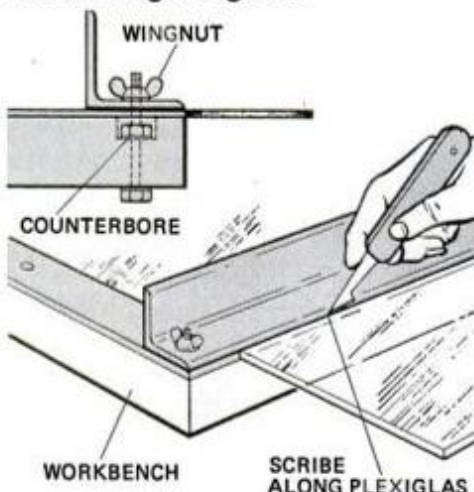
FROM READERS

Firm grip on Phillips-heads



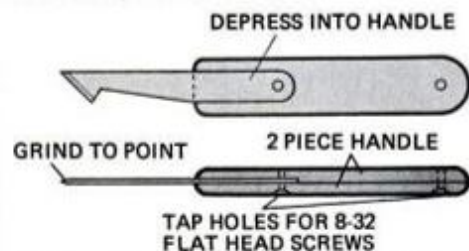
To get a firm grip on Phillips-head screws, grind or file the screwdriver tip to flatten the point. The edges will then make complete contact with the screw.—N.C. Griffin

Ideal straightedge . . .



An angle-iron guide attached to a workbench at right angles to a steel guide makes a good vise and straight-edge for cutting plastic and other flat stock.—Jay Wallace

. . . And plastic scriber



This scriber helps score plastic accurately. Grind an old hacksaw blade to the shape shown and attach it with screws to a two-piece handle glued with epoxy.—Jay Wallace

Unique full-function 8-digit wrist calculator... available only as a kit.

A wrist calculator is the ultimate in common-sense portable calculating power. Even a pocket calculator goes where your pocket goes—take your jacket off, and you're lost!

But a wrist-calculator is only worth having if it offers a genuinely comprehensive range of functions, with a full-size 8-digit display.

This one does. What's more, because it *is* a kit, supplied *direct* from the manufacturer, it costs only a very reasonable \$19.95. And for that, you get not only a high-calibre calculator, but the fascination of building it yourself.

How to make 10 keys do the work of 27

The Sinclair Instrument wrist calculator offers the full range of arithmetic functions. It uses normal algebraic logic ('enter it as you write it'). But in addition, it offers a % key; plus the convenience functions \sqrt{x} , $1/x$, x^2 ; plus a full 5-function memory.

All this, from just 10 keys! The secret? An ingenious, simple three-position switch. It works like this.



1

1. The switch in its normal, central position. With the switch centered, numbers—which make up the vast majority of key-strokes—are tapped in the normal way.



2

2. Hold the switch to the left to use the functions to the left above the keys...



3

3. ...and hold it to the right to use the functions to the right above the keys.

The display uses 8 full-size red LED digits, and the calculator runs on readily-available hearing-aid batteries to give weeks of normal use.

Assembling the Sinclair Instrument wrist calculator

The wrist calculator kit comes to you complete and ready for assembly. All you need is a reasonable degree of skill with a fine-point soldering iron. It takes about three hours to assemble. If anything goes wrong, Sinclair Instrument will replace any damaged components *free*: we want you to enjoy assembling the kit, and to end up with a valuable and useful calculator.

Actual Size

Contents
Case and display window.
Strap.
Printed circuit board.
Switches.
Special direct-drive chip (no interface chip needed).
Display.
Batteries.

Everything is packaged in a neat plastic box, and accompanied by full instructions.

The only thing you need is a fine-point soldering iron.

All components are fully guaranteed, and any which are damaged during assembly will be replaced free.

The wrist-calculator kit is available only direct from Sinclair Instrument. Take advantage of this 10 day money-back offer.

Send the coupon today.

KIT ONLY
\$19.95

Sinclair Instruments Inc.
6 Commercial Street
Hicksville, N.Y. 11801

To: Sinclair Instruments Inc.
6 Commercial Street
Hicksville, NY 11801

PM-1

Please send me

_____ Sinclair wrist calculator kit(s) at \$19.95\$ _____

Sales tax (NY residents) _____

Shipping & handling (\$2.50 per unit) _____

Enclosed is check/MO (payable to Sinclair Instruments Inc.) TOTAL \$ _____

Name _____

Address _____

City _____

State _____ Zip _____

I understand that you will refund the purchase price of the kit in full if I return it in saleable condition within 10 days of receipt.

The Big Gain Hunter

You can profit from the growing demand for on-location cleaning.



Carpet Deterger

Upholstery Deterger

Wall Deterger

If you can check at least 4 of these benefits

—you owe it to yourself to get all the facts about this money making opportunity.

I'm looking for good income from—

A fast-growing service everyone needs—on-location cleaning of carpets, upholstery and walls in homes and commercial buildings

Repeat business from satisfied customers

Work my own hours—part time or full time

Keep all I earn because I will own my equipment. (No payments of fees, dues or royalties)

Easy to use lightweight, professional equipment. (No special skills, education or experience needed)

Work out of my own home

Free continued guidance to help me every step of the way

A surprisingly small investment

As a Von Schrader Associate, you have a complete plan for success. And right at the time when a fine opportunity couldn't be more welcome!

The way to independence

Have a profitable business of your own. Instead of working all your life for someone else and staying tied down, you can control your income. Make it grow bigger month by month, year by year. And you can start without leaving your present job!

Excellent income

These days, homes, businesses and public places everywhere have wall-to-wall carpeting. And walls and ceilings. All can be cleaned on-location beautifully and profitably with Von Schrader Detergers.

It's true! Unlimited opportunity is waiting for you as a Von Schrader Associate. How much you earn depends almost entirely upon the time and effort you put into it.

Your own boss!

Von Schrader Associates aren't dealers, licensees, franchisees, contractors or lessees. They pay no dues, fees or royalties. They work full or part time, as they wish, with their own Deterger(s).

We back you 100%

We help you reach your full potential. We

show you how to get customers and provide advertising materials and literature with each Deterger. Our counsel is yours at no cost—now, later, always.

Remarkably small investment

Start your on-location cleaning service for much less than you imagined. Our complete, free booklet shows you how you can take advantage of an opportunity you can't duplicate anywhere else.

Anyone can get professional results with proven, high-quality Von Schrader Detergers. Simple in design, they're easy to operate, give quick results. Each Deterger includes all necessary accessories and a supply of cleaning materials. Many Associates start with one Deterger and then, as business grows, get all three.

Success speaks for itself!

If you were to meet our Associates, you'd see their enthusiasm. Hear them tell of their success and personal satisfaction. You'd learn how many have expanded into a complete on-location cleaning service. And how they've become financially independent.

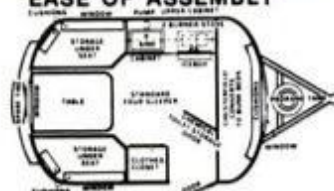
Find out how you can do the same. Take that important first step right now. Mail the coupon today. You've nothing to lose and everything to gain.

BUILD YOUR OWN TRAVEL TRAILER

Scamp



EASE OF ASSEMBLY



For the first time - a fiberglass Do-it-Yourself Kit! No welding. Scamp kit includes all parts you need and fully illustrated step-by-step assembly manual. Scamp can be completed in 60 hours with minimum tools. Also available ready to hitch-up-and-go. Ideal for hunting - fishing - camping. Sleeps 4. Fully guaranteed. 950 lbs. fully equipped. 85 lbs. tongue weight.

Scamp

Write: SCAMP, DEPT. PM-1, Backus, Mn. 56435
Rush 12 pg. full color catalog. \$2.00 enclosed.

Name _____ Age _____
Address _____
City _____ State _____ Zip _____
Home Phone (____) _____
Business Phone (____) _____

"Let me send you our free booklet that gives all the facts"

—Francis von Schrader, President

Read about the big demand for on-location cleaning, see why Von Schrader Detergers are the finest of their kind, how easy they are to operate. Learn how other men have become financially independent, how Von Schrader helps you every step of the way. **Extra! Special Recorded Message included with booklet.** Listen as Francis von Schrader talks to you personally about your growing future using Von Schrader Detergers.



VON SCHRADER company

41 years of helping people earn good money
1017 Place, Racine, Wisconsin 53403
Mail complete information. I understand no salesman will call to bother me.

Name _____
Street _____
City _____
State _____ Zip _____



AUTOMATIC SAW SET

Set saw teeth automatically—400 per minute without effort. Perfect hammer and anvil action sets teeth uniformly—no tooth breakage.



FOR HAND SAWS AND BAND SAWS

Write for details
BURR MANUFACTURING CO.
8931 Venice Blvd.
Los Angeles, Calif. 90034

DUNE-BUG

Complete plans & specs on how to build or buy - disc. prices on parts, kits, engines, & raw material.



Send \$2 for DUNE-BUG pkg. to:
K & P Mfg.
330 S. Irwindale, Azusa P-1
Calif. 91702, Ph (213) 334-0334

VELOCITY SPLITTER

ENDS WOOD SPLITTING DRUDGERY

New low cost COMPACT MODEL with trailer type wheels and hitch coupler for farmers, camps, cottagers. 10 ton ram, 2 cycles per min., splits logs 25" x 18". Also available for 8" wheels for trunk transport.



For details write:

Piqua Engineering, Inc., Dept. P, Box 605 Piqua, O. 45356

PORTABLE WELDER—SHOCK HAZARD—WARNING

If you have purchased a Midway Welder advertised in this magazine at one time, and manufactured by Western Mfg and Supply Co. of Kearney, Nebr. 68847, the Consumer Product Safety Commission urges you to send the welder back for a refund. The product could cause an electrical shock. Include your date of purchase, your return address and your postage costs.

TRANSFORM YOUR VW INTO A UNIQUE-PICK UP



- One weekend home installation using hand tools.
- No torch cutting, welding or mechanical changes.
- Kit includes molded body parts & all needed hardware.

Send \$1 for information & color brochure
\$5 for instructions & templates

DOMUS DEPT. PM 312 EAST 17TH
KANSAS CITY, MO. 64108

AMAZING ELECTRONIC PRODUCTS

Lasers super powered, burning, cutting, rifle, pistol, pocket-see in dark—shotgun directional mike—unscrambler—giant Tesla—stunwand—TV disrupter—energy producing, surveillance, detection, electrifying, chemical, ultrasonic, cb, aero, auto and mech devices, hundreds more—ALL NEW PLUS INFO UNITED PARTS SERVICE.

CATALOG \$1. **INFORMATION unlimited**
BOX 626 LORD JEFFERY ST. • AMHERST, N. H. 03031

PUMPS BUY DIRECT AND SAVE
Drain • Irrigate • Circulate • Spray

Heavy duty ball bearing pump. All metal, rust-proof Type XB. Stainless shaft. Use 1/4 HP or larger. 1 HP 1,200 GPH 60" high or 3,000 GPH 25" well. 5,200 GPH max. 1 1/4" in; 1" out. Belt or direct drive. \$19.95
Type P won't rust or clog. Bronze bearing. To 2,400 GPH. 1" in; 3/4" out. \$13.95
Prod cash with order. Money back Guarantee.
LABAWCO, 80 Hwy 206, Belle Mead, N.J. 08502

BUILD YOUR OWN POWER TOOLS SAVE \$50 TO \$500

METAL PARTS KITS AT LOW FACTORY DISCOUNT PRICES FOR:
• 12-IN. BAND SAW
• 18-IN. BAND SAW
• #6-IN. BELT SANDER
• SPINDLE SHAPER
• 10-IN. TILT/ARBOR SAW
• COMB. DRILL PRESS-LATHE \$29.99 TO \$104.99
Step-by-step plans, photos show how. No machining or welding. 71,000 in use. 5-Year Guarantee. Send \$2.50 for plans (Pap.) or 50c for Catalog. **GILLOM MFG. CO. Dept. PM-1, St. Charles, Mo. 63301**

FOR 13¢

You get Audel's remarkable 6-volume Builders Library to use for 15 days, and a \$3.50 bonus book to keep. (Your cost: one 13¢ stamp!)



You could build a house with all the information in these volumes!

Six hardbound volumes packed with 2,242 pages of advice, 1,638 illustrations, and projects covering kitchen cabinets—fireplaces—windows—walls—terraces—even houses! How can Audel give you all this to use for 15 days—plus a \$3.50 home repair book to keep free?

The answer is simple. Audel's experience as one of the world's foremost self-help publishers has proven that do-it-yourselfers are not satisfied just to do one or two projects. When a really outstanding build-it/fix-it guide comes along, they're not just interested in sampling it. They want to keep it.

107 Chapters filled with trade secrets for building with wood, brick, concrete, stucco, and tile!

We're inviting you to take the Audel *Builders Library* into your home and use it. Build a home workshop—install a staircase—remodel a doorway—plan a patio—panel a wall—lay a sidewalk. Discover valuable new ideas, plans, techniques, and shortcuts for master carpenters and masons—and Sunday do-it-yourselfers, too!

After 15 days, if not convinced that this easy-to-use library will pay for itself again and again—send it back and owe absolutely nothing. But the \$3.50 *Easi-Guide to Indoor Home Repairs* is yours to keep anyway!

On the other hand, we're sure you'll want to use this remarkable, money-saving Audel library for years to come. So why not give it a try? You have a free book to gain, and all you risk is the 13¢ stamp needed to mail the coupon!

Send no money—detach and mail today!

189



FREE-BOOK FREE-TRIAL COUPON

Yes, please send me the Audel *Builders Library* (#23251) to use for 15 days free. If not completely satisfied—I may return it and owe nothing. Otherwise, it's mine to keep for only \$34.20, plus delivery. And whatever I decide, a gift copy of *Easi-Guide to Indoor Home Repairs* (valued at \$3.50) is mine to keep free!

Name (please print)

Address

City

State Zip

Save shipping and handling costs. Enclose full payment (plus sales tax, if applicable). 15-day return privilege still applies.

Mail To: **Audel**
4300 W. 62nd Street/Indianapolis, Indiana 46206
A Division of Howard W. Sams & Co., Inc. CC 25

There are

Big Profits

in radiator repairs . . . and a **BARBEE** equipped shop will make them for you.

Radiator repair is big business. Cash in now on this rapidly growing field. Barbee offers a complete training course and expert counseling on financing.

INVEST AS LITTLE AS \$1800 TO \$3000



A Down Payment gets you started immediately. Use the coupon for free catalog.

THE BARBEE CO.
BOX 323-PM, LOUISVILLE, KY. 40201
Please send catalog and complete information on the Barbee Plan.
Name _____
Address _____
City _____ State _____ Zip _____

Boost fireplace output up to 10X

Glass Door ThermoGRATE® Unit
'Enough to heat a house'



New! Dynamic breakthrough delivers up to 100,000 BTU/hour w/glass door beauty. Total draft control. Converts fireplace to circulating heater. Stops night heat loss.

Performance & quality guarantee.

Open Fireplace ThermoGRATE® Unit

The proven original. Now 28 sizes to assure accurate fit. Heavy duty welded steel construction. Simply slide in, replacing old grate. Up to 40,000 BTU/hr with opt. blower.



Thermograte Enterprises, Inc.
Dept.M 51 Iona Lane St. Paul, MN 55117



OLD FASHION BRANDING IRON
YOUR CHOICE UP TO FIVE 3/8" COPPER LETTERS OR NUMBERS \$5.00 Plus 75¢ handling
ADDITIONAL LETTERS OR PUNCTUATIONS \$1.50 EACH
I. MILLER ENTERPRISES
BOX 772-M
MANCHESTER MD. 63011

GREAT GIFT

TILLER USERS...

Can your machine do all of this?

- ★ Handle with just ONE HAND.
- ★ EVENLY break, turn & till soil.
- ★ Shred vegetation without tangling.
- ★ Leave NO WHEELMARKS or FOOTPRINTS.

The TROY-BILT® ROTO TILLER-POWER COM-POSTER can do all this and more! That's why serious gardeners consider it the finest tiller available. See for yourself! For complete details, OFF-SEASON SAVINGS, and FREE 24-page booklet clip this and mail today to:



TROY-BILT® Tillers
102nd St. & Ninth Ave.,
Troy, N.Y. 12180

TROY-BILT® Roto Tiller-Power Composters
Dept. 70191
102nd St. & 9th Ave., Troy, N.Y. 12180

Please send the whole wonderful story of TROY-BILT® Roto Tillers including prices and OFF-SEASON-SAVINGS now in effect for a limited time. (Please Print Clearly)

Mr. _____
Mrs. _____
Ms. _____
Address _____
City _____
State _____ Zip _____

PLANS AND INSTRUCTIONS FOR

Go Kart	\$2.00
Mini Bike	\$2.00
Mini Car	\$3.00
Pedal Boat	\$4.00
12" Sail Boat	\$4.00
Snowmobile Sleigh	\$3.00
Mini Jeep	\$3.00

Mini Vehicles Plans Dept.-C
Chazy, N.Y. 12021

BUILD YOUR OWN



- MOTORHOME
- 5th WHEEL
- CAMPER
- TRAILER
- COVER
- VAN



KITS • PLANS • FULL SIZE PATTERNS

GLEN-L component kits, plans, and full size patterns make it easy AND YOU SAVE \$\$\$! Factory-like methods adapted for amateurs assure professional results you'll be proud of. Pictorial instructions cover frame construction, undercarriages, cabinetry, framing, electrical plumbing, aluminum skin, and more! Building is fun! No special skills or tools required. Dozens of models PLUS equipment, parts, aluminum skin all available at DISCOUNT PRICES! Send \$1 today for illustrated RV PLANS, KITS & EQUIPMENT catalog.

GLEN-L RV's 9152P Rosecrans Bellflower CA 90706

GLEN-L RV's
9152P Rosecrans Bellflower CA 90706
Enclosed is \$_____ Please rush _____ copies of RV catalog
Van Conversion Plans (all models) only \$5.00
Name _____
Address _____
City _____ State _____ Zip Code _____

SILVO (BRAND NAME) TOOL CATALOG

Thousands of Exciting Tool Values! Stanley, Skil, Millers Falls, Wellswa, Dremel, Disston, Helios, Speedy Sprayers, Plumb, Kennedy, Huot, Rockwell, Channellock, Crescent, Vise-Grip, Ridgid, Unimat, Audel Books, Nicholson, General, Indestro, Xacto, Wiss, Pony Clamps, Wen, and many other Nationally Advertised brands of Tools & Supplies. We ship Coast to Coast at prices hard to beat. Send \$1.00 for our big 168 page tool catalog today.

SILVO HARDWARE CO.

107 Walnut St., Dept.PM-1, Phila., Pa. 19106



Universal Router/Shaper Table—Ideal for shaping and jointing small materials that are normally difficult to handle. Build picture frames, plaques, or easily add a decorative touch to moldings. Features miter gauge for safe cutting at any angle. Accepts most router Skil, B&D, Stanley or Rockwell

— Add \$2.50 for shipping — Reg. \$16.95
71025-537 P—7 lbs. Special—\$10.98

ELECTROPLATING EQUIP.

Portable Platers, Supplies & "Know-How"

Build your own tanks for Nickel, Chrome, etc. Easy-to-install PVC liners. Rectifier components—all sizes. Schematic parts lists, formulas, operating instructions for all plating. Guaranteed to save 25%-75%. Some good used units for sale.

Send for FREE details.

PLATERS SERVICE CO.

2990-PM Supply Ave., City of Commerce, CA 90040

"OUR FOUNDRYETTE" BLAST FURNACE



SINCE 1935
Hobbyists, Schools, Inventors, etc. Make your own castings of any metal from cast iron, down to lead and zinc. Available in sizes from 1½ to 285 lbs. RED BRASS. Complete units furnished with all sizes. Send 25¢ for circular.

KANSAS CITY SPECIALTIES CO., INC.

Dept. P-1, P.O. Box 193, Middleton Wisconsin 53562

MILITARY STUFF

1000s of things: GUNS, JACKETS, BOOTS, METALS, RIBBONS, WINGS & RINGS + OUT-DOOR STUFF — SEND 50¢ (\$1 for 1ST CLASS) for over 50-page catalog to: **KEN NOLAN**, HQ 1, 16901 Milliken, POB C-19555, Irvine, CA 92713. (714) 556-6262.

110 VOLT A.C. GENERATORS

60 cycles, 3000 watts. Wt. 27 pounds, 5"x10" Fanbelt driven from car or pickup. Operates T.V. All power tools. Over 13,000 in service. This is our 27th year. Guaranteed 6 months. \$115.50 Postpaid while supply lasts. Our X1200-watt generator needs no battery. Special price—\$105.00 Postpaid.

Virden Perma-Bilt, P.O. Box 7160 PM,
2821 Mays, Amarillo, Texas 79109

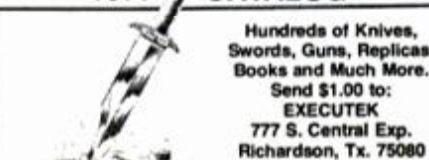
BURIED TREASURE



Locate from a LONG DISTANCE! with Ultra-Sensitive DIRECTIONAL Locator SEND FOR FREE INFORMATIVE BROCHURE

RESEARCH PRODUCTS
BOX 13441-AM TAMPA, FLORIDA 33611

1977 CATALOG



Hundreds of Knives, Swords, Guns, Replicas, Books and Much More. Send \$1.00 to: **EXECUTEK**
777 S. Central Exp.
Richardson, Tx. 75080

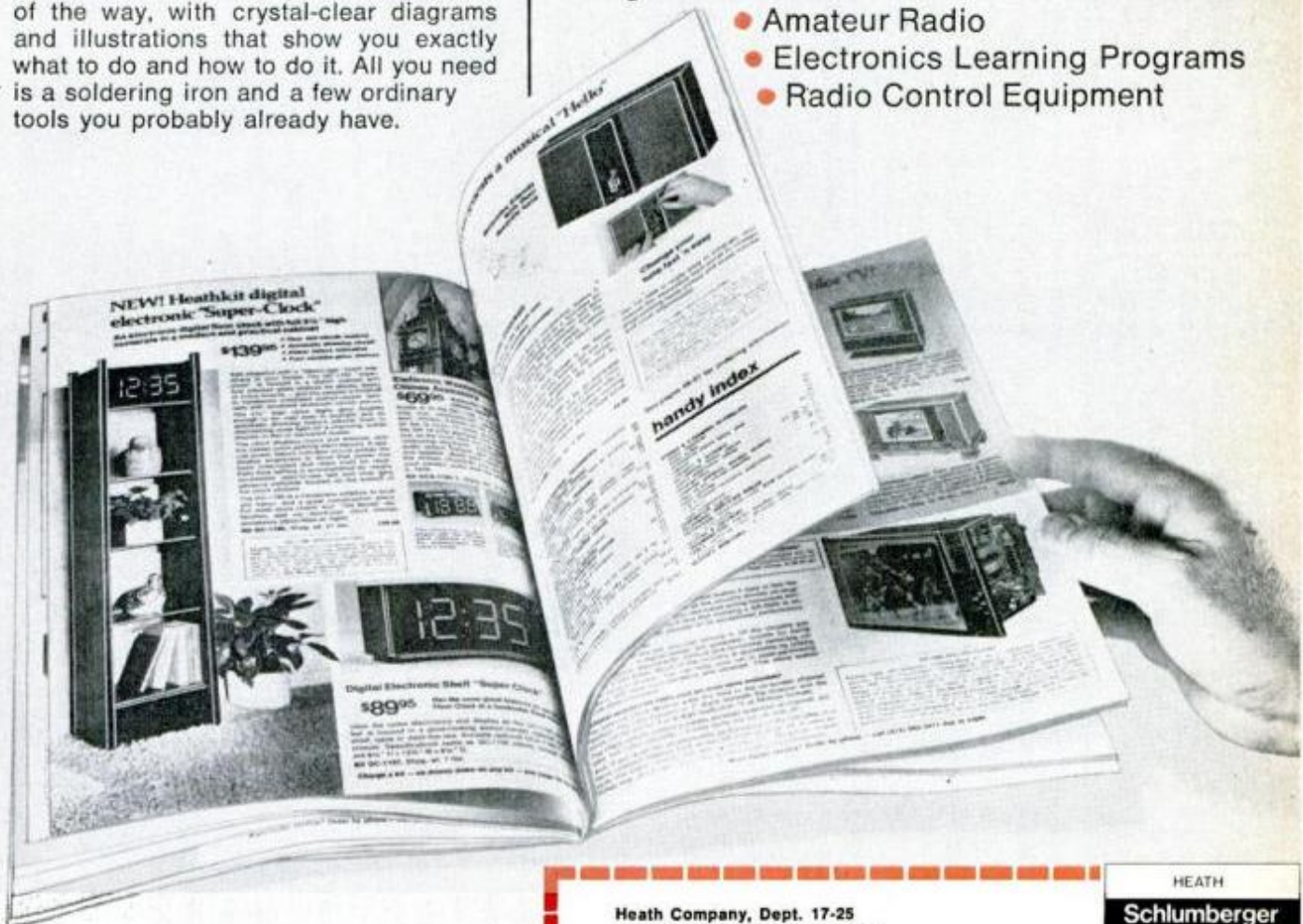
FREE

THE NEW HEATHKIT CATALOG!

World's largest selection of fun-to-build money-saving electronic kits

Read about all the exciting new electronic products you can build yourself — with a little help from Heath. Our world-famous assembly manuals guide you every step of the way, with crystal-clear diagrams and illustrations that show you exactly what to do and how to do it. All you need is a soldering iron and a few ordinary tools you probably already have.

- Test Equipment
- Color TV
- Hi-Fi
- Auto, Marine and Aircraft Accessories
- Digital Clocks and Weather Instruments
- Amateur Radio
- Electronics Learning Programs
- Radio Control Equipment



Send for
your **FREE** copy
TODAY ➔

Heath Co., Dept. 17-25, Benton Harbor, MI 49022

HEATH

Schlumberger

Heath Company, Dept. 17-25
Benton Harbor, Michigan 49022

Please send me my FREE Heathkit Catalog. I am not
on your mailing list.

Name _____

Address _____

City _____ State _____

CL-611 Zip _____

ROTO STRIPPER

Powers Paint Off

FASTER. CLEANER. EASIER. than any other way!

- FURNITURE
- WROUGHT-IRON, MASONRY
- AUTOS AND BOATS
- HUNDREDS OF OTHER JOBS!



FITS ANY 1/2" DRILL

MIRACLE FINGERS of new space age carbon steel alloy

Never buy expensive, paint removers again! Caustic chemical removers are dangerous to skin and eyes and highly flammable. Works on a patented new principle to do the job cheaper, safer and last a lifetime. Made of solid steel, not cheap plastic! High-speed "whipping action" makes paint, rust, scale vanish as if by magic!

BOATS, HOUSE SIDING, does all big jobs in a fraction of the time. **STOPS RUST DEAD,** strips rusted spots down to the bare metal fast! Cleans masonry and swimming pools effortlessly. **LIFETIME WARRANTY**

SAFE TO FINE FURNITURE when used as directed. Leaves a satin smooth finish, ready for paint or stain. No sanding needed (won't raise wood grain as liquids do).

SUPER VALUE only \$12.95

Made in America FULL INSTRUCTIONS INCLUDED

RUSH ORDER COUPON

ROTO STRIPPER (Dept. 203B)
47 Riverside Ave. • Westport, CT 06880

Please rush _____ ROTO STRIPPERS @ \$12.95 ea., two for \$23.95. Sorry, no CODs. Add \$1. handling for each.

I enclose \$ _____ Charge: BankAmericard Master Charge

Card No _____ Exp Date _____

Name _____ Address _____ State _____ City _____ Zip _____

ADD APPLICABLE SALES TAX

CUT STRAIGHT WITH 'STRATE-CUT'



Use "STRATE-CUT" Cutting Guide with any portable circular saw, jig saw or router. Extends to 8'6", reduces to 51" for short cuts and portability. Clamps to paneling, doors and other long work. Make precision 90° cuts, tapers, angles, etc. Two 51" Aluminum sections, connector, clamps, directions, only \$14.95 pp. Send check or MO to R.A.K. PRODUCTS, Dept. M-5, Box 23426, Milw., WI 53223. **MONEY BACK GUARANTEE.** Wis. Res. 4% tax. SOLD ONLY BY MAIL, ONLY IN USA.

SAVE UP TO 85%

GOV'T SURPLUS and NEW EQUIP'T

BATTERY OPERATED Motor Powered Wheel
\$11.98
* 1 (1000) 40-128 (1) - New, very strong, interesting new. Great for motor and projects to make battery operated sidewalk cars, carts, etc. To operate many devices with friction wheel drive. Operates on 6 or 12 volt battery. 1 to 2 amp. 65 to 170 RPM (no load). Reduction gear drive for high torque. Reversible motor. Switch "ON", 4 (1/2) inch hole wheel. 14" x 7" x 4". 3 lbs. 1

DIAL TELEPHONES
4715 W. MAIL \$8.99
4715 BOX \$8.79
* Ideal for use as extension phones, portable phone systems, etc. Work on any standard system. Reconditioned work like new. Choice of wall, 4715 W or desk, 4715 B (see 4715 B).

ALL ITEMS THIS AD F.O.B. LINCOLN, NEBRASKA
Include Adapter Booklets for GPS Shipping

500 23a
1 East Chicago
100 1977
ARMAGAN
CATALOG

100's of Regions in Gov't, Staples, Office Supplies, Stationery, Classroom, New Brand Name Equipment • Hardware • Windows • Floor Plans • Plaster • Scaffolding • Telephone • Electronics • Tools • Air Compressors • Gas Motors • More Items.

SURPLUS CENTER PM-017 Lincoln, Nebraska
Zip Code 68501

PATENT SEARCHES

Patent Searches include max. speed, full Airmail report, copies of closest Patents. Quality searches expertly administered with complete secrecy guaranteed. Ask for Free Record of Invention Form and Free "Patent Information"; write Washington Patent Office Search Bureau
734 15 St., NW, Suite 709-B, Benjamin Franklin Substation, P.O. Box 7167
Wash. D.C. 20044

FIX LAWN MOWERS

FOR FUN & PROFIT! Fascinating new Handbook by F. Peterson gives you the knowledge skilled mechanics learn. OVER 125 ILLUSTRATIONS show how to trouble shoot, repair carburetors, engines, balance and sharpen blades, etc. Exploded drawings are extensively used.

INSTRUCTIONS COVER reel, rotary and rider mowers, preventive and routine maintenance, how to identify brand names, where to obtain replacement parts. How to buy and use a lawn mower. Friends gladly pay \$10 to \$50 to fix their lawn mowers. Try the HANDBOOK OF LAWN MOWER REPAIR. Rush only \$7.95 plus 60¢ handling on 10-day money-back guarantee.

EMERSON BOOKS, INC. Dept. 592C
Reynolds Lane, Buchanan, New York 10511

"MAKE \$25 TO \$100 PER HOUR"

"I'll show you how to cash in on the profitable badge and button business." **BADGE-A-MINUT** lets you make metal pin back badges for pennies which you can sell for up to 75¢ each, or photo buttons for as much as \$2.50 each. Get FREE sample button and fully illustrated money making plans by return mail, or send \$34.95 plus \$1.75 shipping to **BADGE-A-MINUT, Ltd.,** Box 618, Dept. PM-17, LaSalle, Illinois 61301.

Malcolm Peterson, President

Save assembly costs & get it done right — build it yourself!



Here's what one customer said about the rugged trail fun-machine he made with a Kit by Heald.

"My Heald Super Tryke had 3 times the power, greater top end speed, shorter turning radius, faster start, smoother ride than my friend's (major brand) plus Super Tryke's about \$195 cheaper."
John J. Pyles, Jr., Venice, LA

A Kit from Heald will get you a rugged work or play machine for much less. Save assembly costs when you build your machine (in 6-12 hours) with our easy 22"x34" assembly chart.

Choose from 17 bike and 10 tryke models, engines from 5 to 20 H.P. All have Comet torque converters (no shifting); air cushion tires and full suspension (smooth ride); tubular steel frames and engine skid pans (shrug off rough going). Electric start, lights for licensing and many accessories available.

Write today for free brochure:
Heald Inc. Dept. PM-71
P.O. Box 1148, Benton Harbor, MI 49022



Special Offer — One free accessory with bike or tryke order.

SST-821 SUPER TRYKE

VT-812 SUPER BRONC

Full-Size FURNITURE PLAN Roll-Top DESK

Like the one Abe Lincoln used. Authentic double-pedestal desk, 30" x 52" x 30". Roll top unit adds 14" to height. Both single and double curve end panel drawings included. You'll love making it. You'll love using it. A woodworker's delight! Complete plan #140 (roll top unit) and #139 (desk) . . . both only \$12.00 . . . Each \$6.00

FURNITURE DESIGNS, Dept. FD-17
1425 Sherman Ave., Evanston, Ill. 60201

CATALOG \$1
Over 150 different, full-size professional plans. \$1.00—refunded with first order.

BUILD YOUR OWN BEAUTIFUL MOBILE HOME

SAVE 50%

Complete easy to follow plans & do-it-yourself material Kit. No welding. Min. of tools. Send \$2.50 for catalogue (Refundable)

PARTS FOR ALL MOBILE HOMES & CAMPERS.
Write Dekco Dept PM4. Menasha Minn 56464

1¢ SALE GUARANTEED 10 YEARS

The knife for hunting, fishing, and all around use. Mirror polished, imported stainless steel blade. Housed in a razor's edge. Rugged. Opens with flick of finger. Locks into position. Blade will not close when in use. Press button in handle to close. Safety finger guard. Sure-grip handle. Balanced for target throwing. **IF BROKEN WITHIN 10 YEARS WE WILL REPLACE AT NO CHARGE!** Use 30 days. Money back if not pleased. Special 1¢ sale. REG. PRICE \$2.75. Send \$2.76 & receive 2 knives. Add 49¢ postage, handling. Remit TOTAL \$3.25 for 2 knives. ORDER: NEW Midwest Knife Co., 1041 S. Western Ave., Dept. D-408, Chicago, Ill. 60620, Est. 1936



**MEN
WOMEN**

How to get rich in the MAIL ORDER World Trade Business

B. L. MELLINGER, Famous World Trader, Internationally known Mail Order Expert.

"I started in Mail Order a few years ago, part time in my garage. I had less than \$100. I discovered how to make Mail Order pay big. Today my business empire spans the globe . . . 1253 acres of land, office buildings, warehouses. My Plan lets you use my experience to make a fast start in your own big profit home business. I will personally help you start your own Mail Order success.

**BUY BELOW
WHOLESALE**

**24,221
IMPORTS**

You get early news about over 24,000 new imports a year, to sell by mail. My foreign travels uncover newest imports. I show you how easy it is to deal direct with the supplier, cut out middlemen, keep all the profit.

START AT HOME
the very day you receive
my complete profit plan!

You get everything you need to start fast. Step-by-step I reveal how to pick mail order product winners, how to buy Below Wholesale for biggest profits, how to write and place ads that pull orders. . . everything! Thanks to my confidential Drop Ship Plan you need little or no capital. I find fabulous "first time offered" imports you can turn quickly into orders by mail. You deal direct with overseas suppliers, keep all the profit! Make your first Mail Order transaction 10 minutes after you open my Plan. Get into Mail Order now. Make big money fast. Start with my Plan.



A hand shake in Bangkok seals a bargain.



I try hand at Indian loom high in Andes.



And travel abroad. Often members join me.



Personal staff gives support during world travel.



Discover ten-speed bicycle for only \$39.00.



You will have inside connection for finest Jade.



In Moscow, I investigate future of giftwares.



Above Hong Kong Harbor I plan meetings.



Nairobi, scene of meet with carvings supplier.



I inspect simulated diamonds in Taiwan.



South America, I discover source for bedspreads.



One of many oil painting sources I now offer.

6.95 SWISS Electronic Tested DIGITAL WATCH

Only 3.75 Inflatable FISHING BOAT

Miniature Electronic METAL DETECTOR New Invention 2.75

Black Powder

Spanish Muzzle Loader 3.75

PONCHO So. American Gives You 52% profit

3.69 Swiss ELECTRIC RAZOR One Year Guarantee

Racing Bicycle

10-Speed Light Weight BICYCLE Only 39.

WALKIE TALKIES Just 3.12 ea.

Genuine Simulated DIAMOND RING 304 TENNIS RACKET Professional Design 3.95

New Military Design AM-FM RADIO Seven Transistor Large Speaker Only 4.95

Powerful MOTORCYCLE FOB Only 170.

250 cc British Army Surplus

From Orient Genuine JADE NECKLACE Now 3.95

Fine Denmark MINK COAT 385.

SPARE TIME Money Making Opportunity

You need much more money today just to keep even with galloping inflation! Your own home Mail Order business can boost your family income, be a pleasurable way to use your leisure hours! Great for husband/wife teams, family projects. You'll thank your lucky stars for your Mail Order income when retirement comes.

INTERNATIONAL TRADERS HELPS YOU

You are never alone. My Plan includes full membership in International Traders. . . the world's only organization dedicated totally to helping ambitious men and women achieve a fast start in the Mail Order World Trade business. Regularly I meet with I.T. members at closed door Seminars across the country.

BUY ONE AT A TIME OR BUY IN QUANTITY

Many of these 24,221 imports you can buy one at a time. . . others you can order in quantity, with minimum total order as low as one Jade Necklace only \$ 3.95. Other examples, 100 Electric razors only \$ 2.68 ea. or 25 for \$ 2.97 ea. One Mink Coat \$ 385 ea. Electronic tested Digital Watch \$7.75 ea. or 100 for \$6.95 ea. All these prices include duty & shipping. Cut out U.S. middlemen. Buy below wholesale. Deal the International Traders Way!

Read these Actual Reports of Mail Order Money Making

\$5000.00 FIRST MONTH
"First month's sales in new shop \$5000.00. Importing Pewter and Crystal - Norway. Jewelry - Austria, Florentine Wares - Italy. Paintings - Germany." *Louise Ryan, MD*

TRUCK DRIVER TURNS WORLD TRADER
"I have given up my former profession of driving a truck and have gone into World Trade on a full time basis. Have sold 11,000 Multi-Blade Scrapers." *S. N. Dziel, CA*

CUTS OUT GREEDY MIDDLEMEN
"Can make 80% more profit importing merchandise direct from overseas. I work with quality products. Give honest service at all times. Mellinger Plan gave me new home, new car, own store." *Bill Thesen, Canada*

FREE SAMPLE

I'll send you a Free Sample Import to prove my offer is Crystal True.

Mail coupon now for Free Sample Import and Free Mail Order Report, "How to Import and Export." No obligation. No salesman will call. Age and experience no barrier to success. I show you how to cut out middleman. Deal direct. Keep all profits. Your first step to success is mailing Free Sample request card today.

FIRST FAMILY OF WORLD TRADE

The Mellinger family has been active in World Trade for more than 25 years. We have directed the flow of millions of dollars of goods in Mail Order/World Trade. . . helping to make this productive and profitable career for men and women. You gain full impact of this long experience when you follow my Plan.

FINDS IMPORTING EASY
"I am greatly surprised at how easy it is to import. The products I have handled sell themselves." *Paul Crockett, Indiana*

51 ORDERS IN FIRST 2 DAYS
"First two days sold 28 headed sweaters, 15 perfume orders, 8 jewelry orders. Profit \$389.70." *Theodore Helwig, Oregon*

DISABLED VETERAN FINDS SUCCESS
"Since becoming an International Trader, I have gained 3 wheel chairs, a new wooden leg, 1000 friends, 3 Mercury station wagons and a five figure bank account. My biggest one day's sale is \$3640.00 to one company. I sell from home by letter and phone." *Ebert Hale, IL*

\$7000.00 IN BANK AFTER 6 MONTHS
"Sold 29 variety stores watches. Refill every week. Mellinger offers the best for he is the best." *Joey Lichtman, Canada*

UNEMPLOYED FELT HOPELESS
"Then Mellinger Plan brought me sales \$2000.00 first month, \$25,000.00 first year. Biggest day's sale \$3000.00. I give Mellinger all credit for my success." *Russell T. Carter, VA*

I can't promise everyone to do as well. But if you are able and willing to work, I'll help you go after your own fine profits. **Brainerd L. Mellinger**

FREE SAMPLE COUPON

The Mellinger Co., Dept. E2251
6100 Variel Ave., Woodland Hills, CA 91364

Send Free Sample Import & Free Report, "How to Import/Export." Show how I can start a business of my own. I understand there is no obligation and no salesman will call.

IMPORTANT
Please Initial below. Because of high cost and limited supply of samples, I hereby agree to limit my request to only one sample import. I have not previously requested samples. I am 18 years of age or older.

Name _____ Age _____
Address _____
City _____ State _____ Zip _____

Initial here _____

Save 3 days - Give Zip for Fast Reply

THE MELLINGER CO., 6100 Variel Ave., Woodland Hills, CA 91364, DEPT. E2251

SEND THIS COUPON

Name _____
 Address _____
 City/State/Zip _____

FOR THIS CATALOG

SAVINGS TO 90% ON GOVT. SURPLUS

- Electrical
- Mechanical
- Hydraulics
- Marine • Auto • Hardware, etc.



Send 50¢ for catalog or \$1 for extra-fast delivery. Satisfying customers world-wide since 1945
AIRBORNE SALES CO. Dept. PM77
 8501 Steller Drive, P.O. Box 2727
 Culver City, Ca. 90230. Since 1945.

ELECTRIC CAR

Build your own transportation. Electric or gas cars • tricycle or electric bicycle

For descriptive information on plans, parts or complete units -

Send \$1.00 to: TITAN INC. P.O. Box 912 Temple City, Calif. 91780



SHORTCUTS TO SUCCESS



HIGHLY EFFECTIVE SHORT SPECIALIZED HOME STUDY COURSES. 75 Categories to choose. Upgrade your present skills. Learn New Skills. Advance Rapidly! Diploma Awarded. World-Wide Enrollment! Our 31st year! Write for FREE descriptive literature. COOK'S INSTITUTE, P.O. Box 20345, Jackson, MS 39209

BEST BUY!



EASY-TO-ASSEMBLE KIT
ONLY \$355 F.O.B.

4 FOOT DIAM. ADJUSTS TO FLOOR-TO-FLOOR HTS. OF 8' 1/2" TO 9' 6". OTHER DIAMS. FROM 3' 6" TO 6' AT COMPARABLE SAVINGS.

People who've looked everywhere tell us there isn't another spiral stair around that touches our combination of price and quality of materials and workmanship. We believe it!
 CALL OR WRITE FOR FREE BROCHURE:

To: The Iron Shop, Dept. PM-1, 400 Reed Road, Box 128, Broomall, Pa. 19008

Please send your free brochure to:

Name _____
 Street _____
 City _____
 State _____ Zip _____

Our Telephone Number: (215) 544-7100
 We accept Master Charge and BankAmericard

THE IRON SHOP
 MANUFACTURERS

NO GASOLINE!



Run your car, truck, tractor, boat, air generator on wood scraps, coal, charcoal... almost any carbonaceous material! Proven in hundreds of thousands of vehicles during World War II! Guaranteed!

FREE DETAILS Write **JEROME AMES** 16503 STOUT Dept. PM DETROIT, MICH. 48219

STAMP Grab Bag only 10¢

Giant grab bag of over 100 unassorted foreign stamps! Africa, Asia, Europe, South Seas, etc. Plus, the most wonderful catalog of US and foreign stamps in America. Send 10¢ to: **LITTLETON STAMP CO.**, Dept. G-21, Littleton, New Hampshire 03561



NOW! GET 2 REAL OLD INDIAN HEAD CENTS Only \$1

Only \$1 brings you 2 old Indian Head pennies issued before 1908 and the most wonderful catalog of US & foreign coins and paper money in America. One set to a customer. Mail to: **LITTLETON COIN CO.**, Dept. RD-16, Littleton, N.H. 03561



FREE! VENEERING CATALOG

90 varieties world's rarest veneers, pre-joined veneers, checkerboards, broad choice wood band & art inlays, illustrated in full color - at reasonable prices. Learn how to create beautifully veneered furniture, band exotic veneers simply, instantly. Catalog shows simplified contact cement method that you learn fast. Send for free catalog now!

MORGAN VENEERS, Dept. P01K42, 915 E. Ky. Street, Louisville, Ky. 40204

PORTABLE ELECTRIC POWER



Build your own 110-Volt Electric Plant from used parts. Will operate lights, power tools, heating units, brush-type elect. motors, plus charge batteries and arc weld. Ideal for boats, campers and portable shops. Plans \$6.00 check or M.O. **CHAPALA CO.**

1020 E. Irvine, Dept. MN, Tustin, Calif. 92680

SAVE ON ACCORDIONS

33 MODELS - FAMOUS MAKES

Buy direct from Importer. Standard or Electronic for students, teachers, professionals. Most wanted features. Save middleman profit. 5 day home trial. Easy Terms. Trade-ins welcomed. Satisfaction assured.



HÖHNER Button Models, Discount Prices! **FREE Color Catalogs and Price List**

ACCORDION CORPORATION OF AMERICA - Dept. R-17, 5535 Belmont Ave., Chicago, Illinois 60641. Send FREE CATALOGS and Prices - Also send information on: Höhner 'button' Accordions Cordovox Accordion Amps

Name _____
 Address _____
 City _____ State _____ Zip _____

CLOCK LOVER'S HEADQUARTERS - USA

Everything for Clock Builders

Largest selection of kits, movements, hardware for grandmother, wall, shelf, school and novelty clocks.



New: Grandfather Clock Kit

This heirloom quality clock was inspired by the original American design of Benj. Chandler over 200 years ago. Ready to be assembled by you of the finest materials. Described in 100-page clock catalog.



NEW! 100 PAGE CLOCK CATALOG



Don't order until you have seen this exceptional catalog of clock builders and clock lovers supplies: complete kits of solid American hardwoods; a fascinating selection of movements, dials, hands, hardwood moldings, finishing materials, books, barometers and some fantastic buys in completely finished clocks.

Send 50¢ for Craft Clock Catalog

OVER 35 YEARS EXPERIENCE!
CRAFT PRODUCTS COMPANY

Dept. 1

St. Charles, Ill. 60174

Heat-catcher
 CUTS HEATING COSTS

Transforms fireplace into efficient heater. Highly recommended by users from Coast to Coast for cabins, homes, lodges. 7 models. Patented. Write for Free Literature

LASSY TOOLS INC. PLAINVILLE
 EST. 1939 CONN. 06062

MAKE TIFFANY-TYPE LAMPS

Enjoy foil stained glass crafting with our new patented system. Semi-KIT includes pattern on molderd FORM, accurate PAPER PATTERNS, INSTRUCTIONS. Send 50¢ for brochure showing 24 lamps in color, booklet on art glass, glass cutting and catalog of kits and supplies.



H.L. WORDEN-GRANGER, WA
 99312



FREE! POWERFUL MUSCLES FAST!

Fantastic New Discoveries in the science of bodybuilding. Add inches of powerful muscles to arms, chest, shoulders and legs. Secrets on trimming the waist with ultra-modern methods—fast! **FREE BOOK!!**
 Universal-J. Box 6694, Detroit, MI 48240

CORE-CRAFT CANOE FACTORY DIRECT



Lifetime guaranteed fiberglass canoe. All hand manufactured. Triple keel bottom safer for families. Rolled gunwale means dryer ride. Non-skid contoured seats. Five permanent colors. No painting. Built by canoers. Oldest and largest factory-direct fiberglass canoe manufacturer. Own the quiet one, and ask about being a factory representative in your area.



Write Core-Craft, CPM-1, Highway 2, Bemidji, Minnesota 56601 for full-color catalog. \$1.00 enclosed for postage, handling.

Name _____ Age _____
Address _____
City _____ State _____ Zip _____
Phone: Bus. _____ Home _____

PORTABLE STEAM CLEANER

Steam in 60 seconds



CLEAN:

Engines, Air Filters, Lawn mowers. 3 year guarantee on fire box, coils. Uses liquid soap, propane fired. Weight 120 lbs. Auxiliary pump required on low water pressure.

WEDCO MFG. INC., Dept. M-7
Scott Lane-Box D, Jackson, Wyo. 83001

BUMPER STICKER PRINTING DEVICE

SIMPLE, CHEAP, PORTABLE ANY MESSAGE IN MINUTES SEND FOR FREE DETAILS

BUMPER—MAGIC P.O. BOX 22791 () TAMPA, FLA. 33622

WOODWORKERS!

At least 1A newspaper for both novice and veteran bringing you over 75 PLANS per year for building the best of Early American, Shaker, English, Contemporary furniture, clocks, toys, gifts, lamps, and much more... ALL FOR LESS THAN 8¢ PER PLAN Plus jig-building, shop tips, antique restoration, money-making ideas.

Woodworker's Journal DEPT. 51 P.O. BOX 943 NEW MILFORD, CT. 06776

SIX ISSUES PER YEAR FOR ONLY \$6.00 (Canada and foreign \$7.00)

FIND TREASURE!



Free Literature!
DEPT. PA7-D, 1011 PLEASANT VALLEY ROAD SWEET HOME, ORE. 97386

PLANS FOR WOODEN TOYS



LOG CARRYING ELEPHANT \$2.00 EACH
HIPPO WITH TICK BIRD 8 1/4" 6 1/4" EASY TO READ BLUEPRINTS
DESIGN GROUP, BOX 1052, DEPT. A, NEW YORK, N.Y. 10019

BOAT KITS

BUILD YOUR OWN BOAT & SAVE \$\$\$

FRAME KITS, PLANS, FULL SIZE PATTERNS especially for amateurs. Send \$1 (\$2 Canada) for HUGE 128 pg. catalog. Includes FREE "Boatbuilding Supplies" brochure.

GLEN-L MARINE 9152 Dept T Rosecrans Bellflower, CA 90706

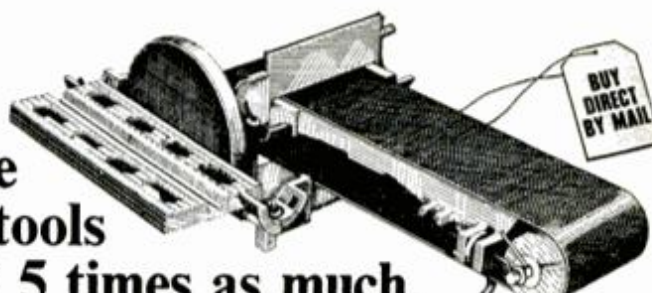
UNIQUE SPORTS CAR KIT

for VW. Fun, Easy to Build... Send \$2 for 20 page color catalog, prices, specs and info on being a 917 representative.



Laser 917
Elite Enterprises Inc.
Dept. PM-1
690 E. 3rd St.
Cokato, MN

Unadorned power tools ... they do the same job as tools costing up to 5 times as much.



We skipped the chrome to save you money... but we did not skip anything on performance. Actually, we skipped more than just chrome, we cut out every costly frill that wasn't absolutely needed.

Our tools are not exactly flashy. We are the first to admit it. But in articles covering test results on AMT tools, written by leading publications such as Popular Science, our tools have been praised over and over again. In spite of their low prices, our tools are full scale and offer full performance and precision.

HERE'S HOW WE DO IT... First, we don't claim our tools should sell for five times the price! Just that our tools do the same job... with the same accuracy, ease and speed... and will last at least as long. AMT tools cost less to make and are sold direct. They are bona fide quality power tools used by serious amateurs and professionals alike and if sold in retail stores would be much higher in price. We use no magic, let's be specific:

SIMPLICITY... AMT tools are soundly engineered to eliminate every frill and gimmick—to minimize material and production costs. Machined parts are used only where they're needed. Unadorned cast iron and aluminum save you a fortune.

DIRECT-FROM-FACTORY SAVINGS... You save a bundle, yet we offer a double guarantee backed by a 45-year-old company with millions of satisfied customers... and hundreds of orders pour in daily. **LARGE VOLUME**... Our own foundry and large mass production facilities plus large buying power all work to keep costs down.

STANDARD PARTS... Our designs use standard hardware items wherever possible. By avoiding custom-made parts we pass on tremendous savings to you.

If you are looking for power tools that perform like units costing many times our low prices, order today and you'll be one step closer to many hours of woodworking satisfaction.

Bill Morley

JOINTER-PLANER... 4" x 22". Cast iron and steel, precision ground adjustable tables. For planning, joints, bevels. Cuts to 1/4" depth. Fence adjustable 0° to 50°. Steel Knives, dual guards. Use any motor. Precision ball bearing industrial model, \$10.00 add'l. Wt. 19 lbs., f.o.b. factory. \$4380

\$4380

TWO GUARANTEES

10-DAY MONEY BACK GUARANTEE
Try any of these power tools and compare it with any similar machine at any price. If not satisfied, return it for prompt, no questions asked refund. We pay the return shipping charges.

10-YR. FULL SERVICE GUARANTEE
Any part or parts of these AMT power tools (except motor which carries a one year guarantee) which become inoperative for any reason within ten years after purchase date will be repaired or replaced by the factory with no cost to the purchaser other than postage.

AMERICAN MACHINE & TOOL CO.
4th & Spring St., Royersford, Pa. 19468

AMERICAN MACHINE & TOOL CO., Dept. PM-17, Royersford, Pa. 19468

Please send me the units checked. Payment in full enclosed \$_____ or \$5 deposit each item enclosed, balance C.O.D. I must be fully satisfied or will return unit within 10 days for full refund. No questions asked.

- | | |
|--|--|
| <input type="checkbox"/> 8" Power Saw at \$34.70 | <input type="checkbox"/> G.E. Motor <input type="checkbox"/> \$29.90 (with other item) <input type="checkbox"/> \$34.85 (purchased separately) |
| <input type="checkbox"/> Standard Rip Fence at \$4.50 | <input type="checkbox"/> Wood Shaper Kit at \$25.95 |
| <input type="checkbox"/> Long Cabinet Rip Fence at \$6.50 | <input type="checkbox"/> Opt. Hold Down Assembly at \$3.95 |
| <input type="checkbox"/> Ball Bearing Spindle at \$9.50 | <input type="checkbox"/> 8" Swing 3' Lathe at \$19.80 |
| <input type="checkbox"/> Belt Sander at \$33.00 | <input type="checkbox"/> 12" Swing 4' Lathe at \$44.10 |
| <input type="checkbox"/> Disc Sander Attachment at \$12.50 | <input type="checkbox"/> Deluxe Ball Bearing 4' Lathe at \$54.10 |
| <input type="checkbox"/> Mitre Gauge for Sander at \$2.95 | <input type="checkbox"/> Face Plate \$2.50) any Lathe |
| <input type="checkbox"/> Jointer Planer at \$43.80 | <input type="checkbox"/> Turning Chisels \$6.95) above |
| <input type="checkbox"/> Ball Bearing Spindle at \$10.00 | |

NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

NOTE: Take advantage of these same low prices at our Royersford factory showroom at 4th and Spring Sts. (9 to 4:30 weekdays, 9 to 12 Sat.).

Brand new electric motor developing full 1 h.p. 17 lbs. (Purchased separately, \$34.85). With any AMT machine here. **\$2990**

POWER SAW 8" tilt arbor saw... cross-cuts, rips, mitres, cuts, com- assembled with ground cast iron table, safety guard, splitter, mitre gauge. Less blade, motor. Rip fence for easier work alignment. \$4.50 add'l. Ball bearing model, \$9.50 add'l. Takes 1/2 h.p. motor or larger, standard blades, attachments. Wt. 22 lbs., f.o.b. factory.



FREE OFFER, cabinet base plans... with one piece of 3/4" plywood, convert your \$34.70 saw into a floor model with a huge 27" x 24" top. Takes cabinet rip fence, \$6.50 add'l. **\$3470**

BELT SANDER A precision unit. It changes from horizontal to vertical in seconds. Heavy, sander includes 4" x 36" sanding belt. Uses 1/2 h.p. or larger motor. V-pulley drive and multi-purpose drive spindle. Disc sander accessory, \$12.50 add'l. Mitre gauge, \$2.95 add'l. 18 lbs., f.o.b. factory. **\$3300**



3' WOOD LATHE... 6" swing. Same precision and speed as \$40 units. Sturdy cast iron with tubular steel bed. Lever action tail stock, two-speed pulley, fits any motor. Set of 3 high speed turning chisels, \$6.95 add'l. 4" face plate, \$2.50 add'l. 15 lbs., f.o.b. factory **\$1980**

4' WOOD LATHE... 12" swing. Industrial size, does same job as \$75 units. Tubular steel bed rails, screw action tail stock, 3-speed pulley. Use any motor. 3 high speed turning chisels, \$6.95 add'l. 4" face plate, \$2.50 add'l. 30 lbs. f.o.b. factory. **\$4410**

DELUXE BALL BEARING 4' WOOD LATHE... 12" swing, similar to 4' model with heavy duty, double shielded, lubricated-for-life ball bearings. 3 high speed turning chisels, \$6.95 add'l. 4" face plate, \$2.50 add'l. 30 lbs., f.o.b. factory. **\$5410**

WOOD SHAPER KIT Makes beads, coves, and-groove joints, etc. Accurate cuts at high speeds. Sealed greased-for-life ball bearings. Less wood. Takes 1/4 h.p. motor or larger, standard cutters. Optional hold down assembly, \$3.95 add'l. 9 lbs., f.o.b. factory **\$2595**

BUY DIRECT USE THIS HANDY ORDER COUPON NOW

BUILD YOUR TILLER FROM SEMI-KIT AND SAVE \$75+

"Earn" \$10-\$50/hr. assembly time

Save assembly costs when you build the groundhog. Heald's Semi-Kit Tiller. With easy-step instruction sheet and common tools you make a rugged tiller in just 6 hours. You'll know maintenance, teach mechanics to kids, and "earn" \$10-\$50/hr. assembly time. **Groundhog features** tough 5 H.P. Tecumseh engine and efficient oil bath chain drive transmission. V-belt clutch protects engine and tines from wedged-tine damage. Tilling depth and bar height adjust to 15 points: 3 on handles, 3 on rear wheel, 9 on drag stake. Slasher tines (14" D.) till 26", 14" or (with optional extra tines) 36" swath. Blades bite 9+ " deep, yet even ladies can handle groundhog. **Groundhog converts to walking tractor** with optional 13" lug tread wheels for use with dozer blade or draw-bar and cultivator/scarifier or furrow opener/hiller attachments. Tiller kit starts at \$199.95.

Send this ad, name, address to:
Heald, Inc., Dept. PM-1 P.O. Box 1148,
 Benton Harbor, MI 49022



Optional 13" wheels convert tiller to walking tractor

Heald groundhog 5 H.P. chain drive tiller Semi-Kit

From the World's Largest Maker of Bike and Tryke Kits — Heald

MAKE \$10 AN HOUR SHARPENING SAWS & TOOLS PART-TIME OR FULL-TIME



- No experience needed.
- Operate in Your basement or garage.
- 95% clear profit; no inventory.
- Start for as little as \$150.
- We finance you.
- Every business & household needs your service.
- Complete instructions & selling aids.

"In 3 months, part time, about 3 hours a day I'm netting \$100 a week." Lincoln B. Stahl.

Send for FREE booklet, no obligation.

TREYCO 113 Treco Bldg., N. Tonawanda, NY 14120
 Established 1946 Phone: 716/693-6525

MIRACLE LIGHT

AMAZING INVENTION SELLS LIKE CRAZY!

Miracle Light is an ingenious self-contained light source that works without electricity, without batteries, without flame, without any conventional source of ignition. Its brilliant light can be seen up to a mile away! Great for camping, fishing, sporting events. Indispensable as a warning light, signal light, flashlight, boating light, party light. **EARN EXTRA MONEY.** Show this incredible Light to friends, neighbors, fellow workers and watch them stare in disbelief. Every demonstration brings crowds swarming around begging to buy. People are selling thousands by just showing it and so can you! Sells on sight for only \$1.95 retail. Your low cost: 1 doz. units \$15.60; 3 doz. \$43.20. 12 doz. \$140.40 (2 samples \$3.00).



LAKESIDE PRODUCTS CO.
 Dept. PL-17; 6646 N. Western Ave., Chicago, Ill. 60645
 Don't miss out! Order today.

LANDSCAPING

Growing demand — good income for trained Landscape Contractors and Garden/Nursery personnel. Start your own business part- or full-time or hobby Home study course prepares you in 6 months. Certificate awarded. Free booklet describes opportunities. No salesman.

LIFETIME CAREER SCHOOLS Dept. A-115
 2251 Barry Ave., Los Angeles, CA 90064

Name _____
 Address _____
 City _____ State _____ Zip _____



USA made 100% legal AMAZON SURVIVAL WEAPONS HUNTING BLOW-GUN

125 STEEL DARTS FREE! BUY 2 GET 800 BONUS!

1/2 OFF

GUARANTEED 15 YEARS

Now only \$12.95 list \$6.98

30 DAYS MONEY BACK

UNAVAILABLE ELSEWHERE

Don't be fooled by imitations! New-Improved-50% More Powerful!

SILENT, POWERFUL, ACCURATE, HITS LIKE A BULLET. Improved version of famous Amazon hunting blow-gun. Thrilling sport! Kills varmints, pests. Defense, ideal gift. Compressed breath gives amazing power. 220 ft range. Astounding friends! Rugged .38 cal. precision aluminum, 2-WAY rubber in, piece. Pierce 1/2" plywood. Speed 300 ft/sec. Not a toy! Has 125-3", 5" steel darts (kit) carry case, instructions. Compact 4 1/2" ft. model \$6.98! Popular 5 1/2" ft. \$7.98! Magnum 6 1/2" \$9.98! Extra darts \$2.50 per 100! \$4.50/200! \$11.50/300! Super BONUS BUY 2 GUNS GET 800 darts, sling, quiver, patches, camouflage, targets, carry box (\$22 Free)! BUY 3 GET SAME + cleaning rod, muzzle guard + \$4.00! \$40 Free! BUY 4 SAME + Guerrilla Gun + 2000 (\$60 Free)! BUY 5 SAME + FREE 7th GUN + 2000 (no add)! \$1.50 postage EACH gun. Send cash, check, m.o. IF BROKEN WITHIN 15 YEARS WE WILL REPLACE! Use 30 days. Money back if not delighted. HOUSE OF WEAPONS, INC. Box 794 v Provo, Utah 84601

35% DISCOUNT

MUST SEE TO BELIEVE!



BUILD THIS WOODEN TOY STEAM TRAIN

This is a fine wooden toy reproduction of a nineteenth century steam train. An order for the woodworking drawings brings you plans for the locomotive plus seven cars: tender, freight car, flat car, passenger car, gondola, crane car and caboose. This is a handsome sturdy toy

and detailed full size drawings make it an easy project. Our catalog of more than 75 wooden toy designs, miniature & dollhouse plans, toy building supplies and books is included free with your train plan order. Catalog alone is 50¢.

\$3.50 ppd. (Cal. Res. add 21¢ Sales Tax)

Love—Built Toys & Crafts

NEW! BATTERY OPERATED WESTMINSTER CHIME, CONVENTIONAL AND QUARTZ CLOCK MOVEMENTS.

Plus Largest Selection of Pendulums and New, Low-Cost Electric Movements. Clock Kits. Beautiful Dial Numerals, Hands, Weights and Clock Accessories.

Write for FREE CATALOG to:
KLOCKIT, P.O. Box 629
 Lake Geneva, Wis. 53147

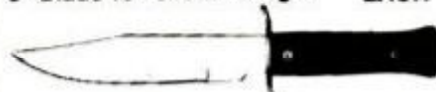
Burglar . Smoke Fire Alarm Catalog

• Billions of dollars lost annually due to lack of protective warning alarms.

FREE CATALOG Shows you how to protect your home, business and person. Wholesale prices. Do-it-yourself. Free engineering service.

Burdex Security Co.
 Box 82209 Dept. PM Lincoln, Ne. 68501

ORIGINAL BOWIE KNIFE \$2.50
 6" Blade 10" Overall Length EACH



THE FAMOUS KNIFE THAT WON THE WEST
 Its sturdy blade and superb balance make it not only an excellent knife for hunting but also for every sporting condition. Comes with sheath.
 Model No. K-82 Plus 50¢ Shipping **DEPT. F-12-PM**
WESTBURY SALES CO., P.O. BOX 64, WESTBURY, N.Y. 11590

HOME CRAFTSMAN (Continued from preceding page)

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.

FURNITURE ASSEMBLY BENCH PLANS. Easily built. Sawhorse Mounted. Complete plans, instructions. Send \$2.00 today. Guaranteed. Sal Ciavola, Box 16, Horsham, Pa. 19044.

PORTABLE WORKBENCH—Complete plans—Send \$1.00 and #2 SASE to: Russ' Workshop, Box 665, Jonesboro, Ga. 30236.

CATALOG FULL-SIZE FURNITURE PLANS—\$1.00. Refunded with first order. Traditional, Early American, over 150! Furniture Designs, 1425 Sherman, Dept. CP-77, Evanston, Illinois 60201.

"PIPE CRAFTING". Thorough book \$5.20 ppd. Choice materials for pipes, list free. Pimo P17, Box 59211, Chicago, Illinois 60659.

WOODWORKERS. Send stamp for monthly "specials." Hardwoods, RR #4, Box 133, Angola, Indiana 46703.

POOL TABLE Plans and Kits. Free Brochure. Tiercraft, P.O. Box 8151, Erie, Pa. 16505

WOODWORKERS, Hobbyists—1977 Catalog containing Chair Cane, Swiss Musical Works, Clock Kits, Lamp Parts, Tools, Finishing Materials, Hardware, Plans, etc. Send 50¢. Barap, Dept. PM177, 835 Bellows, Frankfort, Michigan 49635.

WOODEN TOY PLANS CATALOG. 75 Designs, books, supplies. 50¢. Love-Built Toys, Box 769-PM1, Antioch, California 94509.

HOW To Create Beautifully Veneered Furniture Quickly, Easily! Illustrated Veneering Manual/Catalog FREE. Exotic Veneers, Inlays, Supplies. Morgan, PO1K41, 915 East Kentucky, Louisville, Kentucky 40204.

WOODWORKERS! . . . Save \$\$ on plans. New Publication Brings Over 75 Plans Per Year For Less Than 8¢ Each. Early American, Shaker, Contemporary Furniture, Clocks, Toys, Jigs, Shop-Tips, Money-Makers, 6.00 Brings Six Big Bi-Monthly Issues. Woodworkers Journal, Box 943, New Milford, CT. 06776.

LOW Cost Thickness Planer Sander Plans \$2. Woodworking Bargains Catalog \$1.00. Rego, 49 Downing, Fall River, Mass. 02723.

ATTENTION WOODWORKERS! Save time & money. Come to one source for craft supplies, specialty hardware, billiard materials, clock movements, dials, kits and easy-to-follow plans. Send for free catalog W. Armor Company, 271F Skidmore Road, Deer Park, N.Y. 11729.

TAKE-Apart Furniture—Sturdy, all Wood, No Metal Fasteners. Five Plans \$3.00. Esbenshade, Box 145A, Highspire, PA 17034.

100 JIG SAW PATTERNS Full Size Toys, Animals, Bird Houses, Novelties, etc. \$2.00 Postpaid, Hayes Patterns, 6 Willow St., Woburn, Mass. 01801.

101 PATTERNS, Gifts, Novelties, Action Windmills, plus "Make Money Jig Sawing". Only \$3.00 Prepaid 1st Class. Mastercraft, J5M, P.O. Box 631, Park Ridge, I. 60068.

PM'S GREAT, NEW MASTER HOME CARE GUIDE. The latest and greatest in the Popular Mechanics Master Guide Series. Lays out all you need to know about home repairs, from basement waterproofing to roof repair. 24 laminated, wipe-clean sheets on 12 stand-up, hang-up boards. 150 charts and illustrations. Properly used, it can save thousands of dollars. \$4.95 + 50¢ to cover postage and handling. PM Master Home Care Guide, Dept. HE, Box 1014, Radio City Sta., New York, N.Y. 10019.

CONSTRUCTION PLANS, BLUEPRINTS

STEEL Hull boat plans 37' to 75' 88¢ a foot. For 32 pictures of building a 55' steel hull start to finish \$5.00 deductible on purchase. Toler, 4928P, Galveston, Texas 77550.

BLUEPRINTS—Lowcost energy saving home \$4.00. Graph-Tech, Rt. #1, Marengo, Ohio 43334.

ENGLISH Style Houses? We Can Design Yours. Illustrations Airmail \$5.00. Austral, Box 52, Chislehurst, BR7 6BE England.

LOG CABINS AND "A" FRAMES

"A" FRAME CABIN. 1184 Square feet: \$2400. material. Purchase locally. Complete plans, instruction manual, material list, all for \$5.00. Moneyback guarantee. Plan #4915. "Dependable Products". Box 113, Vista, California 92083.

BUILD Log Cabins, Rustic Furniture, Fireplaces!!! Complete Manual, \$3.00. "A" Frame Plans, \$2.00 . . . Housebuilder's Carpentry Handbook, \$5.00 . . . Guaranteed . . . Beels, 956 Springdale, Atlanta, Georgia 30306.

LOG Cabin Building Instructions. 304 Pages . . . Illustrated! Moneyback Guarantee. \$5.95 Postpaid. Glenn Smith Enterprises, Box 1513, Akron, Ohio 44309.

LOG CABIN plans, detailed instructions: \$3.50.

NATURAL STONE HOUSE. Gather rocks free, build in one summer! Need pickup, hand tools—no experience! Illustrated "House Of Stone" manual, \$3. (Guaranteed). Stonehouse 341, Sweet, Idaho 83670.

HOME REMODELING

POPULAR MECHANICS COMPLETE MANUAL OF HOME REPAIR AND IMPROVEMENT. 480 pgs. Here in one big volume is everything you need to know to keep a home in A-one shape. Indexed and cross-referenced for instant answers. 1,000 illus., charts, etc. Price \$8.95. Send order to: Popular Mechanics, Dept. HE, Box 1575, Radio City Sta., New York, N.Y. 10019.

PLASTICS

CASTOLITE pours like water, hardens like glass without heat. Crystal clear, colors. Embed flowers, seashells, mementos, anything. Make fine gifts. Reproduce your designs with flexible molds any shape, size. Profitable. Illustrated Manual Catalog \$1.00. CASTOLITE, Dept. 77A-PM, Woodstock, Il. 60098.

DO IT YOURSELF

U-BUILD ENGRAVING MACHINE, Power Tools, Profitable Projects! Poor Man's Catalog 50¢. Box 23P, Highland, Maryland 20777.

ELECTROPLATING. Complete amateur's textbook. All metals Electroplate metallic nonmetallic items \$7.00. Details free. Tropic, Box 95-P3, Palm Bay, Fla. 32905.

SAVE! Hundreds of dollars making personal hygiene, household products yourself. Send \$1 for formulas, refundable. A. C. A., Box 518, Spencer, N.C. 28159.

1600 American and Foreign catalogs listed and described \$2.00. MASTERLOG, Box 24413, Oakland, CA 94623.

FREE CATALOG of Over 200 helpful items to turn "Rocks into Gems", for pleasure or profit. Covington Engineering Corp., P.O. Box 35PM, Redlands, California 92373.

DEAFENED Learn Lipreading at Home. Practical Help \$2.00. Fisher, 3636 16th Street, N.W., B-59, Washington, D.C. 20010

IF YOU Have the dough to buy a \$200.00 workbench, buy it. If not, send \$1.25 for our poor-man's workbench plan and build your own for less than \$30.00. Full instructions and material list. Way-Mar, 58 Underhill Road, Scarsdale, N.Y. 10583.

TURN Your Axe of Hatchet into a **DYNAMIGHT** wood-splitter for around \$10.00. Plans and Photos, \$3.00. BHAssoc., Box K, Laurys Station, Pa. 18086.

ENERGY Saving Plans. Water Wheels, Windmills, Electric Cars, Home Power Plants, Free Info., plans list. Goodman Associates, 4 Berryville Pike, Summit Point, WV 25446.

FREE Information Windturbines, Solar Heating. Energycraft, 2350 W47PA, Denver, Co. 80211.

ALUMINUM REPAIR rods. Use propane torch. Free brochure. Niko, 1932 Southwest 12th, Lincoln, Nebraska 68522.

ALTERNATIVE SOURCES OF ENERGY MAGAZINE. Projects, plans and practical ideas, using **SOLAR WIND WATER/METHANE.** \$10/6 issues. Write for FREE Brochure. ASE, Dept. MX, Rt. 2, Milaca, MN. 56353.

TELEPHONES, Equipment, all types including modular. Catalog 50¢. Box 1147, San Diego, California 92112.

BLACK POWDER PISTOL, Build from plans with 90% of parts from home or garage. \$2.95. Alpine Co., P.O., Box 501, Flippin, Ark. 72634.

REDUCE HEATING COSTS. Mail \$2.00 to: P.O. Box 219, Thiensville, Wis. 53092.

200 HOW TO DO Books-free catalog. Sincere, Box 10422, Phoenix, Ariz. 85064.

PM'S FAMOUS MASTER SHOP GUIDE. One of the most important tools you'll ever own! Lays out everything you need to know about nails, screw, bolts & nuts, adhesives, lumber, masonry, plumbing and electrical work. 24 stand-up, hang-up, wipe-clean laminated pages. 56 charts plus a built-in ruler, protractor and compass. Solid value at \$4.95 + 50¢ to cover postage + handling. PM Master Shop Guide, Dept. HE, Box 1014, Radio City Sta., New York, N.Y. 10019.

SUBCONTRACT YOUR HOME! Save! Thousands Easy Complete Instructions. Send \$5.00. Century, 512 Trinity Way, Greenville, S.C. 29609.

REPRODUCTION MOLDS

MOLDS For Ornamental Concrete Products. Catalog 900 Fiberglass Molds \$2.00. Plycrete Mold Co., Elk Rapids, Mich. 49629.

ARTS & CRAFTS

WHERE To Buy Handicrafts Supplies—Directories—Retail—Wholesale edition \$3.00 each. Handicrafts, 924 Winter St., Stamford, Conn. 06905.

"GETTING Started in Stained Glass" 25¢. Whittemore, Box 2065Y, Hanover, Mass. 02339.

GLASS Blowing Kits—Make Glass Miniatures For Fun And Money. Free Details—Willis Glass, Box 3460H, Anaheim, California 92803.

DECORATORS—Hobbyists or Professionals. File clippings and swatches in 24 spiral-bound, 8½" by 11"

MAKE Figurines, plaques, lawn ornaments. Molds, plastercraft kits, liquid rubber. Sample and catalogue 25¢. Wooley Company, Box 29-B, Peoria, Illinois 61601.

NOW AVAILABLE! "Practical Guide to Successful Selling through Craftshows", \$1.00 complete, American Craftsman, 29B Cherokee, Rockaway, New Jersey 07866.

LEATHERCRAFT Catalog. Tools, Leather, Dyes, Dressings, Saddle Stamps, Buckles, much more. Send 50¢ to MacPherson Bros., P.O. Box 395, San Francisco, Calif. 94109.

CARTOONING, COMMERCIAL ARTS, SHOWCARD & SIGN PAINTING

CARTOON For Money!! Free Book!! Success, Box 885A, Dearborn, Mich. 48121.

MODERN Cartooning taught by mail. Write for free brochure. Cartoonorama—Box 263A1, Branford, Conn. 06405.

HOW To Make Money in Commercial Art. Information Free. Box 1204A, Youngstown, Ohio 44501.

LEARN Cartooning at home. Write: Cartooning, Box 70690, Colorado Springs, CO. 80933.

LEARN Sign painting at home. Free Talent test. Ben Kerns, Box 812-PM, Greenville, S.C. 29601.

52 Cartoon lesson course, Cartoon tips, Both \$5.00. Hartman, Box 30367, Lincoln, Nebraska 68503.

"CARTOONING, Caricaturing, Here's How!" Learn Professional's proven methods. \$2.00. Harris, Box 1567-P, Portland, Oregon 97207.

SIGN Painting—Easy method. Free Catalogue. Kaufmann Company, Crate-town, Missouri 65023.

MODELS—CARS, SHIPS, TRAINS, PLANES, ETC.

SHIP And Airplane model kits catalog 25¢. Scientific, Inc., 340 Snyder, Berkeley Heights, N.J. 07922.

MODEL Airplanes—Big 220 Page Catalog \$1.50. Sig Company, Montezuma, Iowa 50171.

RADIO CONTROL Airplanes, Boats, Helicopters, Big Discount Catalog \$3.00. Modelers Supply, Box 7185, Montgomery, AL 36107.

SHIP MODEL Kits, Plans, Fittings from our own Workshop. Big Illustrated Catalog: \$1.00 (Refundable). Bluejacket Shipcrafters, 145-V Water Street South, Norwalk, Conn. 06854.

SHIP Model Kits, fittings, plans, books, tools engines, motors. 1977 illustrated catalog \$1.00—'refundable with first order'. James Bliss & Co., Dept. SM, Route 128, Dedham, Mass. 02026.

MASTER Shipbuilders Catalog 128 Pages, Kits, Tools, Books, Fittings, Wood. \$3.00. Ships Unlimited, Box 32X, Morton Grove, Illinois 60053.

LIVE Steam powered backyard railroads! All sizes. Complete "bolt-together kits," and rough castings. Excellent drawings. 100 page catalog \$2.00. Little Engines, Lomita, California 90717.

KITES, GAMES, PUZZLES, NOVELTIES

UNIVERSITY Degrees (phony) shipped immediately. Authentic Seal. State-2U1, Box 5222, Station F. Ottawa, Canada. K2C 3H5.

MAGIC TRICKS, JOKES, VENTRILOQUISM

FREE Trick and Catalog 25¢. Magic & Fun, Box 1936-MP, New York, N.Y. 10017.

BE A Magician! Two Booklets explaining 156 tricks Plus large Professional Catalog \$2.00 (refundable.) Magic Inc., 5082 Lincoln, Chicago, Illinois 60625.

PROFESSIONAL Magic! Factory Direct to you. Giant Catalog—\$1.00 (Refundable) Hank Lee's Magic Factory, Dept. PM1, 24 Lincoln Street, Boston, Massachusetts 02111.

PROFESSIONAL Magic. Giant Illustrated Catalog 25¢. Top Hat-A, Box 1669, Evanston, Illinois 60204.

FREE! World's leading novelty catalog. 1600 Fun-makers, Jokes, Tricks, Science, Sports, Hobbies, Jewelry, Psychodelia. Johnson-Smith, C-4, Mt. Clemens, Mich. 48043.

VENTRILOQUISM! Guaranteed Instruction, Scripts, Puppets. Catalog 25¢. Maher, Box 420PM, Littleton, Colorado 80160.

TWO! Different Magic Catalogs 25¢. Miami Magic, 9734 Bird Road, Miami 33165.

FABULOUS MAGICS New 1976 Catalog 50¢. Our Specialty Orders Shipped Same Day. No Substitutes. Fabulous Magic, 3319 East Charleston, Las Vegas, Nevada 89104.

HUGE!! Completely New Photographed Illustrated Magic Catalog 25¢. Moore's Magic, International, Box 1405-J1, Plymouth, Michigan 48170.

600 ILLUSTRATIONS—92 Catalog Pages—Free Trick—50¢—Manhattan Magic, Box 334-M, NYC 10011.

MAGIC! Large combination professional and amateur catalog, 50¢, refundable. Order from old, reliable dealer. Fast service. Jeffries Magician, Box 274-A, Dallas, Texas 75221.

(Continued on next)

COINS, TOKENS, CURRENCY

50 Old Buffalo Nickels, \$16.95. The Coin House, Liberty Bank Building, Suite 108, St. Paul, Minn. 55104.

COIN World 18 Week Trial Subscription \$3.99, newsstand price \$10.80. Send Check to: 911 W. Vandemark Road, Sidney, Ohio 45365.

COINS Bought and Sold. Free Listings. Mariani, 2010 Chestnut, Baldwin, N.Y. 11510.

THREE DIFFERENT "S" LINCOLNS Uncirculated, 10¢ and Price List. Post Office Box 197, San Ramona, Ca. 94583.

INDIANHEADS & Lincoln Cents 1883-1949. 33 Different \$2.99. Catalog 25¢. Edel's, Carlyle, Illinois 62231.

HELP! Inherited large collection old coins. Must sell. List \$1.00. P.O. Box 4062, Hollywood, CA. 90028.

KNOW The Bad Ones. "Counterfeit U.S. Coins" by Spanbauer, \$3.99. Copper Man, Box 17676-P, Tucson, Arizona 85731.

BUFFALO Nickels Five Different \$1.00. Byson, 612M White, Toledo, Ohio 43605.

COLLECTORS—LINCOLN/KENNEDY PENNY—Uncirculated, mounted—\$1.00. Consumer Enterprises, Box 8,003, Athens, Ga. 30601.

INCREDIBLE! Five different INDIANHEADS \$2.99. Cacoco, 5865 Pierce, Arvada, Colo. 80003.

COLLECTION United States Listing 50¢. Harpe, 4272-5 Turtle Bend, Grandville, Michigan 49418.

BEAUTIFUL Uncirculated Carson City Silver Dollars—1882CC, 1883-CC, 1884-CC Each \$33.89; All Three \$93.89. BRILLIANT Proof Sets—1857, 1959, 1960 Each \$..89; 1868S, 1869S, 1871S, 1872S Each \$5.49. Super-Bargain Lists 50¢. Bebee's Incorp., Omaha, Nebraska 68111.

SET OF Four Curious 8 and 12 sided, round and square shaped coins from Pakistan. Send only 10¢. Mystic Stamp Company, Dept. CM-1, Camden, New York 13316.

GRAB BAG of coins from 25 countries. Only \$1.00. Money bag if not delighted. Littleton Coins, Dept. DX-1, Littleton, N.H. 03561.

THREE Different Silver Dollars Lists \$16.50. Park Coin, 4400 Excelsior Blvd., Minneapolis, Mn. 55416.

BINOCULARS, TELESCOPES, MICROSCOPES, MAGNIFIERS

FREE Binocular, Rifle scope catalog. Discount sale. Save 50%. Free gift with order. Write: United Binoculars, BN-508, 9043 So. Western, Chicago 60620.

EVERYTHING You Want To Know About Binoculars. Write: Tele-optics, 5514 Lawrence, Chicago, IL. 60630.

CAMERAS AND EQUIPMENT

FREE BARGAIN BOOK—Central Camera Co., Dept. 311, 230 S. Wabash Ave., Chicago, Ill. 60604.

PHOTOS & PHOTO SUPPLIES

FOR PROFESSIONAL RESULTS—Establish proper ASA rating for any B&W film, calibrated to your equipment and procedures. Detailed instructions \$4.00. Tinlem, Box 626M, Brookfield, WI 53005

PHOTO FINISHING

LOOK!—Special Money Saving Offer! Kodacolor Pan developed with Jumbo Prints—12 Exposure \$1.75, 20 Exposure \$2.75. B&W 89¢ (postpaid). Big Supply Discount. Enclose advertisement. Wisconsin Film, Dept. E, La Crosse, Wisconsin 54601.

COLOR SLIDES

RAF Worldwide color slide catalog 50¢. Worldwide, 7427-M Washburn, Minneapolis, Minn. 55423.

BOOKBINDING

REBIND YOUR DAMAGED BOOKS. With a few common tools and a homemade book press (plan included) you'll be able to handle anything from a torn hinge to a complete rebinding. Photocopy of article as it appeared in P.M. available for \$1.75. Send orders to: Popular Mechanics, Dept. HE, Box 1014, Radio City Station, New York, N.Y. 10019.

BOOKS & PUBLICATIONS

FREE Book. Prophet Elijah Coming Before Christ. Megiddo Mission, Dept. 63, 481 Turston Road, Rochester, N.Y. 14619.

AMAZING Profits in Real Estate! Excusive booklet tells you how, where to purchase. Only \$1.50, 13¢ Stamp. Kathi, 15 Yucca Circle, Casper, Wyoming 82601.

WILDERNESS Living! Shelter, Food, Power, Medical, Self-defense, Military. Books—Vital, Fascinating, Extraordinary! Free catalog. Adobe Hacienda, RFD 3, Glendale, Arizona 85301.

GULF FUNNY WEEKLY (1935-1942) wanted. Offer \$10 each. Bill Thailing, Box 352, Cleveland, Ohio 44127.

SELF-Improvement, Unusual books. Sell by mail, excellent profits. Established 1926. Illustrated catalog .50¢ (refundable) Astra, P.O. Box 524, Torrington, Conn. 06790.

"SURVIVAL/Military" Books/Manuals — "Survival" Freeze Dried Foods—Camping/Case. Largest Catalog Available. Free. Ken Hale (K.H.F.) McDonald, Ohio

CLOCK And watch repairing books, tools, materials. Free catalog. North American, Box 77 AAA, Fox River Grove, Illinois 60021.

QUALITY Books. Hundreds. Opportunity, Self-Improvement, Others. Inexpensive! Browse, s.u.p. at home. FREE catalogs. Write KNOWLEDGE BY MAIL, Dept. A, 450 West Las Flores, Thousand Oaks, Calif. 91360.

SAVE \$400 NEW Law Books for Laymen. HOW TO: Form Your Own Corporation, Prepare Your Own Partnership Agreement, Win Landlord-Tenant Disputes, Estate Planning & Will Writing Guide. By Harper Hamilton, Famous trial Lawyer. Send \$8.00 each. Free Details. Guaranteed. Hamilton Press, 4720G Hancock, Boulder, Colorado 80303.

"UNUSUAL" Books! Catalog Free! International Imports, Box 7798PM, Atlanta, Ga. 30357.

BOOKS: Save 83%—Catalog. Franklin Book Company, B208, East Millstone, N.J. 08873.

NATIONAL Geographic Magazines, 1888-1977, any issue. Buxbaum, Box 465-PM, Wilmington, Delaware 19899.

PUBLISHER Edits, prints, promotes. All subjects. Free brochure. Pentacle Books, 115 Water Street, Boston, Massachusetts 02109.

MONEYMAKING BOOKS. WEST DIVERSIFIED, 321 S. Macomb, Monroe, Mich. 48161.

YOU CAN RETIRE AT 40 AND LIVE IN COMFORT FOR THE REST OF YOUR LIFE. Many people work thirty or forty years always looking forward to the day when they can retire. Often they are sadly disappointed when retirement day comes, because they find they don't have the health nor finance to fulfill their dreams. Don't let this happen to you. You can retire while you are still in your prime, young enough and strong enough, plus have the finance to do all the things you have always wanted to do. Don't put it off for another day. Don't let the years continue to pass you by. Act now! It is later than you think! Let me show you how easy it is to plan and reach your retirement goal while you are still in your prime. By simply following the plan that I and many of my close friends have followed you can retire in a few years and do as we are doing, hunting, fishing, golfing, traveling and enjoying all the comforts of life. Send \$9.95 plus .75¢ for postage and handling for this valuable booklet. Retiring At Forty. Send to: Cecil Mason, 900 Portland, Collinsville, Illinois 62234.

PLAYS, SONGS, MANUSCRIPTS

WANT Your book published? Learn how we publish, advertise, promote, distribute. All subjects. Free booklet PM. Vantage, 516 W. 34th Street, New York City 10001.

MUSIC INSTRUCTIONS & INSTRUMENTS

ACCORDIONS—Famous Makes, 32 Models. Importer-To-You Prices! Save On Cordvox And Button Models. Home Trial. Terms. Trade-Ins. Free Catalog. Accordion Corporation, Dept. R, 5535 Belmont, Chicago 60641.

EASY To play and make, quality dulcimers, banjos, thumb pianos, hammered dulcimers; instruments and kits. HERE, INC. #P, 29 SE Main St., Minneapolis, Minnesota 55414.

NEW PLAYER PIANO ROLLS. Free Catalog. Dupree, 2940DM Grace, Costa Mesa, California 92626.

LEARN Banjo—5 string Bluegrass easy. No Music. Free details. Blaylock, Box 25N, Marietta, Georgia 30060.

PLAYER Piano Rolls, New, Discount Prices Catalog 25¢. Under 1st order. Old Melody Den, 454 Freeport Road, Pittsburgh, Pa. 15238.

PIANOS, PLAYERS, PUMP ORGANS. Rebuild and repair. Catalog of "How-To" books, \$1.00 (refundable). Vestal Press, Vestal 11, NY 13850.

LEARN Ukulele. Pick, Strum. New Book. Free Details. Ukeads, 4890-A Lani, Kapaa, Hawaii 96746.

INTERNATIONAL Catalog valuable to makers, repairers string instruments. Biggest variety parts, accessories, a l imported woods, bows, kits. Send 25¢ and this ad for catalog, price list. We'll include certificate worth \$1.25 credit on your first order of at least \$10. International Violin Company, Dept. HC, 4026 W. Belvedere Ave., Baltimore, MD. 21215.

ELECTRIFY Player Pianos, Pump Organs Quickly, Inexpensively with Lee Silent Suction Units. Write: Lee Music, 525F Venezia Avenue, Venice, California 90291.

LEARN to Play Piano, Organ or Guitar the Easy Professional Way. Professional Music, Box 86D, Brookfield, Conn. 06804.

30 TO 60% DISCOUNT! Any Make: Guitar, Amp, Drum, Banjo, Dob or Free Catalog! Warehouse P77, Box 11449, Fort Worth, Texas 76109.

GUITAR, Banjo, Violin, Mandolin making materials, accessories, books, piano tuning, Catalog 25¢. Guitar Center, Box 15444, Tulsa, Ok 74112

POEMS Wanted for songs. Nashville Music Product ons, Box 40001-P, Nashville, Tennessee 37204.

POEMS Wanted. Publishing, Recording, Awards. Broadway Music, Box 7438PM, Sarasota, Fl. 33578.

REUGE! Swiss Finest music Boxes, Movements. Spielman, 55 West 42nd, New York 10036.

KITS! Build dulcimers, guitars, harps, Banjos, mandolins. From \$2.95. Finished instruments from \$23.95. Free catalog. 8665 West 13th-PM, Denver, Colorado 80215.

ACCORDION Top Brands. Cordvox, Buy direct. Tremendous discounts. Trades accepted. Free buy u.e PM. Accordion-O-Rama, 874 Broadway, N.Y.C. 10003.

STRINGS! ALL KINDS! Accessories, Parts. Catalog 25¢. Stringing, M1, Box 5444, Lindenhill, Flushing, New York 11354.

GUITAR, Mandolin & Violin makers bending tools. Cast aluminum electric heated molds. Pamphlet 25¢. A. E. Overholtzer, 618 Orient St., Chico, Cal. 95926.

EDUCATION & INSTRUCTIONS

BE ALIVE AT LAST! TAP your true potential... for increased mindpower, memory, easier relaxation on. Rap.d results assured. Full Details FREE. Life Dynamics Fellowship, P.O. Box 418-DGS, 2935 Chillon Way, Laguna Beach, Calif. 92652.

LEARN Sewing Machine Repairing. Men, Women. Lucrative profits. Profession with bright future. Gresslin Correspondence School, Box 927, Spencer, Iowa 51301.

ELECTRONICS DEGREE by correspondence. Free brochure. Grantham, 2004 Stoner, Los Angeles, California 90025.

DETECTIVE Course. Free Information. Universal Detectives, Box 8180-F, Universal City, California 91608.

SURVEYING PAYS BIG!! United States Department of Labor reports "openings for 26,000 Surveyors in next ten years." Easy home-study p.n guides you. Send for Free "Surveying Career Kit." North American School of Surveying, Dept. PBCC6, Newport Beach, California 92663.

PLAY ORGAN! Learn with inexpensive "professional" method. Write: Tino's Studio-PM, 4001 East Fanoli, Phoenix, Arizona 85028.

LEARN Flower Arranging and Floristry. Start business or hobby. Free information on home study course. Lifetime Career Schools, Dept. B-765, 2251 Barry Avenue, Los Angeles, California 90064.

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.

DETECTIVE Profession. Easy home study; free "check and appeal" p.n, certificate, future. Professional Investigators, Box 41345, Dept. CP, Los Angeles, Calif. 90041.

AUCTIONEERING, Resident or Home Study Course. Free Catalog. Nashville Auction School, 1921 West End, Nashville, Tennessee 37203.

AUTOSUGGESTION. Sleep-learning headquarters! Tapes, records, books. Gigantic catalog free. Research Association, Box 24PM, Olympia, Washington 98501.

LEARN Asleep or awake! Records, tapes, equipment! Free catalog! Drawer PM-400, Rudoso, New Mexico 88345.

PASS Civil Service Examinations—Easily! Details. Arthur Alena, Box 173, Farmingville, New York 11738.

AUCTIONEERING: Mend-nhall School of Auctioneering, High Point, N.C. 27263. Free information.

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.

LEARN Auctioneering. Term soon. Free Catalog. Reich World Wide College of Auctioneering, Inc., Box 949, Mason City, Iowa 50401.

OWN Collection agency. "Little Gold Mine!" Franklin Credit, Roanoke, Virginia 24004.

HIGH SCHOOL AT HOME in spare time, if you left school without finishing, write today for free brochure about our home study method, diploma, and accreditation. American School, Dept. BA-0145, Drexel at 58th, Chicago 60637.

PIANO Tuning quickly learned with home study course. Diploma granted. American Tuning School, 17050 Telfer Dr., Morgan Hill, California 95037.

DETECTIVE—Training Course. American Detective Institute, Box 418-A, Fairfield, Alabama 35064.

USED Courses! Books! List 15¢. Smith's, 124 Marlborough, Salem, Massachusetts 01970.

BOOKKEEPING OR ACCOUNTING! Your own business or work for others. Easy home-study plan prepares you quickly. Veteran-Approved. Free "Accounting Career Kit." Write: Accounting School, Dept. PBCC6, Newport, California 92663

ACCOUNTING Career. Only 20 lessons, \$5. lesson. Send \$5 first lesson. Jenkins, P.O. Box 571, Taft, Calif. 93268.

HOW INTELLIGENT Are you? Special Test reveals IQ in minutes! Send \$2.00 today—guaranteed! Tests, 1827 North "O", Dept. T-11, Lake Worth, Florida 33460.

UNIVERSITY DEGREES BY MAIL Programs! Bachelors, Masters, Ph.D.s... Free revealing details. Counseling, Box 317-PM1, Tustin, California 92680.

EDUCATION & INSTRUCTIONS

(Continued from preceding page)

VETERINARY ASSISTANT. Send for free color brochure. Tells how you may train at home for exciting animal care career for just a few dollars a month. North American School of Animal Sciences, Dept. PBCC6, Newport Beach, California 92663.

MOTORCYCLE MECHANIC. Train at home spare time. Motorcycle tools, test instruments included. Write for facts: Dept. PBCC6, Motorcycle Repair School, Newport, California 92663.

PARAPSYCHOLOGY Course. Certificate. Free information, APRF, Box 5395-B, Sherman Oaks, Calif. 91413.

ACTION IDEAS FOR SUCCESS Cassette tape series for sales, management and personal development. Send \$1.00 for catalog, refundable. DMJ Enterprises, P.O. Box 306, Simpsonville, Md. 21150.

WATCH REPAIRING. Complete home training. Diploma awarded. Free sample lesson. Chicago School of Watchmaking, YN, Fox River Grove, Illinois 60021.

DEGREE Program in Electronics Engineering. Our 31st Year! Free Literature. Cook's Institute, Box 20345, Jackson, Miss. 39209.

THE CHRISTIAN ELEMENTARY CORRESPONDENCE SCHOOL Kindergarten through 7th grade, write: Correspondence School, Dept. P, 125 St. John Street, Pensacola, Florida 32503.

REPAIR Sewing Machines. Profitable Trade, Easy to Learn. Free Details. Sewing Machine Center, 187 FR, Rochelle, Ga. 31079.

IF YOU'RE HANDY WITH TOOLS AND FASCINATED WITH SCIENCE, You may be able to develop specialized vocational skills in electronics technology. Work with professional electronics equipment. Put theory into practice. Prepare for government FCC License exam. Do it all at home, spare time. Career courses fully accredited by National Home Study Council. G.I. Bill. Send for FREE school catalog and independent study details. Snooler rep contact in some areas. No obligation. Write: CIE, Dept. WPM-15, 1771 East 17th Street, Cleveland, Ohio 44114.

SING Beautifully, Easily! Free Proof! Publishers, Box 118, Brooklyn, N.Y. 11203.

SPECIALIZED KNOWLEDGE in CLOCK REPAIR can make YOU a SUCCESS. No obligation. School of Professional Clocksmiths, P.O. Box 176 (PMEA), Frankston, TX. 75763.

WELDING TRAINING—Basic and Advanced for Major Processes—Arc (stick), MIG, TIG, Gas, Pipe all processes. A non-profit school. Accredited member NATTS. Approved Ohio 70-12-0064 HT. Write for school bulletin and course schedule. **HOBART SCHOOL OF WELDING TECHNOLOGY**, Box 77, Troy, OH 45373.

INSTANT MEMORY . . . NEW WAY TO REMEMBER. No memorization. Re-erase "photographic" memory. Forget nothing! Liberates extraordinary knowledge talents, ESP. Immediate results! Free information. Institute of Advanced Thinking, Box 606-PM, Pacific Palisades, California 90272.

FREE Book tells how you can learn camera repair and service. Home study or classroom. Write today! National Camera, Dept. EAD, Englewood, Colorado 80110.

WRITE BETTER REPORTS. Advance your career. Free details: Weber, 1102 1/2 Forest, Lakewood, OH 44107.

PIANO Technology—Electronic organ servicing. learned easily at home. GI Approved. Free booklet. Niles Bryant School, Dept. P, 3631 Stockton, Sacramento, California 95820.

PROFESSIONAL Bartending course. Finest. Details, Mack Mixologists, Box 1219, Boston, Mass. 02104.

EMPLOYMENT INFORMATION

OVERSEAS EMPLOYMENT—Now Available Worldwide!!! All Occupations!! \$12,000-\$60,000 + Free Transportation!!! Latest Printouts \$2.00. Jobworld, 6311-PM Yucca, Los Angeles, California 90028.

MERCHANT MARINE. Instructions for joining \$3. & Self Addressed Stamped Envelope. Ernest Smith, Radio Officer, United States Merchant Marine, POB 17184, Philadelphia, Pa. 19105.

OVERSEAS Jobs—now hiring! All Occupations! High Pay. Transportation. Computerized reports \$2.00. Transworld, International Airport, Box 90802E, Los Angeles, CA 90009.

AUSTRALIA! 50,000 Jobs. Transportation. Information \$2.00. Austco, Box 3623E, Long Beach, CA 90803.

BOOMING Oil Industry—Gulf of Mexico—Thousands of Jobs! Fantastic Pay! Your Chance to Break Away! Get Facts—\$2.00. Thor, Box 53687, Lafayette, La. 70501.

LIVE IN BEAUTIFUL ARIZONA! Job and Business Opportunity Information. \$2.00. Solutions, 6577 N. 44 Ave., Glendale, Arizona 85301.

HELP WANTED

OVERSEAS Employment . . . \$10,000-\$50,000+. Free Information! Employment International, Box 29217AA, Indianapolis, Indiana 46229.

TEXAS REFINERY CORP. Offers PLENTY OF MONEY plus cash bonuses, fringe benefits to mature individual in your area. Regardless of experience, write V.I. Pate, Pres., Texas Refinery Corp., Box 711, Fort Worth, Texas 76101.

FOR INVENTORS

U.S. PATENT Office Searches, 234 Broadway, Room 3615, New York 10007. Free invention certificates.

PATENT Research, Engineering, Tax Assistance for Inventors. CDA, 300 Hollywood Avenue, Hillside, N.J. 07205.

INVENTORS—United States Patent Office Searches. Patent Development Engineering and Marketing of your Inventions, ideas with manufacturer contacts. Send for **FREE INVENTION CERTIFICATES** and invention information. Serving Inventors since 1948. George Spector, **LICENSED PROFESSIONAL ENGINEER—Patent Engineer.** Former **UNITED STATES PATENT OFFICE EXAMINER—3615 Woolworth Building, New York 10007.**

MAKE MONEY AS AN INVENTOR. Booklet reveals how to turn your ideas into profitable inventions. Only \$1.50. **MAIL GIFTS,** 7230 Henri-Julien, Dept. PM-1, Montréal, Québec, Canada, H2R 2A8.

YOUR INVENTIONS/IDEAS—PATENTED OR UNPATENTED—EXPERTLY RESEARCHED, DEVELOPED, MARKETED FOR CASH/ROYALTY SALES. Professional, fee-based invention service company—second decade reliable service. Member: US Council International Chamber of Commerce. Send for **FREE INVENTION RECORD FORM, PRODUCTION MARKETING BROCHURE,** "Your Invention—Its Protection, Development and Sale." Write: **THE IDEA PEOPLE, RAYMOND LEE ORGANIZATION,** 230 Park Avenue (A-113), New York City 10017.

NEED Help? Write our company, what can you lose? Pauley Engineering Sales, 45 Coral Drive, Belleville, Illinois 62221.

INVENTED SOMETHING? What now? Do's and don'ts. Personal experience. \$2.00. BCI, Box 1167, Killeen, Texas 76541.

FREE PAMPHLET: "TIPS ON MARKETING YOUR INVENTION," from an experienced fee-based invention service company. Write: United State Inventors Service Company, Dept. P, 1435 G Street NW, Washington, DC 20005.

"HOW TO INVENT, PROFESSIONALLY." Profitable Booklet! \$3.00. Tech Associates, 24 Cotton Avenue, Braintree, Mass. 02184.

MAKE MONEY As An Inventor. Booklet Reveals How To Turn Your Ideas Into Profitable Inventions, Only \$1.50. Ashline's Gifts, Willisboro, N.Y. 12996.

LEARN How to offer your invention for sale or license. Free booklet outlines procedures, royalty rates, requirements. Kessler Sales Corporation, C-51-FI, Fremont, Ohio 43420.

SEARCHES with Abstracts \$15.00. With Commentary \$22.50. Brief "How To Sell Inventions" \$1.50 Refundable. "Filing Your Own Applications" \$15.90. Professional Engineer, 701 Broughton, Beverly, Massachusetts 01915.

WHY Pay Huge Agency Fees to Protect and market your invention. Do It Yourself. Save Hundreds. Inventor's Helper, 3709 Atwell, Dallas, Texas 75209.

INVENTIONS WANTED

INVENTORS: MANUFACTURERS NEED NEW PRODUCTS. **FREE "RECOMMENDED PROCEDURE,"** by a creative fee-based invention service company. Washington Inventors Service, 422-F Washington Building, Washington, DC 20005.

INVENTIONS MARKETED Cash, Royalties FREE INVENTION PROTECTION CERTIFICATES. George Spector Manufacturers Representative, Woolworth Building, New York, N.Y. 10007.

HONGKONG Factory needs several new products every month to satisfy their overseas buyers. Particularly interested household items, toys, games, gadgets. Please send sketches or detailed explanation for evaluation and cash/royalty purchase. If you have an article/accessory cannot produce domestically because of quantity, price, or labour; please try us. Hongkong Plastic & Metal Products Company, P.O. Box 9627, Kwun Tong, Hongkong.

FREE DIRECTORY OF 1001 CORPORATIONS SEEKING NEW PRODUCTS. Professional, fee-based invention service company. For important information on Protecting, Developing, Marketing your inventions/ideas for Cash/Royalty sales, write for **FREE INVENTORS KIT NO. A-84.** Raymond Lee Organization, 230 Park Avenue North, New York City 10017.

TOOL Inventor, manufacturer, seeking inventions. Percentage bases. Details \$1.00. Turn-O-Carve, Box 8315, Tampa, Fla. 33674.

INVENTOR'S PARADISE—Combination Shows, Catalog Listing. FREE DETAILS To All Inquiries. Deadline Next Shows Soon. Paul Paulsen, Jr., 401 So. Columbia, Frankfort, Ind. 46041.

INVENTORS: Free information on offering your invention for sale. Kessler Sales Corporation, C-51-IW, Fremont, Ohio 43420.

INVENTIONS—IDEAS WANTED. Developed, Marketed by leading professional organization for Cash/Royalty sales. **FREE EXAMINATION and CONFIDENTIAL REPORT** of the Commercial Features of Your Patented/Unpatented Invention. **FREE COPY** "How to Safeguard and Market Your Invention to Industry." Write: **LAWRENCE PESKA ASSOCIATES,** Dept. C, 500 Fifth Ave., N.Y.C. 10036 or call today (212) 391-6350. No

REAL ESTATE & FARMS

NEW—FREE! Big SPRING Edition! Over 5,400 new properties described, pictured—Land, Farms, Homes, Businesses—Recreation, Retirement. Selected Best throughout the U.S.! Over 700 Offices, 43 states Coast-to-Coast. Mailed FREE from the World's Largest! **STROUT REALTY, Inc., 7-MX S. Dearborn, Chicago, IL 60603.**

CANADIAN LAND FROM \$47.00 AN ACRE. Choice properties across Canada. Low monthly payments. Ideal for cottages, hunting, fishing, investment. Free catalogue. Canadian Estates Land, 286 Lawrence Avenue West, Toronto, Canada, M5M 3A8, Dept. PMC.

"CANADIAN Country Properties." Our 61st Year. Free Catalogue. Tax Sale Service, Suite 404-PM, 85 Bloor Street East, Toronto, Ontario M4W 1B5.

GOVERNMENT LANDS . . . from \$7.50 Acre! Homesites, farming, vacationing, investment opportunities! "Government Land Buyer's Guide" plus nationwide listings—\$2.00. Surplus Lands, Box 19107-AX, Washington, DC 20036.

BIG . . . NEW . . . FREE . . . SPRING 1977 CATALOG! Over 2,600 top values coast to coast! **UNITED FARM AGENCY,** 612-PM West 47th, Kansas City, Mo 64112.

\$3.50 ACRE! USA & Canada. Lists, photographs mailed. Government Lands, 421-PM Center, Lewiston, New York 14092.

CANADIAN Acreage plus country lots. Terms. Free Catalogue. Vacation Acres, 426-A Dollard, Lasalle, Canada. H8N 1S6.

ARKANSAS Mountain and Valley Land, Farms, Homes. American Farm Realtors, 71 North, Mena, Ark. 71953.

WYOMING RANCH LAND. 10 Acres \$30.00 down, \$30.00 month. Owner-Mike Gauthier, 9550M Gallatin, Downey, Calif. 90240.

FREE CATALOG! (Covering 15 States!) All types property! Photos! **SAFE-BUY Real Estate Agency, Inc.,** Box 589-PM, Little Rock, Ark. 72203.

GOVERNMENT Lands Digest. Free Details. Millions of acres available. H&H Research Associates, P.O. Box 19644, Dept. PM, Houston, TX 77024.

MANUFACTURING

INVENTORS Ideas Developed, Research, Models, Manufacturing, Sales. Free Brochure. Since 1942. William Parker, Box 6305, Orlando, Fla. 32803.

BUY IT WHOLESALE

PLASTIC BAGS WHOLESALE. 300 Sizes Stocked. List 25¢. Milvan, 7799P Enterprise, Newark, CA 94560.

WHOLESALE Jewelry, sound equipment. Free catalogue. Storekeepers only. Empire-PMO, 1916 Fifth, Sacramento, California 95814.

ALL PET SUPPLIES—SAVE TO 40% and More. Buy From Many Manufacturers Wholesale Catalogs. Details And Sample Offers 25¢. Premium, Dept. M, 498 New Rochelle Road, Bronxville, N.Y. 10708.

HAVE Own Business. World's largest wholesalers. American, foreign. Bargains. Free details. International Buyers, Box 16386-M, Portland, Oregon 97233.

HEARING Aids, batteries. Wholesale. Catalog 25¢. Fiston, Box 1444, New Preston, Conn. 06777.

400,000 BARGAINS Below Wholesale: Many Free! Liquidations . . . Closeouts . . . Job Lots . . . Single Samples. Free Details. Bargainhunters Opportunities, Box 730-A, Holland, Michigan 49423.

ADVERTISING AGENCIES, ADV. SERVICES, MAILING LISTS

ADVERTISING Ratebook leading newspapers, magazines—\$1.00. For mailorder business, salesmen, etc. Chicago Advertising Agency, 28-EM Jackson, Chicago 60604.

MAILING List. Most all kinds. \$11.00 Per M, 500 Circulars mailed \$7.50. Dixmellers, King, NC 27021.

ADVERTISE Free on TV, Radio, or Publications. Details from: Douglas Advertising, PM-1, 5088 Richmond, Buffalo, NY 14219.

MAILING List, buy ours or trade yours. CMA, 2326 Rutgers, Costa Mesa, CA. 92626.

RUBBER STAMPS

FREE Catalog—Custom Made Stamps—Youngers Stamp Shop, Princeton, Iowa 52768.

FREE Catalog of Rubber Stamps. Quality, Box 11094-D, Memphis, Tennessee 38111.

OFFICE SUPPLIES

MAILORDER RECORDS Help get increased business! Complete 32 Page Record Book shows your inquiries, orders, advertising, expense, etc. Only \$1.00. **H. E. KAPPEL, POPULAR MECHANICS, DEPT. R, 224 WEST 57TH STREET, NEW YORK, N.Y. 10019.**

MULTIGRAPH, MIMEOGRAPH

NEED AN INEXPENSIVE COPY MACHINE. Make a dry printer yourself. Buy a photocopy of the plans as they appeared in P.M. Price 75¢. Send orders to: Popular Mechanics, Dept. HE, Box 1014, Radio City Sta., New York, N.Y. 10101.

TYPEWRITERS, DUPLICATORS, OFFICE EQUIPMENT

TYPEWRITERS—New SCM electronics & non-electronics near wholesale. 5 year guarantee your local SCM branch-list enclosed. Color catalog \$1.00 refundable. ROECO, 4140 Washington Street, Roslindale, MA 02131.

PRINTING PRESSES, RUBBER STAMP OUTFITS

PRINT YOUR OWN—Printing Presses, type, supplies direct from factory. Send 25¢ for catalog and samples to: Kelsey Co., DM, Meriden, Conn. 06450.

PRINTING MACHINES. Offset, Mimeograph, Typewriters, Composing, Machines, Dixgraph, King, North Carolina 27021.

SIMPLE-X RUBBER STAMP PRESSES. Hydraulic operated electrically heated. Sizes 5" x 8", 8" x 12", 10" x 15". Starting outfits. Order for presses, supplies shipped day received. Send \$2.00 for Catalog and Brochure. Custom Manufacturers, Box 211-P, Springfield, Mo. 65801.

RUBBER stamp outfits, supplies. Free catalog. Fast service. Jackson's Supply, Brownsville Rd., Mt. Vernon, Ill. 62864.

TYPE FONTS, Hand Printing Presses, Supplies. 120 pages. \$1.00 deductible first order. Acme Type, 732 Federal, Chicago 60605.

SAME day shipment. Rubber stamp supplies. Wholesale price list. \$1.00 deductible. Star Stamp Supply, 732 Federal, Chicago 60605.

PRINTING Presses, type, Supplies Lists, 20¢. Turnbaugh Service, Mechanicsburg, Pennsylvania 17055.

RUBBER Stamp Supplies; Starting Outfits. Catalog \$1.00 Deductible. Martine, 1432 Major, Jefferson City, Mo. 65101.

PRINT for pennies. Electronic stencil printers \$6.95 up. Card free. Booklet \$2.00. Inventec, Incorporated, Box 128PM, Endicott, NY 13760.

FREE Catalog-Type. Rubber stamp supplies 20% discount on first order. Barco Type Mfg., 237 S. Evergreen, Bensenville, Ill. 60106.

PRINTING AND SUPPLIES

1000 EMBOSSED Business Cards \$6.85 Postpaid. Agents Wanted. Elco, 181-A, Sylvania, Ohio 43560.

WHOLESALE. Office Supplies, Equipment, Printing. Agents Wanted. Atlantic, Box 1678-PM1, Florence, South Carolina 29503.

CARDS—Matches—Saleslips—Statements—Signs. John, Box 418, Oaklawn, Ill. 60454.

QUALITY PRINTING!! Price List Available. Selco Products, Department 37PM, Danvers, Massachusetts 01923.

GUMMED LABELS

1000 GUMMED Address Labels \$1.00. Watt's, Box 960A, South Bend, Indiana 46624.

1,000 GUMMED ADDRESS LABELS \$1.00. FREE LITERATURE. Acme, 1238 Voskamp, Pittsburgh, Pennsylvania 15212.

1000 Striped Address Labels \$1 plus \$1.10 Handling. Phillips, 8511 Fontbonne, St. Louis, Mo. 63121.

GIFT SHOPPING

MONEY JAR! Contains Real U.S. Shredded Currency, Face Value to \$10,000. **ON THE ROCKS!** Unique Glasses with Mountain Stream Rocks sealed in the base! Galaxy Gift Company, Box 54594-D, Atlanta, Georgia 30308.

FREE! Gifts Catalog. Dura-House Gifts, 1314 6th Street, Greeley, Colorado 80631.

CLOCKS, WATCHES, OLD GOLD, JEWELRY

HIGHEST CASH For Gold, Jewelry, Gold Teeth, Rings, Diamonds, Watches, Silver, Platinum. Mail Articles Today. Free gift with information. Chicago Gold & Precious Metals, 6 E. Monroe, Dept. 558, Chicago 60603.

CREATE A CLOCK! Movements, Hands, Dials For Home Project. Free Literature! Stewart, Box H2, Hubbardston, Mass. 01452.

NEED CASH? Highest immediately for old gold, silver, platinum, diamonds. Free information. H & I Company, 79 Longview, White Plains, N. Y. 10605.

WANTED—Gold, Silver, Platinum (any form). Pocket watches. Information free. Wilmot's, 345-D South Glassell, Orange, CA 92666.

HIGHEST CASH IMMEDIATELY FOR OLD GOLD, SILVER, PLATINUM, JEWELRY, GOLD TEETH, WATCHES, DIAMONDS, SPECTACLES. FREE INFORMATION. ROSE INDUSTRIES, 29-A EAST MADISON, CHICAGO 60602.

HIGHEST Cash. Old Gold, watches, rings, spectacles, gold teeth or Platinum. Mail today. John's, 13505 San Antonio Drive, Norwalk, Calif. 90650.

HIGHEST Cash For Gold, Jewelry, Watches, Rings, Gold Teeth, etc. Any condition. Satisfaction Guaranteed. Northwest Precious Metals. Dept. 101, Tununuk

WATCH And Clock repairing books, tools, materials. Free Catalogs. North American, Box 77AA, Fox River Grove, Illinois 60021.

1977 Clock Parts Catalog—Do It Yourself! Movements, 1000's Hard To Find Items For Antique, Cuckoo, 400 Day, Electric \$3.00 . . . Clock Repair Center, Dept. T, P.O. Box 65, Carle Place, New York 11514.

GOLD

FIND GOLD, Old Mines, Treasures, Pan Nuggets, Assay Gold Ore Amazing Guide Reveals How. DETAILS FREE. Dave Hunt, Roosevelt, Utah 84066.

PRECIOUS STONES & MINERALS

CUT Stones, jewelry mountings, belt buckles for silver dollars or stones, rockhound supplies Wholesale Catalog 25¢. Eloxite Corp., 810PM 10th St., Wheatland, WY 82201.

500 POLISHED Gemstones \$5.00. Tumblecraft, 5401 James North, Minneapolis, Minn. 55430.

GOLD 10 Small nuggets panned from Oregon Streams \$1.00. Robert Brandt, Sweethome, Oregon 97386.

GET Free catalog no serious rockhound, gem cutter, jewelry maker, hobbyist or craftsman can be without. Full of bargains, exclusive items, low prices from largest suppliers and authorities in the field. Free new catalog just off the press, yours for the asking. Write: Grieger's, Dept. C-12, 900 South Arroyo Pkwy., Pasadena, California 91109.

TREASURE FINDERS

FIND Coins, jewelry, gold nuggets with new patented detector. Astounding range. Unaffected by concentrated black sand, mineralized ground. Rejects metallic trash. Free catalogue. Gardiner Electronics, Dept. 9, 4729 N. 7th Avenue, Phoenix, AZ 85013.

TREASURE FINDER Locates buried gold, silver, coins, treasures. 6 powerful models. Instant financing available. Write or call for free catalog. Phone (713) 682-2728 day or night. Relco, Dept. AA21, Box 10839, Houston, Texas 77018.

BURIED TREASURE—Locate up to Quarter Mile away with Ultra-Sensitive Directional Locator. Send for free, informative pamphlet. Research Products, Box 13441-AMC, Tampa, Florida 33611.

FIND Lost Treasure! Coins, Gold, All Metals. Many Models from \$59.95. Free Catalog. Compass Metal Detectors, Dept. PB07, Box 366, Forest Grove, OR. 97116.

FINEST Discriminating detectors; factory prices. Patented. Treasure Enthusiast, Rt. 1, Box 56MN, Benton, La. 71006.

TREASURE may lie beneath your feet! Discover gold, silver, coins, rings, artifacts and more with world-famous, deeper-detecting White's metal detectors. From \$79.50. Dealers world-wide. Free literature! White's Electronics, Dept. PA7-C, 1011 Pleasant Valley Rd., Sweet Home, OR 97386.

TIRED OF DIGGING UP TRASH? The All New "Coin-Shooter" Rejects Bottle Caps, Tin Foil, Nails and Shallow Trash. Detects Gold, Silver Coins and Jewelry. Free Literature. D-TEX ELECTRONICS, Box 451-U, Garland, Texas 75040.

PROFITABLE OCCUPATIONS

FT. SMITH Auction School, Ft. Smith, Ark. 72901. Resident & Home study. Veteran approved.

FREE Catalogs. Repair air conditioning refrigeration. Tools, supplies, full instructions. Doolin, 2016 Canton, Dallas, Texas 75201.

\$100.00/DAY POSSIBLE!!!! Buy Scrap Gold . . . Easy . . . Complete manual, \$4.00 Satisfaction Guaranteed . . . Brown, 956 Springdale, Atlanta, Ga. 30306.

BAKE New greaseless doughnuts in kitchen. Sell stores. Free recipes. Michael Ray, Waseca, Minn. 56093.

LEARN TO FLY Airplanes. Student Pilot Beginner's Manual 20.00 PPD. Airprint, Box 387P, Elizabeth, Colorado 80107.

SHARPEN—Scissors, Pinkers. Light, compact equipment. Supplies. Blackhawk's, Sheldahl, Iowa 50243.

HOW To Make Money in Commercial Art. Information Free. Box 1204B, Youngstown, Ohio 44501.

HOW To Make Money writing short paragraphs. Information free. Barrett, Dept. C-27-B, 6216 N. Clark, Chicago 60660.

\$10 Daily writing short articles at home. Copywriting Report reveals how and where. Send \$1.50. SHEA HOUSE, 2270 P-Walton Ave., Bronx, New York 10453

GOOD Money Sketching Photos! Details: Gem, 365 Longhill, Shelton, Conn. 06484.

SELECT The Best Career or Job for you! This booklet shows you how! Send \$3.00 to Careers, P.O. Box 1491, Litchfield Park, Arizona 85340.

PLASTERCRAFT!!! Profitable home business. Molds available. Details: Lynette, 6251C, Mentor Park, Mentor, Ohio 44060.

\$200.00 Day possible. Must know electronics. Pre-

OPERATE TOOL RENTAL BUSINESS Sparetime. Manual tells how to Start on shoe string, expand, make big money. \$3. Postpaid. Lincoln, P12, 153 Park, Passaic, NJ 07055.

STEEL Clothes Line posts. Easy to make. Million homes ready to buy. \$200 to start your own business at home. Complete details on construction and marketing. Also including plans for fireplace furnace. \$5.00. Whitehead, Rt. 2, Box 218B, Vinton, Virginia 24179.

SALESMEN—DISTRIBUTORS

HERTEL exclusive reference Bible! Big profits! Starting 3-dimension cover! Demonstrator, supplies furnished. Top commissions plus extra bonus earnings! Free outfit. International Book, Dept. PM, Box 118, Wichita, Kansas 67201.

SELL CALENDARS, SPECIALTIES Repeat Business-Free Details - Fleming, 6535 Cottage Grove, Chicago 60637.

\$100.00 Extra a week easy! Spare time! Show men's, women's Double Air Cushion shoes. Dress, work, safety toe! Highest commissions. Shoes for yourself. Outfit Free. Bronson, Dept. HX-17, Minneapolis, Minnesota 55408.

INSTANT CASH COMMISSIONS Full or part time. Free sales kit features America's largest line low priced Business Printing, Advertising Specialties, Signs, Calendars and other necessities used daily by business people. Profitable repeat orders. No experience. No investment. No collections or deliveries. Write today. National Press, Dept. 709, North Chicago, Ill. 60064.

EARN \$100.00 daily selling Solargem Rings, Jewelry. Free catalog. Anka-PM, 95 Washington, West Warwick, RI 02893.

DISTRIBUTORS and Dealers Wanted. Over 1000 Items—Large Catalog-\$2.00—Refunded With First Order. Milroy Distributing, 2811-15 E. Colfax, Denver, CO. 80206.

AGENTS WANTED

PROFITABLE Business! No investment! Take orders for America's finest shoes from friends, neighbors! Profitable. Easy. No experience needed. Selling outfit free. Mason Shoes, K-266, Chippewa Falls, WI 54729.

PRINTING Advertising Salesmen—Excellent money-making sideline selling Decalcomania Name Plates, small quantities. Advertising Specialties, sign letters. Free Samples. Raico XL, Boston, Mass. 02119.

GUARANTEED Extra income. Instructions, Sources, Services. Join International Association Manufacturers' Representatives, 808 Broadway, Kansas City, Missouri 64105.

SPARE TIME CASH. Sell famous Hanover Shoes. Samples, sales kit free. No experience needed. No age limit. Big commissions. Hanover Shoe, Dept. 1810, Hanover, Pa. 17331.

MAKE MONEY IN SPARE TIME. As a subscription sales representative for leading national magazines, you can earn generous commissions while learning the art of selling. Instructions and supplies will be sent to you free. Send this ad with your name and address to: POPULAR MECHANICS, Room 1107L, 250 W. 55th St., New York, N.Y. 10019.

NEW 1976 Tax Book—Need Agents/Distributors. Tax Factors, Palm Bay, Fla. 32905.

BUSINESS OPPORTUNITIES

IMPORT-Export opportunity, profitable world-wide, mail order business from home, without capital or travel abroad. We ship plan for no risk examination. Experience unnecessary. Free report. Mellinger, Dept. E2701, Woodland Hills, California 91367.

CUSTOM PICTURE FRAMING—a satisfying profitable craft! Learn at home—no experience needed, we supply everything. Booklet mailed free. Creative Framers, 1205 W. Barkley, Box 16, Dept.-DDI, Orange, California 92668.

WORK 6 MONTHS/YEAR. Profitable annual community publications. Information \$2.00. SASE, TAYLOR-PM, Box 356, Salt Lake City, Utah 84110.

\$400.00 Monthly Raising giant fishworms. Soilless method. Charlie Morgan, Bushnell, Florida 33513.

FREE BOOK!! "2100 Unique Ways To Make Money!!" World's Biggest Collection!! Success-M, Box 40614, Detroit, Michigan 48240.

TAKE Catalog orders. We drop-ship 1001 best-selling specialty products. Lowest below-wholesale prices. Immediate delivery. Spectacular home business opportunity. Free Book. SMC, 6061 De Soto Ave., Dept. 20-49, Woodland Hills, CA 91365.

NEW Fire Extinguisher. Sample offer—huge profits. Norwich Chemical, Norwich, Connecticut 06383.

\$300-\$700 Monthly. Raise Rabbits, Laboratory Animals for us. We supply Equipment, Breeders, Instructions, Financing Arrangements. Details-25¢. Laboratory Animals, Inc., PM, Countyline Road, Pentwater, Michigan 49449.

BUMPER Sticker Printing Device. Simple, Cheap, Portable. Any Message In Minutes. Free Details. Bumper-Magic, POB 22791 (GC), Tampa, Florida 33622.

PIANO Tuning quickly learned with home study course. Diploma granted. American Tuning School, 17050 Telfer Dr., Morgan Hill, Calif. 95037.

(Continued on next page)

BUSINESS OPPORTUNITIES**(Continued from preceding page)****MAILORDER** Publisher wants dealers for outstanding instruction books and manuals. Wonderful dropship proposition free. Neil H. Tasker, Shamokin, Pennsylvania 17872.**PHOTOSTAMP** Agents Wanted! Make Big Money From Home Mailorder. Free Samples. Information: Posteromatic-C7, East Providence, R.I. 02914.**MAIL** Order millionaire mails Free report. Start your spare time home mail order business. Mailco, Dept. EC701, Woodland Hills, California 91367.**BECOME** Tax Consultant. Our students earn \$1,000-\$3,000 every tax season preparing returns evenings. State approved, National Tax School, Monsey 2AH, New York 10952.**HOW** Easiest mailorder business nets \$40,000-yearly. Free proof. Send stamped envelope. Thompson, Box 761-M, National City, Ca. 92050.**EARN** Money Raising Fishworms for us. Write Oakhaven-38, Cedar Hill, Texas.**CARPET—RUGS—WHOLESALE** Make big money spare or full time selling carpet to friends—builders—motels—apartments. We drop ship to your customer. Commercial carpet—\$2.39 yd., Rubber back shag—\$3.65 yd., Heavy saxony plush—\$4.25 yd. Many other styles available. Send \$15.00 for professional samples of above styles to: Owen Carpet Co., 248PM, Resaca, Ga. 30735 or call 404-277-1321.**\$400 FIRST** Week with Ad Clocks or money back. Your own Advertising Business. Action Ad Clock, Room AC-2-GA, 1512 Jarvis, Chicago, IL 60626.**EARN \$25.00/Hr.** Part time. Incredible Vinyl Repair. Allentown Vinyl, P.O. Box 2102, Lehigh Valley, Pa. 18001.**FREE MAILORDER** Report! Plan guarantees beginners \$50.00 per order—to \$750 weekly. Professionals, Box 21093E, Seattle, WA 98111.**MAIL ORDER TAX SHELTER BUSINESS** in the States and Canada explained. Can be profitable. Money back guarantee. Send \$4.95 to: ERG Agency, Box 2661, Station D, Ottawa, Ontario, Canada.**"MILLIONAIRE SUCCESS SECRETS"** Details Free. Associates, Box 44781, Centerville, Utah 84014.**OWN** Your Own Business. Select yours from dozens of offers in Business Opportunities Magazine. Get six Free Copies. Write: Specialty Salesman and Business Opportunities Magazine, 307-G N. Michigan, Chicago, 60601.**\$500.00** Weekend taking **OLD TIME PORTRAITS!** Easy. Inexpensive. Detailed Manual, \$5.00. VSU, Box 3586, Kenal, AK 99611.**MAILORDER** Dealers Wanted. Earn outstanding profits using tested promotions! Executive type business. Rutward-PH, Georgetown, CT 06829.**\$200.00** Daily. Guaranteed Results. Samples. Information, \$6.00—refundable. Graphic-Arts, Route One, Box 95, Rapid City, South Dakota 57701.**MAKE \$92.00 FROM** Square Foot Plywood (Jigsaw or Bandsaw necessary). (Proof), details 25¢. (Refundable). Woodart, Bridgewater, Mass. 02324.**START** Your Own Mailorder Business. Details. Senoff Enterprises, 1589 Albion, Rexdale, Ontario M9V 1B6.**"HOW TO BORROW YOUR WAY TO A GREAT FORTUNE"** Anyone can build a fortune fast—starting with no money of his own—if he uses the magic of other peoples money. Here's the book that shows how to use the worlds greatest money secret . . . How to tap 10,000 ready sources of money . . . How to use a personal loan as a springboard to riches . . . How to get instant personal loans . . . How to buy a business without investing a cent . . . How to use the magic techniques of loan pyramiding. This may be the best investment of your life. \$9.95 postpaid. Bookworks, P.O. Box 2426-B, Hollywood, California 90028.**\$1.00** **LISTS** You year sent to 1000 Importers, Jobbers, Mailers, our mailing year. Dixiem, King, North Carolina 27021.**MAILORDER** Millionaire helps beginners make \$500 weekly. Free report reveals secret plan! Executive 1A1, 333 North Michigan, Chicago 60601.**SELL SENSATIONAL LOW-COST BURGLAR ALARM.** Lightening seller. Exceptional margin. Samples for trial. Northwest Electric, Ave. 654, Mitchell, S. D. 57301.**INSTALL** Burglar alarms without previous experience or costly equipment. Big profit. Free details. Nasco, Dept. E2701, Woodland Hills, California 91367.**FREE** 100-Page Catalog waiting to bring you Big spare-time cash commissions. Sell Advertising Book Matches. Every business a prospect . . . complete selling instructions furnished. Steady, repeat business. Dept. MX-177, Superior Match Company, 7530 South Greenwood Avenue, Chicago, Illinois 60619.**STOP!** Settling for nickels and dimes—make it big in mailorder. Free information. NALA, Box 898M, Duluth, Ga. 30136.**BECOME** Our Mail Order Distributor with \$150 investment. Free Brochure. Audit Controls, 40 Brookside Ave., Fair Lawn, New Jersey 07410.**CABLE FM STATION:** No investment! Excellent income! Details free. "Broadcasting", Box 5516BA, Walnut Creek, CA 94596.**OWN** Collection Agency!! \$25,000.00 Yearly Possible. Master-PM, Dawsonville, Georgia 30534.**HOW TO RAISE \$100.00 to \$1,000,000.00!!** Write: Capital-PM, Dawsonville, Georgia 30534.**CALIFORNIA MANUFACTURER NEEDS MAN** To assemble our product and be local agent, experience unnecessary. May start while presently employed. Five-Figure income for responsible applicant. S.K.R.M. Manufacturers, 1419 West Dolores Street, Wilmington, California 90744.**PROFITS FROM CLASSIFIED ADVERTISING!** Booklet shows you how to start your own business with Classified Advertising. Only \$1.00 (Refundable with first order.) H. E. KAPPEL, POPULAR MECHANICS, DEPT. P, 224 WEST 57TH STREET, NEW YORK, N. Y. 10019.**FREE** Mailorder Dropship Business Magazine! Mailer's World, Box 1355K, Sioux Falls, South Dakota 57101.**\$200.00** Monthly Spare Time Making Novelty Items from scrap lumber. Workshop Five, 3800 Harney, Vancouver, Washington 98660.**GET RICH!** Use other people's money. Be money broker. Write: Milligan Trust, 565-PMN Mohawk, Boulder, Colorado 80303.**100% PROFIT** Bronzing Baby Shoes. **FREE LITERATURE.** NBC, Box 1904-PM, Sebring, Florida 33870.**BE YOUR OWN Boss!** 1001 fast, easy ways to make money! Free! Rush name, address, zip. Money Making, 13263-F Ventura Blvd., Studio City, Calif. 91604.**SUPPLEMENT** Your Income or be your Own Boss—Install Automobile Burglar Alarms—Time Y New Product Inexpensive and easy to Install—Everyone a Potential Customer. Write for Free Information. Trionyx Electronics, P.O. Box 5131-D, Santa Ana, CA 92704.**CASH** With Your Camera! Earn \$5000-\$15,000 yearly selling to 4,000 clients. Sell photos 15 or more times. Guaranteed. Details—13¢ stamp. Pictureprofits, Dept. PM-17, Middle Island, N.Y. 11953.**VENDING** Machines. No selling. Routes earn amazing profits. Big catalogue Free. Parkway Machine Corporation, 1930PMB Greenspring Drive, Timonium, Maryland 21093.**\$200 WEEKLY!** Make, Sell Bricks! Free information! Xcito Bricks, 5715 N. Mozart, Chicago, Ill. 60659.**UNIQUE** Woodworking projects for spare time income. Details free. Bradley House, 157 A13, Bradley Ave., Meriden, Connecticut 06450.**STUMBLE UPON A FORTUNE** In Abandoned Industrial Silver. Yours for Taking! Free Information: Silverman K-13, Box 548, Woodville, Texas 75979.**MAILORDER**—Nationally known **MILLIONAIRE** reveals secrets of success. Teaches you personally. Write for informative book, gift catalog, and complete details. **EVERYTHING FREE!** No obligation. Gil Turk, Dept. 553, Montvale, NJ 07645.**BARGAIN!** Mailorder library. professional secrets revealed. Free Details. Echo M2, Box 402, Magnolia, Tex. 77355.**MIDDLE MAN WANTED!** Unusual position representing our company. No selling. Requires telephone, dependability, honesty in disbursing company money. Exceptional income. \$2.00 for printing and postage brings application and descriptive catalog. Inland Empire, 1419 West Dolores Street, Wilmington, California 90744.**MAKE MONEY** in Mailorder Sensibly. Moneyback Guarantee. Free Details. Associates, Box 212-PM, Stoneham, Massachusetts 02180.**1002** Incredible Ways to Make Money!! Free Details! Lynne, 1827 North "O", Dept. 1-1, Lake Worth, Florida 33460.**FAM** Insulation machine & 100 gal. of materials—\$1,950.00. Original cost over \$4,000.00. Call Mr. Walker, 612-454-6706, 2805 Dodd Road, St. Paul, Minn. 55121.**GET** Rich!! Secret Law Erases debts. Free newsletter exposes millionaires' Secrets. Blueprint (#B1), 453 W256, NYC 10471.**U.S. SPONSORS** Booming catfish farming. Fast riches proven from virgin field. Nationwide established markets. U.S. instructions plus financing. Complete package \$8.00. Only literature 50¢. Scientific Catfish Farming, Box 1089-A, St. Petersburg, Florida 33731.**BECOME** "Mortgage Broker" Lucrative! Capital Sources, Box 640099-PM1, Uleta, Florida 33164.**WRITERS** Short Articles Needed Send \$1.50 Dept. WF, 5647 Pepperwood Ave., Lakewood, Calif. 90712.**\$231.00** EXTRA Weekly Playing Mail Order "Money Game"!! Details—Business. 2205-J Robinhood, Albany, Georgia 31707.**250%** Profit Selling Gifts, Jewelry, Carded Merchandise. Catalog \$2.00. Refundable. Shurlaine Sales, 1939P Guernsey, Beaverton, MI 48612.**CLASSIFIED** ADVERTISING. 60,000 Buyers. \$.15/word. Details FREE. Salco, 1432B Birch, Lewiston, Idaho 83501.**MAKE \$1000** A WEEK CAMPING. No Capital, Land, Selling or Experience Needed. Free Details. Write: [unclear], [unclear], [unclear] Calif.**\$32** Hour Possible, Spare Time! Earn \$2,000 monthly—easy! 1000's of prospects in your area need Vinyl Repair, Refinishing, Recoloring for home/office furniture, Autos/ Buses, Hotels/Motels, Restaurants, Cafes. Immediate Earnings. Free Opportunity Kit/Details. Special-T, 7360HM-Varna, No. Hollywood, Calif. 91605.**VINYL'S** Where The Money Is! Invisibly repair, refinish, recolor furniture, luggage, car tops. Qu'ck, easy. Two small \$20 jobs a day earn you \$1,000 a month. Homes, cars, offices, restaurants, unlimited customers. Start earning after a day's practice. Sensational details Free. VIP, 2007 Montrose, Chicago, 60618.**MILLIONAIRE** REPORTS! Free details! Lovvorn, 321 43rd Street, Fairfield, Al 35064.**LEARN** PORCELAIN REPAIR. Lucrative Business Guarded Technique Offered for first time. Write: W. Curtis, P.O. Box 121, Torrance, California 90507.**MAKE 90% PROFIT!** Easy. With the Hottest Mailorder Manual, ever offered. Guaranteed! Free Details. Thompson Products, 419-M 7th Street North East, Fayette, Alabama 35555.**PIANO** Tuning Learned quickly at home! Musical knowledge unnecessary. Free information. Empire School, Box 450327, Miami 33145.**UNLIMITED** INCOME AVAILABLE Selling top quality gifts. 300% profit possible. Experience unnecessary. Details \$1.00. Superior Products Company, 4501 East Patricia, Tucson, Arizona 85712.**\$1000** Monthly Possible, at home spare time. Detailed Success Guide \$4.00. Thomas Willoughby, 1023 Wash, Auburn, Ill. 62615.**SAVE MORE!** Every Business and Moneymaking Opportunities Advertises This Issue. Send Your Name, \$3.00; Elican Services, P.O. Box 35M, Hewlett, NY 11557.**SELL** Books by mail. Complete dealer set-up—Free. Midwest, Box 44R2PM, Shawano, Wis. 54166.**WORLD'S** Largest Supply. 25% to 40% under wholesale. Closeouts. Hongkong clothes. Automobiles. Free details. International Buyers, Box 16386-MM, Portland, Or. 97233.**\$1200.00** Monthly Raising Earthworms For Us. Free Details. Baker Enterprises, Box 193, Sparta, Ohio 43350.**YOUR OWN** Mailorder Catalog Business. No Merchandise investment. Details Free. A.M. Sales, 31-14 94 St., East Elmhurst, NY 11369.**EARN** Big Money Working At Home! New report shows how—lists over 200 businesses to start on a shoestring. \$4.50 postpaid. Guaranteed. Januz Communications, Box 109-AE, Lake Forest, Illinois 60045.**"MILLIONAIRE** SUCCESS SECRETS" Details Free. Associates, Box 447812, Centerville, Utah 84014.**FREE** Catalog—Sell our Iron-On Heat Transfers. Sample \$1.00. Specialty Wholesalers, Princeton, Iowa 52768.**STARTING** A BUSINESS—IMPROVING AN OLD BUSINESS? You need valuable information as contained in **FUNDAMENTAL BUSINESS PRACTICES**. Send \$7.95 to: A.P.G. Corp., Publications Dept., 135 Broadway, Valley Stream, New York 11580.**HOW** To Collect Names, \$6.00 Each. Dickinson-PMD, 133 Falmouth, Rochester, New York 14615.**HOW** TO MAKE \$2,000 WEEKLY At Home using other people's money. Guaranteed. Free Details. Richlieu, Box 25357, Dept. B1, Houston 77005.**HOW** To make \$2 to \$10 each clipping Newspaper Items. No investment. Details 25¢. Clippings, Box 3838-CPX, Centerdale, RI 02911.**STOP!** Wealth Now, Thousands Possible. Complete Guide Plan. Send \$3.00. Joseph, 230 Robbins Road, Neptune, New Jersey 07753.**TREMENDOUS PROFITS!** Import-Export! Report reveals how to get started fast without investing in merchandise. \$1.50. Aerie, Dept. IEPM, 86 Tupper Dr., Thorold, Ontario, L2V 4C8.**\$300.00** Spare Time Profits. Tablesaw/Bandsaw required. Details .50¢ (Refundable). Woodshop "Gnie", 6743 Hanbury, Long Beach, (PMA) California 90808.**FREE**—36 Page Magazine For Mailorder Beginners! Farmer, Box 13975-M, Reno, NV 89507.**WOODWORKERS**—Turn \$4 Material into \$34.95. Free Details. Pine Shop, PO Box 78P, West Peterborough, NH 03468.**FREE** SECRET BOOK "2042 Unique, proven enterprises". Fabulous "Little Knowns" Work home! Haylins, Carlsbad, Calif. 92008.**FREE** MAIL ORDER INSTRUCTION PUBLICATIONS CATALOGS. Cazin, 526 Maple, Redwood City, CA 94063.**MAILORDER SUCCESS! I'M DOING IT AT NINETEEN!** You can too. Amazing businesses! Details: Knowledge, Box 3261AY, Vallejo, CA. 94590.**EXTRA** Earnings Building Small Items From Scrap Lumber. Write: Sorlie, Box 307, Black Eagle, Mont. 59414.**WATCH** REPAIRING. For cash income or hobby. Free sample home study lesson. Chicago School of Watchmaking, YNA, Fox River Grove, Illinois 60021.

TOBACCO

(Continued from preceding page)

SMOKING PARAPHERNALIA—Unusual Pipes not Available in Stores. Send 13¢ Stamp for Free Color Catalog. Toro Boy, Box 998-B, Apopka, Florida 32703.

SCIENCE & CHEMISTRY

SCIENCE SUPPLIES and Kits, Free Catalog; Schubel & Son, Box 21484-M, Sacramento, CA 95821.

DISCOUNTED! Laboratory Chemicals, Glass Apparatus. Catalog 50¢. Deluxe Scientific, 507 Huron, Manitowoc, Wisconsin 54220.

COMPLETE Chemistry Catalog 50¢. Laboratory Sales, Box 161-A, Brighton, Mass. 02135.

FANTASTIC Chemical Catalog. Surprising Extras. \$1.00. Kenrus, Box 205, Staten Island, New York 10306.

FORMULAS, PLANS, ETC.

OUTSTANDING Tone On Wooden Instruments. Instruction \$5.00. Marc Anthony, P.O. Box 1205, Crescent City, CA 95531.

ANY Formula \$6.00. Catalog—Manufacturing Treatise \$1.00. Belfort, Box 568, Chicago 60690.

SPECIAL SERVICES

DOW JONES INDUSTRIALS, 30 Daily 9x12 Stockcharts, 6-12 Months Background, \$15.00. Ruf, 22 Garfield Place, Poughkeepsie, NY 12601.

INFORMATION On anything. Ferguson Research Specialists, 60-15 Woodside, Woodside, New York 11377.

PROFITS FROM CLASSIFIED ADVERTISING! Booklet shows you how to start your own business with Classified Advertising. Only \$1.00 (Refundable with first order.) H. E. KAPPEL, POPULAR MECHANICS, DEPT. P, 224 WEST 57TH STREET, NEW YORK, N.Y. 10019.

BETTER HEALTH

LIVE LONGER! Booklet REVEALS long, Healthy Life SECRETS. Send \$1.50. Booklet #MO-55L. Jay Talmadge, 321-P 43rd Street, Fairfield, AL 35064.

FREE Magazine featuring 450 books—natural health, gardening, occult, other interesting subjects. Provoker Press, Lakeshore Rd., St. Catharines 502, Ontario L2R 7C9.

SLOW BODY AGING. Report tells how to live Healthier and Longer \$1.50. Stanley House, 146 East Wakefield, Anaheim, Calif. 92802.

FOR THE HOME

INSULATE All windows completely with clear inflatable WINDBAGS. Box 222, Millersville, MD. 21108.

WOODWORKING For Fun and Profit! Free Booklet Listing Plans. Send \$1.13 Stamp. C. Ames, 1266, Oakridge Rd., Baywood Estates, Mabank, TX 75147.

"WILL Kit" Informative Booklet Tells How to Make or Break your "Will!" also 4 Forms. Send \$1.98 Plus 90¢ Postage/Handling. M. A. Daniels, Dept. 401, 800 Lafayette Avenue, Brooklyn, N.Y. 11221.

DESTROY Roaches! Easy formula for making an ODORLESS but effective roach killer. Guaranteed to work or money-back!!! Send \$2.95 today. Living, Box 412, Bronx, New York 10458.

ODOR PROBLEM—Home, Barn, Kennels, Cages. Try **MARN-O**. One pound package \$7.25. Send check to Dept. O, Mardel Laboratories, 364 Gundersen, Carol Stream, Illinois 60187.

SEPTIC SYSTEM—Keep your system operating with a boost from **MARN-E**. 3-6 months supply \$4.65. Send Check to Dept. E, Mardel Laboratories, 364 Gundersen, Carol Stream, Illinois 60187.

ENERGY Saving Encyclopedia Save Hundreds Insulation, Lighting, Ventilation \$10. NRG Saved, Box 452, Lafayette, IN. 47901.

WIND-ELECTRIC Systems. Advanced. Reliable. Extremely Economical. Ultima Corporation, Coppitt Rd., Key West, FL 33040.

WEARING APPAREL

WESTERN BELTS—Personalized. Quality tooled leather. Write: Arizona Products, Box 10749-PMA, Phoenix, Arizona 85064.

REPAIRS & SERVICING

COMPLETE Hydraulic Jack Repairing Manual \$3.00. Moneyback Guarantee. Bayerco, 938-Rd. Betty Avenue, Neenah, Wisconsin 54956.

GARDENING & LAWN CARE

REPLACE YOUR ROTARY. NEW Safer Vortex Mower does the Job. Free Literature. VORTEX MOWERS, Dept. P10, R.D. 5, Box 85, Troy, New York 12180.

PM'S BESTSELLING "COMPLETE GARDEN GUIDE" For the man who needs all the basics . . . fast! Superbly organized in famous "Master Guide" format. Dozens of tables, charts and illustrations. Literally crammed with timely bonus specialties like vegetables, fruits, nuts and herbs, garden pools, storage structures, planting dates. Only \$4.95 + 50¢ to cover postage and handling. PM Complete Garden Guide, Dept. HE, Box 1014, Radio City Sta., New York NY 10019.

FLOWERS, PLANTS, & NURSERY SUPPLIES

LEARN Landscaping and the growing of plants. Start a profitable business part or full time. Free information without obligation. Lifetime Career Schools, Dept. A-173, 2251 Barry Avenue, Los Angeles, California 90064.

NEW, Low Cost Booklets; House Plants, Containers, Landscaping. Send 50¢ for 98¢ Plant Tool, Free Details! Laurel Enterprises, 525-7A Kensington, Lancaster, PA 17603.

GINSENG Bring ng \$40 Pound. Hair Seeds, Roots. Information, Growers Manual \$1.50. K. Collins, Viola, Iowa 52350.

WINEMAKING & OTHER RECIPES

WINEMAKERS. Free Catalog. Equipment. Supplies. Continental, Box 68016PM, Indianapolis, Ind. 46268.

CORN Whisky—How you can make the finest—smoothest corn or rye whisky for less than \$2.00 quart right in your kitchen—very simple. Complete plans and recipes—Satisfaction guaranteed. Send \$3.00 today to—Resaca Publishing Co., 248PM, Resaca, Ga. 30720.

WINEMAKERS. Free illustrated catalog of yeasts, equipment. Semplex, Box 12276R, Minneapolis, Minn. 55412.

BEERMAKER'S Supply Catalog—Free. Bacchanalia, 273 Riverside Ave., Westport, Conn. 06880.

WINEMAKERS Free Informative Catalog, Yeast Equipment, Ingredients, DANENBERGER'S, Box 276-M, New Berlin, Ill. 62670.

WINEMAKERS Buy your supplies wholesale—Catalogue. Ohio Wholesale Wine Supplies, Box 21405M, Cleveland, Ohio 44121.

BURGLAR ALARMS & HOME PROTECTION

DOUBLE PROTECT YOUR FAMILY!!! Avoid Intrusion, Fire with 24 hour siren signals!!! Permanent. Portable!!! Fits any door, Batteries included!!! **REPLACEMENT GUARANTEED!!!** \$12.95. Saint Enterprises, 1227 Marais, New Orleans 70116.

FREE 48 Page Burglar and Fire Alarm catalog. Supplies and information. Protecto Alarm Sales, P.O. Box 773A, Michigan City, Ind. 46360.

DIALING Unit calls police. \$29.95. Free literature. S&S Systems, 5619-D St. John, Kansas City, Mo. 64123. (816)483-4612.

FIRE-BURGLAR ALARM 24 hour protection Permanent/Portable Causes intruders to flee! Watches while you sleep. Protect loved ones! \$12.95 Guaranteed. Gilbert Enterprises, Box 323, Boston 02119.

PREVENT HOME FIRES From Appliance and shop tool overloading house wiring. Install **FUSED SAFETY PLUGS** in place of your standard cord plugs on all appliances. Uses standard 3AG and 3AB fuses to 30 amps. Send \$4.95 for 5 plugs postpaid to: Elking Electronics, P.O. Box 457, Chatsworth, Ca. 91311.



THIS LABEL SAYS MORE

Popular Mechanics is far and away the acknowledged authority in the ever-expanding field of do-it-yourself activity. Our readers know the Popular Mechanics tradition of total involvement with leisure equipment, workshop accessories, tools, home and car care supplies—in virtually every area in which do-it-yourself products play a vital part. That's why, when you, the PM reader, see this Product Feature Mark on any product, anywhere, you know that product is a solid member of the growing family of products featured within the advertising pages of Popular Mechanics—a magazine devoted to serving the dedicated do-it-yourselfer for over 73 years.

LOOKING FOR IDEAS ON HUNTING, FISHING, CAMPING, BUILDING, TOOLS, ETC.? CHECK THESE LISTINGS. THEN USE THE COUPON BELOW.

WORTH WRITING FOR

594. If you've got a swimming pool . . .
then this booklet is for you. Olin Corp., maker of HTH Dry Chlorine, offers this free 16 page color booklet called "Pool Care for In-Ground and Above Ground Pools". It gives loads of information on the fundamentals of water care and solutions to frequently encountered water problems.

595. Wood burning heaters are the hottest things in years . . .
and you can see Shenandoah's complete line in this full-color brochure. Dial the amount of heat you want and save up to \$400 or \$500 a year in fuel costs. Not only that, Wood Burning Heaters are attractive. Send for this free booklet.

596. Plant this in your yard . . .
Snap on connectors and flexible pipes make installing this underground sprinkling system extra easy. Learn how to install a Spra-Rite system in only 2-4 hours . . . Free from Mobile International.

597. Protect and beautify
Armour All is a protectant . . . use it on any surface and it will help shed water, dirt and discharge static electricity. It can be used in the house, on the patio, on leather goods, or on just about anything. Included in this kit are samples of Armour All and a fact sheet. Try it for only 50¢.

598. Get an extra hand in the garden.
As the warm weather approaches, you'll want your lawn to look its best. And, Radio Steel's garden and lawn carts, trailers and wheelbarrows, help to make outdoor chores a breeze. See Radio's entire line of home and contractor-sized wheeled products in this free 8-page full-color booklet.

599. Fix it right the first time
If you're tired of doing the same household job again and again, then GE may have the answer. Caulk, mend, seal, protect and more . . . all with GE's Household Silicones. And, in this attractive brochure, you can see all of the silicone products and what can be done with them. Included in the brochure is a handy calendar which describes in pictures when and where to use each product. Free from GE.

600. The Finishing Touch
Here's a 12-page illustrated booklet that's a great help if you're finishing or re-finishing wood. It's a beginners guide to easy and enjoyable wood finishing providing step-by-step instructions and helpful hints. Just 25¢ from United Gilsonite Labs. It's a useful tool to have around.

601. Get your Power Mower Ready . . .
and keep it purring this season. And, you'll get some valuable information on how to keep your mower running

smoothly with this free 26-page booklet from GUMOUT. See how to tune up and keep your mower clean, check spark plugs, fuel mixture and more. Plus, meet GUMOUT's cleaners, degreasers and other great products.

602. CB Products with a difference!
Superex introduces its full line of CB accessories in this brochure featuring innovative products such as mobile CB headphones with remote control safety mike, voice-activated headsets and much, much more. See all of the fine Superex products in this brochure. Just 10¢.

603. When do I plant?
This handy, pocket-sized backyard garden guide from Ames tells how and when to plant all kinds of vegetables from A to Z. It also provides a chart on tool selection, pest control and watering. This useful aid to all gardeners is only \$.25.

604. See Bolens mulching mowers and more . . .
and how they can help you in this free 14-page full-color booklet. FMC, makers of Bolens Mulching Mowers, shows their complete line in this attractive brochure. If you're tired of bagging and raking grass cuttings, Bolens will show you how to save time and effort.

605. Welcome to the world of wood finishing . . .
Here's a free illustrated booklet from Minwax. 16 pages of tips and hints on finishing and re-finishing, plus information on oil and polyurethane finishes. Included too is a handy chart showing all of Minwax's attractive finishes. Plus, Minwax will send you the name of the nearest dealer.

606. It's hot inside!
Reddy Heaters are rugged, durable and dependable, and Koehring Atomaster Division offers this free full-color brochure describing the Reddy Heater oil-fired portable heaters. They're lightweight and portable. Will heat garage, greenhouse and workshop. Sizes range from 30,000 to 150,000 BTU's.

607. Popular Mechanics Complete Car Repair Manual
Slash auto repair bills by handling most maintenance and repair jobs yourself. This big, 328-page book gives step-by-step, "how-to" instructions supplemented with detailed drawings and photos. Only \$9.95.

608. Popular Mechanics Complete Appliance Repair Manual
Fix virtually any household appliance—even shop tools—following the thorough, step-by-step instructions in this comprehensive volume. Irons, toasters, humidifiers, vacuum cleaners—you'll handle them all and much, much more. This 320-page book can save you far more than its modest \$8.95 price.

Popular Mechanics 976
Box 1718, Sandusky, Ohio 44870

This Coupon Expires March 31, 1977

Please see that I receive the items checked below. I have enclosed 35¢ for the overall service charge, plus remittance for any priced items.

- | | | | | |
|------------------------------|----------------------------------|----------------------------------|----------------------------------|-------------------------------------|
| <input type="checkbox"/> 594 | <input type="checkbox"/> 597 50¢ | <input type="checkbox"/> 600 25¢ | <input type="checkbox"/> 603 25¢ | <input type="checkbox"/> 606 |
| <input type="checkbox"/> 595 | <input type="checkbox"/> 598 | <input type="checkbox"/> 601 | <input type="checkbox"/> 604 | <input type="checkbox"/> 607 \$9.95 |
| <input type="checkbox"/> 596 | <input type="checkbox"/> 599 | <input type="checkbox"/> 602 10¢ | <input type="checkbox"/> 605 | <input type="checkbox"/> 608 \$8.95 |

Total items requested _____ Total money enclosed (including 35¢ service charge) _____


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. Please allow 4-6 weeks for delivery.



**Black Velvet feels
like a million bucks.**

The Premium Canadian. Black Velvet® Blended Canadian Whisky.
80 Proof. Imported by ©1976 Heublein, Inc., Hartford, Conn.



Материал, защищенный авторским правом

When your taste grows
up, so should your
cigarette.

What you want from a cigarette changes.
Once I smoked just to be like everybody else. Now I
know what smoking's all about. I smoke for taste.
And Winston's real taste is what I want.
Winston is for real.

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

19 mg. "tar", 1.3 mg. nicotine av. per cigarette.
FTC Report APR. '76.