

POPULAR MECHANICS

WRITTEN SO YOU CAN UNDERSTAND IT

OCTOBER 1959

35 CENTS

FIRST REPORT
on three new
SMALL CARS:

CHEVROLET CORVAIR

FORD FALCON

PLYMOUTH VALIANT



FALCON



CORVAIR

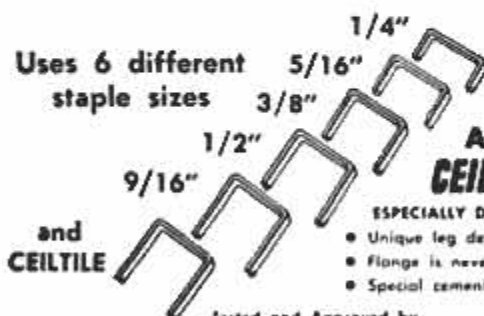
50 PAGES ABOUT HOMES

PM's Indoor-Outdoor House • Landscaping for Year-Round Effect

USE THE TOOL PROFESSIONALS USE!

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All-Purpose HEAVY DUTY

STAPLE GUN



ARROW'S CEILTILE STAPLES!

- ESPECIALLY DESIGNED FOR FASTENING CEILING TILE
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SHOOTS A STAPLE WHEREVER A NAIL CAN BE DRIVEN!



Here's the tool no work bench should be without! Do hundreds of nailing and fastening jobs with this powerful, chrome plated, all steel Arrow Automatic Gun Tacker! Shoots a staple wherever you'd drive a nail! Easier!

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NEW! MODEL NO. JT.21 JUNIOR STAPLE GUN

For Those Light Household Fastening Chores



This powerful little tool chock-full of quality features never before found in a stapling gun at this amazing low price!

- Unique Safety Compression Handle.
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Available at leading hardware, lumber, building supply and stationery stores.

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"PIONEERS AND PACESETTERS FOR OVER A QUARTER CENTURY"

REWARD

Sure as shootin', every man who smokes the new

PHILLIES. CHEROOT

WILL GET A GENUINE REWARD IN SMOKING PLEASURE!

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Why these cigars are as smooth and light as the sun settin' over the hills.

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OCTOBER 1959

Number 4

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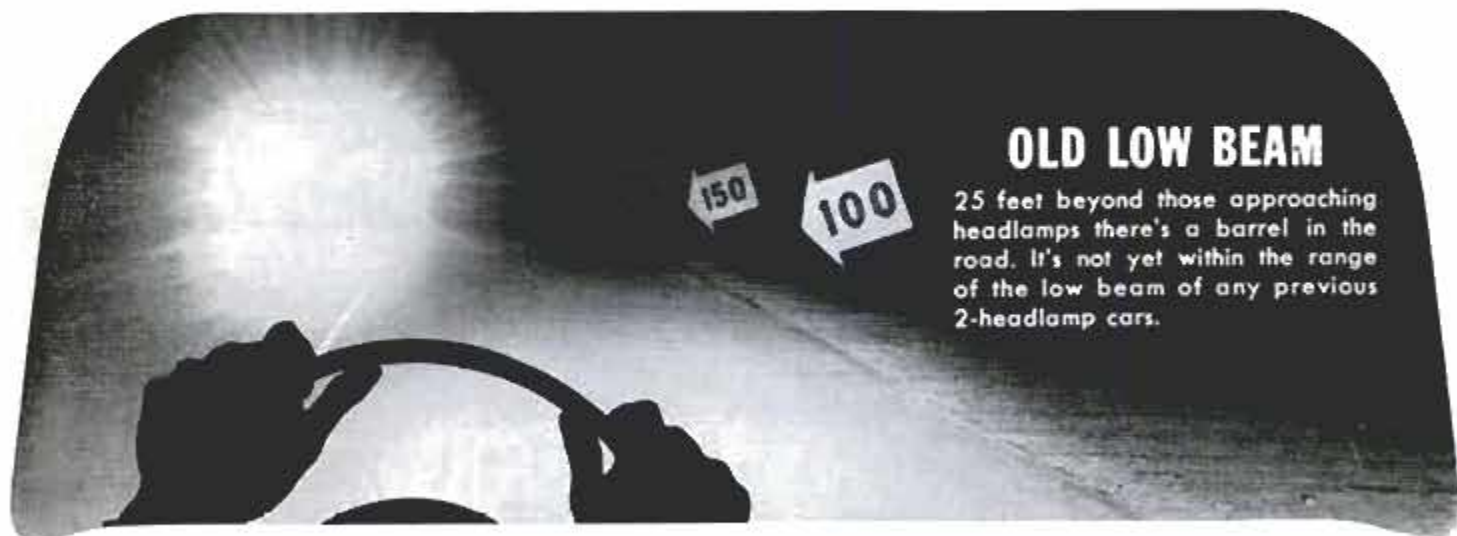
Next Month...

DON'T MISS the parade of new cars. All of them will be shown in full color. . . . Also, there's an exciting look at the superairliner of the future. Ten years from now you'll be flying coast to coast in 90 minutes! . . . And, for Christmas planning, there are 19 pages of Christmas gifts you can buy and Christmas gifts you can make

POPULAR MECHANICS

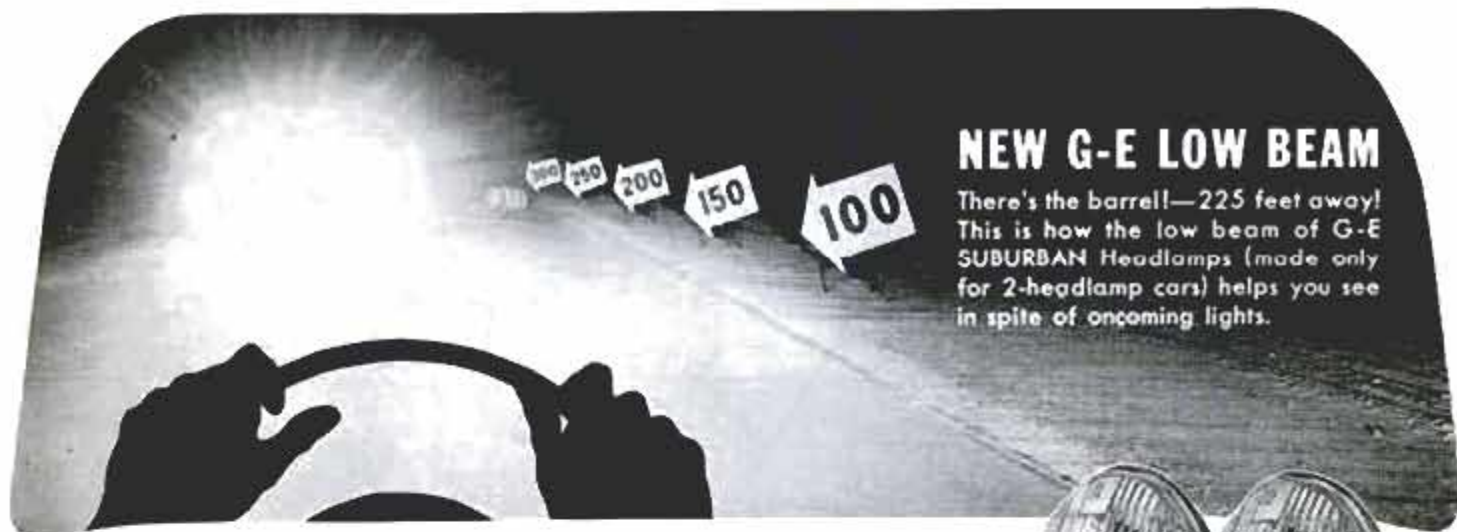
Three fourths of all night driving is now done with the low beam!

The low beam of G-E SUBURBAN Headlamps gives you a "spotlight" effect . . . lets you see better in spite of the other car's lights



OLD LOW BEAM

25 feet beyond those approaching headlamps there's a barrel in the road. It's not yet within the range of the low beam of any previous 2-headlamp cars.



NEW G-E LOW BEAM

There's the barrel!—225 feet away! This is how the low beam of G-E SUBURBAN Headlamps (made only for 2-headlamp cars) helps you see in spite of oncoming lights.

When there wasn't a great deal of nighttime traffic, you used the *upper* beam most often because it pushed a lot more light farther down the road. So, headlamp manufacturers put the upper beam filament on focus for maximum beam control.

Since nighttime traffic has increased tremendously, motorists find they must use the *low beam* more and more. So, General Electric now puts the *low beam* filament on focus to give maximum beam control where it's needed most—to provide a "spotlight" effect which directs more light down the right side of the road. That's why the low beam of new General Electric SUBURBAN Headlamps lets you see past the oncoming car when you're 75 to 200 feet apart. Only General Electric SUBURBAN Headlamps have this feature for 2-headlamp cars. General Electric Company, Miniature Lamp Department M-905, Nela Park, Cleveland 12, Ohio.



ATTENTION ALL OWNERS OF 2-HEADLAMP CARS!

For approximately the same results as the four-headlamp systems in brand new cars (whose low beam filaments are also on focus) . . . have a pair of new G-E SUBURBAN Headlamps installed and aimed today. Tonight you'll see better in spite of the other car's lights.

Progress Is Our Most Important Product

GENERAL  **ELECTRIC**

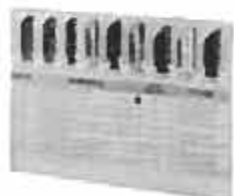
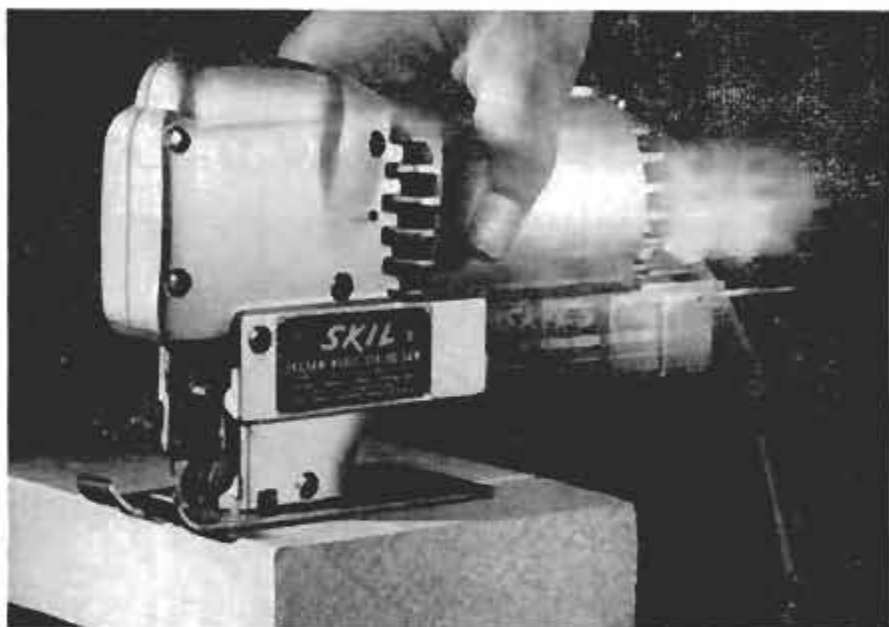
2 NEW SKIL POWER SAW VALUES!

SAWS 2x6 BOARD IN 14 SECONDS!

The Skil Jig Saw is fastest—cuts anything from wood to steel, any shape from straight lines to circles.

Use the Skil Jig Saw with ease for cutting 2" boards, plywood, plastics, metal, other materials. Veteran power tool user or beginner, you'll get professional results.

With Skil's orbital cutting action, the blade cuts on the up-stroke, moves away from the work on the downstroke to eliminate blade drag. That makes it the fastest cutting jig saw on the market.



FREE! \$7.50 Value!

Complete 9-blade kit for cutting all materials—metal, wood, plastic—with this Model 514 Jig Saw—all for only \$47.50. Limited time offer, at most Skil dealers.

EXTRA POWER, SPEED, ACCURACY!

This Skilsaw 6½" Power Saw has a rugged 1+ h.p. motor to handle all cuts faster . . . with greater accuracy. Special features include non-binding lower blade guard and safety clutch, which disengages the blade if it jams or binds. Also has easy-to-adjust depth and bevel controls for accurate 45° to 90° cuts.

In short, there are more professional features on this Skilsaw Model 536 than any other saw in its price class.

See your hardware or lumber dealer today and try these two saws. You'll quickly recognize them as outstanding values.



FREE! \$5.45 Value!

One extra combination blade plus accurate rip guide with this 6½" Model 536 Saw—all for only \$49.95. Hurry! Limited time offer, at most Skil Dealers.

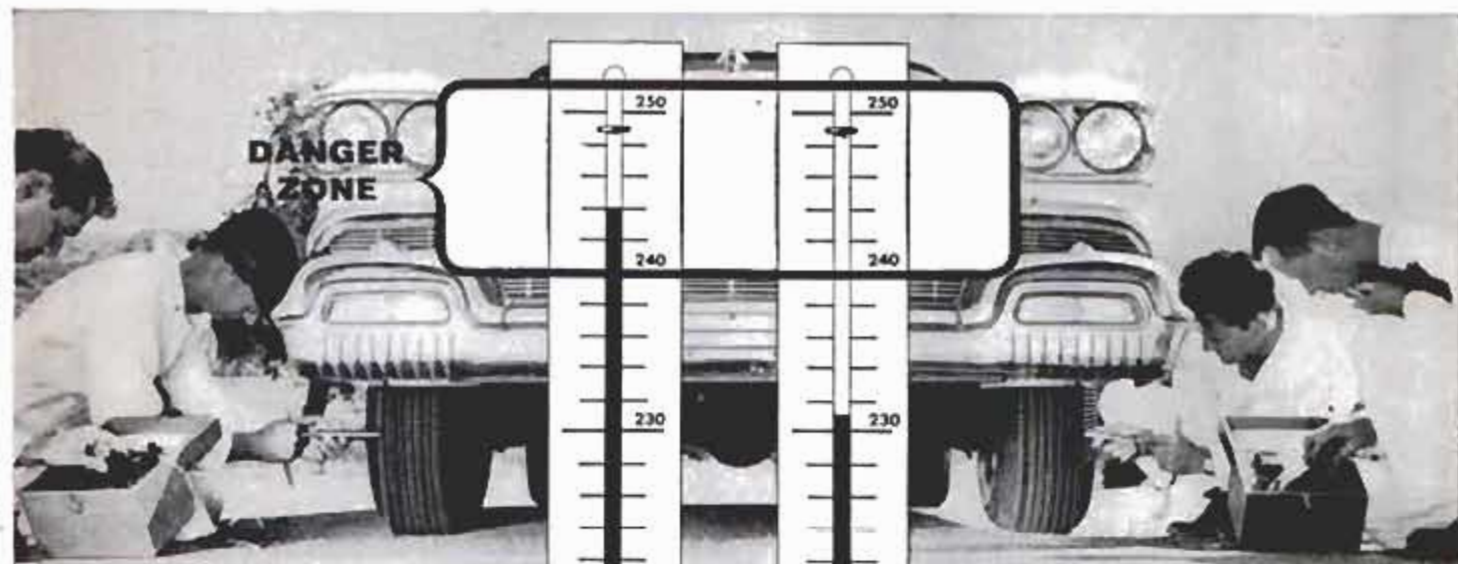


... AND SKILSAW POWER TOOLS

Skil Corporation, Chicago 30, Illinois.
Prices higher in Canada.

Road Tests Prove: **RADICALLY NEW**  **LOW PROFILE TIRES**

BEAT DEADLY TIRE HEAT



SEE HOW RAPIDLY ORDINARY TIRES GET HOT
—WHILE LOW PROFILE TIRES RUN COOL!

Ordinary tire (at left) and new Low Profile tire (at right) get temperatures taken after running only 29 miles at turnpike speeds.

Constant flexing has already pushed ordinary tire's temperature into the tire-destroying heat danger zone. But new Low Profile Safety-Shape tire is well below the danger zone. Even running hour after hour, U.S. Royal's Low Profile tire stays cool!



NEW LOWER, WIDER TIRES RUN COOLER, ARE SAFER, GIVE UP TO 35% MORE MILEAGE, SAVE GAS—YET COST NO MORE!

Why buy hot-running tires... when now, at down-to-earth prices, you can enjoy the extra safety of tires that beat deadly tire heat!

The above diagram shows Low Profile tires are lower and wider than ordinary tires. Built closer to actual working proportions on the road. So they don't flex as much. Don't strain as hard. Run far cooler than ordinary tires!

They're safer against tire

failure at high speed. Safer on turns. Safer against skids. Safer in emergency stops.

They give longer service. Roll easier—save gas.

U.S. Royal's new Low Profile Safety-Shape tire is now yours at popular prices, at your U.S. Royal Dealer's.

- **MILEAGE**
25% to 35% more mileage
- **HIGH SPEED ENDURANCE**
3 times better
- **TURNPIKE GAS ECONOMY**
6 to 12 extra miles per tankful
- **TURNING EFFORT**
20% more stability on curves
- **SKID RESISTANCE AND TRACTION**—raised 5 to 10%

Effective Immediately in U. S. Royal Tires
A REVOLUTIONARY DISCOVERY IN RUBBER
NO-SHOCK RUBBER

GIVES YOU THE **LUXURIOUS**
RED CARPET RIDE



Smother a million jolts a mile!

U.S. Royal's new super-supple rubber—born of new polymers, new processes, new production techniques—absorbs the "high-frequency" vibrations that cause driving fatigue. Gives you the "big-car" feel!

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- No Sing or Squeal
- Less Scuff
- Soaks Up Vibration
- Wears Longer

U.S. ROYAL TIRES



United States Rubber

Rockefeller Center, New York 20, N. Y.

In Canada: Dominion Rubber Co., Ltd.

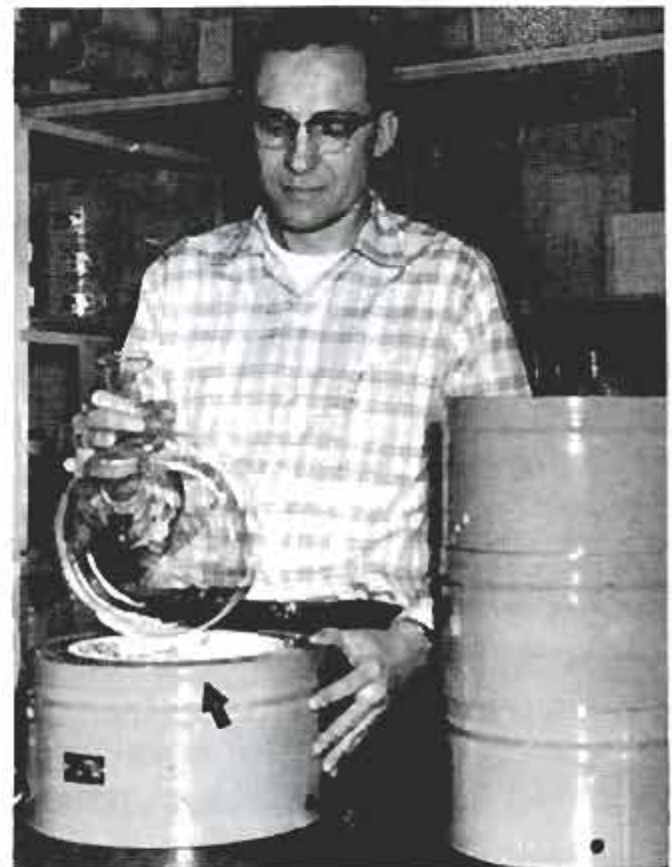
See things you never saw before. Visit U. S. Rubber's New Exhibit Hall, Rockefeller Center, New York.

Over the Editor's Desk



To the Editor:

A business that started as a basement hobby of a Beloit College professor is now producing unique electrical specialties for university, industry and government chemical laboratories. Dr. Frederick Mathews, formerly a research chemist in Philadelphia, has abandoned teaching at Beloit, at least temporarily, to devote full time to



his fledgling business—making electric contour heaters for round-bottom laboratory flasks. Dr. Mathews calls the new heaters, developed to replace Bunsen burners, "studentproof" because they cannot be burned out by distilling the flask dry at too high voltage, cannot be harmed by acids, and they are protected by a durable epoxy paint. The refractory heating shell is built with a special asbestos-cement composition soft enough to be used safely with glass, but fibrous and tough, with high heat conductivity resistant to thermal shock. Dr. Mathews makes the contour heaters in 13 sizes.

Dave Mason,
Beloit, Wis.

☆☆☆

To the Editor:

I am enclosing pictures of the roller coaster I built in 1956. My name is Eugene

(Continued to page 8)



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To those who want to enjoy
an ACCOUNTING CAREER



FREE SAMPLE LESSON

IF you're that person, here's something that will interest you.

Not a magic formula—not a get-rich-quick scheme—but something more substantial, more practical.

Of course, you need something more than just the desire to be an accountant. You've got to pay the price—be willing to study earnestly, thoroughly.

Still, wouldn't it be worth your while to sacrifice some of your leisure in favor of interesting home study—over a comparatively brief period? Always provided that the rewards were good—a salary of \$5,000 to \$10,000 and up?

An accountant's duties are interesting, varied and of real worth to his employers. He has *standing!*

Do you feel that such things aren't for you? Well, don't be too sure. Very possibly they *can* be!

Why not, like so many before you, investigate LaSalle's modern Problem Method of training for an Accounting position?

Just suppose you were permitted to work in an accounting firm under the personal supervision of an expert accountant. Suppose, with his aid, you studied accounting principles and solved problems day by day—easy ones at first—then more difficult ones. If you could do this—and could turn to him for advice as the problems became complex—soon you'd master them all.

That's the training you follow in principle under the LaSalle Problem Method.

Over 4,500 Certified
Public Accountants among
LaSalle alumni

You cover accounting from Basic Accounting right through Principles and Cost Accounting. As you go along, you absorb the principles of Accounting Systems, Federal Income Tax, Certified Public Accountant Training, and prepare for the CPA examinations.

Your progress is as speedy as you care to make it—depending on your own eagerness to learn and the time you spend in study.

Will recognition come? The only answer, as you know, is that success *does* come to the man who is really *trained*. It's possible your employers will notice your improvement in a very few weeks or months. Indeed, many LaSalle graduates have paid for their training—with increased earnings—before they have completed it! For accountants, who are trained in organization and management, are the executives of the future.

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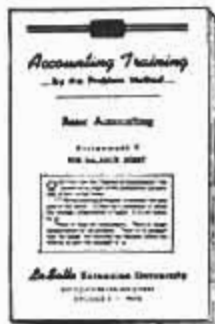
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Name..... Age.....

Address.....

City, Zone & State.....





Train AT HOME for a GOOD JOB in **AUTO MECHANICS**

A better job with more pay will mean *better living* for you. It can mean a fine home, a new car, nice vacations, and good educations for the kids. If you would like to earn up to \$125 a week and more—and be able to afford better living, *train yourself* in Auto Mechanics. You can do it with CTI showing you how—and you can learn at home in spare time!

GOOD JOBS ARE WAITING EVERYWHERE because there are over 60 million cars and trucks on the road—7 million new ones each year. One-third are in the heavy-repair classification. Skilled mechanics are needed to keep these cars operating. You can be one of them—make big money, enjoy lifetime security—even open a shop!

EARN AS YOU LEARN just as many CTI students do. They make up to \$15 a week and more in spare time. Some start their own shops by graduation time. CTI Shop-Method Home training, based on resident school practice, makes every step easy.

DIESEL MECHANICS OR BODY-FENDER TRAINING is also yours at no extra cost. A wonderful chance to give yourself a well-rounded education. Only CTI gives you this extra choice! Get the facts: Mail coupon.



YOU PRACTICE WITH THIS TUNE-UP KIT

Kit includes a Compression Tester, a Vacuum Gauge and Fuel Pump Tester, an Ignition Timing Light, and a portable steel case. These professional instruments help you locate engine troubles, let you get useful practice. You keep this kit!

MECHANIC'S TOOLS TOO

You'll use these tools to get real experience. They'll increase your interest, stamp you as a "pro." You'll earn spare time cash with them. No extra cost for tools—you keep them.



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Send your new Auto Mechanics book and Sample Lesson. BOTH FREE.

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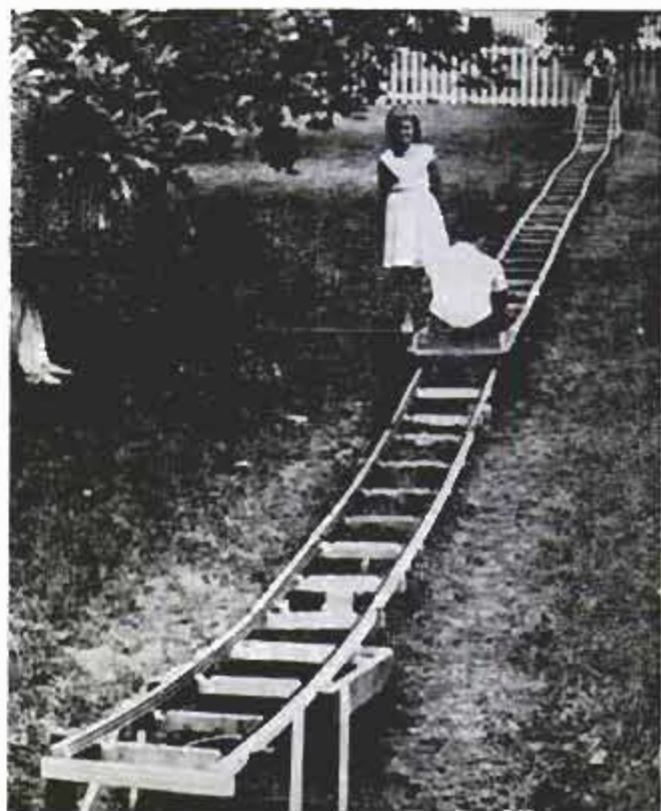
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Paul Clemans and I was only 11 when I built it. I am now 14.

I ordered the wood and got the roller-skate wheels, then started to build my first roller coaster! It took me four days to construct the car and the track. . . . When I set the track out in our back yard, the crowd began to form. Kids from 3 to 13 were there waiting for their first ride. You can bet your bottom dollar that I was the proudest boy in the neighborhood. The top picture is of Judy, my sister, myself, and my brother. They are giving me the shove that I used as power since I didn't make a steep elevation because of the price. The lower picture is an over-all view of my roller coaster, then 93 feet long. The wood cost me \$8.00 and the track

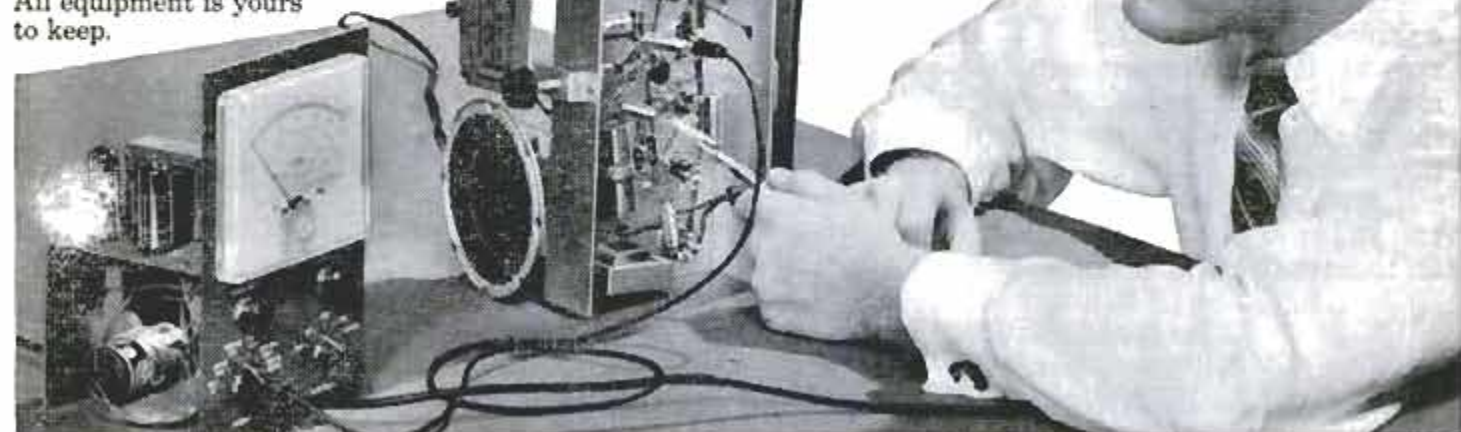
(Continued to page 10)



Learn Radio-Television Electronics

by Practicing at Home in Your Spare Time

WITHOUT EXTRA CHARGE YOU GET special NRI kits developed to give you actual practice with Radio-TV receiver or broadcasting circuits and equipment. All equipment is yours to keep.



RADIO-TV BROADCASTING (see above) offers important positions as Operators and Technicians. **RADIO-TV SERVICING** Technicians (see below) needed in every community. Their services are respected, their skill appreciated.



Fast Growing Field Offers You Good Pay, Success, Bright Future



J. E. SMITH
founder

Bigger than ever and still growing fast. That's why Radio-TV has special appeal to ambitious men not satisfied with their job and earnings. More than 4,000 Radio and TV stations. More than 150 million home and auto Radios, 40 million TV sets. Color TV promises added opportunities. For the trained man, there are good jobs, bright futures in Radio-TV Servicing or Broadcasting.

Training PLUS opportunity is the ideal combination for success. So plan now to get into Radio-TV. The technical man is looked up to. He does important work, gets good pay for it. Radio-Television offers that kind of work. NRI can supply training quickly, without expense of going away to school. Keep your job while training. You learn at home in your spare time. NRI is the OLDEST and LARGEST home study Radio-TV school. Its methods have proved successful for more than 40 years.

Added Income Soon - \$10, \$15 a Week in Spare Time

Soon after enrolling, many NRI students start to earn \$10, \$15 a week in spare time fixing sets. Some pay for their training and enjoy extra luxuries this way. Some make enough to start their own Radio-TV shops. NRI training is *practical*—gets quick results. Easy to understand, well illustrated lessons teach you basic principles. And you LEARN-BY-DOING by practicing with kits of equipment which "bring to life" things you study.

Find Out What NRI Offers

NRI has trained thousands for successful careers in Radio-TV. Study fast or slow—as you like. Diploma when you graduate. Mail coupon now. Paste it on a postcard or mail in envelope. ACTUAL LESSON FREE. Also 64 page catalog that shows opportunities, shows equipment you get. Cost of NRI courses low. Easy terms. **NATIONAL RADIO INSTITUTE, Dept. 9KA, Washington 16, D. C.**

N.R.I. TRAINED THESE MEN FOR SUCCESS



"I was repairing Radios by 10th lesson. Now have good TV job." M. R. LINDEMUTH, Fort Wayne, Ind.



"Doing spare time repairs on Radio and TV. Soon servicing full time." CLYDE HIGGINS, Waltham, Mass.

"I had a successful Radio repair shop. Now I'm Engineer for WHPE." V. W. WORKMAN, High Point, N. C.



"There are a number of NRI graduates here. I can thank NRI for this job." JACK WAGNER, Lexington, N. C.



VETERANS Approved Under G. I. Bills

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National Radio Institute

Dept. 9KA, Washington 16, D. C.

Mail me Sample Lesson and 64-Page Catalog FREE. (No salesman will call. Please write plainly.)

Name _____ Age _____

Address _____

City _____ Zone _____ State _____

Accredited Member National Home Study Council



(Continued from page 8)

ran less than 7 cents per foot. Of course, since it was a rather experimental project, I used a very low grade of white pine for both the car and the tracks. The only expensive part of the whole thing was the roller-skate wheels . . .

Gene Clemans,
Lima, Ohio

☆☆☆

Unknown to us at the time, Popular Mechanics played a part in the beginnings of "Unibath," the one-step chemical for photographers reported on page 256 of this issue. We learned about it in this letter:

You might not know that your wonderful magazine, especially an article in 1957, enabled me to meet Mr. H. S. Keelan, who was at that time a research associate at Boston University, employed in developing a combined developer and fixer. This acquaintance, per your wonderful magazine made through your excellent reporting led to a business proposition resulting in the production of Unibath.

James Kunz,
Director of Quality Control,
Cormac Chemical Corp.
80 Fifth Ave.,
New York City

To the Editor:

When Calvin Hostetler had this huge American flag painted on his farm home near Lovington, Ill., when the house was



built in 1897, it created a lot of interest. It still does. Whenever the house was repainted, the flag was part of the decorating job. Now it will be repainted again. Acquisition of Alaska and Hawaii as 49th and 50th states makes the 48-star flag obsolete. Grover Brinkman, Okawville, Ill.

Enjoy
Velvet-Smooth Smoking
-the whole bowl
through!

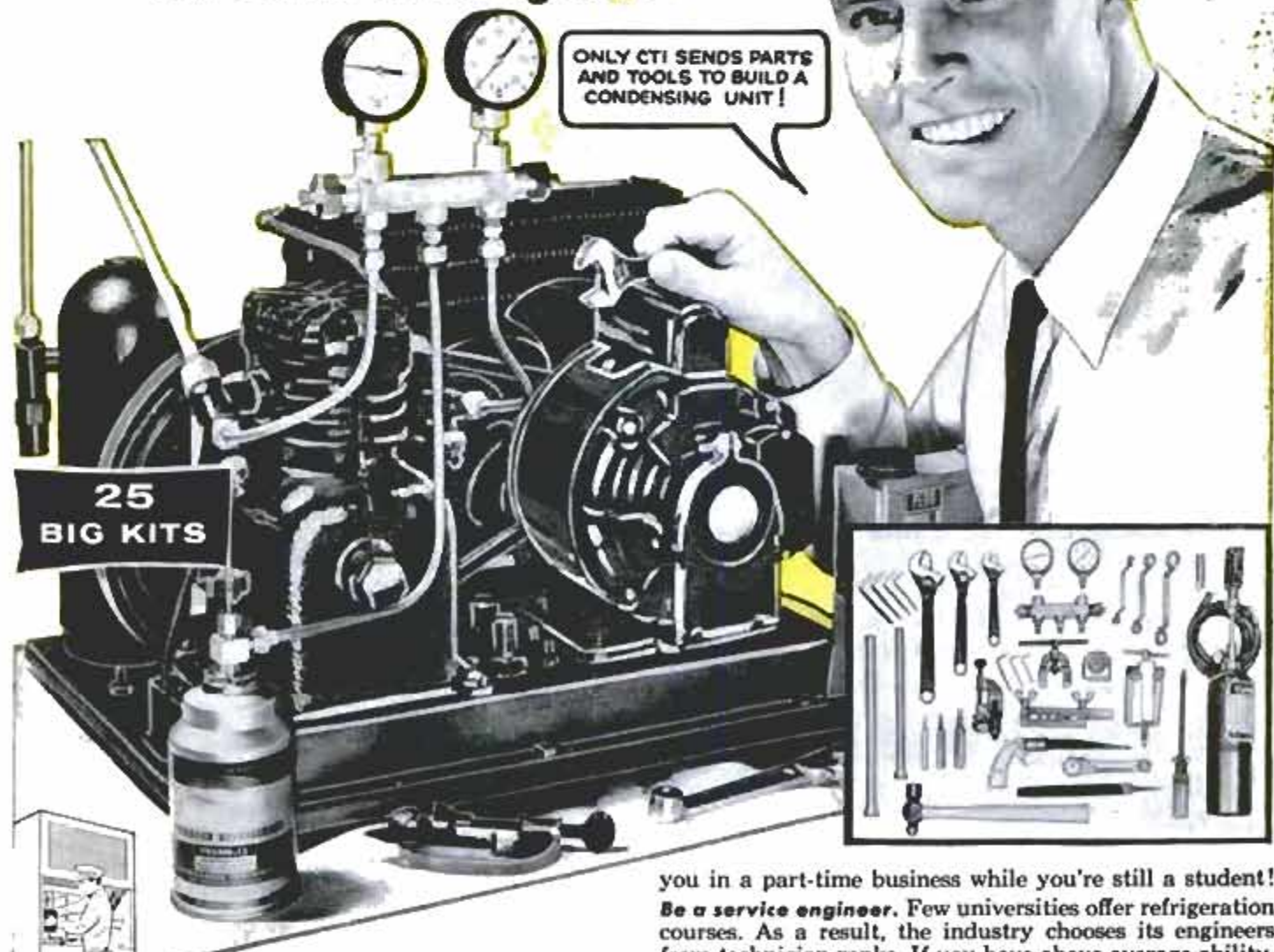


No wonder Velvet stays smooth and mellow from first puff to last. Velvet's aged burley tobaccos are selected and cut to burn slower and cooler in any pipe, for truly Velvet-smooth smoking.

IN POCKET TINS . . . REGULAR
AND LARGE SIZE HUMIDORS

Spend the rest of your life on Velvet!

How to build a big-pay future in the Air Conditioning and Refrigeration industry with CTI Home Training Kits



A better job or your own business

The news is spreading fast: America's finest opportunity field is now Air Conditioning and Refrigeration! Today there are over 150 million domestic and industrial units in use. Over 6 million new freezers, refrigerators and air conditioners are manufactured annually. So quickly is the industry expanding that 20,000 service technicians must be trained each year. Yes, air conditioning is a big, uncrowded field where the opportunities are as large as the paychecks!

Learn at home by practicing. It's easy to master this craft. CTI sends you 25 kits of parts and tools to build a heavy-duty, commercial-type, 1/4 h.p. condensing unit (illustrated above). You complete 23 work projects—do 10 trouble-shooting jobs. Then you build an air conditioner, freezer, refrigerator or milk cooler.

Make money as you train. So practical is CTI training that many students earn extra cash fixing and installing. Some make calls on their own; others work for local appliance dealers. CTI training pays its way—actually puts

you in a part-time business while you're still a student! **Be a service engineer.** Few universities offer refrigeration courses. As a result, the industry chooses its engineers from technician ranks. If you have above-average ability, you too may get into planning and estimating—the engineering phase of a great business.

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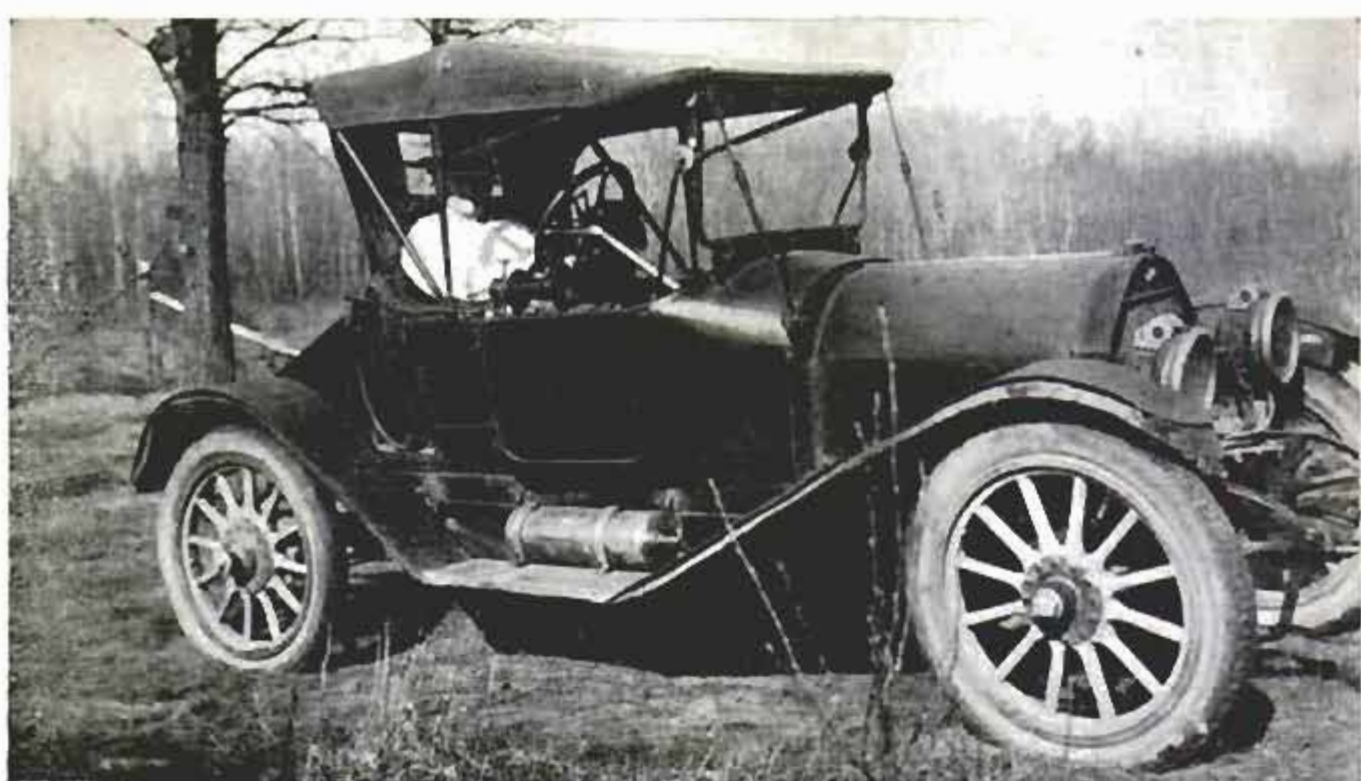
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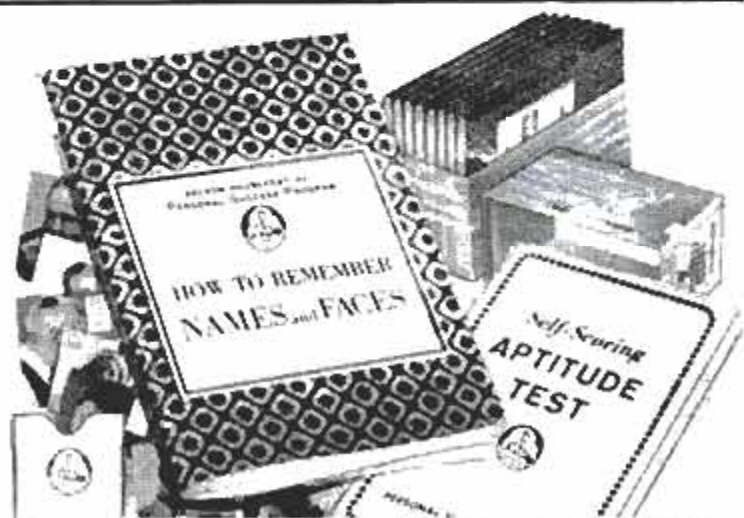
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By James S. Thistle

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Among this scientist's inventions are a throttle valve, a governor for regulating the speed of steam engines, a copying press and copying ink. He proved also that water is a compound substance, not an element.

*These letters, unscrambled,
spell the name of this
month's Great Pioneer
in Science:*

J A W S E T M A T

(First and Last Names)

Write the correct name here:

Now turn to page 318 for the answer.

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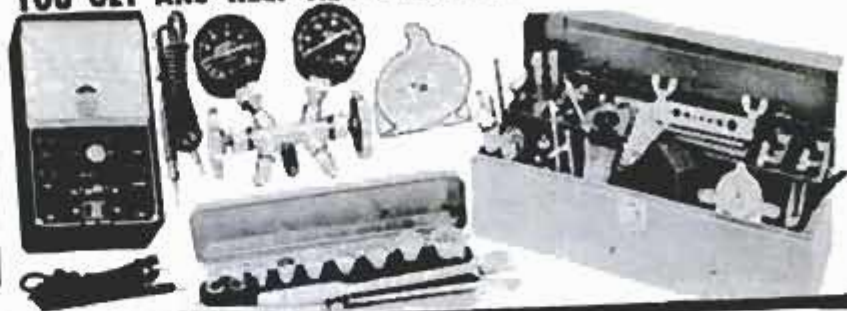
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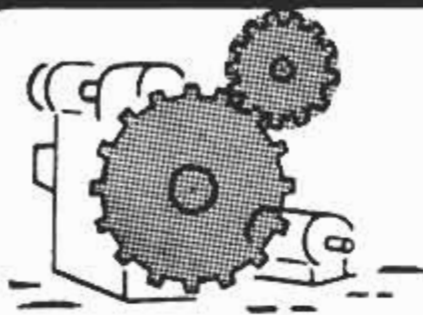
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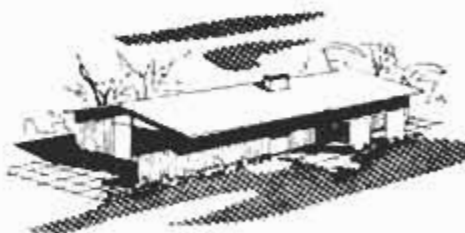
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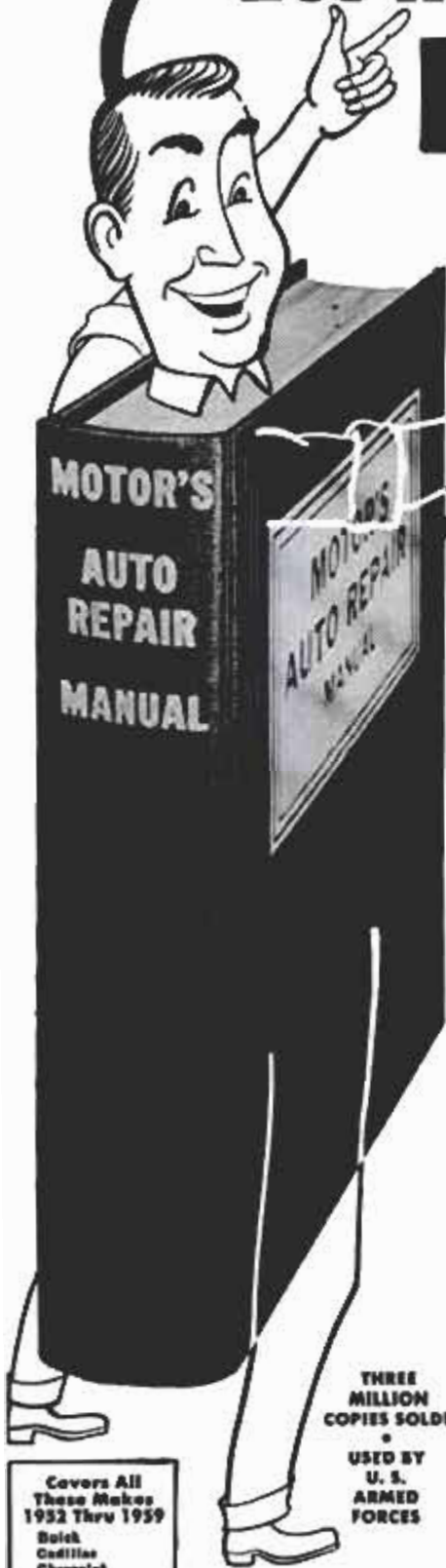
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Astronomers at Yale University expect to determine accurately the distance to the sun for the first time by using a radiotelescope.

Although the distance is known to be about 93,000,000 miles, it must be plotted with much greater accuracy before space vehicles can navigate safely to other planets. The study is expected to take two years.

To carry out their proposal, the astronomers will use an 84-foot radiotelescope belonging to the Naval Research Laboratory at Maryland Point Observatory, 50 miles south of Washington, D.C.

Technically, astronomers call the distance to the sun the astronomical unit, and it establishes the basic scale of the solar system. The radiotelescope method involves obtaining a precise measurement of the earth's speed in its orbit around the sun, and the astronomical unit can be determined by using this figure in future calculations.

The speed of a rocket leaving earth must be changed from conventional units into a velocity in astronomical units to help calculate the gravitational orbit beyond the immediate vicinity of the earth.

At present, the change to astronomical units is in error, an error of one part in 20,000, the same error as in the present value of the astronomical unit, itself. By using the radiotelescope information, scientists expect to cut down the error in measuring the sun's distance to one part in 280,000. This would mean that the astronomers would be only 300 miles in error in measuring the distance from the earth to the sun.

Two current methods of determining the distance show results differing by 89,000 miles, which is considered an alarming amount.

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Wrought-Iron Oil Pipeline Still in Use After 76 Years

Sections of the world's first oil pipeline, unearthed and moved halfway across the continent, are still in good condition and are being used to carry oil in Oklahoma oil fields. First laid in 1893 between Bradford and Marcus Hook, Pa., the 378 miles of four and five-inch pipe were inspected in 1923 and showed some signs of rust but no pitting. The pipe was sold in the ground that year, and relaid in 1924 in Oklahoma. In 1934 the pipe was again inspected and found in good condition, though steel pipe laid at the same time had to be replaced. The pipe is still in service, handling oil at average pressures of 1000 pounds per square inch. Key to the durability of wrought iron, say metallurgists, is the iron silicate physically entrained in the metal. These nonrusting particles force corrosion to disperse over the iron's surface, where it forms a dense layer which halts further corrosion.

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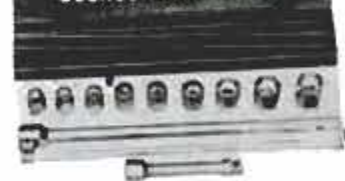
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Harmon & Co., P.O. Box 8026,
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POPULAR MECHANICS

Dowsing "Serves Social Purpose" Say Unbelieving Scientists

Ever hunt for underground water with a divining rod?

Thousands have, and thousands are believers. Now come two scientists who say the art of finding water with a forked stick may have some social purposes but there's no basis for it in science.

In New England, New York and Pennsylvania it's called dowsing. Elsewhere it may be divining, switching, doodlebugging, peach-twig toting or something else. The diviner holds a forked stick, and where there is water beneath, the twig bends downward of its own accord as if to say "Drill here for water."

Evon Z. Vogt, anthropologist at Harvard University, and Ray Hyman, research consultant in behavioral sciences for General Electric Co., in a book on the subject recently published by University of Chicago Press, say that water witching provides a feeling of certainty where scientific advice gives no assurance on hidden sources of water. It relieves a farmer's anxiety about ground water where a geologist might dissuade a farmer from drilling. If the diviner's advice proves correct, his success is remembered and he gains a reputation. Although they consider the practice a form of magical divination, the two scientists conclude that "we do not feel that it is 'superstitious nonsense' that should be stamped out at all costs." It was practiced as far back as the 16th Century, and still is.

Helicopter's Wheel Replaced in Mid-Air

Naval maintenance men replaced a helicopter's wheel while the big aircraft hovered two feet off the ground. The copter, an HO4S, was leaving Chevalier Field, Pensacola, Fla., for Ellyson Field, 30 miles away, when the pilot noticed a wheel rolling down the runway ahead of him. It was his starboard main wheel. He decided to continue on to Ellyson with his load of passengers, since maintenance men there were more familiar with rotary-wing aircraft. At Ellyson the copter hovered close to the ground while the passengers got out. Then, with crash trucking standing by, the ground crewmen attached a spare wheel. Working under the fast-whirling rotor blades and the bulk of the big plane, they needed only 10 minutes to do the job. A chief petty officer who directed the pilot during the operation said that at times—wheels were less than six inches above ground.

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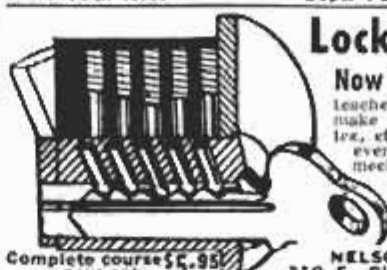
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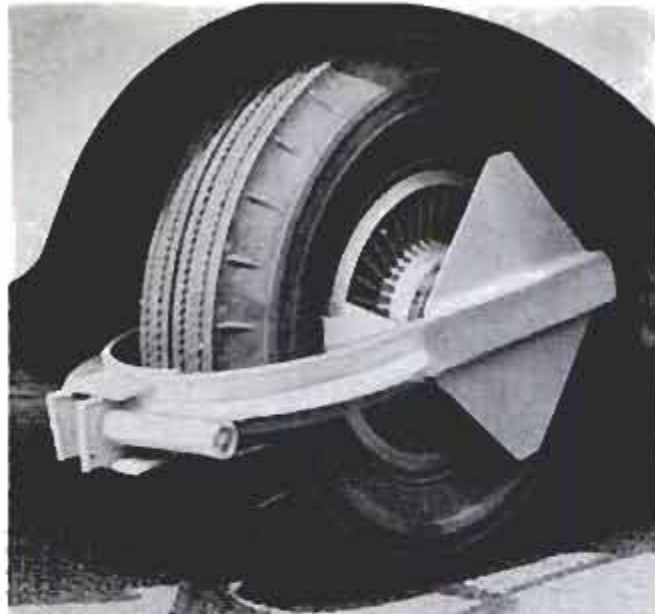
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Rhino Products Co., 438 Lipan St., Denver, Colo.

Metal Boot on Wheel Immobilizes Car

Fastened to the front wheel of an automobile, a metal boot prevents the car from being moved. When the car is backed, the boot catches on the bumper; when the car moves forward the boot digs into the pavement. The boot is used by some municipalities and universities to enforce parking regulations. Instead of towing a car away from a no-parking zone, the police officer simply immobilizes the car by means of the boot. The owner can't move his vehicle until the officer returns to the car and unlocks the boot.

Short Radio Waves Cause Plant Mutations

Shortwave radio may become a tool for causing mutations in plants, possibly leading to the development of new varieties of plant life. This suggestion is based on the discovery that short radio waves can be used to cause changes in chromosomes similar to those produced by cosmic rays and X rays. In experiments at the New England Institute for Medical Research, irregular cell divisions and a shortening of chromosomes were observed in garlic root tips that were subjected to radio energy in the megacycle range. The radio energy was "shot" at the root tips in bursts of $\frac{1}{20,000}$ -second to minimize heating. In studies with living protozoa it was found that these microorganisms could move only in the direction of the lines of force while the electric field was on, resuming their random movements when it was switched off. Advantages of the radio system are that extreme power can be used and that it can be controlled very precisely.

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**Social Scientists Seek Answer
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About 90 million people, equal to the population of Japan, were added to the earth's population in the last two years. This growth is unprecedented in human history. The populations of some underdeveloped countries are increasing at the rate of three percent or more per year as compared to a rate of 1.7 percent in the United States.

Social scientists say that even if fertility soon begins to decline moderately, the present 2.8 billion people on earth will have multiplied to five or six billion by the end of the century, only 40 years from now. In 600 years, at the present rate of growth, there would be no more than a square yard of earth per person. Something obviously will happen to prevent such overcrowding, points out a United Nations report.

The continuing baby boom is occurring at the same time that famines and epidemic diseases, two things which in the past have periodically decimated human populations, have been brought under increasing control. Food production, housing, schooling and hospital facilities have been improved on a worldwide basis but continue to lag behind the needs of the exploding population. The Population Reference Bureau, Inc., a nonprofit organization that gathers and interprets population data, suggests that means must be found to check fertility so that social progress can catch up. For instance, the problems of chronic poverty and malnutrition have not been solved. Half of the world's children of school-going age are not in school. Housing and its financing are matters of international concern, as are adequate hospital facilities. In short, the Bureau finds that substantial reductions in fertility must occur, especially in underdeveloped countries, before living can be raised much above subsistence levels.

Today 55.2 percent of the people of the world live in Asia, 23 percent in Europe (including Russia), eight percent in Africa, 6.7 percent in North America, 6.5 percent in Latin America, and 0.5 percent in Oceania.

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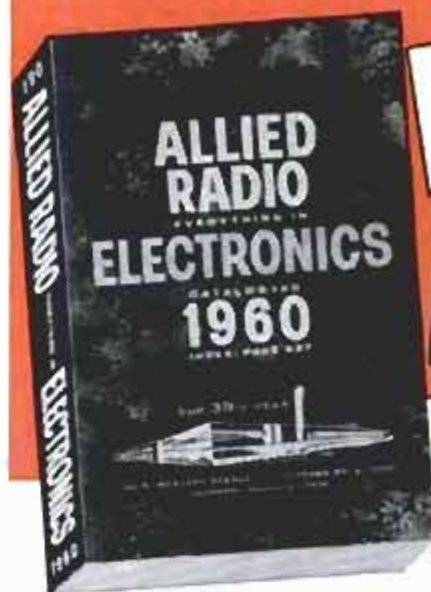
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Evinrude Motors, Milwaukee 10, Wis.

All but one of the "big five" are featuring increased horsepower in their top models, with boosts of up to 50 percent. Evinrude's Starflite II, above, develops 75 horsepower and features an automatic choke, double-action shock absorbers, redesigned "Jet Stream" lower unit and a choice of three propellers

OUTBOARDS for 1960

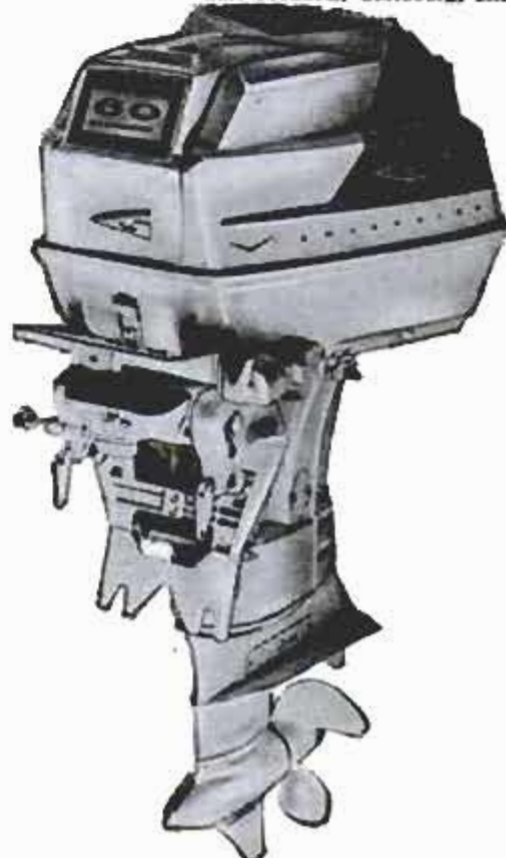
The "big five" outboard motor manufacturers are making news with bigger and better motors for next year. Here's a look at the newest

Johnson's new 75 horsepower Super Sea Horse steps out easily on a big runabout with 10 aboard. New "power package" includes automatic choke, choice of props, new lower unit and shocks

Johnson Motors, Waukegan, Ill.

Leading the Gale line is the 60 horsepower V-Sovereign, an all-new motor from fiber-glass shroud to lower unit

Gale Products, Galesburg, Ill.



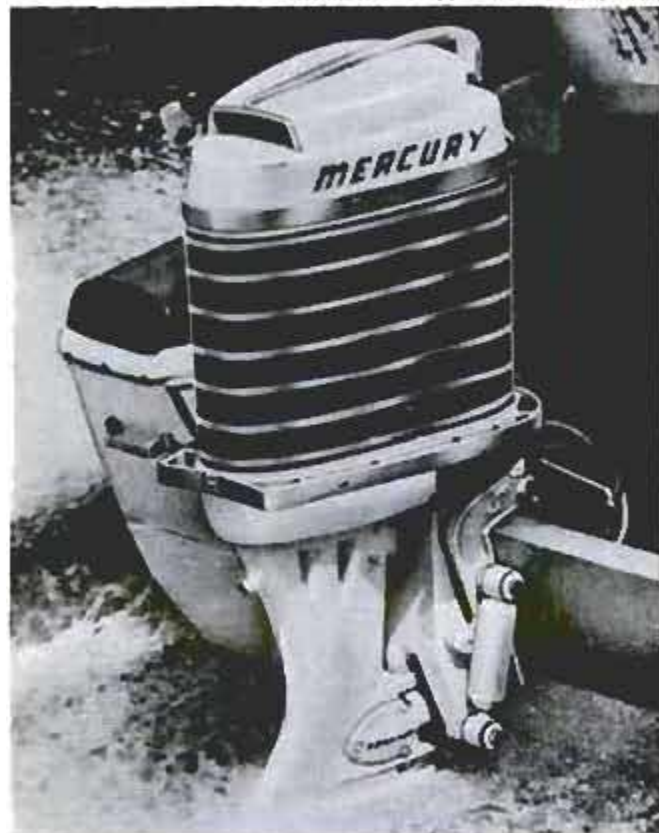


Marine Products Div., McCulloch Corp., Minneapolis 13, Minn.

Newest thing in outboards is the Scott 7½ horse-power motor, smallest and lightest ever offered in or near this power class. Designed for the fisherman, small boat owner, or those who carry their own motor to boat liveries, it's a compact 30 inches long and weighs only 36 pounds — seven inches shorter and 25 pounds lighter than last year's model

Most powerful outboard motor ever put on the market is Mercury's 80 horsepower Merc 800. It boasts an industry top in efficiency with over one horsepower per cubic inch of displacement. The line also has an improved single-lever control unit and better muffling, and offers counter-rotating propellers in their larger motors for torque-free dual installations

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Additional Crude Oil Possible With Gamma-Ray Treatment

Prospects of recovering additional crude oil from the ground are seen in experiments by Southwest Research Institute at San Antonio, Tex., which may lead to reduction of viscosity of tar-type crude by gamma-ray treatment.

Shock-Wave Tubes May Power Spaceship

Tubes that duplicate shock waves from the sun may be used to provide thrust to rocket ships in outer space. Such solar shock waves travel at more than a million miles per hour from the sun to the earth. The shock tubes were developed at the Avco-Everett Research Laboratory in Everett, Mass. They produce such high temperatures with small use of power that they also may be used to help harness the power of the hydrogen bomb for peaceful uses. Developer of the electric tube is Dr. Richard Patrick of the laboratory. He describes the operation of the tube in the following way: A rarefied mass of hydrogen gas, confined by a magnetic field at room temperature, is contained in the 30-inch-long tube. A four-billion-watt electrical impulse lasting two-millionths of a second is discharged into the tube. The gas temperature suddenly goes up 1½ million degrees, and the hydrogen atoms are stripped of their electrons, or ionized. In this split second, the hydrogen ions are shoved a million miles per hour and the shock-wave front is produced.



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Former Luxury Yacht Becomes Fish-Bait Factory

Two California bait-fish suppliers have converted the 65-foot schooner *Hispaniola* to a floating frozen fish-bait plant. They have installed quick-freezing brine tanks and a low-temperature holding room. Independent of shore operations, the suppliers now are equipped for extended cruises along the California coast, where they can catch bait fish, freeze them immediately, and deliver the frozen bait to customers.

Silicon Carbide Tube Would Improve TV

Use of silicon carbide as an electron source may enable scientists to give new electronic tubes the power of vacuum tubes and the minimum heat and greater efficiency of transistors. Such "transistized electronic tubes" would improve TV. The silicon carbide, which would replace the present hot cathode structure as the electron source, would permit a more powerful tube that would emit little heat.



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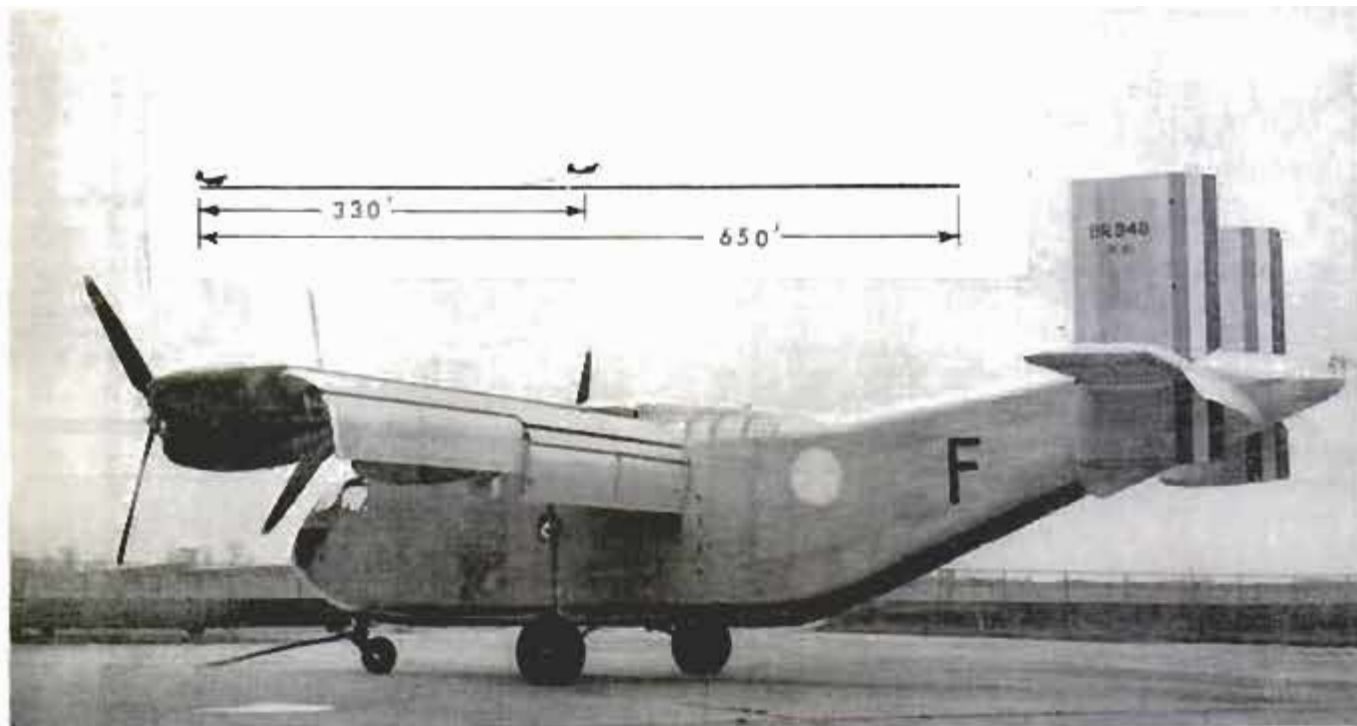
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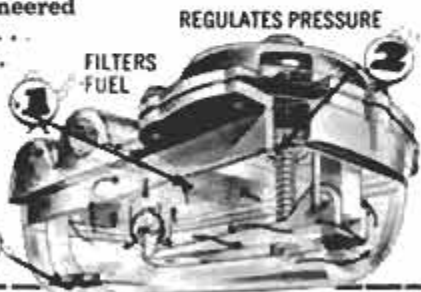
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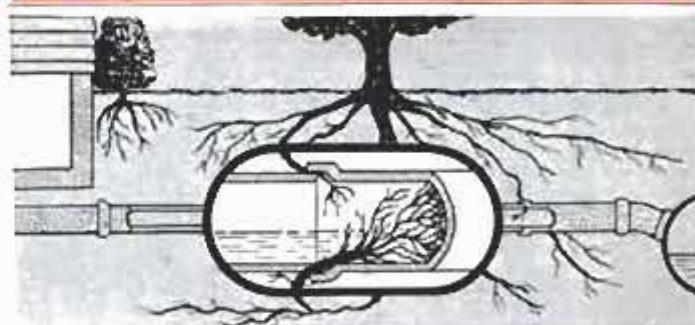
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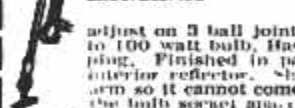
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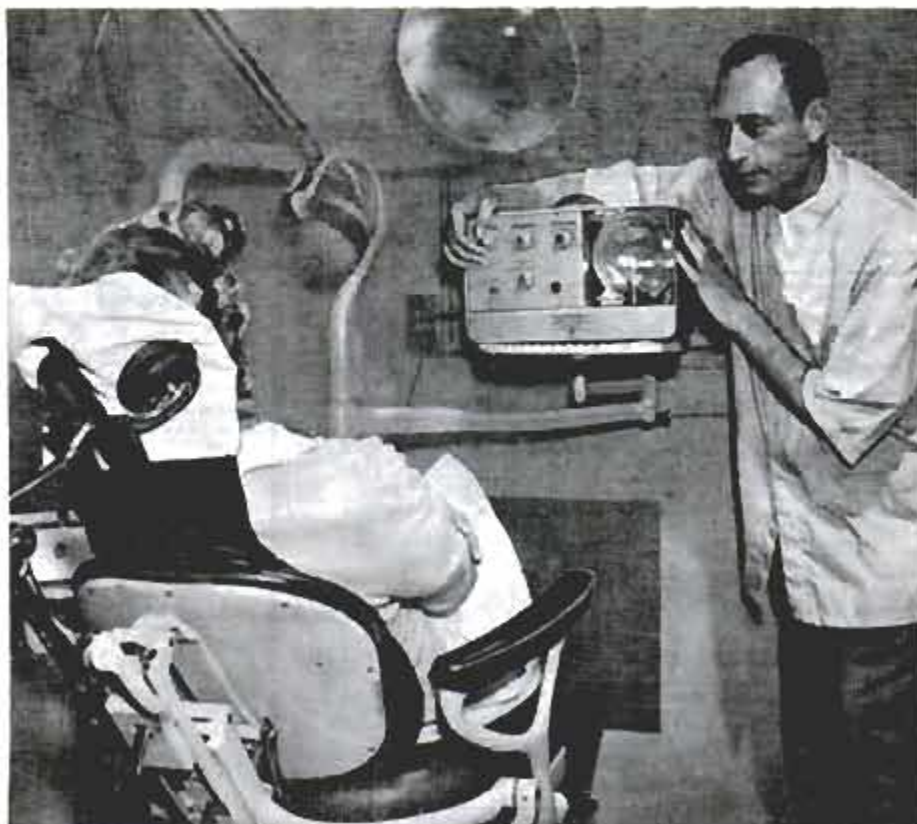
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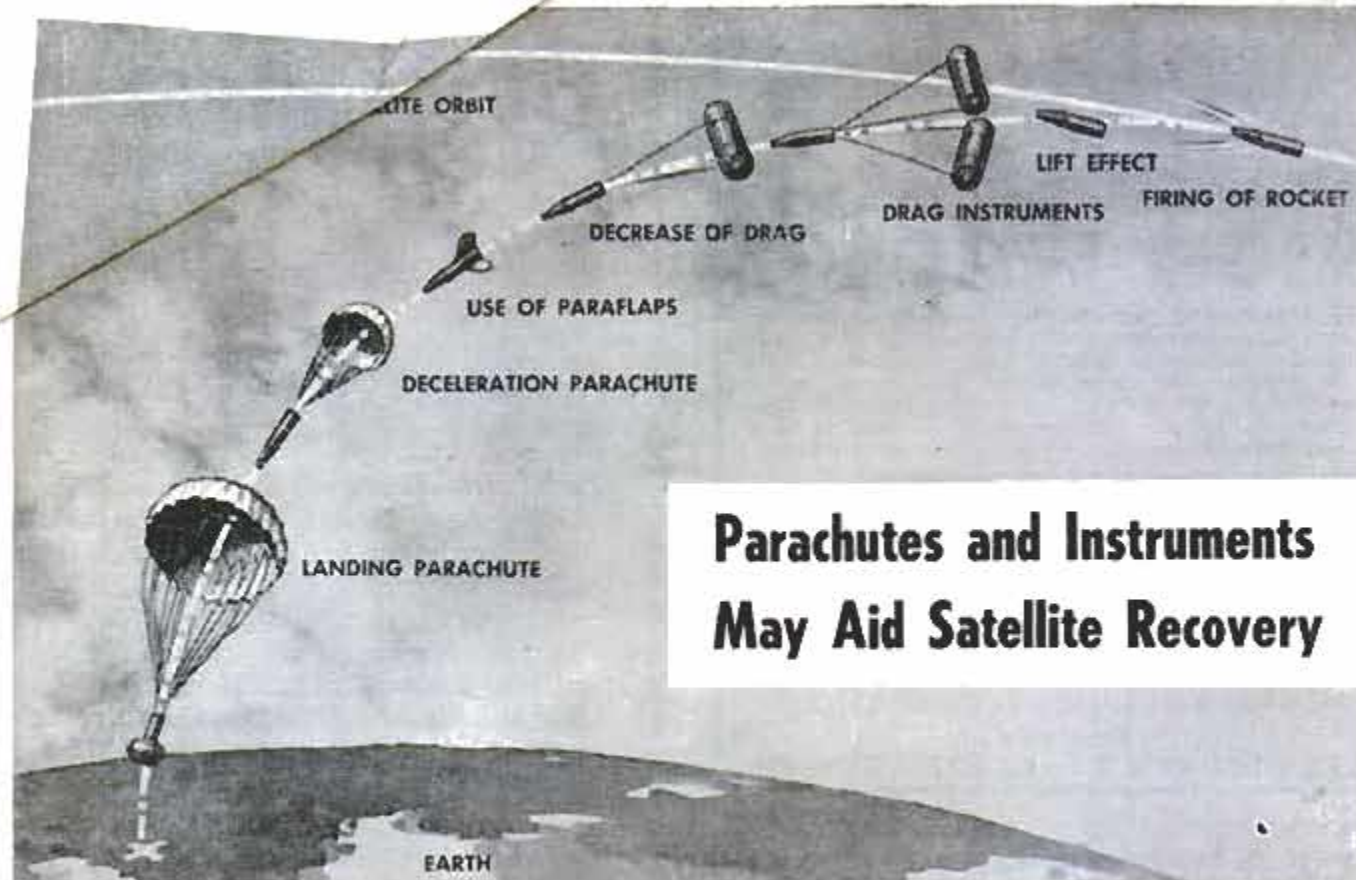
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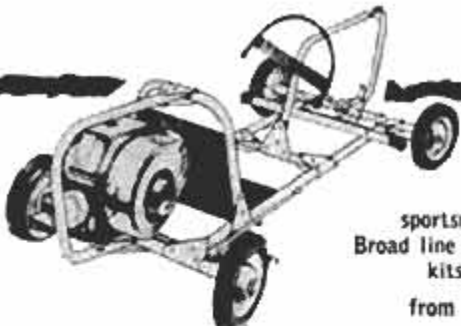


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DETROIT LISTENING POST

By Art Railton

IT WAS ACCIDENTAL, no doubt, but it almost looks as though the Big Three got together and divided up the small-car market. These companies, working separately in vacuum-packed secrecy, have come up with cars of such varied personalities that they are almost noncompetitive.

If you like the Falcon, you probably won't like the other two. If you like the Valiant, you probably can't see anything good about the others and so on. There is a wider range of car "personality" among the three small cars than in the entire Chrysler Corporation big-car line, or the General Motors big-car line.

Once the public shows which of the three it likes best, the others will start moving toward it and eventually all will be alike, if history repeats itself. But right now, the choice is wide.

"Compact without discomfort. Spacious, four-passenger body designed for those who prefer a compact car without the discomfort common to the ordinary small car. All-aluminum body. Swivel front seat."

What car of tomorrow is this?

This is a quotation from an advertisement for the Jordan Brougham published in 1918. Apparently, the word "compact" goes back a long, long way—and swivel seats, too.

By January the Falcon and Valiant will both have station wagons. The Valiant's may be announced along with the sedans at the end of October. They won't be available in volume until later, however.

These two can use much of the sedan tooling in the wagon body. The Corvair can't do it that way—everything has to be different (except the chassis). But just because the Corvair will be late with its wagon (due next year) doesn't mean it isn't bullish about the small car.

Some dealers are already planning to set up a separate retail outlet for Corvair, so bright is its future regarded. Within two years, the Corvair will have a range of models extending from the sports car to the truck.

First out (December) may be a sports coupe not too far from the Karmann-Ghia concept (bigger, of course). It will offer a four-speed full-synchromesh transmission (it will be optional on all Corvairs also).

Corvair is out to explode the myth about rear-engine instability that the competition spread around a few months back. There's a hint that it might try to prove the car's stability by winning the sports-car race at Sebring. Rumors are that a low-price fuel injection package is being developed to sell for about \$75 and with it the Corvair may run the wheels off anything in its class at Sebring this December.

You can't go prowling around a Corvair without being reminded of Volkswagen. Certainly Corvair engineers must have had more than a nodding acquaintance with the little German car. Chevrolet is reputed to have bought 25 Volkswagens in the past year and you can be sure they weren't used for door prizes at a dealers' convention.

Now it is Volkswagen's turn to learn. Don't be surprised to see the VW now-vertical fan switched to a horizontal position as in the Corvair. Such a move will reduce height and help wagon design.

What are VW's plans? We don't know, of course, but we can make a few guesses. Now that General Motors has put its stamp of approval on the air-cooled rear engine, VW may be more acceptable than ever, provided it is competitive pricewise.

After all, if the three U. S. small cars have a list price of \$2000, you will soon be able to buy one for \$1850 with the usual discounting by the American car dealer. (Dealers get a 21-percent discount on the small American cars, 24 percent on the big cars.) This would give the VW (a smaller, less desirable package for the average American) a price advantage of only \$150. That may not be enough.

So you might expect VW to bring out an economy version of its present model for about \$1300 at the same time it brings out its new four-door sedan with slightly more engine. When? Soon as possible, we bet.

Meanwhile there's evidence that Corvair plans to cut into VW's commercial business. And station-wagon business, too. The Corvair wagon is expected to be a comfortable, good-looking, low-slung version of the VW Microbus. It will open up a whole new world to the American motoring public. It could be a vacation home on wheels for three weeks a year and a convenient suburban wagon the rest of the time. Family touring will be a delight.

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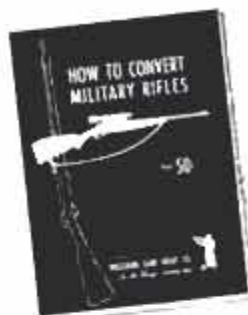
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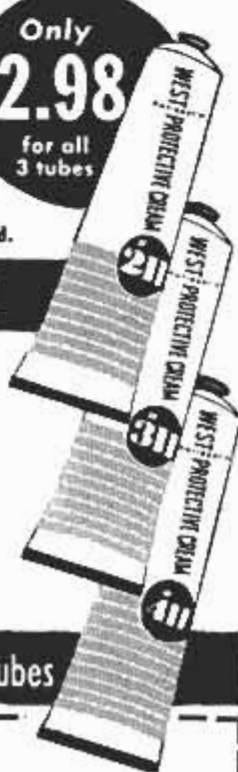
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How to pass a bike down through the family...



Spray on BROMA TOUCH 'N TONE colored aluminum

A good many home-handy people are excited (if the mail is any indication) about spray-on colored aluminum paint. They call it a decorating marvel that's actually fun to use.

Take bikes for example. Big brother's old two-wheeler will look like new in about 30 minutes. Dad's spraying on a gleaming, over-all coat of Broma *Touch 'n Tone*. Small Fry will pass it off tomorrow as a new bike... the colored metallic finish will be the envy of the neighborhood.

Users report that it's no trick now to restore all those hard-to-paint "treasures" around the house. Everything takes on new life and sparkle with colored aluminum paint—lamps, trays, tools, toys, garden furniture, appliances, knickknacks—it's a long list. On rusted areas, many people use a primer such as Master Bronze *Derusto* for longer life.

Available in blue, green, gold and silver, *Touch 'n Tone* is made with Alcoa® Pigments by Master Bronze Powder Company, Calumet City, Ill.



Paint, hardware and building supply dealers everywhere carry colored aluminum paint in spray cans or they can get it for you.

Alcoa does not make paint, but Alcoa Aluminum Pigments are used in most high-quality brands. You should know more about the protective and decorative qualities of aluminum paints and roof coatings. Write today for Alcoa's informative booklets, *Painting With Aluminum* and *Aluminum Roof Coatings Make Time Stand Still*. Use the coupon.

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Name _____

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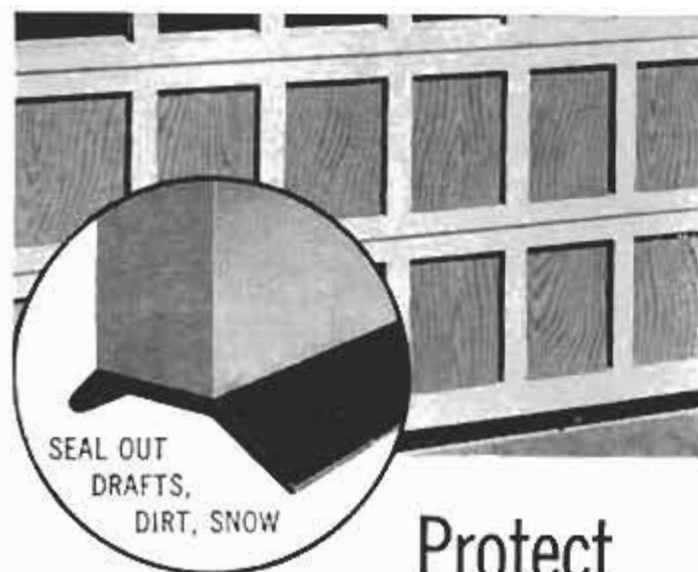
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NOTICE—It is the intention of this magazine to provide its readers with information regarding the latest developments in the mechanical arts. Except where otherwise indicated, this magazine has no information as to any unexpired patents in respect of the developments reported herein. In the event that commercial use is to be made of any of the developments reported herein, it is suggested that legal counsel be consulted to avoid liability for patent infringement. It is not the purpose of this magazine to encourage patent infringement but, as indicated, it is the intention of this magazine to report on the latest developments in the mechanical arts.



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Now . . . for less than \$3.00 . . . in less than 10 minutes . . . you can put StanStrip on an 8-foot overhead garage door. And what a difference it makes!

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Now the wraps are off! We invite you to share the excitement—to see, *try* the sensational new Starflite II—most efficient high performance outboard ever designed!

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NO FLAT "FILTERED-OUT" FLAVOR!

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IMPROVED ORGAN CONTROLS

Self-taught organist Ayres built in improved volume controls after manufacturer said it couldn't be done

Inventors Are Not Eggheads

By George X. Sand

GENIAL and soft-spoken Waldemar A. Ayres, 50, of Fort Lauderdale, Florida, looks more like a debonair yachtsman (which he is) than one of the world's foremost inventors, with some 175 patents, issued or pending, to his credit.

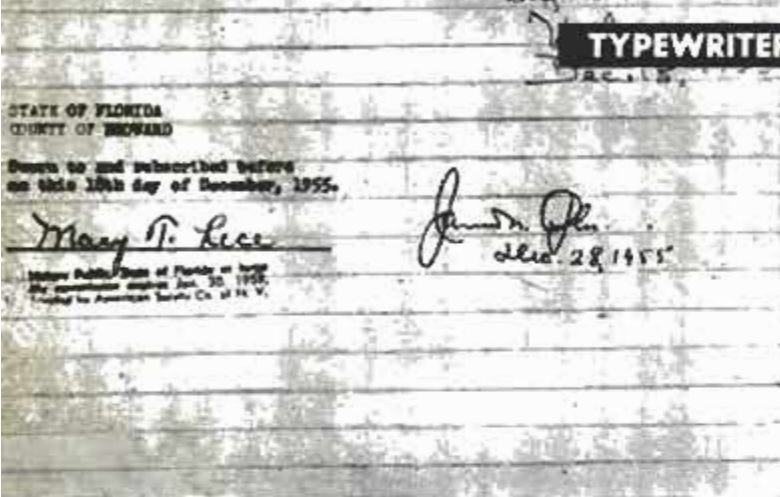
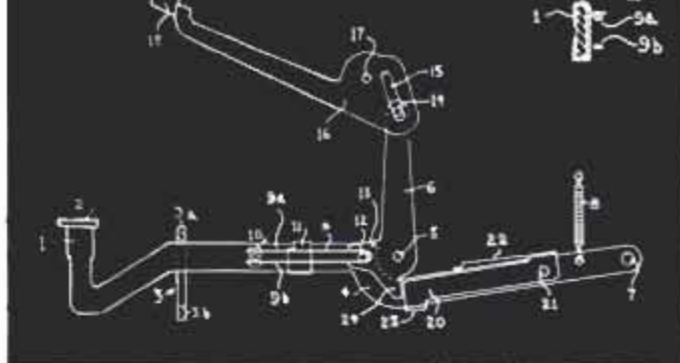
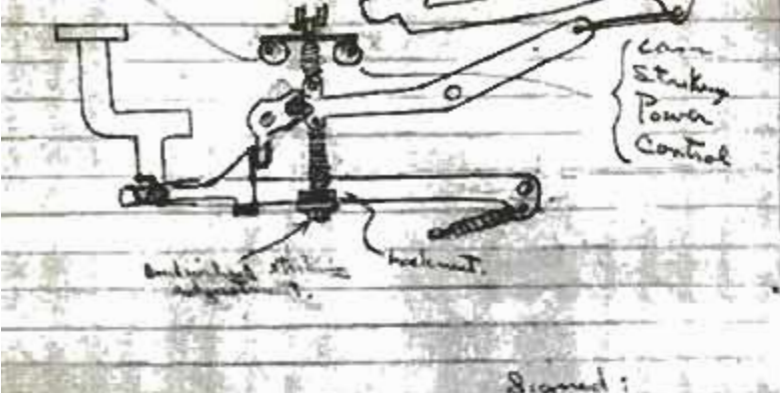
His explanation: "The world often thinks of the inventor as an eggheaded, antisocial personality who hides in an ivory tower with his slide rule. This is ridiculous.

"In fact, to be a success the inventor must actually show a genuine interest in, and enjoy close contact with, his fellow man. For the basic aim of inventing is to provide better solutions for human problems. He should bear in mind the admonition which Thomas Mann had inscribed on his tombstone: 'Be ashamed to die until you have

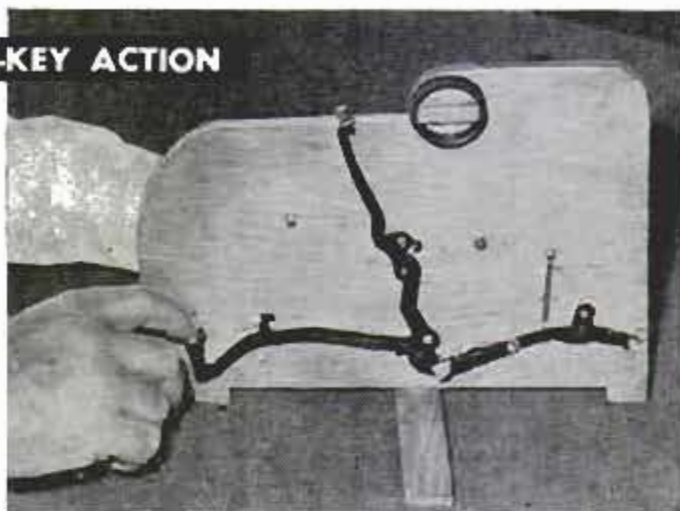
so contributed to the human race that it has been advanced because you lived'."

Ayres, who is listed in *Who's Who in America*, has contributed often and widely for the benefit of his fellow man. During World War II he offered his services to the Sperry Gyroscope Corporation. Within nine months he had devised 28 new inventions, mostly in radar—a word he'd never even heard before. Included were full color radar, three-dimensional (stereo) and anticollision aircraft radar.

Eleven of his inventions were immediately classified as war secrets by the U. S. Government. One of these, the famous radar-guided gliding BAT bomb which the Navy used so effectively against Japanese shipping, became—as far as he can deter-



TYPEWRITER-KEY ACTION



Inventor's progress: Notarized early drawing; sketch for patent application; sales demonstration model

mine—the first electronic self-guided missile for “homing” on enemy targets.

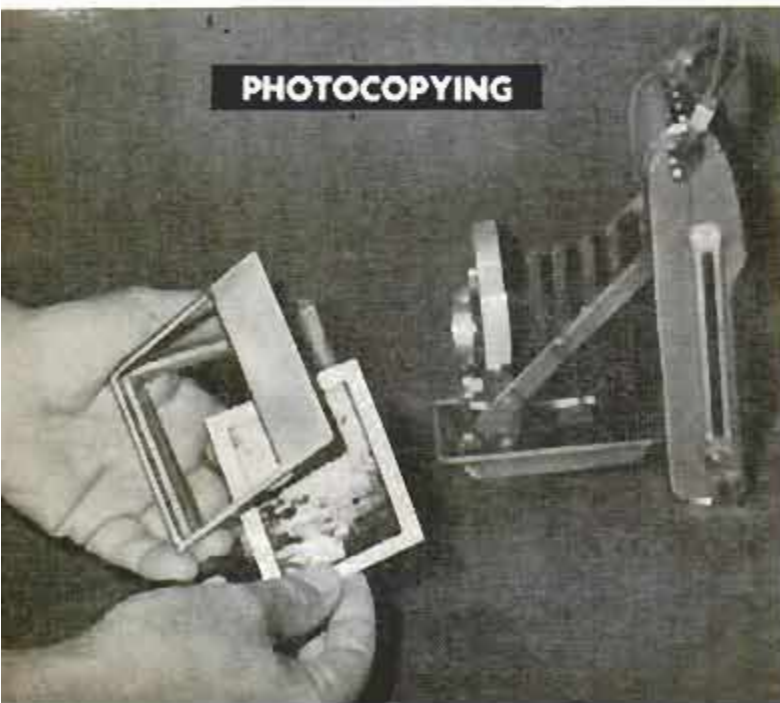
He is the originator of frictional recording for tabulating cards and ledger posting (an improvement over the conventional punched-card methods). He is credited with developing the world's first nonprofessional small camera for three-dimensional pictures which do not require a stereoscope for viewing. While employed by the White Sewing Machine Company (he'd had no sewing-machine experience whatever) he soon built a new machine which incorporated 141 improvements into

the company's product, 30 of them patentable, in spite of the fact he'd found some 20,000 sewing machine patents already issued in Washington for this extremely worked-out field.

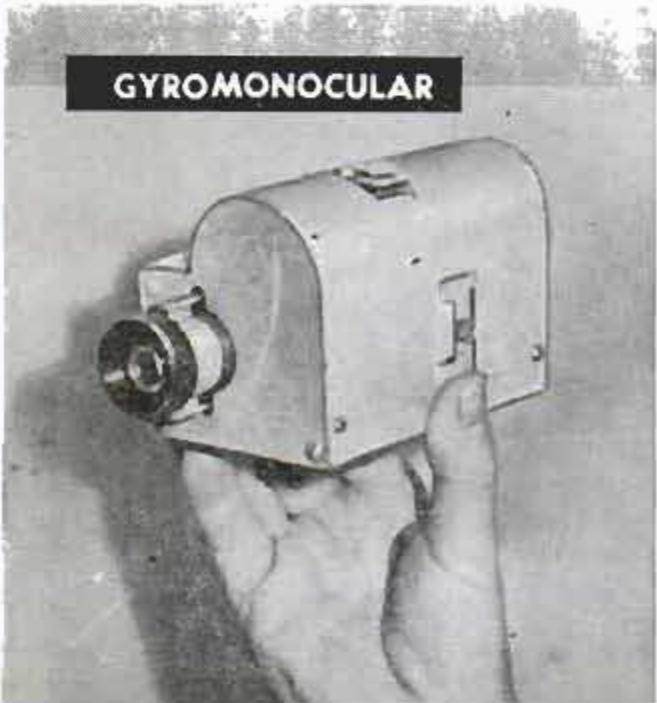
He has also invented such unusual things as underwater swimming gloves for divers, a plastic paper clip that won't rust and stain, a bow tie with grippers that prevent it from coming loose at one's collar, and a novel “puffer” device which milady can use in the sanctity of her boudoir to “powder her bare back in areas ordinarily inaccessible.”

Duplicating attachment built into Polaroid camera makes on-the-spot copies without copying device

Built-in gyroscopic stabilizer eliminates jiggling image in glasses of over eight-power magnification



PHOTOCOPYING



GYROMONOCULAR



Mr. and Mrs. Ayres didn't like the skin-diving gloves available; invented the collapsible gloves shown

There are certain steps which the would-be inventor should follow to insure his greatest chance for success, says Waldemar Ayres. Consider how the veteran completed these successive steps while perfecting a new typewriter keyboard action:

(1) *Judging the need.* Unless you can honestly see a genuine requirement for the product, forget it, he urges. You likely will not earn enough from it to pay for the energy, time and money invested. "It is said less than five percent of the approximately 80,000 U. S. patents that are annually applied for earn enough to pay their patenting costs. Main reason for this is the inventors failed to spend as much thought in selecting what to invent as they did later in solving their inventing problems."

In the case of his new typewriter-key action, preliminary research had revealed people bought electric typewriters mainly to enjoy the perfectly even blackness of printing such machines provided. Yet some 65 percent of the typewriters being sold were still manually operated. Ayres reasoned that if he could cause the conventional machines to type with the same evenness of the electrics a real need could be met.

(2) *State the problem.* The successful inventor learns to first write out his problem, fully and clearly. This initial record, incidentally, can in time become part of your "Invention Disclosure." It can be quite informal, so long as it clearly states what you intend to do, and how you hope

to do it. Since all U. S. patents are issued on the basis of dates, it is quite possible to lose your entire invention by being a *single day* behind a competitor who may have the same invention in mind. So be sure to date this original paper and have it notarized, even should it be hastily written upon the back of an envelope (as has sometimes been done). More on this later.

"Write down *all* the objectives, even if you haven't the faintest idea how you will achieve them," says Ayres. "Aim high, at what you feel would be the ultimate achievement. If it be a complex problem list the major elements and their dependent elements. This will serve to reduce the one large problem into a series of smaller ones that you can more successfully overcome, one at a time.

"Tackle the major elements first, since your solution to these will often modify the subsidiary considerations accordingly. Don't hesitate to invest considerable thought at this stage, since it can save you much trouble later. This careful stating of the problem at the outset will often carry you a long way toward its solution."

Ayres' problem was briefly this: Unevenness of typing resulted because the typist invariably struck some keys harder than others. Hence, he would have to design a key action that would produce letters and numerals of the same blackness on the paper even though the keys be struck unevenly.

(3) *Acquaint yourself with the materials*

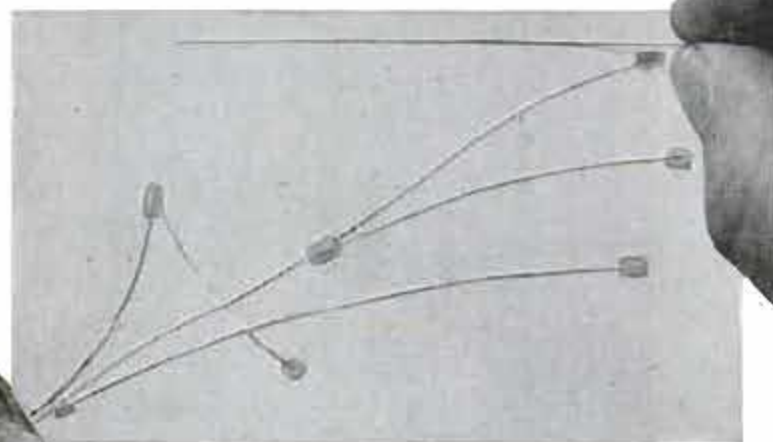


and forces involved. Obviously, you must study and provide yourself with a working knowledge of the things you will be working with. If you intend to invent or improve something mechanical you must have a knowledge of mechanisms; and the same for chemical and other fields. Wally Ayres went to a large typewriter repair company in his city and borrowed an old key action. He removed one key and mounted this on a small piece of plywood breadboard so that when he depressed the key the associated linkage operated and caused the lone type face to strike a small cross-sectional piece that he'd cut from a discarded roller and mounted in proper position on the board.

He played with this gadget. Here before him, then, were the materials, the forces he would have to work with.

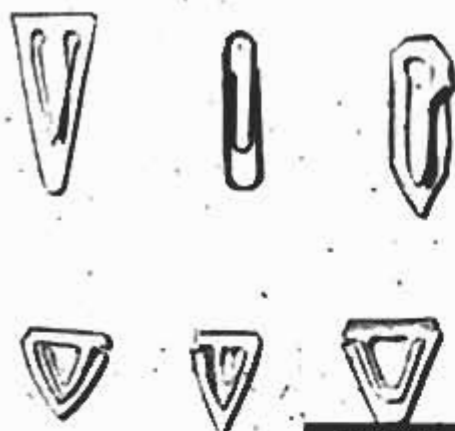
(4) *Arrive at a solution, striving for as many alternative methods as possible.* This is your chance to let your imagination roam, to show your originality. It is surprising, the veteran inventor says, how many of us, by the time we become adults, are conditioned to standardized thinking as a result of reading, watching movies and TV and talking with others. "Originality is the ability to climb out of these ruts of thought and explore new possibilities," he says. "Thinking of alternative solutions, then selecting the best working and least expensive answer to the problem, is one of the *principal* things we can do to insure success in inventing."

He recommends playing chess and reading science fiction as a stimulus to the would-be inventor to develop imagination and originality. The former recreation invites you to continually work out various alternative combinations of moves. ("Definitely a form of inventing!") And the second pastime not only encourages exploring unusual fields of thought, it also teaches the reader a surprising amount of science.



Using special magnifying glasses, Ayres works on hair-sized glass tubing shown in center. Below, Mrs. Ayres inspects a 3-dimensional photograph made through his lenticular stereoscopic lens screen





PAPER CLIPS

Seven styles of plastic paper clip were considered before choosing the final design for patenting

Another helpful device, he says, is to repeatedly state your problem to your subconscious mind, particularly just before going to sleep, since this portion of the brain seems to work a 24-hour-daily shift and can often solve problems for us without our being aware of the process. Sometimes it may take months, of course.

To avoid risk of being charged with "abandonment" of your invention idea you should now be doing some work on it (that you can prove) at least every two months until you are ready to file for a patent.

After considering many alternatives Ayres arrived at this conclusion with regard to his typewriter problem: In the



NONSLIP TIE

Bow-tie wearer Ayres didn't like the clips on his ties; invented a successful nonslip collar clip

ordinary "momentum" machines it wasn't how far, but how fast one pushed the key that determined the blackness of the typing. You always push the same distance. If these principles could be reversed, therefore, so that the force delivered to the striking key is a function of how far, and not how fast you push it, and since you are always going to push it the same distance, you should be able to achieve printing uniformity.

A simple rubber band had helped him arrive at this conclusion. If he pulled the band back a given distance, then released it, it would snap against an obstruction

(Continued on page 302)

Every inventor's objective—proof of his issued patent. This is the patent for a 360-degree movie lens

UNITED STATES PATENT OFFICE
324216
CYCLORAMA OPTICAL SYSTEM
William A. Ayres, New York, N. Y., applicant by International Business Machines Corporation, New York, N. Y., a corporation of New York
Submitted October 4, 1955; Serial No. 523,297
1 Claim, 105, 16—55

This invention relates to improved means for recording and projecting cyclorama and/or moving pictures.

An object of the invention is the provision of a reflector or mirror reflector in position to be associated with a camera in order to take pictures of a cyclorama 360° around of scenes that are recorded and projected.

Another object of the invention is the provision of a reflector or mirror reflector associated with a camera or projector to determine selectively the upper and lower limits of working areas of a projected and projected horizontal band substantially a complete vertical range of light ray heights.

A feature of the invention is the association of a camera lens with a reflector to view it or use with a camera or projector associated to a horizontal band.

Further and other objects of the present invention will be understood and made clear in the following description and claims and in the drawings which show by way of illustration a preferred embodiment and the objects thereof and which I have contemplated of applying the principles. Other modifications of the invention encompassed by the claims or equivalents may be used and structural changes may be made to those shown in the drawings without departing from the present invention and within the scope of the appended claims.

In the drawings:
FIG. 1 is a perspective view showing the structure of a cinematograph reflector with a camera or projector.
FIG. 2 is a plan view of the reflector shown in FIG. 1.
FIG. 3 is a perspective view of the camera or projector associated with the reflector shown in FIG. 1.
FIG. 4 is a perspective view of the camera or projector associated with the reflector shown in FIG. 1.

The invention relates to improved means for recording and projecting cyclorama and/or moving pictures. An object of the invention is the provision of a reflector or mirror reflector in position to be associated with a camera in order to take pictures of a cyclorama 360° around of scenes that are recorded and projected. Another object of the invention is the provision of a reflector or mirror reflector associated with a camera or projector to determine selectively the upper and lower limits of working areas of a projected and projected horizontal band substantially a complete vertical range of light ray heights. A feature of the invention is the association of a camera lens with a reflector to view it or use with a camera or projector associated to a horizontal band. Further and other objects of the present invention will be understood and made clear in the following description and claims and in the drawings which show by way of illustration a preferred embodiment and the objects thereof and which I have contemplated of applying the principles. Other modifications of the invention encompassed by the claims or equivalents may be used and structural changes may be made to those shown in the drawings without departing from the present invention and within the scope of the appended claims. In the drawings: FIG. 1 is a perspective view showing the structure of a cinematograph reflector with a camera or projector. FIG. 2 is a plan view of the reflector shown in FIG. 1. FIG. 3 is a perspective view of the camera or projector associated with the reflector shown in FIG. 1. FIG. 4 is a perspective view of the camera or projector associated with the reflector shown in FIG. 1.

OPTICAL SYSTEM PATENT

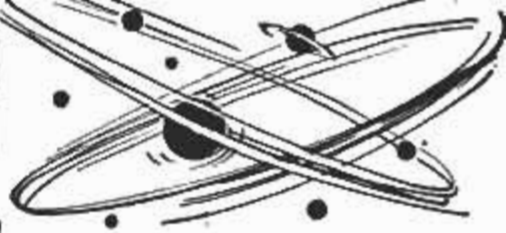
FIG. 1. FIG. 2. FIG. 3. FIG. 4.

1955 105
William A. Ayres

AN EYE ON SPACE

By Dr. Dan Q. Posin

PROFESSOR OF PHYSICS, DE PAUL UNIVERSITY
SCIENTIFIC CONSULTANT AND ADVISOR, COLUMBIA BROADCASTING SYSTEM



WHAT IS THAT THING paddling around out there?" a friend asked the other day. "This paddle wheel satellite gizmo has four paddles, but where's the water to paddle, or the air?"

It isn't paddling anything. It just looks like a paddle wheel. The paddles are fixed to a more or less spherical body, a bit elongated. It's 26 inches across the stomach, and 29 inches tall. The thing weighs 142 pounds.

The paddles themselves are studded with solar batteries for recharging the ordinary chemical batteries of the satellite. Each paddle has 2000 solar batteries—1000 on each side. So a total of 8000 sunlight-snatching devices are supplying the rejuvenating power for the orbiting paddle wheel.

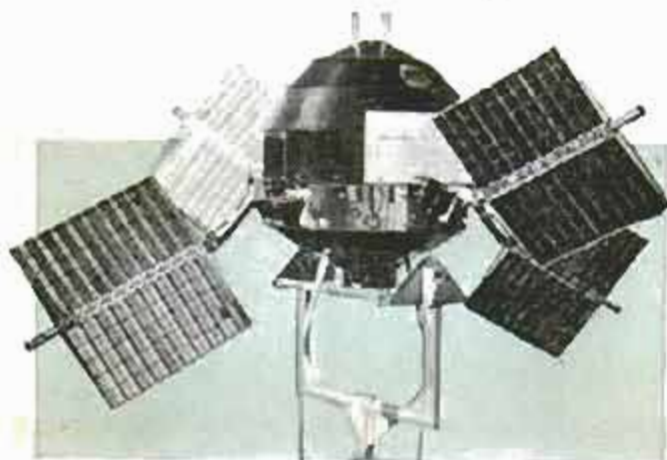
This is not the first time that solar batteries have been installed in a satellite. However, this installation is really knocking on big time.

Solar batteries make use of the basic principle that sunlight can be converted into electricity. The mechanism of conversion is something like this: From sand we extract pure silicon; this silicon, in its molten condition, is given a pinch of a special impurity — arsenic for example (but not old lace). Then, upon cooling, we have a crystal of what we might call "poisoned silicon." From the crystal we slice a wafer, and this is coated with a thin layer of boron. If sunlight now falls on the crystal, electrons in droves are knocked off the silicon atoms, and this flow of electrons is electricity. The solar battery can last hundreds of years, and thus is an instrument which extracts the free gift of radiance from space for the uses of man.

The launching of the paddle-wheel satellite was accomplished by a three-stage Thor-Able rocket, with a horizontal take-off speed of about 22,000 miles per hour. Since even 18,000 miles per hour would have been sufficient to orbit the satellite, the excess of 4000 miles per hour produced an overshooting effect, resulting in a very elongated orbit. A launching at still greater speed could make a satellite have such a long elliptical orbit that it would enclose the moon in its journey. And a still higher launching speed would produce an open curve—that is, the satellite would escape the Earth for keeps. The paddle-wheel satellite goes out to about 25,000 miles at its furthest from the Earth, and comes in closer than 150 miles at its nearest. It transmits the findings of about 15 major experiments. Investigation is being

made of the radiation belts around Earth, the magnetic field of our planet, the electrical condition of our planet, cloud cover, communication through space, the nature and intensity of cosmic rays, and the amount of space dust and particles.

Meanwhile, of course, other successful launchings have been made. Capsules similar to the "home" of the first astronaut have been fired into orbit, although attempts to recover them, at the moment of this writing, have failed. But the heavens are opening up. Here we come!





Chevrolet has restyled its rear for 1960. Toned down are the sweeping fins, and the teardrop taillights are gone



Chevrolet Tones Down Its Flash a Bit

CONTINUING its basic chassis without major changes, Chevrolet restyled its front and rear to look a little less rash.

To increase trunk-loading convenience, the rear-deck sill has been lowered 1.5 inches. Brakes have been improved. The front wheel cylinders are larger. A new parking brake uses a ratchet application so a second stroke can be taken if necessary to hold the car on steep inclines or if

the brakes are somewhat out of adjustment.

Engine changes are in the interest of economy. The standard V8 now has a low-lift camshaft. The carburetor is recalibrated for more miles per gallon. High-performance engines are virtually unchanged. Fuel injection is available only on the Corvette (which is unchanged this year).

The four-speed handshift is available as an option for all passenger cars.

Chevrolet offers three wagons. Continued is its rear-facing third seat. Pictured is the Nomad model





Pontiac

Pontiac gets a completely new grille shaped like a V. Transmission hump has been reduced. The steering wheel is one inch smaller on the Bonneville, half inch on the standard models

SPORTING both a classic and a racy look, Pontiac has new sheet metal front and rear. Continued is the optional V8 economy engine with a new miserly two-barrel carburetor. The rear-axle ratio is lowered for economy. Pontiac now has a horizontal speedometer, and there's a new series, the Ventura, with two hardtop models.

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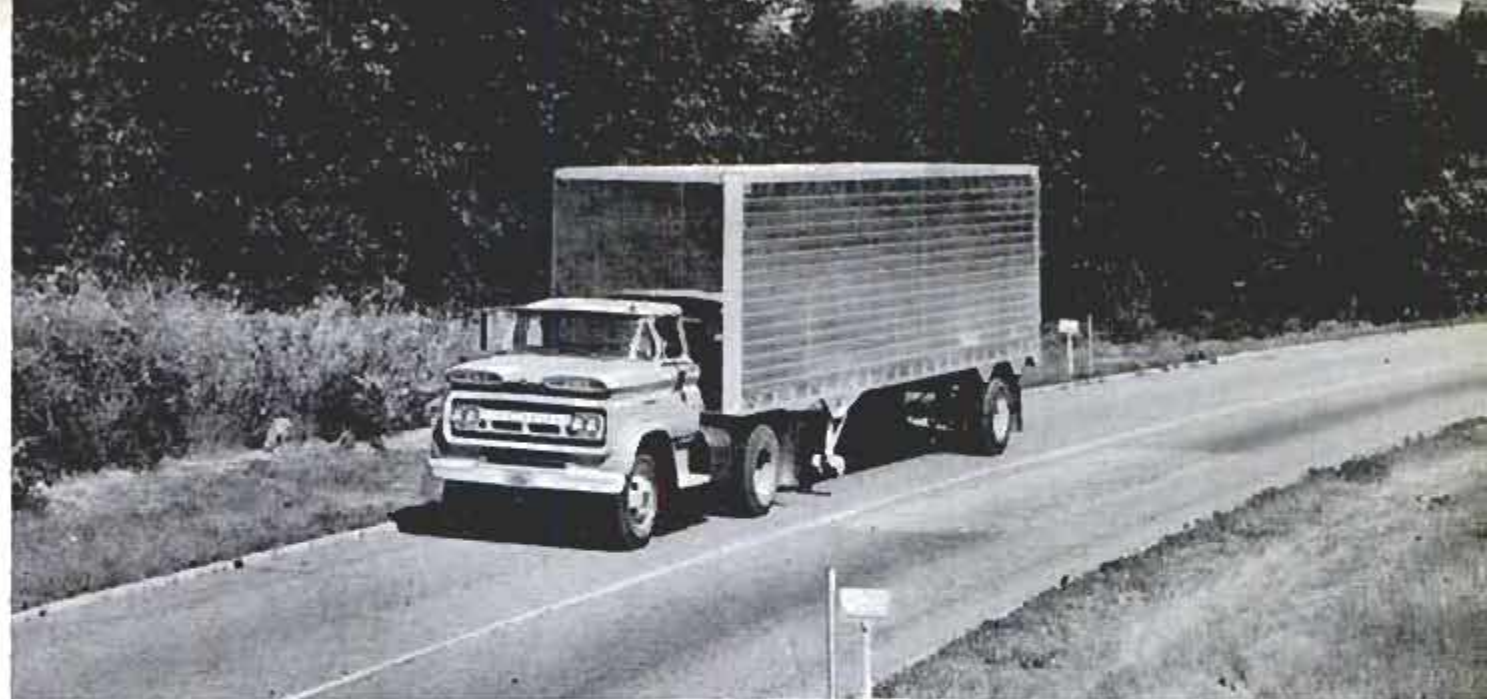
OLDSMOBILE is 2.1 inches shorter in the 98 and 0.8 in the other series. It's lighter by 15 to 25 pounds. An economy engine available for the "Dynamic 88" operates on regular gas. New is a three-seat wagon with a rear-facing third seat that folds into the floor effortlessly. Olds also has a new instrument cluster.



Oldsmobile

Olds has removed its fins. It looks lower, sleeker. The rear doors open five inches wider for easier entry. A lower axle ratio provides more economy, and the transmission hump in the front floor has been lowered





Styling is new, but the big news is chassis where passenger-car comfort is added to trucks as big as this

Chevrolet Trucks Get Independent Front Suspension

Pickups are as much as seven inches lower due to frame kickup. Loading is easier. No step is needed to get into seat so floor is now full width



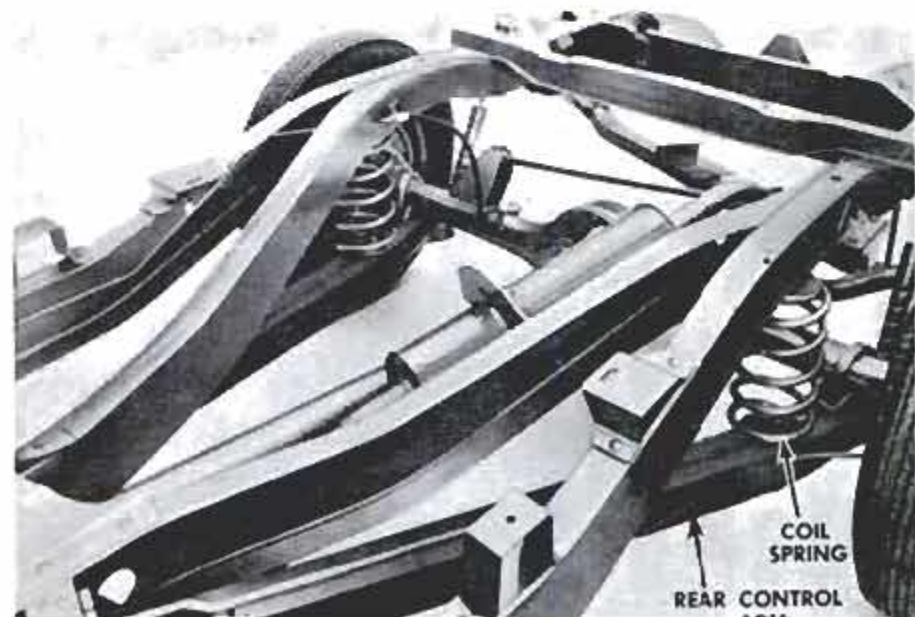
TRUCK DRIVERS can now smile at bumps, forget about pitch and sway. Chevrolet has independent front suspension, first ever offered on an American truck.

It comes on all sizes from the small, light pickup to the huge semitrailer. The only exceptions are the four-wheel-drive models and the forward-control trucks used for around-town deliveries.

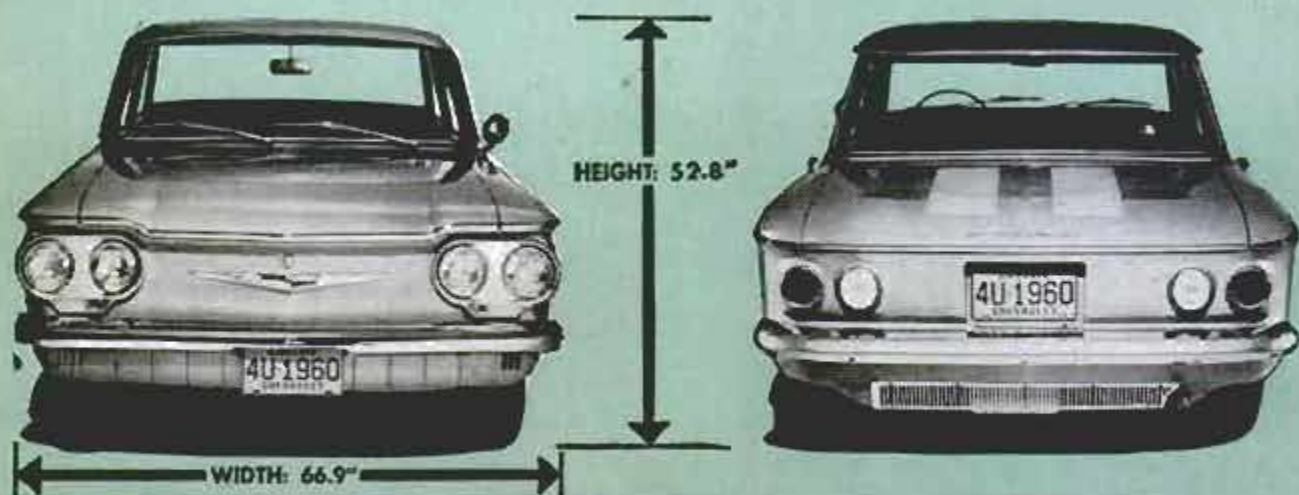
Front springs are torsion bars that run longitudinally alongside the frame members. Ball joints are used in front.

At the rear, coil springs come on trucks up through the $\frac{3}{4}$ -ton size, leaf springs are on the 1 and $1\frac{1}{2}$ -tonners, while the big jobs have a new variable rate, two-stage leaf spring that provides a smooth unloaded ride yet can handle heavy loads.

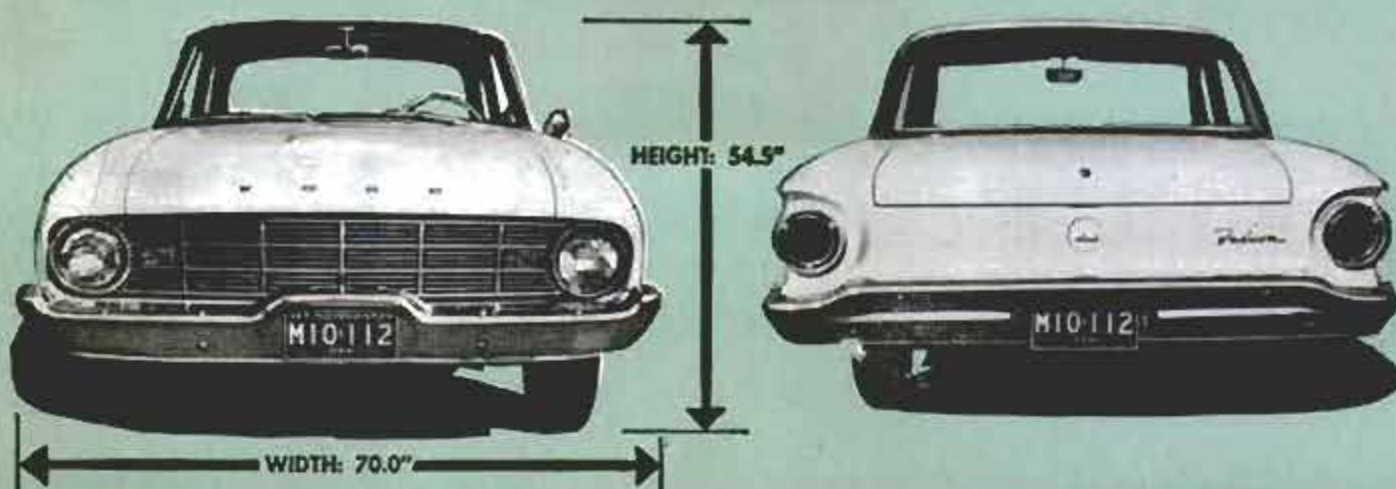
Left, light-duty rear suspension. Note frame kickup. Right, heavy-duty front suspension with torsion bars



Here They Are: **AMERICA'S**

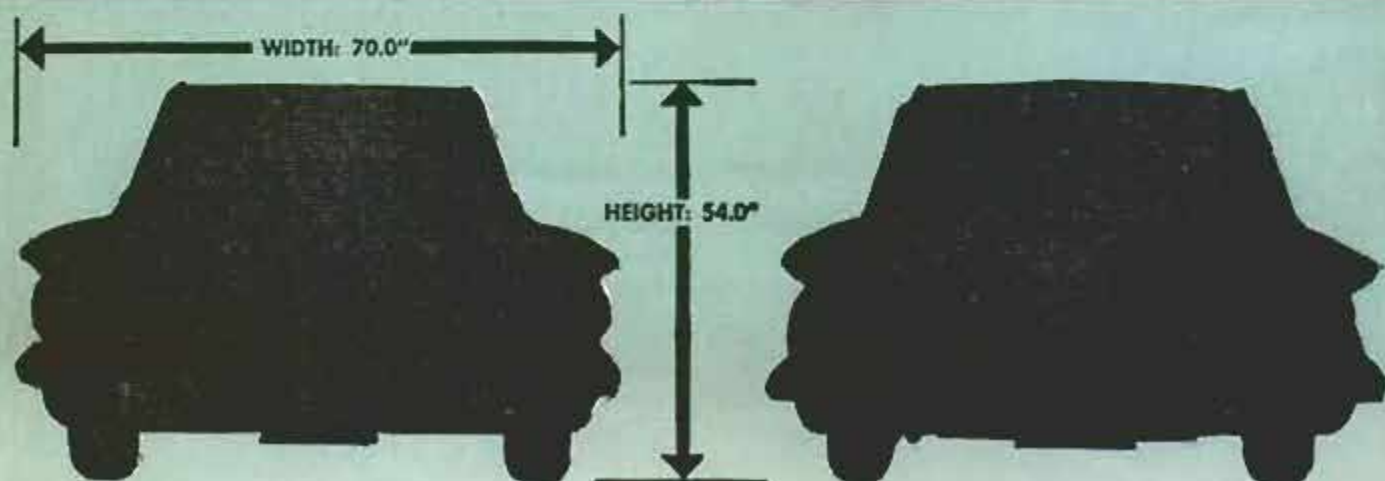


Taking the bold approach, the Chevrolet Corvair offers more innovations than any car ever to come out of Detroit. It's a fresh, new design on the American scene.



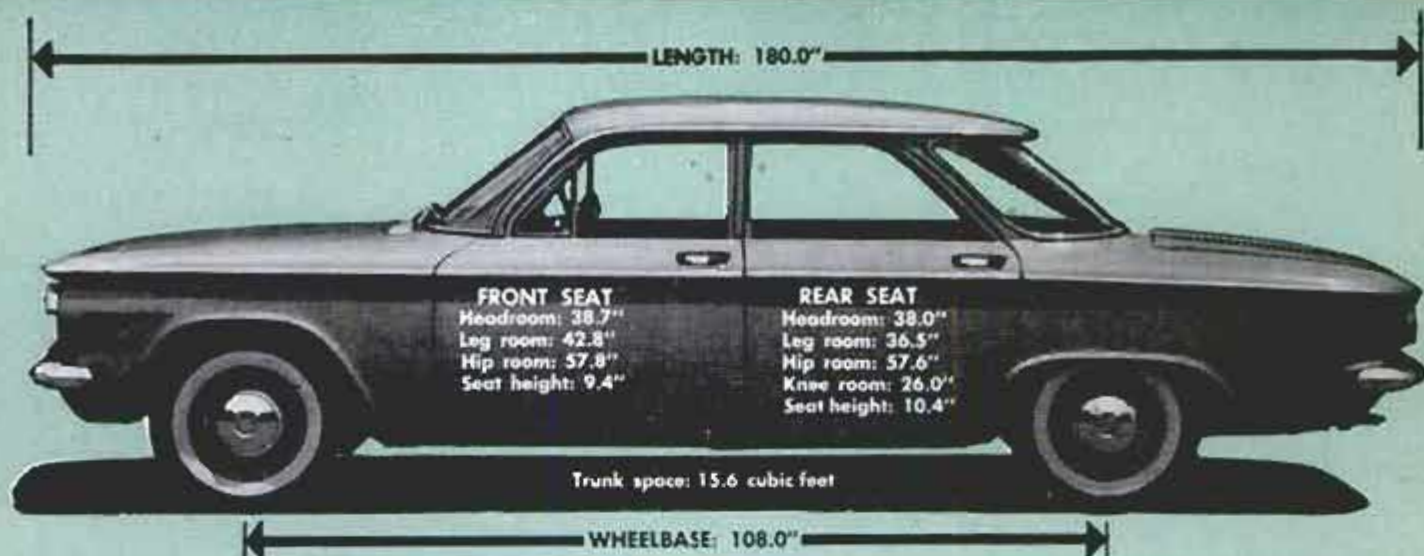
Playing the game conservatively, the Ford Falcon has a simple, conventional design. No rash innovations here. It is time-tested and even its styling is quiet, dignified.

Still under wraps, the Valiant has been "styled" more than the others. It looks bigger, more luxurious, less like an economy car. It has some bold engineering ideas.

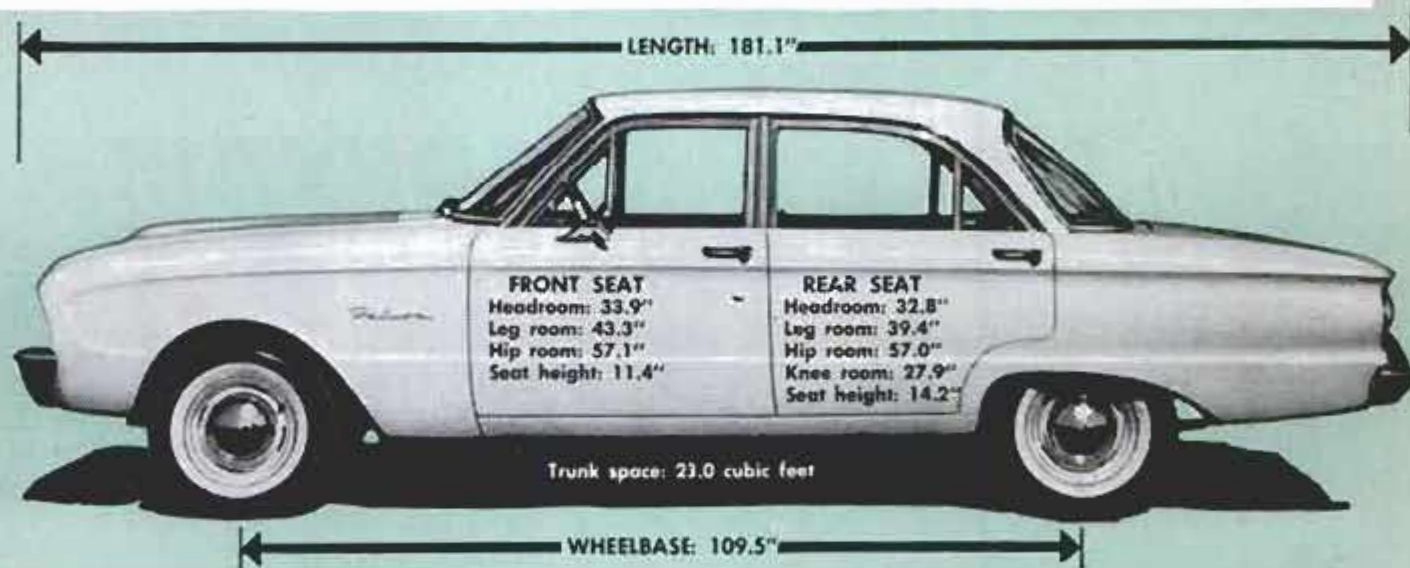


NEW SMALL CARS

By
Art
Railton



TURN PAGE FOR MORE DETAILS ON THE **Corvair**



SEE PAGE 112 FOR MORE DETAILS ON THE **Falcon**

SEE PAGE 116 FOR MORE DETAILS ON THE **Valiant**





Stylists have given the car a conventional look despite its rear engine. Only one body style, a four-door sedan, is available now

CORVAIR —

REVOLUTIONARY, BOLD, daring — these words fit the Chevrolet Corvair.

Here is the most radical engineering design to come down the American road since the car pushed the horse out of the barn.

It has an air-cooled, rear-mounted, horizontal-opposed, six-cylinder engine made with plenty of aluminum to keep it lightweight.

It has independent suspension on all four wheels. It has a rear-mounted transaxle, with a minimum of unsprung weight.

Its neat-and-tidy engine is designed for accessibility. Every part (except the starter) is right out where you can get at it once you lift the rear deck lid (or is it the hood?).

Displacement is 140 cubic inches; bore is 3.375 inches; stroke is 2.60 inches; compression ratio is 8.0 to 1 and the engine thrives on regular gasoline.

Above, with automatic transmission, shift lever is in the dash. Left, a rear engine allows a flat floor with lots of leg room





Top, without fins or razzmatazz, the car has a well-tucked-in look, especially in back. Only the louvers atop the rear deck indicate a rear-mounted engine



Left, luggage goes in front. Visible are spare tire and gas-fired heater. Right, optional rear seat folds to convert back compartment into vast luggage area

The Bold One

It develops 80 horsepower at 4400 revolutions per minute and will drive the car 80 miles per hour all day without strain.

Although *PM* has made no tests (these will come later) at this writing, the car is expected to average between 22 and 25 miles per gallon.

The lightweight engine does not have an aluminum block, as early reports suggested. Actually, it does not have a block at all, in the usual sense. Instead, its aluminum-alloy crankcase is the engine's main structural element. It is made in two halves and bolted together. A sheet-steel oil pan goes on the bottom and an aluminum cover goes on the top to form the engine's central structure.

Three cast-iron cylinders lie flat on each side and are bolted into a unit by an aluminum cylinder head. The whole structure is covered by a sheet-metal shroud that directs cooling air from a horizontally mounted blower down over the finned cylinders and out the back end.

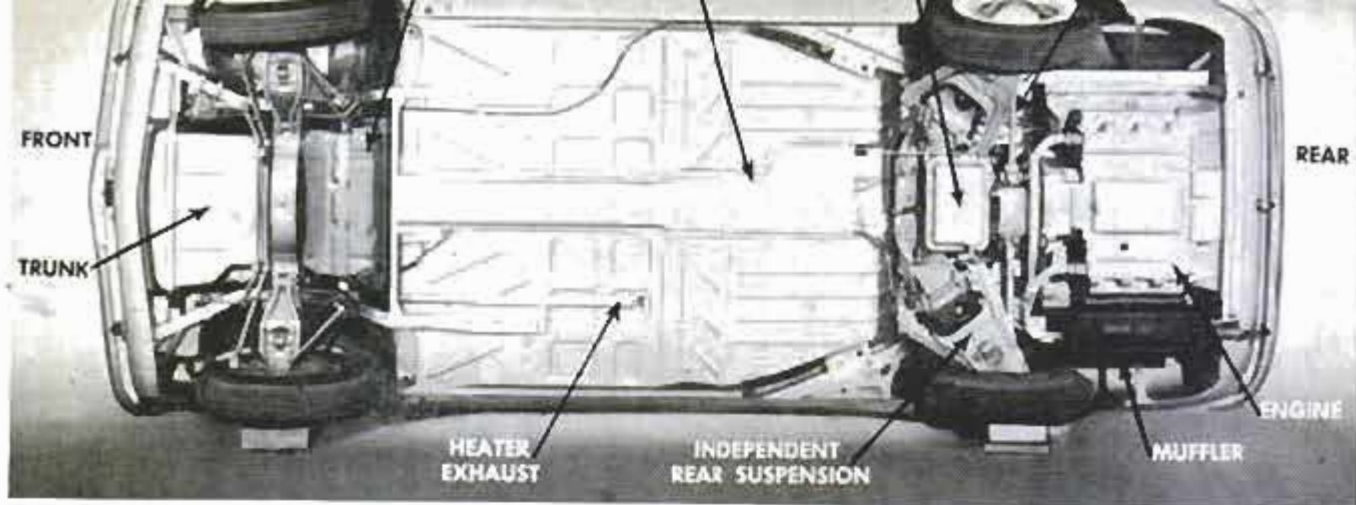
The blower is driven by a long fanbelt that comes up from a crankshaft pulley and makes a right-angle turn over two more pulleys to drive the blower shaft.

The body is 180 inches or exactly 15 feet long. Wheelbase is 108 inches. The car turns in a 39-foot circle.

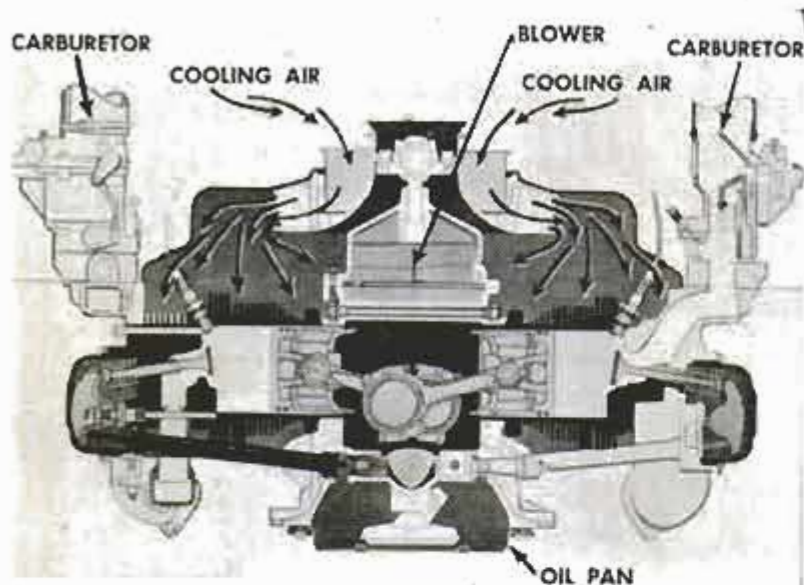


Gas-tank filler pipe is in left front fender. Tank is under the floorpan. Below, there's more luggage space behind the rear seat. Note amount of leg room

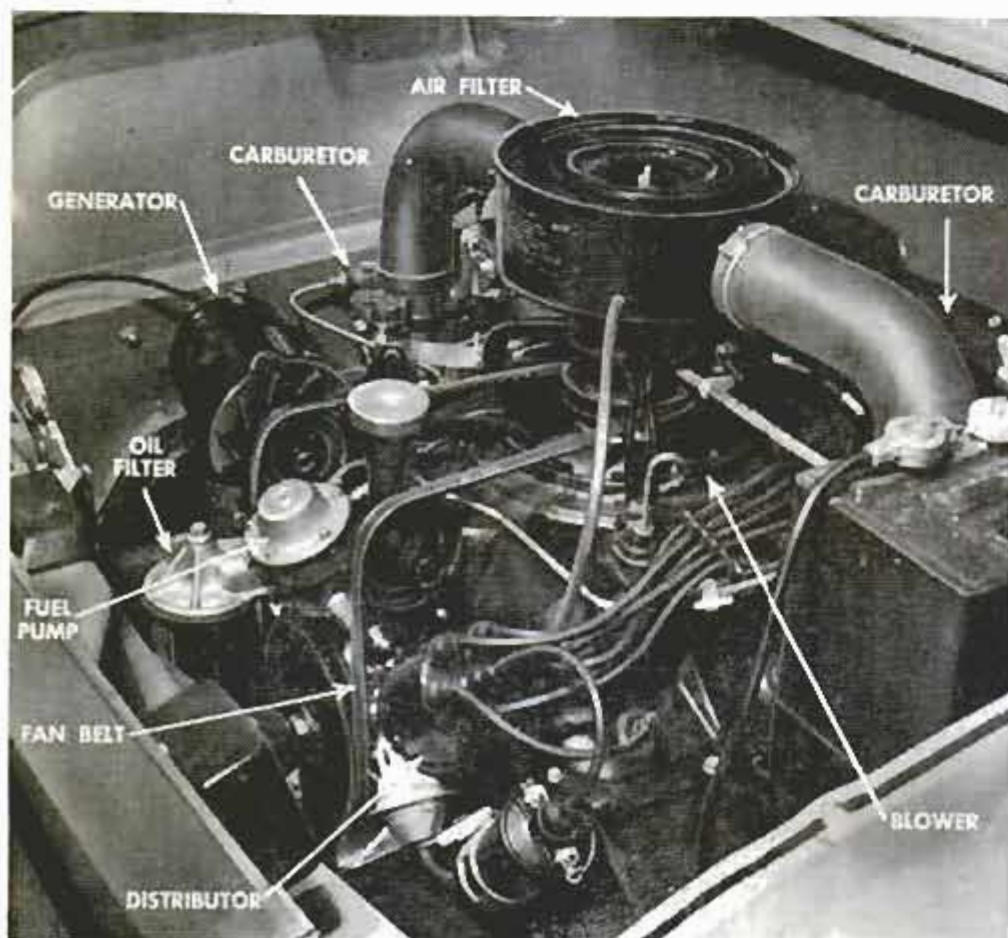




Here's a pavement view of the Corvair. Black line snaking along top of floorpan is the speedometer cable



Above, arrows show how blower forces air over finned iron cylinders. Below, the engine as it appears in the "trunk"



And it is low. Over-all height, unloaded, is 52.8 inches, which means that a tiny five-foot girl towers over it.

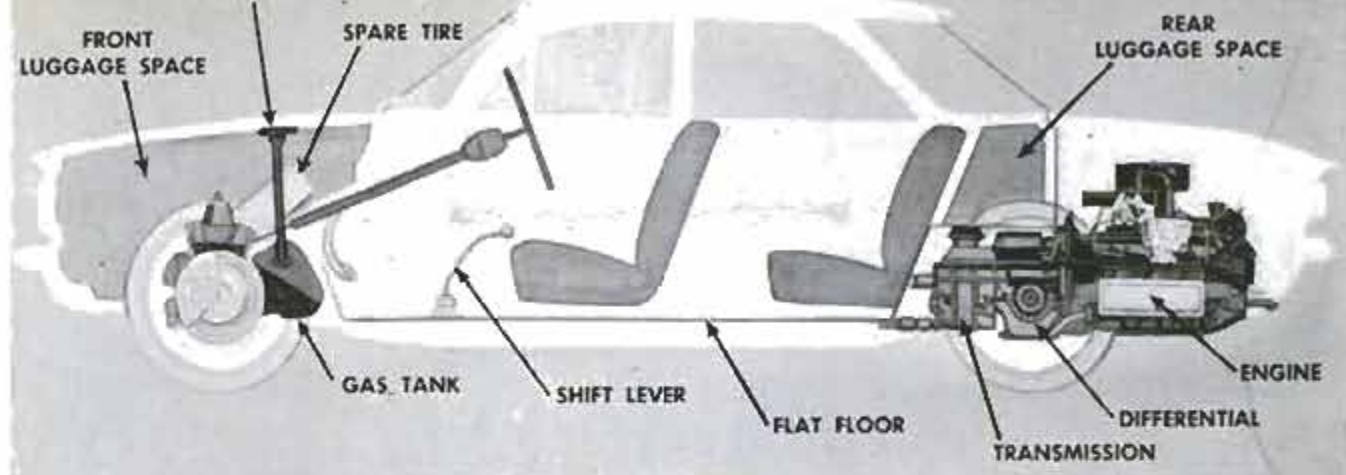
Yet, it is a six-passenger design. It is minus some width by big-car standards, but in other dimensions it is right up there with its big brothers. Seat cushions are high and well padded across their entire width, because of the absence of a tunnel.

The floor is flat, front and rear, except for a one-inch bulge that you can hardly see. Inside this tunnel are all the control linkages, brake lines, fuel lines and electrical harness. The underside is flat and clean, which cuts wind resistance sharply.

Being air-cooled, it needs no radiator (except a small oil cooler inside the engine), no hoses, no water pump, no anti-freeze, no water at all.

Two transmissions are offered: A two-speed automatic and a three-speed handshift, synchromesh in second and third. The short, positive shift lever of the handshift box is mounted on the floor. The automatic transmission is controlled by a stubby lever that sticks out of the dashboard. Instead of moving the pointer, you move the quadrant behind it.

The heater is gas-burning and delivers heat in 30 seconds.



Gas tank is under floorpan, protected by the front suspension. Floor-mounted shift lever works crisply

Gasoline is carried in an 11-gallon tank mounted just behind the front suspension members and down below the floorpan where it is safe from damage in either a front or rear collision. The filler pipe comes up through the left-front fender.

Luggage space is no more than adequate. A rear-engine design does not provide the same amount of luggage space per inch of over-all length as a front-engine design. The Corvair has two luggage bins—one under the front hood contains 11.3 cubic feet and another behind the rear seat has 4.3 cubic feet. Optional is a folding rear seat which converts the entire back compartment into a flat floor.

Coil springs are used on all four wheels. Body construction is of the unit type, completely welded. Anticorrosion treatment includes the use of a high-zinc-content coating prior to welding in such critical spots as sills. In addition, a wax-base aluminum-flake compound is forced inside sills and other critical areas after welding to seal and coat places where condensation is likely to collect. Chevrolet considers this treatment superior to the dipping process used by other unit-body builders.

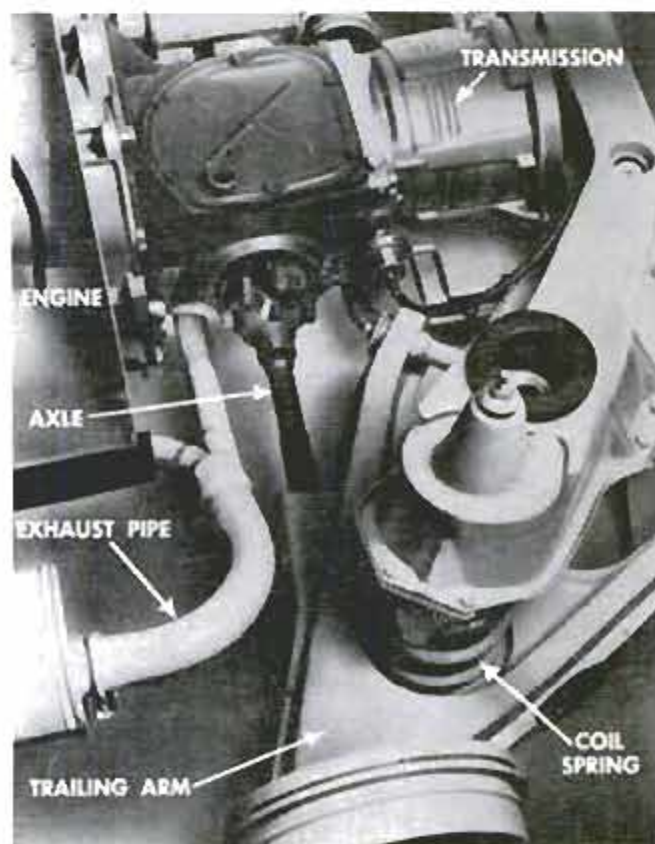
One often-overlooked advantage of the air-cooled engine is its rapid warmup. The automatic choke goes off much sooner than with water-cooled engines, saving fuel on short runs in winter.

Incidentally, the Corvair has two carburetors — one for each bank of three cylinders. One centrally mounted air cleaner is used and the automatic choke operates on the air-cleaner intake rather than at the carburetor as is customary.

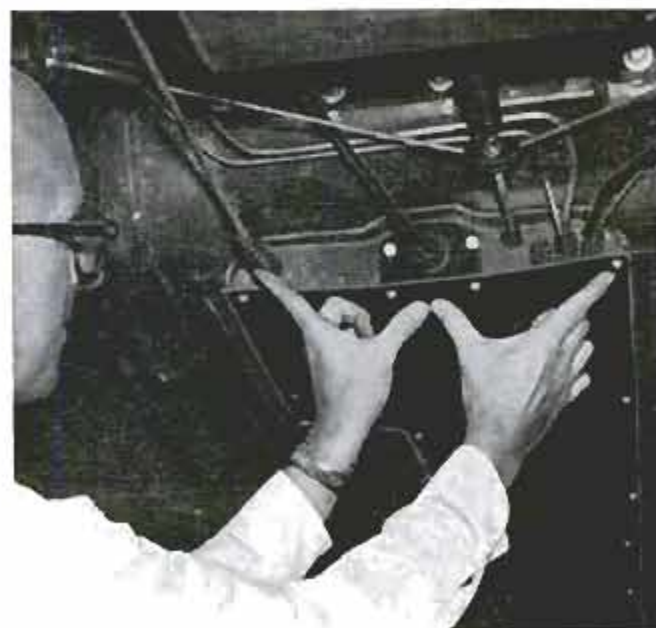
How does the Corvair ride and drive?

It is amazingly quiet. There is none of the engine clatter common to air-cooled foreign engines (the hydraulic tappets are responsible for most of this quietness). There is an absence of vibration, ride is

(Continued to page 300)



Above, rear suspension with automatic transmission. Below, under-floor control tunnel carries (left to right) shift rod, accelerator cable, parking-brake cable, two fuel lines, brake line, wiring harness





Only 181.1 inches long, the Falcon comes as a four-door sedan and two-door. Wagons will be along later

FALCON—The Conventional One

CONVENTIONAL, SENSIBLE and simple—these are the words for the Ford Falcon. Every effort has been made to keep the car as troublefree and as uncomplicated as possible.

Even the styling is in character. Side panels are decorated only by neat, trim sculpturing that runs from headlights to neat, circular taillights. The grille is a simple oval with single headlights (here again evidence of the keep-it-simple philosophy).

Front fenders bolt on separately (despite the fully unit body) and can be replaced quickly if damaged. The heater is as uncomplicated as a fresh-air heater can be.

Yet there is no evidence of skimping. In-

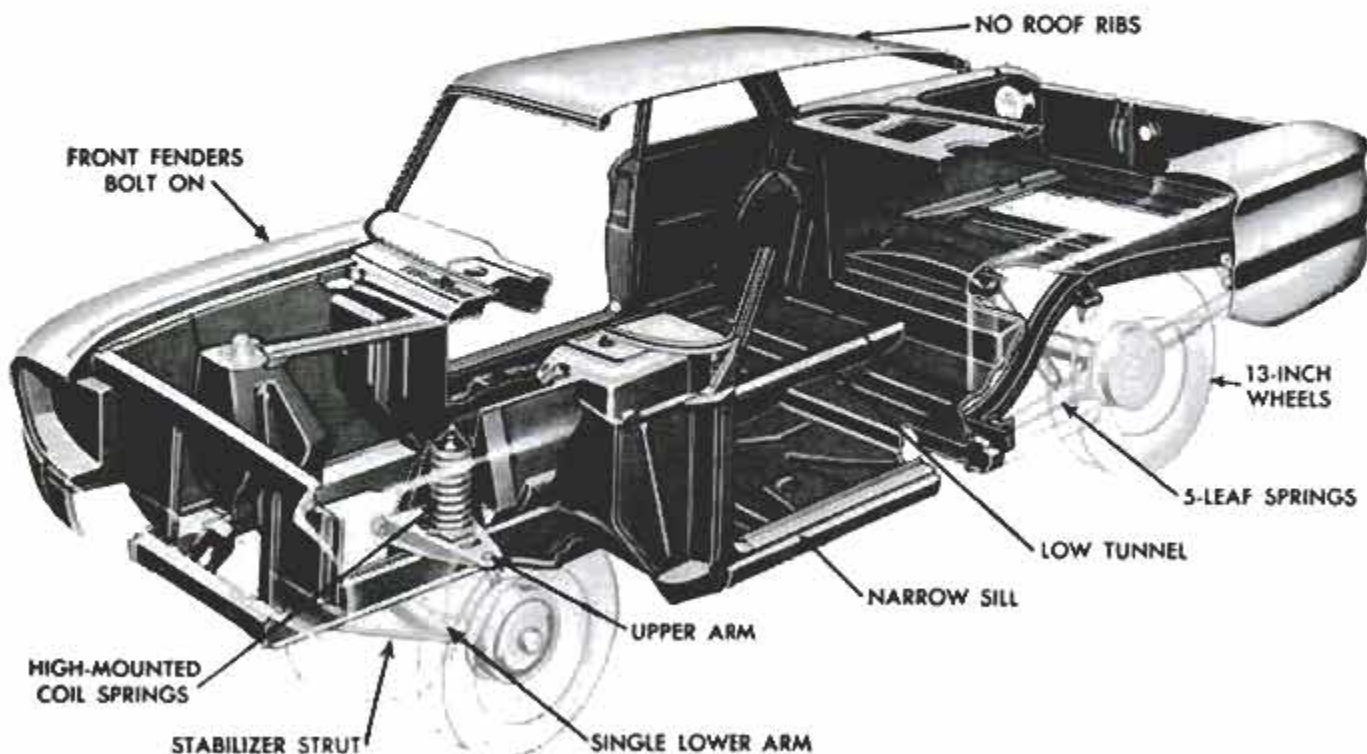
terior details are well done. Upholstery is luxurious to the touch and narrow-pleated in the expensive style. The ash tray, for example, moves in and out on nylon slides to add to the luxury feel.

The front seat feels deep and comfortable and has lots of plastic foam in it. The roof panel is well padded to keep the interior quiet and give a "big" atmosphere to the interior. Even the sun visors are held fast at each end in the best money-is-no-object tradition. Certainly it has no sensation of austerity.

What's under the hood?

There is a six-cylinder inline overhead-valve engine designed especially for the car. It is water-cooled. It has a cast-iron

Solid and roomy, the Falcon body is unitized. High-mounted coils are used in the new front suspension





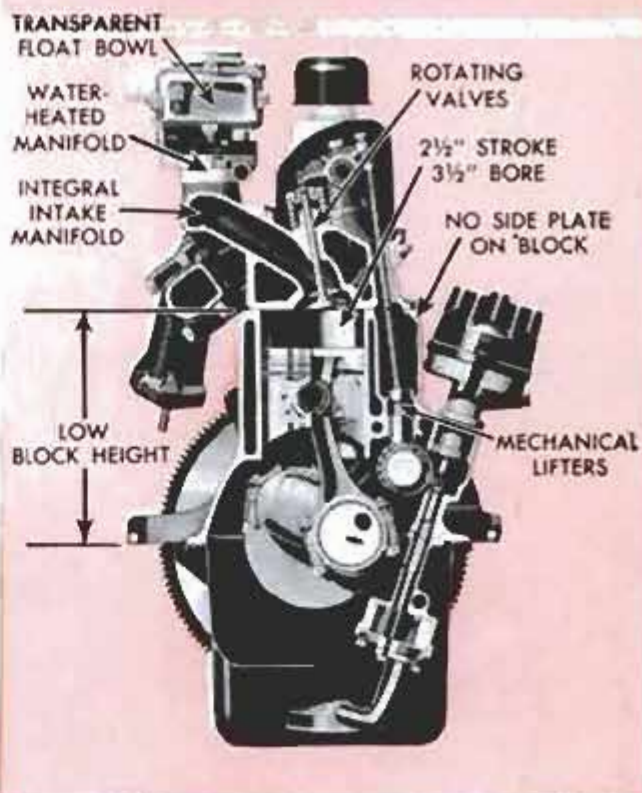
From the rear, the Falcon has a characteristic Ford look. Right, diagram of the car's brand-new engine

block and cylinder head. Displacement is 144.3 cubic inches, the bore is 3.5 inches and the stroke 2.5 inches. Horsepower is rated as 90 at about 4200 revolutions per minute. Compression ratio is 8.7 to 1.

Unlike the air-cooled Corvair engine (which is similar in displacement, having 140 cubic inches), the Falcon engine uses very little aluminum. The only place where the light metal is used is in the flywheel housing. Ford engineers claim that the use of aluminum to reduce engine weight is much overrated. If they had made the Falcon engine of aluminum, they say, it would weigh only 40 pounds less than it does.

With normal accessories, with oil, water

Below, dash design is pleasing, yet simple and the nonwrap windshield gives lots of entry room, right





Instruments are well planned. Gas and temperature gauges are needles, the others are warning lights



Above, the spare is flat in the trunk, yet there's ample room for any except the most heavily bagged. Below, it's amazing how simple an engine can be and how accessible. It's a mechanic's dream



and radiator included, the Falcon engine in running condition weighs only 379 pounds. The Chevrolet Corvair engine, which uses considerable aluminum, in the same condition weighs 343 pounds, only 36 pounds less.

Being conventional in layout, the Falcon has a driveshaft that runs through a low tunnel, which does not intrude into the passenger space as much as you would expect in a car only 54.5 inches high.

The engine design is ingenious, being made for lightness and simplicity. Unlike the other two small cars, the Falcon's engine stands upright (the Corvair's is flat, the Valiant's is tilted).

The block is very low, making it an extremely rigid package. The intake manifold is cast as an integral part of the cast-iron cylinder head. There are no gaskets to install or leak. The manifold looks like a length of pipe plugged at each end. Each cylinder has its own intake port.

The exhaust manifold bolts on in a conventional manner.

Valves use mechanical lifters and are rotating in the usual Ford setup.

The interior of the car is amazingly roomy with seats of excellent height (highest of the three cars, see page 107 for comparisons). Even in the center over the driveshaft tunnel there is ample padding. Headroom, too, is excellent. No crossribs are used in the roof which is rigid enough without them. As a result, there is more room for heads. This left no convenient central spot on which to mount the dome-light (normally a hump on a crossrib) so it is attached above the windshield.

You will be surprised at the ease of entry and exit. Because there is no wrap-around windshield, there is no dogleg to bang your knee on in front and the rear doors open wide for rear-seat entry.

On two-door models (it comes as a two-door and four-door) the door extends all the way back to the forward edge of the rear seat so entry to the back is unhindered.

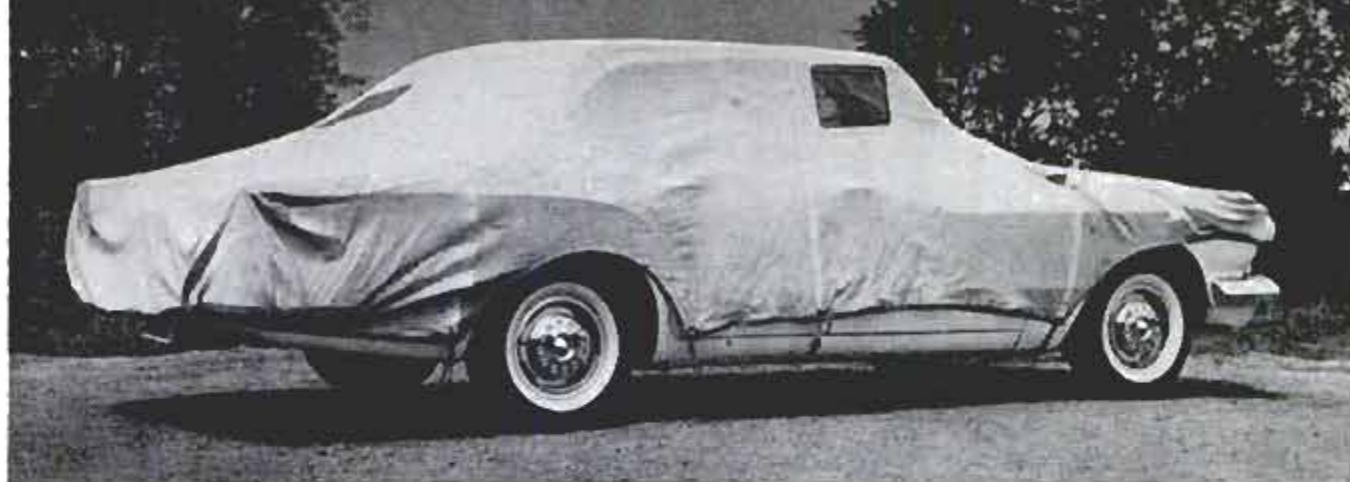
A fairly high lip runs across the back, but it does not interfere with loading into the well-planned and roomy trunk. The spare tire lies flat. Usable trunk space is 23.0 cubic feet (see page 107 for comparisons).

Weight of the four-door is about 2320 pounds. No station wagons are available yet, but they will be along come winter.

The optional automatic transmission is a scaled-down Fordomatic and has two speeds. The handshift gearbox is synchromesh in second and third and the shift lever is mounted on the floor.

Front suspension is a new design that has at least 50 percent less unsprung weight

(Continued to page 326)



Until next month when photographs can be shown, this under-wraps view of the Valiant will have to suffice

VALIANT—The Stylish One

CRISP, CONTINENTAL and muscular —these words fit the Valiant.

Unfortunately, this month we cannot print full photographs of the car. The release date is not until late in October. Next month, however, we will have complete photographic coverage of the Valiant and all other 1960 cars in full color.

How does the Valiant look? As you will see in the silhouettes and dimensions on pages 107 and 115, it is slightly larger than either of the others. Its styling makes it appear bigger than it really is. Seen alone, it has none of the small, economy-car look. It was proportioned and sculptured to avoid this.

Over-all length is 184.0 inches. Wheelbase is only 106.5 inches. A four-door three-seat station wagon (there's a two-seat wagon also) is slightly longer, being 185.1 inches over-all. No two-door model is offered.

All are 70 inches wide and 54 inches high, over-all.

The front grille is an open-mouth, functional air intake covered with aluminum mesh. The Valiant emblem in the center serves as a hood release as well.

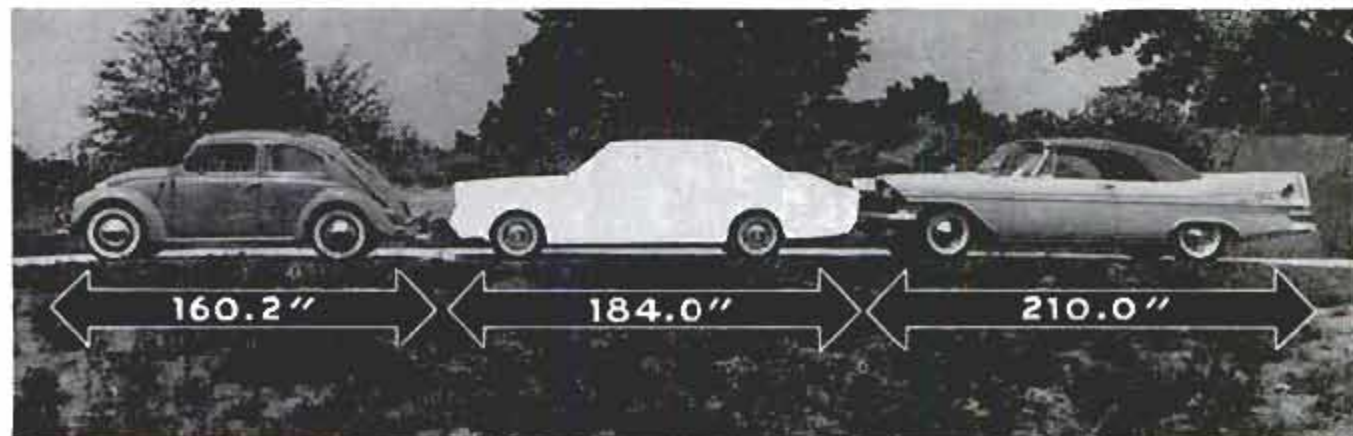
The hood slopes downward sharply to give the front a lunging, eager look, that tends to accentuate its muscularity.

Photographs of the Valiant have been printed prematurely elsewhere. Such pictures have been in our possession for some weeks under a pledge that they be kept confidential until Chrysler Corporation's release date, Oct. 25. While others have broken this promise, *Popular Mechanics* has decided to keep its pledge. You'll see the Valiant here next month.—The Editor



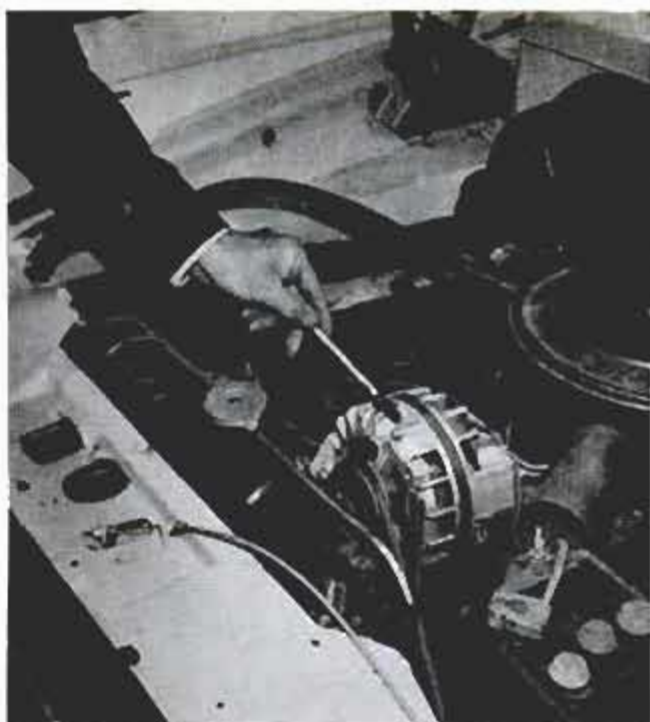
Rear end of the Valiant. Spare fits in a floor well. Trunk lid slopes down sharply from window to bumper

Comparison of a VW, a Valiant and a 1959 Plymouth. Bulge on Valiant rear deck is the dummy spare-tire cover

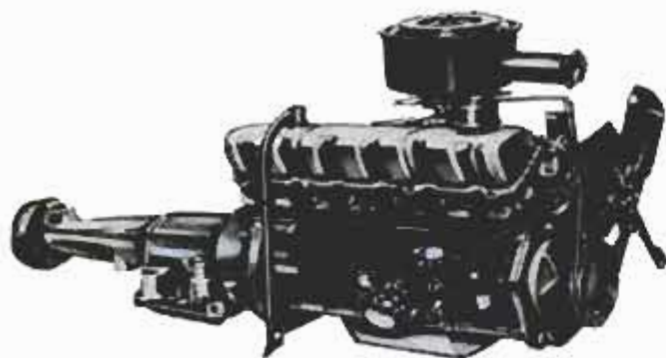




Valiant's unit body has no frame, the welded sheet metal providing the structure. Front fenders bolt on

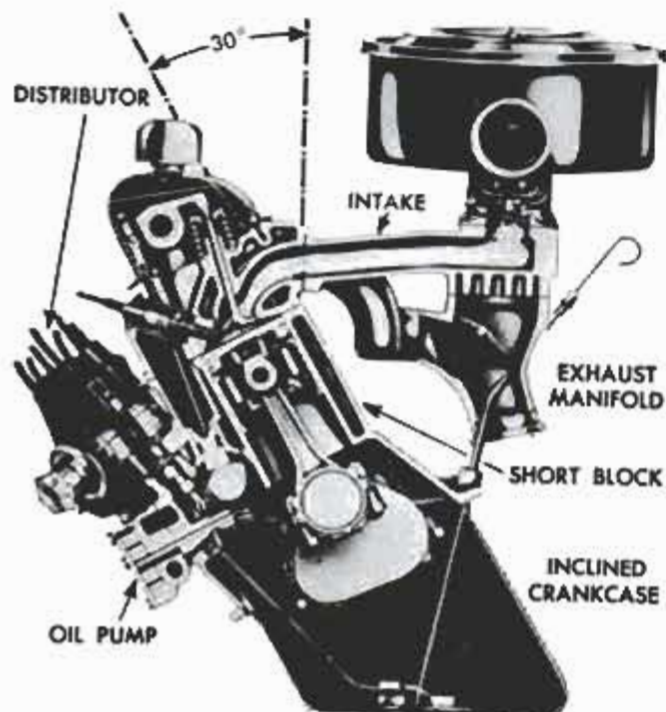


Instead of a generator, Valiant has an alternator. Smaller, lighter, simpler, it charges even on idle



Engine tilts 30 degrees to the right. Transmission slants to the left to permit tunnel to be lowered

Cutaway of overhead-valve six, showing 30-degree slant. Upright carburetor has long, tuned manifold



Roof pillars are slender. Windows and doors extend high into the roof, which is creased along its edges both for styling and engineering reasons. The creases cover the roof ribs which go up into the sheet metal instead of hanging down, thus allowing more headroom and higher door openings. You won't bump your head getting into this car.

Wheel openings are round and large—all four of them.

It is a six-window body, there is a side window behind the rear door. Forward and side visibility is excellent, but the high rear window limits rear vision somewhat, especially close in.

The back end slopes downward from the roof to the bumper without any horizontal surfaces anywhere. It's called a semifast back. The trunk lid has an imitation spare-tire cover, the only artificial styling trick on the car. Taillights are simple ovals that cant outward diagonally to make the body seem wider, lower.

Every effort has been made to put each inch of width into the interior. Doors have been kept as thin as possible. Nowhere is there any excess fat. There is more interior width per exterior inch in this car than in any Chrysler ever built. It is additional evidence of the trend toward sensible designs in automobiles.

What's under the Valiant sheet metal? It has a unit body from bumper to bumper without the stub front frame of the bigger Chrysler cars. Suspension is typically Chrysler with torsion bars in front, leaf springs in the rear. It, alone among the

(Continued to page 314)



Despite altered front, Imperial retains its character. The Le Baron below has a smaller rear window

Imperial

Imperial offers further comfort with redesigned seats that increase interior room and have six inches of foam rubber. Among its innovations are a flattened steering wheel for more knee room and powered window vents. It is the only Chrysler car not unit-constructed.



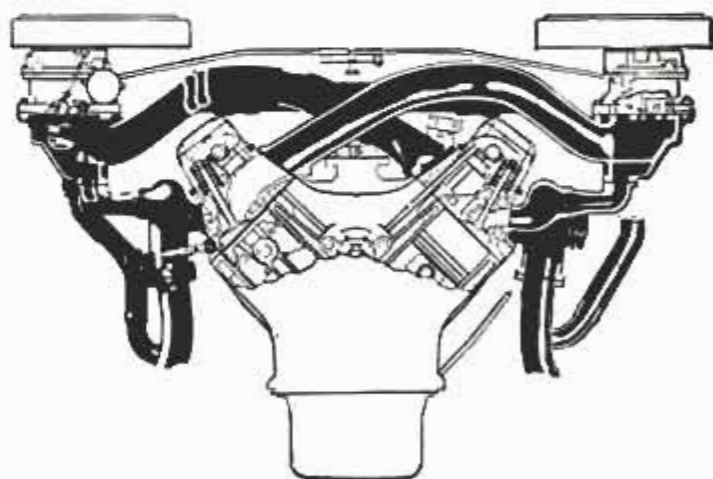
1960 Chrysler Features

Although only the Imperial can be shown in pictures this month, many details of the 1960 Chrysler Corporation cars have been released for publication.

Most important is the fact that these 1960 Chrysler Corporation cars, from the Valiant to the Imperial, are the first cars to be designed with the full-time help of electronic "brains."

Through thousands of calculations on IBM machines, Chrysler engineers determined exactly where the welds should go, where the bracing should go, what gauges of metal were needed to make the body solid, quiet and durable, before the first prototype model was built.

A major achievement was the precise location of the three mounts for the Valiant engine. The usual cut-and-try method was entirely eliminated. The machines calculate exactly how much vibration will result for every possible engine-mount location and combination of locations. Engineers can select spots in which vibrations



Ram manifolds in Dodge V8 have these 30-inch tubes. Below, Plymouth Fury offers a flattened steering wheel

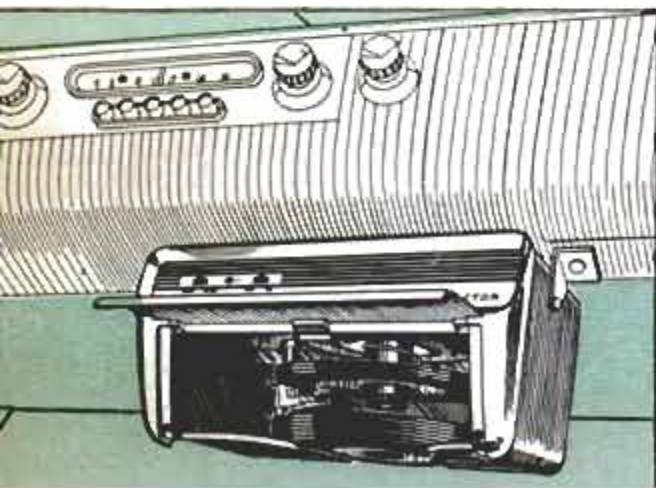




Above, dotted lines show last year's body, solid lines this year's. Deep footwells increase room and the narrower posts and roof make entry easier. Below, plastic figure is used to test out a 1960 Dodge front seat



Now you can play standard 45-r.p.m. records in your car with this automatic changer



are at a minimum. It is estimated that it would have taken one man 165 years to complete the same calculations the IBM machine had to make in solving this problem—and that is one man with an electric calculating machine, not just a slide rule.

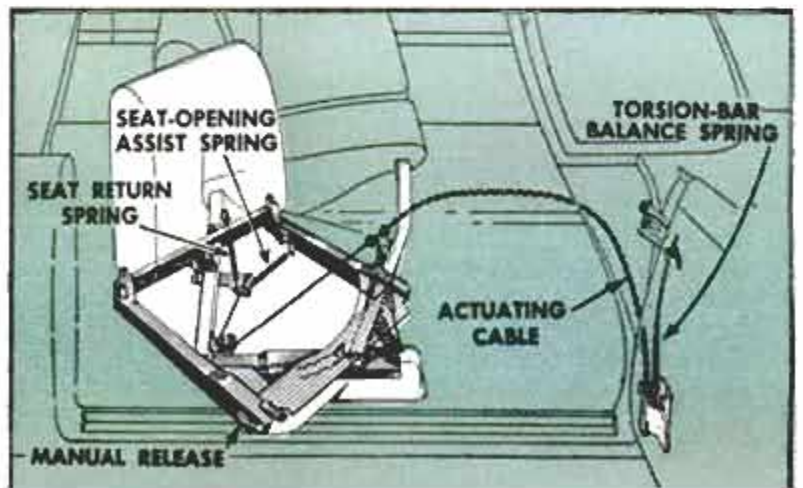
As a result, the 1960 Chrysler cars came out of the prototype shop "cleaner" engineerwise than any cars the Corporation has ever designed. They were "right" from the start. Previously, proving-ground tests were relied upon to show up necessary changes. Under the new "elimination by calculation" system, virtually no changes were necessary after proving-ground tests were completed.

What this means to you is that the very first Chrysler cars off the assembly line will be as perfect as the cars previously were after several months of production. The troubles that usually show up early in the run have been licked at the start, say Chrysler engineers.

The new unit body (shared by all cars from Plymouth up through the Chrysler) offers more interior room, thanks to its lower floorpan, narrower center posts and shallower roof. An in-

(Continued to page 322)

Running under the floor mat, a flexible cable moves the swivel seat in and out as the door is opened. The sketch shows how





Saunders-Roe "Hovercraft" is 30 feet long, 24 feet wide, weighs 3½ tons and has passed its flight tests

Tests Indicate Bright Future for "Air Sleds"

Development of ground-effect machines—vehicles which operate on a cushion of compressed air—is progressing rapidly, with military, commercial and private experimenters racing to build a practical machine. The "air sleds," which "fly" a

few inches above any smooth surface by sliding on a bubble of downward-ducted air, are not related to the helicopter or ducted flying fans, since they depend entirely on the effect of their downthrust against a surface. (The other, higher-flying

craft get their lift from the down-wash of their rotors. They require bigger engines and rotors, and are much more expensive to operate.) Shown here are two leading examples—the British Saunders-Roe SR-N1 "Hovercraft," above, and the "Aeromobile," designed and built by Dr. W. R. Bertelson of Neponset, Ill., for his own use—to speed his rounds over rough country roads. Both machines have been tested at speeds up to 40 miles per hour and over both land and water. Dr. Bertelson plans to market a similar small sled; Saunders-Roe Ltd., encouraged by the SR-N1 tests, are planning a cross-channel ferry. The 100-ton vehicle would carry 300 passengers and 30 tons of cargo at speeds up to 90 knots. Another proposed design is a 400-ton unit that can carry 160 tons of payload over water, ice or land.





In recording, ink-coated sheet is placed under plate on machine, and recording arm revolves under sheet



From originally recorded sheet, hundreds of extra copies can be reproduced as is done on mimeograph



Magazine reader listens to machine play sounds of Prince Akihito's wedding as recorded in publication



Sheets in album have pictures on one side, recording on other. Sheets are removed and played by machine

Magazine Reproduces Sounds With Its Words

There's a Japanese magazine that can boast listeners as well as readers. In magnetically treated pages, it has introduced a new audible-reproduction system that can provide sound effects for its articles. One page of the publication, for example, has photographs of Niagara Falls and London's Big Ben on one side, and a block of solid brown ink on the other. The page is torn out and placed, brown side down, in a specially made machine called a Synchro-

reader, which "plays" the page much like phonograph records. Out of a speaker come the sound of the Niagara's tumbling waters and Big Ben's mighty gongs, just as recorded on the scene. The process of printing with sound costs publishers about three cents for each page and is done by impressing one side of a sheet with special ink from a plate produced from a master recording. The special ink used in this printing contains magnetized iron.

Fuselage of Plane Is Contoured to Eliminate High-Speed Pitch



Unique design is featured in the Air Force's newest supersonic airplane, the T-38 Talon trainer. As shown in the rollover in the photograph, the forward underbelly has fuselage contouring as a trimming device to eliminate high-speed pitch. Another feature is the flat underside of the after-body, which enables engineers to simplify landing-gear door operation, design of access doors and speed brakes, and actuation of the horizontal stabilizer.



Left, flexible shaft powers the hedge trimmer. Right, rotary tiller is lightweight and easy to handle

Shaft on Mower Runs Lawn Tools

WITH THE AID of a new flexible shaft, homeowners in England can use their power mowers for several other jobs. The shaft is adaptable to most makes of mowers. It is driven by belt from an auxiliary pulley mounted on the engine output shaft. Several attachments can be powered by the flexible shaft, including a hedge trimmer, chain saw, rotary-garden tiller, grass trimmer, grinder-sander and pruning saw. Slip-on couplings permit the operator to change rapidly from one attachment to another. No tools are required to connect the shaft or the attachments.

Center right, grass cutter and trimmer will handle high grass and weeds. Right, chain saw, operated by the idling mower, cuts through branch. Attachments can be changed quickly





South America's greatest industrial center, Sao Paulo has been called the fastest growing city in the world

Sao Paulo — the Latin ~~Chicago~~ Detroit

BRAZIL

SAO PAULO •
RIO DE
JANEIRO

By
Thomas E. Stimson, Jr.

IF YOU COULD whisk a North American to the city of Sao Paulo in Brazil and then ask him where in the world he was, chances are his reply would be something like this:

"Somewhere in the United States, I think. Probably in California. I don't recognize these beautiful buildings but they're spanking new and modern in style, and the people, stores and traffic all seem familiar."

Resembling a typical North American city in more ways than one, Sao Paulo has often been called the Chicago of South America. From a climatic standpoint it is

more like Los Angeles. But its burgeoning automobile industry may soon bring Sao Paulo the name of "the Latin Detroit."

Automobiles of both European and North American lineage are on their way to a boom in Brazil. A five-year-old car costs as much as a new car in the United States, chiefly because of high import duties. This government philosophy is intended to spur domestic manufacture, and the idea is working. Foreign manufacturers are moving into the Sao Paulo area with money and know-how and have erected assembly plants that are already producing. Ford is building trucks in Sao Paulo. In the outlying suburb of Sao Bernardo do Campo, Willys-Overland is building Jeeps, Volkswagen is completing a new factory, Simca is already in operation and Mercedes-Benz is building both cars and trucks and adding to its plant facilities. Chevrolet and Inter-

Lined-up Jeeps await delivery outside the Willys-Overland of Brazil factory at Sao Bernardo do Campo, Sao Paulo's industrial suburb. This expanding plant will soon be producing 250 Jeeps, cars and station wagons per day



Willys four-door sedan, last built in the United States in 1955, goes into production late in 1959 at Willys-Overland of Brazil to compete with European manufacturers for the expanding South American auto market

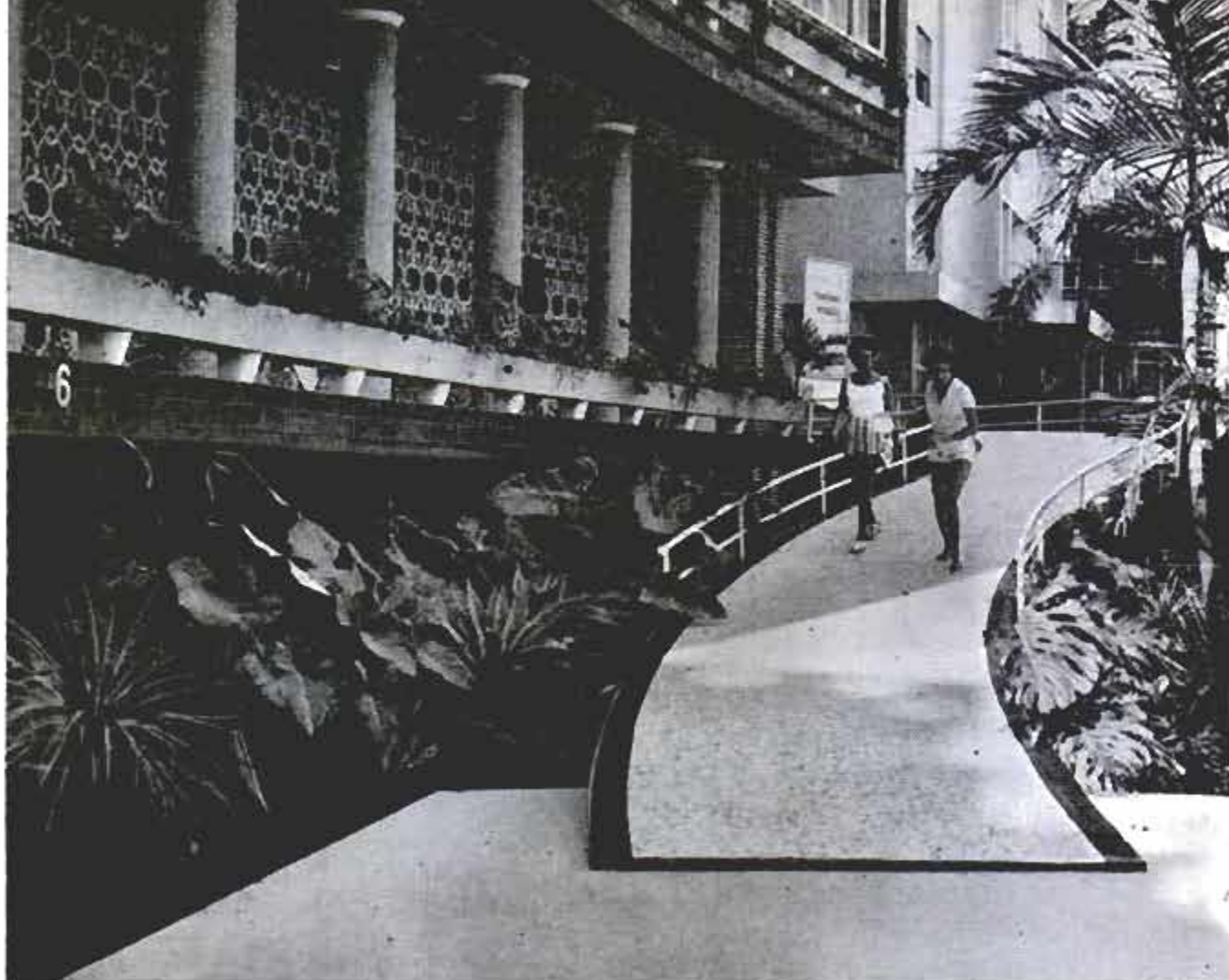


Administration building of the new Fiat plant at Sao Bernardo do Campo. Brazil used high import duties to induce domestic industrial development by foreign manufacturers who would otherwise import their products



Daimler-Benz plant manufactures Mercedes-Benz cars and trucks. Other foreign automobile manufacturers in the Sao Bernardo do Campo industrial suburb include Chevrolet, Ford, International Harvester, Simca, Volkswagen





Sweeping concrete entrance ramp leads into one of the modern apartment buildings on the beach at Santos

national Harvester are building trucks at still other nearby locations.

These assembly plants expect to turn out 250,000 vehicles in 1960. Not an impressive figure? Not until you realize that there were no more than 750,000 automotive vehicles in all of Brazil a year ago. From

next year onward the production figures will spiral up. As an indication of this, Willys-Overland do Brasil no sooner had begun production than the company found it would not be able to keep up with demand. Result: Another half-million square feet of new space is being rushed to

Entrance to one of the large private clubs in Sao Paulo, and a view of its huge swimming pool at right





Downtown street in Sao Paulo shows parks, tree-lined sidewalks as well as well-planned, separated streets

completion, including a press plant, axle and transmission plant, and storage buildings in addition to a cafeteria, hospital and administration offices. With these new facilities it will be possible to produce 104 Jeeps, 62 Jeep station wagons and 84 passenger cars per day. This passenger car is based on the relatively small four-door Willys sedan which was last built in the United States in 1955. It will compete with the European cars in the South American market.

There are some strange paradoxes in this fast-growing city. It is not a tourist center, but there are some 4000 North Americans in town. Brazil is rich in iron and coal, yet an X-ray look at those skyscrapers, the pride of Sao Paulo, would show that almost none has a steel skeleton. Most are of reinforced concrete.

Another oddity, and one reason for Sao Paulo's industrial boom, is its plentiful power. Clever engineering has taken advantage of a unique topographical situation: Rivers that originate only a few miles from the Atlantic flow inland instead of draining directly into the ocean. This is because at the Atlantic coast just 40 miles east of the city the ground rises abruptly in a cliff-like escarpment from sea level to more than 3000 feet, then slopes downward toward the interior. To develop

Huge office building under construction reflects Brazilian mastery of reinforced-concrete architecture





Seemingly impossible shapes molded in concrete form the roof garden of another Santos beach apartment



power, the engineers reversed the flow of one river by a system of dams and pumping plants and used it as a canal to draw water from a larger river that it joins. Now the diverted water flows eastward, is impounded in reservoirs. From the reservoirs it plunges down to sea level, in its fall spinning the turbines of the largest powerhouse in South America. Most of the power is developed underground in the second-largest underground generating plant in the world. The power cavern, hewn from solid rock, is 395 feet long and 130 feet high, contains six generator sets of more than 65,000 kilowatts each. Total capacity of this Cubatao plant is 864,000 kilowatts.

Less familiar to North Americans than Rio de Janeiro, Sao Paulo is Brazil's largest city and Latin America's greatest industrial center, its population of 3,200,000 being surpassed in all Latin America only by Mexico City and Buenos Aires. The state of Sao Paulo, of which the city is capital, is about the size of Arizona and has some 10 million inhabitants. Principal agricultural state in Brazil, Sao Paulo produces 45 percent of the country's coffee, 60 percent of its cotton and large percentages of sugar cane, potatoes, citrus and bananas.

Half a dozen cities of 100,000 population lie within a 60-mile radius of Sao Paulo city and in these industrial suburbs are such diverse industries as glass and ceramics, rayon, plas-

Penstocks at Cubatao are only a small part of the 864,000 kilowatt Sao Paulo-Santos generating system



Apartment building roof garden boasts a gracefully-beamed concrete abstraction for a decorative sunshade

tics, paint, refrigeration and pharmaceuticals. This one dynamic city and its satellites produce one third of the national income and pay 43 percent of Brazil's income taxes. The Paulistas boast that their city uses 40 percent of Brazil's industrial electricity, produces 46 percent of the national industrial product, is the banking capital of Brazil, has three universities, four TV stations, and in its environs are 40 percent of the newspapers of Brazil and 44 percent of the radio stations.

From 1940 to 1950 Sao Paulo was the fastest-growing city in the world and it hasn't begun to slow down yet. Industry is expanding more than 10 percent per year. New homes are being completed every six to eight minutes. The downtown skyline sprouts new shapes every time you look at it.

And all those 20 and 30-story skyscrapers have frames of reinforced concrete (concrete columns and beams poured around smooth steel reinforcing rods $\frac{1}{2}$ to $1\frac{1}{2}$ inches in diameter) with curtain walls of brick or hollow tile. A 45-story building using this technique is under construction, a 56-story building is planned. No steel beams. Why?

Visiting engineers can hardly believe their eyes when they inspect an overhead canopy of solid reinforced concrete only five inches thick, cantilevered 10 feet over a sidewalk. Or a corner column for an office building that is neither round or square but $7\frac{1}{2}$ by 36

View from the roof of a tall apartment building shows window-walls and planting ledges provided for tenants





Spectacular reinforced concrete beach house perches on a boulder overlooking the ocean near Santos

inches, a shape designed to provide more inside space.

Here is the explanation. Dr. Oscar Niemeyer, Brazil's leading architect, studied reinforced concrete under the famous Corbusier in Paris during the 20s, saw that it was ideally suited to conditions in Brazil and arranged for Le Corbusier to found a school there. This influence had a chain reaction. With steel expensive and hard to get and earthquakes no particular problem, reinforced concrete became standard.

Brazil is still a steel-importing country despite the fact that probably one fifth of the world's best iron ore is located in the state of Minas Gerais, north of Rio de Janeiro. In southern Brazil are coal re-

serves estimated at five billion tons. Coal and ore are brought together at Volta Redonda, near Rio, at the largest steel mill in Latin America. Steel production was recently stepped up to 2 million tons per year, is being increased still more but demand is so great that importation must continue for years to come.

Where there are automobiles, good roads are needed but only a small percentage of Brazil's 200,000 miles of roads are paved. An improvement program is under way and several thousand miles of roads are being paved each year, and a start has been made on a toll superhighway network. The unimproved roads are one reason for

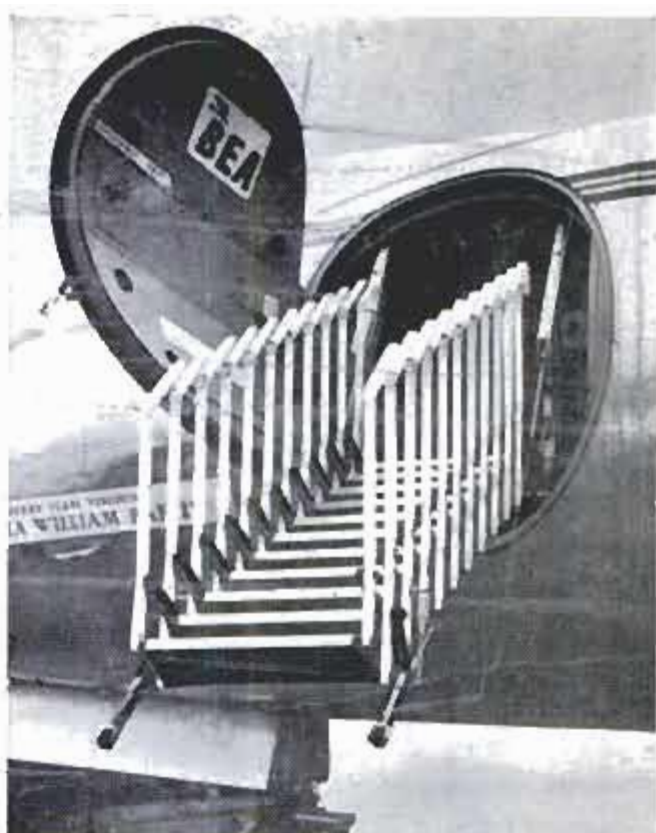
(Continued to page 299)

Ferry across Santos harbor docks sideways to allow the whole load of cars to drive ashore at once





This mobile set of covered passenger steps automatically unwinds and rewinds a gold carpet as it approaches and leaves the side of the plane. Used by Continental Airlines for its Boeing 707s, the unit is directed from top platform by a ramp agent

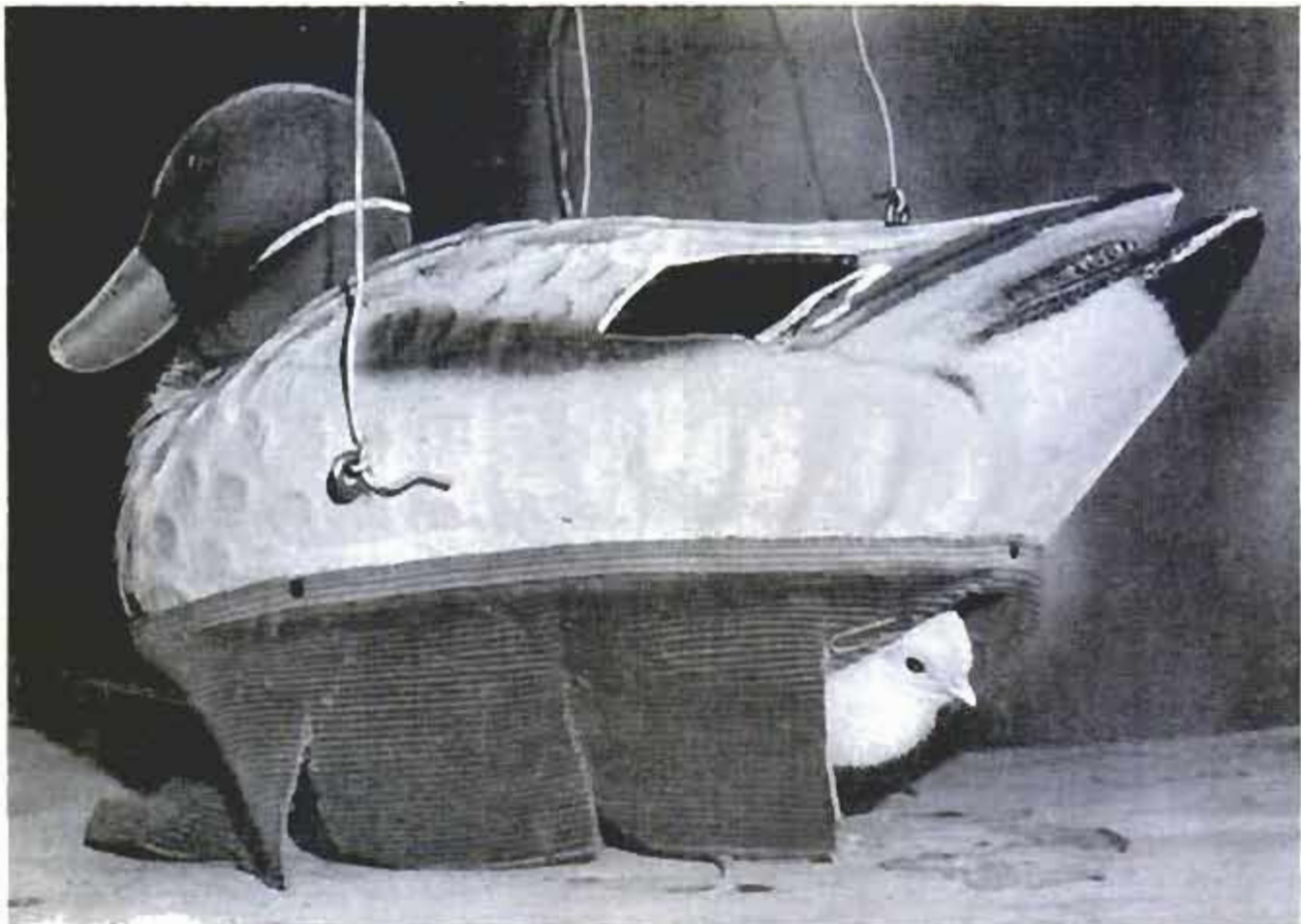


Hydraulically operated, this folding stairway has been fitted to the British Viscount to take the place of a ramp. When the plane is ready for takeoff, the steps fold inside, taking little room. Called an "Airsclator," the unit is made of light alloy

Airlines Keep Stepping Ahead

Tub-shaped baggage containers have been developed by United Air Lines for its new DC-8 Jet Mainliners. Made of lightweight glass fiber, the preloaded containers match the contour of cargo compartments in the underside of the plane. The containers are cradled in carts for towing by tractor to and from planes



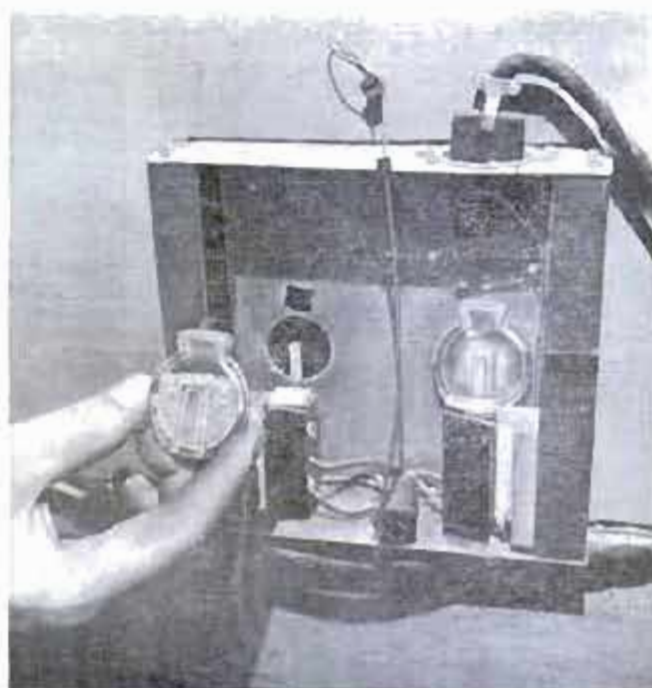


Nestling under mom gives any chick a mighty safe and cozy feeling. Trouble is, this little fellow doesn't know that "mom" is a duck decoy. If the newborn chick sees the decoy first, and it moves—it's mom!

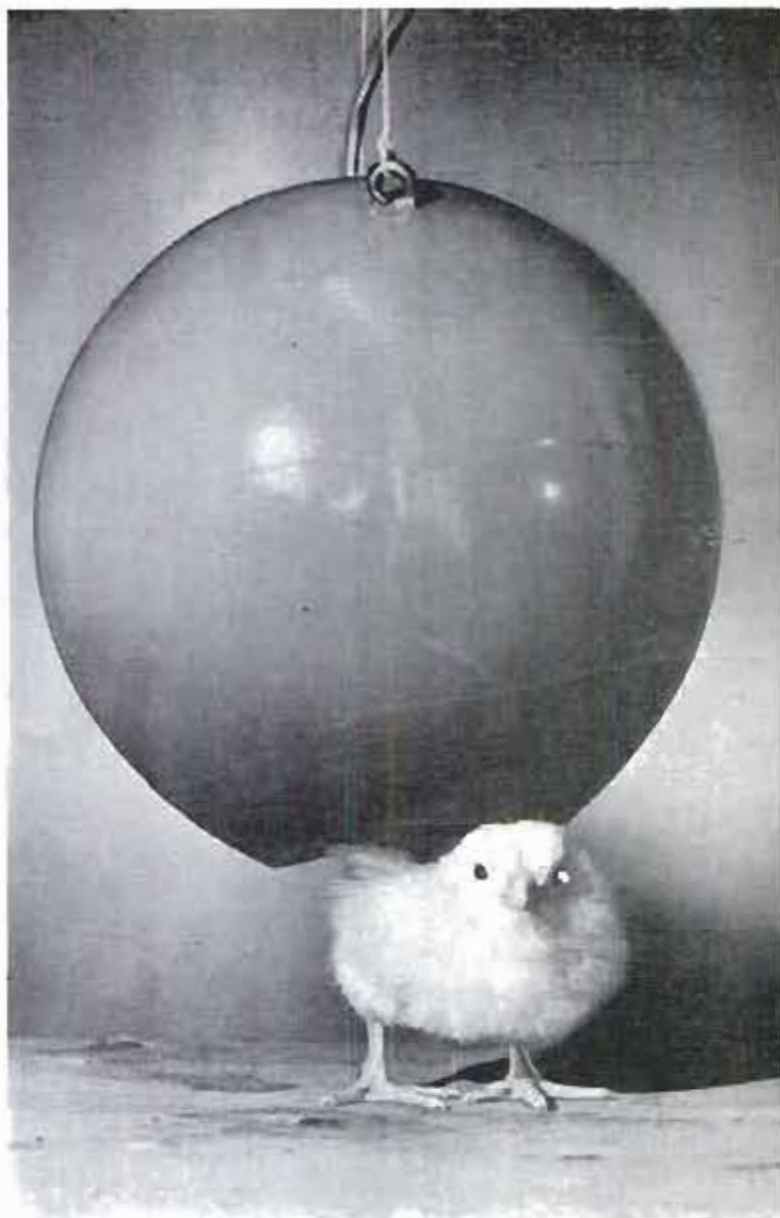
Any Old Mother Will Do

Stuffed fowl is wired for sound to become another substitute mother. Experiments show that the chicks respond more quickly to objects emitting a sound

This is rear view of feeding apparatus. Chicks get feed through holes covered by colored disks. They cluster at red disk, showing definite color preference



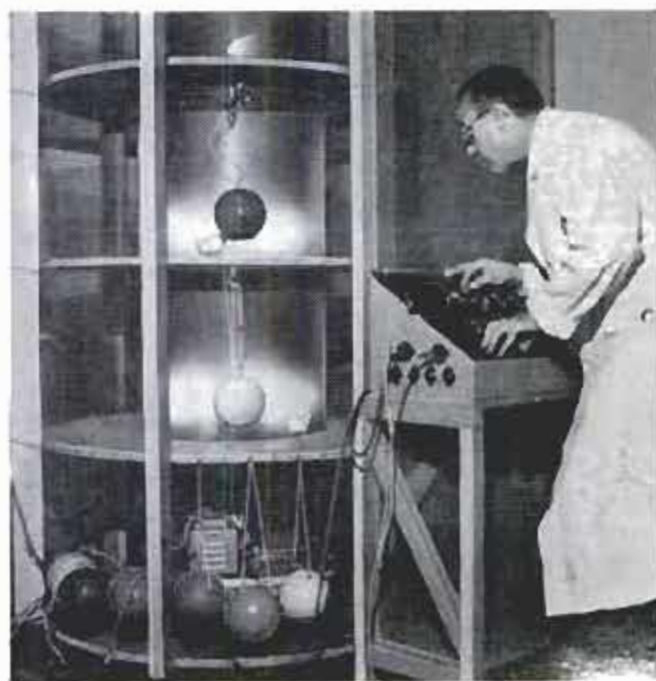
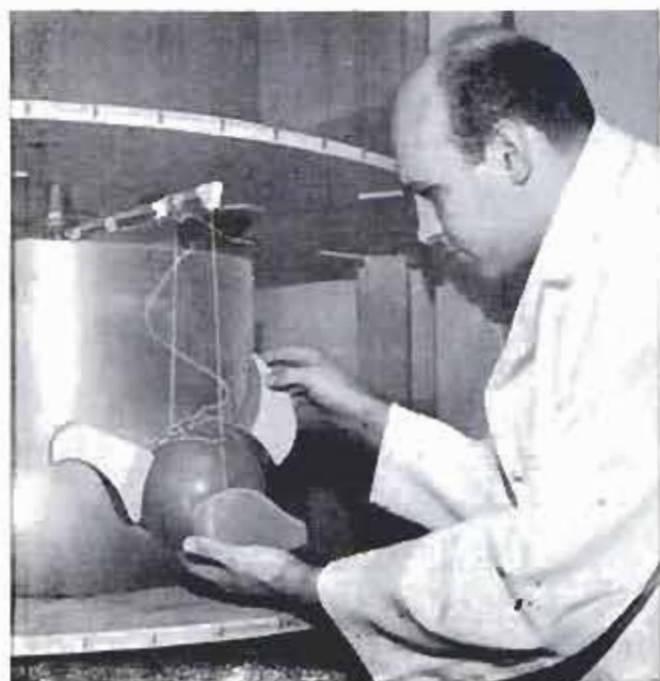
JUST HOW SMART is a baby chick? Not very smart, according to the experiments of Dr. Eckhard Hess, Associate Professor of Psychology at the University of Chicago. As a matter of fact, a baby chick can't tell the difference between its own mother and a rubber ball, as long as the ball moves. Dr. Hess conducted a series of experiments to find out how chicks react to different colors, sounds and stimuli. He rigged up stuffed fowl, decoys and rubber balls so they would move. He discovered that any such object which was dangled in front of the chick as soon as it came out of its shell became the little creature's mother. The chick would follow the object and try to nuzzle under it or against it for security. The texture of the make-believe mother didn't seem to make much difference, so long as the object moved. In other experiments, Dr. Hess found that the chicks have a definite preference for certain colors, particularly yellow and red, and that certain sounds make them neurotic. He administered tranquilizers to reduce early fear responses and to make the chicks more impressionable. After living with their decoy mothers for a while, some of the chicks preferred the artificial mom to the real thing. Purpose of the research? To learn how chicks could live more happily, and thereby produce more eggs. ★ ★ ★



"Mother!" peeps the chick, and immediately nestles up against a rubber ball. Dr. Hess believes chick is looking for security

Technician applies colored head, tail and wings to rubber ball. Chick preferred the unimproved model

Dr. Hess stands at control panel, watching through one-way glass as chicks become familiar with "mother"





Giant Gas-Turbine Helicopter Will Fly for RAF

Britain's Royal Air Force will soon have the largest helicopter in Europe. The gas-turbine, tandem-rotor Bristol 192 is 54 feet long. It has been designed for troop and freight transport, search and rescue operations, and ambulance and supply-dropping work. The big twin-engine aircraft can

carry 25 men and has a concentrated-load freight capacity of 4000 pounds; the distributed-load limit is 6000 pounds. A synchronizing shaft interconnects the two engines, keeping the rotors in the correct phase relationship and permitting both to operate on one engine in an emergency.



All-Weather TV Camera Has Windshield Wiper

Equipped with a windshield wiper, a completely enclosed television camera was displayed at the Industrial Photographic and Television Exhibition in London. For use in a closed-circuit system, the all-weather apparatus can be proofed against noise, heat and cold, according to the manufacturers. It is designed to operate under climatic conditions found anywhere in the world.

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CARPORT OR UTILITY BUILDING COMES IN KIT

Galvanized-steel add-a-section buildings are assembled from packaged sectional units. With all parts pre-cut and pre-punched, drilling and cutting at the site is eliminated. And to change the design you merely add another prefabricated section. In the photo above, a storage room of 60 square feet accompanies the carport that

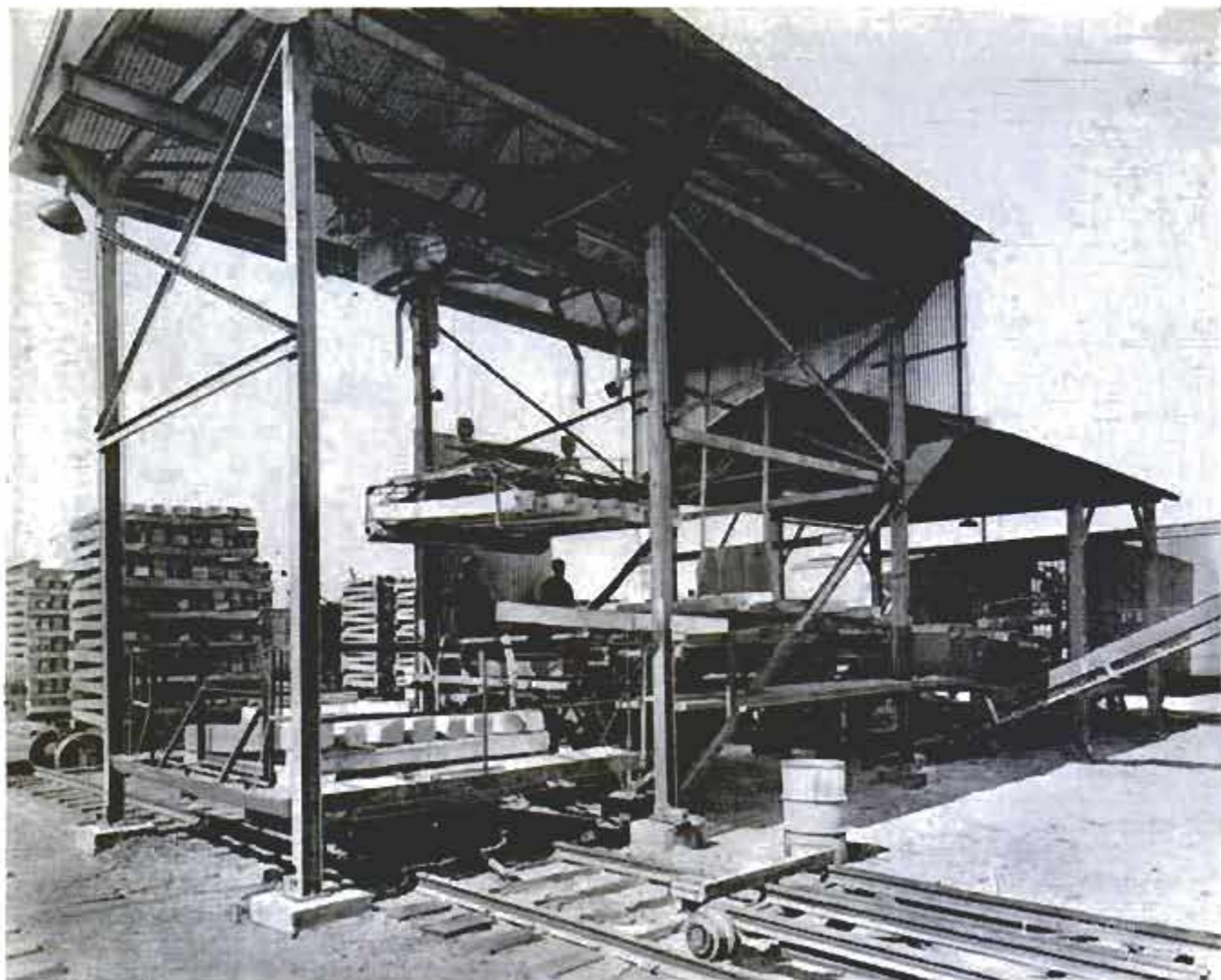
has a 22-gauge steel roof. The structures can be left open or enclosed with siding, and can be painted and insulated. Windows and doors may be located where desired. The structures are designed for use as garages, cottages, repair shops, barbecue shelters, field houses and playhouses. Ordinary hand tools erect structures.

Boat Mounted on Car Rolls Down the Highway

Modified to fit over a Crosley chassis, a boat hull makes a combination rolling advertisement and company car for W. E. West, California boat dealer. Licensed as a conventional auto, the rig cost \$2000 to

build, including the original car. Proof of its effectiveness came when a local newspaper columnist complained about meeting a boat that was rolling down the highway just like an automobile.

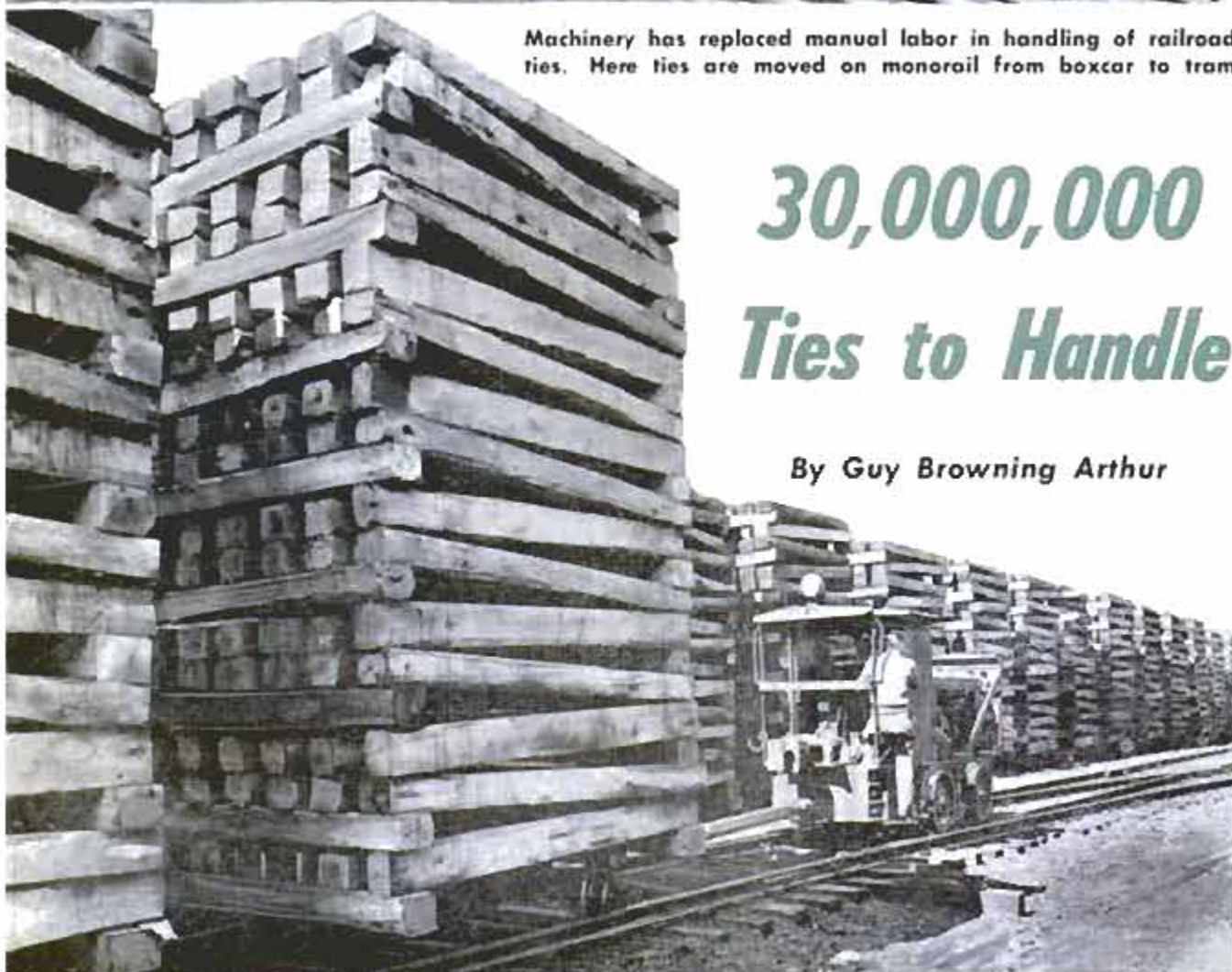


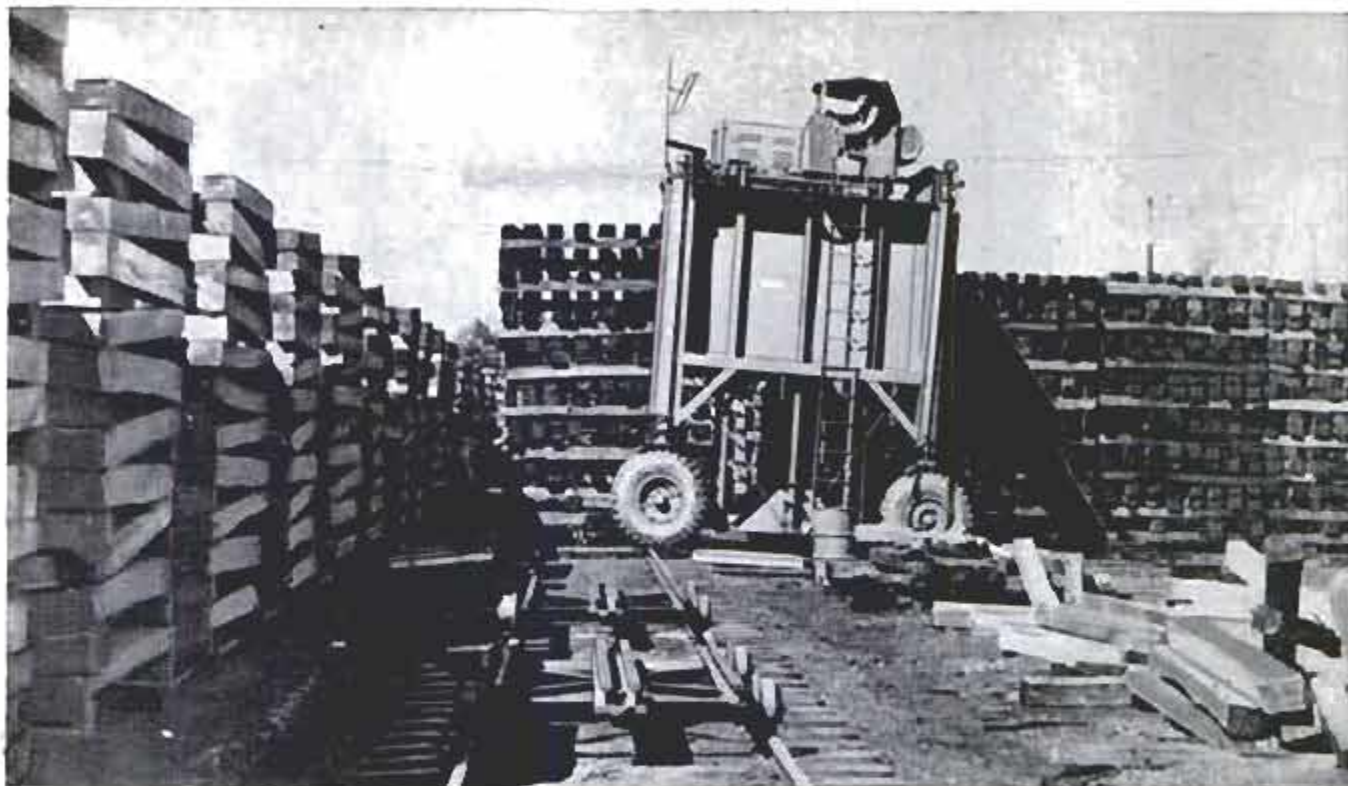


Machinery has replaced manual labor in handling of railroad ties. Here ties are moved on monorail from boxcar to tram

30,000,000 Ties to Handle

By Guy Browning Arthur





Ross Carrier descends from track after placing a rick of 127 dry ties on tram car. Once, each tie was carried by one man

With electronic unit around his neck, workman controls movements of boom, grapple

As grapple hoists unit of eight ties and stringer, hooks catch ends of the stringer

THE RAILROADS use about 30 million cross-ties every year. When wood was cheap, and labor easily recruited, the frequent replacement of ties was a commonplace item in railroad costs. About 50 years ago maintenance men began to show that the waste in using untreated ties could not be justified. Demands on roadbeds were becoming more exacting, with heavier, faster trains.

Paralleling this development, processes for preserving wood were perfected. Today practically all ties are treated to make them last longer, reducing the number of replacements.

The Southern Wood Preserving Company's plant at East Point, Ga., handles 300,000 to 400,000 green and dry ties a year. Until the invention and installation of special labor-saving devices, every tie was carried by hand, unloaded from cars, ricked in the yard, moved from the ricks to tram cars on tracks 120 feet apart, and unloaded from these cars for cutting to length, adzing and boring. Each

(Continued to page 296)





Machine Digs Battlefield Trench at Rate of 12 Feet Per Minute

Soldiers of the future may have their foxholes and trenches dug for them—and much faster than they could do the job themselves. Designed to provide rapid protection for troops, a mechanical ditch dig-

ger can dig a trench four feet deep and two feet wide at the rate of 12 feet per minute. The machine has been undergoing tests at the Army Research and Development Center in Ft. Belvoir, Va.



Sergeant in Air Force Builds a Helicopter

Using material and equipment bought from salvage yards, an Air Force staff sergeant built his own helicopter. And it flies. The craft seats one person and is powered by a 72-horsepower engine. According to Larry Henderson, the 25-year-old builder, it cruises at 80 miles per hour and has a top speed of 110. The eight-foot-long craft, which took almost six months to build, has a fuel capacity of five gallons, weighs approximately 280 pounds and has a 16,000-foot ceiling. The sergeant estimates that he spent about \$300 and almost 600 hours on his homemade helicopter, which he values commercially at \$1700. Nicknamed "Ginny," copter can stay aloft for one hour and 15 minutes.



High-Speed Fireboat Is Equipped With Radar

Custom-built for high speed fire fighting and rescue work in the San Diego harbor area, the 32-foot *Point Loma III* is driven by three engines totaling 750 horsepower and

is capable of 40 knots. Other equipment includes radar, radio, 300-gallon-per-minute pumps to aid sinking boats, and bow and stern lights for night rescue work.

Anglo-Irish Car For U. S. Market

Aimed at the American export market, the Shamrock sports sedan will be assembled in Ireland from parts and materials made in England. The body is all plastic; the prototype shown here demonstrates the removable canopy that quickly transforms it into a hardtop. A four-seater, it has a four-cylinder overhead-valve engine, an American 12-volt electrical system, and a 98-inch wheelbase. The price in England is \$2500, which includes high local taxes which wouldn't apply to the American market. The manufacturer plans to demonstrate the car in California.

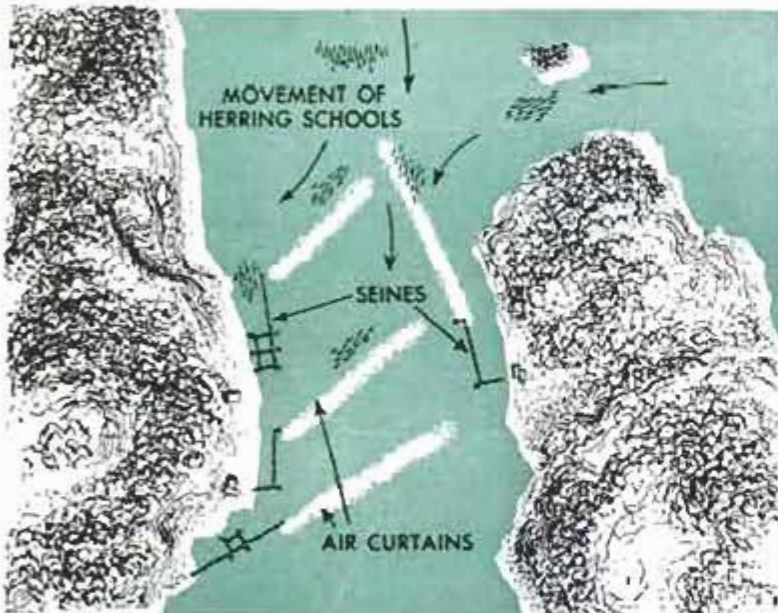


Curtains of Air Corral Herring

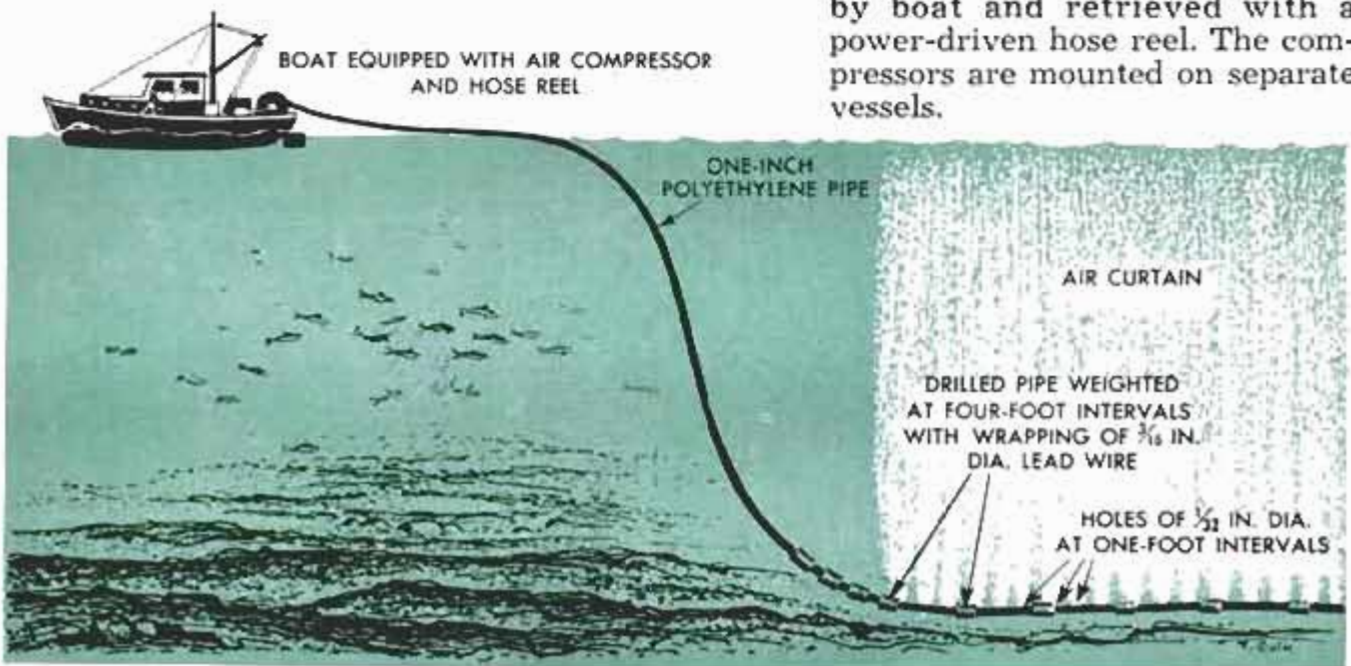
FISHERMEN in Maine are using air curtains to corral herring catches. Their success was first anticipated in research of the U. S. Bureau of Commercial Fisheries during the past two years. The equipment consisted mainly of a 1200-foot length of flexible plastic pipe with holes drilled at one-foot intervals, and two compressors supplying air at each end. The researchers learned that they could herd herring right into waiting seines. Setups made during six nights yielded 5350 bushels of herring. Aerial observations were made to locate the herring schools. The fish moved down channel as usual until they came to an air curtain. Rather than pass through the air, they moved along it to the point where the seine was attached. It was learned that difficult conditions such as deep water, boat traffic, swift tides or debris, which often make it impossible to use nets and other seine gear, have no effect on the use of an air curtain. By using the air curtain, sizeable catches of herring were corralled where no fish had been caught for several weeks. The fish, valued at one dollar per bushel, were worth about twice the cost of the major components of the equipment. The pipe, weighted with lead to make it sink, is laid by boat and retrieved with a power-driven hose reel. The compressors are mounted on separate vessels.



Above is Boothbay Harbor in Maine, showing air-bubble curtains. Sketch below shows how curtains are laid. Herring move along curtains rather than go through them—and end up in seines



Pipe, laid by boat, is supplied with air by two compressors driven by 26-horsepower air-cooled engine and 52-horsepower diesel





Strips of Magnetized Plastic Seal Refrigerator Doors

Magnetized plastic strips have been developed for sealing refrigerator doors. The magnets are produced by melting vinyl resin with plasticizers, and mixing this compound with metallic powder. The mixture is shaped and run through a magnetic field.



Adjustable Stand Holds Paper For Easy Ceiling Installation

If you're going to decorate a room all by yourself you can get a "hand" from an adjustable stand that does two things: It holds paper close to the ceiling while you're working it into place, and it holds paint and tools. It is attached to a stepladder.

Palm-Size Sound Meter "Maps" Factory Noise

Designed for rapid measurement of sound levels, a palm-size noise-survey meter can help establish noise-contour "maps" in large industrial plants. Weighing only 12 ounces, and about the size of an electric shaver, the instrument shows sound-pressure levels in the range of 75 to 140 decibels. This covers noise levels from busy street corners to the painful noise levels in the test cell of an aircraft-engine plant. Two models, one for measuring hearing-damage noise and the other for acoustical engineering studies, are available.





PICTURE BOOKS FOR THE BLIND

Miss Elsey Taft, retired teacher, began illustrating books in Braille as a hobby. Now it's a business

By Joseph E. Brown

IN 1849, the invention of a blind French science teacher named Louis Braille became a beacon to others whose world is perpetual night. In the 110 years since, Braille's system of punched-dot lettering has opened vast new vistas in education, information and entertainment for millions who "read" with their fingertips.

Now an American woman has made a significant improvement upon the revolutionary system Braille perfected. She has added illustrations to his words.

The inventor of this process, called Braille Illustrated, is a retired New York schoolteacher named Elsey Taft who now lives in La Jolla, Calif. She began experimenting with the process last December as a hobby. The hobby now has catapulted itself into a full-time task, bringing Miss Taft out of retirement to provide picture books, wall-size relief maps and other educational tools for sightless children and adults.

Braille Illustrated, which Miss Taft has patented, is basically a simple process, a refined variation of the same molding fundamentals used by hundreds of American industrial firms. A raised impression is fashioned over an outline of a picture on heavy Manila paper. A sheet of plastic is placed over this die, inserted in an oven and baked under vacuum. Then the plastic is allowed to cool and re-harden. The result is a



Completed Braille illustrated page (background) and plastic page (foreground) are shown together. The figures on Manila paper were formed from scraps



House on this page from illustrated book is made in relief from scraps of cloth, wood and toothpicks



Sightless boy "reads" illustrated book with finger tips. Typed text allows sighted reader to follow

plastic mold that reproduces the original picture image.

One day last December, while casting about for a hobby, Miss Taft visited Edward K. Duffy, a friend who operates a restaurant in La Jolla. In his spare time, Duffy serves as one of several hundred Braille transcribers in the United States. He urged she consider this as a hobby, too.

Duffy showed her two basic tools he used: a handheld, oblong wood and metal "slate" to clamp the Braille paper in place, and an awl-like punch or stylus, used to stamp embossed dots in uniform rows through tiny windows in the slate. In Braille, variations of only six dots, punched in squares, can form almost every letter, phrase, sentence and punctuation mark in any language.

Miss Taft was enthusiastic. She enrolled in a class and soon became a rapid transcriber.

On this finished plastic page, various textures of house construction stand out in relief. Story is told in Braille dots at top of page. Demand for Braille Illustrated far exceeds supply, and Miss Taft hopes to expand

"The idea for adding pictures came after I had completed several books," she says. "The books are a Godsend to the blind, especially to young sightless children. They are an important link with the sighted world." But to a former schoolteacher, who realized the value of illustrations to a child, the lack of pictures to implement these words was saddening.

Transforming her La Jolla living room into a makeshift workshop, she set about to correct the situation.





Miss Taft inspects illustration embossed in plastic. Figures are "read" with fingertips by blind

First, she studied several illustrated children's books, selected one she felt best suited as a pilot project, and obtained permission to reproduce it in the new medium.

Sighted Person Can Follow

Miss Taft decided upon a 14 by 14-inch page as a standard size for the Braille work because translating into the raised-dot system required more space than normal printing in the original. Each page of the text was retyped and pasted on the left side of facing pages in the new Braille edition. This permitted a sighted person to follow the text with a blind reader who "read" the corresponding dots with his finger tips.

Each page contained one illustration. On heavy Manila paper, selected because of its ability to withstand the heat of an oven used in a later phase, she traced an outline of the illustration.

Now came the most difficult part of the process—creating a raised die from this outline. Just any material wouldn't do. It had to withstand the oven's heat and pressure and at the same time relay to the touch the impression that the artist, for a sighted reader, achieved with colors and dimensional effects.

Miss Taft began experimenting with various bits of material. She tested scraps of cloth of various textures and thicknesses, a gob of plaster-repair compound, tiny pebbles (to represent boulders), glue, toothpicks, fluffs of cotton for hair, grains of rice and wheat, sand, salt and other



Stylus is used to punch dots through Braille transcription slate. At left is transcription guidebook

odds and ends. These she placed, layer upon layer, over the picture outline.

Gradually, the two-dimensional picture assumed a three-dimensional look. In a typical illustration, for example, cloth and cotton on the die represented a small boy's clothing and hair, a pebble became the boulder on which he sat; toothpicks cut in miniature brick shape formed the chimney of a house, and a scattering of grain was glued into place as a lawn.

The dies finished, Miss Taft fastened a sheet of transparent plastic over each page and inserted them in an oven. Subjected to heat and vacuum pressure, the plastic melted into the tiny impressions formed by the cloth, cotton, toothpicks and grain. These were allowed to cool and harden.

Result Is Durable

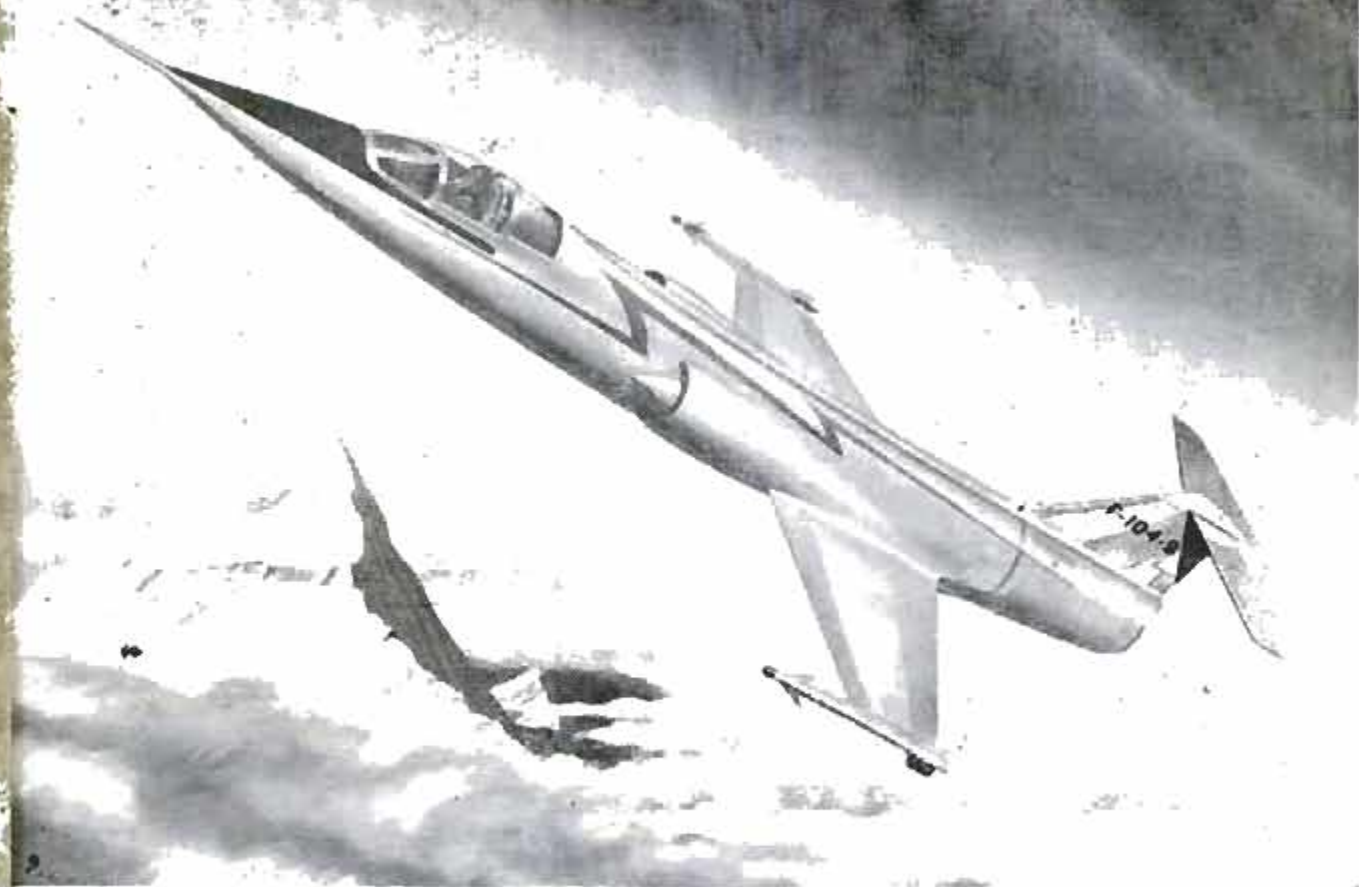
The result was a durable plastic reproduction of the original illustration that could be read with sensitive fingertips.

The first book, Miss Taft admits, was crude. But despite its minor flaws it was an immediate smash hit with sightless youngsters at the Blind Recreation Center in San Diego. They hungered for more.

Miss Taft widened her field of ideas. More advanced books were transformed into plastic. By trial and error, she discovered new materials that would stand up under the oven's heat, and more accurately translate to the sightless the impression the artist tried to convey.

Other projects followed. The most am-

(Continued to page 284)



International Version of Record-Breaking Starfighter

Defense of our allies will soon be strengthened by the addition of Lockheed's new F-104-9 Starfighter, shown here in an artist's drawing. This international version of the famed Starfighter has been planned specially to meet foreign nations' economic

and military requirements for a supersonic front-line fighter. It will be armed with two wing-tip Sidewinder guided missiles. Existing Starfighters hold the world's records for speed (1404 miles per hour) and altitude (91,243 feet).

Metal Made of Fibers Is 90 Percent Air

Fiber metal, a new product that looks and feels like solid sheet metal but is 90 percent air, has been developed at the Illinois Institute of Technology. The material is made of thin metal fibers bonded together by heat. Its high strength and low weight make it practical for aircraft and rocket use. In another form, it may be used as a filter for liquids and gases.

Superior Bluegrass Developed by Radiation

U. S. Department of Agriculture scientists have produced a strain of Merion bluegrass that resists stem rust. Success over the rust, considered a major disease of Merion blue, was achieved by treating seed with thermal-neutron radiation. Plants from the treated seed produced a second generation of more than 3000 individuals, of which one line of 10 plants remained free of stem rust and continued to grow throughout the season.



The 50-page housing section that follows is devoted to your home—whether it be in the dream stage, in need of refurbishing or remodeling, or just in need of fresh ideas here and there to make it more livable. We think you will be as enthused as we are over the PM Indoor-Outdoor House. It was designed especially for our readers by the noted Chicago architect, Edward D. Dart, A.I.A.

—THE EDITORS

The PM Indoor-Outdoor House



DESIGN A HOUSE with no 'indoors' or 'outdoors,'" we asked. "Design a house with no real separation between the two; a house that flows from Dad's easy chair right on out to the patio, diving board or rose garden. At the same time, insure privacy wherever it's needed."

These were our instructions to Edward D. Dart, one of the nation's leading architects.

How well did Dart fill the bill? Take a look at the magnificent home shown on the following pages—and judge for yourself. We think you'll agree that the "PM Indoor-Outdoor House" is one of the finest small-home designs ever presented, a home ideally suited to informal living. And who doesn't want to live informally, inside and out, these days?

Actually, this "small home" isn't so small. *Inside* the house there are 1555 square feet of living area; *outside* there are as many square feet as you wish to include, for in this home you don't live inside or outside, but all over the place.

Despite its comfortable size, the home carries no sky-high price tag. Building costs vary widely across the



Family room is fine for TV viewing and informal dining. With wall-doors open at both ends, it becomes a porch

country, but the *PM* Indoor-Outdoor House is *relatively* inexpensive because of Dart's choice of construction materials. These include used brick and, in some spots, rough-sawn redwood board-and-batten siding.

On these pages we show the house wrapped around a small pool. Dart emphatically points out though, that the house, as situated on the lot, lends itself just as readily to a big patio or an informal garden. What are your family's hobbies? How many children do you have? What are their ages? How many green thumbs in the family? These are factors which should be considered in planning the outdoor portion of the home, factors that will determine whether a pool, patio or garden is best.

Ed Dart is a quiet, highly imaginative young man who knows what it means to live indoors and out. The prize-winning architect has two children who keep him busy all around his home and yard in Barrington, Ill. From practical experience Ed knows that a satisfying family life can't be limited by a doorway between indoors and out. Activities will overflow the house no matter how it's designed. Dart's philosophy, therefore, is to *include the outdoors in the plan.*

A home, Dart says, is inevitably a place of conflicting activities.

"A house belongs to the family," he explains, "and the family is made up of persons of varying ages, interests and activities. It's inevitable that these diverse factors frequently conflict.

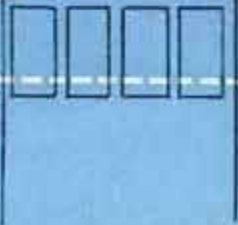
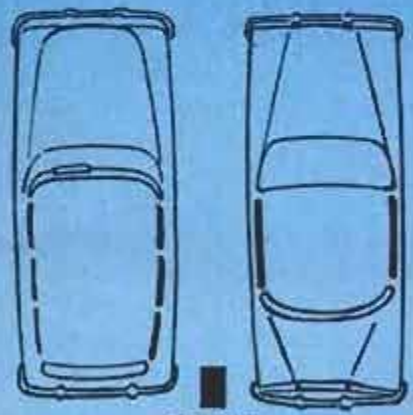
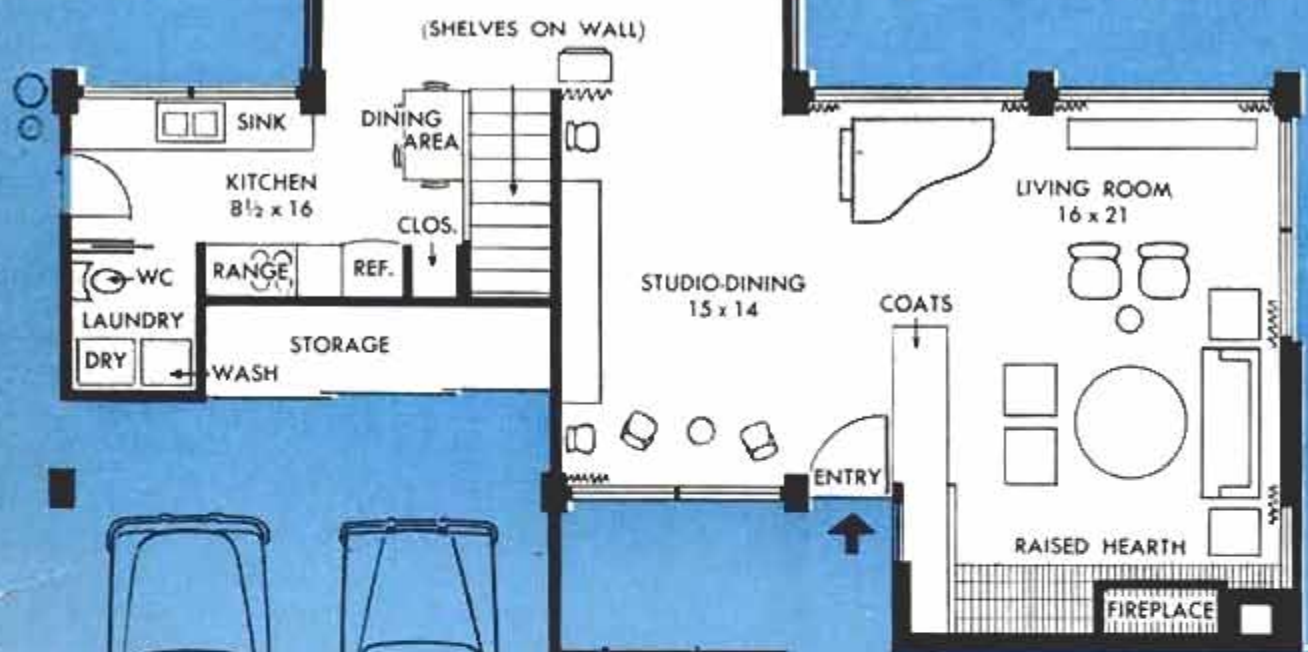
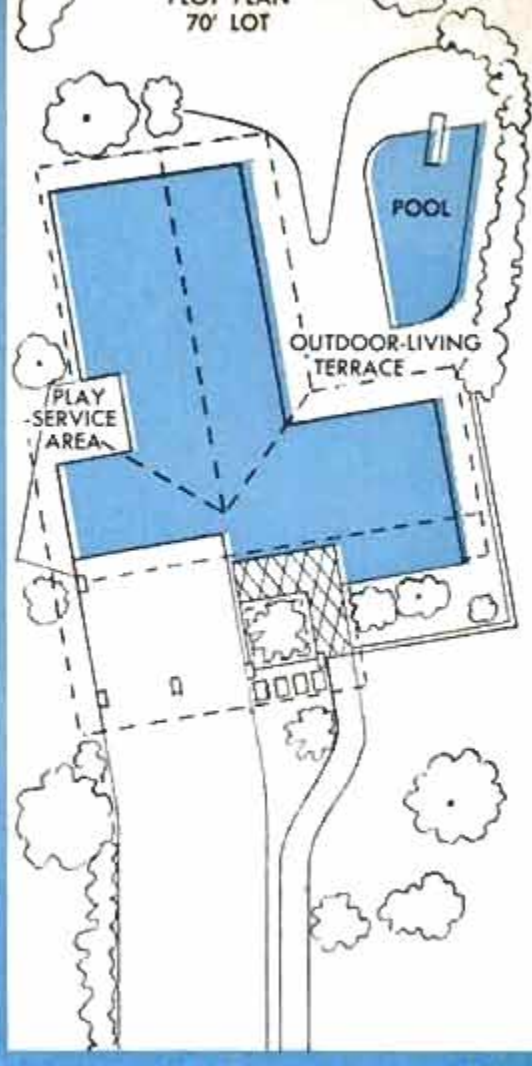
"Take a good look at how a home is used. Actually you require three different houses. There are times when the whole family is together; the house must open out spaciouly to handle everyone at once. This is house number one. There are times when certain age groups get together—for adult or teen-age parties—while other members of the family not only seek but need a retreat. House number two. Then there are times when everyone in the family needs a pocket of complete isolation to sleep, to study, to avoid arguments or just to daydream. House number three.

"Thus each family needs three houses in one. Some homes serve these multiple needs with great adaptability, others very awkwardly."

The *PM* Indoor-Outdoor House is a fine solution to the three-in-one problem. The house for absolute privacy (the bedrooms) forms a separate wing. The house for all

Complete plans for the *PM* Indoor-Outdoor House are available. The package consists of four complete sets of working drawings, two sets of specifications, materials list, cost breakdown and estimating guide. The plans are detailed for construction both with and without a basement. Reverse plans are available upon request. The cost of the complete building package is \$39.00. Write: Plans Department, *Popular Mechanics Magazine*, 200 E. Ontario St., Chicago 11.

70' LOT





Living room features big fireplace wall, with built-in desk and storage on the right, a skylight overhead

the family (the family room-porch-kitchen and the whole outdoors) offers plenty of space for combined activities. The house for entertaining (the expandable living room) also offers ready access to the outdoors.

Take a closer look at the plan of the Indoor-Outdoor House. As you approach, the most striking feature is the mass of masonry that forms one corner of the house. The shrimp color of the used brick provides a warm contrast with the long, low roof, shingled with cedar shakes, that overhangs the home on every side. The masonry theme is repeated periodically across the front by brick pillars that support the roof.

The carport has plenty of room for two cars. Built into one wall is ample storage space for garden tools, lawn mowers, baseball gloves, doll buggies, car wax, used boomerangs and other oddments that don't seem to have a natural place in most houses. Incidentally, Dart designed the carport so it could be converted into a garage by enclosing the sides. "The front of the house will look just as good either way," he says.

From the carport you enter the house either by the side or front door. Both doors are a few steps away, and both are protected from the elements by the big roof overhang. As you walk over to the front door you pass an attractive planter with a tree that grows right through the roof.

Upon entering the house, you can't help but be impressed by the size of the front "hall." Actually this is the most unique room of the house and an innovation in small-home design. Dart calls it the studio-

dining room. Its flexibility is tremendous. First it serves as an entry—a foyer which is a far cry from the crowded vestibules found in most homes. The coat closet on the right goes only part way to the ceiling, so there is no psychological barrier between this room and the living room. Second, it serves as a dining room for entertaining and for somewhat formal family dinners. (Dart considers most dining rooms space-wasters, which is the reason for the flexibility of this room.) Finally, if you are entertaining several guests, this room becomes a natural enlargement of the living room without any preparation, as a glance at the floor plan will show.

A magnificent fireplace with a truly generous raised hearth is the focal point of the living room. One corner of the room has a built-in desk and storage space for books, games and the hi-fi. A skylight in the roof over this corner sheds light dramatically down the mass of the fireplace.

The combination family room-porch is ready-made for family dining, TV viewing and all manner of activities for the kids. Dart considers this room the real nucleus of the home, with all other activities radiating from it like spokes from a hub. The two exterior walls consist of sliding glass doors, one leading to a play and service area off the kitchen, the other to the patio-pool area. Thus with two doors open the room becomes a "porch" smack in the middle of the house. The room also serves as a buffer between the bedroom area and the living room.

A stairway to the basement (optional) is
(Continued to page 286)

*Ask yourself this question
before investing time and money
in a home-improvement project:*

WILL IT INCREASE THE VALUE OF YOUR HOUSE?

THE NEXT TIME you plan to improve your home, ask yourself this question: Am I doing it merely to change the looks of things? If your answer is yes, then give your plans further consideration.

You don't want just a change—you want the time and money you spend to be an investment that will increase the value of your home.

For example, increasing the number of circuits in your home is a modest improvement that will make your house worth more if you should sell it.

On the other hand, removing bedroom ceiling lights and rewiring their wall switches to control bedside lamps is an improvement that is a matter of taste.

Some people prefer ceiling lights in bedrooms; some do not. The house is worth exactly the same either way.

Before beginning any home remodeling, whether it be indoors or outdoors, you should consider these three questions:

- Will the improvement increase your home's livability? The investment is not worthwhile unless you will enjoy it.
- Will it increase the house's market value if and when you sell? Well-chosen improvements can be worth more later than they cost right now.
- To what extent will the improvement increase maintenance? A large formal garden or an elaborate game room may increase property value, but excessive main-

Lightweight brick makes fireplace attractive. The brick is applied with a special adhesive, using a putty knife





Separating the living room from the entranceway are permanent dividers that are an excellent investment

tenance may outweigh this advantage.

After considering these questions, you must decide what improvements you want. One room in the house that should be given priority is the kitchen. Anything that will save work there will certainly increase the value of your home. Good investments are all of the latest mechanisms such as electric dishwasher, garbage disposer and built-in oven. A counter-top range is a definite asset, providing extra storage space beneath. New cabinets add color and storage space. An exhaust fan helps keep the kitchen fresh, especially after cooking and baking.

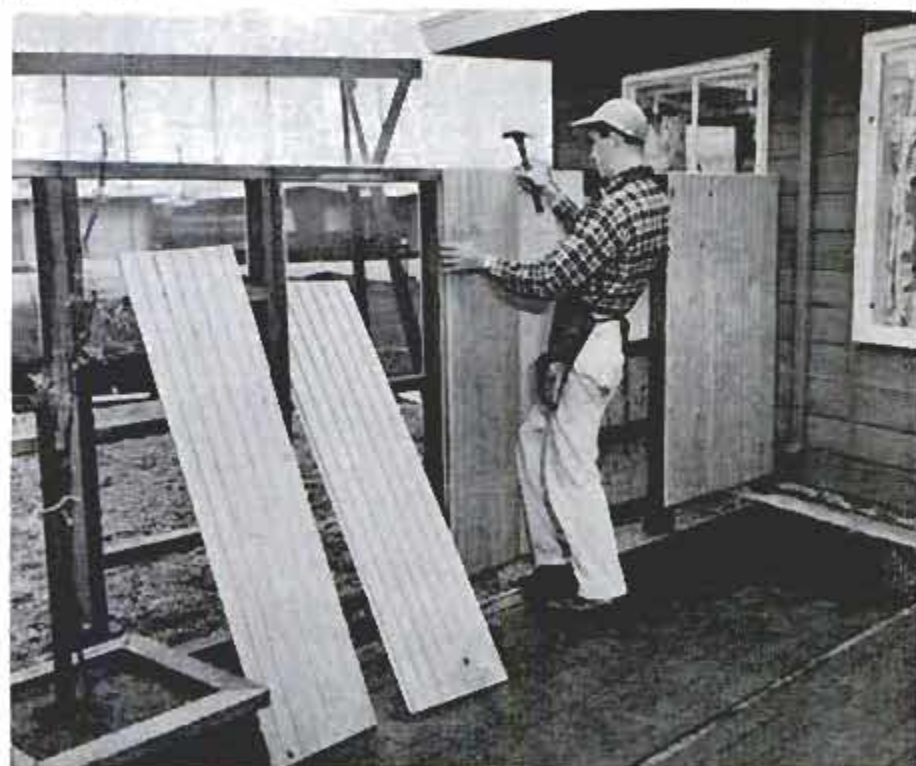
An attractive bathroom is always of value to your home. Plenty of counter and cabinet space is a big asset in a bathroom. Convenient in any bedroom is a closet lavatory, complete with wash bowl, mirror cabinet and storage space.

If your house has a fireplace, it should be made as attractive as possible. Prospective buyers like a large, eye-

appealing fireplace. One method is to cover the surface with a thin brick that can be put on with adhesive. The cost is small compared to the significant increase in value.

If yours is a large living room, dividers can conveniently adapt it for two-room purposes, while adding shelves or storage.

Outdoor fencing—for privacy and wind protection, for appearance, for protecting children and pets—increases the value of your property





Most-for-your-money home has a modern bathroom complete with good lighting, electric heater



Bathroom capacity of a home can be increased by installing a lavatory in the master bedroom closet

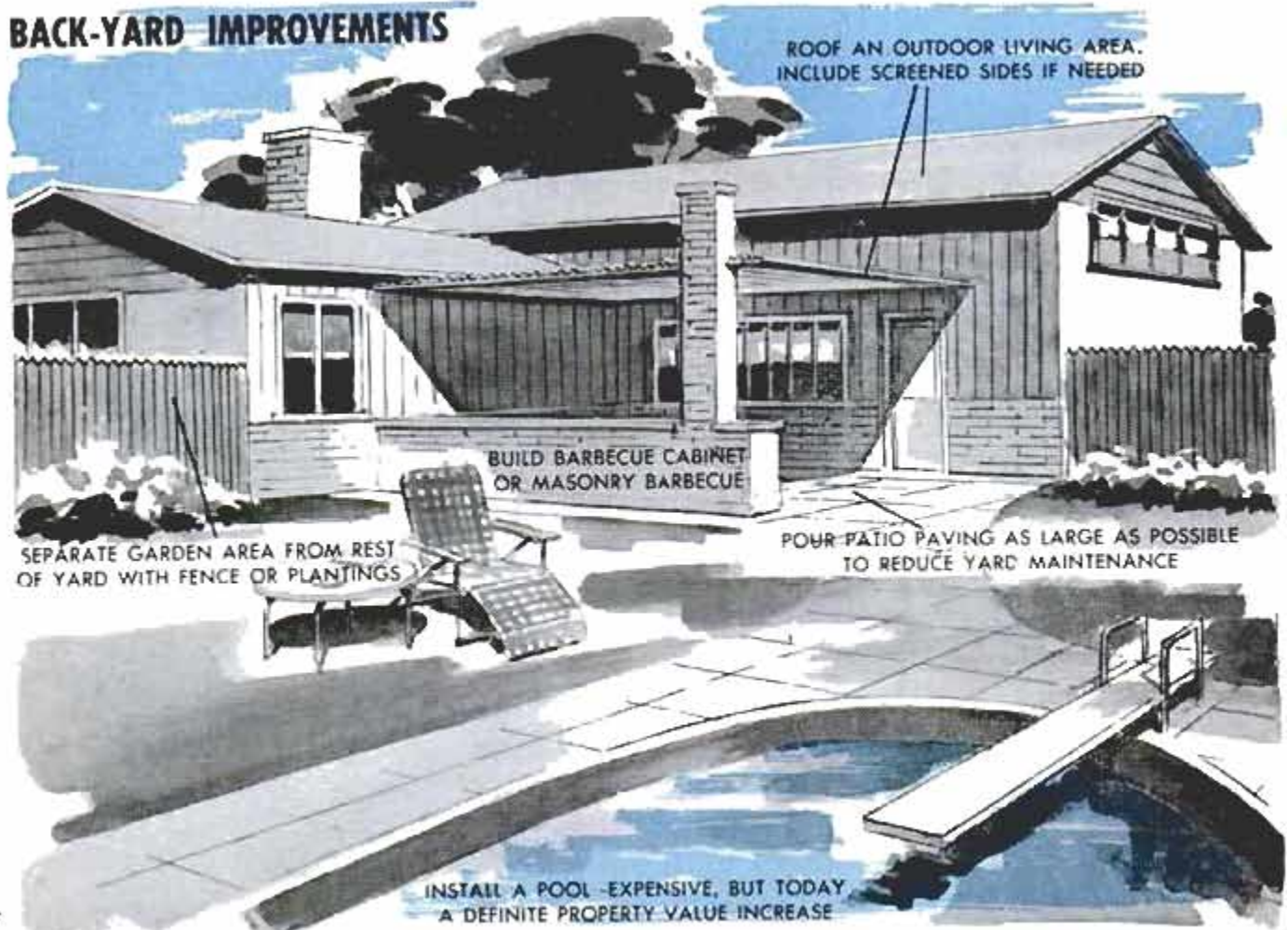
Outdoor landscaping poses less of a planning problem because time works with you. Bare-root trees and one-gallon shrubs are inexpensive and soon grow to be worth many times their cost.

Often during outdoor planning you may find that appearance means more than livability or minimum maintenance. This is because a home that is attractively landscaped draws admirers and instantly adds to the value of your home. Proper shrub-

bery and permanent rather than annual plantings mean a better looking front yard the year around. Permanent sprinkler installed in the lawn not only are convenient but are an excellent investment.

There are innumerable ways to improve the back yard, but most effective in increasing property value are conveniences such as patios, masonry barbecues and roofed, screened-in patios. An outdoor pool may be expensive, but today it is a

BACK-YARD IMPROVEMENTS



ROOF AN OUTDOOR LIVING AREA.
INCLUDE SCREENED SIDES IF NEEDED

BUILD BARBECUE CABINET
OR MASONRY BARBECUE

SEPARATE GARDEN AREA FROM REST
OF YARD WITH FENCE OR PLANTINGS

POUR PATIO PAVING AS LARGE AS POSSIBLE
TO REDUCE YARD MAINTENANCE

INSTALL A POOL - EXPENSIVE, BUT TODAY
A DEFINITE PROPERTY VALUE INCREASE



Facilitating kitchen work with dishwasher, garbage disposer and built-in oven adds much to value of house

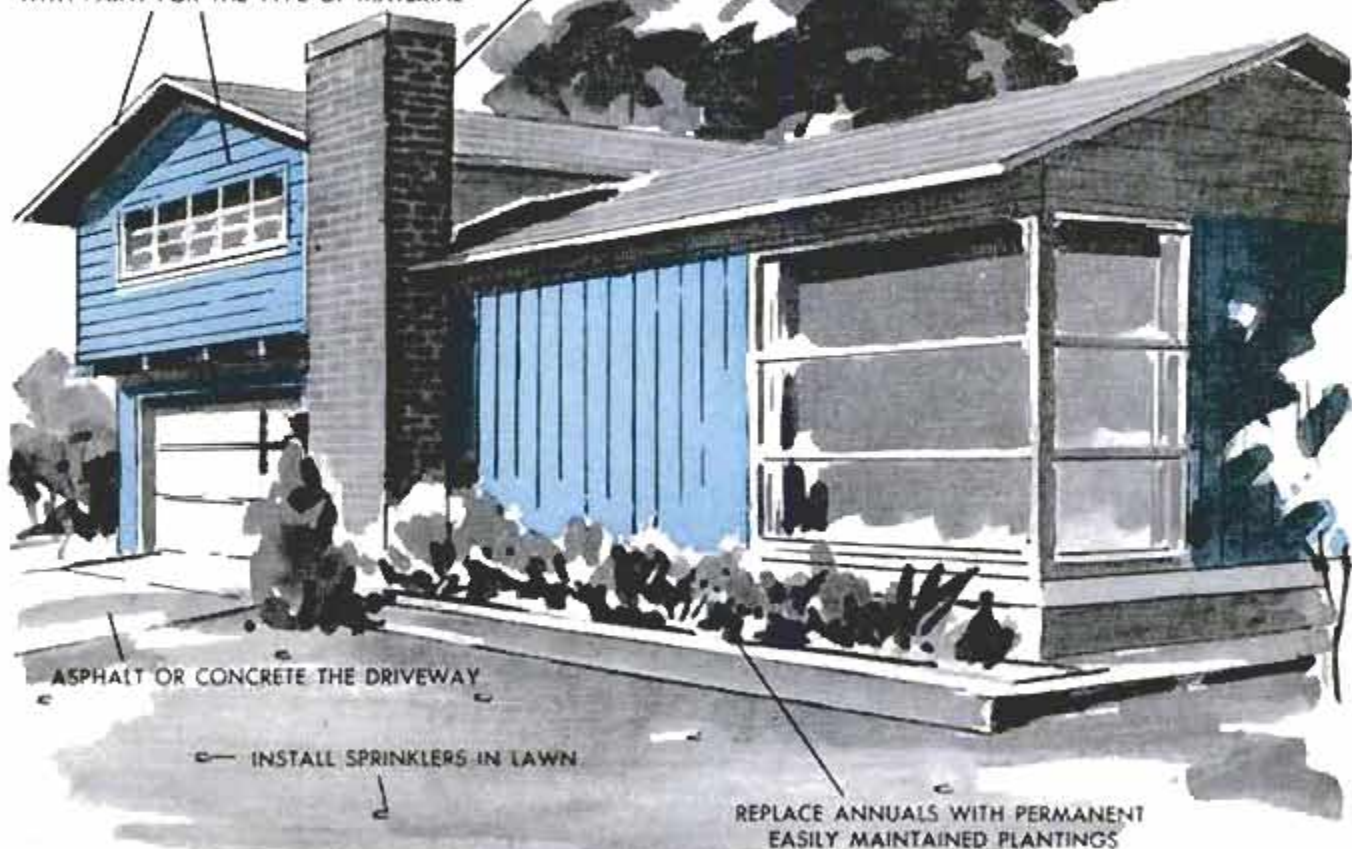
definite property-value asset. All of these items are part of the outdoor way of life now so popular. Any homeowner making these improvements will be paid well for his labor.

When you sit down to plan your home improvements, remember to ask yourself whether you're merely making change for change's sake or if you are increasing the value of your home. ★ ★ ★

FRONT-YARD IMPROVEMENTS

PRESERVE SIDING AND TRIM WITH PAINT FOR THE TYPE OF MATERIAL

TUCKPOINT BRICKWORK



ASPHALT OR CONCRETE THE DRIVEWAY

INSTALL SPRINKLERS IN LAWN

REPLACE ANNUALS WITH PERMANENT EASILY MAINTAINED PLANTINGS



Hadeo Aluminum Products photo

Gas lamps, gaining wide acceptance throughout the country, come in many styles and find a variety of uses. Here an outdoor lamp serves as a light for a front yard. Name plate is conveniently attached to the post. Gas lamps can operate on natural gas, butane or propane

GAS LAMPS-- The Comeback Kids

Adding a modern touch to gas lighting are the futuristic shades atop these lamps. Gas lamps, emitting a moonlike glow of light, provide an attractive lighting system for the outdoor swimming pool

Veeder photo

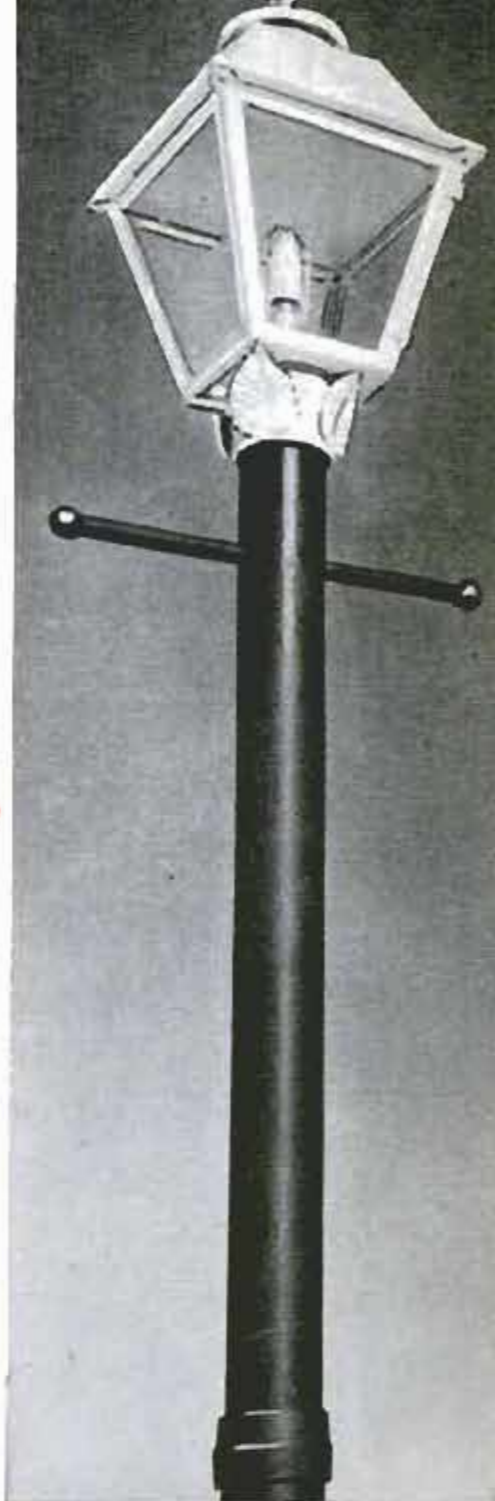




Hastings-Willinger and Associates photo

ARKLA 7

The traditional look of the gas lamp above produces a pleasing effect in decorating the front yard of this modern ranch home. Photo at right shows another type of lamp that is more conventional in design



Modern Home Products photo

GAS LAMPS. mementos of the days when grandpa watched his first electric light with awe, once again are brightening parks and patios across the nation. Started as a promotional stunt by the gas industry, gas lighting has become a fad of ever-spreading proportions.

Lighting a suburban area in Albuquerque, N.M., and marking runways at the North Little Rock, Ark., airport are two modern uses for this ancient light. A swank restaurant in Greenwich, Conn., is using nothing but gas lamps for interior and exterior lighting. A 180-home site in North Olmsted, Ohio, has gas-lighted streets.

The fad has spread to residential living, too. Along driveways, in front and back yards, beside patios, gas lamps are emitting a soft glow, inoffensive to neighbors, unappealing to insects, and economical to pocketbooks—and giving homes a traditional look that grandpa thought he'd never see again when he saw his first electric bulb. ★ ★ ★



ELECTRIC HEATING



IS HERE TO STAY

By Richard Dempewolf

A CROSS THE TOP of the country, from Oregon to Maine, a new kind of house has been appearing. From outside, the only tip-off is the fact that it has no chimney. Inside, though, it's a different story. Last Fall, when most of us busily checked the oil supply and wondered if the furnace and burner should be cleaned before the first frigid gales swept the temperature down the chute, the owner of the new chimneyless home just "tuned in" a comfortable climate on a set of wall dials and forgot about it. He did it with about the same ease you'd tune in a station on your radio—adjusting a dial in each room for whatever temperature he wanted to maintain.

Some of the unique heating systems in these houses use electric coils hidden away behind wall panels, strung around the baseboards or buried in the ceiling plaster. Warmth from the coils toasts inhabitants much the same way a slice of bread is warmed in a toaster—except that most of these house-heating coils never get too hot to touch. Other systems involve heat pumps, which operate like your kitchen refrigerator in reverse. In still other houses, big electric furnaces provide central warm-air heat.

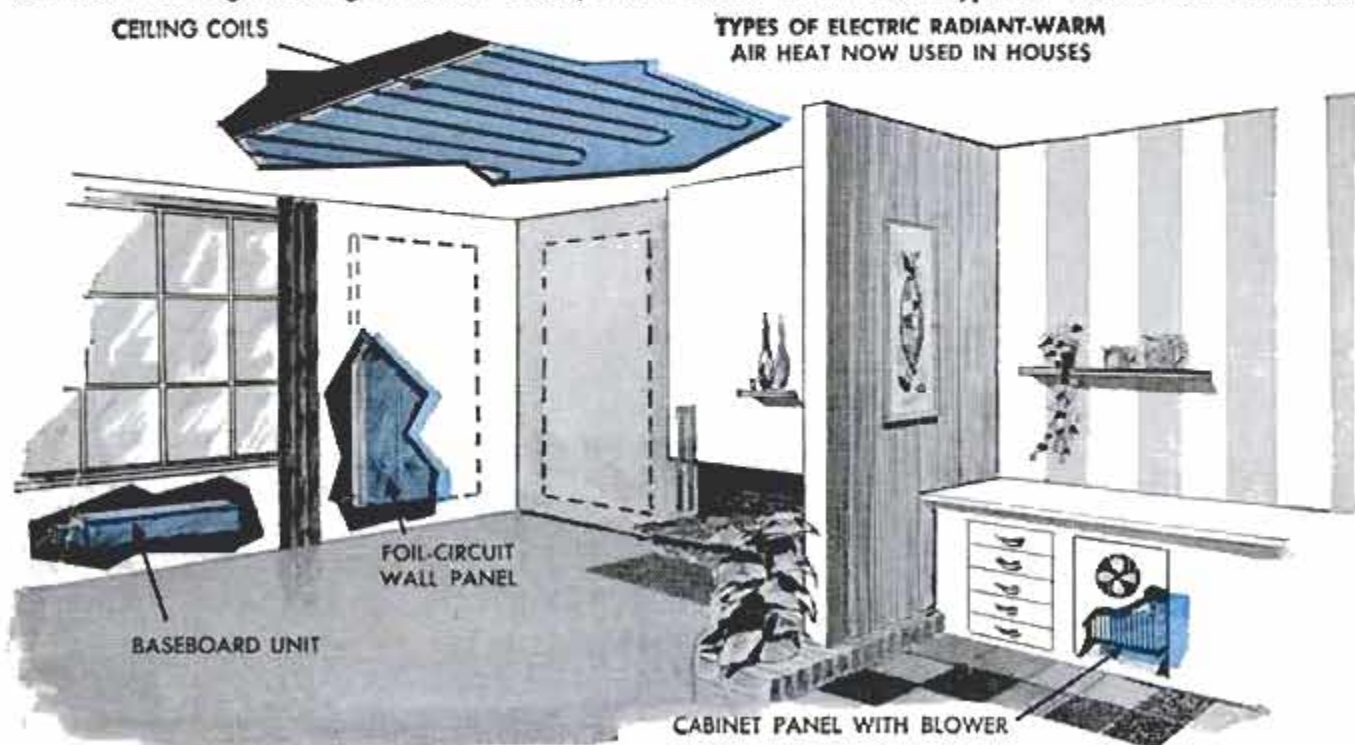
Until recently, such glamorous things as radiant, electric glass panels, ceiling coils and heat pumps were considered useful for taking the morning chill off the air in

southern climates. Up North, they were used occasionally as supplemental heat in apartment bathrooms and chilly corners during winter. What's more, if you were like most people, you figured that using electric heat was like owning a yacht—nice if you could afford it.

All this is changing. Electric heating—for any place in the country—is on the way. Last year, in Chicago's suburban St. Charles, a developer named Ray Borovicka built his revolutionary "Skyline Estates"—some 250 houses heated exclusively with electricity. In an area noted for howling blizzards, whistling gales and temperatures that plummet below zero, owners of the new \$15,000 to \$16,000 dwellings have considerable praise for their electric heating systems, which are largely Hotpoint's baseboard resistance units. Typical comment after two rugged winters: "We love it. It's clean, noiseless and warms the house in a hurry. We don't get any hot or cold spots, and there are no drafts. Best of all, each room has its own control. We can keep the living room at 70 degrees and the bath at 80, while the bedrooms stay as cool as we want them—usually 65—for comfortable sleeping."

In New York City, two new apartment developments boast rooms individually heated by some 3000 "radiant" electric glass panels. All across the country—North as

←Electric baseboard heating now can keep a home comfortable even in northern climates. Slots allow air to circulate through heating elements. Below, sketch shows the different types of electric heat for homes



well as South—hotels and motels are installing individual electric units that can be adjusted by the transient tenant to suit his whims, without upsetting the heat balance in any other room. "We eliminated the cost of vents, chimneys and central boiler," says an Ohio motel keeper who installed 1500-watt wall heaters in each of his 20 units. "We have no smoke or fumes, and the furnishings stay cleaner longer. Besides, the customers like it."

Some applications of electric heat are uniquely appropriate. In Cleveland, an outdoor-theater operator installed 500 in-car heaters that keep him in business all winter. And in northern Michigan, eight million crickets are kept vivacious with voltage in a cricket hatchery. The owner, who sells his crop for bait, discovered that nine Electromode, three-kilowatt electric heaters would keep his charges at a chirpy 90 degrees all winter, at a cost only slightly above the previous heating system that had depleted them due to fumes.

Rapid Growth of Electric Heating

Five or six years ago, fewer than 100,000 homes were heated electrically. Today, more than half a million houses are being warmed with it—50,000 of them newcomers this year alone. While that's still a minute fraction of America's 46 million heated homes, C. J. Witting, vice president of Westinghouse's consumer products division, estimates that in 10 years the national figure for electric heat will jump eight times. By 1978, he figures, electrically heated dwellings in this country will number 20,000,000.

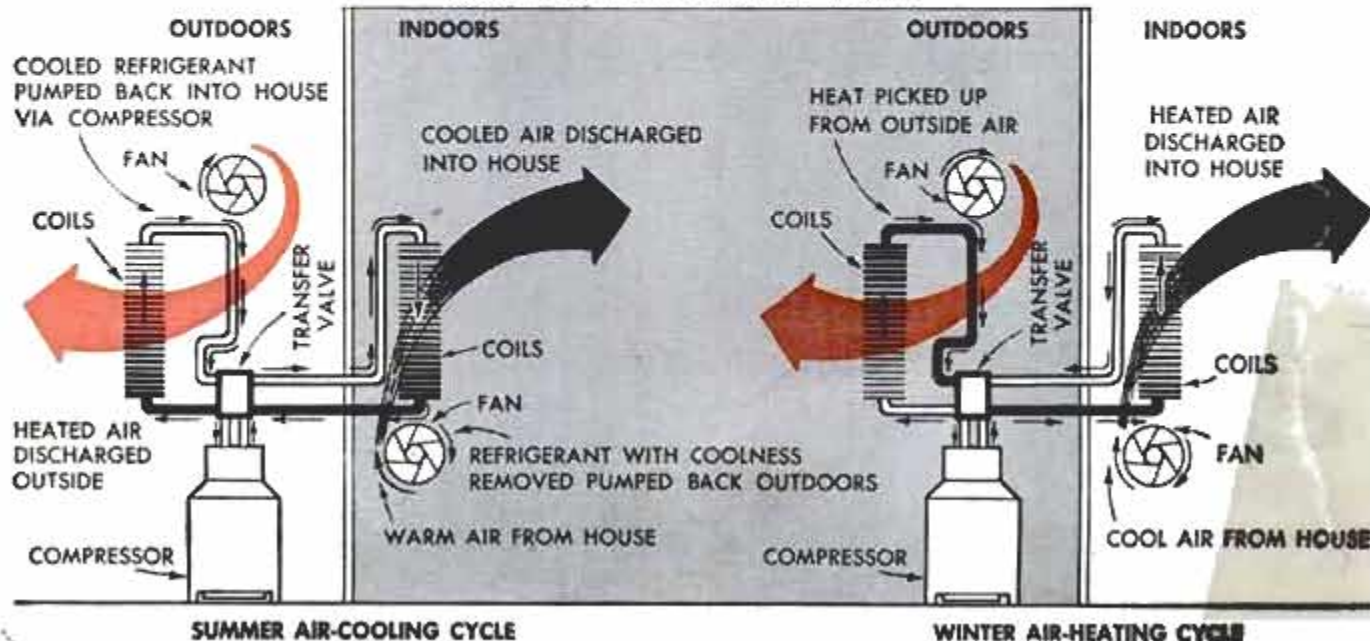
Although electric heating comes in a wide variety of units and systems, there are only two basic types: electrical resistance and heat pump. Resistance systems are the simplest in principle. They carry an electric

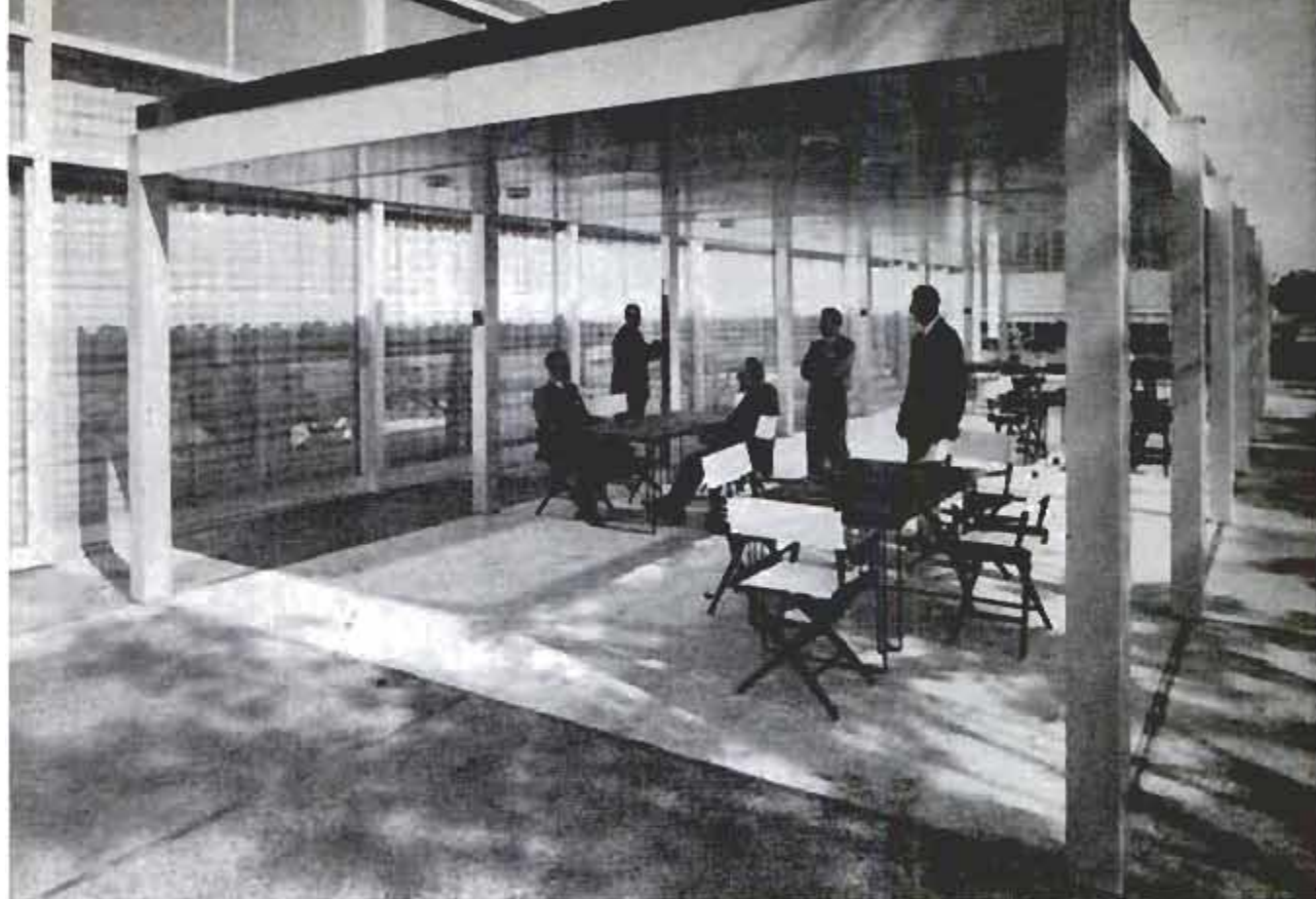


Washington Water Power Co. photo

Latest thing in electric heating is a paper coated with foil "busses." Entire floor will be a "radiator" current through wires or conductive particles that glow with heat like your toaster. In some cases, the wires are buried in the ceiling plaster, in the walls or concrete floor. This is called electric panel heating. Baseboard electric heaters circle the base of the room just as any baseboard radiator would. There are small units that can be built into a wall or cabinet—some with fans and some without—and portable units that can be carried from room to room and plugged into any outlet. One outfit is making a sandwich wall panel with an alumi-

HOW HEAT PUMP FURNACE WORKS





Washington Water Power Co. photo

Pavilion has conductive paper above ceiling and i. floor. It is comfortable even in cool weather

num screen—heating element fused to the inner face. It has a core of paper honeycomb and can be installed in any wall. Another buries its heating grid in a board covered with vinyl plastic for an interior wall finish.

Resistance appears to be the kind of electric heat that is giving birth to the most spectacular developments in electrical home heating. Indeed, resistance units account for an estimated 90 percent of all installations to date. Among the trickiest new wrinkles in the field is an electrically conductive paper, called Cellotherm, developed by Robert Smith-Johannsen of Niskayuna, N. Y. The material, which looks like ordinary building paper, is laminated between microscopic-thin layers of plastic insulation. Copper foil strips along the edges act as busses to carry the current through the sheet. The big rolls of Cellotherm are simply applied to ceilings, walls or floor—beneath the finished surface—just as you would apply a building paper. When tied in to the electrical service and energized, the paper radiates a gentle warmth into the room from its entire surface.



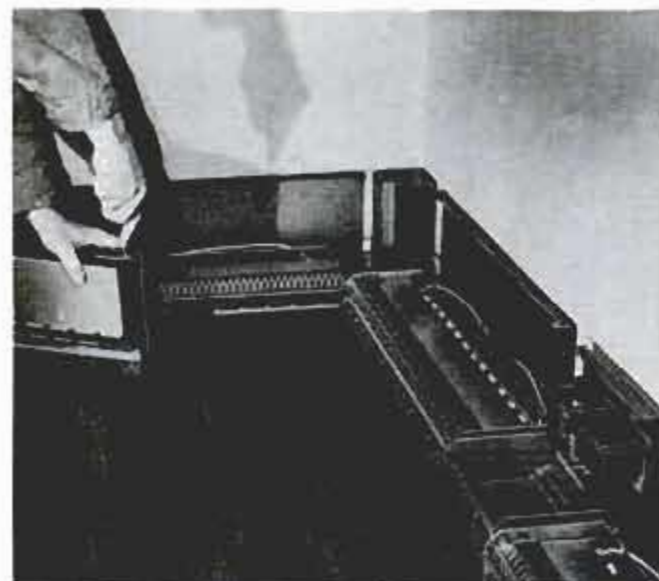
Most expensive electric house-heating system is the heat pump, shown here as installed in fireplace of Florida dwelling. It cools in summer as well as heats in winter. System works much like refrigerator or air-conditioner. In winter, however, cold air is pumped out of house, and heat is discharged into house



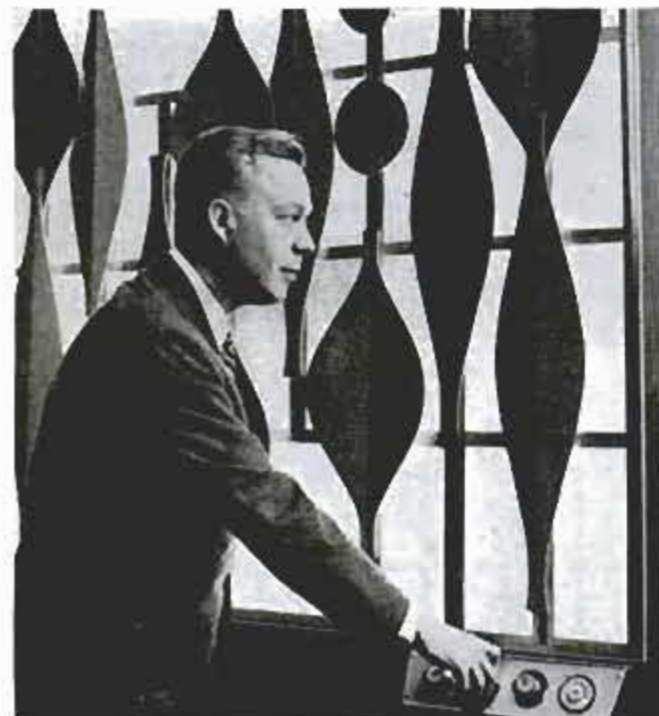
In the hidden ceiling-coil system, resistance coils are stapled in place on an unfinished ceiling



Coils are covered with plaster. Radiant heat warms plaster finish and radiates gently throughout room



Electric baseboard heating comes in sections to fit any contour. Below, experimental Westinghouse panels not only heat the room but also cool and light it



Johannsen, who expects to market his brain child soon, sees a tremendous future for it as a "snow melter" for driveways, airport runways and sidewalks, as well as for food-warming tables, industrial pipes and so on. But used in a living room, on all sides, it will provide a draftless, mysterious heat source as congenial as a summer day. One test installation in the ceiling and floor of an open dining pavilion in Spokane, Wash., enables patrons to eat outdoors comfortably even in winter.

Many panel-type resistance units are commonly called "radiant heaters." They're not, in most cases. Most resistance heaters warm the air in a room by convection, and the warm air, in turn, warms you. True radiant heat is reflected heat that will warm anything solid (including people) that it bounces against, without warming the surrounding air: something like the glare of a flashlight, which lights up objects it hits, but not the night. Under real radiant heat, you could be comfortably warm in a room where the air was near freezing temperature.

One of the many problems with this tricky heating method is that you can't control it with ordinary thermostats, which only work when air temperature changes. But equipment manufacturers are hot on the trail of some combination radiant-convective heaters for tomorrow's "all electric" house. Several outfits already produce panel units in a large assortment of sizes. They look like nothing more than plate glass in a metal frame. These heaters are actually tempered glass backed by a thin, electrically conductive coating. Thin, silver-foil strips on each side of the panel carry the current, and the entire glass sheet becomes

(Continued to page 288)

HOW MUCH CAN YOU AFFORD TO PAY?



BIGGEST QUESTION confronting the house hunter is "How much can I afford to pay each month on a mortgage?"

To help the prospective buyer, *Popular Mechanics* presents a chart that relates monthly housing expense to monthly take-home pay. Prepared by the Federal Housing Administration, this chart is based on the FHA's nationwide figures from 1955 through 1957. It should be understood that this chart is not the final criterion in judging a mortgagor's ability to pay. It is only a guide. The FHA has found that rules of thumb, such as 25 percent for housing expense or 2½ times income as a safe purchase price, are unreliable.

To use the chart, first find the heavy black median line. This represents the median housing expense for borrowers at each income level. Let's say your monthly take-home pay (after income-tax deduction) is \$650. Checking the chart, you'll find that the median for borrowers with that amount of income is about \$122, which means that this is about how much you can afford to pay per month for housing.

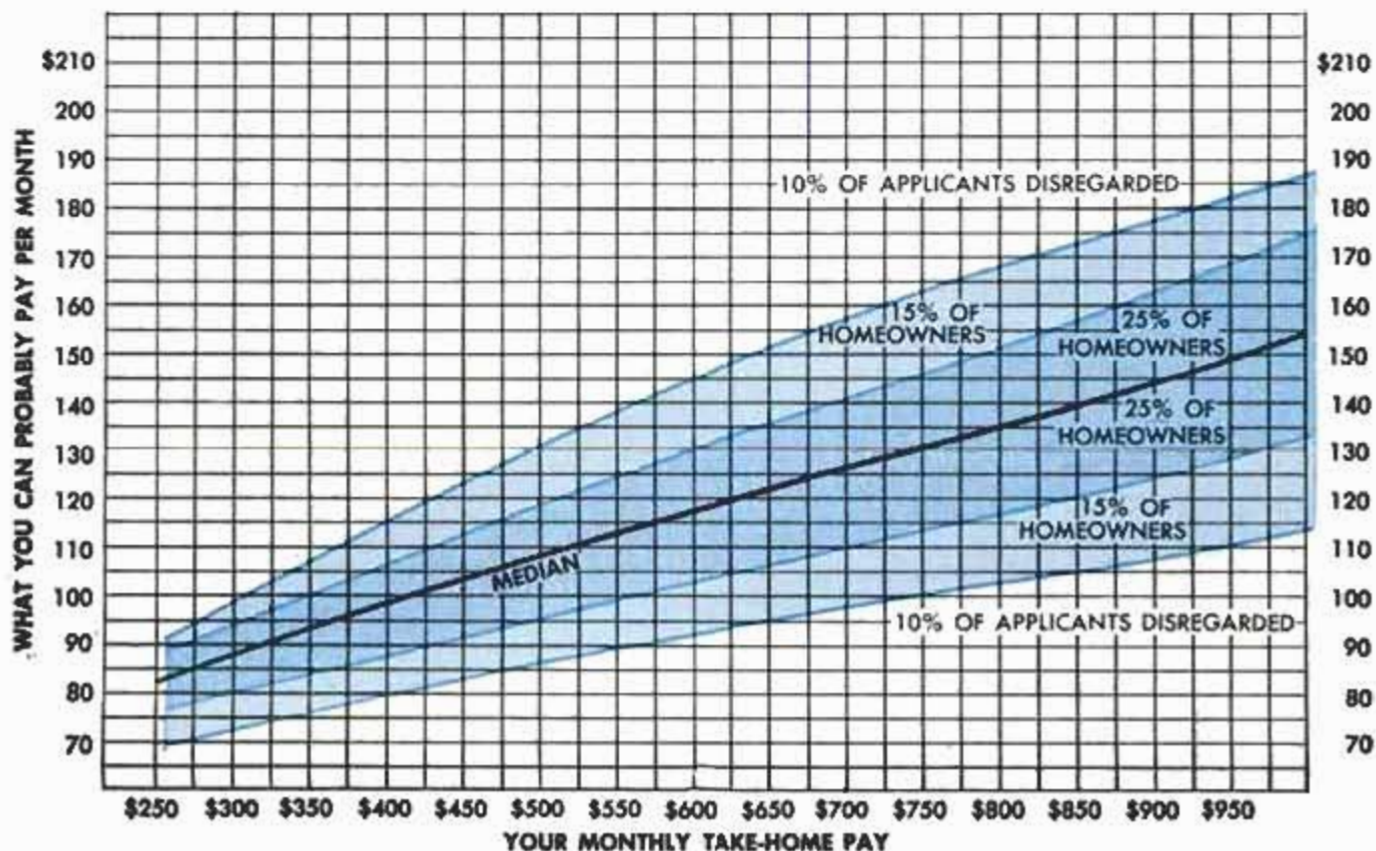
The chart also shows how housing expense for any one income group varies

above or below the median. For example, 25 percent of the borrowers with take-home pay of \$500 a month, who finance their homes with insured mortgages, assume monthly housing expenses ranging from \$108 to slightly less than \$120.

FHA techniques for analyzing mortgage risks, developed over 25 years, are based on three estimates: 1. the prospective mortgagor's dependable, continuing income; 2. the cost of occupying the property; and 3. all debts, living costs and other financial demands.

In estimating the cost of occupying a property ("what you can probably pay per month" in the chart below), home buyers sometimes make the mistake of thinking only in terms of mortgage payments and taxes. Actually the cost of home ownership and occupancy generally involves, in addition to these, the mortgage-insurance premium, hazard-insurance premium, maintenance and repairs, and utilities.

It is important that the estimate of prospective housing expense be compared with the housing expense that the borrower is accustomed to paying.



HOW TO GET YOUR HOUSE



CLEAN OUT ATTIC, BASEMENT, GARAGE



CLEAN UP THE FURNACE



KEEP YARD IN TOP SHAPE



PAINT FRONT DOOR AND SHUTTERS

EACH YEAR millions of Americans play a gigantic game of musical chairs. Last year, for example, a restless 33 million citizens packed up their belongings and moved to a new home, leaving their old abode as a "new home" for others.

Perhaps you are perfectly happy in your present home; you may plan to stay there the rest of your life. This may well happen, but the odds are against it. Figures show that the "average" family—if there is such a thing—moves once every five to six years.

Even though you have no intention of selling your house at the moment, the information on these two pages may be useful in the future. These tips on selling your home come from real-estate brokers—professionals in the business of getting prospects to sign on the dotted line.

These experts say the first thing to do is take an hour's time to tour your home as a stranger. Drive down the street as though you were a prospective buyer. What is your first impression? Does the house look attractive and homey? Now walk through every room, analyzing all the home's good points and bad. List the assets—you know them better than anyone else—for the realtor. On another sheet list the liabilities, along with any good arguments he can use to overcome these drawbacks.

It doesn't usually pay to make major and expensive alterations to a house in order to sell it. Usually such alterations will not increase the selling price proportionately.

Inside the house, the most important thing to do is to *emphasize spaciousness throughout*. A buyer likes to think he is getting a lot of house for the money. You can increase the *feeling* of spaciousness in a good many ways. Clean out the attic, basement and garage, disposing of everything you don't intend to move with you and packing everything you won't need until you're settled in your new home.

Remove out-of-season clothing from the closets and pack or store it elsewhere. Uncrowded closets can convert a looker into a buyer. Remove all other out-of-season items from the house and yard, such as boating equipment and garden furniture in wintertime, skis and duck decoys in the summer.

Have a talk with the kids, if they're old enough to understand what's going on. If possible, find them a parking place for their bicycles outside of the garage, and insist that they keep their toys in their rooms whenever

IN SHAPE TO SELL



the house is being shown. Toys can give an appealing touch to a child's room, but the same toys underfoot can make the house seem crowded.

If your basement is dark and gloomy, make it seem larger by renting a sprayer and spraying the ceilings and walls a light color. Use a water-mixed vinyl or similar paint to get a good one-coat finish.

Suggest easy family living inside the house. If you have a fireplace, clean it out and lay some logs. To the buyer the sight will inspire a mental picture of a pleasant evening in front of the fire.

The most important room in the house is the kitchen, from the standpoint of selling. Glamorize it in any way you can. Give cabinets a new coat of paint. It may pay you to replace worn countertops.

Repair the little things that the buyer is sure to notice. A loose porch step or a leaky faucet can profoundly affect the buyer's attitude, whether he knows it or not. Also, clean the furnace. For some obscure reason, men always look at the furnace of a home in the same way they kick the tires of an automobile.

When you show the house, have the windows sparkling clean and the drapes and shades open. This will make the rooms seem larger.

Outside the house, *suggest pleasant living, not work*. A lawn that needs mowing or a sidewalk that needs shoveling suggests hard work. Hire such work done if you must vacate the house before selling. If planting beds are overgrown and ragged, trim them back.

Repainting the exterior is debatable, but one thing you can do is repaint the exterior doors, particularly the front door. It welcomes any visitor, including the buyer. Make it an appealing welcome.

Federal tax laws allow you to deduct all fix-up costs made within 90 days before selling your home. Keep receipts and a record of all such expenses.

Last but not least, if you turn the home over to a realtor, *let him show it without interference*. Selling is his business. He's much more likely to make a sale if you let him handle prospects himself. ★★★



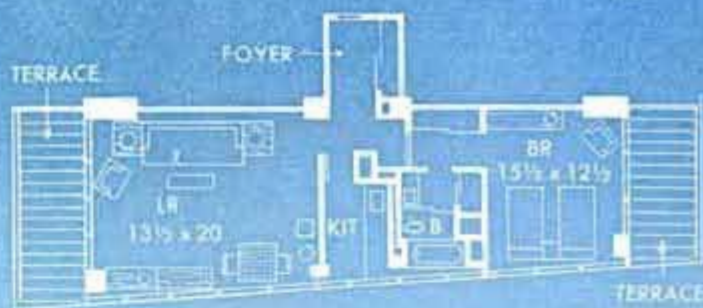
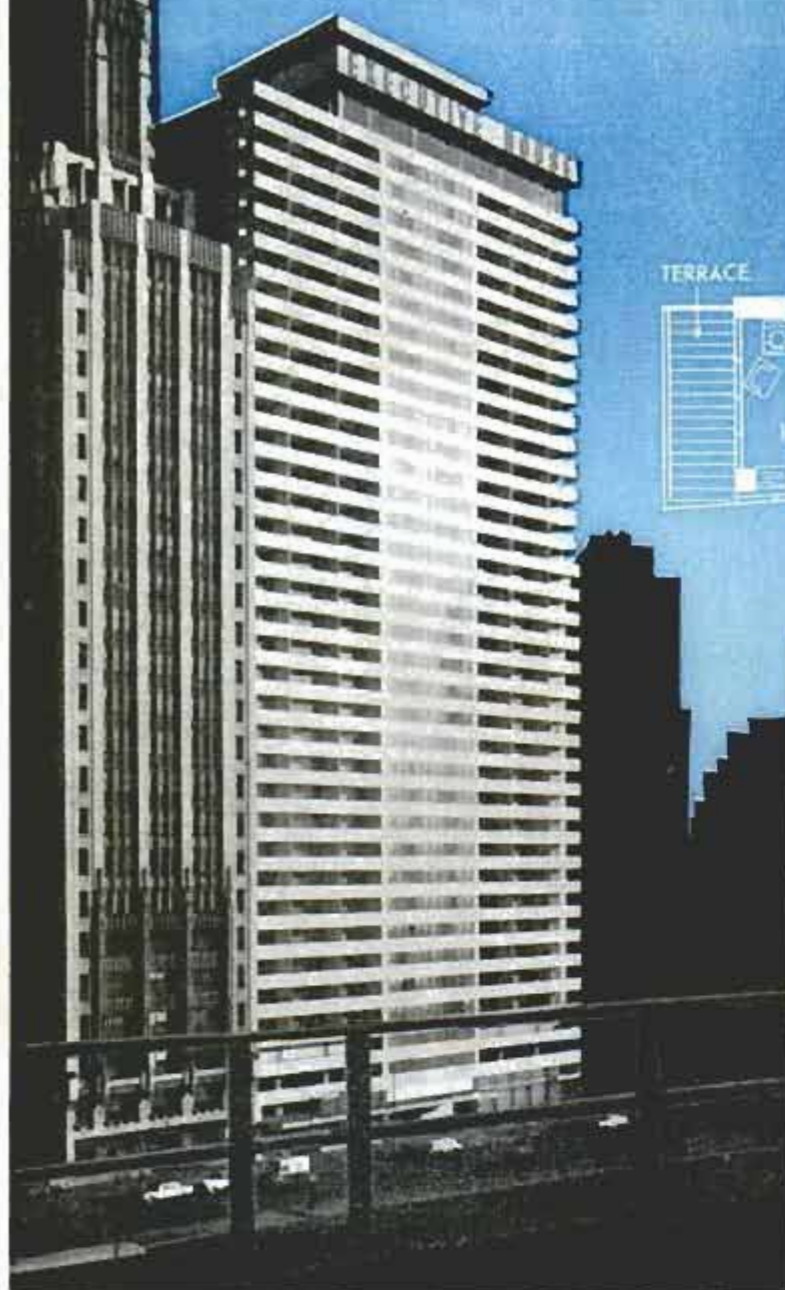
REDECORATE KITCHEN



SPRAY-PAINT BASEMENT



LET REALTOR SHOW HOUSE



New Concepts in Hotel Living . . .

RISING 40 STORIES above Chicago's Wacker Drive, the Executive House offers a new idea in hotel service with 448 suites and rooms for ultra-comfortable living and business entertaining on a daily or long-term basis. Designed by architect Milton M. Schwartz, the stainless-steel-clad skyscraper features accommodations from single studios to suites (plan above). There are kitchenettes in all units, 6 by 20-foot balconies in most. On top is a night club and restaurant, at ground level a 200-car garage.

Winner of a Merit Award from the American Institute of Architects, the Executive House reflects the trend of combining home and business functions under one roof.

Bill Engdahl, Hedrich-Blessing photos

Chicago's Executive House combines downtown-hotel convenience with apartment comforts. Living rooms, below, are designed to double for business entertaining; kitchen, bar and bedroom make the suite (floor plan above) a complete living unit or a self-contained "branch office" during conventions or shows





And New Efficiency From an Old Idea

CLASSIC ROW-HOUSE construction has long been a European favorite, is being widely used by American architects for areas where maximum families-per-acre coverage is necessary without resorting to towering "highrise" apartments. In the Drexel House and Gardens Project in Chicago, architect Bertrand Goldberg simplified design and construction and built 64 three-bedroom units which sold for a low \$12,900.

Despite the high land usage in this development, the use of interior courts and grille-walled patios provides a private outdoor area for each unit. Projecting roof and side walls add to the privacy as well as contributing to the striking over-all design. The development has won several awards and is being held up as an excellent example for future urban redevelopment or for suburban development in areas where a space problem exists.

Construction is almost entirely of concrete blocks and reinforced-concrete roofs and floors. Even the gridded privacy screens are side-laid concrete blocks.

Walled patios, projecting roof and walls give rowhouse units privacy. Through-wall concrete masonry (right) cuts costs, adds permanence. Units are compact, but there's plenty of room inside (see plan)



MORE APARTMENTS...



Split-level units in Loma Palisades project are clustered around landscaped courts; \$13,000,000 co-op was designed specifically for permanent tenants with children, features 25 pools, 10 fenced playgrounds



Interior of Loma Palisades apartment looks out over attractive patio; San Diego climate permits outdoor living year 'round. Santa Monica Biltmore, below, is built around a big swimming pool and patio that are the focal point for all apartments



EVEN IN Southern California, where they think in terms of open spaces rather than in terms of crowded urban areas, multiple-unit construction is increasing as land costs rise. One of the trend-setters in the West is the Los Angeles firm of Palmer & Krisel, which designed the Loma Palisades, a 1062-unit co-op project in San Diego.

Designed for Family Living

To attract permanent tenants with families, Palmer & Krisel built in maximum space and privacy, with split-level units in clusters of eight and twelve. Each unit has a patio or balcony and built-in appliances, and the project has 25 swimming pools and 10 fenced playgrounds—features that would be expensive extras to the private homeowner.

Another of the firm's projects reflects an opposite trend, this one in urban living. The Santa Monica Biltmore is an 80-unit building that was conceived as an apartment hotel, but was changed to an apartment building with a patio and pool in which units are leased to adults only.

The apartment architect today must be more than a designer of sectioned structures—he must provide adequate space with storage, built-ins, parking and outdoor-living areas to compete with home builders, and must provide all those features within the rigid budget set by the rental standards that will control future income.

PARADE OF HOMES

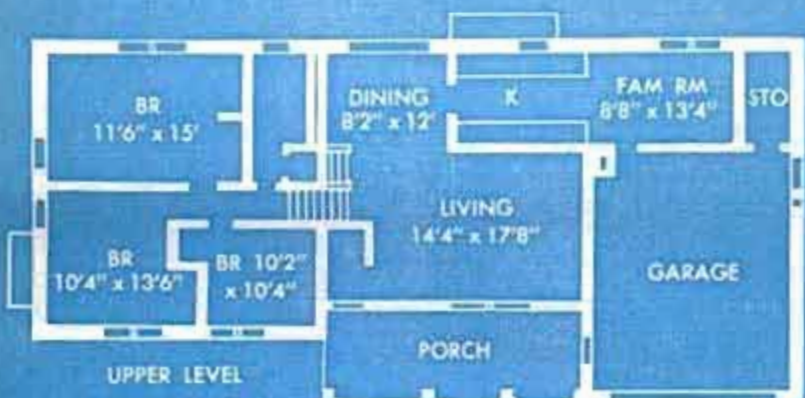
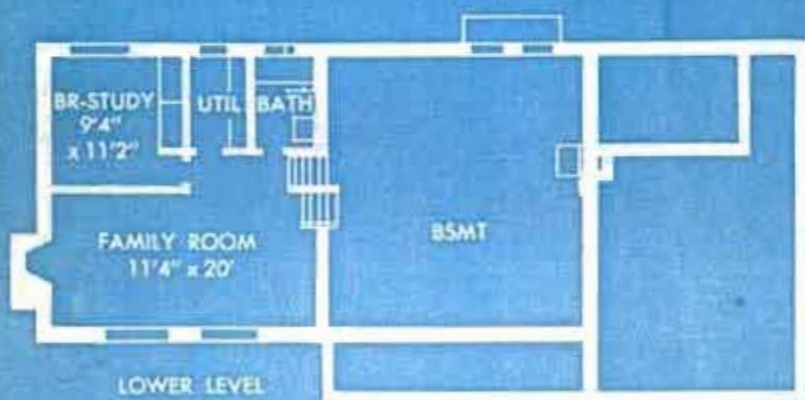
Outstanding homes from across the country, selected for their excellent design, livability and reasonable price



WHERE LAND for building is at a premium, the measure of a good architect can be his ability to design for problem lots. Here's an excellent design by Tacoma architect Marshall Perrow, built on a slope overlooking Puget Sound. A "two stage" house built for \$24,000, it's planned with the living area on the upper floor; the space below can be finished later if it's needed. Decks and sunshades provide plenty of outdoor-living space

VIEW FROM THE STREET belies the living space inside; the 1800-square-foot main floor has a bath and a half and three bedrooms; 800 square feet of deck. The lower floor has equal space and can be finished into two more bedrooms and a bath, but serves as a playroom and utility area until it's needed. Construction is wood frame with grooved fir plywood siding which is carried through the entryway and repeated in interior paneling. An interesting economy note is that the builder used $\frac{3}{4}$ -inch plywood for concrete forms, then reused the plywood for subflooring

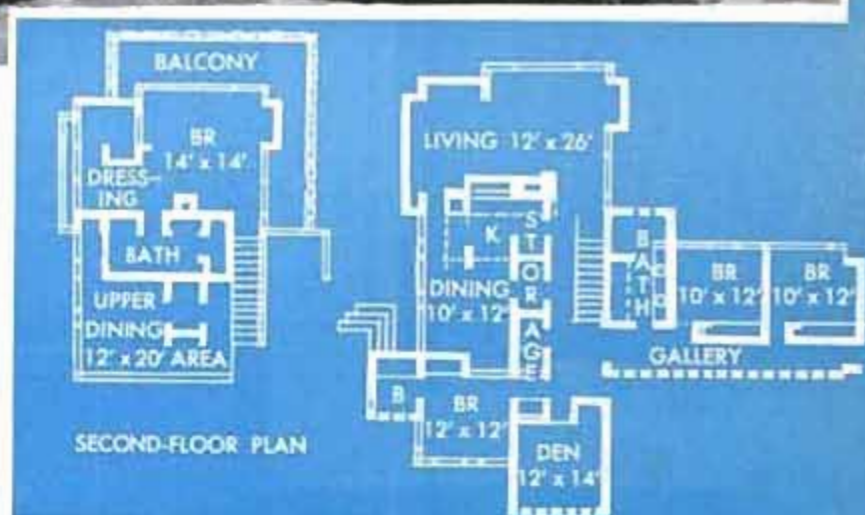




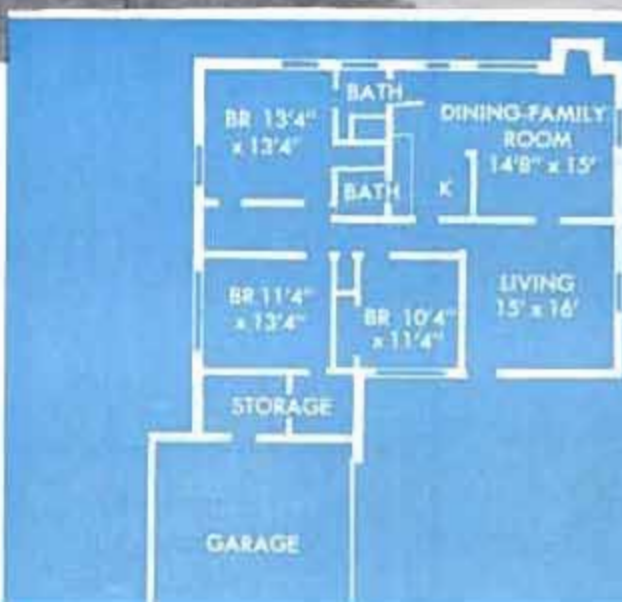
A LEADING MIDWESTERN builder, Gerholtz Community Homes of Flint, Mich., developed this popular side-to-side split-level home with architect Irving E. Palmquist and designer Richard B. Pollman. Called the Rockcreek Executive, the home has two full baths, four bedrooms, a two-car garage and a large patio, and is being built in several variations to sell from \$21,950 up. The price includes a long list of unusual extras — complete comfort conditioning; double-glazed windows, all appliances, carpeting and drapes; and complete sodding and landscaping. There are 1860 square feet of living area, excluding the basement and garage. The two variations shown above demonstrate how the trim—shutters, porch posts and other small but important touches—can add a traditional look to a good contemporary plan



LARGER and more costly than the other homes on these pages, the Tom Seidel home in Los Angeles presented such a good example of contemporary California architecture that we've included it. The Los Angeles architects, Holmes and Sellery, placed the master bedroom and parents' area into a second-floor "ivory tower," away from the other activities in the home, which are at ground level. The use of balconies, terrace and pool provide ideal outdoor living possibilities; deck serves as shelter for terrace. Construction is concrete block, redwood trim



ANOTHER builder's house, this time from the South, is the "Accent" house built by Fox & Jacobs Construction Company, Dallas, Tex. All masonry, the home covers 1375 square feet of living area plus 454 square feet of garage and storage, and sells for \$15,300 with year-round air conditioning, carpeting, dishwasher, garbage disposer, built-in range, oven, hood and several other extras. The Accent home proved popular with Texans — a 500-unit section sold out completely in less than three weeks



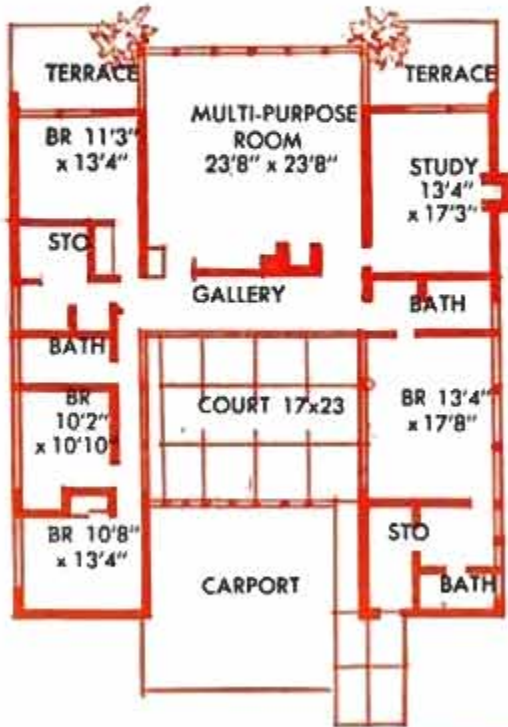


DESIGNED FOR FLORIDA, but a good house in any state, the Century was developed by Cross and Wilkinson of Bradentown, Fla., for Designer Builders' Bayshore Gardens development in Sarasota. This compact home has three bedrooms in its 940 square feet of living space, which is supplemented by 442 square feet of carport, storage and screened patio. It sold for \$11,950 in a planned community with a boat basin, beaches and many recreational facilities usually associated with resorts. The construction is mostly concrete masonry — blocks on three sides, concrete brick and plywood siding on front elevation

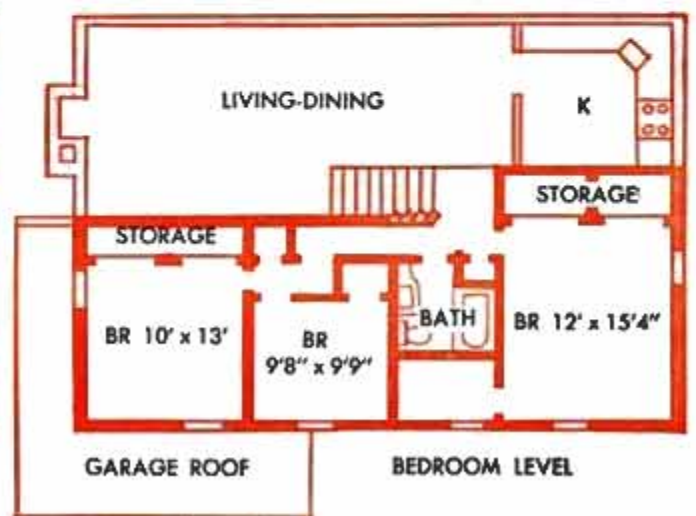


"SOUTHWEST TRADITIONAL" is the best term to describe the home of Mr. and Mrs. Harry Hilson in Tucson, Ariz. Designed by architect Charles E. Cox, the home features three bedrooms and two full baths in its 1550 square feet, and cost approximately \$16,000. Construction is 4 by 8 by 16-inch concrete blocks with "weeping" mortar joints, which soften the large masonry areas and blend very well with the textures of redwood siding, shake-shingled roof

ANOTHER houserol of ideas is the Richard Cornelle home in San Mateo, Calif., by architects Anshen & Allen. Base of the U-shaped plan is formed by a big all-purpose room which combines open kitchen, dining area, living room and family room, with access to terraces on each side. Between the arms of the U is a skylighted court, screened from the adjacent carport



UNUSUAL front-to-rear split level, designed by Rudolph A. Matern & Associates, was built in Riverton, N. J., by Strausman Construction Company. Its 1200 square feet, excluding the full basement under the living level, includes three bedrooms and a bath and a half. The price, including landscaping, built-in range and oven and other extras but excluding the land, was \$14,490; construction is wood frame with brick veneer, asbestos shingle, siding





LEATHER TILES for floors or walls are installed like any other tiles. Surfaced with durable, slip-proof lacquer, pigskin tiles come in $4\frac{1}{2}$ by $4\frac{1}{2}$ or $4\frac{1}{2}$ by 9-inch sizes either with straight or with beveled edges



"FLAT LIGHT BULBS," soon in production, will have many uses in architectural lighting. The inch-thick fluorescent glass plates produce a diffused light with almost no heat. They draw very little power

IDEAS FOR HOME

TRANSLUCENT CURTAIN-WALL PANELS of reinforced plastic and aluminum come prefabricated and fit quickly into floor and ceiling tracks. Doors, windows and color patterns can be built in to suit individual plan



BUILT-IN VACUUM SYSTEM for homes makes cleaning quick, quiet and dustless. Heavy-duty unit is installed in the basement; vacuum is "piped" to rooms. Lightweight hose plugs into convenient wall sockets



POWERED-STORAGE CABINETS slide up and down as needed, disappear when not in use. Operated by a silent electric-drive unit, they allow maximum storage in kitchens without wall space; on the market by 1960



PLANNERS



SLIDING MIRROR DOORS can be installed in bypass, pocket or face-track mountings. They are available in door sizes or floor-to-ceiling size, and can be mirrored on both sides for between-room installations



Request Jan 1960

After checking patio wall with his pocket rule, building inspector explains to owner that wall must be lowered. It is a foot higher than legal limit allows, and it shields next-door neighbor's back yard



By Richard T. Morris

CHIEF BUILDING INSPECTOR,
CITY OF LOS ANGELES

as told to James Joseph

GET IN STEP WITH YOUR BUILDING CODE

In erecting roof and wall, homeowner unwittingly built a "room." This violates window minima in rooms off patio



Here, inspector discovers that center beam is unsupported. Two boards are hanging in midair





In yard above, the cabana wall is too high. Usually, back-yard walls may be no more than six feet in height. Furthermore, cabana is built too close to property line. This violates building code's side-yard law

HOME CRAFTSMEN by the thousands—perhaps you among them—are right now pouring countless dollars and as many hours into home-improvement projects doomed to destruction.

Typical is the Illinois homeowner who labored a month of Sundays erecting a six-foot wall around his front yard. When irate neighbors complained, harried building inspectors had no choice but to ask him to lop off 18 decorative inches—to bring his craftsmanship within the 42-inch legal limit. He'd have conserved both muscle and money had he checked *first* with his local building office.

In New York, a homeowner converted his garage to a maid's quarters and ran afoul of a law common to most towns and cities. Unwittingly, he'd created a multiple dwelling in a neighborhood zoned for single-family homes. He was ordered to return the building to "original condition"—a garage. A moment's inquiry would have put his project in line with the building codes and saved him \$3000.

More costly was the conduit-caused fire in Maryland which gutted a \$30,000 home. Insurance sleuths voided the owner's policy—as they could by terms of its small print—when they discovered he'd installed the wiring without benefit of an electrical inspection. For \$3—the price of a permit—he could literally have saved his house.

In California, a couple invested three

This vent for gas furnace was installed too close to valley flashing. Rainwater coursing along flashing might seep into vent and douse flame in furnace



You'll probably need a building permit if:

1. Your home addition is valued over \$100 (figuring your labor at going local rates).
2. The addition changes your home's use or "occupancy," say from a single to multiple-family dwelling.
3. You add a garage or convert the one you have to another use.
4. You wall in, roof or attach a patio to your house.
5. The pool you're building is deeper than 24 inches.
6. You build a retaining wall over four feet high.
7. You plan to install plumbing or electricity, either inside or outside your home.
8. Your barbecue's chimney is more than six feet high.
9. You drill a well or put in a lawn-sprinkler system.
10. You build a carport.
11. Your radio or TV antenna, tower or flagpole exceeds 45 feet in height.
12. The garden house you plan (lath house or pergola) has a floor area greater than 400 square feet.
13. Awnings or canopies extend 12 feet or more from your home's exterior walls.
14. You plan to install or alter street curbs or sidewalks.

weeks and \$900 in a home-crafted room addition. Scarcely had they applied the last coat of paint than they received orders to demolish it. The new room, though expertly built, pre-empted the space which by law must be left between neighboring dwellings.

"Building codes?" shrugged the unhappy homeowners. "Why, we thought they applied only to contractors."

On the contrary, there's hardly a home project which isn't ruled, one way or another, by local building codes. True, you may not always need a *building permit*. But you always need to know the law—the *building code*.

What's more, if yours is among the 850 cities in 42 states operating under the "Uniform Building Code" (or the 150 southern municipalities using the "Southern Standard Code"), you'll likely need a permit *before* beginning any project which (1) changes the use or "occupancy" of your home; (2) costs more than about \$100, figuring your own labor at local rates (some cities tab costs on the basis of \$10 a square foot); (3) involves electricity or plumbing.

Free Information

Regardless of the project, it's a safe bet that before you pick up trowel or hammer you should pick up the phone and dial your local building office. Moreover, building inspectors have at finger tip a whole

glossary of how-to-build-it information that's yours, free for the asking.

Maybe you're wondering whether the rafters of that detached garage you're planning should be two by fours or two by sixes. The building inspector knows, and advises you to buy two by sixes because he knows your local code.

What's the concrete formula for post-supporting piers under that patio roof you hanker to build? Within seconds the inspector's back on the phone with the answer: "One part cement, three parts sand, four parts gravel."

Or perhaps it's a retaining wall you're planning. The building office will give you the rough specifications, may even send an inspector out to the house to size up your problem. You pay nothing for do-it-yourself information, and but a modest fee for plan checking and building permits, if they're required.

How modest? Well, many building offices charge as little as \$3 to check over plans for projects valued at \$1000 and more. Once plans are approved, you pay another \$5 to \$6 for a permit, which gives you the green light to unlimber shovel and saw.

You've spent but \$8 or \$9, yet bought a bargain: the round-the-clock services of your building department.

As your project progresses, an inspector will check it over. He may suggest money-saving changes and labor short cuts. To-



Inspector notes cold joint in concrete foundation. Fault occurs when too much time elapses between pours

gether, you and the inspector will see the job through. Nor will you be asked to pay a cent more for all these services which, if you contracted them out, would likely run \$10 to \$15 per hour. Your original fee—\$8 to \$9 for the average home project—covers the works, and as many on-the-spot visits as you need to finish the job.

Unhappily, many home craftsmen who could most benefit from the inspector's years of do-it-yourself know-how neglect to ask his advice before taking tools in hand.

Recently, for example, I surveyed a residential tract whose \$15,000 to \$20,000 homes had been built within the past two years. Their owners, with incomes in the \$6000 to \$10,000 bracket, had money to spend—and they'd spent it putting up patios, fences and new room additions. Not one had bothered to apply for a building permit. Nor, for that matter, for construction advice. Small wonder that fully 11 percent of the home projects violated building codes, violated them enough to warrant citations.

One homeowner had installed a dozen light switches, every one of them illegal under the local code (they'd been ruled "not acceptable" by the fire marshal who blamed them for scores of fires).

Another had built a retaining wall with

insufficient reinforcement to hold back a hill which threatened, even as I looked over the job, to bury his house.

Still another had crafted a barbecue in his front yard, a site illegal under most zoning regulations.

(Continued to page 273)

Looking out for homeowner's interests, inspector makes sure contractor understands window minima





Good landscaping is as tidily decorative with its basic evergreens under snow as it is in summer when flowering shrubs bloom (opposite page)

THE TEST OF GOOD LANDSCAPING THAT YEAR-ROUND EFFECT

By **Harold O. Klopp**
LANDSCAPE ARCHITECT

TOO BAD you can't see the place in another six weeks, when the 'mums are in bloom."

"Sorry the yard's such a mess—you should have seen it last month when the spring bulbs were at their peak."

If you're an apologetic gardener who constantly hears himself making remarks like these in spite of the fact that you work like a demon with hose, fertilizer, trowel and seed catalogue, you have lots of company. Chances are you're the victim of an easily remedied deficiency suffered by all but the professionals and a relatively few

knowledgeable amateur gardeners: There's something basically wrong with your landscaping.

The traditional "flower garden," grown in precision-edged patches cut out of the lawn and banked with assorted annuals so everyone can see the display of color each summer, presents one of the toughest maintenance jobs possible. What's worse, the carefully cultured blooms are gone in a few months. During the remainder of the year the "garden" is a patch of scraggly brown stems intermingled with a spattering of struggling green plants, unreachable



Landscaped by the author, the home of John Hedberg in Arlington, Ill. (above), reveals a summer dress of low foundation plantings with a few tall shrubs for accent. Sweeping pavements and broad, curving beds make for eye appeal and easy care. Ground cover borders beds for horizontal balance. Below, spring blossoms in an Elgin, Ill., year-round garden (snowed in at left) provide a riot of color against evergreen shrubs

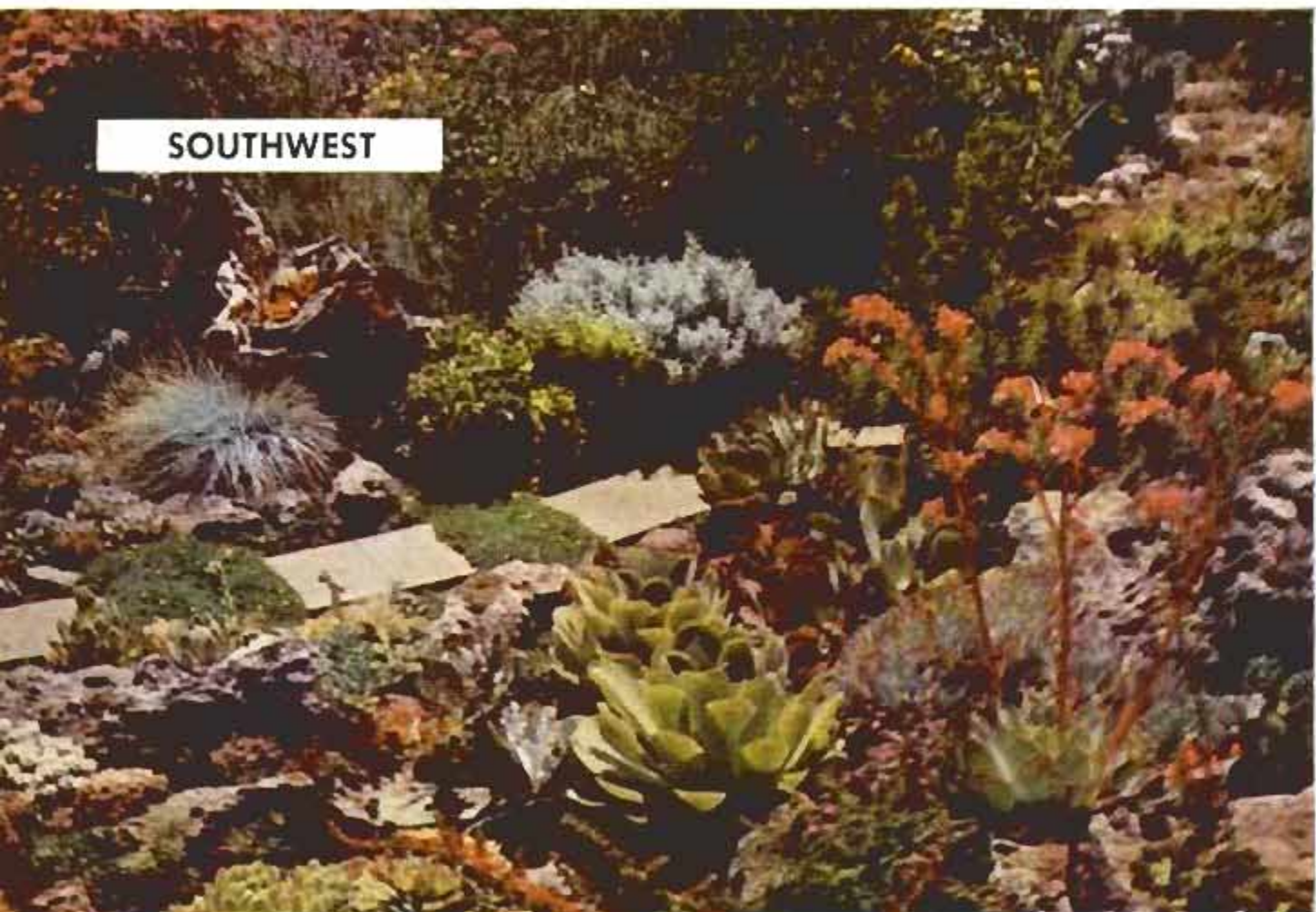


MID-SOUTH



Year-round beauty, requiring little care, can be achieved in any climate by careful planning and by using trees, shrubs and hardy year-round flowering plants. In the mid-South garden above, azaleas blaze against a pattern of dogwood and redbud trees. The Southwest garden, below, features a spectacular array of blooming cactus, providing an intriguing texture even during nonblooming periods

SOUTHWEST

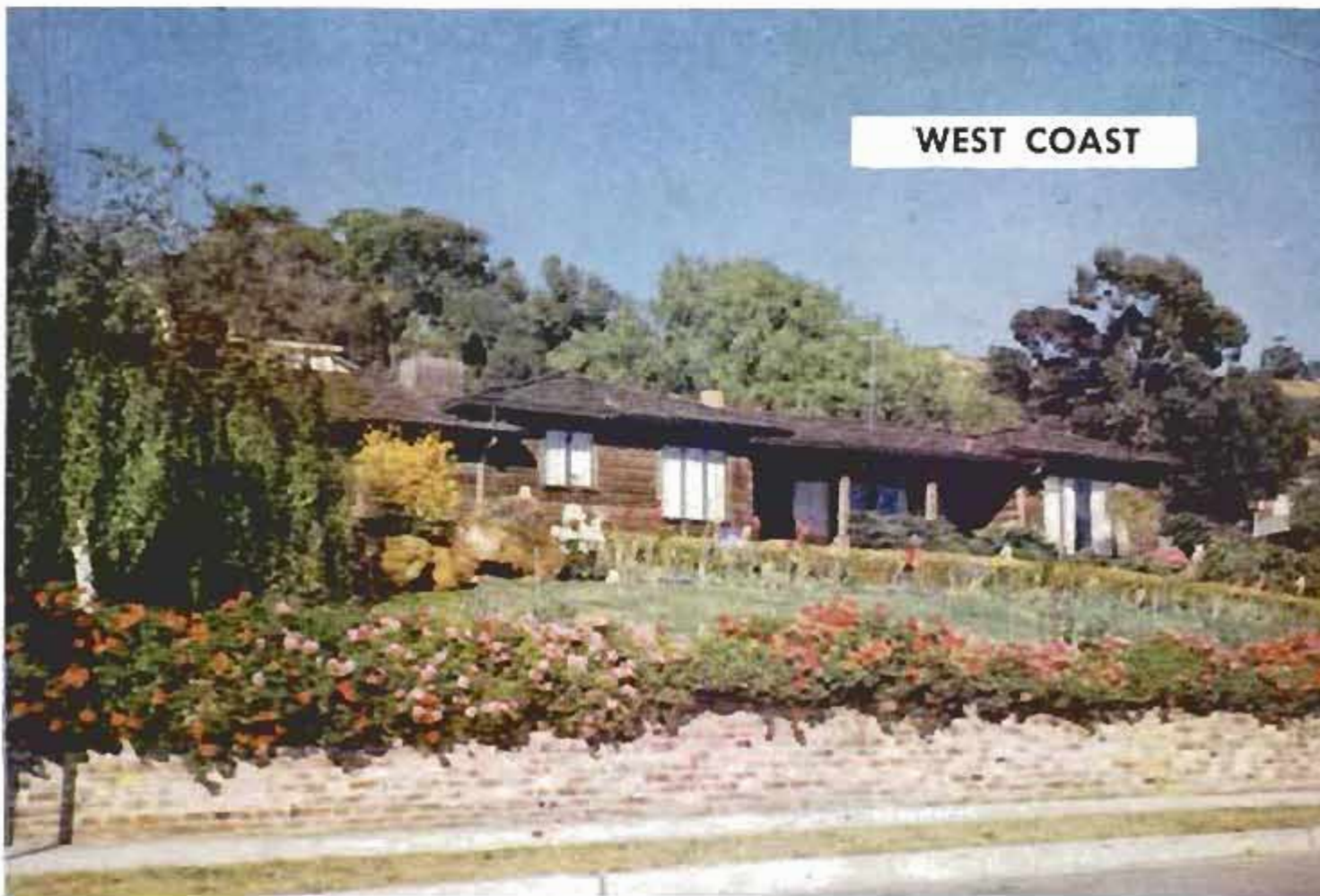


NEW ENGLAND



Red and gold sugar maples are at their flamboyant best during New England fall (above), but their decorative beauty in spring and summer, shading the lawns, is matched in winter when black branches make patterns on the snow. Simple evergreens planted near houses relieve austerity of these yards in winter. Below, the profusion of color surrounding a West Coast home all year is achieved with geraniums, Scotch broom, white roses

WEST COAST





Modern patio landscape designed for *Popular Mechanics* by the author emphasizes easy maintenance and graceful lines. Generous curves provide drama. Interest is added by dual level and low brick wall. Paved area eliminates mowing, creates separate lounging terrace. Paved mowing strips eliminate trimming. Ground cover, evergreens, flowering shrubs and trees complete effect

CHART FOR YEAR ROUND BEAUTY

NORTHERN AREAS

Trees

Evergreen

- Norwegian spruce
- Blue spruce
- Douglas fir
- Canadian hemlock
- White pine
- *Red pine
- Eastern red cedar
- *Juniper

Deciduous

- American maple
 - *Japanese maple
 - *Japanese cherry
 - *Chestnut
 - Alder
 - *Amalanchier (Juneberry)
 - Birch
 - *Redbud
 - *Flowering dogwood
 - Hawthorn
 - *Beech
 - *Silverbell
 - *Magnolia
 - Flowering crab
 - Weeping and corkscrew willow
- *Asterisks above indicate trees equally desirable in South.

Shrubs

Evergreen

- *Azalea
- *Catawba rhododendron
- *Japanese andromeda
- *Mountain laurel
- *Dwarf Japanese yew
- Horizontal juniper
- Mugo pine
- *Arborvitae

Deciduous

- Dogwood (red)
- *Pagoda dogwood
- *Cornelia cherry
- *Cottoneaster
- Russian olive
- Euonymus alatus
- Witchhazel
- *Oregon grape holly
- Sumac
- Buffaloberry
- Wayfaring tree
- Nanny berry
- Blackhaw
- Warminster broom
- Viburnum carlesi

Ground Covers

Sun or Shade

- Ajugga geneuensis
(evergreen—blue flower)
- Euonymus radicans
(evergreen—white-orange berries)
- Iberis sempervirens
(evergreen—white flower)
- Vinca minor (periwinkle)
(evergreen—blue flower)
- Hedera helix baltica
(evergreen—inconspicuous flower)
- Violets
(perennial—white and blue flower)
- Sedums
(perennial—various flowers)
- Euonymus colorata
(perennial—variegated leaf)

Shade Only

- Pachysandra (evergreen)
- Lily of the valley
(Perennial—white bell)

Sun Only

- Creeping thyme
(perennial—white, lavender blue flower)
- Lonicera japonica
(perennial—pink flower)
- Rose wichuriana
(perennial—white flower)
- Rosa Max Graf
(perennial—silver-pink flower)

SOUTHERN AREAS

Trees

Evergreen

- Cedrus
- Cypress
- Pinus excelsa
- English yew

Deciduous

- Southern hackberry
- Ginkgo
- Japanese honey locust
- Sweet-gum
- Magnolia
- Oak
- Kadsura tree

Shrubs

Evergreen

- Pyracanthus
- Buxus
- Carolina rhododendron
- Camellia japonica
- Holly
- Abelia

Deciduous

- Cork maple
- Deutzia
- Hibiscus
- Tennessee false indigo
- Beauty fruit
- Blue spirea
- Sweet fern
- Daphne
- Jasmine

weeds and inevitable sprays of thriving crabgrass. More often than not, the space it occupies, chosen for display from the street, walk or kitchen window, is lawn area that you and the kids could use for lounging or play.

Oddly enough, in most cases it is easier to have a garden you'll be intensely proud of not just three months a year, but virtually all year 'round; one that will make the most of your yard space so everyone can enjoy it. In such a garden, plants that have finished blooming form decorative green banks as a backdrop for other blooms that are on the way. It can, in fact, look like the corner of a lavish estate all the time. And the most startling fact is that all this can be meticulously maintained in a fraction of the time you would have to spend on frustrating flower patches.

The simple secret is landscaping — in a word, planning. Good planning calls for a

written list of all your family needs and desires. Talk it over and get everyone's ideas. A contemporary garden is not just something to look at from the street. It is for people—a place they can use and enjoy. It can and should be a part of outdoor living for every member of the family.

Careful selection of plantings, plus a few techniques we'll discuss in this article, can make it possible to organize your beds so that you won't be a slave to a garden that never looks right. Whatever you do, don't go out and haphazardly buy flowers, shrubs and trees. What should you do, then?

First, make a scale map of your property on graph paper, indicating the position of your house on the plot. All trees, rocks, embankments, slopes and the direction of any view worth emphasizing come next. These are all natural features that can be exploited in a garden, even though some of those rocks and ridges may seem like ob-



Rocky outcrop in the garden can become part of the decorative scheme with interesting rock plants such as "hen and chicken" cluster. Quarter is for size



Effective use of *euonymus colorata* variegated as a ground cover around a curious birdbath adds a spot of texture to make an interesting garden corner



Many ground covers have blossoms or fruits that spatter color across broad areas, such as the berry-laden *euonymus radicans* vegetus, above. Below is *vinca minor* (periwinkle), favorite in sun or shade



stacles at first. Sedums, mosses, perennial rock plants and small horizontal evergreens can make a high point of interest out of an ugly rock.

As you chart these features, try to visualize your yard in areas that can be set apart by plants, with perhaps the addition of a few strategically placed shrubs such as yews, junipers, dwarf Japanese maples and the like. Be careful of towering vertical varieties, since they tend to create a "fence" or "hedge" unless expertly treated as accent units, or for special purposes.

Once you've determined the likeliest positions for these first planting beds, use bold, sweeping lines in outlining their contours. Growing shrubs and plants will soon overrun sharp curves, wiggles and angled corners. Long, bold curves tend to maintain their over-all design.

In plotting the "area divisions" of your land, these are things to consider:

Privacy. You'll want a section of lawn where you can sit, entertain and perhaps barbecue a picnic supper without making it necessary for the neighbors to see and hear everything that's going on. They may not enjoy it any more than you. This is





Combinations of ground-hugging plants make for interesting variety, such as the Queen Anne's lace mixed in with *ajuga genevensis* in garden above



Points of high interest in a garden can be created with simple ingredients shown here—a rock, a *funkia spectabilis*, *euonymus colorata variegated* and ferns

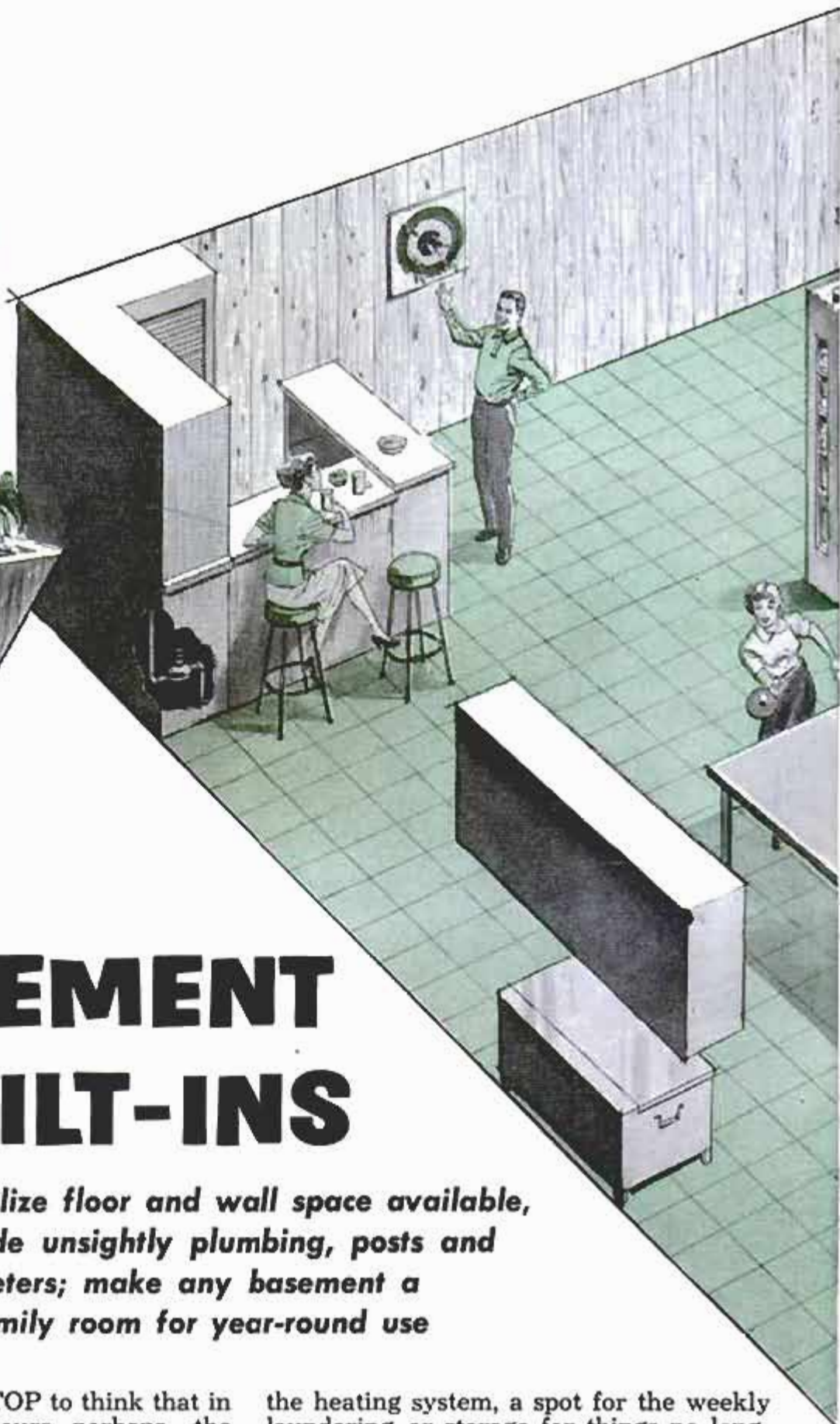
one place where tall, screening evergreen shrubs and trees—such as juniper, rhododendron, cedar and hemlock—can provide a gracefully curving wall of informal privacy, creating a secluded nook without presenting the cold, formidable barrier of a high wall or fence. Banked with low flowering shrubs, border perennials or, even better, low ground cover to mark the contour of the bed, such a green wall can present all the cool seclusion of a forest glen. A tiny pool, or even the grill itself set on a flagged dais a few inches higher than the lawn can provide a fine center of interest in such a quiet corner.

Play area. The kids have to have their fun, so don't cheat them out of their place in the sun. Somewhere, allow for a broad sweep of tough lawn where badminton can be set up, croquet wickets staked out or a bow and arrow range contrived. It should

(Continued to page 258)

Deft artistic touch may be applied to a garden with a single accent tree like the lacy corkscrew willow shown at right





BASEMENT BUILT-INS

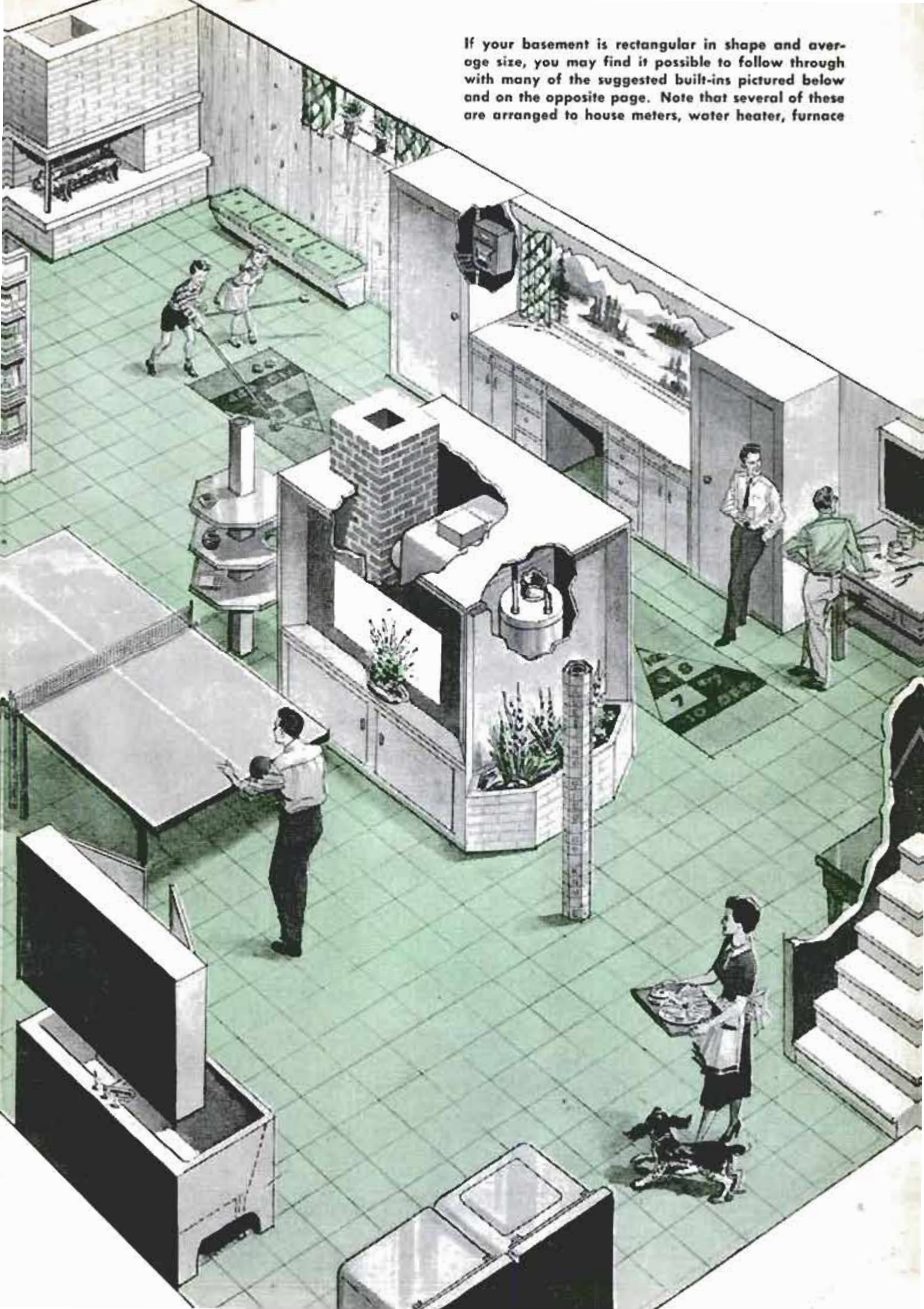
*utilize floor and wall space available,
hide unsightly plumbing, posts and
meters; make any basement a
family room for year-round use*

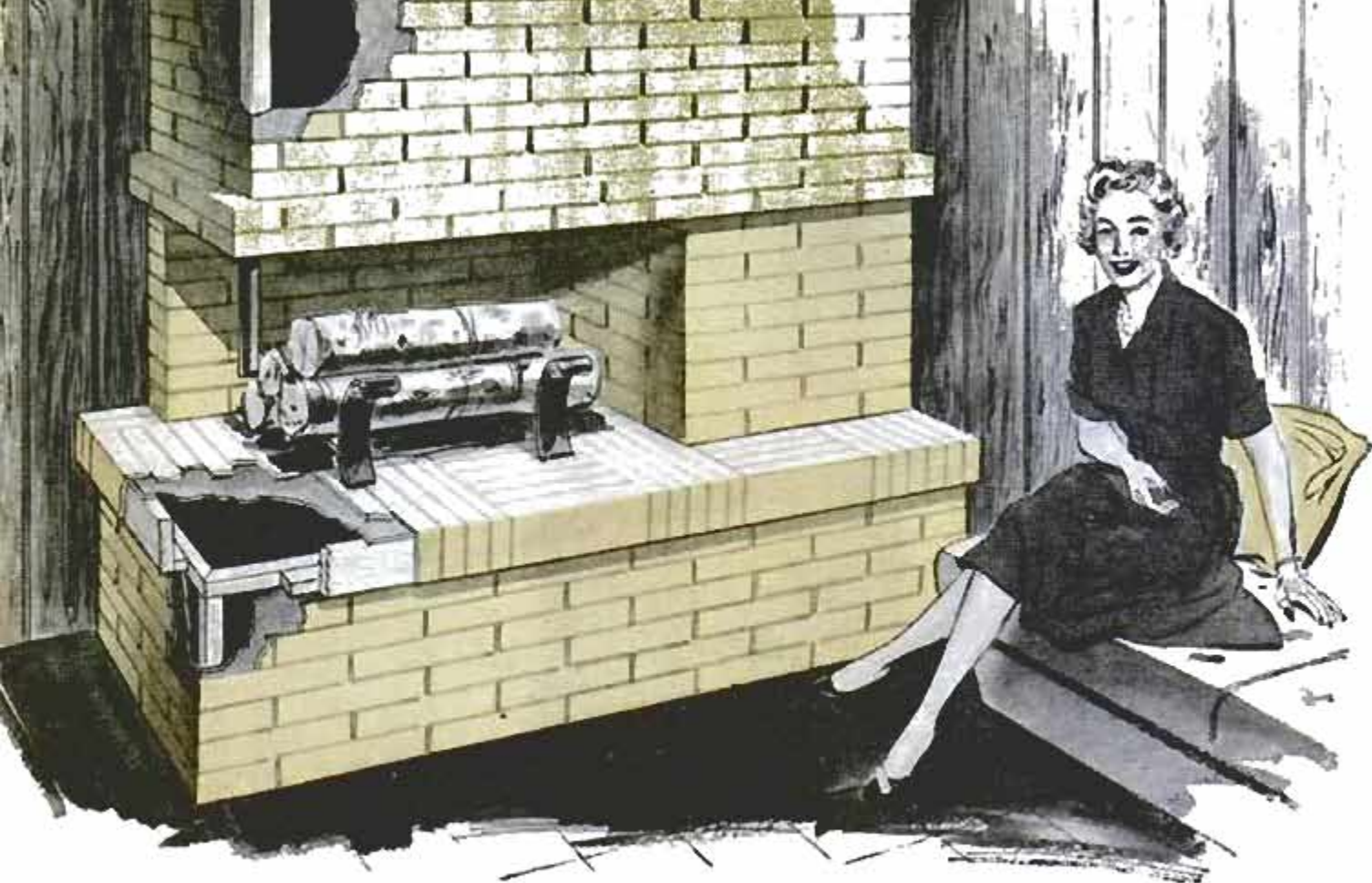
DID YOU EVER STOP to think that in many homes, yours perhaps, the basement floor area is the same as that of the house? If yours is an older home, the basement floor area may be only half that of the house, or even less, but it's still a valuable part of the property. In most homes the basement remains just about as it was when the house was built, nothing more than a plain utility room, a place for

the heating system, a spot for the weekly laundering, or storage for things no longer wanted upstairs. Perhaps there are shelves along the walls somewhere and possibly there's left-over space for a workbench and a few household tools. And that's about all. But with a bit of simple planning it can be something else.

What you plan depends to some extent on the size of the basement, the height

If your basement is rectangular in shape and average size, you may find it possible to follow through with many of the suggested built-ins pictured below and on the opposite page. Note that several of these are arranged to house meters, water heater, furnace

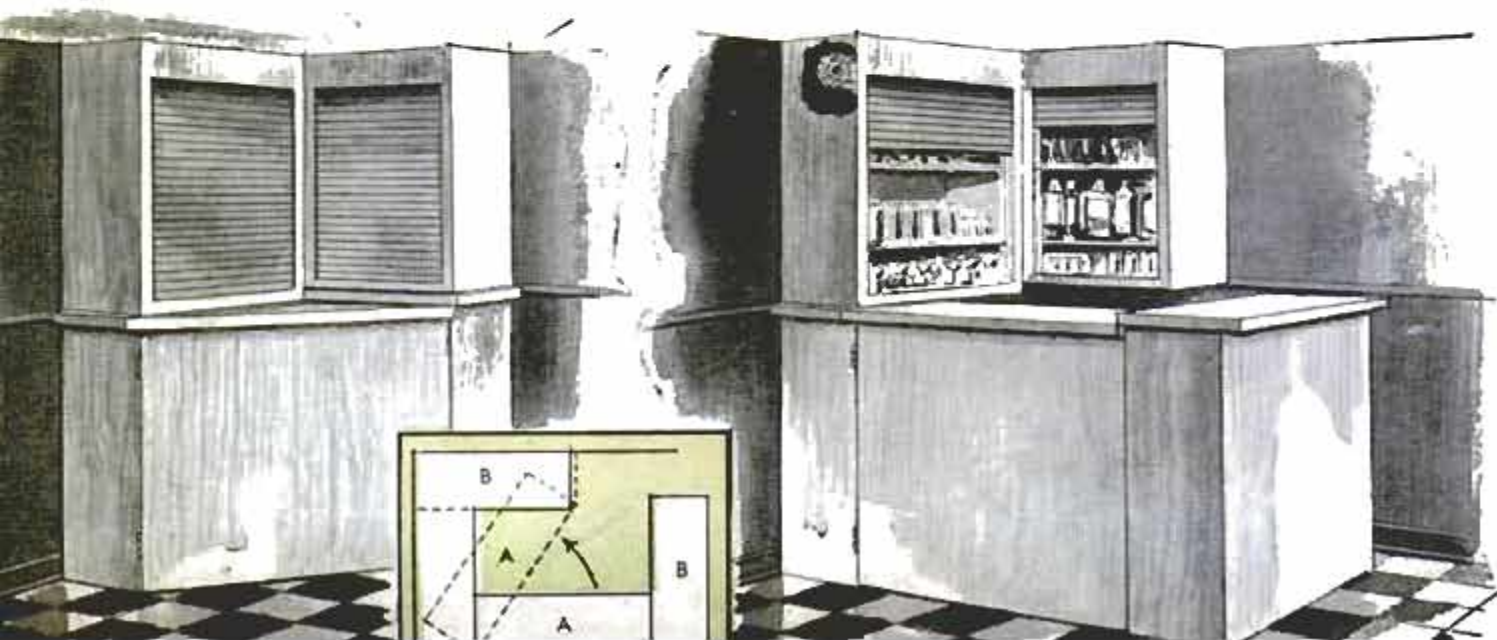




from floor to joists, and whether or not it is a square, rectangular or L-shaped room. Also, the location of the laundry tubs (or the washer-dryer units), the gas, water and electric meters and the location of the furnace or boiler and the chimney are factors to be considered. The center beam and supporting posts also will enter into the planning in the final decorative stages.

If the room is rectangular or square and open without any load-bearing partitions, then it usually is best to plan a single room rather than partitioning into two or more rooms, especially if the floor space is comparatively small. If the room is quite large or is L-shaped, planning should take this into account. It's always a good idea to make a simple sketch to scale, say

1 in. to 1 ft., of the floor area. On this, locate the center beam and supporting posts, the furnace or boiler, chimney, stairway, drains, meters and so on until you have included all the utilities and other items that must remain in place. Then mark the tentative locations of such built-in units as space will permit. If the furnace is near the center of the room, then you may wish to plan an island-type enclosure as suggested in the drawings on preceding pages. In planning such an enclosure it is essential to provide access doors and reduce the fire hazard to the minimum with an asbestos lining. The air requirements of the fuel burner also must be considered. If the basement affords a long, unbroken wall space, plan a hobby or study center



with a suitable wall mural, also a desk-table with plenty of drawer and cabinet storage space. Floor-to-ceiling storage cabinets at the ends of the desk-table can provide additional storage space. Perhaps one or the other can be made to house one of the meters, or other fixed object, as suggested in the illustrations.

A refreshment bar and a real or false fireplace have decorative values that should always be kept in mind when planning. In a rectangular room the corners are likely locations, but don't rule out the possibility of locating one or the other or both on the wall spaces. A real fireplace is, of course, a job for your mason contractor. Let him plan and build it. Just tell him where you want it and let him take it from there. But the ornamental fireplace you can build yourself, using any of the ornamental brick coverings that suits your fancy. It's a fairly simple job to frame such a structure and apply the coverings as suggested in one of the illustrations.

When planning the size, location and construction of hanging wall cabinets, floor-to-ceiling storage cabinets, a refreshment bar, a center island and an ornamental fireplace, plan to use the plywoods and the wood-grained or plain hardboards as building materials. These cut easily and assemble quickly into cabinets, tables, doors and also can be used as wall paneling, especially the grained types.

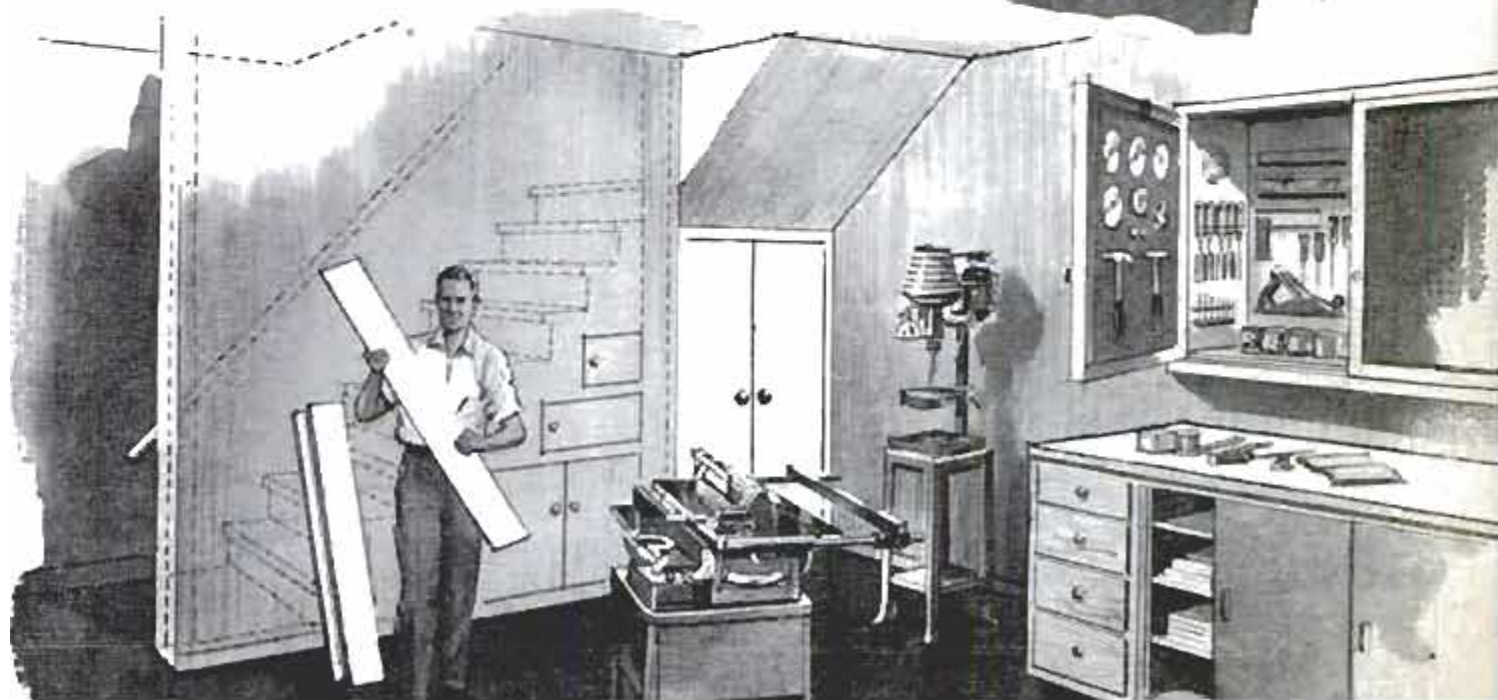
The refreshment bar can be made to

fold into a corner as suggested in one of the illustrations which shows open and closed views and indicates the manner in which the two-piece bar can be made to fold. The corner cabinet can be made with rolling shutters of the tambour type, or you can use sliding glass panels.

If the basement stairway is built against a wall, give special attention to the space under the stair. Enclosed it may afford space for storage of power tools such as a circular saw or wood lathe, a drill press and possibly a small band saw. Or you may find you can utilize the space available to better advantage by building the workbench under the stair and storing small tools in shallow wall cabinets with sliding doors. In this plan, power tools on rolling stands can be arranged along a wall out of the way when not in use. The stairway itself can be enclosed as in a well, or it can be left open and provided with an ornamental rail with square or turned balusters.

Wall, floor and ceiling treatment offers considerable latitude and choice of materials. Paneling of solid woods for the walls is a popular choice, but any of the wood-grained hardboards make a good substitute. Ceiling tile in various colors, types and patterns are available from your local building-materials dealer, also complete instructions for application. You'll also want to think about flush-lighting fixtures in the ceiling, spotlighting a dart

Give special attention to space under basement stairway. In nearly all instances it can be utilized for storage of power tools, hobby supplies, canned fruit, vegetables, anything that requires closed storage space. Or, perhaps you can put the space to better use for a built-in workbench and tool panels

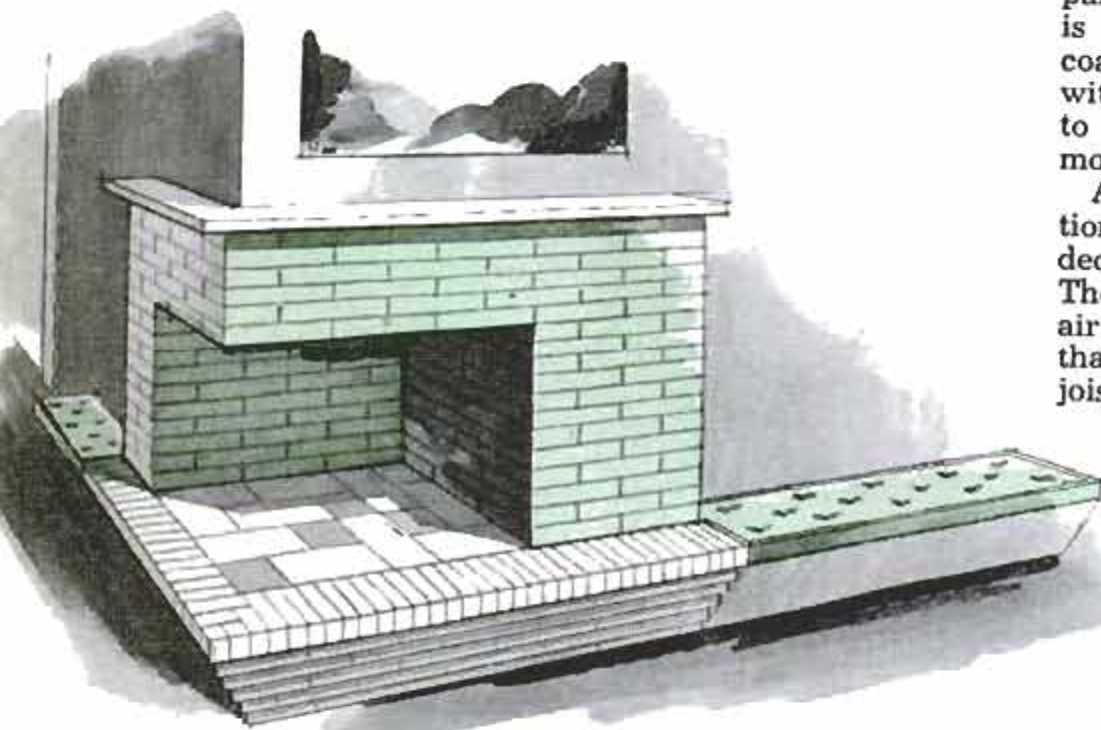




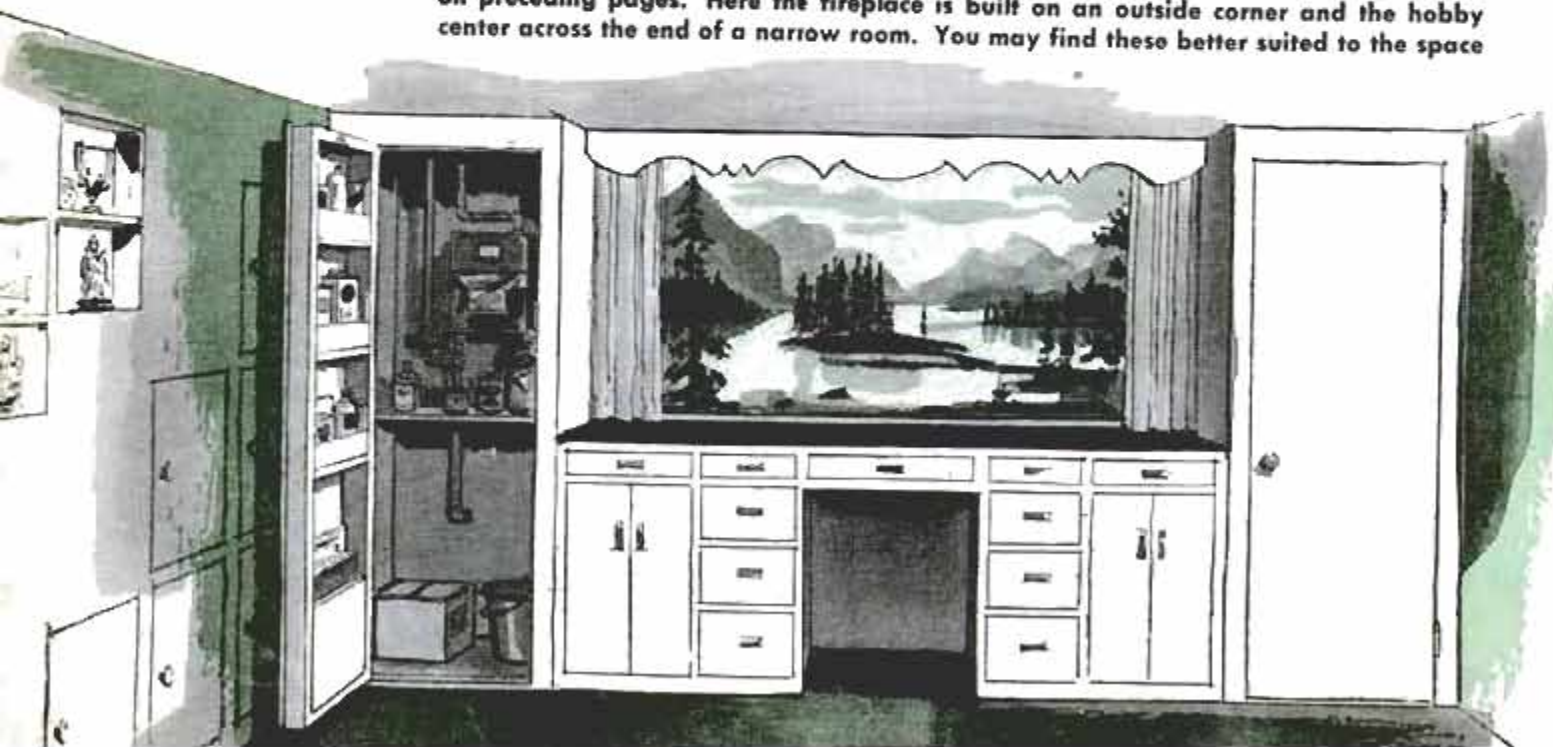
board, floodlighting the shuffleboard area, the workbench and individual power tools and possibly the wall mural. If you plan to use asphalt floor tile be sure to follow in all details the manufacturer's instructions for laying asphalt tile below grade.

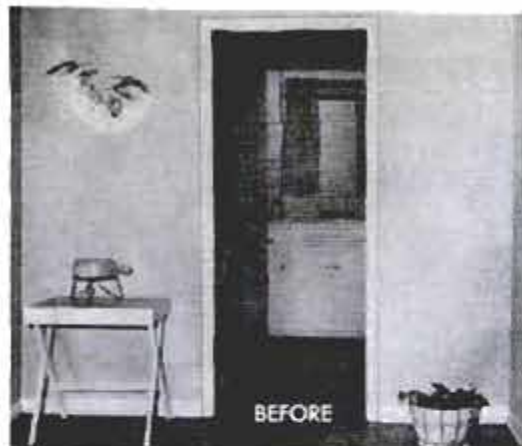
Wall treatment calls for some careful thought. If the room is rectangular it generally is best to panel only two of the walls with wood or a wood-grained hardboard. Walls to be paneled should be coated with a masonry waterproofer or with hot asphalt before attaching furring strips and paneling. If wood paneling is used it's a good idea to coat the backs of the boards with shellac or an oil paint to prevent absorption of moisture.

Accompanying illustrations suggest methods of decorating supporting posts. The supporting beam, warm-air ductwork and plumbing that run below the floor joist require individual treatment. Before beginning work it's important to check all governing provisions of your local building code. ★ ★ ★



Above and below are suggested variations of the fireplace and hobby center shown on preceding pages. Here the fireplace is built on an outside corner and the hobby center across the end of a narrow room. You may find these better suited to the space



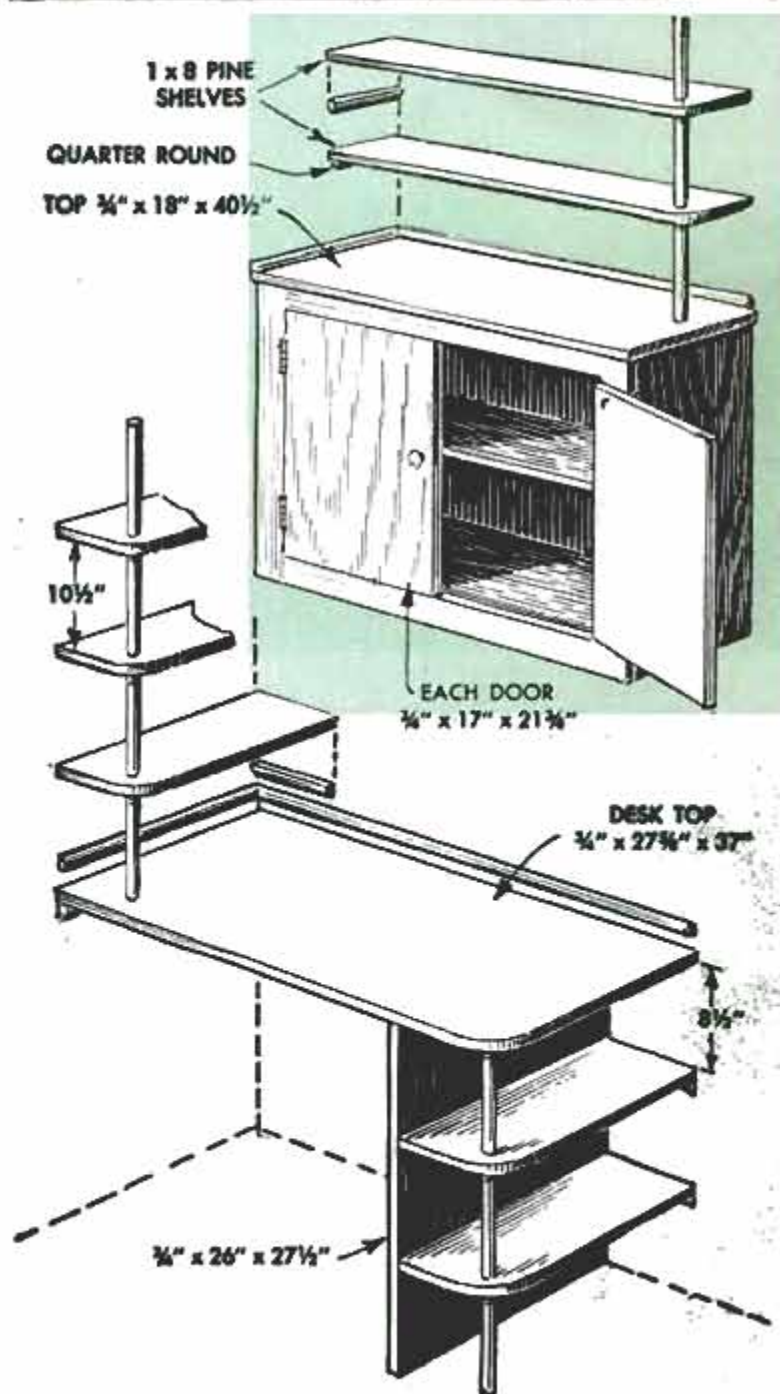


SOLUTION TO A PROBLEM CORNER

WHERE standard-size furniture appears too large, too wide or just plain out of place when furnishing a problem corner, the man with a home workshop can custom-tailor such corners. As an example of what can be done, the before and after photos show a problem area which faced Grover C. Henley of Jacksonville, Fla., and how he solved it. His clever solution of grouping overhead bookshelves, a desk and a storage cabinet around a kitchen doorway could very well be adapted to a similar situation by simply altering the dimensions.

The cabinet and kneehole desk were made of $\frac{3}{4}$ -in. fir plywood and assembled as shown in the drawing. The bookshelves were 1 x 8 boards supported by quarter-round cleats at one end and 1-in. dowels at the other. At the dowel ends, the shelves are anchored to the dowel posts by driving finishing nails through the edge and into the dowel. Both cabinet and desk tops could be covered with plastic laminate if desired. Contact cement makes it easy for anyone to apply this sheet plastic. After it is applied to each top surface, quarter-round is used to add a finish where the surfaces join the wall. One prime coat and two regular coats of white enamel will give a fine finish. On veneer-faced plywood, the edges would be taped and a varnish finish applied.

G. B. Tripp, Jacksonville, Fla.
OCTOBER 1959





Designed by D. E. Boetman

CAR-BED CRADLE

Plywood

- 2 pcs. $\frac{3}{4}$ " x 18" x 21"—Cradle ends
- 1 pc. $\frac{3}{4}$ " x 17 $\frac{1}{4}$ " x 35 $\frac{1}{4}$ "—Bottom

Hardwood

- 2 pcs. $\frac{3}{4}$ " x 1 $\frac{1}{2}$ " x 36"—Top side rails
- 2 pcs. $\frac{3}{4}$ " x 2" x 36"—Bottom side rails
- 2 pcs. 1 $\frac{5}{8}$ " x 1 $\frac{5}{8}$ " x 38"—Posts
- 1 pc. $\frac{3}{4}$ " x 3" x 38"—Stretcher
- 2 pcs. $\frac{3}{4}$ " x 4" x 24"—Cross feet
- 2 pcs. $\frac{3}{4}$ " x 7" x 7"—Post braces
- 2 pcs. 1 $\frac{1}{2}$ " x 1 $\frac{1}{2}$ " x 3 $\frac{1}{2}$ "—Pins

Miscellaneous

- Dowels, nails, screws, glue, wooden buttons, plastic clothesline

EARLY AMERICAN CRADLE

Plywood

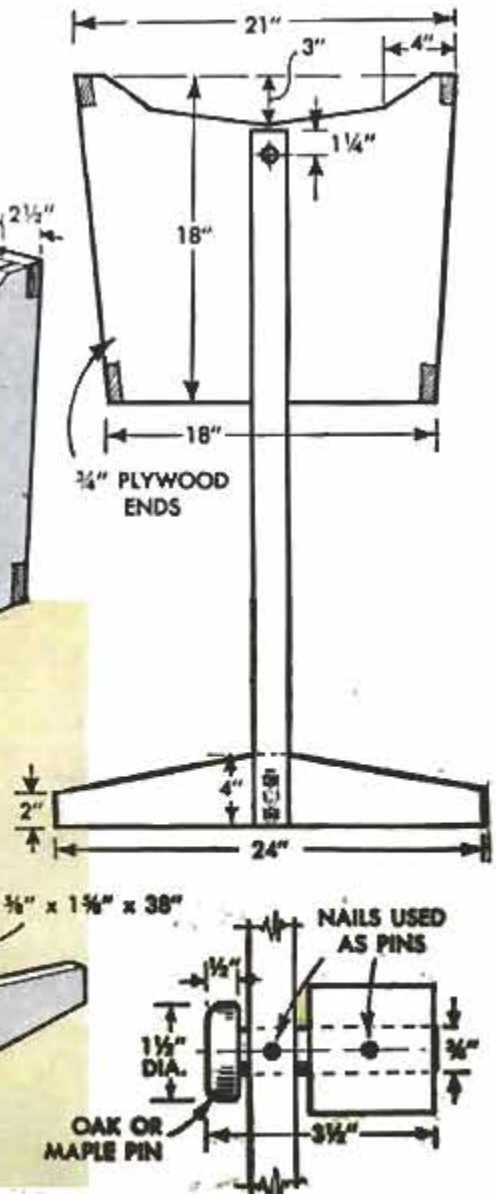
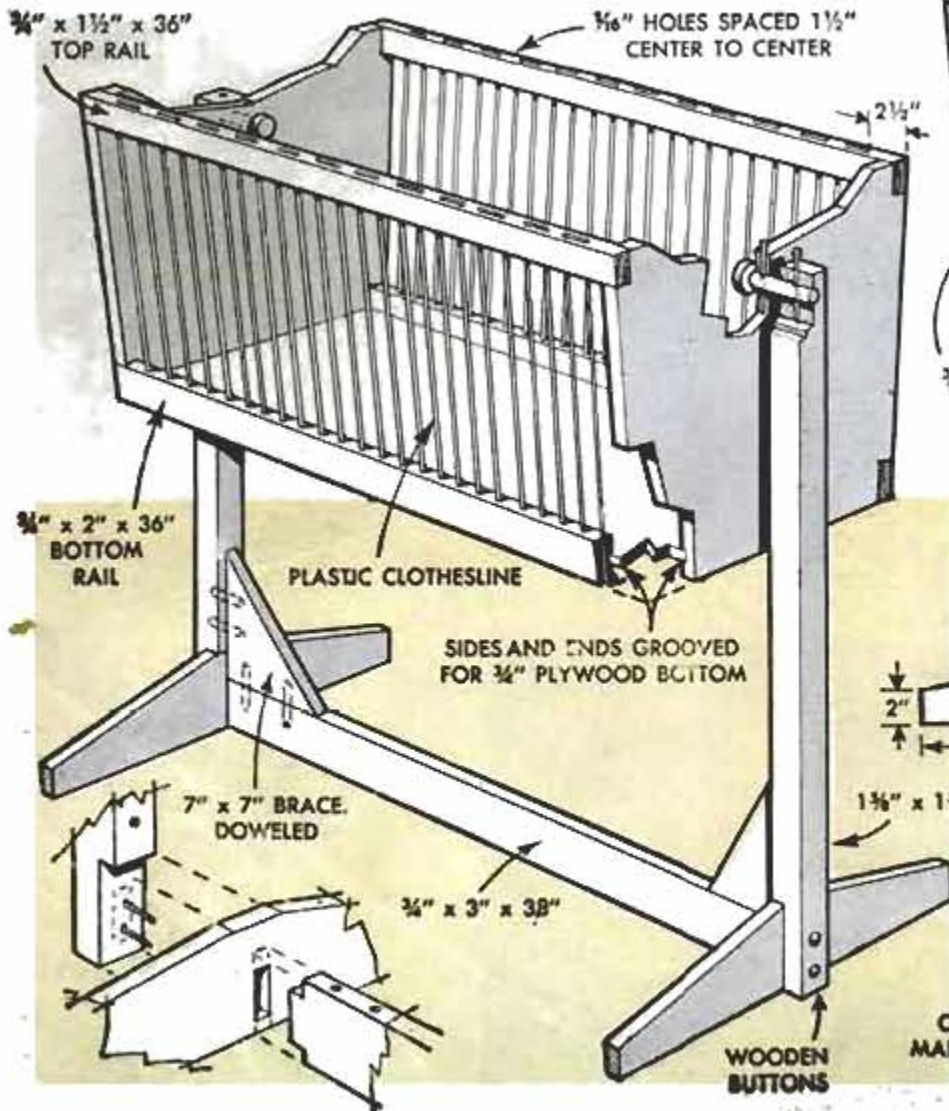
- 1 pc. $\frac{3}{4}$ " x 19 $\frac{1}{2}$ " x 37 $\frac{3}{4}$ "—Bottom

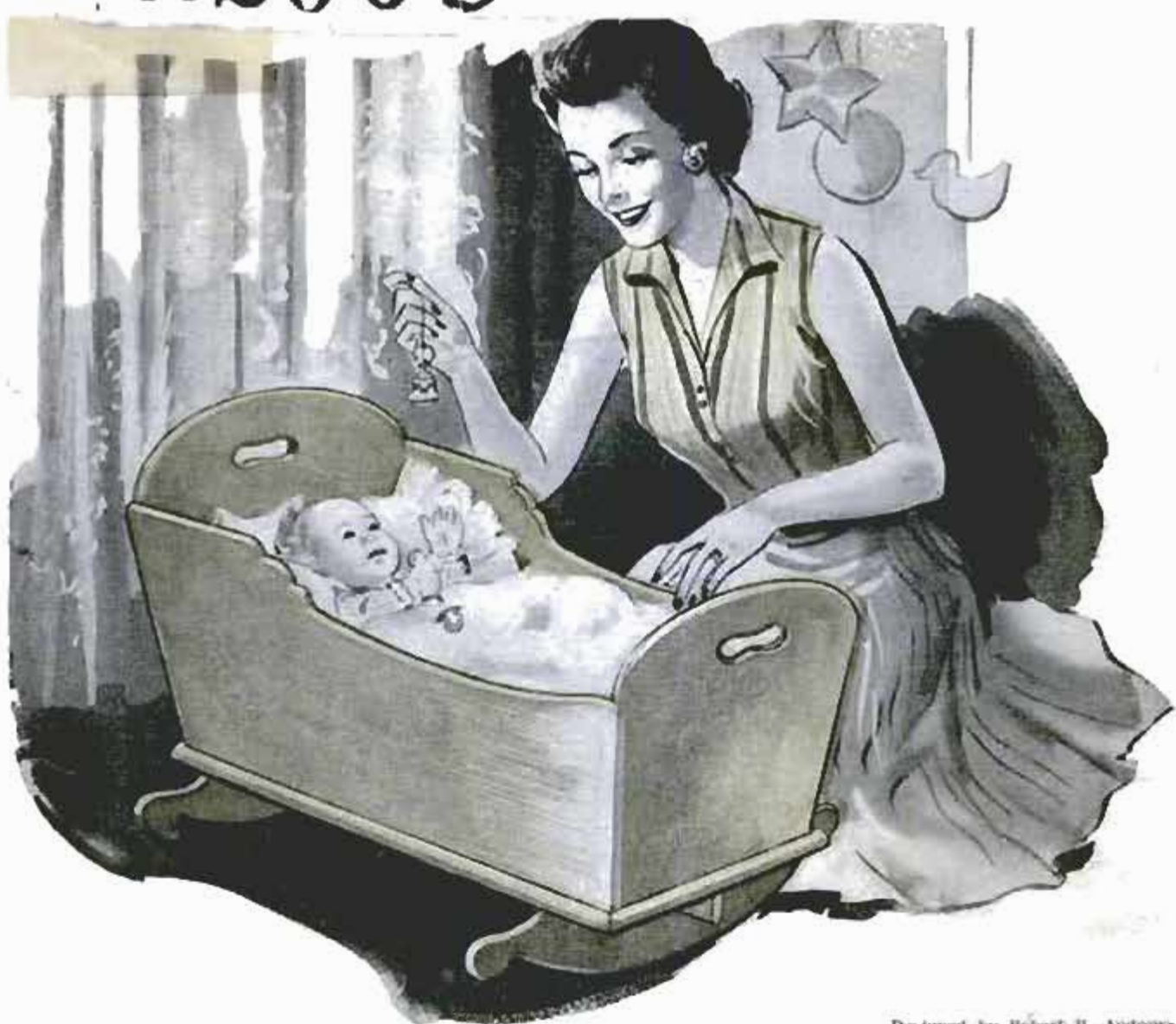
Hardwood

- 2 pcs. $\frac{3}{4}$ " x 15 $\frac{3}{4}$ " x 44"—Sides
- 1 pc. $\frac{3}{4}$ " x 19 $\frac{3}{4}$ " x 20 $\frac{3}{4}$ "—Headboard
- 1 pc. $\frac{3}{4}$ " x 17 $\frac{1}{4}$ " x 20 $\frac{3}{8}$ "—Footboard
- 2 pcs. $\frac{3}{4}$ " x 7 $\frac{1}{2}$ " x 33"—Rockers
- 1 pc. $\frac{3}{4}$ " x 3 $\frac{1}{4}$ " x 35 $\frac{1}{4}$ "—Stretcher
- 2 pcs. $\frac{3}{4}$ " x 1 $\frac{1}{4}$ " x 39 $\frac{3}{4}$ "—Molding
- 2 pcs. $\frac{3}{4}$ " x 1 $\frac{1}{4}$ " x 21 $\frac{1}{4}$ "—Molding
- 1 pc. $\frac{1}{4}$ " dowel 40" long—Gluing pins

MISCELLANEOUS

- Screws, nails, glue





Designed by Robert P. Andrews

CRADLE FOR THE NURSERY

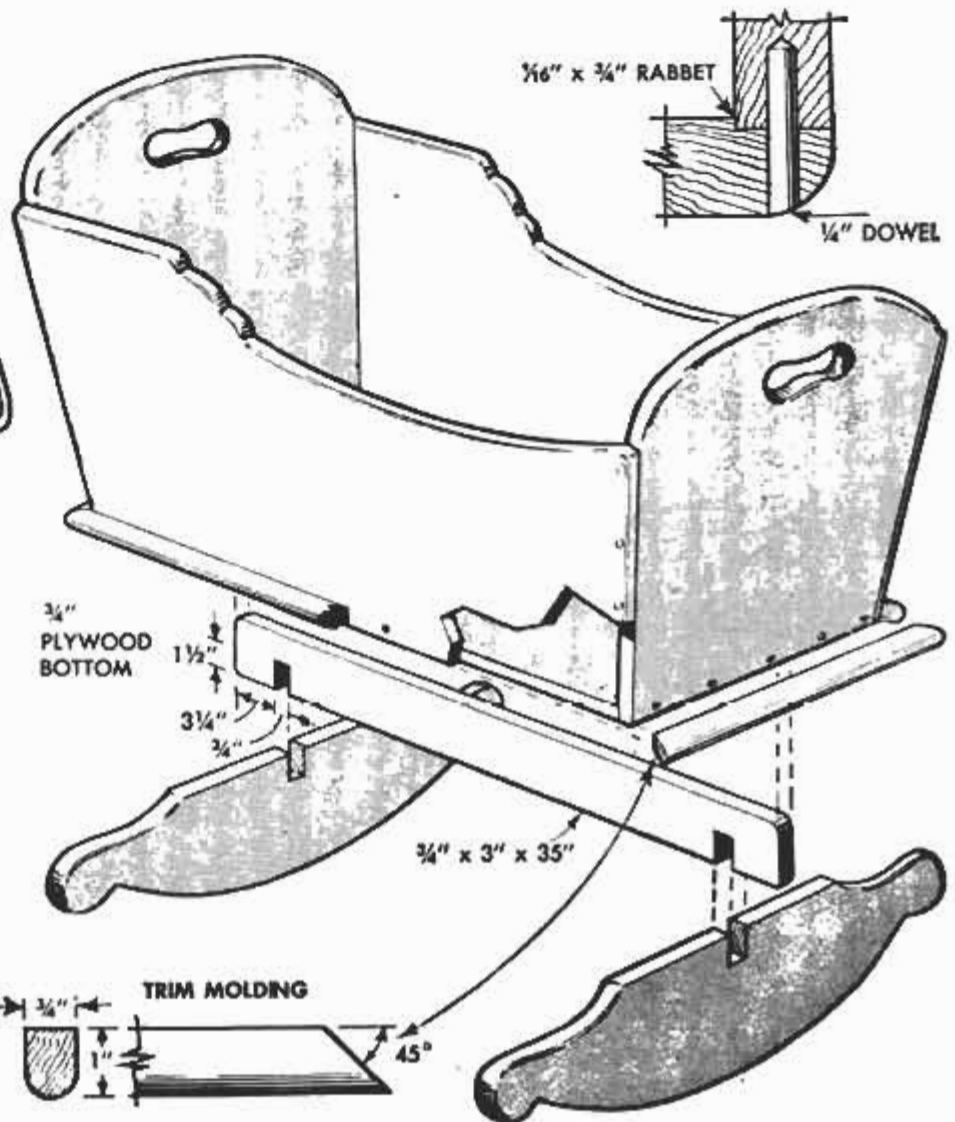
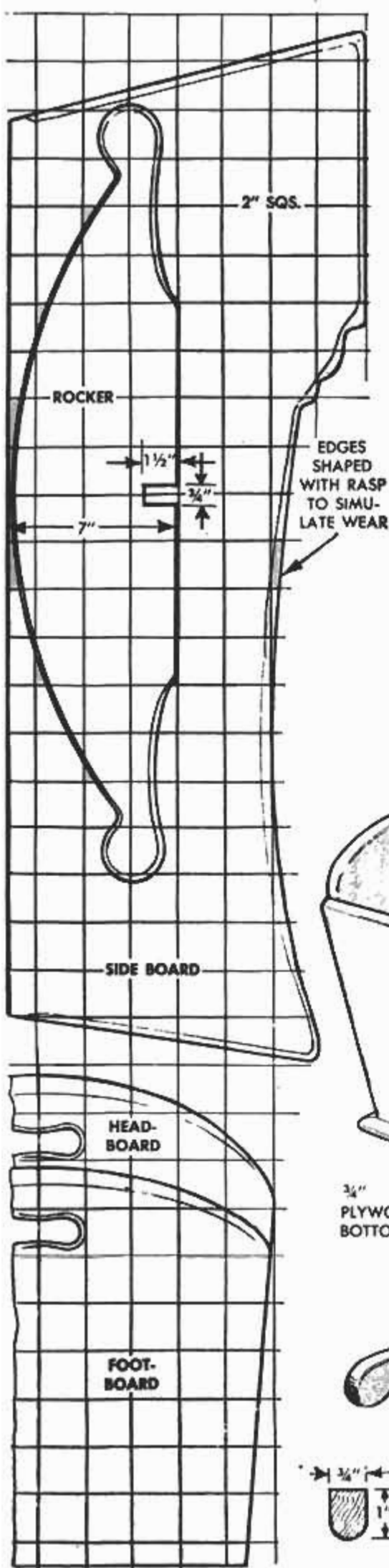
YOU'LL want to be ready for that new arrival and if the blessed event is your first and there is no hand-me-down crib to use, why not surprise mom and the new infant with a cradle? You have a choice of two designs, one traditionally colonial, the other a novel portable affair that rocks in a sturdy floor stand and doubles as a car bed.

Construction of the latter is fully detailed in the drawings on the facing page. The cradle itself rocks, or pivots, on two loose-fitting wooden pins. Two sets of cross pins lock the wooden pins in place, as well as the cradle. Pulling out the cross pins permits the wooden pins to be removed when the cradle is to be detached from the stand and used as a car bed. If you have no way of turning the pins, they can be improvised by using short lengths of $\frac{3}{4}$ -in. dowel and attaching drawer

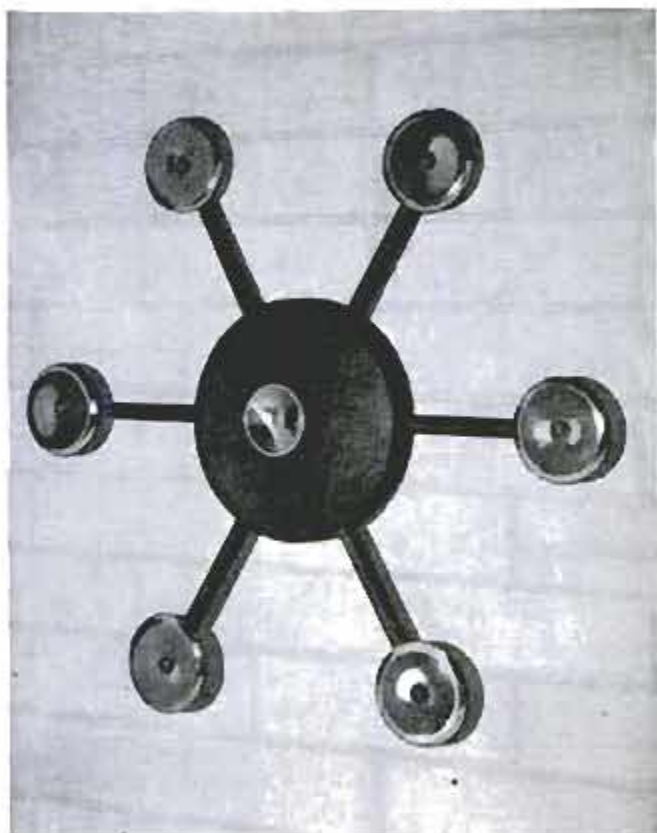
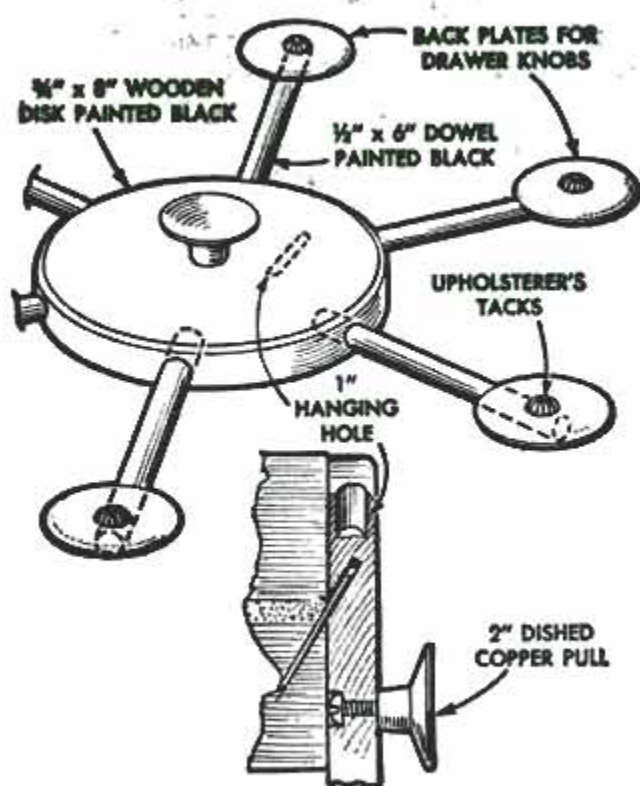
knobs to the ends. The open sides of the cradle are laced with plastic clothesline through holes spaced $1\frac{1}{2}$ in. apart in the top and bottom rails. Start lacing at the bottom so that the knot in the cord will be hidden. The lacing actually should be done last, after the cradle has been painted. Decals, along with colored clothesline, will help doll it up. The cradle is designed to take a standard bassinet mattress.

The Early American cradle is equally simple to build and is of a size comparable to a six-month crib. To be authentic, it should be made of solid maple stock rather than plywood, and you may find it necessary to glue up pieces to obtain the widths required for the various parts. Also, solid stock permits the edges to be shaped to simulate wear. This is done with a coarse rasp, then a file and finally sandpaper. Full-size paper patterns should be

made from the squared magazine patterns. You will notice that the headboard is somewhat larger than the footboard. Dowels are used to fasten the side members to the head and footboards, while screws are used to fasten the bottom, the screw heads later being concealed by a mitered molding. Holes for dowel pins are bored before the edges of the work are rounded and after the sides have been glued and clamped to the ends. You will notice in the section detail that shallow rabbets are made along the slanted edges of the side members. These serve to keep the parts from shifting when clamping pressure is applied, as well as make a better joint. The holes for the dowel pins are bored 2 in. deep into the ends, then the pins are coated with glue and driven in place. When the glue has dried, a rasp is used to round the edges and the ends of the dowels at the same time. Four dowels are used along each joint. The edges of the jigsawed hand holes are worked round with a half-round file and sandpaper. The rocker assembly, consisting of two rockers and a connecting stretcher, is assembled as a separate unit and attached to the cradle with glue and screws driven down through the bottom. Note that the stretcher is half-lapped into the rockers. After sanding, the cradle can be stained, shading from a deep tone in the corners to a lighter tone in the middle of the sides and ends. Final coating can be either lacquer or varnish to give a satin finish. ★ ★ ★



Smart Wall Decor for a Fireplace



While especially striking when mounted on the face of a fireplace, this modern version of a sunburst ornament will become a stunning conversation piece when hung on any wall. The original was done in black and copper but you can choose brass or chrome since the metal parts are standard doorknobs and knob backplates that come in a choice of plated finishes. The backplates are flat 2 $\frac{3}{4}$ -in. metal disks that normally are used with the knobs but which can be purchased separately. Small holes are made in the center of the disks for fancy upholstery tacks which are used to attach the backplates to the ends of six dowel spokes radiating from an 8-in. wooden disk. Holes for the dowels are bored in

the disk 1-in. deep and equidistantly around the edge and the dowels are glued in place. A hole is drilled in the center of the wooden disk for a 2-in. metal knob and then all the wooden parts are painted flat black. If your hardware store does not carry upholstery tacks that match the finish of the backplates, go to a local upholsterer. He will have some called Metaline, which are enameled and are available in almost any color imaginable. Position the backplates so that the tacks enter the dowels about $\frac{1}{4}$ in. in from the ends. The completed ornament is hung flat against the wall on a nail driven at an angle to engage a slanting hole in the disk.—Ruth O'Donnell Geissler, Green Bay, Wis.

Battery Clip Simplifies the Grounding of Portable Tools

When the three-prong adapter plug on a portable electric drill must be removed to permit the tool to be plugged in at another location, the "grounding" of the adapter each time is made easy if a small battery clip is fastened to the grounding wire. The clip makes it a simple task to attach the wire in a jiffy to the outlet box, armored cable or other suitable ground by merely clamping the clip to it. All of your portable electric tools should be grounded before using them to avoid the possibility of serious and sometimes fatal shock. The clip permits the adapter plug to be stored with the tool by clipping it to the cord.





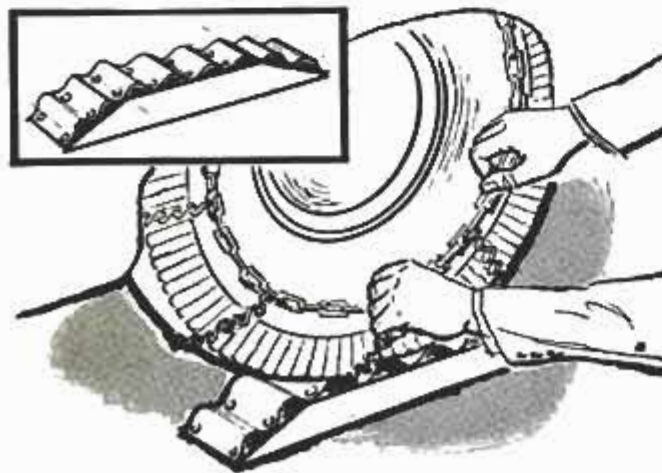
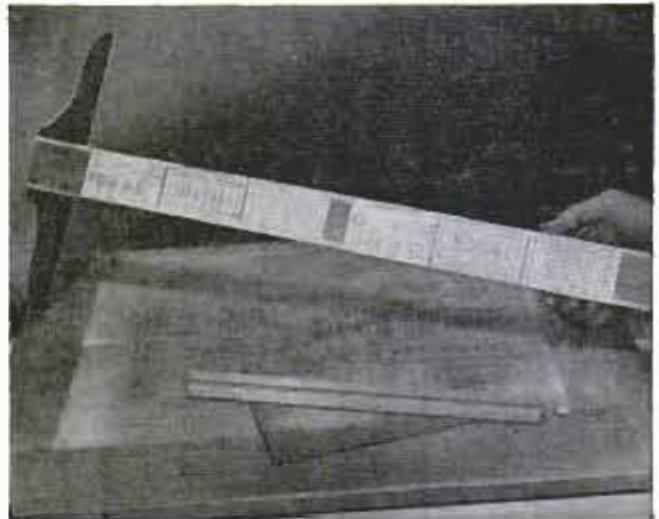
Child's King-Size Whistle Made From Dowel and Hose

Your youngsters will love this kingsize whistle that can be made in a few minutes from a short piece of garden hose and a length of $\frac{5}{8}$ -in. dowel. After both parts are cut and notched as shown in the detail at left, the dowel piece is inserted in the whistle and positioned to produce the desired pitch. This is done by sliding the dowel slowly in or out while blowing into the whistle. A length of bamboo pole may be used in place of garden hose, fitting it with a dowel of the required size.

Reference Data Kept on T-Square

Drafting and engineering reference data can be kept conveniently at hand for the draftsman by gluing decimal equivalents, conversion tables, etc. to the T-square blade as shown at right. If the data is only for temporary use, it can be affixed to the T-square with rubber cement for easy removal. Tables of permanent nature should be given a protective coating of clear lacquer or plastic spray.

R. Hanscom, Elmhurst, Ill.



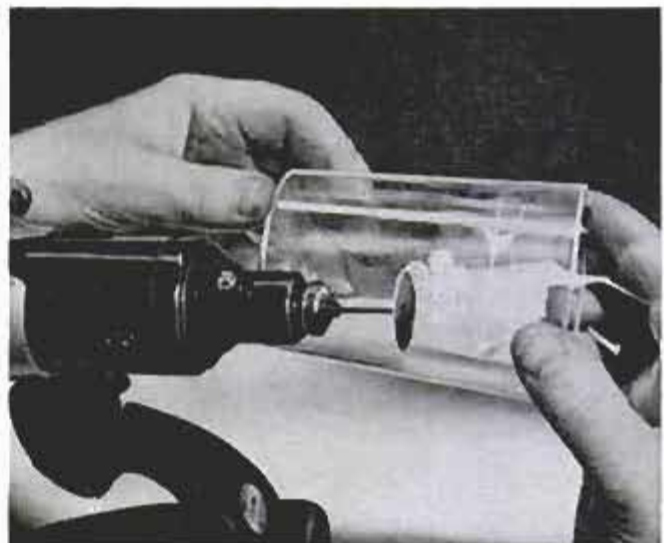
Blocks With Corrugated Surface Aid Installing Tire Chains

Installing car-tire chains is a snap when a block having a strip of corrugated sheet metal nailed to it as shown, is provided for each wheel. Before the car is backed on the blocks, the chains are placed on them so that the cross links lie in the corrugations. The chains then are fastened in place without moving the car since the corrugations permit free movement of cross links when drawing the chains tight.

Bench Mount for Electric Drill Permits Work to be Handheld

Bench-mounting attachments available for some electric drills are a good investment since they permit the use of both hands for steadying work. This is especially helpful when working on small pieces as shown in the photo at right. If a bench mount is not available for a drill you now have, one can be made from two lengths of flat steel shaped and bolted together to provide a clamp at one end to hold the tool and a T-shaped bracket at the other end for bolting to a bench.

—Louis Reitz, Bourbon, Mo.





Winch Mired Car to Firm Ground With Spanish Windlass

Campers who drive their cars off the road and get bogged down need not fear being stranded far from help if they have enough rope or chain to set up a Spanish windlass. The windlass is used to winch the car to firm footing as illustrated. To do this, a small log is placed upright in a shallow hole dug next to a tree to which it is linked with a rope as shown. One end of a tow rope is then tied to the car and the other end is wound on the log, after a

loop is tied on the end. A stout pole inserted in the loop is used as a lever to operate the windlass.

E. V. Reyner, Salinas, Calif.

Rating Numbers Taped on TV and Radio Fuses for Easy Identification

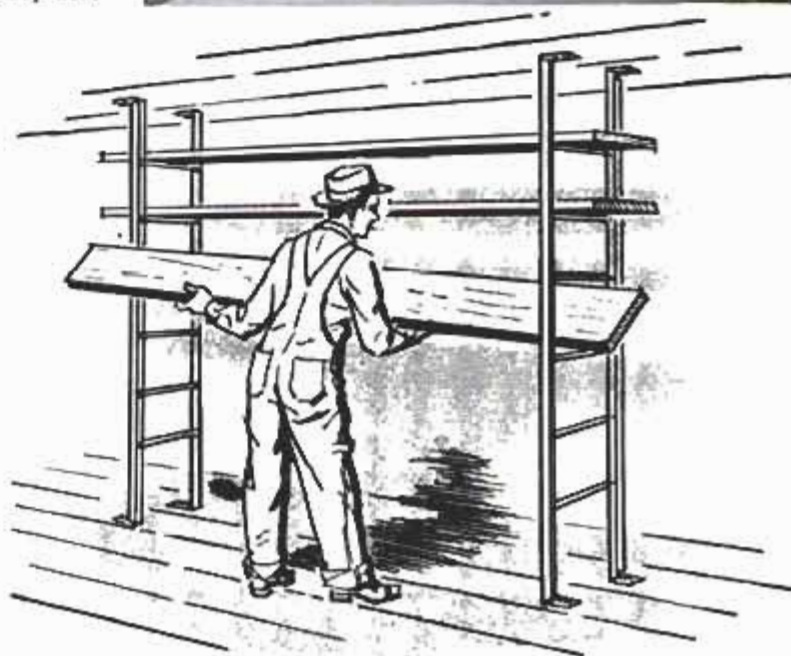
To avoid installing the wrong size circuit fuse in a TV or radio set when tiny fuses for more than one set are kept on hand, one homeowner attaches paper tabs to them listing identifying data. The data for each fuse is lettered in black ink on a strip of paper that is wrapped around the glass part and held in place with cellophane tape as indicated in the photo at right. This is done under a good light soon after the fuses are purchased, using a magnifying glass to read the amp. rating and type numbers stamped on the metal ends of the fuses. Then, when a fuse is needed in a hurry, there is little chance of selecting the wrong one. Always unplug a TV set when replacing the fuse.—R. Hanscom, Elmhurst, Ill.



Windmill-Ladder Sections Used for Shelf Supports

Ladder sections from a dismantled windmill were found by one farmer to make excellent floor-to-ceiling shelf supports for workshop storage of spare parts. The ends of a pair of ladder sections of equal length were drilled to take one screw each and then bent at right angles to provide a means of fastening them to the shop floor and ceiling as shown at right. The shelf supports can be easily removed for use in another location if desired. The planks used for shelves are not fastened in place.

G. E. Hendrickson, Argyle, Wis.

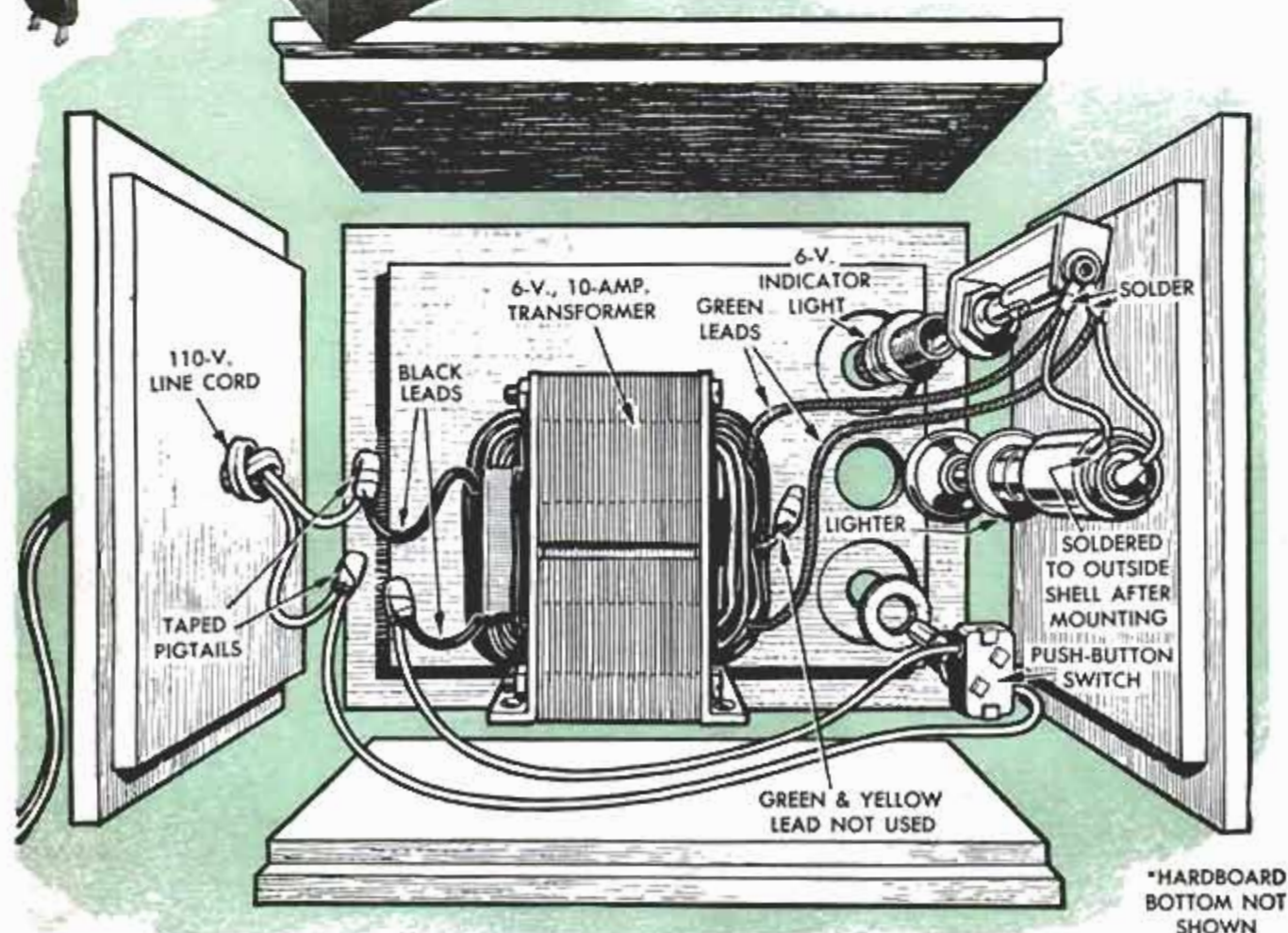


ELECTRIFIED CAR LIGHTER BECOMES NOVEL DESK SET



DESIGNED for use in the home or office, this cigarette lighter and ash tray share a handsome mahogany cabinet that any smoker would be proud to own. What's more, the lighter never runs out of fluid because it is a car cigarette lighter that uses house current converted to 6-v. by a transformer. The parts of this easy one-evening project consist of a car-lighter assembly, a 6-v., 10-amp. transformer, 6-v. indicator light, push-button switch and a glass ash tray. The top, sides and ends of the cabinet are cut from $\frac{1}{2}$ -in. stock, rabbeted and glued together as indicated. A bottom cover of $\frac{1}{8}$ -in. hardboard is screwed in place after the unit is completed. The ash tray is kept in place by a $\frac{1}{4}$ -in.-deep recess cut in the cabinet top to take its base. Operation of lighter is the same as in a car installation, except that a switch is provided to permit turning off the current when it is not in use.

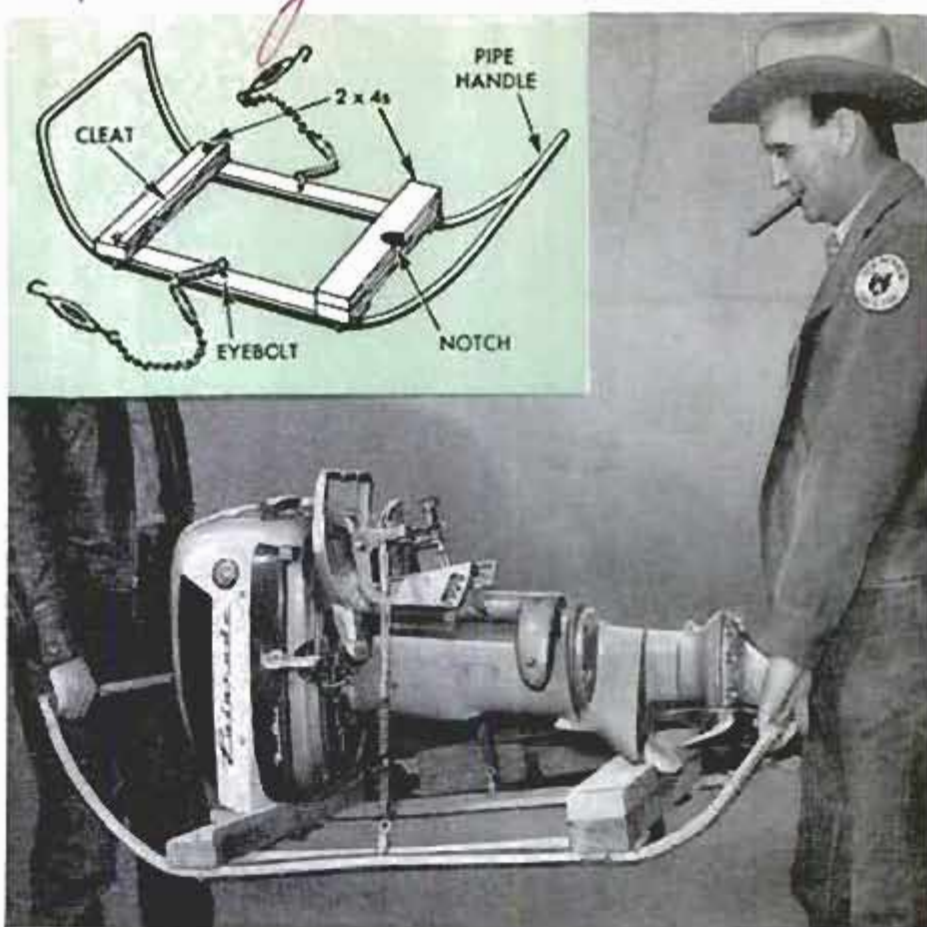
C. A. Phillips, Corning, N.Y.



"Sling" to Carry Heavy Outboard Motor Easily

By using this carrier, two men can carry a heavy outboard motor easily and place it in the bottom of a boat, or the back of a car to keep it from bouncing around over rough roads. The carrier is made from $\frac{1}{2}$ -in. pipe and short pieces of 2x4s. The motor is tied down with turnbuckles anchored to the carrier with pipe clamps and a heavy spring. If a bender is not available for shaping the pipe, tamp it full of sand and then bend it around some object that has approximately the desired radius. The sand will prevent buckling.

L. A. Wilke, Austin, Tex.

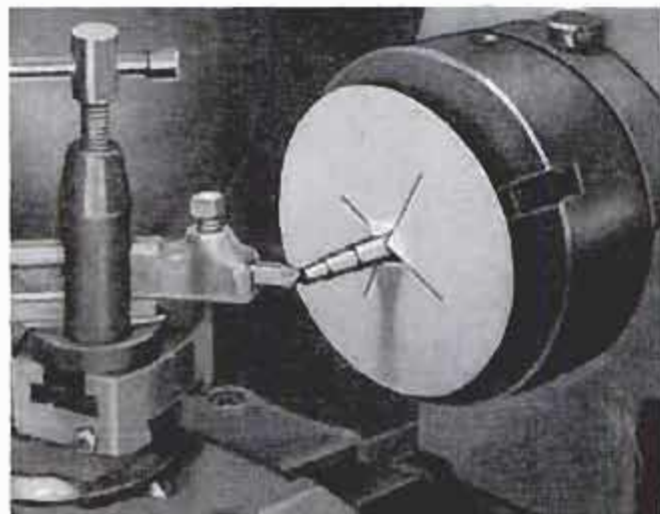


Model Builders, when tying the many fine lines needed to make the shrouds of authentic ship models, can save time by substituting lightweight nylon fishing line for the thread that came with the model kit. The

nylon line is laid out on an assembly board in the usual way, but joined lines need not be hand tied. Nylon melts under heat and permanent joints are made by touching each joint with a soldering iron.

Cardboard Disk Protects Chuck Lathe Dog or Tool Post

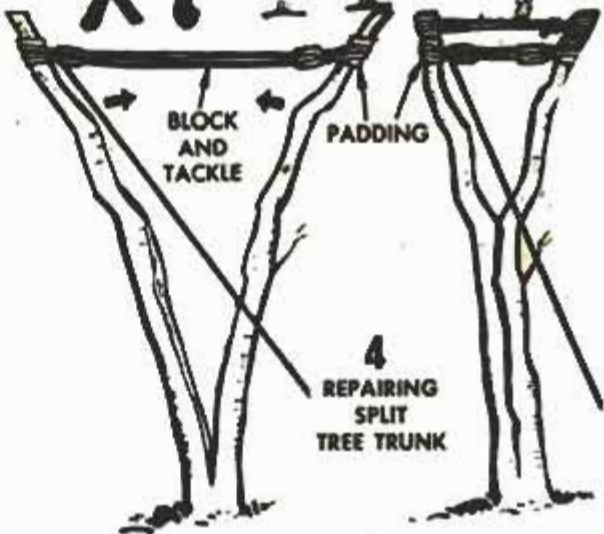
A student, or even an experienced operator for that matter, may accidentally allow the compound rest or tool post to strike a spinning lathe chuck. To serve as a reminder to avoid such an accident, try fitting a white cardboard disk over the face of the chuck. The disk has two cross slots cut in the center to form four points, which hold it in place.



Lathe Carriage Used to Position The Tailstock Accurately

A quick method of positioning a lathe tailstock is to use the carriage to slide it into position. By connecting the tailstock to the carriage with a removable wire clip, it can be positioned with one hand while the work, especially if it is heavy or unwieldy, is held with the other hand. The tailstock then may be moved in either direction to engage the work.





SURGERY

By Earle W. Gage

USE OF PROPER "surgical methods" when pruning or repairing tree damage is nearly as important for survival of the tree as it is for treating human ailments requiring surgery. Tree bark serves the same primary function as the skin covering your body in that it protects underlying tissue from attack by micro-organisms that exist in the atmosphere. Illustrated and explained in this article are the procedures for treating successfully most of the injuries that might possibly occur to your trees, including the proper way to prune them.

Fungi Cause Most Trouble

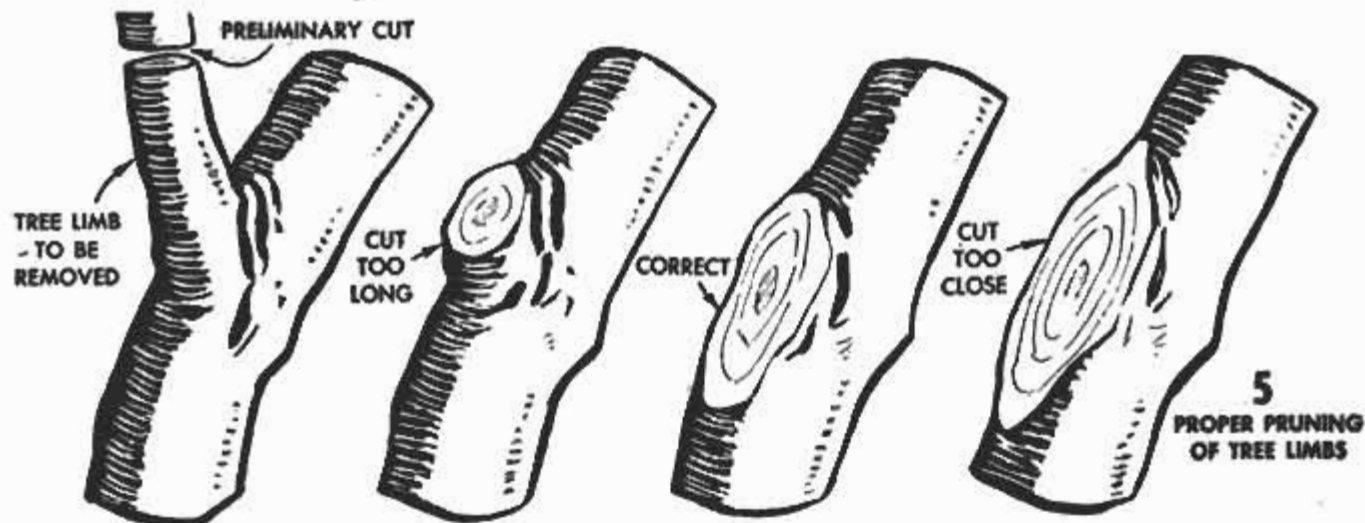
Most of the ills that beset trees are caused by fungi, the spores of which find suitable conditions for incubation and development in sap that flows from exposed wood whenever there is a break in the bark. That is why it is important to treat such areas as soon as possible after the injury. The procedure is the same regardless of the nature of the wound, whether it be a gouge, an amputated limb, an infected cavity, or very serious damage such



Above left, badly split tree need not be cut down. After pulling split parts together and bolting them in place, tree will remain alive and grow stronger

Center left, after removing loose fragments from surfaces of break, antiseptic is applied, followed by coating of asphalt to prevent fungus infection

Left, trunk is drilled through at right angles to surfaces of break to take threaded rod which holds trunk together permanently when screwed in place



MAY SAVE YOUR TREES

as a split down the entire trunk, as shown in Fig. 1. First remove loose fibers and dead tissue. Then saturate the exposed surfaces with an antiseptic, especially the outer growth since it is the sapwood that is most susceptible to infection. This can be a 1-to-1000 solution of bichloride of mercury; a copper sulfate solution, made by dissolving 1 oz. of copper sulfate in 1 qt. of wood alcohol; or creosote. If a mercury solution is used, handle it with care. It is a deadly poison and is harmful to skin and metals. After sterilizing the wound, give it a waterproof coating of chromate asphalt. Inspect large wounds each spring and apply a fresh coat of asphalt if needed.

A valuable shade or fruit tree that is badly split down the trunk, Fig. 1, can usually be saved, if it is repaired promptly. Begin by cutting away all loose fragments. Then sterilize the exposed surfaces and coat them with asphalt as in Fig. 2. Connect a block and tackle to the largest branches growing from the trunk and pull them together as in Fig. 4. Secure the limbs in

position with a Manila rope to prevent the parts of the split from spreading when the tackle is removed. Note that soft padding is placed between the rope and bark at points of contact to avoid crushing the bark. Remove the rope when the repair is completed. Next drill holes through the trunk at right angles to the surfaces of the break, Fig. 3, to take threaded steel rods like the ones shown in Fig. 7. (The latter shows an example of "preventive medicine," the rods being used to reinforce a weak crotch that might have split at a time of stress.) If the bit you have is not long enough to pass through the trunk to be drilled, weld a steel rod on the end of it. Holes must be slightly smaller than the rods used. They should be spaced close enough to draw the split parts tightly together.

When installing a rod, tap it in the hole for a depth of about 1 in. and then screw the rod in the rest of the way, using a pipe wrench for leverage as in Fig. 6. Cut off the unused part with a hacksaw. Both ends should be within the bark layer to permit

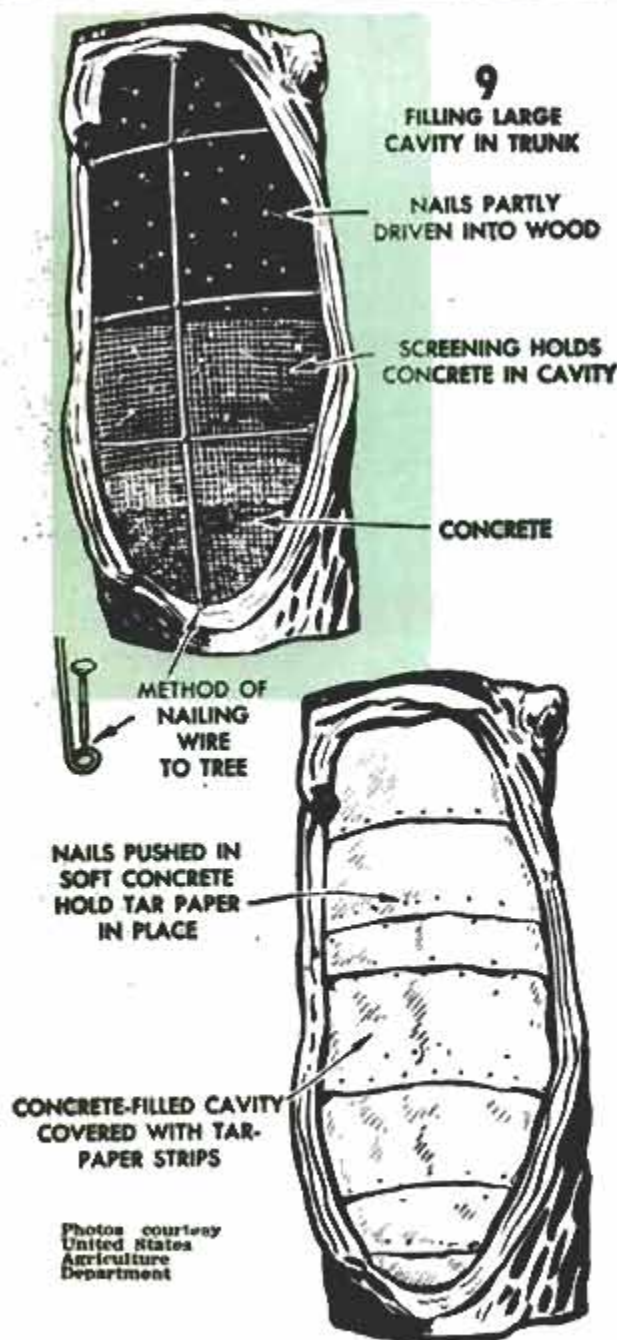




the wounds to heal over and conceal the rod. At strategic places, such as at the upper end of a split trunk, the rod should have a washer and nut on each end as in Fig. 8. This eliminates the possibility of the screw thread slipping out of the hole, as when considerable pressure is brought to bear by a windstorm, or from the weight of fruit or snow.

A cavity in a tree trunk or limb offers an ideal breeding ground for fungi, especially when its position is such that water enters and remains there. To eliminate this threat to the life of a tree, it is necessary to remove all dead matter from the cavity and prepare it for a concrete filling, a procedure which is not too unlike that of filling a tooth. When removing decayed wood from a cavity, use outside-ground gouges having curved cutting edges. Keep them very sharp so as not to tear the delicate cambium tissue (the layer between wood and bark in which almost all growth takes place). Be sure to cut away all discolored and water-soaked heartwood since fungi thrive in this medium, which cannot be disinfected. Trim the bottom of the cavity so that water will drain out, yet leave enough of a pocket or recess to hold the concrete filling. Next disinfect and coat the cavity walls in the manner suggested for treating exposed wood. When filling a large cavity, such as the one shown, it is necessary to drive 3-in. common nails halfway into the wood. Spaced as shown, the nails hold the concrete in place when hard. Use 1 part cement to 3 parts sand for small cavities, substituting fine gravel for the sand when filling large ones. The mortar should be stiff so that it remains in place when troweled into vertical cavities. However, a very large cavity requires a temporary retainer consisting of a piece of screening held in place by wires as shown in Fig. 9. The wires and screening are removed when the concrete has set, at which time a thatch of tar-paper strips is cut to fit the opening and attached to it by pushing nails into the soft concrete. The tar paper protects the somewhat porous concrete from rain, keeping it in good condition for a long time.

The proper way of pruning a tree is detailed in Fig. 5. For large limbs especially, it is important to make a preliminary cut a short distance above the final cut. This prevents the severed limb from tearing bark off the trunk, or from producing a shattered, porous cut that would soak up water and invite infection. A close cut is neat looking and it permits cambium to produce a covering of bark. A cut that is made too close leaves an unnecessarily large wound. ★ ★ ★



Ice-Fishing Hole Kept Open With Improvised Heater

To prevent a fishing hole from freezing over during the night, one ice-fishing enthusiast places a lighted kerosene lantern in a 5-gal. paint pail, which then is allowed to float in the hole. A 2-in. layer of gravel in the pail serves as ballast to keep it upright in a strong wind and prevent the lantern from sliding to one side. The improvised heater is effective, except in very cold weather. The glow from the light also serves as a warning to skaters, enabling them to see the danger spot in time to avert a collision.

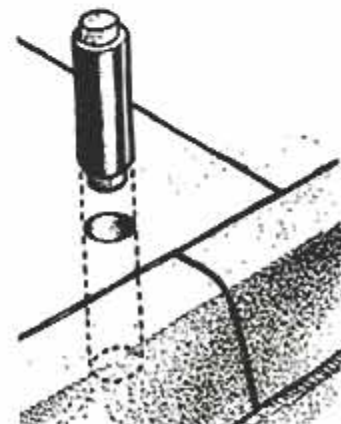
G. E. Hendrickson, Argyle, Wis.

Helpful Hints for Duck Hunters

Chest-high waders are expensive duck-hunting accessories that are well worth repairing to delay the time when they must be replaced by new ones. Most cracks, tears and punctures can be repaired on the spot with an inner-tube patching kit. It is a good idea to reinforce weakened places with large, vulcanized patches. When waders are no longer repairable, cut them off at the ankles and use the bottom for ankle-length rubbers. The tops may be used to protect clothing when changing a tire on the road. They also make excellent rain pants for use on a boat, or when hunting in wet underbrush.

Save the wings from ducks shot in the fall and use them for making realistic-looking training aids for a retriever. When doing this, chop the wings off close to the body and store them in a dry place. Then tape four wings to a small, cork-filled boat fender so that the heavier parts point toward the ends of the fender, making the dummy slightly dumbbell shaped. Such a dummy approximates the size of a duck's body, encouraging a dog to take a proper hold on it.—D. Duffy, Clintonville, Wis.

Hose Prevents Ice From Cracking Flagstaff Hole



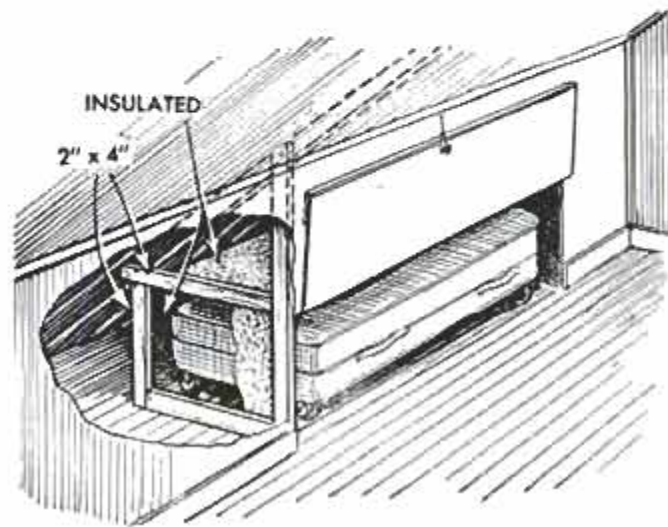
If water is allowed to collect in a flagstaff hole in a curb, it may crack the concrete upon freezing. To prevent this, plug both ends of a length of hose and keep it in the hole as indicated.



"Bed Closet" Saves Floor Space In Attic Bedroom

When an attic is converted to bedrooms without raising the roof, more usable floor space can be gained by providing a storage recess or cabinet in each room to take a single bed of the type mounted on rollers as shown below. Vertical clearance of 2 ft. is provided so that a bed may be rolled into it when made up. Note that insulation board is used to line the recess. The latter can be left open at the front, or fitted with a door as shown. To insure ventilation, perforated hardboard could be used for the door. Extra guest beds may be kept in such enclosures, ready to use when the need arises, but completely out of the way when not in use to leave more space for play, sewing or other uses.

N. M. Pittman, Overton, Tex.





Solving HOME PROBLEMS

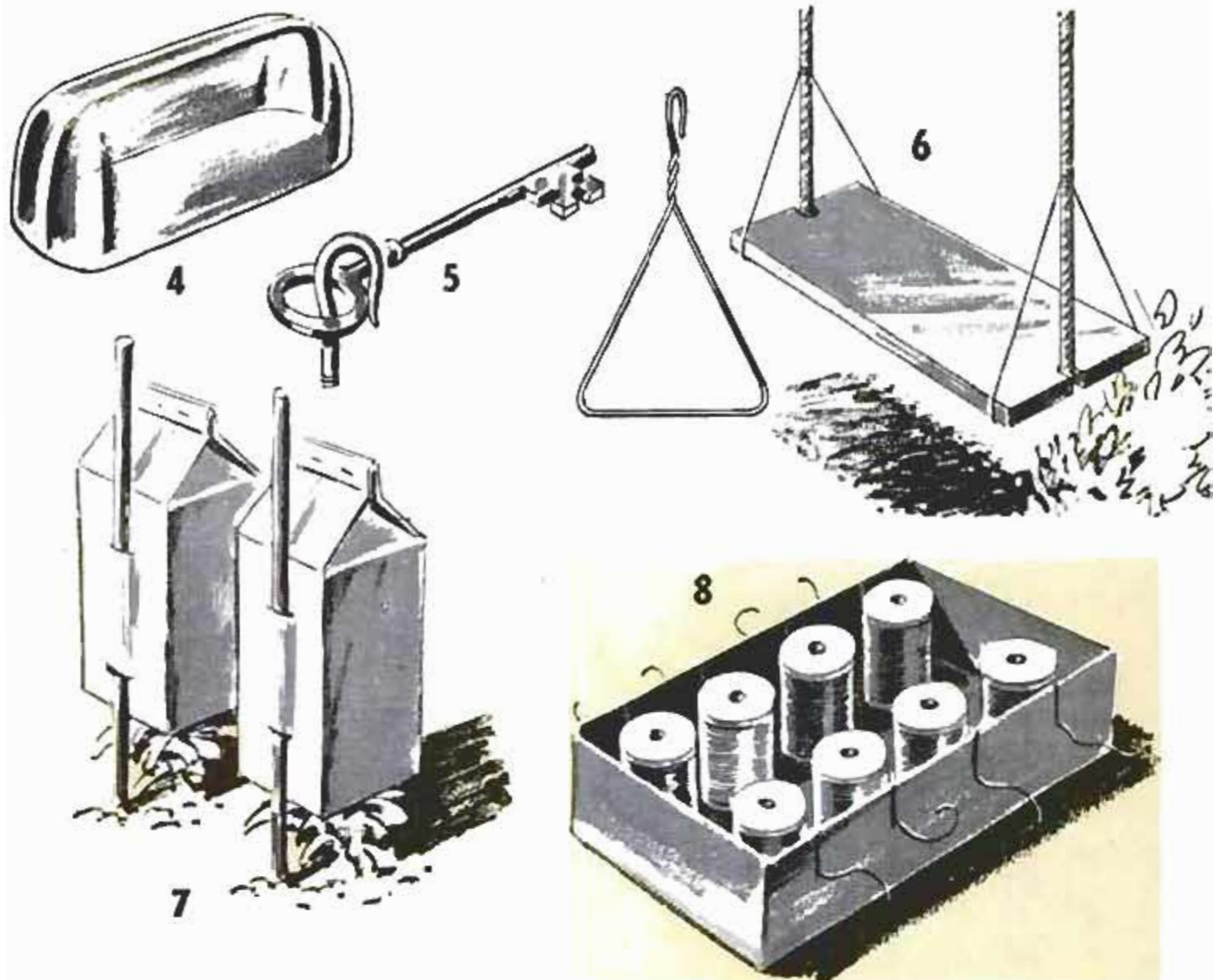


1. ANY DRINKING GLASS can be quickly converted to a beaker by slipping a rubber "spout" over the rim. The latter is a 2-in. section of motorcycle inner tube which is cut to the shape shown to form a pouring lip when the band is stretched over glass

2. THE CHANCE of accidentally cutting the cord on an electric hedge trimmer is lessened when a spiral wrapping of adhesive tape is wound around the cord. The white tape makes the cord stand out in sharp contrast, and thus, is much easier to see

3. TO KEEP A BRUSH soft overnight during a paint job, or for a longer period, wrap aluminum foil around the bristles to form a self "container." Add a little solvent and seal shut by crimping foil around handle. The stored brush will stay soft for several days

4. IT TAKES GOOD EYESIGHT sometimes to spot the clear-plastic protective cap on the cutting head of a razor when it is removed. To make it readily seen when laid on any surface, paint a narrow stripe of nail polish across the top of the plastic cap



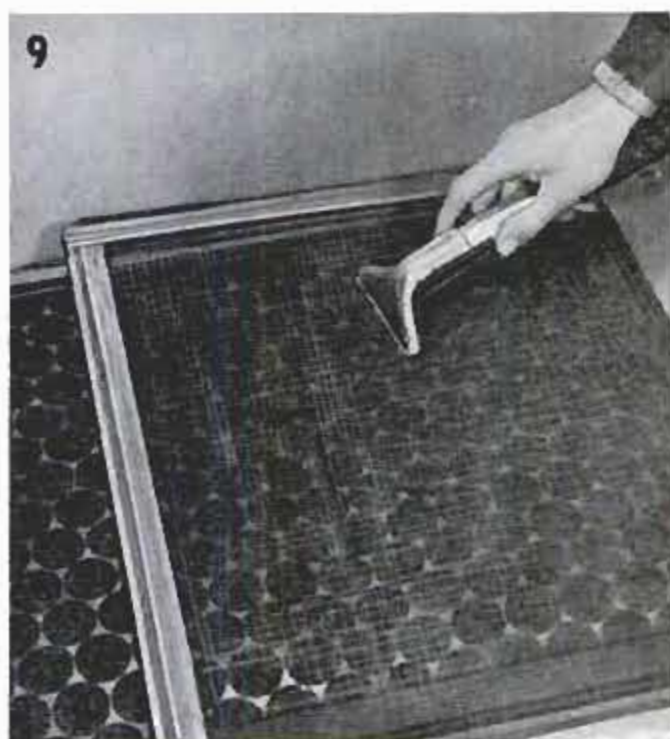
5. WHEN THE HOUSEWIFE is without the proper tool for driving cup or screw hooks, she will find that the skeleton key from a door lock makes a good substitute for the purpose. After the hook is started, the key is slipped over it and then used like a wrench

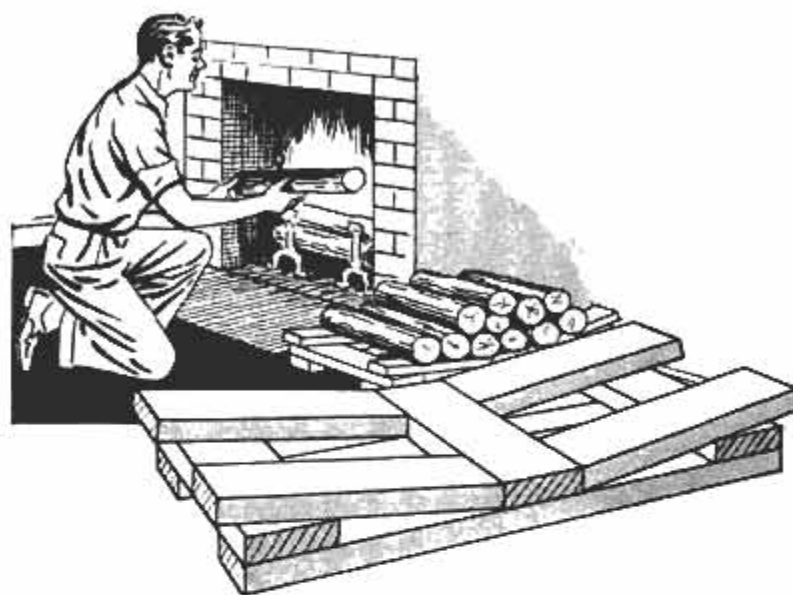
6. THE SEAT BOARD of a child's swing can be made nontipping with a couple of wire coat hangers. Bend the hangers triangular-shape to slip over the ends of the board and then bind the straightened hook ends to the swing rope with several turns of tape

7. MILK CARTONS with the bottoms cut out make dandy temporary hoods for protecting tender transplants from early frost or wilting sun. The cartons are supported over the plants by sticks which are inserted through slits cut in the sides of cartons

8. BOX-TOP THREAD DISPENSER will keep a number of spools of thread tangle-free when the bottom of a candy box is slitted and the thread is pulled out through the slits. Thread ends are always left protruding after use. The box cover holds ends secure

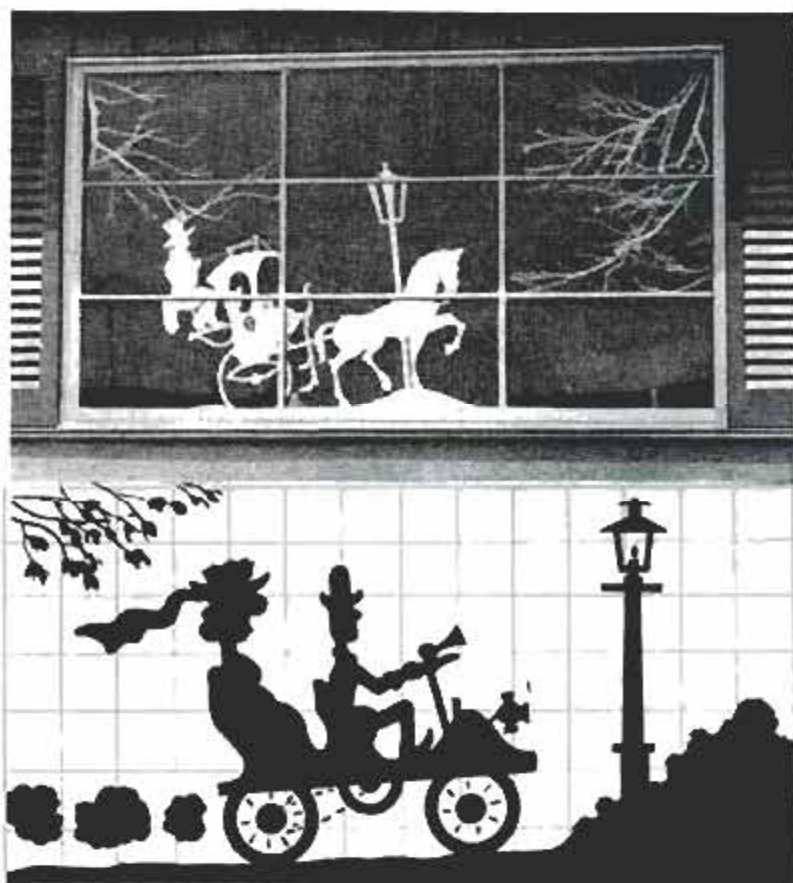
9. FURNACE FILTERS are easily cleaned with your vacuum cleaner if a window screen is placed over the filter to prevent the suction from dislodging the glass-wool fibers. The screen also permits the nozzle to slide without catching in holes in filter





V-Bottom Wood "Basket" Stacks Fireplace Logs

While somewhat crude for use in your living room, this simple fuel rack is ideal for keeping logs neatly piled near a fireplace in your recreation room. Featuring a V-bottom which makes the logs roll toward the center as they are used, the rack is formed by stacking nine 2 x 4 blocks in the manner shown. You have a choice of tossing the blocks in the fire along with the last log, or making the rack a permanent one by nailing the blocks together and painting.



Silhouettes Perk Up Drab Looking Garage

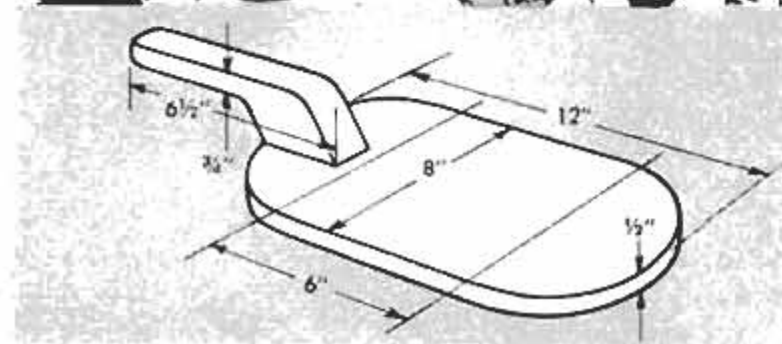
A new fad that is becoming popular in California is the painting of silhouettes on the windows of garages to relieve their plain uninteresting look. The silhouettes are painted directly on the glass by pasting a suitable pattern on the outside of the glass and copying it by painting the outline on the inside. Patterns of horse-and-buggy scenes, as well as early-model autos, are preferred for silhouettes, although almost any magazine illustration will do when enlarged by the square method. The silhouettes are done in white paint to show up against the darkened interior. Actual tree branches, sprayed white, can be used in conjunction with the silhouette as shown in the photo.

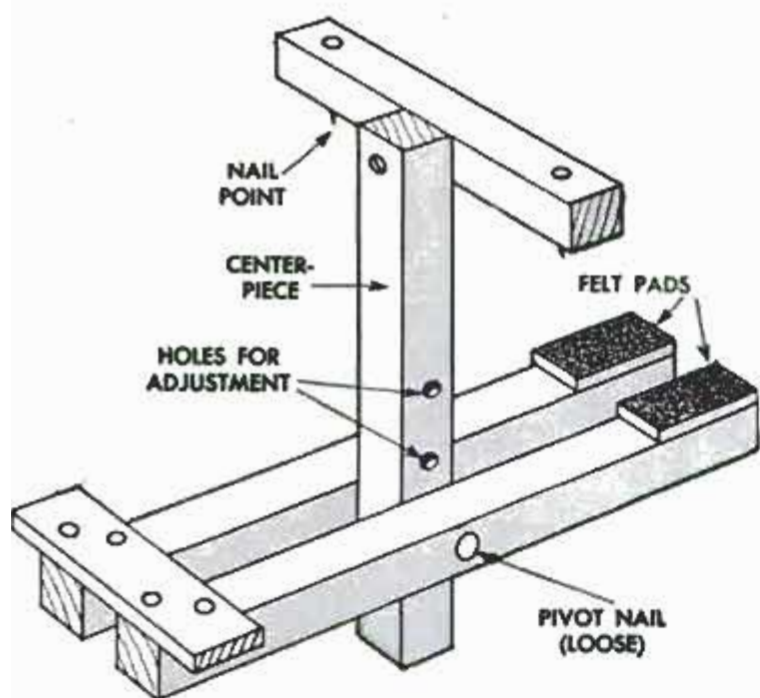


Novel Cookout Trays

Ideal for outdoor cookouts to tote a sizzling hamburger or barbecue, these shovel-like trays will provide your guests with a safe way to carry a paper plate in one hand while they grab a Coke with the other. Varnished and decorated with appropriate decals, the trays are something that can be quickly mass-cut from scraps in your wood box. If you wish, a hole can be cut in one end of the tray to accommodate a drinking glass. The handles are cut from 1-in. wood and attached to the plywood trays with two flatheaded screws.

Ted Fenn, Skokie, Ill.

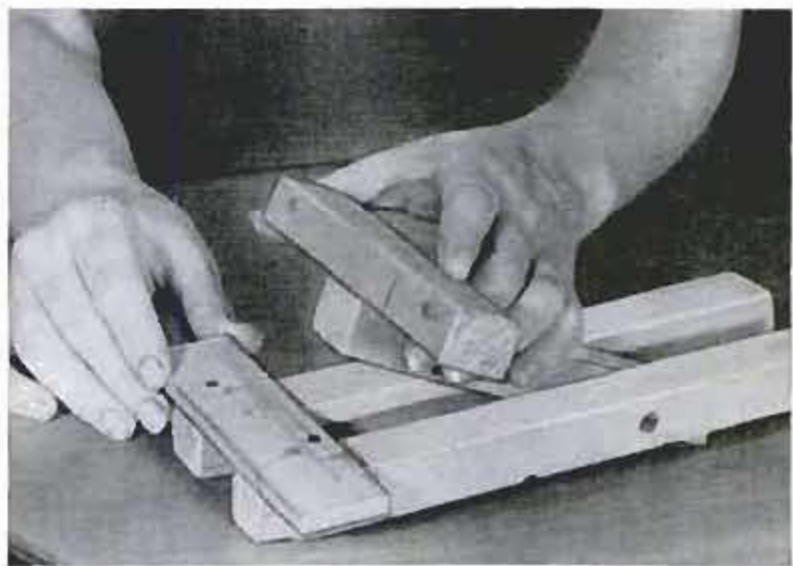




PHOTOFLOOD HANGER



Where to clamp a photoflood overhead poses a problem for most home photographers when there are no light stands at hand. Equally perplexing is how to hang a backdrop without driving nails into the woodwork. I was faced with these problems until I made a couple of these self-locking brackets which are designed to clamp to door or window trim and provide a support for clamping a photoflood or hanging a curtain. As shown in the detail, the bracket is adjustable to fit different-size trim and padded to prevent marring it.

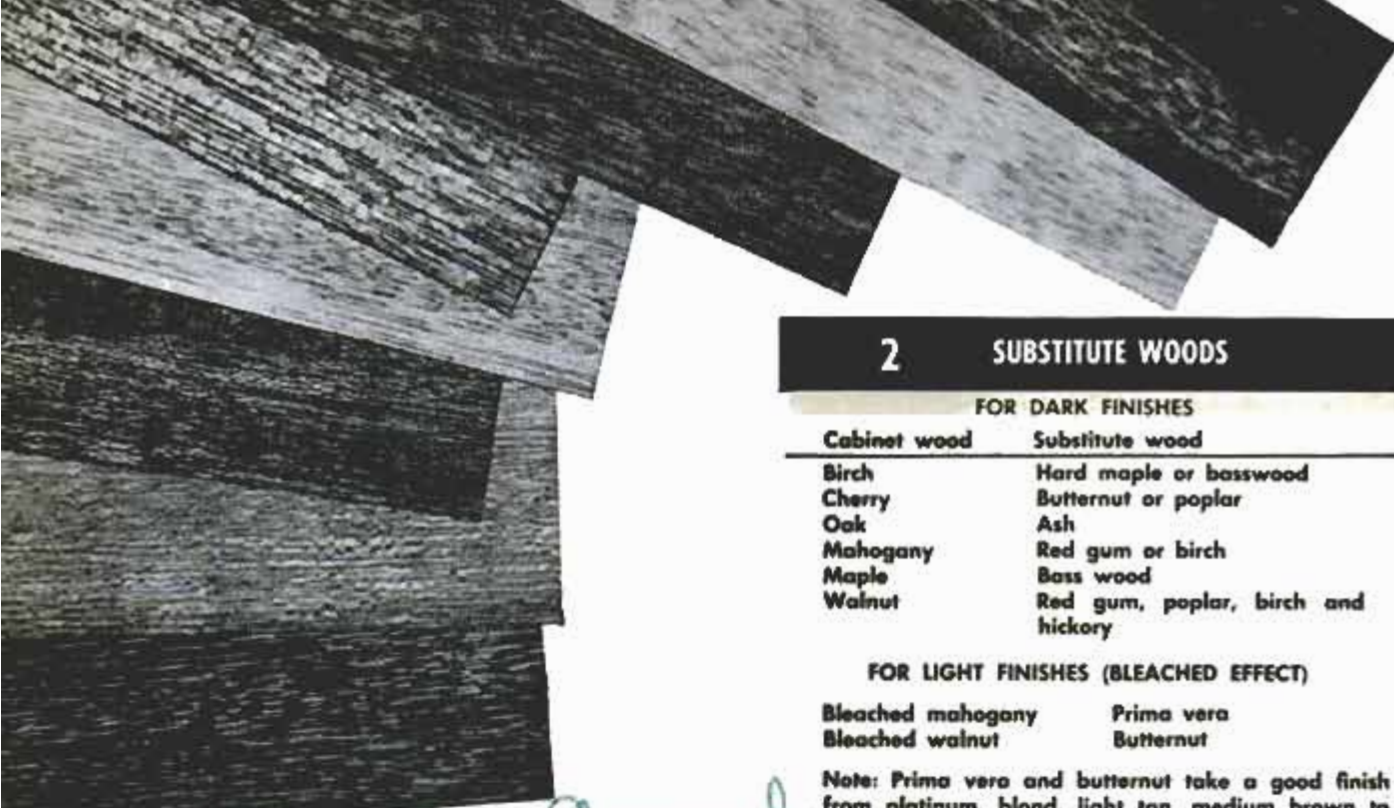


Fast Action Avoids Stains When Tackling Food Spills

If used in time, say technicians of the National Institute of Rug Cleaning, the following two formulas will remove nearly all food stains from rugs and carpets: Formula No. 1 consists of neutral soapless detergent, 1 teaspoonful, lukewarm water, ½ pint. Formula No. 2 consists of white vinegar, 1 teaspoonful, lukewarm water, 3 teaspoonfuls.

As with all food spills, the spot first should be sponged with lukewarm water. Then the remover is applied with an eyedropper and the spot wiped from the outer edge toward the center before finally blotting. Use formula No. 1 first in treating all

food stains. Then if the stain remains, use formula No. 2. Where both formulas are used, dry the spot by absorbing the moisture into thicknesses of paper towels held in place by flat weights. The secret of successful application is to avoid excessive use. Application of either formula to the extent of soaking the back of the rug may result in staining the carpet brown. Likewise, if too much dry-cleaning fluid is used, the fluid may deteriorate the latex backing used in many rugs. To remove butter and other fat stains, apply dry-cleaning fluid with an eyedropper and sponge with white unstarched cloths.



2

SUBSTITUTE WOODS

FOR DARK FINISHES

Cabinet wood	Substitute wood
Birch	Hard maple or basswood
Cherry	Butternut or poplar
Oak	Ash
Mahogany	Red gum or birch
Maple	Bass wood
Walnut	Red gum, poplar, birch and hickory

FOR LIGHT FINISHES (BLEACHED EFFECT)

Bleached mahogany	Prima vera
Bleached walnut	Butternut

Note: Prima vera and butternut take a good finish from platinum, blond, light tan, medium brown to dark finishes of mahogany and walnut

1

CAUSES OF FINISH FAILURES

- 1—Inferior or defective lumber
- 2—Excessive moisture in wood
- 3—Dents, scratches, tool marks, glue spots and stains on work
- 4—Insufficient or improper sanding of wood before finishing
- 5—Presence of sanding dust on surfaces when finishing
- 6—Dust in air settles on surfaces of work while and after finishing
- 7—Wrong temperature and humidity
- 8—Inadequate illumination
- 9—Finishing in direct sunlight
- 10—Poor grade of finishing materials
- 11—Old, spoiled finishing materials
- 12—Incompatibility of materials
- 13—Wrong type of brush
- 14—Improperly cleaned brushes
- 15—Poor brushing technique causing brush marks, skipped areas, runs, sags, and pileup in corners
- 16—Air bubbles in shellac, sealer, varnish, and lacquer
- 17—Faulty spray-gun technique
- 18—Wrong spraying consistency
- 19—Improper adjustment of spray gun
- 20—Insufficient drying between coats
- 21—Improper sanding between coats
- 22—Wrong rubbing and polishing materials
- 23—Faulty rubbing and polishing

YOU CAN

Haste trips up most beginners when finishing furniture. Passing over important little steps in surface preparation is the biggest mistake. Take it easy and you'll find that you can finish furniture beautifully the very first time

By E. R. HAAN

PART 1

ADDING THE BEAUTIFUL finishes which give that store-bought look to home-built furniture is a part of furniture making that throws the average home craftsman for a loop. And yet, it actually requires far less skill than the cabinetry. The cause of most finish failures on the part of the home craftsman is haste. In his eagerness to complete the piece and put it in use, the tendency is to overlook many seemingly unimportant little steps and, consequently, his efforts to produce a fine piece of furniture, finish-wise, result in disappointment. In addition to impatience, other causes of finish failures that plague the beginner are given in Fig. 1.

61" Shopnotes Annual



Delta photo

FINISH FURNITURE

Starting Out Right

A transparent finish emphasizes both the beauty and the defects of wood. Therefore, when building fine furniture to be so finished, select each piece of wood carefully and avoid that which has undesired knots, mineral streaks, sap and heartwood. As it is impossible to obtain lumber without any defects at all, enough should be purchased so that undesired areas can be cut out as waste. For exacting standards in fine cabinet work this may mean a waste of 30 to 40 percent. Where economy must be considered, it is possible to cut costs by using certain substitute woods as listed in Fig. 2, and finish them to resemble the more expensive ones.

Finishing nails should be set below the wood surface and the holes filled with wood putty as in Fig. 3. Sunken screwheads can be concealed with "boat plugs" which show surface grain as in Fig. 4. You can cut these from relatively thin wood by using a "hole punch" of proper size to assure a perfect fit. Such plugs should match the wood grain around the holes. Glue them in place and sand them flush after the glue has dried.

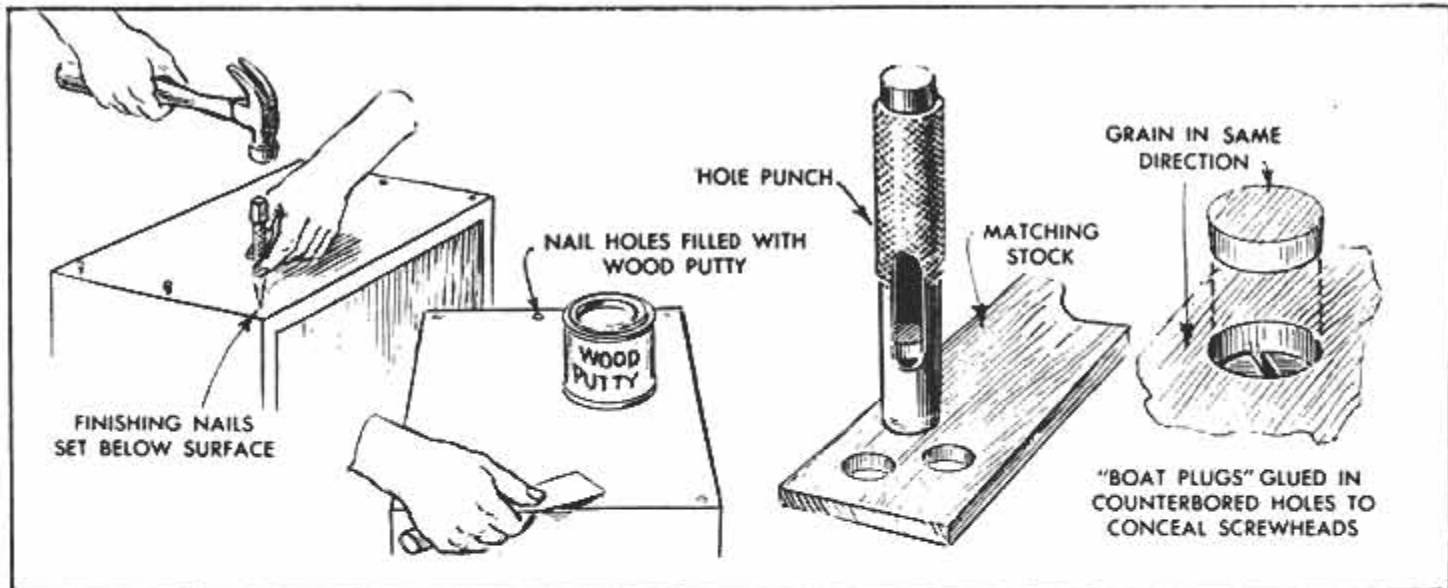
Take care to avoid glue stains as they prevent uniform staining. Remove un-

avoidable glue drops with a sharp wood chisel or scraper, then sand the surface smooth. To eliminate shallow dents, moisten them and then apply a warm iron as in Fig. 5. If the dent does not raise enough, make several razor slits with the grain and then repeat the process.

Sanding Prior to Finishing

Much time and effort can be saved by using power sanders, a belt sander, Fig. 6, for heavy cutting, and a reciprocating pad sander, Fig. 7, for fine finishing. The pad sander is better for cutting off fine ends of wood fibers but is not intended for heavy work. Three grades of sandpaper, coarse, medium and fine, as recommended by the machine manufacturers, are used successively to produce a perfectly smooth and scratch-free surface.

When hand-sanding wood, you also use three grades of open-coat aluminum-oxide abrasive paper, Fig. 8, detail A. Use No. 1/0 to remove tool marks and light glue spots, No. 3/0 to level and smooth and No. 6/0 to produce the final smooth finish. For flat surfaces you should hold the sandpaper on a wooden block or other type of holder. The block or holder shown in detail B, has a felt



3 WAYS TO CONCEAL NAILHEADS

4 AND FLATHEAD WOOD SCREWS

backing. For curved surfaces, hold the sandpaper on a 1/2-in.-thick felt pad as in detail C. For small-radii molding always use a finger behind the paper to make it conform to the curvature. For sanding many pieces of similar molding you can make a sanding block having the same contour, as in detail D.

Always sand with the wood grain to avoid cross scratches that are hard to remove. Pressure should be light, letting the grit do the work. Slightly bevel, or break, all sharp edges with two or three strokes of No. 6/0 sandpaper, but not more than this as the edge then will become noticeably rounded. A sharp edge causes finishing material to build up on either side of it but prevents good coverage on the edge itself.

Fuzzy grain that remains on some woods after sanding is removed by first applying a glue size (glue, 1 oz. and water, 1 pt.), letting it dry for 24 hours and then sanding. After the bare wood on any furniture job has been completed, dust off all surfaces with a soft brush or use a vacuum cleaner with a small brush attachment.

Room Conditions for Finishing

Many home craftsmen do their finishing under adverse room conditions of temperature, humidity, air circulation, cleanliness and illumination. Temperature should be 70 deg. F. or more. Humidity should not exceed 90 percent as this greatly prolongs drying time and much more dust than normal will settle and spot the finish.

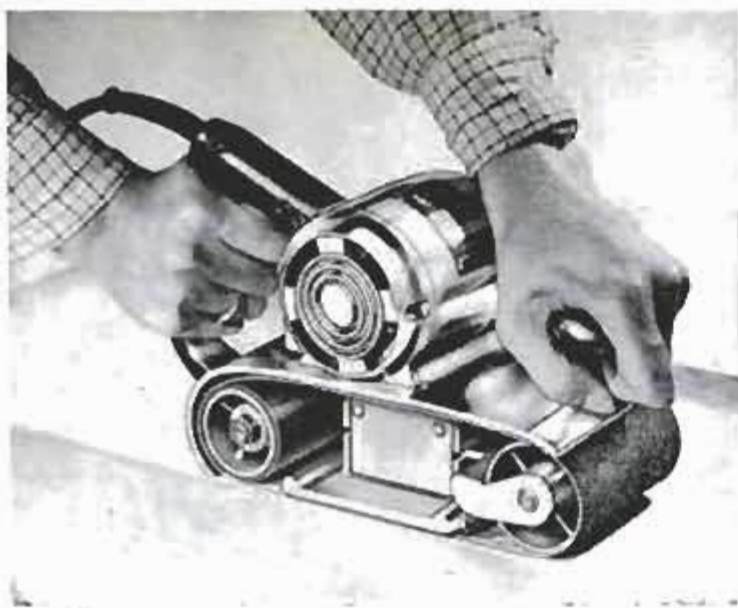
There should be a constant change of air. This equalizes inside and outside humidity and eliminates volatile vapors that may be harmful to breathe and are a fire hazard as well. Too fast a change of air should be avoided as it raises dust. When using a spray gun, a discharge fan and a respirator for the worker are necessary.

Lighting above and on the side of the work as in Fig. 9 (top) should be adequate so that the application of finishing materials can be seen by slight reflection, and thus can be controlled. Finishing and drying should never be done in direct sunlight as this may cause haze and discoloration. The room should be as free as possible of dust. A room that is separate from the workshop is best. Fine finishing never should be attempted outdoors or in an open garage or workshop that is exposed to even a slight wind. This invariably results in a ruined, dust-speckled finish.

Plan on using only the best finishing materials available. Price often is a good criterion. Use fresh materials, avoiding the temptation to economize by using the contents of an opened can over three months old. Old material may never dry,



5 REMOVING SHALLOW DENTS



6 BELT SANDER FOR HEAVY CUTTING

Skill photo



7 PAD SANDER FOR FINE FINISHES

Miller Falls photo

may contain dust deposited in it by a previously used brush, may be oxidized and covered with a skin, may have undergone chemical changes so that a resulting finish will be cloudy.

One kind of finishing material may have a formulation not compatible with another. For example, the solvent of a sealer or top coat applied on a stain or primer may cause the stain to bleed or prevent it from drying. A lacquer top coat should never be applied over a pigmented oil stain, nor over varnish, although varnish can be applied over lacquer. Some materials serve as both sealer and top coat, and are not compatible with regular varnishes and lacquers.

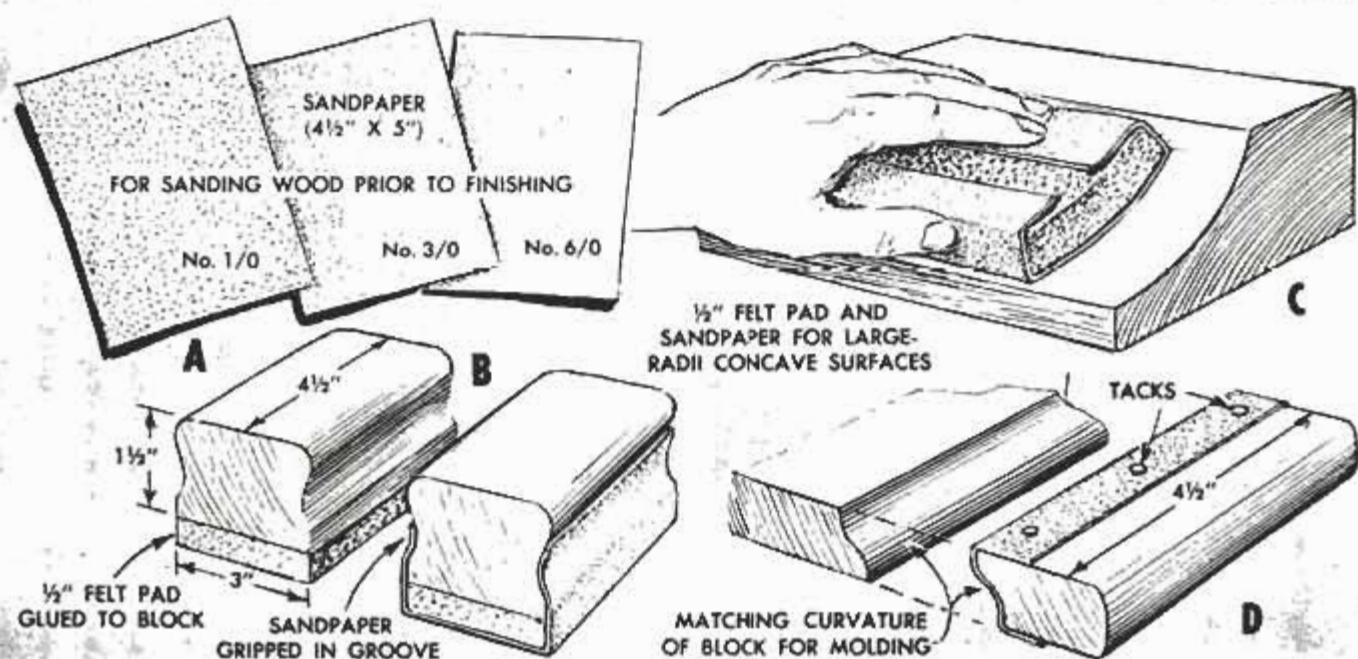
Tips on Brushes and Spray Guns

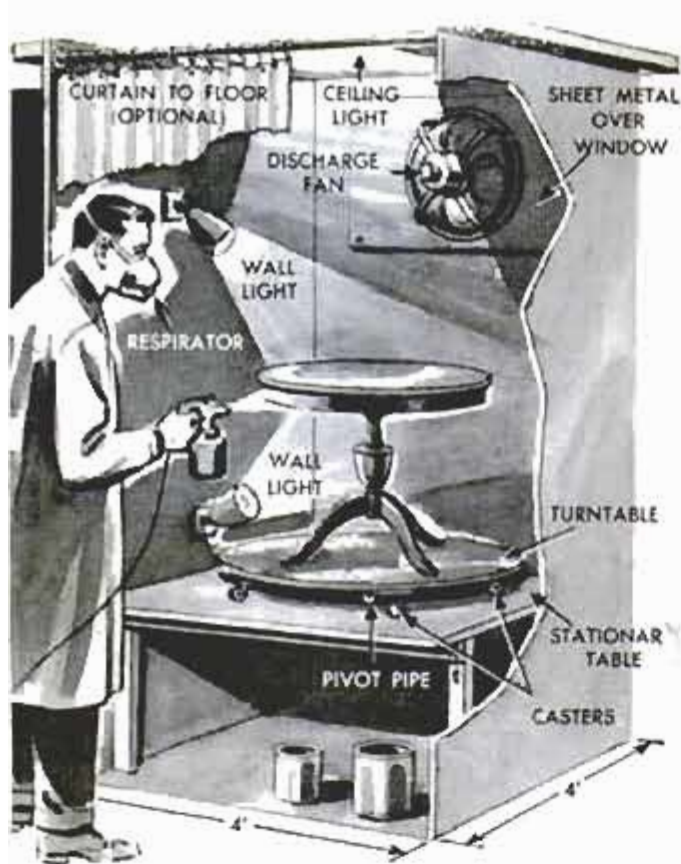
Using the right kind and size of brush

contributes to better work. A soft, long-bristle brush, 2 to 3 in. wide, is best to apply sealer, varnish and lacquer. An inexpensive soft brush, 2 or 3 in. wide, is adequate for applying stain. A stiff-bristle brush, 3 to 4 in. wide is best for applying filler. Get good quality brushes.

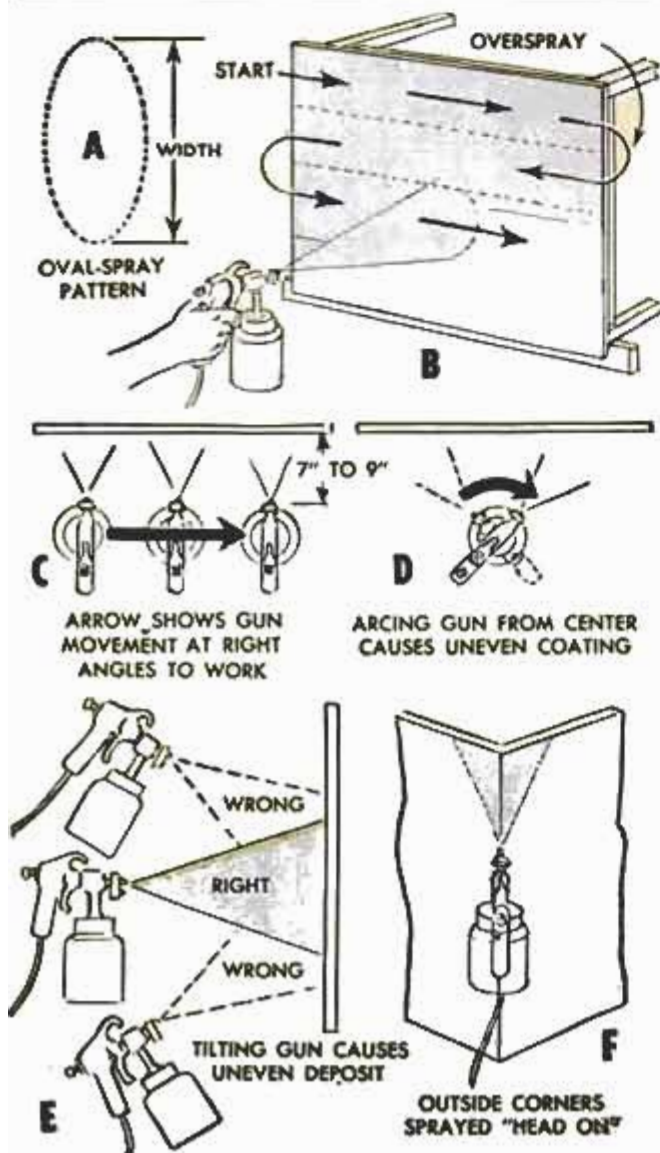
Many finish failures are caused by improper cleaning and storage of brushes. They should be cleaned immediately after using them. Brushes used for stain and filler are cleaned with turpentine, benzine or white gasoline. Those used for varnish are cleaned with turpentine or special solvent used for some varnishes, but never with benzine or white gasoline, which causes the varnish to curdle and form small particles that come off in subsequent jobs. Brushes for shellac are cleaned with wood

8 SANDING BLOCKS AND PADS FOR FLAT AND CONCAVE SURFACES





9 SPRAY BOOTH AND SPRAYING TECHNIQUES



alcohol, and those for lacquer and lacquer sealer are cleaned with lacquer thinner.

To clean a brush properly, submerge it in solvent suitable for material in the brush, working this well into the bristles with your fingers as in Fig. 10. Repeat the process with fresh solvent until the brush is cleaned thoroughly. Shake the brush to throw out dirty solvent each time. Then straighten out the bristles by combing with a wire brush and wrap the brush in aluminum foil for storage as in Fig. 11.

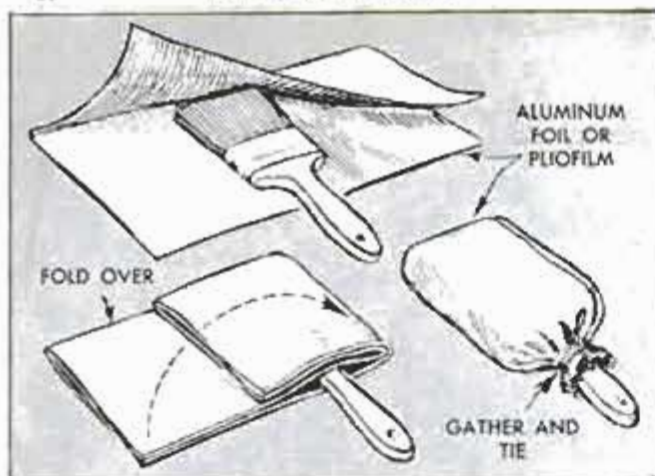
The same solvents are used for cleaning a spray gun, which should be cleaned immediately after use. Clean the cup first, then pour in fresh solvent and spray this through the nozzle. Next, unscrew the nozzle to inspect it and the orifices for cleanliness. If the orifices are clogged, disassemble the gun and submerge the parts in solvent until the orifices are clean. Don't push wire through the orifices.

Any finishing materials should be stirred to mix the ingredients and produce the right consistency. Shellac, sealer, varnish and lacquer are stirred carefully to avoid forming air bubbles which are transferred to the work surface and may cause tiny craters. The brush is dipped into the liquid about one third of its bristle length, and then is drawn over the can rim to remove the excess. In large half-empty cans the brush can be slapped against the inside to do this.

Shellac, varnish and lacquer are "flowed" on with a full brush, first with long and slightly overlapping strokes in the grain direction, then with light cross strokes for uniform spreading, and finally with light finishing strokes with the grain.

Spraying Technique

A spray booth equipped with a fan to discharge the fumes, a turntable and suitable lighting, as shown in Fig. 9, is highly desirable. The average home spray gun op-



erates on a pressure of about 35 lbs. p.s.i., which permits spraying of liquids having about 20 percent solid material. Spray guns working on 90 to 110 lbs. of pressure can spray from 35 to 45 percent solid material in liquids. Finishing materials are brought to proper spraying viscosity by adding solvent. Then they are strained through a 60-mesh wire screen before being used.

The gun nozzle is adjusted to spray a fan pattern 5 to 6 in. wide, detail A, Fig. 9, when holding the gun from 7 to 9 in. from the surface. For each 10 lbs. of additional pressure, the gun is held 1 in. farther away. Holding the gun too close results in an uneven coating that has ripples and runs. Holding it too far away results in a dry, sandy spray with excessive dusting.

Always start spraying a vertical surface at the top and work downward with successive cross strokes as in detail B. Pull the gun trigger just before the spray hits the work, and release it just after it passes the work. You can spray the two vertical edges before making the horizontal strokes to minimize over-spraying. Always spray full wet coats just short of running.

Keep the spray axis at right angles to the work and at a uniform distance from it as in detail C. Arcing the gun from a central position, detail D, results in a heavier deposit at the center frequently causing runs. Holding the gun downward produces a heavier deposit at the upper fringe of the spray pattern, and holding it upward will make a heavy deposit at the lower fringe, detail E.

In spraying horizontal surfaces, you start at the edge nearest you and proceed to the farthest edge with successive horizontal strokes. Then the spray dust that lands on the uncoated surface will be dissolved by a full spray stroke. Reversing this procedure will cause spray dust to settle on the finished surface. Outside corners are sprayed head-on as in Fig. 9, detail F, with the nozzle set horizontally to produce an even deposit. ★ ★ ★

Outlining Aids Typing Stencils

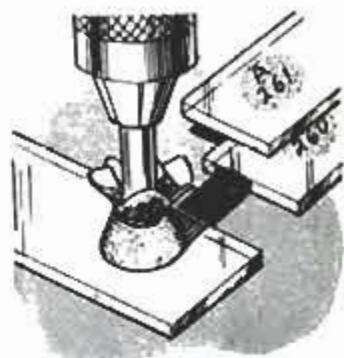
When typing advertising copy on a stencil, it is easy to type within ruled-off areas if their limits are marked off on the cushion sheet between the stencil and the backing sheet. If you outline the areas with black ink, ruling them directly on the cushion sheet, you will be able to see the lines clearly through the stencil.

—G. E. Hendrickson, Argyle, Wis.



Coding Micro Slides

Identifying micro slides becomes a simple job when you are able to write the code number or letters directly on the glass. This can be done with a lead pencil if a roughened spot is made on the glass. A quick way to sand a spot on a number of slides is to cover the end of a dowel with fine emery cloth and chuck it in a drill-press. A roughened spot can be "ground" in a few seconds by a mere touch of the abrasive.



Hand Grip Improves Scraper

Since downward pressure is required when using a paint scraper, particularly when the blade begins to dull, you'll find that a knob added to the handle over the blade end provides a most convenient handhold. A drawer pull will serve as a suitable knob which is easily attached to the wooden handle.



AUTUMN BOUQUET

FROM AN ODD COLLECTION of dried egg shells, seed pods, a fruit jar and some left-over paint and varnish, you can create an artificial autumn bouquet for your table that is a thing of beauty. The bouquet part, consisting of milkweed and honey-locust pods, cattails and bittersweet, is gathered along roadsides, pastures and fence rows. Milkweed pods may be glued shut at the seams to retain the seeds or they may be removed. In the latter case, the open pods are painted inside and out in such colors as white, gold, silver, gray-green and shades of red and orange. The cattails should be cut with long stems and shellacked or varnished lightly to seal the seeds and preserve the original coloring. Bittersweet should be hung stem-end-up to dry for at least two weeks. Clay is used to bed the bouquet in the bottom of the jar vase. The method of decorating the latter is explained in the photos below.

Jean Lyon, Cedar Rapids, Ia.



Above, the fruit jar is decorated by first coating with thick shellac and then rolling it in crushed eggshells while tacky. Eggshell surface and remaining bare spots are then coated with flat-finish paint, or enamel

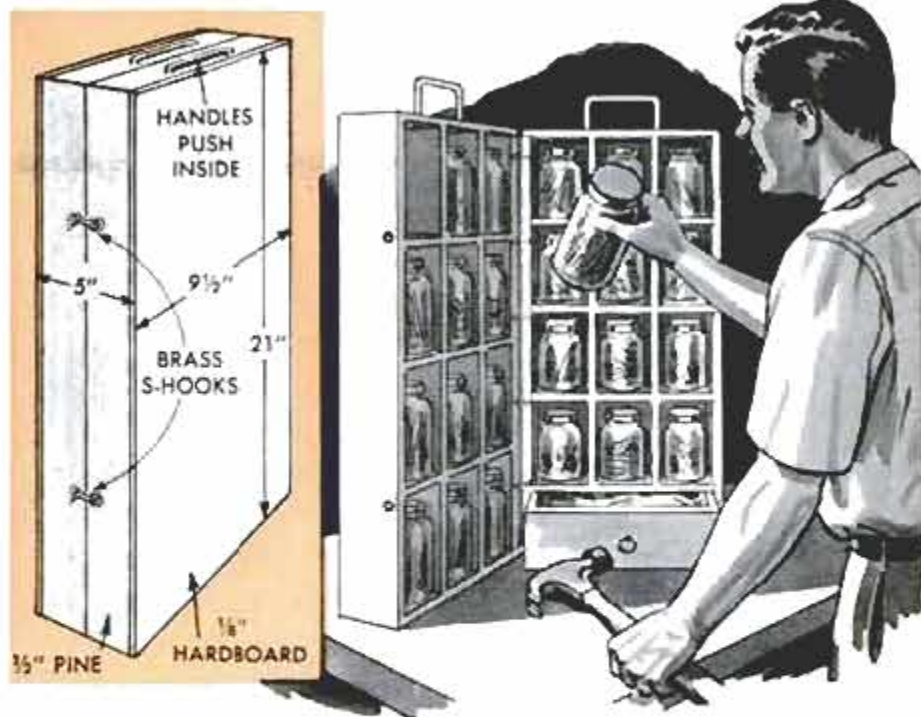


Below left, cattail seed pods are coated with varnish to prevent the millions of tiny seeds from floating about. Below right, when seeds are removed from milkweed pods, both inside and outside of pods are painted



Apartment-Size Tote Box

Although he has no need for as complete a toolbox as his homeowners cousin, the apartment dweller has need for a tuck-away fix-it box that will hold an assortment of tacks, screws and nails needed from time to time to fix a curtain bracket, hang a picture or fix a wobbly chair. Made like a suitcase from pine and hardboard, this box stands open for convenient access and provides shallow drawer space for sandpaper, glue and other items too large to fit in the jars. — Eli Raymond, New Bedford, Mass.

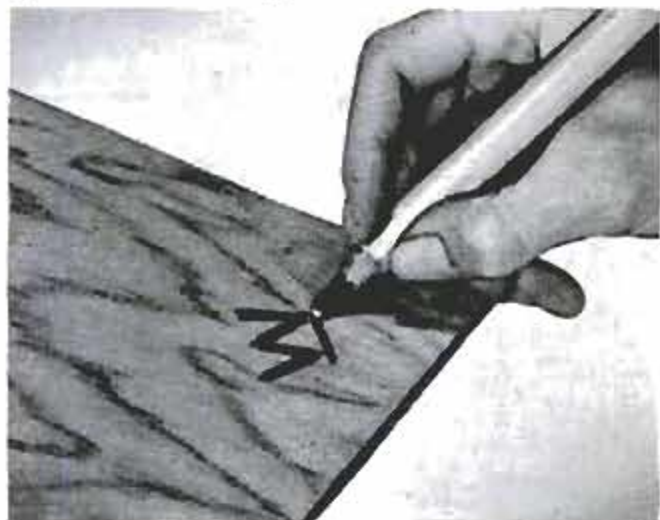


Identification Marks on Plywood Scraps Indicate Type at Glance

Once cut from the main panel, leftover scraps of waterproof plywood lose their identity as to their type. Consequently, it is a good practice to mark such pieces right away so there is no chance of getting them confused with nonwaterproof type. A "W" marked in pencil on one or both sides will tell you at a glance.

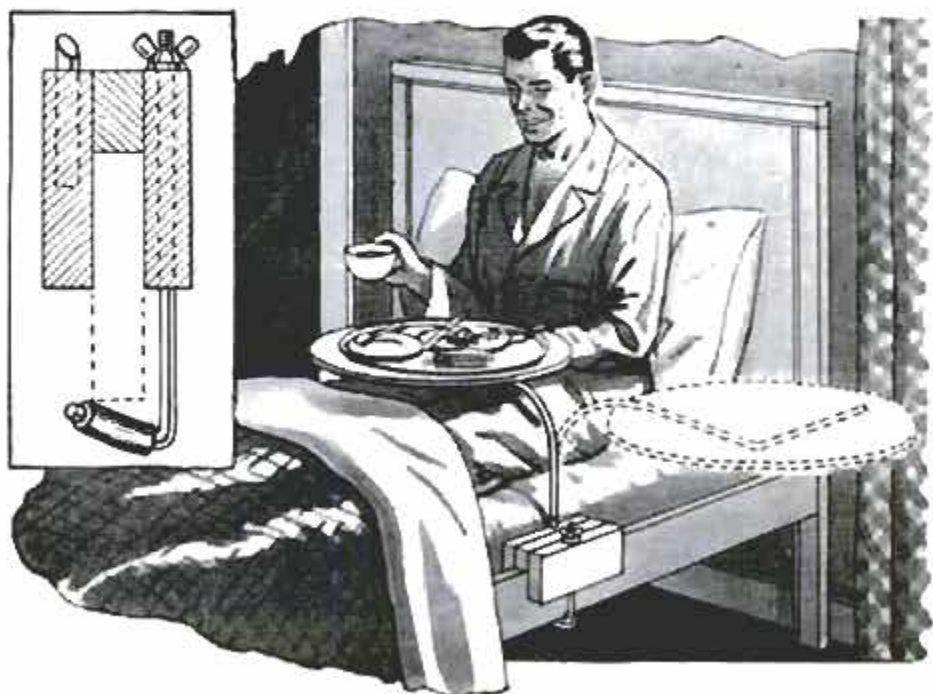
Richard Hanscom, Elmhurst, Ill.

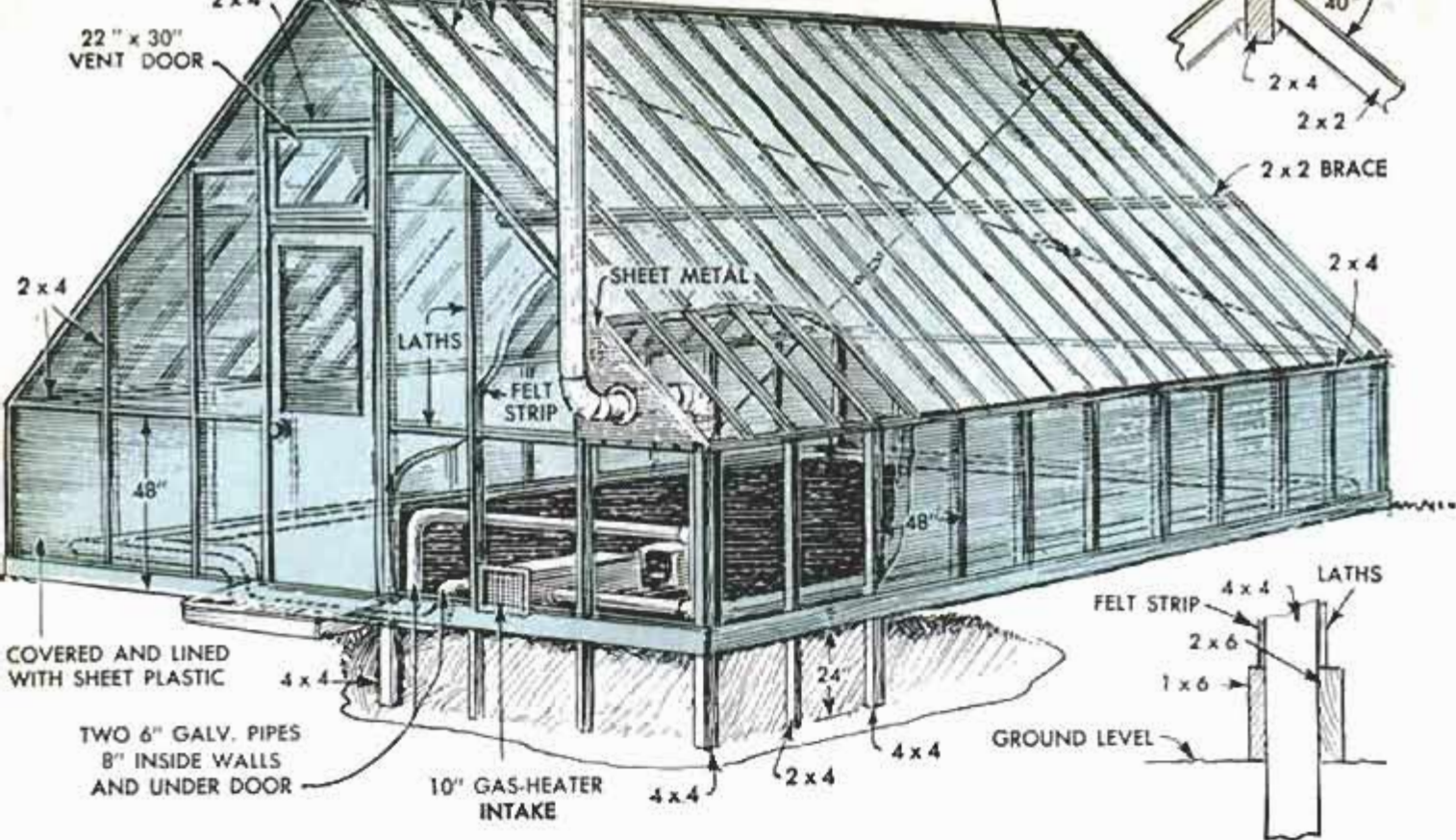
When applying board sheathing diagonally, start a short distance from a corner, say about 6 ft. You'll find it easier to establish a 45-deg. angle, and short cutoffs can later be used up nicely in filling out the corners.



Swing-Away Tray Clamps to Bed Rail

Featuring a pivoted arm which clamps to the bed rail, this convenient tray can be easily swung away with little effort by the patient. The tray is a disk of plywood which is supported by bending a kink in the tubular arm as shown by the dotted lines. The clamp rides the rail and is clamped by a hook which is tightened with a wingnut. A piece of rubber tubing makes the hook nonmarring.



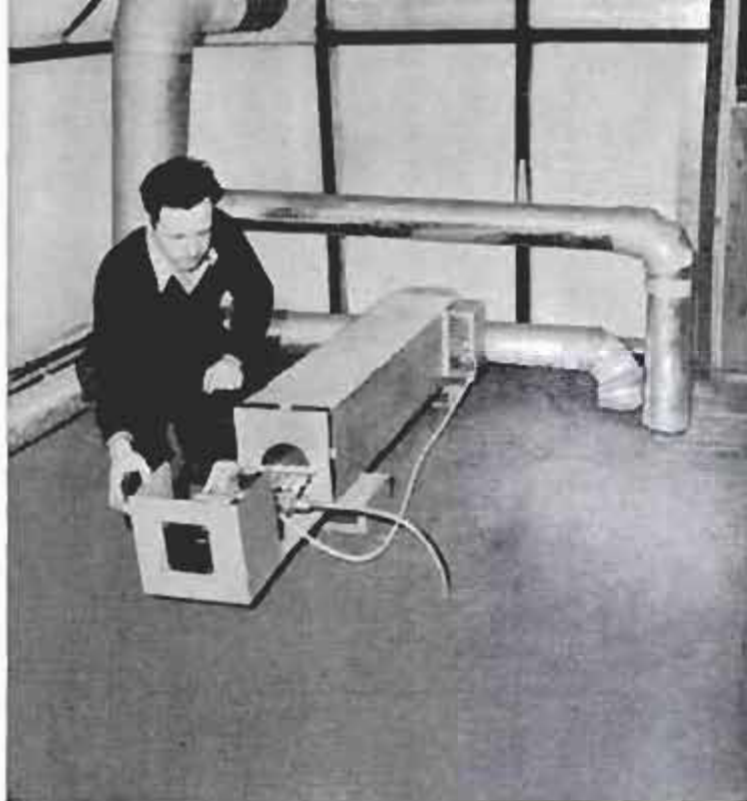


Plastic Cuts Greenhouse

By H. H. Slawson



LOWER ORIGINAL construction costs plus moderate maintenance expenses, for greenhouses used by either commercial or home flower growers, are promised by innovations in a structure designed and built by horticulturists at the South Dakota Agricultural College. Polyethylene-plastic film is used in place of the glass used in conventional greenhouses. Cost of the plastic for the 18 x 40-ft. structure built at the college was 45 dollars. Material for a home-size unit would be correspondingly less costly. To construct the walls 4 x 4s were sunk in the ground every 8 ft., with 2 x 4s centered between each pair. The corner posts are 4 x 4s. Across the top of these vertical members, which project 4 ft. above the ground and extend 2 ft. into the ground, are nailed 2 x 4s. At ground level, outside the walls, are nailed 2 x 6s, while a 1 x 6 is nailed to the inside of the wall opposite each exterior member. All wood contacting the ground is treated with wood preservative. The roof of the building consists of 2 x 2 rafters fitted against a 2 x 4 ridgepole. A 2 x 2 longitudinal is positioned at right angles to the rafters on each side of the roof, and lengths of 9-ga. wire are fitted through screw eyes and tightened by turnbuckles to form an X-brace on each side of the



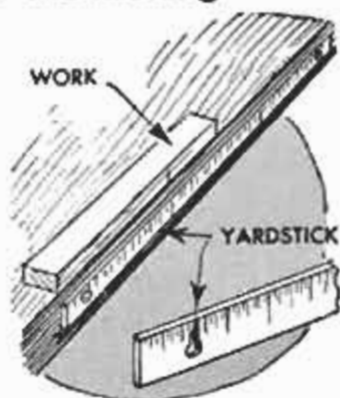
Costs

roof as indicated. Rough spots and slivers are removed or sanded before applying the sheet plastic, to minimize the chance of tearing it. The outside layer of polyethylene plastic is 3 mils (.003 in.) thick, stapled in place with laths nailed over it as added reinforcements. The inside layer of plastic is .0015 in. thick, strips of 2-in.-wide roofing felt being used rather than laths. Heat for the greenhouse is supplied by an LP gas heater, the heat being forced through metal ducts positioned 8 in. inside the walls, with the bottom duct 4 in. above the floor. The ducts run underground inside the door. A commercial version of the greenhouse has a concrete floor, with the furnace in an enclosure outside the greenhouse to conserve floor space. A home greenhouse also could have a concrete floor, with a small oil space heater to maintain temperature. The plastic deteriorates during the summer and must be replaced annually, but the college figures that, for a commercial establishment, its replacement cost is less than the cost of replacing broken glass. Also, with the continual improvement in plastics, it is quite possible that a material will be developed that will last much longer. Replacement of the plastic is made in fall, when the weather is fair. The 50-in.-wide material is lapped 3 in., for a tight, strong joint that keeps heat and humidity inside. ★★★

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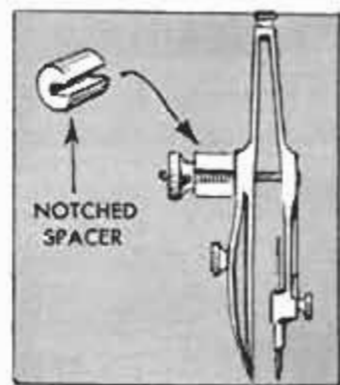
Yardstick on Workbench Edge Handy for Quick Measuring

Keyhole slots cut near the ends of a yardstick will permit it to be attached to the edge of a workbench, for measuring pieces of material. Round-headed screws hold it in place, yet allow it to be removed.



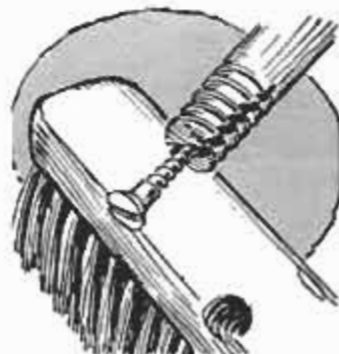
Notched Wooden Spacer Block Speeds Compass Adjustment

Fitted over the threaded adjusting rod of a compass, a notched spacer block permits quick adjustment to a small radius without the need for turning the adjusting nut to the full length of the screw.



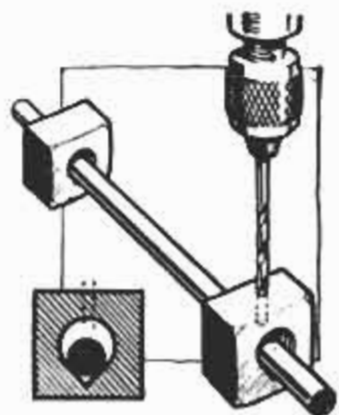
Loose Broom Handle Tightened By Expanding With Screw

When the wooden handle of a broom or brush becomes loose because the threads on the end have worn, it can be re-tightened by splitting the handle end and driving a screw into it.



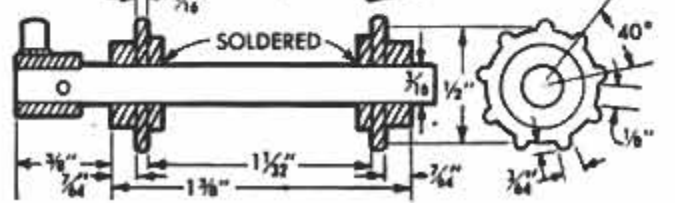
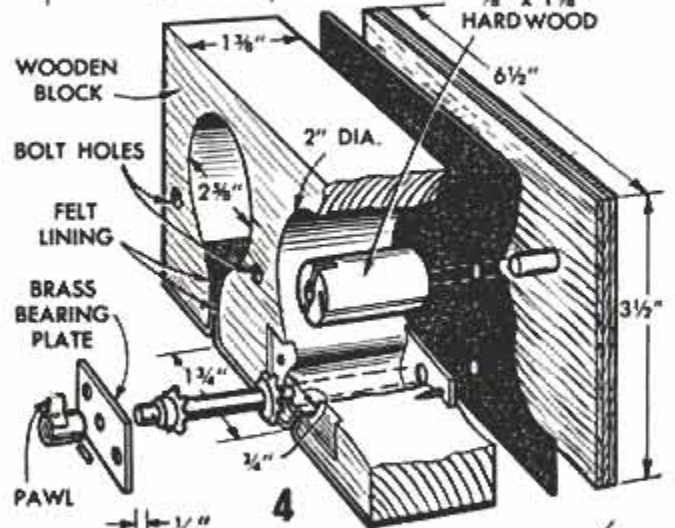
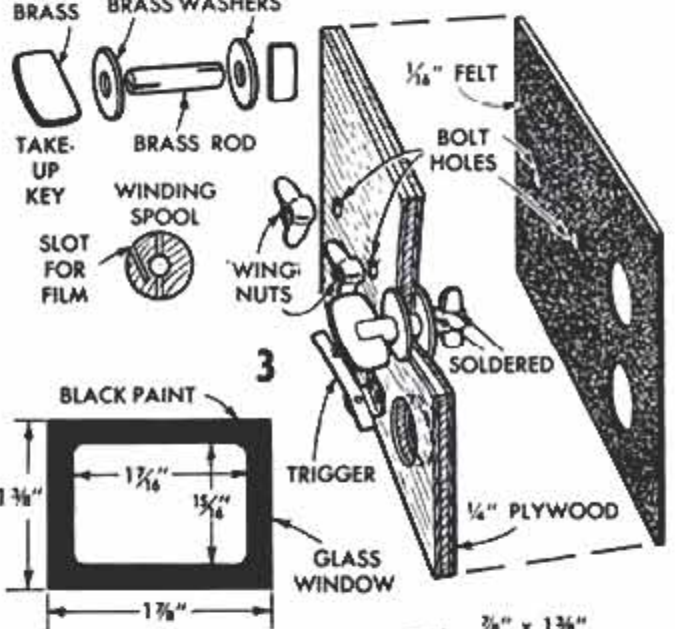
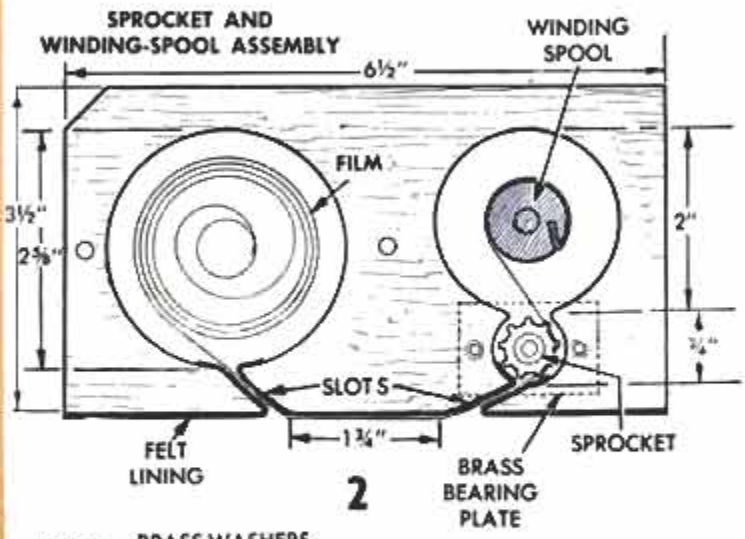
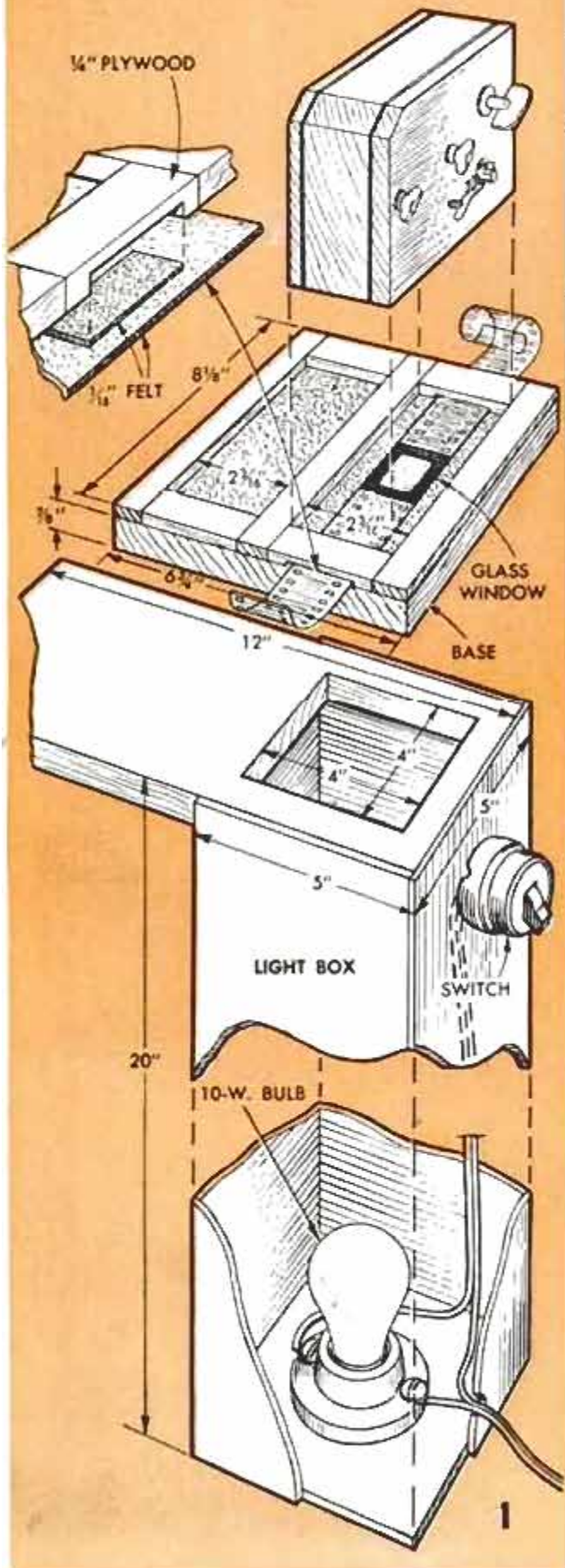
Accurate Center-Drilling Jig

Accurate center-drilling of small-diameter rods and tubes is assured with a jig made of two square nuts in which V-notches are filed. A hole of the desired diameter is drilled in one to guide the drill bit; the second nut holds the work level.





FROM NEGATIVE

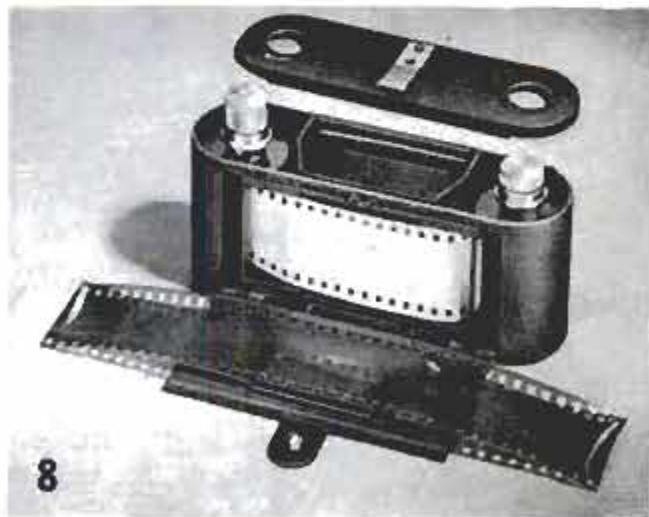
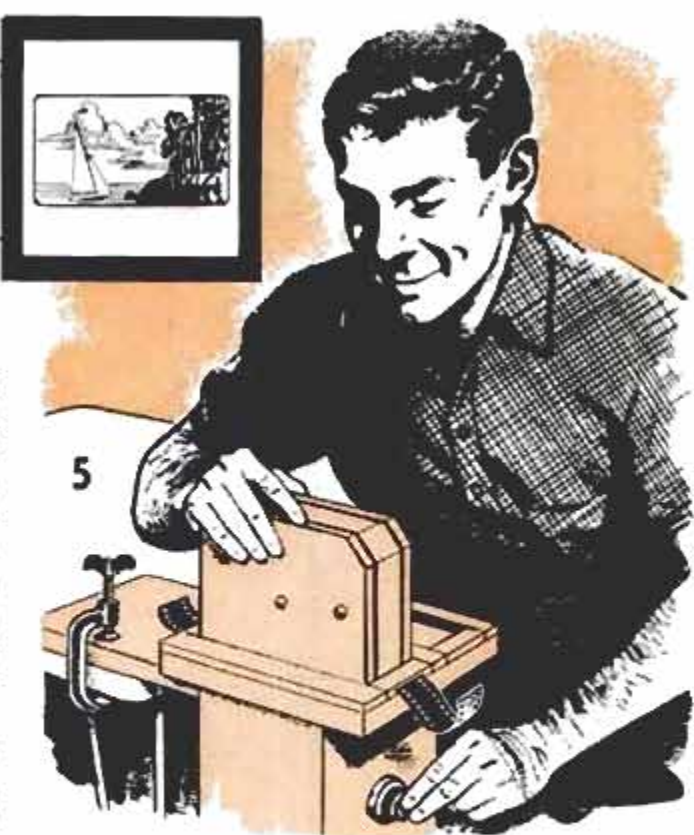


TO POSITIVE

MANY 35 mm fans do not realize that black-and-white negatives can be "reversed" for viewing in a projector like any regular color transparency. Actually, the printing of such positives is as simple and inexpensive as making prints, the main difference being that film is used instead of paper. As for equipment, it requires a film printer, or a printing frame which is designed to print several exposed negatives at one time.

There are several such printers on the market, three of which are pictured in Figs. 6, 7 and 8, which range in price as well as versatility. Some require accessory light sources; others have a built-in light. All have light-tight magazines for holding the raw film. Some have "click stops" for proper movement of the negative and raw film. Still other printers feature a light dimmer to compensate for variances in negative densities.

If you wish, you can save the price of a printer by making the one detailed in Figs. 1, 2, 3 and 4. It consists of a light box which supports a recessed base in which a film magazine rests. One recess has an aperture, or window, over which the





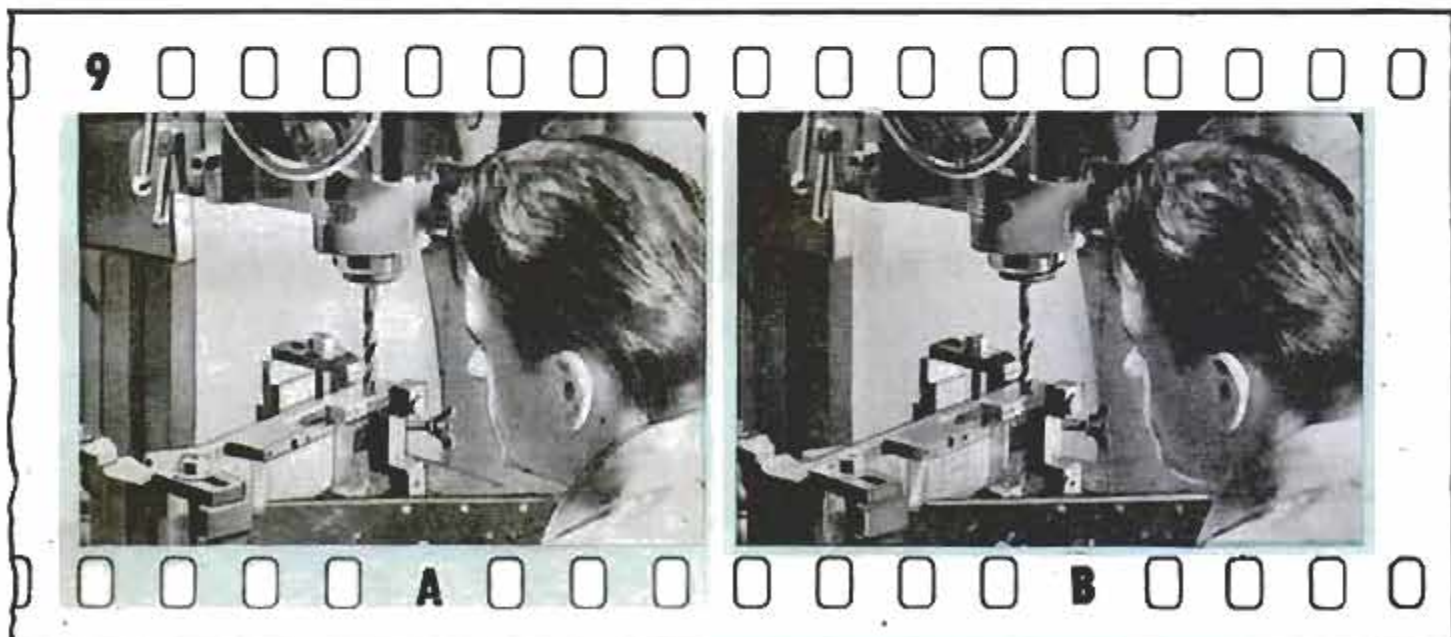
Commercially available printers, such as this one from France, make little work of transferring your prize black-and-white negatives into sparkling positives, ready for projection

negative is placed for printing. The second recess is provided for holding the film magazine while the film strip is being advanced for the next exposure. The film magazine in which raw film is placed, consists of a 1 $\frac{3}{8}$ -in.-thick core which is sandwiched between outer layers of felt and $\frac{1}{4}$ -in. plywood. Fig. 2 shows how openings in the core permit the raw film to be wound through felt-lined slots onto a sprocket and takeup spool. One side of the film magazine is removable for loading and is held by two wing nuts. The take-up key for the

winding spool is detailed in Fig. 3, which also shows how the key is assembled to engage a slot in the end of the winding spool. A pawl on the sprocket shaft is provided to limit the advance of the raw film as it is wound from one frame to the next, and a spring-actuated trigger, engaging the pawl, permits it to be released for advancing the film. Fig. 4 shows how the pawl is pinned to the end of the shaft. The completed printer is held to the edge of a table with a C-clamp, Fig. 4, when being used.

Generally speaking, any good negative will produce a good positive. However, there are pitfalls that the beginner must avoid. Dust is one. A dust particle, unperceptible to the naked eye, becomes readily noticeable when enlarged 40 times. For this reason, it is most important to keep both the raw film and the negative free of dust when printing positives. To make a positive from a negative, you must use positive film, such as Kodak fine-grain positive film P402. This can be purchased in 100-ft. rolls. Whether only part or

all of the film is used at one loading, the amount used must be developed at one time. If you use a commercial printer, the film magazine is loaded according to manufacturer's instructions. If you have made your own printer, the film is placed in the magazine in the manner shown in Fig. 2. In each case, loading of the magazine must be done in total darkness to protect the film. With the magazine loaded, select a negative of normal density and place it against the positive film. Be sure that the emulsion sides of both films (the positive



and the negative) are placed back to back and that both films are firmly in contact. Start your series of test shots with a one-second exposure. Then advance the positive film only and expose the same negative again for an interval of two seconds. Repeat this procedure for four, six and eight-second exposures, advancing just the positive film with each exposure. This operation, naturally, must be done in a dark-room, or in a room or closet made light tight. In operating your home-built printer, set the loaded magazine in the rear compartment of the base. Then fit your negative strip over the glass window in the front recess of the base. To expose the film or make a positive print, the magazine is lifted from the rear recess to the front recess and the lamp in the light box is turned on for the required number of seconds. The film in the magazine is advanced one frame, the magazine itself is removed and returned to the rear recess, after which the negative is shifted over the window. These specific steps are repeated in printing each frame individually in the negative strip. Where only a portion of the full roll of positive film is used, that portion can be cut from the roll and removed and the rest rethreaded onto the take-up spool.

In developing your test exposures to determine the correct exposure time, run them through D-11 developer for 11 min., then rinse, fix, wash and dry as done in normal procedures. Now compare your exposures with the examples shown in Fig. 9, exposure A being underexposed, B being normal and C overexposed. Positives that are near normal are placed in cardboard mounts and projected on a screen for study. Those considered under or overexposed are discarded and the exposure of the perfect positive remembered when making positives of the rest of your negatives. ★★



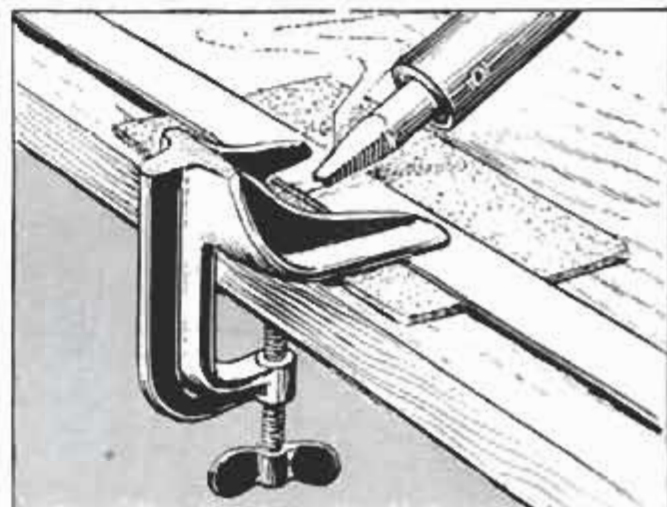
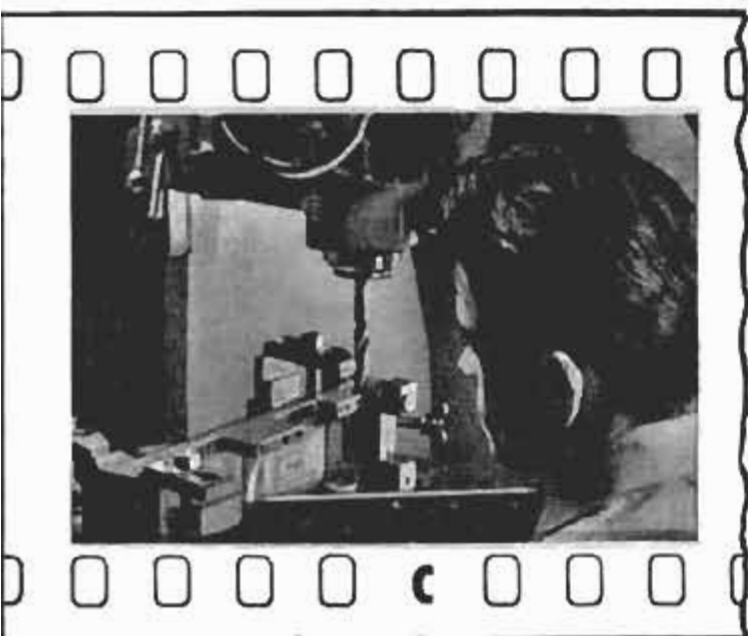
Tractor Tire and Umbrella Make Quickie Sand Box

If you can lay your hands on a discarded tractor tire, you have the makings of a ready-made sand box. And by driving a length of pipe in the center of it to hold an umbrella, you can protect young castle builders from the hot sun. The umbrella would have to be one you didn't care much about since the handle must be cut off in order to stick it into the pipe.

Food Chopper Serves as Hold-down

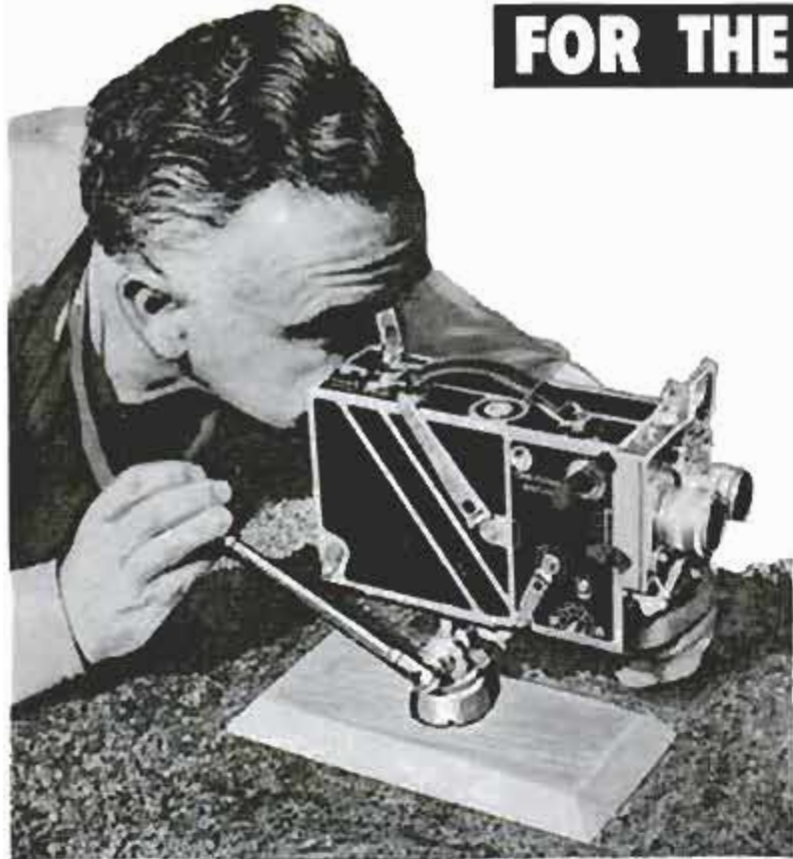
Think twice before you toss out that old food chopper. The clamp part of it will prove useful in your workshop. Sawed off at the point indicated, you'll find that the fork foot of the clamp is especially handy for holding two pieces of work in alignment for soldering the abutting ends.

Alexander P. Truchot, Choteau, Mont.



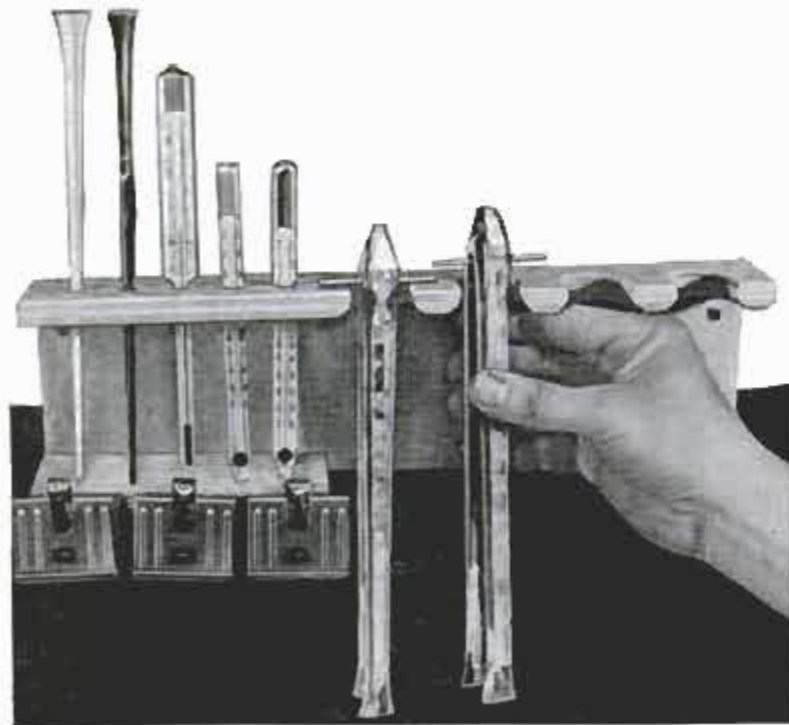
Camera Floor-Pod

An indispensable accessory for shooting low-angle movie scenes is a camera floor-pod like this one. Being nothing more than a board measuring 5 x 10 in. and fitted with a $\frac{1}{4}$ -20 bolt for attaching the pan head, it is an accessory that is easily made and one which will provide firm support for low panning shots. The hole for the bolt head should be countersunk on the underside of the board so the bolt head will be flush with the surface. Where steeper low-angle shots are required than are possible with the tilt head, the front end of the wooden base can be blocked up with a book or other flat object which will provide stable support to prevent rocking.



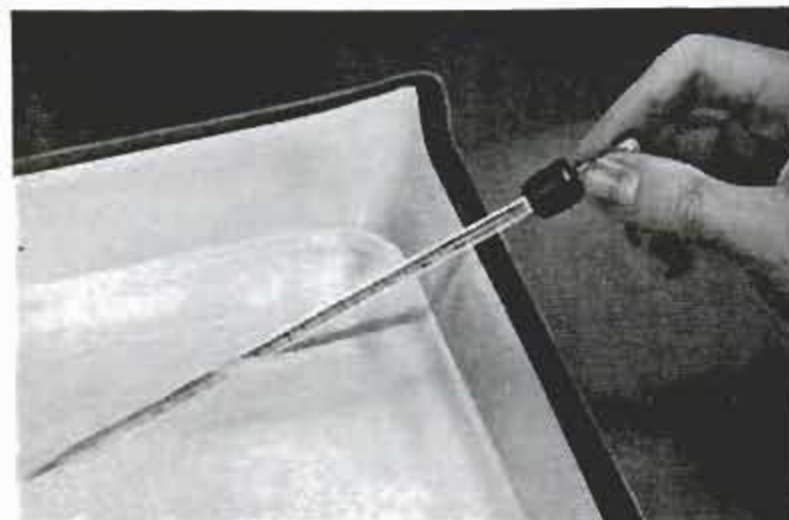
Darkroom Rack

Stirring rods, print tongs, thermometers, as well as film clips, can all be stored in neat orderly array in this simple darkroom wall rack. It's something you can make in a few minutes' time from scraps of $\frac{1}{2}$ -in. wood. The tongs are held in notches by wedging 3-in. lengths of plastic knitting needle crosswise in the ends of the tongs. These crosspins also serve as stops in preventing the tongs from slipping into the tray when resting them on the edge. Holes are provided for holding the stirring rods and thermometers, and a block positioned below the holes provides a support on which to rest. Nails driven into the edge of the block serve to hold a few film clips.



Thermometer Hook

Resting a thermometer on the edge of a developing tray to check the temperature of the solution usually results in the thermometer rolling into the tray. One way to prevent this is to slip a rubber fuller ball part way over the end of the thermometer so it will hook over the edge of the tray. The fuller ball will also serve as a knob to give you a better grip. It will be necessary to enlarge the hole in the ball to suit the particular thermometer.





Set Your Own Gunsights With One Shot

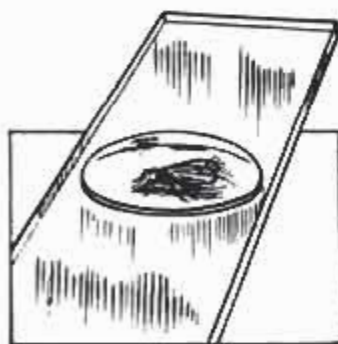
Instead of setting gunsights by the trial-and-error method, take a few minutes and do the job accurately, as illustrated. First, clamp the gun securely in position. A bench vise on a firm support, such as a post or solid table, will do nicely. Then, place the target about 100 ft. from the gun, farther if the gun is high-power. Align the target in the gun sights and secure it so it will

not move from impact with a bullet. Fire the gun. Now, without moving the gun or target, align the sights with the bullet hole in the target, making the adjustment for either a fine or coarse sight as desired. Observe all safety precautions and make the setup so there is no possibility of injuring animals or humans.

H. S. Robbins, San Antonio, Texas.

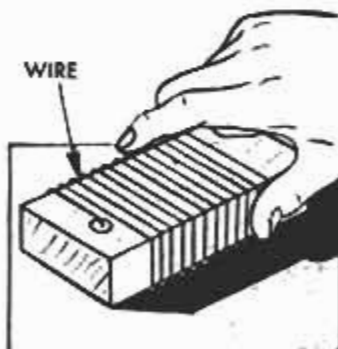
Holding Insect on Slide

To examine a small insect under a microscope, cover it on the slide with a small watch crystal. This will keep the specimen in place without misshaping it.



"Sanding Block" Removes Paint

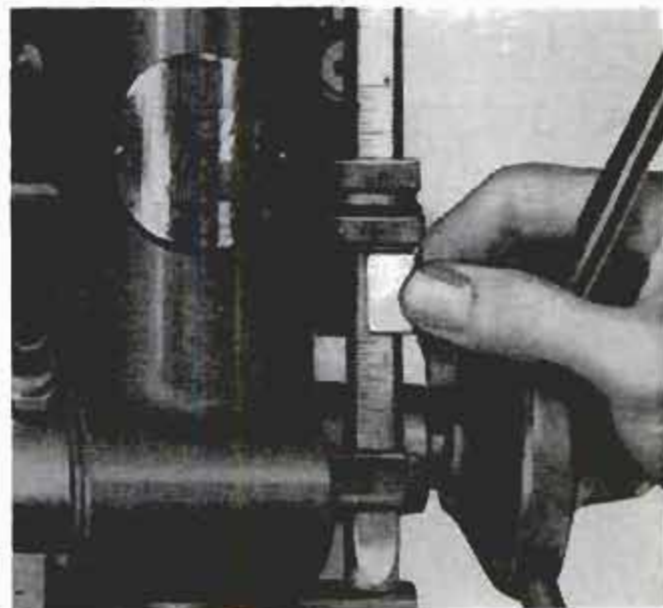
To remove peeling paint, use a block of wood wrapped with fairly small wire as indicated. This provides a "sanding block" that will not clog.

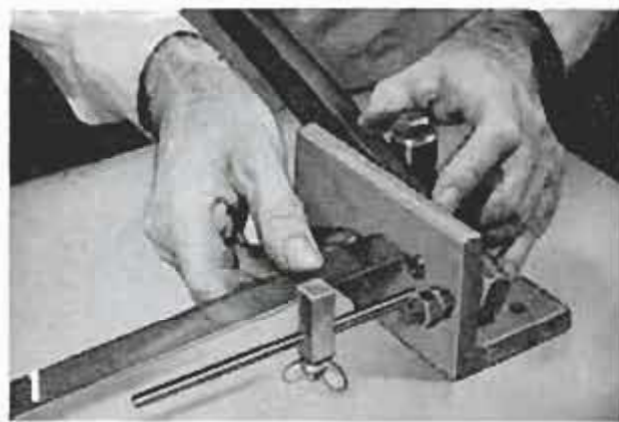


Depth Setting on Drill Press Changed Quickly With Clips

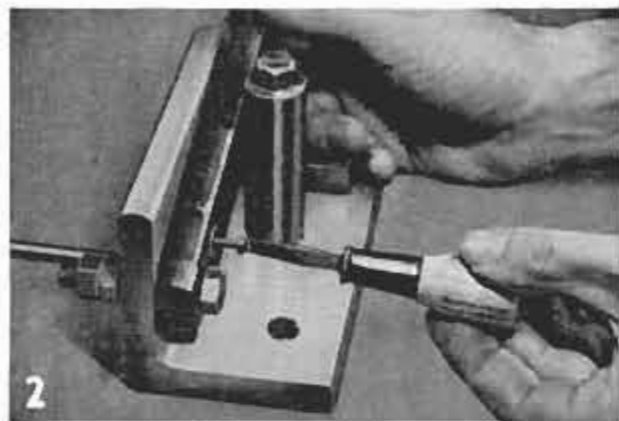
When it is necessary to drill to several different depths on duplicate work, snap-on clips that fit over the drill-press depth stop will permit quick and accurate adjustment of the setting. Cut from light sheet metal, the clips are shaped to a press fit on the stop. They may be of any desired length and, for quick identification, the length may be stamped on them.

To remove stamps from envelopes try a steam iron. Lay a piece of dry white cotton cloth about 4 in. square over the stamp to be removed. Place the iron over the cloth and press the steam button. In about 10 seconds remove the iron without releasing the steam button. Lift the cloth and the stamps will come off undamaged.

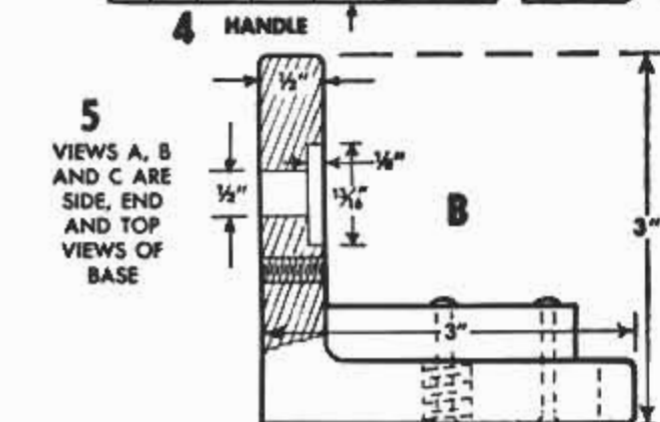
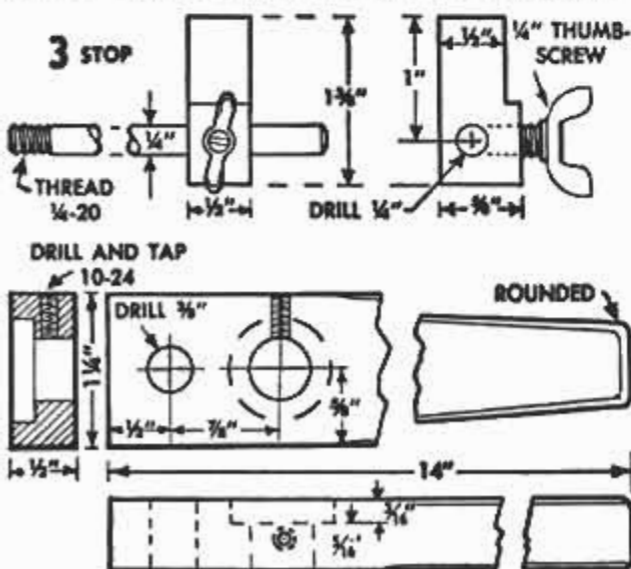




Cutter has adjustable stop for cutting duplicate parts from rods or wire. Has also a novel lever guide which is made in the form of an eccentric. Arrangement allows adjustment to maintain uniform contact of dies and to compensate for wear



By tapping the fixed die, Fig. 6, small screws and stove bolts can be cut to required length without damaging threads. Note eccentric guide



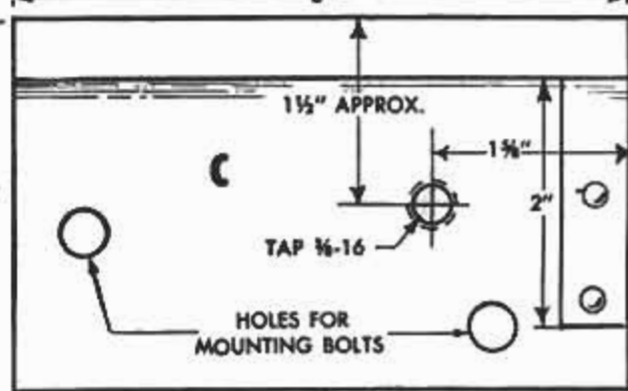
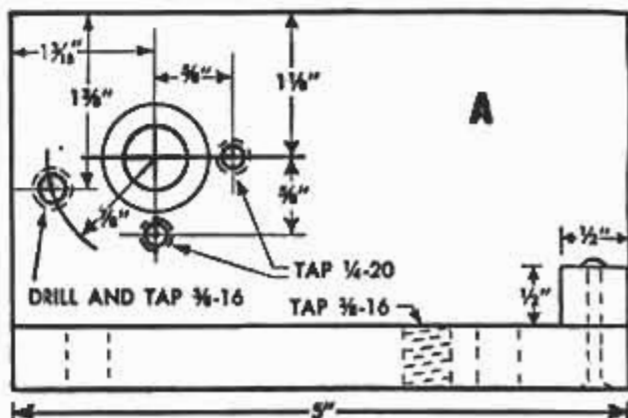
ROD AND BOLT

Makes a clean, square cut on round stock up to 3/16 in. in dia. Adjustable stop assures duplicate lengths

NO EXPERIENCED shop man likes the job of cutting duplicate lengths from light rod stock with a hacksaw; or cutting small bolts to a required length by the same means. In both instances the parts must be finished with a file or grinder if accurate work is to be produced. This shop-made rod and bolt cutter turns the trick with one stroke of a lever and no final finishing of the cut ends is necessary.

As you will see from the detailed parts, the cutter is a simple gadget assembled from stock materials quite readily available. Made as detailed, the unit features an adjustable stop, Fig. 1, for cutting to duplicate lengths, and also a tapped die, Figs. 2 and 6, for cutting screws, bolts and threaded rods. By using a tapped die, bolts, screws and threaded rods can be cut clean and square, with little or no crushing of threads.

Fig. 3 details the adjustable stop; Fig. 4, the handle, and Fig. 5, views A, B and C, the frame, or base. This is made from a length of heavy steel angle and is drilled, counterbored and tapped on both webs as indicated. In use, the unit ordinarily is clamped to the bench top, but mounting holes for bolts can be drilled as in Fig. 5,



CUTTER FOR YOUR SHOP

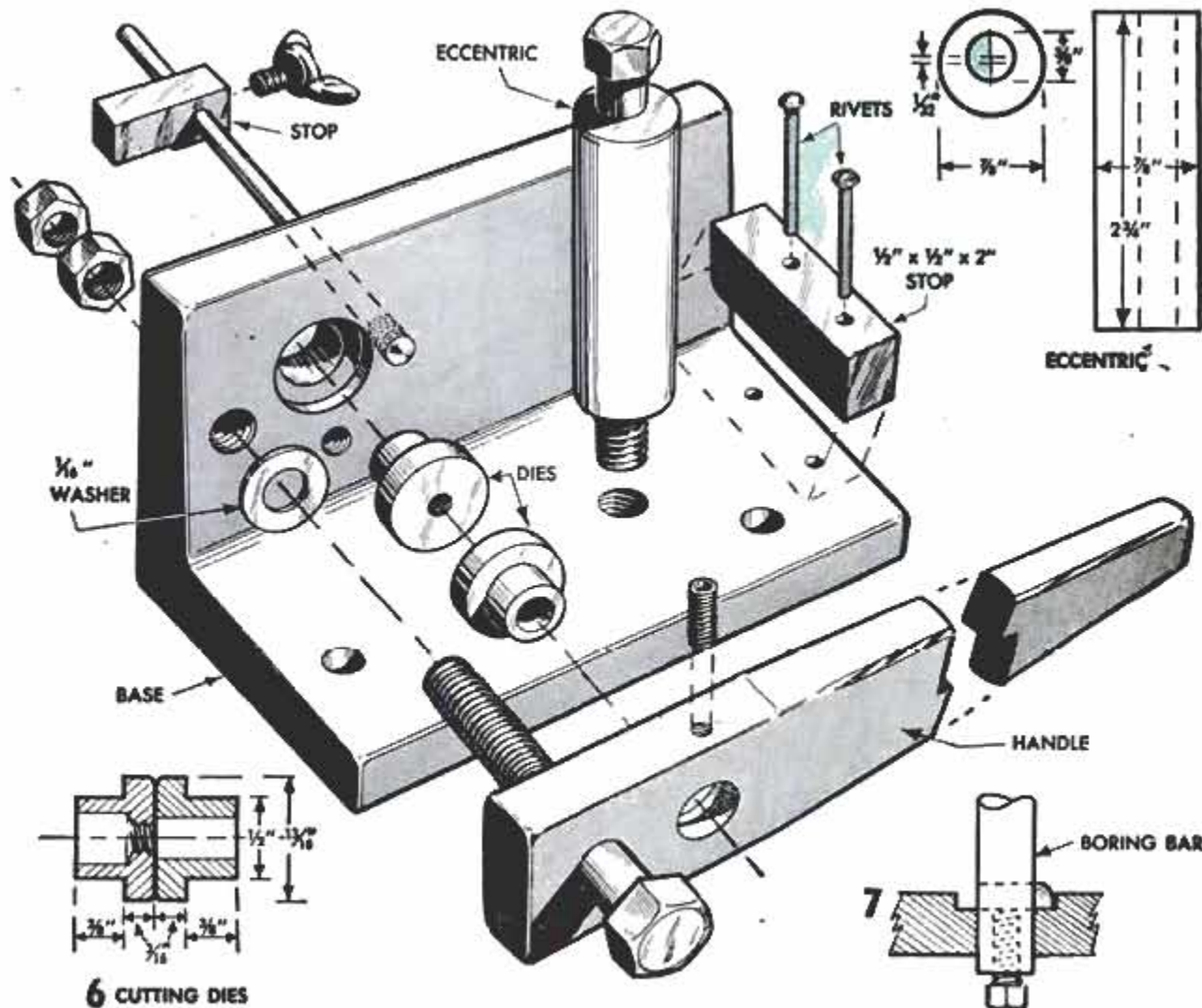
detail C. The diameter and location of these holes are, of course, optional.

The handle and one web of the base are drilled and counterbored to take the shouldered dies in a light push fit. Fig. 7 details one way of making the counterbores on a drill press, using a $\frac{1}{2}$ -in. boring bar and a fly cutter. As detailed, the cutter is mounted about $\frac{5}{8}$ in. from the end of the bar, thus permitting the end to serve as a pilot.

The dies are turned from tool steel, the faces being ground and polished after hardening. Only the dies made for cutting bolts and screws are tapped, of course. The rod and wire-cutting dies have straight holes, the holes in the fixed dies being only slightly larger than the diameter of the stock to be cut. It's a good idea to have an assortment of dies so the stock of varying sizes can be handled without the necessity of making up sets of dies for each job.

Note in the assembly view below that the lever guide is made in the form of an eccentric. This arrangement provides a means of maintaining the dies in sliding contact throughout the cutting stroke. The eccentric also provides an adjustment to compensate for wear. ★ ★ ★

By
Walter E.
Burton

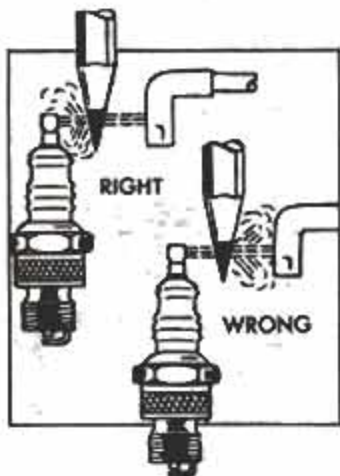


Farm-Built Broadcast Seeder Sows Grain and Grass Seed



At a tractor speed of 4 m.p.h. and a broadcast reach of 30 ft. or more, this seeding unit can really cover ground. That's what counts at seeding time. The specially built hopper has a capacity of 14 bu. A smaller hopper about 1 ft. square, centered in the larger hopper, holds grass seed which is sown along with the grain. Both are connected to the seeding unit which is adapted from the parts of an older type endgate seeder. The seeding unit is driven from the tractor-belt pulley by a crossed flat belt and a reduction of 5 to 1 is made by roller chain from the driven pulley to the gear-wheel shaft of the seeder. The entire unit is carried on channel-steel extensions bolted to the side members of the tractor frame. When grass seed is sown along with grain, make sure by test that the grass seeding unit is feeding the correct amount.

Check for Coil Polarity



Incorrect coil polarity can affect engine performance. Here's a quick check: With the engine running, hold a pencil point between a detached ignition cable and a spark plug as indicated. Details show correct and incorrect spark flare.

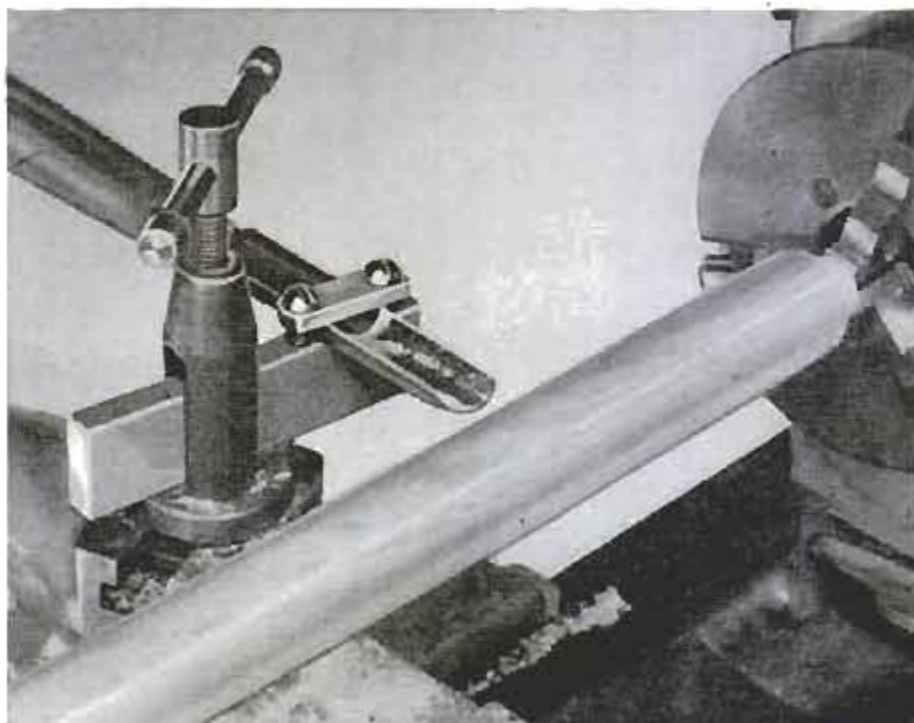
Magnetized Wrench Holds Screws



Starting socket screws in hard-to-reach places is easy when you use an Allen wrench that has been magnetized as shown in the photo at left. Do the same with a screwdriver, which makes it easy to pick up and start small steel screws.

Turn Hardwoods On Metal Lathe

Hardwood turnings, especially cylindrical and tapered forms, can be made very accurately on a metal lathe. You'll need a sharp gouge, a holder that fits in the tool post and wood-turning centers. Or, use the 3-jaw chuck as a live center as pictured. The holder, cut from a steel bar, is about 5 in. long and of a sectional size that will fit in the tool post. Holes are drilled and tapped in one edge to take screws holding the clamping piece.

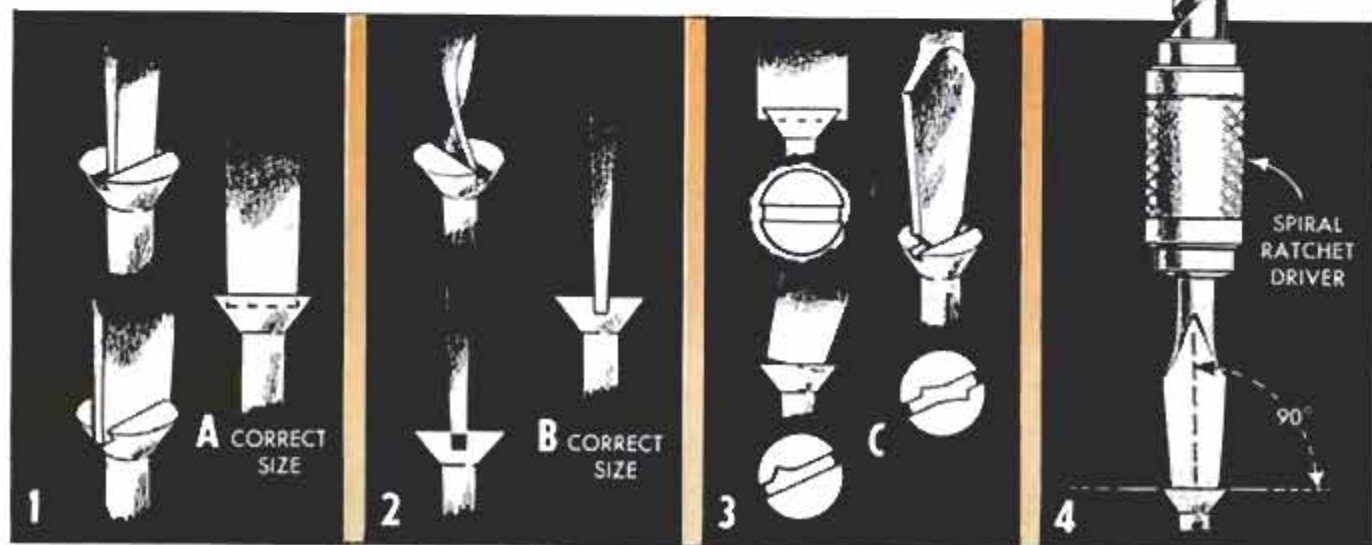


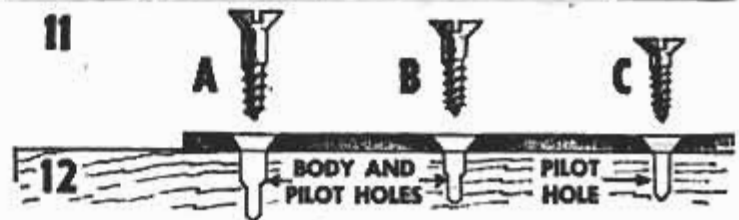
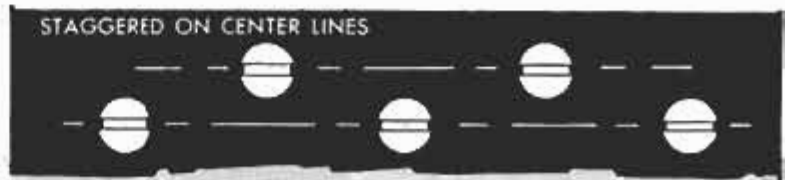
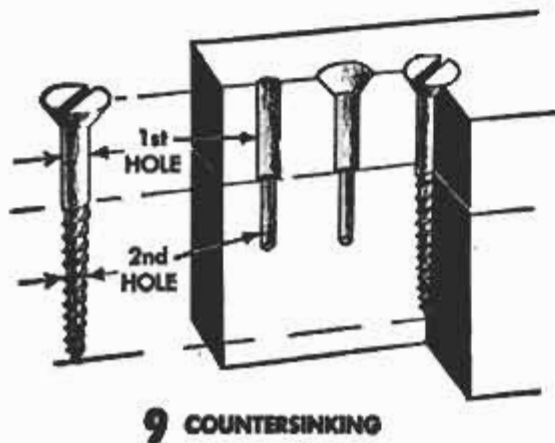
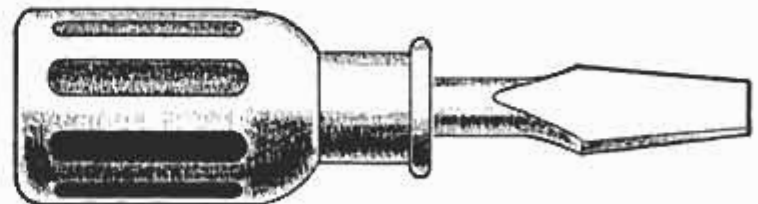
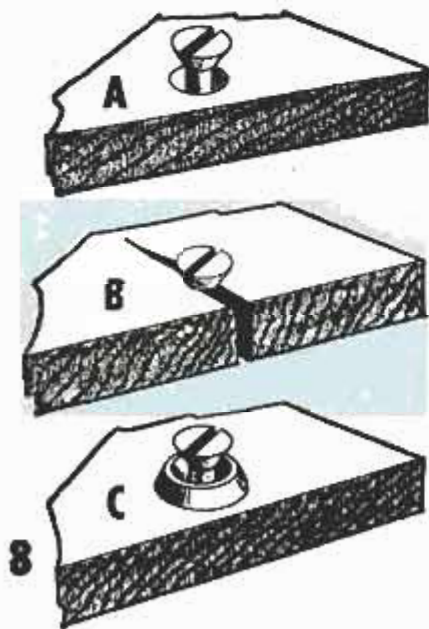
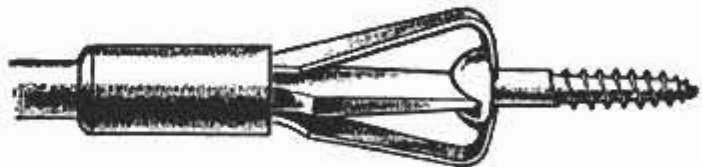
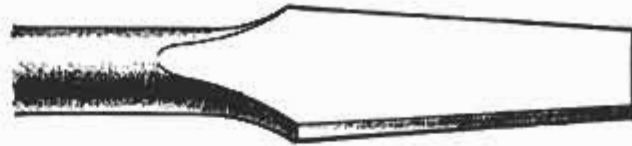
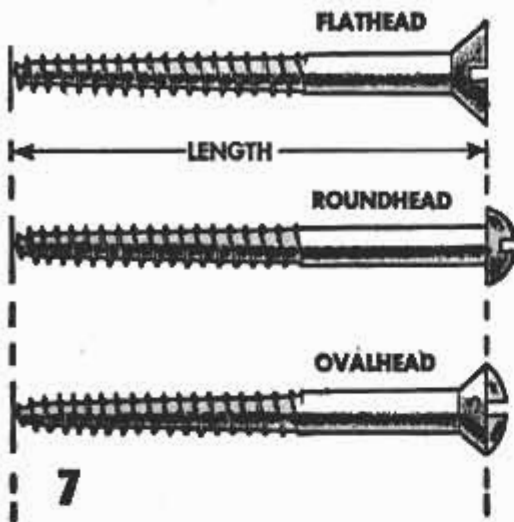
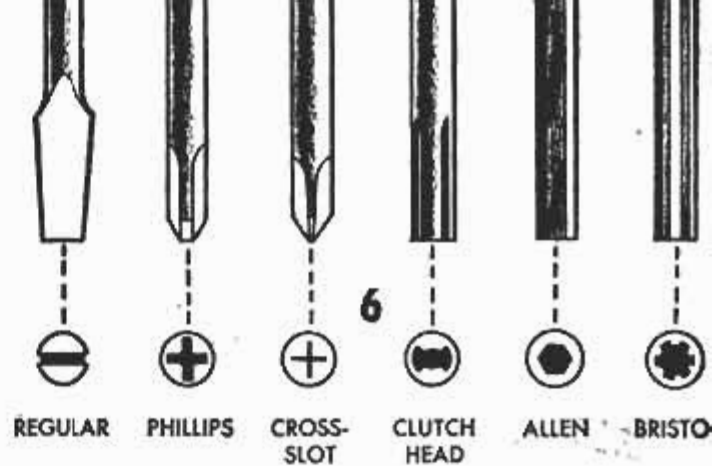
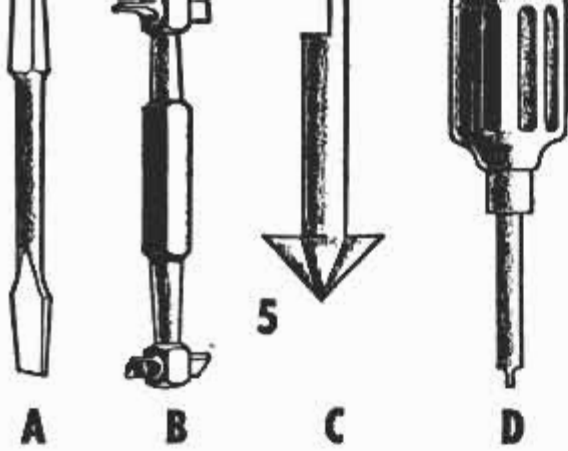
SCREWDRIVING CRAFTSMANSHIP

NEARLY ALL TYPES of craftwork in wood, in which parts must be assembled into a unit, call for the use of wood screws in some part of the construction. It's important to select the right screw and driver for the job to be done. Wood screws most commonly used are those of the regular type having a single slot, Figs. 6 and 18. The two most commonly used drivers are known as the wing and cabinet types, Fig. 10. All other types are simply variations of the basic types.

Figs. 1, 2 and 3 show the importance of selecting a driver having a bit of the correct width and thickness. In Fig. 1, detail A shows the proper width. In detail B, Fig. 2, the correct thickness is shown, and Fig. 3, detail C shows what happens to the screw slot if the blade is too narrow, or is tilted, or has damaged corners. Also, the upper details in Fig. 3 show how the surface of the work can be damaged if the screw is seated with a blade that is too wide. If the blade is too thin or too narrow for the job, you may twist it as in the upper detail, Fig. 2.

Wing-type drivers are preferred for driving flathead screws that seat flush with the surface. Cabinet-type drivers are used when driving screws into counterbored holes, and often when driving round and ovalhead screws, Fig. 7. Spiral ratchet drivers, Fig. 4, speed up the job of driving a great number of screws, as in boatbuilding. Much the same is true of the driver bit designed for use with a brace, detail A, Fig. 5. When space is limited, a ratchet driver of the type shown in detail B, Fig. 5, is used. The cabinet driver also is made in a very small size, detail D, Fig. 5.

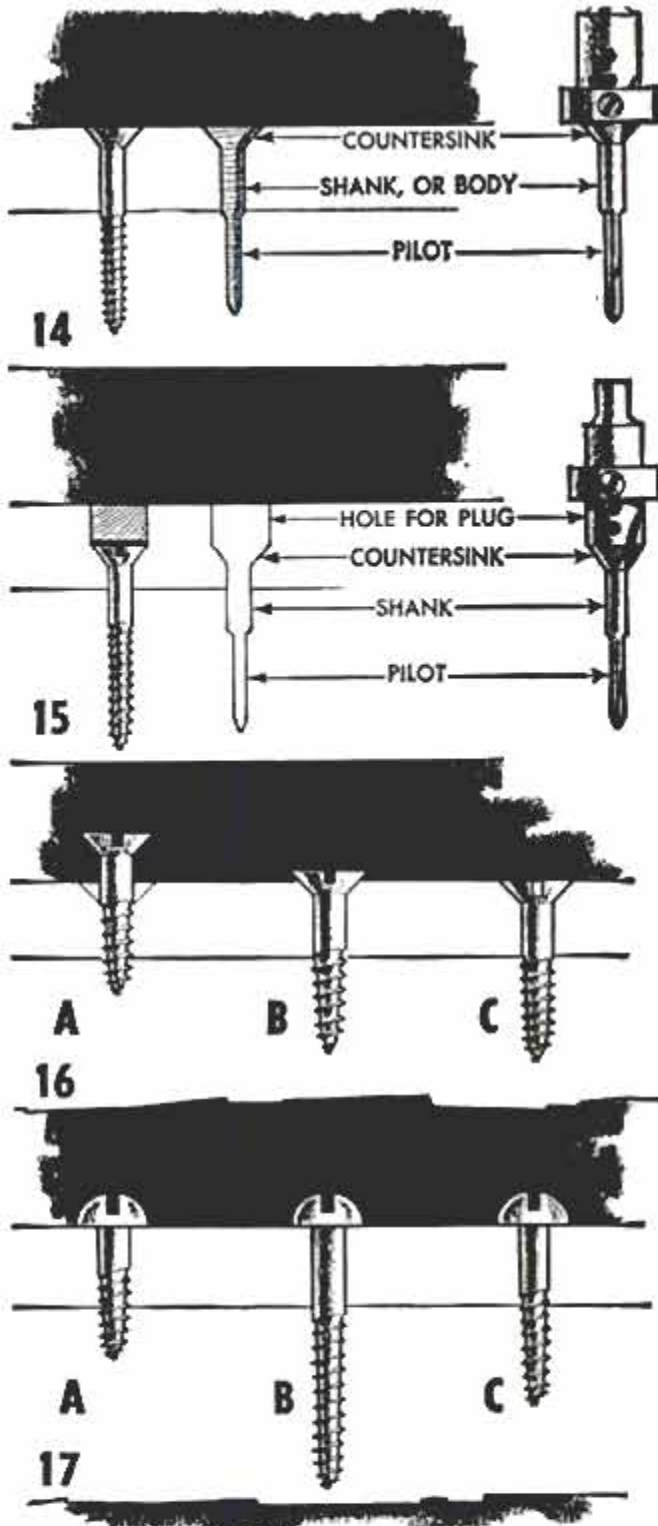




Flathead screws should be countersunk, detail A, Fig. 8, or run down on finishing washers, detail C. Driving a flathead screw without countersinking may result in splitting, detail B. Countersinking can be done with a rose countersink, Fig. 5, detail C, or with a combined countersink and drill, Figs. 14 and 15. The rose countersink is available in two types, one for use in spiral-ratchet drivers and some types of push drills, having a notched shank, Fig. 5. The other type has a squared shank for use in a bit brace. The combination unit drills the body hole and pilot hole and runs the countersink in one operation, Figs. 9, 14 and 15. By adjusting a stop on some types, the tool also will run down a counterbore for a wooden plug, Fig. 15. It is designed to be driven by a 1/4-in. portable drill. Each unit is marked with the number and length of the screw for which it is intended.

Good work calls for a screw of the proper type and length. In Fig. 16, details A, B and C, the screw in detail C is the correct length and is properly countersunk. In Fig. 17, details A, B and C, the longer screw, detail B, would normally be used for maximum strength in softwood. For hardwood the screw in detail C would be about right for average work. For fastening metal to wood, Figs. 12 and 13, screws A and B in Fig. 12 will give the greatest holding power and resistance to shearing strains if the body and pilot holes are drilled to the correct size. When the work requires that screws be driven in line near the edge of the stock on a spacing of 1 in. or less, it's best to stagger the line as in Fig. 11 to avoid any possibility of splitting the stock.

Fig. 18 shows representative sizes of wood screws which are numbered from 1 to 18 inclusive. The table gives the body diameter in inches and indicates the twist, drill size, also the auger bit number. * * *



NUMBER OF SCREW	1	2	3	4	5	6	7	8	9	10	12	14	16	18
BODY DIAMETER	3/64	3/32	3/16	1/8	5/32	3/16	1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8
TWIST-DRILL SIZE 1 (SEE FIG. 9) AUGER-BIT NUMBER	3/64	3/32	3/16	1/8	5/32	3/16	1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8
							3	3	3	3	4	4	5	5
TWIST-DRILL SIZE 2 (SEE FIG. 9) AUGER-BIT NUMBER		3/16	3/8	1/2	5/8	3/4	7/8	1	1	1	2	2	3	3
													3	3
														4

NOTE—SOME FRACTIONAL SIZES GIVEN ARE ONLY APPROX. ALL FRACTIONAL SIZES IN INCHES

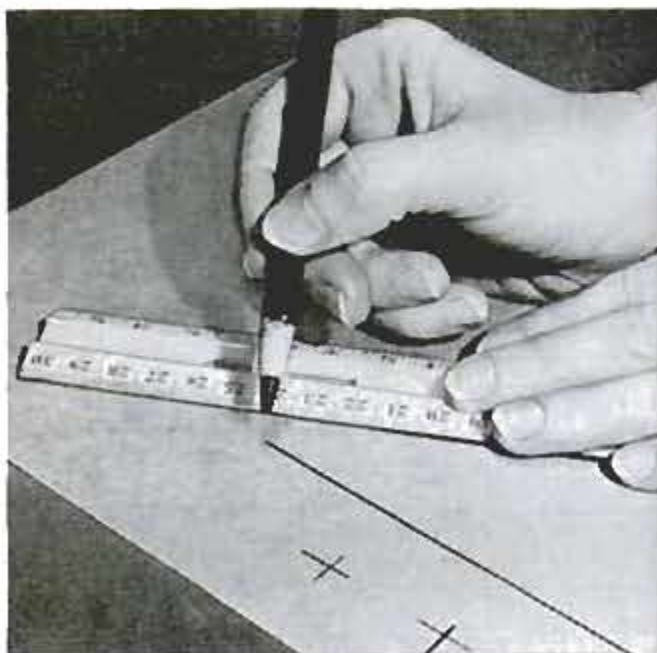
Dust Collector For Home Shop

Obsolete vacuum cleaners, usually available from dealers, provide a means of equipping home-shop machines with individual dust collectors. All you need are the motor, fan and housing, and the dustbag. With these parts at hand and in reasonably good condition, it usually is possible to devise a fitting, or adapter, for almost all the common shop machines. On many old cleaners the fan housing comes with a flange to which a simple adapter, such as a piece of plywood or sheet metal, can be attached. This usually can be bolted or screwed to some part of the machine in a position to permit the cleaner fan to operate.



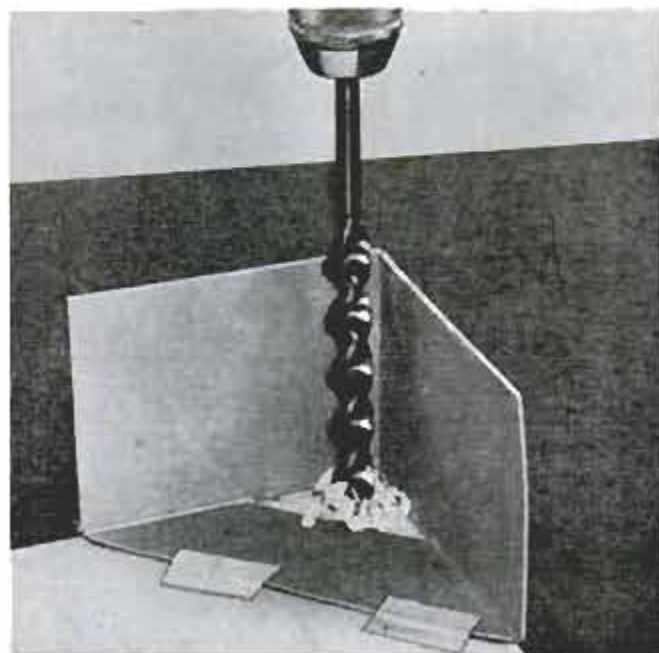
China-Marking Pencil Doubles as Ruling Pen

When you need a drawing that will withstand shop handling without becoming illegible, draw the outlines with a china-marking pencil rather than a lead pencil. By sharpening the "lead" of the marking pencil frequently you can do almost as accurate work as with a ruling pen and you will save the time of inking, which is a factor to be considered when time is limited.



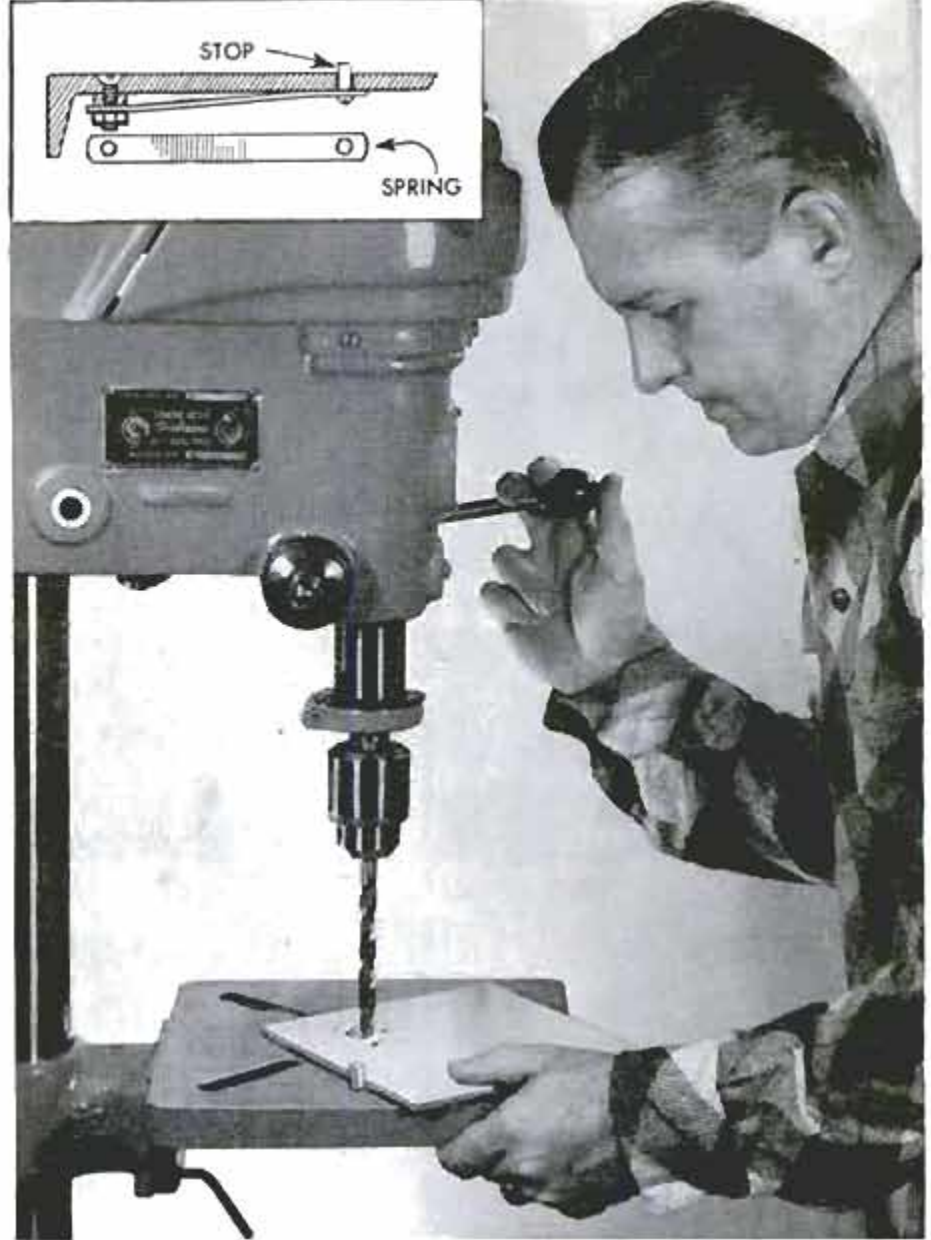
Bore Holes Straight With This Bit Guide

Even highly skilled craftsmen look upon the boring of a hole perpendicular to the surface of the work with some misgiving. In guiding the bit by eye alone, a true hole is largely a matter of luck. Cut a corner from a shoebox, cut away the bottom at the corner as indicated and attach to the work with tape. This gives you a two-way guide for holding the bit true.



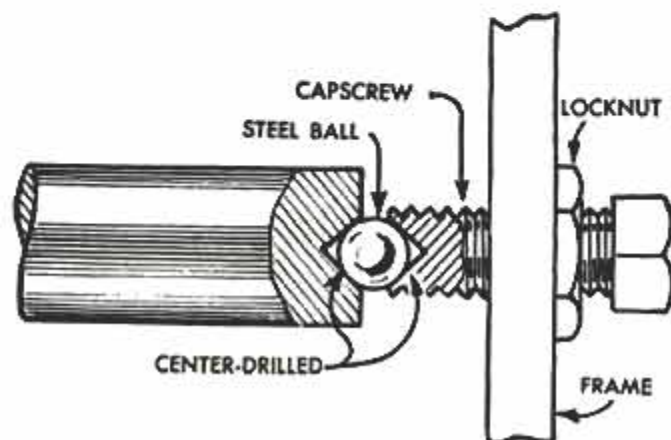
Built-In Stop Saves Fingers

If you've ever had a drill bit seize suddenly, causing the work to spin with the bit, you can fully appreciate the convenience and safety of this spring-actuated stop. The stop not only steadies the work when drilling, it can prevent a painful injury to the fingers of the hand holding the work. The stop pin is $\frac{1}{4}$ in. in dia. and it projects about $\frac{1}{4}$ in. above the table when in working position. One end is drilled and tapped for a 10-32 screw by means of which it is attached to a flat spring. The spring is attached to the underside of the drill-press table with a stove bolt and spacer. Drill a $\frac{3}{16}$ -in. hole about $2\frac{1}{2}$ in. to the left of the center hole in the table to take the stop pin. Location of the hole for the stovebolt, also length of the spring, are determined by the size of the table and position of the slots.



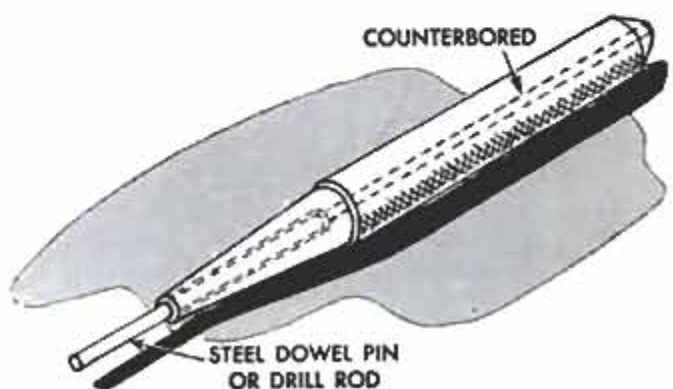
Ball Thrust Bearing For Slow-Speed Shaft

Experimental models, mockups of machine assemblies and temporary fabrications for display purposes often require special bearings that permit close adjustment and easy assembly. One simple bearing which served these purposes is detailed below. It will take both end and side thrust, can be adjusted to eliminate end play and is quickly assembled and disassembled.

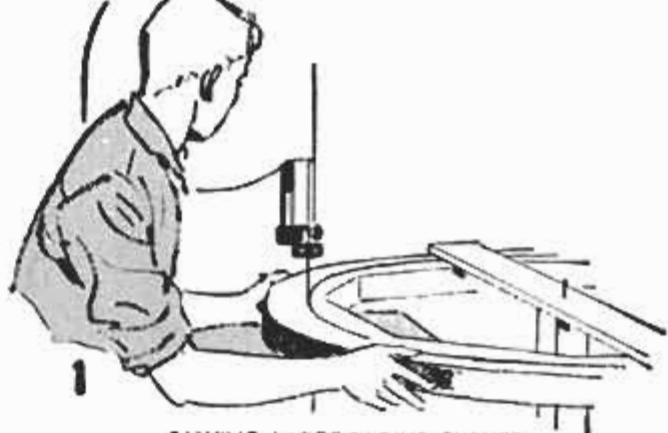


Discarded Nail Set Makes Tiny Pin Punch

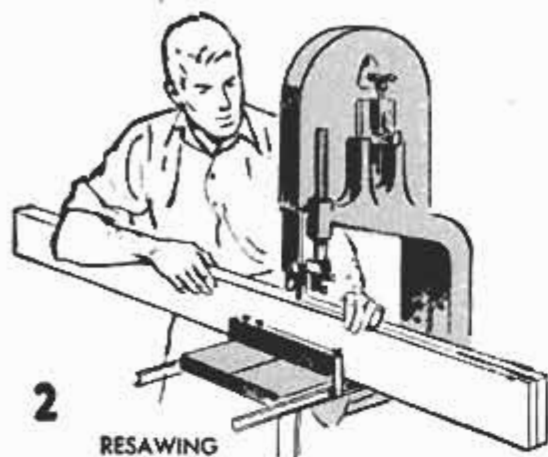
Shanks of broken or damaged nail sets and center punches are utilized to make useful pin punches in small sizes. First, the part is annealed so that it can be drilled to take a steel dowel or a length of drill rod of the required diameter. The dowel or drill rod should be a press-fit in the hole. The detail shows the shank counterbored but this is not essential.



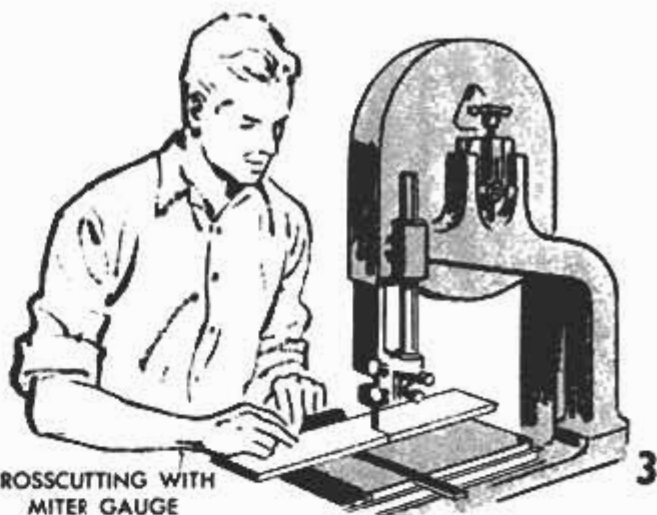
POPULAR MECHANICS SHOWCASE OF TOOLS



SAWING LARGE-RADIUS CURVES



RESAWING



CROSSCUTTING WITH
MITER GAUGE

BANDSAWS FOR YOUR WORKSHOP

By E. R. Haan

NEXT TO THE CIRCULAR SAW and drill press, a bandsaw rates third in importance in the average home shop, school shop or custom woodworking shop. Fitted with the correct blade a bandsaw will cut almost anything. Most of the smaller machines will cut materials up to 6 in. or more in thickness. Using an endless blade the cut can be made only from the edges of the material, but internal cuts started from a hole drilled in the waste can be made with machines fitted with electric blade-welding equipment. Figs. 1 to 6 show various common operations that illustrate the cutting capacity of small bandsaws.

A two-wheeled bandsaw is a simple, durable machine, its principal parts being arranged as in Fig. 7. Some late-model bandsaws in the smaller sizes have a welded steel frame, rather than the cast-iron frame shown in Fig. 7. Some small bandsaws are made with three wheels, Fig. 8, a wheel arrangement that provides greater capacity with less height. Also, on some of the smaller machines the motor is directly connected to the lower wheel spindle, eliminating a belt drive. Others, having a belt drive, are fitted with a gear-reduction

unit giving a wide range of wheel speeds for wood and metal cutting.

On all two-wheeled machines the upper, or idler, wheel can be adjusted for proper blade tension and also tilted to track the blade, Fig. 13. In Fig. 13 the upper wheel is purposely shown without the guard. The table is slotted to the center to permit removal and replacement of blades. Some small machines have the tables grooved for a miter gauge. The table is mounted on trunnions so that it can be tilted for sawing bevels, Fig. 5. The usual range of tilt is 45 deg. forward and 10 to 15 deg. in the opposite direction. There also are machines made with stationary tables and pivoted frames which permit frame, wheels and blade to tilt while the table remains level.

The diameter of the band wheels indicates the size of the machine, just as the swing of a lathe determines its size. As an example, a bandsaw with 14-in. wheels is referred to as a 14-in. bandsaw. Also, the table size usually is quite closely related to the wheel diameter, that is, a 14-in. bandsaw generally has a table approximately 14 in. square.

A 12-in. bandsaw normally requires a

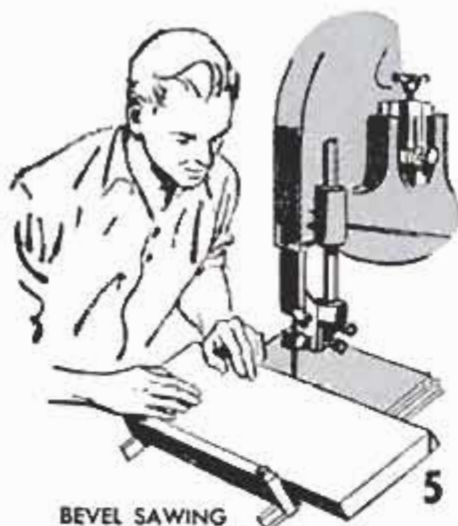
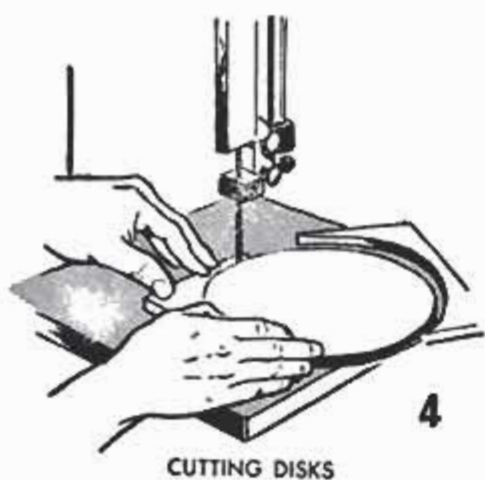
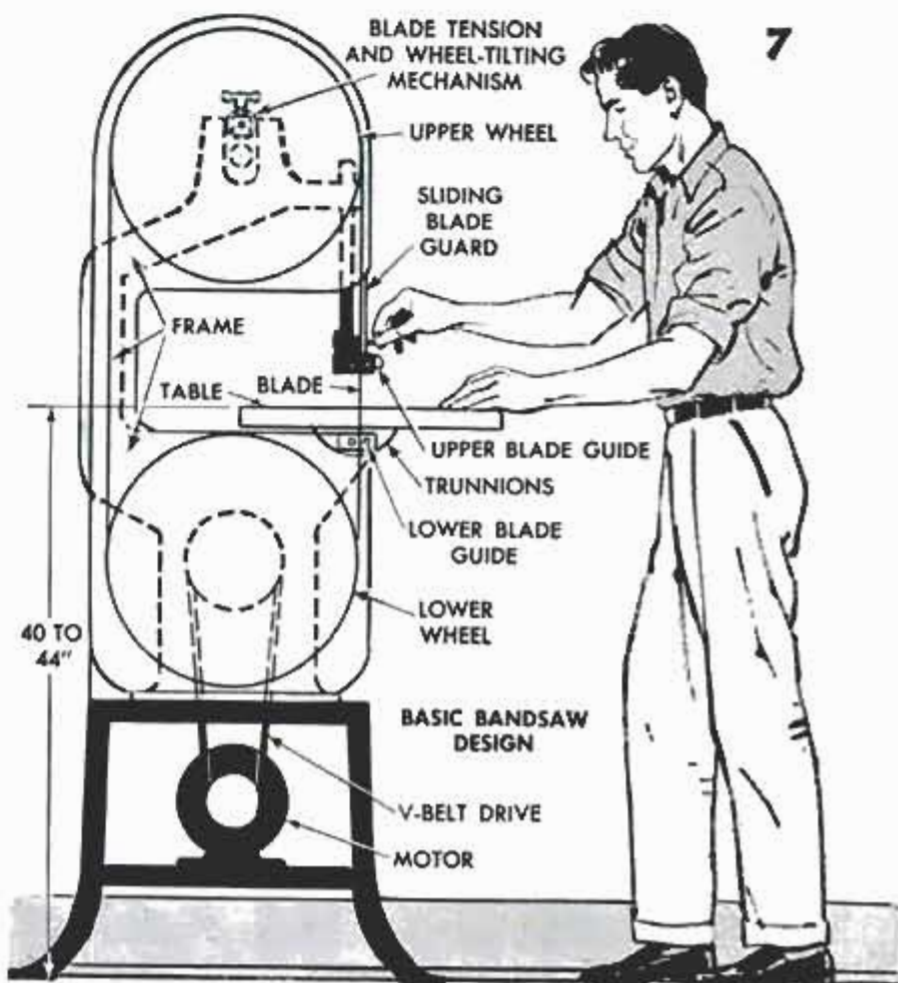


Photo courtesy Delta Power Tool Div., Rockwell Mfg. Co.

IN 12 TO 18-IN. SIZES

$\frac{1}{8}$ -hp., 1725-r.p.m. motor for average work. A 14-in. machine is generally supplied with a $\frac{1}{2}$ -hp. motor. Pulleys recommended for woodcutting bandsaws in the smaller sizes usually give a wheel speed of about 600 r.p.m. On a 14-in. machine this gives a blade speed of about 2200 feet per minute (f.p.m.). Bandsaws designed for woodcutting can be fitted with metal-cutting blades and a simple countershaft arrangement as in Fig. 9 to reduce blade speed to 250 f.p.m., or less.

Small bandsaws are designed for blades ranging from $\frac{1}{8}$ to $\frac{3}{4}$ in. in width. The width of the blade determines the minimum cutting radius it will take without binding and heating, Fig. 10. Spring-tempered blades, Fig. 11, can be resharpened with a file, but



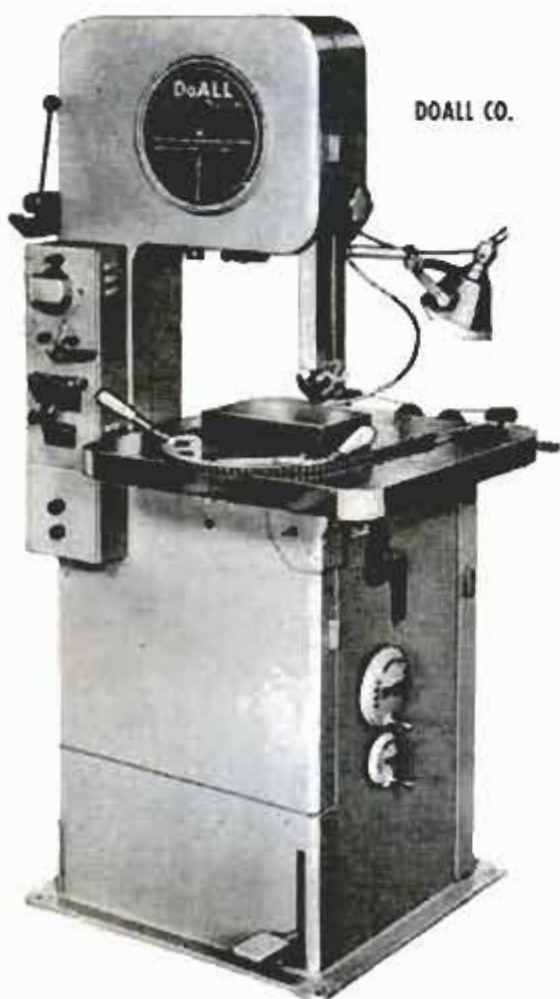


BOICE-CRANE CO.

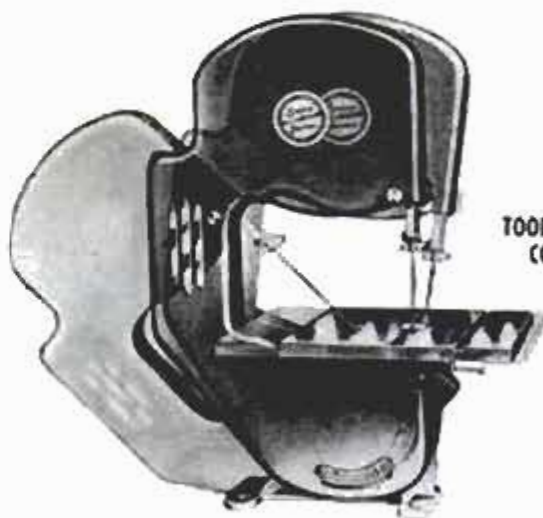


SEARS, ROEBUCK & CO.

DELTA POWER TOOL DIV.
ROCKWELL MFG. CO.



DOALL CO.

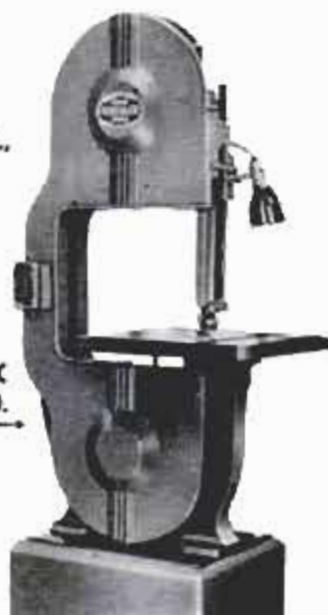


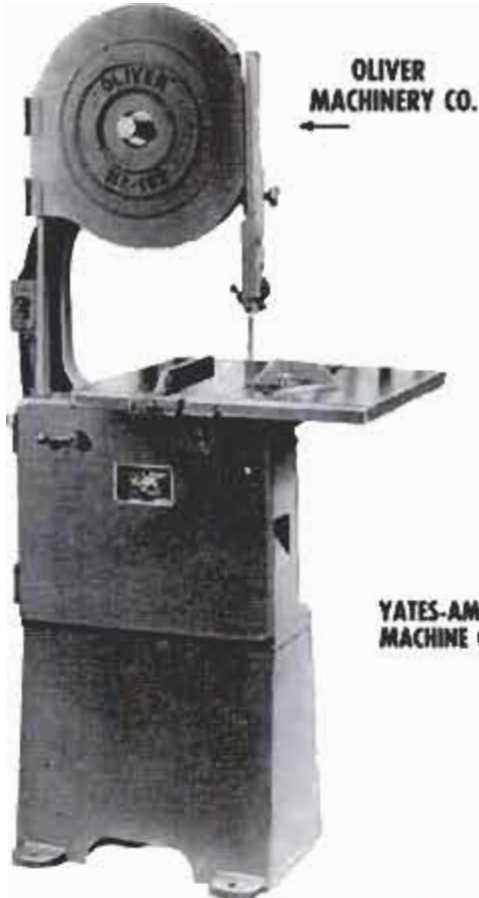
TOOLCRAFT
CORP.



SPRUNGER BROS.,
INC.

POWERMATIC
MACHINE CO.





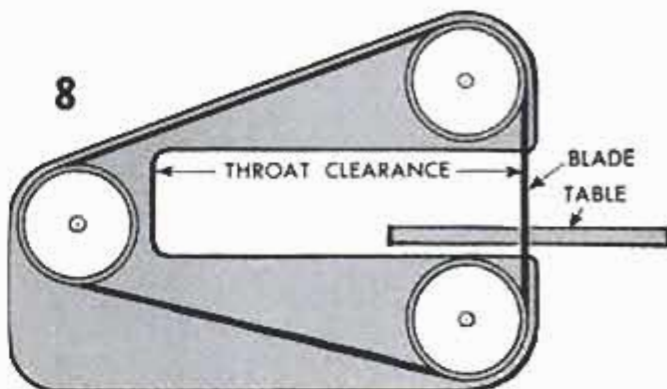
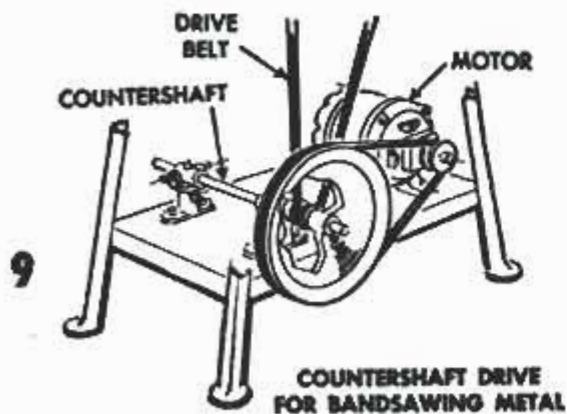
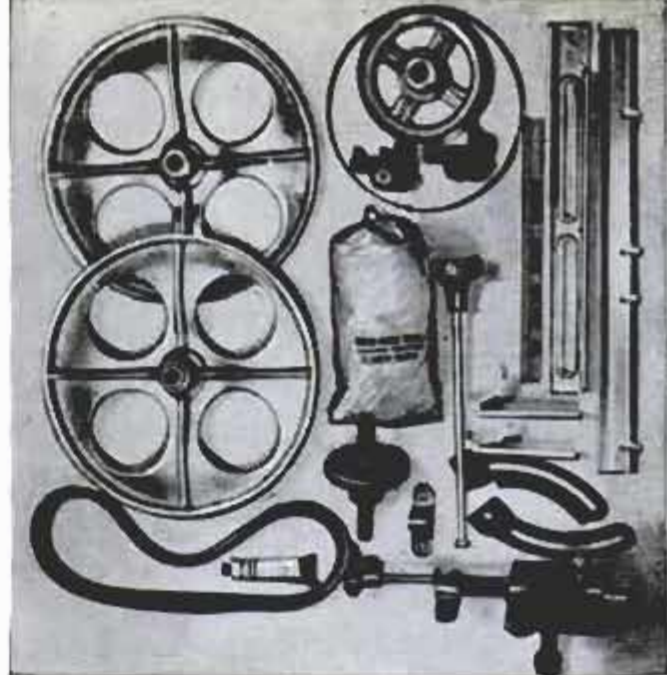
GENERAL SPECIFICATIONS OF BANDSAWS SHOWN (All dimensions in inches)

Trade Names, Manufacturers and Catalogue Number	Size	Throat Cap.	Max. Depth of Cut	Table Size	Table Tilt	Blade Speed (f.p.m.)	Blade Length	Over-All Size		
								Width or Depth	Length	Height
Atlas Press Co. 912	12	12	6-1/4	14 x 14	45 R.	2052	83	14	22-1/4	35-9/16 less stand
Boice-Crane Co. 2300	14	13-1/2	2-3/4	15 x 15-1/2	45 R. 10 L.	92 to 4100	98	27	29	67 on stand
"Craftsman" 1042B Sears Roebuck & Co.	12	12	6	12-1/2 x 14-3/16	45 R.	2165	80	14-3/16	22-7/8	37 less stand
"Darra-James" 512 Toolkraft Corp.	12	12-1/4 to 15-3/8	8	10 x 11	Body tilts					
"Delta" 28-100 Rockwell Mfg. Co.	10	9-5/8	6-1/4		45 R.	2400	71-3/4	10-5/8	18-1/4	32-3/4 less stand
DoAll Co. 16M	16	15-1/4	12	24 x 24	45 R. 10 L.	50 to 5200	122	13-1/2	21-3/4	34-3/8 less stand
Duro Metal Products Co. K-3021	12	12	5-1/8	13 x 13	45 R.					35 less stand
Gilliom Power Tools 471-A	12	12-1/4	6	18 x 18	45 R.	1800	78			
Oliver Machinery Co. 192	18	17-3/4	10	20 x 23-1/2	45 R.	264 & 8500	114			
Powermatic Machine Co. 140	14	13-3/4	7-1/2	16 x 16	45 R. 10 L.	3000	99-1/2	23	33	48 less stand
"Pow-Kraft" 2325 Montgomery Ward Co.	9	9	4	10 x 10	45 R.		60	16	20	68-1/2 on stand
Sprunger Bros. Inc.	14	14	6-1/2	14 x 14	45 R.	2600	94	14	25	42 less stand
"Walker-Turner" 3210 Rockwell Mfg. Co.	14	14	7	16 x 16	45 R. 10 L.	180 to 4550	96-5/8	23-3/4	28-1/2	69-1/2 on stand
Yates-American Machine Co. J-114	14	13-3/4	6-1/2	14 x 14	45 R. 10 L.	3850	91			

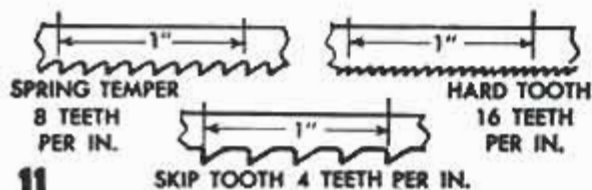
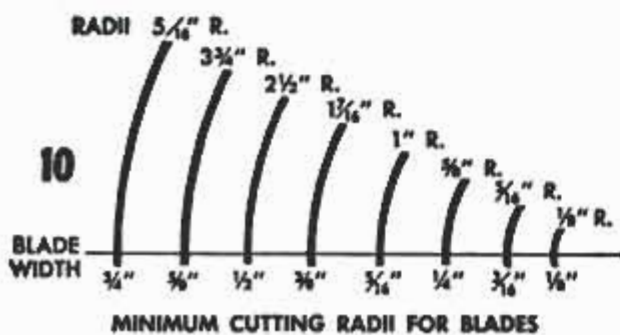


**GILLIOM
POWER
TOOLS**

Bandsaw is supplied as parts kit, right. Frame, guards, table, are made from plywood by purchaser of the kit



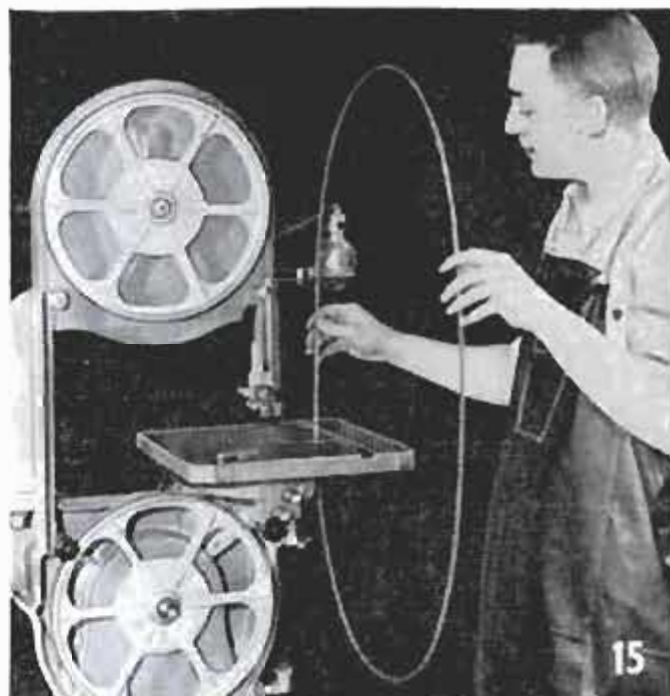
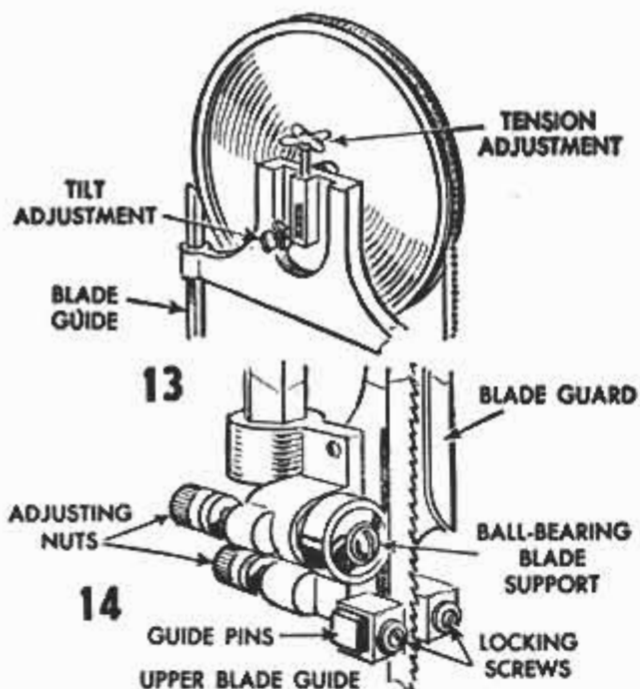
THREE-WHEELED BANDSAW GIVES GREATER THROAT CLEARANCE IN PROPORTION TO HEIGHT



the hard-tooth, flexible-back blade is a disposable type which is discarded when the teeth are dulled by long use. The skip-tooth blade, Fig. 11, is also a hard-tooth blade. It generally is used for cutting wood, plastic, fiber and soft metals. For cutting the harder metals hard-tooth blades having 8 to 24 teeth per inch generally are used.

There are three different types of tooth-set, known as alternate, raker and wave, Fig. 12. In the first, alternate teeth are set in opposite directions. In the raker set, one tooth, the raker tooth, is unset between pairs of teeth set in opposite directions. In the wave set alternate groups of teeth are set in opposite directions. Spring-temper blades generally are supplied with alternately set teeth, suitable for woodcutting. The other two types are metal-cutting blades.

To install a new blade, or change blades on a bandsaw, open or remove the wheel guards as in Fig. 15. If changing blades, or replacing a blade with one of the same width and tooth type, leave the blade guides, Fig. 14, set just as they were, both above and below the table. Release the tension so that the blade can be removed



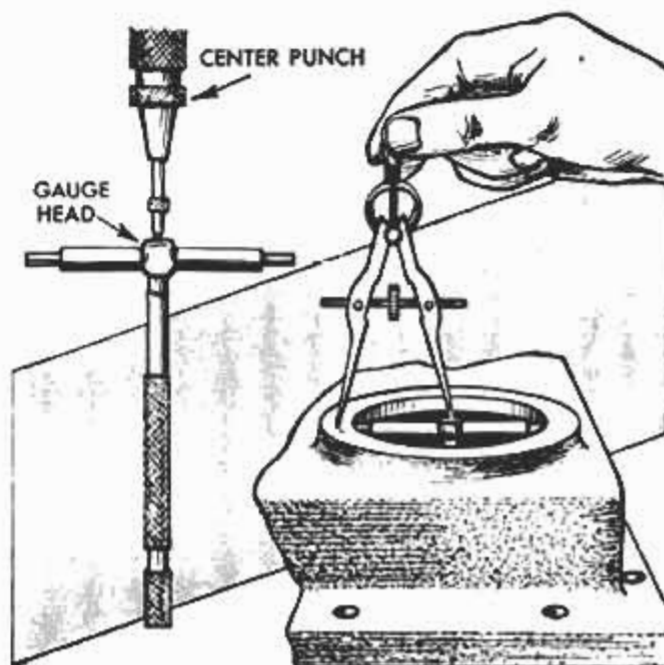
from the wheels. Remove the alignment pin to clear the blade slot. Place the new blade on the wheels and tighten the tension screw just enough to take out the slack. Then turn the wheels slowly by hand, making sure that the blade enters the guides. If the blade runs off center tilt the upper wheel to center it. Then bring it to operating tension and note the position of the back of the blade in relation to the roller supports, Fig. 14. Some small bandsaws are fitted with backing pins instead of rollers but the requirements for blade position are the same. With the blade moving slowly (the wheels being turned by hand) the rollers above and below the table should clear the back of the blade about $\frac{1}{64}$ in. Now start the motor and check both rollers. They should not rotate when the blade is running idle under power. If the machine is equipped with backing pins, the

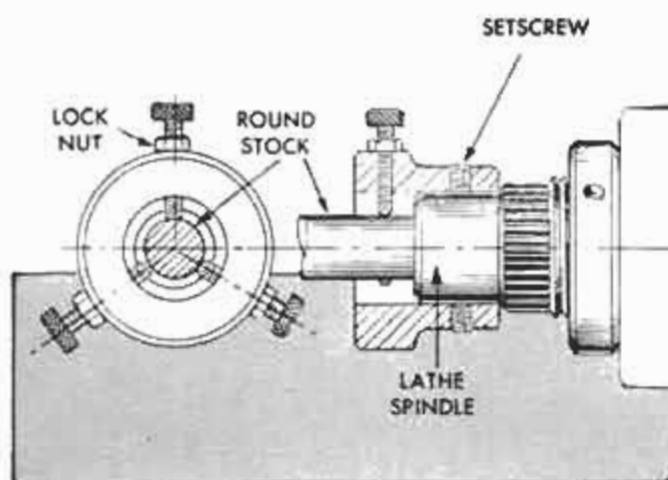
back of the blade should clear each pin by about $\frac{1}{64}$ in.

Next, check the guide pins, Fig. 14. These should be spaced to clear the blade by approximately the thickness of a single sheet of newspaper. The gullets between the teeth should be flush with the outer edges of the pins when the latter are correctly set both for clearance and for position with reference to the blade. If a blade is simply replaced by another of the same width and tooth characteristics and the new blade is correctly tracked it is not likely that the pins and rollers will need resetting but, of course, the setting should be checked. After the blade has been correctly aligned replace the table insert and alignment pin. When a bandsaw must stand idle for long intervals it is a good idea to reduce the blade tension well below that normally indicated for operation. ★ ★ ★

Hole Gauge Serves as Locator For Centering Dividers

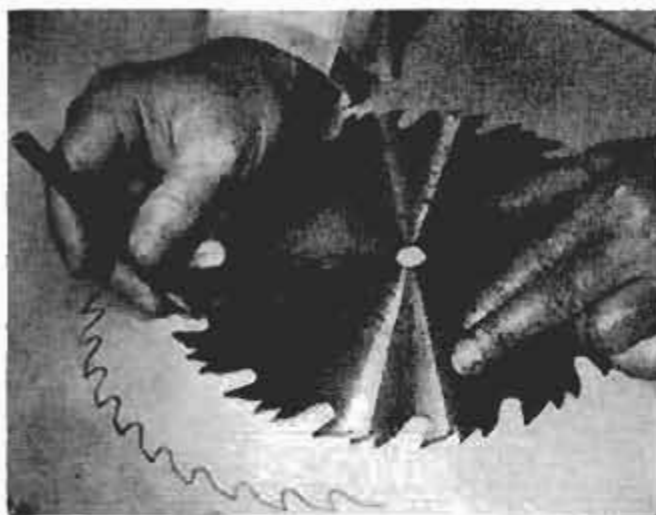
There are times when remembering a simple kink can save hours on the job. Here's an instance where a quick improvisation did the trick. The work required that the machined rim of a hollow boss be scribed concentrically. At hand were a center punch, a telescoping gauge and a pair of dividers. A light punch mark was centered on the head of the gauge which was then centered in the opening to provide support for one leg of the dividers. Then the machined surface of the boss was coated with a marking fluid, the dividers placed in position and the required line scribed on the work as a center line for locating a row of holes.—Bruce D. Stewart, Winder, Ga.





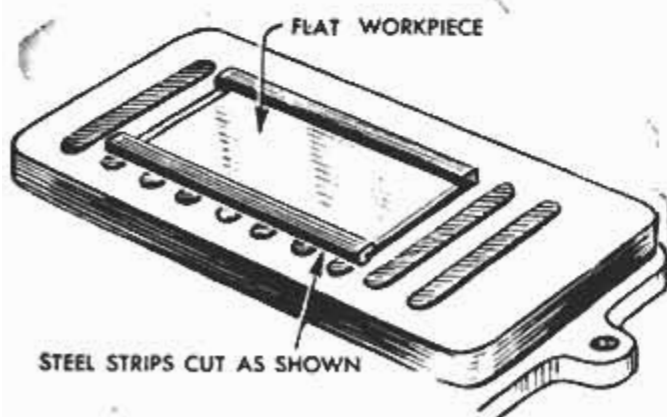
Chuck Centers Long Rods In Lathe Spindle

Machinists in a small shop developed this support, or chuck, for centering long rods at the left end of the lathe spindle. The chuck not only prevents wear of the spindle bore, it also eliminates the annoying whip and clatter of the rod as it rotates. As will be seen from the detail, the chuck body is bored to a slip-fit over the projecting end of the spindle and is fitted with three knurled thumbscrews spaced equidistantly and provided with locknuts.



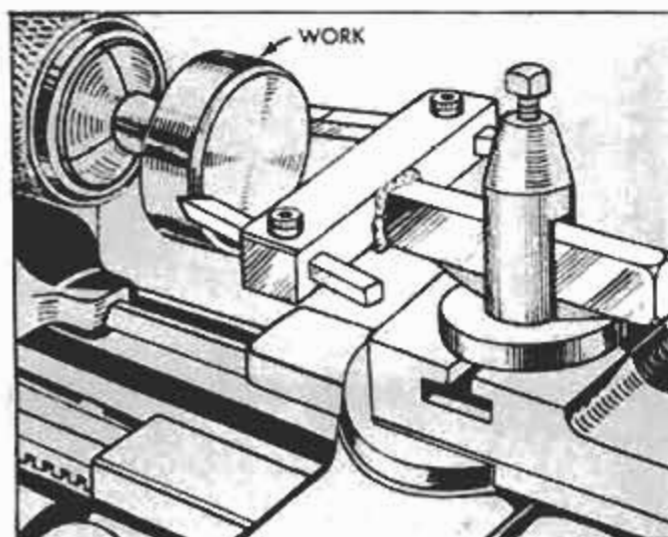
Recording Saw-Tooth Profiles Is Aid in Sharpening

Holding saw teeth to the original shape when filing is no simple trick unless you provide yourself with something to go by. This is especially true of the newer tooth shapes and those combination blades having cutting teeth and rakers spaced by deep gullets. One simple way of preserving the original profiles of the teeth is to lay the new blade on a sheet of heavy white paper and trace the profiles with a pencil having the lead sharpened to a point. Keep handy for reference when filing the blades.



Holding Nonferrous Metals On Magnetic Chuck

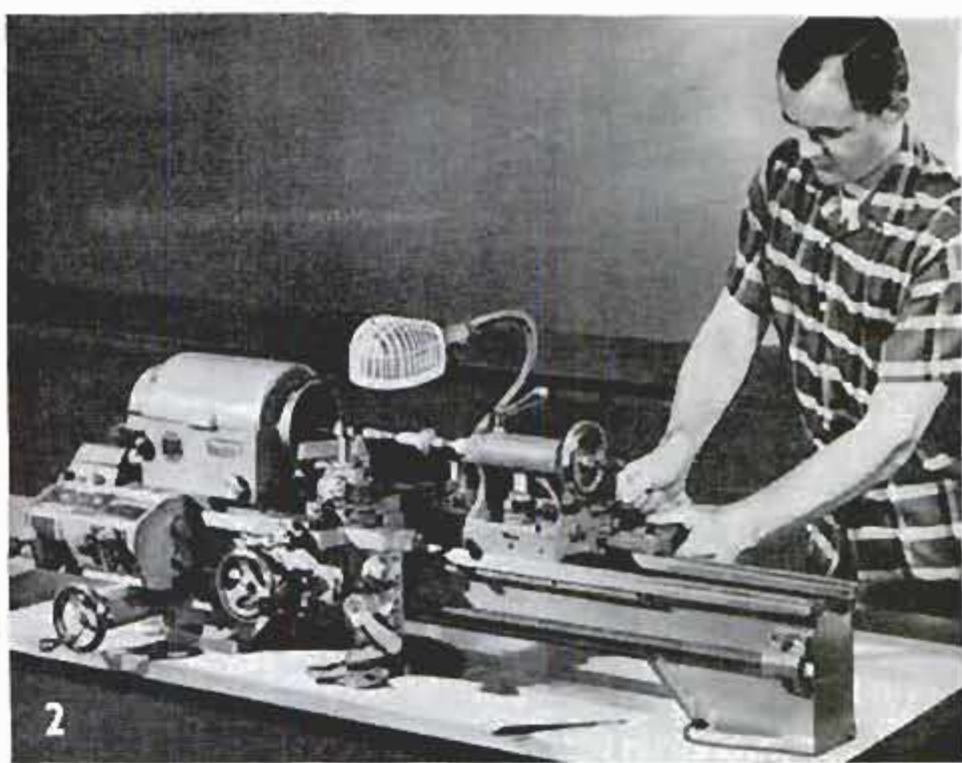
Good shop men usually can come up with a solution for almost any problem posed by a custom job. Here's an example. The job called for V-grooving a number of flats of a nonferrous alloy. No vise large enough to hold the workpieces was available so rabbets were milled on two pieces of tool steel, the depth of the rabbets being made about .005 less than the thickness of the workpieces. These strips served as holders for each workpiece on a magnetic chuck.



Dual Chamfering Cuts Speed Production

This chamfering tool cuts two ways, speeds the job of chamfering, or breaking, corners on duplicate workpieces. Movement of the lathe carriage is reduced to one short stroke. The tool also can be altered to make simultaneous cuts on two corners, as on a shouldered workpiece. It consists of a T-shaped holder designed to fit in the tool post. Holes are drilled at a 15-deg. angle through the crossbar of the tee and then broached to take $\frac{1}{4}$ or $\frac{3}{8}$ -in.-square cutting tools.

Frank L. Rush, Columbus, Ohio.



SHOPPING FOR TOOLS

1. DRYWALL HAMMER is especially made for the purpose. Head is shaped to permit driving nail close to ceiling board. Scored face of poll is designed to make a dimple of the correct depth without breaking facing paper or cracking off edge of board. Cushion grip of nylon won't loosen or wear out

Estwing Mfg. Co., Rockford, Ill.

2. METAL-CUTTING LATHE swings 10 in. over bed and is equipped with variable-speed drive that can be preset for high and low speed limits in direct or gear drive. Spindle speed range is from 50 to 1500 r.p.m. Collet capacity is $\frac{3}{4}$ in. Hole through spindle is $\frac{13}{16}$ in. in dia. Has ball-bearing spindle

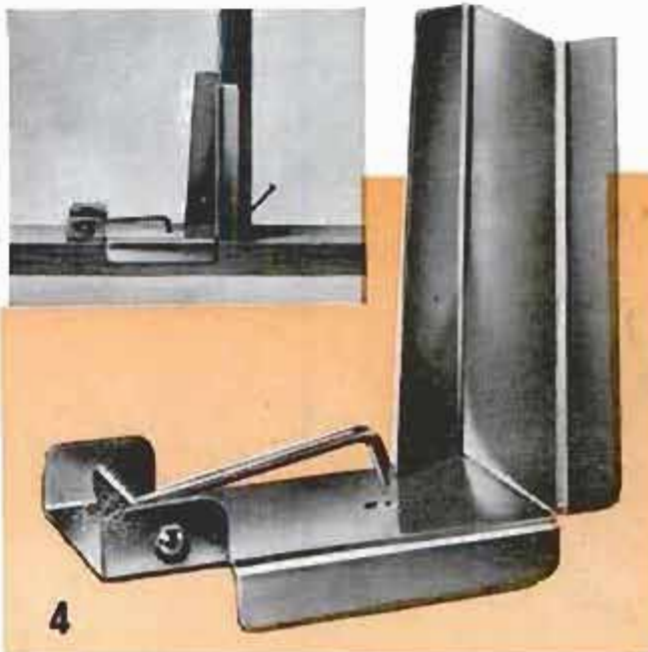
Delta Power Tool Div., Rockwell Mfg. Co.,
452 N. Lexington Ave., Pittsburgh 8, Pa.

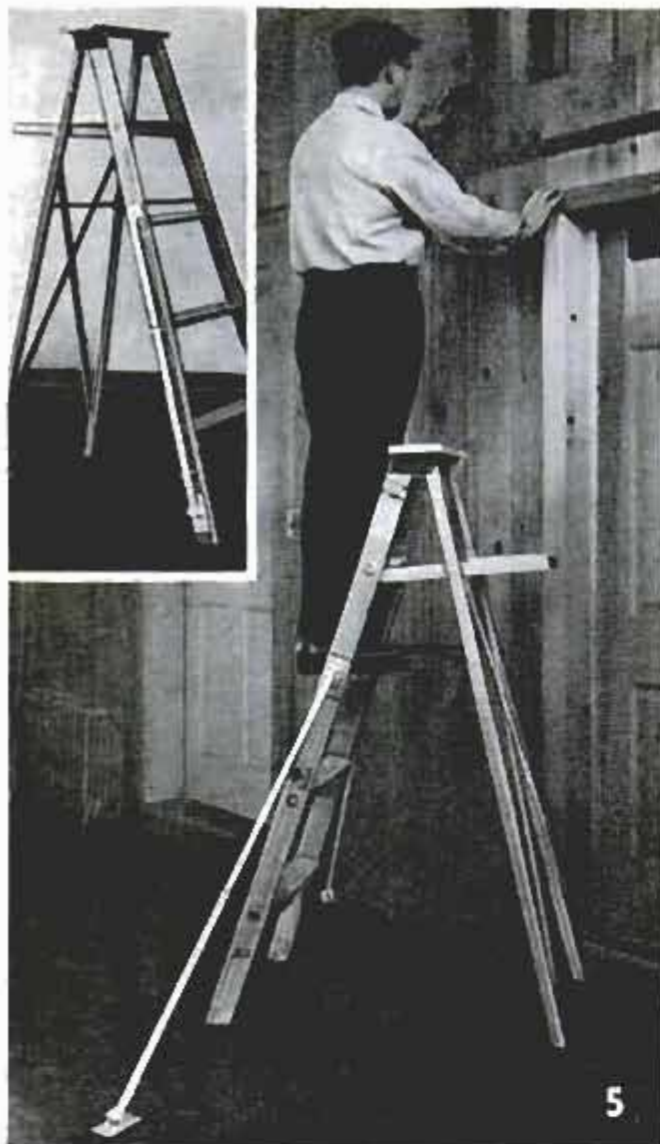
3. REVERSING TRANSMISSION weighs only 7 lb., has one forward, one reverse speed and neutral. Unit is regularly furnished with shift lever and an 8-tooth roller-chain sprocket. Designed for use with engines up to $5\frac{1}{2}$ hp. Suited to riding lawn-mower drives and other small vehicles requiring 2 $\frac{3}{8}$:1 ratio

V. B. Foote Foundry Co., P. O. Box 2214,
Flt. Dearborn Station, Dearborn, Mich.

4. STUD LOCATOR, or jig, simplifies setting and nailing of studding on 16-in. centers. Made of heavy-gauge steel, jig positions individual stud on sole plate and holds it securely as end is toenailed in place. The base of the jig serves as a spacer; twice its length centers the stud 16 in. from the preceding one

James & Edwards, Inc., Floral Park, N. Y.

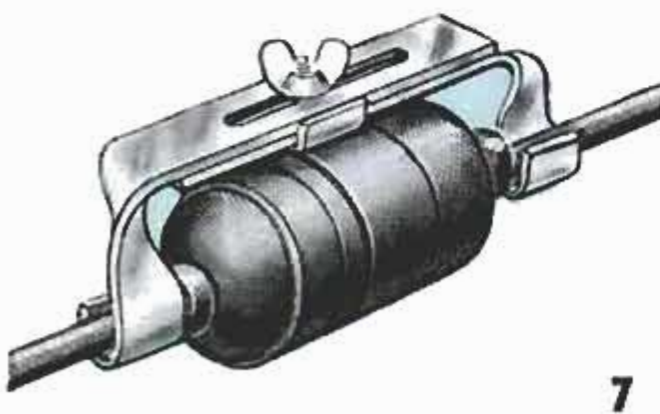




5. LADDER BRACE fits ladders having flat side rails. Telescoping braces prevent the ladder from tipping, even when it must be placed on a sloping grade. Base plates of braces have deeply corrugated rubber pads that won't slip, even on smooth surfaces.
Robbie Durrell, Inc., 278 E. State St., Westport, Conn.

6. CIRCULAR SLIDE RULE is pocket-size, does simple mathematical calculations accurately. Handy for engineers, builders and others who must make rapid and accurate calculations in the field. Complete easy-to-follow instructions supplied with each rule
General Industrial Co., 57-18 Elston Ave., Chicago 30

7. CLAMP prevents heavy extension-cord connections from pulling apart when in use. Prevents power interruptions and damage to cord and plug. Widely used by builders and others who must operate portable electric tools at a distance from power source
Drumcliff Co., Towson 4, Md.



8. PLANE ATTACHMENT for router motor makes high-speed power plane for planing doors and window sash to size. Planes up to 2 in. wide and 3/32 in. deep at one pass. Fence is adjustable to 45 deg. for bevel cuts. Cutter and arbor are standard equipment
Black & Decker Mfg. Co., Towson 4, Md.

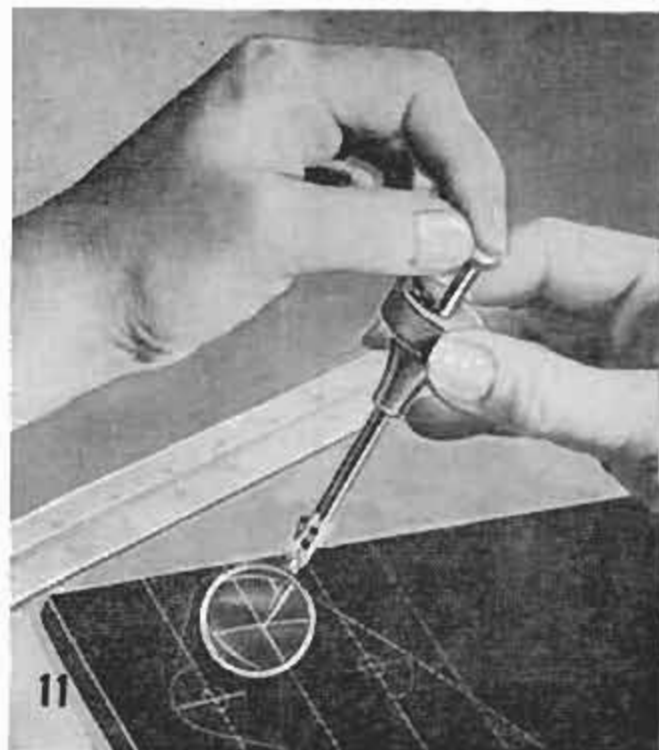
9. SWINGING TOOL TRAY attaches to the column of a drill press, keeps chuck wrench, vise, oil can, drills and miscellaneous tools always at hand when needed. Steel tray is circular, with a rim 3/4 in. high and 12 in. in dia. Tray rotates, also pivots on arm
B & I Mfg. Co., Burlington, Wis.





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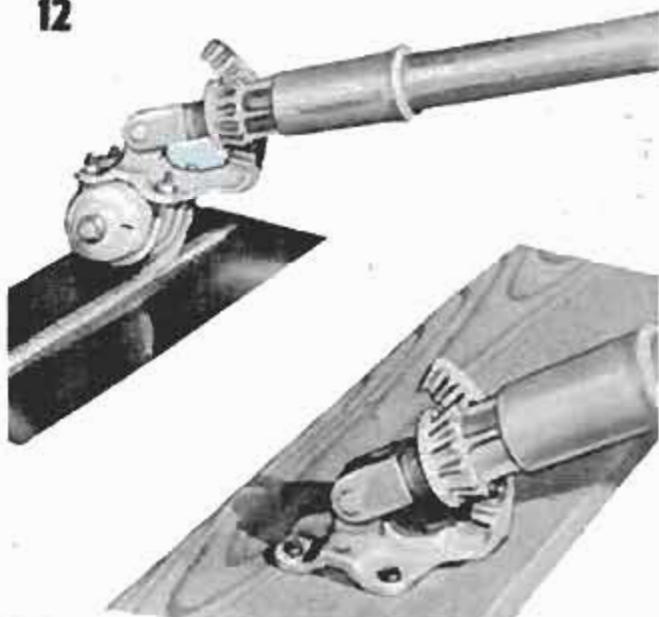
10. PORTABLE TRANSFORMER makes it possible to thaw frozen water pipes by using domestic 110 or 220-v. 60-cycle, single-phase a.c. There are three thawing steps: high, medium and low. Furnished complete with 10-ft. power cord, two 20-ft. thawing cables
Hobart Bros. Co., Hobart Square, Troy, Ohio



11

11. SCRIBER WITH MAGNIFIER is a four-in-one tool consisting of striker, center punch, magnifier and scribe. Makes layout easier for machinists, designers, tool- and diemakers, modelmakers and hobbyists. Tool is available with carbide-tipped scribe
The Langley Corp., San Diego, Calif.

12. CONTROL UNIT is easily attached to any hand trowel or wooden float, permits finishing of concrete slabs from standing position outside forms. Trowel or float remains level regardless of angle of handle. Can be used with handle of any convenient length
Ed Kearney Enterprises, P. O. Box 1152, San Jose, Calif.



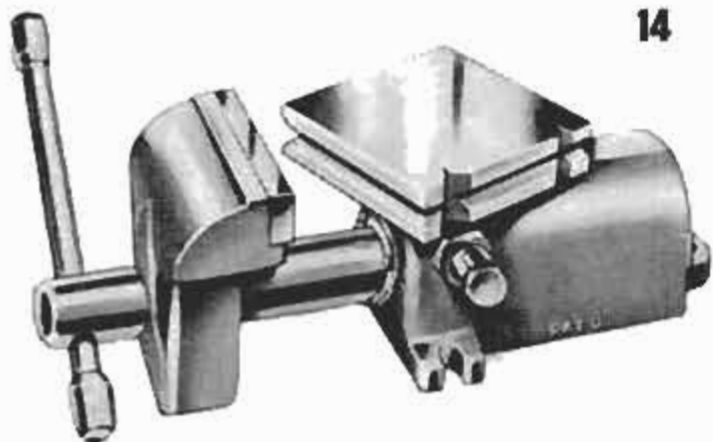
12

13. 30-PIECE DRILL KIT is a handyman's power workshop that includes 1/4-in. portable electric drill and all accessories necessary for drilling, sanding, polishing, buffing and grinding, plus a 21-piece socket-wrench set. Metal carrying case also included
Cummins Portable Power Tool Co.,
Div. of John Oster Mfg. Co., Milwaukee, Wis.

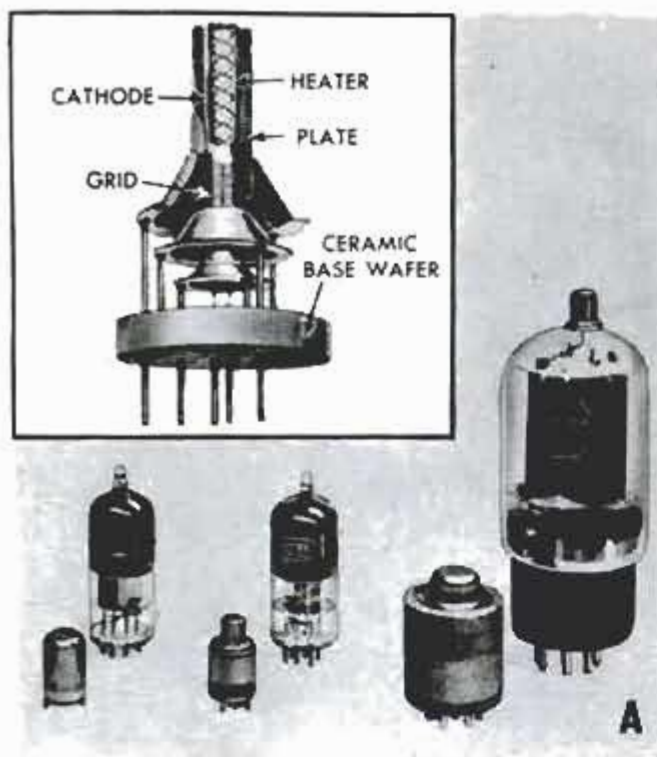


13

14. BENCH VISE features a rotating, turret-type rear jaw having four working faces and a machined flat on the top. Spring-loaded stop locates the turret at any one of the four positions. Holds round, flat and irregular shapes. Can also be used as machine vise
Roto Products Co., 1823 N. Church St., Rockford, Ill.



14



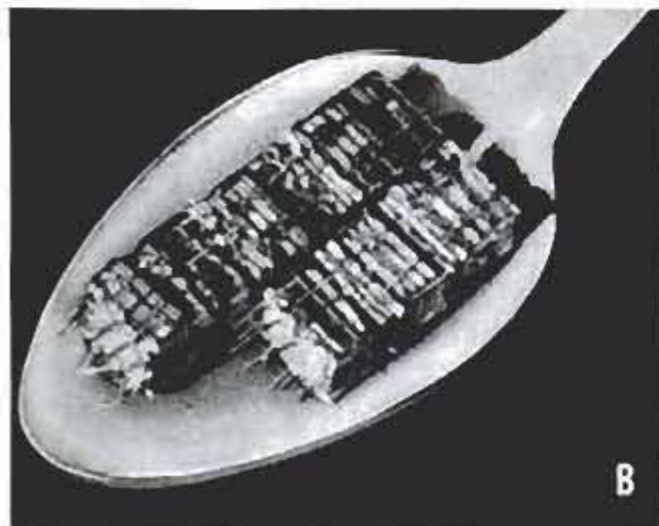
... IN THE NEWS

A.—A "new look" in electron tubes. Dwarfed by their present-day counterparts, RCA's newly developed triodes, tetrodes and beam-power tubes will go into limited production in 1960. Simplified construction, see inset, improves ruggedness and reliability and lowers cost while small size and greater efficiency are expected to cause a revolution in electronics

B.—and still smaller. Micromodular construction has resulted in a 6-transistor radio which fits into a teaspoon with room to spare. Sponsored by the U.S. Army, new miniaturization concept was developed primarily for the military but may also be applied to products for home, commerce and industry

C.—More compact than the Walkie-Talkies of World War fame, Dage's new battery-powered TV system combines fully automatic camera and transmitter in a two-unit, 16-lb. package. System has half-mile range—is designed for military and commercial use

D.—Latest in hi-fi tape reproducers, the Stereophonic Fidelivox makes prerecorded tapes even easier to handle and play than ordinary records. Tape magazine eliminates tape threading or rewinding—plays continuously until removed from the machine. Requires separate stereo amplifier and speaker system





FOR BETTER STEREO

“Third Channel” Fills Hole in the Middle

By Norman Kramer

ASST. CHIEF ENGINEER, KNIGHT ELECTRONICS CORP.

THE SEARCH for “perfection” goes on. Hi-fi has replaced the ordinary radio and phonograph, and stereo is rapidly replacing hi-fi. The phrase “high fidelity” itself is giving way to “stereo fidelity” which, today, represents the ultimate in the reproduction of sound and music in the home. But despite the excellent quality of today’s stereo records (and tapes), despite the near-flawless reproduction available from modern high-fidelity components, even the three-dimensional magic of present-day two-channel stereo does not always satisfy the requirements of the critical listener.

It is generally agreed that two-channel stereo can produce amazingly lifelike results—provided that the two speakers are properly spaced, about 7 to 9 feet apart, and the listener remains in a relatively small area midway between and approximately 12 to 15 feet away from the speakers. This forms a triangle in such a way that the listener sees an angle of 30 deg. to 40 deg. between the speakers.

Unfortunately, room decor frequently places the listener in some position other than this ideal stereo triangle. Moving further away from the speakers, however, causes a fusion of the two dissimilar signals and results in considerable loss of the stereo effect. Conversely, approaching closer to the speakers causes an over-separation which often gives the distinct impres-

sion of two separate orchestras playing in opposite corners of the room; leaving a sort of void, or hole, in the middle.

Even at the proper distance, the hole-in-the-middle effect is often present due to recording defects, such as intentionally over-separated records; or merely because of the psychological effect of actually seeing two speakers. Whatever the cause, the hole in the middle could be eliminated by moving the two speakers closer together, but such a remedy has several disadvantages. Not only does it mar the stereo effect for listeners farther away, it also converts the center section of the orchestra into a sort of “no man’s land”—an area in which the performers seem to be picking up their instruments and moving about from side to side as the listener himself varies his position with respect to the center line between the speakers. In addition, reducing the distance between the speakers reduces the effective spread of the orchestra so that the feeling of spaciousness associated with listening to a live performance is severely restricted.

The “Third Channel”

Ideally, it would be desirable to place the two speakers far enough apart to maintain the full stereo effect at the maximum distance from the speakers, at the same time filling in the space between the speak-

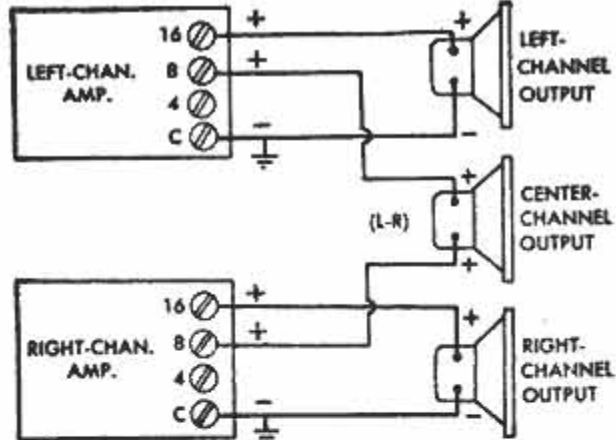
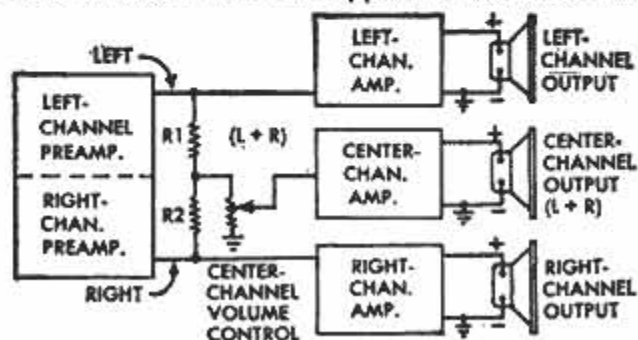


Fig. 1. Center-channel output obtained by the subtraction method. Note that like signals in left and right channels cancel in center-channel output

Fig. 2. Center-channel output obtained by an addition. Resistors provide interchannel isolation but cause blended mixture to appear at volume control



ers and stabilizing the positions of the center-stage instruments for the close-up listener. This effect can be accomplished by placing a third speaker midway between widely separated end speakers and feeding it with a signal which is either the sum of, or the difference between, the two stereo signals. This results in a simulated third channel which increases the size of the stereo listening area, focuses the center-stage performers and fuses the two halves of the orchestra into an integrated unit without compromising the stereo effect.

The various schemes for obtaining such a "third channel" have in common the principle that if two microphones are correctly placed, their combined output will correspond to the output of a single microphone placed midway between the two. This condition can be duplicated without the use of an actual center microphone merely by taking a portion of signal from each of the two stereo amplifier channels and applying the combined signal to a centrally placed speaker.

The "Difference" Method

An early and popular approach to obtaining this simulated third channel is illustrated in Fig. 1. With this method the two stereo speakers are connected to the amplifier output terminals in the conventional manner, while the center speaker bridges the two amplifiers by being con-

nected across the lower impedance output taps of the two transformers.

The operation of this circuit becomes obvious if we consider the voltages appearing at the 8-ohm transformer taps when a stereo signal is applied. Let's assume, first, that the signals applied to the two amplifiers are identical in frequency and amplitude. Under this condition, which corresponds to that of a monophonic signal at the amplifier input, the voltages at the output of the amplifier will also be identical in phase and amplitude at any instant of time. And, if voltages at both 8-ohm amplifier taps are always the same, there can be no voltage across the center speaker. For monophonic input signals, therefore, and for any like portions of a stereo signal, the center speaker will remain mute.

With substantially different signals in the left and right amplifiers, the instantaneous voltages at the 8-ohm amplifier taps will not be the same, so that a voltage difference will appear across the center speaker. This difference between the two signals, therefore, will be reproduced by the center speaker.

Being activated by the difference component of a stereo signal, the center speaker will adequately fill the hole in the middle. This method of obtaining center fill, however, does have some disadvantages. For the reproduction of a monophonic signal, the center speaker serves no useful purpose. And, because only the difference component of a stereo signal is reproduced in the center speaker, the latter could not be employed as a possible remote monophonic reproducer without some loss of audio quality.

The Addition Method

A method of obtaining the third channel by a summation process is illustrated in Fig. 2. Here, mixing takes place in the output of a stereo preamplifier across a common resistor—the center-channel volume control.

Since both the left and the right portions of the stereo signal appear across this volume control, they are effectively added at the input of the center-channel amplifier and reproduced by the center speaker. Resistors R1 and R2 provide the necessary isolation between the left and right-channel amplifiers to eliminate the possibility of cross-talk. The volume of the center speaker is adjustable to provide just the right amount of center-fill signal and, since the center speaker reproduces the entire stereo signal, it can be used remotely as a monophonic reproducer for both stereo and monophonic signals.

This method has the disadvantage of requiring a third power amplifier as well as

a third speaker. It is frequently prohibitive from a standpoint of cost and space considerations.

Another approach to the summation process appears in Fig. 3. Here the mixing takes place at the grid of an amplifying tube in a stereo preamplifier. Several hi-fi equipment manufacturers have used this method in commercially available preamplifiers. Such units are supplied with a third output jack labeled, appropriately, "third-channel output." Like the circuit in Fig. 2, this method too requires a separate third-channel power amplifier and has the same advantages and disadvantages.

No Third Amplifier

Still another approach for achieving the third channel by the summation method was developed by the author. This method, illustrated in Fig. 4, is incorporated in the Knight 40-watt stereo amplifier kit, but can be easily adapted for nearly any stereo amplifier or to two separate amplifiers being used for stereo purposes. It has the advantage of providing full monophonic output from the third speaker, from either a monophonic or stereophonic input signal, without the need for a third power amplifier. The only requirements for proper operation of this circuit are that the secondary windings of both output transformers are provided with a 4-ohm tap, and that all speakers used have voice-coil impedance in excess of 4 ohms.

With this method, mixing is achieved entirely in the output transformers. It should be noted that the 4-ohm transformer taps, rather than the common leads, are grounded. Since the 4-ohm taps, electrically speaking, are the center taps of the secondary transformer windings, the transformers are connected in a sort of push-pull arrangement for monophonic signals and for like components of a stereo signal. This condition is depicted in Fig. 4, which shows the instantaneous polarity across the two output-transformer windings for similar applied signals. When the third speaker bridges the amplifier outputs as shown, the top end of the speaker goes positive while its bottom end goes negative with respect to the grounded center tap. The third speaker, therefore, receives the sum of the voltages appearing across half of each transformer winding. Since these voltages are equal and in phase, the speaker produces an output which is equal in intensity to that of each end speaker.

If, as in stereophonic program material, the signals from the two amplifiers are not identical, the volume of the center speaker may be slightly less than that of the end speakers. In all cases, however, the third speaker will reproduce the combined signal

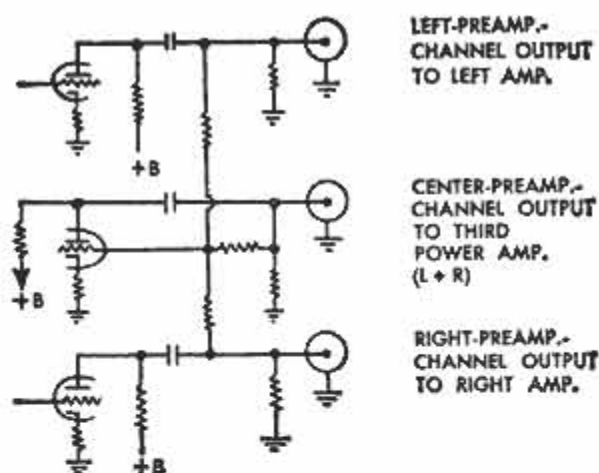
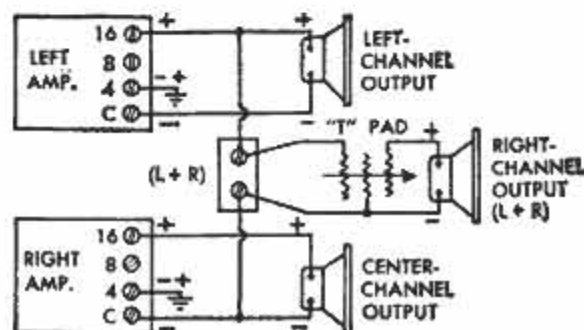


Fig. 3. One approach for obtaining a center-channel output, by mixing the left and right signals directly in the preamplifier, employs extra tube

Fig. 4. Center-channel output obtained by mixing in output transformers. Like signals in left and right channels do not cancel in the center-channel speaker



of the two stereo channels with no frequency discrimination.

Used as a center-fill speaker only, the volume of the third speaker need not be as great as that of the end speakers. In fact, its output should be only loud enough to effectively fill in the space between the other two. For this reason, a T-pad, which acts as a volume control for the third speaker only, is connected to this unit. This permits independent control of center-speaker volume for any desired degree of center fill. The correct amount depends, of course, on the distance between the end speakers, the size of the listening room and, to some extent, on the position of the listener.

Modifying Existing Amplifiers

Virtually any existing stereo amplifier, or two amplifiers used in a stereo set-up, can be modified easily and inexpensively for this type of three-channel operation. The necessary modifications are illustrated in Fig. 5. The original circuit is shown in black while the required changes and additions are superimposed in green ink.

In most hi-fi or stereo amplifiers, the "common" (black) output-transformer leads are connected to the "common" (C) terminals of the speaker terminal strips,

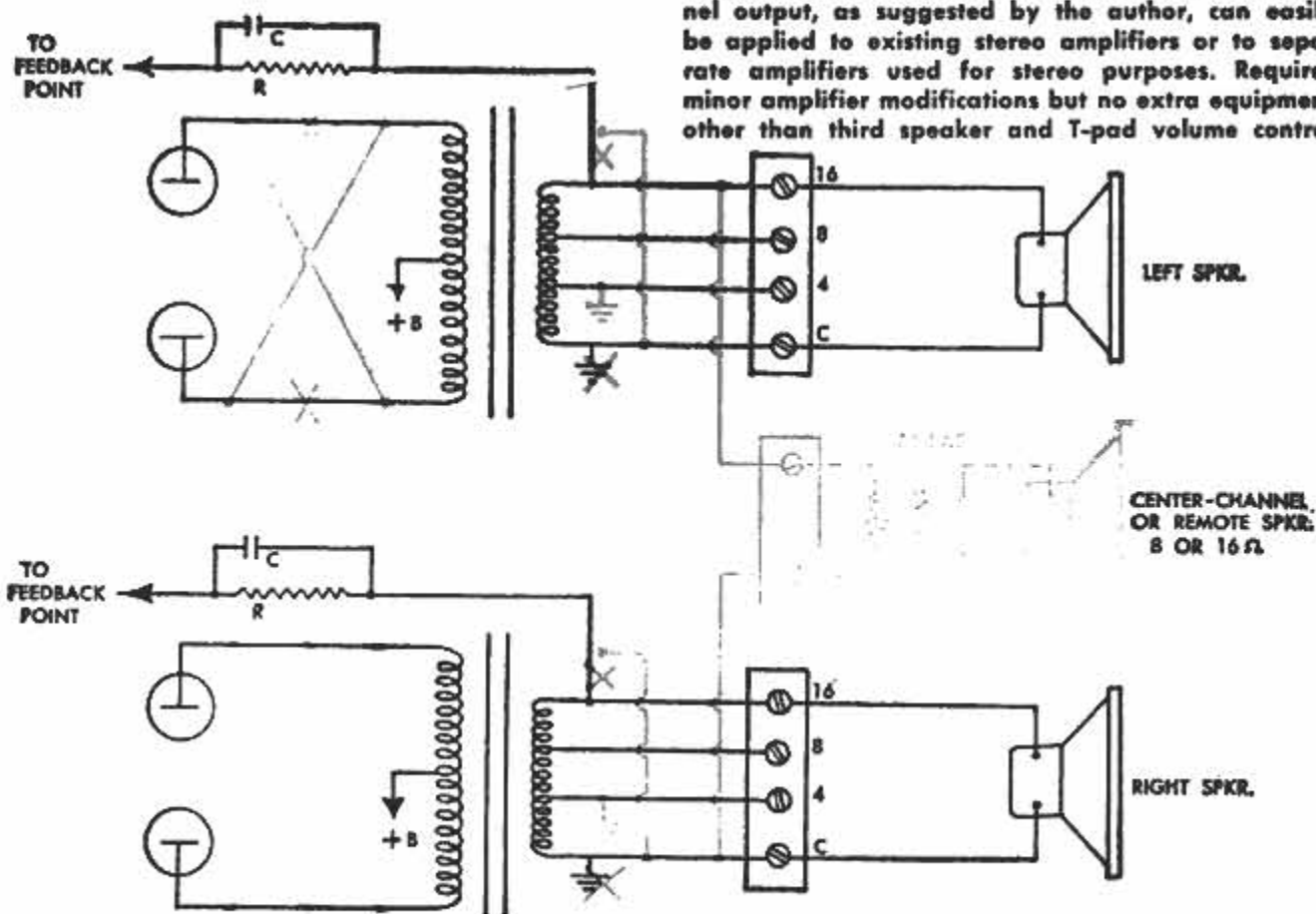


Fig. 5. Additive method for obtaining center-channel output, as suggested by the author, can easily be applied to existing stereo amplifiers or to separate amplifiers used for stereo purposes. Requires minor amplifier modifications but no extra equipment other than third speaker and T-pad volume control

with wires running from these terminals to grounded points on the amplifier chassis. The first step is to remove the ground wires from the C terminals and to solder these to the 4-ohm terminals instead. The black transformer leads must remain connected to the C terminals. (In cases where the black transformer leads are connected directly to the chassis, these must be resoldered to the C terminals of their respective speaker terminal strips.) The external designations of the terminal strips remain as they are and the two end speakers will remain connected to the same terminals as before.

Having made the above change, the feedback voltage, which normally exists between the 16-ohm tap and ground, will have been altered. Usually, feedback is obtained through an R-C network connected from the 16-ohm tap to the cathode of some previous amplifier stage. Under such conditions, changing the ground connection, as described, reduces the feedback to half its original value. To restore the original amount of feedback, each feedback resistor (R in Fig. 5) should be replaced with a resistor having half the original value.

In experimenting with a number of different stereo amplifiers, the author found that some operated extremely well after the above changes were made. Others, how-

ever, notably those with less inherent stability, began to oscillate at very high or very low frequencies. In such cases stability was restored by removing the feedback network from the 16-ohm tap and soldering it, instead, to the C terminal; a change which reduces the inherent source capacity of the feedback circuit, thereby favoring amplifier stability under feedback conditions.

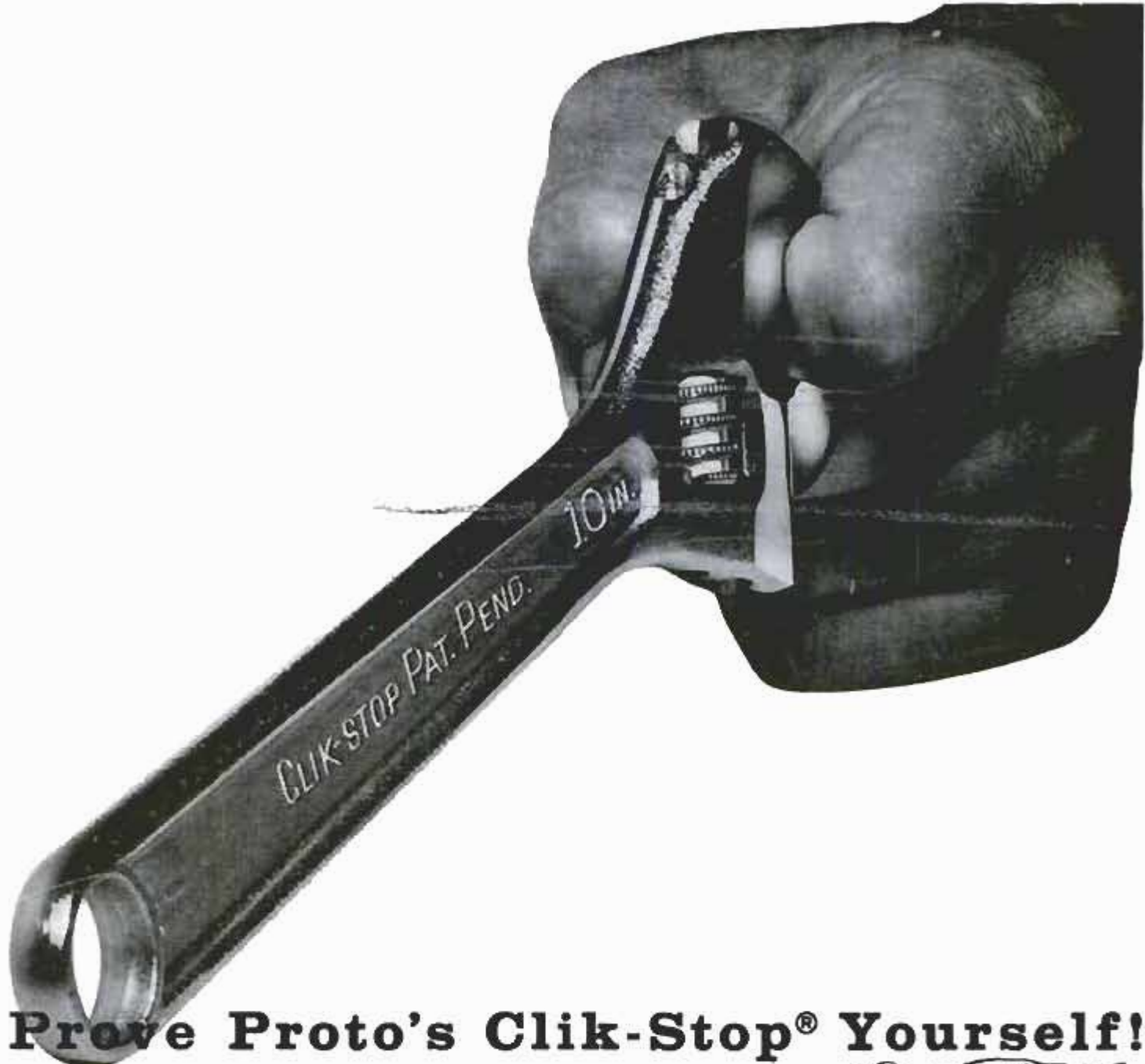
This modification, though it doesn't change the amount of feedback, does change its phase from negative to positive—a condition which must be corrected. This can easily be done by reversing the primary winding of the output transformer. Merely unsolder the output-tube plate and interchange the wires.

Connecting the third or center-channel speaker system (after equipping it with a T-pad to match its impedance) from the 16-ohm terminal of one speaker terminal strip to the C terminal of the other completes the conversion.

Remote Hi-Fi

If the third speaker is used for center fill only, a relatively inexpensive unit will provide satisfactory results. However, the possibility of using this speaker as a high-

(Continued to page 256)



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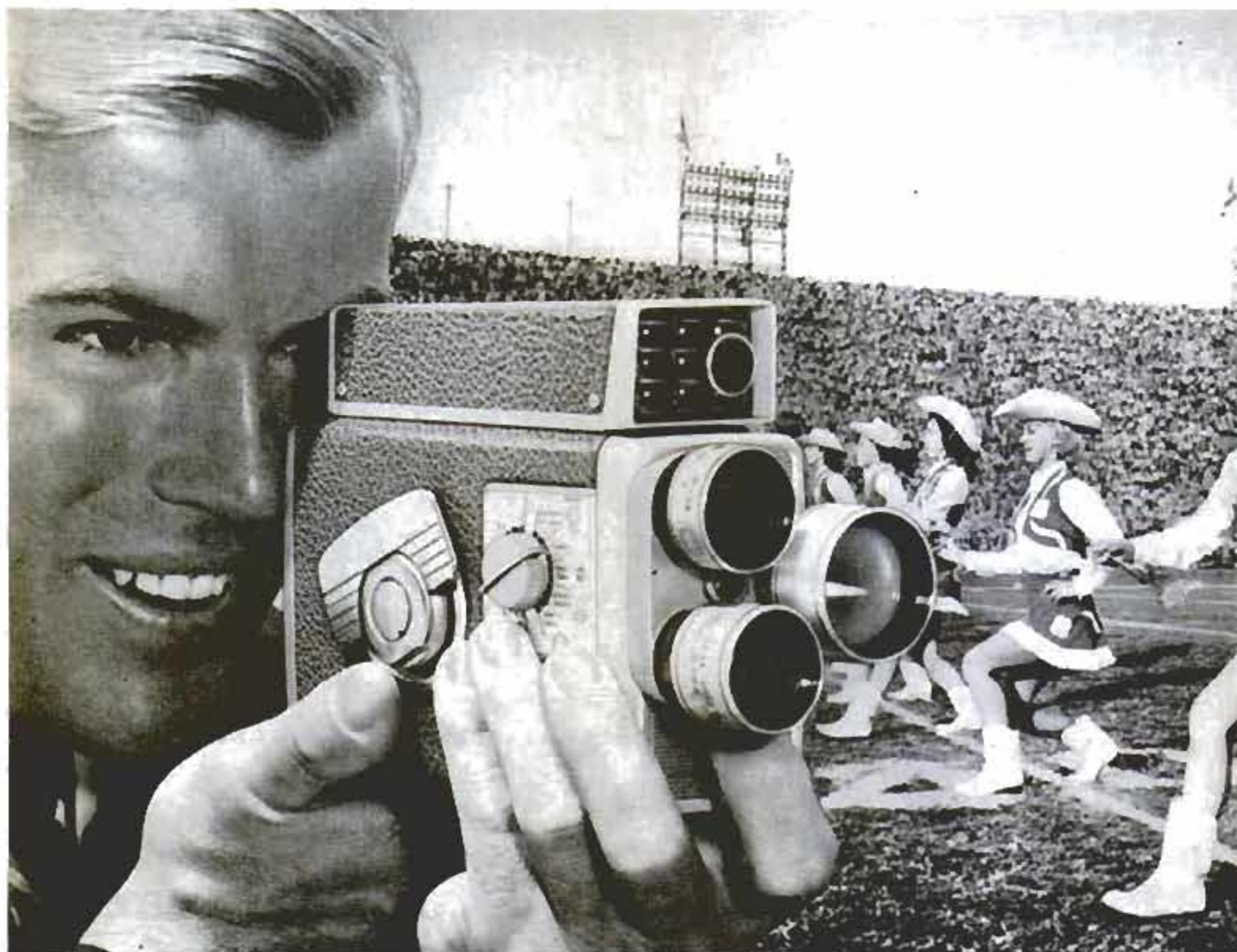
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Defective Plaster Patch

Q—I've just painted a room which has always been papered. I had to patch one large crack and several smaller ones. Now, after applying two coats of paint the patches still show. On the large crack the paint appears to have dried flat. What's the most likely cause and what can I do about it now?

—H.D., Fla.

A—Usually there are two main reasons for plaster patches showing through paint: (1) The patching material may not be precisely flush with the surrounding surface, causing a shadow to be cast. (2) The new patching material may be more porous than the regular plaster and thus absorb more of the oil in the paint, giving it the appearance of drying flat. On such a patching job painters usually size the patches when dry, or spot them with the same paint that is to be applied to the wall. In some instances it is best to apply an undercoater to the new plaster patches and allow it to dry before finishing the job. White shellac also can be used. In your case it would probably be best to spot the patches then finish up by painting the wall one extra coat. This treatment should hide the patches effectively.



Solvent Aids Floor Sanding?

Q—Isn't there some way of preventing the abrasive from clogging when sanding a floor with a sanding machine? I've been told that ordinary kerosene would do it, but I'm afraid to use it because of the fire hazard. What about carbon tetrachloride, is it safe to use?—E.H., Ark.

A—Do you use an open-coat abrasive for the first time over? And do you run the sander at an angle with the boards? As a rule this simple procedure will minimize the trouble you are experiencing. You're right in assuming that use of kerosene would be hazardous. Should the abrasive strike a nail in the flooring, the resulting sparks might ignite kerosene.

(Continued to page 254)



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(Continued from page 252)

Carbon tetrachloride is not flammable but it does pose a health hazard. In fact, any common solvent may be a health hazard in degree in any closed room. For this reason we could not recommend their use for the purpose you have in mind. Rather we would suggest that you equip the machine with a coarse, open-coat abrasive, make each pass of the machine at an angle with the floor boards, and do not attempt to remove all the old varnish the first time over. If you permit the machine to move over the floor quite rapidly there will be less tendency to clogging of the abrasive as less heat will be generated on each pass. Go over the floor rapidly in one direction, then once again at a different angle with the boards. Finish the rough cutting with the grain of the wood. Then, with the wood exposed, finish with a finer abrasive.



Insects on Fresh Paint

Q—Last fall I painted two houses and on one I had trouble with small insects alighting on the fresh paint and sticking fast like flies on flypaper. Next time I want to avoid this trouble as the insects can completely ruin a good paint job. Can you tell me how?

S.L., Ill.

A—Some painters troubled in this manner mix a small quantity of insect repellent with the paint. We understand that it's quite effective. However, we could not recommend the procedure without reservation as it is possible that ingredients of some insect repellents might affect the durability of house paints. In most localities trouble with insects can be avoided by painting only during or after periods of settled weather as the drying conditions are usually ideal and insects ordinarily give very little trouble, especially during the morning hours. Under good drying conditions the paint will set insect-free in an hour or so.

Ice Dam on Roof

Q—My home has a low-pitched roof and last winter the ceiling plaster was damaged by water which evidently leaked through the roof just above the eaves. On going into the attic at the time I first noticed the damp spots on the ceilings, I found that water was dripping from the roof boards near the lower ends of the rafters. I'm puzzled. Where does the water come from?—G.M., N.Y.

A—Condensation is always a possibility, but judging from your description of the trouble we think it more likely that an ice dam forms on the roof just above the eaves. Heat loss to the attic and the warmth of the sun during the clear days melts the snow on the roof. Water from the melting snow is trapped by the dam and seeps under the shingles and through the roof boards, as you have observed. Perhaps the simplest way to prevent this trouble is to install electric heating cables (lead-covered) along the eaves. Heat from these cables will melt the snow that collects at this point and prevent the formation of a dam.

Determining Length of V-Belt

Q—I want to change the pulley sizes on a home-shop power tool, but I don't know how to determine the correct length of V-belt. Is there a formula for figuring the belt length, or must this be determined by measurement?—C.D., Vt.

A—One fairly accurate method is simply to measure around the outside of the V-pulleys with a flexible steel rule. Of course, this must be done with the pulleys on the shafts on which they are to be operated. Or, cut two pieces from the old belt, each one to a length that will reach slightly more than half way around each of the pulleys. Tape the pieces in place on the pulleys and measure around the pulleys as before. This method is somewhat more accurate. You can compute the length of belt required by adding the diameters of the driving and driven pulleys and multiplying by 1.57. Then add twice the distance between the centers of the pulleys when mounted. The final figure is the length of belt required.

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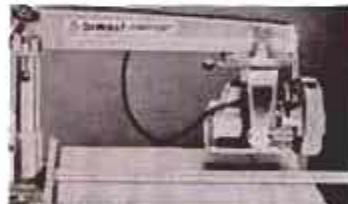
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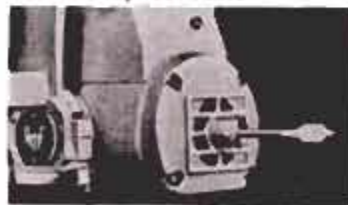
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This "mighty midget" is a natural for a tight grip on small work in hard-to-get-at places. Only 4-1/2" long... drop forged from high grade steel. Four exclusive Channellock precision grooved jaw adjustments... capacity to 1/2". Skilled mechanics say it's one of the handiest pliers in their kits. You'll say so, too!

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ASK YOUR TOOL SUPPLIER
FOR A CHANNELLOCK No. 424



Be sure it's a genuine CHANNELLOCK
Look for the trademark on the handle

"Third Channel" Fills Hole in the Middle

(Continued from page 248)

fidelity monophonic reproducer in some other room of the house should not be overlooked. For such applications, the quality of the reproduced sound will be limited only by the quality of the components, and the third speaker should match the performance of the rest of the system.

Additional versatility can be obtained by connecting two 8-ohm speakers in series in a third-channel hookup. One of these could then be used for center fill and the other as a remote monophonic reproducer. Two 16-ohm speakers connected in parallel could be used for this application with only a slight reduction in acoustical power due to the impedance mismatch.

The need for a third channel reproducer is still a highly controversial issue. Some stereo listeners, perhaps those with ideally placed speakers and a concentrated listening area, insist that there is no conscious feeling of sound separation with two-channel reproduction. Others, enough of them to influence the design of stereo equipment, insist that a third speaker can add greatly to the depth, realism and spaciousness of stereophonic sound. The simplicity and low cost of the method described above should enable every interested stereo fan to—"judge for himself." ★ ★ ★

One-Bath Process Develops and Fixes Film

With a new chemical solution the photographer can process his film in a single bath. The bath cuts developing time from the usual 50 to 60 minutes to 10 to 15 minutes. According to the manufacturer, the photographer no longer needs to go through the three-stage operation of developer, short-stop and hypo. Now he places the film or print in one bath and it is automatically developed. It can be left in the bath as long as the photographer wishes with no fear of overdeveloping. One drawback, however, is that contrast cannot be controlled. Solution temperature is not critical. Processing can take place at any temperature above 68 degrees F. Final washing in flowing water takes five minutes. The bath contains a special chemical to prevent prints from bleaching or turning yellow.

☐ Foam mattresses for cattle, covered with a tough plastic immune to water rot, have been designed by an English farmer who got tired of the high cost of straw bedding.



PAINT NEWS

NEW DU PONT

LUCITE ACRYLIC HOUSE PAINT

TRADEMARK

LASTS 50% LONGER

DRIES IN 30 MINUTES

Here's the greatest paint discovery since Du Pont quick-drying auto finishes: Du Pont "Lucite" Acrylic House Paint. It's so durable it lasts 50% longer than ordinary paints... can save you hundreds in repainting costs. An acrylic emulsion, it is recommended for use only over No. 38 Blister Resistant Wood Primer on new wood or on old surfaces with the finish completely removed.

SOLVES BLISTERING PROBLEM

For a long time blistering has been home owners' most serious paint problem. Until now, it has been an almost insolvable, recurring predicament. The combination of No. 38 Primer and "Lucite" Acrylic House Paint can give unprecedented protection against blistering because it is chemically engineered to al-

low moisture vapor to breathe through while shutting out water penetration.

EASIEST PAINT TO APPLY

"Lucite" Acrylic House Paint flows on more smoothly, evenly than any paint you ever used. Dries in 30 minutes—ready for a second coat in one hour! You save time and money by avoiding the usual ladder shifting that is necessary. One coat covers, two give maximum protection and durability. Water is all you need for thinning. Soap and water clean your brushes.

COMES IN MANY COLORS

"Lucite" Acrylic House Paint is available in white and 16 beautiful colorfast colors. This amazing new paint and primer are ready for delivery now at your Du Pont Paint Dealer's. You'll find his name in the Yellow Pages.

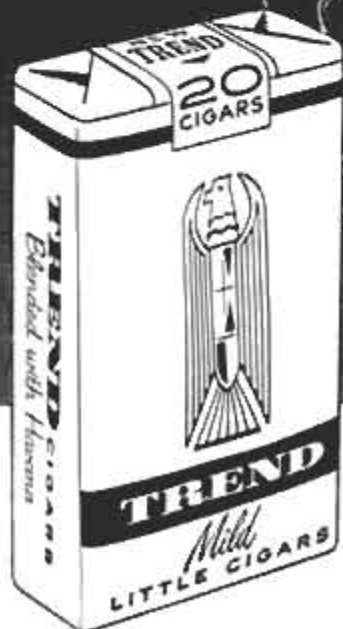
Buy the paint that's worth the work! Your time is too valuable to risk on "bargain" paints. Buy Du Pont Paint and you know you're getting the most modern finishes made... and that the beauty will last. Du Pont Paint Chemistry assures you of that.



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STEPHANO BROTHERS
(Cigar Division) Phila. 7, Pa.

PIONEER IN MODERN LITTLE CIGARS

The Test of Good Landscaping . . .

(Continued from page 187)

be spacious enough for a good game of three-cornered "catch," and can be marked off by natural contours or suggestively defined by small beds with tough bordering shrubs.

Utility. Drying area, burning area, off-street parking space, storage nooks for building materials and compost, space for a small vegetable or fruit garden, all should be worked into the master plan with careful thought to convenience as well as design.

There are many ways to separate even a small yard into areas, but the best way is to utilize the natural formations on the land. Be sure to take advantage of those variations in grade, even if the grade change is only 6 inches in 50 feet. Flat ground or a flat slope is monotonous and hard to landscape, whereas great interest can be created if you're lucky enough to have uneven ground. Even the tiniest slope can be terraced with low-lying, curved walls of flagstone or thin random slabs of shelf rock, creating unique and pleasing garden areas on separate levels.

Fences, Walks, Patios . . .

This brings up the all-important matter of fences, walks, driveways, patios, tool sheds and other architectural structures. These form the main framework of your garden and should be handled carefully. You can make them assets or eyesores. A rough-hewn rail fence, brick or stone wall banked with shrubs and perennials, or laced with ivy can incorporate itself beautifully into almost any garden. A well-designed tool house, nestled in flowering shrubbery and graced with an inviting brick or flagstone walk can look as though it belongs in the garden.

Walks, drives and patios should fit into the garden design, and not be set apart by traditional hard, straight lines of squared-off paving. If such paving is already in, pave additional areas to give pleasing lines and curves. Try not to break up these lines in disjointed segments. Tie in your walks, driveway and garden planting areas with generous, graceful curves which are far more restful to the eye. And be sure to take into consideration the color in your paving material, gravel and outside painted surfaces just as carefully as you would handle an indoor color scheme. In selecting your flowering shrubs and perennial plants for the beds, keep in mind the colors that the blossoms will impose against these backgrounds.

(Continued to page 260)

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9" Saw



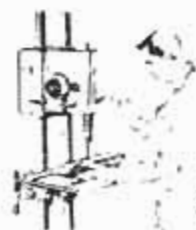
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One of the most important factors in a garden is ease of maintenance. The traditional garden, with its great variety of plants, set out in formal stylized symmetry in a vast profusion of color, made for plant material (largely annuals and potted plants), set out in formal stylized symmetry in a vast profusion of color, made for the highest and most expensive maintenance. The modern garden we're talking about makes use of evergreens, flowering shrubs, ground covers that perpetuate themselves year after year, plus a few well-spaced masses of blooming plants (largely perennial) for dramatic effect. Easy maintenance doesn't just happen. It must be planned. While there is no 100-percent workfree garden, there are degrees of care that certain types of planting require.

Here's a rule-of-thumb list for guidance:

Easy maintenance: Paving, gravel and flagstone in heavily used areas; trees; slow-growing shrubs; ground covers where grass is hard to grow and to create borders.

Medium maintenance: Lawn, perennial flowers.

Heavy maintenance: Annuals, tubed plants, vegetables.

Keeping your maintenance to a minimum comes with experience, but there are

many pitfalls you can avoid at the outset by proper planning. The use of paved terraces in garden areas can eliminate a lot of mowing. Many materials are used today which are highly decorative and interesting. Flagstone, of course, is handsome but expensive. However, I have seen gravel used with great effectiveness. Broken chunks of concrete can be cleverly arranged in random paving. Some western gardens have terraces paved with natural round disks sliced from the trunks of redwood trees. Easterners could do the same with cedar. Old used pink brick set in a bed of sand can make a handsomely textured terrace pavement.

Paved mowing strips along the planting beds eliminate the need to hand trim the lawn edges. Made of stone slabs, clay tile or brick, such edgings will enhance any garden.

Low walls of brick or dry stone construction look as though they belong in a garden. So do paddock-type or rough-hewn rail fences. And don't overlook the decorative value of oddly shaped boulders, a low table made of natural rock slab or an interesting piece of driftwood made into a table or bench. Best of all, such items decorate the garden without the perpetual trimming required by hedges and shrubs. If you must

(Continued to page 262)

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have a hedge, make it of hardy evergreens, in the North, or of slow-growing evergreens in the South, so trimming is necessary only once or twice a year.

Terracing, besides breaking up your garden into pleasant-looking sectors, creates easier maintenance, so pay careful attention to grade.

In selecting your shrubs and plants, remember that they all will grow. So check the mature height and spread of each variety before you put it in, and plant it with proper spacing to allow for growth. This way, they'll take care of themselves and you won't spend the rest of your life transplanting or trimming to keep the place from going to jungle. This can be time-consuming, frustrating and expensive, since transplanting is difficult.

Plan Ahead

Another important item to cut down on future labor is proper soil preparation *before* you begin your beds. It's much easier to mulch and fertilize a bed when it is barren than later on, when the plants are deeply rooted. Once a well-prepared bed is planted, a minimum of cultivating each spring and fall will keep it rich and loamy.

Things to avoid assiduously if you want an easy-to-maintain garden: formal design, sharp curves, straight lines and isolated shrubs.

Probably one of the most satisfying solutions to good landscape design, easy maintenance and a year-round effect is ground cover. For years, such ground covers as pachysandra and periwinkle were considered only as substitutes for grass in places too shady to grow lawn. Today, most good landscape architects hungrily seek new varieties, along with the tried and true varieties, to create vast areas of interesting form, line and texture that will stay green 12 months a year.

Ground Cover Is Versatile

Some of the things you can do with a ground cover are truly amazing. A few years back, attempts to achieve a balance between the height of a house and its setting resulted in a moustache of foundation plantings that soon towered to second floor windows, crowding for space and crying for a saw. Today, horizontal balance is achieved with large masses of ground cover planted in wide, generous beds, with a few accent trees or shrubs strategically spotted in an attractively textured mat of thick ground cover. These ground-hugging plants can also be used effectively in garden beds to pull scattered plantings together.

(Continued to page 264)

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Five yews, for instance, planted like a row of periods, will suddenly melt into a beautifully textured unit design if a bed of ajugga surrounds them. Points of high interest in a garden can be created by a few simple, easy-to-maintain types of ground cover. *Euonymus colorata*, a boulder, a funkia and a couple of ferns can make a magazine picture out of an ugly stone jutting from the lawn. Ground covers, besides their decorative function, still serve well in places too shady or sour for grass to grow—such as under trees, under eaves where rainwater drips and creates bare spots, in hard-to-mow places, on steep embankments to hold soil together. Anywhere you use them, try to create interesting patterns and use the vertical accent of a tree, shrub or boulder here and there to break the horizontal monotony.

In Color All Year

Virtually all the plants we've discussed here will keep their form and color through all the seasons. Many evergreen shrubs, such as the japonicas and laurels, provide a mass of exotic blooms each spring as a bonus, and so do many ground-cover plants (see chart). There is hardly a season, in fact, when you can't have some blossoms blazing away in your year-round landscaped garden. Even in northern winters, the little erica carnea King George—a one-foot-high evergreen—bursts into five months of continuous bloom that more often than not has a blanket of snow for a background. Even without such spectacular plants, the stark, lacy branches of a white birch, a sugar maple, a dogwood or a pin oak tree can be a decorative asset to a snowbound northern garden that is well landscaped and held together with evergreens.

In spring, of course, masses of color burst from an endless assortment of easily maintained shrubs, trees and perennial plants. Clumps of forsythia light up the dark evergreens like spots of bright sunshine; dogwoods, fruit trees and lilacs spatter color against the sky; japonicas and deciduous shrubs are puffballs of bloom; borders come alive with bulb plants (planted in clusters amid decorative boulders); peonies make their dramatic debut, and even some ground covers become beds of solid blossom. In springtime a year-round garden is at its colorful height.

Summer finds blossoms on some rhododendron varieties and althea (*hibiscus syriacus*). Hundreds of perennial flowers (planted in masses of single varieties for dramatic effect) make it possible for even the busiest homeowner to enjoy a display

of color in a well-planned garden throughout the summer with a minimum of care.

Fall, for some obscure reason, is thought by most northern people to be limited to chrysanthemums. This is far from true. 'Mums are a great asset to any year-round garden, since their leafy foliage forms a soft green cover all summer. But a carefully landscaped garden of trees, shrubs and perennials can literally burn with a wide variety of other blossoms through the chilly months. The blazing colors of turning leaves on maples, oaks, euonymus shrubs, dogwoods, can be fringed with hardy flaming asters, bronze heleniums, monkshoods, Japanese anemones, tall hibiscus or mallow. One group of clematis (*heracleifolia davidiana*), and crocus-like colchicums will bloom well into October as far north as the Canadian border.

There are many other late-blooming shrubs and perennials if you take the trouble to seek them out. But none will look like much unless your garden is planned to make the most of each seasonal display. That means good landscaping. At the risk of some repetition, these are the inside tips that are the key to achieving a garden with a year-round effect:

- Use of bold forms in planting lines.
- Skillful use of evergreen materials.
- Choice of plants with interesting form, texture, branching or bark.
- Utilization of every change in the grade of your land.
- Use of trees and tall shrubs for accent in design.
- Attention to color of architectural materials (paint, brick, etc).
- Attention to overhead branches for sky pattern, light and shadow.
- Attention to lines and patterns created by walks, drives and patios.

★ ★ ★

High-Frequency Sound Waves "See" Inside the Eye

Areas inside and behind the eye, previously inaccessible without surgery, can now be examined through a new technique using harmless high-frequency sound waves. Foreign bodies that are invisible to X rays may also be seen. Key advantage of the diagnostic apparatus is that it may be used to visualize diseases in eyes that cannot be examined by X rays and other existing instruments. An "ultrasonic locator" at the heart of the new equipment sends forth a burst of sound waves that penetrates the tissues. A microphone picks up echoes reflected from the tissues. The echoes are converted to electrical energy, then displayed on a radar-indicator tube. The picture is similar to that seen on television.



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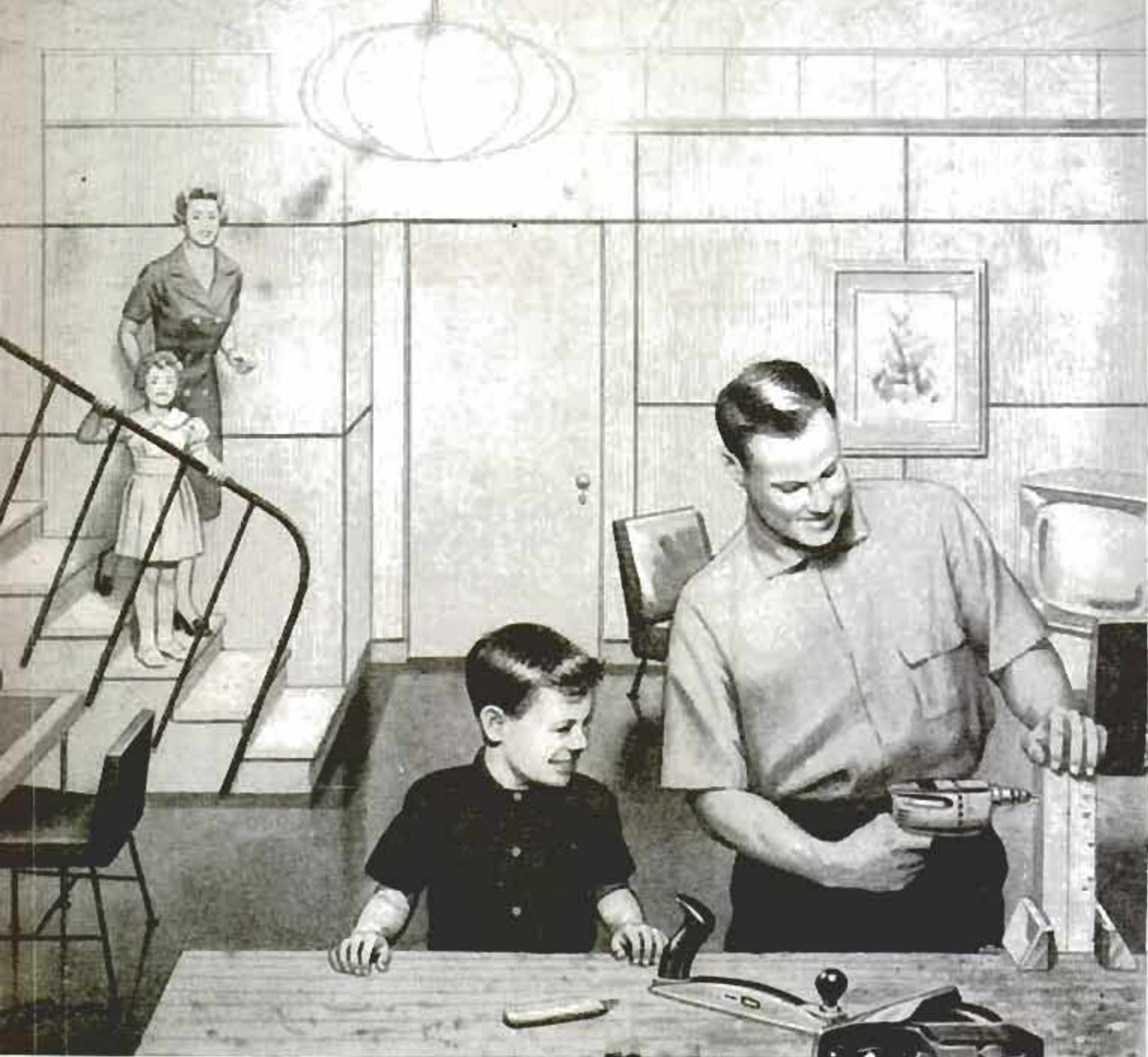


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Get in Step With Your Building Code

(Continued from page 179)

"But," complained the householder, "it's my property, and I'll build my barbecue any darn place I please."

And people did, a short 25 years ago. They also built apartments next door to snug little bungalows. Nor was it uncommon for a 10-foot wall to rise, blocking both the view and light from a neighbor's house. You've seen such neighborhoods in the older parts of town. But you wouldn't want to live there, much less own one of the houses.

Building codes exist for your protection and safety—and for your neighbor's, too.

Recently, a homeowner hired a contractor to add a \$5000 den. Luckily, before the contractor reached the plastering stage an alert inspector discovered that he'd set the room's girders on hollow concrete blocks. The added weight of the plaster, which often doubles the framed-in weight, would have crushed the blocks, wrenching the room out of shape and the plaster off the walls.

Wincing the appreciative homeowner, "if it hadn't been for that inspector and the building codes, I'd have had nothing for my \$5000 but a roomful of cracked plaster."

He might also have been left with a den whose windows (distorted in their frames) wouldn't open, and whose chimney, its flue lining cracked, might have set his house afire.

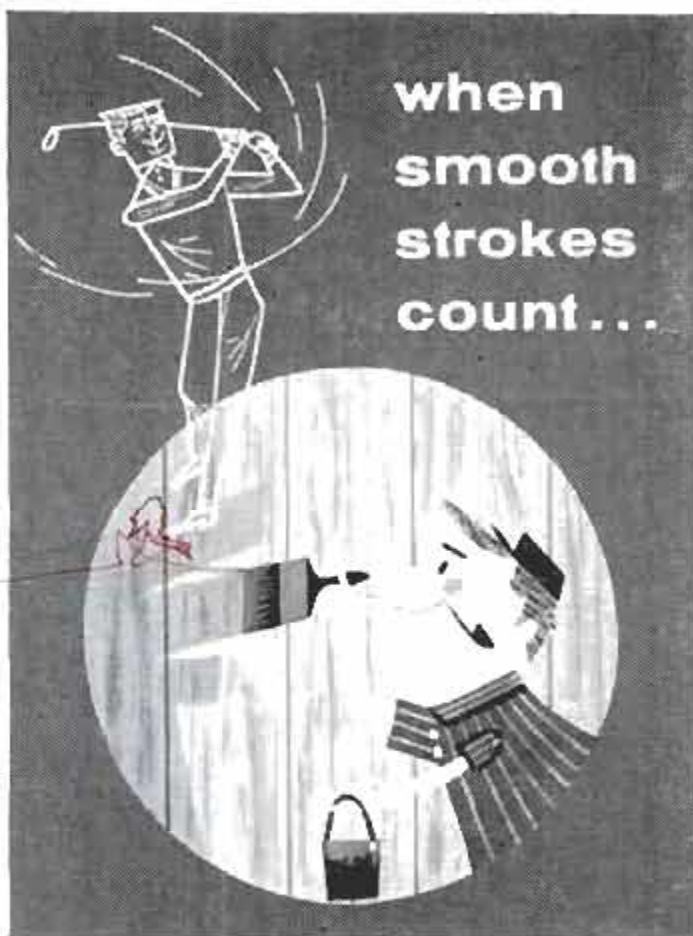
The inspector, and the rule book he carries, protect *you* from *your neighbor*, as well. In most cities the fellow next door can't build a barbecue without a spark-arrestor atop its chimney (sparks would threaten your home). Nor can he encroach upon your property line (he's got to leave a reasonable and specified "side yard" between his house and yours). Neither can he own a swimming pool unless he encloses it with a fence, its gate rigged with a kid-proof lock (thus, by law, he's required to protect *your* children from drowning as well as his own).

Set up in 1927 (and updated every three years), the Uniform Building Code is framed on the time-tested premise that if for safety's sake a brick chimney requires a fire-clay flue in Denver, the same lining is as necessary in Des Moines.

Manual for Homeowners

Most homeowners don't realize, however, that the Code is one of the most comprehensive do-it-yourself manuals ever compiled. It spells out specifically, for example, what kind of materials should go into your

(Continued to page 274)



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house, how its foundation should be laid, and the set back it must have from the street.

Nor is the code, as some have complained, either complex or contradictory. On the contrary, it's written as much for the do-it-yourselfer as for the contractor.

Let's see, for example, what the Code has to say, in part, about windows—a section that's typical, and applicable to hundreds of home projects.

"Windows. All living rooms, kitchens and other rooms used for living, eating or sleeping purposes shall be provided with windows with an area not less than twelve square feet (12 sq. ft.) nor one-eighth of the floor area of such room. Not less than one half such area shall be openable."

Ironically, though the regulation is set down in plain language, it's one of the most frequently violated. Let's see why. Suppose you decide to add a den to your living room. The living room is 12 by 12 feet, or 144 square feet, and the contractor, abiding by the rules, installed 18 square feet of windows ($\frac{1}{8}$ the floor area, the legal minimum for a room this size).

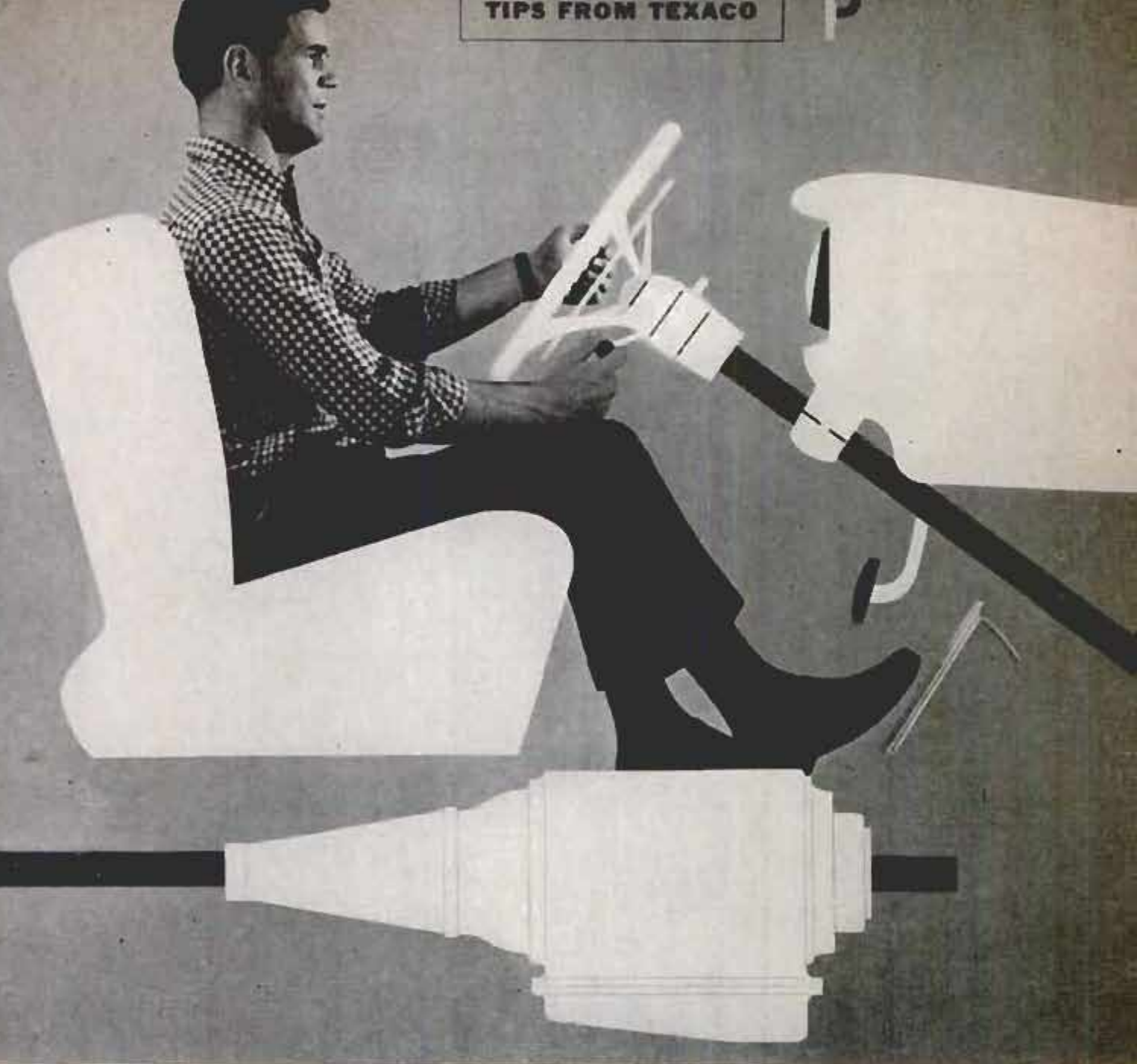
But in cutting the door between the new den and living room you use half the room's former window area. You've violated the code, and also health and safety statutes. There's one obvious solution, of course: Install additional living-room windows, at least the minimum amount.

Just as commonly the window minima are violated when the owner of a U-shaped bungalow roofs and walls in what was once his patio and converts it into a den or bedroom. The windows in the three walls which now open onto the enclosed room are no longer "windows." Because they aren't, it's more than likely that the rooms they once brightened have less than minimum window area.

Are the window minima, and scores of minima like them justified? If you've been house shopping lately, I think you'll agree they are. You didn't carry a measuring tape as you went house to house, nor did you stop to measure window area. You didn't because you *knew* the house had been built to code specifications (thus had windows enough for light and health). Nor did you have to crawl beneath the house to check sewer connections. Neither did you chip off a hunk of foundation to have it lab-analyzed for strength. The code, in effect, had done that for you.

The code does more. In laying down zoning regulations, it protects your investment, insures that a foundry won't blight your neighborhood. Further, it guarantees that the neighbors won't turn their homes

(Continued to page 276)



How to care for your automatic transmission

1 Apply your parking brake or keep your foot firmly on foot brake before starting engine or shifting automatic transmission from neutral into any driving range.

2 When a red light stops you on an upgrade, apply either parking or foot brake, then shift transmission into neutral. For a wait of only a minute or two it's permissible to push the gas pedal down just enough to make the engine "hold" the car on the grade.

3 When driving downhill, never shift into neutral and allow your car to coast. This is illegal, and also dangerous.

4 Make sure you are completely stopped before shifting from "drive" to "reverse."

5 When you leave your car, make sure ignition is turned *off* and key removed, the parking brake set tight, and gear selector set at "park" or "neutral."

6 Never have car pushed or towed without first making sure the procedure being used is correct for *your* make of car.

7 Be sure you're using the finest automatic transmission fluid money can buy... and that fluid is up to proper level. No problem when you're a Texaco motorist. For Texaco Dealers service your car with Texaco Texamatic Transmission Fluid and they are trained to check fluid level regularly.



into motels or boarding houses. And, by the same token, neither can you.

Frequently, home owners run afoul of zoning laws because they don't understand the terms.

Front yard requirements: In a single-family residential zone (applicable to most of us) all homes must be set back a specified minimum and maximum distance from the front property line. In effect, front yards must have about equal depth (though this may vary under some codes as much as 10 feet).

Suppose that the minimum setback for houses in your block is 22 feet. Your house, however, is set 25 feet back from the front property line. You'd like to extend the dining room six feet into the front yard. Will the code permit a six-foot extension? Probably not, though you'd likely be allowed to add three feet, bringing your house within the 22-foot setback minimum.

Side yards: Most codes require that you have an open space—a side yard—between your house and the neighbors'. The side yard usually applies only to your house (but not, for example, to the garage). Some codes require a five-foot side yard (thus, 10 feet between houses). Some say the side yard must be no less than 10 percent of your lot width.

Your lot, let's say, is 50 feet wide. By

the 10 percent rule, the open spaces on either side of your house must each be five feet wide.

More often than any other, homeowners violate the side-yard code. They extend den, patio, kitchen or dining room, closing this "breathing space" between their house and a neighbor's.

Rear yard: Just as the code specifies front-yard depth and width of side yards, it may also rule that your backyard be at least 25 feet deep (from the rear property line). Some codes specify a backyard "not less than 25 percent of the lot's depth."

There are exceptions, however, to even the code's most rigid edicts. The exceptions are necessary because, for one thing, there may be several types of lots—inside lots, corner lots, reverse corner lots and key lots—in the same block.

Side-Yard Construction

Regardless of lot type, some building may be permitted even in side yards. A carport, for example, is often permissible in a side yard so long as the structure is but one story high, not more than about 20 feet in length, and is entirely open on at least three sides (save for necessary supporting columns).

An attached garage may also be located

(Continued to page 278)

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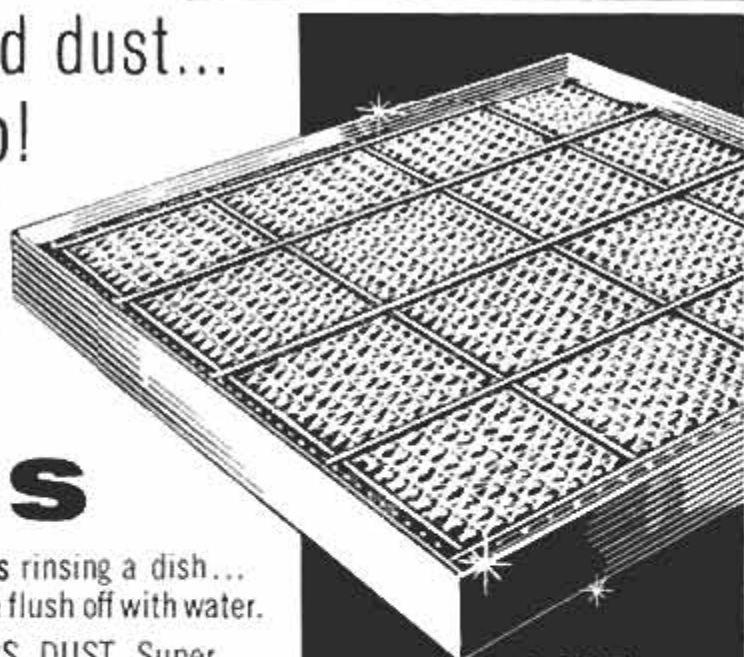
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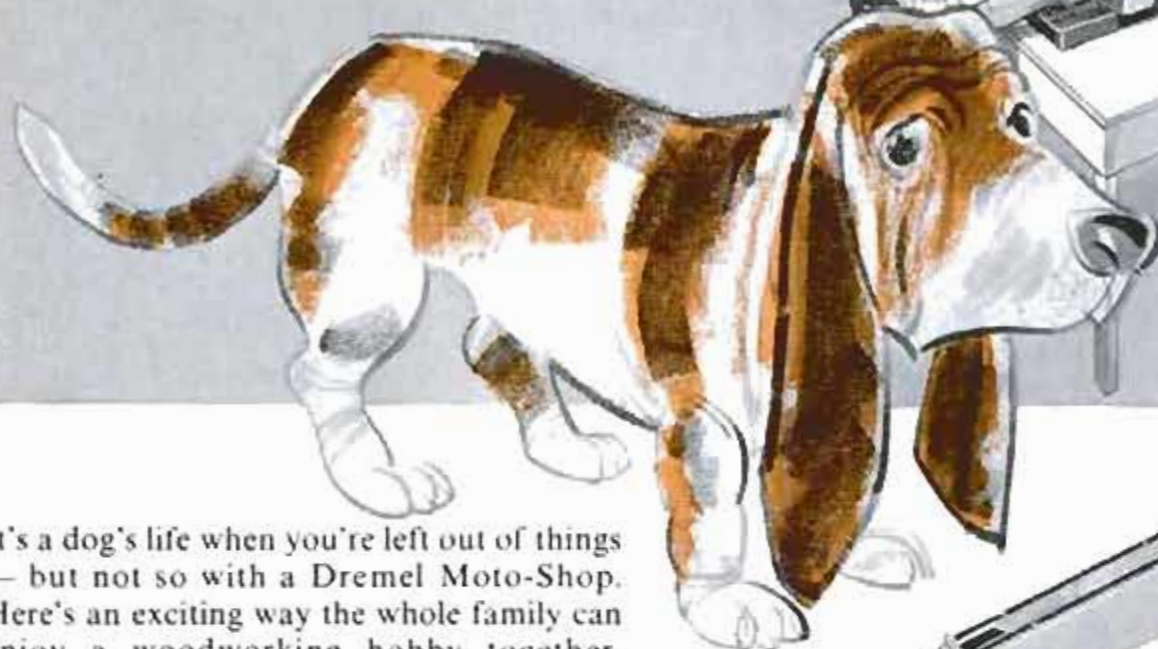
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Model 571 Moto-Shop. Includes 15" Jig Saw with disc sander attachment only as shown above . . . \$33.95

Model 572 Deluxe Moto-Shop. Includes 15" Jig Saw with disc sander, grinding wheel and guard, wire and cloth buffing wheels, a 12 piece accessory set, and 30" flexible shaft (grinds, drills, carves, polishes, engraves, sands, sharpens) . . . \$49.95

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in a front yard (though usually it must be set back at least five feet from the property line).

Cornices, sills, canopies and other architectural projections (but not bay windows) may often extend into a side yard. One code says, "but they may not project more than two inches for each one foot of side-yard width."

There's scarcely a project around the home which doesn't fall under your building code. You can, for example, fence your yard without getting a permit. Regardless, its height and placement must hew to the code. Generally you can build platforms, walks and driveways as long as they're not over two feet above ground nor constructed over the basement. You can put up flagpoles, towers and radio antennas, but they can't be over 45 feet high, nor attached to a building. You can build patios, yet they must comply with the code.

To help the homeowner comply, many cities have compiled easy-to-understand fact sheets. Among the dozen fact sheets available at no cost to the homeowner in Los Angeles, some detail minimum specs for low retaining walls, foundations and even one and two-story houses. One, for example, explains allowable fence heights on residential lots. Drawings simplify and interpret the code, telling the do-it-yourselfer all he needs to know about fences. (If yours is an "inside" lot set between adjacent lots, your front-yard fence may be no more than 42 inches high. But you may fence your backyard to a height of six feet).

Another fact sheet tells you how to build a detached garage. Drawings show how supporting posts should be centered, how many nails of what size must be used, and where. You're told, for example, that corner braces should be one by sixes. These are *minimum* requirements. If you want to use more than the required five eight-penny nails to secure the braces, you may. But you can't use less and stay within the code.

Instructions for Patio

Still another fact sheet for do-it-yourselfers explains how to put up a patio addition. Drawings indicate, for example, that you should use four by four-inch posts to support the patio's roof. And further, that the posts should be set on 12 by 12 by 12-inch concrete piers.

Building inspectors have made it unnecessary for you to thumb thru the 300 pages of the "Uniform Building Code." You're handed the rules on a single instruction sheet.

Nor does your building department stop there in catering to the fellow who hankers to build. Some inspection offices supply ready-made plans for projects ranging from two-story houses to fireplaces. You simply fill in the blanks with your project's dimensions and ask the inspector to approve them.

Filing for a building permit is almost as easy. Either by mail or in person you make application, detailing what it is you want to build. You may be told that your project doesn't require a permit (in which case, the inspector simply explains the code, hands you a fact sheet covering your project and sends you home to start work).

If a permit is required, you'll be asked to draw a plot plan (the scale usually $\frac{1}{8}$ to $\frac{1}{4}$ inch to the foot). For simple home-projects (a breezeway, attached patio or remodeling) the building office may accept your own or a draftsman's plans, or plans from a magazine. Some offices, as I've mentioned, have plans already drawn which need only the insertion of your project's measurements. For elaborate or complex construction—anything "major"—you need an architect's plans and services.

For the average home project such as an attached patio, the building office will need a week for plan checking. If corrections are warranted, they'll be noted. And you'll be told to correct your drawings and return them for another look.

Once plans are approved and you've paid the plan-checking fee, you'll be issued a building permit. The permit fees, like local codes, vary. The average cost on a \$1000 project shouldn't exceed about \$6.

With your permit—your green light to build—you'll be given an inspection record card. The card is posted on your project, and must be available to the inspector.

Visits by Inspector

Modest home projects—a retaining wall, for example—may require only two visits by the inspector: one when you have the forms built and reinforcing steel installed, and another when the wall is finished.

Major projects require at least four checks of your workmanship and progress.

Foundation inspection is made *after* you've dug trenches for the foundation, have erected forms and installed reinforcing steel, but *before* you've poured concrete.

Framing inspection is made *after* all wood roof, wall and floor framing, fire-blocking and bracing are complete and all pipes, rough plumbing, chimneys, wiring and vents are in, but *before* you've placed any interior wall covering (rough-in plumbing and electrical work require, un-

(Continued to page 282)



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UNSCREW upper assembly, drop a Remington "Power-Guide" Stud into barrel, insert chamber bushing and proper 22 caliber Power Load.



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der most codes, the services of a licensed plumber or electrician).

Plastering inspection is made after all exterior, fire-resistive and structural plaster backing is in place but before you apply plaster or stucco.

Final inspection is made after your project is completed and ready for occupancy.

Nor should the home craftsman be vexed if the inspector spots a code violation and asks that it be corrected. The fact is that licensed contractors and professional craftsmen who've been years at their trades are almost as often found in error as the fellow putting up his first project. The inspector isn't infallible either.

Classic is the swank men's club in Oakland, Calif., which was completed some years ago, ready for tenants, before it was discovered that the contractor had forgotten to install bathrooms (nor had the building inspector been more perceptive).

More recently, a contractor putting in massive concrete piers for a multimillion-dollar university building couldn't savvy the architect's logic in designing some one size, and some another. Unhappily for the over-zealous construction man, the architect was on firm engineering ground. The contractor built all the piers alike—a boner far more costly than any homeowner's.

The fact is that homebuilders are often excellent craftsmen. Yet too often they transgress the code, jeopardizing the very projects on which they've spent months of effort and hundreds of dollars.

Not long ago I was summoned to a home on the complaint of a neighbor who objected to "what the people next door have done to their garage."

The people next door had done wonders. They'd converted the garage to a paneled den, its glass doors opening onto a patio.

They'd also broken half a dozen laws. They hadn't bothered to get a building permit (their project's evaluation exceeded \$100). Just as unwittingly, they'd violated one of the most basic of residential codes: Having converted their garage, they'd literally put the family cars out on the street. Yet the code demanded garaging of one kind or another for the car.

Even after they'd paid a fine for building without a permit, the homeowners had to choose between returning the garage to original use or investing in a detached garage. Luckily, they had space enough for the detached unit. But the fine, construction corrections and the new garage cost them hundreds of dollars.

To get in step with their codes they'd have needed to spend only a dime—the price of a phone call to their local building office.

★ ★ ★

How safe are your shock absorbers?



Shock absorbers are as important to *safety* as they are to comfortable riding. They stabilize your car, keep wheels from bouncing off the road, prevent erratic steering and side sway.

Shocks wear so gradually that you aren't aware of ride deterioration. Sometimes, it takes an accident caused by loss of control to point up the danger of worn shocks. Don't wait for that to happen.

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Picture Books for the Blind

(Continued from page 142)

bitious was a wall relief map of the world, complete in detail down to identification of countries in Braille lettering, major mountain ranges, rivers and oceans.

Miss Taft chose pieces of variously textured cloth to separate the countries and make them distinguishable by touch. Russia and her satellite nations, for instance, were patterned in corduroy. West Germany was represented by smooth muslin. Plaster was used to form mountain ranges.

The map was made in sections because of the limit of the molding oven. When baked, cooled and hardened, the plastic sections were glued together and stapled on a plywood backing.

The possibilities of future projects appear limited only by the imagination of a creative mind. Miss Taft, an oil and water-color hobbyist, envisions the day when famous works of art may be reproduced in Braille for sightless art lovers to "see" for the first time.

Today, it is estimated, there are about 6000 sightless children under the age of seven, and more than 300,000 blind or partially blind persons above that age, in the United States alone. In the world, the

number of sightless has been variously estimated between seven and fourteen million.

Like the Braille system in its baptismal years, Miss Taft's picture process is not without its mechanical problems. They will have to be solved before mass production is attempted.

For example, the die materials must withstand the molding oven's heat without catching fire and must yield their surface configuration on the plastic. Miss Taft says only about ten copies can be obtained from each die before it is unfit for use.

The response to the new process has expanded a onetime hobby into what is now a full-time occupation. Friends are sending Miss Taft all sorts of new materials (A recent donation yielded two gunny-sacks!). When she develops a faster system for making the dies, and is able to obtain more copies in the baking process, she hopes to expand the ideas beyond the Southern California area, where the demand for Braille Illustrated now is far beyond the supply.

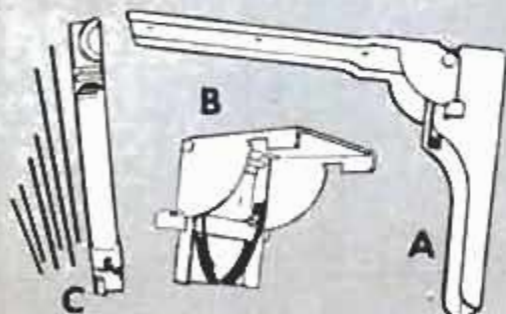
Like the invention of a determined Frenchman a little more than a century ago, Miss Elsey Taft's hobby has lighted another candle in a darkened world. ★★ ★

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8-inch diameter
\$3.98
will be
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KARBO GRIT RIM CUTTING WHEEL

- 6 1/2-inch diameter 2.65 will be 3.98
Designed to cut with extra speed. Leaves an exceptionally smooth, finished surface.
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Hundreds of tungsten carbide particles are brazed to the edge and sides of the wheel. That means you can saw, dado, shape, sand, and plough all on the same blade! Safe to use, too, because there are no teeth to snag or drag! Designed especially for bench and radial arm saws. Knockout bushed to fit 5/8-1 1/2 inch center hole. 10-inch diameter 6.65 will be 9.98



Karbo Grit 10-inch Flat File 1.32 will be 1.98
Files in any direction. Coarse on one side—medium on the other. Wide-spaced grits give self-cleaning action. Wood handle. #3001
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Karbo Grit Hand Sander 92¢ will be 1.39
Outlasts hundreds of sandpaper sheets. 2 3/4 x 5 1/2-inch platen with felt back-up pad. Fine or medium grit. #3002

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The PM Indoor-Outdoor House

(Continued from page 151)

located between the kitchen and the family room.

Efficiency is the keynote of the kitchen itself. In a relatively small area there's an efficient food-preparation area, a table for a quick breakfast, a laundry room and even a toilet near the side door (a must for children).

Feature for Mom

Any mother will appreciate one feature of the house above all others: From the kitchen, without moving anything but her head, she can keep a supervisory eye on the play yard outside, the family room-porch and even the patio just beyond. Thus she has complete control over the natural play areas. Furthermore the basement stairway is only two or three steps away. Strangely enough, despite the view, the kitchen has its own form of privacy. Work counters a mess? They are completely screened from the dining area and even from the eating area on the family room-porch.

In the sleeping wing are a large master bedroom and two smaller bedrooms. One feature of the master bedroom that Dad will like (Mom, too!) is the dressing alcove including basin, toilet and shower. And take a look at the generous closet.

One entire wall of the master bedroom is glass. As a matter of fact, Dart obviously uses huge expanses of glass to achieve the feel of the outdoors inside the house. Every room, with the sole exception of the kitchen, has at least one entire wall of glass. When you're inside, the outdoors seems part of the room. When you're outside, there is no visual barrier to the interior.

But even outdoors, there's a need for privacy. The design of the house and its placement on the lot (see page 150) lends itself to privacy. The house itself visually shelters the patio-pool area. A landscaping screen along the lot line can insure complete privacy if desired.

The house has one big plus that isn't apparent at a glance: It's expandable. To a growing family this can be of great importance. Additional bedrooms can be added by extending the bedroom hall. The master bedroom then becomes a child's room, and at least two additional rooms can be added. A glance at the floor plan will indicate how readily this can be done.

That's the PM Indoor-Outdoor House. Ed Dart calls it one of the finest he has ever designed for privacy and fine living, outside or in. We think you'll agree. ★ ★ ★

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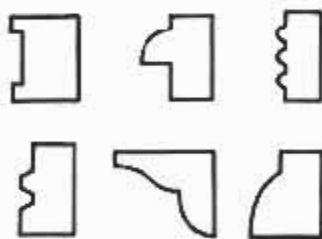


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If bought separately, would total \$21.69

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6 3/4"	3/4" x 3/4"	\$ 8.95	\$6.95
8"	3/2" x 3/8"	\$ 9.95	\$7.95
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Make Sears your saw blades headquarters. The selection is complete—the prices are below all comparable-quality blades sold elsewhere. Buy Craftsman Blades at the Craftsman Home Workshop Display at your nearest Sears Retail Store... or order from Sears Catalog, by mail, phone or at your nearest Sears Catalog Sales Office.

BUY TWO AND SAVE! CRAFTSMAN KROMEDGE BLADES



2 for **\$3.88** or \$2.19 each.

6 3/4" & 6 1/2"	reg., \$2.29
7 1/2"	reg., \$2.49
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10" Blades

2 for **\$5.99** \$3.29 each

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for
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Next time you see a carpenter, plumber, steam fitter, sheet-metal worker at work, take a look at his rule.

Ten to one you'll see a Lufkin Red End . . . and often it will be the handsome X-46, with 6" brass extension slide.

Men who do quality work prefer quality tools. They like the old-fashioned character of a natural finish as used on the X-46 . . . the quality-look of gleaming joints and strike plates . . . the precision-look of sharp graduations.

Pick up an X-46 at your hardware store. One close look at it, and you'll want it. Buy it right then.

*You'll find a world of
LUFKIN measuring tools
at your hardware store.*



LUFKIN RED END RULES
TAPES • PRECISION TOOLS

Electric Heating Is Here to Stay

(Continued from page 162)

one solid heating element. Such units become warm, but not too hot to touch, and can be used as highly decorative wall panels. Although these elements produce some true radiant infrared heat, most of their work is done by air-warming convection.

Panel Will Heat, Cool and Light

Most fabulous harbinger of things to come, along this line, is Westinghouse's full-scale wall panel that promises to light tomorrow's house while also heating and cooling it. Still a laboratory guinea pig, the hot-cold glass wall (or ceiling) works from a set of dials that controls its temperature from a low of 55 degrees to a high of 120 F., and changes the color or intensity of its glowing "electroluminescent" light at will. "Your living room could be flooded with white or gold light during the day," explains C. J. Witting, "then converted to soft blue tones for evening." The entire unit operates from tiny thermoelectric cells that are a part of the artistic design superimposed on the huge decorative panels.

More complex than the electric-resistance house heater is the heat pump. This gadget is nothing more than the familiar air-conditioner, designed to work both ways. In summer, the pump cools your house by extracting heat from the air inside your home and pumping it outside where a heat exchanger gives up the heat to the outside air. An electric refrigerator does the same thing, and if you don't believe it, just slip your hand behind the box sometime when it's working.

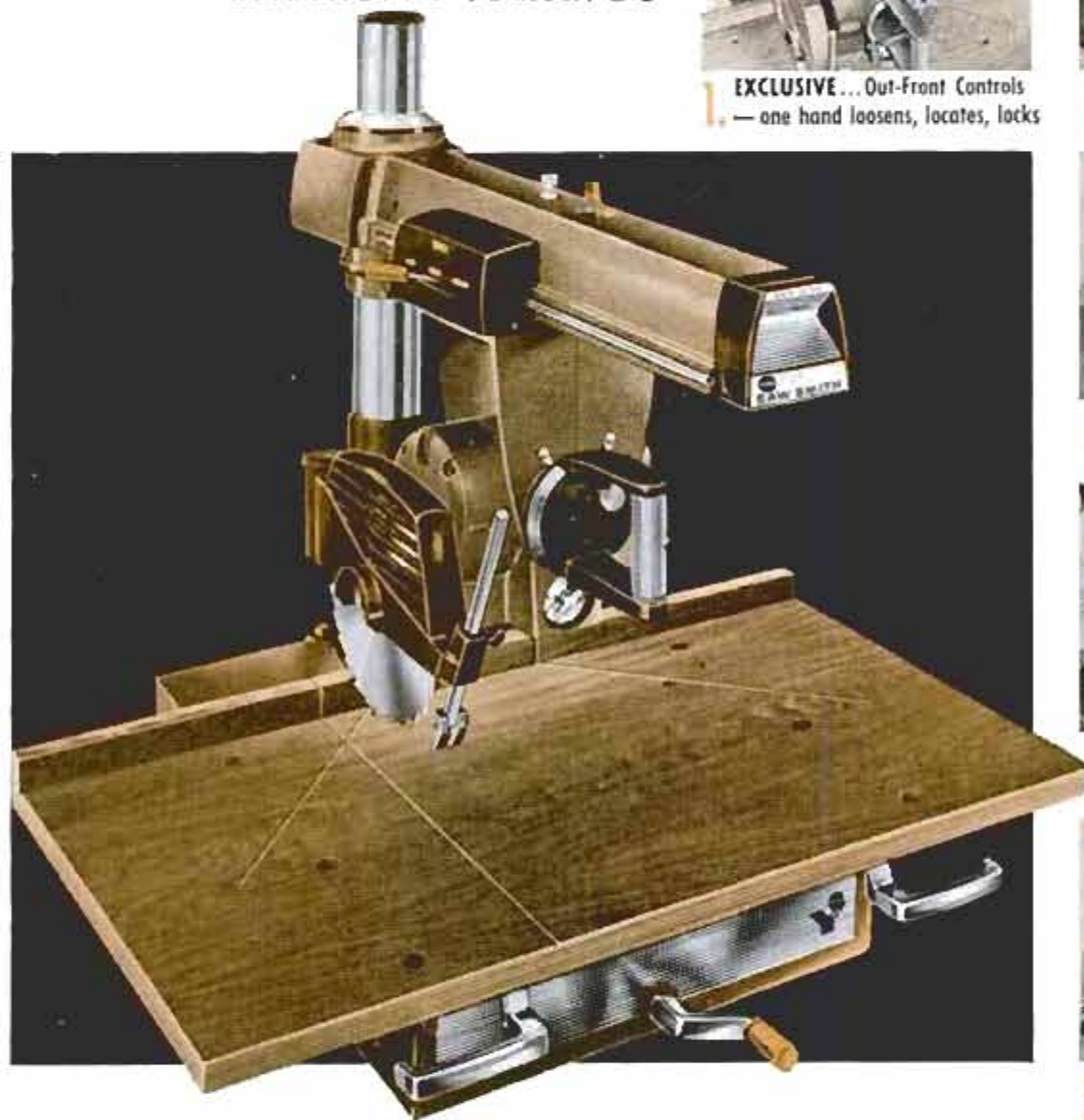
In winter, the refrigeration cycle on the heat pump is simply reversed. Heat is extracted from the outside air (just as a refrigerator extracts heat from the ice-cube compartment), and is circulated back into the house. Even in zero weather, there's enough heat in the outside air so that, when passed through the unit's compressor, it yields enough warmth to raise the temperature inside the house. Actually, heat pumps can be rigged to draw heat from underground water supplies, and even from deep dry wells drilled in the earth.

Big advantage in heating with a heat pump is that simply by throwing a switch it provides cooling in summer. New, glamorous units, with remote compressors that can be located in a garage or other out-of-the-way spots, are designed for recessed installations in walls and book cabinets. They look no more obvious than a recessed steam radiator. One disadvantage of this

(Continued to page 294)

TRULY NEW...ALL NEW...from **YUBA**
SAWSMITH Radial Arm Saw

with the
BIG 5
 exclusive features



1. **EXCLUSIVE... Out-Front Controls**
 — one hand loosens, locates, locks



2. **EXCLUSIVE... Vari-Speed Drive**
 — 7 speeds, not just one



3. **EXCLUSIVE... Switch-Over Blade**
 — puts all cuts fully on table



4. **EXCLUSIVE... one-piece Sliding Table**
 — no fence-fumbling



5. **EXCLUSIVE... Coil Cord** — safely and always out-of-the-way

Now... do it *yourself*—do it better—on a SAWSMITH. It's the newest radial arm saw... *does* so much more but costs *no more*. The exclusive Big 5 features put new ease into every phase of woodworking. SAWSMITH makes home craftsmanship so simple you do a professional job the *very first time!*

You just decide and guide. SAWSMITH furnishes skill and precision for *fourteen* basic operations, does hundreds of jobs... enables you to convert instantly

from one operation to the next. It's the *only* saw with the right speed for every power sawing job—from softest pine to toughest oak.

Whether you're a hobby-man or handyman, you'll find SAWSMITH a revelation in time and money-saving... a responsive tool for creative man-type talent.

See it at your dealer or Montgomery Ward store. For literature on SAWSMITH's exclusive BIG 5 features and 25 extra values, write Dept. RPM-10.

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 of world-famous
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 A Subsidiary of
YUBA CONSOLIDATED INDUSTRIES, INC.



Your
invitation
to outboard
living

1960

**9 Great New Models —
6 to 80 hp. — New Single-
Lever Remote Controls!**

Hanker for the scent of pine on a mountain lake or the salty tang of an ocean breeze? Mercury gives you a new definition of outboard living. Fishing, skiing or cruising, you'll command the world's most advanced outboards — *all-new* from controls to props! Your Mercury dealer is ready to open the doors to adventure for you *today!*

- **Powerful Sixes** — 80 hp Merc 800, 70 hp Merc 700, 60 hp Merc 600, World's most powerful family outboards.
- **Fabulous Fours** — 45 hp Merc 400, 35 hp Merc 300. Smoothness and fuel economy unmatched by "big-bore" twins.
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MERCURY

World's No. 1 Outboard!



NEW SINGLE-LEVEL REMOTE CONTROL FOR TWINS, FOURS AND SIXES! *One* hand commands Mercury power, with the world's fastest, safest, easiest-to-operate remote controls — combine throttle, forward, neutral and reverse. Six cylinder model controls incorporate starting as well!

NEW FIXED JET CARBURETORS ON EIGHT MODELS! Eliminate troublesome high-speed needle valves, guarantee efficient carburetion throughout the speed range; no adjustments except idle, as on your car!

NEW PROP-JET EXHAUST! On 80 and 70 hp models and *Glide-Angle* Twins, submerges exhaust noise and fumes under water, far aft of boat.

NEW IN-LINE ENGINES! Modern small-bore, short-stroke design that delivers the most horsepower per pound, per cubic inch.

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80 hp Six-in-Line . . . new leader of the world record line!

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Address Dept. PM-10





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**WORLD'S
FAVORITE**

powered models—with
the world's easiest starting engines!

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Ready-to-Fly Models

IF YOU LIKE SPEED, you'll like model flying... the Thimble-Drome way. On the end of a control line, Thimble-Drome's LI'L STINKER or SUPER CUB 105 going 45 feels like it's doing 150 mph! Even if you're a beginner a Thimble-Drome flight tested plane will let you perform realistic flight maneuvers, loops and wing-overs, after just a few practice flights. And there are no hours of tedious construction—Thimble-Drome planes are fully assembled, ready-to-fly!



"Li'l Stinker"

Fully assembled—
with engine



\$9.00
Sug.
Ret.

YOU CAN ACTUALLY FLY IT IN YOUR BACKYARD! The world's first ready-to-fly biplane, Thimble-Drome's LI'L STINKER, has a wingspan of only 10 in., fuselage of 9 1/2 in.! Yet every detail is complete—wing struts, covered landing gear, wing and body realism. The engine is the world's smallest—Thimble-Drome's fabulous PEE WEE .020 with displacement of less than 1/50th of a cu.in.—the size of a pencil eraser!



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WORLD'S LARGEST SELLING MODEL PLANE. Thimble-Drome's model of the PIPER SUPER CUB 105 has outsold all other models because it starts faster, flies better, and lands more smoothly. Beautiful chrome yellow plastic, contrasting blue struts and tail, enclosed cabin, official C-A-P insignia, Thimble-Drome .049 BABE BEE engine... a BIG 17 1/2 inch beauty!



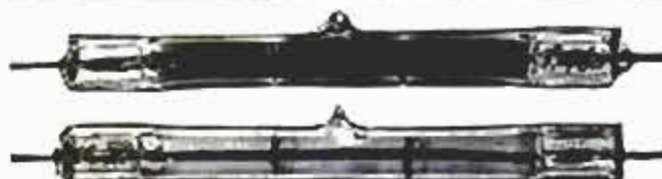
Thimble-Drome
GLOW FUEL
for finest
performance
PINT 95¢ ... 1/2 PINT 50¢

CHOOSE FROM THESE and other flight-tested Thimble-Drome models at your favorite hobby counter.

If not available locally
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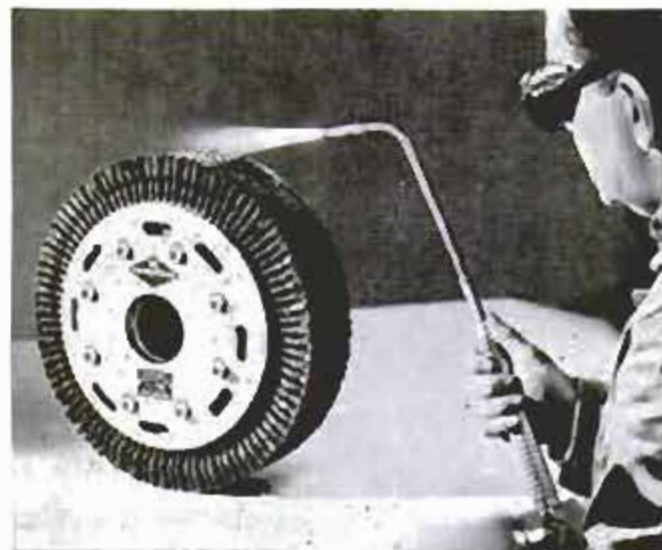


Iodine Prevents Lamps From Growing Dim

New tubular quartz lamps won't blacken because they have an iodine cycle that re-deposits the evaporated filament. The lamp is 200 times smaller than the standard industrial lamp but gives 10 percent more light in its life because it never dims. The lamp at the top had no iodine and darkened after two hours. The one at the bottom included iodine and was clear after 1000 hours.

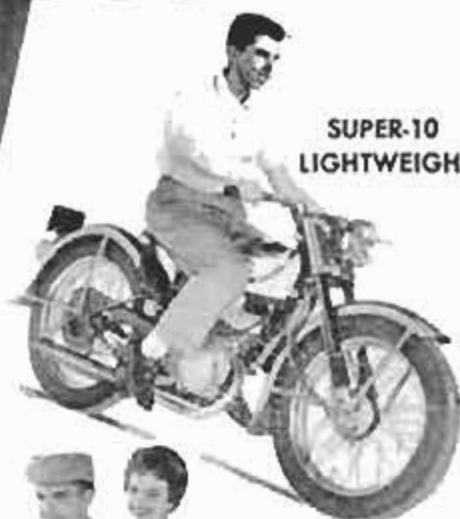
Tire Never Needs Air

Made entirely of wire, a new tire will be used on space vehicles passing through the thermal barrier on re-entry into the air-mass. The tire can withstand temperatures in the 1000 to 2000-degree F. range.





SPORTSTER



SUPER-10
LIGHTWEIGHT



TOPPER



DUO-GLIDE

Choose
your
FUN
RIDE

from Harley-Davidson's "all-round" line for '60

DUO-GLIDE — Harley-Davidson's finest is the luxury cruiser of motorcycles. Smoothest ride on two wheels. Newly styled and engineered for 1960. Available in the FL series or super-powered FLH models.

SPORTSTERS — H Model (shown) for highways or byways — rough going or smooth. Also Sportster CH for "driving" through the rough in "off-the-road" competition.

NEW SUPER-10 LIGHTWEIGHT — Harley-Davidson's newest wheels for the young and young at heart. Ideal for work, school and play. Exciting new styling. Up to 80 miles per gallon.

NEW TOPPER SCOOTER — Tops all others in beauty and performance. Fashioned in gleaming chrome and fiberglass. No shifting

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Perfect Mating of Man and Machine

or clutching with *Scotaway* drive. Low center of gravity makes for easy handling.

In '60 more than ever before, there's a Harley-Davidson for every purse . . . every purpose. We've added the new *Super-10* Lightweight and *Topper* Scooter. We've made the famous *Duo-Glide* and *Sportster* better than ever. See the all 'round line for '60 at your dealer's now. He'll show you how easy it is to own a Harley-Davidson with his easy-pay plans. Or mail the coupon for free, colorful folders.

HARLEY-DAVIDSON MOTOR CO.

Dept. P, Milwaukee 1, Wisconsin

Please send me information on

Duo-Glides Sportsters Super-10 Topper

Name.....Age.....

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device is the fact that the colder it gets, the less heat becomes available to a heat pump operating on outside air. Hence, in colder climates, heat pumps must generally be augmented with some resistance heaters as well.

Electric heating can be as elaborate as you want it. If you like central heat, you can get that with electricity, too, plus all kinds of fancy wrinkles.

Several familiar furnace companies are producing electric furnaces with resistance elements in modules for any heat output needed up to 123,000 British Thermal Units. Such electric units, which sit in the basement like any furnace, deliver warm air through ducts to various rooms in the house. Some even come in modular sections. If you want central air conditioning, just add it to the pile. The cooling coil fits right into the furnace assembly, while compressor units are located somewhere outdoors. Electrostatic air filters can be clipped into place just as easily to remove the dust from your house, if you're interested. And if controlled humidity is important, you can slip an electric humidity-control in the assembly whenever you want.

Set it and Forget it

Besides doing away with things like soot, chimneys, cumbersome radiators and expensive steam-fitting, electric house heating has a number of appealing advantages. Its inherent automatic features make it possible to set it once and forget it for a season. Some of the new control panels for complete home systems look like small radios recessed in the wall, and are easily set with dial controls. Their flexibility goes beyond "zone heating," to allow control of heat for each room in the house individually. When you want heat, there's no muss or fuss. Just flick a switch. The heat is clean, flameless and hence requires no oxygen supply. Resistance units are completely noiseless, and even heat pumps are reasonably quiet.

Until now, the one big disadvantage has

been operating cost. Much of the steam behind the geysering growth of electric heat comes from special low rates many power companies have established to encourage its growth. In the Chicago area, Commonwealth Edison cut its rates 30 percent for all owners of electrically heated homes. As a result, the annual cost of heating those new three-bedroom houses in St. Charles is about \$240. Heating with gas or oil in the same area would cost between \$125 and \$150.

Most power companies are enthusiastic about electric heating because it helps balance their load output. The boom in air conditioning has put their peak loads in summertime, while in winter they have more generating capacity than customers can use. Heating a three-bedroom house around Chicago with resistance units takes about 16,000 kilowatt hours per year, and that's a lot of juice.

Actually, while resistance heating systems are far cheaper than any other to install (about half the cost of conventional systems), they are far and away the most expensive to operate. Heat-pump systems can cost several times more than even an oil or gas-fired system (steampipes, radiators, chimney and all), but they use considerably less operating current. The Carrier Corporation estimates that in Portland, Ore., at the going utility rate, it costs \$113 annually for a 1200-square-foot house to be cooled in summer and warmed in winter with its heat-pump system. In Roanoke, Va., where utility rates are higher and temperatures more moderate, the same service would cost \$266.

And, for all electric heating systems, the house must be adequately sealed with vapor barriers and additional insulation to prevent heat loss—all of which bumps up the price of this new luxury.

But as rates are whittled down, and manufacturers devise more ingenious and less voracious juice-gobbling units, there's little doubt that electric home heating will become more and more popular. Already there's no doubt that it's here to stay. ★★★

Days Are Growing Longer

If a clock had been set at the time of the birth of Christ and kept running accurately through the past 2000 years, it would be two hours fast today, report two California geophysicists. Following a line of investigation started by the 18th century English astronomer Edmund Halley, Professors Walter H. Munk and Gordon J. F. MacDonald have calculated that our days are growing longer at the rate of one hundred-


thousandth of a second each day. The cause of this phenomenon is the gradual slowing of the earth's rotation. The calculations were made by measuring successive transits of the sun or a star across the zenith. The most-popular explanation for the slowdown is that the ocean tides cause a loss of energy, but Munk and MacDonald disagree, though they have not yet found any other explanation.

For that "FACTORY FINISH"




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BELT
SANDER
KIT
A 4-STAR
TOOL!**


The most versatile sander you can own. The Porter-Cable Belt Sander not only gives you "professional finishes" — fast . . . it is a real time-saver for heavy stock removal, fine cabinet work, home remodeling, paint and varnish removal, boat work, rubbing, polishing, sharpening, etc. Extra quality features include: precision spur gears, ball bearing construction, and neoprene-covered drive pulley. A professional-quality tool especially priced for home craftsmen and hobbyists.



Ideal for sanding broad surfaces. With correct abrasive, sander quickly fits doors, storm screens.



Quickly removes paint or varnish. With felt and canvas belts, it does a professional job of polishing and rubbing.



With Bench Stand, sands curved edges, small pieces. Also sharpens knives, chisels, tools.

**BIG 10-PIECE KIT
FOR ONLY \$59⁹⁵**



Reg. \$67.50 Model 165P Kit includes 2 1/2" x 21" Belt Sander, heavy-duty Bench Stand with miter gauge, abrasive belt, felt belt, canvas belt, 4 rubbing and polishing compounds, and "The Finishing Touch" — how-to-do-it booklet.

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ORDER YOUR SANDER KIT NOW!
SEND NO MONEY!
TAKE SIX MONTHS TO PAY!**

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I wish to order the tools checked below. I agree to pay my Porter-Cable Dealer full price or down payment indicated upon receipt of tool, and the balance in monthly installments shown below.

	Price	Down Payment	Balance Monthly for 6 months
Model 165P Kit	\$59.95	\$11.00	\$8.65*

*Includes Service Charge

This offer good only in U.S.A., Hawaii and Alaska. State and local taxes applicable. (Void where prohibited, license required or otherwise restricted.)

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CRESCENT ADJUSTABLE WRENCHES



Crescent offers unequalled value, performance and selection in Adjustable Wrenches. Choose CRESTOLOY for greatest strength and finest finish in 4" to 24" sizes, single and double end patterns; CRESCENT for toughness and durability at lesser cost in 4" to 18" sizes. Also insulated handles on the 12" CRESTOLOY. See CRESTOLOCK, the new locking adjustable wrench.

Sold by hardware dealers everywhere.



Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

CRESCENT TOOL COMPANY, JAMESTOWN, N. Y.

30,000,000 Ties to Handle

(Continued from page 135)

tie was carried by one man, moved to the processing end of the plant in the same manner, and from there to shipment.

Rising wages and the increasing difficulty of finding men strong enough to carry ties weighing 200 to 275 pounds forced all wood-preserving companies to think of mechanical handling. A group of devices was designed to reduce manual labor.

The operations may be briefed in this order: (1) unloading green ties from box cars, (2) sawing to length, (3) drying in the yard, (4) adzing and boring and, finally, (5) preservation and shipping.

Green ties are ricked in the yard for drying, and each tie loses about 50 pounds of moisture. This opens the grain for deep penetration of the preserving liquids. Free circulation of air through the ricks is imperative, and eight ties are placed in each layer, with wide spaces between them. A stringer tie is laid crosswise under one end of each layer, first at one end and then at the other, providing still more air spaces.

The basic idea is to lift a layer of ties, complete with its stringer, as a unit.

Car Unloader

A heavy, three-legged frame is mounted on a concrete foundation alongside the track. It has a retractable boom mounted at the top, which is moved in and out with a motor mounted on the frame. For raising and lowering the load, another motor, with a cable drum, is mounted on the rear end of the boom.

When a car is placed, the boom is projected to reach the far end of the load.

A grapple, designed to pick up five or six ties, is lowered over the pile. The hooks of the grapple naturally swing in to catch, and drop over the ends of the ties. The hooks dig into the ties and lift. The load is racked back along the boom, and the boom is retracted until it can be thrust through the far door of the car. The boom is then racked forward until the load is outside the car. Then the load is turned and lowered and the grapple releases the ties on a chain conveyor.

All movements of the boom and grapple are controlled by a workman by means of an electronic unit slung round his neck.

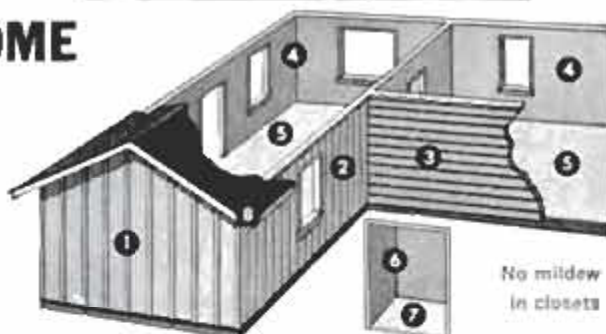
Chain Conveyor

The chain conveyor carries the ties crosswise. As they move along they are engaged by guides that arrange them in position to be cut to length by a saw. A cam arrangement, with a following dog, is timed

(Continued to page 298)

8 WAYS TO REDUCE COSTS AND INCREASE QUALITY IN BUILDING YOUR NEW HOME

For certain applications, the *lowest-cost materials* you can use are the *highest quality* products in their field. This is true of Homasote products—by their very nature and by their wide variety of sizes, forms and thicknesses. Here are some of the savings possible—compared with other standard building materials—on a 3-bedroom house with 1200 square feet of exterior wall surface...



REDUCE YOUR COSTS BY \$515 TO \$1712	1 Homasote Board-and-Batten	2 Homasote Grooved Vertical Siding	3 Homasote 12" Siding
4 Homasote Interior Walls	\$220 to \$1092	\$175 to \$1048	\$110 to \$ 983
5 Homasote Sub-Flooring	297 to 480	297 to 480	297 to 480
6 Closet Walls	34 to 40	34 to 40	34 to 40
7 Closet Floors	29 to 46	29 to 46	29 to 46
8 Facia and Rake Molds	11 to 14	11 to 14	11 to 14
	34 to 40	34 to 40	34 to 40
	\$625 to \$1712	\$580 to \$1668	\$515 to \$1603

Further savings occur, because Homasote methods also reduce application costs.

FREE—HOMASOTE'S COST-REDUCTION ANALYSIS. Send us the plan for your new home—without cost or obligation. We will show you just how these savings can be effected—in your area—on your particular house. Your plan

will be treated confidentially and returned to you. Or—for further details—send 10¢ for the 72-page Homasote Handbook.

Remember— Homasote products increase the quality, comfort and life of your home—as well as reducing the original cost. Kindly address Dept. K-1.

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GENUINE ALNICO MAGNETS

AMAZING, PERMANENT, NON-ELECTRIC, HIGHLY PRACTICAL. Conduct interesting experiments. Hundreds of uses. Retrieve valuable steel items such as guns, tackle from fresh or salt water; tools from tanks & drains. **GUARANTEED.** Try any magnet one week.

- MONEY BACK IF YOU ARE NOT WELL-PLEASED**
- M-710 (Wt. 53 oz.) Has pull of 225 lbs. on steel block... \$18.00
 - M-625 (Wt. 70 oz.) Has pull of 125 lbs. on steel block... \$10.00
 - M-575 (Wt. 18 oz.) Has pull of 75 lbs. on steel block... \$ 7.00
 - M-500 (Wt. 13 oz.) Has pull of 50 lbs. on steel block... \$ 5.00
 - M- 90 (Wt. 5 oz.) Has pull of 15 lbs. on steel block... \$ 3.50
 - M-102 Pocket Magnet. 5 lb. pull. 2 for \$ 1.50
 - M- 47 Hot Pad Magnets. 10 for \$1.00... 50 for \$ 4.87
 - M- 35 Hobbyist assortment of 8 magnets... \$ 2.00

Send M.O. or check. We pay postage. Sorry no C.O.D.'s.
MIAMI MAGNET COMPANY, 3240 N. W. 27TH AVE., MIAMI 42, FLORIDA

POWERFUL!

Man, here's *light!* 1/4-mile beam—15,000 beam candle power. Compact, easy to carry, built to last! Uses two 6-volt batteries. See your dealer. **\$6.75** less batts.



Delta POWER-KING ELECTRIC LANTERN

HANG FIXTURES SECURELY... USE MOLLY Screw Anchors and JACK NUTS

PERFECT FASTENERS to hold anything on walls, floors, ceilings

With Molly you can install fixtures exactly where you want—not just where studs are. Won't pull through. Spider backing reinforces area in which used. Fixtures can be removed and replaced in same anchor. Easy to install without disfiguring wall. Inexpensive, guaranteed. Ask your hardware dealer for genuine Molly—the name is stamped on the cap.

New JACK NUTS HOLD IN HOLLOW-CORE FLUSH DOORS
Now you can fasten fixtures securely to flush doors! Jack Nuts need only 1/4" expansion space, grip any material up to 3/4" thick.

EXPANDS BEHIND WALL
MOLLY Corp. • 200 N. 5th St. • Reading, Pa.

Enclosed is \$1.00 for sample box of (check one) Mollys Jack Nuts

NAME _____
ADDRESS _____
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STOP WINDOW DRAFTS

do-it-yourself
in just minutes

with

Mortite WINDOW WEATHERSTRIP

everything you need...
no tacks or tools
required

only
29¢



JUNIOR BOX 29¢, gives you enough for a single window. For 5 to 6 windows, ask for the **BARGAIN BOX** at only \$1.39.

MORTITE is the unique "FINGERTIP" weatherstrip. Simply press into place—it adheres to any clean, dry surface. Use it around drafty windows—Government reports show cracks and crevices are responsible for up to 25% heat loss in the average home. Use it around uneven screens to keep insects out. Use it as a sealer, gasket, caulker, plugger-upper... there are hundreds of uses around the home, farm, shop, cottage.

- Works equally well inside or out.
- Never cracks, chips or peels.
- Can be painted over.
- Stays soft—unrolls like a ribbon.
- Easily removed—leaves no marks.

LOOK FOR "FINGERTIP" MORTITE
AT YOUR NEARBY HARDWARE
OR BUILDING SUPPLY STORE.

Seals cold out! Seals heat in!

**JUNIOR
BOX**



**BARGAIN
BOX**



Another Home-Saver Product by

Mortell
COMPANY
KANKAKEE, ILLINOIS

with lugs on the chain so the ties move past the circular saw about 30 inches apart.

After this the ties must be spaced on the chain so that when they are placed in the rick there will be free circulation of air. This spacing is done by cams, and dogs on the chain, which retard the forward motion of a tie until it is properly spaced.

The most ingenious trick is getting the stringer tie turned and moved into position under the end of a layer of ties. It is lowered from its preceding position on the crosswise chain on gravity rollers, and then pulled around into place under the end of the layer on a drag chain.

Lifting the Unit of Ties

Another grapple, larger than the one used for unloading cars, is designed for this special "lift." It has extra hooks on all four corners. When the grapple lifts, the hooks catch the ends of the ties in the layer, and also the ends of the stringer. The complete unit is moved outward on a monorail and lowered onto a tram car. The next unit is laid in the opposite direction. A complete rick of 127 ties is thus built up on the car.

The tram train is pulled to the drying yard, where the ricks are taken from the cars. The rick is moved as a unit by a Ross Carrier, or straddle truck. The straddle truck mounts and crosses the railroad track to stand over the rick of ties. It lifts the rick, backs off the track, and moves the rick to its place in the yard. After drying, the ricks are moved out of the drying yard in the same way, and hauled to the adzing and boring machine.

Planning and Results

The new system has brought many gains. A tie yard, for example, is commonly laid out with tram tracks 120 feet apart. For a man carrying a tie, this meant a maximum distance of 60 feet.

Injuries to tie carriers have been eliminated. A number of men used to develop bad sacroiliacs, injured shoulders and other ailments. Lost-time accidents have been greatly reduced in number.

Costs are reduced to negligible amounts for gasoline, oil and electricity. Maintenance expense has been very low. All these charges, along with interest and depreciation, come to seven or eight cents a tie on an output of 300,000 ties. ★★★

☞ If mosquitoes find you especially tasty, it may be that you've been eating bananas. A Philippine researcher says mosquitoes crave serotonin and norepinephrine, and can detect these two chemicals in your perspiration or blood stream if you have recently eaten a banana.

Sao Paulo — the Latin Detroit

(Continued from page 128)

popularity of the Jeep, which is even used for taxi service in some rural areas. Lacking enough good roads, and with some areas entirely without roads, Brazil has relied heavily on air transportation and is reputed to be second only to the United States in volume of air traffic. This despite the fact that flights on many routes terminate before dark for want of airway radio aids and night-landing facilities. Sao Paulo's principal airport is the busiest in Brazil, one of the few equipped for night operations, and is served by 25 airlines of which 14 operate international flights. This one airport handles nearly 8000 scheduled commercial flights per month, carrying 100,000 passengers and 4,000,000 pounds of cargo.

Seaport 40 Miles Away

Forty miles from Sao Paulo is its seaport, Santos, Brazil's busiest. More than 5000 ocean ships clear the port annually with more than 8,000,000 tons of cargo. The cities were first connected by railroad, more recently by a high-speed divided highway. Pipelines climb the coastal escarpment and carry to Sao Paulo the fuel oil and gasoline once moved inland by rail, but the railroad hardly notices this lost business. It is so busy it has put back into service some of the ancient wood-burning locomotives that first hauled trains over its tracks. On the same rails today you are apt to see modern diesel engines, conventional steam locomotives and the early wood-burners all at work.

Sao Paulo may be chilly and damp in winter while sea-level Santos enjoys a year-round tropical climate and so has become, with its adjoining beach communities, a year-long resort area. A typical Paulista business man sends his family to Santos for the winter and joins them on weekends.

The cosmopolitan nature of its population is one reason for its vitality. Sao Paulo began as a Jesuit mission in 1553, became a village in 1660, attained the status of a city in 1711. Beginning about 1870, waves of immigrants from Italy, Germany, Japan, Spain and Portugal moved into the area. A small percentage came from the United States, a number of southern families moving to Sao Paulo after our Civil War. The Paulista today is described as highly industrious, individualistic and independent.

The 4000 North American citizens resident in Sao Paulo are mostly employed by United States companies that have invested a billion dollars in industry here. The Sao



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Patent Pending

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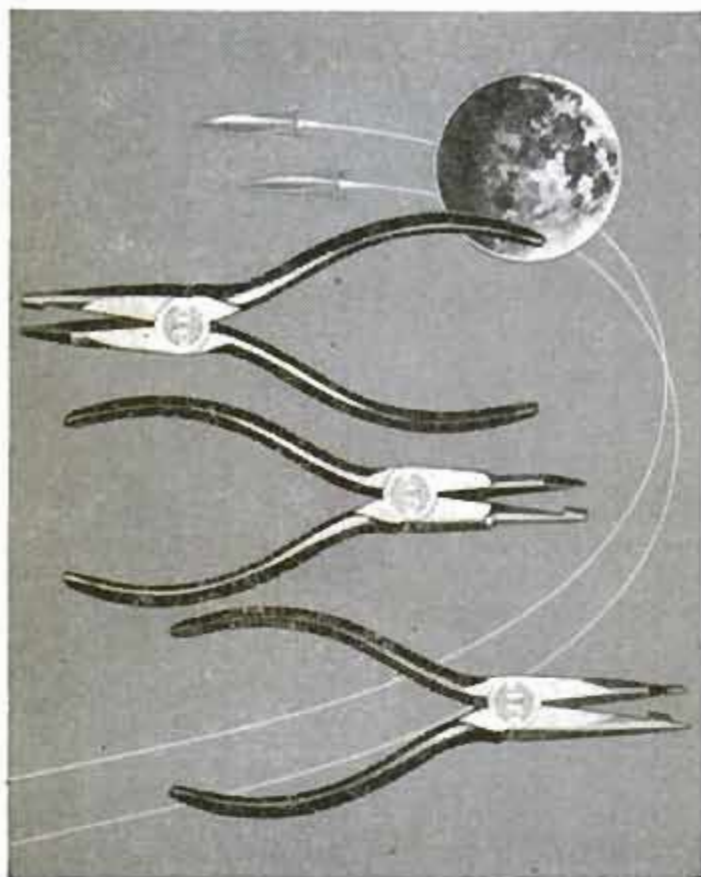
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These three shear cutting pliers cut flush and hold clipped end of sheared wire firmly. Available with spring to hold jaws open.

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Pau American Chamber of Commerce is 40 years old. The Economics Officer of the American Consulate at Sao Paulo answers inquiries about living conditions and trade opportunities. Prospective emigrants to Brazil should remember that while some Brazilians speak English and Spanish, Portuguese is the common language. And they should know that today inflation is such a problem that newcomers may find it hard to make ends meet on an income that would be considered adequate in the United States. One utility company, for example, had to grant its employees a 35 percent wage increase in the last year.

One information brochure for newcomers has other words of caution: It's safer to boil drinking water. Wash leafy vegetables with chemicals before cooking. Bus transportation in Sao Paulo sometimes finds rush hour queues standing in line for an hour. Electric power in residential areas, advertised as 110 volts, may fluctuate between 90 and 135 volts. Water pressure varies. And you may wait a year to have a telephone installed.

But these are the growing pains of a growing city. Sao Paulo and Brazil itself are growing so fast that everything cannot keep up the pace. But it is a progressive pace, and Sao Paulo is racing into a dynamic future. ★ ★ ★

Corvair—The Bold One

(Continued from page 111)

surprisingly soft yet not hammocky. The body generally feels solid, substantial despite its smallness. Entry room is good, especially in front where there is no wraparound windshield to interfere.

Cornering is a pleasant experience. It does it flat and with confidence. There is no apparent tendency to oversteer. It does feel slightly different from a front-engine car, but there are no new skills to learn.

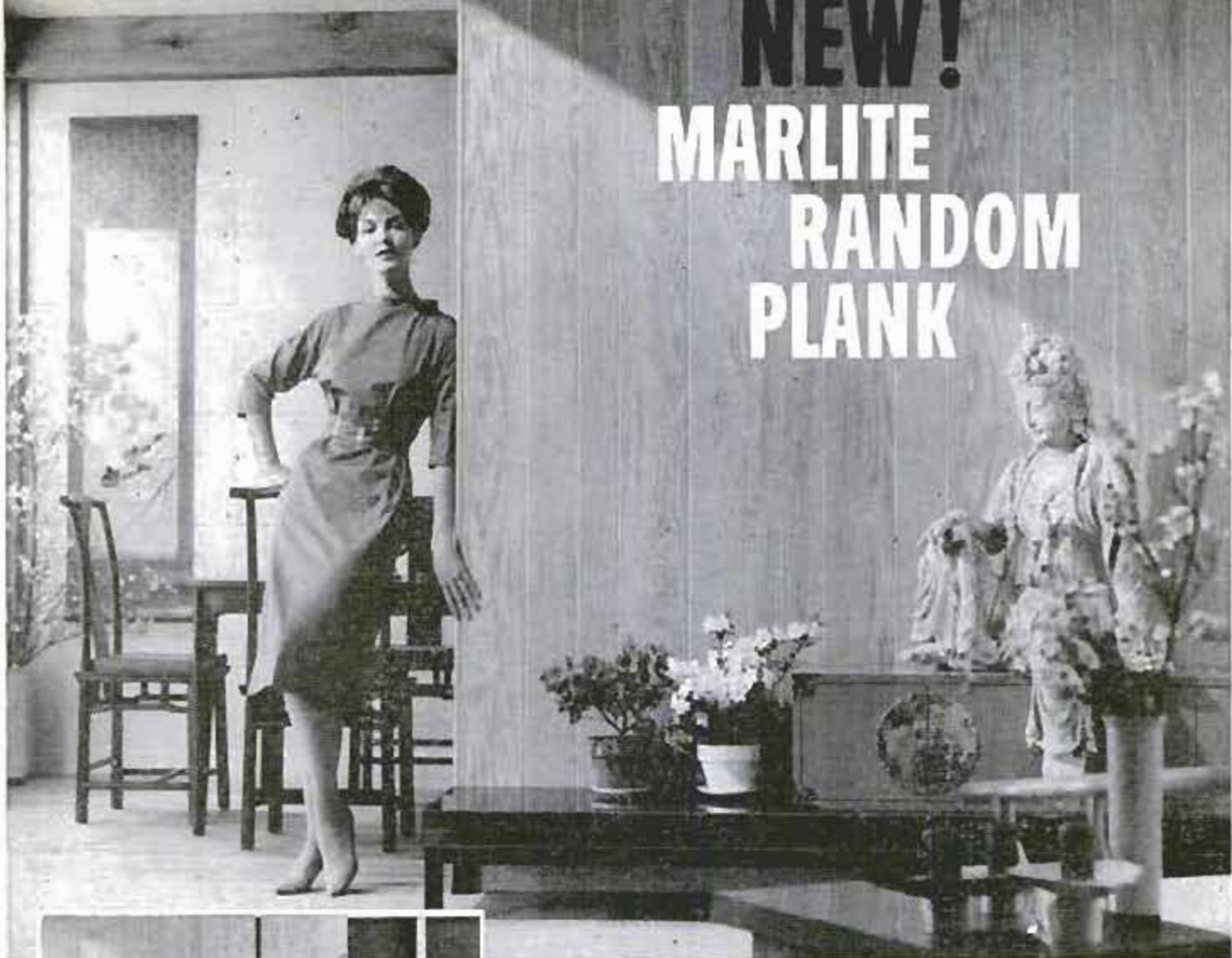
Even braking is fun. From high speeds, there is no dip, the car simply squats down and grabs hold of the pavement.

Seat design is good, although shorties may have trouble seeing over the steering wheel. There are no intrusions by front-wheel housings into the front compartment.

No power assists are available and none seems necessary. Steering is light and, although not extremely fast, is quick enough to give the car an agile character. There is no wheel fight in chuckholes or soft shoulders. Shifting with the floor-mounted stick is a pleasure.

For years, it was felt that rear engines would not work in wheelbases over 100 inches. They said it couldn't be done, but Chevy seems to have done it here. ★ ★ ★

NEW! MARLITE RANDOM PLANK



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You can add extra luxury to any room with new Marlite Random Plank. The 16-inch-wide planks with modern random grooves are eight feet long, 1/4-inch thick—tongued and grooved for easy installation. Six new Trendwood hues (Danish Birch, English Oak, Swedish Cherry, Italian Cherry, Swiss Walnut, American Walnut) capture the beauty of fine hardwoods. And Marlite's baked melamine plastic finish requires no painting or further protection; resists stains and mars; cleans with a damp cloth. See your building materials dealer, or mail coupon below.

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Inventors Are Not Eggheads

(Continued from page 101)

with a given amount of force. It made no difference whether he pulled it back quickly or slowly each time he let it go, it always struck with the same force.

Keeping this observation in mind he proceeded to build up a key action that would remain locked during the initial depressing of the key. He arranged for this original finger energy to be stored in a spring. Then, as one approached the end of the finger stroke, the mechanism unlatched automatically—after which it was this same spring that drove the type. Thus, the same striking force was delivered each time.

Notarize All Changes

(5) *Complete the Invention Disclosure.* Very likely by this time you will have incorporated several changes and improvements into your originally written plan how to solve your invention problem. It is important that the original disclosure be followed by supplementary disclosures describing such changes, each such notarized disclosure clearly referring to its predecessors, to make a connected series.

A vital part of Ayres' invention disclosure in this case was several samples of uneven printing, both originals and carbons, that were made on an ordinary machine to compare them with the even typing available from his improved system. In the case of the ordinary machine carbons became illegible in spots in some cases after the fourth copy sheet, whereas his copies remained easily readable and uniform. These printing samples were likewise each carefully dated and notarized.

"Studied All Means"

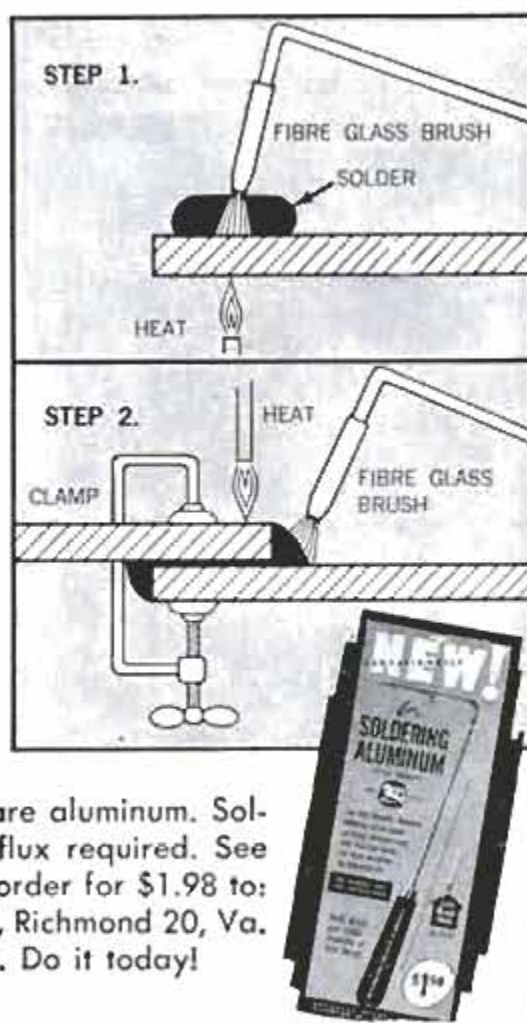
"I've studied all the available means for legalizing conception dates of inventions and I cannot overemphasize the value of a simple notarization," says Waldemar Ayres. "There are those persons who erroneously believe they can accomplish the same thing by mailing themselves a copy, then leaving the envelope unopened. However, when the self-addressed envelope reaches you it is quite apt to have a cancellation date stamped on it that is illegible. Too, in court a good opposition attorney could claim you had steamed the envelope open and changed its contents.

"Some inventors depend upon ordinary witnesses for proof. But you may not know where to find these again when the need arises. (It may be several years later that

(Continued to page 304)

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EASILY, INEXPENSIVELY
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At last, you can do a first-class soldering job on aluminum, right in your own workshop—produce strong, clean, corrosion-resistant joints with Reynolds new soldering brush kit. The secret lies in the stiff fibre glass brush which abrades the aluminum oxide on the metal surface so solder can be readily bonded to the bare aluminum. Soldering is fast, easy, economical . . . no flux required. See your local dealer or send check or money order for \$1.98 to: Mailing Services, Dept. PM, P. O. Box 5027, Richmond 20, Va. Be sure to print name and address plainly. Do it today!



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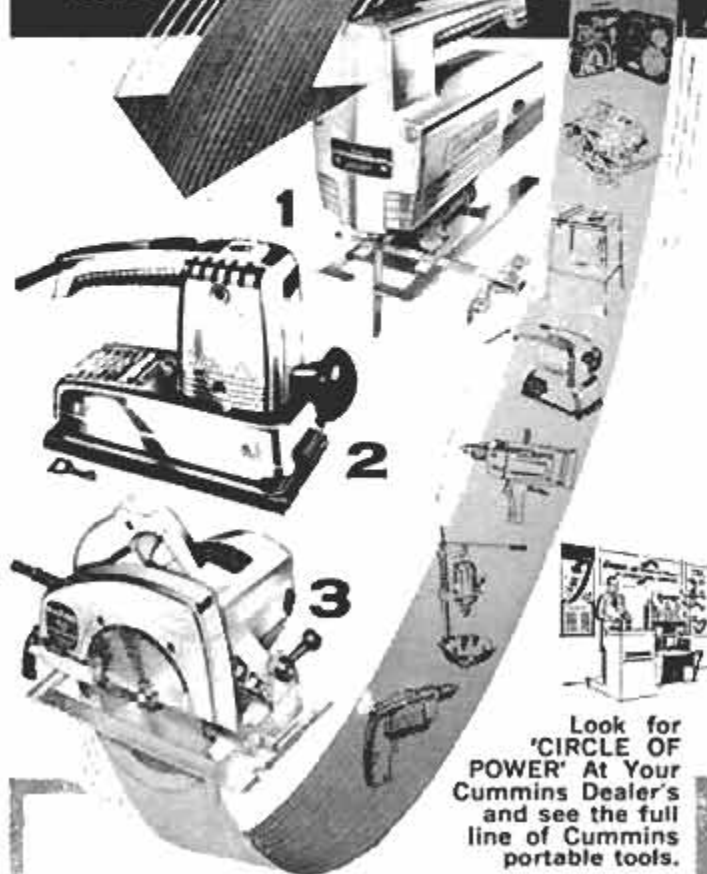
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- 1** Cummins Sabre-Jig Saw\$44.95
NO VIBRATION! Seven saws in one — cuts 2" dressed lumber at 45°, cuts plywood, plastics, leather, even metal. Accurate control.
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an invention is challenged.) They may be dead. Their memories may prove poor, or the opposition lawyer may trip them up. In any event, you'll likely have to pay their expenses to come and testify. On the other hand, the notary public's presence is seldom required in court. He need know nothing about the mechanism or inventing. All you want from him is his certification that the papers in question were shown him by you, a person who had identified himself, on the date that his signature and seal confirms."

Witness Can Help

It is a good idea at this time, too, to have several persons observe your invention in operation, he says. Have notarized statements signed by them to this effect. Try to attach a picture of the invention to each statement and have the notary's seal include a portion of each such photo, too. It will be even better if one of these witnesses is a recognized authority in the field in which you've invented. (Ayres took his improved key action back to the typewriter store from whose repair department he'd originally gotten the parts and the much-impressed owner gave him a letter stating that it was "the first major improvement of the manual typewriter in 50 years.")

(6) *Have a patent search made.* By this time your library research and perhaps guarded questioning of others may have encouraged you to believe there exists no other invention like yours. Next step will be to hire a patent attorney to confirm this by making a "preliminary novelty search" in the Washington, D. C. patent office. In most cases, if the "art" be fairly simple, such a novelty search can be made for about \$50. You should instruct the attorney not to make any additional expenditures without first getting your approval.

Get Copies of Other Patents

"He will provide you with copies of issued U. S. patents closest to your invention, together with a written opinion analyzing your own chance for getting worthwhile invention claims," says Ayres. "The extent of this analysis will, of course, be limited by the small amount you are authorizing him to spend. However, it should be understood that no search made in the patent office is ever complete, even should you spend millions, since under U. S. patent law an invention has to be 'new everywhere in the world,' must never have been 'published,' even in mimeographed likeness, and no one could possibly prove such a worldwide claim."

Your brain child may infringe upon one

(Continued to page 306)

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CAST ALUMINUM • MACHINE-CUT GEARS • PRECISION-ENGINEERED • EASILY INSTALLED • MOUNTING PADS ROTATE 360° • FOR ALL CARTS OR CHUGS.

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3/8" rear axle for 31" tread and 2 1/2" hubs, with castellated nuts.....\$2.95

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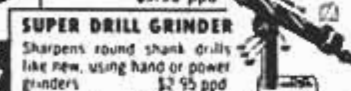
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SUPER DRILL GRINDER
Sharpens round shank drills like new, using hand or power grinders. \$2.95 ppd.

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Complete with Twin Carbon Arc Torch and accessories... to handle all metal-craft work.

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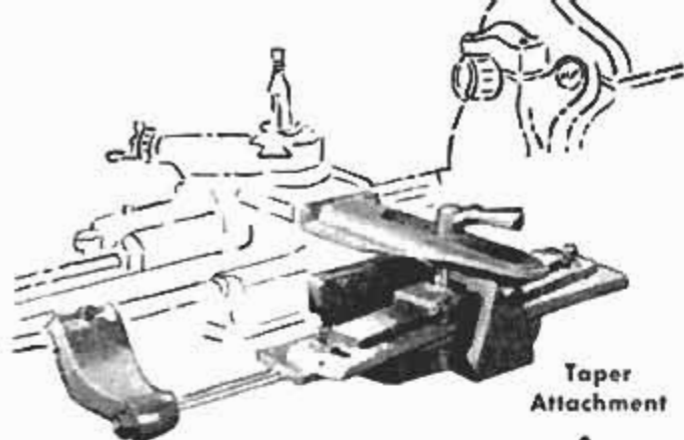
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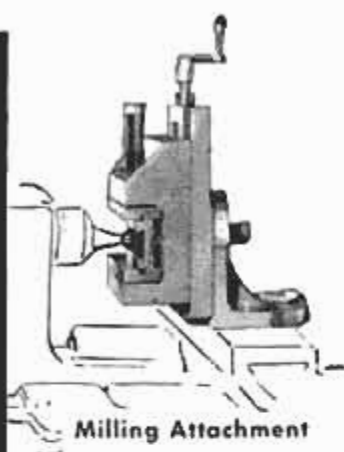
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or more patents already issued, in which case your attorney may recommend that you "design around" these conflicts.

(7) *Build a working model.* You will stand a better chance of getting a patent—and successfully defending it in court later, if necessary—if you will build a working model. Too, in the case of a prospective manufacturer for your product, "seeing is believing." He will have difficulty with a "paper patent" when he tries to visualize changes he may wish to make in styling and production economies. Don't underestimate the importance of attractive appearance, since women shoppers do about 80 percent of the buying in the U. S.

Don't Forget Working Model

A working model is important, also, since it constitutes what is known legally as a "reduction to practice." The law requires that the model be capable of performing all the functions which the complete device would perform. Ayres' single type-writer-key action failed to meet this requirement, since it could type only the letter "y." He and his attorney maintained "diligence," however, by promptly applying for a patent, since this constituted the necessary legal "constructive reduction to practice."

"A great problem — often harder than making the invention itself—is getting the thing sold," says Ayres.

There are several reasons for this, he explains. One is the "NIH Factor" or "not invented here" stigma. It seems that many potential manufacturers, perhaps often unconsciously, are reluctant to invest in something they didn't think of themselves. "It is much as though you, an outsider, were to walk into their plant and say, 'Here, I'm offering you something you weren't smart enough to figure out yourselves'."

Make Your "Product" Attractive

Another big obstacle is that such concerns are understandably reluctant to gamble on expensive changes that will usually be necessary in their production, advertising, merchandising and other programs. You must offer a product so attractive they will still want it, despite such drawbacks.

The inventor has three possibilities, in the following order of financial importance: for earning a return from his patent:

(1) He can *practice his own invention*, that is, go into the business of manufacturing and selling his device. This involves the highest risk, but also the highest potential return. It calls for being a good

(Continued to page 308)

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**NEW HEAVY-DUTY
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Get this handy new set of wood-boring power bits with FREE metal bit holder. Keeps bits protected and in order . . . gives instant size selection. Holds up to 11 bits. Comes to you free with set of six GREENLEE ZIP BITS sizes $\frac{3}{8}$ ", $\frac{1}{2}$ ", $\frac{5}{8}$ ", $\frac{3}{4}$ ", $\frac{7}{8}$ ", 1".

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businessman as well as a good inventor. Many people are not both.

(2) He can license his invention on a royalty basis to some other person or concern who will undertake the business risks of production, promotion, inventory maintenance and all the rest that is involved in placing a new product on the market. If the product is successful the inventor gets the agreed-upon royalty for as long as it is kept on the market. Should it fail, however, his licensee quickly stops payment of the royalties. ("In which case, if your contract is properly drawn, you resume ownership and are free to offer it elsewhere.") This method couples less income for the inventor with less risk.

If You Wish, Sell It Outright

(3) He can sell his patent outright. This offers the least risk — but also the least profit. The purchaser now takes all the risk, giving the inventor an agreed-upon cash payment.

Most U. S. patents are exploited in the second category above. Royalties range from $\frac{1}{2}$ percent to 20 and more, although 5 percent of the net return is the most common. This is not as little as may seem at first glance, since today a corporation is considered to do well to earn a net return of 10 percent.

Is inventing worth the effort, despite such obstacles? "Certainly," says the genial Ayres who today owns his own yacht, is his own boss. "I feel certain there is, and always will be, opportunity for individuals despite the current team-research methods of many of today's big businesses. It's true that the wire paper clip, crimped bottle cap and other simple yet tremendously successful innovations may have already been invented, but many others are waiting. Consider the recent hula-hoop craze. I understand the originator made a million dollars from that thing, and it was utterly unpatentable!"

"What Does Everyone Need?"

Wally Ayres reiterates that the prospective inventor must ask himself "What is it that the people need?" In this connection he recently discovered that the sale of binoculars dropped off sharply for power greater than eight. It is physically impossible for the average person to hold a stronger glass in his hands without having the image "jiggle." Binoculars on the market today are the same as those invented 75 years ago. You guessed it . . . Ayres got busy and designed a gyroscopic stabilization system that permits use of higher

(Continued to page 310)

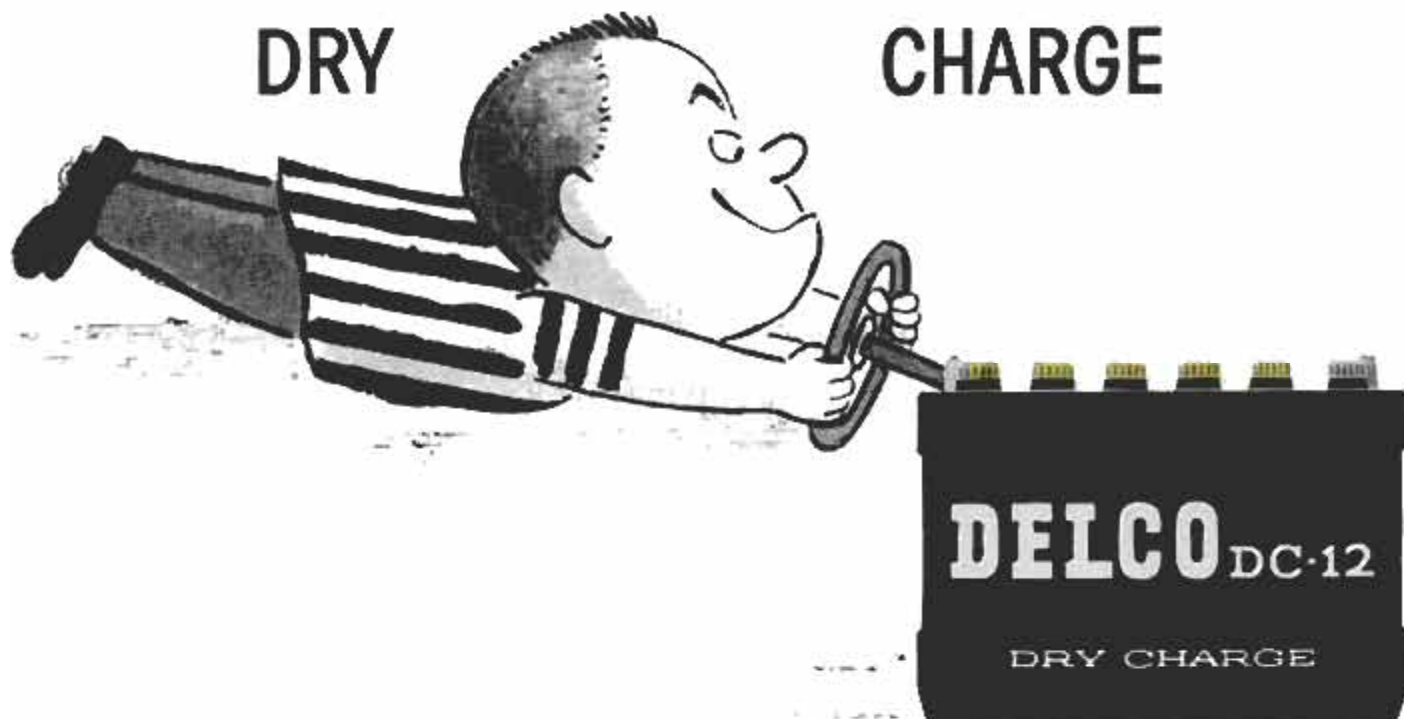
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It's a hard-working dry charge battery built to handle the extra demands of high compression engines and power equipment. Moreover, it's the only battery designed and manufactured by an automobile producer. These are important reasons why, when you replace, you should ask for a Delco DC-12—the 100% fresh battery that is factory installed on almost half of the new cars built.



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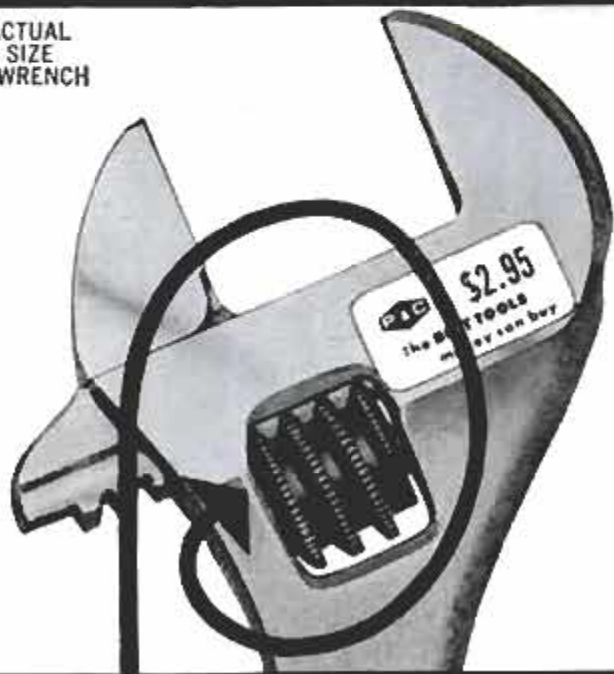
OCTOBER 1959

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THE ADJUSTABLE WRENCH THAT **NEVER SLIPS!**

ACTUAL
SIZE
8" WRENCH



Locking Feature is Automatic Ends Knuckle Skinning While Working

This is not just another adjustable wrench. The jaws on a P & C Clik-Stop can't work loose or creep open . . . ever. Gear teeth on bottom of knurl lock against immovable meshpoints when the wrench is in use. Yet the knurl adjusts easily to any setting.

Each Clik-Stop wrench is chrome plated, made of alloy steel, scientifically heat treated and guaranteed.

The Clik-Stop adjusts to any size opening and is available in 4" through 20" sizes at more than 14,000 stores.

You'll find the Clik-Stop adjustable wrench in hardware stores displaying the colorful blue and white P & C Merchandiser.



P & C **TOOL COMPANY**

Portland 22, Oregon

Subsidiary of Pendleton Tool Industries, Inc.
In Canada, Box 366, London, Ontario

powers. He has applied for a patent to protect his work on this project.

Again looking close to home, Wally analyzed the spinet-model electric organ which he enjoys playing in the main cabin of his boat. (No one has yet figured out how he got this big instrument inside without first disassembling it, since the cabin doors and windows are too small.) The inventor had taught himself to play this tone-wheel-type organ but felt he could do better if he were able to control separately the volumes of the upper and lower keyboards.

He asked the selling dealer to make this change for him. He was told it would be impossible. He then asked if he could borrow a circuit diagram of the organ. It was given to him.

Ayres Makes Some Changes

Ayres then proceeded to make the changes he wanted. He went a step farther, too. Displeased with even the concert model's 81 preset combinations ("Only about 60 per cent of which could be used in various combinations, since some of the tones were too low with others too loud"), he effected a second circuit improvement on his spinet organ which now permits him to use a full hundred such possible cross-combinations—all with ample volumes, easily controlled. The organ people asked how he did this. Ayres won't tell them.

"That's why I constantly advise young inventors to take nothing for granted," he observes in conclusion. "Work it out for yourself."

He cites as another example the time an employer assigned him the job of developing a circular movie theater film-projection system that would permit those in the audience to view moving pictures going on about them simultaneously in all directions just as they might observe real life objects outside.

It had been suggested that a cluster of 10 movie cameras be used to make the original life-as-is pictures, each pointing outward from the center and spaced 36 degrees apart. Wally was told to develop a device that would keep the films synchronized so they could be properly shown by 10 correspondingly mounted projectors inside the circular theater.

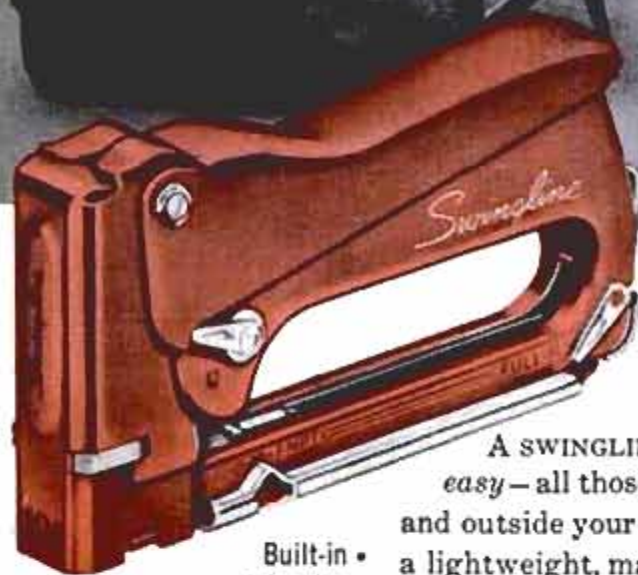
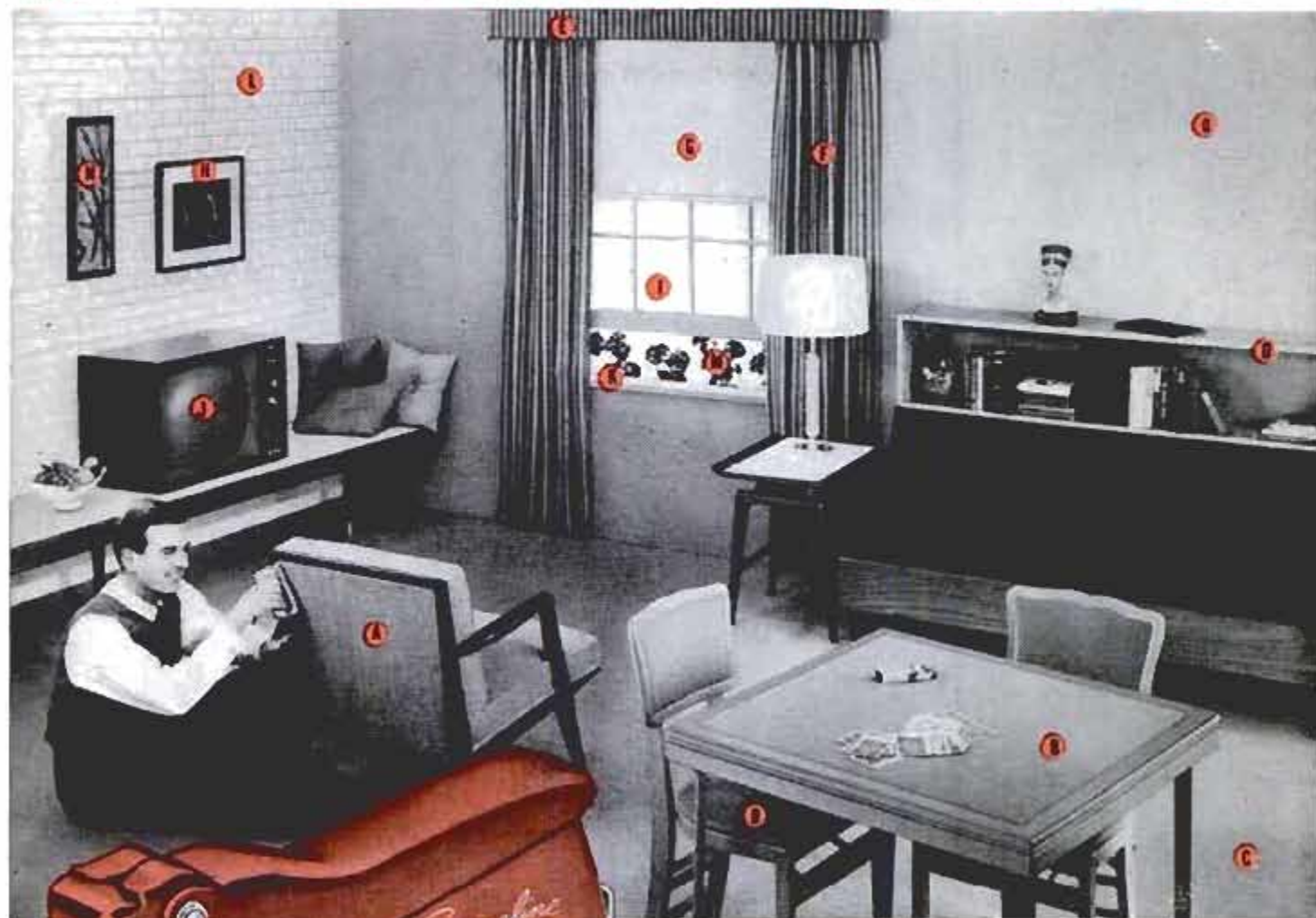
Synchronization Impossible

Ayres, however, pointed out this would be impossible since operation was intended 14 hours daily, for months on end, and the films were bound to break. This would hopelessly upset the synchronization.

One day, after giving the problem considerable thought, he walked into his boss's

(Continued to page 312)

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office with a soup ladle in hand. He invited his superior to hold the big spoon inverted over his head and observe how reflections from the four office walls could be viewed simultaneously as reflections on the outside of the soup ladle's curved surface. "My suggestion is that we both photograph and project a moving picture against a similar curved reflector, thereby beaming the scene in all directions at once," he said.

His boss was agreeable but two of the country's foremost optical experts promptly told Wally this couldn't be done. When horizontal objects were in focus the vertical plane objects would be out of focus, and vice versa, they warned. Nevertheless, starting once more with a crude working model (this one he built around the mirrored globe of a secondhand lawn ornament which he bought for \$3), Ayres finally built a cycloramic optical system and projecting device (U. S. Pat. Nos. 2,244,235 and 2,304,434) which preceded the popular Cinerama-type "wide screen" moving pictures we enjoy today, nearly a decade later.

"Both those 'experts' knew more about optics than I'll likely ever know—but they were both wrong on one little point," says the inventive genius in retrospect. "They were both convinced that a camera lens couldn't be stopped down sufficiently to insure sharp focus in both the horizontal and vertical planes, and still pass sufficient light to properly expose the film at the speed necessary for movies.

"Obviously, they both had accepted this belief as truth, without ever taking a camera in hand to make sure. And that one little point made them wrong." ★ ★ ★

Construction has begun on a generating plant near Healdsburg, Calif., which will tap live steam trapped underground to produce 12,500 kilowatts of electric power.

Do You Know This Old-Timer?

(answer to quiz, page 12)



1910 Overland

CASITE'S 3-ZONE engine protection

Guaranteed Protection for your car's power and performance

The technical staffs of Casite and its parent organization, Hastings Manufacturing Company, specialize in just one thing—the maintenance of automotive engines. Working together, these experienced scientists and engineers have utilized the latest chemical discoveries to improve car performance, combat engine deterioration and wear.

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IMPROVED CASITE . . . FOR THE FIRING ZONE

The nation's favorite "Tune-up in a can" now vastly improved with spark plug and carburetor cleaner and acid inhibitor. Recommended for use in the gas tank or carburetor air intake to free valves and rings and clean carburetor and spark plugs. Also for use in crankcase oil for quicker starting, less start-up wear and to break-in new or rebuilt engines. List price \$1.25.

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Valiant—the Stylish One

(Continued from page 116)

new small cars, offers power steering and power brakes.

The engine is a brand-new overhead-valve six of 171.0 cubic inches. Bore is 3.40 inches, stroke is 3.125 inches. Compression is 8.5 to 1.

Horsepower is not available at this time, but it is expected to be about 100. Gasoline economy is estimated at about 25 miles per gallon, although PM's tests will come in a later issue.

Unusual is the fact that the engine lays over on its right side 30 degrees to permit a lower hood line and give a lower center of gravity. The lower hood line means less frontal area, which means less wind resistance, more economy, better high-speed performance.

Because of the laid-over design, intake manifolding has been stretched out. Fuel distribution is improved by a long-branch manifold design (called a "bunch of bananas" by Valiant engineers), which permits intake-manifold tuning.

The carburetor is located on the high side of the engine. Plugs, fuel pump, distributor and oil filter are on the lower left side along the fender well and remain surprisingly easy to get at from above.

The transmission is tilted in the opposite direction to increase interior room and permit a lower hump in the front floor. The power train is familiarly called the "corkscrew" by engineers because of its design.

Outstanding among the Valiant innovations is the generator, which is an AC alternator. This is a new generating system and is expected to spread to all Chrysler cars in a year. It is smaller, lighter and simpler. It requires less maintenance. But best of all, it provides excellent charging while the engine is idling, unlike the DC generator which usually does not produce any current at idle.

No current regulator is needed because the alternator is self-regulating. The design does not require a cutout, because the silicon-diode rectifiers prohibit a reverse current flow. The only external component is a simple voltage regulator.

Optional in the Valiant is a three-speed automatic transmission with pushbuttons. It is the only three-speed automatic offered in the new small cars. With it, the car should have excellent stoplight getaway even though it is undoubtedly the heaviest of the three (no weight is available at this writing but the guess is that it weighs about 2500 pounds).

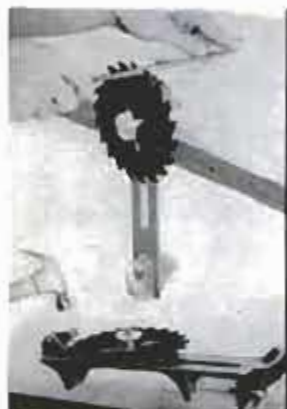
The handshift transmission has a floor-
(Continued to page 320)

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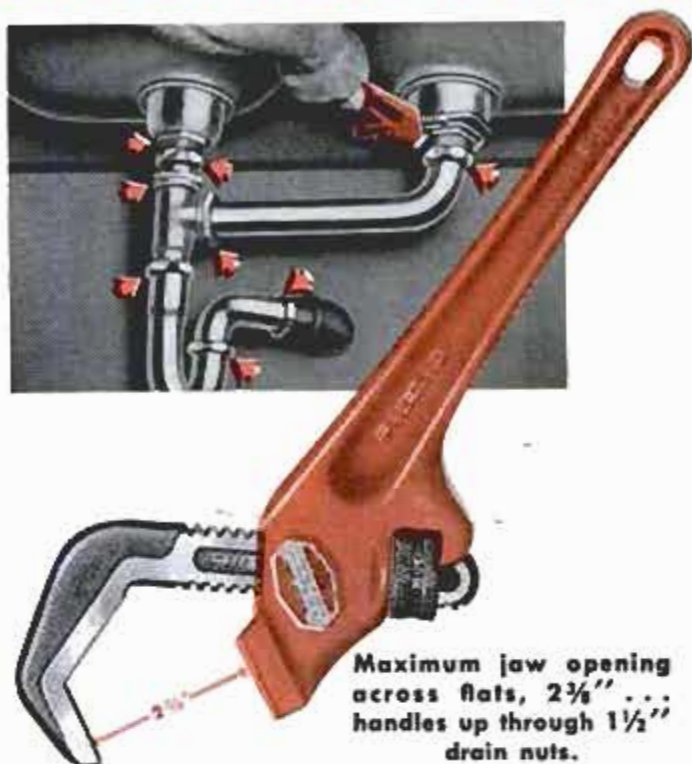
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Famous heavy-duty RIGID construction. Alloy malleable housing guaranteed against warping or breaking. Comfort-grip handle has handy hang-up hole.

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THE REVOLUTIONARY
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WITH THE ENGINE IN THE
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*You have your choice of two Corvairs—
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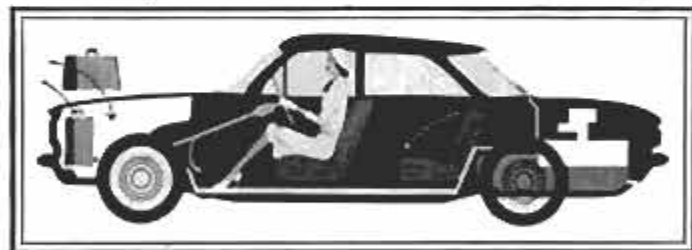
The only American car with an airplane-type horizontal engine!
The only American car with independent suspension at all 4 wheels!
The only American car with an air-cooled aluminum engine!

The rumors about this one were right—but they didn't go far enough. Because here, for the first time, is a truly compact, economical American car that retains the ride and 6-passenger comfort you're used to in a big one. The key to this small miracle: America's first and only *rear-mounted aluminum engine*—a revolutionary 6-cylinder power plant that combines compactly with the transmission and drive gears in one lightweight package. You'll get up to 30% more miles to a gallon and—because this engine is *air cooled*—you'll never have to fuss with antifreeze.

Corvair's size—almost 5 inches lower, 2½ feet shorter, 1,300 pounds lighter than conventional sedans—makes it a joy to jockey through traffic and park in tight spots. Yet its unique Unistrut Body by Fisher offers plenty of room for 6 broad-shouldered passengers. And, thanks to Corvair's rear engine, the floor is practically flat, front and rear, so there's generous foot room. Shifting engine weight to the rear also adds extra ground-gripping traction and gives better compact car

handling and braking. And with *independent suspension at all 4 wheels*, Corvair rivals much more costly cars in the poised, unruffled way it rides.

A price your budget will appreciate. Wonderfully practical as all these advances sound, you'll find the most practical thing about this new Corvair is its price. Make it a point to visit your Chevrolet dealer soon—and see what a wealth of engineering a modest amount of your money buys! . . . *Chevrolet Division of General Motors, Detroit 2, Michigan.*



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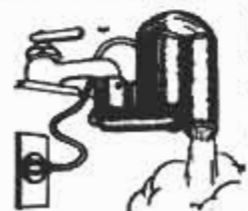
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(Page 16)



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Model MC-28
28" x 9" x 8"

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These famous Kennedy tool chests in brown, ripple baked enamel. See them at your dealer's NOW.

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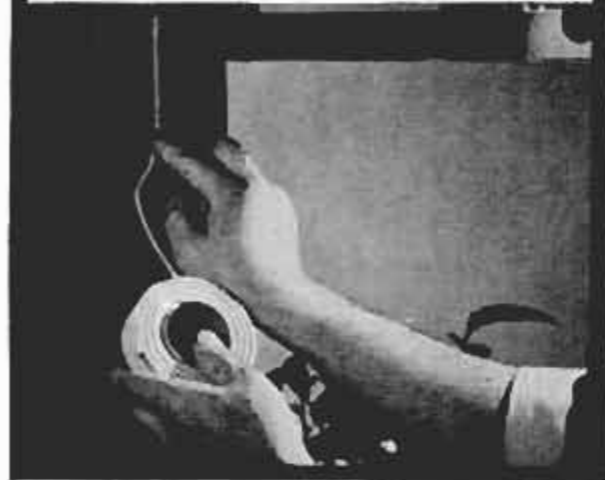


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mounted shift lever that goes through the gears like that hot knife in butter. It makes gear shifting what it should be—the most pleasant activity in driving.

Trunk room is abundant, largest of the group, due to the semifast back. The spare tire is carried flat in a floor well. The gas tank is forward of the well (under the floorpan, of course) and is kidney-shaped to fit neatly between the well and the rear-axle housing. It holds 13 gallons.

Head room and legroom are good. Being a front-engine design, there is a driveshaft hump in the floor, but it is narrow and low so the seats are comfortable all the way across. The dashboard has no horizontal shelf on top to reflect sunlight. It slopes sharply downward from the windshield, adding to the roominess of the front seat.

Instruments are mounted in two large circles beneath an overhanging shroud. All are gauges except the oil-pressure light.

Front-seat access is excellent as there is no wrap-around windshield to interfere. Seats, front and rear, are comfortably high and the rear floor has a deep stepdown with plenty of foot room.

Now for a few driving impressions based on a limited test:

The car is very responsive (the one I drove had handshift transmission plus power steering). It is as agile and nimble as many cars much smaller and lighter. Power steering is typically Chrysler with precise, light control at all times. Manual steering (which I did not try) is 23 to 1, fast by American standards.

Most pleasing of all is the sporty feel of the floor-mounted shift lever. The knob is right where your hand rests on it naturally. Running up and down the gears is a delight. These three new small cars all have floor-mounted shift levers that work beautifully and they may reverse the trend toward automatic transmissions for all cars.

Ride is excellent. The body is tight and rattlefree with no sheet-metal flutter. All three of these cars will add new standards to the American car market that will cause the big cars much concern.

Altogether, this Valiant (and it should not be called the Plymouth Valiant despite the label on the cover of this issue—it is simply the Valiant) is the small car that feels biggest, most luxurious and least like an economy car. There's no hint of austerity here. Items like door handles and window cranks are solid, heavy, rich-looking. They feel good to the touch. Dash styling is substantial. No penny-pinching is evident anywhere.

Whether it has too much muscle, too much weight, too much styling to satisfy the market remains to be seen. ★ ★ ★

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1960 Chrysler Features

(Continued from page 118)

tensive rustproofing process has been developed for these bodies.

Each body is given three metal-cleaning baths, seven anticorrosive dips, seven spraying operations and seven external paint finishing operations. Inside and outside, the metal is coated to prevent corrosion.

Ram manifolding, available on certain high-performance engines, increases power as much as 19 percent between 20 and 50 miles per hour. Sonic impulses traveling inside 30-inch-long manifold tubes create pressure pulses that ram outside air into the cylinders giving much greater power in the middle-speed ranges.

Optional on several models is a rectangular steering wheel that provides added room between the bottom of the wheel and the seat cushion. Steering with it is something like juggling a cigar box, but you soon get used to it.

Available again after an absence of a few years is the Chrysler record player that mounts below the dashboard. This new model plays regular 45-r.p.m. records so you can use the same records you play at home. The earlier version required specially cut disks.

Swivel seats have been improved. As you swing open the door, the seat pivots out automatically so it is ready for you to plunk into. When you close the door after getting out of the car, the seat swings itself back into place as you close the door. A flexible cable actuates the seat.

Instrument panels on the Chryslers and Imperials are illuminated by a no-glare light source called electroluminescent (EL) lighting. It is produced by sending electricity through phosphor. It is a low-level light, yet is extremely visible in the dark. The numerals and letters on the dials are backlit by flat, thin EL lamps that produce a blue-green light. Moving across the dial faces are pointers that glow in contrasting colors and are EL lamps themselves.

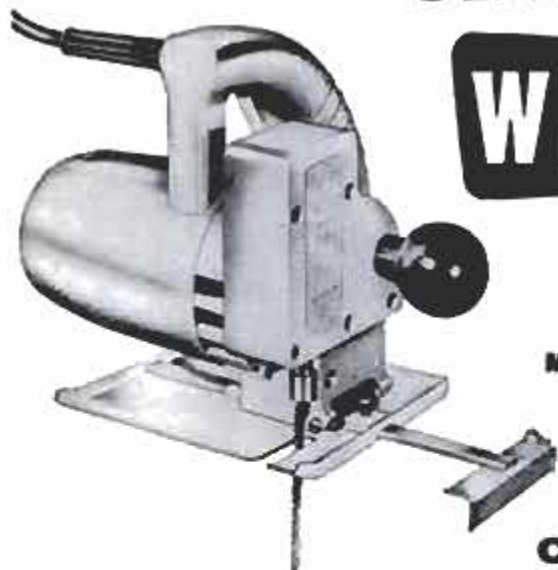
The new lamps are virtually unbreakable and give maximum light for over 10,000 hours. They never burn out suddenly, but simply get dimmer. At 40,000 hours, they produce about half of their original light intensity.

Also new at Chrysler is the overhead-valve six-cylinder engine that is used by Valiant, Plymouth and Dodge Dart. For details on this exciting new engine design turn to the article in this issue on the Valiant. ★ ★ ★

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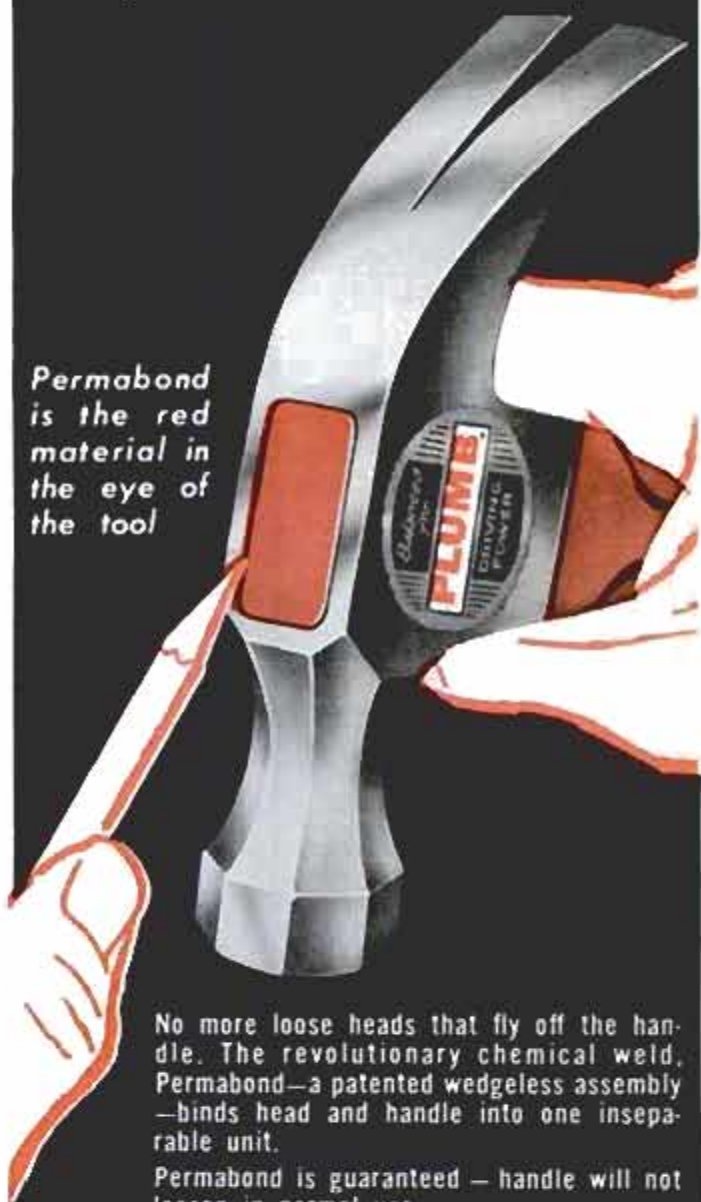
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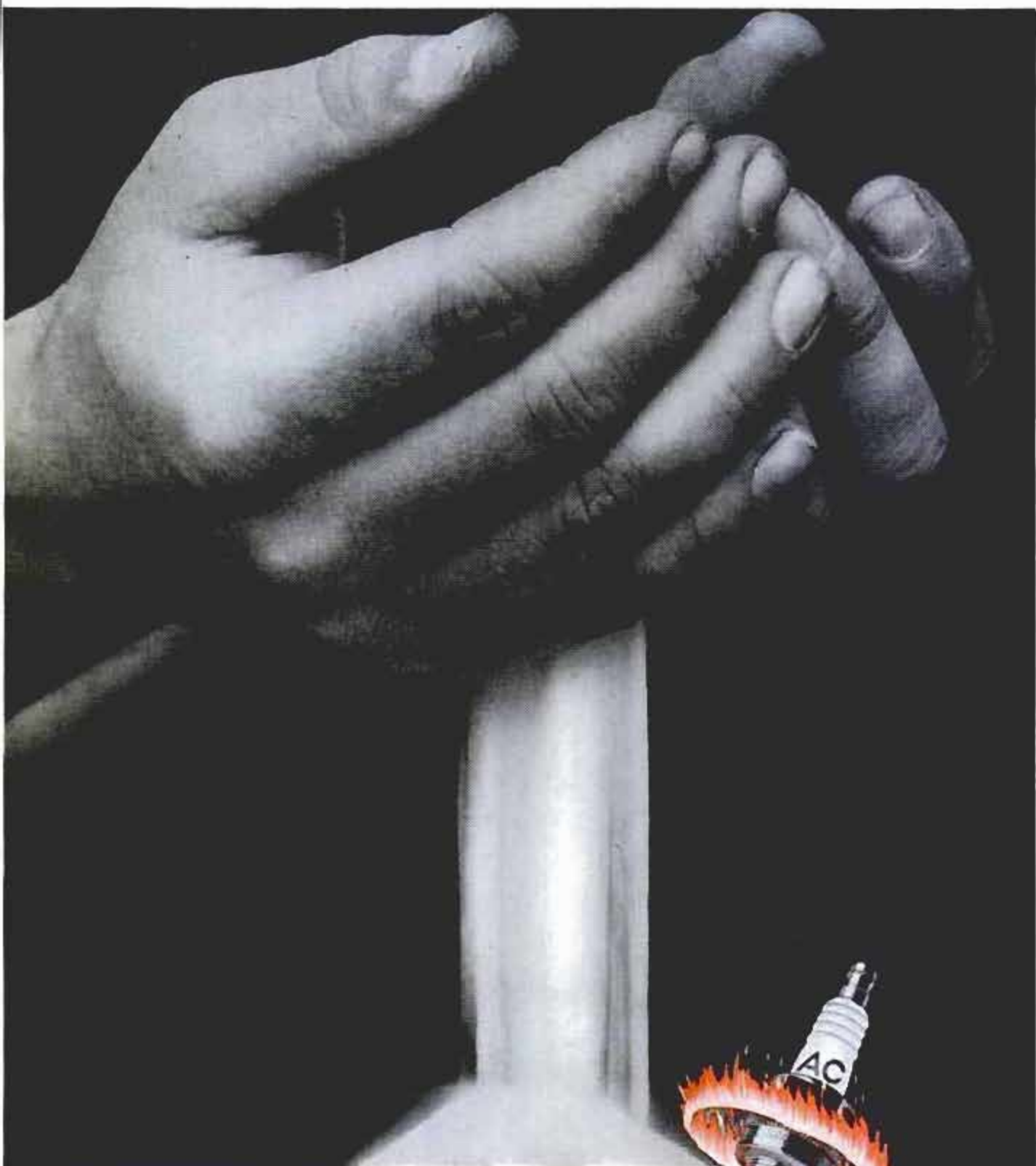
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ALUMINUM OXIDE—WHAT IT IS. The fine, white powder shown opposite is aluminum oxide. It is the basic material of the ruby, emerald and sapphire. It is made artificially from bauxite, the raw material of aluminum, and it is from this material that AC forms its spark plug insulators of gem-like hardness. AC pioneered and perfected the idea of aluminum oxide for spark plug insulators and uses it by the carload for the millions of AC Spark Plugs made for original equipment and replacement. Each carload is laboratory tested to rigid standards of quality and reliability.

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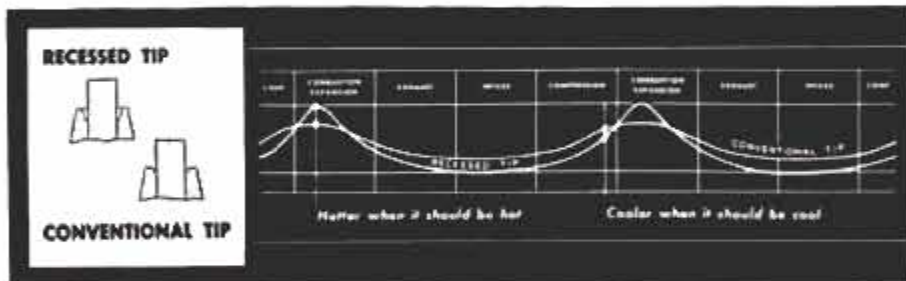
TESTING TO INSURE HIGHEST QUALITY. In the Kodak shadowgraph, at high magnification, insulators are given a highly accurate dimensional check. Further, samples of finished insulators are tested to withstand a 600 pound tensile pull that is well beyond the strength of other makes. There are weight tests, density checks and thermal expansion and conductivity tests. In total, some 116 reliability tests are given to AC Spark Plugs.

GEMS IN EVERY SENSE. The ruby, emerald and sapphire are nature-processed aluminum oxide. AC Spark Plug insulators are man-processed aluminum oxide. In the gems, a trace of impurity lends color. AC insulators are pure white and have no crystalline fracture pattern. They are truly gems—but yours at a price far less than a gem, and no more than that of ordinary spark plugs.



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KENDALL REFINING COMPANY
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Falcon—the Conventional One

(Continued from page 114)

than a standard design. The result is a quiet, bump-smoothing suspension that takes tar strips quieter than many bigger cars. Only a single lower arm is used instead of the usual A-frame. The coil spring is mounted above the upper control arm (which is of a conventional design) and extends upward almost as high as the hood-line.

Steering is by recirculating balls and is extremely light. It is slower than you might expect on such a small car, the over-all ratio being 27.0 to 1. Turn-circle diameter is 37.7 feet, curb to curb, very good for a 109.5-inch wheelbase.

As for the way the car feels when you drive, many of the points have already been discussed. The outstanding impression is the car's extreme quiet and complete lack of harshness. The 13-inch wheels seem to roll over irregularities without the slightest fuss. No wheel fight is apparent even under extreme conditions.

There is absolutely no sensation of smallness about the car once you sit behind the wheel. Every effort was made to have it ride and handle like a big car. This, perhaps, is the reason why it does not seem as nimble as you might expect for a car this size.

Seats are high. Visibility front and rear is excellent. The hood slopes down sharply and the road is visible.

Instruments are in excellent taste and simple and straightforward in styling. The wipers work in unison, clearing an uninterrupted section all the way across the glass.

PM did not run any economy test on the Falcon (that will come in a later issue when we can test a production model, not a handbuilt prototype), but gas economy is expected to be at least 25 miles per gallon.

Altogether this is a comfortable, pleasant machine. It may not be exciting in the design sense to the same degree that the Corvair is, but it is an excellent solution to the problem that America wants answered: How to get sensible transportation without too much unnecessary expense. ★ ★ ★

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AC-DC WELDER KIT #511 G.E. Generator. Makes 1250 Watts AC light plant and 200 amp. DC welder and battery charger. Includes all items listed in accessories kit. AC-DC generator & instr. \$38.50

Complete Pk. Accessories For welding & battery Chg. including Reactor coil arc stabilizer \$29.50. With 300 amp gen. \$45.50. With 200 amp gen. \$39.95. With 166-250 amp \$39.45

3-V Belt Pulley Kit fits all gen. has 2 ball bearings blocks. H. speed bearings 3-V-pulley, shaft 8" L & flex coupling \$17.50

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Bendix Vac. Air	15 cu. ft. M.	4700 RPM 10"		\$22.50 used \$12.95

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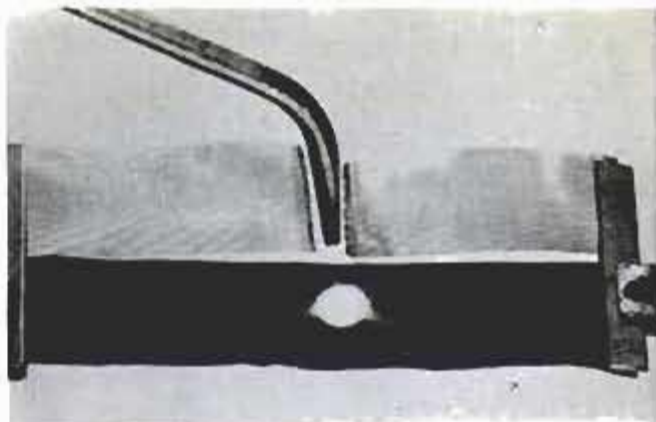
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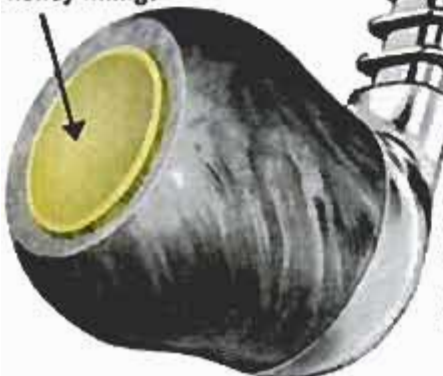
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U.S. Gauge Co. Model #4½AD-6977. 4½" dia. white face; cast iron case. Rear flange mounting. ½" pipe thread bottom connection. 6" O.D., 2½" deep. Postpaid. No. 566 \$5.95

OBERDORFER BRONZE CENTRIFUGAL PUMP

FOR: Fluid Transfer, Sprinkler Boost, Circulating Marine Coolant.

Designed for continuous, heavy service. Carbon bearings require no lubrication. For direct or belt-drive with speeds up to 3450 R.P.M. All bronze housing and impeller with ½" stainless steel shaft. Has ¾" inlet and outlet. Pump delivers maximum 4.25 gals. per min., 20 ft. head, at 3450 R.P.M. Requires up to ¼ H.P. Motor. Postpaid.



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NOW \$8.95 Each
Two for \$17.00

Regularly ~~\$26.50~~

BLOWER WITH MOTOR



24 volt electric motor driven blower has 1¼" dia. inlet, 1¾" dia. outlet. Can be used on 32 volt systems for even greater output. Dim.: 5" L. x 3¾" W. x 3½" H. Postpaid. No. 551 \$3.95

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80% Steel
When home repair troubles start to pile up . . . don't let it get you down . . . Get **PLASTIC STEEL** the permanent mender with a million uses around the home, garage or farm. **PLASTIC STEEL** fixes practically anything in minutes . . . saves you hundreds of dollars on repair bills.

As easy to use as modeling clay **PLASTIC STEEL** forms to any shape, bonds metals, wood, concrete or glass to itself or each other. Hardens to a steel-like strength in two hours. Can be filed, sanded or painted.

Repairs broken furniture, light fixtures, tools, toys, and appliances without special tools. No heat or pressure required. Seal leaking pipes, tanks, sinks, radiators and furnaces with **PLASTIC STEEL**. Holds under pressure. Won't shrink or expand.

PLASTIC STEEL fixes cracked motor blocks, torn fenders, leaking gas tanks, tractor parts, feed tanks and planting machinery. Unaffected by weather, won't corrode!

PLASTIC STEEL — in the black and yellow package — is available in three convenient home kits — \$1.98, \$1.89 and \$3.95. At all leading hardware stores.



WRITE FOR FREE HOME REPAIR BOOKLET
DEVCON CORPORATION
176 Endicott Street, Danvers, Mass.

Also available — **NEW Devcon**® Rubber and **Devcon**® Aluminum

GUNK-it-yourself!

Gunk® G.P. removes grease from engines or concrete floors; cleans paint brushes, power mowers, or machinery completely, economically, safely. It's ready-to-use, rinses off with water, won't clog drains. Quart size with handy "Squirt Spout" top speeds application. Insist on the *best* degreaser — the original "GUNK" at better automotive supply and hardware retailers everywhere. © REG. TRADE MARK.



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Serving the East, Southeast and far West

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PUSH-BUTTON GARDEN & LAWN PROTECTION

...with a Hayes spray gun

\$2.95 and up

Simply press down the button on a Hayes garden hose sprayer to start spraying garden chemicals. It's the quick, easy way to control insect pests that eat into leaves and flowers, sap plant vitality and damage your garden.

The Hayes mixes, proportions and applies spray materials automatically — using the water power from your garden hose. Hayes spray guns are approved by leading manufacturers of garden chemicals. At nursery and hardware dealers.

- **Hayes Garden Sprayers.** For insecticides, fungicides, crabgrass killers, fly, ant and termite control. In 1½, 3, 4, 6 and 12 gallon sizes.
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FREE! 16-pg. booklet on garden and lawn care. Write Dept. M. HAYES SPRAY GUN CO.—World's Largest Manufacturer of Garden Hose Sprayers—98 N. San Gabriel Blvd., Pasadena, Calif.

NOW! HOME CRAFTSMEN CAN OWN THIS PROFESSIONAL ARC WELDER

EASY TERMS
ONLY \$98.50
F. O. B.

Now you can own a Trindl full 125 amp Industrial Welder at a price far less than smaller machines. With a Trindl 125A you can weld metals up to ½ inch thick. Operates off either 110 or 220 volt line, properly wired, 16 heat stages from 20 to 125 amps. Make and repair anything of metal around the home, garage, farm or shop, like a professional. No previous experience or training needed. Full "do-it-yourself" instructions with each machine. Complete only \$98.50 f.o.b. factory, or write for details. Trindl manufactures a complete line of heavy duty welding machines. Dealer inquiries invited.

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STOP DRAFTS
 and **QUIET**
NOISY DOORS
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DRAFSTOP
WEATHERSTRIPPING

Weatherstripping

Door Bottom

Just cut to fit and nail on door jamb. Made of Poly-vinyl foam permanently bonded to clear grain wood molding. Non-absorbing foam can be painted, resists weather and wear. Stops dust, drafts and water, quiets door slam—blends with door frame. Complete kit only \$1.95 suggested retail.

Easy to install, fits snugly. Unique automatic spring action clears carpets and door mats. Made of durable silver satin anodized aluminum. Nylon stop-roller provides positive closing, draft-tight seal. Complete kit only \$2.95 suggested retail.

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QUALITY PRODUCTS FOR HOME AND INDUSTRY FOR OVER 20 YEARS

STAR HACK SAW BLADES

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Hack Saw Blades and Frames

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★ For better, faster metal cutting in your home work-shop or on the job, use the ★
 ★ Hack Saw Blades preferred by people who know — Star. "Handy-Pak" convenience, with card holding one or two blades, makes storing and handling easier and safer. Cards give valuable and helpful tips on metal cutting. 1493 ★

Star "Lever-Lock" Hack Saw Frames

- ★ automatically position and tension blade.
- ★ high-strength tempered steel back.
- ★ perfectly balanced to make cutting easier.

At all leading hardware stores—be sure and ask for STAR
 Send 10¢ in coin for information-filled booklet on metal cutting.

★ **CLEMSON BROS., INC.** Middletown N.Y., U.S.A. ★

New Homelite



Chain Saw



ONLY

\$153⁵⁰

COMPLETE, F. O. B. FACTORY

The new Homelite BUZ is the first direct-drive chain saw to give you quality performance at a price everyone can afford... only \$153.50 complete, F. O. B. Factory!

It cuts 16" trees in 16 seconds, fells trees up to 3 feet in diameter. Light 19 pounds (less bar and chain) are easy to handle on any cutting job or carry to a campsite. Famous Homelite short-stroke engine and diaphragm carbureter give you full cutting power in any position. Flush-cut handle lets you cut level with the ground.

Ask your Homelite dealer for a free demonstration.

Send 10¢ for informative 16-page booklet "A Man's Guide To Chain Saws."



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 A DIVISION OF TEXTRON
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Dress up your front door
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kwikset ENTRANCE HANDLE LOCKSET



Distinguished styling,
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Write for FREE catalog.

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SENSATIONAL
RECHARGEABLE LIFETIME
FLASHLIGHT BATTERY

CONTAINS OWN CHARGER

PLUG IN 110 VOLT AC, RECHARGE OVERNIGHT.
NO DAMAGE IF CHARGED LONGER. 10 RECHARGES
COST 1¢



FITS STANDARD LIGHT • REPLACES 2 DRY CELLS



Designed by
SONOTONE CORP.
FOR MILITARY USE
NOW AVAILABLE
TO YOU

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RECHARGEABLE

RUGGED BUILT:
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For every fastener application that calls for permanence, Southern makes a quality screw to fit the job. There are no better screws made than U.S.A.-made Southern Screws.

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Buy 'em by the box and save!

**SOLD THROUGH LEADING HARDWARE
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Wood Screws • Tapping
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GOVT. SURPLUS
EXCESS INVENTORY
BANKRUPT STOCK

SPECIAL OF THE MONTH!

GOVT. FIRE EXTINGUISHER

● Item #120. New Govt. genuine Phister pressurized carbon-tet extinguisher. Ideal for homes, garages, factories, offices, farms.

● Consists of 2 gal. steel cylinder with 1-gal. carbon-tet, pressurizing pump, pressurizing valve, pressure gauge, 24" hose, nozzle.

● To use simply open valve, compressed air throws powerful stream. No need to invert. Renew air pressure by operating pump or at filling station. Refill carbon-tet readily available. Size 25"x7"x7". Wt. 35 lbs. Govt cost \$89.50. SALE..... \$19.95 FOB



BATTERY HYDRAULIC PUMP

● Item #220. New electric hydraulic pump. Use on lift trucks, loaders, etc.

● Operates on 12 or 5 24-v DC, 1000 p.a.i. 1 to 3 rpm. Inlet and outlet ports, 3/4". 14 female threaded. Size 15"x7"x6". 35 lbs. Cost Govt. \$175. SALE..... \$16.95 FOB

115-V to 34-V TRANSFORMER

● Item #1522. New, Ideal for DC battery gear motor and DC winch shown in this ad.

● 115 volts to 34 volts at 85 amp. 8"x10"x6". Wt. 48 lbs. Cost \$45. SALE..... \$17.95 FOB



ELECTRICAL-ELECTRONIC BUYS

Typical surplus items in our '59 catalog:

- Radiation Geiger Tubes, cost \$20. \$.79
- 905 Cathode Ray Tubes, cost \$52.50 4.91
- G.E. Telechron Clock Timer..... 5.97
- Army HS-30 Head Sets, cost \$10.50 1.75
- AC Voltmeter, 0-150-v..... 3.55

FREE CATALOG Electronics, Power Tools, Binoculars, Hydraulics, Power Plants, Air Compressors and thousands of other items.

SURPLUS CENTER
LINCOLN, NEBR DEPT 812

12-V DC ROBOT CONTROL MOTOR

● Item #522. Powerful DC unit. Geared motor operates lever. Use to operate remote valves, throttles, levers, steering, doors, switches, open-close drapes, etc. Govt. cost \$47.50. SALE..... \$5.95 FOB

STANDARD DIAL PHONE

● Item #715. Modern dial phone. Use for extension to main line on private system. Work on any system. Govt. cost \$25. SALE..... \$9.95 Ppd



MIRACLE EPOXY LIQUID METAL

● Item #1725. Marvelous new Epoxy chemical metal bonds to any surface. Big writeup in LIFE and HEADERS DIGEST. Consists of 2 chemicals in self-measuring tubes. Squeeze out the correct amount of each, then apply. Dries steel-hard in 50 minutes. Can be sanded, drilled, tapped, etc. One ton strength. Bonds objects in glass, steel, brass, plastics, wood, aluminum, etc. Kit of 2 self-measuring tubes. \$3.95 Ppd.

FARMER-CONTRACTOR PUMP

● Item #200. 2 1/2" size, 16,500 gph. New ball-bearing centrifugal irrigation-contractor pump. 280 gpm. 45 ft. head. 6" pulley. 2 1/2" intake, 2" discharge. Wt. 37 lbs. Govt. cost \$98. SALE..... \$49.50 FOB



GOLF and PERSONNEL CAR MOTOR

● Item #573. Amazing buy! Use for golf cars, factory personnel cars.

● Powerful expensive ball-bearing gear reduction motor runs on any 6-v or 12-v storage battery. Powerful high torque. Shaft speed 150-300 rpm. Full instr. Easily reversible. Wt. 34 lbs. Size 7 1/2"x9"x14". Est. \$250. Govt. cost \$250. SALE..... \$19.46 FOB



STORAGE BATTERY WINCH

● Item #311. Powerful fully reversible ball-bearing gear reduction winch, 1000-2000 lb. pull. Use on 6 or 12-v battery. Holds 40' of 1/4" cable. For trucks, docks, boats. Govt. cost \$280. SALE..... \$46.71 FOB



AIR COMPRESSOR BARGAINS

● For painting, cleaning, tires, termite, Assemble own outfit.

● Item #450. Deluxe Kit. Compressor, tank, gauge, regulator, paint gun, relief valve, fittings, hose, instructions. List \$52. SALE..... \$43.91 FOB.

● Air Components. Compressor 1-cyl. \$19.35. Air tank, \$10.90. Regulator \$3.95. Pop-off \$1.95. Press. Gauge \$1.89. Finest Paint Gun \$11.50. Auto Switch \$4.75. All Ppd. in US.

HYDRAULIC EQUIPMENT BARGAINS

Savings to 80%. Build loaders, diggers, presses, etc. All brand new.

- Hydraulic Hand Pump & Cyl. \$29.87 FOB
- Control Valve, 1 or 2 way... 18.00 Ppd
- Tractor Pump 1000 psi... 45.50 Ppd
- 2-Way Cyl. 1 1/2" bore, 11" stroke 9.87 FOB

Get catalog, many items.

CONTRACTORS LEVEL-TRANSIT

● Item #804. Leading make, brand new latest model level-transit with tripod and case. Used by leading builders, schools, etc. 12-X scope, high accuracy. Use as level or transit. \$69.95 Ppd. Limited time offer.

● Many other instrument buys.



INVALID CHAIR—BOY'S AUTO MOTOR

● Item #576. Marvelous ball bearing battery (6 or 12 v.) electric gear reduction motor. Makes wonderful amazing electric drive for boy's auto, invalid's chair, etc. Also useful for factory electric lifts—trucks, etc.

● Gear ration 33 to 1. High torque. Finest precision gears. Fully reversible. Buy or the year. Size 15 1/2"x5 1/4". Wt. 27 lbs. Est. Govt. cost over \$295. SALE..... \$15.79 FOB



Sharpen All Circular Saws with QUICK-WAY

Model PG12 \$19.95 Postage-Paid

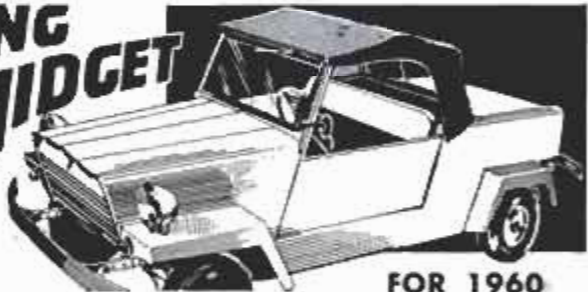
IDEAL for home-workshops; carpenters, contractors, QUICK-WAY unit precision sharpens, joints, gums and retools all circular saws to 12" diameter. Fits all bench, table and radial saws. Thousands of satisfied users. Send for Circular Make money sharpening saws. Order today \$19.95 postage-paid. Complete Unit with Grinder Wheel. No Extras to Buy. Patented.

FREE Saw Set with Initial Order

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FOR 1960

More aluminum, lighter weight, better performance, beautiful styling. Still Worlds Lowest Priced Car. Drive it for 75c a week. Rider Agents Wanted. If no dealer near you send 25c for 32 page picture book, full details, dealer price. Or send \$1 (refunded first order) for this and Service Manual plus Repair Manual and 15 5 x 7 photos of car and factory.

MIDGET MOTORS CORPORATION, ATHENS 1, OHIO

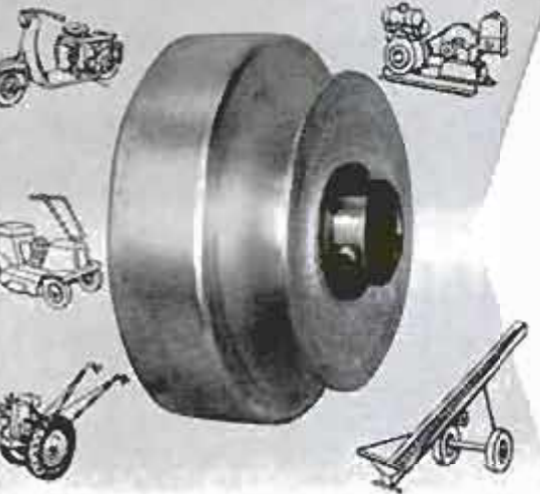
ATTENTION! Farmers, Hobbyists, Do-it-yourselfers! ADD THIS LOW-COST, AUTOMATIC STARTING CLUTCH TO YOUR GASOLINE-ENGINE DRIVES

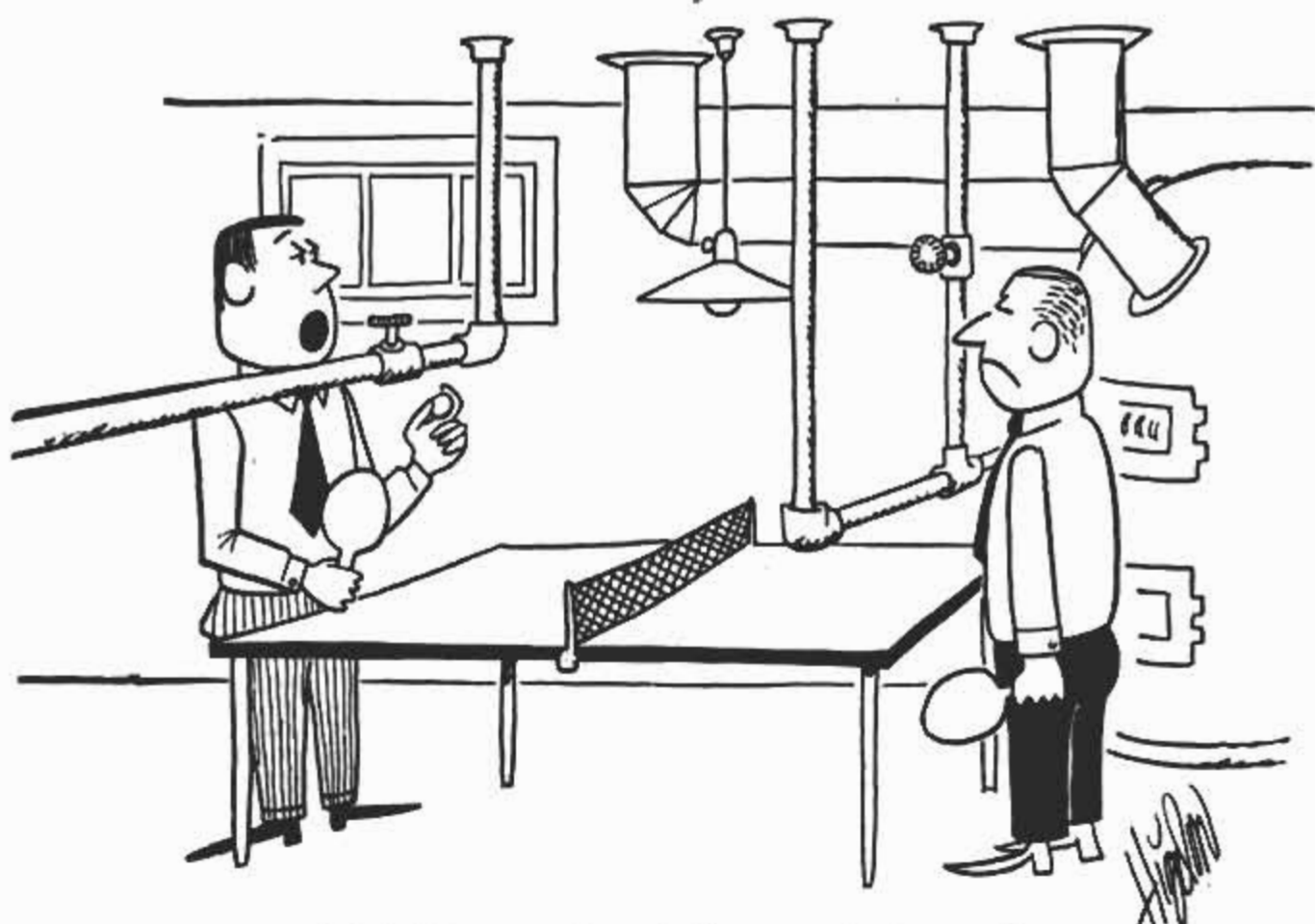
Permits instant, easy engine starts, even in cold weather. Stops wear and equipment damage caused by overloads.

Here's a safety and convenience feature anyone can install on pumps, compressors, sprayers, mowers, and other engine- or motor-powered equipment. Automatic clutch disengages the drive when your engine is stopped or throttled low. No-load starts are fast and easy. Centrifugal clutch engages automatically at proper engine speed. You can control engagement and release with the gas throttle. Installs easily—just slip over drive shaft and tighten setscrew. Drive pulley is machined right into clutch housing. Write for free booklets Fairbanks, Morse & Co., Magneto Division, Beloit, Wisconsin.

FAIRBANKS-MORSE
A name worth remembering when you want the BEST

Six models for 1 to 10 hp engines, 3 hp motors. Standard A-B pulley-groove. Engagement speeds, 1450 to 3100 rpm.





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More cutting power ✓
for 1/4" electric drills

Irwin Speedbor "88"
most revolutionary bit in years

➔ Irwin's Exclusive Hollow Ground Point and spade-type cutters bore faster, deeper, cleaner with less power. Try the Speedbor "88" in your small 1/4" electric drill or drill press and see. Get smooth, effortless cutting action in hard or soft woods, plaster, plywood, plastics — even hardrock maple! Forged in one piece from solid bar of high carbon steel, hardened full length to stay sharp. And remember . . . the hollow ground point is exclusive with Irwin's Speedbor "88". Buy individual sizes or sets from your independent hardware dealer.

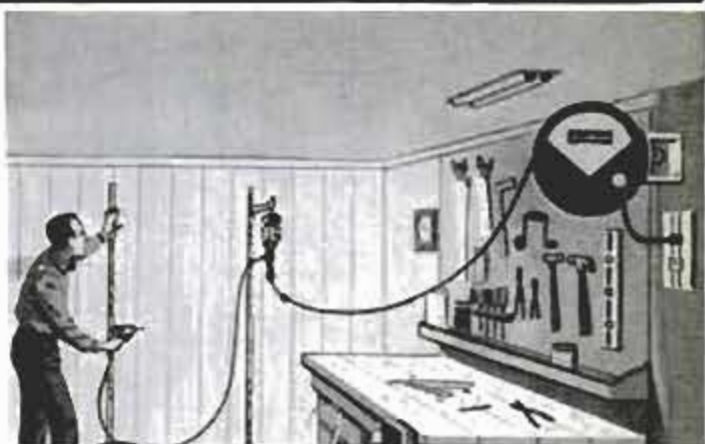
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when and where
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AUTOMATICALLY!

Modern, convenient • 20-foot cord pulls out to any desired length, locks, retracts into case automatically • phenolic pistol grip handle has built-in electric outlet for power tools and appliances • mounts easily on wall or ceiling.

New HANDY-LITE REEL

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Available at all Hardware and Department Stores

DC JET GENERATOR ARC WELDING KIT Complete with GE Type CM-77 Generator (30 volts D.C., 400 Amp., 3000 RPM up; ampere rating is for continuous duty, intermittent amperage is 500 to 600 amps.), also 2 rheostats, 1 voltage regulator, 1 voltmeter, 1 electrode holder, 2 ea. 25 ft. lengths No. 0 welding cable, 1 welder's mask, 1 toggle switch, 10 lb. vacuum packed 1/8 in. welding rods, pair welder's gloves & spline coupling. All units guaranteed pre-tested. Wt. 110 lbs. Approx. GOVT. COST \$700. All items, now only **\$64.50**.

*G.E. Generator noted above can be purchased separately. Makes deluxe heavy-duty welder comparable to the finest commercial welders available. Wt. 90 lbs. Approximate GOVT. COST \$400. Gen. alone — **\$49.50**.

ECLIPSE ARC WELDING KIT with built-in internal cooling fan. Complete with P-2 Generator (200-250 AMP. rating, continuous duty; 24 to 32 volt output; speed 5000 RPM), also voltage regulator, ammeter, shunt, voltmeter, rheostat, switch, electrode holder, welder's mask, 50 ft. heavy-duty welding cable, pair welder's gloves, 10 lb. vacuum packed 1/8 in. welding rod and wiring diagram. All units guaranteed pre-tested. Weight 60 lbs. Approx. GOVT. COST \$450. All items, now only **\$47.50**.

*P-2 Generator noted above can be purchased separately. One of finest D.C. gen. for arc welding purposes. Wt. 50 lbs. Approx. GOVT. COST \$300. Gen. alone — **\$29.50**.

OXYGEN BREATHING SUPPLY UNIT. Designed for the Air Force for high altitude flying, also ideal for medical purposes. Compact, portable; could save your life in the event of a heart or asthma attack. Complete with steel oxygen bottle, cylinder pressure gauge, demand type reg., oxygen flow blinker, 36" hose and face mask. Shpg. wt. 20 lbs. Tested, checked and filled. Approx. GOVT. COST \$250. NEW. **\$39.95**.

SENSITIVE ALTIMETER in 20 ft. increments, 0 to 35,000 ft. (inches of Mercury). Famous Pioneer. Tested & inspected in our own instrument lab. Guaranteed perfect. Approx. GOVT. COST \$150. Wt. 2 lbs. **\$14.50**.

SOUTH WIND HEATER & ACCESSORIES
Mfd. for govt. antarctic expeditions for jeeps and half-tracks. Heating unit puts out over 20,000 B.T.U.'s. Burns any type gas, 6 volt system. Fuel consumption extremely low, 1 gal. per 8 hrs. Terrific for trucks, loads, tractors... farms, warehouses, ranches, boat houses, cabins, etc. Complete with service & installation manuals and over 360 components. Approx. GOVT. COST \$550. Shpg. wt. 120 lbs. gross. NEW. **\$39.95**. Limited quantity.

WELDING CABLE DOUBLE-O, heavy-duty, neoprene jacket, fiberglass insulation. Will handle 400 amps. or better. NEW. Approx. GOVT. COST \$40. 50 ft. lengths — **\$12.50**... 100 ft. lengths — **\$24.00**.

140-1 REDUCTION GEAR For beaching boats, winches, hoists. Ideal for motor in golf or boy's electric car. DC motor & clutch. Easily reversible wiring diagram furnished. Hi torque, 1st speed. Runs on 6-12 or 24 V. Wt. 65 lbs. gross. Approx. GOVT. COST \$300. Like NEW, **\$12.00**. Matched splined gear for above — **\$3.00** ea.
*225-1 Reduction Gear — **\$13.50**

BENDIX GEROTOR PUMP & MOTOR — NEW!
Use wherever fluid pumping required. Excellent for hydraulic installations. Has 3/4" pipe connections, built-in relief valve adjustable up to 1500 lbs. Max. cap. 6 GPM. 1 1/2 H.P., 24 V. motor. Use on 12 to 36 V. Approx. GOVT. COST \$350. **\$8.75**.

ELECTRIC PUMP WITH CONTROL UNIT
Runs on 12 or 24 V. Centrifugal type. Draws 5.2 AMPS. Has built-in removable filtering screen. Great for bilge, circulating or sump pump... ball tanks, etc. Pumps 500 GPH. Complete with on and off switch rheostat, 2 speeds (hi & lo). Mfd. by Ingersoll-Rand. Shpg. Wt. 7 lbs. Approx. GOVT. COST \$195. NEW **\$8.95**.

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CHROME PLATED ADJUSTABLE TUBULAR HACK SAW

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MINEOLA, N. Y. — SEE YOUR LOCAL STORE

Frantz Miracle ENGINE GUARD
PROTECTS ENGINE & BEARINGS

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\$8.50

FRANTZ MIRACLE PRODUCTS CORP.
YOSEMITE BLVD. MODESTO, CALIF.

STOP that **DRAWER** from **STICKING**
Easy—Quick—Forever!

WITH **Roll-eez** **ROLLER BEARINGS FOR WOODEN DRAWERS**

Eliminates friction of wood-against-wood, keeps drawers in proper alignment. Makes wooden drawers work like magic — *even in hot, humid weather!* Made with improved NYLON rollers mounted on steel frames. Each drawer set includes simple instructions and nails. Anyone can apply. Ideal for furniture as well as built-ins. Used by cabinetmakers to provide lasting convenience in homes of every price range.

49¢ SET FOR ONE DRAWER

At Hardware, Lumber and Building Supply Stores.

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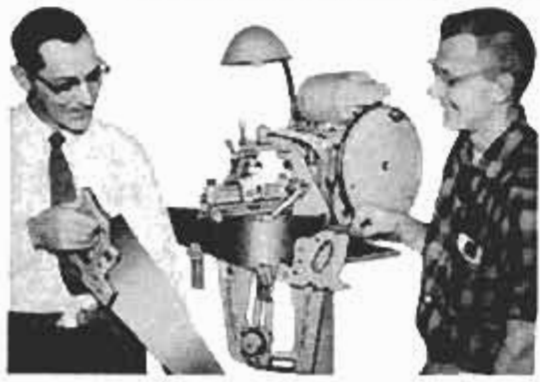
Building? Remodeling? Insist on Roll-eez for Better Drawer Action — Lowest Cost!

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Make from \$3 to \$6 an hour spare time or start a full time business with the

FOLEY SAW FILER



Here is a steady repeat CASH business you can start at home. No experience is necessary to turn out perfect cutting saws. With the new 1959 Foley Saw Filer you can file hand, band and both "combination" and cross-cut circular saws. Easy to operate — no eyestrain. You will find you can make from \$3 to \$6 an hour — \$20 to \$30 a week in spare time as a starter.

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"MONEY MAKING FACTS" shows you how to get plenty of saws to file. Time payments if desired. Send coupon today — no salesman will call.

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75 Mounted Wheels & Miniature Cutters. Regular \$11.00 value **\$4.50** P.P.
For cutting and grinding on paid wood, metal or plastic. Includes 25 mtd. wheels and points on 3/32" shanks; 24 miniature cutters on 3/32" shanks; 25 short shank min. cutters. Will fit all electric drills and hand grinders.

FLEXIBLE SHAFT—ONLY \$6.50 P.P.
Fits all electric drills & hand power tools 3/32" long. Oilite bearings. Core of specially wound, high carbon steel wire in flexible steel casing. Will accommodate tool shafts up to 1/4" dia. For lathes, electric drills, etc.

2 DRUM SANDERS With 12 bands in Assorted Grits. 1/2" dia. x 1" long on 1/4" arbor with **\$1.50 P.P.**
One drum, 1" dia. x 1" long on 1/4" arbor with 6 extra sleeves **\$1.00 P.P.**

2 Carbon Steel Wood Bits for Brace. Assorted sizes. 3/32" to 5/8", for drilling on wood or metal. **\$1.75 P.P.**
18 Assorted Drills. From 1/16" to 1/2" high speed steel and carbon. Only **\$3.95 P.P.**

10 HIGH SPEED STEEL REAMERS—Straight and Taper Shanks— all brand new and in excellent condition. Reg. \$25.00 **\$4.50** value. 10 for **\$45.00**

2 Circular saws. On 2 Mandrels—all at one low price. 1" diameter saws on 1/4" Mandrels. For cutting wood, plastic or soft metals. **\$1.50 P.P.**
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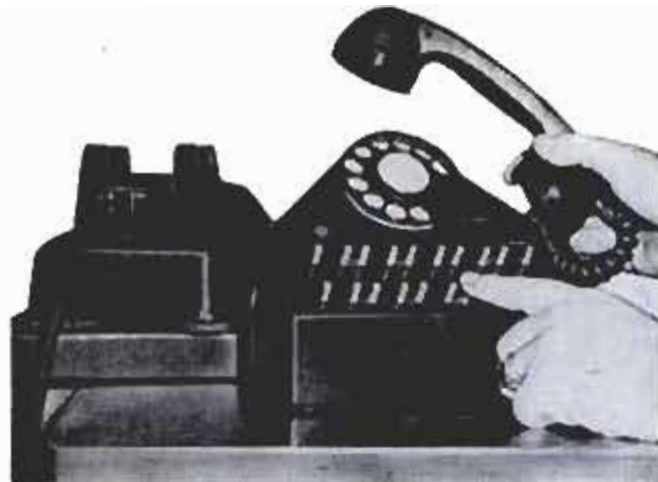
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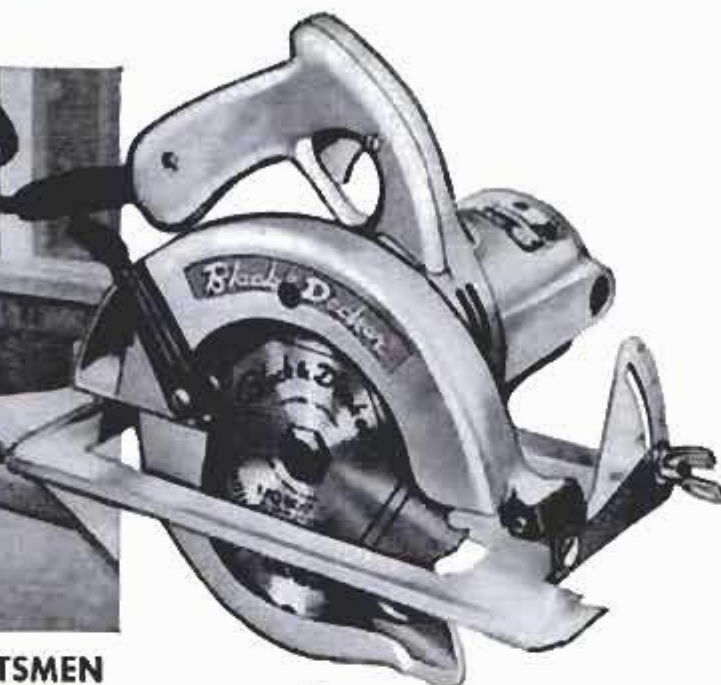
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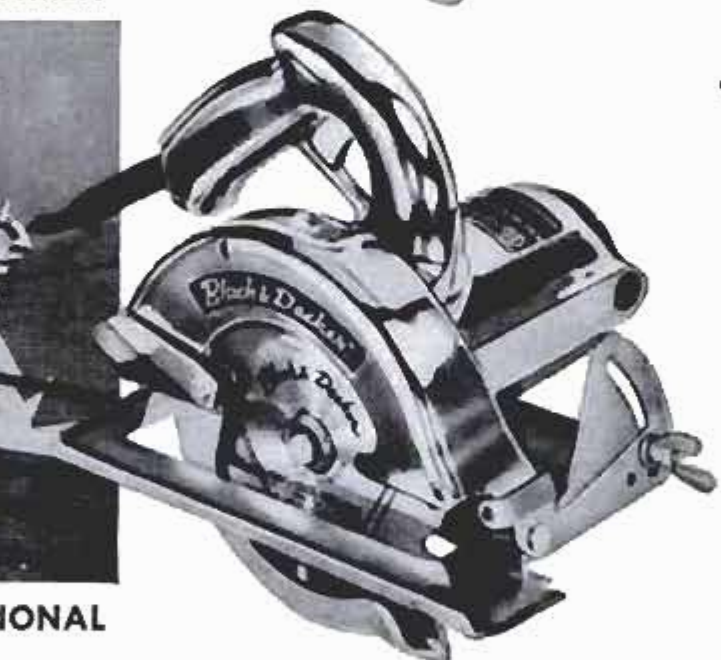
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