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POPULAR MECHANICS

AUG. 1971
50 CENTS



*'It Sprouted
Wings... So I
Flew It'* Page 87

**23 PAGES—GET MORE FUN OUT OF SUMMER
AT HOME FOR VERY LITTLE MONEY** Page 123:

3 Ways to Make Your Garage an Outdoor Family Room
■ Diving Deck for Above-Ground Pools ■ **How to Wire
Your Patio for Music** ■ A Fold-Flat Buffet Table That Can
Handle a Crowd ■ **Rollaway Wall Makes Your Driveway
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comes with an easy-to-handle 4-speed synchromesh transmission. 6-ply rated tires. Flo-thru ventilation. A full 6-foot bed. Padded dash. A towhook that bolts to the front of the truck. Tie hooks all around the bed. And a spare tire under the truck that you lower with a hand crank.

In short, when you buy our small Toyota Half-Ton, you get a lot of truck. With enough money left over for some other nice things as well.

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This One



A087-N1U-37RA

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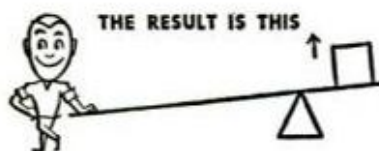
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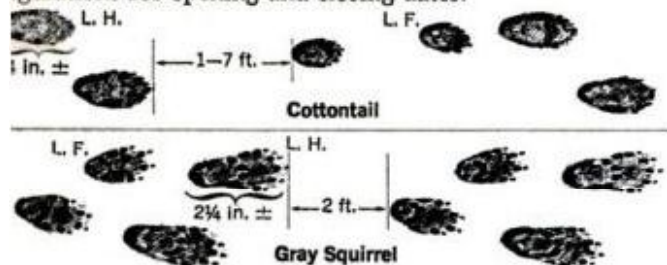
TOOLS BY
CHAN NEL LOCK

MEADVILLE, PA. 16335

Make small-game hunting hard on yourself.

Hunting rabbits and squirrels with a 22 is a real challenge. Here are some tips that'll lead you to some real sharpshooting... some real sport... and put some meat in the pot, too.

Rabbits are by far our most popular small game. They are found almost everywhere and present a very sporting target—especially for riflemen. They also make good eating. There are a number of species, each with its own habits, found in America, so if you're hunting in a strange locale, the easiest way to get started is to check with the local farmers. They usually regard wild rabbits as pests and will be glad to show you where to find them. Always consult your state hunting regulations for opening and closing dates.



Once you're in a likely area, the fun begins. The western cottontail tends to run from a hunter—and he can reach speeds of 45 miles per hour! On the other hand, the eastern cottontail tends to hide, and you've got to make him break cover. A good dog that can go into the thickets after them is invaluable. When a cottontail comes bursting out of the brush, you're in for some real fast action that can help improve your shooting. East or west, north or south, a running rabbit is not an easy target for a rifle.

Squirrel hunting is popular, too. However, the conditions are different.

for spotting the game and sighting.

Going after rabbits and squirrels calls for a 22 that's accurate, easy to handle and fast-firing. Among the fine Remington repeaters, a good choice would be either our Model 552 "Speedmaster" Automatic or our Model 572 "Fieldmaster" Pump-Action rifle. Both are tube-fed and hold 20 short, 17 long or 15 long rifle cartridges to give you the firepower you need. Their receivers are grooved for "tip-off" scope mounts, and both have a cross-bolt safety at the rear of the trigger.



The Model 552 "Speedmaster" is a well-balanced rifle designed for fast, accurate shooting. A carbine version with a 21-inch barrel is also available. The Model 572 "Fieldmaster" is a logical choice for anyone who has a pump-action Remington Model 760 center fire rifle. Its cartridge-feeding-system design helps prevent jamming, and it can be converted to a single-shot rifle for a beginner. If you want to get the best results with either of these rifles, be sure to use Remington or Peters ammunition.

And, to make the most of the game you take, get a copy of the Remington "Wild Game Cookbook". It's available through your Remington dealer or by sending \$2.95 to: Sportsmen's Library, P.O. Box 731, Dept. FA, Bridgeport, Connecticut 06601. It's part of the Remington Sportsmen's Library and belongs on every serious hunter's bookshelf. Here are a couple of recipes (shown below) from it.

Remington Reports are based on information supplied by Remington-Peters experts. If you'd like to put them in your library, too, we'll be glad to send you a free folder to keep them in—along with our 1971 catalog. Just mail a postcard to: Remington Arms Company, Inc., Dept. 205, Bridgeport, Conn. 06602.



Model 552A

Model 572 BDL Deluxe

One-Dish Rabbit

- | | |
|---------------------------------|----------------------------------|
| 1 rabbit, cut in serving pieces | 2 medium onions, sliced |
| salt, pepper | 1/2 inch thick |
| flour | 4 or 5 small potatoes, quartered |
| oil | 1 can tomatoes |
- Sprinkle rabbit with salt and pepper and flour. Fry in oil until lightly browned. Layer rabbit, onions, potatoes in casserole. Cover with tomatoes. Bake in 350° F. oven 2 hours. Serve on hot biscuits. Serves 4 to 6.

Squirrel With White Wine

- | | |
|------------------------------------|------------------------------|
| 4 squirrels, cut in serving pieces | 1/2 teaspoon rosemary |
| 2 tablespoons butter | 1 cup dry white wine |
| 1/4 cup olive oil | 1 cup chicken broth |
| salt, pepper | 1 tablespoon chopped parsley |
| 2 cloves garlic, crushed | 2 cups sliced mushrooms |
- Sauté squirrel in butter and oil until lightly browned; add salt and pepper to taste, garlic, rosemary, wine and broth; simmer until nearly done, turning often. Add parsley and mushrooms; cook 5 minutes. Serves 4.



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Cover Photo by Bob Grant

"It Sprouted Wings . . . So I Flew It!"—Testing Aerocar III, Combination Sports Car and Airplane

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LETTERS

TO THE EDITOR

Copper for gas pipe?

Your Shop Editor had better do a little more checking before he puts anything like *Light It—and Your Barbecue's Ready* (page 136, May PM) in your magazine if he doesn't want to get someone's head blown off.

There is a building code in Wyoming about using copper pipe for a fuel line for natural gas. Natural gas has a lot of sulfur in it and sulfur eats copper up. (Copper pipe is all right for propane gas.)
BUFFALO, WYO. W. S. SCHLICHT

Adrian Conway of the Gas Appliance Manufacturers Assn. (GAMA) replies: "It would appear that Mr. Schlicht is addressing himself to a problem that is localized in his area. I have discussed this with GAMA's director of technical services, Jack Langmead. He has assured me that the use of copper tubing for the installation of gas appliances is widely accepted today and is commonly used for gas piping in most of the nation.

"As you know, the sulfur content in most natural gas is quite small. There are a couple of areas, however, where sulfur is a problem. In these areas—and evidently Wyoming is one of them—the use of copper tubing is restricted."

Two-fisted firefighter

Being a member of the Roxboro Volunteer Fire Brigade, I found *How to Choose and Use Fire Extinguishers* (page 116, June PM) particularly interesting. I go along completely with the advice and facts given in the story, but someone got his left mixed up with his right in the upper lefthand photo caption, page 117. The dry chemical extinguisher is on the left: the water extinguisher is on the right.
ROXBORO, QUE. G. R. RHODES

'Mole' comes from Seattle

That tunneling machine that appears in the news brief, *'Mole' Digs in South Africa* (page 80, May PM), is a Lawrence Hardrock Tunneler, manufactured and designed in Seattle, Wash.

LAWRENCE MFG. CO. ROBT. W. GORDON,
SEATTLE, WASH. ASST. CHIEF ENGINEER

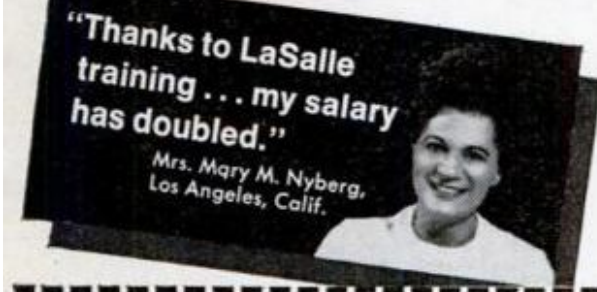
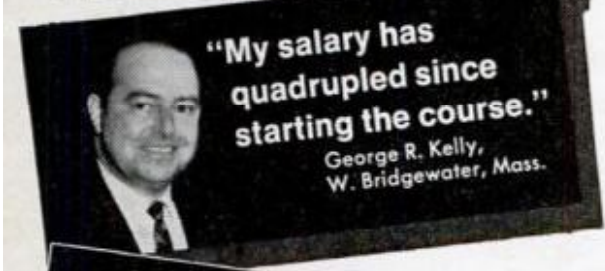
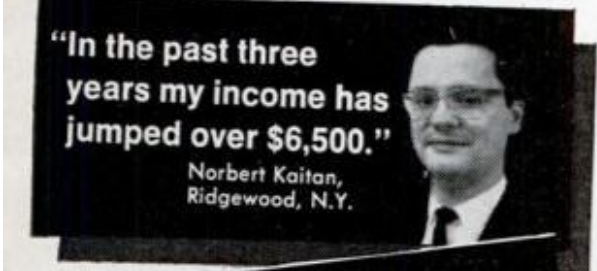
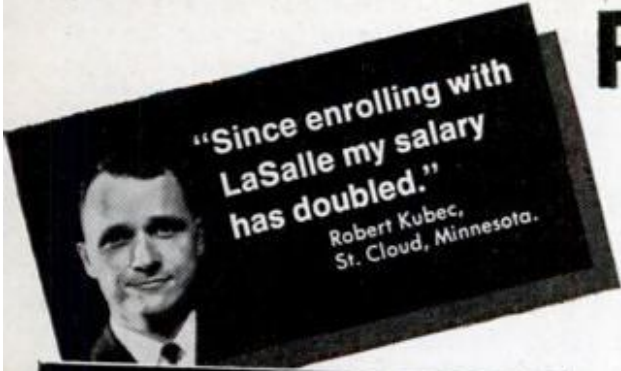
Safer roller coaster

The idea of a *Back-Yard Roller Coaster*
(Please turn to page 8)

POPULAR MECHANICS

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 Mrs. _____
 Miss _____ (Circle title and please print)

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LETTERS

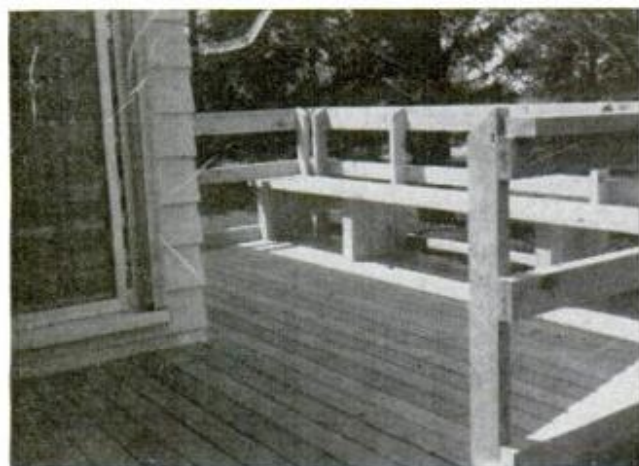
(Continued from page 6)

(page 118, May *PM*) is great. However, I'd like to make a suggestion to cut down on broken legs. The ladder-type construction of the rails forms a natural trap for a youngster's feet. I would suggest a closed-box construction be used.

DENVER, COLO. RONALD E. FRANCIS

Deck builder

After reading *Enjoy the Wide Outdoors on an Open Deck* (page 140, June '70 *PM*), I've completed a deck for my home at a cost of \$125 and 25 hours of work.



Decking is 2x4s nailed flat on 4x4 cedar beams; the beams are on 4x4 cedar posts and piers. Deck rail and bench are made of 2x4s.

MONTPELIER, OHIO RAYMOND D. FISHER

Meet Mr. Bower

I appreciate your using my photograph of Jeanie's Teenie for the cover of your May issue. However, through a misspelling of my last name, credit was given to someone else. Because this was my first major photo job, I'd appreciate a note of correction.

DECATUR, GA. ROBERT E. BOWER

There, put that in your portfolio. And tell 'em you take good pictures, too.

Keep those blocks dry!

In *Building a House?* (page 112, May *PM*) caption No. 2 states that concrete blocks should be dampened thoroughly with water before placement.

In contrast, the *Concrete Masonry Handbook* from the Portland Cement Assn. states on page 23 that concrete masonry units should never be wetted immediately before and during laying in the wall, a practice customary with some masonry materials. Also, on pages 7 and

8, the handbook goes into the importance of laying blocks dry.

EDGEWOOD ARSENAL, MD. T. P. FREEMAN

Our architect consultant says reader Freeman is right. Block is never dampened, but stone and brick are. (We've found, though, that moistening block is a common practice among professionals.)

Gaps in I-90

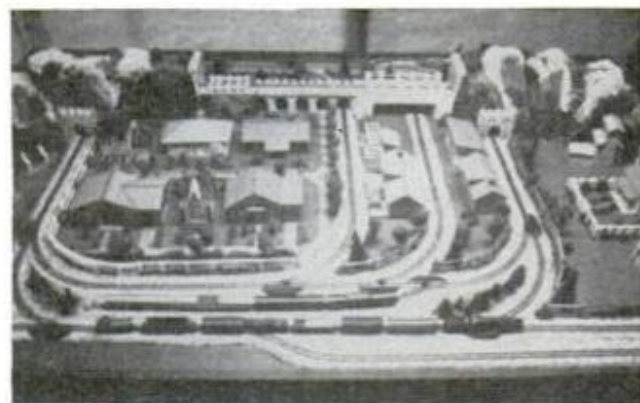
Read with interest *Interstate Driving* (page 82, June *PM*) but found some errors in the Cleveland area. The Interstate route I-90 is definitely NOT finished through this area. I am including some material from our local newspaper.

WESTLAKE, OHIO DONALD BORDEN

The May 27 edition of The Plain Dealer (enclosed by reader Borden) noted that the 14.39-mile Northwest Freeway (Interstate 90) will not be open until at least 1975. Only 1.72 miles are completed.

Railroad builder

I had great pleasure building a model railroad from Wayne Leckey's *A Lot of Railroad in a Little Space* (page 150, Jan. '70 *PM*).



I did not follow your plans for making the mountains. I used chicken wire which was much easier to handle and much stronger and you could bend it to any shape. Without your plans I would not have been able to build the railroad.

TORONTO, ONT. WILLIAM H. TOWN

No discarded blade for metal

Having upwards of 40 years of experience in various types of machine work, I have read *PM* with much interest and have found a good many useful ideas.

However, in the May issue on page 139 (*Hints From Readers*), the idea of using a discarded hacksaw blade in a lathe cutoff toolholder for the purpose of cutting steel or other hard and tough materials is both

(Please turn to page 10)



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LETTERS

(Continued from page 8)

impractical and dangerous. I have, on several occasions, used such a blade for cutting plastic, nylon and wood—and it works fine. I also tried cutting soft steel and aluminum bronze rod and found this type of blade would shatter like glass. One could very readily lose an eye.

Under the circumstances, you should make clear to readers this type of tool be used only to cut nonmetallic materials.

OIL CITY, PA.

HOWARD H. FOGGAN

You're right; readers are now warned.

Planer in two months

I am very pleased with the performance of the *Wood Planer* (page 174, Aug. '70 PM). It took about two months



of my spare time; I had very little trouble with adjustments for it to work properly.

I used 1½-in. tubing rather than the recommended 1¼-in. I also added some small corner braces to the frame and changed switch locations to make them more accessible with stock in the machine.

NEWPORT NEWS, VA.

GEORGE F. KLICH

Let's have a laugh

The content of *PM* is sufficient, but I have one complaint: Your magazine is only serious. In other words, your publication lacks humor. Add a column of humorous selections.

MAPLEWOOD, N.J.

ROBERT IZENBERG

Not funny? You should meet the staff. Seriously (and we are serious, aren't we?) your suggestion is good. ★★★

POPULAR MECHANICS



Some of the best mechanics in West Los Angeles.

From left to right: Carlos Anton, Helmut Klinck, Michael Kimomoto, Jack Heyler, Henri Schneider, Winnie Boersch, Tom Grimmett, Del Wright, Ed Paskey, Les Bowen, Bob Cullen (in the truck), Bill Boliner, Bud Stanfield, Jim Jones, Barry Noland, Al Girard (kneeling), Jack Rahe, Bill Cavaness.

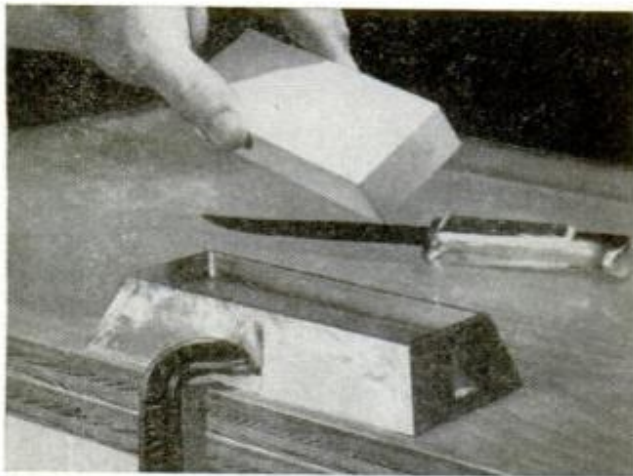


Toledo, Ohio 43601

**20 million people have switched to Champion Spark Plugs.
This has been 18 of them.**

NEW TOOLS

YOU SHOULD KNOW ABOUT



SHARPENING STONE cut from a narrow segment of Novaculite is sold with unconditional guarantee and is claimed by the maker to be the world's best sharpening stone. Available soft or hard, stones come with holder for clamp-on bench use. Russell's Arkansas Oilstones, Box 474, Fayetteville, Ark. 72701.



PAINT-CAN LIP that snaps onto any quart or gallon paint can is claimed to eliminate spills, drops and dribbles. Called No-Drip Paint Lip, the accessory is priced at 39 cents. Jet-X Corp., 2550 West 2nd Ave., Denver, Colo. 80219.



VERSATILE 1/4-IN.-SQ. DRIVE SOCKET SET contains interchangeable components that can be combined in seven different ways to drive both square and hex fasteners. Reach of components varies from 1 1/2 to 9 1/4 in. Set No. 1001 comes in a snaplock case molded of high-impact plastic. Xcelite Inc., Orchard Park, N.Y. 14127.



EXPANSION-ANCHOR WINDING KIT lets you roll your own screw-holding anchors on the job. Kit contains enough aluminum blanks to wind 200 wood and masonry anchors for No. 6 screws up to 1/2-inch lags. Refills available. Kit is \$14.95 from Ace In-The-Hole, Inc., Box 739, Lebanon, Pa. 17402.



FANCY COVE-CUTTER



BEAD-CUTTER



ROMAN OGEE-CUTTER



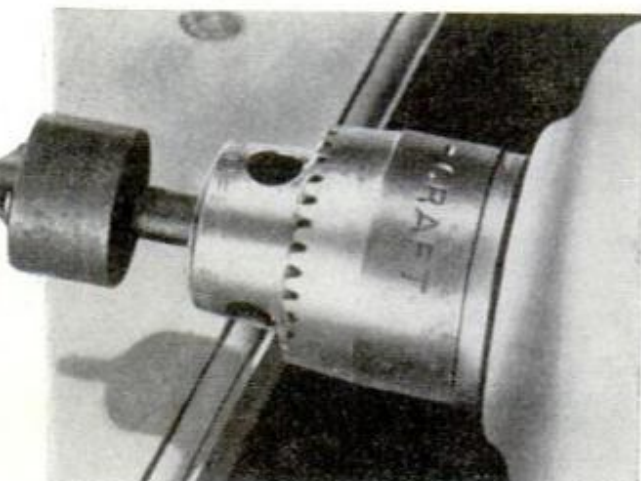
COVE-CUTTER



RABBIT-CUTTER



OGEE-CUTTER



MOLDING CUTTERS for portable electric drill can be used to shape wood, plastic and soft metals. Two sets—No. 6 (left in drawing) and No. 7 (right) consist of three cutters each and sell for \$3.95 apiece. From Arco Tools, Inc., 421 West 203 St., New York, N.Y. 10034.

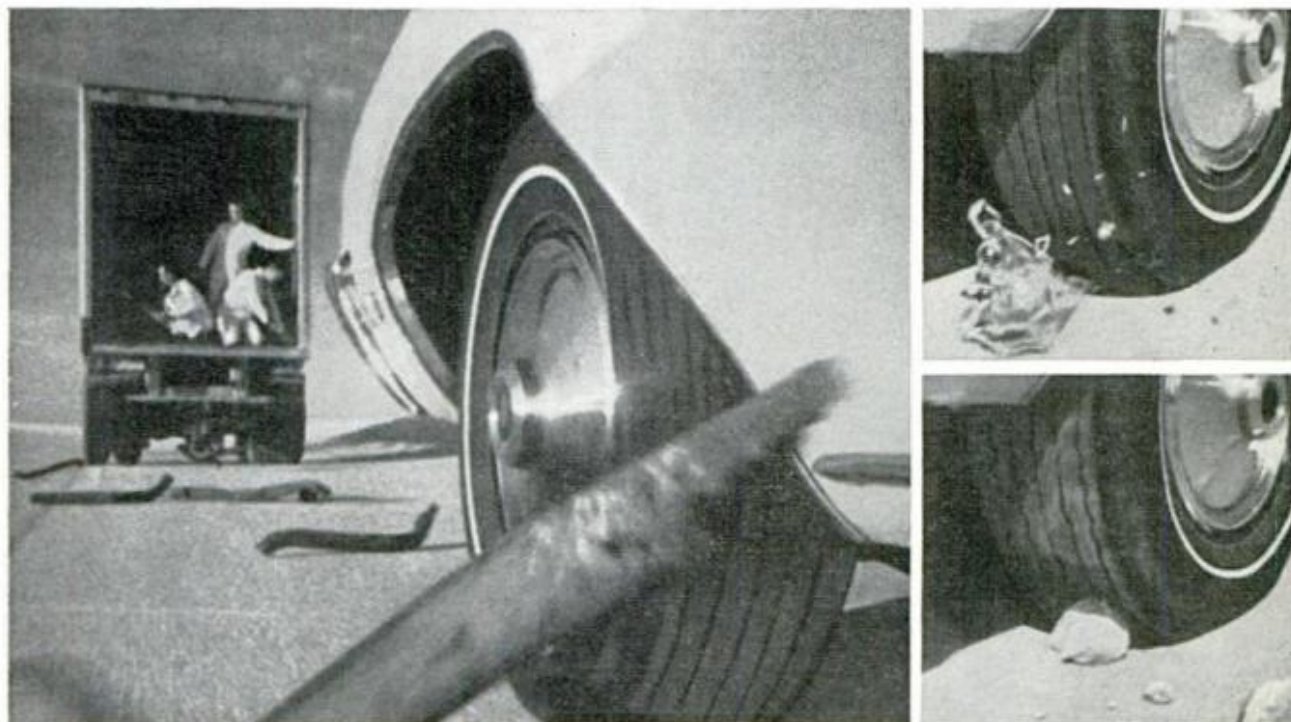
"Honey, the boss wants me here Saturday"

"The weekend weather: rain beginning Saturday..."

"Jim, Billy's temperature is over 100"

"...arriving around noon Saturday. Love, Aunt Lucy"

There are enough things to spoil your weekends—
We didn't want Firestone tires to be one of them.



Because weekends are too short for tire trouble, we threw all kinds of things in front of double-belted Firestone tires — to show you how the strength of double belting gives you added protection against road hazards. You can get Firestone Sup-R-Belt tires on your car before next weekend wherever you see the Firestone sign, on convenient credit terms.

"have a good weekend"

Firestone

FREE... Any 3 Stereo LPs or

WITH NO OBLIGATION



66764 ELTON JOHN
Tumbleweed Connection
Uni LP, 8TR, CASS



41213 JESUS CHRIST SUPERSTAR
(2 record set)
Decca LP, 8TR, CASS



66782 BILL COSBY
When I Was A Kid
Uni LP, 8TR, CASS



67517 THREE DOG NIGHT
Golden Biscuits
Dunhi LP, 8TR, CASS



68030 CROSBY, STILLS, NASH & YOUNG
Four Way Street
(2 record set)
Atlan LP, 8TR, CASS



65797 GABOR SZABO
Blowin' Some Old Smoke
Budda LP, 8TR, CASS



42780 LED ZEPPELIN III
Atlan LP, 8TR, CASS



37833 ROD MCKUEN
In The Beginning
Sunset LP, 8TR



43871 STATLER BROS
Bed of Roses
Merco LP, 8TR, CASS



42988 ROGER WILLIAMS
Love Story
Kapp LP, 8TR, CASS



75002 JACKSON 5
Maybe Tomorrow
Motow LP, 8TR, CASS



50506 BUFFY SAINT-MARIE
Wanna Be A Ballerina
Vangu LP, 8TR, CASS



21597 RIMSKY-KORSAKOV
Scheherazade
Yorks LP, 8TR, CASS



33093 IAN & SYLVIA
Greatest Hits
(2 record set)
Vangu LP, 8TR, CASS



44765 SHIRLEY BASSEY
Is Really Something
UniAr LP, 8TR, CASS



21551 BEETHOVEN
Piano Sonatas
Yorks LP, 8TR, CASS



42986 ROGER WILLIAMS
Golden Hits
Vol. II
Kapp LP, 8TR, CASS



42665 CROSBY STILLS & NASH
Atlan LP, 8TR, CASS



32882 JOAN BAEZ
Joan Baez 5
Vangu LP, 8TR, CASS



33182 SUSAN SINGS
SESAME STREET SONGS
Scept LP, 8TR, CASS



41217 BERT KAEMP-FERT
Orange Colored Sky
Decca LP, 8TR, CASS



37837 FLIP WILSON
Flipped Out
Sunset LP, 8TR



48800 B. B. KING
Live At Cook County Jail
ABC LP, 8TR, CASS



38373 IKE & TINA TURNER
Workin' Together
Liber LP, 8TR, CASS



30618 DIANA ROSS
Motow LP, 8TR, CASS



21633 RED ARMY ENSEMBLE
Yorks LP, 8TR, CASS



38368 VENTURES
10th Anniversary Album
(2 record set)
Liber LP



39089 5th DIMENSION
Greatest Hits
SouGi LP, 8TR, CASS



43870 MELBA MOORE
Look What You're Doing
Merco LP, 8TR, CASS



68019 EMERSON, LAKE & PALMER
Cotil LP, 8TR, CASS



16595 VIRGIL FOX
Bach at the Fillmore
Decca LP, 8TR, CASS

Compare and see!

See for yourself why over 1 1/2 million record and tape collectors paid \$5 to join Record Club of America when other record or tape clubs would have accepted them free.

	Citadel Record Club (as adv. in TV Guide Oct. 3, 1970)	Columbia Stereo Tape Cartridge Service (as adv. in Esquire Nov. 1970)	Capitol Record Club (as adv. in Look Jan. 26, 1971)	Columbia Record Club (as adv. in Playboy Feb. 1971)	RCA Stereo 8 Tape Club (as adv. in Esquire Oct. 1970)	RECORD CLUB OF AMERICA
CAN YOU CHOOSE FROM ALL LABELS' LP'S OR TAPES, INCLUDING CARTRIDGE AND CASSETTE TAPES?	NO	NO	NO	NO	NO	YES! Choose any LP or tape on any label! No exceptions! Over 300 different manufacturers including Capitol, Columbia, RCA, A&R, London, etc.
MUST YOU BUY A "MINIMUM" NUMBER OF RECORDS OR TAPES? HOW MANY?	12	12	12	10	6	NONE! No obligations! No yearly quota! Take as many, as few, or nothing at all if you so desire!
HOW MUCH MUST YOU SPEND TO FULFILL YOUR LEGAL OBLIGATION?	\$59.76 to \$71.75	\$83.76 to \$95.40	\$59.76 to \$71.76	\$49.80 to \$59.80	\$41.70 to \$47.70	ZERO DOLLARS! You don't have to spend a penny—because you're not "legally obligated" to buy even a single record or tape!
CAN YOU BUY ANY RECORD OR TAPE YOU WANT AT A DISCOUNT?	NO	NO	NO	NO	NO	ALWAYS! Your discount up to 75% OFF—guaranteed never less than a third! No exceptions!
DO YOU EVER RECEIVE UNORDERED RECORDS OR TAPES?	YES	YES	YES	YES	YES	NEVER! There are no orders which you must return. Only the records and tapes you want are sent—and only when you ask us to send them.
HOW LONG MUST YOU WAIT FOR SELECTIONS TO ARRIVE?	5 to 6 weeks	5 to 6 weeks	5 to 6 weeks	5 to 6 weeks	5 to 6 weeks	NO LONG WAITS! Your order processed same day received. No shipping on cycle.

TYPICAL "EXTRA DISCOUNT" SALE

\$4.98 LPs average as low as \$1.96
\$5.98 LPs average as low as \$2.25
\$6.98 LPs average as low as \$2.56

Savings of 63% or more from recent Club sales up to \$4.42 per LP. Start these giant savings now... not after you fulfill your obligation like the other clubs.

	Label	List Price	Average Club Price
Andy Williams—Love Story	Colum	5.98	2.25
Anne Murray	Capit	5.98	2.25
Ed Ames—This Is	RCA	6.98	2.56
2001—A Space Odyssey	MGM	6.98	2.56
Mary Travers—Mary	War Br	4.98	1.96
Creedence Clearwater			
Revival—Pendulum	Fanta	4.98	1.96
Miles Davis—Bitches Brew	Colum	5.98	2.25
Love Story—Soundtrack	Param	5.98	2.25
Perry Como—It's Impossible	RCA	5.98	2.25
Bloodrock—3	Capit	5.98	2.25
Santana—Abraxas	Colum	5.98	2.25
Worst of Jefferson Airplane	RCA	5.98	2.25

RECORD CLUB OF AMERICA—The World's Largest Record and Tape Club

Any 1 Tape or Cartridge or Cassette Shown Here Worth up to \$20.94

TO BUY ANYTHING EVER!

Yes, take your pick of these great hits right now! Choose any 3 Stereo LPs (worth up to \$20.94) or any 1 Stereo Tape (cartridge or cassette, worth up to \$13.96) FREE... as your welcome gift from Record Club of America when you join at the low lifetime membership fee of \$5.00. You can defer your selection of FREE items and choose from an expanded list later if you can't find 3 LPs or 1 Tape here. We make this amazing offer to introduce you to the only record and tape club offering guaranteed discounts of 33 1/3% to 79% on all labels—with no obligation or commitment to buy anything ever. As a member of this one-of-a-kind club you will be able to order any record or tape commercially available, on every label—including all musical preferences. No automatic shipments, no cards to return. We ship only what you order. Moneyback guarantee if not satisfied.



66738 NEIL DIAMOND
Tap Root Manuscript
Uni LP, 8TR, CASS



65793 BREWER & SHIPLEY
Tarkio
KamSu LP, 8TR, CASS



38376 CANNED HEAT
'N JOHN LEE HOOKER
(2 record set) Liber LP



42784 STEPHEN STILLS
Atlan LP, 8TR, CASS



66709 ORSON WELLES
Begatting of the President
Media LP



65784 MELANIE
Leftover Wine
Budda LP, 8TR, CASS



21537 TCHAIKOVSKY
1812 Overture
Yorks LP, 8TR, CASS



41152 WHO
Tommy
(2 record set)
Decca LP, TR, CASS



33185 JOSEPH & THE AMAZING TECHNICOLOR DREAMCOAT
Scept LP, 8TR, CASS



33183 B. J. THOMAS
Most of All
Scept LP, 8TR, CASS



67519 STEPPENWOLF
Gold
Dunhi LP, 8TR, CASS



33092 BEST OF BUFFY SAINTE-MARIE
(2 record set)
Vangu LP, 8TR, CASS



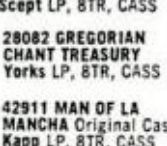
44746 DUKE ELLINGTON
70th Birthday Concert
(2 record set) SolSt LP



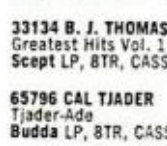
33179 DIONNE WARWICK
I'll Never Fall in Love Again
Scept LP, 8TR, CASS



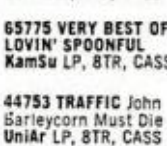
44726 FERRANTE & TEICHER
10th Anniversary Album
(2 record set) UniAr LP



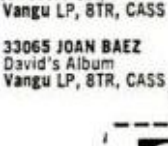
28082 GREGORIAN CHANT TREASURY
Yorks LP, 8TR, CASS



33134 B. J. THOMAS
Greatest Hits Vol. 1
Scept LP, 8TR, CASS



65775 VERY BEST OF LOVIN' SPOONFUL
KamSu LP, 8TR, CASS



33065 JOAN BAEZ
David's Album
Vangu LP, 8TR, CASS



65796 CAL TJADER
Tjader-Ada
Budda LP, 8TR, CASS



44753 TRAFFIC
John Barleycorn Must Die
UniAr LP, 8TR, CASS

NOW YOU CAN CHARGE IT, TOO!

AT LAST A RECORD AND TAPE CLUB WITH NO "OBLIGATIONS"—ONLY BENEFITS!

Ordinary record and tape clubs make you choose from a few labels—usually their own! They make you buy up to 12 records or tapes a year—usually at list price—to fulfill your obligation. And if you forget to return their monthly card—they send you an item you don't want and a bill for \$4.98, \$5.98, \$6.98, or \$7.98! In effect, you may be charged almost double for your records and tapes.

BUT RECORD CLUB OF AMERICA ENDS ALL THAT!

We're the largest all-label record and tape club in the world. Choose any LP or tape (cartridges and cassettes), including new releases. No exceptions! Take as many, or as few, or no selections at all if you so decide. Discounts are GUARANTEED AS HIGH AS 79% OFF! You always save at least 33 1/3%. You get best sellers for as low as 99¢.

NO AUTOMATIC SHIPMENTS

With our Club there are no cards which you must return to prevent shipment of unwanted LPs or tapes (which you would have to return at your own expense if you have failed to send written notice not to ship). We send only what you order.

HOW CAN WE BREAK ALL RECORD AND TAPE CLUB RULES?

We are the only major record and tape club NOT OWNED... NOT CONTROLLED... NOT SUBSIDIZED by any record or tape manufacturer anywhere. Therefore, we are not obliged by company policy to push any one label. Nor are we prevented by distribution commitments from offering the very newest LP's and tapes.

SPECIAL INTRODUCTORY MEMBERSHIP OFFER
Join RECORD CLUB OF AMERICA now and take advantage of this special Introductory Membership Offer. Choose any 3 LPs or any 1 tape shown here (worth up to \$20.94) and mail coupon with check or money order for \$5.00 membership fee (a small handling and mailing fee for your free

LPs or tapes will be sent later. If you can't find 3 LPs or 1 tape here, you can defer your selection and choose from expanded list later. This entitles you to LIFETIME MEMBERSHIP—and you never pay another club fee. Your savings have already more than made up for the nominal membership fee.

NOW YOU CAN CHARGE IT

If you prefer, you may charge your membership to one of your credit cards. We honor four different plans. Check your preference and fill-in your account number on the coupon.

LOOK WHAT YOU GET

- **FREE Lifetime Membership Card**—guarantees you brand new LPs and tapes at discounts up to 79%... Never less than 1/3 off.
- **FREE Giant Master LP and Tape Catalog**—lists all readily available LPs and tapes (cartridges and cassettes) of all labels (including foreign)... all musical categories.
- **FREE Disc and Tape Guide**—The Club's own Magazine, and special Club sale announcements which regularly bring you news of just-issued new releases and "extra discount" specials.
- **FREE ANY 3 Stereo LPs or any 1 Tape** shown here (worth up to \$20.94) with absolutely no obligation to buy anything ever!

GUARANTEED INSTANT SERVICE

All LPs and tapes ordered by members are shipped same day received (orders from the Master Catalog may take a few days longer). ALL RECORDS AND TAPES GUARANTEED—factory new and completely satisfactory or replacements will be made without question.

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If you aren't absolutely delighted with our discounts (up to 79%)—return items within 10 days and membership fee will be returned AT ONCE! Join over one and one-half million budget-wise record and tape collectors now.



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YORK, PENNSYLVANIA 17405 V051

Yes—Rush me a lifetime Membership Card, Free Giant Master LP & Tape Catalog, and Disc & Tape Guide at this Special Membership Offer. Also send me the 3 FREE LPs or 1 FREE tape which I have indicated below (with a bill for a small mailing and handling charge). I enclose my \$5.00 lifetime membership fee. This entitles me to buy any LPs or tapes at discounts up to 79%, plus a small mailing and handling charge. I am not obligated to buy any records or tapes—no yearly quota. If not completely delighted I may return items above within 10 days for immediate refund of membership fee.

3 FREE LPs

or 1 FREE TAPE

8 track
 cassette

or Defer Selection—send expanded list.

Mr. _____
Mrs. _____
Miss _____

Address _____

City _____ State _____ Zip _____

All Servicemen write Soc. Sec. # _____

CHARGE IT to my credit card. I am charging my \$5.00 membership (mailing and handling fee for each FREE LP and tape selected will be added).

Check one: Diners Club Master Charge
 American Express BankAmericard

Acct. # _____ Expiration Date _____

Signature _____

Canadians: mail coupon to above address. Orders to be serviced from Canada.

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RECORD CLUB OF AMERICA—The World's Lowest Priced Record and Tape Club

SOLUTIONS FOR MECHANICAL HEADACHES

AUTOMOBILE CLINIC

BY MORT SCHULTZ

A shattering shudder

The front end of my 1970 Plymouth Fury III shudders when I apply the brakes at speeds above 50 mph. I've been told that all Plymouths (and other cars) do this. Must I live with the problem or is there a fix?—Edward A. Place, Danville, Iowa.

Many cars have the problem, which can be avoided. In many cases, air guns that servicemen use to run up wheel nuts are distorting brake drums. Have the drums in your car turned with wheels on and the nuts properly torqued. That should stop the present trouble. To keep it stopped, have wheel nuts tightened in the proper way—with a torque wrench. For your car, the correct wheel-nut torque is 65 ft.-lb. Just to be sure that it's not causing your problem, I would also check the lower control-arm strut front-attaching nuts for proper torque as well. Correct torque here is 52 ft.-lb.

Swampy trunk

Last summer I purchased a used 1964 Thunderbird that's in fine shape except that moisture collects on the underside of the trunk cover. What can be done?—Gunnar Jensen, Huntington Station, N.Y.

Be sure the weatherstripping is in A-1 condition and the trunk lid is aligned so that it compresses the weatherstripping firmly all around. You should have a tight seal. Otherwise heat from the exhaust system will seep into the trunk.

In a pinch

My 1970 Pontiac Catalina with three-speed (M38) transmission shifts as hard as an Army deuce-and-a-half truck. My dealer has checked linkage and all vacuum hookups, and has replaced the modulator valve many times. The last modulator change included a booster spring with washer for added strength. Can you offer any suggestions?—Rod Vallot, Lake Charles, La.

Look closely for a pinched hose from the modulator to the engine that's choking off vacuum. I've found a couple like this that were stamped too tightly at the fac-

tory. If you find a pinched area, cut it out and put a length of rubber line in its place. Also check the vacuum modulator for loose fittings, a vacuum leak or a stuck valve. Be sure the pressure regulator isn't sticking, and inspect the 1-2 and 2-3 accumulator for a sticking piston, bore damage and broken rings or springs.

Low slung rear

I ordered my 1969 Chevrolet Camaro convertible with heavy-duty suspension. It has F78-14 tires. The rear end is too close to the ground. What can be done?—David W. Martin, Fort Washington, Pa.

The rear suspension riding height of a 1969 Camaro is $2\frac{7}{16}$ in. $\pm \frac{1}{2}$ in. This measurement is the vertical distance from the top of the axle housing to a point rearward of the bend in the frame adjacent to the jounce bumper. When the measurement is taken, the car should be at curb weight—that is, a full gas tank, no passengers, and spare tire and jack in the trunk—and positioned on a smooth level floor. If the trim height is below specification, replace the springs.

When to check oil


My service station attendant insists that motor oil should be checked with the engine cold. I say that the engine should be warm, because when it is cold, oil is thick and you would get an inaccurate reading. What do you say?—Steven Terry, Covington, La.

Forget what I say. The car manufacturers state that the best time to check oil is before operating the engine or as the last step in a full stop. This allows the normal oil accumulation in the engine to drain back into the crankcase.

Sloppy steering

After I took delivery of my 1971 Plymouth Barracuda I found that water had gotten into my power-steering reservoir because of a missing power-steering cap. I had the dealer flush the system and supply me with a cap. The mechanic who did the job put in automatic transmission

(Please turn to page 18)

A man and a woman are shown in a romantic embrace at an outdoor party. The man, on the left, is wearing a light blue button-down shirt and light-colored cargo pants, holding a cigarette and a decorative fan. The woman, on the right, is wearing a patterned top and a dark blue skirt, reaching up to touch a glowing orange paper lantern. Other lanterns in shades of yellow and blue are hanging from a string above them. The background is filled with lush greenery and potted plants, creating a warm, intimate atmosphere.

Tonight it's
the Orient at home.
They like their parties
a little different. And
getting ready for them is
at least half the fun.
Their cigarette?
Viceroy. They won't settle
for less.

It's a matter of taste.

All the taste.
All the time.



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

AUTOMOBILE CLINIC

(Continued from page 16)

fluid. He said that it's okay to use. The fluid has turned a milky pink color. Is this normal or did it happen because the wrong fluid was used?—Thomas Langston, Glendora, N.J.

The discoloration is probably due to air or water that remained in the system after flushing. However, I would flush fluid from the system again and have the right power-steering fluid put in. According to Chrysler Corp., "Power steering fluid, part No. 2084329, or its equivalent, is recommended. Caution: Do not use automatic transmission fluid." You can't get any more explicit than that.

Window rattle

I have a 1970 Mercury Marquis with a window problem. On a slightly rough road the windows rattle as if someone were beating on them with a hammer. I'm told that other Marquis have similar troubles. Hope you can suggest a solution.—C.L. Edwards, Chester, Mont.

Try service bulletin 9 (1971 series) that tells your dealer how to correct the separation between the glass and the lower channel. The modification applies to all Mercs with the problem.

Cups and scallops

Last August I noticed wear (cupping) on the right front tire. I had the front end aligned. The same thing is happening again. Shouldn't a front end alignment have cured my problem?—Lloyd B. Douglass, Milton, Mass.

I think that wheel balancing is needed. Each tire and wheel as a unit should be statically and dynamically balanced off the car. Then the tire wheel and brake drum should be rechecked on the car. If an unbalanced condition is reflected, the brake drum is out-of-balance and should be replaced. In addition, I would rotate tires to equalize wear.

A car that hesitates . . .

I have a 1970 Opel with 1.9-liter engine and a hell of a hesitation on acceleration. The head guy at the dealership knows that

the problem exists—says it's been around for some time—but he doesn't know how to fix it. How long do we have to wait for a cure?—Walter W. Condon, Brush Prairie, Wash.

For as long as it takes you to read this. First make sure ignition timing is smack on the button—TDC at 700 rpm. It's critical. Now have your dealer apply the fix outlined in service bulletins 70-T-04 and 70-1-33, which tell him to apply a new carburetor kit that will give you a more substantial flow of gasoline into the manifold on acceleration.

LeSabre dance

The rear end of my 1970 Buick LeSabre swings around when I hit the brake. I have found myself facing the opposite way. Why?—N.C. Walters, Sherman Oaks, Calif.

Because the rear wheels are locking, while the front wheels remain unlocked. Buick recommends that you have the rear wheel cylinders replaced with those designed for the 1970 Riviera. This will permit even distribution of braking power.

Service Tips

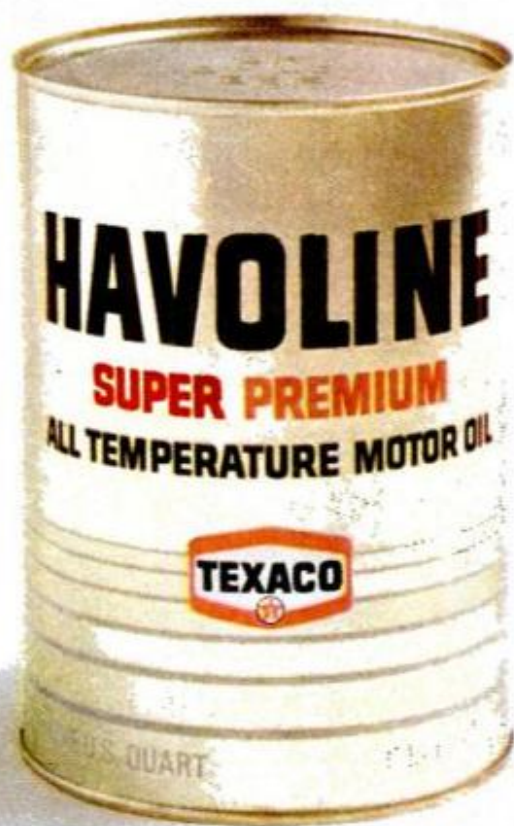
● **1971 Capri owners**, if their cars were built before September of 1970, may have wet feet because of water entering the passenger compartment. There's a better way of handling the trouble than wearing boots. Have your dealer replace the undersize plenum drain hose as outlined in service bulletin 9.

● **1971 Chrysler and Plymouth**: A lag, stumble or die-out during acceleration with cars that have 318-cu.-in. engines is the subject of a couple of important service bulletins. The information applies to those models which are equipped with Rochester two-barrel carburetors and explains how to enlarge the idle channel and jets. The number of the bulletin applying to Dodge is D71-14-3. Bulletin 71-14-2 is for Chrysler and Plymouth.

● **Oldsmobile** has issued a new upper bypass hose-repair kit (part No. 231256) for 1964 models with 330-cu.-in. engine and all 1965 through 1970 models with V8 engines. The 1971 cars are being equipped at the factory. The cast-iron thermostat housing and pipe assembly in the new kit will outlast the aluminum parts originally used. ★ ★ ★

GOT A PROBLEM WITH YOUR CAR? Ask Mort about it. Send your question to Auto Clinic, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. Letters cannot be answered individually, but problems of general interest will be published in the column.

The new motor oil that does great things for your car. Everywhere. Always.



Our new Havoline Super Premium All Temperature Motor Oil does amazing things to lubricate and protect a car's engine.

New Havoline is resistant to thickening under high-temperature conditions. Such as heavy-load, high-speed driving. Next, it is also fantastic at low temperatures.

We tested it all the way down to -30°F. , and it was still flowing.

Of course, new Havoline Super Premium prevents rust, wear, and sludge deposits. And, it will also protect anti-pollution devices better than ever, helping to minimize "smog" emissions.

Now that's an oil you can really trust!



MAKE BIG MONEY

OPERATING HEAVY EQUIPMENT



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The Construction Industry is Booming! Earn top money in this fast moving, action-packed field. Keep present job and train at home in spare time followed by practical training on our machines under project conditions at our facilities. Nationwide placement assistance. For FREE information fill out and mail coupon today!
Member American Road Builders' Assn.

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Phone: (305) 642-2332 (24 Hours)

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Address _____

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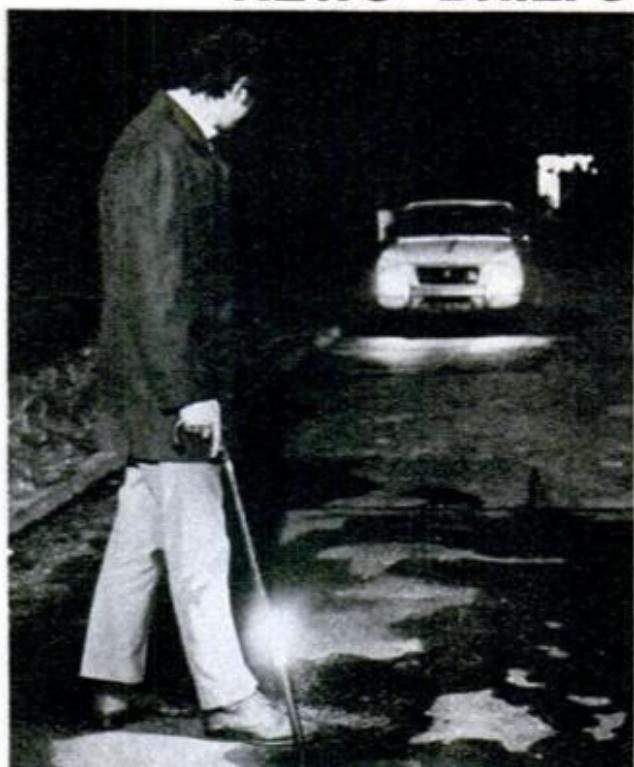
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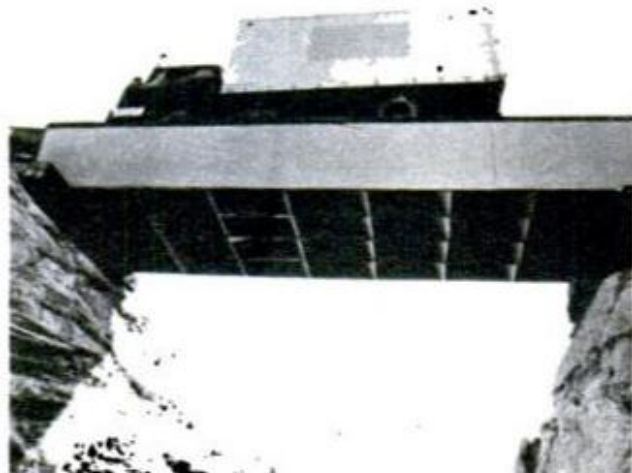
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NEWS BRIEFS



Flashing walking stick

Walking alongside a roadway at night, the user of a new British cane need only flip a switch to set off a built-in blinking light and warn drivers of his presence. The cane breaks down into two sections for storage.



Looks great on paper

A 12,000-pound truck offers dramatic proof that a paper bridge can withstand traffic. A development of International Paper Co., the bridge required 9000 pounds of paper and glue. Environspace Corp. designed it.

Uncommon carriers

Uncommon cargoes? Don't flip. Datsun gives you two great ways to haul.

Seals to Sasswood—the tough Li'l Hustler Pickup. Penguins to Potentates—try the more luxurious 5-Door Wagon.

Both give you 96 horsepower overhead cam engines. Potent in the short haul, reliable in the long. Both have some six feet of bed and floor space.

The Li'l Hustler, for example, has a flat loading tailgate. Slide on a spinet or generator. Hay bales or surfboards. Tie them down—there are plenty of built-in hooks. Slip into the all-vinyl

upholstered cab, flick the neat 4-speed stick and away you go.

And whatever you stash in the easy-load Wagon, you don't have to worry about the easy-to-clean vinyl upholstery. You just relax in full-reclining front buckets. Cool it under tinted glass (all standard equipment). And if shifting the full-synchro 4-speed isn't your style, liberate a hand and foot with the optional 3-speed automatic.

Carry out your plans in a Datsun. The number one selling import truck's just \$1916.* The perfect-size 5-Door Wagon just \$2350.*

Drive a Datsun...then decide.

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HOMEOWNERS' CLINIC

BY W. CLYDE LAMMEY

Orienting your new house

We plan to build a new house on our lot next spring. Can you outline briefly how to place a house to gain best advantage of sunlight, air circulation and privacy?—A.L., Tex.

Consider first your local building restrictions, then plan window sizes and exposure to sunlight the year round, direction of prevailing winds, location of plantings and use of fencing or shrubbery or both to attain the desired privacy. A simple penciled plotting of these various features will help you plan your home.

Painting brick house

I own an older brick house and although the brickwork is still in good condition the structure is of a style I think would look better painted. But my wife says no. Can you help us decide?—F.M., N.Y.

This question comes up for discussion often. I'm inclined to agree with your wife. I, too, don't like painted brickwork; any painted masonry, in fact. There's another factor: Paint on masonry, also brickwork, tends to weather rather rapidly, resulting in a grayish, patchy look that's not pleasing to the eye. You can give some old brickwork a freshened appearance by coating it with a masonry sealer, which is a colorless liquid similar to clear varnish.

Softening old putty

Several windows in my home need to be reputtied. But how do I effectively soften old putty so that it can be removed easily, without damaging the wood? Can I use my propane torch?—E.W., Pa.

Yes, you can use the torch with the standard head, or nozzle, but one should keep the fire hazard in mind. It's best to remove the sash from the frames. One slow pass of the torch flame along the putty line usually does it. Knife out the softened putty immediately, also any paint on the frame that is softened; you'll have to repaint anyway. If the first pass doesn't get all the old putty, make a second sweep of the flame but be sure to keep it moving fast enough to prevent charring of the wood, or breakage of the glass pane.

Baffling fireplace problem

I like a blaze in my fireplace on those rainy fall evenings and several times when I've started the fire I can smell wood smoke in the basement, of all places! No smoke comes from the fireplace into the room. Neither I nor a neighbor have been able to figure this out. What gives?—W.N., Mich..

On those evenings when you enjoy your fireplace the air is "heavy," so to speak. Smoke from the flue trails downward, even near ground level in some instances. A slight stir of air outside can bring it in through your basement window; hence the odor of wood smoke in the basement. This is not a common atmospheric condition, but it does happen. You're fortunate that you don't get smoke in the family room.

Plaster patch shows

Before redecorating I patched an area about 1 ft. square on the ceiling. It shows under two coats of latex paint, although the second coat made it look much better than did the first. Did I omit something that should have been done?—D.E., Nebr.

I assume you used a prepared patching plaster but did you follow all the instructions? Check with a straightedge and you may find it's a little lumpy, which would cause high places to cast a shadow. Perhaps you can salvage the job by sanding flush, applying an undercoat of paint (same as used as top coat) and then spot-finishing the area. Better yet, apply another coat to the entire ceiling, as spot-finishing is not always satisfactory, although it can be done if you are careful to feather the edges.

Window sash sweats

I haven't converted to aluminum storms and screens as yet. The old, wood storm sash I have aren't the tightest fitting and, as a result, the window sash sweats in cold weather. What can I do to solve this problem?—O.L., Minn.

For a quick solution, fasten felt weatherstrip to all four edges of the poor fitting storm sash. To apply the felt, you can use a weatherproof glue or staples spaced about 6 in. apart. By applying the felt to your existing storm sash you, in effect, will create a force-fit when the window is pushed in position. Because of this, you may find it necessary to use a pair of turn-buckles per window instead of the original hangers.

★★★

Never a rough puff



Come all the way up to KOOL

Because Kool smokers like smooth taste, we thought they might like smooth sailing. So we're offering the popular Sea Snark sailboat. Ordinarily about \$120, this unsinkable 11-ft. boat is yours for only \$88 and one Kool carton end flap. So get Kool and stay cool, with the Sea Snark, and the taste of extra coolness.

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Price includes delivery of the sailboat pictured at right. Complete with 30-lb. polystyrene hull, all fittings, sail, and instructions.

Allow 6 weeks for delivery. Offer expires December 31, 1971, is limited to U.S.A., and to persons age 21 or over.

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Please send me _____ SEA SNARK(S). For each boat I enclose a carton end flap from Kool plus \$88. Certified check. Money order. I am 21 years of age or over.

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

18 mg. "tar," 1.4 mg. nicotine av. per cigarette, FTC Report Nov. 70.



I'd like to give this to my fellow men... while I am still able to help!

I was young once, as you may be—today I am older. Not too old to enjoy the fruits of my work, but older in the sense of being wiser. And once I was poor, desperately poor. Today almost any man can stretch his income to make ends meet. Today, there are few who hunger for bread and shelter. But in my youth I knew the pinch of poverty; the emptiness of hunger; the cold stare of the creditor who would not take excuses for money. Today, all that is past. And behind my city house, my

summer home, my Cadillacs, my winter-long vacations and my sense of independence—behind all the wealth of cash and deep inner satisfaction that I enjoy—there is one simple secret. It is this secret that I would like to impart to you. If you are satisfied with a humdrum life of service to another master, turn this page now—read no more. If you are interested in a fuller life, free from bosses, free from worries, free from fears, read further. This message may be meant for you.

By Victor B. Mason

I am printing my message in a magazine. It may come to the attention of thousands of eyes. But of all those thousands, only a few will have the vision to understand. Many may read; but of a thousand only you may have the intuition, the sensitivity, to understand that what I am writing may be intended for you—may be the tide that shapes your destiny, which, taken at the crest, carries you to levels of independence beyond the dreams of avarice.

Don't misunderstand me. There is no mysticism in this. I am not speaking of occult things, of innumerable laws of nature that will sweep you to success without effort on your part. That sort of talk is *rubbish!* And anyone who tries to tell you that you can *think* your way to riches without effort is a false friend. I am too much of a realist for that. And I hope you are.

I hope you are the kind of man—if you have read this far—who knows that anything worthwhile has to be *earned!* I hope you have learned that there is no reward without effort. If you have learned this, then you may be ready to take the next step in the development of your karma—you may be ready to learn and use the secret I have to impart.

I Have All The Money I Need

In my own life I have gone beyond the need of money. I have it. I have gone beyond the need of gain. I have two businesses that pay me an income well above any amount I have need for. And, in addition, I have the satisfaction—the deep satisfaction—of knowing that I have put more than three hundred other men in businesses of their own. Since I have no need for money, the greatest satisfaction I get from life is sharing my secret of personal independence with others—seeing them achieve the same heights of happiness that have come into my own life.

Please don't misunderstand this statement. I am not a philanthropist. I believe that charity is something that no proud man will accept. I have never seen a man who was worth his salt who would accept something for nothing. I have never met a highly successful man whom the world respected who did not sacrifice something to

gain his position. And, unless you are willing to make at least half the effort, I'm not interested in giving you a "leg up" to the achievement of your goal. Frankly, I'm going to charge you something for the secret I give you. Not a lot—but enough to make me believe that you are a little above the fellows who merely "wish" for success and are not willing to sacrifice something to get it.

A Fascinating and Peculiar Business

I have a business that is peculiar—one of my businesses. The unusual thing about it is that it is needed in every little community throughout this country. But it is a business that will never be invaded by the "big fellows." It has to be handled on a local basis. No giant octopus can ever gobble up the whole thing. No big combine is ever going to destroy it. It is essentially a "one man" business that can be operated without outside help. It is a business that is good summer and winter. It is a business that is growing each year. And, it is a business that can be started on an investment so small that it is within the reach of anyone who has a television set. But it has nothing to do with television.

This business has another peculiarity. It can be started at home in spare time. No risk to present job. No risk to present income. And no need to let anyone else know you are "on your own." It can be run as a spare time business for extra money. Or, as it grows to the point where it is paying more than your present salary, it can be expanded into a full time business—overnight. It can give you a sense of personal independence that will free you forever from the fear of lay-off, loss of job, depressions, or economic reverses.

Are You Mechanically Inclined?

While the operation of this business is partly automatic, it won't run itself. If you are to use it as a stepping stone to independence, you must be able to work with your hands, use such tools as hammer and screw driver, and enjoy getting into a pair of blue jeans and rolling up your sleeves. But two hours a day of manual work will keep your "factory" running 24 hours turning out a product that has a steady and

ready sale in every community. A half dollar spent for raw materials can bring you six dollars in cash—six times a day.

In this message I'm not going to try to tell you the entire story. There is not enough space on this page. And, I am not going to ask you to spend a penny now to learn the secret. I'll send you all the information, free. If you are interested in becoming independent, in becoming your own boss, in knowing the sweet fruits of success as I know them, send me your name. That's all. Just your name. I won't ask you for a penny. I'll send you all the information about one of the most fascinating businesses you can imagine. With these facts, you will make your own investigation. You will check up on conditions in your neighborhood. You will weigh and analyze the whole proposition. Then, and then only, if you decide to take the next step, I'll allow you to invest \$15.00. And even then, if you decide that your fifteen dollars has been badly invested I'll return it to you. Don't hesitate to send your name. I have no salesmen. I will merely write you a long letter and send you complete facts about the business I have found to be so successful. After that, you make the decisions.

Does Happiness Hang on Your Decision?

Don't put this off. It may be a coincidence that you are reading these words right now. Or, it may be a matter that is more deeply connected with your destiny than either of us can say. There is only one thing certain: If you have read this far you are interested in the kind of independence I enjoy. And if that is true, then you must take the next step. No coupon on this advertisement. If you don't think enough of your future happiness and prosperity to write your name on a postcard and mail it to me, forget the whole thing. But if you think there is a destiny that shapes men's lives, send your name now. What I send you may convince you of the truth of this proverb. And what I send you will not cost a penny, now or at any other time.

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science worldwide

By JOHN PEARSON



Detecting tides in a teacup

A LEVEL SENSOR SO SENSITIVE that it can detect the tidal pull of the sun and moon on the liquid in a teacup has been developed by the Hughes Aircraft Co. The sensor is capable of measuring tilt angles equal to one inch in 16,000 miles. A much larger version than that shown is used to test accelerometers in the Navy's Poseidon missile inertial guidance system. Another sensor is installed in an abandoned Colorado gold mine to measure movements of the Rocky Mountains caused by snow loads, tidal pulls and Earth tremors.

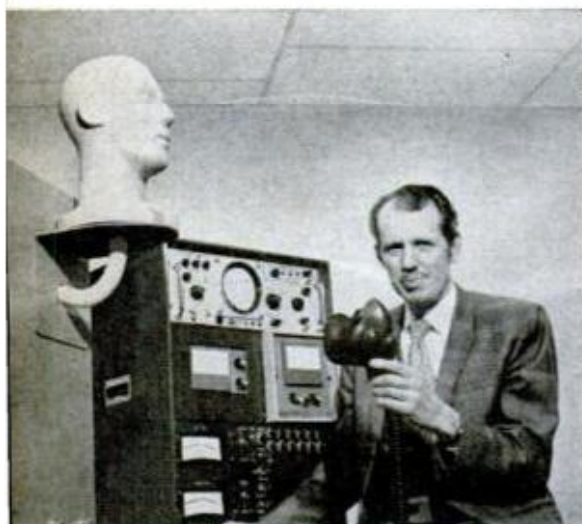
THE REAL THING. Dissatisfied with lab preparations, Dr. Mary Hewitt Loveless uses live wasps to give patients booster shots after immunization with wasp venom. The Connecticut allergist says that patients get longer-lasting protection, even though the method has problems. Frequently wasps won't sting. Best way to provoke them, according to the doctor, is to hold back their wings with forceps, which "makes them furious."

A MACHINE THAT INHALES AIR, consumes oxygen and exhales carbon dioxide—and that can pant or breathe as deeply as a man playing basketball—has been developed by the IBM Corp. The device will be used to improve the testing of protective masks, resuscitating equipment and space life-support systems. Breathing rate can be controlled from 5 to 60 breaths a minute. Exhaled breath is conditioned so that temperature is maintained within two degrees of 98.6°F.

ORPHANED LAMBS USUALLY ARE REJECTED by foster mothers because the young ones don't have a familiar smell. Now a New Zealander has solved the problem, according to a report in *News in Engineering*. Just spray a local anesthetic into the ewe's nostrils, killing her sense of smell. By the time the anesthetic wears off, the ewe has fully accepted the little newcomer.

EQUIPPED WITH TAPE RECORDER, slide projector and other special equipment, the "learning egg" permits a student to escape the distractions that abound in today's schools and do a bit of studying. Created by European designers, the egg was shown at a recent exhibition of educational equipment in West Germany.

DO DAMS CAUSE EARTHQUAKES? A geophysicist with the Commerce Dept.'s National Ocean Survey studied seismic data recorded at several U.S. dams and concluded that Hoover Dam has caused earthquakes but that none resulted from the building of Flaming Gorge, Utah, and Glen Canyon, Ariz., dams. The scientist thinks the massive weight of water behind dams built near active faults triggers tremors. ★★★



Air goes in, CO₂ comes out



Learning egg is no yoke

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Stock No. 71,272H \$89.75 Ppd.

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Relatively small (12") fixtures give surprisingly bright blacklight. Mirror-finished reflector makes instant starting 8-watt, high-intensity bulb look like 40-watter. Up to 5,000 hours of safe, long-wave (3660A) blacklight to really turn-on parties, light & theatrical shows, psychedelic decors, holiday decorations. Shockproof end-caps remove for safe, easy replacement of bulb and starter. Stands upright or horizontal. Aluminum case.

Stock No. 71,274H \$14.95 Ppd.

DELUXE OUTDOOR/INDOOR MODEL \$19.95 Ppd.

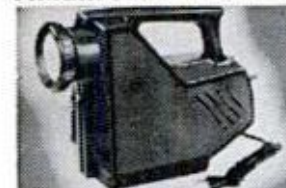
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AMERICAN MADE OPAQUE PROJECTOR



Projects illustrations up to 3" x 3 1/2" —enlarges them to 35" x 30" if screen is 6 1/2 ft. from projector, larger pictures if screen is farther away. No film or negatives needed. Primarily intended for children. Projects charts, diagrams, color or black-and-white in darkened room. 115 v. A.C. . . . 6 ft. cord and plug included. Size 12" x 8" x 4 1/2" wide. Weight 1 lb. 2 ozs. Plastic case.

Stock No. 70,199H \$8.75 Ppd.

HOT-AIR FLYING SAUCER KIT



Giant 9 ft. model rises to amazing heights. Easy to assemble and launch. Use over and over. Low cost. Lots of fun. Can carry 1 1/2 lb. objects with string tether. Fly school colors at games, use for advertising, attach mirror—play "spy in the sky." Includes complete instructions, 16 pre-cut = 1 white model paper gores, 8 red panels for portholes, wire, cord. Easily repaired if damaged.

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9 FT. HOT AIR BALLOON KIT \$2.00 Ppd.

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Go treasure hunting on the bottom! Fascinating fun & sometimes profitable! Tie a line to our 5 1/2-lb. Magnet—drop it overboard in bay, river, lake or ocean. Troll it along bottom—your "treasure" haul can be outboard motors, anchors, other metal valuables, 5 1/2-lb. Magnet is war surplus—Alnico V Type—Gov't cost \$50. Lifts over 150 lbs. on land.

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lbs. \$ 5.75 Ppd.

lbs. (lifts 40 lbs.) \$ 8.75 Ppd.

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AMAZING NEW Wankel Engine KIT!



Thrill to the fun of building your own see-through motorized model of revolutionary pistonless type engine . . . only engine experts think economically modifiable to meet new pollution standards. Replaces piston, cylinder, crank assemblies with rotating discs (sections removed for firing chambers). Smaller than conventional; fewer parts, greater reliability, same speed w/less horsepower. Feat: flashing plugs, rubber fan belt, stick-shift on-off switch. Req. 2-1.5V batt. (not incl.).

No. 71,424H (4 1/2"X5"X9") \$6.75 Ppd.

ASTRONOMICAL TELESCOPE KITS

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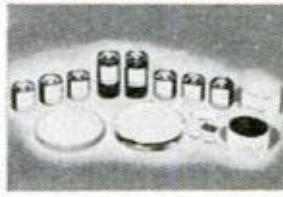
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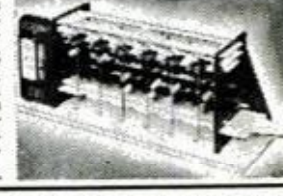
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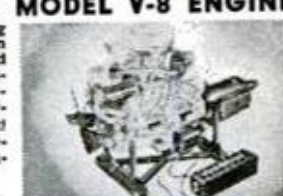
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Drivin' with Dan

Why are few stock-car drivers running 1971 models? What's behind the Indy-car change from the cigar to wedge shape? Does bleach aid dragster traction? Dan Gurney answers these and other automotive questions

Q. Why are so few NASCAR drivers running 1971 models?—Jay Hangen, West Lawn, Pa.

A. My guess is that since the factory participation has receded, the money to make the annual model changeover is not so readily available. The older models are still very competitive and the drivers are very familiar with them. Fundamentally, older versions are not really any older, but some difference in sheet-metal styling may be better—or worse—as far as racetrack performance goes.

Q. Why do you think Indy cars are changing from cigar shapes into straight-sided, wedge-shaped cars?—William Golisch, Moscow, Pa.

A. The rules are partly responsible, as is the supercharged engines' fuel appetite. The cars have to carry 75 gallons of fuel, and this fuel comprises much of their total sprung weight. A wedged, flat-sided, wide shape lets the fuel be carried much lower than a cigar shape does. The latter has less straight-ahead wind

resistance or drag, but the wedge converts some of its drag into down force which presses tires down in the curves and gives the car better traction, thus increasing its cornering ability. At the moment, the corners seem more important than the straights.

Q. I've read that a 426 Hemi Barracuda is the fastest street car turned out by Detroit. What would you guess it would run in terms of top speed?—Marco Montovan, Windsor, Ont., Canada.

A. About 130 mph in average trim.

Q. Do you think driving schools give you the best chance to start racing for company or privately owned teams?—Craig Welty, Pekin, Ill.

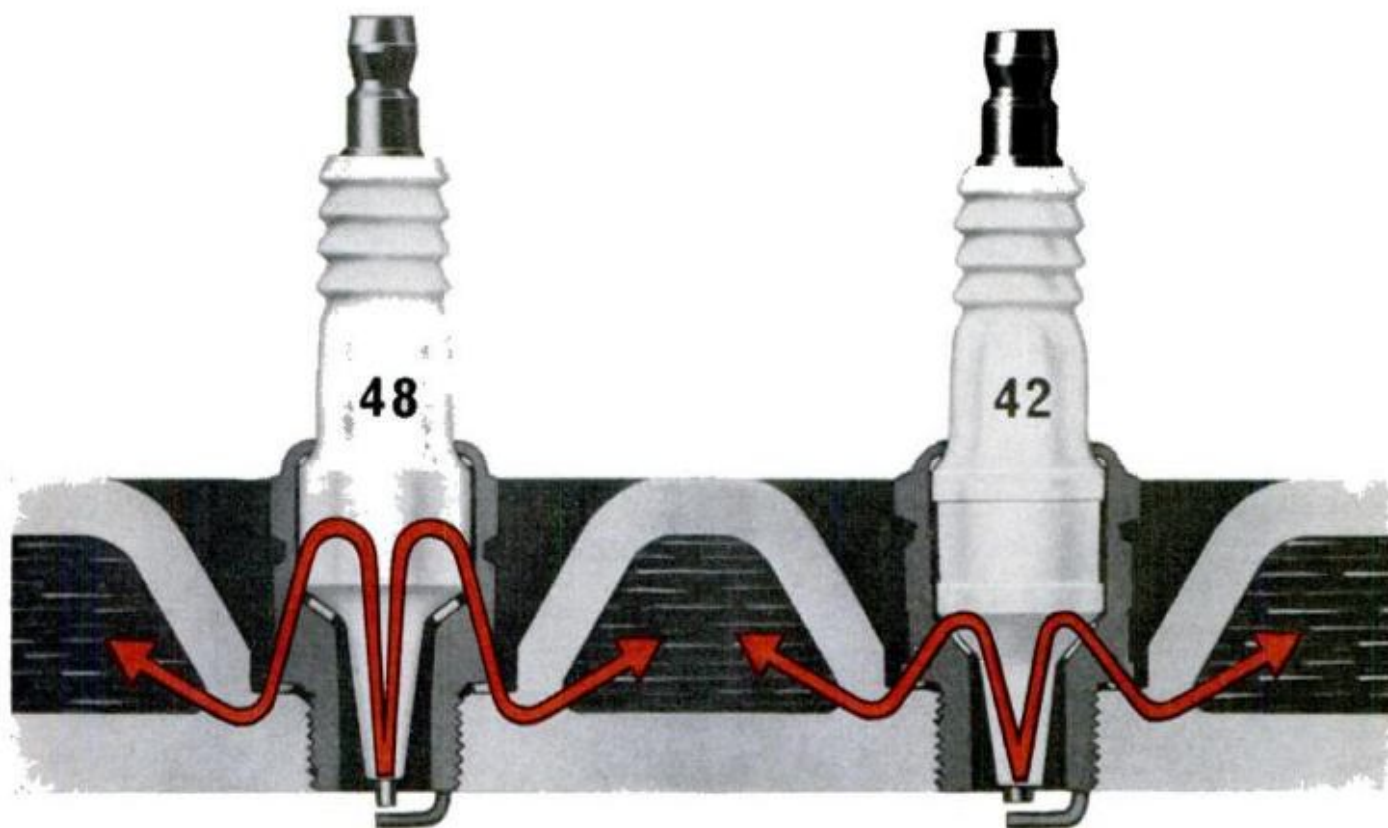
A. This is a great way to get started and it stands to reason that you should be able to avoid many "pitfalls" by paying close attention to what they tell you in driving school. In the meantime, it gives you experience—the

(Please turn to page 32)



TEAM MANAGER DAN discusses the handling of the Eagle chassis with driver Bobby Unser. This was just before the Rex Mays 150 at Wisconsin State Fair Speedway. Bobby had the pole but was forced out of the race at the halfway mark with ignition trouble. Bobby's brother, Al, went on to win the USAC race

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DRIVIN' WITH DAN

(Continued from page 30)

thing that is so important. You must get experience somehow, for that is your apprenticeship.

Q. Does the bleach they pour out for dragsters help their traction? If so, how?—Robin Osterman, Wichita, Kans.

A. Yes, it does help traction; how much is difficult to say. I'm told that people use three things: bleach, water and resin. The bleach and water work almost equally well—they are used to clean off the oil and dirt often picked up when rolling around the pits. Spinning of the tires creates a lot of heat, which makes the rubber softer; it then becomes gummy and gets a better grip on the pavement. Drivers don't like to spin their tires in an actual race, just in the warm-up or burn-out. Resin is used to make the tires even stickier for more traction.


Q. What do you look for when you are watching a race for fun, not running in it or doing anything else?—Ben Barnaby, Wilmington, Del.

A. First, I like to get as close to the action as possible. Then I try to watch the style of the various drivers to get an idea of how hard they are trying, how many chances they are taking, what sort of judgment they use to cope with the problems that come up due to traffic and changing track conditions.

Q. What one or two main points made the McLarens so much faster at Indy this year? And why didn't other cars have them?—J.L. Foster, Omaha.

A. The McLarens were lower in center of gravity, lighter overall, shorter in polar moment of inertia and better in weight distribution. They had a better, more stable aerodynamic configuration and some excellent suspension geometry. Their designers deserve a lot of credit. They didn't win, but there was no race at all as long as Donohue was in the race. The other guys' cars didn't have these features. ★ ★ ★

If you have questions on racing, high-performance and everyday driving techniques, send them to "Drivin' with Dan," c/o Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. Questions cannot be answered by individual letters. Questions on maintenance and repair should be addressed to the Auto Clinic (see page 16).



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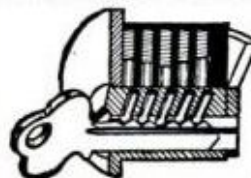
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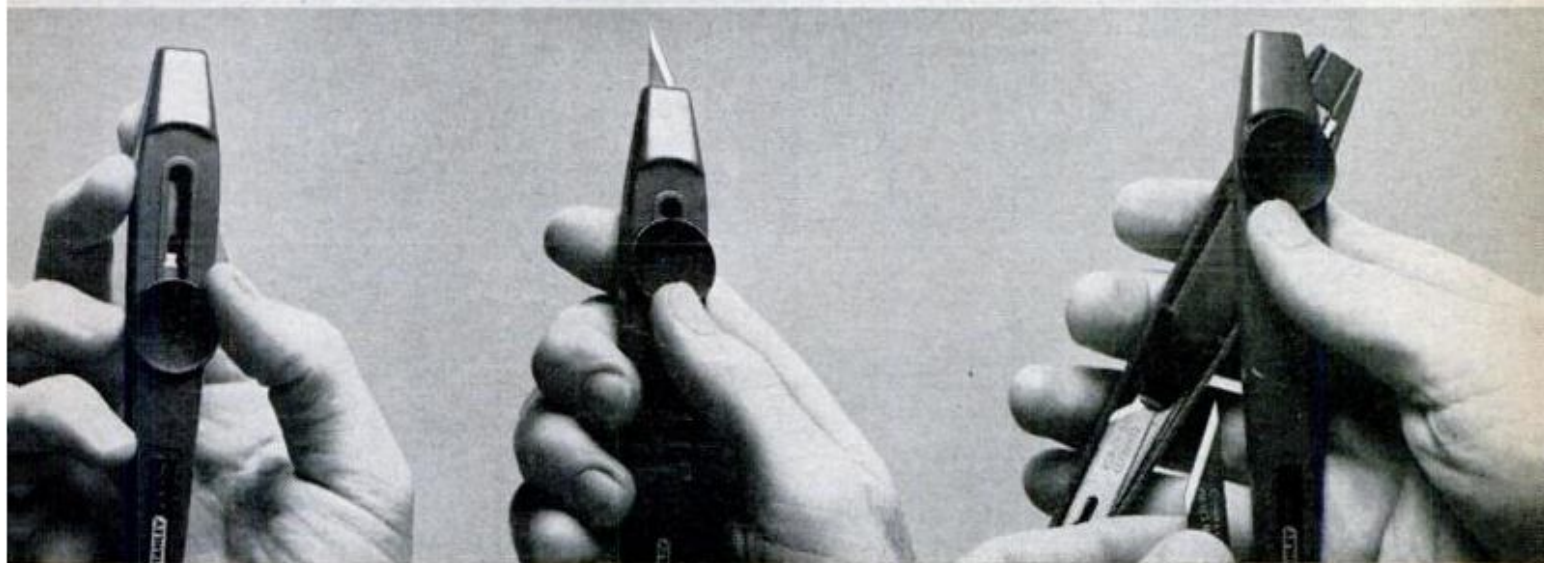
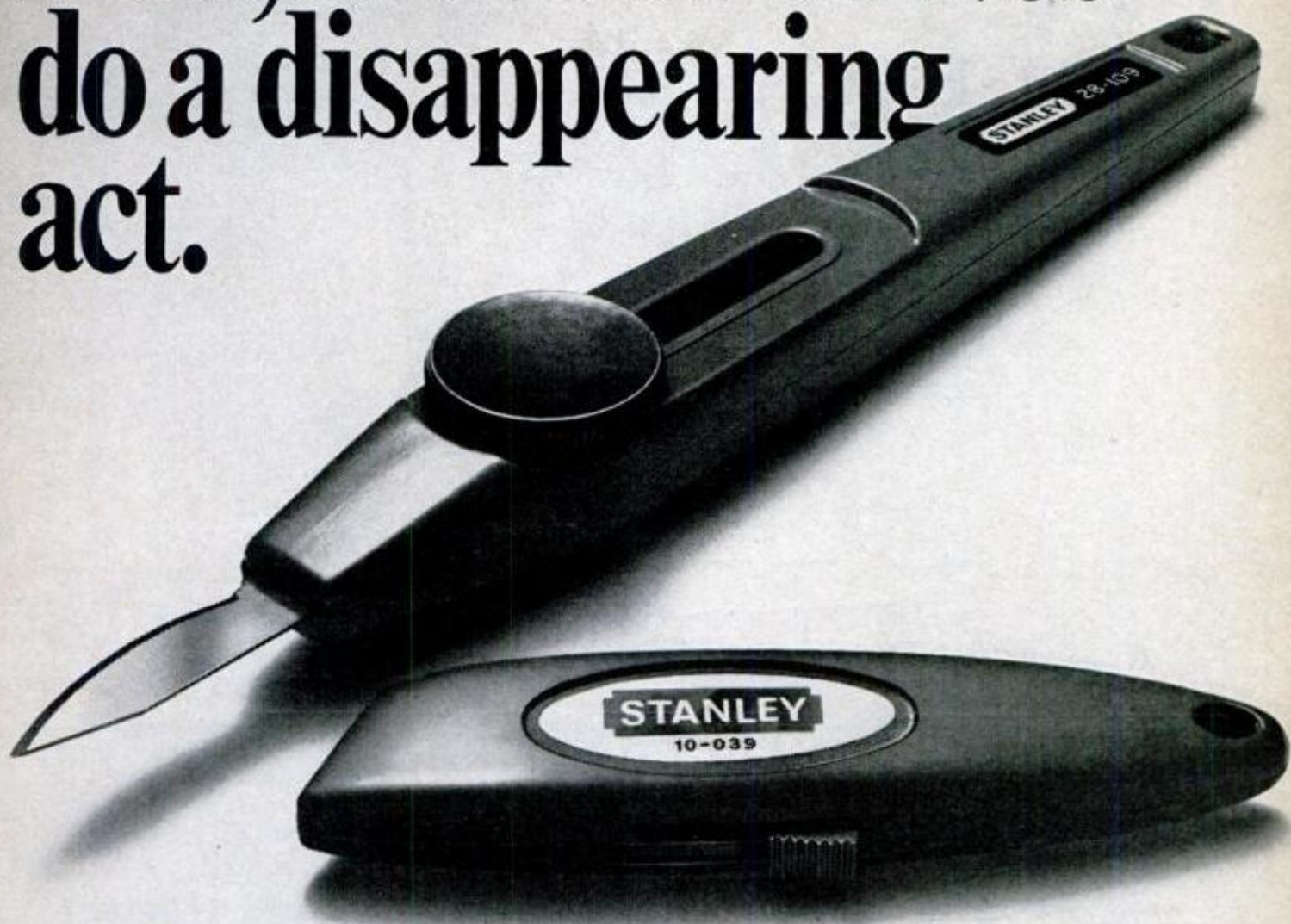
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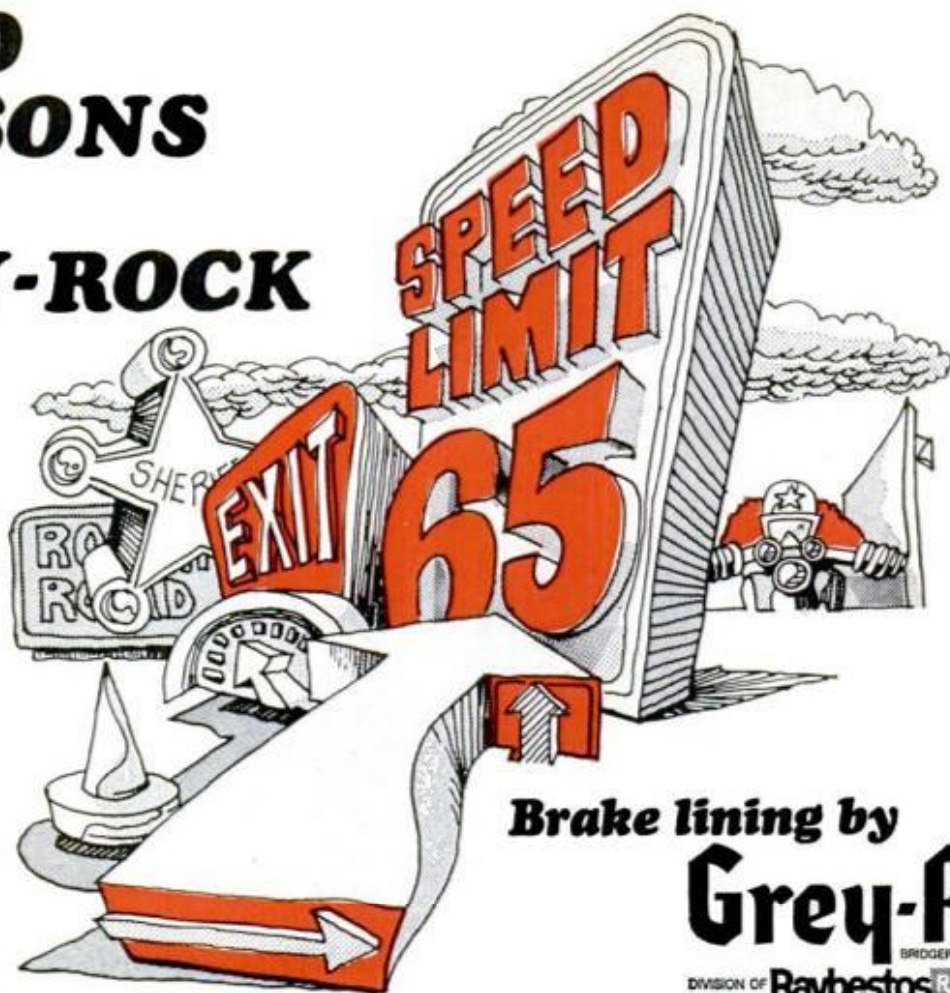


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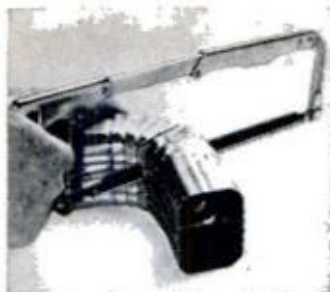


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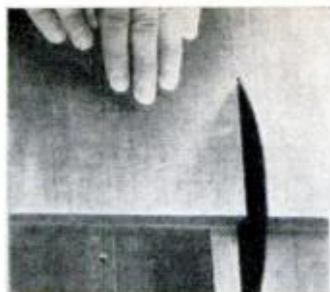
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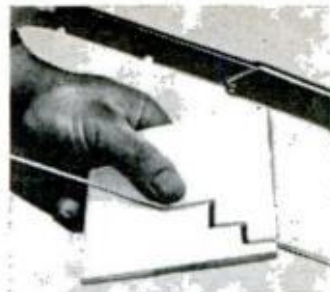
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REFRIGERATION is a hot subject these summer days. Camping expert Lee Oertle reports there's a new safety device designed for motor campers who like to run around with their gas refrigerators on. Refrig-Alarm, available from Travel Aids Manufacturing, Box 47, Pomona, Calif., provides a heat sensor on the box and a dash-mounted indicator to alert you if your reefer is not working.

Another interesting development in mobile cooling is Darwin, Inc.'s new battery-powered refrigerator. Rather than use a piston pump system, which generally means you must hermetically seal the entire unit (pump and motor) in its own metal container in order to prevent Freon loss, the Darwin system uses a diaphragm-type pump which merely confines the refrigerant to one side of an impervious diaphragm. The freezing coils are surrounded by a solution with the lowest possible melting point in a sealed plate. Coolness is retained for long periods. The Darwin system operates one hour on to eight off, so battery drain is minimal and the 1 to 4.5-cu.-ft.-capacity units thus represent a big breakthrough for battery-powered refrigerators for motor homes and boats.

Footnote: To practice what he preaches, Lee Oertle, regular contributor to *PM's* camping pages, recently opened his own

(Please turn to page 40)



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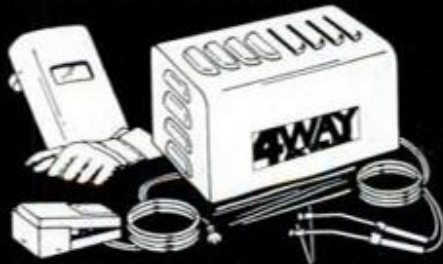
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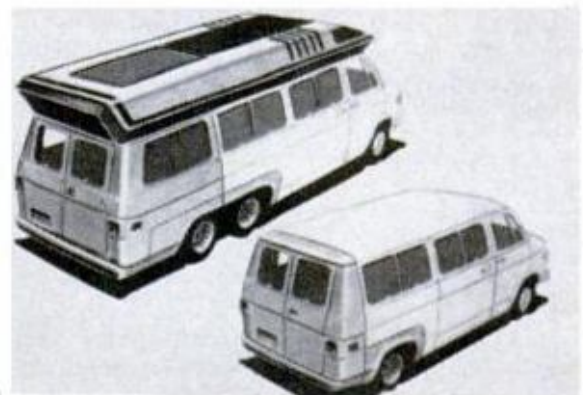


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ALL OUTDOORS

(Continued from page 38)

Beaver Canyon Campground in Beaver, Utah. Readers are invited to drop by and express opinions—or complaints. ★★★



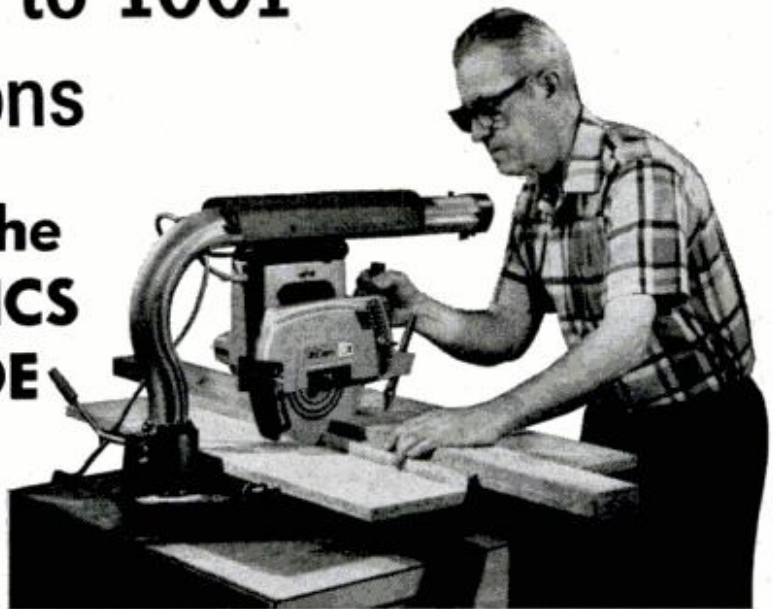
CHEVY RV DREAM MACHINES, previewed at recent recreational vehicle symposium in Mesa, Ariz., are new concepts for camping vehicles based on current stock vehicles (Chevy makes no recreational bodies now). Company's interest in living, not just traveling, outdoors, is expected to spur improvements in camper design. Basic Chevy van is shown (from top) piggybacked, pop-topped, capsulated and enlarged

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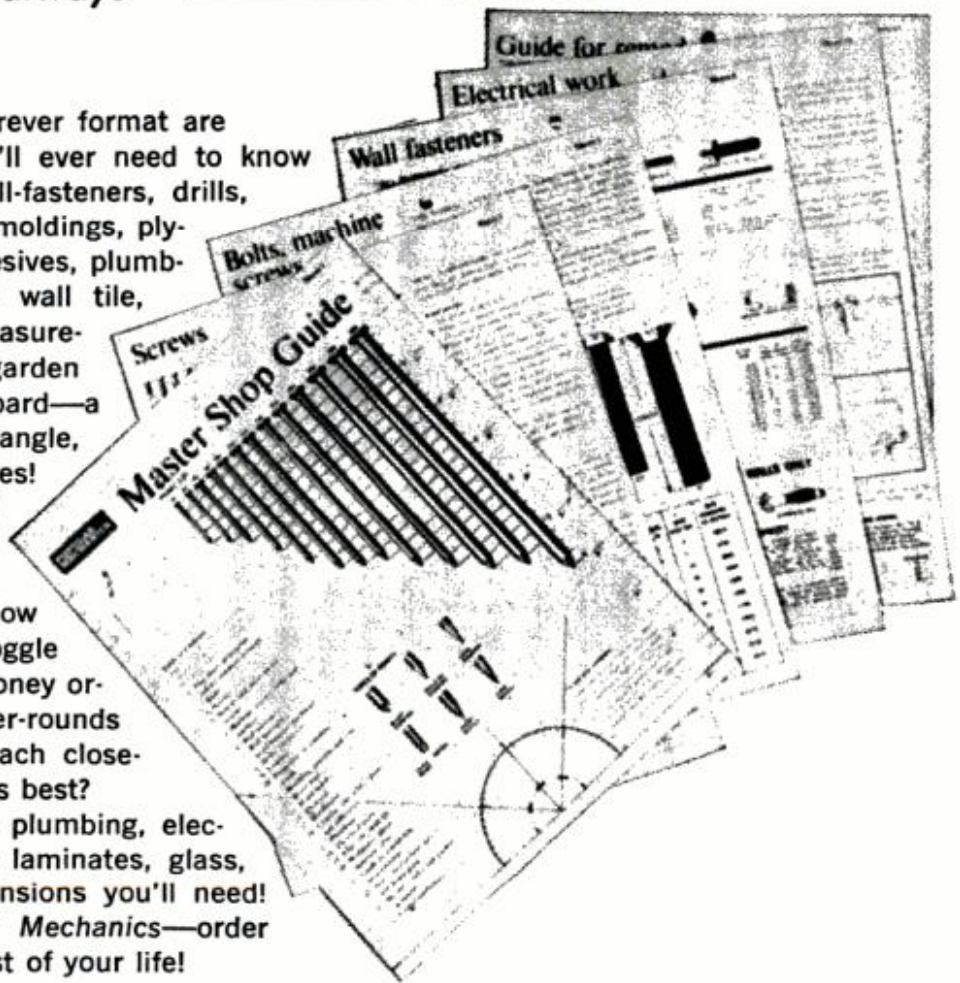


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AUGUST 1971

41

DETROIT LISTENING POST

BY ROBERT LUND

TAKING IT ON THE CHIN for years, Detroit has been charged with too much sameness and copying, and not enough innovation and imagination. The criticism hasn't been entirely undeserved. If you thought all cars hatched out of the same egg up to now, you're likely to think that even more in the next few years. But blame Uncle this time. The government's gradually putting all carmakers on the same design cycle, so that when one brings out a new automobile, everybody follows suit. The people who write Detroit's rules probably aren't aware they're stifling initiative, but here's what's happening:

Up to now, if A came up with a new idea one year, the next time competing cars B, C and D were due to be reworked, they'd try to top A's original. It didn't always come off and the "improvements" frequently flopped. But it was a game of one-up; everybody tried. In issuing new regulations, the government doesn't consider when a particular make is scheduled for a major change. New standards are keyed to the calendar and clock: this is the rule and everybody has to fall in line.

The car companies say they can't afford to do a major overhaul every time the government blows the whistle, so they're trying to work out an agreement with Washington whereby new regulations will be pegged to a regular timetable. But the government can't tell Chrysler to do something this year, Ford next year and GM and American Motors the year after that. All the companies will have to be on the same timetable, the same design cycle. This doesn't mean the end of all competition, but it does mean less rivalry, less trying to top the other guy.

GM'S BEEN WORKING UP some preliminary numbers on what would be involved in putting a Wankel into production. The numbers are just scratch-pad estimates and GM's free to back off on the project at any time. But it's obvious from the size of the figures—over a million—that GM's thinking of the Wankel for more than one line of cars.

AT LEAST ONE AUTOMAKER is giving serious thought to offering a no-options, take-it-or-leave-it car in a last-ditch effort to keep a low-price car in the catalog in the face of rising costs. The company's been talking in terms of a small, six-cylinder job, possibly with an automatic transmis-

sion and radio as standard gear. The customer might have a choice of a couple different exterior colors, but nothing else. The target price is \$50 either side of \$2000.

LIMIT TOP SPEED TO 85 OR 90? The government's been making noise about this, but Detroit may beat Washington to the draw—do it voluntarily. Both Ford and GM have considered such a move. If it's inevitable, why not be first and then claim credit for having pioneered the idea? Make points on a fight you're going to lose anyway. Ford's usually more alert than GM to seizing a negative situation and turning it into a victory, so we'd bet on Ford making the first move.

REMEMBER BILL NEWBERG? He's the one-time mechanic who worked his way up to become president of Chrysler, only to get the bounce after a couple months on the job in a shake-out of management. That was 10 years ago. Newberg's back in the business as chairman of the board of a new company, Astro Programs, franchising tune-up centers. He's had his fingers in a lot of business pies since leaving Chrysler, so he doesn't have to do the nine-to-five to earn a living.

"What brought you back to the car business?" we asked.

"The same thing that led old Mr. Ford to build Henry Ford Hospital," he replied. "He thought the doctors overcharged him because his name was Ford. I had some trouble with the oil cooler on my power steering. A bracket had to be replaced. While waiting for the car, I looked up in the flat rate manual what the company (meaning the auto manufacturer) would pay for the job if the car was under warranty. It was three-tenths of an hour—18 minutes. You know what the dealer charged me? Ninety minutes labor time. Five times the book charge. That's murder. I think the dealers need some new competition."

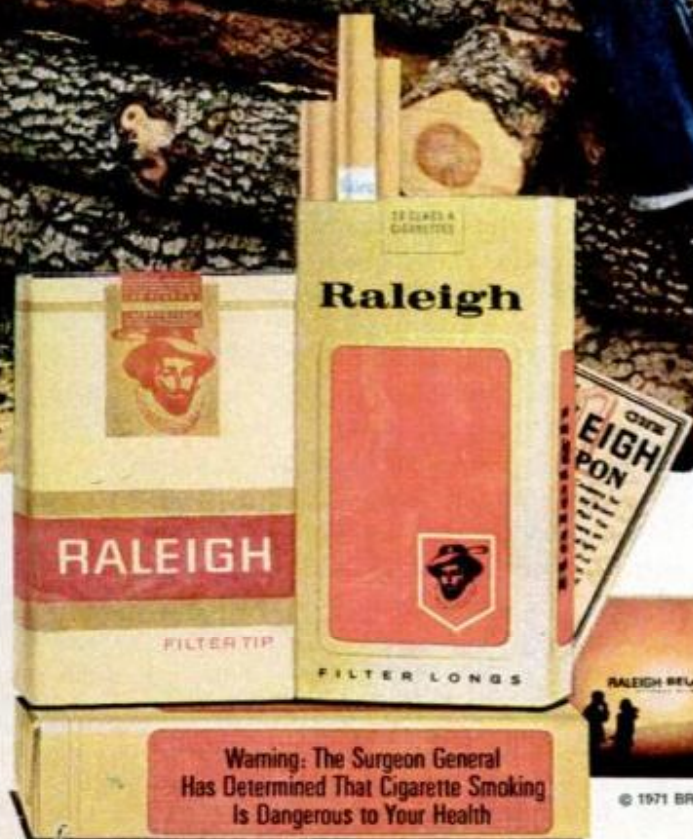
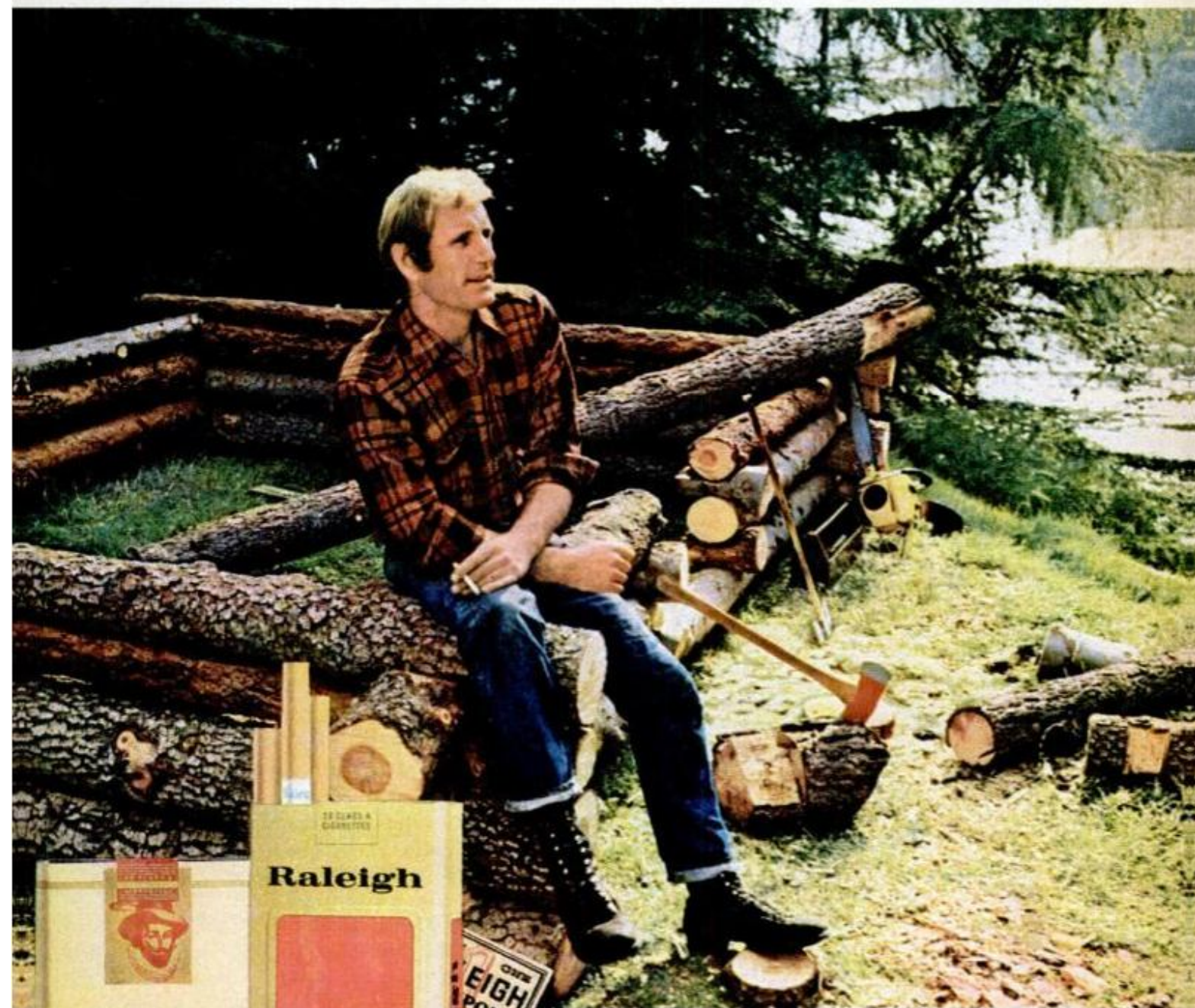
Newberg no longer drives Chrysler cars. His current car is a GM product.

FORD MAY HAVE TROUBLE sticking to its promise to de-emphasize styling on future cars. The company has already worked up major changes for '73 and '74 versions of cars that will be new this year. But it's doing this by choice. Torino,

(Please turn to page 44)

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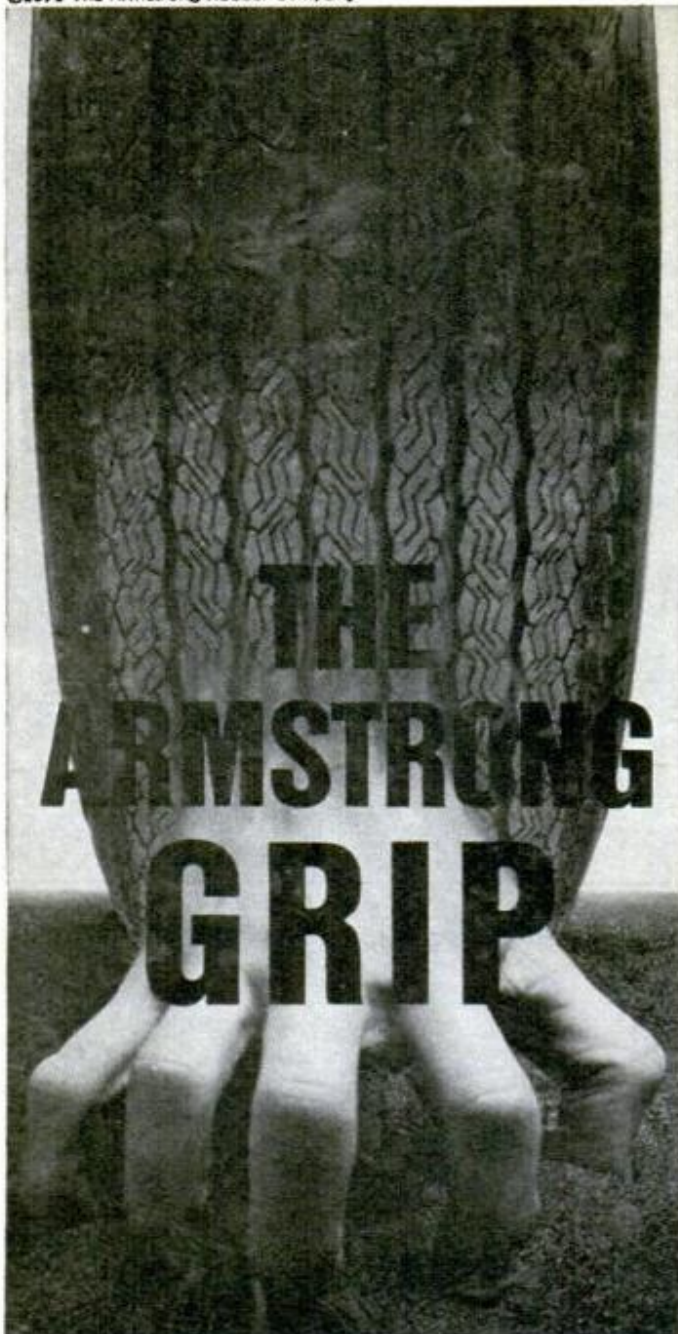
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DETROIT LISTENING POST

(Continued from page 42)

Montego and T-bird, all new this fall, will have to be reworked in the front for 1973 to comply with the government standard on bumpers; then again for '74 models, Ford expects, when the government announces the bumper standard for the following year.

DRIVERS IN SPRINGFIELD, MO., are being convinced in a dramatic way to buckle their seat belts. The Springfield Police Safety Unit is giving rides on a roller-coaster device that stops short at 7 mph. People who've ridden the little cart, which is set up at local shopping centers, say they get a lasting impression of how belts prevent injury—and even at 7 mph!

WHAT HAPPENS TO CAR DESIGNERS with all the talk about de-emphasizing styling? In a word, nothing. There have been no mass layoffs of designers since Chrysler pink-slipped 40 of its staffers 18 months ago. But the nature of the job is changing. The goal used to be to make the part or machine look different without necessarily improving it; now the target is to make it safer, easier to repair or replace or less expensive to turn out. Same people are on the job, but they're less concerned with trifles, more concerned with building 'em better.

THE 1971 WORLD CAR CATALOG from Herald Books is a winner again this year. The 9½x11-inch volume, with its specs and pictures of over 800 models from 23 countries, is a must for car buffs. In addition to showing every 1971 production car in the world, the \$17.50 book contains useful indices and a 100-page introductory section on the auto industry, racing and prototype cars. Look for it at bookstores or write Herald Books at Box 63, Bronxville, N.Y. 10708.

LINK SPEED TO BRAKE EFFICIENCY? One of the supplier companies to auto factories is working on this idea. The device wouldn't replace the brakes. It'd supplement them. If there was a loss of braking power, the supply of fuel to the cylinders would be reduced accordingly, slowing the vehicle. Slowing the car would signal the driver to have his brakes looked at. There will be no way of bypassing the device—that is, of increasing speed of the vehicle beyond the capability of the brakes to bring the car to a safe stop. It may sound like a far-out idea, but that was said of a lot of other now-commonplace gear when it was under development. ★★★



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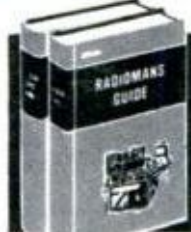
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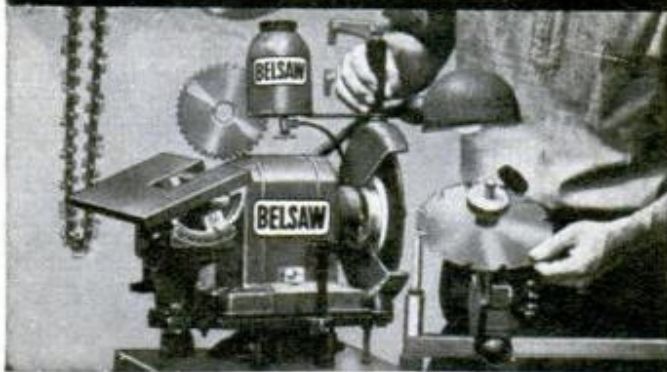
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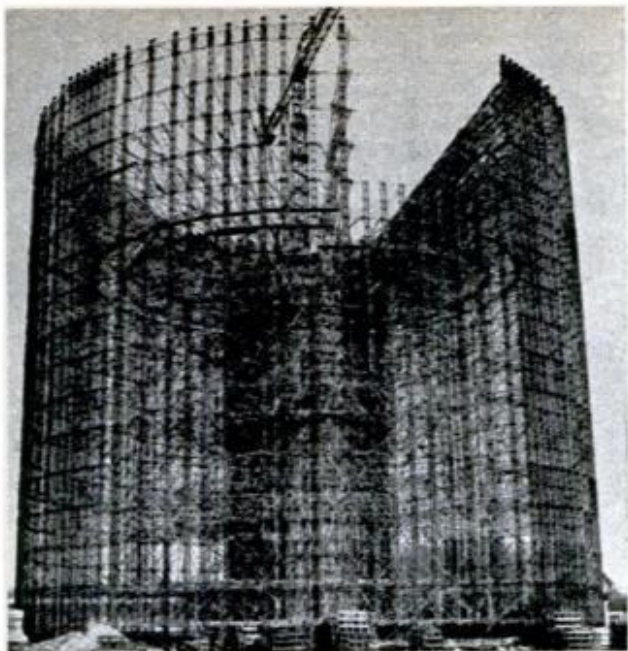


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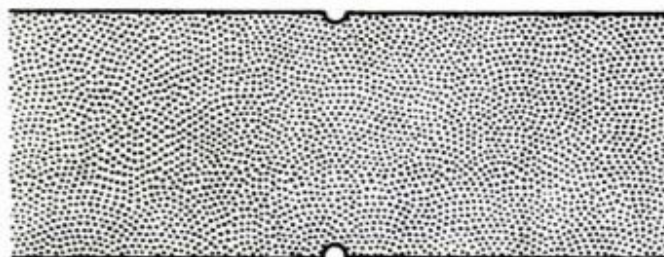
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NEWS BRIEFS



Pussy on a pedestal

All of a cat's comforts are grouped in this English invention. At the base are two un-tippable feeding bowls; a scratching pad is built into the upright section, and at top is a foam-padded bed.



Two-fisted auto driver

Confined to a chair, Kevin Whittaker, 7, invented a hand-powered car for himself. Aided by a group of students, he's had it patented, now looks for a manufacturer.

Pollution Fighters' Newsletter

Acre reclaimed for each one mined

Mined-out phosphate lands in Florida are producing crops of citrus fruit, vegetables, peanuts and timber as well as supporting catfish farms and providing public recreation, reports Continental Oil Co. Conoco's Agrico Chemical Div., near Tampa, mines the largest tract of phosphate-bearing land (65,000 acres) in the state, and follows a policy of reclaiming an acre for every acre mined.

Origins of pollution analyzed

Population size times per-capita consumption times environmental impact per unit of production equals level of pollution.

This formula, offered by Dr. Paul Ehrlich, Stanford University biologist, was used by three scientists to help analyze the origin of pollution. Dr. Barry Commoner, Washington University ecologist; Michael Corr, executive secretary of the American Assn. for the

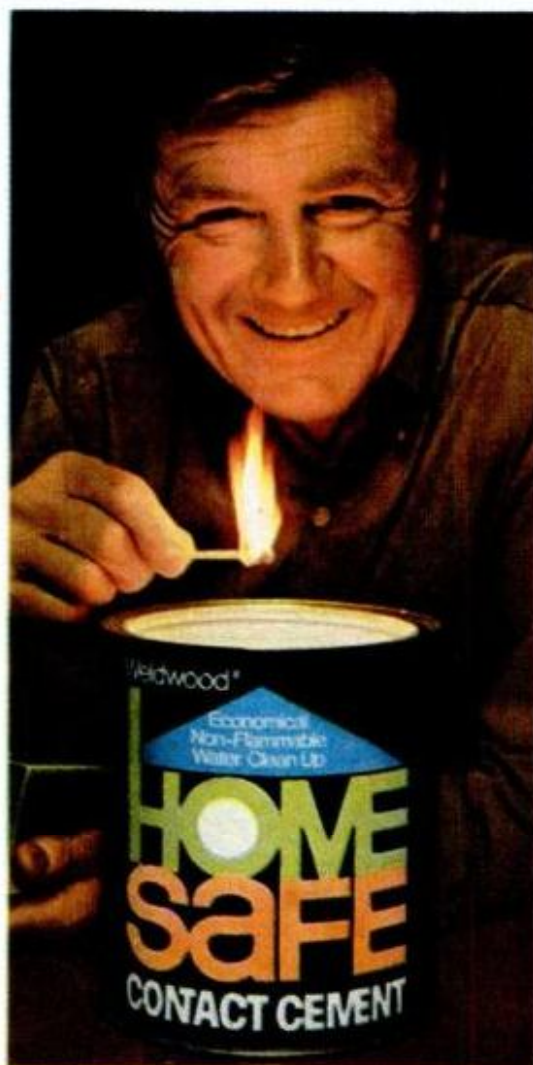
Advancement of Science's Committee on Environmental Alterations, and Paul Stamler, a researcher for the committee, concluded: "The predominant factor in our industrial society's increased environmental degradation is neither population nor affluence, but the increasing environmental impact per unit of production due to technological changes."

Total-environment planning

Deer, muskrat, ferns and hickory trees in an industrial park? They're some of the tenants of Pureland, described as the nation's first ecologically planned and pollution controlled industrial community by the developers, State Mutual Life Assurance Co. of America and a Landtect Corp. subsidiary, LT Developers, Inc. Located on a 3000-acre site in Logan Township, N.J., Pureland features a central plant that offers assistance to the industries of the area that are unable to handle their own discharge of pollutants.

Do you know about some action being taken to fight pollution that we don't know about? In your community? On the job? Tell us about it. Write Environment Editor, Popular Mechanics, 224 W. 57th St., New York, N.Y. 10019. ★★

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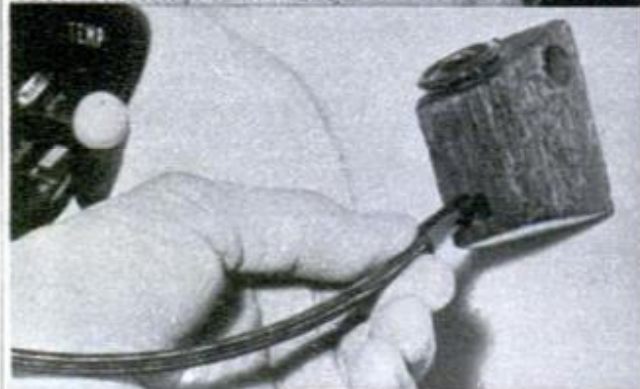
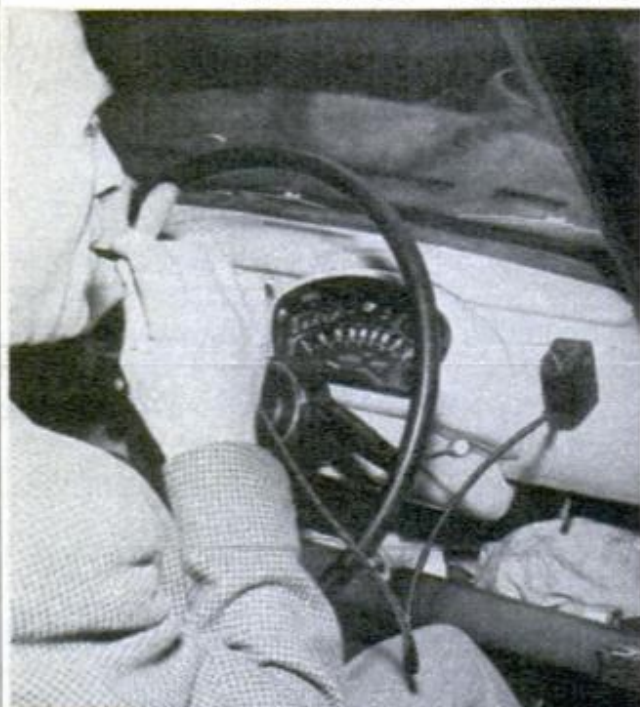
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Pipe for drivers

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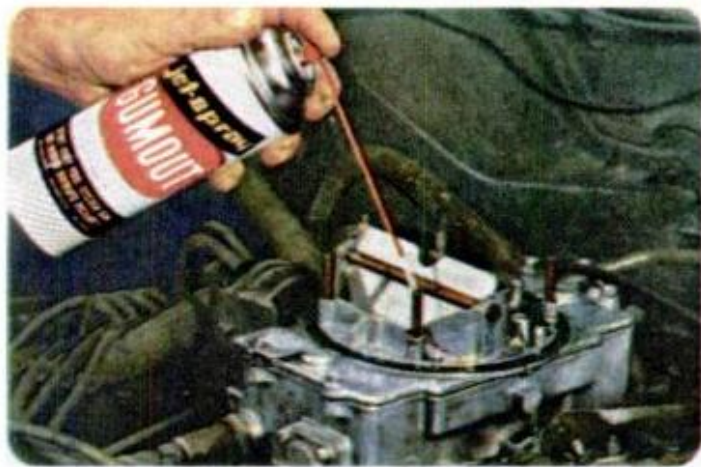


Army joins Navy for test

A 152-mm gun-launcher and turret from a Sheridan tank have been mounted on the USS Flagstaff for test firings of an Army missile. The aim is to give small ships the firepower of a 6-inch gun without its weight.

The clean team

Take a typically dirty carburetor (like yours maybe) clean it...and get easier starting, smoother idling, no stalling, faster take-offs and better mileage.



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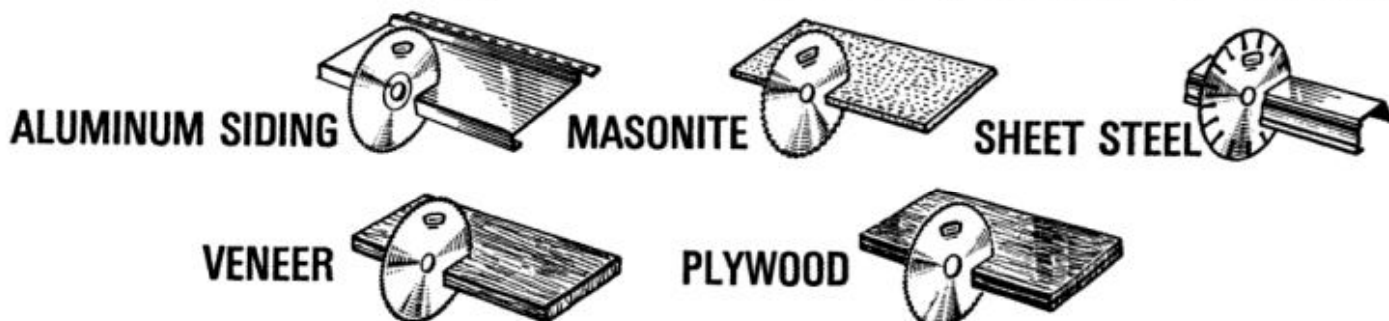
2 Now pour a pint of Gumout in your gas tank. It does the same great job inside your carburetor as you drive. Cleans out all the jets and passages, removes the gum and varnish.

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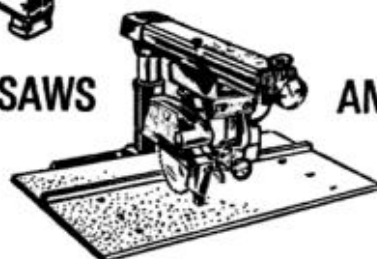
BAND SAWS



RECIPROCATING SAWS



RADIAL SAWS

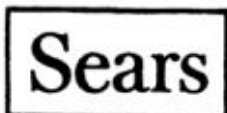


AND

BENCH SAWS

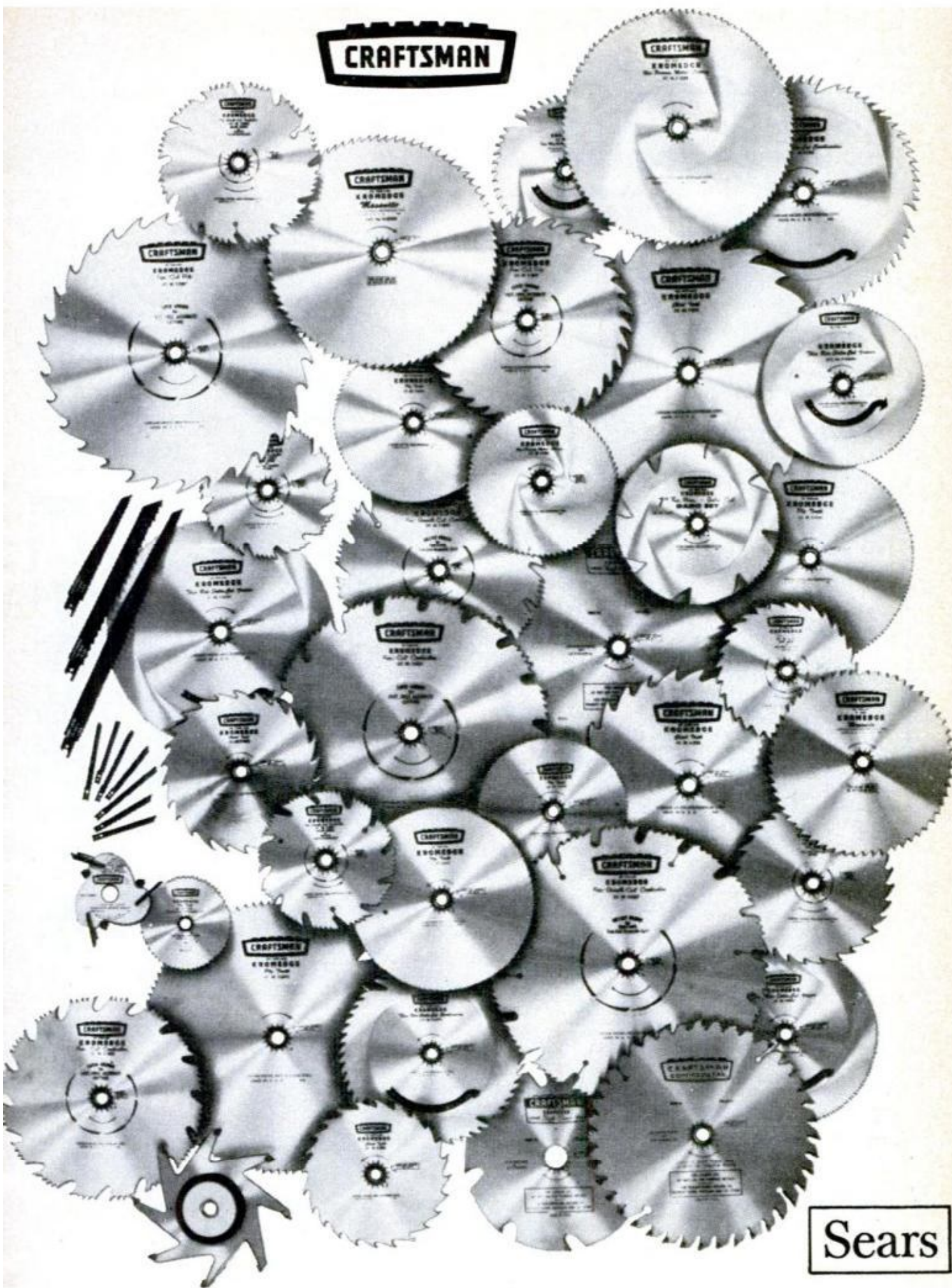


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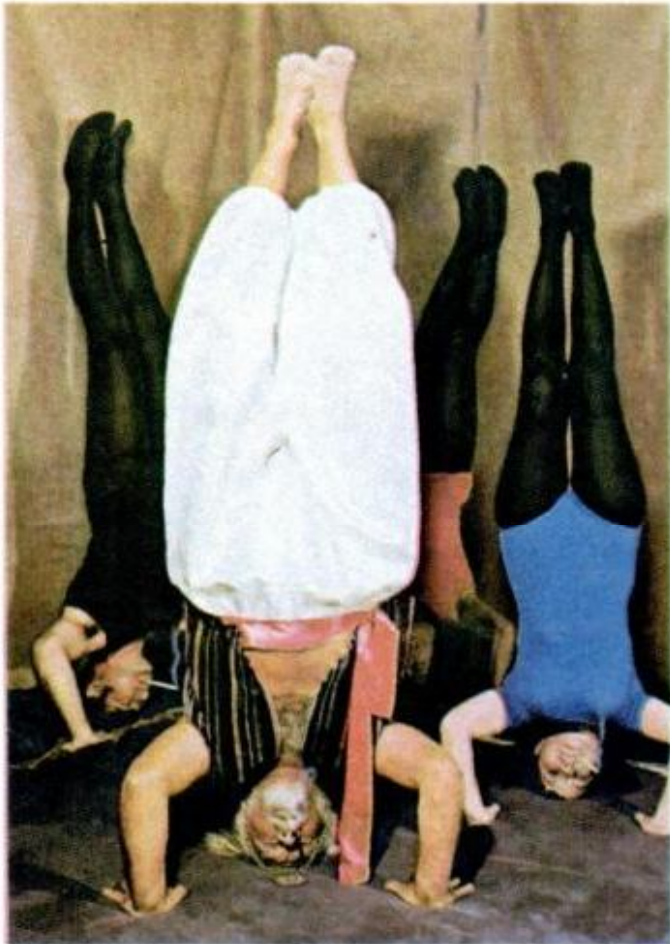
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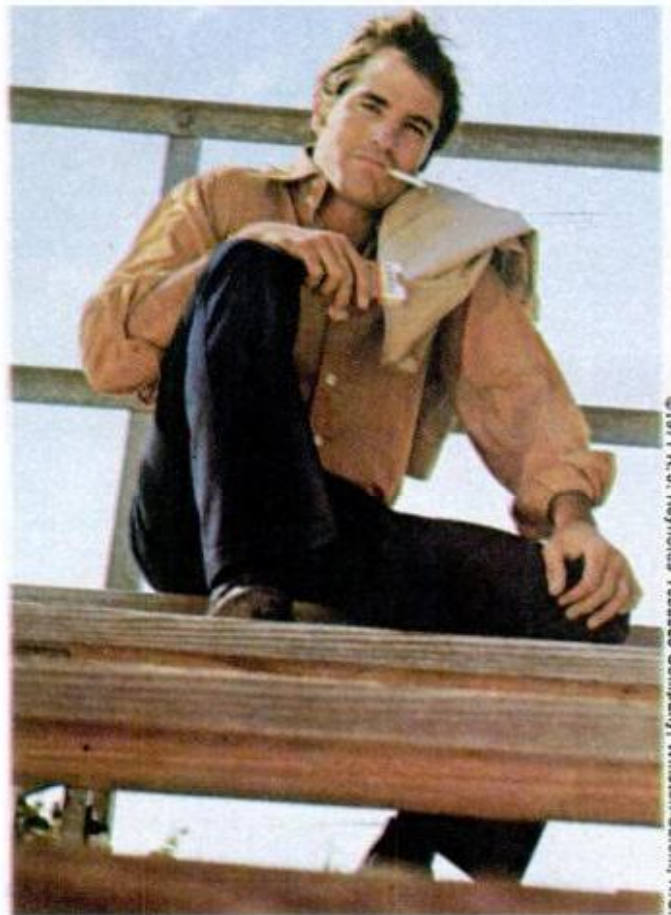
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For true smoking enjoyment, the Great Yogi puffs wheat germ cigarettes while standing on his head.

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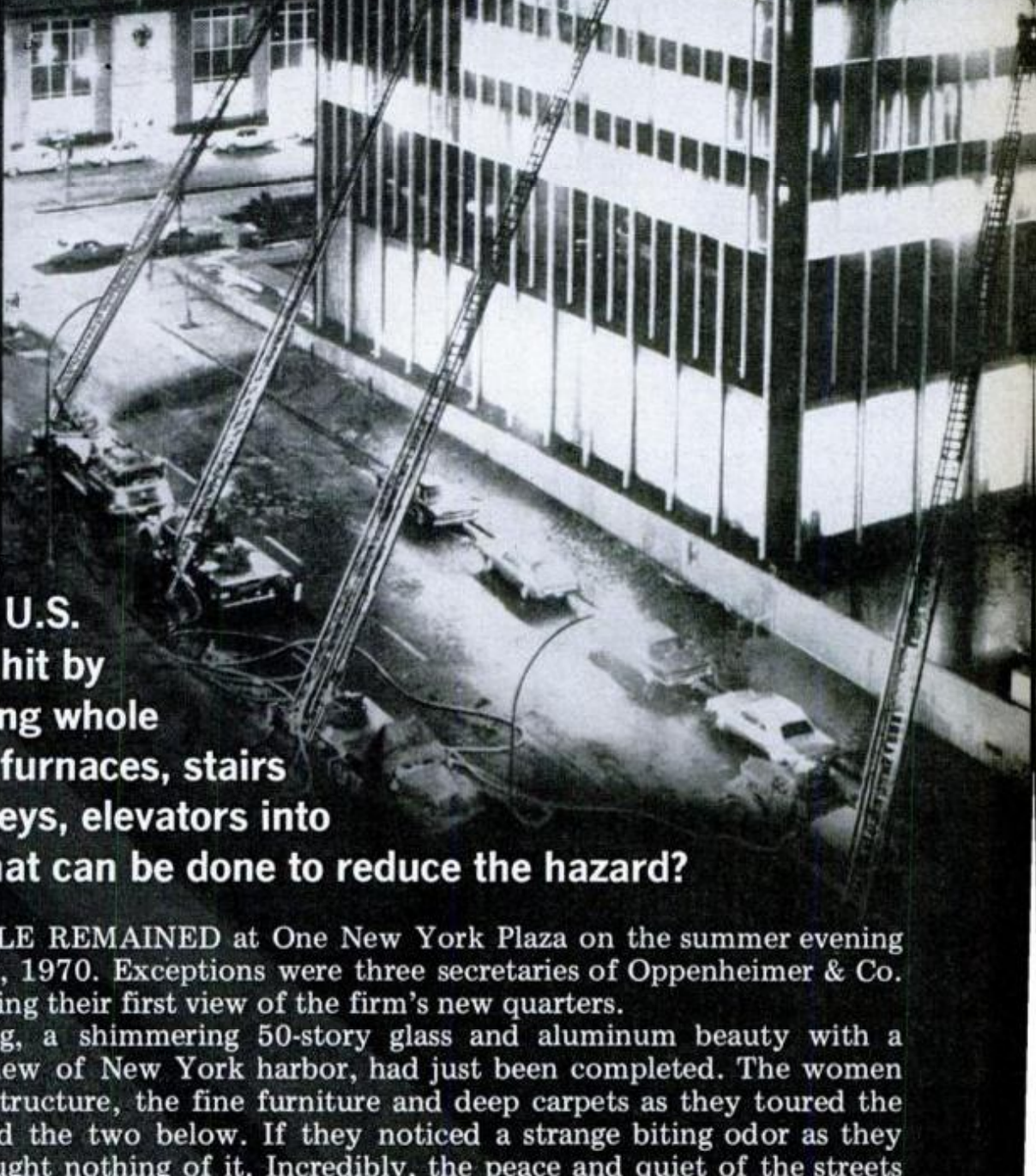
Camel Filters.
They're not for everybody.
(But then, they don't try to be.)



20 mg. "tar," 1.3 mg. nicotine av. per cigarette, FTC Report NOV. '70.

50-Story Firetraps

By ARTHUR S. FREESE



'Fireproof' high-risers across the U.S. have been hit by fires, turning whole floors into furnaces, stairs into chimneys, elevators into coffins. What can be done to reduce the hazard?

FEW PEOPLE REMAINED at One New York Plaza on the summer evening of Aug. 6, 1970. Exceptions were three secretaries of Oppenheimer & Co. who were getting their first view of the firm's new quarters.

The building, a shimmering 50-story glass and aluminum beauty with a magnificent view of New York harbor, had just been completed. The women admired the structure, the fine furniture and deep carpets as they toured the 33rd floor and the two below. If they noticed a strange biting odor as they left, they thought nothing of it. Incredibly, the peace and quiet of the streets



SMOKE BILLOWS around 50-story One New York Plaza as fire consumes three floors. Two died in \$10-million blaze



BURNED-OUT FLOOR of Plaza building reveals that "fireproof" materials do burn. Fire was traced to ceiling area.



would soon be shattered by the scream of sirens and the roar of engines, by powerful floodlights and hovering helicopters, by shattered glass falling 35 stories into the street. Fire would break out in the "fireproof" building, and two men would die. Many others would suffer from smoke inhalation. Finally, the skyscraper inferno would trigger an intensive re-examination of building practices across the country.

An Oppenheimer guard on the 33rd floor was the first to notice anything unusual. A few ceiling tiles had been removed to make a small opening, and smoke was drifting out of it. Racing to the firebox on the floor, he set off the alarm, then rode the elevator to the first floor to spread the warning. Two others—another guard and a telephone supervisor—joined him in the lobby, and all three rushed into an elevator to alert building employees working on the 39th floor.

The elevator was to become a vehicle of death. As it traveled upward, it abruptly stopped and its doors opened to the now raging fire on the 33rd floor. Heat and smoke poured into the car and the men desperately fought to close the doors and get it going again. Minutes later, close to unconsciousness from the heat and smoke, they dropped to the floor.

Their faces covered with their shirts in a last anguished attempt to breathe, the two guards died. Only the telephone foreman was alive—barely—when firemen got to him two hours later.

Meanwhile, those on the 39th floor had smelled the smoke. They packed themselves into another elevator which, as it went down, stopped for passengers on the floors below. It then stopped at the 33rd floor and the doors jammed. The smoke and fire struck at these people, too. One survivor recalls: "It was pitch black, just like night. There was nothing to breathe and I felt like dying."

Someone yelled, "Down on the floor!" and, despite their panic, the passengers obeyed. Somehow they managed to get the doors closed and—although it seemed like hours—the elevator started down minutes later and carried them to safety. Elsewhere at One New York Plaza courageous supervisors rounded up their men while executives in upper stories found their eyes smarting and tearing. All were at last

ESCAPE FROM BURNING HIGH-RISE can be almost impossible. Seven persons fell to their death in fire in Rio de Janeiro building



KEY

- ① RESCUE HELICOPTER
- ② SMOKE TOWER
- ③ SPRINKLER
- ④ FIRE CALL BOX
- ⑤ SMOKE-FREE STAIRS
- ⑥ HELICOPTER PAD
- ⑦ SKY VAN
- ⑧ FIRE SEPARATION WALL

Art by Fred Wolff

"SURVIVAL" SKYSCRAPERS MIGHT INCORPORATE features shown: areas with fire-resistant walls, smoke towers to insure clear stairways, alarm boxes on each floor, exterior emergency elevators and sprinklers

evacuated as smoke permeated the building. It took an observant guard in an adjoining structure to call the fire department.

The first group of firemen were trapped in an elevator at the fourth floor and had to chop their way out to escape the heavy smoke. Others found elevators which took them to the 30th floor. Hoses were attached to standpipes in the stairways, but the smoke was so severe that masks had to be used, the heat so great that the fire-fighters could work only for minutes at a time.

In an older building, the windows

could have been opened to vent the heat, gases and smoke. At One New York Plaza they were locked with special latches, and the firemen broke the heavy glass with great difficulty.

Five hours later the fire was under control, but only after a second and third alarm, and 25 pieces of equipment and 150 firemen had been brought in. A nearby hospital was overwhelmed with choking victims, many semiconscious and retching. Police helicopters hovered overhead to rescue possible survivors from the roof, but a floor-by-floor search disclosed no more occupants—dead or alive. One thing

was clear: Modern "fireproof" skyscrapers are not really fireproof at all but are what one authority termed "semicomcombustible."

A few months later a three-alarm blaze roared through the 35th floor of San Francisco's Bank of America Building and provided more evidence. Some 30 frightened people were trapped on the floors above. Half an hour lapsed before the windows could be broken to vent the fire (the streets below had to be cleared first) and it took two hours to get the blaze under control.

The next month—December—the fifth floor of a 49-story structure in mid-Manhattan added to the growing list of calamities. Heavy smoke reached as high as the 45th floor, and soon hundreds were staggering out into the street gasping for air. Once again elevators became potential coffins.

Six victims from upper floors were caught on a car that opened and stuck on the blazing fifth floor. Terrified and unable to see, they were rescued by firemen who formed them into a human chain and led them to safety. A less-fortunate victim perished in a stalled elevator and two more, who exited a stalled elevator, died on the fifth floor. The final toll included 39 injured.

There are other examples. A fire in a 22-story "fireproof" building in Rio de Janeiro killed five. A blaze burned out the 22nd floor of San Antonio's Life Building and then spread to the five floors above. The 9th through 12th floors of a Mexico City office building recently went up in flames and claimed one life. Finally, a spectacular conflagration in a penthouse restaurant atop a 10-story building in Montgomery, Ala., killed 25 patrons.

Again elevators malfunctioned. Firemen trapped in cars had to slide down the counterweight cables to the basement.


Modern high-rise building techniques are relatively new. "A skyscraper fire is a unique kind of fire," says John E. Plantinga, consulting engineer and chairman of the New York Building Congress's Fire Safety Committee. "These new buildings are considerably more complex than those of the 1930s. Then you just threw up some columns and concrete floors, put brick walls around them, added some windows and lights in the ceilings. When it got hot, you opened a window. If it was cold, you turned on the radiator."

Modern skyscrapers like One New York Plaza spread out around a reinforced concrete core containing the elevators and stairways. Each floor is a concrete platform supported by steel girders and beams like the fabric of an open umbrella. At the New York building, 2.5 inches of concrete rests on the steel members, which are protected from fire by sprayed asbestos fiber. The

(Please turn to page 166)

POPULAR MECHANICS

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A NEW ESCAPE SYSTEM is called Sky Van. The elevator car clips onto exterior vertical rails, is self-powered. It can carry 4500 pounds up or down



Tests rails ultrasonically

Rolling along at 25 mph, an ultrasonic test trolley mounted between the drive wheels of a British railway car (above) probes the rails beneath for cracks and fatigue. Signals from the probes are monitored inside the car (left) and recorded on film for later study.

Executive jet

Cessna's new fan-jet business plane, Citation, carries six passengers plus two crewmen. Said to be low-cost, quiet and slow-flying, the craft cruises at 400 mph and lands in as little as 2950 feet.



Raise Hellcat after 26 years

This Navy fighter, ditched off San Diego in 1944 when its fuel system malfunctioned, was raised recently from a depth of over half a mile. Scientists from PPG Industries found the laminated glass windshield clear and intact after lengthy immersion. They're developing glass components for submersibles.

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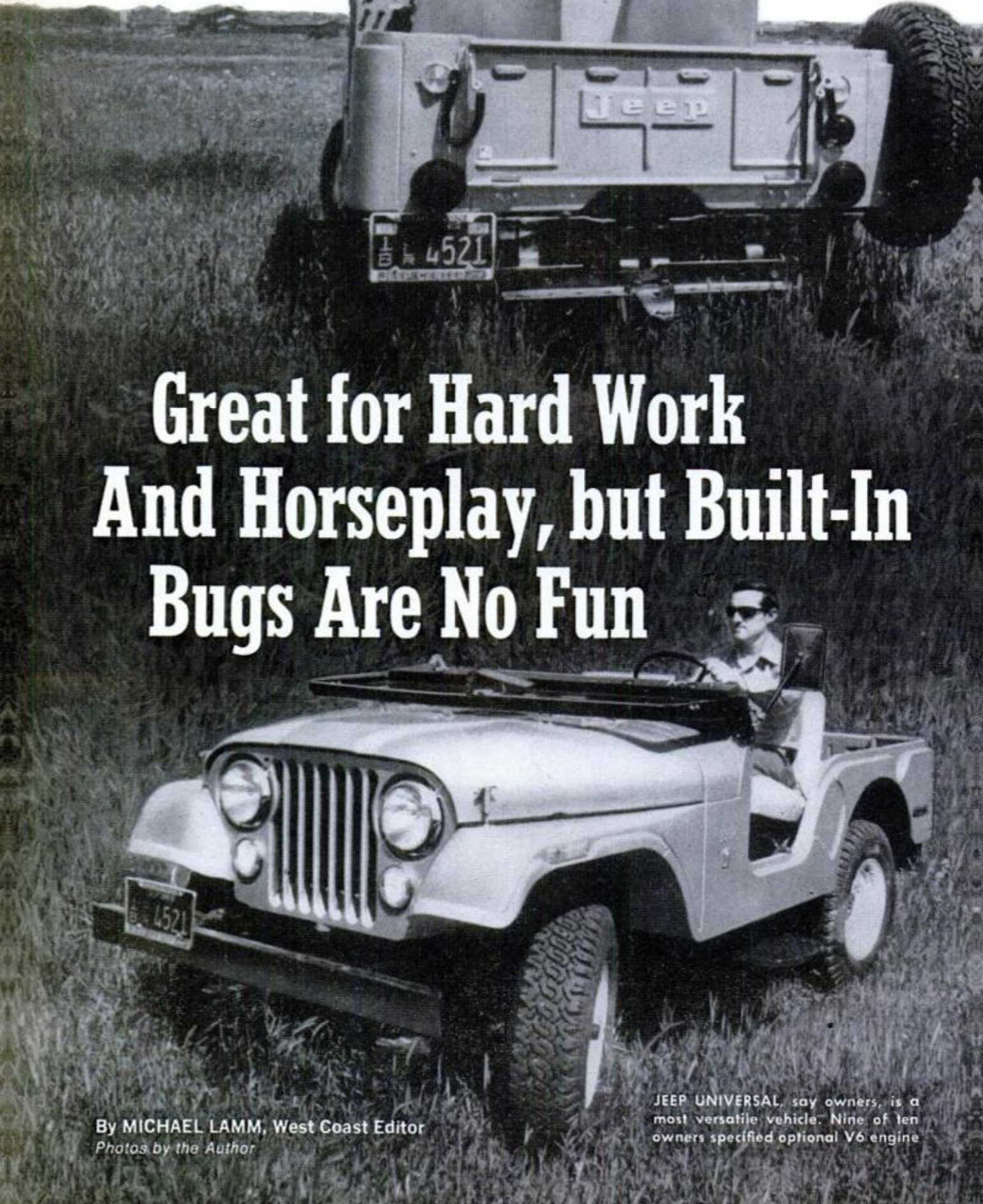


Magnetism powers fast train

Powered by an electromagnetic field set up in its "rails" this train was tested recently in Munich. Propelled by a linear motor, the prototype reached 62 mph on a 2000-foot test run. Production models, planned for the 1980s, are expected to reach speeds of 310 to 372 mph.

PM OWNERS REPORT
JEEP UNIVERSAL

A Nationwide Survey Based on
400,000 Owner-Driven Miles



**Great for Hard Work
And Horseplay, but Built-In
Bugs Are No Fun**

By **MICHAEL LAMM**, West Coast Editor
Photos by the Author

JEEP UNIVERSAL, say owners, is a most versatile vehicle. Nine of ten owners specified optional V6 engine

THE JEEP UNIVERSAL isn't so universal that just anyone would want one. It takes a very special reason. Like:

"I own property in Colorado and bought the Jeep especially to get into the high country."—Kansas police lieutenant. A Washington logger writes: "Four-wheel drive is the only thing suitable where we live."

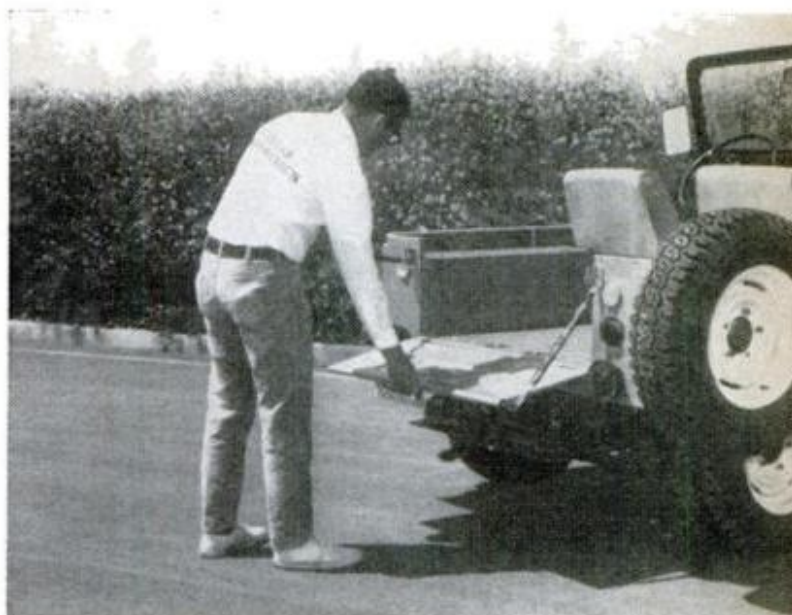
Many respondents, especially farmers and ranchers, said they use their Jeeps for plowing snow. Sportsmen favor the Jeep for hunting and fishing trips. One Californian said he bought his Jeep, "... because they have been manufacturing 4wd vehicles for 30 years and know their product; also the resale value is much higher compared to other 4wds." And a Florida salesman said simply, "Jeeps have been in our family since 1946."

While glancing through our questionnaires, we were struck by the devotion so many owners have to their Jeeps. It's more than just a car to them; it's like a member of the family or an old friend. A student in environmental health says, "I've covered some rough country surveying water supplies, and my ol' Jeep has been right there. It's really the two-car car. I drive it to school and to work every day, and when hunting time rolls around, off to the mountains I go." A Tennessee mechanic: "I would never be without a Jeep; wouldn't trade mine for two of any other car."

On *comfort*: "Mine's not the best riding, but it's more comfortable than the old Jeep. My wife complained about the ride at first but changed her mind after doing some backtrailing and seeing some eye-opening demonstrations."—Ohio farmer. "Jeeps aren't expected to ride smoothly—they're not luxury cars. But try a Cadillac on a mountain trail."—Tennessee steelworker.

About *quality* and *workmanship*: "Excellent."—Virginia co-op operator. "No complaints."—California superintendent. "Average to good for a vehicle of this type."—Florida electrical engi-

AUGUST 1971

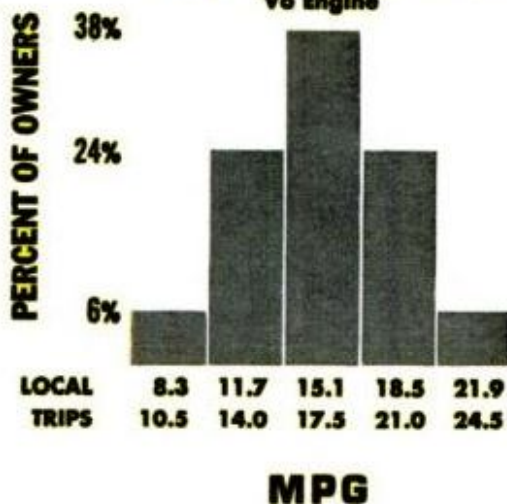


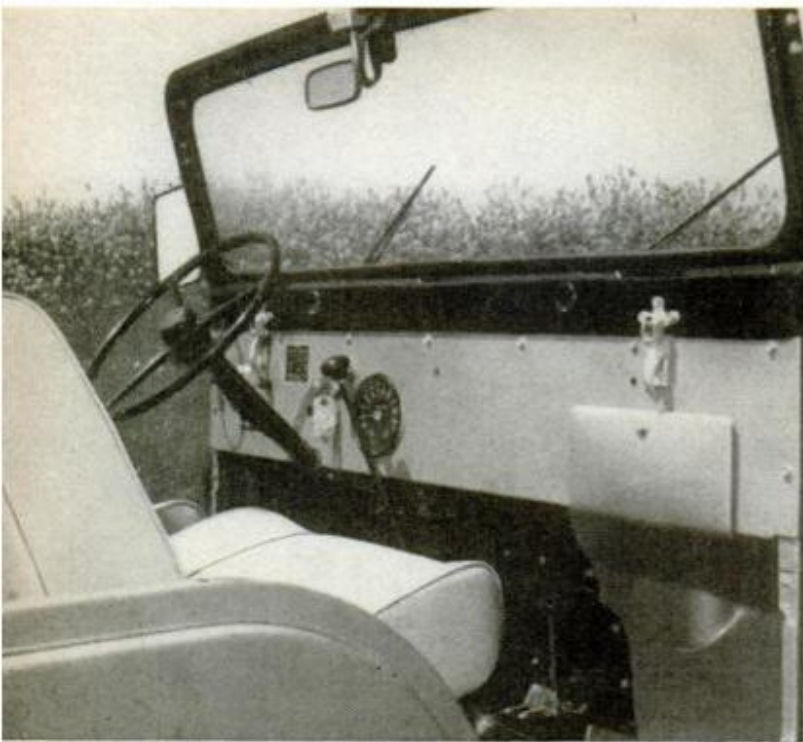
JEEP'S TAILGATE folds flat for long loads. Bed extensions are available optionally, as are a rear seat, metal cab, cloth top; 4wd is standard on CJ



LOCKABLE STORAGE BIN under the passenger's seat hold valuables. Firm, comfortable buckets place occupants above most cars. Jeep's ride is bouncy

JEEP UNIVERSAL FUEL MILEAGE CHART
V6 Engine





SPARTAN DASH has no provision for radio. Ashtray, lighter are extra, and several readers complained that for \$3000 base, CJ needs more standard items



JEEPSTER COMMANDO has same ruggedness and 4wd as Universal, can be made as wagon, roadster or pickup; uses same F-head 4 or V6 as regular Jeep

GLOVEBOX has more room than most, also has lock. Hasp above it secures the folding windshield

DEFROSTER vents supposedly duct hot air onto windshield, but owners feel heater and defroster aren't too hot

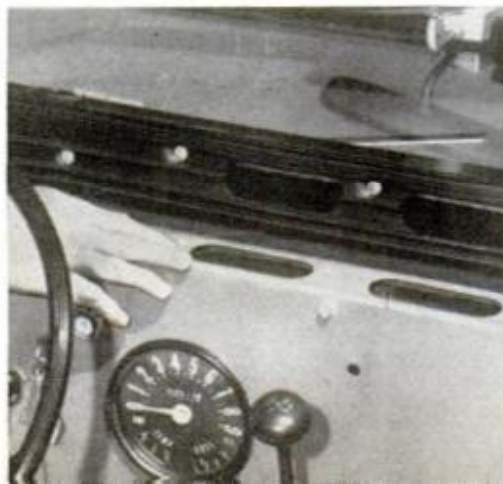
BASIC CJ JEEP has no doors to rattle, yet tailgate does; un-insulated body amplifies sound

neer. "The workmanship is really good, and an outstanding feature is that the Jeep is really serviceable."—New York carpenter. "Construction is very solid, but attention to quality control and finishing of body components is very poor."—Pennsylvania physicist.

Best liked features: "Dependable in all types of weather and fun to drive." "Versatility." "Simplicity of construction." "Economical and easy to drive." "We live in the mountains—no roads—and they are great fun!" "It's got a lot of guts." An 18-year-old Wisconsin student likes his Jeep because, "It makes money for me (plowing snow in winter), takes girls out, gets me around fast, gets looks from almost every one."

Least liked features: "Rattles." "Rough riding." "Mine leaks and allows air to enter cracks." "I expected better gas mileage from the V6." "Workmanship could stand improvement, especially considering the price." "Gas-tank location on 1971 models is dangerous." "Smog-control device makes engine hard to tune and causes dieseling." "Hard to get parts." "Defroster system gets no air onto windshield." "Wheel hop in sand." "I'd like to see more items made standard equipment. For instance, I had to pay extra for sun visors, top, and rear seat."

About performance: "V6 engine gives it get-up-and-go power." "Excellent on rough terrain, and it handles well on the highway right up to 70 mph." "I use my Jeep to pull a hay-baler, sometimes a horse trailer, and to



Summary of 1971 Jeep Owners Reports*

Total miles driven404,630	Economy16.5	Dealer repairs satisfactory?
Average miles per gallon	Roadability13.2	Yes67.4%
Local driving15.1	Styling11.0	No32.6
Long distance17.5	Specific dislikes:	Is the Jeep your only car?
Series:	Workmanship17.4%	No85.3%
Jeep Universal93.8%	Dealer service14.1	Yes14.7
Jeepster6.2	Window leaks10.9	Other cars owned:
Body styles:	Low gas mileage9.8	Chevrolet32.5%
Convertible81.1%	What changes would you like?	Ford18.9
Station wagon10.8	Better heater9.4%	Buick11.3
Roadster8.1	Change seat style9.4	Plymouth11.3
Engines:	Change styling8.2	Cadillac10.0
Ohv V6 (160 bhp)89.2%	Better workmanship8.2	Dodge10.0
F-head 4 (75 bhp)10.8	More options7.1	Accessories/power options:
Why the Jeep?	Better materials7.1	Free-wheeling hubs41.3%
Recreational use33.0%	Had any mechanical troubles?	Radio28.3
Four-wheel drive28.7	Yes50.0%	Roll bar27.2
Past experience17.0	No50.0	Oversized tires23.9
Performance8.5	What kind of trouble?	Rear seat20.7
Ruggedness8.5	Clutch17.4%	Age distribution of owners:
Specific likes:	Windshield wipers13.0	15-29 years52.7%
Handling45.1%	Speedometer cable10.9	30-49 years30.1
Four-wheel drive33.0	Did you repair it yourself?	50-plus17.2
Performance20.9	No93.8%	Would you buy another Jeep?
Power17.6	Yes6.3	Yes90.0%
		No10.0

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

plow snow—now *that's* performance.” But a San Diego cab driver says, “It’s the worst possible car for highway use—short wheelbase, light weight, rough, noisy, poor gas mileage and only a 10½-gallon tank. But it’s the best 4wd there is for offroad use.”

About Jeep dealers: “We feel we got a pretty good deal. The dealer treats us courteously.”—Colorado trucker. “I have experienced the poorest dealers and the best. I am 100 percent satisfied with my present dealer.”—New York service rep. “Courtesy good, sales methods questionable, service fair to poor.”—California construction worker. “Excellent—courteous and great service.”—Colorado student. “If there were more dealers throughout the country, there would be more competition on sales and service. Parts and service for Jeeps are usually costly and slow.”—Missouri salesman.

What *improvements* do Jeep owners suggest? “More body insulation—as it is now, there’s absolutely none.” “Power steering; the Jeep is too hard to steer for most women.” “A better heater.” “Lower the price, up the quality.” “More durable materials for body and frame; also a quieter engine.”

“Larger gas tank.” “I would like to see a roll bar and a tilt indicator made standard equipment; a person doesn’t really know the value of these items until they use the Jeep for the purposes for which it was designed.” “Put skid plate under oilpan.” “A dash panel for the radio; also an ashtray and lighter as standard equipment.”

In *conclusion*: “I’ve tried every 4wd made, and Jeep has less upkeep than any.”—Illinois mechanic. “It’s the best all-around 4wd there is, and it’s just what its name says, ‘Universal.’ You can do just about anything with it—work or play. I wouldn’t buy anything else.”—Connecticut mechanic. ★★

FOLDING WINDSHIELD—one of few holdovers from WW II—adds to fun of driving Jeep in hot weather



Now They're Probing The Hidden Depths Of Your Mind

You can turn on a TV set just by thinking. You can control your heartbeat through thought alone. These are two of the amazing feats made possible by new scientific knowledge of what makes the human brain tick.

By STEVE BACON

IN A BALTIMORE HOSPITAL, a patient controls his heartbeat just by thinking about it.

- In research laboratories, test subjects turn their "alpha waves" on and off at will—and use this ability to control a TV set.

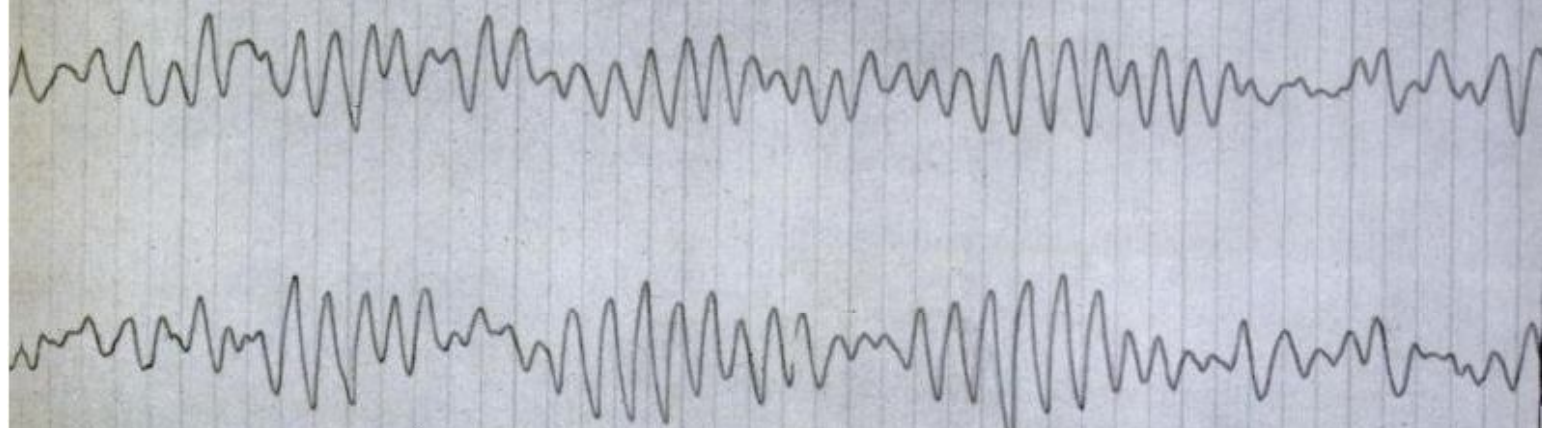
- In California, a chimp plays tic-tac-toe with a researcher. By looking at brain-wave patterns on an oscilloscope, the man can tell if his furry opponent will make the right move.

- Other fantastic discoveries: You have hidden mental capacities; it may be possible for you to increase your intelligence and your ability to learn and remember. It may also be possible to cure those with epilepsy, brain injuries and mental disorders, also

to return control to paralyzed limbs.

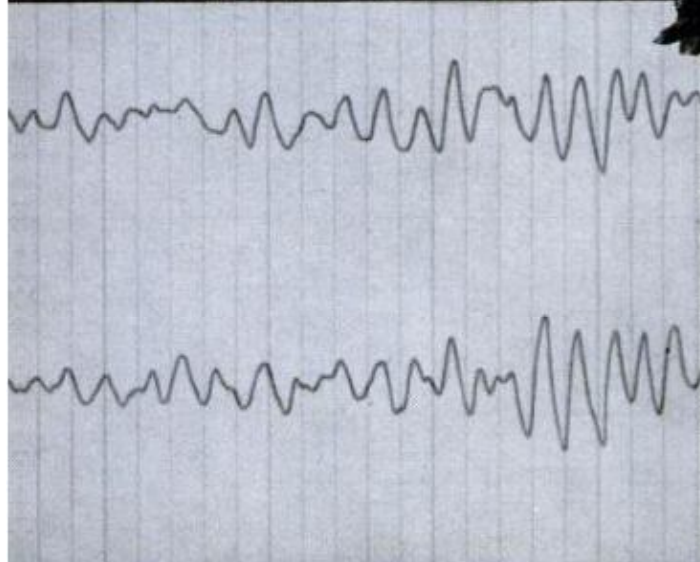
In a scientific bonanza, chemists, engineers, mathematicians, physicists and other researchers are joining those traditionally concerned with medicine and biology to explore a last great frontier of science—the human brain. Their tools include an arsenal of computers, electronic brain stimulators, telemetry units, drugs and new insights provided by such fields as biochemistry and molecular biology.

Although the brain is often compared to a digital computer, the similarity is more apparent than real. Instead of wires, transistors and other conductive elements, our nervous system uses traveling chemical reactions involving slight changes in electrical



voltages. These reactions switch nerve impulses from one area of the body or brain to another. Our permanent memories, researchers theorize, are stored in an amazingly economical, high-capacity molecular form. They are converted back to electrochemical energy only when acted upon.

Human circuit elements, or neurons, are much like digital on-off switches. They are either on or off: transmitting an impulse or at rest. Regardless of their location in the body, they are tiny bulbous cells with many twisted, rootlike extensions (dendrites) for receiving impulses and a long fiber (axon) for transmitting them. When a nerve impulse arrives—via a chemical transmitter substance operating across



PARALYZED ARM of monkey is jolted into motion by brain stimulator. Impulses surge through electrodes implanted in the animal's brain. Dr. L. R. Pinneo sits at computer console at the Stanford Research Institute

CONSCIOUS CONTROL of alpha waves (left) enables human test subjects to turn on TV set by thinking

the small gap (synapse) between the axon of the transmitting neuron and a dendrite of the receiving neuron—it triggers an electrochemical breakdown.

This breakdown, caused by charged particles flowing through the cell membrane, literally races through the neuron and out its axon at speeds of 2 to 200 miles an hour. The cell can relay hundreds of messages every second.

It is easy to record the brain's electrical activity from scalp connections or from implanted electrodes. Although much of what goes on inside your head looks purely like electrical noise, a synchronous rhythm is often present, producing what are called alpha waves.

Alpha waves result from the simultaneous triggering of many neurons, and have a frequency of about 10 a second in a relaxed adult. Scientists speculate that they may be periodic waves of sensitization: They add to the voltages already present in the brain and those received from sensory nerves, making it easier for you to react to a loud noise, a threatening gesture or some other important stimulus.

It appears that alpha can be consciously controlled. Subjects under Dr. Joe Kamiya at the University of California Medical Center in San Francisco are actually learning to turn them on and off at will. With electroencephalograph (EEG) electrodes connected to their scalps they can control machines with their thought processes.

An elementary demonstration of such control has already been made by British researcher Grey Walter. He has shown that volunteers—with EEG electrodes, suitable amplifiers and a computer to recognize brain-wave patterns—can turn on a TV set by remote control.

In addition to alpha waves, it is now becoming possible to recognize patterns due to normal brain functioning as well as those due to brain injuries or other abnormalities. The complex wave forms can be analyzed by computer and the next action of the subject accurately predicted.

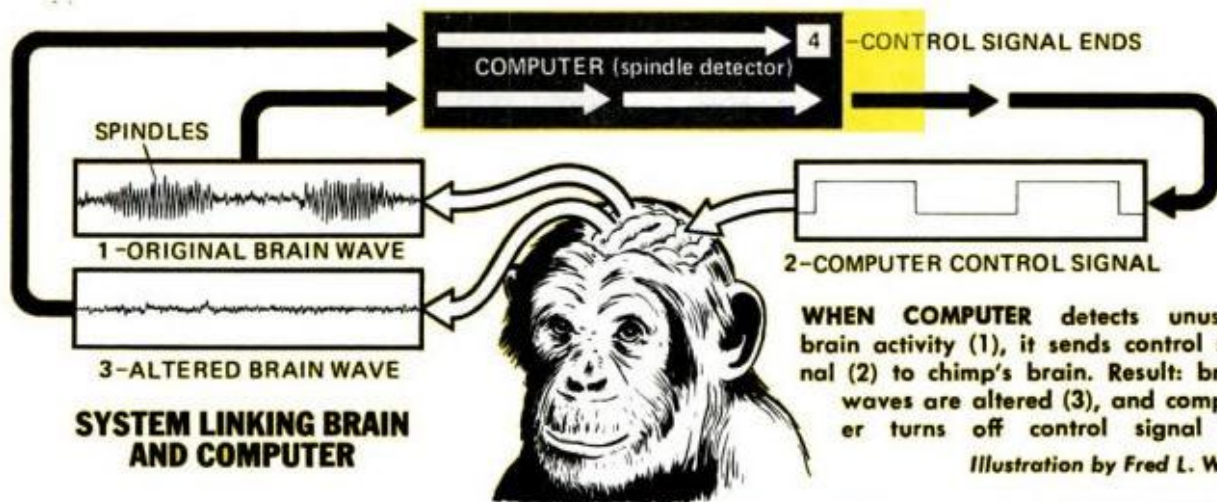
Some years ago, researcher E. Roy John of New York Medical College found that he could foretell the choices of trained cats in pressing one of two levers in response to a flickering light. He did it by studying their brain waves. Confirmation recently came from the University of California: Brain waves show whether or not chimpanzees playing tic-tac-toe are paying attention to the game and, thus, make the right choices.

It's possible that this basic work could lead to ways of improving human mental efficiency. For example, before material was presented to a student, executive or other person with a need to absorb new data, a computerized brain-wave recognition device could make sure he was alert and ready to learn. Other objectives of Dr. Kamiya's project are to determine whether alpha waves really are sensitization waves and thereby related to perception and memory, and to find out whether people might be able to do such things as put themselves to sleep or control stomach acidity.

In this area of controlling bodily functions, it's possible that "mind cures" may prove more effective than drugs in coping with certain illnesses. In Baltimore, Dr. Bernard I. Engel has cardiac patients smooth out irregular



PATIENT WATCHES "traffic signal" as he attempts to control heart action. Yellow light signals normal heart rhythm. Red is too fast; green, too slow



heart action just by thinking about it. They watch a small indicator resembling a miniature traffic signal with red, yellow and green lights. The patient tries to keep the yellow light on, a sign he is actually improving his heart rhythm.

If so many exciting discoveries can be made by mental control and by studying the weakened hodgepodge of brain waves at the scalp, what can researchers achieve by actually probing deep within the brain itself?

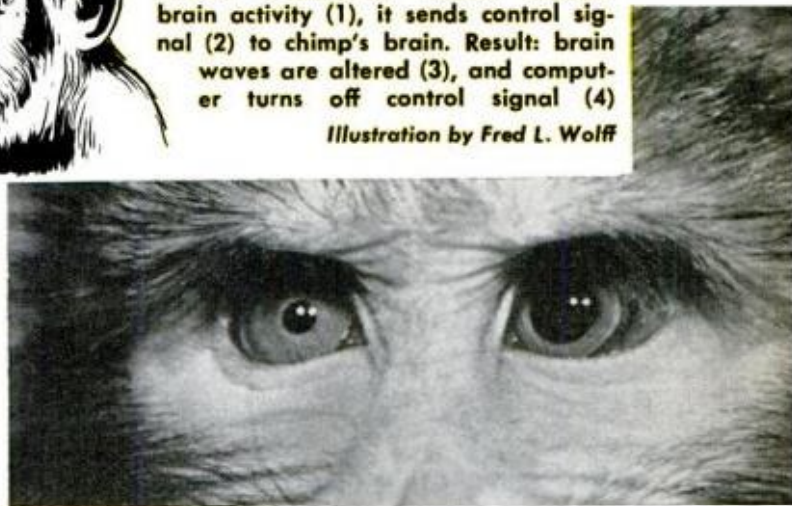
At Yale University's School of Medicine, Dr. Jose M. R. Delgado, a pioneer in using implanted electrodes and electronics to communicate with the brain, has jolted the public in recent years with impressive demonstrations of the power of electrical stimulation of the brain (ESB) to modify the behavior of cats, monkeys, chimpanzees and an angry bull.

Several years ago Dr. Delgado climbed into a bullring near Cordova, Spain, armed only with a red cape and a small transmitter. A fragile radio antenna took the place of the weapon carried by professional bullfighters. When a bull came thundering toward him, it was stopped short by a signal from the transmitter.

Dr. Delgado's real weapon included not only this device, but a receiver attached to the bull's head and connected to electrodes implanted in the animal's brain. Pulses were received and applied to an inhibitory area, triggering neu-

(Please turn to page 170)

AUGUST 1971



LIKE A CAMERA DIAPHRAGM, pupil of a monkey's eye enlarges in response to a current that's applied to an electrode implanted in the lab animal's brain



CHARGING BULL STOPS DEAD in tracks when Dr. Jose M. R. Delgado sends a signal from his hand-held radio transmitter. A receiver attached to the animal's head relays the signal to electrodes in the inhibitory area of the brain. Working at Yale University, Dr. Delgado is pioneer in using implanted electrodes and electronics in doing brain research

65

4-Channel Stereo —Here at Last!

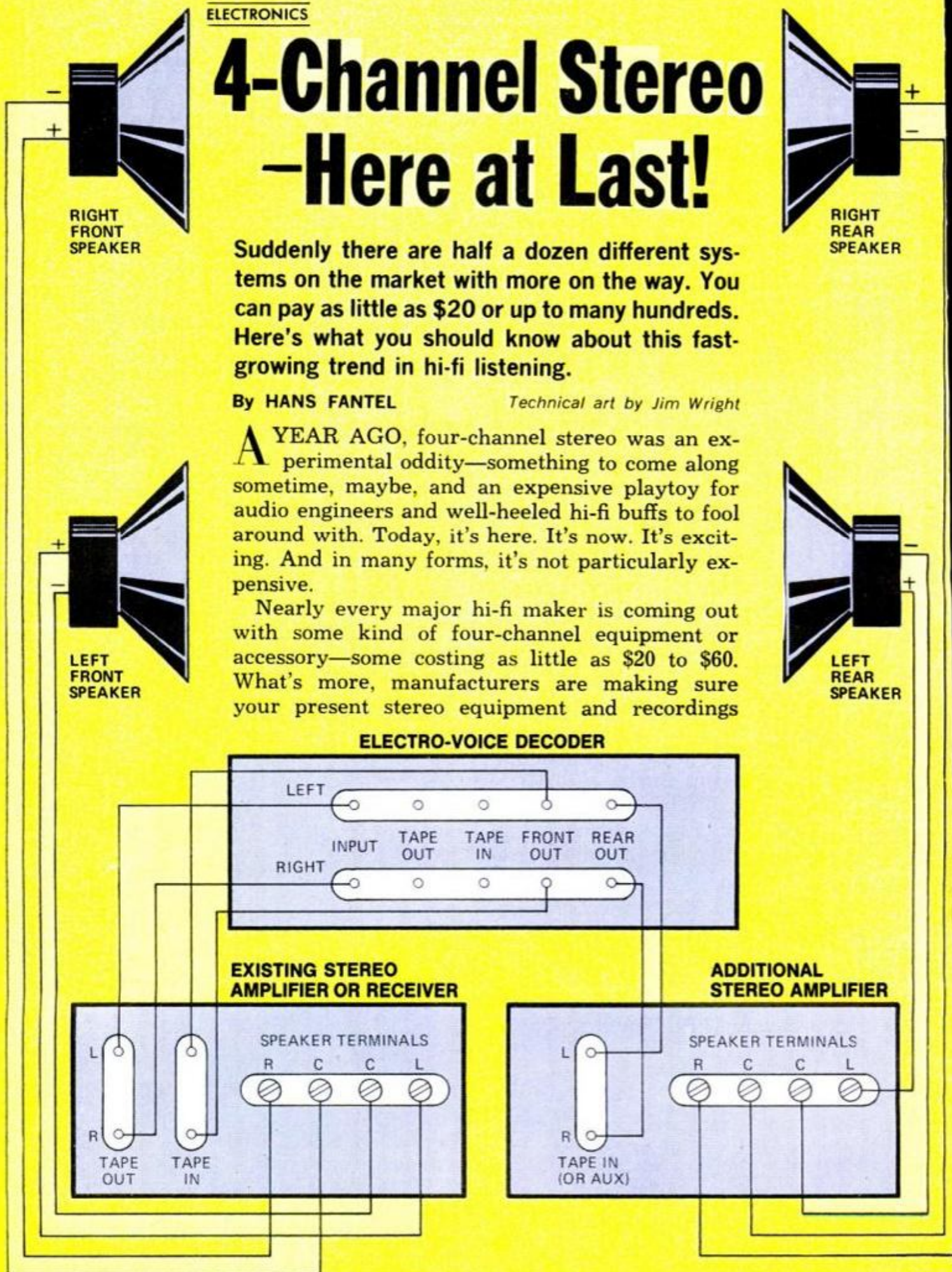
Suddenly there are half a dozen different systems on the market with more on the way. You can pay as little as \$20 or up to many hundreds. Here's what you should know about this fast-growing trend in hi-fi listening.

By HANS FANTEL

Technical art by Jim Wright

A YEAR AGO, four-channel stereo was an experimental oddity—something to come along sometime, maybe, and an expensive playtoy for audio engineers and well-heeled hi-fi buffs to fool around with. Today, it's here. It's now. It's exciting. And in many forms, it's not particularly expensive.

Nearly every major hi-fi maker is coming out with some kind of four-channel equipment or accessory—some costing as little as \$20 to \$60. What's more, manufacturers are making sure your present stereo equipment and recordings





SMALL ELECTRO-VOICE DECODER, shown on top of receiver above, provides four-channel output from two- or four-channel sources, is priced at \$59.95. Diagram on facing page shows hookup requiring second stereo amplifier as well as existing one. Photo below shows various connections on back of decoder



will not be made obsolete by this new development. Most systems represent "add-on" units that can be used with existing amplifiers, receivers, phonographs and tape machines. Depending on what you want, you'll need an extra pair of speakers, a four-channel conversion adapter and probably a second amplifier. But you'll be able to listen to conventional stereo records, tapes and radio broadcasts just as before.

Why the sudden craze for four-channel sound? The original case for two-

channel stereo was that, since people listen with two ears, the sound should also come from two different directions. Hence your two stereo speakers spaced apart on opposite sides of the room. Actually, however, you don't hear in just two directions, but in many. The sound of music in a concert hall bounces around the room, reflecting off the side and rear walls and literally surrounding you from all directions. A lot comes from behind you, although you may not be aware of it. The slight delay between the direct sound waves from the front and reflected ones from the rear produces a rich, reverberant, echo-like effect, adding a quality of depth and dimension to the music.

Four-channel stereo, or quadraphonic sound, as it's called, is designed to create in your own living room the same sense of depth and richness you experience in a concert hall. The two added channels, feeding speakers placed at the back of the room, simulate the sounds heard from the sides and rear of an auditorium. The effect can range from a mild enhancement of musical realism to uncanny acoustical illusions.

One maker recently startled an audience of electronic experts by making an express train appear to roar around the room. The sound was gradually faded from the left front speaker to the right front speaker, then to the right rear speaker, the left rear speaker and finally back to the left front speaker—around and around until you'd swear the train was right in the same room with you. While such tricked-up theatrics are for demonstration purposes only, they dramatically illustrate the effects that are possible and the fun you can have experimenting with them.

Four-channel sound is also relatively easy to produce. Recording companies have for years been using multi-channel recording techniques in which microphones are placed in a variety of locations to pick up sounds from many different directions. It's not unusual for an original "master" to be recorded with up to 8, 12 or even 16 channels—

these are then "mixed down" into the final two that represent the conventional stereo recording you buy. It's thus comparatively simple to produce the same recordings in a four-channel format—or even to reissue old recordings in four channels—since the extra channels are already present in the original master.

Not all four-channel stereo is the same, however. Manufacturers have adopted many different approaches to this new-found sound dimension. There is so-called "true" or discrete four-channel stereo—four distinct and separate sound sources individually recorded and played back. Secondly, there is "matrixed" four-channel stereo in which music is originally recorded on four channels, but then electronically blended into two that can be played back on conventional stereo equipment. Finally, there is "derived" four-channel stereo that, by clever electronic trickery, produces simulated four-channel effects from standard two-channel recordings or broadcasts.



1

DIFFERING APPROACHES to four-channel sound are illustrated here. Above (1) is TEAC's rakishly styled reel-to-reel recorder that plays four separate channels through a pair of stacked stereo amplifiers. At top right (2) is Fisher's four-channel AM/FM receiver—first of its kind. At center right (3) is Sansui's QS-1 synthesizer, a highly sophisticated control that can be used with any stereo amplifier to provide derived four-channel effects. At bottom right (4) is Toyo's four-channel, eight-track cartridge player that, like RCA's, has self-contained amplifiers and requires only four speakers to complete the system



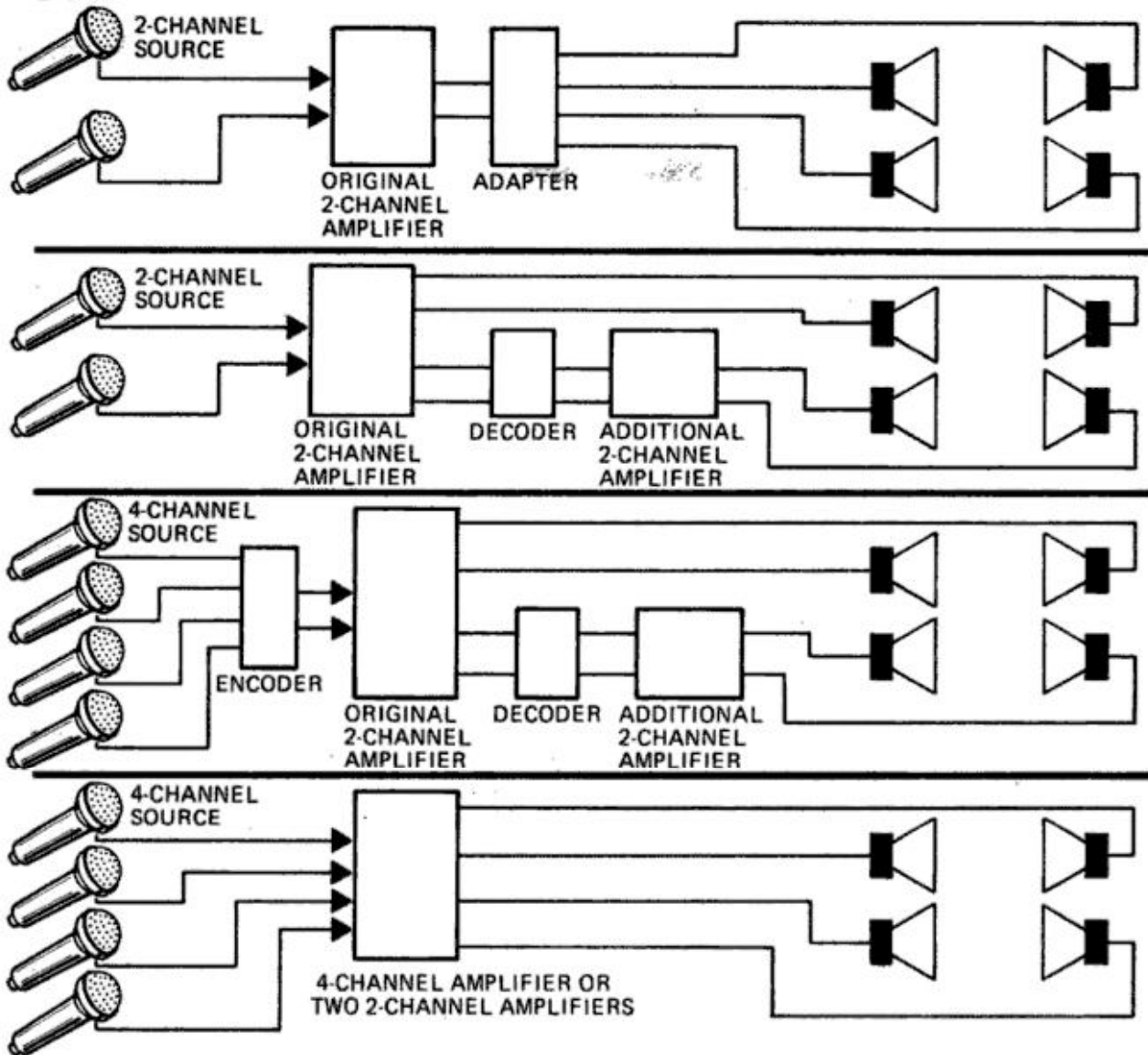
RCA'S QUAD-8 SYSTEM plays four-channel recordings from special eight-track cartridges. Self-contained player needs no additional amplifiers. It comes complete with four speakers for about \$250



A SEEMING IMPOSSIBILITY—playing four channels from a single record groove—is accomplished by this Japanese Victor decoder to be marketed soon. It will work with any high-frequency phono pickup



FOUR BASIC WAYS YOU CAN GET FOUR-CHANNEL SOUND



YOU GET FOUR SPEAKERS no matter which system you pick, but methods vary, as shown above. In simplest (top diagram), adapter splits regular two-channel output to feed four speakers. Two middle diagrams show how decoder used in conjunction with second stereo amplifier provides four channels from either a conventional two-channel source or four-channel source encoded into two channels. In bottom diagram, four separate channels are individually processed in four-channel amplifier with each channel feeding a speaker

Experts differ on which system is best, and many dislike the distinction between "true" and "simulated" because of the obvious implication that one is real and the other is not. The fact is, all three systems produce remarkable effects—you have to hear them to believe them. Which you pick depends mainly on how much money you want to spend and the degree of flexibility you're after. The more sophisticated machines do more things. Some let you select whichever mode of operation you desire—discrete, matrixed or derived.

One of the simplest arrangements,

pioneered by Dynaco, makes use of the so-called "difference" signal arrived at by subtracting one stereo channel from the other. This signal is extracted from the two regular stereo channels and fed to two added rear speakers. The effect is surprisingly good.

Dynaco has been offering this multi-speaker provision on some of its amplifiers for several years. Now it has just brought out an inexpensive adapter that can be attached to any stereo amplifier or receiver to provide the same four-speaker setup. All you need is the adapter and an extra pair of speakers. Called the Quadaptor, the unit will sell



for \$19.95 in kit form and \$29.95 assembled. Lafayette will also sell a similar version for \$29.95 assembled.

By far the largest number of add-on units on the market are of the matrixing type in which music actually starts out as four separate channels of information, then is reduced to two for conventional stereo playback. This is done by an encoding device that electronically adds or subtracts two signal frequencies in such a way that they produce a single third frequency representing the sum of, or difference between, the two original signals. In this way, the front and rear left signals are combined into one stereo channel, and the front and rear right signals become the other stereo channel.

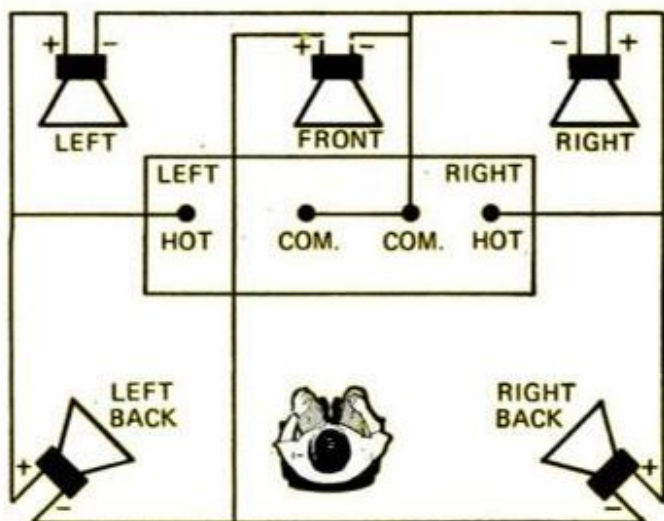
It's like mixing oil and egg to make mayonnaise. The oil and egg are combined in the recording process, then in playback are separated again. This is how you can get four channels from two. To separate the mayonnaise, you need a decoding device that does the matrixing process in reverse. You also need a second stereo amplifier to handle the two additional channels and an extra pair of speakers. One amplifier feeds the left and right front speakers, and the other amplifier feeds the left and right rear speakers.

The fascinating thing about decoders is that they can also "derive" four-channel effects from ordinary two-channel sources—the records and tapes you already have. The reason this is possible is that the two conventional stereo channels contain, hidden in them, all the different pieces of musical information mixed down from the original 8, 12 or 16-channel master. Through a matrixing process in which the two channels are added and subtracted in various combinations, some of the pieces of information are separated out and fed to different channels. These derived signals supply the necessary information for the two additional rear speakers, simulating a four-channel setup. Front-to-rear separation is not

(Please turn to page 172)

POPULAR MECHANICS

KIT-BUILT DYNACO AMPLIFIER above provides for hooking up several different multispeaker arrangements. It can be wired for a third, center-channel front speaker, two added rear speakers or combination of all five, as diagrammed below. An excellent performer, the SCA-80 amplifier sells for about \$170 in kit form and \$250 assembled. A multispeaker adapter for any existing hi-fi system is also available from Dynaco for about \$20 as kit and \$30 wired





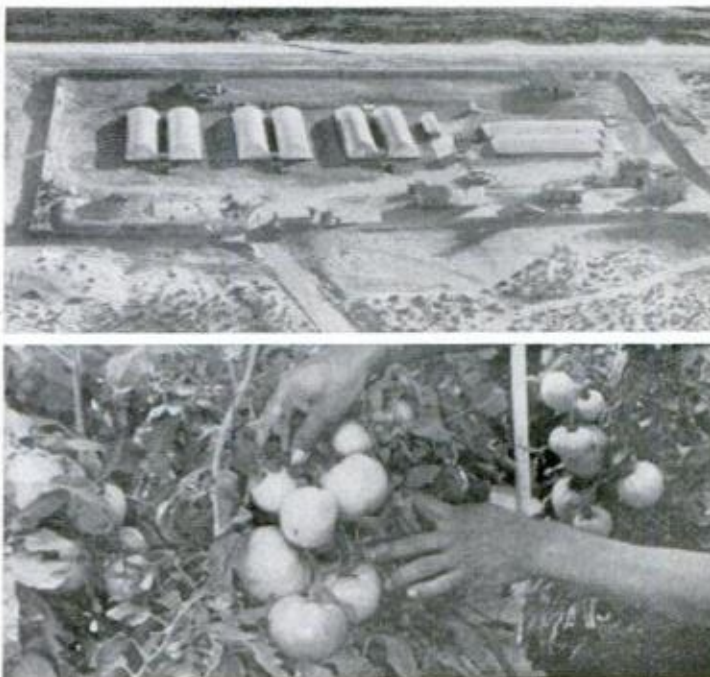
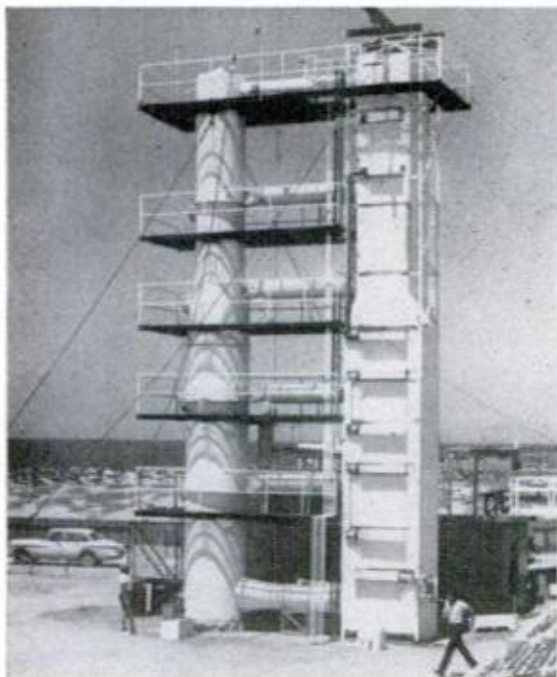
Lifejackets for torpedoes

Fitted snugly around a torpedo during practice firing, a tirelike float inflates automatically as the torpedo ends its run so Navy crews can recover the weapon. In the past, torpedoes were often lost on the bottom.



Fast smasher

You'd have to have a dandy party going to keep this bottle-crusher busy. It can crush some 1500 glass containers an hour. Designed for use in homes or restaurants, the Breakmatic is a German product.



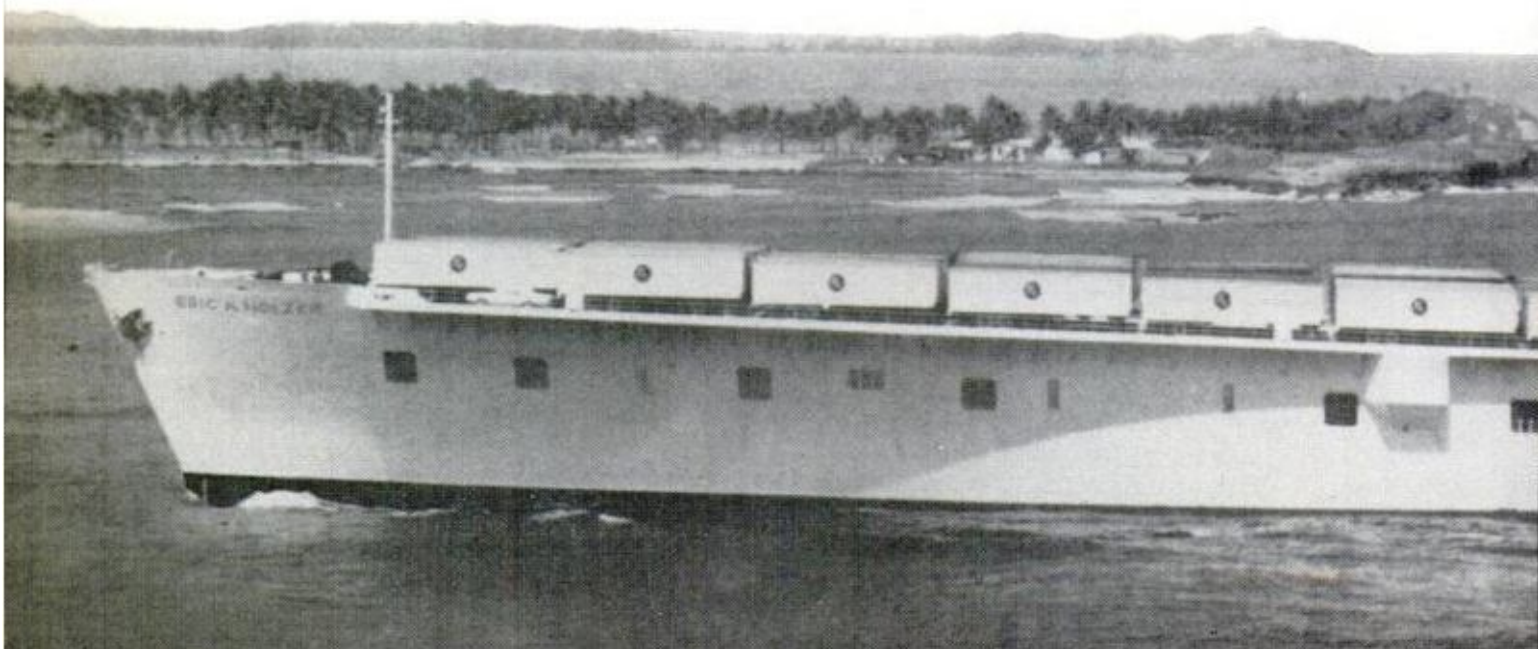
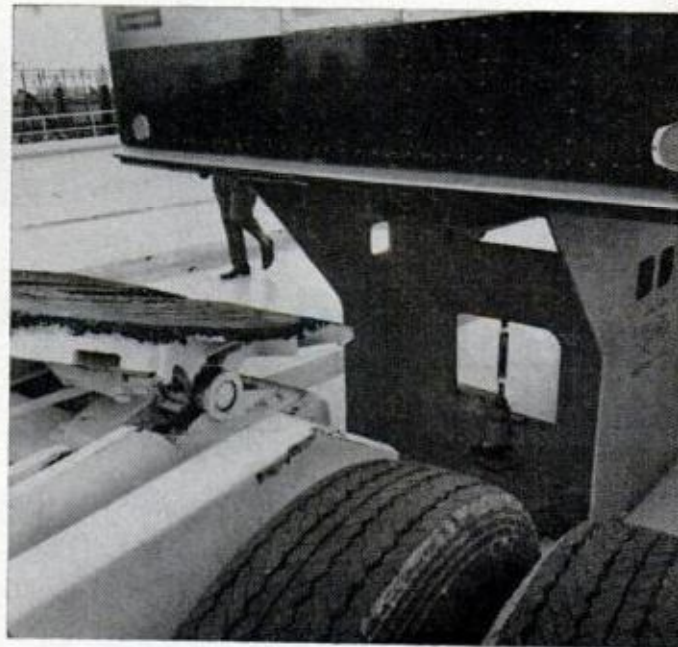
Lush vegetables grow in sand and seawater

Lush vegetables can be grown in the sands of desert coastal areas. This has been proved by the University of Arizona's Environmental Research Laboratory in an installation at Puerto Penasco, Mexico. A desalting tower (left-hand photo), powered by diesel engines, converts sea brine into fresh water for the plants. The plants are housed in plastic air-inflated structures, where humidity is high. Nutrients are fed through tubes.

TRANSPORTATION

THE ERIC K. HOLZER—700 feet long and 24,000 tons—is the world's largest capacity roll-on ship. Trailers are loaded and unloaded via ramp, towed by "yard" tractors. After they are parked, the trailers rest on specially designed stands (below, right) that provide front-end support.

A sister ship, *Ponce de Leon*, inaugurated roll-on service between New York and San Juan





THERE'S LITTLE CHANCE that the recently launched *Eric K. Holzer* resembles any freighter you ever saw. One of the first of a new breed, the vessel has the uncluttered decks of an aircraft carrier. She's a roll-on, roll-off freighter, a big seagoing cousin of the piggyback railroad car.

In New York, the *Holzer* takes aboard 240 40-foot trailers—loaded with cargo from many parts of the country—and about 400 autos, trucks, flatbeds, steam rollers and even huge overhead cranes. Nothing is lifted aboard. Everything rolls up one of three ramps, drivers piloting vehicles to assigned parking spots. Trailers are towed by small but powerful “hustler” tractors.

It takes the *Holzer* less than 60 hours to cover the 1600 miles to San Juan, Puerto Rico, cruising at 26 knots. In from 8 to 12 hours she is unloaded and loaded again for the return trip. The *Holzer* and a roll-on sister ship shuttle between New York and Puerto Rico.

The roll-on ship is the freighter of the future, say the *Holzer's* owners, Transamerican Trailer Transport. It is more efficient and flexible than the container ship. Transamerican officials look to the day when 1000-foot roll-on freighters will carry 1600 trailers and other vehicles at 35 knots between ports in America and Europe. ★★★

26-KNOT PARKING LOT

By JOHN F. PEARSON
Science Editor



Inner-Tube Float Fishing

Here's a 'boat' that
will take you places
no outboard ever could

By CALVIN A. DEVINEY

A LARGE INNER TUBE as a fishing vehicle can be more fun, more convenient and considerably more economical than a boat! The most obvious advantage is the reduced price of making this "boat" compared to buying the conventional kind.

The tube is light for transporting in a car or for carrying through miles of fields and brushlands to your favorite, hidden fishing hole where you could never carry a heavy boat. It's also easily deflatable, so you reduce the number of bulky items you have to carry. And if you like to move around or go on combination camping-fishing trips, all you have to do is deflate the inner tube, carry it along to the next spot, and inflate it when you're ready to fish again!

For fishing in streams, you can walk across the shallow spots and then float through the deep holes. Deep rivers, canals, lakes or mud ponds—none are inaccessible to the inner-tube fisherman.

Floating also provides a quiet approach to your quarry because you eliminate the thrashing sound of a man churning his way out into a river.

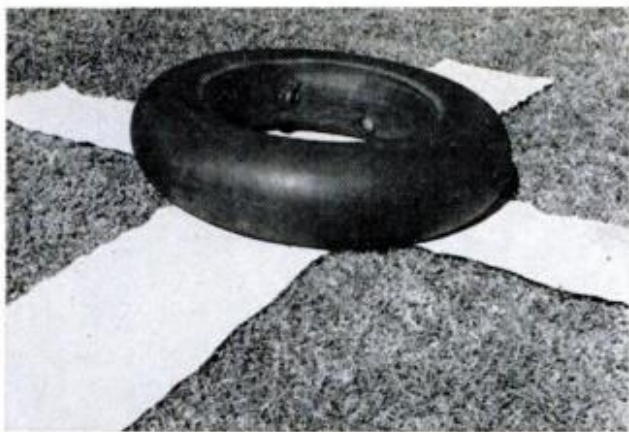
Whether you're fishing with a fly, spinning or casting rod, you can manage all your tackle from a tube by filling the pockets around the sides with everything you'll need or by wearing a fishing vest to carry spare lures, fishing hooks and accessories. If you plan to be out during mealtime, fill another tube with an ice chest and picnic basket and tow it behind. No need to waste valuable fishing time to go ashore to chow.

You might want to substitute a rope sling to sit on instead of making the canvas harness—or tie a pair of large pants or the seat of old waders inside the tube.

With this novel fishing "boat," you might even convince the family to take separate tubes and join you at your favorite sport. Try it, and good fishing!

* * *





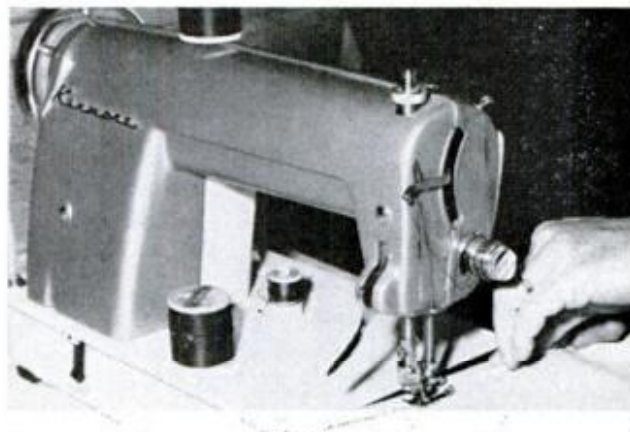
CUT TWO CANVAS STRIPS long enough to fit across and under the inner tube and to wrap around it later



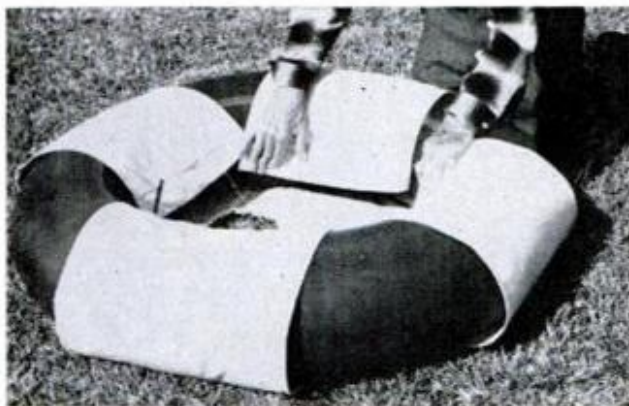
MARK OFF TWO OPENINGS large enough for your legs. Remove tube and you're ready for the scissors



CUT OUT MARKED AREA NEATLY, being sure to go through both pieces of the overlapping canvas



HEM OUTER EDGES AND LEG HOLES with a sewing machine and a little help from the lady of the house



FOLD CANVAS BACK in and over tube to check for the proper length before installing the grommets



SPACE GROMMETS EVENLY to obtain the maximum strength from nylon or other long-lasting lacing

LACE INNER TUBE IN CANVAS and your instant boat is done. Try variations on this basic design

RESULTS ARE REALIZED in excitement of entering fish's domain to take your prey—and your dinner





'The Racetrack Is Still Detroit's Best Test Track!'

Jacque Passino

The former head of Ford's racing operations knows that racing on Sunday makes better cars on Monday. **By DON O'REILLY**

IN SPITE OF CUTBACKS in auto racing efforts and expenditures by the auto manufacturers, your passenger car will continue to be improved because of the sport."

That's the opinion of an expert, the man who headed the Ford Motor Co.'s racing operations from 1957 to 1970, Jacque Passino.

The quiet, taciturn industrialist is known familiarly as the "Gray Fox." He's conservative in most everything except his choice of weekend attire, when he goes for bright colors and bold stripes.

Jacque Passino can speak freely today, as he did in this exclusive *Popular Mechanics* interview, because he abruptly resigned from Ford less than a week after the Dearborn, Mich., automaker just as abruptly cut its ties to motor sports last fall.

Auto racing has contributed many passenger-car improvements beyond the oft-cited 1911 rear-view mirror on Ray Harroun's car, says Passino, speaking with the knowledge and assurance

of one in the automotive industry all his adult life. After graduating from Toledo (Ohio) University with a mechanical engineering degree, he joined Willys-Overland, moved up to vice-president for administration in the export corporation and, after eight years, joined Ford Div. in sales promotion and advertising.

Within three months, he was in charge of Ford's racing program, although he had never seen a race. Even today, Passino is not a racing fan. It was his business, but he looks on auto racing as becoming the number one spectator sport in the United States.

"The race track that has proven in the past to be the real 'test track' for production cars will continue to be so, more emphatically, in the future."

Passino explains the benefits from racing like this: "An engineer who works on a car is a unique kind of a guy who can take an automobile—or any product you sell—and minimally engineer it.

"You don't put any more into any-

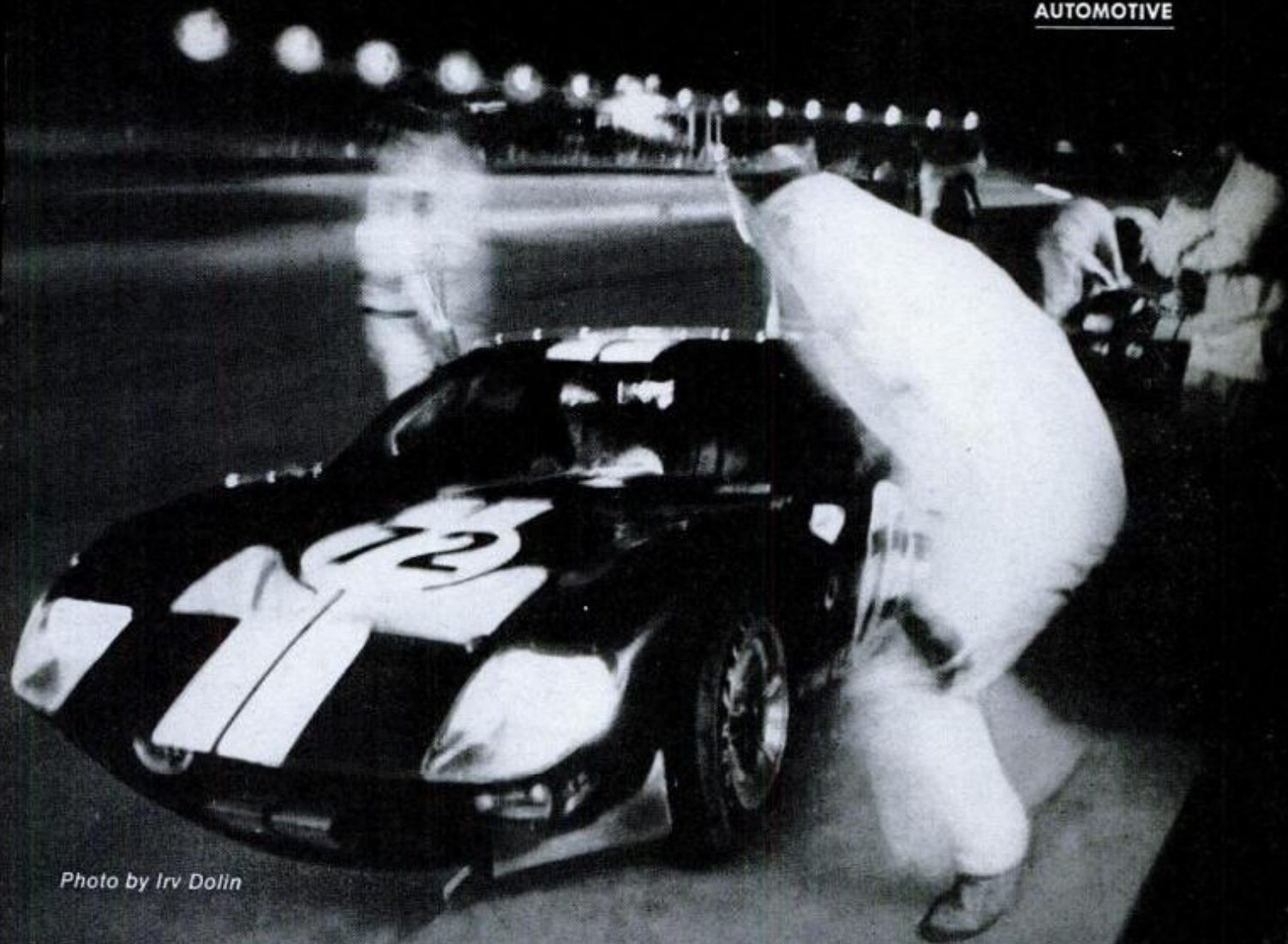


Photo by Irv Dolin

FIRST BIG WIN for Ford GT Prototypes was at Daytona in 1965. Miles/Ruby GT40 took first and the Ginther/Bondurant car No. 72, in a night pit stop here, took third in the 2000-kilometer race

thing you sell than you have to for it to do the job it's designed to do. You don't over-engineer it. On the other hand, you don't skimp. The companies have all kinds of statistics as to what it costs in terms of failure. They don't want any warranty failures, so they engineer the automobile to do what the automobile's supposed to do and at the same time to make the company the most money."

"The engineer says, 'I have engineered that car and it's perfect.' Well, fine, we take it on the track and destroy all those little things that he designed, but we improve it."

"Disc brakes have been used and proved on sports cars and foreign cars and in racing for years, but disc brakes

were slow to appear on American production cars because Kelsey-Hayes, Budd Co., Ford Motor Co. and General Motors have been dedicated to drum brakes. They have the machines, the castings, so they build drum brakes."

Everyone knew the disc brakes were better, Jacque insisted, and sooner or later, you will see four-wheel disc brakes on our domestic cars.

"So, you ask, did it come from racing? Sure, it did! When we wanted to stop a race car, dissipate heat, we used disc brakes."

Wide tires are another improvement transferred from race cars. The racers learned they got better adhesion and the automakers discovered that the passenger car was more stable with a



GRAND NATIONAL STOCK CAR, David Pearson's No. 17 Ford, described by Passino before factory pullout!

little better ride wherever the wide tires were used.

"Transmissions have also been greatly improved. Once upon a time, your kids took the car out, went drag racing on Woodward Ave. (the local, illegal drag strip in Detroit) and broke the transmission.

"'How come?' you demand to know. 'I never broke a transmission before!' That's because it's a different kind of car now: wider tires, more power. So transmissions had to be made better than they ever had to before. The improvements don't happen instantly; little by little they take something off a race car and put it on a production passenger car."

In hot Phoenix, Ariz., one summer day, Passino was amazed to see a huge supermarket display of Prestone, which is being marketed as a year-round coolant. "It all started in racing when the stock-car boys discovered antifreeze dissipates heats better than water."

"While the passenger cars will definitely continue to benefit from auto

racing in the future, the rate of progress will be slowed by the factory cut-backs because the independent racing teams won't have the finances at hand to develop the innovations they might need.

"Lacking the previously available factory technicians, engineers and large staffs, it will be difficult for an individual on a small budget, to gear up to produce a special item, even a short run item."

Regardless of the pace, improvements will continue to be made, in Passino's estimation, because "someone will always be out there on the track. And with the fierce competition, everything breaks sooner or later. The teams have to come up with better ideas and better ways."

Jacque looks back at the situation in 1962—the year Ford officially got back in racing after the "first factory pull-out" of 1957. "From 1962 it was onward and upward with Ford in racing, stocks, drags, Indianapolis, the Baja and other offroad races, and at Le Mans, France. We went to Le Mans

with a stock-car engine, the 427 push rod, a lump engine made out of iron, in a unique kind of car they said would never last. But we beat them.

"Henry Ford, you know, had tried to buy the Ferrari factory in 1963, but the famed Commendatore wouldn't sell so the goal became: If you can't buy them, beat them.

"After two years of trial-and-error experience, Ford scored the greatest team triumph in Le Mans history. In 1966, the first three cars finished almost simultaneously, close enough to be covered by the proverbial umbrella. Chris Amon/Bruce McLaren were the winners, Ken Miles/Denis Hulme, second, and Dick Hutcherson/Ronnie Bucknum, third."

That triumph belonged to Leo Beebe, then Jacque Passino's immediate boss, but as Beebe moved up in the company, Passino was placed in complete charge before the 1967 race, with his new title as special vehicles manager.

So, what do you do for an encore?

In 1967, in the black of the night, about the halfway point, "we were running one-two-three and sixth," Passino recalls.

"Mario Andretti crashed as he was braking down from 150 mph for the esses. Moments later, teammate Roger McCluskey, thinking Andretti might still be in the car, crashed his Mark II avoiding it and Frenchman Jo Schles-



AT LE MANS, where Fords had their big victories in '66 and '67, Jacque confers with John Holman

ser tried in vain to thread the needle between the two wrecks.

"There we are, running one-two-three and sixth and we lose three cars—two, three and six—in one crash. So, you expect them to ask, 'How did you work that out?' Well, that's life.

"Mr. Ford had just left the track before the crash and was gone for two or three hours. He could have said a lot of things, but when he came back he did say, 'I heard you had a bad crash.'

"Yes, we lost three cars.'

"Was anybody hurt?"

"No.'

"Fine.'

"There was no screaming at me. I might have screamed. In a 24-hour race, we're only 11 hours into the race and we lost three cars.

"We won the race with Dan Gurney

(Please turn to page 174)

TRANS-AM SERIES of SCCA races is manufacturers' championship. Factory Fords won it in '66, '67 and '70

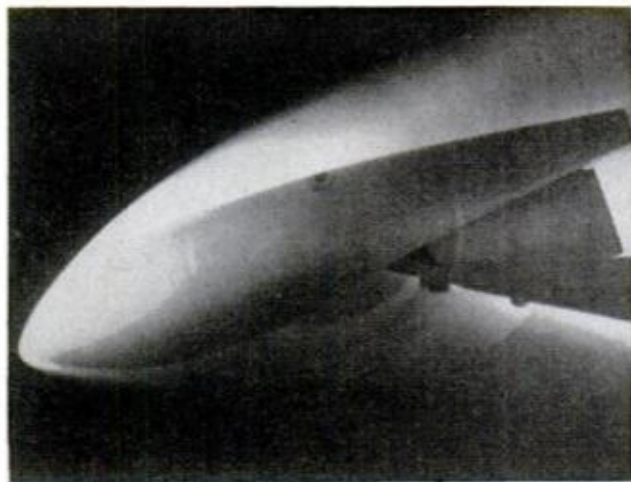


NEWS BRIEFS



Auto engine powers 'copter

Haruaki Ozeki, a Japanese architect, built this hydrocopter in four months with the help of friends. Powered by a used-car engine, it lifted a few feet off the water, flew 25 mph.



28,000-mph wind tunnel

A wind tunnel at Australian National University can deliver 28,000-mph blasts, twice the speed possible in other tunnels. Model is of a reusable German interplanetary glider.



Glider with a prop

When the AK 1's pilot wants a boost, he starts a retractable 26-hp engine that drives a pusher-type propeller. The powered glider was built by members of a Karlsruhe, West Germany, flying club in about 8000 hours.



Steam machine from junk

Morris Cleveland's 2½-ton steam monster lumbers along at only 5 mph. But the Lawrence, Kans., electrician built it from junk just for fun. The engine is an old oil-well pump; the boiler, salvaged from a cleaning plant.



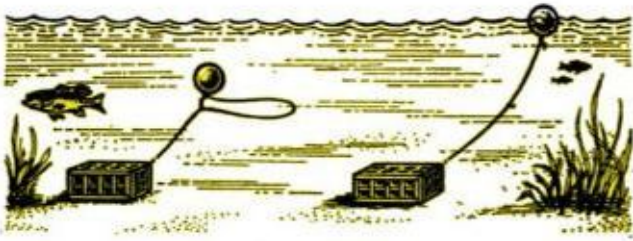
Pushbuttons run train

No one is aboard the yard engine that pulls 12 cars around a Salzgitter, West Germany, steel mill. Man at the right controls it with radio signals triggered by buttons on the little switchboard around his neck.



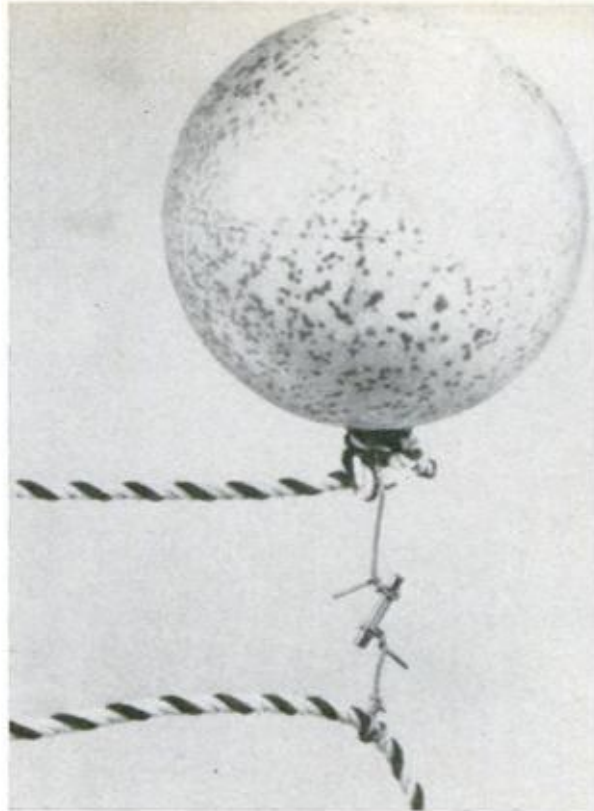
Seeing by moonlight

An image-intensifier in this electronic spy-glass detects moonlighted objects one-third of a mile away. Light from an object is amplified 45,000 times in the three-pound device, which runs 50 hours on two dry cells.



Pop-Up fools poachers

Angered by poachers who were finding his lobster traps and stealing the catch—and often the traps themselves—Spencer Meredith invented the Pop-Up, a “timer” that keeps the marker float hidden below the surface for a set period. The Pop-Up is a short rod that disintegrates in seawater. It's attached to the line from lobster trap to float so that when the trap goes to the bottom, the Pop-Up holds the float below the surface where poachers can't find it. When it disintegrates (there are overnight and two, three, five and seven-day models), the float pops to the surface where the returning lobsterman can locate it. Meredith's firm, Oceanetics International, Miami, Fla., makes the Pop-Up.



Ancestor gallery

Farmers in parts of Bavaria carve life-sized portraits of grandparents to sit on the ends of benches as memorials. The benches are destroyed when the last family member dies.



Foam for year-round home

Made of Selectrofoam polyurethane foam sprayed over inflated plastic forms, this home required no conventional framing. It was designed by architect Stan Nord Connelly; the plastic foam is by PPG Industries.

AUGUST 1971



Well, it's not stolen, anyway

A portable safe that's claimed by its makers to be burglarproof will be marketed soon in Australia. A built-in electronic system and tiny computer guard the safe so if any attempt is made to break into it, the contents are automatically rendered useless by an indelible blue dye. In the photo, money is impregnated with dye in a demonstration.

81

JUST PATENTED

They Roam

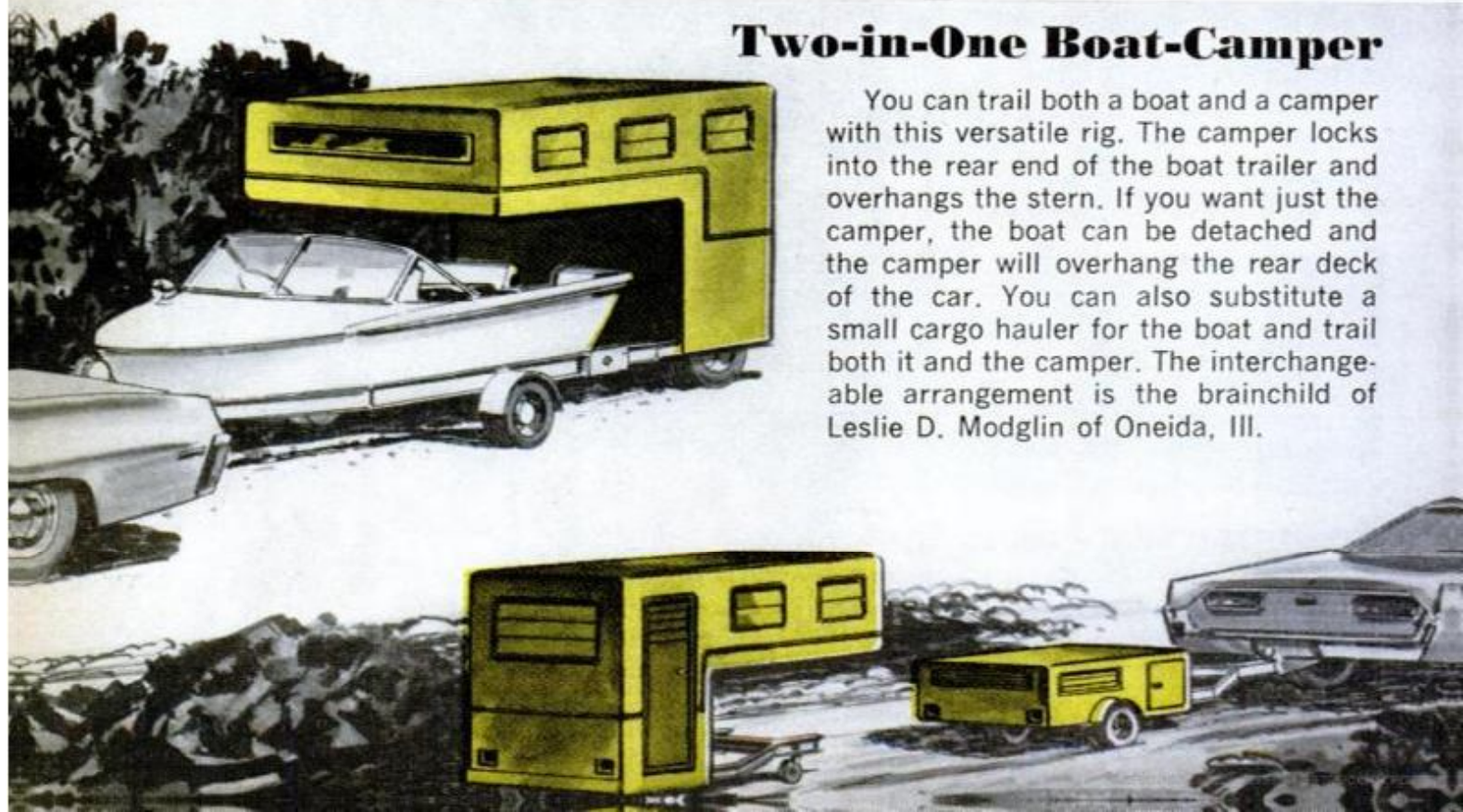
UNDERWATER
HABITAT PULLS
ITSELF ALONG
OCEAN BOTTOM

DIVERS
ENTER
AND LEAVE
THROUGH
OPEN
BOTTOM



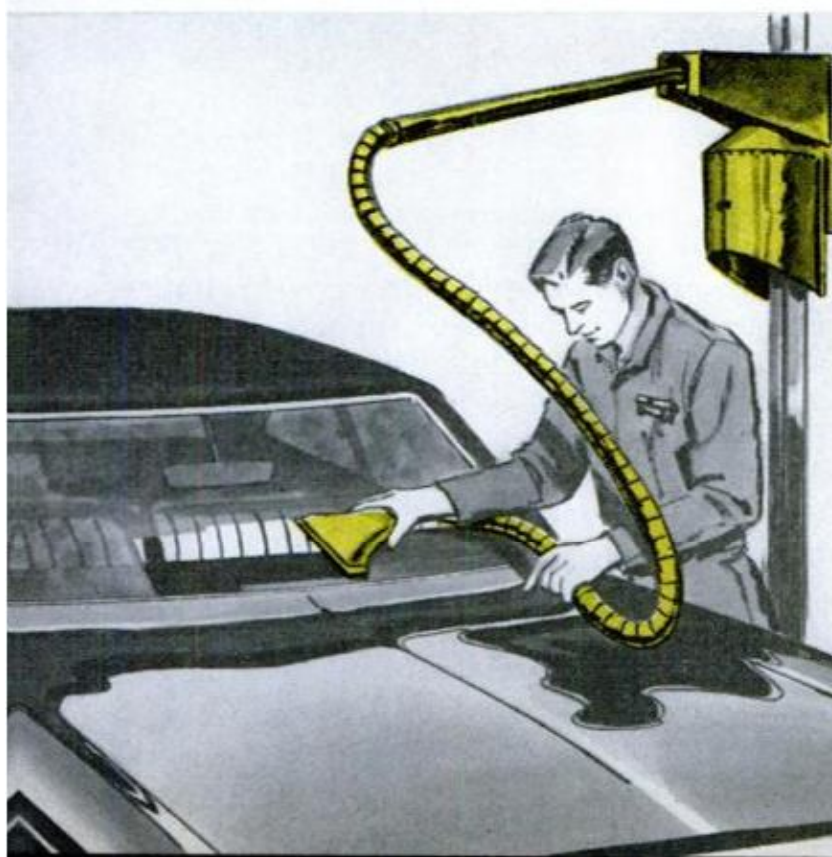
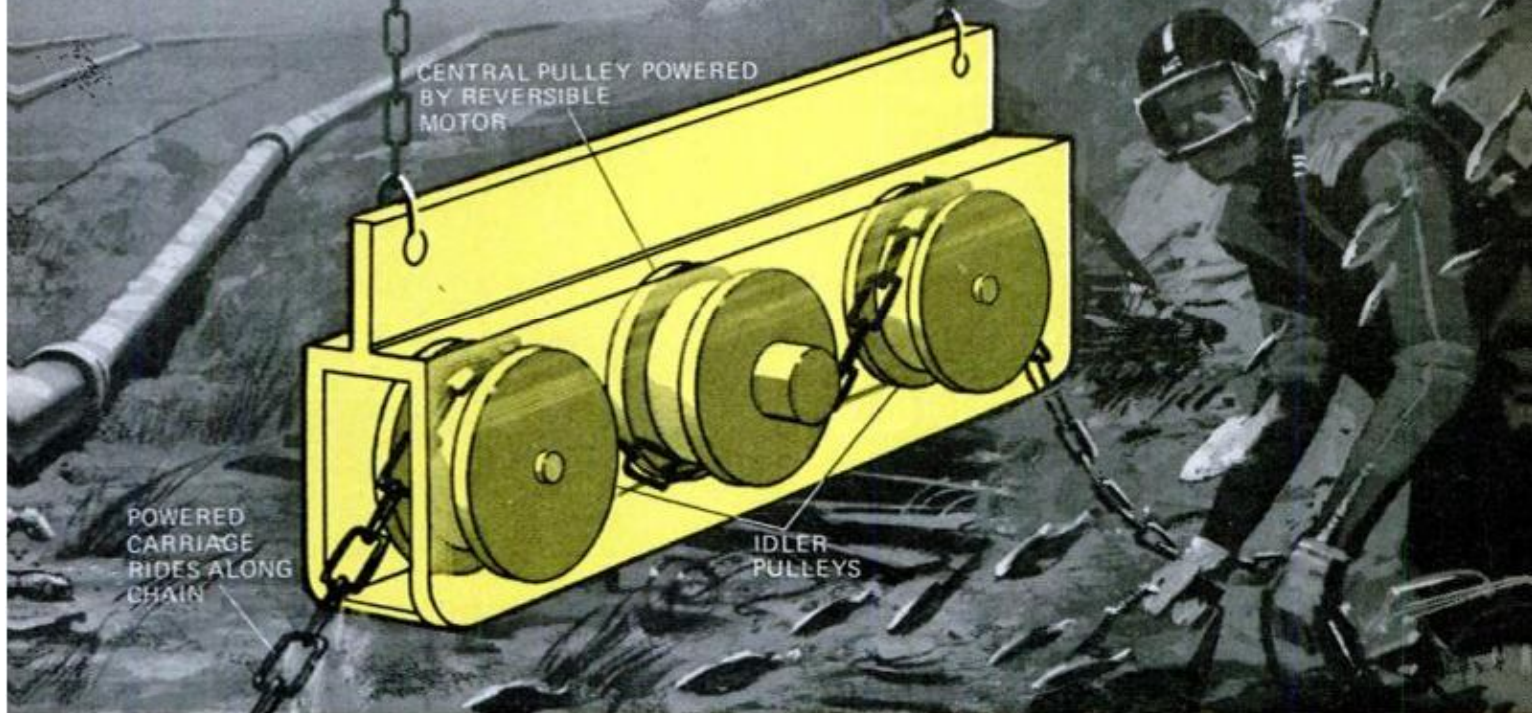
Two-in-One Boat-Camper

You can trail both a boat and a camper with this versatile rig. The camper locks into the rear end of the boat trailer and overhangs the stern. If you want just the camper, the boat can be detached and the camper will overhang the rear deck of the car. You can also substitute a small cargo hauler for the boat and trail both it and the camper. The interchangeable arrangement is the brainchild of Leslie D. Modglin of Oneida, Ill.



the Sea Floor on a Chain

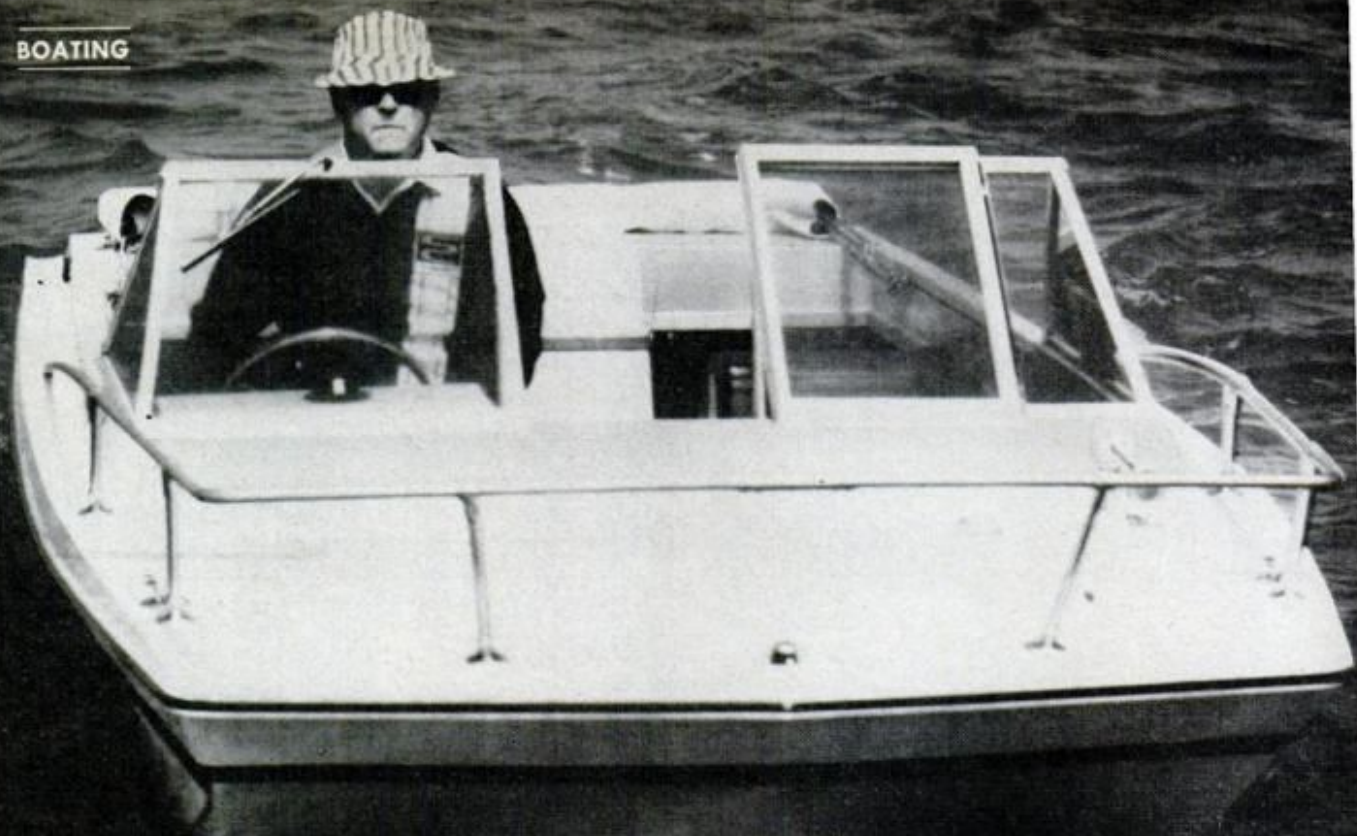
Conventional underwater habitats are either unpowered and must remain anchored in one spot or they operate like submarines and need elaborate navigating equipment. The strange underwater craft shown here are neither. They can't navigate, yet they can roam for miles along the ocean bottom, carrying divers for pipe laying or research work. The trick is that they pull themselves along on chains laid down by ship on the desired course. A motor-driven carriage rides the chains, towing the habitat with it. The system, under study by Westinghouse, was developed by Wilbur J. O'Neill and Alan R. Krasberg of Annapolis, Md.



Automatic Washer

Washing windshields would be quick and easy with this automatic device for gas stations. It dispenses heated detergent, then vacuums up the dirt and suds, piping the waste to a tank. The air flow created by the vacuum also provides a drying action. Standard Oil is developing the idea from inventors Irwin Ginsburgh, Lawrence Wright and Benjamin Pennington.

Illustrations by Roy Grinnell



A SLICK NEW TRI-HULL

Slickcraft's SS-185 takes the hard, wet ride out of the bow

By GEORGE REIGER, Boating Editor

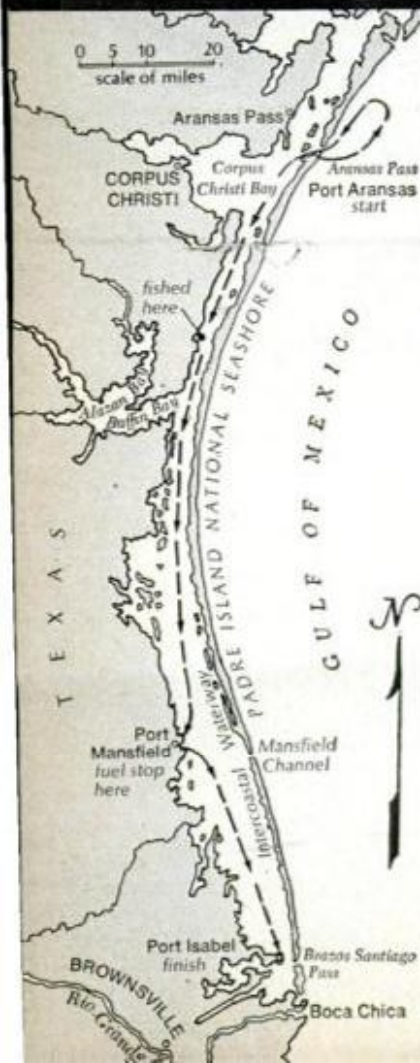
THE SOUTHERN COAST OF TEXAS is a great place for a boat test—and I found a three-day excursion between Port Aransas and Port Isabel to be therapeutic as well. Bob Davis, southwestern distributor for Slickcraft boats, wanted me to visit his favorite boating waters to look at a “truly different” tri-hull. I settled on one date for the trip but then called Bob to ask him for a raincheck because I had picked up a vicious cold just before flight time.

“Come on down anyway,” he insisted. “This new tri-hull is so smooth, it’s like riding on a water bed! And the trip and fresh air will do you good. You’ll be over your bug in no time.”

Bob’s water-bed claim was an exaggeration, but his prediction of improved health sure came true.

The reason for his enthusiasm was quickly apparent. Most tri-hulls have a compartment in front of the steering console where passengers are supposed to sit. Yet experience shows that most riders get too much wind, spray or bounce there to find it a pleasure on any but the calmest days. Thus, many tri-hull owners convert the well space into spare-tackle storage. But since this hardly

BOB SHOWS SS-185 near old Port Aransas lighthouse. Middle right: profile. Near right: We end journey in Port Isabel. Far right: Bob chooses tackle from Berkley travel pack







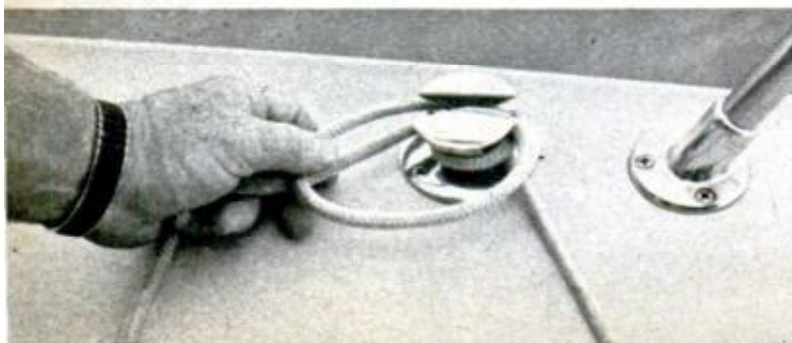
AT START OF EACH DAY Bob gave our 140-hp I/O system a thorough going-over to insure smooth running. With enough marina facilities along the way, we never had to use the spare fuel in can at center foreground



EASILY READ INSTRUMENT PANEL (including lower-unit angle indicator) helped to make trip a pleasure



CLOVEN-HOOF and low-silhouette design of Slickcraft cleats makes them less likely to stub bare toes

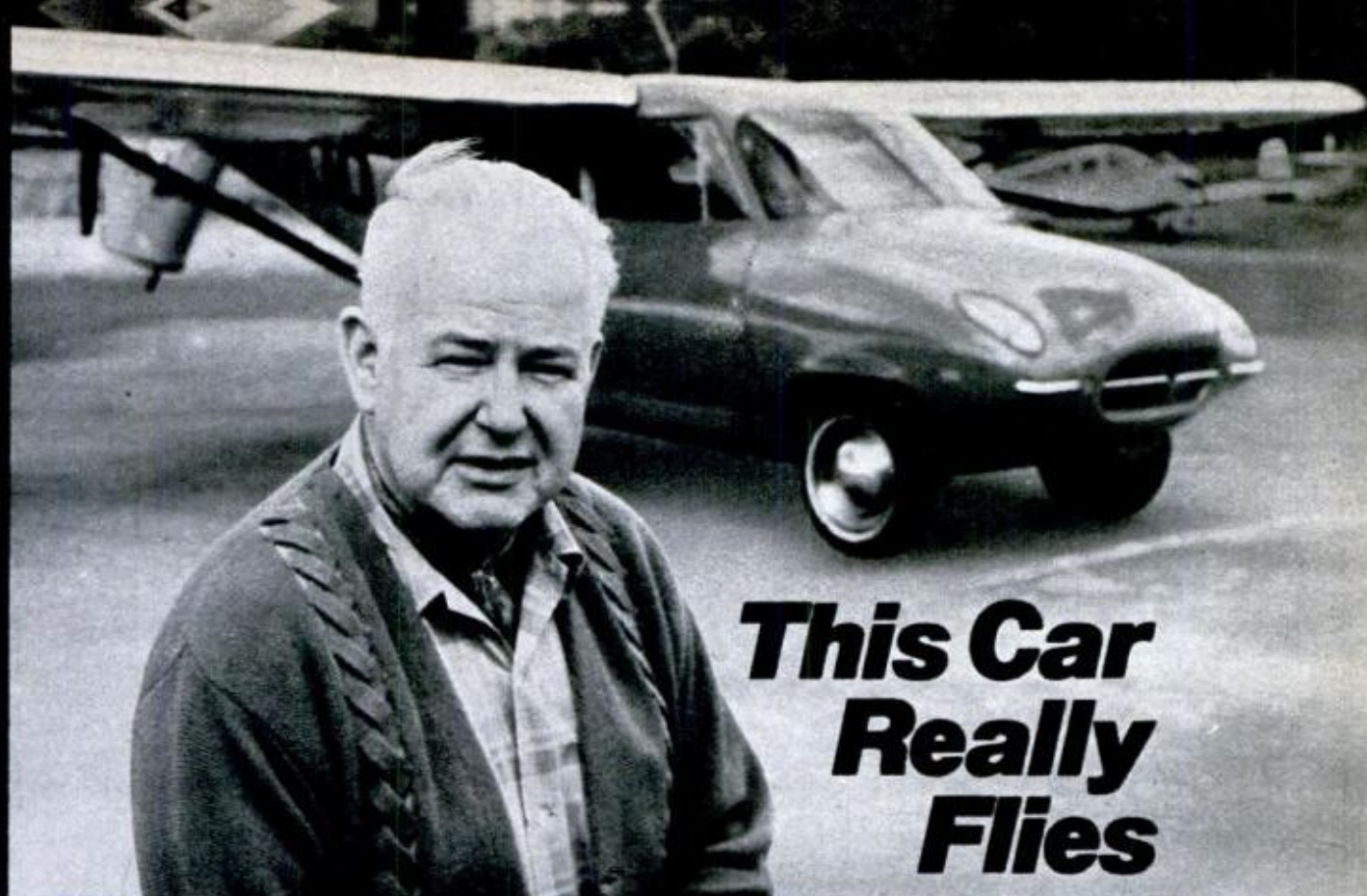


qualifies as "dry storage," any metal gear exposed to the salt-water spray quickly rusts and deteriorates.

Slickcraft has taken an 18-foot, 11-inch tri-hull, moved the fuel tanks for its 140-hp powerplant forward to the bow and decked over the space, incidentally providing the boat with an ideal casting platform for anglers.

During our run from Aransas to Isabel, I also found the weight of fuel forward countered the weight of the engine aft so that we experienced a smooth transition from plane to idle and back again. Then since we endured the discomfort of stiff winds during our first day of tests in the inlet area of Aransas Pass, I had first-hand opportunity to see the advantage of a decked-in forward compartment that sheds water rather than scooping it up from oncoming rollers. The chop was so severe that a number of whitecaps washed over the deck and the windshield before slapping me in the face or running down my neck when I ducked. If we'd had an open cockpit in front, we could have been in trouble.

The SS-185 is available for \$4745 with 140 Merc I/O unit; \$250 less with 120 hp. Write Slickcraft, 500 East 32nd St., Holland, Mich. 49423. ★★★



This Car Really Flies

By BOB GRANT

A FLYING AUTOMOBILE that sells for less than some luxury cars? It will happen if Moulton (Molt) P. Taylor has his way. His Aerocar III has been certified by the FAA for sale to the public, and could be produced with a price tag as low as \$10,000. The only machine of its type so certified, the Aerocar is the result of two decades of development at Taylor's little shop in Longview, Wash.

The trouble with today's private planes, says Taylor, is that "when you get where you're going, you aren't where you want to be! The Wright Brothers made a serious omission. A bird that can't walk would starve to death. Henry Ford, on the other hand, came up with a thoroughbred automobile but corralled us from the start—it's limited to highways."

The Aerocar III, a sporty little two-seater that can roll as well as fly, is basically a sleek compact fiberglass car and an aluminum flight component of wings and tail. When you land, you get out and pull a few pins and bolts. The wings fold and wheels extend to turn the flight component into a trailer. You can park it at the airport while you buzz off on business or tow it home and store

it in the garage until you're ready to fly.

Aerocar might be the answer if you have to commute anywhere. It will carry 500 pounds—two people and 100 pounds of baggage. Empty weight is about 1500, comparable to a standard four-place airplane. Some 1100 pounds is the automobile/cockpit. Gear necessary to run on the road—clutch, transmission, differential, horn, turn signals, headlights—make up about 300 pounds. It's very useful weight back on the ground.

Changing from plane to car and back takes about 10 minutes to do manually. A production model incorporating hydraulic mechanisms would do most of the work at the touch of a button.

Aerocar could make learning to fly easier than learning to drive. It is an enormously stable craft and has certain other advantages inherent in its design. By putting the prop in back, it flies through undisturbed air.

"Man has dreamed about a flying automobile for years," Taylor comments, "and Walt Disney even made a movie about one." Perhaps the Aerocar will be a dream come true. ***

(For a PM flight report, turn the page)



Photos by Bob Grant



THE FLYING AUTOMOBILE attracts startled glances in downtown traffic. It handles easily even when towing the flight trailer. A special pylon is said to keep the trailer steady up to 70 mph and in 40-mph crosswinds



'I Flew It'

By FRANK A. TINKER

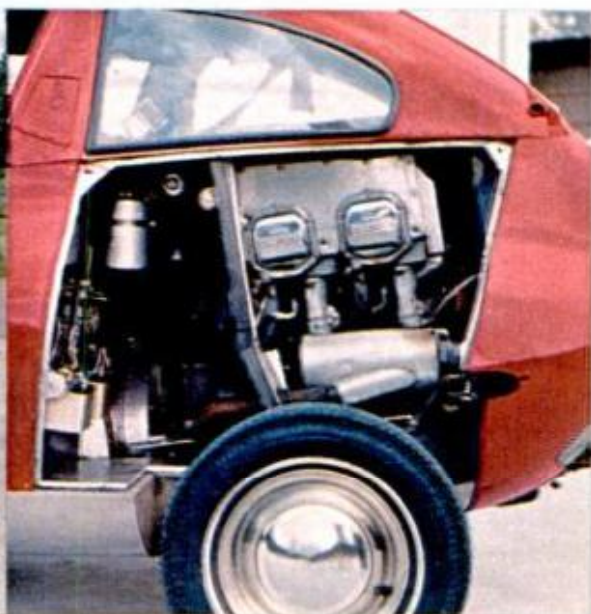
IN 15 MINUTES we'll be looking down on this," said Molt Taylor as we drove past a restaurant on the way to the airport. He was right; in that time we had fixed the Aerocar III's wings in place and taken off. Try this on any other combination sports car and airplane!

My job was to test the Aerocar in the air, and, as a professional pilot weaned on distrust of any aircraft not factory built and strictly conventional, I had some qualms. In the first place, the contraption Taylor had wheeled out of his little shop in Longview, Wash., appeared to be primarily an auto. It proved to be exactly that as we drove to the airport. Except for several odd controls and instruments, the interior looked very much like a sporty compact.

The noise level was higher than an ordinary car as we drove away, but that was expected and did not approach the uncomfortable. The only



BUG BECOMES BIRD as two pins are driven in place to secure flight component and wings unfold for takeoff



LYCOMING AIRCRAFT ENGINE with special ignition and cooling systems powers both car and plane

'I Flew It! . . .'

disconcerting item was a twitch to the front wheels in a low-speed turn. "It's the simple U-joint we have," Taylor told me. "We could cure it with a constant speed joint, but we're working on a less-expensive one to keep costs down."

Turn signals, brakes and other controls all worked normally, and the Aerocar cruised along on its undersized wheels at a comfortable 50 mph.

Naturally, I was interested in how secure the conversion from bug to bird would actually be. It turned out to be very substantial—and fast. Just unfasten the trailer wings by pulling two longeron pins, turn them around and fit the prop driveshaft into its socket. Let the wings swivel into position, lock them, and the job's done. Those same two pins hold the wings and tail section on, and the only tool needed is an ordinary hex wrench.

As I looked at the car that was no longer a car, I couldn't deny the challenge. It had sprouted wings—so I'd fly it.

It was reassuring to learn that the plane had been certified by the FAA some years ago. It is flying under an experimental tag because of a unique ignition system yet to be okayed.

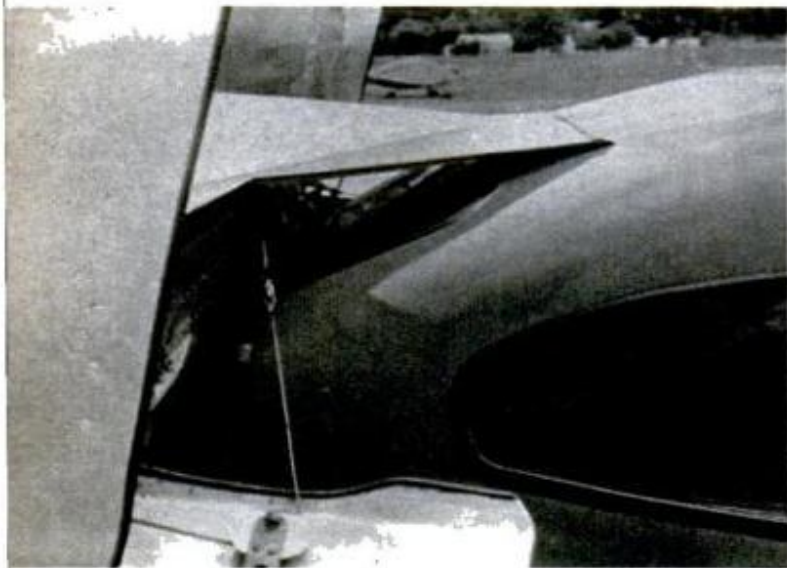
To get under way, the Aerocar starts up with the engine key like a car; no



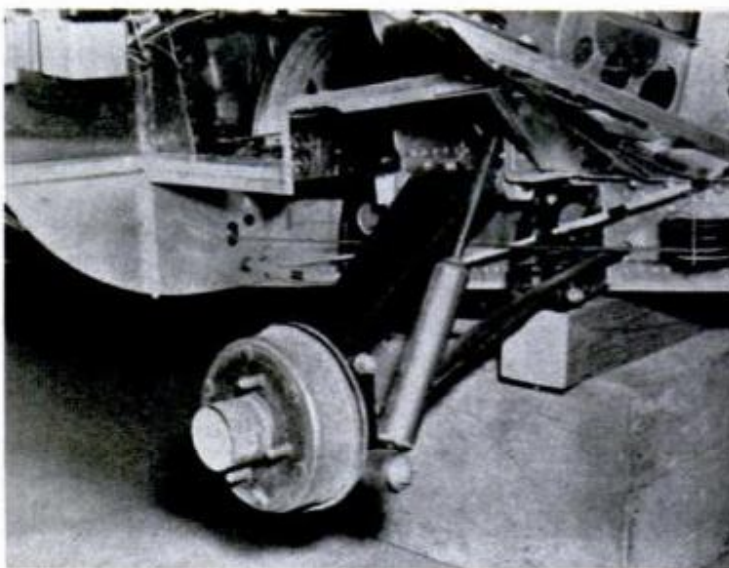
HANDSOME DASH holds car and plane instruments. Rudder pedals are outboard of clutch, accelerator

jockeying with mixture controls and throttle as with most aircraft. Molt then simply shifted into reverse and backed away from the ramp. He had already extended the wheels and/or landing gear into flight position, putting us inches higher off the runway.

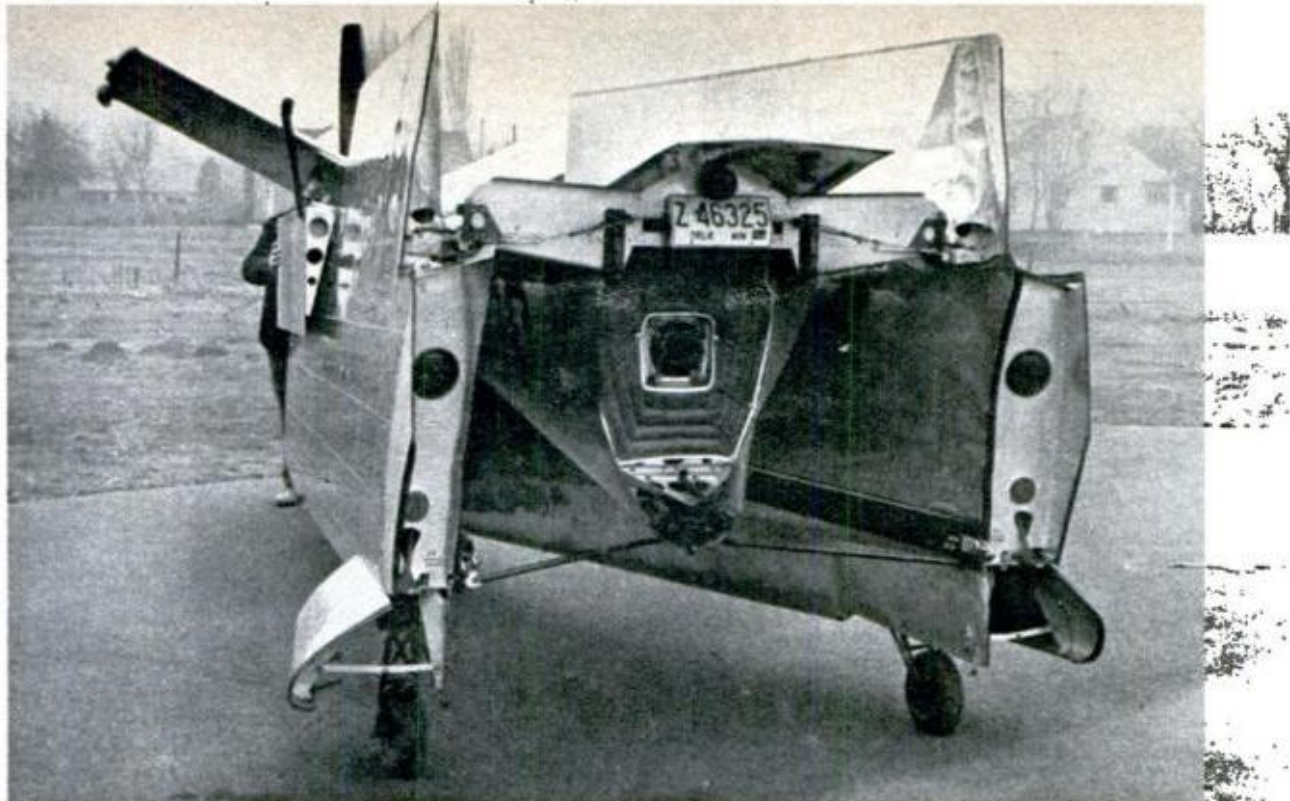
To go from ground power to flying power you merely put the standard gear-shift lever into neutral. This leaves the wheels free to roll (the front brakes are also disengaged) and transmits power back to the fixed-pitch prop through a sophisticated fluid drive



SLICK IN THE AIR, Aerocar is streamlined to aid airflow by an aluminum panel covering back window



RETRACTABLE WHEELS are extended for takeoff, retracted for flight. A midposition is for road use



THE FLIGHT TRAILER, towed backwards on the road, is turned around on its small wheels to mate with car

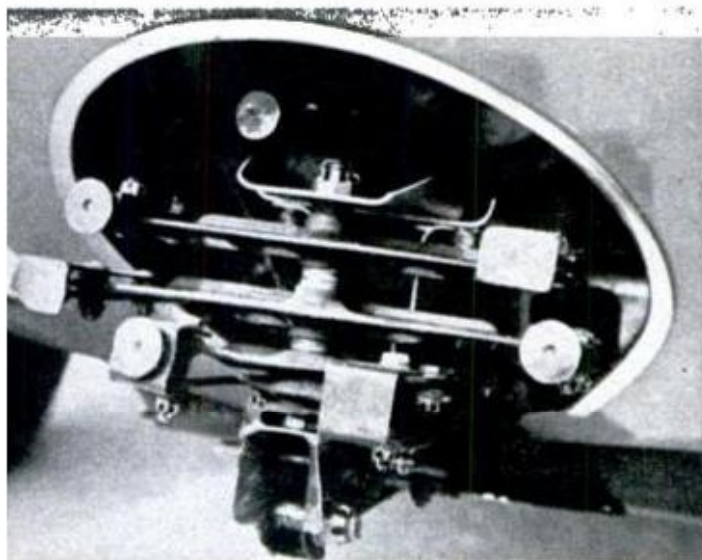
known as the Flexidyne. The "fluid" is actually some 1,400,000 tiny steel balls. When rotated, they are compressed by centrifugal force into a solid mass around a wavy drive plate. In effect it's a constant-speed clutch that locks solidly with no slippage. The device neatly solves a difficult problem: Snap-torque between motor and the prop would bend or break an ordinary driveshaft.

With full power applied, we had the airspeed needle at 60 in seconds. The steering wheel—which became the control column by being unlocked and

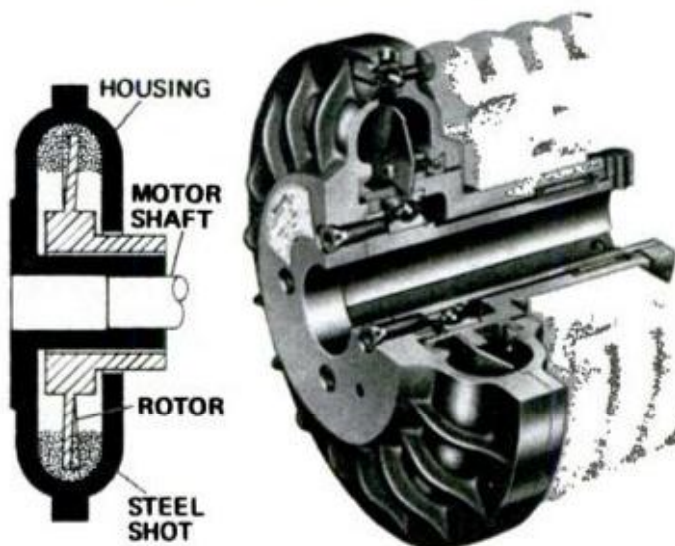
automatically engaged to elevators and ailerons—was full back, and we left the runway at a good angle. (The specs say 650 feet for takeoff fully loaded.) Then, with elevator trim set, Molt calmly took his hands off the wheel and folded them. Not so calmly, I watched the climb-out continue with remarkable stability, the Aerocar guided only by an occasional toe-touch on the rudder pedals.

Best climb speed is about 70 mph, which gave us 800 feet per minute—that with two 200-pound pilots. The

(Please turn to page 116)



AIRCRAFT CONTROL connectors on car automatically lock to matching connectors on flight component



FLUID PROP DRIVE uses steel shot which pack between rotor and housing, providing no-slip coupling



No longer freaks in yachting circles, catamarans appear in everyday use with trailerable and even cargo models

CONVENIENCE is what contemporary sailors want in a boat. Fold-aways, cartoppers and easily-trailerred models are all popular with boaters pressed for time, money and storage space. Today, durable, lightweight metals and plastics are put to use in catamarans, just as in single-hull boats.

Though the Polynesians have been roaming the Pacific for centuries in the swift and graceful twin-hulled craft, it took World War II to acquaint the rest of the world with them. In July 1948 *PM* helped spread the word with a cover story about an ocean-going model made in Hawaii.

But mishaps and misunderstandings attended catamaran development in the 1950s, and many designers abandoned the concept, convinced it would never catch on. However, a California surfer by name of Hobie Alter saw that potential success for the catamaran lay

in using lightweight materials like vinyl-coated nylon and anodized aluminum and in keeping his design simple. He set out to provide surfing thrills in a sailboat for a nonexorbitant price. His result: the Hobie 14 for \$1195.

The Hobie Cat at left was packed from New Jersey to Virginia, then was assembled and set under way in less than half an hour. Both the 14-foot model and Hobie's new 16-footer can be dismantled and stored in your backyard or under your garage rafters.

Hobie's success has spawned some capable competition; in trampoline designs are Aqua Cat in Charleston, S.C.; Sea Spray in Hermosa Beach, Calif.; and Sizzler in Bedford Heights, Ohio. Then there are mini and maxi-catamarans like those pictured below. Hobie's address: Coast Catamaran Corp., 33012 Calle Perfecto, San Juan Capistrano, Calif. 92675. ★★★

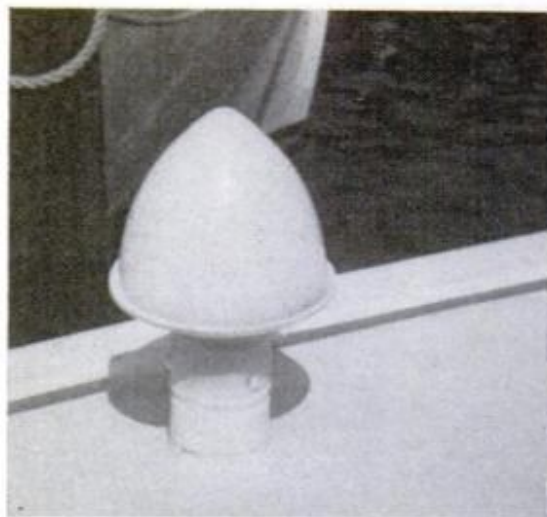
SETTING UP the Hobie Cat 14 requires only some white grease, a rubber mallet, crescent wrench, screwdriver, small file and pliers. By careful loading we were able to carry the entire assembly of twin hulls, trampoline, rudders, mast and sail inside and atop an International Travelall. Assembly time? Just 20 minutes. Below: Catamarans come in all sizes from 10-ft. Frolicat (left) to ocean-going 37-ft. Poly Con (right)

Catamarans Catch On!

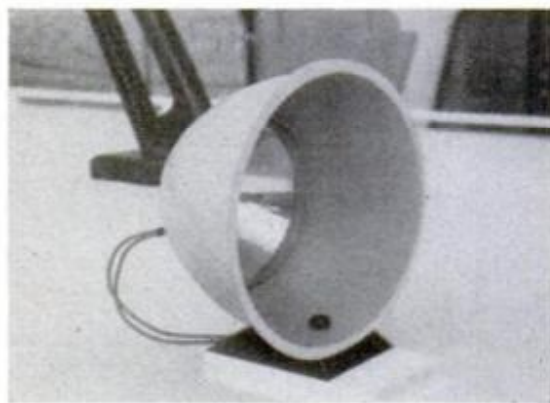


BOATING TIPS

By ROD RADFORD

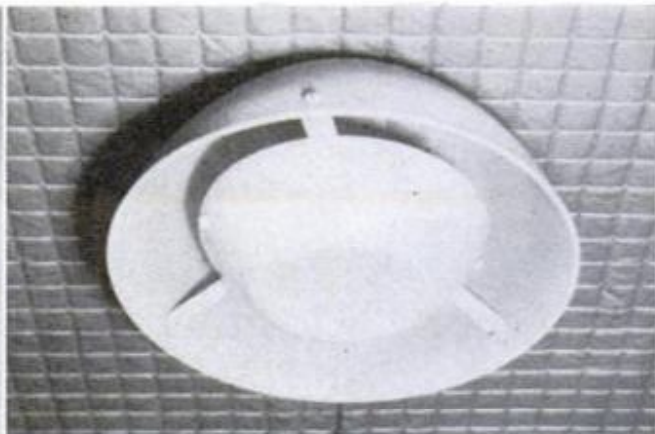
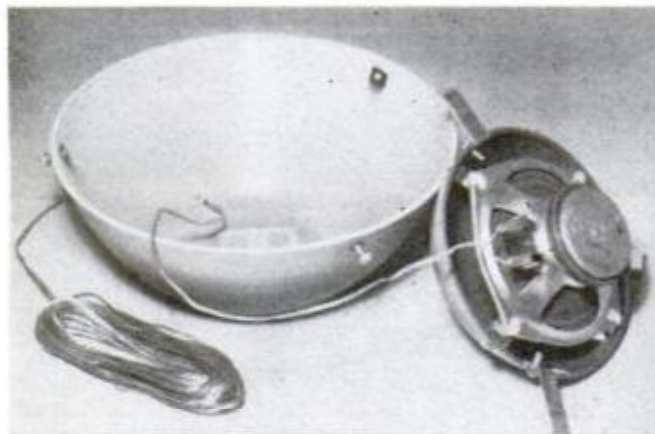


PLASTIC FLOWER URNS convert into a variety of uses. Above: I drilled holes in one and mounted it over a vent pipe to make an attractive and functional cover. Below: I bought a sealed beam headlamp from a junk dealer and set it in the bottom of another urn to make an inexpensive boat spotlight for myself



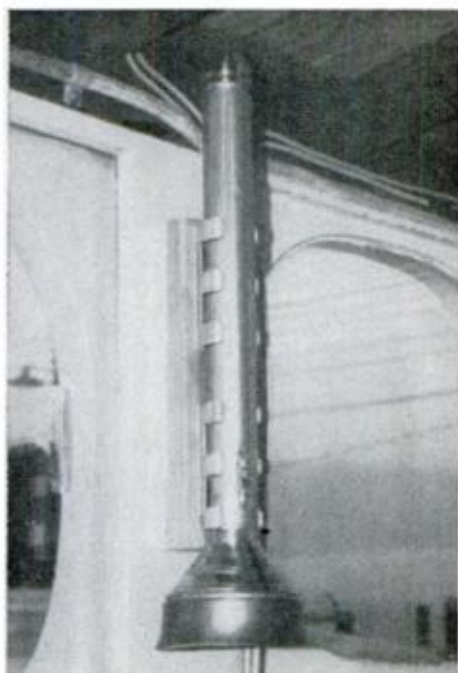
Look for 'Marine Gear' on Supermarket Shelves

Half my boating fun comes from recognizing useful marine accessories in familiar plastic, fiberglass and aluminum household items. Those plastic flower urns in a "gardener's corner" (above, left) can be converted into a number of boat devices.



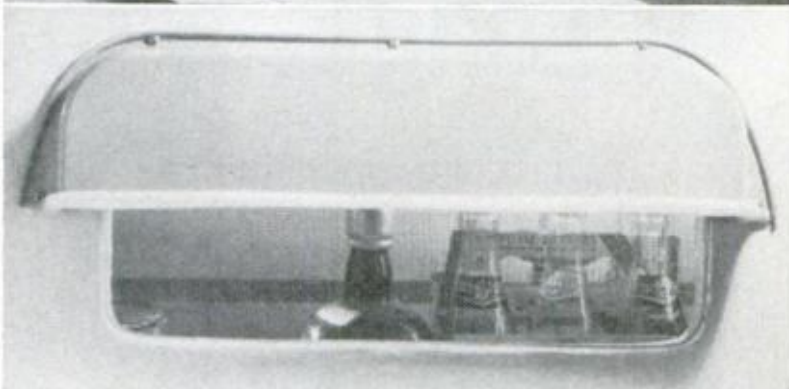
Extension speaker cover: two fruit bowls

I fastened a 3-inch-diameter speaker two inches from the bottom of a small plastic bowl, cone up. With homemade brackets I mounted this inside the rim of a larger bowl. The two-bowl cover diffuses sound nicely over my dinette table.



Flashlight holder

Two short bike-light brackets I picked up at a bicycle store hold an emergency flashlight handy near the boat's helm. In place, the flash also serves as a chart or instrument light. I mounted the brackets $\frac{1}{32}$ -in. out of line with one another to give them a stronger grip. Even a heavy six-cell flashlight can't be jolted out of the holder.



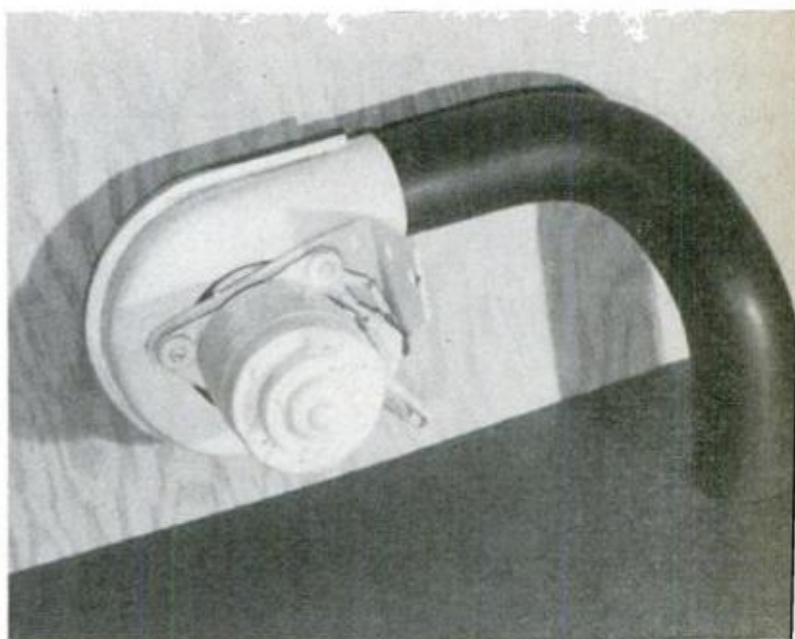
Pan converts to 'eyelid' over window

Aluminum baking pans come in many sizes. I chose one a few inches longer than the width of a window I wanted to shade from glaring sun and driving rain. After sawing it in half lengthwise with a sabre saw (a hacksaw works too), I primed the "eyelid" and spray-painted it to match the boat. Rubber or PVC tubing covers the rough edges.



Tray flashes signal

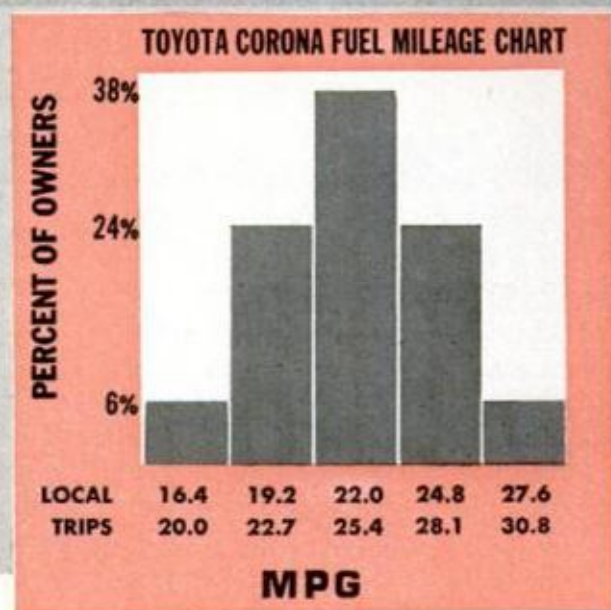
A chrome-plated serving tray doubles as an oversized mirror to signal for help if you're in distress during the daytime. The tray is easily stored.



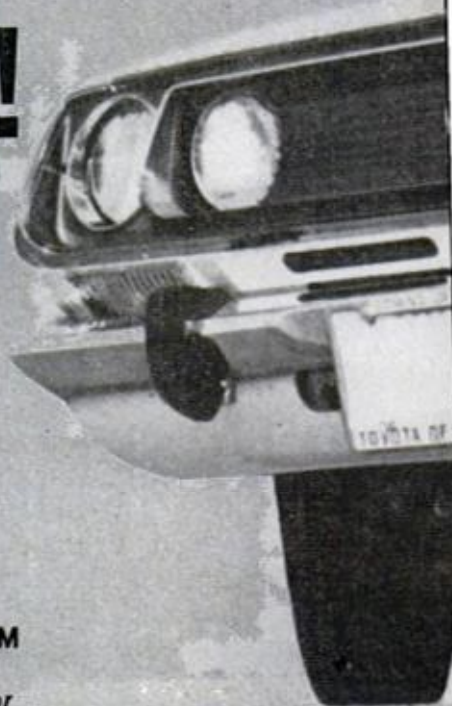
Auto parts cool cabin

My forced-air cooling system uses a fan motor from an auto heater and molded auto radiator hose. The motor is well above bilge to avoid sparking gas fumes.

Gas Goes a Long Way, But Dealer Service Has a Long Way to Go!



By **MICHAEL LAMM**
West Coast Editor
Photos by the Author



CORONA'S 108-hp engine gives snappy performance; 97.5-in. wheelbase makes ride jouncy on rough roads but, still, owners like the handling

CORONAS don't often give trouble, but when they do, service sometimes becomes a problem. Reason: Not enough competent mechanics.

We must stress that the incidence of mechanical failure is very low in Toyotas. Only 18.1 percent of all Corona owners surveyed reported that they've had to take their cars back for any repairs *at all!* That's a record for recent reports. But of those, 38.8 percent said those repairs didn't come up to snuff.

A Maine firefighter: "They seem to want to fix it, but they *don't* fix it." A New York projectionist: "It takes two or three trips to the shop to get any simple adjustment. They keep the car overnight, give it back the next day either totally untouched or done so badly it must be left or brought back again." A Nashville management con-

POPULAR MECHANICS

PM OWNERS REPORT TOYOTA CORONA

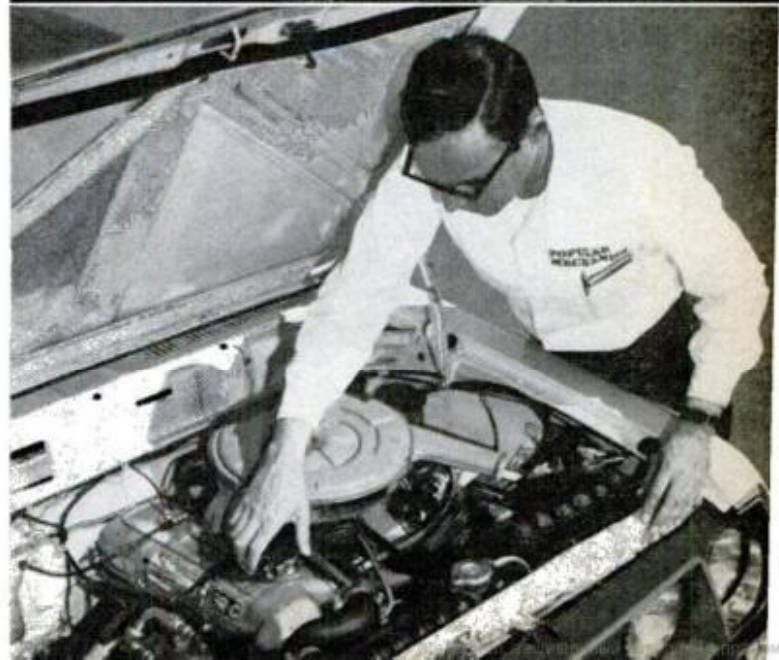
A Nationwide Survey Based on
1,250,000 Owner-Driven Miles



sultant: "They are very friendly, but I have lost confidence in my dealer's ability to service the car." Several owners said that routine service—checkups and warranty maintenance—is too expensive, often running \$40 or more.

Workmanship opinions rate very high for the Corona, with over 90 percent marking it "good" or better. Only 1.4 percent gave it a "poor" rating.

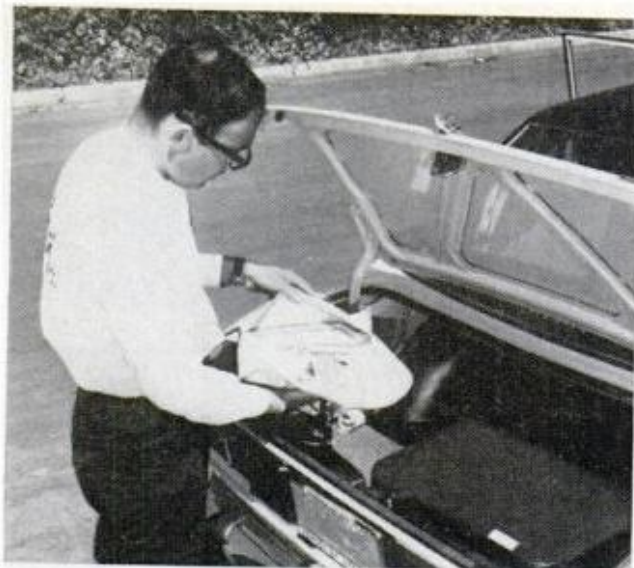
We also asked Corona owners to give their opinions on comfort; 3.7 percent termed it "excellent"; 38.1 percent said "very good"; 53.1 percent rated comfort as "good"; and only 1.5 percent put it down as "poor." (Our definition of "comfort" covers a lot of ground—it



DASH LAYOUT, GENERAL VISIBILITY win high marks. The heater, though, is hard to adjust, and the seat doesn't move back far enough. Ohc Four has ample work room. Some owners feel mechanics fear engine



QUALITY OF MATERIALS and workmanship rate very high. Squared lines provide lots of usable space



DEEP TRUNK is among largest in this class. Corona includes good tools—one of many unexpected extras



DISC BRAKES up front are standard. Jack fits into special slot, holds car steadier than bumper jacks



includes roominess, seating, ride, ventilation and visibility.)

When asked, "What was your primary reason for buying a new Toyota Corona?" more than half answered, "Economy." And most of those feel they're getting it, both in terms of gas mileage and upkeep. Except for the few grumbles about maintenance charges, no one felt he was paying too much.

Several owners pointed out all the extras that Toyota throws in as standard equipment and how "... it's refreshing to get \$1's worth of car for \$1 spent." And, "I was pleasantly surprised to learn my auto insurance had gone down as a result of my having bought a smaller car."

Several owners mentioned they had "moved up" from VWs. They said that while they liked VWs, they wanted more room, or four doors, or greater silence. Oddly enough, not one Toyota owner gave "trade-in value" as part of the Corona's economical virtues. These Japanese imports do hold their resale value as well as any U.S. car (but not so well as VWs).

A significant number of Toyota owners brought up the topic of oil consumption. It seems that about 800-1000 miles per quart is par for the Corona. It's possible, however, that after log-

RECLINING BUCKET SEATS, standard, let backrest adjust to many positions, can be converted to a bed

ging more miles (most respondents had less than 10,000 miles on their new cars), oil consumption might go down.

Under *specific likes*, here are some random comments: "It has a lot of power for a small car and will perform with the best of them." "Good city transportation." "Good visibility under all conditions." "Room for four, easy to work on myself, plenty of power; the most car for the money." "Handles beautifully." "Has a great deal of luggage space." "Gives you all those options and big-car features plus economy of purchase and operation." "No American car, including Cadillac, is built as well."

This isn't to say there aren't a few gripes, but they're mostly minor. Under *specific complaints*, we got these: "None." (18.3 percent had no complaint.) "Dealer service is a laugh." "When shifting from Park to Reverse, it has a bit of a jerk." "Whirring noises at 60 mph." "Disc brakes squeal." "Too hard to start in cold weather; also very slow to warm up." "Driver's seat doesn't move back far enough." "Steering so tight and heavy my wife complains that her arms ache." "Engine pings and keeps running on, even

with high-test gasoline." "Understeer." "Suspension is too firm to ride well and too soft to corner well."

Considering that the Corona often gets bought as a second car, we weren't too surprised by the number of Corona owners who compared it with other makes. Here's what we mean: "It tows our camping trailer better than the 1964 Dart we traded for it did." "It has everything the Caddy has except it's smaller." "More comfortable to ride in than my 1968 Thunderbird." "Our other car is a 1959 Volvo with 102,000 miles and still going strong. Hope the Corona will do the same." "There is a feeling of roominess that I did not get from the Volkswagen." "Outclasses our 1968 Buick in every way."

To summarize, Corona owners feel they're certainly getting their money's worth. In terms of economy, quality, workmanship, reliability, performance, comfort, ride, roominess and styling, the Toyota does all it's supposed to do and then some. The only grumbly area is dealer service, which runs hot and cold with any car, domestic as well as foreign. Apparently, though, Toyota could do with a few improvements in the back shop. ★★★

Summary of 1971 Toyota Corona Owners Reports*

Total miles driven	1,286,161
Average miles per gallon:	
Local driving	22.0
Long trips	25.4
Body styles:	
Two-door hardtop	1.5%
Four-door sedan	98.5
Models	
Corona Deluxe	97.9%
Corona Mark II	2.1
Why the Corona?	
Economy	50.7%
Size	21.6
Reputation	16.6
Price	14.0
Styling	12.6
Specific likes:	
Economy	63.2%
Handling	43.3
Comfort	29.2
Style	22.7
Power	19.5
Size	15.5
Workmanship	15.2
Ride	14.8

Specific dislikes:	
Dealer service	11.3%
Poor gas mileage	10.3
Rattles	8.8
Poor brakes	8.4
Cold starting	7.0
Wind noise	6.2
Steering	5.1
What changes would you like?	
Seat style	6.8%
Better service	6.4
More legroom	6.4
Lighter steering	5.9
Vent windows	3.8
Better gas mileage	3.8
Better materials	3.4
Better tires	3.4
Had any mechanical trouble?	
No	81.9%
Yes	18.1
What kind of trouble?	
Cold starting	13.0%
Other carb ills	13.0
Electrical	10.9
Valves	10.9
Transmission	8.7
Oil leaks	8.7

Did you repair it yourself?	
No	96.1%
Yes	3.9
Dealer repairs satisfactory?	
Yes	61.2%
No	38.8
Is the Corona your only car?	
No	55.5%
Yes	43.5
Other cars owned:	
Chevrolet	24.4%
Ford	15.6
Pontiac	11.2
Plymouth	8.8
Toyota	8.8
Volkswagen	8.8
Buick	6.9
Age distribution of owners:	
15-29 years	35.1%
30-49 years	39.8
50-plus	25.1
Would you buy another Corona?	
Yes	87.9%
No	12.1

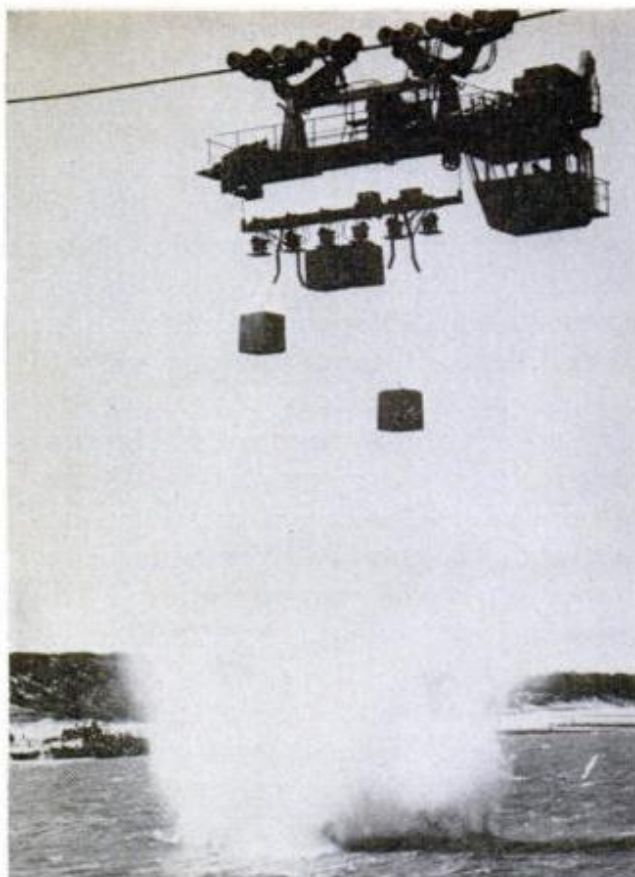
*Percentages might not total 100% due to rounding and/or insufficient data.

NEWS BRIEFS



Blocks for a Dutch dike

These five-ton concrete blocks—200,000 of them—are headed for the sea bottom off the Dutch town of Brouwershaven. They're being dropped from a crane (right) to form a base for a huge dike that will close off the last big mouth of the Dutch Delta. Begun in 1963, the ambitious project is nearing completion.



Newest British challenger

Another import will soon battle Detroit's subcompacts. The 1800 De Luxe sedan shown is one of 10 all-new Morris Marina models. They boast low-pollution exhaust, quiet running, simple upkeep, safety features.



Bulldozer works underwater

An amphibious Japanese dozer—with twin snorkels and radio remote control—rips rock and shoves dirt around in nine-foot depths. It's made by Komatsu, Ltd.



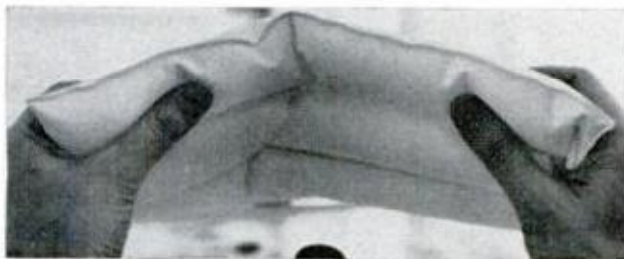
Pedal-powered chopper

Joe Tamburello of Inglewood, Calif., spent six months and \$150 building this chopper-style tricycle. Called the "draggin' wagon," it has spoked mag wheels, a handlebar-mounted compass, twin rear-view mirrors. All other parts are standard bicycle components.



New Cessna sports twin booms and a pusher prop

Still experimental, the Cessna XMC is testing some new ideas in private plane design. Its pilot sits forward of sweptback wings for better upward visibility. His view ahead and down has been improved by mounting the engine on the after end of the cabin. The cabin's wider and lower than present models, with extra-wide doors.



Baby's mattress alerts nurse

If a baby's rhythmic breathing movements stop, a mattress being tested at a London Hospital sets off an alarm. The movements squish tiny air currents from inflated plastic cylinders inside the mattress into a manifold. A thermistor overheats and sounds an alarm unless constantly cooled by moving air.



See-through umbrella

Called "The Birdcage," this new plastic umbrella fits over head and shoulders like a canopy. Giant Umbrella Co., New York makes it in five sizes from 17 to 29 inches across.



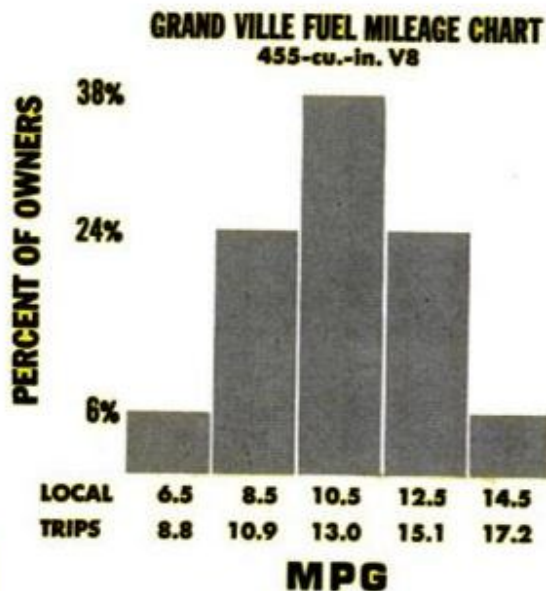
TV watching's a ball

A London department store designed its own completely round plastic cabinet for a 25-inch color TV chassis. Customers can order any color or pattern they want on the cabinet.

If Only That Space Ahead of the Radiator Were Added to the Trunk!

By MICHAEL LAMM, West Coast Editor

Photos by the Author



PONTIAC OFFERS 16 models this year, the most expensive being the new Grand Ville. It's a fancification of the Bonneville, sharing its wheelbase (126 inches) and basic engine, but with more horsepower (325 vs. 280 bhp).

The Grand Ville comes in three body styles—two and four-door hardtops and convertible. But no one in our sampling owned a convertible, and it appears a sad likelihood GM will build

FRONT ENSEMBLE is made of fiberglass; grille, of plastic. The snout protrudes, gets dinged in parking



no more ragtops after this model year.

The Grand Ville is one of those full-sized cars that's helping speed the swing to smaller ones. For all its hugeness, the big Pontiac doesn't satisfy the craving of 18.3 percent of its owners for trunk space. "I'd like to get back all that nice trunk," writes a Wichita engineer, "that I lost when I traded my 1968 Bonneville." The Grand Ville's designers did see fit to include many cubic feet of unusable dead space between the engine and the grille. In an effort to bring off the long-hood/short-deck look, Pontiac stylists cut trunk length this year, and the four-door Grand Ville's bustle houses too few cubic feet of storage space, say owners.

A few owners also grumbled about "... too little room inside," and "... not enough space between the front and rear seats," and a noticeable (but untallied) percentage bemoaned the lack of glovebox interior.

Another persistent complaint was poor gas mileage. Our total sampling averaged 10.5 mpg for around-town driving and 13.0 mpg on the highway. Under *specific complaints*, low gas mileage took top honors at 22.4 percent. Understandably, with 455 cubes to feed it wouldn't be reasonable to expect tremendous gas mileage.

Styling proved the main reason most buyers chose Grand Villes (37.2 percent), but it wasn't universally applauded. On the plus side, these reactions: "First year for this series, so the car clearly stands out as a 1971, while other Pontiacs changed so little they are confused with 1970 models." And, "It still looks like a Pontiac—I mean great!" But others view the G.V. through different eyes. "Rear is not in balance with front area." Or, "The grille and headlights are so square and ugly, and what makes it worse, the whole front end is made of plastic."

Owner loyalty played a big role in many owners' buying decisions. A New York salesman said this is his 23rd Pontiac. Many mentioned their satisfaction with previous models. A Michigan

AUGUST 1971



HANDLING gets top marks from owners, who praise not only cornering but also ride and ease of parking



BIG 455 V8 is only engine available, gets lousy gas mileage. Note dead space ahead of powerplant



LONGTIME PONTIAC FAITHFUL criticize too small trunk, shortened by stylists to emphasize long hood

103



MORE LEGROOM in back seat than in most cars, but some complained that rear quarters make blind spots

manufacturer's rep wrote, "I've developed a closeness with Pontiac people over these last 12 years."

But quality and workmanship didn't seem to come up to previous Pontiac standards. This could be because many owners bought their cars just after the GM strike. Yet that doesn't compensate the furniture executive who remarked, "I've had 1958-60-62-64-66-68 Bonnevilles and all were great. Not this Grand Ville. Workmanship is terrible. It's thrown together." That same owner scrawled across his questionnaire: "Pure Pontiac? Phooey!"

Another peeved respondent wrote,

"Certainly not very good for a car costing \$5700. This model is the worst for squeaks, rattles, etc. We found numerous nuts, bolts, and screws missing." Said a Texas trucker, "My biggest disappointment really is that they cheapened the quality of the car."

Most owners (76.3 percent) report no mechanical problems with their new cars, and this speaks well for Pontiac's basic mechanical design and workmanship. Where there are gripes, they generally deal with ill-fitting soft trim, runny paint, glue spills, misaligned panels, and so forth. The basic running gear is undoubtedly well put together and gives many more miles of trouble-free service than most first owners will ever use. And where mechanical problems do crop up, they're usually well taken care of. In general, 82.6 percent rate their dealers "good or above," and only 17.4 percent give them "average or worse." Those are high marks when pitted against dealers of other makes.

A few owners mentioned a certain uneasiness with warranty cutbacks—from, "Not pleased with warranty dropped 38,000 miles this year," to, "I think if the manufacturer thinks so much of his car, he ought to stand behind it longer than 12,000 miles."

Ride and handling top the list of

Summary of 1971 Grand Ville Owners Reports*

Total miles driven 855,466

Average miles per gallon

Local driving 10.5
Long trips 13.0

Body styles

Four-door hardtop 72.8%
Two-door hardtop 27.2
Convertible 0.0

Why the Grand Ville?

Styling 37.2%
Past experience 36.6
Dealer service 7.6

Specific likes:

Ride 50.9%
Handling 46.2
Styling 42.6
Comfort 34.9
Power 17.2
Performance 9.5

Specific dislikes:

Gas mileage 22.4
Workmanship 21.8

Small trunk 12.9
Quality of materials 11.8
Rattles 10.6

What changes would you like?

More trunk space 18.3%
Better workmanship 16.8
Better vent system 9.9
Change front styling 9.9
Change dash layout 9.9

Had any mechanical troubles?

No 76.3%
Yes 23.7

What kind of trouble?

Electrical 19.5%
Carburetor 19.5
Transmission 9.8
Windshield wipers 9.8

Did you repair it yourself?

No 100.0%
Yes 0.0

Dealer repairs satisfactory?

Yes 78.6%
No 21.4

Other cars owned:

Pontiac 32.8%
Chevrolet 22.7
Ford 11.8
Buick 6.7

Accessories/power options:

Airconditioning 68.8%
Power windows 52.9
Radio 47.8
Power seats 24.6
Stereo tape system 22.5

Age distribution of owners:

15-29 years 5.2%
30-49 years 49.7
50-plus 45.2

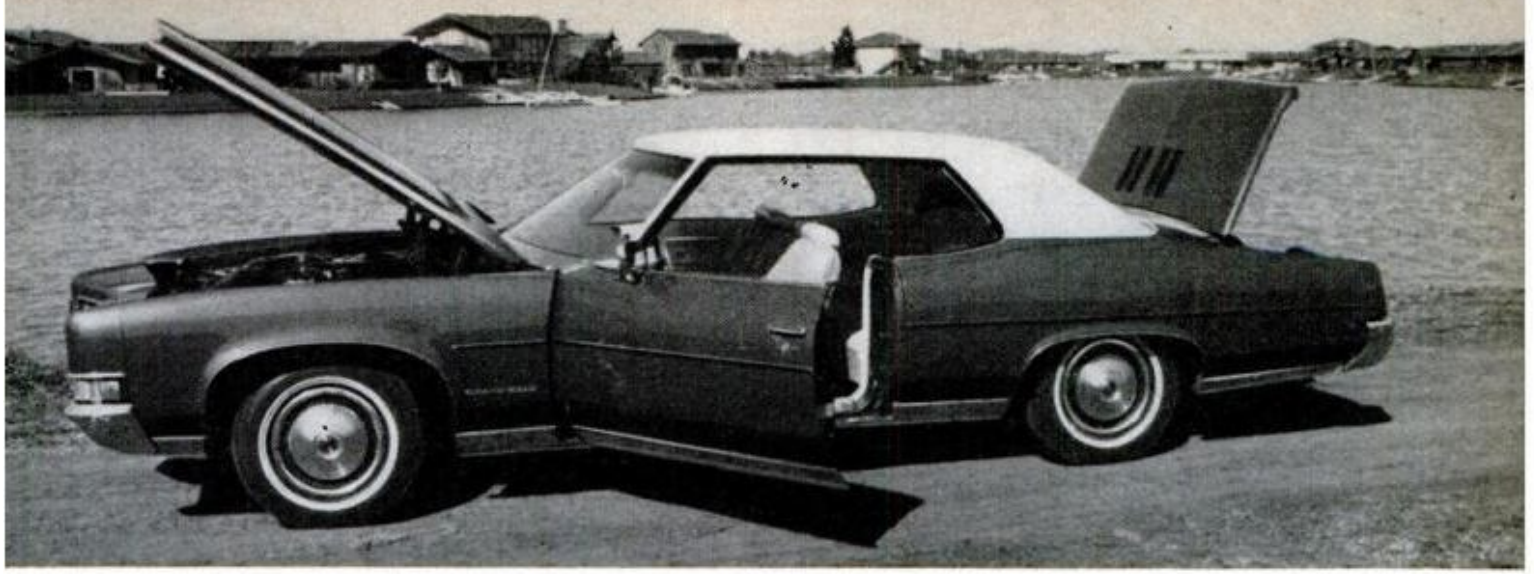
Would you buy another Grand Ville?

Yes 80.0%
No 20.0

How many cars in family?

Grand Ville only 33.1%
Two cars 59.0
Three or more cars 7.9

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



GRAND VILLE shares Bonneville's 126-in. wheelbase, chassis, overall length; has more power, fancier trim

specific likes. "Quiet, easy ride," says a North Carolina housewife. "Plenty of power, handles and turns corners great."—Mississippi chemist. "It handles wonderfully on the road, is easy to maneuver in traffic, good acceleration."—Milwaukee auditor. "Fantastic pick-up, great passing power."—Staten Island disc jockey. "Seems to have a better braking system this year."—Alabama contract administrator (and indeed it does; power discs are standard on Grand Villes).

Answers to our question *What would you like to see changed?* are always enlightening, and here are a few: "Big side windows don't fit at top; bow out at speeds above 60 mph." "Rear-view mirror obstructs driver's vision at certain times." "Change front grille and bumper so they're not so vulnerable in parking." "Better workmanship." "I would like to be able to see out the rear quarters." "A car that sells for over

\$6000 should have a speedometer that you can see, not hidden by the steering wheel." "Rear of trunk gets dirty like a station wagon without an air deflector." "Eliminate wind noise from windows." "Give me more trunk and a more convenient dashboard." "I'd like to see side vent windows used again on cars—however, this is certainly not peculiar to Pontiacs." "I definitely do not like the flow-through ventilation system. My back passengers complain of cold feet." "Improve gas mileage."

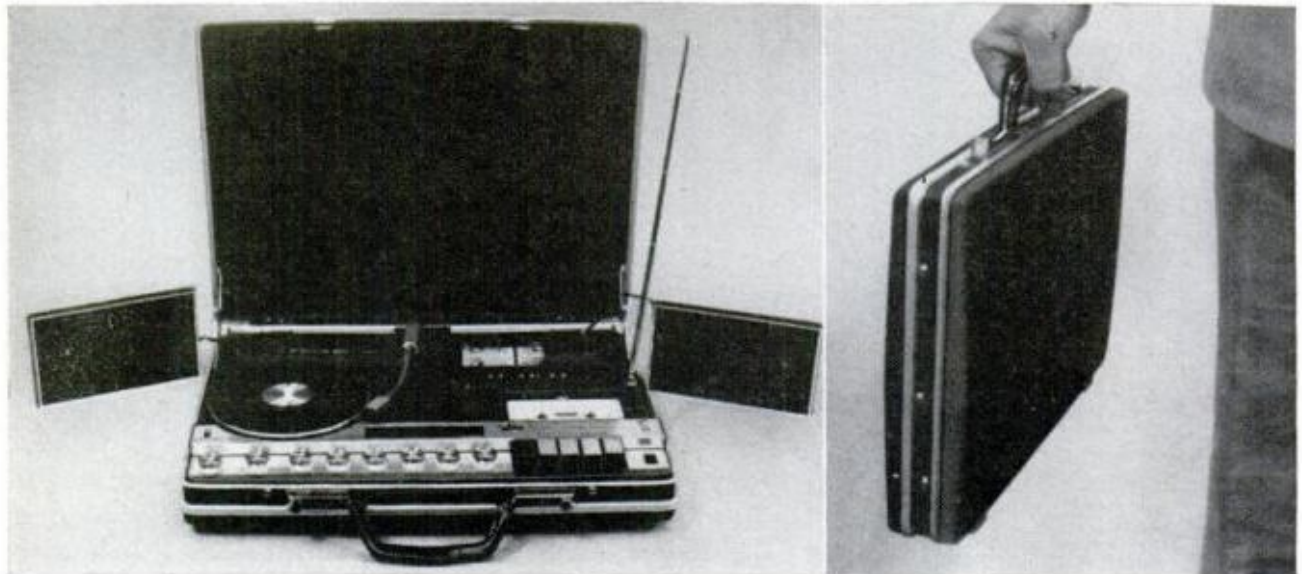
So while the Grand Ville has its share of quirks, it's generally more liked than not. "It has everything I've always wanted in a car," beams a Georgia sales manager. And a Massachusetts superintendent: "Traded a 1966 Bonneville, and I really feel this Grand Ville is the best car I have ever owned." "Perfect for our needs—a heavy, supremely comfortable, smooth-riding, good-looking big car." ★★★

STYLING was the main reason for buying, but some felt that rear of car was out of balance with front

SOME DRIVERS can't see speedometer through wheel; most find interior and stance very comfortable

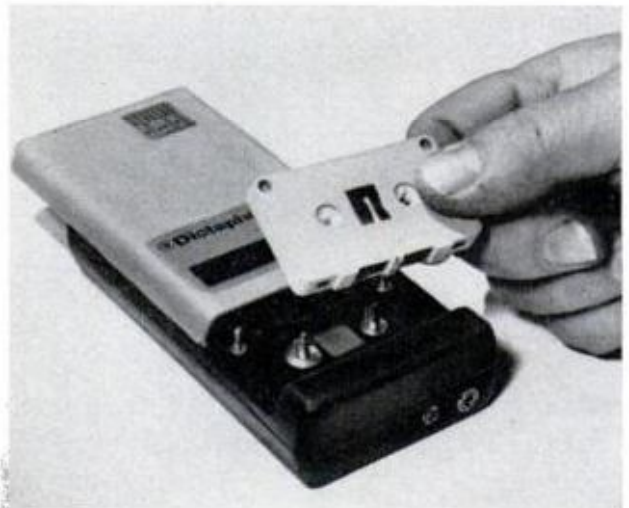


NEW IN ELECTRONICS



PORTABLE HI-FI SYSTEM (above) contains a stereo cassette recorder, a stereo phonograph, an AM/FM radio and twin stereo speakers—all housed in a briefcase-size carrier for easy handling. Designed for camping and travel use, the play-anywhere system operates on batteries or house current. \$175, Abbott Distributing Co., 915 Selby St., El Segundo, Calif.

POCKET-SIZE RECORDER (right) gives up to 30 minutes' taping time on mini cassettes half as big as the standard type. The new battery-powered midget Dictaphone 10 has a built-in mike and a slide-apart cover that speeds tape changing. It also has provision for plugging in an external mike and earphone. Price is about \$100. Dictaphone Corp., Rye, N.Y.



DOUBLE-DUTY SPEAKERS are styled to look like furniture and serve as end tables or hassocks with pillows on top. The walnut-finished ribbed enclosures contain a 40-watt, four-way speaker system with range of 30 to 30,000 cycles. \$79.95 each, Magitran Co., 311 E. Park St., Moonachie, N. J.



TWO-WAY PICKUP lets you record or transmit taped messages over the telephone. The ring-shaped attachment slips over the earpiece and functions as a conventional phone pickup when plugged into the recorder's input. Connected to the output, it sends pretaped messages over phone to another party. \$9.95. Trinetics, Inc., 807 West 3rd St., Mishawaka, Ind.

Something Really New In Revolvers

By MAJ. GEORGE C. NONTE JR.

W-12 Fires
Variety of
Cartridges

2½-Inch
Snub Nose

4-Inch
Medium

6-Inch Target



EVER SINCE Sam Colt's 1836 Paterson cap and ball, all six-shooters have been painstakingly assembled from individually fitted parts.

Dan Wesson of the famous gunmaking family changed that with his Wesson W-12; it uses investment-cast and sintered parts wherever possible. Each part is interchangeable except the "hand," a pawl that rotates the cylinder. Internal tolerances are concentrated in the hand, which is made over-long and trimmed until the gun works properly.

Equally unique, the W-12 has different-sized barrels that can be interchanged in a minute or so, as shown below. We used it for several weeks in all configurations with every type of .357 magnum and .38 special ammunition, found it reliable and accurate. ★★★



CHANGING from the 2½ to 4-inch barrel takes only a few minutes and a special tool. You merely remove the muzzle nut with the tool, slide the barrel housing off, and unscrew the 2½-inch barrel (above left). Then screw the 4-inch barrel into the frame (above right), slip on the longer barrel housing (below left), and snug the housing tight against the frame by tightening the serrated muzzle nut (below right).



How to Survive

By KEN ANDERSON

Illustrations by Roy Grinnell
and Fred L. Wolff

NOT LONG AGO a U.S. marine with survival training was stranded on the Great Salt Lake Desert when his car broke down. Through the rest of the day, he simply rested in the shade of his car. At sunset, he started walking along a route that he knew would lead him to a fresh-water storage tank. There he drank as much as he could and filled his canteen. He also stopped occasionally and arranged rocks to form emergency messages and arrows pointing in the direction of his travel. At dawn, he found a shady spot under which to sleep. The second evening, he started again toward a source of fresh water and left more messages along the way. Several days elapsed before the messages were noticed by a driver who followed the arrows and found the marine resting in the shade. Except for weight loss, he was as fit as when his ordeal began.

His survival of what could have been a tragic situation was not simply luck; he knew what to do, and he did everything right. And he knew where to find water.

Scarcity of water makes desert driving formidable. Intense heat is a supplementary factor, but heat and sun damage can pretty well

be avoided if you stick to the shade in the event of a car breakdown. Water is critical because the human body needs as much as a gallon a day to function effectively in desert climates. While you can exist for awhile on smaller amounts, moisture losses through perspiration quickly result in dehydration and lowered efficiency. A 180-pound man who loses 4.5 pounds of body weight by dehydration suffers a 25 percent loss of efficiency. Greater weight losses are increasingly disabling, and a 10 percent weight loss through dehydration can be fatal.

Desert physiology studies reveal that rationing small amounts of water is futile. Because of great perspiration rates during desert summers—which may be unnoticed because the moisture evaporates so quickly—a person who tries to subsist on a pint or cupful of water may extend his life by only a few hours. The Hollywood cliché of travelers staggering across a desert for days while sharing a small canteen of water is nothing more than a movie writer's fantasy.

Every driver planning a desert excursion should start with at least two gallons of fresh water. He should also have detailed maps of local water sources, ranch houses, govern-

In the Desert



People have died on the desert . . . after their cars broke down on back roads. Never travel unprepared

ment stations or other facilities that could help him in a crisis. A man who died of dehydration in his car on the California desert in 1968 was just four miles from a spot offering better shade and water. But the victim was not familiar with local geography.

Your car should be in good operating condition before starting a desert trip. The cooling system, battery and tires are among items that should be checked. Take along a set of screwdrivers: blade and Phillips; two pairs of pliers including one of the C-clamp type; pocketknife; friction tape; matches; flashlight with extra batteries; shovel; food; water; first-aid kit and a good survival manual. Some experts recommend that desert travelers also carry such items as blankets, snakebite kit, rope and wire.

Finally, make sure somebody knows where you are going and when you expect to return or arrive at your destination beyond the desert.

If you have made proper preparations, you should be able to cope with any situation if you become stranded. With basic tools and a little ingenuity, you can attract attention miles away. For example, you can remove the car's rear-view mirror and use it as a sun-

reflecting signal device. Gasoline can be drained for use as a fire starter. Engine oil can be burned to produce a column of black smoke. At night, headlights can be used as signal lights.

Hub caps can be used as water containers or cooking utensils. Many parts of the car from tires to upholstery, will serve as emergency fuel. The idea of dismantling and burning portions of your car may seem repugnant to a proud owner. But in a real emergency, survival takes precedence over pride.

If water in the radiator is not contaminated by antifreeze or other chemicals, it can be drained and used for drinking. In any event, you might try incorporating its fluid [in a desert distillation system, \(see box, page 111\)](#). [The radio antenna can serve as a spear or skewer](#); broken glass can become a makeshift knife. Bumpers and other car parts can sometimes be removed to dig with. Seat belts, electrical wiring, floor mats and uphol-

Arrows showing your direction of travel can be made with rocks or drawn in the sand





"Many parts of the car . . . will serve as emergency fuel."

stery are materials for rigging shelter against daytime heat or cold of night. The same materials are available for making splints if a member of the party suffers a fractured limb.

Cold nights are as much a part of the desert as a midday heat. The temperature after sunset may drop as much as 70°. Even on the Sahara Desert, overnight lows average 57° F. in August after daytime highs of around 125° F. And temperatures of close to zero have been recorded in the deserts of Arizona and Southern California. Although such frigid nights are rare, desert travelers should be prepared to cope with the cold.

Besides using fire—or warmth from the car heater if it is operative—the stranded driver should be most active at night. If there are tasks that require digging, lifting, or whatever, schedule them for the cool of evening. The heat energy of muscle action will keep you warm. This same activity performed in midday would be unpleasant, if not unbearable.

Whether you decide to stay with the disabled car or walk out will depend upon your own estimate of the situation. The deciding factor is water availability. With a water source and shelter, a person in good health can hold out for some time. There may even be edible plants or animals in the neighborhood. If there is no water available, no hope of immediate rescue, and you are in satisfactory physical condition, your only alternative is to seek a site where your chances for survival are better.

Leave a note in a conspicuous place about the car, telling your direction of travel and where you hope to reach safety. Travel only at night; rest in shade by day.

If you have companions, travel together

and move at the pace of the slowest person. Stop occasionally to leave markers for search parties. Take the easiest route around obstacles; don't risk injury or exhaustion by trying to fight your way through the terrain. Keep some record of your route; it will help you keep to your planned course.

Don't discard your clothing. It's your best protection against heat, cold and insects. And clothing helps retard moisture loss through perspiration. Dress like an Arab: Protect your head, neck and shoulders with a cloth or other material draped around the upper body.

If you don't have a suitable hat, you can make a functional headdress with a loop of rope that fits over your head like a hat band. Put a wadded handkerchief on top of your head, then fold a square of cloth over the handkerchief and arrange the loop of rope to hold it all in place. If the cloth, seat-cover material, whatever, is big enough to extend over your shoulders, so much the better. Wear sunglasses if you have them. If not, smear soot under your eyes to help reduce glare.

When looking for shade behind rocks, ledges, dunes or hills, make sure there are no snakes already using these cool sites. Desert snakes, like humans, have an aversion to excessive sun.

Use salt tablets if you have them—but take them sparingly. Air Force survival instructors recommend that salt tablets be avoided during desert travel unless you can drink at least three quarts of water per day during summer conditions and more than a quart of water during the winter. An exception is made when heat prostration threatens.

You can gain added comfort from daytime heat if you raise your body about a foot above the ground so that air circu-



"Hub caps can be used as water containers or cooking utensils."

lates beneath it. If you dig down about two or three feet, you should find cooler sand. And if you pile the sand from the hole on your sunny side you can produce additional shade. If you have blankets or other shelter material, you can derive fair insulation against the sun if you can arrange the material in double layers.

Most desert plants look inedible. But if there is no alternative, test the plants you find. Start with the roots of trees and shrubs. Peel off the bark. The root may be composed of soft, fleshy, or even moist material. There may even be water dripping from the cut root surfaces. Next try all the soft parts above the ground, including young shoots, bark and fruit. The barrel cactus of the southwestern United States is a known water source. If you find one, slice off the top and mash the pulp of the cactus. A refreshing watery fluid will ooze out of the plant.

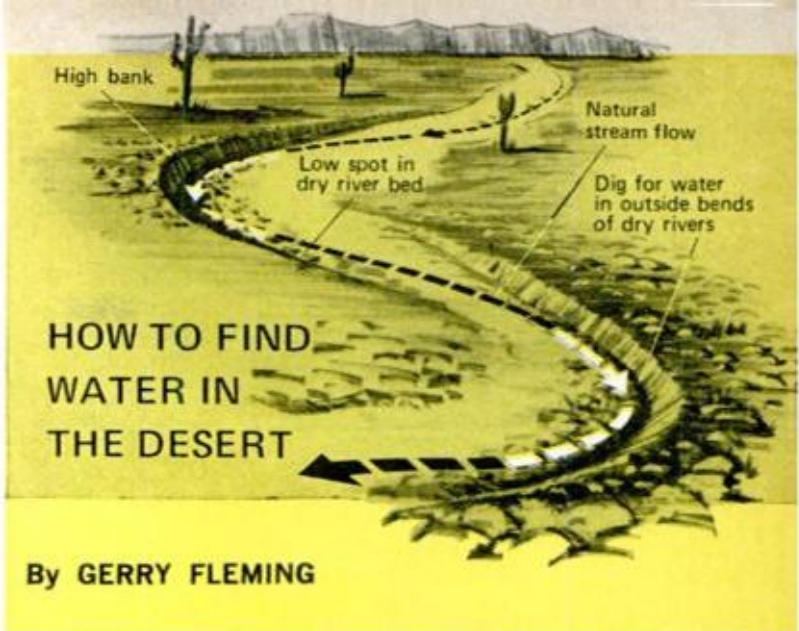
But avoid all desert plants that have a milky juice. A white ooze running from a broken stem is a test. This juice also generally irritates the skin considerably.

The presence of plants is frequently a sign that water is nearby. It may be straight down, several feet beneath the desert floor, but water is needed for plant life and it's worth probing the sands around the roots. If the plants are greener, larger, or more tender than other varieties in the area, chances are that they are being nourished by ground water.

Another trick is to watch birds or animals. They usually seek out water at dawn and dusk and remain inactive during the day. Follow their trails and they may lead you to vegetation and water.

One of the most celebrated desert tragedies in recent times was the death of Bishop James Pike during a trip to Israel. Pike and his wife became trapped in the Judean desert when their car could not negotiate a rocky creek bed. According to news reports, the couple entered the desert equipped only with a map, sunglasses and a couple of bottles of soft drink. Although they were only a few miles from help and probably would have been rescued by a search party had they stayed put, the couple choose instead to walk out of the desert in 120° afternoon heat. Bishop Pike never made it, and his wife only reached safety when she happened to stumble across a roadbuilding crew the following morning.

★★★



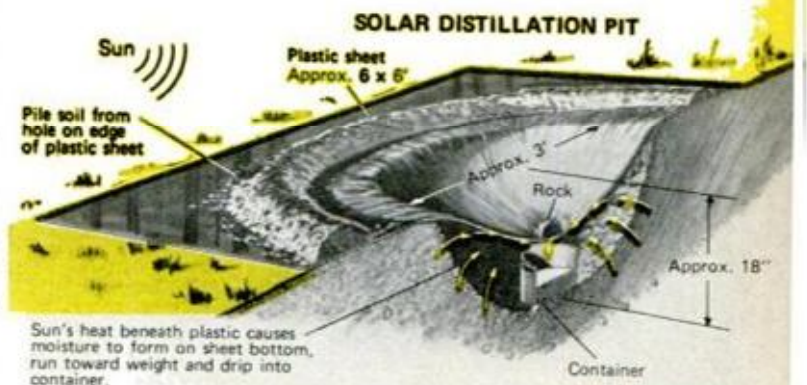
By GERRY FLEMING

GROUND MOISTURE—even seawater—can be converted to fresh water with a solar distillery made of sheet plastic and a container in the form of a coffee can, bucket or cup fashioned from canvas, plastic or aluminum foil. The plastic sheet should be about 6 feet square. The container is placed in the bottom of a hole in the ground; the hole should be about 3 feet deep and 4 feet across. The sheet is stretched over the hole and anchored at the edges with soil or sand. The plastic is weighted at the center with a small stone so that the lowest point will be directly above the container.

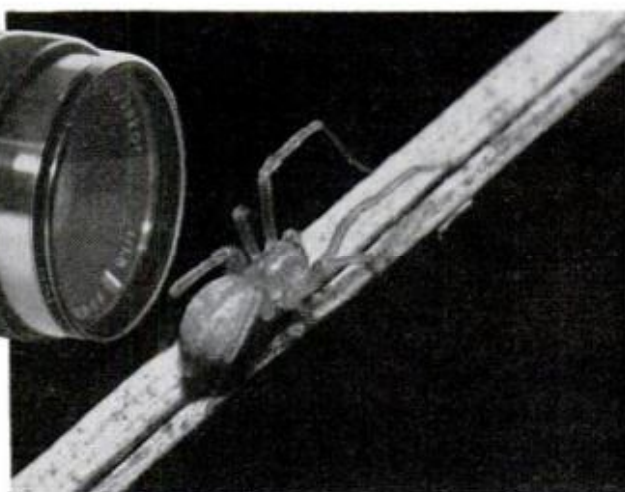
Finding the most likely spot to get moisture is extremely important. Choose the lowest site possible. An arroyo or dry stream bed is ideal. If the soil or sand is moist, sunlight passing through the plastic will evaporate the moisture, which will condense on the underside of the plastic and drip into the container. If pieces of fleshy plants are placed in the hole, the "still" will extract the moisture from the plants. Brackish water, radiator fluids, even human body wastes—can be converted to a potable drinking water in this manner.

Success of the still depends upon the amount of moisture beneath the plastic and the amount of sunlight available. One still can produce up to two pints of water during the day and one pint during the night, if there is enough moisture in the soil or plant life is used to prime the system. Obviously, this won't be enough water to sustain life indefinitely, so if enough material is available, make more than one still in different locations.

Finally, make sure that contaminated water does not come in contact with the plastic sheet; it may drip into the container of fresh water and pollute it. And avoid movement of the sheet as much as possible while it is producing fresh water. It takes from 30 minutes to an hour for the still to begin working again after the plastic has been disturbed.



Simple Rig for Close-Up Flash



THE TROUBLE WITH TRYING to shoot close-ups with a camera-mounted flashgun is that the flash is designed to beam its light straight ahead, not down on a subject only a few inches away. With this simple flash bracket for a 35-mm camera, all you need is a set of extension tubes or a bellows attachment and you can take dramatic close-ups of flowers and insects like those shown here. The bracket holds the flash above the camera so its light clears the lengthened lens. It also lets you tilt the gun downward at any angle, depending on your focusing distance.

Exact dimensions will depend on your particular camera and flashgun. The rig shown here consists of a small block of 1x3 wood for a base and a support for the flashgun bent from metal strip. Any thin metal strip will do. I used aluminum edging made for tacking down linoleum. Two long 1/4-inch bolts with wingnuts complete the assembly. The top one tightens the metal strap around the flashgun and at the same time locks the gun at the desired angle. The bottom one anchors the bracket to the wood base.—*Edwin Borgeson*





Look What a Difference The Paper Can Make

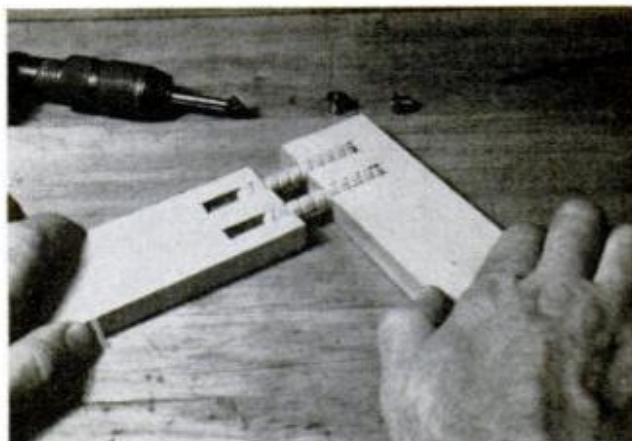


Want to make good black-and-white prints from color negatives? Here's the secret—use this special Kodak paper made for the job.

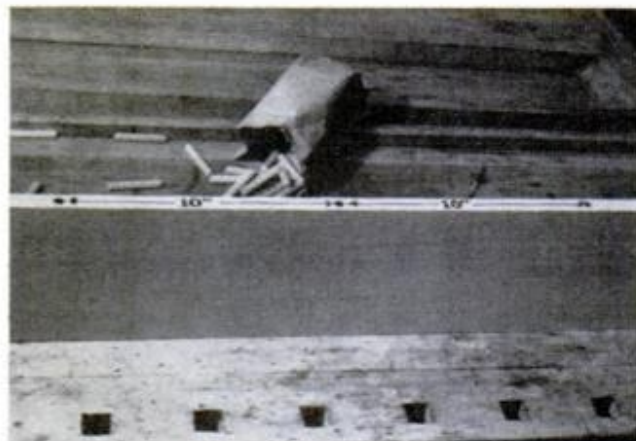
AT FIRST GLANCE, the two photos might appear pretty similar. But take a closer look. In the lower photo, the sky and water are too light and detail is washed out. The girl's face is too dark and one stripe on her blouse is missing completely. In the upper photo, the background is darker, the face is lighter, there's good detail and the overall result is much crisper and more pleasing.

Why the difference? The lower print was made from a Kodacolor-X negative on a standard No. 3 contrast paper—the one you'd normally pick. The upper print was made from the same negative but on Kodak's Panalure paper designed for proper rendering of tones when making black-and-white prints from color negatives.

Exposing and processing Panalure is basically the same as for any prints—just follow instructions packed with the paper. With tungsten-light enlargers, no filter is usually necessary. With fluorescent-type enlargers, use a yellow filter, such as Kodak's CC20Y, to correct for the higher blue content. Filters can also be used to create special effects just as if you had one over the camera lens when taking the picture. A yellow filter, for instance, produces a darker, more dramatic sky.—*Sheldon M. Gallager*



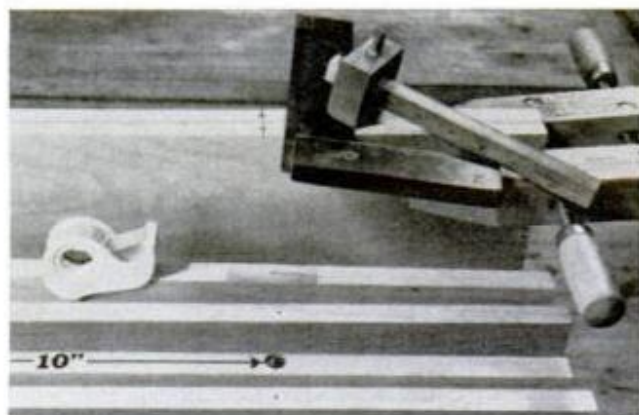
FOR MAXIMUM SHEAR STRENGTH, dowel diameter should be half the thickness of wood being joined and dowel length six to eight times its diameter



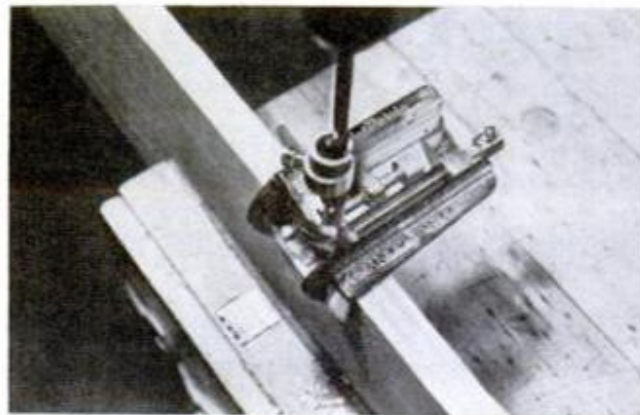
FOR MAXIMUM TORQUE STRENGTH, use at least two dowels. For a tight joint when edge-joining boards, dowels should be no more than 20 in. apart (maximum)

You Can Make Professional-Fitting

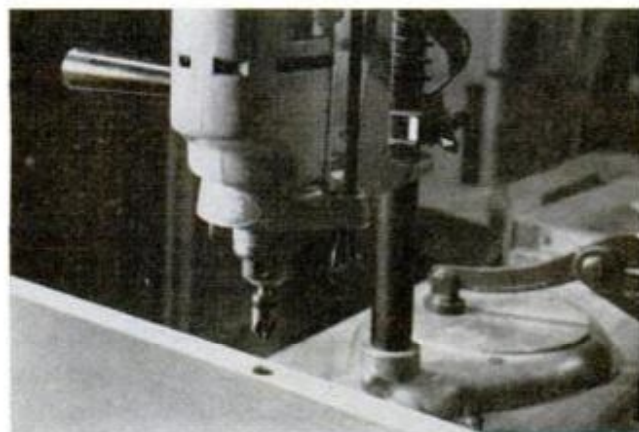
They're a good substitute for mortise-and-tenon joints, and your total cash outlay for power tools will be less



THREE WAYS TO LAY OUT DOWEL CENTERS: (at top) gauge and try square, (in middle) tape and pinheads, and (at the bottom) drilled holes and dowel centers



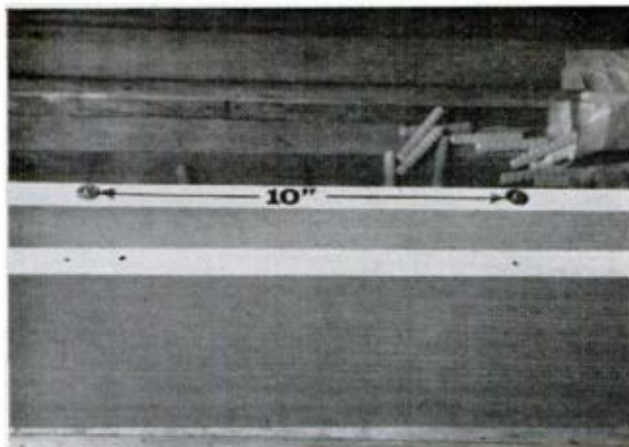
FAST WAY TO BORE PRECISE HOLES is with a spur bit chucked in a portable drill or drill press. Wrap piece of tape around bit shank for use as depth stop



COUNTERSINK DRILLED HOLES to remove any burr that might hold joint apart, also to facilitate the board assembly and to permit excess glue to escape



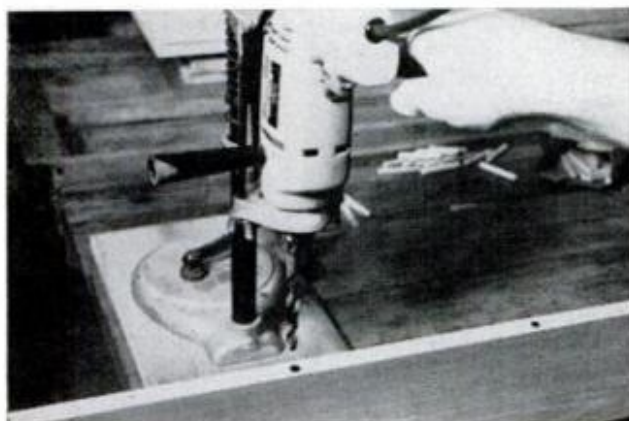
FOR SHOP-MADE DOWEL PINS, measure the bored holes with a depth gauge and then mark length accordingly. To make neat cut use a fine-tooth hacksaw



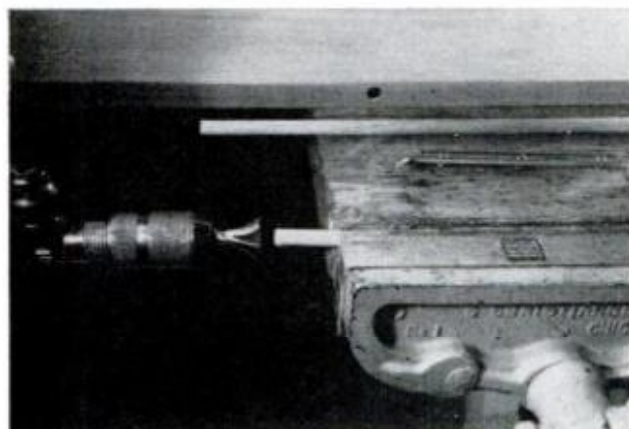
DOWEL CENTERS are slipped in holes bored in first board; then, to transfer centers to second board, both boards are lined up and tapped with a mallet

Dowel Joints

By **DAVID WARREN**
And **HARRY WICKS**



STUBBY SPUR BIT won't drift from center point as metal bits often do, and it will also drill deeper than a spade bit without piercing the other side



DOWEL SHARPENER is used to taper both ends of dowels, simplifying the job of inserting them into holes. Model chucked in brace above is from Stanley
AUGUST 1971

THE FAMILIAR DOWEL JOINT, now centuries old, is a good substitute for a mortise-and-tenon or a tongue-and-groove joint and, of course, is superior to screws and nail joinery. And the investment in power tools for doweling is less than that for mortising tools.

A dowel butt joint isn't quite as strong as a mortise-and-tenon, but that difference can be minimized by using good doweling techniques and modern plastic-resin glue. That's why you find that most of today's commercially manufactured furniture is doweled.

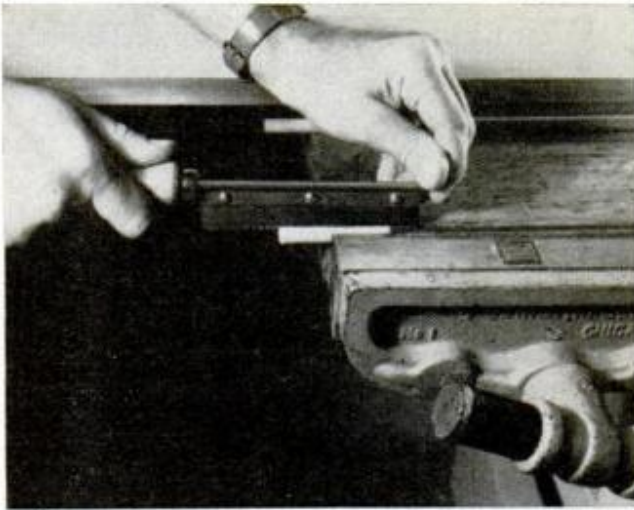
Before starting any doweling operation there are a few points to have in mind. When you're edge-gluing stock, the annular growth rings in each board (they're visible on the ends) should curve alternately. Viewed from an end, for example, if the rings on the first board arch, they should dip on second board—and so on. Such care to alternate the rings will offset the tendency of each board to cup. Also, when the edges of two boards touch, the middle two-thirds of the joint should show a sliver of light. Then, when the bar clamps draw the joint tight, the glue-line at the ends will be especially fine.

And, before picking up the drill to bore those dowel holes, sight along the edges of the boards to be joined. If a board shows even a slight bow or warp, it should be trued-up on the table saw.

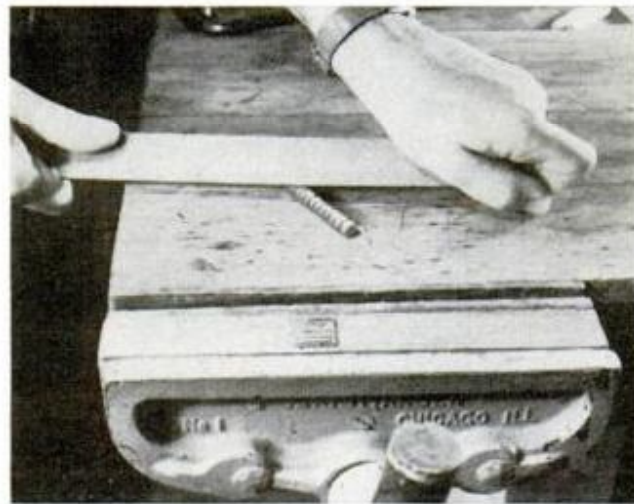
As a final step before drilling, lay out the boards to be joined to get the most pleasing grain design. The ultimate, of course, (for perfectionists) is to achieve a finished surface that appears to be one wide plank. Here you will be restricted by how careful you were when you selected the planks at the lumberyard. In other words, don't let the yard man foist material upon you exactly as he takes it from the pile.

The six basic doweling steps are shown in the photos. As a rule of thumb for the size dowel to use, the dowel's diameter should equal one-half the thickness of the wood being joined. As for dowel length, you are safe if you cut it about six times the dowel diameter. Thus, to join $\frac{3}{4}$ -in. stock, you would use $\frac{3}{8}$ -in. dowels cut to $2\frac{1}{2}$ -in. lengths.

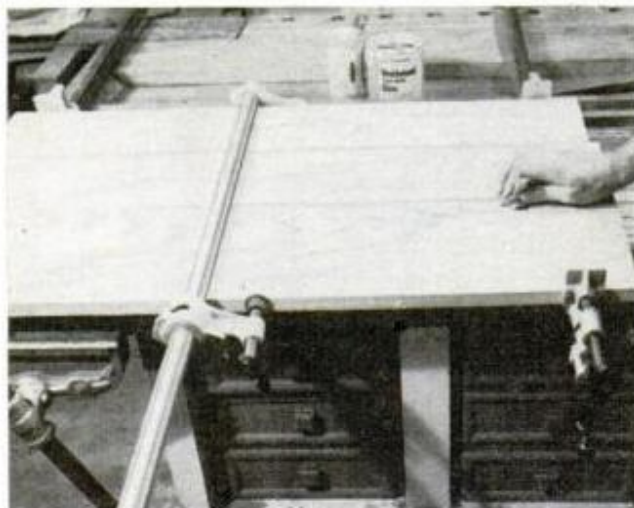
Lay out the holes to be bored so that



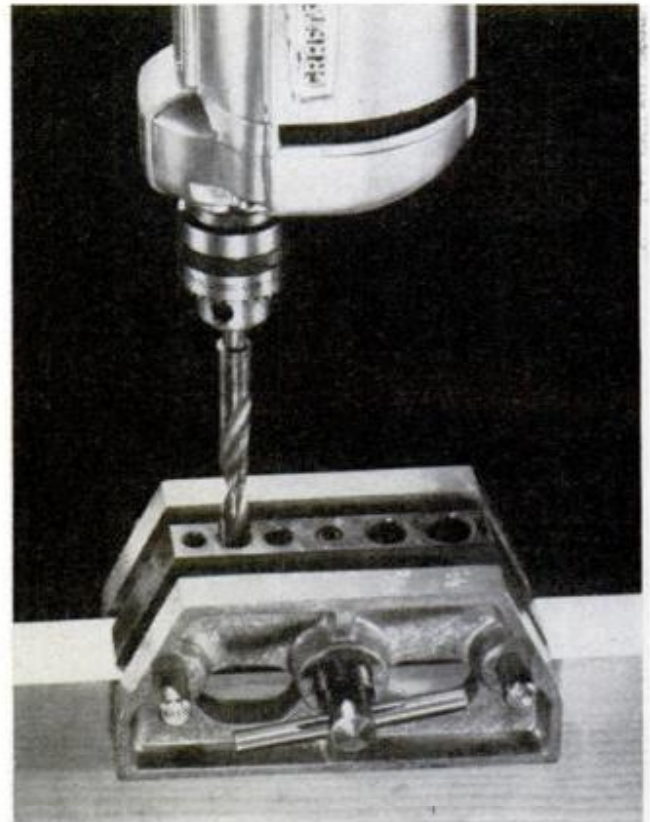
WHEN USING SOLID DOWELS, cut a groove the length of each pin to let air and glue escape. Without such relief there's a good chance of splitting wood



TO SCORE A SPIRAL ALONG DOWEL, you just apply a sliding-rolling pressure on dowel with the edge of a small mill file. Spiral helps to spread glue evenly



BOARDS ARE EDGE-JOINED by dripping glue in each hole, twisting the dowels in place and applying glue to mating edge. Then clamp boards until glue sets



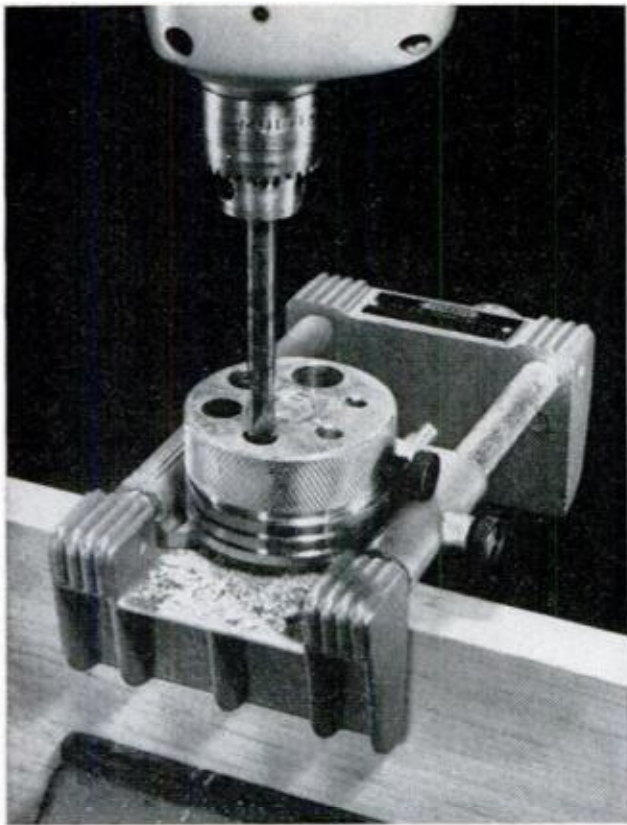
SELF-CENTERING DRILL GUIDE that boasts a heat-treatment feature will accommodate six drill sizes ranging from $\frac{1}{4}$ through $\frac{1}{2}$ in. Priced at \$12.95, the Model A Dowl-It jig is manufactured by the Dowl-It Co., 515 North Hanover St., Hastings, Mich. 49058

they are registered perfectly. You can do this with one of the simple hand methods shown on page 114 or, if your shop projects call for a lot of doweling, with a dowel jig. Five models are shown and countless other versions are probably available. (All jigs pictured were tested by *PM's* Home and Shop Editors and found to be dependable, quality tools.)

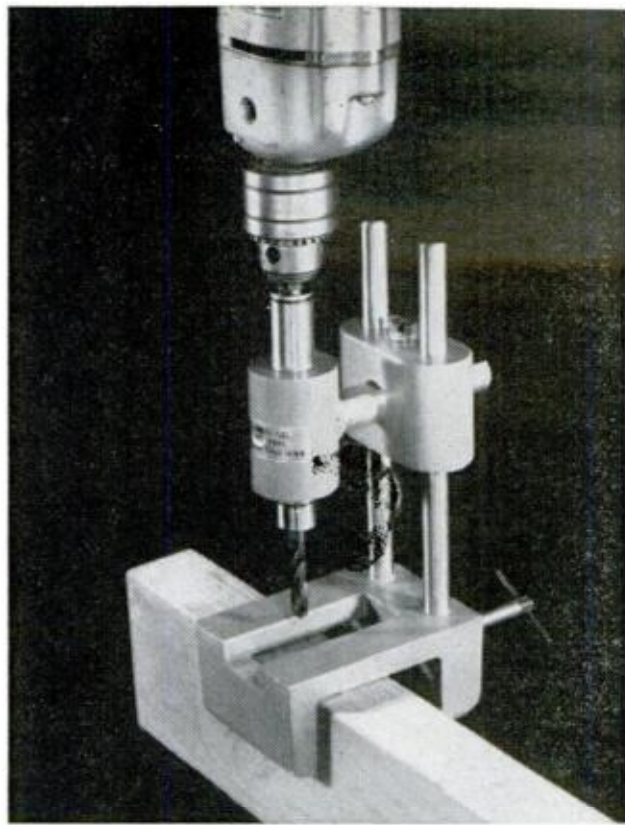
With dowel pins cut to length, chamfered and kerfed for glue ooze-out, assembly can be started. Dribble glue in the holes in the first board and tap the dowels in place. After applying glue to the board-edge and mating drill holes, press the boards together and finish with bar clamps. Don't overtighten clamps or you might cause bowing. Finally, wipe off all excess glue before it sets and set the workpiece aside overnight to dry. Next day, use a plane if necessary to smooth the surface and then finish the job with a thorough sanding.

If you take a reasonable amount of care along the way, you will have professional-looking—and fitting—dowel joints. ★★★

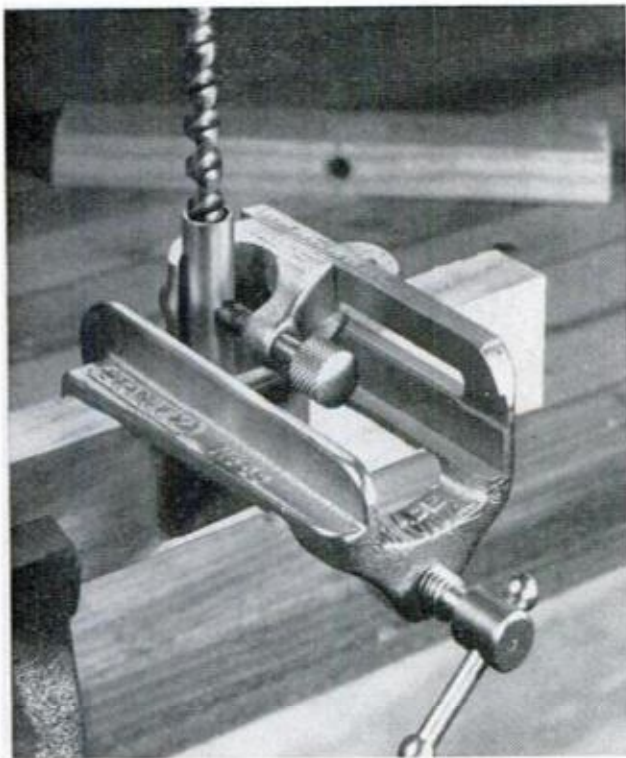
THAT MAKE DOWELING EASIER



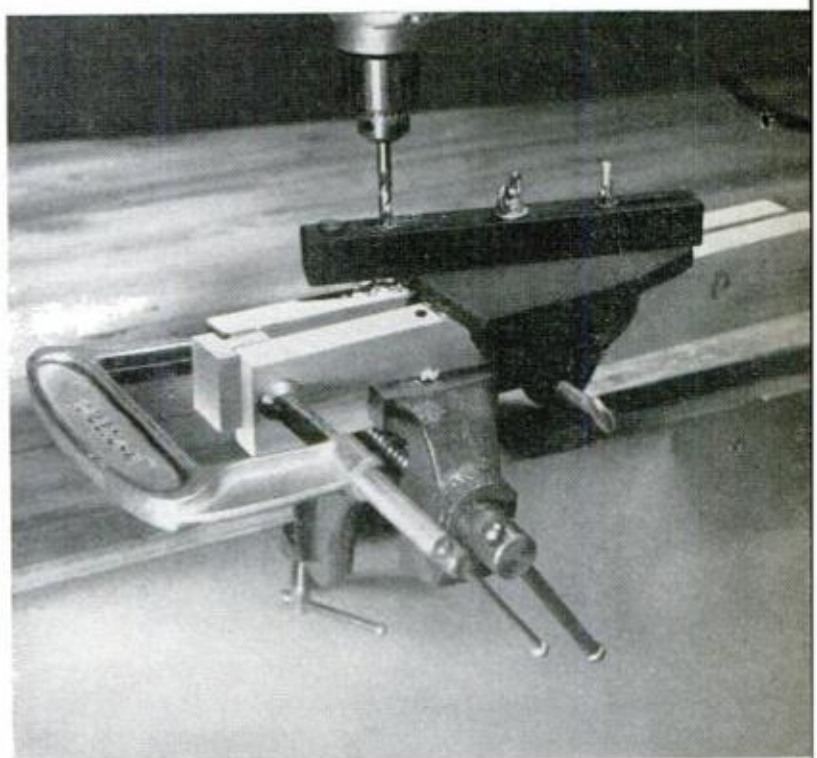
DRILLING IS SIMPLIFIED with this jig because its revolving turret adjusts quickly and eliminates loss of loose sleeves or parts. Model 840 with auger bit stop is \$8.90 at hardware stores; made by General Hardware Manufacturing Co., New York, N.Y. 10013



THIS DRILLING JIG provides the means to drill properly aligned holes to depths of 1-1/16 in., adapts to board thicknesses. Comes with full instructions for \$24.95 postpaid from Elder's Manufacturing Co., Dept. PM, Box 322, West Des Moines, Iowa 50265



INEXPENSIVE VERSION available at building-supply houses and hardware stores, this unit accommodates most common dowel sizes, requires registration lines made with a try square. Model 59, \$11.55, is made by The Stanley Works, New Britain, Conn. 06050



LATEST DOWEL JIG on the scene is this model by Home & Industry Tool Distributors, 2867 Long Beach Rd., Oceanside, N.Y. 11572. With guide clamped in position, the top bar swings two ways for perfectly matched holes. \$19.95. (Clamp not included in set.)

New Color TV: Kit-Builder's Dream Job

Heath's first solid-state TV kit is loaded with handy features like plug-in circuit boards, a swing-out chassis, even a built-in test meter.

By SCOTT M. GALLAGER

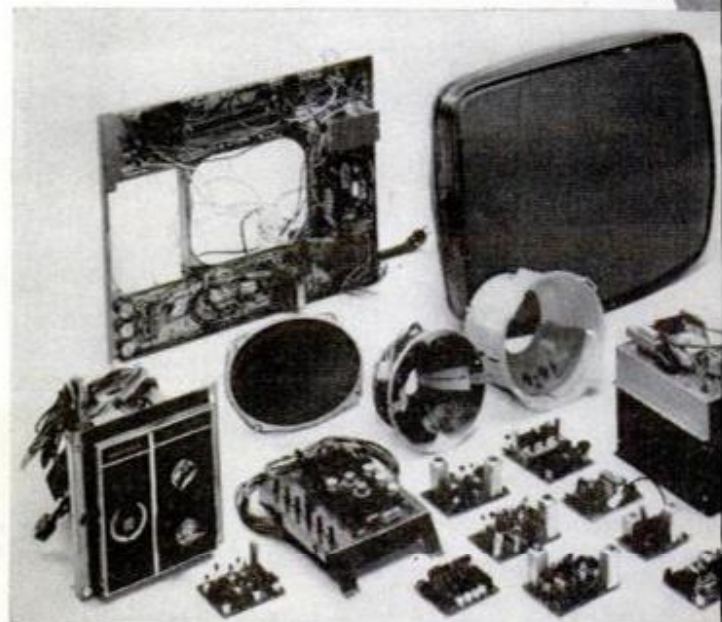
IT COMES PACKED in three huge cartons, consists of hundreds of parts and is accompanied by not one, but half a dozen thick instruction manuals. It looks, in short, like a hefty kit-building job.

It's Heathkit's newest color TV console—the first to employ all-solid-state circuitry and the first to incorporate modular plug-in circuit boards, a new concept in kit-built TVs. The set is available in three screen sizes—20, 23 and 25 inches. There are 10 snap-in circuit modules, 76 diodes and nearly 100 transistors.

Sounds complicated. But the minute you begin construction you realize the job isn't as hard as it seems. Everything is designed to simplify assembly and insure perfect results. You build and test each module individually before installing it. If something doesn't check out, you know exactly where the trouble is. Later, if you

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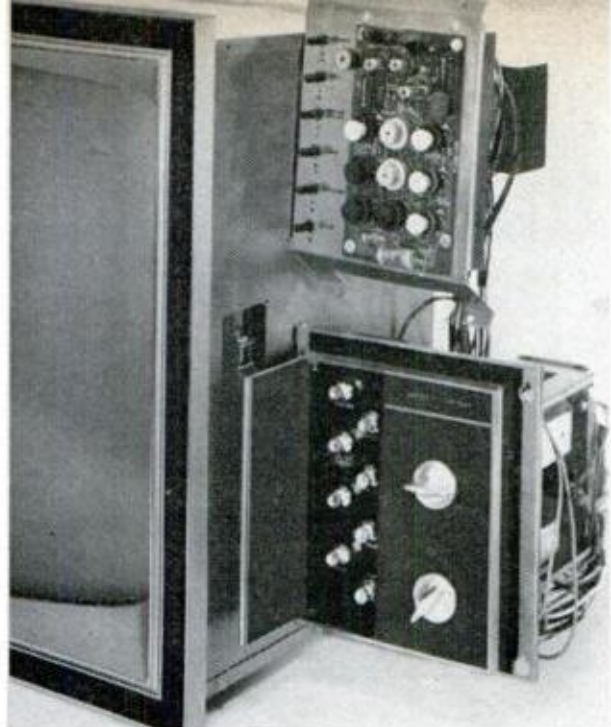
TINY CIRCUIT BOARD in hand above is typical of kit's simple step-by-step approach—you build and test one at a time, assuring accuracy



BASIC PARTS are plug-in circuit boards, tuning control, convergence panel and power supply shown in foreground. In background are picture tube and hinged main chassis into which circuit boards plug

POPULAR MECHANICS

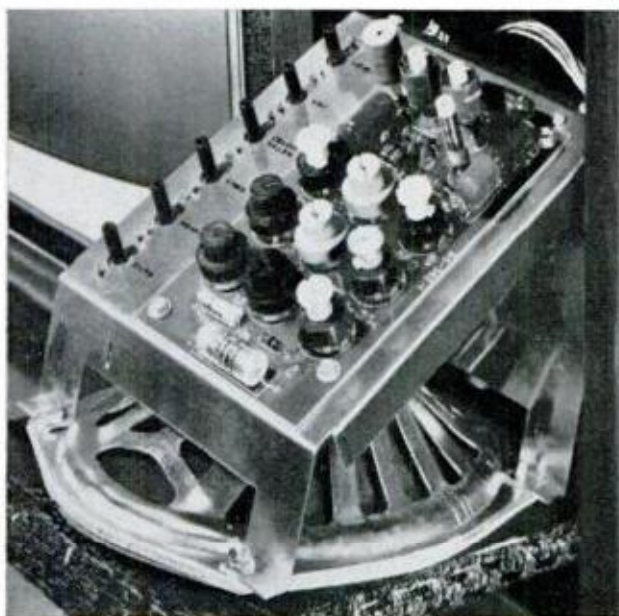
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DURING CONSTRUCTION, separate tuning and control assemblies mount temporarily on side of chassis—a handy idea for keeping everything together

need a new part, Heath will repair or replace the old one for a small charge.

Critical parts like the VHF and UHF tuners, IF amplifier and high-voltage assembly come preassembled and adjusted—you don't have to worry about these at all. Other nice touches are a built-in volt-ohm test meter for checking your work as you go along, dual antenna inputs for either 300 or 75-ohm lead-in, pushbutton tuning and an output jack for piping TV sound through your hi-fi system. Controls normally in back swing out in front so you can make color convergence and oth-



TILT-OUT CONTROL PANEL is accessible from front of cabinet, enabling you to make fine tuning and color adjustments without having to get at rear of set. Panel mounts behind swing-out speaker grille

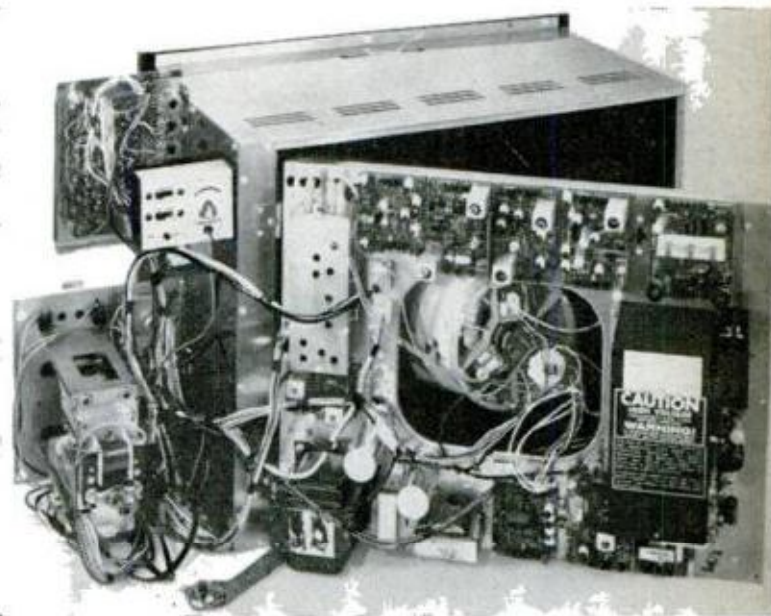
AUGUST 1971



WIRELESS REMOTE CONTROL turns set on and off, changes channels and adjusts volume and color—all from across room without your leaving your chair

er adjustments as you watch the screen.

The models are the 20-inch GR-270, \$489.95; the 23-inch GR-370, \$559.95, and the 25-inch GR-371MX for \$579.95. Cabinets are extra and come in three styles—Contemporary, Early American and Mediterranean—for \$75 to \$130. Also available is an accessory pushbutton wireless control for \$65 that operates the set remotely through ultrasonic signals. Assembly time varies according to your working speed, but averages around 45 hours. All in all, the set is a masterpiece of design and a rewarding kit-building experience. ★★★



HINGED CHASSIS opens like a door at back of set for ready access to wiring inside. Modular circuit boards plug in on outside within easy reach. Note the built-in volt-ohm test meter at upper left corner

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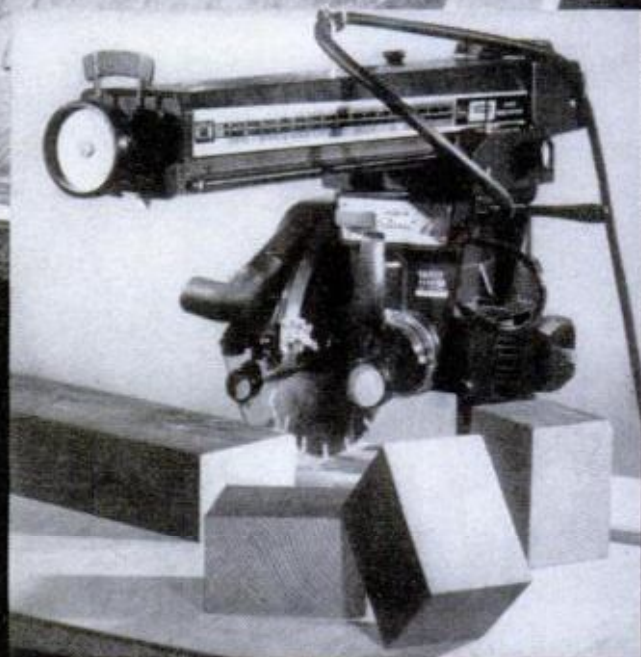
Sears' Best Radial: You Get What You Pay For

Plenty of power makes this new radial saw virtually unstoppable



By **HARRY WICKS**, Workshop Editor
Photos by Robert D. Borst

NOW I really am in a bind. Having spent all my shop career working with a table saw, the answer always came easy when I was asked, "Which saw should I buy, table or radial?" Until several weeks ago, my immediate answer was, "I prefer a table saw." But now, after I "put the boots" to Sears' newest radial, it's not that simple. And, since Home and Shop Editor Wayne Leckey knew of my



PLYWOOD PANEL (top) was easy to rip on this new saw. Tool also sliced 4x6 timber (above) effortlessly.

preference, I'm convinced that's why he assigned me to test the tool. He knew I'd go all out to find faults I could report.

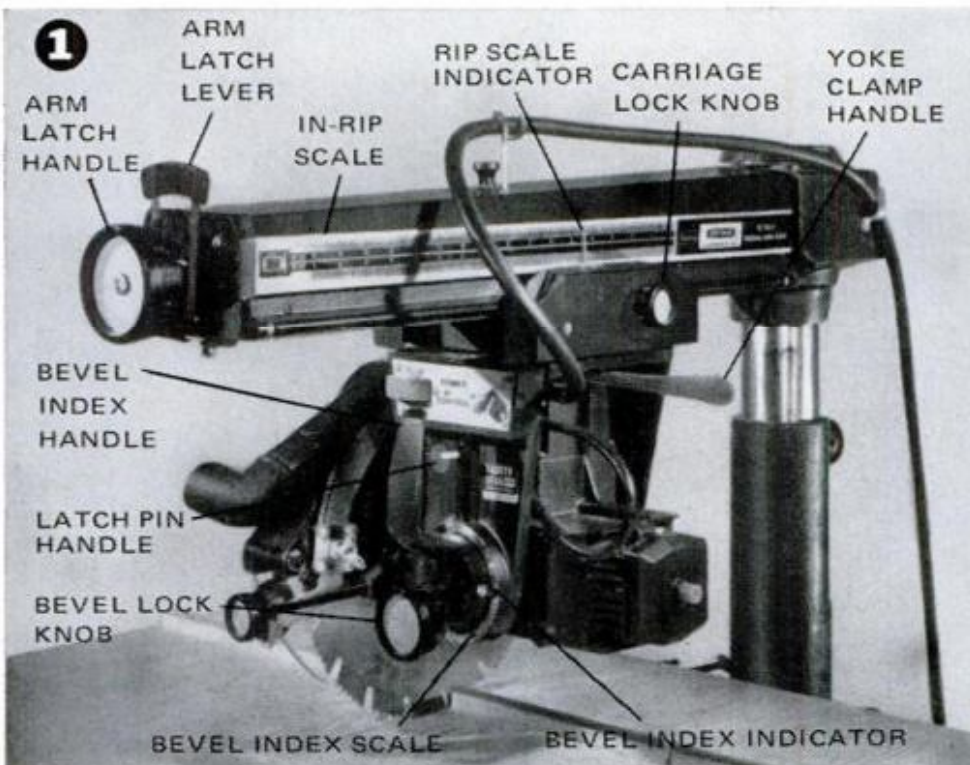
Setting up the saw presented no problem. Though it weighs almost 250 lbs., I handled the tool easily and occasionally, one of my two sons (Jack and Jim, ages 7 and 9 respectively) would lend a hand getting a nut started or holding a part in position while I did the fastening. Instructions packed with the saw are clear, easy-to-follow and well illustrated.

After several all-day sessions with the saw I could find only two possible faults:

● **Noise.** It is a lot noisier than my table

saw. But a workhopper somehow comes to accept noise. (My router screeches like a banshee, for example, but I wouldn't part with it.) Once I had become familiar with the tool, and its seemingly endless variety of knobs and locking devices, I found that I turned to it automatically for jobs such as ripping a bevel edge on a long board and crosscutting hefty stock.

● **Sawdust.** Spoiled by the cabinet beneath my table saw which neatly collars and stores dust, I found that the real price you pay—for the prodigious output this 12-incher is capable of—is the sawdust that seems to fill the shop. When cross-

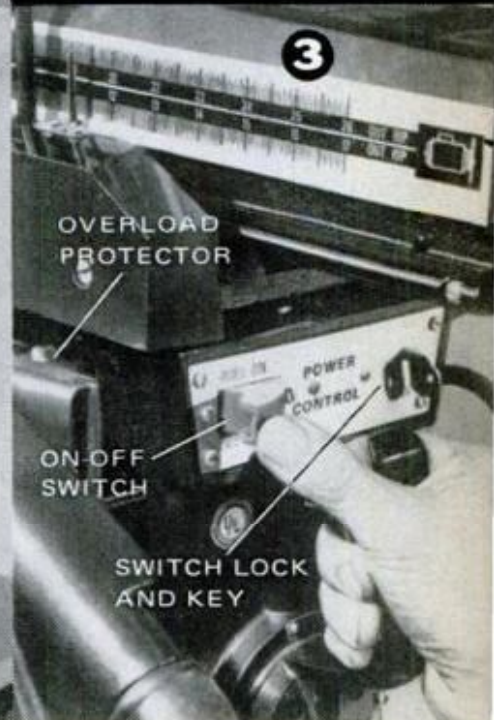
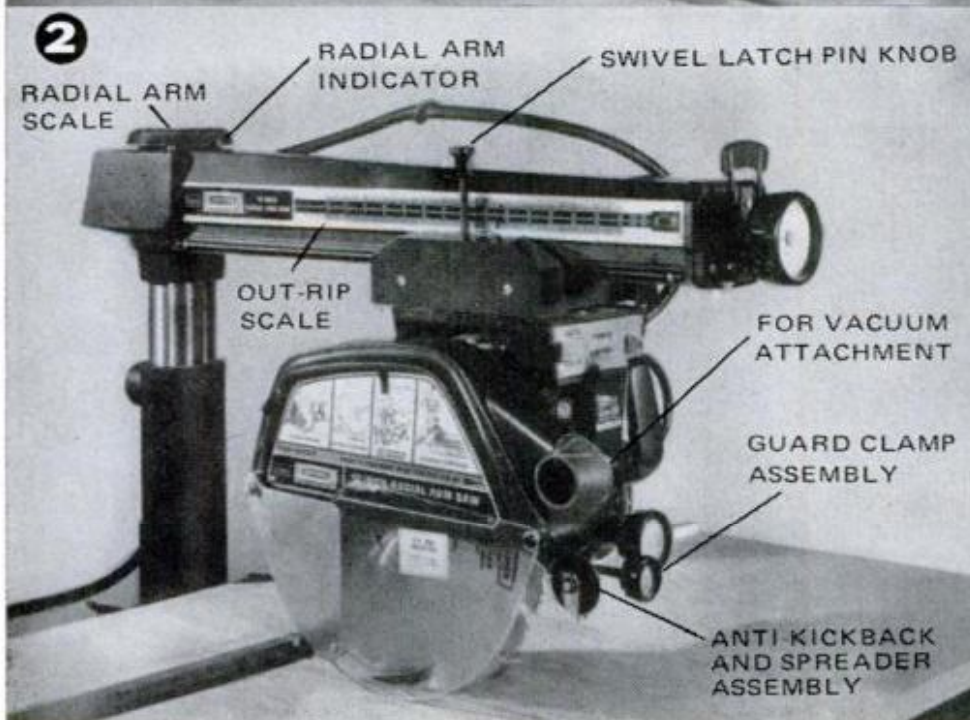


What you see is what you get...

1 Right-side view shows locking devices and 4.5-hp (developed) motor that powers rig. Notice line cord is clear of blade.

2 Left-side view shows important safety feature: the saw guard. Plastic guard reduces amount of blade that's exposed.

3 Good feature is convenient location of on-off button. Key-lock prevents young hands from turning tool on.



cutting it's no problem, but when ripping wide sheets of plywood—wear goggles!

Since the saw attachment for routing the sawdust to your shop vacuum is relatively inexpensive—about \$15—I strongly recommend that you buy it with the saw. I didn't, but one is on order now.

The motor. The 12-in. blade is powered by a 4.5-hp motor protected with a manual reset thermal overload switch. (The motor will kick off when its temperature exceeds a safe limit). It comes with a molded plug for 240-v. operation, connected to a 15-amp. circuit equipped with a 15-amp., time-delay circuit breaker.

In general. The saw comes equipped with a hardboard-faced particleboard top. For longer life, it is recommended that you cover it with 1/4-in. plywood. (The maker correctly advises against using hardboard as a protective surface because the glues that it contains will dull blades.) A particularly good feature, I feel, is the location of the on-off switch. When making crosscuts, it couldn't be handier. The key lock is also good; it guards against accidental starting of the machine.

PM Base. Since portability in any shop is desirable, I mounted the test unit on

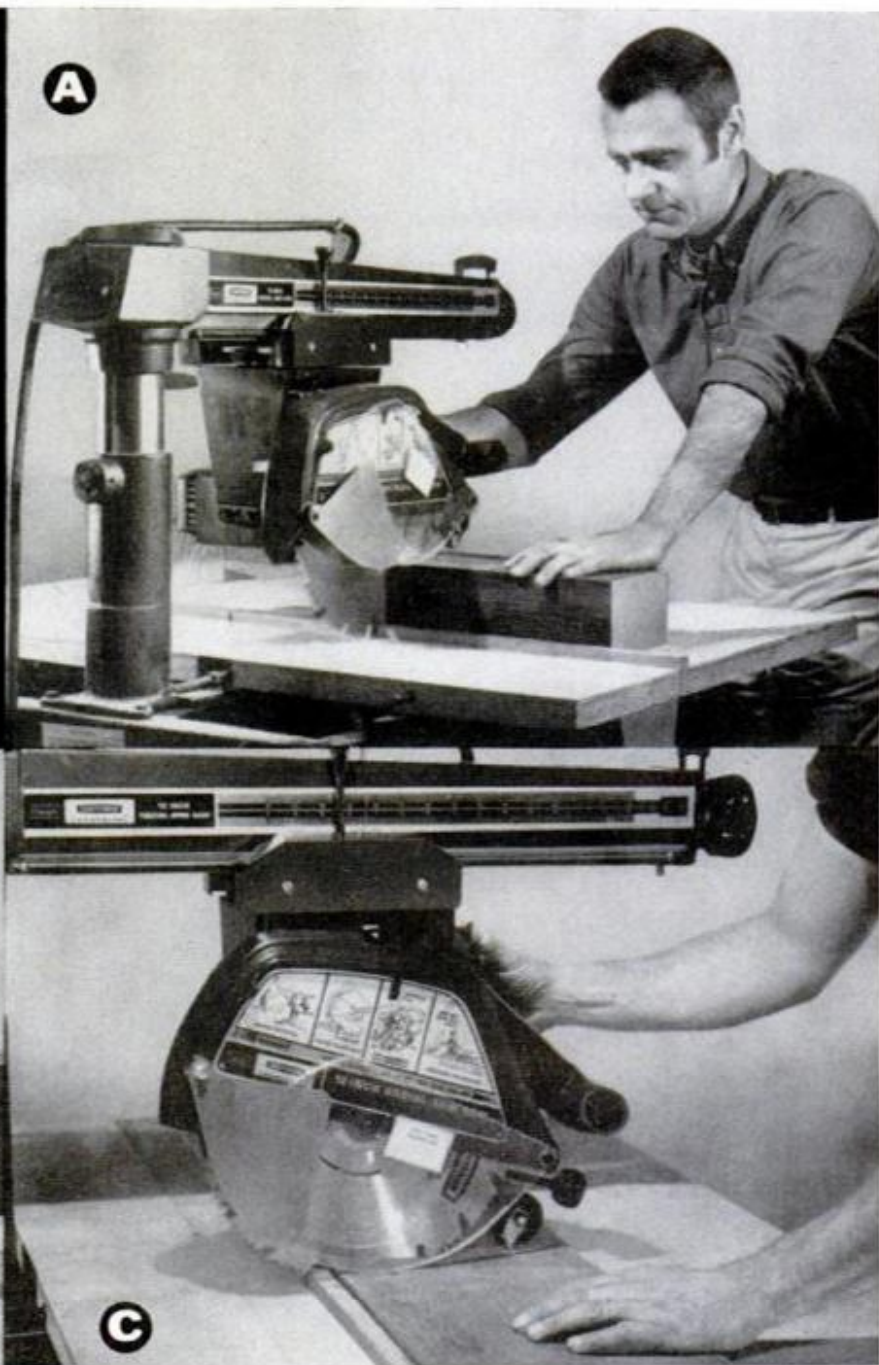
(Please turn to page 179)

Where this saw excels...

A Big 12-in.-dia. blade cuts hefty timbers so easily in one pass that it takes getting used to. Sawdust from these passes shot 12 ft. across shop.

B Radial is a delight to work with when making compound miter cuts. Material being cut here is for *PM Workshop Project* coming up soon.

C Typical crosscut is easy in pine, but blade has tendency to pull when making similar cut in hardwood or two-by stock.



How to Enjoy More Summer Fun At Home



Your own back yard can be your low-cost vacation retreat . . . every evening, every weekend. The fun for you and the kids needn't end with darkness (or the approach of autumn); under floodlights tennis, volleyball and basketball are even more enjoyable. In the smallest back yard there's room for a patio—and The Good Life close to home. . . .



Make Every Weekend a Vacation

Electrical Appliance Center for Your Patio **Page 124**

Your Garage Can Double as Your Outdoor Family Room **Page 128**

Fold-Flat Cookout Table for a Smorgasbord **Page 130**

Slip-Proof Diving Board for Pool and Storage **Page 132**

Measurements You Need for Laying Out Yard Games . . **Page 136**

Tennis, Badminton, Basketball, Shuffleboard, Dancing—Enjoy Them in the Evening Under the Lights **Page 137**

Garage Party Wall With All the Patio Conveniences . . **Page 140**

Add Music to Your Patio **Page 142**



Build This Patio Appliance Center

By WAYNE C. LECKEY, Home and Shop Editor

*Color Photo by Ernest Silva
Styling by Robert Lofgren*

WISH YOU COULD USE your kitchen appliances out on the patio? You can with this rolling appliance center which offers a convenient plug-in counter for your electric griddle, casserole, bun warmer, fondue pot, coffeemaker and other appliances normally used indoors.

It's sure to make your fall cookouts a lot more fun and easier since you can serve such things as hamburgers, chicken and franks without the work of starting up a smelly charcoal grill. You just plug in the appliance and you're in business.

The affair provides you with the convenience of a kitchen since the roomy cabinet and counter, plus cutting block, make "dishing it out" extra handy. Lift up the hinged cutting block and there's an ice-filled cooler under it full of chilled soda and beer. A shelf across the back provides a space for all your cooking spices and condiments, and the roomy cabinet offers cupboard space galore for storing all the gear that goes with outdoor entertaining. It rolls freely on ball casters, the counter is Formica-covered and a retractable reel saves the bother of rolling up a plug-in cord. A striped-awning top adds a gay festive look to the party.

The whole idea was presented to us by the Aluminum Assn., 124

and Bud Johnson, PM's cabinetmaker, built it. Materials ran about \$100, but you can build it for less by using less expensive casters, forgetting the Formica on the counter and using softwood for the maple cutting board. Most of the cart is made from $\frac{3}{4}$ -in. exterior plywood, the lumber being common $\frac{3}{4}$ -in. (actual) white pine. The back panels are $\frac{3}{8}$ -in. plywood. The Styrofoam cooler is made by Skotch-Hamilton and sells for about \$2.50. The cover of the cooler is cemented to the underside of the cutting board. The fluorescent fixture is controlled by a separate switch and, along with the plug-in strip,

THE COUNTER features a lift-up, maple cutting block that is handy for preparing salads. Ice-filled cooler is kept under block

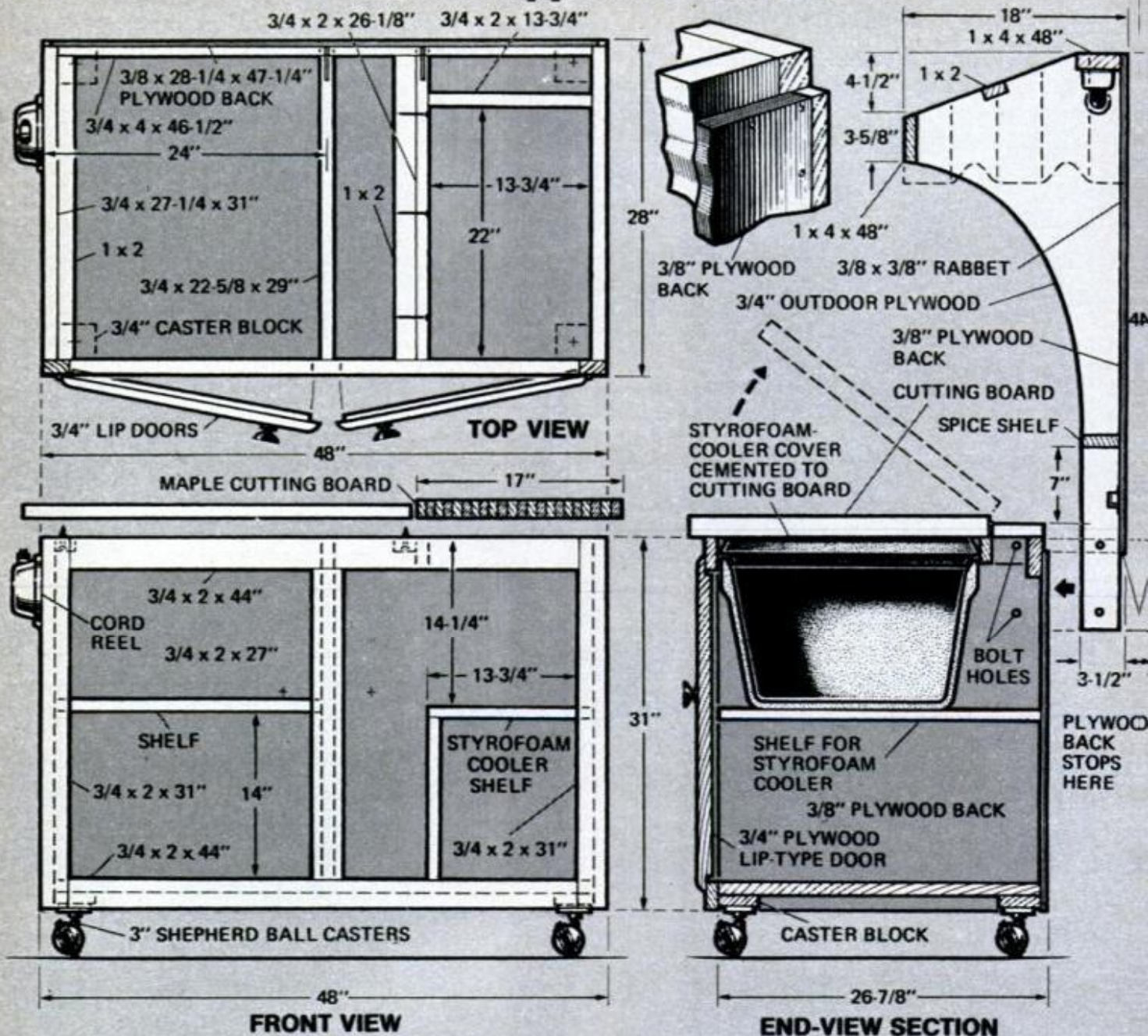


POPULAR MECHANICS

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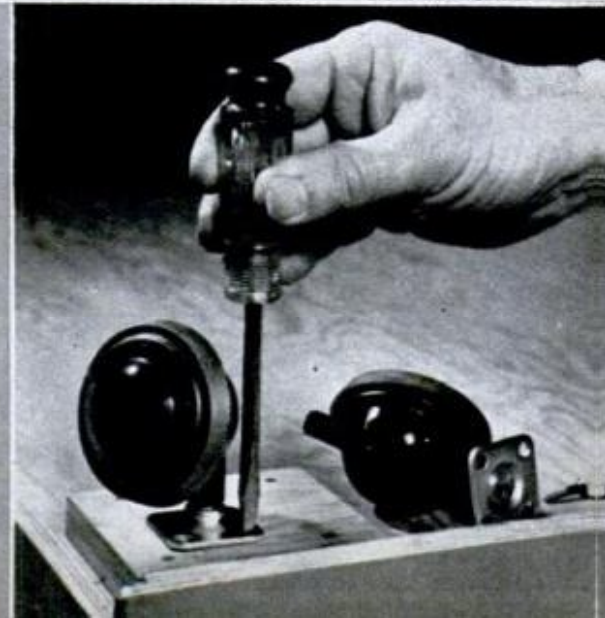
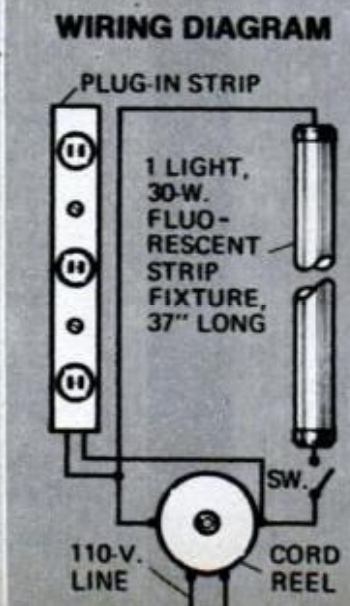
Patio Appliance Center



RETRACTABLE CORD REEL corrals 6-ft. plug-in cord, sells for \$15; A. A. Peters, Inc., 404 Union Blvd., Allentown, Pa. 18103

PLATE-TYPE BALL CASTERS, two having brakes, are screwed to all four corners

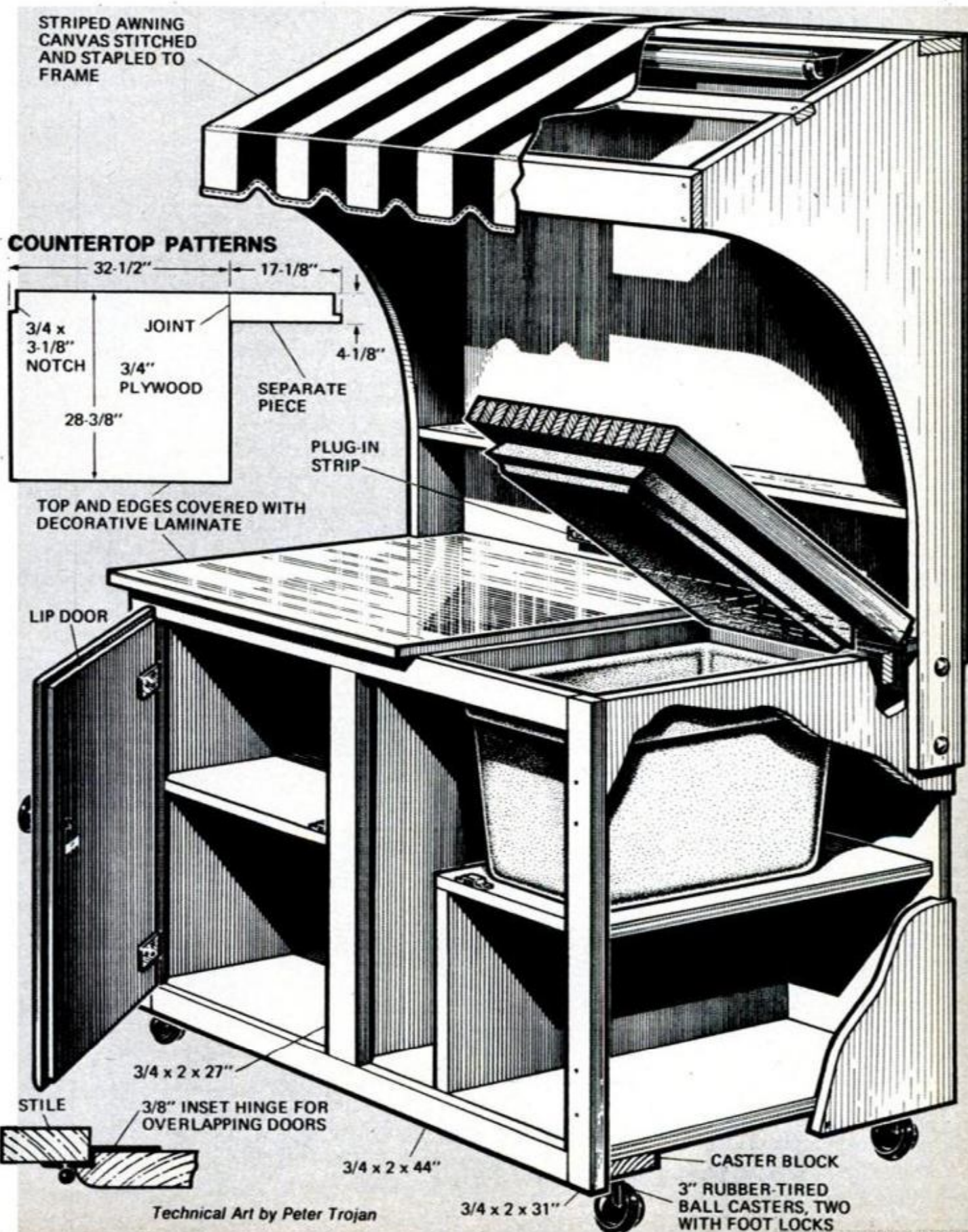
PHOTOS BY ROBERT BORST



is wired to the cord reel. The canopy frame can be removed to facilitate storage.

What's more, it's not just something you can use during the summer only; if you have a big enough family room or recreation room to accommodate it, the cart can be rolled inside when winter comes and used for indoor entertaining.

Construction details on these two pages show how the cart is made. You start by making the front framework from $\frac{3}{4}$ x 2-in. pine strips. This is then glued and nailed to the plywood members which form the ends, bottom, shelf and center divider. Notice that the bottom is set even with the top of the lower rail. ★★★

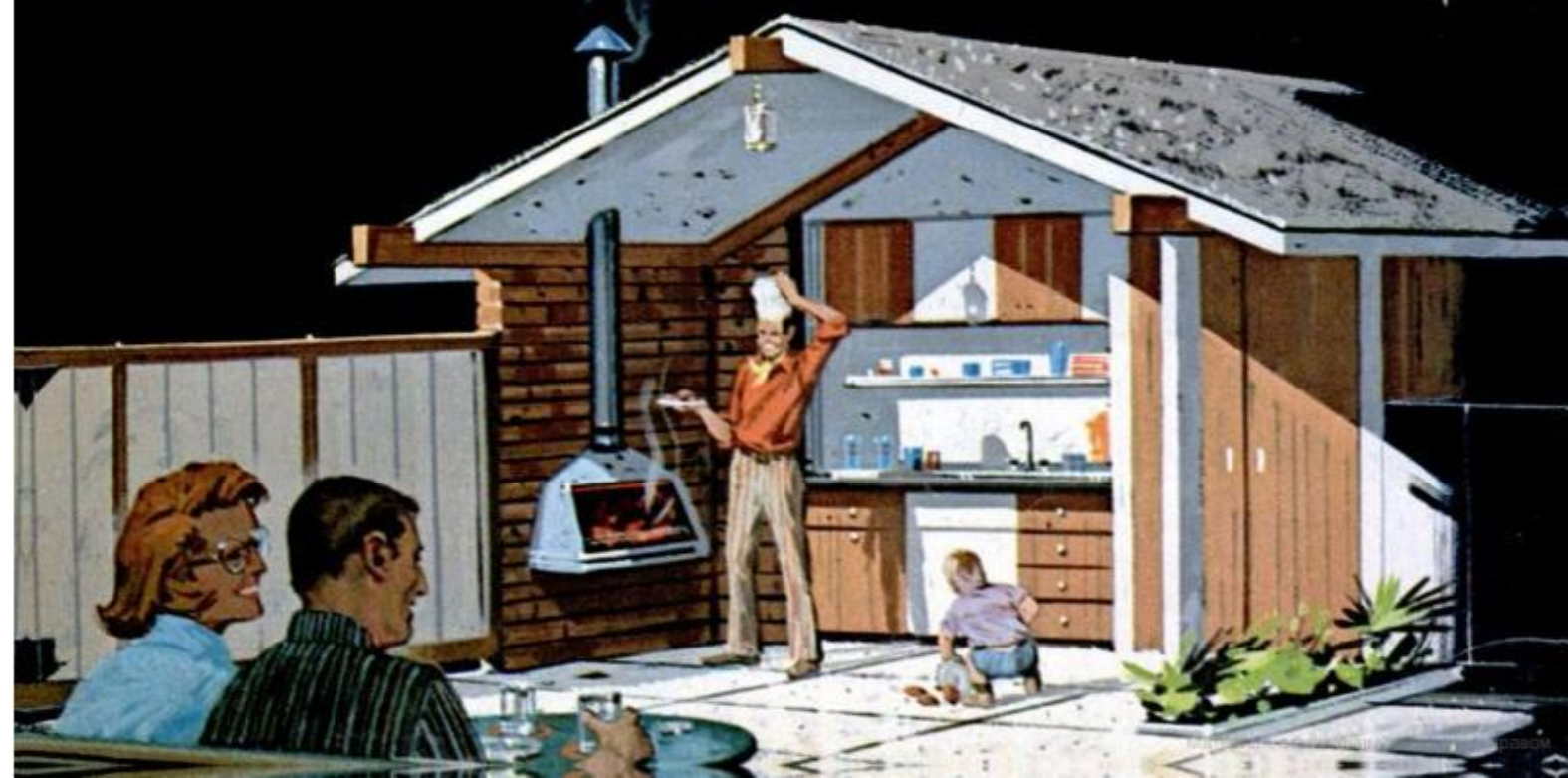


Your Garage Can Double as

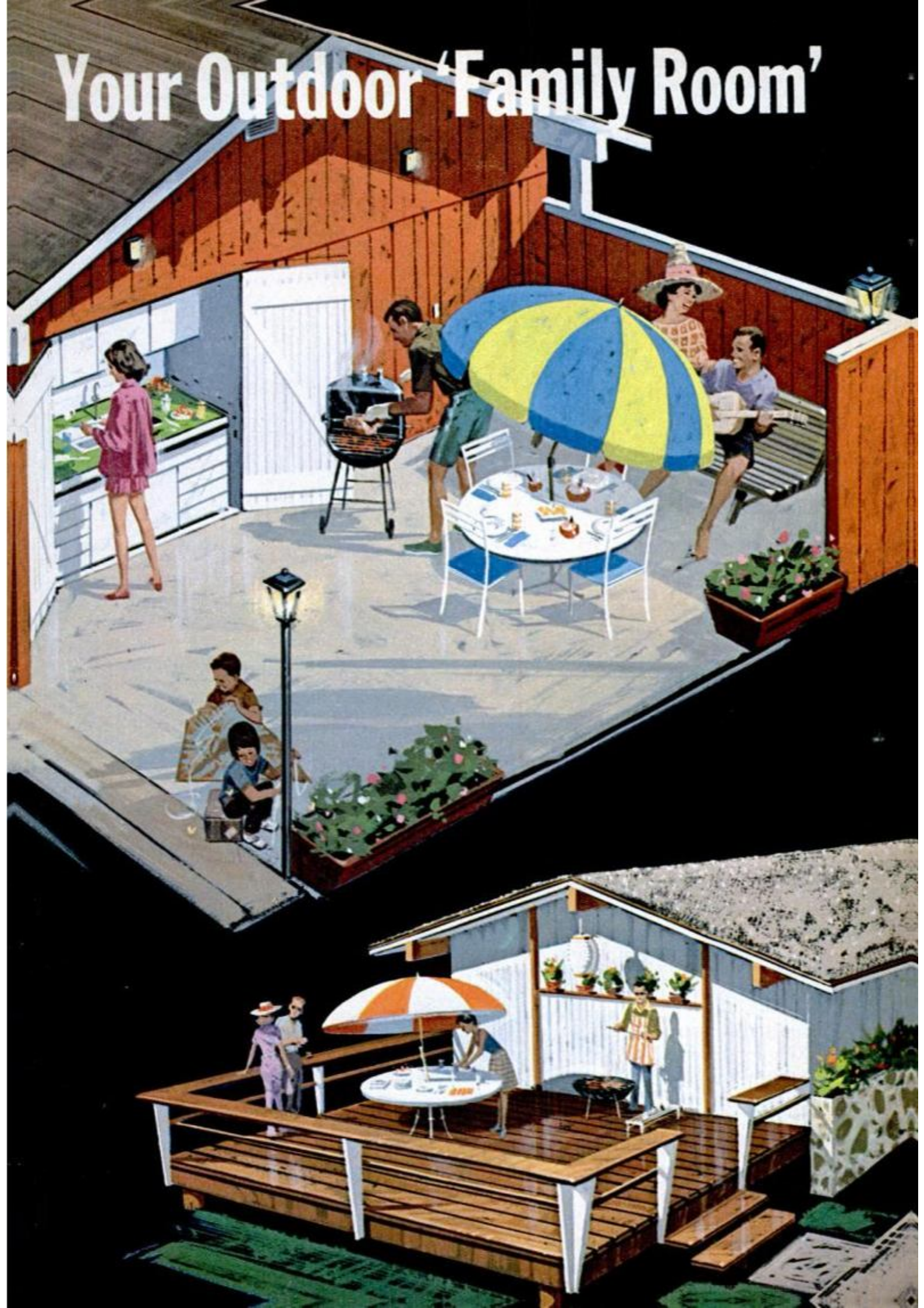
Tack a patio onto your garage and build this entertainment center for months of fun

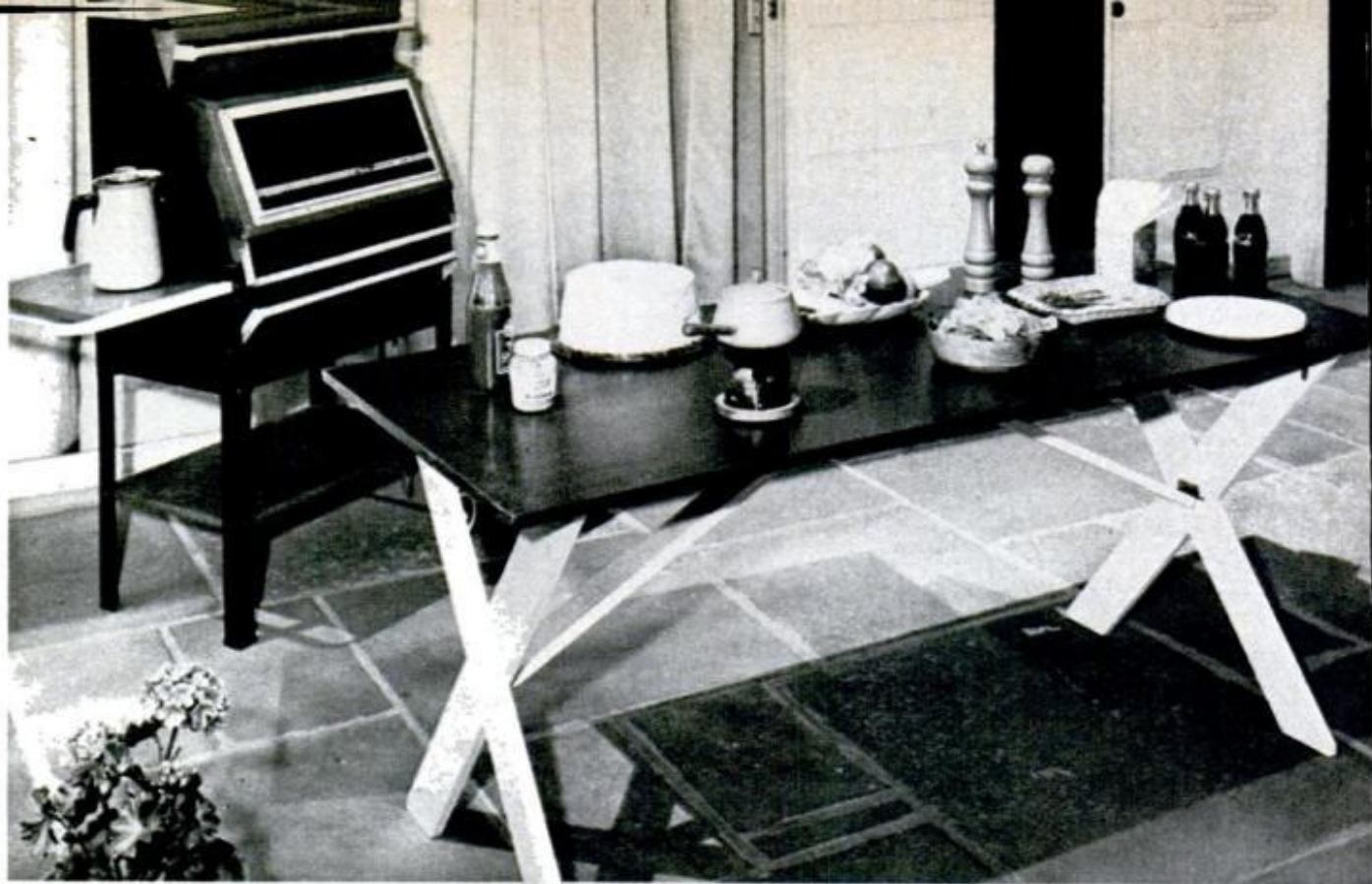
By HARRY WICKS, Workshop Editor
Illustrations by Roy Grinnell

ANYTIME YOU CAN GET DOUBLE USE from what you already own, you're ahead of the game. And that's what this concept is all about. When originally presented (page 136, April '65 *PM*), the garage-patio idea was readily accepted by readers who knew a good thing when they saw it. Three ideas are shown—the original plan (at the top of the facing page) and two new versions. Plans for the first version are available; simply send \$1.50, plus 25 cents for postage and handling, to Popular Mechanics, Dept. GP, 224 West 57th St., New York, N.Y. 10019. You can add additional comforts to suit your personal tastes and the equipment you have on hand. The important point is to have an overall plan of exactly what you want as a finished product. Then, you can tackle the job bit-by-bit as time and money allow. The result will be an outdoor "room" with a professional look. Basically, the heart of the center is the cooking and storage unit that is built into the garage. If your preference is the cooking part of entertaining you'll probably want to treat yourself to the built-in grill shown below. On the other hand, if, as far as you're concerned, cooking is just one of the necessary evils, you can simply use a portable brazier as shown on the facing page. No matter what your family preferences, you'll wind up with an outdoor room "in" which you'll be proud to do your entertaining.



Your Outdoor 'Family Room'





Fold-Flat Picnic Table Lets You Put It Away

THE BIG PROBLEM with a conventional back-yard picnic table is that you can't put it away between cookouts. It's just too big to store—which means it's in the way when you mow the lawn, and it takes a beating from the weather. The latter means you'll have an annual paint or stain job.

You don't have such problems with this patio table. When the party's over, it can be stored in a minimum of space in your garage. With legs folded, it takes only 2¼ in. of space.

The table is sturdy when it's set up; the sawbuck-type legs are braced by their hinged supports. The braces not only lock the legs in the open position; they also lock them when folded—by using a pair of

regular loose-pin hinges and substituting pull pins made from coathanger wire for the original hinge pins.

You can increase the size of the top, but if you maintain the 5½-in. dimension at the ends, you'll have to increase the length of the braces accordingly.

Block B is glued and screwed to the underside of the plywood top at its exact center. Although the braces are hinged to this block with plain butt hinges, you'll see in the enlarged detail that the braces are on the top of the hinge leaf and the screws are turned in from the rear side of the leaf.

The 1x4s, which are used to make the legs should lap flush at the point where the members cross. To cut the dadoes at the correct angle, set your saw miter gauge at 11°.

Use three loose-pin hinges (six leaves). One leaf is screwed to each end of the braces. Another is screwed to each block A and the other two are screwed to the inside of each leg assembly. Thus, single leaves at ends of the braces engage the single leaves screwed to the legs as well as to those screwed to blocks A. To set up the table you pull the hinge pin at blocks A, swing up the legs to engage the hinge leaf of the brace with the one on the legs and replace the wire pull pin.—Paul Bell, Clifton, N. J.



Slip-Proof Diving Deck Plus Storage

This platform can also be locked
to keep toddlers out of the pool

By HARRY WICKS, Workshop Editor

LAST SPRING, a letter received from a *PM* reader in New Jersey posed an interesting challenge. This homeowner had, he said, "an above-the-ground pool that was in dire need of some sort of diving arrangement. What do you suggest?"

So, *PM's* editors huddled and sketched some ideas. A self-imposed restriction was that no proposal would be considered valid unless the particular idea was unanimously acceptable. A package of ideas was sent to the reader and the structure you see on these pages was subsequently built entirely by him. And he let our photographer shoot pictures as he built.

Features. Since footage would be taken from the yard, it was agreed that space beneath the deck should be utilized for seasonal storage as well as to house the pool filter system. It was also decided to place the stairs behind the door to protect young ones. Extras that "make" the structure include a foot bath, indoor/outdoor carpeting and nautical rope railing.

Design is basic; there are no fancy, frilly construction techniques. Tried construction methods were used to insure maximum sturdiness, yet details were kept simple to keep costs down to a minimum. For example, careful layout permitted cutting the deck from just two 4x8-ft. sheets of exterior plywood with practically no waste.

Overall dimensions of the deck can be varied to suit the size of your family. The version shown provides ample room for sunbathing as well as diving for this

reader, his wife and their five youngsters. One critical measurement to keep in mind—when laying out your structure—is the portion of the deck that overhangs the pool. This can be altered to suit without any problems.

The four-by-four posts are anchored to footings which should be below your area frostline. Once the four-bys are in place, and the concrete has set, the post-holes can be backfilled and cutoff marks at the top located. To do this, determine desired height on one corner post and mark off the other posts using a mason's line and line-level.

Top and bottom rails are simply spiked to the posts and framing is completed with joists and bridging installed. The rails and posts are fitted with cleats positioned to give a setback (architectural shadow-line) when the exterior plywood panels are in place. (In place of cleats, the 2x4 rails can be edge-rabbeted on a table saw.)

Doors to the storage area and stairs are simply plywood panels framed with rails and stiles fastened to the structure with strap hinges. Catches to hold them closed and vertical half-round moldings complete their construction.

The stairs. A limited run made a steep riser-to-tread ratio a must. But, unlike conventional stairs, it is not a drawback. Actually, their "marine-ladder" steepness adds to the nautical design. The foot bath at bottom is optional (it's an inexpensive plastic baby bathtub from Sears, Roe-

ABOVE-GROUND POOL mandates a structure alongside for diving fun. This one has steps inside (upper right) that are inaccessible when door is locked. Space behind doors (upper left) is ample for year-round storage of bike and yard equipment plus house for pool filter. Owner built deck shown in four weekends



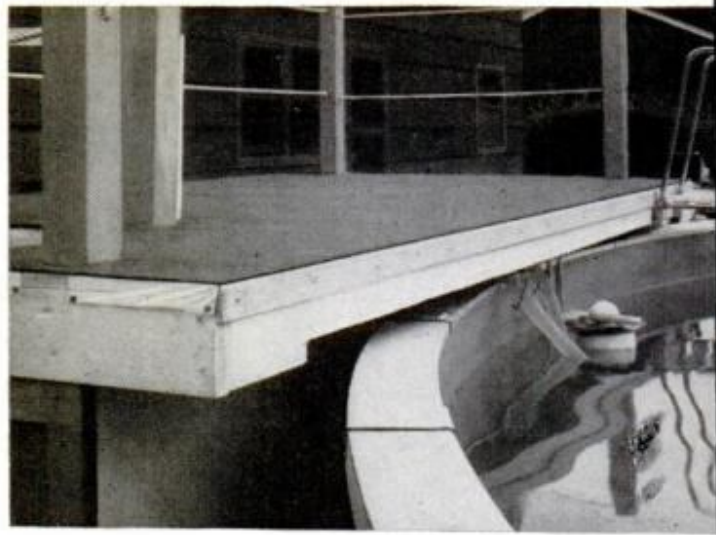
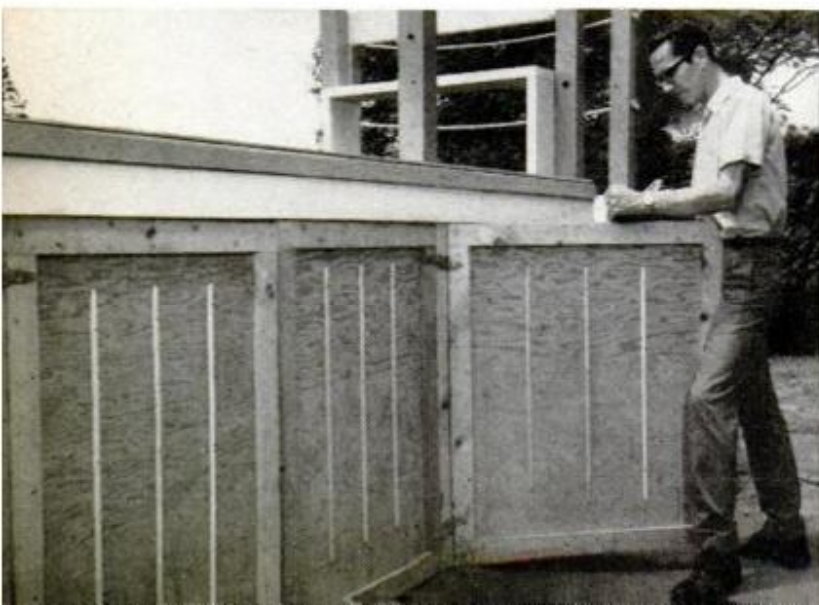
INDOOR-OUTDOOR CARPETING insures skidproof footing, goes over 15-lb. felt and 6-mil polyethylene

buck), but it does decrease the mud tracked up to the deck carpet by overzealous youngsters.

The deck can be finished using an exterior latex paint with some fine masonry sand mixed in for skidproofing. (Or, you can purchase a ready-mix sand paint.) But our suggestion was to cover the plywood with 15-lb. felt, followed by 6-mil polyethylene and Ozite outdoor carpeting. (The felt waterproofs the storage area while the polyethylene prevents any possible stains from the felt rising to the carpet.) Either way the finished surface is an effective safeguard against accidental skids and falls. The latter method is just more comfortable underfoot and better looking.

Since a slab wasn't used here, you'll notice in the photos that the structure walls leave space at the bottom to permit rainwater runoff. If you prefer slab construction, you are well advised to install

STORAGE DOORS are built with one-by stock and 1/4-in. plywood. Half-round moldings give a decorative touch



PLATFORM OVERHANGS pool slightly; measurements might vary from drawing to suit different size pool

a block wall or form the slab to create a curb. A standard soleplate can then be installed, with posts toenailed to the plates, and conventional wall framing used. But remember that a slab would require the addition of a pitched apron in front of the doors to provide positive water runoff. The apron will also make it easier to roll bikes and other wheeled vehicles in and out of the storage area.

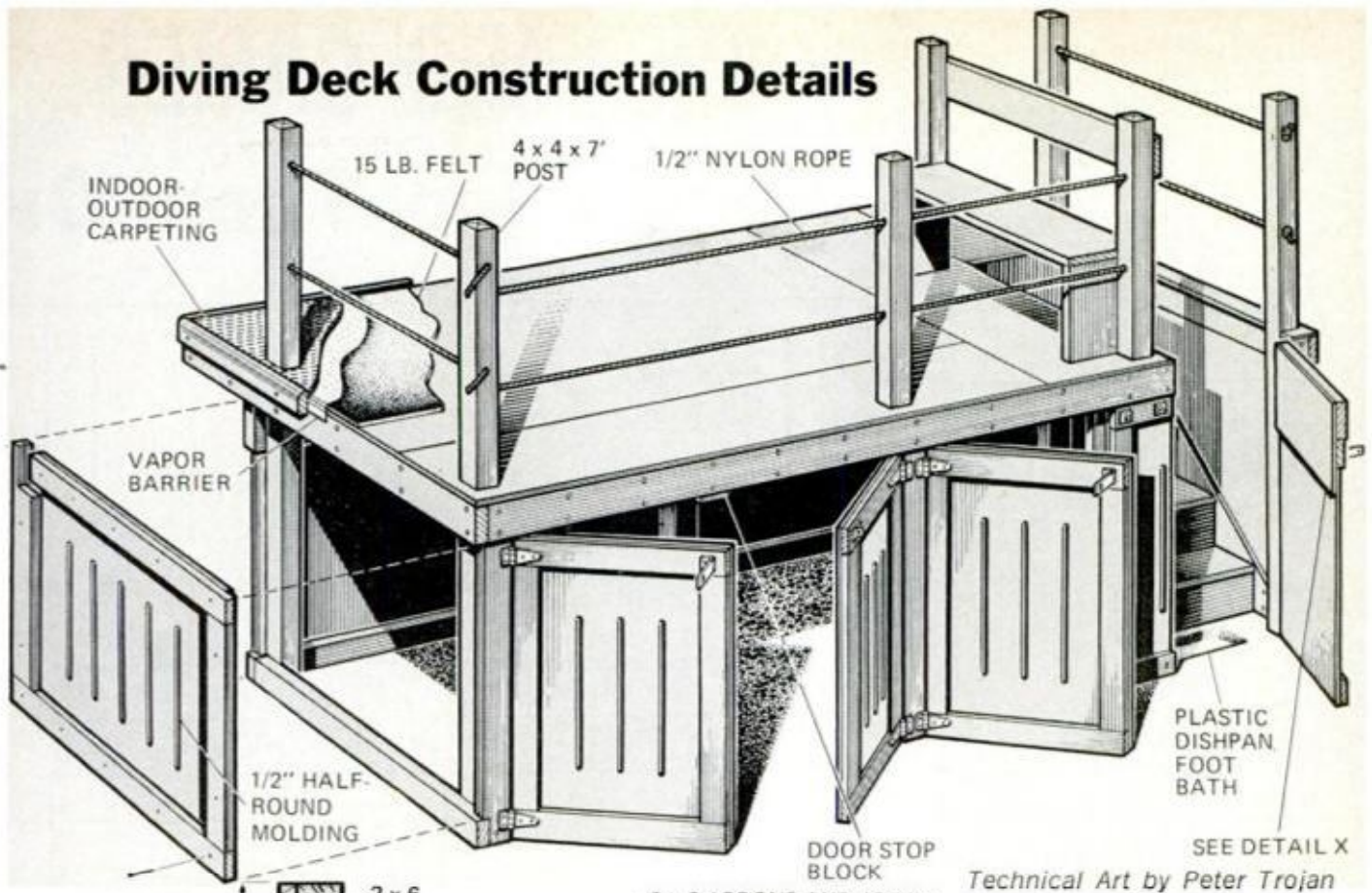
To finish, the entire structure was primed and painted (inside and out) with a high-quality, latex house paint. (For additional safety, the stair treads could also be carpeted or coated with a sandmix paint to make them skidproof.

The prototype project shown took the owner four weekends to complete. He started it late in April 1970, and by the time the thermometer climbed to swimming temperatures he was happily spending his vacation atop his "Slip-Proof Diving Deck" in his own back yard. ★★★

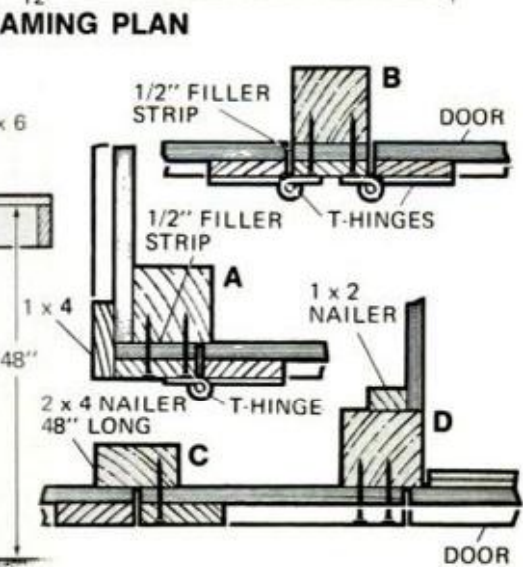
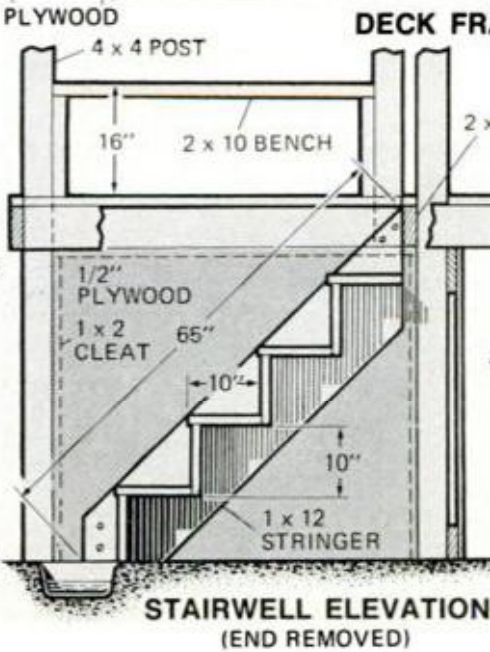
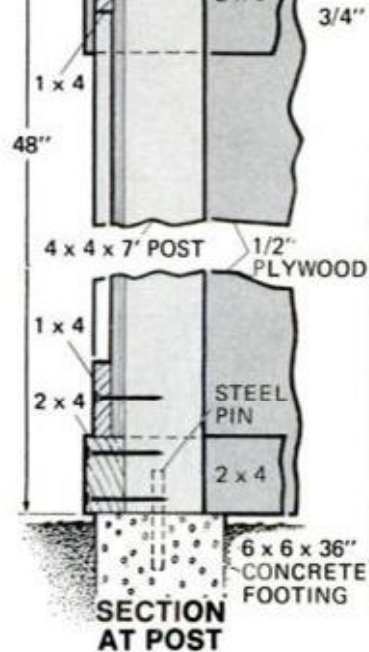
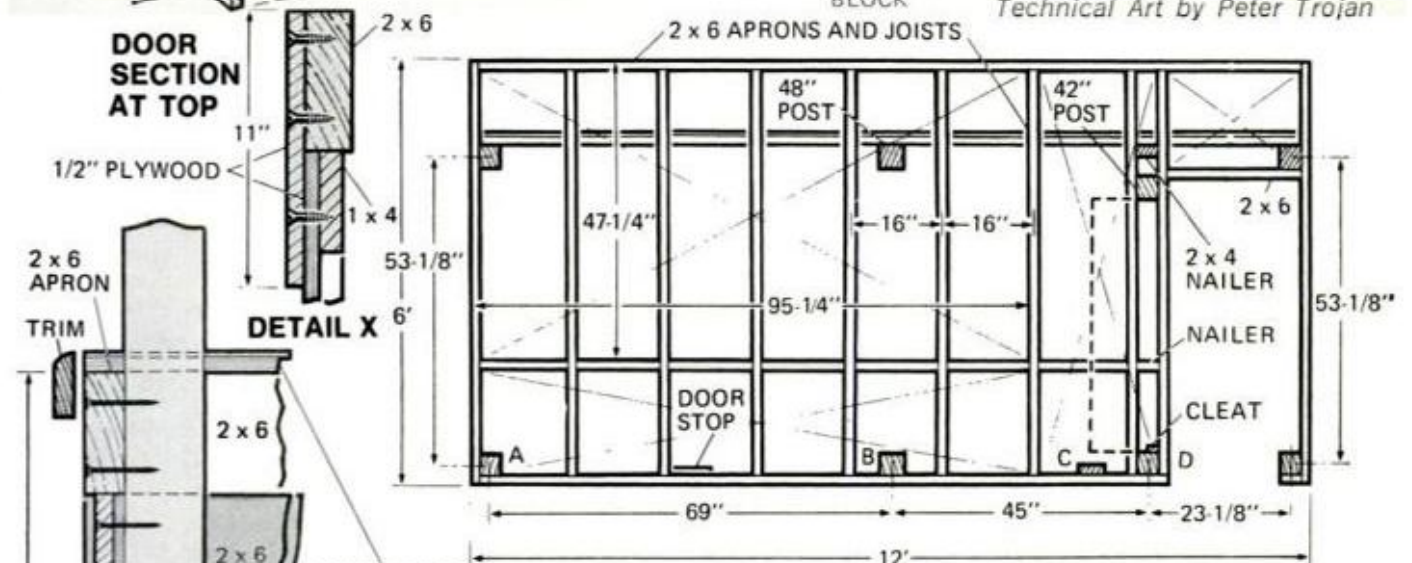
HOMEOWNER-BUILDER lowers prebuilt stairs into position. There's space at bottom for small footbath



Diving Deck Construction Details

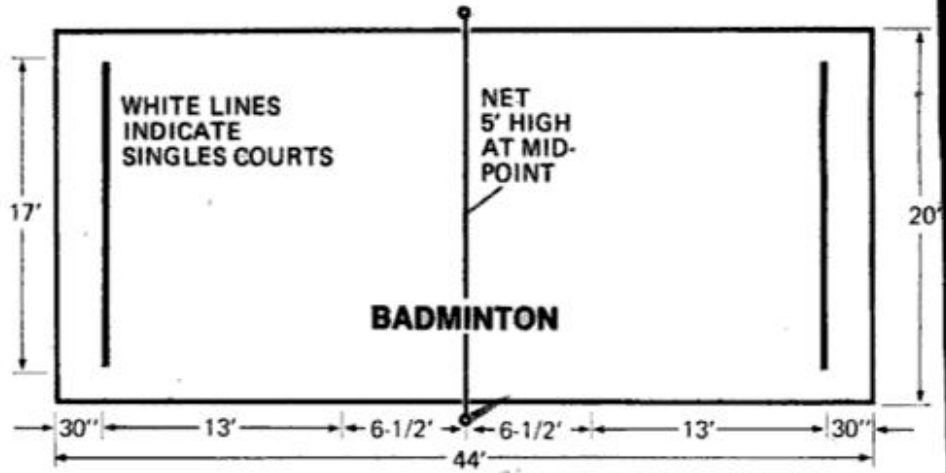
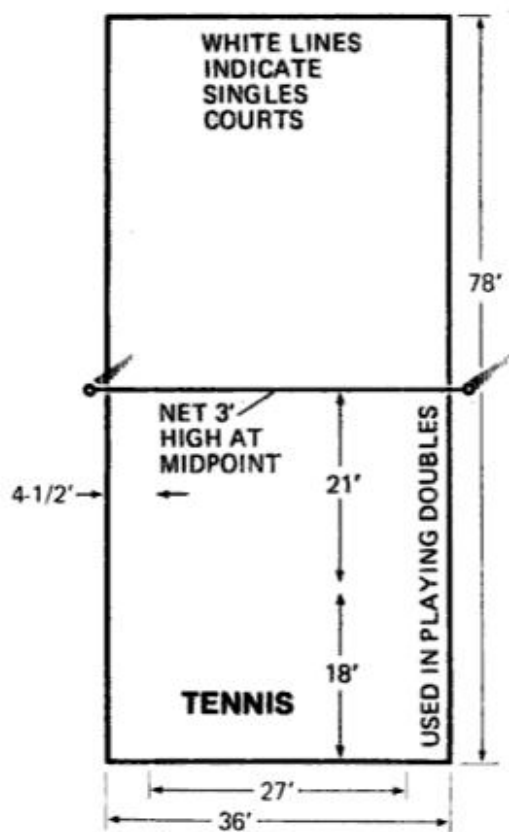


Technical Art by Peter Trojan

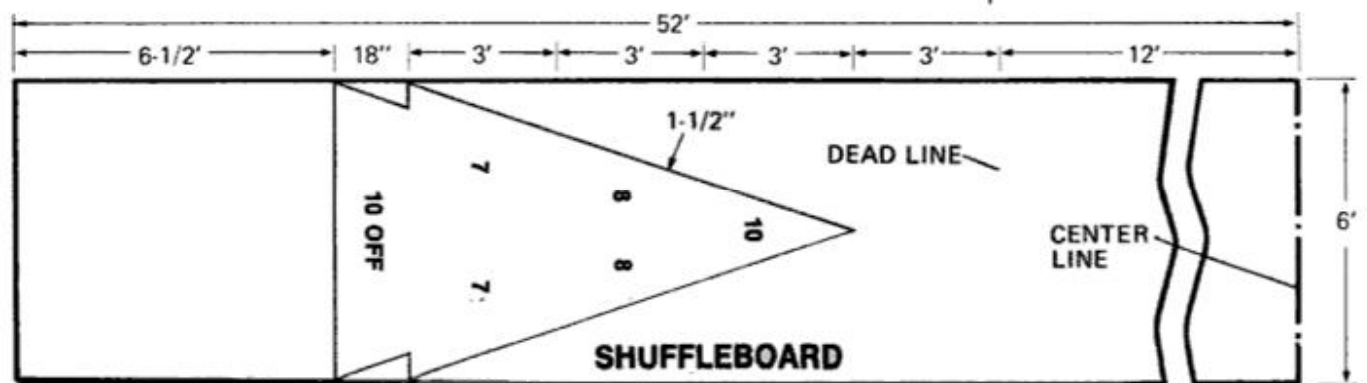
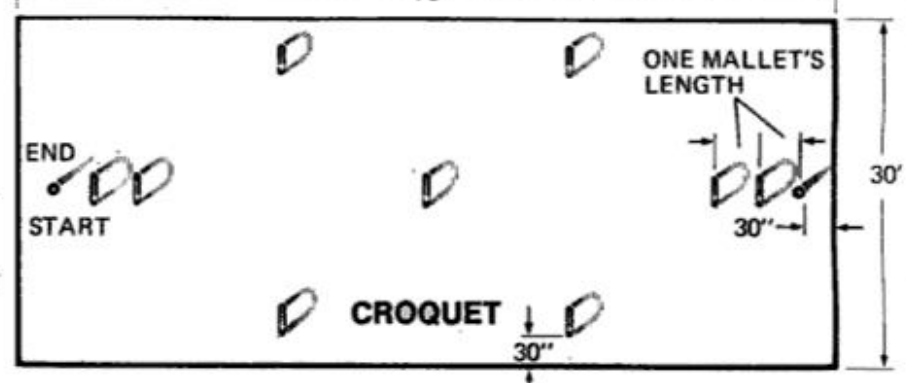
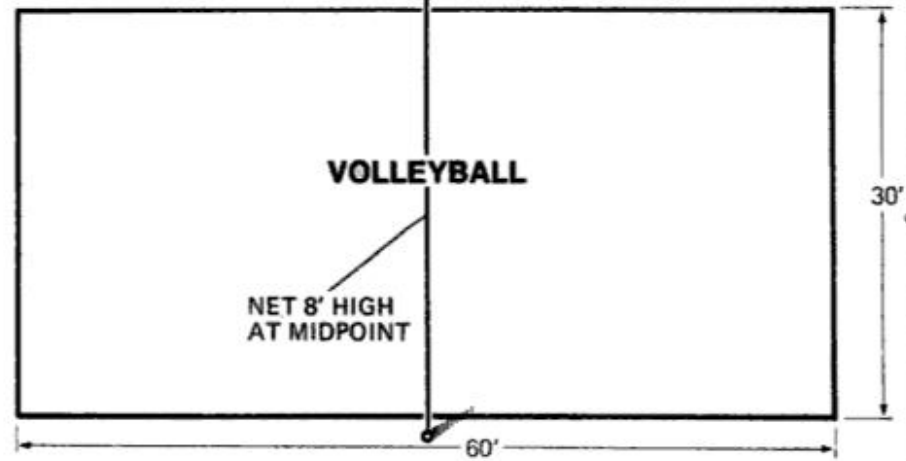
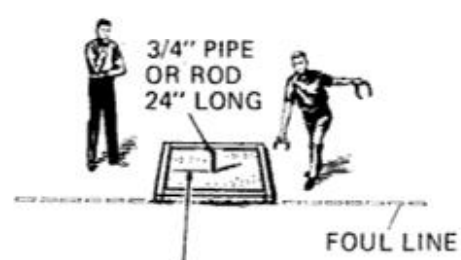


BACK-YARD GAMES

How to Lay Them Out

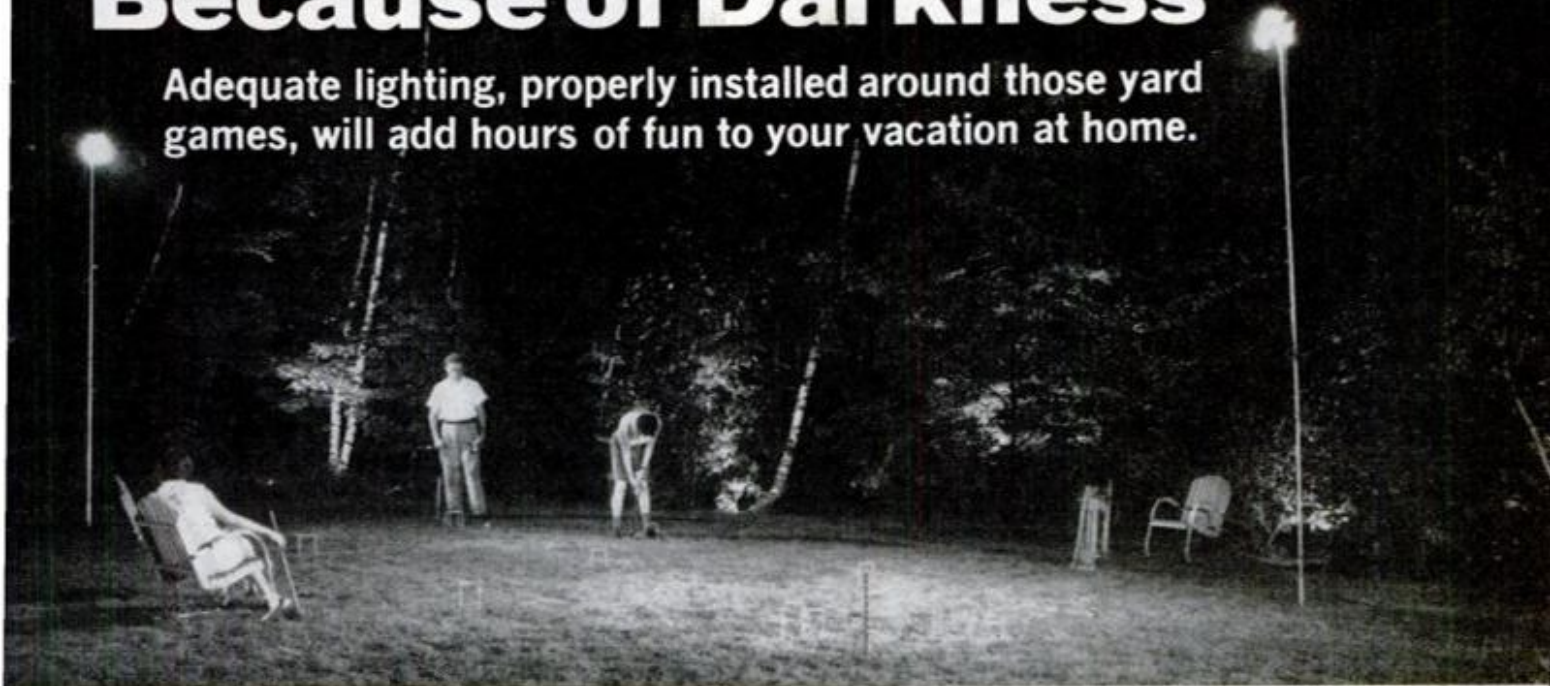


Technical Art by Peter Trojan



Game Not Called Because of Darkness

Adequate lighting, properly installed around those yard games, will add hours of fun to your vacation at home.



WESTINGHOUSE CORP. PHOTOS

By HARRY WICKS, Workshop Editor

ONCE YOU DECIDE to set aside a portion of your property for lawn games, and put in the time and cash to install them, it makes good sense to extend their use into the evening by providing adequate illumination. In fact, during the blistering hot months, you'll probably find the youngsters using the games more during the cool after-dinner hours.

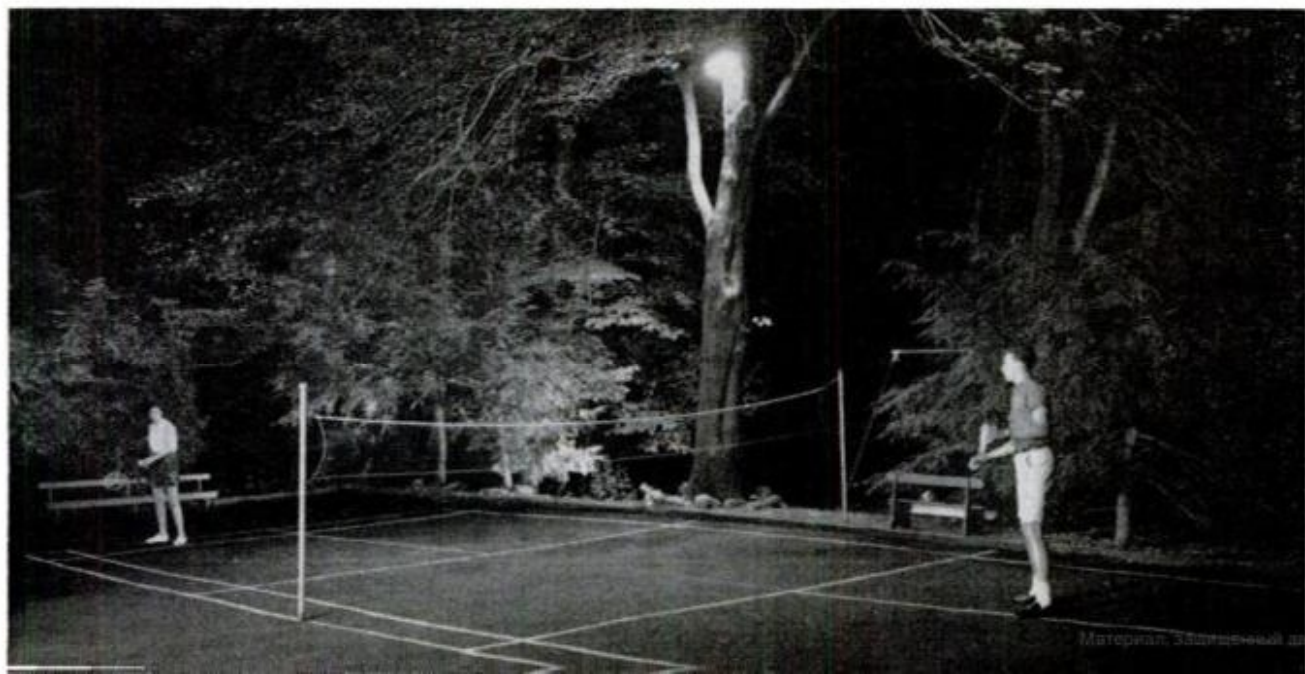
There are several important points to keep in mind when you set out to light any yard game or swimming pool:

- First, the game's location—which of course will determine the placement of lighting standards—should be considered carefully to avoid annoying neighbors by intruding on their privacy.

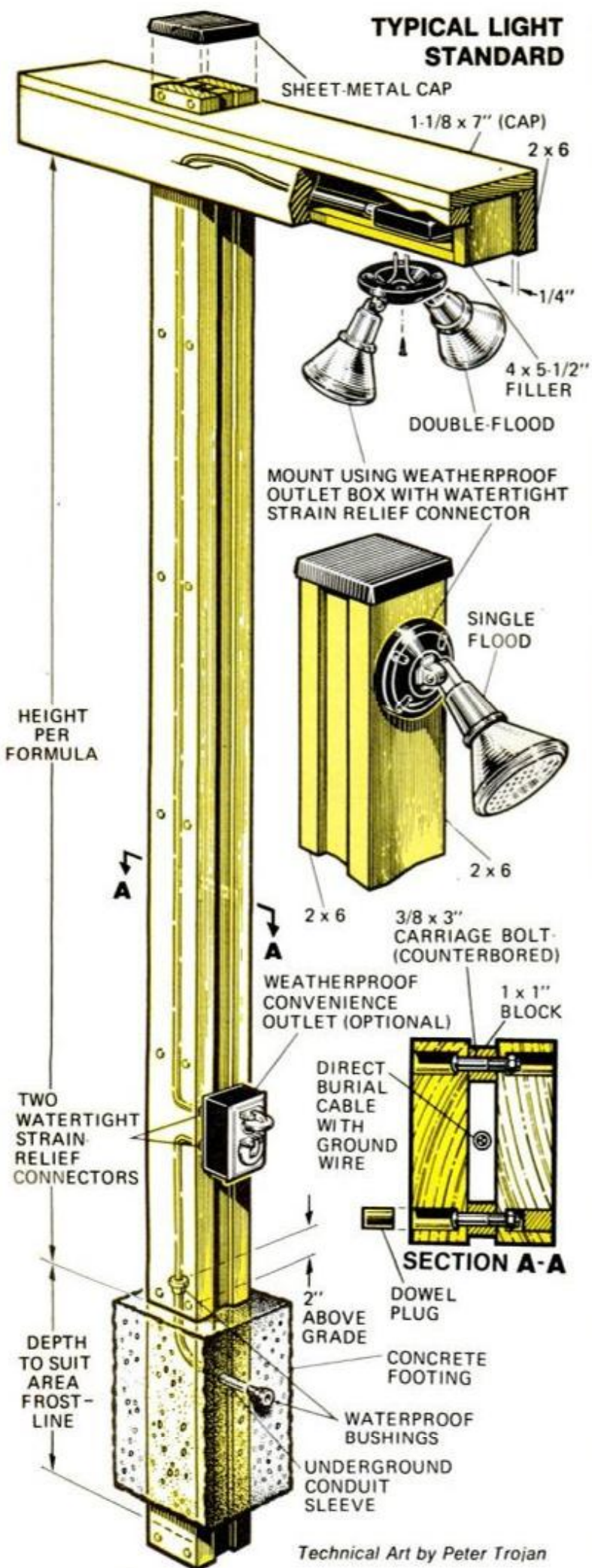
- A major consideration in the design of any direct-lighting system is the uniformity of illumination over the entire playing surface. A "hot spot" can be as distracting to a player as staring directly into the sun.

- Since filament lamps tend to have a

LAWN GAMES are often more fun when played in the evening. But avoid glare on your neighbor's property

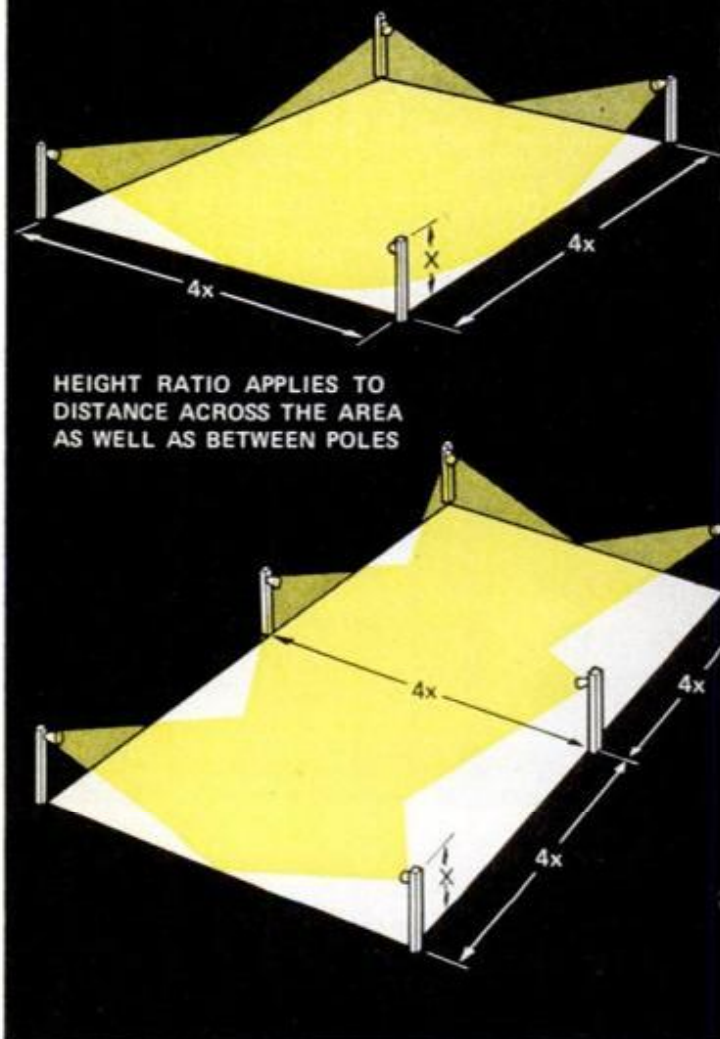


TYPICAL LIGHT STANDARD



Technical Art by Peter Trojan

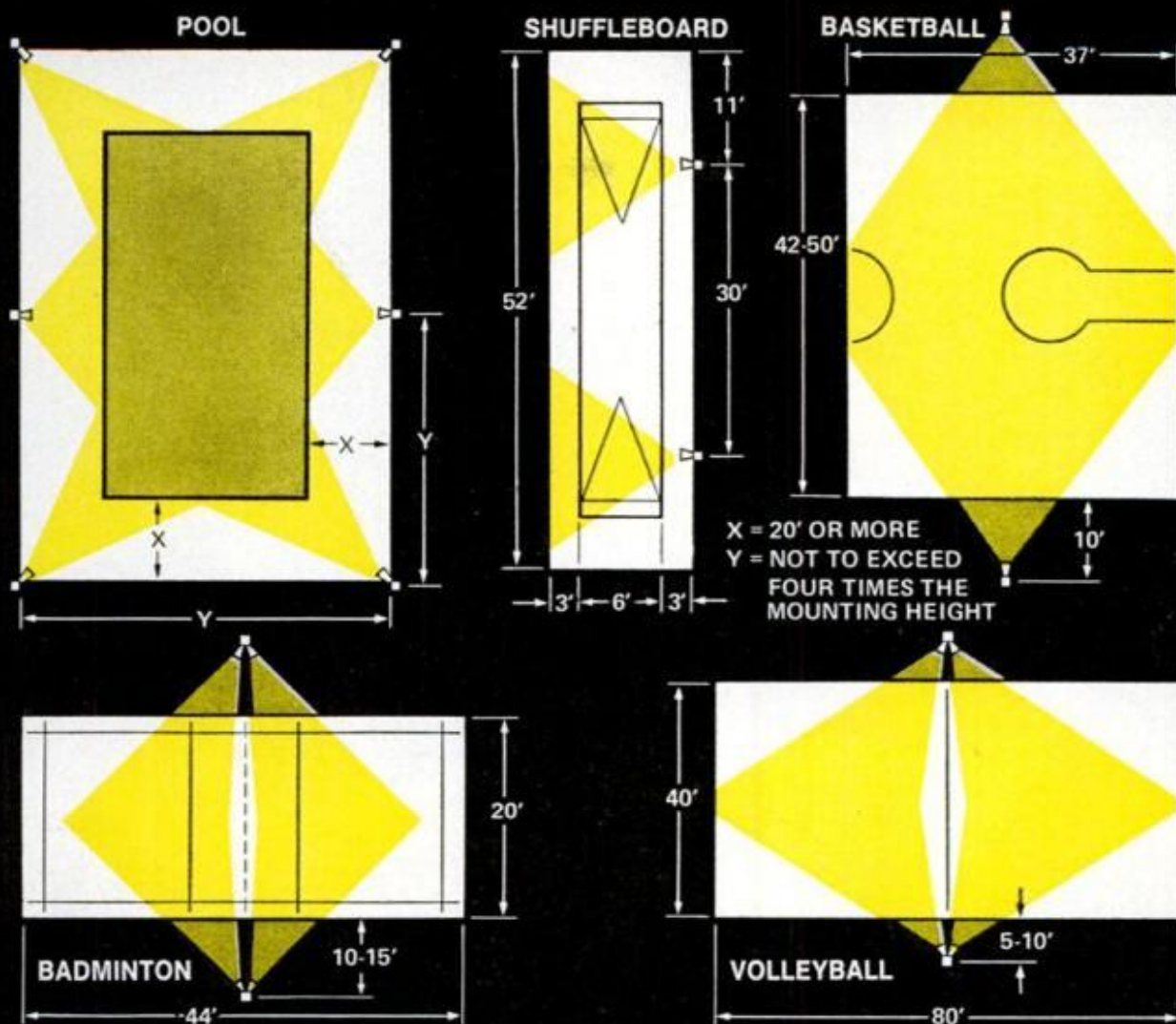
LAMP MOUNTING HEIGHT



TYPICAL YARD-LIGHT STANCHION shown at left was conceived by author, can be varied to suit house architecture. The four-times mounting ratio shown above applies to width of area as well as distance between poles. For example, if the court width is 40 ft., the pole height should be 10 ft. and the poles should be spaced no more than 40 ft. apart whether mercury or filament bulbs are used for light. Any activity area should be bathed with illumination, and standards should be attractive during daylight

short lamp life, mercury luminaires, designed for 24,000 burning hours per year, are recommended by most experts.

There are other factors to bear in mind when laying out your lighting. There may be times when you do not wish to light a game but want to make aesthetic use of the light for highlighting rock gardens, fish pools and the like. For barbecues, picnics and social gatherings you will want a lower level of illumination. Thus, when possible, utilize dimmer switches in your controls. And, as shown illustrated at left in the typical light standard if at all possible, provide watertight convenience outlets wherever you think you may need



PARABOLIC ALUMINIZED REFLECTOR-type floods are best to use for outdoor lighting because they are watertight and can withstand bad weather conditions

ACTIVITY ILLUMINATION calls for high-wattage bulbs, carefully placed standards. Lights should not be controlled by the switches used for party lighting

them. At some later date, you might decide to relocate a patio or purchase an electric mower.

Though good illumination for a particular game is of primary concern, do give some thought to how the lights (and their poles) will look during the day.

Above are shown the most common back-yard games and the lighting setup best suited for each. Normally, 10 footcandles of illumination are recommended for all activities shown except shuffleboard. For this game, five footcandles are sufficient. Tennis courts (not illustrated above) require 10 footcandles of illumination.

(Ed. note: Swimming-pool lighting refers to pole lights placed around the pool, *not* in-the-pool, underwater lights).

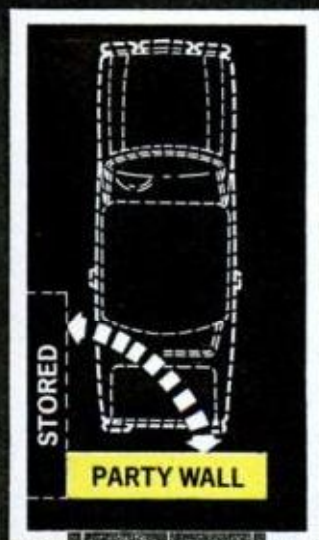
Another advantage of well-planned ac-

tivity and general outdoor lighting, is that such illumination can be utilized for security—particularly if it is controlled from within the house. So, you might also consider installing timers or light-sensitive switches that will turn lights on and off at predetermined times.

Outdoor floodlighting can be installed with either overhead or underground wiring, but from the standpoint of appearance, and for minimal interference, the latter is more desirable. An underground system can use either direct-burial cable conductors or wire in conduit. While overhead lines can be less costly, they may require additional items. For example, extra poles may be needed to keep wires from dangling into a playing area, or guys may be required on poles where there is a change in direction of feeders or where the feeders dead-end. ★★★



Rollaway Party Wall



Parked in your garage doorway, this mobile wall holds everything for cookouts. After the party, it stores along the garage wall.

Illustration by Roy Grinnell

WITH A MOVABLE WALL like this, which rolls out to span the garage-door opening, your driveway can serve as a patio that expands to fit the size of the party. If you want privacy from the street, you can build a couple of light-weight 6-ft. screens and set them up across the driveway.

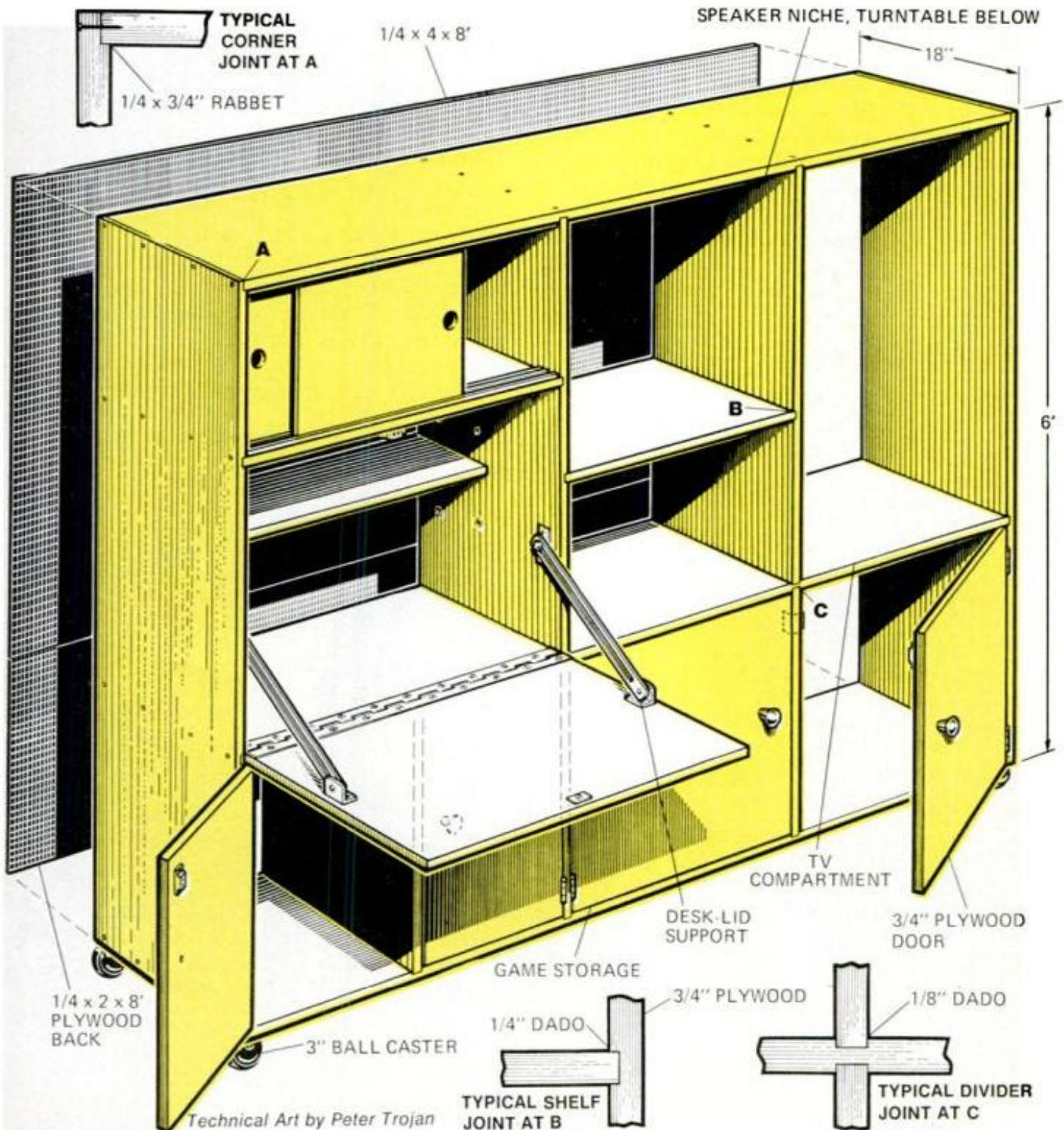
You'll have partial shelter in the garage from an unexpected shower, and when the party is over, you simply roll the wall out of the way and drive the car in.

Besides providing a serve-yourself buffet, the caster-fitted wall has roomy compartments for your cookout gear, a place for a portable TV set and compartments for a turntable and stereo speakers. The party wall is a step-saver

too; a lot of the gear you use can be stored in the cabinets between cookouts to save carting things back and forth. Best of all, the wall is something you'll use year after year since it stores conveniently and is protected from the weather at all times.

As the drawing shows, the party wall is nothing more than a big box on casters which is divided into compartments to accommodate the particular stereo components you have and the cookout gear you'll need. For this reason we show overall dimensions only. The whole thing is made of plywood and joint details A, B

and C show how the horizontal members join the vertical ones. Standard aluminum track is used for the sliding cupboard doors, plain butts or offset hinges for the hinged doors. Swinging doors are fitted with magnetic catches. A piano hinge provides strong support for the fold-down shelf and two desk-lid supports hold it when it's extended. Rubber-tired, ball-type plate casters make it easy to roll the wall out of the way. The back of the unit is covered with two pieces of 1/4-in. plywood. Paint the wood with an undercoater, then two coats of semigloss enamel in a bright color. ★★★



WIRE YOUR PATIO FOR SOUND

New trim, light, portable speakers make it easy to pipe your hi-fi outdoors for added listening pleasure in summer. Indoors, they double as extra extension speakers

By HANS FANTEL

Photos by Robert D. Borst

PIPING YOUR HI-FI OUTDOORS is a good way to get more fun from your home during the summer months. It will provide background music for a cookout, turn your terrace into an open-air dance floor and generally make your back-yard entertaining more pleasant.

The old-fashioned horn-type outdoor speakers, designed for public-address use, used to look as ungainly as an air-raid-warning siren and sound just as hoarse. Today's models, however, are a completely new breed. They're handsomely styled, lightweight and easy to carry. They're

capable of true hi-fi reproduction and are especially designed to perform well under the difficult conditions of rough weather and wide-open space.

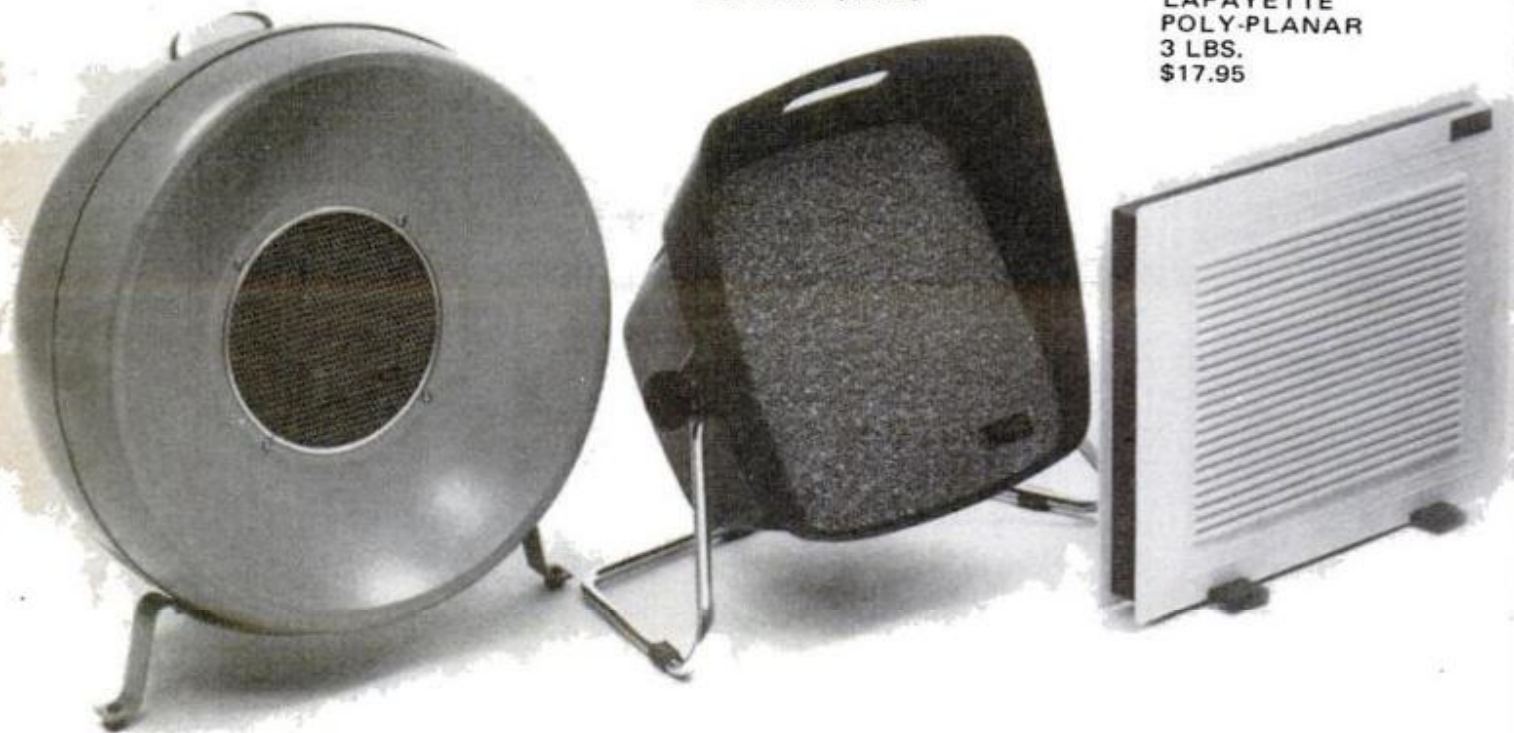
Most of these trim little portables have convenient carrying handles and attractive floor stands. They have tough, weather-proof enclosures and will play right through a sudden downpour without missing a note. They also serve as extra speakers indoors. Their compact size and smart appearance make them ideal for use on a shelf or table.

Outdoors, sound energy dissipates much

BOZAK BARD
22 LBS.—\$89.50

ALTEC LANSING
MODEL 829A
10½ LBS.—\$82.50

LAFAYETTE
POLY-PLANAR
3 LBS.
\$17.95



DEEPLY DISHED hemispherical enclosure on this Bozak model helps to prevent such acoustic problems as false resonances, standing waves. One of most powerful outdoor types, it contains an 8-inch speaker, handles 40 watts of power and has frequency range of 50 to 15,000 cycles. Its weatherproof outer shell is 18 inches in diameter, 12 inches deep. Weight is 22 pounds. The base adjusts to vary the speaker's angle of tilt, also serves as wall mount for permanent installation. Called the Bard, speaker is priced at \$89.50 from Bozak, Box 1166, Darien, Conn.



more rapidly in the open air than in an enclosed space indoors. To offset this loss, most outdoor speakers have a hefty power-handling capacity so you can crank up the volume without losing sound quality. Typical power ratings range from 20 watts per channel to as much as 60 watts. The higher the rating, the more power they'll handle before overloading and distortion set in.

Most outdoor models also offer good low-frequency response. This is important because full-bodied bass reproduction is difficult to maintain out in the open with

no surrounding walls to add reverberation and richness. Some models go as low as 40 cycles, with 60 to 80 cycles about average. Speakers that don't go below 150 cycles, primarily for public address use, don't have sufficient bass response for good hi-fi.

At the high end of the frequency range, most models reach a respectable 13,000 to 15,000 cycles. The majority are single-cone types, but a few have added coaxial tweeters extending the range even higher.

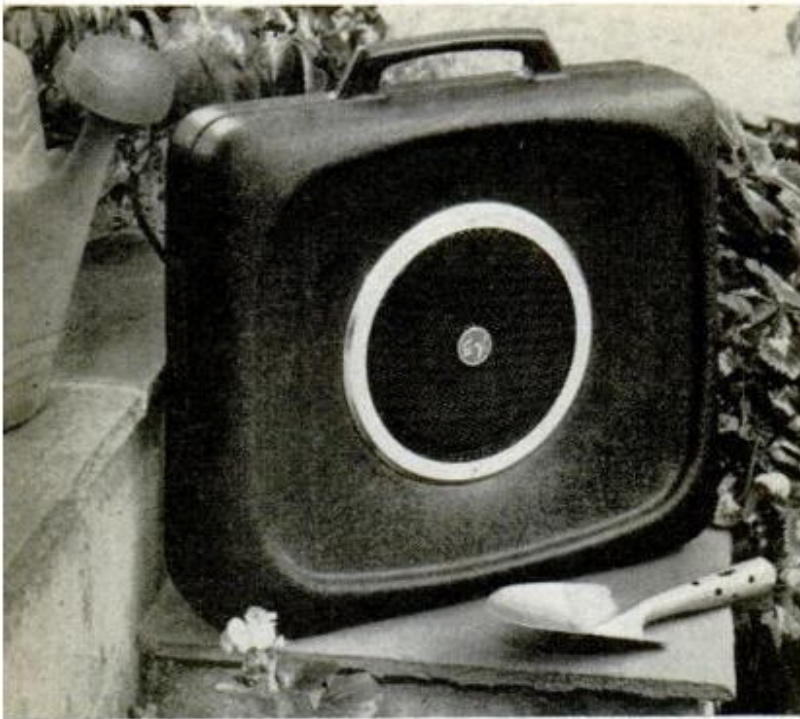
Can you hear stereo outdoors? Experts differ on this point. Some claim that true stereo effect is pretty much lost in open air because of the lack of room reverberation. Others contend that the very vastness of the outdoors tends to create a sense of spaciousness—a feeling of music everywhere—that's not possible in a closed-in room. In any case two speakers—even two monaural types—are bound to sound fuller and richer than one. If you want good lawn-filling sound over a large area, you may want to consider a pair of stereo speakers placed at opposite sides to flood the space from two directions. If you're in doubt, try some test setups using your regular speakers before investing in two outdoor types.

Some typical outdoor speakers are shown in the accompanying photos. These range in shape from Lafayette's waffle-thin Poly-Planar model—the lightest of the group—to Bozak's hemispherical Bard that stands on tripod legs and looks some-

**ELECTRO-VOICE
SONOCASTER
6½ LBS.—\$22.50**



**MAXIMUS
4 LBS.
\$49.95**



LIGHT AND HANDY, E-V's Sonocaster has suitcase-like weatherproof plastic housing, weighs under 7 pounds. Its 8-inch coaxial speaker handles 30 watts, has range of 70 to 13,000 cycles. Price is \$22.50

thing like a small kettledrum. Weights run from three to 22 pounds. Prices start at under \$20 and go to about \$90.

Resembling a trim piece of airline luggage is Electro-Voice's Sonocaster. At 6 $\frac{3}{4}$ pounds and \$22.50, it's one of the least expensive and handiest models for toting around the house and yard. The Poly-Planar also delivers surprisingly good sound for its slim shape and low cost. Though more expensive, the Bozak booms out powerfully from its deeply dished housing and is a good choice for covering large areas. Two of the smartest-looking designs are Altec Lansing's swivel-mounted model and the ball-shaped Maximus. Suspended in a chrome frame, the slickly styled Altec Lansing can be tilted up or down to any desired listening angle. The Maximus also adjusts to any angle and has a two-way base that serves as either a floor stand or wall mount. In addition, both Jensen and University, famous for military and public address speakers, have come up with home-style models designed for patio sound systems.

Outdoor speakers vary somewhat in their degree of weather resistance. Some can be left outside indefinitely without

POLE-MOUNTED SPEAKER at right has high-frequency tweeter horn mounted inside larger low-frequency driver. Made by Jensen, it handles 25 watts, has a frequency range of 60 to 15,000 cycles, is \$97.50

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harm; others are best brought in at the end of the day or perhaps after a weekend of use outdoors to avoid prolonged exposure to the elements. All, however, will withstand an occasional shower without damage. If you're interested in permanent outside installation, be sure to pick a model for which this is recommended. Some have special brackets to permit permanent mounting on a tree, fence or outside wall. Some have clips so they can be hung temporarily on hooks outdoors, then removed for safekeeping indoors.

Connecting outdoor speakers to your amplifier is basically the same as adding extra speakers indoors. Most models have 6 or 8-inch speaker cones with an impedance of 8 ohms. A few are rated at 16 ohms. If your amplifier has a choice of output impedances—usually 4, 8 and 16 ohms—simply use the terminals that match the speaker's impedance. If the output is fixed at 8 ohms, be sure the speaker you buy is of corresponding impedance. Most are.

If your amplifier has provision for extension speakers, use these connections for your outdoor hookup, using the switch on the control panel to select whichever set of speakers you want. If there's only one set of connections, you'll need to add some sort of switching arrangement to let you turn on one or the other. Suitable speaker selector switches are available from radio-parts stores and mail-order electronics houses.

For short runs of wire, you can use

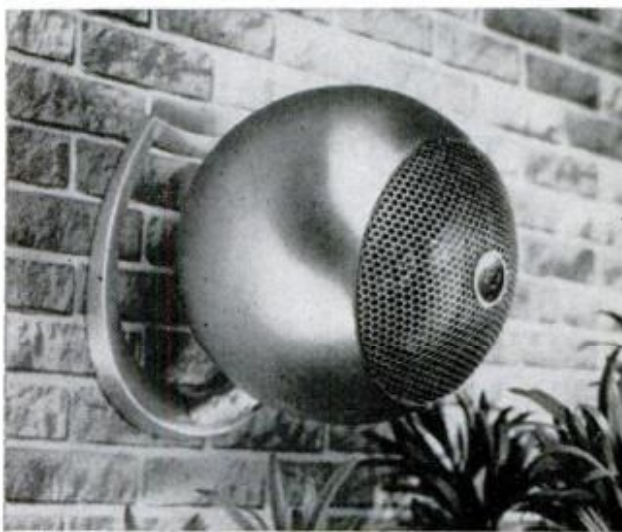
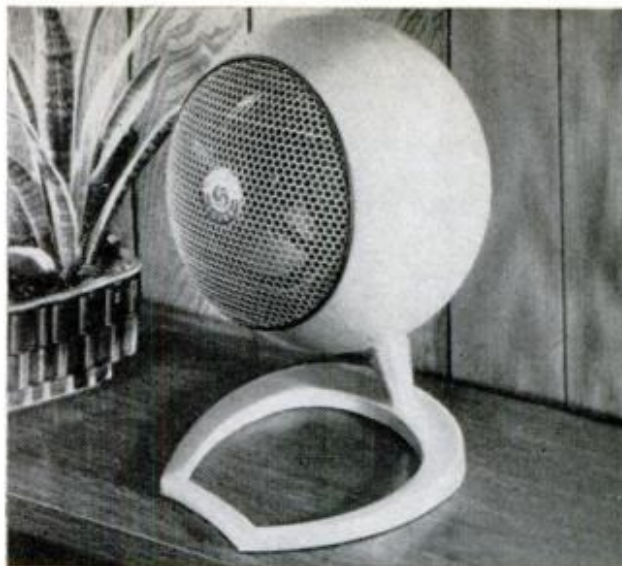


POPULAR MECHANICS

Материал, защищенный авторским правом



SUPERTHIN SPEAKER uses flat plastic baffle to move air instead of cone, is impervious to weather. Sold by Lafayette Radio, Poly-Planar has wide frequency range from 40 to 20,000 cycles. It's \$17.95



TWO-WAY BALL SPEAKER can stand on its base or mount on a wall. Ball is 8 inches in diameter and houses a 5½-inch weatherproof acoustic-suspension speaker. It handles 20 watts, has a range of 55 to 15,000 cycles, comes in five colors. It's \$49.95, Maximus Sound, 809 Stewart Ave., Garden City, N.Y.



STYLISH LINES of this swivel-mounted Altec Lansing make it just as suitable for indoor use as on the patio. Its 8-inch speaker has a frequency response of 70 to 15,000 cycles. Weight is 10½ pounds

ordinary lamp-type zip cord, just as for indoor speakers. If the distance from speaker to amplifier is greater than 40 feet, however, it's best to use a heavier gauge—no less than No. 14. Long runs of overly thin wire cause a buildup of resistance that can make the sound less clear and crisp. For permanent installations, wires can be run out of the house around window frames or through the wall in the same way as for TV lead-in. Just be sure any holes are well caulked against leaks.

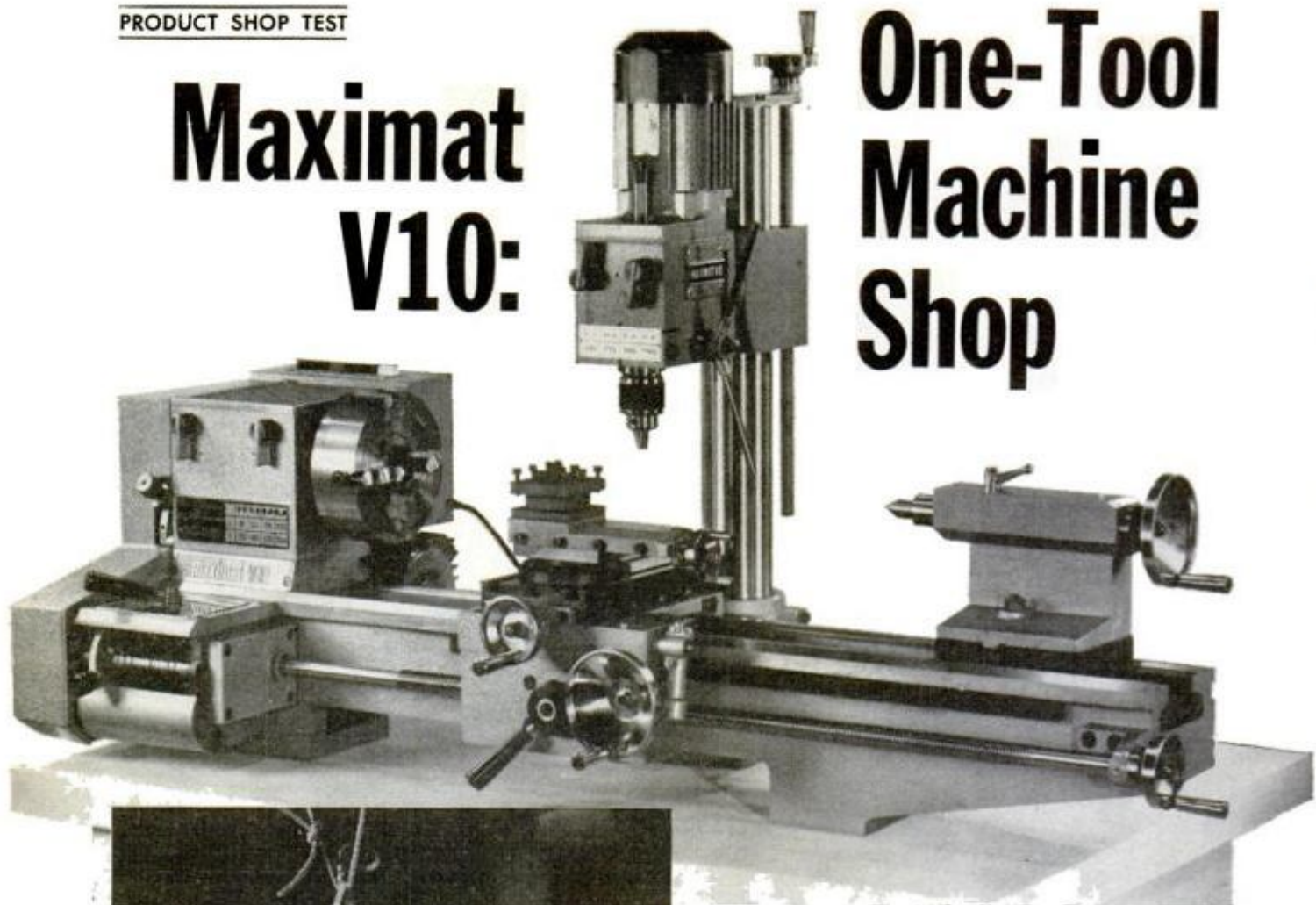
If you're going to be connecting and disconnecting your speaker frequently, it will pay you to install a line connector near the speaker terminals so you won't have to keep removing the wires from the screws. This can be a phone-type plug and jack, a microphone line connector or even an ordinary household plug and socket.

If you're using stereo speakers, proper phasing is especially important outdoors because of the difficulty maintaining good bass projection in open air. Out-of-phase speakers work against each other and much of their output, particularly in the already weak bass range, is canceled out.

You can check for correct phasing by standing midway between the two speakers while playing a record that contains good bass tones, such as classical organ music. Have a friend reverse the connections on one of the speakers as you listen. The bass tones will either increase or decrease in fullness. Leave the connections whichever way they produce the fullest, richest bass sound. Switch off the set during the time the speaker is disconnected. Leaving the set on with a speaker disconnected unloads the circuit and can damage some amplifiers. ★★★

Maximat V10:

One-Tool Machine Shop



By JOHN BURROUGHS/Photos by the Author

COMBINING three precision tools in one, American Edelstaal's 10-in.-swing Maximat V10 is a compact metal-working machine that incorporates a screw-cutting metal lathe, a sensitive drill press and a vertical-spindle milling machine. The V10 performs any of the common metal-machining operations—turning, drilling, milling, even surface grinding—all with toolroom precision.

Built in Austria, this unusual universal machine tool is designed for shops where space is limited—mobile repair shops, re-

AFTER TESTING TOOL (above), the author said it's so different it has to be studied to be appreciated. at left, the unit is mounted on workbench. Then its vertical head unit is bolted to the bed casting

search labs, toolrooms or pattern shops, technical schools, and inventor's or engineer's workshops. It gives full machine-shop facility in a few square feet of bench space, yet is so easily handled that any handy craftsman can soon learn to use it like a journeyman machinist.

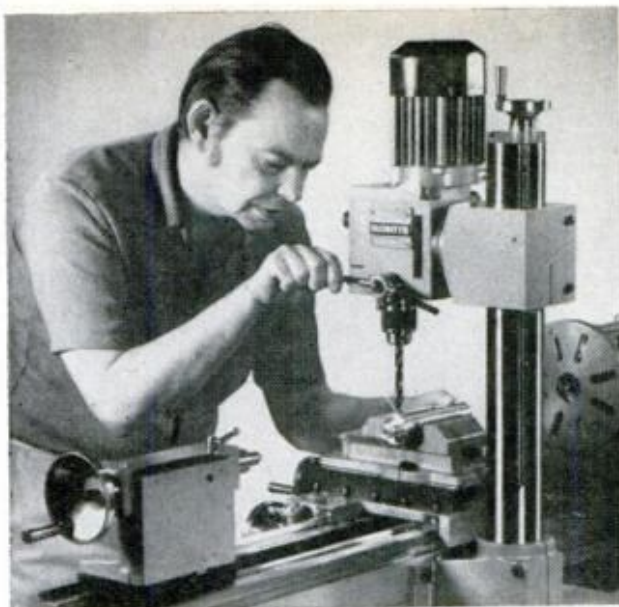
Two key features give the machine its extraordinary versatility:

- An independent vertical drilling-milling head on a column mounted on the back of the lathe bed.
- A hefty carriage cross slide, precision-ground and T-slotted, for use either as a mount for the lathe's compound-slide toolrest or as a precision worktable for drilling or milling.

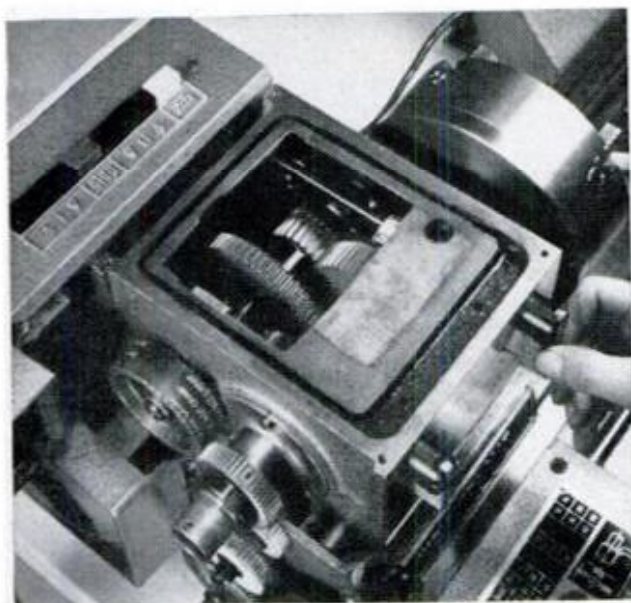
When the machine is used as a lathe, the vertical head is swung to one side where it won't interfere with turning operations. To convert the tool for drilling or milling, the head is swung over the ways with its spindle centered above the carriage worktable, and the lathe's compound slide, which mounts on the table with two



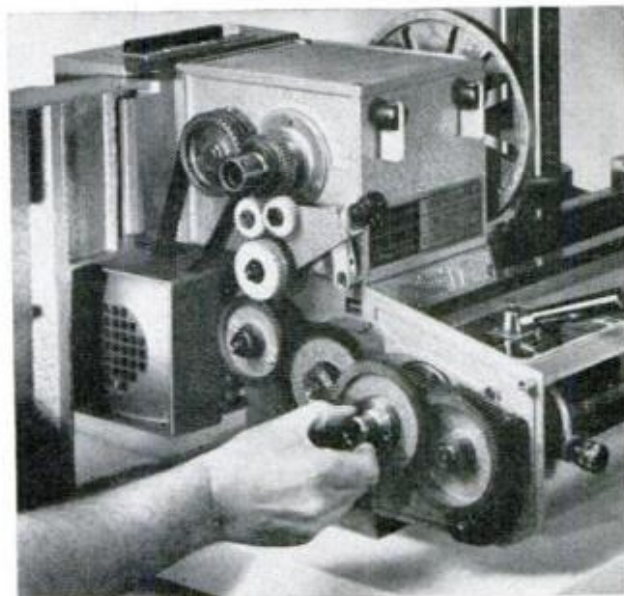
FOR LATHEWORK, machine's vertical head can be swung out of the way. The column rotates full 360°



FOR DRILL-PRESS WORK, compound slide is unbolted from carriage worktable, replaced by machine vise



TWO-SPEED MOTOR belt-drives sliding back gears that gear-drive the spindle at one of eight speeds



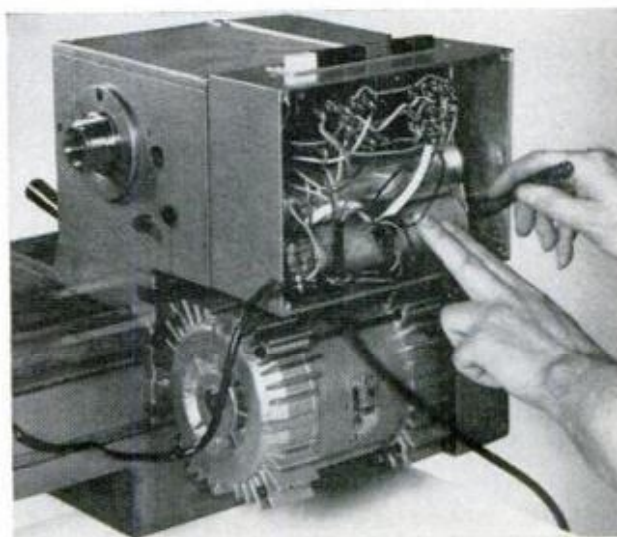
WITH SLIDING GEAR of end-gear train "in," box has 24 carriage feeds; "out" gives 24 thread pitches

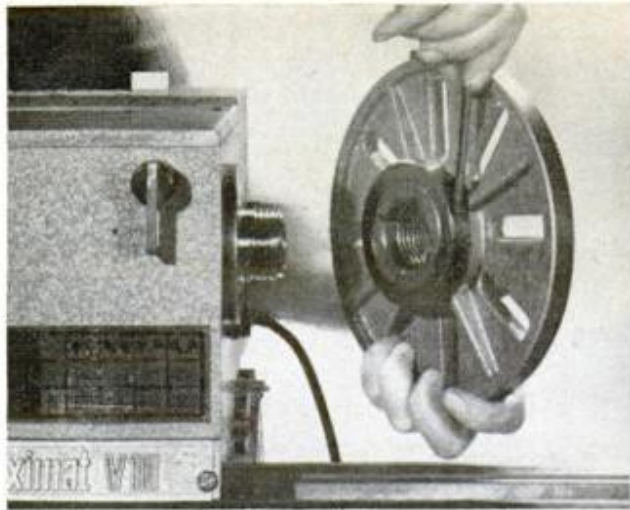
T-bolts, is replaced with a machine vise.

Other unconventional features include its bed casting: Diagonally ribbed like a bridge girder, it mounts with two on-center-line bolts, which makes the tool very easy to set up. The bed doesn't have to be leveled accurately. After hoisting the lathe onto a suitable bench, you simply bolt it down on sheet-rubber pads with no risk of twisting the ways. Then you screw the vertical head unit (shipped in a separate crate) on a keyed boss on back of the lathe bed with four hex head capscrews. The vertical head's short motor cord connects to switchbox terminals.

Like an industrial lathe, the V10 has a gear-driven lathe spindle. The head-stock is built much like a four-speed auto

CORD FROM VERTICAL HEAD runs to lathe switch-box. Both starting capacitors mount below switches



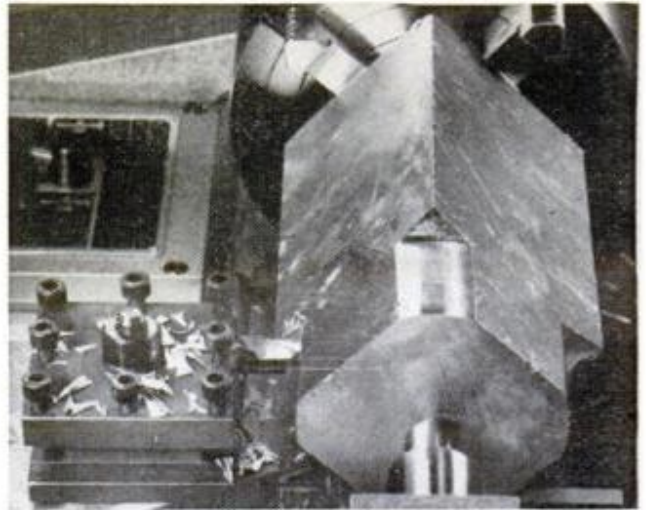


CHUCK AND FACEPLATES have split, threaded hubs. Clamp ring keeps the plate on when the lathe stops

transmission, with both spindle and backshaft completely enclosed and running in an SAE 10 oil splashbath. A pair of two-position levers on the headstock casting that shift sliding gears on the shafts give the spindle four geared speeds. A reversible two-speed (1700/3500 rpm) $\frac{3}{4}$ -hp motor, which drives the backshaft with a dogged-rubber timing belt, doubles these geared speeds to give eight spindle speeds, forward or reverse, from 60 through 2500 rpm.

Pushbutton switches (in the switchbox behind the headstock) control both motors. These can be operated separately or simultaneously. A red safety stop-button stops both motors.

The lathe's end gear train employs steel and nylon gears (which outwear steel) in combination for silent operation. A Norton-type, quick-change feedbox with eight stack gears provides 24 power carriage feeds. When a sliding gear in the

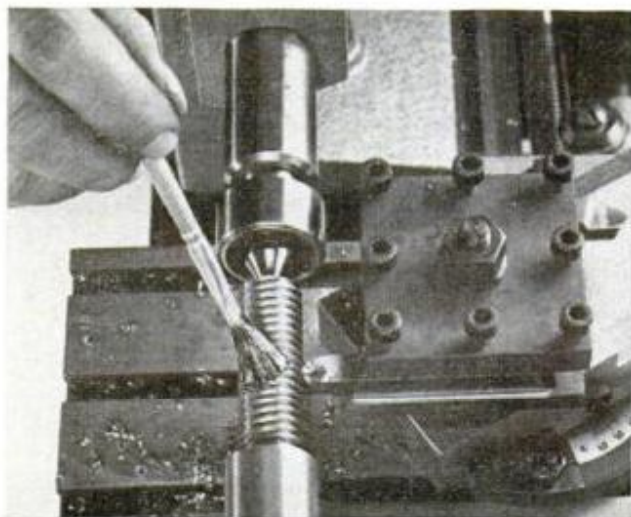


LATHE'S GEARED SPINDLE gives good power for smooth, interrupted cuts as in rounding square stock

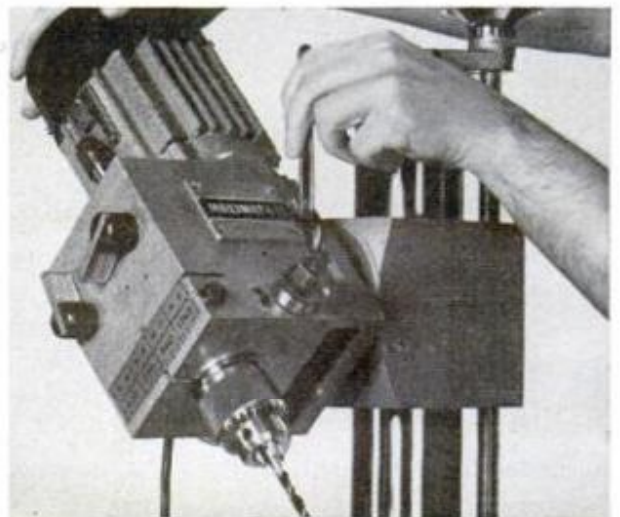
end gear train is shifted, the quick-change feedbox engages the lead screw for cutting any of 24 thread pitches, 8 through 56 threads per inch. Other inch thread pitches and metric threads can be cut with change gears. Feedbox shafts are ball-bearing mounted and the gears run in an oil bath.

The drilling-milling head's single-speed $\frac{1}{3}$ -hp motor gear-drives a precision spindle through a compact four-speed gearcase, with two shift levers providing spindle speeds from 420 to 1740 rpms. The spindle, spring-loaded like a drill-press quill, can be advanced $1\frac{1}{16}$ in. with a removable handle. The head rotates 360° on its graduated column mount, and the entire column rotates 360° in its graduated base, so you can drill at compound angles (see photos) or use the head with the spindle horizontal.

Not only arbor-mounted drill chucks, but collet chucks, end-mill holders, bor-



SHIFTING FEEDBOX LEVERS will cut 24 thread pitches. Other pitches can be set up with change gears



DRILLING-MILLING HEAD rotates 360° in its mount. The rotating column permits compound-angle settings

POPULAR MECHANICS

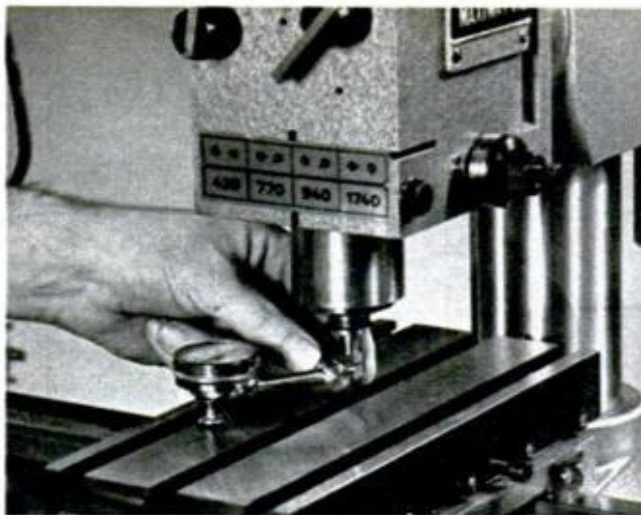


**DOWN HOME
TASTE!**
Real and rich and good

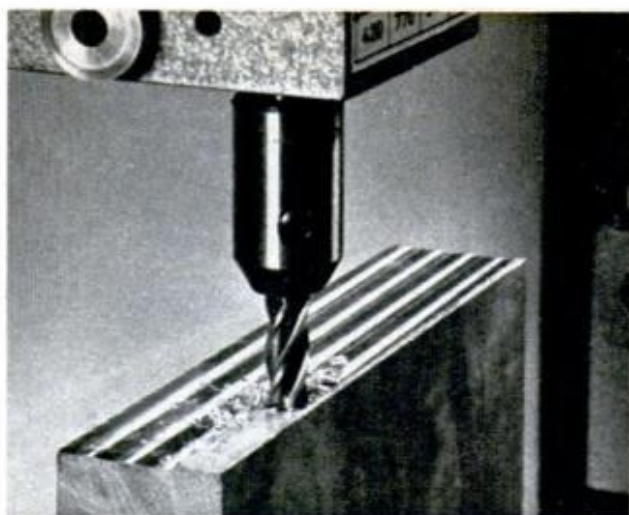


Warning: The Surgeon General Has Determined That Cigarette Smoking Is Dangerous to Your Health.

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20 mg. "tar", 1.3 mg. nicotine av. per cigarette, FTC Report NOV. '70.



DIAL INDICATOR on an arbor makes it a simple task to set vertical spindle perpendicular to the worktable



WITH DEPTH SET, end mill machines surfaces perfectly flat with successive cuts, moderate power feed

ing heads, fly-cutters, saw arbors or taper-shanked drills or reamers can also be used in the vertical spindle's internal No. 2 Morse taper. It has a cap nut used with a pushrod to screw-eject tools.

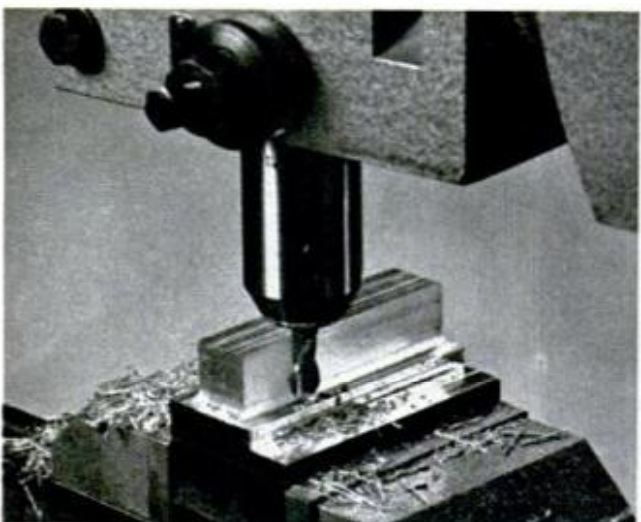
For milling, the spindle's rack-and-pinion advance is clamped tightly with a lockscrew. A feed screw calibrated in half-thousandths that slides the head the full length of the keyed 2 $\frac{3}{4}$ -in.-dia. column is used for precision depth-of-cut control. By engaging the lathe's power feed, any of 192 feed rates (carriage feeds multiplied by spindle speeds) can be used for milling, or work can be hand-fed to the cutter with the calibrated handwheel on the lathe's lead screw.

Comparing this quality machine feature by feature with ordinary bench lathes is like comparing a race car to a 10-wheel dump truck. The V10 isn't as heavily built as some 10-in. lathes. Its carriage apron is single-walled and has no power cross

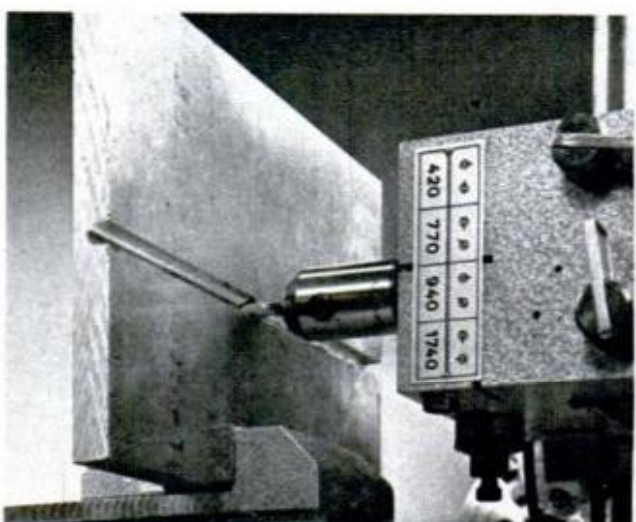
feed. Though the V10 has a large 10x26-in. capacity, it's designed primarily for careful, precision work. Its lathe spindle is mounted in ultraprecision SKF Class 7 tapered roller bearings (ordinary bearings are Class 2 or 3). The drilling-milling head spindle, with a precision roller bearing below and two matched opposed angular-contact ball bearings above, turns with no play whatever.

The machine's versatility, precision and compact construction make it the near-ultimate metalworking tool for any small shop. The V10's real virtue is that it removes limitations. It equips you to do any kind of metal-machining as well as anyone else.

This probably justifies the price: \$1350 (with motors). Chucks, toolholders and other accessories are available at extra cost. For specifications, write to American Edelstaal, Inc., 1 Atwood Ave., Tenafly, N.J. 07670. ★★★



END MILLS are available in a variety of shapes, can be used to mill complex parts from solid stock



THICK METAL is easily cut if slotted with a two-flute mill until stock is thin enough for hacksawing

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Make sure your next pickup includes the better ideas you get only from Ford. See your Ford Dealer for the pickup that works like a truck, rides like a car.

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	TOTAL	\$54.15
Rebuilt Brake Unit, Self- Installed	Rebuild Kit:	\$7.00
	Your Labor:	0.00
	TOTAL	\$7.00

YOU SAVE \$47.15

It's really quite easy to troubleshoot and fix your automobile's power-assist brake unit. But of various ways to do the job, one will save you the most money

By **MORT SCHULTZ**

THE LEAST COSTLY WAY of repairing a power brake unit is to overhaul it. For example, the parts kit that's needed to rebuild a unit from a late-model Pontiac costs \$7, while a brand-new unit purchased from a Pontiac dealer costs \$46.15!

There is only one problem: Rebuild kits are hard to find. Of the new-car dealers in my area that I surveyed, only one stocked them for his make of car, which was Dodge. None of the five independent re-

tail automotive parts supply houses that I checked carried them.

The reluctance to have an inventory of rebuild kits stems from the fact that there is no professional market for them. Most professional mechanics won't spend the time needed for overhauling power brake units, because that job takes from one to two hours. But replacing a unit requires only 15 to 30 minutes.

So what do you do if you can't find a rebuild kit and want to get around the

According to most house paint ads, the quickest and easiest job is all you care about.



The Dutch Boy believes you care about something else: a paint job that will stay looking good a long time.

We won't kid you and say there's nothing to it. Painting a house—even painting it with Dutch Boy® Latex House Paint—takes planning and work.

If the surface is new, or if it was painted with latex house paint before, your surface preparation may involve very little beyond resetting nails, putting nail holes, or removing chalk.

If your house was painted with oil paint before, or you don't know if it was and can't find out, you should consult your Dutch Boy dealer and he will advise you as to what methods of surface preparation may be in order.

Two things particularly contribute to the long-lastingness of Dutch Boy Latex House Paint. One is that since the paint "breathes," moisture can't get trapped under it. The other is that the acrylic resin base of Dutch Boy Latex House Paint has the ability to lock in colors and consequently, the colors last for the life of the job and the job lasts longer.

If you've got shutters and trim that you want to look glossy, although you want the rest of the house flat, your

Dutch Boy dealer can sell you flat and glossy colors designed to work together.

And the painting of gutters and drain pipes is no problem, either. Dutch Boy Latex House Paint clings to aluminum, galvanized and copper surfaces for the life of the paint job—no special primer is needed.

As to the quickness and ease of the painting itself, Dutch Boy Latex House Paint actually flows on easier without dragging or sticking. It doesn't leave lap-marks when you stop and start, so that if you want, you can paint every weekend for the whole summer. Paint before and after the rain. And no matter what kind of a mess you make (and you can make a mess) it will wash up with soap and water.

But we're never going to tell you that painting a house is so much fun you'll feel like running out and doing it again. You have kids to raise and living to do and our main job is to help you forget about us for a long time.

NL
INDUSTRIES



purchase of a new unit? First, try to get one on special order from a parts supply house. Your next move is to canvass the junkyards for a part taken from a wreck. I found one for the Pontiac that cost \$15, which is \$31.15 less than the cost of a new part bought from the dealer.

Mail-order vs. dealer prices

Failing this, you will have to buy a new unit. But before paying dealership prices it would be a good idea to check with a mail-order house, such as J. C. Whitney & Co. in Chicago. Its price for a Pontiac power-brake unit, for instance, is \$29.95, which is \$16.20 less than that charged by a Pontiac dealer.

No matter what you eventually pay for parts, it is less expensive to repair a power-brake unit yourself than to turn the job over to a mechanic. In the case of the Pontiac, a mechanic wanted \$54.15 to do the work—\$46.15 for the part and \$8 for labor.

This means that a saving of \$47.15 would be realized by doing it yourself with an overhaul kit; \$39.15 would be saved with a used unit from a junkyard; \$24.20 with a new unit from a mail-order house; and \$8 with a new unit from a dealer.

Naturally, you should be sure that the power-brake unit is really shot before you pay anyone for a new unit or rebuild kit. Although the brake may be hard to activate or fail to release when you take your foot off the pedal (each action indicates a malfunction), bear in mind that the power-brake unit itself is not necessarily to blame. In fact, most times the

cause of the problem lies outside the unit.

All power-brake units work on unequal pressure when activated. When the brake is not applied, pressure on both sides of a power piston assembly inside the unit is more or less equal. When the brake is applied, this equilibrium is upset, and unequal pressure forces the power piston and a hydraulic fluid from the master cylinder into the brake lines.

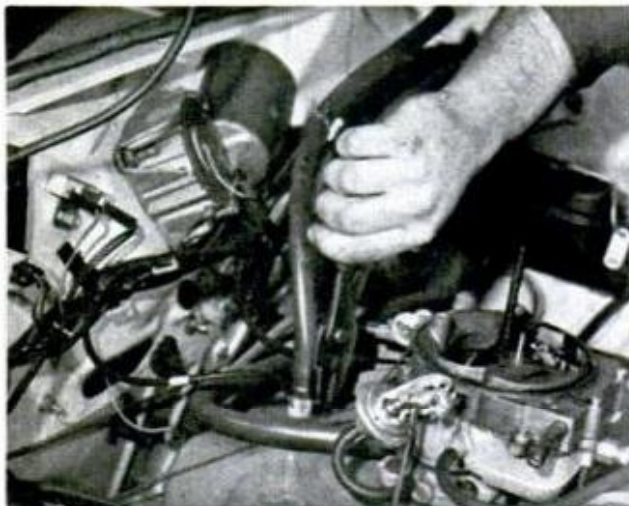
Actually, power brakes and nonpower brakes work the same way. The only difference between them is the presence of the power-assist unit at the rear of the master cylinder to lessen the brake pedal pressure required for the same degree of application.

Two types of power-brake units

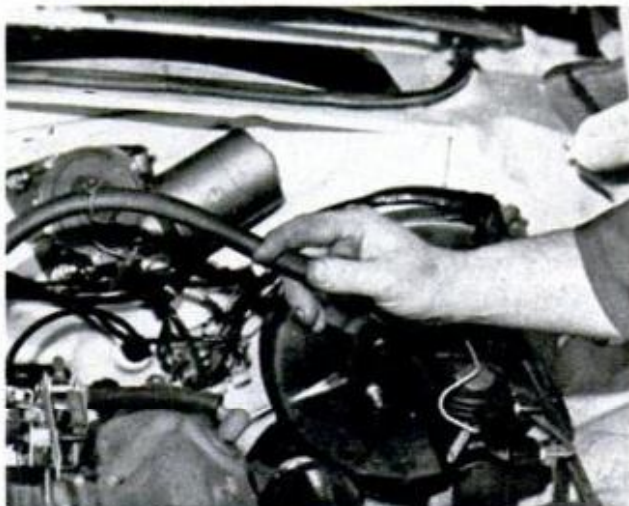
Power-brake units for passenger cars are classified as either atmospheric or vacuum-suspended. With an atmospheric-suspended power brake, atmospheric pressure is present on both sides of the power piston with the brake off. When the brake is applied, air is evacuated on the side of the piston that's nearest the master cylinder, which creates a vacuum that allows the piston to "collapse" toward the master cylinder.

In a vacuum-suspended power-brake unit, the vacuum is present on both sides of the power piston with the brake off. When the brake is applied, air enters at the rear of the power piston, thus pushing the piston forward toward the master cylinder.

Every domestic car built in 1966 and in later years, except the 1966 Valiant and



INTAKE MANIFOLD is source of vacuum for power brake. To check vacuum, remove hose at this point

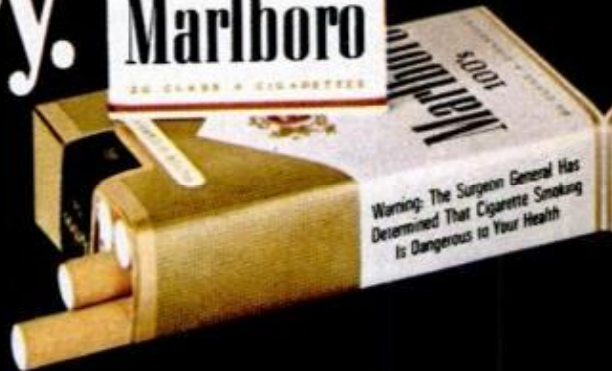


RULE-OF-THUMB is a check on vacuum when you don't have vacuum gauge to measure value precisely



Marlboro Red
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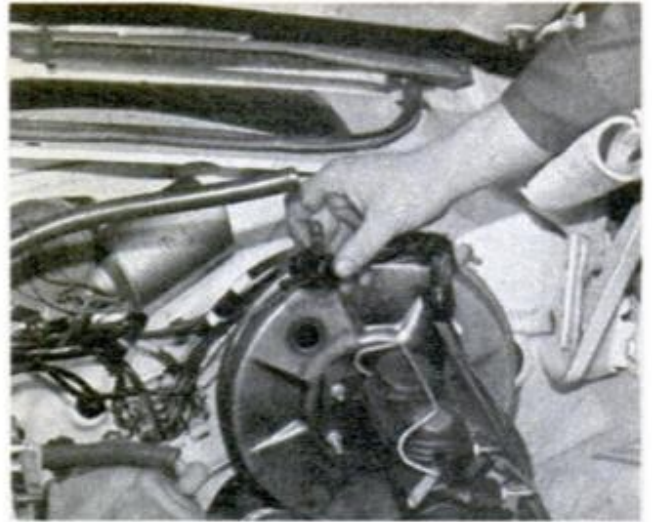
Warning: The Surgeon General Has
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Is Dangerous to Your Health

Kings: 20 mg. tar, 1.3 mg. nicotine—
100's: 22 mg. tar, 1.5 mg. nicotine av. per cigarette, FTC Report Nov. 70

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TRACING VACUUM back to manifold: Use your thumb over the nipple when you don't have a vacuum gauge



FIRST THING TO CHECK on power brake unit is the vacuum check valve. This component fails most often

Dart, uses a vacuum-suspended power-brake unit.

You can determine the condition of your power-brake unit from behind the steering wheel. Just start the engine and let it idle for a few seconds to permit the vacuum to build up. Then, shut it off and depress the brake pedal a few times, noting any increase in the amount of pressure as you do so.

If there is a noticeable increase in the amount of pressure that's needed to engage the brake as you apply and release pressure on the pedal, the power-brake unit is in good shape. However, if there is no change in the amount of pressure, something is wrong.

Check for adequate vacuum first. Use a vacuum gauge if you have one. It will give you the most accurate indication.

Take a reading at the vacuum port or fitting at the manifold by disconnecting the hose that extends from the power-brake unit and attach the vacuum gauge to the manifold.

After recording the reading, reattach the hose to the manifold, disconnect the other end of the hose from the vacuum check valve at the power-brake unit, and connect the vacuum gauge to the hose for another reading.

Readings at both spots should be a steady 15 to 20 in. with the engine running at slow idle.

If vacuum is adequate at the manifold, but low at the hose, the hose is bad. Replace it.

If you don't own a vacuum gauge, start the engine and allow it to idle. Disconnect the vacuum hose from the vacuum

check valve and place your thumb over it. Your thumb should be pulled to the hose.

If you don't experience a strong vacuum, inspect the hose for kinks and cracks. Then disconnect it from the intake manifold and hold your finger over the nipple with the engine idling. If you don't feel strong suction, the loss of vacuum is being caused by an engine problem.

The vacuum check valve can cause trouble, too. Its purpose is to help create a vacuum inside the power-brake unit. It is a one-way valve that is easy to test.

Remove the valve and blow into the end to which the vacuum hose attaches. Then draw out on it. Even maximum pucker power should not allow air to flow into the valve. Conversely, you shouldn't have to exert any force on the draw.

When vacuum has been checked, make sure that no hydraulic fluid is being pulled



VACUUM CHECK VALVE is easy to test: Blow into it and then draw out through it. (See text for details)



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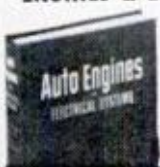
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into the power-brake unit from the master cylinder because of bad seals existing in the master cylinder. Inspect the brake-fluid level. The correct level is approximately $\frac{1}{2}$ in. from the top of the reservoir.

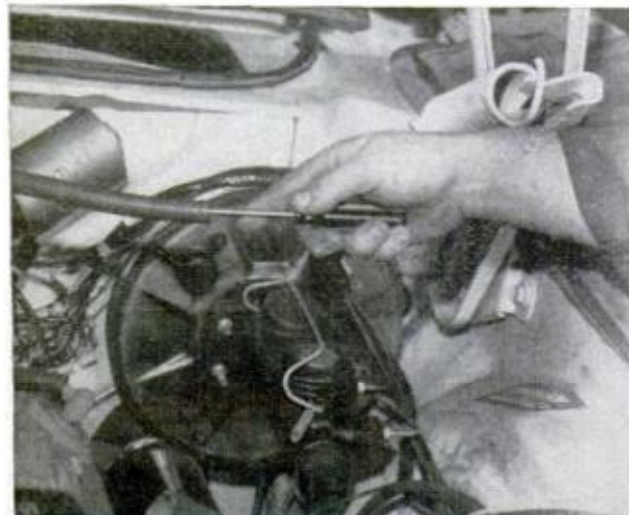
To determine if lost brake fluid is being pulled into the power-brake unit, twirl the shank of a screwdriver inside the vacuum hose. The presence of fluid on the shank means that the master cylinder has to be overhauled or replaced. The power unit should be disassembled, too, so that brake fluid can be cleaned off parts. Use alcohol for this.

Naturally, if no brake fluid is found in the power-brake unit, check to see whether fluid is being lost at other points, such as at the wheel cylinders or the brake lines.

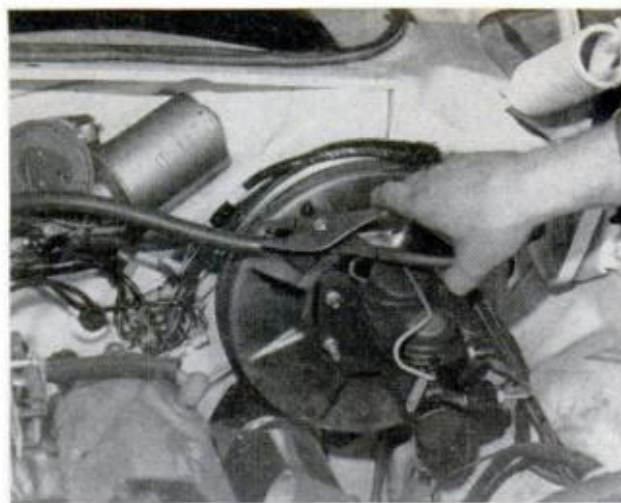
Up to this point, if the cause for a lack of power assist (a hard brake pedal) has still not been found, then you'll want to perform a general inspection of the entire braking system, looking for such things as worn linings, bad wheel cylinders, and kinked lines. If the system passes inspection, then the malfunction is inside the power-brake unit with defective power piston and other weakened parts. Overhaul or replace the unit.

The biggest problem in overhauling may be to separate the power-assist unit into its two main chambers. Some units are held together by a tight-fitting band, while others are twist-locked by off-setting lugs and will have to be opened with a strap wrench.

Once the unit is opened, an overhaul consists of replacing the parts in the unit



RUPTURED SECONDARY SEALS in the master cylinder can be determined by presence of brake fluid in hose



CHECK CLAMP TENSION on hose supplying vacuum to unit. Loss of hose will render the unit inoperative

with the parts that come in the rebuild kit.

If you must replace the unit, the usual procedure is to detach the master cylinder, disconnect the vacuum hose, remove the fasteners that hold the unit to the brake pedal linkage, and remove the fasteners that hold the unit to the car. The manufacturer's service manual or a general auto-repair manual, such as *Motor's*, which will be found in a public library will outline the exact procedure for your particular unit.

What do you do if your power fails while you're out on the road? First, bear in mind that most of the time failure of a power unit is gradual, and you should heed warning signs.

However, it is possible, say, for the vacuum hose to pop off. What then? To find out, I tried it.

I got the car halted okay, but it took my full 175 pounds transmitted through my size-12 clodhopper to the brake pedal to do it. A five-foot, 100-pound gal like my wife would have a hell of a time.

That's why I tell her, that if she ever does lose the power, to downshift the transmission and stand on the brake pedal with all of her strength—without, of course, locking up the brakes which may cause a skid.

To minimize your chances that a hose might pop off, you should check to make sure that those hose clamps haven't lost their tension and are positioned so that they hold the hose tightly. If you can pull the hose off the check valve or the manifold nipple by hand, it's time to get a couple of new clamps. ★★★

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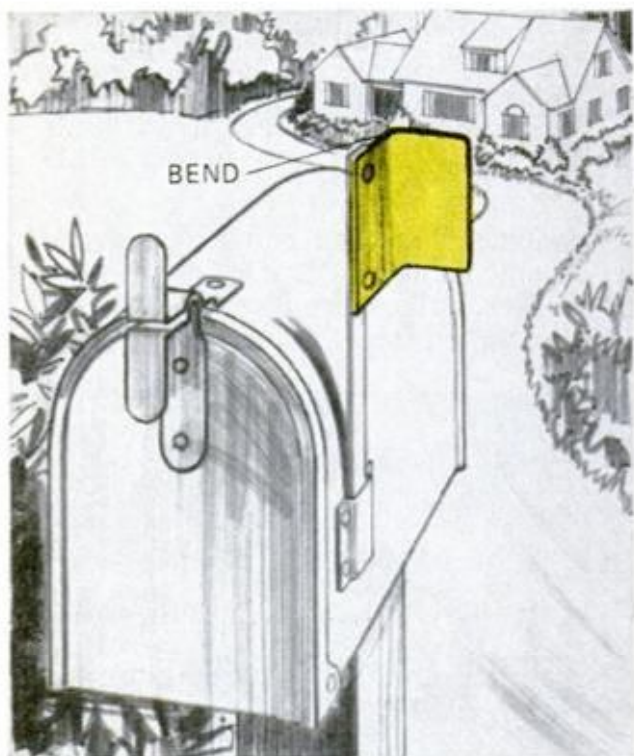
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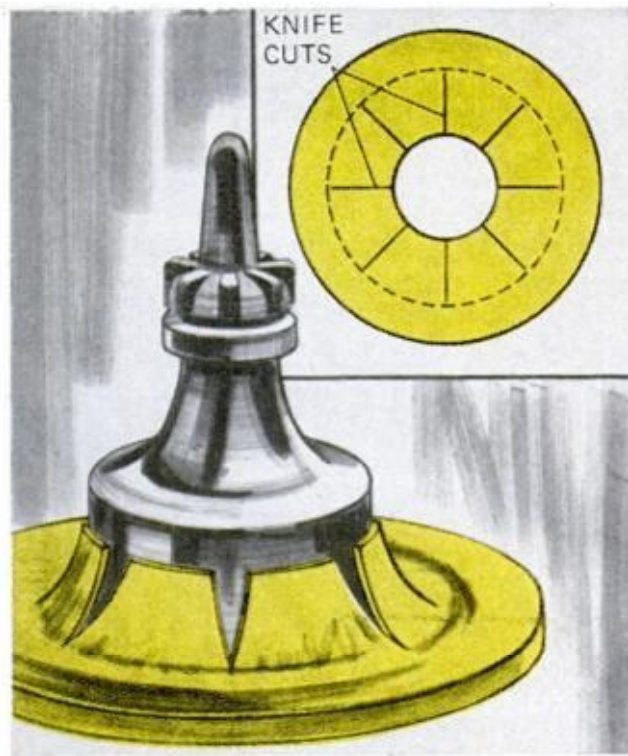
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SOLVING



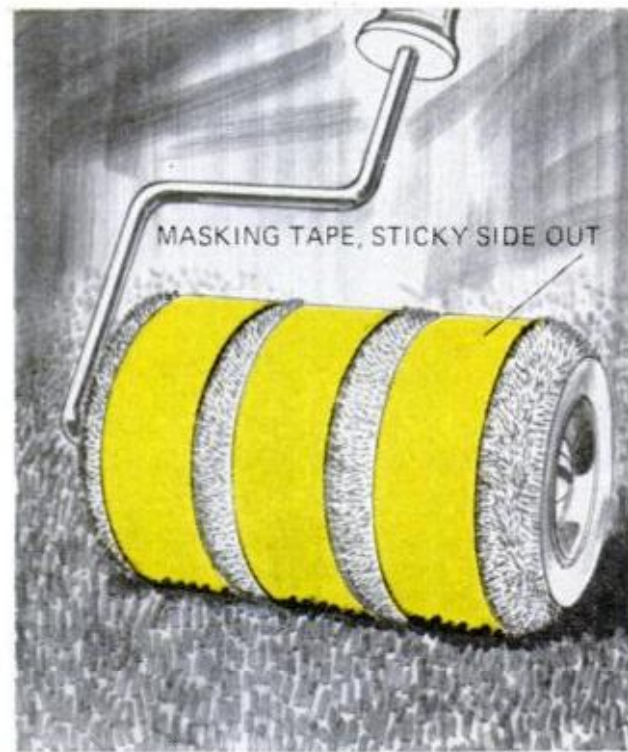
THE RAISED FLAG on your roadside mailbox will be easier to spot from the house if you bend it 90° as shown. Simply clamp a straightedge at the middle and carefully make bend.—*Ernest O. Heim, Seattle.*



NONTIPPING BOTTLE HOLDER can be fashioned from a discarded plastic can cover. Just cut a hole at center, make several radial slits and push ink bottle through from below.—*Harry Radzinsky, Charlotte, N.C.*



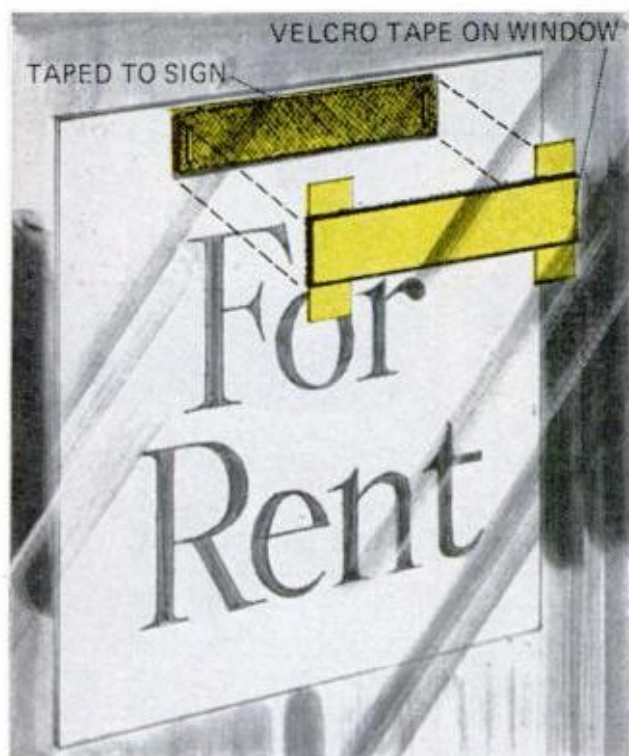
SMALL SCREW can be held where you want it with this trick. Put a strip of cellophane tape across the tines of an old fork and push the screw through. Now it can't move.—*Albert A. Losack, Lakewood, N. J.*



LINT-PICKER for cleaning fuzz and such from rugs can be made by putting several rows of masking tape —sticky side out—around a paint roller. When finished, discard the tapes.—*Wilfred Beaver, St. Anne, Ill.*

HOME PROBLEMS

Illustrations by Adolph Brotman, Worman Associates



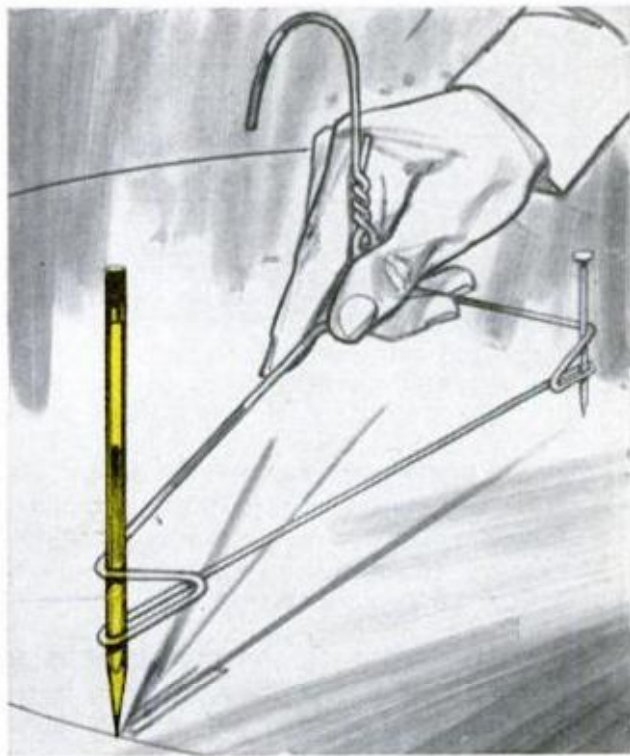
GLASS-MOUNTED SIGNS can be removed easily if they are affixed with Velcro. To do it, stick one strip of the tape on the glass and attach the other to the sign to be posted.—Harry Radzinsky, Charlotte, N. C.



OVERNIGHT PAINTBRUSH HOLDER shown in *Hints* (page 159, Jan. PM) inspired this idea. I simply cut down plastic bottles to suit brushes I'm using. Handle should fit neck snugly.—John Traube, St. Joseph, Mich.



EMERGENCY CAP, for machine oil and other small cans having plastic spouts, can be adapted from solderless wire connector. Turn connector on the spout for a force fit to avoid leaks.—Leo Niemi, Warren, Ohio



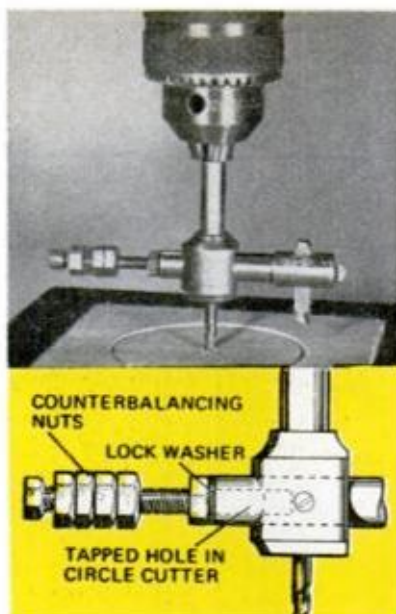
LARGE COMPASS consists of a metal coathanger bent at both ends plus nail and pencil. To vary circle size, you merely bend the coathanger at its center.—C. K. Bonds and D. K. McMannes, East Greenwich, R. I.

HINTS FROM READERS



Hooks from sash lift

A common window-sash lift, or handle, can be converted into two serviceable hooks by simply sawing it in half. Usually the cut will be in the middle, but an offset cut gives two different-length hooks. It's a good way to use a leftover handle.—*B.W. Ervin, Kent, Ohio*



Balanced circle cutter

Loosening of the drill-press chuck—often caused by circle-cutter vibration—can be prevented by balancing the cutter. On the type shown it was done by drilling and tapping the rear of the cutter's shank for the addition of a bolt and nuts.—*Peter Legon, Malden, Mass.*



Drill-press depth chain

A ball chain, of the type used on light fixtures, can serve as a gauge for regulating hole depth when the press has no depth stop. The clip is cut from a tin can and mounted on the spindle assembly so the chain moves up and down with the chuck.—*Walter E. Burton, Akron, Ohio*

Old fishing line makes 'net' to protect strawberries

Our strawberries were literally for the birds until I hit upon this idea as a substitute for a scarecrow. I simply drove some 1-ft. stakes around the strawberry bed and ran old monofilament fishline from stake to stake over the plants. The line lasts all season and now the family gets the berries.—*Anton Barkey, Sunnyvale, Calif.*

NEXT MONTH IN SHOP AND CRAFTS

WOULD YOU BELIEVE THIS WAS ONCE A GARAGE? When the Robert M. Skares of Golden Valley, Minn., needed a family room, the already roofed-in garage was the logical place. And with some building ingenuity on the part of their contractor, they ended up with recessed-paneled walls, cathedral ceiling and sliding-door passage to their often-used patio. Next month in *PM* you'll learn how you can duplicate the job.

TWO MEDITERRANEAN-STYLE WORKSHOP PROJECTS. Though we've simplified construction details so that either piece can be built in a weekend, both are handsome and guaranteed to get raves from family and friends. The first is a sculptured chest with a marproof top and the second is a high-style coffee table that's easy to build because the "carved" plaques that "make" the table are actually factory-made.

BEAUTIFY YOUR HOME WITH MODERN BIFOLDS. There's no need to put up with dated sliding closet doors when they can be replaced so easily with modern bifolds. These good-looking folding doors are available in kits to fit almost any size opening, with everything included to make the changeover in a matter of hours. You can get them in wood, plastic or metal and in a variety of designs from simulated or open louvers.

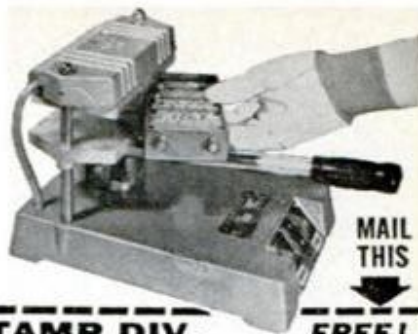
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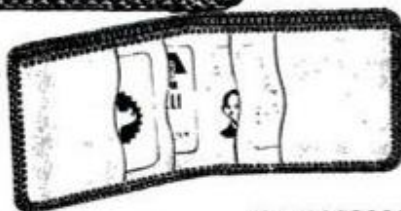
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50-STORY FIRETRAPS

(Continued from page 56)

outer rim of each floor is separated from the aluminum skin of the building by a gap of 16 inches.

Part of this gap is filled with foam plastic insulation covered on the inside by wallboard. Unfortunately, the remaining space can act like a flue to carry the fire upward with the combustible plastic insulation as fuel.

"In this space (at One New York Plaza) was found lots of paper, beer cans and everything else," says Richard Gewain, senior fire protection engineer of the American Iron and Steel Institute. "The construction workers probably just threw their lunch bags there."

Yet another airspace is hidden by hung ceilings. Crammed in the gap between the overhead acoustical tile and the floor above are air supply ducts, lighting fixtures, electrical and communications cables. Insulation on many wires is polyvinyl

When the guard "pulled" the firebox, it sounded an alarm only in the building itself.

chloride or other combustible plastic.

It was in such a concealed ceiling on the 33rd floor, near a telephone equipment room, that the One New York Plaza fire had its start. Flaming droplets of plastic from the ceiling set fire to the plastic foam furniture, which had been covered with more plastic in the form of sheets to keep it clean. Soon, everything was burning.

When the guard "pulled" the firebox, it sounded an alarm *only in the building itself*. Battalion Chief Long of the New York City Fire Dept. sums these devices up in two words: "No good." The actual alarm to the fire department came from an adjoining building.

When firefighters did arrive, they had to contend with inoperable windows; the airconditioning system was intended to recirculate either warm or cold air throughout the building. Smoke detectors should have shut the fans off in a fire, but they failed to operate. The ventilators sent smoke throughout the skyscraper.

While there is much talk of new regulations to prevent skyscraper fires—the installation of sprinkling systems, for example—a number of important questions remain unanswered:

● *Why do high-rise elevators tend to be deathtraps?* Experts tell you never to use them in a fire because they're unpredict-

able, but the reason why is not clear. Richard Stevens, chief engineer of the National Fire Protection Assn., suggests that the ionization of the air in a fire may "ground" capacitance-operated call-buttons—the type you normally rest your finger on—and cause elevators to stop at a burning floor. W. Robert Powers, investigator for the New York Board of Fire Underwriters, agrees that somehow fire, smoke or heat may actuate calling mechanisms to bring cars—and passengers—to the scene of the disaster.

● *Are emergency stairways safe?* Most experts think so, but Dr. Edward H. Blum of the Rand Institute, studying fire protection with the New York City Fire Dept., points out that they can become perfect chimneys after doors on upper floors are opened. The draft sucks the smoke up. Aside from the smoke, are you physically capable of walking down 50 or more flights of stairs?

Buildings with enclosed stairways, separate smoke towers, and more fire-resistant walls may provide part of the answer. An excellent example is the First National Bank Building in Portland, Ore. Another new development is the Sky Van, an external elevator which travels on tracks on the outside wall of a building. It could quickly evacuate the inhabitants of a burning skyscraper.

● *How do you plan for evacuation?* Fire protection engineers recommend a fire warden for each office and fire marshals for the building. Regular fire drills should be held. Such measures are difficult to effect, however, when there are a dozen offices on a floor, each with only a few people.

● *What materials should be used for insulation?* Much plastic insulation is combustible. Alternatives should be found for wall insulation, cable, air-duct coverings.

● *Should combustible furniture be banned?* Present-day furnishings are highly flammable, especially plastic-foam chairs and couches. Heated to 212° F., polyurethane, a common furniture stuffing, gives off a flammable gas that can quickly turn a room into an inferno.

● *How good are fire-alarm systems?* Each floor should be equipped with a pullbox that notifies the fire department directly, as do street boxes. Sprinklers—and their installation is considered highly desirable by many authorities—can be designed to call the fire department when activated by heat. Also needed are systems to notify all occupants that fire has broken out.

If you work in or have occasion to visit a high-rise building, you should note the location of exits and, if possible, the nearest fire-alarm box. This knowledge could save your life. ★ ★ ★

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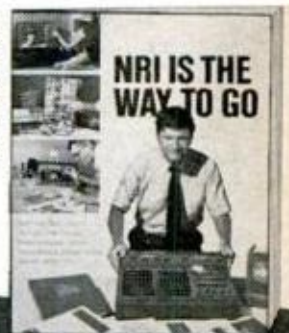
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HIDDEN DEPTHS OF YOUR MIND

(Continued from page 65)

rons into action and turning the bull into a docile creature.

Now Dr. Delgado has demonstrated two-way communication between the brain of a chimpanzee and a computer. Recently a young male chimp named Paddy had 100 electrodes implanted in "primitive" parts of his brain (those under the cerebrum). Targets included the amygdala, a section responsive to odors that seems to affect all emotional behavior. Other electrodes were placed in the reticular formation, a mass of neurons at the top of the brainstem that appears to act like a telephone switching office.

A peculiar burst of waves—which looked like spindles on an oscilloscope—occurred about 16 times a minute in Paddy's amygdala, and the researchers decided to see if this unusual nervous activity could be automatically suppressed with a computer-triggered signal.

Brain contains 10 billion neurons, some with as many as 60,000 interconnections

Paddy was outfitted with Dr. Delgado's Stimoceiver, a tiny gadget that includes both a receiver to detect transmitted ESB pulses and a telemetry unit to send brain signals to a remote point. A computer was programmed to recognize Paddy's abnormal spindle waves when received and to send back inhibitory ESB pulses to the reticular formation to stop them.

Moving freely about his enclosure under the influence of computer-controlled ESB, Paddy—normally excitable and stimulated by visitors, odors and other influences—became quiet and placid. Although he could perform his regular chores, he paid them little attention. He returned to normal two weeks after the experiments ended.

One possible application of such a computer-brain link: Malfunctioning human brains—damaged or epileptic—also generate abnormal electrical activity and could signal a computer when help was needed. The computer could radio back controlling impulses that might prevent a violent epileptic seizure.

Dr. Vernon H. Mark, a well-known Boston neurosurgeon, and his colleagues at Massachusetts General Hospital have already used the Stimoceiver to record and stimulate activity at points deep within the human brain.

In one case, that of a violent young woman who had stabbed another woman with a knife and later drove a pair of scissors into a nurse's back, the clinicians were able to monitor the abnormal brain seizures that led to the patient's violent behavior and then trigger similar behavior with a small stimulating current broadcast to a Stimoceiver under her head bandage.

With the malfunctioning neurons responsible for the violent behavior identified, a tiny destructive lesion was made in the woman's amygdala. The operation appears to have cured the patient's extreme violence, although full results will not be known for a number of years.

Implantation of electrodes in the human brain is not new; first efforts date from 1953. Far from being radical surgery, such procedures are now almost routine for diagnosis or treatment of certain illnesses. Electrode implantation is painless—the brain has no sense of touch or pain—and destroys almost no brain tissue.

Stimulate certain areas in the human cortex—the brain's outer layer—and the patient sees a flash of light, hears a buzz, makes a sound or observes, to his amazement, his finger move or his leg twitch. Stimulation of other areas produces elaborate patterns of behavior or the recall in minute detail of long-forgotten memories.

So mystifying and amazing are the results of work with both humans and animals that there has been speculation that a tyrannical government could control man's every thought. Working with computers, scientists would operate people like puppets.

Fortunately, all available evidence indicates that the human brain—the most magnificently complex device known to man—will never lend itself to any type of comprehensive control. The brain contains 10 billion "circuit elements" or neurons, some with as many as 60,000 interconnections. The most advanced computer is simple-minded by comparison; it contains about one one-millionth of that number of circuit elements.

In addition, the cooperation of a subject is needed to insure the effective positioning of electrodes. And, research shows, ESB can simply trigger responses that are already in the brain, not inject new ones.

If it is possible to trigger built-in responses, however, how about restoring routine control of limbs and body to those suffering from stroke, spinal cord injuries and the like? Would it be possible, through some very sophisticated ESB, to restore sight to the blind and hearing to the deaf? These are the questions being probed by Dr. Lawrence R. Pinneo and

his fellow scientists at Stanford Research Institute. They have already enabled paralyzed primates to eat, groom themselves and function in a near-normal manner. The animals' once-useless limbs are directed by a computerized brain stimulator.

ESB is not the whole answer, however, for chemistry will play an increasingly important role in all efforts to understand the human brain and cure its illnesses. Psychoactive drugs—tranquilizers and psychic energizers—have had enormous impact on many mental disorders.

Learning and long-term memory (as distinct from short-term memory in which details are quickly forgotten) have been under intensive investigation ever since Swedish scientist Dr. Holger Hyden found that animals learning new tasks produce increased amounts of protein molecules (RNA) in their brains. Can chemicals be used to make people more intelligent or to aid the failing memories of the old? The results are inconclusive, but there are indications that biochemistry may take over where ESB leaves off.

Efforts to create a drug to aid memory have been disappointing thus far, but a recent breakthrough shows some far-out possibilities. Scotophobin, a chemical isolated from the brains of rats trained by electric shock to avoid the dark, has been found to produce a fear of the dark when injected into "untrained" animals.

What makes this experiment by Dr. George Ungar of Baylor College of Medicine so incredible is that the "anti-dark" compound is simple to make and has just been duplicated in the laboratory. Will it someday be possible to simply inoculate students with a knowledge of geography or mathematics, or cure drug addicts and alcoholics with a single injection?

These possibilities are not as fantastic as they seem. Man has learned much about his own brain in the last few decades. It's conceivable that he will ultimately know exactly how it functions and will use that knowledge to foster the development of healthier and more intelligent human beings. ★ ★ ★

NEXT MONTH IN PM

Helicopters: Unsafe at Any Height

Over a two-year period, some 2300 military 'copters crashed—about a quarter of them in non-combat accidents. The cost: more than \$500 million—and over 1200 lives.

How You Help The Burglar

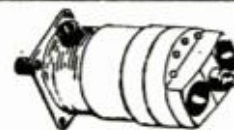
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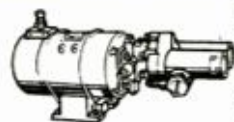
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4-CHANNEL STEREO—AT LAST!

(Continued from page 70)

quite as pronounced as what you get from four genuinely discrete channels, but the effect is amazing and significantly enhances the sound of standard stereo recordings or broadcasts.

Decoders thus improve two-channel program sources as well as playing four-channel matrixed sources. They come in many types and are known by a variety of names. Some makers use terms like "processor," "synthesizer" or "converter." One of the least expensive models is the EVX-4 decoder sold by Electro-Voice for about \$60. A small, trimly styled box, it connects between your existing amplifier or receiver and an added second ampli-

Matrixed four-channel tapes and records are expected to be on the market later this fall.

fier (the basic hookup is shown in the illustration at the beginning of this article). It provides four derived channels from any two-channel program source and will also decode four-channel matrixed recordings and broadcasts. A kit-built version is available from Heath.

Somewhat more complex decoders are offered by Toshiba, Sansui, Harman-Kardon, Lafayette and others. In addition to decoding and matrixing circuitry, units like these employ other tricks to further enhance the four-channel effect. One is the phenomenon known as "phase shift." When two speakers are properly phased, the peaks and valleys of their sound waves march along together, arriving at the listener in step with each other.

It's important that your front speakers are wired in phase so they work together, rather than fight each other. But you *don't* hear all sound in phase. In a concert hall, the sound waves bouncing around the rear of the room travel longer paths than the direct waves and their peaks and valleys get all mixed up, arriving out of step. This out-of-phase character of reflected sound waves helps to create the effect of great spaciousness in a concert hall.

Some makers take advantage of this phenomenon and deliberately alter the phase relationship of their rear-speaker signals to give the illusion of concert-hall spaciousness. This is called phase shift, and the amount can be varied to provide different effects.

Another trick is to introduce a time delay between the front and rear-speaker

signals to simulate the delay between the direct and reflected sound waves in a concert hall. The delay is very brief—only a few milliseconds—just enough to add a slight reverberant quality to the music. Harman-Kardon, for instance, uses a 7-millisecond delay as well as a partial phase shift of 90°.

Some of the more elaborate decoders are virtually miniature sound studios and let you play at being your own audio engineer. Various factors such as speaker balance, separation, volume level, phase shift, reverb effect, high-frequency roll-off and speaker pattern are all adjustable so you can tailor the sound to your particular living-room acoustics or select different effects for different types of music. The Toshiba, Sansui and Harman-Kardon decoders are all highly sophisticated control centers incorporating their own two-channel amplifiers. The idea here is that you need only your existing stereo amplifier and two added speakers to complete the system. You don't have to buy a second, separate stereo amplifier.

The Toshiba and Sansui models sell for about \$200. Harman-Kardon's will go for about \$300. Lafayette's model differs slightly in that it incorporates a four-channel amplifier so you need only the speakers for a complete four-channel system. It sells for about \$220 by itself or \$378 with four speakers and a four-channel tape player. Scott also offers a self-contained four-channel amplifier, and Fisher has just announced a four-channel receiver with AM/FM radio.

Matrixed four-channel tapes and records have already been produced experimentally and are expected to be on the market later this fall. JVC, the Japanese Victor Co., has produced four-channel records using a different system. Instead of mixing signals by matrixing, it piggybacks two signals together by employing a carrier frequency similar to FM multiplexing. Four-channel FM broadcasts using the same method have also been proposed, but these require FCC approval because of the greater band width that the signals occupy. No FCC approval is needed for matrixed four-channel broadcasts because the signals sent out over the airwaves are, in effect, the same as those for regular FM stereo.

Meanwhile, other makers have taken still another route. RCA recently pioneered the Quad-8 cartridge tape system and since then a number of others have hopped on the bandwagon. Quad-8 recordings are standard eight-track cartridges, but instead of containing four two-channel programs, they provide two four-channel programs. Four tracks are

recorded simultaneously in one direction and four in the other. The cartridges are played back through a four-channel amplifier with four speakers.

RCA's Quad-8 player contains its own four-channel amplifier and sells, complete with four speakers, for about \$250. It will also play standard two-channel, eight-track cartridges. Similar Quad-8 players—some for car installation as well as home use—are also sold by Motorola, Toyo, Teledyne, Fisher and Lafayette.

While Quad-8 players offer one of the simplest and least expensive ways of getting into genuine four-channel sound, they do limit you to the eight-track cartridge format. They are not designed to play four-channel matrixed sources or to add special four-channel effects to ordinary two-channel sources.

One interesting variation is the development of Quad-8 playback "decks." Panasonic has just introduced one that sells for about \$130; Lafayette one for about \$80. Being decks, they do not contain their own amplification systems, but can play Quad-8 cartridges through any four-channel amplifier or decoder along with other true or matrixed program sources. This gives you the flexibility of being able to enjoy a variety of four-channel systems using basically the same equipment. Other Quad-8 decks are expected later.

In the reel-to-reel tape format, Panasonic, Telex, Crown, 3M/Wollensak, TEAC and Sony all offer quadrasonic machines that both play and record on four separate channels. While these tend to be somewhat higher in price, from \$400 to \$600, they also contain more elaborate circuitry and provide greater flexibility of control.

There's also a move on to put four-channel sound on increasingly popular cassette tapes. This is a tougher problem because of the much narrower tape width used in cassettes, but several makers are already studying the possibility. Norelco, originator of the cassette concept, has proposed a compatible four-track arrangement in which cassettes could be recorded quadrasonically, stereophonically or monophonically and all be playable on the same equipment. Ampex is also rumored to be working on such a system.

Incidentally, don't be confused by the many different spellings you'll see of the term "quadrasonic." While this is the most widely accepted version with an "a" in the middle, some makers spell it with an "i" or "quadriphonic." Some drop the middle letter completely and call it "quad-phonetic." Some still use the earlier "quadrasonic." No matter how you spell it, it all comes out the same, and it comes out sounding pretty good. ★★ ★

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DETROIT'S BEST TEST TRACK!

(Continued from page 79)

and A. J. Foyt, and it would have been nice to have those cars around at the finish, but Mr. Ford recognized how blessed we were that we didn't hurt anybody in the thing. He's a pretty realistic kind of guy.

"It's Indianapolis, of course, that is the world's greatest spectator event. They get more people, more involvement and more press coverage. That's what established the name *Ford* in the minds of so many people; it was very worthwhile."

In later years after the initial venture into Indianapolis racing, in 1963, there was some management reluctance to keep pumping money into the Indy project, and the Special Vehicles Dept. had to keep 'selling' the idea, right?

"True," Jacque agreed, but it was the fault of the (racing) system. In 1963 it was a worthwhile venture and the company dedicated a certain number of dollars

**... you can't win them all,
and if you did it would grow
monotonous for the fans ...**

to doing it, and we should have won that first race—Jimmy Clark really should have beaten Parnelli Jones.

"At that time, Goodyear got into racing with a lot of enthusiasm and the tire companies started to buy their way into racing teams, pay the drivers large sums (for exclusive contracts), pay the mechanics and even buy the automobile.

"They'd furnish the tires, buy the engines and the thing escalated itself to the point that running a race car was a many-hundred-thousand-dollar proposition!"

When asked, "Who is the greatest all-around driver?" Jacque responds that it's the guy who understands more about what's happening to him, to his car, to other people, to what's going on and that's, he says, A. J. Foyt.

"On any given day, and given place, if his frame of mind is right, he's unbeatable. He's excitable, but they're all excitable. If he thinks he's right, he tells you. He just lays it on the line; here's the way it's going to be! He's an honest kind of guy. Gets wild once in a while, but more often he's easy to work with."

Passino was asked if Foyt is really as sharp from a mechanical standpoint as he thinks he is.

"He's sharper than he thinks he is. We have a suspension expert at Ford, Klas

Arning, a German fellow, and a very theoretical engineer, who said, 'Foyt can tell me exactly what's going on in that automobile. He may not understand it as far as engineering is concerned, but he knows exactly what is going on and can describe it to me, tell me what's happening so I can suggest changes to make.'"

How about stock-car drivers?

"Well, I remember, I surprised David Pearson when I told him one reason I was glad to get him in a Ford was because he used to scare me to death when he drove the Dodge and Pontiac. I hoped his car would break, because if it didn't he was going to win.

"Pearson is a remarkable driver; he's smart and he's calm. Of course, he's getting a little older now, and he's more seasoned.

"The greatest all-time stock-car driver? It's hard to say because of the differences in equipment they ran, but I'd say Fireball Roberts has to be very close to being tops. If Fireball in his prime had been driving a car that would handle—he didn't always have the best set-up cars as far as chassis is concerned—he would have been fantastic.

"I've seen Banjo Matthews, and talked with him, after he'd gotten out of some of those cars, and Banjo's hands were literally raw from fighting the wheel. But Roberts used to drive those things like they were running on rails."

How about your choice of outstanding mechanic?

"You have to give Herb Nab (crew chief for Junior Johnson's cars with Lee Roy Yarbrough driving) a lot of credit. In terms of being clever and running the rules to the ragged edge and doing all the things, you'd have a hard time beating Herb Nab and Junior Johnson, who is also a pretty crafty guy.

"When those two guys roll that car out on the line, you just know that they've got everything in that thing that they can get in it."

If there was one outstanding problem for Jacque Passino in his 14 years as Ford Motor Co.'s leading practitioner in auto racing, it was translating to other company executives the reasons for manufacturers' involvement in the sport, the benefits to be gained.

"The expression 'race on Sunday, sell on Monday' is a pretty good description."

Obviously, the objective of an auto-racing team is to win, but practical people realize that you can't win them all, and if you did, auto racing would grow monotonous for the fans and defeat your own purpose.

"In racing, the auto manufacturer has a

whole series of audiences. You have the fellow who was there and saw it. He's the No. 1 interested guy. You have the fellow who wanted to be there and couldn't, but he's interested and reads the newspapers. He's the No. 2 interested guy.

"Later, in two or three months, you have the follow-up in the buff magazines, where they talk about the race and victory all over again.

"There is a very broad extension of the race itself that goes to the public by virtue of the news media. Of all the people I ever talked to, Bunkie Knudsen understood that best."

Knudsen became interested in racing as an activity which would benefit the automotive business when he was general manager of Pontiac, and often has credited the racing activity with scrapping the former 'old lady's car' image of Pontiac, giving it the racy image it has retained, even today, years after the racing program ended, with model names such as Bonneville, Grand Prix, Le Mans and Firebird.

"When he came in to Ford," Passino continues, "it was like a breath of spring, because he knew and loved that (racing) end of the business. He knew everybody in the sport, almost without exception.

"In fact, with the exception of John Holman and Ralph Moody, and the Wood Brothers, all of our people had at one point in time worked for Bunkie. Banjo Matthews ran Pontiacs for him. Junior Johnson had run Chevrolets for him.

"He could walk through the pit area and talk with everybody there. He knew Bill France intimately. It surely made things a lot easier and you didn't have any arguments with anybody about anything.

"We were racing strongly at that point in time, so he didn't have to change anything. It was refreshing to have a guy of his type around."

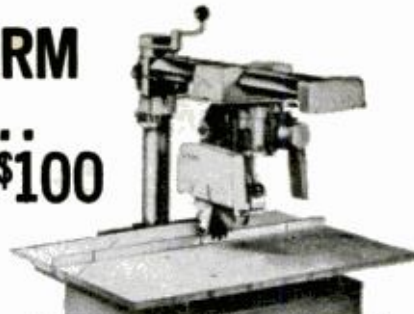
Asked about Henry Ford II's racing interest, Passino sums it up this way: "I wouldn't say Mr. Ford is a race nut, but he feels that racing is part of the car business and that's why we did it.

"As a manufacturer, of course, you race within certain boundaries: financial, publicity-wise. You have to play things cool right now, because people are concerned about safety and emissions.

"If you try to figure out what the future holds now for the automobile industry in racing, you'll need a darn good crystal ball."

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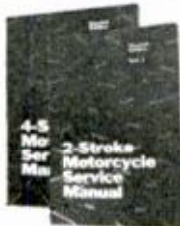
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(Continued from page 91)

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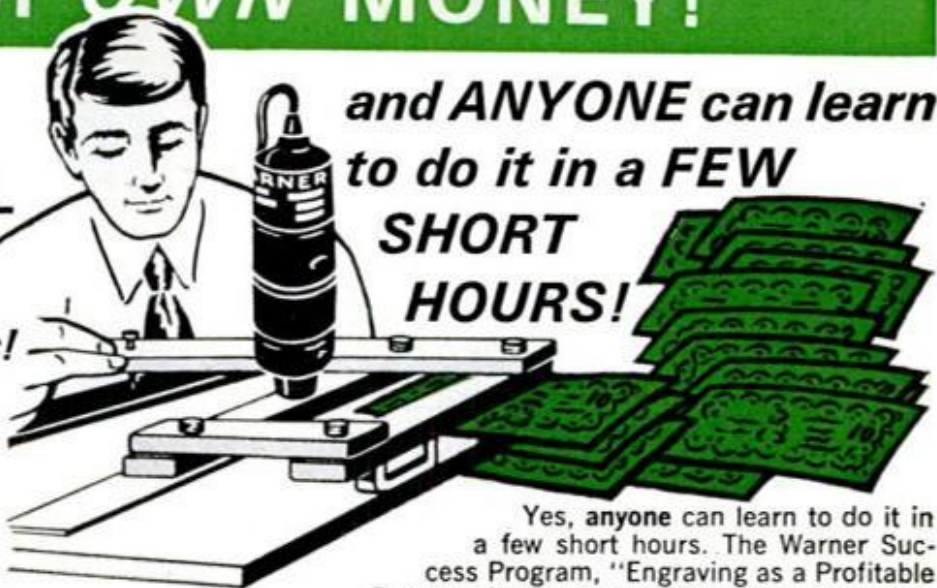
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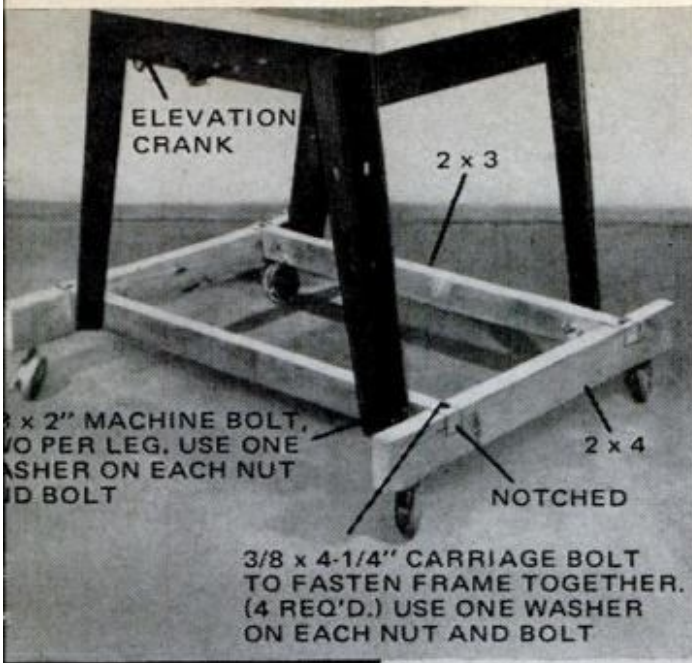
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SEARS' BEST RADIAL

(Continued from page 122)

the base shown above. With this base added, the saw rolls about easily and can be locked in place wherever wanted. The Shepherd casters selected are top-of-the-line, industrial rated, and if your hardware dealer doesn't stock them, write the maker at the address shown below.

Summing up, I have to rate the radial saw as a best buy. In fact, having it side-by-side with my table saw almost causes pangs of guilt when I spend all day Saturday whaling away at some future PM project. ★★★

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Model: No. 99 AT 2951N
 Blade: 12 in., 5/8 in. arbor
 Max. depth of cut: 4 in.
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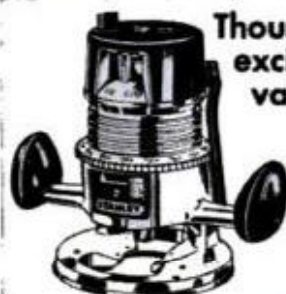
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(Continued on next page)

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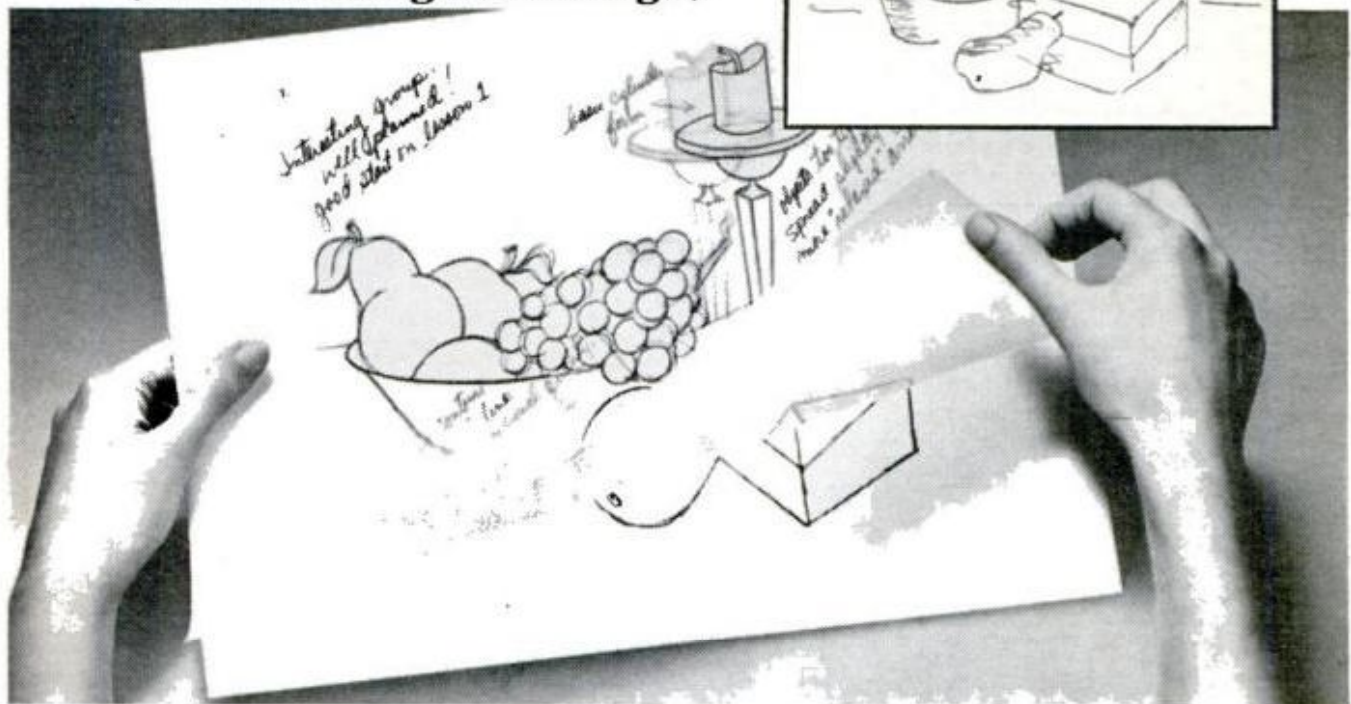
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(Continued on page 188)

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(Continued from page 184)

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(Continued on next page)

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(Continued from preceding page)

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(Continued on next page)

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(Continued from preceding page)

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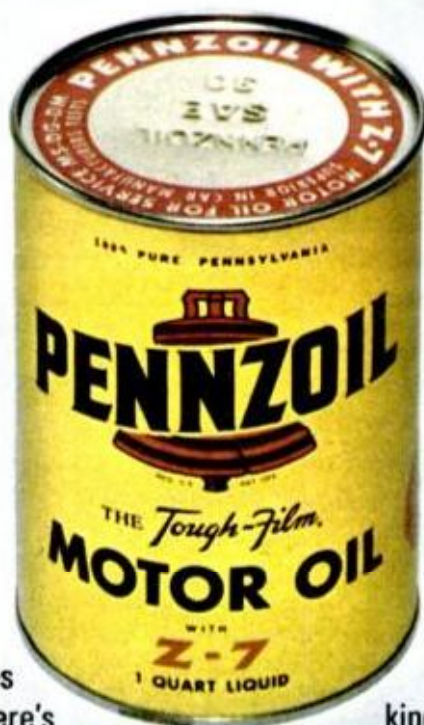
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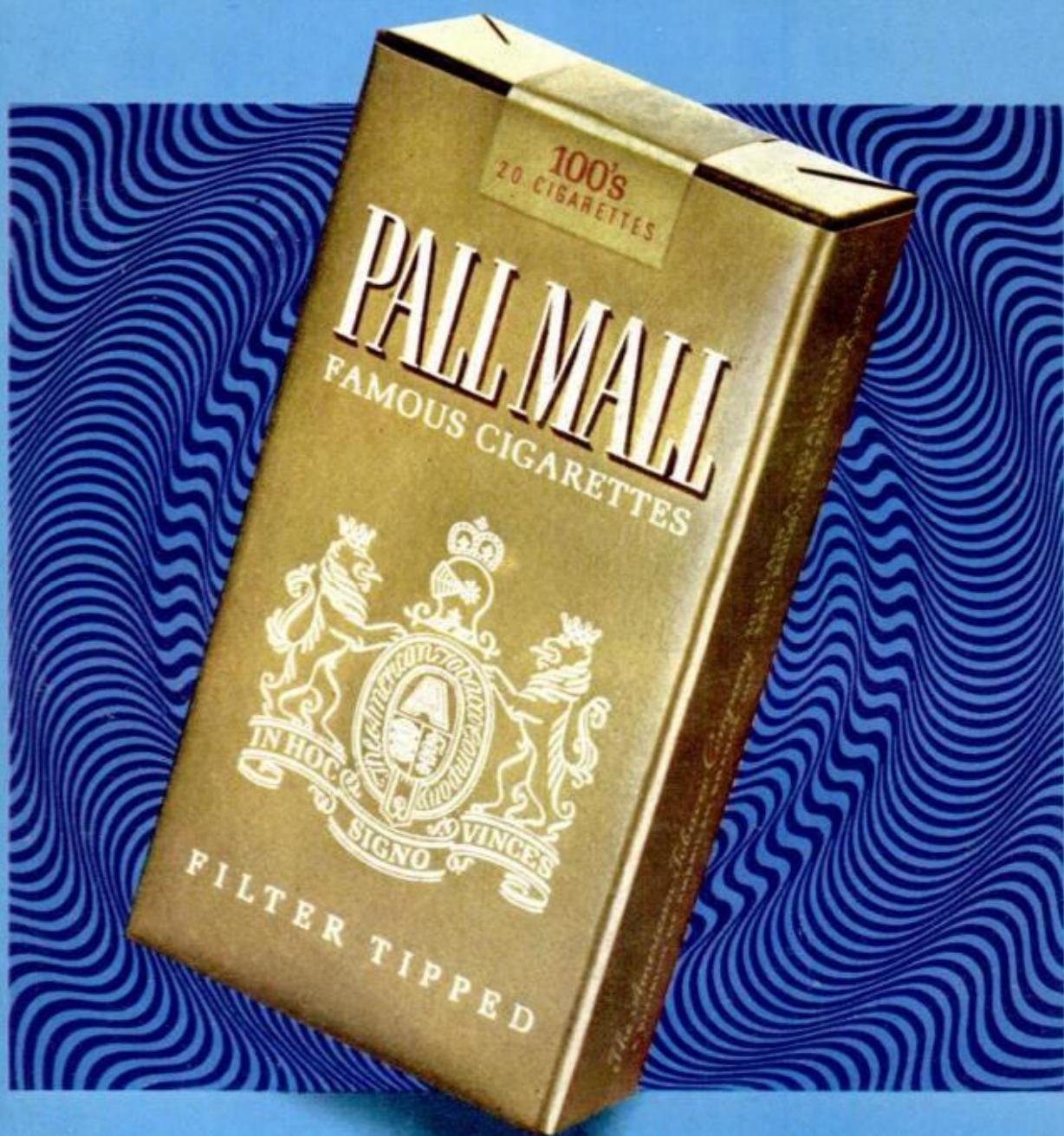
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