

XCLUSIVE! Preview of Great Gadgets and New Ideas
from the World's Greatest Inventors Show

POPULAR MECHANICS

SEPT. 1967
35 CENTS

Clearing
the Air
on Those
New Types
of Tires

HOW FAST IS TOO FAST?

A Startling New Study on
Driving Speeds by
the Stanford
Research Institute

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EXCITING NEW

ONE-MAN HYDROFOIL

40 Pages of Ideas for
Improving Your Home

How
to:

Beat the Storage Shortage

Turn a Garage Into an Extra Room

Build Kitchen Cabinets • Install a Central

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Tufsyn, Workhorse—T.M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

SEPTEMBER 1967

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L. PARK BENJAMIN, Advertising Director

ADVERTISING OFFICES: New York: 575 Lexington Ave., Murray Hill B-8500; Chicago: 520 N. Michigan Ave., 527-2400; Detroit: General Motors Bldg., TRinity 5-8711; Cleveland: Hanna Bldg., 1422 Euclid Ave., PRespect 1-0456; Los Angeles: 601 North Vermont Ave., 666-6263; San Francisco: 1101 Hearst Bldg., YUkon 2-0823; Savannah, Ga.: 310 Drayton St., ADams 2-1106.

SUBSCRIPTION SERVICE: Mail all subscription orders, changes of address, correspondence concerning subscriptions, and Postmaster notices of undeliverable copies to Popular Mechanics, Box 646, New York, N.Y. 10019.

Popular Mechanics is published monthly by The Hearst Corporation, 57th St. at 8th Ave., New York, N.Y. 10019. U.S.A. Richard E. Berlin, President; George Hearst, V-Pres.; Richard E. Deems, President of Magazines; John R. Miller, Executive V-Pres. of Magazines; William S. Campbell, V-Pres. and Director of Circulation; Joseph F. Kern, V-Pres. for Popular Mechanics; Frank Massi, Treasurer; Harvey L. Lipton, Secy. Single copy in the United States and Canada, 35 cents. Subscription prices: United States and Possessions, \$4.00 for one year; \$7.00 for two years; \$10.00 for three years. Canada, add \$0.50 for each year. Pan American Postal Union countries, add \$1.00 for each year. All other countries, add \$2.00 for each year. When changing address, give old address as well as the new, with postal-zone number, if any, and allow six weeks for change to become effective. Second-class postage paid at New York, N.Y., and at additional mailing offices. Authorized as second-class mail by the Post Office Department, Ottawa, and for payment of postage in cash. Registered as second-class matter at the Post Office at Mexico D.F., Mexico, June 20, 1950. © 1967 by The Hearst Corporation. All rights reserved. Printed in U.S.A.

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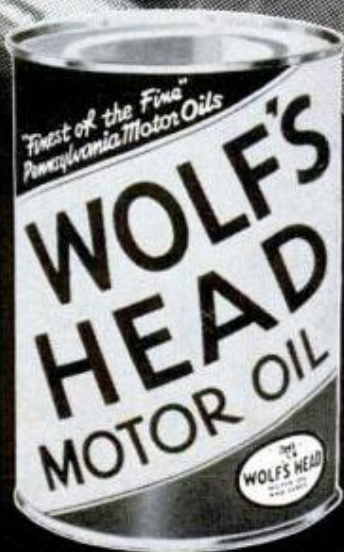
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LETTERS TO THE EDITOR

Too far out

I enjoyed the article *Getting Started in Model Rocketry* (page 148, July PM). However, it states that a $\frac{1}{4}$ A.8-2 engine has a thrust duration of 17 seconds. Someone left out a decimal point for it lasts only .17 seconds (17 hundredths). A 17-second thrust would put the rocket far out of sight. The same is true of the $\frac{1}{2}$ A.8-2 engine. It burns for .40 seconds, not 40 seconds.

Harrisville, Mich.

DAVID KAARRE

Those elusive little dots can cause trouble, can't they? Yes, the decimal points were accidentally omitted, and we seemingly took a giant step forward in the space race. (With thrust like that, our astronauts would already be heading for Pluto.)

Just needs money

I read *Gar Wood: An Old Sea Dog Is Up to New Tricks* (page 82, July PM). He thinks he has something big going for him.

Well, I have some news for you. Although I'm not an engineer and not so good on figures and blueprints, I'm very good on ideas. If I was as rich as Mr. Wood is I could make an electric car such as you've never seen before—and not just one model but at least six and the battery life will just about be limitless.

Winnipeg, Man.

SANDOR MODEC

We have some ideas, too, about what we'd do with a few million dollars, but oddly enough, we hadn't thought of electric cars.

Wave as you go by

In *Earthquakes Made to Order* (page 78, June PM), you discuss the San Andreas fault and state that "the land on the ocean side of the fault is sliding northwestward from the rest of the state at a rate of two inches a year."

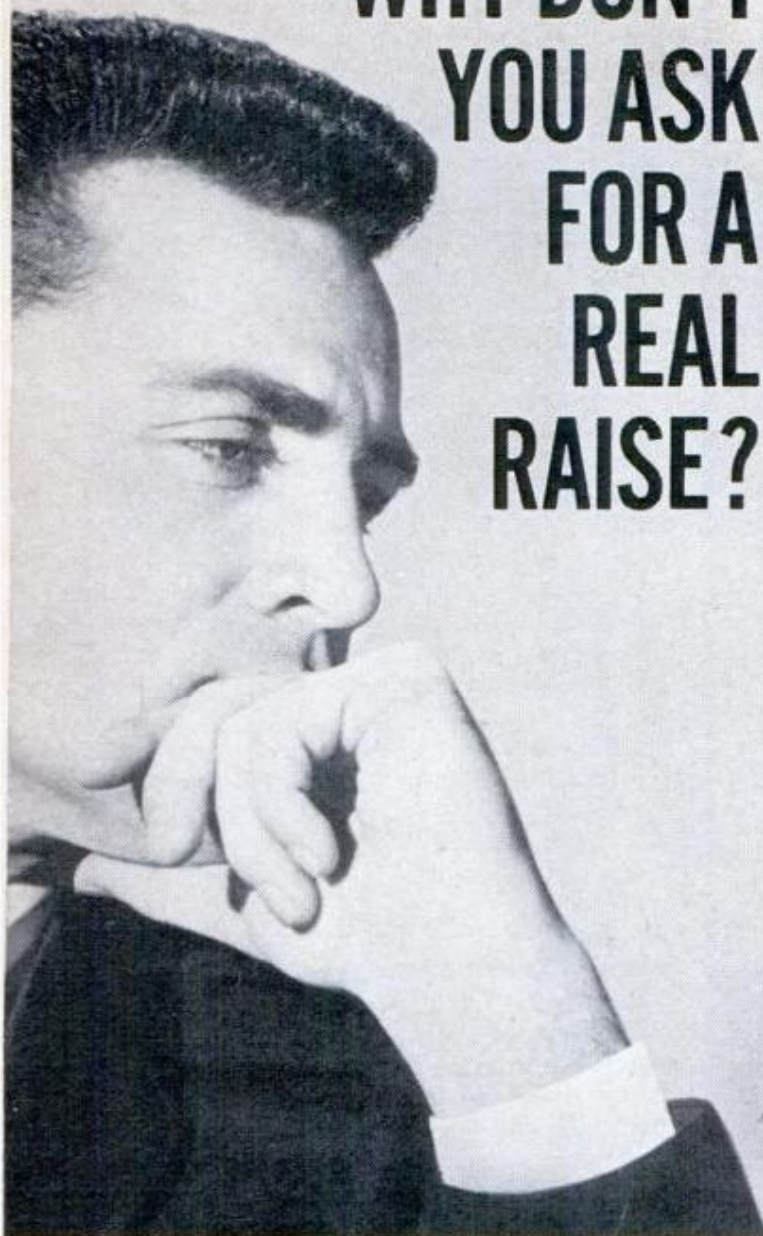
Isn't that rather rushing things? I was under the impression that it is two inches a century!

Los Angeles

NOEL KIRK

"Sorry," responds Author Kenneth Anderson, "two inches a year is correct. Since the earth fluctuates more than a foot a day vertically, due to tidal action, a couple of inches of lateral movement over a period

(Please turn to page 8)



WHY DON'T YOU ASK FOR A REAL RAISE?

Think you may be turned down? Here's how ambitious men get important promotions without even having to ask.

If it's been a long time since you've celebrated a raise in salary, ask yourself why. Are you really worth more money? If you're not sure, look again at men who have moved ahead...men so clearly marked for promotion that when it came it was just what everyone expected.

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LETTERS

(Continued from page 6)

of 12 months is nothing to worry about—unless you live along the San Andreas fault. What may be more disconcerting is the realization that eventually Los Angeles will be farther north than San Francisco, or that some day Los Angeles will be known as West San Francisco.”

Not so tough

You never know what effect your magazine may have. After reading *Four-Wheel Safari Test in the Rugged Rockies* (page 119, May PM), I converted my boat trailer to haul my motorcycle and took off. It was just the kind of challenge I eat up; the tougher the obstacle, the better I like it. I climbed everything those mountains had to offer. I went up every path and hill and mountain I could find, following the same route mapped out in the story. Great country . . . beautiful land. I loved every bit of it, but must say that it wasn't near as tough as that writer made it out.

Terre Haute, Ind.

DON DOMINIX

Our writer's view may have been slightly colored by the fact that he nearly slithered over a precipice from a muddy road. Next time, we'll have him wrestle alligators, and you can compare notes on that.

In July, 1966, I drove my 1965 Mercedes Benz 220S sedan over the “four-wheel-drive only” trail from Lake City to Ouray, Colo., over Engineer Mountain pass. It was an interesting trip, and I did not have any problems or damage to the Mercedes, which can go almost anywhere. It has nearly as much ground clearance as four-wheel-drive vehicles. I would not recommend the trip to drivers of American cars as they probably would tear off their oil pans.

Burnsville, Minn.

FRANK VAN ALSTINE

Cool it

Mort Schultz left out one of the most serious and baffling causes when he wrote *How You Can Find Those “Hidden” Causes of Engine Overheating* (page 140, June PM).

A muffler not designed for the engine it serves can cause back pressure, which will result in loss of power and overheating climbing a hill or pulling a load. It cost me over \$175 in new parts on a 1953 Chevrolet equipped with a brand-new factory-rebuilt (short block) engine. After all that expense, none of the “experts” in any garage could find the solution. It was my

(Please turn to page 10)

Machinist Art Lamon Tells You A MONEY-MAKING SECRET

Art Lamon is a machine operator in Bloomsburg, Pa. But, all of a sudden, he's making more money than ever. He has a fascinating, spare time business of his own—one that gives Art "all the work I can handle." And the only equipment he needs is a ballpoint pen and a clipboard!

Art's secret? He simply found out that Accident Investigation is one of the biggest service businesses in the country today—a \$19 billion industry with a need for trained men everywhere to work full or spare time.

The reason is obvious when you know this fact: Every year there are some 22 million accidents and losses. They must be investigated for insurance and other companies. It's a huge, booming field!

"There's No Limit To The Opportunities"

Art Lamon easily learned how to investigate accidents and start his own spare time business. He simply studied lessons-by-mail from Universal Schools in his own home. No classes to attend, no equipment to buy. He risked nothing, since he kept right on with his regular job—as he still does.

Now, with a solid, extra paycheck coming in every week from his own business, Art has this to say: "For any man who completes this course, there is no limit to the opportunities. He will be ready to step into this field without trouble."

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Mr. Arthur Lamon



Factory And Shop Men Find New Careers

Frank Bryant of San Lorenzo, Cal., took Universal Training then left a parts department job to make "at least \$100 more a month" in Accident Investigation. And he has a new company car and an expense account.

John Dorraugh, machine parts inspector in Akron, Ohio, earns extra cash in Accident Investigation. He writes: "I'll recommend Universal Schools to anyone."

Jerry Price was a machinist in Manitou Beach, Mich., until he contacted Universal. Now, he's full time in Accident Investigation with a pay raise, "a new Plymouth for my business and personal car, expense account, and bonus at the end of the year."

James Breneman was an instrument assembler in Columbus, Ohio, until he graduated from Universal Schools. Now he's an Investigator-Adjuster with a large insurance company at a \$1,200 a year raise and many benefits. Says Jim: "Without your fine course I would still be putting screw "A" into hole "B" as I was on my old job."

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LETTERS

(Continued from page 8)

16-year-old nephew who suggested that my new lifetime muffler was not designed to handle that engine. He was right!
San Diego, Calif. A. J. DEXTRAZE

Mort says: "It's not a common cause, but it is a cause. Faulty and wrong exhaust-system parts will build up back pressure that leads to overheating."

Idiotic helicopter

Your article, *The Stupendous Saturn V* (page 96, July PM), was so incomplete that it didn't even get across facts that seem more interesting to PM readers:

- The five F-1 engines develop 7.5 million pounds of thrust, equal to 160 million hp.
- Saturn can put 120 tons in orbit or 45 tons in the vicinity of the moon.
- The vehicle assembly building (VAB) covers eight acres and the weight of the walls would shear the ground and cause the walls to sink out of sight were it not for more than 4000 pilings in the ground.
- The first stage will get the rocket going 6000 mph and 40 miles up.
- The third stage will have it going over 25,000 mph.

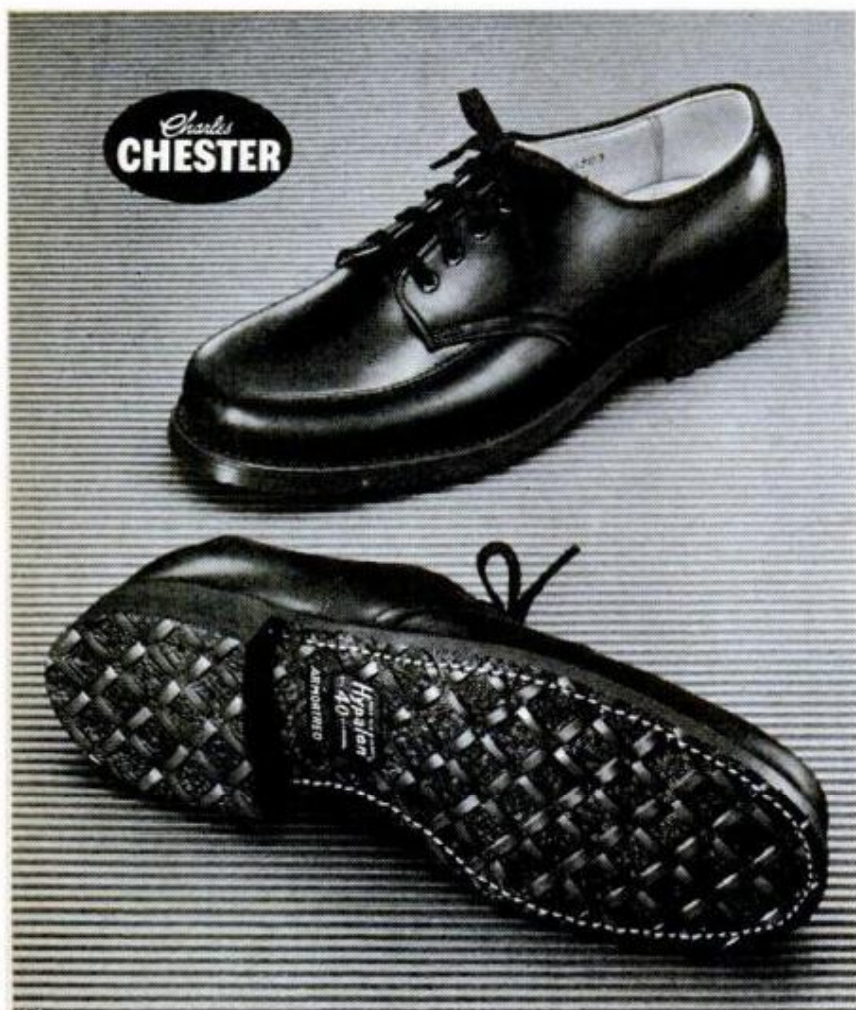
How idiotic the picture looks with a helicopter seemingly flying within 100 feet of the launcher umbilical tower. By the time the helicopter pilot got through his turn, he would have wiped out a multi-million dollar vehicle. Besides, NASA does not fly helicopters anywhere near Pad 39A, nor does anyone else.
Tustin, Calif. HARRY R. FIX

Shucks, we thought everybody would already have seen all those "laid-end-to-end" statistics, so we tried to give you information you wouldn't read anywhere else. (Besides, our art director would never let that chopper hit the Saturn V.)

Looking for a Jag

While reading old copies of PM, I saw in your "previews" that you intended to print plans for a scale model of the Jaguar SS100 in Sept. 1954. Can I get a copy?
Marton, New Zealand IAN BILL

We have copies—but not enough to send a spare one. You and other readers can get Xerox copies of any PM stories for 15 cents per page from the Popular Mechanics Service Bureau, 575 Lexington Ave., New York, N.Y. 10022. ★★



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BY JOHN F. PEARSON
SCIENCE
WORLDWIDE

PLASTIC COATING ON TEETH of 201 patients resulted in an 86-percent reduction of cavities. Those results were recently reported by two New York State dental researchers who said they used a "clear liquid monomer" on 601 teeth in the subjects' mouths and left an equal number uncoated. Plastic was applied twice during the one-year test period. The method is still in the experimental stage—so don't rush off to your dentist to ask for a treatment.

WORLD'S LOWEST TEMPERATURE—within less than a millionth of a degree of absolute zero (minus 459.69° F.)—was recently achieved at the Naval Research Laboratory, Washington, D.C. A powerful magnetic field was used to cool a bundle of fine copper wires to the record low. The experiment is part of a study of the forces that act on particles within the atom.

SENSE OF DANGER doesn't sharpen your wits and perceptions, as is widely believed. Just the opposite happens, according to UCLA researchers who monitored the reactions of scuba divers while underwater. The stress that accompanies the feeling of danger, say the researchers, diminishes a person's ability to see and may also blunt his other senses.

DORMANT BUT NOT DEAD. That's how scientists of the U.S. Geological Survey describe the volcanic potential of Washington's Mount Rainier. They say the pattern of past activity indicates the possibility of an eruption every 500 to 1000 years. Some 500 years ago Rainier produced a flow that traveled 40 miles and buried the floor of the Puyallup River Valley under a 15-foot layer of rock and mud. So watch out.

FROZEN FOR SIX MONTHS, a cat's brain was thawed and monitored by Japanese scientists. They reported detecting electrical activity, which, they say, indicates that nerve cells in the brain are not particularly vulnerable to damage through lack of oxygen. If blood flow to the brain is interrupted for even a few minutes, however, irreversible damage occurs. This may happen, theorize the scientists, because the microcirculation of

blood within the brain cannot be restored if once stopped.

NEW WAY TO PRESERVE apple cider has been developed by the Department of Agriculture. The apple juice is irradiated with ultraviolet rays. Two exposures reduce the microbe population by 98 percent and allow for refrigerated storage up to 35 days. Untreated cider usually doesn't keep for more than seven days even when refrigerated. Best of all, a panel of tasters found the irradiated cider had all the flavor of fresh juice.

A NEW SCIENCE BUILDING will soon be erected in New York City on the site of the 1964-65 World's Fair. The modernistic five-story structure, shown below,



will connect with the original science building (seen in the background) that was carried over from the fair. The new building will contain science exhibits, research laboratories and student training facilities. Reaching to the top will be giant circular core housing a nuclear reactor and known as the Atomarium. Later, a third building will be added, and the three together will comprise a permanent New York Hall of Science.

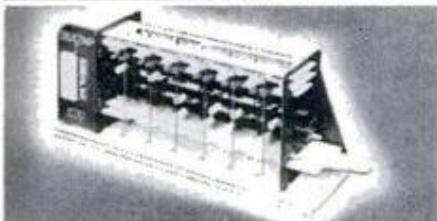
STRONTIUM 90 FALLOUT is heaviest in the spring, according to observations by Atomic Energy Commission scientists. Fine particles from nuclear explosions hang in the stratosphere for as long as 10 months, say the scientists. In spring, masses of stratospheric air descend to lower levels in the polar regions, taking with them the radioactive particles, which then fall to earth. Strontium 90 is chemically similar to calcium and becomes deposited in the bones of humans. ★ ★ ★



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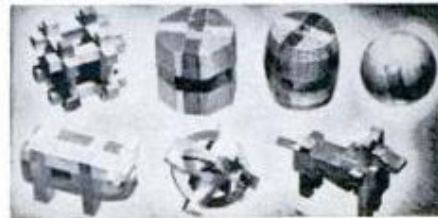
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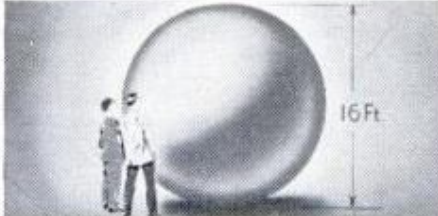
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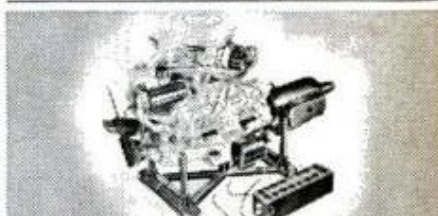


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FROM THE PATENT OFFICE **NEW INVENTIONS**

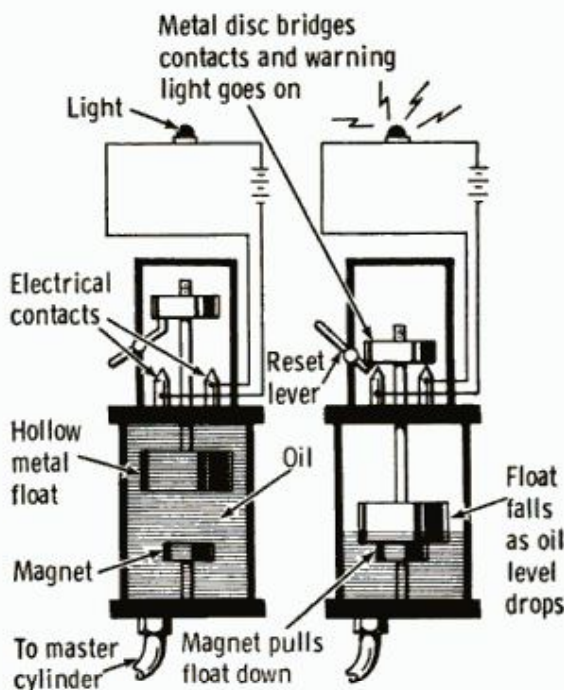
BY M. J. PEDERSEN

GIANT KITES may carry logs from forests to sawmills or rivers. A series of balloons would get the kites airborne, and an elaborate system of winches and control lines would keep the loads steady in crosswinds. William Rock of Portland, Ore., has received patent 3,326,392.

SUBTERRANEAN CABLES may be laid by an electric "gopher" that digs holes underground by remote control. An important use of the device, which looks like a snake with a power drill, lies in military communications since it could plant wires deep enough to be safe from atom bombs. Patent 3,326,008 went to Paul Baran and Samuel Genensky of Los Angeles.

FAIL-SAFE BRAKES for cars are the object of the invention diagrammed at right. If hydraulic fluid starts to leak out, a metal float in a reservoir falls, closing a pair of electrical contacts and flashing a

warning light on the dashboard. A second reservoir (not shown) contains enough spare hydraulic fluid to get you safely to a service station. When this tank is empty, a second float-actuated alarm



goes off, giving a final warning. Patent 3,319,240 was granted to Giacinto Mararchi and Felix Tirone of Long Island, N.Y. ★★

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DETROIT

LISTENING POST

BY BOB IRVIN

TURBINE-POWERED RACE CARS don't necessarily lead to gas-turbine passenger vehicles. That's the conclusion to be drawn from Parnelli Jones's near victory with his STP Turbine in the Indy 500. It hasn't changed the opinion of auto men here that the future for turbines is still in trucks, not cars. And that's where the first turbines will be installed in the early 1970s—in long-distance tractor-trailers. The execs here aren't even interested in building turboracers. "We're designing ours for trucks and have no interest in using them for auto racing," said Charles Patterson, Ford executive v.-p. Added Ronnie Householder, Chrysler's racing boss, "Our car turbine wouldn't be suitable for Indy." Perhaps the last word came from Don Frey, Ford's v.-p. for product planning, who said, "This turbine could make our V8 the new Offy of Indy."

FIRST "CLEAN" ENGINE DESIGNED FROM GROUND UP is Ford's 429-inch Thunderbird V8. It's the first designed right from the drawing board to reduce carbon monoxide and unburned hydrocarbons below the new 1968 U.S. standards. The techniques learned in building this engine, Ford says, "will be applied to new designs which will progressively lower the emission levels of engines to the point where they no longer will be considered a troublesome source of pollution." The technique followed is that pioneered by Chrysler with its "clean air package." It's cheaper and less troublesome than the air pump originally developed to meet California's requirements.

THE AUTO SAFETY CAMPAIGN has had some unforeseen side effects. Car manufacturers have been doing such a thorough job of informing customers about recall of their cars that a couple of owners have even complained. One man bought a car and gave it to his girl friend. The auto firm didn't know this, naturally, and when the car was recalled it sent the registered letter to the man's home. The last I heard, his wife was suing for divorce. Another man's new car had defective brakes. By the time the recall campaign was announced, he had already started on a cross-country trip. Police in another state were notified and found the car before there was an accident. The motorist didn't thank the auto company, though, because police discovered he was driving with a revoked license and put him in jail.

Add untold stories: A top auto engineer recently went through his files and came across some interesting correspondence he had never seen before. There was a letter written several years ago by a Harvard law student who wanted to know why cars weren't being designed safely. He got the stock reply of "Thank you, here are some pamphlets." My engineer friend wonders what might have happened if someone had bothered to show some interest in this student instead of giving him the brush-off. The student's name was Ralph Nader.

EVERY CAR OWNER will be interested to know that the average motorist spends 11 cents a mile to own and operate an automobile. And he spends more on parking and toll road fees than he does for taxes to build and maintain the highways over which he drives. A new report by the Federal Highway Administration shows the biggest expense to be depreciation, which accounts for 2.8 cents. Maintenance, accessories, parts and tires cost 2.1 cents; gas and oil, 1.7 cents; insurance, 1.4 cents; garage, parking and toll fees, 1.8 cents, and state, federal and local taxes, 1.2 cents.

VINYL-ROOF STATISTICS point to a whole new business area developing around a fabric backing. Almost one out of every four 1967-model cars had a factory-installed vinyl top. But the cost—ranging anywhere from \$75 to \$200—has triggered competition

(Please turn to page 22)

AC's Full Time Firepower sparks Chevrolet & Oldsmobile to a 1-2 finish at Pikes Peak!



This twisting, punishing 12½-mile dash up the mountain, a race against the clock, in which every foot of every turn, every stroke of every piston, makes a difference, is one of the most critical tests of spark-plug endurance known.

This year, a Chevrolet Impala Super Sport and an Oldsmobile Toronado, both equipped with AC Fire-Ring Spark Plugs, finished first and second in the stock car class at the 45th running of the Pikes Peak Auto Hill Climb.

AC's Full Time Fire-

power makes the big difference!

Full Time Firepower can make the difference in your car, too—its self-cleaning hot-tip insulator gets hot faster to burn away fouling deposits. That's why AC Fire-Ring Spark Plugs are original equipment in Chevrolets and Oldsmobiles, as well as in all other General Motors cars.

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DETROIT LISTENING POST

(Continued from page 20)

from after-market suppliers. A crinkle paint—the sort used on some typewriters—can be sprayed on car roofs to simulate vinyl, at a much lower cost. An eastern chemical manufacturer has developed what's called a true liquid vinyl. It's marketed by the Cal Corp., Ferndale, Mich., and it is actually hard to distinguish from the real cloth vinyl. Processing a car takes about an hour and costs \$60 to \$75. It's been applied to about 25,000 cars in recent months.

ELECTRIC CARS pose a serious threat to the industry's Big Three. According to Indiana University's Dr. Lloyd D. Orr, electricians will wipe out the three-pronged advantage the giants have had over would-be competitors: the dealership system, the economies of mass production and planned obsolescence. As he sees it, electricians will be durable and made of plastics, which means small manufacturers can get into the field and, thus, there will be many firms selling these vehicles. With trouble-free operation, the owner won't be dependent on dealers for maintenance. "Probably this will lead to a supermarket selling of electric cars, with one dealer selling many different makes," Orr said.

A SECRET AMC MARKET SURVEY indicates American Motors may grab a 4.2 percent share of the business next year. This would be up from the 2.5 percent in recent months.

A BETTER LIFESAVER than hoped for. That is the verdict on the General Motors impact-absorbing steering column—after almost a year of actual use. "Medical and engineering data from hundreds of accidents show that the column is performing its task even better than developers had expected," GM's Saginaw Steering Div. reported. The column is designed to collapse when a person's body strikes it.

AT THE FEDERAL SAFETY AGENCY—the tumult and the shouting of recent months notwithstanding—harmony is getting to be the order of the day. The government and the auto industry are holding closed-door meetings to discuss car safety goals for 1969 and the early '70s. It revised the controversial 1968 Standard 201. And bowing to strong criticism from many groups, the safety agency also weakened some of its state safety standards, covering things like driver licensing, drunken driving and motor-vehicle inspection. ★★★

TOM McCAHILL SAYS:

"There's COLD CASH In Repairing These Things!"

Each time a buddy of mine moans about the lousy repair job he got on his refrigerator or toaster or washing machine, I'm reminded of the fact that a good Appliance repairman is a mighty rare breed these days.

This neighbor of mine had refrigerator trouble just last month, and needed some speedy repair service. After phoning half a dozen repairmen who were booked solid for days, he finally had to settle for a bum job from a guy who had no business calling himself an Appliance repairman. This brings me to an important point. No one who wants to earn money in Appliance repair needs to learn by trial and error. There's a great, low-cost home study plan on the market that covers every type of Appliance repair in detail. The course was prepared by the Appliance Division of the National Radio Institute, one of the biggest and best schools in the field. Thousands of guys like yourself have studied with NRI, and many of them have more than paid for the low tuition fee within their first couple months servicing Electric Appliances.

If you want to make money (and who doesn't) in a field that's crying for good talent, make certain you send for a free NRI catalog. Get the details on the well-illustrated lessons that teach you how to repair home, farm and commercial Appliances, and small gasoline engines. You'll be amazed at how little the training costs. And you'll even get a professional Appliance Tester without extra cost.

NRI has been in the home study field since 1914, and they have a staff of 150 experts in Washington, D.C., who guide you through the course with more personal attention than you'd find in some classrooms. If you're really out to learn, they can furnish a



special course in air-conditioning and refrigeration repair, too.

Even if you've never tried to put a toaster in working order, even if your schooling never went beyond the tenth grade, I'm as certain as my name is McCahill that you can make money in the Appliance repair field with the help of this NRI course.

Do yourself a favor right now. Send off the coupon below and NRI will send you a free catalog. If you don't like the looks of this material, you can forget the entire deal, and you'll be out only one postage stamp. But remember, the Appliance repair field needs qualified men *now*. And you can qualify with NRI training.

Tom McCahill

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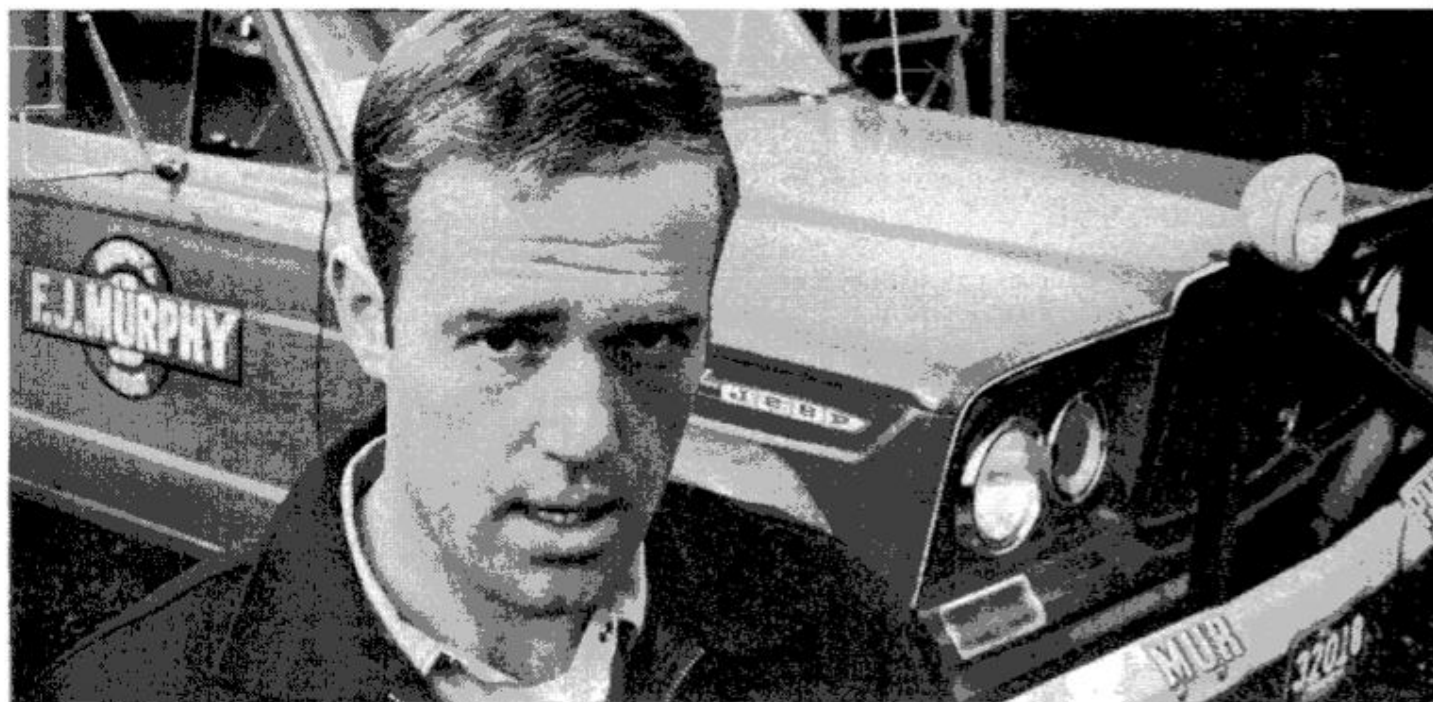
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“I paid a little more to get ‘Jeep’ 4-wheel drive... but it’s the best investment I ever made.”



says William Murphy, of Bristol, Rhode Island.

“My business associates were skeptical, last fall, when I decided on the ‘Jeep’ Gladiator instead of the other pick-up trucks we looked at,” says William Murphy of Bristol, Rhode Island. “They weren’t sure we’d use 4-wheel drive enough in our fuel oil business to pay the extra money for it.”

“Three weeks later, that Gladiator paid off in a spectacular way.”

“Art Mackie, one of our biggest customers, called late one afternoon. Like

most of our customers the blizzard caught him by surprise. He needed a delivery to keep his plant going that night. And he needed it fast.

“We sent out our last oil truck. The roads were snow-packed and slick as ice. Going down the hill on Metacom Ave., as our driver tells it, the whole rig slipped slowly off the road and down into the gully. Wham!... It looked like Art would have to shut down.

“I never used a pick-up truck as a

wrecker before. But when I arrived to get the driver, we decided to try. I put the Gladiator into 4-wheel drive low and went down into the gully. After a few unsuccessful tries the tanker began to move. Let me tell you that was an amazing sight: our little 5000-lb. Gladiator pulling a 36,000-lb. oil tanker up that snow-packed hill. So Art got his oil, and he’s been a big booster of ours ever since.

“That winter the Gladiator earned its keep in a lot more ways. When the snow

See 'Jeep' vehicles in action on "World Series of Golf," September 9-10, NBC-TV Network.



"A while back, 'Jeep' 4-wheel drive really paid off. Art Mackie needed oil in a hurry and...wham! our last tanker got stuck in a gully."



"I shifted into 'Jeep' 4-wheel drive and backed down into the gully. Going from 2-wheel to 4-wheel drive is easy as turning on my lights!"



"Finally the tanker began to move. What a sight: our 5000-lb. Gladiator pulling a 36,000-lb. oil tanker up that snow-packed hill."



"My customers always count on me to make any delivery in any weather."



"On the road, the Gladiator handles like my family car, only more comfortable because there's more room."



"That's our boat. No problem getting this baby afloat when we use the Gladiator."

in a customer's driveway stopped a delivery we'd plow it out quickly with the Gladiator. On cold mornings, we'd use the Gladiator to tow-start even our heaviest trucks. Actually I use 'Jeep' 4-wheel drive only 2 or 3 times a month. But my customers always count on me to make deliveries anywhere in almost any weather.

"But it's not just a brute, either. On the highway it handles as sweet as my wife's car. I just flip a lever and shift in and out of 4-wheel drive at any speed. And that

V-8 engine gives us more power than we actually need.

"My wife and I discovered it's terrific for our boating too! On weekends we throw a picnic in the back and drive our boat trailer right across the beach to the water's edge. No problem getting the boat afloat with this baby.

"For my money, the Gladiator is the best darn

truck on the road...with that 'Jeep' 4-wheel drive it's so versatile it's like having two trucks instead of one."

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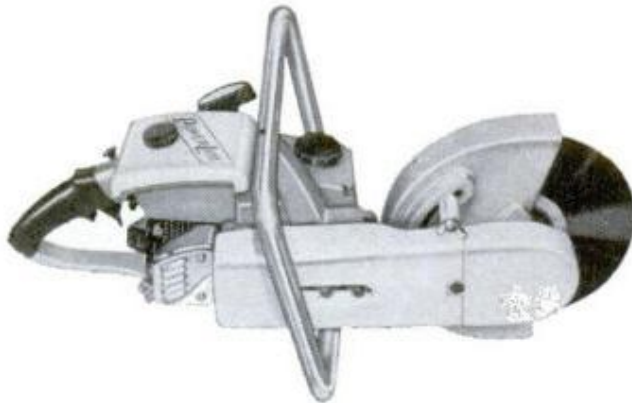
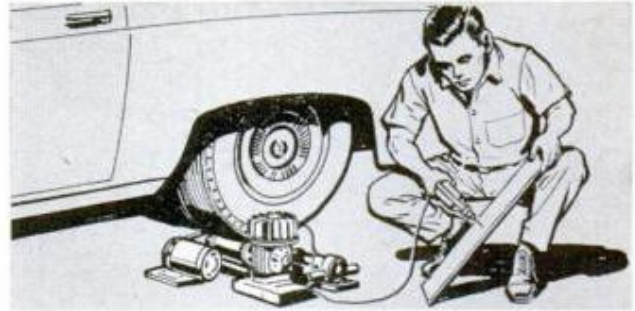
'Jeep' Gladiator

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See your 'Jeep' dealer. Check the Yellow Pages.

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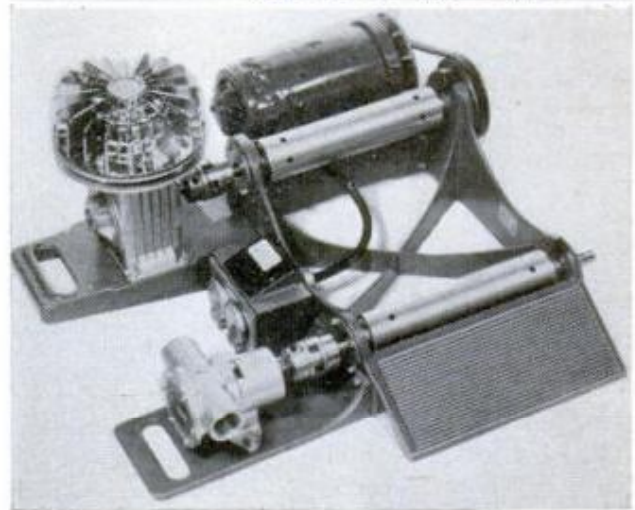
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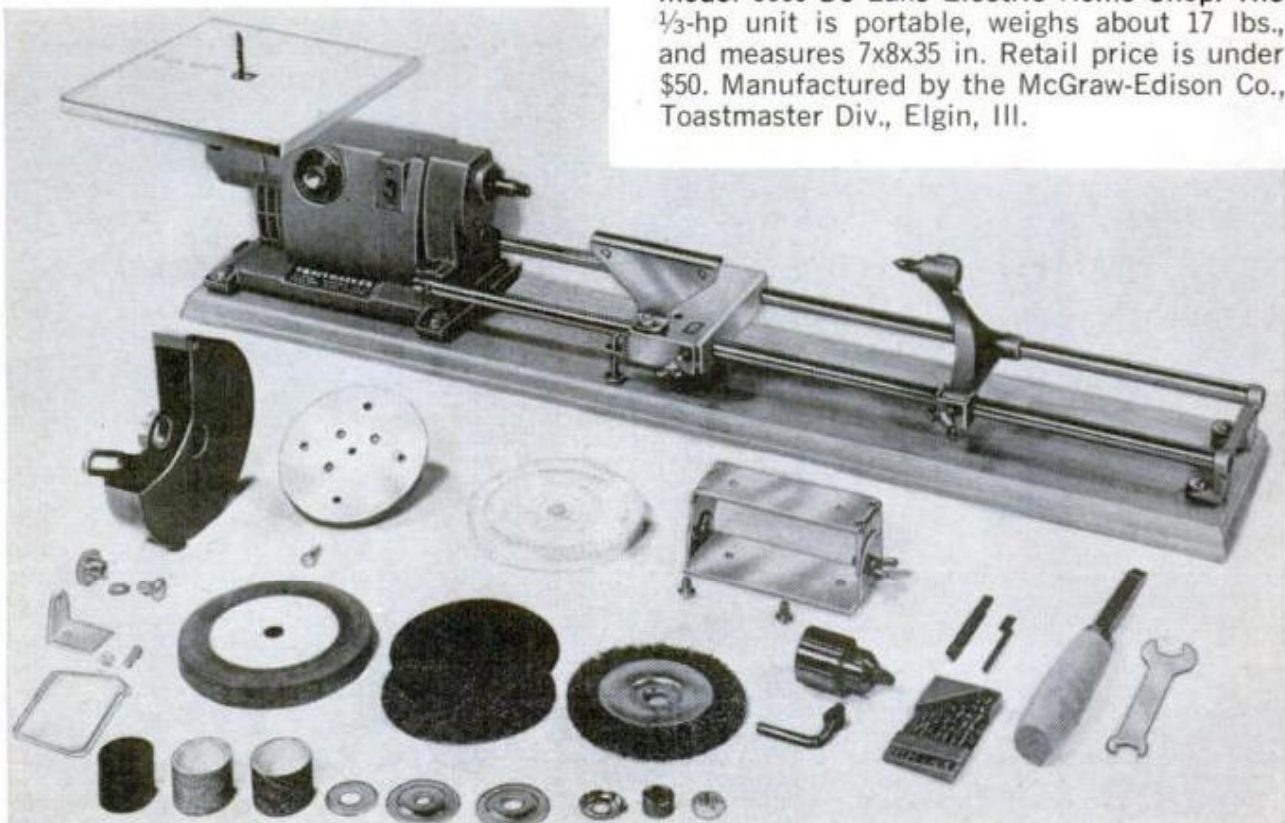
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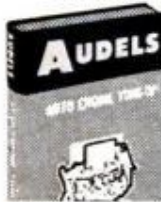
Countdown . . . lathe, saber saw, bench grinder, buffer, polisher, disc or drum sander and horizontal drill. Add a three-speed motor (3100, 3300 and 3700 rpm), throw in a number of accessories and fittings, and you have the model 5660 De Luxe Electric Home Shop. The $\frac{1}{3}$ -hp unit is portable, weighs about 17 lbs., and measures 7x8x35 in. Retail price is under \$50. Manufactured by the McGraw-Edison Co., Toastmaster Div., Elgin, Ill.



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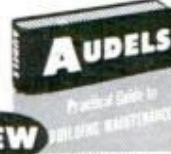
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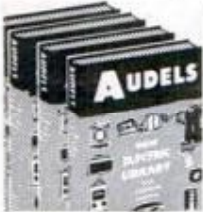
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Drivin' with Dan

Were you unhappy about the turbine car at Indy? How will Chevelle fare in racing this year? Do you check your family car like your racing cars? Dan Gurney answers these and other provocative questions

Q. Some friends of mine say you were pretty unhappy about the turbine car at Indianapolis, like most other drivers seemed to be. Were you?
—Ben A. Robertson, Gary, Ind.

A. My quarrel was with the rules which permitted the turbine. As was obvious on Memorial Day, the rules, which were supposed to handicap the turbine so it would be comparable to a conventional engine, in fact allowed it a big performance advantage. The job Andy Granatelli and his crew did is another matter altogether. They deserve credit for a brilliant and courageous job; my hat is off to them. Now, USAC has tightened up the rules for 1968 by limiting the area of the turbine's air intake. Andy and Parnelli Jones, who drove the big tur-

bine this year, say USAC might as well have barred it altogether. But I'm betting they'll be back.

Q. My husband drives a modified on half-mile dirt tracks. I object because we have a family. He claims he is safer on the track than on today's highways. Is he pulling my leg?—Mrs. George Field, San Diego.

A. I have to smile a little because I think I know how badly your husband wants to race. In the event that something happens to his race car he is probably safer than if the same sort of thing happened to him in an ordinary car on the highway. The chances of something happening on a racetrack,
(Please turn to page 30)

WINNER OF THREE EUROPEAN RACES so far this year, Dan is off and running in his F1 Eagle (No. 5) in the 40-lap Auto Race of Champions at Brands Hatch, England, where he set new track record of 101.58 mph



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DRIVIN' WITH DAN

(Continued from page 28)

however, are higher than the chances of a mishap on the highway because you ordinarily are working with much closer margins in racing. On the other hand, there are fewer women drivers on the racetrack. (That's a joke, Mrs. Field).

Q. *Is Chevelle entering any big races this year? If so, what are the races and does Chevelle have any chances of finishing in the top three?—Russell Scott, Weld, Me.*

A. Chevelles have made their mark in several of the major stock-car races, despite the fact that there are very few in evidence. This is because they don't have the full-fledged factory support Ford and Chrysler products enjoy. Curtis Turner put Smokey Yunick's Chevelle on the pole at the Daytona "500" and was in excellent position to win the race until he lost the engine in the late stages. Big-league racing is so competitive these days that your chances of winning depend heavily on how much technical and financial assistance you receive. Even so, a well-prepared Chevelle should be a contender most anywhere. You can also find some outstanding Chevelles competing at major drag races.

Q. *Do you think it makes much difference where my hands (or hand) rest when I'm driving my car?—Bill Coe, Minneapolis.*

A. Yes, particularly if they aren't on the steering wheel. Seriously, I recommend both hands on the wheel at all times, with the hands just above halfway on each side of the wheel, which permits maximum agility in case of an emergency, along with maximum comfort. I also feel a driver should sit a comfortable distance away from the wheel, so that his arms are not restricted.

Q. *What did you think about winning Le Mans this year and how did you like teaming up with A. J. Foyt?—Don N. McAllister, San Francisco.*

A. I thought it was about time, for one thing. I had been trying there for ten years, had led many of the races and come pretty close more than once, only to have something happen. I was particularly proud to be a part of the first all-American win at Le Mans. (I don't mean All-American racers, but an American-built car—Ford—driven by

American drivers.) A. J. Foyt did a great job. Le Mans is a very long course, over eight miles, and not easy to learn. This was A. J.'s first year and he didn't have much practice, but he's an excellent driver with an unusually keen feel for machinery. I consider him as fine a long-distance driver as anyone I've driven with. We had a ball.

Q. *I've noticed how carefully you check out your race cars before you start a race. Do you do the same with your family car, or is that unnecessary?—J. J. Delaney, Tampa.*

A. Yes, I do, in a somewhat different way. It's a habit I formed a long time ago and I found it convenient as well as safe. Before I start the car I make sure the seat position is comfortable and that both the side and rear-view mirrors are properly adjusted. Then, before I move, I check the brakes, fuel level and any other available gauges and glance all around to make sure nothing is about that wasn't there before I got into the car. If it's a car I've never driven before I usually cautiously test the brakes, steering and response of it to learn as much about the car as possible in case I should suddenly have to depend on it in an emergency.

Q. *I've heard about your Eagle Club, but I'm not sure whether it's planned to raise money for your Grand Prix team or just as a fan club.—Jerry Turnbull, Columbia, S. C.*

A. We started the Eagle Club when we began to realize how many fans were interested in seeing an American GT team fielded. This was about the same time that one of our major sponsors decided to withdraw from motor racing. Despite the fact that we had made no plea of any kind, people were sending us money in the mail almost every day, just because they wanted to help. The Eagle Club is aimed at giving racing fans a chance to be "on" our team. The \$15 membership goes directly to finance the Formula 1 Eagles. We send contributors a membership kit which includes a silver pin, T-shirt, decals, patches, photograph, schedule, membership card and a regular newsletter, among other things. If interested, write Box 2283, Santa Ana, Calif., and mention that you're a *Popular Mechanics* reader.

If you have questions on racing, high-performance and everyday driving techniques, send them to "Drivin' with Dan," c/o Popular Mechanics, 575 Lexington Ave., New York, N.Y. 10022. Questions cannot be answered by letter. Send questions on maintenance and repair to the Auto Clinic (see page 38).



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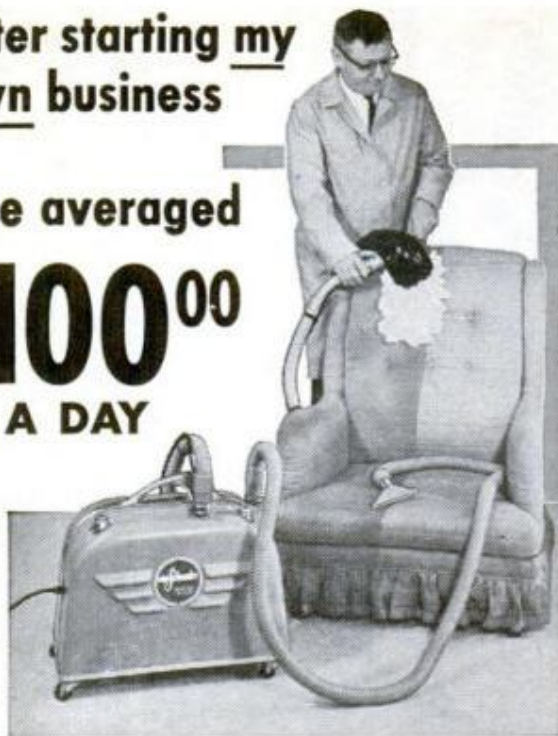
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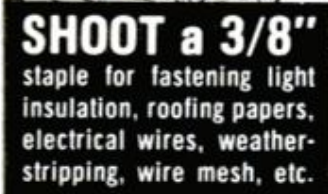
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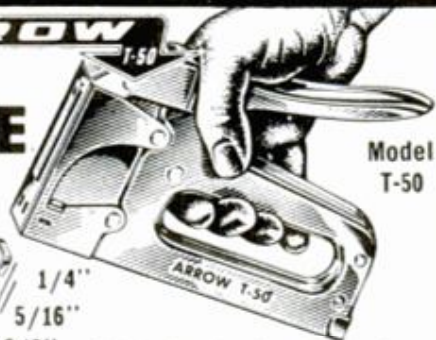
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Outboard Clinic

By HENRY B. NOTROM

Q. I thought my outboard engine was overheating, so I took it to a dealer. He used some kind of crayon thing to check it. What is it?—P.T.M., La.

A. Probably a thermomelt stick, which is a heat-sensitive indicator that melts on contact with a surface at a specific temperature. For example, suppose he used a 163° F. stick. He would heat the engine up to operating temperature and mark the side of a cylinder with the stick. The mark will appear dull and chalky if the engine is not overheating. If the mark melts and appears glossy, it indicates an overheating engine.

Q. Where can I get a service manual for my outboard motor?—T.T.C., Mont.

A. If the manufacturer can't supply one, try the Abos Marine Division, Technical Publications, Inc., 1014 Wyandotte, Kansas City, Mo.

Q. I have a 35-hp Johnson that refuses to stay in gear. The motor shifts into neutral under acceleration, although the shift control stays in forward. What's wrong?—T.W.S., Ore.

A. I'd say that forward gear is bad or the shift linkage beneath the powerhead is worn. I'd lay my money on the latter.

Q. Any of your readers need replacement parts for a Champion outboard? You might pass along the information that they can get parts from Swanson Outboard Service, 1520 West Broadway, Minneapolis, Minn. I found parts for my Champ from this outfit when no one else had 'em.—J.B.S., Wis.

A. Thanks, J.B.

Q. My '65 Evinrude hits on only one cylinder at idle. I did a complete tune-up, but the problem's still with me. Please advise.—N.S., N.J.

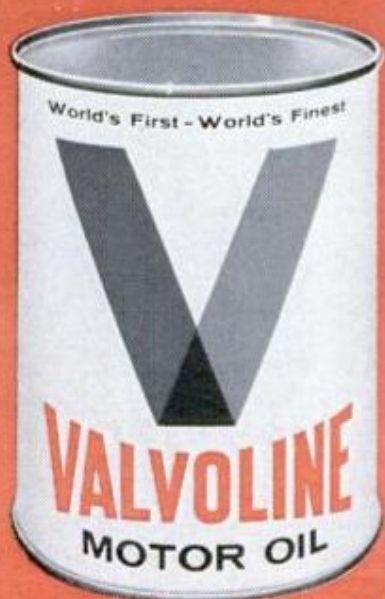
A. I'm afraid you may have a scored piston or cylinder in the non-firing cylinder.

FOR A PERSONAL REPLY to your outboard motor questions, write to Outboard Clinic, Popular Mechanics, 575 Lexington Ave., New York, N.Y. 10022. Enclose 25 cents to cover the cost of postage and handling.



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AUTOMOBILE CLINIC

BY MORT SCHULTZ

Upshift slippage

What would cause an automatic transmission in a 1962 Oldsmobile F85 to slip in all gears when upshifting?—Wayne D. Loyer, Bloomington, Ohio.

Most likely the trouble is due to low fluid-level pressure, and this can be caused by: A bad pressure regulator valve; an internal leak; a front pump slide that is sticking; a bad control-valve assembly; or bad O-rings. In any case you'll have to tear down the transmission to find the trouble. Sorry.

Timing à go-go

What's happened to the timing on my 1963 Ford? After tuneup, I set timing at 10° BTDC and stopped the engine. When I went to restart it, it turned over like an engine with the timing set too far BTDC. I rechecked and found the ball on the vibration damper about 4° advanced from where it was originally set. I can't get it set so it stays put. Is it possible that the vibration damper is slipping?—Russell Anderson, Huntsville, Ala.

Yes. And it is also possible that the timing chain is jumping.

To fill or not to fill

I am going around in circles with my 1961 Falcon with automatic transmission. Told at a gas station that I needed transmission fluid, I had it added. A week later a mechanic friend checked it and said it was overfilled, and that overfilling an automatic transmission will bring on troubles. Another man said it won't. I have two questions: 1. What trouble will overfilling cause? 2. How can I prevent this sort of confusion from occurring in the future?—Joseph Roman, Brooklyn.

Okay, Joe, here are the answers. Overfilling your transmission won't cause any trouble because excess will be kicked out through a breather vent. To protect yourself from now on, know the proper way to check the transmission fluid level yourself—like this:

- Start the engine and let it idle for about one minute.
- Pull up the handbrake and shift the transmission lever into Low. Let it stay

there for about three seconds to allow the cavities to fill up.

- Shift into Drive, then into Neutral, then into Reverse and finally into Park—each time allowing that three second fill-up period.

- Now, with the lever in Park and the engine still running, get out and check the transmission dipstick.

Wind-tossed Caddy

Why is my '64 Model 62 Cadillac so severely affected by crosswinds? The car is buffeted from side to side whenever there are any appreciable gusts. I've had the front wheels aligned, a new ball joint installed in the rear stabilizer yoke and new heavy-duty shocks put on. Nothing helps. Can you?—John T. Barry, Tonawanda, N.Y.

I have it on good authority that the fishtailing you describe can occur with this particular model when the ball joint on the upper rear suspension A-frame loosens up. Of course, not being there, I can't tell whether this is actually happening in your case. However, I suggest you look into the possibility. If you find this is the cause, you'll just have to replace the entire upper rear suspension A-frame to eliminate the problem.

Oil's well that ends well

I am losing oil from my 1964 Dodge Dart Six. I can see the fluid on the garage floor, and attempts at finding the reason have failed. Do you know what this is "oil" about?—Jack Parks, Milwaukee.

Could be. It seems that this was a minor problem with 1964 Dodge Darts and full-size Dodges with 170 and 225-cu.-in. engines. The diaphragm in the low oil-pressure switch, which is mounted in the oil gallery, could have failed, allowing the leak. Fixing this is easy enough and it should be done under the terms of your 5-year warranty. In fact, there is a service bulletin that covers it—No. D65-102 (6/23/65). The low oil-pressure switch is removed from the oil gallery and the opening plugged with a 1/8-inch pipe plug. Then, the 3/8-inch pipe plug is removed from the oil-pump housing and a new
(Please turn to page 40)

The Round Tire

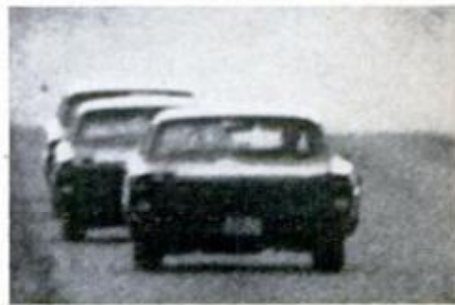


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AUTOMOBILE CLINIC

(Continued from page 38)

switch installed at this point (part No. 2585110).

All bound up

The steering wheel in my 1964 Chrysler Newport with power steering binds when I park. It is an erratic condition, but at times it binds so badly I can't turn the wheel. The mechanic finds nothing wrong. Is this an inherent defect?—Moe Helfant, Brooklyn.

I don't think so. It's a mechanical problem that has developed in *your* car. I would look for three possible causes. First, the steering housing might be loose on the frame. If it should happen to shift position, a binding condition will occur. Second, the power-steering belt may be too loose. When you give it a sudden turn, it will slip and cause the bind. Finally, you may have a bad ring in your power-steering cylinder.

In-flight defueling

Like many station wagon owners, I had the problem of gas slopping out of the tank, especially on turns. I've solved it with my 1960 Pontiac wagon. Maybe this will help others.

I put heavy-duty shock absorbers equipped with load-lifter coil springs on the rear and heavy-duty shocks on the front. No more spillage—no more constant gas odor. The rear end has been lifted considerably, eliminating the sway on corners.—Ron Hewett, Ont., Canada.

A most practical solution, Ron. Thanks.

Rear-end troubles

The car's a 1965 Studebaker Commander. The problem is a vibrating feeling and low grinding noise from the rear of the car when I'm traveling between 58 and 63 mph. The drive shaft, universal joints, rear wheel bearings and wheel balance are in order. What's out of order?—W. Koroluk, Tisdale, Sask., Canada.

Experience has shown that it's probably the pinion gear and/or pinion shaft bearing in the rear end. If it's any consolation, you're not alone.

Domestic problem

My 1965 Plymouth, equipped with Torqueflite transmission, hesitates when shifted into reverse. I don't mind, but my

wife is afraid to drive the car. Is there anything I can do to alleviate this upset in my household?—Jim Hall, Minneapolis, Minn.

Why sure. The fellows at the factory point out that the problem could be caused by loose valve-body assembly screws. If so, the transmission oil pan and oil filter have to be removed, and the transfer plate to valve body screws tightened to 30 in.-lbs. Assuming the screws are tight, though, then check for sticky valves in the valve body or internal oil leakage due to porosity or warped parts. This also applies to 1965 through 1967 Plymouths, Chryslers and Imperials equipped with Torqueflite.

Arbitrator

Clear up an argument, please. My friend says leaving snow tires on a car all year causes no trouble. I say it does, but can't explain why. Who is right and why?—Marv Greene, Boston, Mass.

You're right, Marv. Using snow tires in warmer weather is a good way to ruin those tires. Snows heat up considerably more than regular tires at sustained highway speeds. High temperature is one of the main reasons for tires failing.

Service Tips

• **CHRYSLER OWNERS:** Get your numbers straight should you have to replace the power-steering pressure hose in your 1962, 1963 or 1964 models with airconditioning. Make sure the new hose carries part No. 2537811. You see, there's another hose out that could be given to you by mistake. It is part No. 2537613 and is for use in 1965 and 1966 Plymouth Furies with airconditioning.

• **PONTIAC REPORTS** that in some cases the proper circuit breaker for specific options has not been installed in some '65 Pontiacs and Tempests. The result is damage to parts in the event of an electrical overload. If this happens, check the circuit breaker. A two-pronged breaker is used on all models with power seats and/or power windows, including the power tailgate window on station wagons. The single prong breaker is a junction box used on convertibles **without** power seat or windows.

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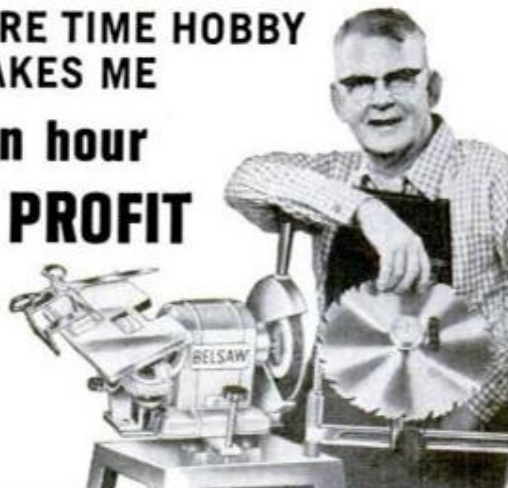
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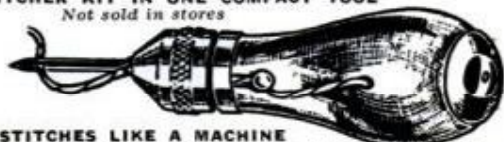
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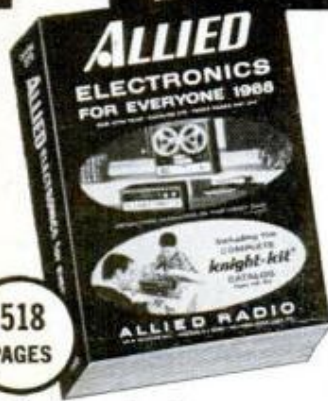
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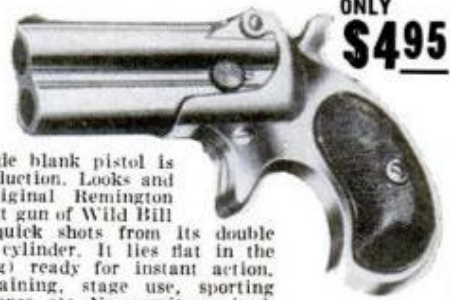
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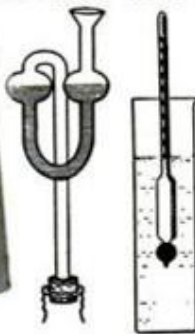
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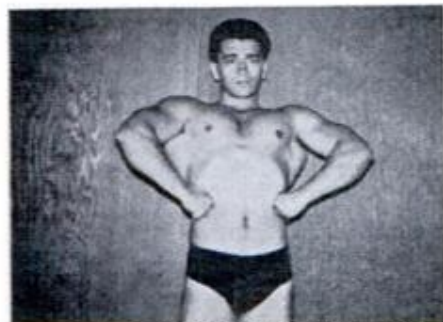
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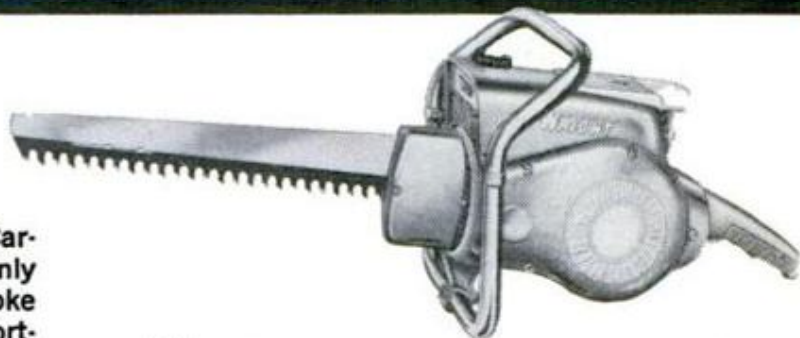
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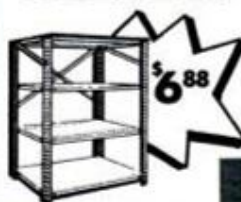


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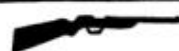
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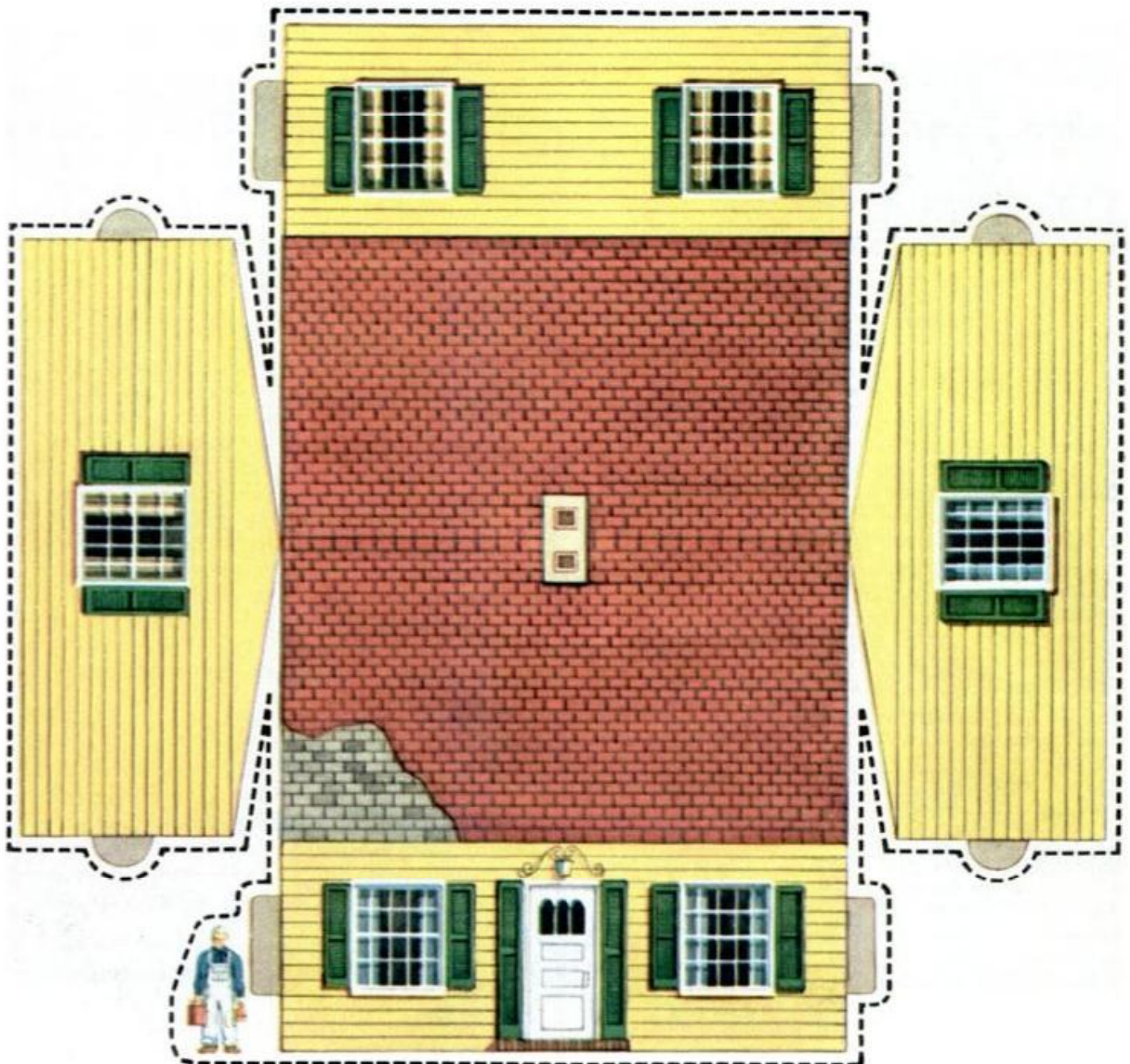
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BY KEVIN V. BROWN AVIATION JETSTREAM

FLIGHT INSURANCE, the kind purchased from coin machines in airport terminals, may soon be prohibited by law. At least one state has already ruled it illegal, and legislation has been introduced in both the House and Senate in Washington, D.C., to make its sale a violation of federal law.

Most vigorous proponent of the legislation is the Air Line Pilots Assn. It claims the machines make it too easy for crackpots to sabotage airliners for profit. The one common denominator in all known sabotage crashes, it says, was machine-purchased flight insurance. Remove them, so its reasoning goes, and you remove a motive and keep more passengers and crews alive.

The one state that outlawed the machines, Colorado, may have been influenced by one of the most notorious sabotage cases in airline history. A man, later convicted and executed for the crime, put dynamite in his mother's luggage, purchased huge amounts of insurance on her from the airport vending machine, then saw her off on the flight. The plane later exploded and killed 44 persons. It took off from Denver, Colo.

The arguments for and against the Colorado legislation, introduced by State Representative Ted Bryant, who—not entirely coincidentally—is also a United Air Lines pilot, may be harbinger of arguments on the federal level. Bryant says the opposition came primarily from the airport operators and the insurance vendors whose major argument was loss of revenue.

Chief backing for the anti-insurance legislation, besides the ALPA, came—surprisingly—from other insurance companies who claimed the unknowing public was being bilked by the "bargain rates" of 25-cent insurance. "The insurance covered only the flight itself, which at best lasted only five or six hours," Bryant argued. "Other insurance, which covers you anywhere, anytime—including to and from the airport—and all year around, is much cheaper when you sit down and figure it out."

Bryant believes the ban would be especially effective against the borderline cases, the near-insane types who would need just one more convenient reason—easy profit from the insurance—to tip them toward sabotage. ★ ★ ★

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Independent suspension means each wheel can move up or down without moving the one on the other side.

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WHAT'S NEW OUTDOORS

BY DAN FALES

TARPAULINS are always useful. But some tarps, especially those of odd sizes, are expensive. So two enterprising men, Jack Boot and Dick Loew, of Waterford, N.Y., discovered an inexpensive and easy way to put a tarp together. They're not at all handy with needle and thread. But they are extremely adept at squeezing a tube. In this case a tube of General Electric's Silicone Construction Sealant.



By accident, these two discovered that this sealant sticks to canvas. They needed a cockpit cover for a 16-foot sloop. To buy such a cover would cost about \$60. They made one for \$12. It took canvas, a \$3.25 package of grommets, the silicone and a can of waterproofing. The canvas they purchased was not wide enough. So they "glued two pieces together using the silicone." Then they used an iron to press over a one-inch hem. They filled the hem with silicone and tapped in grommets. It worked, and they were happy about the price.

You can make any shape tarp you wish for any purpose. It's not limited to boat covers. Make sure you waterproof the canvas if the tarp's to be used outside.

WET WOOD has always been a problem for campfire builders. But for some people, it's no problem at all. They just jam a road flare into the center of a pyramid of wood. The intense heat from the burning magnesium flare raises the temperature of the wood to its kindling point, causing it to ignite quickly. You can also push the flare into the side of the pyramid. Either way, it's better than dumping loads of flammable liquids on a stubborn fire to dry out the wood. You can get 15-minute road flares at most auto-supply stores.

HOLIDAY TRAVEL with a camper is becoming a real project, especially if you have a breakdown on a superhighway. Police in several states report that it's taking up to three hours to get repair trucks to vehicles that have broken down on some of the more heavily traveled routes. And gas stations on some expressways are reporting 30-minute waits for gas during peak hours of holiday travel. (Pulling off an expressway to gas up may be quicker.) So make sure your rig is in good shape before taking to the highways on long holiday weekends.

BEEF JERKY can be a tasty snack when you're on the trail or sitting by your camper at a lake. The American West Products Co. has an easy-to-assemble Jerky Dryer Kit complete with secret recipe for preparing strips of beef for drying.



Jerky comes from the Spanish-Indian word "charqui" meaning dried meat. You can get one of AWC's kits by sending \$5.95 to 251 Beloit Ave., Los Angeles, Calif. 90049.

SEPARATING FISHING ROD LENGTHS can be tough. If one section doesn't detach easily from another, here's an old, but tested method. Instead of forcing the sections apart in front of you, put the rod behind your knees. With your hands outside your knees, grasp each section of the rod. Slowly force your knees out.

MOTORCYCLES AND TRAIL BIKES are becoming ever more popular, not only on the open road but in cities and towns. Montgomery Ward, in cooperation with the National Safety Council, has prepared a booklet outlining basic principles for operating a cycle. It can be obtained by writing MW at Dept. 61, B-5, Box 8339, Chicago, Ill. 60680. ★ ★ ★



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HOMEOWNERS' CLINIC

BY W. CLYDE LAMMEY

Fake cedar lining?

Some years ago I had a closet lined with cedar. It was strongly aromatic at first but now there is little left of the pleasant cedar aroma. What has happened? I've always understood the aroma lasted indefinitely. Is the lining a fake?—N.E., N.M.

No, it isn't a fake, assuming, of course, that you specified—and therefore purchased—a natural cedar lining. Even then, the aroma does not last "indefinitely." It gradually dissipates over a long period, due to the slow evaporation of the volatile oils in the wood. Evaporation may have been hastened somewhat by your relatively dry climate or some condition peculiar to the structure. I also have to assume you have not applied a finish; that is, a varnish or oil. If there's no such coating on the wood, the aroma can be restored simply by sanding the wood lightly, making sure you "cut" the entire surface of each board uniformly. Some solutions are available with additives having the aroma of natural cedar. But I would try the light sanding first as this usually restores the natural aroma.

Storage in garage attic

I have need of extra storage space and am thinking of utilizing the space in my garage for an attic. The roof is low-pitched, the door is the roll-up type and I will need access to stored items rather frequently. Should the storage space be in the center area over the car, with access from both sides, or on each side with access from an open center?—O.D., Ore.

Your problem, as described, doesn't have a ready solution. One has to think first of the minimum allowable headroom, the space required to permit the door to open fully and the frequency of access to stored items. If your car is used often—that is, out of the garage daily—then I'd say offhand that storage space on the sides with access at the center might offer the greatest area and convenience of access. On the other hand, the center storage area over the car would offer the most convenient access to stored items at any time. This is up to you to decide as you will know what is to be stored. In any case the storage floor or platform should be adequately supported on

stretchers or joists, and the whole "tied" to the rafters. The joists or collar beams (2x6s, or 2x8s, depending on the span) should run from plate to plate. Vertical supports (at least 2x4s) should be bolted to the "attic" floor joists and to the collar beams. The upper ends should be joined to the rafters with plywood gussets. In this way you will achieve a triangular support that will prevent a tendency of the roof to sag due to the extra weight.

Sure it's a leak?

My six-year-old home has a concrete-slab floor with the main plumbing in the slab. There's a leak somewhere which causes dampness to appear along one side of the slab. However, water has not yet come through the floor inside. How can I locate the leak and repair it?—E.O., Ga.

This is a knotty one! But are you sure there's a leak in the plumbing, and that the dampness is not caused by a natural spring either under or close to the house? This is a possibility worth investigating closely. I can't tell you how to go about this as I do not know the immediate locality, but if the dampness is caused by a spring or other natural phenomenon it should be possible to discover it. Otherwise, have the piping checked by a plumber. If there is a leak in the plumbing, he should be able to locate it and suggest a method of repair.

Usually leaks in plumbing installed in concrete will develop at sharp bends, especially if the piping is of copper, or at elbows if the plumbing is steel pipe. Your house plans, if available, should show the plumbing layout.

Sow, yes; trap, no!

When I sow grass seed to patch my lawn, small, sparrow-size birds pick it up as fast as I can sow it. Evidently they are migratory as they only come in the spring and fall. Even though I cover the seed lightly they scratch it up. Do you have plans for a suitable trap that will enable me to get rid of the pests or thin them out a little?—P.R., Iowa.

This department does not supply plans. Besides, trapping birds is illegal in nearly all states. You might check with your state's department of conservation but I doubt if it would issue you a permit to trap what you describe as migratory birds. Actually, the birds never get all the seed in any given area and really do less harm than it may seem. However, a light covering of straw or grass clippings over the newly sown areas will cut seed consumption to a minimum. ★★★

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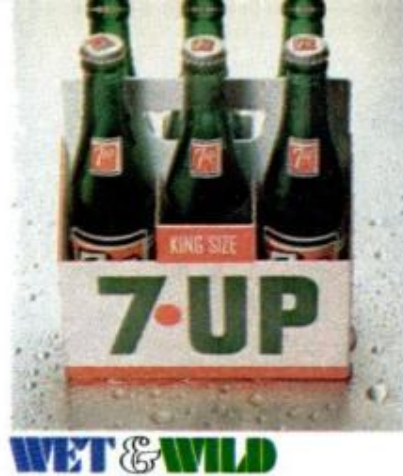
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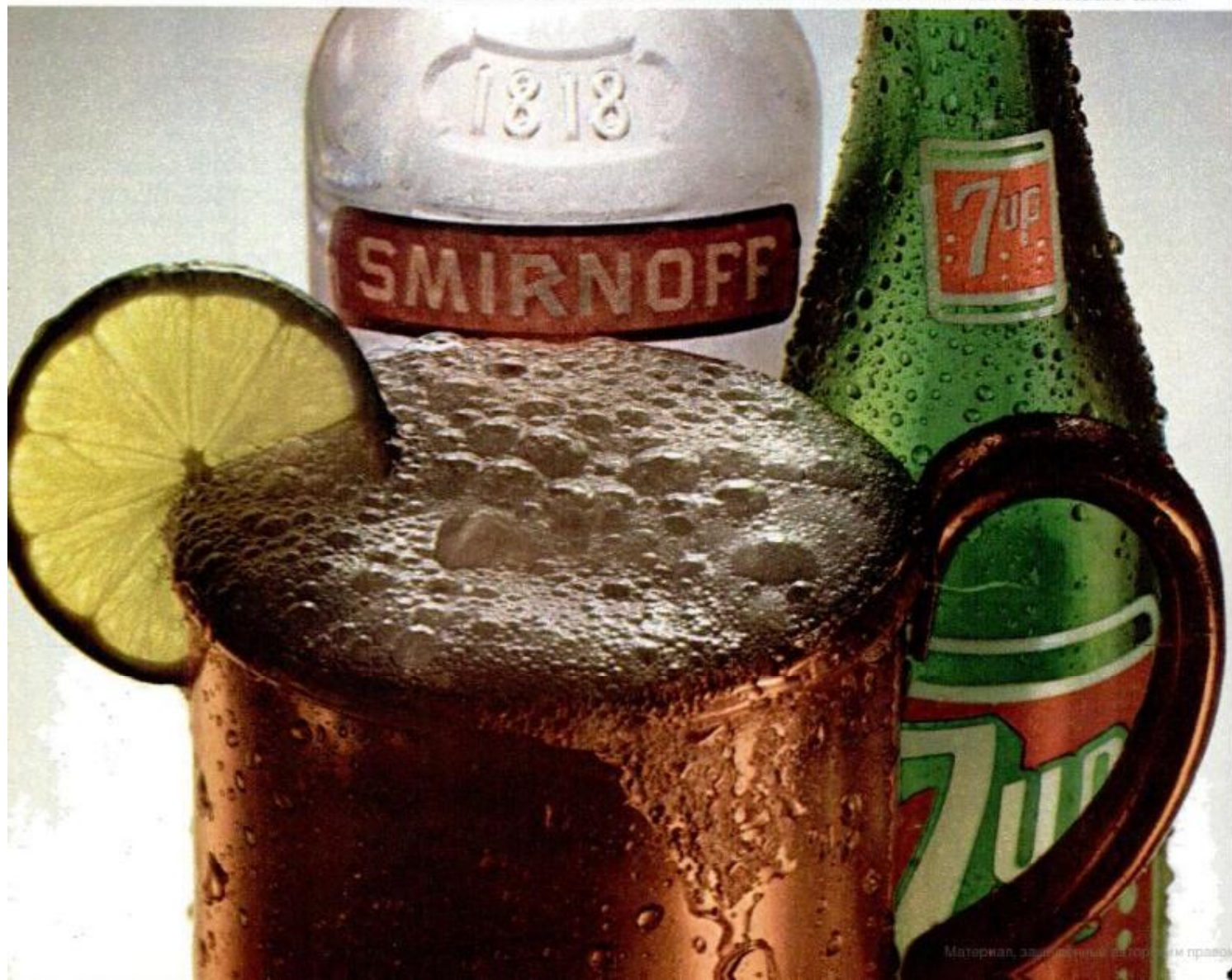
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How Fast Is *TOO* Fast?

A distinguished research center figures it this way: Cut speeds 20 percent and save 25,000 lives per year

By TOM STIMSON

POPULAR MECHANICS has written much about the excitement of high-speed driving and the masculine satisfaction of commanding a powerful automobile. We have been on the high-performance bandwagon and we still are.

However, let's face it. Speed *is* a killer—along with wild drivers, bad roads, poorly designed cars and decrepit parts.

One organization that has faced it is Stanford Research Institute, of Menlo Park, Calif. One of America's most respected scientific centers, SRI has published a report on "Drastic Measures for Reducing Traffic Casualties." One of the measures SRI proposes is a "trade-off" in which all of us would swap a few minutes a day for an immense jackpot of saved lives. They may have a point.

ROBERT P. CROSSLEY

Editor

WE CAN DECIDE, RIGHT NOW, how many people we'll kill in car crashes next year. It's simply a matter of trading off lives against convenience.

Shall we slaughter as many as last year, a couple of hundred more than 52,000? That would be no worse than dropping an A-bomb on White Plains, N.Y., or Rock Island, Ill., or Tyler, Tex., or Boise, Idaho, or Palo Alto, Calif. We *could* cut that number in half, though it would be a nuisance. It might cost each of us 11 more minutes driving time per day.

That's the harsh conclusion reached by Stanford Research Institute in Menlo Park, Calif. The researchers have other disturbing ideas. They say modern traffic laws are an Alice-in-Wonderland dream that ignores reality. They say traffic cops are as out of date as the horse and buggy; that detection and ticketing of safety-law violators should be automated.

They say we could save thousands of lives by removal of driving privileges from high-risk drivers, including everyone under 21 and the elderly Medicare set. They say super-highways probably *are* dangerous no matter what their designers believe; that speed *does* kill, no matter what we've been told.

I read SRI's report on "Drastic Measures for Reducing Traffic Casualties." Then I went to see the Institute's senior operations analyst, Richard L. Goen. Mild and scholarly in appearance, 39-year-old Dick Goen has

"There's no evidence that safety campaigns have had any effect in reducing accidents."

reached some startling conclusions about highway deaths and injuries.

He says there is no evidence that safety campaigns have had any effect in reducing accidents. Traffic deaths, he points out, are climbing in spite of safer roads, safer cars, safety drives.

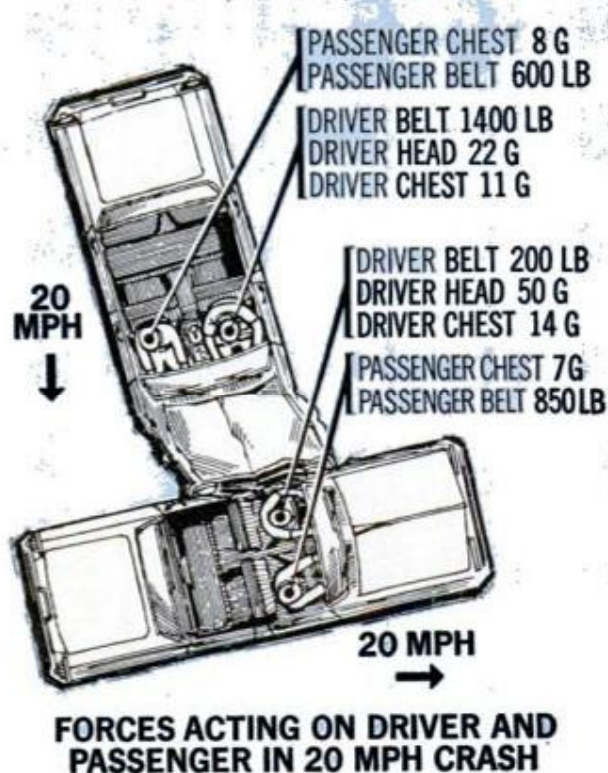
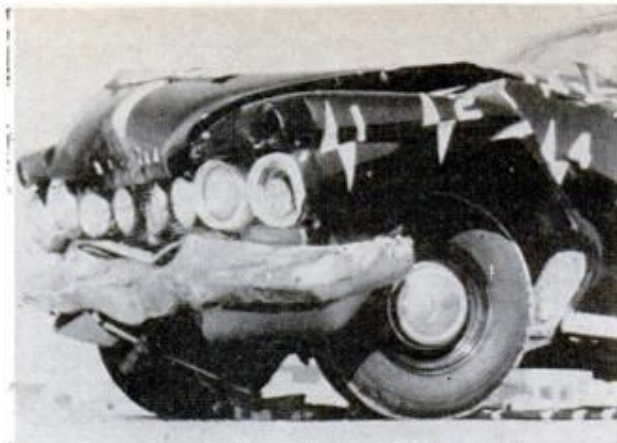
"Within 20 years, at the present rate of increase, we'll be killing 200,000 people per year. And we'll be putting 600,000 into bed or wheelchairs with permanent disabilities. We'll be inflicting other serious injuries on 18 million people per year, one person in every 14."

Goen believes that the easiest and quickest way to reduce the accident toll is to reduce speed limits and to rigidly enforce the lower speeds. He cites what happened last year on a 36-mile stretch of U.S. 101 in San Diego County, Calif., when the speed limit was lowered from 65 to 55 mph and more patrolmen were assigned to enforce the lower speed. Result: Accidents dipped 15 percent, even though traffic in the meantime had *increased* by eight percent.

SRI is convinced that the public has been lulled into false, fuzzy thinking about speed. It believes ideas like "speed itself is not hazardous" are based on misinterpretations of statistics, not on facts. So, too, are such ideas as "most fatal accidents occur at moderate speeds" and "the fastest drivers don't have the highest accident rates."

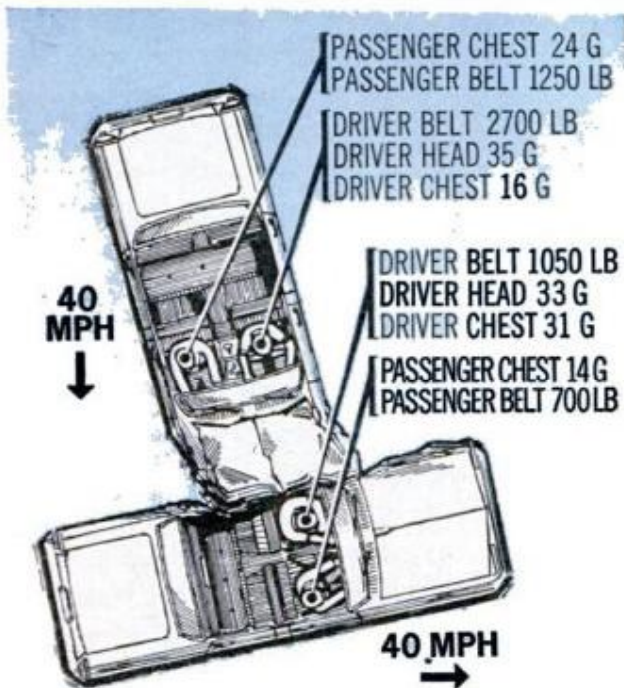
Goen's report quotes National Safety Council figures that show three out of five fatal accidents were at legal, and thus at "safe," speeds. So, in one year, about 30,000 people are killed at "safe" speeds.

SRI concludes that there is no such thing as a safe speed, that there are only degrees of safety, that a so-called moderate speed may be excessive for the conditions that prevail. To explode the "speed itself isn't hazardous" theory, it



20-MPH CRASH. Photos above by Automotive Collision Research Laboratory at UCLA show effects of side-impact crash with both cars going 20 mph. Sketch shows forces acting on drivers and passengers

points out that the death rate per vehicle mile at the Indianapolis Speedway has been 1300 times greater than that on California freeways.



FORCES ACTING ON DRIVER AND PASSENGER IN 40 MPH CRASH



40-MPH CRASH. Pictures above, also from UCLA, show how much more damage is done when the cars are moving at 40 mph. Note also how the forces acting on both drivers and passengers have multiplied

It's known that fast drivers can increase the accident rate, even though the fast drivers may not become involved themselves. The Bureau of

"The way we're going, we'll kill 200,000 a year by 1987."

Roads says that variations in speed among vehicles definitely increases the accident rate. This suggests that if the speed of the faster vehicles were reduced, the speed differential and, thus, the number of accidents would be reduced. In single-car accidents, such as running off the road at "moderate" speed and slamming into a tree, it's obvious that a slower speed would have reduced the chances of running off the road, and certainly the severity of the impact.

"Reducing speed can reduce casualties, even in situations where other factors are more responsible," says SRI.

Quoting National Safety Council figures, SRI shows that the fatality rate *per accident* rises sharply with increased speed. At above 40 mph the casualty rate rises at just about the square of the speed. This reflects the increase in multiple-death accidents at higher speeds. "Even if the accident rate is unchanged, fatalities would be reduced as speeds are reduced," SRI concludes.

Goen estimates that if all speed limits were cut in half (and enforced), traffic deaths would drop to about 6250 a year. This is one eighth of the present toll.

50 mph limit on freeways?

Even a modest speed reduction of only 20 percent would spare 25,000 lives per year, he estimates. This would mean reducing a typical 65-mph speed limit on freeways to 50 mph, reducing 50-mph rural highways to 40 mph, and imposing 15 to 20 mph limits on business and residential streets.

Aside from the lives saved, the 20-percent speed reduction would spare 77,000 permanent disabilities per year, two million other injuries and save more than four billion dollars in car repairs. The cost? Eleven more minutes driving time per day per driver.

"Except for commercial traffic, any

"When drivers get used to higher speeds on turnpikes, they may go faster on other roads, too."

increase in driving time seldom involves economic loss. The loss is in leisure time and annoyance," Goen says.

People can't see as well at night as in the daytime and this is one reason why the fatality rate at night is two and a half times the daytime rate. If night speeds were cut, the death toll would drop. A 20-percent reduction in night speed limits would save 13,000 lives a year. A 40-percent reduction would save 21,000 lives a year.

Put another way, if day speeds were cut 20 percent and night speed limits reduced by 40 percent, the lives saved

save as many lives as their designers claim. "Turnpikes may reduce the fatalities per vehicle-mile but whether they reduce the total number of fatalities has not been proved. There's the possibility that when drivers get used to higher speeds on turnpikes, they may go faster on other roads too, thus increasing the fatality rate on conventional streets and highways.

"Another factor is that people now buy a home 20 miles or more from work because a superhighway allows a driving time of 40 minutes one way, versus one hour by ordinary roads. But without the superhighway they would live closer in, say within 20 minutes' driving time. They actually increase their driving by 40 minutes a day and have higher driving costs because of the superhighways."

Tending to confirm Goen's suspicion is a survey just finished by the California Highway Patrol. The report says that single-car crashes are increasing, and that the rise parallels the spread of California's freeway network and the improvement of other roads. The conclusion is that drivers are getting into trouble because they don't have to concentrate on the road as much as they did before.

Drowsy drivers take chances

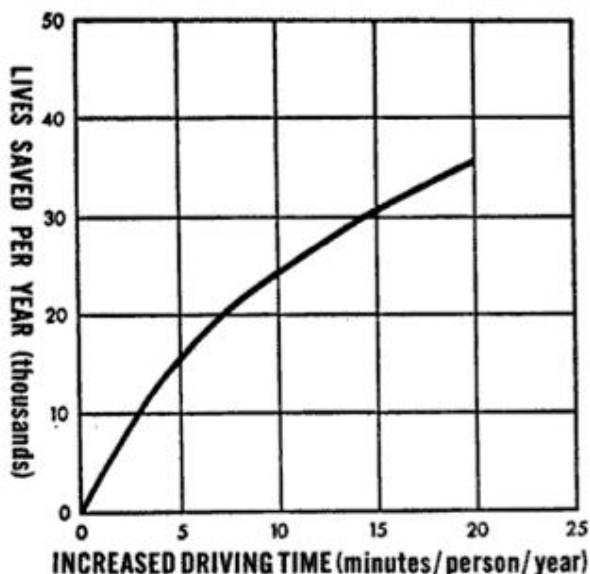
A CHP official says freeway drivers are tempted to keep on going, even though tired or drowsy. "They battle to keep their eyes open, and they see things that aren't there," he says.

"One man who was dying on a freeway told an officer he swerved his car to avoid a cow, though the nearest cow was miles away. A fatally injured driver said he had spun the wheel to avoid a child, though no child was in the area. An injured motorist said he tried to avoid a light plane that was making an emergency landing, though no light plane had flown in the area for days. This is driver-hypnosis, induced by fatigue."

When Dick Goen first proposed that

(Please turn to page 188)

LIVES SAVED BY INCREASES IN DRIVING TIME



GRAPH BY SRI shows we could save 15,000 lives a year by increasing everyone's driving time five minutes per day. By adding 10 minutes we'd save 23,000

per year would amount to 33,000. This would be at the cost of 16 minutes more driving time per day. "The selection of appropriate speed limits is a tradeoff between time lost at lower speeds and lives lost at higher speeds," Goen explains.

Goen is not exactly a true believer in super-highways. He says they do not



Telephone with a memory

Frequently called numbers are stored in the "memory bank" of a British telephone. The name of each such number—the weather bureau, the grocery store, etc.—is written directly on a magnetic tape. The tape is rolled into view, then the "call" button is pushed. The tape automatically dials the desired number.



He's found the right key

A music shop in Munich, Germany, features one nonmusical corner that's devoted to the shopkeeper's hobby, collecting keys. He has more than 200,000 of them, of all shapes and sizes to fit any kind of lock, and some of them are quite rare. He collects them chiefly by offering a key to fit a customer's lock, then asking for three keys—of any shape or size—in return. The merchant says that the key exchange helps lure in musical-instrument buyers.

SEPTEMBER 1967



Polaris, meet Poseidon

Twice as powerful and twice as accurate, the new Poseidon atomic missile for submarines poses (in mockup) alongside the most recent version of the Polaris missile. Still under development, the Poseidon is expected to take its place in nuclear-powered submarines in the 1970s. The Poseidon is three feet longer than the 31-foot Polaris and is six feet in diameter. The Polaris is 4½ feet wide. Both missiles are made by Lockheed.

75



We're dogging Charlie's tracks with

Four-Footed

tions in order to establish identification.

Prince had other ideas. He growled and lunged forward in the darkness. The intruder went for a grease gun slung around his neck. He was dropped by a scout riding "shotgun" for the handler and his dog.

Alpha Company maintained its position through the night. The following morning, Prince alerted to the patrol's right, again indicating the presence of Charlie. Two scouts ordered the enemy out. He came but made the mistake of pushing a Chincom carbine ahead of him!

As soon as word got back to H.Q., the brigade commander flew out and presented Prince with a battlefield commission—a second lieutenant's bar pinned onto a 1st Infantry Div. patch. The dog's handler was recommended for a Bronze Star Medal.

Prince had prevented Alpha Company from walking into a squad of Vietcong who were trying to ambush American patrols in the Thu Duc District. Alpha Company not only racked up two KIAs (killed in action), plus the enemy's guns, ammunition and grenades, but came through the encounter without a scratch.

Said one soldier, "Without Prince, there would have been a lot of cold turkeys in Alpha Company that night."

"Ever since the Vietnam war began, Charlie has been hitting only when everything has been to his advantage," explains Sgt. Jesse Mendez, chief of instructors for scout-dog training. "His advantages are now tripped up by the scout dog, something he's never had to contend with before."

Prince is just one of hundreds of scout dogs now serving the American infantry in Vietnam for a multitude of purposes, including combat and reconnaissance patrols, sweeping operations,

Scout dogs in Vietnam can detect trip-wires, tunnels, buried ammunition, mines, traps—even flush out VC

By JOSEPH ALBINO

ON THE NIGHT of Oct. 7, 1965, Prince, a scout dog, was on point for Alpha Company of the 2nd Battalion, 18th Infantry in the Thu Duc District of the Bien Hoa Sector in Vietnam. Just 150 yards short of where Alpha had planned to establish an ambush site, he alerted to a live scent.

The squad leader, advised by the handler of the dog's alert, instructed his men to set up a defense perimeter. An hour later, Prince again alerted, indicating that someone was approaching. Because other American patrols were in the area, the squad leader and handler began to rise from their posi-

Radar in Vietnam

village clearing missions and security. Scout dogs, trained to alert to sound, sight and scent, can detect tunnels, false walls, hidden documents, decoys, traps, buried mines, snipers, spider holes, punji sticks and trip wires. Though the exact number of dogs is classified, it is safe to say there is a scout-dog platoon serving with every major Army and Marine group in Vietnam.

If a popularity contest were held in Vietnam tomorrow among the fighting forces, the scout dog would win hands down. Many an infantry soldier who has seen the dogs in action re-enlists and trains to become a dog handler. Joining a scout-dog platoon as a handler is one of the quickest ways for a professional soldier to return to Vietnam. But the scout dog isn't at all popular with Charlie. In fact, according to captured VC documents, snipers are instructed to aim low to hit the dogs. "Shoot the dog first," the instructions read, "then the handler."

The scout dog appears to have initi-

ated more firsts than any other fighting group in Vietnam. For example, during action in the Ira Drang Valley in the summer of 1966, Tiger, a scout dog with the 25th Scout-Dog Platoon gave an alert at 300 yards and kept a company from walking into a battalion-size ambush.

Says Lt. Teddy Hampton, "After Tiger gave the alert, the company swung left and hit just the trailing edge of the ambush. In the ensuing fire fight, the company suffered only light casualties. *But what was so great about this action is that it was the first time an American soldier had fired at Charlie first.* Then Charlie fired back. His first shot killed Tiger, who was at the point. The second wounded Brown, Tiger's handler. The company commander recommended Tiger for the Silver Star and Brown for the Bronze Star with V for valor."

Because of the scout dogs' effectiveness, they are worked literally day and night. In less than 60 days during the Ira Drang Valley action, Lt. Hampton's

HIDDEN BUNKER IS FOUND by Army scout dog in jungle. Other scouts flank handler as dog closes in

"VIETCONG" SURRENDERS. Dogs are kept in training by using soldier, with unfamiliar scent, as decoy





HANDLER CONCENTRATES ON DOG'S ALERT while others in patrol "ride shotgun" to return sniper fire

scout dogs went out on 310 patrols and were directly responsible for the capture of 41 PAVN (People's Army of Vietnam), 113 rucksacks, 70 VC suspects, and 6 weapons plus "all kinds of discarded equipment including canteens, pots, grenades, uniforms, meat hooks, etc."

Early in the war when Americans were merely advising South Vietnamese troops, it was learned that the VC would dig an opening under the water's edge on the bank of a river and hide in a hole just above the water's edge. They lived by breathing through a tiny opening leading to the surface. The South Vietnam forces searched for these hiding places by banging a large pole on the ground.

"Why use this method?" asked the American advisors. "This is how we've always done it," was the reply. *About time to change*, thought the Americans who brought in scout dogs.

Many—Americans and South Vietnamese—couldn't believe that a scout dog could detect a VC hidden under the ground simply by "catching" the scent coming through a tiny air hole. From the beginning there was doubt and skepticism that scout dogs could be used effectively in counter insur-

gency warfare. Because of the successful results obtained by the advisors early in the war, scout dogs are now high on Gen. Westmoreland's priority list.

In April, 1963, on the outskirts of a village in the Central Highlands, a scout dog detected Charlie hidden in a hole under a trapdoor, over which infantrymen had walked. The dog simply sat down on the ground with his nose pointed straight down and scratched. When the Americans dug at the spot, they discovered a propaganda agent with fistfuls of anti-American literature. The agent, it turned out, had just arrived from Hanoi and never got a chance to do his dirty work—thanks to a scout dog.

In another village, the same dog alerted to several tunnels by sitting down in front of the hole with his ears up and his muzzle pointed down. It takes real guts to go into a booby-trapped VC tunnel, but the handler drew his .45 and, with the scout dog leading, went

NOSE KNOWS. Scout dogs have succeeded in detecting VC hidden in water-level holes on river banks



in. When the VC hidden in the tunnels saw the big dog at close quarters, they surrendered immediately. That day the handler and his dog flushed 13 VC from their tunnels.

Whenever patrol leaders have disregarded a dog's alert or elected not to use the scout dogs, their mission results have been less successful. During an operation near Phouc Vinh a patrol had just finished sweeping a village when the scout dog gave a weak alert to the right and about 30 yards ahead of the men in the dense jungle. The handler informed the commander the dog was holding the alert on a dead scent. The commander deployed a defense perimeter 25 yards wide and sent scouts in to check. They returned without finding anything.

The commander, skeptical about the alert, was about to regroup. But Sgt. Mendez, who has had 16 years' experience with war dogs and has a collection of springs taken from booby traps found by them, was with the patrol.



AFTER A HARD DAY, dog and handler are flown to new assignment. Handler carries supplies for both

CHOW TIME and scout dog gets treat. From start of training, handler and dog are never separated



"Sir," he said, "if the handler says there's something there, it's there." The commander sent his forces out a second time. They came upon no less than 380 bags of rice perfectly camouflaged on mats of bamboo in the dense undergrowth. Documents found with the rice indicated that Charlie had planned a major offense in the area. Thanks to the scout dog, the plans never came off.

Near Houng Bong Village in Houng Tra District, a patrol group thoroughly searched a suspected house without finding anything awry. Scout dog Seppi and his handler were brought in. The dog alerted to one particular corner. Further investigation revealed a false wall behind which a female VC agent was hiding in a spider hole (counterpart of the American foxhole).

Time and again, scout dogs have saved lives by alerting either to booby

traps or to the enemy. On April 19, 1964, after an American patrol entered a VC stockade, scout dog Fels alerted strongly to scents left by the VC. The men proceeded uphill in the direction of the alert and Fels gave an aggressive alert.

Standing on his hind feet, he lunged forward straining at his harness, his hair bristling. The handler shouted a warning. Everyone hit the dirt and Charlie opened up with captured Browning automatic rifles. The forward element of the 90-man patrol returned the fire, and Charlie withdrew.

Eleven times that same day Fels alerted in the same way. The patrol later learned that it had been continually running into a large enemy force fighting a withdrawing action. Though two Americans were wounded, if it hadn't been for Fels, the entire patrol could have been annihilated by VC ambushes.

Until 1965, the 26th Platoon was the

only complete infantry scout dog platoon in existence. A holdover from World War II and Korea, the 26th I.P.S.D. was used to support infantry school problems in training officer candidates at Fort Benning, Ga., largest military base in the world.

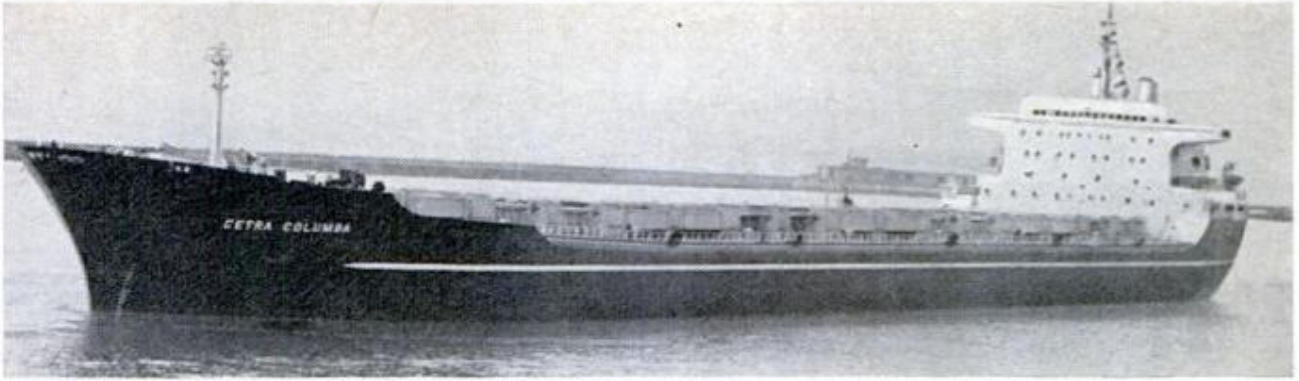
However, because of the success American advisors had in Vietnam using dogs for the first time for counter-insurgency warfare, the Army decided to again make active and extensive use of the German shepherd as a war dog. A training program was established, and in Dec., 1965, the 25th and 35th Scout-Dog Platoons were formed at Fort Benning—the men coming from the professional army infantry and the dogs from Main St., U.S.A.

Currently, regardless of what service is to use them, the Air Force is responsible for procuring all dogs at their induction center at Lackland Air Force Base in Texas. The Air Force prefers

(Please turn to page 194)

DOG TIRED, this team sacks out after a combat assignment. Army and Marines use medium-size German shepherds because they can move easily through heavy underbrush and don't tire as quickly as larger dogs





Biggest coal carrier to make Atlantic runs

Recently launched at St. Nazaire, France, was the *Cetra-Columba*, described as the world's largest collier. The ship, which weighs 86,000 tons, is over 880 feet long. Powered by an 18,500-hp diesel engine, the vessel has a speed of 14 knots. It will be used to carry coal from the United States to a power station at Le Havre in northern France.



Clean air for customs men

After customs men at Constanz, between Germany and Switzerland, found they were becoming ill from auto-exhaust fumes, they installed four giant chimneys to suck up the fumes and disperse them. Other border stations will follow suit if this one is successful.



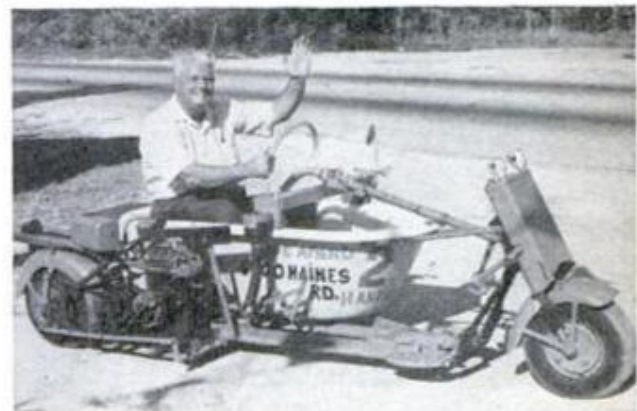
Self-propelled cable car

Twenty-five seated passengers can ride in the fiberglass gondola of the new Aerial-Bus operating at Custer, S.D. The cable of this system remains stationary; rubber pressure rollers and grooved tires, driven by a 150-hp engine, grip the cable and move the gondola.



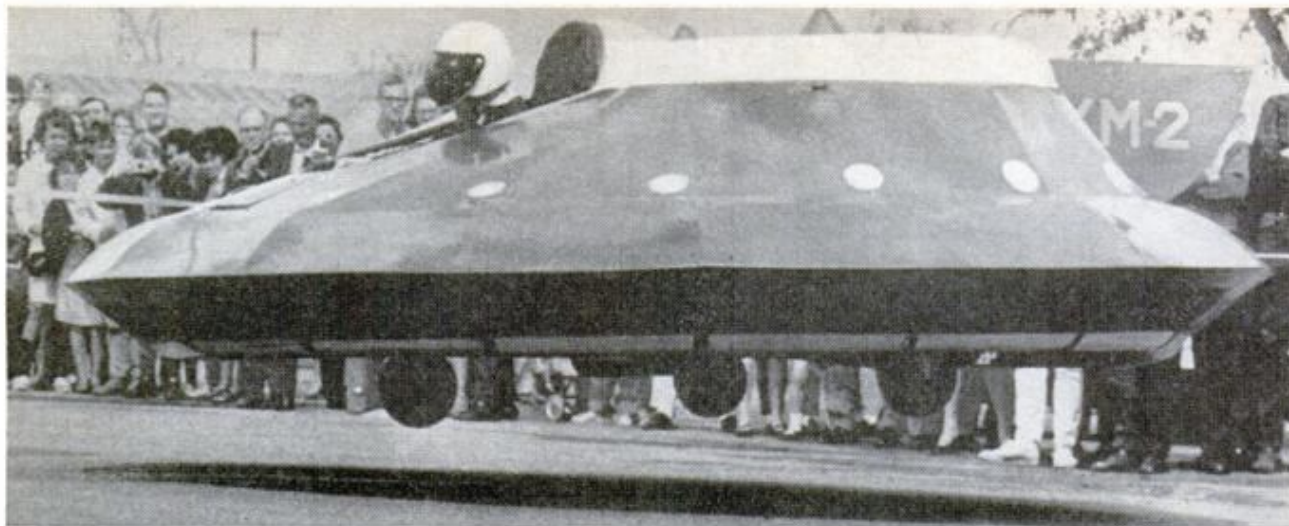
And the kiddies' pictures?

Carry an identification photo in your dentures. That's the suggestion of Dr. Irwin Altheim, head of dentistry in Cook County (Ill.) institutions. The denture could also carry a social security number and emergency information like blood type, he suggests.



Clean lines on new model

Fishponds made of bathtubs are old hat, and lots of people have put outboards on tubs and sailed them. So what do you do to be different? Add a motor and wheels, as Doc Amend of St. Petersburg, Fla., did. (It helps if you own a second-hand store, as Doc does.)



Who says they don't exist?

You had better believe residents of Davis, Calif., when they say they have seen flying saucers. They have. Paul S. Moller, professor of aerodynamics at the University of California, has given his first public demonstration of a saucerlike craft he's designed. The craft is 14 feet in diameter, four feet high, and is powered by four 90-hp engines.

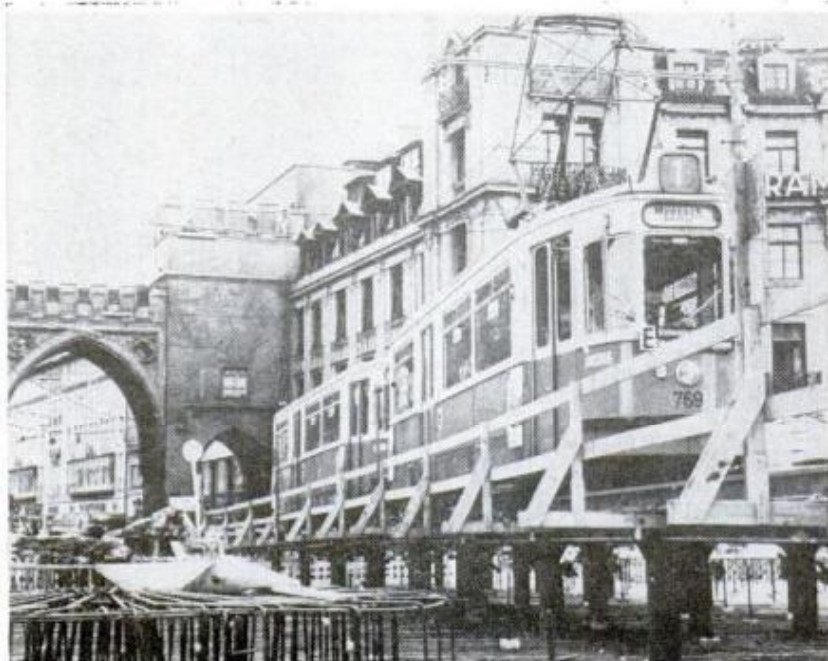


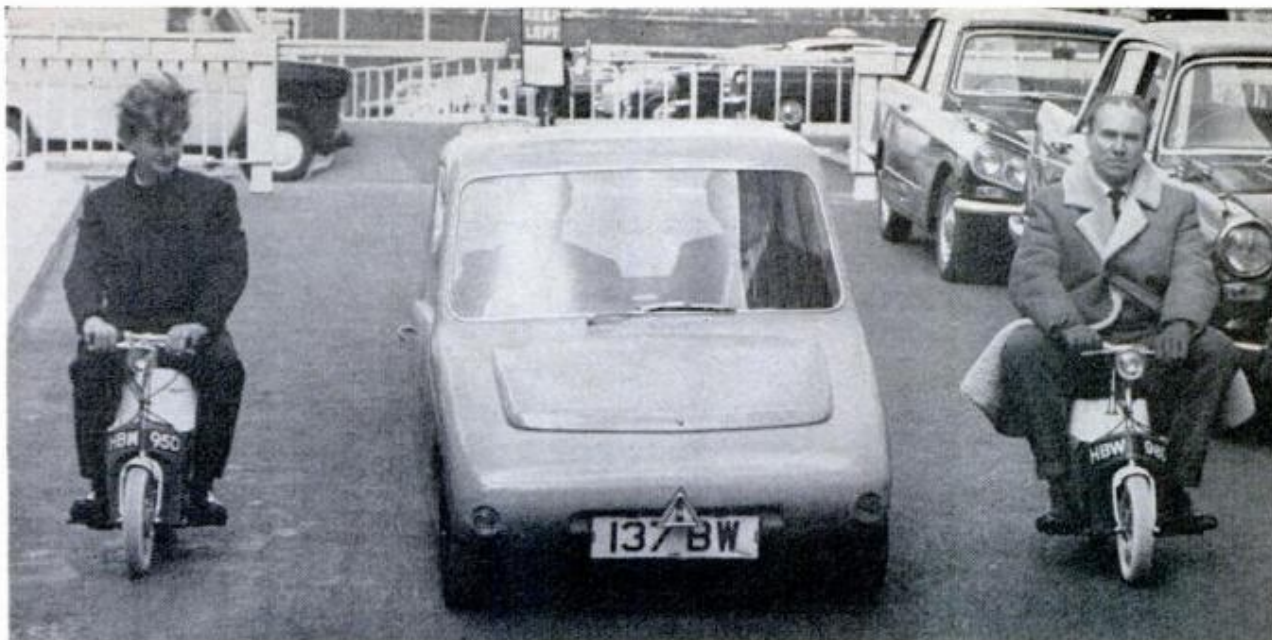
TV spits out printed news

You may soon turn on your TV set and get an actual printed copy of the daily weather map, the latest stock-market quotations, or your favorite comic strip—delivered right in your living room. According to recent tests by RCA, printed words and pictures can be transmitted to home viewers by electromagnetic signals that "hitchhike" on regular TV broadcasts. In the home, the electromagnetic signals are converted back into printed form by a device similar to the electrostatic copying machines now commonly used in offices. In the photo at left, a weather map rolls out of the receiver without affecting the picture of a pretty girl on the TV screen.

Elevated streetcar

Though the tracks are built on pillars, this is no overhead railway. It's a streetcar crossing Stachus Square in Munich, Germany. The trolley used to run at street level, but construction of an underground railway forced engineers to raise the streetcar tracks high in the air so service would not be interrupted. Once the excavation is complete and the steel meshing for concrete is laid, the concrete will be poured, the street repaved and the trolley tracks returned to their normal street level. The electric lines have also been elevated to power the trolley.





All-electric transportation

Two electric scooters flank a completely new electric car capable of driving 50 miles at an average speed of 25 mph. The new two-seater car with plastic body uses conventional batteries. It can make 176 start-stops while traveling 30 miles in heavy traffic. The car was developed by Tube Investment Co. of England. It is not presently in production.



New in golfing circles

Pat Simmons, a teaching golf professional, displays an innovation in practice putters for golfers seeking perfection. The head of this putter is a metal sphere of the same size as a golf ball. Anything but a square hit sends the ball quite wide of the cup either to the right or left. A perfect hit sends the ball down a straight line.



A real live be-in

You have to be *in* "The Star Garden—A Place," not simply looking at it from the outside. On view at New York's Museum of Modern Art, the Garden has no importance without people inside. It packages people in endless space, says Les Levine, artist. The structure is made of clear plastic, heated then shaped by jets of air.



Memo to VW: Your Competition Is Loaded for Bear

By TONY HOGG

Photos by Irving Dolin

VOLKSWAGEN, definitely top dog in the U. S. imported-car market, has some tough competition on its hands. Not only are French, Italian, Japanese and fellow German competitors building good and in some ways better cars, but they also have as their avowed purpose knocking VW off its sales leadership perch.

Renault, Datsun, Fiat and Toyota are backing their overall efforts with programs aimed at building "in depth" dealer organizations and Opel, General Motors' German subsidiary, is marketing its cars through certain Buick dealers. All this scrambling for sales can only add up to the kind of shoot-out, go-get-'em competition that inevitably results in more car for the money.

Recently added to the list of those zeroing in on VW is American Motors' "\$1839 Special," an as-is, no-nonsense Rambler American that is bound to attract many buyers. Here, however, this story is confined to foreign-made economy cars.

The history of the small imported sedan in the United States over the past

20 years has been somewhat checkered. From a slow start, sales built up to a point some ten years ago when any and every manufacturer was shipping cars into the market. Some of these cars were quite unsuited to American conditions. Others should never have left the factory gates.

But the position now is that a few established manufacturers, led by Volkswagen, are fighting for a share of the small-sedan market. They are doing so through distributors and dealers who have strong factory backing, are properly equipped to handle sales and service, and are seemingly in the market to stay. So it's an appropriate time to examine and evaluate the six most popular imported sedans selling for less than \$2000.

Obviously, as No. 1, the ubiquitous VW "Beetle" is the yardstick and basis for comparison. In second place, and gaining, is the Opel Kadett, built by General Motor's German subsidiary. Following these two, but not necessarily in order of importance, we selected the Italian Fiat 124, the French Renault



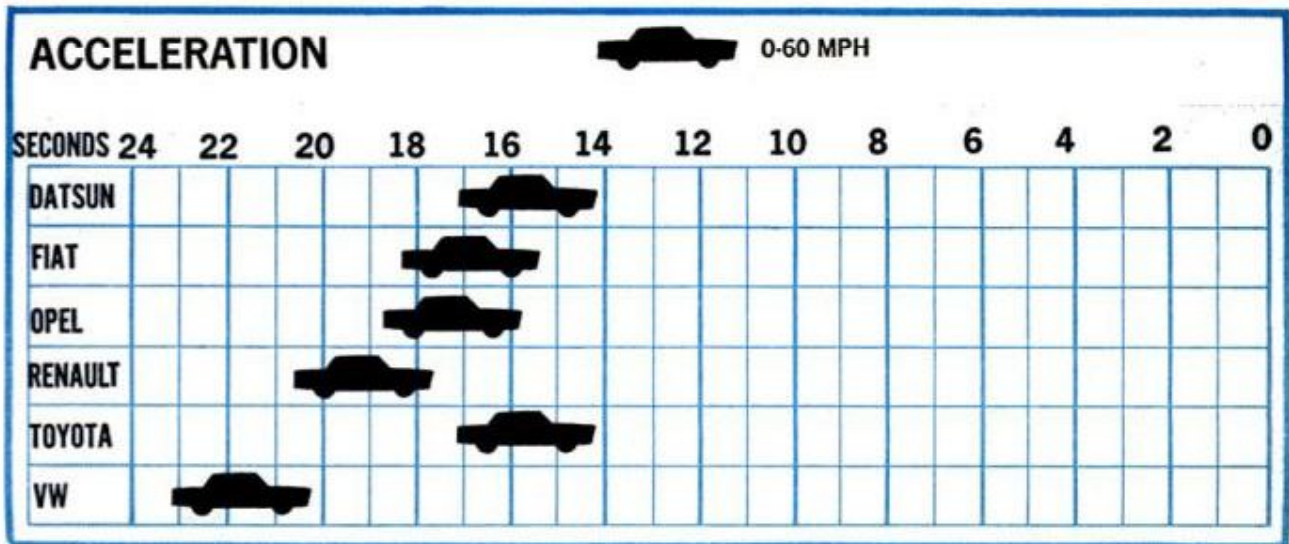
LINED UP for tests at Mount Pocono (Pa.) airport are (from left, opposite page) Volkswagen 1500, Fiat 124, Opel Kadett, Renault R 10, Toyota Corona and Datsun RL 411. Tests proved each unique in own way

R 10 and the Datsun RL 411 and Toyota Corona from Japan.

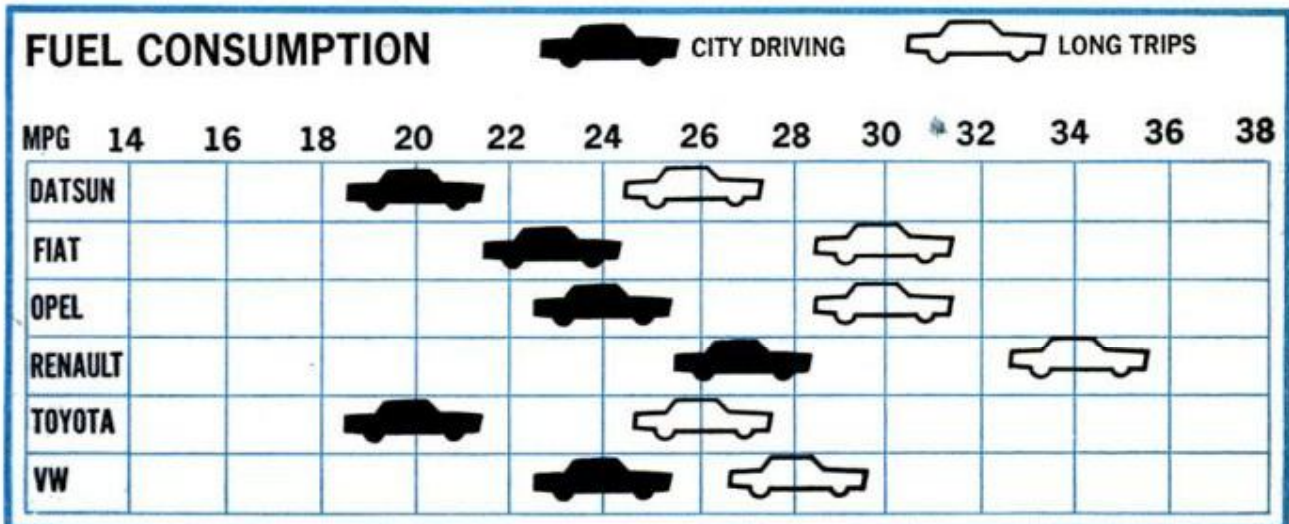
Before attempting a detailed evaluation of these cars, it is necessary to es-

tablish their position in the market, consider their good qualities and investigate their shortcomings.

First of all, if you are planning a



JAPANESE DATSUN proved fastest away from mark in 0-60 acceleration tests, followed closely by Toyota, both with automatic transmissions. Driving to test site, Datsun showed better-than-average passing power



MOST MISERLY gasoline consumption was shown by Renault R 10 for both around-town and cross-country trips. Each car tested normally burns regular grade gas, providing additional overall economy of operation

vacation trip in one of these cars, taking the three kids and the Doberman pinscher, forget it, because you would be all played out by the time you got half way to anywhere. On the other hand, if you are considering buying a second car, or if you are single without a family, a small import might be just the answer.

The primary attraction is low initial cost, plus low running costs. The low running costs are not confined to fuel economy alone, because each of the cars tested is powered by a simple four-cylinder engine requiring a minimum of maintenance and a minimum of replacement parts when any are needed.

Added attractions are ease of parking, more room in the garage, and the fact that it is not really necessary to have 300 horsepower in a vehicle 17 feet long in order to make a trip to the drugstore. Also, from the family viewpoint, a small import is a good vehicle for teen-agers at the start of their driving careers—before being let loose in the full-sized family sedan.

On the debit side, because of its limited capacity, the small sedan cannot be considered as an all-purpose family vehicle. On long trips—even with one or two in the car—it becomes tiring to drive because of its comparatively firm suspension, relatively high noise level and, in most cases, the necessity for shifting gears manually. Thirteen-inch wheels are normal with a tire section in the region of 5.60, which means that road irregularities—such as expansion joints in concrete—can be felt and heard in a much more pronounced way,

and the noise is magnified by the use of unit construction bodies.

From the performance standpoint, each car tested was found to be capable of holding its own under all driving conditions, except that acceleration for passing purposes and also hill-climbing proved marginal in the lower-powered cars when loaded with four people and luggage. I found road-holding, steering and braking superior to the average American sedan in each case. So was mpg. When considering mpg, it must be remembered also that you can use regular-grade fuel.

It's not the purpose here to make any recommendations, but rather to make an accurate assessment of the facts in order to assist a potential buyer. Therefore, I'll take each car in alphabetical order.

DATSUN RL 411 4-DOOR SEDAN

Base price: \$1846

Engine: In-line 4, 1595 cc (97.3 cu. in.), 9:1 compression, 96 bhp @ 6000 rpm

Gearbox: 4-speed all synchro; 3-speed auto

Brake type (front/rear): disc/drum

Dimensions: 157.3 long, 68.7 wide, 56.3 high, 93.7 wheelbase, 1984 weight

Performance (0-60): 15.2 seconds

MPG: 20-26

Warranty period: 12 months/12,000 miles

The Japanese once had a reputation for being copiers rather than innovators. And, small motorcycles excepted, only recently have they entered the worldwide automotive market. Furthermore, when they copy, they tend to improve at the same time. With four doors, adequate head and legroom and a good trunk the Datsun makes effi-

DATSUN driver, front passenger room was rated good, fair for rear passengers. Headroom is only fair

FIAT leg and headroom were rated good up front and in the rear. Car is well finished, quite comfortable

OPEL fastback styling restricts rear-seat leg and headroom. Front-seat accommodations were rated good





CORNERED HARD, Datsun proved able to track quite well, showed little tendency to break loose aft. Suspension on test car proved a bit stiff, but factory is reportedly modifying entire setup to accommodate American driving expectations, general road conditions

ROOMY FIAT 124 proved lively all-'round performer, offered best braking power of all cars tested. Along with Renault R 10, Fiat is equipped with disc brakes fore and aft. Unique rear suspension setup enables Fiat to handle like car with an independent system



cient use of the available body space.

My test car was equipped with an English-made Borg-Warner Type 35 automatic transmission which costs an additional \$150. The automatic increases fuel consumption and decreases performance potential, but with 96 bhp the car is the most powerful of those tested and, consequently, its performance does not drop off as much as the load is increased.

Suspension, brakes and steering are not up to the high standard set by Renault or Fiat; the suspension in particular seeming harsh, although we understand that the factory is correcting this fault. Because of the bigger engine, and the automatic, which has peak shift points at 40 and 58 mph, the Datsun is better suited for long trips than the other cars in the test series.

FIAT 124 4-DOOR SEDAN

Base price: \$1798

Engine: In-line 4, 1197 cc (73 cu. in.), 8.8:1 compression, 65 bhp @ 5600 rpm

Gearbox: 4-speed all synchro

Brake type (front/rear): disc/disc

Dimensions: 158.7 long, 64 wide, 53.7 high, 95.3 wheelbase, 1808 weight

Performance (0-60): 16.8 seconds

MPG: 23-30

Warranty period: 12 months/12,000 miles

Fiat has a virtual monopoly of the Italian automobile industry. The recently-introduced 124 has been chosen "Car of the Year" by a group of European journalists. With 65 bhp from its 73-cu.-in. engine, the Fiat engineers have squeezed a quart out of a pint pot and, like most Italian cars, the Fiat has definite sporting tendencies. The upholstery is pleated vinyl and, from the

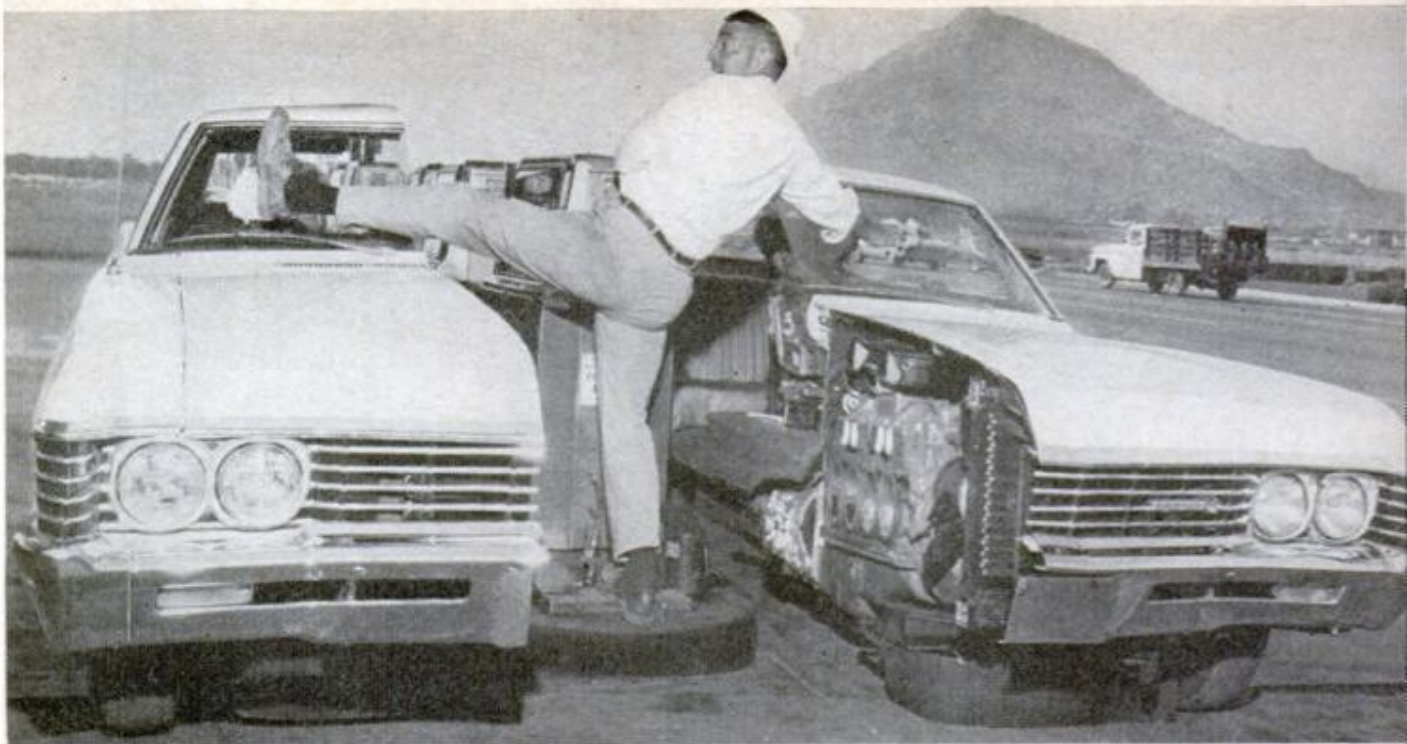
(Please turn to page 186)

RENAULT was rated good, being roomy and comfortable in back and up front. Interior is handsome

TOYOTA leg, headroom was rated good up front, fair in back. Car is spacious, above average in comfort

VOLKSWAGEN "Beetle" body crowds things a bit in rear. Driver, front-passenger room was rated good





THERE'S NO PROBLEM about which side of the pumps to pull up to when driving into a gas station: The AMT-customized Impala splits down the middle and pulls up on both sides. One TV sequence has car doing that

'You go your way; I'll go mine'

Chevy's new television-commercial car has a split personality that's really split!

IT LOOKED LIKE AN ACCIDENT and a deputy sheriff was flagging down traffic at the scene, near Scottsdale, Ariz.

"What a terrible thing!" exclaimed one shocked woman driver. "Why, that car is cut right in two, straight down the center line!"

And so it was—but on purpose!

You've seen the car on television. It's the Chevrolet Impala Super Sport that charges a traffic cop, splits in two at the last possible moment, goes around both sides of him then joins together again. It's the car that comes apart in traffic, leaving one side behind. It's the car that drives into a gas station and splits apart so that each half parks on its own side of the gas pumps.

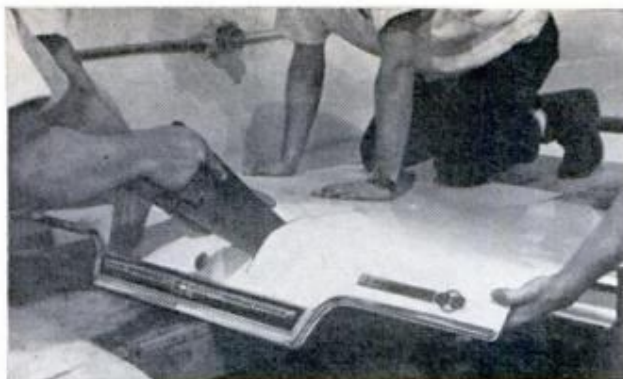
These and other eye-grabbing antics were conceived in the world's zaniest automobile factory, AMT's speed and custom division in Phoenix. This spe-

cialty shop remanufactures vehicles for TV and movie film makers.

It was here that the U.N.C.L.E. car was created, with its flame thrower, rocket launchers and smoke screens. From AMT, too, came the "Get Smart" car, complete with its pay phone and a slot mechanism that switches the numbers on the license plates.

Even Detroit's big factories are regular customers at AMT. Chrysler's 300X dream car of the future, with its padded steering handles and a video readout for speed, engine temperature and mpg, was produced in secret at the Phoenix shop. This year's space-age Mercury show car, with oblong headlamps and a rear deck that opens from the side, likewise was produced in Phoenix. So, when Chevrolet decided to have a car cut in two, its officials beat a path to the Arizona factory.

"We want to show the public a cross



IT ONLY LOOKS as if a giant bandsaw cut through the car in one slice. Each part was painstakingly cut—the body with a handsaw—then touched up



THE FORE AND AFT CUT was actually made to the right of the center line to leave the drive train intact. The left side can do 40 mph on its own

section of a Chevrolet," they told Don Beebe, AMT's Phoenix manager. "It has to do tricks, to capture attention, then we'll use the cross section to point out the car's qualities!"

Don got together with Gene Winfield, AMT's designer and custom carbuilder, and they worked out a way of creating this newest idea. It was decided to make the cut almost five inches to the right of the center line so the transmission and drive train would remain in working order. The engine, too, was left intact, though it projects out into the cut. All this was necessary because the left side of the car was to be completely drivable at up to 40 mph. The radiator was cut, plugged and filled with coolant. Brake lines were blocked off to provide braking to the two left wheels. Fuel comes from a small concealed tank.

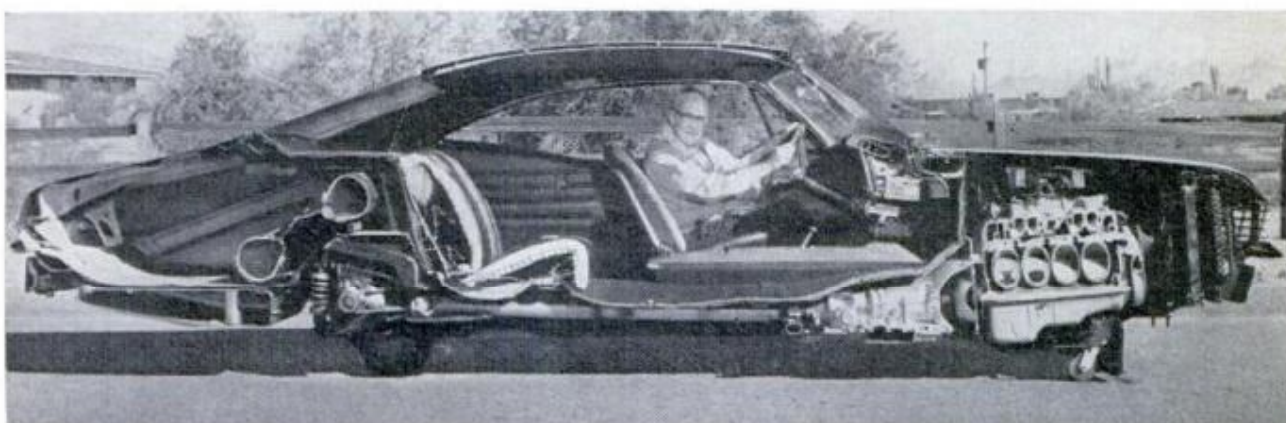
"First thing we did," reports Winfield, "was remove the body from the

chassis and then slice the chassis in two with a torch, using a bandsaw for such items as the gasoline tank and the radiator. There was no trouble with the differential because it is of the posi-traction type, though we did have to install a bushing type of bearing and an alignment hub for it.

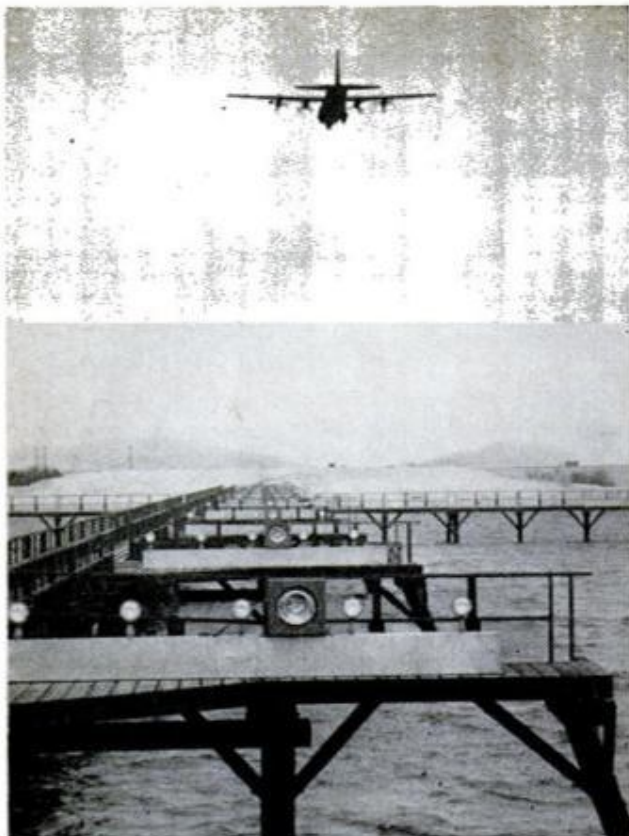
"Each half of the car is supported by a pair of small dolly wheels in addition to its two regular wheels. You don't see the dolly wheels on TV—they are masked off with black cardboard.

"We reworked each side of the suspension, using airbags for partial support. The heavy engine was tied back to the frame with concealed brackets. One problem was how to cut the spare tire and wheel in two, since the tire had to appear to be inflated even though cut apart. We solved this by filling the tire with foam-in-place plastic, allowed it to dry, then cut right through the

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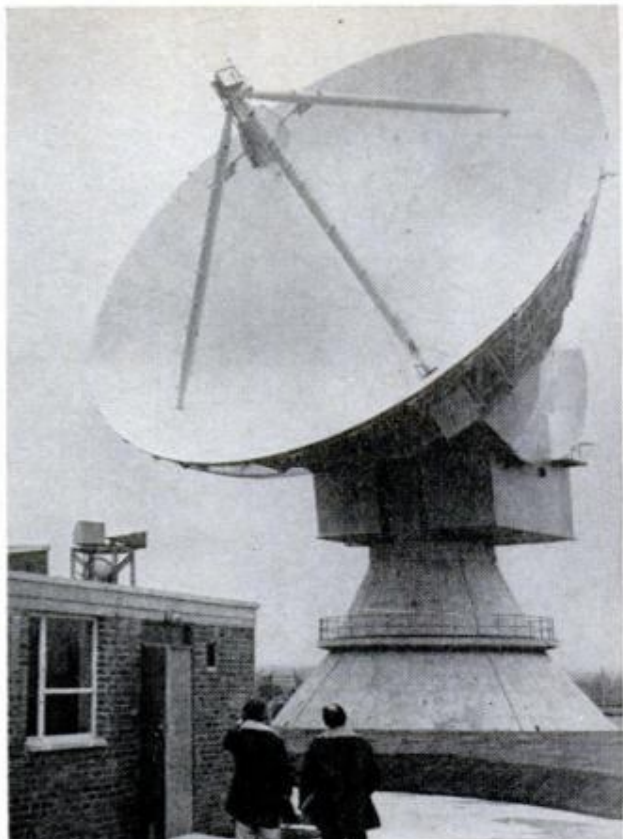


BUMPER-TO-BUMPER PROFILE reveals all the technical details of what lies under the skin of a Chevy Impala. Not standard equipment are the small dolly wheels which hold up the right side of the left half of the car. PM's Tom Stimson, after coming to a stop here for the photographer, wryly commented, "Good visibility"



Lights up for touch down

Part of the landing-approach control system at Cam Ranh Bay Air Base in Vietnam is a series of strobe lights that guide aircraft down toward the landing strip. The lights are turned on during inclement weather. A radar system (RAPCON) guides aircraft down to within 100 feet of the runway, and from there the pilot follows the lights to a landing.



430-ton listener

Newest and second largest satellite tracker in the United Kingdom, this radio telescope is fully steerable and capable of operating at wavelengths as low as three centimeters. The antenna weighs 430 tons, is 82 feet high and is located at Chilbolton. Britain's largest tracker, located at Goonhilly, is three feet greater in diameter than this new one.



Early start for Grand Prix

With a Formula One-style body and a lawnmower engine, the tiny Barnard Formula Six racing car enables English 7-year-olds to buzz around small tracks in Grand Prix style. The cars are the work of Tom Barnard an ex-racing driver who built the first one for his son. When it attracted attention, he built others for other youngsters and started selling them in kit form. Depending on engine size and gear ratio, the cars can go up to 60 mph.



A handful of fuel

Jellied for safety, aircraft fuel may now come by the pound instead of by the gallon. Already tested in a Pratt & Whitney jet engine, the fuel turns to liquid when it is pumped into the engine. In the emulsified state, it is safer from fire and spillage than standard jet fuel.



Technician in a teacup

A big tub is the best way to get close to check a model of a submarine that's soon to be constructed for Dr. Jacques Piccard. Called the PX-15, the 50-foot sub will be taken on a 1500-mile underwater voyage, drifting with the Gulf Stream from Miami to Nova Scotia. Dr. Piccard and five companions will make the trip in 1968.



Army's electric truck is powered by fuel cells

Now the Army is getting into the "electric-car" act. A new truck, called the M-37, uses four fuel cells which furnish electricity by combining hydrazine and oxygen. Each fuel cell produces 5000 watts of electricity. The exhaust is harmless water vapor and nitrogen. The test vehicle can climb grades of 20 percent and reach a top speed of 47 mph. The cost is still too high to consider using the fuel cells for conventional automobiles, according to Monsanto Research Corp., which developed it for the Army. Electric-powered vehicles could be very valuable in Vietnam, reducing the number of things that could go wrong when compared to a conventional engine, and offering silence of operation. Also the fuel cells could be used as an independent source of power for communications, emergency hospitals and other operations. The photos, above, show the fuel cells (upper left), the truck's dashboard (lower left) and the truck in operation.

Lions? Elephants? Hyenas?

“WHEN I FIRST CAME to Africa,” says Dr. Hans Kruuk, “I started off with the same ideas everyone has about hyenas.” By following hyena packs in a blacked-out car on moonlight nights, Dutch-born Dr. Kruuk soon discovered most of those ideas were wrong.

With America’s George Schaller, it

HOW MUCH DO

1. Lions are born killers.
2. Lions usually hunt alone.
3. A lioness never leaves her cubs.
4. A “pride” of lions usually consists of one male and a harem of females.
5. Male lions spend most of their time hunting and bringing food to the pride.
6. In every herd of elephants, one old bull is always the boss.

TRUE	FALSE
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____



“WALKING BUTCHER SHOP.” Thompson’s gazelles are most abundant snack for lions (left). Game managers must know how much predators eat, also if prey is big or little, young or old. Looking an elephant in the eye (below) is not as dangerous as it seems. He can’t see worth sour apples, but has a keen sense of hearing and a nose for B.O.



has been lions. With Dr. Ian Hamilton, an Englishman, elephants. Famous for his eye-opening studies of gorillas and tigers, Dr. Schaller is now making the first scientific study of the life and hunting habits of wild lions in their natural habitat.

Some of the most surprising new discoveries by the three naturalists, re-

vealed here, will be shown in more detail on Sunday, Sept. 10, when ABC-TV presents a four-hour, full-evening program on Africa. PM's pictures were taken for ABC by famed sports photographer Marvin Newman on Tanzania's Serengeti Plains, a 12,000-acre refuge with 1½ million head of big game.

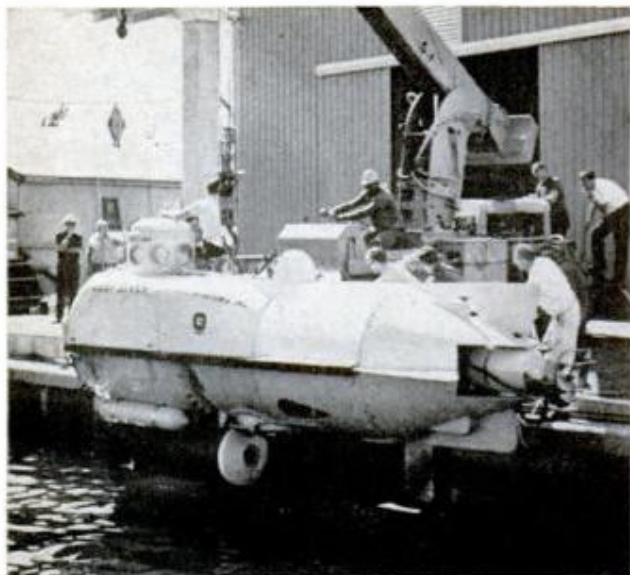
YOU KNOW THAT ISN'T SO?

	TRUE	FALSE
7. Elephants live about as long as man.	_____	_____
8. Elephants are hard on trees, but at least one tree can't live without them.	_____	_____
9. Elephants are deathly afraid of lions.	_____	_____
10. Hyenas are not hunters. They live mainly by cleaning up after lions and other major predators.	_____	_____
11. Hyenas always travel in packs.	_____	_____
12. Hyenas are picky eaters, waste much of what they kill.	_____	_____
13. Female hyenas dominate the pack.	_____	_____
14. Female hyenas withdraw from the pack to have their cubs and care for them.	_____	_____
15. Hyenas "laugh" to attract their mates.	_____	_____

To see how much you really know about the habits of these African animals, turn to page 184

KNOCKED OUT TEMPORARILY by tranquilizer dart from carbon-dioxide gun, hyena lies quietly while Dr. Kruuk determines age and sex. He will also make distinctive small cut in hyena's ears for future identification. Lions get ear tags. Some "carry" radios to help Dr. Schaller follow them over 50-mile migrations





Going to work underwater? Take a submarine 'taxi'

Divers will soon ride to work in a baby sub designed to speed them from job to job like a taxi. The 22-foot-long craft, called *Deep Diver*, can carry four men to a depth of 1250 feet—far below present working limits of about 400 feet. A "lock-out" chamber enables divers to enter and leave at the pressure of the surrounding water. Ocean Systems, Inc. is the inventor.



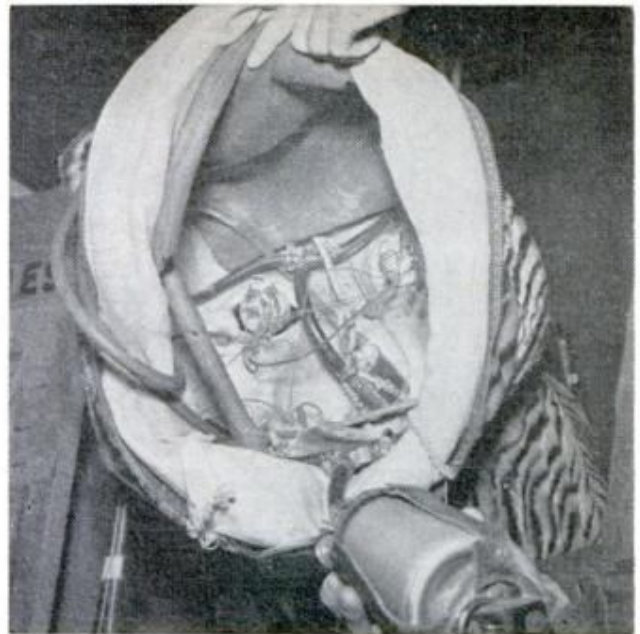
Icy test for 'survivors'

The strange-looking craft above is actually the cockpit section from an F-111 fighter-bomber. If there's trouble, the entire section parachutes free and is kept afloat by inflatable bags. In recent Air Force tests, a two-man guinea pig crew comfortably rode out 12-foot waves and 40-mph winds for 24 hours in the icy waters off Kodiak Island near Alaska.



Mobile nozzle fights fires

This new "fire truck" is merely a nozzle on wheels. The trick is that it can be fed by up to 12 pumpers simultaneously to throw a stream 300 feet—much farther than is possible from any hand-held hose. It can also be fed from a fireboat for fighting waterfront fires. It's dubbed "Quinn's Big Mo" after its designer, Chicago Fire Comm. Robert Quinn.



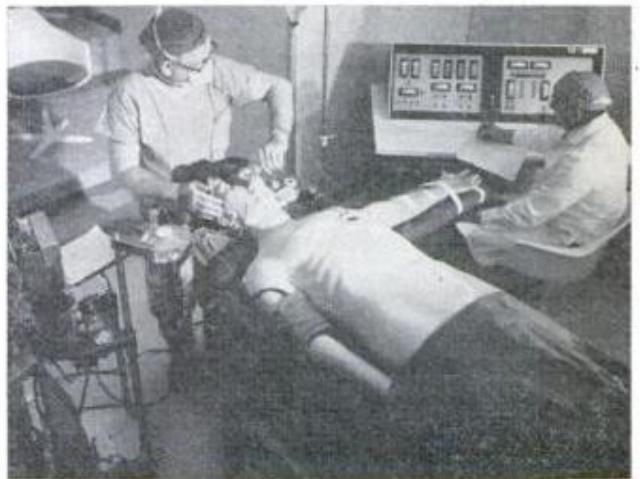
What makes a tiger tick?

Timmy the Tiger, an expert skater, has several other abilities beyond most tigers. He smokes a cigar, spurts water from his ears, winks his eyes—even flashes them blindingly. Timmy is shown at upper left as he appears in the Shipstads & Johnson Ice Follies. Suiting up at left for a Timmy performance are Rik McKinnon (fore) and Dick Cooper (aft). Inside the head (above) are most of the controls, such as wires to the eyes to make them wink, a rubber syringe full of chalk (the smoke), a soda-fountain dispenser for water and flashbulbs in the eyes.



Eight-wheel drive

The Twister, a new rough-terrain vehicle, can accelerate from standstill to 45 mph in 18 seconds and reach a top speed over 65 mph. The five-ton, eight-wheel-drive machine has two main body segments joined by a pivotal yoke. Independently suspended wheels at the front and a rear walking-beam suspension allow Twister to keep all eight wheels on the ground even over rough terrain. Lockheed is the builder of the new vehicle.



Does Blue Cross cover him?

Designed for the training of anesthesiologists, Sim One is a lifelike, computer-controlled manikin that functions like a human patient—even to responding to injections of drugs. Sim One has a heartbeat, pulse, blood pressure, breathing action, eyes that open and close (and pupils that dilate and constrict). Computer-programmed electronic systems control the action. Sierra Engineering Co. made the manikin to the specifications of Aerojet-General.

WHAT'S WITH THOSE NEW TIRES?

Today's technology adds up to improved driving safety

By GENE BOOTH

Illustrations by Donald Evans

TOMORROW'S TIRES are here today. At least, transitional tires—foreshadowing those for tomorrow's cars—have arrived. You can get them for an older car or, in some cases, you'll find them standard equipment or an option on a new car. They've been rolling onto the market in greater numbers during the past 18 months, and, not surprisingly, have added to consumer confusion about the business of buying and selling tires.

These new tires are bigger, fatter, bulgier, squatter, tougher. They last longer, have greater puncture resistance, provide better handling and mpg, afford higher top speeds, heavier load capacities, cooler running, and—ultimately—improved driving safety.

In addition, they're built of new plastic and polymer materials by new molding methods. They have vastly improved footprints and are designed to meet the demands of faster average speeds, longer trips, more vigorous driving and heavier and more powerful cars.

At present, these new tires come in three distinctive types—high-performance tires (sometimes called sports or police specials), typified by, say, Uni-



DESIGNED AND BUILT TO TAKE IT, the super tires of today must meet unusually rigid test standards. Checked here is cord strength, compound ruggedness

Royal's Tiger Paws and General's "Grrabber"; ultra-low profile types, known in the trade as "Series 70" tires, an example of which is Goodyear's Wide Boot; and radial or "belted" tires, such as Goodrich's Radial 990, a design concept upon which future tires will most likely be modeled. In fact, Firestone recently announced a new tire called a Wide Oval Radial, a Series 70 design built as a radial. All major tire producers have versions of each either on the market or about to be introduced.

However, before examining each type of tire with the idea of helping you se-

lect which one—if any—is for you, your car, and the type of driving you do, let's take a brief look at tire development background.

When ordinary passenger cars started performing in many ways like race cars of only a few years earlier, tire manufacturers realized they had to come up with better rubber. The Mustang probably started it all. It no longer was enough to allude merely to the racing laurels of a particular tire brand; instead, it became necessary to build passenger-car tires actually approaching racing capacity.

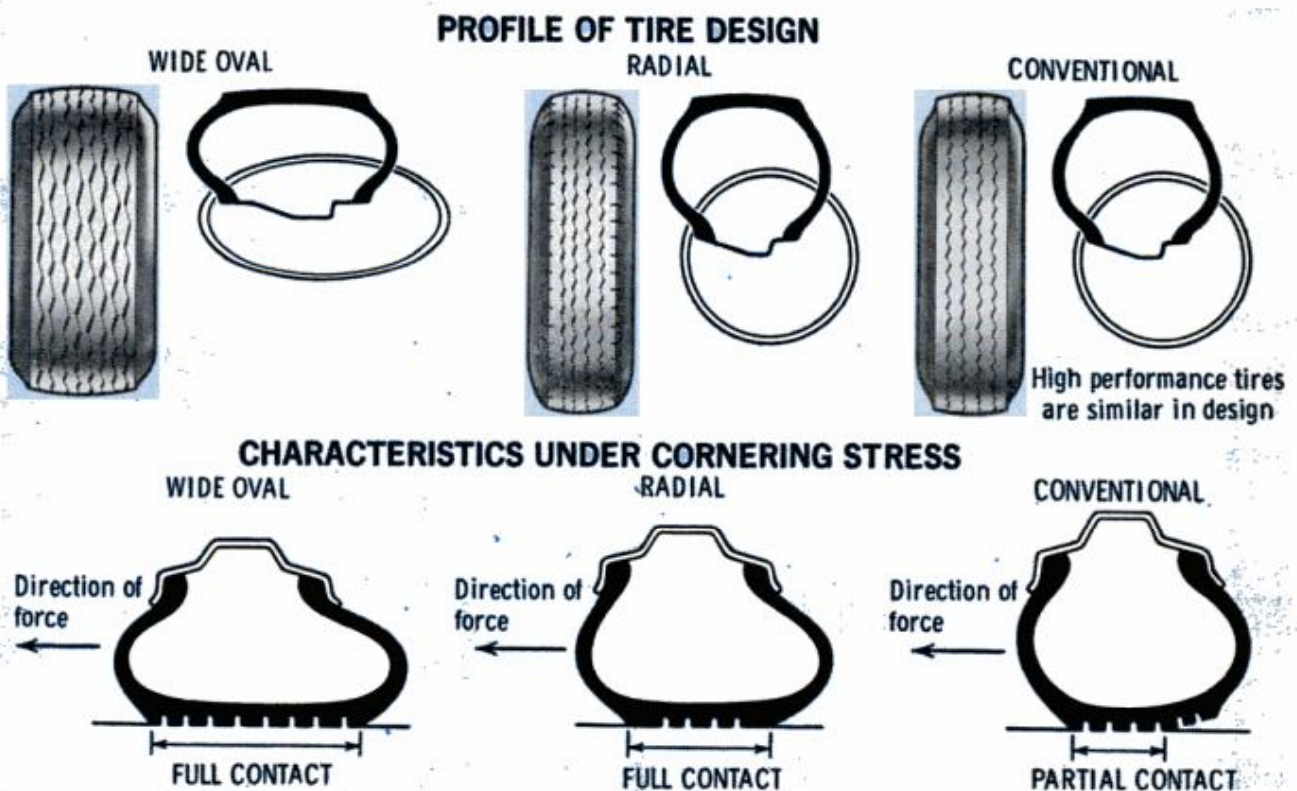
Almost 30 years ago, of course, following the advent of the balloon tire in the mid-1920s, it was simpler. All tires (or most of them, anyway) were something like 6.00-16 in size, built around six plies of cotton cord. In cross section, they were just about as high, from tread face to rim, as they were broad, from sidewall to sidewall. In a tire, the importance of this height and width relationship—called the "aspect ratio"—had yet to be discovered. These tires had inner tubes and could run—surprisingly often—at speeds of 70 mph all

day long without throwing the tread.

So-called "conventional" tires of the type described above are still the mainstay of the industry and appear most often as OE (for Original Equipment) tires on most Detroit-built cars. But changes and improvements have been made. Cord materials are now rayon, nylon, polyester, even much stronger fiberglass (Armstrong has a conventionally-built fiberglass tire on the market, others are experimenting). Cord angles—i.e., the angle in degrees with which the plies of a tire crisscross each other—have changed, too. Despite these vital improvements, however, the really significant changes in tires can be found in the three new types now on the market.

These tires have lower cord angles and also lower aspect ratios, meaning they are built wider than they are high. They can sustain speeds of 100 mph and over and keep their treads glued in place. They also cost more; instead of \$25 to \$35 apiece, these tires list for \$45 to \$60 each, or more; hardly the sort of thing you'll find at the local discount store's "Big Truckload Tire

NEW TIRE DESIGNS provide much improved traction under cornering stress, are designed to keep maximum rubber on road at all times. High-performance tires usually carry tread around shoulder, part-way up walls



Sale Special." These new types should be purchased in sets of four in order to gain their full benefits. For your spare, there's still another departure—a tire that remains folded around the rim 'til it's placed in emergency use.

To build these so-called "super" tires, the industry had to solve or overcome some rather exotic problems.

The basic problem all tires have is that of keeping a maximum tread patch (or footprint) in contact with the road at all times. Also, a tire's tread tends to "squirm" as it rolls along, even more so under the added side thrust of cornering. This squirm, combined with the distortion caused by centrifugal force created at higher speeds, reduces traction and cornering ability and hastens tread wear and deterioration. Thus, the main goal behind the design of these three new types of tires has been to reduce the squirm tendency. Of the three types, radials apparently do the best job.

The big factor in reducing squirm is a tire's cord angle. The cord layers that form the plies of a tire carcass are placed at an angle to a theoretical center tread line. The angle varies from 40° to less than 30° on most of today's tires. A lower cord angle means better lateral stability, less "roll under" on turns. Also, it means added stiffness and resistance to sidewall flexing. Mainly, though, it means a tire needn't "work" (or squirm) so hard as it rolls.

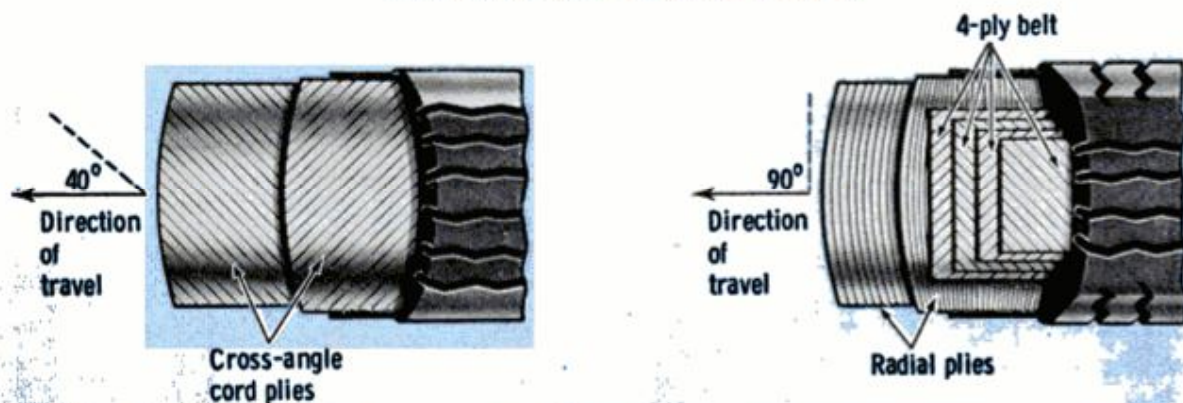
Cord layers alternate across each other, crossing the carcass from bead to bead on a "bias," giving conventional tires their special label—bias, or bias-ply tires. This type of construction also differentiates conventional tires from increasingly important radials. The latter have an almost 90° cord angle, which would seem to indicate low lateral stability and minimum harshness. Yet, as will be seen later, radials actually offer outstanding lateral stability and—oddly enough—a slightly stiffer ride.

In bias-ply tires, the cord layers act against each other, thus tending to build up heat in addition to "scrubbing" the tread over the road surface. In radial tire construction, however, there is very little interaction between the cord layers, meaning a cooler-running, more durable tire. The almost- 90° carcass cords give the tire a low spring rate, cushioning the ride by flexing its sidewalls to absorb road bumps. Yet the stiffer circumferential belted section reinforces the tread and maintains lateral stability without concern for a cushioning function. Thus, less stretchable materials—fiberglass, for example, or steel cords—are used to build up the outer belt.

Michelin, of France, originators of the radial concept some 30 years ago, stumps for the steel-cord belt and is now building such a tire for Sears Roebuck. Other producers use either rayon

DIFFERENT METHODS of tire construction affect wear and performance. Conventional tires (left) "squirm" on road, wear quicker than radials, whose carcass cords hit surface at 90° angle, afford cooler running

TIRE CARCASS CONSTRUCTION

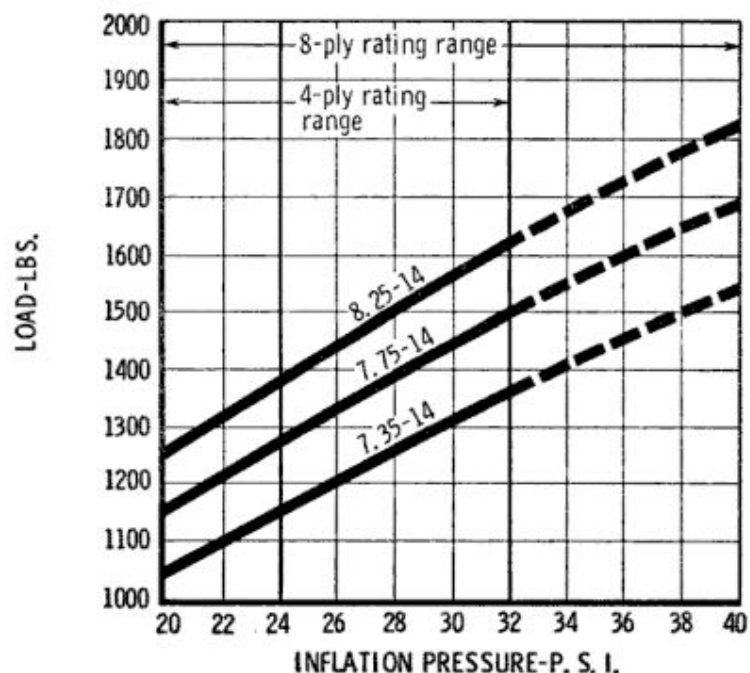


SIZE AND LOAD COMPARISON

(Conventional, High Performance)

Tire Size	Load (lbs.)
6.50-13	980
7.00-13	1080
6.95-14	1051
7.35-14	1160
7.75-14	1270
8.25-14	1380
8.55-14	1510
7.35-15	1160
7.75-15	1270
8.15-15	1370
8.45-15	1480
8.85-15	1580
9.00-15	1680
9.15-15	1680

TIRE LOAD-CARRYING ABILITY VS. INFLATION PRESSURE



or fiberglass cords because they offer a less harsh ride.

It was a radial's comparatively rough ride that heretofore cooled the interest of American makers in such tires. Their contention has been that auto suspension systems must be modified to overcome (or at least mask) this harshness. Once automakers—following the lead of Ford—started to do that, the domestic market for radials brightened.

Overseas tiremakers, including those owned by U.S. companies, have been in the radial business for years. Many brands of these tires are imported into this country—Dunlop, Michelin, Pirelli, Continental, Semperit, Englebert, and so on. But until recently, sizes available were limited almost entirely to those for the more popular imported cars. Now, exporters are expanding their range of sizes to include the larger wheels of U.S. cars.

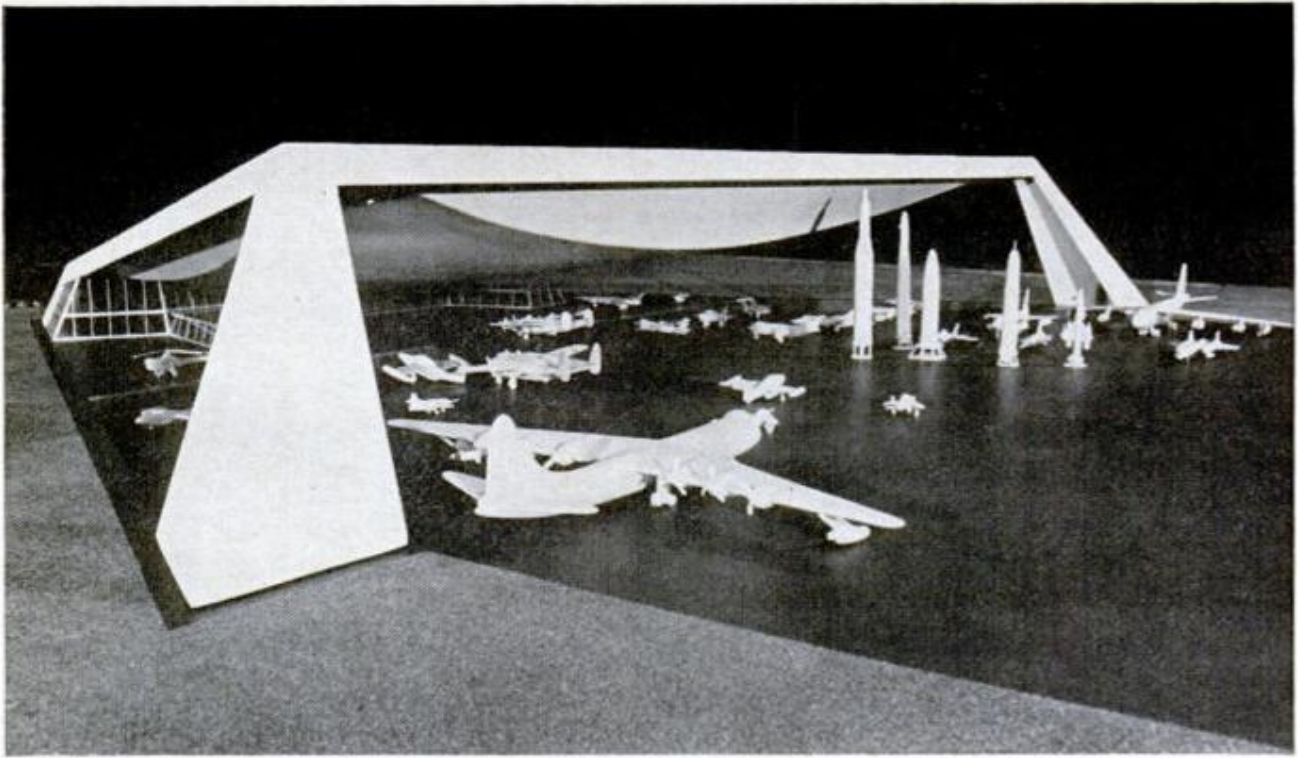
Radials are relatively low and squat, with an average aspect ratio of 0.80 or so. They tend to look underinflated because of their soft sidewalls, even with proper air pressure. If they have any significant drawback—aside from a slight stiffness of ride—it would be in

top-speed potential. The belted tread, which must be sturdy enough to maintain optimum shape for road adhesion, tends to become too heavy from centrifugal force at speeds above 110 mph. This could weaken the bond between belt and casing and is the primary reason why radials are rarely seen on race courses. (There are high-speed radials, but they are expensive and do not wear well.)

Another characteristic of a radial is that while it will hold a line around a given corner at a far higher speed than the best bias-ply tire, the break-away action—when it occurs—is more sudden because the stiffer belted tread either holds traction or it doesn't; there's no transitional "in between" stage.

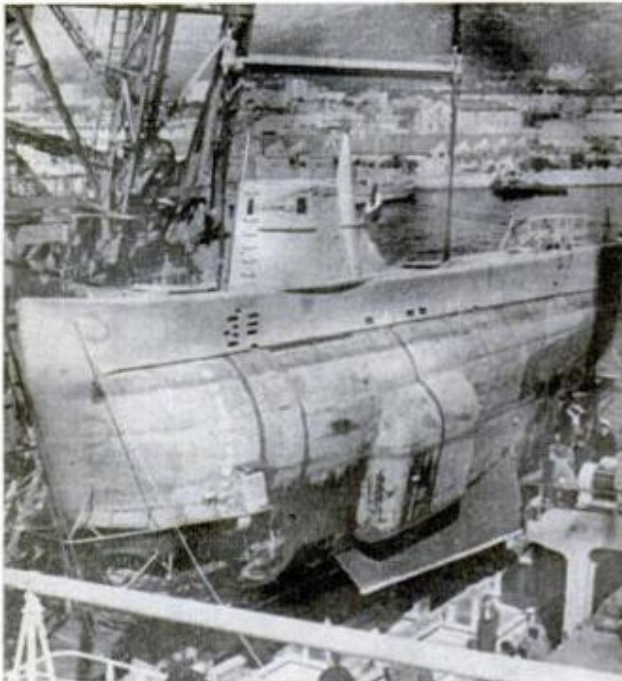
While radials represent an entirely different technology in tire construction, the other types of "super" tires are more in the nature of inspired refinements. The ultralow profile and the high-performance tires carry to new limits so-called "conventional" tire-building techniques.

In the case of ultralow-profile, or
(Please turn to page 204)



Air Force will build a new 'attic'

One of these days the Air Force is going to clean out its old museum (humorously referred to as the Air Force's attic) at Wright-Patterson Air Base, Dayton, Ohio, and move into a new one. The present museum, which dates back to 1923, depicts the growth of military aviation, and it's no longer large enough to hold the displays. The new museum, shown above in a scale model, will have 200 acres of display space, eight acres of which will be under the 130-foot-high canopy. Earlier, fragile aircraft will be completely protected, while later craft will be displayed in an outdoor environment. Construction is scheduled to start this year.



Bathyscaph dives near Japan

Shown being loaded aboard the Japanese freighter, *Yamguichi Maru*, at Toulon, France, is the French bathyscaph, *Archimede*. The submersible was taken to Japan where it has been making a number of deep dives for scientific purposes. One dive of 14,000 feet is planned.



No footwork needed

Hospital patients can have the fun of playing table tennis without ever leaving bed—even to retrieve the ball. The ball of the Tiny Tethered Table Tennis set is attached to a spring-steel wire fastened to a bracket. The opponent, of course, must be on his feet.



Aluminum giant

The largest aluminum sailboat afloat is the *Beyondan*, an 82-foot ketch built by Palmer Johnson Boats in Sturgeon Bay, Wis. The craft's waterline length is 63 feet, 8 inches. The hull draws 13 feet with the centerboard down. Total sail area is 1515 square feet.



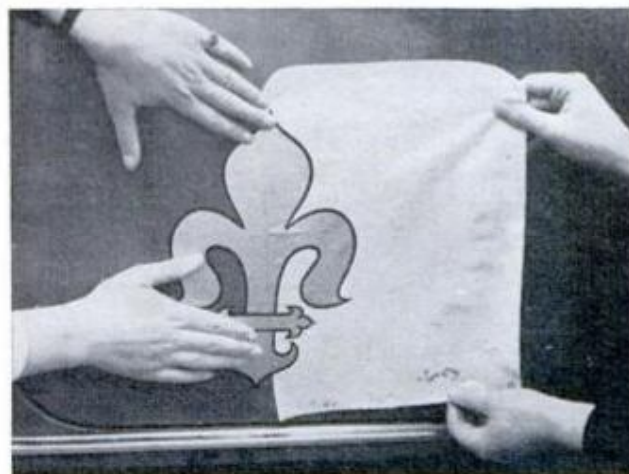
Tender tonsorial touch

How skillful should a barber be with a razor? His touch should be so light that he can shave a balloon without bursting it, says barber Neville Gowland of Sydney, Australia. And just to keep that light touch, Gowland shaves a balloon at least once a month.



Fancy that for your car

If you can't afford a new car, here's a way to make the old buggy look different, at least. Two young English sisters, one a fashion writer and the other an art student, have come up with a group of designs that can be applied to a car by a transfer method. At upper left, the two young ladies appear with a car on which fleur-de-lis patterns have been applied. Directly above is a selection of the designs that they've created. And at left, a design is being applied to the side of a car. The transfer is soaked in water and applied to the car where desired. Then the backing paper is slid away, and the design stays in place.



Project Gasbuggy

Next month an underground nuclear blast in New Mexico holds promise of doubling the world's supply of natural gas.

By Norman and Jon Carlisle

IT WON'T LOOK LIKE MUCH. Just a puff of dust rising above the piñon pines. It won't make much noise. Just a heavy rumble, like a passing freight train.

But the several hundred engineers and scientists who will gather next month at a remote wilderness spot 100 miles north of Gallup, N.M., won't need any sensory evidence to tell them that the chips are down in a daring atomic wager. They'll know that some 4200 feet underground, a nuclear explosion with the awesome power of the Hiroshima bomb has triggered a unique experiment aimed at tapping the riches of the earth.

Project Gasbuggy is a \$4,700,000 bet by government and private industry that nuclear explosives can be used to shake loose vast quantities of something the United States needs a lot more of—natural gas. That's why you and everybody else in the nation have a big stake in the



SHALE
AND
SAND

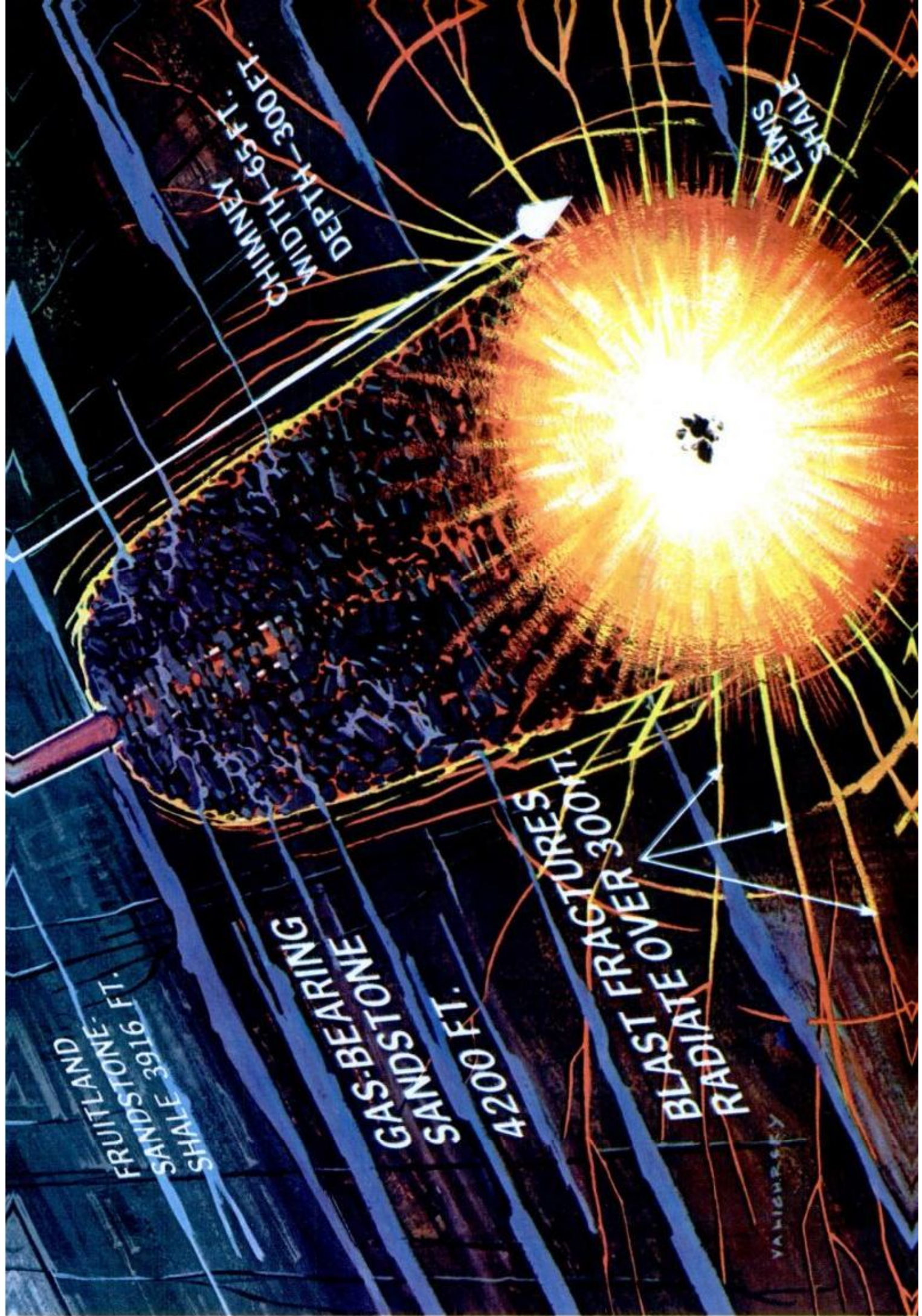
4781 FT.
TERTIARY
DEPOSITS

4240 FT.

3654 FT.
SANDSTONE
OJO ALAMO

3654 FT.
SHALE
KIRTLAND

3757 FT.



FRUITLAND SANDSTONE 3916 FT. SHALE

GAS-BEARING SANDSTONE 4200 FT.

BLAST FRACTURE OVER 300 FT. RADIATE

CHIMNEY DEPTH-300 FT. WIDTH-65 FT.

VAUGHNEY

LEWIS SHALE

success of this whopping explosion.

You're bound to be a direct or indirect user of natural gas, the versatile stuff that already provides one-third of all energy developed in the United States. It heats 39 million homes, fuels an ever-growing number of industries, and is a chemical treasure trove with more than 2500 applications in products ranging from fertilizers to nylon. Because it is easily transported, clean burning and relatively cheap, a still greater rise in its use is certain—if we can just get enough of it.

Long ago geologists discovered that the yield of natural gas could be increased by setting off an explosion in the bottom of a well that was slowing down. This created fractures in the rocks and freed more gas. Gunpowder, dynamite and TNT were all tried. Later, engineers found that fractures can be made by forcing down liquids at high pressure.

In some places ordinary explosives and hydro pressure work well, but, unfortunately, not everywhere. They just can't fracture some kinds of rocks.

That's where nuclear explosives—NE—get into the picture. Engineers believe that the powerful punch of Gasbuggy can do two jobs at once: make more and bigger fractures, and hollow out a huge cavity that will serve as a reservoir for the natural gas released from them.

In the immense deposits of natural gas locked in the rocks of the New Mexico field, it would ordinarily be possible, in a 20-year period, to extract 10 percent of the gas. With NE, the scientists esti-

mate they'll be able to get out 70 percent—a 700 percent increase!

It's taken a lot of pushing to get Gasbuggy rolling.

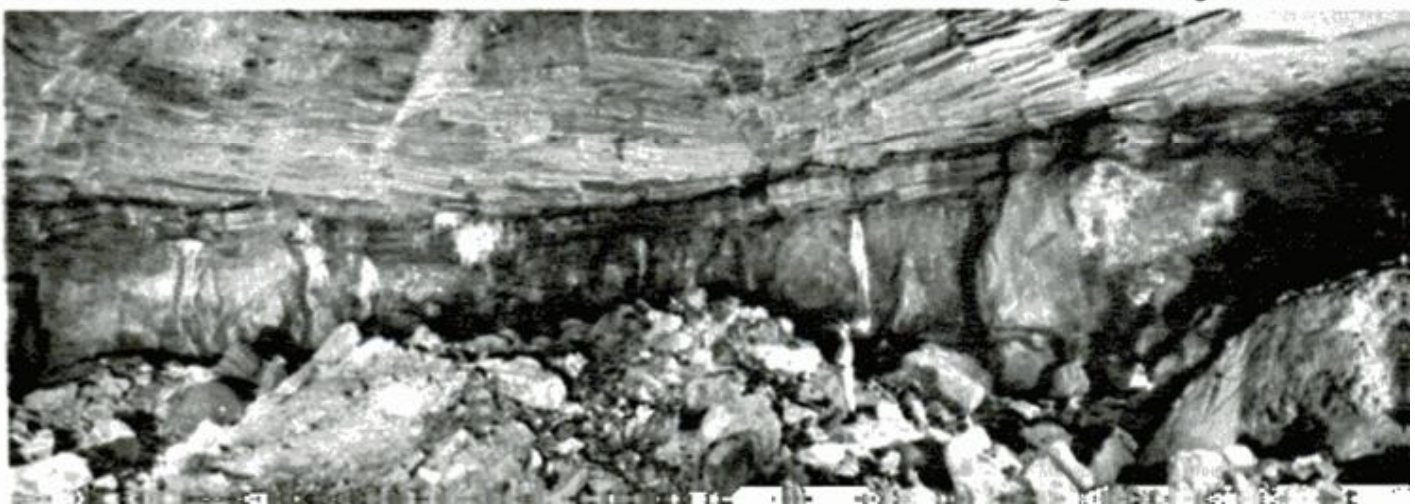
"We've been working up to it one way and another for nine years now," says Sam Smith, the engineer in charge of the project for the El Paso Natural Gas Co. A big, easygoing man, his Texas drawl speeds up a bit when he talks about Gasbuggy. It's not hard to see that he shares the enthusiasm of the scientists and the other engineers teamed to implement the project.

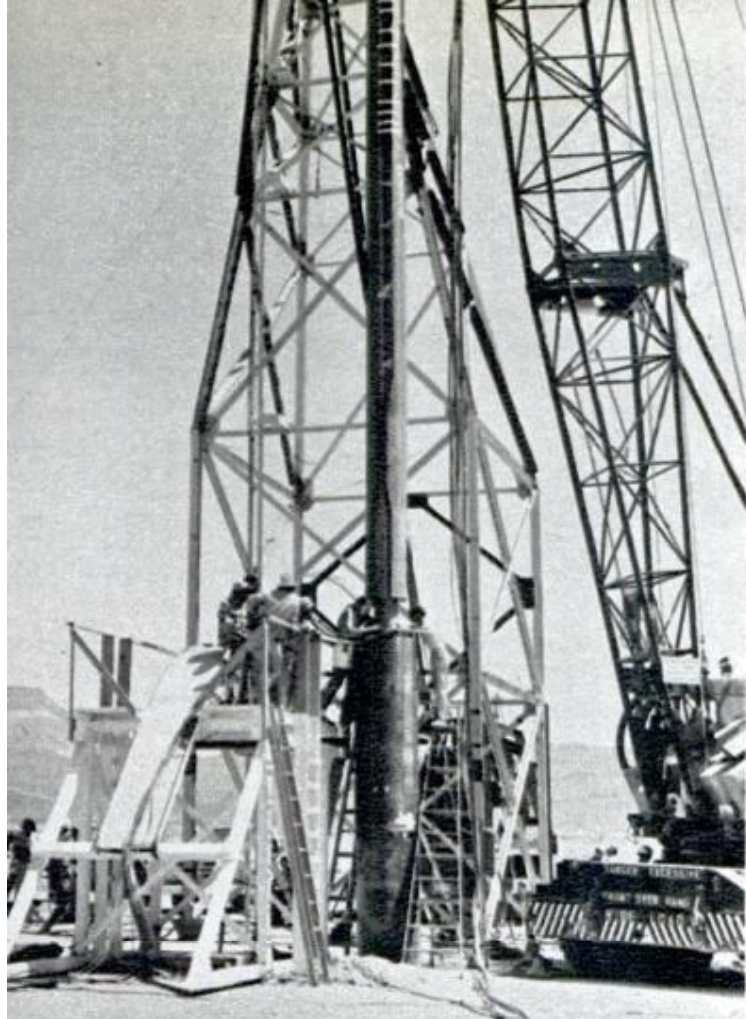
It was back in '58 when EPNG engineers got the idea of using something more potent than TNT or hydro pressure to stimulate gas production. They got in touch with the AEC. What did the nuclear scientists think about the possibility of using the power of the atom? The answer was that the idea tied right in with the AEC's Project Plowshare, set up to explore peacetime uses of nuclear explosives.

The AEC, the U.S. Bureau of Mines, and other government agencies, pooled resources with EPNG, which is picking up \$1.8 million of the tab. The AEC is providing the information gained from 200 experimental underground blasts at other sites, while the El Paso engineers contribute their know-how of everyday production techniques.

A vast amount of preparatory work went into creating Gasbuggy Park, the 160-acre test site. After numerous geological studies, two preshot test holes were drilled. Core samples from them indicated the best depth and location for the shot hole itself. Recently com-

ONE OF FIRST UNDERGROUND SHOTS carved this cavern. Note its size in relation to figure in foreground





NUCLEAR-EXPLOSIVE DEVICE being lowered for the experimental blast is type to be used for Gasbuggy.

pleted, and now waiting to receive the mighty charge, this 18¾-inch-diameter well penetrates a 150-foot-thick gas-rich strata of sandstone. It was drilled by conventional rigs in standard use in oil and gas fields.

The same drill rig that bored the hole will be used to get the potent packet of NE down to the explosion level. The container in which all that potential violence is housed is unimpressive. A cylinder 17½ inches in diameter and approximately 15 feet long, it looks like a hunk of steel pipe.

To place it in the well, it will be threaded to a length of 7-inch well casing. As it goes down, more lengths will be added to the casing until the device rests on the bottom of the hole.

On D-Day, the blast will be set off by signals from a timing mechanism actuated by technicians in a trailer one mile from Ground Zero. In less than a millionth of a second after the device is detonated, the gigantic force of the blast will vaporize, melt and crush

the surrounding rock. In one-tenth of a second, a spherical cavity will balloon upward 150 to 170 feet. Vaporized and melted rock will form a puddle at the bottom of this cavity, later cooling and solidifying.

The force of the explosion will fracture rock beyond the cavity for approximately 300 feet on all sides. As things cool down, and pressure inside is reduced, the ceiling will collapse, enlarging the cavern to a huge cylindrical chimney 350 to 400 feet high.

Gas released from the fractured rock around it will flow into this enormous chamber. Later, some weeks or months after core samples are taken and many tests for radioactivity and other factors made, a new well will be drilled to tap the gas in the chamber. As gas is removed, more gas from the surrounding fractured rocks will flow in to replace it.

"There's nothing theoretical about Gasbuggy," says Sam Smith. "What we're hoping to learn from it is going to make it a practical tool—something we can use any day of the week in any gas field."

That's a pretty strong statement in view of the price tag on Gasbuggy. It's expensive, but simply because it's the first of its kind. A prototype always runs high. Actually, NE offers a bigger bang for a buck—it's a cheap explosive. Producing one million B.T.U. with TNT costs \$250. A giant economy size NE blast (bigger than Gasbuggy) can produce the same amount of energy for as little as 75 cents! An NE blast of Gasbuggy size could, in the future, cost about \$350,000 all told.

What about radioactivity? Who wants to heat his home with contaminated gas? The experts say there's no chance of any radioactive gas reaching your furnace. They're confident that the long series of radioactivity tests to be conducted after Gasbuggy will bear out calculations they've made.

Most radioactivity created by fission and fusion products, they say, will be

(Please turn to page 222)

Successor to the Queens

Cunard's new luxury liner, the most powerful twin-screw ship ever built, will carry as many passengers as fast as the *Queen Mary* or *Queen Elizabeth*, but on just half the fuel

SHE'S NOT QUITE AS BIG as the Queens, and she doesn't even have a name yet—they call her Q4—but she'll have a big role to play in maintaining the luxury-cruising tradition of the Cunard Line's famous Queens.

With the *Queen Mary* due to go out of service this October and the *Queen Elizabeth* by the end of 1968, the Q4 will be the "star" of Cunard's six-ship passenger fleet.

The new 963-foot liner is currently at the Clydebank, Scotland, shipyard of John Brown & Co.—builder of all the present Cunard fleet—where she's scheduled to be launched Sept. 20. She will go into regular service late next year.

Once in service, the Q4 will be carrying up to 2025 passengers across the Atlantic—or anywhere else in the world.

"We tried to design the largest and most powerful ship that could be driven by twin screws," says Daniel Wallace, head of Cunard's naval architects,



in summing up the philosophy behind the new ship.

With only two propellers—where the Queens have four—the Q4 will require only two engine rooms instead of four. These will take up about half the space and weigh half as much as those in a

MODEL OF Q4 shows sleek lines and tall, thin funnel



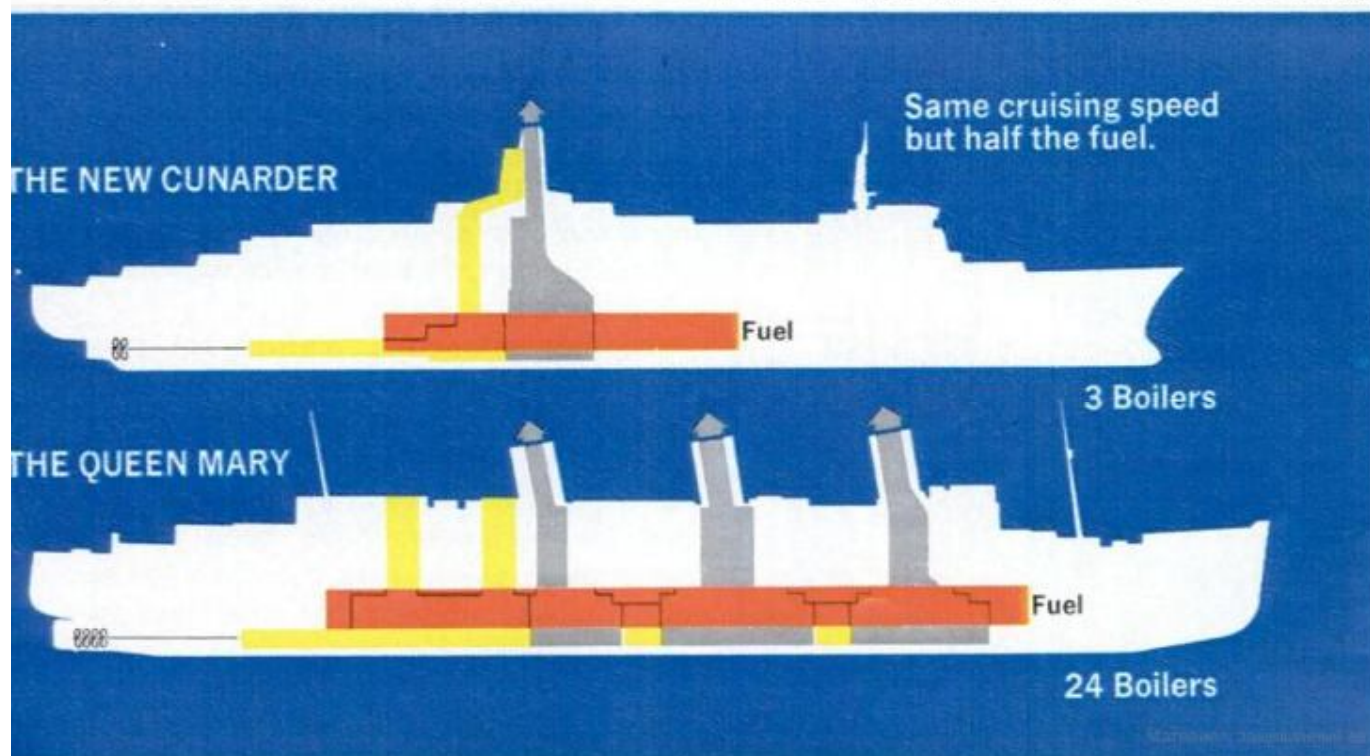


NEW CUNARDER will be launched in Scotland this month and enter regular passenger service late next year

four-engine ship. In addition, only 55 percent of the latter's crew is needed. On half the fuel consumption, the Q4 will go as fast as the Queens (28½ knots service speed). All the space saved, says Cunard, will be used for more and better cabins for passengers.

The Q4 will use more power for each propeller than any other passenger liner afloat. There was no problem in getting sufficiently powerful engines; the problem was in utilizing the power efficiently. To do this, Cunard is using, for the first time on any passenger

TWIN SCREWS—rather than usual four—allow decrease in size and weight of engine room and fuel storage



liner, a six-bladed propeller rather than the more usual four. The Q4 will be run at full power all of the time.

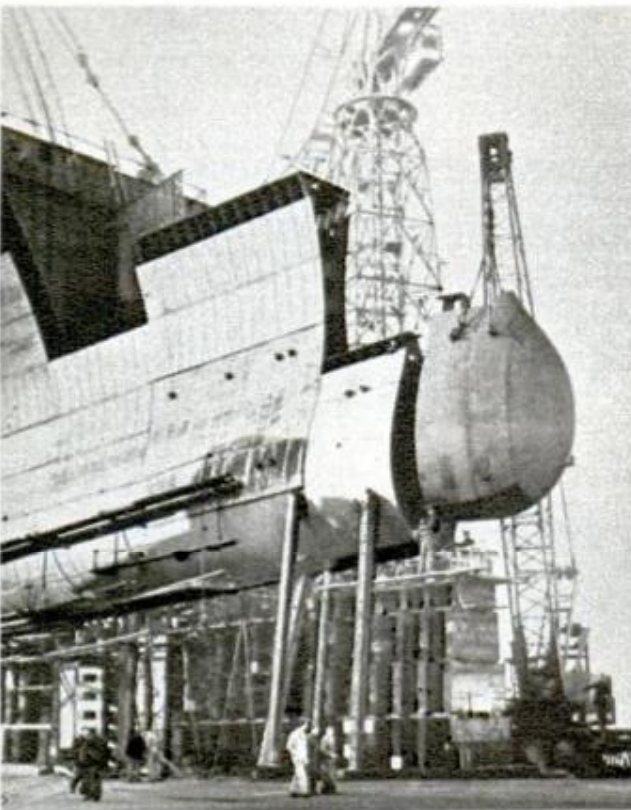
As long ago as 1954, Cunard started work on a replacement for the *Queen Mary*. Until this year, it was believed that the new ship would be a running mate with the *Queen Elizabeth* in weekly North-Atlantic express service. However, in May, Sir Basil Smallpiece, Cunard chairman, announced the retirement of both Queens "within 18 months."

Designed for express crossings of the Atlantic, the Queens are not well-suited for the financially necessary winter cruises to warm waters, according to Sir Basil. And jet air travel across the Atlantic has hurt them, particularly in winter. Neither ship has paid her own way since 1961, he added.

To make the Q4 attractive to passengers and profitable to Cunard, the designers had to abandon the idea of "another Queen" (there actually was a four-engine design called the Q3) and start from the keel up.

The Queens, for example, are restricted by their draft (over 39 feet)

THIRTY-TWO TON SECTION of Q4's bulbous bow is swung in place at John Brown's Clydebank shipyard



SIX-BLADED PROPELLERS for the new liner are 19 feet in diameter—the largest on any twin-screw ship

to sailing from Southampton only at high tide. So that the Q4 can sail at midday every other Thursday, her weight was reduced to keep the draft at about 32½ feet. (Her gross tonnage is approximately 58,000 compared to more than 80,000 for the Queens.)

By reducing the normal height between decks by six inches, the Q4 designers gave her 13 decks, compared to the Queens' 12. They did this without reducing ceiling height in the bedrooms by routing piping and ventilation where height isn't needed—in bathrooms and wardrobes. Every room, incidentally, has a private shower and toilet.

Three-fourths of the 2025 passengers will be accommodated in outside rooms on the five stateroom decks. There will be 26 suites "of a size and luxury equal to or beyond anything afloat," Cunard says. Most passengers will be in single or double rooms. There will be only 15 rooms with four berths and 145 with three—all designed for family or group use. Even with a full ship, only 178 passengers will sleep in upper berths.

Another attractive feature for passengers is the placement of the Q4's dining rooms high up in the superstructure of the ship so that all passengers can view the sea during meals. In the past, dining rooms have been placed lower in ships because their weight so high up was undesirable and because

(Please turn to page 216)

World's Biggest Bunch of



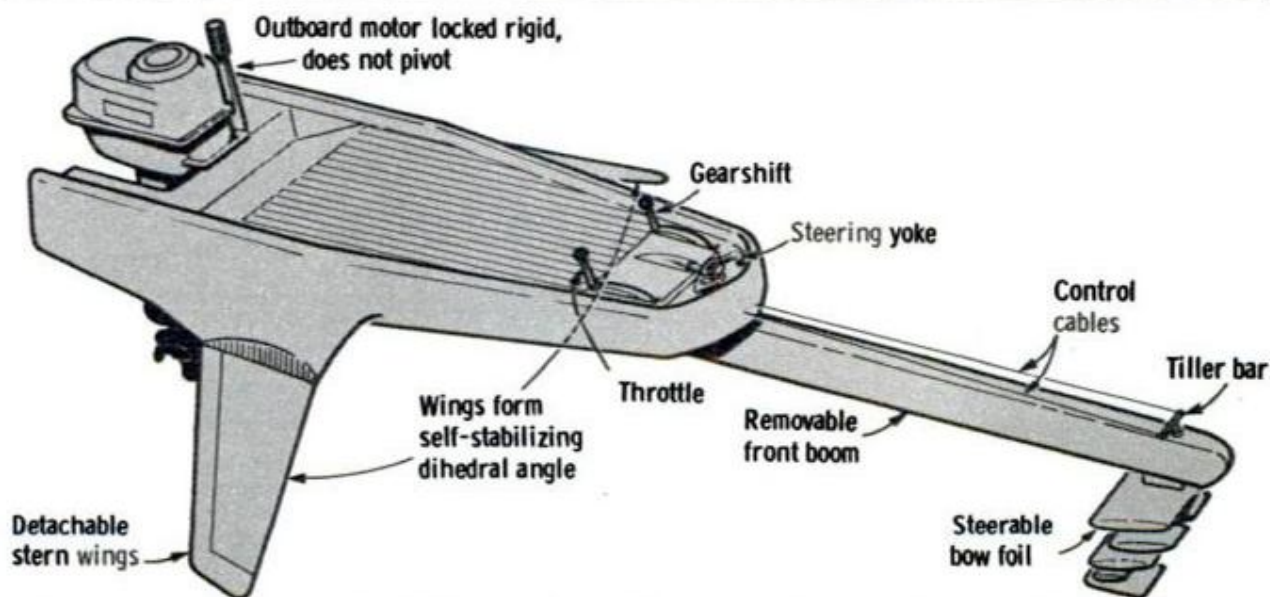
By SHELDON M. GALLAGER

On this and the following eight pages, *PM* gives you a behind-the-scenes look at some of the cleverest, zaniest, farthest-out, most exciting mechanical creations to be unveiled this month at New York's huge Inventors Show—the largest ever staged

WHEN 1600 inventors get together in one spot, exciting things are sure to happen. This is about to take place at the Third Annual International Inventors and New Products Exposition to be held in the giant New York Coliseum Sept. 9-17.

From all over the United States and 21 foreign countries, the world's foremost inventors will meet to display their most ingenious creations. Intriguing gadgets, flashing lights, ringing bells and strange machines will stretch as far as the eye can see over exhibit floors the size of football fields.

To bring you this excitement, *PM* previewed hundreds of entries to find the show's top attractions. These range from the new personal hydrofoil shown below and on the cover to a clever pocket telephone and a fantastic flying sub. The show's sponsor is Patent Exhibits, Inc., 554 Fifth Ave., New York, N.Y.



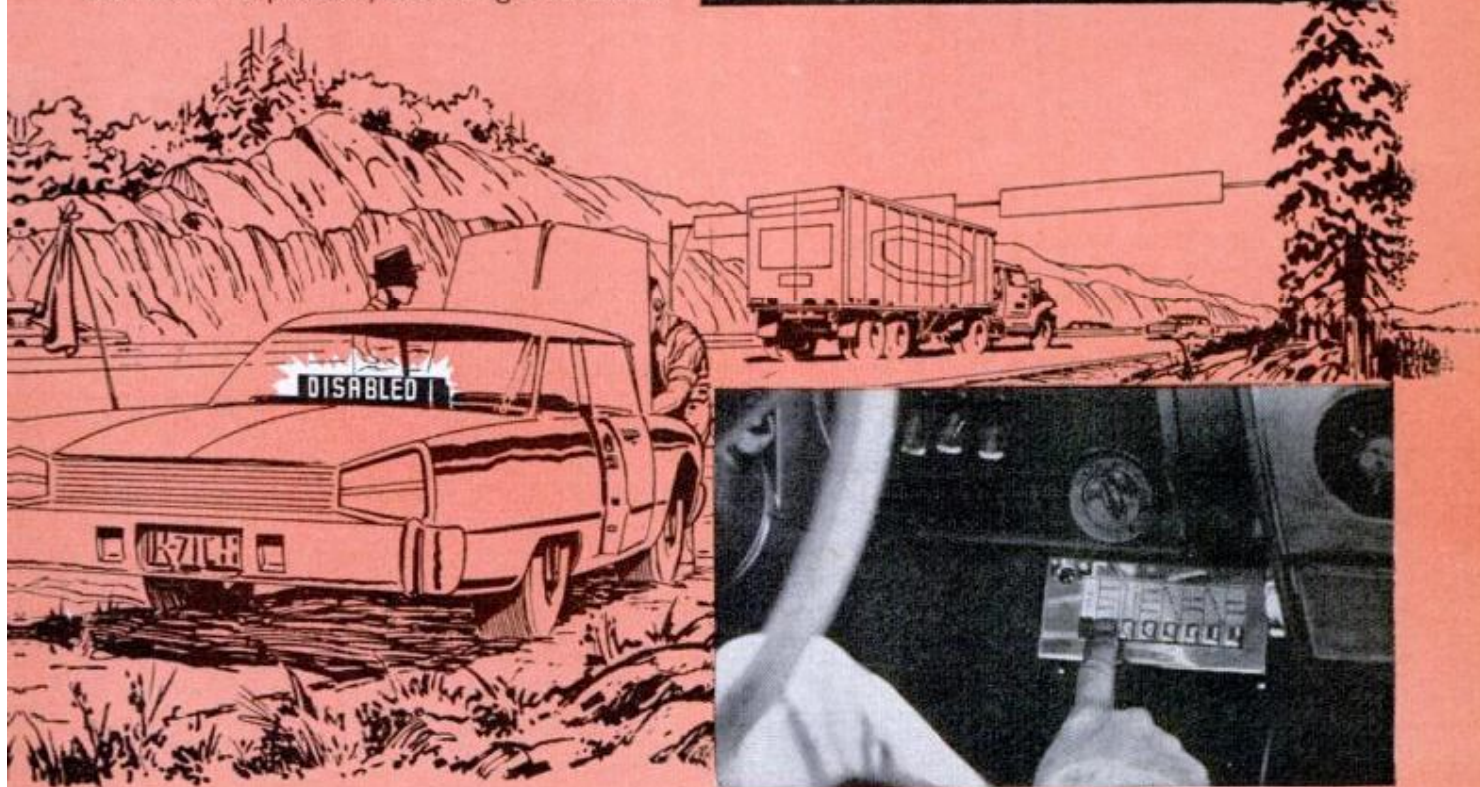
For sheer madcap thrills, this one-man hydrofoil can hit 35 mph with a conventional 18-hp outboard engine. The rakish, rocketlike craft, featured on *PM*'s cover this month, is 11½ feet long and "flies" on three foils—two fixed-angle wings at the stern and a steerable bow foil. The front steering permits extremely tight turns and exciting acrobatic maneuvers. The foam-filled fiberglass hull is unsinkable and comes apart in sections for easy carrying. Italian designer Renato Castellani of Verbania developed the craft and hopes to sell kits.

If your phone rings and you aren't there to answer it, don't worry. Just pull this walkie-talkie-like gadget out of your pocket, press a button and say "Hello." An electronic device placed under your home phone (far right) intercepts incoming calls and relays them to you by radio. When the phone rings, it triggers a switch, sending out a beep signal to let you know you have a call. Sound from the phone's earpiece is then picked up by a microphone and broadcast to the pocket receiver. Range is one to two miles. Device was developed by Sibony Mfg. Corp. of Greenwich, Conn.



New pocket telephone: now they can call you anywhere

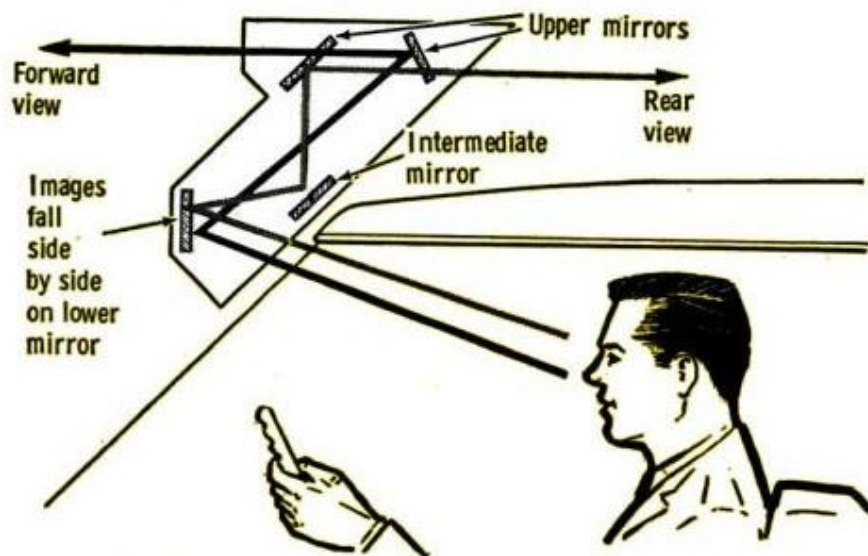
This flashing red sign in the rear window of your car is designed to warn following motorists of bad driving practices or dangerous road situations. It can also be used to signal police if you're having trouble. A pushbutton control mounted under the dash (lower right) gives you a choice of seven different messages: "Slow Down," "Don't Tailgate," "Don't Blow Horn," "Careful Please," "Parking," "Back Soon" and "Disabled." The sign, devised by Herman Newman of New York City, is connected to a car's regular 12-volt electrical system and flashes on and off intermittently like a turn signal. The messages consist of translucent lettering lighted from behind. Each one pops into view as the appropriate button is pressed, actuating a solenoid.



Pop-up timer automatically cooks eggs to your favorite consistency. Clipped to the side of a pan, it holds two eggs in a wire basket. At the end of a preset time, it flips up, removing the eggs from the water. The timer, invented by Marcel Jeannette of Rego Park, N.Y., is spring-driven and can be set for one to five minutes of cooking. Pushing the egg basket down into the water cocks spring and starts timer going.



Like to have your own car lift? You could with this invention from the Italian firm of Friulmacchine di Gerussi in Udine. The simplified rack works something like a collapsible lawn chair and is designed to be low enough in cost to make it practical for use by weekend mechanics who like to tinker with cars in the back yard. As the rack comes up, two inner rails raise the car off its wheels so that all four tires can be removed simultaneously, as at right above. Hydraulic lift is electrically controlled and can be stopped and locked at any height.

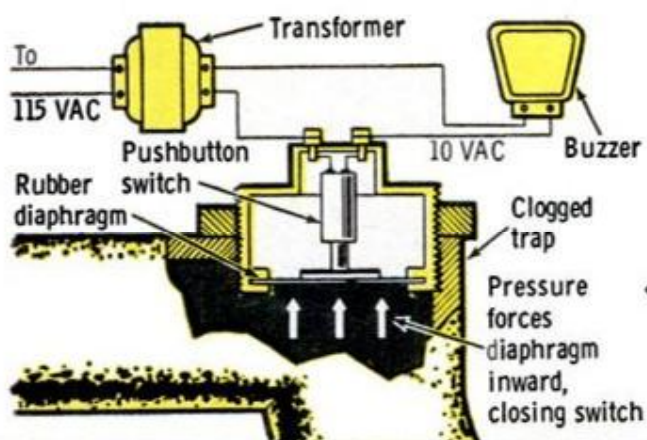
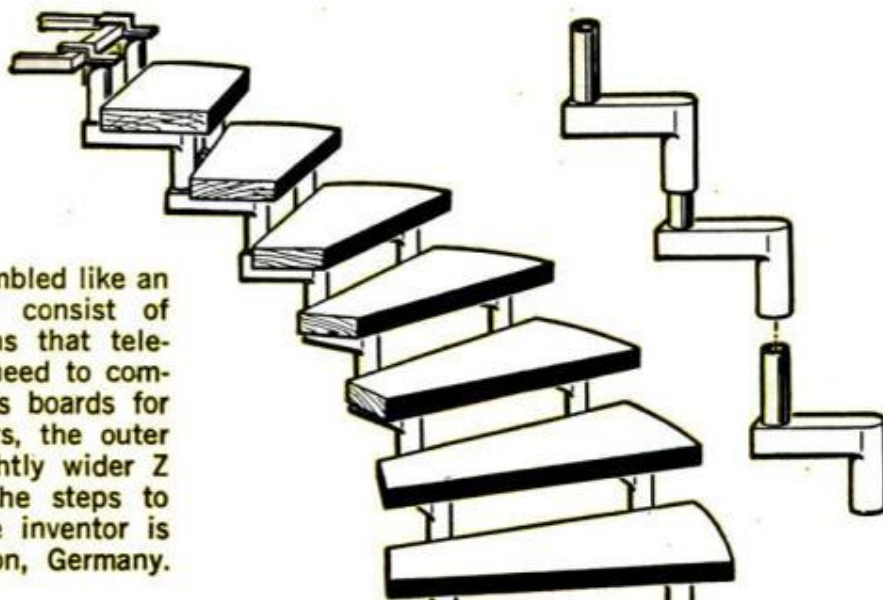


Two-way mirror for cars gives you a view of the road ahead as well as to the rear. A system of angled mirrors functions like a periscope, raising your level of vision well above the car's roof. This, says inventor Raymond Kerfoot of Wenatchee, Wash., lets you see over traffic in front and behind that might otherwise block your view. Elevated position also eliminates headlight glare and helps to keep mirrors free from road splatter.

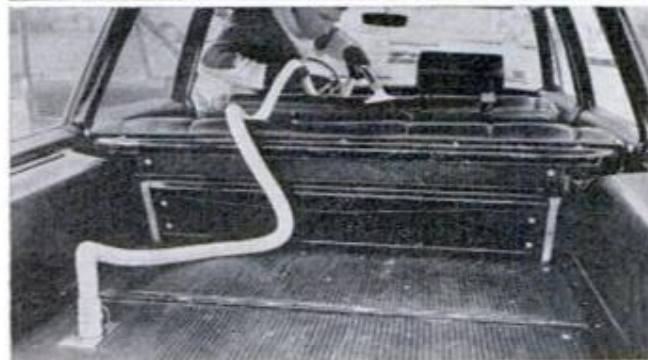


Keeping your car clean would be a breeze with the built-in vacuum cleaner shown at right. The system is based on a conventional household vacuum cleaner fitted with a special 12-volt motor to run off the car's generator. The cleaner would be installed under the floor in a station wagon, as here, or behind the rear seat in a sedan. The hose socket is similar to the type used in residential systems and has a built-in switch. Plugging the hose in the socket automatically starts cleaner's motor. Hose makes quick work of emptying out ashtrays as well as getting into other nooks and crannies. Morris Rothstein of Passaic, N. J., developed the vacuum as optional accessory to be offered by automakers.

Kit-built stairway is assembled like an Erector set. The parts consist of Z-shaped tubular sections that telescope together. All you need to complete the steps are cross boards for treads. For circular stairs, the outer support is made of slightly wider Z sections, which cause the steps to turn as they go up. The inventor is Herbert Ernst of Heilbron, Germany.



A warning buzz from the invention at left tells you that your sewer drain is about to back up, saving a messy overflow. The device screws into the regular clean-out opening in the trap and contains a sensitive switch behind a rubber diaphragm. If the trap starts to clog up, pressure against the diaphragm closes the switch, sounding a buzzer. Bertram Schultz of Inwood, N.Y., developed ingenious alarm.



Nearest thing to a portable jukebox is the automatic phonograph below. It plays up to 30 records in any desired sequence. All you do is push buttons in front to indicate which selections you want to hear and the order of play. The records are stored vertically in a stack, jukebox style. A sliding carriage moves along the stack, plucks out a record, plays it, then returns it to the stack and moves on to the next selection. Machine plays $33\frac{1}{3}$ or 45-rpm records. German inventor Werner Hagen got the idea.

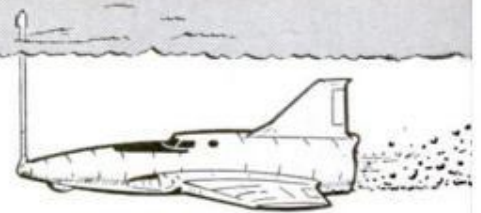




6. TAKING OFF - Jet fires up, float retracts



5. SURFACING - Float extends, air intakes open



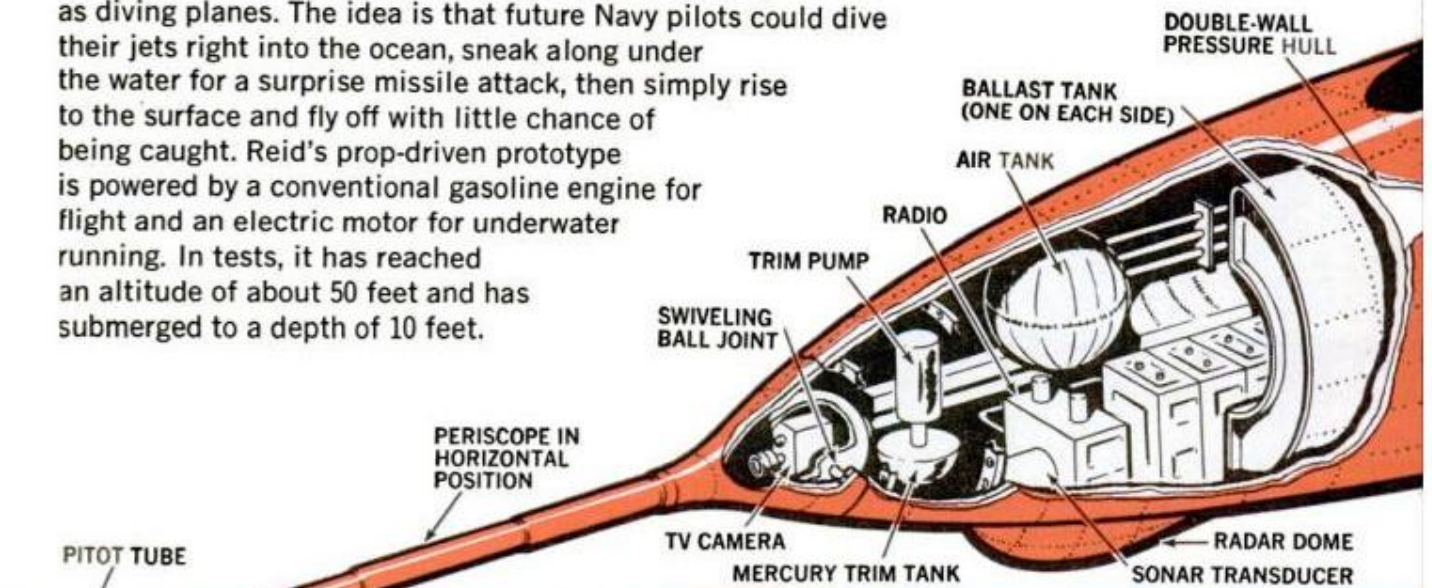
4. CRUISING - Periscope swings up, underwater engine takes over

INVENTORS SHOW FEATURE:

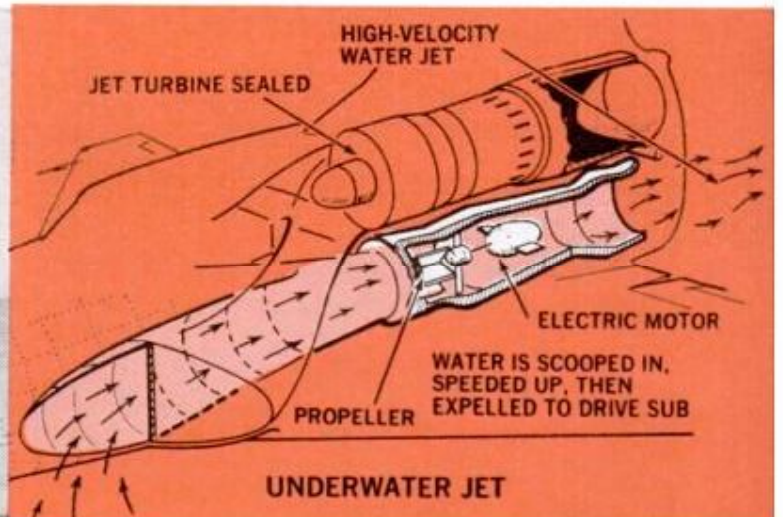
Fantastic Flying Sub

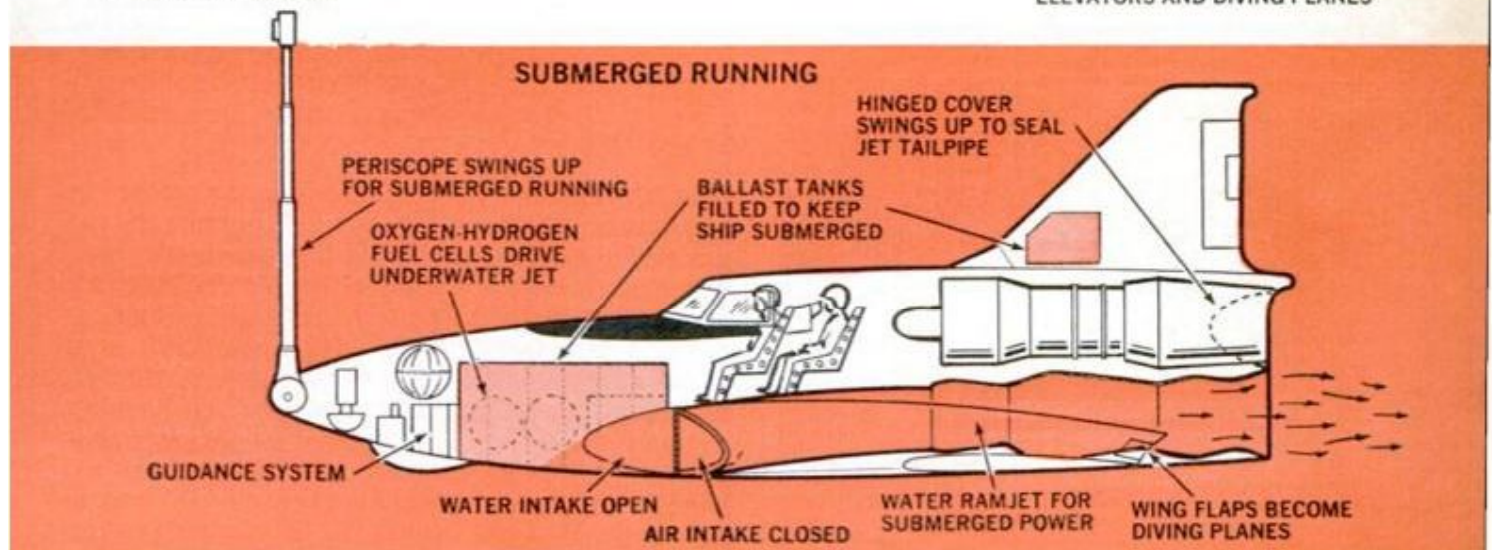
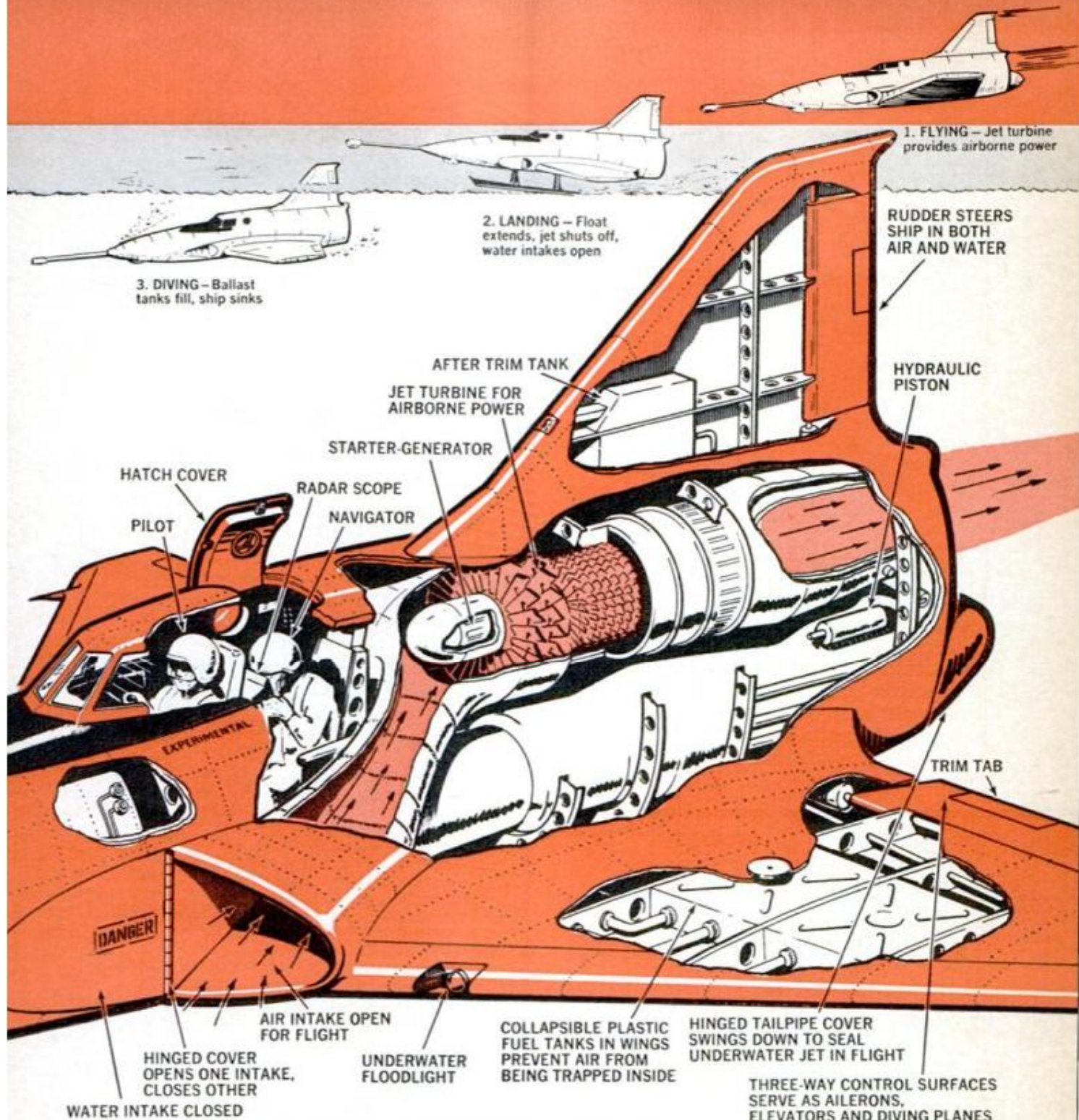
Technical Art by Donald Evans

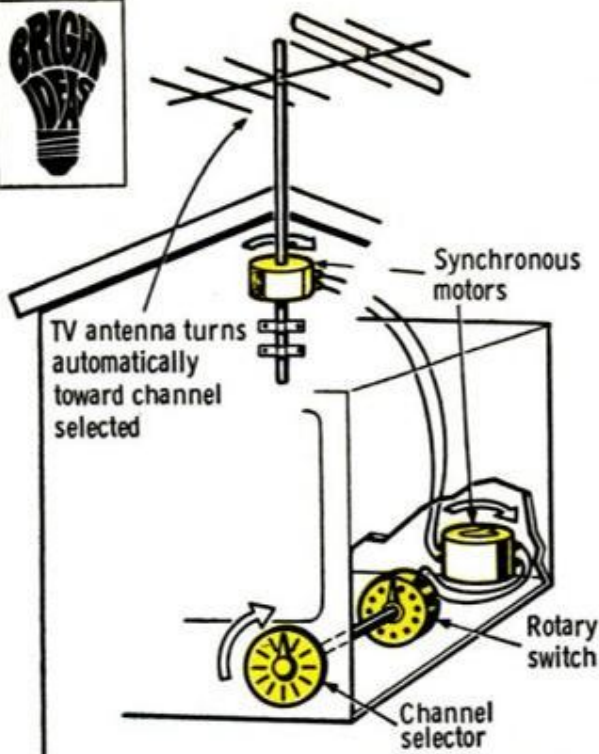
One of the top crowd-gatherers at the Inventors Show will be a strange-looking craft designed to fly like an airplane and submerge like a submarine. Shaped like a cigar, the propeller-driven ship, shown in the photo below, is a forerunner of a more advanced jet-powered version represented in the artist's conception at right. The inventor, Donald V. Reid of Asbury Park, N.J., plans to have both the prop-driven prototype and a mock-up of a jet model on view at the show. The jet ship has a novel two-way intake system that scoops in air for flight and water for submerged cruising. A clever swivel-mounted nose boom swings up to become a periscope under water. The control surfaces work in both air and water, with the elevators doubling as diving planes. The idea is that future Navy pilots could dive their jets right into the ocean, sneak along under the water for a surprise missile attack, then simply rise to the surface and fly off with little chance of being caught. Reid's prop-driven prototype is powered by a conventional gasoline engine for flight and an electric motor for underwater running. In tests, it has reached an altitude of about 50 feet and has submerged to a depth of 10 feet.



PROP-DRIVEN VERSION of the flying sub is 28 ft. long, has actually flown







Flip the dial on this TV set and the motorized antenna automatically swings to the position of best reception for the channel you select. The antenna is driven by a pair of synchronous motors, one in the set and one on the roof. As the dial is turned, the antenna rotates to a corresponding point, hits a limit switch and stops. Frank Neumeier of Macungie, Pa., is the inventor.



Close the door and it becomes a garage.



Swing up the door and you have a canopy.



Lower the screen and now it's a cabana.

The convertible garage door above is designed to give you additional outdoor living space in the summer. Swing up the door and it becomes a patio-shading canopy supported on two drop-down poles. An inner hinged partition of insect screening then swings down to close off the garage's opening and provide a bug-free lounging or eating area inside. There's a separate door in the screened section. The inventor is Evadna Hammersly of Denver, Colo.



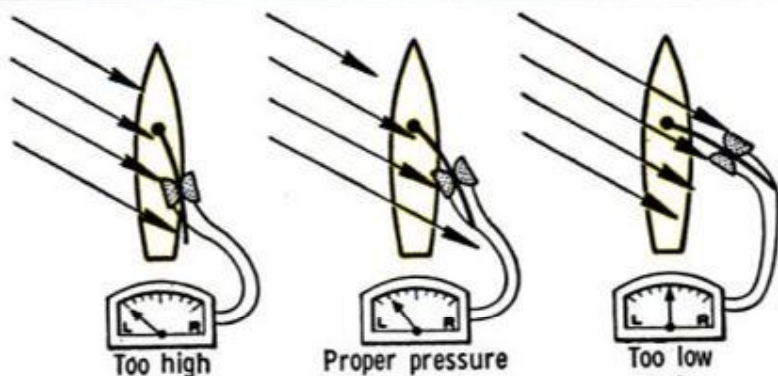
Into the street rolls the plucky wheelchair . . .



. . . and right up over the curb on the other side

This electric wheelchair scoots along under its own power, enabling handicapped persons to get around without help. The battery-powered chair, invented by Swedish doctor Per Uddén, has a 3-hp motor that gives it a top speed of 3½ mph. It easily takes curbs in its stride and can even climb shallow steps. All controls are electric so the operator guides the chair merely by pushing buttons. Steering is provided through servo mechanisms that swivel the entire rear-wheel assembly. All you do is turn a knob to the right or left and off goes the chair in that direction.

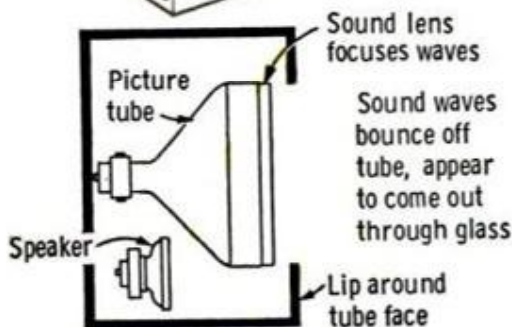
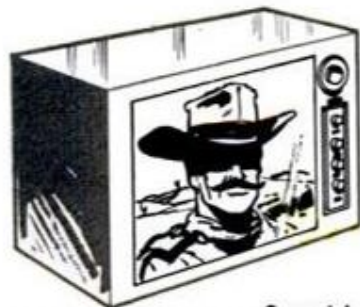
If your soil is dry, this moisture indicator tells you at a glance. If the needle registers "dry" even after you've watered, it indicates a lack of fertilizer as well. What happens is that fertilizer and water form a chemical solution like electrolyte in a battery. Dissimilar metals generate a tiny electric current to deflect the needle. If water or fertilizer is missing, no current is generated. Harry A. Wayne of Skokie, Ill., is the inventor.



Electronic wind sensors help you trim the sails on a sailboat for maximum speed merely by watching a dial. Two tiny pressure gauges mount on opposite sides of the sail, and their signal is fed to a meter in the cockpit. A low reading indicates the sail is spilling wind, while too high a one warns against inefficient sideslip. Marvin W. Stuart of Russellville, Ky., devised the system to help him learn to sail and now sells kits.



Tape-recorded growls from this electronic watchdog are designed to scare off prowlers if your wife is alone or nobody's home. The recorded barking is set off by a switch under the door mat or other switches hidden in the house. The machine, developed by Allison Collard of New York City, takes endless-loop cartridges, can also be used to give prerecorded messages.



TV sound seems to come right out of the picture tube in this system devised by Japanese inventor Yoshiro Nakamatsu. Instead of aiming out the side of the cabinet, as in most sets, the speaker faces forward. The cabinet forms a lip around the tube with a slight gap between it and the face. Sound waves are channeled around the tube and bounce off the face, appearing to come from inside. A sound lens is added to concentrate and focus the waves.

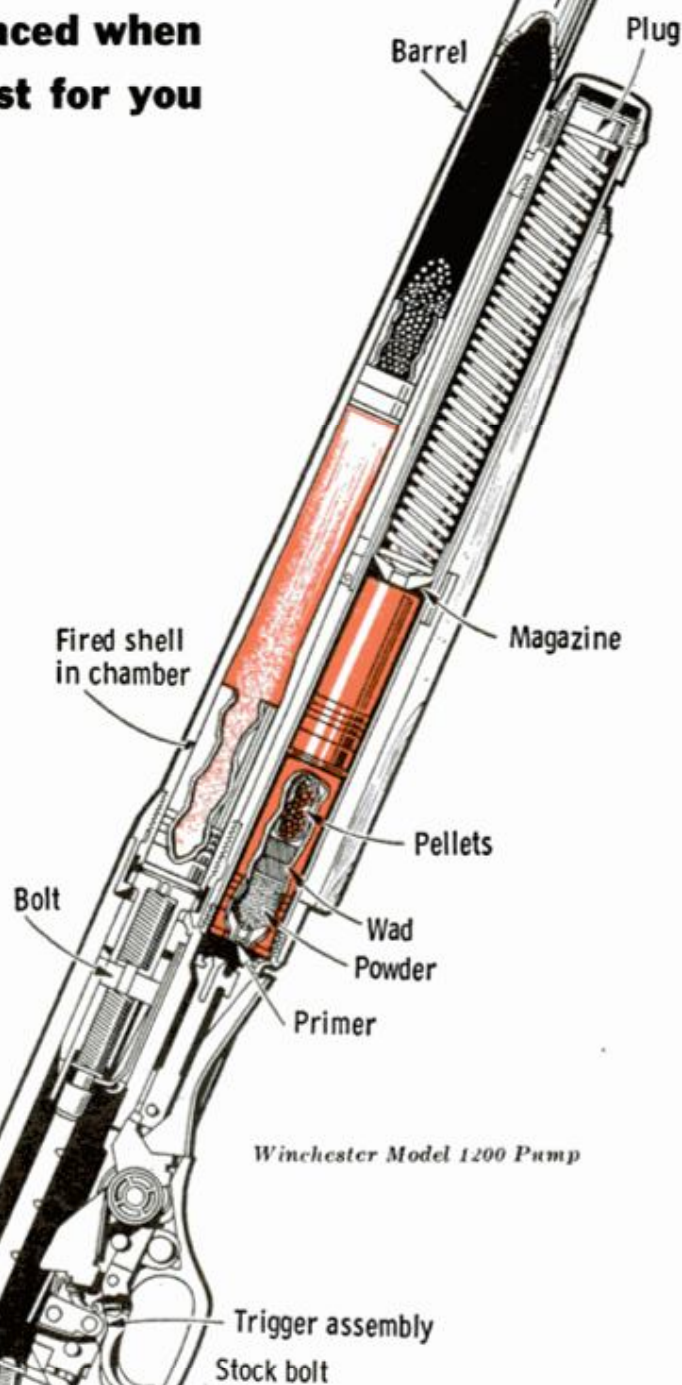
SHOTGUNS:

BUYING THE RIGHT BOOM

Choke, chamber, gauge, barrel, weight, style and price must all be balanced when choosing the shotgun that's best for you

THE SHOTGUN BOOM isn't all noise. This year, two scatterguns are being sold for every rifle. And two-thirds of the nation's 18 million hunters will fire one. But some who buy or own don't know one shotgun from another.

Descendants of the bell-mouth blunderbuss and muzzle-loading caplock fowling piece, modern shotguns fire small pellets down smooth bores. They're the only practical guns for bird shooting, and are used in hunting small game like rabbit or larger quarry like deer. So pick the right fowling piece for your target, be it pheasant, duck, skeet or trap. Here's what you should know.



Winchester Model 1200 Pump



GAUGE



GAUGE REALLY MEANS the number of lead balls to a pound. It comes from early gunmaking days when a lead ball was used to measure bore diameter. Thus, if a .730-inch ball neatly fits into a barrel, it's called a 12-gauge. That's because 12 such balls weigh one pound. If a .615-inch ball fits, it's a 20-gauge—20 balls weigh a pound.

Today's standard gauges are 12, 16, 20, 28 and .410. Technically, .410 is a caliber; it's actually 36-gauge. There is a 10-gauge, but it is seldom used because of its weight.

Gauge not only applies to guns, but to shotgun shells. The larger the bore the more powder and shot you can use. Thus a

12-gauge can fire more pellets farther than a 16 or 20-gauge.

For all-around shooting you can't beat a 12-gauge shotgun, the only gauge suitable for every shotgun target from dove to deer—and clay birds too.

For some upland shooting, the 20 or 16 is good. Compact and light, a fast-handling 20-gauge is ideal for close-up shooting at swiftly moving targets like quail.

A real expert, wanting a challenge, might use a 28-gauge or .410 for small upland game or skeet shooting. But the shells pack 25 percent less shot than those for a 20-gauge; are effective only to 30 yards.

BARREL

IN DECIDING upon barrel length, probably the most important consideration is how a shorter or longer barrel will affect weight, balance and handling of the gun. Another factor is the shooter's build—short people usually find long guns awkward to carry and shoot. Don't get more gun than you can comfortably handle.

A 28-inch barrel usually is selected for the general-purpose shotgun. Where fast gun handling is called for, as in upland shooting and skeet, your best bet is a 26-inch barrel. Gunning for ducks and geese at long range, you need the muzzle heavi-

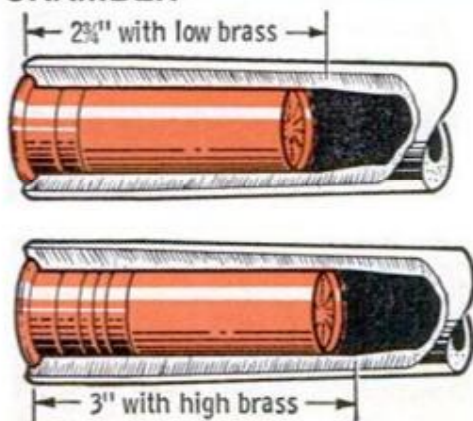


Browning Broadway Trap Model

ness and longer sighting radius of a 30 to 32-inch barrel for the steady swing and more accurate aim on far-out targets. Trapshooters generally prefer long tubes.

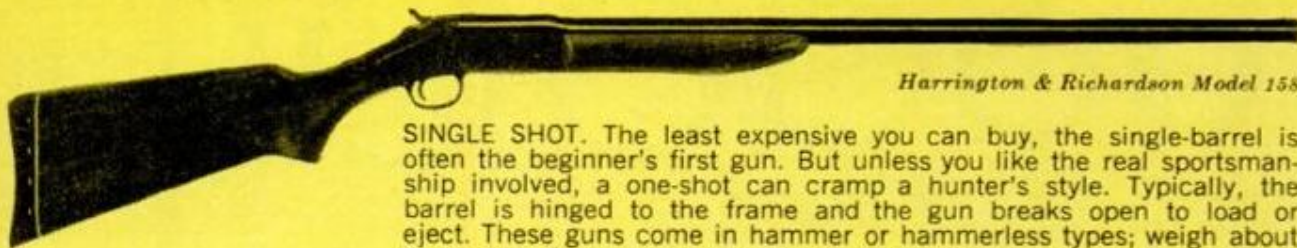
A raised or ventilated rib, above, provides a straight-line sighting plane above the barrel. It also breaks up disturbing heat mirages caused by rapid firing.

CHAMBER



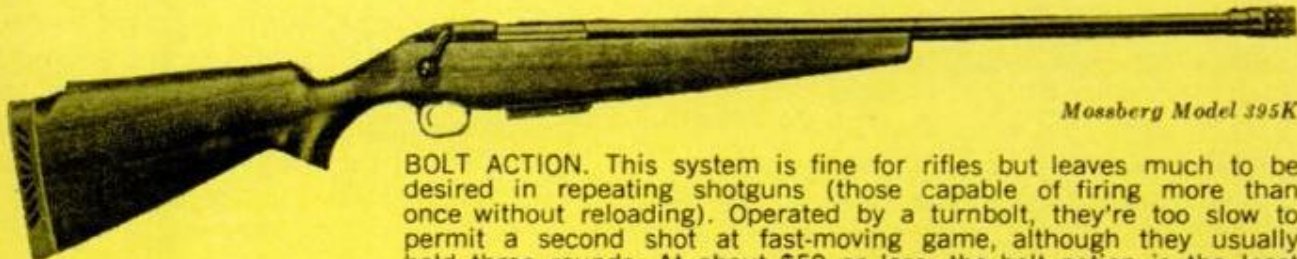
THERE ARE TWO CHAMBER SIZES—2 3/4 and 3-inch. Most shotguns have the shorter chamber. But guns used for long-range targets have the longer, which can use the more powerful Magnum shells (designated by a high band of brass around the bottom). Less powerful "low" brass shells are generally used in the 2 3/4-inch chambers, though high brass shells are available in this length if extra power is needed. Shotshells don't fully fit into chambers. Extra space allows crimping to expand when shell is fired.

SIX BASIC ACTIONS



Harrington & Richardson Model 158

SINGLE SHOT. The least expensive you can buy, the single-barrel is often the beginner's first gun. But unless you like the real sportsmanship involved, a one-shot can cramp a hunter's style. Typically, the barrel is hinged to the frame and the gun breaks open to load or eject. These guns come in hammer or hammerless types; weigh about 6 pounds. Some have unpleasant kicks when heavy loads are fired. Prices range from \$25 to \$35, except for costly competition trap guns.



Mossberg Model 395K

BOLT ACTION. This system is fine for rifles but leaves much to be desired in repeating shotguns (those capable of firing more than once without reloading). Operated by a turnbolt, they're too slow to permit a second shot at fast-moving game, although they usually hold three rounds. At about \$50 or less, the bolt action is the least expensive repeating shotgun you can buy, but most people are not fast enough to operate it effectively in the field.



Stevens Model 77

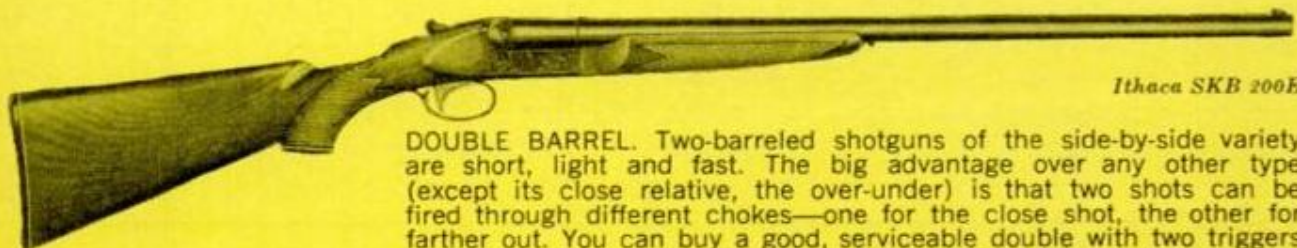
PUMP OR SLIDE ACTION. One of America's favorite shotguns, it has a smooth, easy, slide-trombone action that, in an expert's hands, can match an automatic's speed in successive shots. Capacity usually is five or six shells, but the magazine can readily be plugged to meet federal regulations allowing only three for migratory bird shooting or to comply with some state's upland game laws. Weight in 12-gauge is about 7 pounds. You can buy a good pump gun for \$100 to \$125.



Remington Model 1100

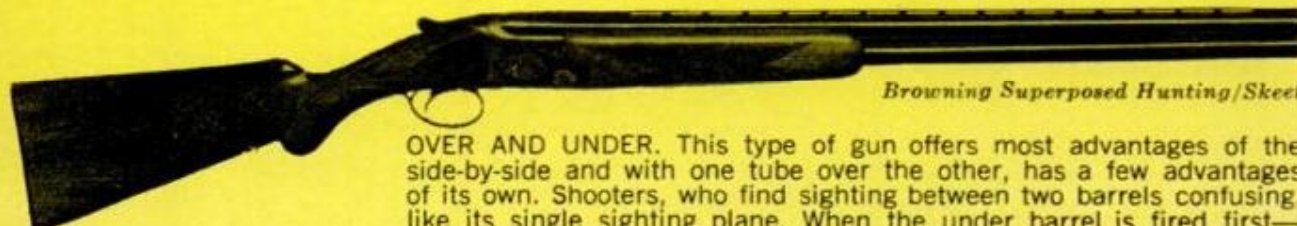
AUTOMATICS. In an automatic shotgun the fired shell provides the energy to eject the empty case, cock and reload the gun automatically. You just pull the trigger for each shot.

Recoil is less in automatics than in non-automatic guns of the same gauge and weight. Automatics usually hold three or five rounds (the latter can be easily plugged to meet federal and state three-shot laws). Some are two-shot guns. Standard grades sell for about \$150.



Ithaca SKB 200E

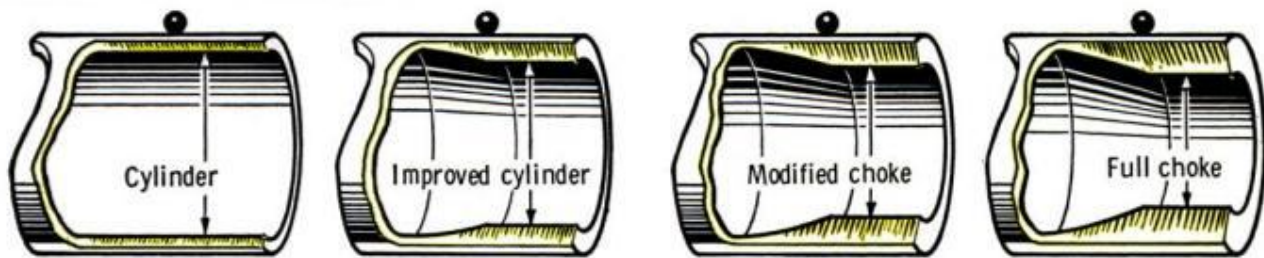
DOUBLE BARREL. Two-barreled shotguns of the side-by-side variety are short, light and fast. The big advantage over any other type (except its close relative, the over-under) is that two shots can be fired through different chokes—one for the close shot, the other for farther out. You can buy a good, serviceable double with two triggers and plain ejectors for less than \$100. About \$200 buys one with selective single trigger and automatic ejectors.



Browning Superposed Hunting/Skeet

OVER AND UNDER. This type of gun offers most advantages of the side-by-side and with one tube over the other, has a few advantages of its own. Shooters, who find sighting between two barrels confusing, like its single sighting plane. When the under barrel is fired first—the usual order because it has the more open choke—recoil is nearly straight back, and muzzle jump is less, allowing a faster second shot. Prices range from \$200 to \$300 and up.

CHOKE AND PATTERN



Exaggerated illustrations

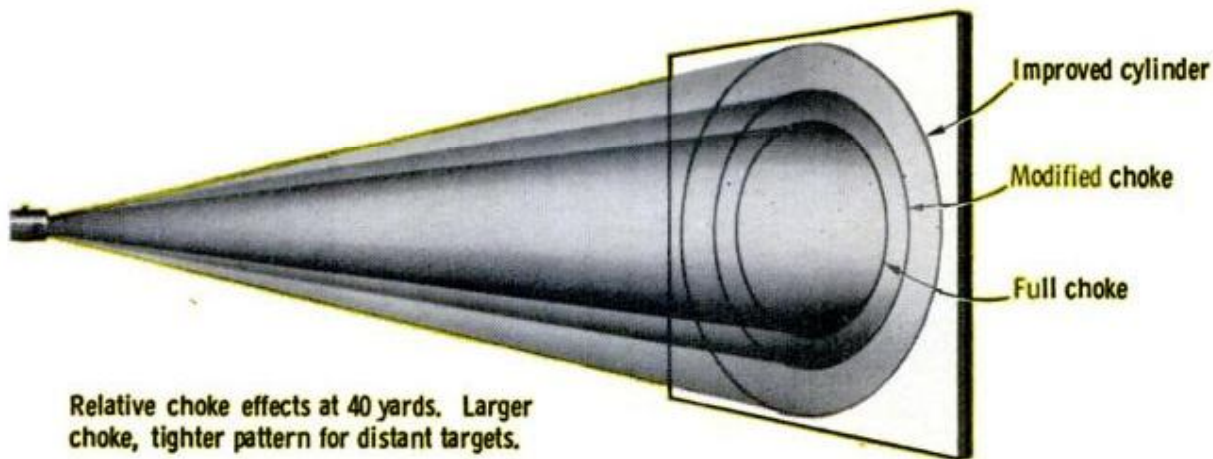
MUZZLE CONSTRICTION in a shotgun is called choke. It's important because it affects dispersion (pattern) once the shot leaves the barrel. Quick dispersion is needed for close targets—delayed dispersion for targets farther out. A barrel with no constriction has no choke. It's called cylinder or true cylinder, but is seldom used.

Different degrees of choke have different

over 40 yards, you'll need full choke; if under 35 yards, improved cylinder.

Most people overestimate distance, so here's a handy rule: your first shot at upland game is generally from 20 yards; second shot, 25 yards. The average shot at ducks over decoys, 35 yards.

Each barrel of most double-barrel shotguns—side-by-side or over-under—has a



Relative choke effects at 40 yards. Larger choke, tighter pattern for distant targets.

names—each dependent on the percentage of shot hitting a 30-inch circle 40 yards away. If a shell carries 400 pellets and 65 to 75 percent hit within the circle, the choke is called full; 45 to 55 percent, modified; 35 to 45 percent, improved cylinder. For all-around shooting, modified choke is recommended. But if most of your shots will be

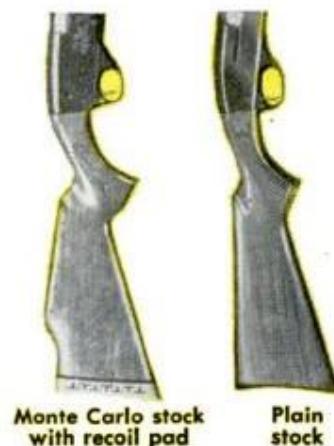
different choke than its mate. Generally one barrel is modified, the other full. But single-barrel guns like automatics and pumps have only one type choke. Obviously, if your targets vary you'll need different choke settings. For \$20 to \$30 you can get a variable choke that adjusts by twisting the fitting attached to the muzzle.

STOCK AND WEIGHT

STOCK LENGTH can be a problem. If too long, the gun may throw you off balance, or catch in your clothing. If too short, you can be punished by recoil. Either condition means misses. Make sure your stock feels right. Many like the softening effect of a recoil pad.

Some shotguns, especially trap guns, have a variation called a Monte Carlo stock, a portion of which is raised to support the cheek.

Gun weight is important. The easy swing of a heavy gun is good for long-range trap or geese shooting. But the seven pounds of the average 12-gauge is better for quick sighting on upland game birds. Besides, you don't get as arm-weary carrying a lighter gun afield all day.



How to cure power loss during acceleration

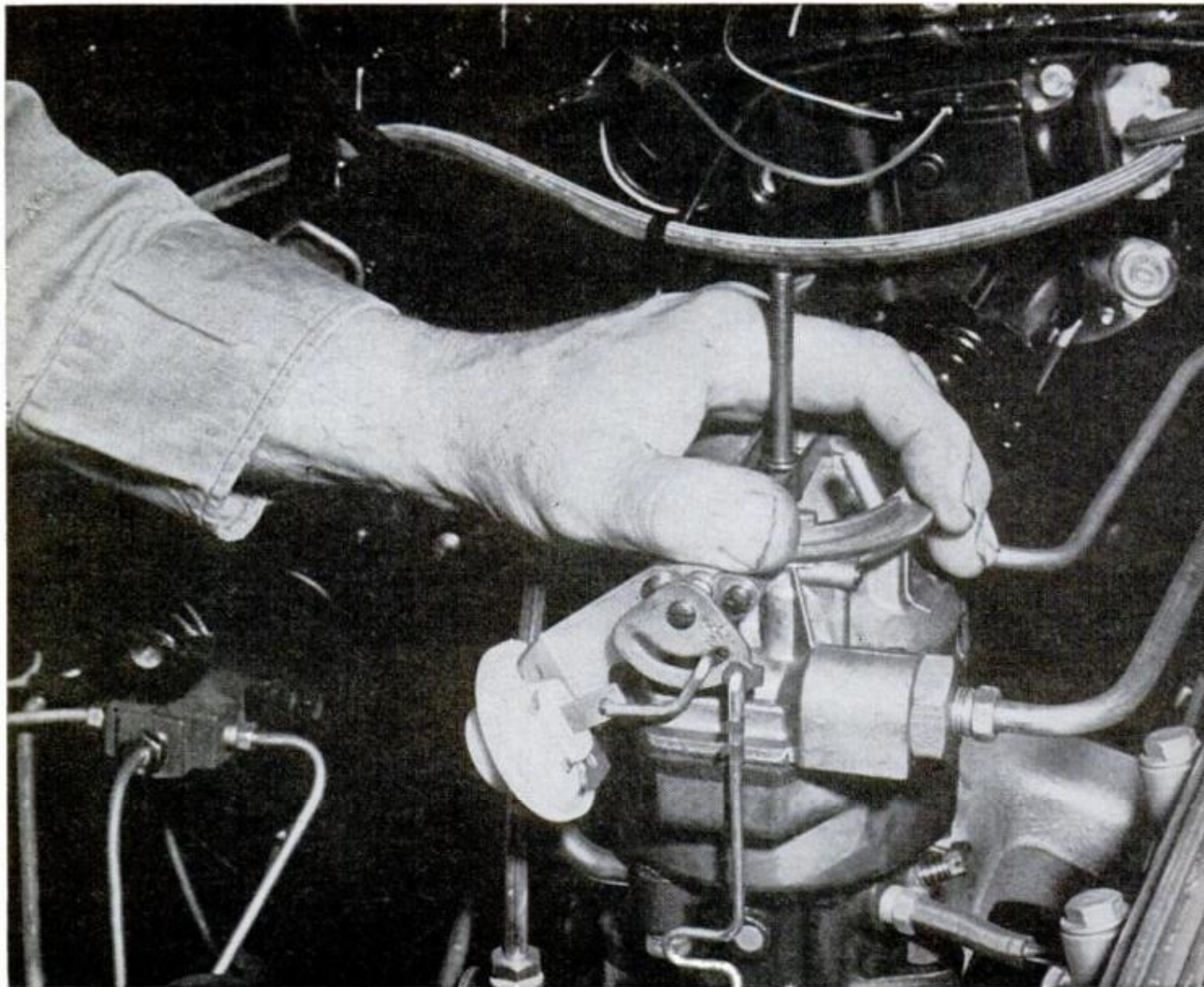
LISTED under the headings "poor acceleration" or "engine has no power" in every manufacturer's service manual are at least 26 different causes.

If you're a Saturday Mechanic, trying to troubleshoot them all will take into Monday morning. And that's giving up too much time, no matter how much you love that now lifeless bundle of bolts. But if you cut some corners, you'll get to the heart of the trouble fast.

There are a few quickie tests that will pinpoint the obstacles to pep and power. Once they're located, it becomes a matter, in most cases, of tearing down an assembly and cleaning or replacing a part.

The carburetor is the best place to start. The accelerator pump and high-speed circuits are the two major areas that could

PARTIALLY COVERING AIR INLET should increase engine speed if the high-speed circuit is operating



keep a car hanging back as if it were playing tug-of-war with a tank. (There's nothing electrical about these "circuits," yet they are often referred to this way.)

The purpose of the accelerator pump circuit is to avoid a power lag. If it were not for this circuit, gas going through the carburetor would lag behind the influx of air. The pump circuit evens the score by accelerating the flow of gas through the carburetor when necessary.

Operation of the carburetor's accelerating system is easily followed in the diagram below. Briefly, a quick jab on the accelerator pedal opens the throttle and pulls the pump plunger down. This exerts pressure on the fuel, which forces the inlet check ball against its seat, closing it and forcing the pump discharge check ball off its seat, opening it. The extra quantity of fuel is thereby injected into the car-

buretor to meet the increased demand.

If this circuit gets fouled, however, it's just the same as if it weren't there at all. Gas flows slowly, and there's a power loss when you step on the accelerator.

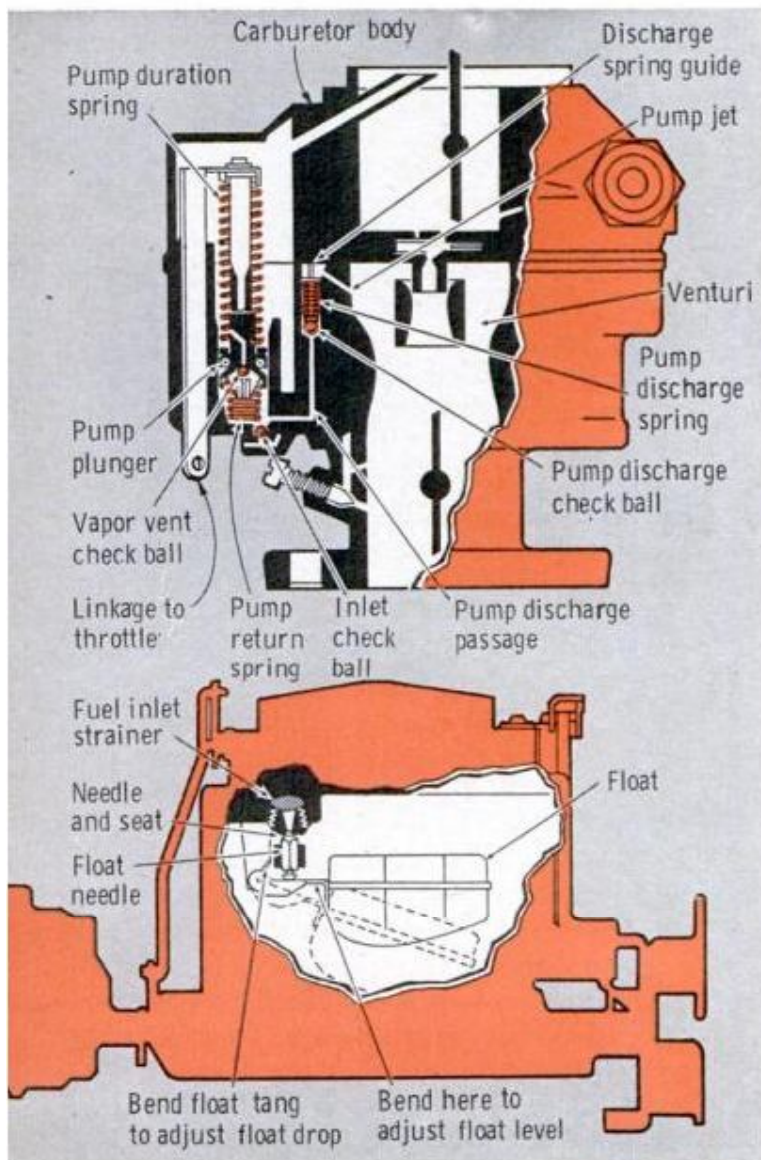
To check this circuit, hold the choke open and look into the carburetor while someone stomps down on the accelerator pedal a couple of times. You should see and hear a steady stream of raw gas spraying into the venturi.

If not, the carburetor has to come apart and the blockage must be removed. That blockage most often is a fouled accelerator pump plunger. However, also spend a few seconds checking the accelerator pump inlet and discharge valves and seats for corrosion and dirt.

Keep in mind that the accelerator pump stroke of carburetors is adjustable. Make sure yours conforms to specs in the manual. This is done with a gauge, but the method differs from carburetor to carburetor.

A carburetor's high-speed circuit that's

CARBURETOR CROSS SECTIONS show accelerator pump action (top) and the float action (bottom)



Troubleshooting Poor Acceleration

Fuel System Reasons:

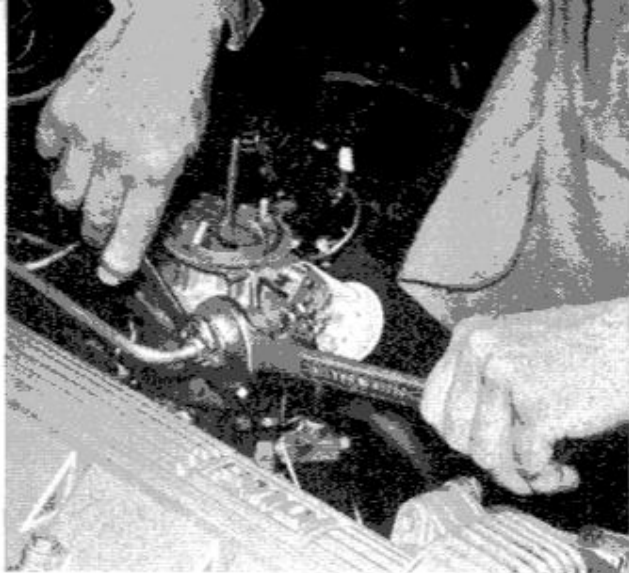
- Improper carburetor float level
- Damaged needle-seat assembly
- Fuel mixture too lean or too rich
- Restricted gas line or in-line fuel filter
- Dirty carburetor
- Bad fuel pump
- Inoperative carburetor accelerator pump circuit
- Plugged carburetor high speed circuit

Ignition System Reasons:

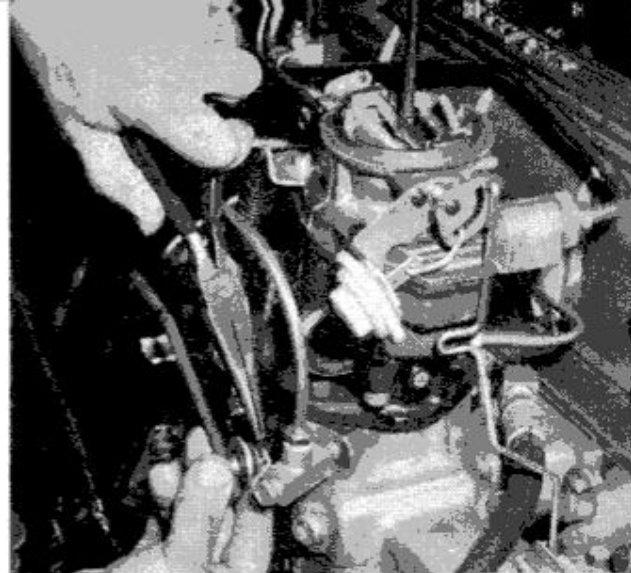
- Weak coil or condenser
- Incorrect ignition timing
- Excessive play in distributor shaft
- Distributor cam worn
- Insufficient point dwell
- Sparkplugs fouled or incorrectly gapped
- Bad vacuum advance unit

Other Reasons:

- Valve springs weak or valves sticking when hot
- Burned, warped or pitted valves
- Valve timing incorrect
- Incorrect valve lifter clearance
- Blown cylinder head gasket
- Low compression
- Clutch slipping
- Brakes dragging
- Engine overheating
- Transmission linkage out of adjustment
- Transmission bands out of adjustment



DISCONNECT FUEL LINE at carburetor to check the fuel flow. *Caution:* Check when the engine is cool



THROTTLE LINKAGE should be thoroughly checked and adjusted to the car manufacturer's specifications

in good shape will supply the needed amount of fuel during cruising and part-throttle operation. This is done when the partial vacuum at the discharge nozzle increases as the air flow increases, thus allowing atmospheric pressure on top of the fuel in the bowl to push fuel through the discharge nozzle.

How do you check for a partial vacuum? It seems as if you'd need a complicated barometric measuring device, but you don't. Just run the engine at about 1000 rpm and partially cover the air-horn assembly with your hand. This should cause more fuel discharge from the high-speed circuit, and there should be an increase in engine speed. If there isn't, the high-speed circuit is clogged, and the carburetor should come apart for cleaning.

You should always check one part of the carburetor in cases of poor acceleration, and that's the float level and needle-seat assembly in the bowl. There is no fast test for either, so you'll have to do it by removing the carburetor.

Make sure there is no dirt on the needle tip and that the needle and seat aren't damaged. Just as important, check the float-level setting with the correct gauge to the specifications for the carburetor given by your manufacturer.

Naturally, if not enough gas is getting to the carburetor, your car will be starving for fuel. Check fuel supply to the carburetor by disconnecting the fuel line at the carburetor inlet. If gas just trickles out or there is none, you'll have to trace back until you find the restriction. Usually, that restriction is a bad fuel pump or a plugged-up in-line fuel filter.

Not enough gas causes poor acceleration, and too much fuel leads to the same problem. There are two quick ways to determine if your engine is running too rich a fuel mixture.

First, start it up and check the exhaust. Black exhaust is almost always indicative of too much fuel getting to cylinders.

Pull a couple of sparkplugs and check their tips. If the plugs are wet, they could be gas-fouled. Or, if they have dark gray, black, yellow or tan deposits on them, it usually means they are lead-fouled from a rich mixture.

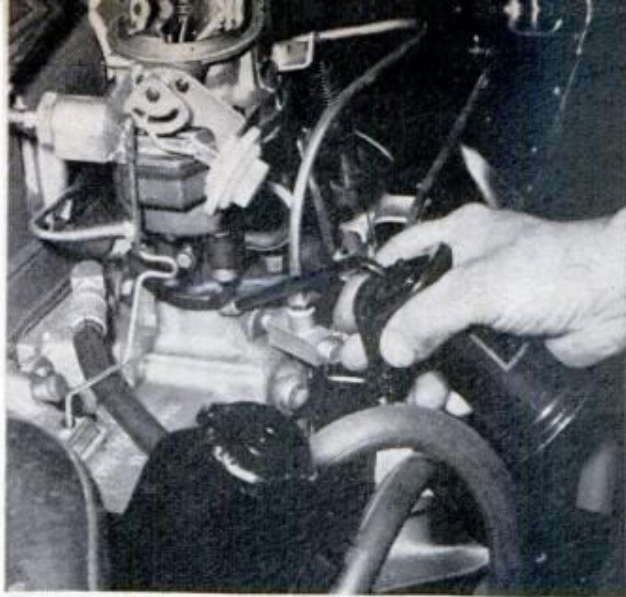
There are several reasons for an over-rich condition. Those you can check easily are a clogged carburetor air cleaner, improperly adjusted automatic choke, high idle-speed adjustment, a high float level and a worn needle-seat assembly.

In the case of a carburetor air cleaner, for instance, note the difference in engine speed with and without the air cleaner in place. If engine rpm decrease when the cleaner is installed, the cleaner is clogged.

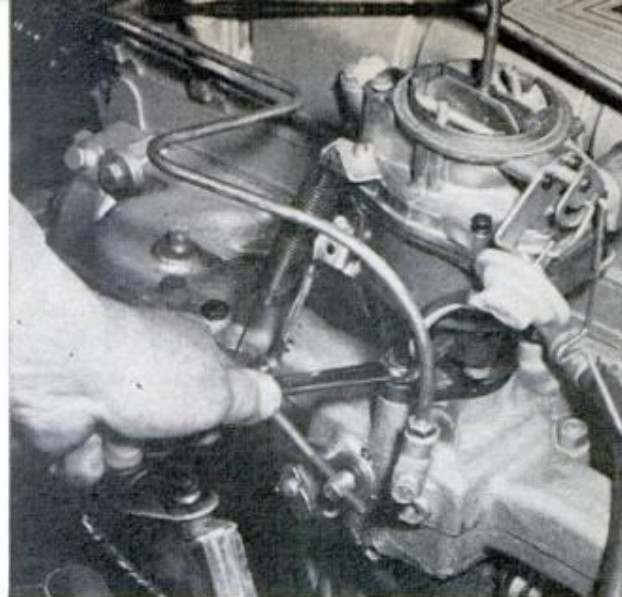
Other causes for an over-rich condition, such as a sticking metering rod or economizer valve, or worn carburetor jets, call for a tearing down of the carburetor for thorough cleaning or jet replacement.

That takes care of the fuel system, which shouldn't have taken you more than one hour to troubleshoot. Now let's see what ignition problems could make your car sluggish on acceleration.

Ignition problems that lead to poor acceleration can be grouped in the following order (from the most to the least prevalent): 1. improper ignition timing; 2. bad or improperly adjusted sparkplugs; 3. bad or



AIR LEAKS AROUND CARBURETOR can cause poor acceleration. Check with use of oil-kerosene mixture



TIGHTEN MOUNTING BOLTS of the carburetor, head and manifold and replace gaskets if necessary

improperly adjusted breaker points: 4. a malfunctioning vacuum advance unit; 5. a defective primary circuit.

To check timing, of course, you need a timing light. I wouldn't think of doing it any other way—timing is too critical. A spark that's timed too early or too late causes poor acceleration because full energy is not obtained from every drop of fuel.

Since we discussed timing in great detail in the April '67 *Saturday Mechanic*, I'll not go into it here, only to say that when you're plagued with poor acceleration, check engine timing.

Neither do we have to discuss at length the importance of correctly gapped spark-plugs and plugs that are in good shape. It's obvious that each plug should be removed and visually inspected.

As for breaker points, wide gap causes them to open slowly. Therefore, the points don't stay closed long enough for full coil saturation, and the engine will lose power at higher speeds.

A gap that's too small also contributes to the problem. Points will open and close with a pounding action, which won't allow the coil and condenser to discharge fully.

The sure way to adjust points is with a dwell meter and feeler gauge. However, don't overlook point spring tension. If tension is too weak, point contacts will actually bounce.

The spring tension of points should be tested with a spring-tension scale, and tension should be adjusted to the specification called for by the manufacturer.

The purpose of the vacuum advance (or spark advance) is to advance ignition timing in proper relation to engine speed and

load. If your car poops out as you try to accelerate, the diaphragm inside the advance unit may have an air leak.

How can you check on this without using special equipment? That's easy in some cars. Just pull the distributor breaker plate *against* its rotation and hold a wet finger over the vacuum inlet. The plate should not move. If it does, the diaphragm in the advance unit is leaking, and the unit should be replaced.

In some cars, you can't pull the distributor breaker plate against its rotation. The advance unit of these must be checked with a timing light or a distributorscope.

Finally, a weak spark caused by a defect in the primary circuit can cause poor acceleration. Although it's not 100-percent sure, one way to check on this possibility is by grounding out the coil lead going from coil to distributor. Hold it about $\frac{1}{4}$ inch from ground.

A weak spark or one that is not blue signifies a problem in the primary, such as a weak coil or condenser, too much resistance or circuit leakage.

Another common cause of poor acceleration is an air-intake leak that leans out the fuel mixture.

Test for such leaks by squirting a mixture of one-half SAE 10W oil and one-half kerosene around the base of the carburetor and the intake manifold, and then start the engine.

If the mixture appears to draw itself inward or if engine speed increases, an air leak exists.

Tighten down all bolts first. If this doesn't help, chances are you have a bad gasket, that needs replacing. ★★★



FROM THE OUTSIDE, only the remaining driveway tips you off that the room addition was once a garage

When it's the garage... or else

When living needs demand more space and you just can't pack up and move, an attached garage may be your ace in the hole

THERE CAN BE any number of reasons why all of a sudden your house is too small. A new addition to the family may be one of these. Perhaps the time has come when a son and a daughter need rooms of their own. Or maybe Mom and Dad have reached the age where they must move in and be a part of the family.

Whatever the reason, seldom is there a room waiting for such use, and it isn't always so simple to just move to larger quarters.

So where can you squeeze in another room? You could consider the basement,

but it could be damp and cold. There's the attic, but then, there may be no stairs. This leaves one spot which you probably haven't thought of—the attached garage. But what about the car?

Just how desperate you are for an additional room will determine how willing you might be to sacrifice the garage and park the car outside. The curb, of course, has been the garage for many a car, so leaving it out might not be too much a consideration.

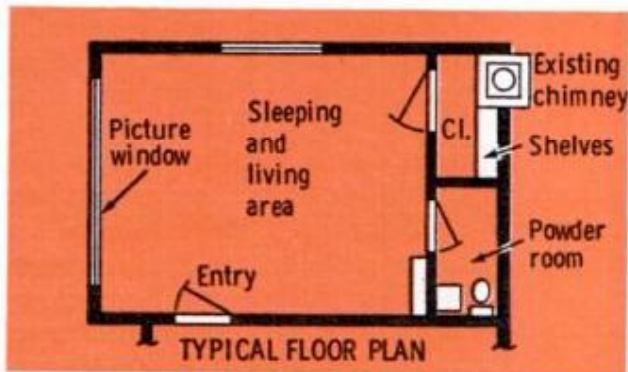
As for the garage, it's a natural for converting into a room or two. It's already a



FROM THE INSIDE you'd never know it was a garage. In this view, picture window replaces former door.



THIS VIEW shows louvered door that leads to roomy closet which is located next to the powder room.



FLOOR PLAN shows how even a one-car garage will provide adequate living and bedroom facilities.



A PEEK into the powder room. Room, plus closet, occupies 4 feet of space across rear of garage area.

part of the house. The four walls (three to be exact) are already there. If you leave the overhead door as is and frame an inner wall across it, no one will be the wiser and the remodeling won't change the looks of the house at all. If you prefer a picture window in place of the door, the exterior can be treated to blend in architecturally with the rest of the house. Only the driveway will be a tip-off that the room was once a garage. Best of all, you'll get by for a lot less than the cost of an add-on room and certainly with a lot less work.

Remote, yet near enough

Where the need for extra space might be a room for Mom and Dad, the attached garage is perfect in many ways. Usually it's on ground level with no stairs to climb. If it's only single-car size, it's big enough to provide a cozy sitting room-bedroom, a half bath and a closet. It's remote enough to let the folks get away from family hubbub, yet close enough for them to join the fun when they wish.

Aside from needing professional help to put in the plumbing for a powder room and to extend a duct to provide heat, the job of converting the drab space into a cozy room is something any handy guy can do.

Since most garage floors do not have a moisture barrier in them and are damp and cold, the first thing you must do is lay a wooden floor over the concrete. Here you have a choice of two types and the kind you use depends upon heating re-



SINCE CEILING JOISTS are spaced 16 in. center to center, they're too wide for 12-in. tile, so you have to add 1x3 furring at right angles to joists



AFTER DETERMINING WIDTH of border tile to maintain equal spacing along each wall, start stapling tile through exposed flange to furring in corner of room



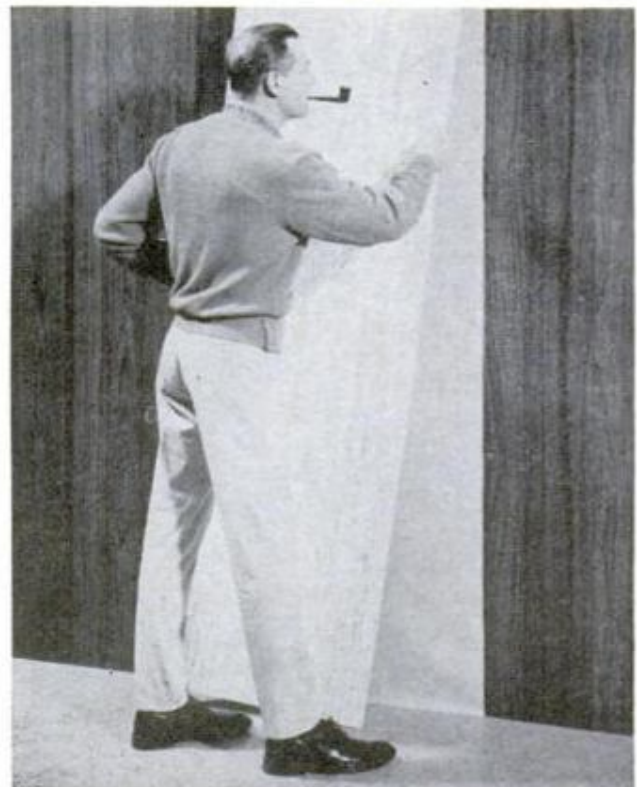
AS EACH ROW IS STAPLED, grooved edge of tile of next row is pressed over flange edge of previous row. Watch to keep joints in tile running straight

quirements. Where a single ceiling or wall register is adequate to heat the area, you can build a floor by simply laying sheets of $\frac{3}{4}$ -in. plywood decking on top of 2x4 sleepers set on short screeds bedded to the floor in mastic. On the other hand, where the size of the area requires more than one heat outlet and ducts must be run in the floor itself to an outside wall, then you'll have to put in a raised floor which is high enough to accommodate floor registers. The drawing on page 129 shows how this is done: a vapor barrier first being spread over the concrete floor, then 2x8s installed on edge, wall to wall. Blanket insulation is placed between the 2x8s, heat duct installed and the whole thing is floored over with plywood.

Screeds are short lengths of 2x4 cemented flatwise to the concrete floor in staggered rows 12 in. apart. Then long 2x4s, called sleepers, rest on top of the screeds to which they are nailed. The sleepers are covered with a polyvinyl membrane before being floored with plywood sheathing.

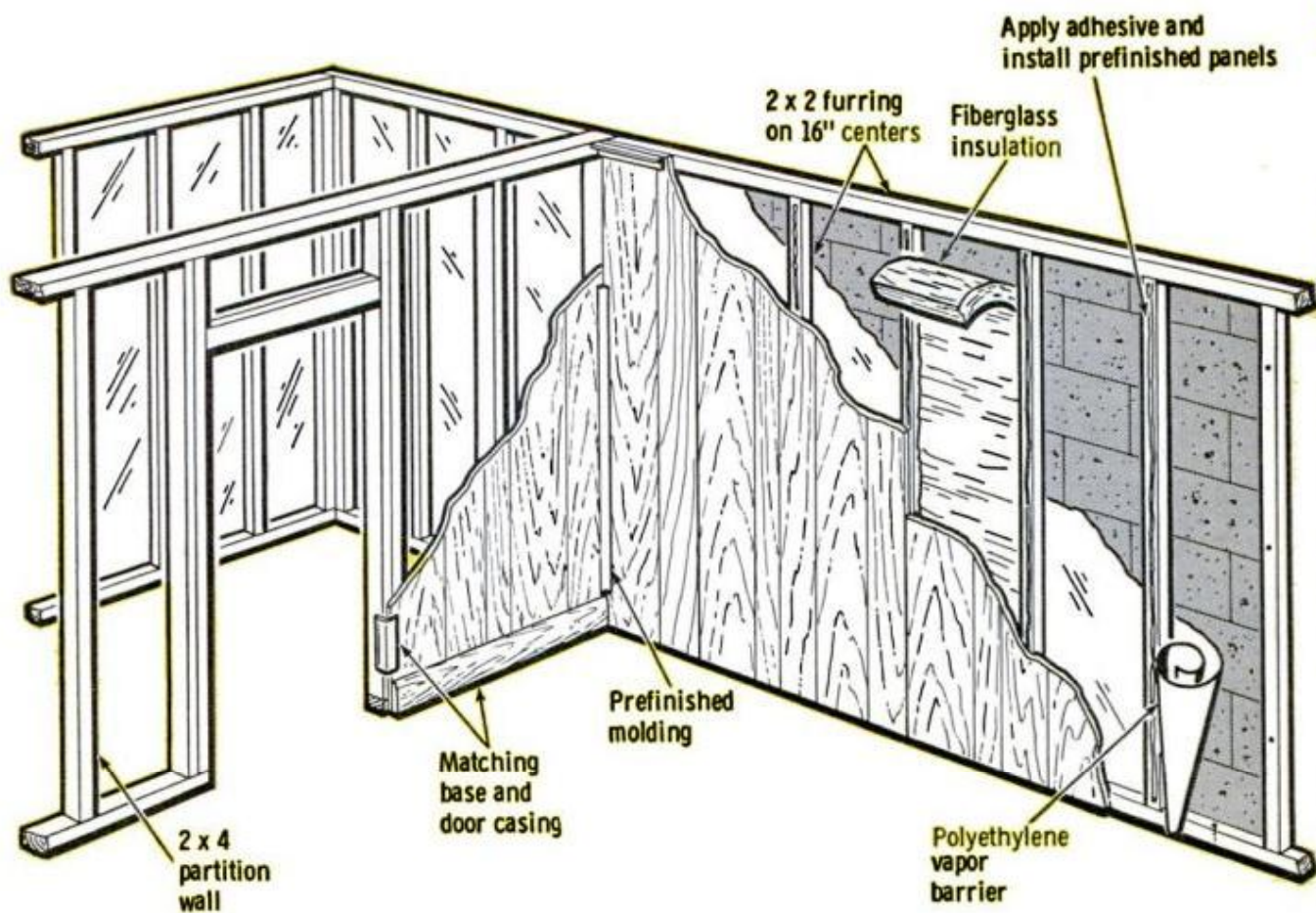
Bath and closet partitions are erected as in typical wall framing, the studs being placed 16 in. center to center and doubled up at the doorways. If the overhead door is the only access to the garage, you'll have to cut a new opening leading to the house.

(Please turn to page 218)

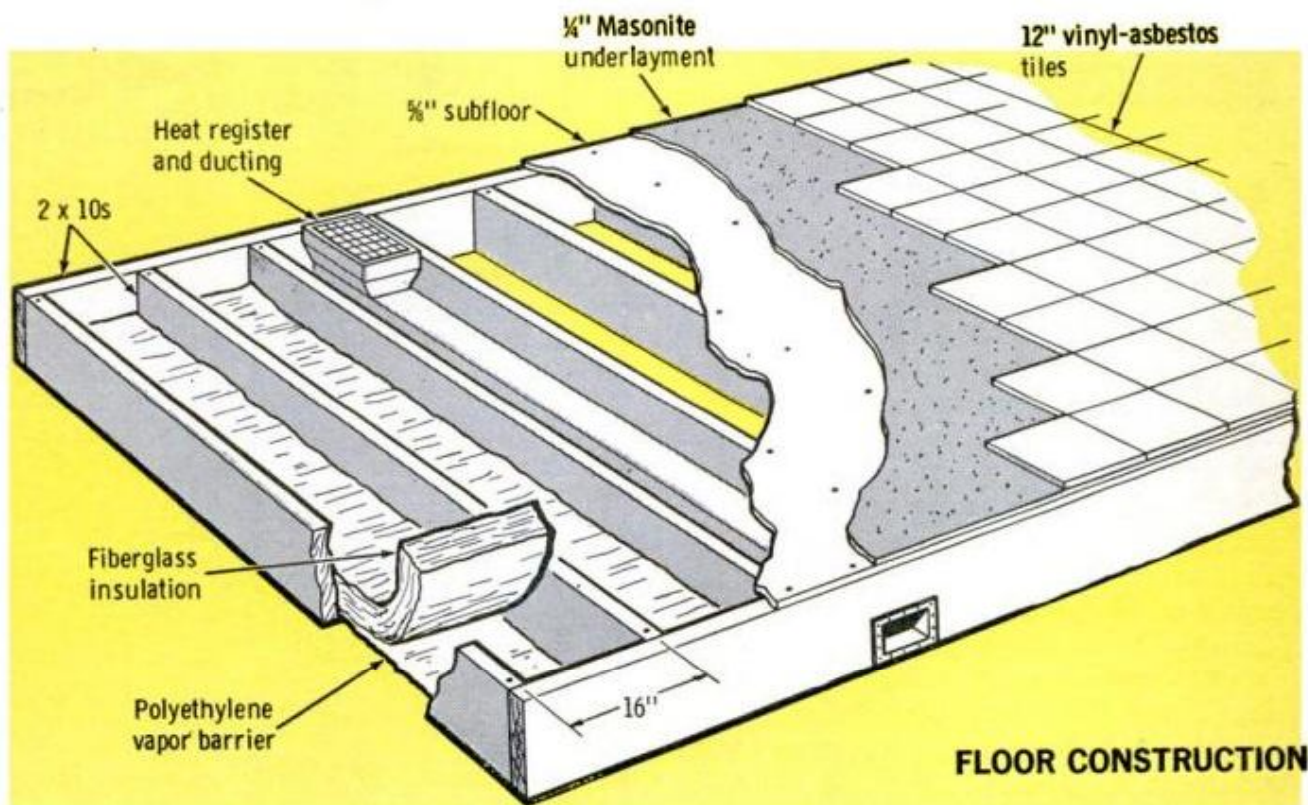


BIG 4x8-FT. SHEETS of factory-finished hardboard paneling give you finished wall as soon as they're in place. Accent panel is being installed here

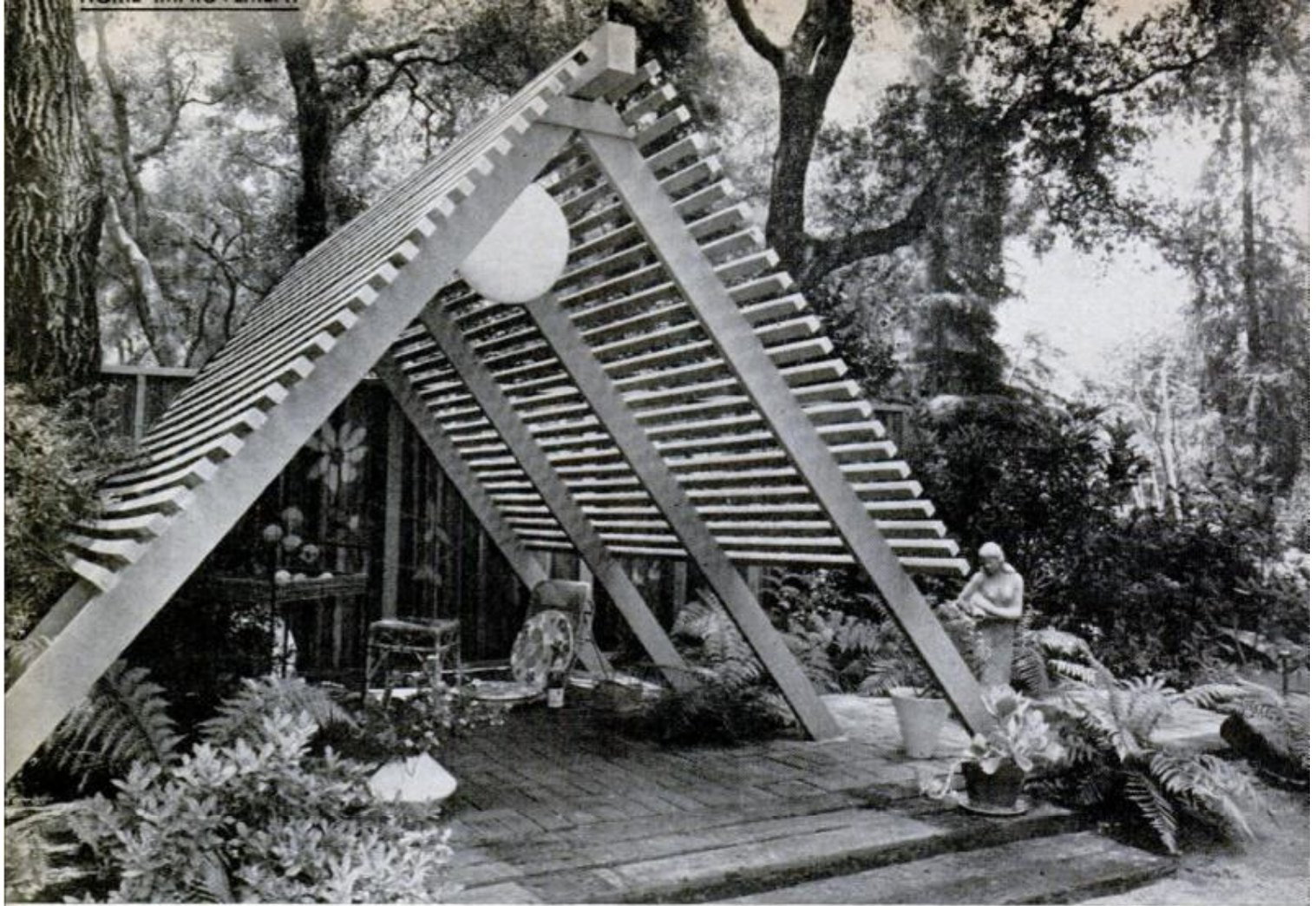
BUILDING DETAILS



WALL CONSTRUCTION



FLOOR CONSTRUCTION



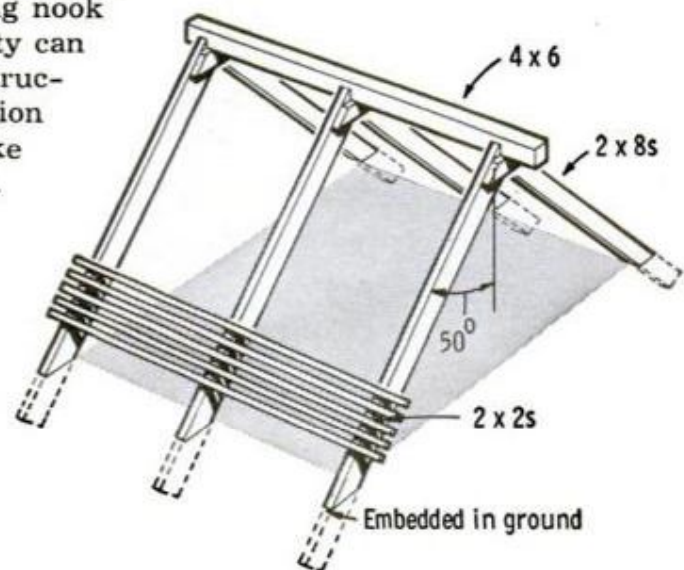
2 GARDEN SHELTERS

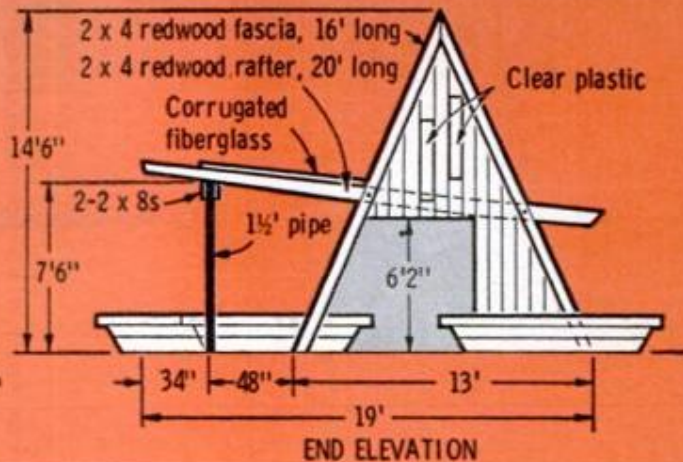
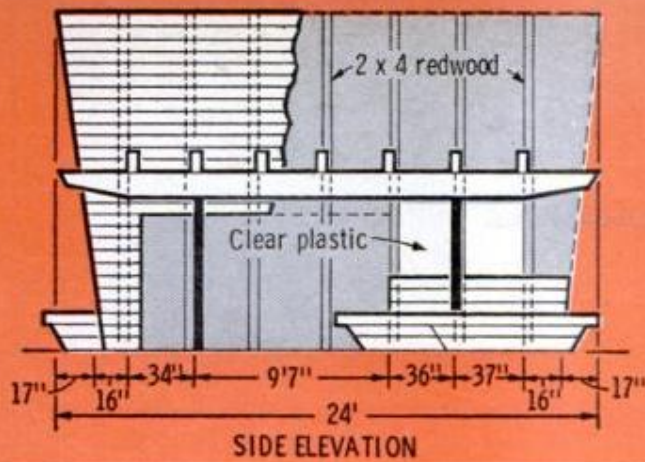
Technical Art by ZIK Associates, Ltd.

A GRACEFUL GARDEN SHELTER offers much more than escape from burning sun, chilling shower or gusting winds—it's an enticing nook where soothing solitude or suave sociality can be savored and enjoyed. The physical structure itself can be a rewarding expression of your own individuality, for shelters like these offer unlimited freedom of design.

This freedom is mainly due to the availability, attractiveness and sound durability of redwood; especially attractive when complemented by brick, concrete, bamboo or plastic.

Don't trouble yourself with the thought of rot or finishing problems, either, for the natural chemicals in California redwood make it impervious to decay and termites. And yet, redwood holds finishes well—you can paint it, stain it, bleach it, or just let it weather to a soft gray.



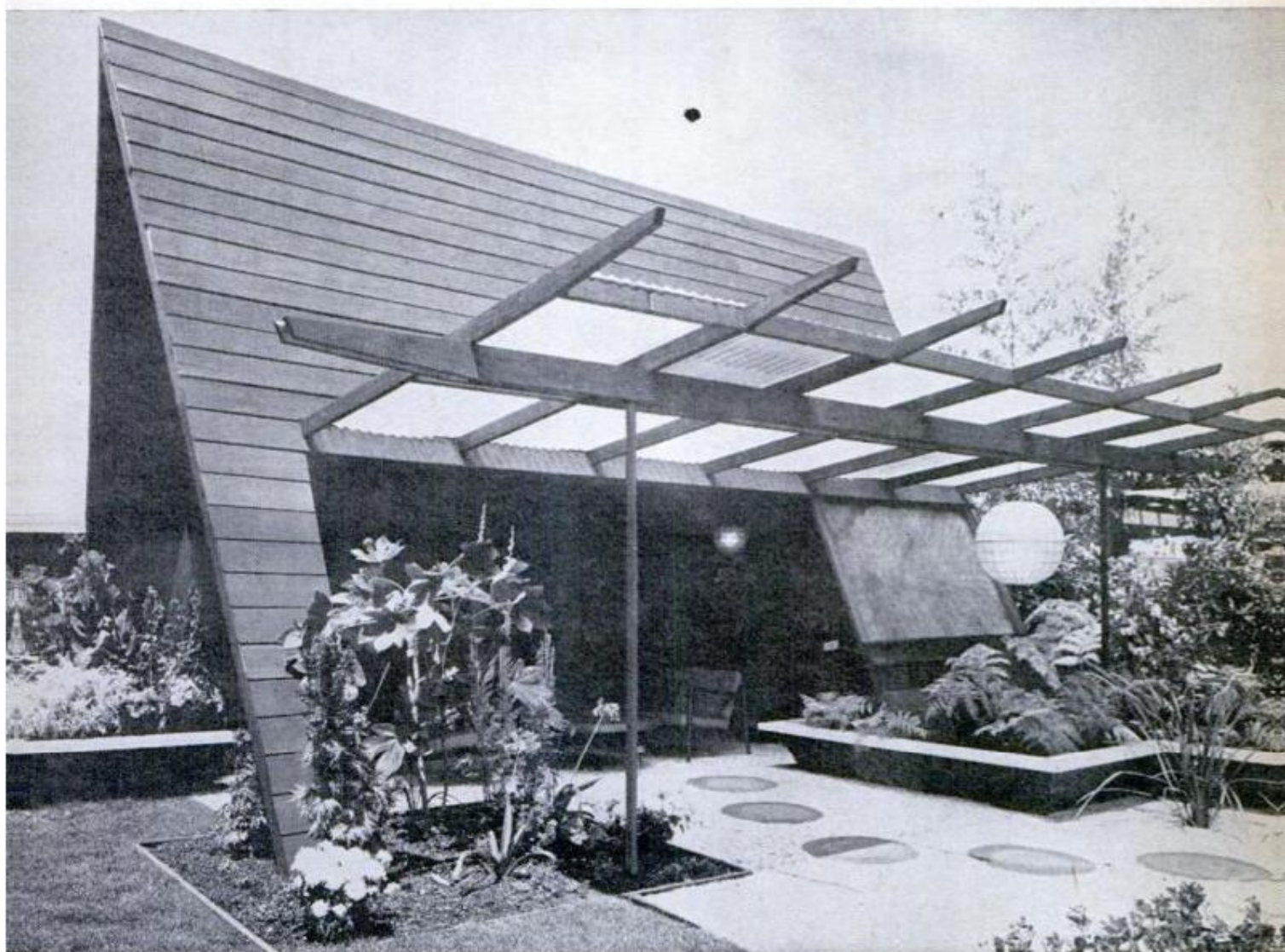


CLEAR PLASTIC PANELS pass sunlight to interior of shelter while the fiberglass panels filter sun's rays

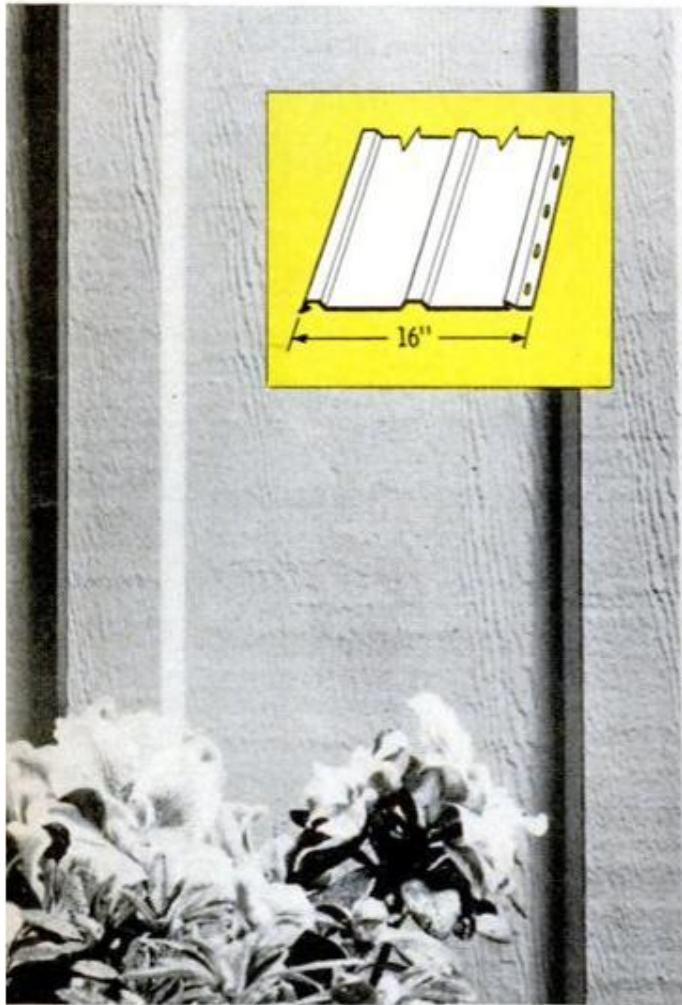
LEFT: The geometric A-frame shelter is a simple, surefire way to add to your enjoyment of outdoor living. The frame consists of 2x8-in. redwood legs and a single 4x6 notched into the apex of the legs. The 2x2-in. strips are spaced about 2 in. apart. For a bit of whimsy, flowers are painted on the fence. Armand Ramirez, architect.

ABOVE: Plastic panels offset an extensive array of redwood for a pleasing blend of dissimilar materials. As seen below, the shelter seems to invite passersby in for a few quiet moments. Other ideas are presented in a booklet by the California Redwood Assn., 617 Montgomery St., San Francisco. Send 10 cents for handling. ★★

SETTING FOR MIDSUMMER NIGHT'S DREAM is also appropriate for afternoon baskings and evening buffets



New building products

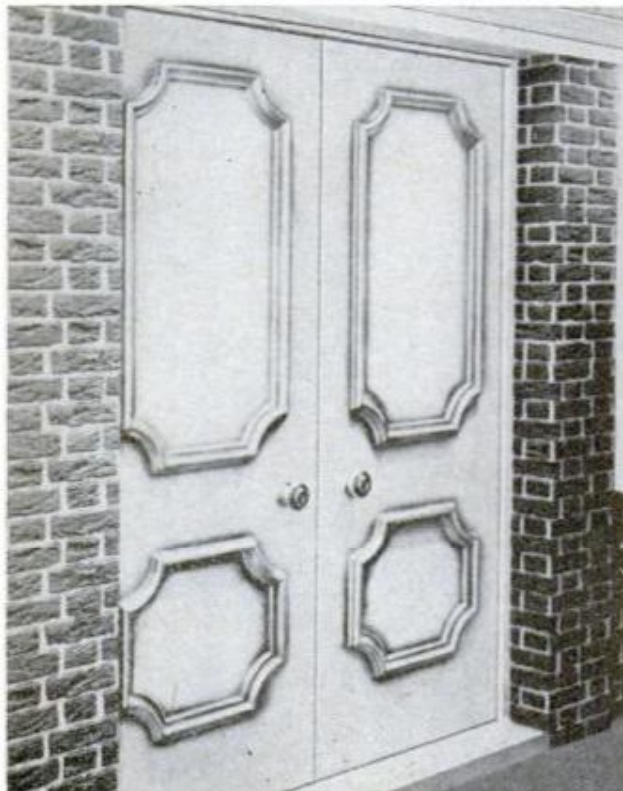


◀ Textured aluminum siding

Three styles of siding with a realistic rough-sawn texture have been developed by Kaiser Aluminum. Aside from the board-and-batten design shown, conventional 8-in. bevel siding and double-five (a 10-in. panel that creates the effect of two 5-in. boards) are also being made available in six colors. The embossed surface is protected by Kaiser's new Kal-Shield, a plastic finish that's applied by rolling on a single coat, rather than by spraying. The result is a tough, fused-on plastic coating that won't blister, peel or react if exposed to common solvents.

Floor air diffuser ▶

Here's a diffuser that lets you change the pattern of air flow with the changing of seasons. Made by Leigh Products, Inc., of Coopersville, Mich., it has a reversible grille that's capable of producing two different flow patterns. For heating during the winter, the diffuser grille provides a well-dispersed blanket of warm air. During the summer months, it directs a high velocity stream of air towards the ceiling, thereby increasing cool air circulation. No tools are needed to make the change. Just lift the grille, or face, from the diffuser, turn it over and slip it back in place.



◀ Aluminum-clad doors

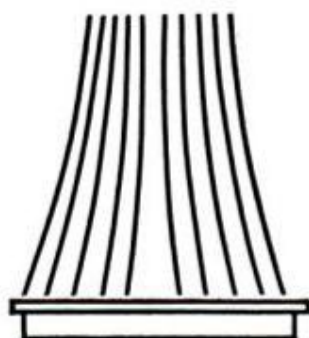
Alumidor identifies a line of exterior, solid-core doors with an aluminum face. Using only common woodworking tools, you can apply molding as shown, or you can otherwise machine the door for hardware and windows. The door also features vinyl-sealed edges and magnetic weatherstrip. Made by the Young Door Co., Plymouth, Ind.

Spreadable insulation ▶

For installation over present attic insulation or for use with new ceilings, this material is made of treated cellulose fibers and is called Conwed Attic Insulation. It comes in cubes which are spotted between joists and then fluffed. Each cube covers 30 sq. ft. with two in. of material. Wood Conversion Co., Minneapolis, Minn.



you should know about

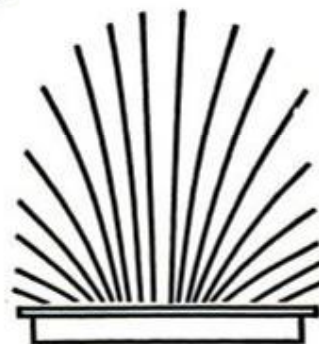


FOR COOLING

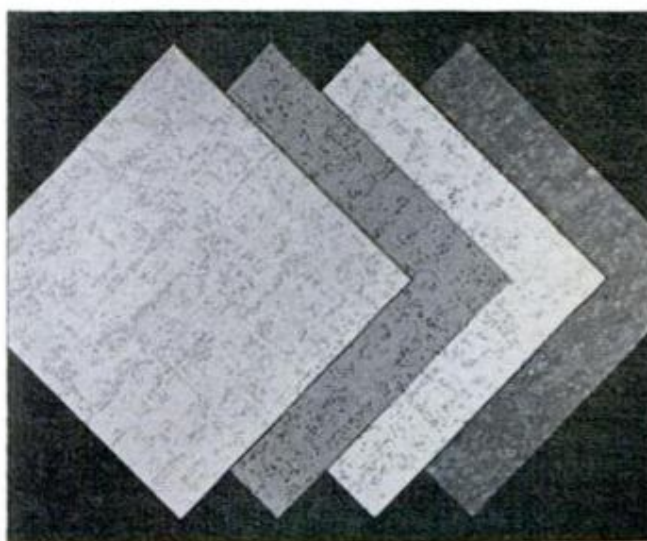
COOL COLUMN of air is directed at ceiling during warmer months. Diffuser is available in widths of 2¼, 4 and 6 in.



WARM BLANKET of air is evenly distributed during winter. Diffuser face can be reversed in a matter of a few seconds



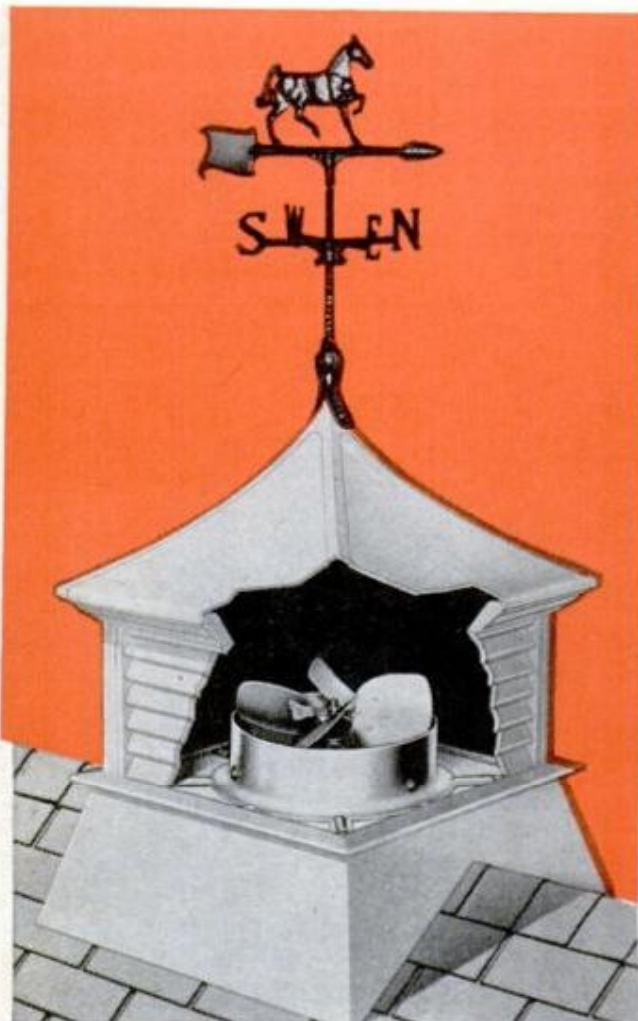
FOR HEATING



Marble-finished tiles

They're actually made of vinyl asbestos and are embossed with a nondirectional design that enables you to lay a floor undisturbed by varied patterns. The tiles are 3/32-in. thick and are available in 12-in. squares. Azrock Floor Products, San Antonio, Tex.

New products



Attic-ventilating cupola

Combining the attractive appearance of the traditional cupola with the advantages of forced-air attic ventilation, the Cupola-Matic will remove superheated air from homes with up to 1500 sq. ft. of ceiling area. The power ventilator is turned on and off automatically by a thermostat control to help keep the house cool both day and night. The roof of the cupola is made of bronze-colored thermoplastic, while the rest of the unit is redwood. The weatherproof louver section is screened against birds and rodents. Kool-O-Matic Corp., 1831 Terminal Rd., Niles, Mich.

Bifold hardware swings doors 180°

For use on hinged doors opening to 180° the new Stanley bifold hardware set allows doors to swing clear for full access to closet or passageway. The set can be used with or without stops in either the header or the jambs, with the operation of the telescoping aluminum track unaffected by even a warped or misaligned door. The hardware is designed for doors 1 to 1 3/8 in. thick, up to 8 ft. high and weighing up to 50 lbs. per door. Two sets will fit standard openings. Use one set for two doors (2 to 4-ft. opening) or two sets for four doors (4 to 8-ft. opening). Stanley Hardware, Dept. PID, New Britain, Conn.

Wireless, automatic light control

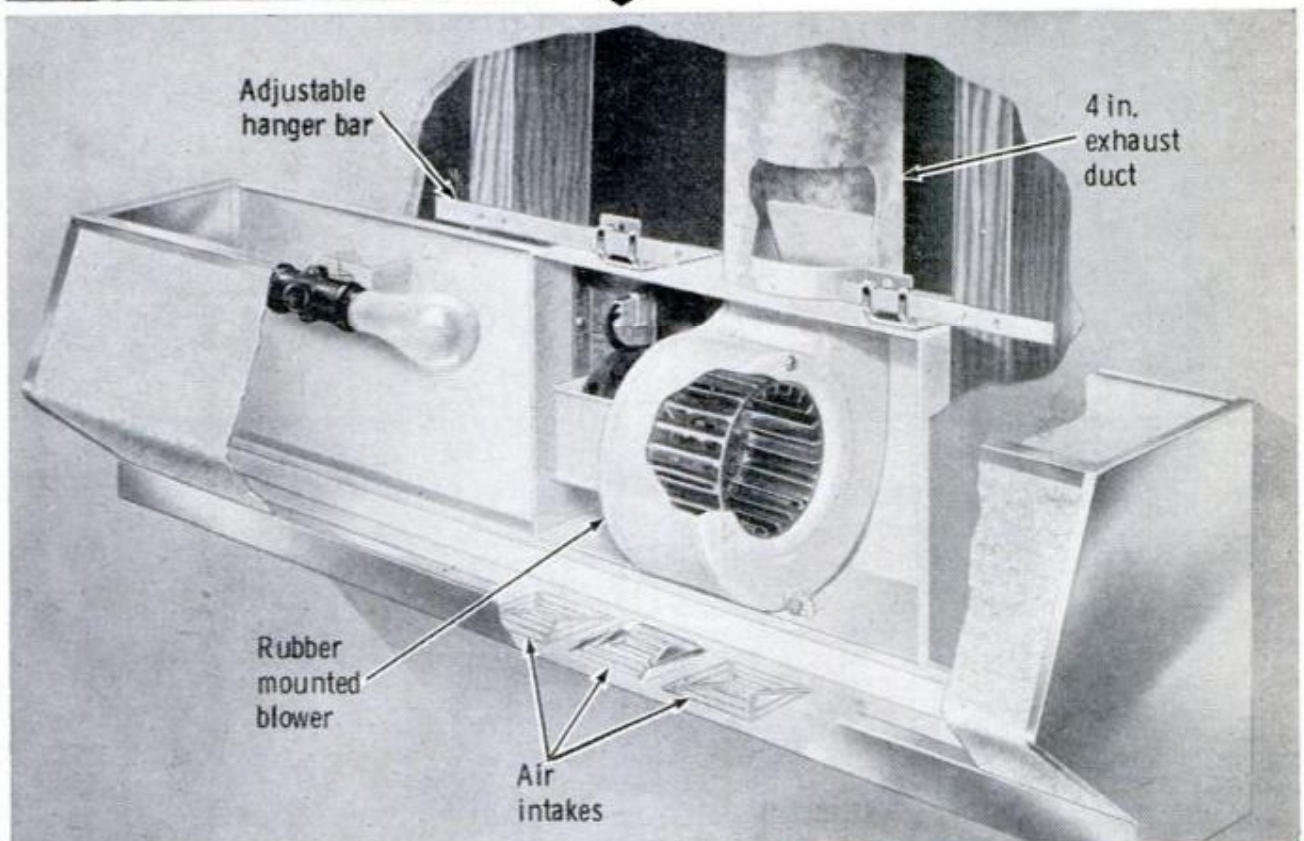
Prevent midnight stumbles and discourage prowlers by installing Nightwatch, an automatic light-control device that will turn a lamp on at dusk and off at dawn. There's no wiring involved; installation is like that for a regular light bulb. Just remove the light to be controlled from its socket, screw it into the device and screw both bulb and controller back into the original socket. Because it has a spring-type contact, the unit then can be rotated without breaking electrical continuity. Artolier Div., Emerson Electric Co., 141 Lanza Drive, Garfield, N.J.





Vanity-ventilation ensembles

Available in five standard widths from 24 to 48-in., models of the Vanity Ventlite family incorporate a built-in exhaust fan rated at 75 cu. ft. per minute to provide increased bathroom ventilation. The units actually combine the blower, mirror, light and stainless steel cosmetic cabinet, thereby reducing the installation costs of separate components. Deluxe and standard models are fitted with a rubber-mounted squirrel-cage blower for quiet and efficient operation. The fan draws in air from the top and through the decorative inlets in the base of the cabinet. Installation is relatively uncomplicated due to an adjustable hanger bar which can be mounted on either 16 or 24-in. o.c. studs. Made by Nutone, Inc., Madison and Red Bank Rds., Cincinnati, Ohio.



Air chambers stop water-hammer noises

You can end those nerve-racking nocturnal bursts of staccato hammering noises in your water pipes by installing air "cushion" chambers called, naturally enough, water-hammer stops. Manufactured by Plumb Shop, Detroit, Mich., the units operate on the basic principle that air can be compressed to absorb the shock waves that produce hammer-like noises in water pipes. They are designed to be connected to the supply line under a wash basin, toilet or sink, rather than in a normally inaccessible area behind the wall. Hooked up to the supply shutoff valve, a unit can readily be replenished with a fresh supply of air by simply turning the knurled knob to drain the chamber. Do this periodically and you'll be able to keep the chamber operating efficiently without having to go through the time-consuming and quite inconvenient process of draining the entire network of pipes—the only other way to eliminate these noises. ★★★



Water thrust into chamber is cushioned against air. Since the air is gradually absorbed by water, just drain chamber to replenish air cushion.



3 UNIQUE WAYS TO BEAT THE STORAGE SHORTAGE

Whether your particular storage problem lies with card tables, winter coats, a myriad of records and books, or just an accumulation of everyday necessities, one (if not all) of these concepts may be the answer

*Illustrations by Worman Associates
Technical Art by ZIK Associates, Ltd.*

TAKE A CASUAL STROLL through your abode and just count all the different items that really should be stored away somewhere—a considerable tally, isn't it?

Now grimace at the thought of all the embarrassing times you had to ask guests to add their coats to a big pile heaped on the bed.

Next, envision all the reference books you'd like to keep handy, and then wince at the way you always find your favorite

long-playing records in a haphazard stack. And if *that* hasn't inspired you to dust off the hammer and bench saw, then think of the money it's costing to store the entire family's winter wardrobe at the cleaner's.

Depressed enough? Don't be, for with just one of these storage units, you can fill a major portion of the storage shortage in your home—and do it in style, too. Take, for example, unit No. 1, shown below at the left. Built into an otherwise wasted corner of the attic, it will accommodate an

AN OTHERWISE WASTED CORNER in the attic becomes a functional storage center with the addition of the unit shown below at left, while files, records and other miscellaneous items are kept out of sight in the lowboy unit shown below at right. On the opposite page, the freestanding storage unit acts as a divider when placed next to the entrance of the house and is literally an island of storage space





(To view the other side of the unit, please turn the page)

amazing quantity of miscellany and out-of-season clothing—yet it will blend right in with the attic finishing project you intend tackling one day.

Project No. 2, a lowboy affair with roomy tilt-down compartments, will make a handsome but highly functional addition to the living room. If your personal taste happens to run more to the traditional than modern, don't let the attractive Spartan look of the unit put you off. Affix a bit of molding here and there, interpose a dash of decorative hardware, and you've converted a Danish-inspired cabinet into a piece to flatter the rest of the decor in the room.

Storage unit No. 3, though, is most likely the one unit that just about any family could use. Situated as shown above, it not only breaks a capacious entry-living room area into a pleasingly private foyer and a pleasantly proportioned living room, but it also whips the problems of guests' coats and those impossible card tables and folding chairs. And don't neglect the other side of the story—in this case, a bookcase or perhaps even a small cabinet that can be built into the back of the unit.

Now that we've pointed out the advantages you'll enjoy after you've built any one of these units, just turn the page to uncover details on *how* to build each.



CUT
FOLD
TAPE

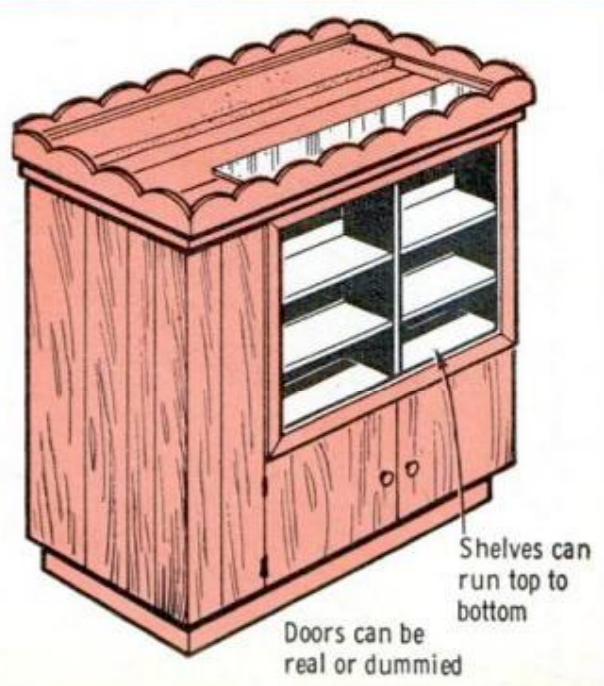
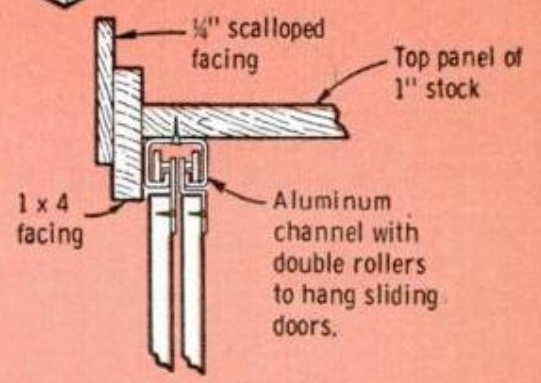
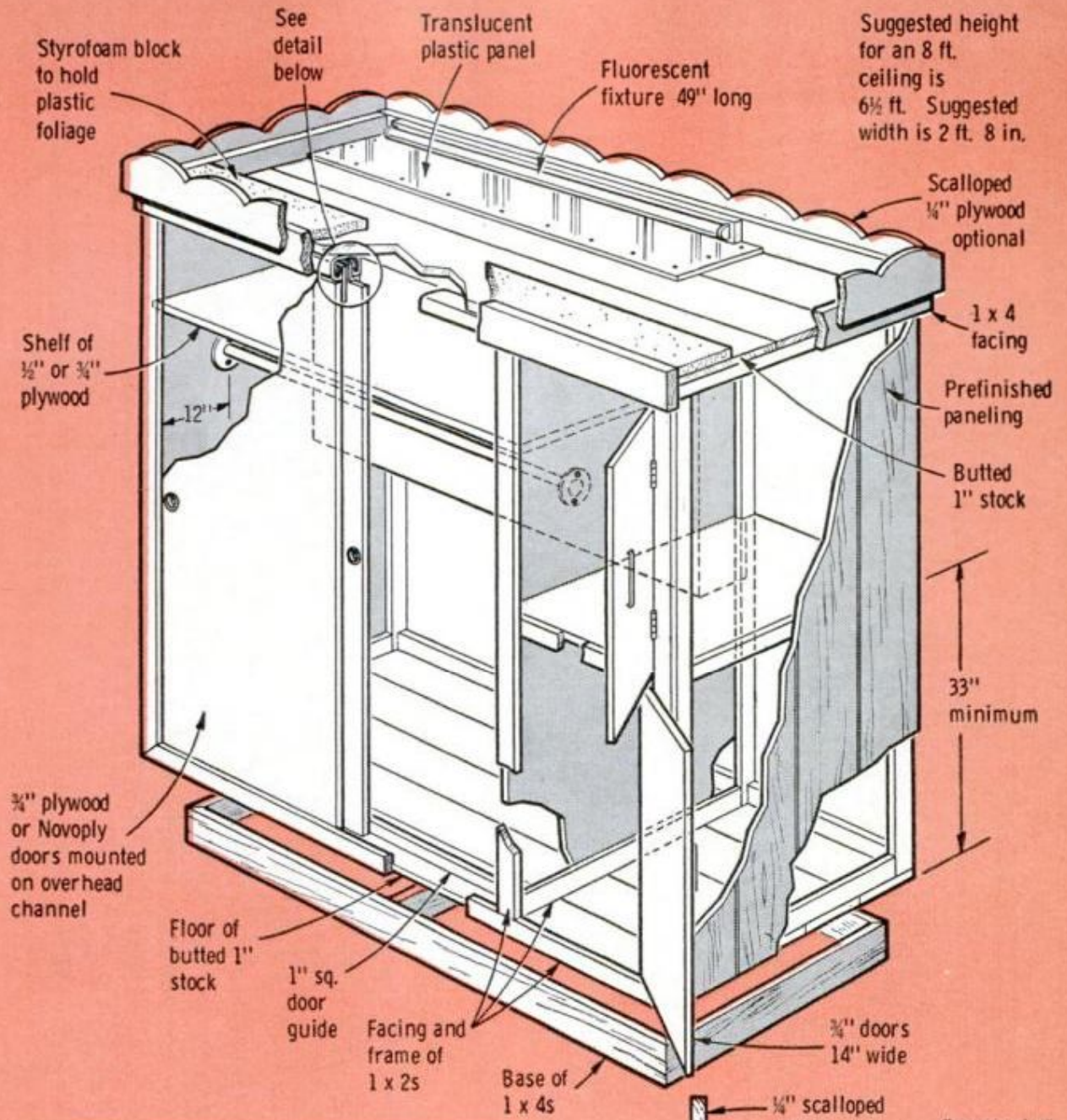
STORAGE
CABINETS

Indeed a multipurpose cabinet, No. 3 shown above is no more complicated than you make it. There are actually three main sections to consider: the closet, storage compartments and the bookcase. Examining each as detailed at right, you'll find that although the overall dimensions of the entire storage unit can be tailored to suit the space available, some dimensions *must* be followed. The closet, for example, must be at least 22 to 24 in. deep to accommodate bulky overcoats. The lower of the two storage compartments is at least 33 in. high to provide enough room to store folding chairs and a card table (normally 30x30 in.). Finally, the shelves must be designed with the size of either

your book or curio collection in mind.

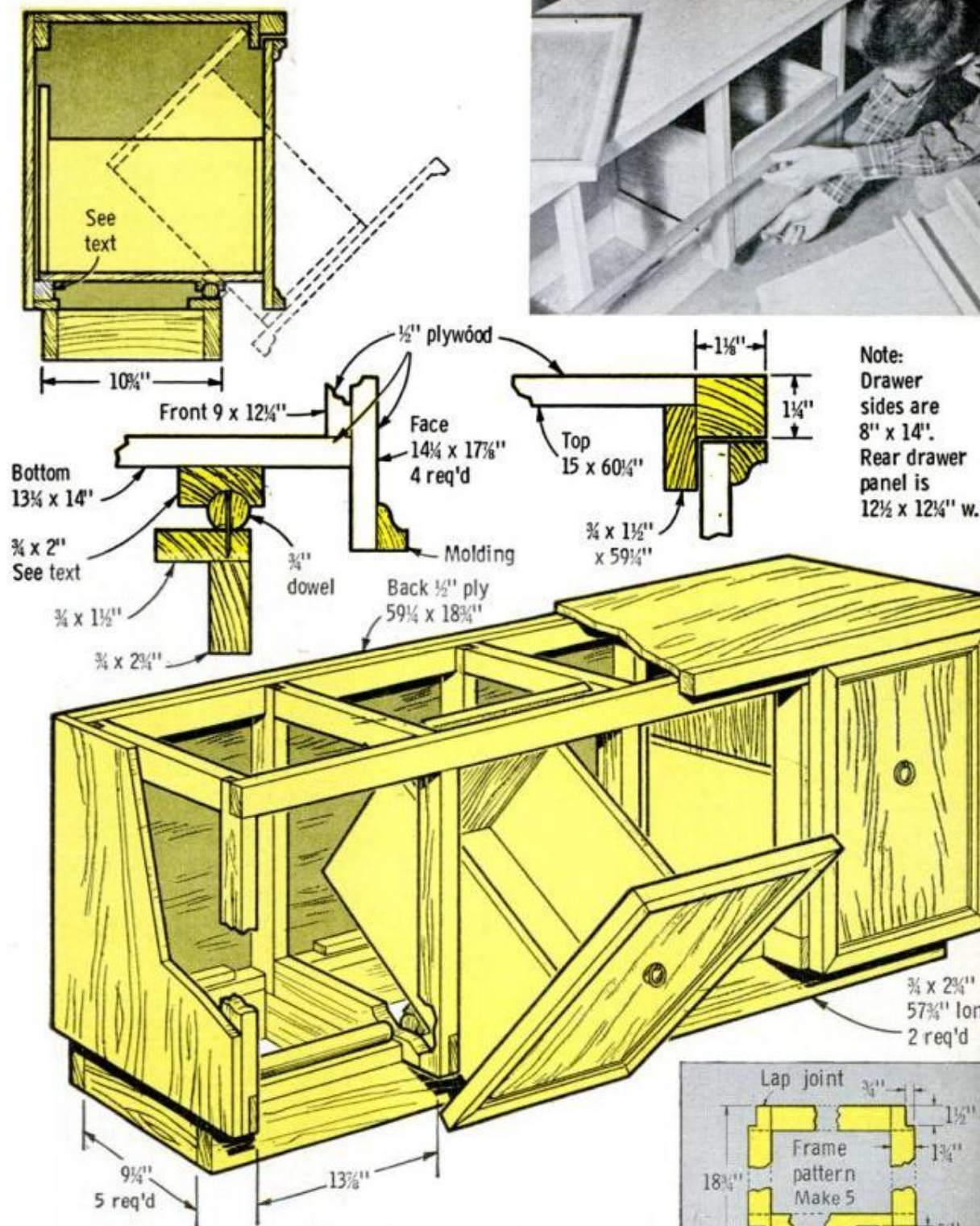
To simplify the construction, frame in the main compartments first, according to the allowable space in your entry area. Then, according to your taste, you can personalize the exterior treatment to suit the rest of the domineering decor. This may include prefinished paneling as shown, or a painted or stained finish.

Shelves can be treated in a manner other than that illustrated. You can run them from top to bottom, build them into the entire upper half of the unit, centralize them in the upper half or tie them in with a set of doors (real or dummied). Just be sure not to cut into the area reserved for the table.—*American Plywood Assn.*



DEPENDING UPON THE NEEDS of your family, unit shown above can be modified to include small cabinet just below the bookshelves. The upper storage compartment, in turn, can also be designed to accommodate such awkward items as bowling necessities and other sports equipment

EACH BIN must be individually fitted in the frame and marked for location of curved pivot member



Construction Details: Lowboy Storage Unit

◀ The more you study the drawing at left, the simpler the construction of the attic unit becomes. No need to fret that your particular attic doesn't have the slope shown, for if you follow the dimensions given, you'll find the only sections you'll need to measure and cut are those marked "... to suit." If you use adjustable standards, don't forget to shorten the shelves slightly.—*American Plywood Assn.*

▲ Physical construction of the lowboy is greatly simplified by a lack of hinges and hardware (excepting, of course, the front-panel brass pull-rings). You'll need to pay special attention to the 2-in. stock that fits over the 3/4-in. dowels. (Make the curved cuts by feeding the work at a slight angle across a bench-saw blade.) Test-fit bins, install spacers to level compartments when closed.—*M. M. Matthews*

Clever Remodeling

Whether you're planning a new home or fixing up an old one, here is a collection of ideas to add to your clipping portfolio.

By WAYNE C. LECKEY

Technical Art by Graphic Presentations

WHEN THERE'S A NEW HOME in your future, be it summer cottage or in-town dwelling, browsing through folders and magazines for clever ideas is half the fun of building. Clipping an idea here, another there, and filing them in a portfolio to be incorporated later into your "home of ideas," helps in planning and often makes for a better-built house.

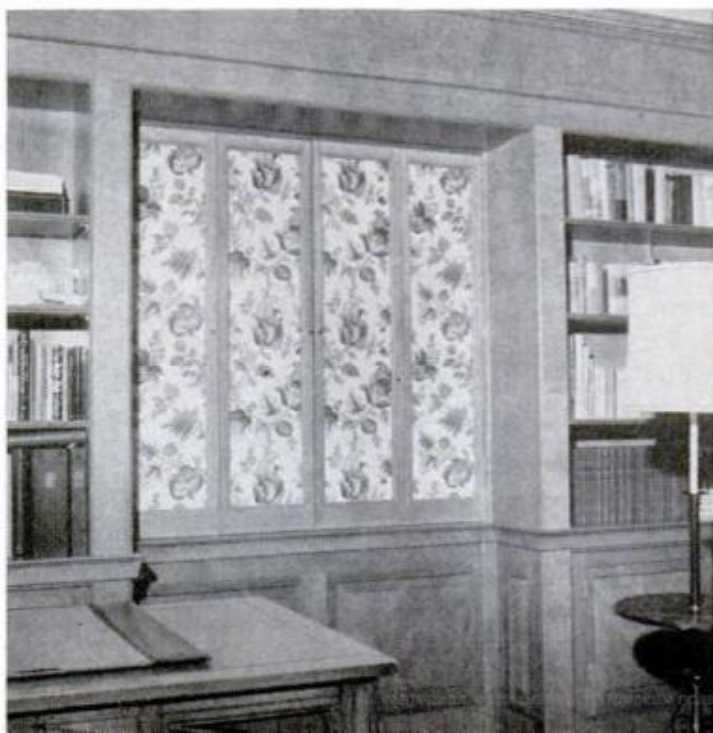
Many construction ideas you'll run across won't necessarily increase building costs; they may be simply a clever departure from conventional construction. For example, raising the shoe mold $\frac{1}{16}$ in. off the floor makes it a lot easier to keep paint off the floor when

you paint the baseboard. Dropping the top casing over bifold doors will hide the track to give a neater look. Running a crown molding atop the baseboard and up and around heat registers will add a more finished look to them.

Many times you'll find ideas that suggest a more economical building method worth considering. An example is the elimination of door casings by using a metal, plasterboard-edge band around the opening. This is ideal for a less pretentious type of structure such as a vacation home. Similarly, the use of laminated fireplace mantels as ready-made treads will prove a quick way to build durable steps for a cottage.

Cloth-covered shutters match companion drapes

When a deep bay presents a drapery problem, a clever departure from common louvered shutters is to fit the window with four equal-size frames and cover them with matching drapery material. Colorful panels tie in beautifully with companion drapes. Hinged to fold like bifold doors, they fold back wide when full daylight is desired.

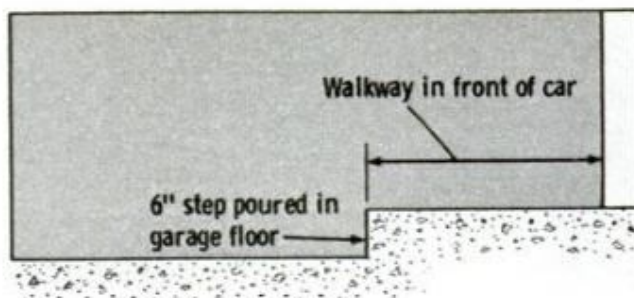
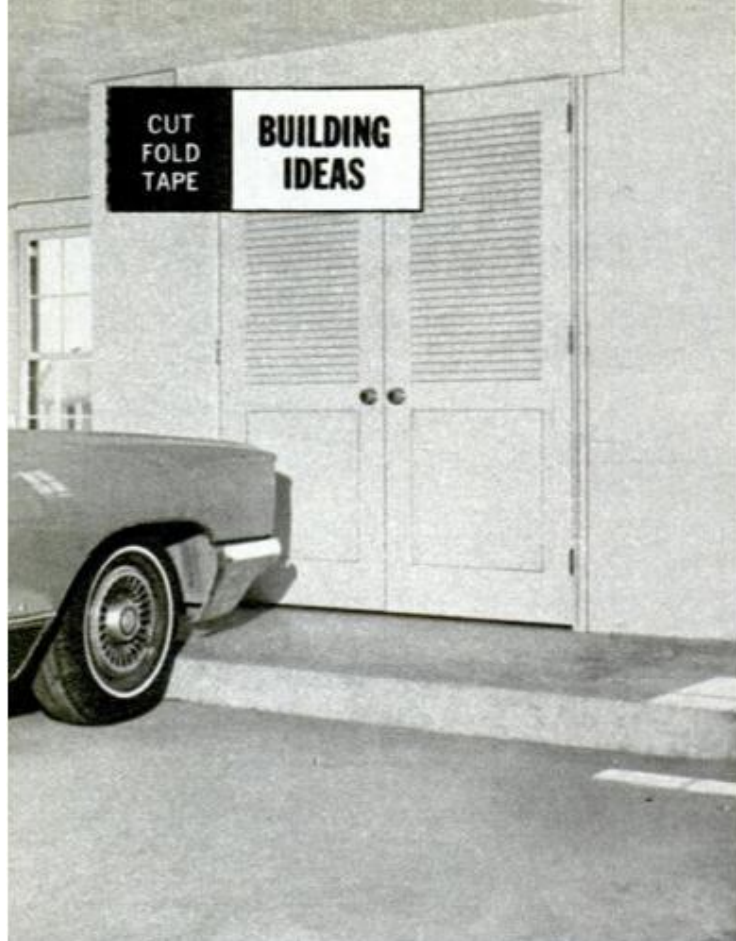


and Building Ideas



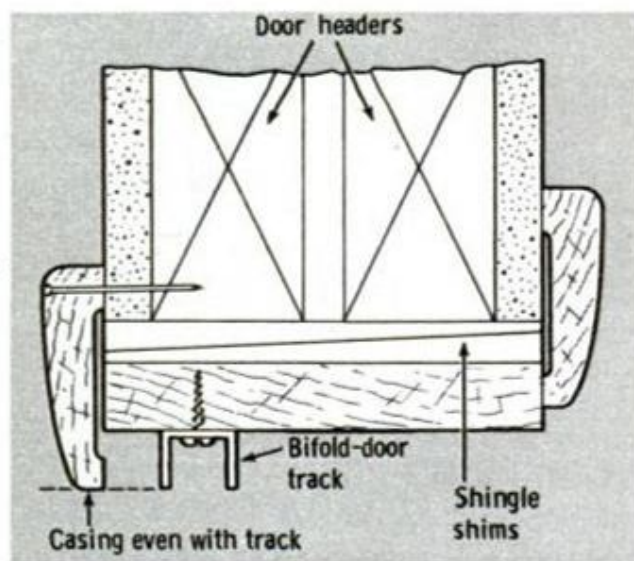
Putting a sloping ceiling to work

If you must live with the sloping roof line of an attic bedroom, here's a clever way you can put the ceiling to work holding a ruffled canopy over a bed. Complemented by a ceiling of sculptured Celotex tile, the hanging canopy attached to the sloping ceiling takes on a smart built-in look.



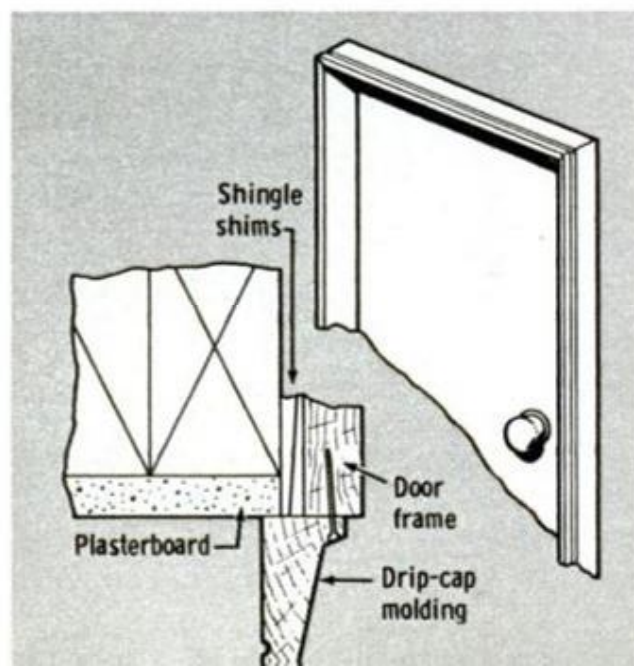
Wide step curbs car

You (and the other drivers in the family) will have no fear of pushing out the end of the garage should you sail in too fast some night if a wide step is formed in the floor at the time it is poured. Affording a safe, solid bumper for the front wheels, the wide step also provides a convenient walkway in front of the car, eliminating the nuisance of having to squeeze around it, front or back. A louvered step-to-ceiling closet centered in the end of the garage provides out-of-sight storage for tools, paints and kids' toys.



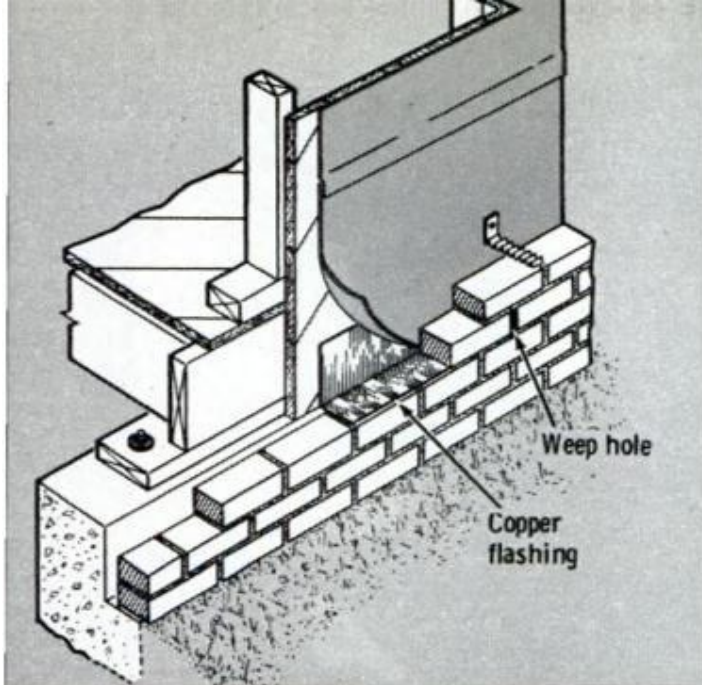
Lowered casing hides track

Requiring no more work than applying a casing around any door, this stunt for concealing the track of bifold doors is one that's applicable to both new construction and remodeling. As the sketch shows, it's simply a case of applying the top casing so it's even with the bottom edge of the track. Corners of the trim are mitered in the normal way but the side members are shortened. Nailing is limited to the top edge of the casing. If you wish, a thin shim can be inserted in the cavity in the back of the top casing to also permit nailing into the frame header.



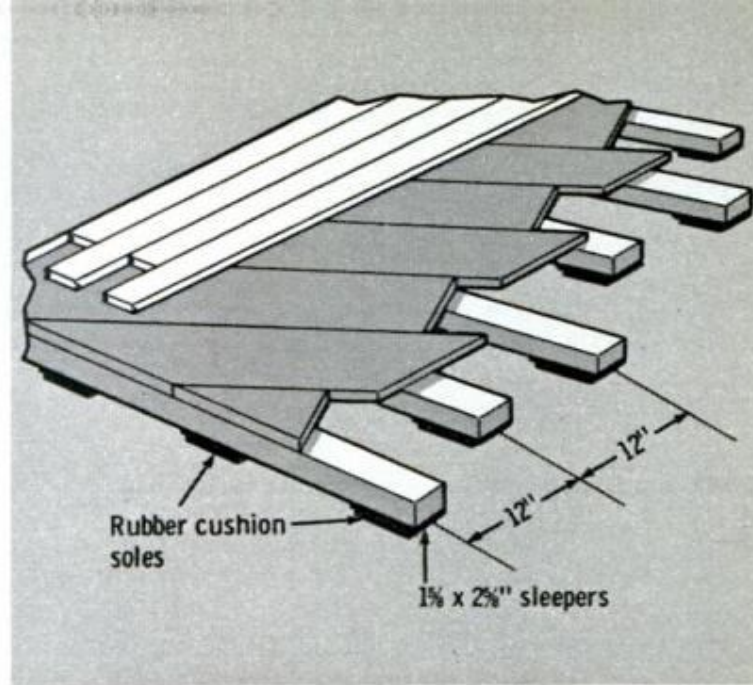
Drip cap frames door like picture

No reason why you always have to use the customary flat casing around doors and windows. A most interesting picture-frame effect is had by framing the door with common drip-cap molding. Decorative in itself, the molding produces a pleasing shadow effect, when mitered at the corners and applied taper-side in. The sketch shows how the molding is set back $\frac{1}{4}$ in. from the edge of the door frame and nailed on edge through its lip. Molding thickness will usually cover the gap between the frame and the wall. The idea is most practical when molding is applied to one side of door, opposite door's swing.



Flashing keeps dry lumber dry

Even though you make sure that dry lumber is used in your new home, it's equally important to see that it remains dry when in place. Excessive moisture entering walls from below can cause dry lumber to shrink and swell and be the cause of cracking plaster. The wise homeowner will have flashing installed around the foundation of brick construction.



Sleepers "cushion" slab floor

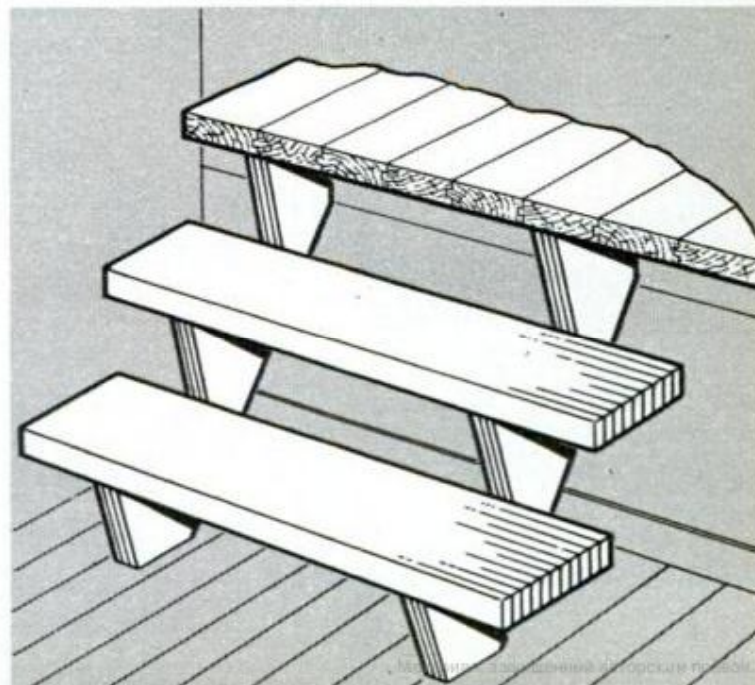
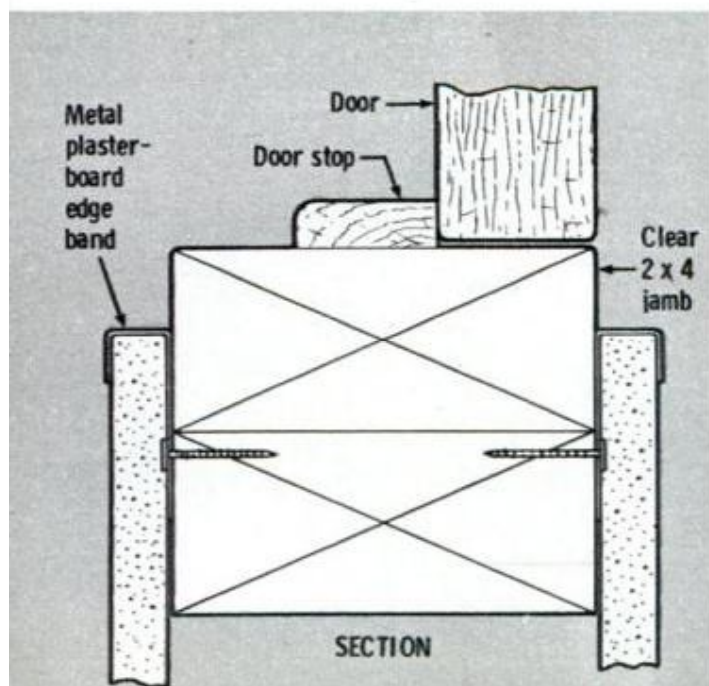
When your remodeling plans call for a wood floor over a concrete slab, you can save money by using Potlatch's new cushion-sole sleepers as a substitute for floor joists. Fitted with rubber soles 12 in. apart, the sleepers provide a pleasant floor resilience and also reduce noise. The sleepers (screeds) come in 3, 4, 5 and 6-ft. lengths and are 2 in. thick overall.

Edge band eliminates casing

When you're seeking economy in building a summer cottage, you can save on door and window trim by trimming with gypsum-board edge band instead of regular casing. No frame is used; the metal band is nailed to the door studs, 1/2 in. in from the edge, and mitered at upper corners. Then slip the plasterboard into the channel to form a neat, final trim.

Quickie, durable steps

Laminated fireplace mantels make fine ready-made treads for interior cottage steps. Vertically laminated of hardwoods, they are handsome and durable. Likewise, laminated beams make equally fine members for stringers and won't warp or check like common planks. Both laminated items are available from Potlatch Forests, Inc. through lumber dealers.





Build your own Kitchen Cabinets

A pretty penny can be spent on custom-made cabinets when remodeling a kitchen. You can pocket a considerable saving by turning them out in your own workshop

By WAYNE C. LECKEY

Color Illustrations by Harry Marinsky of Worman Associates

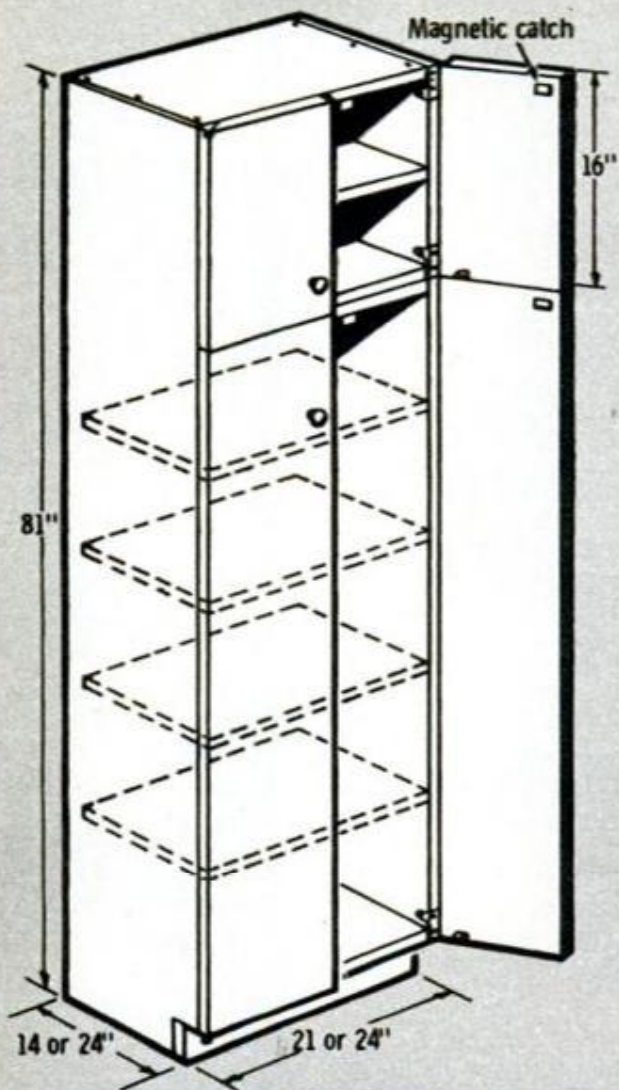
Text begins on page 148



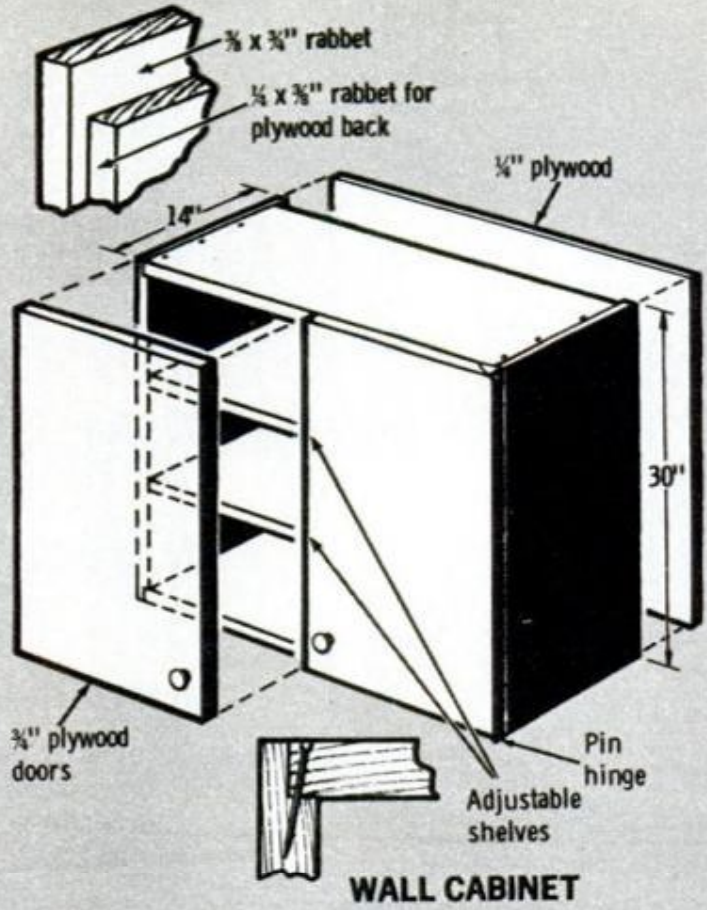


Mermaid

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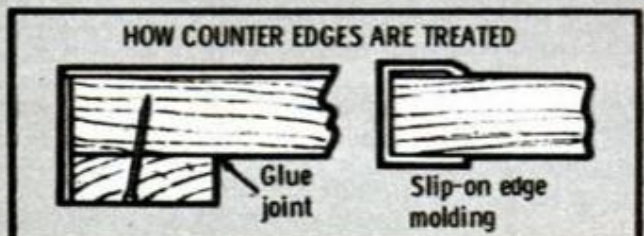
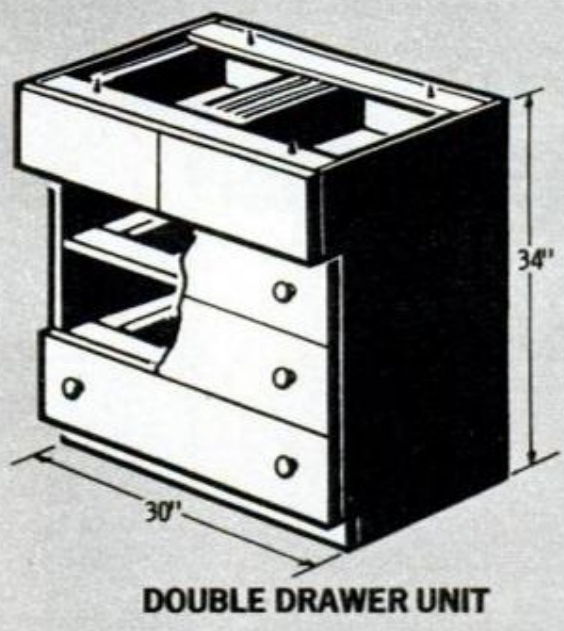
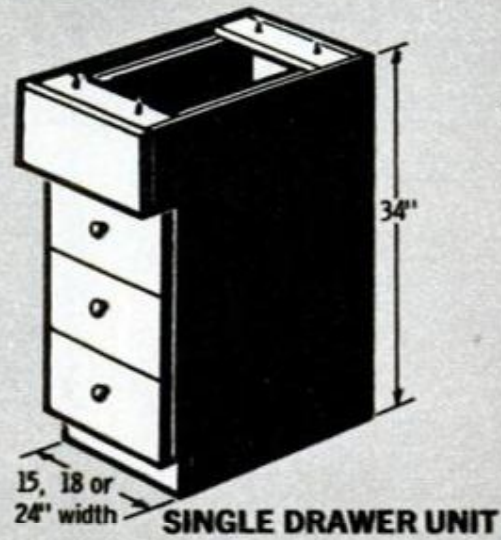


UTILITY (LINEN) CABINET



CUT FOLD TAPE

KITCHEN CABINETS

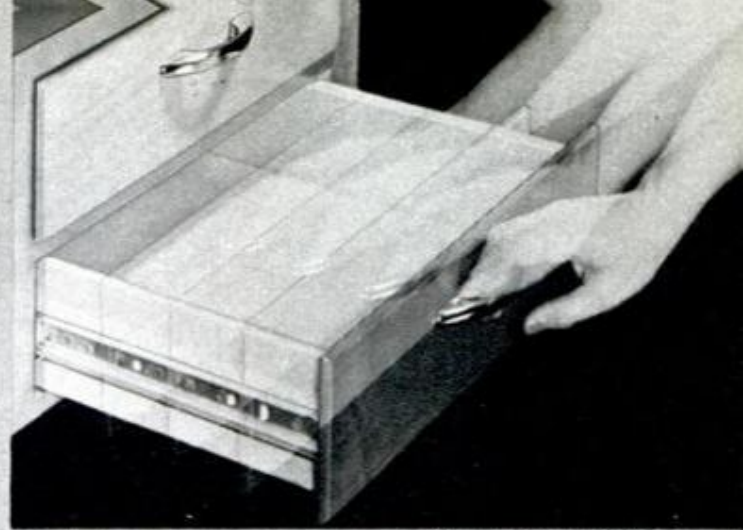
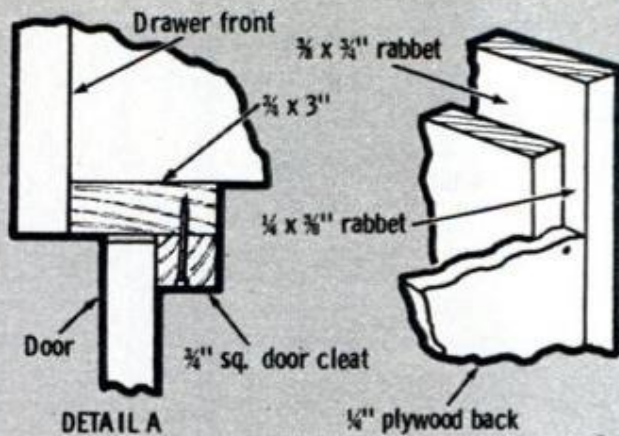


Technical art by Don A. Evans

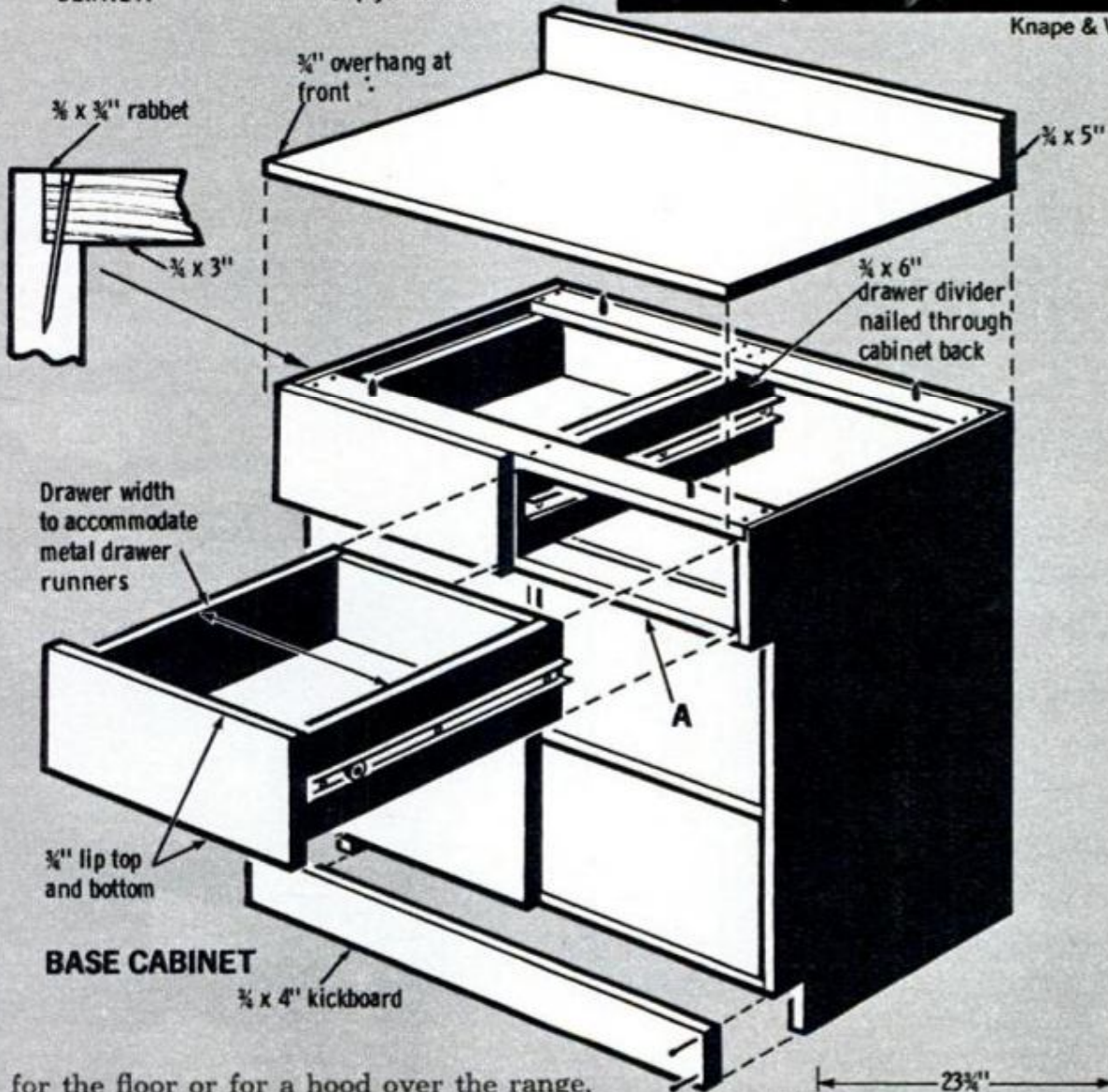
WHEN IT COMES to remodeling a kitchen, custom-made cabinets are often the biggest expense. Even the plain ready-made ones are not cheap. But, so many times, the problem with ready-made cabinets of stock widths is that two or more units will not always fill the space. The grouping either falls short or is too long.

When you're able to make your own cabinets, a specific length is no problem; you simply make them to fit—at no extra charge. By doing so, you can save enough on your custom kitchen to pay for the tile

POPULAR MECHANICS



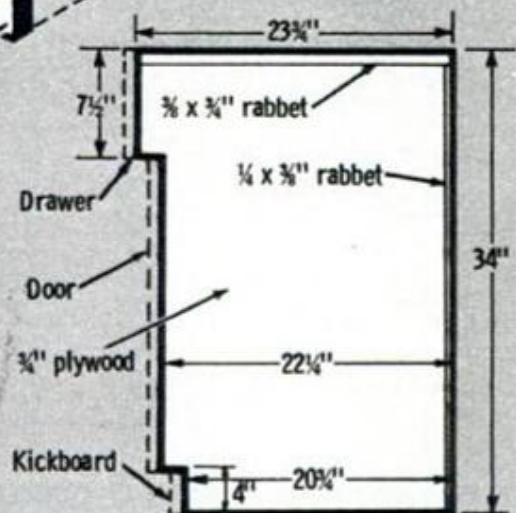
Knape & Vogt photo



for the floor or for a hood over the range, and you'll also have the fun and pride of making the units yourself.

Building your own cabinets isn't as difficult as you might think. Except where drawers are involved, the cabinets are, basically, little more than boxes fitted with shelves, and plain ones at that. It's the doors and drawers that give your cabinets eye appeal and here you can get as fancy as you like.

Flat, smooth panels of plywood help make your cabinets go together in a hurry. The sides and backs, which in most



END PATTERN FOR BASE CABINETS



COLORFUL PANELS OF DECORENE by Celotex make beautiful cabinet doors as you see above. When backlit by lamps inside the cabinets, the 1/8-in. polystyrene panels add a most dramatic effect. The plastic comes in 2 x 4, 2 x 6 and 4 x 8-ft. panels and in two patterns (Valencia and Granada) and in five tones, three being shown below. While it looks like glass, it won't shatter, cuts easily with a saw.

VALENCIA
(Avocado)

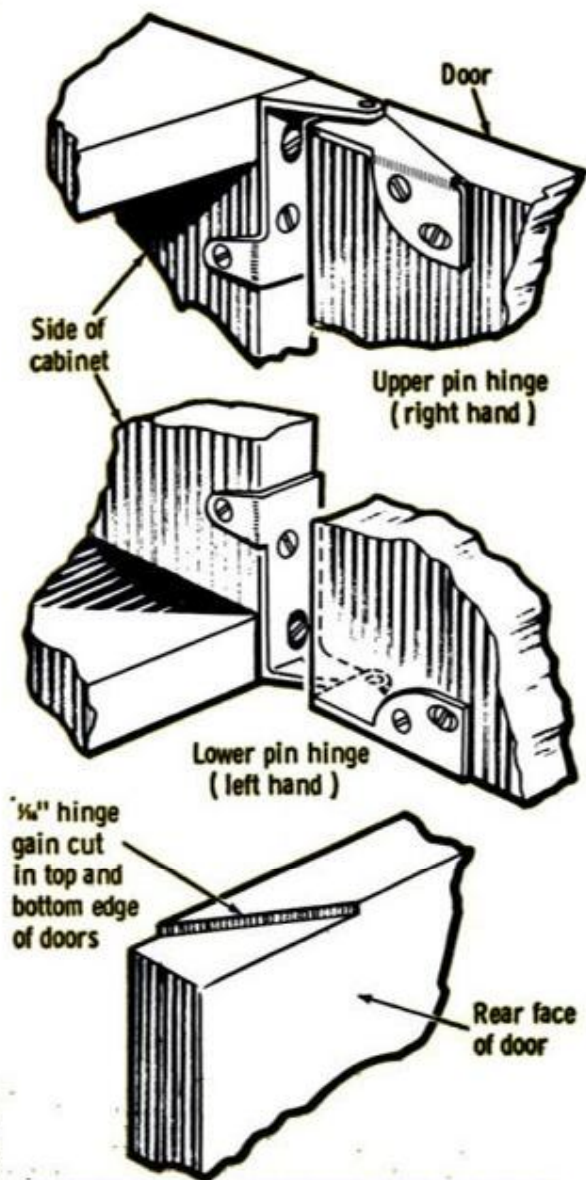


GRANADA
(Gold)

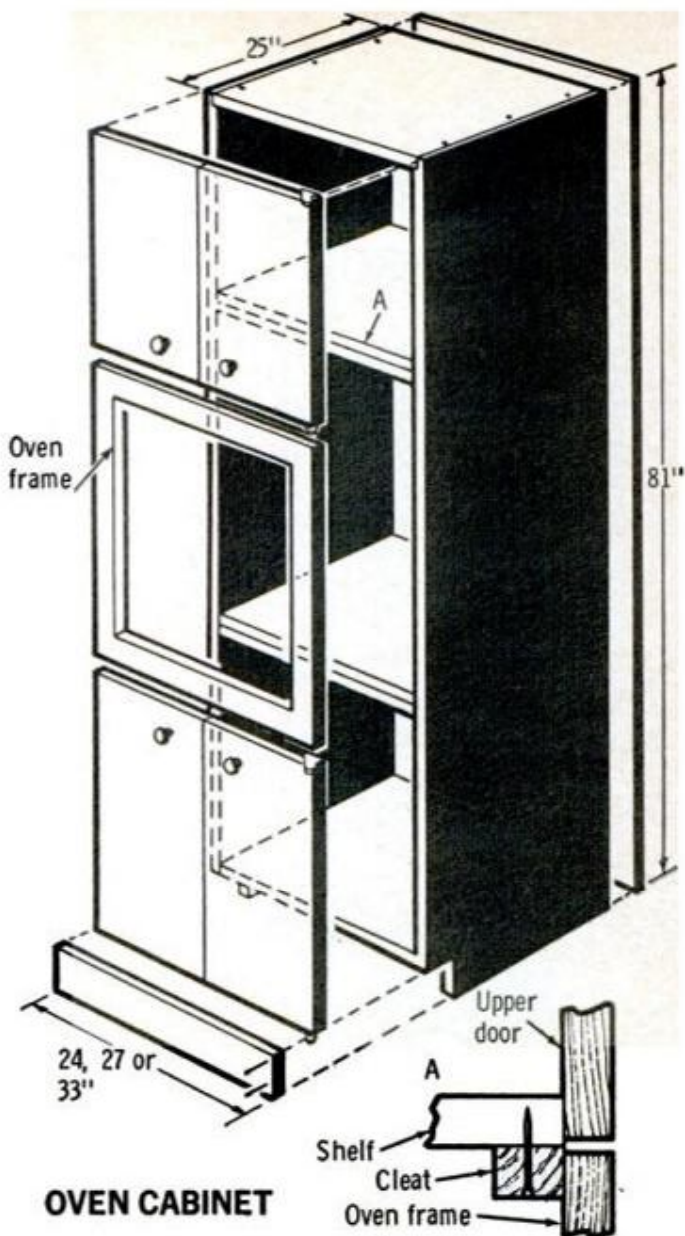


VALENCIA
(Tangerine)





HOW CONCEALED PIN HINGES ARE INSTALLED



OVEN CABINET

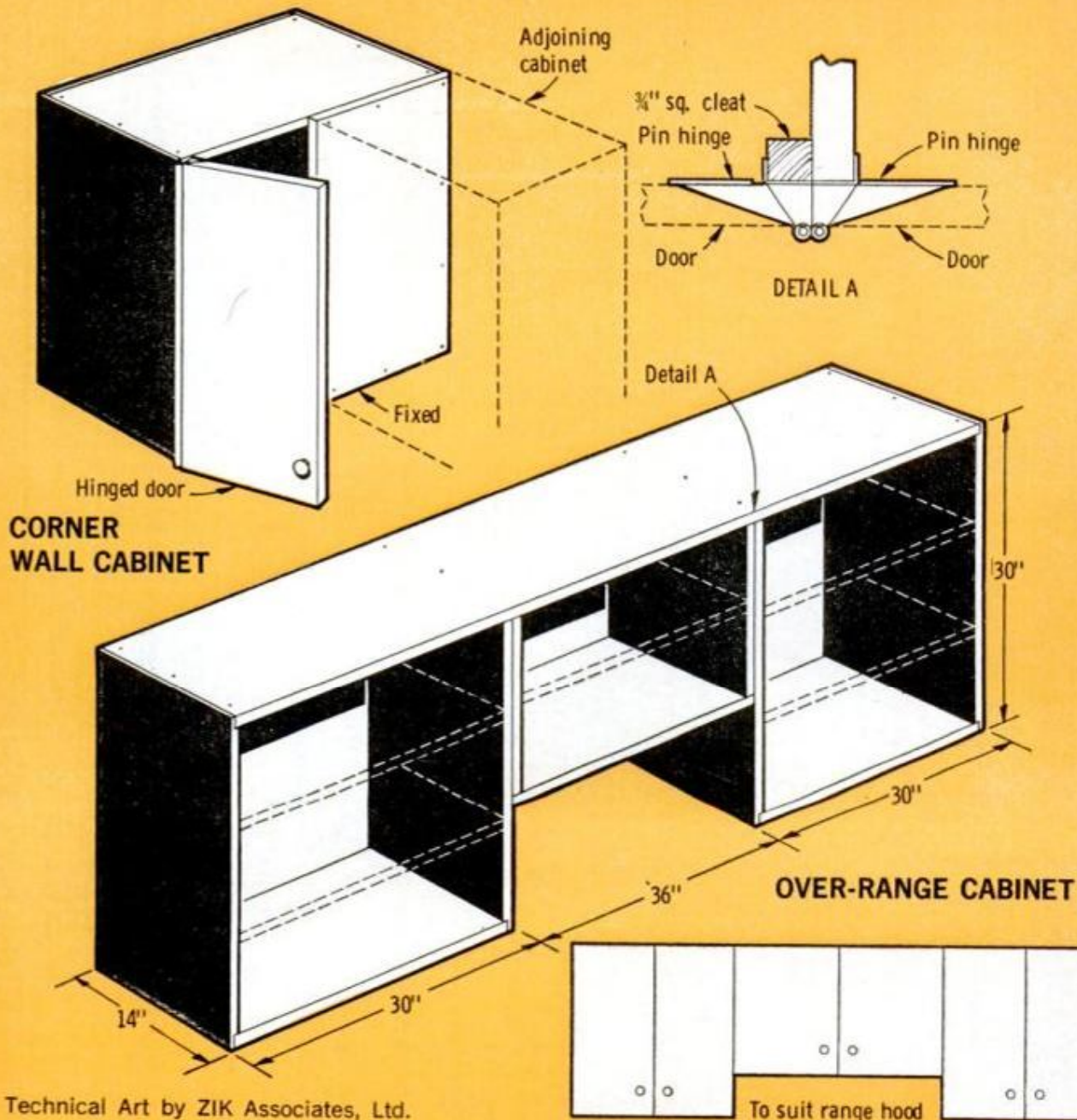
cases are hidden, can be of less-expensive fir plywood, with better, hardwood-faced plywood being used for such exposed parts as drawer fronts, doors, kickboards or an end member. The exposed edges of the plywood can be covered neatly with veneer tape which you can buy for this very use. Whether they're to be stained or painted will determine the kind of plywood you pick.

Standard height for base or counter cabinets (minus top) is 34 in., whereas the standard for wall units ranges from 30 in. for cabinets over a counter to 15 in. for a cabinet over a refrigerator, sink or range. Tall utility and oven units are generally fitted from floor to soffit 81 in. high.

Standard depth for wall cabinets is 14 in.; for base cabinets, 23 $\frac{3}{4}$ in. Utility-cabinet depth can be as much as 24 in. if space permits. However, an oven cabinet has to be at least 25 in. deep. Width or

Frigidaire photo





Technical Art by ZIK Associates, Ltd.

length can be whatever the space demands, although you should keep in mind that such items as range hoods come in standard lengths of 30, 36 and 42 in.

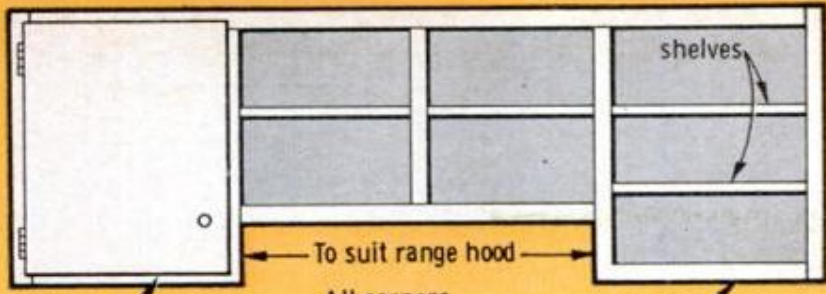
Base cabinets can be made with a straight front, with only the kickboard set back, or the drawers (or apron, as the case may be) can be made to overhang the doors as detailed on pages 148 and 149. Note here that the doors and drawers have square edges and close against the edges of the cabinet members. Lip doors are not suitable for this type case.

Whether the front is kept straight or set back, construction remains basically the same. The upper edges of the end members are rabbeted across the top to accept $\frac{3}{4}$ x 3-in. crossrails, and the rear

edges are rabbeted to accommodate a $\frac{1}{4}$ -in. plywood back. Since the front and back crossrails rest in the rabbets, they are cut $\frac{3}{4}$ in. longer than the bottom, the shelf and crossrail A which are cut to fit between the end members. Note in detail A how a $\frac{3}{4}$ -in. cleat is added to cross-rail A to provide a stop at the top for the doors.

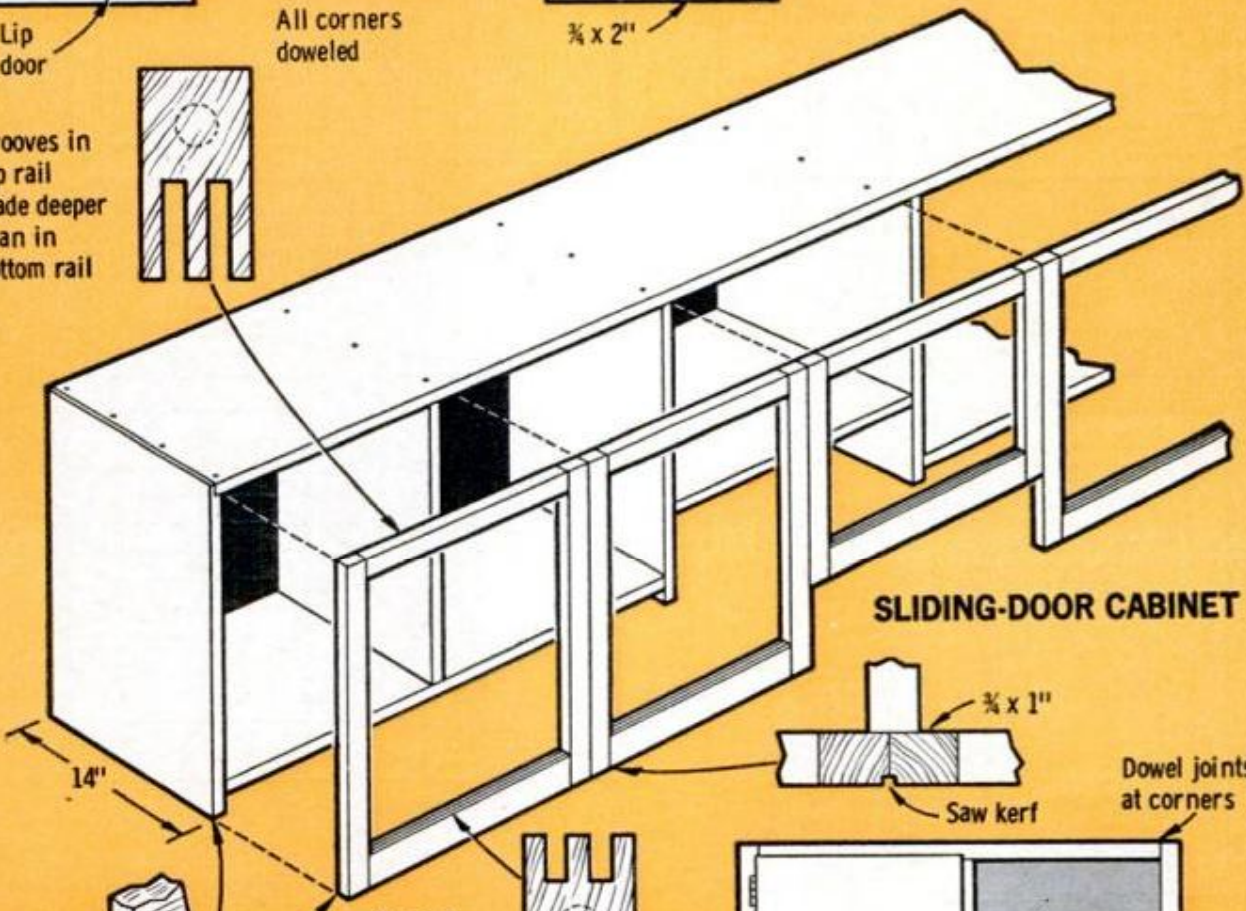
The $\frac{3}{4}$ x 6-in. drawer divider is fastened in place by nailing through all three cross-rails and in through the plywood back. The kickplate is cut the full width of the cabinet and nails to the end members. In the case of a row of cabinets, one long kickplate member is used.

Drawers are made to fit the openings; you'll need to have your metal drawer slides at hand to know how much space

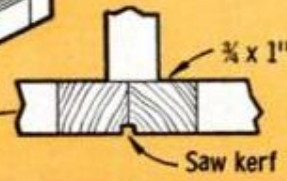


WHERE NOTHING but the front trim shows on a cabinet, common fir plywood is adequate for the "box" part of the assembly. Solid stock is used for trim; doors and drawer fronts are made from matching, hardwood-faced cabinet plywood

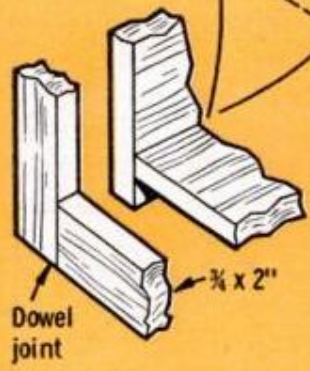
Grooves in top rail made deeper than in bottom rail



SLIDING-DOOR CABINET



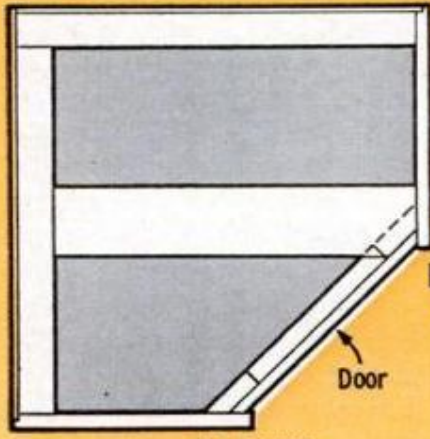
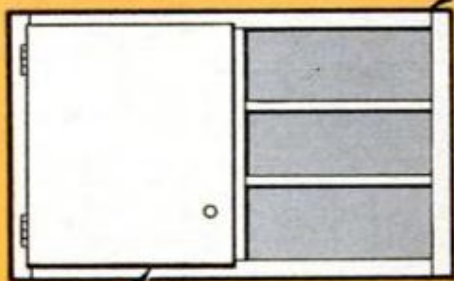
Dowel joints at corners



Top and bottom rails grooved for 3/8\"/>

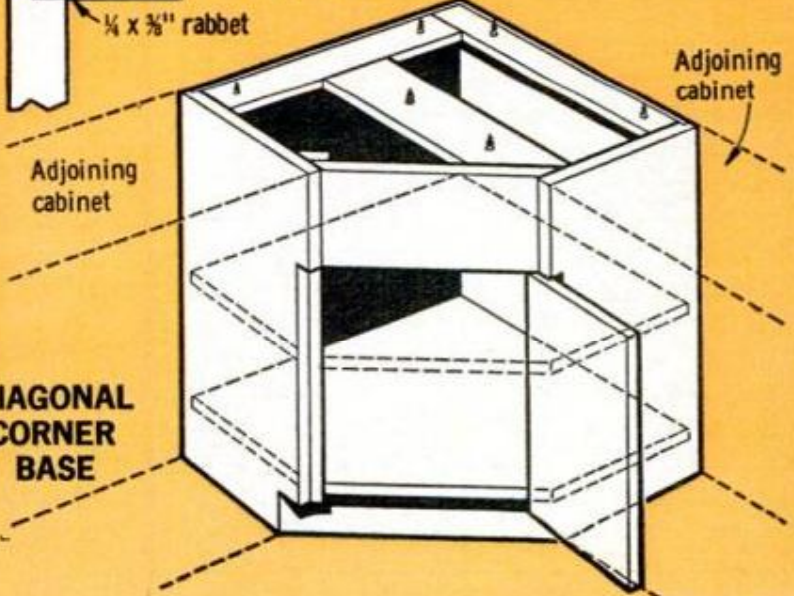


3/8\"/>

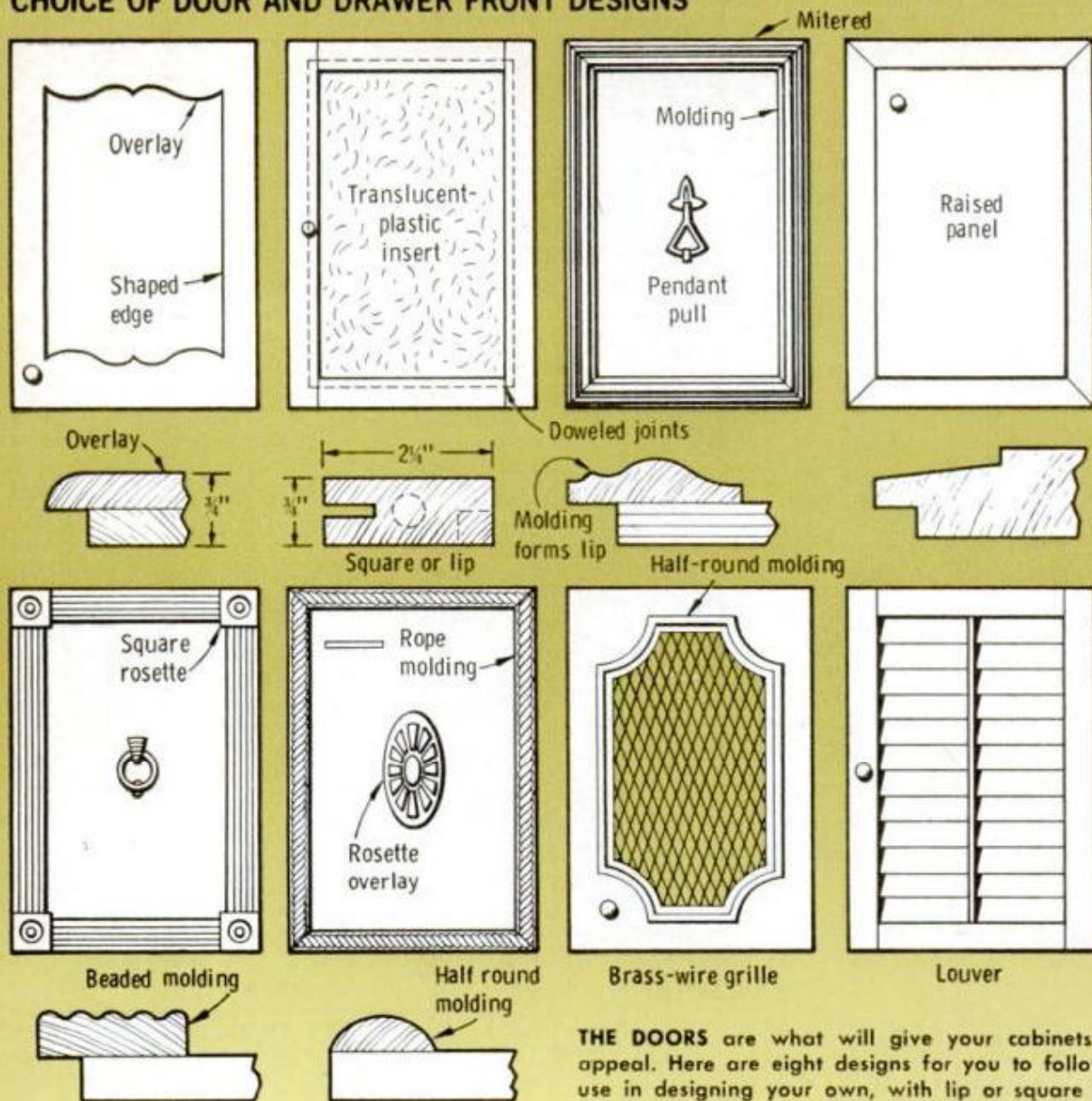


PLAN VIEW

DIAGONAL CORNER BASE



CHOICE OF DOOR AND DRAWER FRONT DESIGNS



THE DOORS are what will give your cabinets eye appeal. Here are eight designs for you to follow or use in designing your own, with lip or square edge

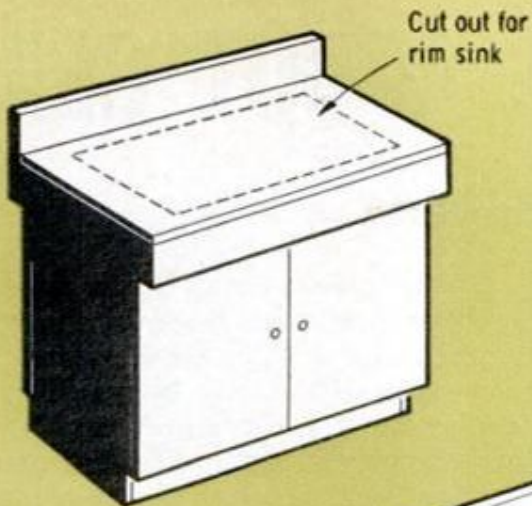
they'll take in determining drawer width. One part of the slides screws to each side of the divider and to the cabinet ends, the other to the drawer sides. Except for the fronts, which are $\frac{3}{4}$ in., the drawers are made of $\frac{1}{2}$ -in. material with grooves cut in the side members to accept $\frac{1}{4}$ -in. hardboard or plywood bottoms. The drawer sides are attached to the fronts by nailing them into the ends of members glued to the back side of the drawer fronts.

Screws driven up through the cross-rails hold the countertop. Sometimes a thick top looks better than just a $\frac{3}{4}$ -in. panel. A $\frac{1}{2}$ -in.-thick strip glued around the four edges will give a $1\frac{1}{4}$ -in. top. By covering the front edge with decorative laminate, you won't see the joint and it will look like a single thickness.

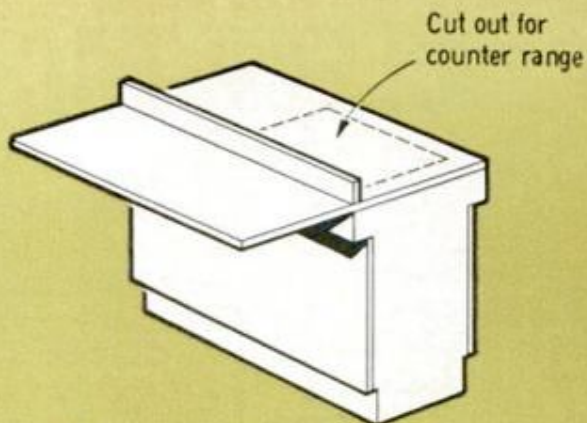
Covering countertops with decorative laminate is not hard to do. Full instructions come with the contact cement that is

used to bond the plastic. Briefly, the work consists of coating both plastic and the countertop and letting them stand until dry to the touch. The ticklish part is placing the plastic right where you want it, since once the two coated surfaces touch, you can't shift them. The trick is made easy with sheets of wrapping paper which are laid over the dry coat on the counter. Then the plastic is laid on top of the paper, in position, and while one end is held firm, one sheet of paper is pulled out, allowing the two coated surfaces to touch. The other papers can then be pulled out. Go over the complete top with a block and hammer, tapping it all over to assure a good bond. Where the edges of the counters are to be covered with plastic instead of metal edging, these are usually covered first before the top.

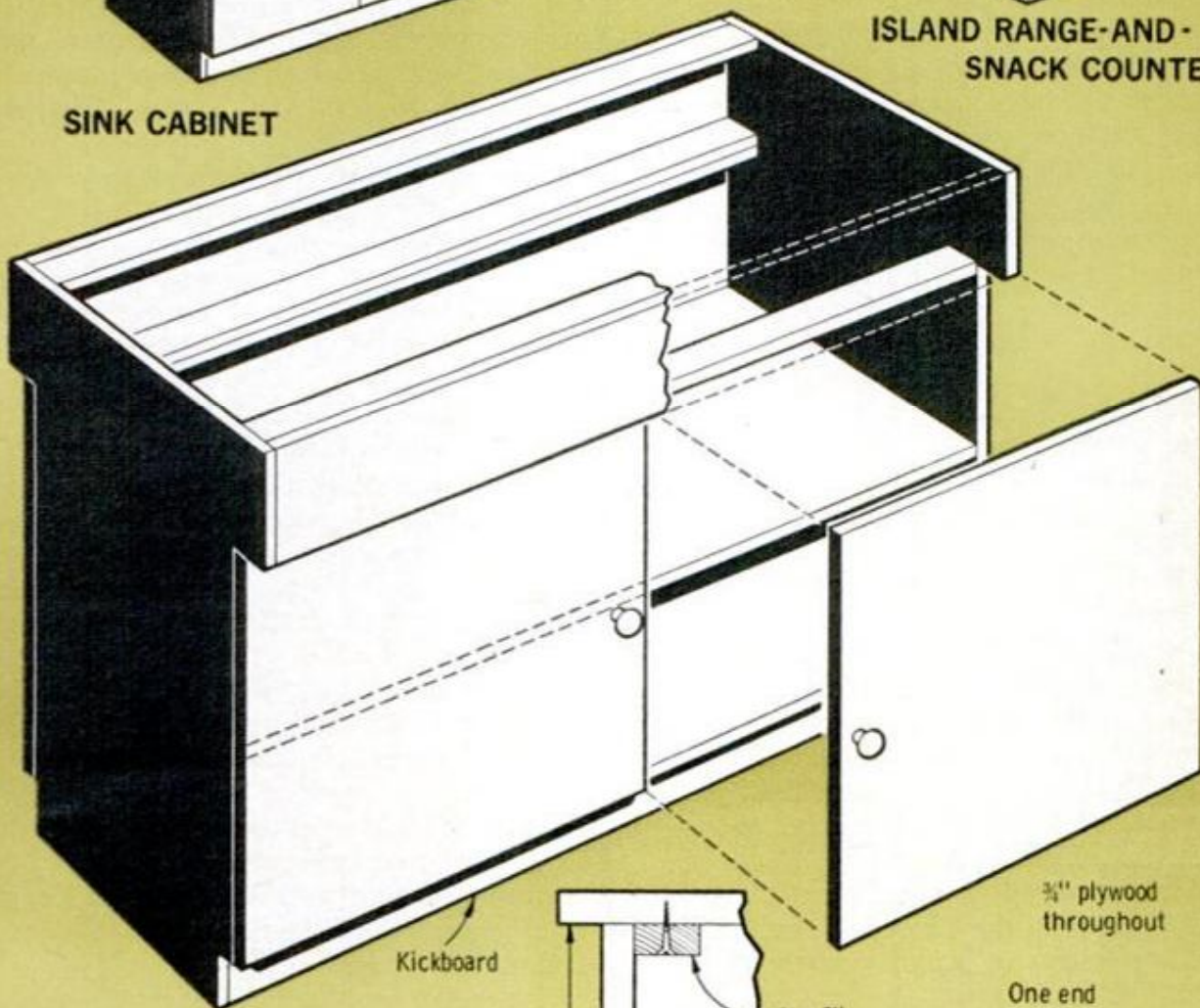
Concealed pin hinges offer the neatest
(Please turn to page 220)



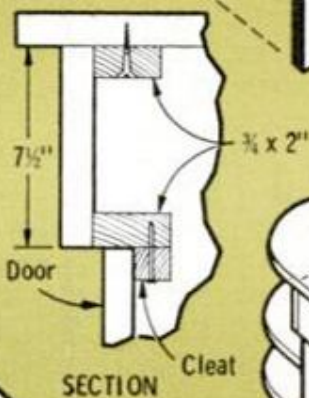
SINK CABINET



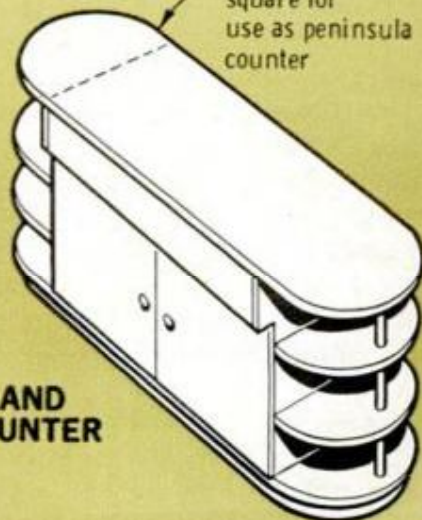
ISLAND RANGE-AND-SNACK COUNTER



BASIC CONSTRUCTION



One end can be left square for use as peninsula counter



CLEAR FACTS ABOUT GLASS

Technical Art by ZIK Associates, Ltd.

EVER REPLACE A PANE of window glass in your living room, only to discover after cleaning that it showed a series of optical ripples? Chances are you got Common, or Grade B Sheet, when you should have had Polished Plate. In the attic or basement, on the other hand, plate glass would have been a waste of money. Such windows are primarily for light, and people don't generally make a practice of staring out of them.

Knowing a few simple facts about the different types and grades of glass will help you to put your money to more effective use when buying glass.

Window glass, for instance, is drawn molten in sheets through an annealing oven. In the process, it's almost impossible to avoid slight variations in thickness which cause those optical ripples. Grade AA has the fewest, Grade A has more and Grade B, known as Common, even more.

Use any of these where light is more important than "looking through." In fact, there is a special grade called Greenhouse Glass made just for that purpose.

Plate glass is annealed like regular window glass, but afterward it's ground and polished between twin discs to a very close tolerance.

Recommended weight (or thickness) will depend on the size of the pane. Sheet window glass in single weight ($\frac{3}{32}$ in. thick) is safe normally up to 2x2 ft.; double weight ($\frac{1}{8}$ -in.) will go to 3x5 ft.; heavy weight ($\frac{5}{32}$ -in.) is recommended where there are high winds or other dangers of breakage.

Plate glass, usually used in larger areas, ranges through weights of $\frac{3}{16}$ -in., $\frac{7}{32}$ -in., and $\frac{1}{4}$ -in. on up to commercial weights. The $\frac{1}{4}$ -in. weight is for large window walls and sliding glass doors.

Heavy sheet glass is a useful grade for special applications where slight distortions won't be noticeable—tabletops or shelving, for instance. Its fired surface is less likely to scratch than that of polished plate. Available in $\frac{3}{16}$ and $\frac{7}{32}$ -in. thicknesses, it comes in grades AA, A and B.

Tinted plate cuts glare in areas which lack the protection of an overhang. Blue-green reduces glare by 25 percent and is also heat-absorbent, so you'll save on cooling costs. Neutral gray cuts brightness to 44 percent that of clear glass, pale bronze to 48 percent. Colors are not distorted by these tints, though they are softened.

Insulating glass consists of two panes joined at the edges by a metal-to-glass or glass-to-glass bond, leaving a $\frac{1}{4}$ -in. air space between. It's available in Grade A Sheet, Tinted Plate and Heat-Absorbing. In any combination, the inner sheet is clear glass.

This double-glazing-plus-air blanket will reduce heat loss through the glass area by as much as 50 percent. The use of tinted plate in insulating glass will also reduce the heat gain factor in cooling. Often, the extra cost of a double-glazed installation can be offset in only two years of fuel savings.

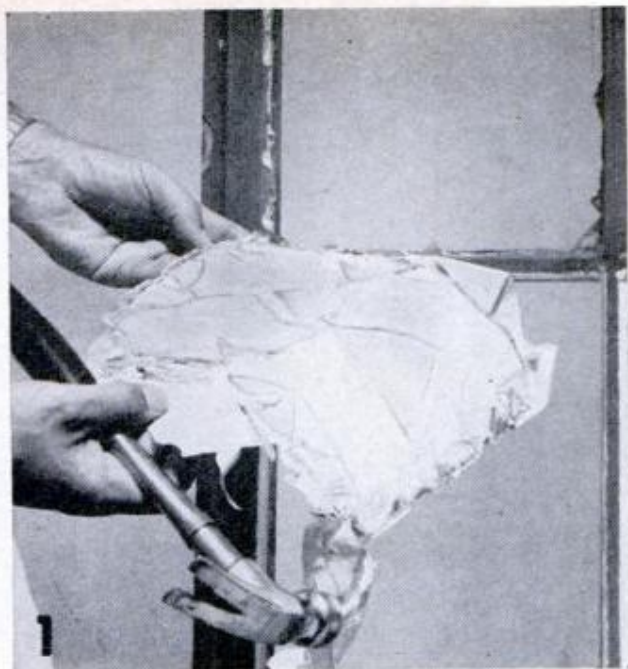
Picture glass is lightweight ($\frac{3}{64}$ -in. to $\frac{5}{64}$ -in.), and is generally available in grades AA and A. It's used to cover all types of art except oil paints, and also for projector slides and instrument dials.

Mirrors are commonly made of the highest grade twin-ground polished plate, since the slightest imperfection is amplified in reflection.

If the size isn't critical, acceptable mirrors can be made of sheet (sometimes called "crash glass") when the imperfect areas are cut away. These are usually single weight, and are often supported by a backing.

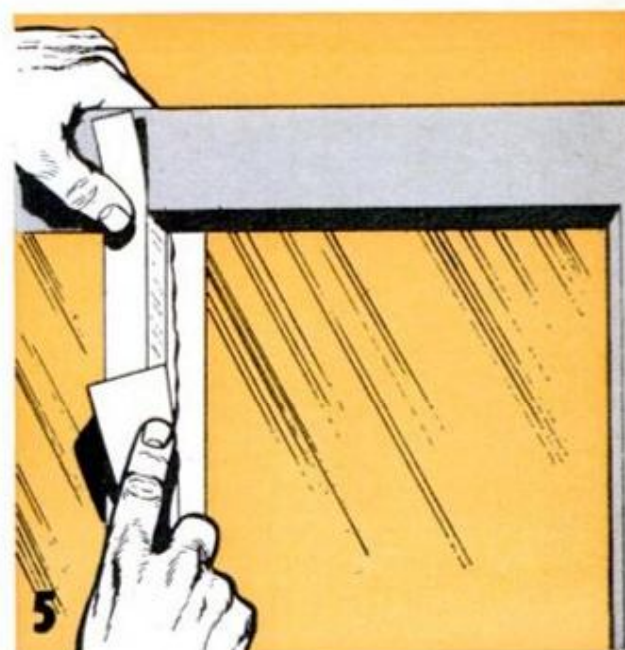
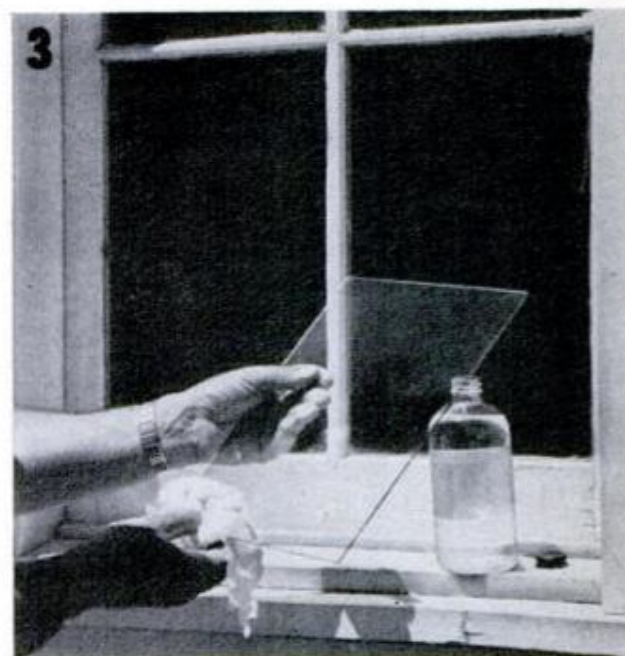
Textured glass diffuses light. It's effective in skylights and exterior sidelights since it can hide an objectionable view. In interior partitions, it allows more than one room to share a single light source.

Wired glass, originally for industrial application, has a pattern of fine wires embedded in it and features a textured surface. It's primarily for safety, preventing injury from flying glass shards in case the window should break.—*John D. Enney*



New 'Putty' for Window Panes

1. Easy way to remove broken pane is to cover it with masking tape, then crack it further
2. Scrape out all the old dried putty and clean surface. A wooden sash will need priming
3. Clean new pane of glass thoroughly with an oil-free solvent and a clean lint-free rag
4. After masking both pane and sash, apply bead of silicone rubber sealant along a side
5. Smooth surface immediately before it can skin over. Repeat on the other three sides

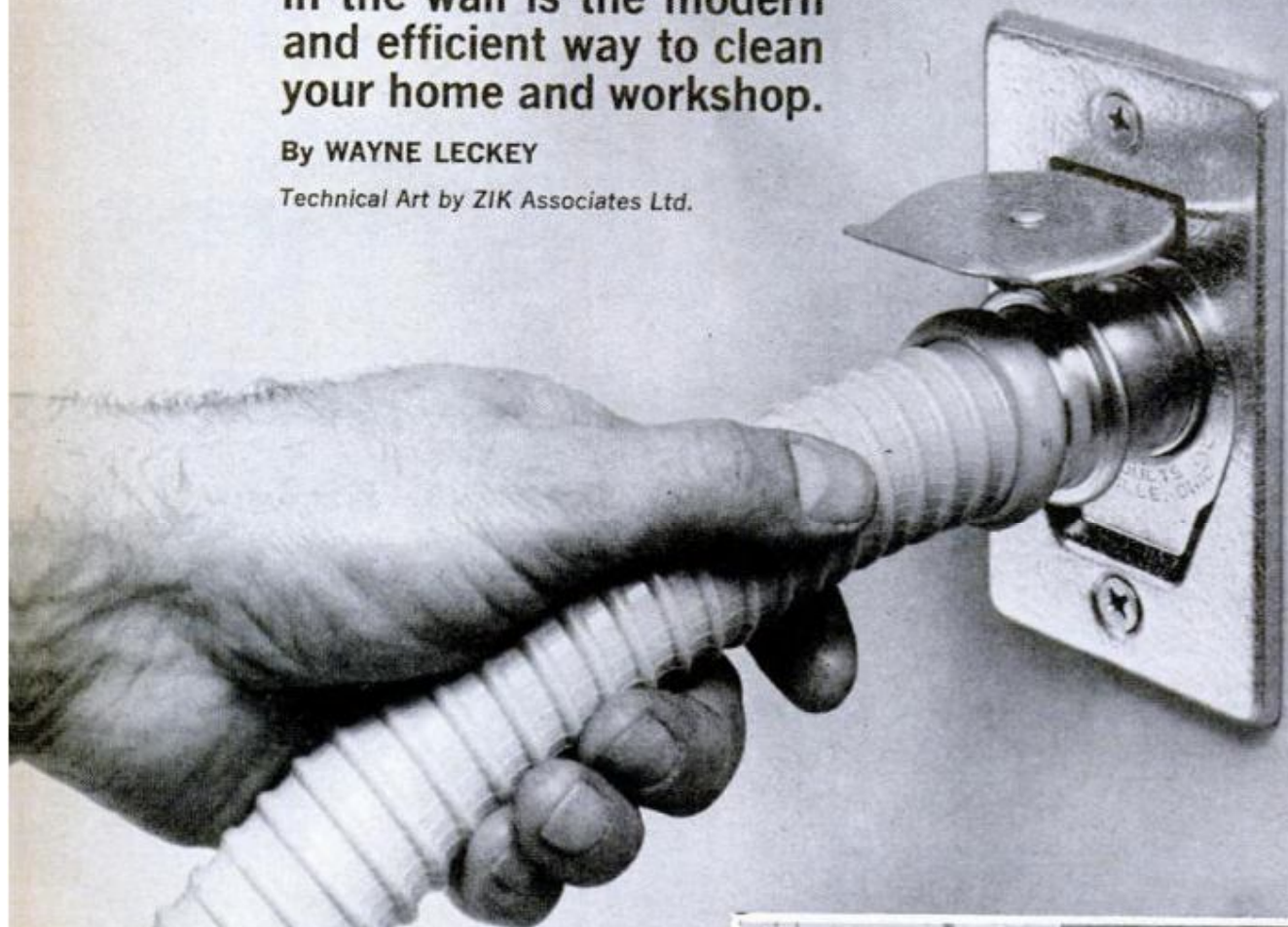


How to Install a

Plugging a hose in a hole in the wall is the modern and efficient way to clean your home and workshop.

By WAYNE LECKEY

Technical Art by ZIK Associates Ltd.



REAL ADVANTAGE is in cleaning stairs — there's no bulky, heavy machine to lug up and down. Long lightweight hose reaches every step from top to bottom, safely.



Built-in Vacuum System

IF YOUR OLD VACUUM CLEANER is on its last "carpet" so to speak, and you're about ready to trade it in for a new one, you'll do well to consider the advantages and convenience of a modern central cleaning system. True, it'll cost you more than a regular cleaner, but your carpets will be cleaner than ever before. This we discovered after making an actual installation and testing it against conventional portable units.

Similar to central airconditioning, a central cleaning system consists of a network of 1 $\frac{3}{4}$ -in. airtight, tubular ducts that are hidden in the walls to funnel dust and dirt into a cyclonic separator which is located out of sight and sound in the basement, utility room or garage. The only visible part of the system is a series of wall inlets the size of a light switch. When you want to vacuum, you merely get out the hose and plug it in.

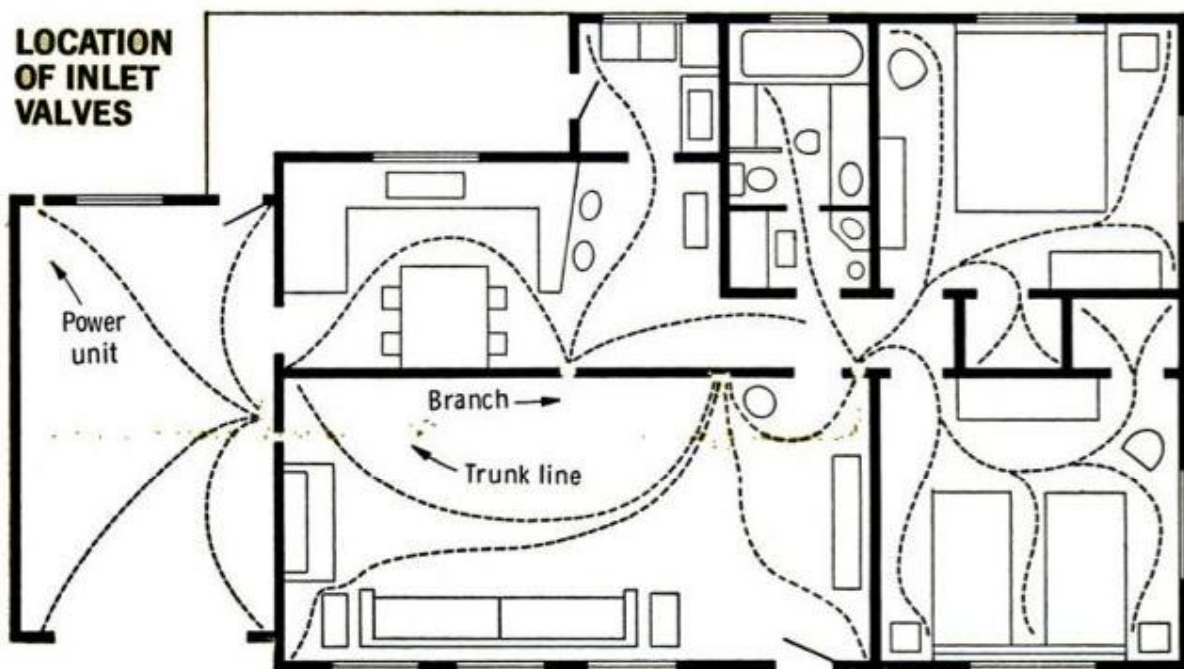
Besides its greater cleaning power, a central system has a lot going for it.

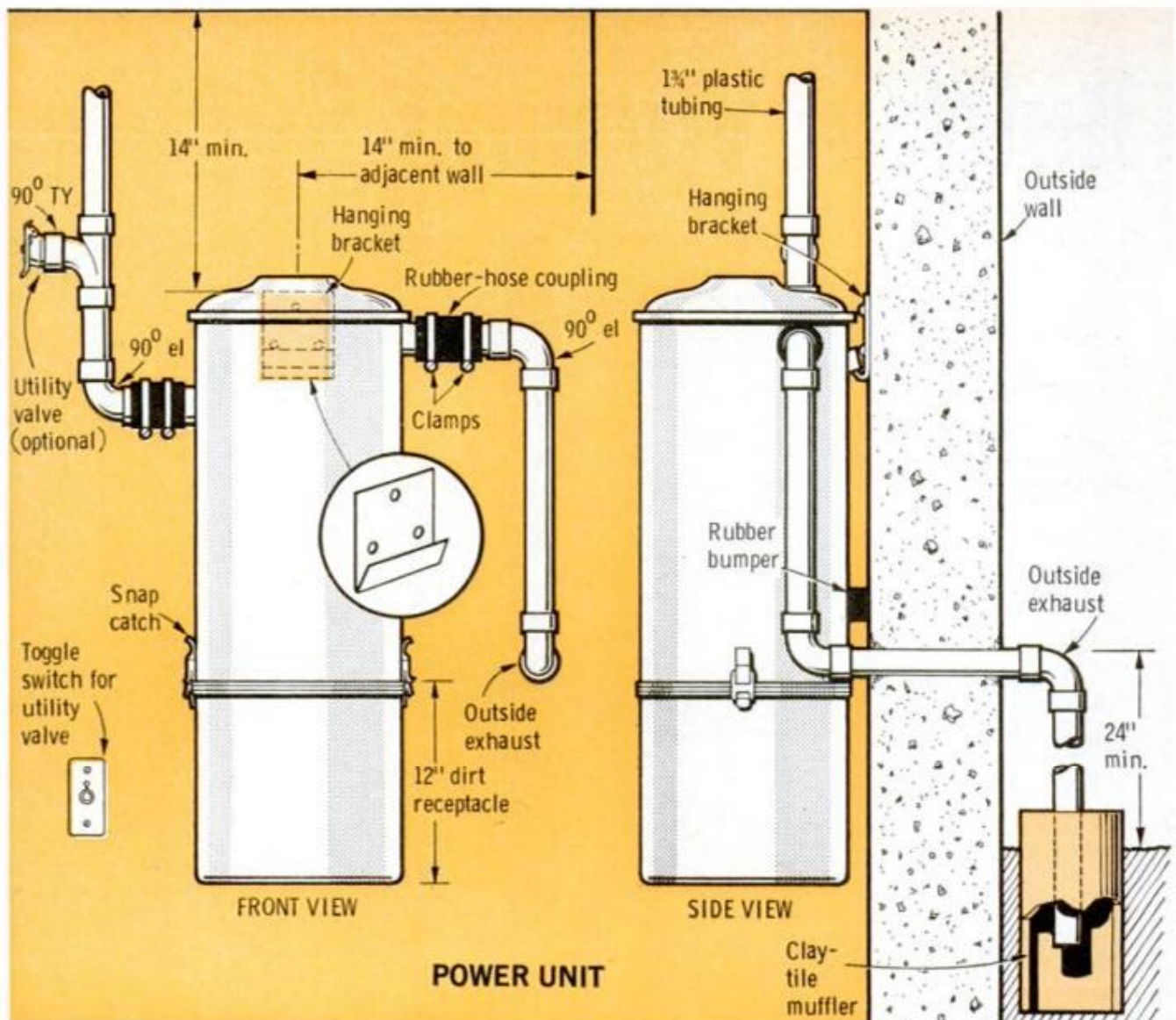
- There's no tangling cord to plug in or coil up—the system turns on automatically when you plug the hose into a wall inlet and turns off when you unplug it.
- There's no bulky tag-along machine



DIRT RECEPTACLE snaps to bottom of power unit for easy removal and replacement. It holds 12 qts.

LOCATION OF INLET VALVES is found by "measuring" house with 21-ft. string—length of the hose





FRONT AND SIDE VIEWS show how power unit hangs from wall-mounted bracket and is vented through wall to discharge fine dust outdoors. Note tile "muffler" to dampen noise of unit



to lug up and down when cleaning stairs—a lightweight hose (21, 24 or 28 feet long) lets you reach from top to bottom.

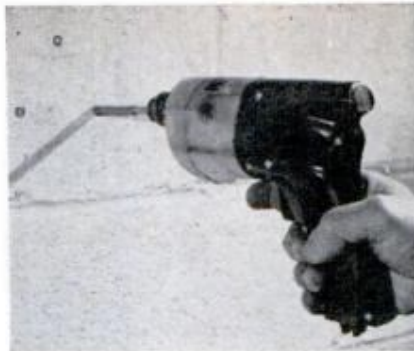
- You can go for months before you have to empty it—a king-size receptacle holds a "barrel" of dirt.

- Fine particles of dust are no longer exhausted back into the room and recirculated—they're whisked directly outdoors.

- And with no filter to cut down suction power, you obtain a deep-down cleaning action that you can't hope to match with less powerful conventional cleaners.

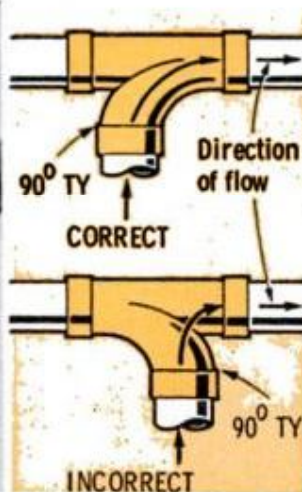
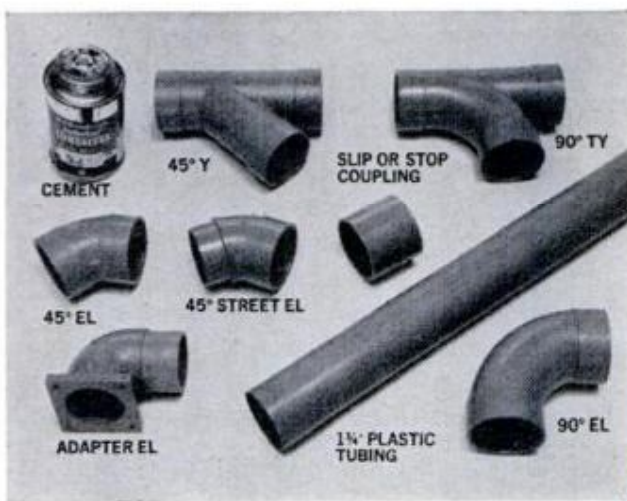
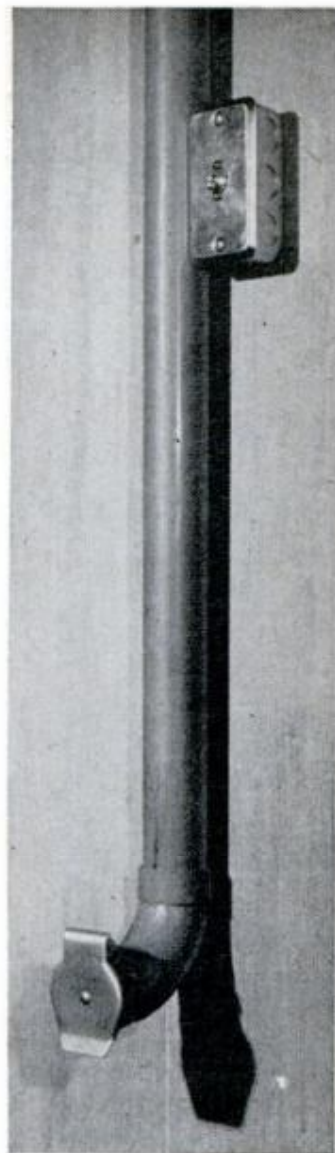
- As for noise—there's only the constant swish of suction at the cleaning wand, the rest is out of earshot. You can listen to radio, TV or stereo while you work.

RUBBER SLEEVES, secured by band clamps, serve as couplings for attaching fittings to input and exhaust ports of power unit. Note BX cable which enters hole in casing for connecting the 110-v. line



▲ **MASONRY** bit in portable drill quickly bores holes for anchoring power-unit mounting bracket

◀ **HOLE FOR EXHAUST PIPE** is cut through masonry wall with cold chisel. Caulking seals the tubing



SLIP-ON PLASTIC FITTINGS include those shown above, plus a tee adapter. Tubing is available in plastic and metal, plastic tubing being easiest to work

SEPARATE SWITCH is provided to turn on power unit at utility valve. Latter can be installed right at unit or at a more convenient spot in basement

A built-in cleaning system need not be looked upon as a mere housewife convenience. With an inlet in the basement, it will let you keep your workshop spick and span. And with one in the garage, you can use the system to keep the interior of your car as clean as a whistle.

While it's easier, of course, to install a central system in a home at the time it's being built, we were curious to find out just how difficult it might be to install such a system in an existing home. We picked a unit called Vacuflor made by H-P Products, Inc., Louisville, Ohio, which is typical of a number of systems on the market, and we installed it in a split-level home. Here's what we found out:

Getting the tubing up through the walls is the hardest part, the rest is easy. There's nothing difficult about hanging the power unit on its bracket, installing

the inlet valves in the wall or connecting the low-voltage wiring that triggers the power unit. Even when it comes to assembling the plastic tubing and fittings, they go together so simply it's almost fun.

Planning your system

Your first step is to determine the best path for the tubing system and the best location for the power unit. As each house will present its own particular problems in getting the tubing inside the walls, you must make a thorough study of your own situation. Naturally, there's less of a problem when it's a one-story home where it's simply a case of coming up through the walls from the basement.

A two-story house is something else. Your problem here is getting through from the first to the second floor without chopping damaging holes in the wall to do



HOLE CUTTER (inset) at end of bit extension makes quick work of boring holes for tubing through floor and sole plate from below with a portable drill

WHEN REMOVAL OF BASEBOARD isn't feasible to reach sole plate, access can be made through dry-wall by cutting "melon plug" and later replacing



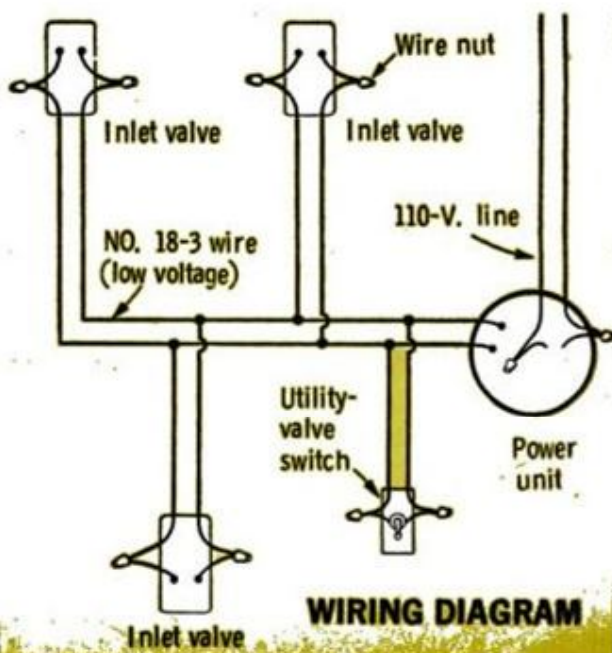
PLASTIC TUBING saws easily. If you don't have a power saw, a miterbox will assure squarely cut ends to obtain perfect fit inside the plastic fittings

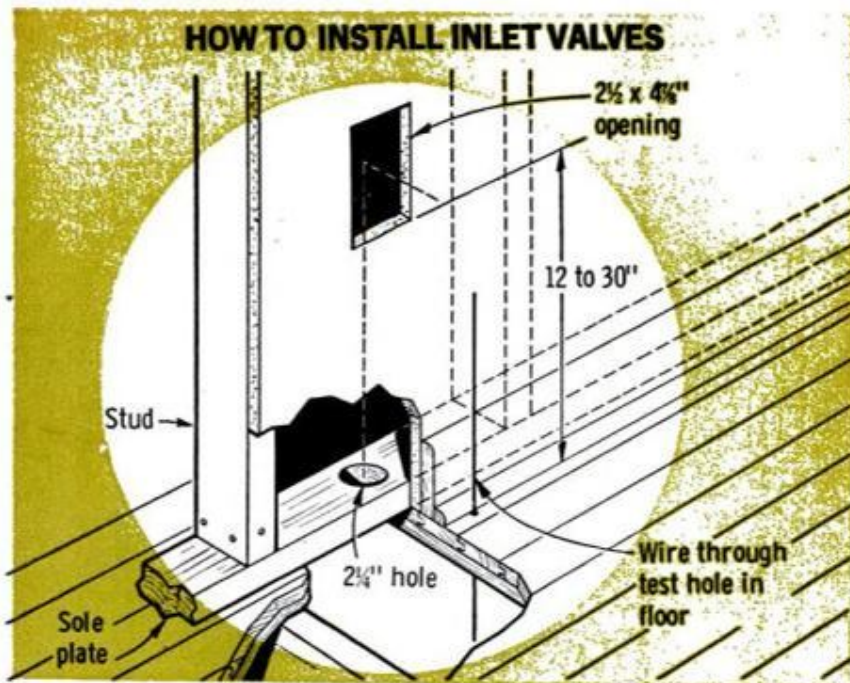
so. In most cases your best bet is to run a single trunk line up through to the attic. This way you only have to worry about getting one duct through. Once you do, bringing branch lines down inside partition walls from the top is easy. It's not hard to spot the walls and to center and bore holes through them.

Getting up through to the attic can be done sometimes by coming up inside a first-floor closet where the exposed tubing won't matter. On the other hand you may find that you can get through by running the tubing alongside a soil pipe or alongside a cold-air duct.

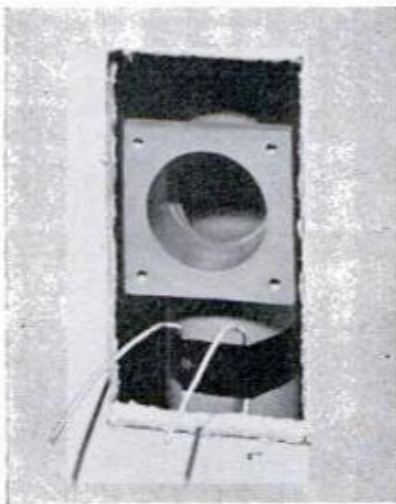
Frequently the soil pipe in an existing house will run straight from the basement to the roof in a wall 6 in. thick or more rather than the conventional stud width, and this wall is seldom blocked off with cross bridging. The holes that were

(Please turn to page 191)

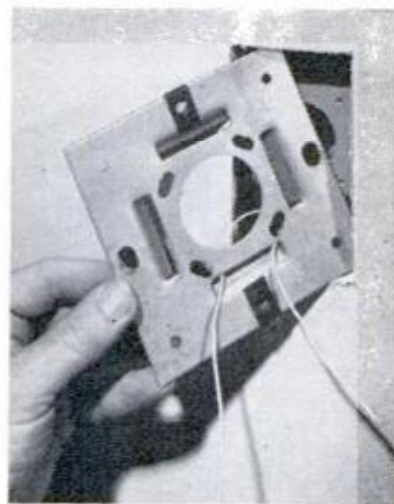




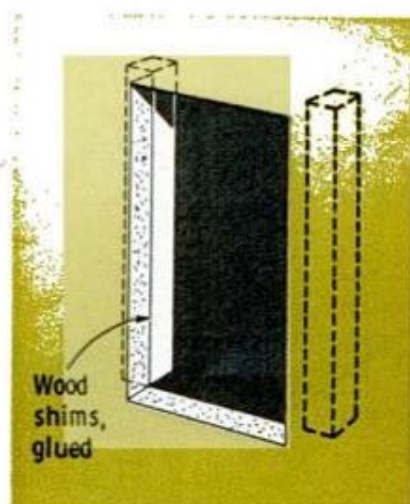
AFTER SAWING OPENING so it registers with tubing in the wall, adapter elbow is coated with cement and inserted in the tubing



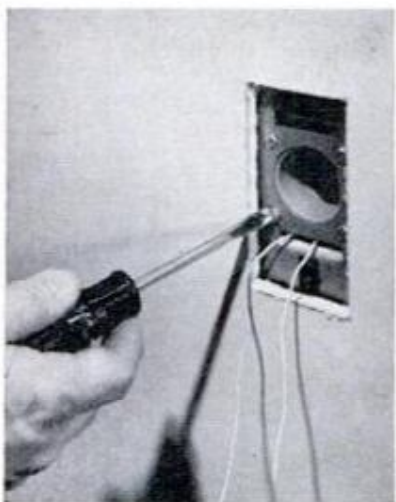
ELBOW SHOULD CENTER in hole when in place. Note the low-voltage wires which are taped to the tubing before it's installed



WALL MOUNTING PLATE is inserted next with its four bent tabs toward adapter elbow. Note wires poking through slot in plate



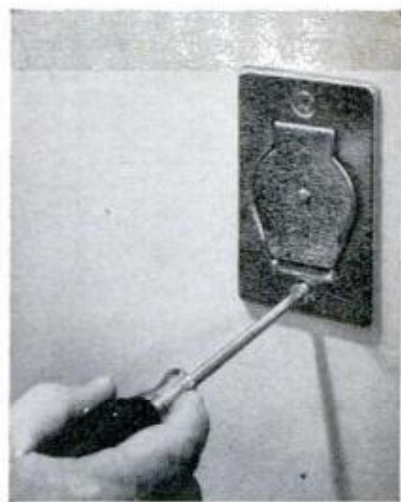
ALL INLET VALVES require 1/2-in. minimum wall thickness. If less, then shims must be added between wall and mounting plate



MOUNTING PLATE is attached to adapter elbow with four self-tapping screws. Leave ample leads for wiring the inlet valve

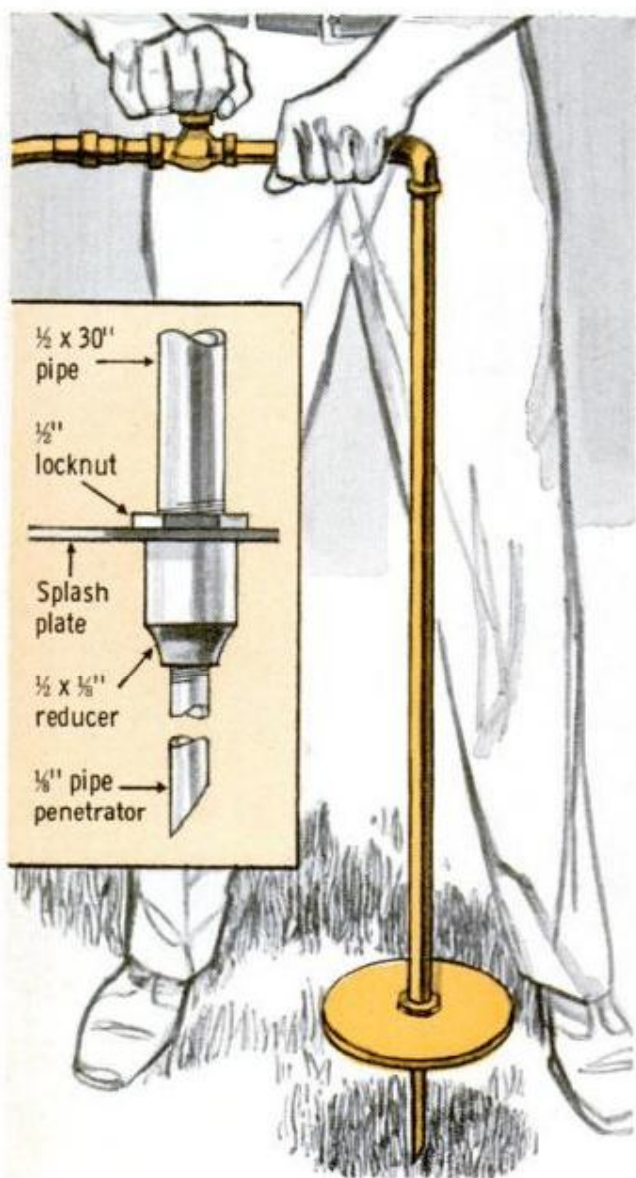


PIGTAIL CONNECTIONS of inlet valve are twisted to bared ends of the wires, then Vacu-Seal adhesive is applied to the valve



COATED TUBE is inserted in adapter elbow, then mounting screws holding valve are turned into tapped holes in mounting plate

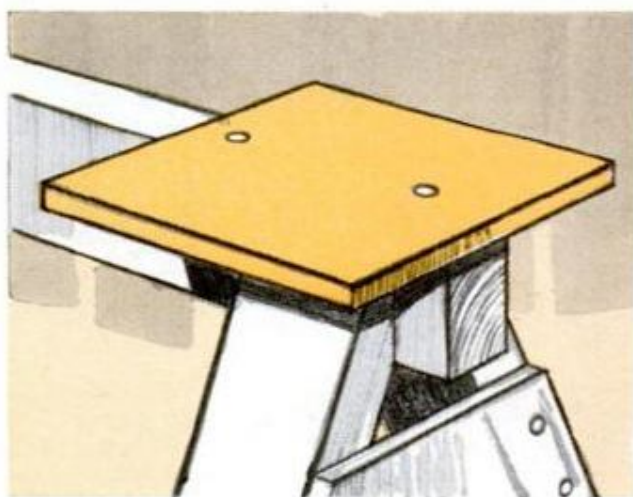
Solving home problems



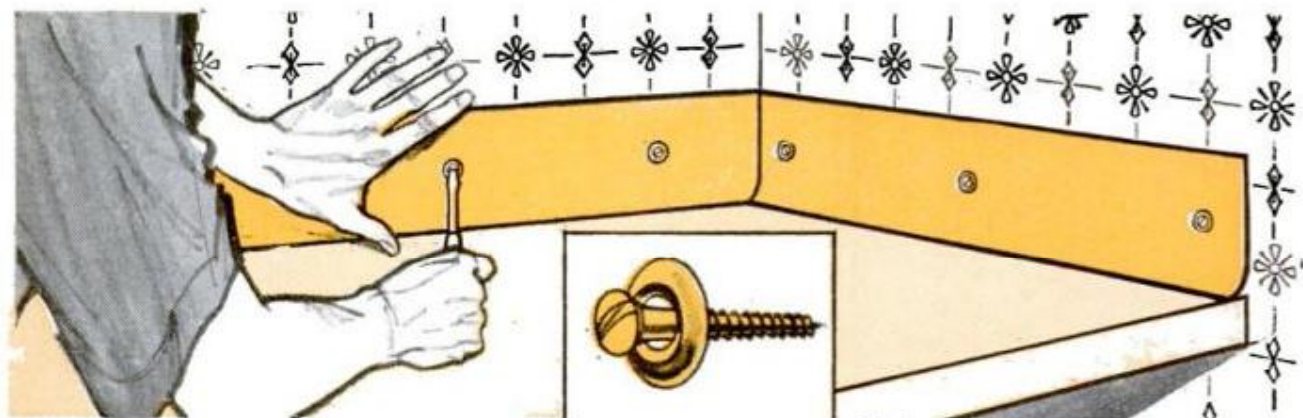
DEEP WATERING of lawns, shrubs and trees is no problem if you make a penetrator pipe to attach to your hose, like that shown above. Hydraulic action does the digging. When set, reduce flow to a trickle



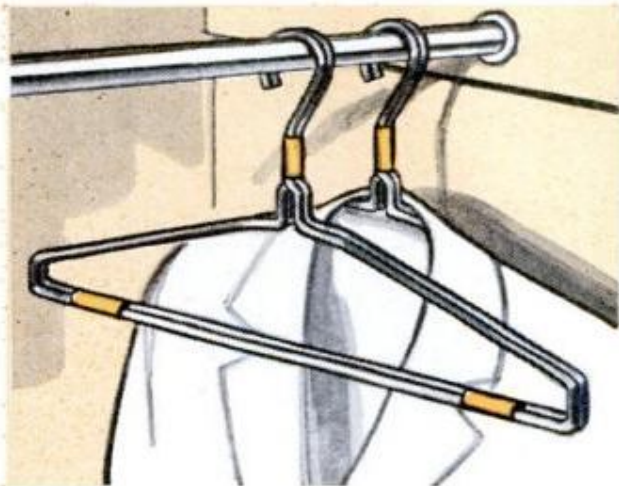
SPOUT OPENING cut in the protective seal of a new jar of instant coffee makes it easy to pour coffee into measuring spoon and prevents anyone from dipping wet spoon into the jar when making second cup



SAWHORSE SHELF cut from scrap piece of hardboard or plywood and attached with wood screws provides a place to put a can of paint, tools or any other necessities. Sand plywood edges to prevent splinters



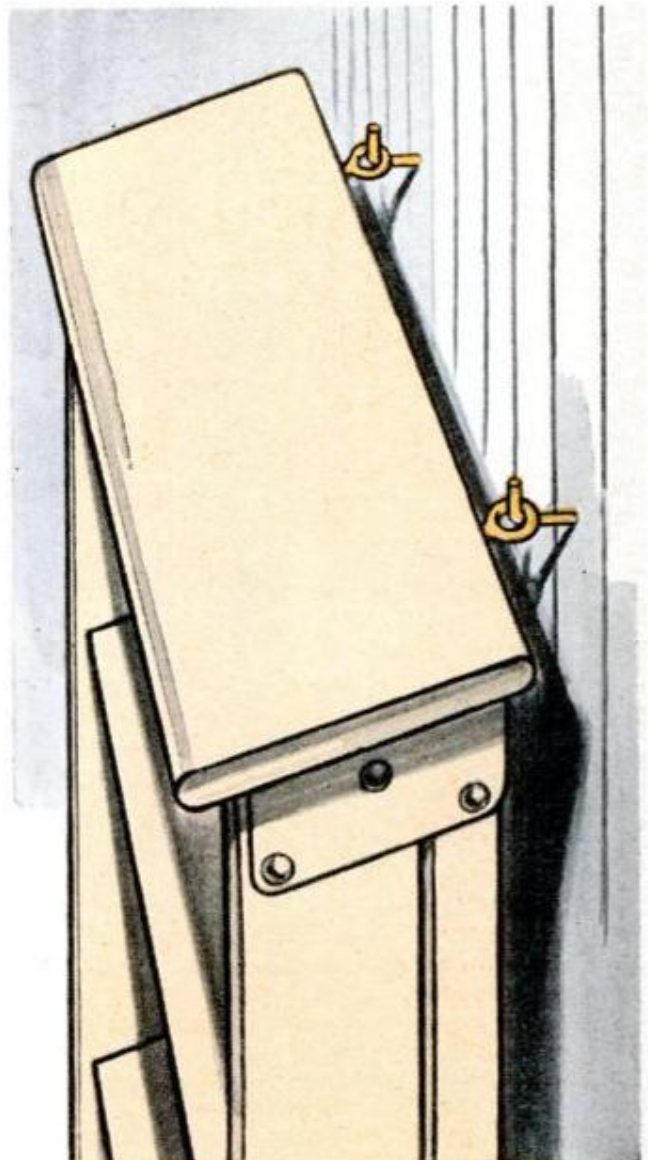
LOW-COST SPLASHBOARD for a laundry-room counter is just a baseboard molding installed with oval-head screws and cup washers. The lower edge does fine job of hiding unequal spacing between counter and wall



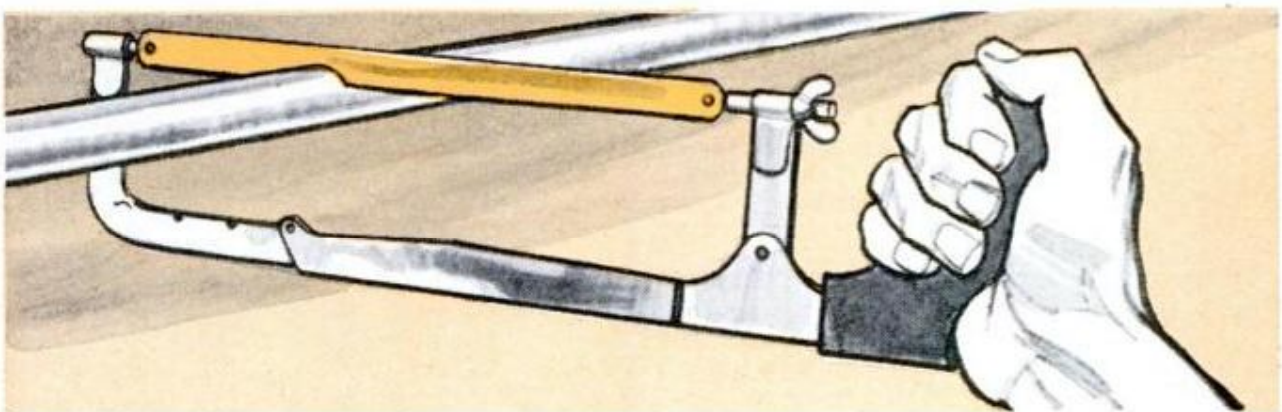
YOU CAN MAKE heavy-duty coat hangers out of light wire hangers simply by taping two or three of them together. Secure them at the top and at the ends of the crossbars so the tape won't snag on clothes



COARSE NEEDLE for sewing burlap or other heavy fabrics is a converted key-type can opener. Just straighten the handle and file the end to a sharp point. The slot in the other end then becomes the eye



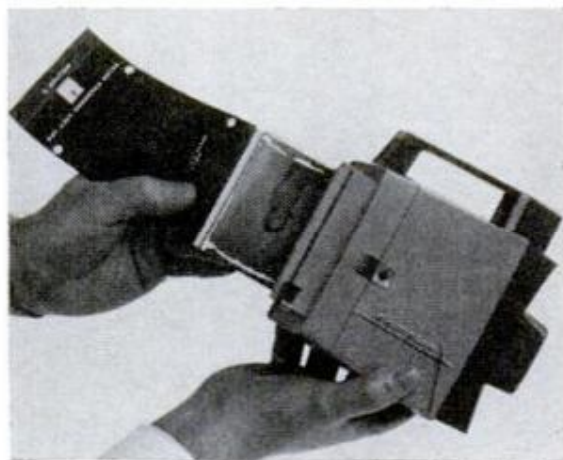
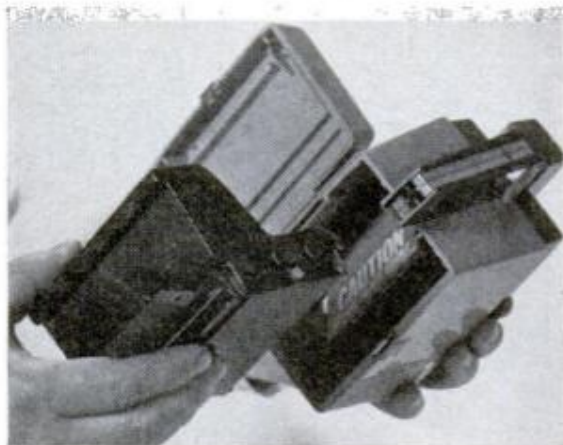
SAFE WAY TO STORE a stepladder is to drive a pair of screw eyes into the edge of the top piece and install a corresponding pair of L-hooks on the wall. A ladder hung this way can't be knocked over



OVERHEAD CUTTING with a hacksaw will be a lot less tiring if you remove the blade, reverse it so the teeth face downward, then reassemble it around pipe, and make cut. This lets gravity help with the work

BRIGHT NEW AIDS

From a motorized tripod head to a goof-proof camera



FIRST NEW "INSTANT PRINT" SYSTEM to appear in nearly 20 years, the Chrislin Insta-Camera above turns out finished black-and-white pictures in 60 seconds. It sells for \$14.99, complete with flash. The film and developing chemicals are contained in an L-shaped cartridge that slips into the back of the camera (upper right). You just shoot, pull a tab, wait a minute, then pull again and out pops the picture (center right). Each cartridge gives eight exposures for \$1.79. Prints are 2½ by 2¾ in. The sample print at right shows the image you get at approximately six feet. The image is actual size, but the print has been trimmed somewhat at the edges. Shutter speed is fixed, but there's an adjustable diaphragm opening to vary exposure. A tiny flashgun with built-in batteries plugs into the side, as shown above. The newcomer is made by Camera Corp. of America, 12 Commercial St., Hicksville, N. Y.



Image shown actual size



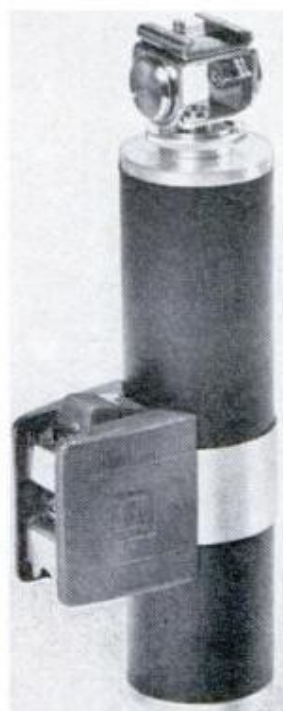
SMOOTH PAN SHOTS with a movie camera are easy with battery-powered drive at right. It swings the camera either left or right at the touch of a button. It's \$49.50 from EPOI International, Ehrenreich Industries, 623 Stewart Ave., Garden City, N.Y.

BABY FLOODLIGHT at left, a photographic version of the powerful little Tensor desk lamp, lets you choose any of three light levels with three color temperatures: 3000°K, 3200°K and 3400°K. Intensity remains constant regardless of line voltage. \$35 from Tensor Corp., Great Neck, N. Y.



FOR BETTER PICTURES

for close-ups, here's a look at some of the latest in clever photo gadgets



WANT A QUICK RELEASE for your flashgun? The Aimes-Hershey people have come up with a clever idea. It's a tubular plastic hand grip with a flash shoe on top. The grip fits any standard Honeywell or Graflex quick-release flash bracket. All you do is mount your own flashgun in the shoe and attach the grip to your camera with a quick-release clamp. To remove the flash for off-camera use, you just unsnap the grip and lift it off, as at right above. The grips come in three styles: with a tilting shoe for bounce flash for \$9.95, with a fixed shoe for \$7.95, and with a 1/4-20 threaded stud for \$5.95. Aimes-Hershey, Inc., P.O. Box 73, Lockport, Ill., is the maker.

YOU CAN TAKE GOOF-PROOF CLOSE-UPS of models, flowers and other small objects with a new kit based on Kodak's Instamatic 104 camera. A frame with a built-in close-up lens attaches to the camera, making it easy to pose subjects as near as five to eight inches (below). Another supplementary lens has a measuring chain that's marked for 15 and 24-in. distances (right). The kit sells for under \$50 from Lester A. Dine, Inc., 2080 Jericho Turnpike, New Hyde Park, N.Y.



Is your camera really on the beam? Try this SIMPLE TEST FOR SHUTTER SPEED

Checking shutter accuracy, usually a job for a pro, is easy with this ingenious trick of using a phonograph as a timer

By CHARLES WELCH

Technical Art by Donald Evans

IT'S EASY to take shutter speeds for granted. You set your camera for 1/200th of a second and you assume that that's what you get. But is it? Shutter timing is delicate. A tiny bit of dust or moisture can throw it off as much as two or three stops—and you won't know it until the pictures come back ruined.

Here's a simple way to check your camera without sending it off to a repair shop. All you need is a phonograph. Mark a white line on an old record, as shown, then spin the record on the machine and photograph it at each shutter setting.

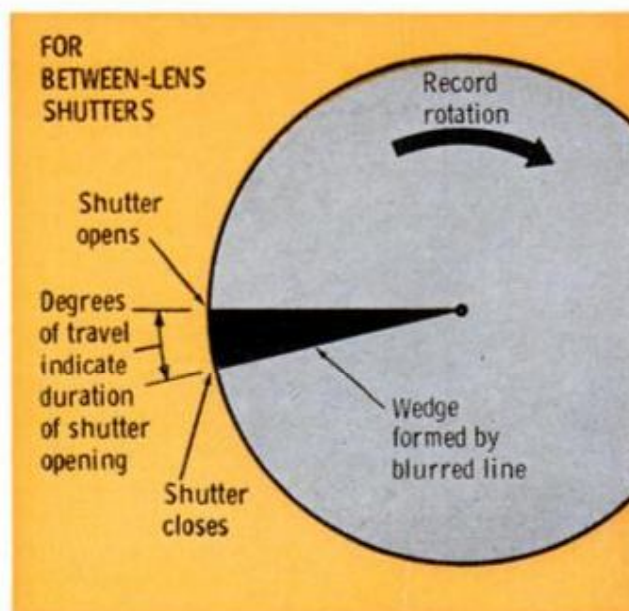
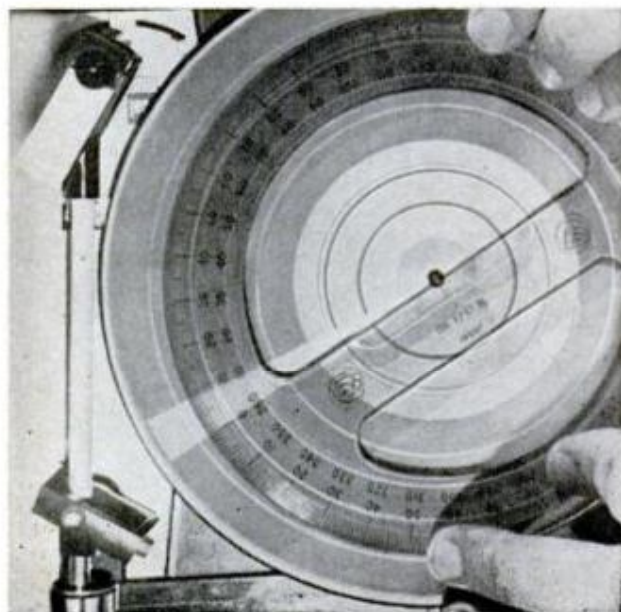
The moving white line will show up as a blurred wedge on the film. By measuring the width of the wedge on an enlarged print, you can tell exactly how long the shutter was open at each setting. For example, at 78 rpm, a phonograph turns 1.3 revolutions a second, or 468° . This means it will rotate 46.8° in 1/10th of a second and 4.68° in 1/100th of a second. Even the wedge produced by 1/1000th of

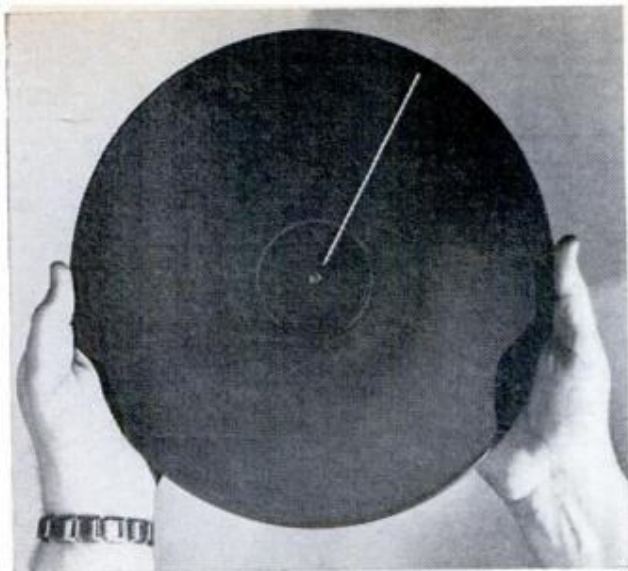
a second—approximately half a degree—can be measured accurately with a large protractor.

The accompanying table gives the degrees of travel for the most common shutter speeds. A 78-rpm speed is best for short shutter openings because it gives you a bigger, more easily measured wedge. If your shutter settings are different from those listed, you can easily figure out your own table of wedge widths. Just divide the total degrees of travel in one second by the shutter speed you want to check, and the result will be the degrees of travel for that particular speed. If you have a focal-plane shutter, note the special procedure for measuring the curved wedge that results.

Shutter speeds that aren't off by more than 25 percent are considered acceptable. Often a sluggish shutter can be cleared merely by snapping it a few times. If serious errors persist, have an expert repairman readjust the shutter. ★ ★ ★

WEDGE-SHAPED BLUR on the film indicates how long the shutter remains open while the record turns. Place a protractor over the wedge and carefully measure its width in degrees at the rim of the record





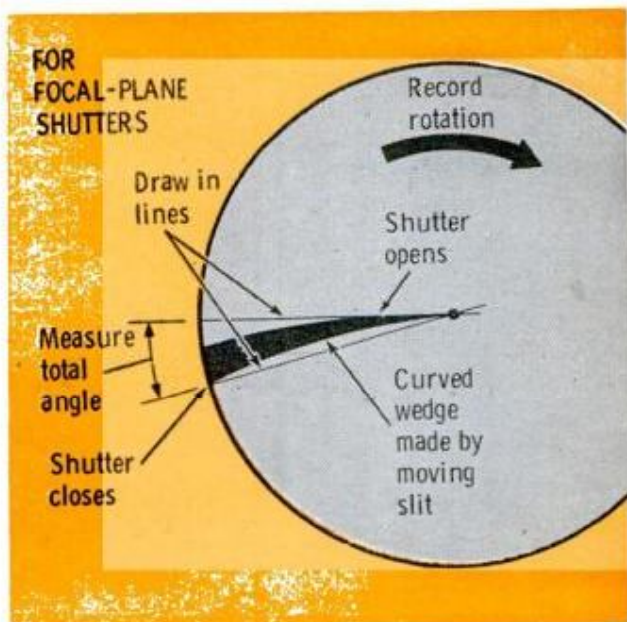
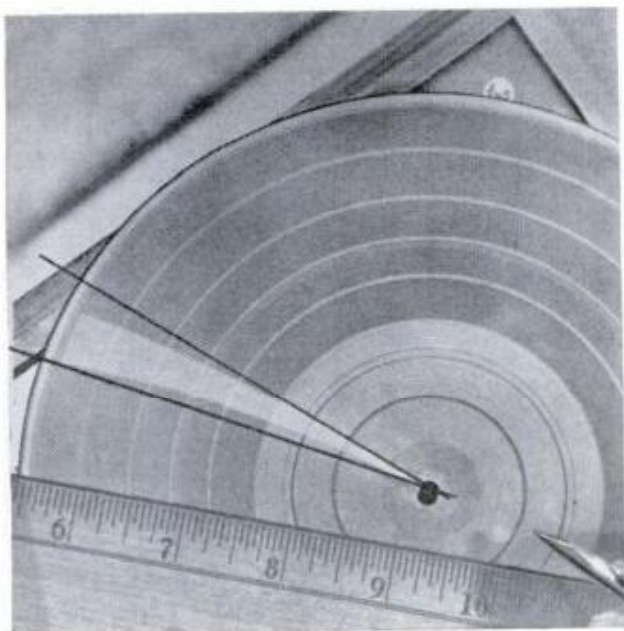
MAKE A TEST DISC from an old worn-out record painted flat black to cut reflections. White line should be about 1/16 in. wide, can be a strip of white tape or paper. Setup at right shows how the camera is positioned directly over the phonograph



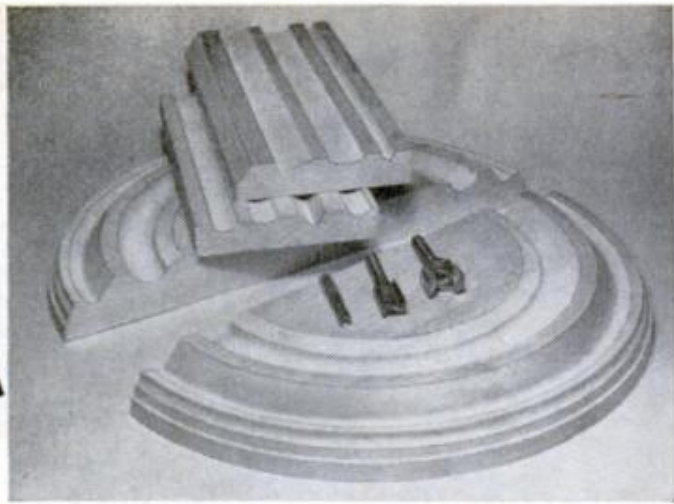
SHUTTER TEST TABLE

SHUTTER SPEEDS (seconds)	TURNTABLE SPEEDS		
	33 1/3	45	78
1	200	270	468
1/2	100	135	234
1/10	20	27	46.8
1/50	4	4.4	9.36
1/100	2	2.7	4.68
1/200	1	1.35	2.34
1/400	0.5	0.675	1.17
1/500	—	0.54	0.936
1/1000	—	—	0.468

CURVED WEDGE is produced by a focal-plane shutter because it exposes the line progressively. To measure wedge's total angle, draw lines with a ruler to indicate points where the shutter opens and closes



TILT YOUR ROUTER



Flat-bottom bits perform as shaper cutters when you clamp your router's powerhead in this adjustable base

By RAY SHOBERG

Technical Art by Donald Evans

BY SLIPPING your router motor out of its regular base and mounting it in this adjustable plywood support, you'll be able to vary the angular position of the bit in relation to the work, thereby making it possible for you to cut vee, circular or even elliptical grooves with a single, straight-sided router bit.

How this occurs is easy to understand if you first draw a horizontal line on a piece

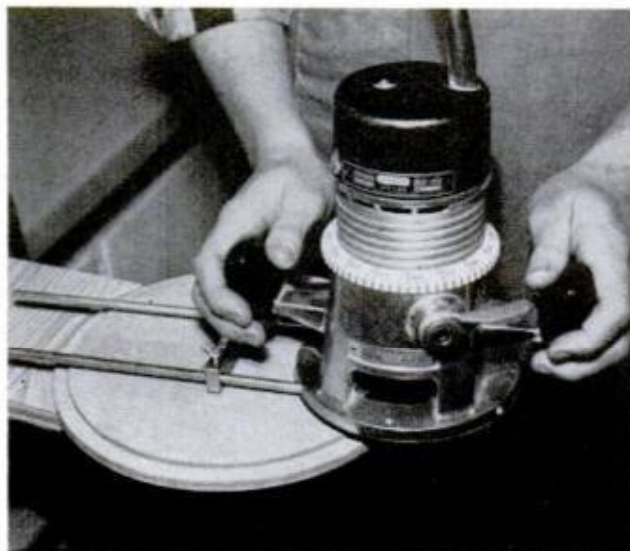
of paper to represent the profile of a piece of wood. Then align the bottom edge of a straight-sided router bit with this line. The cutting outline you see is rectangular; thus, when you push the bit slightly below the line, the cut will appear rectangular or like a dado.

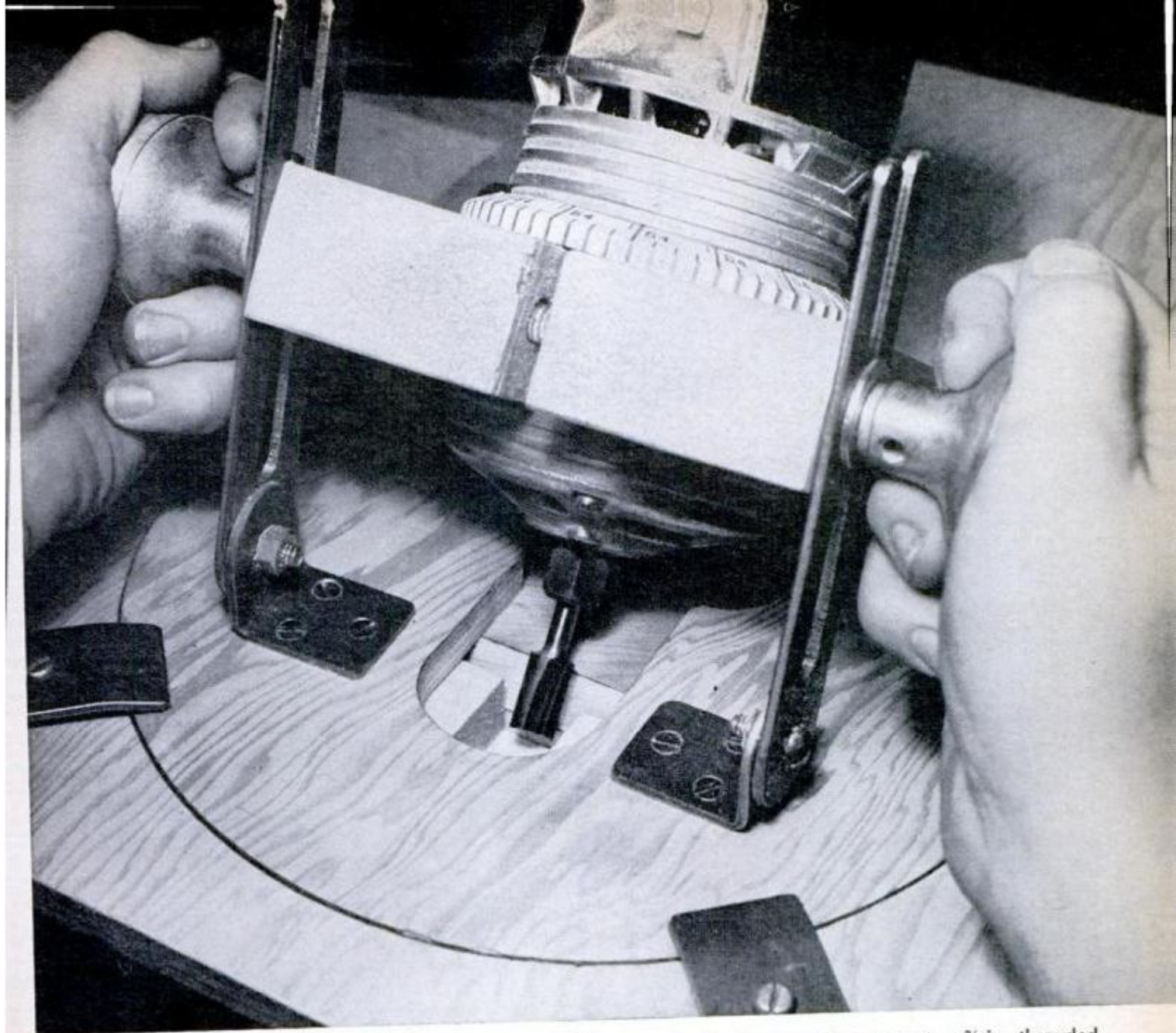
But now tilt the bit until it's inclined at about a 45° angle and you will note that if it were turning through a piece of wood,



FREEHAND WRITING takes on an interesting effect when a flat-bottom bit is tilted at an angle. Note how the width of the cut varies between the vertical and horizontal strokes. Here only the base is used

CIRCULAR BASE can be cut by pivoting the router around a center point. It also can be cut from a sheet of ½-in. plywood using either a band or jigsaw. Recommended diameter of base is ten inches

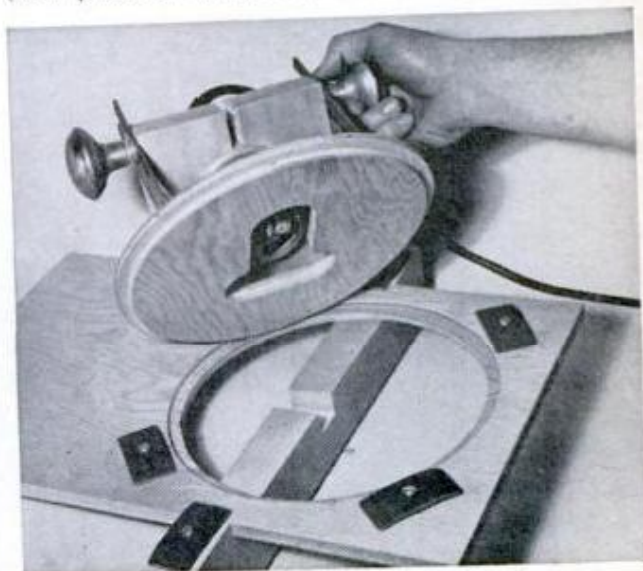


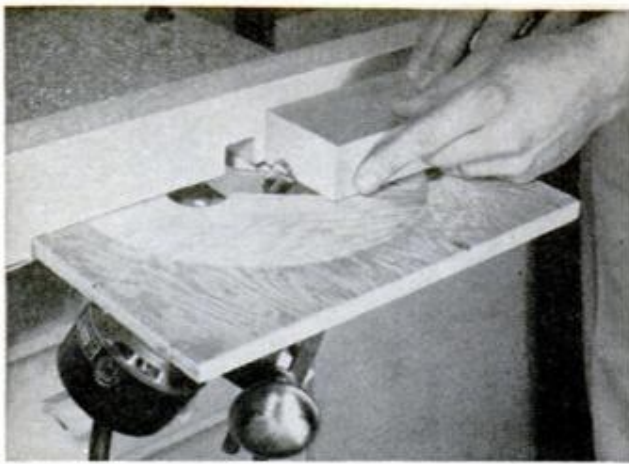


READY FOR ACTION, the completed assembly is held by two doorknobs, tapped to accept a $\frac{3}{8}$ -in. threaded rod. When tightened, the knobs also pinch the split 2x6x6-in. wooden block around the powerhead

BASE AND SUB-BASE are both rabbeted around their edges. Use the router and pivot once again to cut the $\frac{1}{4}$ -in. deep, $\frac{1}{2}$ -in. wide rabbets

CUT AN OBLONG HOLE in the center of the base so the bit can be tilted freely. Add pivot clamps (bent pieces of strap iron) to lock base to sub-base





TURN THE BASE OVER, clamp it to a workbench and you have a shaper table. Here fence should be used

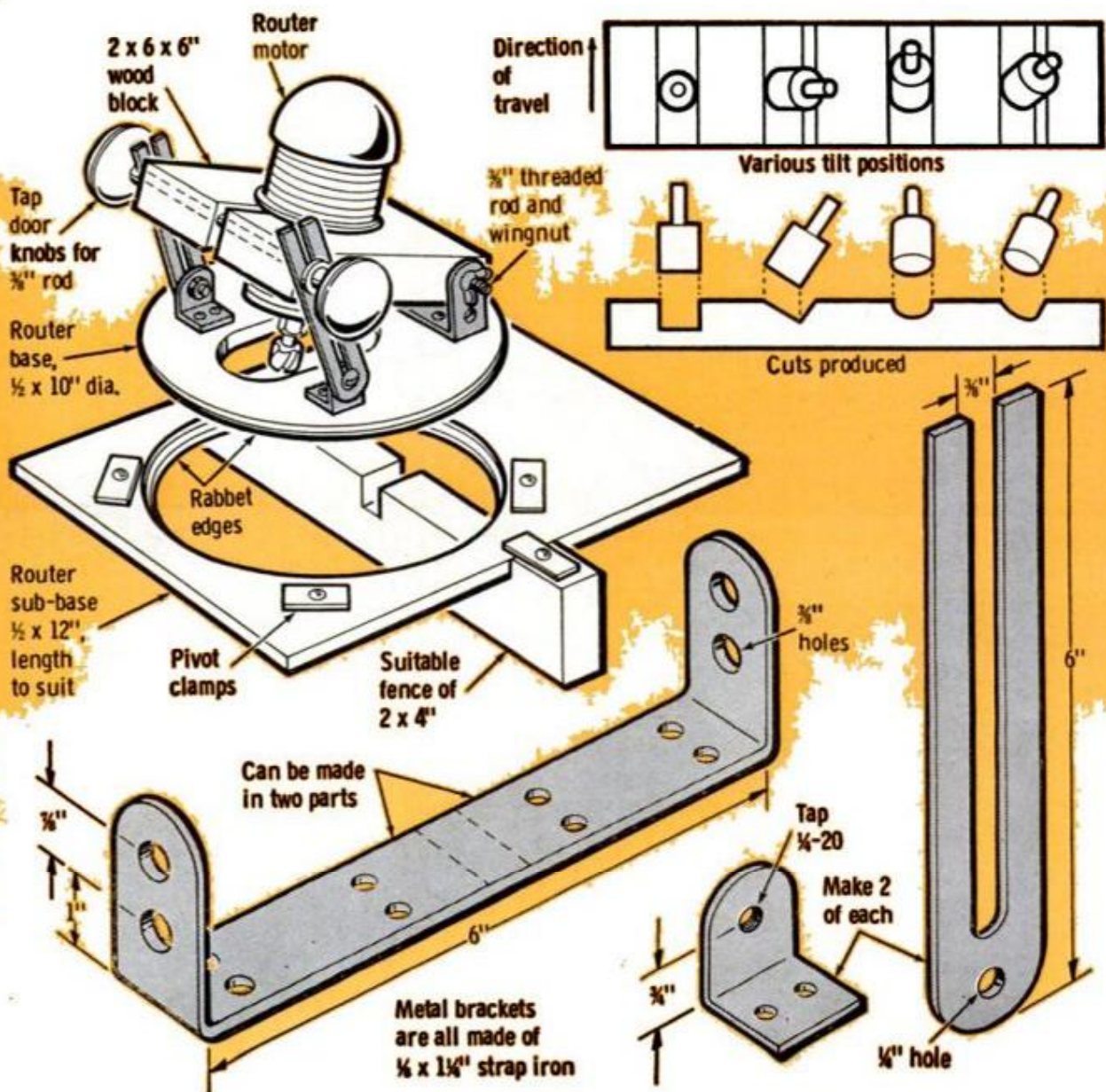
the cut produced would appear triangular—in short, it cuts a vee groove.

Cutting circular grooves is just as easy to master. Reset the bit to its original position; that is, with the bottom edge

slightly below and parallel to the horizontal line. Now lift the shank of the bit until it is about 45° off the surface of the paper. If you then look down at the cutting outline and imagine you're pushing the bit through a piece of work, you'll see that the resultant cut will be a curved groove.

The elliptical cut may sound difficult to produce, but you've already done all that it requires. Just align the bit with the horizontal line and tilt it to the 45° angle as for a vee cut. Then raise the shank to the 45° angle you'd use for a grooved cut. By combining both positions, you wind up with a third position that enables you to cut ellipses in wood.

Sounds great, doesn't it? And what sounds even better is the fact that construction is so simple that the single drawing below provides all the information you'll need to tilt your router. ★★★

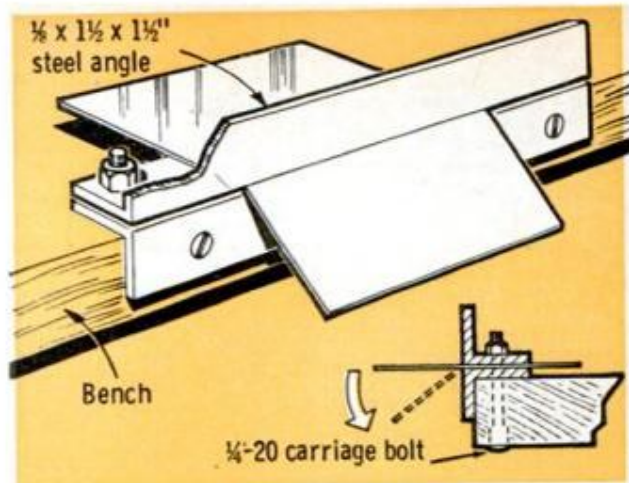


HINTS FROM READERS

Bench-type "brake"

Bending sheet metal can be easy if you mount two lengths of angle iron to the top of your workbench as shown. Then simply position the work between the two pieces, tighten the bolts, and bend the sheet metal down to the desired angle. The bends will be clean and sharp.

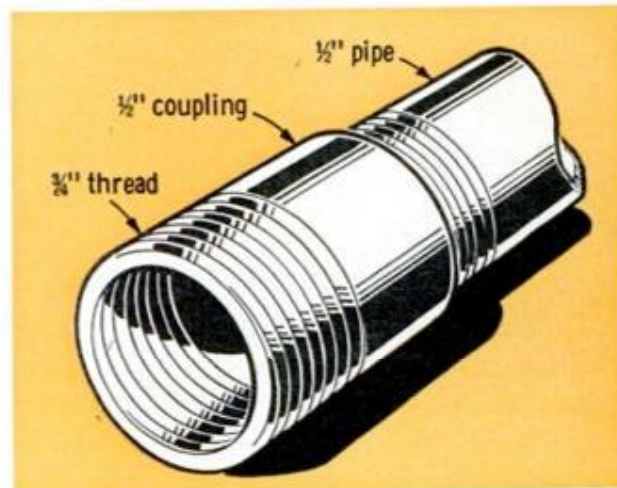
—Frank L. Rush



Threaded coupling becomes bushing

When you suddenly discover that you don't have the regular pipe bushing you need to complete a job, try substituting an ordinary coupling. First run the coupling on the pipe until it's good and tight. Then thread the outside of the coupling (the end away from the pipe, of course) so it will mate with the internal thread on the fitting. This type of substitution will work nicely whenever you require a bushing for 1/8 to 1/4, 1/4 to 3/8, 3/8 to 1/2, 1/2 to 3/4, and 3/4 to 1-in. pipes and fittings.

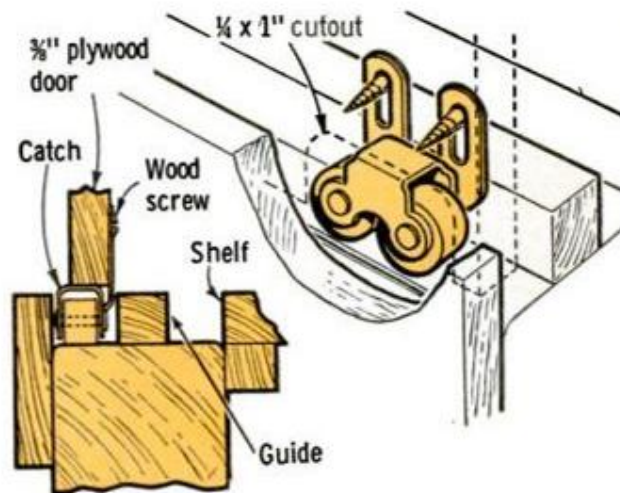
—Lloyd Baird



Doors roll on cabinet catches

The type of cabinet catch with two plastic rollers not only is inexpensive, but it is tailor-made for duty as sliding door hardware. Make the appropriate cutouts at the bottom corners on each of the door panels and mount the catches as shown. Add guide strips to the top and bottom of the frame to form tracks and to keep the doors in proper alignment. As is the case with most sliding doors, make the bottom strip thinner than the top strip.

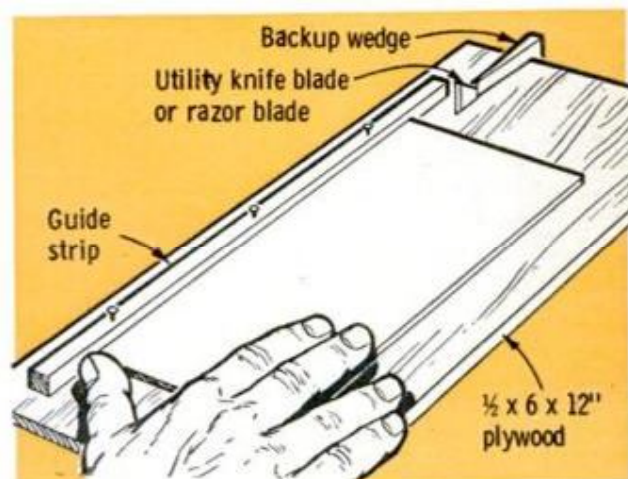
—Anton Barkey



Razor jig cuts balsa

To cut a number of uniform strips from a modeler's standard sheet of balsa, knock together this simple jig and do the job neater than a razor-toothed beaver. First cut a fine kerf at one end of the plywood bed and then insert a razor or utility knife blade in it. Form a thin wedge and slide it in back of the blade to keep it in place. Measure the required width, tack down a guide strip, and you can slice off strips slicker than salami.

—Alexander Valentine



BUILD YOURSELF THIS CARBON ARC WELDER

ACTUALLY, it probably will cost you less than \$5 because the components you'll need to construct this versatile resistance-type arc welder are standard items that can be bought in almost any hardware or electrical-supply outlet.

The welder is versatile indeed, for although it weighs less than a pound and is only 14-in. long, it nevertheless places a heating potential of better than 10,000° F. at your command. Just plug the welder in any 110-v.a.c. outlet, adjust the width of the arc, and you'll be able to braze, weld or solder most metals found in the home workshop.

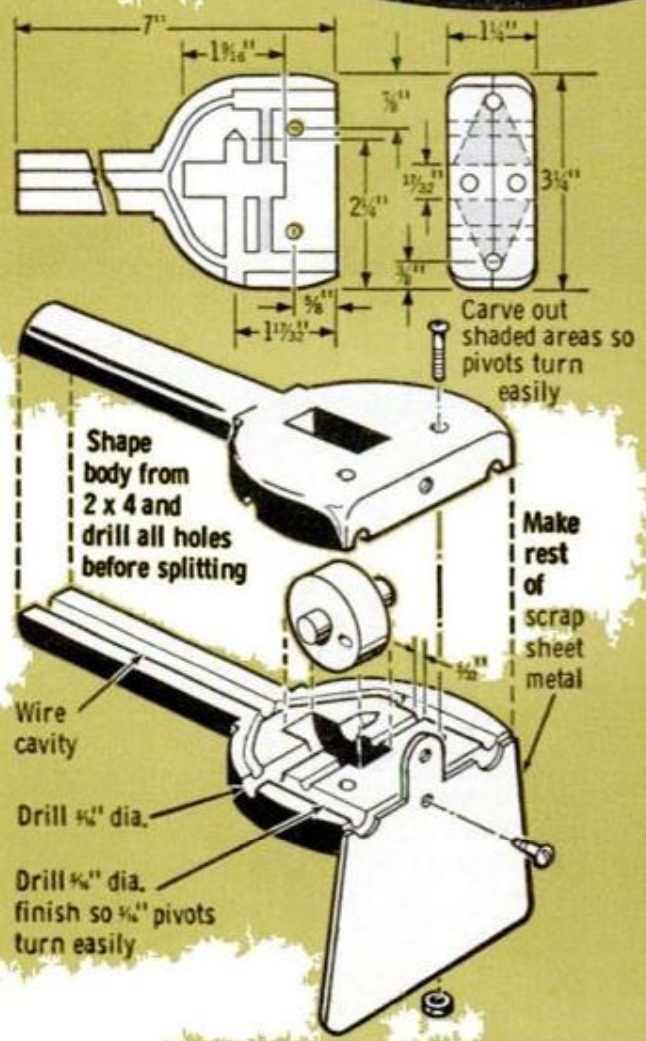
As is the case with most projects involving many small parts, it's best to fabricate each before attempting assembly. The body, for example, can be shaped from a piece of 2x4, then drilled wherever necessary and, finally, split into halves (Use a saw blade with the thinnest kerf possible.)

The cavities for the wires, thumbwheel and axle pivots should first be carved or routed out to the dimensions shown. Then after the components have been test-fitted, any modifications needed to produce a good fit can be made. (Incidentally, a comfortable cover for the handle—and one that also helps to secure the two halves of the body together—is a rubber grip from the handlebar of a bicycle.)

The thumbwheel also is made of wood. You can turn the wheel and axles from a single piece, or you can form it of a wooden disc drilled for a $\frac{5}{16}$ -in. dowel. Either method will suffice.

Using a power bench grinder is probably the easiest way to cut the porcelain shafts to the lengths specified in the drawing. Slowly turn the shafts against a corner of the spinning grindstone until the porcelain separates. Square off the ends of the shafts and stuff them with asbestos paper. (Both the stuffing and the asbestos sheet can be easily worked if first they are moistened.)

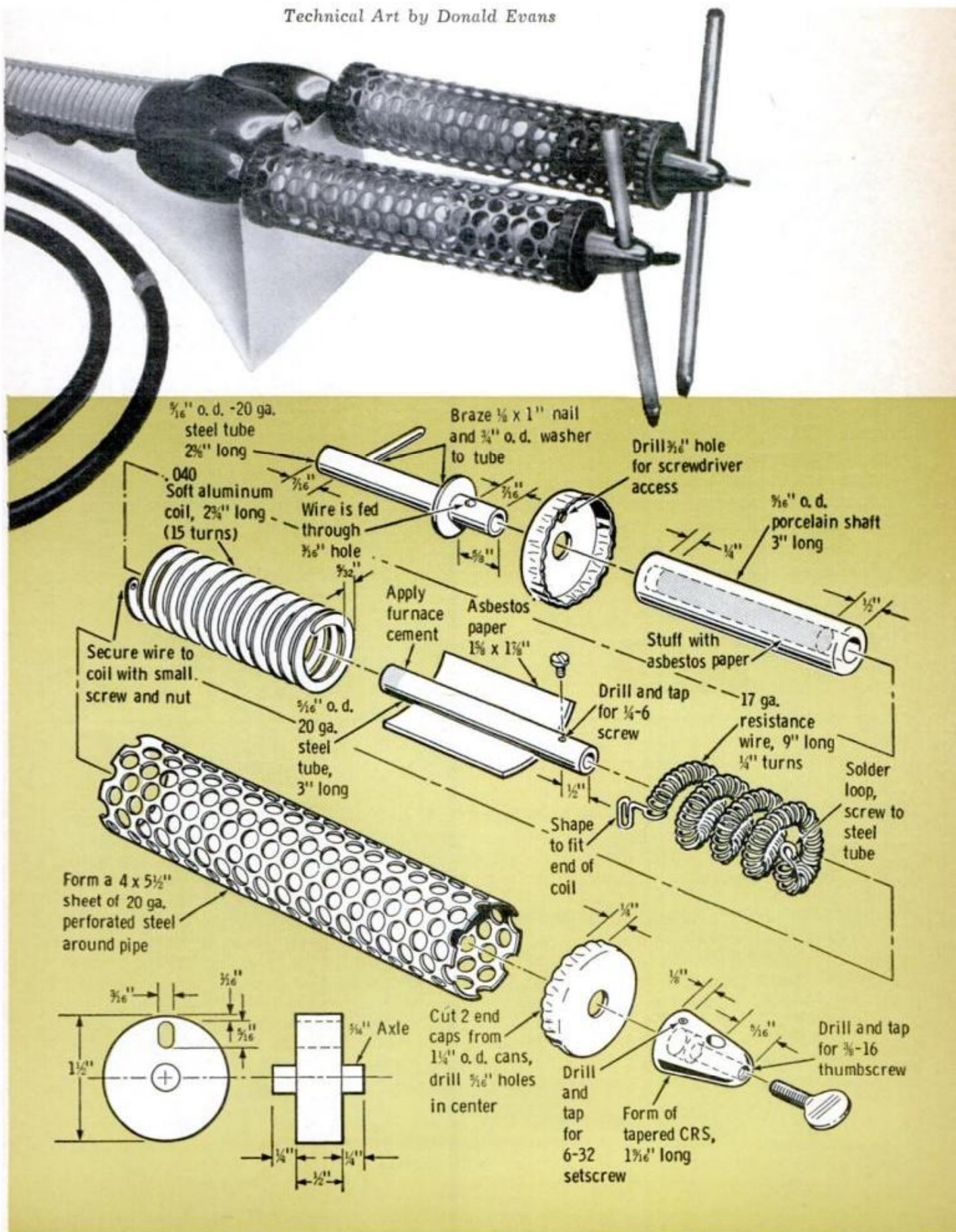
The steel tubes are secured to the porcelain shafts by means of asbestos furnace cement. Apply a liberal coating to both surfaces, align the shafts and then bake them in a 500°-F. oven for a half

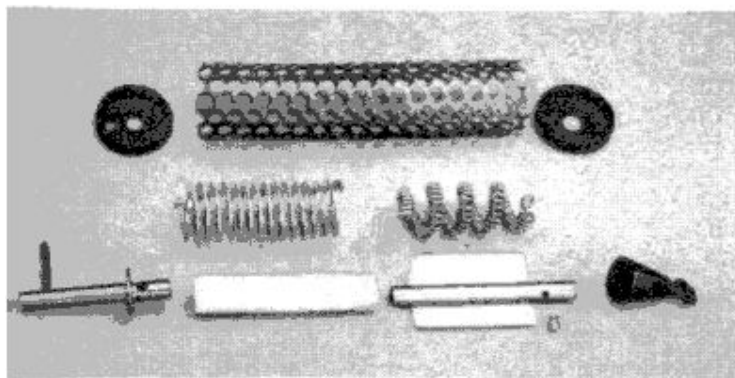


FOR \$5

By PAUL SCOTT

Technical Art by Donald Evans





TWO OF EACH of the above components must be formed. Thumbwheel, body, cord are single items

hour. These assemblies then can be attached to the steel axle pivot shafts with epoxy cement. However, don't forget to install the rear end caps first. (The rear caps differ from those used for the front in that they have a $\frac{3}{16}$ -in. hole through which a screwdriver can later be passed.)

Form the carbon-rod holders from a $1\frac{1}{16}$ -in. length of $\frac{3}{4}$ -in. o.d. cold-rolled steel (CRS). Drill and tap the hole for the 6-32 setscrew and also drill a $1\frac{1}{64}$ -in. hole to accept the carbon rods. In place of the thumbscrew shown, you might choose to use a $\frac{3}{8}$ -16 bolt to hold the rods in place.

The power cord should be at least 16-ga., double conductor. Measure and cut off a 6-ft. length, strip off $4\frac{1}{2}$ -in. of the outer insulation from one end, and then strip off $\frac{3}{8}$ -in. of the insulation on each of the exposed wires.

Slide the bicycle handle grip over the

power cord (you may have to enlarge the hole in the grip to accomplish this). Press the wires into the cavities in the bottom half of the wooden body, thread them through the steel-axle pivot shafts, and pull them out through the $\frac{3}{16}$ -in. hole near the end of each shaft. (The rear end caps should be temporarily taped to the washers so as not to interfere with the wires.)

Spread a heavy coat of paste wax on the wooden surfaces that will be subjected to friction and then place the thumbwheel in position. Engage the nails on the axle pivot shafts with the slot in the thumbwheel and screw the two halves of the body together. Slide the bicycle handle grip over the wooden handle and attach the metal rest to the body.

Form an eyelet at the ends of the two wires and connect each to an aluminum coil with a small machine screw and nut. It's here that the access hole in the rear end caps become useful.

Slip the resistance coils over the asbestos-wrapped steel tubes and clamp one end to the aluminum coil. The other end of each resistance coil is then secured to the steel shaft with a $\frac{1}{4}$ -6 screw.

Insert the entire assembly in the perforated steel cage and slip the front end caps in place. Install and align the rod holders, tighten the setscrew and add the carbon rods. Plug the welder into 110-v.a.c., slip on a pair of welder's lenses and *practice, practice, practice.* ★ ★ ★

NEXT MONTH IN SHOP AND CRAFTS

COLD DRAFTS AND HOT FLASHES. You can get more total comfort out of your warm-air heating system this winter by tuning it for continuous air circulation. Next month's *PM* tells you how to adjust the whole system for a smooth flow of moderately warm air, thus eliminating those sweltering peaks and shivering valleys.

WHAT YOU SHOULD KNOW ABOUT PAINT ROLLERS. Choosing the right paint roller for any job can mean the difference between professional results and a complete botch. In the October issue, *PM* brings you all the facts on everything from fibers to nap, plus a handy chart telling what to use where.

HOW TO TURN PRO WITH A ROUTER. Your router is a tool that possesses a lot of built-in skill. Just read *PM's* definitive router article next month, spend an hour or so practicing with this extraordinary tool and you'll marvel at your new-found master's touch. It's a special *PM* "Toolesson."

HOW TO PICK THE RIGHT MASONRY PAINT. Puzzled about all those masonry coatings on today's market? Know the facts about the seven basic types and you'll have no trouble picking out the one that's just right for your problem. You'll find all the necessary information in the October issue of *PM*.



Build this fine-furniture HI-FI CONTROL CONSOLE

Just make a walnut cabinet to match your hi-fi component enclosures, then wire in a clock radio mechanism and a stereo-speaker switching circuit

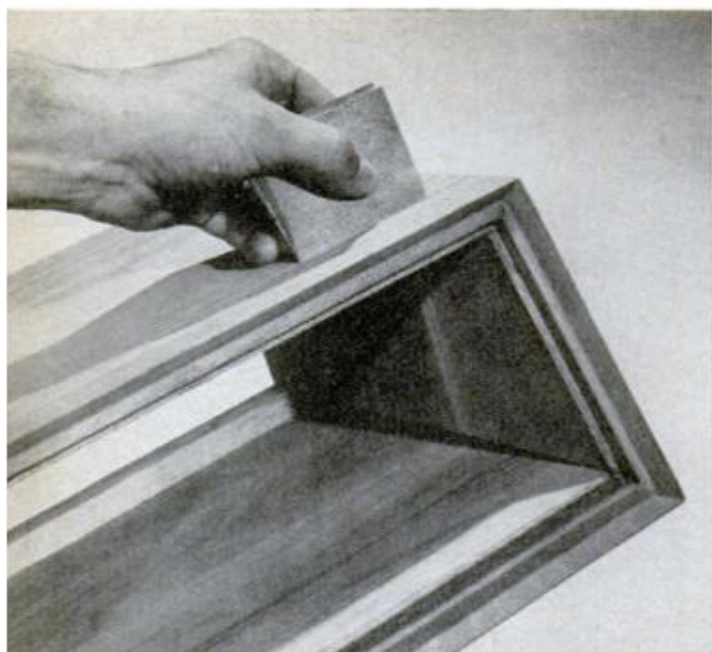
By BILL HARTFORD, Electronics Editor

Photos by Robert Borst

EVEN THE NEATEST hi-fi installation has a way of getting tangled in a mass of power cords, extra plugs and sockets, and auxiliary speaker switches tucked here and there. This control console puts all the loose ends in a handsome walnut enclosure designed to rival in

appearance your finest hi-fi components.

Supplementary controls are all at your fingertips on one convenient panel. One circuit in the console controls three pairs of hi-fi speakers, while another circuit automatically turns the components and any appliances on and off through the

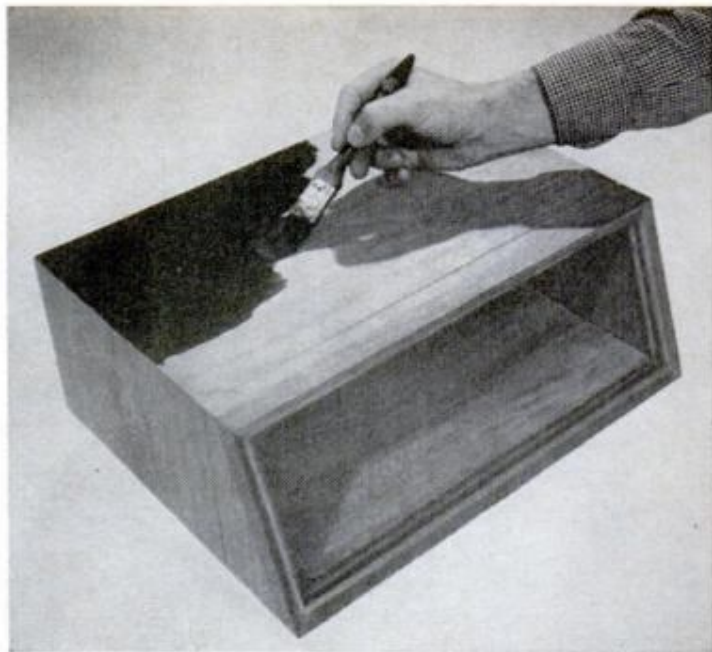


MATCHING HI-FI CABINETS can be approximate—in exterior dimensions only, for example—or in detail, including routed groove as shown here

switching action of a built-in clock-timer.

The power circuit: Take a \$5 clock-timer mechanism, add some a.c. sockets and some switches, and wire them all together following the schematic diagram, and you've got what's otherwise known as a clock-radio. But in this case, the clock controls power to any or all of seven receptacles on the back of the console.

Plug in your hi-fi tuner, amplifier, TV, turntable, tape recorder, table lamp—even your electric coffee percolator if it's nearby—then set the clock to turn on in the morning or set its 60-minute sleep switch to turn off everything at night. Just plug your equipment into sockets SO1 through SO7. Corresponding switches S1 through S7 on the front panel



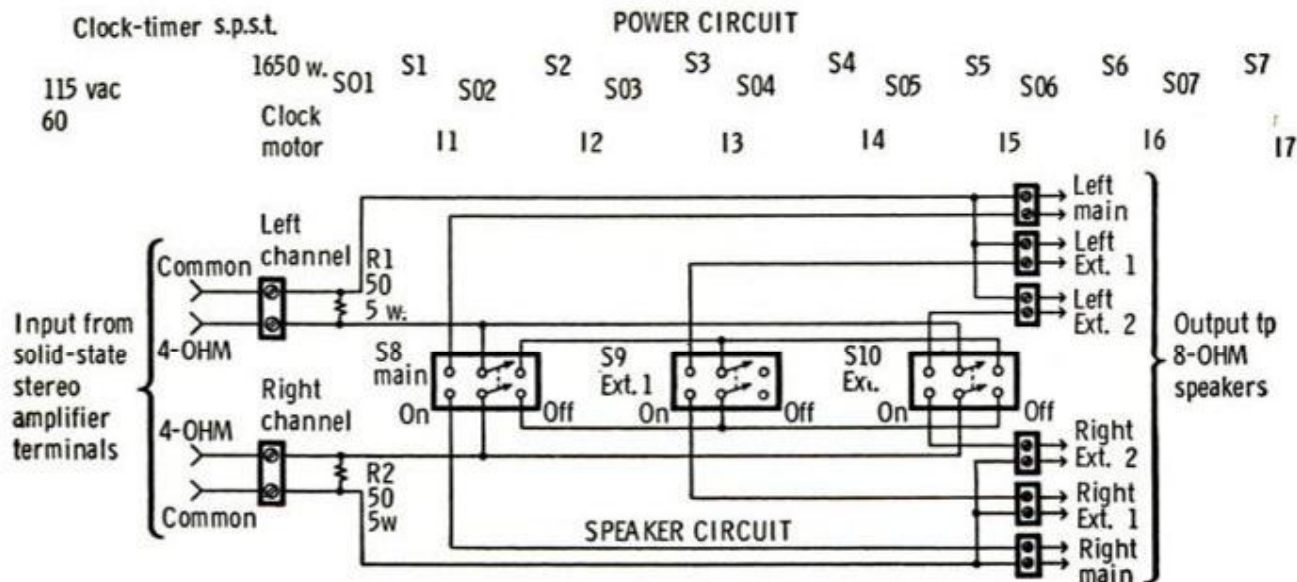
STAIN THE CABINET to take the easy way or oil and hand-rub the wood. Note the darker, solid-walnut picture-frame molding around cabinet front

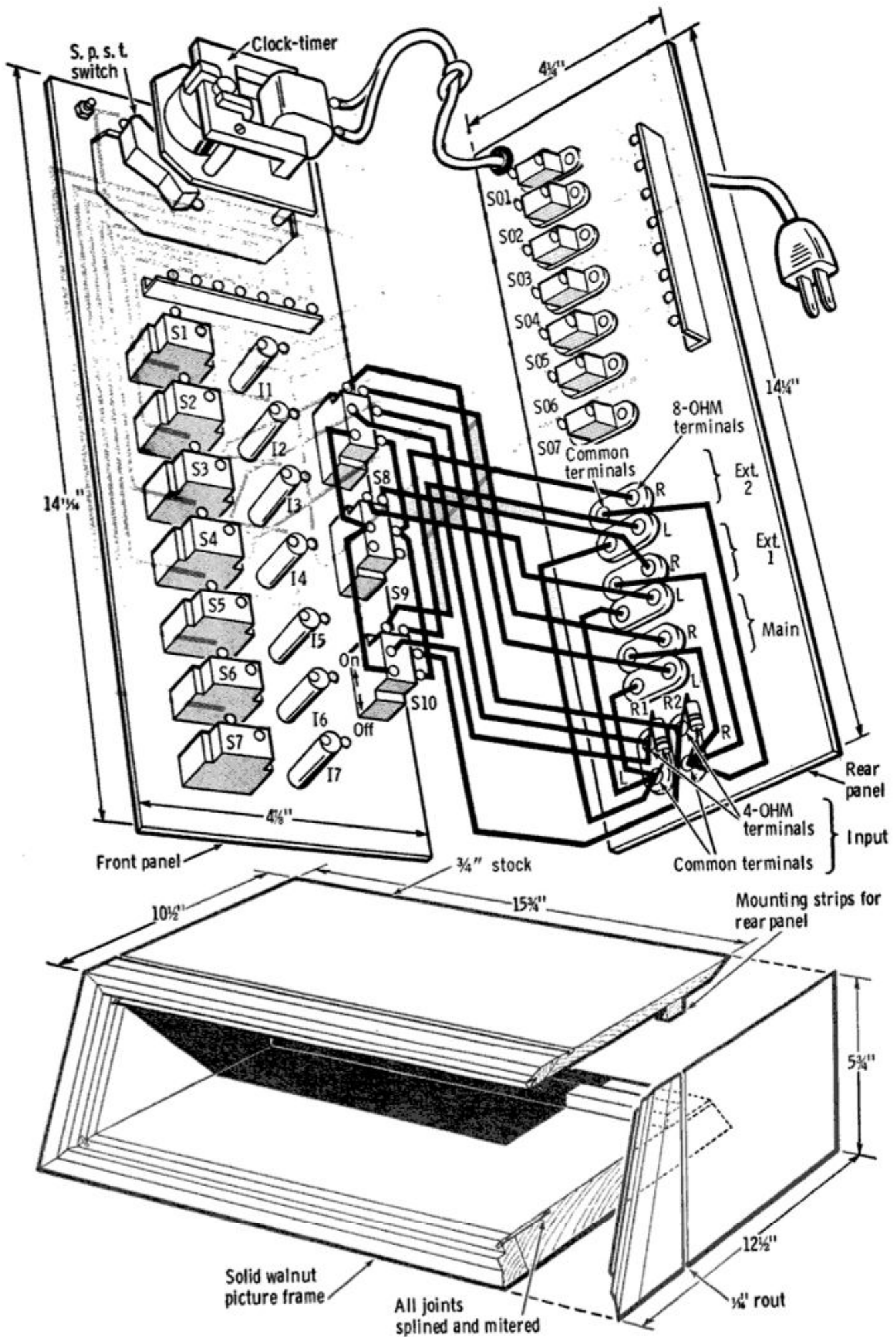
will control power to the sockets and lamps I1 through I7 will indicate what's on and what's off.

The single-pole, single-throw switch in the clock, which is supplied with instructions for wiring, is rated at 1650 watts. This rating sets the only limitation on how many hi-fi components or appliances are operating from the console at one time.

The speaker circuit: The circuit shown in the schematic diagram is designed to control a pair of 8-ohm main speakers and two pairs of 8-ohm extension speakers connected to the 4-ohm output terminals of a solid-state stereo amplifier.

The circuit is designed so the load on the amplifier is nearly constant, regardless





of the number of speakers connected. Any pair of speakers can be on alone, any two pairs may be on simultaneously, but the circuit does not allow all three pairs to be on simultaneously.

Other arrangements for connecting varying numbers of speakers to your amplifier—whether tube-type or transistor—are possible and can be substituted for the circuit shown here.

The console cabinet: *PM's* cabinetmaker, Everett Johnson, made quick work of building the walnut-veneered console cabinet shown partially exploded in the pictorial diagram. It was designed as a companion to the hi-fi tuner enclosure on page 177, with the addition of a sloping front panel. It will be up to you to design your cabinet to match your own components.

Depending on the amount of scrap materials and hardware you have around your workshop, you can figure this console will cost somewhere between \$20 and \$30 in materials.

Final construction and wiring: After designing and building the cabinet for your console, you can determine the size of the front and rear panels on which all components are mounted. All that is needed is scrap aluminum of approximately No. 17 gauge. If you don't have any around, a local sheet-metal distributor can supply it.

Cut out the appropriate holes for mounting the clock, switches, indicator lamps and speaker connection posts. Drill mounting holes for the terminal strips, shown in the pictorial wiring diagram, which simplify wiring. Also provide holes for small wood screws for mounting front and rear panels to the console cabinet.

Actually, this console was designed to have two front panels—the aluminum subpanel, which mounts all components, and a finishing front panel which is cut out to slip over the clock face, switch rockers and indicator lamp lenses. The finishing panel hides switch and terminal mounting screw heads. The finishing panel can be made of any suitable material in any decorator color and marked to indicate switch functions.

For clarity in the pictorial diagram, all power (115 v.a.c.) wiring is shown in color and speaker-circuit wiring is shown in black. Leave the wires running between the front and back panels long enough so



SWITCHES ARE MOUNTED using washers to adjust distance from front panel. Second panel slips over switches, lamps and clock to hide hardware

you can easily install and remove the panels without disconnecting any wires. This can be done by passing one of the panels through the cabinet and out the opposite side. ★★★

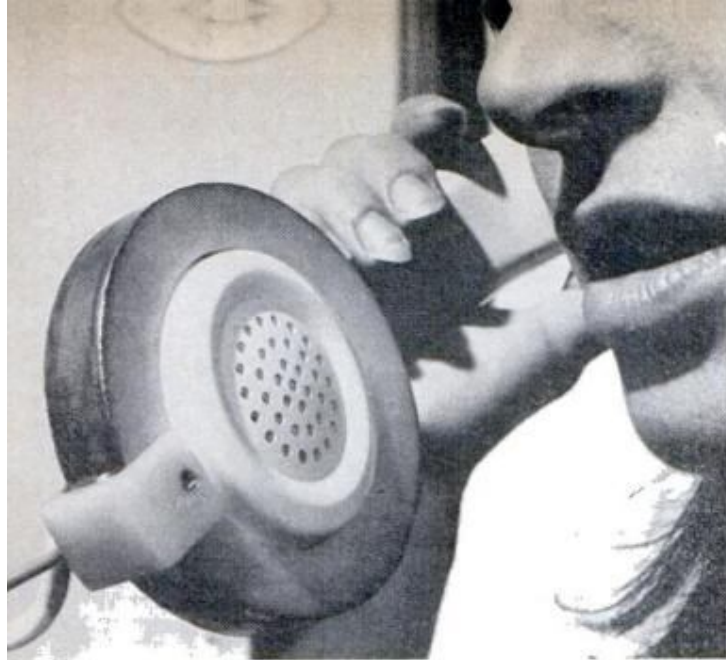
PARTS LIST

Electrical

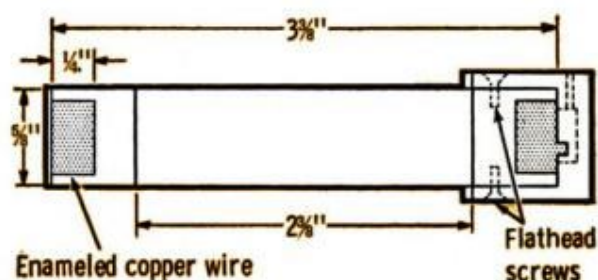
- I1 through I7**—Neon indicator lamps with built-in resistor and square, amber lens cap (Leecraft 32R2913T or equiv.)
- R1, R2**—50-ohm, 5-watt fixed resistors
- S1 through S7**—S.p.s.t. rocker switches (Cutler-Hammer 8144K7 Rockette or equiv.)
- S8, S9, S10**—D.p.d.t. rocker switches (Cutler-Hammer 8132K3 Rockette or equiv.)
- S01 through S07**—A.c. receptacles, chassis-mounting (Cinch-Jones Type 2R2 or equiv.)
- 1** **GE Telechron clock-timer** (Allied Radio 58A8438 or equiv.)
- 8** **Dual binding-post assemblies** (H.H. Smith Type 224BB or equiv.) or barrier blocks (16 terminals) for amplifier input and speaker output
- Misc.**—No. 18 hookup wire, speaker wire, No. 16 lamp cord and plug, terminal strips, grommet, 6-32 hardware, and solder

Sheet metal and lumber stock

- Walnut-veneered, 3/4-in. stock for four sides of console (dimensioned to match your hi-fi components)
- Solid walnut strips, approx. 3/4 x 3/4 in., for picture-frame molding on front of console (cut to match molding on your components) Scrap pine for rear-panel stops
- Sheet aluminum, approx. No. 17 gauge stock for front and rear panels
- Front-panel facing material—sheet plastic, brushed aluminum, adhesive decorating material
- Misc.**—Splines, glue, wood screws, rubber feet, panel marking decals or equiv.; finishing stain, finishing oil or wax

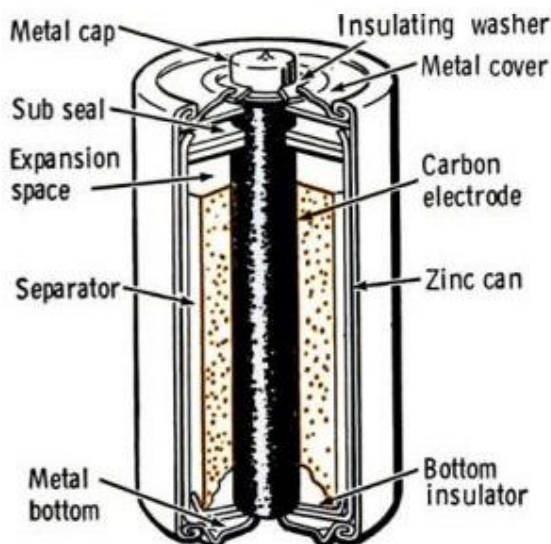


ELECTRONIC KINKS



Do-it-yourself telephone pickup coil

Small suction-cup type pickup coils often are not sensitive enough for recording telephone conversations—especially that half generated on the other party's side. You can beat the limitation by winding your own on a plastic or any other nonmagnetic form material that you can make to slip over your receiver. The cutaway of the pickup above shows how fine wire is wound in the groove around the form. The ends of the wire are connected to the two leads of a two-conductor cable with plug that goes to your tape recorder.—*Lewis E. Robertson*

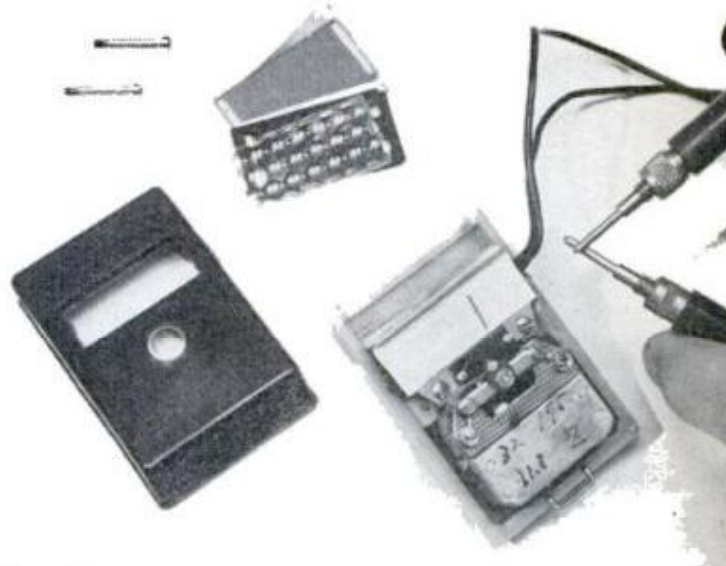


Brushes from a battery

Think twice next time you start to throw away dead batteries. The most valuable part of a dry cell is shown in the cutaway of the typical D cell on the left. It's the rod of carbon running through the center of the cell. It makes perfect brushes for small electrical motors used in electric shavers, kitchen mixers and so on. Just cut open the used cell, being careful not to break the carbon, and remove the rod for use when one of those motors need new brushes. If you have to shape the rod to fit the brush holders, carefully sand it down.—*Joseph C. Keefe*

Making the most of old meter movements

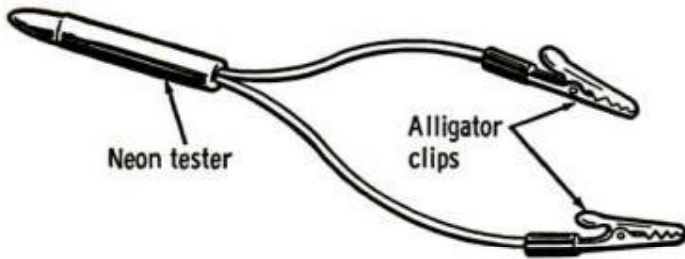
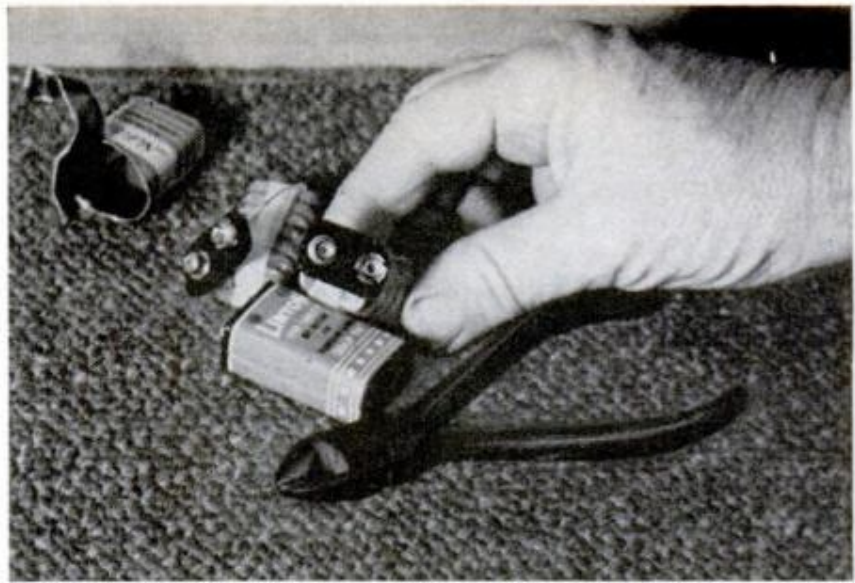
A light meter can be modified to function as a continuity meter for checking out shorts or open circuits in anything electrical around the house. Open the meter and cover the f-stop meter markings with white tape that can be marked. Remove the small control that selects film speed and run two probe leads through the hole in the case. Connect the probes in series with the meter movement, the small battery and a small resistor the value of which is selected according to the ohmmeter range desired. To calibrate the meter and mark the meter face, measure several known resistances.—*Joseph Braunstein*



Salvaging battery connector clips

No-cost battery connectors are free with every 9-volt transistor battery you buy. Before discarding the used battery, use side-cutting pliers to cut open the battery's metal shell. The insulated cover on which the clips are mounted is easily removed. The two positive, and negative terminals can be used as a pair or cut apart and used separately.

—Glen F. Stillwell



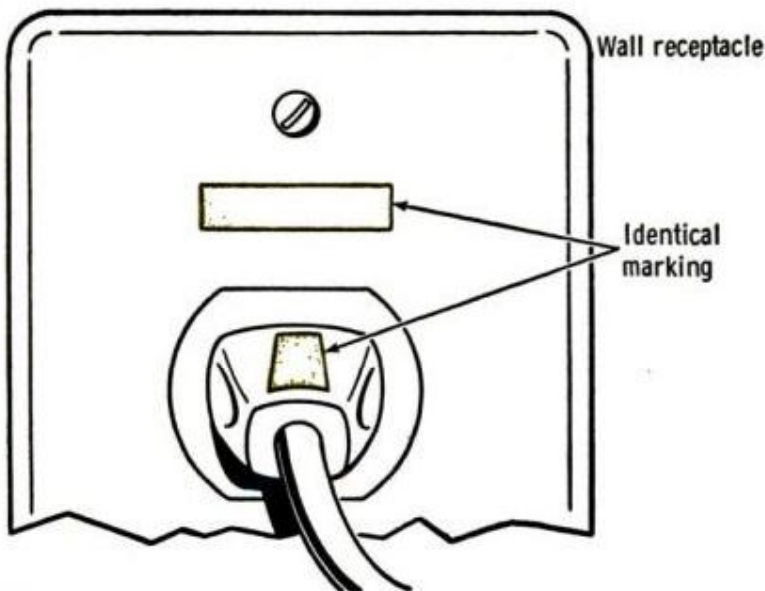
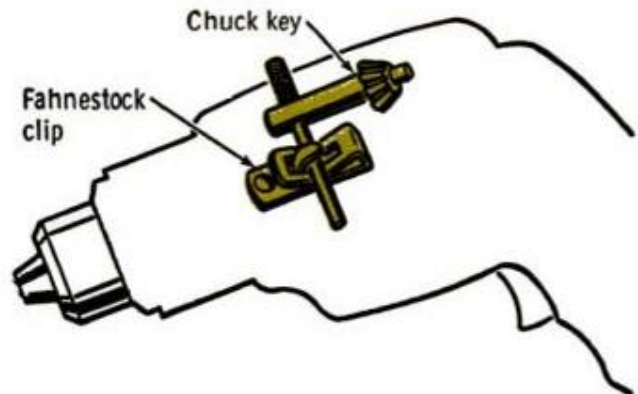
Add-on clips for test lights

A pair of alligator clips on the ends of your test-light leads is a pretty obvious way to gain an extra pair of hands. But you can't buy the light that way so you'll have to solder on your own. Just clip the light into a circuit while you check it out.

—Wilfred Beaver

Trick with a Fahnestock clip

A Fahnestock clip isn't limited to wire connections. Mount a large clip on your power drill and use it to hold your chuck key. Bend out the tang slightly if necessary for the key to fit.



Color code for polarity

You can polarize all your household plugs and sockets with nothing more than a role of colored tape. Shock hazards are minimized by connecting the ground side of any electrical device to the ground side of your house wiring. Just cut a strip or paper-punch a dot from the colored tape and stick it on the ground side of both the line plug and the wall receptacle.



Introducing the Rapido. Look quickly.



Rapido. The word means rapid. The cycle means business. Here's 125 cc's of explosive performance behind a smooth, four speed foot shift. Top that off with new styling that looks like it's going someplace. And is. Test ride the Rapido 125. And change your style. Rapidly. For a fast start... find your Harley-Davidson dealer in the Yellow Pages.

HARLEY-DAVIDSON

LIONS? ELEPHANTS? HYENAS?

—Answers to quiz on pages 92-93

Here are the answers to the 15 questions about wild animals. If you got more than 10 right, you're a tiger.

1. FALSE.

The instinct may be there, but the "how-to" has to be learned. Cubs wrestle and practice stalking as soon as they can move around, but they don't know the killing holds. Their mother has to teach them where to bite.

2. FALSE.

It depends on the size of the animal they're hunting. If the main food available is a small animal like a Thompson's gazelle, which makes a meal for a single lion, it's every lion for himself. But if there are large animals like wildebeests and hippos, where one kill will supply "dinner for eight," lions will hunt as a group.

3. FALSE.

Often a lioness will go off hunting, leaving her cubs with a "friend." The latter will not only look after her neighbor's youngsters, but will also permit them to suckle along with her own.

4. FALSE.

There are often several males in a pride, but one is usually head man, especially with the ladies.

5. FALSE.

Male lions spend most of their time sleeping. Lionesses do most of the hunting, although males do hunt when they're alone and when prey is too big for females to handle. Usually, though, they goof off until lionesses have made a kill, then dash in and grab the dinner.

6. FALSE.

The boss is usually a cow. Bulls generally leave the herd when they get to be teen-agers. They return to mate or to get in on some good food.

7. TRUE.

They live up to 60 years or thereabouts, and they age as fast as we do.

8. TRUE.

Elephants "ring" and kill acacia trees by tearing off the bark with their tusks. But acacias are often found growing directly from elephant droppings. Scientists believe it necessary in the acacia's life cycle for the seed to pass through the gut of an animal, most often an elephant.

9. FALSE.

A herd of big females stamped a lion to death when it attacked one of their calves.

10. FALSE.

Hyenas are often seen hanging around waiting for lions to finish eating. But this is usually because the king of beasts has stolen their dinner. As soon as a pack of hyenas has pulled down a zebra or wildebeest, lions "move in" and help themselves. In some areas hyenas do the killing for the lions 100 percent.

11. FALSE.

They are usually *seen* traveling alone, because they separate from the pack in the daytime. At night 20 or 30 hyenas assemble to hunt large game. In some parts of Africa hyenas are the most important factor in maintaining the wildlife balance. No one had ever watched hyenas hunt at night until Dr. Kruuk followed them in his car by moonlight. For the first time, they were observed attacking herds of zebras and wildebeests. To Dr. Kruuk's surprise, each hyena picks out his own prey, but as soon as he gets a grip on a zebra or wildebeest, the whole pack comes running.

12. FALSE.

Hyenas eat *everything*, even the bones. Dr. Kruuk was able to determine what animals they had eaten by grinding hyenas' chalk-white droppings in a coffee mill and looking at the powder under a microscope. Although 99 percent bone, it contained enough hair to indicate zebra, gazelle or other prey.

13. TRUE.

The females are slightly larger and generally push the menfolk around. If there is a single bit of food, mama gets it. If papa grabs it, she will chase him and get it back. Whenever a male is lying in a nice, soft spot and a female comes by, he gets up and gives her his seat.

14. FALSE.

All the females of a hyena clan have their young in one big underground den. The mothers leave during the day, returning at dusk to nurse the cubs. Each mother nurses her own, usually a pair. Then she takes off after dark to go hunting with the pack, returning again at daybreak.

15. FALSE.

Hyenas have at least a dozen different calls. Dr. Kruuk was able to summon hyenas to his car from distances up to four miles by playing tape recordings of feeding calls over a loudspeaker. The famous hyena laugh is heard only from an animal who has a bit of food and is being chased by another hyena. ★★

For more fascinating facts on Africa, watch ABC-TV Sunday evening, September 10.

The Winterproofers.

Summer's the time to use them.

Sorry. We didn't mean to interrupt your summer leisure.

But we did want to point out that some do-it-yourself jobs are easier to do in summer than in winter.

Especially those jobs that need waterproof gluing.

And since it's dry out, why not take advantage of it. With Elmer's. Elmer's makes a glue, or adhesive, for every job. Indoors or out.

Number one always goes to America's most popular home glue, Elmer's Glue-All®. Elmer's Glue-All comes in a handy squeeze bottle with a mess-free applicator top. It's a white plastic glue that dries fast and clear.

Elmer's Glue-All is great for gluing wood, paper, pottery, leather, cloth and all porous materials. (And it's great for any season of the year.)

For home construction, or repairs, use Elmer's Waterproof Glue. It's great for exterior doors, storm windows and shutters. As well as boats, outdoor furniture and sporting equipment.

For construction and furniture repairs, use Elmer's Plastic Resin. It's highly water resistant and will not stain acid woods such as oak or mahogany.

For waterproof caulking around windows, showers and tubs, use Elmer's Mystik Tub Caulk. It's also excellent for resetting tiles, sealing plaster cracks and marine work.

Elmer's Contact Cement is an adhesive you can use on both porous and non-porous surfaces. It needs little or no clamping. And you can use it to bond such materials as wood, leather, linoleum and plastics.

For construction and repairs on non-porous materials, such as glass, iron, aluminum and hard plastics, use Elmer's Epoxy Glue. It makes an especially strong waterproof bond.

And for a handy home lubricant for windows, doors and drawers that squeak, stick or bind, use Elmer's Slide-All. (Now with miracle Teflon*). It sprays dry, is non-greasy and odorless.

Now that you know all about our glues, there's only one thing we want to remind you: It's easier to winterproof your home in the summer than it is to winterproof your home in the winter.

 BORDEN
CHEMICAL



*Teflon is a DuPont registered trade mark.

MEMO TO VW

(Continued from page 87)

standpoint of comfort and appearance, the interior shares top honors with the Renault R 10.

The Fiat also shares with the Renault the distinction of having disc brakes fore and aft. The action of the brake pedal was soft and spongy, but the braking power was greater than that of any of the other cars tested. Although the rear suspension is not independent, the manner in which the axle is located on its coil springs by radius arms and a transverse rod makes it equal in performance to an independent system, even superior under certain circumstances. Because of this, the road-holding is first class.

A low first gear assists the 0-60 time, but it is not very practical under normal driving conditions. The car is lubed for life so that the service interval is 6000 miles, when the oil must be changed.

OPEL KADETT 2-DOOR SPORTS COUPE

Base price: \$1884

Engine: In-line 4, 1078 cc (65.8 cu. in.),
7.8:1 compression, 55 bhp @ 5600 rpm

Gearbox: 4-speed all synchro

Brake type (front/rear): drum/drum

Dimensions: 161.6 long, 61.8 wide, 55.1 high,
95.3 wheelbase, 1661 weight

Performance (0-60): 17.1 seconds

MPG: 24-30

Warranty period: 24 months/24,000 miles

What's good for General Motors is evidently good for Germany. The Opel is a "captive" import that is beginning to offer serious opposition to Volkswagen. The two-door coupe version I tested is the most popular Opel in America, although the body style restricts passenger space on the rear seat. A Rallye Kadett model is available at extra cost with a 67-bhp engine, disc brakes and certain other features for those who want a little sport with their economy. As one expects from a German car, it is sensible and sturdy, and the fastback styling adds a touch of glamor lacking in the box-on-wheels configuration of the other cars. The Opel has the advantage of being backed by a GM 24-month or 24,000 miles warranty. Second to the VW in the import race, it is being pushed hard by General Motors and sales are climbing.

RENAULT R 10 4-DOOR SEDAN

Base price: \$1647

Engine: In-line 4 in rear, 1108 cc (67.6 cu. in.), 8.5:1 compression, 46 bhp @ 4600 rpm

Gearbox: 4-speed all synchro

Brake type (front/rear): disc/disc

Dimensions: 167.5 long, 58.5 wide, 55.5 high,
89 wheelbase, 1775 weight

Performance (0-60): 19 seconds

MPG: 27-34

Warranty period: 12 months/12,000 miles

A product of the vast state-owned Regie Renault, the R 10, with 46 bhp from its 67.6-cu.-in. engine, is the lowest powered of the group, but makes it up in other ways. The rear suspension is independent (normal with rear-engined cars) and the ride is particularly good over bad roads.

On normal roads the steering and road-holding are notable and they are complemented by the four-wheel disc brakes. The four-door body is roomy and comfortable, and particular attention has been paid to the design and upholstery of the seats. At \$1647, the car comes within \$10 of the base price of the VW. The only item of optional equipment on the car as tested was the radio.

Renault has been in the American market for many years, and is now—after a serious drop in sales—making a comeback with the R 10.

TOYOTA CORONA 4-DOOR SEDAN

Base price: \$1760

Engine: In-line 4, 1899 cc (115.9 cu. in.),
8:1 compression, 90 bhp @ 4600 rpm

Gearbox: 3-speed all synchro; 2-speed auto

Brake type (front/rear): drum/drum

Dimensions: 161.8 long, 61 wide, 55.9 high,
95.3 wheelbase, 2139 weight

Performance (0-60): 15.6 seconds

MPG: 20-26

Warranty period: 12 months/12,000 miles

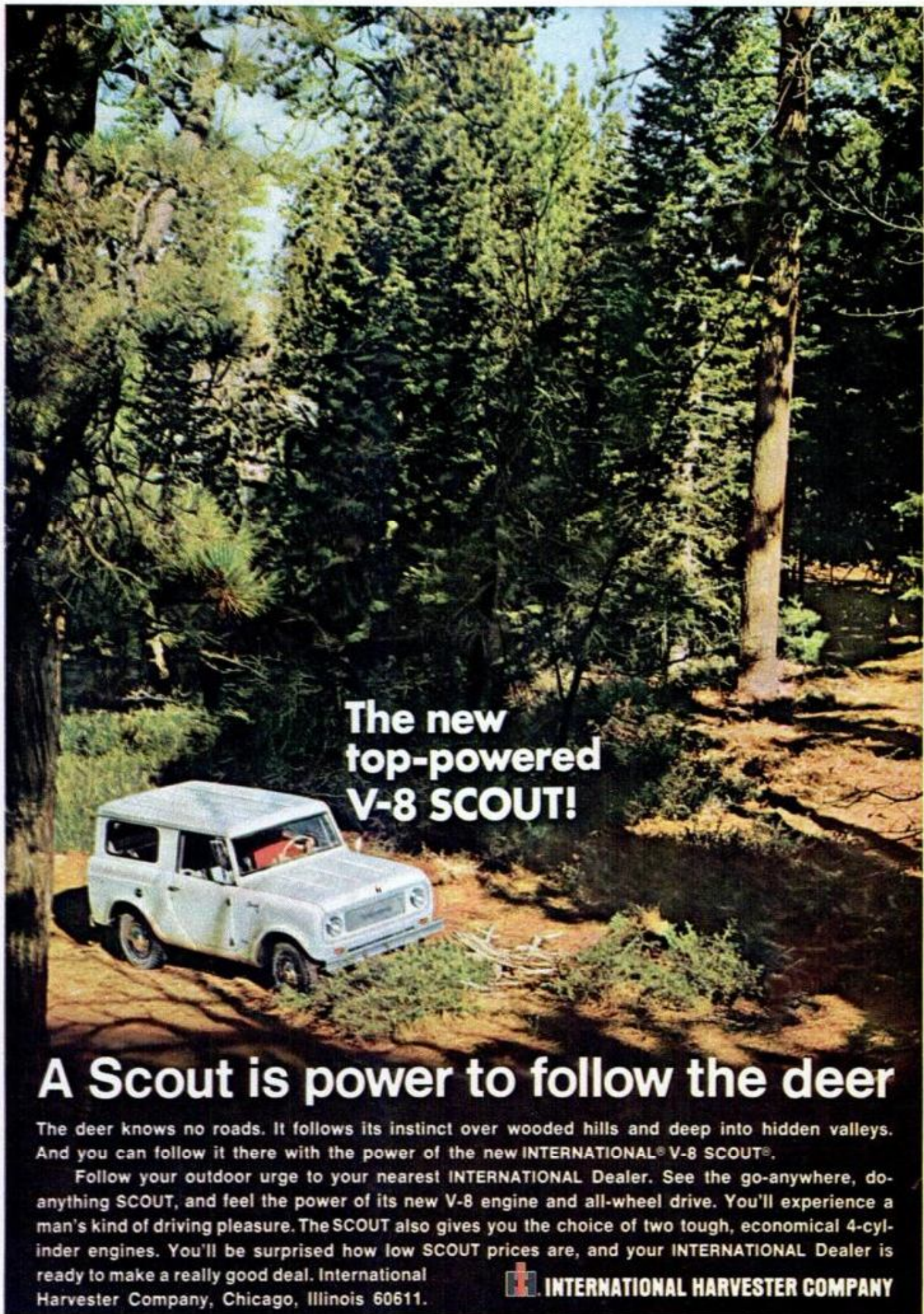
As with the Datsun, the Toyota has many features that are reminiscent of current European practice, but the car shouldn't be criticized on that score. The 115.9-cu.-in. engine is the largest of those tested, but the output of 90 bhp is second to the Datsun. The car was equipped with a 2-speed Toyoglide automatic transmission at \$165 extra with a peak shift point at 55 mph.

Due to the better low-speed pulling power of the engine, the car did not appear to need the 3-speed transmission of the Datsun. The body is well designed and spacious, with good detail work. The ride is superior to that of the Datsun, but the roadholding and steering do not—in my opinion, anyway—match the Renault and the Fiat. However, they are still superior to those of the average domestic car.

VOLKSWAGEN 1500 2-DOOR SEDAN

Base price: \$1639

(Please turn to page 188)



**The new
top-powered
V-8 SCOUT!**

A Scout is power to follow the deer

The deer knows no roads. It follows its instinct over wooded hills and deep into hidden valleys. And you can follow it there with the power of the new INTERNATIONAL® V-8 SCOUT®.

Follow your outdoor urge to your nearest INTERNATIONAL Dealer. See the go-anywhere, do-anything SCOUT, and feel the power of its new V-8 engine and all-wheel drive. You'll experience a man's kind of driving pleasure. The SCOUT also gives you the choice of two tough, economical 4-cylinder engines. You'll be surprised how low SCOUT prices are, and your INTERNATIONAL Dealer is ready to make a really good deal. International Harvester Company, Chicago, Illinois 60611.



INTERNATIONAL HARVESTER COMPANY

SCOUT is the registered trademark for a vehicle manufactured exclusively by International Harvester Company.

MEMO TO VW

(Continued from page 186)

Engine: Horizontally opposed 4, air-cooled, in rear; 1493 cc (91.1 cu. in.), 7.5:1 compression, 53 bhp @ 4200 rpm

Gearbox: 4-speed all synchro

Brake type (front/rear): drum/drum

Dimensions: 160.6 long, 60.6 wide, 59.1 high, 94.5 wheelbase, 1764 weight

Performance (0-60): 21.5 seconds

MPG: 24-28

Warranty period: 6 months/6000 miles

The VW Beetle needs no introduction, and sales exceed those of all the other imports lumped together. Whereas the other five cars tested appeared to be definitely 1967 in design, the Beetle begins to show its age when subjected to a serious comparative evaluation.

The shape of the two-door body does not accommodate four people in much comfort, and the trunk, supplemented by a small compartment behind the rear seat, is so shaped that it will accommodate hardly anything other than soft luggage, and very little of that. The noise level from the air-cooled engine is relatively high, the brakes are drum, the warranty period is only six months or 6000 miles, and the 53 bhp from the 91.1-cu.-in. engine gives marginal performance with a full load.

The ride has been improved recently by the introduction of softer torsion bar springs, supplemented in the rear by an auxiliary spring which only comes into use when the rear of the car is loaded or when a severe bump is encountered. The difference between VW and the other imports is a superb dealer organization, tending to give an owner complete confidence in his car because he knows that he can obtain efficient service by trained mechanics at set prices wherever he goes. Partly due to the efficient organization, the Beetle enjoys a resale value above that of other cars.

One feature common to all the six models tested is that they are all good cars and they are all suited to American conditions, and it is a pleasure to be able to say so when one considers some of the imports that have been offered the American public in the past. It is impossible to list them in order of preference because car purchase has become more and more a question of individual taste. Any of the cars tested will give satisfaction within the noted limitations and, if you are thinking of buying one of them, our only recommendation is that you make the purchase according to your particular driving wants and needs. ★★★

HOW FAST IS TOO FAST?

(Continued from page 74)

speed limits be lowered in order to save lives, howls of protest rose from every part of the country. Hardly anyone, including most traffic experts, welcomed such a drastic idea. Goen wryly recalls, "The reaction was generally unfavorable." He says the trouble with traffic experts is that they are striving for "two mutually conflicting objectives"—reducing traffic deaths while retaining the convenience and freedom of the present traffic complex. You can't have both of them, Goen insists.

Dick Goen is a new kind of specialist—a systems analyst. With an aerospace background, he's trained to analyze a whole system in terms of what is desired of it. If analysis shows that a particular missile can't carry a desired payload a desired distance, for instance, a tradeoff is sought. A way may be found of reducing the weight of the payload, or possibly the whole structure can be lightened to permit carrying more fuel. It's a matter of looking at alternatives and deciding which is best.

Says Goen, "This kind of philosophy isn't yet understood by the traffic-safety community. It's still seeking sugar-coated ways of reducing casualties by three or five percent instead of 90 percent."

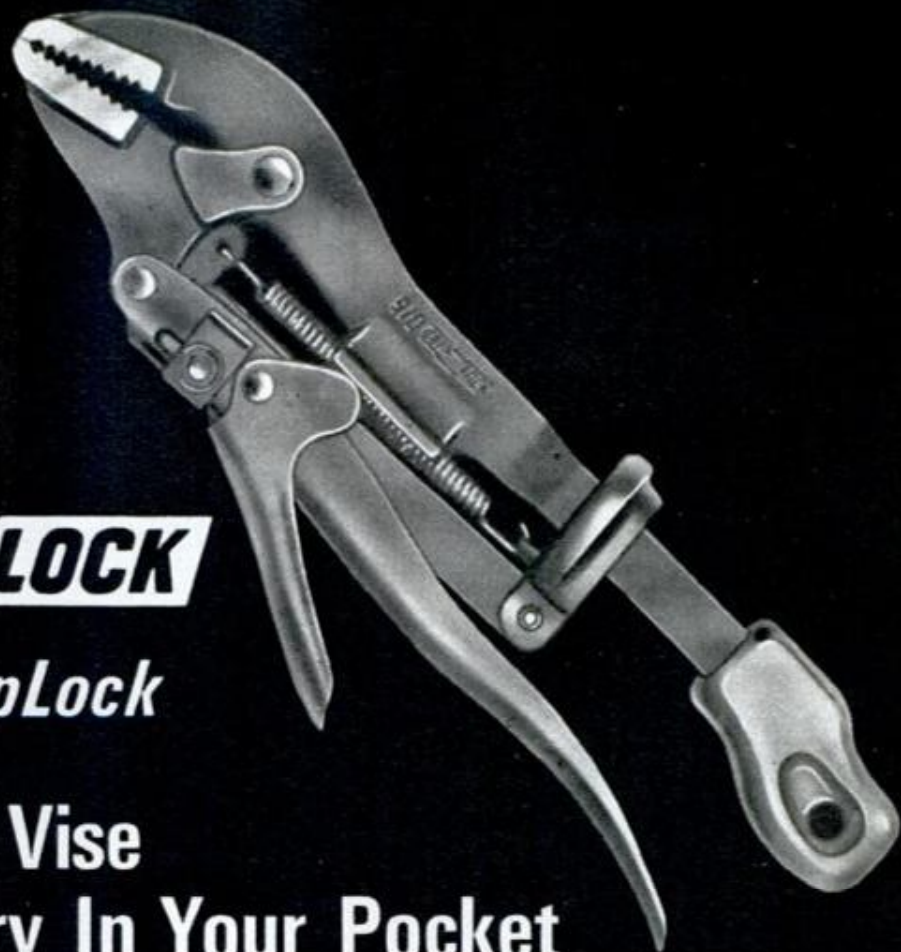
Do we need 100-mph-plus cars?

But safety ideas may start swinging in the direction that Goen points out. Recently Dr. William Haddon Jr, head of the National Traffic Safety Agency, called for a national debate on whether Americans really need cars that can exceed 100 mph. Dr. Haddon told a Senate committee that he had been appalled to read about a driver who was killed when his car crashed into a bridge at 120 mph. "The imprint of the license plate was left on the concrete," Dr. Haddon said, "and the speedometer needle was stuck at 120 mph. I don't think this is necessary."

Dr. Haddon says a governor can be installed on cars without reducing power for accelerating, passing, and hill-climbing. He suggests a "reasonable" speed limit of about 80 mph.

Is slower driving the *only* way to reduce deaths and injuries on our public thoroughfares? No! says Goen. This is only one of several ways that traffic can be made safer. ★★★

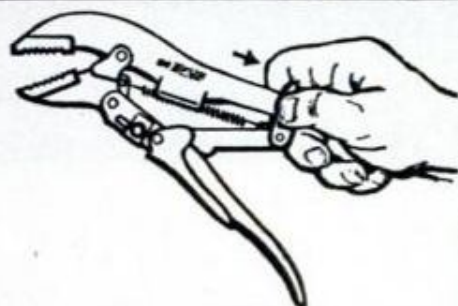
NEXT MONTH: *Are Some Drivers Unsafe in Any Car? Should Driving Privileges Be Taken Away From Five Classes of Drivers?*



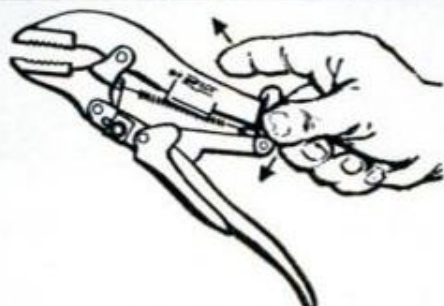
CHAN NEL LOCK

No. 910 GripLock

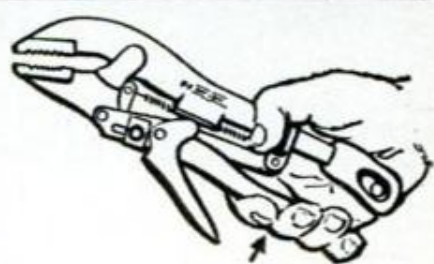
**The Portable Vise
You Can Carry In Your Pocket
....And Operate with ONE HAND**



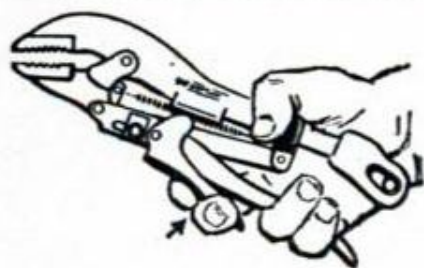
1 OPEN IT!



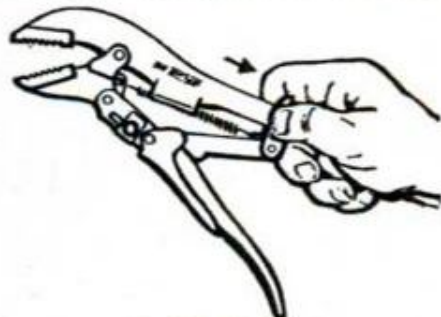
2 LET GO!



3 LOCK IT!



4 E-Z RELEASE!



5 OPEN IT!

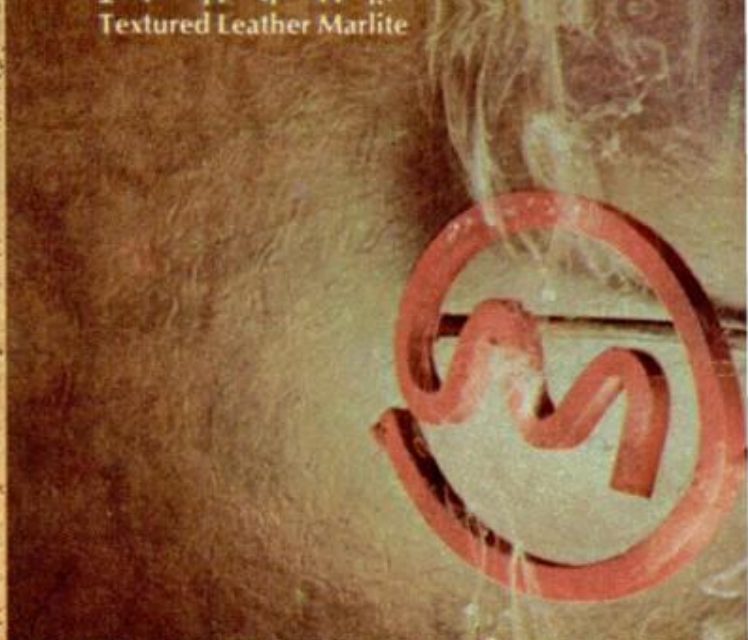
**Easy, Fast,
Efficient
And All with ONE HAND**

*Let us send you a copy of our
catalog, no charge.*

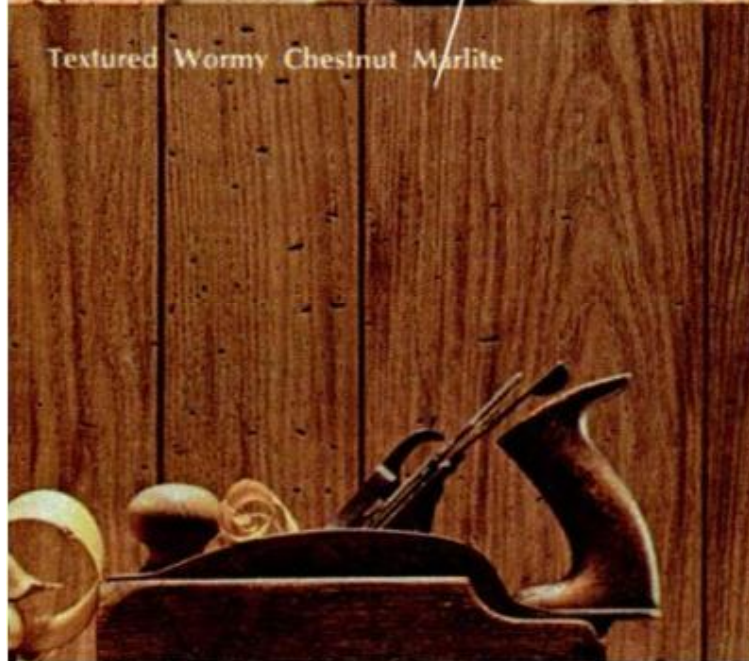
TOOLS BY
CHAN NEL LOCK
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Textured Wormy Chestnut Marlite



Textured Leather Marlite



Textured Tapestry Marlite

6724

How to put the Marlite Touch in your next paneling project.

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And soilproof Marlite stays new-look-

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ANOTHER QUALITY PRODUCT OF MASONITE® RESEARCH



Marlite prefinished hardboard paneling goes up fast with ordinary carpenter tools.



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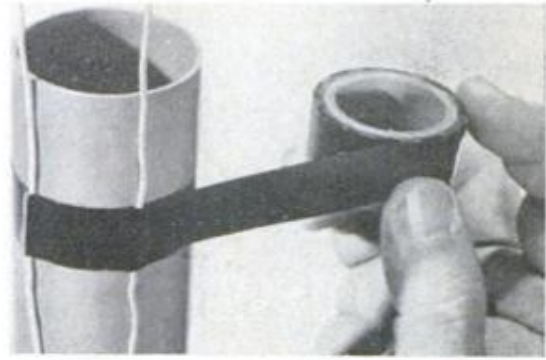
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LOW-VOLTAGE WIRING is taped to side of tubing before installing latter in the wall. Let about 8 in. of wire extend beyond the end of the tubing

BUILT-IN VACUUM SYSTEM

(Continued from page 162)

cut in the top and sole plates of this wall to accommodate the pipe are much larger than necessary. When this situation exists, you have a ready-made avenue for the tubing all the way to the attic.

If the only way up for your trunk line is through the wall plates themselves, then you'll have to cut through them. Cutting through the sole plate (the bottom plate of a wall) can be done with no visible damage to the wall by first removing a section of baseboard, provided it is sufficiently wide to hide the access opening when replaced. Once the plate is exposed, you can cut it away by going in from the side with a wing-tip bit and boring a series of overlapping holes. Then, by going in at an angle, you can chew away a hole through the floorboards.

Getting at the top plate of a first-floor wall is more of a problem. One way is to remove a section of floor with a saber saw. Where this isn't feasible, you have no recourse but to cut through the wall itself at the ceiling and then patch it.

One good way to locate the center of a hidden sole plate from below is to drill a tiny hole through the floor, close to the baseboard, and pass a wire down through it. Knowing the distance from the center of the 2x4 wall to the wire and measuring over the same amount in the basement, will assure you of coming up in the center of the wall when boring from below. A hole saw attached to a drill-bit extension lets you bore holes up through the floor and sole plate easily enough when coming up from the basement.

Locating the power unit

The power unit can be located in al-

most any remote area *except the attic*. Since it must exhaust outdoors, try to mount it on an outside wall, preferably at the back or side of the house and away from a patio, window or entrance. It's important, too, that it be sufficiently away from heat-producing units such as a dryer, water heater or incinerator.

Locating inlet valves

One consolation in boring holes for the tubing is that an inlet valve is not required for each room. In fact, four valves, plus a utility valve, are all that's needed for the average three-bedroom home. When inlet valves are placed in halls and near doorways, it's possible to clean three or four rooms from one valve. To determine the best spot for each valve, use a 21-ft. length of clothesline to represent the hose. Start with the area farthest from the power unit and tentatively select a valve location that will let you cover a maximum area.

It's best to plan your valve locations around a 21-ft. hose although lengths of 24 and 28 ft. are available. The longer length should be considered only when adding another valve is not practical.

When you have located the best place for the valve farthest from the power unit, work back toward the unit and locate what additional valves are needed to reach all parts of the house.

While it is preferable that all valves be placed in the walls, in cases where the tubing *cannot* be put in the wall, the same valves can be installed in the floor.

Wall openings for the valves can be anywhere from 12 to 30 in. above the floor, and the steps for installing a valve are given on page 163. Final location and cutting of the valve openings is done after

(Please turn to page 192)

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BUILT-IN VACUUM SYSTEM

(Continued from page 191)

the tubing is roughed in. The valve openings should fall between the studs and be clear of plumbing, wiring or other obstructions.

Installing the power unit

The power unit hangs from a flat steel bracket which is anchored to the wall 14 in. from the ceiling. A rubber bumper attached to the back of the unit cushions it, bearing against the wall. If the outside wall is masonry, you'll need a cold chisel to chop a hole through it for the exhaust pipe. If your unit hangs on a wooden garage wall, the exhaust hole can be formed with a regular hole cutter. Noise from the exhaust pipe can be dampened appreciably by extending the pipe into a tile "muffler" buried below grade.

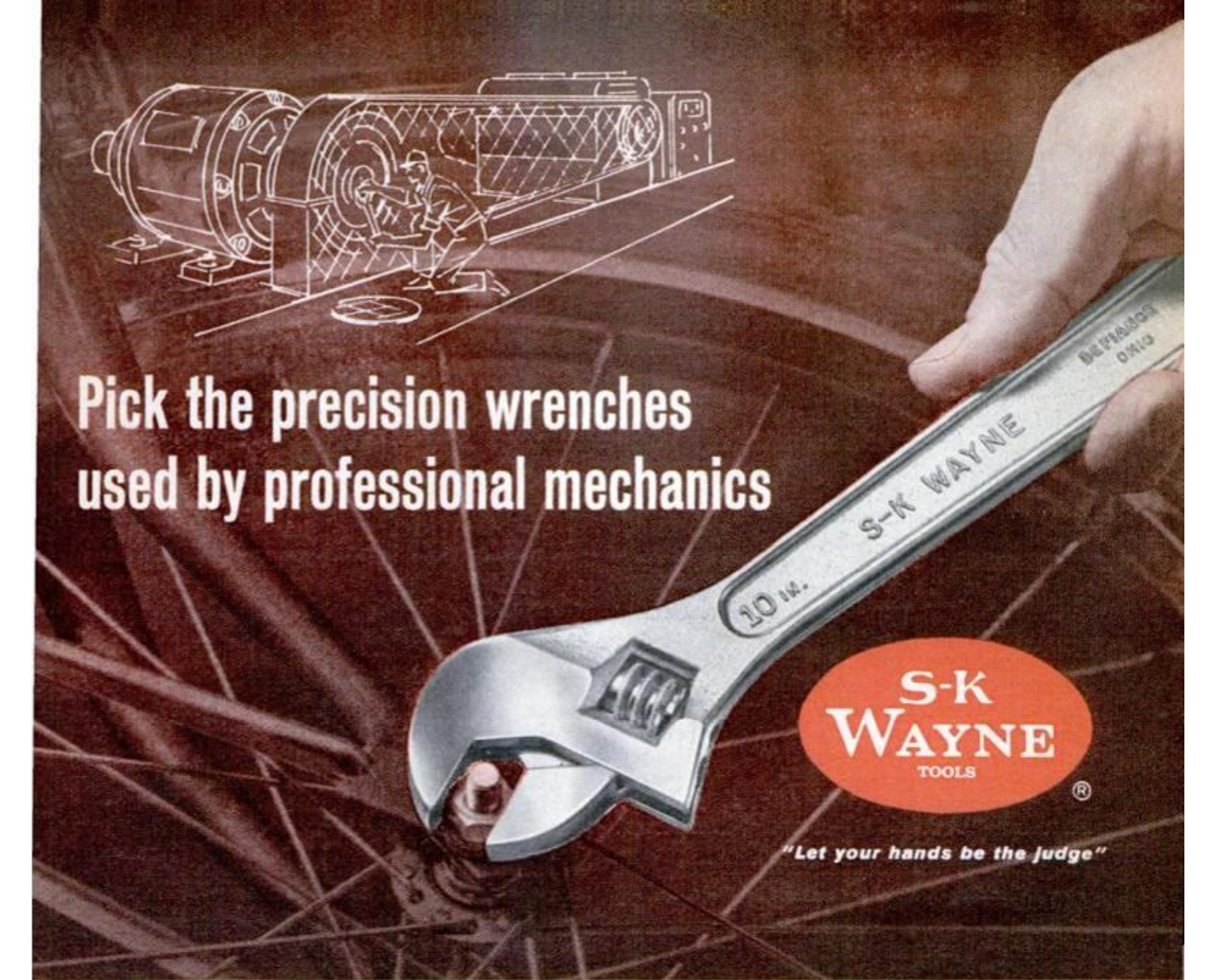
Tubing connections to both the input and exhaust ports of the power unit are made by rubber coupling sleeves which are tightened securely with band clamps.

While the power unit can be turned on by each inlet valve, a separate toggle switch is provided to turn it on at the utility valve. You can locate the latter right at the power unit as shown in the drawing or at a more convenient place.

Wiring the system

It's a simple thing to wire the power unit and the inlet valves. A 110-v. line is brought to the power unit and connected to two pigtail connections found inside. A low-voltage relay, also inside the unit, permits common bell wire to be used to wire the built-in switches in the inlet valves. Two screw-head terminals make it a simple matter to attach the wires to the power unit. The low-voltage wire is brought to each valve opening taped beforehand to the tubing and the bared ends of the wires are twisted to two pig-tails you'll find on each valve. The wiring diagram shows how the wires of each valve are tied into the two main wires which run to the power unit.

The plastic PVC tubing which comes in 8-ft. lengths, is first cut and installed for a trial fit without cement. It's always best to fit two or three sections in advance before cementing. In adding the fittings, it's important to see that the directional flow is toward the power unit; also, always run a branch line out the side or top of a horizontal trunk line, never the bottom. The various fittings are "fused" to the tubing with a quick-setting PVC cement. Coat the end of the tubing liberally with cement before slipping on the fitting to assure a tight leak-proof system. ★★ ★



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FOUR-FOOTED RADAR

(Continued from page 80)

a large animal for sentry dog use at fixed installations, while the Army and Marines utilize smaller German shepherds weighing 55 to 60 pounds because they can move more easily through heavy underbrush and do not tire as quickly.

"The object of the training program is to improve upon the dog's natural senses," explains Major John W. McKinney, project officer of the Army scout dog organization. "We train the dog to alert on an object or person, thus providing early warning to the units. The results have been fantastic. In fact, after we deployed our initial platoons, we received a brief reply from the commanders in Vietnam. It read, 'Send More Dogs!'"

The first day of training is called *Introduction to Dog Day*. In a sense, the dogs are like misplaced persons. They have been sent by their owners to Lackland Air Force Base where medical teams have examined and X-rayed them, and infantry officers reviewed them. Then they've been flown to Fort Benning where one fine morning a handler comes out and says, "Here, nice dog!" Some men have been bitten four times in a morning before getting it across to the dog that the handler—not the dog—is going to be boss.

12-week training course

Though obedience is stressed throughout the 12-week course, it is especially emphasized during the first two weeks when basic control by the handler is taught through hand and arm signals and voice command.

Daylight scouting techniques are taught during the third, fourth and fifth weeks. The dog is taken into the field, and an individual at 75 feet waves his arms and creates noise alerting the dog to his presence. The dog is then led up to the decoy who makes attacking motions. After a day's training, the dog will automatically alert.

"By getting the dog afield immediately, the handler gets a chance to see exactly how his dog alerts, and the dog learns that we are vitally interested in this type of activity," explains Lt. Jon Akselsen, executive officer of the Dog Training Organization and leader of the 26th I.P.S.D. of which 40 percent of the instructor personnel have seen action in Vietnam.

"After this the soldiers go out to retrieve whatever the dog alerted to. He sees what we are bringing in and is praised for his good alert. This teaches the dog that we are interested in the prey, that he will get to see it and that we will bring it to him."

A scout dog, trained not to whine or growl, alerts with his body. Usually, the dog's body will tense up. And he will pull his head sharply from the direction of approach as he fixes on a specific location.

Each dog is an individual and alerts in his own peculiar way. One dog may stop and fix on the hidden enemy. Another may leap forward or pull on his harness. How does a scout dog alert to punji pits, mines, and wires? He will slow his pace and often stop. Through training, he will sit, indicating a booby-trap device.

According to 1st Lt. John P. Davern, 51st I.P.S.D., "Recent training calls for the dog to cross in front of his handler when punji pits, mines and booby trap devices are in front of him. We find this more effective than making the dog sit. This emphasizes the dog's protective instinct. He is praised when he refuses to let his handler move; corrected when he lets his handler walk into a trip wire, mine or punji pit."

Live and dead-scent alerts

The dog alerts to either a live or a dead scent. And, of course, it's up to the handler to understand his dog and the dog's alerts so he can, with facility, differentiate between the two types of alerts.

On a live scent the dog is alerting to the actual presence of a human being. Unless the patrol knows other friendly forces are nearby, they suspect the enemy. Scouts always check to determine what the dog has alerted on.

The scout dog cannot distinguish between North and South Vietnamese. In fact, American-trained scout dogs become very aggressive toward all Vietnamese because of the difference in scent. The scout dog will also alert on other American patrols working adjacent to the patrol he is scouting for—if he has not become familiar with their scent.

During combat conditions, additional friendly forces may join a patrol. All efforts are taken to insure that the following pattern is followed: The patrol is formed. The dog becomes acquainted with the men of the patrol by seeing and smelling them. By familiarizing himself with the scent of all patrol members, he can differentiate between friend and foe.

In the event the patrol is enlarged, the above procedure of dog introduction has to be used. Otherwise, the dog will become distracted by new—but friendly—sights and smells.

On a dead scent, the dog alerts either to the scent left by the enemy who set the trap or to the scent of the trap itself. Most mechanical traps have been made

(Please turn to page 198)

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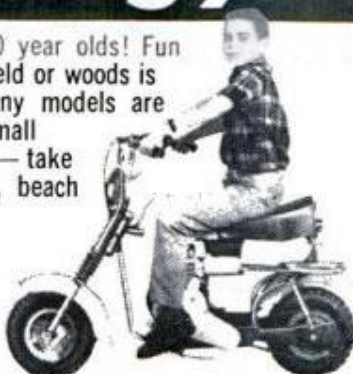
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FOUR-FOOTED RADAR

(Continued from page 194)

from animal fats. In the humid jungle, these scents linger heavily in the air.

"The training of a scout dog to alert on a booby-trap device," adds Lt. Davern, "is accomplished in the following manner: The dog is allowed to go through the trip wire. The simulated booby trap explodes. The handler gives the dog firm correction, jerking him back and giving him a firm corrective command: 'No.'"

"The dog is then brought cautiously up to the tree where the expended booby trap was anchored. He is allowed to smell the expended device and thus can associate the smell of gunpowder with the noise."

There are three reasons why the dog will alert on the device: First, the noise of the exploding device disturbs him. Second, the physical correction. And third, the lack of praise from his handler. He has displeased his handler! It's to be emphasized that the dog works solely to please his handler, not for tidbits. The dog alerts in order to please his handler and protect him from danger.

Night alert depends on nose

During the sixth week night training is taught. At night, when neither handler nor dog can see well, the dog depends only upon his sense of smell, forcing the handler to get the alert message through the leash. As a result, during daytime action the handler knows the alert by the feel of the leash, as well as by visual observation of the dog.

During the seventh and eighth weeks, the dogs are trained to alert to all types of booby traps. Soon, they can alert at four feet to trip wires in the jungle, which could not be detected by the human eye.

During the eighth and ninth weeks, the handler/dog teams gain experience in working from tracked wheeled vehicles, in loading and unloading from helicopters, and in alerting from the bow of a boat. It's believed the dogs will help prevent ambushes along the riverways.

Beginning the 10th week of training, emphasis is placed on training the handler who has already attended three days of classroom sessions to learn about diseases and ailments associated with dogs plus feeding and grooming procedures.

The handler has a wide variety of responsibilities. Because the wind carries scents in cone formations, he must be aware at all times of the direction of the wind. And because these scent cones can be deflected—by a tree line, for example—the handler must also know his terrain.

In fact, he must concentrate upon the dog and their environment to such extent that he is always accompanied by a body-guard, an infantry soldier who rides shotgun with the dog team. Though the handler carries personal weapons, he returns fire only when his life is immediately endangered.

Throughout the training period the handlers are continually evaluated on their ability to brief the soldiers on the capabilities and limitations of the dog team. The infantry group must view the team realistically lest they relax their own vigilance.

Action comes quickly

Final evaluation of the dog team is made during the 11th and 12th weeks, when preparation is made for overseas deployment of the scout-dog platoons. Men and dogs get a two-week break before departing from Lawson Field, the transcontinental airfield at Fort Benning. Scout-dog platoons going to Vietnam are usually at work 15 days after arrival.

In Vietnam and wherever else American forces are on duty, dogs and their handlers are assigned to an infantry scout-dog platoon which comprises one officer, a platoon sergeant and four six-man squads. When an infantry commander requests scout dogs through his S3 man in charge of operations, the request is sent to the platoon commander who selects the scout dog and handler most suitable, in his opinion, for the mission.

Time is allowed for the handler and his dog to familiarize themselves with the fighting group, for the handler to brief the commander and his forces on the utilization capabilities of the team, and for the handler to gather necessary supplies.

The use of dogs in Vietnam has not been without its light moments. Take, for example, the case of the scout dog which alerted by sitting down. While crossing a deep stream, the dog suddenly sat down and sank out of sight, forcing the handler to dive after him. This happened three times in a row before the handler realized the dog was alerting on a scent to the forces' left rear. Scouts then found caves holding a sizable amount of weapons and equipment.

During patrolling maneuvers along the Laotian border, a scout dog gave a 150-foot alert at a place where the men could not see around fresh punji sticks and had sent scouts ahead. The scouts cautiously made their way around the bend and suddenly found three VC sitting on a log whittling punji sticks from bamboo.

The debate continues as to who was

(Please turn to page 202)

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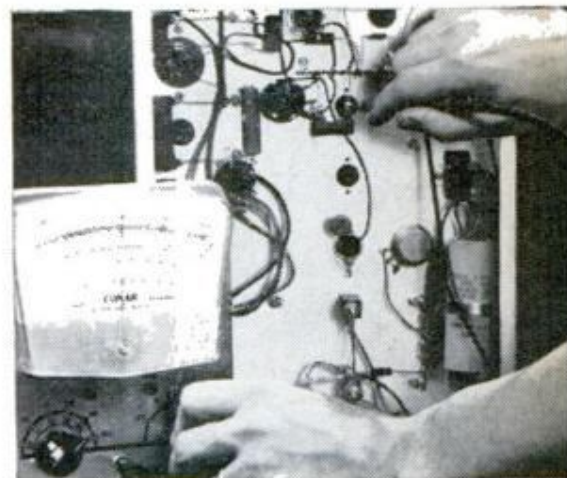
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FOUR-FOOTED RADAR

(Continued from page 198)

the more surprised: the VC—who got up and ran like hell, or the scouts—who fired but were too excited to aim carefully.

Vietnam is the kind of place where the person who shoots first is the one who usually gets to walk away.

The night no longer belongs entirely to stealthily moving VC. American forces need no longer feel “naked” as they move along jungle trails. Nor need they be limited to merely guessing where Charlie has placed his booby traps and hidden his equipment and supplies.

The scout dogs aren't foolproof; nor are the men who train and handle them. But, to date, they've proven to be four-footed radar. ★★★

CHEVY'S IMPALA SPLIT

(Continued from page 89)

rubber, plastic and the steel wheel with the bandsaw. Then we scooped out part of the plastic and sprayed the surface with black paint.

“The windshield and rear window were replaced with transparent plastic molded to shape. Then we cut the body apart, from one end to the other, with a handsaw that had been ground to a special cutting edge. Last of all, each body half was then attached back on its half of the chassis and the two halves were bolted together. The bolts are removed, of course, along with several alignment pins, whenever the camera is to show the car coming apart.”

Winfield explains that the passenger side of the car is just about as maneuverable as the driver's side. The passenger has a steering wheel on the floor which operates with one hand and brakes and a foot pedal controlling an electric propulsion motor that feeds off hidden batteries.

Chevrolet posed another problem. “For some shots,” they told Beebe and Winfield, “we want a cut-away engine in the car and we still want that side of the car to move.”

“No problem,” Winfield told them. “We'll mold a cut-away plastic engine and install it. There isn't much room for an electric motor on the car's left side, so it would be easiest to make your movies on a slight downgrade. The car will coast along just as if it was under power.”

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THOSE NEW TIRES

(Continued from page 99)

Series 70, tires cord angles are reduced to 30 to 32° (compared to the 34 to 38° of the conventional tire), even as low as 28°. These tires are test-rated at up to 130-plus mph, meaning they've been tested for 100 miles at such speeds and haven't failed.

The high-performance tire, at 0.80, has a less drastic aspect ratio than the ultra-low profile tire (0.70, accounting for the Series 70 label). Harder rubber compounds are used in the tread and sidewalls are less flexible, necessary for higher speeds. While both high-performance and Series 70 tires provide much improved traction and cornering ability on dry pavement, the improvement isn't as great in wet weather. Generally, they are a bit stickier on wet roads, but not an appreciable amount over conventional premium tires, which are—simply—beefed-up, high-quality versions of standard OE units.

Cooler running at high speed

The Series 70 tire, with a footprint that places another two inches of rubber on the road, has proven the best tire so far for enthusiastic acceleration and stopping power. By carefully tailoring the rubber to the tire cross-section contour, excessive tread weight is avoided, making possible higher speeds and cooler running temperatures. The special molding process by which a Series 70 tire is built puts a more even layer of tread rubber across the carcass, thus eliminating large shoulder buildups.

This style of tire has an obvious racing heritage. In fact, it was the growing practice of putting racing tires on street machines that hastened development of the ultralow profile tire. Out-and-out racing tires, with much thinner sidewalls, limited load ratings, and rapid-wearing if sticky compounds, are totally incapable of withstanding typical "average motorist" punishment. Hence, the Series 70 tire, an inspired compromise.

This widened tire may not fit older cars because wheelwell clearance isn't adequate. But if it does fit, you'll notice vastly improved cornering power in the old family bus. A tire of this type places more rubber on the road, with less "squirm" and roll-under. By contrast, the high performance tire carries its tread section around the shoulders, thus maintaining pretty much equal (to the Series 70) cornering power even though thrust deforms the carcass sideways.

Another new type of tire—Goodrich's

exclusive "folding spare" bias-ply development—will probably go radial pretty soon in view of the company's avowed interest in this method of construction. The folding spare now on the market is tubeless, with specially designed sidewall cords that fold in beneath the tread until inflated from an accessory freon-gas bottle. If necessary, the tire is good for about 1000 miles of emergency travel.

Until recently, OE tires on new cars were barely adequate—on the basis of load ratings—for general service. To overcome this inadequacy, many motorists used to buy oversized tires. And although today's OE tires are far superior to those of just a couple of years ago, buying oversized tires is still worth considering. The next larger-size of a standard bias-ply tire can be beneficial where driving conditions regularly include sustained high speeds, rough and unimproved roads, or uncommonly heavy loads. The larger tire runs slightly cooler and has a higher load capacity for a given inflation pressure. On most U.S. cars today, wheelwells are large enough to take the next-larger-size tire.

Also to be considered in your tire thinking is inflation pressure. All tires are load-rated for specific pressures, although most owner manuals base their load ratings on an average p.s.i. of 24. But, within limits, a tire's load rating can go up as p.s.i. increases, or, conversely, down as p.s.i. decreases. You'd do well to determine exactly the load ratings at various p.s.i. for any tires you buy, because with a full load, for example, you'll want a different pressure in your tires than you'll want for comparatively lightweight, or unladen, operation. Long trips at high speeds call for tire p.s.i. adjustment, too. Paying attention here will mean not only greater tire life and better performance, but also improved driving safety.

Which tire for you?

So what sort of tire should you get for your car? It depends upon how you drive and to what service your car is put.

Do you fit the average driving pattern—a little freeway here, a lot of errand-running there, and occasional vacation trip, nothing more vigorous than a U-turn now and then? Stick with the OE tires; you're the fellow carmakers and tire designers have in mind. If you want a little added peace of mind, you might buy nylon or fiberglass cord tires (both are stronger), but that's about it.

If you own a station wagon used mostly in local hauling (of kids, groceries, lawnmower, some lumber, and so on), OE

(Please turn to page 206)



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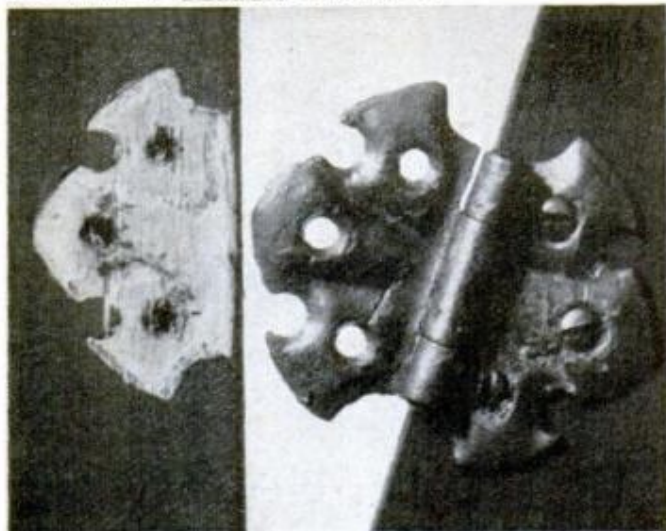
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THOSE NEW TIRES

(Continued from page 204)

tires are perfectly adequate. If you now and then carry a really heavy load, though, you might consider moving up to the next-larger-size tire.

If you live in a dampish climate, or where snow and ice are lingering road problems, radials would be worth considering. They do hold the road.

If you're a "sporty-type" driver—a fellow who likes to zip along twisty roads just for the fun of it—you'll want (in addition to a stiff suspension) either high performance or Series 70 tires, usually standard equipment on "hot" versions of the so-called "personal" cars—Mustang, Camaro, Cyclone, GTO, Barracuda, and so on. These tires might also be a good idea for the traveling salesman with a three-state territory and a heavy load of sample cases. Yet here again, keep an eye on tire pressure.

If you have an eye on the budget, radials are a good choice, regardless of higher initial cost. Such tires have as much as 50 percent less rolling resistance, meaning much improved fuel economy, and they return anywhere from 50 to 100 percent longer tread life, depending upon the way you drive.

In a final analysis, the radial concept probably provides a better all-round tire and offers more of what most motorists need and want. And now that the radial concept has been crossed with the Series 70 profile, we just may be reaching towards an ultimate tire. ★★★

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New chain saw licks

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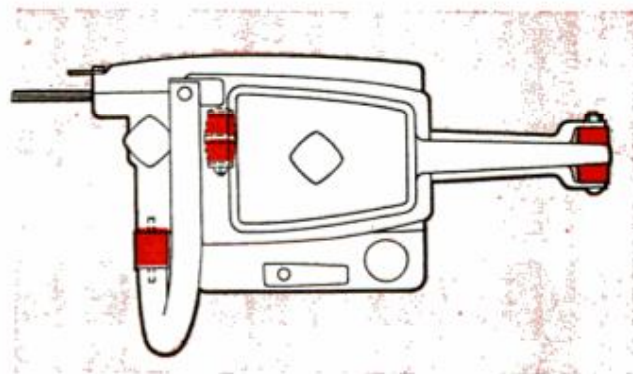
WHAT COULD MAKE this "new" chain saw so different from any other?

I asked myself this question on the way to see and test it at the Stihl American plant in Midland Park, N. J. A new handle shape wouldn't make it new. Neither would a new engine shroud. To me, the only chain-saw improvement left was for someone to come up with a totally silent one. But I had forgotten one thing!

Grabbing hold of the average chain saw and wading through a log with it is not unlike handling a pint-size air hammer. After less than an hour's use, it still feels as if the saw's in your hand after you lay it down—the vibration leaves you numb all over. You're more than ready to give your aching muscles a rest.

When I arrived I was handed two saws. Outwardly they looked alike, and I began to wonder which one had the Toni. After putting the first saw through its paces, I found it was no different from any other chain saw as far as vibration was concerned—I experienced the same arm fatigue when I shut it off. It was the second saw I couldn't believe. There was practically no vibration!

Much to my surprise, I was told that I was holding the world's first and only chain saw having built-in *shock absorbers*. Rubber mountings, placed at five strategic suspension points, had absorbed both engine and chain vibration almost completely to make the Stihl 041AV the smoothest-working chain saw I had ever used.



COLOR-KEYED with the photo at top, drawing shows the five suspension points that are rubber-cushioned

A boon to even the occasional "logger," this antivibration saw, I realized, would mean even more to the guy who wrestles one of these roaring, arm-aching babies eight hours a day. He now could work for hours without physical discomfort to arms and back.

In addition to its antivibration feature, this powerful 5½-hp lightweight (it weighs only 16 lbs.) is claimed to give more horsepower per pound than any other make of saw. It has a fully automatic oiler, a lifetime cylinder, an "all-position" diaphragm carburetor completely protected from engine heat, a supersize muffler to cut noise and an oversize air filter for longer working time between changes. It also boasts a special "immediate" ignition system, plus a long-lived friction clutch. The saw, complete with bar and chain, sells for \$229.50, f.o.b. Midland Park, N. J. —Wayne C. Leckey



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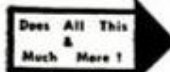


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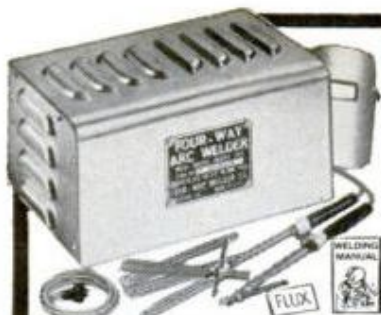
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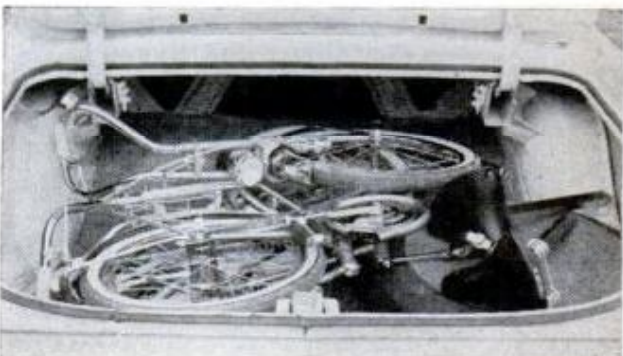
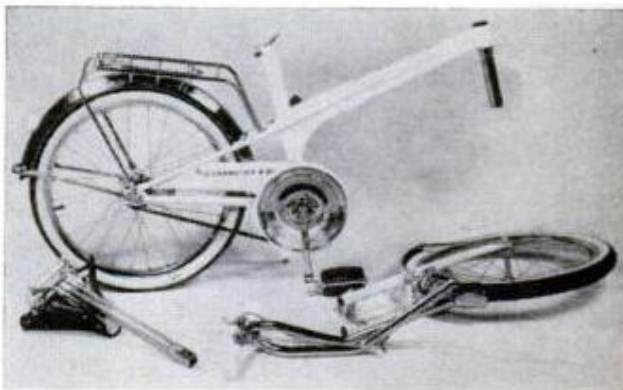
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For cycling buffs, Columbia is importing the Commuter II—a take-apart bike that fits easily into a car trunk. Actually, the bike is so compact when dismantled that two will fit neatly into the trunk of a Mustang.

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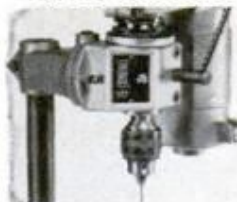
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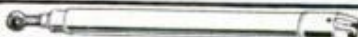
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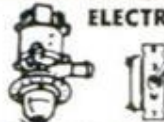


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SUCCESSOR TO THE QUEENS

(Continued from page 108)

effects of rolling in heavy weather were felt most on upper decks.

However, the use of aluminum for the superstructure has minimized the problem of weight high up, and the use of stabilizers will virtually abolish rolling.

Another pleasant prospect for passengers is that of swimming in the ship's four pools, two outdoors and two indoors.

Swimmers in the two open-air pools on the lido decks at the stern of the ship won't be bothered by fumes from the single funnel swirling down on them. Cunard technicians tested 20 different funnel designs in a wind tunnel before arriving at the present tall, thin configuration, which releases the exhaust high enough to keep it away from the passenger decks.

Ship called 'safest ever'

Cunard describes the Q4 as "the safest ship ever to sail." The ship's structure is built from incombustible materials and there's an elaborate sprinkler system throughout.

Extending through two decks is a damage-control center, which will be linked electrically and pneumatically with every part of the liner. Fireproof and watertight doors can be closed from the control room, and CO₂ gas can be released into cargo spaces at any point if fire is detected there.

Deep in the hull, beneath all the passenger luxury, will be the powerplants. Three huge boilers will each produce 310,000 pounds of steam per hour at maximum power. (The *Queen Mary* has 27 boilers and the *Queen Elizabeth*, 12.) The Q4's two double-reduction geared turbines will produce a total of 110,000 shaft hp. Fuel consumption, about half that of the *Queen* liners, will be about 520 tons a day at normal service speed.

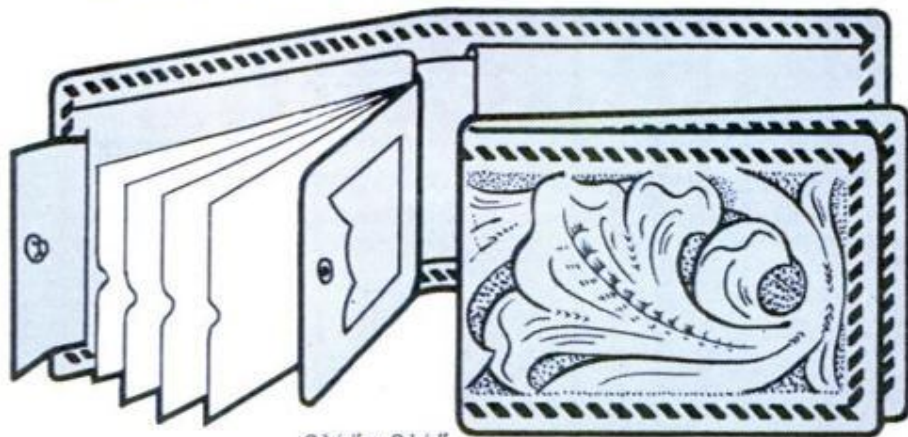
A self-sufficient "city" at sea, the Q4 can also be quite independent when it comes to berthing in port. She is fitted with bow thrusters that'll bring her in when tugs aren't available.

The two retiring *Queens* have been symbols of trans-Atlantic speed and luxury for over 30 years. The 1019-foot *Queen Mary* made her maiden voyage to New York 31 years ago, while the 1031-foot *Queen Elizabeth* dashed across secretly in 1940 to escape German bombers. Both vessels were troop carriers during World War II, successfully dodging German submarines and planes.

The *Queens'* tradition won't end with their retirement, though. When the Q4 is commissioned in 1968, most of her crew will come from the *Queen Mary*. ★★★

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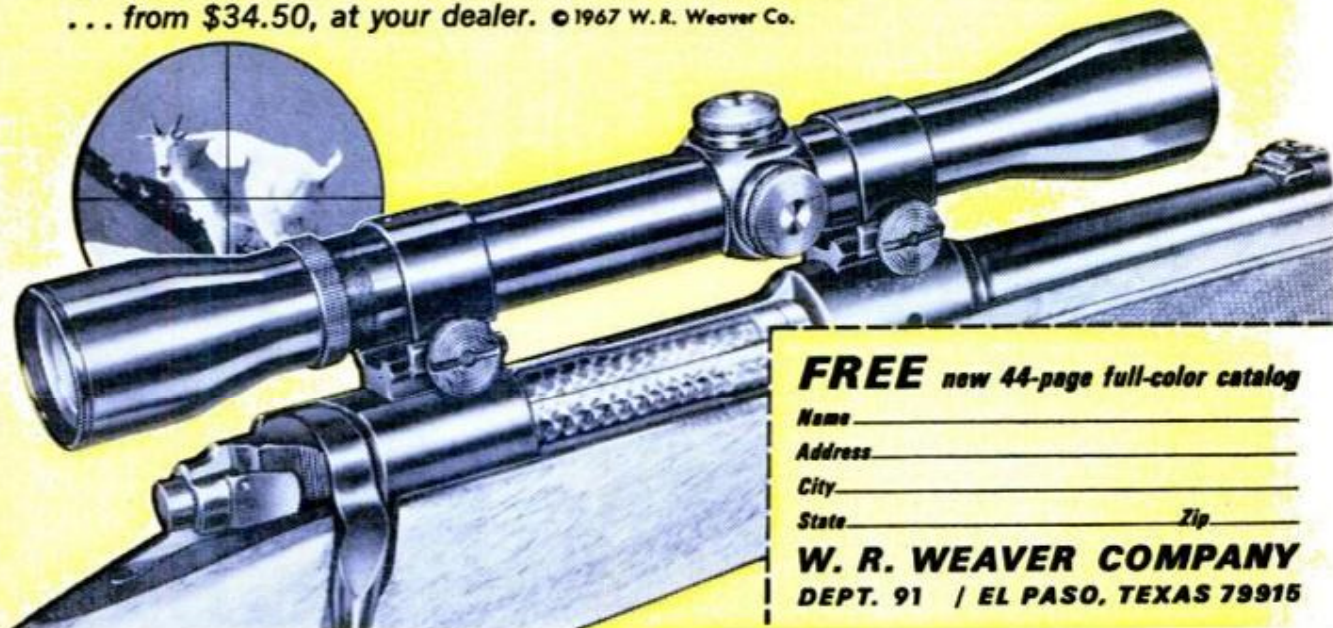
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THE GARAGE . . . OR ELSE

(Continued from page 128)

Wiring is run through the walls next, following local code requirements, and connected to fixture, switch and receptacle boxes nailed to the studs.

Walls must be insulated

All outside walls must be completely insulated by stapling blanket insulation between the existing studs and then covering with a plastic vapor barrier. Where exterior walls are masonry, furring strips must be first anchored to the walls to provide nailing for the paneling. Blanket insulation is tucked in place between the strips, then the furring and insulation is covered with a moisture barrier before the walls are faced with paneling.

In cases where the garage is already lined with plasterboard, you have no assurance, of course, that the walls are insulated. The only way of being sure is to remove a section of the plasterboard. If you find that they have not been insulated, you'll have to remove the plasterboard lining from the exterior walls so you can insulate them.

A short piece of 1/2-in. tubing with the edge sharpened like a chisel makes an excellent tool for cutting around the nails that hold the plasterboard. When cut through all the way to the studs, the panels can be lifted off without damage and later replaced and renailed. The plasterboard base will let you cement your finished paneling to it.

While the walls of the garage pictured here were paneled with Masonite's Royalcote, you'll find a whole array of paneling to pick from at your lumber dealer's. You'll have a choice between hardboard, plywood, fiberglass, fiberboard and others, all beautifully finished and ready to install. There are also fancy wood grains in random-groove boards, textured boards in leather, tapestry and marble.

Acoustical tile is ideal for finishing the ceiling. If the garage ceiling is plasterboard, you can simply cement the tiles directly to it. If the ceiling is open, you'll have to add 1x3 furring strips at right angles to the joists and space them 12 in. on centers for use as a base for the tile.

If a picture window is to replace the overhead door, the opening will have to be filled in, framed to suit the particular sash and covered with sheathing on the outside.

How you treat the outside depends on the rest of the house. If it's siding, you simply match it. If it's brick, you fill in with brick, or possibly with simulated stone as was done in the remodeling job shown in the accompanying photos. ★★



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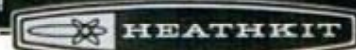
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KITCHEN CABINETS
(Continued from page 154)

hardware for hinging the doors on this type of cabinet. They come in right and left-hand pairs. The drawing on page 151 shows how they are surface mounted except for a $\frac{1}{16}$ -in. gain cut in the top and bottom corners of each door. Pin hinges are made for $\frac{3}{4}$ -in. doors only and are more or less self-positioning. You can buy them at any hardware store.

The drawings on page 155 show how the same basic counter cabinet can be modified to serve as a sink cabinet, an island range-and-snack counter or an island or peninsula snack counter. Notice, too, that the island counter can be turned into a peninsula counter by making it with shelves only at one end.

What do you do when you want to turn the corner with cabinets? The details at the bottom of page 153 show how a cabinet of matching design can be made to fit a corner. Here the shape of the ends is identical with the ends of the adjoining cabinets. Screws up through the rails anchor the top as before.

In the case of a wall cabinet, details at the top of page 152 show how a matching cabinet is made to go around a corner. It differs from a regular wall cabinet in that one "door" of the two-door cabinet is a fixed panel against which the adjoining cabinet butts.

When building a three-in-one cabinet to hang over a range or sink, the complete cabinet is made as a single unit, rather than three individual cabinets joined side by side. Here as shown in the details on page 152, cleats at the front of the middle cabinet make up for the lack of an end member for attaching the pin hinges.

Should you prefer wall and counter cabinets having a casing which surrounds the door and drawer openings, thus permitting the use of lip doors and drawers, the details on page 153 show how to build them. The basic case is still a simple box made as before, except that the bottom is installed $1\frac{1}{4}$ in. up from the lower edge. A $\frac{3}{4}$ x 2-in. casing of solid stock, placed flush with the top and side members, covers the edges of the plywood. In the case of partitions, the casing is positioned to straddle them.

A variation in the application of the casing is made for sliding doors. An example on page 150 shows colorful doors of $\frac{1}{8}$ -in. sheet plastic. Here, as you'll see in studying the drawings that detail a sliding-door cabinet on page 153, the casing is applied as individual frames, with the top and bottom members being

(Please turn to page 222)

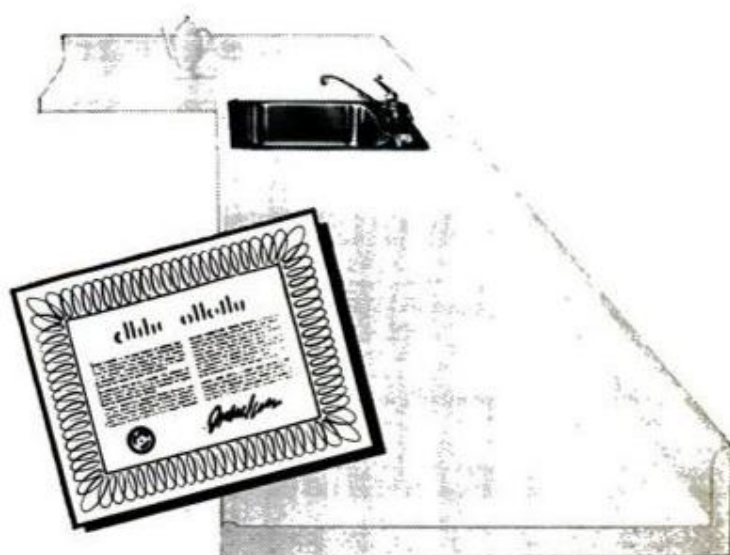
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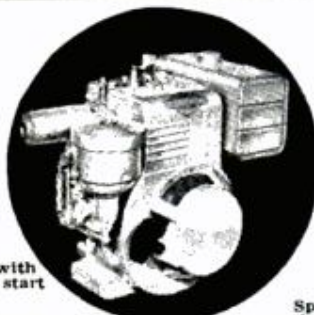
Briggs & Stratton 3 1/2 hp. Mdl. 143302. Re-coil start. Std. 1" shaft w. keyway, and adjustable governor—a rugged big engine ready to tackle any job.

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5 3/4 hp.

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Same engine with 12 v. elec. start and battery charging. (Item = 1571) **\$89.95**

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Model 400, rugged 4 cycle model. Alum. Block, castiron cylinder Rope start—3/8" std. shaft. Item 1107 34.95
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Remember these engines are absolutely perfect and standard and under factory warranty. Money back guarantee. Order now while stocks are complete. Factories—we buy new engines.



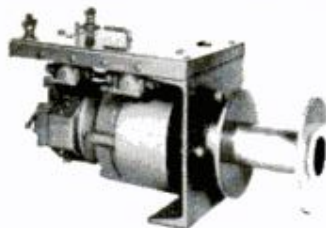
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Southern Customers write Dept. A-97, Box 65, Sarasota, Florida

KITCHEN CABINETS

(Continued from page 220)

grooved to provide tracks for the plastic doors. Since the bottom of the cabinet is recessed, space is provided for concealing flat cabinet fixtures to illuminate the countertop dramatically.

Door treatment is what makes your cabinets. The eight ideas on page 154 should help you give your cabinets eye appeal. In some, the lip is formed simply by letting a frame of molding or an overlay overhang the edge 3/8 in. In others, you'll notice where the door members are kerfed to accept a 1/8-in. panel of translucent plastic. For a raised-panel door, you can cut the beveled edges by tilting your circular saw and running the panel through on edge. Grillwork of brass wire makes a striking door. Louver doors can be purchased ready-made, but the size of your cabinets must be based upon the widths in which these doors are available. Regular offset cupboard hinges can be used on lip doors.

You'll find all kinds of fancy knobs and pulls and catches at your hardware store. Knobs are not always required and you might prefer cabinets without them. You can use touch-latches on the inside which require only a slight touch of the hand against the door to make them pop open. Door closers are available, too, to close the doors for you. Magnetic catches are used to hold the doors shut. ★★

PROJECT GASBUGGY

(Continued from page 105)

locked in the bottom of the cavity after the vaporized rock cools and solidifies. They estimate that half of the remaining radioactivity will be drawn off when they extract the first chimney full of gas. If a slight amount of hot stuff should reach the refinery, it would be well below any hazardous level, and it would be still further diluted when the gas was mixed with the products of other wells that hadn't been given a boost by NE.

Adding it all up, the scientists, engineers and businessmen running the show are convinced they won't find any bugs in Gasbuggy. They're sure the experiment in New Mexico will prove NE a practical working tool that can be used immediately to step up our supply of natural gas.

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Sam Smith smiles when you ask him that one. "In the Rocky Mountain region alone," he says, "we've already pinpointed 30,000 likely places where we can put NE to work!" ★★★

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Locks securely at any angle up to 50°, raises, lowers 0"-2¼". Patented tilt mechanism, accurate etched scale. Patented motor mount takes std. ¼ h.p. or larger motor, keeps belt tight, assures perfect alignment at any angle, transmits full power. Takes std. blade, saw insert removes to take dadoe heads, cutters, etc. (not incl.). Accurate mitre gauge assembly. Ground spindle. Enclosed steel base. "Compo" bearings. Access. Std. size (for bench saw) \$3.50; larger fence (for cabinet base, as ill'd.) \$4.50.

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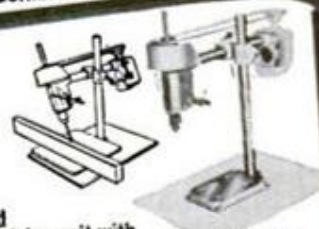


f.o.b. factory. Wt. 15 lbs. **\$14.95** †Disc Sander attachment incl. disc bracket, ground cast table (tilts 0-45°): \$7.95 add'l.

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