

POPULAR MECHANICS

SEPT. 1966
35 CENTS

DAN GURNEY
Answers Your
Questions on
**RACING AND
DRIVING**

'Confessions'
of a Car
Salesman

**AMAZING NEW
'SIDLER'
PARKS YOUR
CAR SIDeways**

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BIG 42-PAGE HOME REMODELING SECTION
Before-and-After Bathroom... Swing-Down Kitchen Cupboards
The Fanciest Bar You Can Build... Wife-Saving Sewing and
Laundry Centers... 11 Weekend Projects

**PLUS: TEAR-OUT-AND-SAVE CARD OF
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MECHANICS**

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September, 1966
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Vol. 126, No. 3



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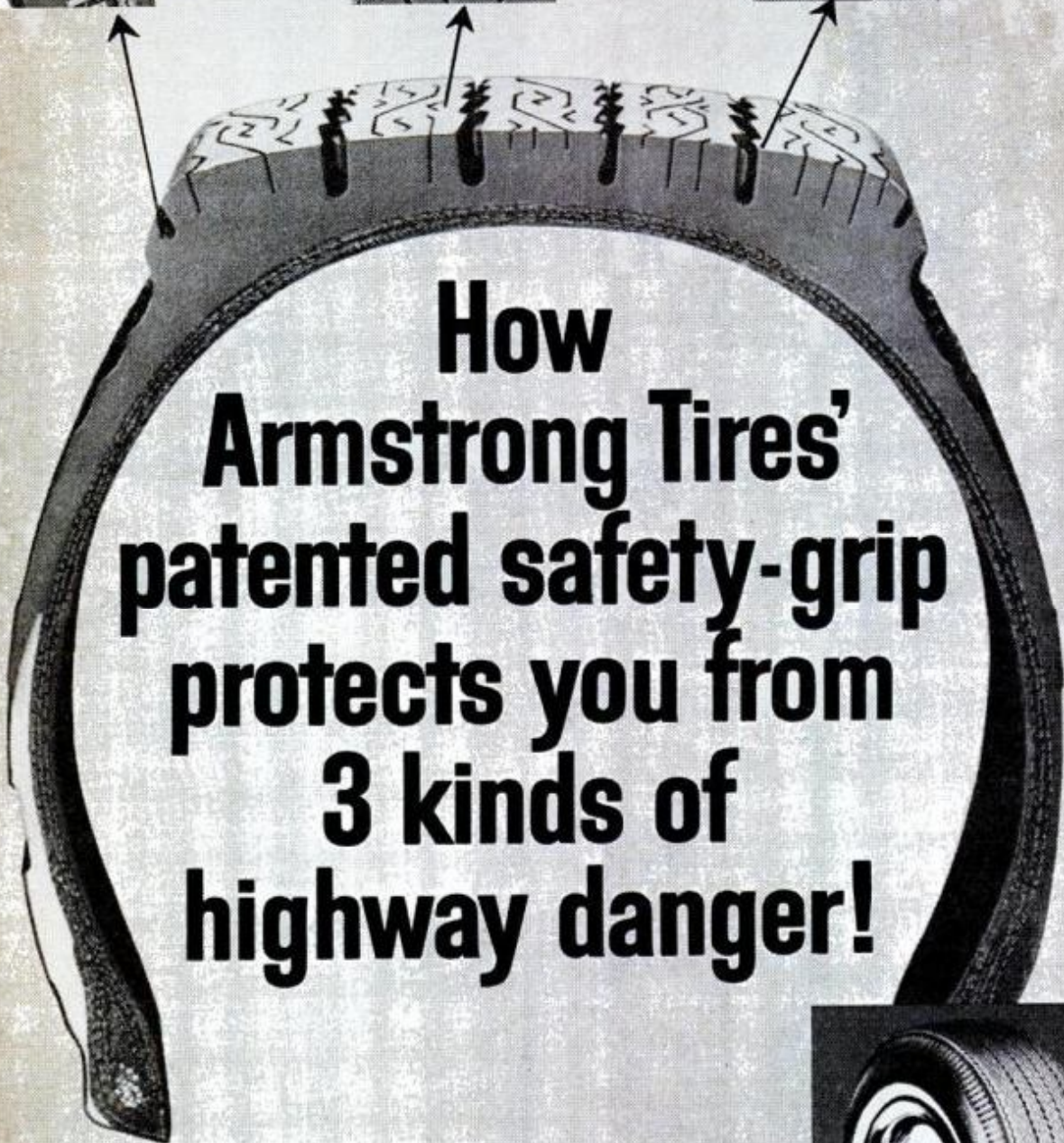
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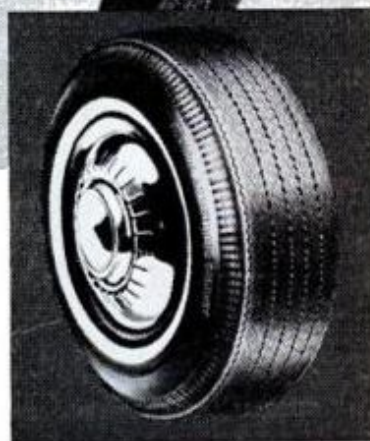


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SEPTEMBER 1966

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SEPTEMBER 1966



How I retired in 15 years with \$300 a month

"Here's one retired Yankee who's fallen in love with Florida. I've begun a new life—all because of the check for \$300 I get each month.

"My retiring came out of a business trip to Tampa in 1950. I ran into Don Nelson, an old friend from New York. I thought he was on vacation, but he said he had retired!

"He told me he'd planned it for 15 years. He explained that he never could have retired on his investments or savings alone. He had a Phoenix Mutual Retirement Income Plan.

"Flying home, I noticed a Phoenix Mutual ad in a magazine. Sure enough, I could get a retirement income guaranteed for life if I started young enough. When I got home, I cut out the coupon and sent for more information. In a few days, a booklet came by mail. And there was exactly the Plan for me. If I started right then—at 40—I'd be able to retire in only 15 years with \$300 a month.

"I felt more and more secure as those 15 years went by. When my first check for \$300 arrived, I was off. Now that I'm settled, the real fun's just beginning."

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Address _____

LETTERS

TO THE EDITOR

Dowsing, anyone?

We were very pleased with the excellent article, *Can You Find Water with a Forked Stick?* (page 88, July PM).

You mentioned the American Society of Dowzers, Inc. Your readers may be interested in knowing that the national headquarters is in Danville, Vt. 05828. Membership is open to all interested persons; yearly dues are \$5.

Danville, Vt.

HENRY P. BALIVET,
Secretary

We'll join—but first send us a forked stick that'll locate five bucks in an empty wallet.

Warner Brothers studio is built on an old dry river bed in Burbank, and you don't have to dig far to have a well anywhere in that area.

We were on a back lot, and the subject of water witching came up. One of the fellows cut a green forked stick, and we all tried it.

I have a pretty good grip. I held the darn thing as tight as I could, trying to keep the end from tipping down. Some of the green bark actually peeled off in my hands. I tried it again and again, and I simply could not keep the end of the stick from turning toward the ground.

Tarzana, Calif.

PAUL M. CALVERT

I challenge any engineer or geologist to say that I cannot differentiate large or small amounts of water in the earth by dowsing.

I can prove to anyone what direction the water veins run and prove if it is a large or small-volume water vein, even blindfolded!

Grants Pass, Ore.

MANVEL O. ANDERSON

Back to Los Angeles

I predict that you are going to hear from Dallas regarding the drawing on page 100 of your July issue (*The Man Who Can Move Mountains*).

You describe the building shown as the "tallest building in Dallas." I count only 16 stories with some sort of roof house. Citizens of that city are extremely proud of their skyline—some of the skyscrapers being over 40 stories high.

Corpus Christi, Tex.

C. G. INGLISH

On a clear day you can see that build-

ing very well—but, darn it, you have to be in Los Angeles. The building is the home office of the Signal Oil and Gas Co., it is 16 stories high, and it never was in Dallas.

Incidentally, that offshore drilling platform shown in the drawing is taller than a 30-story building—and that's 30 stories in Los Angeles or Dallas . . . or Kokomo . . . or Des Moines . . . or anywhere.

Maybe anchors will help

After reading *Car Stealing Made Simple!* (page 57, July PM), I'd like to add a line or two.

Many people leave their keys in the ignition lock at all times, and many turn the ignition only part-way off so that the engine stops but not far enough to keep the ignition from being turned on again with a pocket knife.

I have an idea that will stop all car stealing: Simply put a valve on the gas line that shuts off the gas with a key.

Evansville, Ind.

JAMES E. ARNOLD

Okay, but you'll never sell that idea to a woman. Imagine looking through a handbag for two keys instead of one! (Besides, how are you going to keep a thief from getting a copy of that second key, too?)

European cars are better

Congratulations on your reports on the new cars from Detroit's junkyard of supposedly new automobiles.

At present I'm stationed in Germany and have had ample opportunity to compare European automobile workmanship with that of Detroit. Needless to say, the European workmanship is far superior to Detroit's.

Thanks for a fine magazine. I like the way you call your shots as you see them. Keep up the pressure; insist on quality.

APO, New York M.SGT. HARRY H. ELKINS

Not the only one

In regard to *Dirty Cars Wanted* (page 66, June PM), Mr. Milstin has a very fine business, I know, for I've had such a business for five years. I know of several other such operations in the nation, so Mr. Milstin's isn't "perhaps the only mobile auto bathing business in the world."

Little Rock, Ark.

GERALD BINNS

7 ways to get out of a job rut

Which one of these high-pay fields do you want to prepare for at home, in your spare time:



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Occupation..... Working Hours..... A.M..... P.M.

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- Business Law
- Business Management
- Drafting
- Real Estate
- Stenotype
- Transportation

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Auditing
Business Law
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C.P.A. Review
Estate & Trust Accounting
Executive Accounting
Federal Tax
General Accounting
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Small Business Accounting
Starting & Managing a Small Bookkeeping Service

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Building Estimator
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Building Maintenance
Carpenter-Builder
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House Planning & Interior Design
Mason
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Review of Mech. Systems in Buildings

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Oil Painting for Pleasure
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Automobile Technician
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Systems and Procedures Analysis

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(Indicate Mr., Mrs., or Miss)

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Occupation _____ Working hours _____ A.M. to _____ P.M.

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FROM THE PATENT OFFICE **NEW INVENTIONS**
BY M. J. PEDERSEN

Fishermen may relax their own watch for a strike and rely instead on an automatic sentinel that signals the moment a fish is felt nibbling—a light by night, a buzzer by day. Clamped onto either a sand spike—for surf fishing—or boat seat, the signaller earned patent 3,216,142 and 3,228,135 for Julius Krickfeld and Sol Wasserman, Brooklyn, N.Y. It may be seen at the *Inventors Show*. See page 70.

Highway safety is the concern of a remote-control speed governor that automatically limits the supply of fuel to the engine, earning patent 3,195,671 for Richard Wolfe, Abita Springs, La. It may be connected to a conventional speedometer and controlled either manually or by an external radio transmitter operated by traffic authorities or other authorized persons—such as parents of teenage drivers. The preset maximum speed may be overcome briefly, if necessary for passing or other emergency reasons.

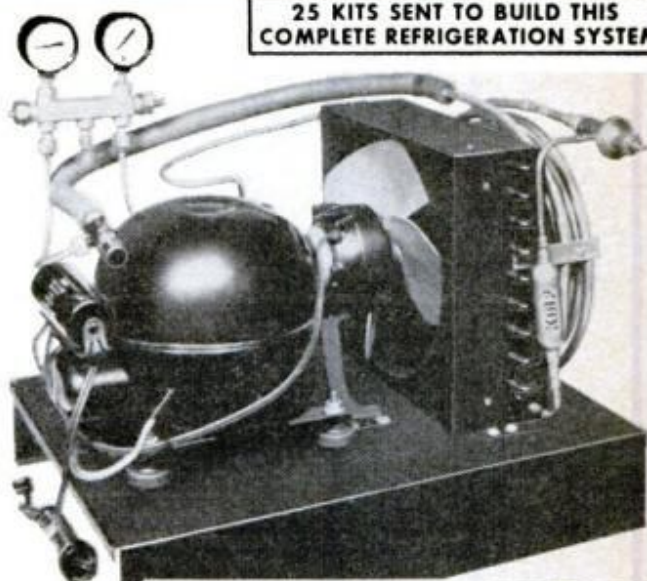
To sleep—perchance to dream—is the pay-off of an electrical sleep inducer that was awarded patent 3,255,753 for Dr. Omar Wing, New York. Electric pulses are slowly applied to a patient's head through pads, producing a tingling around the eyelids. Users report sensing impressions of black and white until the white disappears; sleep presumably occurs when everything becomes black.

A fuel injection system for the Wankel engine to increase the efficiency of fuel usage in the rotary-piston engine, was awarded patent 3,255,738 for Willi Springer and Heinz Lamm, Germany.

Instantaneous transmission of "photographs" from future Mariner probes may be accomplished by means of a semiconductor laser that could cut the 12-hour transmission time of microwaves to a few seconds. Laser light waves may be considered as radio waves of extremely high frequency, capable of carrying thousands of times more information—at least one million "bits" of information per second. In the future, scientists hope to be able to reconstruct photographs from far-flung space missions within minutes. Patents 3,248,669-671 were assigned to IBM., N. Y.

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BY JOHN F. PEARSON
SCIENCE
WORLDWIDE

No-shrink wool may be available before too long. So say Australian scientists who have developed a revolutionary process that makes wool fibers so stable they can be given repeated washings without showing appreciable shrinkage.

What color is Love Light? Or Vamp? Or Kitten's Ear? Such fanciful names are becoming commonplace in various industries, from fashions to autos. To help technicians and businessmen—and even the consumer—pin down the hues indicated by the frothy names, the National Bureau of Standards has just compiled a color dictionary and chart containing about 7500 color names and identifications. (In case you're interested, the dictionary says Love Light is greenish yellow, Vamp is light purplish pink and Kitten's Ear is pale yellow.)

The dictionary is called NBS Circular 553 and costs \$2. To get your copy, write to the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C.

Radioactivity in Canadians—polonium-210 in particular—is 80 times higher than it is in residents of London. Diet makes the difference, says the British scientist who made the findings. The Canadians, he explains, live off reindeer and caribou, animals that graze on the lichens that cover vast areas of the Yukon and Northwest territories. It's known that the lichen—a plant that combines a fungus and an alga—absorbs radioactive fallout from the atmosphere.

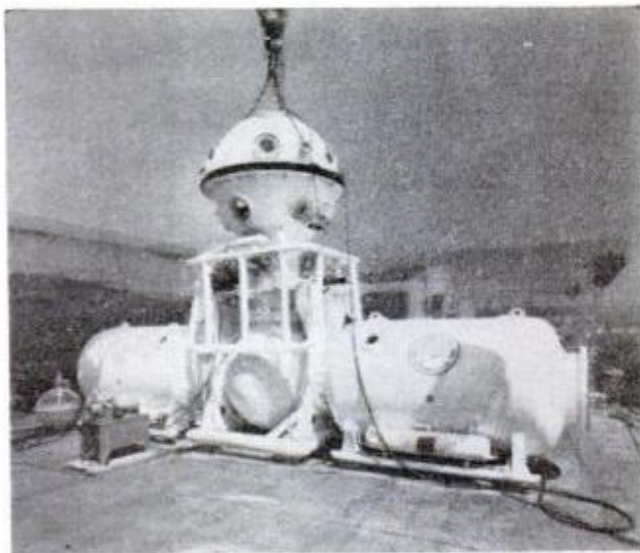
Weird world of antimatter refuses to stay pinned down. Scientists at New York's Columbia University and State University at Stony Brook, working together, recently came up with a discovery that upsets the previously well-established theory of symmetry—that every particle of matter has its antimatter counterpart, its exact mirror-image.

Some antiparticles, the researchers found, aren't exact opposites in all respects. They found that in the decay of a certain neutral particle, the eta meson, the emerging positive particle is more energetic and travels away from the decay site faster than the emerging negative particle. Now more experiments along this line are planned at several universities.

Cattle like a midnight snack, researchers at the Department of Agriculture have discovered. A specialist in beef nutrition recently finished a six-year study in which he used electric eyes and other gadgets to snoop on cattle. He says the study shows that the bovines take in a quarter of their daily ration at night, regardless of whether their pasture is lighted or not.

Divers now can work hours longer under water, thanks to a new diving system. A ball-like submersible chamber is used to taxi the divers to the work site. They re-enter it when they're ready to come up, and seal it to maintain bottom pressure.

Then they're hauled up to the ship where the submersible is hooked up with twin deck decompression chambers, as



shown in photo, and atmospheric pressure is gradually restored. Thus, the lengthy underwater decompression routine followed by free divers is completely eliminated. The diving system is made by Ocean Systems, Inc., and will soon be used in drilling operations in the North Sea off the coast of Norway.

Outer-space ouch. Astronauts going on future space flights of 30 days or longer will take along a dental kit containing such items as pliers, pain killers, paste to patch up broken or chipped teeth and antibiotics. And before they blast off, they'll have a five-day course in dental techniques. Doctors believe that man's molars may be the major medical problem in space flight.

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BY W. CLYDE LAMMEY

Ridding wood of mildew

On reclaiming a chest of drawers I had stored in the basement over the past couple of years, I noticed it had developed a strong musty odor. I've scrubbed it thoroughly with a mild detergent, but the odor persists. I can't understand why this odor developed, since the basement remained dry during the time the chest was stored there. Anyway, can you suggest how the chest can be deodorized?—O.J., Mass.

Perhaps your basement was not as dry as you thought, and since moisture tends to collect in any enclosure, your chest probably became mildewed.

Wait for a sunny day, then take the chest outside, remove the drawers and wash all parts—inside and out—with a 50/50 solution of white vinegar and water. Then let drawers and chest soak up sunshine for four or five hours or longer. Repeat this procedure a second day and chances are your chest will come up smelling like roses. You might then want to lightly sand and revarnish it before putting it back into service.

Winter attic antics

Last winter ice formed on the ends of the shingle nails that project through the roof of my attic. This happened in spite of a number of vents in the wide cornices and near the roof ridge. I tried leaving the door to the attic stairway opened occasionally, hoping the warm air rising from below would dry out the attic. However, this only made the problem worse: the floor became damp. How can this condition be corrected?—F.E., Ark.

When the projecting ends of the nails became colder than the moisture-laden air around them, the air condensed on the nail ends, then turned to ice when the temperature fell to the freezing point. When the temperature rose, this ice melted—hence, the damp floor.

First of all, close that attic door—and keep it closed. You say there are vents, but they may be inadequate; you need about 1 sq. ft. of open vent area for each 100 sq. ft. of attic floor. Adequate circulation of air throughout the attic is imperative if the formation of ice and frost is to be prevented. Also, your attic floor should

be insulated. The use of foil-faced batting is recommended because it also serves as a vapor barrier that prevents moisture rising to the attic from the rooms below.

Crumbling basement plaster

Recently I plastered the poured walls of my new basement with an ordinary mixture of sand and cement. It looked fine for a while, but now it's falling off in huge chunks and massive flakes; this in spite of the fact that I thoroughly dampened the walls before plastering, then carefully troweled it on to a thickness of about 3/8 in. What's happen?—W.D., N.Y.

Even a top-seeded mortarman can fail to get a new cement mix to bond reliably to an older cement structure. Though you dampened the wall before plastering, the new mix probably lost a substantial portion of its moisture through absorption and evaporation even before its initial "set." Since there was little or no period of cure, the plaster soon disintegrated.

I suggest you scrape off the remaining plaster and let the junkman haul it away. Scrub the walls clean again, then lay on a couple of coats of waterproofing masonry paint. This paint comes in a variety of decorator colors and dries to a soft, flat finish.

Nails pushing out wallpaper

Several nailheads are working out under the wallpaper on a drywall in one of our bedrooms. I'd like to correct this problem before they punch through the wallpaper. Any suggestions?—D.E., Wash.

Use a sharp knife or razor blade to cut a small triangular piece of the paper away from the top of each loose nailhead. Use a nailset to seat the nails below the surface of the wall, then fill the depression over each nailhead with putty. When the putty dries, sand it lightly, then repaste the flap of wallpaper.

Use for double-headed nails

I've just found some nails which are a mystery to me. Nobody I've asked seems to know what they're for. They look like regular nails, except that a little below the head there appears to be a second "head." What are these nails called and what are they used for?—W.H., Miss.

They're called *scaffold nails* because they're mainly used for joining wood scaffolding. The second "head" prevents the nail being driven all the way into the wood, thus allowing its easy removal with a claw hammer when the scaffold is dismantled.

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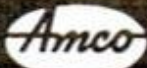
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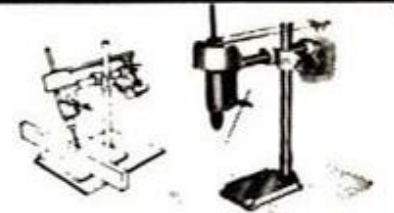


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- DIESEL MECHANICS
- ENGINE TUNE-UP AND ELECTRICITY

AIR CONDITIONING-REFRIGERATION DIVISION

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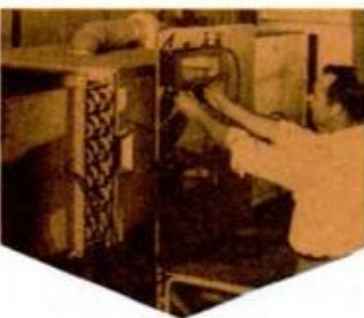
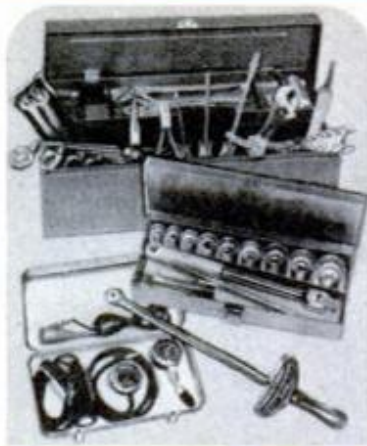
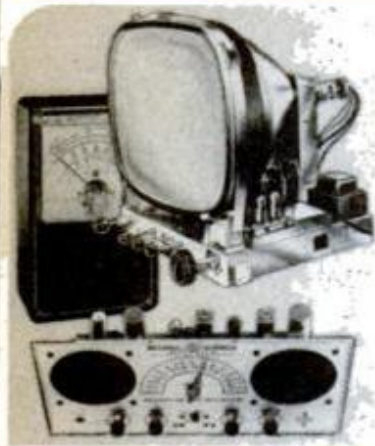
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WHAT'S NEW OUTDOORS

BY STUART JAMES

A consulting engineer for General Electric Co. has taken exception to an item which was included in *Roughing It in High Style* (May PM), an article describing my experiences and misadventures with a 14-foot travel trailer.

"The trailer park yokel," writes Mr. R. H. Kaufmann, "who haywired your electric service connection so that it could be plugged into a two-terminal ungrounded receptacle suspended in a tree was dangerously out of order. The three-conductor power cord and the three-terminal plug with which the trailer was equipped was by no means a stupid mistake. It had been carefully planned to abide by established safety regulations and to best assure you of safety for your trailer and its occupants. The use of the improper connections has in many instances been responsible for the initiation of fires and of electrocution of occupants"

I gleefully showed this letter to my smart-aleck 12-year-old who keeps reminding me of what Burley Farber would do in various situations that leave me completely baffled. He gnashed his teeth over the part where Burley is referred to as a "trailer park yokel," then said: "Do you realize these people would have outlawed Ben Franklin's kite?" And what do you say to that?

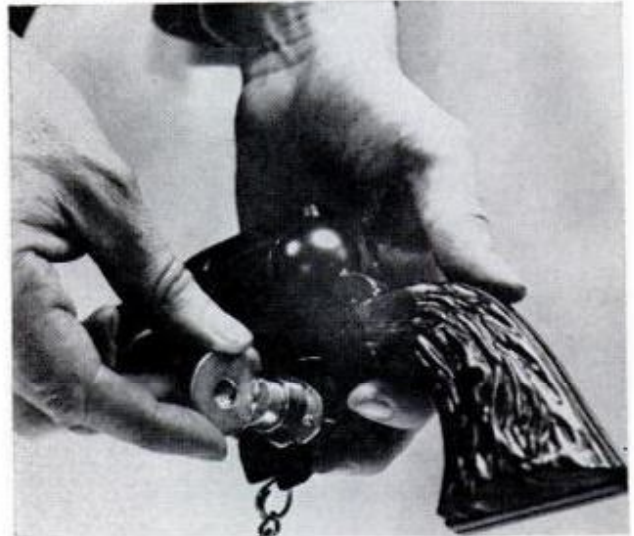
Slippery fish can be gripped and held easily with the Fish Mitt, a glove that has an abrasive surface and a metal cleat riveted to the palm. It is particularly use-



ful for removing a hook, but it is also handy when scaling the fish. It sells for \$2.95 from Kebek Industries, Inc., Box 138, Knoxville, Tenn.

Thermos jugs stay sweet over the winter if you drop a piece of charcoal into them before storing them away.

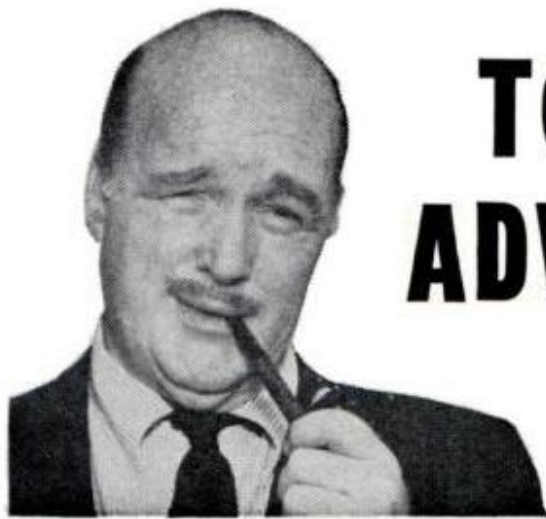
Handguns make me nervous. For some reason the moment a person picks up a revolver his finger slips into the trigger guard and he has to let off a dry run. I was delighted to see a small lock that



fits into the trigger guard to make the gun impossible to fire. It's called the Trigger Lock and it is made by Central Specialties Co., 6030 N. Northwest Hwy., Chicago, Ill. Its price is \$2.49, and it also fits rifles and shotguns.

Nettle juice will surely cure dandruff, and a potion made from marsh-marigold can be used to cure warts, fits and dropsy. This sounds a bit like witchcraft, but it's just Euell Gibbons (*Wild Supermarket in the Woods*, July '65 PM) at it again with another fascinating book about the plant life that abounds in the outdoors. This time Euell is *Stalking the Healthful Herbs* (David McKay Co., \$6.95) and he comes up with a cure for poison ivy, colic and bad complexion. And just for good measure he includes a "recipe" for a worm-wood love charm. For delightful reading this is a book that belongs on your outdoors bookshelf.

Angling records are usually in inches and pounds, but Kervin Hake of Wrightsville, Pa., established one in the numbers. He took 99 fish and a crawdad on one cast! When Hake hauled in a three-pound bass he opened the stomach and found 78 sunfish, 20 minnows and the crawfish.



TOM McCAHILL ADVISES SATURDAY MECHANICS

If you're a Saturday mechanic, my guess is you can fix the screen door, build lawn furniture, overhaul the kid's bike, and rotate your own tires.

It's a different story when that fancy electric coffeemaker stops perking or the push-button automatic washer quits halfway through a cycle. You might spend an afternoon admiring the coffee-maker's innards before giving it a permanent vacation on the top kitchen shelf.

As for the automatic washer, after the Little Lady shouts "Do something!" you'll end up phoning an Appliance Serviceman across town. He shows up in 3 days and has the washer going in one-fourth the time it took you to study the coffeemaker. He also presents you with a ticket for 30 bucks. When you consider he could make twice that selling you a new machine, you got off easy.

Maybe you never realized it, friend, but you have more Appliances around your hacienda today than you did five years ago. If you count power tools, your wife's hair dryer, an air conditioner, plus the standard stuff like vacuum cleaner, toaster, refrigerator, freezer and so forth, you probably have well over a dozen.

These electrical gadgets nowadays represent a pretty good chunk of your hard earned dollars. Did you ever stop to think it could pay you in savings and convenience to know how to fix these things? Also, it could be a great source of extra income if you're inclined to tackle the few thousand broken Appliances right in your own neighborhood.

The Appliance Repair business is easier to learn than you imagine. The National Radio Institute's Appliance Division has a downright interesting, low cost course you can take in your spare time. It covers every type of Appliance you can think of plus air conditioning, refrigeration, house wiring, electric motors—even small gas engines. There's a worthwhile section on farm and commercial appliances too.

NRI starts you with the basic principles of electricity to give you a solid background. Using clear-cut picture diagrams, they show you how various types of Appliances work, separating each into groups. Included with the course is a topnotch, professional Appliance Tester for fast troubleshooting.

Easy to read, bite-size lessons are loaded with photos and cutaway drawings so you see how each Appliance comes apart, and more important—goes back together in working order.

Whether or not you agree that knowing Appliance Repair could help you, I recommend you see for yourself. The little coupon below will get you a free book that fully describes this unique home training. It also brings a free sample lesson. No salesman is going to call.

Do yourself a favor and mail the coupon today.

TOM McCAHILL

APPLIANCE DIVISION, NATIONAL RADIO INSTITUTE
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CAREER BAROMETER

BY CREIGHTON PEET

JOBS IN SPACE

SOME SUMMER NIGHT a few years from now you may look up at the moon and casually remind your girl friend you had a hand in building that LEM (Lunar Excursion Module) which will, by then, be exploring the lunar landscape. Or maybe you will have worked on some assembly installed in a space laboratory.

Although your chances of being blasted into orbit and walking around in space or on the moon are slim, you may well play a working role in the space program. All over the country, aircraft plants and small subcontracting shops are busy inventing, designing, building and testing space hardware—including some of the most fantastic gadgets ever seen. Even if you only have a high school diploma, there are jobs open to you, although a few additional correspondence-school courses in mechanics, electronics and physics would make you more acceptable.

Some space engineers are highly enthusiastic about two-year tech courses. They say they start a man off just right. After another couple of years on the job, a two-year tech graduate is really ready—and usually financially able—to go on and earn his bachelor's degree. Most big firms doing aerospace work also have scholarship or training programs for men who want to get ahead. In some cases the company pays full cost of such classes for men who get "A", 85 percent for those who get "B" and 75 percent for those with a "C." Meanwhile, as a technician a man earns from \$2.50 to \$3 an hour.

In space work your job may be in any state, working for a local company. On occasion you may be sent to Cape Kennedy, Fla., Huntsville, Ala., or a California launch site to help assemble or adjust

(Please turn to page 26)

JOB TITLE	RELATIVE NATIONAL DEMAND		3-MONTH TREND	STATES WITH HIGHEST DEMAND				
Chemists, Biological	18		Demand steady	Pa. 2	Ohio 2	Minn. 2	Wis. 4	Calif. 4
Chemists, Organic	89		Good increase	Conn. 5	Pa. 8	Ala. 11	Ill. 7	Colo. 25
Engineers, Metall.	54		Demand steady	N.J. 16	D.C. 4	Pa. 4	Ohio 5	Ill. 5
Engineers, Civil	527		Some decline	D.C. 72	Pa. 33	Ohio 68	Calif. 106	Wash. 25
Engrs. Elect. & Electron.	1083		Demand steady	N.Y. 49	Ohio 43	Ill. 40	Ind. 32	Calif. 108
Engineers Industrial	542		Good increase	N.Y. 81	D.C. 47	Fla. 78	Mo. 65	Calif. 311
Engineers, Mechanical	1421		Slight decline	N.J. 106	Pa. 64	Ohio 98	Wis. 100	Calif. 310
Engineers, Aero.	599		Some decline	Fla. 33	Ohio 21	Mo. 65	Calif. 264	Wash. 180
Pharmacists	88		Demand steady	Va. 10	Ill. 5	Ind. 10	Calif. 8	Idaho 19
Natural Scientists	229		Demand steady	N.J. 19	D.C. 21	Tex. 10	Calif. 6	Wash. 144
Draftsmen, Architectural	91		Some decline	N.Y. 9	Ohio 8	Ill. 6	Calif. 16	Wash. 9
Draftsmen, Electrical	288		Good increase	N.J. 24	N.C. 20	Pa. 23	Mo. 20	Calif. 150
Draftsmen, Mechanical	482		Good Increase	Pa. 74	Ohio 50	Wis. 55	Calif. 48	Wash. 66
Draftsmen, all other	420		Good increase	Pa. 271	Ohio 27	Mo. 55	Calif. 81	Wash. 42
Tool Designers	210		Demand steady	Conn. 21	Pa. 15	Mo. 17	Calif. 50	Wash. 50
Lab. Tech. & Assistants	133		Good increase	Pa. 17	Fla. 8	Ill. 10	Ind. 11	Minn. 21
Medical Technicians	202		Demand steady	D.C. 29	Md. 21	Ill. 24	Colo. 19	Calif. 19
Sports Instr. & Officials	21		Demand cut in half	Conn. 2	Vt. 2	N.C. 2	Pa. 2	Ind. 2
Surveyors	13		Demand unchanged	Va. 3	Fla. 1	Iowa 1	Ark. 1	Calif. 2
Techs. Eng'g & Phys. Sci.	812		Slight drop	Ala. 37	Fla. 56	Ohio 60	Calif. 258	Wash. 242
Tool Planners	34		Slight drop	Ohio 12	Ind. 7	Iowa 1	Kans. 10	Okla. 4
Systems Engineers	56		Good increase	N.Y. 5	Alaska 2	Kans. 10	Mo. 31	Nebr. 2
Programmers	485		Good increase	Ohio 15	Ill. 10	Mo. 11	Calif. 151	Wash. 227
Systems Analysts	64		Demand steady	N.Y. 5	D.C. 8	Ohio 4	Calif. 18	Wash. 16

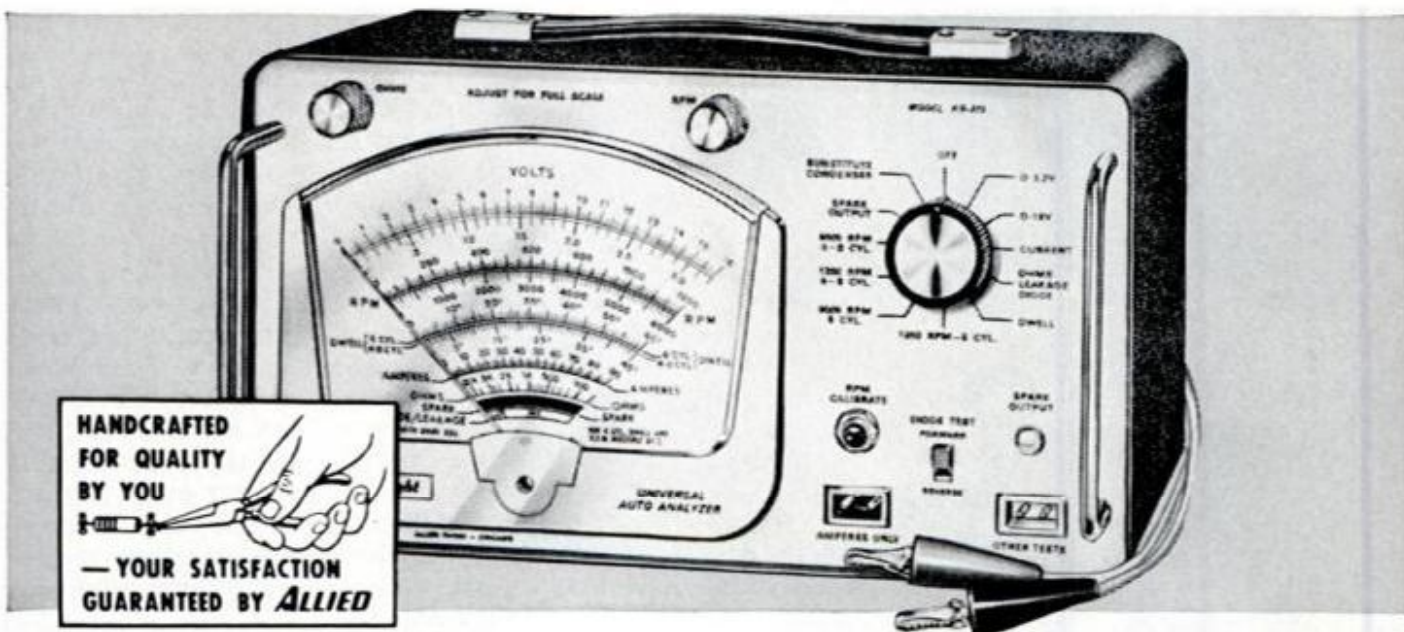
PM's Career Barometer Chart, above, gives the actual number of job openings listed with state employment agencies by various industries. They do not represent all jobs available, but relative demand is reflected. "Relative Demand" figures are true as of our closing date. Check this chart each month and it will tell you where your talents are needed, and how badly. For names of actual employers represented by these

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CAREER BAROMETER

(Continued from page 24)

your company's equipment. A third to half of all space equipment is built in California, although plants do this work in New York, Connecticut, Florida, Washington and other states.

Important in the aerospace field is, of course, NASA (National Aeronautics and Space Administration), the federal agency directly involved in developing the peaceful exploration of space. About 70 percent of its jobs are high level, many requiring advanced degrees. This leaves 30 percent of the jobs for technicians and craftsmen.

Most actual construction of space equipment is farmed out to a score of major contractors with plants nationwide. They subcontract work to literally thousands of smaller firms in every conceivable type of production. Among the major space contractors, nearly all aircraft producers, are Bendix, Boeing, Douglas, Dow Chemical, Grumman, Honeywell, Hughes, McDonnell, Lockheed, North American Aviation and TRW Inc. Hiring is usually local, so it is wise to contact plants near your home.

For general information about jobs and educational requirements in the space program, write Educational Programs Div., NASA Headquarters, Code FE, Washington, D.C. 20546.

The firms employ three types: scientists, engineers and technicians. The first two require advanced degrees, but there are plenty of openings for technicians.

Here are some things these support technicians do: tabulate readings from recording instruments, plot graphs, file and index blueprints, compile statistical data, write technical reports, read and interpret blueprints, make models and mock-ups. Other men cut and shape sheet metal, and do riveting, drilling, filing, soldering, cementing and gluing. Still others assemble, take apart and install mechanical and electronic subassemblies, work in laboratories or serve as math specialists. Some work as tool and die makers, or in foundries as patternmakers, molders or core-makers. Many are jig and fixture builders.

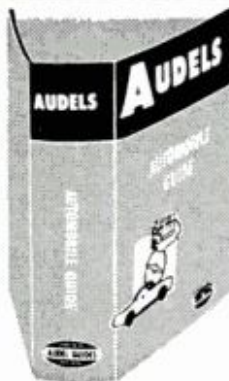
Employment in this field is expected to remain steady for the next decade, with several thousands of job opportunities available annually. Though technician jobs are provided chiefly by private manufacturers and NASA, there are openings in universities, the Air Force, Army and Navy for civilian employees.

A word about the draft: at this level, none of these jobs provide an exemption, so employers are inclined to look for men who are a little older or not likely to be called right away. ★ ★ ★

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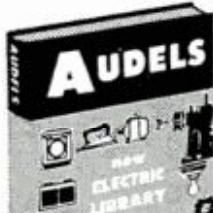


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DETROIT

LISTENING POST

ROBERT W. IRWIN

Ford won at Le Mans, months before the race. The GT Mark IIs which came in 1-2-3 at the 24-hour endurance race in France were built to run twice as long. The "design criteria" called for equipment to stand up under 48 hours of Le Mans-type racing, according to Ford Div. general manager Donald N. Frey. And, it did take that much punishment in laboratory tests at the company's engineering center in Dearborn. All the changes in gears and engine rpm in one tour of the 8.3-mile course were fed into a computer. So were the braking applications. The lap average was computed at 3:30, or more than 140 mph. The computer was hooked to test cell 17D in the Ford engine dynamometer building. One signal from the computer program controlled the accelerator, another the clutch, and a third actuated a mechanism to shift the gears. Every 3½ minutes the transmission went through 17 separate gear changes—first gear twice, second gear five times, third gear six times and fourth gear four times. The engine raced up and down from 2600 to 6200 rpm. The process was repeated in the Ford reliability lab, where the car's disc brakes were tested on a four-wheel brake dynamometer, only one in the industry. After describing this, Frey held up a black ring notebook like those sold by the millions to students. "It's all in here," he said. "How to organize and win at Le Mans. It's one of the most expensive notebooks I know of—and it's not for sale."

Computers are making more car design decisions. One played a major part in designing frames for the present Ford Bronco and future Thunderbird and Lincoln models. Another has been used to design automotive gears and hood hinges. The process is still being developed. And William McConnell, director of systems research of the Ford engineering staff, says "it's not too far fetched" to look for the time when computers will design and evaluate parts and automatically program machines to produce them. Called a "structural analysis system," it started when Ford's Philco subsidiary was given a government contract to analyze the makeup of a big radar antenna. Philco studied separate elements of the antenna by computer. Ford's automotive engineers thought they might be able to use it, too. "Car frames looked like one of the easiest ways to try it out and darned if it didn't work," McConnell said.

Eight basic frame configurations of the Bronco were run through the computer; the design that evolved through analytical procedures went into production. In fashioning a car part this way, McConnell explained, an engineer will develop "a tentative design of a frame, specifying what loads he expects it to withstand, and the computer will analyze materials and point out critical stress areas." If the engineer doesn't like the result, he can change the design and get another evaluation.

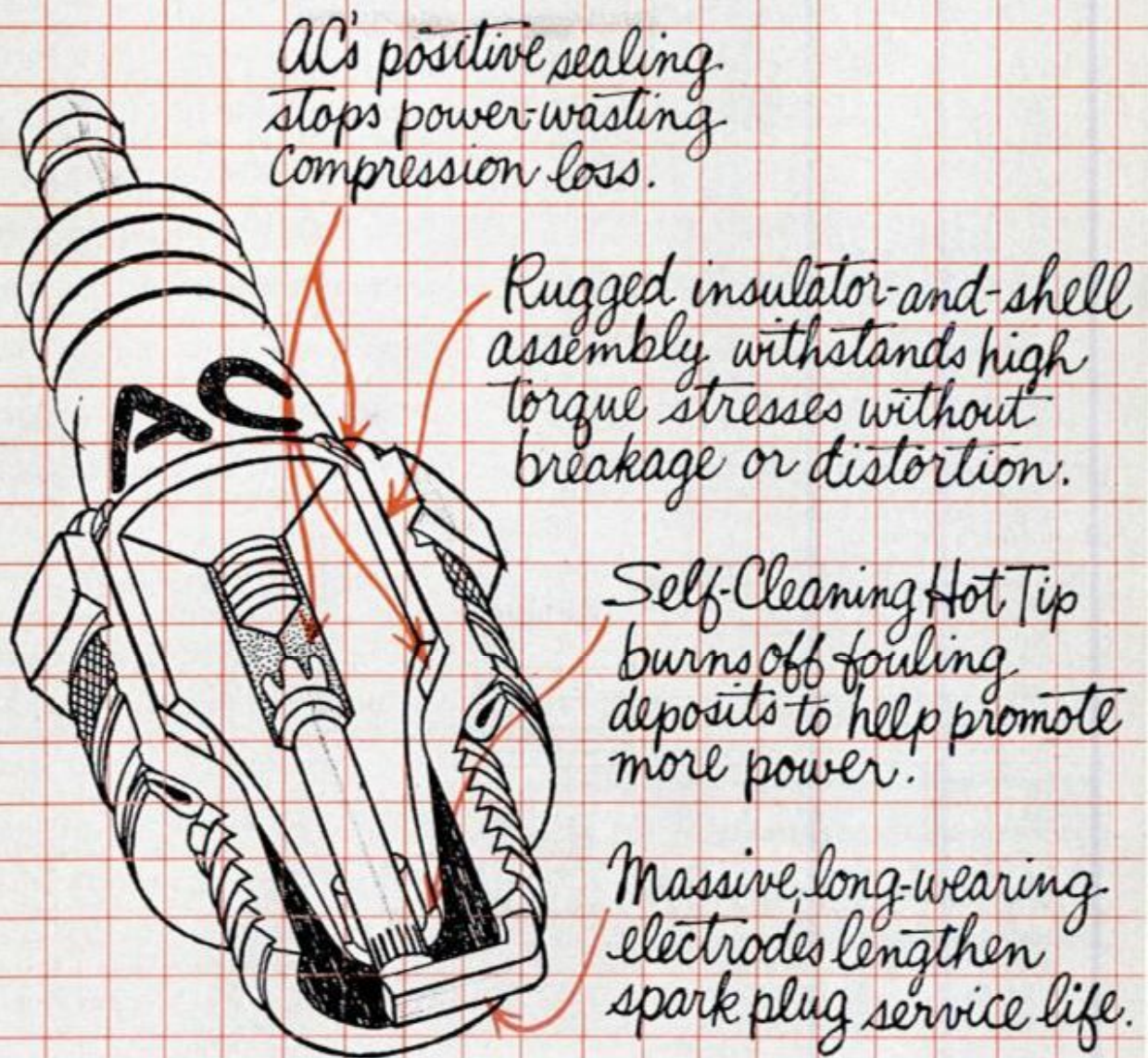
The computer, world's largest except for that used by the Department of Defense, is also being used to coordinate instrument panel work. By continually updating the computer, several design groups can work on the instrument panel area at one time, each aware of what the other is doing. This way, McConnell said, "you don't find out three months later that someone has put the steering column through the radio."

Travel-minded Americans are booming the camper vehicle business. Manufacturers expect to sell 100,000 truck-mounted camper units this year. By 1967 about 400,000 such units should be in use. A recent Chevrolet survey indicates the market could triple by 1970. It found that 60-65 percent of those owning tents will buy truck campers the next time they enter the market. Camper owners now take about ten trips a year, logging about 5000-10,000 miles over 30 days.

Chevy and other automakers supply the basic pickup truck or truck chassis; more than 200 other firms build the camper bodies. A good truck camper combination will

(Please turn to page 30)

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DETROIT LISTENING POST

(Continued from page 28)

cost at least \$4000. If you want to "buy up" to the "motor home" class, it's \$10,000 or more.

Motorized campers aren't new. Back in 1923, Chevy made a truck with a mobile camper mounted on the back. It was a tent designed to sleep two adults in comfort and to fold into the body of the truck when not in use. This principle has been widely adopted for camping trailers, while modern camper bodies have evolved into larger, plusher one-piece units.

Chevy's choice of the Camaro name for its new car was not unexpected, but raised some competitor eyebrows, anyway. "I think they've painted themselves into a corner with the tradition of starting their names with the letter C," one said. He thought Panther, the name popularly given the car during its development period, was better.

AMC vs. VW? American Motors has been dropping hints it may try to compete with Volkswagen in the small-car field. "We have to give the public cars that go beyond what the 'big three' gives them," says new AMC chairman, Robert B. Evans. "We have to offer something different and unique—and this will take time." Two of AMC's new idea cars—Cavalier and Vixen—take dead aim on the subcompact car market. Built on a 108-inch wheelbase, they're 175 inches long, 50 inches high and 65½ inches wide. Tooling costs could be cut more than 30 percent by using interchangeable parts. The left front fender can be swapped with the right rear and the right front with the left rear. In the same fashion, hood and deck lids and doors are interchangeable. Manufacturing costs would also be cut. The little Metropolitan, which AMC once sold in this country, had interchangeable inner panels but the outer skin was different.

That American Motors should enter the small-car field has considerable support within the company.

Evans notes that AMC, home of the compacts, had its greatest success before the "big three" entered the field in force, adding that it "relied too strongly on the compact after the 'big three' entered the market. As far back as 1960, the management should have found another product to put the company in the unique position that the compact had afforded it." But don't look for anything before 1968. In the meantime, Evans hopes the two AMC show cars plus the Cavalier-Vixen combo

(Please turn to page 32)

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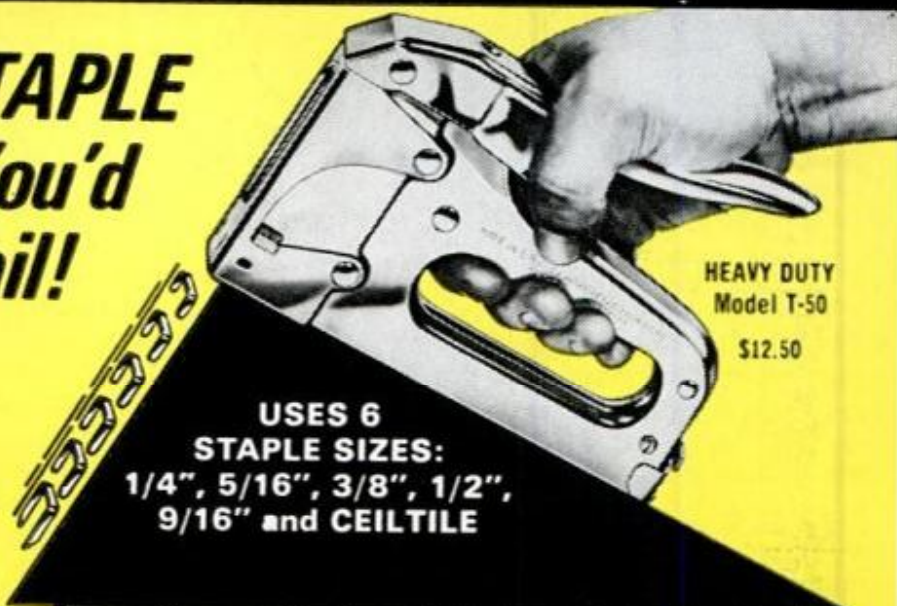
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DETROIT LISTENING POST

(Continued from page 30)

will help restore public confidence in AMC, where sales have sagged.

Which is the safer construction: Frame-body construction as in standard Fords and Chevys, or unitized construction as used for Fairlanes, Comets, Plymouths and Ramblers? The question was revived this summer when auto critic Ralph Nader quoted certain claims that frameless cars were not as safe as the other kind. Auto engineers deny there's any major difference. One said, "I don't feel one type is an advantage over the other." In a side impact, he explained, the bumper of one car would probably hit the sheet metal above the frame of the other car.

Traffic-accident research finds the auto industry open-minded. Engineers are seeking ways of building cars to absorb the energy of a crash and spare the driver. In one study, a capsule was filled with hollow steel balls and then smashed into concrete to see how it would crumple. Another study is trying to determine how to make an engine go under the car body in an accident—not through the firewall and into the passenger compartment. After one failure, a test car was radically modified to ensure the engine would slide under the body. Wheels were set out more than a foot from the body and steel plating was welded to the firewall behind the engine. Only the block was left in the engine compartment. With no interference and with no place else for the engine to go, it was felt the test would work. Needless to say, this is a long way from production. And this is just one of many tests undertaken almost weekly by the auto firms.

Another study involved fastening the frame to the body with plastic bolts connected to small explosive charges. In a front-end collision, the charges would blow the bolts, the body would separate from the frame and ride up over the engine. "We have people seriously looking at radical concepts," one auto man acknowledged. Don't expect to see anything as drastic as explosive bolts or capsules filled with hollow steel balls on cars in the near future. The best you can expect, according to an engineer who should know, is a 20-percent reduction in belt load, using standard frame-body construction. This means the force reaching the passenger would be one-fifth less than now on most cars. There are no magic solutions, despite what you might read to the contrary.

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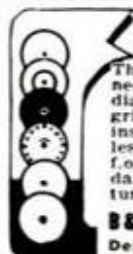
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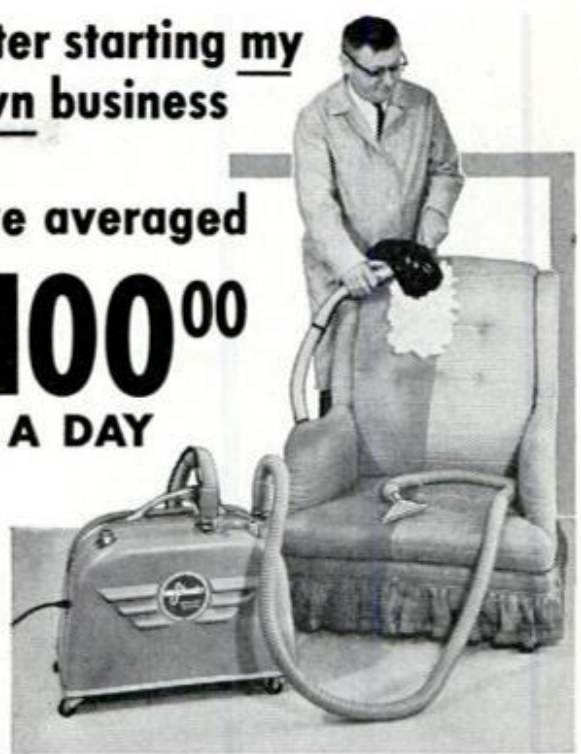
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BY MORT SCHULTZ

All cracked up

My 1961 Rambler has developed a small crack in its aluminum block. Is there any means of economical repair?—R. J. Huzak, Richmond, Va.

I checked with several machine shops and none would be willing to guarantee anything on this. In fact, few said they would be willing to tackle the job. The consensus seems to be that the possibility of an effective repair depends on where the crack is located. If it's in an open area where it can be drilled, tapped and plated, you may have success with the repair holding. However, if the crack's in a spot where there's a great concentration of heat, such as between cylinders, there will probably be some distortion and the repair won't hold.

Winter-weary VW

My '65 Volkswagen refuses to start when the temperature drops to around zero. Since winter will soon be here, I'm hoping you can give me some tips as to the causes of this balkiness. My mechanic has checked it and found nothing wrong.—Merlin Wilgers, Wichita, Kans.

There are five common reasons why a VW fails to start in cold weather. Here they are:

- **A weak battery.** It should be at least three-quarters charged and have no weak or dead cells.

- **The wrong oil in the crankcase.** For your area it should be SAE 10W. Use of a good additive such as STP will also help.

- **Ignition timing.** This must be set to specification.

- **Automatic choke.** To check if it's functioning properly, look at the choke while you have someone depress the gas pedal just once; it should click to the bottom of the ratchet. If it doesn't, it should be adjusted so that it does.

- **Improper cranking.** Are you starting the car properly? You should depress the gas pedal only once before cranking.

This one's dying to back up

The only thing wrong with my '57 DeSoto V8 with TorqueFlite transmission

is that the reverse gear won't engage without turning off the engine. What's wrong?—S. Sgt. J. M. Delgadillo, Brookley AFT, Ala.

Seems DeSoto had a bit of a problem with the blocker valve in the valve body of their TorqueFlite transmissions that year (it tended to stick). Before you submit your car to an expensive repair job, I suggest you replace this valve with a new one. Though DeSotos are no longer being made, TorqueFlite is; order the valve from any Chrysler parts dealer.

Where's my answer?

I sent a letter to Auto Clinic three weeks ago and thus far have received no answer. Why?—John Pedersen, Tacoma, Wash.

My sincere apologies to John and other readers with similar complaints. The truth is that Auto Clinic's mail load is so heavy that it sometimes causes delays. We're trying our very best to reply promptly to each letter. Beyond this, we can only beg your indulgence and ask that you please bear with us.

Brake adjustment—Florida style

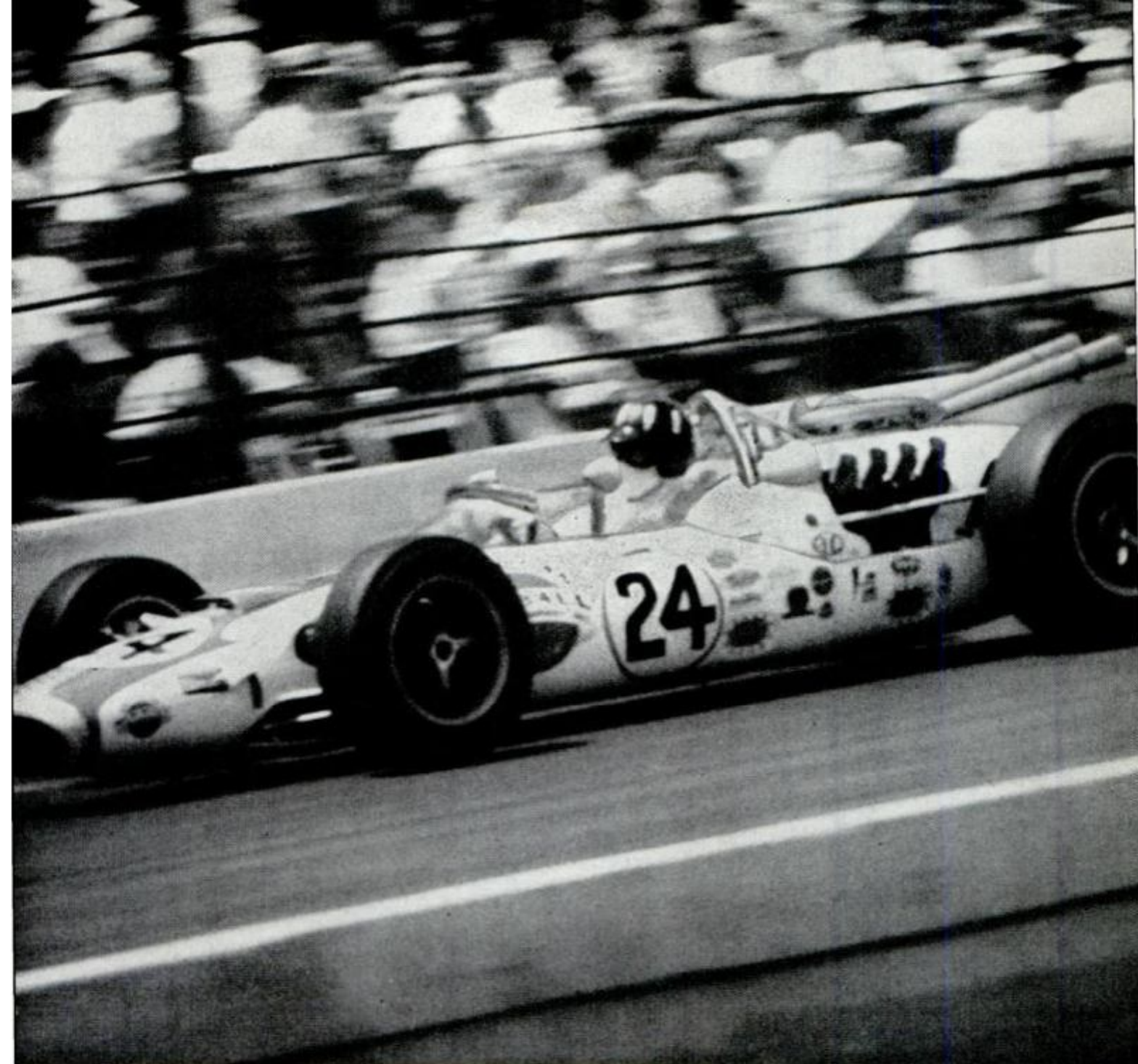
Here are a couple questions concerning my 1965 Ford Fairlane 500:

1. *During servicing recently, a mechanic "adjusted" my emergency brake by engaging the emergency brake, stomping the foot brake and revving hell out of the engine. When I got angry at this he told me it was a common practice with mechanics to "stretch the cable." Is it?*

2. *My automatic choke operates for the full distance I drive to work (about one mile). This causes fast idle. Can something be done to shut off the choke sooner?—Bob Boynton, Fort Pierce, Fla.*

Maybe that's the way they adjust emergency brakes in Florida, Bob, but I've never heard of it and neither have any of the mechanics in my area. I'd be happy to hear from any others in the Auto Clinic audience who are familiar with this "method."

(Please turn to page 38)



For the 33rd time, Champions spark the winner at the Indianapolis 500. This year it was the Mecom American Red Ball Special.

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(Continued from page 36)

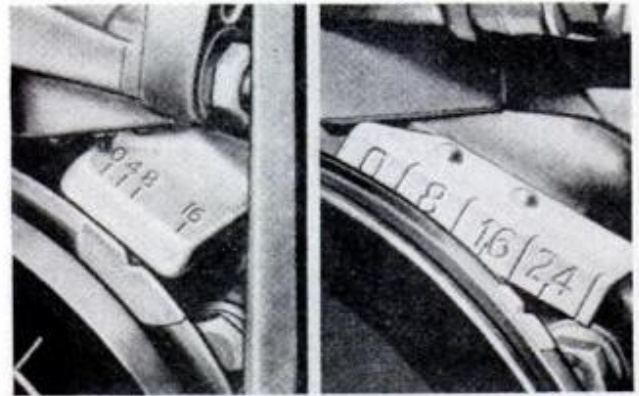
As for that automatic choke problem, you can get the choke to open sooner by rerouting the heater hose nearer the choke housing to concentrate more heat on the choke thermostatic spring. A bracket for this job is available from your Ford dealer.

Timing Corvairs

I have a 1965 Corvair with a 110-hp engine, and equipped with airconditioning. I've always set the ignition timing at 14° BTDC. My buddy, who has an identical car, sets his timing at 24° BTDC and insists that's the correct specification. Who's right?—Lloyd Baxter, Los Angeles.

Probably you're both right. There were two types of engines fitted in these cars. A so-called *2nd Design* engine was installed in the later model '65 Corvairs and superseded a *1st Design* engine that

went in the earlier models of that year. While these engines are identical in every other respect, we can assume that a minor change was made in the distributor.



1st Design (14°)
Ignition Timing

2nd Design (24°)
Ignition Timing

The 1st Design engine takes a 14° timing setting, the 2nd Design engine a 24° setting. You can tell which engine by noting the timing mark plate (see drawing).

Service Tips

- **Pontiac dealers have gotten the word** that some Turbo Hydra-Matic transmissions installed in the 1965 and 1966 models could be heading for trouble. A manual shaft with a single O-ring seal was used in these, and investigation by Pontiac has shown that this shaft can corrode or be damaged by dirt. This has caused some shafts to bind in the bore. Have a manual shaft rubber shield (Part No. 8624975) installed. Pontiac Service News No. 2 (April '66) gave your dealer the poop on this job.

- **Some owners of Ramblers** with 199 and 232 CID six-cylinder engines have complained about a rattling noise during acceleration. The trouble has often been traced to the manifold heat-valve assembly. There's an antifriction spring kit available at your Rambler dealer's for silencing the thing. Consisting of a spring anchor bracket, the kit hooks between the manifold and valve shaft to quiet the rattling heat valve.

- **Are strange noises** coming from the front suspension of your Dodge when making full wheel turns, during a U-turn or a 90° driveway approach? Any model from 1957 through 1964 can produce them.

Since 1957, Dodge has had front-wheel full-turn restriction created by contact between the knuckle arm and the lower control arm (or strut). Motion between these surfaces on extreme wheel turns can cause grunts and groans when the surfaces get rough or corroded. You must eliminate any roughness on the two contact surfaces by filing or buffing them until smooth. Follow with a lubing of water-resistant grease.

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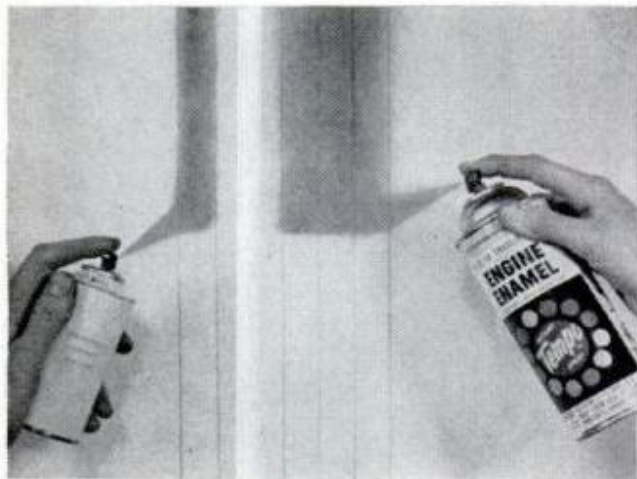
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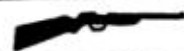
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OFFSET Printing. 500 8½ x 11's, \$4.50 Postpaid. 24-hour service. Cisco's, Atlanta, Illinois 61723.

QUALITY Printed business envelopes. Wholesale prices! Samples. Stetson's, Wiscasset, Maine 04578.

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FREE Booklet—"Secrets of Cutting Printing Cost". Cisco's, Atlanta, Illinois 61723.

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SEND Us your ideas or samples for quotation. Lyle Printing Co., Box 38, Salem, Ohio 44460.

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Clean because every "golden" bullet is coated with a specially formulated high-temperature lubricant. Unlike ordinary grease-coated bullets, it shuns dirt, grit and lint like the plague. Prevents these particles from reaching your gun to cause a jam or misfire.

So every "golden" bullet goes into your chamber clean, sizzles out of your

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We originally developed the clean 22 to make 22 automatics feed smoother and surer. (Which it does in fine style.) But you'll also find that a Remington "Hi-Speed" with its "golden" bullet is powerful medicine in any action.

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life of your barrel.

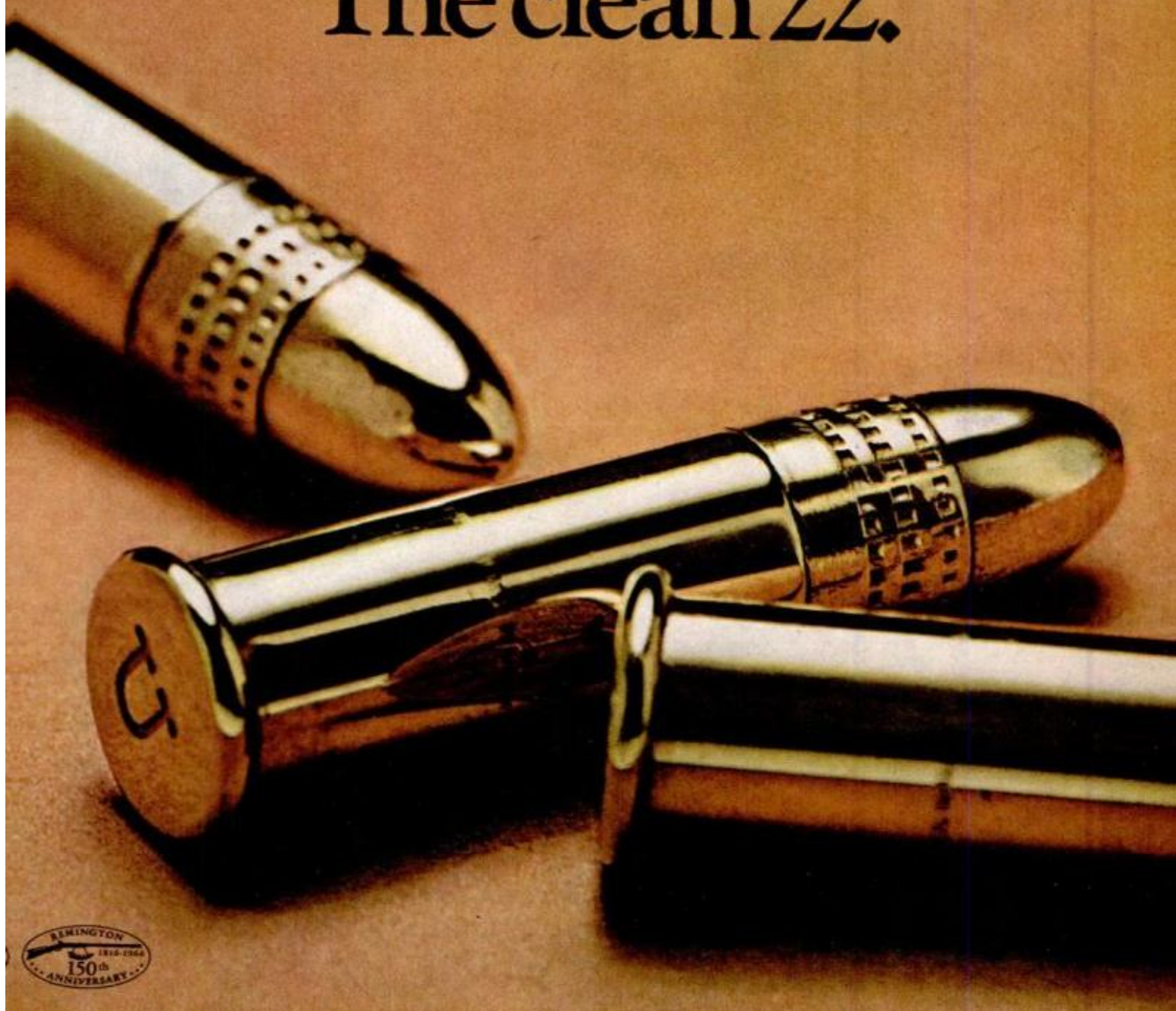
All for the same price as ordinary grease-coated 22's.

You can call these remarkable rim-fire cartridges clean 22's. Or dry 22's. Or "Hi-Speed" 22's. Or "golden" bullet 22's. But call for them at your Remington dealer's. In shorts, longs or long rifles, solid or hollow point.

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Remington 

The clean 22.





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... gets identified in seconds with a new, completely automatic BVI Electric Pencil. It lets you engrave your name or other information on metal, wood or plastic surfaces as easily as you write with a regular pencil.

BVI Electric writing is clean. Permanent, too. Can't be smeared, erased or rubbed off. Durable steel point vibrates at 7200 strokes a minute. Adjustable knob lets you change the length of your stroke or the width of your line.

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* *Manufacturers of electric marking devices and paint sprayers*

BY KEVIN V. BROWN

AVIATION

JETSTREAM

World records are hard to establish sometimes, but you have to start somewhere.

Dorothy Reeves is a California teen-ager who admits to being a tomboy. Recently she and her family visited Cone Peak, 5100 feet up in Los Padres National Forest where she launched a bagful of five-cent balsa gliders. She wrote her name and address on some of them, and, because it was a calm day, she could watch them



DOROTHY REEVES, world-champion glider thrower

soar in the thermals for as much as 10 or 15 minutes before they disappeared.

That would have been the end of it except that three days later she got a letter from a Charles Van Dyke of Salinas, Calif., who said he saw one of her gliders float to earth in front of his house. It was the day after the glider was launched and Salinas is 50 miles from Cone Peak.

No almanac carries distance records for five-cent toy gliders, but Dorothy Reeves of Oakland, Calif., may be a world champion. She had better look to her laurels, however. At last report, her young brother was writing notes, sealing them in bottles and throwing the bottles in the Pacific ocean to see how far they would float.

What's the record for floating bottles?

Hot flights! If supersonic transports go into regular service—say 400 of them flying four flights daily—they will raise the average surface temperature of the earth, according to a University of California professor. The heavy burning of fuels is the cause, he says. How much hotter will we be? Oh, about four-tenths of a degree.



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Aluminum Siding rewards you in leisure, in savings, in beauty. Baked-on color saves so much on painting alone that it *practically pays for itself!* In addition, you save on repairs—because this siding can never rust, warp or rot. Get the facts on this important investment that comes back to you in savings and adds substantially to the value of your home.

Reynolds Metals Company does not make siding, but does supply quality aluminum sheet to the leading Siding Manufacturers. The "Mark of Quality" seal shown below identifies these manufacturers and their dealers in the Yellow Pages. The emblem appears on many brands of finished siding. Look for it as a "Mark of Quality" in the basic material—Reynolds Aluminum.



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See 'Jeep' vehicles in action on "World Series of Golf," September 10-11, NBC-TV Network.



Go 'Jeep' V-6

(It's really fun!)



Throw it in gear. And take off! It's really fun for the whole family. There's new V-6 power pulling for you, 160 horses strong. You'll think you've got wings—that's why we call it the Flying 'Jeep' Universal! With that solid build 'Jeep' vehicles are famous for, you ride relaxed—with assurance. 'Jeep' 4-wheel drive helps you stay safely in control when rain, ice, or snow make driving treacherous. That same extra

traction gets you into the back country, where it's rough and rugged. Choose the jaunty 'Jeep' Tuxedo Park Mark IV (shown), or the familiar 'Universal'. Both with V-6 engine or world-famous 'Hurricane' 4...bucket seats...81" or 101" wheelbases...tops, colors galore...special equipment. You've got to drive it to believe it! See your 'Jeep' dealer. Check the Yellow Pages. **KAISER Jeep CORPORATION**
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The Flying 'Jeep' Universal with 4-wheel drive

'Confessions' of a car salesman

Double-talk, model-confusion, accessory pricing are all in the can of worms used by sharp showroom peddlers to catch car-buying fish, but it's a two-way street, says this reporter who sold cars to find out

By RONALD G. SHAFER*



OCCASIONALLY A "BAREFOOTED PILGRIM", as the trade calls him, walks in prepared to pay the "sticker price" for a car

WE CAN PUT YOU IN A NEW CAPRICE with all the equipment you want for only \$2846."

The offer came from Big John, a husky Chevrolet salesman, after several minutes of pencil scribbling and adding-machine calculating.

The prospective buyer reached into his pocket and whipped out a handwritten list of dealer wholesale prices.

"That's too much. I figure this car cost you only \$2643," he said to the dumbfounded salesman. "We'll concede you \$100 profit, not \$200, and maybe we can beat that at another dealer."

*Ronald G. Shafer recently spent two weeks as an automobile salesman in a large city. This account of his experience is condensed from the Wall Street Journal, for which he is a staff reporter.

The Wall Street Journal (June 13, 1966). © 1966 Dow Jones & Company

'Confessions' of a car salesman

Such a scene increasingly is taking place at the nation's 33,000 new-car dealerships. And to most auto buyers, the "heavy" in the drama is the car salesman.

But there's another side to the story: I saw it by spending two weeks recently at a Chevrolet dealership in a major city. Like the typical auto salesman, I put in 50 to 68 hours a week, sat in on deals and listened patiently to the questioning, haggling and two-fisted horse trading of today's car buyers.

It was an eye-opening experience, leaving these impressions:

For one thing, it's much more of a buyer's market than most people think. Even before the recent auto sales decline, which has aggravated the salesman's problem, car shoppers seemed to have the upper hand. Reason: Most are repeat customers, many of them veterans of "deals" they later regretted; now they are more knowledgeable, partly because of "how-to-buy" articles and booklets available at newsstands that provide, among other things, wholesale price lists.

Second, I discovered that today's customer often will order, say, a \$300 air-conditioner without haggling. But a total car price that is maybe only \$10 above what he had in mind can kill the whole transaction. And the more affluent the buyer, the tougher he usually bargains.

Third, despite all the talk about auto safety, I observed surprisingly little con-



WITH A "MOOCH" the battle is short. One grizzled buyer offered cash for a take-it-or-leave-it price

cern on the part of serious shoppers. In fact, most of the safety-related questions I heard were about tires, not the car. Of the few shoppers who did raise safety questions, none appeared to consider it an important factor in deciding whether to buy.

There was more showroom talk about financing. The salesmen tried hard to get customers to buy on credit, even if they could afford to pay cash. This is because credit provides a key source of a salesman's profit. He can increase his profit on a sale by as much as 40 percent by persuading a customer to finance his purchase through the dealership, rather than paying cash.

I learned too that auto salesmen have more flexibility than is readily apparent. Though the sales manager must approve a "close" deal, the salesman often has up to an \$800 trading margin between dealer cost and the factory suggested price of a car. In a sense, the salesman conducts an auction, getting the best deal he can.

Finally, I came away with a fresh sympathy for the car buyer. "The buyer can get so caught up in price and models and bounced around from dealer to dealer with figures, misquotes and double-talk



THE PROSPECTIVE BUYER whipped out a list of wholesale prices and conceded the dealer a \$100 profit

that he doesn't know what he's doing," a soft-spoken salesman of 42 admits.

How do buyers choose a car today? The majority of our customers had their minds made up on Chevrolet when they walked into our showroom. We didn't compete with Ford or Plymouth, but with the other Chevy dealers in our area. As one salesman put it, the buyers parade from dealer to dealer "like Armenian rug peddlers," collecting competitive prices at each stop.

When a customer walks into a dealership, the scene unfolds something like this: The nearest salesman quickly descends upon the visitor and "takes his temperature." That is, through seemingly normal conversation, he finds out if the prospect is a buyer or a "mooch" (a price shopper); whether he plans to pay cash or will finance, and if he has a trade-in.

Once the salesman has thus sized up his prospect, and given him a chance to look at the showroom cars, the action moves to his office—a partially glass-enclosed cubbyhole at the side of the display floor. Now the battle begins.

With a "mooch," the battle is usually short. "Just tell me how much this Corvette will cost. Don't give me any of that stuff about service—price is everything to me, and I have more stops to make," ordered a doctor, shopping for a \$5000 car for his son.

One burly, unshaven man in his forties, who stopped by for his third haggling session with Bob, our top salesman, said: "What's your price on this Impala? I'm



"SCHLOCK DEALERS" still open their doors each day looking for buyers they can take. But they are fading

SEPTEMBER 1966



IT'S EASY TO SELL A WOMAN—somewhere along the line make sure to compliment her. It never fails

going to pay cash if we can get together."

"Well, we have a contest on right now, so I can deal closer than usual. I'll sell you the car with this equipment for only \$2552, plus \$200 for your old clunker," replied Bob.

"I've got you beat by \$20."

"With this equipment? I can't believe it. And remember we can give you immediate delivery," said Bob.

"Hmm. Wait a minute," the customer said. "I'm not sure about those tires. What will it cost me to get heavier ones?"

"Let's see. I can give you those at our cost, only \$44 extra. And if you let me write up your order tonight, I'll drop my price to \$2525 plus the \$44."

"Tell you what," countered the buyer, pounding his fist on Bob's desk. "Take off \$10 and you got a deal. Take it or leave it."

"You mean you were ready to pay \$2515 in cash and you'd walk out for \$10?"

"\$10 or \$10,000. It don't make no difference. Want my deal?"

"You drive a hard bargain. But I'll take it," conceded Bob, after a thoughtful stare at the ceiling.

Actually, Bob wasn't quite as upset as

[\(Please turn to page 216\)](#)

Just point 'er in and

No matter how tight the squeeze, this amazing new

IT PROMISES to end the fender-bashing technique of parking by ear and make it easier to park a Caddy than a Mini. It is the "Sidler," which will be shown for the first time in the United States at the Inventors Show, N.Y. Coliseum, September 9 through 18. Basically,

what Sidler does is allow the rear end of an automobile to be driven sideways in to the curb while the front wheels remain stationary.

Invented by Archie Butterworth, British engineer and former racing driver, the "Sidler" really negotiates a tight squeeze



THE "IMPOSSIBLE" IN CAR PARKING is not only possible but downright easy when car is equipped with a "Sidler." Nose into a parking space, pull a knob and—presto!—the car's rear end rises and swings over to curb



SIDWAYS PARKING depends on fluted wheel-driven rollers which press against inner side of rear tires and act as bevel gears. Rollers turn driving direction 90 degrees. Low gear swings rear to left; reverse, to right

push the button By M. J. PEDERSEN

car 'Sidler' will swing your tail in snug against the curb

like a shoehorn, reports Mike Priestley, PM's correspondent in Britain.

Priestley watched a demonstration of the device, and gave this explanation of how it works:

All you do is nose the car's front end into a parking space scarcely bigger than

the car's length. Pulling a control knob activates two hydraulic rams which are powered by a small engine-driven pump. The rams lower two specially shaped rollers whose two main features are a fluted outer rim and an annular polyurethane tread. When the treads touch the ground, the force applied by the rams jacks the automobile's rear wheels slightly clear of the road.

At the same time, the fluted outer rims of the twin rollers engage the tires, acting as bevel gears. They are driven by the rear tires which, as usual, are powered by the car's engine. Shifting into reverse gear swings the rear to the right; low gear, to the left.

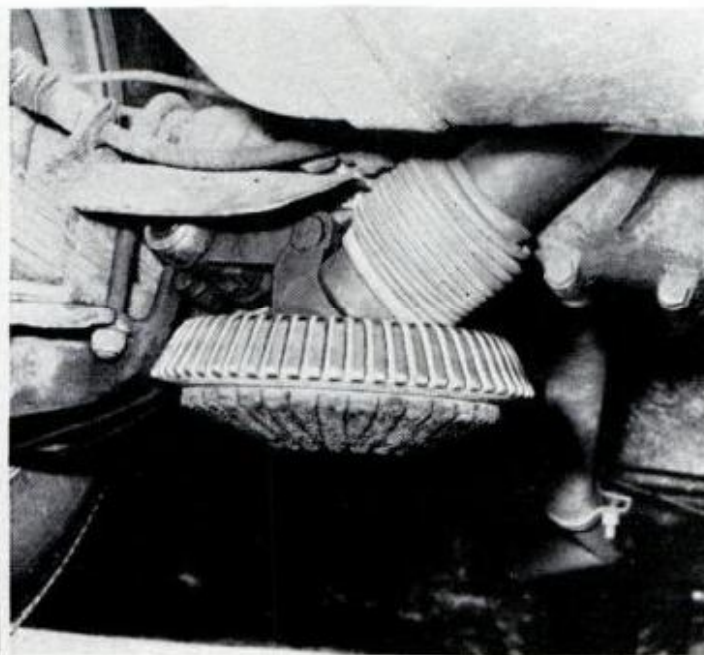
After entering or leaving a parking space, the control knob is reset in its "off" position, and the whole apparatus—rams and rollers—retracts.

Though the pictures show the Sidler bolted to the rear axle, a later design locates it forward of the rear axle, attached to the underside of the body—in order to hold unsprung weight to a minimum.

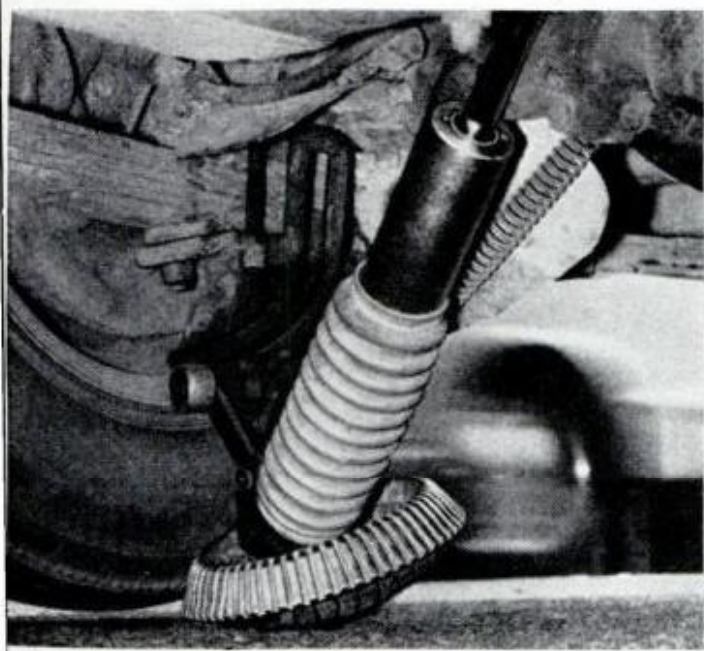
For front-wheel-drive vehicles, from Minis to heavy semi-trailer trucks, Butterworth has designed a modified version of the Sidler unit, utilizing small retractable road wheels instead of rollers and involving a slightly different parking technique. Now, instead of driving the front end all the way in to the curb, the driver stops two or three feet short of the vehicle in front, engages the Sidler (which raises the back end as before), and then drives forward again. This last movement swings the rear end in to the curb.

Butterworth sees his invention as an invaluable urban driving aid, technically and commercially viable, and virtually maintenance-free. He claims there is no measurable wear either on the tires or the fluted aluminum outer rims. The only part that might need to be replaced is the polyurethane tread, which could be exchanged for an inexpensive retreaded one.

On a limited production run, Sidler would sell for about \$200. In quantity would price it around \$140—placing it in the optional-equipment market. ★ ★ ★



FLUTED ROLLER engages each rear wheel. Left roller is shown in retracted position, bolted to rear axle



HYDRAULIC RAMS lower beveled rollers, jacking rear wheels off ground to enable sideways drive to curb

New Tools for Surgery: Searing Heat and Deep Frost

Probes cooled to minus 300° F. are knocking out tumors and diseased brain cells. White-hot laser beams are "cooking" cancers and "welding" damaged retinas. And now medicine looks to the plasma arc—which burns hotter than the sun—as a superscalpel

By James R. Berry

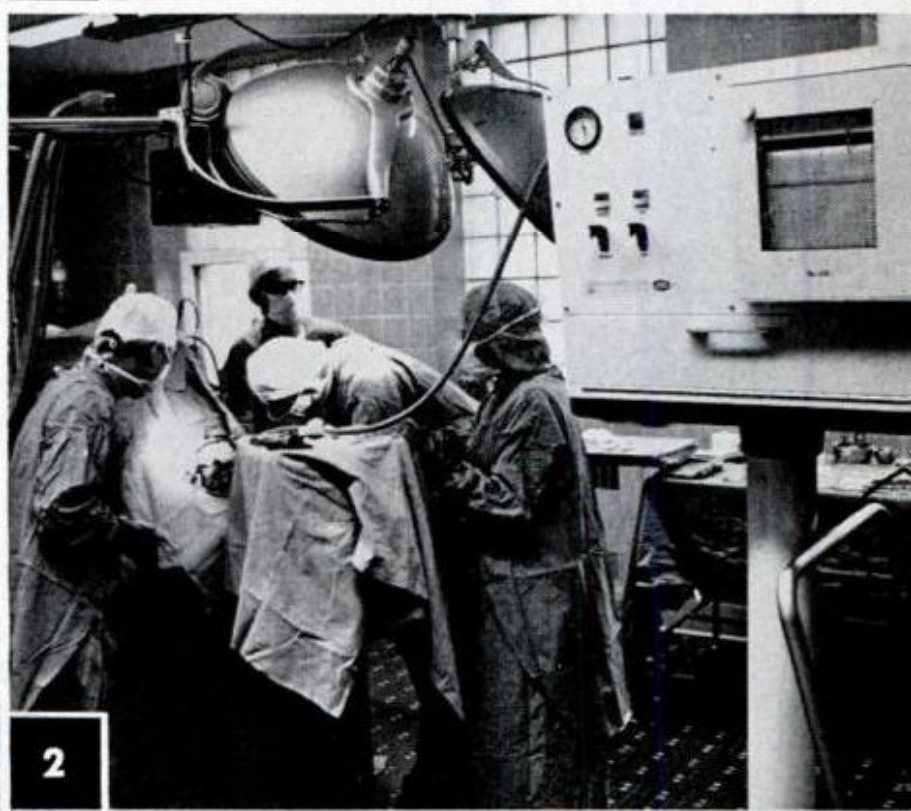
TUMOR IS TURNED into an ice ball in operation shown above. Cryoprobe in surgeon's hand can solidify tissues at temperatures as low as minus 300° F.

TWO of man's traditional foes—extreme heat and extreme cold—are fast becoming important friends. Medical researchers are learning how to tame temperatures colder than the dark side of outermost planets and hotter than the sun's surface. And, although the therapeutic use of heat and cold has only recently begun to be seriously explored, some amazing results have been achieved. Dozens of new operations, treatments and medical devices based on either low or high temperatures are now used for man's welfare. Other developments, equally impressive, are nearing perfection.

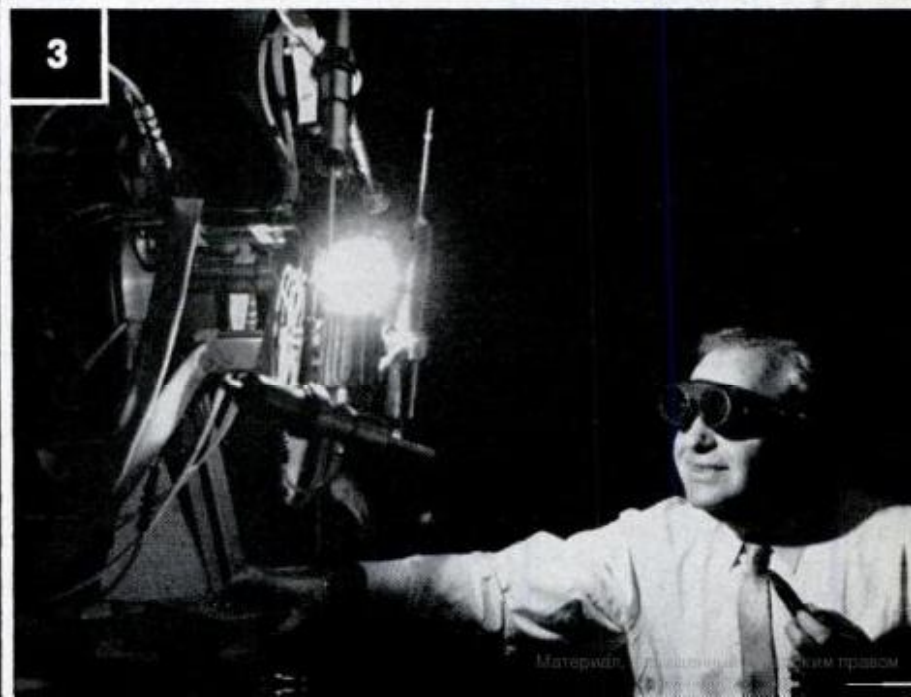
Take the plasma arc scalpel, for example. Since man's first crude operations with a stone knife, bleeding has been a major surgical problem. "Today, surgeons spend up to 85 percent of their time keeping a patient from bleeding to death," says Dr. Robert Shaw, staff surgeon at San Francisco's Presbyterian Medical Center. The difficulty is especially severe with blood-rich organs like the liver, pancreas and spleen. Often, age or disease has so



1



2

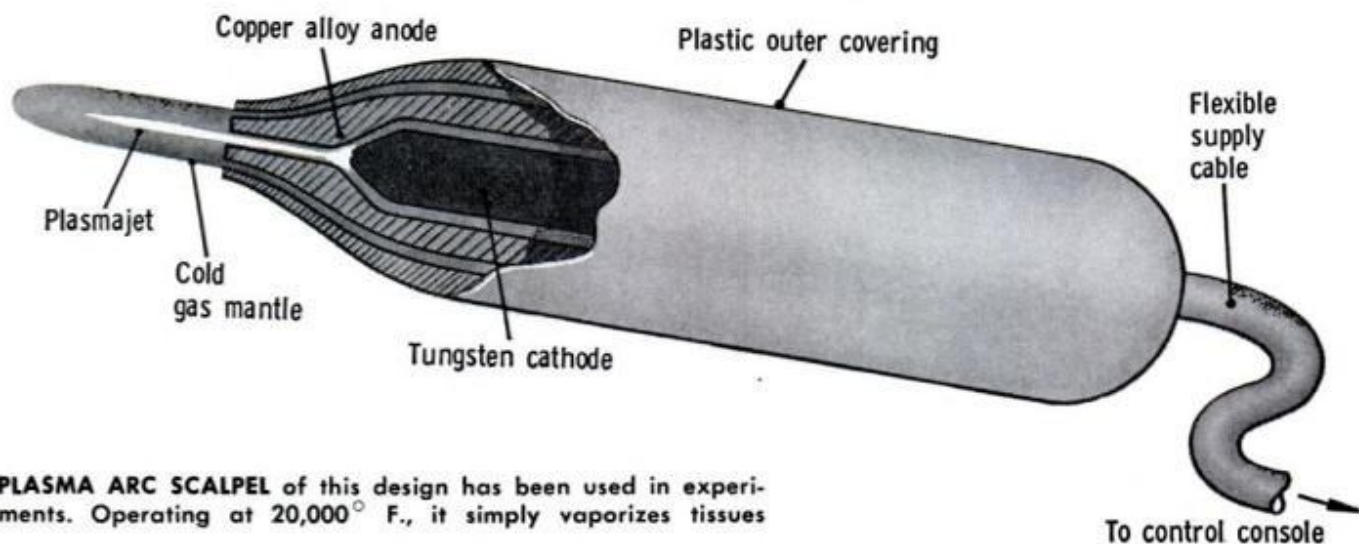


3

1. **CRYOPROBE** has proved especially useful in removal of cataracts. Unlike conventional instruments, the probe does little damage to the eye's lens membrane

2. **WHILE SURGICAL TEAM** concentrates on the patient, instrument atop pedestal automatically monitors the temperatures of the probe and the tissue around it

3. **HOTTER THAN SUN'S SURFACE**, plasma jet was a laboratory phenomenon with a lot of potential. Now scientists are developing it as a superscalpel



PLASMA ARC SCALPEL of this design has been used in experiments. Operating at 20,000° F., it simply vaporizes tissues

weakened a patient that his doctors won't risk prolonged hemorrhage, even though surgery might extend life.

A solution to this problem now seems near—and it does away with the traditional knife. Dr. Shaw, along with Columbia University physicist Dr. Charles Sheer, is perfecting a scalpel that cuts with a searing jet of plasma—a gas so furiously hot that electrons are ripped loose from its atoms.

Work on the plasma scalpel began a few years ago when the two researchers thought of using a miniature blowtorch to cut tissue, which is roughly 80 percent water. A thin flame, they reasoned, would vaporize the water, disintegrate the solid matter, and cauterize the two sides of the incision. Though the idea was sound, it didn't work.

For one thing, some of the gases they used for fuel proved toxic to tissue. When Sheer and Shaw used a nontoxic fuel, oxyhydrogen, the flame cut too wide a line and charred healthy tissue. In addition, the tiny flame front cooled slightly on touching the skin, didn't vaporize solid matter quickly or evenly enough.

Then the two men thought of another fuel: plasma, the hottest stuff found in the universe. Its advantages:

- Heat isn't developed by chemical combustion, but by exciting a gas until the electrons strip from their nuclei. Since a chemically inert gas such as argon or helium can be used, there's no chance of contaminating an incision.

- Even a small generator can create plasma with a temperature of 20,000° F.—twice as hot as the sun's surface and hot enough to vaporize living tissues instantaneously.

- Plasma acts like a gas and can flow

at high speeds. Vaporized matter is swept away by the plasma stream so quickly that heat isn't conducted to tissues beyond the incision. The cut is cauterized, but nearby tissue isn't charred.

At the time the research team hit on the idea, the smallest plasma generator available weighed four pounds, hardly an instrument for delicate surgery. With a grant from the John A. Hartford Foundation, the two men began work on a smaller model, Dr. Sheer taking over the engineering end and Dr. Shaw handling the medical aspects.

The result resembles a ballpoint pen. Inside, a copper alloy element surrounds a tapering core of tungsten. A narrow space between the two metals serves as a channel for the gas, which exits at the narrow end. An electric current through the two metals sparks an electric arc near the instrument's pointed tip. As the gas passes through this arc, it's transformed into plasma. To prevent the tip from melting, a jet of cool gas passes through separate channels and sprays over the nozzle. As a bonus, this gas exits from the tip and surrounds the needle point of plasma with a cool mantle, helping to arrest charring.

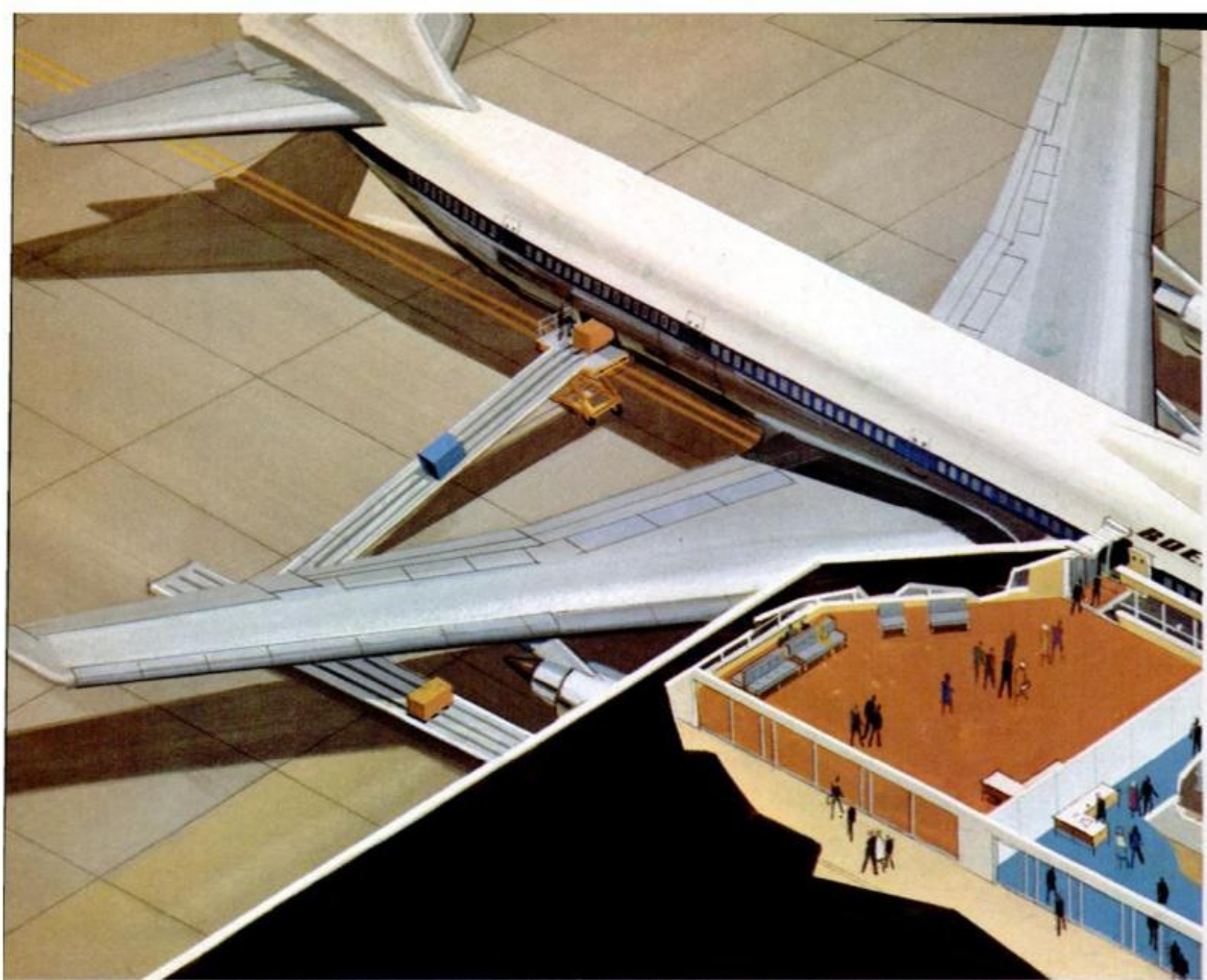
In operations on animals, the plasma scalpel has performed perfectly, making bloodless incisions no wider than a pencil line. Right now, Sheer and Shaw are perfecting the instrument's design.

Another of science's hottest gadgets is the laser, which produces an intense, crystalline-pure beam of coherent light.

(Please turn to page 224)

ZAP! LASER BEAM flashes into a tumor on hamster (right) in test at Boston hospital. Quick burst of energy causes many tumors to disappear within month





500 eggs in one basket

A revolutionary new era in air travel is only three years away. Then the first of the jumbo jets — with more than twice the capacity of present planes — will go into service. And even bigger “flying hotels” are in the works!

By THOMAS E. STIMSON

THEY'RE CALLING IT the “Boeing Hilton,” unofficially, because this enormous, new airliner will be able to carry 490 people, the capacity of a good-sized hotel.

There's room on board for private state-rooms plus a big lounge up forward. “Economy” seats will be large and luxurious. If an airline desires, the builder will

install a separate motion picture area and even a special playroom for children!

And here's the big surprise: Other builders are saying that Boeing's jumbo jets *aren't large enough!* Douglas is thinking about a 550-passenger DC-10 and Lockheed is talking about a gigantic L-500 that could carry from 750 to 900 passengers. Lockheed says its plane could fly





TO SPEED BOARDING, 490-passenger Boeing will require four waiting rooms, each with entrance to airliner. Speedy conveyors will carry aboard all baggage



SEATING CONFIGURATION for Boeing 747 calls for 9 or 10 abreast, but individual seats will be 10 percent wider than those currently used in the "economy" class



CONTAINERIZED CARGO in 10-foot-long boxes will roll on at rate of 100 tons—plane's capacity—in under 10 minutes. There will be both nose and side loading



HELICOPTER, MISSILE, TANK, JEEPS—typical cargo is shown aboard model of Lockheed C-5A. In commercial version, this plane could carry 750 to 900 passengers

you coast to coast for the price of a bus ticket, and make a profit. Or carry cargo at truck rates.

Pan American has ordered 23 of the new Boeing 747 airliners, plus a couple of cargo craft, and will put them into service beginning in three years.

In spite of their great size and weight, the new airliners will climb out faster than

the present jet transports. They will operate from existing runways. They will be able to fly higher, yet will be so sturdy that the present emergency oxygen systems for passengers may not be required.

They will be completely self-contained, with their own auxiliary powerplants to handle electrical requirements while on

(Please turn to page 192)

LILLIPUTIAN GOLF SET has a power driver that shoots the miniature ball variable distances up to 125 feet and requires skill and technique similar to its full-size counterpart. (Further details on this hobby-sport appear on page 77)



BETTER MOUSETRAPS

Here are just a few of the gadgets, the gimmicks, the far-out ideas that'll be unveiled at the International Inventors Show this month

By M. J. PEDERSEN
PM's Inventions Editor

THIS MONTH America will be hit by the grandest, most eye-boggling group of UFOs ever to set down in one place at one time. Ranging from the kooky to the brilliant, they are all UFO—that is, Unbelievably Fantastic Objects—and all will be on display at the New York Coliseum from Sept. 9 through 18.

Gawkers will behold a stepladder that contorts itself every which way; a parking garage that spews forth cars with nary a human touch; an aural recorder that records onto paper instead of tape; a water-sensitive alarm for use on a bed-wetter's mattress. There's a submarine that flies, a car that braves the water, and a car that parks sideways (page 62). Other items appear on following pages.

In short, from the looks of things at the *2nd International Inventors and New Products Exhibition* there's scarcely a material human need not considered.

Along with this fantasia of inventions is a flurry of activity that somehow fuses the fun-and-games atmosphere of a carnival to the wheeling-and-dealing element of an Arab bazaar. Like carnival masters, inventors delight gaping spectators with their "routines"—contrary to the usual image of an inventor as a man long on thought and short on talk. Though this may be the case in lab or by workbench, once he's taken up "residence" in the exhibition hall, he's transformed into a topnotch performer who avidly demonstrates the marvels of his brainchild.

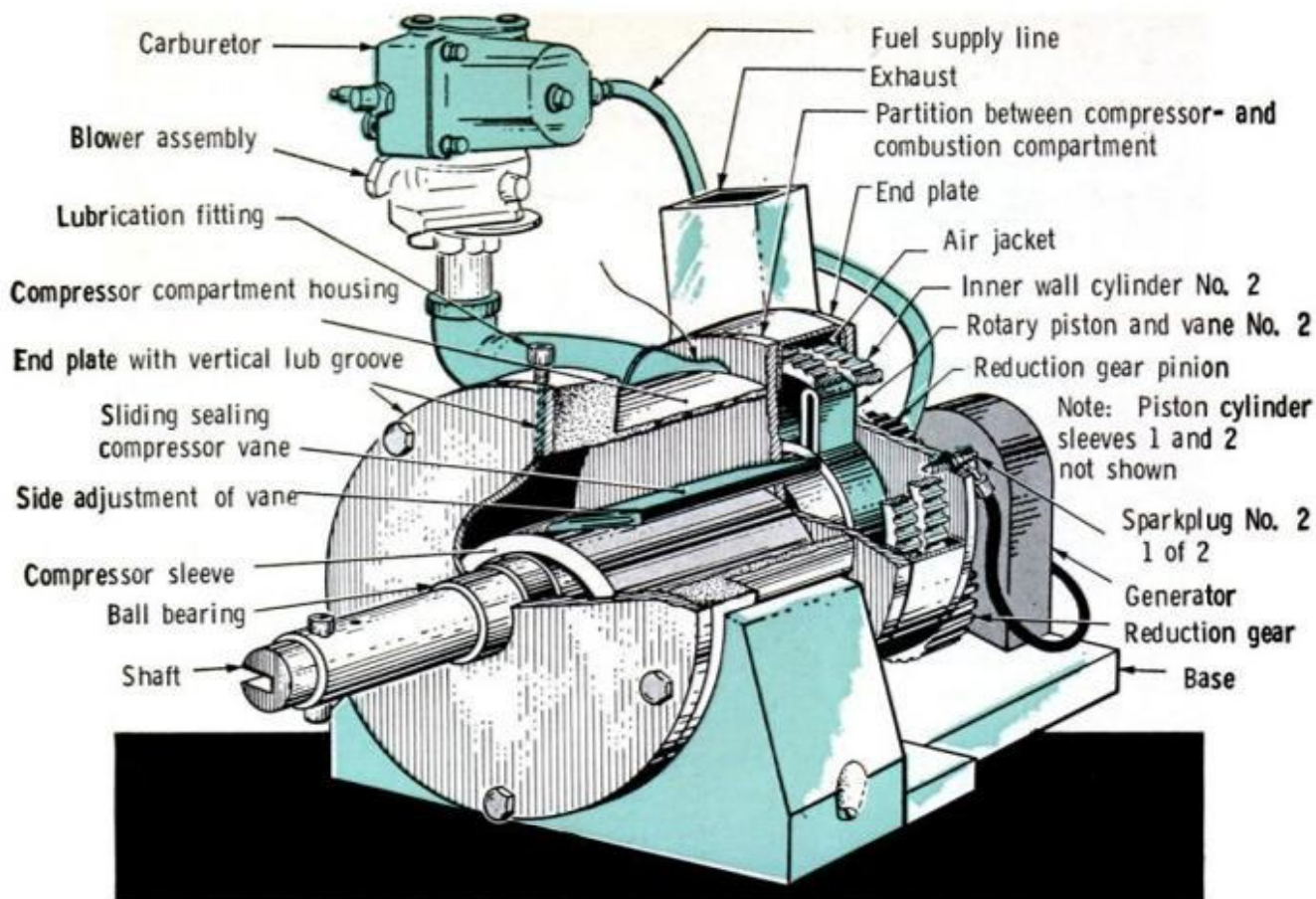
Shooting for high stakes

Such enthusiasm grows out of countless hours of previous solitary toil. In fact, many ideas were spawned in the weirdest circumstances. One inventor, Tom Bergstrom, had the inventive process thrust upon him when an automobile accident laid him up for a year and a half. "Being bedridden for so long forces you to think," he says. His thinking during convalescence resulted in the beautifully hand-tooled Lilliputian golf set (opposite page).

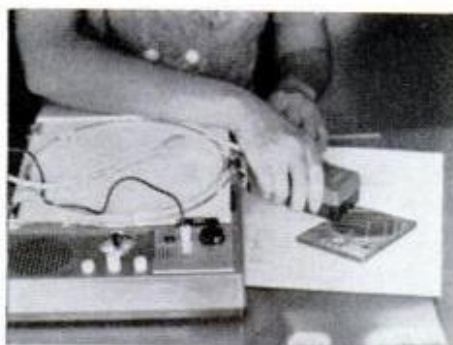
However, for all its holiday spirit, the crux of the show turns on serious business with high stakes. Obtaining a patent is one thing—it costs money. But for most of the hopeful inventors here, it's only one step in long-range plans which frequently boast a million-dollar flag at the goal. Hoping to be seen by the "right" people, they've plunked down \$180 for an exhibition booth for the 10 days.

The need, on the part of the inventor, for monied people to see his patent into production, coupled with the need of manufacturers for new products and ideas, is the *raison d'être* of the *2nd International*. It provides a forum for the bidding and dickering necessary to financial agreements—and perhaps some unfulfilled, high-sounding promises and false hopes as well. In any case, the exhibition will bring together inventors and manufacturers from all corners of the world.

Sponsoring and organizing the show is a firm called Patent Exhibits, Inc. (554 Fifth Ave., New York City), which is also active in European exhibition circuits. And representatives from foreign inventors' associations—as well as from the U. S. Patent Office and the Small Business Administration—will be on hand to answer inventors' and spectators' questions.

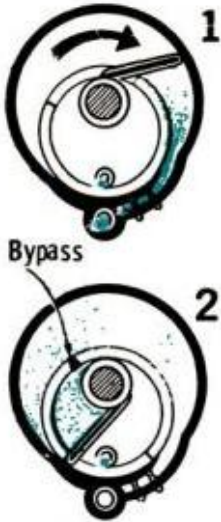


Another pistonless engine joins the celebrated Wankel as a means of powering vehicles. Not as powerful as the German-made machine, this new rotary internal-combustion engine will produce up to about 30 hp and will be useful for motorcycles or very small compact automobiles. Chief features of the unusual design, patented by Jaime Udelman of Venezuela, are a compression chamber with an adjustable sweep blade or vane that rotates both inside and outside a rotating cylinder, and two separate combustion chambers that operate in opposite sequence to each other. While one is firing, the other is cooling off. Unlike the Wankel, the Udelman is air-cooled and burns a mixture of air and naphtha. Also, it is light weight and apparently easy to manufacture. The compression and combustion sequences are shown on the opposite page, starting with compression of air and fuel through burning.



Recording sound on paper (which may then be written on and stuffed in an envelope like a letter) is possible with a transistorized machine called Nakavision. Nakapaper, the magnetic recording sheet, may be used time and again on both sides, notes Yoshiro Nakamatsu, Tokyo. Left, girl ready to record, microphone in hand, Nakapaper on turntable. Erasures of sound are made by sweeping the erasing unit over the paper's surface (upper right). Its graphic message unimpaired, Nakapaper is ready for reuse (lower right).

Compression



1. Compression chamber contains unusual blower-vane assembly. At top of sweep, vane protrudes almost entirely through slot in rotating cylinder, compressing air-fuel mixture and forcing it into commuting line at bottom of housing where it goes to combustion chambers. Meanwhile, fuel is injected into cylinder for next sequence.

2. As vane sweeps through bottom of sequence, it retreats almost entirely inside cylinder, forcing new air-fuel mixture through bypass holes into outer chamber for next go around. Vane rotates on center shaft; cylinder rotates freely in grooves at both ends of the chamber.

3. Two combustion chambers are identical, but ignite on alternating revolutions. While sequence (1) is occurring, one combustion chamber is in this phase, with vane almost entirely inside its cylindrical sleeve. Compressed air-fuel mixture from commuting line enters and

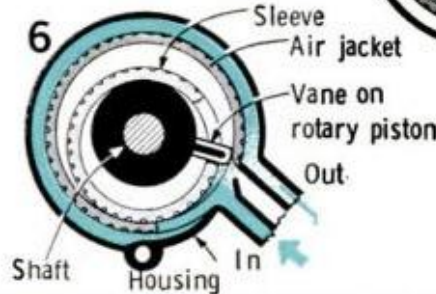
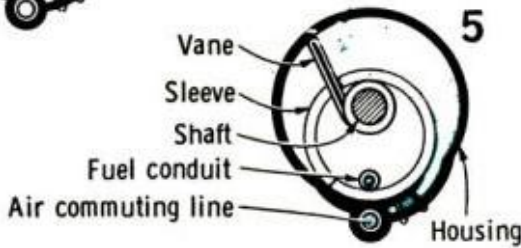
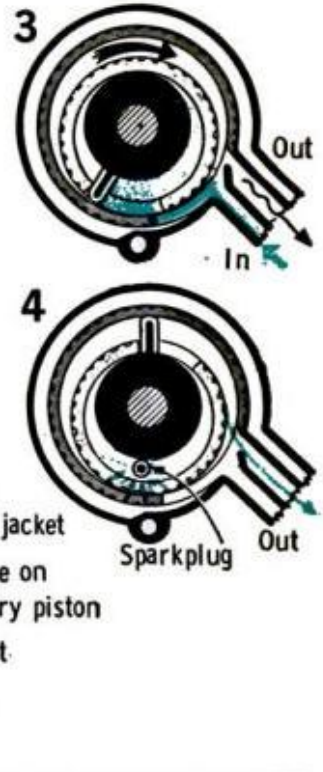
fills area between cylinder sleeve and rotating piston.

4. Fuel-air mixture is compressed even more inside sleeve and, at this position, corresponding to (2), sparkplug ignites, burning mixture and producing power for entire sequence. Second combustion chamber, meanwhile, has been getting flush-out with cold air during cycle.

5. Sequence starts again in compression chamber with new fuel-air mixture that was forced through bypass holes. Vane has slipped through slot in sleeve to begin compressing it again, maintaining pressure-tight seal throughout.

6. As second combustion chamber begins firing cycle, first chamber closes its exhaust and gets flush-out with air mixture, cooling chamber. Ridges on outer sleeve and air jacket surfaces merely increase area for quicker cooling.

Combustion



Wankel

Differences and advantages between Wankel and Udelman engines are that Wankel is liquid-cooled, burns gasoline or other fuels and can go to larger horsepower

Udelman

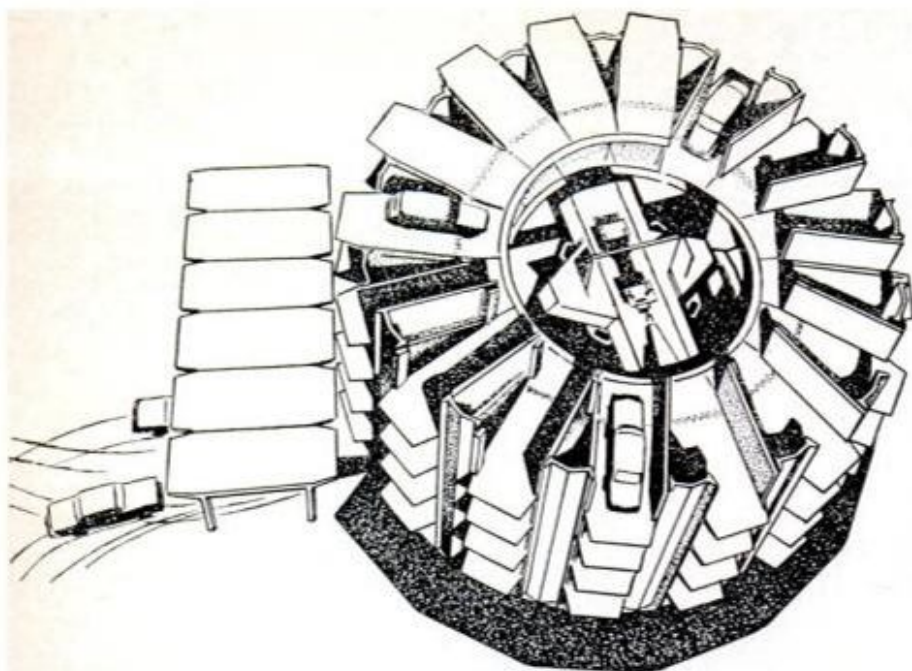


New Udelman engine is air-cooled, uses separate chambers for compression and combustion, is limited in horsepower but inexpensive to make, and burns naphtha



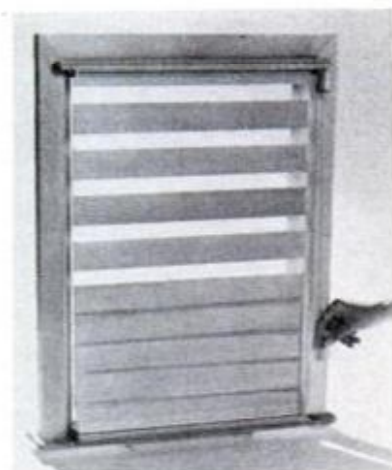
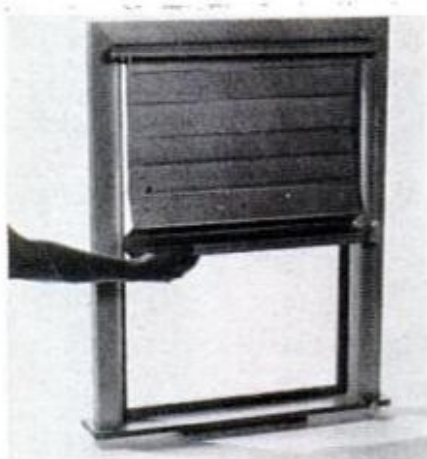
Eight shots per loading may be fired from this studgun with a one-eighth turn of the cylinder after each firing. Used for steel and concrete, the gun is loaded by removing the cylinder pin and disengaging the cylinder (left). After the projectiles have been inserted, the cylinder is put back in its housing and secured by reinserting the cylinder pin. In order to fire, the gun must be pressed firmly against the work surface (right). To eject the empty shells, the cylinder is once again disengaged. Driving the pin through the center of the cylinder from front to back forces all the shells out at once. M. Thomas, St. Etienne, France, notes that the studgun is automatically uncocked the moment it's removed from the work surface.

7000 better mousetraps



Put a nickel in the slot—or a charge-plate—and like peanuts from a vending machine, out pops your car from this self-service garage. Parking is just as automatic. Once the credit card registers, the car moves, via a rolling platform, onto an elevator in the center, which “feels” for the nearest vacant slot. When one has been detected, the elevator rises and rotates until it is in position to deposit its load. Cars signaled for withdrawal can be picked up on the same trip. The same principle that enables direct contact between the circular lift and parking spaces underlies automatic shelf-stacking systems of many European grocery stores. By C. Hagel, Germany.

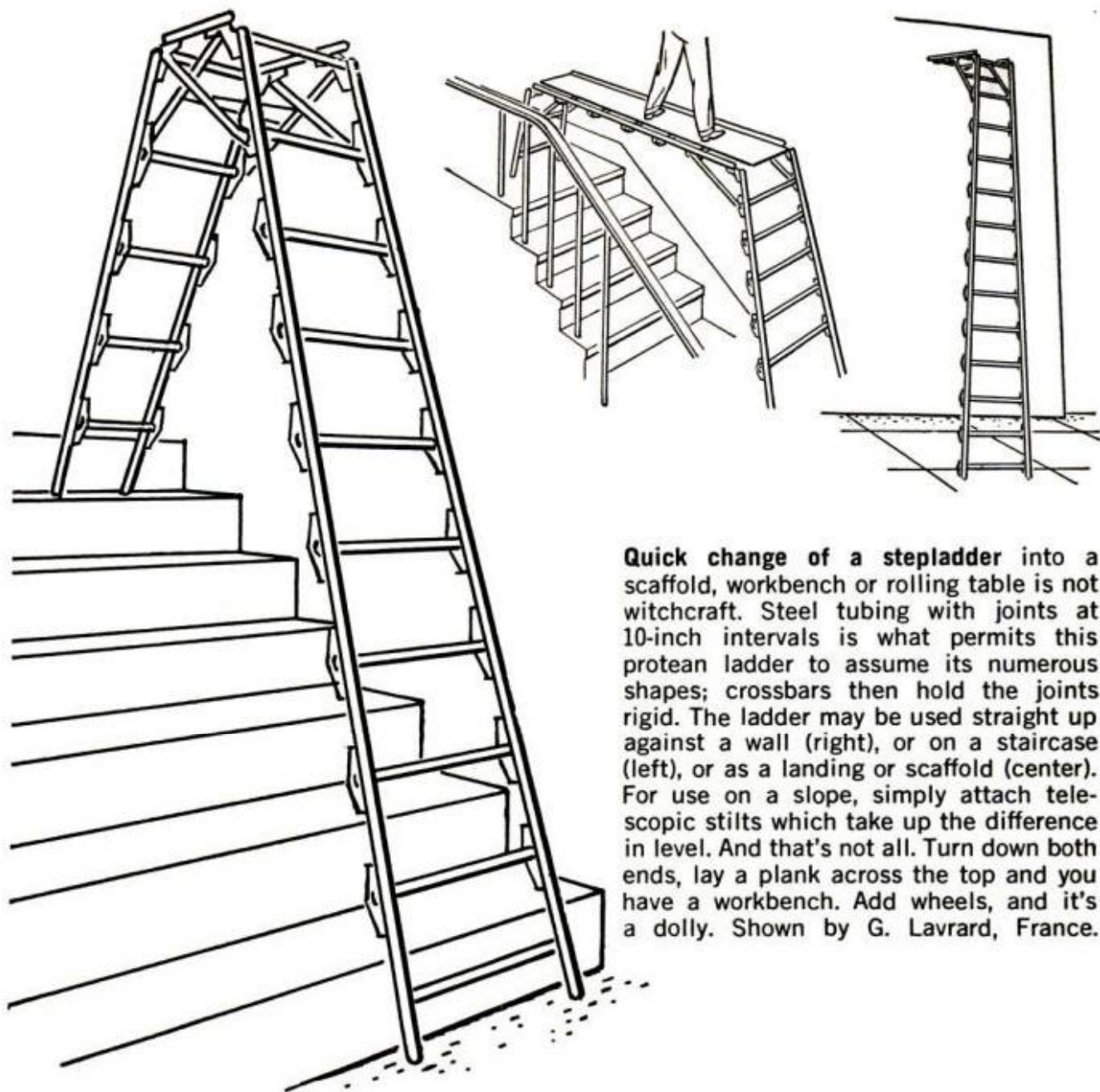
Peeping Toms will have their view severely hampered by a window shade made of wooden slats that works several wonders. It will unfold from the bottom and up—to provide cafe-curtain privacy—or the slats may be spaced to allow shafts of light through. By means of a counter-balancing arrangement in the cords, the shade retains any position at the push or pull of the slats. Inventor: Garnett Abraham, New York.



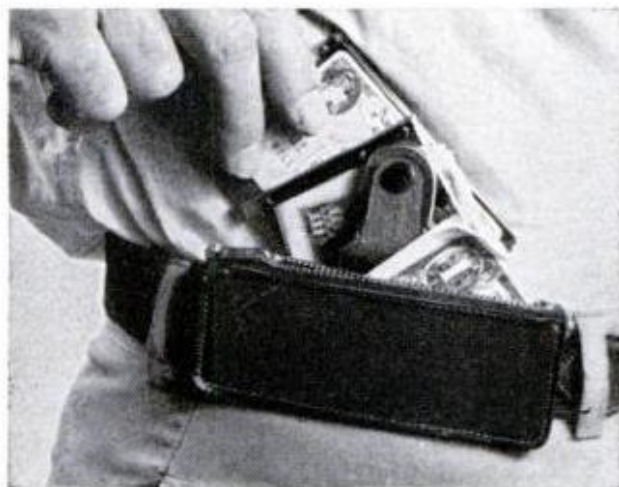
You can drive a car to water—then drive it on water. A twin-pontoon trailer provides the means of flotation and the car engine, the power. A system of universal joints enables John Brush, Cincinnati, to hook up the car's transmission to the propeller. The 13-foot catamaran shrinks to a 74-inch width for highway travel.



Not a flying saucer, but a saucer-shaped boat which skims the waves with either sail or power or both. Its radical design incorporates a sail that stretches between two masts and three swivel centerboards used for steering, notes D. H. Sharp, Strathmore, Que.



Quick change of a stepladder into a scaffold, workbench or rolling table is not witchcraft. Steel tubing with joints at 10-inch intervals is what permits this protean ladder to assume its numerous shapes; crossbars then hold the joints rigid. The ladder may be used straight up against a wall (right), or on a staircase (left), or as a landing or scaffold (center). For use on a slope, simply attach telescopic stilts which take up the difference in level. And that's not all. Turn down both ends, lay a plank across the top and you have a workbench. Add wheels, and it's a dolly. Shown by G. Lavrard, France.



Hard times would soon hit pickpockets if enough men wore this belt billfold. Threaded onto a man's belt, it has a safety compartment which flaps over the belt to hide two separate inserts for large bills and important cards. The exposed zippered section is for small bills, Howard A. Kehl, Detroit, is the inventor.



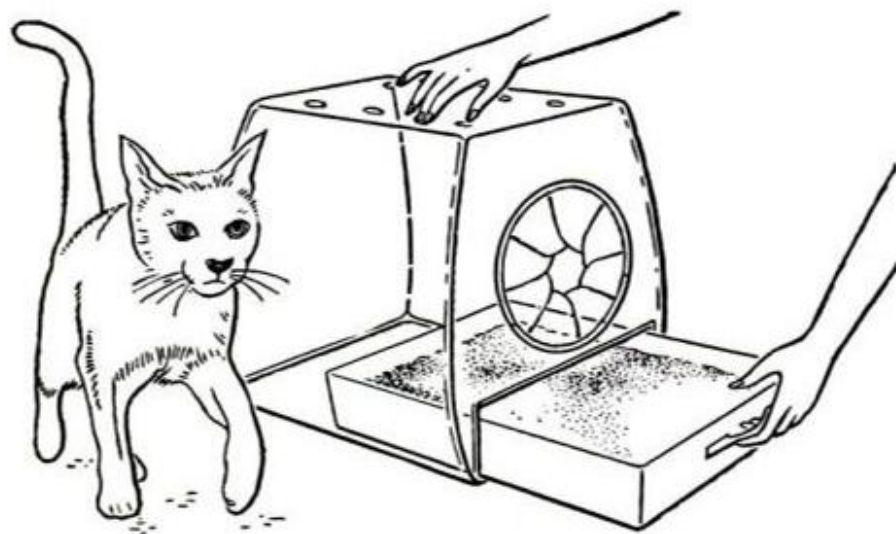
Your car won't budge with this Sta-Put wheel chock. As explained by the inventor, Michael Vigilante, Massapequa Park, N.Y., the secret's in the legs. The forward force from the weight of the vehicle is transferred to the wheels and converted into downward pressure, locking the chock to the ground on any surface.



Mono sounds like stereo when played on this two-needle cartridge head. Or if it's used in a stereo setup, it produces a still richer tone, according to the inventor, Enrico E. Pennucci, New York. Since both needles trace the same groove, there is a split-second time lag in pickup which causes a slight overlapping or blending of the sounds.



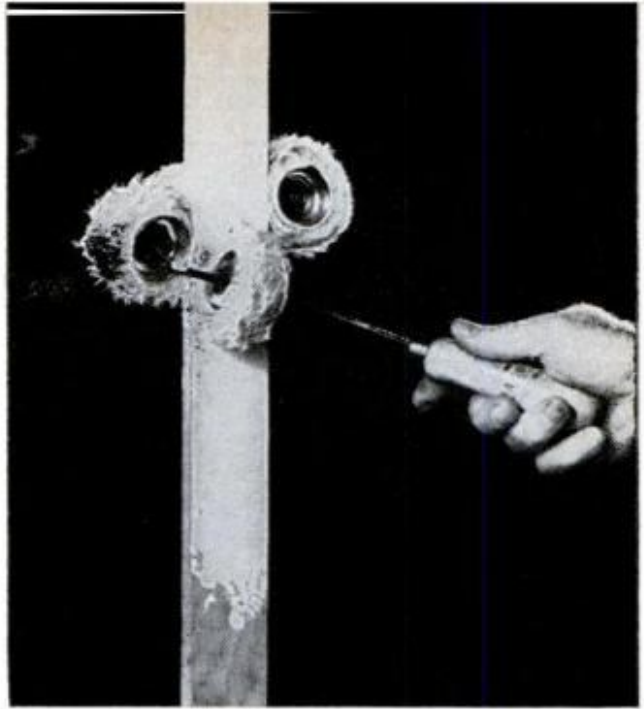
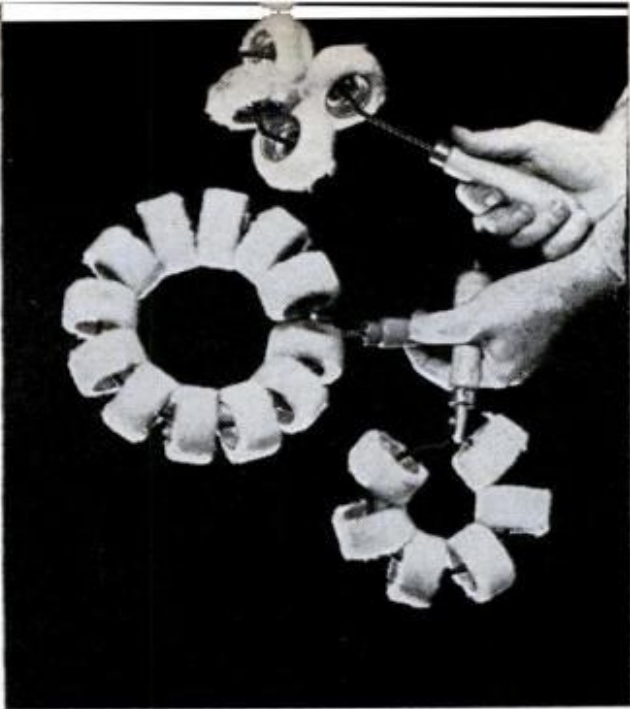
Extracting a fishhook with finesse is nearly impossible if the hook is swallowed by the fish or otherwise deeply embedded in flesh. Earl Buttemeier, Chicago, offers a solution by attaching an auxiliary line to the bight of the hook, as in the drawing above. A tug at the auxiliary line swings the hook around so it may be pulled out, bight first, the same way it went in.



Clean as a whistle is kitty's corner with this enclosed cat commode which keeps litter in the box—not on the floor. Made of clear plastic, it has a removable tray for easy disposal of the litter. Kitty gets in and out by pushing through the flexible plastic tongues of the porthole. All this plus finger-size air holes to make it easy to carry. Eleanora Walker of New York is the person responsible for this latest word in modern living for hep cats.



Golfers and non-golfers will find sport in flexing their finger muscles in this finely tooled miniature of an old favorite. Inventor Tom Bergstrom notes that its utilization of such techniques as slicing and hooking makes it good practice for big-league playing. Long drives are delivered by a spring-action power driver; short strokes (left) use a finger-tip "chip-'n-putt." May be played table-top style, or on lawn or basement floor.



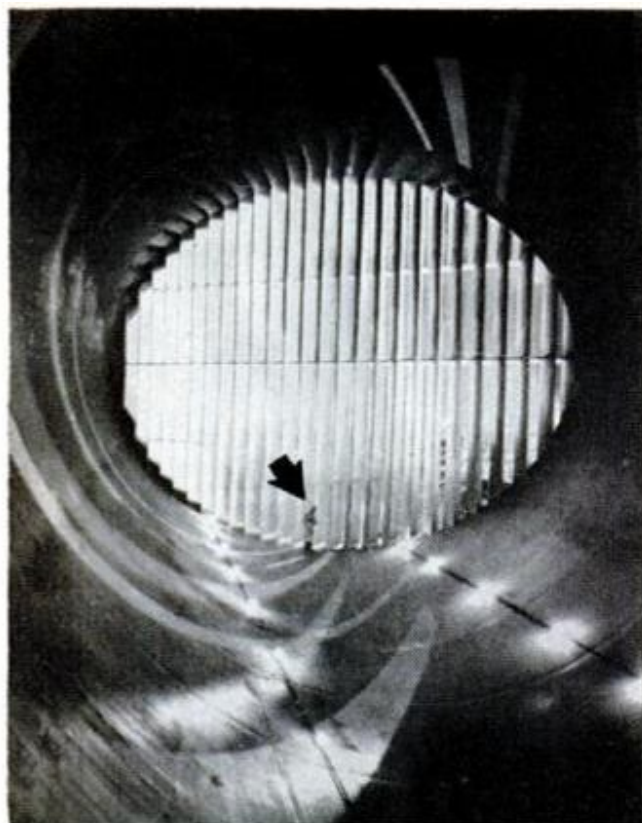
All-embracing paintbrushes combine up to four strokes in one, thus speeding up the painting of poles, posts and railings. George Schleicher, New York, has used high-carbon steel spring wire for the axles of all his prototypes. A lamb's-wool fabric was used for the rollers—short nap for thick, tarry paint; long nap for regular consistency. Both square and round designs come in different sizes. A wider brush can be made to cover a slightly smaller rod by holding it at an angle. The square brush paints round as well as square bars; the round brush—columns, ranch-type fences, pipes. Schleicher sees pipes as providing the most lucrative market for his brushes; industrial contracts covering hundreds of miles of piping frequently run into six-figure costs.



Hard-hatted soft heads enjoy an extra measure of safety with a hidden, interchangeable helmet. Called Sport-Guard and made of Royalite, it slips underneath the sweat band of most of the hats. Swimmer's cap (foreground) and derby require permanent insertion. Not only sportsmen need a helmeted hat; Mario Plastino, New York, reports the N.Y.C. Police ordered several for their tactical force.



Floating landing mat, made of bonded aluminum sections with polyurethane cores, can be set up in marshes and rice paddies converting them into airfields for helicopters. The mats, which can support impact weights up to 26,000 pounds, have a two-year life expectancy.



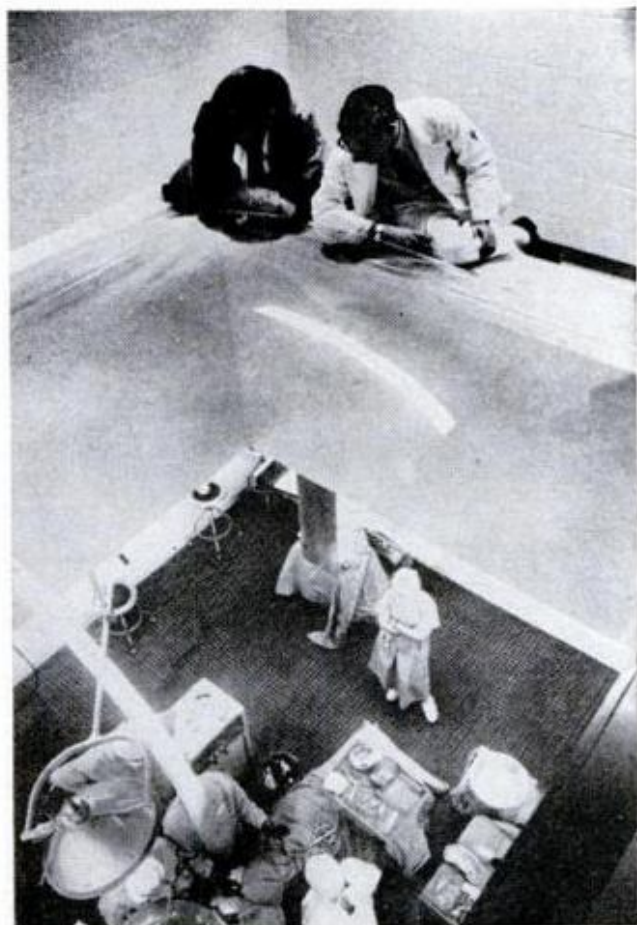
High winds and extremes in temperatures for both aerodynamic and climatic automotive testing are made possible in this new wind tunnel at Volkswagen's Wolfsburg plant in West Germany. Largest of its type in Europe, the tunnel can test cars in 95-mph winds and in temperatures from minus 22° to 122°F. Big, hydraulically operated blades move up to 51,200 cubic feet of air per second. Man (arrow) is dwarfed in the huge tunnel.



Three-wing plane, replica of World War I Sopwith Scout, was built by an amateur builder in Illinois from original 1916 factory drawings and even has original Clerget rotary engine, propeller, cockpit instruments and Vickers machine gun. It is painted and marked to duplicate a Sopwith flown by Lt. Col. Raymond Collishaw, Canada's second leading ace, who had 60 victories. The plane is airworthy.



An inflatable hovercraft, built in Britain, is powered by a pair of small engines which blow it up like a vacuum-cleaner bag. The craft is being developed to carry seven men at speeds up to 35 mph. The machine has lifted itself over parked cars and people as well as the usual smooth surfaces, roads, grass and water.



Plastic viewing dome permits students at New York's Albert Einstein College of Medicine to watch operations. A two-way communications system allows surgeon to explain procedures and students to ask questions. By sealing off operating room, the bubble eliminates the contamination problems of the usual open amphitheater setups.

SEPTEMBER 1966



Emergency wheel positioned behind ordinary auto wheel and tire provides greater driver control in the event of a blowout, puncture, or similar "panic" situation, according to the device's French inventor. The tire is solid rubber and can bear weight of car for as many miles as necessary.



Steered by television and operated by a remote console, the Ryan Firebeetle was developed as a mobile gunnery target. Air crews or surface gunnery crews both may use it. The vehicle is built around a Corvair chassis and engine.

Whirring, clanking and wheezing, this automated kitchen is a gourmet gadgeteer's dream as meals made to order come off conveyor belts untouched by human hands

By CLIFFORD B. HICKS

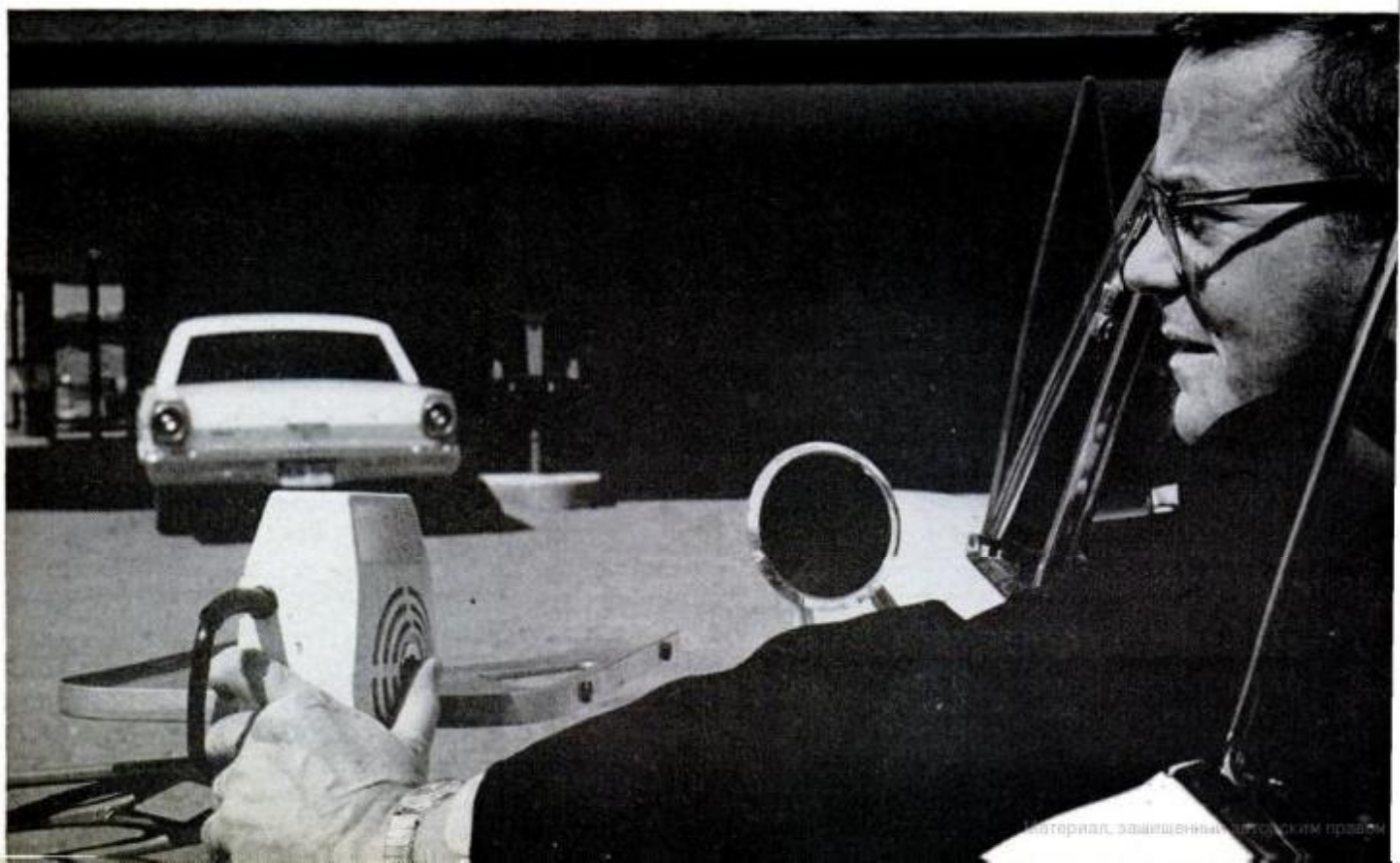
ORBIS IS A PRETTY LITTLE THING, although not the type you'd expect to find around a drive-in restaurant. Her hips are four feet wide, and she's just about the same height.

But despite her short stature, Orbis is absolute boss of a kitchen crew that can, within one hour, turn out 400 hamburgers and the same number of frankfurters; 360 orders of french fries; 175 platters of fried chicken, seafood or onion rings; and a torrent of milk shakes and carbonated drinks. And not a human hand does a lick of the work.

Orbis (for Order, Billing System) is a tidy little computer. She and her busy mechanical helpers were designed by American Machine & Foundry Co. to replace three specialists: the hamburger man, the short-order cook and the soda jerk.

The first AMFare installation is at Jay's Drive-In Restaurant in a tidy, modern eating place in Brooklyn Center, a large, sprawling suburb of Minneapolis. I traveled 400 miles to meet Orbis and

DOUBTFUL AUTHOR PUSHES BUTTON on speaker, which alerts computer operator that he is ready to order. Eighty percent of restaurant's food is prepared by machine





FOOD TUMBLES OUT of all the machines and marches on conveyor belts toward assembly man. He puts up orders in accordance with bills which have automatically been calculated and printed

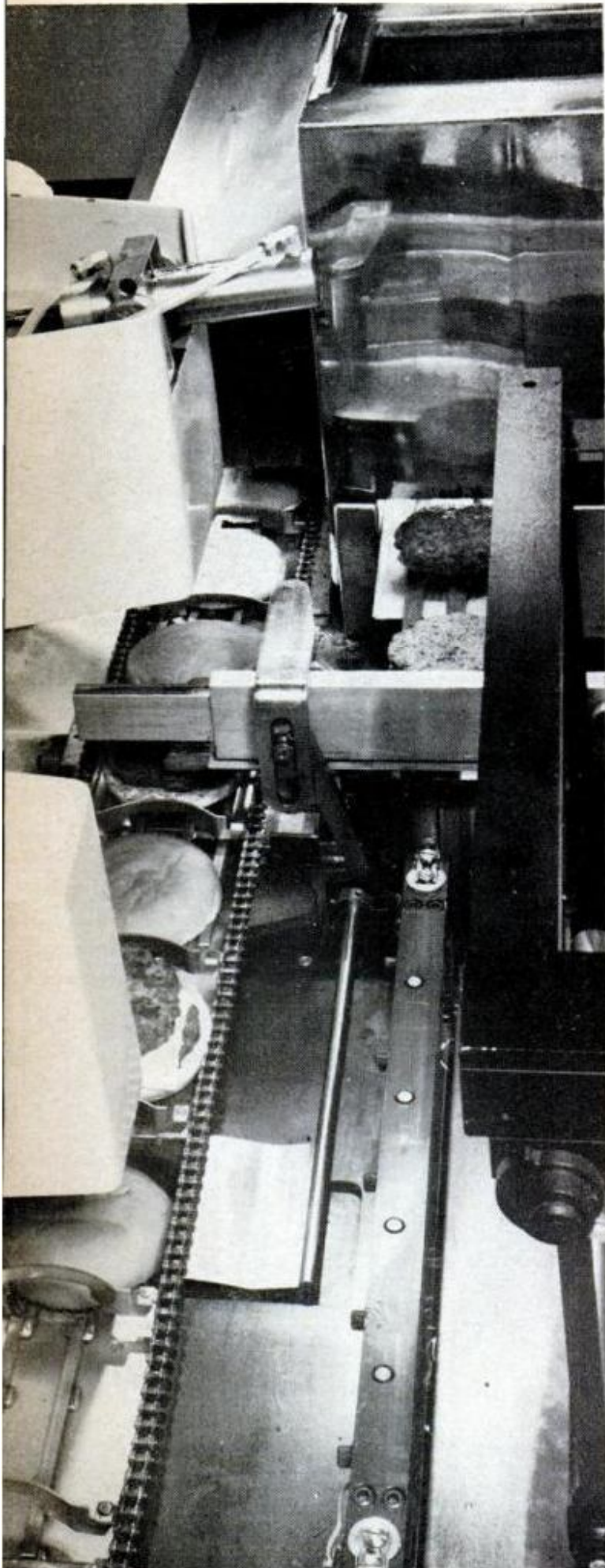
ORBIS the computer (helped a bit by her operator) supervises the kitchen in lonely grandeur. As the customer dictates his order, operator pushes corresponding keys on Orbis. Orbis holds order in her memory system until it has been repeated to customer and acknowledged



SEPTEMBER 1966

After broiling . . .

the burgers are topped with sauce or cheese



prove that no machine can substitute for a human being over a hot stove—at least as far as preparing *my* food.

In this aggressive frame of mind I drove into one of the stalls at Jay's, and promptly found myself soothed by soft music from a speaker at my elbow. With a final sneer, I looked at the menu, displayed on a stand nearby, figuring I'd be lucky to be able to select from five items. There were 38 selections.

I pushed the button in the middle of the speaker, and a sexy voice promptly asked for my order. I went all out: a platter of fried chicken with french fries, cheeseburger, hot dog, side order of onion rings, strawberry shake and a cup of coffee with cream.

After the order was repeated to me in the same low voice, I waited 30 seconds, then pushed the button and told Orbis that I'd changed my mind; substitute fish for the chicken, change the malt to chocolate, bring some extra salt, and make the coffee black. That should foul her circuits.

Eight minutes and eleven seconds later my order was delivered by an attractive young thing definitely more robust than robot. I'd planned to argue over the bill, but it was plainly printed by computer, and totaled exactly right.

To make matters worse, it was the best meal I've ever had at a drive-in.

Complacently full of good food, I went inside and joined other customers who were gazing through picture windows at the mechanical wizardry in the kitchen; a gadgeteer's paradise. There's the constant clicking, clacking and whirring of precision thingamajigs, punctuated by an occasional pocketa-pocketa-pocketa as whirligigs whirl buns right and left, dingbats sweep onion rings onto conveyor belts and dohinkies push hot dogs out of squirrel cages into ovens. Food, in various stages of preparation, marches on belts in every direction.

In one corner of the room, Orbis bleeps away. Her operator and an assembly man would be the only humans required in the kitchen, but John Reimann Jr., 38-year-old owner of Jay's, likes to vary the menu with feature soups and sandwiches of the day, which are prepared by hand. Still, 80 percent of Jay's business is turned out by the mechanical chef.

When a customer punches a button on the speaker outside (or picks up a phone at his booth inside the restaurant), Orbis

winks a numbered light corresponding to that station. As the customer orders each item, the operator punches a corresponding key on the computer. When the order is completed and verified, she presses a master key which tells the check calculator to print the bill, and at the same time shoots the order to Mims for processing.

Mims (Menu Item Memory System) is a brain in itself. It not only provides a visual record of every item currently on order and in preparation, but also a running total of the number of each item that has been served so far that day. Mims also distributes orders to the individual cooking machines. Every single item is prepared to order; not one hamburger is cooked unless there's a customer for it.

However, all the machines and roller belts are in operation all the time. When Mims tells the hamburger machine to turn out a double cheeseburger, a knob pops out on a revolving drum. As the knob turns, it tells a submachine to shove a bun through a slashing knife, drop it on a conveyor belt and lift off the top half. Simultaneously it tells the pattymaker to squeeze fresh-ground hamburger into two molds and deposit them on a belt that crawls through a broiling oven.

Four minutes and seven seconds later the meat topples off the conveyor onto the bottom of the toasted bun, another gadget drops a slice of cheese on top, a squirter squirts a special sauce on top of the cheese (if ordered), the top half of the bun descends, and the piping hot burger is wrapped by machine in plastic film. Its contained heat continues to cook it for more than a minute inside the plastic, and at the same time melts the cheese.

Orders of chicken, shrimp, fish and onion rings are stored in refrigerators above the machines.

If you've ordered a shake or a soft drink, Mims turns on the appropriate pump and the liquid squirts into a cup until it rises near the top, where it breaks a light beam to turn off the pump.

All conveyor belts march straight at the assembly man, who fills the orders in accordance with the preprinted bills that the calculator has turned over to him. Carhops and waitresses promptly pick up the orders for delivery.

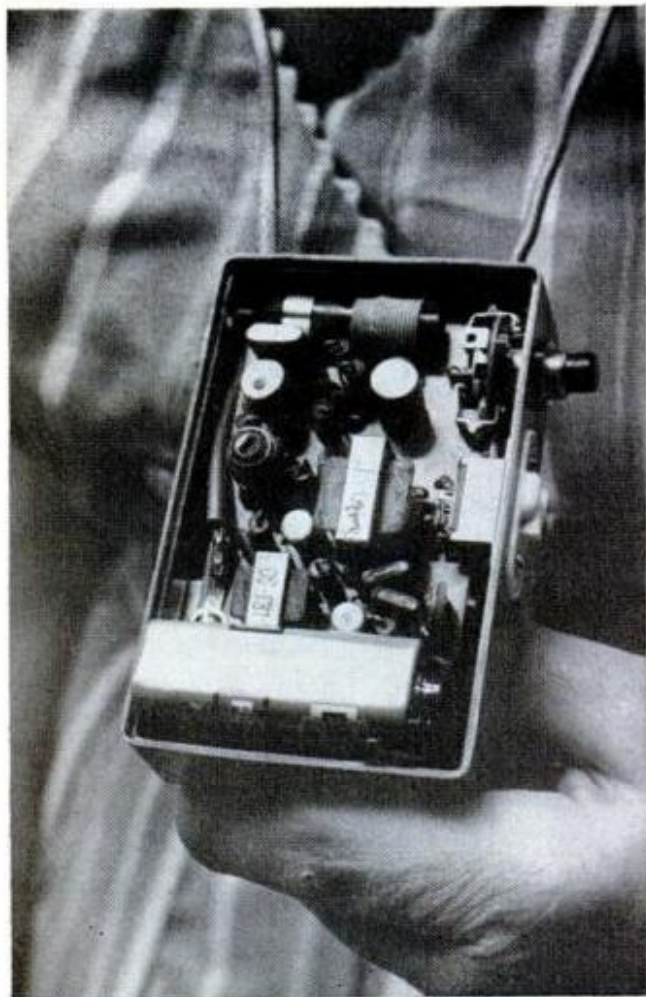
The AMF engineers had enough perception *not* to substitute gadgetry for the dazzling carhop. This automation jazz, after all, can be carried too far. ★ ★ ★

wrapped in plastic and accompanied by onion rings





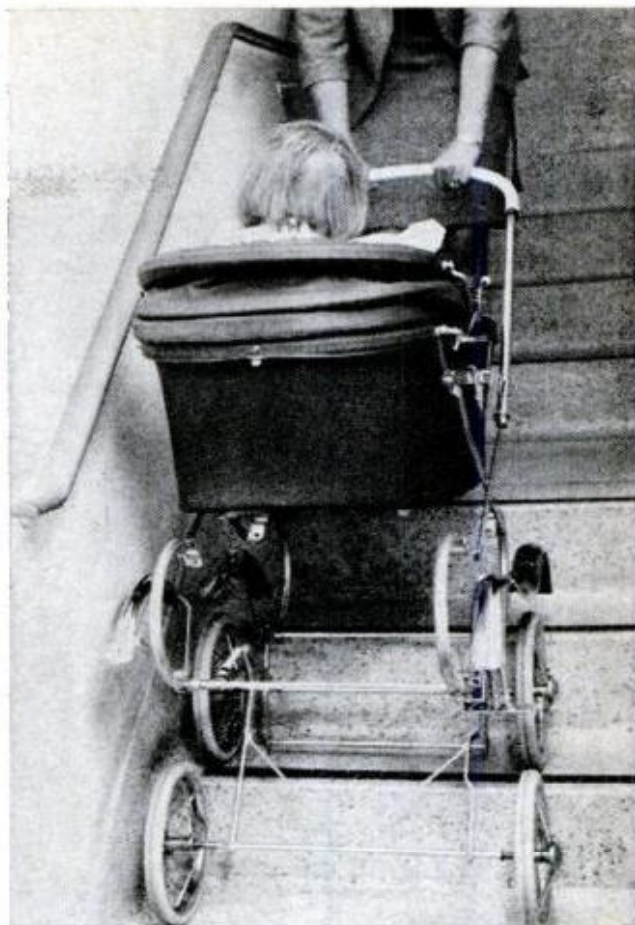
Zap! Could it be a batboat? There's a strong rumor running from Hollywood to Texas that Batman is out to corral the forces of crime-on-the-water with a new weapon—the Batboat. Developed secretly by the Glastron Boat Co., Austin, Tex., the boat was used in a full-length Batman feature movie released last month.



Invalids and disabled people are prone to home accidents. Now, a new radio-controlled alarm ensures that help can be summoned. Consisting of a miniature, transistorized radio transmitter worn about the neck, the system operates lights, buzzers, flashing window signs (above) and unlocks the front door. The Electronic Auto Alarm is made by British Relay Ltd., London, England.



Good communications are possible even in dense jungles with this lightweight "Man-pack" radio developed for the Army. The 10,000-channel, single-sideband set is 18 by 12 by 4 inches. It can be carried and operated by one man, and unlike most combat radios, works on ordinary flashlight-type dry batteries, wet-cell batteries or from vehicle battery, standard powerline or field generator. The 29-pound, high-frequency set can operate over 500 miles.



Step climbing pram helps mothers get baby carriages up stairs easily and safely. The secret is a movable axle. Mom operates a bar at the rear of the pram which releases a catch on the chassis. In this way, one pair of wheels can rest on one step and the other on the lower step. Made in Sweden by Ilos AB.



Built to resemble a parachute, the Allied Landing Museum at St. Mère-Eglise was recently completed by the French construction firm of Dubigeon-Normandie. Designed by Francois Carpentier and made of stratified polyester, the museum is dedicated to the British and American paratroops who made the liberation landing. It contains thousands of wartime mementoes.

Drivin' with Dan

Were some of the Indy 500 drivers "a bunch of clowns"? Do foreign drivers cause accidents on American race tracks? Here are Dan Gurney's outspoken answers to these and other provocative questions



DAN GURNEY (left) wishes A. J. Foyt luck at Indianapolis just before the signal: "Gentlemen, start your engines!" Just a few minutes later both were out of the race in the devastating first-lap pile-up

We are proud to announce that starting this month Dan Gurney, considered by many the greatest all-around racing driver in the world, will join Popular Mechanics as a regular contributor. His column, "Drivin' with Dan", will appear in PM each month. In it, Dan will answer selected questions from readers on racing, high performance, and everyday driving. Send questions on these topics to "Drivin' with Dan," c/o Popular Mechanics, 575 Lexington Ave., New York, N. Y. 10017. Questions cannot be answered by individual letters. Questions on auto maintenance and repair should be addressed to the Auto Clinic. (See page 36.)

Robert O. Crossley
Editor

Q. After the wreck knocked you out of the Indy 500 in the first lap, you said that you "saw it coming for weeks and that you expected it. . . . These are a bunch of clowns." To whom were you referring, and why did you anticipate a big pile-up?
—Peter Cotton, Huntington, W. Va.

A. I was referring to the throttle-happy drivers who in fact caused the accident. That is precisely where I lay the blame—on the drivers, not on the pace car or even the starting formation. The start is the most dangerous part at Indy. I could see the likelihood of an accident happening in the month-long build-up of tension. That tension gets under a driver's skin and makes it easy for a guy who isn't concentrating on the serious realities of the situation to do something foolish. A few guys simply did something foolish or

that accident would never have happened.

Q. After the big crack-up at Indy, A. J. Foyt was quoted as saying, "I knew those blankety-blank foreign midget drivers would get us into trouble." Since none of them were involved in the crash, how does A. J. get around to blaming them?—
T. K. Marvin, Fort Wayne, Ind.

A. Frankly, I doubt that A. J. made such a remark. He is certainly a pro's pro and has always been quick to recognize ability. I neither observed nor heard of any instance in which the foreign drivers caused any trouble, except, perhaps, for wounding our pride with their fine finishes.

Q. What should the Speedway management do to prevent pile-ups like the one on the first lap

this year?—Robert M. Douglas, Altoona, Pa.

A. I believe the best preventive measure they could take would be to show pictures of first-lap or early-going accidents at the drivers' meeting. This would point out vividly how foolhardy it is to try to make much of a move before the field gets sorted out. A two-abreast start with greater distance between rows would undoubtedly also be safer.

Q. I say all sport cars and so-called "sporty cars" like the Mustang and Barracuda should have roll bars. Don't you agree?—Jack Blake, Milwaukee, Wis.

A. Yes, especially if they are going to be upside down.

Q. Who is the most competitive driver you have raced against?—John B. Patterson, Asheville, N.C.

A. I would not want to single out one, but it would likely be among a group including Jimmy Clark, John Surtees, A. J. Foyt, Mario Andretti and Graham Hill.

Q. Strictly from a driving-comfort and no-fatigue standpoint, what sort of car would you choose for a long-cross-country trip?—Larry Prather, Grand Island, Nebr.

A. Probably a Mustang or Mustang-type car with a handling-kit suspension package. In Europe, I would say the 250 SE Mercedes. Bigger cars don't have the agility necessary for as much comfort and safety as I like when I'm pressing all day over long distances.

Q. Why don't we have more Formula 1 races in America?—Steve Harris, Orlando, Fla.

A. Formula 1 racing means both cars and drivers must be flown over here from Europe, and that's expensive. I don't think American fans have reached the point where they realize what Formula 1 racing is. Until they do, it would be impractical to have more than one Formula 1 race over here.

Q. Why don't you drive in the Daytona 500 anymore? I know you can drive stock cars from your four wins at Riverside.—H. L. Mackey, Pensacola, Fla.

A. The Daytona 500 comes at a busy time for me. To do a good job there requires a 10-day-to-2-week stay, which I simply haven't found possible the last couple of years.

Q. How can I tell when my car needs new shocks?—George Smith, Oakland, Calif.

A. When you hit a bump and your car continues an up-and-down motion more than twice, chances are you need new shocks.

Q. I've heard that they are going to build a new speedway in Southern California that will be an exact duplicate of Indianapolis. Why would anyone want to duplicate a track that is 55 years old and obsolete?—Bill Zinzmaster, Salina, Kans.

A. A lot of people don't think Indy is obsolete even though it is an old track. Personally, however, I tend to agree with you.

Q. Everybody was hollering about oil on the track at Indy this year. Do rear-engine cars by their very design spray more oil on the track than the roadsters?—Oliver P. Scott, Roanoke, Va.

A. There is a slight possibility that this may be true, although I don't believe it's an inherent problem with a rear-engine car. There have been some pretty oily roadsters too.

Q. I read that the slow laps run under the yellow flag at the beginning of the Indy 500 were what caused Mario Andretti's engine to go bad. If this is true, why didn't it affect the other cars, too?—M. P. Henderson, Amarillo, Tex.

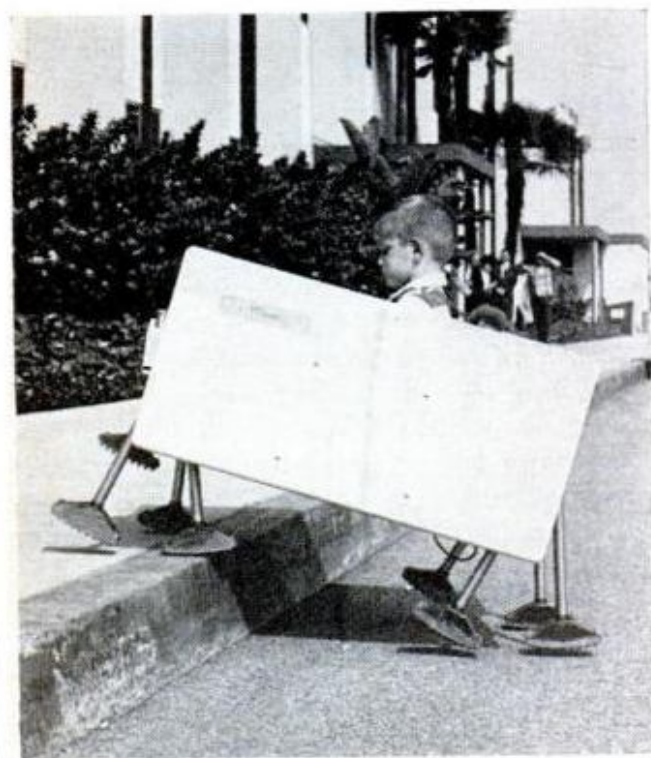
A. The yellow flag laps shouldn't have hurt anyone's engine. I don't pretend to know what Mario's particular problem was, but slow laps such as are run under the yellow flag pose no basic danger for cars or engines. You can't do much idling around with a dragster, but easy laps pose no problems for an Indianapolis car.

Q. Which is the most disappointing: to lose on the first lap, as you did at Indy or on the last lap as you did at Sebring?—Joe Adams, Los Angeles.

A. It's worse to lose on the first lap, I think. At Indy I didn't get a chance to show how well or how fast we could run with my car or how competitive we might have been. There is quite a bit of satisfaction in proving such points as these. It tends to ease the pain of even a last-lap disappointment. Although we were disqualified altogether at Sebring we were able to break the lap record and lead the major portion of the race. I'll take that anytime over a 50-yard scramble and flying wheels.



Snazziest snake pit in the world is this one in the Black Hills that's enclosed in a spectacular steel and plastic dome (right). Inside the dome (left) visitors can go to a "snake safari" among the nonpoisonous snakes and lizards, while birds and monkeys move overhead. The dome, which is 60 feet high and 113 feet in diameter, is just one of several display areas at the Reptile Gardens near Rapid City, S.D.



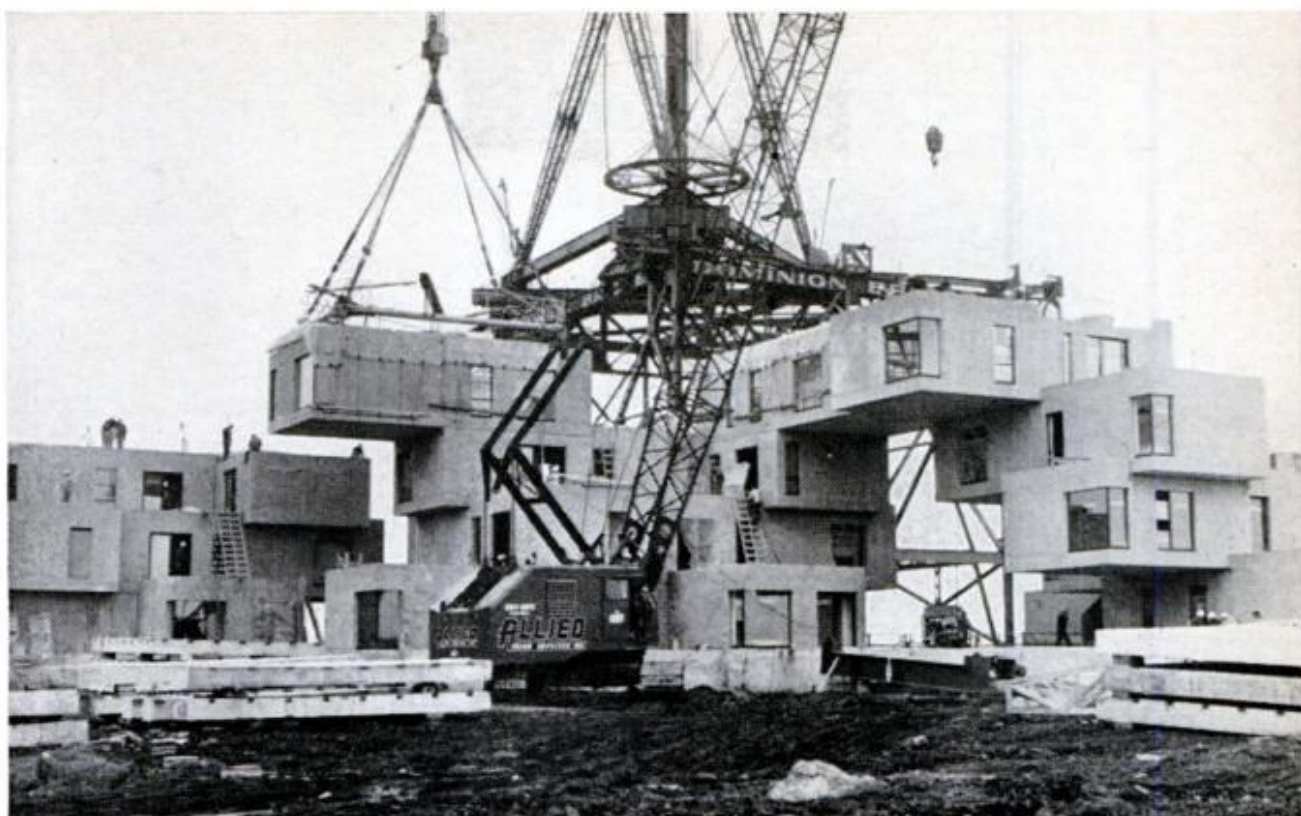
"Walking on the moon" may become a handicapped child's way of getting around. Utilizing the engineering developed for a moon-exploration machine, engineers of the Space-General Corp., El Monte, Calif., put together an eight-legged stick-operated walker that'll travel at two mph. A handicapped child can control the walker by hand, foot or chin. The battery operated machine can climb, turn and negotiate rough ground.



Rowing on dry land in this contraption keeps Yugoslavian athletes in trim all year round. The wheeled rig was built so rowers could practice even when rivers were ice-packed.



Ring-tail helicopter can zip along at 225 mph. The craft, a Piasecki 16H-1A, is a compound helicopter, with wings for lift in addition to the rotor. A propulsion propeller is in the ring at the tail. Power comes from a GE 1250-hp turbine.



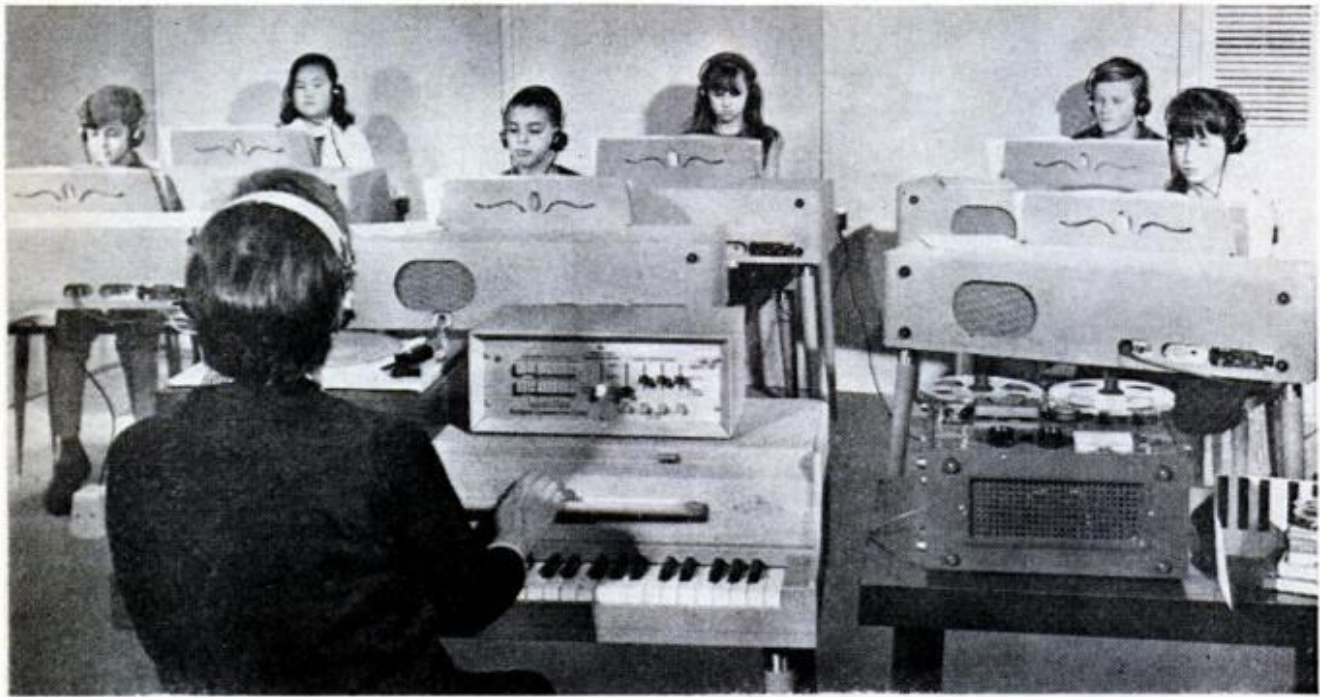
Precast concrete "boxes" are lifted into place to form apartments in Habitat 67, an urban dwelling project that will be a major display during Expo 67, Montreal's world exhibition next year. The precast apartment units weigh up to 85 tons. The apartments will have from one to four bedrooms each, plus an outdoor garden that's watered and fertilized automatically.



Oil is okay on troubled waters, but in harbors it's a nuisance. To clear the gooey substance from the waters around Berlin, the West Berlin Fire Department has put this floating skimmer to work. It's shown here on its first run on the Havel River. The fire department gets one or two calls each day to remove oil from the water's surface. The machine can take up to about 70 cubic feet of skimmed oil per trip.



Backfiring realistically and holding its own in London traffic, this odd little car looks like another tiny vehicle for urban commuters. However, it was built just for an appearance in a comic opera—and it's propelled by pedals, at that. John Heatherington, the builder, is shown at the wheel.



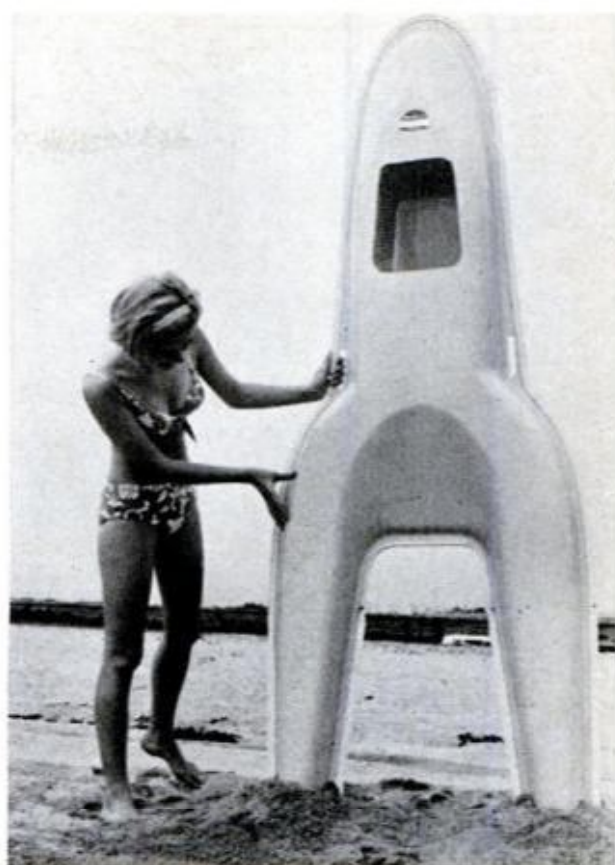
Twenty-four piano students can be given individualized instruction simultaneously in a new Wurlitzer music laboratory. All pianos are electronic, and are connected to a communication center atop the teacher's piano. She can listen to any student and discuss his work privately through earphones without distraction to the rest of the class.



Flexible wings are now appearing as parachutes for Army paratroopers. Called a para-wing, the maneuverable gliding-chute can be steered over moderate distances to pinpoint landings. It can be folded, packed and deployed as a normal chute. The flexible wing was conceived nearly 18 years ago by Francis Rogallo, a scientist with NASA.



Between-size tractor is designed for maintaining golf courses, parks and playgrounds. The 18-hp engine is pivoted behind the riding unit, enabling the driver to make sharp turns close to shrubbery and trees. Accessories include a rotary mower, a snow plow, a grader blade and a dump cart. The manufacturer is Bolens Div., FMC Corp., Port Washington, Wis.



Sled for swimmers and skin divers is shaped like a paddleboat and scoots across the surface in much the same way. Swimmer lies on a slanted surface between two legs of the sled. He kicks in his normal style, and can stroke with his arms. The sled has a compartment with a transparent window on the bottom and a hinged door on the top, offering either a view into the water or convenient storage. It's made by SAECO, Box 144, Malibu, Calif.



Pint-size bulldozer, built from scrap parts, not only serves as a toy but does real landscaping chores. Two Marine sergeants at Camp Lejeune, N.C., fashioned the miniature dozer from metal bedrails, a small automotive transmission and differential, a 7-hp engine and other salvaged parts. It weighs 900 pounds and obviously makes chores fun for the kids.

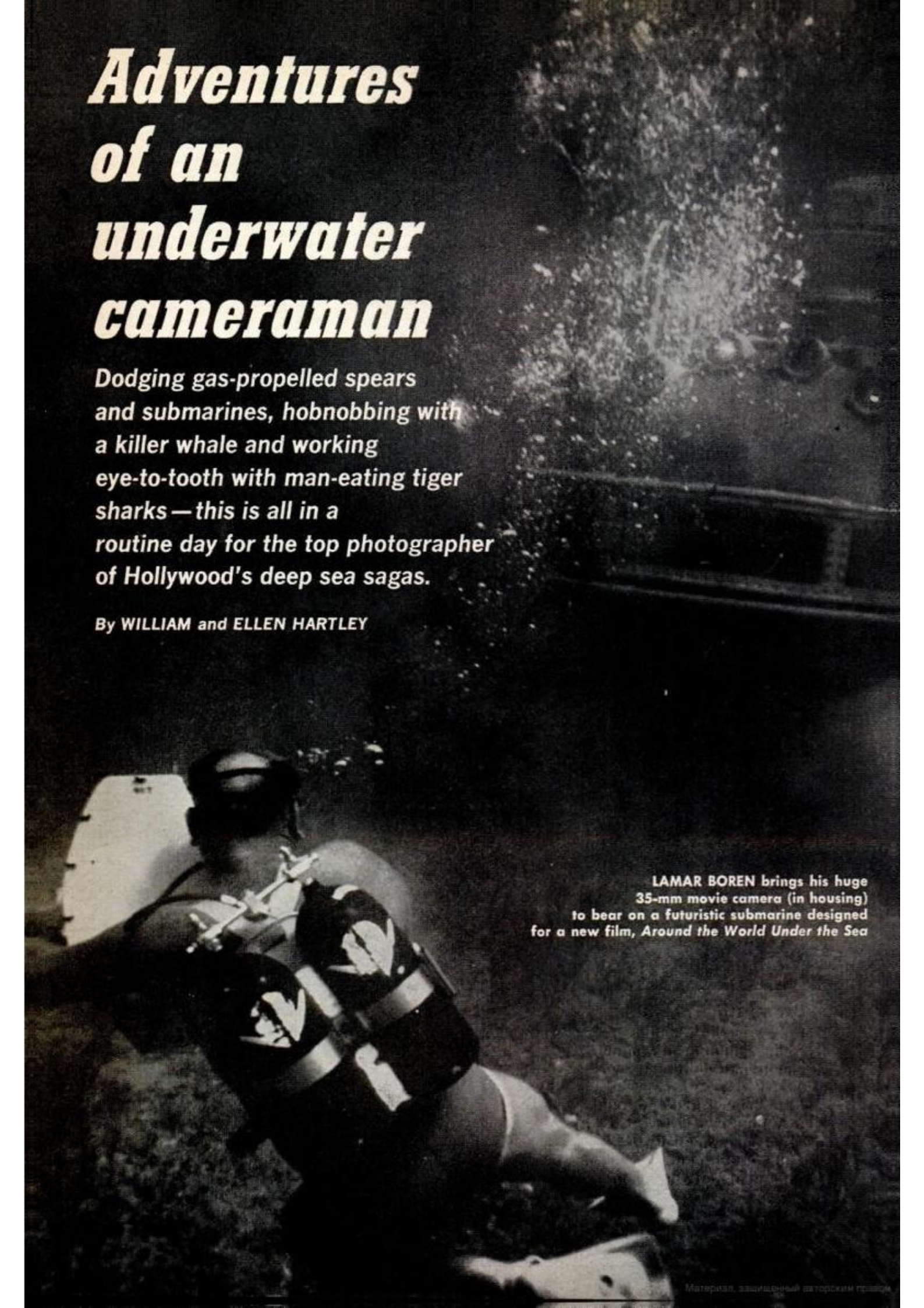


Boat precisely fits the top of a VW Microbus and requires no cartop carrier. Made of fiberglass, it is nearly 12 feet long. Luggage can be stowed under the boat for highway travel. The fast hull design minimizes wind drag at high speed. It's made by Kenar Co., Poway, Calif. 92064.

Adventures of an underwater cameraman

Dodging gas-propelled spears and submarines, hobnobbing with a killer whale and working eye-to-tooth with man-eating tiger sharks—this is all in a routine day for the top photographer of Hollywood's deep sea sagas.

By WILLIAM and ELLEN HARTLEY



LAMAR BOREN brings his huge 35-mm movie camera (in housing) to bear on a futuristic submarine designed for a new film, *Around the World Under the Sea*

NAMU LOOKED AS BIG AS A SUBMARINE and twice as dangerous. Think of a tiger that weighs five or more tons, and you get the general idea of how it feels to be in the water with a killer whale."

This is Lamar Boren earning his daily bread. A burly, soft-spoken man, Boren is an expert scuba diver and the most sought-after underwater cinematographer in the world. In 20 years of underwater filming he has been eye-to-tooth with most of the denizens of the deep. This was his first contact with a creature reputed to be the sea's most vicious.

Captured in a fisherman's net and bought by Ted Griffin, operator of the Seattle Public Aquarium, the much-publicized Namu seemed friendly toward human beings. Griffin could feed him by hand and ride on his back, but how would he react to a stranger? On assignment for Ivan Tors' *Flipper* series, Boren was about to find out.

The water in the enclosure in Puget Sound was murky and Boren was busy adjusting his camera housing when Namu suddenly rushed at him with mouth open. "It was a terrifying moment," Boren said. "My teeth were making more noise than the camera." But this was just Namu's way of being playful, and he quickly warmed up to Boren. "I just hope he stays friendly until we finish the movie," Boren said. "I'd be a light lunch for a creature that eats 400 pounds of salmon every day." Namu remained a "playful" and powerful giant until last July when, during whale mating season, he tangled with the steel net restraining him—in an effort to gain freedom—demolishing the net as well as himself.

Flirting with danger is not a new thing for Boren. His reputation has been established by filming underwater thrills that keep movie-goers on the edges of their seats. During the filming of the James Bond movie, *Thunderball*, for instance, Boren had to photograph an underwater spear-gun battle. "This was unnerving," he said. "It was hard to work with those spears swooshing past me. I'd have been much happier with sharks."

Boren has often filmed man-eating sharks without protection, but when he did the underwater shark scenes for *The Old Man and the Sea* he worked from a cage, a necessary precaution because there were often as many as 100 sharks within camera range at one time, and the scene called for them to tear a huge marlin to shreds. "They were truly vicious," Boren recalls. "We got them worked up by throwing them raw meat, and when the marlin was put over the side they tore into it like buzz saws. They devoured a 500-pound marlin in three minutes. I was in the cage right in the midst of it, and it was the most terrifying, blood-curdling scene I've ever filmed."

Raised in Riverside, Calif., Boren started diving as a kid with a homemade helmet. During high school he became interested in photography, and after studying engineering at Riverside Junior College, he became a professional still photographer.

In the 1940s he joined the Bottom Scratchers Club, a famous diving

SUITING UP with the help of an aide, Boren prepares for a day of filming. In 20 years of movie work he has spent over 2000 hours underwater





TAMED WITH TRANQUILIZERS, a fearsome man-eating tiger shark is guided into position for Boren's camera to record a sequence of thrills for an underwater movie



SHOOTING THROUGH A WINDOW, Boren films the interior of an underwater sphere, the Hollywood concept of future aquanauts' living and working at the bottom of the sea



MOVIE MAKE-BELIEVE is provided by a giant moray eel built by a studio prop department. Boren makes adjustments that will add to the realism of the scene

BUOYANCY is important to an underwater cameraman. The diver must act as both dolly and crane, so the housing must be free to move with gyroscopic precision



club in San Diego. This was a do-it-yourself period in underwater photography, and Boren built his first underwater case for a 16-mm Bolex and started filming. In 1952 he built a 35-mm underwater motion picture camera, and his results with this rig were so good he landed his first feature film assignment, a treasure hunting epic starring Jane Russell, Richard Egan and Gilbert Roland.

This camera and housing were the result of years of grappling with the problems of underwater photography. "You need a camera that's free to swim in all directions," Boren explains. "You are your own dolly and crane and everything else while you're down there filming, so you and the camera have to become a unified controllable piece of equipment."

Boren's first job for Ivan Tors was *Underwater Warrior*, a movie about Navy frogmen, and it was also his closest underwater scrape. Shooting a submarine in murky water he suddenly saw the craft about 10 feet away and coming straight on. He dropped the camera and swam, getting away with just slight bruises.

"The last thing on your mind at a moment like that is to continue filming," he

said. "You just move as fast as possible."

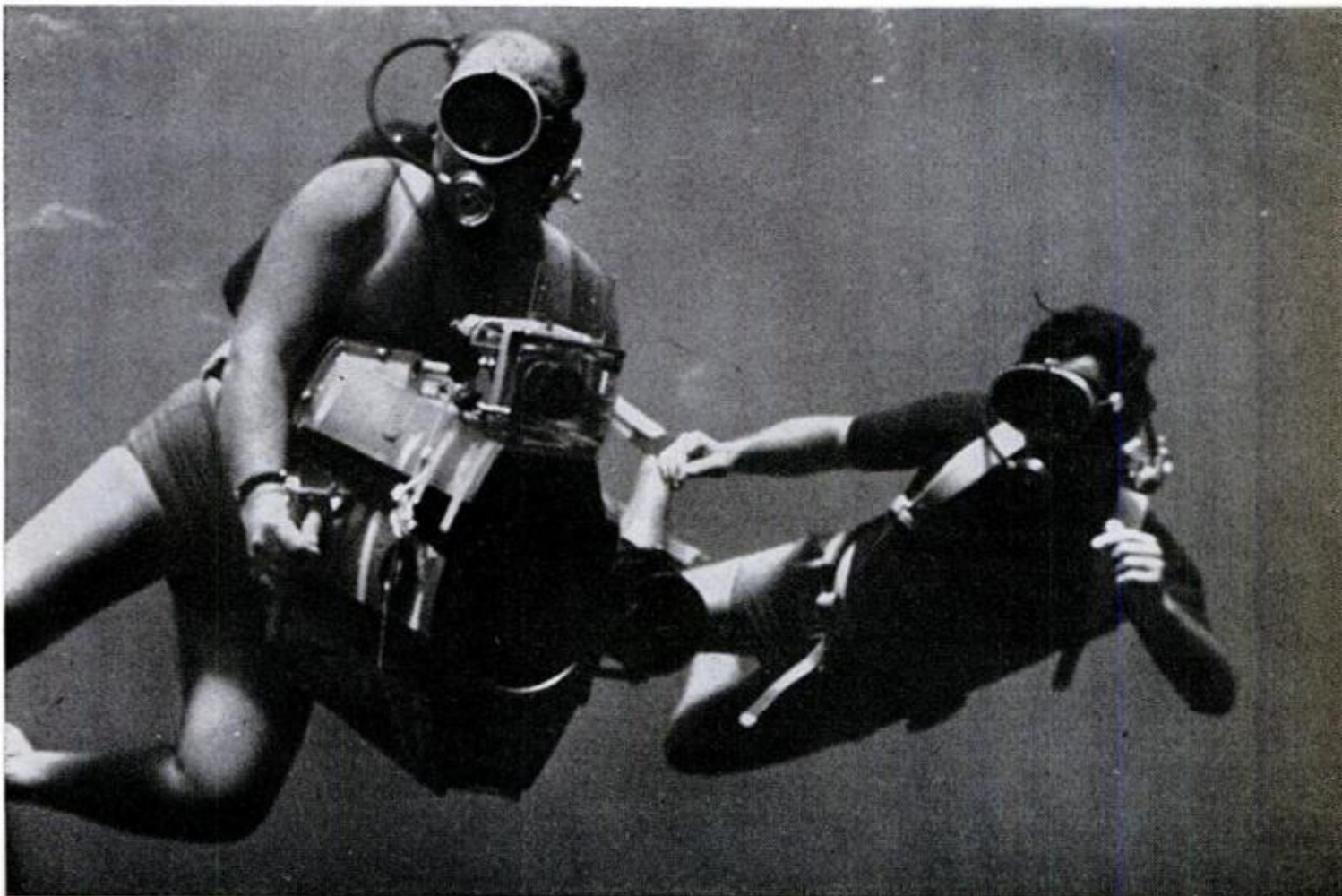
His next assignment for Tors was the television series, *Sea Hunt*, filming almost all of the 155 episodes. He also did 32 segments of *The Aquanauts* for television. His credits also include the feature films, *Flipper*, *Flipper's New Adventure*, *Thunderball*, and *Around the World Under the Sea*.

"Simplicity is the key to successful underwater photography," Boren explains. "A camera housing should have big control knobs and dial indicators. It should be so simple that you can operate it wearing boxing gloves."

He feels that amateurs tend to make photography too complicated. "Hit for the nearest exposure you can guess at," he says. "Or take a light meter down in a mason jar."

First impressions often make the best pictures, Boren says. "Even the underwater world can become commonplace, so the novice should shoot whatever intrigues him on first sight and then move on."

Boren scoffs at the dangers underwater. "Just be a safe, sensible diver," he says. "As in everything else, the adventures are a result of mistakes or accidents." ★★★



Correspondence school by radio

By JAMES R. BERRY

Now mail-order courses come over the air to students who answer instructors by pushing buttons, and who are told if they're right or wrong—and why

LAST JUNE 6, at exactly 8:00 p.m., 100 Philadelphia men opened an exercise book in their homes, turned on a special radio—and inaugurated the biggest innovation in correspondence schools since the mailbox.

For one hour, the duration of the day's lesson—the first of 30 in "Modern Management"—the announcer explained sections of the material. After each explanation he shot a question at his listeners, detailing up to four possible answers. Then he told the students to make a choice.

Each listener jabbed one of four buttons atop his radio. If the pressed button corresponded to the correct answer, the in-

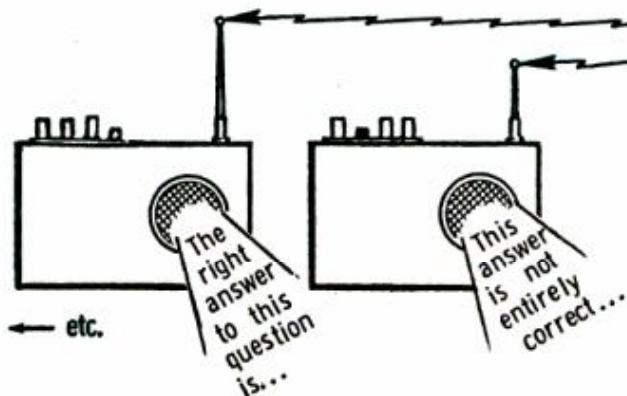
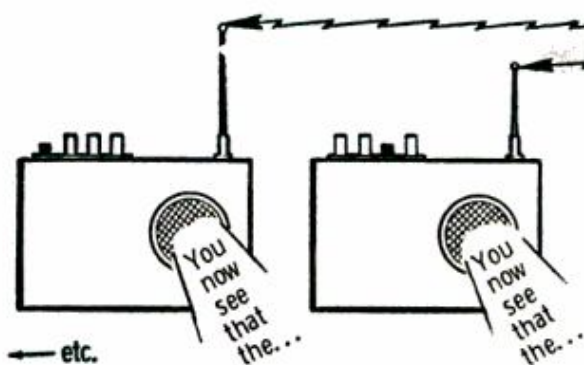
structor elaborated on the response. If the student hit the wrong button, he heard what the correct answer was and why. After dealing with the responses, the instructor went on with the lesson.

Called **Educasting**, this broadcasting technique of probing a student's knowledge with questions and immediately giving him an answer, turns what ordinarily would be hour-long lectures into 60-minute periods of active learning.

"Learning is work, just as playing tennis or shoveling coal is work," explains John Villaume, president of the International Correspondence Schools, the outfit that programs the radio courses. "But a



STUDYING BY RADIO IN HIS HOME, student answers instructor's question by pushing one of four buttons

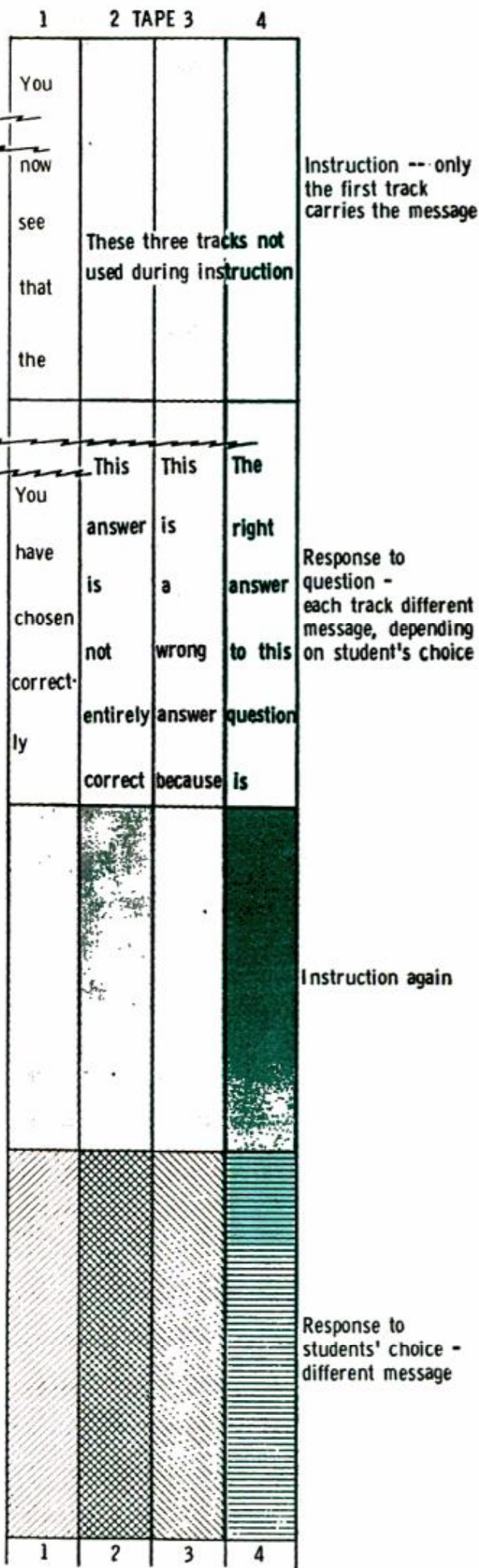


STUDENT SELECTS one of four possible answers to a question (left), and pushes the corresponding button on his receiver. He receives a taped reply telling him whether he's right or wrong. If he made wrong choice, he's told why it is incorrect. Diagram (right) shows operation of four multiplex channels

guy playing tennis is *participating*, and he calls it a game. A man shoveling coal isn't really involved and he calls it work. Having students make constant choices makes them participants in the learning process. Consequently, the idea of work is forgotten and learning comes easier and faster."

The idea behind Educasting is rooted in the same principles governing teaching machines. Information is broken into small, easily digested doses that are presented in logical order by the instructor. After a student has understood an elementary unit of the material, he's fed a more complex dose, gradually tackling more difficult information until the course is finished.

Application of teaching machine methods to correspondence schools resulted from a recent FCC ruling that allows FM stations to "multiplex" several channels with a main frequency. Some FM stations do exactly the same thing to create stereo:



It's one of the unique bits of magic in radio waves—similar in concept to the way that the main stream of a jet pump entrains water. But here the analogy ends because each multiplexed channel is equivalent to a separate station; yet, it doesn't interfere with the regular broadcasting of its mother station or others on the dial. Buttons on a radio designed to receive these separate channels-within-a-channel electronically select one of the four for broadcast.

Educasting uses a four-track tape, with each track carried on one of four multiplexed channels. During instruction, course material is beamed over the first channel. To receive it, students press button one. After a question, all channels—and tape tracks—come into play. Responses to a question are on different tape tracks, thus are broadcast over different channels. The instructor announces the possible answers and assigns a button to each one. The student jabs a button, thus selecting a channel and receiving the message on the corresponding tape track.

Programmers at ICS try to cover lessons in a lively, entertaining manner. Practically every aspect of a lesson is illustrated with an actual example or case history.

One section of the modern management course, for instance, covers foreman-employee relations. After discussing how supervisors should handle disputes, the

instructor underscores his points with the story of a worker who was accidentally deprived of his week's quota of overtime. The worker, demanding payment, complains to the foreman, correctly pointing out that company rules require equal distribution of overtime. The foreman refuses, saying he'll let the worker make up the lost overtime. The worker, unsatisfied, brings his complaint to a grievance committee—and wins. Why? The instructor cites these three possible reasons:

- Rescheduling of the worker's overtime for the next week would disrupt the overtime of other men. (The instructor then announced that those who think this is the correct answer should push button one on their radio.)

- Even though the foreman made an honest mistake in overlooking the worker's overtime, the company is still responsible for the error by its own rules. (Button two is the one to press here.)

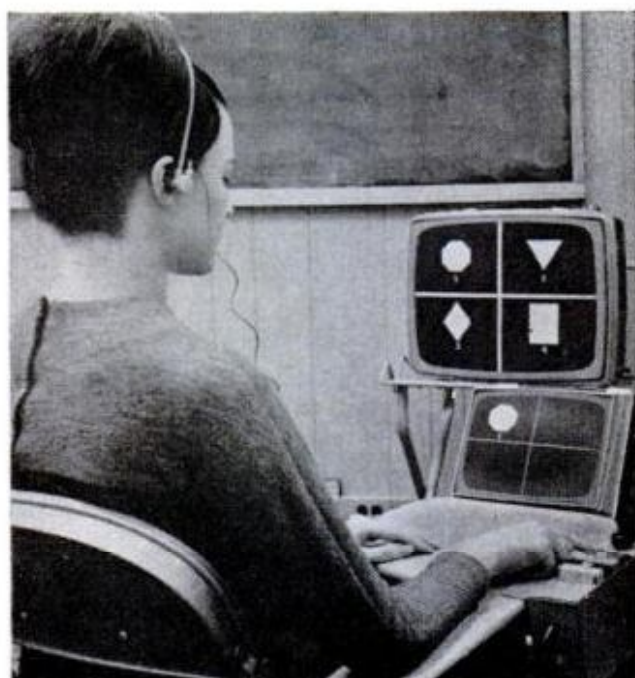
- Since the company rule for equal distribution of overtime existed, mistakes demoralized the workers. To keep up morale—and production—the worker was granted payment. (Button three.)

The correct answer: number two. Listeners who pushed the second button heard the announcer explain why company rules on overtime actually bind the foreman to pay the worker. Students who

(Please turn to page 188)



NORMAN LIVINGSTON (left), inventor of Educasting, checks out special receiver and equipment that multiplexes four channels over Philadelphia station



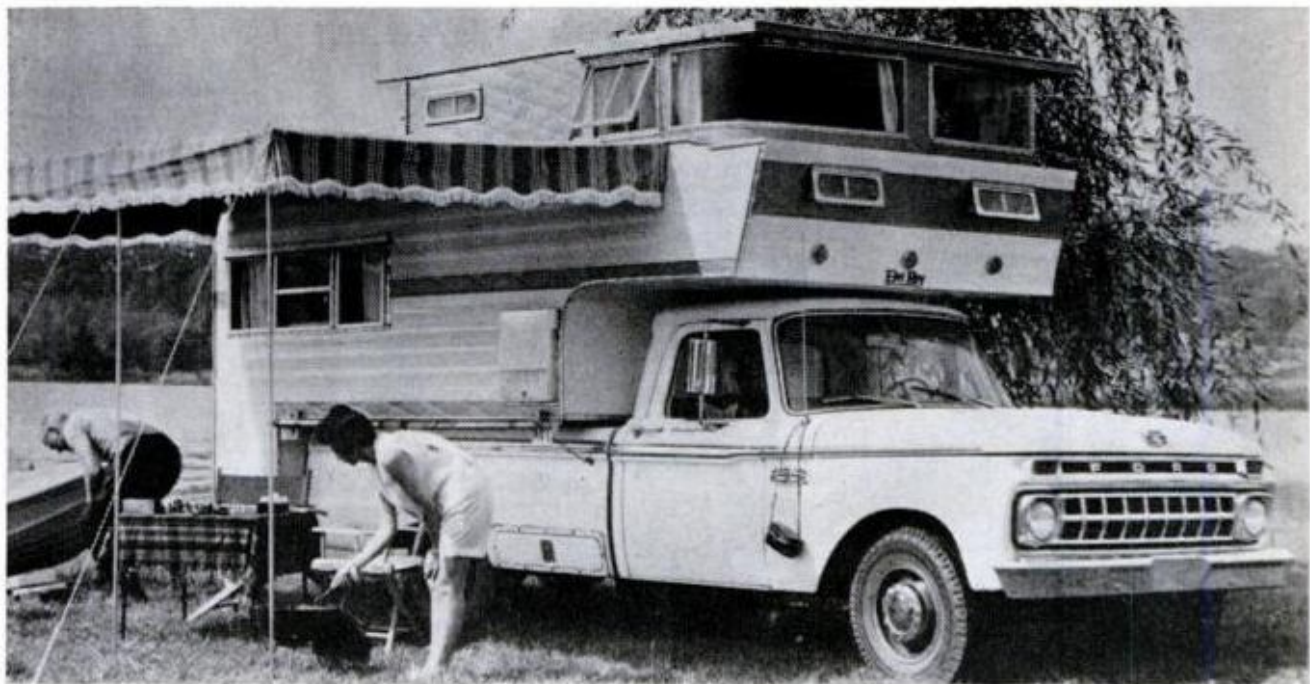
PATTERN ON THE TV SCREEN is divided into four equal segments. When student makes choice and pushes button, corresponding segment gives response



Invisible fence, set up by laser beams, is under study by military engineers. Infiltrators would unknowingly interrupt the beam to set off an alarm. The transmitter and receiver are powered by flashlight batteries. One set can cover up to one mile.



Dense net of chains protects big road-equipment tires from blowouts caused by rocks more than three inches in diameter. In one test the chains saved 60 cents an hour in rubber wear. Each set weighs 4430 pounds, so the chains also materially improve traction.



Rough life? Hardly, in this super-camper for pickups. It has virtually all the conveniences of home, including a combination dressing-room-lavatory with shower and toilet, a kitchen complete with built-in appliances, and "sky seats" for watching the world roll by from the top "floor." There's sleeping room for six persons. The camper is manufactured by Del Rey Industries, 3958 Cassapolis, Elkhart, Ind.

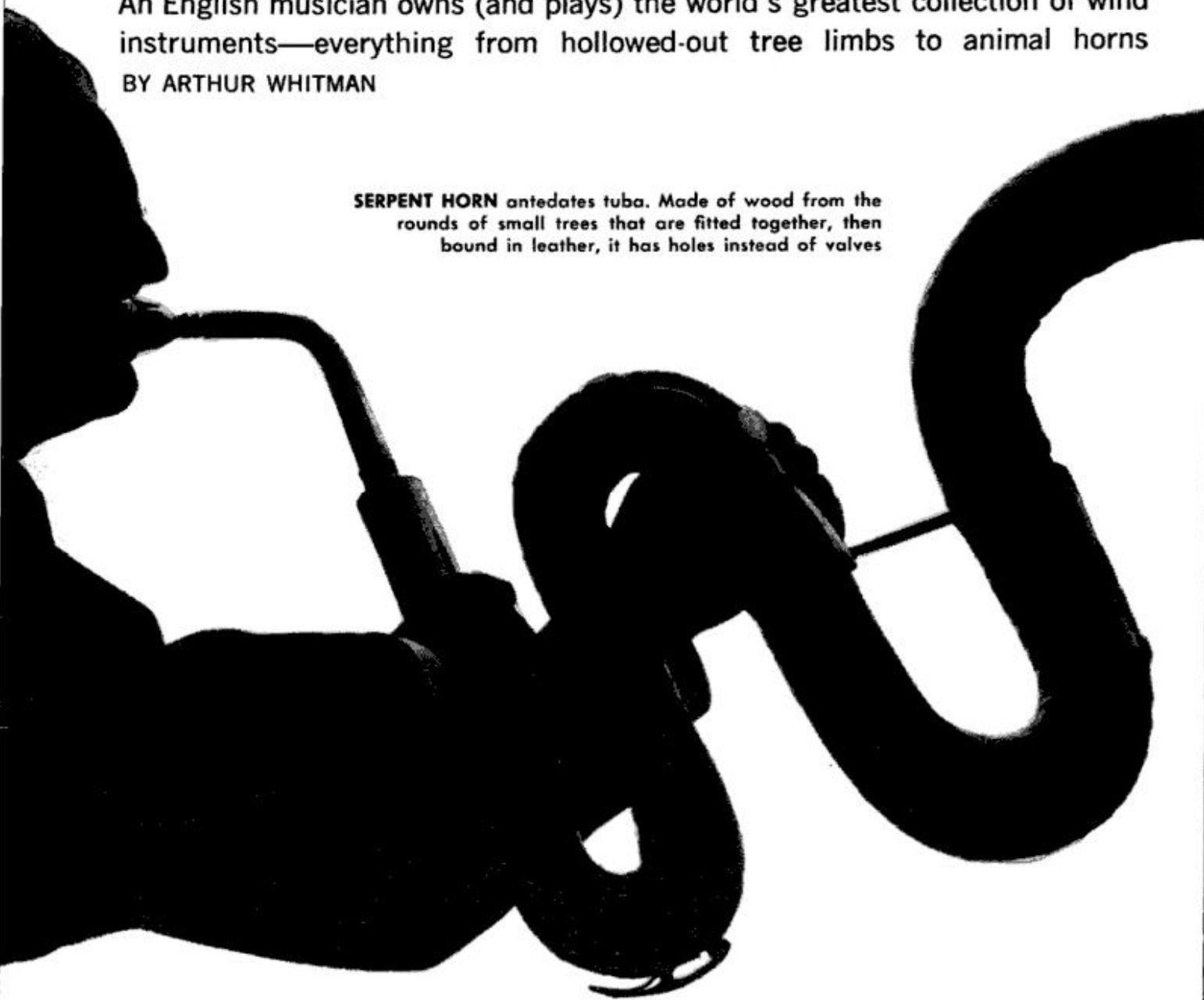


The music goes round and round ...and comes out over yonder

An English musician owns (and plays) the world's greatest collection of wind instruments—everything from hollowed-out tree limbs to animal horns

BY ARTHUR WHITMAN

SERPENT HORN antedates tuba. Made of wood from the rounds of small trees that are fitted together, then bound in leather, it has holes instead of valves

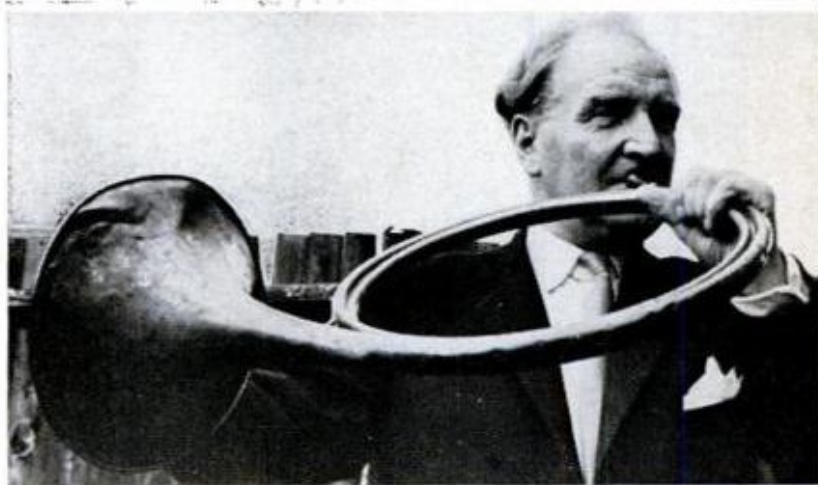


ONE LOOKS LIKE a thick, undulating serpent. Another like a random section of pressure piping. A third resembles, well, it resembles what it is, a length of half-inch rubber hose with a funnel stuck in one end. Snake? Pipe? Hose? Yep, and they're all musical instruments, and they're all played by one man. Godfrey Kneller, originally a trombonist with the Royal Philharmonic Orchestra under the late Sir Thomas Beecham, became known as a man with a "flexible lip," because he could play more than one brass instrument. Because of his versatility, he was asked by Sir Thomas to demonstrate brass instruments in lecture tours before schools. It led to later appearances and to seeking out other unusual wind instruments he could use. Among them are an authentic prehistoric buffalo horn bought from an archeologist, a ram's horn of the kind used against the walls of Jericho, and the weird wild instruments shown here.

CONTRA-BASS TROMBONE features two slides. Wagner wrote parts for it but orchestras stopped using it, even for his music. There just weren't enough musicians around proficient at playing it



OPHICLEIDE HORN bridges gap between serpent and tuba. Developed in Russia in 1860s, this is one of first made. Other horns in Kneller's collection are little more than twisted pipes



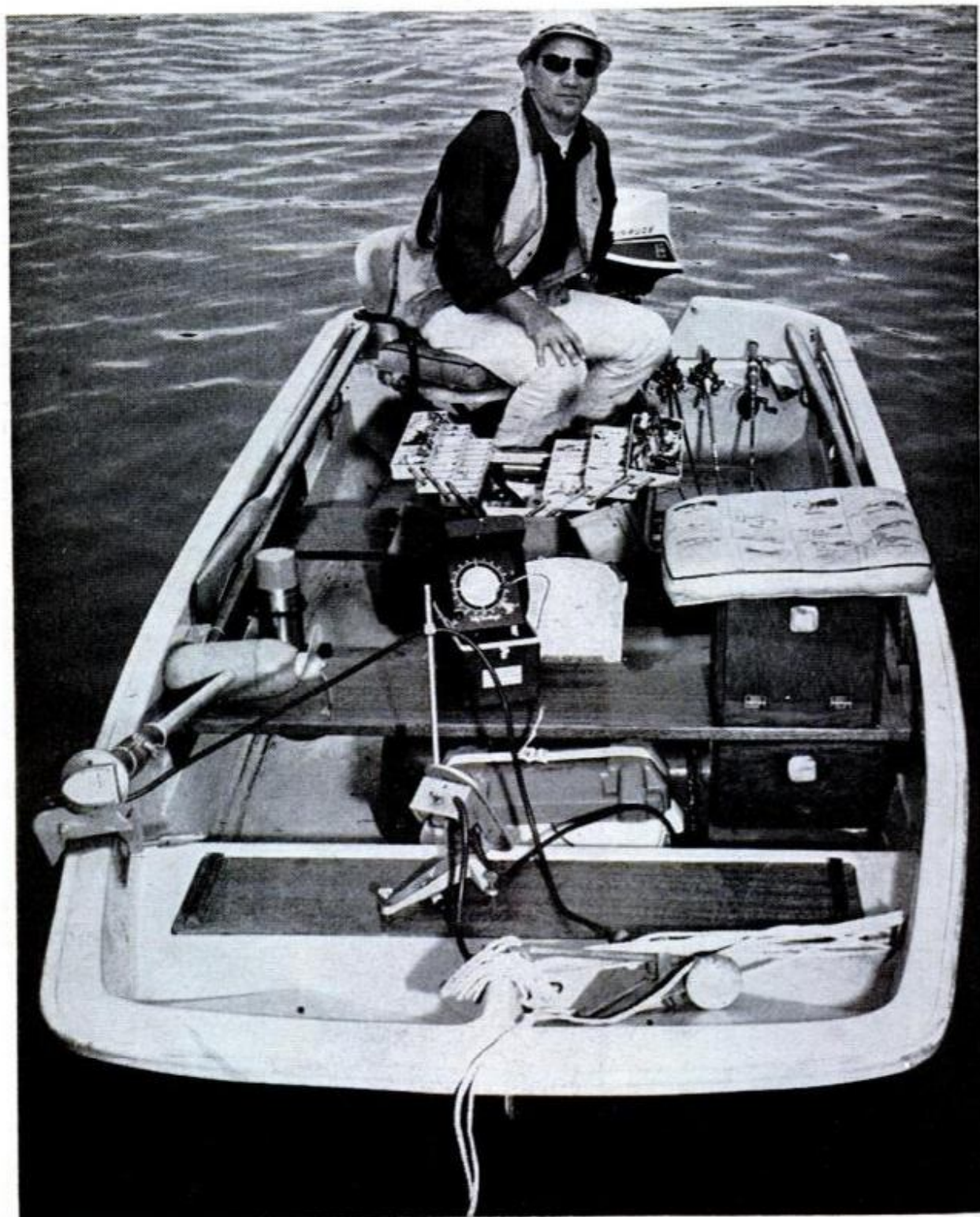
HANDLEBAR HORN is just that—a bicycle handlebar that Kneller blows to produce sound like you get from Coke bottle. Despite rare collection, Kneller considers himself mostly a musician

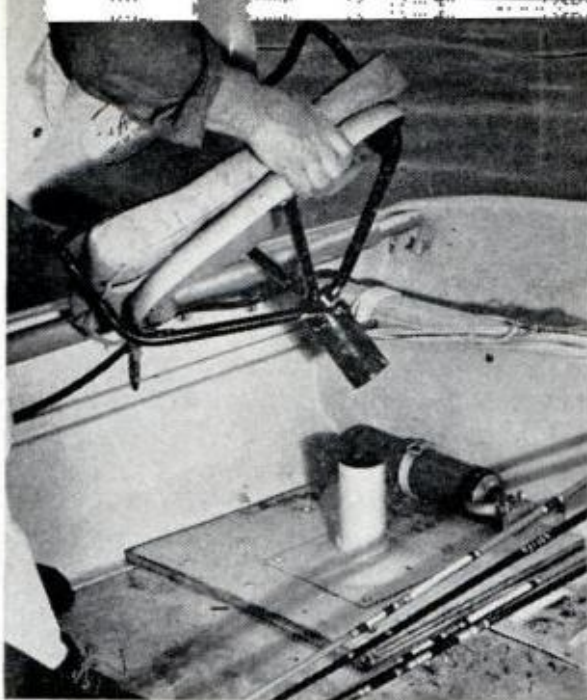


He's always ready to go...

His station wagon looks like a rolling tackle shop, and his boat is a well-planned fish-catching machine. Dick Kotis says you can catch more fish by organizing your fishing gear. Here's how he does it

By GEORGE LAYCOCK

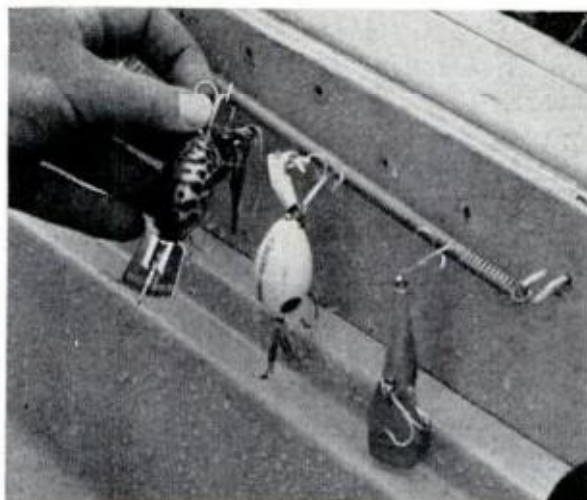




REMOVABLE CHAIR has a base which slips inside a pipe socket so it can be turned in any direction for casting. Dick made it himself by welding a pipe framework to an old office swivel chair



STORAGE CHEST made by enclosing space beneath a seat provides a dry place to put rain gear, tools, lunches and other necessities. It keeps the boat free of clutter, ready for fishing



LURE HOLDER, Dick's first addition to the boat, is just a screen-door spring stretched between two hooks. It does the job, though. The lures don't bounce out and they're always within reach



HOT AND COLD DRINKS are always carried in the same place—seated in a recessed base and secured to the side of the boat with a screen-door spring. They're easy to remove, but can't fall over

IT ALL STARTED with a big one that got away. One warm Florida evening several years ago Dick Kotis was casting underwater lures on a small lake when he spotted a huge fish feeding just beneath the surface.

"I reached into the tackle box for a surface plug," he says, "but found that the one I wanted was down in the bottom." In the process of digging out the right lure, he accidentally bumped the side of the boat. "And that was the last I saw of my big fish," Dick recalls ruefully.

Not wanting to make the same mistake twice, he installed a simple lure holder in the boat—a screen-door spring stretched along the inside within easy reach of the seat. "It made a handy place to hang all the lures I might need in an evening's fishing," he says, "without having them scattered all over the boat."

The screen-door-spring idea worked out so well that Dick was soon adding other innovations to his fishing boat and to the station wagon in which he carries all his fishing gear. Each of his ideas has but one aim—to organize the equipment

DON'T BE FOOLED by the apparent confusion in Kotis's boat, left. Everything is there for a purpose

more efficiently so he can forget about unnecessary details and concentrate on fishing.

When Kotis talks about fishing, his words carry a lot of weight. In addition to ranking among today's most skillful fishermen, he's president of the Fred Arbogast Co., one of the country's largest manufacturers of artificial lures (the Jitterbug, for instance). Fishing is his job.

Dick has been fishing as long as he can remember, and like any true fisherman, he has some definite ideas on the subject. One of these is that a good fisherman must keep his equipment in orderly arrangement. He should be ready to cast at any time with a minimum of fuss.

Long ago, Kotis concluded that the more comfort you build into a fishing boat, the longer you can stay out on the lake and the more chance you have for catching fish. This means plenty of hot coffee or tea in the winter and cold drinks in the summer. Instead of having a couple of Thermos bottles rolling around the bottom of the boat, however, Dick fashioned a special holder to stow them out of the way.

Another comfort feature is a swivel chair mounted on a pipe base which can be removed when the boat is being trailered. "Casting from the back of the boat,"

he says, "I can swing the chair in a 360° circle and fish any spot around me."

When fishing alone, though, Dick usually casts from the bow where a foot-controlled electric trolling motor is installed. He sits on a box hinged to the front seat, which also serves as a storage compartment for his electronic fish finder.

Additional storage was provided by enclosing part of the space beneath the seats. This gives him a place to stow rain gear, lunches, a first-aid kit, and tools.

In his station wagon, Kotis has a definite place for storing each item of fishing equipment. "I decided long ago," he says, "that I wasted too much time assembling fishing rods when there was good fishing water in sight." He now has a set of rod racks installed in the roof of the wagon so the rods can be carried already set up. Another carrier with snap-off pouches hangs over the back of the front seat, and the storage space beneath the floor has been partitioned into compartments.

The Kotis ideas for instant fishing can work for anyone. Just remember that the guy who catches the most fish is likely to be the one who spends the most time actually fishing, the one who's always ready for the next cast. ★ ★ ★



UNDER-DECK STORAGE in station wagon is partitioned into compartments to keep the equipment in order



GADGET CARRIER hanging from the front seat has snap-off pouches which can be carried to the boat



BOW SEAT, a box hinged to the boat's front seat, is also a storage compartment for Dick's electronic fish finder. Using the foot control, right, he can regulate the operation of the electric trolling motor



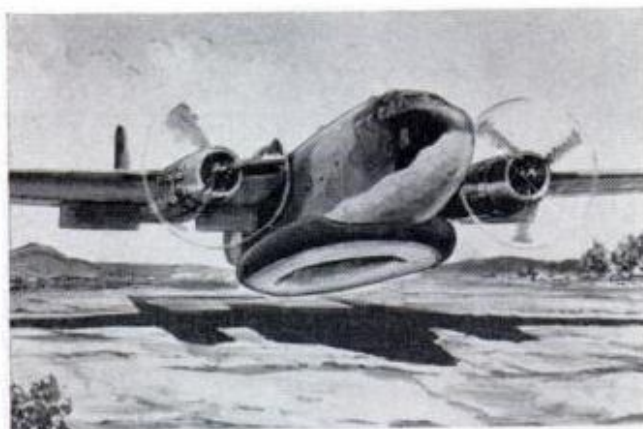
ROD RACKS in the top of his station wagon hold all his rods assembled, so no time is wasted once he reaches good fishing water. In the boat, he always has two fully equipped rods with different lures



Midget two-man subs, Star II and Star III, to be used principally for deep-sea research, get their first taste of salt water as they are launched by crane by General Dynamics Corp. With tail fins and "rudders" they look like chubby aircraft. The larger can operate at a depth of 2000 feet, has a range of 15 miles and a speed of five knots. The Navy foresees use of such subs in surveillance.



Extension handle for outboards permits midships control of throttle and steering. The handle can be snapped on or off in seconds, and extends from 28 to 37 inches, with locking positions at three-inch intervals. It's made by Waukegan Outdoor Products, 1534 Washington St., Waukegan, Ill.



Cushion-soft touch-downs on a carpet of air make it possible for planes to land on rough fields and unimproved strips. The new technique, developed by Bell Aerosystems Co., is similar to that of ground-effect machines. An inflatable ring covers much of the aircraft's belly. As the plane nears the ground, jets lay down a cushion of air beneath it. The plane thus is supported inches off the runway until it loses speed and stops.



Kite flying is a snap for Hank van Meekeren, a staff photographer for the Holland-American Line. To take aerial photos of the S.S. *Statendam* at sea, van Meekeren built a Bleriot-type kite modified to have a bar suspended from the body of the kite to hold a camera which is triggered by a music box-type shutter release. He can shoot an entire liner from 300 feet.



Spring-loaded "gun" is used at Canada's University of British Columbia to "fire" tree seedlings into the ground. Gun bores hole before shooting plastic "bullets" (above) containing seedlings, into the soil. As roots grow, they crack open bullet along vertical slit in casting. A "clip of ammo" contains two dozen bullets. Gun enables one man to plant 1500 seedlings an hour, about 10 times faster than by hand.



That pesky PCV

By MORT SCHULTZ

PCV (positive crankcase ventilation) is the anti-air-pollution system in modern cars. Be nice to yours—or you may end up with a ruined engine

NIGHTCLUB COMEDIANS used to get a lot of laughs with jokes about Los Angeles' smog. But gradually the laughter stopped—and so did the jokes. Today urban smog (air pollution) has "gone national" and is recognized for what it is: a serious hazard adversely affecting the health and well-being of millions of our citizens.

Carbon monoxide is the principal ingredient of polluted air, and the principal source of carbon monoxide is the automobile. In 1961 California passed a law requiring that all new cars sold in that state be equipped with a positive crankcase ventilation (PCV) system, or blow-by device. Two years later similar laws covering new cars were passed by other states.

Nevertheless, PCV has not been enough to offset the ever-rising pollutant levels of our atmosphere. New federal legislation will make it mandatory for all 1968 cars to be equipped with a new, more effective type of blow-by device. Until then we'll all have to make do with the PCV systems built into current models.

Watching your PCV Ps & Qs

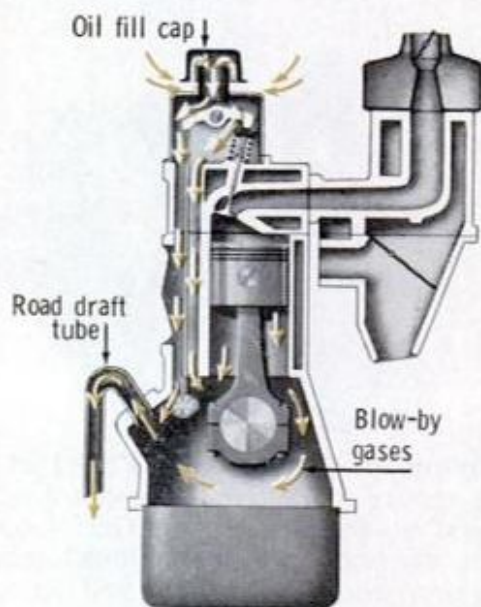
The one thing to remember about a PCV system is this: *If it is not properly maintained, it will ruin your car's engine.*

The fact is that even today, three years after its introduction, PCV is still a big mystery to many car owners—and maybe you're one of them. To find out, see how well you do on the following quickie test:

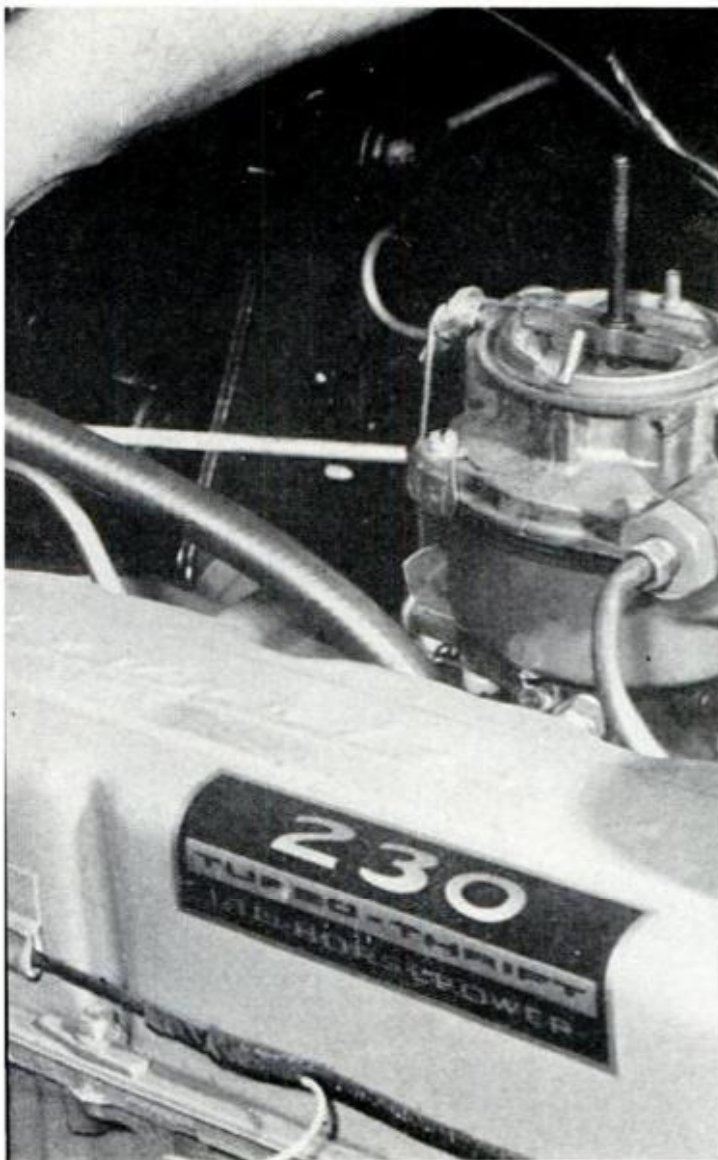
1. What is PCV and how does it work?
2. What are the consequences if PCV maintenance is neglected?
3. What are the trouble signs when PCV begins going on the blink?
4. How often should PCV be serviced?



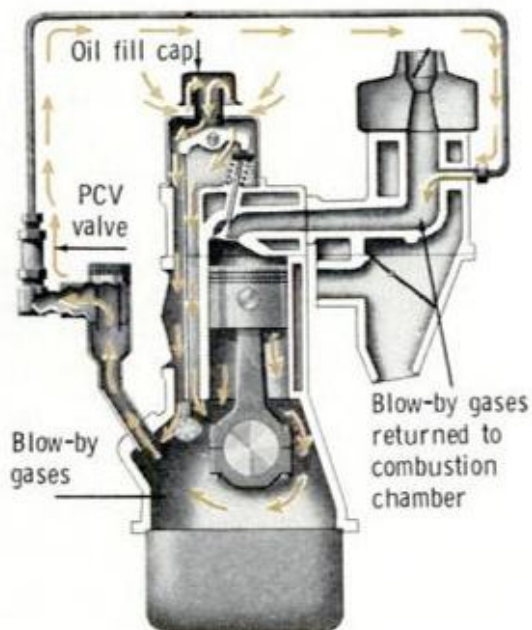
HEART OF A PCV SYSTEM is this valve which



ON CARS BUILT PRIOR TO 1963, engine exhaust was—and still is—thrown out into the atmosphere through a road-draft tube leading from crankcase



regulates air flow into engine's combustion chambers



PCV HAS BEEN REQUIRED on cars built since 1963. Typical system (above) shows how blow-by gases are led to combustion chamber for after-burning

5. How do you service PCV?

Well, how did you do? Don't worry if you flunked; chances are the guy down the street did too.

PCV—what it is, what it does

Every car has a ventilating system designed to get rid of blow-by gases produced by combustion. These contaminating gases consist of water vapor and fumes which, if not purged from the engine, will cause sludge and varnish to form on moving parts and permit internal rust and corrosive acids to build up and damage highly polished engine components.

In cars built prior to 1963, engine ventilation is achieved by vehicle motion. As the car moves forward, a low-pressure area is created in a road-draft tube that protrudes from the lower end of the crankcase. At the same time, air rushes into the oil-filler tube via the cap and passes into the crankcase where it picks up crankcase gases and fumes (so-called blow-by) and carries them out into the atmosphere through the draft tube.

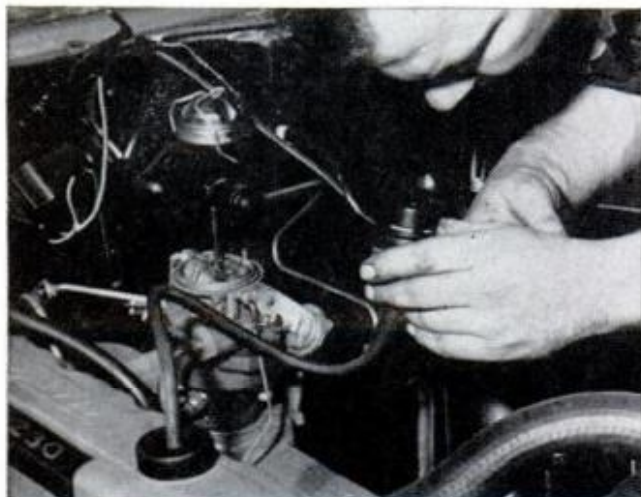
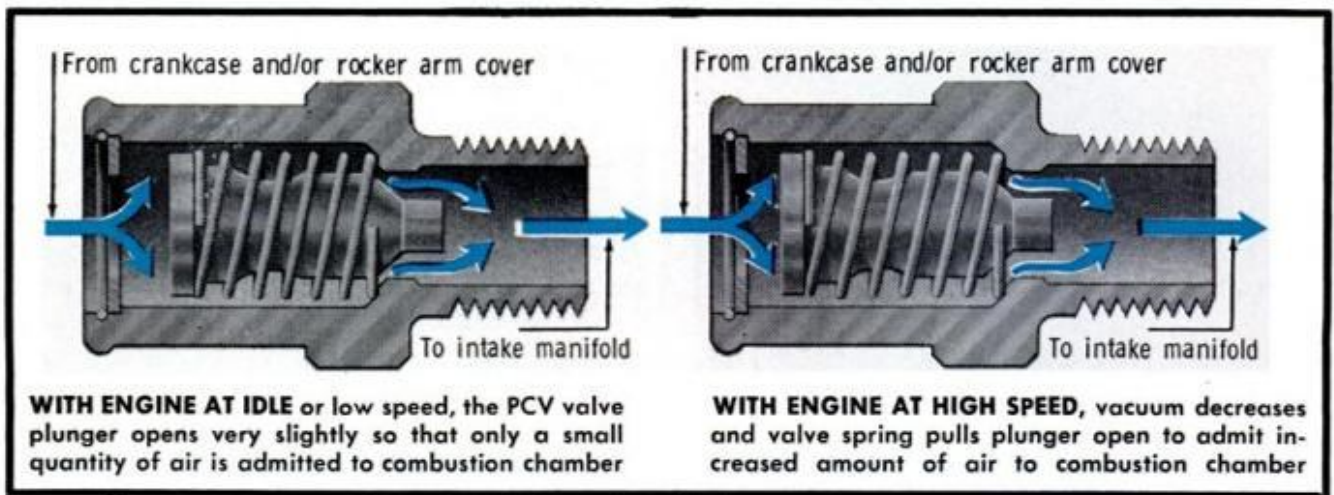
The discharging of these contaminants into the air which we breathe is what PCV is designed to prevent. PCV uses the vacuum created in the engine's intake manifold to draw blow-by from the crankcase and return it to the combustion chambers for burning, instead of pushing it raw into the atmosphere.

As with the road-draft tube setup, air enters the oil-filler pipe and goes into the crankcase where it picks up blow-by. However, the PCV system is "closed"; that is, it has no outlet into the atmosphere.

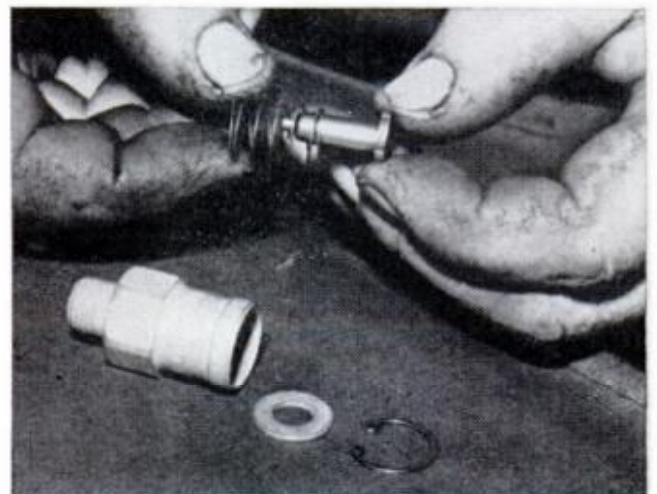
Engine vacuum in the manifold pulls the contaminant-loaded circulating air from the crankcase into the lower end of the carburetor—or directly into the manifold—by means of a ventilating hose. The contaminated air then passes into the combustion chambers where it is burned and then exhausted.

The heart of PCV is a valve which regulates the flow of air into the combustion chambers so that contaminated air coming from the crankcase doesn't upset the proper fuel-air ratio necessary for efficient engine operation.

At idle speed, for example, intake manifold vacuum is at its peak. If vacuum were allowed to pull a maximum amount of air into the combustion chambers, the air would upset fuel-air ratio and idling



USE PCV TESTING INSTRUMENT (about \$8) to measure air circulation through crankcase while engine idles



PCV VALVE ABOVE can be taken apart. Some valves can't be taken apart, but both types can be cleaned

would be rough. However, the high vacuum created in the manifold overcomes the tension of the valve spring and moves the valve plunger all the way forward to its low-speed position. With the plunger thus set, a minimum amount of air is allowed to pass into the intake manifold.

As engine speed increases, manifold vacuum decreases and the valve spring tightens up, forcing the plunger to move gradually backward and allowing more air to flow into the intake manifold. Naturally, blow-by increases as engine speed increases.

Another purpose of the PCV valve is to guard against a crankcase explosion should the manifold backfire. Manifold backfire must pass through the valve before getting to the crankcase. When the valve plunger is shoved back by the backfire it prevents the backfire from entering the crankcase.

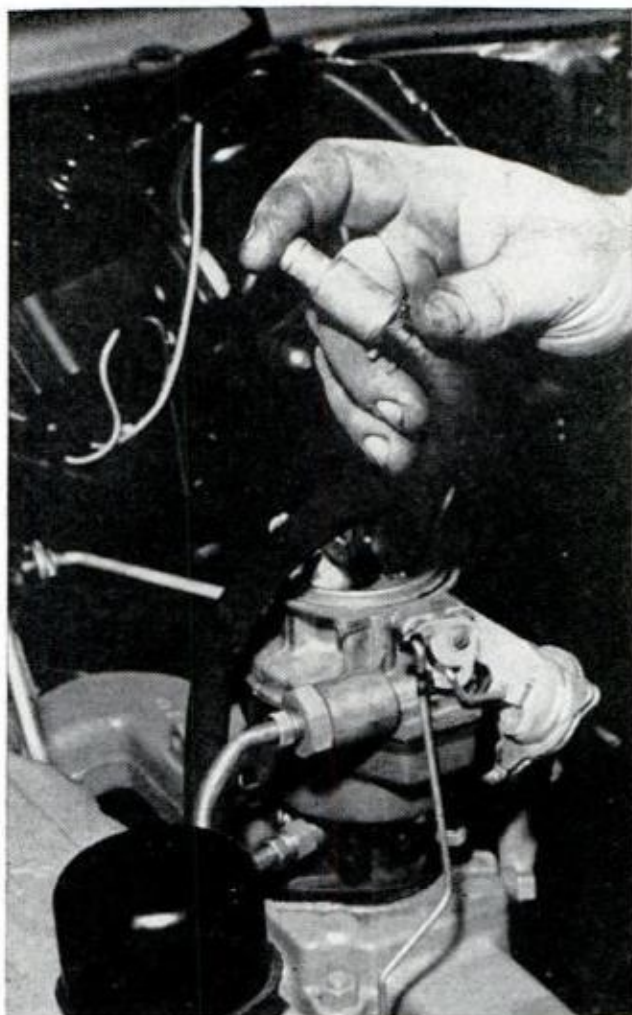
One sure sign of trouble in the PCV system is when the spring valve starts jamming in the open, closed or in-between position as a result of sludge

buildup. Then fumes left in the crankcase will begin to cause an accumulation of varnish, rust and acids. Sludge may also get to engine parts via the intake manifold.

You can buy a PCV testing instrument for use in checking out the system. It's a pressure-sensing device that measures air circulation through the crankcase while the engine is idling. These sell for about \$6 to \$8 at auto supply stores.

In use, the tester is placed over the oil-filler tube when the engine has reached normal operating temperature. Idle the engine and look directly into the tester glass to check the color indicator. Green tells you the system is okay; a yellowish hue indicates that the valve or system is partially blocked; and red means that it's badly blocked.

You'll find one of two types of valves in your PCV system. In most cases it's a crimped valve that can't be taken apart for cleaning. Remove it, soak it in solvent, then blow it dry with compressed air. Now shake it. Listen for the clicking of



CHECK SYSTEM by flicking finger over valve end of hose; vacuum should be good, engine idle should vary

the plunger as it moves back and forth. If the plunger doesn't click, it's plugged up with sludge and the valve (about \$2) should be replaced.

The other type of valve can be taken apart for cleaning.

Both types of valve consist of a plunger, spring and valve case. The take-apart kind is disassembled by pulling a retaining ring and removing a washer to get to the inside parts. Brush all parts clean in a pan of solvent, but be careful not to stretch the spring.

When reassembling this valve, make sure the spring is pushed well back onto the plunger so that the plunger will be squarely seated during operation.

To test the rest of the PCV system, start and idle the engine. Hold your finger over the open end of the ventilating hose or valve. You should feel a strong suction, and engine idle should vary as you cover and uncover the end with your finger. Weak suction or lack of engine-idle variance indicates a plugged-up hose.

Look at the system. Most Sixes and

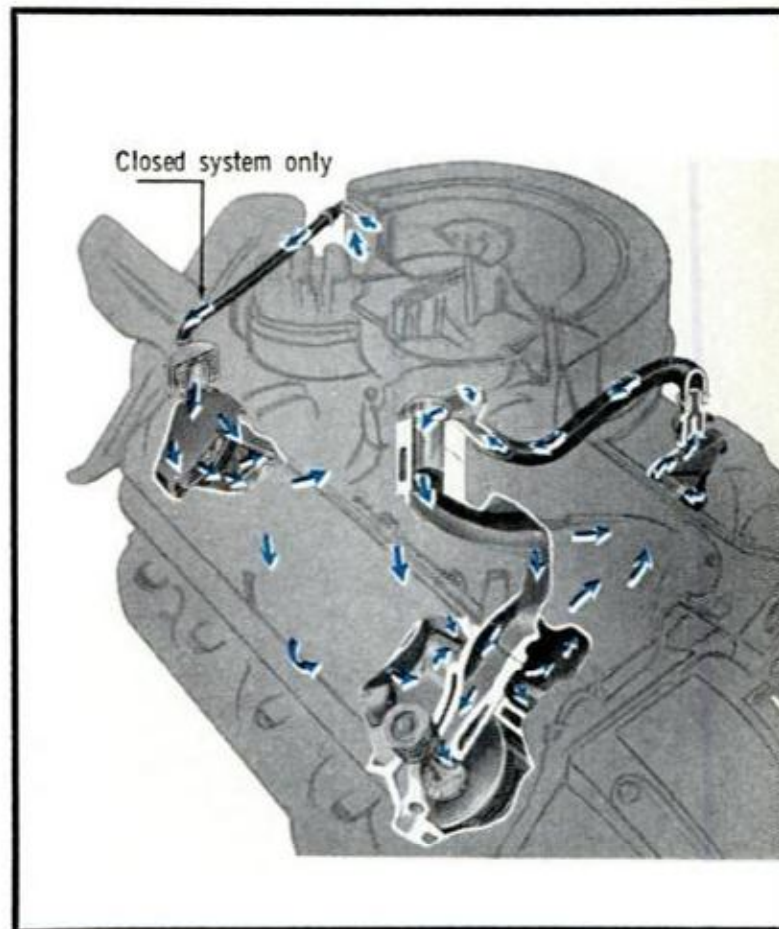
V8s have only one hose—the one going from the crankcase (or rocker-arm cover) to an inlet in the carburetor, or directly to a nipple on the manifold.

However, some engines use the so-called closed PCV system. This system is identified by a hose running between the oil-filler cap and the carburetor air cleaner. The closed system is the same as the other except that incoming ventilating air is picked up at the carburetor air cleaner, then travels through the hose to the oil-filler cap which is otherwise closed to the atmosphere.

In a closed system it's very important that the carburetor air cleaner be cleaned or replaced whenever the PCV is serviced. Hoses should be removed, cleaned out with solvent, then blown out with compressed air. Cracked and worn hoses should be replaced.

In those systems where hoses connect to the carburetor, it's not unlikely for the carburetor passage to get dirt-clogged. You can ream out this passage with a piece of wire or small drill bit, but be

(Please turn to page 180)



A CLOSED PCV SYSTEM is illustrated in above drawing. Note hose that connects carburetor air cleaner to oil filler cap. It is responsible for carrying circulating air through system to the crankcase



Home is

Big 42 page home-remodeling section

10 idea-packed features:

Eleven weekend projects

Adding a window to a paneled door

Give your wife a break with a sewing or laundry workcenter

Swing-down kitchen cupboards

Exciting new building products

Deluxe bathroom for a modest home

Build this home "wonderbar"

Once a grill, now a fireplace

9 novel hinges — can you guess what they're for?

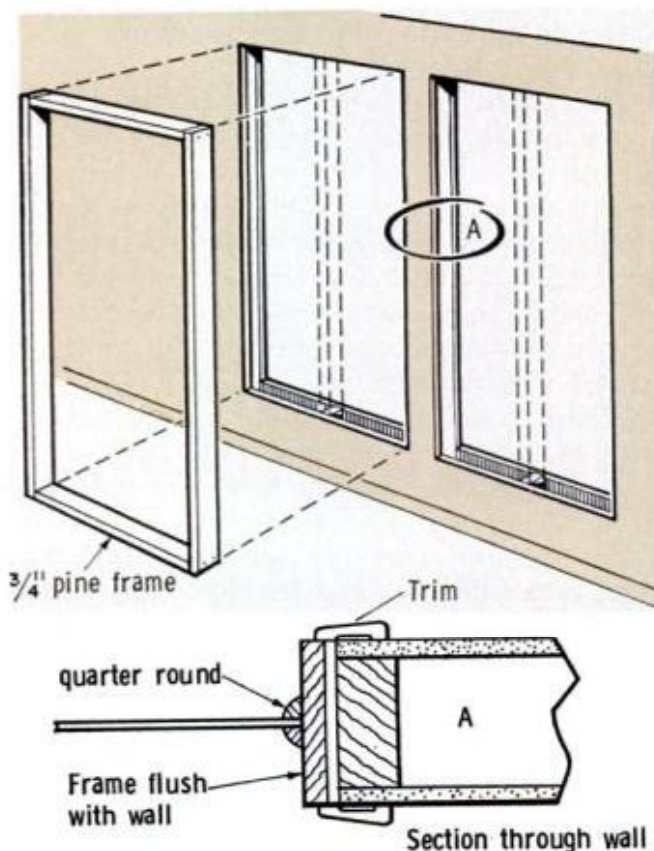
Add-on bay takes load off garage

Plus: Handy clip-and-save reference chart on basic remodeling measurements, shortcuts and tips, homeowners clinic and many other exciting ideas for the do-it-yourselfer

11 Weekend projects

LOOKING for quickie ways to add working convenience and eye-appeal to your home? Here are 11 such projects for you to browse through which cover every room of the house. Perhaps you'll find at least one which will spark your interest and be adaptable to your own home. Some may require more than one weekend.

1 SKYLIGHT WALL. If you have a non load-bearing wall that separates kitchen and dining room, decorative panels of fiberglass framed in the wall will create a most dramatic day and nighttime effect. Light from either room illuminates the other. It requires cutting rough openings through the wall, framing them on both sides with trim like a door and holding flat sheets of translucent Barclite in the openings with strips of quarter-round molding. Locate the studs that are to be sawed out first. This will let you chop away enough wall to make it easy to spot the others along which you will saw in forming the openings. Don't worry about the wall falling down. Since it is not load-bearing, and the studs are not adjacent, the removal of the two members will not weaken it appreciably. The frames which line the openings are made so they're flush with the wall on each side



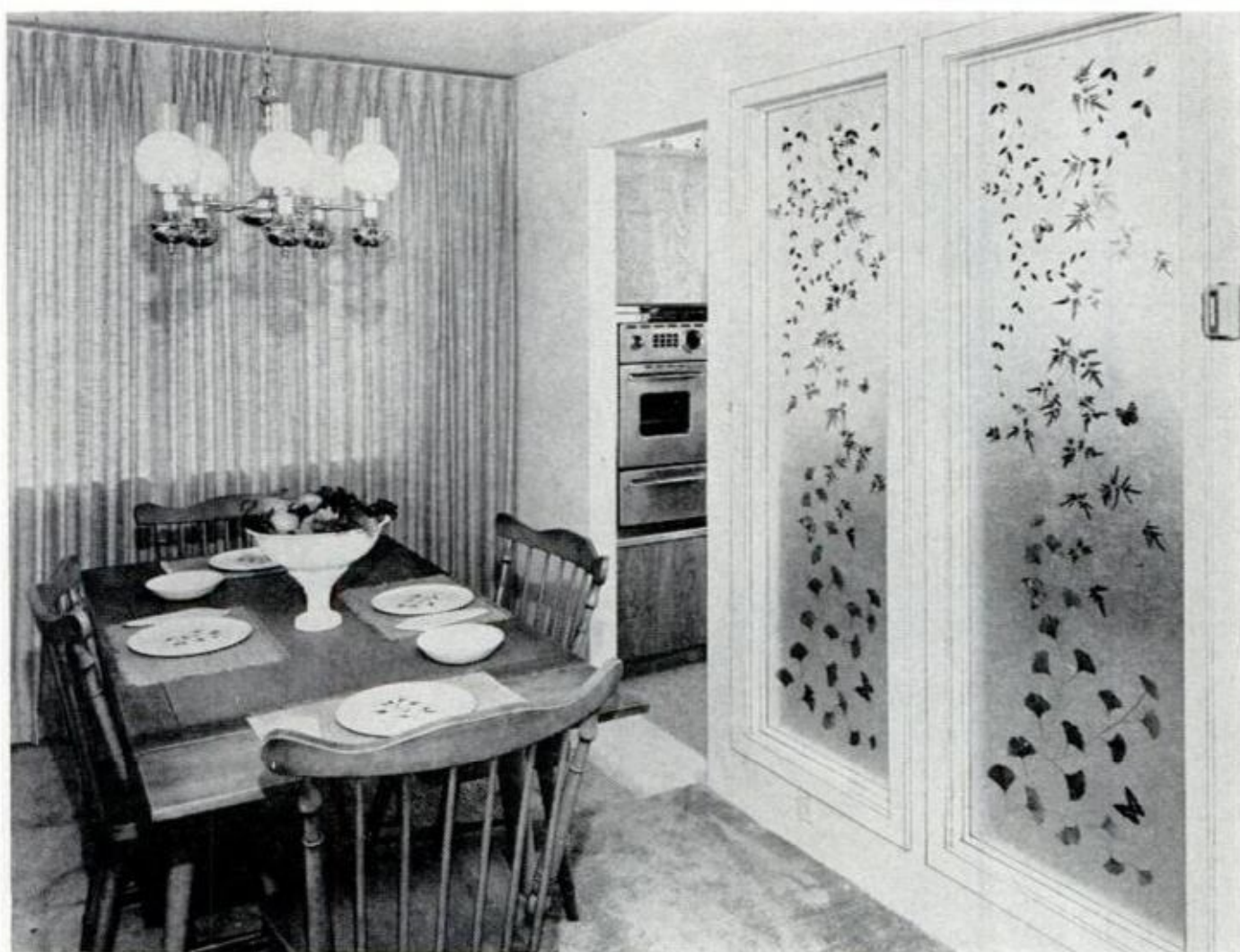
what you make it!

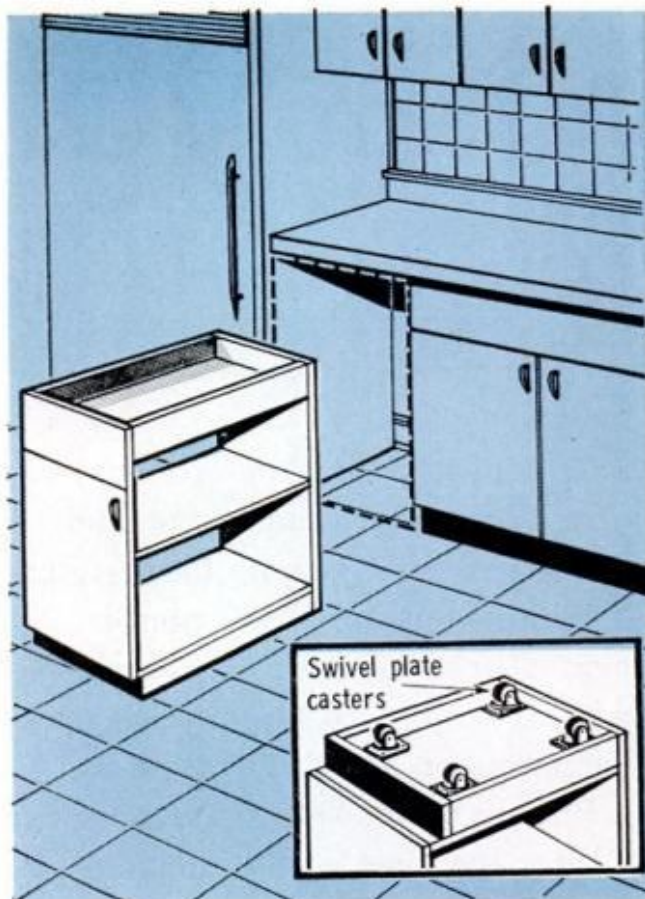
THE ADAGE, “*Home is what you make it*”, certainly could have been coined by the do-it-yourselfer. For it couldn’t apply more appropriately than to the guy who gets a kick out of remodeling his home and fixing up his yard.

To him it’s not a mere money-saving chore, but more a fun sort of thing that brings great enjoyment and relaxation to one who likes to work with his hands—who gets a charge from being handy.

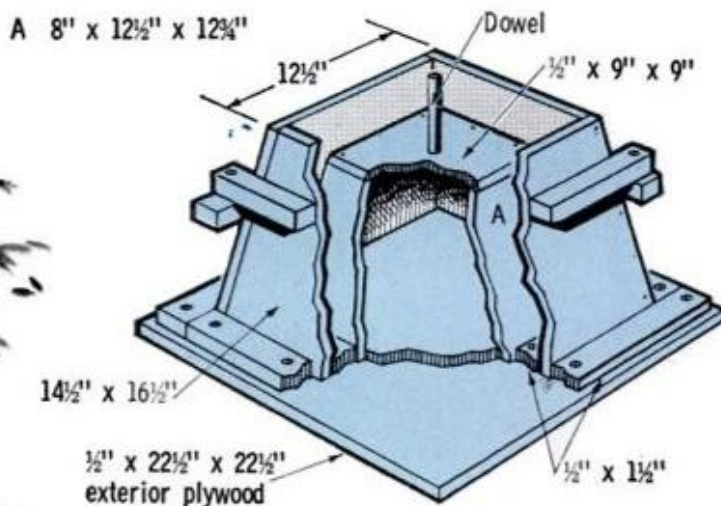
Who is this rare and wonderful breed of guy? To some he’s the oddball next door who is ripping out his old bath. He’s the character up the street who’s adding a patio out back. He’s some sort of a nut who’d rather grab a hammer than a golf club.

But in being one of the breed yourself you know that he’s a guy who’s having the time of his life enjoying the rewarding and relaxing hobby of “*making his home what it is.*”

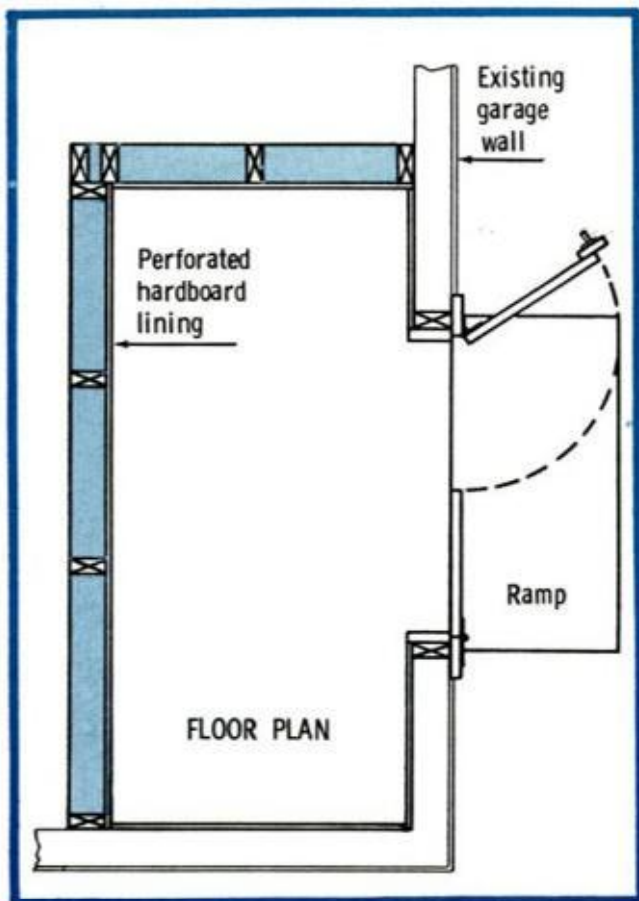




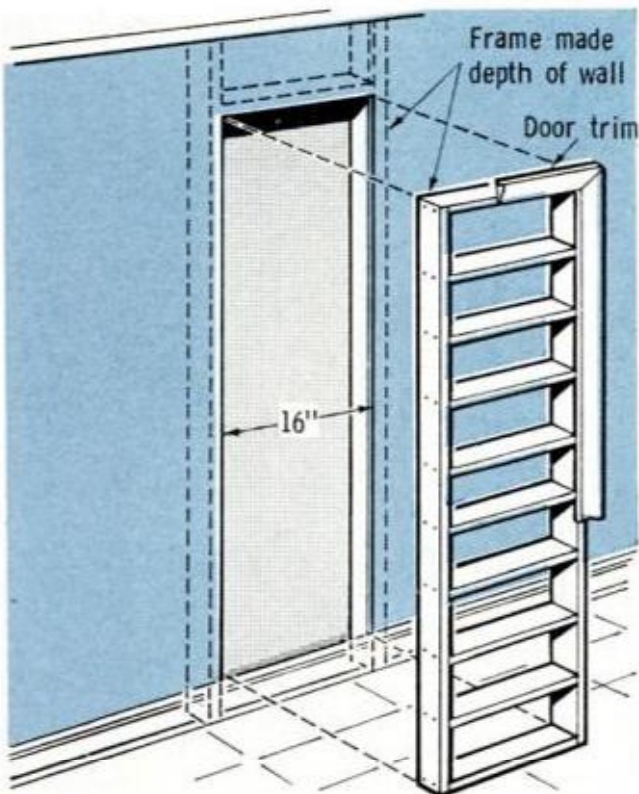
2 WASHER STALL. Stumped for a place to park a portable clothes washer in the kitchen? Here's a clever answer if you can afford to sacrifice a little cupboard space. You simply form a stall for it under the counter by removing a portion of your base cabinet. When parked, the washer looks like any other built-in appliance. Same idea is adaptable to a roll-around kitchen appliance cart. When it's parked, a dummy drawer front and matching finish makes the cart blend in and look like the rest of the cabinet, with no one being the wiser. Pulled out, it makes a handy caddy for a toaster, mixer or coffee maker at table-side



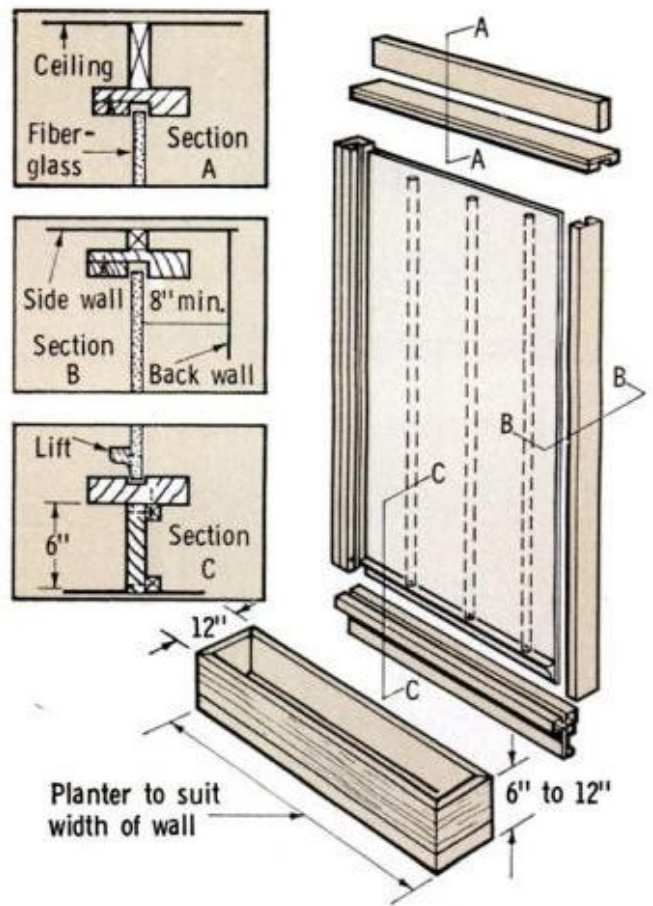
3 PLANTERS BY THE DOZEN. King-size patio planters cost a pretty penny, but not when you cast your own. Once the mold is made, you can cast as many as you want, using convenient bag mixes that need only water added. In filling the mold be sure to spade the mix well so it will be dense and without voids. Brushing a light coating of grease on the mold will keep it from sticking. Cure the finished planter by keeping it moist for five days or so by sprinkling occasionally with water. The longer concrete is kept moist, the more durable it will be. Keeping it from drying out too quickly by covering with burlap or straw is the thing to remember



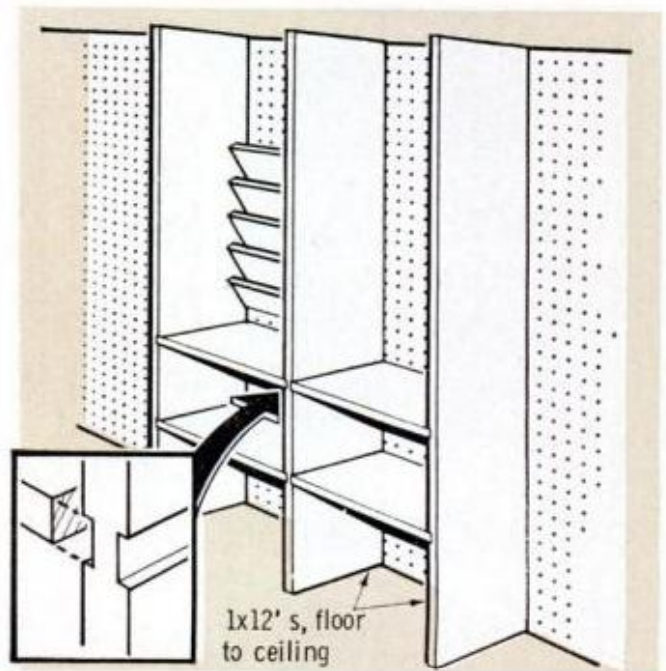
4 **SHORTCUT TO TOOL STORAGE.** It's downright silly to have to walk clear around to the garage each time that you want a garden tool—especially when this step-saving storage closet can be made to open up directly from the yard. Framing it of 2 x 4s as shown in the drawing and then lining it with Peg-Board is all there's to it other than cutting a doorway through the garage wall from the outside. Made large enough and fitted with a ramp, such a closet makes it extra convenient to park heavy yard equipment. The perforated-hardboard lining makes it easy to hang all kinds of garden tools in neat and convenient array



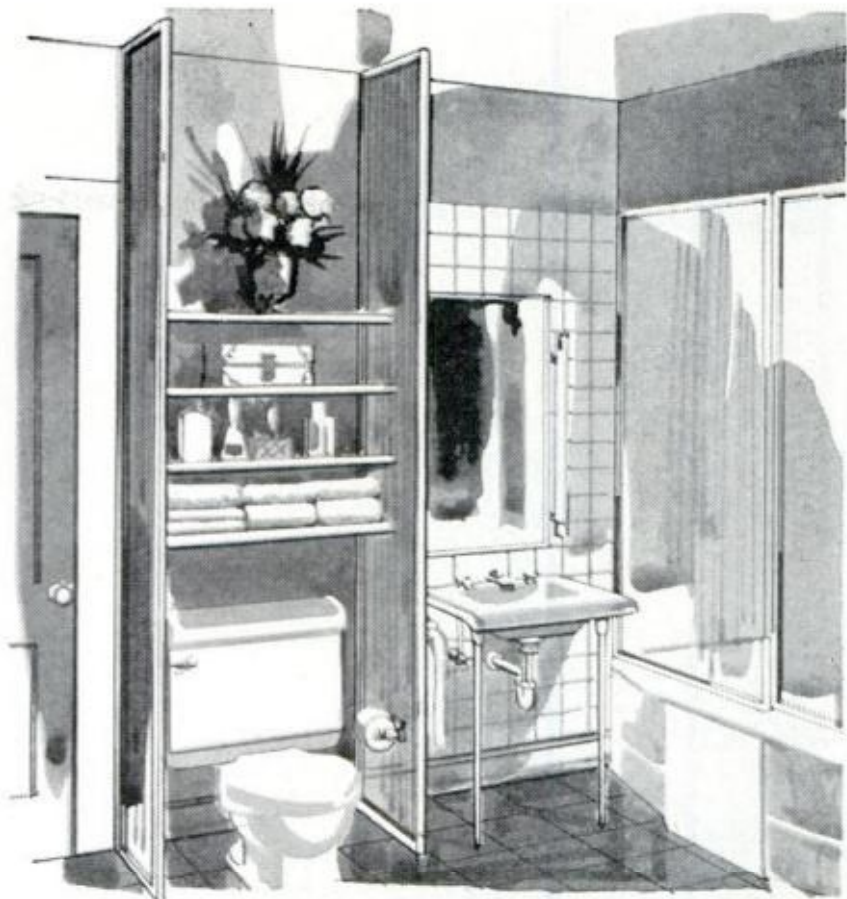
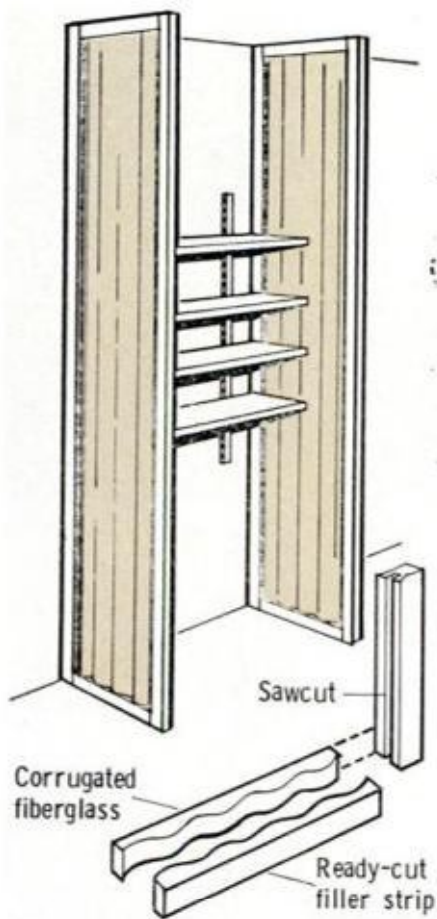
5 **SPACE A-WASTING.** Believe it or not, there's space going to waste in the walls of your house. This is especially true in your kitchen since the hollow space between the studs affords ideal storage for canned goods. What's more, with the cans on shelves of one-can depth, you can see every can at a glance with supermarket efficiency. All it takes is a shallow, backless cabinet fitted with plenty of shelves and a stock-size louver door which is made to fit a niche cut between two studs. Door trim mitered at the corners, is used to cover the rough opening, and a common magnetic catch holds the louvered door shut



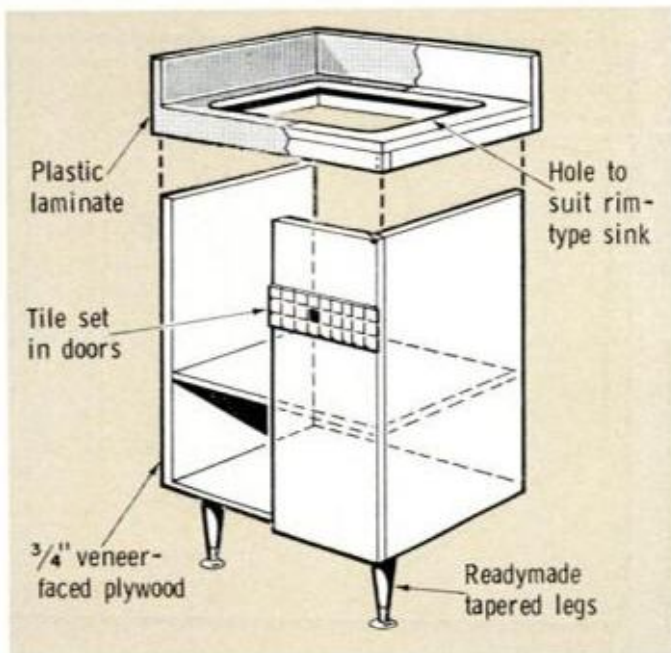
6 LET THERE BE LIGHT. Next best thing to an actual window at the end of a dark hallway is this smart illuminated panel and planter. Dramatic looking both day and night, it combines a touch of greenery against a backdrop of a floor-to-ceiling fixture. A panel of white translucent Filon hides a bank of fluorescent lamps fastened directly to the wall. Removable molding holds the fiberglass panel, to let you get at the lamps. The matching wooden planter box, filled with plastic plants, is separate from the rest. In studying section details A and B you'll note there are filler strips indicated, called scribing members, which are marked and cut to conform to any irregularities that there may be in walls and ceiling. Main purpose of the strips is to prevent light leakage around the edges of the frame supporting the plastic diffuser



7 SHELVES APLENTY. To solve that never-ending need for more shelf space to hold books and magazines in a family room, this unit stands against a wall of perforated hardboard to double its capacity. A divider-type affair of wide (1 x 12) boards, it creates shelves and niches across the wall. Since the niches thus have perforated backs, countless additional shelves and hooks can be used to give unlimited display. Slanting dividers between the uprights make for easy magazine selection. The detail shows how dados in the vertical members permit the shelves to be joined and cross-aligned in assembling and gluing the unit together

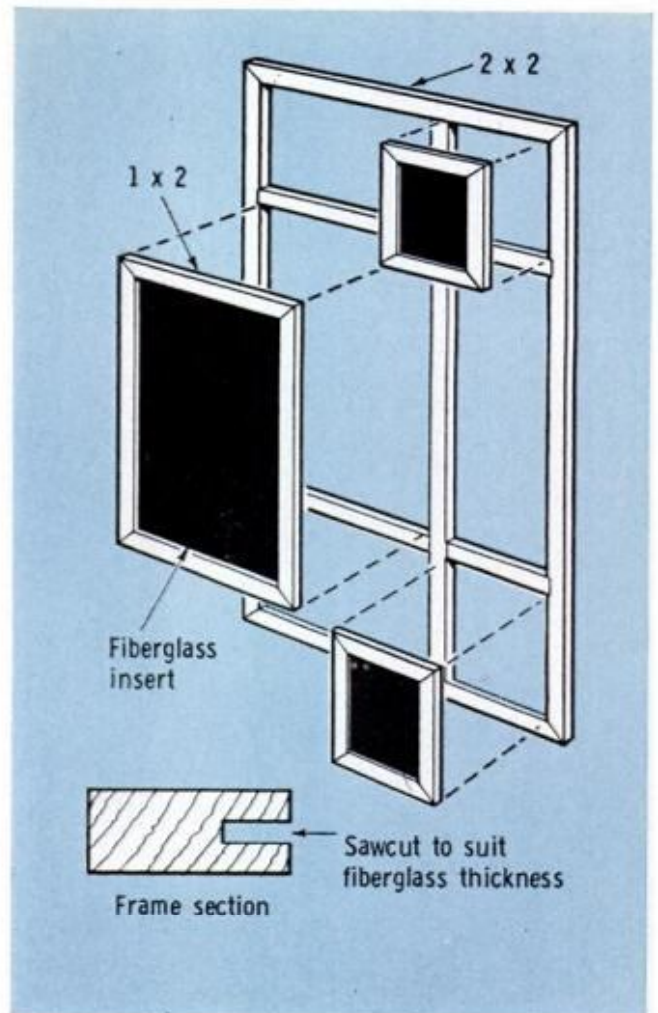
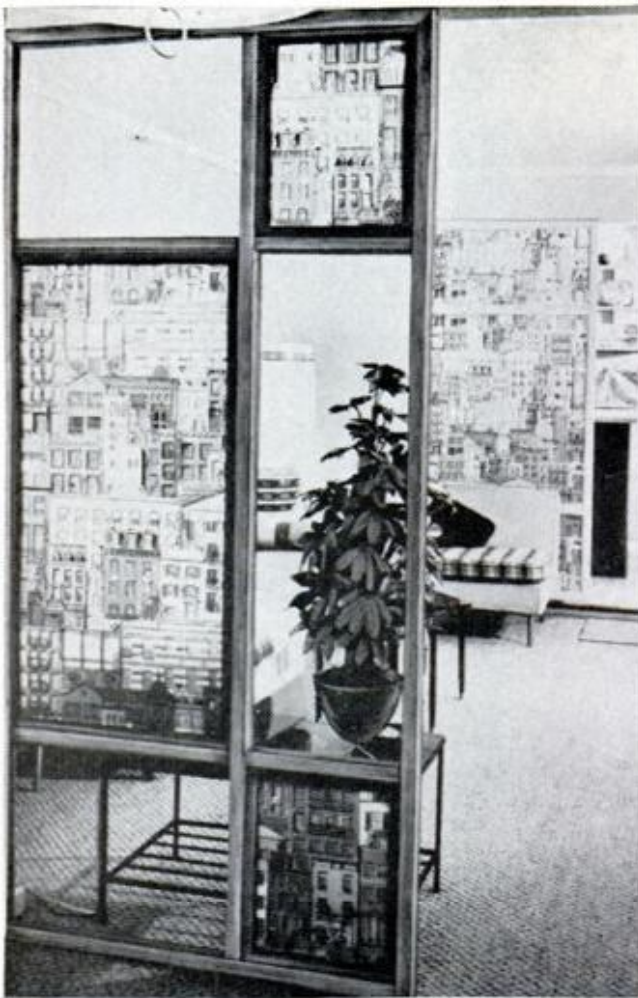


8 TOWELS OVER THE JOHN. You'll be making the most of space in a small bathroom with this attractive towel rack that stands over the toilet tank. Not only is it a clever idea for making use of waste space, but the open rack lets a group of towels add a bright spot of color while they're waiting to be used. Rack sides are of tinted corrugated fiberglass set in narrow floor-to-ceiling frames. Regular standards and adjustable brackets are used to support the shelves

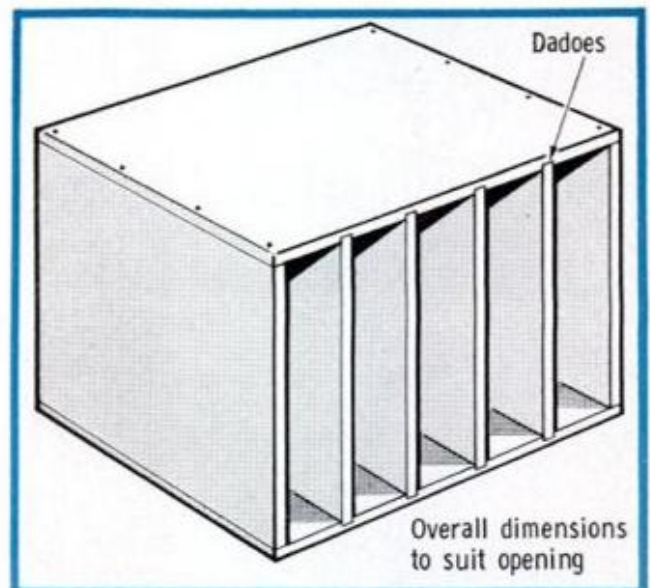


9 VANITY CONVERSION. Another way of gaining space in a tiny bathroom is to convert a leg-supported washbowl to a vanity. Little more than a cabinet, it does offer additional storage for such bathroom essentials as bowl cleansers, tissue. Matching wall tiles set flush in the door give the vanity a custom look





10 SEE-THROUGH DIVIDER. A room divider that's different indeed, this beauty features separate inserts of patterned fiberglass that resembles stained glass. Left open in a staggered see-through pattern, it can create a small hallway without reducing the overall spacious feeling of the room itself. The basic framework is a simple grid design constructed of 2 x 2s. Separate frames of 1 x 2s, grooved to house the fiberglass, are made to fit inside the openings in the grid frame. Half-lapped joints are used where members cross, while corners of both main grid frame and the inserts are mitered

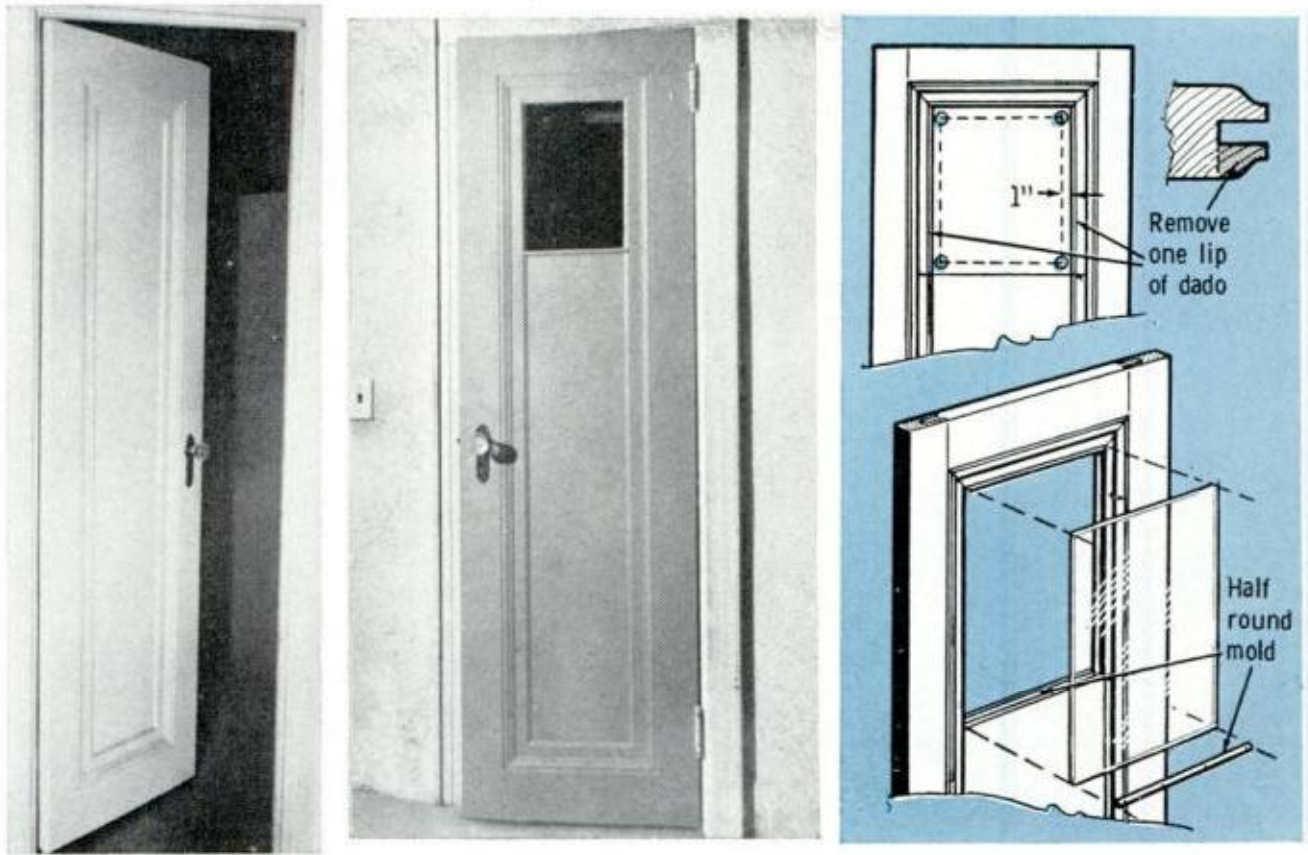


11 ORDERLY STORAGE FOR TRAYS. How and where do you stash such hard-to-store things as serving trays, cookie sheets and similar slim-jim items? On edge and in narrow pigeon holes is perhaps the best answer as to how, and in a section of a pan cupboard is one version of where. Here a portion of the center shelf will have to be sawed off to accommodate a separate slip-in unit which you make to fit. Shallow dadoes in top and bottom members will add rigidity when the parts are assembled with nails and glue. It's easier to paint the dividers, as well as the top and bottom parts, before gluing in the dadoes



Home is what you make it!

Adding a window to a panel door



SOMETIMES IT'S HANDY to have a glass-paneled door in the house. In the project shown, for instance, the door led into a laundry room and was normally kept closed. With a window added, however, the wife could glance in and see whether the washer was ready for another load. Also, the glass panel let in quite a bit of extra light.

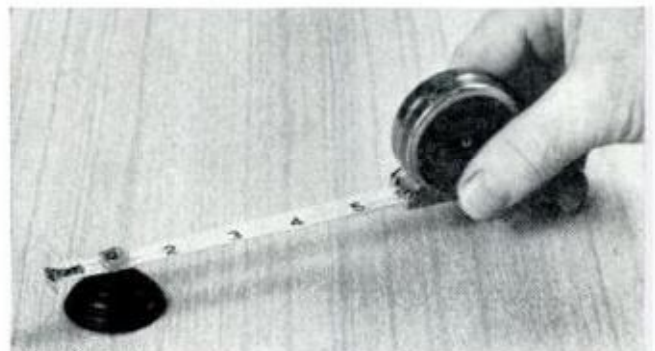
Installing the window involved nothing more than replacing a portion of the wood panel with a pane of glass. The section of wood panel was removed by drill-

ing starter holes 1 in. in from each corner and sawing out the center section, then making a saw cut into each corner so that the four remaining strips could be pulled out of the dados.

The top edge of the pane was bedded in putty in the regular panel dado at the top of the door. One lip of each side dado was removed with a sharp wood chisel so the glass could be slipped into place. Glazier's points and putty were used to hold it. Half-round molding was added at the bottom to act as retainer strips.

Suction cup increases versatility of your steel tape

It's difficult to get an accurate measurement with a steel tape if you can't anchor the end by hooking it over an edge. A suction cup bolted to the end of the tape does away with such difficulties, making it easy to take measurements off a flat wall surface, either vertical or horizontal. Just drill a hole in the tape to fit the bolt in the suction cup, and keep the suction cup handy in your tool chest.—Ken Patterson





Home is what you make it!



Give your wife a break

Here are two step-saving work centers, one a multipurpose kitchen laundry wall, the other a complete dress-making shop in a cabinet, to make housework easier for her

1. Kitchen laundry wall

By Hank Clark

IT MAKES SO MUCH SENSE to locate the home laundry in the kitchen that I'm surprised more people haven't done so. Modern washers and dryers are as smartly styled as any stove or refrigerator, and most of them are whisper-quiet. But the strongest argument is convenience—no more running up and down those basement stairs.

I installed our washer and dryer in the space originally planned to hold a dinette set. (We now eat all our meals in the dining room). The one problem was finding a place to store all those laundry necessities—soap, bleach, a sorting hamper for dirty clothes, and the rest

of it—but I had already planned a solution for this.

Special-purpose cabinets above and on either side of the washer and dryer provided plenty of storage space for all of these things. There was even some extra shelf space to take the overflow from other kitchen cabinets. Since all the cabinets were styled to match the kitchen decor and dimensioned to fill the available space, the whole thing ended up looking like an efficient built-in laundry center which might well have been a part of the original kitchen plan.

Now that it's finished, I can see that this laundry wall could just as well be

BROOM CLOSET at the end of the laundry wall holds the vacuum cleaner, floor polisher and even a broom

DOUBLE HAMPER features partitioned bottom section for sorting clothes. Top is for unironed laundry





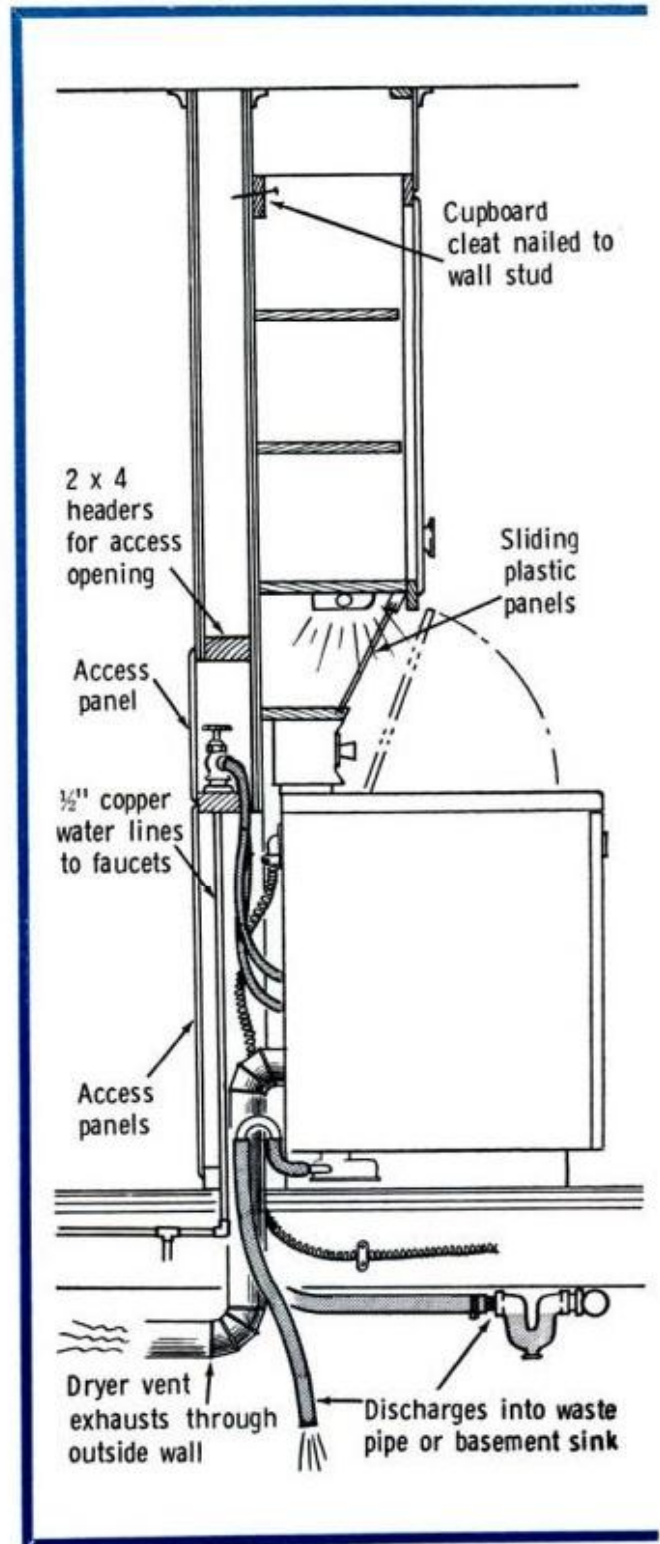
KITCHEN DESK above hamper has plenty of pigeonholes for household accounts and correspondence



END CABINET is a handy place to store detergents and bleaches. It's located right next to the washer



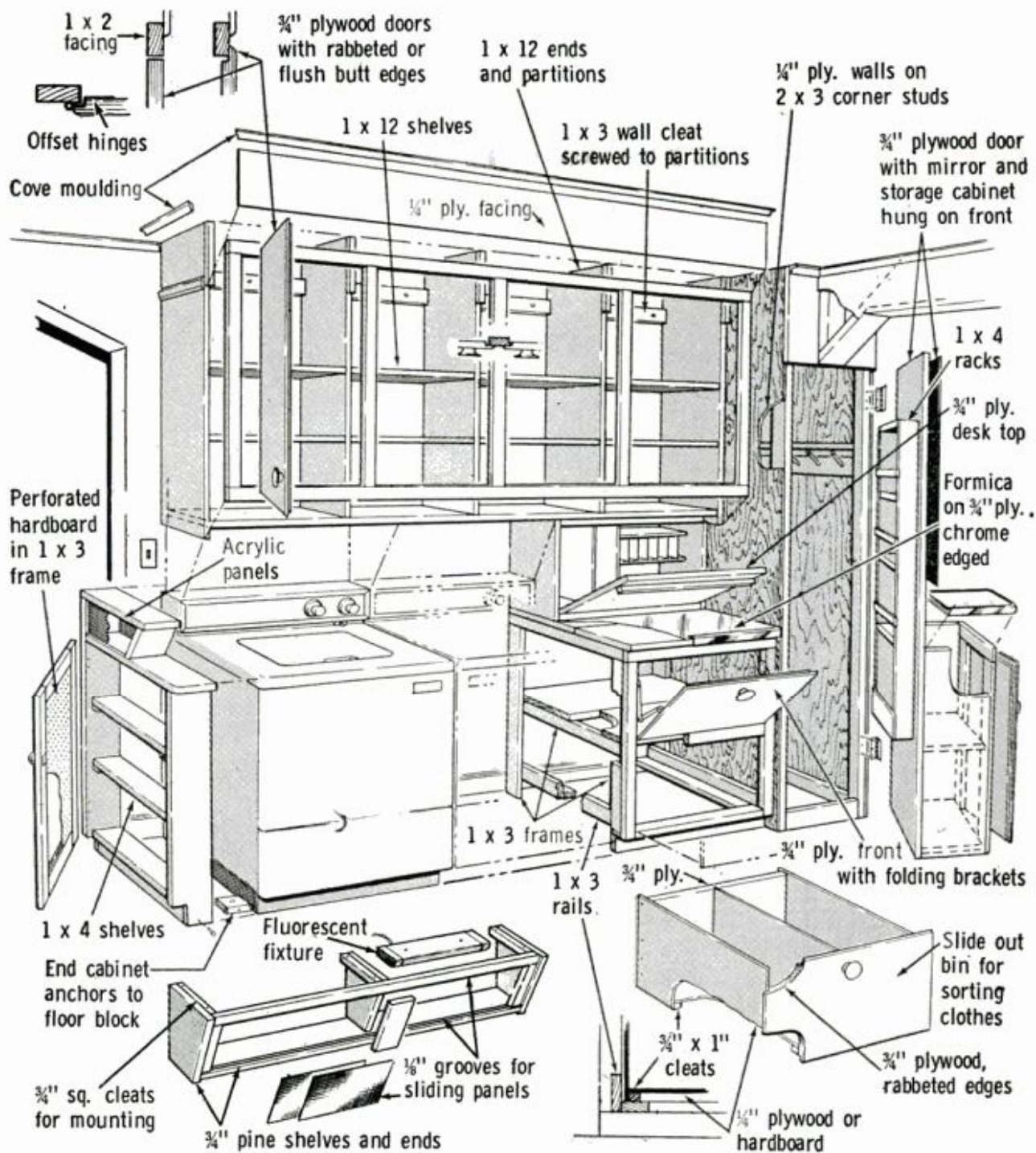
COOKBOOK SHELVES have sliding doors of opaque plastic to diffuse light from fluorescent fixtures inside



built as an island divider wall or a partition with one end against a regular wall to form an alcove. It depends on your floor plan.

The only real requirement is access to the laundry lifelines—hot and cold water for the washer, a drain line to a trap, a 20-amp outlet to plug in the washer, a 50-amp circuit to the dryer (or a gas line, if you have a gas dryer) and an outside exhaust duct for the dryer.

The water lines should have shut-off valves at the outlets, since washer manufacturers recommend that the water be

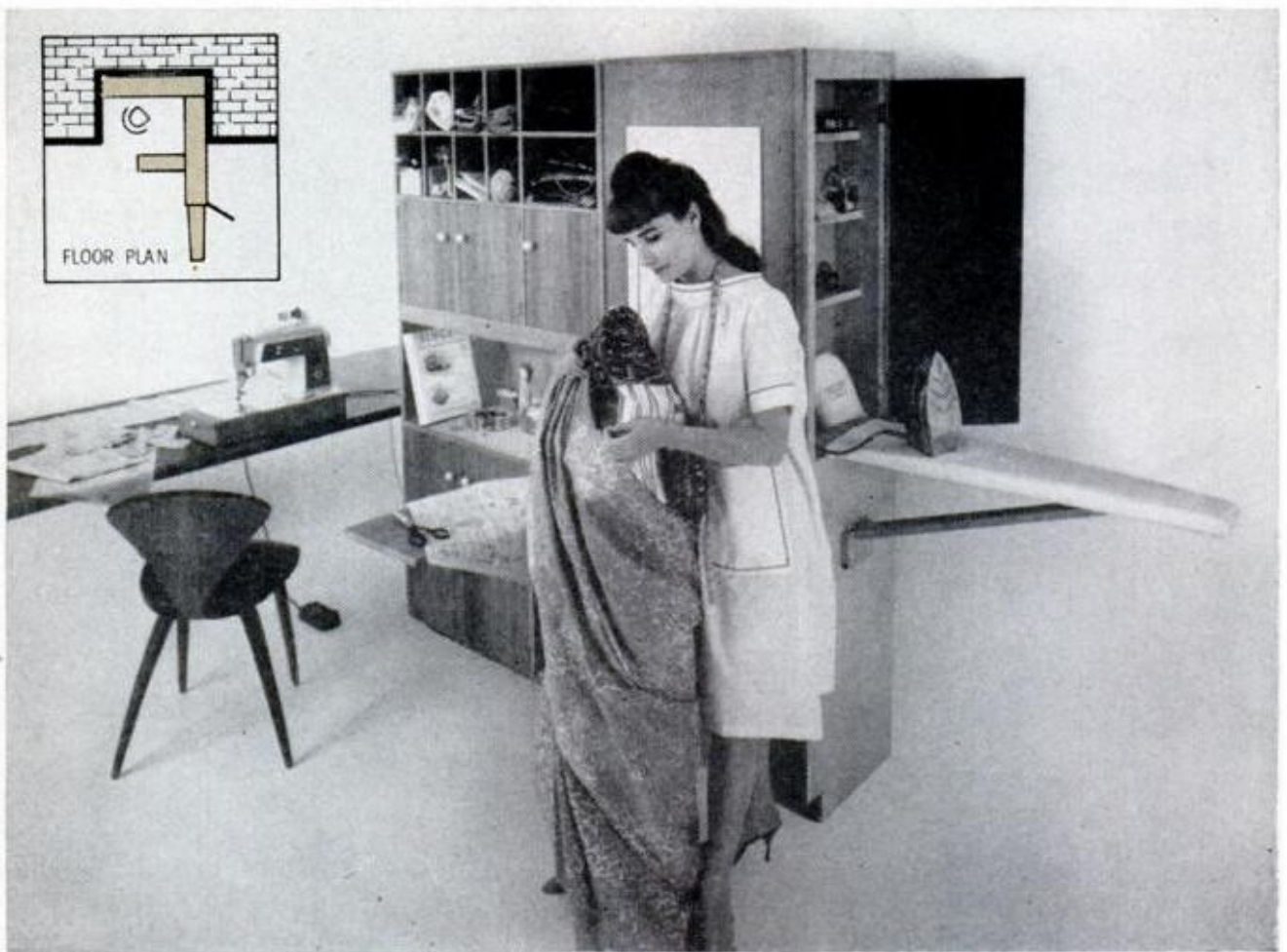


shut off between loads to take pressure off the hoses. I installed an access panel in the opposite side of the wall from the laundry center for this purpose.

All building codes require a trap in the drainage line to prevent sewer odors from backing up. Instead of installing a separate drain with a trap, I led a hose down through the floor to our unfinished basement so that the washer would drain into a stationary laundry tub which is equipped with a trap, so it's all legal.

The plans for the cabinetry are self-

explanatory, with exact dimensions being determined by the space available. Bear in mind, though, that most washers are top-loading so the bottom of the wall cabinet above should be high enough to allow the lid to swing up. Shallow cookbook cupboards with inclined sliding doors of translucent plastic fill this space nicely without obstructing the lid. Fluorescent fixtures mounted in the top of these cupboards and wired to a wall switch, provide plenty of light directly over the washer and dryer where it's needed.



DESIGNED TO FIT the alcove of a dormer (see inset), sewing center makes full use of light from window

2. Dormer sewing center

HAS YOUR WIFE'S SEWING gradually outgrown the sewing-basket stage? If her sewing paraphernalia is now scattered all over the house, here's a welcome solution designed by *PM* and built for us by Simpson Timber Co. that will organize everything in one place.

Basically, it's just a compact free-standing cabinet equipped with a number of special-purpose storage compartments and a spacious worktable. And while it could be used anywhere, it was originally designed to suit a rather unusual situation in which the only possible location for a sewing area proved to be in a large double-windowed dormer at one end of the master bedroom. While the lighting situation was ideal, potential storage space seemed quite limited.

To take full advantage of the light, a spacious worktable was installed in the dormer directly under the windows. It rested on cleats secured to the wall.

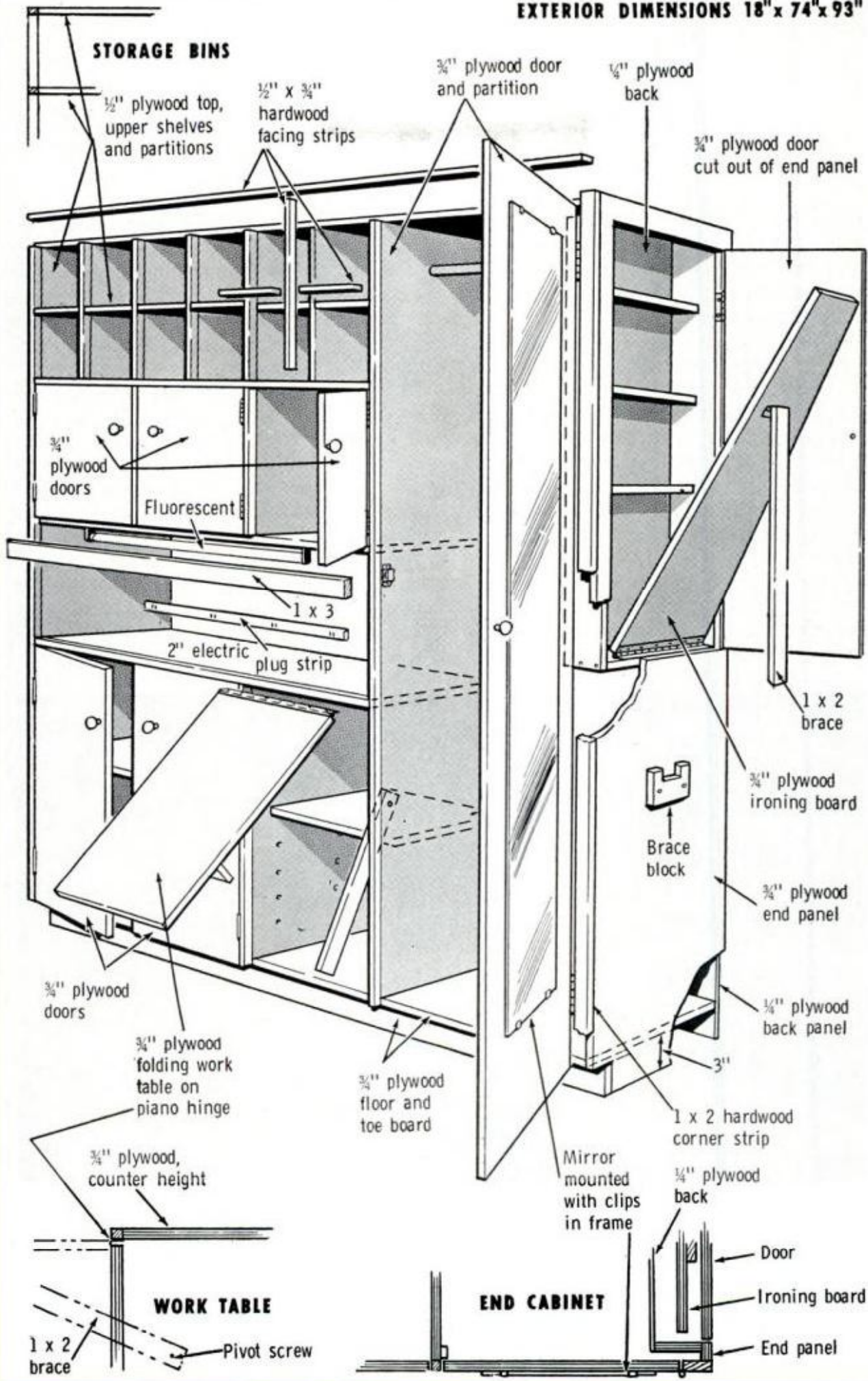
Providing adequate storage space seemed to be an almost impossible problem at first glance. The dormer was too narrow to ac-

commodate storage cabinets on both walls, and the slanting roofline made it impractical to locate cabinets along both sides.

The solution was actually quite simple—a single large cabinet along one wall of the dormer extending out into the room to partition off that corner and turn it into a sewing alcove. Designed specifically for this storage job, the cabinet's an ingenious combination of different-sized bins and shelves to hold all; everything from buttons to sewing-machine attachments. In addition, it includes a miniature swing-down ironing board, a swing-up work table and a closet for partially finished garments and a dress form. A full-length mirror on the door of the closet makes it easy to check hems and proper fit.

Of course, the worktable and storage cabinet could be located anywhere in the house, either as an L-shaped unit in a corner or with the end of the cabinet against a wall to partition off a sewing corner. By adding legs to the worktable, the two units can be made independent of each other and arranged to suit your floor plan.

EXTERIOR DIMENSIONS 18"x 74"x 93"





Swing-down cupboards

STRETCHING may be good for your wife's figure, but hardly safe when reaching for a dish on the top shelf of a kitchen cabinet. Standing on a chair isn't recommended either.

You'll have greater peace of mind if you build her cupboards fitted with "Magic Shelf" and send her off to the YWCA for her exercise. Magic Shelf is a spring-controlled set of brackets for a cupboard within a cabinet that permits pulling the cupboard down to you. It's distributed by Functional Designs, Inc., 609 Fifth Ave., New York, N.Y. 10017, for \$10.

You can use your existing cabinet merely to make access to the upper shelves easier, or you can rebuild it to the ceiling, adding to your storage space

by eliminating the soffit above. Dimensions are not given, since every kitchen will have different ceiling heights and cabinet widths. All material except cabinet backs is $\frac{3}{4}$ -in. plywood. The backs can be made from $\frac{1}{4}$ or $\frac{3}{8}$ -in. plywood, rabbeted or lapped.

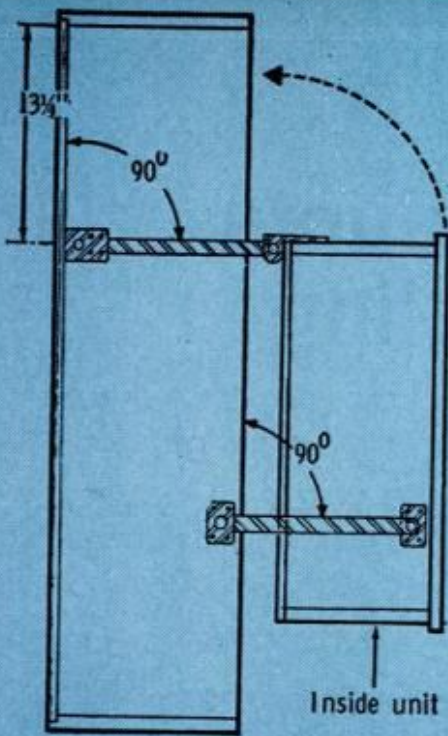
The inner cabinet is made with the clearances shown on the opposite page. It will be one shelf shorter than the outer cabinet to allow for attaching the bottom brackets and to permit the easily reached bottom of the outer cabinet to serve as another shelf.

The upper brackets are affixed to the outer cabinet so their upper parts clear the cabinet top. The lower brackets are attached near the bottom and to the sides of the inner cabinet.—*Bill Baker*

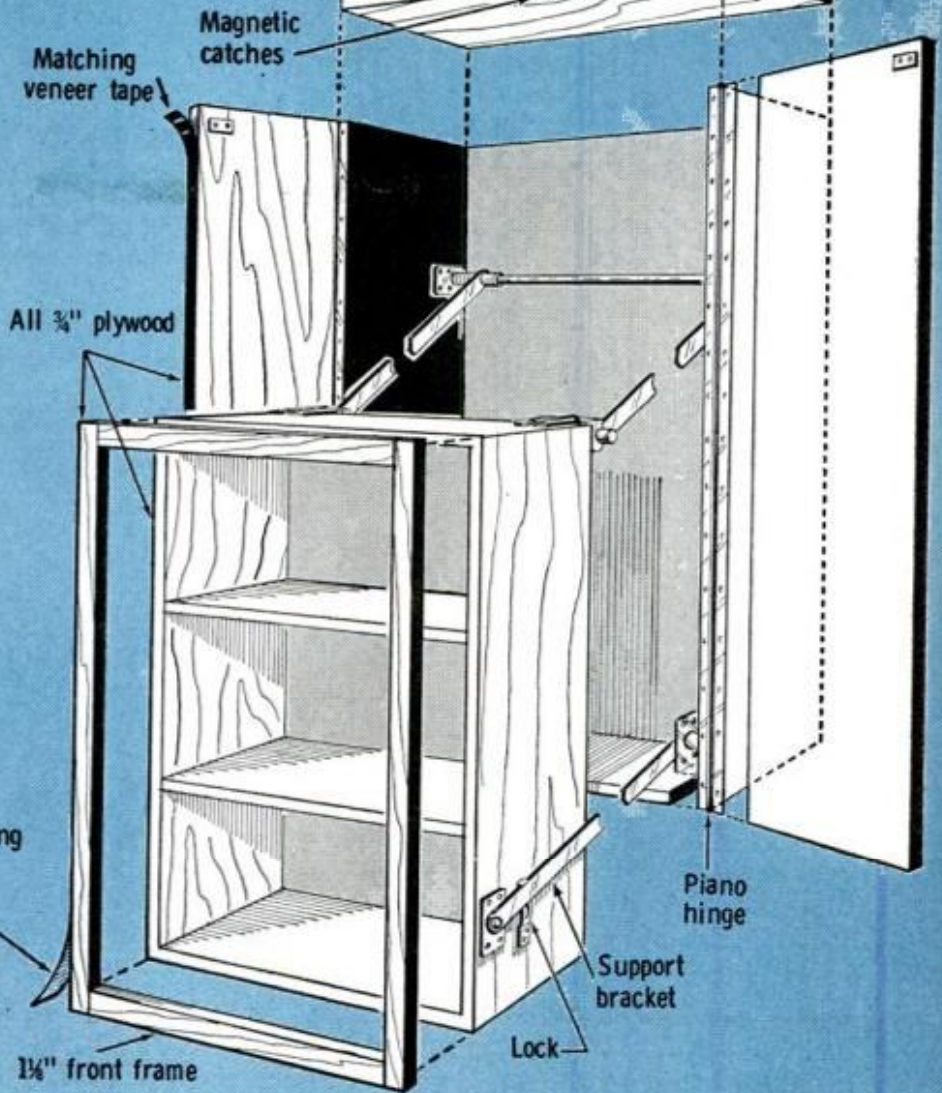


CABINETS IN POSITION (above) make a neat installation. The $1\frac{1}{2}$ -in. cupboard frame conceals most of the brackets. Even a short person has no trouble in reaching the top shelf when the cupboard is swung down (right)



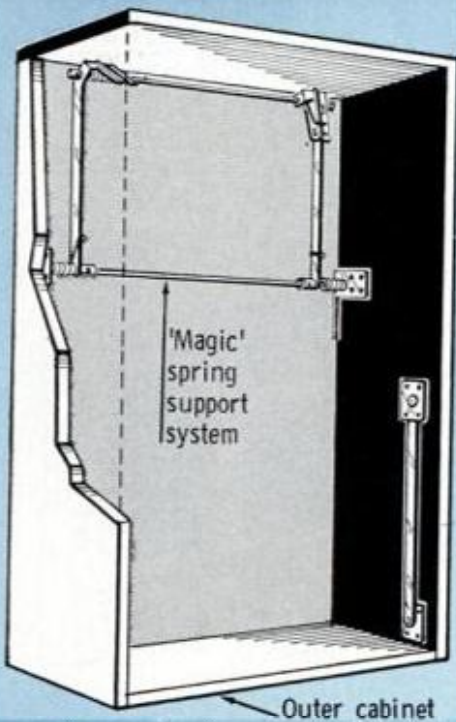


SIDE SECTION



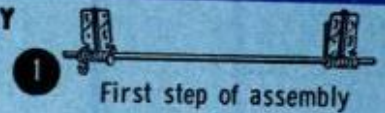
All exposed edges covered with matching veneer tape

BRACKET MOUNTING

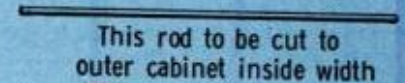


BRACKET ASSEMBLY

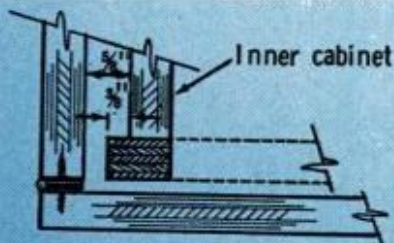
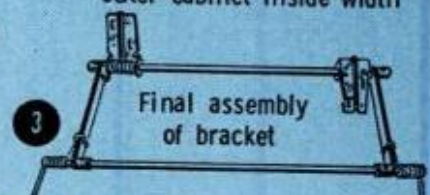
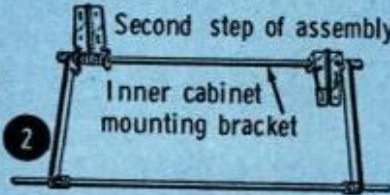
Short rod for inner cabinet



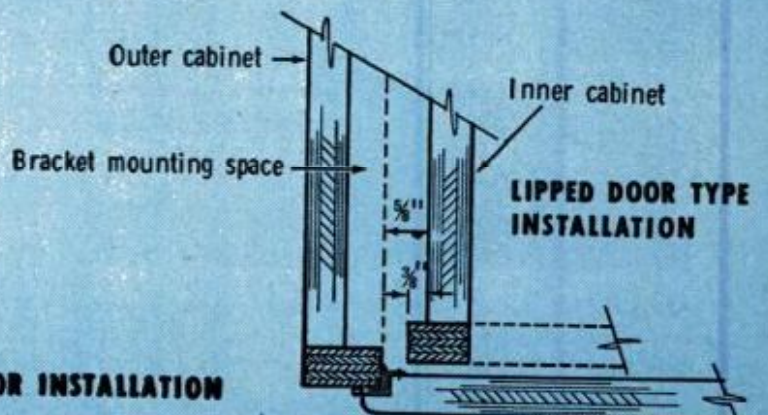
Long rod for outer cabinet



Second step of assembly



LAPPED DOOR INSTALLATION





Home is what you make it!

Exciting new products for home remodeling

'Things are seldom what they seem' in the new crop of materials — aluminum shingles that look like wood... vinyl that passes for tile... metal 'wood' beams — and more!

By Richard Howe

IN CASE YOU HADN'T NOTICED, a greater variety and selection of fabulous new home-improvement products is flowing into the market today than ever before in history. Henry Homeowner will be hard put to dream up something that isn't already inventoried at his local hardware or lumber dealer. The cornucopia of American industry has anticipated and fulfilled just about every need a do-it-yourself home buff could have.

Space limitations permit us to describe only a handful of the many new products available to the public this year; but their very diversity will give you some idea of the wide range of needs they meet.

Item—you can have a shower floor to match the tile floors and walls of your bathroom, thanks to Surfline shower re-

ceptors of Duramold by American Radiator & Standard Sanitary Corp.

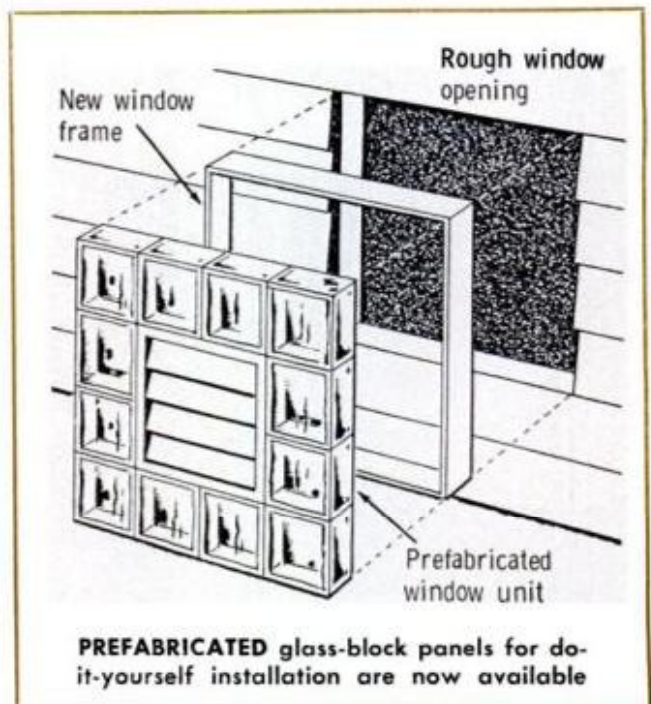
Item—The Armstrong Cork Co. offers a Cambrian Vinyl Corlon sheet flooring material that combines a foamed vinyl cushion backing with a new nubby surface texture. Treading its cushiony, quiet surface is very like "walking on air."

Item—In the market for shutters? You can get them in rotproof nylon that's indistinguishable from fine woodwork. Their factory-applied finish doesn't require painting for years. A Du Pont product, they install with a hidden fastener.

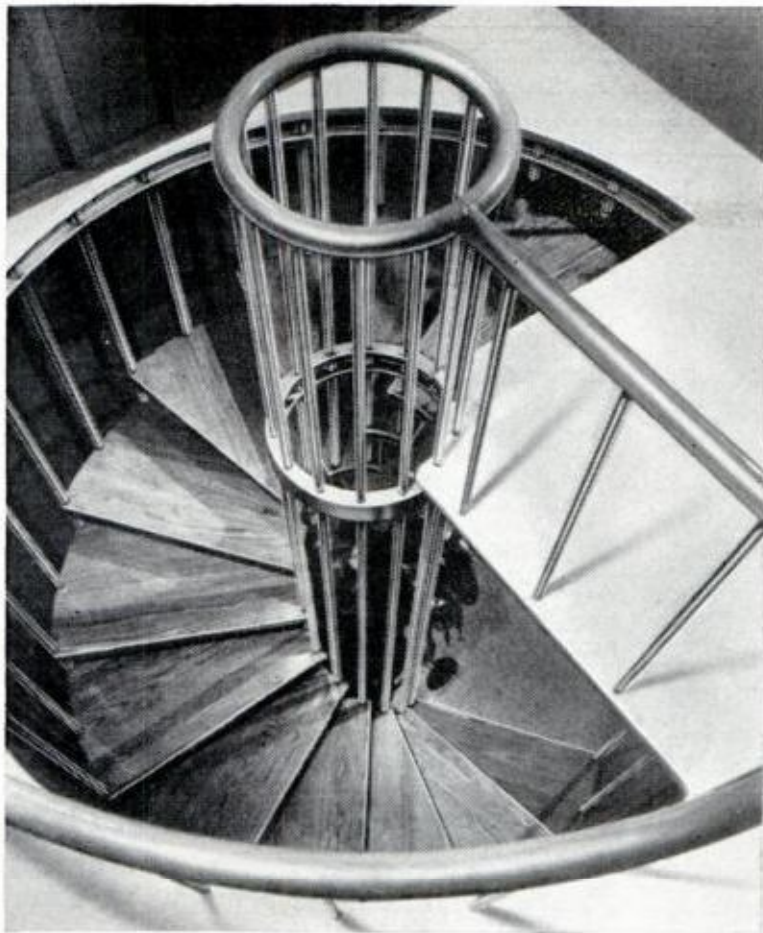
Item—Low-budget hardwood wall paneling is an entry from Georgia-Pacific Corp. It features a solid clear vinyl sheet bonded to a wood-grained surface. Plywood veneers include Philippine lauan



TRANSLUCENT GLASS-BLOCK WALL features hour-glass and oval pattern. Steel reinforcing strips were inserted in mortar joints to add strength to the wall



PREFABRICATED glass-block panels for do-it-yourself installation are now available



THIS IS THE SPIRA-STAIR. Suspended from a structural steel ring assembly, it is independent of walls for support. Spacing of gold anodized aluminum tubes eliminates need for handrail

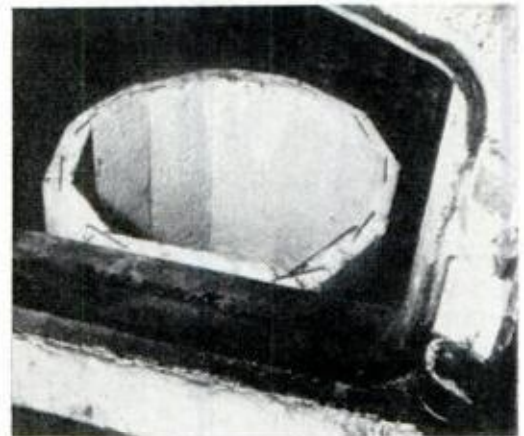
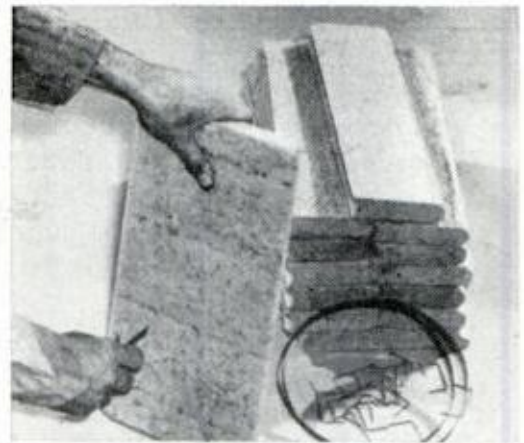
hardwood, "iced teak," walnut pecan and natural teak or oak. They're 4x8-ft. panels, $\frac{3}{16}$ -in. thick with embossed grooves striped to simulate real hardwood lumber.

Item—Johns-Manville offers lightweight fiberglass lay-in acoustical panels which are washable and fire-resistant. Their embossed white surface in an overall pattern will lend a soft, decorative note to the decor of any room. One inch thick, the panels

METAL CEILING BEAMS with wood-grain finish offer a fast way to update a ceiling. Costing much less than wood beams, they can be installed in an afternoon



SEPTEMBER 1966

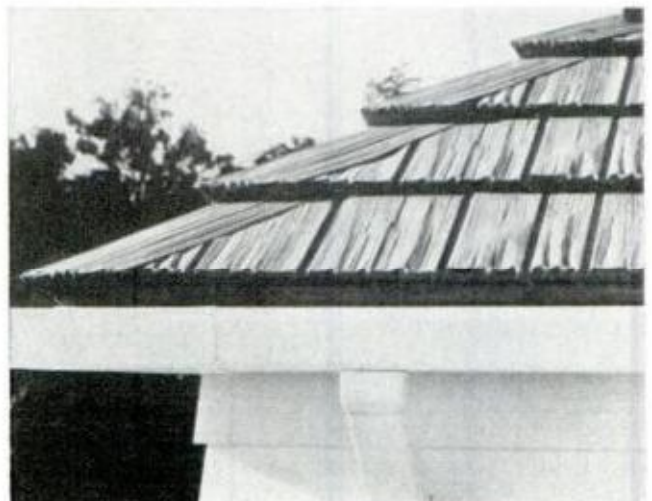


A MOUTHFUL OF A NAME, but a furnace-full of heat—that's the Cera-Form Combustion Chamber Replacement Kit for oil-burning furnaces. Unit saves fuel, contributes to quiet operation and assembles in minutes

are available in 2x2 and 2x4-ft. sizes.

Then there are new fiberglass wall panels from Owens-Corning Fiberglas Corp. that combine thermal and acoustical insulation with a washable vinyl surface . . . Lock-Deck decking by Potlatch Forests, Inc., in nine prefinished pastel colors and five softwood species that install without drilling or the need for special fasteners . . . Sierra Sawn siding of prefinished

WOOD IT AIN'T (it's aluminum). This eye-fooling Rustic Shingle can be installed directly over existing roofing or siding; it weighs only 50 lbs. per square



129

redwood by Simpson Timber Co. which is available in a choice of colors . . . A dramatic one-piece fiberglass tub-and-shower unit that is easy and economical to install (Universal-Rundle Corp.) . . . Weyerhaeuser's new Prefinished Soffit/Series S-10—an exterior plywood panel with a baked-on, reinforced, white acrylic finish guaranteed for 10 years . . . and (like the man says), scores of other fascinating home-beautifying goodies too numerous to mention.

Take glass brick. Designers at Pittsburgh Corning Corp. have given some really exciting new shapes and dimensions to this long-established building product. You can still get the traditional waffle-textured, translucent block that has enjoyed such popularity over the years, but now you can also select from a variety of colored block to match the trim of your house; or blocks that look like cement units with glass portholes for installation as windows and entry panels.

A highly original effect can be achieved in home, office or den with a whole wall of

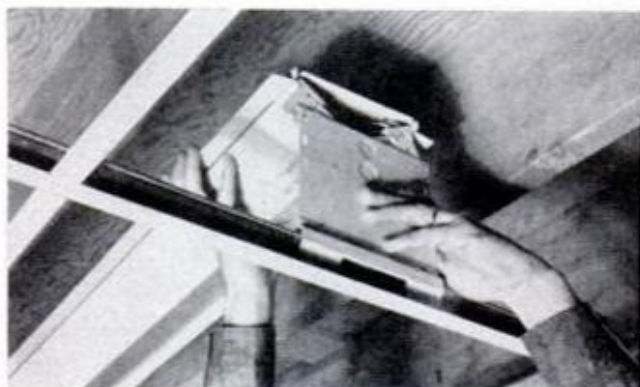
decorative glass masonry. The installation shown on page 128 was accomplished by tearing out the existing wall, framing the opening, then constructing a new wall of glass brick having an hour-glass and oval pattern (just two of many patterns now available). Sunlight streams through the wall by day, yet the bricks provide the same privacy as would an opaque wall. Translucency, privacy, beauty—a hard combination to beat in a price range most homeowners can span.

You don't have to be a lighthouse-keeper to appreciate the advantages—artistic and practical—of Spira-Stairs, a spiral staircase that flows with the warmth of wood and gold tones. Spira-Stair is suspended from a structural steel ring assembly that makes it independent of walls for side support. Its direction can be clockwise or counterclockwise. The ample oak treads are supported by gold anodized aluminum tubes anchored to the ring and to the oak treads. Tubes are so spaced that no handrail is needed. Each stair comes with all necessary attachment hardware.

Recessed lighting is available to any handyman with a yen for it—and a few hand tools. The basic installation steps required to carry out this home-improvement project are shown in photos below



TWO MOUNTING BRACKETS secure Armstrong Grid-mate-unit in place after completion of suspended ceiling grid. Pressure screws secure brackets to the grids



FLUORESCENT FIXTURE is then attached to mounting brackets by means of two sliding tabs at its ends which are simply bent over slots in the brackets



NEXT, REFLECTOR PANELS are attached to the top of the fixture. These provide a highly reflective surface which distributes light evenly throughout room



FINAL STEP is to insert the fluorescent tubes, plug the unit into an electrical outlet, then place a luminous panel into the grid beneath the fixture

This beautiful installation is a product of Pease Woodwork Co., Hamilton, Ohio. Prices start at \$495.

Homeowners who heat with oil—hearken to this! How would you like to cut your heat bill 25 to 30 percent, at the same time eliminating much of the soot, smell and noise often associated with oil heating? Well, there's a little item called the Cera-Form Combustion Chamber Replacement Kit, made by Johns-Manville, that can be installed by the average homeowner in about an hour at a cost of \$14. A real fuel-saver, the kit installs right inside the old firebox of your furnace. When the oil-burner goes on, the Cera-Form heats instantly to incandescence, thus eliminating the warm-up period which is usually the most costly part of the oil-burning cycle.

Installation is easy. The floor of the combustion chamber is covered with the floor panels furnished with the kit. The sections are nested together so that their grooved edges interlock. A hole is then cut into the wider front panel to accommodate the oil-burner blast tube. The rest of the chamber is then stapled together according to instructions accompanying the kit. Finally, the unit is firmly held in place with a stainless-steel band that is wrapped around the chamber's outside walls, then tightened in place. Noise reduction during

operation will be noticeable immediately. The kit is available from most oil-supply dealers, or directly from Johns-Manville.

The mushrooming popularity of metal ceiling beams with wood-grain finish is proving slightly sensational these days. Their appearance is that of expensive walnut box beams. Their installation time is a single afternoon. The tools required are a hacksaw, and a screwdriver or hammer. They attach to any kind of existing ceiling. Best of all, they cost a pocketful less than genuine wood beams, yet an eagle-eyed termite couldn't tell they weren't the real McCoy—until he tried to chew one.

Installing the lightweight beams is simply a matter of screwing or nailing special clips at 4-ft. intervals to the existing ceiling. The beams are then snapped into place over the clips. Special 2-in. end pieces are included to abut the walls, and splicers are available to extend the beams to fit any size room. An additional design feature can be achieved by installing cross beams at appropriate locations.

Celotex Corp. of Tampa, Fla., makes these beauties in 4 and 12-ft. lengths. They measure 2½x3 in. Prices are \$2 for a 4-ft. beam, \$3 for a 6-ft. beam.

If a rose is a rose is a rose, is an aluminum shingle a hand-split wood shake?

(Please turn to page 184)



NEW VINYL SIDING IN A 6-IN. WIDTH duplicates colonial clapboard. It can be used as original or replacement siding. No special backerboard is needed, since it nails directly to sheathing. Siding has special nailing tabs that act as built-in springs which achieve a secure but "floating" suspension of each course of siding. Slotted nailing holes permit the siding to expand and contract during temperature changes



Home is what you make it!

Beauty on a budget was PM's goal when we tackled the updating of an outmoded bathroom. We packed it full of modern accessories for your convenience

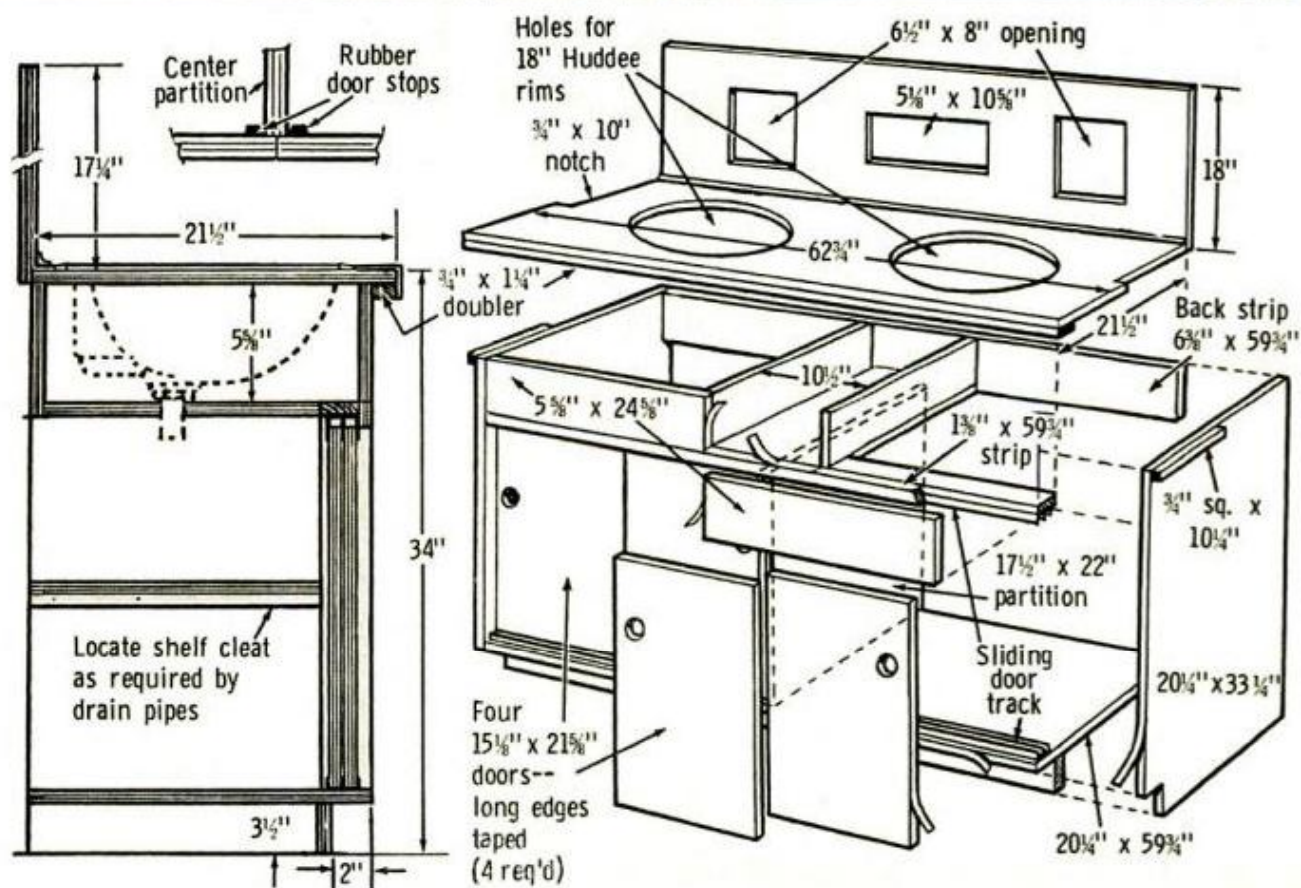
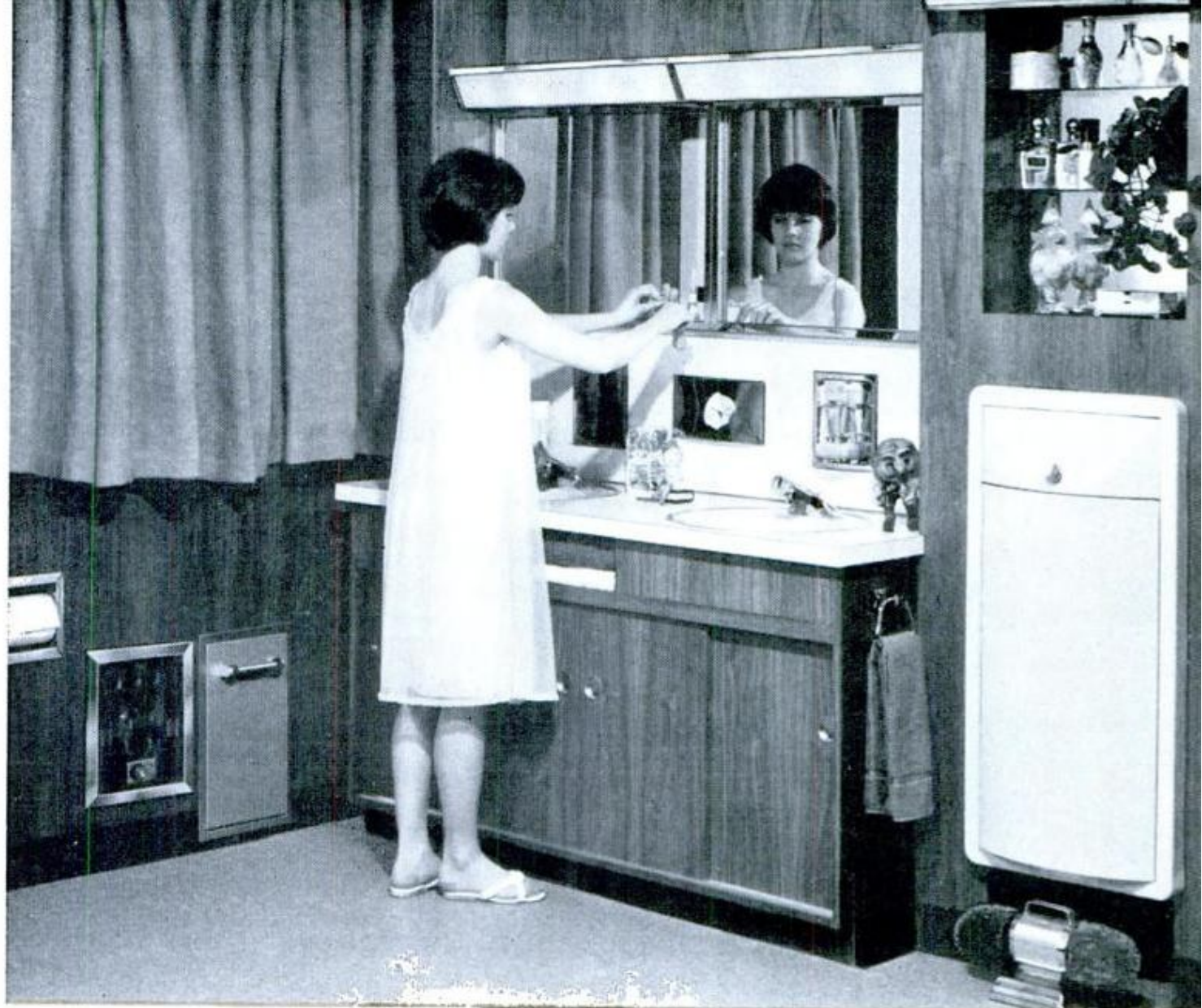
Deluxe bathroom for a modest home

By Al Lees, PM's Home Workshop Editor

What room in your home is the mood-setter? We'll wager it's your bathroom—the room that greets you in the morning and sends you off to bed. Small wonder, then, that many of us start and end the day glumly. Most bathrooms are cursed with clutter: The family toothbrushes bristle at you from exposed racks . . . the wife's lingerie droops soggily from the shower rod . . . and the general atmosphere is as chilly and antiseptic as a hospital.

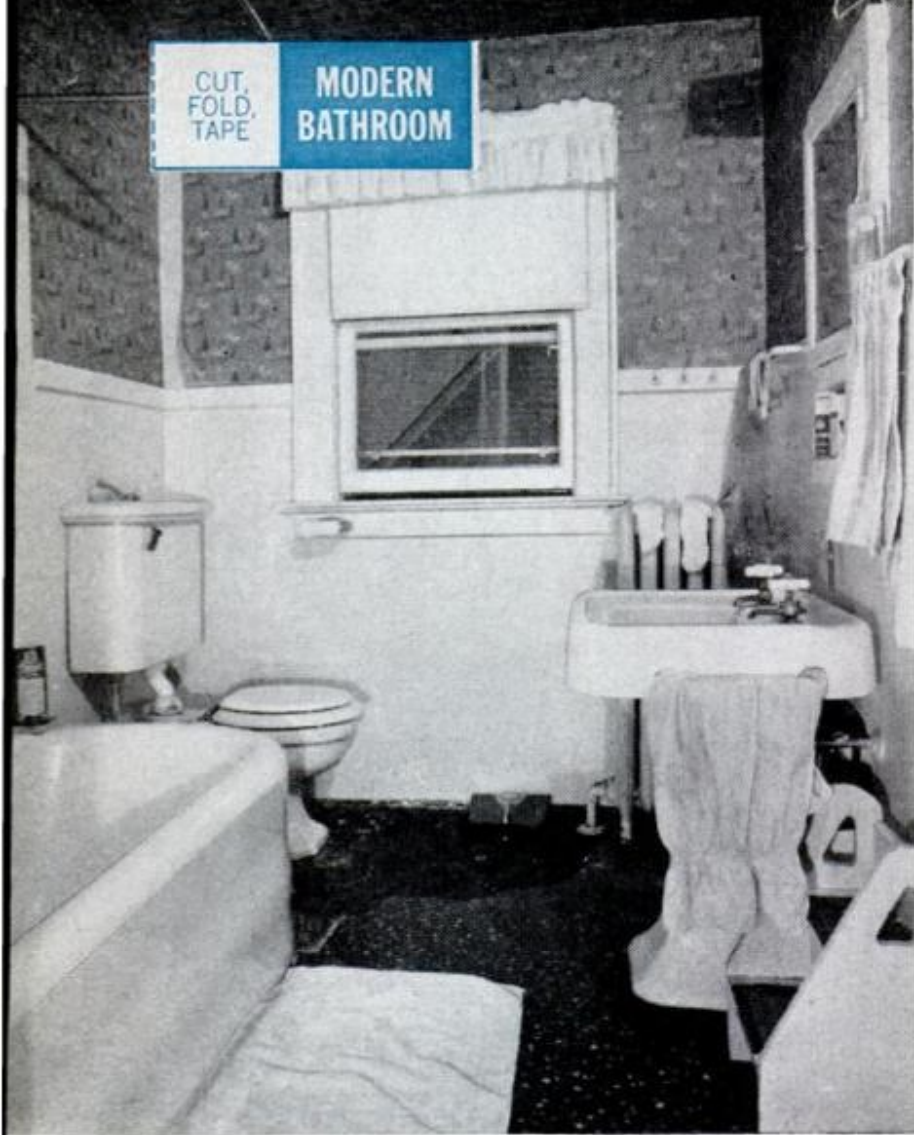
What we wanted to create was a *cheerful* bathroom—one that exploited the warmth of natural wood and sunny colors, tucked unsightly necessities into the wall when they weren't in use, promised easy maintenance—and offered the do-it-yourselfer maximum opportunity to cut outside labor costs.

To keep our feet on the ground, we hunted up an actual bathroom in a family home—one that presented a grim challenge, as you can see from our



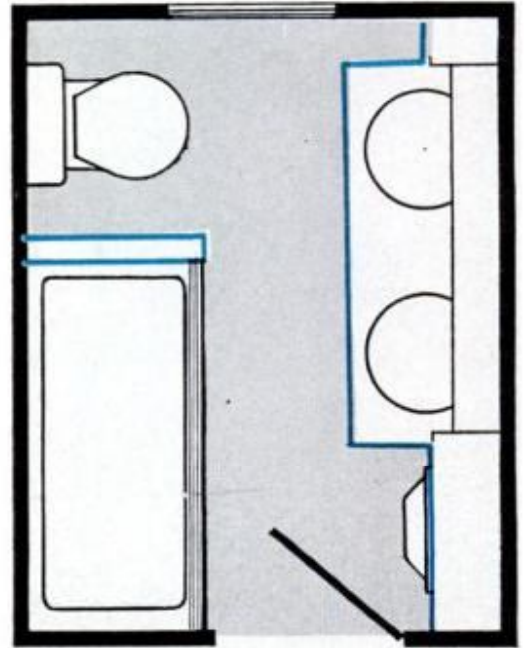
CUT,
FOLD,
TAPE

MODERN
BATHROOM



◀ From this
to this ▶

FLOOR PLAN is basically unchanged in transformation of old bath at left to deluxe room at right, avoiding major plumbing revision. Color outlines on plan indicate new construction



“before” photo, above. Neglect and hard use from a succession of owners had left this bath the ugliest room in the house, with battered fixtures dating from an era that wasn’t noted for good design. An exposed radiator added another age wrinkle, as did a naked shower rod and a tiled backsplash with crumbling mortar that rendered the shower unusable.

We asked noted designer Franklyn Jacoby to give this room a major face lift, replacing the fixtures but keeping their present locations, to simplify plumbing. We then researched the accessories field to select a wealth of commercial units that could be built into our bathroom—including the retractable tub-alcove clothesline and let-down scale shown at left. These



TRIPLEX GLASS DOORS give generous access to tub, are easier to clean than shower curtains. Cleaning's easier, too, when vinyl flooring is covered up behind closet, without baseboard seam

TWIN LAVATORY permits double use of vanity during peak traffic at start and end of day. Recessed pivoting racks tuck toothbrushes, tumblers and soap behind chrome panels. Center panel dispenses tissue

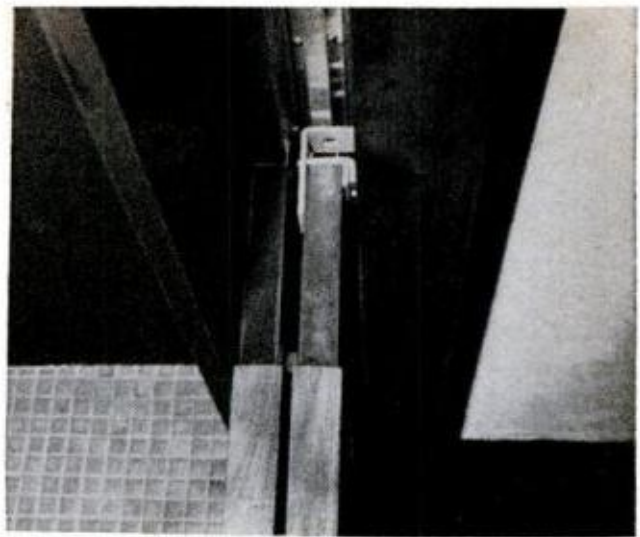
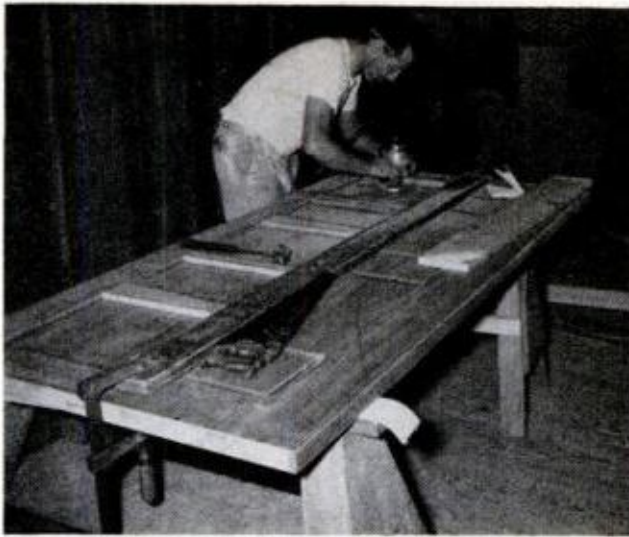




EXTRA ACCENT of color and texture is provided by niche that nestles two guest towels between basins. Family towels are tucked through rings at either end, with spares behind sliding doors of cabinet. Recess under hamper stores foot-switch-operated shoe polisher when it's not in use

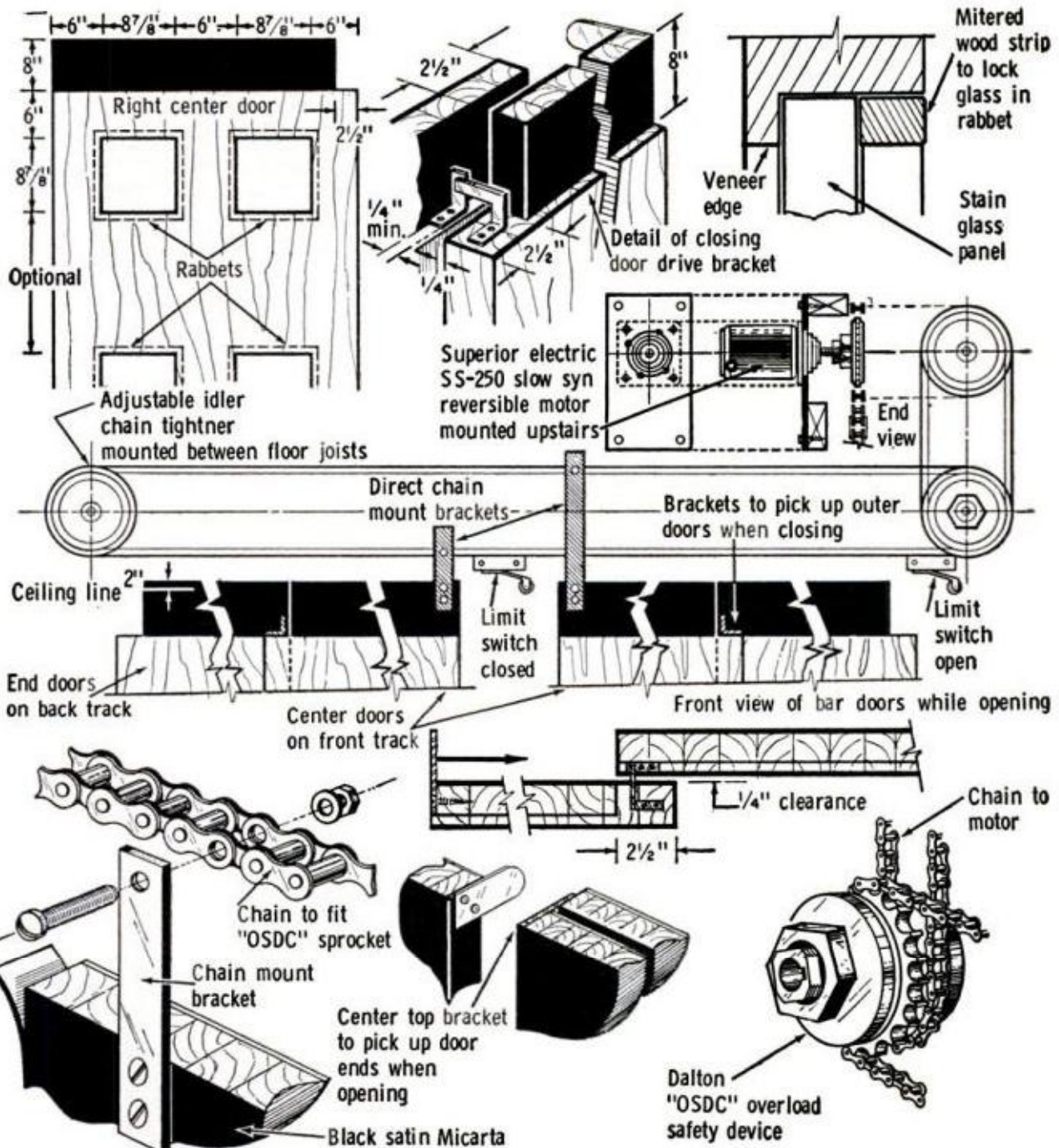
Photos by PM's Chief
Photographer Frank P. Fritz

IDEAL SOLUTION for storing scale in bathroom with limited space: recess a hinged version between wall studs. When folded up, scale takes no floor space at all. At end of tub alcove, far left, is sleek chrome ladder for family's bath towels and—above it—reel for the retractable clothesline



CUTOUTS FOR GLASS INSERTS in two center panels of solid-core doors need cleats clamped to surface as template for routing grooves. Grooves become rabbets when cut along inner edge with sabre saw

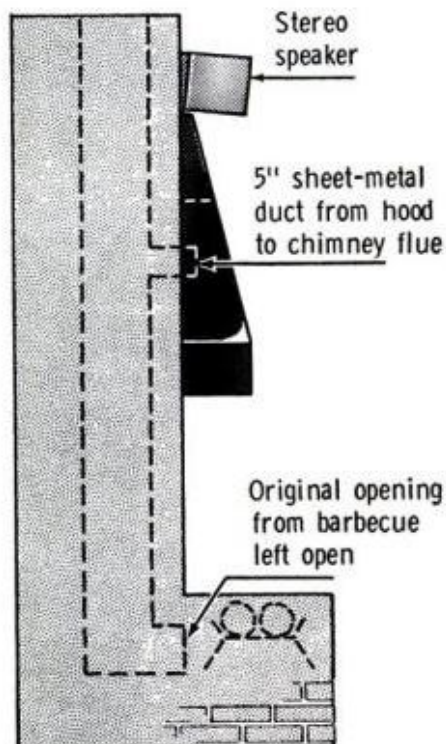
SPECIAL BRACKET hooks into drive chain and also engages adjacent non-driven panel to push it along heavy-duty track. Note black Micarta facing set into $\frac{1}{4}$ x8-in. rabbet around top end of doors





Home is what you make it!

Once a grill, now a fireplace



THE OUTDOORS becomes the indoors and a barbecue grill becomes a fireplace in this novel remodeling job. Rather than tear down an existing barbecue that stood back to back with an interior fireplace when adding a den and hi-fi room to my house, I converted it to a fireplace for the room.

The two fireplaces shared a chimney but had separate flues. All I had to do was convert its appearance and draw off smoke.

I removed some bricks from the chimney about 3 ft. above the grill and chiseled a 5-in. hole in the flue for a sheet-metal smoke pipe. Then I removed the grill and cut the front wall of the hearth back to the sides.

I sealed the brick, attached a large metal hood over the flue opening and placed a log rest in the hearth.

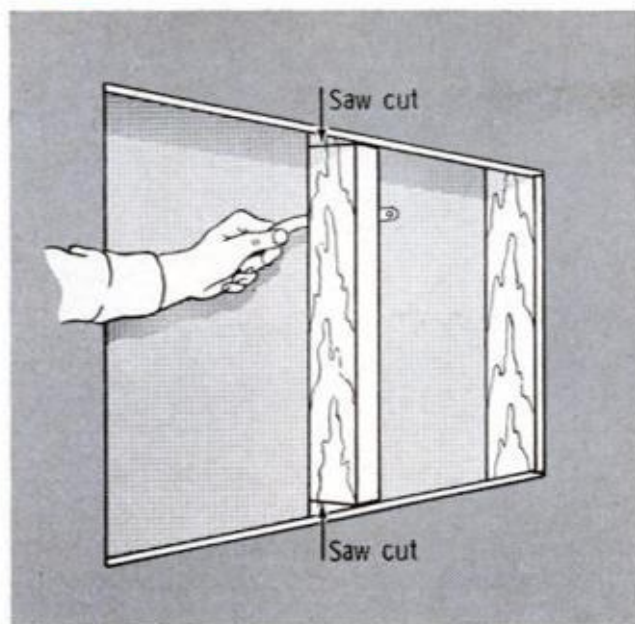
—Cliff L. Woolsey





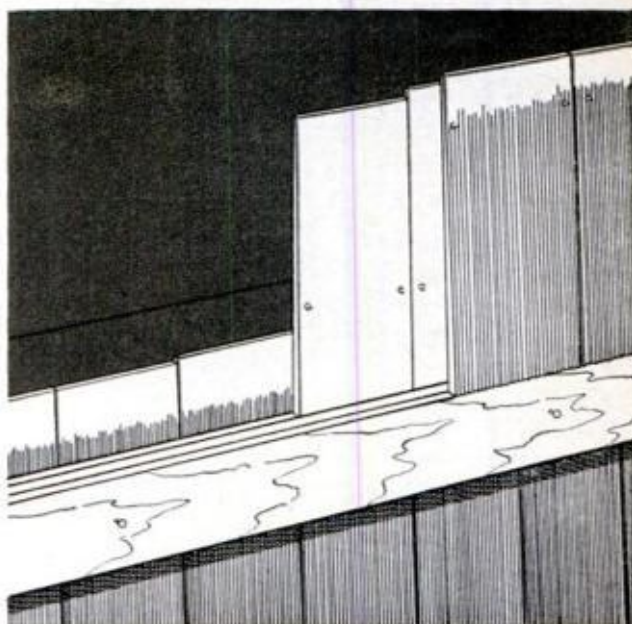
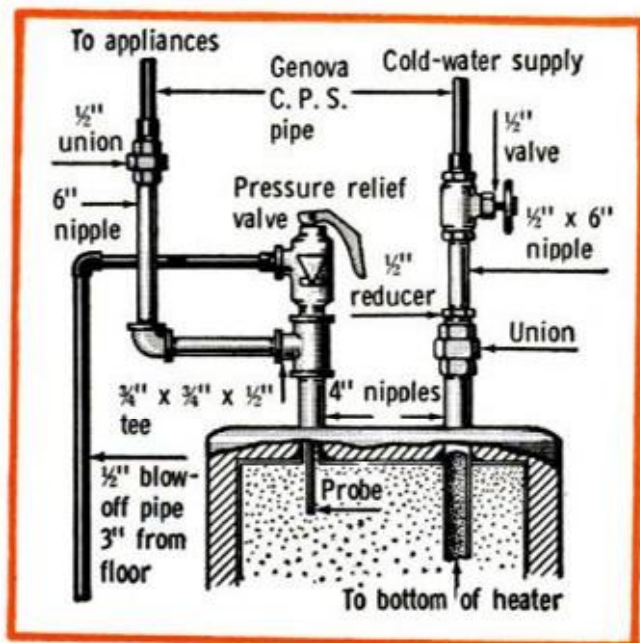
Home is what you make it!

Home handyman hints from PM readers



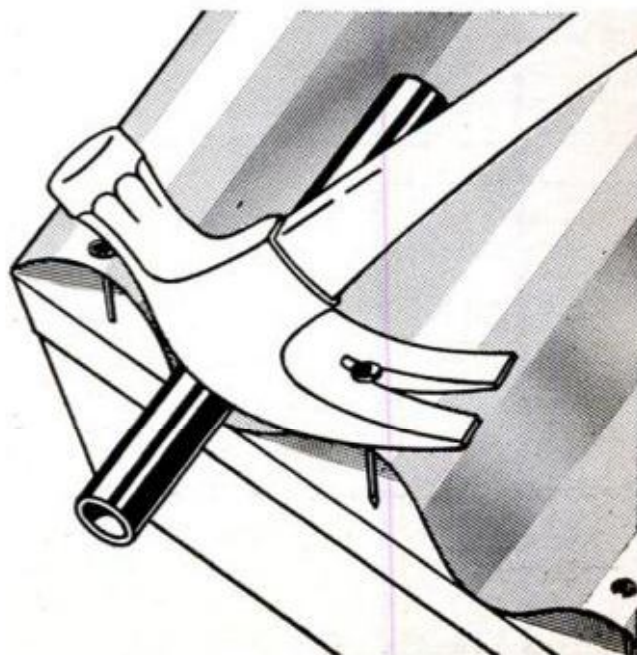
Cutting an opening for a flush medicine cabinet usually involves removing a short section of wall stud. Sawing it off at top and bottom is simple enough, but to pry it out will pull the lath nails with it and deface the opposite wall. You won't harm the wall if you work a hacksaw blade behind the stud and cut off the nails.

There'll be no question as to the correct way to install a domestic water heater when your old one gives out if you save and follow this basic diagram. Whether you use galvanized or Genova C.P.S. (plastic) pipe, you will have a safe installation that should satisfy code as well as water-heater manufacturers' requirements.



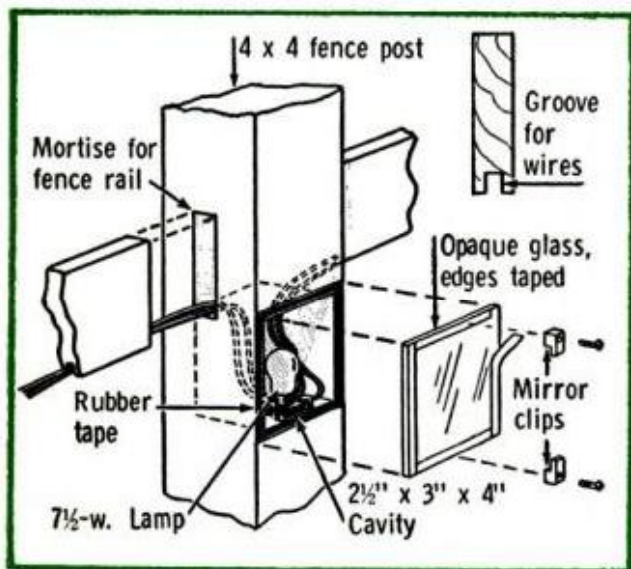
A length of common shiplap, with its rabbeted edge, makes an ideal straightedge when you apply double-course shingles. With the board tacked at right height for each new row, stand the inner-course shingles on very edge of the board, then place those of the outer course in the rabbet. The drip lap will be straight and uniform.

Next time you have to pull nails from corrugated roofing or siding, try this: Use a short length of pipe of suitable diameter as a fulcrum for the claw hammer. With pipe placed in a valley of the corrugation you will be able to get a straight pull on the nails. This trick will also help prevent the hammer from damaging the material.





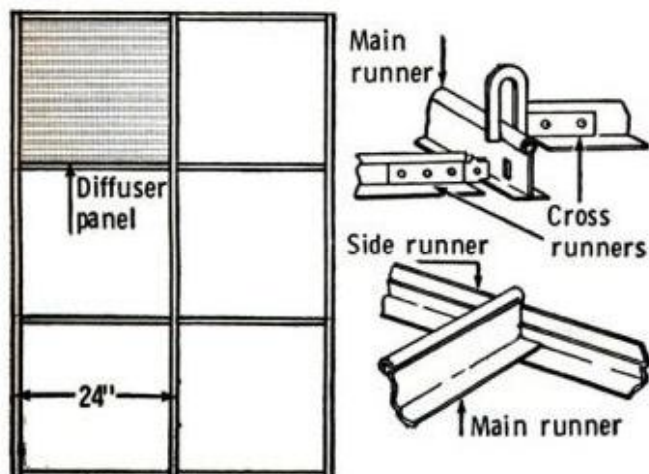
Fence "turns on" to light front walkway



"Just a fence" wasn't enough for Air Force Capt. Raymond Kuhlman of Belleville, Ill. Besides beauty and practicality, his fence had to provide illumination. So he built a basic post-and-rail fence with 3x4-in. openings recessed 2½ in. into the face of each post at about ankle height. He mounted a light socket for a 7½-watt bulb in each recess, then ran wire to the sockets along a groove cut in the bottom edge of the lower fence rails. Foil mounted on back of each recess bounces light through translucent glass panels. Guests leaving the Kuhlman house never sing *Show Me the Way to Go Home*; the captain just "turns on" the fence.

How to light a skylight—without the sun

What looks like an ordinary skylight in this attic studio is cleverly simulated by applying regular suspended-ceiling diffuser panels to the sloping roof. Lighted from behind by 4-foot fluorescent lamps, the panels, by Moe Light, create the feeling of real skylight with sunlight streaming through. Interlocking metal molding supports the lift-out diffuser inserts.

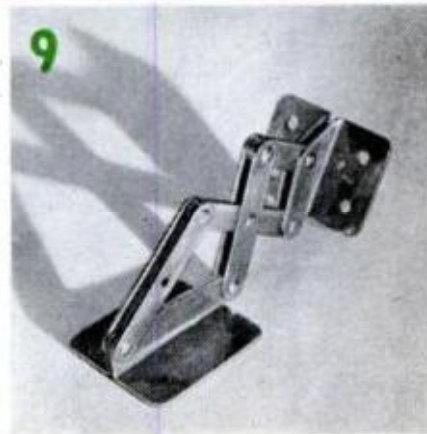
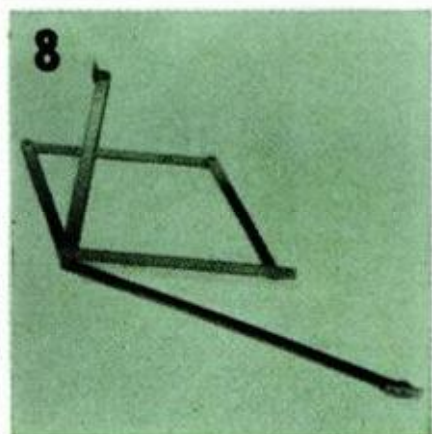
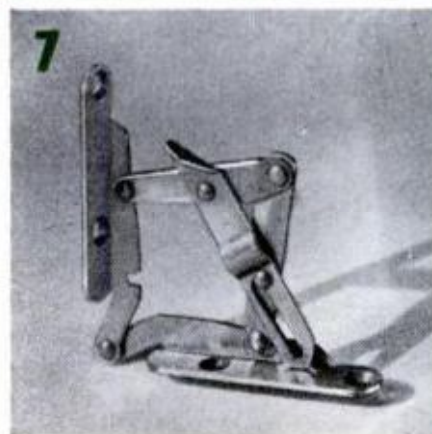
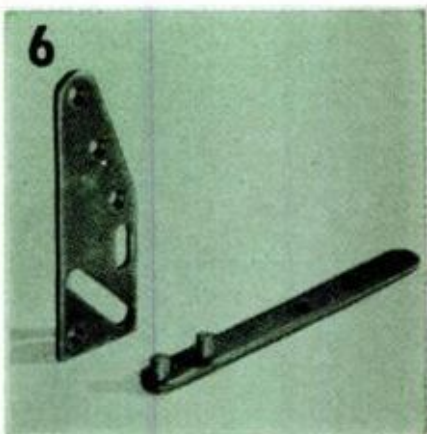
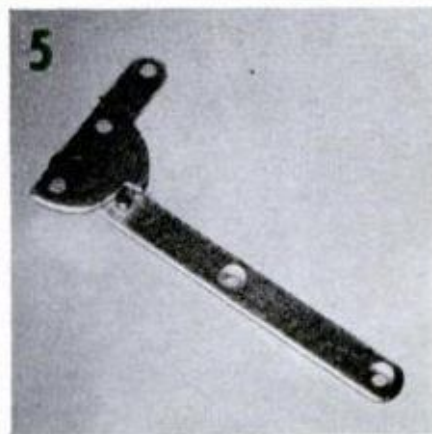
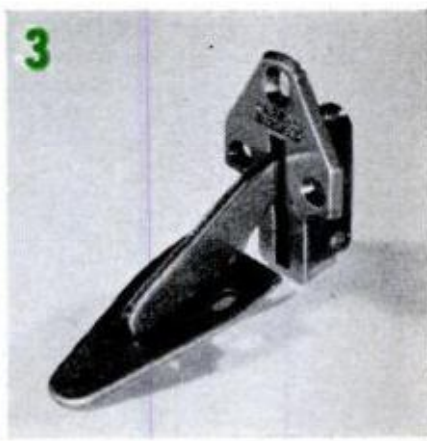
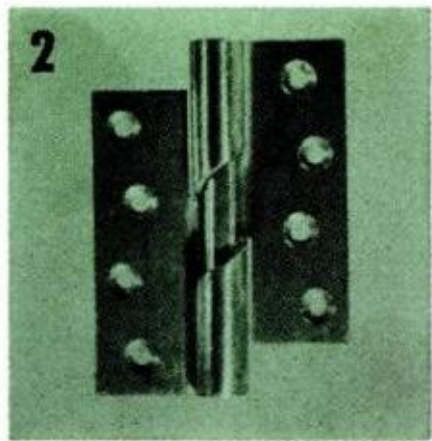




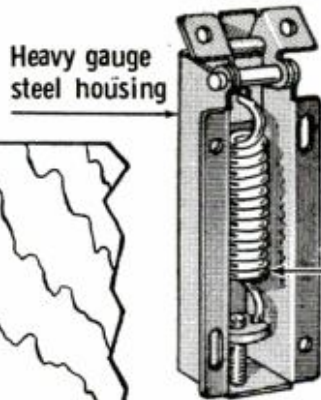
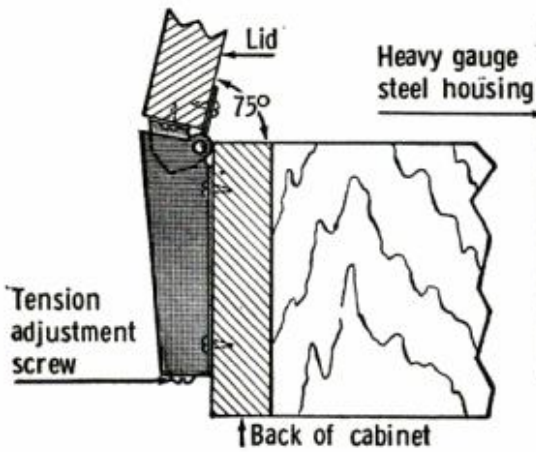
Home is what you make it!

9 Novel hinges — can you guess what they're for?

Specialty hardware exists for almost any purpose your furniture projects could require. The trick is to know about it—and where you can buy it. Pictured below are nine pivoting devices that do their jobs better than anything you could improvise. See how many of those jobs you can identify—then turn the page to check yourself.

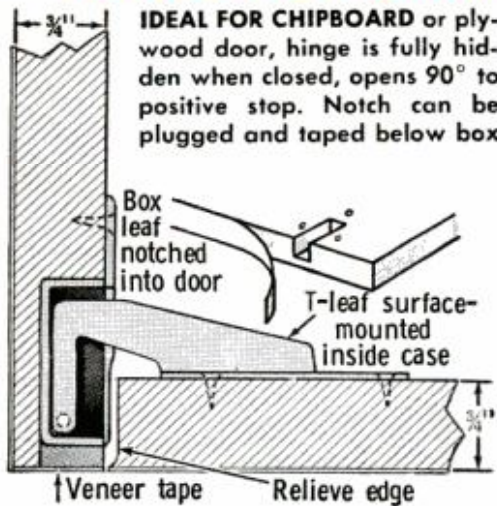


1-SELF-BALANCING LID HINGE

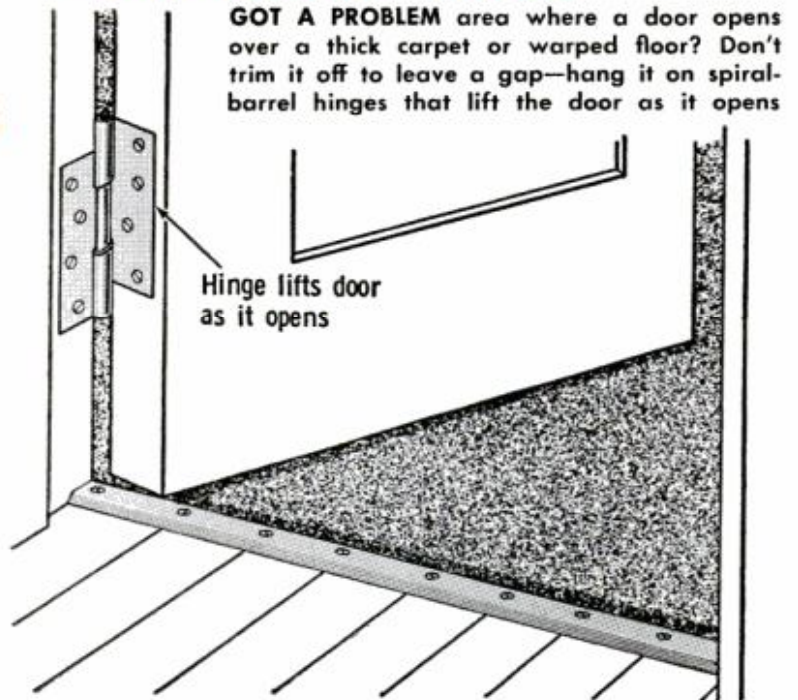


DUAL-PURPOSE UNIT is spring-loaded to support lid at various angles and prevent its slamming shut. It permits full use of cabinet interior and eliminates need for conventional hinging. Exterior mounting needs no mortise. If light lid requires only one support, use companion hinge, without spring, shown in photo

3-CONCEALED HINGE FOR LAY-ON DOORS

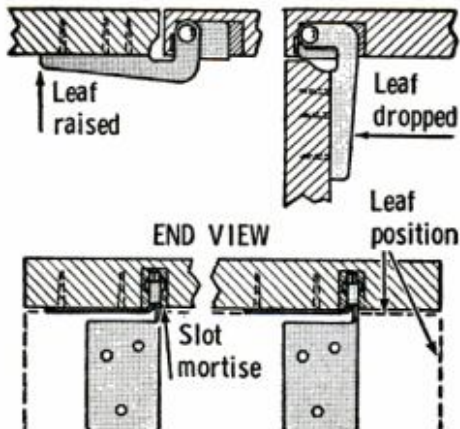


2-RISING PIN HINGE



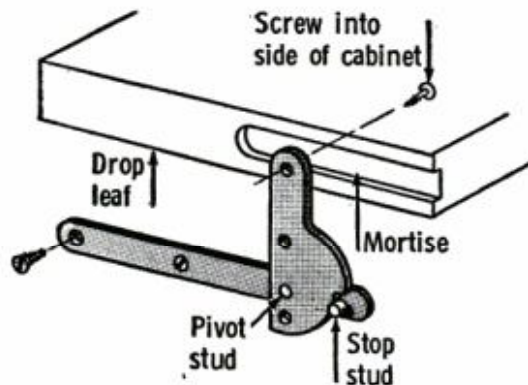
4-FLUSH-JOINT DROP-LEAF HINGE

INVISIBLE HINGE offers easy mortising and a flush joint in both positions. Dropped leaf sits under edge of table and hides its own edge. Comes only as in photo, so "pair" is formed by mounting two as shown

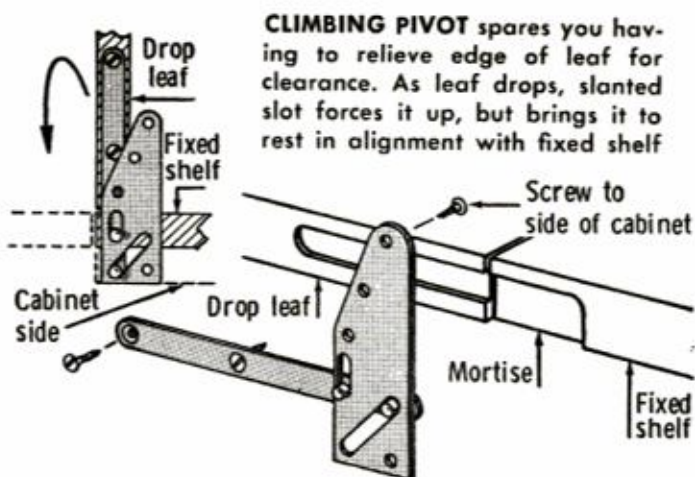


5-DROP-LEAF STOP PIVOT

COMBINATION HINGE and support provides sure 90° stop for light fall flaps, consists of two separate parts that fit together during mounting. Long leaf is recessed in edge of flap, other is screwed to inside face of side. Stud on first strikes shoulder on second

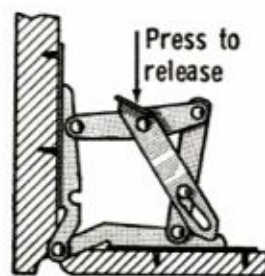


6-RISING SLOT PIVOT

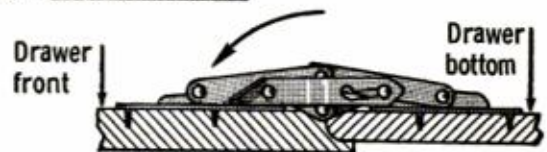


CLIMBING PIVOT spares you having to relieve edge of leaf for clearance. As leaf drops, slanted slot forces it up, but brings it to rest in alignment with fixed shelf

7-FALL-FRONT DRAWER STAY



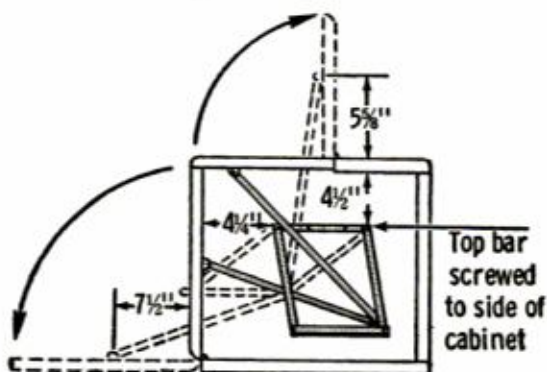
TRICK DRAWERS in some chests slide out in conventional way, then drop their fronts for shelf-type access to contents. Here's the locking hinge-stay you need. Thumb release lets front pivot down as shown



8-DOUBLE-ARM BAR STAY

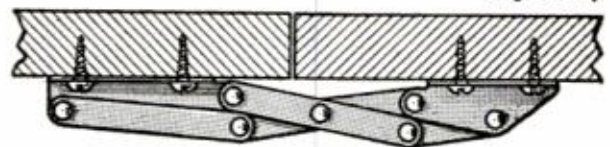
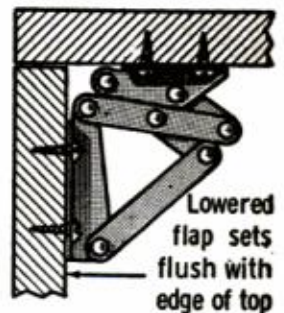


WE'RE CHEATING to classify this one a hinge, since flaps must be hinged separately. Bracket at left opens both front and top flaps of bar cabinet at once while lifting shelf forward for easy access. Only top bar of bracket is anchored to cabinet; bar that parallels it is an angle to accept shelf



9-LAZY-TONG FLAP HINGE

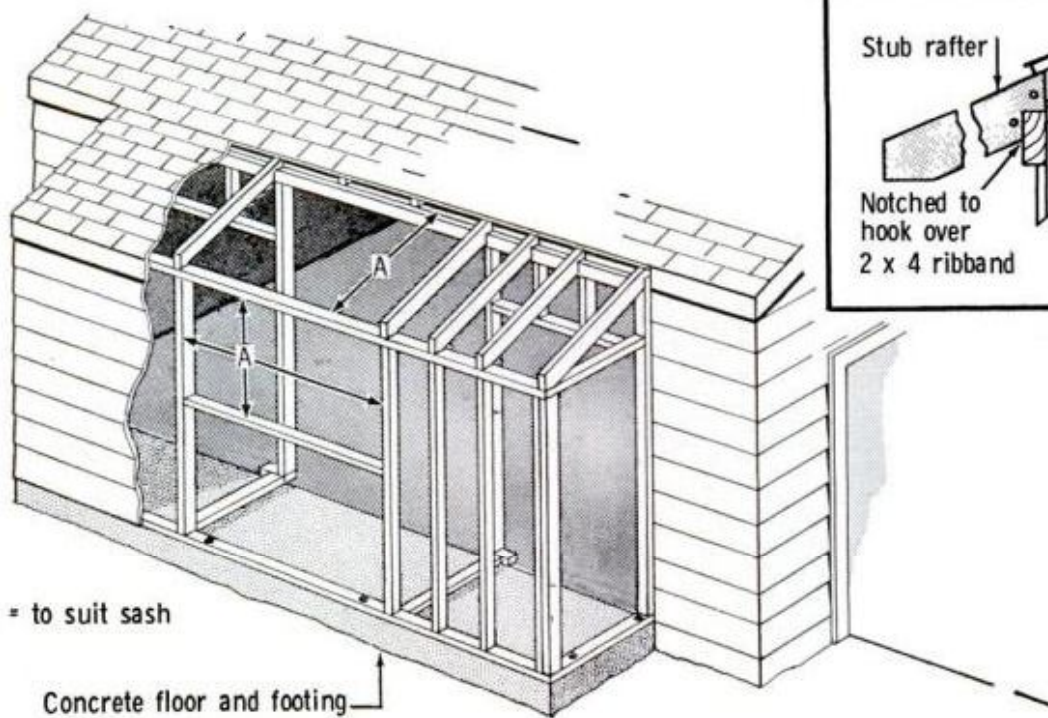
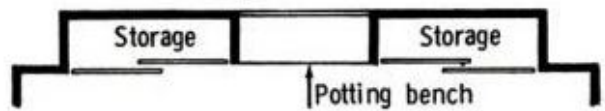
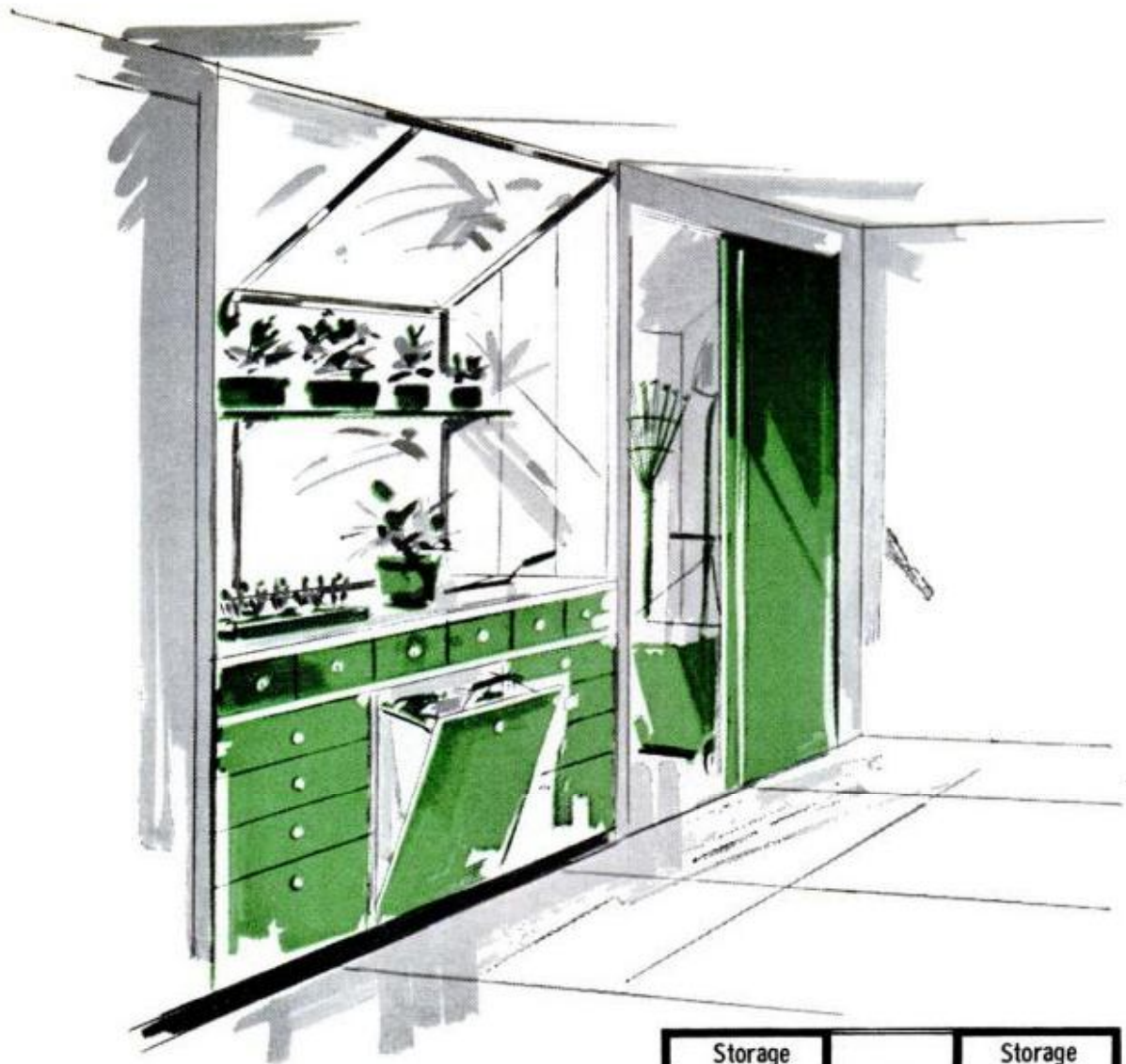
INSOLUBLE PROBLEM: hanging a flap so it tucks flush under table edge yet raises snug against that edge, using an invisible hinge that needs no mortising. It's solved with a pair of these plus a pull-out support



WHERE TO BUY THE HINGES

The nine hinges come from a variety of manufacturers—several are British imports—and are available by mail from Selby Furniture Hardware Co., 15-19 East 22nd St., New York, N. Y. 10010, at these prices (postage extra):

1. Self-balancing lid hinge	Cat. No. 633	\$1.25 ea.
Companion hinge	653	.66 ea.
2. Rising pin hinge (3 1/2")	466	2.50 pr.
3. Concealed hinge	852	1.42 pr.
4. Flush joint hinge	417	.96 pr.
5. Stop pivot	229	1.22 pr.
6. Rising slot pivot	231	1.90 pr.
7. Fall-front drawer stay	445	2.70 pr.
8. Bar shelf stay	215D	6.50 pr.
9. Lazy-tong flap hinge	427	2.48 pr.





Home is what you make it!

Add-on bay takes load off garage

Garage bursting at the seams? Here's a way you can add storage and satisfy a frustrated hobby to boot

IF YOU'VE HAD a hankering for a window greenhouse with a potting bench but no place for it, you'll have all the more reason to do something about that crowded garage. For by adding a bay along one side to relieve the overflow and clutter, you'll have a fine opportunity to include a dandy little greenhouse right smack in the middle of it. Its windows can be a couple of storm sash, sealed with caulking to make them watertight, and the potting bench can be either a mere shelf or a full-fledged cabinet with lots of drawers to store all the paraphernalia needed to satisfy a green thumb.

The added storage the bay affords will provide welcome out-of-the-way parking for the bulky yard and garden equipment that hardly leaves room for the family car.

The thought of tackling such a project shouldn't scare you. If you're handy with saw and hammer, it's really not as big a job as you might think. Before you touch the garage at all, your first step is to pour a footing and floor for the bay, making it even with the garage floor itself.

The width of this narrow slab will be determined more or less by the width of the window which will be used for the greenhouse roof. Perhaps you know where you can get a couple of those large, older wooden storm windows. They are ideal since you can bevel the edge of one to meet the other tightly at the front.

Naturally, you can't remove the whole side of the garage at once. In fact, after you have taken off the sid-

ing, and the sheathing, if any, you should first add to the wall the studs which will form the end posts of the greenhouse opening. Once these are in place, you can start removing the studs and sill that fall between them. Don't touch any more studs in the garage wall for now, but concentrate on erecting the outer framing of the bay.

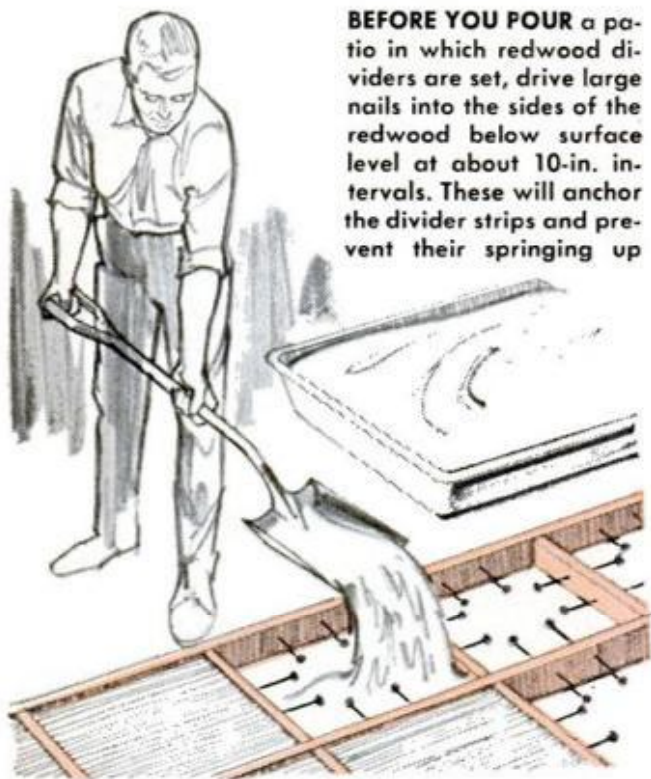
Here you should first add the 2x4 plate around the three sides of the slab and anchor it with bolts embedded in the slab at the time it is poured. You'll need an identical top plate of 2x4s which, in turn, is spiked to the upper ends of the studs that form the outer walls. The studs, of course, will be shorter than the garage studs due to the slant of the roof; you can determine their length by placing a long straightedge on the garage roof and letting it extend out over the bay. By deducting the thickness of the roof boards and the top plate, plus the width of the stub rafters (from the measurement to the bottom plate), you'll arrive at the proper length.

As in normal house construction, the studs should be spaced 16 in. on centers, the corner posts being doubled. The lower ends of the studs are toenailed to the bottom plate.

Part of the fascia board at the eave of the garage will have to be removed to expose the ends of the roof rafters. Then, as shown in the inset detail, a 2x4 ribband is nailed directly to the outside of the garage studs, $\frac{3}{4}$ in. or so below the top of the top

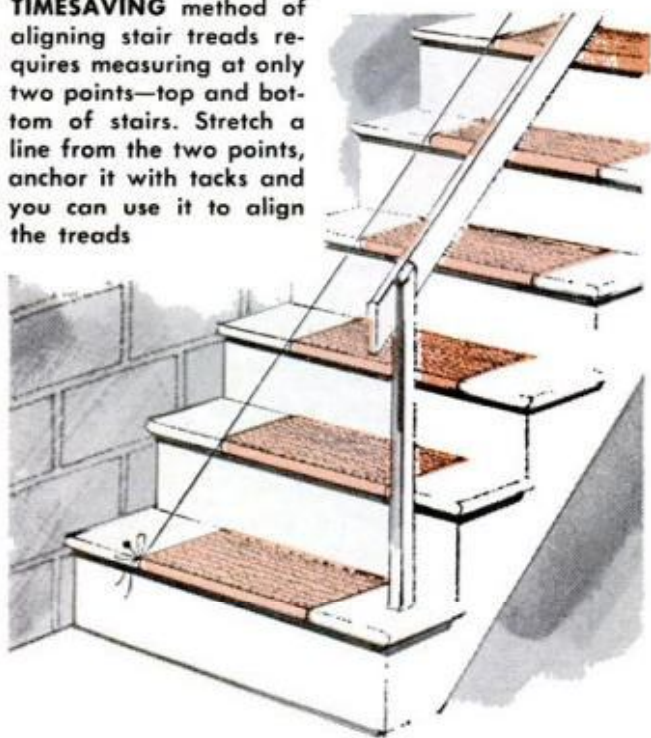
(Please turn to page 175)

SOLVING HOME PROBLEMS

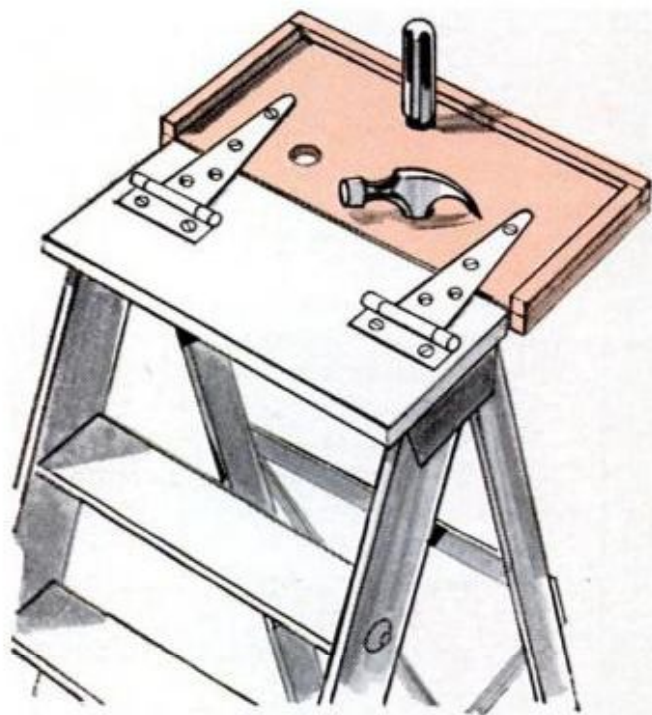


BEFORE YOU POUR a patio in which redwood dividers are set, drive large nails into the sides of the redwood below surface level at about 10-in. intervals. These will anchor the divider strips and prevent their springing up

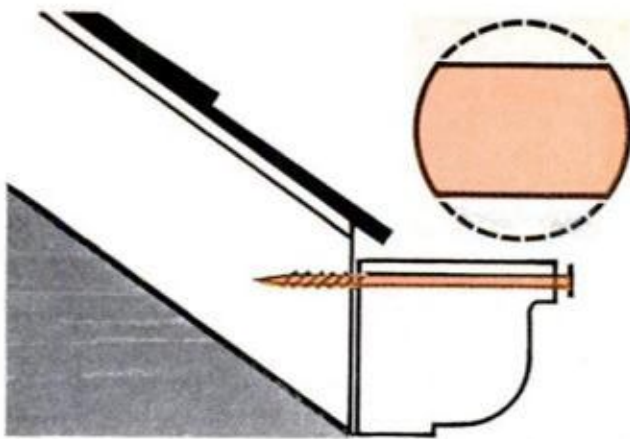
TIMESAVING method of aligning stair treads requires measuring at only two points—top and bottom of stairs. Stretch a line from the two points, anchor it with tacks and you can use it to align the treads



SOCK THOSE MOTHS with a simple vaporizer made by filling the foot of an old nylon stocking with moth balls and knotting the upper end. The nylon allows the air to circulate for more efficient vaporization



FLIP-TOP SHELF for stepladder features holes to hold hammer, screwdrivers and other tools, enlarges top step to provide room for a can of paint. Make it as shown, using bolts to attach hinge to the ladder



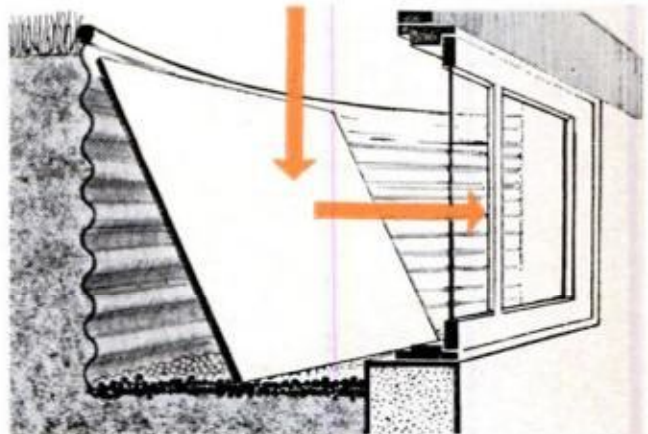
PLAN AHEAD when installing box-type aluminum gutters and you'll avoid trouble later if they have to be removed. File two flats on each spike head so you'll be able to twist the spiral shank out with a wrench



THROW-AWAY LINER for rim of paint can prevents it from becoming clogged with paint. Just press a pipe cleaner into the bead to soak up the paint. When the job's completed, lift it out and replace the lid



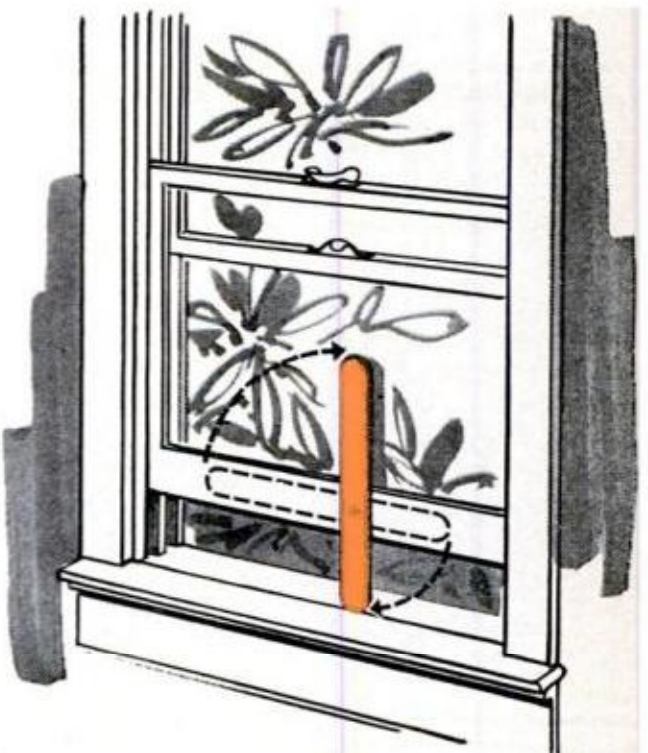
KEY LINE on embossed floor tile simplifies installation. Tile must be laid in one direction to avoid shadow effect, so open each box from same end and scribe line across tile edges with chalk or crayon



TO BOUNCE LIGHT into a dark basement cut a piece of exterior plywood to set at an angle in the window well and give it a couple of coats of high-gloss white exterior enamel. This makes a fine reflector

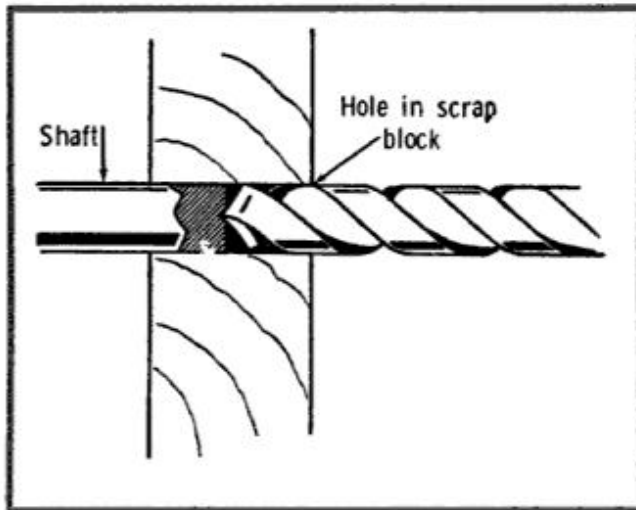


CHAIR EASEL for budding young artist costs almost nothing to make. Just nail a retainer strip across the seat of an old wood chair to support a plywood "easel" against the back and add a shelf underneath

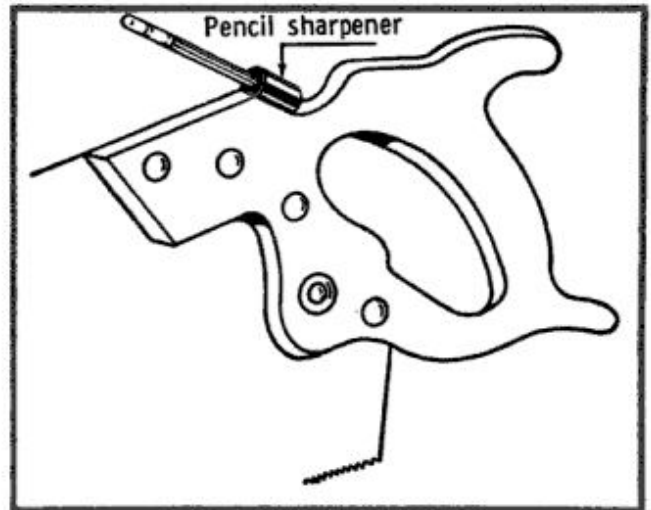


PIVOTED PROP for garage window holds sash opened at two different heights. Make the prop narrow enough so that it won't keep the window from closing fully, and install it with a pivot screw near one end

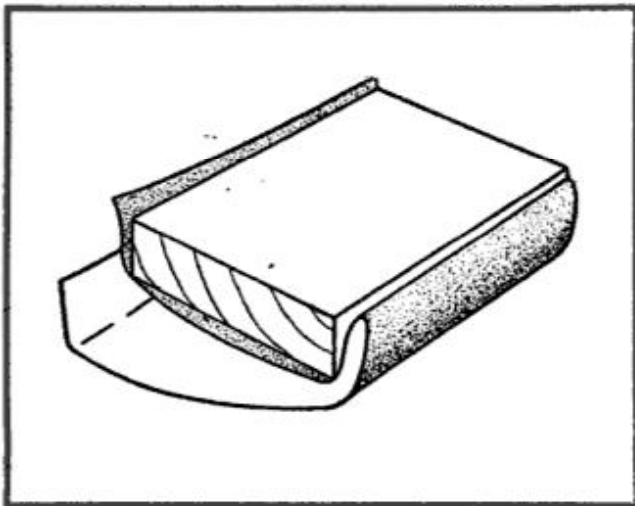
6 Helpful hints to make shop work easier



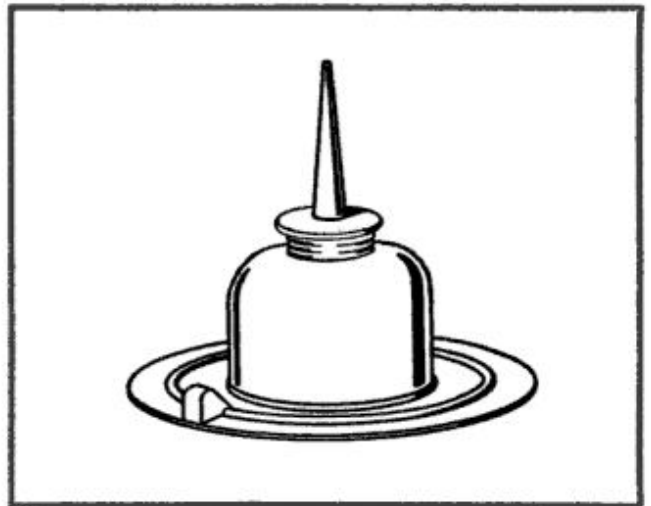
TO CENTER-DRILL ROUND STOCK without a lathe, drill a same-size hole as the stock in scrap of hardwood. Insert stock as shown, then insert the drill from the other side. The resulting hole will be centered



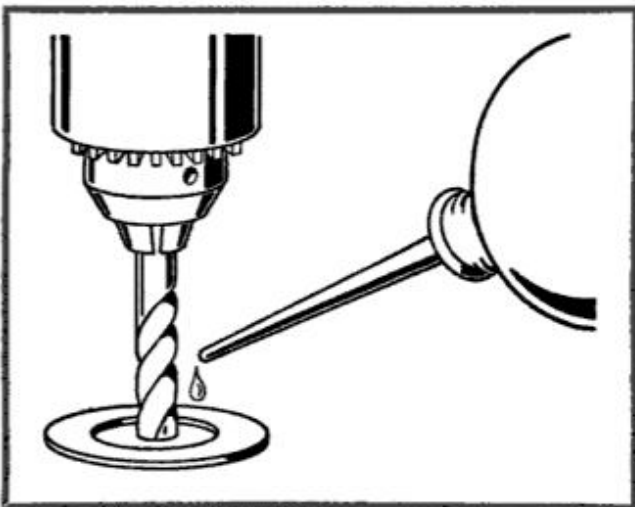
YOU START TO MARK A BOARD for sawing—and your pencil breaks! A simple gimmick to minimize and overcome this aggravation is the gluing of a dime-store pencil sharpener on top of saw handle



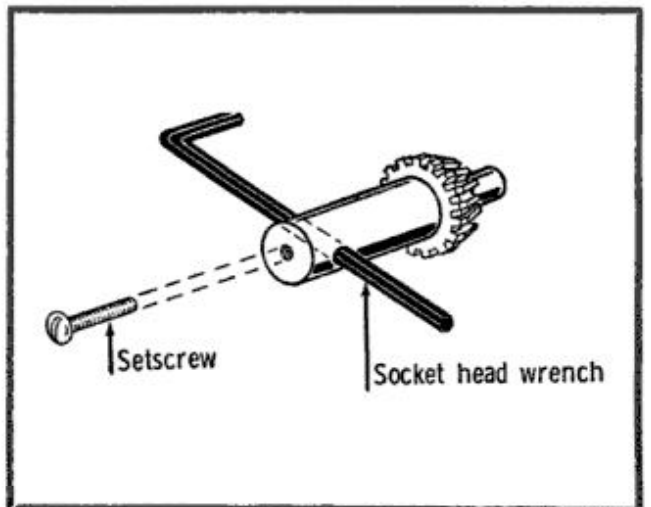
RELIEVE FINGER CRAMP acquired from trying to hold sandpaper to a sanding block. Fold the paper in half, abrasive side out, before wrapping it over the block. The paper will cling to block with a nonslip grip



A BEAUTIFULLY KEPT WORKBENCH is the pride of many a home craftsman. Here's a trick to help keep your bench free of stains: use one of those large, flat sink stoppers as a coaster for your oilcan



CONSTANT LUBRICATION is often required when drilling holes in metal. When drilling flat stock on a drill press, put a rubber washer around the hole to serve as an oil reservoir; then feed lubricant to it



IF YOUR CHUCK-KEY HANDLE BREAKS, replace it with an Allen wrench of size you often use. If hole is too small, enlarge it to permit wrench to be press-fitted; if too large, use a setscrew through top

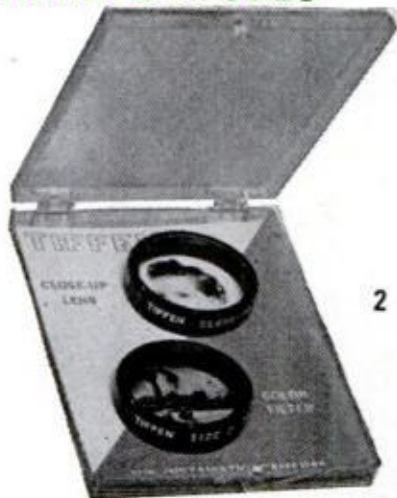
NEW FOR CAMERA BUFFS

BY LEONARD SAMUELS



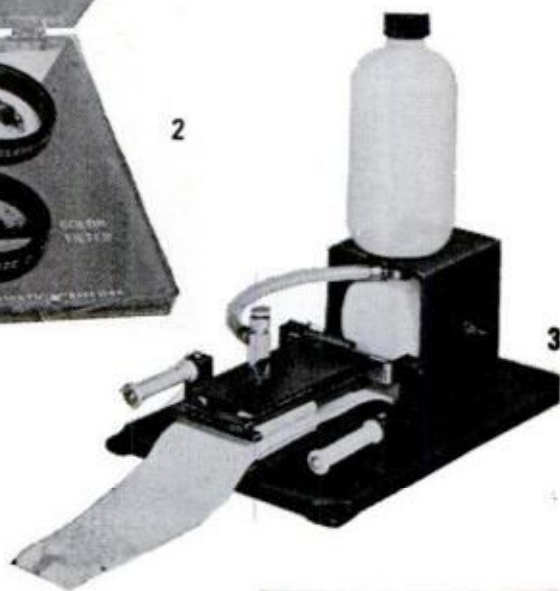
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1. "Split-personality" Dual-Filmatic has detachable Super 8 magazine for \$209.50 and takes magazine for Single 8. Tri-Filmatic version can also handle regular 8. They reverse, have power zoom and through-the-lens operation. Honeywell, Inc., 4800 E. Dry Creek Rd., Denver, Colo.



2

2. Instamatics get an assist from the \$4.50 Duo-Pak: +1 close-up lens and color filter. Tiffen Optical, 71 Jane St., Roslyn, N.Y.



3

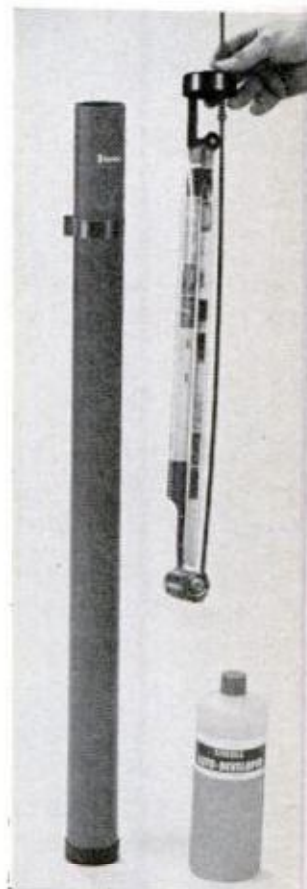
3. For the meticulous guy, there's the Model-D Speed Roll Applicator for cleaning and conditioning film. For \$37.50, you get applicator, antistatic cleaner, cleaning rolls. Electro-Chemical Prods., 89 Walnut St., Montclair, N.J.

4. Develop anywhere with Brooks Daylight Deep Tank at \$7.50. Film is unwound when tank is closed. One-step developer works in four minutes. Burleigh Brooks, 420 Grand Ave., Englewood, N. J.



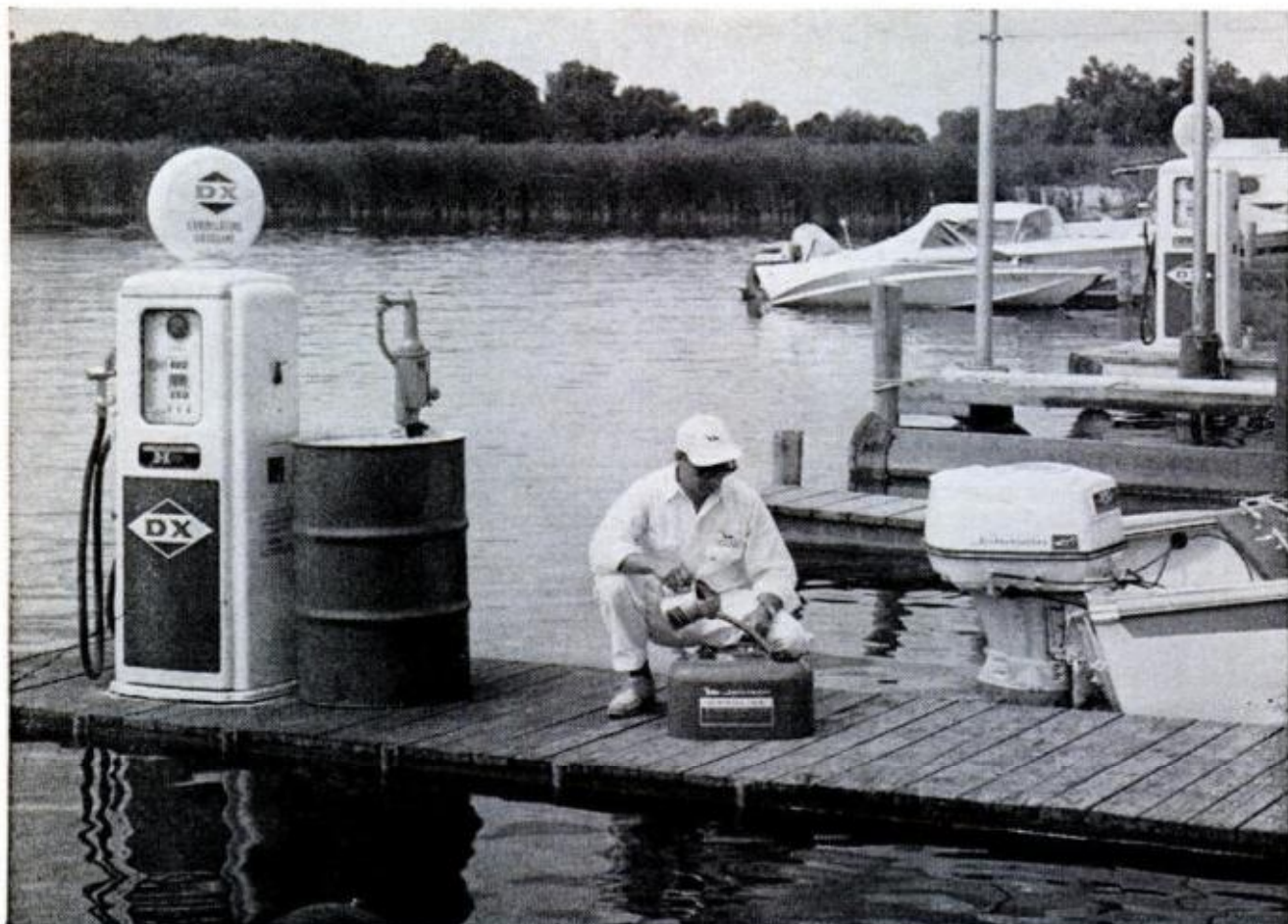
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5. Like flashcube idea? The Rotocube Flashholder permits most cameras to use them on accessory shoe or cable. Cubes rotate automatically by spring. Priced under \$22. Eastman Kodak Co., 343 State St., Rochester, N. Y.



4

YOUR OUTBOARD MOTOR



What's the truth about fuel mixes?

Every outboard manufacturer has his own ideas about how much oil you should mix with the gas. Here's the story behind this hassle and what it means to you

By Henry B. Notrom

IN THE OLD DAYS, anyone who owned an outboard could tell you the right fuel mix for any make of motor—one quart of oil to every six-gallon tank of gas. The motors grew larger, the engineering more sophisticated, but the 24-to-1 ratio remained as sacred as the Ten Commandments. Until 1962.

That year, McCulloch suddenly revised its fuel-ratio recommendations upward. In quick succession, the other companies also introduced new oil-gas recommendations,

which resulted in no end of confusion. Even today, few people (including dealers) can give you the manufacturer's fuel-mix recommendations for every brand of motor.

What do the new ratios mean to you? Money in the pocket, for one thing. You spend less on oil, because you use less oil. Greater efficiency, for another. Many engine problems of the past are almost completely eliminated with today's new oils. In other words, it's real engineering progress.

Manufacturers were experimenting with

reduced oil-gas ratios as far back as 1939. Ironically, the engines were ready for reduced ratios long before an oil was available which would provide safe lubrication in a leaner mixture.

The oil breakthroughs began in 1962, but it wasn't until last year that the last major outboard manufacturer announced a reduced fuel mixture for his products.

To get the most benefit from the new ratios, you have to know not only *what* your motor's manufacturer recommends, but also the wherefores behind his recommendations. And even more important, the right way to carry them out. We went straight to the companies for this information, and here it is:

McCulloch. In 1962, McCulloch Corp. announced development of an oil that could be mixed with gasoline in the ratio of 100 to 1 (6 ounces of oil to 5 gallons of gasoline). This fuel mixture is still recommended today for all McCulloch and Scott two-cycle engines from 1962 to the present, except the 3½-hp model. But to use this ratio, you *must* use McCulloch's 100:1 Outboard Motor Oil.

The original 100:1 Outboard Motor Oil marketed by McCulloch is no longer with us. In 1964, the company reintroduced the product in an "improved" form.

What makes this oil—or for that matter, any outboard engine oil—better for use in two-cycle engines than automotive oil? Frankly, no manufacturer who markets an outboard oil is willing to reveal any secrets.

Generally, though, outboard oils are classified as ashless oils, either SAE 30 or SAE 40 in weight, that contain polymeric thickeners, detergents and dispersants, among other things. Now let's decipher all this Greek.

By "ashless" is meant that the oil, when burned, leaves little if any foreign matter (particularly carbon) inside the engine. Automotive oils, which contain mineral detergents that cause little harm inside a four-cycle engine will, when used in a two-cycle, leave deposits as the oil is burned. The fact that outboard oils do not leave these deposits results from the use of *organic* detergents in outboard oil, which dissipate as oil is consumed.

Polymeric thickeners are used in the oil to prevent piston scuffing which could oc-

HOW ABOUT PREMIXES?

Premixed fuels, which contain outboard engine oil, are mixed in one of three ways:

1. At a bulk plant of the manufacturer.
2. At the marina by a representative of the manufacturer.
3. Oil and gas are provided the marina in separate containers and a mixing pump is used to mix the fuel to the ratio specified by the customer.

It is perfectly okay to use a premix in your outboard engine, provided it is at the correct ratio specified by the engine's manufacturer. Keep in mind, though, that as of the moment, if a marina is supplied with a premix made at a bulk plant or otherwise mixed by the refiner, it is probably at a ratio of 24 to 1. This is fine for use in Mercury engines.

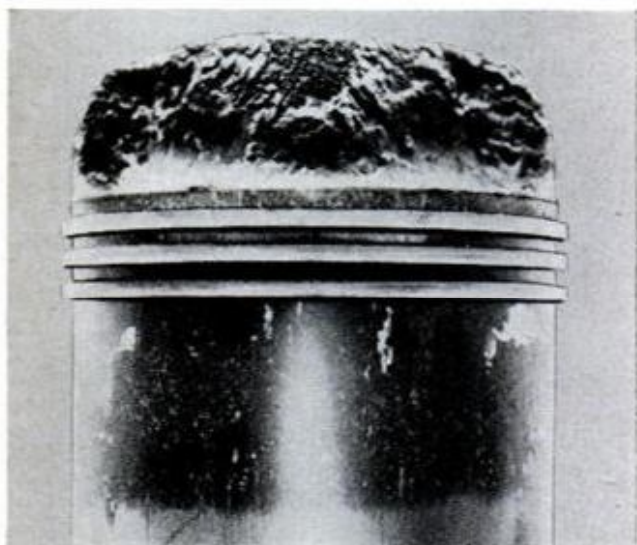
However, in OMC's, McCulloch's and Chrysler's of the correct year, you can still take advantage of the 50-to-1 mixture. Simply have the marina dilute the 24-to-1 premix with enough gasoline to arrive at a 0-to-1 mixture.

cur at the reduced oil level. In addition, two-cycle oil does not contain a dilution inhibitor as does automotive oil. This inhibitor prevents gasoline from diluting oil in a car's crankcase. In a two-cycle engine, though, you *want* the oil to be diluted by the gas to enhance mixing of the two in the gas tank.

Getting back to McCulloch, if 100:1 Outboard Oil is not available, any other *outboard engine oil* can be employed at a ratio of 50 to 1 (that is, about 1 pint of oil to every 6 gallons of gasoline). Preferably, that oil should be McCulloch's 40/50 Two-Cycle Motor Oil, which was introduced in 1964. The "40" part of the label refers to two-cycle engines other than outboards, such as chain saws, power mowers and go-karts. The ratio for these is 40 to 1.

McCulloch does not recommend the use of an automotive oil in its engines except in emergencies—like when you're stranded on Big Creek with only a gas station around.

OMC (Johnson and Evinrude). In September of 1963, in conjunction with introduction of its 1964 Johnson and Evinrude models, the Outboard Marine Corp. an-



AFTER 155 HOURS running wide open on manufacturer's recommended mix (McCulloch 100:1 in this case), top piston looks fine. Bottom piston shows the effect of using premium automotive fuel in an outboard

nounced that a fuel mixture of 50 to 1 (1 pint of oil to every 6 gallons of gasoline) can be used. This applies to 1964 to present models. The 50-to-1 fuel mixture should *not* be used in a new engine, though, until that engine is operated for the first 10 hours at a 24-to-1 mixture.

OMC does not market its own brand of outboard oil. Instead, the company states that "a reputable outboard motor oil or a *regular SAE 30 grade automotive engine oil*" can be used. Be careful in interpreting that italicized portion.

Assuredly, you can use any outboard motor oil, including Kiekhaefer's Formula 50 and McCulloch's 40/50, in OMC engines at a ratio of 50 to 1. But you can't use *any* automotive oil.

Automotive oil is classified as MS or MM. One or the other is imprinted on every can of oil. Do *not* use MS oil under any circum-

stances. It contains a high concentration of mineral detergents. When this oil is burned in a two-cycle outboard engine, a tremendous accumulation of deposits, particularly carbon, will be left. These deposits will glow red-hot under operating temperatures and cause preignition, which is erratic combustion of the fuel mixture.

In fact, in tests run by outboard engine manufacturers it was found that after as little as 59 hours of operation, use of MS oil caused complete destruction of the engine. Center main bearings fail, and cylinder block assemblies, crankshafts and pistons are damaged beyond use.

However, OMC does state that automotive oils designated as MM (or ML-MM) can be used in OMC engines at the 50-to-1 ratio. These oils do not have a great concentration of mineral detergents in them and are generally classified for use in engines subjected to medium-duty operation.

You may come across a can of oil carrying the designation ML. Do not use it in OMC engines. It is designed for light-duty use, and when mixed with gasoline will not have sufficient lubricity to adequately lubricate an OMC engine.

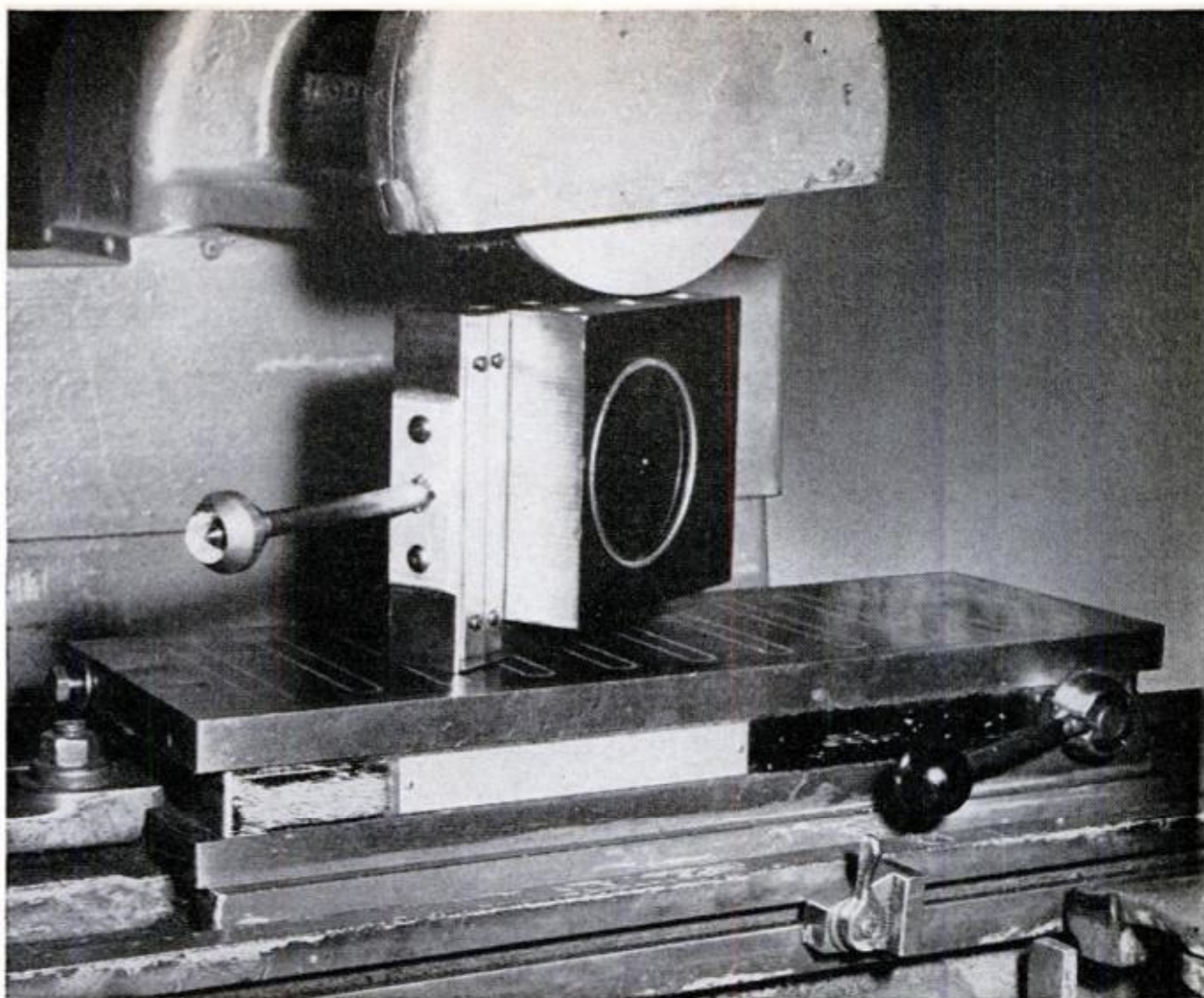
All OMC two-cycle outboards prior to 1964 should continue operation at a fuel ratio of 24 to 1.

Kiekhaefer. In September of 1965, Kiekhaefer Corp. announced development of an oil it felt suitable for use at a ratio of 50 to 1 in Mercury outboards. The oil, called Formula 50 Quicksilver Outboard Motor Oil, is classified as a low-ash multi-functional motor oil, SAE 40 in weight.

The 50-to-1 fuel mixture with Formula 50 oil can be used in all Mercury two-cycles from 1963 to present models. In the event Formula 50 isn't available, the company recommends use of Quicksilver Formula 2 oil at a 24-to-1 ratio.

These are the only two oils recommended for use in Mercury engines. "In an emergency," a company spokesman told me, "an owner can use a regular two-cycle outboard oil at 24 to 1. But it has to be a *real* emergency before he should use an automotive oil, and then only one designated MM."

Chrysler. Chrysler (nee West Bend) made its announcement of the 50-to-1 ratio in late 1964. The ratio is recommended for use in all its engines for 1965 and 1966.

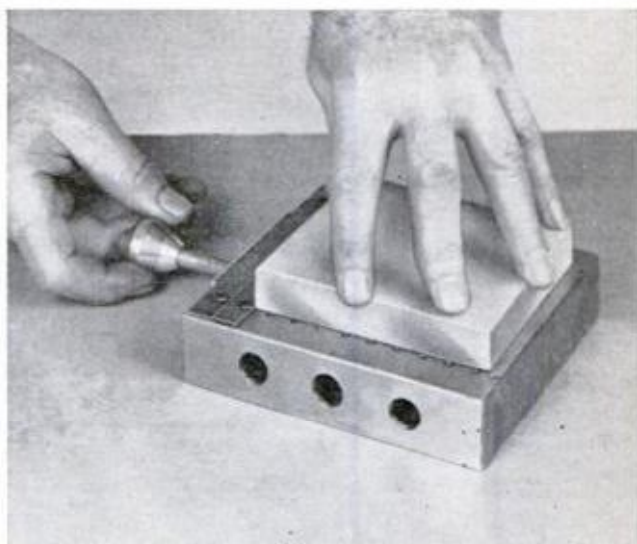


VACUUM PLATE IN PLACE on magnetic table for surface-grinding edge of workpiece held by suction alone

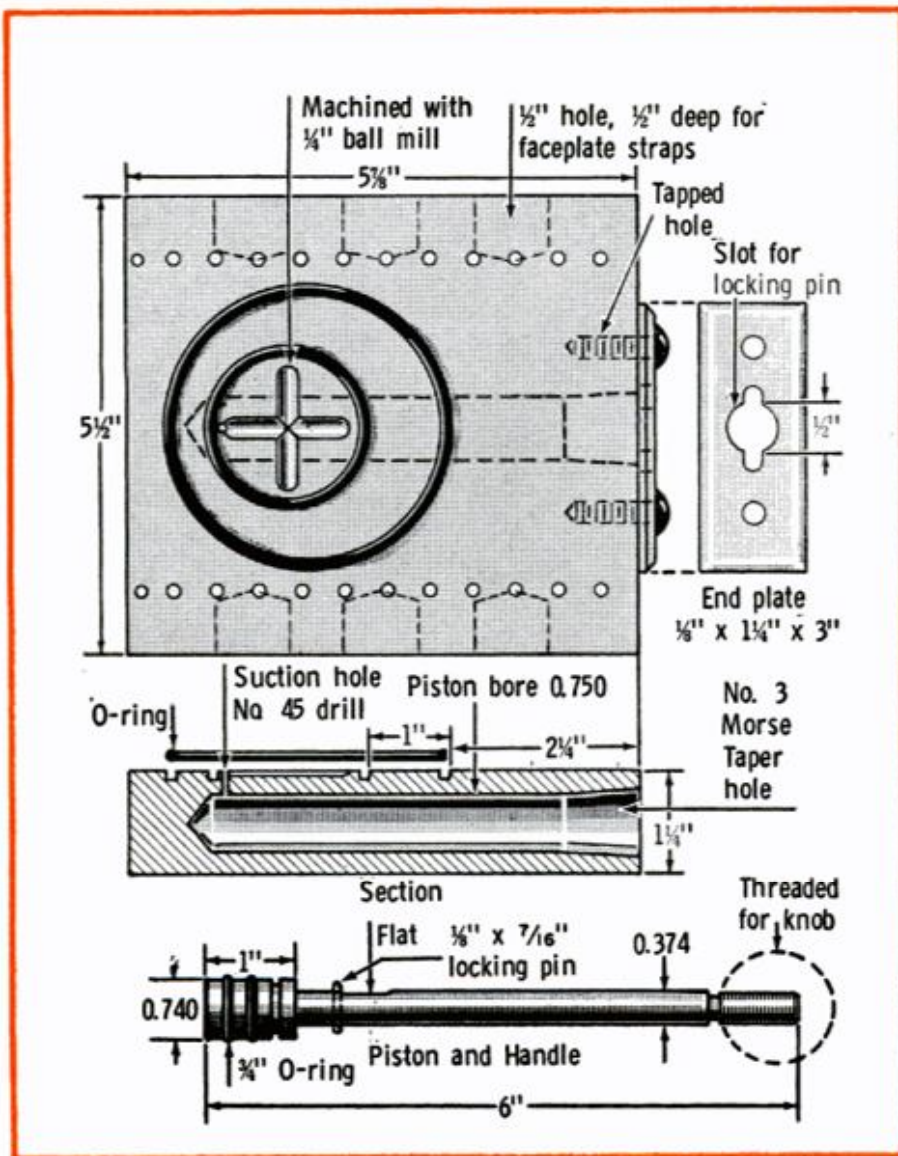
Make this unique work-holding vacuum plate

STUDENTS at the Brockton Trade High School at Brockton, Mass. are an ingenious group. When a parent suggested they make a work-holding plate for their surface grinder that would grip the work by mere suction, the class and their instructor, John T. Lane, set to work and developed this unique vacuum plate. Now, instead of having to follow the old practice of using double-faced tape to hold the work to the grinder table, they quickly anchor it by sucking it firmly to the top of a heavy workplate. Better than any tape, since there is no chance of movement, the vacuum plate also lets them use all the coolant they want—another problem with tape.

Mounting the workpiece to the plate is as simple as can be. First you place



WORK IS ATTACHED securely to vacuum plate by pulling piston which sucks air trapped between workpiece and plate through a tiny hole inside the O-rings



it on top of the rubber O-rings that are half buried in the surface. Then with the piston all the way in, you press down firmly on the work as you pull the piston all the way out. This creates a strong vacuum on the workpiece which is maintained by turning the piston's handle 45° to lock it in its extended position. It's now nigh impossible to pull the work from the plate. To break the vacuum and release the work, you simply unlock the piston and push it all the way back into the plate.

Obviously, to obtain a vacuum the surface of the work must be perfectly flat and so it is necessary to machine one surface first. Likewise, the work has to bottom perfectly on the plate if ground surfaces are to be parallel.

The plate can be made almost any size although the overall dimensions given in the drawing presented above will meet most home and school-shop requirements. Here, again, while only two O-rings were used in the surface of the

original, more can be added if desired. In determining the proper comparative sizes of O-rings for any given plate, if the larger of the two surface O-rings measures 3 in., the piston O-rings should be about 3/4 in. in diameter. For every 1-in. increase in the diameter of the surface rings, the piston rings should be increased 1/8 in.

Start out making your plate from a block of mild steel, either 1018 or 1020. If a vertical miller with a rotary table is used to machine the O-ring grooves in the plate, you won't have to bother boring the 1/2-in. holes in opposite edges as indicated. However, if the ring grooves are to be lathe turned, you'll need these holes for mounting the block to the faceplate with metal straps. The straps are

inserted in the most convenient pair of holes on each side and then bolted to the faceplate.

To turn the circular grooves, first lay out and punch the center of each. Then bring the tailstock up and use it to accurately center the large groove first as you strap the block to the faceplate. After turning the large one, shift the block and turn the groove for the small ring.

The outside diameter of the surface grooves must be 0.005 in. larger than the o.d. of the ring and the groove's inside diameter must be 0.005 in. smaller than the ring's inside diameter. The depth must be about 0.011 in. less than the actual sectional diameter of the ring. This means that there is 0.005 in. clearance on each side of the ring when it's placed in the groove. The O-ring itself must project about 0.011 in. above the surface of the plate to obtain proper vacuum and contact with the workpiece.

(Please turn to page 191)



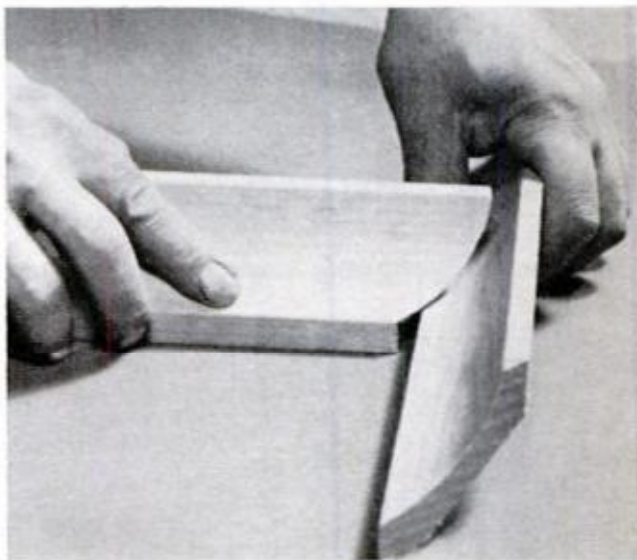
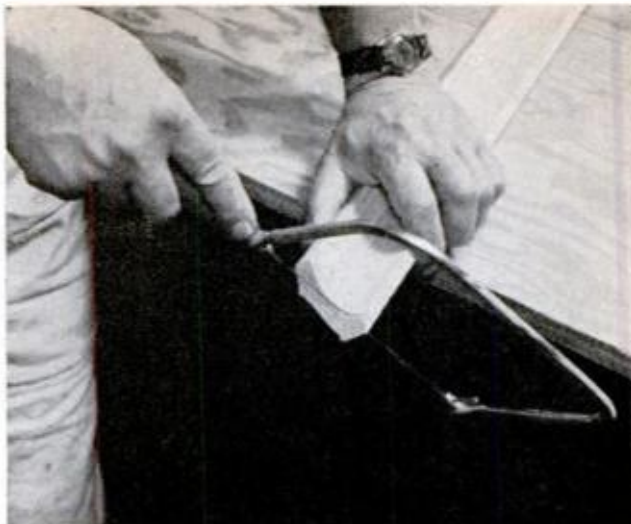
How to cope molding

WHEN INSTALLING cove or crown molding around the ceiling of a room, you should remember that while outside corners are generally mitered, inside corners should always be coped—you should never miter both. If you do, the inside ones will later open up when the wood shrinks, making a poor joint.

Coping is the term applied to cutting the reverse shape of one molding to coincide with the profile contour of the adjoining molding when the two are butted together.

Transferring the reverse shape to the molding can pose a perplexing problem. However, there's a simple stunt to follow that will give you a near-perfect fit every time. The line of cut is actually "marked" by placing the molding in a miterbox and sawing the end at a 45° angle. Here you will notice that the molding is set in the miterbox in the same position as it will be installed—the part that fits flat against the wall is placed flat against the back of the box.

The very edge of the 45° cut estab-



lished the line of cut which is now carefully followed with a coping saw held at right angles to the face of the molding. The waste piece removed will be wedge-shaped. Where all corners of a room are inside corners, only one end of each molding is coped, the other end is simply sawed off square to butt into the corner—Western Wood Products.

NEXT MONTH IN SHOP AND CRAFTS

ALL ABOUT SEALANTS. Winter may seem a long way off now, but by the time next month's *PM* hits the stands you'll be knee-deep in fall maintenance jobs. To help you with one of the biggest of these prewinter chores, the October issue includes a detailed guide to choosing home caulking materials, complete with a three-page clip-out chart

SMALL-JOB CONCRETE MIXER. It's perfect for those small patching jobs, and you can build it for \$25. No wheelbarrow or mortar box required with this undersized mixer, either—the five-gallon bucket lifts right out of its basket for easy on-the-job pouring. Watch for detailed plans and photographs of this handy midget mixer in next month's issue

LIVING ROOM THEATER WALL. It looks like any paneled wall, but when you start to push the control buttons, things begin to happen. Tall stereo speakers rotate to face out into the room. Panels slide aside to reveal a color TV and a big 4-ft.-square screen on which you can show slides, sound movies or even TV, all by rear projection. It's all remote-controlled and concealed in a 5x14-ft. closet. You'll see complete plans in next month's *PM*



Build this CB intercom and keep track of your kids

You can convert an old telephone to a citizens band transmitter—then use it to keep track of your children while they're outdoors

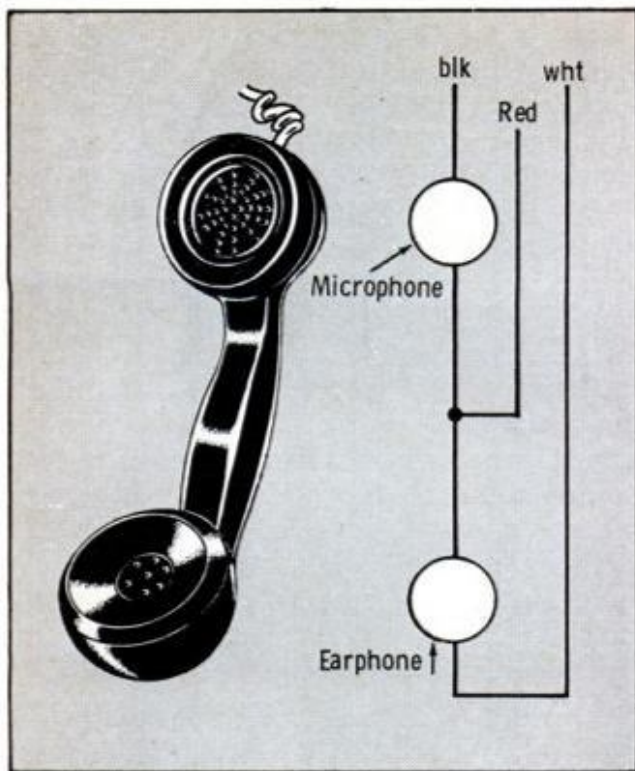
By CHRIS STEVENS



DINNER'S READY! CB radio replaces the old dinner bell. Contained in phone housing, it fits anywhere



BE RIGHT THERE! We hope she will. That little radio keeps mother right at hand with active daughter



HANDSET WIRING must match this circuit. Check to make certain before you wire up your unit. At the same time, be sure there are no breaks in the wiring

tion of the base for the push-to-talk button. Mark its location carefully—it must be positioned accurately. If it is too short substitute a longer pushbutton knob or cement a piece of plastic rod or wooden dowel to the top of the original knob to have it longer—long enough to depress the switch for transmitting.

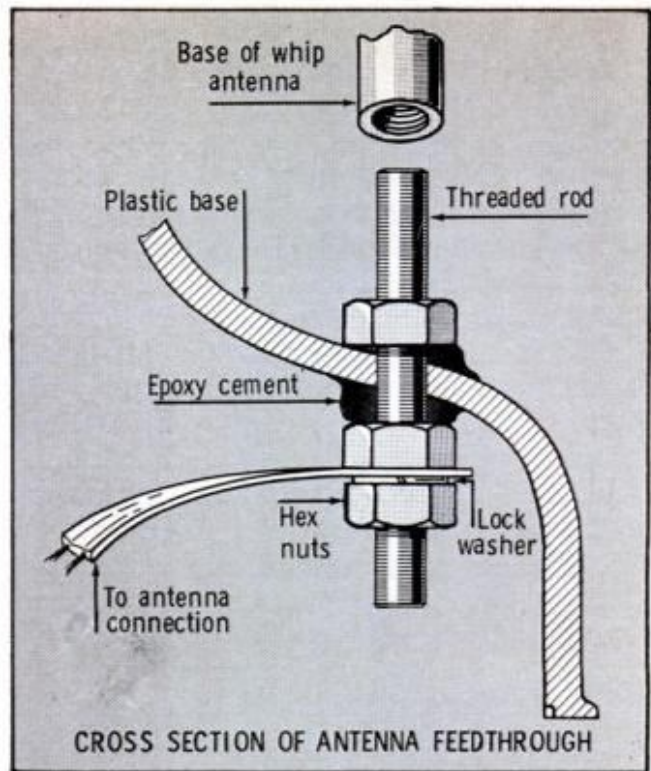
Temporarily position the printed-circuit chassis of the transceiver in the base to mark the mounting holes.

Once the transceiver chassis is mounted in the base and you are certain it will operate properly, it is safe to make the few circuit changes that are necessary.

Remove the angle bracket and mounting screw for the antenna and attach a $\frac{1}{4}$ - to $\frac{3}{8}$ -inch-wide strip of copper or soft aluminum in its place. Drill the other end to fit around a short length of 6-32 threaded rod (a 1-inch machine screw with the head cut off will do).

Insert the threaded rod in a hole drilled through the base of the deskset. If the base is metal a feed-through insulator must be used. Two hex nuts hold the rod in place.

If necessary, epoxy-cement the threaded rod in place to keep the whip antenna vertical. Keep exposed portions of the threaded rod clean. If this cement gets on the threads it may be difficult or impossible to attach the whip antenna and the



FEED-THROUGH CONNECTIONS through the plastic case are made as shown here. Epoxy cement holds threaded rod in place to keep whip antenna vertical

antenna connector strip from the transceiver chassis. Mount the battery on-off switch any place that is convenient.

Remove the bracket used to mount the switch. It makes a good template for marking the holes necessary for remounting the switch. File the rectangular hole to size after starting it with a couple of drilled holes.

Mount the small speaker behind the circular plate used to label the phone—the extension number. It may be necessary to cut or drill an opening for the speaker. These plates are removable. On some phones a dial is used in place of a solid disc. Protect speaker with a small louver.

With the chassis mounted at an angle it may be difficult to get to the slug used for tuning the receiver. A tuning control can be added to the front panel of the desk set. Cut the L-shaped plastic tuning tool at the bend. Mushroom the end with a warm (not hot) soldering iron.

Make a suitable flexible shaft by cementing plastic tubing and rod together end-to-end. A piece of tubing cemented inside a section of spring (like that used to hang light curtains) will work too.

The tuning control on the front of the deskset base is a countersunk flathead machine screw. A short spring, a couple of washers and a hex nut will prevent

(Please turn to page 176)

Build a 1-transistor autogen radio

By JOSEPH D. AMOROSE

HERE'S A SENSITIVE, one-transistor regenerative radio to tune local stations automatically and DX reception manually. In automatic, a switch selects up to nine preset local stations. Headphone volume is more than ample.

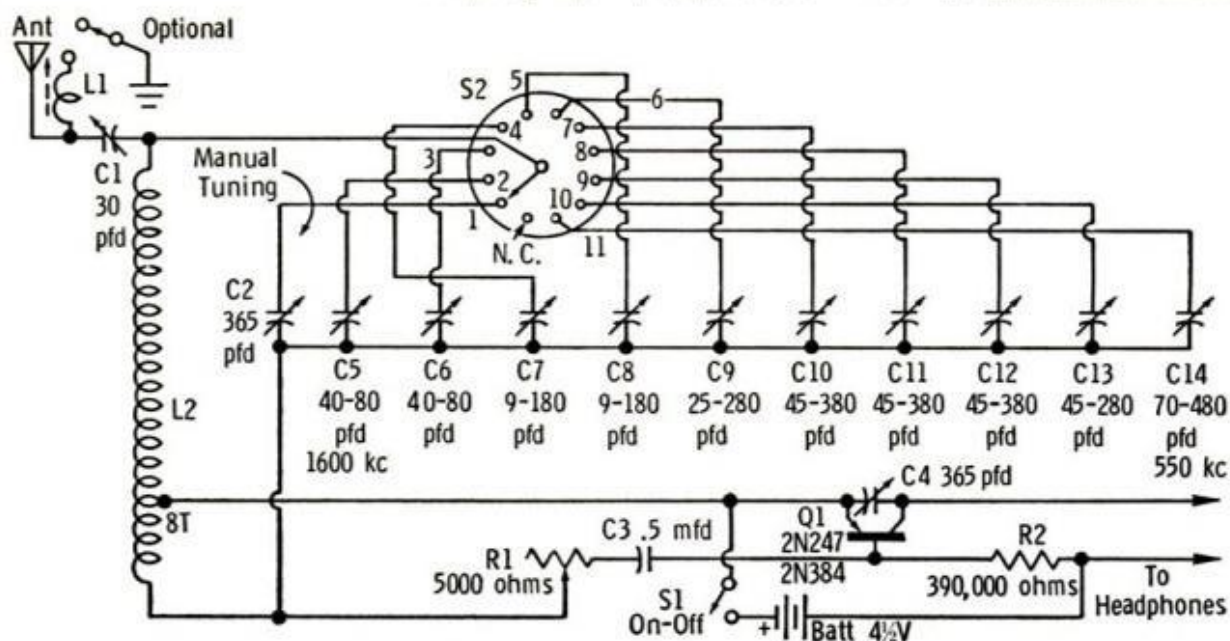
The front panel is a $9\frac{1}{2} \times 6\frac{1}{2} \times \frac{1}{8}$ -in. sheet of hardboard. The chassis is a $9\frac{1}{2} \times 5\frac{1}{2} \times \frac{1}{16}$ -in. sheet of perforated phenolic. The chassis is raised $\frac{3}{4}$ -in. from the bottom of the front panel to allow wiring room under the chassis. Angle brackets hold the pieces together.

First, mount all parts on the front panel and chassis. Mount the trimmer capacitors on a strip of wood and connect the bottom lugs of these units together. Wire the rest of the circuits according to the diagram.

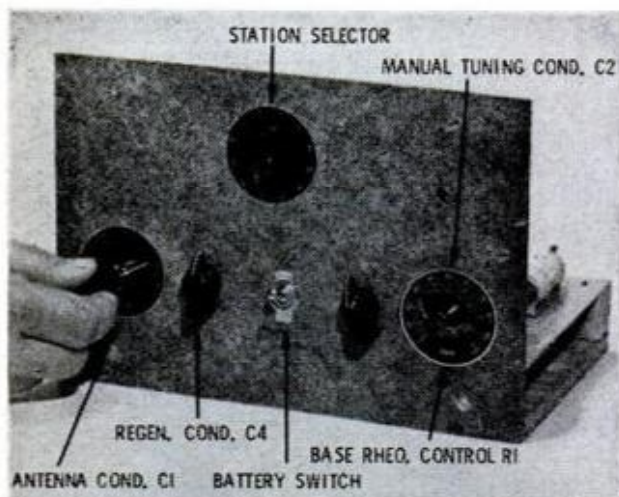
You can use a standard ferrite-core antenna coil (L1), but for greater sensitivity you should make your own. On a 4-inch length of $\frac{1}{2}$ -in.-dia. ferrite coil

PRESET THE TRIMMERS, one by one, to set up the automatic tuning. Once it is adjusted, a listener can choose any one of nine preset stations by just turning a switch

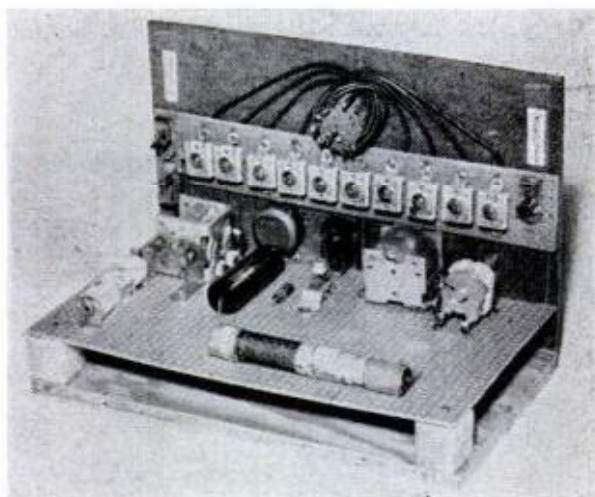




CIRCUIT OF ONE-TRANSISTOR RECEIVER. Note location of optional standard ferrite-core antenna coil



FRONT PANEL HOLDS ALL CONTROLS. They should be adjusted according to instructions in text. Then you can start experimenting for better results



CLOSEUP CHASSIS VIEW shows details of parts layout. Chassis is rather large so space is no problem. Just try to keep the antenna coil at the rear

material, starting $\frac{1}{4}$ -in. from one end, wind 70 turns of No. 24 DCC wire. Make a tap at 8 turns. Mount coil (L2) as shown, at the rear of the chassis, as far from other circuit components as possible.

After completing the set, hook it up to an antenna (you'll need 100 feet or more of 7/22 antenna wire). No ground is used as it broadens tuning. But when greater volume is desired, a ground will help.

To set up for automatic tuning, turn on the set and move the rotary switch to position 1. Tune C2 to a station at about 900 kc. Adjust C1 for best selectivity. Set C4 to a point where audible oscillation just stops. Now set R1 until volume is comfortable.

Next turn the rotary switch to position 2

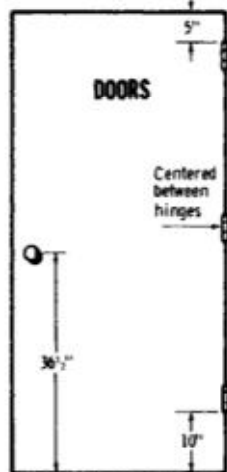
and adjust the appropriate trimmer to bring in the desired station. Use a plastic tuning tool. Identify the station on the front panel next to the proper switch position. Repeat for each trimmer. ★ ★ ★

PARTS LIST

- C1—30-pfd. variable capacitor
- C2—365-pfd. variable capacitor
- C3—.5-mfd. capacitor
- C4—365-pfd. variable capacitor
- C5, C6—40-80 pfd. trimmers
- C7, C8—9-180 pfd. trimmers
- C9—25-280 pfd. trimmer
- C10, C11, C12, C13—45-380 pfd. trimmers
- C14—70-480 pfd. trimmer
- R1—5000 ohms, rheostat
- R2—390,000 ohms, $\frac{1}{2}$ -watt carbon resistor
- Battery—4 $\frac{1}{2}$ v. (3 D-cells in series)
- Q1—2N247 or 2N384 transistor
- S1—s.p.s.t. toggle switch
- S2—Single-pole 12-position rotary switch
- L1—Standard ferritecore antenna coil
- L2—(see text)
- Headphones—2000-ohm

PM's Guide to Basic Remodeling Measurements

Whether you want to remodel your kitchen or add a room to your house, this guide can be of immense help in the planning stage. It provides some basic measurements of common structures, equipment and materials and recommended minimum dimensions. Tear out this card and keep it as a handy reference. Widths are given as the narrower horizontal dimension or as the distance from left to right from the front of an item. Heights are given from the floor or from the bottom of suspended items. Depths are from front to rear. Some measurements are not given because they vary widely or are not significant for the remodeling project.



FRAMING

Width and height of rough opening are $3\frac{1}{2}$ " larger than the door. Head and side casings are $\frac{1}{2}$ " x $1\frac{3}{4}$ "; exterior door sill is $1\frac{3}{8}$ " x $7\frac{3}{8}$ "; a stock jamb with a $\frac{1}{2}$ " rabbet is $1\frac{3}{8}$ " or $1\frac{5}{8}$ " x $5\frac{1}{4}$ "

ENTRANCE DOOR

Standardly 2'6", 2'8", 2'10" and 3' wide, and 6'8" and 7' high; thickness is $1\frac{3}{4}$ "

INTERIOR DOOR

Most commonly 2'4" and 2'6" wide; 6'6", 6'8" and 7' high; thickness is $1\frac{3}{4}$ " or $1\frac{1}{4}$ "

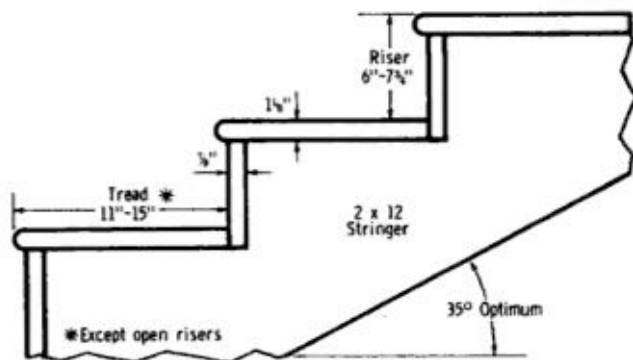
DOORBELL BUTTON

Commonly 45" above top of doorsill

DOORKNOB

Commonly $36\frac{1}{2}$ " from floor

STAIRS Recommended stairway width 2'10"-3'



Outside stoop should be 4'6" deep to allow for storm door swing. Minimum step tread is 12" with $\frac{1}{4}$ " pitch. Brick steps should be header fronted

WINDOWS

Placement height is based on aligning with room door top. Measure distance from ceiling to door molding. Window sizes are widely variable. Common wood double-hung sizes: 2', 2'4", 2'8" and 3' wide; 3'2", 3'10" and 4'6" high

RAILINGS

STAIRCASE—Height 2'10"-3'

PORCH AND DECK—Height 3'

HOUSE WIRING

MAJOR EQUIPMENT WATTAGE RATINGS

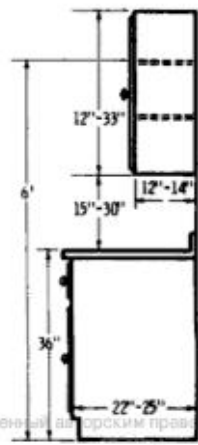
Air conditioner 850-1200, 3100	Motor, $\frac{1}{4}$ hp.	530
Attic fan 500-1500	Oil burner 300-550	
Clothes dryer to 4500	Range 7000-14,000	
Dishwasher 530-1000	Refrigerator 200-670	
Disposer 380-530	Television 200-400	
Furnace blower 380-670	Toaster 600-1350	
Heater 1000-1650	Washer, automatic .. 350-900	
Home freezer 300-670	Water heater 750-3000	

ROOMS—MINIMUM SIZE RECOMMENDATIONS

	WIDTH	LENGTH	HEIGHT THICKNESS	DEPTH
KITCHEN, for 4 persons, depends on layout and equipment	7'	10'		
BATHROOM	5'	7'		
DINING ROOM with 36" chair room	10'	10'		
BEDROOM, including 8' of clothing drawer space per person:				
Single bed	8'	12'	or 10'x10'	
Double bed	12'	13'	or 10'x15'	
Twin beds	12'	15'6"	or 10'x17'6"	
GARAGE without laundry or shop:				
One car with 8' or 9' door	12'	22'		
Two-car with 2-8' or 16' door	19'	22'		
Storage above car hood			4'	5'
Workbench on side, add to width	3'6"		36"	
Floor should pitch toward door $\frac{1}{4}$ " per foot				

FURNISHINGS & APPLIANCE RECOMMENDATIONS

KITCHEN	WIDTH	LENGTH	HEIGHT THICKNESS	DEPTH	CLEARANCE
Base Cabinet (undersink and corners not included in frontage; height includes counter top)	6'-10'		36"	22"-25"	
Common individual widths: 12", 15", 18", 21", 24", 27", 30", 36", 42", 48"					
Wall cabinet—for 4 persons	6'-10'			{ 12" 13" 14"	
—for service for 12	10'-14'				
Common individual widths: 15", 18", 21", 24", 27", 30", 33", 36", and 44"-60" (triple units)					
Common heights: 15", 18", 21", 24", 30", 31". Top shelf maximum height from floor is 6'					
Cabinet placed above range					30"
above sink					22"
above counter					15"-18"
Counter space needed (not including corners; may be reduced by multiple use)					



PM's Guide to Basic Remodeling Measurements

	WIDTH	LENGTH	HEIGHT THICKNESS	DEPTH	CLEARANCE
next to: Refrigerator	15"-18"				
Sink, each side	18"				
Food preparation, mixing	36"				
Range	15"				
Oven	15"				
Wall oven—Open door should be 3"-5" below wife's elbow. Average height from floor to bottom of oven is 27"-32"					
Common kitchen appliance sizes:					
Refrigerator	36"		59"		
1-bowl sink	24"				
2-bowl sink	36"				
Range	30"		36"		
Built-in range	30"				
Built-in oven	24"				
Dishwasher	24"		34½"-36"		
DINING AREA					
Dining table, allow 2' per person	30"-42"		30"		(36" 20" knee
8 persons fit at a 5' round, a 4' square or a 3'x8' rectangle					
Dining counter			36"		
Barstool (footrest 6"-8" from floor)			24"-25"		12" knee
Wainscoting			30"		
BATHROOM					
Sinks				31"-36'	
Tubs, square & square corner	3'10", 4'1½"				
Tubs, rectangular	2'6"-2'9"	4'-5'6"			
Free-standing shower cabinet, square and corner	2'6"-3'6"	6'3"-7'			
Toilets	17¾"- 29¼"			26"- 31¾"	18" front
Shower head			74"		
Curtain rod for tub			78"		
Towel bar			36"-42"		
Medicine cabinet from floor			48"-54"		
Tiling (4¼"x4¼")—room walls, plus trim			10 tiles		
—tub area from floor, plus trim			16 tiles		
BEDROOM					
Double bed (inside frame measure)	54"	75", 78"			
Twin bed (inside frame measure)	39"	75", 78"			
Clothes closet (depth is minimum)			7'-7'6"	22"	
Closet rod			5'3"		
Chest of drawers	36" up		28"-34"	18"-21"	
WORK AREAS					
Laundry area space in front of washer and dryer	66"			36"	
Space for hand ironing	72"			52"	
Bookshelves and cases (adjustable shelves have pin holes 1" o.c.)			6'6" to top shelf	8"-9"	

MATERIALS

BOARD & LUMBER SIZES

Nominal & actual dimensions: 1x2=¾"x1½", 1x3=¾"x2½", 1x4=¾"x3½", 1x5=¾"x4½", 1x6=¾"x5½", 1x8=¾"x7½", 1x10=¾"x9½", 1x12=¾"x11½"; 2x4=1½"x3¾", 2x6=1½"x5¾", 2x8=1½"x7½", 2x10=1½"x9½", 2x12=1½"x11½"

SHEET MATERIALS

Interior plywood—Most common sizes: 4'x8', 4'x10' and 4'x12'; also available, widths 30"-48", lengths 5'-12', thicknesses ¾" and ⅝"-¾" by eighths

Exterior plywood—Same dimensions as interior except in thicknesses: ¾" and ⅝"-1½" by eighths

Gypsum wallboard—Width 4', lengths 4' and 8', thicknesses ½"-⅝" by eighths

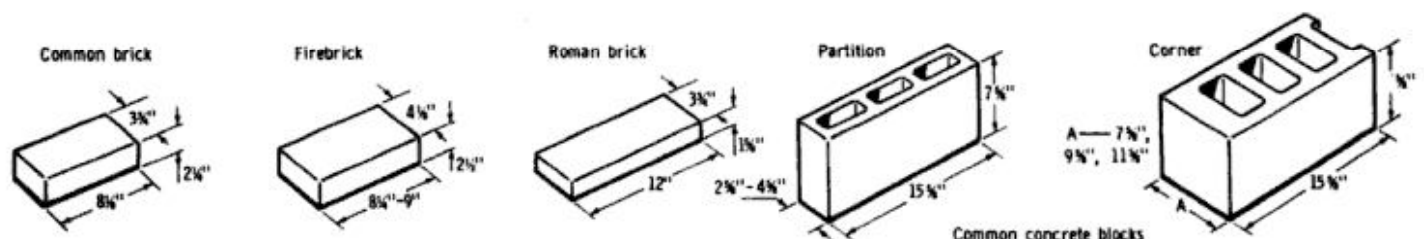
Asbestos cement wallboard—Width 4', lengths 4' and 8', thicknesses ⅝" and ¾"

Fiber wallboard—Standard width 4', lengths 4'-12', thicknesses ¾"-¾" by eighths. Also 4'x14' & 16', 8'x14' & 16' and 8'x18'

Hardboard, standard & tempered—Widths 2', 4' and 5'; lengths 2'-16'; thicknesses ¼"-¾" by sixteenths

Plastic laminate—Widths 24", 30", 36", 48"; lengths 60", 72", 84", 96", 120", not all combinations; thickness ¼"

MASONRY



Concrete—General-purpose mix is 1:2¼:3. To make 1 cu. yd., use 6¼ sacks of cement, 14 cu. ft. of sand, 20 cu. ft. of gravel and 6 gal. of water per bag of cement

INSULATION—Commonly available are rolls and loose insulation. Rolls are 16" o.c. x 36'; loose comes in 4-cu.-ft. bags; also 16" and 24" o.c. 4' batts and 8' blankets (o.c.—on center)

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And with bucket seats plus a lot of other fancy fixin's inside, it's a pretty classy way to travel city streets or

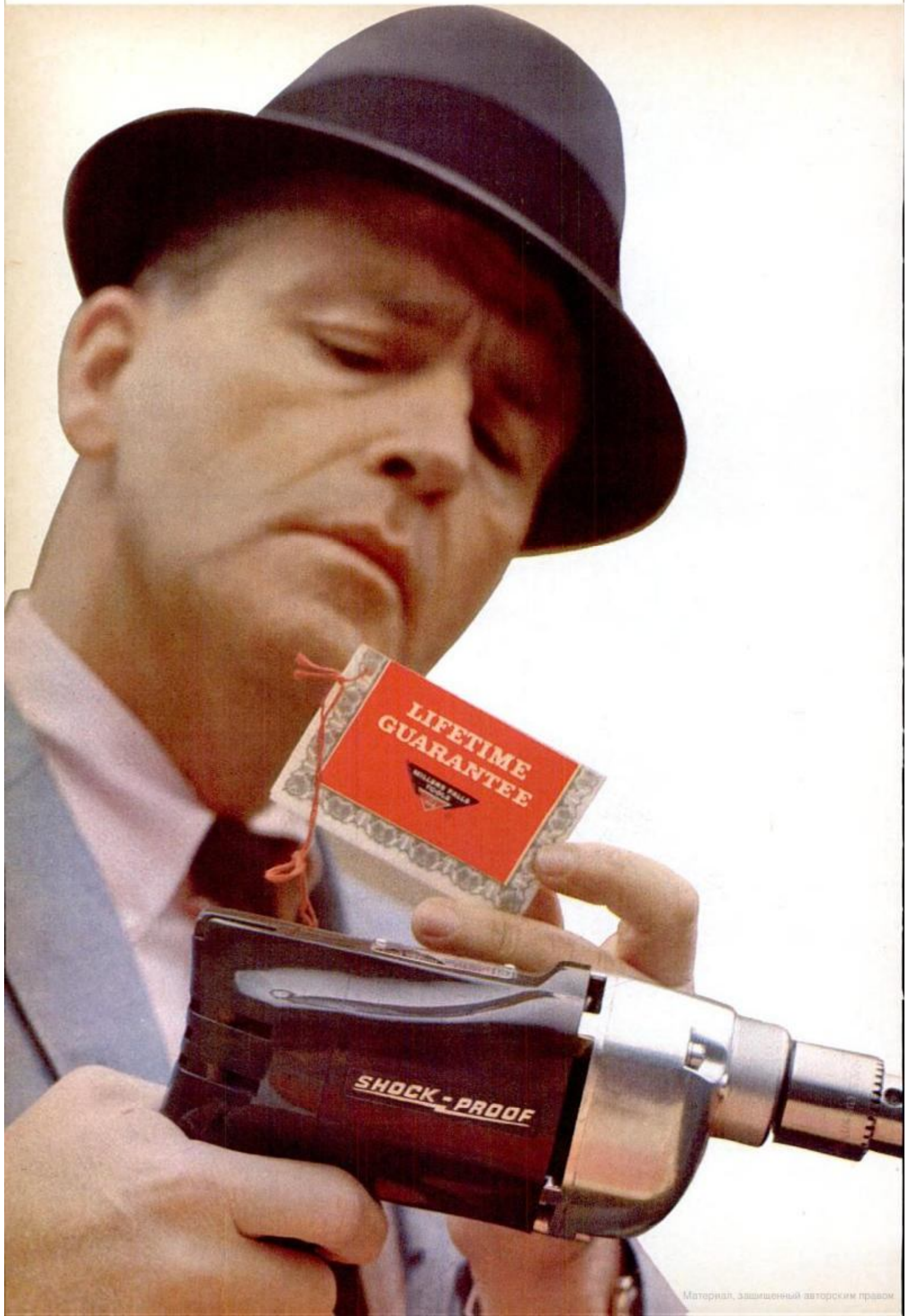
get to the suburban shopping center.

Why not go down to your nearby INTERNATIONAL Dealer to look it over. Take your wife along. Give the new SCOUT SPORTOP a real test drive—just to get a new slant on fun.



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Did you ever get a "buzz" from electricity? Did it worry you? Maybe you *should* be worried. Here's why:

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If you want safety, you want Millers Falls Shock-Proof tools. So safe they need no grounding. So safe they carry the U.L. seal of approval. And remember — U.L. puts ungrounded, double insulated tools through many more torture tests than ordinary tools. Remember, too, safety is only the first of the benefits we offer.

While we were retooling for Shock-Proof

production, we built in every worthwhile new feature known to tools. You'll notice the superior performance as soon as you squeeze the trigger switch.

The performance keeps right on performing, too, hour after hour, and day after day. For proof, read the Millers Falls Lifetime Guarantee — a 100% repair or replacement guarantee extended to the original user. Millers Falls will repair or replace any tool which fails for any reason other than abuse or normal wear, provided the tool is returned to Millers Falls transportation prepaid.

How do we dare lay our money on the line with the industry's strongest guarantee? Easy. We know what's inside Millers Falls tools. Also that *to make tools safe, you've got to make them better. We do, in Greenfield, Massachusetts.*

Part of world-wide **Ingersoll-Rand**

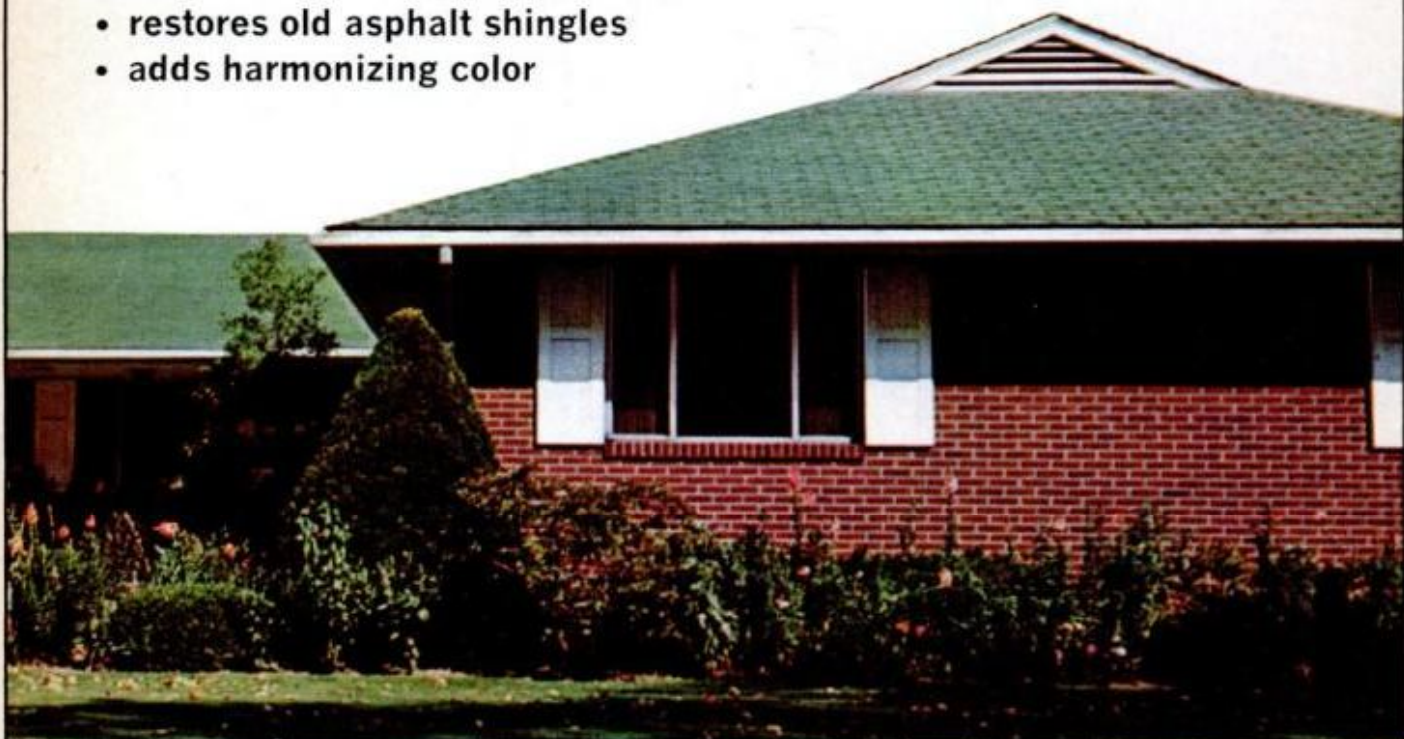
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New aluminum roof coating • stops leaks

- restores old asphalt shingles
- adds harmonizing color



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ALCOA

ADD-ON BAY

(Continued from page 151)

plate. Stub rafters are then notched and cut to hook over the 2x4 ribband and to rest on the top plate of the outer wall, to which they are toenailed. Like the studs, the stub rafters are spaced 16 in. on centers or simply located in line with the garage rafters.

Add the skylight before covering the roof with plywood. The two rafters which support it should be spaced so the sash laps just midway on them. This will then provide a nailing surface for the plywood. Embed both the plywood sheathing and the window sash in mastic before nailing them to the two rafters. Metal flashing is used to seal the window at the garage roofline. This is tucked up under the first row of shingles and bent at right angles to lap the sash. Mastic is used to seal it. The asphalt shingles applied to the roof to match those on the garage should lap the skylight an inch or so at the sides and then sealed with mastic. The front window of the greenhouse is set in mastic also and is nailed to the edges of the studs. Like the top sash, this one also should lap midway on the studs to provide a nailing surface for the wall siding.

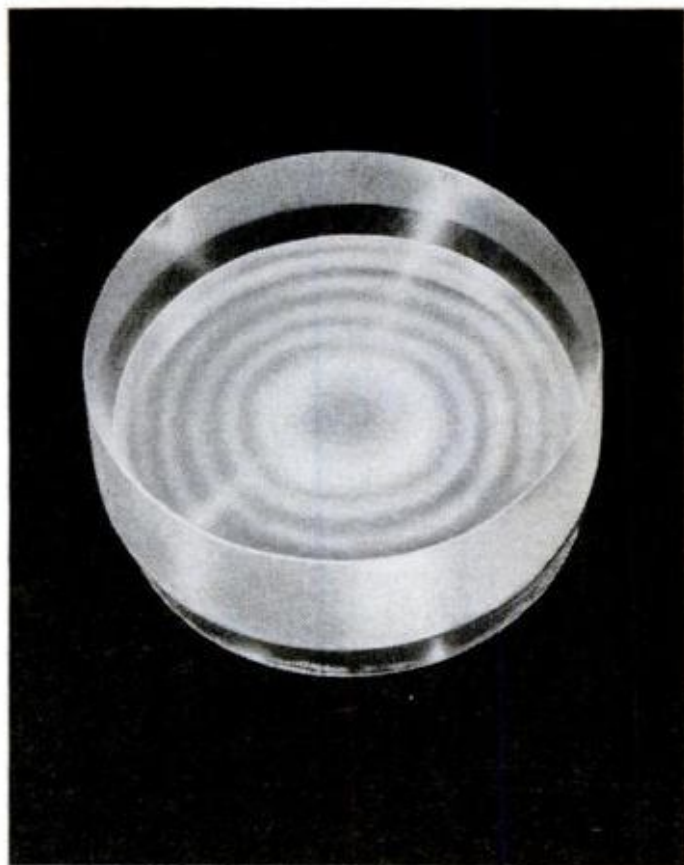
All that remains is cutting the doorways to the storage areas and paneling the sidewalls of the greenhouse nook. You'll notice that header members support short studs above them, and that a portion of the sill is cut away in each case so it will not interfere with wheeling heavy yard equipment in and out. Either sliding or hinged doors can be fitted to the storage closets. How you want to make the potting cabinet to satisfy your individual requirements is up to you. ★★

Deep sea valley

An 800-mile crack in the ocean floor has been discovered between the Hawaiian Islands and the Aleutians.

The near 15-mile wide trench resulted some 50 million years ago from a massive undersea upheaval which raised a mountain range over a half mile high and dropped part of the adjacent bed one-half mile, forming a valley or trough extending in a northeast-southwest direction.

Not yet named, the newly-discovered break is the northernmost of a series of fracture zones which include the Mendocino, Murray and Molokai Fracture Zones. The discovery is the result of the SEAMAP project, an intensive program aimed at mapping the ocean bottoms.



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**... but it's not
good enough for you!**

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CB INTERCOM

(Continued from page 168)

looseness. Adjust tension by compressing the spring with the hex nut.

Basically, circuit changes are just to substitute the carbon microphone in the handset for the dynamic speaker for listening—it doesn't replace it entirely.

Remove the wire from point 2 (output transformer secondary) to point 1 (push-to-talk switch). These points are called out on the C-100 printed circuit.

Thread one end of a 6 to 7-inch length of stranded hookup wire through the unused mounting hole at the rear of the push-to-talk switch (near C4) and solder to point 2. Connect the other end to the center leaf of the cradle switch. A lug can be attached if screw terminals are available in the deskset base. No connection is made to point 1.

Connect a 5-inch length of hookup wire between point C (where it is soldered) and the screw terminal for the handset's black wire. Put a lug on this end. Remove original wire to point C.

Prepare a 6-inch length of wire with a lug on one end. Solder the other end to point B ("common" or "ground" on the schematic). The lug end of the wire goes to the white wire of the handset.

Twist 8-inch and 11-inch lengths of wire together on one end. Solder these to the speaker terminals after removing the original wires. Solder lugs to the other two ends. The short one goes to a common, ground-screw terminal; the longer to the NO switch terminal screw.

Connect the push-to-talk switch terminal to one lead of C7 (about 1/4-inch away) which is unsoldered from the printed-circuit wiring.

Cut the negative end of a 25-mfd., 10-v. electrolytic capacitor to 5/8 inch. Solder it to one lead of an 1100-ohm resistor cut to the same length. Solder the positive lead of the capacitor to the junction of C8 and R5. Connect the free end of the 1100-ohm resistor to the negative battery terminal. The conversion of the circuit is now complete.

A simple bracket can be mounted under a speaker mounting screw to hold the battery in place. A larger 9-v. battery can be used to increase battery life.

The sound output level of the C-100 can be increased, along with the modulation, by changing the audio transistors. Replace TR-2 and TR-3 with higher gain transistors. Use a 2N107 for TR-2 and a 2N241A for TR-3.

After the transceiver is mounted in the deskset base you may have to retune it. Follow Allied's instructions. ★ ★ ★



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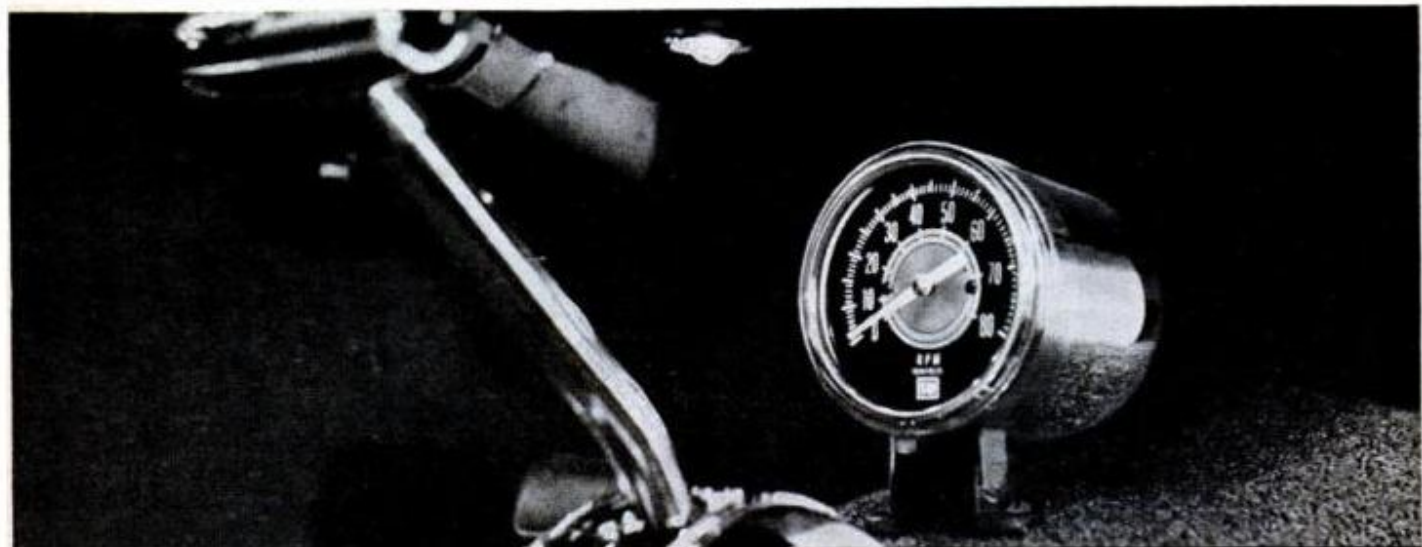
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All too often, humans who sit and stand pay the price of vertical posture. Sitting and standing combine with the force of gravity to produce extra pressure on veins and tissues in and around the rectal area. The result may be painful, itching or burning hemorrhoids.

The first thought of hemorrhoid sufferers is to relieve their pain and discomfort. However, of the products most often used for hemorrhoids, some contain no pain-killing agent at all... others have one too weak to provide necessary relief... and still others provide only lubrication.

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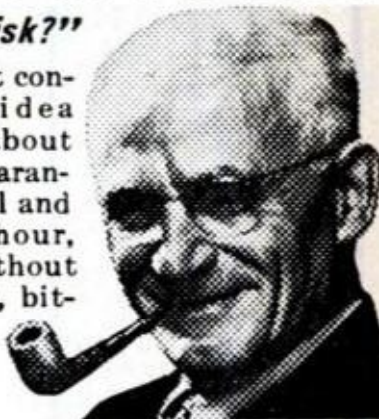
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THAT PESKY PCV

(Continued from page 111)



DON'T FORGET TO CLEAN oil-filler cap. Wash the filter in solvent, then lubricate it with new motor oil

careful not to enlarge the hole.

Hose-clogging is seldom a problem in systems where the hose goes directly to the manifold, because the nipple in the manifold is large in diameter and doesn't plug up readily. If it should get clogged, a shot of compressed air will clear it.

The oil-filler cap should also be removed and cleaned when the PCV system is serviced. Wash the cap in solvent, using a brush to work the solvent into the filter material. Let it air dry, then lubricate it with the same grade of motor

oil you use in the car's crankcase.

Okay, now you know the *how* of servicing a PCV system; what about the *when*? An SOS from your system may take any of the following forms:

- A drop in gasoline mileage.
- Engine starts missing at high speed.
- Rough engine idle.
- Engine can't develop full power.
- Oil is thrown around oil filler cap.
- Oil dipstick develops a film of rust or varnish on it, indicating a buildup of contaminants in the engine.

Manufacturer recommendations as to how frequently PCV should be cleaned vary from car to car. Also, some call for cleaning the valve, others for *replacing* it. Check your owner's manual.

Generally speaking, when a car is driven mostly on good roads and in warm weather, the PCV should be serviced every 6,000 miles. However, a car that gets heavy use in stop-and-go city traffic—especially during cold weather—should be checked out every 3,000 miles.

Remember, the job of PCV is to help clean up America's air—not ruin your engine. You can keep it performing reliably by following the servicing recommendations we've outlined above. ★★★



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SEPTEMBER 1966



How to STOP SMOKING

says

Dick Weber

Bowler of the year



It isn't easy to bowl 300. Most people feel it isn't easy to stop smoking, either. But read the words of a man who has done both:

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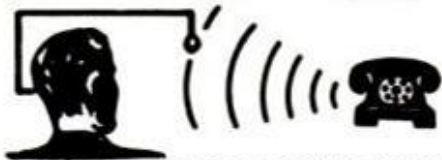
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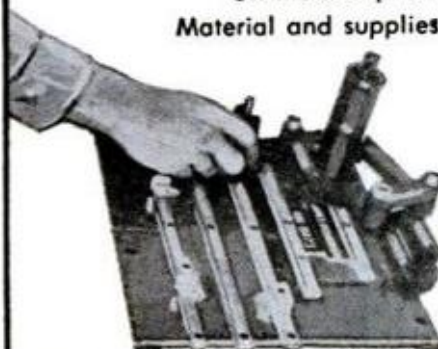
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Exciting New Products

(Continued from page 131)

Not quite . . . it just looks like it. Kaiser Aluminum offers Rustic Shingle, their eye-fooling roofing and siding material, in Sierra Brown, Shasta White and Surf Green. It can't crack or rust, and won't be ignited by flying sparks or falling embers.

Durability? Tests have shown that these shingles can withstand wind-driven rain in gusts up to 100 mph. The material can be installed over existing roofing and siding, and weighs only 50 lbs. per square (100-sq. ft.). Matching accessories include flashing, coping, ridge caps, valleys, starter strips, hip caps, gable strips and end caps. Rustic Shingle is competitively priced with other premium materials such as slate and

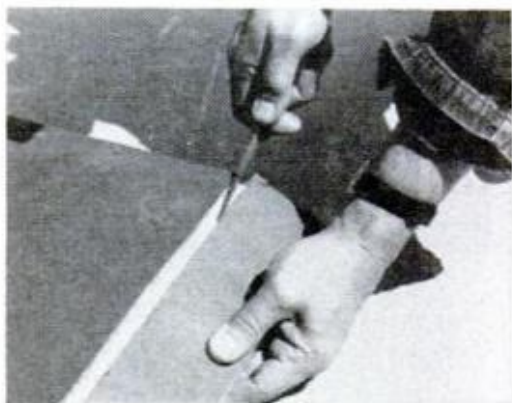
tile, and it carries a 20-year guarantee.

So you're not an electrical engineer. Don't worry. You needn't be to tackle one of the most dramatic of home-improvement jobs—the installation of recessed lights. The Armstrong Cork Co. will provide you with complete easy-to-follow instructions for the task.

Overhead recessed lighting begins with a suspended ceiling consisting of ceiling panels supported by a metal framework or "grid" hung from the existing ceiling structure or joists by wires. The grid is installed by nailing L-shaped metal molding to the walls of the room at the desired ceiling height. Hanger wires are then attached to the joists at 4-ft. intervals, and the suspended ceiling main runners are fastened to the hanger wires.

"Gridmate" units—new 4-ft., two-lamp

A NEW BREED OF INSULATION BOARD, Barrett TF 310 (Technifoam), is a core of rigid urethane foam with paper facer sheets on either side. It can be nailed to studs, attached with metal fasteners in metal construction, or nailed to furring strips in masonry construction. It can be finished with most covering materials that apply with adhesive. TF 310 is available in 1/2, 3/4 and 1-in. thicknesses



TECHNIFOAM BOARD cuts easily with ordinary pocket knife



ATTACH BOARD to furring strips or studs with nails and roofing washers



URETHANE provides twice the insulation of other materials



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NAILS HOLD wallboard up until adhesive sets (24 hrs.)

fluorescent fixtures that reflect 35 percent more light than standard strip lights—are then installed directly to the ceiling structure above the grid.

Finally, removable translucent panels are inserted into the grid beneath the fixtures. The result is a luminous ceiling emitting softly diffused light from invisible fixtures. Such an installation can be made in the average 12x15-ft. room for \$60 to \$90 exclusive of the luminous panels, which run 50 to 75 cents per sq. ft.

Maybe you've finally decided to put some new siding on your house. Congratulations! How about vinyl siding? Sure, we know, 8-in.-wide vinyl siding came down the pike a few years ago. But vinyl siding in a 6-in. width is new. A Monsanto product, the siding nails directly to standard sheathing, eliminating the necessity of a special backerboard. A novel nailing tab acts as a built-in spring that insures a secure but "floating" suspension of each siding course. Nailing holes are slotted to permit the siding to expand and contract during extremes in temperature. The siding does not require paint and will not chip, dent or rust.

A new breed of insulation board has just been introduced by the Barrett Division of Allied Chemical Corp. Called Barrett TF (for Technifoam) 310, the board is comprised of a core of rigid urethane foam with paper facer sheets on both sides. It provides as much insulation as other insulating materials twice as thick. The home handyman can use it to insulate basement, attic and other areas without breaking into walls. The material can then be topped with any finished surface desired.

Providing maximum insulation with minimum thickness, TF 310 can be used to special advantage in such places as attics and basement rooms where space is at a premium.

So there you have a brief sampling of just a few of the new home-improvement products and materials now available to homeowners. A visit to your local hardware store and lumber dealer will introduce you to dozens more. And if you're a guy who does his own home maintenance and remodeling, it's a visit well worth making. ★★★

Army's high-speed printer

A high-speed electrostatic printer that can reproduce 2000 five-color maps an hour from 70-mm. microfilm has been developed by the Army. It's mounted in a mobile van and is designed to provide detailed maps for troops in the field.

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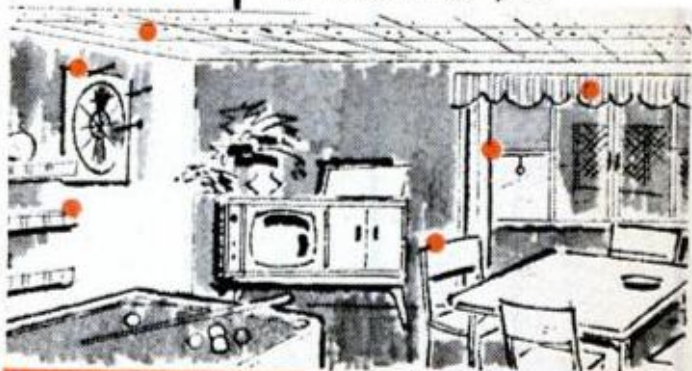
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650x16(6)	7.15	670x15	4.15	750x17	10.05	1100x20	19.05
750x14	4.15	710x15	4.15	750x16	9.05	1000x22	19.05
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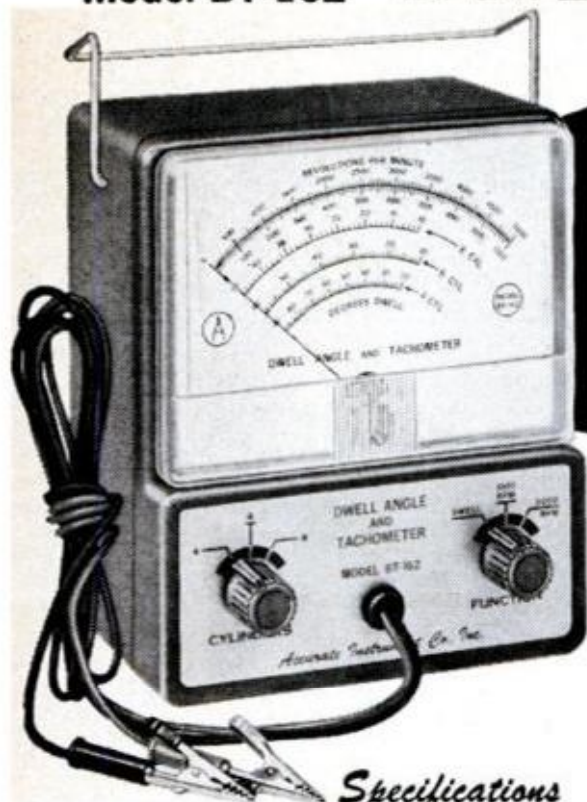
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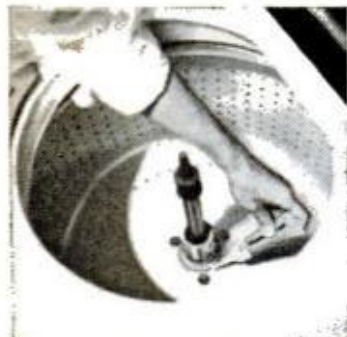
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CORRESPONDENCE SCHOOL

(Continued from page 98)

jabbed button one or three heard what the right answer should have been, then received a brief but comprehensive review of the purpose and implications of company policy.

Missing a broadcast isn't serious. Each lesson is repeated two days in a row. On Sundays, starting at 9:00 a.m., the preceding week's lessons are repeated all day. As long as a student is within 30 miles of Philadelphia's center, the range of the FM station, he can pull in lessons. The special radio designed to receive these broadcasts is battery-powered. It is loaned to students for the duration of the \$50 course. After the last broadcast, each student takes a final examination, which is mailed to him, and he returns it to ICS.

The idea of radio correspondence schools caught on immediately. The Philadelphia modern-management course is a pilot project designed to work out administration hitches and, therefore, is limited to just 100 people. Yet, only a few advertisements over WFIL, the FM station broadcasting the lessons, brought in more than 1000 inquiries. Right now, the school is designing five additional courses for broadcast over FM stations throughout the country by January, 1967.

The idea of Educating doesn't stop with radio. Closed-circuit experimental courses in some high schools with TV have been tried with encouraging results. In this case, after the instructor presents a portion of the lesson and asks a question, the TV screens divide into four quadrants, each quadrant having its own symbol. When a student presses one of four buttons, one quadrant on his screen shows the instructor—confined to that quadrant—elaborating on the response.

The possibilities for dramatizing instruction with this method are enormous. At the University of Tulsa, a pilot law course shows actual courtroom scenes. In one case, the prosecutor, questioning a key witness, suddenly asks for an important but tangential bit of information. Then the scene stops and the instructor comes on, pointing out the different tactics a defending lawyer could adopt. Each student then chooses what he believes to be the correct strategy to follow. The quadrant on the TV screen corresponding to his selection then covers the response.

No one claims that Educating—by radio or TV—takes all the effort out of learning. But ICS does hold that by handing students an active role in acquiring an education, knowledge and new skills can be learned faster than ever before. ★★★

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UNIQUE VACUUM PLATE

(Continued from page 164)

The shallow crisscross grooves shown within the small O-ring groove theoretically increase the surface area and thereby help produce a greater vacuum. These are formed with a ball end mill and extend to about $\frac{3}{16}$ in. from the ring groove and to the very edge of the tiny suction hole. It's best to drill the latter now than to wait until after the piston hole is bored. You won't have a burr in the piston hole and there will be less chance of drill breakage.

Next, the block is set on edge on a vertical milling machine for boring the piston hole. This is centered in the thickness of the block, lapped after boring and finally tapered with a No. 3 Morse taper reamer. Holes are drilled and tapped on each side of the piston hole for an end plate. Note that the center hole in it for the piston handle is cross-slotted to admit a cross pin which bears against the face of the plate to hold the piston in its locked position.

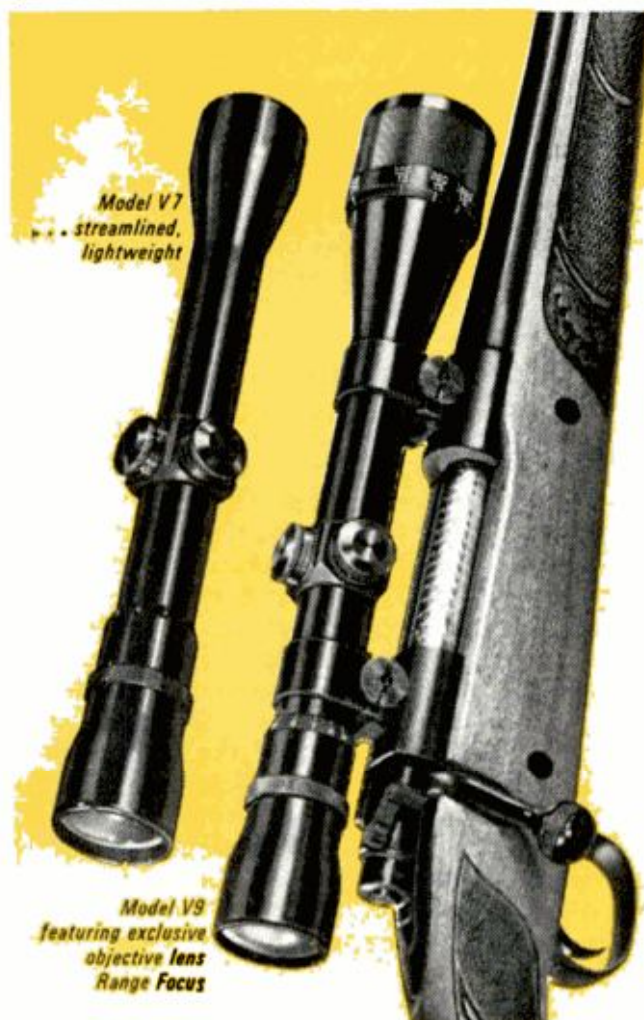
The piston itself is turned from drill rod following the detail. Make its diameter about 0.010 in. smaller than the bore so the rubber O-rings will make

full contact with the bore when the piston is in place. A small amount of light grease is placed in the grooves of the piston before the O-rings are added. Assembly is completed by inserting the piston, attaching the end plate and fitting a knob to the handle end of the piston.

One final step in making the plate is to drill and tap a row of holes along opposite edges for two parallels. These are $\frac{1}{2}$ -in.-wide metal strips which serve to keep the work from moving laterally, as well as to hold it more rigidly for a greater bite in the removal of stock. The strips are placed on each side of the work and fastened with small machine screws. ★★★

When north was south

If a prehistoric man of more than 850,000 years ago had had a compass, it would have pointed south instead of north. Then, the magnetic polarity of earth reversed, leaving the original magnetic pole frozen in hardening lava that is now sea bottom. By measuring the depth at which the polarity change appears in some 400 bottom core samples, Dr. Norman Watkins of Florida State University hopes to find the age of the Antarctic Ocean floor.



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(Continued from page 69)

the ground during loading and unloading.

Engineers say that the jumbo jets will be so foolproof that it will be difficult for a pilot to make an error. In fact, for most routine operations the pilot will monitor the controls instead of handling them.

Landings will be semiautomatic, with the radio landing system coupled to the automatic pilot. An automatic flare system will bring the plane into its landing attitude when 50 feet above the runway.

To speed loading, passengers will assemble in four waiting rooms instead of one and will enter the cabin through four double-width doors. Baggage will be routed from the plane to the claim areas on high-speed conveyor systems.

This brand-new development in air travel stems from what's called the "C-5A technology." The C-5A is a monster transport that the Air Force has ordered, for carrying more than 100 tons of cargo farther than 3000 miles at 550 mph. Engine manufacturers have been developing its powerplants. Boeing, Douglas and Lockheed designed their own versions of the C-5A, with each design incorporating the latest knowledge in high lift-wing devices and other improvements. Lockheed won the military contract and is building 58 of the transports. The first will fly in less than two years.

Here's a capsule description of the C-5A: It will be 245 feet long, almost 100 feet longer than the present big 707 airliner, with a wingspan of 222 feet. The top of its tail will be 65 feet above ground.

The plane has 28 wheels to allow it to land and take off at unimproved fields. After being parked, it can "kneel down" for unloading.

Its cargo compartment (19 feet wide and 121 feet long) can house a mixed cargo such as a large helicopter, a tank, an intermediate range missile and an assortment of trucks and jeeps, plus all the crews and maintenance personnel.

Big on power

The plane will be powered by four "high bypass" fanjets that develop 41,000 pounds of thrust apiece. Basically, a fanjet is a turbojet that uses much of its power to spin a large-diameter fan attached to the front of the engine. The fan blows more air back around the outside of the engine than flows through it. This bypass principle creates more thrust at the same time that it reduces specific fuel consumption.

The new fanjets have a bypass ratio of eight to one, four times greater than in

present fanjets, and are considerably more efficient. They are big engines. The fan is more than eight feet in diameter.

Each of the companies that competed for the C-5A contract knew that huge airliners were going to be needed sometime in the future. The date depends on how fast the volume of air travel grows and on how many passengers the upcoming supersonic transports will steal from the subsonic jets. The companies knew, too, that with some modification and possible reductions in size, their C-5A designs would be ideal for subsonic airliners.

Each is "ahead"

This is a case where each of the companies, one way or another, has gotten the jump on its competitors. Lockheed won the military contract and Boeing got the first order for a supersized airliner. Douglas, in the meantime, is making hay with its DC-8 Super 61, the largest airliner now flying. The Super 61 carries as many as 251 passengers versus 189 in the standard model. Airlines have ordered 73 of them recently and Douglas is prepared to "stretch" the design to 350-passenger capacity when the high bypass fanjets are available. Beyond that, the company would jump to its proposed two-deck 550 passenger jumbo DC-10.

Douglas is telling the airlines that its two-deck design is the most efficient for either passengers or cargo, that the DC-10 would cruise at Mach .9 (about 650 mph) and that seat-mile costs would be about 25 percent less than in existing jets. (Its competitors say that two decks would create unnecessary loading problems at the terminals and a serious problem if ditching was necessary.)

Boeing says that its design, with up to 450 passengers on a single deck in a longer fuselage is best. (Its competitors say that the skin surface per passenger is greater, hence the design is less efficient.)

Lockheed is saying that the basic C-5A would make the best passenger transport of all, after rearranging the interior to accommodate 750 passengers or more. Costwise, this would save many millions in extra engineering and tooling. (Its competitors say their versions are much faster, that the C-5A high wing is inefficient for commercial operations and that it will be a long time before 750-passenger aircraft are needed.)

Arguments like these are normal in the aircraft industry and in the long run it's the public that profits from them.

The fast and inexpensive transportation made possible by the jumbo jets will completely alter the transportation industry. ★★★

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Weller Dual-Heat Soldering Gun Kit Includes 100/140 dual-heat gun with single spotlight, three copper soldering tips, wrench, flux brush, soldering aid tool, 60/40 rosin core solder and "Soldering Tips" manual in plastic case. **\$8.95** (Gun alone is \$6.95.) Kit Model 8200PK **\$8.95** list

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In the driver's seat of:

The Frantic Fitch Phantom

By ALEX MARKOVICH

WHAT HAPPENS when a well-known racing driver reworks a front-wheel-drive Oldsmobile Toronado to suit his kind of driving? To find out, I paid a visit to John Fitch at his bustling garage in Falls Village, Conn. There I picked up his newly designed Phantom, a gung-ho Toronado with \$2000 worth of performance and luxury extras, and gave it a road test.

Fitch is a tall, modest, personable man who looks younger than his 48 years. If you follow car racing, you've heard of him. For the past 18 years he has been driving for the Mercedes, Cunningham, Ferrari, Maserati, Jaguar and Porsche factory teams and taking class or overall wins at such top races as Le Mans, the Mille Miglia, Sebring, and the Argentine Grand Prix.

For several years he has been modifying Corvairs on special order through Chevrolet dealers. Called the Sprint, this package features controversial body restyling, more power and greatly improved handling. (Just this summer he announced another luxury sports car, the Phoenix, with a Corvair engine and power train.)

Back to the Phantom. If you want to buy one, you first make a deal with your Olds dealer. (Toronados start at \$4600 list.) The car is sent from the factory directly to Fitch, who—for an extra \$2000 or more—turns it into an honest-to-goodness luxury Grand Touring car.

What do you get for your money? The Phantom doesn't look too different from the un-Fitched version: There's a mean-

looking blacked-out grille, a couple of extra lights in front, and an unusual two-tone paint job that makes the already-sleek car look as if it's crouching. Most of the changes are in the cockpit, engine and running gear.

Climb in and you feel as if you're in a \$13,000 foreign GT car—except for all the room. An extra panel on top of the dash holds a diminutive tachometer, a button that switches on a fog light built into the front bumper, and a spring-loaded lever that flashes an 80,000-candlepower driving light, also in the bumper. A toggle switch on the left side of the dash makes the driving light go on whenever headlights are on high beams. The driving light is also wired to flash each time you blow the horn—an effective long-range warning at crossroads and when passing.

The steering wheel wears a snugly laced leather cover that provides a nonslip grip and stays cooler in the summer and warmer in the winter. The small plastic shift-lever knob is replaced by a huge wooden handle.

A close inspection of the dash reveals still more switches hidden in the most unlikely places. A couple of them operate electric motors inside the front seats that direct cool air through the perforated upholstery. The motor on the driver's side seemed to be ailing; when started from cold, it was noisy and, what's worse, it vibrated. The feeling I got when I sat on it

(Please turn to page 205)

LOW, SLEEK AND DOWNRIGHT MEAN is Fitch's customized Toronado, a \$6500-plus beauty that really goes



FRANTIC FITCH PHANTOM

(Continued from page 198)

is . . . well . . . uh . . . odd.

I noticed three little colored lights blinking at me from under the dash. Fitch explained that the red one warns that a headlight, taillight or stoplight is burned out or malfunctioning. The yellow one tells you when the stoplight switch is energized. The green one just reassures you that all systems are go. Then there's a handy map light on the dash, and a map tray that slides from under the seat.

Time for the shakedown run. I twisted the starter key and the engine fired up with a throaty growl. The only engine modifications are a straight-through exhaust system, a low-restriction air cleaner and an electronic magneto ignition. Fitch says horsepower is raised from the stock 385 to 405. I was skeptical, but my acceleration figures later bore him out.

Handling is most impressive

The most impressive feature of the Phantom is the handling. All six stock shock absorbers are replaced with Koni heavy-duty, adjustable shocks. Also contributing to adhesion are eight-inch-wide wheel rims and large radial-ply tires. Even in the most vicious corners, I could sense no lean whatsoever. Just a nice, reassuring understeer under hard throttle, changing to nearly neutral steering with the throttle backed off. You hardly know you're driving a front-drive car until you hit a really bad road surface; and that's where the inherent stability of front drive shows up best. I wouldn't have believed that the Toronado's already fine handling could be improved without hurting the ride, but Fitch has done it.

Steering and brakes have better feel



EXTRA DASH PANEL houses tach, fog-light switch and driving light flasher. Wheel has laced leather cover

because of a reduction in power boost to each. The stock Toronado steering ratio is quite fast, and Fitch left it unchanged in the Phantom. The stock brakes, however, tend to fade during hard usage, so sintered-metallic linings are installed on the Phantom. Not only do these provide better stopping, they also last longer.

Fitch has made some handy modifications to the shifting mechanism. First he modified the detents. In the stock Toronado, Super and Low ranges are in the same slot, making it difficult to shift from Drive to Super without overshooting to Low. Here, Drive and Super are in the same slot, and I could shift quickly back and forth without looking at the quadrant.

Even more interesting is the plastic switch on the shift lever that controls stator-blade angle. Flick the switch back and stator-blade pitch increases to give the effect of lower gearing; push the switch forward and the pitch decreases like a manually controlled overdrive. Thus four useful ratios are available manually.

Doesn't feel big

The car is a pleasure to drive. Though flooring the throttle results in an exciting power roar, the engine is quiet under steady throttle, even at high speeds. My test car was loaded with options—air conditioner, power windows, radio—that made driving relaxing. Most unusual of all, the Phantom just doesn't feel like a big car.

I concluded my tests with the acceleration runs, first hooking up the fifth wheel, a device that gives speed readings calibrated to within .001 mph. I was immediately aware of a problem:

I had to feather the throttle carefully to avoid wheelspin coming off the line. In a road test of a stock Toronado (PM, December 1965) we had to work hard to induce wheelspin.

With the transmission in Drive, 0-60 averaged 8.0 seconds in the Phantom. Shifting manually at 5000 rpm resulted in exactly the same time, and revving higher actually hurt performance. The stock Toronado we tested needed 9.4 seconds to reach 60. But perhaps the comparison isn't quite fair, since the car had just completed 3000 hard cross-country miles and wasn't in the best tune. The Phantom did 40-60 in 4.4 seconds and 50-70 in 4.8, versus 4.6 and 5.6 seconds respectively for the stock Toronado.

All in all, the Phantom is an exciting and satisfying car that leaves little to be desired. Fitch's plan to build 500 of them by the end of the year is certainly ambitious. But I think he might just sell every one of them. ★★★

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FUEL MIXES

(Continued from page 159)

mixture, accidentally or otherwise. Carbon can build up and begin to glow red-hot. As we said, this leads to preignition. In addition, exhaust ports can plug up because of excess carbon, allowing internal temperatures to soar. Sparkplugs can foul which can lead to hard starting, rough idling and a powerless engine.

One operating condition which indicates an oil-rich mixture is excessive smoking from the engine at idle speed. A carbon-fouled sparkplug also signifies that you've been using too much oil.

Not enough oil is just as bad. Cylinder walls score because of poor lubrication, piston rings stick and bearings start to fall apart. Although lack of sufficient oil often results in engine clatter and a slowdown at high-speed throttle for no apparent reason, the safe course is *not* to wait for indicators.

How to mix. Only yesterday I saw an outboard owner carefully measure out the correct quantity of oil and pour it into his gas tank. Then, oh so carefully, he measured out the correct quantity of gas and poured that into his tank.

Then what? He hooked up the tank, started the engine and off he went.

That isn't what's meant by "proper mixing." Oil is heavier than gasoline and will sink to the bottom of the tank unless the two are mixed thoroughly.

When a remote gas tank is used, the proper way to do the job is to first pour the correct amount of oil into the tank and then add *one* gallon of gasoline.

Now, pick up the tank and shake it vigorously to mix oil and gas together. Add the remainder of the gas and follow with another period of agitation.

If you operate your engine when temperatures are below freezing, you have to be even more thorough in mixing fuel. At low temperatures, oil and gas are even harder to mix, so *extreme* agitation is necessary.

If your boat's equipped with a large, built-in tank, don't simply pour gas and oil into the tank and hope they mix. They won't.

Instead, pour the oil and a few gallons of gasoline into a spare remote tank and mix them up *thoroughly*. Then pour this small amount of mixture into the tank, followed by the remainder of the gasoline.

Some outboard owners believe that if the fuel mixture doesn't feel oily, there isn't sufficient oil in the mixture. That's not so! Although mixed together in the gas tank, oil and gas part company when they are

(Please turn to page 208)



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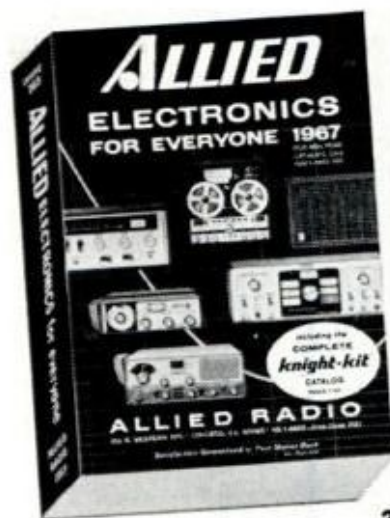
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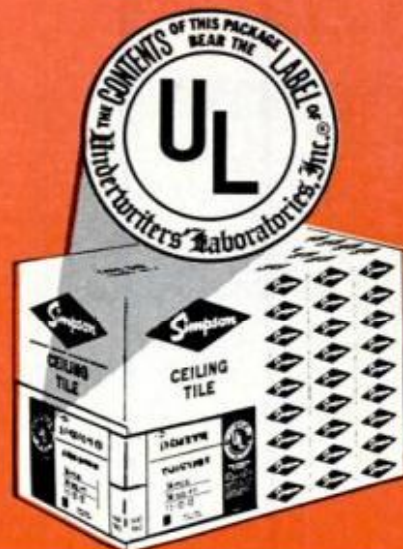
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FUEL MIXES

(Continued from page 206)

sprayed from the carburetor into the induction system.

At carburetor temperature, the volatility of the gas permits it to vaporize for burning. Oil, however, remains in globules, and is deposited on cylinder walls and crankcase walls. From here, it runs into the sump, where it is pumped to bearings.

So the fact that the fuel mixture doesn't feel slick shouldn't cause one bit of concern, as long as you have the right amount of oil, the right amount of gasoline.

Gasoline tips. We've spoken a great deal about oil. But what about gasoline? Use of the wrong kind can also cause problems.

No outboard manufacturer will go on record as recommending one brand of gasoline over another. The only specific recommendation given by all of them is to use a "white" unleaded gasoline if at all possible. Why? Because lead is an outboard engine's nemesis.

The development of high-compression auto engines made mandatory the addition of chemicals to gasoline to overcome knocking problems. An increase in octane rating was needed, and many gasoline refiners did this by adding tetraethyl or tetra-

methyl lead.

Lead can cause trouble in an outboard engine by forming a conductive film on the sparkplug insulator. This fouls out the plug and causes loss of engine power.

If you have to settle for a leaded fuel, use a popular brand of *regular* grade automotive gas. Do not use premium, which contains even more lead than regular.

Finally, here are a few general hints concerning gas and fuel mixture:

- Use a fresh fuel mixture at all times. After several months of standing in a container or a remote fuel tank, as it might over the winter, fuel ages and develops petroleum gum. Use of this fuel can cause clogging of fuel screens, carburetor orifices and valves. Dump it and mix a new batch.

- Likewise, purchasing gasoline from a service station or marina in a remote area presents the possibility of the fuel being old. Try to buy your gas from outlets with quicker fuel turnover.

- Always use a clean container when mixing fuel, and make sure that no dirt drops into it. Even a small particle can plug up carburetor passages and prevent fuel from reaching the combustion chamber. Then you have the job of trying to figure out why your outboard doesn't start, or stalls, or idles rough. ★ ★ ★

How to pick the right glue to do the job right!



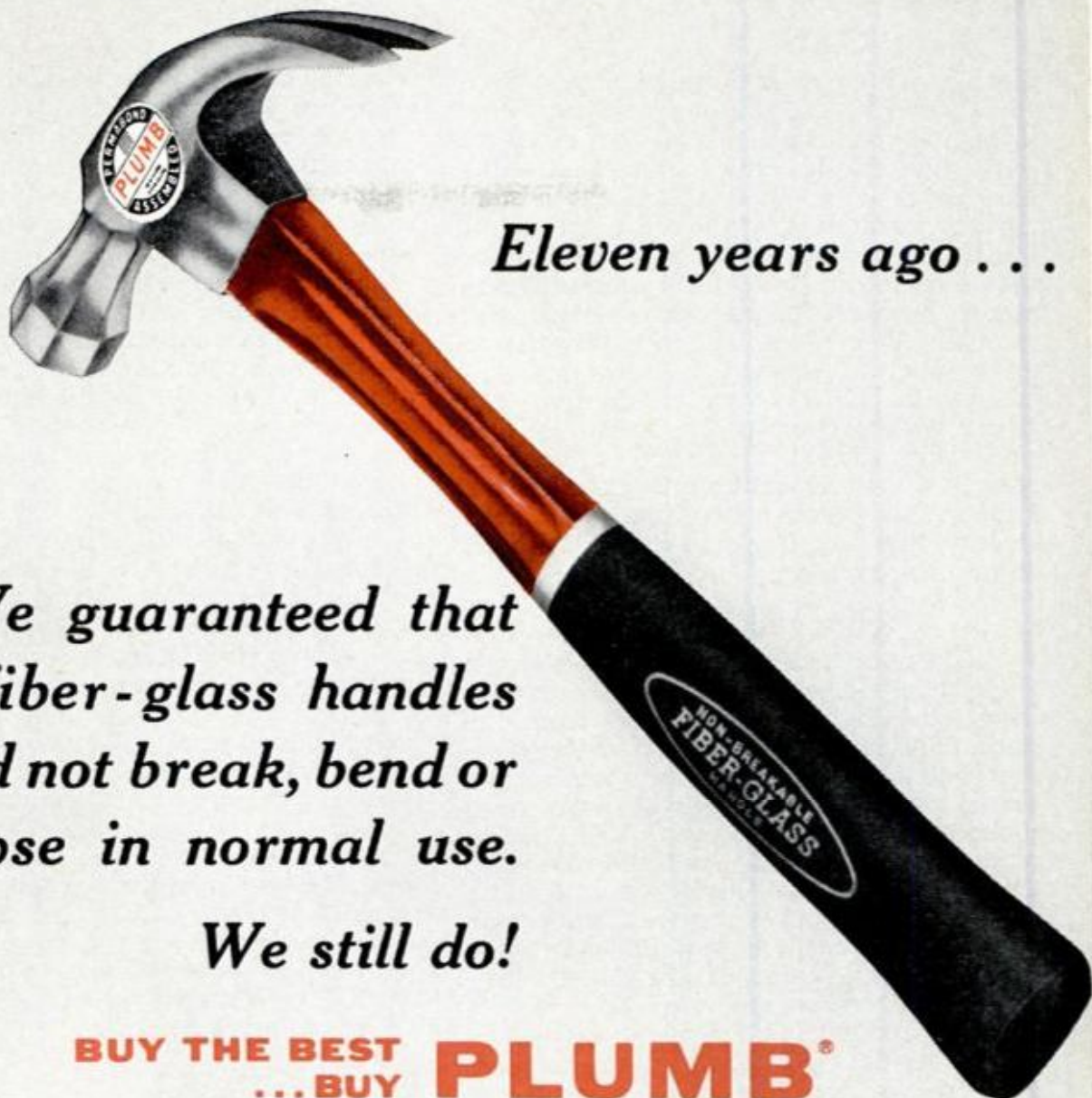
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Stronger ceramics

A new process that can make ordinary ceramics eight times stronger has been developed in a University of California engineering laboratory.

In a series of tests using a compression process called "pre-stressing," scientists applied 10,000 pounds of pressure per square inch along the width and length of an ordinary brittle tile. For laboratory purposes, the force was furnished by two hydraulic jacks, each of which exerted 30 tons of pressure against the edge of the six-inch-square tile. A third jack pushing from below tested the load-bearing strength of the compressed tile.

Results: Brittle ceramics can support much heavier loads without shattering when their particles are pushed together and will not crack if suddenly heated. They can be used to make strong, lightweight, decorative, fireproof and earthquake-resistant buildings, as well as

bridges, road paving and airport runways.

Ceramics' high heat resistance already enhances its use in jet and rocket engines and space vehicles exposed to extreme temperatures during reentry into the atmosphere.

Oldest life forms

Minute forms of life existed on earth as much as three billion years ago. Tiny, bacterium-like organisms have been found preserved in black chert rock in eastern Transvaal, South Africa. Identification of these microfossils—by means of both optical and electron microscopy—was made by Drs. Elso S. Barghoorn and J. William Schopf of the department of biology and botanical museum at Harvard University.

The oldest cellular microorganisms previously discovered are the two-billion-year-old fossils found on the Gunflint Iron formation in northern Ontario.

DELUXE BATHROOM

(Continued from page 137)

Ply's own high-gloss Satinlac. (If you prefer a softer sheen, rub down the final coat with fine steel wool.) With this moisture seal, you should have no problem—unless your bathroom is the Great Dismal Swamp, without normal air circulation.

All construction involving a visible face was done with $\frac{3}{4}$ -in. G1S walnut Weldwood. Exposed edges were taped with matching Wood Trim. The window wall was covered with a sheet of $\frac{1}{4}$ -in. walnut, applied with U.S. Ply's panel adhesive—but if you want to save time, you can go to a prefinished paneling, here and on the toilet side of the stub partition. Standard black rubber baseboard contributes a finished look at the floor line and masks the wall from wet-mopping.

Back wall is coved

You'll note that the back wall between these two alcove faces is surfaced with vinyl sheeting, coved right up from the floor. This not only creates a striking effect but eliminates the bathroom's most unsanitary corner. (The wall-hung bowl makes cleaning even easier.) The flooring is Armstrong's brand-new Cambrian vinyl Corlon with Cushioncord. The latter is a foam vinyl backing that "gives" underfoot, then springs back as you lift your foot. Many flooring materials are labeled "resilient," but these new foam-layer types really are. Such resilience offers two bonuses besides foot comfort: Because it cushions impact, the sheet is protected from puncture and wear; and the foam's insulating quality creates a warmer floor—ideal for barefoot standing. The bonded-on surface vinyl features a deep pebbled texture that tends to "slip-proof" a wet floor.

Armstrong doesn't recommend do-it-yourself installation of sheet flooring—particularly of so novel a material as this, which requires two special adhesives: S-210, applied to the floor with a notched trowel, and S-70, for edge application to seal the seams. In a proper installation, the seams will be invisible.

The other installation you may wish to leave to a pro is the tiling of the tub alcove—although we presented full how-to instructions in our February, 1964, issue. For this job, we chose a light yellow tile to match the fixtures and the Micarta countertop.

In the counter construction detailed on page 133, the backsplash panel is optional. If the wall between the countertop and the recesses for the medicine cabinets is sound, you'll doubtless apply Micarta di-

rectly to the wall surface (after cutting three holes for the dispensing fixtures, as indicated). A full back has been omitted from the cabinet to facilitate the plumbing hook-up. The basins hang from special rims and require no support blocking. The countertop is made of any smooth-faced $\frac{3}{4}$ -in. panel with forward edges doubled to present greater thickness for Micarta edge-banding.

The two mirror-backed shelf shadow-boxes are easily custom-made, utilizing a standard-sized chrome-framed mirror set against back cleats and "locked" in place with the adjustable L-brackets that support the plate-glass shelves. The shadow-box above the hamper is identical to the one in the stub partition, except for its greater depth. Each 24-in. lighting fixture is simply wall-mounted so its bottom panel is flush with the top of the recess.

The old-fashioned radiator was replaced with an efficient electric wall heater (it has its own circulating fan), but if we had wished to keep steam heat, we'd have converted to one of the trim modern baseboard radiators.

The guiding principle of our whole approach was: recess for maximum space. Perhaps the most incredible aspect of our conversion is that all that glamour and all those conveniences are packed into a floor space 6-ft.-3-in. wide and 8-ft.-2 $\frac{1}{2}$ -in. long! So you needn't feel *your* present bathroom is too small for a similar treatment. To select fixtures and materials, see the directory at right. ★★★

Mud-walled village

The oldest village with mud walls still standing has been unearthed in Iran by Canadian anthropologists headed by Dr. Philip Smith of the University of Toronto. Apparently built by people of the New Stone Age nearly 10,500 years ago, the village has three or four levels, each containing the remains of successive mud-walled villages.

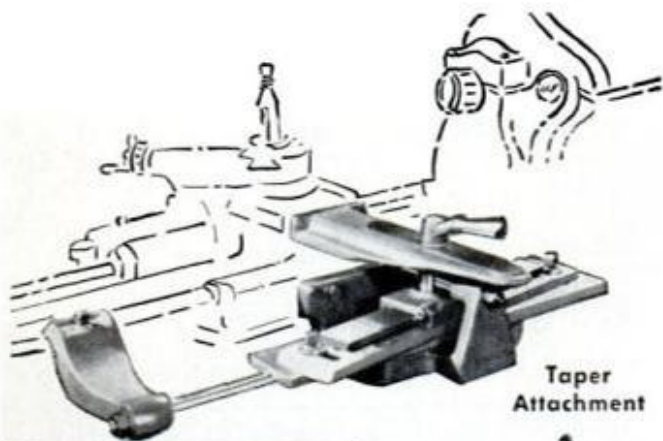
It was during this time that man first began to domesticate animals, as well as till the soil and raise his own crops—instead of gathering them from the wilderness. Proof of such activity was found in quantities of animal bones, charcoal and other debris from ancient hearth fires, scattered about the Iranian site.

The mud huts which Neolithic man fashioned were the beginnings of an architectural style that is still typical of many Middle Eastern areas. Dr. Smith hopes to return to the site and help document the gradual evolution of Middle Eastern culture from its origin in early Neolithic times to the present.

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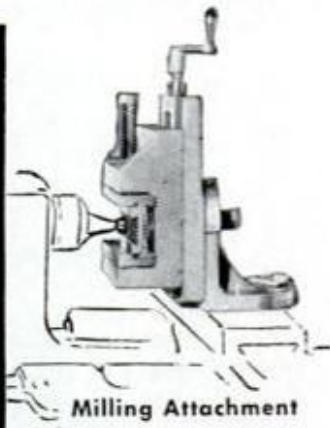
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Armstrong Cork Co. Lancaster, Pa. 17604	Cambrian Vinyl Corlon flooring	80002	6-ft. width			—			\$1.35 sq. ft. installed
Artco Products Corp. 328 Grand Ave. Brooklyn, N. Y. 11238	Enameled steel clothes hamper	Yellow	19 1/8	38 1/2	7 1/2	16 3/4	36	3 1/2	\$27.00
Crane Co. 4100 S. Kedzie Ave. Chicago, Ill.	Round enameled cast iron lavatory	April 1-294 w/8-2036A Capri Dialette fittings (2 req'd)	18 dia., 8 1/8 deep			—			\$57.52 ea. (Hudee frames are \$8 ea. extra)
	Enameled cast iron recess tub	Fairfax 2-100 w/8-1412 Criterion Dialette trim, with shower and diverter over rim spout	5 ft.	14	30	—			\$174.00
	Wall-hung reverse trap closet	Rexmont 3-117 w/3-886 Teleseat	Bowl projects 26 3/4", tank is 21" wide			—			\$113.78 (concealed hanger is \$44 extra)
Dremel Mfg. Co. Racine, Wis. 53403	Electric shoe polisher	Diplomat, 771	15	6 1/2	5	—			\$29.95
Theodore Efron Mfg. Co. 7519 S. Greenwood Ave. Chicago, Ill. 60619	Triplex glass-door shower enclosure	Showerite 333	For 5-ft. tub			—			\$94.95
Hall-Mack Co 1380 W. Washington Blvd. Los Angeles 7, Calif.	Concealed scale	350	11 3/4	19 1/2	—	10 3/4	18 1/4	4	\$59.50
	Relaxation unit	300	21 1/2	7 1/2	—	20 1/2	6 1/4	4	\$25.50
	Relaxation unit for magazines	302	13 1/4	19 1/2	—	12 1/8	18	4	\$34.50
	Recessed tissue holder	319	11 1/2	6	—	10 5/8	5 1/8	4	\$9.50
	Retractable clothesline	316	3 5/8 dia.			1 1/16	—		
Miami-Carey Div. Philip Carey Mfg. Co. Cincinnati, Ohio 45215	Mirror-doored medicine cabinet	Duette Windsor 2006 (2 req'd)	30 5/8	21 1/2	4 3/4	30	20	3 1/2	\$36 ea.
	4-lamp light fixture	{ 436 (2 of ea. 435 req'd)	30	4	7 1/2	—			\$16 ea.
	Framed mirror	1824 (2 req'd)	24	4	7 1/2	—			\$14.60 ea.
	Pivoting soap and toothbrush holder	Turnette 8090 (2 req'd)	18 1/2	24 1/2	—	—			\$19.40 ea.
	Soap dish and grab bar	8004	7 1/2	8 3/4	—	6 1/2	8	3 1/2	\$22 ea.
	Heavy-duty grab bar "L"	8044	6 1/4	6 1/4	—	5 1/4	5 1/4	2	\$5.40
	Same, straight	8041	16	32	—	—			\$18.40
	Towel ladder	6023	16	—	—	—			\$6.61
	Towel ring	8053 (2 req'd)	18	33	—	—			\$24.50
	Electric wall heater	290	—			10 1/2	13 1/4	4 1/4	\$2.85 ea. \$45.00
Syroco Syracuse, N.Y. 13201	Battery-operated clock	4881/1	—			—			\$35.00
U.S. Plywood Corp. 777 Third Ave. New York, N.Y. 10017	Veneer-core walnut plywood	Weldwood G1S	4'x8', 1/4" and 3/4" thick			—			{ 1/4": \$25.60 3/4": \$32.00 60¢ sq. ft.
	Countertop laminate	Micarta 91M03	Various panel sizes 1/16" thick			—			

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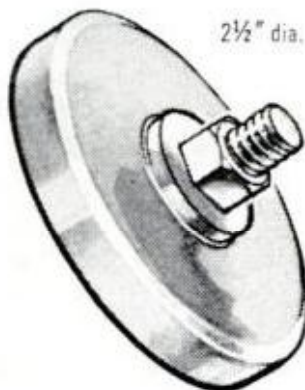
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'CONFESSIONS' OF A CAR SALESMAN

(Continued from page 61)

he seemed. True, the deal was close—only a \$42 profit and a \$20 commission—but he could move to \$10 because his "cost" price quoted on the heavier tires included \$10 profit. "I figured he'd go lower, and I'd need that 10 bucks," Bob said later, adding, "If it weren't for the contest, I wouldn't have let the car out the door at that price."

Such haggling, of course, is the crux of the car-buying battle. New cars, by law, have a factory suggested, or "sticker," price posted on the window. As most seasoned buyers know, however, this price tag can be whittled down. But most don't know precisely how much, and this increases the buyer's natural distrust of the car salesman.

At our Chevy shop, the sticker price was at least \$300 above cost on compact cars and as much as \$800 over cost on larger cars. We usually would start the bidding at a \$250 to \$350 markup—well below the "sticker" price. If pressed, we eased lower. At about \$200 profit, we were "talking turkey," and a \$150 profit was considered a "break-even deal." But we were ready to sell at a still lower price during a sales contest; we needed the volume to win.

Also, our salesmen usually tried to switch a buyer into a car that was in stock instead of ordering one from the factory. Reason: A new-car sale counts for a contest only when it is actually delivered to the customer. There is often a month-long wait for factory-ordered Chevs.

Not all customers, of course, are tough bargainers. Once in a long while, a "lay-down," or inexperienced customer, walked in offering to pay the "sticker" price, or near it. He got his car with no argument. Such "barefooted pilgrims," as they are called, are rare.

The bartering and emphasis on price inevitably leads to confusion. At any dealership, the shopper is likely to be hit with a "lowball" price, an unrealistically low figure to get the buyer back. When he returns, the price will be increased but the shopper, tired of looking, may take it.

Complicating the hunt is the myriad of models, colors and optional equipment. For example, today's buyer has a choice of 375 U.S. models, up from 199 a decade ago. Our Chevy shop offered 50 different models, with a choice of 15 solid and 8 two-tone exterior colors. One booklet listed 163 options, including four types of
(Please turn to page 218)



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'CONFESSIONS' OF A CAR SALESMAN

(Continued from page 216)

Most customers, I noticed, don't trust the car salesman. The auto sellers at our agency insisted the reputation for tricky dealing is an outdated black eye inherited from old-time used car dealers. They conceded, though, that there still are "schlock" dealers, who—as Jim, our boss, put it—"open their doors every morning looking for suckers they can take." But he believes they are becoming fewer and fewer.

At our dealership, we relied heavily on repeat customers. We rarely "lowballed" shoppers and never "bushed" a buyer by charging a higher price than agreed on.

But that didn't mean our salesmen wouldn't draw on their ingenuity to sell a buyer "today." Promising immediate delivery of cars not yet in stock, or urging buyers to break commitments to other dealers, for example, were considered fair competitive practices.

A little play-acting sometimes paid off. One young couple stopped for a price on a Caprice. The salesman knew he'd have to lower his initial offer, but wanted to make it convincing. "Let me talk to the sales manager and see if I can't get \$100 more on your car," he said.

Decision from "manager"

While the man and his wife anxiously awaited the manager's decision, the salesman strolled into the garage for a drink of water. A few minutes later, he returned with the good news that the sales manager would indeed allow \$100 more.

A good salesman has to be ready with a bag of answers. A typical customer's comment: "We've got a better price at XYZ Chevrolet. We bought our last four cars there, but haven't been satisfied with the service lately."

Our answer: "XYZ is a volume dealer and doesn't have time for the service we can give you."

A common stall from hesitant shoppers is, "I have to talk it over with my wife."

This one isn't easy to counter. Our standard line was: "That's a good idea, but why not surprise her and order the car now? Then bring her in to choose the color." (Lynn, our hard-bitten used-car man, had another answer: "Okay, and while you're getting your wife, I'll call mine and see if she'll let me sell you a car.")

"It's easy to sell a woman," claims Eddie, a 38-year-old bachelor salesman from Alabama. "Somewhere along the line you

(Please turn to page 220)

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'CONFESSIONS' OF A CAR SALESMAN

(Continued from page 218)

make sure to compliment her. It never fails."

Most of our nine salesmen had been in the business for five to ten years, after switching from other jobs. Bob, who sold 275 cars last year and holds a college degree in merchandising from DePaul, ran his own repair shop. Mac earned his first good money in the 1930s by jumping out of planes at a county fair, and later sold house trailers. Frank, 60, turned to car selling from an office job after the company he worked for folded.

At first glance, the job would seem to have little appeal. Our salesmen worked strictly on commission. They put in 8 to 12 hours a day, six days a week (including Sundays). "I'm making more money than I ever did, but it's not worth it," complained one very busy salesman.

The salesmen were agitated by the hours spent waiting in vain for "be-backs" (shoppers who promise to return), by "flakes" (people who sign orders and never show up again) and by "nightfighters" (shoppers who show up just before evening closing time.) Another annoying customer was the "homing pigeon"—a buyer who keeps coming back to complain about squeaks and rattles that the salesman deems minor.

Pay is good

Then why sell cars? Mainly because the pay is good—our regulars earned \$9,000 to \$18,000 last year by selling 12 to 20 cars a month.

Some also said the day-to-day dealing with all types of people offered a variety few jobs can match. "Sometimes you wonder if you should get out of this crazy business," said Joe, a 19-year veteran of the auto wars. "But I have no regrets. I look forward to every customer and every month. No two are the same."

A fast learner and hard worker can climb up the pay scale fast. Big John turned to car selling in April 1965 after 15 years of office work. The first month he earned only \$134; all of last year, \$6300. But in March of this year alone he earned \$1250, and he expects to top the \$12,000 mark for the full year.

The salesmen's paychecks vary sharply. Eddie recently added up one week's commission and bonuses on six sales. The total was \$457. "Sure, it's great," he said, "but last December I didn't even get a paycheck."

At our dealership, the sales commission worked like this: A minimum, or "minnie," salesman's commission of \$20

for anything under \$150 profit; 25 percent of the first \$150 profit (\$37.50); and 35 percent of any profit over \$150.

In addition, there was a commission of \$2.50 to \$20 for financing, depending on how long it was for, and 10 percent of any premiums received on insurance offered by the dealers. Also, there was a bonus of \$100 for selling at least six cars in a two-week pay period.

At our dealership, on a sale netting \$200, with financing stretching over three years, the salesman's commission amounted to \$75.10; the average commission per sale was about \$70.

In one recent month, our dealership averaged a profit of \$177 per car sale, down from around \$200 per sale a year before; the lower "gross" reflected efforts to do well in the recent contest. (That \$177 didn't include a 2 percent "hold-back" on each car, money due the dealer but kept by the factory and paid out periodically in a lump sum; part of the "hold-back" was pure profit for the dealer, the rest went to cover such costs as "get-ready" expenses, for cleaning up a new car for delivery.

The man in charge of these complex operations was Jim, our 31-year-old part-owner. With his crew-cut hair, glasses

and slight build, he easily could be mistaken for a college student. But there was nothing part-time about his energetic handling of his business.

Jim has been with the dealership for 11 years, mostly on the business side. He was never a salesman. Early last year he bought half-ownership for \$250,000. He soon boosted sales by 55 percent to 2700 cars last year. His company earned a net profit last year of \$70,000, all of which was plowed back into the business. For himself, he cuts out an annual salary of \$26,000.

Jim considers his place a "built-in" dealership, noting that "only about 30 percent of our sales come from the showroom. The rest are built-in customers—repeat buyers and referrals." ★★

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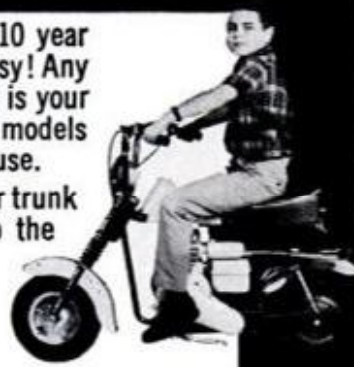
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RIDGID

NEW TOOLS FOR SURGERY

(Continued from page 66)

Invented almost a decade ago, it is now performing medical jobs ranging from blasting skin cancers into oblivion to vaporizing blood clots.

Paradoxically, the laser—whose powerful beam can blind instantaneously—was first used to treat the eye. Because of disease or physical injury, the light-sensitive retina sometimes peels away from the rear wall of the eyeball. Traditional treatment consists of welding the rip back in place with scar tissue, made by focusing the beam of an arc lamp on the site. The arc lamp method is effective. It is also cumbersome, painful and relatively slow. The patient has to be anesthetized, and his pupil completely enlarged, allowing some light rays to irritate healthy areas.

Because of its intensity, a laser beam needs only 1/1000-second to cause scar formation. The duration of the burst is so short the patient feels no pain, doesn't have to be anesthetized. In addition, the laser beam can be focused to a microscopic point of light, avoiding irritation to surrounding tissue. This, plus the fact that the energy in each laser burst can be easily varied, means the surgeon can control the size and degree of scar tissue with unparalleled accuracy. Because of these advantages, the laser beam is fast becoming a common treatment for retinal detachment.

Laser blasts tumors

Cancer is another malady the laser beam has zeroed in on. At the Tufts-New England Medical Center in Boston, Dr. Paul McGuff transplanted human thyroid cancers into the cheek pouches of hamsters. When the malignancies began to grow in their new hosts, Dr. McGuff and physicist David Bushnell hit them with the searing blast of laser light. Within a month most tumors had disappeared.

Human beings are receiving similar treatment. At the Foundation for Medical Research in Pasadena, Dr. James Helsper resorted to the laser on two cancer patients when all other types of therapy had failed. Within weeks the treated growths began to shrink. Some disappeared completely. Guardedly, Dr. Helsper warns that the results are "most encouraging, but not a complete success." Research on the laser's cancer-killing effect is in full progress in several hospitals and laboratories.

Perhaps the most startling use of the laser is in microsurgery on single cells. At Philadelphia's Albert Einstein Medi-

cal College, Dr. Joseph Kochen focused a laser beam through a microscope and blasted groups of cell chromosomes, units that determine heredity. By studying changes in each cell's growth, Dr. Kochen hopes to unveil the mysteries of cellular formation.

Unlike the laser and plasma scalpel, another major medical advance doesn't generate heat at all. Instead, it detects it. The device—called the thermograph—spots minute variations in skin temperatures, opening up a new dimension in diagnostic medicine. Some consider it an advance comparable to X-rays. (See *Box Cameras Were Never Like This*, page 66, July PM.)

Thermography was born several years ago when Dr. Ray Lawson, a Montreal surgeon, discovered that cancers are slightly warmer than normal tissue.

To detect such small temperature variations, Dr. R. Bowling Barnes, considered among the world's top infrared scientists, perfected sensitive infrared cameras. Within minutes, such a camera can scan a person's body and pinpoint abnormal skin temperatures anywhere between hairline and toes. Today the thermograph is used in at least 12 major hospitals.

Cooling off ulcers

While some medical researchers are perfecting methods of using heat for man's welfare, others are concentrating on cold—with equally impressive results.

What was probably the first widespread therapy employing frigid temperatures came along in the early '60s. At that time, conventional treatment for gastric ulcers was stomach surgery. Dr. Owen Wangensteen, professor at the University of Minnesota Medical School, wondered if a less drastic and painful treatment could be devised. One day, he hit on the idea of halting the manufacture of hydrochloric acid—the prime ulcer-causing agent—by chilling the stomach.

Along with Dr. Harlan Root, Dr. Wangensteen tried out the concept on an ulcer-ridden lawyer. The team held the man's stomach temperature at 50° F. for 48 hours. A day after, acid production had ceased and the patient was relieved of his gnawing pain for the first time in years. But the relief didn't last. Within a few weeks, the stomach was making as much acid as before.

At this point, Dr. Wangensteen thought of freezing the stomach in hopes of achieving a permanent ulcer cure. After experiments on animals to determine safe freezing limits, he used the technique on a human being. In May, 1962, an ulcer pa-

(Please turn to page 226)

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NEW TOOLS FOR SURGERY

(Continued from page 224)

tient at the Minnesota hospital swallowed a small rubber balloon. Alcohol held at almost 0° F. was circulated through the balloon by means of a tube leading from the patient's mouth. Within minutes the stomach became as hard as an ice cube. It was held that way for an hour, then thawed out. The next day, the patient's pain had vanished. Several weeks later the craterlike stomach sores had healed, and eight months afterwards there was still no sign of an ulcer.

However, the therapy is regarded as "controversial" in medical circles. While many doctors are enthusiastic supporters of gastric freezing, others claim the technique's long-range effect is exaggerated and that surgery is ultimately required in many cases. Still, the method has brought relief to hundreds of ulcer victims.

Blood-chilling technique

Other developments in low temperature medicine have recently resulted in what is literally the most cold-blooded surgery on record.

Repairs to weakened or damaged brain arteries were often impossible to make since three minutes is the most time blood can be withheld from the brain without permanent damage—at normal body temperatures, anyway. For every 15° reduction in temperature, enzyme production and cell metabolism in the brain—as well as in other body tissue—falls 50 percent.

Doctors at the Mayo Clinic used this fact to devise a radically new procedure in brain surgery. First, a patient's body is cooled to 65° F. by standard methods. Next, blood from heart arteries is shunted through a cooling unit. The cool blood, chilling every cell in the body, soon reduces the patient to a state of suspended animation.

Then circulation to the brain is stopped. For up to 30 minutes damaged brain arteries are repaired, just as a plumber fixes a leaky or clogged pipe by first shutting off the main water valve. This operation, recently perfected, opens up the brain to surgery never before possible, and is now being adopted by other hospitals in the country.

Probably the most important single advance employing cold is cryosurgery—use of temperatures approaching absolute zero. This breakthrough can be traced to an accidental discovery made in 1960 by Dr. Irving Cooper, a 43-year-old surgeon at St. Barnabas Hospital in New York.

At the time, Dr. Cooper was interested in Parkinson's disease, a crippling ailment caused by the malfunction of a clump of brain cells smaller than a pea. Treatment at that time consisted of paralyzing the group of cells with alcohol, or excising it with a scalpel. But the method had a serious drawback: the surgeon often couldn't tell just how much brain tissue to inactivate or remove. Too little, and muscle rigidity continued. Too much, and the patient might become partially paralyzed.

Tip from bottle opener

The next step forward was triggered by chance. Dr. Cooper was toying with a new gadget his wife had given him. It was a carbon dioxide wine bottle opener; it's used to inject gas underneath the cork, forcing it out of the bottle. Dr. Cooper tried the release, spraying some gas on his hand. The spot grew cold. He gave it another, longer burst. The area began to feel numb.

Then the idea struck: use cold to first numb a suspected site of damaged brain cells. When the cold reached healthy tissue, it would paralyze normal body functions—but only temporarily. In this way, the surgeon could determine the boundary between malfunctioning and healthy cells. After that, quick freezing the damaged area would kill the diseased tissues.

Dr. Cooper tried out the idea. It worked with dramatic success. A typical case involved a 55-year-old insurance executive whose body had become a shaking hulk because of Parkinson's disease. In an operating room at St. Barnabas Hospital the man was given a local anesthetic and a small hole was drilled in his skull. Then, a probe—about the thickness of a knitting needle, and insulated except at the tip—was pushed into the brain until it reached the suspected area of malfunctioning cells. Liquid nitrogen was pumped into the probe and the patient, fully conscious (the brain has no pain-sensitive nerves), was asked to move his limbs one by one. The tremors had stopped; the numbing cold had knocked out the spot of tissue that had caused the muscle spasms.

At this point, Dr. Cooper lowered the probe's tip to minus 80° F. Almost instantaneously the warm tissue became a block of solid ice. About three minutes later—not enough time to damage normal tissue outside the pea-sized area—the probe was removed. Next day, the patient had normal use of his limbs. Today, such cryogenic brain operations are curing various crippling diseases.

After Dr. Cooper's pace-setting work,

cryosurgery began to be used for other ailments, too. Today, temperatures as low as minus 300° F. are employed for such tasks as killing the pituitary gland, atrophying tonsils, hardening tumors for bloodless removal and shrinking inoperable carcinomas.

For some cryogenic operations, specialized probes had to be devised. The cryostylet, developed by Dr. Charles Kelman, is one.

Freezing a cataract

Soon after Dr. Cooper's pioneering work, Dr. Kelman, head of the Cryosurgery Research Center at Manhattan Eye, Ear, and Throat Hospital, New York, realized cold might help in cataract surgery. Cataracts—a clouding of the eye lens with a toxic, opaque fluid—were usually removed by pulling them through a surgical opening in the eye with a pair of tweezers. But sometimes the thin lens membrane broke, much as a water-filled balloon might rupture if lifted with a pair of pliers. Dr. Kelman reasoned that a cryogenic probe touching the cataract would turn some of the liquid inside the lens into a small ice ball, spreading the load over a greater area and decreasing the chance of rupture.

Observing operation

Together with engineers of Frigitrionics Inc., Dr. Kelman designed the cryostylet, which cools by passing an electric current through two dissimilar metals. After experiments on animals, a project supported by the John A. Hartford Foundation, Dr. Kelman tried the cryostylet on human cataracts. Recently, I saw just how the operation is performed.

First, Dr. Kelman made a small, half-moon incision around the border of the patient's iris. An assistant handed him the cryostylet, a flat, narrow instrument about six inches long with a short, bent probe at its end. As another assistant held open the incision, Dr. Kelman touched the probe's tip—held at minus 40° F.—to the cataract.

Within seconds, a small ice ball formed at the end of the probe, which was now a frosty white from ice crystals. Slowly, Dr. Kelman pulled out the cataract. It looked like a very large globule of yellow oil. After that, closing the incision was a routine matter.

Techniques using cold and heat have so far produced dozens of medical miracles. Today, researchers continue to explore how temperature extremes can be used for man's benefit, offering a promise of even more significant advances in the years to come. ★ ★ ★

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